EUCHNER

Operating Instructions

Non-Contact Safety Switch

CES-I-BR-.-C07-... (Unicode/Multicode)

EN

Contents

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1. About this document

1.1. Scope

These operating instructions are valid for all CES-I-BR-.-C07-... These operating instructions, the document "Safety information and maintenance" and any enclosed data sheet form the complete user information for your device.

1.2. Target group

Design engineers and installation planners for safety devices on machines, as well as setup and servicing staff possessing special expertise in handling safety components.

1.3. Key to symbols

Symbol/depiction	Meaning
	Printed document
	Document is available for download at www.euchner.com
	Document on CD
DANGER **WARNING** **CAUTION**	Safety precautions **Danger** of death or severe injuries **Warning** about possible injuries **Caution** slight injuries possible
NOTICE **Important!**	**Notice** about possible device damage **Important** information
Tip	Useful information

1.4. Supplementary documents

The overall documentation for this device consists of the following documents:

Document title (document number)	Contents	
Safety Information and Maintenance Safety Switch CES-AP/CES-AR/CES-BR (2514431)	Basic information for safe setup and service	
Operating Instructions (2510145)	(this document)	
Possibly enclosed data sheet	Item-specific information about deviations or additions	

Important!

Always read all documents to gain a complete overview of safe installation, setup and use of the device. The documents can be downloaded from www.euchner.com. For this purpose enter the doc. no. or the order number for the device in the search box.

2. Correct use

Safety switches series CES-I-BR are interlocking devices without guard locking (type 4). The device meets the requirements according to EN IEC 60947-5-3. Devices with unicode evaluation possess a high coding level, devices with multicode evaluation possess a low coding level.

In combination with a movable guard and the machine control, this safety component prevents dangerous machine functions from occurring while the guard is open. A stop command is triggered if the guard is opened during the dangerous machine function.

This means:

- Starting commands that cause a dangerous machine function must become active only when the guard is closed.
- Opening the guard triggers a stop command.
- Closing a guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN ISO 12100 or relevant C-standards.

Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
- IEC 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems.

Correct use includes observing the relevant requirements for installation and operation, particularly based on the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 14119, Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
- EN 60204-1, Safety of machinery – Electrical equipment of machines.

The safety switch is only allowed to be operated in conjunction with the intended EUCHNER CES actuators and the related connection components from EUCHNER. On the use of different actuators or other connection components, EUCHNER provides no warranty for safe function.

Connection of several devices in a BR switch chain is permitted only using devices intended for series connection in a BR switch chain. Check this in the instructions of the device in question.

A maximum of 20 safety switches are allowed to be operated in a switch chain.

Important!

- The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- It is only allowed to use components that are permissible in accordance with the table below.

Table 1: Possible combinations for CES components

Safety Switch	Actuator	
	CES-A-BTN-C07-...	CES-A-BDN-C06-...
CES-I-BR-.-C07-...	●	●

Key to symbols	●	Combination possible

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3. Description of the safety function

Devices from this series feature the following safety functions:

Monitoring of the guard position
(interlocking device according to EN ISO 14119)

- Safety function:
  - The safety outputs are switched off when the guard is open (see chapter *6.3. Switching states on page 7*).
- Safety characteristics: category, Performance Level, PFH_D (see chapter *11. Technical data on page 22*).

4. Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety instructions are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

5. General safety precautions

Safety switches fulfill personnel protection functions. Incorrect installation or tampering can lead to fatal injuries to personnel.

Check the safe function of the guard particularly

- after any setup work
- after the replacement of a system component
- after an extended period without use
- after every fault

Independent of these checks, the safe function of the guard should be checked at suitable intervals as part of the maintenance schedule.

WARNING

Danger to life due to improper installation or due to bypassing (tampering). Safety components fulfill a personnel protection function.

- Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7.
- The switching operation must be triggered only by actuators designated for this purpose.
- Prevent bypassing by means of replacement actuators (only for multicode evaluation). For this purpose, restrict access to actuators and to keys for releases, for example.
- Mounting, electrical connection and setup only by authorized personnel possessing the following knowledge:
  - specialist knowledge in handling safety components
  - knowledge about the applicable EMC regulations
  - knowledge about the applicable regulations on occupational safety and accident prevention.

Important!

Prior to use, read the operating instructions and keep these in a safe place. Ensure the operating instructions are always available during mounting, setup and servicing. For this reason you should archive a printed copy of the operating instructions. You can download the operating instructions from www.euchner.com.

6. Function

The safety switch monitors the position of movable guards. The safety outputs are switched on/off when the actuator is moved into/out of the operating distance.

The system consists of the following components: coded actuator (transponder) and switch.

Whether the device learns the complete actuator code (unicode) or not (multicode) depends on the respective version.

- **Devices with unicode evaluation**: The actuator must be assigned to the safety switch by a teach-in operation so that it is detected by the system. This unambiguous assignment ensures a particularly high level of protection against tampering. The system thus possesses a high coding level.
- **Devices with multicode evaluation**: Unlike systems with unique code detection, on multicode devices a specific code is not requested but instead it is only checked whether the actuator is of a type that can be detected by the system (multicode detection). There is no exact comparison of the actuator code with the taught-in code in the safety switch (unique code detection). The system possesses a low coding level.

When the guard is closed, the actuator is moved towards the safety switch. When the switch-on distance is reached, power is supplied to the actuator by the switch and data are transferred.

If a permissible code is detected, the safety outputs are switched on.

The safety outputs are switched off when the guard is opened.

In the event of a fault in the safety switch, the safety outputs are switched off and the DIA LED illuminates red. The occurrence of faults is detected at the latest on the next demand to close the safety outputs (e.g. on starting).

6.1. Door monitoring output

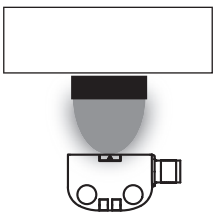
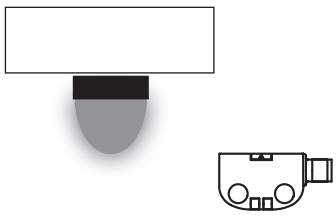
The door monitoring output is switched on as soon as a valid actuator is detected in the operating distance.

6.2. Limit-range monitoring

If the safety door with the actuator should settle over time, the actuator can drift out of the read head operating distance. The device recognizes this situation and indicates that the actuator is in the limit range by flashing the STATE LED. This allows the safety door to be readjusted in time. Also see chapter *10. System status table CES-I-BR-... on page 21*.

6.3. Switching states

The detailed switching states for your switch can be found in the system status table. All safety outputs, monitoring outputs and display LEDs are described there.

	Guard closed (actuator in operating distance and permissible code detected)	**Guard open (actuator not in the operating distance)**
		
Safety outputs FO1A and FO1B	on	off
Monitoring output OD/C	on	off

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7. Installation

CAUTION

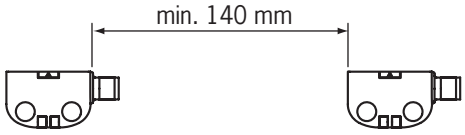
Safety switches must not be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.

- Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.

NOTICE

Risk of damage to equipment and malfunctions as a result of incorrect installation.

- Safety switches and actuators must not be used as an end stop.
- Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about fastening the safety switch and the actuator.
- From the assured switch-off distance S_{ar}, the safety outputs are safely shut down.
- When mounting several safety switches, observe the stipulated minimum distance to avoid mutual interference.



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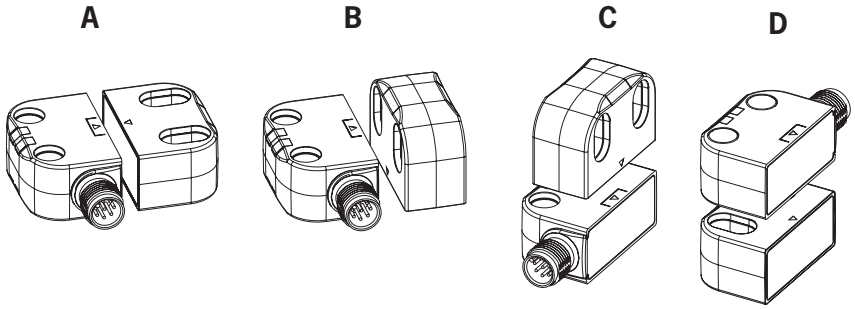
- The operating distance changes during the mounting of the actuator as a function of the material used for the guard.
- Observe direction of arrow on the device (see figure below).

Permissible approach directions



Note the following points:

- Actuator and safety switch must be easily accessible for inspection and replacement.
- Actuator and safety switch must be fitted so that
  - a minimum distance is maintained with a side approach direction to avoid entering the area of possible side lobes. See chapter *11. Technical data,* section *Typical operating distance* for the related actuator.
  - when the guard is open up to the distance S_{ar} (assured switch-off distance), a hazard is excluded.
  - the actuator is positively mounted on the guard, e.g. by using the safety screws included.
  - they cannot be removed or tampered with using simple means.
- Pay attention to the maximum tightening torque for the read head or safety switch and actuator mountings of 0.8 Nm.
- Seal the mounting holes after mounting using the caps provided to prevent the accumulation of dirt.
- In order to avoid damage, the connection cable must be laid with protection in areas in which high-pressure cleaners are used.

8. Electrical connection

The following connection options are available:

- Separate operation
- Series connection with Y-distributors
- Series connection, e.g. with wiring in the control cabinet.

WARNING

If there is a mistake, loss of the safety function due to incorrect connection.

- To ensure safety, both safety outputs must always be evaluated.
- Monitoring outputs must not be used as safety outputs.
- Lay the connection cables with protection to prevent the risk of short circuits.

CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connection.

- Do not use a control system with pulsing or switch off the pulsing function in your control system. The device generates its own test pulses on the safety outputs. A downstream control system must tolerate these test pulses, which may have a length of up to 300 µs. The test pulses are only output with the safety outputs switched off during device start. Depending on the inertia of the downstream device (control system, relay, etc.), this can lead to short switching processes.
- The inputs on an evaluation unit connected must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.
- All the electrical connections must either be isolated from the mains supply by a safety transformer according to IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures (PELV).
- All electrical outputs must have an adequate protective circuit for inductive loads. The outputs must be protected with a free-wheeling diode for this purpose. RC interference suppression units must not be used.
- Power devices which are a powerful source of interference must be installed in a separate location away from the input and output circuits for signal processing. The cable routing for safety circuits should be as far away as possible from the cables of the power circuits.
- To avoid EMC interference, the physical environmental and operating conditions at the installation site of the device must comply with the requirements according to the standard EN 60204-1:2006, section 4.4.2 (EMC).
- Please pay attention to any interference fields from devices such as frequency converters or induction heating systems. Observe the EMC instructions in the manuals from the respective manufacturer.

Important!

If the device does not appear to function when operating voltage is applied (e.g. green STATE LED does not flash), the safety switch must be returned unopened to the manufacturer.

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8.1. Notes about c UL us

Important!

- For use and operation as per the c UL us requirements [1], a power supply with the feature “for use in class 2 circuits” must be used.
  Alternative solutions must comply with the following requirements:
  - Electrically isolated power supply unit with a max. open-circuit voltage of 30 V DC and a limited current of max. 8 A.
- For use and applications as per the requirements of c UL us [1], a connection cable listed under the UL category code CYJV2 or CYJV must be used.

1) Note on the scope of the UL approval: the devices have been tested as per the requirements of UL508 and CSA/ C22.2 no. 14 (protection against electric shock and fire). Only for applications as per NFPA 79 (Industrial Machinery).

8.2. Safety in case of faults

- The operating voltage U_B is reverse polarity protected.
- The safety outputs are short circuit-proof.
- A short circuit between the safety outputs is detected by the switch.
- A short circuit in the cable can be excluded by laying the cable with protection.

8.3. Fuse protection for power supply

The power supply must be provided with fuse protection depending on the number of switches and current required for the outputs. The following rules apply:

Max. current consumption of an individual switch I_{max}

I_{max} = I_{UB} + I_{OD} + $I_{FO1A+FO1B}$

I_{UB} = Switch operating current (40 mA)

I_{OD} = Load current of monitoring outputs (max. 50 mA)

$I_{FO1A+FO1B}$ = Load current of safety outputs FO1A + FO1B (2 x max. 150 mA)

Max. current consumption of a switch chain Σ I_{max}

ΣI_{max} = $I_{FO1A+FO1B}$ + n x (I_{UB} + I_{OD})

n = Number of connected switches

8.4. Requirements for connection cables

CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connection cables.

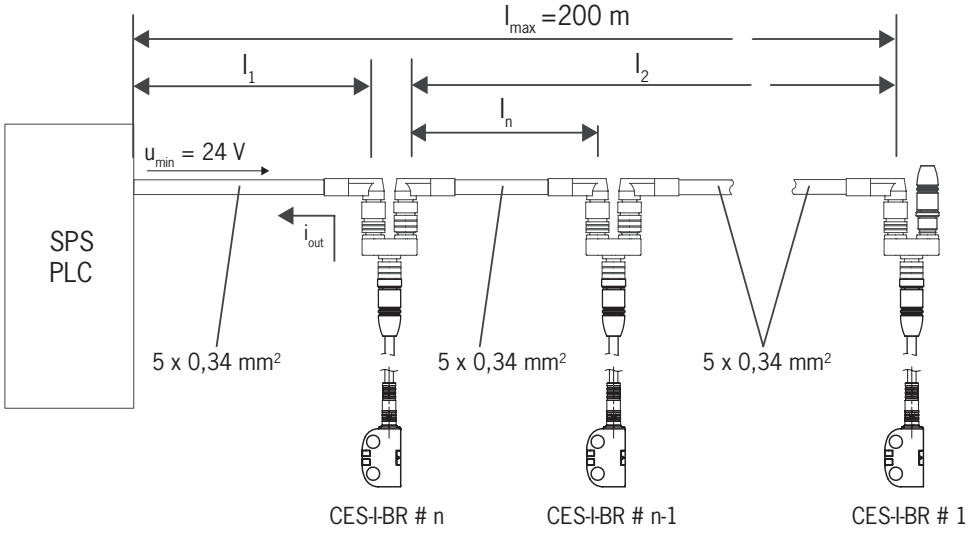
- Use connection components and connection cables from EUCHNER.
- On the usage of other connection components, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.

Observe the following requirements with respect to the connection cables:

Parameter	Value	Unit
Conductor cross-section, min.	0.25 ... 0.34	mm²
R max.	80	Ω/km
C max.	120	nF/km
L max.	0.65	mH/km
Recommended cable type	LIYY 8 x 0.34 mm²	

8.5. Maximum cable lengths

Switch chains are permitted up to a maximum overall cable length of 200 m taking into account the voltage drop as a result of the cable resistance (see table below with example data and case example). The cable length between two switches is limited to 100 m.



n Max. number of switches	I_{OD} (mA) Possible output current per channel FO1A/FO1B	l_1 (m) Max. cable length from the last switch to the control system 0.34 mm²
5	10	100
	25	100
	50	80
	100	50
	200	25
6	10	100
	25	90
	50	70
	100	50
	200	25
10	10	70
	25	60
	50	50
	100	35
	200	20

Contact EUCHNER in the following cases:

- If you connect more than 10 switches in series.
- If you plan to use a different cable design (cross-section, material, etc.).

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8.5.1. Determining cable lengths using the example table

Example: six switches are to be used in series. Cabling with a length of 40 m is routed from a safety relay in the control cabinet to the last switch (#6). Cables with a length of 20 m each are connected between the individual safety switches.

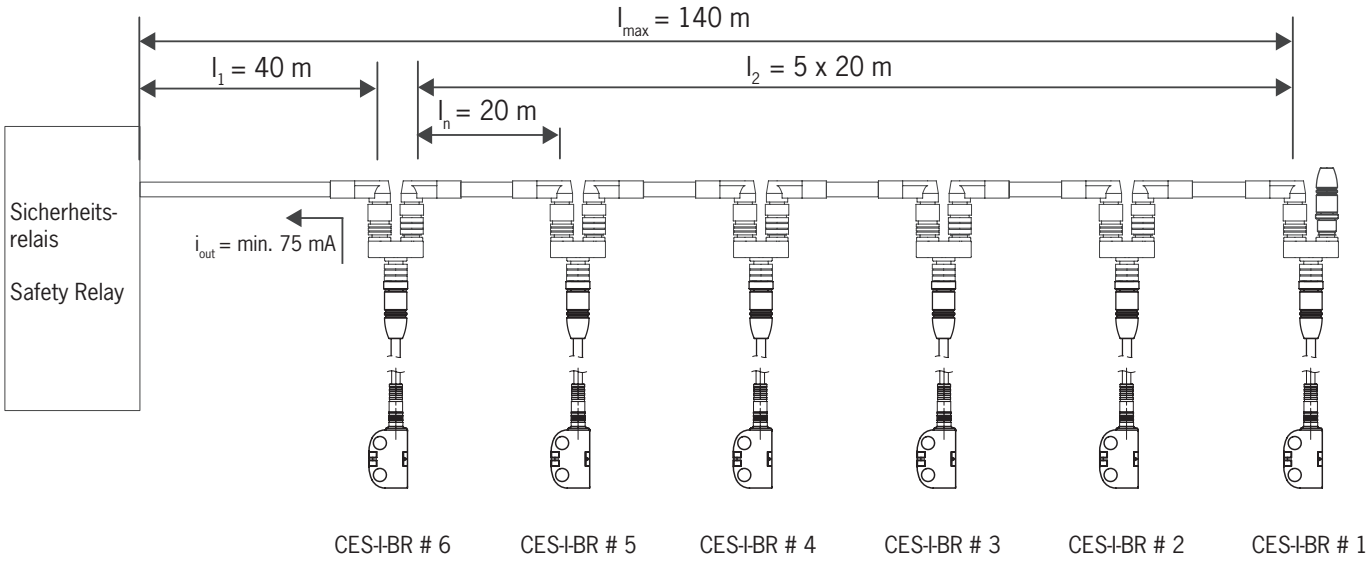

Figure 1: Circuit example with six CES-I-BR

A safety relay is connected downstream which consumes 75 mA at each of the two safety inputs.

All the relevant values can now be determined using the example table:

1. Select the corresponding section in the column n (max. number of switches). Here: six switches.
2. In column I_{OD} (possible output current per channel FO1A/FO1B), find a current greater than or equal to 75 mA. Here: 100 mA.

➡ It is then possible to determine the maximum cable length from the last switch (#6) to the control system from column l_1. Here: a length of 50 m is permitted.

Result: The desired cable length l_1 of 40 m is below the permitted value from the table. The overall length of the switch chain l_{max} of 140 m is less than the maximum value of 200 m.

➡ The planned application is therefore functional in this form.

8.6. Pin assignment of safety switch CES-I-BR

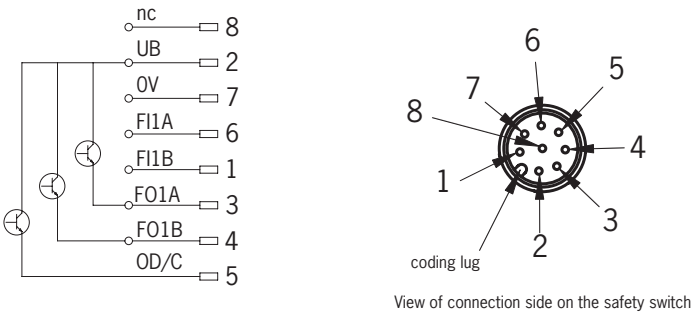

Figure 2: Pin assignment of safety switch CES-I-BR

Pin	Designation	Description
1	FI1B	Enable input for channel 2
2	UB	Power supply, DC 24 V
3	FO1A	Safety output, channel 1
4	FO1B	Safety output, channel 2
5	OD/C	Monitoring output/communication
6	FI1A	Enable input for channel 1
7	0V	Ground, DC 0 V
8	nc	n.c.

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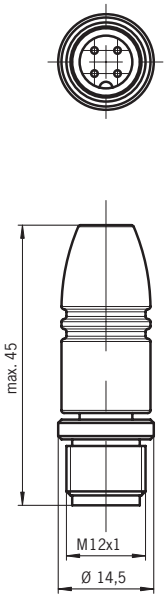
8.7. Pin assignment of Y-distributor

Pin assignment
of safety switch CES-I-BR
(8-pin plug)
and
Y-distributor (8-pin socket)

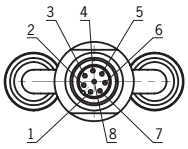
Pin	Function
X1.1	FI1B
X1.2	U_B
X1.3	FO1A
X1.4	FO1B
X1.5	OD
X1.6	FI1A
X1.7	0 V
X1.8	RST

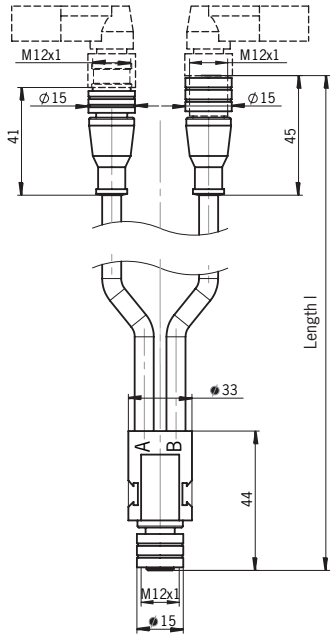
Strapping plug 097645
4-pin, plug
(figure similar)



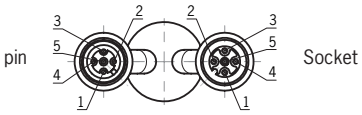
Y-distributor
with connecting cable
111696 or 112395

Socket





Order no.	Length l [mm]
111696	200
112395	1000

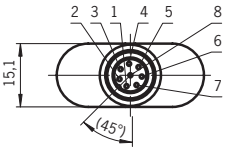


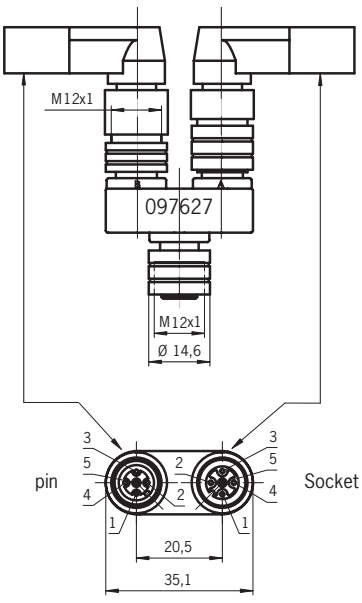
Pin	Function
X2.1	U_B
X2.2	FO1A
X2.3	0 V
X2.4	FO1B
X2.5	RST

Pin	Function
X3.1	U_B
X3.2	FI1A
X3.3	0 V
X3.4	FI1B
X3.5	RST

Y-distributor
097627

Socket





Pin	Function
X2.1	U_B
X2.2	FO1A
X2.3	0 V
X2.4	FO1B
X2.5	RST

Pin	Function
X3.1	U_B
X3.2	FI1A
X3.3	0 V
X3.4	FI1B
X3.5	RST

8.8. Connection of a single BR device

If a single BR device is used, connect the device as shown in *Figure 3*. Monitoring outputs can be routed to a control system.

WARNING

If there is a mistake, loss of the safety function due to incorrect connection.

- To ensure safety, both safety outputs (FO1A and FO1B) must always be evaluated.

Important!

The example shows only an excerpt that is relevant for connection of the CES system. The example illustrated here does not show complete system planning. The user is responsible for safe integration into the overall system. Detailed application examples can be found at www.euchner.com. Simply enter the order number in the search box. All available connection examples for the device can be found in “Downloads.”

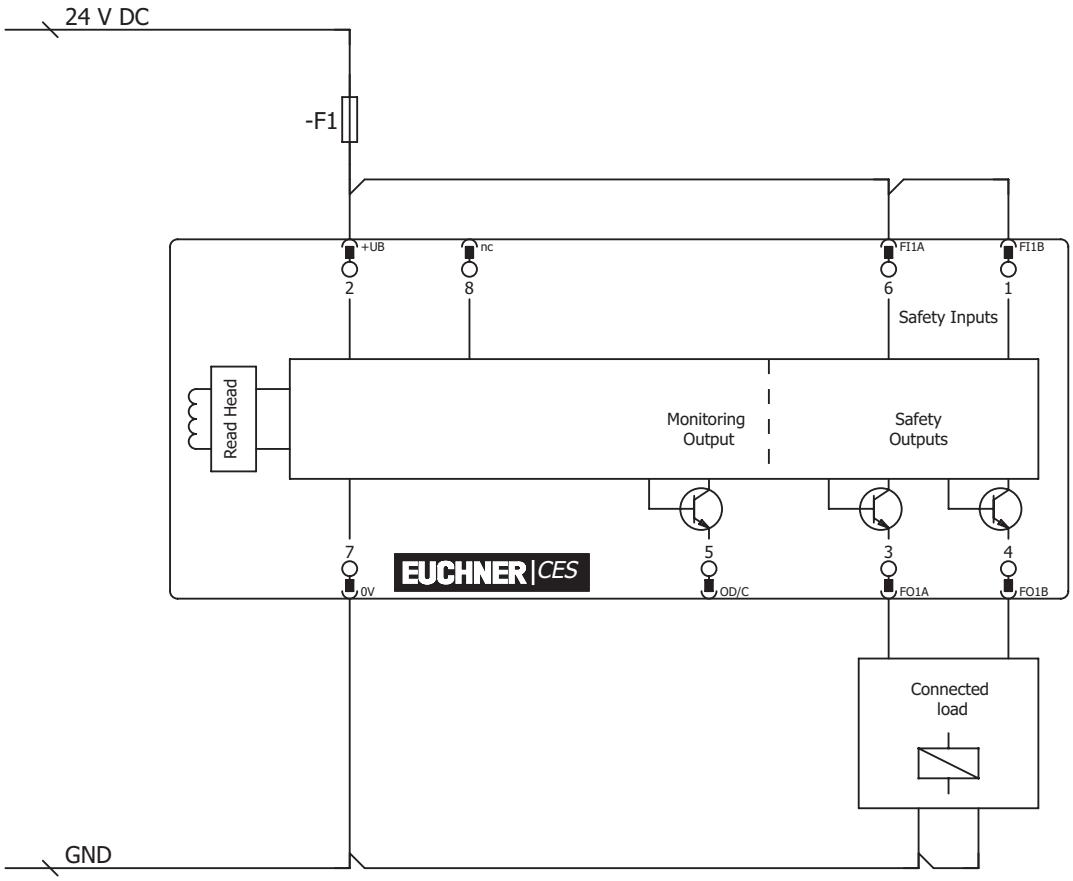


Figure 3: Connection example for separate operation of a CES-I-BR-...

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8.9. Connection of several devices in a switch chain

Important!

- A BR switch chain may contain a maximum of 20 safety switches.
- The example shows only an excerpt that is relevant for connection of the CES system. The example illustrated here does not show complete system planning. The user is responsible for safe integration into the overall system. Detailed application examples can be found at www.euchner.com. Simply enter the order number in the search box. You will find all available connection examples for the device in Downloads.

The series connection is shown here based on the example of the version with plug connectors M12. The switches are connected one behind the other with the aid of pre-assembled connection cables and Y-distributors. If a safety door is opened or if a fault occurs on one of the switches, the system shuts down the machine. A higher-level control system cannot, however, detect which safety door is open or on which switch a fault has occurred with this connection technology.

The series connection can also be realized via additional terminals in a control cabinet.

The safety outputs are permanently assigned to the respective safety inputs of the downstream switch. FO1A must be routed to FI1A and FO1B to FI1B. If the connections are interchanged (e.g. FO1A to FI1B), the device will switch to the fault state.

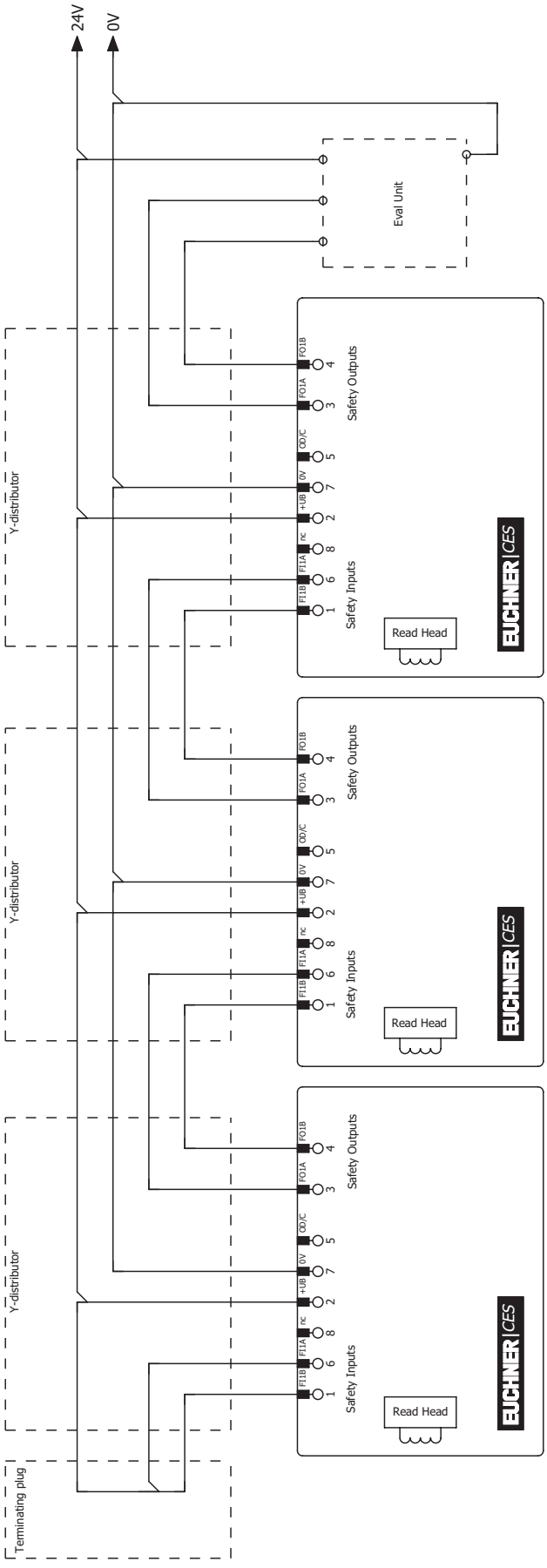

Figure 4: *Connection example for series connection*

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8.10. Notes on operation with safe control systems

Please observe the following requirements for connection to safe control systems:

- Use a common power supply for the control system and the connected safety switches.
- A pulsed power supply must not be used for U_B. Tap the supply voltage directly from the power supply unit. If the supply voltage is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- Always connect inputs FI1A and FI1B directly to a power supply unit or to outputs FO1A and FO1B of another EUCHNER BR device (series connection). Pulsed signals must not be present at inputs FI1A and FI1B.
- The safety outputs (FO1A and FO1B) can be connected to the safe inputs of a control system. Prerequisite: the input must be suitable for pulsed safety signals (OSSD signals, e.g. from light grids). The control system must tolerate test pulses on the input signals. This normally can be set up by parameter assignment in the control system. Observe the notes of the control system manufacturer. For the test-pulse duration of your safety switch, please refer to chapter *11. Technical data on page 22*.

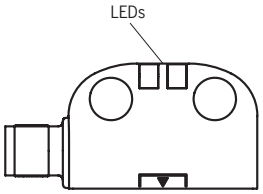
A detailed example of connecting and setting the parameters of the control system is available for many devices at www.euchner.com in the area Download » Applications » CES. The features of the respective device are dealt with there in greater detail.

9. Commissioning

9.1. LED displays

You will find a detailed description of the signal functions in chapter *10. System status table CES-I-BR-... on page 21*.

LED	Color
STATE	green
DIA	red



9.2. Teach-in function for actuator (only for unicode evaluation)

The actuator must be allocated to the safety switch using a teach-in function before the system forms a functional unit.

During a teach-in operation, the safety outputs and the monitoring output OD/C are switched off, i.e. the system is in the safe state.

Tip!

It is recommended to perform the teach-in operation prior to mounting. Mark switches and actuators that belong together in order to avoid confusion. For devices to be connected in series, we recommend performing the teach-in operation separately for each device prior to series connection.

Important!

- The teach-in operation may be performed only if the device functions flawlessly. The red DIA LED must not be illuminated.
- The safety switch disables the code of the previous actuator if teach-in is carried out for a new actuator. Teach-in is not possible again immediately for this actuator if a new teach-in operation is carried out. The disabled code is released again in the safety switch only after a third code has been taught in.
- The safety switch can be operated only with the last actuator taught in.
- The number of teach-in operations is unlimited.
- If the switch detects the actuator that was most recently taught in when in the teach-in standby state, this state is ended immediately and the switch changes to normal operation.
- If the actuator to be taught in is within the operating distance for less than 30 s, it will not be activated and the most recently taught in actuator will remain saved.

9.2.1. Preparing device for the teach-in operation and teaching in actuator

1. Apply operating voltage to the safety switch.

➡ The green LED flashes quickly (approx. 5 Hz)
A self-test is performed during this time (approx. 5 s). After this, the LED flashes cyclically three times and signals that it is in standby state for teach-in.
Standby state for teach-in remains active for approx. 3 minutes. On switches that have not been taught in, teach-in standby is unlimited.

2. Move new actuator to the read head (observe distance < S_{ao}).

➡ Teach-in operation starts, green LED flashes (approx. 1 Hz). During the teach-in operation, the safety switch checks whether the actuator is a disabled actuator. After successful teach-in, the STATE and DIA LEDs flash alternately. The new code has now been stored, and the old code is disabled. The teach-in operation takes approx. 30 s.

3. Disconnect safety switch from the operating voltage for 3 seconds.

➡ The switch is in normal operation after the self-test.

EN

9.3. Functional check

⚠	**WARNING** Danger of fatal injury as a result of faults in installation and functional check. ‣ Before carrying out the functional check, make sure that there are no persons in the danger zone. ‣ Observe the valid accident prevention regulations.

9.3.1. Electrical function test

After installation and any fault, the safety function must be fully checked. Proceed as follows:

1. Switch on operating voltage.

➡ The machine must not start automatically.

➡ The safety switch carries out a self-test. The green STATE LED flashes for 5 s at 5 Hz. The green STATE LED then flashes at regular intervals.

2. Close all guards.

➡ The machine must not start automatically.

➡ The green STATE LED illuminates continuously.

3. Enable operation in the control system.
4. Open the guard.

‣ The machine must switch off and it must not be possible to start it as long as the guard is open.
‣ The green STATE LED flashes at regular intervals.

Repeat steps 2 - 4 for each guard.

10. System status table CES-I-BR-...

operating mode	Actuator/door position	Safety outputs FO1A and FO1B	Monitoring output OD/C	LED indicator Output STATE (green)	LED indicator Output DIA (red)	State
Self-test	X	off	off	5 Hz (5 s)	○	Self-test after power-up
Hot plugging	X	off	off	5 Hz (5 s)	1 x	
Normal operation	closed	on	on	☀	○	Normal operation, door closed, safety outputs on the preceding device in the switch chain switched on
	closed	off	on	1 x inverse	○	Normal operation, door closed, safety outputs on the preceding device in the switch chain switched off
	open	off	off	1 x	○	Normal operation, door open
	closed	on	on	flashes quickly 2 Hz	○	Normal operation, door closed, actuator in the limit range ➡ Re-adjust door
Teach-in operation (only unicode)	open	off	off	3 x	○	Door open, device is ready for teach-in for another actuator (only short time after power-up). Switches that have not been taught in remain in teach-in standby until the teach-in operation starts.
	closed	off	on	1 Hz	○	Teach-in operation
	X	off	X	⬅➡		Positive acknowledgment after completion of teach-in operation
Fault display	X	off	X	1 x	☀	Fault in the teach-in operation (only unicode), actuator removed from the operating distance prior to the end of the teach-in operation or faulty actuator detected.
	X	off	off	2 x	☀	Input fault (e.g. missing test pulses, illogical switch state from previous switch in the switch chain)
	X	off	off	3 x	☀	Defective or incompatible actuator (e.g. fault in code or code not readable)
	X	off	off	4 x	☀	Output fault (e.g. short circuits, loss of switching ability)
	X	off	X	5 x	☀	Environment error (e.g. temperature or operating voltage in the limit range)
	X	off	off	X	X or ☀	Internal fault (e.g. over-temperature, over/undervoltage or component faulty)

Key to symbols	
○	LED not illuminated
☀	LED illuminated
5 Hz (5 s)	LED flashes for 5 at 5 Hz
3 x	LED flashes three times, and this is then repeated
⬅➡	LEDs flash alternately
X	Any state

After the cause has been remedied, faults can generally be reset by opening and closing the guard. If the fault is still displayed afterward, briefly interrupt the power supply. Please contact the manufacturer if the fault could not be reset after restarting.

Important!

If you do not find the displayed device status in the system status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

EN

11. Technical data

NOTICE

If a data sheet is included with the product, the information on the data sheet applies.

11.1. Technical data of safety switch CES-I-BR-C07-...

Parameter	Value			Unit
	min.	typ.	max.	
Housing material		PBT plastic		
Dimensions		40 x 26.5 x 18		mm
Weight (device without connection cable)		0.08		kg
Ambient temperature at U_B = DC 24 V	- 25	-	+ 55	°C
Storage temperature	- 40	-	+ 70	
Degree of protection		IP 65/IP 67/IP 69/IP 69K		
Safety class		III		
Degree of contamination		3		
Installation position		Any		
Installation method		Non-flush		
Connection		Plug connector M12, 8-pin		
Operating voltage U_B (regulated, residual ripple < 5%)		24 ± 15% (PELV)		V DC
Current consumption		40		mA
External fuse (operating voltage)	0.25	-	8	A
Safety outputs FO1A/FO1B		Semiconductor outputs, p-switching, short circuit-proof		
- Output voltage U(FO1A)/U(FO1B) 1)				
HIGH U(FO1A) / HIGH U(FO1B)	U_B-1.5	-	U_B	V DC
LOW U(FO1A)/U(FO1B)	0		1	
Switching current per safety output	1	-	150	mA
Utilization category according to EN IEC 60947-5-2		DC-13 24 V 150 mA Caution: outputs must be protected with a free-wheeling diode in case of inductive loads.		
Off-state current I_r		≤ 0.25		mA
Monitoring output OD/C 1)		p-switching, short circuit-proof		
- Output voltage				
HIGH	U_B-1.5	-	U_B	V DC
LOW	0	-	1	
- Switching current	1	-	50	mA
Rated insulation voltage U_i	-	-	300	V
Rated impulse withstand voltage U_{imp}	-	-	1.5	kV
Conditional short-circuit current		100		A
Resilience to vibration		Acc. to EN IEC 60947-5-2		
Switching frequency	-	-	1	Hz
Repeat accuracy R		≤ 10		%
EMC protection requirements		Acc. to EN IEC 60947-5-3		
Ready delay	-	5	-	s
Risk time for single device	-	-	125	ms
Risk time delay per device		10		ms
Switch-on time	-	-	400	ms
Discrepancy time	-	-	10	ms
Test-pulse duration		0.3		ms
Test-pulse interval		Approx. 100		ms
Reliability values acc. to EN ISO 13849-1:2015				
Category		4		
Performance Level		PL e		
PFH_D		6×10^{-10} / h		
Mission time		20		years

1) Values at a switching current of 50 mA without taking into account the cable length.

11.1.1. Radio frequency approvals

FCC ID: 2AJ58-01

IC: 22052-01

FCC/IC-Requirements

This device complies with part 15 of the FCC Rules and with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and

2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

11.1.2. Typical system times

Please refer to the technical data for the exact values.

Ready delay: After switching on, the device carries out a self-test. The system is ready for operation only after this time.

Switch-on time of safety outputs: The max. reaction time t_{on} is the time from the moment when the actuator is in the operating distance to the moment when the safety outputs switch on.

Simultaneity monitoring, safety inputs FI1A/FI1B: If the safety inputs have different switching states over a certain time, the safety outputs (FO1A and FO1B) will be switched off. The devices switches to fault state.

Risk time according to EN 60947-5-3: If an actuator moves outside the operating distance, the safety outputs (FO1A and FO1B) are switched off after the risk time at the latest.

If several devices are operated in a series connection, the risk time of the overall device chain will increase with each device added. Use the following calculation formula:

$t_r = t_{r,\,e} + (n \times t_l)$

t_r = Total risk time

$t_{r,\,e}$ = Risk time, single device (see technical data)

t_l = Risk time delay per device

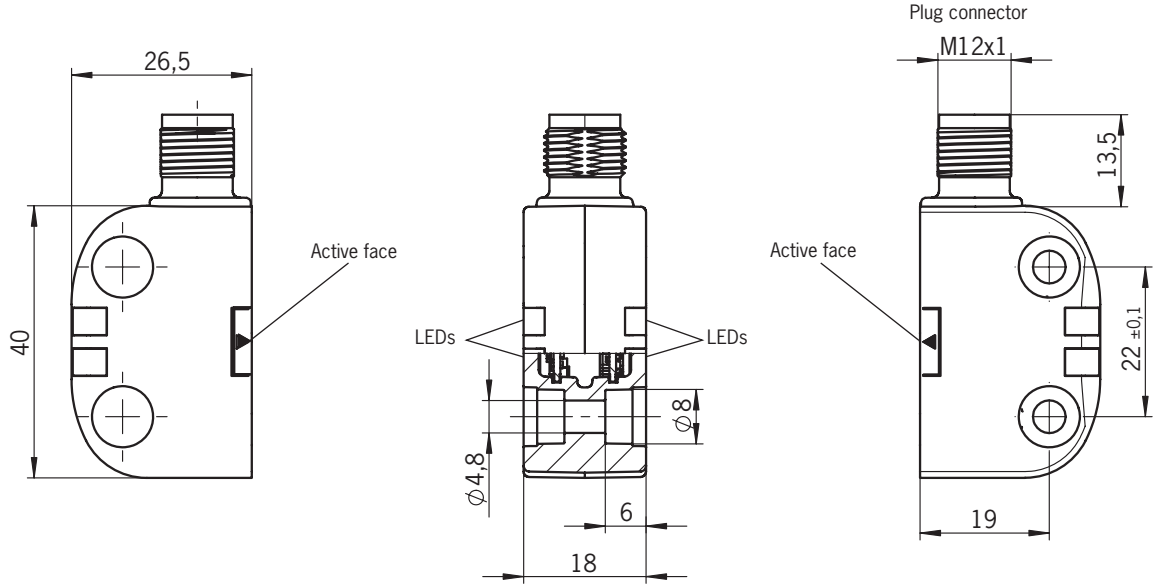
n = Number of additional devices (total number -1)

Discrepancy time: The safety outputs (FO1A and FO1B) switch with a slight time offset. They have the same signal state no later than after the discrepancy time.

Test pulses at the safety outputs: The device generates its own test pulses on the safety outputs (FO1A and FO1B). A downstream control system must tolerate these test pulses.

This can usually be set up in the control systems by parameter assignment. If parameter assignment is not possible for your control system or if shorter test pulses are required, please contact our support organization.

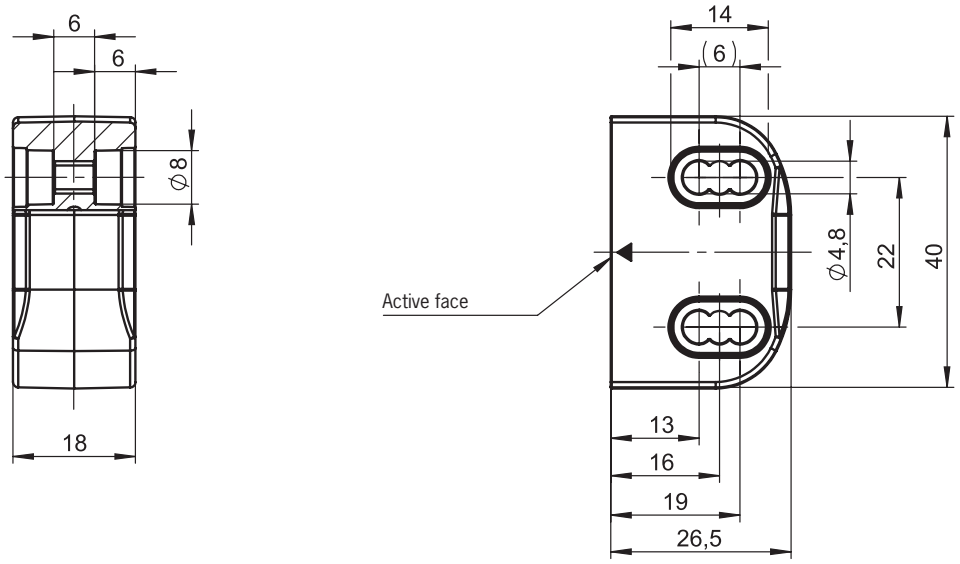
11.1.3. Dimension drawing for safety switch CES-I-BR-C07-...



11.2. Technical data of actuator CES-A-BTN-C07-...

Parameter	Value			Unit
	min.	typ.	max.	
Housing material		PBT plastic		
Dimensions		42 x 25 x 18		mm
Weight		0.03		kg
Ambient temperature	- 40	-	+ 70	°C
Degree of protection		IP 65/IP 67/IP 69/IP 69K		
Installation position		Active face opposite read head		
Power supply		Inductive via read head		

11.2.1. Dimension drawing



NOTICE

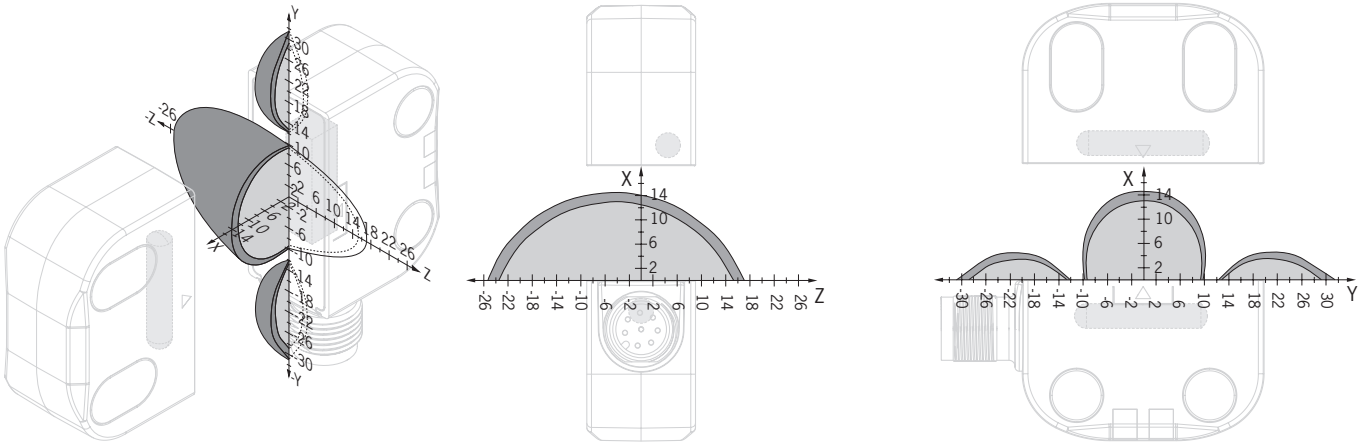
- Two safety screws M4x20 included.
- Covers are included.

EN

11.2.2. Operating distances and approach directions

(only in conjunction with actuator CES-A-BTN-C07)

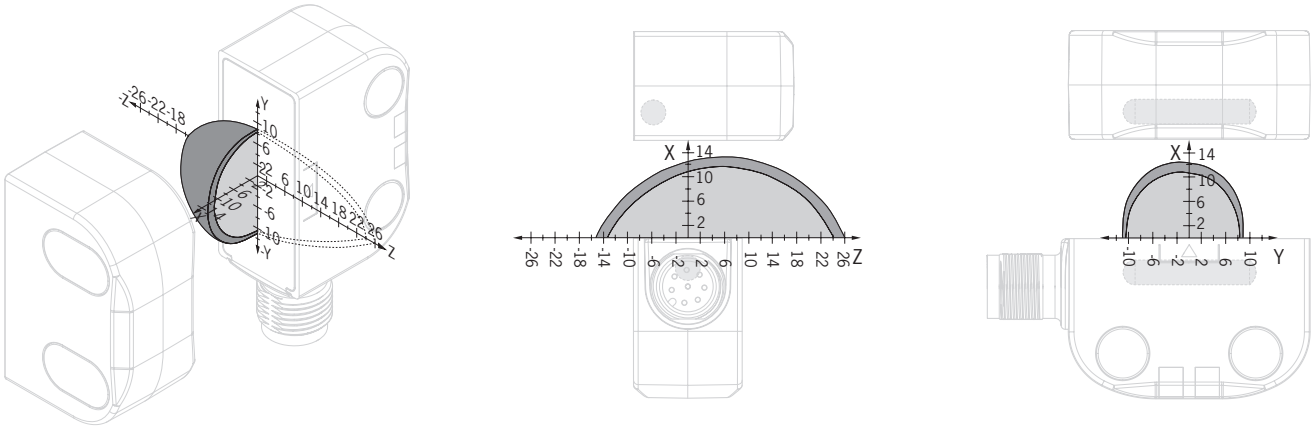
Typical operating distance in approach direction A



Switching distances on approach in x direction without center offset (z, y = 0)

Parameter	Value			Unit
	min.	typ.	max.	
Switch-on distance	-	13	-	mm
Assured switch-on distance s_{ao}	10	-	-	
Switching hysteresis [1]	1	2	-	
Assured switch-off distance s_{ar}	-	-	20	

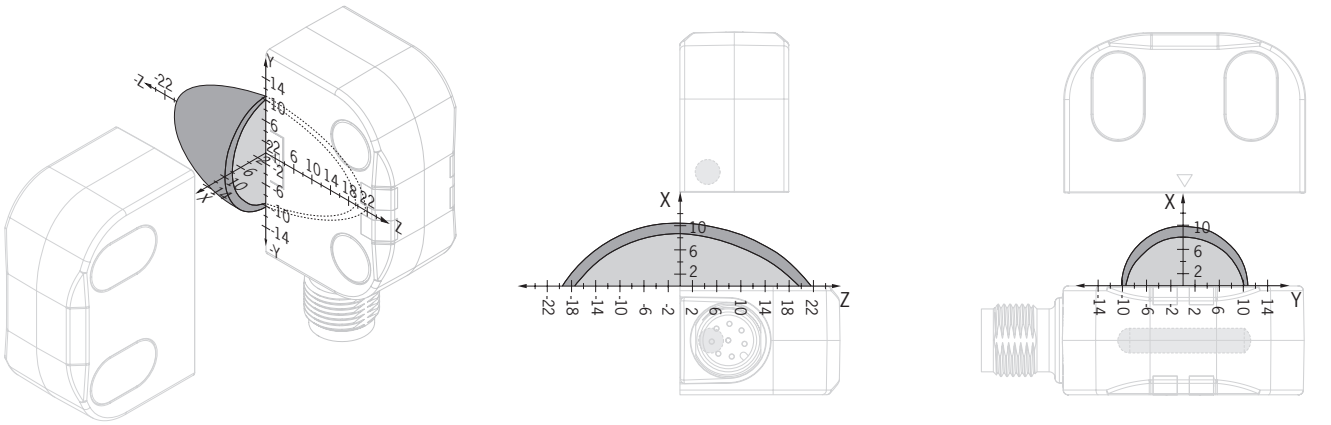
Typical operating distance in approach direction B



Switching distances on approach in x direction without center offset (z, y = 0)

Parameter	Value			Unit
	min.	typ.	max.	
Switch-on distance	-	13	-	mm
Assured switch-on distance s_{ao}	9	-	-	
Switching hysteresis [1]	1	2	-	
Assured switch-off distance s_{ar}	-	-	20	

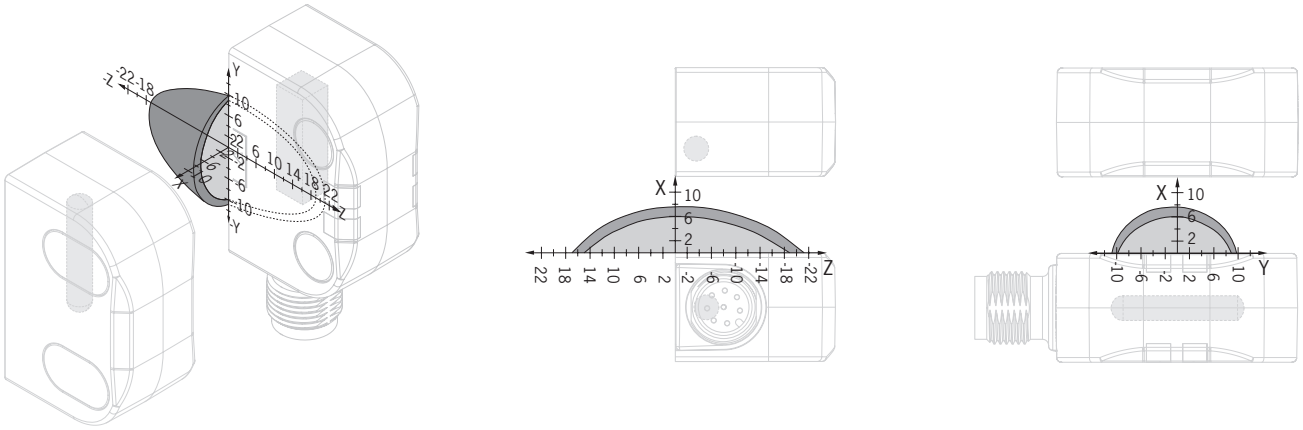
Typical operating distance in approach direction C



Switching distances on approach in x direction without center offset (z, y = 0)

Parameter	Value			Unit
	min.	typ.	max.	
Switch-on distance	-	7	-	mm
Assured switch-on distance s_{ao}	3	-	-	
Switching hysteresis [1]	1	2	-	
Assured switch-off distance s_{ar}	-	-	17	

Typical operating distance in approach direction D



Switching distances on approach in x direction without center offset (z, y = 0)

Parameter	Value			Unit
	min.	typ.	max.	
Switch-on distance	-	7	-	mm
Assured switch-on distance s_{ao}	2	-	-	
Switching hysteresis [1]	1	2	-	
Assured switch-off distance s_{ar}	-	-	17	

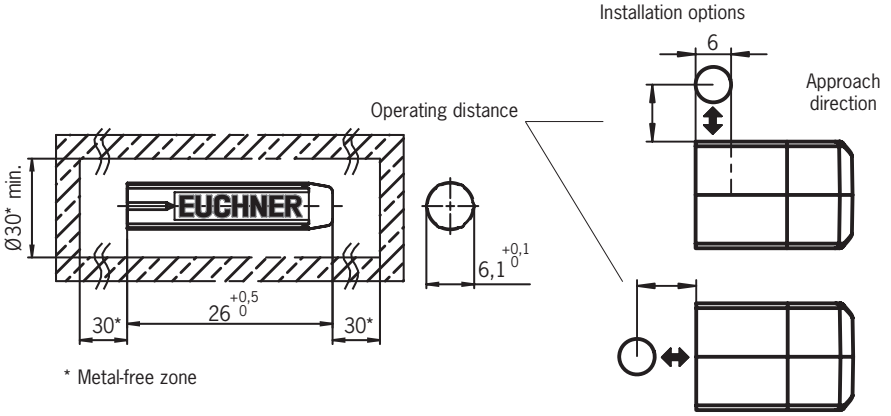
EN

11.3. Technical data of actuator CES-A-BDN-06-158210

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Macromelt PA-based plastic			
Dimensions	26 x ∅ 6			mm
Weight	0.005			kg
Ambient temperature	- 40	-	+ 70	°C
Degree of protection acc. to EN IEC 60529	IP 65/IP 67/IP 69/IP 69K 1)			
Installation position	Active face opposite read head			
Power supply	Inductive via read head			

1) With flush installation

11.3.1. Dimension drawing

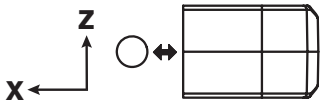


CAUTION

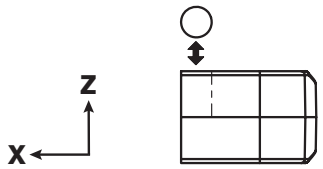
- Do not mount at temperatures below 0 °C.
- The actuator can be damaged during mounting.

11.3.2. Switching distances

Operating distance for center offset m = 0

Approach direction	Parameter	Value			Unit
A		min.	typ.	max.	
	Switch-on distance	-	16	-	mm
	Assured switch-on distance s_{ao} 1)	13	-	-	
	Switching hysteresis 1)	1	2	-	
	Assured switch-off distance s_{ar} - in x direction	-	-	24	

1) The values apply to surface installation of the actuator

Approach direction	Parameter	Value			Unit
C		min.	typ.	max.	
	Switch-on distance	-	11	-	mm
	Assured switch-on distance s_{ao} 1)	6	-	-	
	Switching hysteresis 1)	1	2	-	
	Assured switch-off distance s_{ar} - in x direction	-	-	21	

1) The values apply to surface installation of the actuator

12. Ordering information and accessories

Tip!

Suitable accessories, e.g. cables or assembly material, can be found at www.euchner.com. To order, enter the order number of your item in the search box and open the item view. Accessories that can be combined with the item are listed in “Accessories.”

13. Inspection and service

WARNING

Loss of the safety function because of damage to the device.
- In case of damage, the entire device must be replaced.
- Only accessories or spare parts that can be ordered from EUCHNER may be replaced.

Regular inspection of the following is necessary to ensure trouble-free long-term operation:
- Check the switching function (see chapter *9.3. Functional check on page 20*)
- Check the secure fastening of the devices and the connections
- Check for soiling

No servicing is required. Repairs to the device are only allowed to be made by the manufacturer.

NOTICE

The year of manufacture can be seen in the bottom right corner. The current version number in the format (VX.X.X) can also be found on the device.

14. Service

If service support is required, please contact:

EUCHNER GmbH + Co. KG

Kohlhammerstraße 16

70771 Leinfelden-Echterdingen

Service telephone:

+49 711 7597-500

E-mail:

support@euchner.de

Internet:

www.euchner.com

EN

15. Declaration of conformity

Declaration will be added after approval.

Euchner GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
info@euchner.de
www.euchner.com

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