

## Safety switches CES-AR...

### Your advantages

- ▶ Possible to connect up to 20 safety switches in series
- ▶ Integrated short circuit monitoring by pulsing
- ▶ Large operating distance
- ▶ High protection against tampering
- ▶ Adjustable actuating head with 5 approach directions
- ▶ Housing according to EN 60947-5-2
- ▶ Fastenings compatible with standard housing
- ▶ Diagnostics using LED

The non-contact safety switch CES-AR... is designed for systems in which a large number of safety doors need to be monitored. It can also be used as a compact individual switch. The small design of the actuator and read head (incl. integrated evaluation unit) makes mounting on the safety guard easy.

### Design and functionality

The safety switches are connected together using connectors. The CES-AR... has two safety outputs. In a chain of switches, the signals from the safety outputs are connected to the next switch. The outputs on the first switch in the chain are connected directly to drives, downstream safety relays or safe control systems. The switch monitors itself for short circuits using pulsed signals. External clock signals are not allowed (see next section).

# SENSORS

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### Connection to safe control systems or safety relays

Do not use a control system or safety relay with pulsing or switch off the pulsing function in these devices. The switch generates its own clock signal on the output lines OA/OB. A downstream device must tolerate these test pulses, which may have a length of up to 1ms.

The inputs on the downstream device must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.

### OUT output

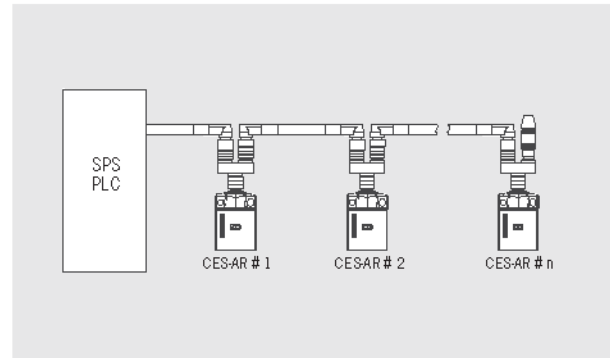
The semiconductor output OUT is switched if the safety guard is closed (actuator in the operating distance). It is not allowed to be used for safety functions. The OUT outputs on the individual switches can, however, not be polled if connected in series using a Y-connector. Evaluation is only possible on parallel wiring to the control cabinet.

### RST input

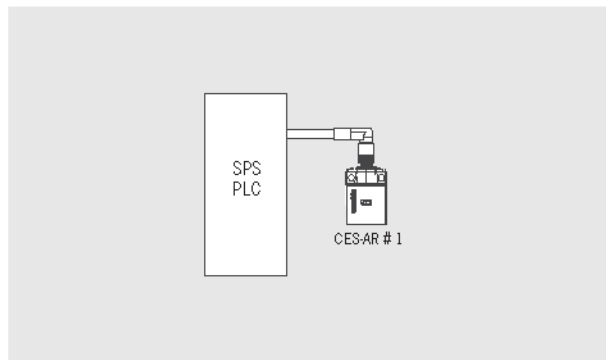
The switches in a chain in a fault state can be reset using the RST input. To do this, a voltage of 24 V is applied to the RST input for at least 3 seconds. It is not necessary to disconnect the supply of power to reset a fault.

### Usage as individual switch or switch chain

The safety switch CES-AR can be operated as a compact individual switch or in a switch chain with max. 20 devices.



The switches are connected in series using plug connectors and T-pieces. If a safety guard is opened or if a fault occurs on one of the switches, the system shuts down the machine. A higher level control system can, however, not detect which safety guard is open or on which switch a fault has occurred. The last switch in the chain must always be fitted with a terminating plug.



If a single CES-AR-C is used, connect the switch as shown in figure above. The OUT output can also be connected here to a control system as a monitoring output.

## Typical system times

### Ready delay

After switching on, the unit carries out a self-test for 8 s. The system is ready for operation only after this time.

### Risk time according to EN 60947-5-3

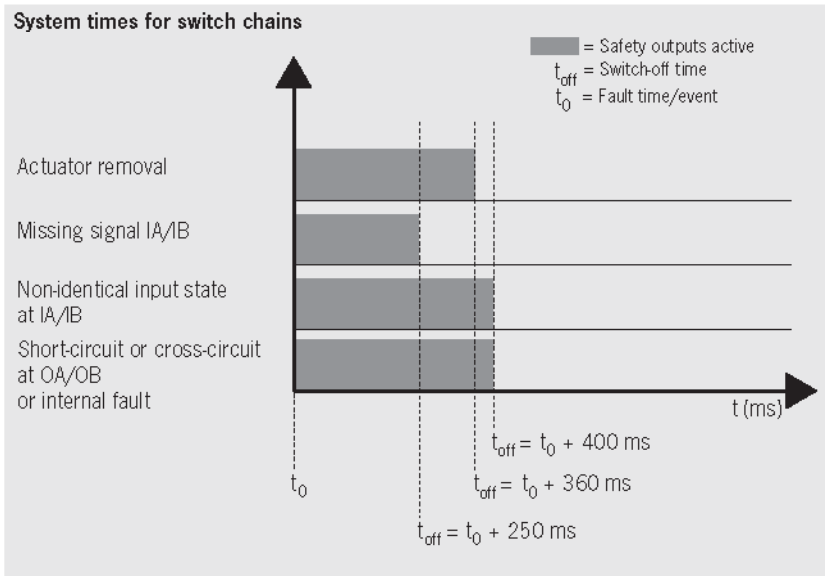
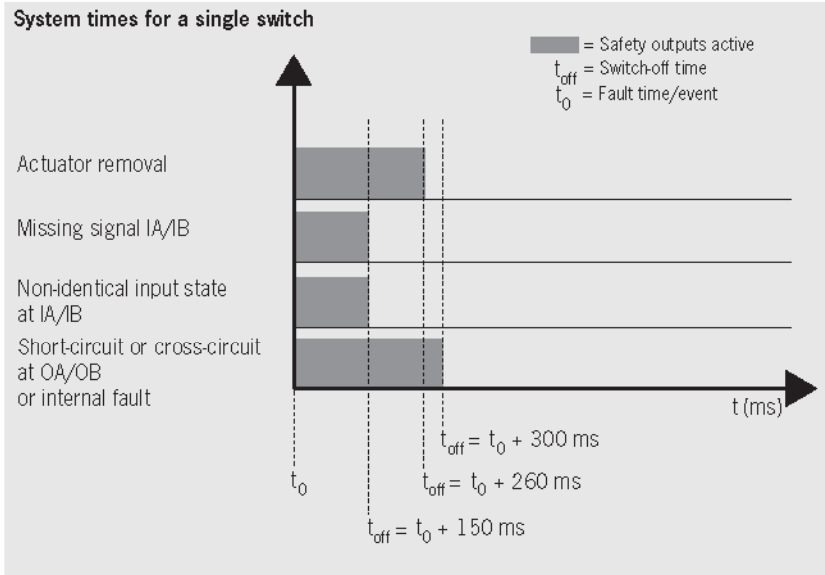
If an actuator leaves the operating distance, this situation is detected by the related switch after 260 ms at the latest. If more than one switch is used, the value increases correspondingly (see *System times for switch chains*).

### Difference time

The safety outputs OA and OB switch with a slight time offset. They have the same signal state at the latest after a difference time of 10 ms.

### Important!

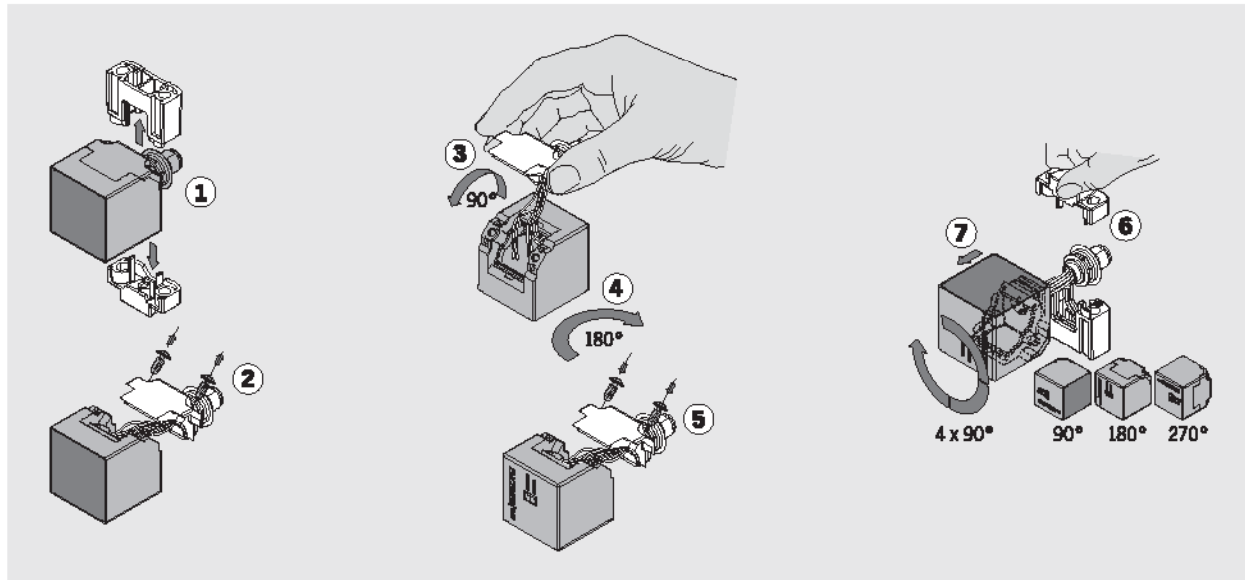
The system times shown are maximum values for a circuit arrangement with 20 safety switches connected in series. Shorter times can also be achieved in circuits with fewer switches.



## LED displays

LED	Color	State	Significance
STATE	green	illuminated	Normal operation
		flashing	Teach-in operation or Power Up (for further signal function see status table)
ERROR	red	illuminated	- Internal electronics fault - Fault at the inputs/outputs

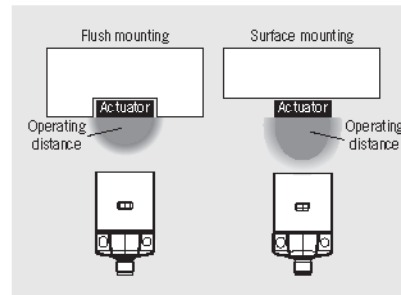
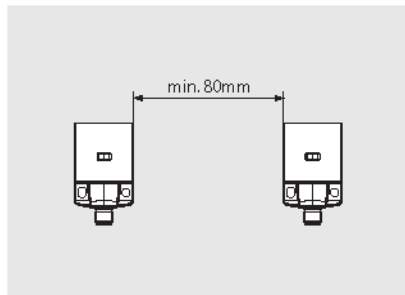
## Changing the approach direction



## Installation

When mounting several safety switches, observe the stipulated minimum distance to avoid mutual interference.

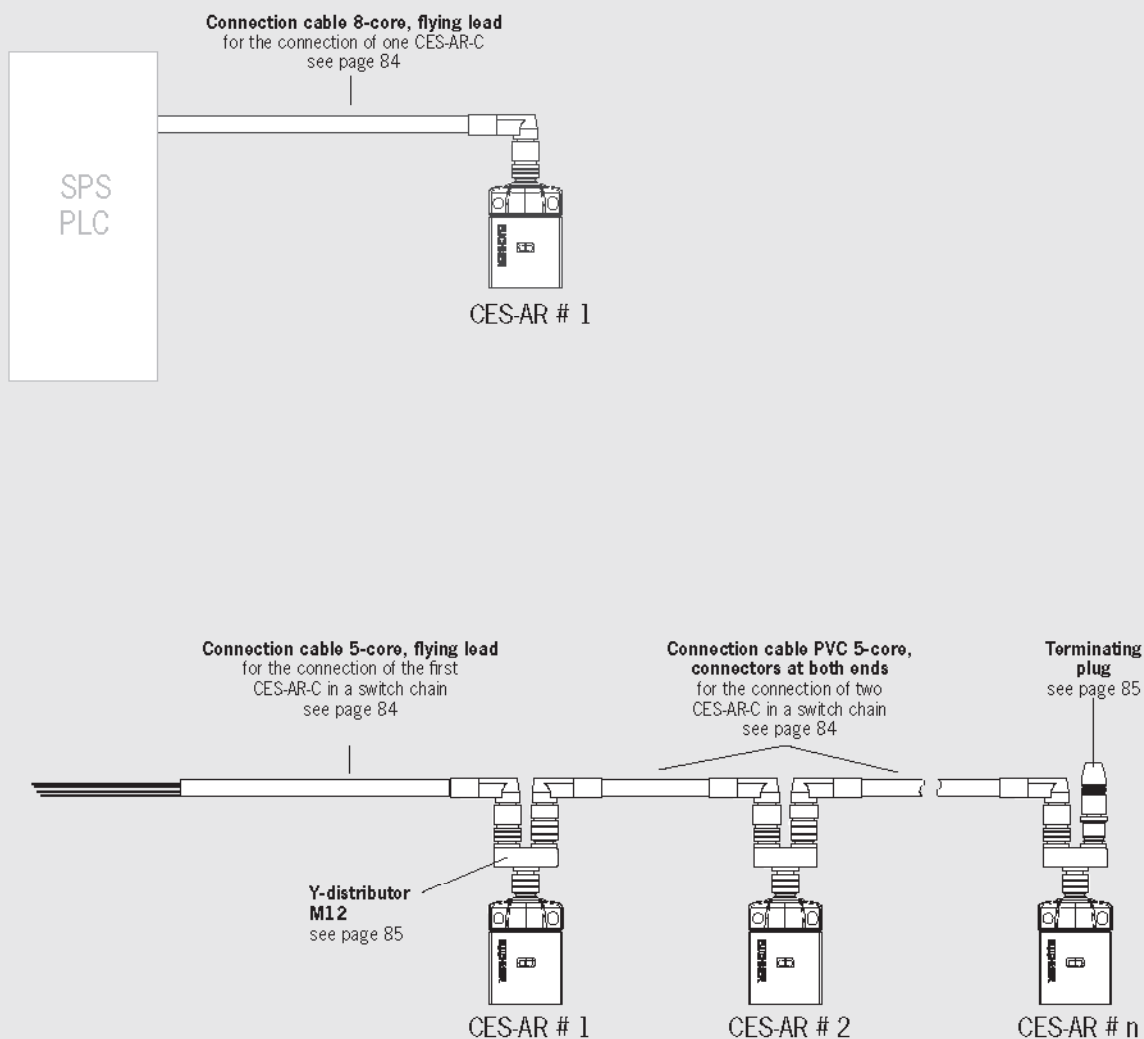
Distance changes as a function of the installation depth and the safety guard material.



## Selection table for non-contact safety switches CES-AR

Connection cable	Safety switch	Actuator	Bolt
<p>Page 84</p>	<p>CES-AR-C01... Page 80</p>	<p>CES-A-BBA  Page 82</p> <p>CES-A-BCA  Page 82</p> <p>CES-A-BPA  Page 83</p>	<p>Page 91/92</p>

### Usage of the connection cables



## Non-contact safety switch CES-AR-C01...

- ▶ Up to 20 safety switches in series (see p. 76)
- ▶ 2 safety outputs (semiconductor outputs)
- ▶ Unicode and multicode evaluation unit



### Approach direction

Can be adjusted in 90° steps

### Safety switch

The safety switch CES-AR-C01-AHSA is suitable for the detection of only one actuator.

The evaluation unit 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 process is carried out. The disabled code is deleted again in the evaluation unit only after a third code has been taught.

The evaluation unit can only be operated with the last actuator taught.

### Unicode evaluation unit

Each actuator is unique. The evaluation unit detects only the actuator that has been taught-in. Max. 8 actuators can be taught-in.

### Multicode evaluation unit

Every actuator is detected by the evaluation unit.

### Category in accordance with EN 13849-1 and EN 954-1

Due to two redundant design semiconductor outputs (safety outputs) with internal monitoring suitable for:

- ▶ Category 4 in accordance with EN 13849-1 and EN 954-1

**Important:** To achieve the stated category in accordance with EN 13849-1 or EN 954-1, both safety outputs (OA and OB) must be evaluated.

### Operating distance

The safety switch has the standard operating distance that, e. g., permits larger tolerances in the alignment of read head and actuator.

### Additional connections

- OUT Monitoring output (semiconductor)
- RST Reset input

### Ordering table

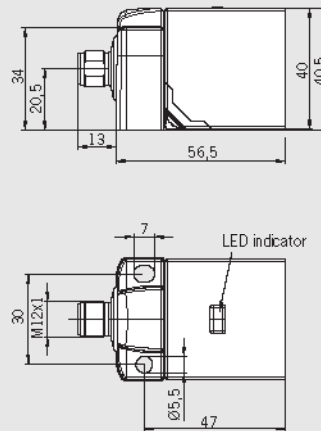
Series	Category according to EN 954-1	Operating distance	Order No.
CES-AR-C01-AH-SA Unicode	4	Standard	<b>098 941</b> CES-AR-C01-AHSA
CES-AR-C01-CH-SA Multicode	4	Standard	<b>098 942</b> CES-AR-C01-CHSA

### Non-contact safety switch CES-AR-C01...

M12 plug, 8-pin

Cat. 4

### Dimension drawing



For connection cable see page 84

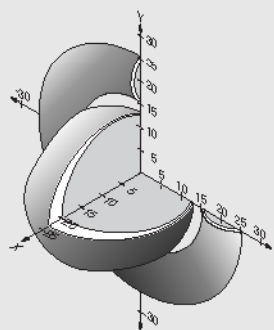
### Block diagram

IB	UB	OA	OB	OUT	IA	OV	RST
1	2	3	4	5	6	7	8
M12 plug-connector (8-pin)							
CES-AR							

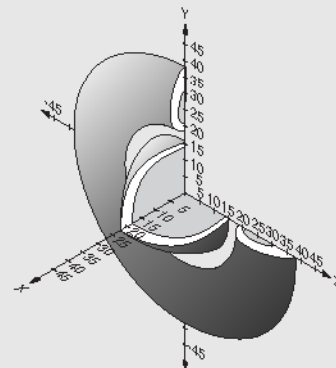
For pin assignment see technical data page 81  
For connection examples see page 86

### Typical operating distance

With actuator CES-A-BBA



With actuator CES-A-BPA



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

## Technical data non-contact safety switches CES-AR-C01...

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	PBT V0 GF30			
Dimensions	According to EN 60947-5-2			mm
Weight	0.4			kg
Ambient temperature at $U_b = DC\ 24\ V$	-20	-	+55	°C
Degree of protection according to EN 60529	IP67			
Safety class according to EN 61558	III			
Installation position	Any			
Connection type	M12 plug connector, 8-pin			
Operating voltage $U_b$ (reverse polarity protected, regulated, residual ripple < 5 %)	24 ± 15%			V DC
For the approval according to UL the following applies	Operation with UL-class 2 power supply only			
Current consumption		80		mA
External fuse (operating voltage $U_b$ )	0.25	-	8	A
Classification according to EN 60947-5-3	PDF-M			
EMC protection requirements	In acc. with EN 60947-5-3			
<b>Safety outputs</b> (OA/OB, 2 semiconductor outputs, p-switching, short circuit-proof)				
- Output voltage $U(OA)/U(OB)$ <sup>1)</sup>				
HIGH $U(OA)$	$U_b - 1.5$	-	$U_b$	V DC
HIGH $U(OB)$	$U_b - 1.5$	-	$U_b$	
LOW $U(OA)/U(OB)$	0	-	1	
Switching current per safety output	1	-	400	mA
Utilization category to EN 60947-5-1	DC-13 24V 400mA Caution: outputs must be protected with a free-wheeling diode in case of inductive loads			
Rated insulation voltage $U_i$	-	-	30	V
Rated impulse withstand voltage $U_{imp}$	-	-	1.5	kV
Resilience to vibration	According to EN 60947-5-2			
Switching frequency	-	-	1	Hz
<b>Monitoring output</b> (OUT) (Semiconductor output, p-switching, short circuit-proof)				
Output voltage	$0.8 \times U_b$	-	$U_b$	V DC
Max. load	-	-	200	mA
<b>In combination with actuator CES-A-BBA</b>				
Operating distance for center offset $m = 0$				
- Switch-on distance	-	18	-	mm
- Assured switch-on distance $s_{so}$ <sup>2)</sup>	15	-	-	
- Switching hysteresis <sup>2)</sup>	1	3	-	
- Assured switch-off distance $s_{sr}$	-	-	45	
<b>In combination with actuator CES-A-BPA</b>				
Operating distance for center offset $m = 0$				
- Switch-on distance	-	22 <sup>3)</sup>	-	mm
- Assured switch-on distance $s_{so}$	18	-	-	
- Switching hysteresis <sup>2)</sup>	1	2	-	
- Assured switch-off distance $s_{sr}$	-	-	58	

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

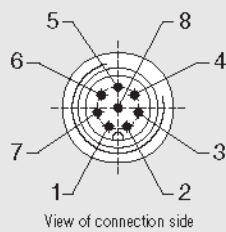
2) Values apply for surface mounting of the actuator.

3) On surface mounting on aluminum, in a non-metallic environment the typical switching distance increases to 30 mm.

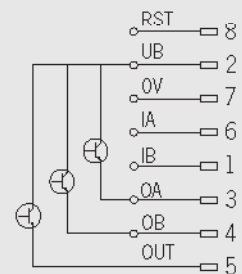
### Important:

Also use the System Manual for planning

### Pin assignment



Pin	Designation	Description	Wire color as per DIN 47100
1	IB	Enable input for channel 2	white
2	UB	Power supply, DC 24 V	brown
3	OA	Safety output, channel 1	green
4	OB	Safety output, channel 2	yellow
5	OUT	Monitoring output	gray
6	IA	Enable input for channel 1	pink
7	0V	Ground, DC 0 V	blue
8	RST	Reset input for hardware reset	red



## Actuator CES-A-BBA / CES-A-BCA



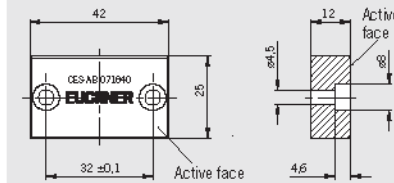
► Cube-shaped design 42 x 25 mm

### Actuator CES-A-BBA

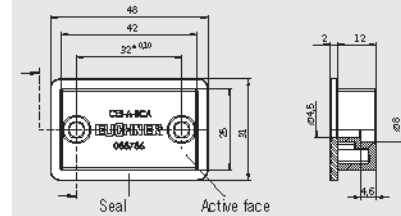
### Actuator CES-A-BCA Housing material PE-HD



#### Dimension drawing



2 safety screws  
M4x14 are  
supplied



2 safety screws  
M4x14 are  
supplied

### Ordering table

Series	Comment	Version / actuator number	Order No.
CES-A-BBA	2 safety screws M4 x 14 are supplied	-	<b>071 840</b> CES-A-BBA
CES-A-BCA	2 safety screws M4 x 14 are supplied Flat seal included	Housing material PE-HD <sup>1)</sup>	<b>088 786</b> CES-A-BCA

1) Suitable for use in aggressive media (e. g. acids, alkalis)

### Technical data

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Fortron, reinforced thermoplastic, fully encapsulated			
- CES-A-BBA	Fortron, reinforced thermoplastic, fully encapsulated			
- CES-A-BCA	Plastic PE-HD without reinforcement, fully encapsulated			
Flat seal material (CES-A-BCA only)	Fluororubber 75 FPM 41.00			
Dimensions	42 x 25 x 12			mm
Weight	0.02			kg
Ambient temperature				
- CES-A-BBA	-25	-	+70	°C
- CES-A-BCA	-25	-	+50	
Degree of protection	IP67/IP69K			
- CES-A-BBA	IP67/IP69K			
- CES-A-BCA	IP67			
Installation position	Active face opposite read head			
Power supply	Inductive via read head			

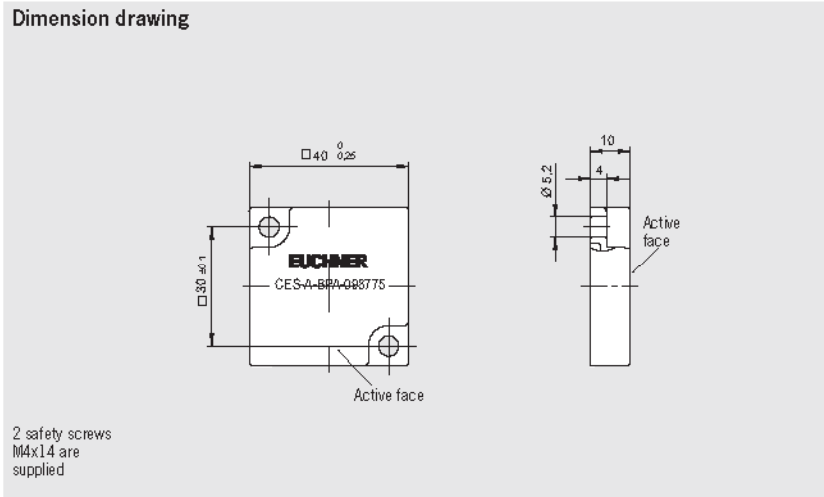
## Actuator CES-A-BPA

- ▶ Cube-shaped design 40 x 40 mm

### Actuator CES-A-BPA



#### Dimension drawing



#### Ordering table

Series	Comment	Version / actuator number	Order No.
CES-A-BPA	2 safety screws M4 x 14 are supplied	-	098 775 CES-A-BPA

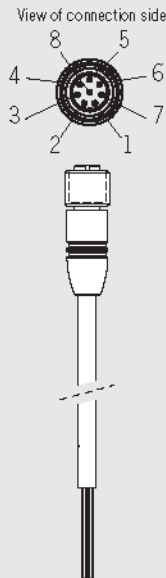
#### Technical data

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	PBT			
Weight	0.025			kg
Degree of protection according to IEC 60529	IP67/IP69K			
Ambient temperature	-25		+70	°C
Installation position	Active face opposite read head			
Power supply	Inductive via read head			

## Connection cables

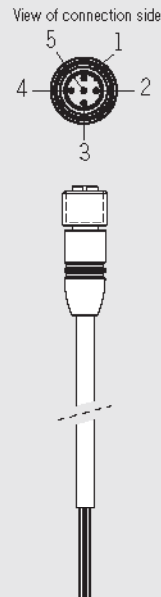
### Connection cable flying lead M12 female plug 8-pin

#### Dimension drawing



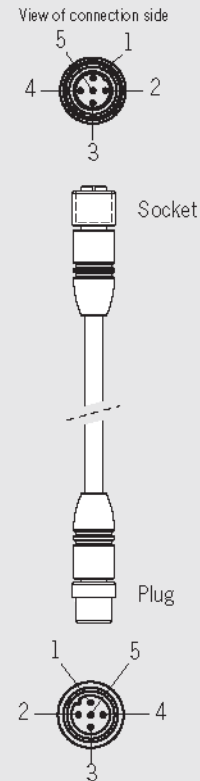
- 1 = WH ▶ IB
- 2 = BN ▶ UB
- 3 = GN ▶ OA
- 4 = YE ▶ OB
- 5 = GY ▶ OUT
- 6 = PK ▶ IA
- 7 = BU ▶ 0 V
- 8 = RD ▶ RST

### Connection cable flying lead M12 female plug 5-pin



- 1 = BN ▶ U<sub>B</sub>
- 2 = WH ▶ OA / IA
- 3 = BU ▶ 0 V
- 4 = BK ▶ OB / IB
- 5 = GY ▶ RST

### Connection cable connectors at both ends M12 male and female plug 5-pin



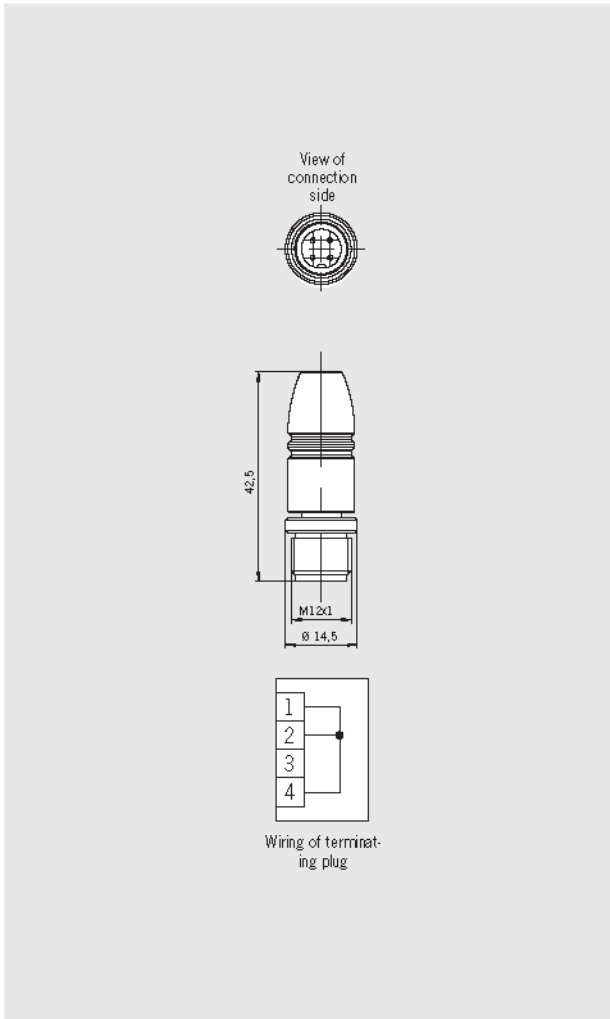
- 1 = BN ▶ U<sub>B</sub>
- 2 = WH ▶ OA / IA
- 3 = BU ▶ 0 V
- 4 = BK ▶ OB / IB
- 5 = GY ▶ RST

## Ordering table

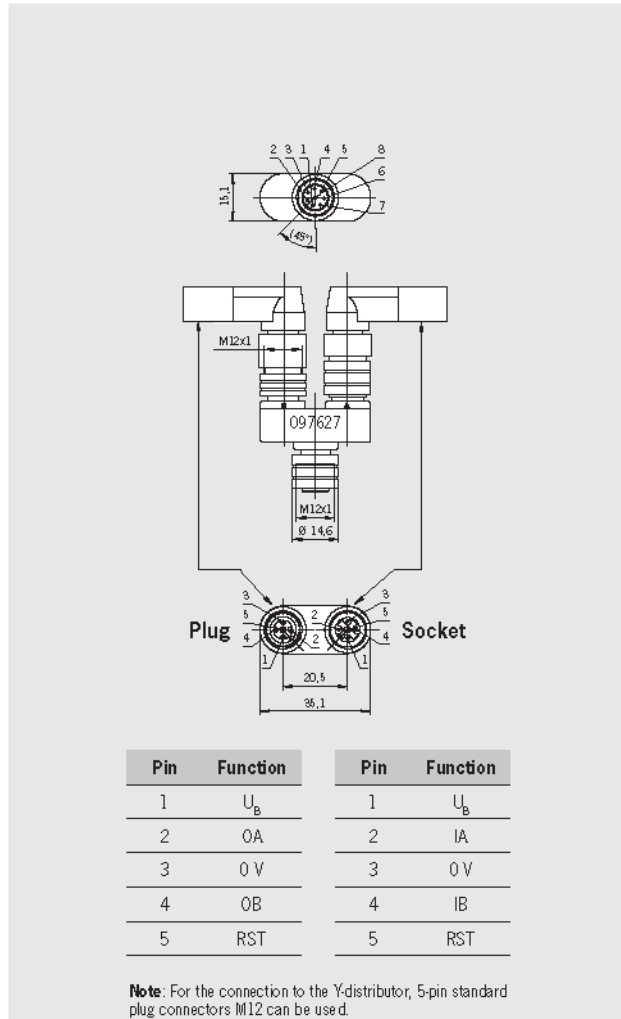
Series	Comment	Order No.
<b>Connection cable 8-core, flying lead</b> for the connection of one CES-AR-C	M12 female plug 8-pin, length 5 m	<b>100 177</b> CM12F08-08X025PV05,0-ZN-100177
	M12 female plug 8-pin, length 10 m	<b>100 178</b> CM12F08-08X025PV10,0-ZN-100178
	M12 female plug 8-pin, length 20 m	<b>100 179</b> CM12F08-08X025PV20,0-ZN-100179
<b>Connection cable 5-core, flying lead</b> for the connection of the first CES-AR-C in a switch chain	M12 female plug 5-pin, length 5 m	<b>100 183</b> CM12F05-05X034PV05,0-ZN-100183
	M12 female plug 5-pin, length 10 m	<b>100 184</b> CM12F05-05X034PV10,0-ZN-100184
	M12 female plug 5-pin, length 20 m	<b>100 185</b> CM12F05-05X034PV20,0-ZN-100185
<b>Connection cable PVC 5-pin, connectors at both ends</b> for the connection of two CES-AR-C in a switch chain	M12 female plug 5-pin to M12 male plug, length 5 m	<b>100 180</b> CM12F05-05X034PV05,0-M12M05-100180
	M12 female plug 5-pin to M12 male plug, length 10 m	<b>100 181</b> CM12F05-05X034PV10,0-M12M05-100181
	M12 female plug 5-pin to M12 male plug, length 20 m	<b>100 182</b> CM12F05-05X034PV20,0-M12M05-100182

## Terminating plug/Y-distributor

**Terminating plug**  
Male plug 4-pin



**Y-distributor M12**  
Housing material PE-HD



**Important:** Switch chains must always be terminated with a terminating plug. Switch chains up to maximum 200 m are allowed taking into account the voltage drop due to the cable resistance (see System Manual).

### Ordering table

Series	Comment	Order No.
Terminating plug	M12 plug connector 4-pin	<b>097 645</b> Terminating plug
Y-distributor M12	M12, 1 x 8-pin, 2 x 5-pin	<b>097 627</b> Y-distributor M12

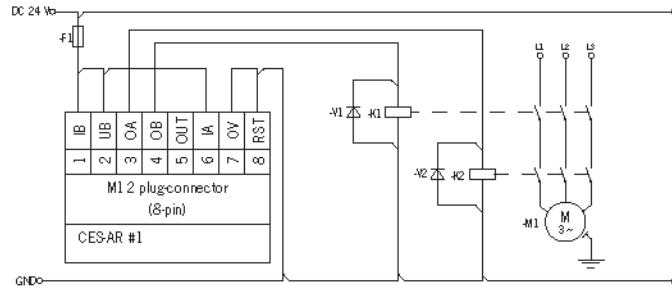
## Connection examples

**Important:** To achieve the stated category in accordance with EN 13849-1 or EN 954-1, both safety outputs (OA and OB) must be evaluated.

### Connection of a single CES-AR-C

If a single CES-AR-C is used, connect the switch as shown in figure below. The OUT output can also be connected here to a control system as a monitoring output.

The switch can be reset via the RST input. To do this, a voltage of 24 V is applied to the RST input for at least 3 seconds. The supply voltage to the switches is interrupted during this time. The RST input must be connected to 0 V if it is not used.

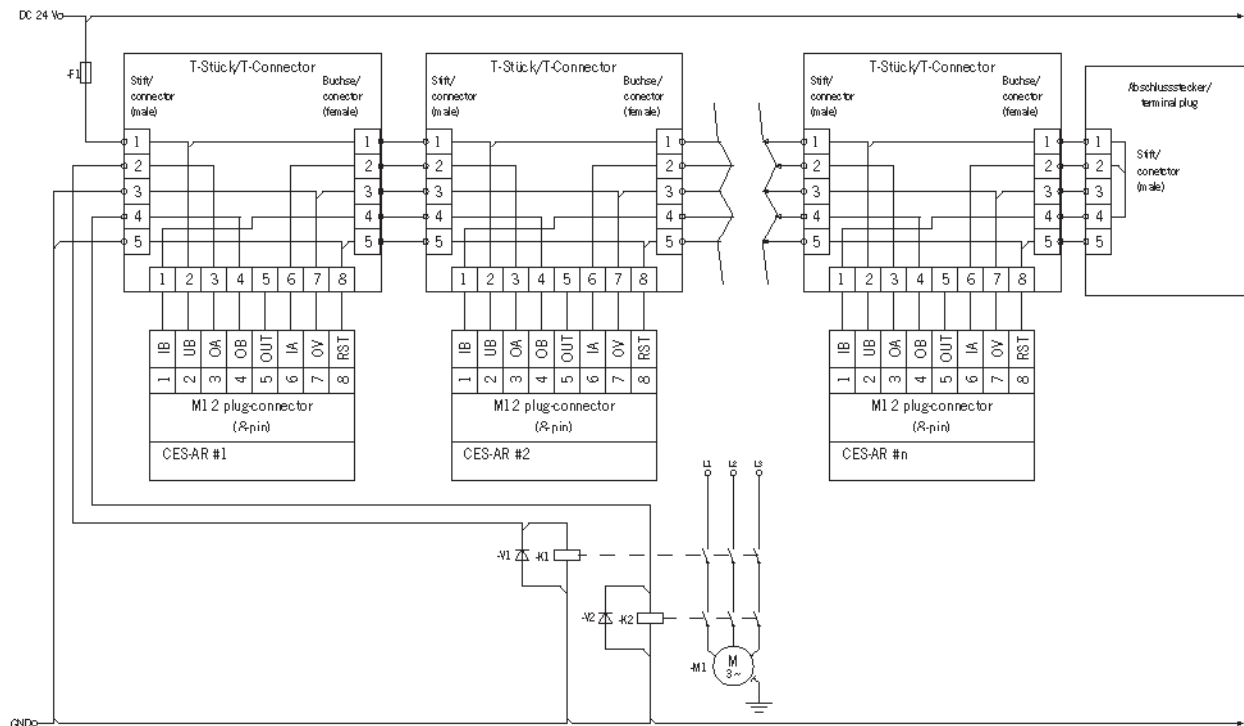


### Connection of several CES-AR-C in series

The switches are connected in series using plug connectors and T-pieces. If, in this connection example, a safety guard is opened or if a fault occurs on one of the switches, the system shuts down the machine. A higher level control system can, however, not detect which safety guard is open or on which switch a fault has occurred. So that a control system can detect the status of each switch in a switch chain, the monitoring output OUT must be connected separately for each switch.

The switches can be reset via the RST input. To do this, a voltage of 24 V is applied to the RST input for at least 3 seconds. The supply voltage to the switches is interrupted during this time. The RST input must be connected to 0 V if it is not used.

**Important:** Switch chains must always be terminated with a terminating plug.



## Bolts for safety guards

According to EN 12100-2 movable safety guards must be equipped with an interlocking device, with or without guard locking.

Here it must be ensured that

- ▶ dangerous machine functions are stopped as soon as the safety guard is no longer in the closed position
- ▶ dangerous machine functions are not started when the movable safety guard is closed.

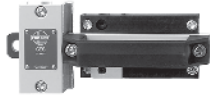
When the EUCHNER safety door bolts are opened intentionally, the actuator mounted on the handle is pulled out of the operating distance of the safety switch or read head.

### Bolts for safety guards offer important advantages:

- ▶ Bolts provide mechanical guard locking, i.e. the monitoring circuit cannot be opened unintentionally by moving the hinged door.
  - ▶ Accidental stoppage of the machine is prevented
- ▶ If the safety doors are shaken, the force is transmitted to the mechanically strong bolt and not to the safety switch.
  - ▶ Safety switches and actuators are thus protected against damage
- ▶ By using bolts, persons who must enter hazardous areas, e.g. for servicing and setup work, can protect themselves. By attaching one or more simple padlocks to the bolt in the open position, the movable safety guards cannot be closed and thus the dangerous states cannot be triggered.
  - ▶ The operator is protected
- ▶ Standard aluminum profiles are frequently used for safety guards. The bolts are particularly easy to fit here.
  - ▶ Optimum adaptation of the bolts to the market standard
- ▶ Bolts are available for all EUCHNER safety systems
  - ▶ Extensive product range
  - ▶ Products refined in every detail

## Bolt CES-A-A

- ▶ In combination with read head CES-A-LNA...
- ▶ For left or right hinged doors



### Features

- ▶ Easy mounting of the read head on the bracket for the bolt tongue
- ▶ Uniquely coded actuator (one-off)
  - absolutely secure against tampering
- ▶ Ball detent mechanism in closed bolt position
  - protection against vibration

### Features

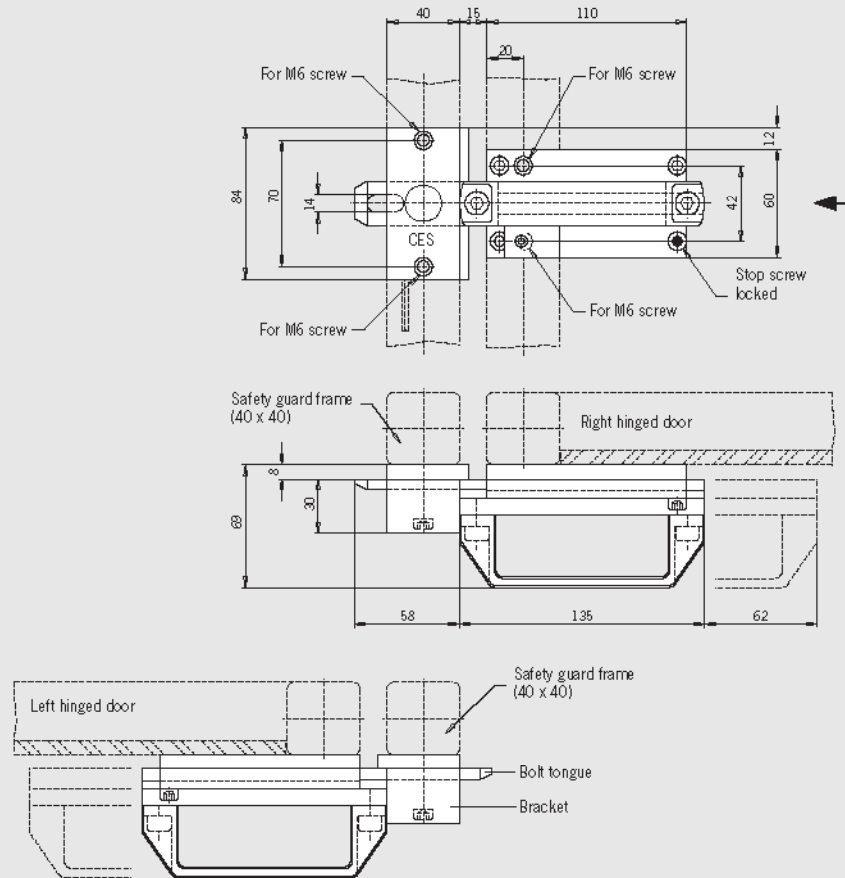
- ▶ Easily fitted to standard aluminum profiles and machine covers with screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary

### Notes

- ▶ CES actuator integrated in the bolt tongue
- ▶ Order read head and evaluation unit separately
- ▶ Other bolt types (e.g. with mechanical detent mechanism in closed bolt position) on request

## Bolt CES-A-A

### Dimension drawing



### Ordering table

Designation	Detent mechanism	Type	Order No. / Item
<b>Bolt CES-A-A</b>	Closed position: Ball detent mechanism Open position: No detent mechanism	For right or left hinged doors	<b>076 487</b> CES-AA

## Bolt CES-A-A/F

- ▶ Lever for escape release from the danger area
- ▶ In combination with read head CES-A-LNA...
- ▶ For left or right hinged doors



### Features

- ▶ Easy mounting of the read head on the bracket for the bolt tongue
- ▶ Uniquely coded actuator (one-off)
  - absolutely secure against tampering
- ▶ Bolt with detent mechanism
  - bolt latches in open position to prevent unintended closing

### Features

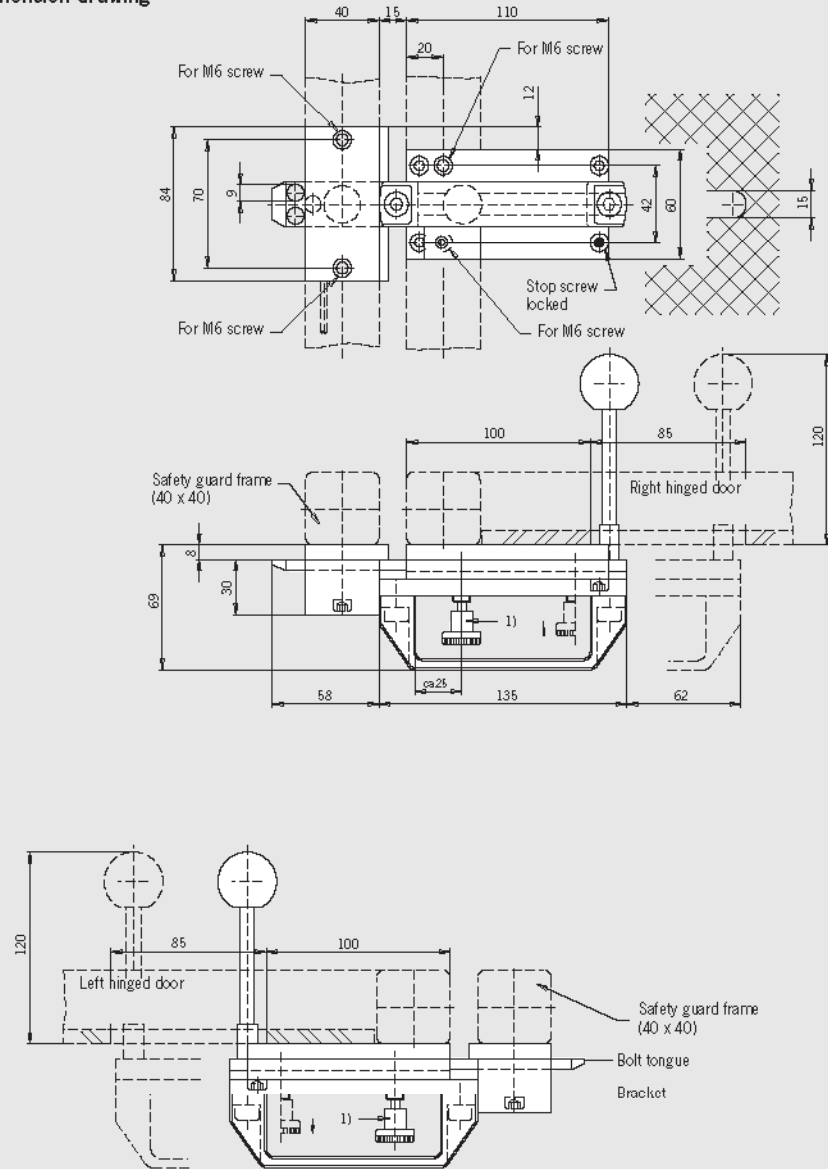
- ▶ Easily fitted to standard aluminum profiles and machine covers with screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary

### Notes

- ▶ CES actuator integrated in the bolt tongue
- ▶ Order read head and evaluation unit separately

## Bolt CES-A-A

### Dimension drawing



1) Bolt with detent mechanism Latches in open position and prevents unintended closing of the bolt. Unlocked by pulling the detent knob upward.

### Ordering table

Designation	Detent mechanism	Type	Order No. / Item
Bolt CES-A-A/F	Closed position: None Open position: Detent knob	For right or left hinged doors	<b>086 173</b> C.FS-A-A/F

## Bolt CEM-A and CEM-C

- ▶ In combination with read head CEM-A-LE05...
- ▶ For left or right hinged doors



### Features

- ▶ Easy mounting of the read head on the bracket for the bolt tongue
- ▶ Uniquely coded actuator (one-off) - absolutely secure against tampering

### Features

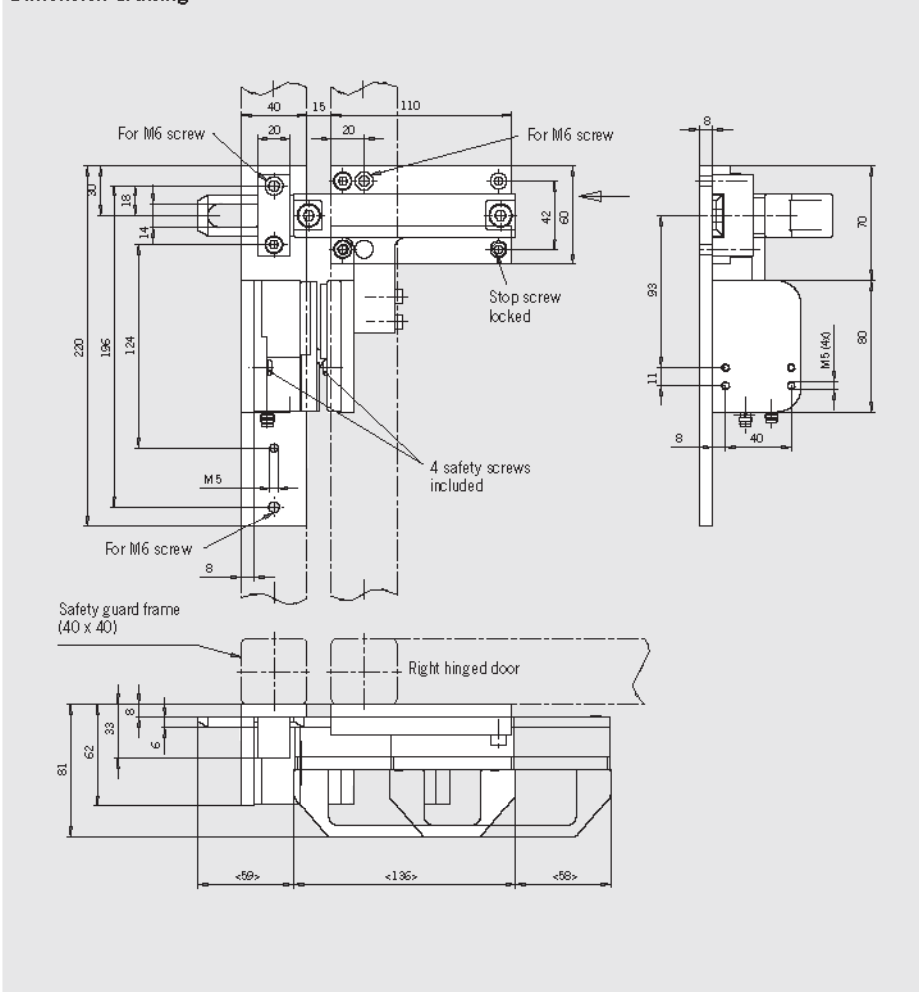
- ▶ Easily fitted to standard aluminum profiles and machine covers with screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary

### Notes

- ▶ Order read head, actuator and evaluation unit separately
- ▶ Other bolt types (e.g. with mechanical detent mechanism in closed bolt position) on request

**Bolt CEM-A**  
Bolt CEM-C mirror image

### Dimension drawing

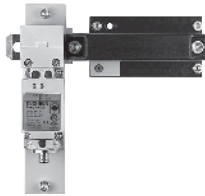


### Ordering table

Designation	Detent mechanism	Type	Order No. / Item
<b>Bolt CEM-A</b>	<b>None</b>	For right hinged doors	<b>097 955</b> Bolt CEM-A
<b>Bolt CEM-C</b>	<b>None</b>	For left hinged doors	<b>097 957</b> Bolt CEM-C

## Bolt CES-A-C

- ▶ For non-contact safety switch CES-A-C.../CES-A-W.../CES-AR...
- ▶ Connection to safety circuit using M12 plug connector
- ▶ For left or right hinged doors



### Features

- ▶ Easy mounting of the safety switch on the bracket for the bolt tongue
- ▶ Uniquely coded actuator (one-off)
  - absolutely secure against tampering
- ▶ Ball detent mechanism in closed bolt position
  - protection against vibration

### Features

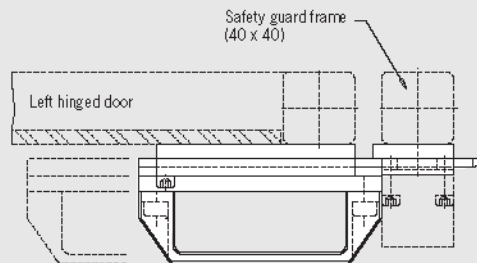
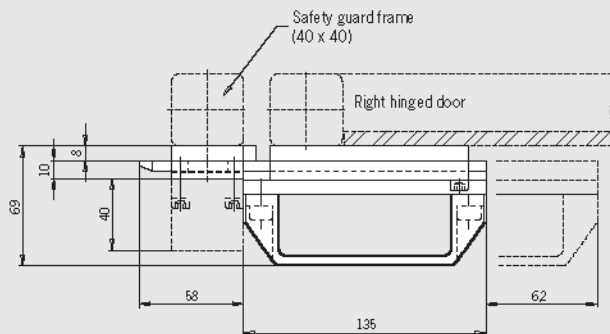
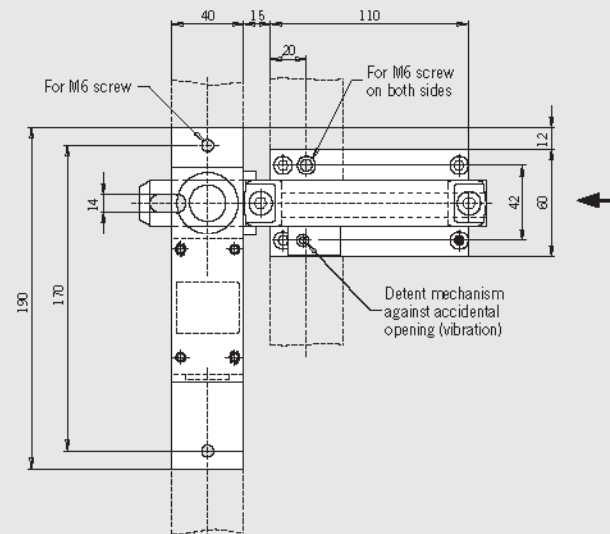
- ▶ Easily fitted to standard aluminum profiles and machine covers with screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary

### Notes

- ▶ CES actuator integrated in the bolt tongue
- ▶ Please order safety switch separately
- ▶ Other bolt types (e.g. with mechanical detent mechanism in closed bolt position) on request

## Bolt CES-A-C

### Dimension drawing



### Ordering table

Designation	Detent mechanism	Type	Order No. / Item
Bolt CES-A-C	Closed position: Ball detent mechanism Open position: No detent mechanism	For right or left hinged doors	082 220 CFS-A-C

## Bolt CES-A-C/F

- ▶ Lever for escape release from the danger area
- ▶ For non-contact safety switch CES-A-C.../CES-A-W.../CES-AR...
- ▶ Connection to safety circuit using M12 plug connector
- ▶ For left or right hinged doors



### Features

- ▶ Easy mounting of the safety switch on the bracket for the bolt tongue
- ▶ Uniquely coded actuator (one-off)
  - absolutely secure against tampering
- ▶ Bolt with detent mechanism
  - bolt latches in open position to prevent unintended closing
- ▶ Ball detent mechanism in closed bolt position
  - protection against vibration

### Features

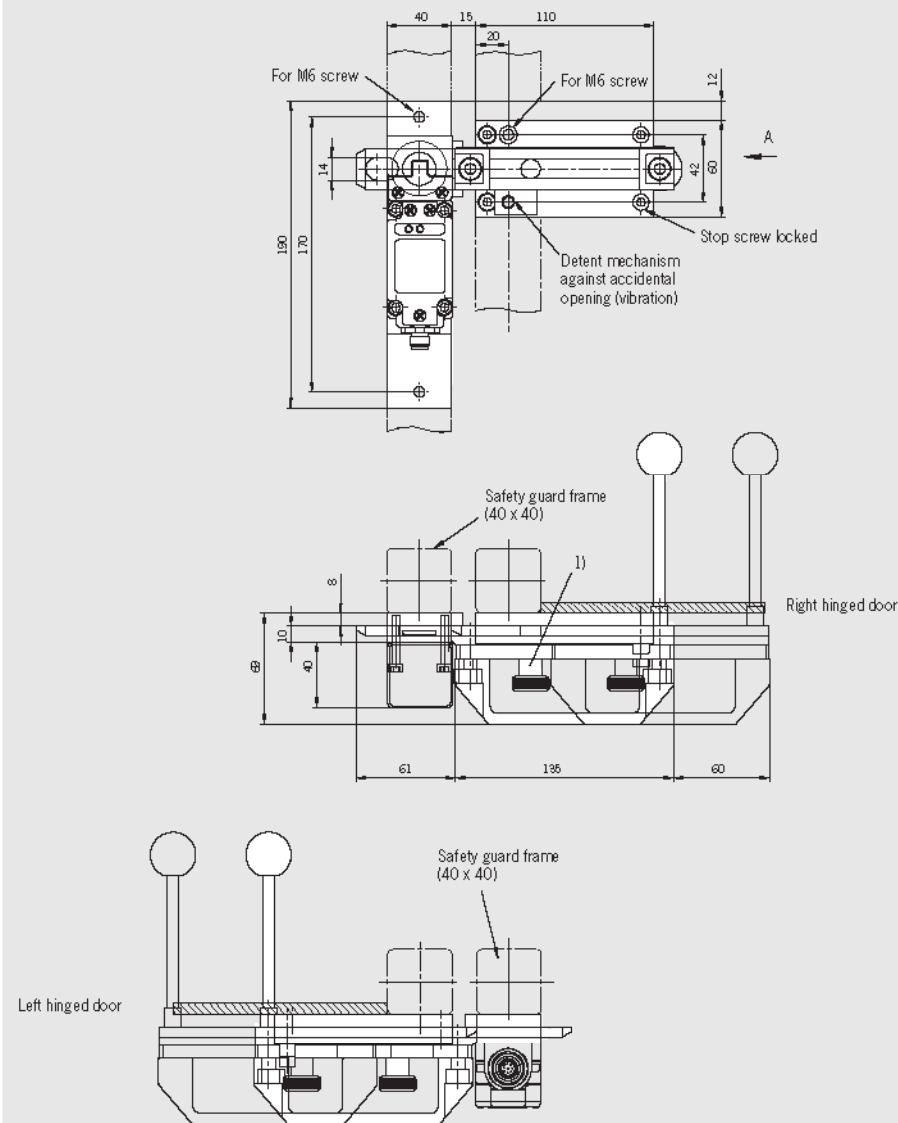
- ▶ Easily fitted to standard aluminum profiles and machine covers with screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary

### Notes

- ▶ CES actuator integrated in the bolt tongue
- ▶ Please order safety switch separately

## bolt CES-A-A

### Dimension drawing



1) Bolt with detent mechanism Latches in open position and prevents unintended closing of the bolt. Unlocked by pulling the detent knob upward.

### Ordering table

Designation	Detent mechanism	Type	Order No. / Item
Bolt CES-A-C/F	Closed position: Ball detent mechanism Open position: Detent knob	For right or left hinged doors	<b>098 357</b> CES-A-C/F