



**Safety Light Curtain**  
**C 4000 Micro/C 4000 Basic Plus**  
**C 4000 Basic/C 4000 Eco**

**SICK**

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# 1 About this document

Please read this chapter carefully before working with this documentation and the safety light curtain C 4000 Basic, C 4000 Micro or the C 4000 Eco.

## 1.1 Function of this document

These operating instructions are designed to address *the technical personnel of the machine manufacturer or the machine operator* in regards to safe mounting, installation, electrical installation, commissioning, operation and maintenance of the safety light curtain C 4000 Basic, C 4000 Micro or C 4000 Eco.

These operating instructions do *not* provide instructions for operating machines on which the safety light curtain is, or will be, integrated. Information on this is to be found in the appropriate operating instructions of the machine.

## 1.2 Target group

These operating instructions are addressed to *planning engineers, developers and the operators* of plant and systems which are to be protected by one or several safety light curtains C 4000. It also addresses people who integrate the C 4000 into a machine, initialise its use, or who are in charge of servicing and maintaining the device.

## 1.3 Depth of information

These operating instructions contain information on:

- Installation and mounting
- Electrical installation
- Commissioning
- Care and maintenance
- Fault, error diagnosis and troubleshooting
- Part numbers
- Conformity and approval

of the safety light curtain C 4000.

Planning and using protective devices such as the C 4000 also require specific technical skills which are not detailed in this documentation.

When operating the C 4000, the national, local and statutory rules and regulations must be observed.

General information on accident prevention using opto-electronic protective devices can be found in the brochure "Safe Machines with opto-electronic protective devices".

**Note** We also refer you to the SICK homepage on the Internet at  
[www.sick.com](http://www.sick.com)

Here you will find information on:

- Sample applications
- A list of frequently asked questions about the C 4000
- These operating instructions in different languages for viewing and printing
- Certificates on the prototype test, the EC declaration of conformity and other documents

## 1.4 Scope

**Note** These operating instructions only apply to the safety light curtains C 4000 Basic, C 4000 Micro and C 4000 Eco.

This document is part of SICK part number 8 009 410, 8 009 410/N082, 8 009 410/0855 (operating instructions “Safety Light Curtain C 4000 Micro/Basic/Eco” in all available languages). You will find this number on the type label of the system.

## 1.5 Abbreviations

**ESPE** Electro-sensitive protective equipment (e.g. C 4000)

**OSSD** Output signal switching device

## 1.6 Symbols used

**Recommendation** Recommendations are designed to give you some assistance in your decision-making process with respect to a certain function or a technical measure.

**Note** Refer to notes for special features of the device.



Display indicators show the status of the 7-segment display of sender or receiver:

Constant indication of characters, e.g. 9

Flashing indication of characters, e.g. 8

Alternating indication of characters, e.g. L and 2

● **Red**, ● **Yellow**,  
○ **Green**

LED symbols describe the state of a diagnostics LED. Examples:

● **Red** The red LED is illuminated constantly.

● **Yellow** The yellow LED is flashing.

○ **Green** The green LED is off.

➤ **Take action ...** Instructions for taking action are shown by an arrow. Carefully read and follow the instructions for action.



WARNING

### Warning!

A warning notice indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents.

Read carefully and follow the warnings!



### Sender and receiver

In drawings and diagrams, the symbol denotes the sender and the symbol denotes the receiver.

### The term “dangerous state”

The dangerous state (standard term) of the machine is always shown in the drawings and diagrams of this document as the movement of a machine part. In practical operation, there may be a number of different dangerous states:

- Machine movements
- Electrical conductors
- Visible or invisible radiation
- A combination of several risks and hazards

## 2 On safety

This chapter deals with your own safety and the safety of the equipment operators.

- Please read this chapter carefully before working with the C 4000 or with the machine protected by the C 4000.

### 2.1 Specialist personnel

The safety light curtain C 4000 must be installed, commissioned and serviced only by specialist personnel. Specialist personnel are defined as persons who

- have undergone the appropriate technical training
- and
- who have been instructed by the responsible machine operator in the operation of the machine and the current valid safety guidelines
- and
- who have access to these operating instructions.

### 2.2 Applications of the device

The safety light curtain C 4000 is an electro-sensitive protective equipment (ESPE). The physical resolution is 14 or 30 mm with a maximum protective field width of 6 metres. The realisable protective field height is between 300 and 1,800 mm for the C 4000 Basic/Eco and between 150 and 1,200 mm for the C 4000 Micro.

The device is a *Type 4 ESPE* as defined by IEC 61496-1 and -2 and is therefore allowed for use with controls in safety category 4 in compliance with EN 954-1. The device is suitable for

- Hazardous point protection (finger and hand protection)
- Hazardous area protection
- Access protection

Access to the hazardous point must be allowed only through the protective field. The plant/system is not allowed to start as long as personnel are within the hazardous area. Refer to chapter 3.3 “Examples of range of use” on page 12 for an illustration of the protection modes.



WARNING

#### **Only use the safety light curtain as an indirect safety measure!**

An opto-electronic protective device provides indirect protection, e.g., by switching off the power at the source of the hazard. It cannot provide protection from parts thrown out, nor from emitted radiation. Transparent objects are not detected.

Depending on the application, mechanical protective devices may be required in addition to the safety light curtain.

- Note** The safety light curtain C 4000 Basic, C 4000 Micro or C 4000 Eco operates as a standalone system, comprising a sender and receiver. It cannot be combined with other C 4000 systems, e.g. C 4000 Advanced.

## 2.3 Correct use

The safety light curtain C 4000 must be used only as defined in chapter 2.2 “Applications of the device”. It must be used only by qualified personnel and only on the machine where it has been installed and initialised by qualified personnel in accordance with these operating instructions.

If the device is used for any other purposes or modified in any way – also during mounting and installation – any warranty claim against SICK AG shall become void.

## 2.4 General safety notes and protective measures



WARNING

### Safety notes

Please observe the following procedures in order to ensure the correct and safe use of the safety light curtain C 4000.

- The national/international rules and regulations apply to the installation, commissioning, use and periodic technical inspections of the safety light curtain, in particular:
  - Machine Directive 98/37/EEC
  - Equipment Usage Directive 89/655/EEC
  - the work safety regulations/safety rules
  - other relevant health and safety regulations

Manufacturers and operators of the machine with which the safety light curtain is used are responsible for obtaining and observing all applicable safety regulations and rules.

- The notices, in particular the test regulations (see “Test notes” on page 36) of these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- The tests must be carried out by specialist personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- The operating instructions must be made available to the operator of the machine where the safety light curtain C 4000 is fitted. The machine operator is to be instructed in the use of the device by specialist personnel and must be instructed to read the operating instructions.
- The external voltage supply of the device (SELV/PELV) must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK (SICK Power Supply 50 W (Part number 7 028 789)/SICK Power Supply 95 W (Part number 7 028 790)).

## 2.5 Protection of the environment

The safety light curtain C 4000 has been designed to minimise environmental impact. It uses only a minimum of power and natural resources.

At work, always act in an environmentally responsible manner. For this reason please note the following information on disposal.

### **Disposal**

➤ Always dispose of unserviceable or irreparable devices in compliance with local/national rules and regulations with respect to waste disposal.

**Note** We would be pleased to be of assistance on the disposal of this device. Contact your local SICK representative.

## 3 Product description

This chapter provides information on the special features and properties of the safety light curtain C 4000. It describes the construction and the operating principle of the device, in particular the different operating modes.

➤ Please read this chapter before mounting, installing and commissioning the device.

### 3.1 Special features

#### C 4000 Basic

- Protective operation
- Facility for connecting the reset button, model-dependent
- Connection option for external device monitoring (EDM), model-dependent
- Protective operation with either internal or external restart interlock (realised on machine), model-dependent
- Status display with 7-segment display

The C 4000 Basic is available in two designs (models).

Tab. 1: C 4000 Basic model overview

Designation (Connection Format)	External device monitoring (EDM)	Restart interlock	Reset button
C 4000 Basic Plus (M12 × 7 + FE)	yes	yes	yes
C 4000 Basic (M26 x 6 + FE, Hirschmann-plug)	yes	no	no

#### C 4000 Micro

- Protective operation with either internal or external (realised on the machine) restart interlock
- Facility for connecting the reset button
- Facility for connecting the external device monitoring (EDM)
- Status display with 7-segment display

The C 4000 Micro is available in one design.

Tab. 2: C 4000 Micro model overview

Designation (Connection Format)	External device monitoring (EDM)	Restart interlock	Reset button
C 4000 Micro (M12 × 7 + FE)	yes	yes	yes

#### C 4000 Eco

- Protective operation
- Status display with 7-segment display

The C 4000 Eco is available in one design.

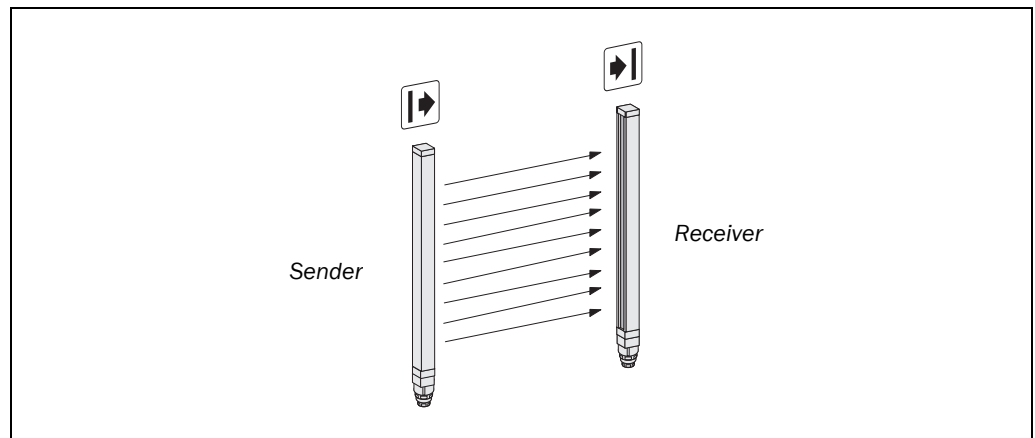
Tab. 3: C 4000 Eco model overview

Designation (Connection Format)	External device monitoring (EDM)	Restart interlock	Reset button
C 4000 Eco (M12 × 4 + FE)	no	no	no

## 3.2 Operating principle of the device

### 3.2.1 Components of the device

Fig. 1: Components of the C 4000



Please refer to chapter 10 “Technical specifications” on page 43 for the data sheet.  
Please refer to pages 49ff. for the dimensional drawings.

### 3.2.2 The light curtain principle

The safety light curtain C 4000 consists of a sender and a receiver (Fig. 1). Between these two units is the protective field, defined as the protective field height and the protective field width.

The construction height determines the *protective field height* of the appropriate system. For the exact protective field height, please see Tab. 21ff. in chapter 10.4 “Dimensional drawings” on page 49.

The *protective field width* is derived from the dimension of the light path between sender and receiver and must not exceed the maximum rated protective field width (see “Technical specifications” on page 43).

Sender and receiver automatically synchronise themselves optically. An electrical connection between both components is not required.

The C 4000 is modular in structure. All optical and electronic components and assemblies are housed in a slim and torsionally rigid housing.

### 3.3 Examples of range of use

Fig. 2: Protecting hazardous points with a safety light curtain C 4000 (left)

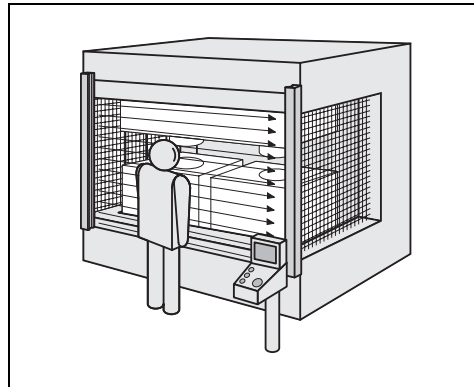


Fig. 3: Hazardous area protection with a safety light curtain C 4000 (right)

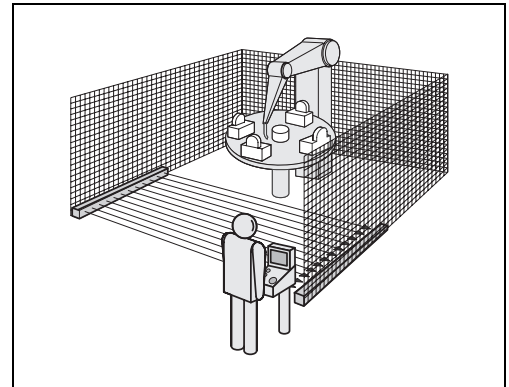
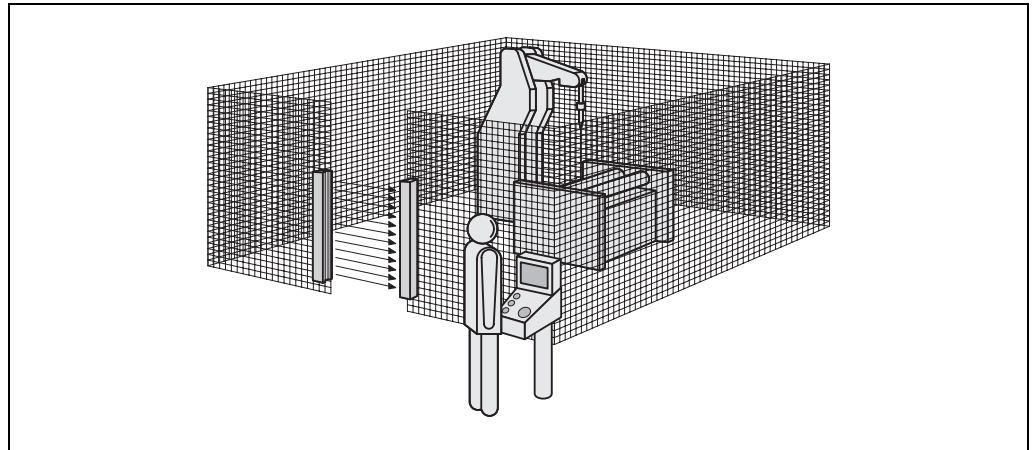


Fig. 4: Access protection using a safety light curtain C 4000



The safety light curtain C 4000 operates correctly as a protective device only if the following conditions are met:

- The control of the machine must be electrical.
- The dangerous state of the machine must be transferable at any time into a safe state.
- Sender and receiver unit must be so mounted that objects penetrating the hazardous area are safely identified by the C 4000.
- The reset button must be fitted outside the hazardous area such that it cannot be operated by a person working inside the hazardous area. When operating the reset button, the operator must have full visual command of the hazardous area.
- The statutory and local rules and regulations must be observed when installing and using the device.

### 3.4 Configurable functions

This chapter describes the functions of the safety light curtains C 4000 Basic and C 4000 Micro.



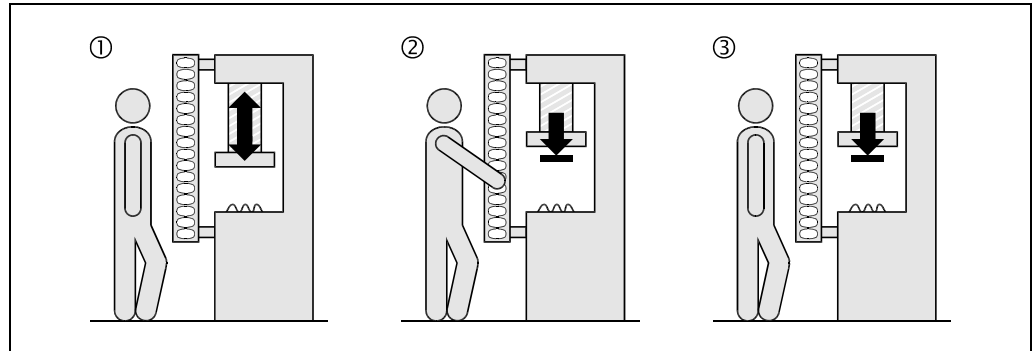
WARNING

#### Test the protective device after any changes!

After each modification to the protective device or its connection, you must check the whole protective device for effectiveness (see 6.3 on Page 36).

#### 3.4.1 Restart interlock

Fig. 5: Outline drawing of the protective operation



The C 4000 Micro/Basic has an internal restart interlock. The dangerous state of the machine (①) is interrupted if the light path is broken (②), and is not re-enabled (③) until the operator presses the reset button.

**Notes**

- If you use the C 4000 Micro/Basic without internal restart interlock, then you must implement the restart interlock externally, i.e. on the machine.
- Do not confuse the restart interlock with the starting interlock on the machine. The start interlock prevents the machine starting after switching on. The restart interlock prevents the machine starting again after an error or an interruption in the light path.

When using the C 4000 Micro/Basic, you can implement the restart interlock in two different ways:

- With the internal restart interlock of the C 4000 Micro/Basic:  
The C 4000 Micro/Basic controls the restart.
- With the restart interlock of the machine (external):  
The C 4000 Micro/Basic has no control over the restart.

The possible combinations are shown in the following table:

Tab. 4: Permissible configuration of the restart interlock of the C 4000 Micro/Basic

Restart interlock of the C 4000 Micro/Basic	Restart interlock of the machine	Permissible application
deactivated	deactivated	Only if the light curtain cannot be stood behind. Observe EN 60 204-1!
deactivated	activated	All
activated	deactivated	Only if the light curtain cannot be stood behind. Observe EN 60 204-1!
activated	activated	All. The restart interlock of the C 4000 Micro handles the reset function (see “Reset” below).



### Always configure the application with restart interlock!

Ensure that there is always a restart interlock. The C 4000 is unable to verify if the restart interlock of the machine is operable. If you deactivate both the internal and the machine's restart interlock, the operators of the machine will be at an acute risk of injury.

The electrical connection of the reset button is described in chapter "Reset button" on page 32.

#### Reset

If you want to activate the restart interlock on the C 4000 Micro/Basic (internal) and also a restart interlock on the machine (external), then each restart interlock has its own button.

When actuating the reset button (for the internal restart interlock)

- the C 4000 Micro/Basic activates the switching outputs
- the safety light curtain changes from red to green

Only the external restart interlock prevents the machine from restarting. After pressing the reset button for the C 4000 Micro/Basic, the operator must also press the restart button for the machine. If the reset button and the restart button are not pressed in the specified sequence, the dangerous state remains disrupted.

#### Recommendation

The reset button prevents the accidental and inadvertent operation of the external restart button. The operator must first acknowledge the dangerous state with the reset button.

The electrical connection of the reset button is described in chapter "Reset button" on page 32. The configuration of the reset button is described in chapter 7.2 "Activating the restart interlock" on page 38.

### 3.4.2 External device monitoring (EDM)

C 4000 Micro and C 4000 Basic have an EDM. The external device monitoring (EDM) checks if the contactors actually de-energise when the protective device responds. If you activate external device monitoring, then the C 4000 checks the contactors after each interruption to the light path and prior to machine restart. The EDM can so identify if one of the contactors has fused, for instance. In this case

- the error message appears in the 7-segment display
- the safety light curtain remains red
- with the internal restart interlock activated, the safety light curtain uses the flashing LED **Yellow** to signal "Reset required"

#### Note

If the system is unable to change to a safe operational state (e.g. after contactor failure), the system locks and shuts down completely ("Lock-out"). The 7-segment display will then show the error message .

The electrical connection for the external device monitoring is described in chapter "External device monitoring (EDM)" on page 31. The configuration of the external device monitoring is described in chapter 7.4 "Start-up configuration" on page 38.

### 3.4.3 Scanning range

The safety light curtain is available with different scanning ranges. An overview is contained in Tab. 6.



WARNING

#### Only use devices with a scanning range that matches the protective field width!

- If the scanning range is set too low, the light curtain may not switch to green.
- If the scanning range is set too great, the light curtain may malfunction. This would mean that the operator is at risk.

#### Notes

- The additional front screens, which are available as accessories (see page 59), reduce the effective scanning range per additional front screen by 8%.

Tab. 5: Scanning range of the C 4000 without and with additional front screen

Physical resolution	Available scanning ranges	Scanning range with 1 additional front screen	Scanning range with 2 additional front screens
14 mm	0–2.5 m 1–5 m	0–2.3 m 0.9–4.6 m	0–2.1 m 0.7–4.2 m
30 mm	0–6 m	0–5.5 m	0–5 m

- The deflector mirrors available as accessories (see page 60) reduce the overall scanning range depending on the number of deflector mirrors in the light path (see section 11.7.1 for PNS 75 and section 11.7.2 for PNS 125).



WARNING

#### Do not use deflector mirrors if the formation of droplets or heavy contamination of the deflector mirrors is to be expected!

The formation of droplets or heavy contamination can be detrimental to the reflection behaviour. The protective function of the system will be affected and the system will thus become unsafe. This would mean that the operator is at risk.


Tab. 6: Scanning range when using 1 or 2 deflector mirrors

Deflector mirror	14 mm	30 mm
1 × PNS 75	4.4 m	5.0 m
2 × PNS 75	2.4 m	3.3 m
1 × PNS 125	4.4 m	5.3 m
2 × PNS 125	2.8 m	3.8 m

The information in the table relates to 90° beam deflection per mirror and a protective field height of 900 mm. If you need more advice on mirror applications, please get in touch with your contact at SICK.

### 3.4.4 Sender test

The C 4000 sender (except C 4000 Basic M12 x 4 + FE) has a test input for checking the sender and the related receiver. During the test, the sender no longer emits light beams. Thus, it simulates – for the receiver – an interruption of the protective field.

- During the test the sender indicates .
- The test is successful, if the C 4000 receiver switches to red, i.e. the switching outputs (OSSDs) are deactivated.

**Note** C 4000 sender and receiver are self-testing. You only need to configure the function of the sender test if this is necessary for an older existing application.

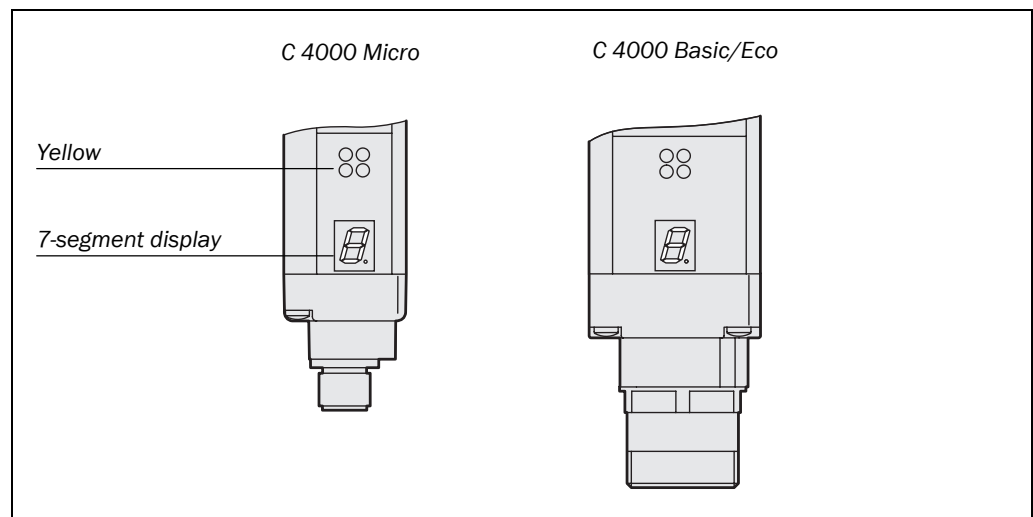
In order to perform a sender test, a means of controlling the test input must be available. The electrical connection at the test input is described in chapter 5.6 “Test input (sender test)” on page 32.

## 3.5 Status indicators




The LEDs and the 7-segment display of sender and receiver signal the operating status of the C 4000.

### 3.5.1 Status indicators of the sender

Fig. 6: Status indicators of the sender



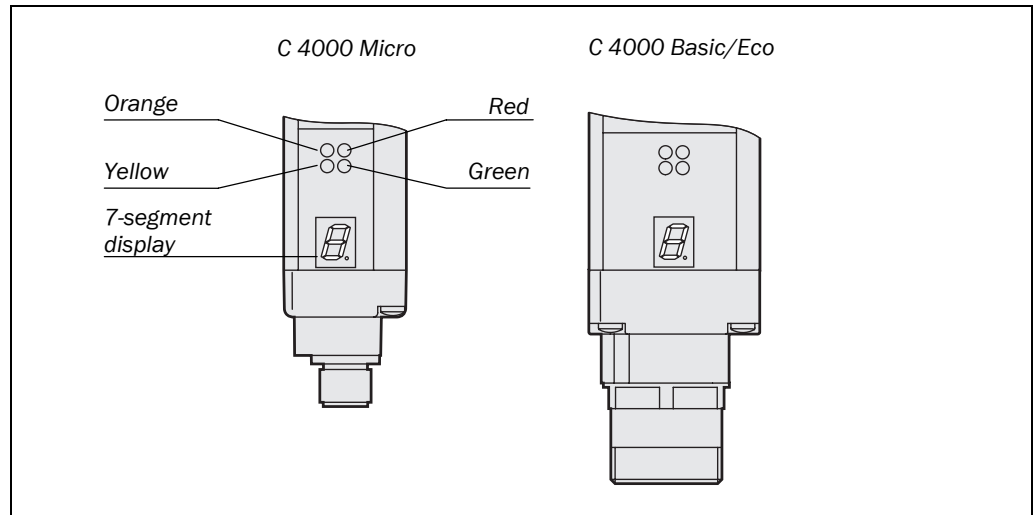
Tab. 7: Status indicators of the sender

Display	Meaning
● Yellow	Supply voltage OK
	System error. The device is defective. Replace the sender.
	The device is in the test mode.
	Non-coded operation (only after switching on)
Other displays	All other displays are error messages. Please refer to chapter “Fault diagnosis” on page 41.

## C 4000 Micro/Basic/Eco

### 3.5.2 Status indicators of the receiver

Fig. 7: Status indicators of the receiver



Tab. 8: Status indicators of the receiver

Display	Meaning
● Orange	Cleaning or realignment required
● Yellow	Reset required
● Red	System providing signals for shutting down the machine (switching output off)
● Green	System enabled (switching output on)
	System error. The device is defective. Replace the receiver.
	Poor alignment to sender.
	Please refer to chapter 6.2 "Aligning sender and receiver" on page 35.
	Approx. 1 s. Device waits for start-up configuration (Only after switching on. See section 7.4 "Start-up configuration" on page 38).
	Approx. 0.5 s. Only for systems with a resolution of 14 mm and a scanning range of 1–5 m: Operation with large protective field width (only after switching on)
	Non-coded operation (only after switching on)
Other displays	All other displays are error messages. Please refer to chapter "Fault diagnosis" on page 41.

## 4 Installation and mounting

This chapter describes the preparation and completion of the installation of the safety light curtain C 4000. The installation and mounting requires two steps:

- Determining the necessary safety distance
- Installation with swivel mount or side brackets

The following steps are necessary after mounting and installation:

- Making the electrical connections (chapter 5)
- Aligning sender and receiver (chapter 6.2)
- Checking the installation (chapter 6.3)

### 4.1 Determining the safety distance

The light curtain must be mounted with the correct safety distance

- from the hazardous point
- from reflective surfaces



WARNING

---

#### **No protective function without large enough safety distance!**

The reliable protective effect of the light curtain depends on the system being mounted with the correct safety distance from the hazardous point.

---

#### **4.1.1 Safety distance from the hazardous point**

A safety distance must be maintained between the light curtain and the hazardous point. This safety distance ensures that the hazardous point can only be reached after the dangerous state of the machine has been completely stopped.

##### **The safety distance as defined in EN 999 and EN 294 depends on:**

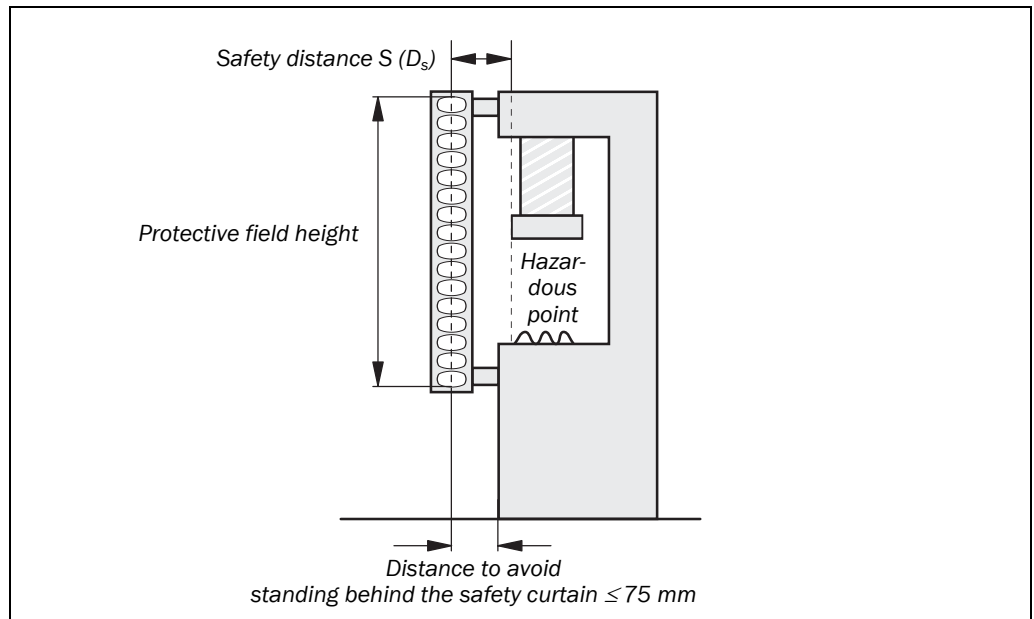
- Stopping/run-down time of the machine or system  
(The stopping/run-down time is shown in the machine documentation or must be determined by taking a measurement.)
- Response time of the entire protective device, e.g. C 4000 (response times see chapter “ ” on page 46)
- Reach or approach speed
- Resolution of the light curtain and/or beam separation
- Other parameters that are stipulated by the standard depending on the application

##### **Under the authority of OSHA and ANSI the safety distance as specified by ANSI B11.191990 E.4.2.3.3.5 and Code of Federal Regulations, Volume 29, Part 1910.217 ... (h) (9) (v) depends on:**

- Stopping/run-down time of the machine or system  
(The stopping/run-down time is shown in the machine documentation or must be determined by taking a measurement.)
- Response time of the entire protective device, e.g. C 4000 (response times see chapter “Response time ” on page 46)
- Reach or approach speed
- Other parameters that are stipulated by the standard depending on the application

**C 4000 Micro/Basic/Eco**

Fig. 8: Safety distance from the hazardous point

**How to calculate the safety distance S according to EN 999 and EN 294:**

**Note** The following calculation shows an example calculation of the safety distance. Depending on the application and the ambient conditions, a different calculation may be necessary.

➤ First, calculate S using the following formula:

$$S = 2000 \times T + 8 \times (d - 14) \text{ [mm]}$$

Where ...

T = Stopping/run-down time of the machine  
+ Response time of the protective device after light path interruption [s]

d = Resolution of the light curtain [mm]

S = Safety distance [mm]

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

➤ If the result S is  $\leq 500$  mm, then use the determined value as the safety distance.

➤ If the result S is  $> 500$  mm, then recalculate S as follows:

$$S = 1600 \times T + 8 \times (d - 14) \text{ [mm]}$$

➤ If the new value S is  $> 500$  mm, then use the newly determined value as the minimum safety distance.

➤ If the new value S is  $\leq 500$  mm, then use 500 mm as the minimum safety distance.

**Example:**

Stopping/run-down time of the machine = 290 ms

Response time after light path interruption = 30 ms

Resolution of the light curtain = 14 mm

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

$$S = 2000 \times 0.32 + 8 \times (14 - 14) = 640 \text{ mm}$$

S  $> 500$  mm, therefore:

$$S = 1600 \times 0.32 + 8 \times (14 - 14) = \underline{\underline{512 \text{ mm}}}$$

**How to calculate the safety distance  $D_s$  according to ANSI B11.19-1990 E.4.2.3.3.5 and Code of Federal Regulations, Volume 29, Part 1910.217 ... (h) (9) (v):**

**Note** The following calculation shows an example calculation of the safety distance. Depending on the application and the ambient conditions, a different calculation may be necessary.

➤ Calculate  $D_s$  using the following formula:

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

Where ...

$D_s$  = The minimum distance in inches (or millimetres) from the hazardous point to the protective device

$H_s$  = A parameter in inches/second or millimetres/second, derived from data on approach speeds of the body or parts of the body. Often 63 inches/second (1600 millimetres/second) is used for  $H_s$ .

$T_s$  = Stopping/run down time of the machine tool measured at the final control element

$T_c$  = Stopping/run-down time of the control system

$T_r$  = Response time of the entire protective device after light path interruption

$T_{bm}$  = Additional response time allowed for brake monitor to compensate for wear

**Note** Any additional response times must be accounted for in this calculation.

$D_{pf}$  = An additional distance added to the overall safety distance required. This value is based on intrusion toward the hazardous point prior to actuation of the electro-sensitive protective equipment (ESPE). Values range from 0.25 inches to 48 inches (6 millimetres to 1220 millimeters) or more depending on application.

**Example:**

In opto-electronic protecting, such as with a perpendicular safety light curtain applications with object sensitivity (effective resolution) less than 2.5 inches (64 millimetres), the  $D_{pf}$  can be approximated based on the following formula:

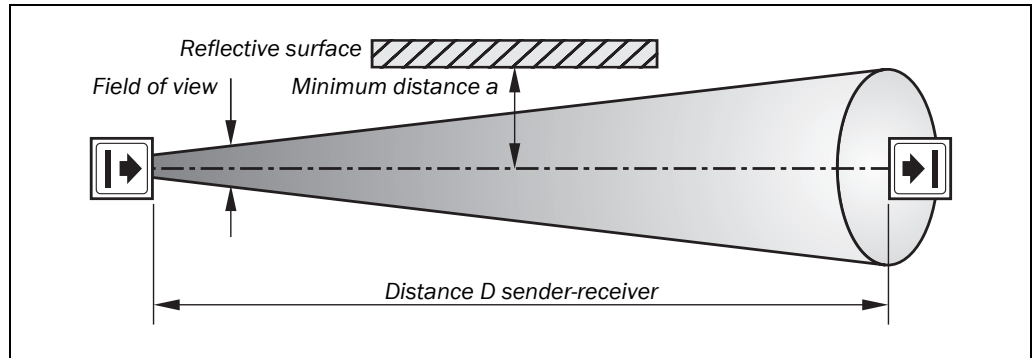
$$D_{pf} \text{ (inches)} = 3.4 \times (\text{Object Sensitivity} - 0.276), \text{ but not less than } 0.$$

## 4.1.2 Minimum distance to reflective surfaces

The light beams from the sender may be deflected by reflective surfaces. This can result in failure to identify an object.

All reflective surfaces and objects (e.g. material bins) must therefore be located at a minimum distance  $a$  from the protective field of the system. The minimum distance  $a$  depends on the distance  $D$  between sender and receiver.

Fig. 9: Minimum distance to reflective surfaces

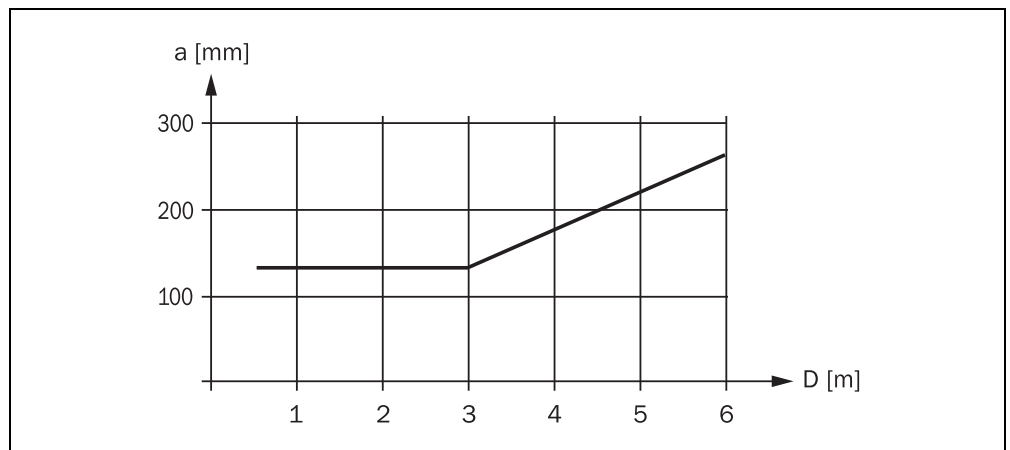


**Note** The field of view of the sender and receiver optics is identical.

### How to determine the minimum distance from reflective surfaces:

- Determine the distance  $D$  [m] sender-receiver.
- Read the minimum distance  $a$  [mm] from the graph:

Fig. 10: Graph, minimum distance from reflective surfaces



## 4.2 Protection from affecting systems in close proximity



WARNING

### Prevent the affection of systems mounted in close proximity

If several safety light curtains operate in close proximity to each other, the sender beams of one system may interfere with the receiver of another system. This can disrupt the protective function of the system. This would mean that the operator is at risk. You must avoid such mounting scenarios or take appropriate measures, e.g. by mounting non-reflective sight protection walls or by reversing the transmission direction of a system.

Fig. 11: Unwanted influencing of a 2<sup>nd</sup> C 4000 system. The receiver of the 2<sup>nd</sup> system is affected by the beams of the 1<sup>st</sup> system.

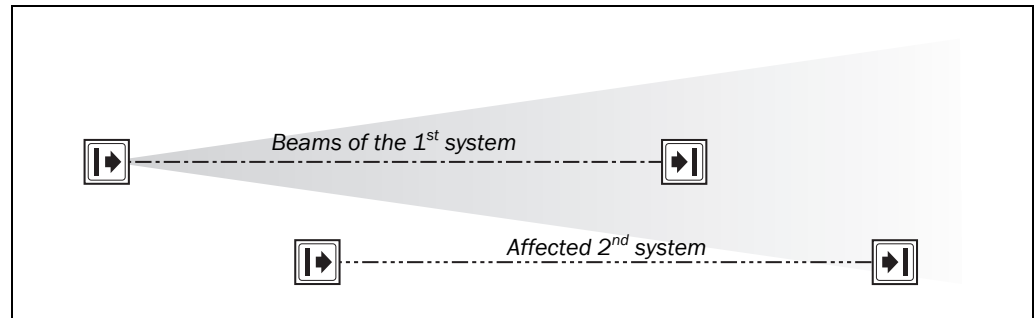
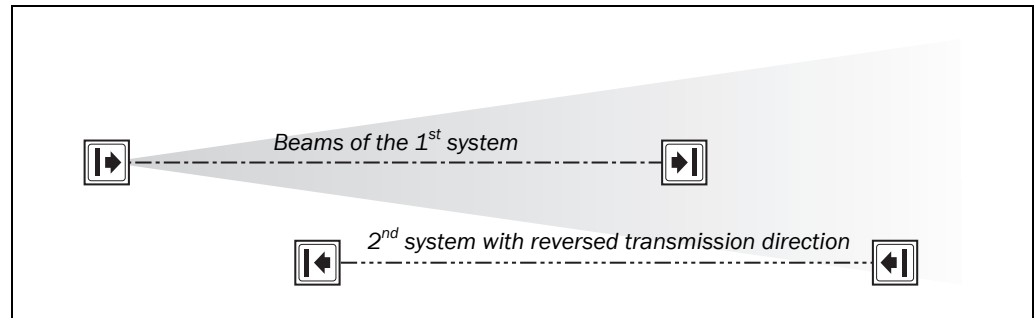


Fig. 12: Reversing the transmission direction of systems in close proximity. The sender of the 2<sup>nd</sup> system is not affected by the beams of the 1<sup>st</sup> system.



### 4.3 Steps for mounting the device

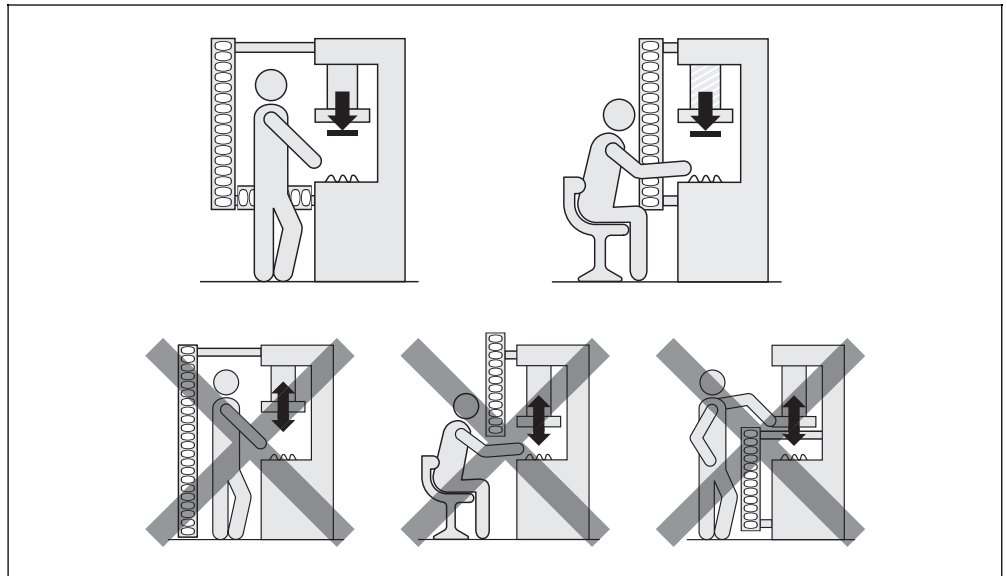


WARNING

#### Special features to note during mounting:

- Always mount the sender and receiver parallel to one another.
- During mounting, make sure that sender and receiver are aligned correctly. The optical lens systems of sender and receiver must be located in exact opposition to each other; the display elements must be mounted at the same height. The system plugs of both devices must point in the same direction.
- Take suitable measures to attenuate vibration if the shock requirements are above the values given in chapter 10.1 “Data sheet” on page 43.
- Observe the safety distance of the system during mounting. On this topic read the chapter “Determining the safety distance” on page 18.
- Mount the safety light curtain such that the hazardous point cannot be reached from below, above or behind the safety light curtain and that the light curtain cannot be repositioned.

Fig. 13: The correct installation (above) must eliminate the errors (below) stepping behind, reaching below and reaching above.



- Once the system is mounted, one or several of the enclosed self-adhesive safety information labels must be affixed.
  - Use only information labels in the language which the operators of the machine understand.
  - Affix the information labels such that they are easily visible by the operators during operation. After attaching additional objects and equipment, the information labels must not be concealed from view.
  - Affix the information label “Important Notices” to the system in close proximity to sender and receiver.

The senders and receivers can be mounted in two different ways:

- Mounting with swivel mount bracket
- Mounting with side bracket

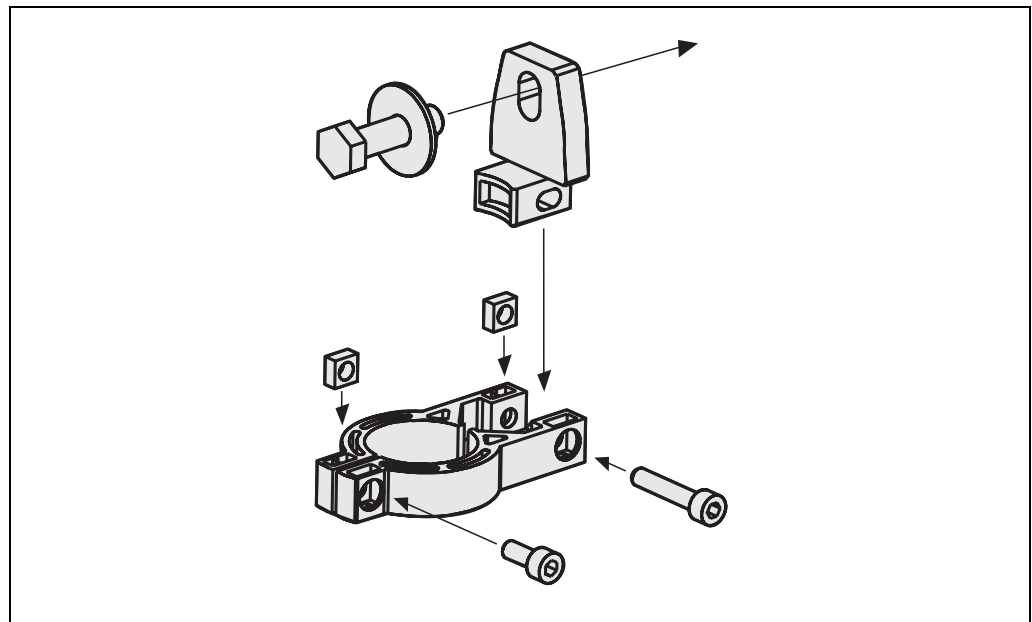
### 4.3.1 Mounting with swivel mount bracket

The swivel mount bracket is made of black plastic. The bracket is designed such that sender and receiver can still be accurately aligned even after the bracket has been mounted.

The swivel mount bracket is also suitable for mounting the deflector mirrors PNS 75 and PNS 125 (see chapter 10.4.5 f. on page 52 f.).

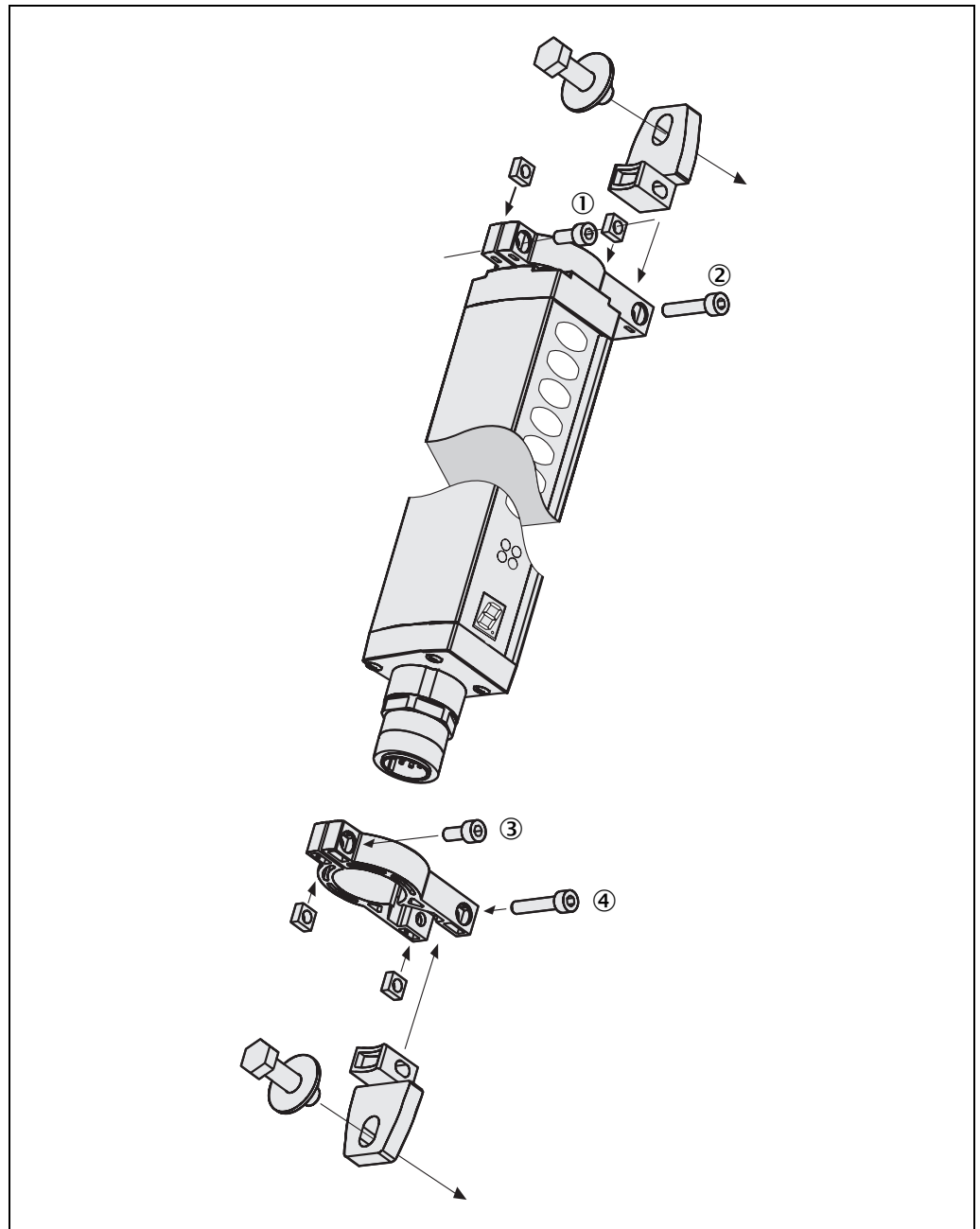
- Note** ➤ Attach the bolts of the swivel mount bracket with a torque of between 2.5 and 3 Nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibration.

Fig. 14: Composition of the swivel mount bracket



**C 4000 Micro/Basic/Eco**

Fig. 15: Mounting sender and receiver using swivel mount brackets

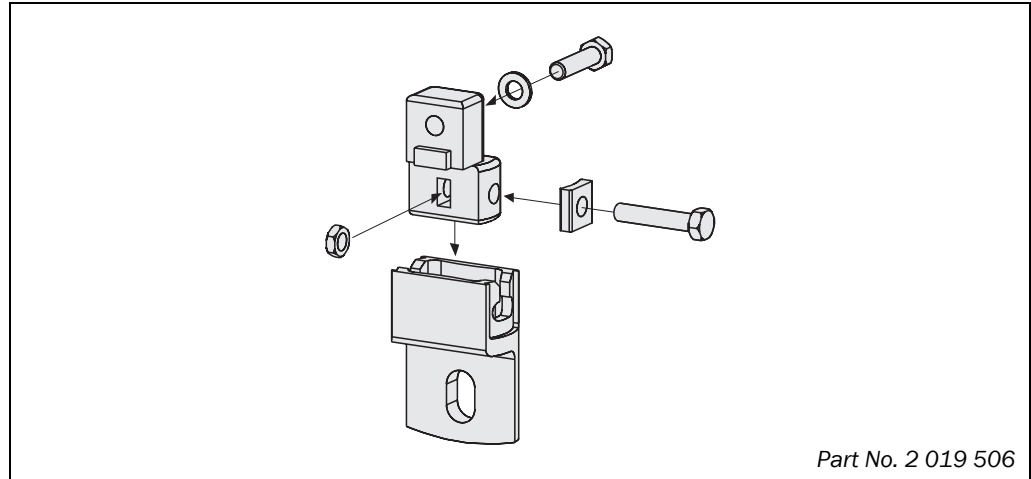


- Notes**
- Mount the bolts marked with ① to ④ on the operator side of the system to ensure that they remain accessible after mounting and to allow you to readjust the light curtain later, if necessary.
  - If you wish to use the additional front screen (see “Additional front screen (weld spark guard)” on page 59), make sure that the curved side of the device remains accessible after mounting.

### 4.3.2 Mounting with side bracket

The side bracket is made of die cast zinc. It is enamelled in black. The side bracket will be covered by the device after mounting. But it is only suitable for mounting surfaces lying parallel to the desired protective field because the alignment of sender and receiver can only be adjusted by a maximum of  $\pm 2.5^\circ$  after mounting.

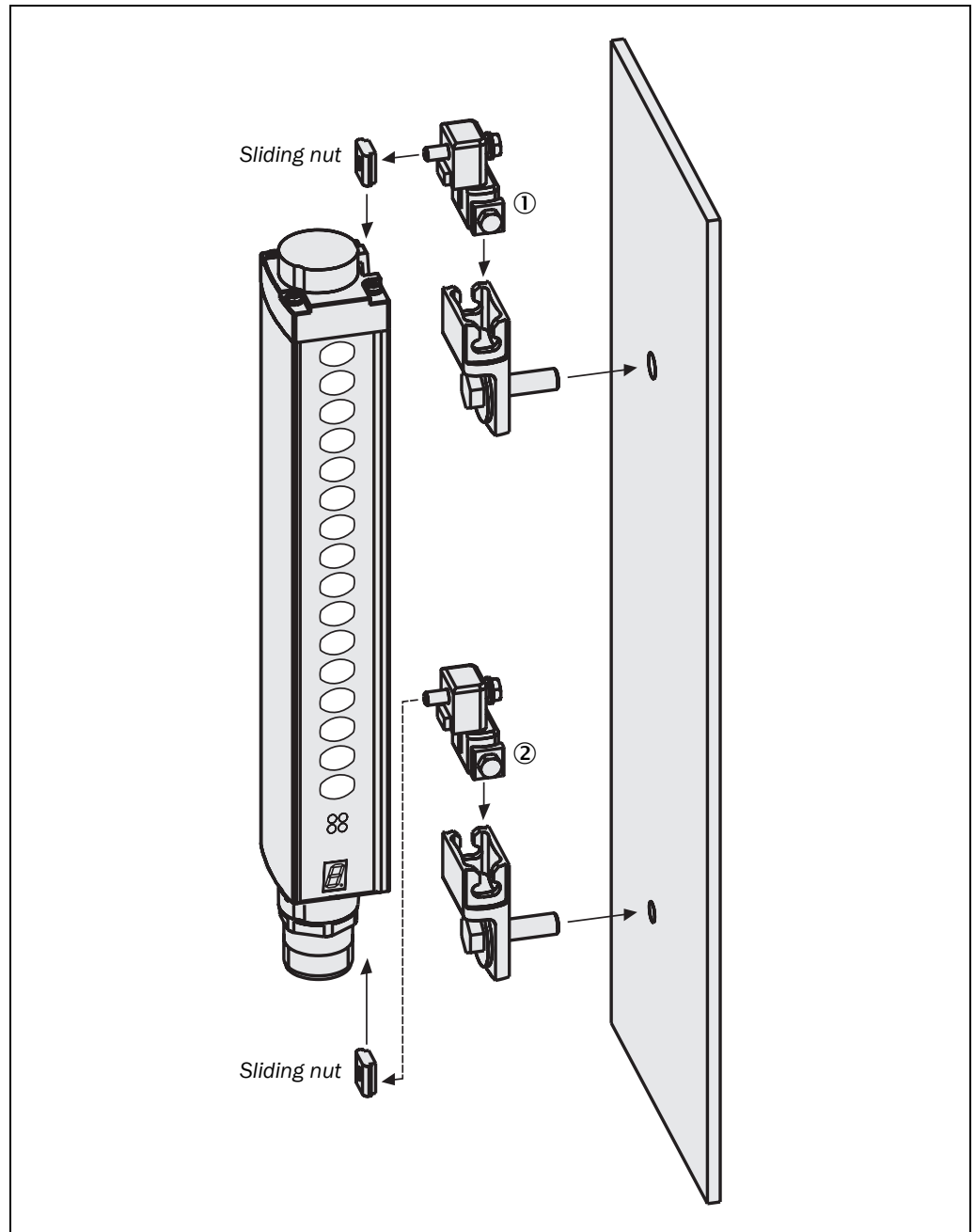
Fig. 16: Composition of the side bracket



- Notes**
- Attach the bolts of the side bracket with a torque of between 5 and 6 Nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibration.
  - When mounting the bracket, note the distance and the position of the sliding nuts as described in chapter 10.4 “Dimensional drawings” on page 49f.

**C 4000 Micro/Basic/Eco**

Fig. 17: Mounting the C 4000 with side bracket



- Notes**
- When mounting the side bracket make sure that the bolts marked ① and ② remain accessible, allowing you later to adjust and lock the light curtain in position.
  - If you wish to use the additional front screen (see “Additional front screen (weld spark guard)” on page 59), make sure that the curved side of the device remains accessible after mounting.

## 5 Electrical installation



WARNING

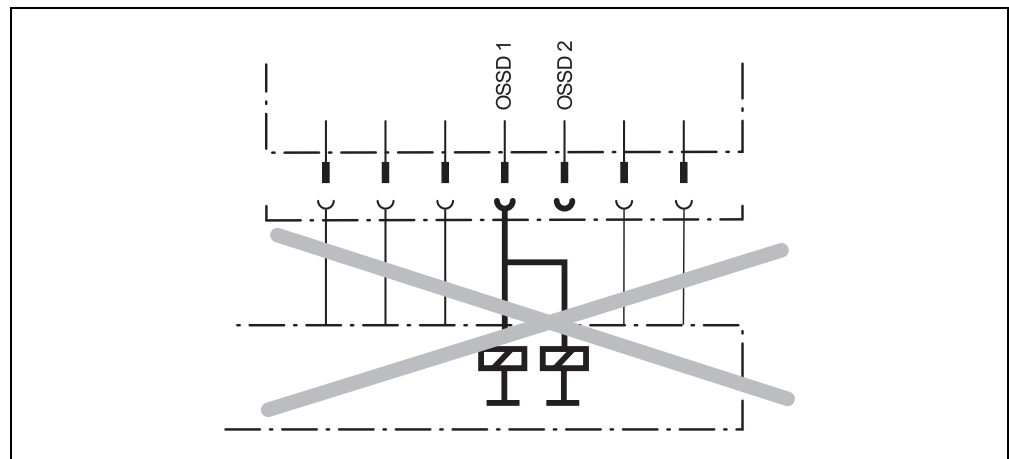
### Switch the entire machine/system off line!

The machine/system could inadvertently start up while you are connecting the unit.

- Make sure that the entire machine/system is disconnected during the electrical installation.

### Connect OSSD1 and OSSD2 separately!

- To ensure that the signals are safe, OSSD1 and OSSD2 are to be connected separately to the machine controller and the machine controller must process the two signals separately. OSSD1 and OSSD2 must not be connected together.



WARNING

### Only connect the OSSDs to a single subsequent switching element!

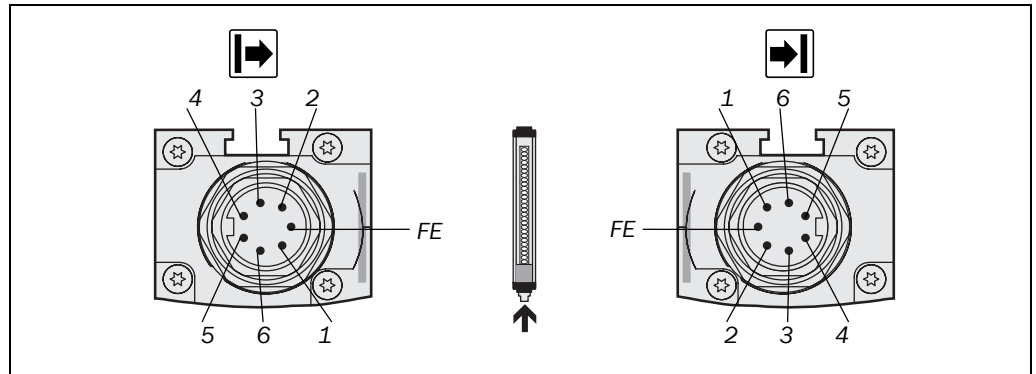
Each output signal switching device (OSSD) is only allowed to be connected to one switching element (e.g. relay or contactor). If several switching elements are required, then you must choose a suitable form of contact duplication.

- Notes**
- The two outputs are protected against short-circuits to 24 V DC and 0 V. When the light path is clear, the signal level on the outputs is HIGH DC (at potential), when the light beams are interrupted or there is a device fault the outputs are LOW DC.
  - The safety light curtain C 4000 meets the interference suppression requirements (EMC) for industrial use (interference suppression class A). When used in residential areas it can cause interference.
  - To ensure full electromagnetic compatibility (EMC), functional earthing (FE) must be connected.
  - The external voltage supply of the device must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK (SICK Power Supply 50 W (Part number 7 028 789)/SICK Power Supply 95 W (Part number 7 028 790)).

**C 4000 Micro/Basic/Eco**

## 5.1 System connection C 4000 Basic (M26×6 + FE)

Fig. 18: Pin assignment system connection C 4000 Basic (M26×6 + FE)

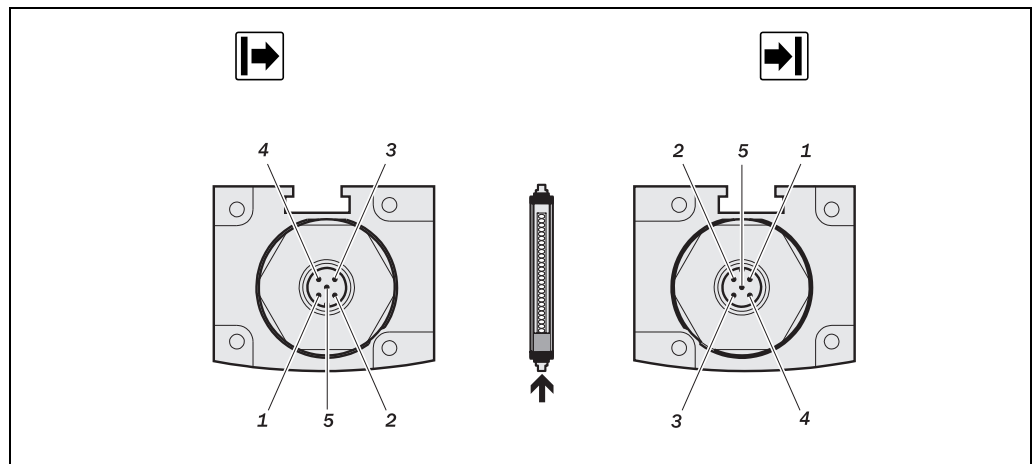


Tab. 9: Pin assignment system connection C 4000 Basic (M26×6 + FE)

Pin	Wire colour	Sender	Receiver
1	brown	24 V DC input (voltage supply)	24 V DC input (voltage supply)
2	blue	0 V DC (voltage supply)	0 V DC (voltage supply)
3	grey	test input: 0 V: external test active 24 V: external test inactive	OSSD1 (switching output 1)
4	pink	reserved	OSSD2 (switching output 2)
5	red	reserved	start-up configuration 1
6	yellow	reserved	external device monitoring (EDM) or start-up configuration 2
FE	green	functional earthing	functional earthing

## 5.2 System connection C 4000 Eco (M12×4 + FE)

Fig. 19: Pin assignment system connection C 4000 Eco (M12×4 + FE)

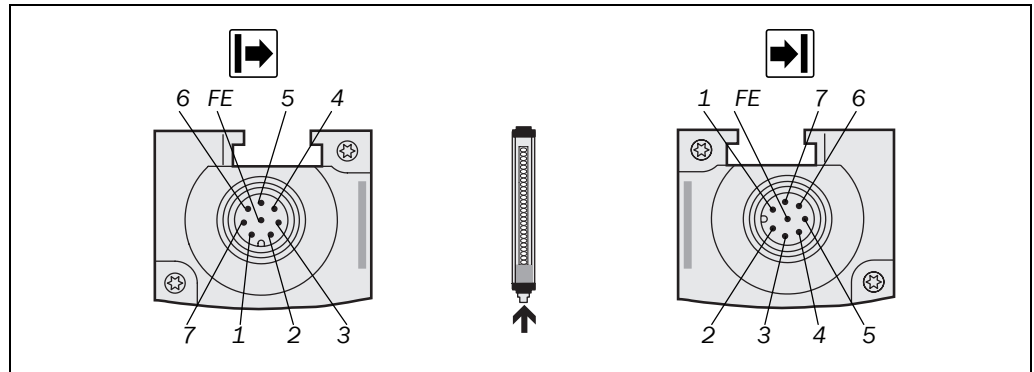


Tab. 10: Pin assignment system connection C 4000 Eco (M12×4 + FE)

Pin	Wire colour	Sender	Receiver
1	brown	24 V DC input (voltage supply)	24 V DC input (voltage supply)
2	black	reserved	OSSD1 (switching output 1)
3	blue	0 V DC (voltage supply)	0 V DC (voltage supply)
4	white	reserved	OSSD2 (switching output 2)
5	grey	functional earthing	functional earthing

### 5.3 System connection C 4000 Micro/Basic Plus (M12×7 + FE)

Fig. 20: Pin assignment system connection C 4000 Micro/Basic Plus (M12×7 + FE)



Tab. 11: Pin assignment system connection C 4000 Micro/Basic Plus (M12×7 + FE)

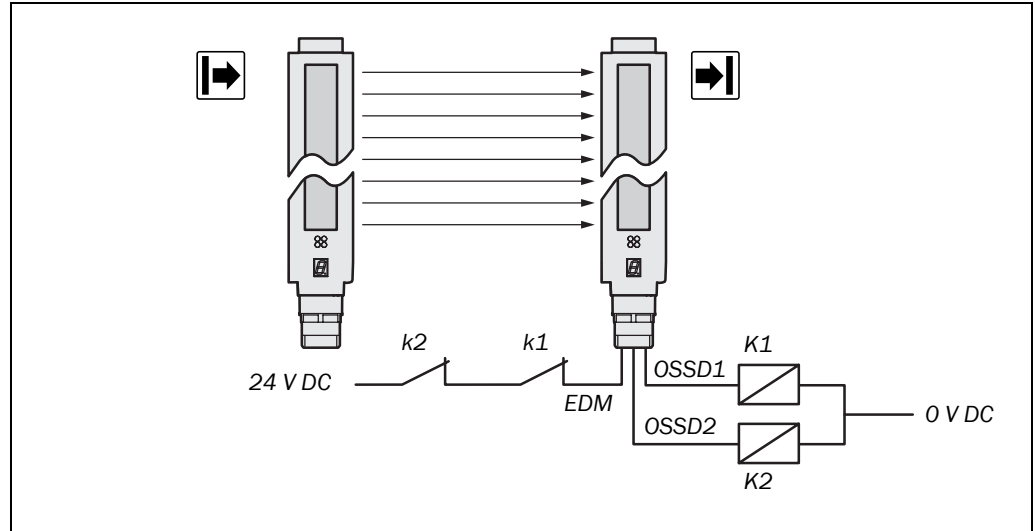
Pin	Wire colour	Sender	Receiver
1	white	reserved	reset/restart or start-up configuration 2
2	brown	24 V DC input (voltage supply)	24 V DC input (voltage supply)
3	green	reserved	start-up configuration 1 <sup>1)</sup>
4	yellow	reserved	external device monitoring (EDM) <sup>1)</sup>
5	grey	test input: 0 V: external test active 24 V: external test inactive	OSSD1 (switching output 1)
6	pink	reserved	OSSD2 (switching output 2)
7	blue	0 V DC (voltage supply)	0 V DC (voltage supply)
FE	screen	functional earthing	functional earthing

<sup>1)</sup> Pins 3 and 4 of the receiver connection are jumped internally.

## 5.4 External device monitoring (EDM)

The EDM checks if the contactors actually de-energise when the protective device responds. If, after an attempted reset, the EDM does not detect a response from the switched device within 300 ms, the EDM will deactivate the OSSD switching outputs again.

Fig. 21: Connecting the contact elements to the EDM



You must implement the external device monitoring electrically by the positive closing action of both N/C contacts (k1, k2) when the contact elements (K1, K2) reach their de-energised position after the protective device has responded. 24 V is then applied at the input of the EDM. If 24 V is not present after the response of the protective device, then one of the contact elements is faulty and the external device monitoring prevents the machine starting up again.

### Notes



- If the contact elements to be monitored are connected to the external device monitoring (EDM) input, then the safety light curtain activates external device monitoring during the next start-up and saves this configuration in the device.
- You can again deactivate the external device monitoring at a later time by using the start-up configuration (see section 7.4 “Start-up configuration” on page 38). In this case, pin 6 (C 4000 Basic) and pin 4 (C 4000 Micro/Basic Plus), respectively, must not be connected to 24 V.

## 5.5 Reset button

When using C 4000 Micro (see section 3.4.1 “Restart interlock” on page 13), the operator must press the reset button prior to restart.

**Note** If you use the C 4000 Micro/Basic without restart interlock, then you must implement the restart interlock externally, i.e. on the machine.

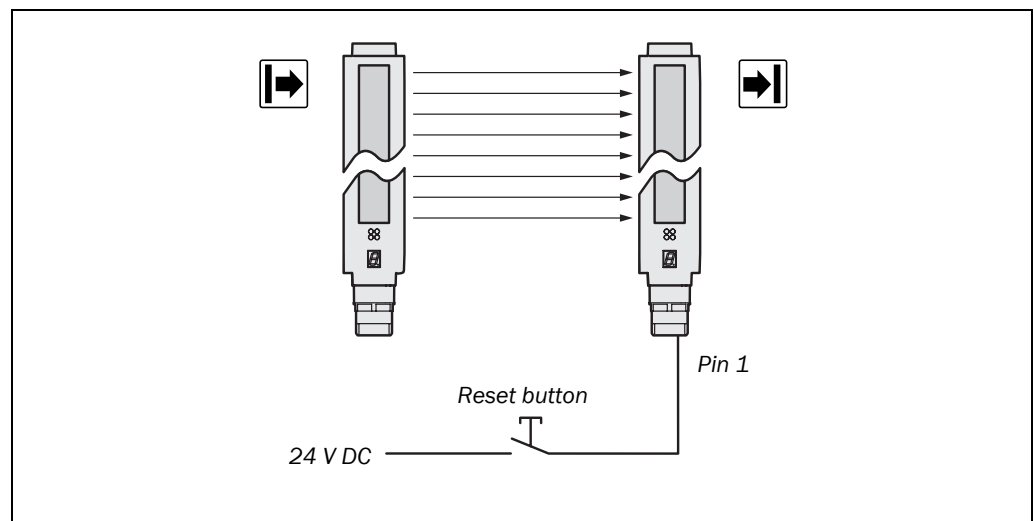


WARNING

### Select the correct installation site for the reset button!

Install the reset button outside the hazardous area such that it cannot be operated from inside the hazardous area. When operating the reset button, the operator must have full visual command of the hazardous area.

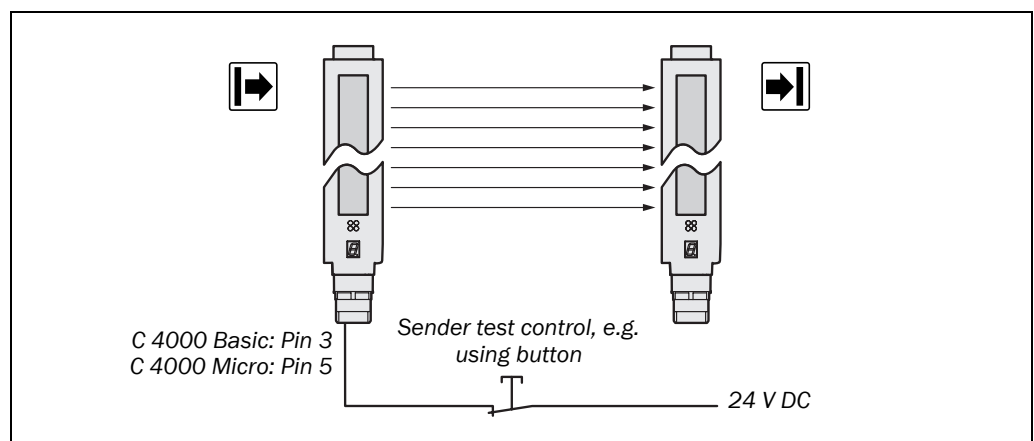
Fig. 22: Connection of the reset button on the C 4000 Micro/Basic



**Note** You must activate the restart interlock function, otherwise the reset button remains without function during operation. (See chapter 7.2 “Activating the restart interlock” on page 38.)

## 5.6 Test input (sender test)

Fig. 23: Connection of the sender test button



The sender test is performed when 0 V is present at the test input.

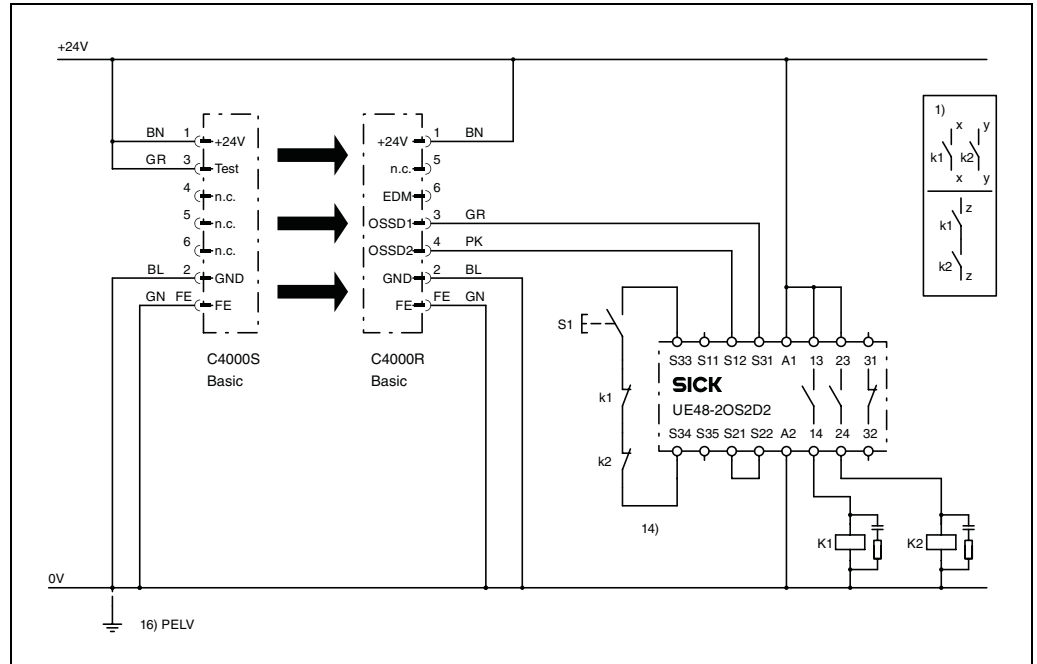
**5.7 Switching examples**

**Note** Please observe the respective operating instructions of the integrated devices!

**5.7.1 C 4000 Basic on UE48-20S/UE48-30S with restart interlock and EDM**

The C 4000 Basic light curtain can be integrated in the switching amplifiers UE48-20S or UE48-30S. Operation is carried out with restart lock and EDM.

Fig. 24: Switching example for C 4000 Basic on UE48-20S



**Mode of operation:**

If the light path is not interrupted, the outputs OSSID1 and OSSID2 are energised. The system is ready to switch on when K1 and K2 are in the de-energised position. Pressing the button S1 switches on the UE48 switching amplifier. The contacts 13-14 and 23-24 of the UE48 activate the contact elements K1 and K2.

If the light path is interrupted, the outputs OSSID1 and OSSID2 are de-energised. This switches off the UE48 and deactivates K1, K2.

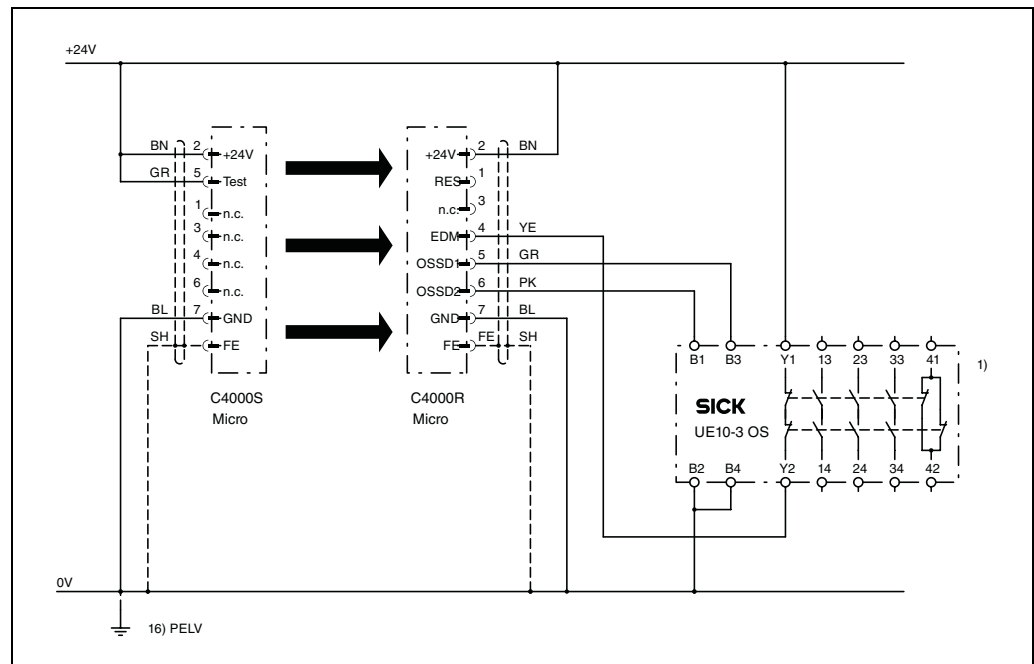
**Possible fault sources:**

Cross and short-circuiting of the outputs OSSID1 and OSSID2 are detected and lead to a lock-out. Malfunctions of the contact elements K1 and K2 are detected; the switch-off function remains active.

### 5.7.2 C 4000 Micro/Basic on UE10-30S without restart interlock, with EDM

The C 4000 Micro/Basic light curtain can be integrated in the UE10-30S switching amplifier. Operation is carried out without a restart interlock but with an EDM.

Fig. 25: Switching example for C 4000 Micro/Basic on UE10-30S



#### Mode of operation:

If the light path is not interrupted and the UE10 is in the de-energised position, the system is released for use. The outputs OSSD1 and OSSD2 are energised. This switches on the UE10.

If the light path is interrupted, the outputs OSSD1 and OSSD2 are de-energised. This switches off the UE10.

#### Possible fault sources:

Cross and short-circuiting of the outputs OSSD1 and OSSD2 are detected and lead to a lock-out. Malfunctions of the UE10 are detected; the switch-off function remains active.



































































