OPERATING INSTRUCTIONS

deTem4 Core IP69K

Safety multibeam sensor

SICK
Sensor Intelligence.

Described product

deTem4 Core IP69K

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

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1 About this document

1.1 Function of this document

These operating instructions contain the information needed during the life cycle of the safety multibeam sensor.

Operating instructions of the safety multibeam sensor must be made available to all people who work with the device.

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

1.2 Scope

Product

This document applies to the following products:

- Product code: deTem4 Core IP69K
- “Operating instructions” type label entry: 8021557

Document identification

Document part number:

- This document: 8021559
- Available language versions of this document: 8021557

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

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 47 see "Accessories", page 53
Installers	"Mounting", page 27
Electricians	"Electrical installation", page 32
Safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application)	"Project planning", page 15 "Commissioning", page 34 "Technical data", page 47 "Checklist for initial commissioning and commissioning", page 60
Operators	"Operation", page 39 "Troubleshooting", page 43
Maintenance personnel	"Maintenance", page 40 "Troubleshooting", page 43

1.4 Additional information

www.sick.com

The following information is available on the Internet:

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

1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

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

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

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

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

DANGER
Improper work on the product

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

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

2.2 Intended use

The deTem4 Core IP69K safety multibeam sensor is an electro-sensitive protective device (ESPE) and is suitable for the following applications:

- Single-sided access protection
- Multi-sided access protection

The product may be used in safety functions.

The safety multibeam sensor fulfills the requirements of the IP69K enclosure rating.

The deTem4 Core IP69K safety multibeam sensor 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 deTem4 Core IP69K safety multibeam sensor shall void any warranty provided by SICK AG; furthermore, SICK AG shall not accept any responsibility or liability for any resulting damage and consequential damage.

2.3 Improper use

The safety multibeam sensor works as an indirect protective measure and cannot provide protection from pieces thrown from the application nor from emitted radiation. Transparent objects are not detected.

Among others, the deTem4 Core IP69K safety multibeam sensor 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 protective device must be planned in, installed, connected, commissioned, and serviced by qualified safety personnel only.

Project planning

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

Mounting, electrical installation and commissioning

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

Operation and maintenance

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

3 Product description

3.1 Setup and function

Overview

The deTem4 Core IP69K safety multibeam sensor is an electro-sensitive protective device (ESPE) consisting of a sender and receiver.

Parallel infrared light beams between the sender and receiver protect the hazardous area. When one or more light beams are completely interrupted, the safety multibeam sensor 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.

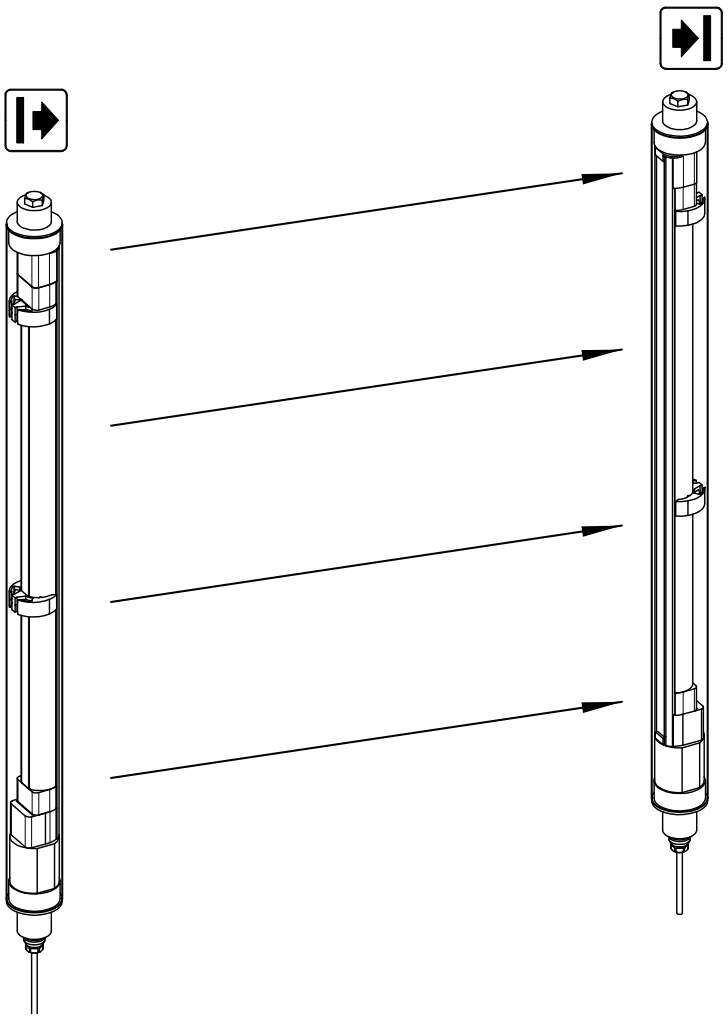


Figure 1: Sender and receiver

Beam separation and number of beams

The beam separation is the distance between two adjacent light beams, measured from the center of one beam to the center of the next.

The beam separation and number of beams depend on the device variant.

Scanning range

The scanning range is the maximum dimension of the light path between sender and receiver.

The scanning range is reduced by using deflector mirrors.

Further topics

- "Data sheet", page 47
- "Deflector mirrors", page 55

3.2 Product characteristics

3.2.1 Device overview

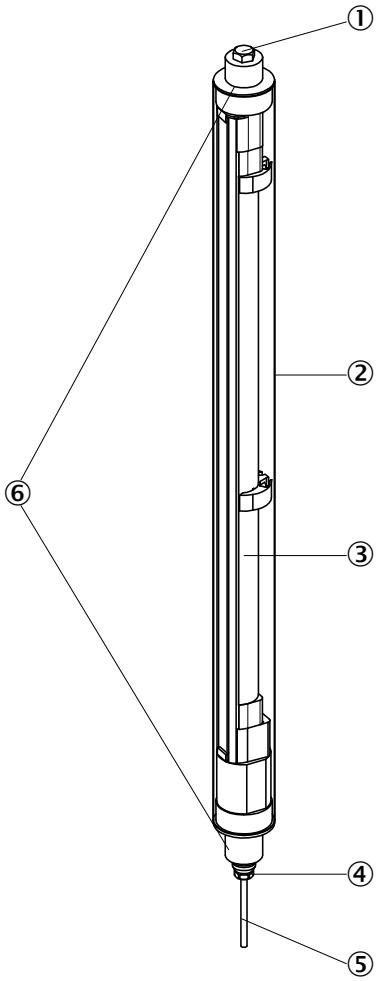


Figure 2: Device overview

① Pressure equalizing element (aeration and ventilation membrane)
② IP 69K protective housing
③ Sender or receiver
④ Cable gland
⑤ Cable with flying leads
⑥ End caps

3.2.2 IP 69K protective housing

The safety multibeam sensor is mounted in an IP69K protective housing.

The protective housing is well resistant to standard cleaning agents, high-pressure cleaners with a water pressure up to 100 bar, and water temperatures up to 80° C. A pressure equalizing element (aeration and ventilation membrane) prevents plastic tubes being covered in condensation and liquids from entering the housing.

3.2.3 Status indicators

Overview

The sender and receiver LEDs indicate the operational status of the safety multibeam sensor.

Sender indicators

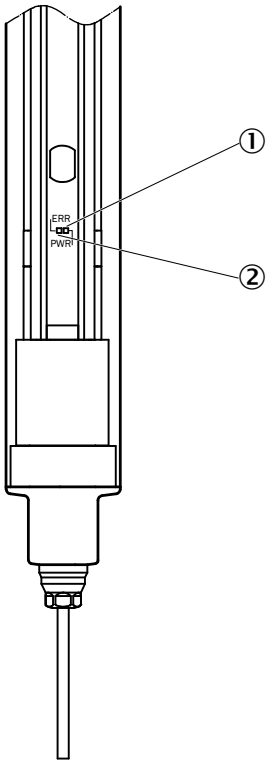


Figure 3: Sender indicators

Two light emitting diodes on the sender indicate the operational status:

Position	LED color	Display	Labeling
❶	Yellow	Status indicator	PWR
❷	Red	Fault indicator	ERR

Receiver indicators

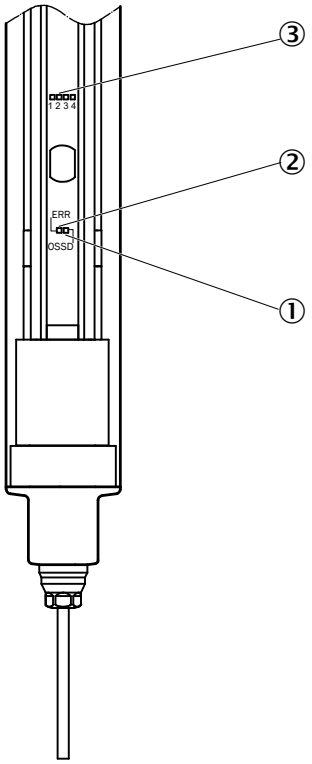


Figure 4: Receiver indicators

Six light emitting diodes on the receiver indicate the operational status:

Position	LED color	Display	Labeling
❶	Red/green	OSSD status	OSSD
❷	Red	Fault indication	ERR
❸	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 43

3.3 Example applications

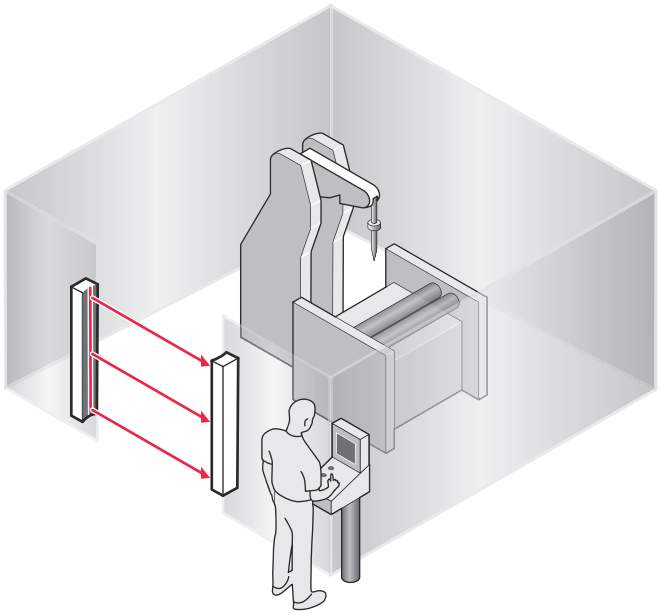


Figure 5: Single-sided access protection

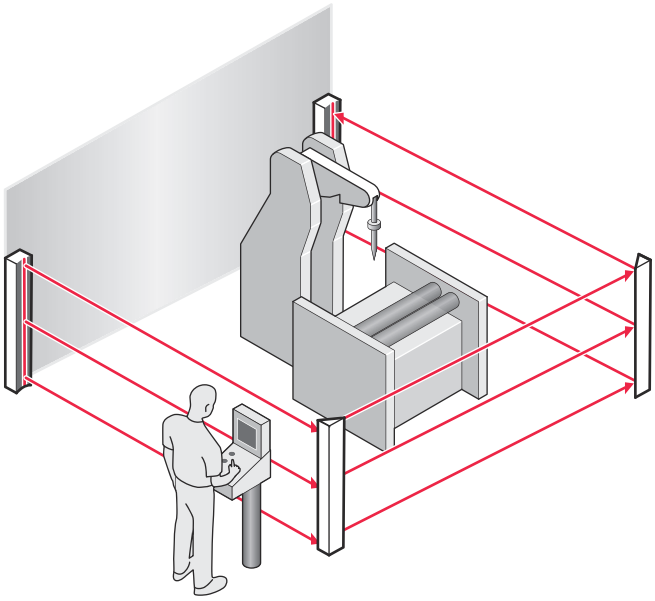


Figure 6: Multi-sided access protection

4 Project planning

4.1 Manufacturer of the machine

DANGER
Hazard due to lack of effectiveness of the protective device

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

- Use of the safety multibeam sensor requires a risk assessment. 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 multibeam sensor with components from other safety multibeam sensor.
- Apart from the procedures described in this document, the components of the safety multibeam sensor must not be opened.
- The components of the safety multibeam sensor must not be tampered with or changed.
- Improper repair of the protective device can lead to a loss of the protective function. Do not carry out any repairs on the device components.

4.2 Operating entity 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 multibeam sensor in the machine controller and changes to the mechanical mounting of the safety multibeam sensor necessitate a new risk assessment. The results of this risk assessment may require the entity operating the machine to meet the obligations of a manufacturer.
- Apart from the procedures described in this document, the components of the safety multibeam sensor must not be opened.
- The components of the safety multibeam sensor must not be tampered with or changed.
- Improper repair of the protective device can lead to a loss of the protective function. Do not carry out any repairs on the device components.

4.3 Design

Overview

This chapter contains important information about the design.

Important information

DANGER

Hazard due to lack of effectiveness of the protective device

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

- ▶ Make sure that the following design requirements are met so that the safety multibeam sensor 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.
  - Ensure that nobody can pass under the lowest light beam, pass over the highest light beam, get between two light beams, or pass by the side of the protective device.
  - If people can stay between the protective device and the hazardous point without being detected, check if additional protective measures (e.g., restart interlock) are required.

Further topics

- "Mounting", page 27

4.3.1 Minimum distance from the hazardous point

A minimum distance must be maintained between the safety multibeam sensor and the hazardous point. This distance is required to prevent a person or part of the body from reaching the hazardous area before the dangerous state of the machine state has completed.

Calculating the minimum distance according to ISO 13855

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

If the minimum distance is calculated according to ISO 13855, 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
- Approach speed of personnel
- Type of approach: orthogonal (at right angles)
- 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 (CFR29) Part 1910.217

b) Standards: ANSI B11.19

Complementary information

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

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

Further topics

- "Technical data", page 47

4.3.1.1 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 multibeam sensor is integrated.
- ▶ When mounting the safety multibeam sensor, observe the minimum distance.

Approach

The example shows the calculation of the minimum distance for an orthogonal (at right angles) approach to the safety multibeam sensor. Depending on the application and the ambient conditions, a different calculation may be required (e.g., at a different angle to the direction of approach or an indirect approach).

1. Calculate S using the following formula:
   S = 1,600 mm/s × T + C
   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)
   - C = supplement in accordance with ISO 13855:
     - If it is not possible to reach over the protective device: C = 850 mm
     - If it is possible to reach over the protective device, the value C_{RO} must be used for C in accordance with ISO 13855, provided that this is greater than 850 mm: C ≥ 850 mm and C ≥ C_{RO}

   The reach/approach speed is already included in the formula.

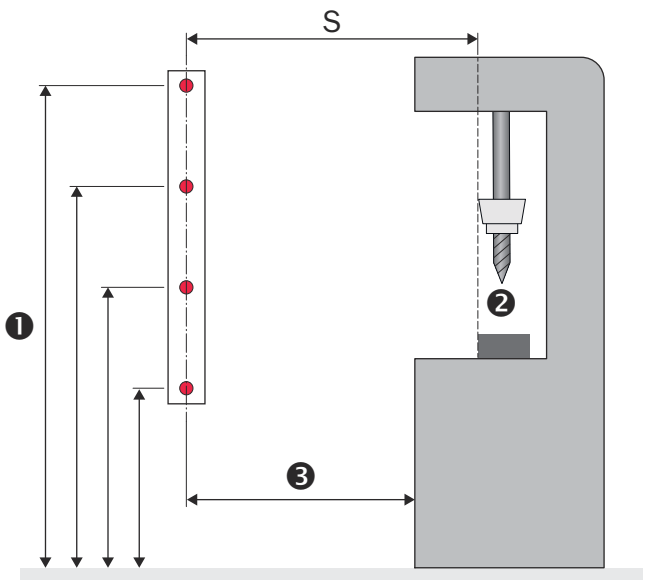


Figure 7: Minimum distance from the hazardous point

❶ Height of the light beams above ground

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 = 20 ms

T = 290 ms + 20 ms = 310 ms = 0.31 s

S = 1,600 mm/s × 0.31 s + 850 mm = 1,346 mm

4.3.2 Minimum distance from reflective surfaces

Overview

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

Therefore, all reflective surfaces and objects (e.g., material bins, machine table, etc.) must maintain a minimum distance (a) from the light beams. This minimum distance (a) must be maintained on all sides of the light beams. This applies in horizontal, vertical and diagonal directions as well as at the end of the device. 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.

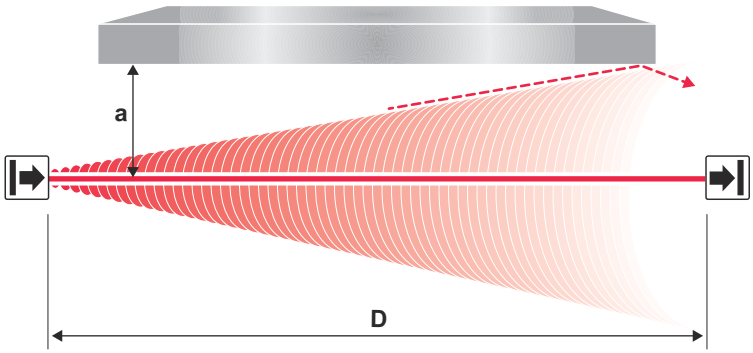


Figure 8: Minimum distance from reflective surfaces

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, they remain undetected.

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

Determining minimum distance to 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:

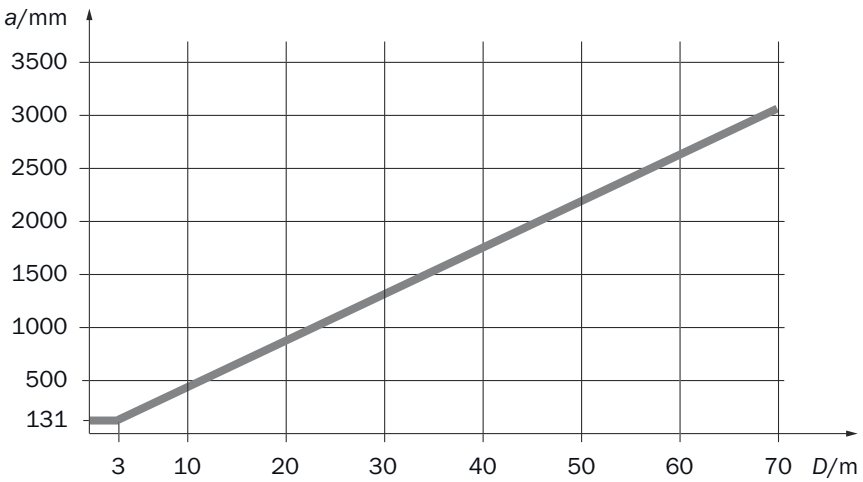


Figure 9: Graph, minimum distance from reflective surfaces

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

Distance between sender and receiver D in m	Calculating the minimum distance from reflective surfaces a in mm
D ≤ 3 m	a = 131 mm
D > 3 m	a = tan (2.5 °) × 1,000 mm/m × D = 43.66 × 1 mm/m × D

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

Overview

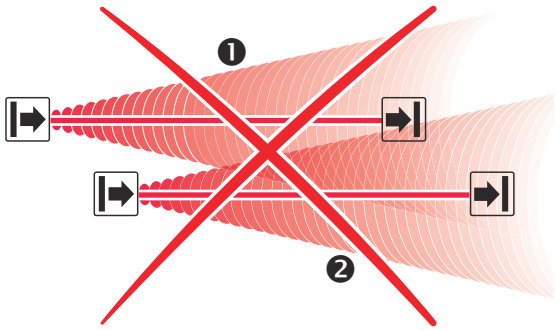


Figure 10: Preventing mutual interference from system ① and system ②

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 multibeam sensor in close proximity to each other can mutually interfere with each other.

- ▶ Use suitable measures to prevent interference between systems in close proximity to each other.

4.3.3.1 Using reversed direction of transmission

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

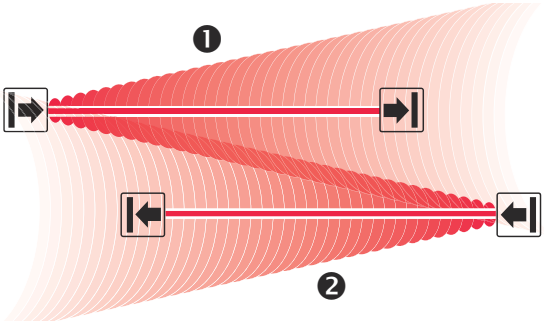


Figure 11: Trouble-free operation due to reversed direction of transmission of system ① and system ②

4.4 Integrating into the electrical control

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 32.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

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

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

Requirements for use

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

- 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 protective device does not have an integrated restart interlock, this 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 controller must be selected according to the application
- The OSSD1 and OSSD2 output signals must not be connected to each other.
- In the machine controller, the signals of both OSSDs must be processed separately.

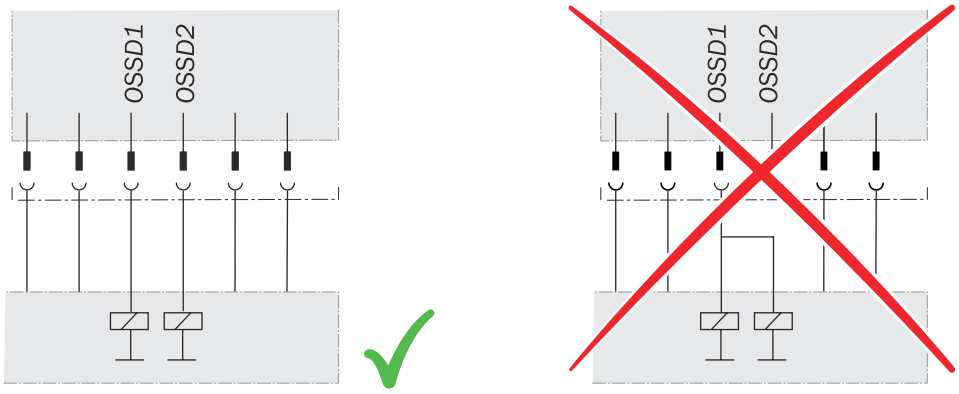


Figure 12: Dual-channel and isolated connection of OSSD1 and OSSD2

- 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 (switch 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.

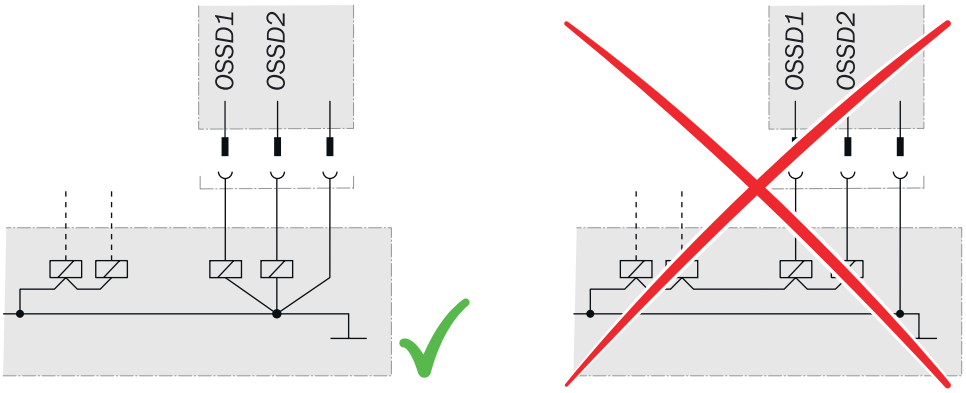


Figure 13: No potential difference between load and protective device

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).

NOTE

Because the protective device 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 light path 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 protective device 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.

The following requirements are met:

- The external voltage supply of the safety multibeam sensor must be capable of buffering brief power failures of 20 ms as specified in IEC 60204-1.
- The power supply unit must provide safe isolation according to IEC 61140 (SELV/PELV). Suitable power supply units are available from SICK as accessories, see "Accessories", page 53.

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.

Functionality

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

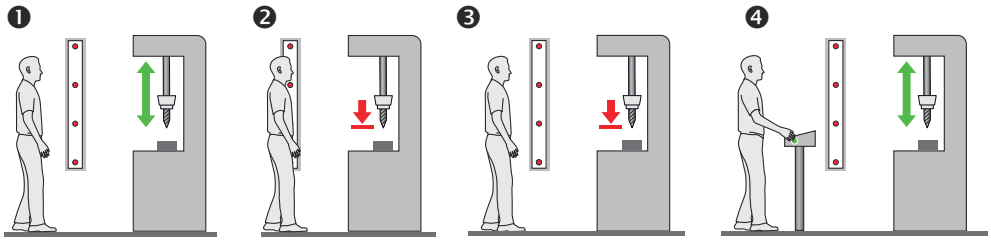


Figure 14: Schematic representation of operation with restart interlock

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 protective device 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.

4.4.3 Connection diagrams

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

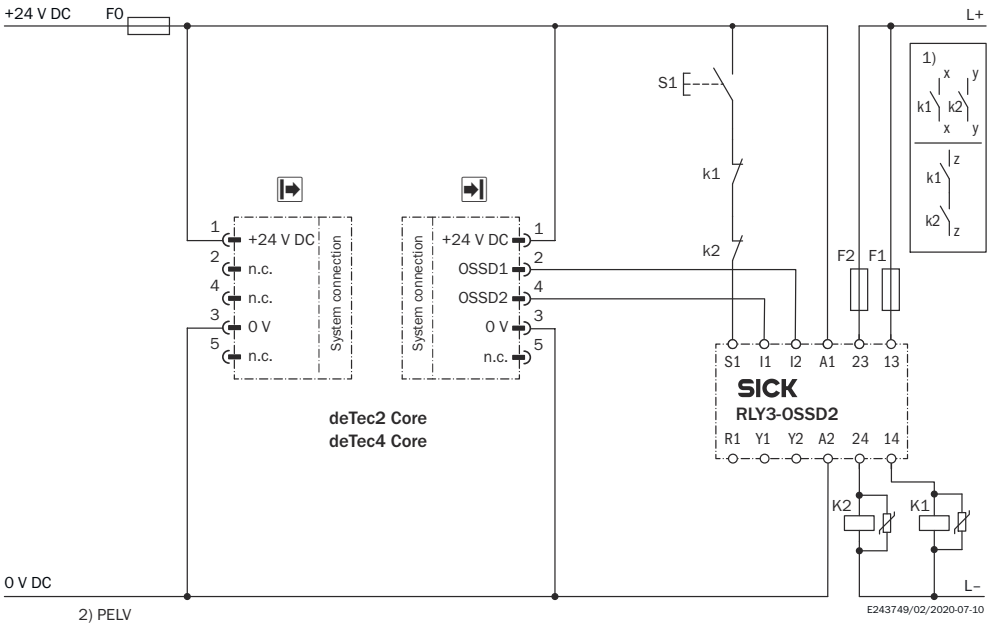


Figure 15: Connection diagram for RLY3-OSSD2 with restart interlock and external device monitoring

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 safety multibeam sensor deTem4 Core IP69K to a RLY3-OSSD2 safety relay. Operating mode: With restart interlock and external device monitoring.

Mode of operation

- When the light path 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 light path 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 check

Check during commissioning and modifications

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

The 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 quality safety personnel?
- Can the thorough check be completed by personnel specially qualified and authorized to do so?
- Does the check have to be documented in a traceable manner?
- Can the check be carried out according to a check list (see "Checklist for initial commissioning and commissioning", page 60)?
- Do the machine operators know the function of the protective device?
- Have the machine operators been trained to work on the machine?
- Have the machine operators been notified about modifications on the machine?
- Does the hazardous area to be secured have to be checked with a test rod, see "Test rod check", page 25?

▶ Define all guidelines for the check.

Regular 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 25
  - Visual check of the machine and the protective device, page 26
- 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 light beam is covered with an opaque test rod (minimum diameter of 30 mm). When the light beam is covered, the OSSD LED on the receiver must light up red. The check is carried out for each light beam and at multiple positions between the sender and the receiver.

Important information

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 multibeam sensor do not affect the machine during the thorough check.

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!

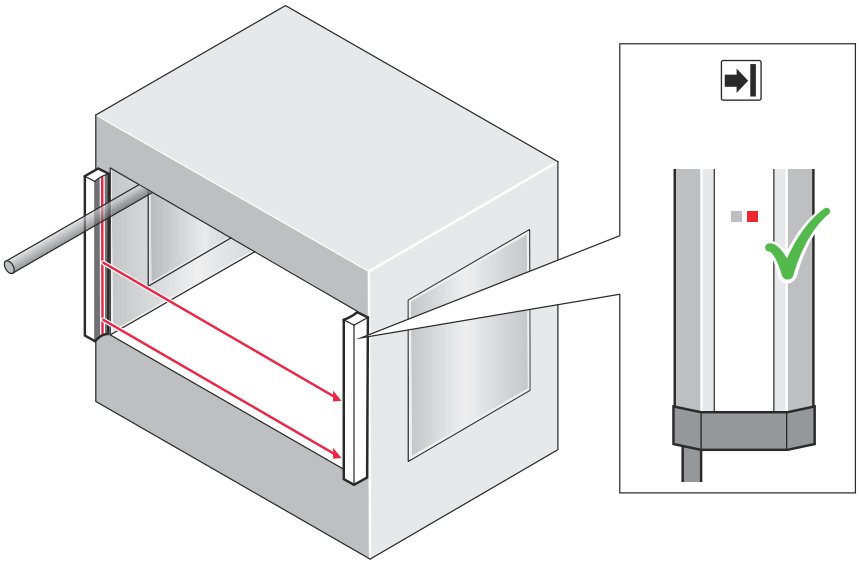
- ▶ If the OSSD LED lights up green during the test, even if only briefly, work must stop at the machine.
- ▶ In this case, the mounting and electrical installation of the safety multibeam sensor must be checked by appropriately qualified safety personnel.

Prerequisites

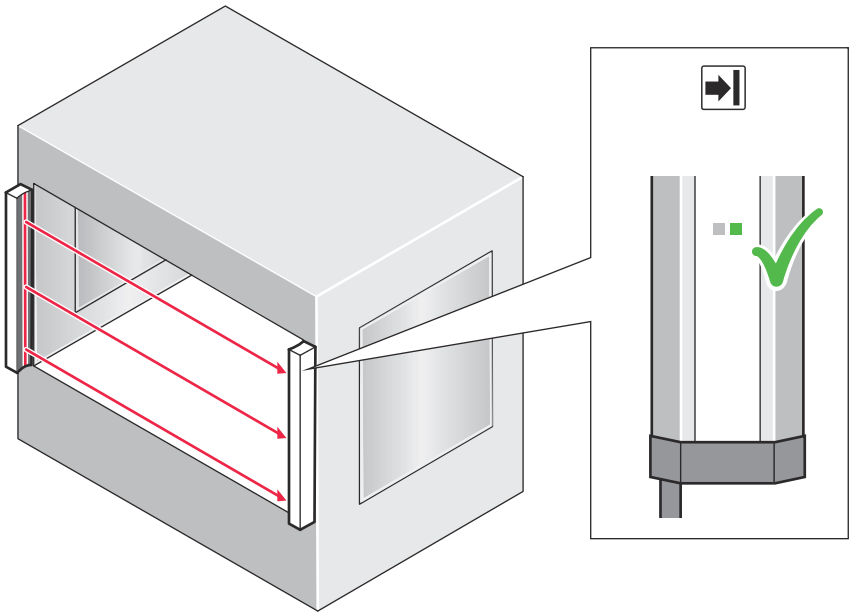
- The OSSD LED lights up green.

Approach

1. Cover a light beam completely.



✓ The OSSD LED on the receiver lights up red.
2. Enable the light beam.



✓ The OSSD LED on the receiver lights up green.

3. Carry out the check for each light beam.
4. Carry out the check at the following positions:
   - Immediately in front of the sender
   - In the middle, between the sender and the receiver (or between the deflector mirrors)
   - Immediately in front of the receiver
   - Directly before and after each deflector mirror (if installed)

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
Hazard due to lack of effectiveness of the protective device

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

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

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

NOTE
Mount the device in the following order.

Prerequisites

- The safety multibeam sensor has been designed correctly.

Further topics

- "Design", page 15
- "Technical data", page 47

5.2 Unpacking

Approach

1. Check the components for completeness and the integrity of all parts.
2. Do not completely remove the protective film from the plastic tubes.
3. Clean the plastic tubes prior to first commissioning.
4. In the event of complaints, contact the responsible SICK subsidiary.

Further topics

- "Ordering information", page 51

5.3 Mounting

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.

- ▶ Take into consideration the minimum distances calculated for the machine.
- ▶ Mount safety multibeam sensor such that nobody can pass under the lowest light beam, pass over the highest light beam, get between two light beams, or pass by the side of the 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.

- The end with the cable connection must point in the same direction for the sender and receiver.

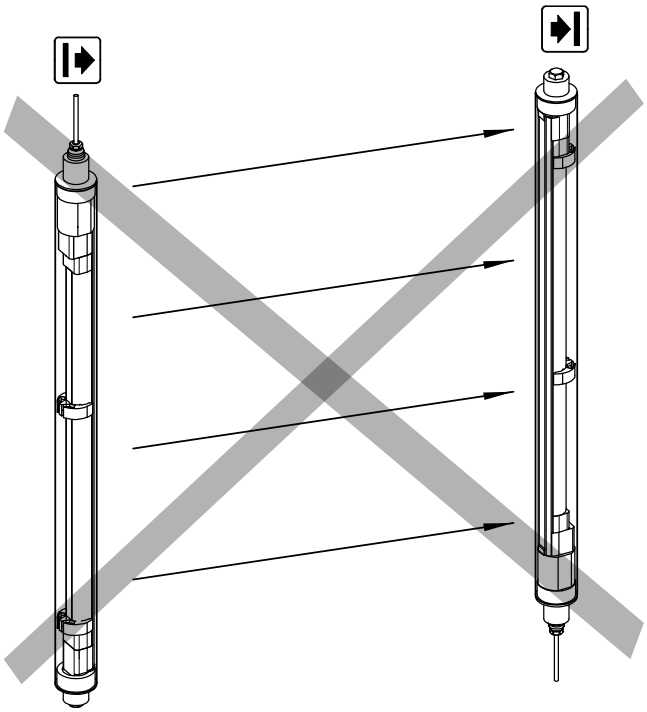


Figure 16: Sender and receiver must not be installed such that they are rotated 180° relative to each other

Notes on mounting

- Mount the sender and receiver on a level surface.
- Mount the sender and receiver at right angles to one another, i.e., at the same height when mounted vertically.
- If possible, select the mounting height of the top bracket such that the bracket rests as close to the 90° bend of the protective housing end cap as possible.
- In the event of vibratory/impact loads, mount additional stainless steel supporting brackets at regular intervals on the device.
- Tightening torque for the screws used to mount the bracket: 5 Nm ... 6 Nm. Tightening torque for the screws used to secure the safety multibeam sensor in the bracket: 4 Nm ... 5 Nm. Higher torques can damage the bracket, while lower torques are not secure enough to prevent the safety multibeam sensor from moving.
- Make sure that the sender and receiver are aligned correctly. The optical lens systems of the sender and the receiver must be located opposite one another.
- If necessary, use a spirit level to check that the components are parallel.

Further topics

- "Sender and receiver alignment", page 35
- "Minimum distance from the hazardous point", page 16
- "Minimum distance from reflective surfaces", page 18

5.3.1 Mounting the reinforced stainless steel bracket

Overview

With the reinforced stainless steel bracket, the sender and receiver can be precisely aligned with the device axis even after mounting.

The sender and receiver are mounted with two reinforced stainless steel brackets each.

The reinforced stainless steel bracket consists of two parts, which are placed onto each other. The two parts are connected and the protective device secured with two M5 screws.

An M8 screw with washer is used to mount the reinforced stainless steel bracket on a machine or profile frame.

Important information

NOTE

The following should be considered when mounting the reinforced stainless steel bracket:

- Select an appropriate screw length to prevent any risk of injury from an overrun
- Take the reinforced stainless steel bracket and the machine or profile frame into account when selecting the screw length, see figure 24, page 53

Mounting the reinforced stainless steel bracket on a machine or profile frame

Table 3: Mounting the reinforced stainless steel bracket on the side and back

Mounting method	Description
On the side	With the M8 screw through the reinforced stainless steel bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.
	With the M8 screw through the machine or profile frame to the reinforced stainless steel bracket. A screw nut is required for each reinforced stainless steel bracket.
On the back	With the M8 screw through the reinforced stainless steel bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.

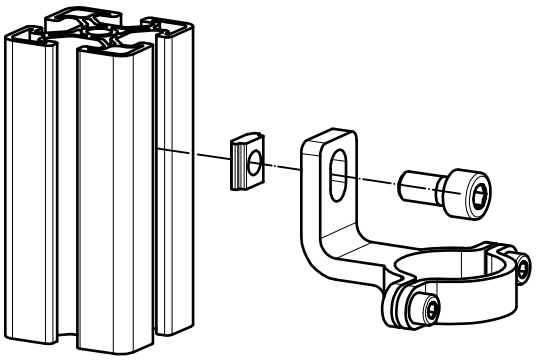


Figure 17: Mounting the reinforced stainless steel bracket on a profile frame

Approach

1. After mounting the reinforced stainless steel bracket, guide the sender/receiver into it.
2. Use the two M5 screws to fix the position of the sender/receiver in the reinforced stainless steel bracket.

5.3.2 Mounting the stainless steel bracket

Overview

With the stainless steel bracket, the sender and receiver can be rotated around their longitudinal axis.

The sender and receiver are mounted with two stainless steel brackets each.

The stainless steel bracket consists of two parts, which are pushed into each other. The two parts are connected and the protective device secured with one M5 screw.

An M8 screw with washer is used to mount the stainless steel bracket on a machine or profile frame.

Important information

NOTE
When mounting the stainless steel bracket, the M8 screw can present a risk of injury if it is too long. Select an appropriate screw length to prevent any risk of injury from an overrun.

Mounting the stainless steel bracket on a machine or profile frame

Table 4: Mounting the stainless steel bracket on the side and back

Mounting method	Description
On the side	With the M8 screw through the stainless steel bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.
On the back	With the M8 screw through the stainless steel bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.

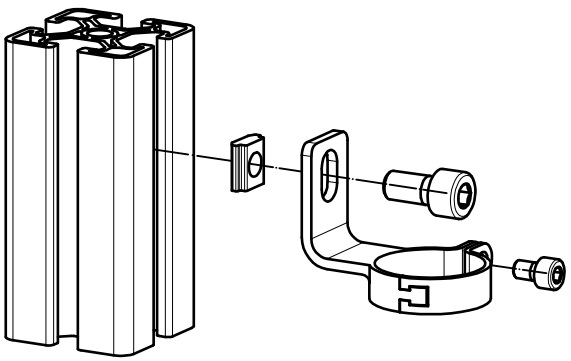


Figure 18: Mounting the stainless steel bracket on a profile frame

Approach

1. After mounting the stainless steel bracket, guide the sender/receiver into it.
2. Use the M5 screw to fix the position of the sender/receiver in the stainless steel bracket.

5.3.3 Mounting the stainless steel supporting bracket

Overview

In the event of vibratory/impact loads according to IEC 61496, devices must be fitted with additional stainless steel supporting brackets.

The stainless steel supporting bracket consists of two parts, which are placed onto each other. The two parts are connected and the device secured with one M5 screw.

Mounting instructions

The following should be considered when mounting the stainless steel supporting brackets:

- The stainless steel supporting brackets may only be used in conjunction with the reinforced stainless steel brackets.
- They are mounted on the device at intervals of 300 mm ... 350 mm.
- The fixing hole for the stainless steel supporting bracket has a lateral deviation of 17.5 mm from the fixing hole for the reinforced stainless steel bracket.
- The stainless steel supporting brackets and the reinforced stainless steel brackets are mounted on a machine or profile frame using M8 screws. Guide the device into the brackets and tighten the M5 screws for the reinforced stainless steel brackets first, followed by the M5 screws for the stainless steel supporting brackets. Finally, tighten the M8 screws.

NOTE

To ensure the protective housing of the device does not become warped during mounting, only fully tighten the M8 screws right at the end of the mounting process.

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 power 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 multibeam sensor do not affect the machine during electrical installation.
- Only use an appropriate voltage supply, see "Technical data", page 47.

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 multibeam sensor has been safely integrated into the control system and the electrical system of the machine.
- Mounting has been completed correctly.

Example: Isolated connection of OSSD1 and OSSD2

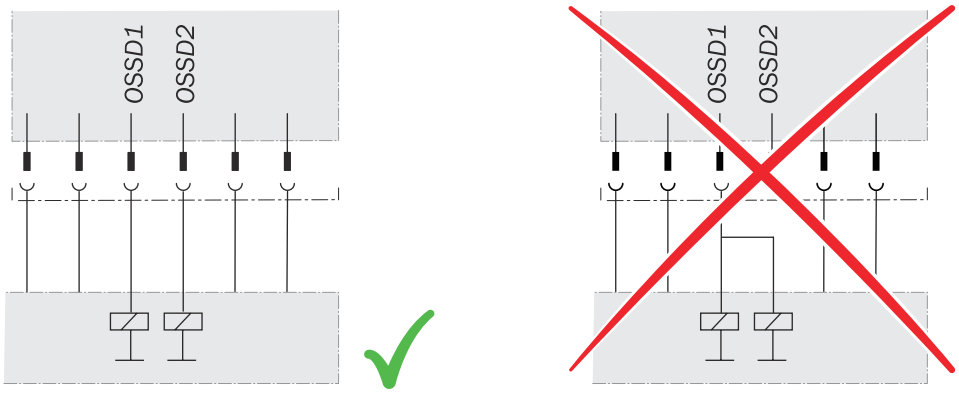


Figure 19: Dual-channel and isolated connection of OSSD1 and OSSD2

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.

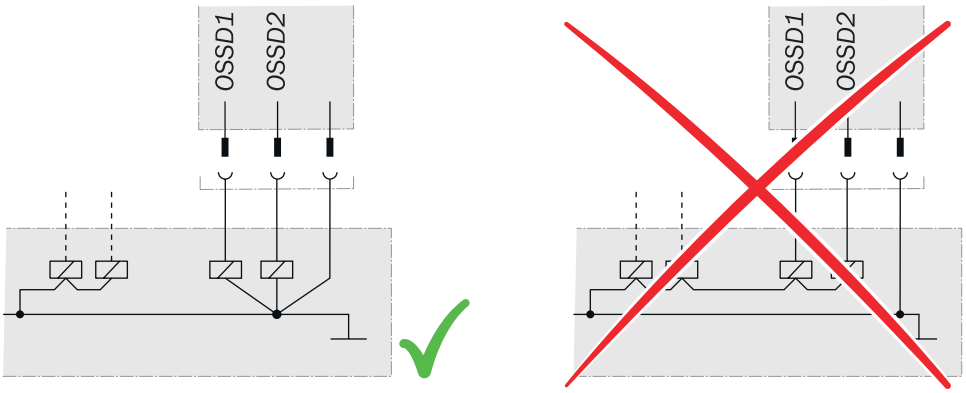


Figure 20: No potential difference between load and protective device

Further topics

- "Integrating into the electrical control", page 20

6.2 System connection (flying leads, 5-wire)

Table 5: System connection pin assignment (flying leads, 5-wire)

Wire color	Sender	Receiver
Brown	+24 V DC (voltage supply input)	+24 V DC (voltage supply input)
White	Reserved	OSSD1 (switching output 1)
Blue	0 V DC (voltage supply input)	0 V DC (voltage supply input)
Black	Reserved	OSSD2 (switching output 2)
Gray	Not assigned	Not assigned

Further topics

- "Integrating into the electrical control", page 20

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 multibeam sensor, check the protective device for effectiveness and recommission as specified in this section.

WARNING
Hazard due to lack of effectiveness of the protective device

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

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.

1. Make sure that the optical properties of the protective housing of the sender and receiver are not changed during operation, e.g., by:
   - Beading water, mist, frost, or ice formation on the protective housing. Remove condensation of this kind or other types of contamination, then restart the receiver.
   - Scratches or damage to the protective housing. Replace the protective housing of the respective sender or receiver if its protective housing is scratched or damaged.
2. Make sure that all reflective surfaces and objects maintain a minimum distance from the light beams.
3. Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the light beams.

Further topics

- "Minimum distance from reflective surfaces", page 18

7.2 Overview

Prerequisites

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

Further topics

- "Project planning", page 15
- "Mounting", page 27
- "Electrical installation", page 32

7.3 Switching on

Overview

After switching on, the sender and receiver initialize. All LEDs of the sender and receiver briefly light up. After initialization, the receiver displays the alignment quality using four blue LEDs. Once the safety light curtain is aligned (OSSD LED: green), the alignment indicator 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 43

7.4 Sender and receiver alignment

Overview

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

Important information

DANGER
Dangerous state of the machine

- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during the alignment process.
- ▶ Make sure that the outputs of the safety multibeam sensor do not affect the machine during the alignment process.

Further topics

- "Alignment with the reinforced stainless steel bracket", page 36
- "Alignment with the stainless steel bracket", page 37
- "Indication of the alignment quality", page 37
- "Diagnostic LEDs", page 43

7.4.1 Aligning the sender and receiver

Prerequisites

- Sender and receiver have been mounted at the correct height.
- The safety multibeam sensor can rotate in the bracket. If necessary, loosen the fixing screws slightly.

Approach

1. Switch on voltage supply of safety multibeam sensor.
2. Roughly align the sender with the receiver by rotating it.
3. Align the receiver with the sender. To do this, 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 to 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 to the sender so that as many alignment quality light emitting diodes as possible light up on the receiver.

6. When at least three (preferably four) alignment quality light emitting diodes light up on the receiver, fasten the components in the brackets. Torque: 4 Nm to 5 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 three blue alignment quality light emitting diodes light up, alignment is good and availability is stable.

Please note that parts of the body or objects between the sender and receiver (e.g., hand, tool) will impair the function of the alignment quality light emitting diodes. Remove all objects from this area to allow the alignment quality to be assessed.

Further topics

- "Indication of the alignment quality", page 37
- "Mounting", page 27

7.4.2 Alignment with the reinforced stainless steel bracket

Prerequisites

- The sender and receiver have been mounted with a reinforced stainless steel bracket

Alignment with the reinforced stainless steel bracket

You can align the sender and receiver to each other as follows if the reinforced stainless steel bracket is used:

- Rotate

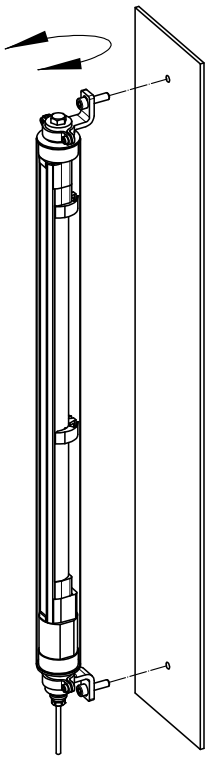


Figure 21: Rotating the sender or receiver in the reinforced stainless steel bracket

7.4.3 Alignment with the stainless steel bracket

Prerequisites

- The sender and receiver have been mounted with a stainless steel bracket

Alignment with the stainless steel bracket

You can align the sender and receiver to each other as follows if the stainless steel bracket is used:

- Rotate

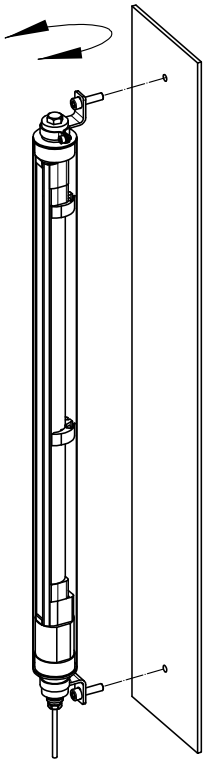


Figure 22: Rotating the sender or receiver in the stainless steel bracket

7.4.4 Indication of the alignment quality

Important information

NOTE

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

Please note that parts of the body or objects between the sender and receiver (e.g., hand, tool) will impair the function of the alignment quality light emitting diodes. Remove all objects from this area to allow the alignment quality to be assessed.

Indication of the alignment quality

Table 6: Indication of the alignment quality

LEDs					Meaning
Alignment quality light emitting diodes				OSSD	
1	2	3	4		
○	○	○	○	● Red	Alignment is insufficient or a light beam is interrupted at least partially. The receiver cannot synchronize with the sender.
● Blue	○	○	○	● Red	Alignment is insufficient or a light beam is interrupted at least partially.
● Blue	● Blue	○	○	● Red	Alignment is insufficient or a light beam 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. [1]
● Blue	● Blue	● Blue	● Blue	● Green	Alignment is very good.

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

1) If the light path is very long, there is a possibility that all four alignment quality light emitting diodes will not light up even when alignment is excellent.

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 specified in the test plan of the manufacturer of the machine and the operating entity.

8 Operation

8.1 Safety

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.

- ▶ 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.

1. Make sure that the optical properties of the protective housing of the sender and receiver are not changed during operation, e.g., by:
   - Beading water, mist, frost, or ice formation on the protective housing. Remove condensation of this kind or other types of contamination, then restart the receiver.
   - Scratches or damage to the protective housing. Replace the protective housing of the respective sender or receiver if its protective housing is scratched or damaged.
2. Make sure that all reflective surfaces and objects maintain a minimum distance from the light beams.
3. Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the light beams.

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

Further topics

- "Minimum distance from reflective surfaces", page 18

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 specified in the test plan of the manufacturer of the machine and the operating entity.

9 Maintenance

9.1 Regular cleaning

Overview

Depending on the ambient conditions of the safety multibeam sensor, the protective housing must be cleaned regularly and in the event of contamination. Static charges can cause dust particles to be attracted to the protective housing.

The deflector mirrors also must be cleaned regularly and in the event of contamination.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

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

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

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.

1. Make sure that the optical properties of the protective housing of the sender and receiver are not changed during operation, e.g., by:
   - Beading water, mist, frost, or ice formation on the protective housing. Remove condensation of this kind or other types of contamination, then restart the receiver.
   - Scratches or damage to the protective housing. Replace the protective housing of the respective sender or receiver if its protective housing is scratched or damaged.
2. Make sure that all reflective surfaces and objects maintain a minimum distance from the light beams.
3. Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the light beams.

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 multibeam sensor do not affect the machine during cleaning.

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 any contamination from the protective housing with plenty of water.
2. Wipe the protective housing with a clean, slightly damp cloth.
3. Then dry the protective housing with a clean cloth.
4. Check the position of the sender and receiver after cleaning.
5. Check the effectiveness of the protective device.

Further topics

- "Test rod check", page 25
- "Minimum distance from reflective surfaces", page 18

9.2 Replacing the protective housing

Overview

If the protective housing is scratched or damaged, the protective housing must be replaced.

Important information

NOTICE

- The protective housing may only be replaced by qualified safety personnel.
- Replace the protective housing in an environment free of dust and dirt.
- Avoid soiling the inside of the protective housing.
- Do not use an additional sealant, such as silicone, for sealing the protective housing. Any vapors that are created may damage the optical components.
- Mount the protective housing according to the following instructions, to ensure IP 69K leak tightness of the housing.
- Only use a new protective housing as a replacement.

NOTICE

Enclosure rating IP 69K only applies if the protective housing and the cable gland are closed.

Required tools

- Screwdriver for the M5 and M8 mounting screws of the stainless steel brackets

Approach

1. Make sure that the environment is clean and clear of fog, moisture, and dust.
2. Detach the bracket at the end furthest away from the cable.
3. Remove the defective protective housing and end cap at the end furthest away from the cable by rotating it gently.
4. Completely remove the protective film from the new protective housing.
5. Push the new protective housing on firmly as far as it will go.
6. Remount the device in the bracket.
7. Realign and check the device.

Further topics

- "Spare parts", page 52
- "Commissioning", page 34

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 specified in the test plan of the manufacturer of the machine and 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.

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 light emitting diode display on the sender or receiver.

Sender

Position of LEDs: see "Sender indicators", page 12

Table 7: Fault indicator on the sender

PWR-LED	ERR-LED	Possible cause	Rectification
○	○	No supply voltage or supply voltage is too low or internal fault	Check the voltage supply, see "Technical data", page 47. Switch the voltage supply off and then on again. If the fault persists, replace the sender, see "Ordering information", page 51.
○	Red	The voltage was too high when operating the sender.	Check the voltage supply, see "Technical data", page 47. Replace the sender, see "Ordering information", page 51.

PWR-LED	ERR-LED	Possible cause	Rectification
Yellow	Red	Fault in the supply voltage	Check the voltage supply and the power supply unit, see "Technical data", page 47. Switch the voltage supply off and then on again. If the fault persists, replace the defective components, see "Ordering information", page 51.
Yellow	Red	The sender identified an internal fault.	Switch the voltage supply off and then on again. If the fault persists, replace the sender, see "Ordering information", page 51.

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

Receiver

Position of LEDs: see "Receiver indicators", page 13

Table 8: Fault indicator on the receiver

OSSD LED	ERR-LED	Alignment quality LEDs				Possible cause	Rectification
		1	2	3	4		
● Red	✳ Red	✳ Blue	○	○	○	An internal fault has occurred.	Switch the voltage supply off and then on again. If the fault persists, replace the receiver, see "Ordering information", page 51.
● Red	✳ Red	○	✳ Blue	○	○	Fault in the supply voltage	Check the voltage supply and the power supply unit, see "Technical data", page 47. Switch the voltage supply off and then on again. If the fault persists, replace the defective components, see "Ordering information", page 51.
● Red	✳ Red	○	○	✳ Blue	○	The receiver has recognized beams from several senders.	Check the distance to senders of the same type. Make sure that beams from another sender cannot hit the receiver, see "Protection against interference from systems in close proximity to each other", page 19. Switch the voltage supply off and then on again.

OSSD LED	ERR-LED	Alignment quality LEDs				Possible cause	Rectification
		1	2	3	4		
● Red	✳ Red	○	○	○	✳ Blue	A fault or unexpected status was identified on the OSSDs of the system connection (e.g., overvoltage, short-circuit to HIGH or short-circuit to LOW, cross-circuit, permissible load capacity exceeded)	Check the system wiring for a fault. Make sure that the OSSDs have been wired correctly, see "Integrating into the electrical control", page 20. Switch the voltage supply off and then on again. If the fault persists, replace the defective components, see "Ordering information", page 51.

○ 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

General system data

Table 9: General system data

	Minimum	Typical	Maximum
Dimension of the light path [1]			
	0.5 m ... 12.5 m	0.5 m ...15.5 m	
Number of beams, depending on type	2, 3, or 4		
Beam separation, depending on type	500 mm, 400 mm, or 300 mm		
Protection class [2]	III (IEC 61140)		
Enclosure rating	IP 65 (IEC 60529) IP 66 (IEC 60529) IP 67 (IEC 60529) IP 69K (ISO 20653)		
Supply voltage V_S [3] [4]	19.2 V DC	+24 V DC	28.8 V DC
Residual ripple [5]			± 10 %
Response time	20 ms		
Synchronization	Optical		
Type	Type 4 (IEC 61496-1)		
Safety integrity level [6]	SIL3 (IEC 61508)		
SIL claim limit [6]	SILCL3 (IEC 62061)		
Category	Category 4 (ISO 13849-1)		
Performance level [6]	PL e (ISO 13849–1)		
PFHd (mean probability of one dangerous failure per hour)	3.0×10^{-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
Test rod speed at which the test rod is reliably detected [7]	0 m/s ... 1.6 m/s		

1) If the light path is very long, there is a possibility that all four alignment quality light emitting diodes will not light up even when alignment is good.
2) SELV/PELV safety extra-low voltage.
3) 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.
4) A fuse rated maximum 4 A shall be installed in the 24 V DC power supply circuit to the device in order to limit the available current.
5) Within the limits of U_V.
6) For more detailed information on the exact configuration of your machine, please contact your relevant SICK subsidiary.
7) Direction of movement and axis of the test rod perpendicular to the light beam.

Technical data for sender

Table 10: Technical data for sender

	Minimum	Typical	Maximum
Wavelength of sender	Near-infrared (NIR), invisible		

	Minimum	Typical	Maximum
Effective aperture angle (EAA) [1]			2.5°
Current consumption			50 mA
Power consumption			1.44 W

1) Distance between sender and receiver D ≥ 3 m.

Technical data for receiver

Table 11: Technical data for receiver

	Minimum	Typical	Maximum
Current consumption			150 mA
Power consumption			4.32 W
Output signal switching devices (OSSDs)			
Type of output	2 PNP semiconductors, short-circuit protected [1], cross-circuit monitored		
Duration of OFF state	100 ms		
Switch-on delay		3 × response time	
Output voltage for ON state (HIGH) [2]	(U_V – 2.25 V) ... U_V		
Output voltage for OFF state (LOW) [2] [3]	0 V ... 2.0 V		
Output current for ON state (HIGH)			300 mA each
Leakage current of the OSSDs			2 mA each
Load capacity			2.2 µF
Load inductance			2.2 H
Test pulse data [4]			
Test pulse width		150 µs	300 µs
Test pulse rate	3 s^{-1}	5 s^{-1}	10 s^{-1}
Permissible cable resistance			
Between device and load [5]			2.5 Ω
Supply cable [6]			1 Ω

1) Applies to the voltage range between -30 V and +30 V.
2) According to IEC 61131-2.
3) The specified values are the switching voltage passed to the device. If higher voltages are impressed from the outside, the maximum value of 2.0 V can be exceeded.
4) When active, the outputs are tested cyclically (brief LOW). When selecting the downstream controllers, make sure that the test pulses do not result in deactivation when using the above parameters.
5) The cable resistance of the individual wires to the downstream controller must not exceed this value, to ensure that a cross-circuit between the outputs is safely detected. (Observe standard IEC 60204-1 too.)
6) The supply cable must not be used to connect other loads with the exception of the sender.

Operating data

Table 12: Operating data

System connection	Flying leads, 5-wire, 15 m preassembled
Ambient operating temperature [1] [2]	–30 °C ... +55 °C
Air humidity (non-condensing)	15 % ... 95 %
Storage temperature	–30 °C ... +70 °C
Housing cross-section	ø 50 mm

Weight	Dependent on the number of beams, see "Table of weights", page 49
Vibration resistance [3]	5 ... 150 Hz, 3,5 mm / 1 g (EN 60068-2-6)
Shock resistance [4]	15 g / 6 ms (EN 60068-2-27)
Class	3M4 (IEC TR 60721-4-3)

1) The temperature difference between sender and receiver must not exceed 25 K.
2) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under -25 °C.
3) Test conditions per axis: 1 octave/minute, 20 sweeps.
4) Test conditions per axis: 200 shocks.

Type of material

Table 13: Type of material

	Type of material
Protective housing	Acrylic glass (PMMA)
End caps	Stainless steel 1.4404
Cable gland	Stainless steel 1.4404 including silicone seal
Pressure equalizing element (aeration and ventilation membrane)	PA 6

12.2 Table of weights

Table 14: Weight of sender and receiver

Number of beams	Weight with cable in g [1]		Weight without cable in g [1]	
	Sender	Receiver	Sender	Receiver
2	1860	1870	1320	1330
3	2190	2200	1650	1660
4	2290	2300	1750	1760

1) Tolerance: ± 50 g

12.3 Dimensional drawings

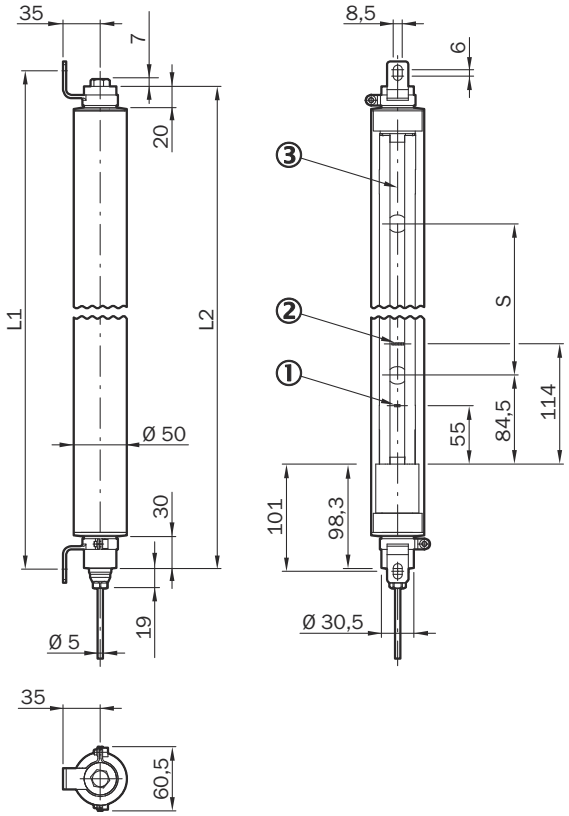


Figure 23: Dimensional drawing of sender and receiver

① Status indicator
② Alignment indicator
③ Optical axis

Table 15: Dimensions based on the number of beams, sender and receiver

Number of beams	Beam separation, dimension S in mm	L1 in mm	L2 in mm
2	500	830	815
3	400	1131	1116
4	300	1231	1216

13 Ordering information

13.1 Scope of delivery

Items supplied, sender

- Sender, mounted in protective housing, with 15 m connecting cable

Items supplied, receiver

- Receiver, mounted in protective housing, with 15 m connecting cable
- Safety note
- Mounting instructions
- Operating instructions for download: www.sick.com

13.2 Ordering information

Table 16: Ordering information, deTem4 Core IP69K small scanning range

Number of beams	Sender		Receiver	
	Part number	Type code	Part number	Type code
2	1089977	M4C-SB0250LA10	1089978	M4C-EB02500A10
3	1089979	M4C-SB0340LA10	1089980	M4C-EB03400A10
4	1089981	M4C-SB0430LA10	1089982	M4C-EB04300A10

14 Spare parts

14.1 Protective housing

Table 17: Ordering information for protective housing

Designation	Number of beams	Part number
Protective housing spare part, deTem IP69K	2	2096395
	3	2096396
	4	2096397

15 Accessories

15.1 Brackets

Table 18: Brackets ordering information

Part	Type code	Part number
Reinforced stainless steel bracket, rotatable	BEF-2SMMVAES4	2026850
Stainless steel bracket, rotatable	BEF-2SMMEAES4	2023708
Stainless steel support bracket	BEF-2AAAADES2	2026849

Reinforced stainless steel bracket, rotatable

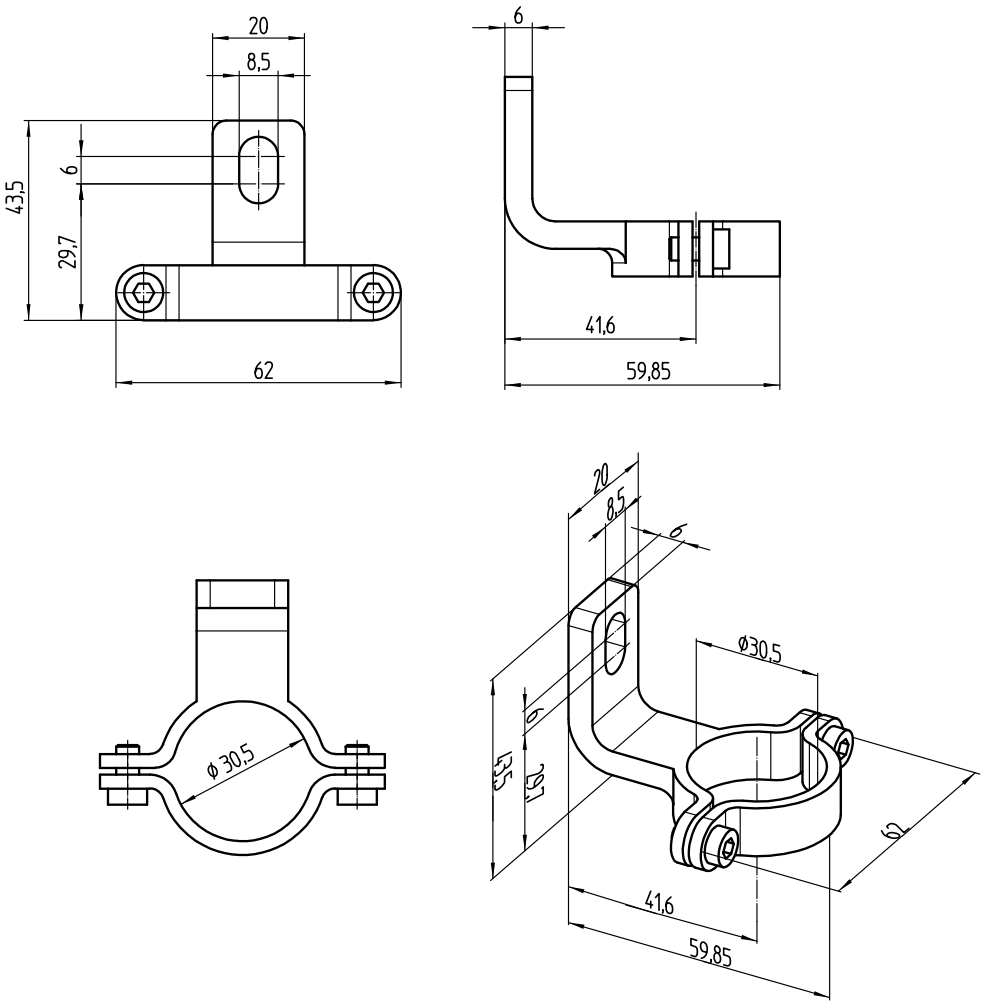


Figure 24: Dimensional drawing of the reinforced stainless steel bracket, rotatable (2026850)

Stainless steel bracket, rotatable

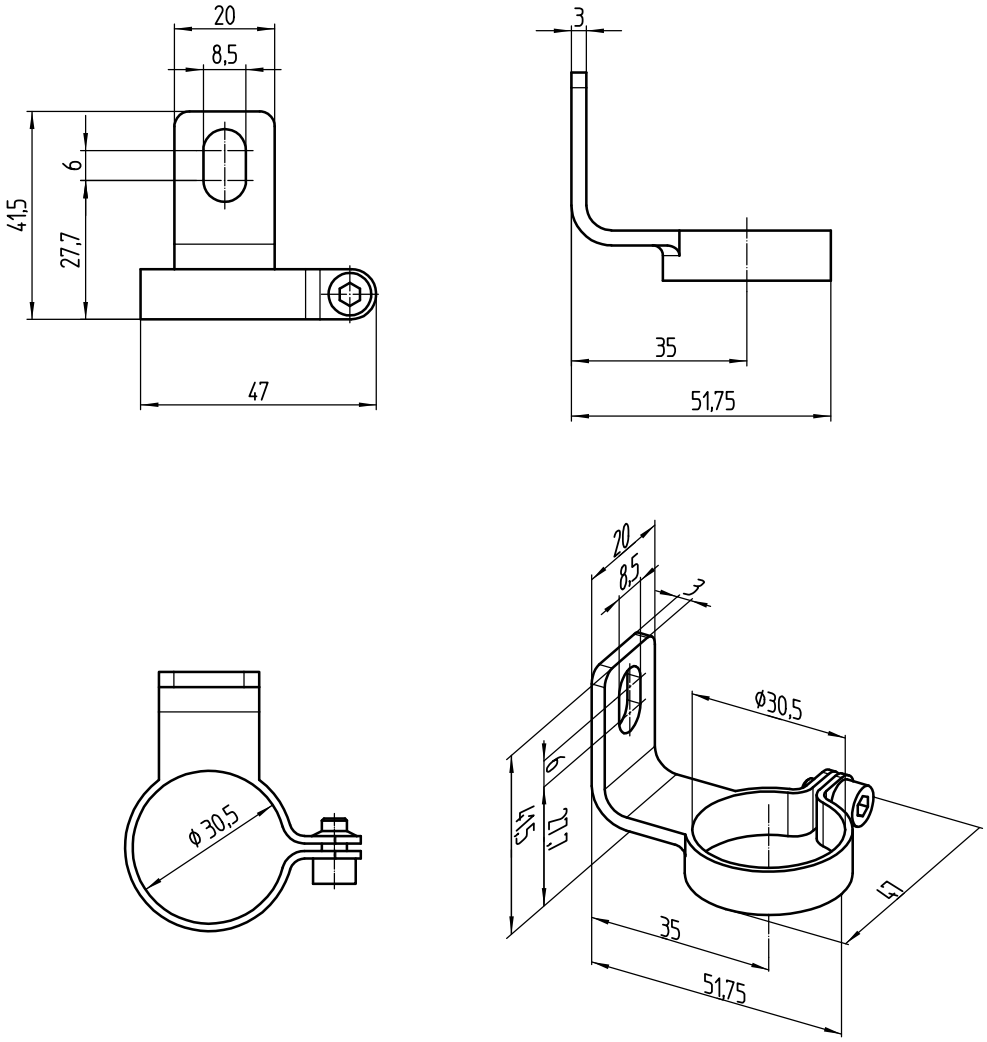


Figure 25: Dimensional drawing of the stainless steel bracket, rotatable (2023708)

Stainless steel supporting bracket

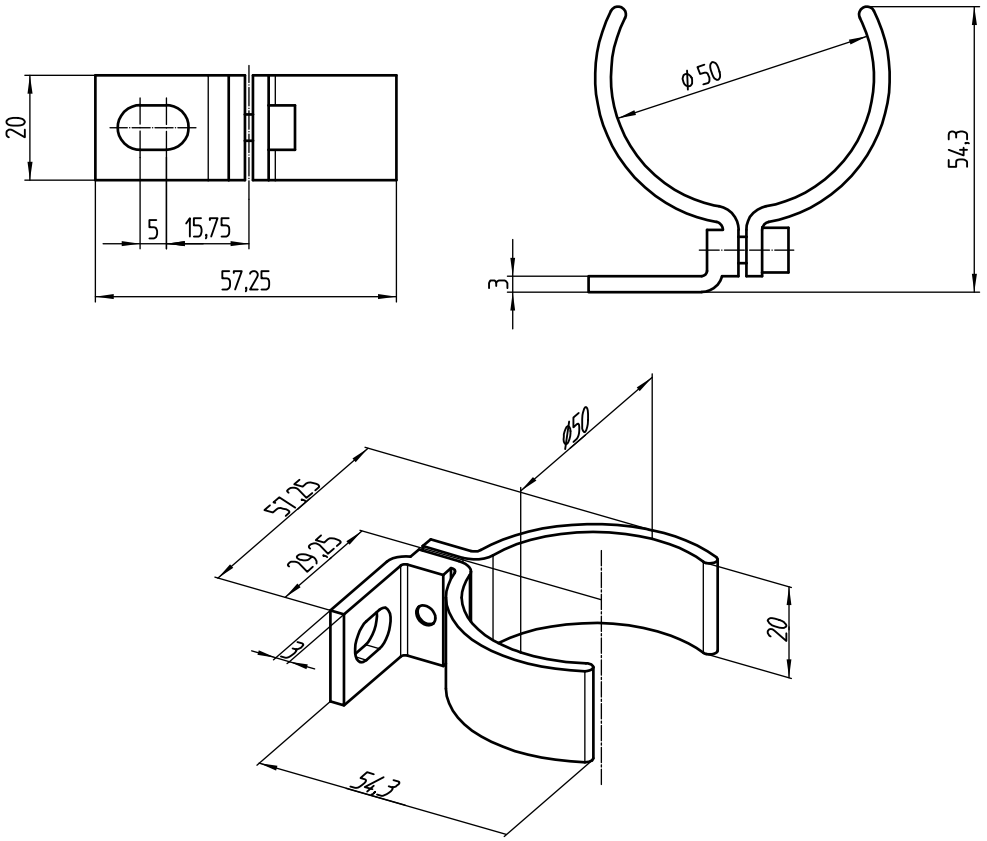


Figure 26: Dimensional drawing of the stainless steel supporting bracket (2026849)

15.2 Connectivity

Table 19: Ordering information for power supply

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

15.3 Deflector mirrors

15.3.1 Function and use

Overview

Deflector mirrors can be used to shape the light path to secure hazardous points from multiple sides using a single safety multibeam sensor.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

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

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

Further topics

- "Mirror columns", page 56

15.3.2 Change in scanning range using deflector mirrors

NOTE
The use of deflector mirrors reduces the sensing range depending on the number of deflector mirrors in the light path.

Table 20: Scanning range with and without 1, 2, or 3 deflector mirrors

Type	Scanning range, typical	Scanning range with 1 deflector mirror, typical	Scanning range with 2 deflector mirrors, typical	Scanning range with 3 deflector mirrors, typical
PNS75, PNS125	15.5 m	14 m	12.6 m	11.3 m

15.3.3 Deflector mirror – ordering information

Table 21: Ordering information, deflector mirror

Part	Type code	Part number
Deflector mirror incl. mounting kit	PNS75-008	1026647

15.4 Mirror columns

Table 22: Ordering information, mirror columns

Column height	Suitable for number of beams	Suitable for beam separation	Type code	Part number
985 mm	2	500 mm	PM3S96-00240020	1040619
1,185 mm	3	400 mm	PM3S11-00330030	1040625
1,285 mm	4	300 mm	PM3S13-00430040	1040626

Complementary information

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

Further topics

- "Deflector mirrors", page 55

15.5 Device columns

Table 23: Ordering information for device columns

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

15.6 Accessories for mirror columns and device columns

Table 24: Ordering information, accessories for mirror columns and device columns

Part	Part number
Compensating plate, suitable for mirror columns and device columns	4031053
Steel dowel for fixing the compensating plate to the floor	5308961

15.7 Cleaning agent

Table 25: Cleaning agent ordering information

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

15.8 Test rods

Table 26: Ordering information, test rods

Part	Part number
Test rod 30 mm	2022602
Test rod holder	2052249

16 Annex

16.1 Conformities and certificates

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

16.1.1 EU declaration of conformity

Excerpt

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

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

16.1.2 UK declaration of conformity

Excerpt

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

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

16.2 Note on standards

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

Table 27: Note on standards

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

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

16.3 Checklist for initial commissioning and commissioning

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

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

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

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

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

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