UE402

Switching Amplifier

en

SICK
Sensor Intelligence.

List of contents

1 About this document

This document is an original document of SICK AG.

Please read this chapter carefully before working with this documentation and the UE402.

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 switching amplifier UE402 in connection with the safety light curtain C4000.

These operating instructions do *not* provide instructions for operating machines on which the UE402 resp. the safety light curtain is, or will be, integrated. Information on this is to be found in the appropriate operating instructions of the machine.

1.2 Target group

These operating instructions are addressed to *planning engineers, developers and the operators* of plant and systems which are to be protected by one or several safety light curtains C4000 in connection with the switching amplifier UE402. It also addresses people who integrate the UE402 into a machine, initialise its use, or who are in charge of servicing and maintaining the unit.

1.3 Depth of information

These operating instructions contain information on:

- installation and mounting
- electrical installation
- putting into operation and parameterization
- fault, error diagnosis and troubleshooting
- part numbers
- conformity and approval

of the switching amplifier UE402 in connection with 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 UE402 in connection with the safety light curtain C4000, the national, local and statutory rules and regulations must be observed.

General information on health and safety at work and 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

Here you will find information on:

- sample applications
- a list of Frequently Asked Questions about the C4000 in connection with the UE402
- these operating instructions in different languages for viewing and printing
- certificates on the prototype test, the EU declaration of conformity and other documents

1.4   Abbreviations

BDC	Bottom dead centre. Indicates that the bottom dead centre has been reached on a press
CDS	SICK Configuration & Diagnostic Software = software for configuration and diagnostics on the UE402
EDM	External device monitoring
EFI	Enhanced function interface = safe SICK device communication
ESPE	Electro-sensitive protective equipment (e.g. C4000)
MCC	Machine cycle contact. Indicates that a certain point in the machine cycle has been reached on a press
OSSD	Output signal switching device
PSDI	Presence sensing device initiation = PSDI mode
SCC	Stop control contact = Run-on monitoring. Indicates the end of the expected stopping path on a press
TDC	Top dead centre. Indicates that the top dead centre has been reached on a press

1.5   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.
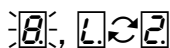
⊞, 🔲🔄🔲   Display indicators show the status of the 7-segment display of sender or receiver:

🔲	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 7-segment display is however always in the normal, non-rotated position. Please consult the C4000 operating instructions for a detailed description of the C4000 indicators.

● Yellow, ☀ Yellow,   LED symbols describe the state of a diagnostics LED. Examples:
○ Yellow

● **Yellow**	The yellow LED is illuminated constantly.
☀ **Yellow**	The yellow LED is flashing.
○ **Yellow**	The yellow LED is off.

➤ Take action ...   Instructions for taking action are shown by an arrow. Read carefully and follow the instructions for action.

⚠ WARNING

Warning notice!

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

Read carefully and follow the warning notices!

💻   Software notes show the location in the CDS (Configuration & Diagnosis Software) where you can make the appropriate settings and adjustments. Go to the menu **View**, **Dialog box** of the CDS and activate the item **File cards** to view the named dialog fields as required. Alternatively, the Software Assistant will guide you through the appropriate setting.

The software notes contained in the operating instructions of the safety light curtain C4000 apply accordingly in connection with the UE402. Depending on the scope of the respective function (see page 19 of this document) you will find the corresponding setting in the CDS below the select **System** or **Operating mode** of the CDS configuration dialog.

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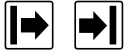
Sender and receiver

In drawings and diagrams, the symbol ⇨ denotes the C4000 sender and the symbol ⇥ denotes the C4000 receiver.

The term "dangerous state"

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

• machine movements

• electrical conductors

• visible or invisible radiation

• a combination of several risks and hazards

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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 UE402 or with the machine protected by the safety light curtain C4000 in connection with the UE402.

2.1   Qualified safety personnel

The switching amplifier UE402 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 the operating instructions of the UE402 and of the safety light curtain C4000.

2.2   Applications of the device

The switching amplifier UE402 is a SICK safety light curtain C4000 accessory. It extends the technical application possibilities of the C4000. The physical resolution, the maximum protective field width and the realizable protective field height of the C4000 are not changed by deploying the UE402.

It may be necessary to install additional mechanical protective devices when using the C4000 in connection with the UE402.

2.3   Correct use

The switching amplifier UE402 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.

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 protective 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 in connection with the UE402.

- Please observe the notes in the chapter titled "General protective notes and protective measures" of the C4000 operating instructions.
- Moreover, it may be necessary to observe the following standards, among other things, for your particular application:
  - EN 692: Mechanical Presses, Safety
  - EN 693: Hydraulic Presses, Safety
- The C4000 and UE402 operating instructions must be made available to the operator of the machine, with which the safety light curtain C4000 is used in connection with the UE402. 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 UE402 must be connected to the same external voltage supply as the safety light curtain. The voltage supply 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).

2.5 Protection of the environment

The switching amplifier UE402 has been designed to minimise environmental impact. It uses only a minimum of power and natural resources.

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

Disposal

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

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

3   Product description

This chapter provides information on the special features and properties of the UE402. It describes the construction and the operating principle of the device, in particular the different operating modes in connection with the safety light curtain C4000.

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

Note   The functions of the UE402 can only be used in conjunction with the C4000 safety light curtain Standard or C4000 Advanced with the following entry on the type label in the field *Software version*: 3.0.0 or later.

3.1   Special features

The switching amplifier UE402 extends the application possibilities of the safety light curtain C4000:

- 6 operating modes are predefinable (see page 18)
- PSDI mode (see page 12)
- protective field evaluation bypass (see page 11)
- teach-in mode: Adjusting the blanked-out areas directly on the device through the corresponding objects in the protective field (C4000 Advanced only, see page 17)

3.2   Operating principle of the device

3.2.1   Principle of the device

The UE402 is an electronic module. It processes certain signals of the safety light curtain C4000 or the cascading C4000 and merges them with the signals of other connected systems. These systems may include:

- an operating mode selector switch
- a teach-in key-operated switch
- a key-operated pushbutton for bypass
- machine cycle contacts, e.g. for the top and bottom dead centres of a press

The UE402 is usually installed in the control cabinet.

3.3   Configurable functions

This chapter describes the functions of the safety light curtain C4000 which are selectable via software, which can only be used *in connection with switching amplifier UE402*. The functions can be partially combined with the other configurable functions of the safety light curtain.
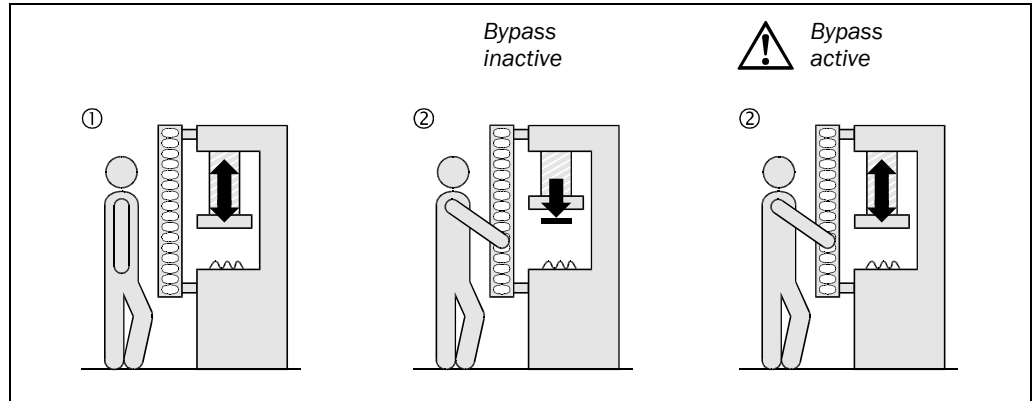
⚠
WARNING

Test the protective device after any changes!

Each time the configuration is changed you must test the effectiveness of the entire protective device (see chapter titled "Test notes" in the operating instructions of the safety light curtain C4000).

3.3.1 Bypass

Fig. 1: Schematic layout of the bypass function

In some applications it is at times necessary to mute the protective field evaluation of the safety light curtain. This could be, e.g., in a safe machine setup mode, in which the machine can be operated only at walking speed. When the bypass is active, the safety light curtain displays ● **Green** and the 7-segment display of the receiver displays ⓑ.

WARNING

Switch on the machine safely, when using the bypass function!

While the bypass function is active, the safety light curtain will **not** detect any intervention in the protective field. You must ensure that other protective measures are forcibly activated during the bypass, e.g. the safe machine setup mode, so that the machine cannot endanger persons or parts of the machine during the bypass function.

The bypass function may only be activated by a key-operated switch with an automatic reset and two levels or by two input signals that are independent of each other, e.g. two positioning switches.

Notes
- It must be possible to view the entire hazardous point when pressing the key-operated switch.
- When you activate the bypass function, you can only connect a teach-in key-operated switch (see page 26) directly to the C4000, because the corresponding terminals of the UE402 are occupied by the key-operated pushbutton for bypass.
- It is not possible to combine the bypass and PSDI mode functions.
- The safety light curtain terminates the bypass function automatically, when …
  - the operator starts a teach-in procedure.
  - the operator changes the operating mode.
  - there is a signal change at the Emergency Stop input on the C4000.
  - a system error (lock-out) occurs.
- 200 ms after switching off the bypass, the system is again in a safe status (latency time).

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **Bypass**.

The connection of the key-operated pushbutton for bypass is described in chapter 5.3 "Key-operated pushbutton for bypass" on page 25.

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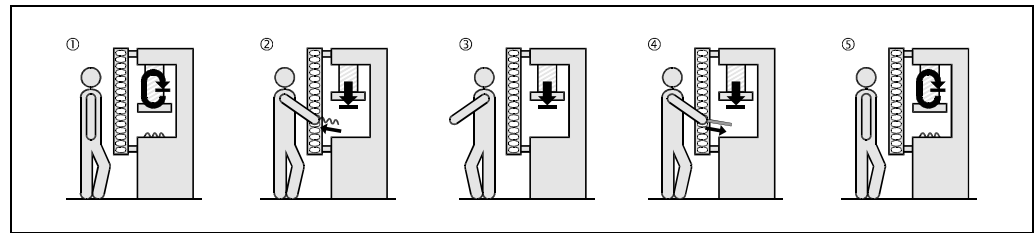
3.3.2 PSDI mode

In the PSDI mode, the machine waits at the top dead centre for a defined number of interruptions by the operator. After a certain number of interruptions, the safety light curtain automatically releases the dangerous movement. Dual mode PSDI means e.g., that the safety light curtain causes the movement to block after the first interruption by the operator (②). The safety light curtain does not release the movement until the operator has completed the second interruption (④, ⑤).

Note The PSDI mode function can only be configured for light curtains with an effective operating resolution of ≤ 30 mm.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, area **PSDI mode**.

PSDI time monitoring

In the case of active PSDI time monitoring, the maximum duration of an entire PSDI is limited to 30 seconds.

- The 30 seconds start by the machine being stopped at the top dead centre.
- When the final PSDI interruption of an entire PSDI is not terminated within this time, the safety light curtain remains red and waits until the reset button has been pressed.

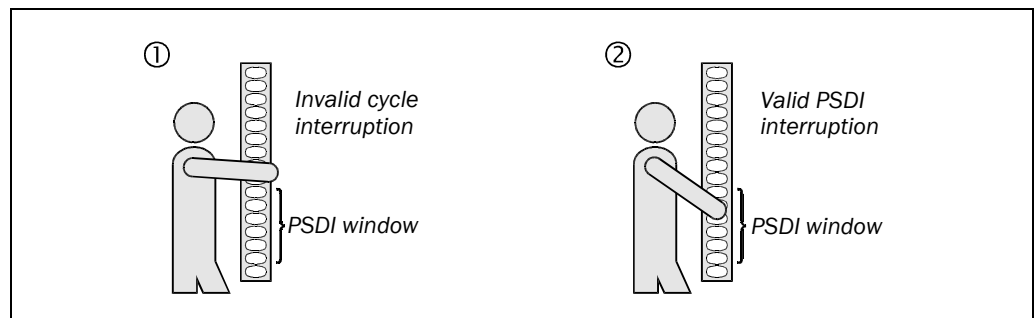PSDI time monitoring has been configured by default and can be deactivated.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **PSDI time monitoring active**.

PSDI window

You can determine the section of the protective field in which the safety light curtain can interpret an interruption as a PSDI. This section of the protective field is called the *PSDI window*.

If you configure a PSDI window as shown in Fig. 3, the safety light curtain only interprets ② as a valid PSDI interruption.

Notes
- You can only define one PSDI window. This also applies to a cascading system.
- At least one beam must be free between the PSDI window and adjacent blanked-out areas.
- If you do not define a PSDI window, all areas of the protective field that have not been blanked out are PSDI windows.

![Laptop icon] Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **PSDI window**. You must then specify the beginning and the size of the PSDI window on file card **Host** or **Guest** of the system in question.

Significance of the machine cycle contact for PSDI mode operation

Fig. 4: Schematic layout of the machine cycle for PSDI mode operation for the example of a press
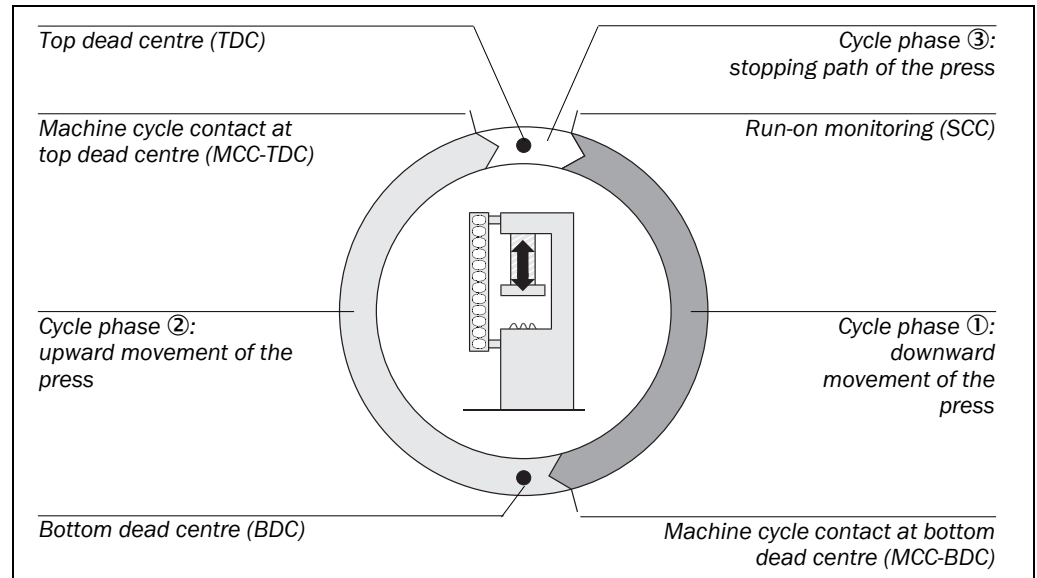
To ensure that the PSDI mode operation is safe and true to the application, C4000 in connection with UE402 evaluates three machine signals:

- run-on monitoring (SCC)
  Run-on monitoring evaluation is optional.

- bottom dead centre (MCC-BDC)

- top dead centre (MCC-TDC)

On the basis of the three machine signals, the safety light curtain can identify the machine's current cycle phase:

① Downward movement of the press. This cycle phase involves danger.

② Upward movement of the press. This cycle phase does not involve danger for all machines.

③ Stopping the press. This cycle phase does not involve danger provided the "Run-on monitoring" machine signal is not followed.

The figure below clarifies the process in time with the aid of an example of the single PSDI mode:

Fig. 5: Time-process diagram for single PSDI mode
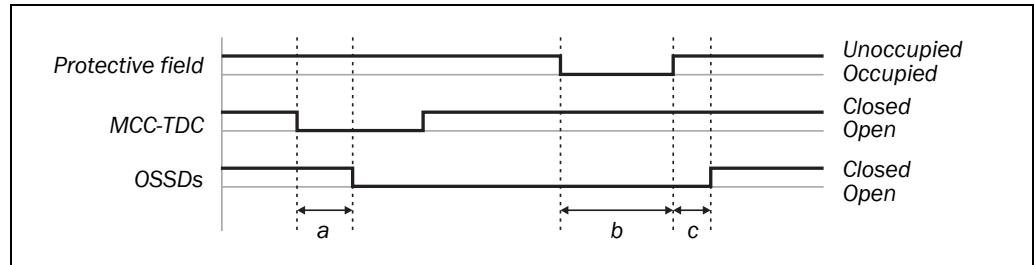
a   Max. 150 ms after reaching the machine cycle contact MCC-TDC, the output signal switching devices (OSSDs) fall away.

b   The operator reaches into the protective field for at least 100 ms. The protective device therefore recognizes the interruption as the PSDI.

c   The protective contacts close again no longer than 200 ms after the last PSDI.

Note   The C4000 does not offer control and monitoring functions for reverse operations or single-stroke safety. In other words, the safety light curtain cannot detect any reverse movement of the machine.

The electrical connection of the machine cycle contact is described in chapter 5.5 "Machine-cycle contacts" on page 26.

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Start sequence (PSDI mode initiation)

The UE402 support three start sequences in PSDI mode:

Tab. 1: Possible start sequences in PSDI mode

		Standard	Alternative ("Sweden Mode")	Without restart interlock
Start sequence	**Requirements**	The machine cycle contact MCC-TDC must be connected.		
		The internal restart interlock of the C4000 must be activated.		The internal restart interlock of the C4000 is deactivated. An external restart interlock must be available.
	Procedure	You have just switched on the machine or have switched the machine to an operating mode with the PSDI mode.		
		The ● **Yellow** LED of the host system is illuminated constantly.	The ☼ **Yellow** LED of the host system is flashing.	The ● **Yellow** LED of the host system is illuminated constantly.
		➢ Reach once or twice into the protective field according to the PSDI mode. ➢ Press the reset button.	➢ Press the reset button. ➢ Reach once or twice into the protective field according to the PSDI mode.	➢ Reach once or twice into the protective field according to the PSDI mode.
		The machine runs until it reaches the top dead centre and waits there for the cycle. The ● **Yellow** LED of the host receiver is then illuminated constantly.		
PSDI cycle	**Interruption during the downward movement (①)**	The safety light curtain changes to red.		
	Interruption during the upward movement (②)	The behavior of the safety light curtain depends on the PSDI control (see "Eccentric press mode" further below).		
	Interruption during the stopping phase (③)	First interruption: PSDI starts Last interruption: PSDI ends. The safety light curtain reverts to Green as soon as the protective field interruption is ended.		

Releasing the PSDI control

You can release the PSDI control in two different ways:

- Limited: The safety light curtain only evaluates interruptions within the stopping phase as a PSDI, i.e. if the machine cycle contact was made for the top dead centre (MCC-TDC) and has also fallen away again.

- Not limited: The safety light curtain also evaluates interruptions within the upward and stopping phases as PSDIs if the machine cycle contact is made for the top dead centre (MCC-TDC) and has not yet fallen away again. This configuration makes higher clock speeds possible.

⚠ WARNING

Limit the release of the PSDI control if the machine does not automatically stop at the top dead centre!

➤ If you wish to set the release of the PSDI control to *Not limited*, then you must make sure at the machine side that the machine stops automatically at the top dead centre.

➤ For this you must always observe the standards that apply for your specific application/machine situation.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **Enable PSDI control**.

Run-on monitoring

The purpose of run-on monitoring is to detect any failure of the machine brake at the top dead centre. If you activate run-on monitoring, the UE402 in front of the stroke release monitors whether the SCC is still closed, i.e. whether the machine has actually stopped at the top dead centre.

If the press exceeds the SCC before the operator has intervened once or twice depending on the PSDI mode, the C4000 switches to lock-out.

Note   The SCC contact must be connected for run-on monitoring.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **Run-on monitoring active**.

Eccentric press mode

Eccentric presses must not be allowed to stop at the bottom dead centre because their construction does not enable them to stop in this situation. In eccentric press mode, the safety light curtain mutes the protective field function in this phase. The muting begins when the machine cycle contact for the bottom dead centre is reached. You must ensure that the machine cycle contact for the bottom dead centre is not made until *after* the end of the dangerous movement. The muting ends when the machine cycle contact for top dead centre is reached, but no longer than after 30 seconds.

Notes
- When you configure the eccentric press mode you must also connect the machine cycle contact for the bottom dead centre (MCC-BDC). The connection is described in chapter 5.5 "Machine-cycle contacts" on page 26.

- The muting can only be activated once per machine cycle.

Protect the machine during the mute state!

WARNING

In eccentric press mode, you must take suitable measures to ensure that no dangerous state can occur while muting is active.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection of the **operating mode**, file card **General**, option **Eccentric press mode active**.

Note

In eccentric press mode with release mode "not limited", the safety light curtain only detects an interruption during the total muting time as PSDI, if the interruption lasts longer than the time it takes to reach the machine cycle contact for the top dead centre (MCC-TDC).

3.3.3 Teach-in

The configurable Teach-in function has been realized in the safety light curtain C4000 and explained in the appropriate operating instructions. The electrical connection of the teach-in key-operated switch on the UE402 is described in chapter 5.4 "Teach-in key-operated switch" of this document on page 26.

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3.4   Operating modes

You can configure up to six operating modes with the aid of the CDS. The operator can switch between these operating modes by means of an operating mode selector switch. This section describes the scope of the configured functions and the possibilities for combining them.

Notes
- The operating mode selector switch *must* be a key-operated switch.

- You can also set up fewer than six operating modes.

- No electrical connection may be made for operating modes that are not in use. Otherwise the safety light curtain will be completely blocked (lock-out).

WARNING

Check the protective device in every operating mode and after every change!

If you configure several operating modes, you must especially check the operation of the protective device in each of these operating modes. To this end, you must observe the test notes in the operating instructions of the safety light curtain C4000.

Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, area **Operating modes**. You can find more information on setting up and storing an operating mode in the C4000 online help in the CDS.

The connection of the operating mode selector switch is described in chapter 5.2 "Operating mode selector switch" on page 25.

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Product description

3.4.1 Scope of configurable functions

The configurable functions of the C4000 have different scopes (cf. Tab. 2). The scope depends on whether …

- the function can be configured separately for every individual system in a cascade or only for the entire cascade.

- the function can be configured separately for every operating mode or only for the entire application.

Depending on the scope of the function in question, you can find the corresponding setting in CDS under the **System** or **Operating mode** options of the CDS configuration dialog.

Tab. 2: Scope of configurable functions

Function that can be configured	Scope			
	All the systems of a cascade	An individual system	All operating modes	One operating mode
Rotation of the 7-segment display		■	■	
PSDI mode	■			■
PSDI window		■		■
Beam coding	■		■	
External device monitoring (EDM)	■		■	
Reduced resolution		■		■
Scanning range		■	■	
Type of bypass switch	■		■	
Enable bypass	■			■
Emergency stop-input	■		■	
Fixed blanking		■		■
Floating blanking		■		■
Teach-in	■		■	
Type of restart interlock (internal/external)	■			■
Type of reset button	■		■	
Connection site of the reset button	■		■	
Signal output	■		■	

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3.4.2 Functions that cannot be combined

Several functions of the safety light curtain C4000 cannot be combined.

Note   You can configure two functions, each of which are applicable within one operating mode, in two different operating modes of the same application, even if Tab. 3 indicates that they cannot be combined.

Tab. 3: Functions that cannot be combined

Configurable function	Limitation
Teach-in key-operated switch on the extension connection	• Not with the Emergency Stop on the C4000
Teach-in key-operated switch on the UE402	• Not with *Bypass*
Emergency stop	• Not with the teach-in key-operated switch on the extension connection of the C4000
Bypass	• Not with *PSDI mode* • Not with *PSDI window* • Not with the teach-in key-operated switch on the UE402
PSDI mode	• Not with *Bypass* • Not with *fixed blanking with increased size tolerance* • Not with *floating blanking with partial object monitoring* • Not, if the *effective resolution* is > 30 mm (EN 692)
PSDI window	• Not with *Bypass* • Not with *fixed blanking with increased size tolerance* • Not with *floating blanking* • Not with *reduced resolution*
Reduced resolution (effective resolution > 30 mm)	• Not with *fixed blanking with increased size tolerance* • Not with *floating blanking with partial object monitoring* • Not with *PSDI mode* • Not with *PSDI window*
Floating blanking with partial object monitoring	• Not with *fixed blanking with increased size tolerance* • Not with *reduced resolution* • Not with *PSDI mode* • Not with *PSDI window*
Fixed blanking with increased size tolerance	• Not with *floating blanking with partial object monitoring* • Not with *reduced resolution* • Not with *PSDI mode* • Not with *PSDI window*

3.5 Display elements

The UE402 has a diagnosis LED. Moreover, all operational status indicators appear immediately on the corresponding C4000 sender and/or receiver.

Fig. 6: Diagnostic LED of the UE402
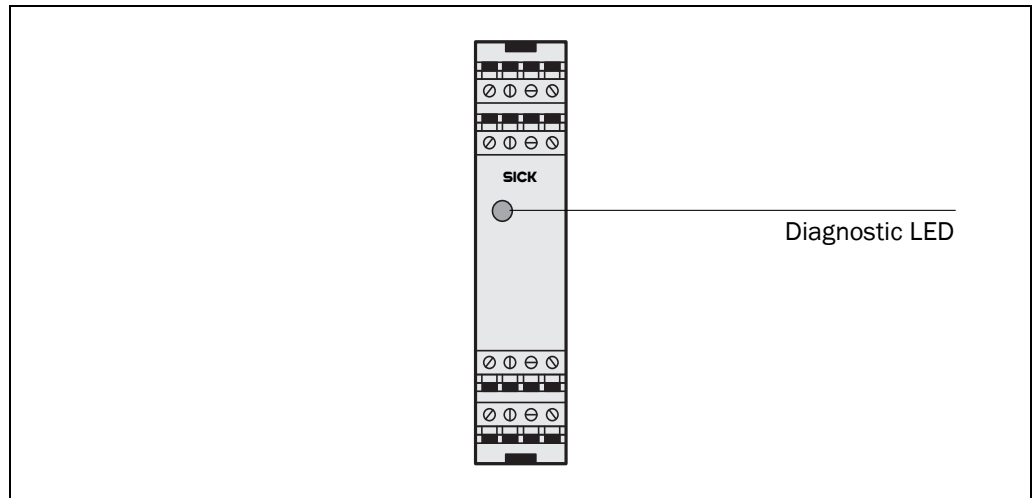
Diagnostic LED

Tab. 4: Meaning of the diagnostic LED of the UE402

Display	Meaning
○ **Yellow**	LED off: no supply voltage
● **Yellow**	LED illuminated: device ready for operation
☀ **Yellow**	LED flashing: error (see section 8 "Fault diagnosis" on page 30)

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4   Installation and mounting

The UE402 has been designed for assembly on a mounting rail. The positioning place must at least comply with enclosure rating IP 54.

The following steps are necessary after mounting and installation:

• making the electrical connections (chapter 5)

• testing the installation (To this end you should read the section titled "Test notes" in the safety light curtain C4000 operating instructions.)

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5   Electrical installation

⚠ **WARNING**

Switch the entire machine/system off line!

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

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

Notes

- The UE402 meets the interference suppression requirements (EMC) for industrial use (interference suppression class A). When used in residential areas it can cause interference.

- The control cabinet or assembly housing of the UE402 must at least comply with enclosure rating IP 54.

- You must connect the UE402 to the same external voltage supply as the safety light curtain.

- 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).

- If the signal transmitters (e.g. operating mode selector switch, teach-in key-operated switch, etc.) are mounted in control panels outside the installation, you must protect the corresponding connecting cables from short and cross-circuiting, e.g. by installing them in suitable cable conduits.

5.1   Connections of the UE402

Fig. 7: Connections of the UE402
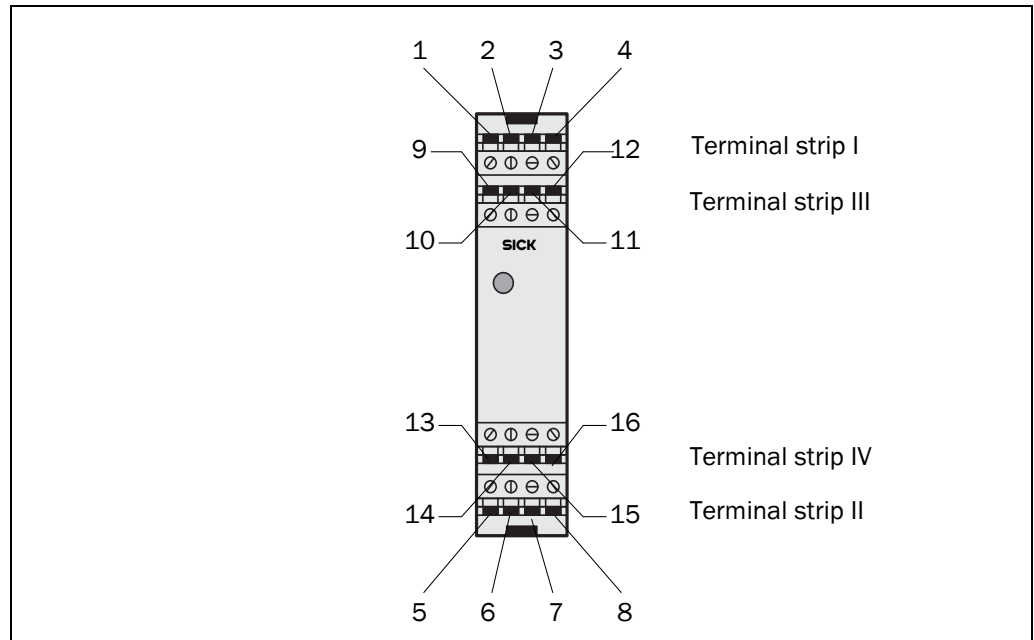
Tab. 5: Terminal assignment of the UE402

Terminal	Assignment	
1	24 V DC	V DC input (voltage supply)
2	0 V DC	V DC input (voltage supply)
3	EFI$_B$	Device communication to the C4000 receiver
4	EFI$_A$	Device communication to the C4000 receiver
5	In A1	Input operating mode 1
6	In A2	Input operating mode 2
7	In A3	Input operating mode 3
8	In A4	Input operating mode 4
9	In B1	Input for key-operated pushbutton for bypass or teach-in key-operated switch
10	In B2	Input for key-operated pushbutton for bypass or run-on monitoring (SCC)
11	Out B1	Output for In B1
12	Out B2	Output for In B2
13	In A5	Input operating mode 5
14	In A6	Input operating mode 6
15	MCC-BDC	Input machine cycle contact, bottom dead centre
16	MCC-TDC	Input machine cycle contact, top dead centre
Housing	FE	Functional earthing

Note The UE402 also has a functional earth (earth contact to the mounting rail). You must ensure that the mounting rail is connected to the functional earth (FE) of the safety light curtain C4000.

Fig. 8: Minimum necessary connections of the UE402 to the safety light curtain C4000
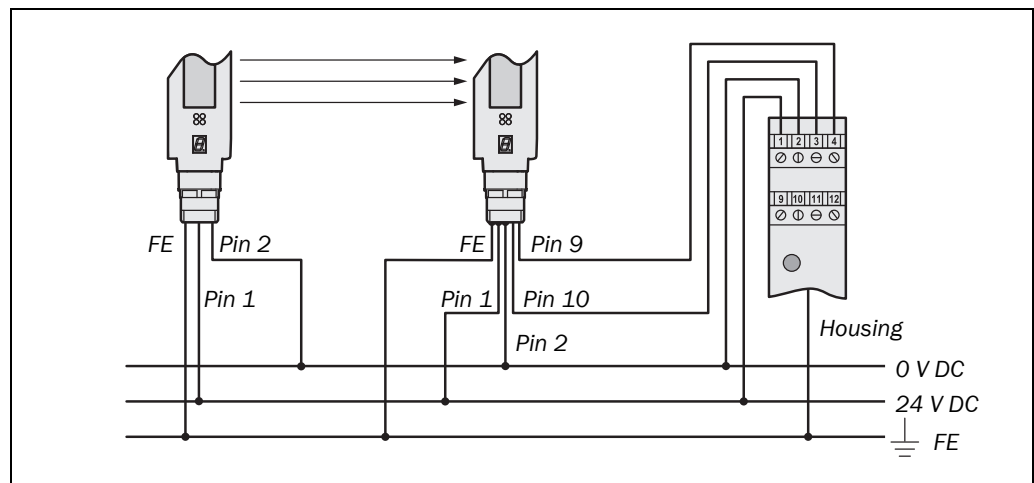
5.2   Operating mode selector switch

The UE402 has connections for an operating mode selector switch with up to 6 switch settings.

Fig. 9: Connection for the operating mode selector switch on the UE402
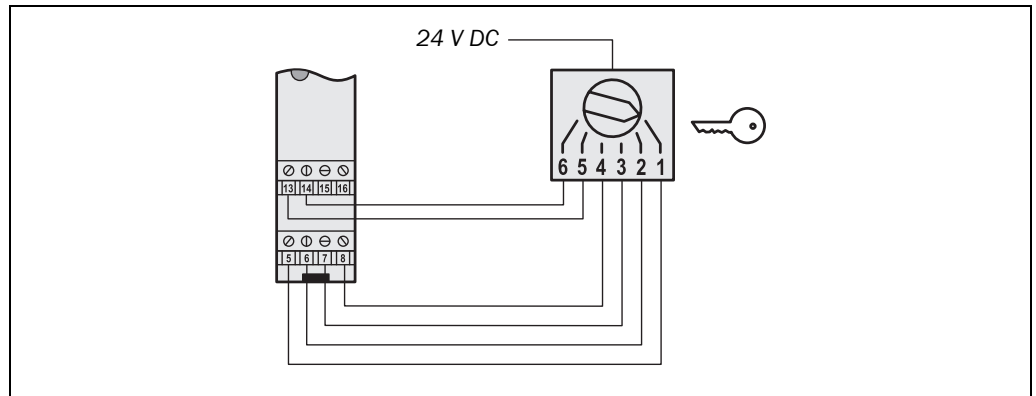
Notes
- If the safety light curtain can be selected on the machine side, this must also be selected via the operating mode selector switch.
- The operating mode selector switch *must* be a key-operated switch or a similar device.

Recommendation   Use an operating mode selector switch, that has only the same number of switch settings that you actually need. This will help you to reduce the likelihood of operating errors.

5.3   Key-operated pushbutton for bypass

The bypass function may only be activated by a key-operated switch with an automatic reset and two levels or by two input signals that are independent of each other, e.g. two positioning switches.

Fig. 10: Alternative connections for the key-operated pushbutton for bypass on the UE402
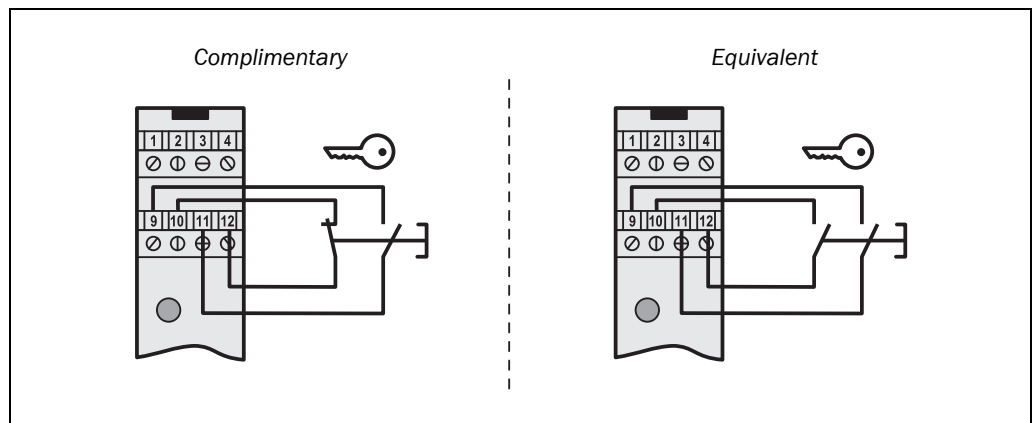
Notes
- ➢ Mount the key-operated pushbutton for bypass in such a way that the hazardous point is completely visible when the key-operated switch is used.
- The key-operated pushbutton for bypass must have potential-free contacts.
- When you connect the key-operated pushbutton for bypass to the UE402, you can only connect a teach-in key-operated switch directly to the C4000.
- You must configure the switching mode of the key-operated pushbutton for bypass to comply with the selected switch type (N/C, N/O or N/O, N/O) with the aid of the CDS:

    Device symbol **C4000 Host (receiver)**, context menu **Configuration draft**, **Edit**, selection **System**, file card **General**, option **Key-operated pushbutton for bypass**.

5.4 Teach-in key-operated switch

Fig. 11: Connecting the teach-in key-operated switch to the UE402
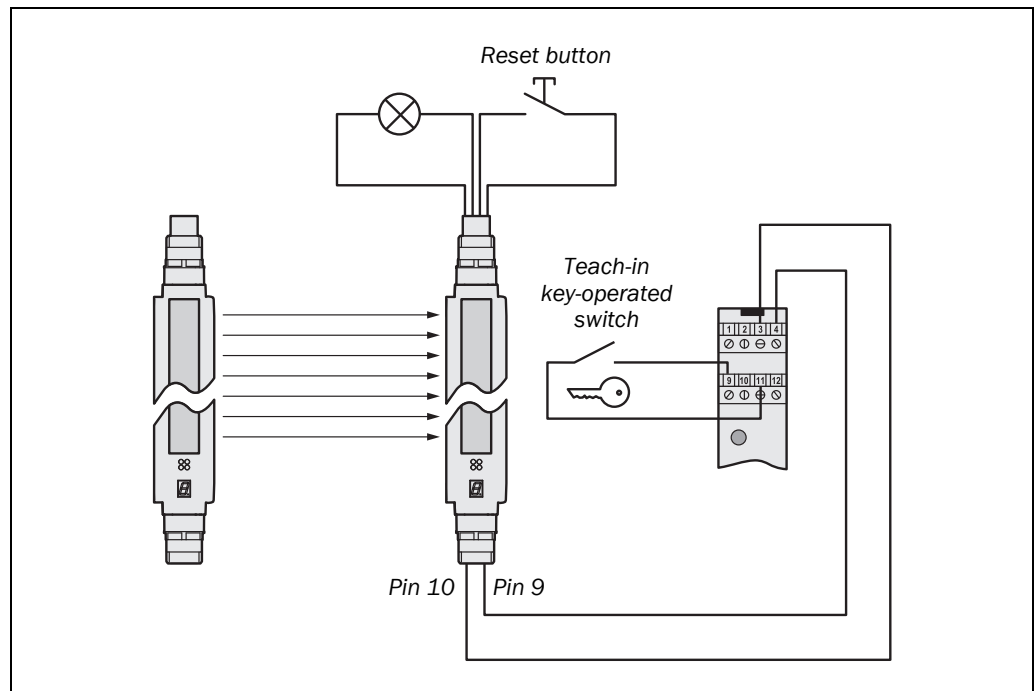
Note You can decide to connect the teach-in key-operated switch to the C4000 or to the UE402. If you connect the teach-in key-operated switch to the UE402, you cannot connect a key-operated pushbutton for bypass, and the bypass function can therefore no longer be used.

5.5 Machine-cycle contacts

For PSDI mode, the machine cycle contact of the machine must be connected to the UE402. Depending on the PSDI mode, the UE402 can evaluate various contacts, some are mandatory (Tab. 6).

The signals of the machine cycle contact MCC-BDC and MCC-TDC are allowed to briefly overlap each other. MCC-BDC must always fall away before MCC-TDC.

Tab. 6: Necessary machine cycle contact

Configured function	Top dead centre (MCC-TDC) contact	Bottom dead centre (MCC-BDC) contact	Run-on monitoring (SCC) contact
PSDI mode with restart interlock	■	■ (optional)	■ (optional)
PSDI mode without restart interlock	■	■ (optional)	■ (optional)
PSDI mode Alternative ("Sweden Mode")	■	■ (optional)	■ (optional)
Eccentric press mode	■	■	■ (optional)
Run-on monitoring	■	■ (optional)	■

Electrical installation

Fig. 12: Connecting the machine cycle contact to the UE402
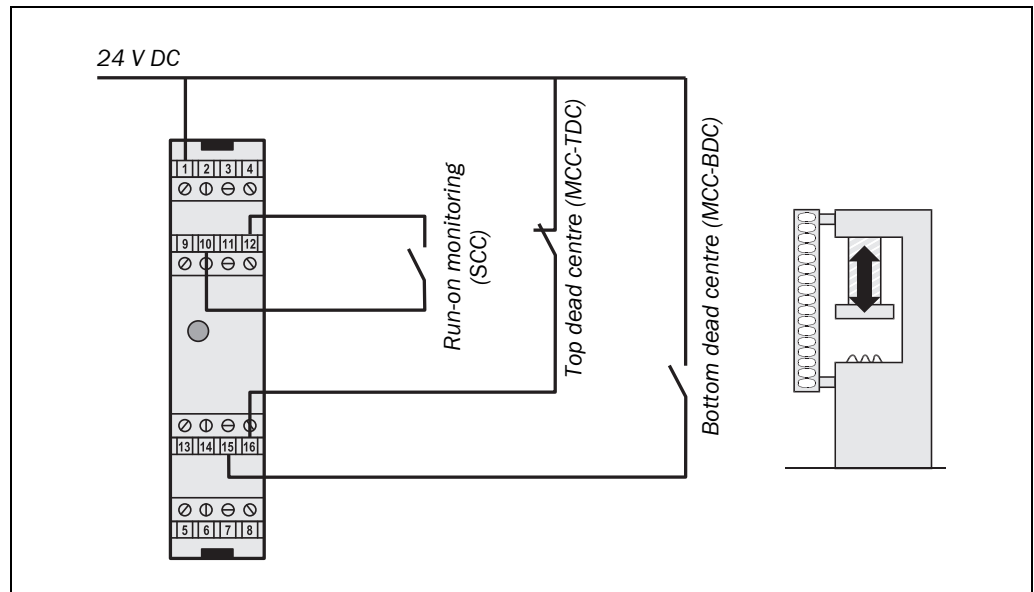
You must ensure that the machine cycle contacts meet the following criteria:

Tab. 7: Criteria for connecting the machine cycle contact

Machine cycle contact	Criteria
MCC-TDC	• The contact is normally closed. • Before reaching the top dead centre, the contact must have been open for at least 100 ms. • The contact must be closed again at the top dead centre.
MCC-BDC	• The contact is normally open. • At the end of the dangerous movement, the contact muss must be closed. • After the MCC-TDC has opened, the contact can be opened again. • The contact must be opened again before the MCC-TDC is closed.
SCC	• The contact is normally open. • The contact must be closed when the machine is restarted. • The contact must already be closed when the MCC-TDC opens. • The contact may be opened shortly after the machine is restarted.

6   Commissioning

> Deploy the protective device in accordance with the instructions contained in the chapter titled "Commissioning" of the safety light curtain C4000 operating instructions.

⚠️
WARNING

Commissioning requires a thorough check by qualified safety personnel!

Before you operate a system protected by the safety light curtain C4000 in connection with the UE402 for the first time, make sure that the system is first checked and approved by qualified safety personnel. Please read the notes in chapter "On safety" on page 8.

7 Configuration

7.1 Preparing the configuration

The UE402 does not have its own configuration connection. It is configured exclusively directly at the configuration connection of a connected safety light curtain.

How to prepare the configuration:

➢ Plan all the necessary settings (operating modes, restart, PSDI mode, etc.).

➢ Ensure that the UE402 and the safety light curtain C4000 are correctly assembled and that the electrical connections are also correct.

For the configuration of the UE402 and the connected safety light curtain you will 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

➢ To configure the device, please read the user manual for the CDS (Configuration & Diagnostic Software) and use the online help function of the programme.

8   Fault diagnosis

This chapter describes how to identify and remedy errors and malfunctions during the operation of the UE402.

8.1   What to do in case of faults

⚠️

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 connected C4000 receiver then indicates $\boxed{A}$, $\boxed{c}$, $\boxed{E}$, $\boxed{F}$ or $\boxed{L}$. To place the device back in operation:

➢ Rectify the cause of the fault as per Tab. 9.

➢ Switch the power supply to the UE402 off and on again (remove terminal strip I of the switching amplifier and replace it again).

➢ Switching the power supply to the connected safety light curtain off and on again (remove the system plug of the C4000 receiver and replace it again).

8.2   SICK Support

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

8.3 Error displays of the diagnostics LEDs

This section explains the meaning of the error displays of the LEDs and how to respond.

Tab. 8: Error displays of the diagnostics LEDs

Display	Possible cause	Remedying the error
☀	Wrong connection	➢ Check the wiring for short and cross-circuiting. ➢ Check the voltage supply of the UE402. ➢ Switch the UE402 and the C4000 off and back on again. If the problem continues to occur, you must replace the UE402.
	Internal error of the UE402	➢ Carry out an extended diagnosis of the connected safety light curtain C4000 with the aid of the CDS (see page 32). ➢ Replace the device if an internal error is diagnosed.

8.4 Additional error displays of the 7-segment display of the C4000

The safety light curtain C4000 has new functions when connected to switching amplifier UE402. This section explains the meaning of the additional error displays of the 7-segment display and how to respond to the messages. You can find a description of the 7-segment display in the chapter titled "Status indicators" of the safety light curtain C4000 operating instructions.

Tab. 9: Error displays of the 7-segment display

Display	Possible cause	Remedying the error
A↻8	UE402 configuration is incorrect	➢ Configure the UE402 with the aid of the CDS. ➢ Check the connection from the C4000 to the UE402.
c↻5	Several operating modes configured, but none selected	➢ Check the connection and the function of the operating mode selector switch. ➢ Check the connection for the operating mode selector switch on the UE402.
c↻6	Several operating modes selected simultaneously	➢ Check the connection and the function of the operating mode selector switch. ➢ Check the connection for the operating mode selector switch on the UE402 for a short-circuit.
c↻7	Unconfigured operating mode selected	➢ Configure the operating mode set on the operating mode selector switch, or ensure that this operating mode cannot be selected.

Display	Possible cause	Remedying the error
c.⟳8	Key-operated push-button for bypass is malfunctioning or invalid configuration	➢ Check whether the configuration of the key-operated pushbutton for bypass in the CDS matches the electrical connection. ➢ Check the function of the key-operated push-button for bypass and replace it if necessary. ➢ Ensure that both contacts on the key-operated pushbutton for bypass are pressed within 2 seconds.
c.⟳9	Short-circuit at the operating mode selector switch	➢ Check the operating mode inputs on the UE402 for short-circuit to 24 V.
E.⟳4	UE402 is defective	➢ Interrupt the supply of power to the C4000 and to the UE402 for at least 3 seconds. ➢ If the problem is still present, then replace the UE402.

8.5   Extended diagnosis

The CDS software (Configuration & Diagnostic Software) supplied with the safety light curtain C4000 contains extensive diagnostic facilities. 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 function of the CDS (Configuration & Diagnostic Software)

• in the user manual for the CDS

Conduct an extended diagnosis of the UE402 as follows:

➢ Connect the PC/notebook in which CDS has been installed to the receiver of the safety light curtain C4000.

➢ Carry out a diagnosis on the host of the C4000 receiver.

Device symbol **C4000 Host (receiver)**, context menu **Diagnostics**, **Show**.

9 Technical specifications

9.1 Data sheet

	Minimum	Typical	Maximum

General system data

Type	Type 4 (IEC 61496-1)		
Safety integrity level[1]	SIL3 (IEC 61508)		
SIL claim limit[1]	SILCL3 (EN 62061)		
Category	Category 4 (EN ISO 13849-1)		
Performance Level[1]	PL e (EN ISO 13849-1)		
PFHd (mean probability of a dangerous failure per hour) C4000 Standard/ C4000 Advanced	System figures including the safety light curtains. The figures for the safety light curtains do **not** need to be added to these system figures.		
Host	15×10^{-9}		
Host/guest/guest (14 mm, 30 mm)	32×10^{-9}		
Host/guest/guest (20 mm, 40 mm)	63×10^{-9}		
C4000 Entry/Exit	15×10^{-9}		
C4000 Palletizer/C4000 Fusion	15×10^{-9}		
T_M (mission time)	20 years (EN ISO 13849-1)		
Protection class	III (EN 61140)		
Enclosure rating	IP 20 (IEC 60529)		
Supply voltage U_V at the UE402[2]	19.2 V	24 V	28.8 V
Residual ripple[3]			$\pm 10\%$
Power consumption			110 mA
Power-up delay after connecting the supply voltage		0.5 s	4 s
Housing dimensions	See "Dimensional drawing" on page 35.		
Weight		120 g	

[1] For detailed information on the exact design of your machine/system, please contact your local SICK representative.
[2] 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).
[3] Within the limits of U_V.

	Minimum	Typical	Maximum

Inputs In A1 to A6, MCC-BDC and MCC-TDC

	Minimum	Typical	Maximum
Switching voltage[4] HIGH	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Switching voltage[4] LOW	–30 V	0 V	5 V
Input current LOW	–3 mA	0 mA	0.5 mA
Changeover time operating modes In A1 to In A6	150 ms		2 s
Bouncing time of the contacts			25 ms

Inputs In B1 and In B2, outputs Out B1 and Out B2

Cable resistance			30 Ω
Cable capacitance			10 nF
Bouncing time of the contacts			25 ms
Bypass function			
Changeover time			2 s
Latency time			150 ms

Operating data

Cable length[5] for the C4000			50 m
Wire cross-section	0.25 mm²		2.5 mm²
Ambient operating temperature	0 °C		+55 °C
Air humidity (non-dewing)	15 %		95 %
Storage temperature	–25 °C		+70 °C
Rigidity	5 g, 10–55 Hz acc. to IEC 60068-2-6		
Shock resistance	10 g, 16 ms acc. to IEC 60068-2-29		

[4] As per IEC 61131-2.
[5] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

9.2 Dimensional drawing

114.5

22.5

99
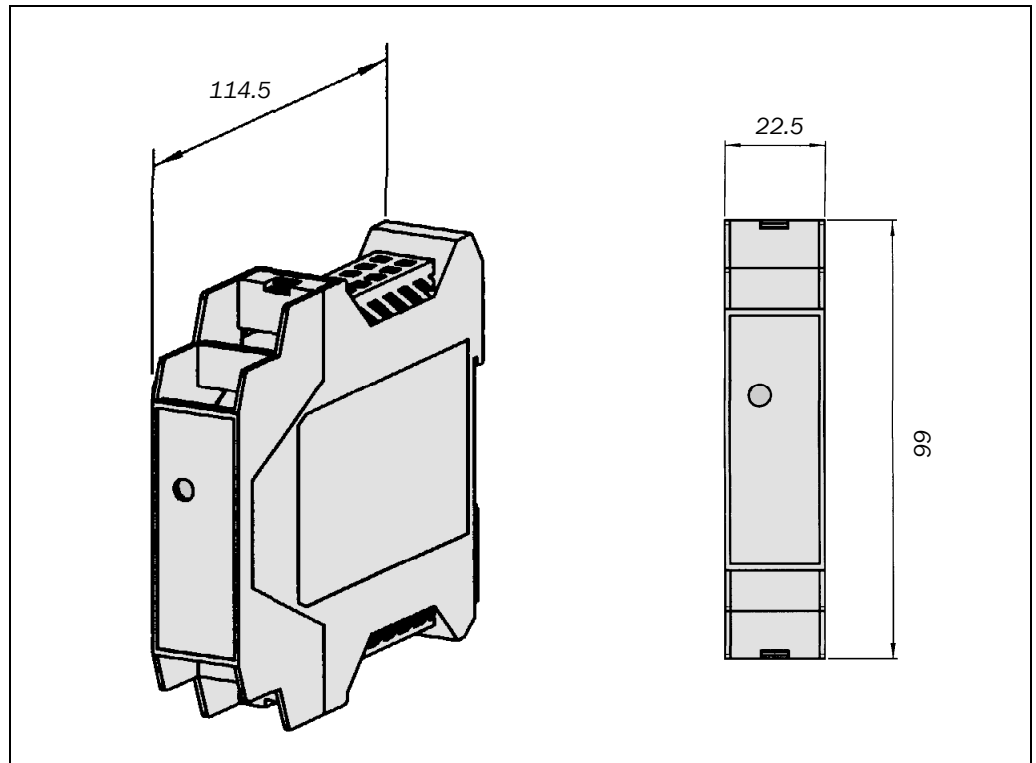
10 Ordering information

10.1 Delivery

The switching amplifier UE402 is available from SICK as part number 1023577. The delivery comprises:

- switching amplifier UE402

- 4 terminal strips

- operating instructions on CD-ROM

10.2 Accessories

Tab. 11: Part numbers, accessories

Part	Part number
Replacement terminal strips, 4 pieces	6025841
Operating instructions UE402 in 12 languages on CD-ROM	2027082
CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2026875

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11   Annex

11.1   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

11.2   **List of tables**

11.3   **List of illustrations**

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