

EUCHNER

Operating Instructions

**Transponder-Coded Safety Switch With Guard Locking
CET.-AR-... (Unicode/Multicode)**

EN

Contents

1.	About this document	4
1.1.	Scope.....	4
1.2.	Target group	4
1.3.	Key to symbols.....	4
1.4.	Supplementary documents	4
2.	Correct use	5
3.	Description of the safety function	6
4.	Exclusion of liability and warranty	7
5.	General safety precautions	8
6.	Function	9
6.1.	Guard locking monitoring.....	9
6.2.	Monitoring output (OUT)	9
6.3.	Door monitoring output (OUT D).....	10
6.4.	Diagnostic output (DIA).....	10
6.5.	Guard locking for versions CET1 and CET3.....	10
6.6.	Guard locking for versions CET2 and CET4.....	10
6.7.	Start button and feedback loop (optional)	11
6.8.	Switching states	11
7.	Manual release	12
7.1.	Auxiliary release and auxiliary key release (can be retrofitted)	12
7.1.1.	Actuating auxiliary release	12
7.1.2.	Actuating auxiliary key release	12
7.2.	Emergency unlocking (can be retrofitted)	13
7.2.1.	Actuating emergency unlocking	13
7.3.	Escape release (optional)	13
7.3.1.	Actuating escape release.....	13
7.4.	Wire front release (optional)	14
7.4.1.	Laying wire front release.....	14
8.	Changing the approach direction	14
9.	Mounting	15
10.	Electrical connection	17
10.1.	Notes about 	18
10.2.	Safety in case of faults.....	18
10.3.	Fuse protection for power supply	18
10.4.	Requirements for connection cables.....	19

10.5.	Maximum cable lengths.....	20
10.5.1.	Determining cable lengths using the example table.....	21
10.6.	Connector assignment for safety switch CET-AR with plug connectors 2 x M12	22
10.6.1.	Version without door monitoring output (CET1/2)	22
10.6.2.	Version with door monitoring output (CET3/4)	22
10.6.3.	Version with door monitoring output (CET3/4) and additional monitoring output OUT on X 2.3.....	23
10.7.	Connector assignment for safety switch CET-AR with plug connector M23 (RC18).....	23
10.7.1.	Version without door monitoring output (CET1/2)	23
10.7.2.	Version with door monitoring output (CET3/4)	24
10.8.	Pin assignment for Y-distributor	25
10.9.	Connection of a single CET-AR	26
10.10.	Connection of several CET-AR in a switch chain.....	29
10.11.	Information on operation on an AR evaluation unit.....	31
10.12.	Notes on operation with safe control systems.....	31
10.12.1.	Particularities for version with plug connectors 2xM12, wiring diagrams A, B, and plug connector M23 (RC18), wiring diagram D and E.....	31
11.	Setup	33
11.1.	LED displays	33
11.2.	Teach-in function for actuator (only for unicode evaluation)	33
11.2.1.	Preparing device for the teach-in operation and teaching in actuator	34
11.2.2.	Teach-in function with series connection, replacing and teaching in device	35
11.3.	Functional check.....	36
11.3.1.	Mechanical function test.....	36
11.3.2.	Electrical function test.....	36
12.	System status table	37
13.	Technical data	38
13.1.	Technical data for safety switch CET.-AR.....	38
13.1.1.	Typical system times.....	39
13.2.	Dimension drawing for safety switch CET.-AR.....	40
13.3.	Technical data for actuator CET-A-B... ..	42
13.3.1.	Dimension drawing for actuator CET-A-BWK-50X	42
14.	Ordering information and accessories	43
15.	Inspection and service	43
16.	Service	43
17.	Declaration of conformity	44

1. About this document

1.1. Scope

These operating instructions are valid for all CET-AR versions in accordance with the following table. These operating instructions, the document "Safety information and maintenance" and any enclosed data sheet form the complete user information for your device.

Version	System family	Version number
CET1/2	...AR...	From V 1.5.0
CET3/4		From V 1.5.2

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 CET-AR/ CET-AP (2105517)	Basic information about safe setup and maintenance	
Operating Instructions (2110788)	(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. in the search box.
---	--

2. Correct use

Safety switches series CET-AR are interlocking devices with guard locking (type 4). The device complies with 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 the guard from being opened while a dangerous machine function is being performed.

This means:

- › Starting commands that cause a dangerous machine function must become active only when the guard is closed and locked.
- › The guard locking device must not be unlocked until the dangerous machine function has ended.
- › Closing and locking 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.

Devices from this series are also suitable for process protection.

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 – Part 1: General requirements

The safety switch is allowed to be operated only in conjunction with the intended EUCHNER actuator 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 an AR switch chain is permitted only using devices intended for series connection in an AR 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 CET components

Safety switch	Actuator	
	CET-A-B...	
CET.-AR-... (Unicode/Multicode)	●	
Key to symbols	●	Combination possible



NOTICE

For information about combination with an AR evaluation unit, please refer to chapter 10.11. *Information on operation on an AR evaluation unit on page 31.*

3. Description of the safety function

Devices from this series feature the following safety functions:

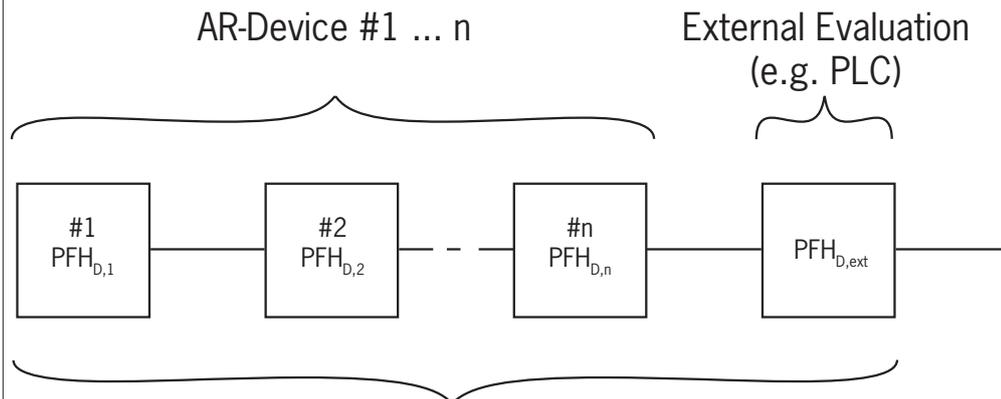
Monitoring of guard locking and the position of the guard (interlocking device with guard locking according to EN ISO 14119)

- Safety function (see chapter 6.8. *Switching states on page 11*):
 - The safety outputs are switched off when guard locking is released (monitoring of the locking element).
 - The safety outputs are switched off when the guard is open (monitoring of the door position).
 - Guard locking can be activated only when the actuator is located in the switch head (failsafe locking mechanism).
 - The following additionally applies in an AR series connection: the safety outputs are switched only when the device receives a corresponding signal from its predecessor in the chain.
- Safety characteristics: category, Performance Level, PFH_D (see chapter 13. *Technical data on page 38*).



NOTICE

You can regard the complete AR device chain as one subsystem during calculation. The following calculation method applies to the PFH_D value:



$$PFH_D ges = \sum_{k=1}^n PFH_{D,k} + PFH_{d,ext}$$

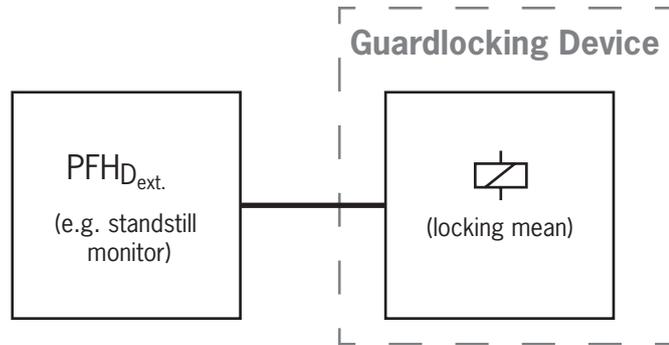
Alternatively, the simplified method according to section 6.3 of EN 13849-1:2015 can be used for calculation.

Activation of guard locking

If the device is used as guard locking for personnel protection, control of guard locking must be regarded as a safety function.

The device does not feature a safety characteristic for the control of the guard locking, because the guard locking solenoid is completely disconnected from outside the device (no control function within the device). It therefore does not contribute to the failure probability.

The safety level for the control of guard locking is determined exclusively by the external control (e.g. PFH_{D_{ext.}} for the standstill monitor).



NOTICE

For more information about safe control of guard locking, see chapter 10.12. *Notes on operation with safe control systems on page 31*

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 CET 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 perform 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. EUCHNER cannot provide any warranty in relation to the readability of the CD for the storage period required. 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 device permits the locking of movable guards.

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

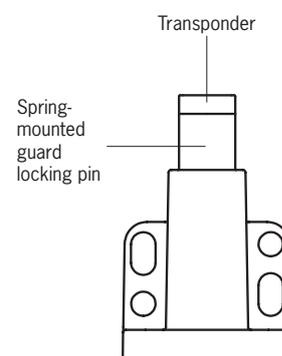
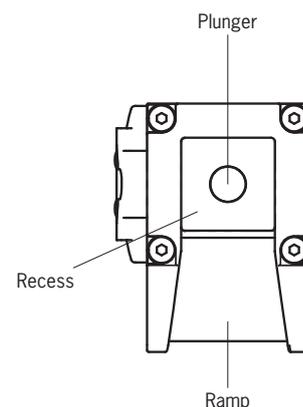
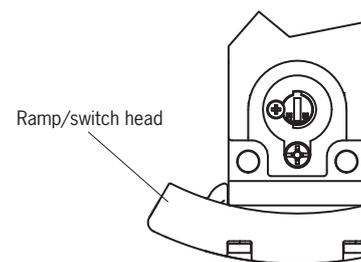
Whether the device learns the complete actuator code (unicode) or not (multicode) depends on the respective version.

- ▶ **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.

The safety outputs  are switched on when the locking pin is in the recess (state: door closed and locked) and a permissible code is detected.

When guard locking is released, the safety outputs  and the monitoring output (OUT) are switched off.



Important!

- ▶ CET3 (closed-circuit current principle)
The activation of the guard locking solenoid results in the shutdown of the safety outputs OA/OB and the monitoring output OUT.
- ▶ CET4 (open-circuit current principle)
The interruption (> 5 ms) of the power supply to UCM results in the shutdown of the safety outputs OA/OB and the monitoring output OUT.
- ▶ In both cases the outputs are shut down independent of the actual position of the solenoid.
- ▶ For more detailed information, see also chapter 10.12. *Notes on operation with safe control systems on page 31.*

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 switch on the safety outputs (e.g. on starting).

6.1. Guard locking monitoring

All versions feature two safe outputs for monitoring guard locking (OA and OB). The safety outputs  are switched off when guard locking is released.

6.2. Monitoring output (OUT)

The monitoring output is switched on as soon as guard locking is active (state: door closed and locked) and the transponder has been detected.

6.3. Door monitoring output (OUT D)

Versions CET3 and CET4 feature a door monitoring output (OUT D). The door monitoring output is switched on as soon as the actuator is above the extended plunger (state: guard closed and not locked). The door monitoring output also remains switched on when guard locking is active.

6.4. Diagnostic output (DIA)

Some versions have a diagnostic output. The diagnostics output is switched on in the event of a fault (switch-on condition as for DIA LED).

6.5. Guard locking for versions CET1 and CET3

(Guard locking actuated by spring force and released by power-ON)

Activating guard locking: close guard; no voltage at the solenoid.

Releasing guard locking: apply voltage to the solenoid.

The spring-operated guard locking functions in accordance with the closed-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking remains active and the guard cannot be opened directly.



Important!

If the guard is open when the power supply is interrupted and is then closed, guard locking is activated. This can lead to persons being locked in unintentionally.

The actuator's guard locking pin cannot be moved out of the recess and the guard is locked as long as the plunger is pressed down by the actuator.

When voltage is present at the guard locking solenoid, the plunger is extended and lifts the actuator's guard locking pin above the edge of the recess. The guard can be opened.

6.6. Guard locking for versions CET2 and CET4

(Guard locking actuated by power-ON and released by spring force)



Important!

Use as guard locking for personnel protection is possible only in special cases, after strict assessment of the accident risk (see EN ISO 14119:2013, section 5.7.1)!

Activating guard locking: apply voltage to the solenoid.

Releasing guard locking: disconnect voltage from the solenoid.

The magnetically actuated guard locking operates in accordance with the open-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking is released and the guard can be opened directly!

The guard can be opened as long as the plunger is held in the extended position.

The plunger is released when voltage is present at the guard locking solenoid. The actuator's guard locking pin can now press the plunger down. The guard is locked as soon as the guard locking pin is fully inserted into the recess.

6.7. Start button and feedback loop (optional)

A start button and a feedback loop can be connected (for monitoring downstream relays and contactors) (input Y).



Important!

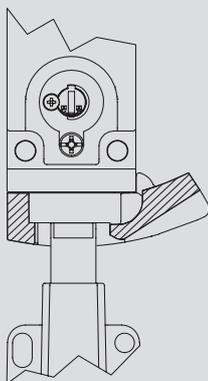
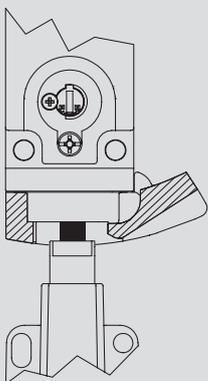
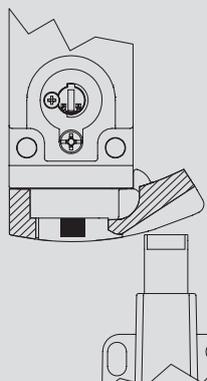
Faults on the start button/in the feedback loop are not detected. This can lead to unintentional automatic starting.

On devices with start button and feedback loop, safety outputs  are switched on only when the start button is pressed and the feedback loop is closed. Start button and feedback loop must be closed for at least 500 ms.

The monitoring output OUT is switched on as soon as guard locking is active. The status of the feedback loop/the start button has no effect on this aspect (see also chapter 12. *System status table on page 37*).

6.8. Switching states

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

	Guard closed and locked	Guard closed and not locked	Guard open
			
Voltage at guard locking solenoid CET1/3	off	on	(irrelevant)
Voltage at guard locking solenoid CET2/4	on	off	(irrelevant)
Safety outputs OA and OB 	on	off	off
Monitoring output OUT	on	off	off
Door monitoring output OUT D (only CET3 and CET4)	on	on	off

7. Manual release

Some situations require the guard locking to be released manually (e.g. malfunctions or an emergency). A function test should be performed after release.

More information on this topic can be found in the standard EN ISO 14119:2013, section 5.7.5.1. The device can feature the following release functions:

7.1. Auxiliary release and auxiliary key release (can be retrofitted)

In the event of malfunctions, the guard locking can be released with the auxiliary release irrespective of the state of the solenoid.

The safety outputs  are switched off when the auxiliary release is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OUT is switched off; OUT D can assume an undefined state. Open the guard and close it again after resetting the auxiliary release. The device will then operate normally again.

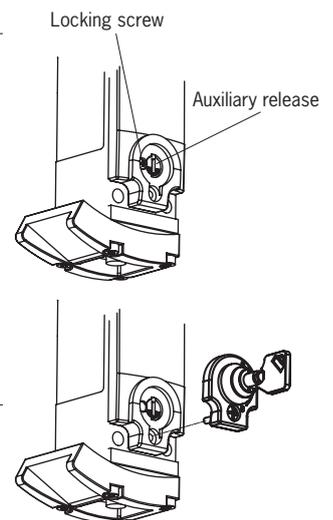
7.1.1. Actuating auxiliary release

1. Unscrew locking screw.
 2. Using a screwdriver, turn the auxiliary release to  in the direction of the arrow.
- ➔ Guard locking is released.



Important!

- › The actuator must not be under tensile stress during manual release.
- › After use, reset the auxiliary release and screw in and seal the locking screw (e.g. with sealing lacquer).
- › The auxiliary key release must not be used to lock the switch during servicing to prevent activation of guard locking, for example.
- › Loss of the release function due to mounting errors or damage during mounting.
- › Check the release function every time after mounting.
- › Please observe the notes on any enclosed data sheets.



7.1.2. Actuating auxiliary key release

On devices with auxiliary key release (can be retrofitted), simply turn the key to release. Function as for auxiliary release. For mounting, see the auxiliary key release supplement.

7.2. Emergency unlocking (can be retrofitted)

Permits opening of a locked guard from outside the danger zone without tools. For mounting, see the mounting supplement.



Important!

- › It must be possible to operate the emergency unlocking manually from outside the protected area without tools.
- › The emergency unlocking must possess a marking indicating that it may be used only in an emergency.
- › The actuator must not be under tensile stress during manual release.
- › The emergency unlocking must be sealed or the misuse of the release function must be prevented in the control system.
- › The unlocking function meets all other requirements from EN ISO 14119.
- › The emergency unlocking meets the requirements of Category B according to EN ISO 13849-1:2015.
- › Loss of the release function due to mounting errors or damage during mounting.
- › Check the release function every time after mounting.
- › Please observe the notes on any enclosed data sheets.

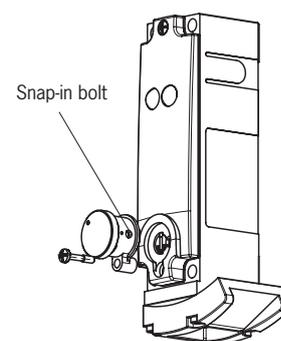
7.2.1. Actuating emergency unlocking

- › Turn emergency unlocking clockwise until it clicks into place.
- ➔ Guard locking is released.

To reset, press the snap-in bolt inward using a small screwdriver or similar tool and turn the emergency unlocking back.

The safety outputs  are switched off when the emergency unlocking is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OUT is switched off; OUT D can assume an undefined state. Open the guard and close it again after resetting the emergency unlocking. The device will then operate normally again.



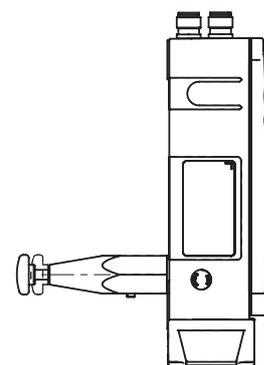
7.3. Escape release (optional)

Permits opening of a locked guard from the danger zone without tools (see chapter 13.2. Dimension drawing for safety switch CET.-AR-... on page 40).



Important!

- › It must be possible to actuate the escape release manually from inside the protected area without tools.
- › It must not be possible to reach the escape release from the outside.
- › The actuator must not be under tensile stress during manual release.
- › The escape release meets the requirements of Category B according to EN ISO 13849-1:2015.



7.3.1. Actuating escape release

- › Press the red release knob to the stop.
- ➔ Guard locking is released.

Pull the knob out again to reset.

The safety outputs  are switched off when the escape release is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OUT is switched off; OUT D can assume an undefined state. Open the guard and close it again after resetting the escape release. The device will then operate normally again.

7.4. Wire front release (optional)

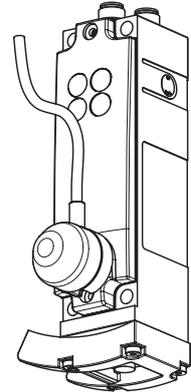
Release via a pull wire. Depending on the type of attachment, the wire front release can be used as emergency unlocking or escape release.

The following applies to non-latching wire front releases.

If the release is to be used as emergency unlocking, one of the following measures must be taken (see EN ISO 14119:2013, section 5.7.5.3):

- › Install the release so that it can be reset only with the aid of a tool.
- › Alternatively, the reset can be undertaken at the control system level, e.g. by means of a plausibility check (status of the safety outputs does not match the guard locking activation signal).

The emergency-unlocking specifications in chapter 7.2 on Page 13 apply irrespective of this information.



Important!

- › The wire front release meets the requirements of Category B according to EN ISO 13849-1:2015.
- › The correct function depends on the laying of the pull wire and on the attachment of the pull handle, and this is the responsibility of the plant manufacturer.
- › The actuator must not be under tensile stress during manual release.

7.4.1. Laying wire front release



Important!

- › Loss of the release function due to mounting errors, damage or wear.
- › Check the release function every time after mounting.
- › When routing the wire front release, ensure that it operates smoothly.
- › Observe the min. bending radius (100 mm) and minimize the number of bends.
- › The switch is not allowed to be opened.
- › Observe the notes on the enclosed data sheets.

8. Changing the approach direction

1. Remove the screws from the safety switch
2. Set the required direction
3. Tighten the screws with a torque of 1.5 Nm

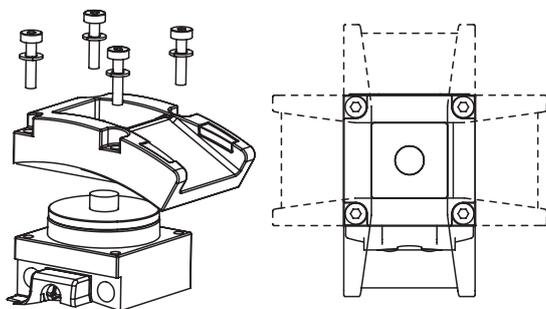


Figure 1: Changing the approach direction

9. Mounting



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.
- › The max. achievable category according to EN 13849-1 depends on the installation position (see chapter 13. *Technical data on page 38*).



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.
- › Protect the switch head against damage, as well as penetrating foreign objects such as swarf, sand and blasting shot, etc. The switch should be installed with the actuating head down for this purpose.
- › Observe the min. door radii (see figure below).
- › Ensure that the actuator contacts the ramp in the designated area (see figure below). Marks on the ramp specify the prescribed approach zone.



Tip!

EUCHNER offers special cover plates to improve protection against tampering. These accessories can be found at www.euchner.com.

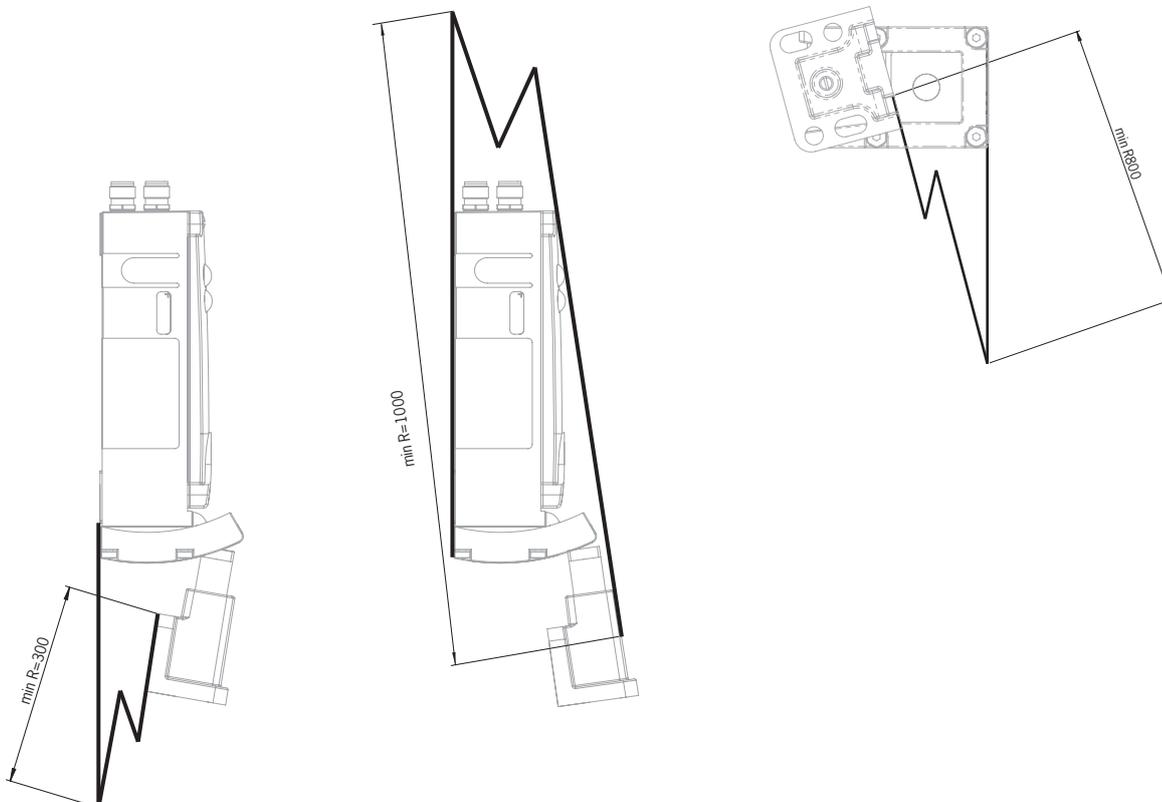
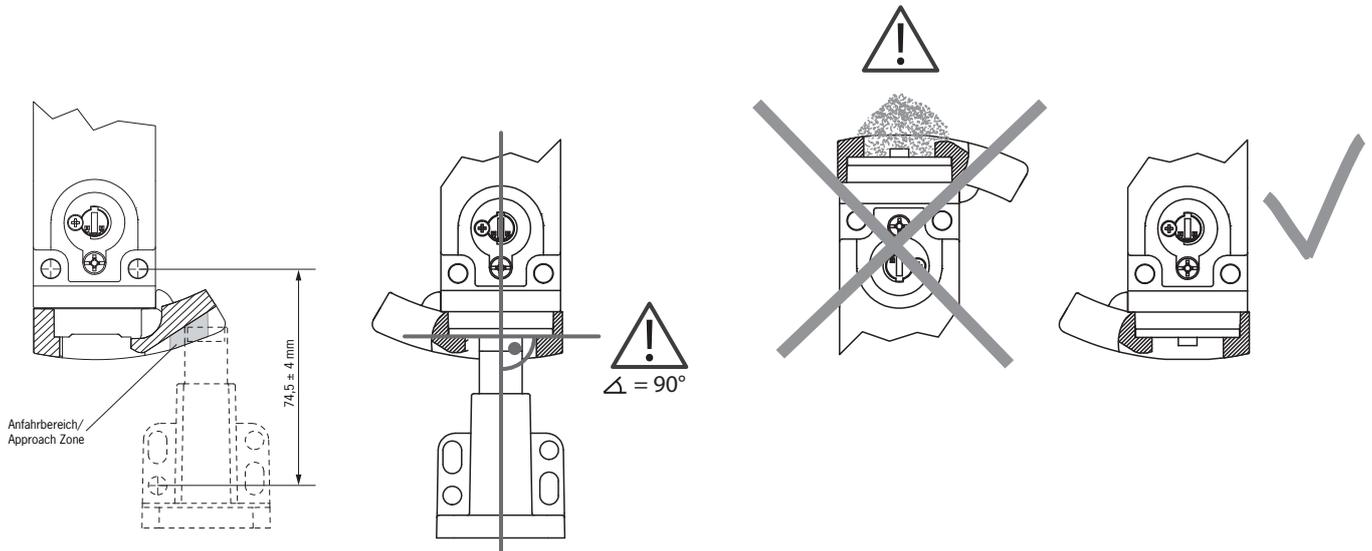


Figure 2: Door radii and approach zone

Note the following points:

Actuator and safety switch must be fitted so that

- › the active faces of the actuator and the safety switch are parallel with each other.
- › the actuator is fully inserted into the switch recess when the guard is closed.
- › no dirt can accumulate in the recess.



10. Electrical connection

The following connection options are available:

- › Separate operation
- › Series connection with Y-distributors from EUCHNER (only with M12 plug connectors)
- › Series connection, e.g. with wiring in the control cabinet
- › Operation on an AR evaluation unit.



WARNING

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

- › To ensure safety, both safety outputs  (OA and OB) 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.

- › The power supply for the evaluation electronics is electrically isolated from the power supply for the guard locking solenoid.
- › The following is valid for all CET1/2 and devices with plug connectors 2 x M12:
The teach-in input and feedback loop, as well as the freely controllable LEDs, have the same ground potential as the guard locking solenoid.
- › 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 output lines OA/OB. A downstream control system must tolerate these test pulses, which may have a length of up to 1 ms. The test pulses are also output when the safety outputs are switched off. 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.
- › The device is not suitable for operation on earth-leakage monitors.
- › 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.

10.1. Notes about



Important!

- › For use and operation as per the  requirements*, a power supply with the feature “for use in class 2 circuits” must be used. The same requirement applies to the safety outputs.
Alternative solutions must comply with the following requirements:
 - Electrically isolated power supply unit in combination with fuse as per UL248. This fuse should be designed for max. 3.3 A and should be integrated into the 30 V DC voltage section.
- › For use and applications as per the  requirements¹⁾, a connection cable listed under UL category code CYJV/7 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 and the solenoid voltage U_{CM} are reverse polarity protected.
- › The safety outputs OA/OB are short circuit-proof.
- › A short circuit between OA and OB is detected by the switch.
- › A short circuit in the cable can be excluded by laying the cable with protection.

10.3. 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}

$$I_{max} = I_{UB} + I_{OUT} + I_{OA+OB} (+ I_{OUT D}^*)$$

$$I_{UB} = \text{Switch operating current (80 mA)}$$

$$I_{OUT} / I_{OUT D} = \text{Load current of monitoring outputs (2 x max. 50 mA)}$$

$$I_{OA+OB} = \text{Load current of safety outputs OA + OB (2 x max. 200 mA)}$$

* only for version with door monitoring output

Max. current consumption of a switch chain ΣI_{max}

$$\Sigma I_{max} = I_{OA+OB} + n \times (I_{UB} + I_{OUT} (+ I_{OUT D}^*))$$

$$n = \text{Number of connected switches}$$

* only for version with door monitoring output

10.4. 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:

For safety switch CET-AR with plug connectors 2 x M12

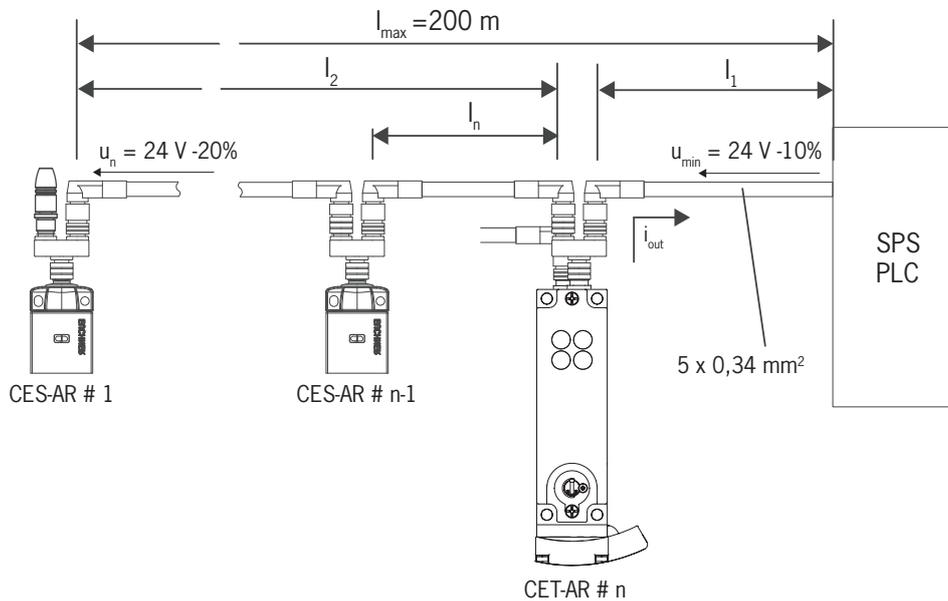
Parameter	Value	Unit
Conductor cross-section, min.	0.25	mm ²
R max.	60	Ω/km
C max.	120	nF/km
L max.	0.65	mH/km
Recommended cable type	L1YY 8 x 0.25 mm ²	

For safety switch CET-AR with plug connector M23 (RC18)

Parameter	Value	Unit
Conductor cross-section, min.	0.25	mm ²
R max.	60	Ω/km
C max.	120	nF/km
L max.	0.65	mH/km
Recommended cable type	L1FY11Y min. 19-core	

10.5. 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).



n Max. number of switches	I _{OA/OB} (mA) Possible output current per channel OA/OB	l ₁ (m) Max. cable length from the last switch to the control system
5	10	150
	25	100
	50	80
	100	50
	200	25
6	10	120
	25	90
	50	70
	100	50
	200	25
10	10	70
	25	60
	50	50
	100	40
	200	25

10.5.1. 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 CES-AR/CET-AR safety switches.

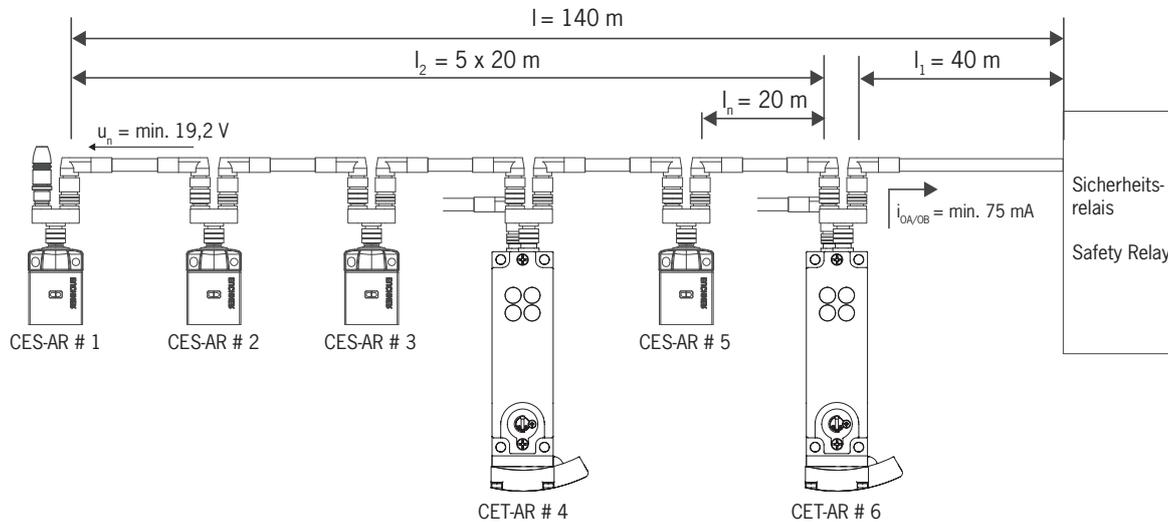


Figure 3: Circuit example with six CES-AR/CET-AR

A safety relay is connected downstream which consumes 75 mA at each of the two safety inputs. This operates over the whole temperature range with a voltage of 19.2 V (corresponds to 24 V - 20%).

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 $i_{OA/OB}$ (possible output current per channel OA/OB), 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 I_1 . Here: a length of 50 m is permitted.

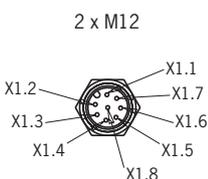
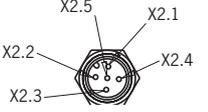
Result: The desired cable length I_1 of 40 m is below the permitted value from the table. The overall length of the switch chain I_{max} of 140 m is less than the maximum value of 200 m.

➔ The planned application is therefore functional in this form.

10.6. Connector assignment for safety switch CET-AR with plug connectors 2 x M12

10.6.1. Version without door monitoring output (CET1/2)

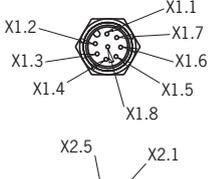
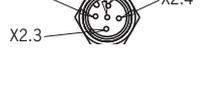
Wiring diagram A

Plug connector (view of connection side)	Pin	Designation	Function	Wire color of connection cable ¹⁾
 <p>2 x M12</p> <p>X1.1, X1.2, X1.3, X1.4, X1.5, X1.6, X1.7, X1.8</p>	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U _B	Operating voltage of AR electronics, 24 V DC	BN
	X 1.3	OA	Safety output channel A 	GN
	X 1.4	OB	Safety output channel B 	YE
	X 1.5	OUT	Monitoring output	GY
	X 1.6	IA	Enable input for channel A	PK
	X 1.7	0 V U _B	Operating voltage of AR electronics, 0 V	BU
	X 1.8	RST	Reset input	RD
 <p>2 x M12</p> <p>X2.1, X2.2, X2.3, X2.4, X2.5</p>	X 2.1	0 V U _{CM}	Operating voltage of guard locking solenoid 0 V	BN
	X 2.2	LED 1	LED 1, red, freely configurable, 24 V DC LED 1 red, solenoid energized ³⁾	WH
	X 2.3	LED 2	LED 2, green, freely configurable, 24 V DC	BU
	X 2.4	U _{CM}	Operating voltage of guard locking solenoid, 24 V DC	BK
	X 2.5	J	Version with teach-in input: To teach-in a new actuator, connect to 24 V DC; leave open in normal operation. ²⁾	GY
		Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.	
		FE	Function earth Version without feedback loop and without teach-in input: This connection must be connected to 0 V. ³⁾	
		-	Version without feedback loop and without teach-in input: This connection must be connected to 0 V.	

- 1) Only for standard EUCHNER connection cable
2) For single-channel control of the solenoid connect to 0 V U_{CM}
3) Only for ID no. 109015

10.6.2. Version with door monitoring output (CET3/4)

Wiring diagram B

Plug connector (view of connection side)	Pin	Designation	Function	Wire color of connection cable ¹⁾
 <p>2 x M12</p> <p>X1.1, X1.2, X1.3, X1.4, X1.5, X1.6, X1.7, X1.8</p>	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U _B	Operating voltage of AR electronics, 24 V DC	BN
	X 1.3	OA	Safety output channel A 	GN
	X 1.4	OB	Safety output channel B 	YE
	X 1.5	OUT	Monitoring output	GY
	X 1.6	IA	Enable input for channel A	PK
	X 1.7	0 V U _B	Operating voltage of AR electronics, 0 V	BU
	X 1.8	RST	Reset input	RD
 <p>2 x M12</p> <p>X2.1, X2.2, X2.3, X2.4, X2.5</p>	X 2.1	0 V U _{CM}	Operating voltage of guard locking solenoid 0 V	BN
	X 2.2	OUT D	Door monitoring output (indication on LED 2)	WH
	X 2.3	LED 1	LED 1, red, freely configurable, 24 V DC	BU
	X 2.4	U _{CM}	Operating voltage of guard locking solenoid, 24 V DC	BK
	X 2.5	J	Version with teach-in input: To teach-in a new actuator, connect to 24 V DC; leave open in normal operation. ²⁾	GY
		Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.	
		FE	Function earth Version without feedback loop and without teach-in input: This connection must be connected to 0 V.	
		-	Version without feedback loop and without teach-in input: This connection must be connected to 0 V.	

- 1) Only for standard EUCHNER connection cable
2) For single-channel control of the solenoid connect to 0 V U_{CM}

10.6.3. Version with door monitoring output (CET3/4) and additional monitoring output OUT on X 2.3

Wiring diagram C

Plug connector (view of connection side)	Pin	Designation	Function	Wire color of connection cable 1)
	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U _B	Operating voltage of AR electronics, 24 V DC	BN
	X 1.3	OA	Safety output channel A	GN
	X 1.4	OB	Safety output channel B	YE
	X 1.5	OUT	Monitoring output	GY
	X 1.6	IA	Enable input for channel A	PK
	X 1.7	0 V U _B	Operating voltage of AR electronics, 0 V	BU
	X 1.8	RST	Reset input	RD
	X 2.1	0 V U _{CM}	Operating voltage of guard locking solenoid 0 V	BN
	X 2.2	OUT D	Door monitoring output (indication on LED 2)	WH
	X 2.3	OUT	Monitoring output	BU
	X 2.4	U _{CM}	Operating voltage of guard locking solenoid 24 V DC (indication on LED 1)	BK
	X 2.5	-	n.c.	GY

1) Only for standard EUCHNER connection cable

10.7. Connector assignment for safety switch CET-AR with plug connector M23 (RC18)

10.7.1. Version without door monitoring output (CET1/2)

Wiring diagram D

Plug connector (view of connection side)	Pin	Designation	Function	Wire color of connection cable 1)	
	1	U _{CM}	Operating voltage of guard locking solenoid, 24 V DC	VT	
	2	IA	Enable input for channel A	RD	
	3	IB	Enable input for channel B	GY	
	4	OA	Safety output channel A	RD/BU	
	5	OB	Safety output channel B	GN	
	6	U _B	Operating voltage of AR electronics, 24 V DC	BU	
	7	RST	Reset input	GY/PK	
	8	-	n.c.	GN/WH	
	9	-	n.c.	YE/WH	
	10	OUT	Monitoring output	GY/WH	
	11	-	n.c.	BK	
	12	FE	Function earth	GN/YE	
	13	J	Version with teach-in input: To teach-in a new actuator, connect to 24 V DC; leave open in normal operation. 2)		
		Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.		PK
		-	Version without feedback loop and without teach-in input: This connection must be connected to 0 V.		
	14	-	n.c.	BN/GY	
	15	LED 1	LED 1, red, freely configurable, 24 V DC	BN/YE	
	16	LED 2	LED 2, green, freely configurable, 24 V DC	BN/GN	
	17	-	n.c.	WH	
18	0 V U _{CM}	Operating voltage of guard locking solenoid 0 V	YE		
19	0 V U _B	Operating voltage of AR electronics, 0 V	BN		

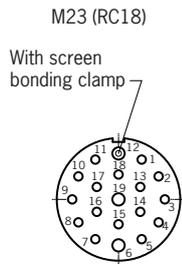
1) Only for standard EUCHNER connection cable

2) For single-channel control of the solenoid connect to 0 V U_{CM}

10.7.2. Version with door monitoring output (CET3/4)

Wiring diagram E

Plug connector (view of connection side)	Pin	Designation	Function	Wire color of connection cable 1)
	1	U_{CM}	Operating voltage of guard locking solenoid, 24 V DC	VT
	2	IA	Enable input for channel A	RD
	3	IB	Enable input for channel B	GY
	4	OA	Safety output channel A 	RD/BU
	5	OB	Safety output channel B 	GN
	6	U_B	Operating voltage of AR electronics, 24 V DC	BU
	7	RST	Reset input	GY/PK
	8	OUT D	Door monitoring output	GN/WH
	9	-	n.c.	YE/WH
	10	OUT	Monitoring output	GY/WH
	11	-	n.c.	BK
	12	FE	Function earth	GN/YE
		J	Version with teach-in input: To teach-in a new actuator, connect to 24 V DC; leave open in normal operation.	
	13	Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.	PK
		-	Version without feedback loop and without teach-in input: This connection must be connected to 0 V.	
	14	-	n.c.	BN/GY
	15	LED 1	LED 1, red, freely configurable, 24 V DC	BN/YE
	16	LED 2	LED 2, green, freely configurable, 24 V DC	BN/GN
	17	-	n.c.	WH
	18	0 V U_{CM}	Operating voltage of guard locking solenoid 0 V	YE
	19	0 V U_B	Operating voltage of AR electronics, 0 V	BN



1) Only for standard EUCHNER connection cable

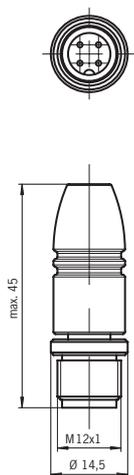
10.8. Pin assignment for Y-distributor

(only for version with plug connectors 2 x M12)

Connector assignment for
safety switch CET-AR
(plug X1, 8-pin plug)
and
Y-distributor (8-pin socket)

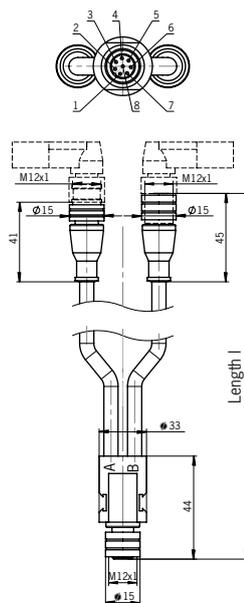
Pin	Function
X1.1	IB
X1.2	U _B
X1.3	OA
X1.4	OB
X1.5	OUT/DIA
X1.6	IA
X1.7	0 V
X1.8	RST

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

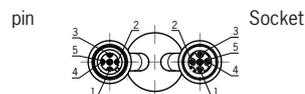


Y-distributor with connecting
cable
111696 or 112395

Socket

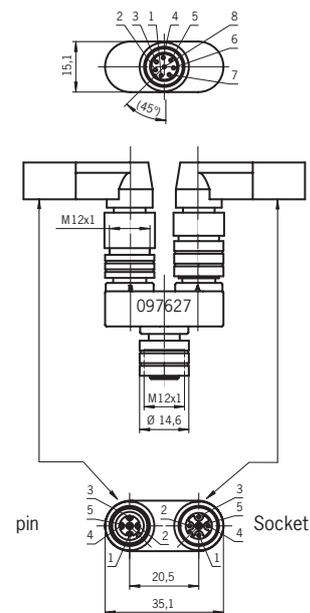


Order no.	Length l [mm]
111696	200
112395	1000



Y-distributor
097627

Socket



Pin	Function	Pin	Function
X2.1	U _B	X3.1	U _B
X2.2	OA	X3.2	IA
X2.3	0 V	X3.3	0 V
X2.4	OB	X3.4	IB
X2.5	RST	X3.5	RST

10.9. Connection of a single CET-AR

If a single CET-AR is used, connect the device as shown in *Figure 4*, for example. The monitoring outputs can be routed to a control system.

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 s.



WARNING

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

▸ To ensure safety, both safety outputs (OA and OB) must always be evaluated.



Important!

▸ The example shows only an excerpt that is relevant for connection of the CET 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."

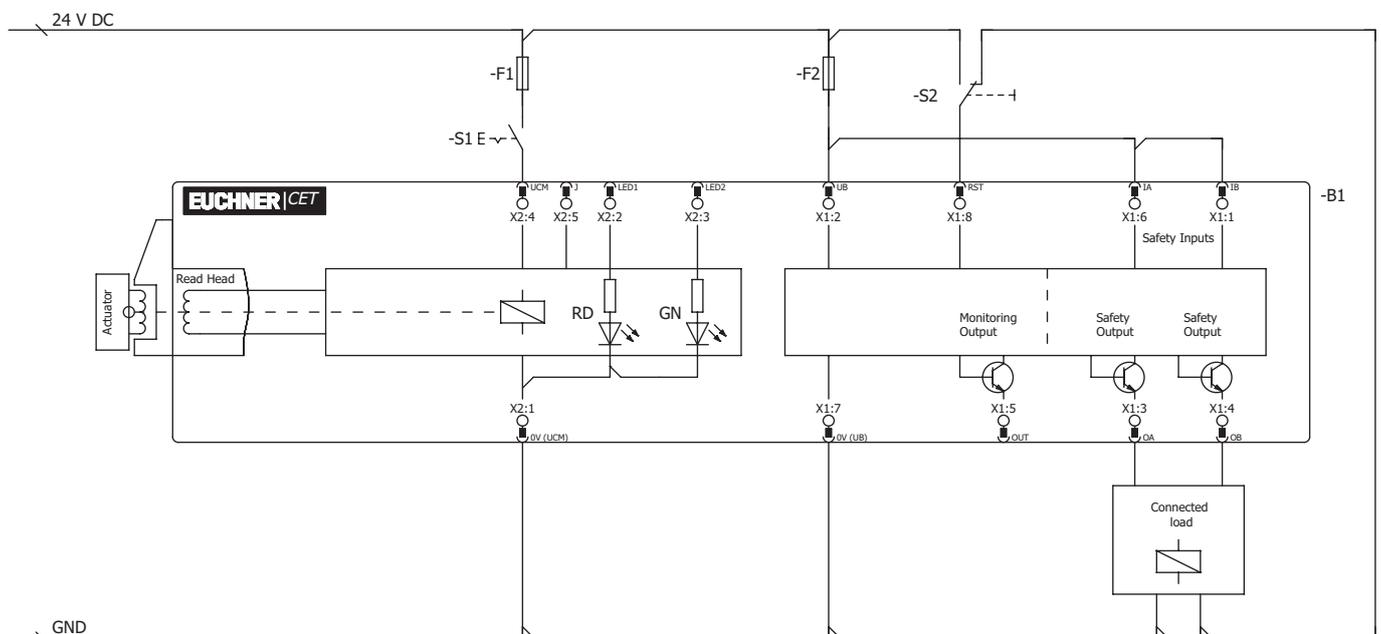


Figure 4: CET1/2-AR with plug connectors 2 x M12 and teach-in input (wiring diagram A)

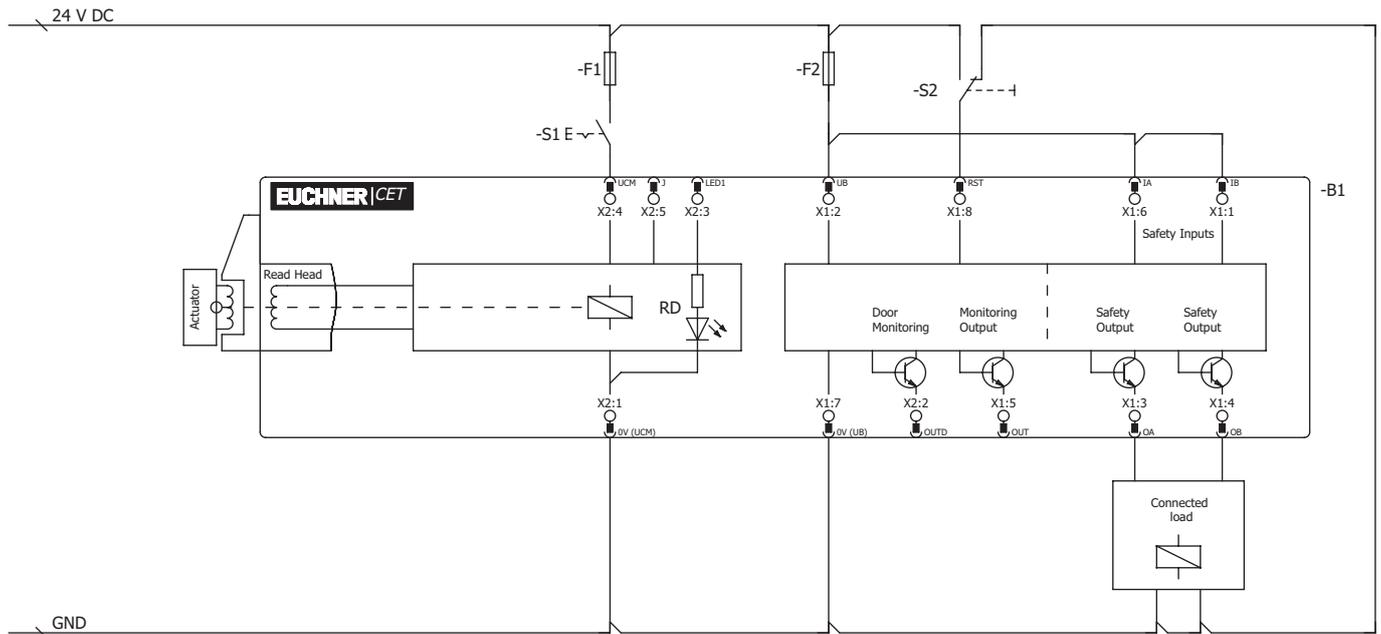


Figure 5: CET3/4-AR with plug connectors 2 x M12 and teach-in input (wiring diagram B)

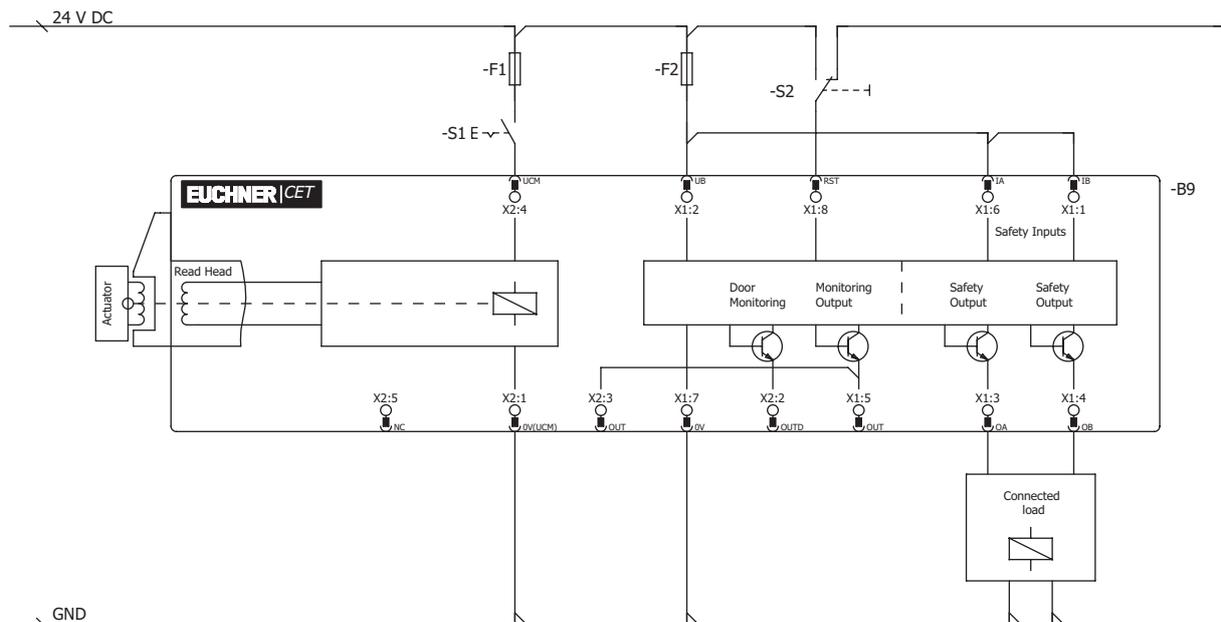


Figure 6: CET3/4-AR with plug connectors 2 x M12, teach-in input and monitoring output OUT (wiring diagram C)

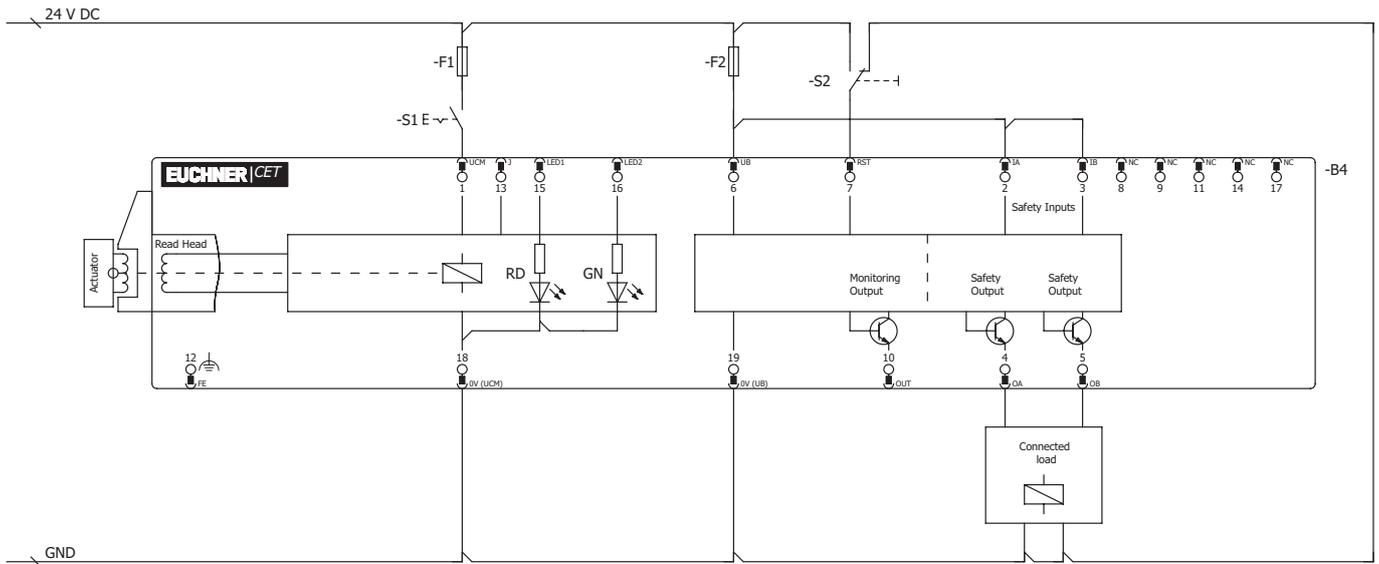


Figure 7: CET1/2-AR with plug connector M23 and teach-in input (wiring diagram D)

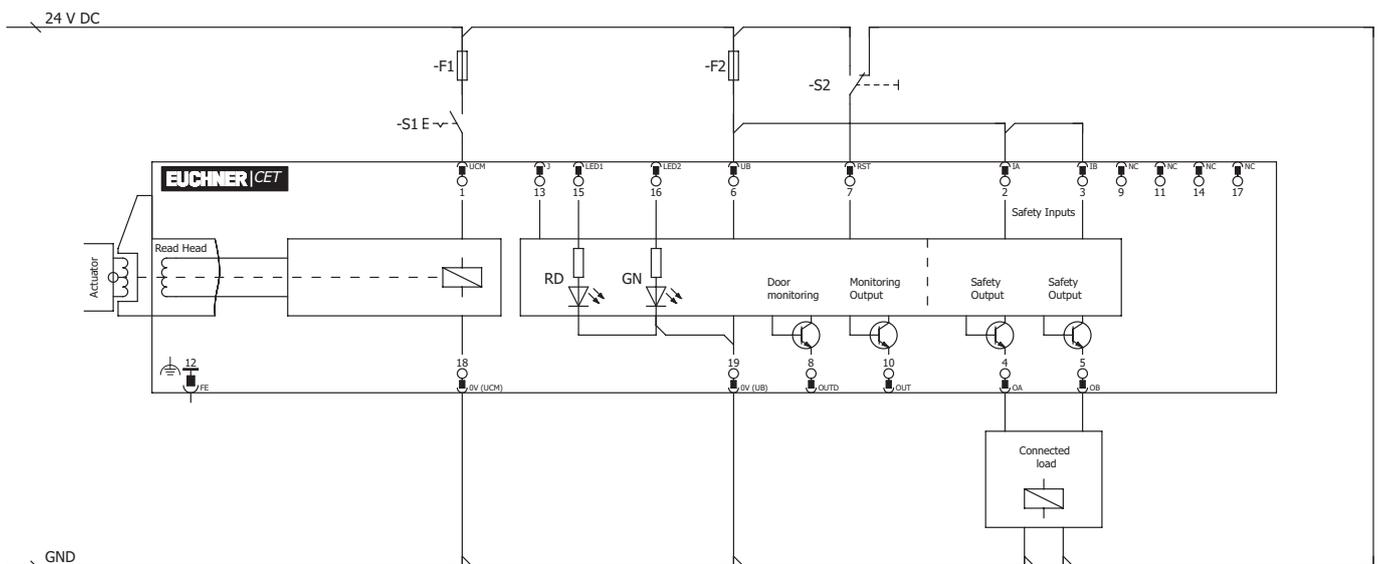


Figure 8: Connection example for CET3/4-AR with plug connector M23 and teach-in input (wiring diagram E)

10.10. Connection of several CET-AR in a switch chain



Important!

- › An AR switch chain may contain a maximum of 20 safety switches.
- › The subsystem CET-AR complies with PL e in accordance with EN 13849-1.
- › On the use of the CET-AR with feedback loop/start button, this must be in the last position in the switch chain (see *Figure 9 on page 30*).
- › The example shows only an excerpt that is relevant for connection of the CET 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 under "Downloads."
- › For information about the safety assessment for AR switch chains, see chapter 3. *Description of the safety function on page 6*.

The series connection is shown here based on the example of the version with plug connectors 2 x M12. The series connection of the version with plug connector M23 (RC18) has similar behavior, but is realized using additional terminals in a control cabinet.

The switches in the version with plug connectors 2 x M12 are connected one after the other with the aid of pre-assembled connection cables and Y-distributors. If a guard 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 guard is open or on which switch a fault has occurred with this connection technology.

The safety outputs  are permanently assigned to the respective safety inputs of the downstream switch. OA must be connected to IA and OB to IB. If the connections are interchanged (e.g. OA to IB), the device will enter the fault state.

Always use the RST input in series connections. All switches in a chain can be reset at the same time with this reset input. To do this, a voltage of 24 V must be applied to the RST input for at least 3 s. If input RST is not used in your application, it should be connected to 0 V.

Note the following on this aspect:

- › A common signal must be used for all switches in the chain. This can be a changeover switch or the output of a control system. A pushbutton is not suitable, because Reset must always be connected to GND during operation (see switch S11 in *Figure 9 on page 30*).
- › Reset must always be performed simultaneously for all switches of the chain.

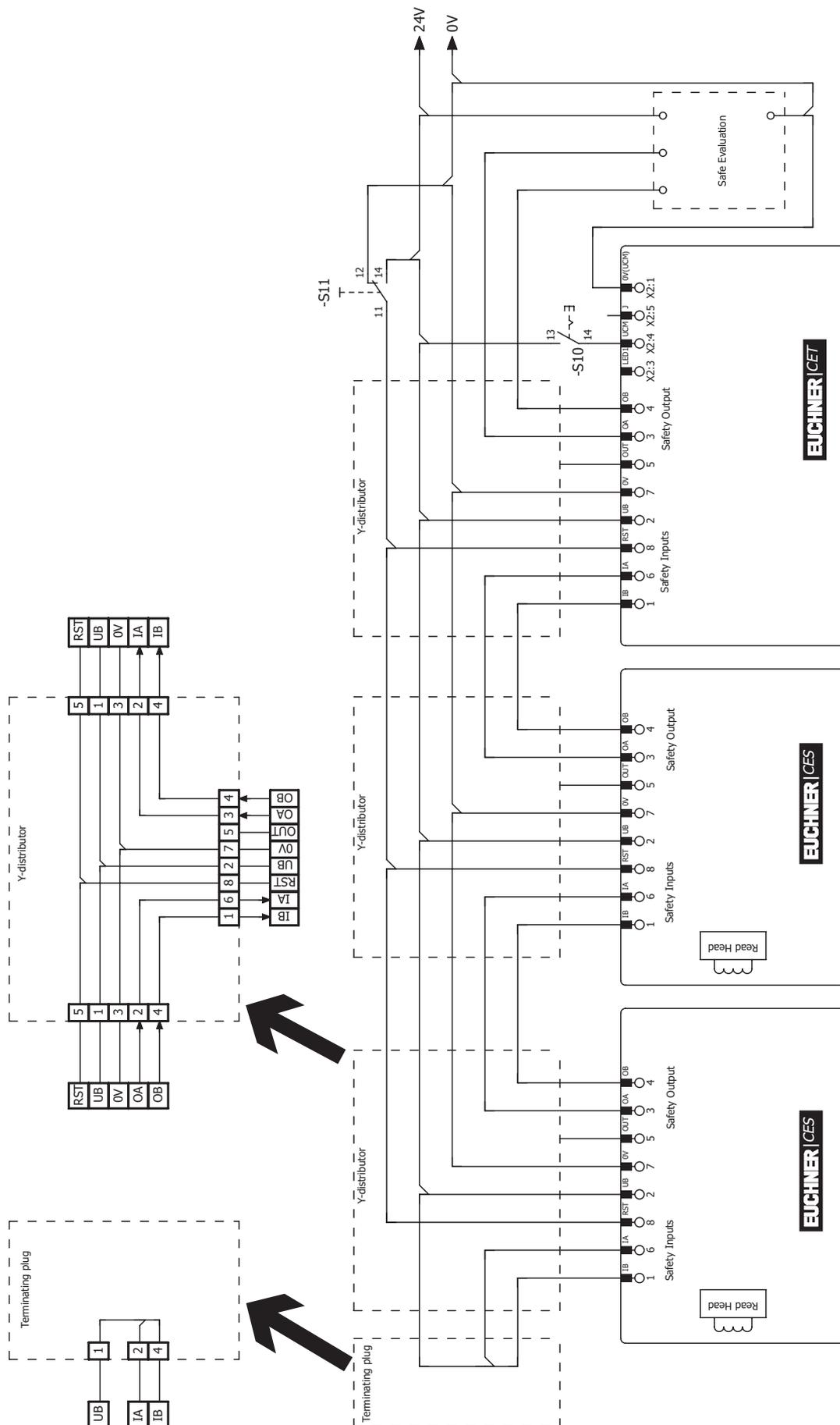


Figure 9: Connection example for operation in a CES-AR switch chain

10.11. Information on operation on an AR evaluation unit

The following devices can be operated on an AR evaluation unit.

Device	Version number
CET1/2	from V1.1.2
CET3/4	from V1.0.0



Important!

Devices with start button and feedback loop are not suitable for operation on an AR evaluation unit.

Please refer to the operating instructions for the relevant AR evaluation unit for more information. Devices that do not have a version number yet are not suitable for this.

Devices without door monitoring output (CET1/2) each occupy one monitoring output on the AR evaluation unit (HIGH with active guard locking).

Devices with door monitoring output (CET3/4) each occupy two monitoring outputs on the AR evaluation unit. The first monitoring output signals the position of guard locking (HIGH when guard locking is active). The second monitoring output signals the position of the guard (HIGH when the guard is closed).

10.12. 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 .
- If the supply voltage is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- For CET 1/2: A pulsed power supply must not be used for U_{CM} .
From version V1.5.0 the following applies: The device tolerates voltage interruptions on U_{CM} of up to 4 ms.
- The following applies to CET3/4 from version V1.5.2: The device tolerates voltage interruptions on U_{CM} of up to 5 ms.
- Always connect inputs IA and IB directly to a power supply unit or to outputs OA and OB of another EUCHNER AR device (series connection). Pulsed signals must not be present at inputs IA and IB.
- The safety outputs (OA and OB) 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 13.1. *Technical data for safety switch CET.-AR... on page 38.*

Depending on the connection type, additional details must be observed. Refer to the following sections. The pin assignment of the individual connection types can be found in chapter 10.6. *Connector assignment for safety switch CET-AR with plug connectors 2 x M12 on page 22* and in chapter 10.7. *Connector assignment for safety switch CET-AR with plug connector M23 (RC18) on page 23.*

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 » CET. The features of the respective device are dealt with there in greater detail.

10.12.1. Particularities for version with plug connectors 2xM12, wiring diagrams A, B, and plug connector M23 (RC18), wiring diagram D and E

For two-channel control of the solenoid voltage by safe outputs of a control system, the following points must be observed:

- For devices with teach-in input J, the input must remain unconnected in normal operation.
- Operation is not permissible for devices with feedback loop/start button.
- Freely controllable LEDs are only allowed to be connected in parallel with the solenoid (i.e. the LED indicates whether the solenoid is energized).

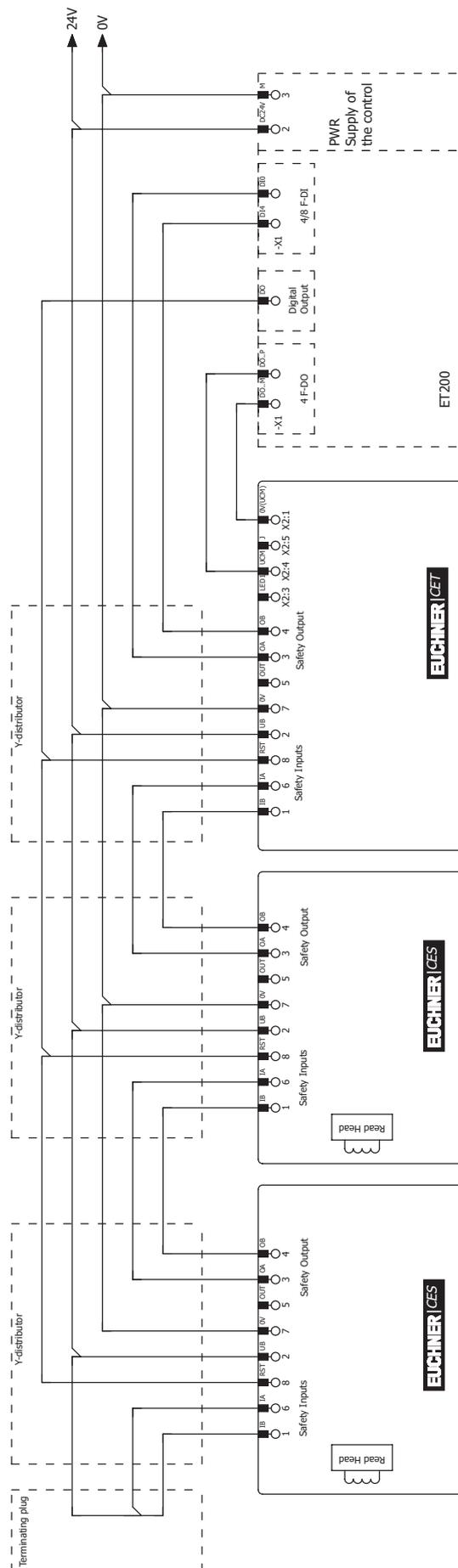


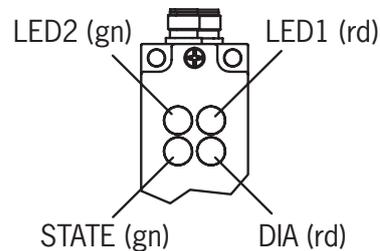
Figure 10: Connection example for mixed series connection (2 x CES and 1 x CET) to ET200

11. Setup

11.1. LED displays

You will find a detailed description of the signal functions in chapter 12. *System status table on page 37.*

LED	Color
STATE	green
DIA	red
LED 1	red
LED 2	green



NOTICE

- › With hard-wired LEDs the following applies:
 - LED1: red = Solenoid activated (voltage present at solenoid)
 - LED2: green = OUT D is switched on (door is closed)
- › Depending on version, the function of LED 1 and LED 2 can differ. Detailed information is available on the enclosed data sheet or at www.euchner.com. Simply enter the order number in the search box.

11.2. 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 OUT are switched off, i.e. the system is in the safe state.

Depending on the version, the teach-in operation is automatic or is undertaken with the aid of the teach-in input J.



Tip!

We recommend performing 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.
- › Version without teach-in input: After starting, the device remains in teach-in standby state for 3 min. If no new actuator is detected in this time, the device changes to normal operation. 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.
- › Versions with teach-in input: Teach-in operation ends when the power supply to the teach-in input is interrupted, but no later than after 3 min. If no actuator was detected during this time, the device enters the fault state.
- › The actuator to be taught in is not activated if it is within the operating distance for less than 60 s.

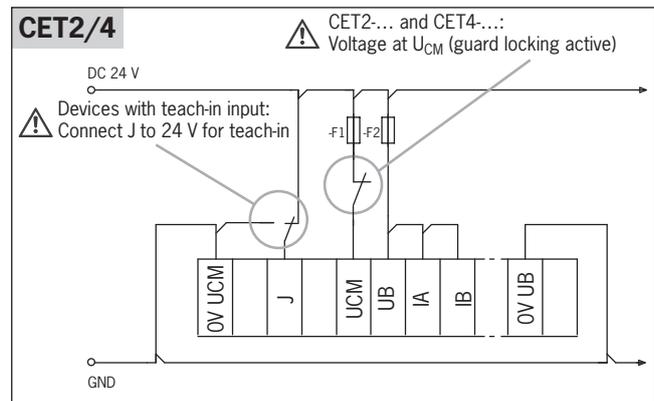
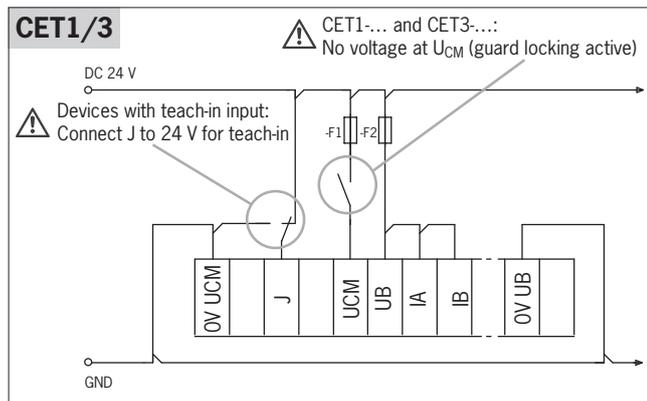
11.2.1. Preparing device for the teach-in operation and teaching in actuator

1. Connect the switch as shown below, but do not apply any voltage to U_B yet.

In case of version with teach-in input: For the teach-in standby state, the teach-in input J must be connected to +24 V DC.

In case of version without teach-in input: The circuit is the same, but connection J is omitted.

Observe different control of guard locking for CET1/3 and CET2/4.



2. Switch on operating voltage U_B .

- ➔ The green STATE LED flashes quickly (approx. 10 Hz). A self-test is performed during this time (approx. 10 s). After this, the green STATE 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 min.
- ➔ If the red DIA LED is illuminated, there is a fault. Teach-in is not possible. The green STATE LED indicates the error code. For diagnostics see section 12. *System status table on page 37.*

3. Activate guard locking.

CET1/3: No voltage at U_{CM} .

CET2/4: Voltage at U_{CM} .

4. Fully insert new actuator into the recess. Do not cant it; place it in the center of the recess (see picture on right).

- ➔ Teach-in operation starts, the green STATE LED flashes (approx. 1 Hz). The teach-in operation is completed after approx. 60 s, and the green STATE LED goes out.

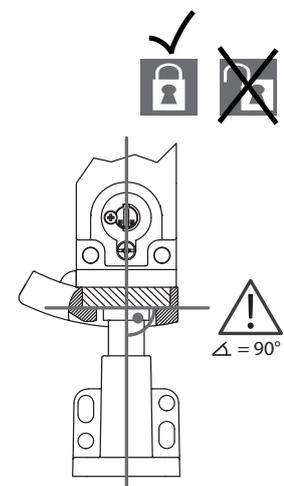
5. Switch off operating voltage U_B or use input RST (min. 3 s).

- ➔ The code of the actuator that was just taught in is activated in the safety switch.

6. In case of version with teach-in input: Disconnect the teach-in input from +24 V and leave open.

7. Switch on operating voltage U_B .

- ➔ The device operates normally.



11.2.2. Teach-in function with series connection, replacing and teaching in device

It is recommended not to teach in the actuators in the series connection but to teach them in one by one instead. Teach-in in a series connection works analogously to separate operation in principle. All switches in the chain can be taught in at the same time. The prerequisite is that the switch chain functions without problems and the following steps are followed. Further steps might have to be observed for mixed switch chains (e.g. for chains with CES and CET). Observe the operating instructions for the other devices in the chain for this purpose.

Work on the wiring (e.g. during device replacement) should generally be performed in a de-energized state. On certain systems, it is nevertheless necessary to perform this work and subsequent teach-in during ongoing operation.

Input RST must be connected as shown in *Figure 9 on page 30* to permit this.

Proceed as follows:

1. Open the guard on which the switch or actuator is to be replaced.
2. Mount the new switch or actuator and prepare it for the teach-in operation (see chapter 11.2.1. *Preparing device for the teach-in operation and teaching in actuator on page 34*).
3. Close all guards in the chain and activate guard locking.
4. Actuate the reset for at least 3 s (24 V on RST).
 - ➔ On the safety switch that is positioned at a new actuator, the green STATE LED flashes at approx. 1 Hz and the actuator is taught in. This takes approx. 1 min. Do not switch off during this time and do not actuate reset! The teach-in operation has ended when all LEDs on the device are off.
5. Actuate the reset for at least 3 s (24 V on RST).
 - ➔ The system restarts and then continues to function in normal operation.

11.3. 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.

11.3.1. Mechanical function test

The actuator must slide easily into the recess on the actuating head. Close the guard several times to check the function. For devices with mechanical release (emergency unlocking or escape release), the correct function of the release must be checked as well.

11.3.2. 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 10 s at 10 Hz. The green STATE LED then flashes at regular intervals.
2. Close all guards. Guard locking by solenoid force: activate guard locking.
 - ➔ The machine must not start automatically. It must not be possible to open the guard.
 - ➔ The green STATE LED illuminates continuously.
3. Enable operation in the control system.
 - ➔ It must not be possible to deactivate guard locking as long as operation is enabled.
4. Disable operation in the control system and deactivate guard locking.
 - ➔ The guard must remain locked until there is no longer any risk of injury.
 - ➔ It must not be possible to start the machine as long as the guard locking is deactivated.

Repeat steps 2 - 4 for each guard.

12. System status table

Operating mode	Actuator/door position	Safety outputs OA and OB 	Monitoring output OUT	Door monitoring output OUT D (only CET3 and CET4)	LED indicator Output		State
					STATE (green)	DIA (red)	
Self-test	X	off	off	off	 10 Hz (10 s)	○	Self-test after power-up
Normal operation	closed	on	on	on		○	Normal operation, door closed and locked
	closed	off	on	on	 1 x in-verse	○	Normal operation, door closed and locked, safety outputs not switched because: - Preceding device in the switch chain signals "door open" (only with series connection) - Feedback loop/start button not closed (if fitted)
	closed	off	off	on	 1 x	○	Normal operation, door closed and not locked
	open	off	off	off	 1 x	○	Normal operation, door open
Teach-in operation (only unicode)	open	off	off	off	 3 x	○	Door open, device is ready for teach-in for a new actuator (only short time after power-up)
	closed	off	off	off	 1 Hz	○	Teach-in operation
	X	off	off	off	○	 1 x	Acknowledgment after successful teach-in operation (DIA flashes once, no repetition)
Fault display	X	off	off	off	 1 x		Fault in teach-in operation (only unicode) For autom. teach-in: - Actuator removed from the operating distance prior to the end of the teach-in operation For teach-in input: - Actuator removed from the operating distance prior to the end of the teach-in operation - Disabled actuator within the operating distance - Most recently taught in actuators within the operating distance - No actuator detected after 3 min.
	X	off	off	off	 2 x		Input fault (e.g. missing test pulses, illogical switch state from previous switch in the switch chain)
	X	off	off	off	 3 x		Actuator faulty
	X	off	off	off	 4 x		Output fault (e.g. short circuits, loss of switching ability)
	X	off	off	off	 5 x		Internal fault (e.g. component faulty, data error or impermissible pulsing on U _B)
	X	off	off	off	X	X	Internal error
Key to symbols	○						LED not illuminated
							LED illuminated
	 10 Hz (10 s)						LED flashes for 10 s at 10 Hz
	 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, use the reset function or 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.

13. Technical data



NOTICE

If a product data sheet is included with the product, the information on the data sheet applies in case of discrepancies with the operating instructions.

13.1. Technical data for safety switch CET.-AR-...

Parameter	Value			Unit
	min.	typ.	max.	
General				
Material, ramp	Stainless steel			
Material, safety switch housing	Die-cast aluminum			
Installation position	Any (recommendation: switch head downward)			
Degree of protection with plug connector M12 with plug connector M23 (RC18)	IP 67			
	IP65/IP67 (screwed tight with the related mating connector)			
Safety class	III			
Degree of contamination	3			
Mechanical life	1 x 10 ⁶ operating cycles			
Ambient temperature	-20	-	+55	°C
Actuator approach speed, max.	20			m/min
Locking force F _{max}	6,500			N
Locking force F _{Zh} acc. to GS-ET-19	F _{Zh} = F _{max} /1.3 = 5,000			N
Weight	Approx. 1.0			kg
Degrees of freedom (actuator in recess) X, Y, Z	X, Y ± 5; Z ± 4			mm
Connection type (depending on version)	2 plug connectors M12, 5- and 8-pin 1 plug connector M23 (RC18), 19-pin			
Operating voltage U _B (reverse polarity protected, regulated, residual ripple < 5%)	24 ± 15% (PELV)			V DC
Current consumption I _B	80			mA
External fuse (operating voltage U _B)	0.25	-	2	A
External fuse (solenoid operating voltage U _{CM})	0.5	-	8	A
Rated insulation voltage U _i	-	-	75	V
Conditional short-circuit current	100			A
Resilience to vibration	Acc. to EN 60947-5-2			
EMC protection requirements	Acc. to EN IEC 60947-5-3			
Ready delay	-	-	10	s
Risk time for single device	-	-	400	ms
Runtime extension per device	-	-	5	ms
Switch-on time	-	-	400	ms
Discrepancy time	-	-	10	ms
Test-pulse duration	-	-	1	ms
Safety outputs OA/OB Semiconductor outputs, p-switching, short circuit-proof				
- Output voltage U _{OA} /U _{OB} ¹⁾				
HIGH U _{OA} /U _{OB}	U _B - 1.5	-	U _B	V DC
LOW U _{OA} /U _{OB}	0	-	1	
Switching current per safety output	1	-	200	mA
Utilization category acc. to EN 60947-5-2	DC-13 24V 200mA Caution: outputs must be protected with a free-wheeling diode in case of inductive loads			
Switching frequency	0.5			Hz
Monitoring outputs OUT and OUT D (optional) p-switching, short circuit-proof				
Output voltage	0.8 x U _B	-	U _B	V DC
Max. load	-	-	50	mA
Teach-in input J or feedback loop input Y				
HIGH	15	-	26.4	V
LOW	0	-	1	
Solenoid				
Solenoid operating voltage U _{CM} (reverse polarity protected, regulated, residual ripple < 5%)	DC 24 V +10%/-15%			
Solenoid current consumption I _{CM}	480			mA
Power consumption	Max. 12			W
Duty cycle	100			%
Freely configurable LEDs ²⁾ LED1 red, LED2 green				
Operating voltage	20.4	-	26.4	V DC
Reliability values acc. to EN ISO 13849-1				
Mission time	20		20	years
Monitoring of guard locking and the guard position				
Category	Head downward or horizontal		Head upward	
Performance Level (PL)	4		3	
PFH _D	e		e	
	3.1 x 10 ⁻⁹ /h		4.29 x 10 ⁻⁸ /h	
Activation of guard locking				
Category	Depends on external control			
Performance Level (PL)				
PFH _D				

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

2) Can vary depending on version. See data sheet.

13.1.1. 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 guard is locked to the moment when the safety outputs switch on.

Simultaneity monitoring, safety inputs IA/IB: If the safety inputs have different switching states for longer than a certain time, the safety outputs \square (OA and OB) 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 \square (OA and OB) are deactivated at the latest after the risk time.

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:

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

t_r = Total risk time

$t_{r,e}$ = Risk time of single device (see chapter 13. Technical data on page 38)

t_i = Runtime extension per device (see chapter 13. Technical data on page 38)

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

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

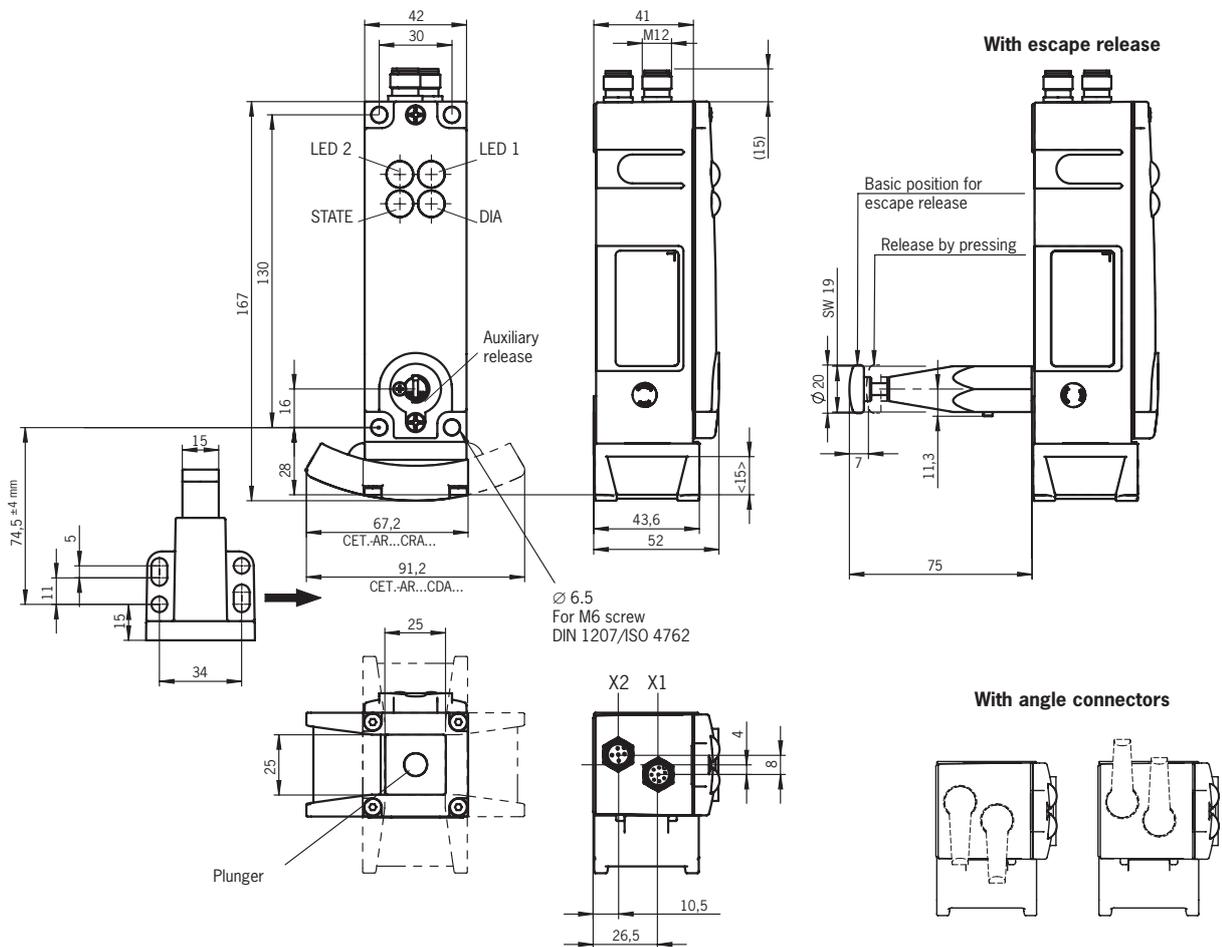
Test pulses at the safety outputs: The device generates its own test pulses on the safety outputs \square (OA and OB). A downstream control system must tolerate these test pulses.

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.

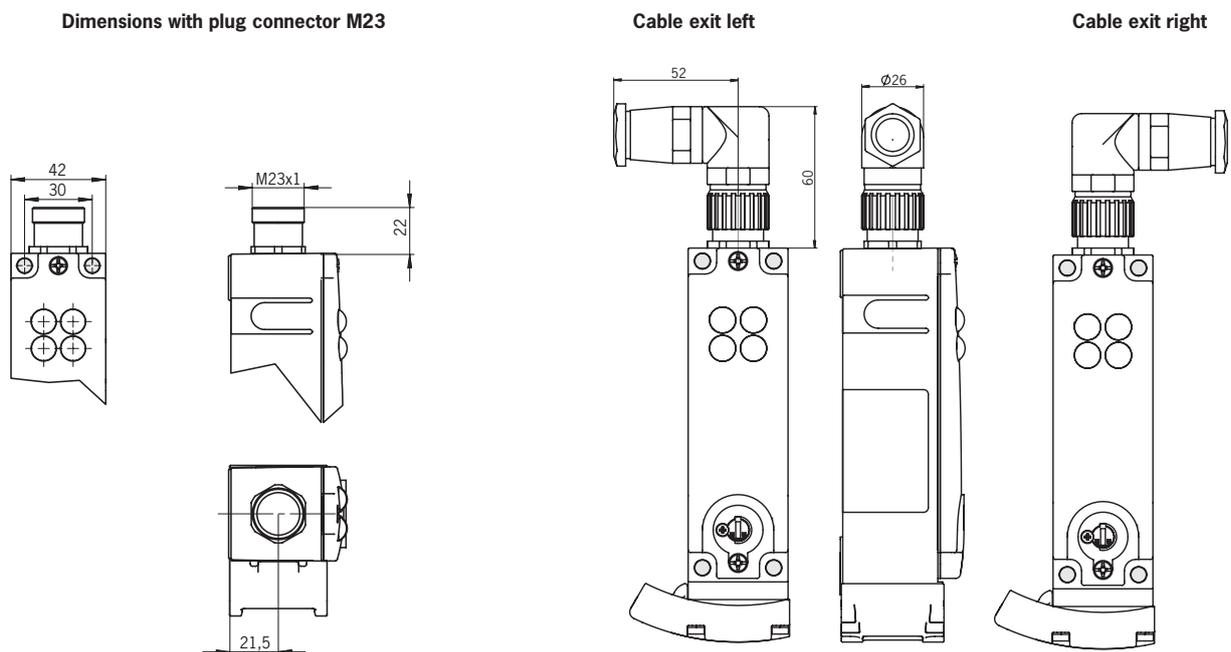
The test pulses are also output when the safety outputs are switched off.

13.2. Dimension drawing for safety switch CET.-AR-...

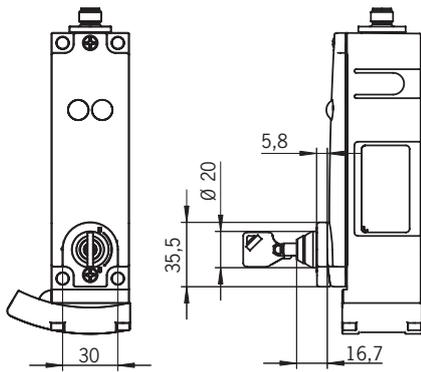
Version with plug connectors 2 x M12



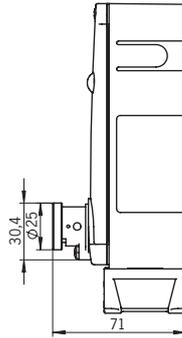
Version with plug connector M23 (RC18)



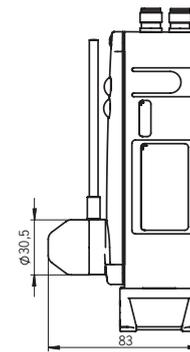
With auxiliary key release



With emergency unlocking



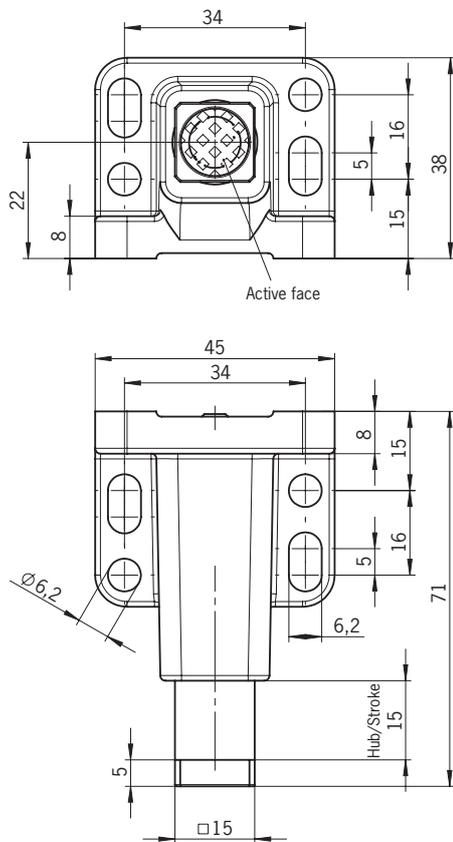
With wire front release



13.3. Technical data for actuator CET-A-B...

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Stainless steel			
Stroke, max.	15			mm
Weight	0.25			kg
Ambient temperature	- 20	-	+ 55	°C
Degree of protection	IP 67			
Mechanical life	1 x 10 ⁶ operating cycles			
Locking force, max.	6,500			N
Installation position	Active face opposite switch head			
Power supply	Inductive via switch			

13.3.1. Dimension drawing for actuator CET-A-BWK-50X



NOTICE

- › Four safety screw M5 x16 are included with the actuator.
- › All four safety screws must always be used.

14. 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."

15. 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 11.3. *Functional check on page 36*)
- › Check all additional functions (e.g. escape release, lockout bar, etc.)
- › 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 lower right corner of the type label. The current version number in the format (V X.X.X) can also be found on the device.

16. 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

17. Declaration of conformity



EUCHNER

More than safety.

EU-Konformitätserklärung
EU declaration of conformity
Déclaration UE de conformité
Dichiarazione di conformità UE
Declaración UE de conformidad

Original DE
Translation EN
Traduction FR
Traduzione IT
Traducción ES

2110802-10-01/17

Die nachfolgend aufgeführten Produkte sind konform mit den Anforderungen der folgenden Richtlinien (falls zutreffend):
The beneath listed products are in conformity with the requirements of the following directives (if applicable):
Les produits mentionnés ci-dessous sont conformes aux exigences imposées par les directives suivantes (si valable)
I prodotti sotto elencati sono conformi alle direttive sotto riportate (dove applicabili):
Los productos listados a continuación son conforme a los requisitos de las siguientes directivas (si fueran aplicables):

I:	Maschinenrichtlinie	2006/42/EG	
	Machinery directive	2006/42/EC	
	Directive Machines	2006/42/CE	
	Direttiva Macchine	2006/42/CE	
	Directiva de máquinas	2006/42/CE	
II:	Funkanlagen-Richtlinie (RTTE / RED)	1999/5/EC bis 2017-06-12	2014/53/EU ab 2017-06-13
	Radio equipment directive	1999/5/EC until 2017-06-12	2014/53/EU from 2017-06-13
	Directive équipement radioélectrique	1999/5/CE	2014/53/UE
	Direttiva apparecchiatura radio	1999/5/CE	2014/53/UE
	Directiva equipo radioeléctrico	1999/5/CE	2014/53/UE
III:	RoHS Richtlinie	2011/65/EU	
	RoHS directive	2011/65/EU	
	Directive de RoHS	2011/65/UE	
	Direttiva RoHS	2011/65/UE	
	Directiva RoHS	2011/65/UE	

Die Schutzziele der Niederspannungsrichtlinie 2014/35/EU und EMV Richtlinie 2014/30/EU werden gemäß Artikel 3.1 der Funkanlagen-Richtlinie eingehalten.

The safety objectives of the Low-voltage directive 2014/35/EU and EMC Directive 2014/30/EU comply with article 3.1 of the Radio equipment directive.

Les objectifs de sécurité de la Directive basse tension 2014/35/UE et Directive de CEM 2014/30/UE sont conformes à l'article 3.1 de la Directive équipement radioélectrique.

Gli obiettivi di sicurezza della Direttiva bassa tensione 2014/35/UE e Direttiva CEM 2014/30/UE sono conformi a quanto riportato nell'articolo 3.1 della Direttiva apparecchiatura radio.

Los objetivos de seguridad de la Directiva de bajo voltaje 2014/35/UE y Directiva CEM 2014/30/UE cumplen con el artículo 3.1 de la Directiva equipo radioeléctrico.

Folgende Normen sind angewandt:	a:	EN 60947-5-3:2013
Following standards are used:	b:	EN ISO 14119:2013
Les normes suivantes sont appliquées:	c:	EN ISO 13849-1:2015
Vengono applicate le seguenti norme:	d:	EN 62026-2:2013 (ASi)
Se utilizan los siguientes estándares:	e:	EN 50581:2012 (RoHS)
	f:	EN 50364:2010
	g:	EN 300 330-2 V1.6.1

Bezeichnung der Sicherheitsbauteile	Type	Richtlinie	Normen	Zertifikats-Nr.
Description of safety components	Type	Directives	Standards	No. of certificate
Description des composants sécurité	Type	Directive	Normes	Numéro du certificat
Descrizione dei componenti di sicurezza	Tipo	Direttiva	Norme	Numero del certificato
Descripción de componentes de seguridad	Typo	Directivas	Estándares	Número del certificado
Sicherheitsschalter	CET1-AR...	I, II, III	a, b, c, e, f, g	UQS 117149
Safety Switches	CET2-AR...			
Interrupteurs de sécurité	CET3-AP...	I, II, III	a, b, c, e, f, g	UQS 122248
Fincorsa di sicurezza	CET3-AR...			
Interruptores de seguridad	CET4-AP...			
	CET4-AR...			
	CET3-AS...	I, II, III	a, b, c, d, e, f, g	UQS 113400
	CET4-AS...	I, II, III	a, b, c, d, e, f, g	UQS 113971
Betätiger				
Actuator				
Actionneur	CET-A-BW...	I, II, III	a, b, c, e, f, g	UQS 122248
Azionatore				
Actuador				

Genehmigung der umfassenden Qualitätssicherung (UQS) durch die benannte Stelle 0035
Approval of the full quality assurance system by the notified body 0035
Approbation du système d'assurance qualité complet par l'organisme notifié 0035
Approvazione del sistema di garanzia di qualità totale da parte dell'organismo notificato 0035
Aprobación del sistema de aseguramiento de calidad total por parte del organismo 0035 notificado

TÜV Rheinland Industrie Service GmbH
Alboinstr. 56
12103 Berlin
Germany



EUCHNER

More than safety.

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller:
This declaration of conformity is issued under the sole responsibility of the manufacturer:
La présente déclaration de conformité est établie sous la seule responsabilité du fabricant:
La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante:
La presente declaración de conformidad se expide bajo la exclusiva responsabilidad del fabricante:

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

i.A. Dipl.-Ing. Richard Holz
Leiter Elektronik-Entwicklung
Manager Electronic Development
Responsable Développement Électronique
Direttore Sviluppo Elettronica
Director de desarrollo electrónico

i.A. Dipl.-Ing.(FH) Duc Binh Nguyen
Dokumentationsbevollmächtigter
Documentation manager
Responsable documentation
Responsabilità della documentazione
Agente documenta

Leinfelden, Januar 2017

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

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

Edition:
2110788-12-07/18
Title:
Operating Instructions Transponder-Coded Safety Switch
CET-AR-...
(Translation of the original operating instructions)
Copyright:
© EUCHNER GmbH + Co. KG, 07/2018

Subject to technical modifications; no responsibility is accepted for the accuracy of this information.

Third-party trademark information:
SIMATIC ET200pro and ET200S are trademarks of SIEMENS AG.