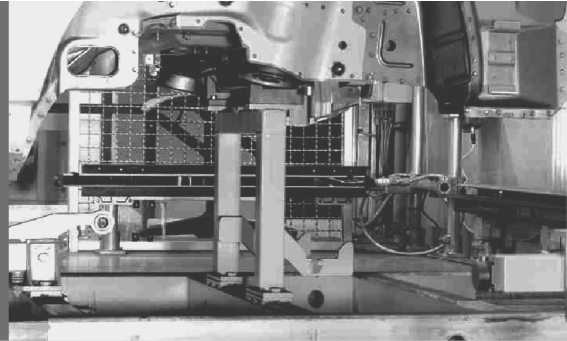
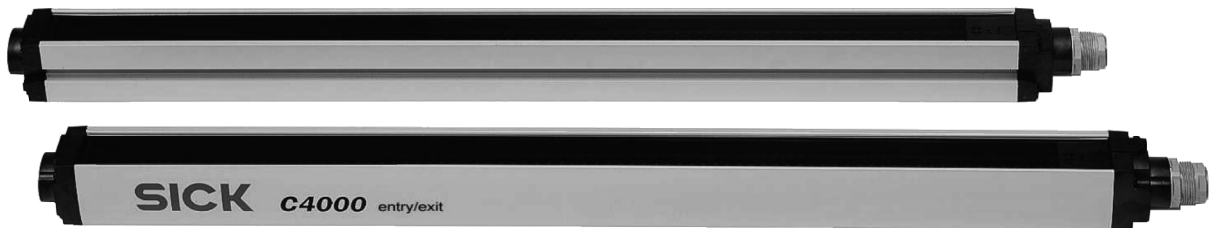


## C4000 Entry/Exit



### Safety Light Curtain

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# 1 About this document

Please read this chapter carefully before working with the documentation and the C4000 Entry/Exit, also referred to in the following as C4000 for short.

## 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, configuration, electrical installation, commissioning, operation and maintenance of the safety light curtain C4000.

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 for the machine.

## 1.2 Target group

These operating instructions are addressed to *planning engineers, developers* and *operators* of plants and systems which are to be protected by one or several C4000 safety light curtains. It also addresses people who integrate the C4000 into a machine, initialise its use, or who are in charge of servicing and maintaining the device.

## 1.3 Scope

This document is an original document.

**Note** These operating instructions apply to the safety light curtain C4000 Entry/Exit with one of the following entries on the type label in the field *Operating Instructions*:

- 8010235
- 8010235/TI73
- 8010235/YT68

This document is part of SICK part number 8010235 (operating instructions “C4000 Entry/Exit Safety Light Curtain” in all available languages).

For the configuration and diagnostics of these devices you require CDS (Configuration & Diagnostic Software) version 2.1.0 or higher. To check the version of the software, on the **?** menu select **Info....**

## 1.4 Depth of information

These operating instructions contain information on:

- installation and mounting
- electrical installation
- commissioning and configuration
- care and maintenance
- fault, error diagnosis and trouble-shooting
- part numbers
- conformity and approval

of the safety light curtain C4000.

Planning and using protective devices such as the C4000 also require specific technical skills which are not detailed in this documentation.

When operating the C4000, 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 regarding the C4000
- these operating instructions in different languages for viewing and printing
- certificates on the prototype test, the EU declaration of conformity and other documents

## 1.5 Abbreviations

<b>ADO</b>	Application diagnostic output = configurable signal output that indicates a specific status of the protective device
<b>CDS</b>	SICK Configuration & Diagnostic Software
<b>EDM</b>	External device monitoring
<b>EFI</b>	Enhanced function interface = safe SICK device communication
<b>ESPE</b>	Electro-sensitive protective equipment (e.g. C4000)
<b>OSSD</b>	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. U



Flashing indication of characters, e.g. 8



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

The depiction of numbers on the 7-segment display can be rotated by 180° with the aid of the CDS. In this document the depiction of the numbers on the 7-segment display is however always in the normal, non-rotated position.

- 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. Read carefully and follow the instructions for action.



WARNING

### Warning!

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

Read carefully and follow the warning notices!





Software notes show the location in the CDS (Configuration & Diagnostic Software) where you can make the appropriate settings and adjustments. In the CDS open the menu **View, Dialog box** and select the item **File cards** to go straight to the above dialog fields. Alternatively, the software wizard will guide you through the appropriate setting.

If you use the SICK switching amplifier UE402, you will find the functions under the same names, however to some extent in different places in the CDS Configuration dialog box. This is dependent on the scope of the related function. The operating instructions for the UE402 contain detailed information.



### 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 a 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 C4000 or with the machine protected by the C4000.

### 2.1 Qualified safety personnel

The safety light curtain C4000 must be installed, commissioned and serviced only by qualified safety personnel. Qualified safety 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 C4000 is an electro-sensitive protective equipment (ESPE).

The physical resolution is 14, 20, 30 or 40 mm with a maximum protective field width of 19 metres (resolution 20 mm and higher). The realisable protective field length is between 900 and 1,500 mm.

The device is a *Type 4 ESPE* as defined by IEC 61496-1 and -2 and is therefore allowed for use with controls in control category 4 in compliance with EN ISO 13849-1. The device is suitable for

- 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 protective 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 C4000 Entry/Exit cannot be cascaded.



## 2.3 Correct use

The safety light curtain C4000 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 safety 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 C4000.

- 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
  - Work Equipment Directive
  - the work safety regulations/safety rules
  - other relevant health and safety regulations

Manufacturers and operators of the machine on 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 42) of these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- Changes to the configuration of the devices can degrade the protective function. After every change to the configuration you must therefore check the effectiveness of the protective device.

The person who makes the change is also responsible for the correct protective function of the device. When making configuration changes, please always use the password hierarchy provided by SICK to ensure that only authorised persons make changes to the configuration. The SICK service team is available to provide assistance if required.

- The tests must be carried out by qualified safety 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 C4000 is fitted. The machine operator is to be instructed in the use of the device by qualified safety personnel and must be instructed to read the operating instructions.
- 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 (Siemens type series 6 EP 1).

## 2.5 Environmental protection

The safety light curtain C4000 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 on 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 C4000 Entry/Exit. 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.

**Note** The descriptions of functions in this chapter only apply to the safety light curtain C4000 Entry/Exit with the following entry on the type label in the *Operating Instructions* field: 8010235.

### 3.1 Special features

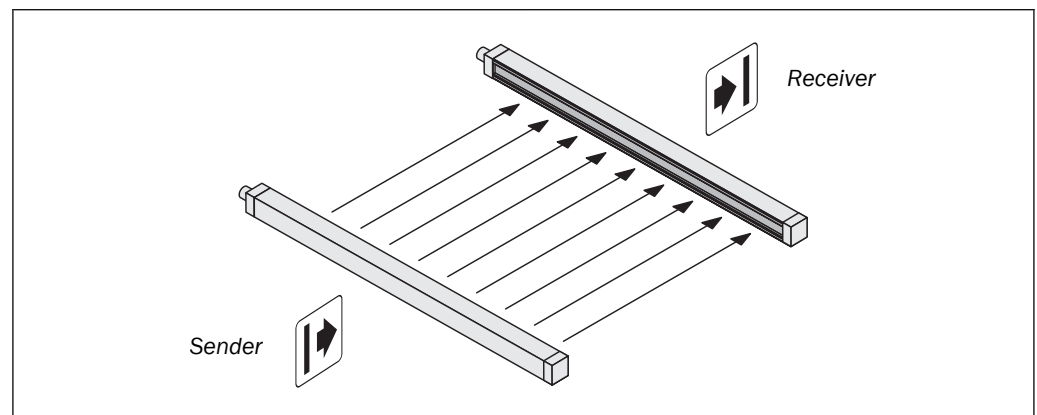
The safety light curtain C4000 Entry/Exit has the following characteristics:

- protective operation with either internal or external (realised on the machine) restart interlock
- connection for the reset button either in the control cabinet or directly to the device
- external device monitoring (EDM)
- bypass for safe operational statuses (only in conjunction with SICK switching amplifier, e.g. UE402)
- 2 beam codings possible in addition to non-coded operation
- configurable signal output (ADO) for improved availability
- status display with 7-segment display
- range of functions can be expanded using switching amplifiers in the SICK Intelliface product family
- self-teach dynamic blanking of moving objects in the protective field level
- operating mode switching (only in conjunction with SICK switching amplifier, e.g. UE402)

### 3.2 Operating principle of the device

#### 3.2.1 Device components

Fig. 1: Components of the C4000 Entry/Exit



Please refer to chapter 11 “Technical specifications” on page 50 for the data sheet. Please refer to pages 56ff. for the dimensional drawings.

### 3.2.2 The light curtain principle

The safety light curtain C4000 consists of a sender and a receiver (Fig. 1). Between these two units is the protective field, defined as the protective field length and the protective field width.

The construction height determines the *protective field length* of the appropriate system. For the exact protective field length, please see Tab. 22ff. in chapter 11.4 “Dimensional drawings” on page 56.

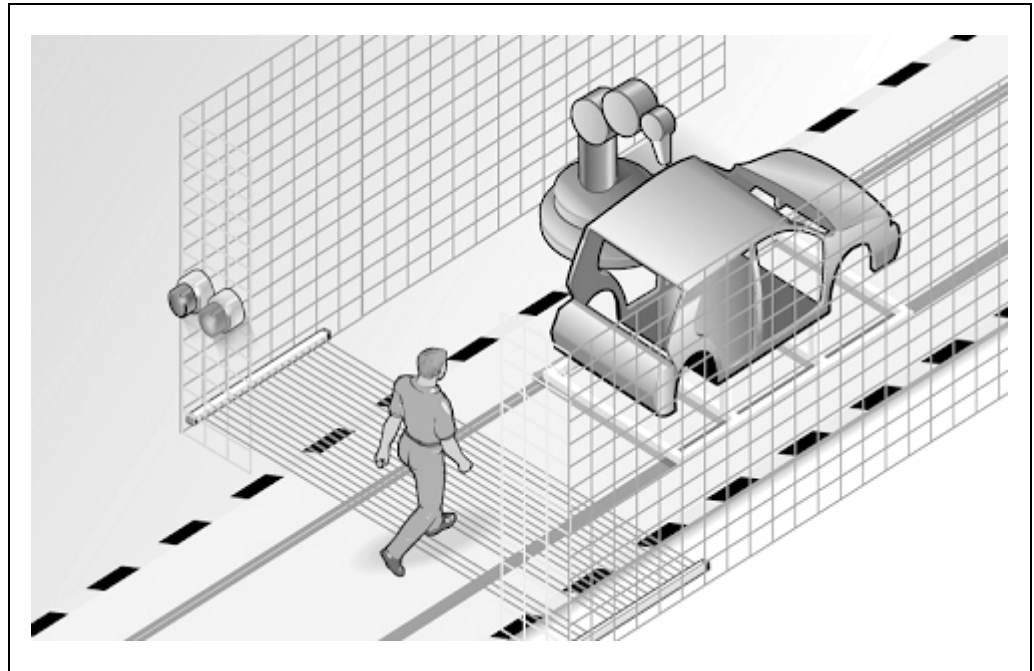
The *protective field width* is derived from the dimension of the light path between sender and receiver and must not exceed the maximum rated protective field width (see “Technical specifications” on page 50).

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

The C4000 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: Access protection with self-teach dynamic blanking



The safety light curtain C4000 operates correctly as a protective device only if the following conditions are met:

- The control of the machine must be electrical.
- It must be possible to achieve a safe state on the machine at any time.
- Sender and receiver unit must be so mounted that objects penetrating the hazardous area are safely identified by the C4000.
- The restart 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 Status indicators

The LEDs and the 7-segment displays of the sender and the receiver signal the operating status of the C4000.

**Note** The depiction of numbers on the 7-segment display can be rotated by 180° with the aid of the CDS (Configuration & Diagnostic Software). If you rotate the numbers of the 7-segment display, the point on the 7-segment display goes out:

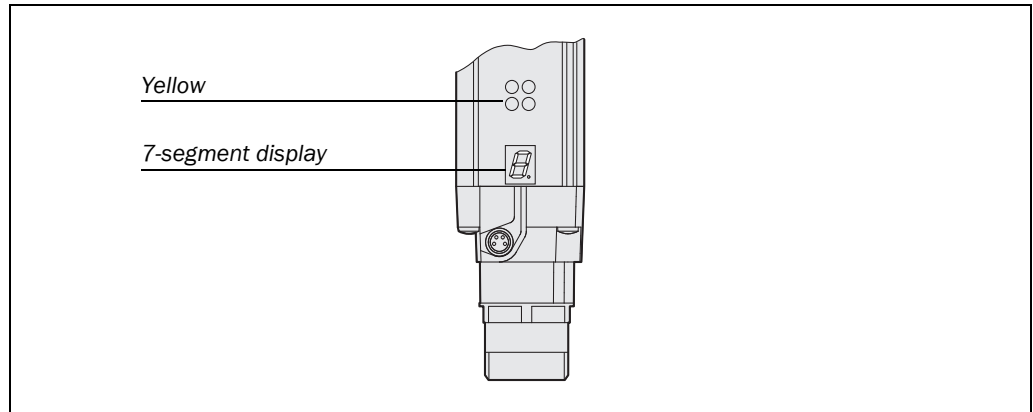
- Point visible: The bottom edge of the numbers on the 7-segment display is pointing towards the configuration connection.
- Point not visible: The bottom edge of the numbers on the 7-segment display is pointing towards the LED display.



Device symbol **C4000 Entry/Exit (receiver)** or **C4000 Entry/Exit (sender)**, context menu **Configuration draft, Edit**, option **7-segment display** of the related device.

#### 3.4.1 Status indicators of the sender

Fig. 3: Status indicators of the sender

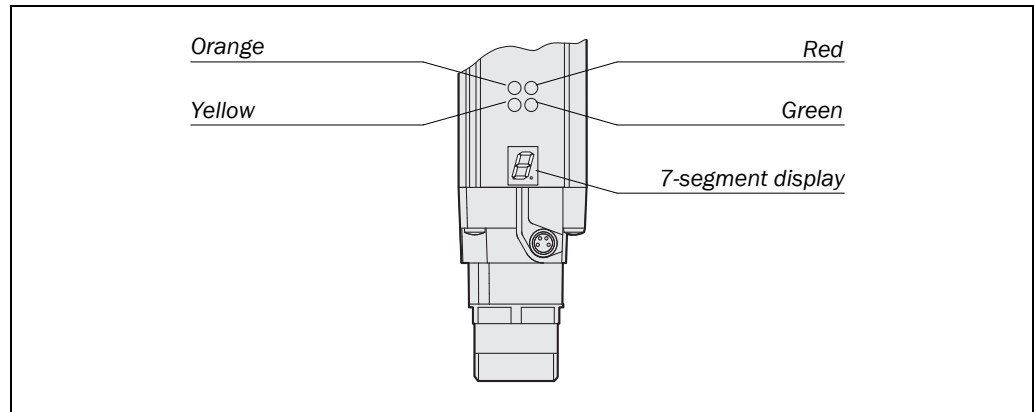


Tab. 1: Status indicators of the sender

Display	Meaning
● Yellow	Power supply OK
E	System error. The device is defective. Replace the sender.
a	The device is in the test mode.
U	Non-coded operation (only after switching on)
-	Operation with code 1 (only after switching on)
□	Operation with code 2 (only after switching on)
Other displays	All other displays are error messages. Please refer to chapter "Fault diagnosis" on page 46.

## 3.4.2 Status indicators of the receiver

Fig. 4: Status indicators of the receiver



Tab. 2: Status indicators of the receiver

Display	Meaning
● Orange	Cleaning or realignment required
● Yellow	Reset required
● Red	System providing signals for shutting down the machine (output signal switching devices off)
● Green	System enabled (output signal switching devices on)
	Bypass active (only in conjunction with SICK switching amplifier, e.g. UE402.)
	System error. The device is defective. Replace the receiver.
	Poor alignment to sender.
	Please refer to chapter 7.2 "Aligning sender and receiver" on page 41.
	Operation with large protective field width (only after switching on)
	Self-teach dynamic blanking active
	Object in the protective field with activated self-teach dynamic blanking
	Non-coded operation (only after switching on)
	Operation with code 1 (only after switching on)
	Operation with code 2 (only after switching on)
	Emergency stop active
Other displays	All other displays are error messages. Please refer to chapter "Fault diagnosis" on page 46.

# 4 Configurable functions

This chapter describes the functions of the safety light curtain C4000 Entry/Exit which are selectable via software.



**WARNING**

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

The entire protective device must be tested for correct operation after each change of the configuration (see chapter 7.3 “Test notes” on page 42).



When starting to configure the device, you may save an application name with a maximum of 22 characters. Use this function as a “memory jog”, e.g. to describe the application of the current device configuration. Device symbol **C4000 Entry/Exit (receiver)** or **C4000 Entry/Exit (sender)**, context menu **Configuration draft, Edit**, file card **General**, option **Application name**.

## 4.1 Restart interlock



**WARNING**

**Always configure the application with restart interlock!**

Ensure that there is always a restart interlock. The C4000 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 dangerous state of the machine is interrupted if the light path is broken, and is not re-enabled until the operator presses the reset button.

**Note**

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.

The possible combinations are shown in the following table:

Tab. 3: Permissible configuration of the restart interlock

Restart interlock of the C4000	Restart interlock of the machine	Permissible application
Deactivated	Activated	All
Activated	Activated	All. Restart interlock of the C4000 handles the reset function (see “Reset” below).
Activated	Deactivated	Not permitted
Deactivated	Deactivated	Not permitted

The electrical connection of the reset button is described in chapter “Reset button” on page 38.



**Recommendation**

Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **General**, option **Restart interlock**.

You can indicate the status *Reset required* using a signal lamp. The C4000 has a dedicated output for this purpose. The electrical connection of the signal lamp is described in chapter “Connection of a signal lamp to the output *Reset required*” on page 38.

**Reset**

If you want to activate the restart interlock on the C4000 (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 C4000 activates the output signal switching devices.
- 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 C4000, 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.

**4.2 External device monitoring (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 C4000 checks the contactors after each interruption to the light path and prior to machine restart. The EDM can so identify if one of the contacts 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 6.4 "External device monitoring (EDM)" on page 37.



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **General**, option **EDM**.

**4.3 Emergency stop**

The C4000 has an input for a two-channel emergency stop button. The emergency stop monitoring in the device corresponds to stop category 0 in accordance with EN ISO 13850. You can connect e.g. a door contact or an emergency stop button to the emergency stop input. The operation of the emergency stop button has the following effect:

- The safety light curtain deactivates the OSSDs.
- The C4000 Entry/Exit switches to red.
- The 7-segment display on the C4000 Entry/Exit indicates .



## C4000 Entry/Exit

**Notes** The emergency stop function deactivates the OSSDs even if the bypass function is activated.

Take into account the response time of the emergency stop function! The response time of the safety light curtain on interruption via the emergency stop input is up to 200 ms.



WARNING

### Pay attention to the way in which the emergency stop function works!

The emergency stop button connected to the extension connection on the C4000 affects *only* the output signal switching devices (OSSDs) on the C4000.

- Notes**
- The C4000 checks after switch on whether an emergency stop function has been configured and whether a door switch or similar switch is connected. If the configuration and the electrical connection do not match, the system locks completely (lock-out). The 7-segment display will then show the error message .
  - The safety light curtain has a signal output (ADO) at which the status of the emergency stop input can be signalled. For details refer to the next section.



WARNING

### Regularly check the connected emergency stop button or door contact!

- By means of organisational measures ensure that the emergency stop button or door contact is operated once at a specified interval.

This is necessary so that the C4000 can detect any fault that has occurred on the emergency stop button or door switch. The interval is to be defined to suit the specific case dependant on the application.

- Always check whether the output signal switching devices on the light curtain are deactivated on the operation of the emergency stop button or door switch.

The electrical connection of the emergency stop is described in chapter 6.6 “Emergency stop” on page 39.



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **General**, option **Emergency stop active**.

## 4.4 Signal output (ADO)

The C4000 has a signal output (ADO) that can be configured. With the aid of the signal output, the safety light curtain can signal specific states. You can use this output for a relay or a FPLC.



WARNING

### You must not use the signal output for safety-relevant functions!

You are only allowed to use the signal output for signalling. You must never use the signal output for controlling the application or with safety-relevant functions.

Tab. 4: Possible configuration for the signal output

The connection can signal one of the following states:

Assignment	Possible uses
Contamination	Eases diagnostics in case of contaminated front screen.
OSSD status with delay of [s]	Signals the status of the output signal switching devices. If the safety light curtain switches to red, then it signals the status immediately. If it switches to green, then it signals the status only after an adjustable delay in the range from 0.1 to 3.1 seconds.
Status of the emergency stop	Signal is present if the button connected to the emergency stop input on the C4000 has been pressed.



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **General**, option **Assignment of the signal output**.

The electrical connection of a PLC/controller to the signal output is described in chapter 6.7 "Signal output (ADO)" on page 40.

## 4.5 Beam coding

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. With code 1 or 2 activated, the receiver can distinguish the beams designated for it from other beams. The following settings are available: non-coded, code 1 and code 2.

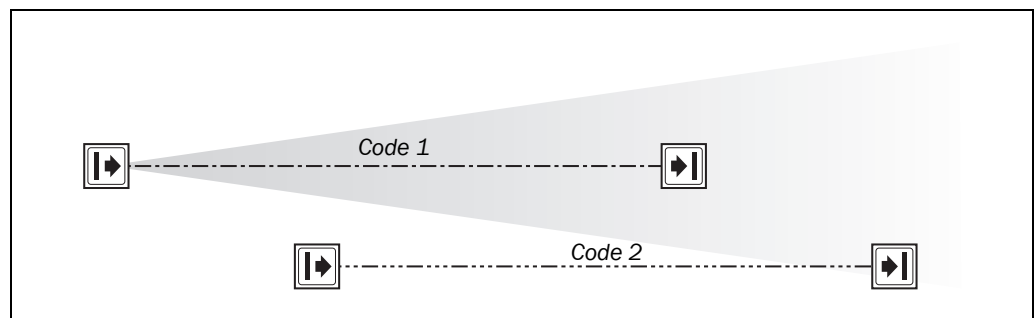


WARNING

### Use different beam codings if the systems are mounted in close proximity!

Systems mounted in close proximity to each other must be operated with different beam codings (code 1 or code 2). If this precaution is neglected, the system may be impaired in its protective function by the beams from the neighbouring system and so change to the unsafe state. This would mean that the operator is at risk.

Fig. 5: Schematic layout of the beam coding



- Notes**
- Beam coding increases the availability of the protected machine. Beam coding also enhances the resistance to optical interference such as weld sparks or similar.
  - Beam coding will increase the response time of the system. This may also change the required safety distance. Instructions can be found in chapter 5.1 "Determining the safety distance" on page 24.
  - After activating the system, sender and receiver will briefly display the coding.



Device symbol **C4000 Entry/Exit (receiver)** or **C4000 Entry/Exit (sender)**, context menu **Configuration draft, Edit**, file card **General**, option **Beam coding**.

## 4.6 Scanning range



WARNING

### Match the scanning range with the protective field width!

The scanning range of the system must be adapted to 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 too great, the light curtain may malfunction. This would mean that the operator is at risk.

The available settings depend on the physical resolution of the system:

Tab. 5: Physical resolution and scanning range

Physical resolution	Selectable scanning ranges	Scanning range with 1 additional front screen	Scanning range with 2 additional front screens
14 mm	0.5–2.5 m	0.5–2.3 m	0.5–2.1 m
	2–6 m	1.8–5.5 m	1.7–5 m
20 mm, 30 mm, 40 mm	0.5–6 m	0.5–5.5 m	0.5–5 m
	5–19 m	4.6–17.4 m	4.2–16 m



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **Standalone**, option **Scanning range [m]**.

### Notes

- If you are using the additional front screen (see page 62) available as an accessory, the overall scanning range will be reduced by 8% for each additional front screen.
- The deflector mirrors available as accessories (see page 59f.) reduce the overall scanning range as a function of the number of deflector mirrors in the light path (see Tab. 6 for PNS75 and Tab. 7 for PNS125). When using deflector mirrors, you *must* configure the light curtain for a long scanning range.
- The usage of deflector mirrors is not allowed if the formation of droplets or heavy contamination of the deflector mirrors is to be expected.

Tab. 6: Scanning range when using 1 or 2 PNS75 deflector mirrors

Protective field length [mm]	Scanning range for physical resolution/number of deflector mirrors			
	14 mm		20, 30 or 40 mm	
	1 × PNS75	2 × PNS75	1 × PNS75	2 × PNS75
900	4.8 m	3.3 m	7.4 m	8.0 m
1050	4.8 m	3.2 m	6.8 m	7.5 m
1200	4.8 m	2.9 m	6.4 m	7.1 m
1350	4.8 m	2.6 m	6.0 m	6.6 m
1500	4.6 m	2.3 m	5.8 m	6.3 m

Tab. 7: Scanning range when using 1 or 2 PNS125 deflector mirrors

Protective field length [mm]	Scanning range for physical resolution/number of deflector mirrors			
	14 mm		20, 30 or 40 mm	
	1 × PNS125	2 × PNS125	1 × PNS125	2 × PNS125
900	4.8 m	3.8 m	14.2 m	12.3 m
1050	4.8 m	3.8 m	13.6 m	12.3 m
1200	4.8 m	3.6 m	13.0 m	12.3 m
1350	4.8 m	3.5 m	12.6 m	12.3 m
1500	4.8 m	3.3 m	12.0 m	12.3 m

## 4.7 Multiple sampling

When multiple sampling is set, the C4000 Entry/Exit must detect an object several times, before it deactivates its OSSDs. In this way you can reduce the probability that objects falling through the protective field, for example welding sparks or other particles, result in the shutdown of the plant.

With a multiple sampling configuration of, e.g., 3, the C4000 Entry/Exit must detect an object three times in succession before it switches off the OSSDs.



WARNING

### Check the total response time!

The total response time is increased by the multiple sampling! If you change the multiple sampling, then you must recalculate the response time (see Tab. 19 on page 54).

### Note

On the C4000 Entry/Exit, a multiple sampling of 2 is the default setting. You can set the multiple sampling to up to 3 with the aid of the CDS.



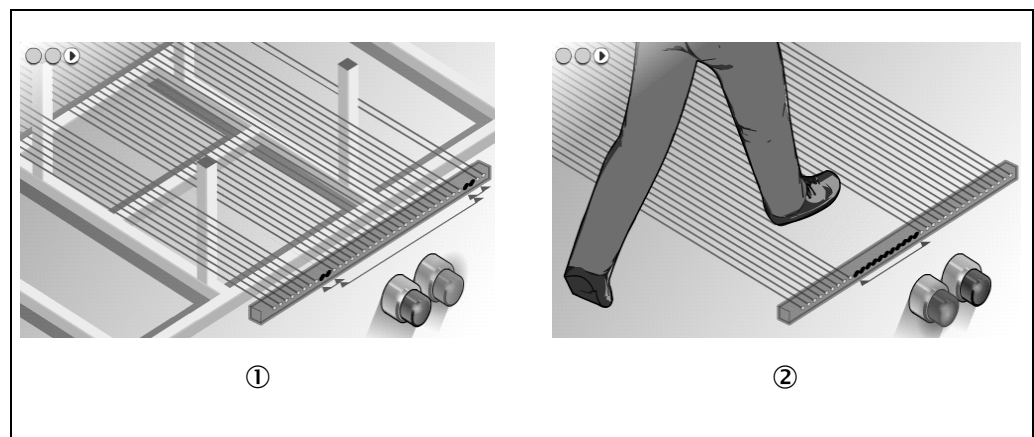
Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, selection **System**, file card **Standalone**, option **Multiple sampling**.

## 4.8 Self-teach dynamic blanking

On the C4000 Entry/Exit you configure the self-teach dynamic blanking.

The self-teaching dynamic blanking provides access protection in which precisely defined objects (e.g. transport trolleys for car body shells) have access to a system or machine (see Fig. 6, ①). However, if other objects, particularly people, enter the protective field, the C4000 shuts down the output signal switching devices (see Fig. 6, ②).

Fig. 6: Schematic diagram of the self-teach dynamic blanking



The self-teach dynamic blanking enables several objects in the beam path to be blanked dynamically, depending on the protective field length (see Tab. 8). In addition, these objects are allowed to move in both directions.

Tab. 8: Maximum number of dynamic blanked objects, depending on the protective field length

Protective field length [mm]	Maximum number of dynamic blanked objects
900	3
1050	4
1200	4
1350	5
1500	5

## C4000 Entry/Exit

If you configure e.g. three objects which are allowed to be blanked dynamically, transport trolleys with one, two or three legs or transport trolleys with one, two or three pairs of aligned legs can be used.

**Note** On light curtains with a resolution of 30 or 40 mm only one object is allowed!

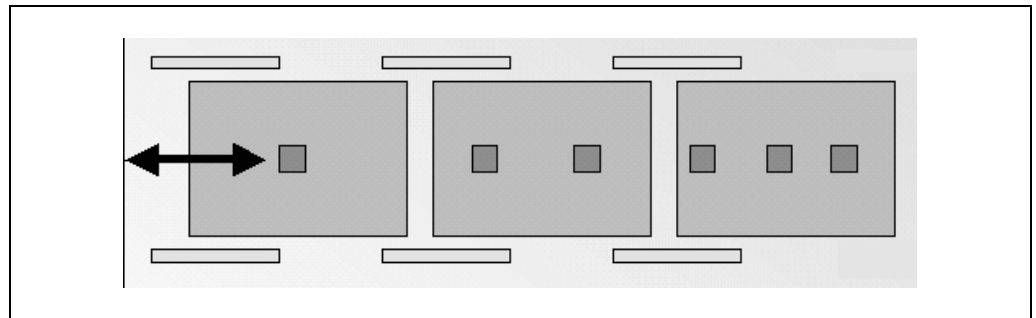


Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **Self-teach dynamic blanking**, option **Maximum number of floating objects**.

While the object passes through the protective field, the C4000 monitors the speed at which the object moves. This must not exceed 2 m/s.

The objects must enter the beam path of the C4000 from the same direction. During this process the C4000 first dynamically teaches itself the distance between the objects. The C4000 monitors this distance until the objects leave the beam path.

Fig. 7: Transport trolleys with one, two or three legs



You also configure the maximum permissible object size. On devices with a physical resolution of 14 mm, 20 mm or 40 mm this can be up to 150 mm, on devices with a physical resolution of 30 mm up to 140 mm.

- Notes**
- Objects up to this size are not detected. Safe shut down requires larger objects (see Tab. 9 on page 22).
  - In any case, the objects have to be larger or equal to the resolution of the safety light curtain.



WARNING

#### Prevent objects that are too small entering the protective field!

The safety light curtain does not switch to red when the object is smaller than the configured maximum permissible object size.

The safety light curtain only safely switches to red when the object is sufficiently larger than the configured maximum permissible object size. Exactly how large an object must be to cause a safe shut down depends on two factors:

- the physical resolution of the safety light curtain
- on whether the object is moving through the protective field or is stationary in the protective field (e.g. when the machine is being restarted)

➤ Based on Tab. 9 on page 22 determine the object size that results in safe shut down.

If you allow a maximum permissible object size bigger than 70 mm, then you must take organisational measures to ensure that people (or other objects that are not allowed) are detected, e.g. appropriate safety clothing or industrial clothing. This also applies particularly for so-called skids. A person is only detected when he/she is larger than the object size necessary for safe shut down or when the distance between his/her legs changes when walking.

Tab. 9: Object size from which the C4000 reliably shuts down the OSSDs.  
 Example (\*): At a physical resolution of 20 mm and a maximum permissible object size of 30 mm, a moving object with a size of 40 mm or larger results in safe shut down

Configured maximum permissible object size [mm]	Necessary object size [mm] from which the C4000 reliably shuts down the OSSDs							
	Physical resolution							
	14 mm		20 mm		30 mm		40 mm	
	Floating	Stationary	Floating	Stationary	Floating	Stationary	Floating	Stationary
15	22.5	29	-	-	-	-	-	-
20	-	-	30	40	-	-	-	-
22.5	30	36.5	-	-	-	-	-	-
30	37.5	44	40*	50	-	-	-	-
37.5	45	51.5	-	-	-	-	-	-
40	-	-	50	60	50	70	-	-
45	52.5	59	-	-	-	-	-	-
50	-	-	60	70	-	-	-	-
52.5	60	66.5	-	-	-	-	-	-
60	67.5	74	70	80	70	90	70	100
67.5	75	81.5	-	-	-	-	-	-
70	-	-	80	90	-	-	-	-
75	82.5	89	-	-	-	-	-	-
80	-	-	90	100	90	110	-	-
82.5	90	96.5	-	-	-	-	-	-
90	97.5	104	100	110	-	-	100	130
97.5	105	111.5	-	-	-	-	-	-
100	-	-	110	120	110	130	-	-
105	112.5	119	-	-	-	-	-	-
110	-	-	120	130	-	-	-	-
112.5	120	126.5	-	-	-	-	-	-
120	127.5	134	130	140	130	150	130	160
127.5	135	141.5	-	-	-	-	-	-
130	-	-	140	150	-	-	-	-
135	142.5	149	-	-	-	-	-	-
140	-	-	150	160	150	170	-	-
142.5	150	156.5	-	-	-	-	-	-
150	157.5	164	160	170	-	-	160	190



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **Self-teach dynamic blanking**, option **Maximum permissible object size**.

## C4000 Entry/Exit


**Conditions that result in the shut down of the output signal switching devices**

The C4000 Entry/Exit deactivates its OSSDs for at least 1 second ...

- if there are more objects in the protective field than configured.
- when the size of an object exceeds the object size necessary for safe shut down.
- if the distance between two objects in the protective field changes.
- if an object enters the protective field other than at the start.
- if an object enters the protective field other than at the end.
- if the speed of an object exceeds 2.5 m/s.

## 4.9 Sender test

The C4000 sender has a test input on pin 3 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 C4000 receiver switches to red, i.e. the output signal switching devices (OSSDs) are deactivated.

**Note** C4000-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.

To be able to perform a sender test ...

- the option **Enable sender test** must be active. This is the condition as supplied.
- a means of controlling the test input must be available.



Device symbol **C4000 Entry/Exit (sender)**, context menu **Configuration draft, Edit**, option **Enable sender test**.

The electrical connection at the test input is described in chapter 6.8 “Test input (sender test)” on page 40.

## 5 Installation and mounting

This chapter describes the preparation and completion of the installation of the safety light curtain C4000. 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:

- completing the electrical connections (chapter 6)
- aligning sender and receiver (chapter 7.2)
- testing the installation (chapter 7.3)

### 5.1 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 sufficient 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.

---

#### **5.1.1 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.

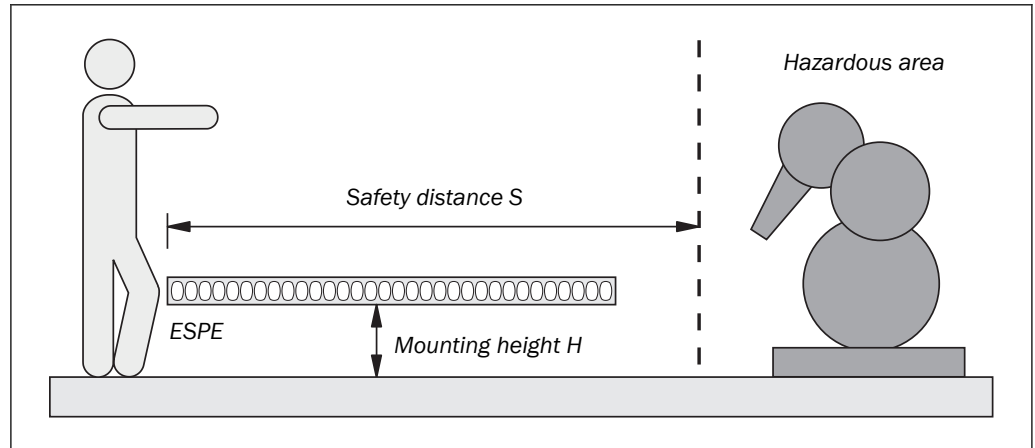
#### **The safety distance as defined in EN ISO 13855 and EN ISO 13857 depends on:**

- 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 protective device (response times see chapter 11.2 “Response time” on page 53)
- approach speed
- resolution of the light curtain and/or beam separation
- other parameters that are stipulated by the standard depending on the application



**C4000 Entry/Exit**

Fig. 8: Safety distance from the hazardous point



**How to calculate the safety distance S following EN ISO 13855 and EN ISO 13857:**

**Note** The safety distance is in respect to the first beam in direction of the approach to the hazardous point (cf. Fig. 8).

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 S using the following formula:

$$S = 1600 \times T + 850 + (760 - 0.4 \times H) \text{ [mm]}$$

Where ...

1600 = Approach speed [mm/s]

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

850 = Arm length according to EN ISO 13855 [mm]

760 = Step length according to EN ISO 13855 (700 mm) plus the entry area of the ESPE (60 mm)

H = Mounting height for the light curtain

S = Safety distance [mm]

The approach speed is already included in the formula.

**Example:**

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

Response time after light path interruption = 30 ms

Mounting height for the light curtain = 300 mm

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

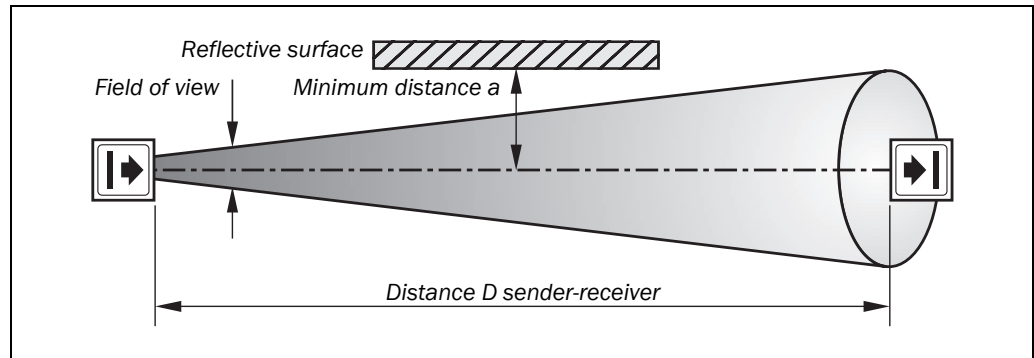
$S = 1600 \times 0.32 + 850 + (760 - 0.4 \times 300) = 2002 \text{ mm}$

### 5.1.2 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

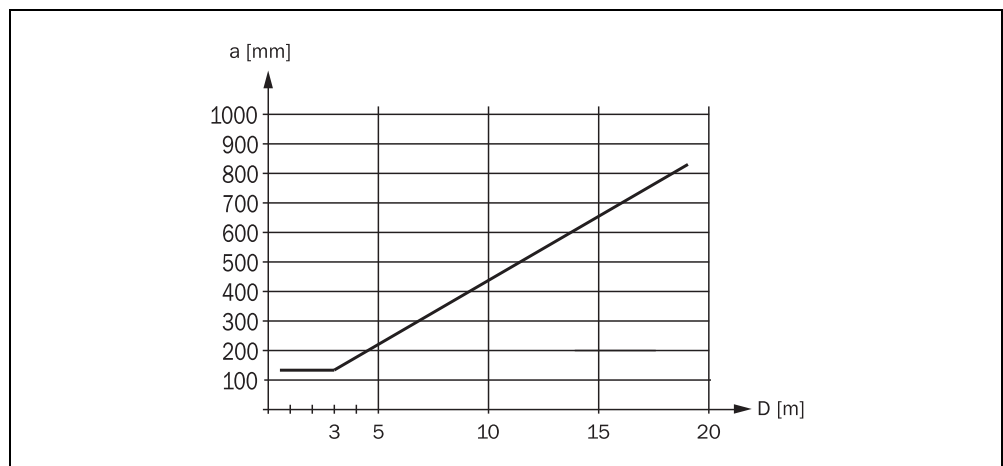


**Note** The field of view of the sender and receiver optics is identical.

#### 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



## 5.2 Steps for mounting the device



WARNING

### Special features to note during mounting:

- Always mount the sender and receiver parallel to one another.
- Only mount the sender and receiver horizontally.
- During mounting, ensure 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 system plugs of both devices must point in the same direction.
- The minimum distance between sender and receiver is 500 mm.
- Take suitable measures to attenuate vibration if the shock requirements are above the values given in chapter 11.1 “Data sheet” on page 52.
- Observe the safety distance of the system during mounting. On this subject read the chapter “Determining the safety distance” on page 24.
- Mount the safety light curtain such that it is not possible to climb over, crawl underneath or stand behind the safety light curtain and such that the light curtain cannot be repositioned.
- Access to the hazardous area is only to be via the protective field.
- 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

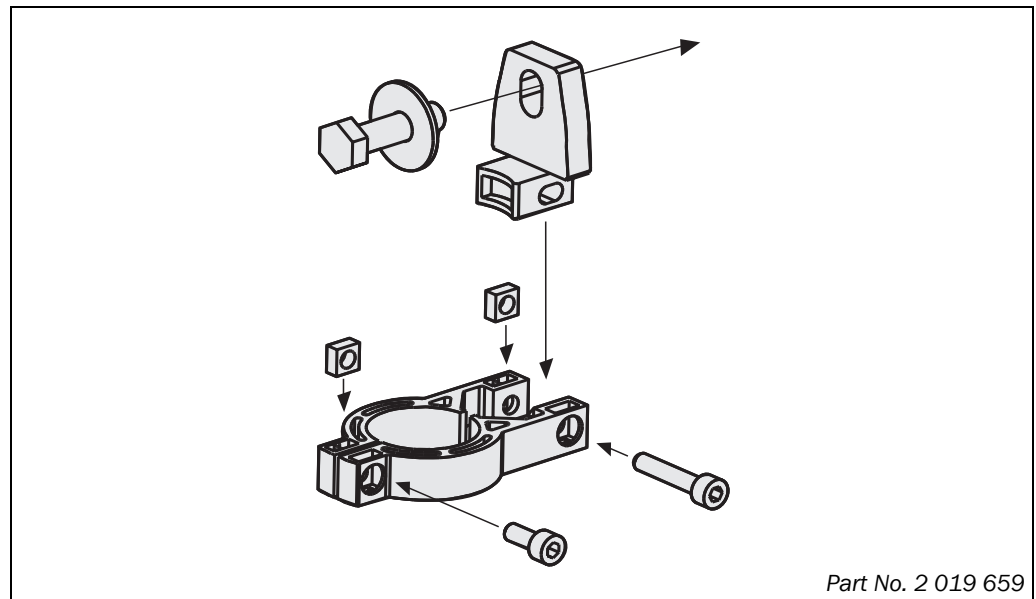
### 5.2.1 Mounting with swivel mount bracket

The swivel mount bracket is made of black polyamide PA6. 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 PNS75 and PNS125 (see chapter 11.4.5f. on page 59f.).

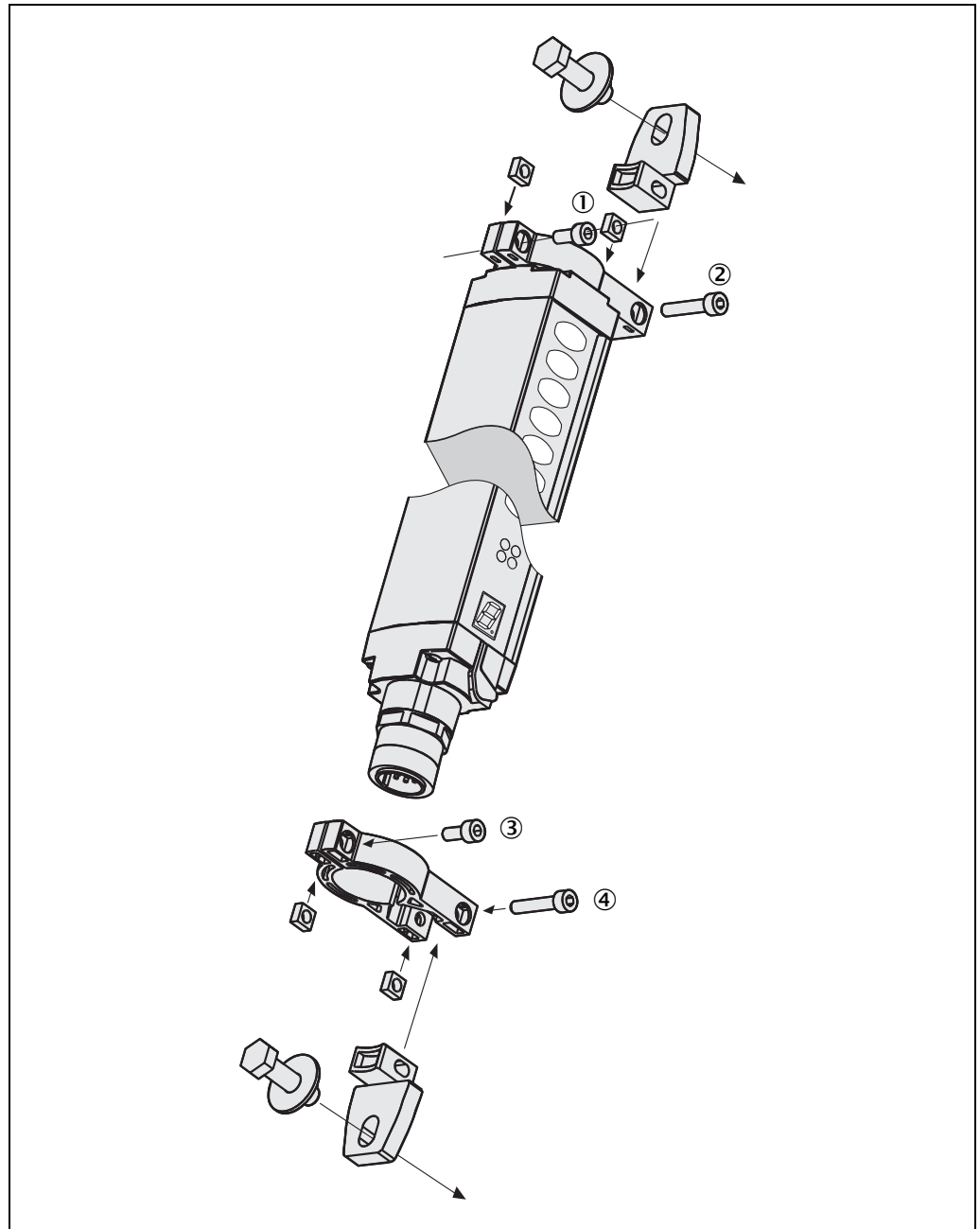
- Note**
- Attach the bolts of the swivel mount bracket with a torque of between 2.5 and 3 nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibration.

Fig. 11: Composition of the swivel mount bracket



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Fig. 12: Mounting sender and receiver using swivel mount brackets

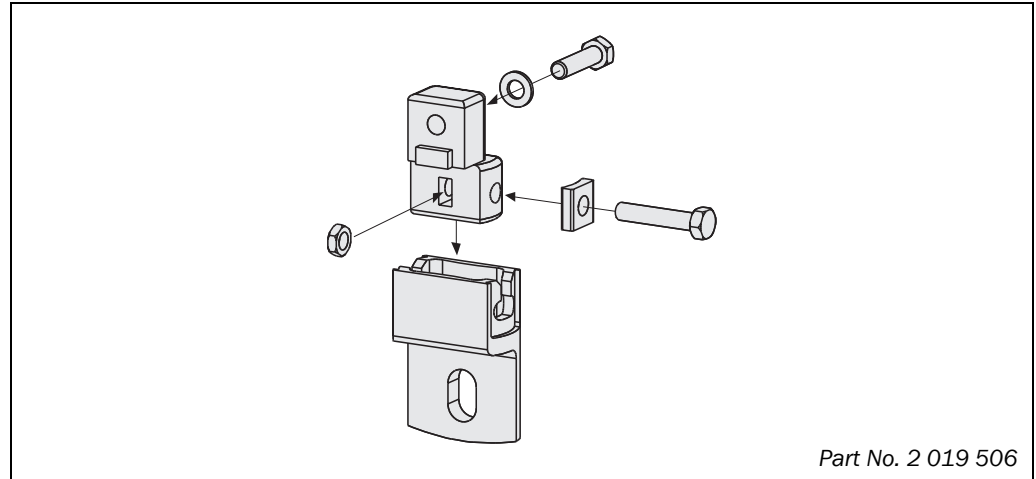


- Notes**
- Mount the bolts marked with ① to ④ on the operator side of the system to ensure that they remain accessible after mounting and to allow you to readjust the light curtain later, if necessary.
  - If you wish to use the additional front screen (see “Additional front screen (weld spark guard)” on page 62), make sure that the curved side of the device remains accessible after mounting.

### 5.2.2 Mounting with side bracket

The side bracket is made of die cast zinc ZP0400. 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.

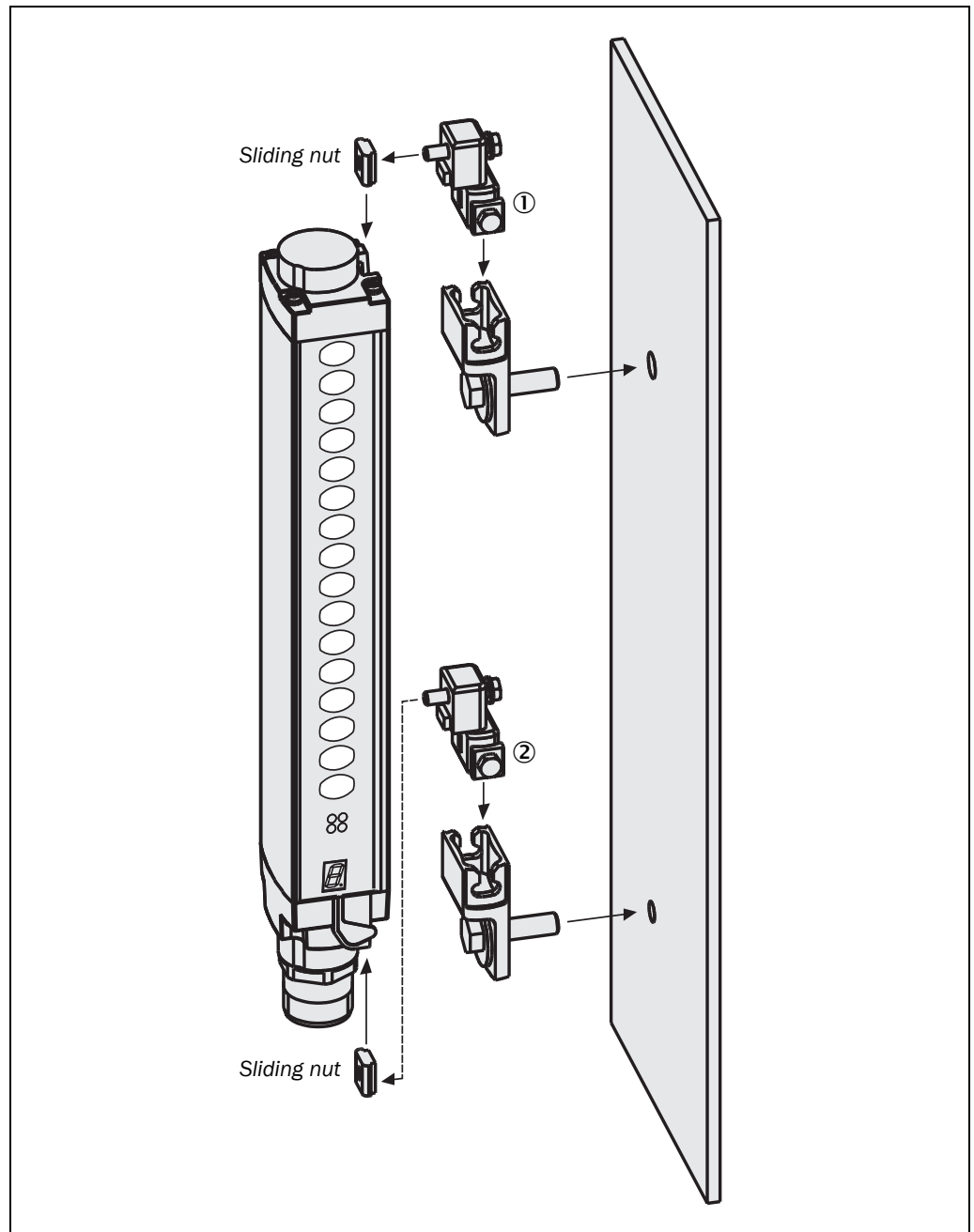
Fig. 13: Composition of the side bracket



- 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 11.4 “Dimensional drawings” on page 56f.

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Fig. 14: Mounting the C4000 with side bracket



- Notes**
- When mounting the side bracket ensure 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 62), make sure that the curved side of the device remains accessible after mounting.

## 6 Electrical installation



WARNING

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

The machine/system could unintentionally start up while you are connecting the devices.

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

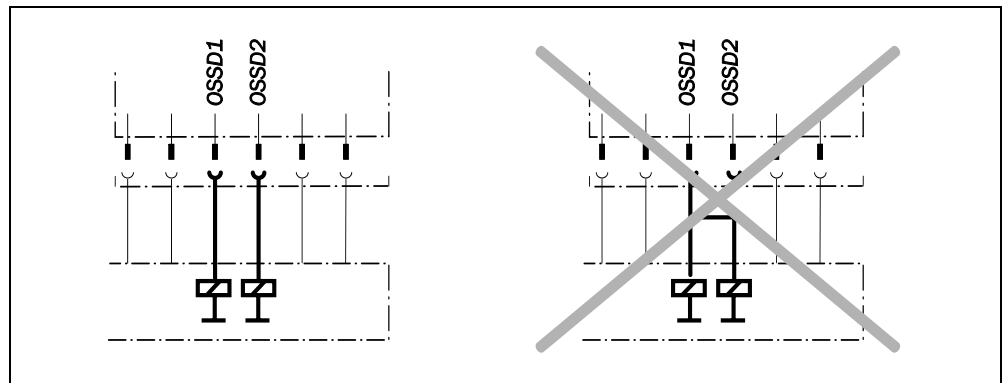
### Ensure that downstream contactors are monitored!

Downstream contactors must be positively guided and monitored (see section 6.4 “External device monitoring (EDM)” on page 37)!

### Connect OSSD1 and OSSD2 separately!

You are not allowed to connect OSSD1 and OSSD2 together, otherwise signal safety will not be ensured.

- Ensure that the machine controller processes the two signals separately.

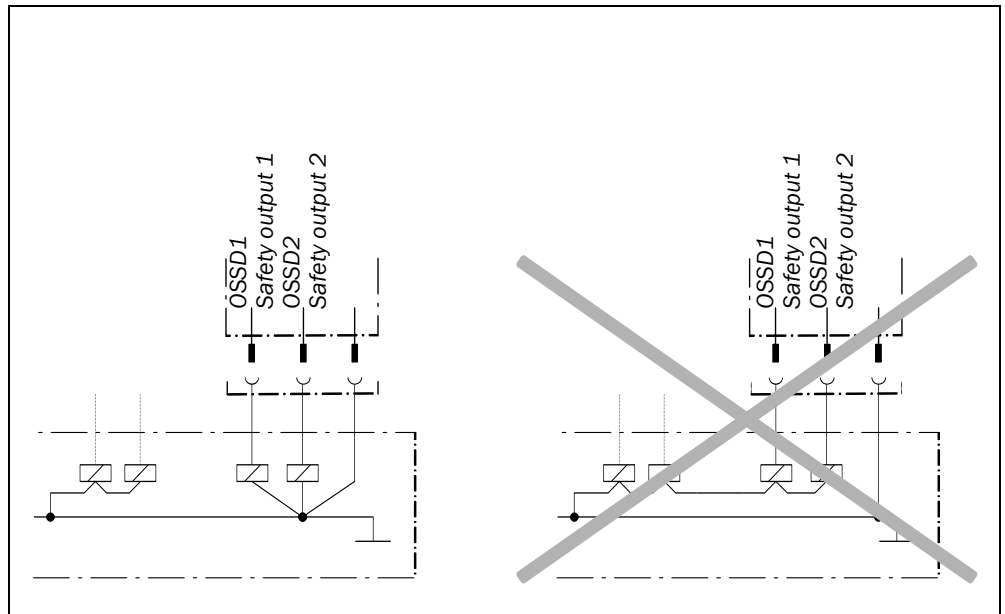




## C4000 Entry/Exit

**Prevent the formation of a potential difference between the load and the protective device!**

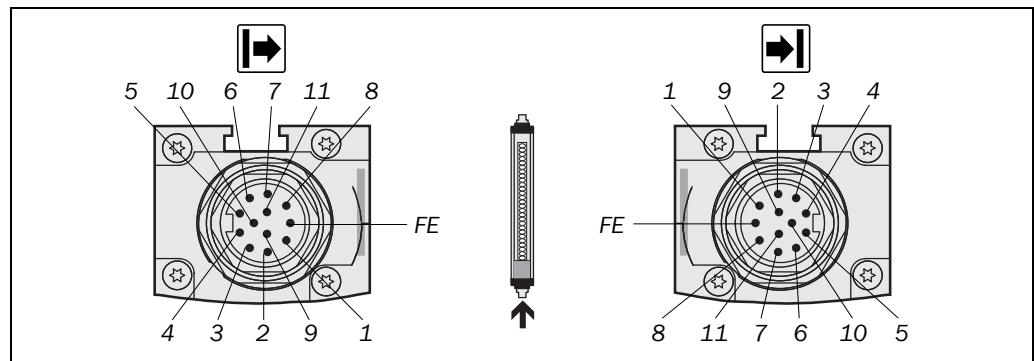
- If you connect loads that are not reverse-polarity protected to the OSSDs or the safety outputs, you must connect the 0 V connections of these loads and those of the corresponding protective device individually and directly to the same 0 V terminal strip. This is the only way to ensure that, in the event of a defect, there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.



- Notes**
- The safety light curtain C4000 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 60 204-1. Suitable power supplies are available as accessories from SICK (Siemens type series 6 EP 1).

## 6.1 System connection M26 × 11 + FE

Fig. 15: Pin assignment  
system connection  
M26 × 11 + FE



Tab. 10: Pin assignment  
system connection  
M26 × 11 + FE

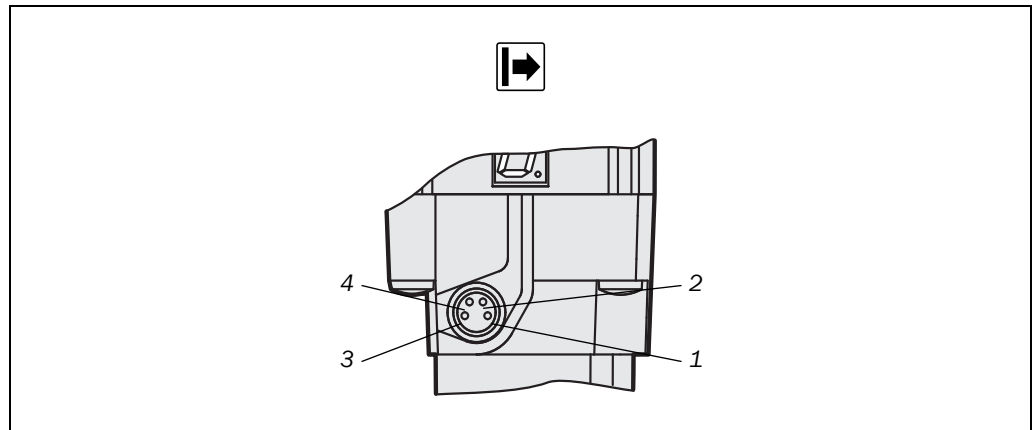
Pin	Wire colour	Sender	Receiver
1	Brown	24 V DC input (voltage supply)	24 V DC input (voltage supply)
2	Blue	0 V DC (voltage supply)	0 V DC (voltage supply)
3	Grey	Test input: 0 V: external test active 24 V: external test inactive	OSSD1 (output signal switching device 1)
4	Pink	Reserved	OSSD2 (output signal switching device 2)
5	Red	Reserved	Reset/restart
6	Yellow	Reserved	External device monitoring (EDM)
7	White	Reserved	Signal output (ADO)
8	Red/blue	Reserved	Output <i>Reset required</i>
9	Black	Device communication (EFl <sub>A</sub> )	Device communication (EFl <sub>A</sub> )
10	Purple	Device communication (EFl <sub>B</sub> )	Device communication (EFl <sub>B</sub> )
11	Grey/pink	Do not use	Do not use
FE	Green	Functional earthing	Functional earthing

- Notes**
- For the connection of pin 9 and 10 only use cable with twisted cores, e.g. the SICK connection cables available as accessories (see chapter 12.5 “Accessories” on page 63).
  - If you do not use either a SICK switching amplifier or a SICK bus node, to improve the EMC behaviour we recommend the termination of the connections pin 9 and 10 (device communication EFl) on the system connection in the control cabinet using a resistor of 182 Ω (SICK part number 2027227).

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6.2 Configuration connection M8 × 4 (serial interface)

Fig. 16: Pin assignment configuration connection M8 × 4



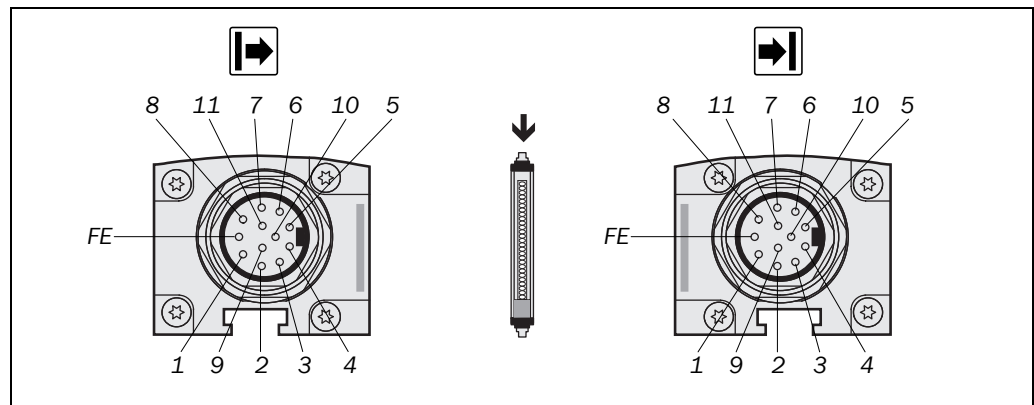
Tab. 11: Pin assignment configuration connection M8 × 4

Pin	➡ Sender/➡ Receiver	PC-side RS-232-D-Sub
1	Not assigned	
2	RxD	Pin 3
3	0 V DC (voltage supply)	Pin 5
4	TxD	Pin 2

- Notes** The pin assignment of sender and receiver is identical.
- After configuration always remove the connecting cable from the configuration connection!
  - After the configuration of the device has been completed, locate the attached protection cap to cover the configuration connection.

### 6.3 Extension connection M26 × 11 + FE

Fig. 17: Pin assignment  
extension connection  
M26 × 11 + FE



Tab. 12: Pin assignment  
extension connection  
M26 × 11 + FE

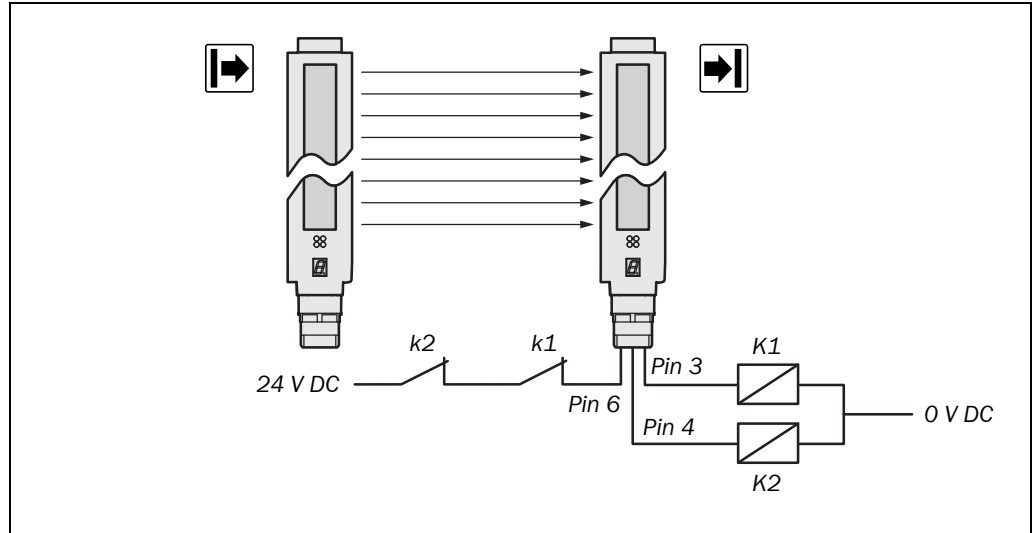
Pin	Wire colour	☑ Sender	☑ Receiver
1	Brown	24 V DC output (voltage supply)	24 V DC output (voltage supply)
2	Blue	0 V DC (voltage supply)	0 V DC (voltage supply)
3	Grey	Reserved	Input emergency stop 1
4	Pink	Reserved	Input emergency stop 2
5	Red	Reserved	Reset/restart
6	Yellow	Reserved	Test output emergency stop 2
7	White	Reserved	Test output emergency stop 1
8	Red/blue	Reserved	Output <i>Reset required</i>
9	Black	Device communication (EFl <sub>A</sub> )	Device communication (EFl <sub>A</sub> )
10	Purple	Device communication (EFl <sub>B</sub> )	Device communication (EFl <sub>B</sub> )
11	Grey/pink	Do not use	Do not use
FE	Green	Functional earthing	Functional earthing

- Notes**
- The plug alignment (direction of turn) in the housing may vary from device to device. You can identify the correct pin assignment by the position of the pins in relation to each other as shown in the drawings.
  - If you do not connect any further safety light curtain to an extension connection, then you must also not connect any cable to pins 9 and 10.
  - If the extension connection is no longer required, always screw the attached protective cap over the extension connection.

### 6.4 External device monitoring (EDM)

The external device monitoring (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 output signal switching devices again.

Fig. 18: 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 you connect the contact elements to be monitored to the EDM input, then you must activate the option **EDM** in the CDS (Configuration & Diagnostic Software). If not, the device will show the error .
- If you later deselect the **EDM** option, pin 6 of the system plug must not remain connected to 24 V.

## 6.5 Reset button

In the protective operation mode with internal restart interlock (see page 15) the operator must first press the reset button before restarting.

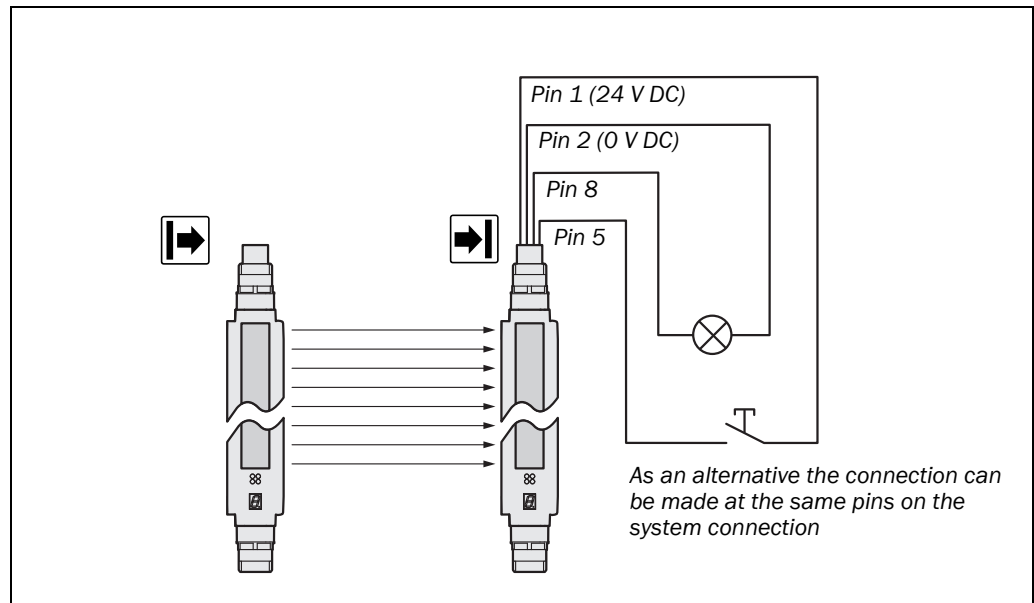


WARNING

### 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. 19: Connection of the reset button and the signal lamp "Reset required" to the extension connection



WARNING

### Device configuration after replacement!

If you replace a safety light curtain with deactivated reset function with a replacement unit, the reset function must again be deactivated via the software. It is not sufficient to make the electrical connections, because new devices are supplied ex factory always with activated reset function.

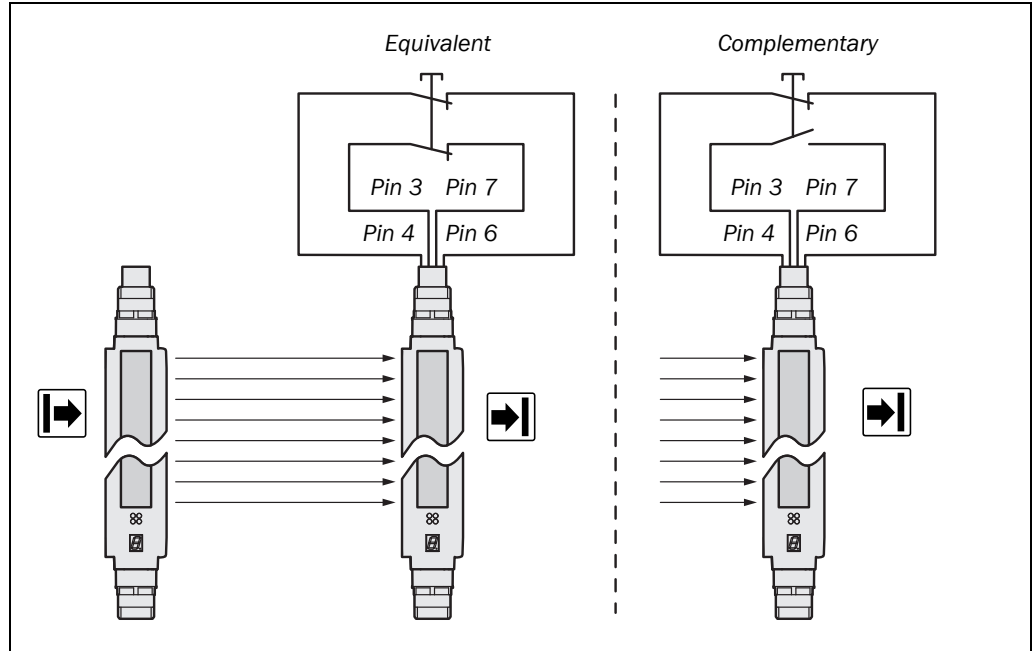
### Connection of a signal lamp to the output *Reset required*

Pin 8 of the system plug is the output *Reset required* (24 V). You can connect a signal lamp here to indicate this status. The output has a frequency of 1 Hz.

### 6.6 Emergency stop

The emergency stop input has two channels. The emergency stop monitoring in the device corresponds to stop category 0 in accordance with EN ISO 13850. Switch off at the emergency stop input (see page 16) has the same effect as reaching into the protective field. You can connect the emergency stop input e.g. to a door switch.

Fig. 20: Possible methods of connection of a door switch or similar to the emergency stop input



You can design the two-channel button as equivalent (N/C / N/C) or complementary (N/O/ N/O). You must configure the C4000 as appropriate with the aid of the CDS. If the configuration and the electrical connection do not match, the system locks completely (lock-out). The 7-segment display will then show the error message



Device symbol **C4000 Entry/Exit (receiver)**, context menu **Configuration draft, Edit**, file card **General**, option **Emergency stop active**.



WARNING

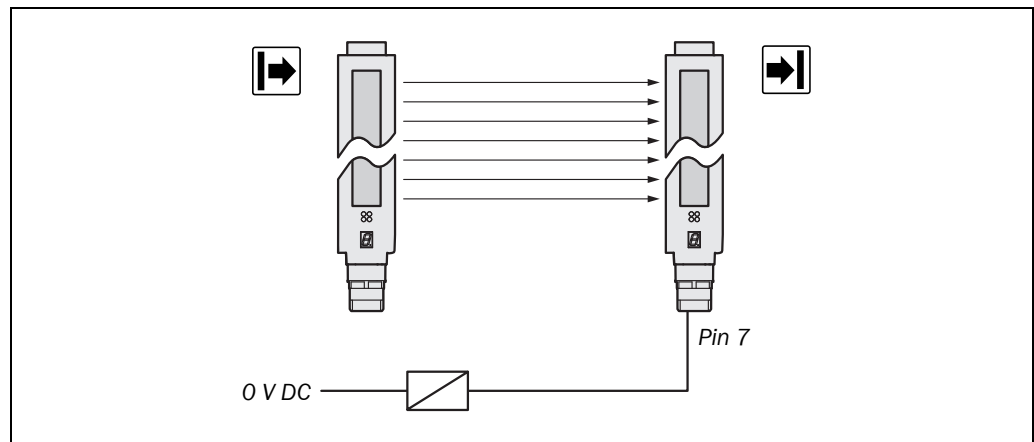
#### Device configuration after replacement!

If you replace a safety light curtain with the emergency stop function active, then you must transfer the configuration to the device again. It is not sufficient to make the electrical connections, because new devices are supplied ex factory with deactivated Emergency stop function.

## 6.7 Signal output (ADO)

Pin 7 on the system plug is a signal output (ADO). You can use this output for a relay or a PLC.

Fig. 21: Connection to the signal output



If you connect the signal output, then you must configure it with the aid of the CDS prior to commissioning. Details can be found in chapter 4.4 “Signal output (ADO)” on page 17.



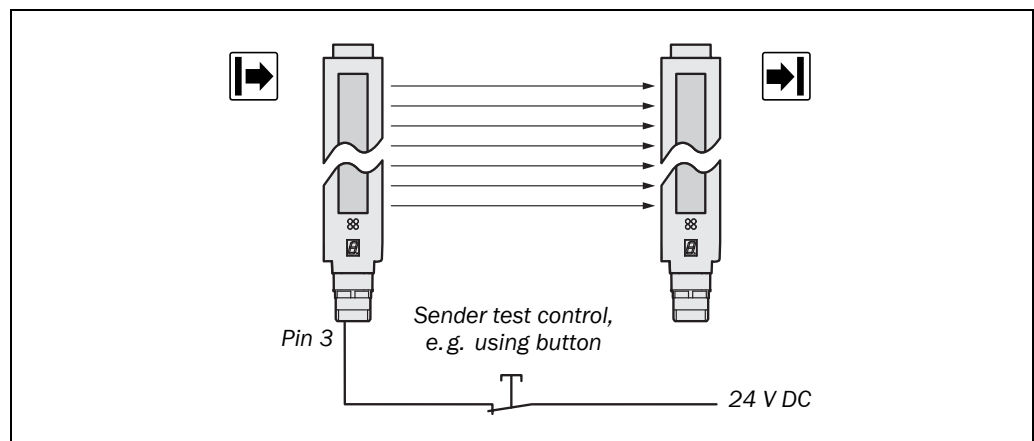
WARNING

### Device configuration after replacement!

If you replace a safety light curtain on which the signal output (ADO) is connected, then you must transfer the configuration to the device again. It is not sufficient to make the electrical connections, because new devices are supplied ex factory with the signal output deactivated.

## 6.8 Test input (sender test)

Fig. 22: Connection of the sender test button



The sender test is performed when 0 V is present at the test input (pin 3).



To be able to use the sender test button, you must also configure the sender test function with the aid of the CDS: Device symbol **C4000 Entry/Exit (sender)**, context menu **Configuration draft, Edit**, option **Enable sender test**.



# 7 Commissioning



WARNING

**Commissioning requires a thorough check by qualified safety personnel!**

Before you operate a system protected by the safety light curtain C4000 for the first time, make sure that the system is first checked and released by qualified safety personnel. Please read the notes in chapter “On safety” on page 8.

Tab. 13: Displays shown during the power-up cycle

## 7.1 Display sequence during start-up

After the system is activated, sender and receiver go through a power-up cycle. The 7-segment display indicates the device status during the power-up cycle.

The display values have the following meaning:

Display	Meaning
	Testing the 7-segment display. All segments are activated sequentially.
	Approx. 0.5 s. Is displayed only at the receiver and only in operation with large scanning range.
	Approx. 0.5 s. Non-coded operation or operation with code 1 or 2.
	The device is operational. The indication  appears if the device has detected an object in the protective field on switch on.
	Receivers only: Receiver-sender alignment is not optimal (see “Aligning sender and receiver” below).
Other display	Device error. See “Fault diagnosis” on page 46.

## 7.2 Aligning sender and receiver

After the light curtain has been mounted and connected, the sender and receiver must be aligned in relation to each other. The light beams emitted by the sender must hit the receiver with pin-point accuracy.

**How to align sender and receiver in relation to each other:**



WARNING

**Secure the plant/system. No dangerous state possible!**

Ensure that the dangerous state of the machine is (and remains) switched off! During the alignment process, the outputs of the safety light curtain are not allowed to have any effect on the machine.

- Loosen the clamping bolts which hold the light curtain in place.
- Switch on the power supply to the light curtain.
- Important for problem-free availability is the alignment of all axes:  
Place the AR60 at the start and end of the device in succession. The laser point is incident on the “Receiver/Sender” text on the device opposite or in the hole on the second mounting bracket that is also to be fitted to the device.
- Watch the alignment information on the 7-segment display of the receiver (see Tab. 14). Correct the alignment of the sender and receiver, until the 7-segment display goes off.

- Using the clamping bolts, fix the light curtain in place.
- Switch the power supply off and then back on again and check via the 7-segment display whether the alignment is correct after tightening the clamping bolts (Tab. 14).

The display values have the following meaning:

Tab. 14: Display values during the alignment of sender and receiver

Display	Meaning
	The receiver cannot synchronise with the sender; the alignment is very poor.
	Some light beams do not hit the receiver.
	All the light beams hit the receiver, but the alignment is still slightly off.
	The alignment is now true; the devices must be locked in this position. The indication  appears when the device has detected an object in the protective field, otherwise  is indicated.

- Notes**
- If the optimum alignment (= no display) persists for longer than 2 minutes without the protective field being interrupted, the system automatically deactivates the alignment mode.
  - If you wish to readjust the alignment later, switch the power supply of the C4000 off and back on again.

**Recommendation** For aligning the sender and receiver use the laser alignment aid AR60.

### 7.3 Test notes

Check the protective device as described below and in accordance with the applicable standards and regulations.

These tests are also used to identify if the protection is affected by external light sources or other unusual ambient effects.

These tests must therefore always be performed.

#### 7.3.1 Tests before the first commissioning

Check the protective device as described below and in accordance with the applicable standards and regulations.

- Check the effectiveness of the protective device mounted to the machine, using all selectable operating modes as specified in the checklist in the annex (see 13.2 on page 65).
- Ensure that the operating personnel of the machine protected by the light curtain are correctly instructed by qualified safety personnel before being allowed to operate the machine. Instructing the operating personnel is the responsibility of the machine owner.
- Annex 13.2 of this document shows a checklist for review by the manufacturer and OEM. Use this checklist as a reference before commissioning the system for the first time.

**7.3.2 Regular inspection of the protective device by qualified safety personnel**

- Check the system, following the inspection intervals specified in the national rules and regulations. This procedure ensures that any changes on the machine or manipulations of the protective device after the first commissioning are detected.
- If any modifications have been made to the machine or the protective device, or if the safety light curtain has been changed or repaired, the system must be checked again as specified in the checklist in the annex.

**7.3.3 Daily functional checks of the protective device**

The effectiveness of the protective device must be checked daily by a specialist or by authorised personnel, using the correct test rod.

**Note** Always test along the complete hazardous area to be protected, never solely at the mounting position of the light curtain.

**How to check the effectiveness and correct function of the safety light curtain:**

- The output signal switching devices on the light curtain must shut off once every 24 hours, i.e. the LEDs must illuminate Red. For this purpose interrupt the protective field from the top, in the middle, not in the entry or exit area. In this case the brief illumination of the red LEDs indicates the shut down of the OSSDs.
- It is not necessary to test individual beams.

**WARNING****Do not operate the machine if the red LED does not light up during the test!**

If the red LED does not light up *during the test*, work must stop at the machine. In this case the installation of the safety light curtain must be checked by qualified safety personnel (see chapter 5).

- *Before* inserting the test rod, check that the green LED is lit if the internal restart interlock is deactivated and that the yellow LED flashes (“Reset required”). If this is not the case, ensure that this condition is reached. The test is otherwise meaningless.

# 8 Configuration

## 8.1 Default delivery status

As delivered the C4000 is configured ready for protective operation. You can change the configuration at any time with the aid of the CDS. Default delivery status:

- restart interlock: external
- external device monitoring (EDM): deactivated
- beam coding: non-coded
- dynamic blanking: none
- scanning range:
  - devices with a resolution of 14 mm: 0.5–2.5 m
  - devices with a resolution of 20, 30 and 40 mm: 0.5–6 m

## 8.2 Preparing the configuration

### How to prepare the configuration:

- Ensure that the safety light curtain has been correctly mounted and that the electrical connections are correct and in place.
- Plan all required settings (operating mode, beam coding, resolution, etc.).

To configure the safety light curtain, you need:

- CDS (Configuration & Diagnostic Software) on CD-ROM
- user manual for CDS on CD-ROM
- PC/Notebook with Windows 9x/NT 4/2000 Professional/XP and a serial interface (RS-232). PC/Notebook not included
- connecting cable between PC and C4000 (SICK part no. 6021195)
- To configure the device, please read the user manual for the CDS (Configuration & Diagnostic Software) and use the online help function of the programme.

## 9 Care and maintenance

The safety light curtain C4000 is maintenance-free. The front screen of the safety light curtain C4000 and any additional front screen(s) (see “Additional front screen (weld spark guard)” on page 62) should be cleaned at regular intervals and when dirty.

- Do not use aggressive detergents.
- Do not use abrasive cleaning agents.

**Note** Static charges cause dust particles to be attracted to the front screen. You can prevent this effect by using the antistatic plastic cleaner (SICK Part No. 5600006) and the SICK lens cloth (Part No. 4003353).

### **How to clean the front screen and/or the additional front screen (optional extra):**

- Use a clean and soft brush to remove dust from the front screen.
- Now wipe the front screen with a clean and damp cloth.

**Note**

- After cleaning, check the position of sender and receiver to ensure that the protective device cannot be bypassed (reaching above, below or stepping behind).
- Verify the effectiveness of the protective device as described in chapter 7.3 “Test notes” on page 42.

# 10 Fault diagnosis

This chapter describes how to identify and remedy errors and malfunctions during the operation of the safety light curtain.

## Recommendation

You can speed up the fault diagnosis of some frequent faults by querying a signal on the signal output on the safety light curtain on the occurrence of the fault. Details can be found in chapter 4.4 “Signal output (ADO)” on page 17.

## 10.1 In the event of faults or errors



WARNING

### Cease operation if the cause of the malfunction has not been clearly identified!

Stop the machine if you cannot clearly identify or allocate the error and if you cannot safely remedy the malfunction.

### The system state lock-out

In case of certain faults or an erroneous configuration, the system can go into the lock-out state. The 7-segment display on the safety light curtain then indicates , , , or . To place the device back in operation:

- Rectify the cause of the fault as per Tab. 16.
- Switch the power supply for the C4000 off and on again (e.g. by unplugging the system plug and reinserting it).

## 10.2 SICK support

If you cannot remedy an error with the help of the information provided in this chapter, please contact your local SICK representative.

## 10.3 Error displays of the diagnostics LEDs

This chapter explains the meaning of the error displays of the LEDs and how to respond. Please refer to the description in the chapter 3.4 “Status indicators” on page 13.













Tab. 15: Error displays of the LEDs












Display	Possible cause	Remedying the error
● <b>Orange</b> LED of receiver lights up	Weak signal	<ul style="list-style-type: none"> <li>➤ Check the alignment of sender and receiver.</li> <li>➤ Check the front screen (dirt) and clean, if necessary.</li> </ul>
● <b>Yellow</b> LED of receiver flashes	Reset required	<ul style="list-style-type: none"> <li>➤ Press the reset button.</li> </ul>
○ <b>Yellow</b> LED of sender fails to light up ○ <b>Red</b> and ○ <b>Green</b> Neither the red nor the green receiver LED lights up	No operating voltage, or voltage too low	<ul style="list-style-type: none"> <li>➤ Check the voltage supply and activate, if necessary.</li> </ul>

## 10.4 Error displays of the 7-segment display

This section explains the meaning of the additional error displays of the 7-segment display and how to respond to the messages. For a description of the 7-segment display please refer to chapter 3.4 “Status indicators” on page 13.





Tab. 16: Error displays of the 7-segment display

Display	Possible cause	Remedying the error
 or 	Inadequate alignment	<ul style="list-style-type: none"> <li>➤ Re-align sender and receiver (see page 41).</li> </ul> The display goes off after 2 minutes.
	Configuration incomplete	<ul style="list-style-type: none"> <li>➤ The display goes off automatically once the configuration has been successfully transferred.</li> </ul> If display  does not go off: <ul style="list-style-type: none"> <li>➤ Check the configuration of the system using the CDS (Configuration &amp; Diagnostic Software).</li> <li>➤ Re-transfer the corrected configuration to the system.</li> </ul>
 or 	EDM error	<ul style="list-style-type: none"> <li>➤ Check the contactors and their wiring, eliminate any wiring errors, if necessary.</li> <li>➤ If  is displayed, switch the device off and back on again.</li> </ul>
	Reset button fault	<ul style="list-style-type: none"> <li>➤ Check the reset button for correct function. The button may be defective or stuck.</li> <li>➤ Check the wiring of the reset button for any short-circuit to 24 V.</li> </ul>
	Configuration of the switching amplifier connected (e.g. UE402) is incorrect	<ul style="list-style-type: none"> <li>➤ Configure the switching amplifier connected with the aid of the CDS.</li> <li>➤ Check the connection from the C4000 to the switching amplifier.</li> </ul>
	Several operating modes configured, but none selected	<ul style="list-style-type: none"> <li>➤ Check the connection and the function of the operating mode selector switch.</li> <li>➤ Check the connection for the operating mode selector switch on the switching amplifier.</li> </ul>
	Several operating modes selected simultaneously	<ul style="list-style-type: none"> <li>➤ Check the connection and the function of the operating mode selector switch.</li> <li>➤ Check the connection for the operating mode selector switch on the switching amplifier for a short-circuit.</li> </ul>
	Un-configured operating mode selected	<ul style="list-style-type: none"> <li>➤ Configure the operating mode set on the operating mode selector switch, or ensure that this operating mode cannot be selected.</li> </ul>

Display	Possible cause	Remedying the error
	Key-operated pushbutton for bypass malfunctioning or invalid configuration	<ul style="list-style-type: none"> <li>➤ Check whether the configuration of the key-operated pushbutton for bypass in the CDS matches the electrical connection.</li> <li>➤ Check the function of the key-operated pushbutton for bypass and replace it if necessary.</li> <li>➤ Ensure that both contacts on the key-operated pushbutton for bypass are pressed within 2 seconds.</li> </ul>
	Short-circuit at the operating mode selector switch	<ul style="list-style-type: none"> <li>➤ Check the operating mode inputs on the switching amplifier connected for short-circuit to 24 V.</li> </ul>
	System error	<ul style="list-style-type: none"> <li>➤ Replace the unit (receiver or sender).</li> </ul>
	Switching amplifier connected (e.g. UE402) is faulty	<ul style="list-style-type: none"> <li>➤ Interrupt the supply of power to the C4000 and to the switching amplifier for at least 3 seconds.</li> <li>➤ If the problem is still present, then replace the switching amplifier.</li> </ul>
	Overcurrent at output signal switching device 1	<ul style="list-style-type: none"> <li>➤ Check the contactor. Replace, if necessary.</li> <li>➤ Check the wiring for short-circuit to 0 V.</li> </ul>
	Short-circuit at output signal switching device 1	<ul style="list-style-type: none"> <li>➤ Check the wiring for short-circuit to 24 V.</li> </ul>
	Short-circuit at output signal switching device 1	<ul style="list-style-type: none"> <li>➤ Check the wiring for short-circuit to 0 V.</li> </ul>
	Overcurrent at output signal switching device 2	<ul style="list-style-type: none"> <li>➤ Check the contactor. Replace, if necessary.</li> <li>➤ Check the wiring for short-circuit to 0 V.</li> </ul>
	Short-circuit at output signal switching device 2	<ul style="list-style-type: none"> <li>➤ Check the wiring for short-circuit to 24 V.</li> </ul>
	Short-circuit at output signal switching device 2	<ul style="list-style-type: none"> <li>➤ Check the wiring for short-circuit to 0 V.</li> </ul>
	Short-circuit between output signal switching device 1 and 2	<ul style="list-style-type: none"> <li>➤ Check the wiring and rectify the error.</li> </ul>



**C4000 Entry/Exit**

Display	Possible cause	Remedying the error
	Error of the emergency stop button	<ul style="list-style-type: none"> <li>➤ Check whether the configuration of the emergency stop button in the CDS matches the electrical connection.</li> <li>➤ Check whether the emergency stop button works.</li> </ul>
	Invalid configuration of the EDM	<ul style="list-style-type: none"> <li>➤ Verify that the machine-side EDM is connected correctly.</li> </ul>
	External sender detected	<ul style="list-style-type: none"> <li>➤ Check the distance from reflective surfaces (page 26) or from other light curtains.</li> <li>➤ If necessary, re-configure the device with another beam coding (page 18) or install non-reflective partitions.</li> </ul>
	Supply voltage too low	<ul style="list-style-type: none"> <li>➤ Check the supply voltage and the power supply. If necessary, replace defective components.</li> </ul>

**10.5 Extended diagnostics**

The CDS software supplied with the device (Configuration & Diagnostic Software) includes extended diagnostic options. It allows you to narrow down the problem if the error is non-specific or if you experience usage downtime problems. Detailed information to be found ...

- in the online help for the CDS.
- in the user manual for the CDS.

# 11 Technical specifications

## 11.1 Data sheet

Tab. 17: Technical specifications C4000

	Minimum	Typical	Maximum
<b>General system data</b>			
Type	Type 4 (IEC 61496-1)		
Safety integrity level <sup>1)</sup>	SIL3 (IEC 61508)		
SIL claim limit <sup>1)</sup>	SILCL3 (EN 62061)		
Category	Category 4 (EN ISO 13849-1)		
Performance Level <sup>1)</sup>	PL e (EN ISO 13849-1)		
PFHd (mean probability of a dangerous failure per hour)	$15 \times 10^{-9}$		
T <sub>M</sub> (mission time)	20 years (EN ISO 13849)		
Protective field length, depending on type	900 mm to 1500 mm		
Resolution, depending on type	14 mm to 40 mm		
Protective field width			
Resolution 14 mm	0.5 m		6 m
Resolution 20, 30 or 40 mm	0.5 m		19 m
Protection class	III (EN 61140)		
Enclosure rating	IP 65 (EN 60529)		
Supply voltage U <sub>V</sub> at device <sup>2)</sup>	19.2 V	24 V	28.8 V
Residual ripple <sup>3)</sup>			±10%
Synchronisation	Optical, without separate synchronisation		
Power-up delay of sender and receiver before ready			8 s
<b>☛ Sender unit</b>			
Test input			
Input voltage <sup>4)</sup> HIGH (active)	11 V	24 V	30 V
Input current HIGH	7 mA	10 mA	20 mA
Switching voltage LOW (inactive)	-30 V	0 V	5 V
Input current LOW <sup>4)</sup>	-3.5 mA	0 mA	0.5 mA
Reaction time to test	Depending on the number of beams, maximum 150 ms		
Wavelength of sender		950 nm	
Power consumption			1 A
Weight	Depending on the protective field length (see page 55)		

<sup>1)</sup> For detailed information on the exact design of your machine/system, please contact your local SICK representative.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK (Siemens type series 6 EP 1).

<sup>3)</sup> Within the limits of U<sub>V</sub>.

<sup>4)</sup> As per IEC 61131-2.

**C4000 Entry/Exit**

Minimum	Typical	Maximum
---------	---------	---------

**Receiver unit**

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected <sup>5)</sup> , cross-circuit monitored		
Response time	See chapter 11.2 on page 53		
Switch off time	1000 ms		
Power-up delay		1.5 × response time	
Switching voltage <sup>6) 7)</sup> HIGH (active, $U_{eff}$ )	$U_V - 2.25 V$	24 V	$U_V$
Switching voltage <sup>6)</sup> LOW (inactive)	0 V	0 V	2 V
Switching current	0 mA		500 mA
Leakage current <sup>8)</sup>			0.25 mA
Load capacity			2.2 $\mu F$
Switching sequence	Depending on load inductance		
Load inductance <sup>9)</sup>			2.2 H
Test pulse data <sup>10)</sup>			
Test pulse width	120 $\mu S$	150 $\mu S$	300 $\mu S$
Test pulse rate	3 $1/s$	5 $1/s$	10 $1/s$
Permissible cable resistance between device and load <sup>11)</sup>			2.5 $\Omega$
Supply lead			1 $\Omega$
Power consumption			1.8 A

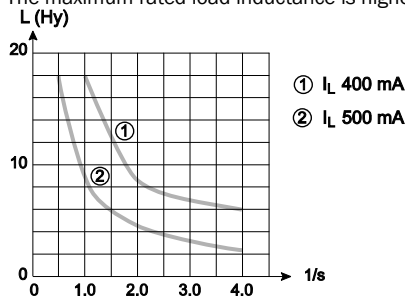
<sup>5)</sup> Applies to the voltage range between -30 V and +30 V.

<sup>6)</sup> As per IEC 61131-2.

<sup>7)</sup> On the device plug.

<sup>8)</sup> In the case of a fault (0-V cable open circuit) maximally the leakage current flows in the OSSD cable. The downstream controller must detect this status as LOW. A FPLC (fail-safe programmable logic controller) must be able to identify this status.

<sup>9)</sup> The maximum rated load inductance is higher with lower switching sequence.



<sup>10)</sup> 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.

<sup>11)</sup> Make sure to limit the individual cable resistance to the downstream controller to this value to ensure that a cross-circuit between the outputs is safely detected (also note EN 60204 Electrical Machine Equipment, Part 1: General Requirements.).

	Minimum	Typical	Maximum
External device monitoring (EDM) input			
Input voltage <sup>12)</sup> HIGH (inactive)	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Input voltage <sup>12)</sup> LOW (active)	-30 V	0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
Contactors			
Permissible dropout time			300 ms
Permissible pick-up time			300 ms
Control switch input (reset button)			
Input voltage <sup>12)</sup> HIGH (active)	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Input voltage <sup>12)</sup> LOW (inactive)	-30 V	0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
Operation time control switch input	100 ms		
Output <i>Reset required</i> (24 V lamp output)			4 W/0.2 A
Switching voltage HIGH (active)	15 V	24 V	28.8 V
Switching voltage LOW (inactive)		High resistance	
Signal output (ADO)			
Switching voltage HIGH (active)	15 V	24 V	28.8 V
Switching voltage LOW (inactive)		High resistance	
Switching current	0 mA		100 mA
Emergency stop			
Changeover time			2 s
Latency time			200 ms
Cable resistance			30 Ω
Cable capacitance			10 nF
Weight	Depending on protective field length (see page 55)		

**Operating data**

Connection	Hirschmann plug M26 × 11 + FE		
Cable length <sup>13)</sup>			50 m
Wire cross-section		0.75 mm <sup>2</sup>	
Ambient operating temperature	0 °C		+55 °C
Air humidity (non-dewing)	15 %		95 %
Storage temperature	-25 °C		+70 °C
Housing cross-section	40 mm × 48 mm		
Rigidity	5 g, 10–55 Hz acc. to EN 60 068-2-6		
Shock resistance	10 g, 16 ms acc. to EN 60 068-2-27		

<sup>12)</sup> As per IEC 61 131-2.<sup>13)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

## 11.2 Response time

The response time depends on the following parameters:

- number of beams
- beam coding
- configuration of multiple sampling of the scan

### How to determine the response time of the system:

- Read the response times of the C4000 (shown on the type label). Note whether the system is operated with or without beam coding.

**Note** If you are planning the application without actually having any devices available, you may also determine the response time using Tab. 18 and Tab. 19. When determining the number of beams in Tab. 18, the physical resolution is important. The physical resolution of the light curtain does not change even if self-teach dynamic blanking has been selected.



WARNING

### The response time must be $\leq 94$ ms!

Verify that the total response time determined is  $\leq 94$  ms. IEC 61496 does not permit response times exceeding 94 ms. If necessary, adjust the configuration.

Tab. 18: Number of beams depending on the protective field length and the physical resolution

Protective field length [mm]	Number of beams for physical resolution			
	14 mm	20 mm	30 mm	40 mm
<b>900</b>	120	90	45	30
<b>1050</b>	140	105	53	35
<b>1200</b>	160	120	60	40
<b>1350</b>	180	135	68	45
<b>1500</b>	200	150	75	50

Tab. 19: Response time depending on the number of beams and the multiple sampling selected

Number of beams	Without beam coding		With beam coding	
	Multiple sampling		Multiple sampling	
	2-times	3-times	2-times	3-times
30	15 ms	20 ms	22 ms	29 ms
35	16 ms	21 ms	23 ms	31 ms
40	16 ms	22 ms	24 ms	33 ms
45	17 ms	22 ms	26 ms	35 ms
50	17 ms	23 ms	27 ms	37 ms
53	18 ms	23 ms	28 ms	38 ms
55	18 ms	24 ms	29 ms	39 ms
60	18 ms	24 ms	30 ms	41 ms
68	19 ms	26 ms	33 ms	44 ms
75	20 ms	27 ms	35 ms	46 ms
83	21 ms	28 ms	37 ms	50 ms
90	22 ms	29 ms	39 ms	52 ms
105	23 ms	31 ms	44 ms	58 ms
120	25 ms	33 ms	48 ms	64 ms
135	27 ms	35 ms	52 ms	70 ms
140	27 ms	36 ms	54 ms	72 ms
150	28 ms	38 ms	57 ms	76 ms
160	29 ms	39 ms	60 ms	80 ms
165	30 ms	40 ms	61 ms	82 ms
180	31 ms	42 ms	66 ms	88 ms
200	34 ms	45 ms	72 ms	Not permitted
220	36 ms	48 ms	77 ms	Not permitted
240	38 ms	51 ms	83 ms	Not permitted

## C4000 Entry/Exit

## 11.3 Table of weights

## 11.3.1 C4000 Entry/Exit

Tab. 20: Weight of sender and receiver

Protective field length [mm]	Weight [g]	
	☑ Sender	☑ Receiver
900	1960	1990
1050	2250	2280
1200	2530	2560
1350	2820	2850
1500	3110	3140

## 11.3.2 Deflector mirrors PNS75 and PNS125

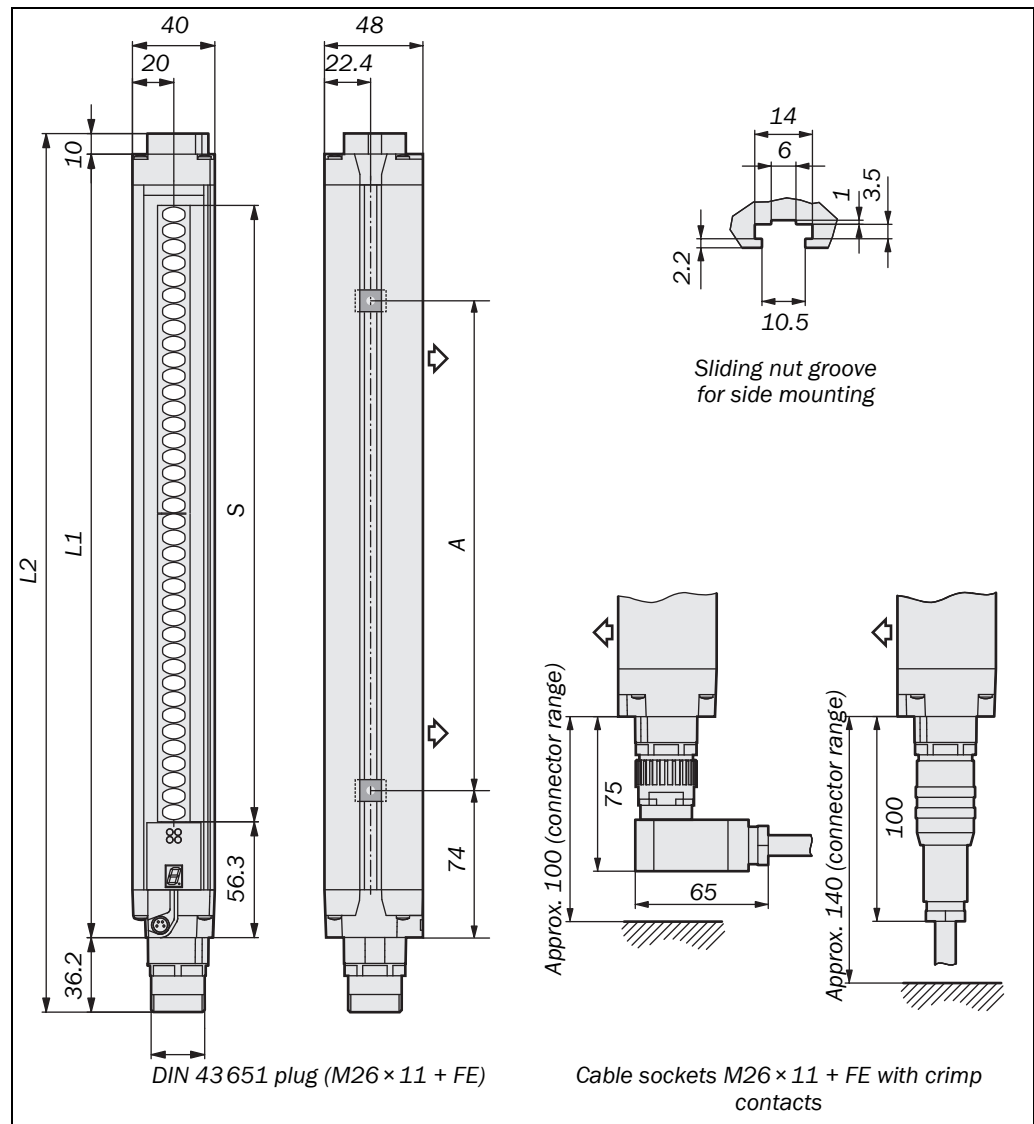
Tab. 21: Weight of the deflector mirrors PNS75 and PNS125

Mirror height [mm]	Weight [g]	
	PNS75	PNS125
940	2680	4080
1090	3095	4710
1240	3510	5345
1390	3925	5980
1540	4340	6610

### 11.4 Dimensional drawings

#### 11.4.1 C4000 Entry/Exit without extension connection

Fig. 23: Dimensional drawing C4000 Entry/Exit without extension connection, sender. Receiver, mirror image



Tab. 22: Dimensions depending on the protective field length, C4000 Entry/Exit without extension connection

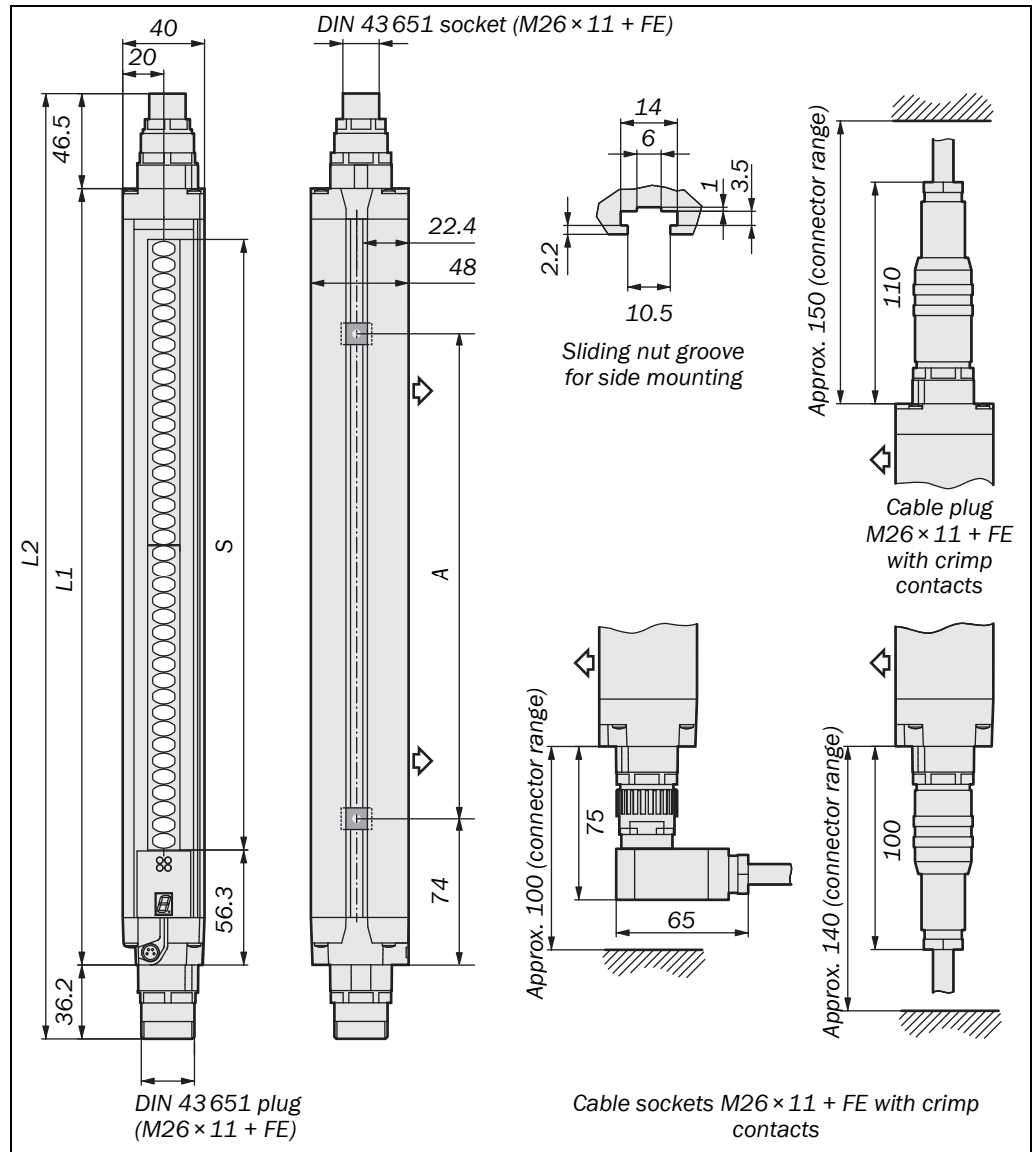
Protective field length $S$ [mm]	Dimension $L1$ [mm]	Dimension $L2$ [mm]	Dimension $A$ [mm]
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424



## C4000 Entry/Exit

### 11.4.2 C4000 Entry/Exit with extension connection

Fig. 24: Dimensional drawing C4000 Entry/Exit with extension connection, sender. Receiver, mirror image

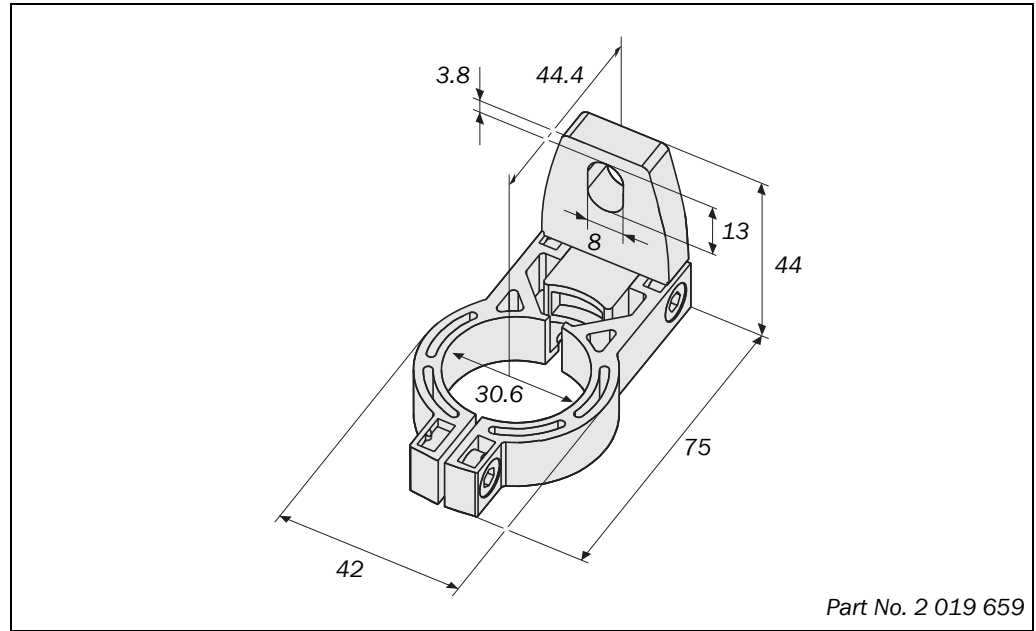


Tab. 23: Dimensions depending on the protective field length, C4000 Entry/Exit with system connection

Protective field length S [mm]	Dimension L1 [mm]	Dimension L2 [mm]	Dimension A [mm]
900	984	1066	824
1050	1134	1216	974
1200	1283	1366	1124
1350	1435	1517	1274
1500	1586	1669	1424

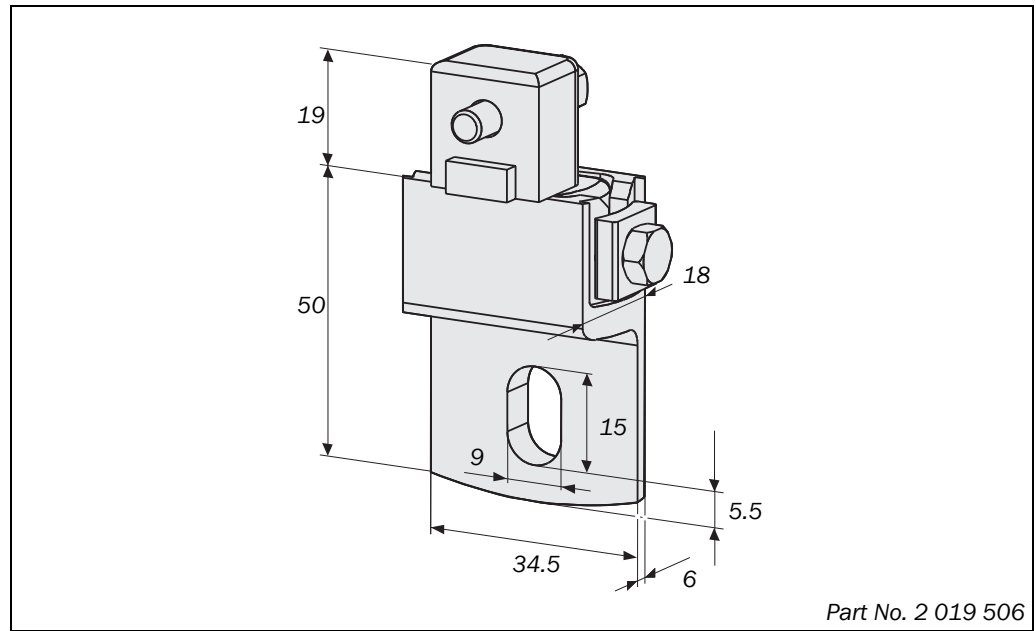
### 11.4.3 Swivel mount bracket

Fig. 25: Dimensional drawing swivel mount bracket (mm)



### 11.4.4 Side bracket

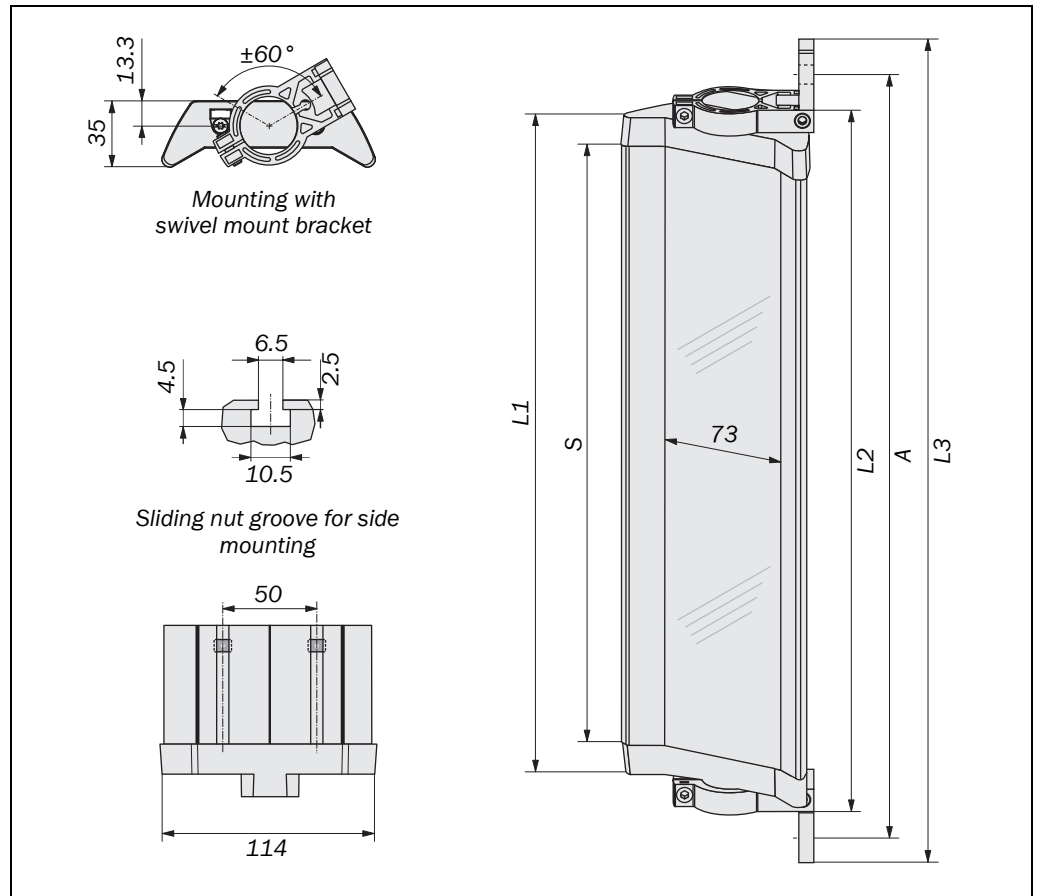
Fig. 26: Dimensional drawing, side bracket (mm)



**C4000 Entry/Exit**

### 11.4.5 Deflector mirror PNS75

Fig. 27: Dimensional drawing deflector mirror PNS75 (mm)



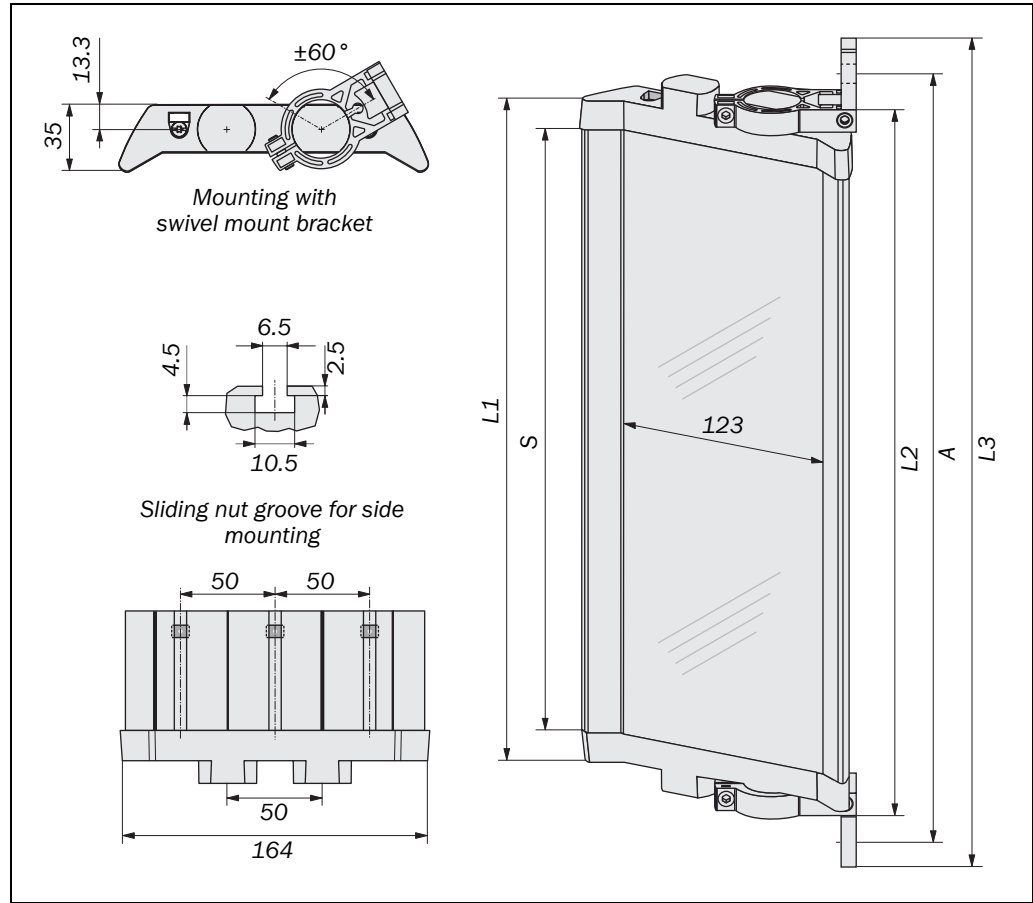
Tab. 24: Dimensions for the deflector mirror PNS75 depending on the mirror height

Mirror height S [mm]	Dimension L1 [mm]	Dimension L2 [mm]	Dimension L3 [mm]	Dimension A [mm]
<b>940</b>	972	996	1060	1040
<b>1090</b>	1122	1146	1210	1190
<b>1240</b>	1272	1296	1360	1340
<b>1390</b>	1422	1446	1510	1490
<b>1540</b>	1572	1596	1660	1640
<b>1690</b>	1722	1746	1810	1790
<b>1840</b>	1872	1896	1960	1940

- Notes**
- When using deflector mirrors, the effective scanning range is reduced (see Tab. 6 on page 19).
  - The usage of deflector mirrors is not allowed if the formation of droplets or heavy contamination of the deflector mirrors is to be expected.

11.4.6 Deflector mirror PNS125

Fig. 28: Dimensional drawing deflector mirror PNS125 (mm)



Tab. 25: Dimensions for the deflector mirror PNS125 depending on the mirror height

Mirror height S [mm]	Dimension L1 [mm]	Dimension L2 [mm]	Dimension L3 [mm]	Dimension A [mm]
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

- Notes**
- When using deflector mirrors, the effective scanning range is reduced (see Tab. 7 on page 19).
  - The usage of deflector mirrors is not allowed if the formation of droplets or heavy contamination of the deflector mirrors is to be expected.

# 12 Ordering information

## 12.1 Delivery

### C4000 Entry/Exit

Delivery, sender

- sender unit
- 4 sliding nuts for side bracket

Delivery, receiver

- receiver unit
- 4 sliding nuts for side bracket
- test rod with diameter corresponding to the physical resolution of the light curtain
- label “Important Information”
- operating instructions
- CDS (Configuration & Diagnostic Software) on CD-ROM

### Deflector mirror

- deflector mirror
- 2 swivel mount brackets

## 12.2 C4000 Entry/Exit

Can only be used as a single system, not in combination with other C4000.

Tab. 26: Part numbers  
C4000 Entry/Exit

Protective field length [mm]	Part numbers for resolution and scanning range 20 mm
900	▶ 1023968 (C40S-0902CI010)
	▶ 1023969 (C40E-0902CI010)
1050	▶ 1024044 (C40S-1002CI010)
	▶ 1024045 (C40E-1002CI010)
1200	▶ 1024046 (C40S-1202CI010)
	▶ 1024047 (C40E-1202CI010)
1350	▶ 1024048 (C40S-1302CI010)
	▶ 1024049 (C40E-1302CI010)
1500	▶ 1024050 (C40S-1502CI010)
	▶ 1024051 (C40E-1502CI010)

Other systems on request.

## 12.3 Additional front screen (weld spark guard)

- Notes**
- Two additional front screens (weld spark guards) supplied for each part number.
  - The additional front screen fits both on the sender and on the receiver.
  - The additional front screen may be used only if the curved enclosure side is accessible.
  - An additional front screen reduces the scanning range of the system by 8%. If sender and receiver each use an additional front screen, the scanning range will be reduced by 16%.

Tab. 27: Part numbers, additional front screen (weld spark guard)

Protective field length [mm]	Part number
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420

## 12.4 Deflector mirror

### 12.4.1 Deflector mirror PNS75 for protective field width 0 ... 4 m (total)

Tab. 28: Part numbers, deflector mirror PNS75

Protective field length [mm]	Type code	Part number
900	PNS75-094	1019418
1050	PNS75-109	1019419
1200	PNS75-124	1019420
1350	PNS75-139	1019421
1500	PNS75-154	1019422

Dimensional drawing see Fig. 27 on page 59. Effect on the scanning range see Tab. 6 on page 19.

### 12.4.2 Deflector mirror PNS125 for protective field width 4 ... 15 m (total)

Tab. 29: Part numbers, deflector mirror PNS125

Protective field length [mm]	Type code	Part number
900	PNS125-094	1019429
1050	PNS125-109	1019430
1200	PNS125-124	1019431
1350	PNS125-139	1019432
1500	PNS125-154	1019433

Dimensional drawing see Fig. 28 on page 60. Effect on the scanning range see Tab. 7 on page 19.

## C4000 Entry/Exit

Tab. 30: Part numbers, accessories

## 12.5 Accessories

Part	Part number
<b>C4000-system connection</b>	
Hirschmann cable socket M26 × 11 + FE, crimp contacts, straight	6020757
Hirschmann cable socket M26 × 11 + FE, crimp contacts, angled	6020758
Terminal with 182 Ω resistance for pin 9 and 10 on the system connection (cf. page 34)	2027227
Connection cable	
Socket straight/stripped, 2.5 m	2022544
Socket straight/stripped, 5 m	2022545
Socket straight/stripped, 7.5 m	2022546
Socket straight/stripped, 10 m	2022547
Socket straight/stripped, 15 m	2022548
Socket straight/stripped, 20 m	2022549
Socket straight/stripped, 30 m	2022550
<b>Other accessories</b>	
Mounting kit 2: Swivel mount, 4 pcs. for any protective field length	2019659
Mounting kit 6: Swivel function (side bracket), 4 pcs. for any protective field length. For higher vibration and shock exposure	2019506
Reinforced stainless steel bracket, swivel mount, 4 pieces for all protective field lengths (vibration load 5 g/10–55 Hz, impact load 10 g/16 ms)	2026850
AR60 – laser alignment aid (does not require connection to electricity power supply)	1015741
AR60 adapter for C4000 (2 pieces recommended for the alignment of all axes)	4032461
Switching amplifier UE402: expands the C4000 with the functions Bypass and Operating mode switching	1023577
Connection cable between the serial interface of the PC and the configuration interface	6021195
<b>Accessories included in a standard delivery</b>	
Sliding nuts for side bracket, 4 pcs.	2017550
CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2026875

# 13 Annex

## 13.1 Compliance with EU directives

### **EU declaration of conformity (excerpt)**

The undersigned, representing the following 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 respective standards and/or technical specifications are taken as the basis.

Complete EU declaration of conformity for download: [www.sick.com](http://www.sick.com)



## 13.2 Manufacturer's checklist

# SICK

### Checklist for the manufacturer/installer for the installation of electro-sensitive protective equipment (ESPE)

Details about the points listed below must be present at least during initial commissioning – they are, however, dependent on the respective application, the specifications of which are to be controlled by the manufacturer/installer. This checklist should be retained and kept with the machine documentation to serve as reference during recurring tests.

- |  |                              |                             |
|--|------------------------------|-----------------------------|
| 1. Have the safety rules and regulations been observed in compliance with the directives/standards applicable to the machine?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Are the applied directives and standards listed in the declaration of conformity?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. 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 IEC 61496-1?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4. Is the access to the hazardous area/hazardous point only possible through the protective field of the ESPE?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5. Have appropriate measures been taken to protect (mechanical protection) or monitor (protective devices) any persons or objects in the hazardous area when protecting a hazardous area or hazardous point, and have these devices been secured or locked to prevent their removal? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 6. Are additional mechanical protective measures fitted and secured against manipulation which prevent climbing over or crawling underneath the ESPE?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 7. Has the maximum stopping and/or run-down time of the machine been measured, specified and documented (at the machine and/or in the machine documentation)?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 8. Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 9. Are the ESPE devices correctly mounted and secured against manipulation after adjustment?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 10. Are the required protective measures against electric shock in effect (protection class)?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 11. Is the control switch for resetting the protective device (ESPE) or restarting the machine present and correctly installed?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 12. Are the outputs of the ESPE (OSSD) integrated according to required PL/SILCL compliant with EN ISO 13849-1/EN 62061 and does the integration correspond to the comply with the circuit diagrams?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 13. Has the protective function been checked in compliance with the test notes of this documentation?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 14. Are the specified protective functions effective at every operating mode that can be set?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 15. Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 16. Is the ESPE effective over the entire period of the dangerous state?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 17. Once initiated, will a dangerous state be stopped when switching the ESPE on or off and when changing the operating mode, or when switching to another protective device?  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 18. Has the information label "Important Information" for the daily check been attached so that it is easily visible for the operator?   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

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

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