EUCHNER

Operating Instructions

Transponder-Coded Safety Switch with Guard Locking

CET.-AR-... (Unicode/Multicode)

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Contents

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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 any enclosed data sheet form the complete user information for your device.

Version	System family	Version number
CET1/2	...-AR...	V 1.6.X
CET3/4		V 1.7.X

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
 **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 (2525460)	Basic safety information	
Operating instructions (2110788)	(this document)	
Declaration of conformity	Declaration of conformity	
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 document number or the order number for the device in the search box.

2. Correct use

Safety switches series CET-AR are interlocking devices with guard locking solenoid (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 must not be released 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
- EN ISO 12100
- IEC 62061

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

- EN ISO 13849-1
- EN ISO 14119
- EN 60204-1

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

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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 35*.

3. Description of the safety function

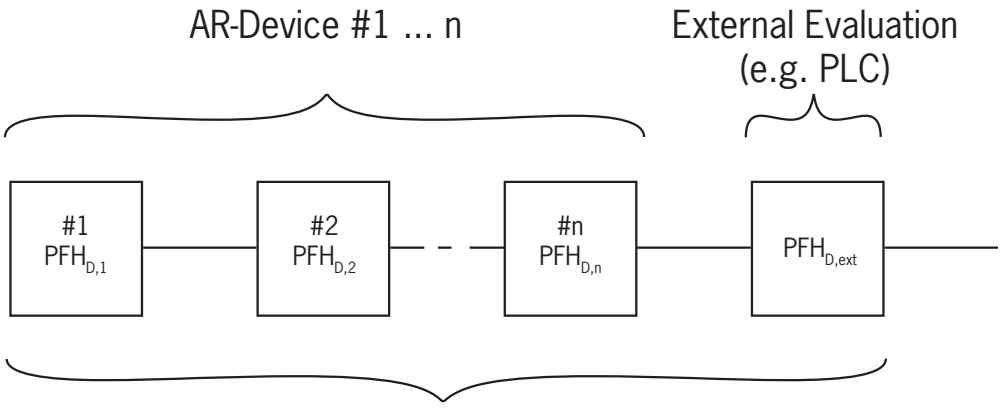
Devices from this series feature the following safety functions:

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 (prevention of inadvertent locking position (faulty closure protection)).
  - The following additionally applies in an AR series connection: the safety outputs are switched on 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 43*).

NOTICE

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



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

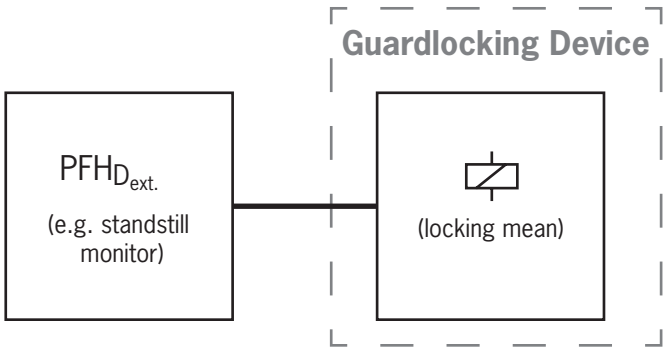
Alternatively, the simplified method according to section 6.3 of EN 13849-1:2015 can be used for calculation.

Control 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 control of 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 35*

4. Exclusion of liability and warranty

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

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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 safeguard 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 safeguard 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 operational safety and accident prevention.

Important!

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

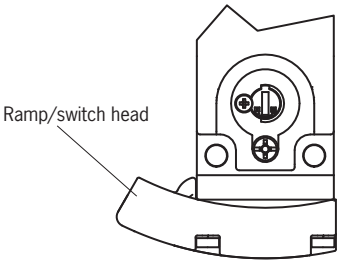
6. Function

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.

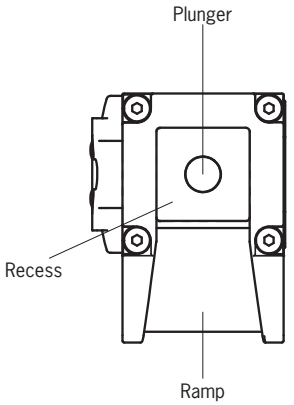
- **Devices with unicode evaluation**: The actuator must be assigned to the safety switch by a teach-in operation so that it is detected by the system. This unambiguous assignment ensures a particularly high level of protection against tampering. The system thus possesses a high coding level.
- **Devices 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 operating distance is reached, power is supplied to the actuator by the switch and data are transferred.

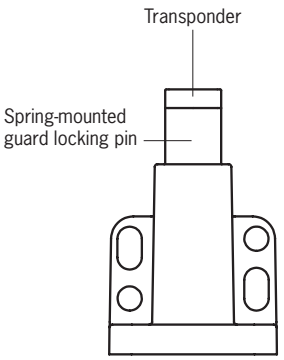
The safety outputs ⊣ are switched on when the locking pin is in the recess (state: door closed and locked) and a permissible code is detected.

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



Important!

- CET3 (closed-circuit current principle)
  The activation (>5 ms) 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 U_{CM} 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 35*.



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 lock 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 recognized.

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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 diagnostic output is switched on in the event of a fault (switch-on condition as for DIA LED, see chapter *12. System status table on page 41*).

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!

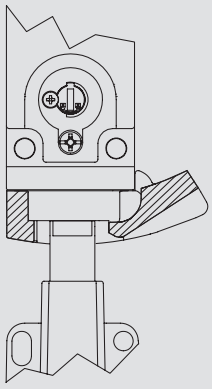
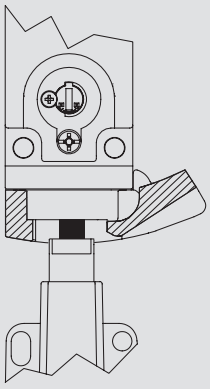
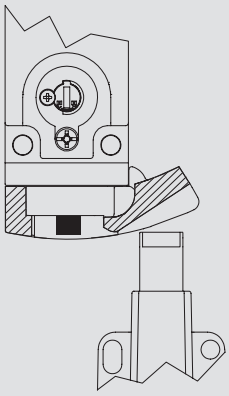
Faults on the start button or in the feedback loop are not detected. This can lead to unintentional automatic starting.

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 or the start button has no influence on this (see also chapter *12. System status table on page 41*).

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

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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 or the auxiliary key release irrespective of the state of the solenoid.

The safety outputs are switched off when the auxiliary release or auxiliary key 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 or auxiliary key release. The device will then operate normally again.

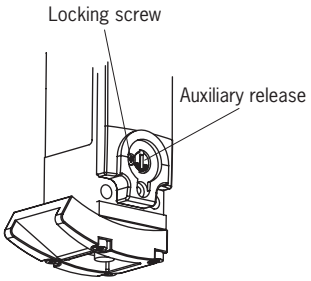
Important!

- 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 (with sealing lacquer, for example).
- To prevent tampering, the auxiliary release must be sealed (e.g. sealing lacquer) before the switch is set up.
- 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.
- Observe the notes on any enclosed data sheets.

7.1.1. Actuating auxiliary release

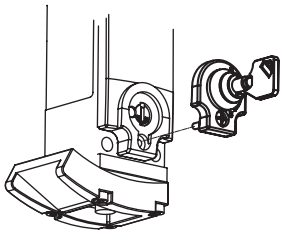
1. Unscrew locking screw.
2. Using a screwdriver, turn the auxiliary release to in the direction of the arrow.

➡ Guard locking is released.



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 release (can be retrofitted)

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

The safety outputs ⊣ are switched off when the emergency 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 emergency release. The device will then operate normally again.

Important!

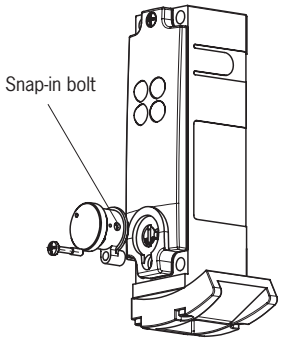
- It must be possible to operate the emergency release manually from outside the protected area without tools.
- The emergency release must possess a marking indicating that it may be used only in an emergency.
- The actuator must not be under tensile stress during manual release.
- The emergency release must be sealed or the misuse of the release function must be prevented in the control system.
- The release function meets all other requirements from EN ISO 14119.
- The emergency release 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.
- Observe the notes on any enclosed data sheets.

7.2.1. Actuating emergency release

Turn the emergency release 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 release back.



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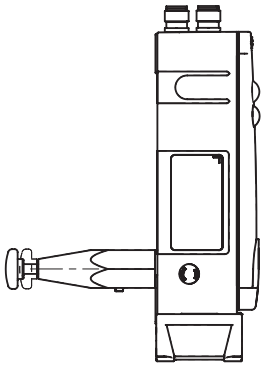
7.3. Escape release (optional)



This 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 45*).

The safety outputs ⊣P are switched off when the escape release is actuated. Use the safety outputs ⊣P 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.

ⓘ	**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.

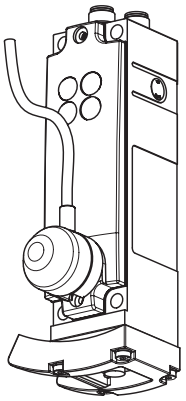
7.3.1. Actuating escape release

Press the red release knob to the stop.

➡ Guard locking is released.

Pull the knob out again to reset.

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 release or escape release.

The following applies to non-latching wire front releases:

If the release is to be used as an emergency release, 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, resetting can be realized at the control-system level by means of a plausibility check (status of the safety outputs does not match the guard locking control signal), for example.

The emergency-release 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 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.
- Please observe the notes on the enclosed data sheets.

8. Changing the approach direction

1. Remove the screws from the safety switch and take the head off the safety switch.
2. Place the ramp in the required approach direction.
3. Tighten the screws with a torque of 1.5 Nm.

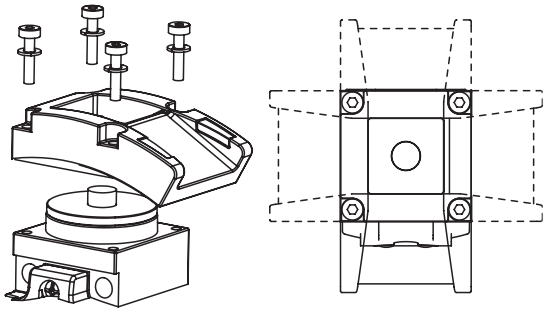


Fig. 1: Changing the approach direction

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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.

NOTICE

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

- Safety switches and actuators must not be used as an end stop.
- Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about mounting the safety switch and the actuator.
- 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 *Fig. 2*).
- 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.

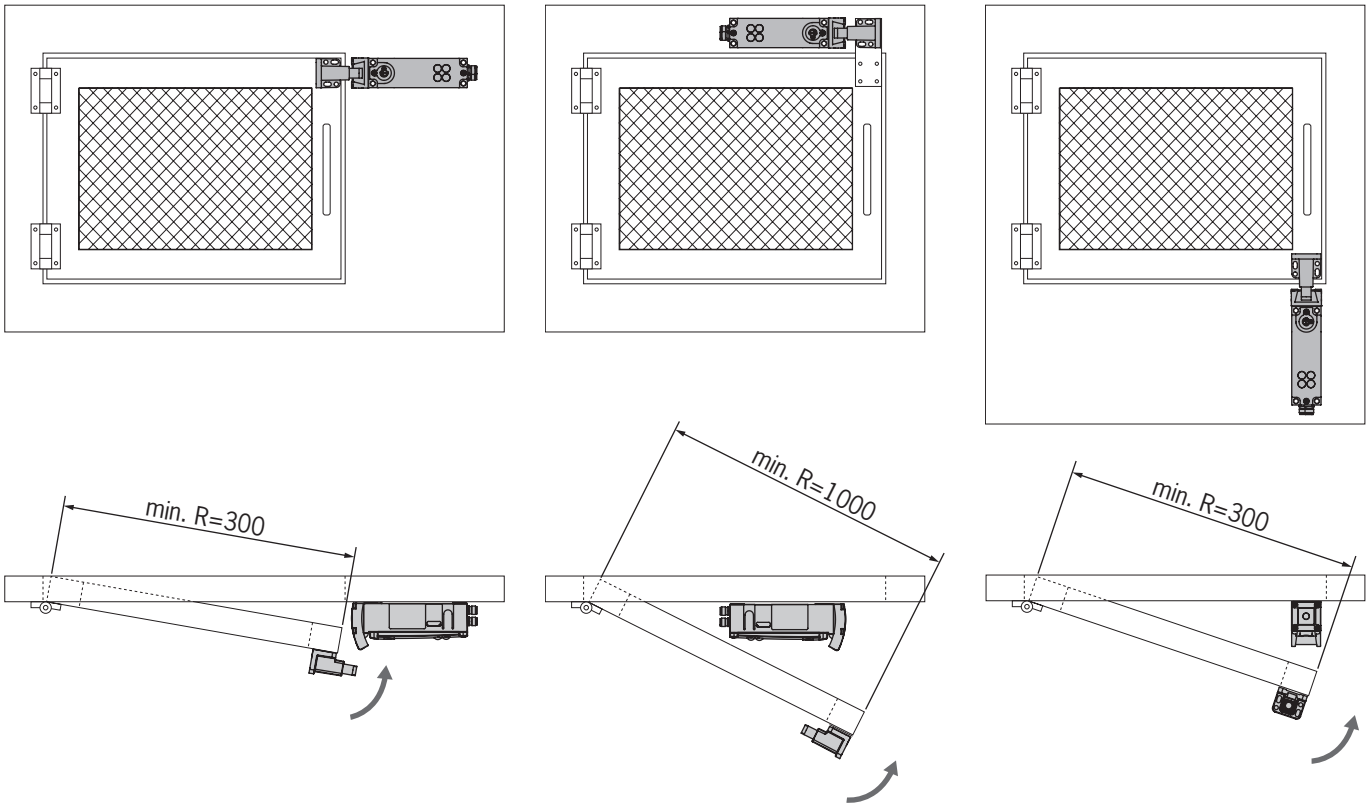
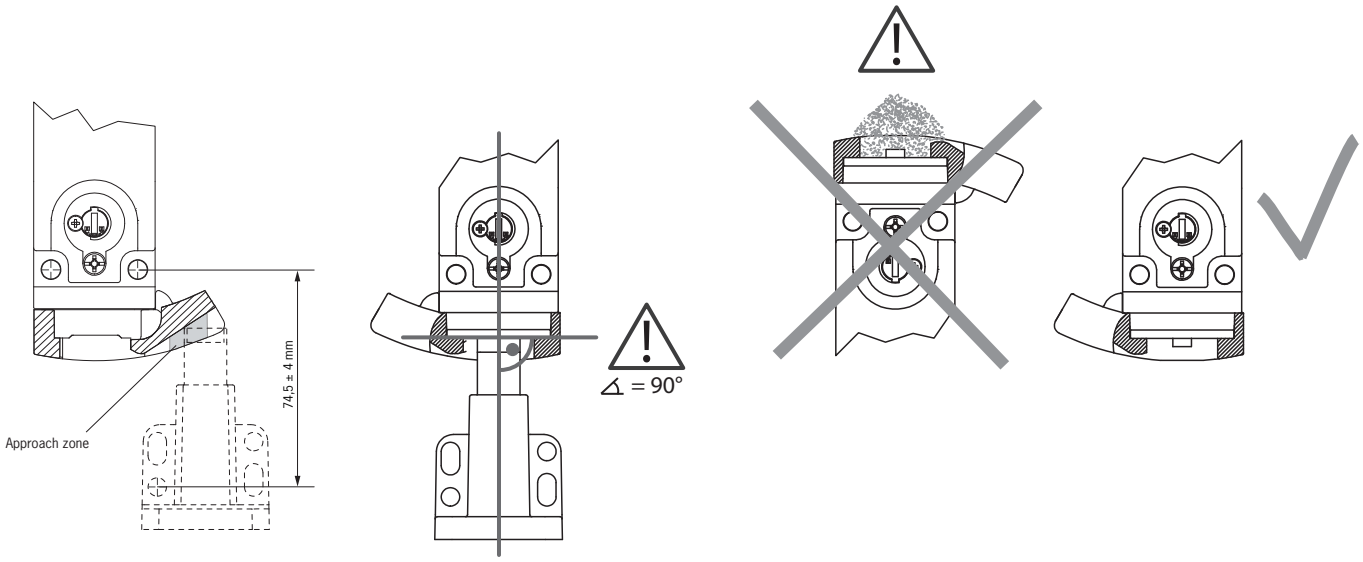


Fig. 2: Installation situation and door radii

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

In the event of a fault, 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 connecting 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 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. Test pulses are output on safety output OA 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 insulation 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.
  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 c UL us

Important!

- This device is intended to be used with a Class 2 power source in accordance with UL1310. As an alternative an LV/C (Limited Voltage/Current) power source with the following properties can be used:
  - This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 3.3 A and be installed in the max. 30 V DC power supply to the device in order to limit the available current to comply with the UL requirements. Please note possibly lower connection ratings for your device (refer to the technical data).
- For use and applications as per the c UL us requirements [1], a connecting 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 the 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} = Switch operating current (80 mA)

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

I_{OA+OB} = 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 Σ I_{max}

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

n = Number of connected switches

* only for version with door monitoring output

EN

10.4. Requirements for connecting cables

CAUTION

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

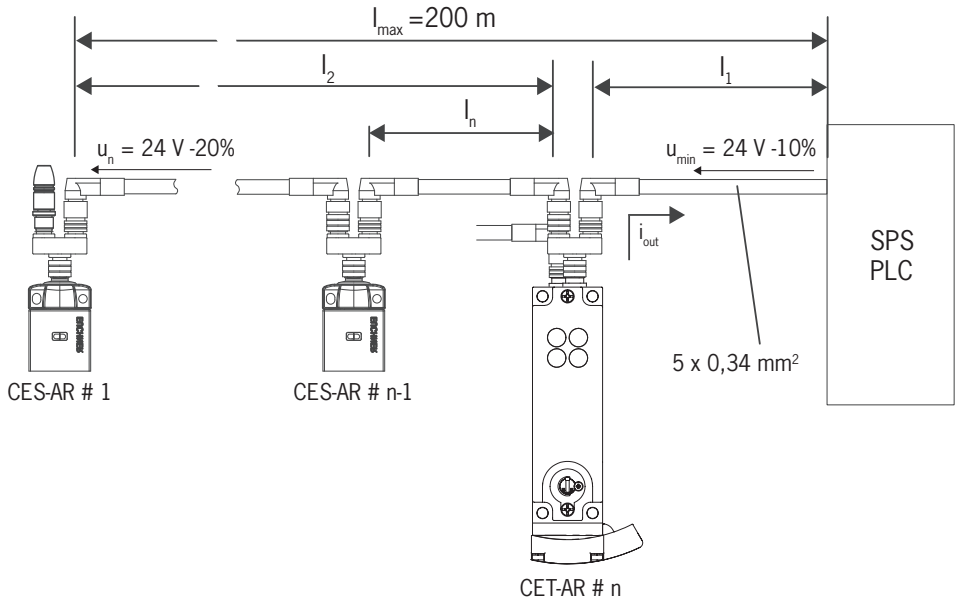
- Use connection components and connecting cables from EUCHNER.
- On the use of other connection components, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.

Observe the following requirements with respect to the connecting cables:

Parameter	Value					Unit
	M12 / 8-pin	M12 / 5-pin		M23 / 19-pin		
Recommended cable type	LIYY 8 x 0.25	LIYY 5 x 0.25	LIYY 5 x 0.34	LI9Y11Y 16 x 0.5 + 3 x 1.0		mm²
Cable	8 x 0.25	5 x 0.25	5 x 0.34	16 x 0.5	3 x 1.0	mm²
Cable resistance R max.	78	78	58	39	20	Ω/km
Inductance L max.	0.51	0.64	0.53	0.62	0.58	mH/km
Capacitance C max.	107	60	100	49	55	nF/km

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

EN

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.

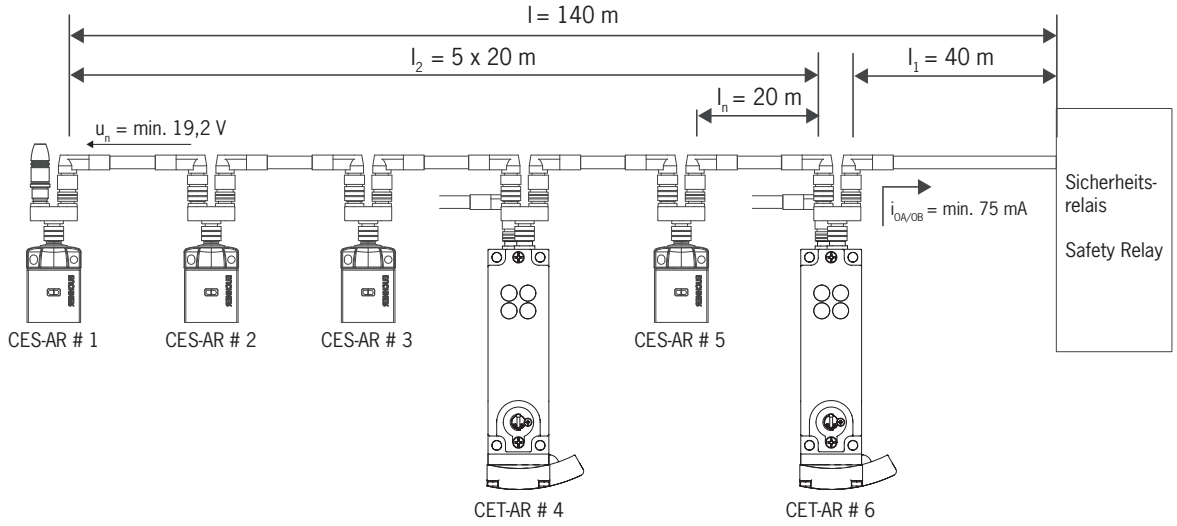


Fig. 3: Circuit example with six CES-AR/CET-AR

A safety relay is connected downstream that 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. In this case: 100 mA.

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

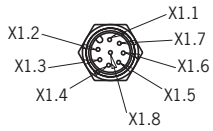
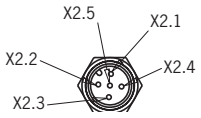
Result: The desired cable length l_1 of 40 m is below the permitted value from the table. The overall length of the switch chain l_{max} of 140 m is less than the maximum value of 200 m.

➡ The planned application is therefore functional in this form.

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)

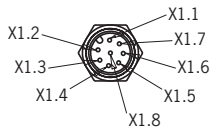
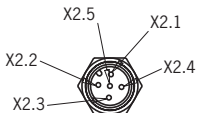
Wiring diagram A

Plug connector (view of connection side)	Pin	Designation	Function	Conductor coloring of connecting cable [1]
2 x M12   	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U_B	AR electronics operating voltage, 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	AR electronics operating voltage, 0 V	BU
	X 1.8	RST	Reset input	RD
	X 2.1	0 V U_{CM}	Guard locking solenoid operating voltage, 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}	Guard locking solenoid operating voltage, 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	Functional 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 connecting cable
2) With dual-channel solenoid control, do not connect to 0 V U_B.
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	Conductor coloring of connecting cable [1]
2 x M12   	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U_B	AR electronics operating voltage, 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	AR electronics operating voltage, 0 V	BU
	X 1.8	RST	Reset input	RD
	X 2.1	0 V U_{CM}	Guard locking solenoid operating voltage, 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}	Guard locking solenoid operating voltage, 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	Functional 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 connecting cable
2) With dual-channel solenoid control, do not connect to 0 V U_B

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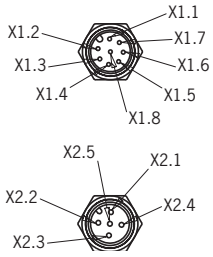
10.6.3. Version with door monitoring output (CET3/4) and additional monitoring output OUT on X 2.3

Wiring diagram C

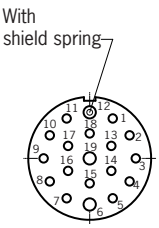
Plug connector (view of connection side)	Pin	Designation	Function	Conductor coloring of connecting cable 1)
2 x M12 	X 1.1	IB	Enable input for channel B	WH
	X 1.2	U_B	AR electronics operating voltage, 24 V DC	BN
	X 1.3	OA	Safety output, channel A	GN
	X 1.4	OB	Safety output, channel B	YE
	X 1.5	OUT	Monitoring output	GY
	X 1.6	IA	Enable input for channel A	PK
	X 1.7	0 V U_B	AR electronics operating voltage, 0 V	BU
	X 1.8	RST	Reset input	RD
	X 2.1	0 V U_{CM}	Guard locking solenoid operating voltage, 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}	Guard locking solenoid operating voltage, 24 V DC (indication on LED 1)	BK
	X 2.5	-	n.c.	GY

1) Only for standard EUCHNER connecting 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)

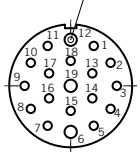
Wiring diagram D

Plug connector (view of connection side)	Pin	Designation	Function	Conductor coloring of connecting cable 1)
M23 (RC18) With shield spring 	1	U_{CM}	Guard locking solenoid operating voltage, 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	AR electronics operating voltage, 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	Functional earth: This connection must be connected to 0 V.	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)	PK
		Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.	
		-	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}	Guard locking solenoid operating voltage, 0 V	YE
	19	0 V U_B	AR electronics operating voltage, 0 V	BN

1) Only for standard EUCHNER connecting cable
2) With dual-channel solenoid control, do not connect to 0 V U_B

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

Wiring diagram E

Plug connector (view of connection side)	Pin	Designation	Function	Conductor coloring of connecting cable 1)
M23 (RC18) With shield spring 	1	U_{CM}	Guard locking solenoid operating voltage, 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	AR electronics operating voltage, 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	Functional earth: This connection must be connected to 0 V.	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)	PK
		Y	Version with feedback loop: If the feedback loop is not used, connect to 24 V DC.	
		-	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}	Guard locking solenoid operating voltage, 0 V	YE
	19	0 V U_B	AR electronics operating voltage, 0 V	BN

1) Only for standard EUCHNER connecting cable
2) With dual-channel solenoid control, do not connect to 0 V U_B

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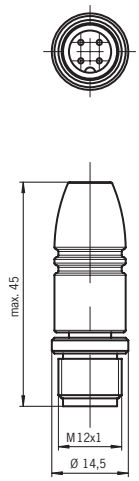
10.8. Connector assignment for Y-distributor

(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)

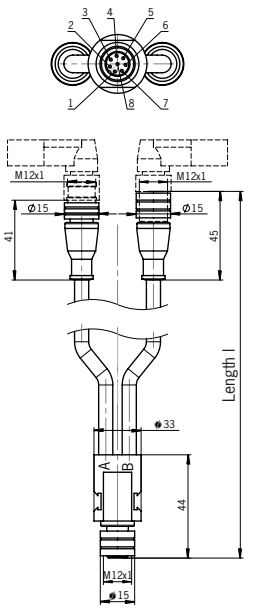
Pin	Function
X1.1	IB
X1.2	U_B
X1.3	OA
X1.4	OB
X1.5	OUT/DIA
X1.6	IA
X1.7	0 V U_B
X1.8	RST

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



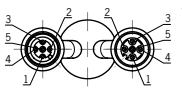
Y-distributor with connecting cable 111696 or 112395

Socket



Order no.	Length l [mm]
111696	200
112395	1,000

Plug



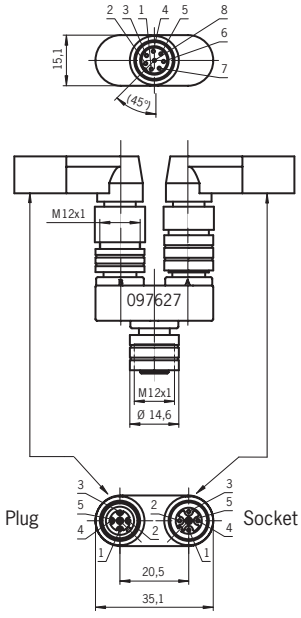
Socket

Pin	Function
X2.1	U_B
X2.2	OA
X2.3	0 V U_B
X2.4	OB
X2.5	RST

Pin	Function
X3.1	U_B
X3.2	IA
X3.3	0 V U_B
X3.4	IB
X3.5	RST

Y-distributor 097627

Socket



10.9. Connection of a single CET-AR

If a single CET-AR is used, connect the device as shown in the figures below. 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

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

- To ensure safety, both safety outputs ⊣P (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 of your switch in the search box. You will find all available connection examples for the device in *Downloads*.

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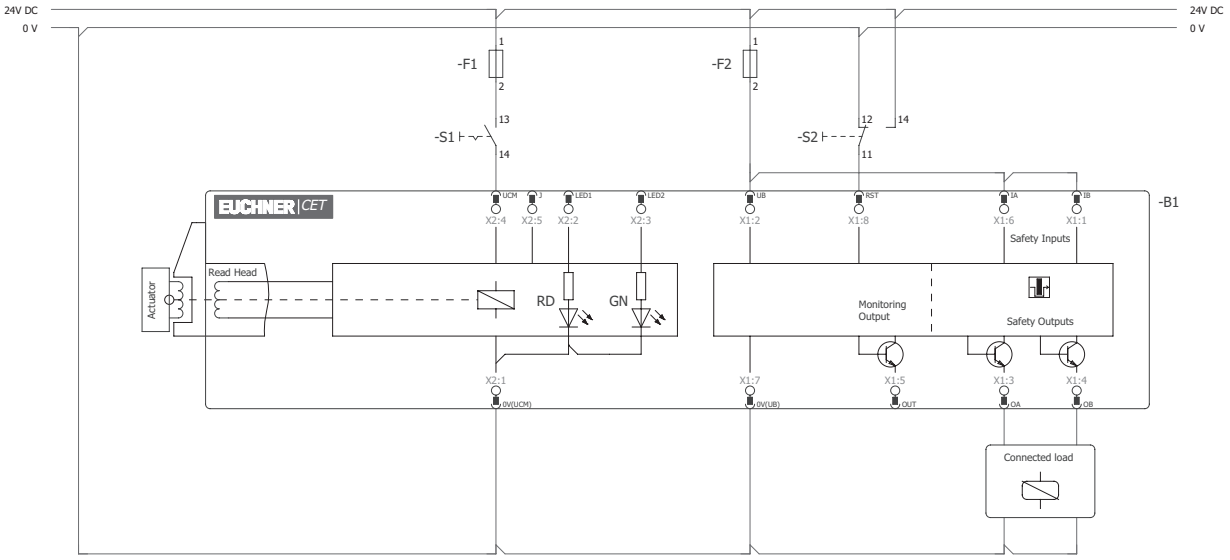

Fig. 4: Wiring diagram A, CET 1/2-AR with plug connectors 2 x M12
Single-channel control of the guard locking solenoid

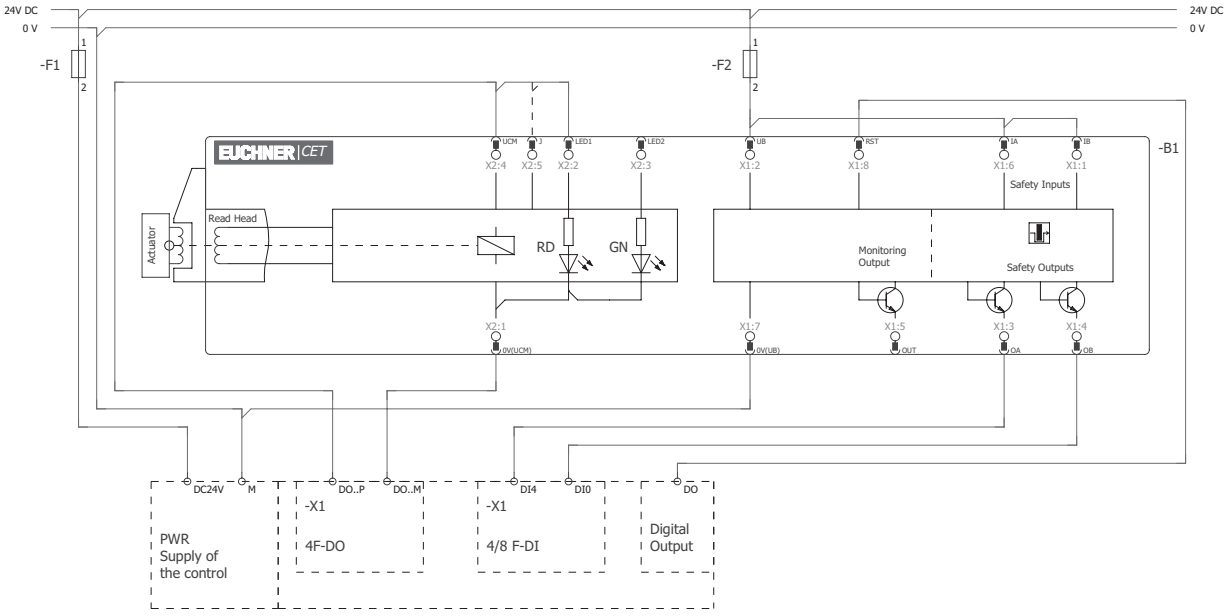

Fig. 5: Wiring diagram A, CET 1/2-AR with plug connectors 2 x M12
Dual-channel control of the guard locking solenoid

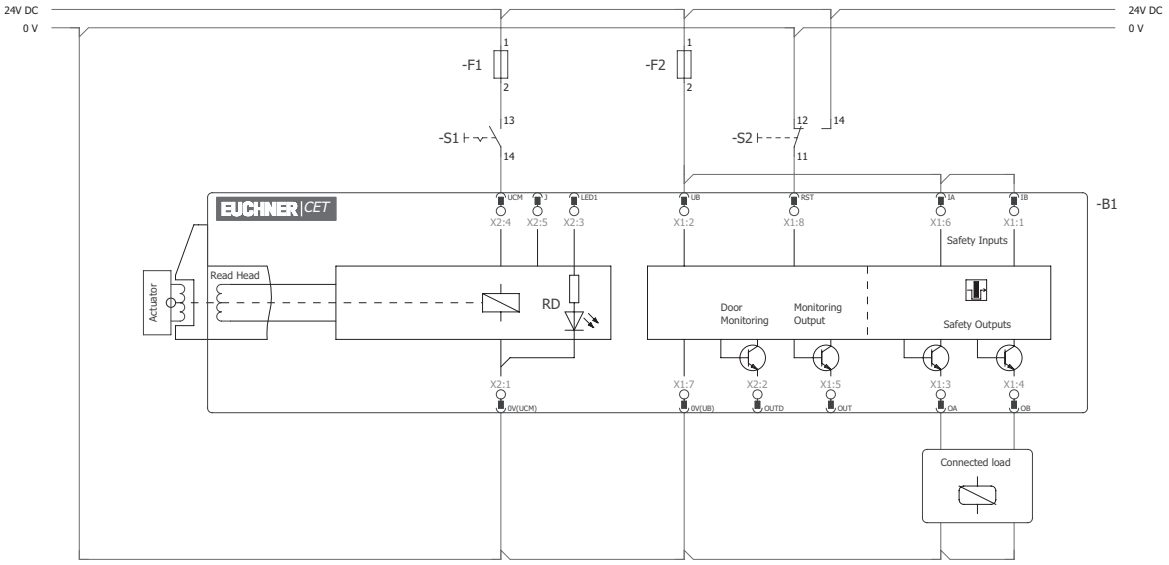

Fig. 6: Wiring diagram B, CET 3/4-AR with plug connectors 2 x M12
Single-channel control of the guard locking solenoid

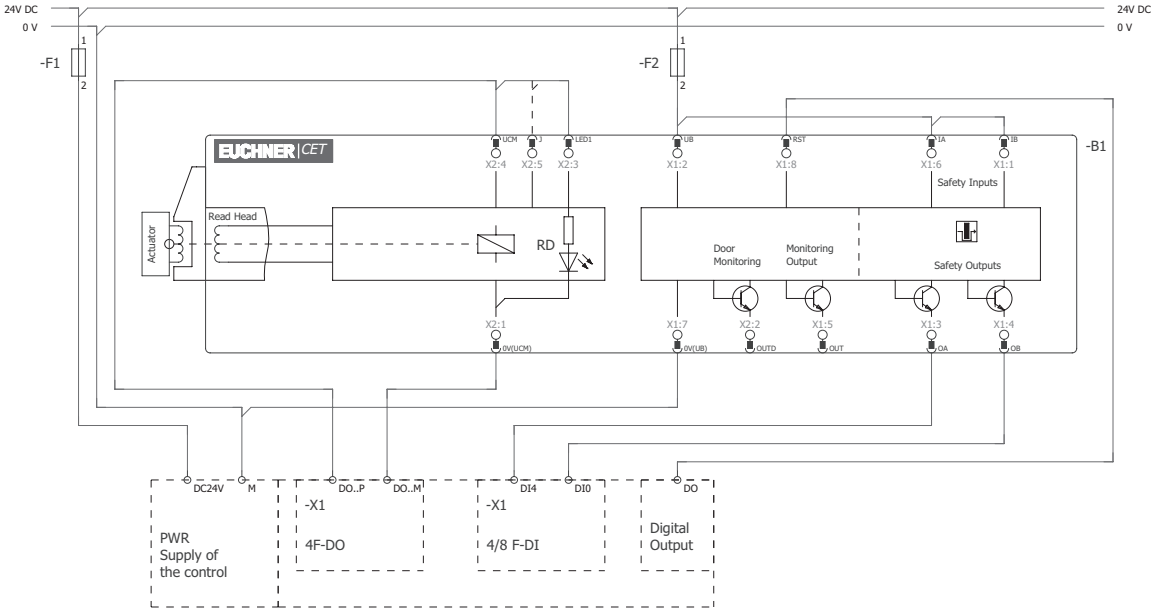

Fig. 7: Wiring diagram B, CET 3/4-AR with plug connectors 2 x M12
Dual-channel control of the guard locking solenoid

EN

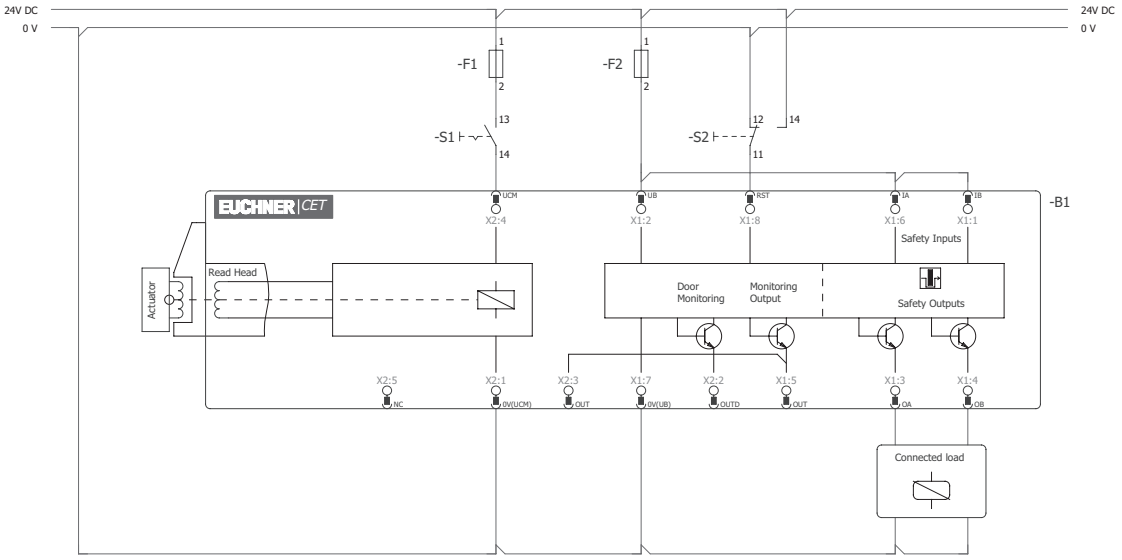

Fig. 8: Wiring diagram C, CET 3/4-AR with plug connectors 2 x M12 and additional monitoring output OUT
Single-channel control of the guard locking solenoid

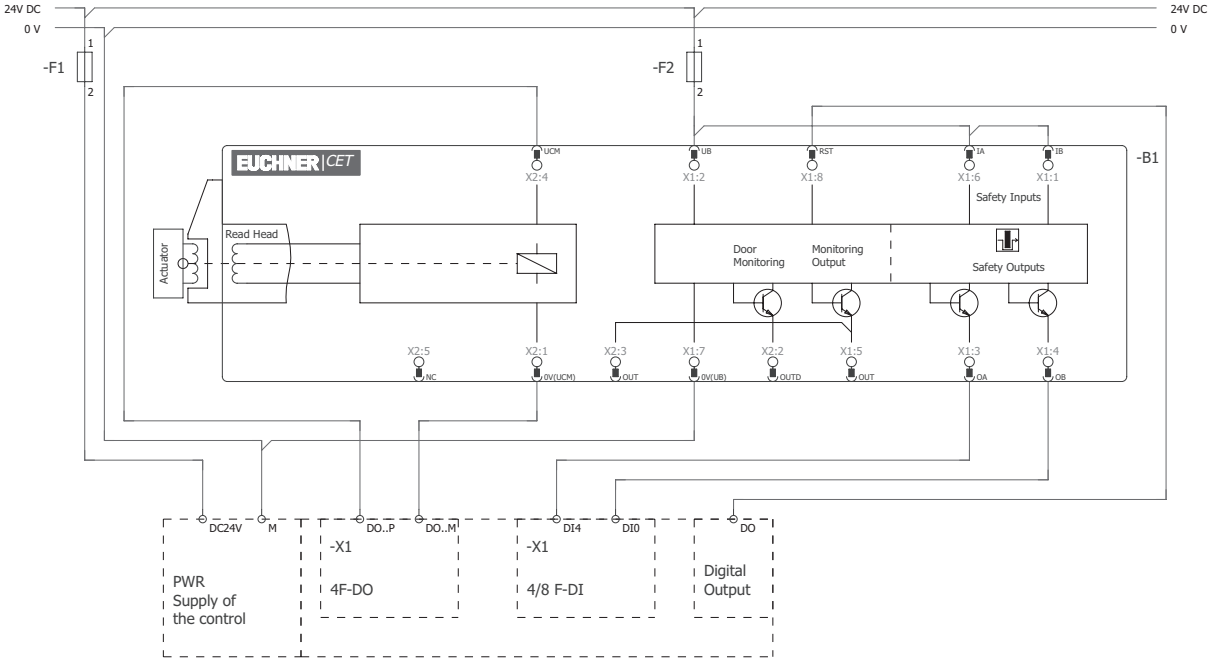

Fig. 9: Wiring diagram C, CET 3/4-AR with plug connectors 2 x M12 and additional monitoring output OUT
Dual-channel control of the guard locking solenoid

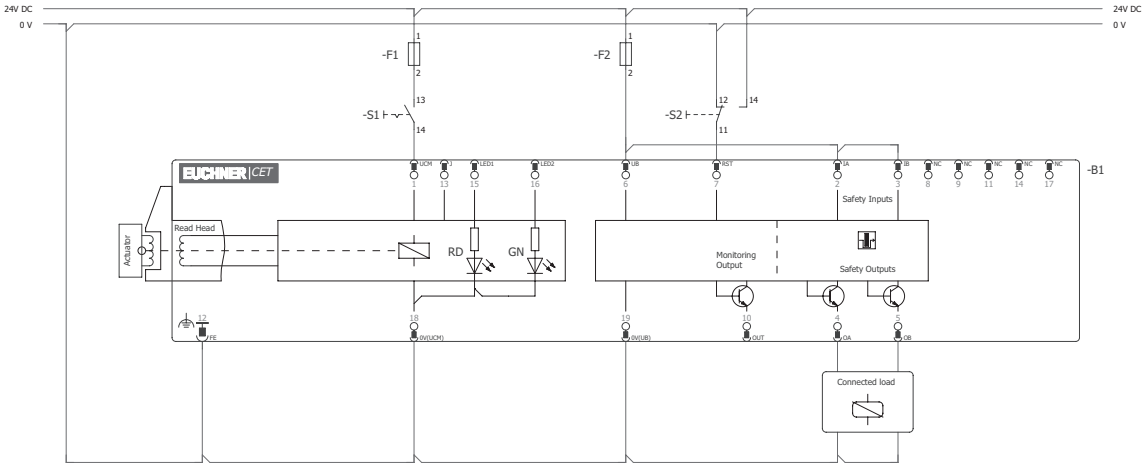

Fig. 10: Wiring diagram D, CET 1/2-AR with plug connector M23
Single-channel control of the guard locking solenoid

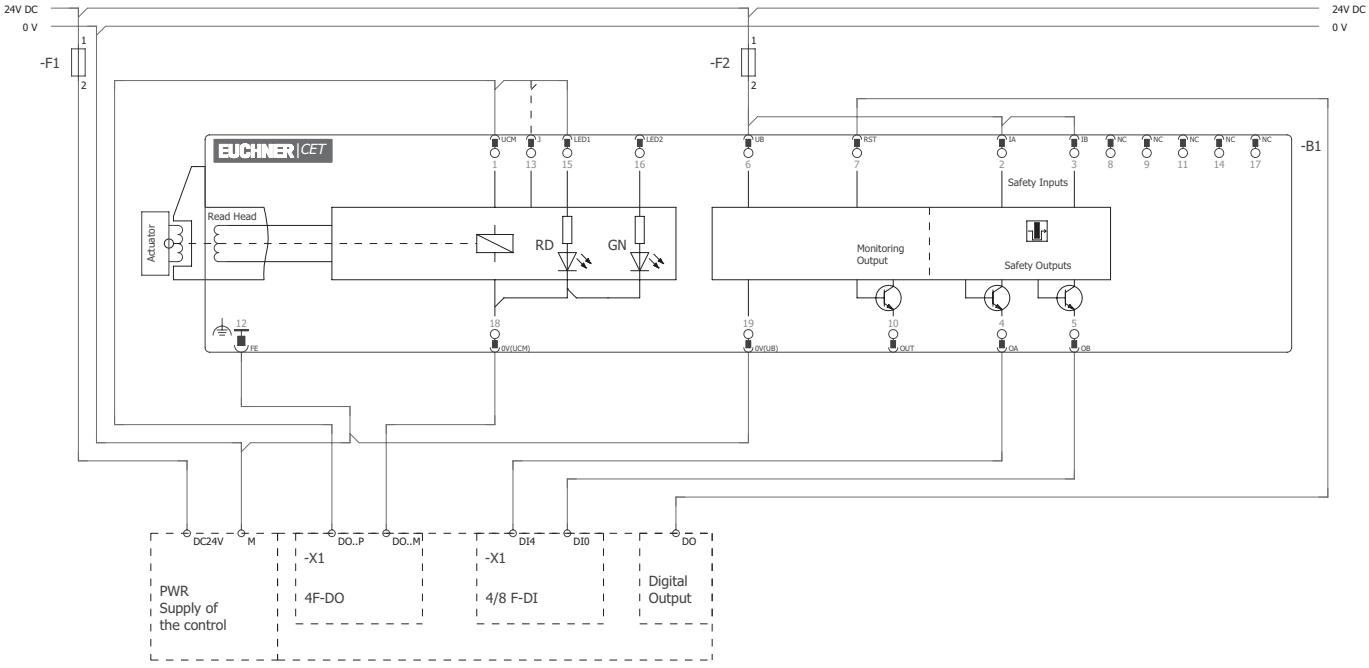

Fig. 11: Wiring diagram D, CET 1/2-AR with plug connector M23
Dual-channel control of the guard locking solenoid

EN

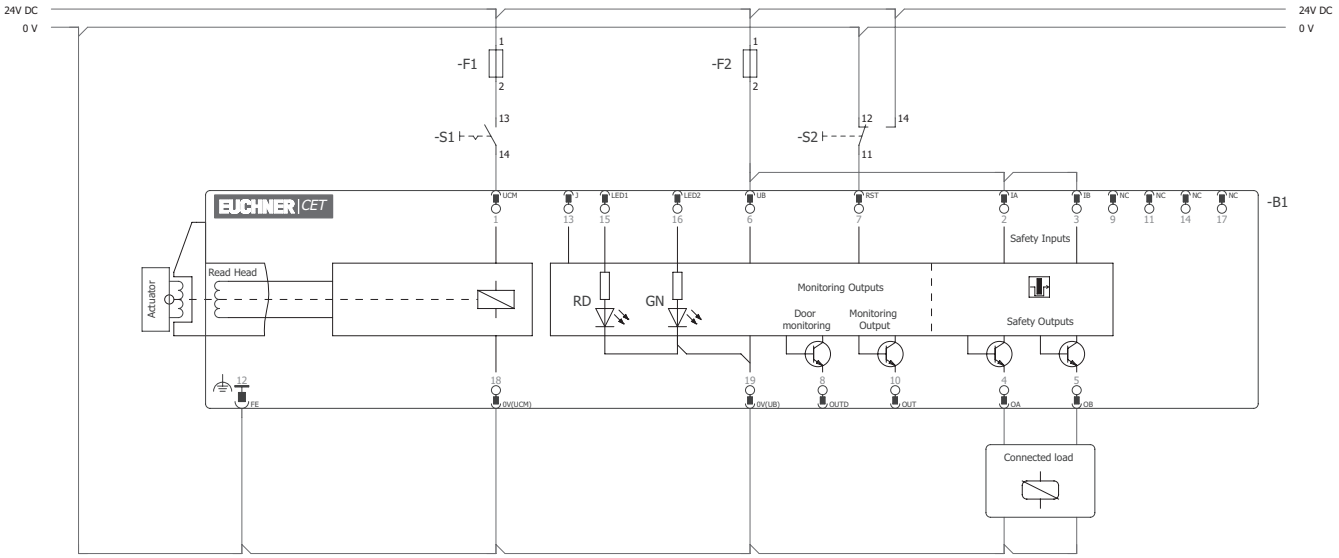

Fig. 12: Wiring diagram E, CET 3/4-AR with plug connector M23, versions with and without teach-in input
Single-channel control of the guard locking solenoid

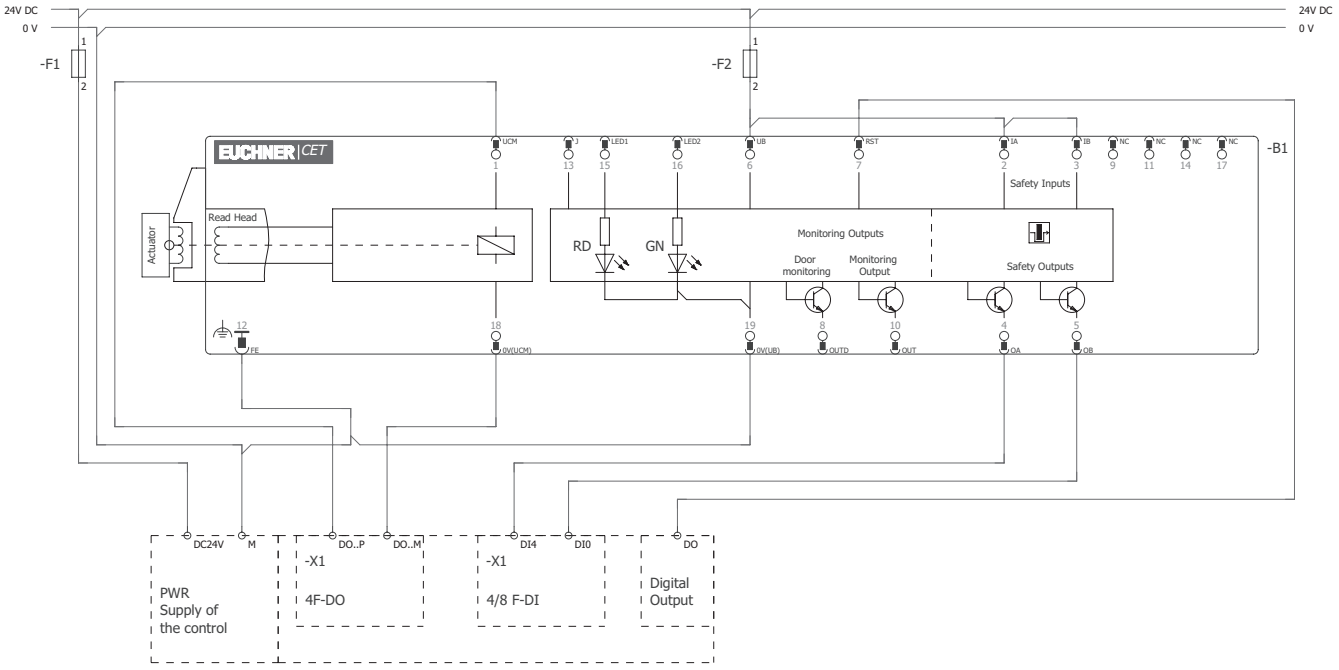

Fig. 13: Wiring diagram E, CET 3/4-AR with plug connector M23, versions with and without teach-in input
Dual-channel control of the guard locking solenoid

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 and start button, this must be in the last position in the switch chain (see *Fig. 14 on page 34*).
- 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 of your switch in the search box. You will find all available connection examples for the device in *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 connecting 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 ⊣P 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 the RST input is not used in your application, it must 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 *Fig. 14 on page 34*).
- Reset must always be performed simultaneously for all switches of the chain.

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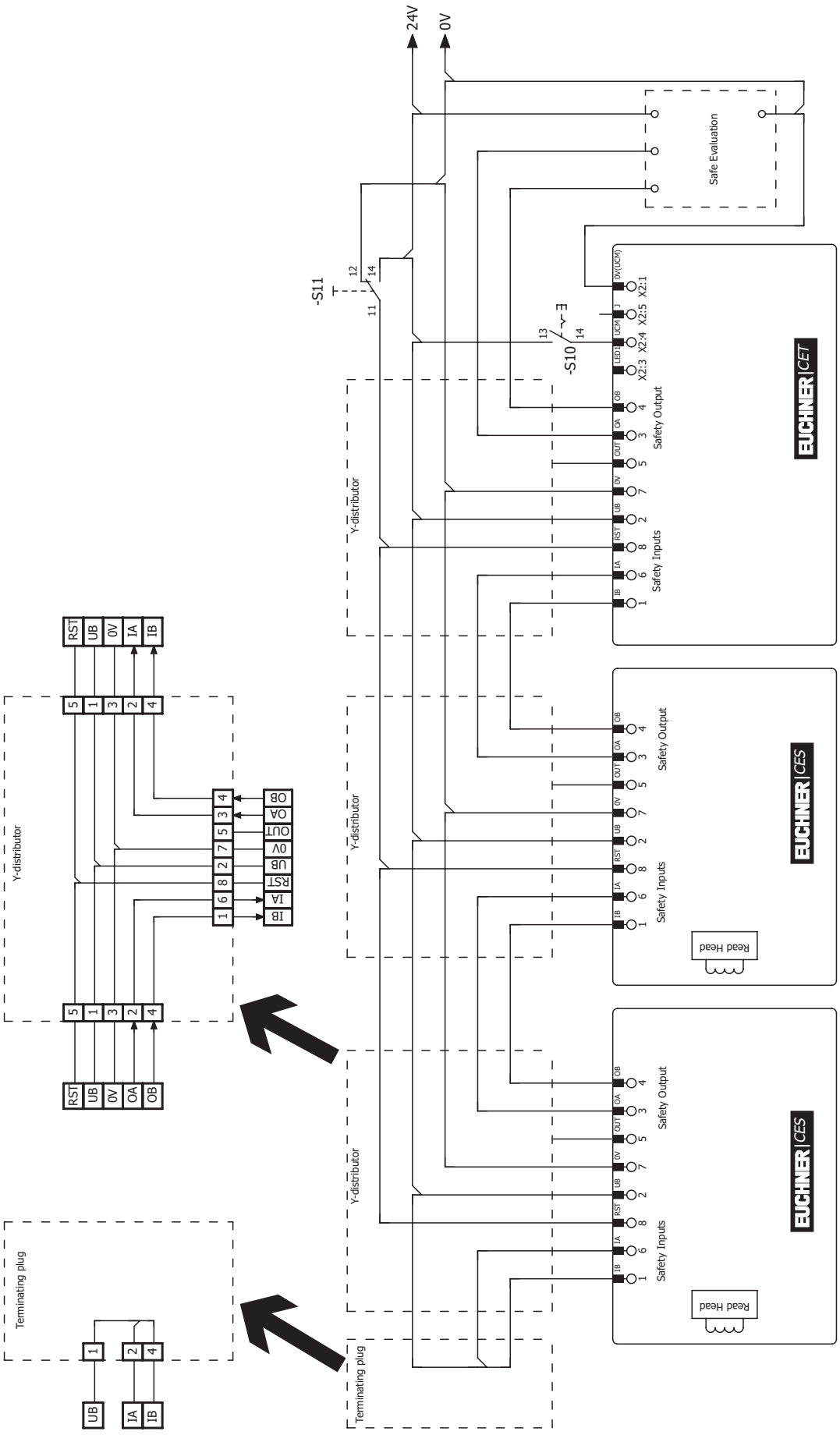


Fig. 14: Connection example for operation in a CES-AR switch chain

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 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

Observe the following guidelines 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 safety outputs OA and OB are connected to safe control systems or external peripheral devices with ground disconnection, the device can enter the fault state. The problems can generally be corrected using the EUCHNER filter module AC-FM-AR-127460 (order no. 127460).
- If the power supply is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- The following applies to dual-channel control of the guard locking solenoid:
  - CET 1/2-AR from version V1.5.X: The device tolerates switch-on and switch-off pulses up to 4 ms.
  - CET 3/4-AR from version V1.5.X: The device tolerates switch-off pulses up to 5 ms.
  - CET 3/4-AR from version V1.7.X: The device tolerates switch-on and switch-off pulses 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 43*.

Depending on the connection type, the following sub-chapters and the pin assignment must be observed. 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 23* and in chapter *10.7. Connector assignment for safety switch CET-AR with plug connector M23 (RC18) on page 24*.

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 *Downloads/Applications/CET*. The features of the respective device are dealt with there in greater detail.

EN

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

For dual-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 and 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).

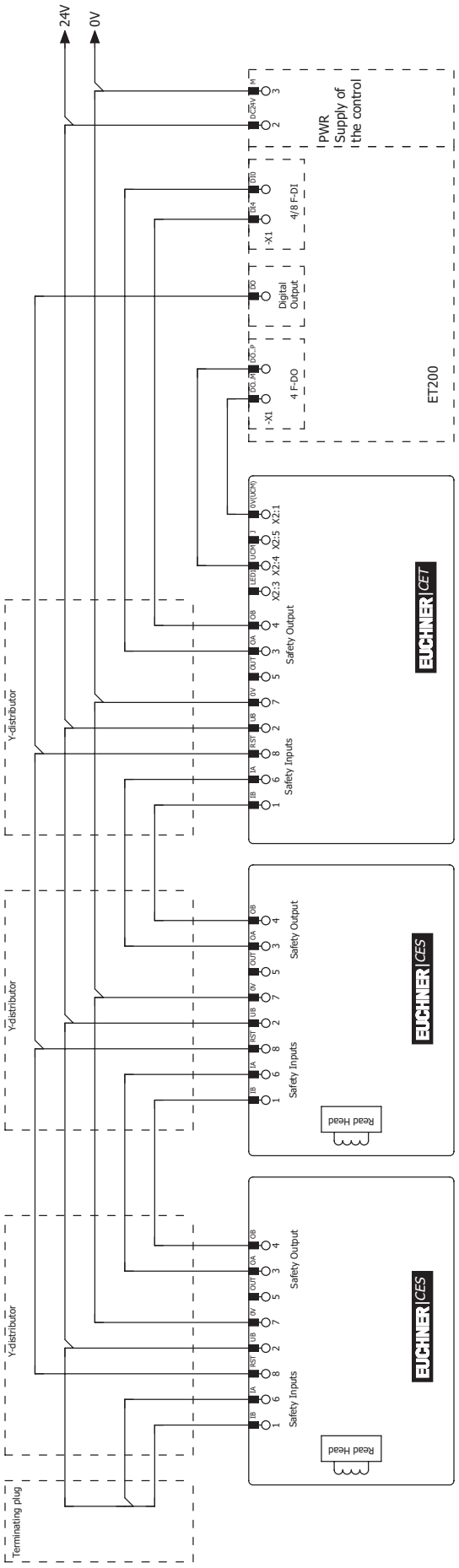


Fig. 15: Connection example for mixed series connection (2 x CES and 1 x CET) to ET200

11. Setup

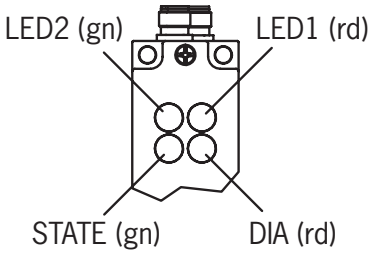
NOTICE

Before setup, the orange insert must be removed from the recess on the switch.

11.1. LED displays

You will find a detailed description of the signal functions in chapter *12. System status table on page 41*.

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



NOTICE

- With hard-wired LEDs, the following applies:
  - LED 1: red = Solenoid activated (voltage present at solenoid)
  - LED 2: 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 of your device 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 outputs OUT/OUT D are switched off, i.e. the system is in a safe condition.

Depending on the version, the teach-in operation is automatic or is performed 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 preceding device if teach-in is carried out for a new actuator. Teach-in is not possible again immediately for this device 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 or a disabled actuator when in the teach-in standby state, this state is ended immediately and the switch changes to normal operation.

EN

Important!

- Version 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 is detected during this time, the device enters the fault state. 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 the fault state.
- The actuator to be taught-in is not activated if it is within the actuating range for less than 60 s.

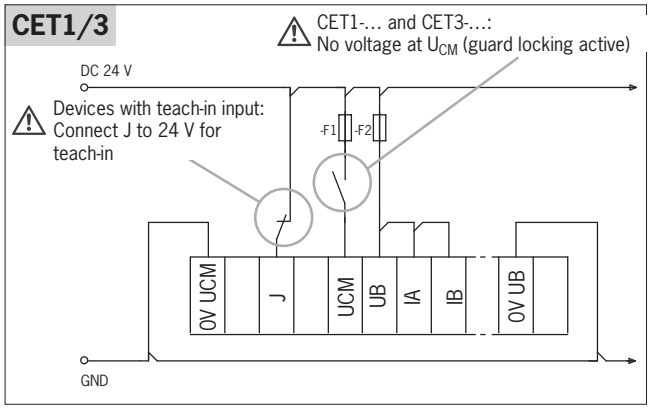
11.2.1. Preparing device for the teach-in operation and teaching-in actuator

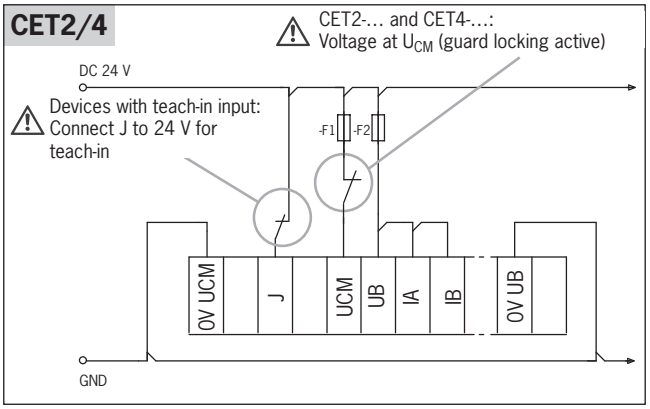
1. Connect the switch as shown below, but do not apply any voltage to U_B yet.

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

   For devices 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.



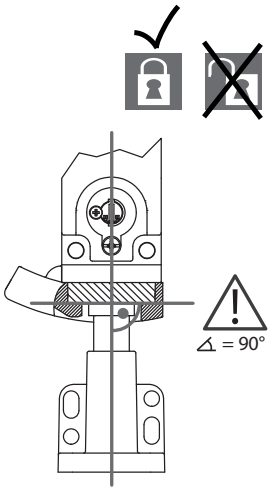


2. Switch on operating voltage U_B.

➡ 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 41*.

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. Disconnect operating voltage U_B or apply a voltage of 24 V to the RST input for at least 3 s.

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

6. For 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.

The RST input must be connected as shown in *Fig. 14 on page 34* 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 38*).
3. Close all guards in the chain and activate guard locking.
4. To reset the switch, apply a voltage of 24 V to the RST input for at least 3 s (Reset).

➡ 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 only when all LEDs on the device are off.

5. Apply a voltage of 24 V to the RST input for at least 3 s.

➡ The system restarts and then continues to function in normal operation.

EN

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 release 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. In case of 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 (green)	LED indicator Output: DIA (red)	State
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 inverse	○	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							**Fault in teach-in operation (only unicode)**
							During automatic teach-in:
	X	off	off	off	✳ 1 x	✳	- Actuator removed from the actuating range prior to the end of the teach-in operation
	closed	off	off	off	✳ 1 x	○	- Disabled actuator within the actuating range
							For teach-in input:
	X	off	off	off	✳ 1 x	✳	- Actuator removed from the actuating range prior to the end of the teach-in operation - Disabled actuator within the actuating range - Most recently taught-in actuator within the actuating range - 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 circuit, loss of switching ability)
	X	off	off	off	✳ 5 x	✳	Internal fault, e.g.: - Component faulty - Data error - Impermissible pulsing on U_B - Voltage applied to the RST input for less than 3 s
	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 cyclically flashes three times
X	Any state

EN

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 min.	Value typ.	Value max.	Unit
General				
Material, ramp	Stainless steel			
Material, safety switch housing	Die-cast aluminum			
Installation orientation	Any (recommendation: switch head downward)			
Degree of protection with plug connector M12	IP67			
with plug connector M23 (RC18)	IP65/IP67			
	(screwed tight with the related mating connector)			
Safety class	III			
Degree of contamination	3			
Mechanical life	2 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 (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	-	8	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
Shock and vibration resistance	Acc. to EN 60947-5-3			
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
Turn-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}	-	450	-	mA
Connection rating	-	11	-	W
Duty cycle	100			%
Freely configurable LEDs [2]	**LED 1 red, LED 2 green**			
Operating voltage	20.4	-	26.4	V DC
Reliability values acc. to EN ISO 13849-1 [3]				
Mission time	20			years
Monitoring of guard locking and the guard position	**Any installation orientation (head downward, upward or horizontal)**			
Category	4			
Performance Level (PL)	e			
PFH_D	3.1 x 10^{-9}/h			
Control 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.
3) Refer to the declaration of conformity in chapter *17* for the issue date.

EN

13.1.1. Typical system times

Please refer to the technical data for the exact values.

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

Turn-on time of safety outputs: The max. reaction time t_{on} is the time from the moment when the guard is locked to the moment when the safety outputs switch on.

Simultaneity monitoring of safety inputs IA/IB: If the safety inputs have different switching states for longer than a certain time, the safety outputs (OA and OB) will be switched off. The device enters the fault state.

Risk time according to EN 60947-5-3: If an actuator moves outside the actuating range, the safety outputs (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:

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

t_r = Total risk time

$t_{r,\,e}$ = Risk time of single device (see chapter *13. Technical data on page 43*)

t_l = Runtime extension per device (see chapter *13. Technical data on page 43*)

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

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

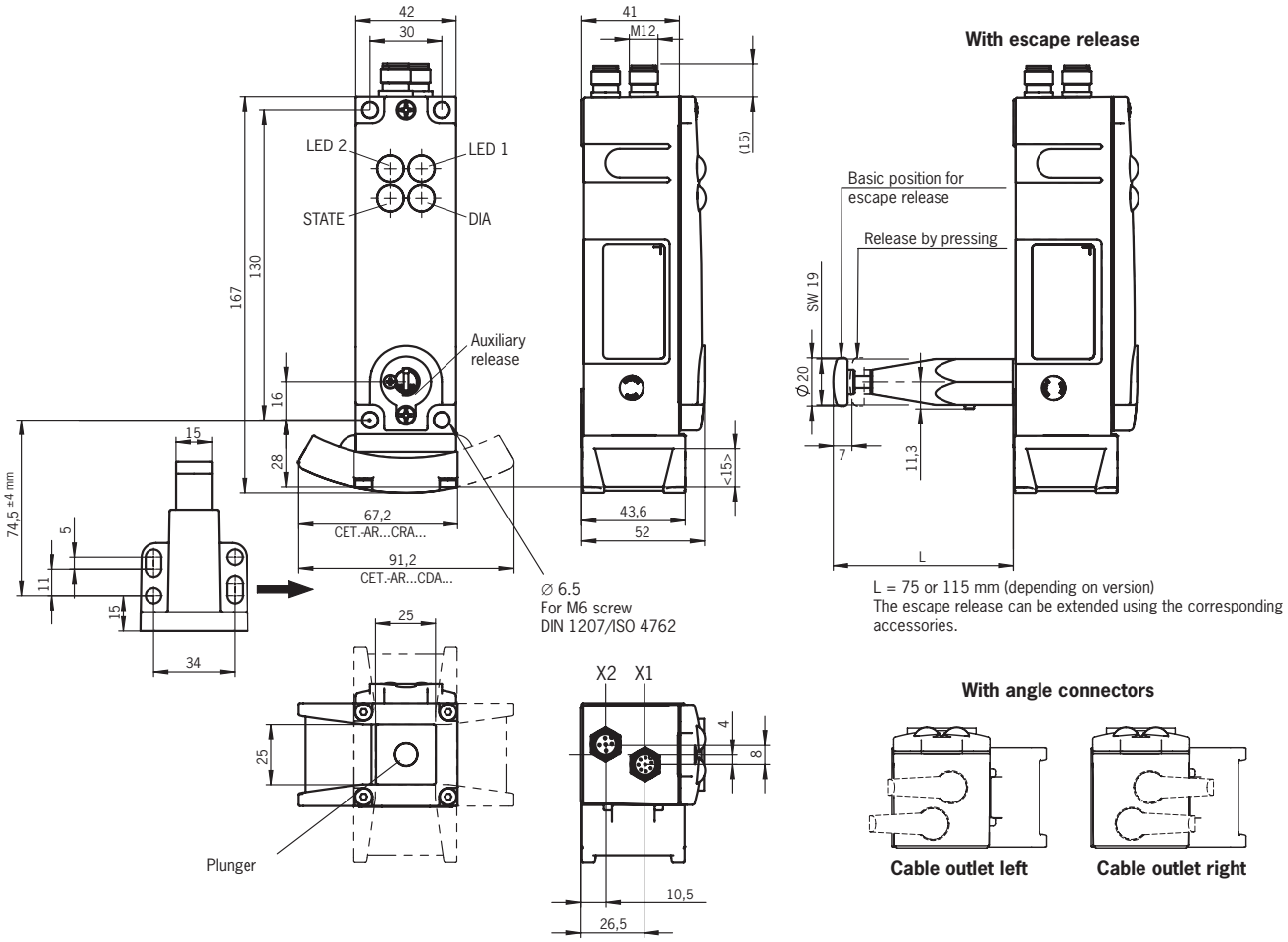
Test pulses at the safety outputs: The device generates its own test pulses on the safety outputs (OA and OB). A downstream control system must tolerate these test pulses.

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.

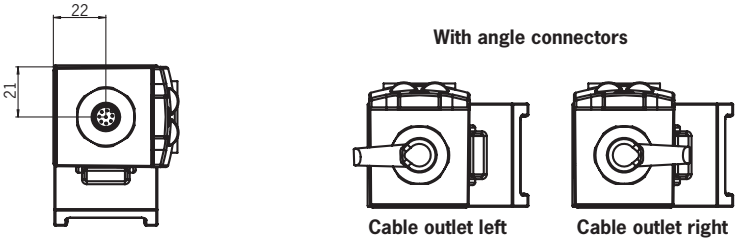
The test pulses are also output when the safety outputs are switched off.

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

Version with plug connectors 2 x M12



Version with plug connector 1 x M12



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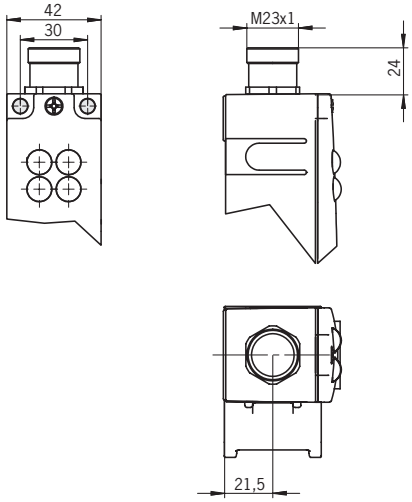
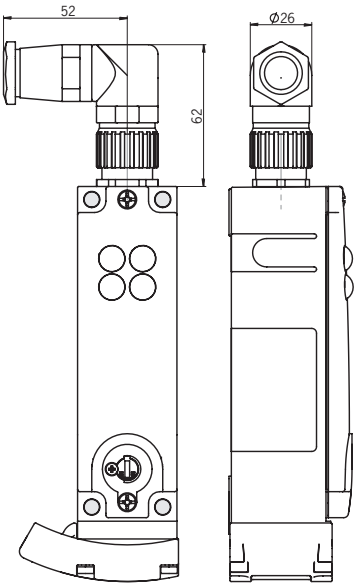
Version with plug connector M23 (RC18)

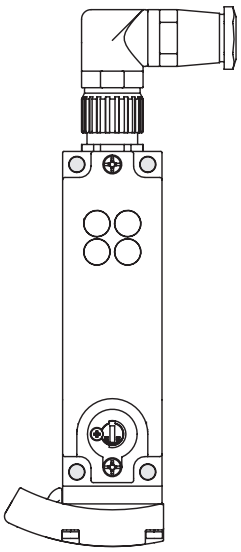
Dimensions with plug connector M23



Cable outlet left

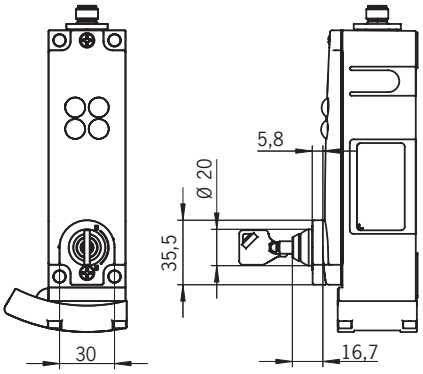


Cable outlet right

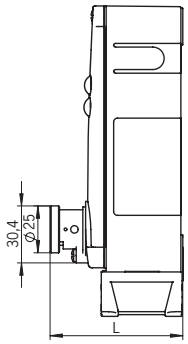


Versions with manual release options

With auxiliary key release

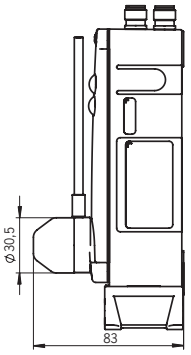


With emergency release



L = 19 or 71 mm
(depending on version)

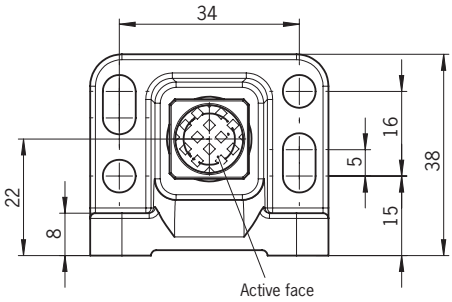
With wire front release (bowden)

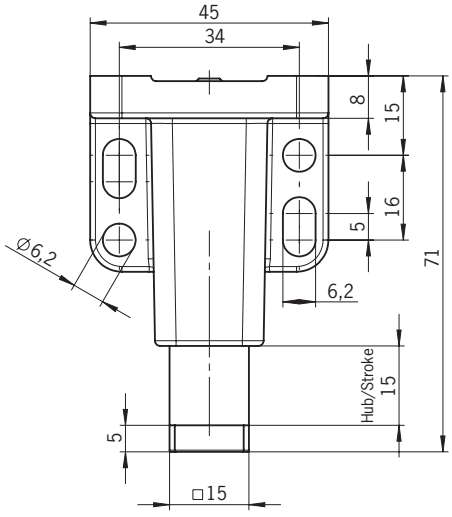


13.3. Technical data for actuator CET-A-B...

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	IP67 (transponder protection)			
Mechanical life	2 x 10^6 operating cycles			
Locking force, max.	6,500			N
Installation orientation	Active face opposite switch head			
Power supply	Inductive via switch			

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





NOTICE

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

EN

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 40*)
- Check all additional functions (e.g. escape release, lockout bar, etc.)
- Check the secure mounting of the devices and the connections
- Check for contamination

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

NOTICE

The year of manufacture can be seen in the lower right corner of the type label. The current version number in the format (V X.X.X) can also be found on the device.

16. Service

If servicing is required, please contact:

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

Service telephone:
+49 711 7597-500

E-mail:
support@euchner.de

Internet:
www.euchner.com

17. Declaration of conformity

The declaration of conformity is part of the operating instructions.

The complete EU declaration of conformity can be found at *www.euchner.com*. Enter the order number of your device in the search box. The document is available under *Downloads*.

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

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(translation of the original operating instructions)