

# **EUCHNER**

## **Operating Instructions**

**Non-Contact Safety Switch**  
**CES-A-C5H-EX Unicode/Multicode**

**EN**



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## 1. About this document





### 1.1. Scope

These operating instructions apply to all CES-A-C5H-EX of version V1.0.X. These operating instructions, the document *Safety information* 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 <a href="http://www.euchner.com">www.euchner.com</a>
 <b>DANGER</b> <b>WARNING</b> <b>CAUTION</b>	Safety precautions <b>Danger</b> of death or severe injuries <b>Warning</b> about possible injuries <b>Caution</b> slight injuries possible
 <b>NOTICE</b> <b>Important!</b>	<b>Notice</b> about possible device damage <b>Important</b> information
<b>Tip</b>	Useful information

### 1.4. Supplementary documents

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

Document title (document number)	Contents	
Safety information (2525460)	Basic safety information	
Operating instructions (2110182)	(this document)	
Declaration of conformity	Declaration of conformity	
Possibly enclosed data sheet	Item-specific information about deviations or additions	
	<b>Important!</b> Always read all documents to gain a complete overview of safe installation, setup and use of the device. The documents can be downloaded from <a href="http://www.euchner.com">www.euchner.com</a> . Simply enter the document number or the order number in the search box.	



## 2. Correct use

Safety switches series CES-A-C5H-EX 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
- › EN ISO 12100
- › IEC 62061

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

- › EN ISO 13849-1
- › EN ISO 14119
- › EN 60204-1
- › DIN EN 1127-1
- › EN 60079-0
- › EN 60079-7
- › EN 60079-14
- › EN 60079-31

The safety switch must be used only in conjunction with the designated CES actuators from EUCHNER. On the use of different actuators, EUCHNER provides no warranty for safe function.


	<p><b>Important!</b></p> <ul style="list-style-type: none"><li>› Devices with ATEX rating may be operated only with actuators that also have an ATEX rating for the same zone.</li><li>› 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.</li><li>› It is only allowed to use components that are permissible in accordance with the table below.</li></ul>
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Table 1: Possible combinations for CES components

Safety switch	Actuator	
	CES-A-BBA-EX 098158	CES-A-BPA-EX 102125
CES-A-C5H-EX 097945	●	●
Key to symbols	●	Combination possible
		Combination not permissible

Table 2: Associated connecting cables

Designation	Cable length [m]	Order no./item
M12 connecting cable, silicone-free PVC, flying lead, 8-pin	5	<b>077751</b> C-M12F08-08X025PV05,0-GA-077751
	10	<b>077752</b> C-M12F08-08X025PV10,0-GA-077752
	15	<b>077753</b> C-M12F08-08X025PV15,0-GA-077753
	20	<b>077871</b> C-M12F08-08X025PV20,0-GA-077871
	25	<b>077872</b> C-M12F08-08X025PV25,0-GA-077872
	50	<b>077873</b> C-M12F08-08X025PV50,0-GA-077873

### 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 7.2. *Switching states on page 9*).
- › Safety characteristics: category, Performance Level, PFH<sub>D</sub> (see chapter 13. *Technical data on page 22*).



## 4. Explosion protection safety concept



### Important!

- › In order to achieve the explosion protection stated, all the conditions in the operating instructions must be met. HIGH RISK product.
- › Devices with ATEX rating may be operated only with actuators that also have an ATEX rating for the same zone.
- › Use connection components and connecting cables from EUCHNER.
- › The connecting cable must be laid such that it is protected against mechanical damage.
- › In addition, a mechanical barrier is to be provided on the connecting cable as per EN 60079-14, section 9.3.9, to prevent flame propagation from the non-potentially explosive atmosphere to the potentially explosive atmosphere.



II 3G Ex ic ec IIB T5 Gc X

II 3D Ex ic tc IIIC T90°C Dc X

... **Gc X** = 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 insulation measures (PELV).

... **Dc X** = To prevent electrostatic charging, do not subject the switch/actuator to any processes that generate a large amount of charge.

**Safety switches with ATEX rating from EUCHNER are not safety devices as defined by the ATEX Directive.**

The specified type of protection ic applies only to the integrated reader module. The electrical circuits in the device connection (M12 plug connector) are not intrinsically safe!

In case of mounting on heating/cooling sources, the permissible ambient temperature (see technical data) must be observed.

To avoid electrostatic charging, the protective plate must be grounded via the grounding terminal with a conductor cross-section of at least 4 mm<sup>2</sup>.

Protection against mechanical effects on the switch: to achieve the indicated explosion protection, it is essential the protective plate supplied is mounted (ESD protective paint).

On use in potentially explosive atmospheres, there is a danger of explosion due to electrical sparks.

- › Never connect or disconnect terminal plugs when live.

If damage or wear is found, the complete switch and actuator assembly must be replaced. Replacement of individual parts or assemblies is not permitted.

## 5. Exclusion of liability and warranty

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



## 6. 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 safeguard 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 safeguard should be checked at suitable intervals as part of the maintenance schedule.



### DANGER

Danger of explosion due to sparks.

- › Mounting, connection and maintenance are not allowed to be performed in a potentially explosive atmosphere.



### 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 operational 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](http://www.euchner.com).



7. Function

The safety switch monitors the position of movable guards. The safety outputs are switched on/off when the actuator is moved to/removed from the actuating range.

The system consists of the following components: coded actuator (transponder with high coding level) 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 unicode evaluation, 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 (unicode evaluation). The system possesses a low coding level.

When the guard is closed, the actuator is moved towards the safety switch. When the operating 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.

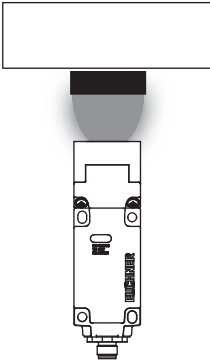
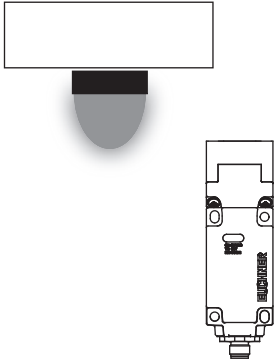
In the event of a fault in the safety switch, the safety outputs are switched off and the DIA LED illuminates red. The occurrence of faults is detected at the latest on the next demand to close the safety outputs (e.g. on starting).

7.1. Door monitoring output

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

7.2. Switching states

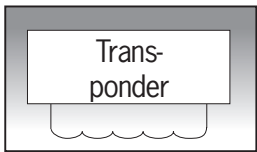
The detailed switching states for your switch can be found in the system status table. All safety outputs, monitoring outputs and display LEDs are described there.

	Guard closed (actuator in the actuating range and permissible code detected)	Guard open (actuator not in the actuating range)
		
Safety outputs LA and LB	on	off
Monitoring output OUT	on	off

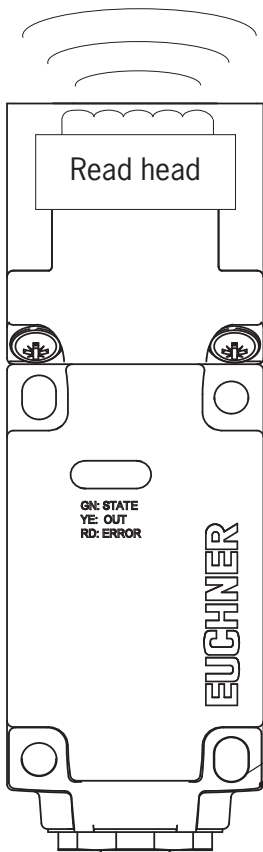


7.3. Block diagram

Coded  
actuator



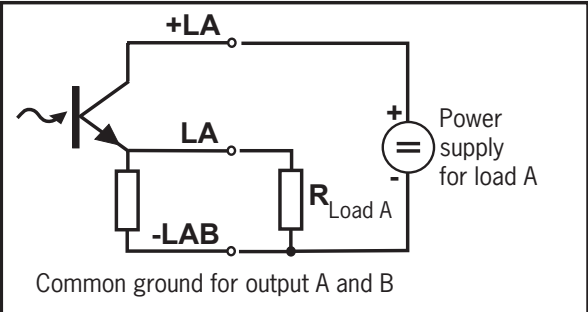
Read head with  
evaluation unit  
CES-A-5



Housing:  
118 x 40 x 40 mm

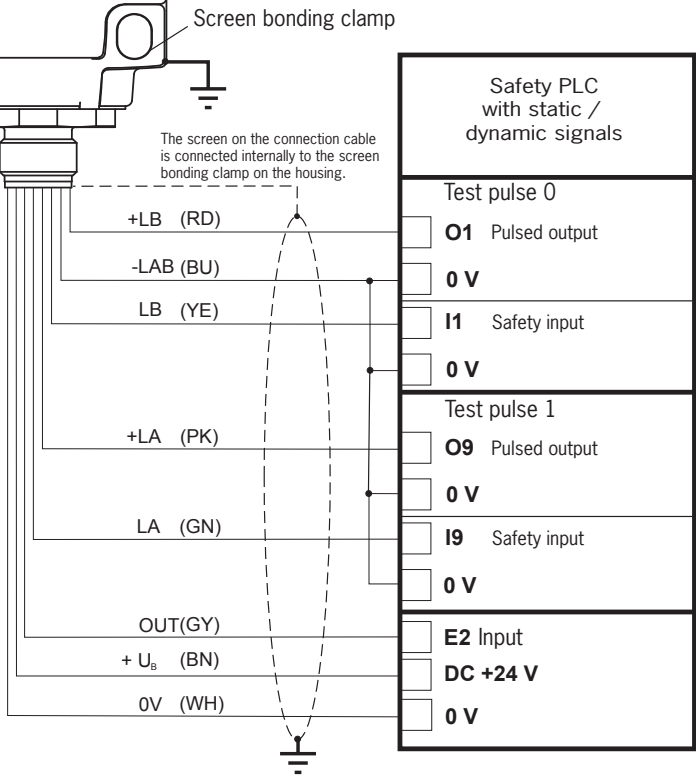
Connection:  
M 12x1  
8-pin, screened

Output circuit:



Pin assignment:

Pin	Core color	Function
1	WH/white	0V
2	BN/brown	+ U <sub>B</sub>
3	GN/green	LA
4	YE/yellow	LB
5	GY/gray	OUT
6	PK/pink	+LA
7	BU/blue	-LAB
8	RD/red	+LB



Connection example with  
safety PLC PSS 3056 (PILZ)



## 8. Changing the approach direction



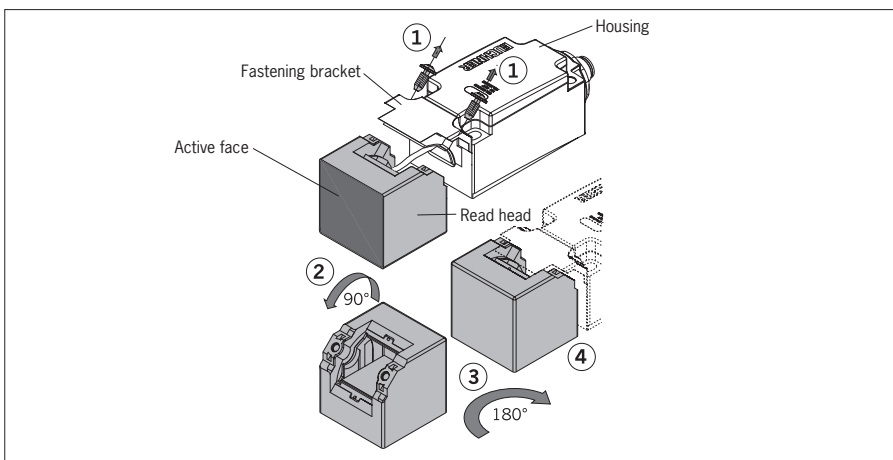
### NOTICE

Risk of damage to equipment as a result of trapped cables.

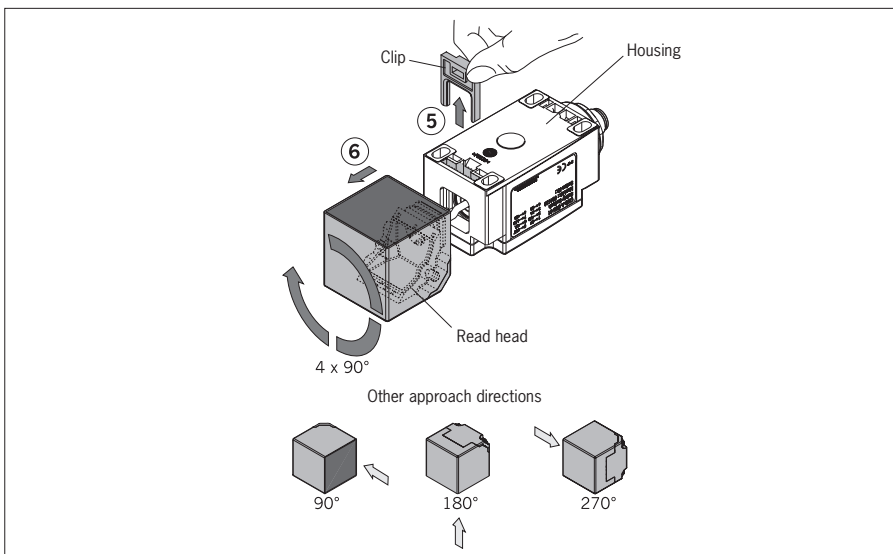
► Make sure that the cables are not trapped or torn off when the approach direction is changed.

The active face of the read head can be adjusted in 5 directions. It is marked by the red face.

1. Unscrew the screws on the fastening bracket.
2. Pull the read head off the fastening bracket and tilt the read head by 90° (arrow 2).
- ➔ The active face is now pointing downward.
3. Turn the read head by 180° (arrow 3).
4. Re-tighten the screws for the read head on the fastening bracket. Tightening torque 0.6 Nm.



5. Remove the clip from the underside of the housing to change the lateral approach direction.
6. Pull the read head off the housing and turn it in 90° steps in the desired approach direction.
7. Fit the read head to the housing and re-fit the clip.





## 9. Mounting



### WARNING

On use in potentially explosive atmospheres the following applies:

- Protection against mechanical effects on the switch:
  - Install switch so that the rear of the housing is entirely covered in order to protect it from mechanical damage through impact.



### CAUTION

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

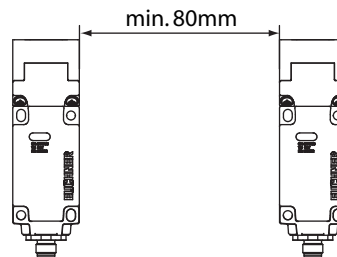
- Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.



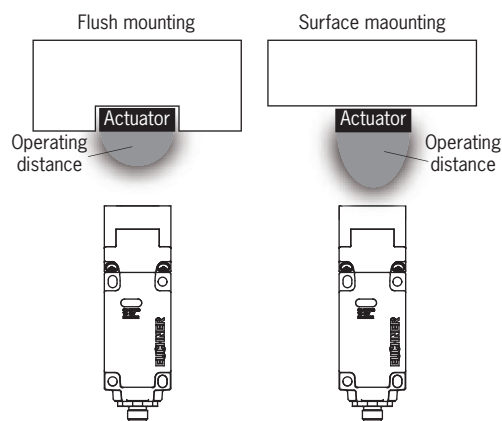
### NOTICE

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 mounting the safety switch and the actuator.
- From the assured release distance  $S_{ar}$ , the safety outputs are safely shut down.
- When mounting several safety switches/actuators, observe the stipulated minimum distance to avoid mutual interference.



- If the actuator is installed flush, the operating distances change as a function of the installation depth and the guard material.





### 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
  - the front faces are at the minimum operating distances  $0.8 \times S_{a0}$  or closer when the guard is closed. To avoid entering the area of possible side lobes, a minimum distance is to be maintained in case of a side approach direction. See chapter 13. *Technical data*, section *Typical actuating range* for the related actuator.
  - when the guard is open up to the distance  $S_{ar}$  (assured release 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 safety switch and actuator mountings of 1 Nm.



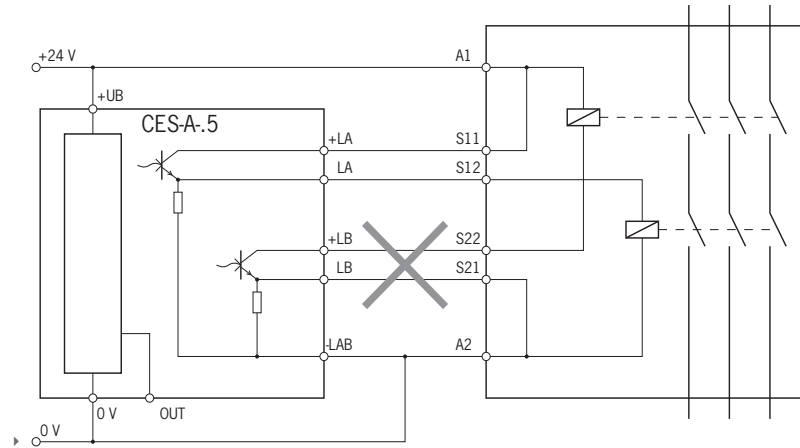
## 10. Electrical connection



### WARNING

Loss of the safety function due to incorrect connection.

- › Not suitable for safety relays that implement short circuit monitoring with different potentials (0 V/24 V). The voltage at +LA/+LB must correspond to the information in the technical data.



### WARNING

In the event of a fault, 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 connecting cables with protection to prevent the risk of short circuits.



### WARNING

On use in potentially explosive atmospheres, there is a danger of explosion due to electrical sparks.

- › Never connect or disconnect terminal plugs when live.
- › Never apply electrical power to open connectors!
- › Protection against mechanical effects on the switch:
  - The connecting cable must be laid such that it is protected against mechanical damage.
  - The connecting cable must be laid rigidly; it is not permissible to lay the cable so that it can move (e.g. in a drag chain).
  - 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 insulation measures (PELV).



### CAUTION

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

- › The inputs on a connected evaluation unit must be positive switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.
- › 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.
- › 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 illuminate or flash), the safety switch must be returned unopened to the manufacturer.
- › The device is fully encapsulated; it is therefore not possible to remove the lid from the housing.

## 10.1. Notes about



### Important!

- › This device is intended to be used with a Class 2 power source in accordance with UL1310. As an alternative an LV/C (Limited Voltage/Current) power source with the following properties can be used:
  - This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 3.3 A and be installed in the max. 30 V DC power supply to the device in order to limit the available current to comply with the UL requirements. Please note possibly lower connection ratings for your device (refer to the technical data).
- › For use and application as per the requirements of  1) a connecting 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).

## 10.2. Safety in case of faults

- › The operating voltage  $U_B$  is reverse polarity protected.
- › The contacts LA/LB and -LA/-LB are short circuit-proof, but they are not reverse polarity protected.
- › A short circuit between LA and LB can be detected only by external pulsing.
- › A short circuit in the cable can be excluded by laying the cable with protection.

## 10.3. Requirements for connecting cables



### CAUTION

- Danger of explosion or malfunctions as a result of incorrect connecting cables.
- › For connecting cables, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.

- › The device meets the necessary EMC regulations even with an unscreened connecting cable. For applications that are particularly sensitive to interference, a screened cable can be connected to the shield spring. The shield spring is electrically connected to the grounding terminal via the protective plate. The shield at the open end of the cable must also be connected electrically to the machine ground.
- › On the use of a screened cable connected at both ends, it must be ensured that both ends are connected to a common earthing (and equipotential bonding) system according to EN 620079-14. If necessary, an equipotential bonding cable must be laid.



Observe the following requirements with respect to the connecting cables:

Table 3: Voltage drop as a function of switching current and cable length (examples)

Switching current [mA]	Cable length "l" [m]	Voltage drop Output [V]	Max. voltage drop Cable [V]	Max. voltage drop Total [V]
6 (safety control system with pulsed signals)	1 - 100	1.4	0.1	1.5
	101 - 300	1.4	0.4	1.8
50 (safety relay)	1 - 15	1.5	0.2	1.7
	16 - 50	1.5	0.5	2.0
	51 - 100	1.5	1.0	2.5
	101 - 300	1.5	3.0	4.5
100 (e.g. small contactor)	1 - 15	1.7	0.4	2.1
	16 - 50	1.7	1.0	2.7
	51 - 100	1.7	2.0	3.7
	101 - 300	1.7	6.0	7.7

#### 10.4. Connector assignment of safety switch CES-A-C5H-EX

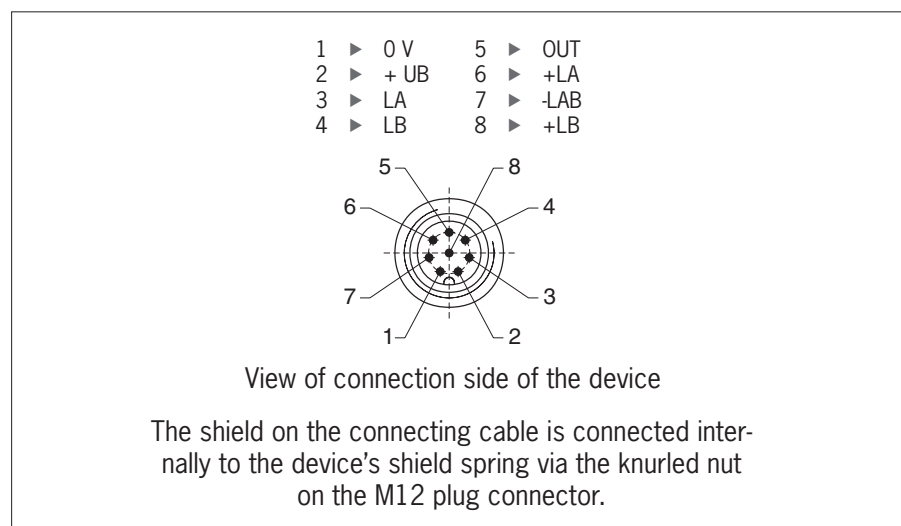


Fig. 1: Connector assignment of safety switch CES-A-C5H-EX



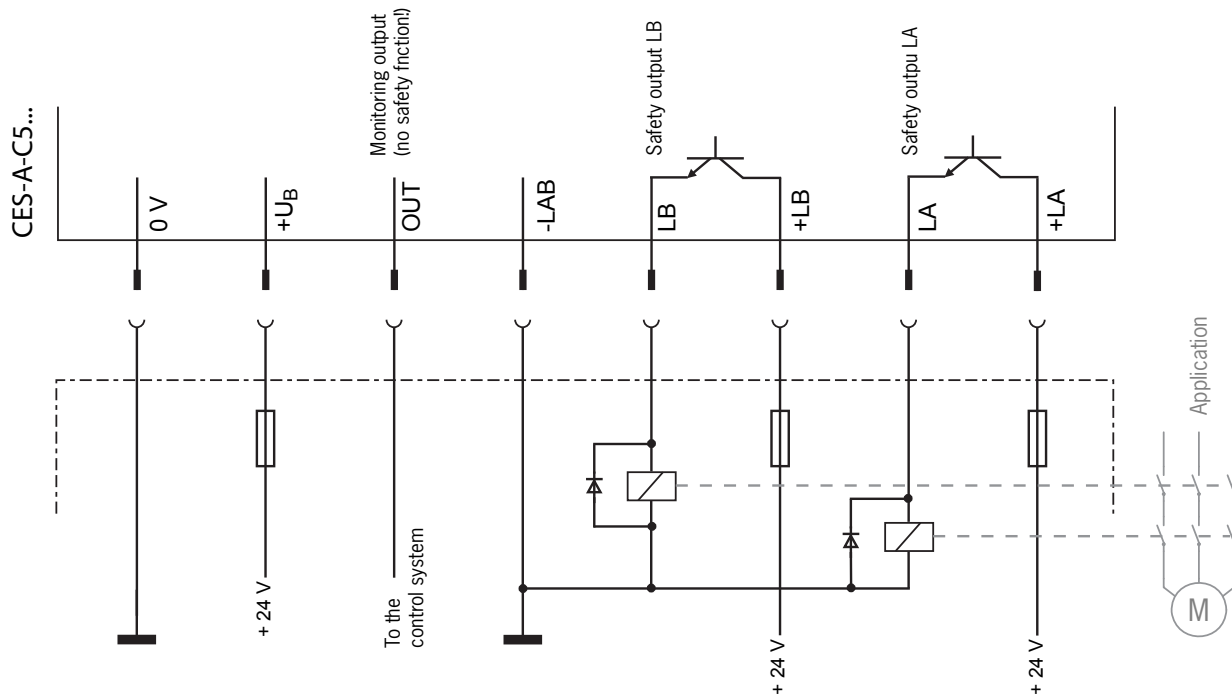
### 10.5. Correct connection



#### WARNING

In the event of a fault, loss of the safety function due to incorrect connection.

- › To ensure safety, both safety outputs (LA and LB) must always be evaluated.
- › To achieve category 4 according to EN ISO 13849-1, it is necessary to monitor the downstream contactors.





## 10.6. Connection example



### Important!

- To achieve category 4 according to EN ISO 13849-1, it is necessary to monitor the downstream contactors (not shown here).
- The example shows only an excerpt that is relevant for the 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.

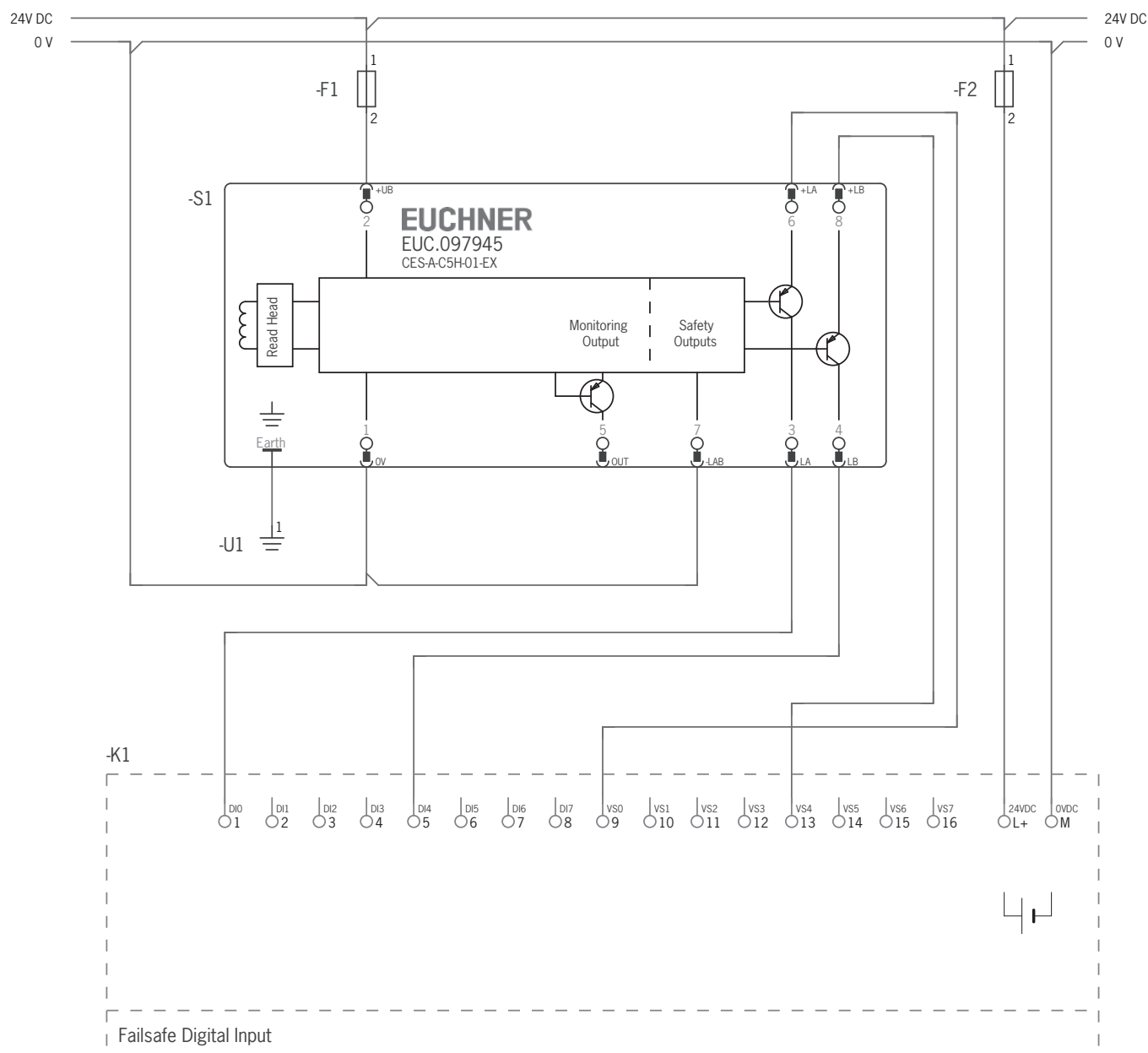






Fig. 2: Connection example for CES-A-C5H-EX



## 11. Setup

### 11.1. LED displays

LED	Color	State	Meaning
STATE	green	illuminated 	Normal operation
		flashing 	- Teach-in operation (for further signal function, see chapter 12. System status table on page 21)
OUT/ERROR	yellow	illuminated 	Valid actuator detected
	red	illuminated 	- Internal electronics fault - Invalid teach-in operation (for further signal function, see chapter 12. System status table on page 21)

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

The actuator must be assigned to the evaluation unit using a teach-in function before the system forms a functional unit.

During the teach-in operation, the safety outputs are open and the door monitoring output is LOW. The system is in the safe state.



#### Important!

- › During the teach-in operation, the following conditions must be met:
  - No state change, e.g. opening of a safety door.
  - The power supply must not be switched off.
- › If these conditions are not met, the evaluation unit switches to the safe fault state (ERROR LED illuminates) and signals this operating fault with the STATE LED.
- › The number of teach-in operations on one evaluation unit is limited to a maximum of 8.
- › The evaluation unit can be operated only with the last actuator taught-in.
- › An actuator that has not been subjected to teach-in will not be detected by the related read head.
- › When the evaluation unit is switched on (operating voltage is applied), the STATE LED signals the number of possible remaining teach-in operations (see system status table).
- › After the 8th teach-in operation or if an "old" actuator is placed against the read head, the system automatically switches to the teach-in mode. In both cases, a teach-in operation with a duration of 60 seconds is started; however, the last actuator code remains active in the memory (see system status table) – a new code is not taught-in.

#### 11.2.1. Carrying out teach-in for first actuator (delivery state)

To trigger the first teach-in operation, the user must perform the following actions in the stipulated order:

1. Start teach-in operation
  - Switch on operating voltage (STATE LED flashes at approx. 4 Hz)
  - Close door to be monitored (the actuator must be in the actuating range of the read head)
  - Teach-in operation starts (STATE LED flashes at approx. 1 Hz)
  - Wait for acknowledgment of the teach-in operation (STATE LED goes out after approx. 60 seconds)
2. End teach-in operation
  - Interrupt operating voltage for at least 3 seconds (code for the actuator taught-in is activated)
3. Check safeguard for effectiveness



### 11.2.2. Carrying out teach-in for a new actuator

A maximum of 8 teach-in operations can be performed. The number of already completed teach-in operations is signaled by the flashing sequence of the STATE LED each time the power supply is connected (see 12. System status table on page 21, area Status indication).

Faulty actuators can be replaced. Then a complete teach-in operation must be performed as per this section.

To trigger a further teach-in operation, the user must perform the following actions in the stipulated order:

1. Start teach-in operation
  - Switch on operating voltage
  - Close door to be monitored (the new actuator must be in the actuating range of the read head)
  - Teach-in operation starts (STATE LED flashes at approx. 1 Hz)
  - Wait for acknowledgment of the teach-in operation (STATE LED goes out after approx. 60 seconds)
2. End teach-in operation
  - Interrupt operating voltage for at least 3 seconds (code for the new actuator taught-in is activated)

The newly taught-in actuator is saved and the old actuator deactivated.

3. Check safeguard for effectiveness

### 11.3. Functional check

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



#### WARNING

Danger of fatal injury as a result of faults in installation and the 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.

1. Switch on operating voltage.
  - The safety switch carries out a self-test.
  - The green STATE LED flashes up to 3 times.
  - The STATE LED then illuminates continuously; the OUT and ERROR LEDs do not illuminate.
2. Close all guards.
  - The machine must not start automatically.
  - The green STATE LED and the yellow OUT LED light up 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 illuminates continuously; the OUT and ERROR LEDs do not illuminate.

Repeat steps 2 ... 4 separately for each guard.



### 12. System status table

Operating mode	Actuator/door position	Safety outputs LA and LB	PLC	LED indicator Output			State
			Output				
			OUT (status signal)	STATE (green)	OUT/ERROR (yellow)	OUT/ERROR (red)	
Normal operation	closed	on	1			○	Normal operation, door closed
	open	off	0		○	○	Normal operation, door open
Teach-in operation (only unicode)	open	off	0	4 Hz	○	○	Initial setup after delivery, ready for first teach-in operation
	closed	off	0	1 Hz (60 s)	○	○	Teach-in operation
	closed	off	0	○	○	○	Positive acknowledgment of completion of teach-in operation. To activate the actuator code from the teach-in operation in the evaluation unit, the operating voltage must then be switched off at the evaluation unit for min. 3 seconds
Status indication (only unicode)	X	off	0	3 x +	○	○	Indication after 1st to 5th teach-in operations
	X	off	0	2 x +	○	○	Indication of the remaining teach-in operations after the 6th teach-in operation
	X	off	0	1 x +	○	○	Indication of the remaining teach-in operations after the 7th teach-in operation
	X	off	0	○	○	○	Device cannot perform any further teach-in operation
Fault display	X	off	0	○	○		Internal component failure or excessively high interference (EMC) or short circuit/external power at safety output LA/LB
Operating fault (only unicode)	closed	off	0	1 x	○		Incorrect 9th teach-in operation (unicode only)
	closed	off	0	2 x	○		Incorrect teach-in operation for an old actuator (only unicode)
	closed	off	0	3 x	○		Negative acknowledgment for teach-in operation. Actuator was held in front of the read head for less than 60 s

Key to symbols	N	0 V or not connected
	1	24 V
	0	0 V
	○	LED not illuminated
		LED illuminated
	15 Hz (8 s)	LED flashes for 8 seconds at 15 Hz
	3 x +	LED flashes three times and then illuminates continuously
	3 x	LED flashes three times, and this is then repeated
	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. 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.



## 13. Technical data



### NOTICE

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

### 13.1. Safety switch CES-A-C5H-EX

- › Read head and evaluation unit integrated in the normal housing
- › Semiconductor output
- › M12 plug connector

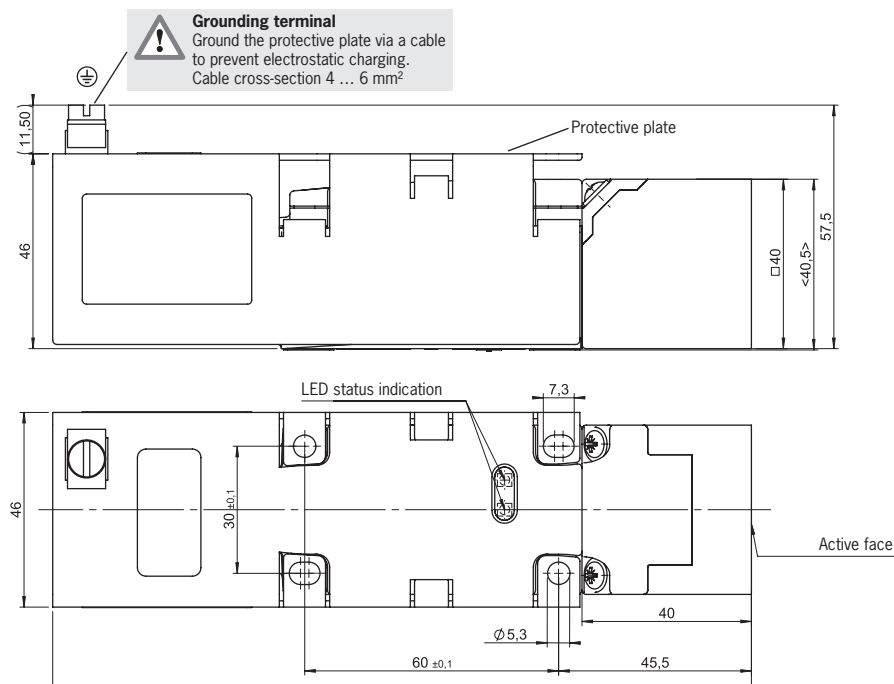
#### ATEX rating



II 3G Ex ic ec IIB T5 Gc X

II 3D Ex ic tc IIIC T90°C Dc X

#### Dimension drawing



#### Switching characteristics

- › 2 safety outputs (semiconductor outputs)
- › 1 door monitoring output (semiconductor output, not a safety output)

		Guard	
		closed (actuator detected)	open (actuator not in the actuating range)
Read head	Actuator		
		+LA ———— LA	+LA ———— LA
		+LB ———— LB	+LB ———— LB
		24 V ———— OUT	24 V ———— OUT



### 13.1.1. Technical data for safety switch CES-A-C5H-EX

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	PBT V0 GF30			
Dimensions	Acc. to EN 60947-5-2			mm
Weight	0.4			kg
Ambient temperature at $U_B = 24$ V DC	-20	-	+50	°C
Degree of protection	IP65/IP67			
Degree of contamination	3			
Rated insulation voltage $U_i$	-	300 <sup>1)</sup>	-	V
Rated impulse withstand voltage $U_{imp}$	-	1.5	-	kV
Rated conditional short-circuit current	100			A
Shock and vibration resistance	Acc. to EN 60947-5-3			
Installation orientation	Any			
Connection	M12 plug connector, 8-pin; shield can be connected			
Operating voltage DC (regulated, residual ripple < 5%)	21	24	27	V DC
The following applies to the approval acc. to UL	Operation only with UL Class 2 power supply or equivalent measures			
Current consumption		80		mA
Switching load acc. to UL	max. DC 24 V, Class 2			
External fuse (operating voltage)	0.25	-	8	A
Power supply for load $U(+LA)/U(+LB)$	18	24	27	V DC
Safety outputs (LA/LB, 2 semiconductor outputs, p-switching, short circuit-proof, electrically decoupled) - Output voltage $U(LA/U(LB))$ <sup>2)</sup>				
HIGH $U(LA)$	$U(+LA) - 1.5$	-	$U(+LA)$	V DC
HIGH $U(LB)$	$U(+LB) - 1.5$	-	$U(+LB)$	
LOW $U(LA)/U(LB)$	0	-	1	
Output current per safety output	1	-	100	mA
External fuse ( $U(+LA)/U(+LB)$ , safety circuit)	0.1 A medium slow-blow			
Utilization category acc. to EN 60947-5-2	DC-13 24 V 100 mA			
Monitoring output (OUT, semiconductor output, p-switching, short circuit-proof) - Output voltage - Max. load	$0.8 \times U_B$	-	$U_B$ 20	V DC mA
Risk time <sup>3)</sup>	-	-	180	ms
Discrepancy time	-	-	120	ms
Ready delay <sup>4)</sup>	-	-	3	s
Dwell time <sup>5)</sup>	0.5	-	-	s
Switching frequency	-	-	1	Hz
Repeat accuracy R acc. to EN IEC 60947-5-2	-	-	10	%
Mounting distance between 2 read heads or 2 actuators	80	-	-	mm
EMC protection requirements	Acc. to EN 60947-5-3			
LED displays	STATE OUT/ERROR OUT/ERROR	LED green: Flashing: LED yellow: LED red:	Normal operation Teach-in operation Actuator detected - EMC interference - Internal electronics fault - Invalid teach-in operation	
<b>Reliability values acc. to EN ISO 13849-1 <sup>6)</sup></b>				
Category	4			
Performance Level (PL)	PL e			
$PFH_d$	$3.7 \times 10^{-9}$ / h			
Diagnostic coverage DC	99			%
Mission time	20			years

1) Tested by employers' liability insurance association up to 75 V.

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

3) Maximum OFF time for the safety outputs following removal of the actuator.

4) After the operating voltage is switched on, the semiconductor outputs are switched off and the monitoring outputs are set LOW during the ready delay.

5) The dwell time of an actuator inside and outside the actuating range must be at least 0.5 s to ensure safe detection of internal faults in the evaluation unit (self-monitoring).

6) Refer to the declaration of conformity in chapter 17 for the issue date.



### 13.1.2. Typical system times

Refer to the technical data for the exact values.

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

**Turn-on time of safety outputs:** The max. reaction time  $t_{on}$  is the time from the moment when the actuator is in the actuating range to the moment when the safety outputs switch on. This time corresponds to the risk time.

**Risk time according to EN 60947-5-3:** If an actuator moves outside the actuating range, the safety outputs (LA and LB) are deactivated at the latest after the risk time.

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



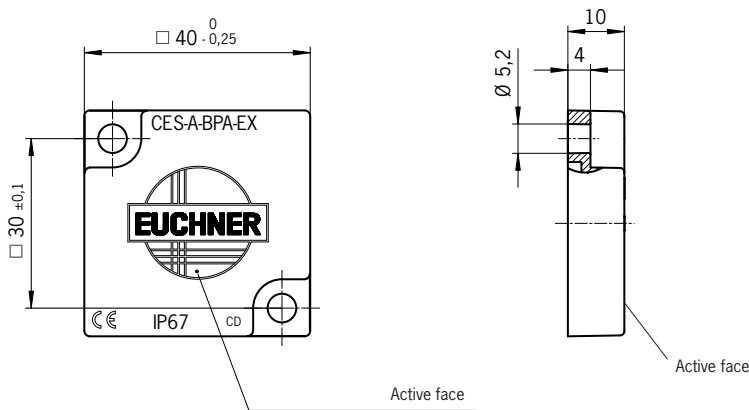
13.2. Actuator CES-A-BPA-EX

▸ Cube-shaped design 40 x 40 mm

ATEX rating

II 3G Ex ic IIC T6 Gc  
II 3D Ex ic IIIC T85°C Dc X

Dimension drawing for CES-A-BPA-EX



2 safety screws M4 x 14  
included

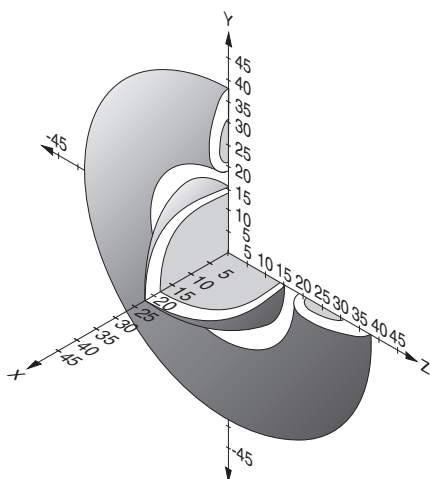
13.2.1. Technical data

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Plastic (PBT)			
Dimensions	40 x 40 x 10			mm
Weight	0.025			kg
Ambient temperature	-25	-	+70	°C
Degree of protection	IP65/IP67/IP69K			
Installation orientation	Active face opposite read head			
Power supply	Inductive via read head			



### 13.2.2. Typical actuating range

Only in conjunction with actuator CES-A-BPA-EX on surface mounting.



For a side approach direction for the actuator and read head, a minimum distance of  $s = 6$  mm must be maintained so that the actuating range of the side lobes is not entered.

### 13.2.3. Actuating range for center offset $m = 0$ <sup>1)</sup>

Parameter	Value			Unit
	min.	typ.	max.	
Operating distance	-	22 <sup>1)</sup>	-	mm
Assured operating distances $S_{ao}$	15	-	-	
Switching hysteresis	1	2	-	
Assured release distance $S_{ar}$	-	-	58	

1) On surface mounting on aluminum; the typical operating distances increase to 30 mm in a non-metallic environment.



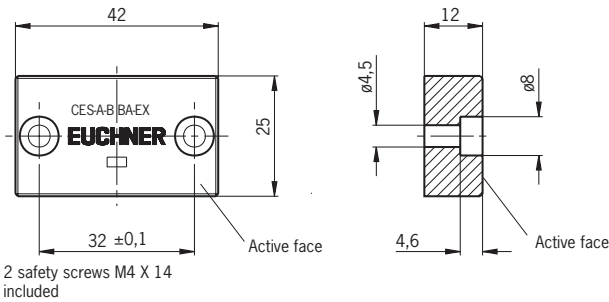
13.3. Actuator CES-A-BBA-EX

▸ Cube-shaped design 42 x 25 mm

ATEX rating

II 3G Ex ic IIC T6 Gc  
II 3D Ex ic IIIC T85°C Dc X

Dimension drawing for CES-A-BBA-EX



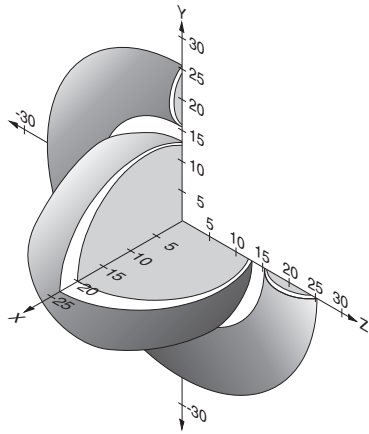
13.3.1. Technical data

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Plastic (PPS)			
Dimensions	42 x 25 x 12			mm
Weight	0.02			kg
Ambient temperature	-25	-	+70	°C
Degree of protection	IP65/IP67/IP69K			
Installation orientation	Active face opposite read head			
Power supply	Inductive via read head			



13.3.2. Typical actuating range

Only in combination with actuator CES-A-BBA-EX.



For a side approach direction for the actuator and safety switch, a minimum distance of  $s = 4$  mm must be maintained so that the actuating range of the side lobes is not entered.

13.3.3. Actuating range for center offset  $m = 0$  1)

Parameter	Value			Unit
	min.	typ.	max.	
Assured operating distances $S_{ao}$	18	-	-	mm
Operating distance	-	20	-	
Switching hysteresis	2	3	-	
Assured release distance $S_{ar}$	-	-	40	

1) The values apply to surface mounting of the actuator.



## 14. Ordering information and accessories



### Tip!

Suitable accessories, e.g. cables or assembly material, can be found at [www.euchner.com](http://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."

## 15. Inspection and service



### WARNING

Loss of the safety function and danger of explosion due to damage to the system.

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



### WARNING

Danger of explosion due to electrostatic charging.

- › Always use a damp cloth or a special anti-static cloth during cleaning work.
- › The device must not be subjected to any processes that generate a large amount of charge.

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- › Check the switching function (see chapter 11.3. *Functional check on page 20*)
- › Check the secure mounting of the devices and the connections
- › Check for contamination

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 lower right corner of the type label.

## 16. Service

If servicing is required, please contact:

EUCHNER GmbH + Co. KG  
Kohlhammerstraße 16  
70771 Leinfelden-Echterdingen

**Service telephone:**  
+49 711 7597-500

**E-mail:**  
[support@euchner.de](mailto:support@euchner.de)

**Internet:**  
[www.euchner.com](http://www.euchner.com)

## 17. Declaration of conformity

The declaration of conformity is part of the operating instructions.

The complete EU declaration of conformity can also be found at [www.euchner.com](http://www.euchner.com). Enter the order number of your device in the search box. The document is available under *Downloads*.











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70771 Leinfelden-Echterdingen  
info@euchner.de  
www.euchner.com

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