

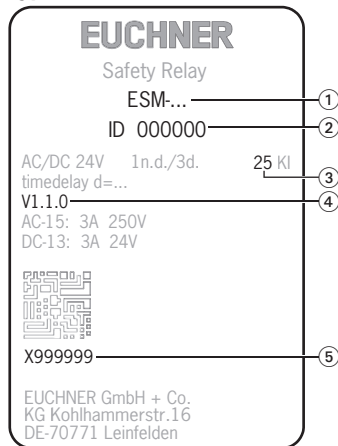
Scope

These operating instructions apply to all safety switchgear ESM-BT4...V1.1.X. These operating instructions, the document *Safety information* and any available data sheet form the complete user information for your device.

Important!

Make sure to use the operating instructions valid for your product version. The version numbers can be found on the type label of your product. Please contact the EUCHNER service team if you have any questions.

Type label



- ① Item designation
- ② Item number
- ③ Year of manufacture
- ④ Version
- ⑤ Serial number

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 (2109074)	(this document)	
Declaration of conformity	Declaration of conformity	
Any additions to the operating instructions	Take any associated additions to the operating instructions or data sheets into account.	

Important!

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

Notes about the EU Data Act

During operation, this product produces data that are available to the user in accordance with EU Data Act 2023/2854. The corresponding chapters in these operating instructions explain what these data are and how you can access and use them.

Correct use

ESM-BT4.. is an emergency stop safety relay combination that combines non-time-delayed (u) and time-delayed (v) contacts in a very compact housing. This permits dangerous components of a system to be switched off quickly and safely in an emergency situation.

At the same time, other safety circuits can continue to be supplied with power for up to 30 seconds to allow a tool to be moved to its idle position or to brake overtraveling parts, for example.

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
- EN IEC 62061.

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

- EN ISO 13849-1
- EN IEC 60204-1
- EN IEC 62061.

Important!

- The user is responsible for the integration of the device in a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-1.
- The device user must assess and document remaining risks.
- If a data sheet is included with the product, the information on the data sheet applies.

Safety precautions

⚠ WARNING

- Installation and setup of the device must be performed only by authorized personnel.
- Observe the country-specific regulations when installing the device.
- The electrical connection of the device is only allowed to be made with the device isolated.
- The wiring of the device must comply with the instructions in these operating instructions, otherwise there is a risk that the safety function will be lost.
- It is not allowed to open the device, tamper with the device or bypass the safety devices.
- All relevant safety regulations and standards are to be observed.
- The overall concept of the control system in which the device is incorporated must be validated by the user.
- Failure to observe the safety regulations can result in death, severe injuries and serious damage.
- Note down the version of the device (see type label Vx.x.x) and check it each time prior to setup. If the version changes, the use of the device in the overall application must be validated again.

Features

- 4 safe, redundant relay outputs. Depending on variant:
 - 3 non-time-delayed contacts, 1 time-delayed contact
 - 2 non-time-delayed contacts, 2 time-delayed contacts
 - 1 non-time-delayed contact, 3 time-delayed contacts
- Continuously adjustable time delay (1 ... 30 s) or fixed time delay (ESM-BT4...20S (2 s); ESM-BT4...50S (5 s))
- Connection of:
 - Emergency stop buttons
 - Safety switches
 - Non-contact safety switches
 - Safety components with OSSD outputs
- Single- and dual-channel operation possible

- Additional, non-safe function: feedback loop for monitoring downstream contactors or expansion modules
- Cyclical monitoring of the output contacts
- Indication of the switching state via LED
- 2 starting behaviors possible:
 - Manual start
 - Automatic start
- Short circuit and ground fault monitoring
- Use up to PL e, SILCL 3, category 4

Function

The moving parts of a machine or system can be quickly and safely stopped in case of danger with the non-time-delayed contacts of the ESM-BT4... Safety contacts with time-delayed switch-off are also integrated into the ESM-BT4... They are used whenever it is safer to keep supplying power to parts of a machine after demand for the safety function from the emergency stop circuit (e.g. safety door opened).

Due to the redundant use of positively driven relays, it is ensured that a single fault in the device does not lead to the loss of the safety function and the loss of the safety function is detected by cyclical self-monitoring with the next demand for the safety function.

The time-delayed contacts switch on at the same time as the non-time-delayed contacts, but they are switched off again only after the time set on the potentiometer elapses (1 ... 30 s) or after a fixed time delay (ESM-BT4...20S; ESM-BT4...50S) upon demand for the safety function from the emergency stop circuit (e.g. safety door opened).

The power supply must be present during the time sequence.

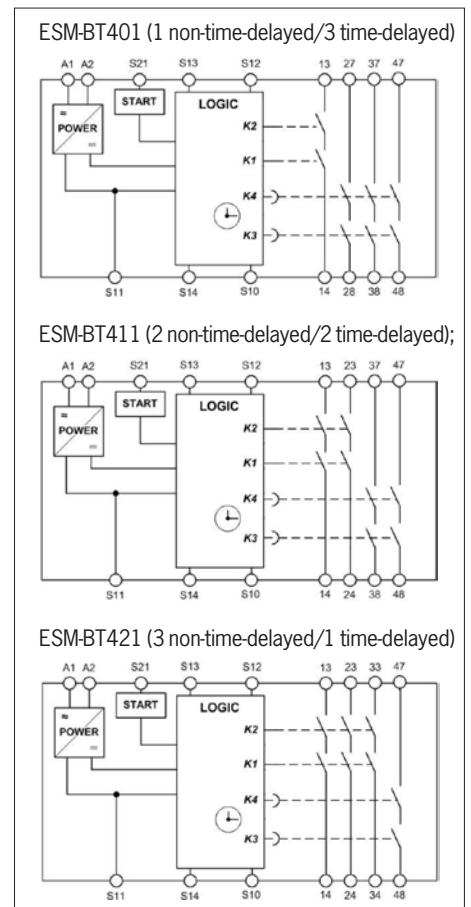


Fig. 1: Block diagrams ESM-BT4..

Mounting

As per EN IEC 60204-1, the device is intended for installation in control cabinets with a minimum degree of protection of IP54. It is mounted on a 35 mm mounting rail according to EN IEC 60715 TH35.

Important!

- Sufficient heat dissipation is to be ensured in the control cabinet.
- For the AC 115 V/230 V variant, maintain a distance of min. 10 mm to neighboring devices.

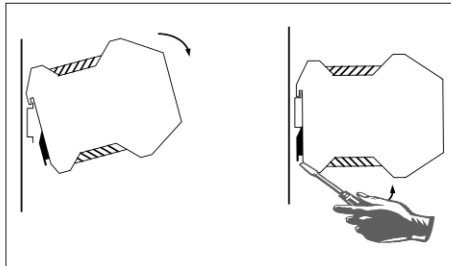


Fig. 2: Mounting/removing

Electrical connection

- A safety transformer according to EN IEC 61558-2-6 or a power supply unit with electrical isolation from the mains must be connected.
- External fusing of the safety contacts must be provided.
- A maximum length of the control lines of 1,000 m with a conductor cross-section of 0.75 mm² must not be exceeded.
- The conductor cross-section must not exceed 2.5 mm².
- If the device does not function after setup, it must be returned to the manufacturer unopened. Opening the device will void the warranty.
- A suppressor circuit suitable for inductive loads (e.g. free-wheeling diode) is to be provided.

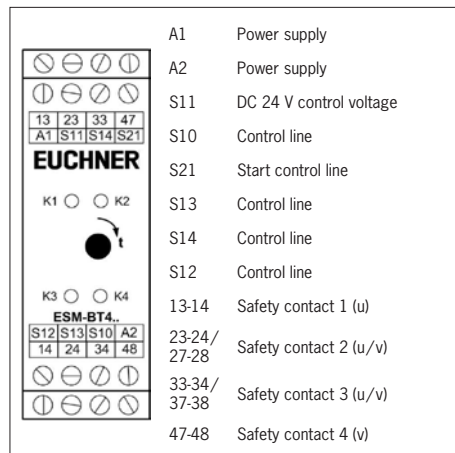


Fig. 3: Connections (u = non-time-delayed, v = time-delayed)

Setup procedure

Notice

The items listed under *Electrical connection* must be observed during setup.

1. Wiring emergency stop circuit:

Wire the emergency stop circuit according to the required Performance Level determined (see Fig. 5 to Fig. 9).

2. Wiring start circuit:

Wire the start circuit as shown in the examples in Fig. 10 or Fig. 11.

Attention: If *Automatic start* is set, bear in mind that the safety contacts will switch immediately after the power supply is connected. If *Monitored manual start* is set, the start button must be opened after wiring.

3. Wiring feedback loop:

If your application provides for external contactors or expansion modules, connect them as shown in the examples in Fig. 12 or Fig. 13.

4. Wiring power supply:

Connect the power supply to terminals A1 and A2 (see Fig. 14).

Attention: Wiring only in de-energized state.

5. Setting time delay:

Set the required time delay on the potentiometer (not necessary for variants with fixed time).

Attention: Tick marks should be regarded only as a setting aid. Always make sure to measure the time delay.

6. Starting the device:

Switch the operating voltage on.

Attention: If the *Automatic start* behavior is set, the safety contacts will close immediately.

If the *Monitored manual start* behavior is set, close the start button to close the safety contacts.

LEDs K1, K2, K3 and K4 illuminate.

7. Activating safety function:

Open the emergency stop circuit by actuating the connected safety switch. The safety contacts open immediately.

Attention: Measure the time delay.

8. Reactivating:

Close the emergency stop circuit. If *Automatic start* is selected, the safety contacts will close immediately.

If the *Monitored manual start* behavior is set, close the start button to close the safety contacts.

What to do in case of a fault?

Device does not switch on:

- Check the wiring by comparing it to the wiring diagrams.
- Check the safety switch used for correct function and adjustment.
- Check whether the emergency stop circuit is closed.
- Check whether the start button (with manual start) is closed.
- Check the operating voltage at A1 and A2.
- Is the feedback loop closed?

Device cannot be switched on again after an emergency stop:

- Check whether the emergency stop circuit was closed again.
- Was the start button opened before closing of the emergency stop circuit (with manual start)?
- Is the feedback loop closed?

If the fault persists, perform the steps listed under *Setup procedure*.

If these steps do not remedy the fault either, return the device to the manufacturer for examination.

Opening the device is impermissible and will void the warranty.

Maintenance

The device must be checked once per month for proper function and for signs of tampering and bypassing of the safety function. Check the wiring of the device and activate the emergency stop function. Check the time delay.

The device is otherwise maintenance-free, provided that it was installed properly.

Disposal

Pay attention to the applicable national regulations and laws during disposal.

Notes about UL requirements

This device is intended to be used with a Class 2 power source in accordance with UL1310. Connecting cables for safety switches installed at the place of use must be separated from all moving and permanently installed cables and un-insulated active elements of other parts of the system that operate at a voltage of over 150 V. A constant clearance of 50.8 mm must be maintained. This does not apply if the moving cables are equipped with suitable insulation materials that possess an identical or higher dielectric strength compared to the other relevant parts of the system.

Declaration of conformity

The product complies with the requirements according to

- Machinery Directive 2006/42/EC (until January 19, 2027)
- Machinery Regulation (EU) 2023/1230 (from January 20, 2027)

The 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*.

Service

If servicing is required, please contact:

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Service telephone:
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Technical data

Parameter	Value	
Operating voltage	AC/DC 24 V	
Rated supply frequency	50 - 60 Hz	
Permissible deviation	± 10%	
Power consumption	DC 24 V Approx. 4.7 W	AC 24 V Approx. 5.3 VA
Control voltage at S11	DC 24 V	
Control current	Approx. 190 mA	
Response delay after actuation of the buttons	< 20 ms	
Safety contacts	4 NO contacts (3 non-time-delayed/1 time-delayed, 2 non-time-delayed/2 time-delayed, 1 non-time-delayed/3 time-delayed)	
Max. switching voltage	AC 250 V	
Safety contact breaking capacity (13-14, 23-24, 33-34, 47-48)	AC: 250 V, 2,000 VA, 8 A for ohm resistive load (6 operating cycles/minute) 250V, 3A for AC-15 DC: 40 V, 320 W, 8 A for ohm resistive load (6 operating cycles/minute) 24V, 3A, for DC-13	
Max. cumulative current of all safety contacts	15 A ¹⁾	
Time delay	1 ... 30 s	
- ESM-BT4..	1 ... 30 s	
- ESM-BT4..20S	2 s fixed	
- ESM-BT4..50S	5 s fixed	
Minimum contact load	5 V, 10 mA	
Contact fuses	10 A gG	
Conductor cross-section	0.14 - 2.5 mm ²	
Tightening torque (min./max.)	0.5 Nm/0.6 Nm	
Typ. switch-on delay/switch-off delay for the normally open contacts upon demand from the safety circuit	< 30 ms / < 30 ms	
Max. length of control line	1,000 m with 0.75 mm ²	
Contact material	AgSnO ₂	
Mech. contact life	Approx. 1 x 10 ⁷	
Test voltage	2.5 kV (control voltage/contacts)	
Rated impulse withstand voltage, leakage paths/air gaps	4 kV (DIN VDE 0110-1)	
Rated insulation voltage	250 V	
Degree of protection	IP20	
Temperature range	-15 °C to +40 °C ¹⁾	
Installation altitude	≤ 2000 m (above sea level)	
Degree of contamination	2 (DIN VDE 0110-1)	
Overvoltage category	3 (DIN VDE 0110-1)	
Weight	Approx. 250 g	
Mounting	Mounting rail acc. to EN IEC 60715 TH35	

Characteristics according to EN ISO 13849-1 for all variants of the series ESM-BT4²⁾

Load (DC-13; 24 V)	≤ 0.1 A	≤ 1 A	≤ 2 A
n _{op}	≤ 500,000 cycles	≤ 350,000 cycles	≤ 100,000 cycles
T ₁₀₀	20 years		
Category			
- Safety contacts time-delayed	3		
- Safety contacts non-time-delayed	4		
PL	e		
PfH			
- Safety contacts time-delayed	8.84 x 10 ⁻⁸ 1/h		
- Safety contacts non-time-delayed	4.22 x 10 ⁻⁸ 1/h		

1) If several ESM-BT4.. are closely spaced, the max. cumulative current under load is 9 A at an ambient temperature of T = 20 °C, 3 A at T = 30 °C and 1 A at T = 40 °C. If these currents are exceeded, a spacing of 5 mm between the devices must be observed.

2) Additional data can be requested from the manufacturer for applications that deviate from these conditions.

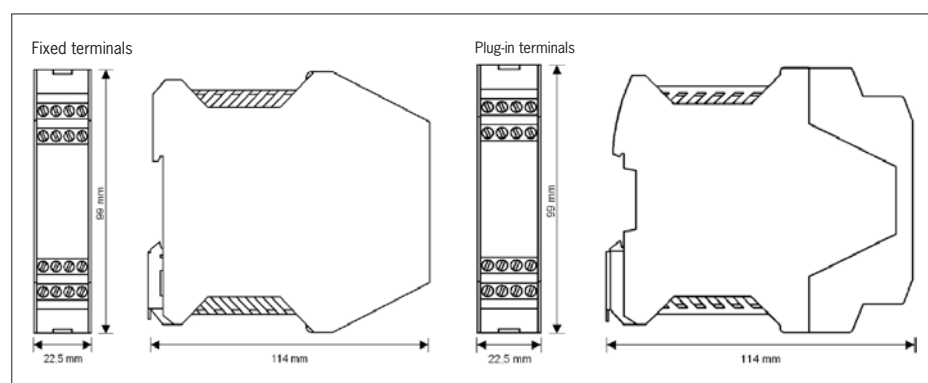


Fig. 4: Dimension drawing for ESM-BT4..

Applications

Depending on the application or the result of the risk assessment according to EN ISO 13849-1, the device must be wired as shown in Fig. 5 to Fig. 15. Non-time-delayed safety contacts can be used up to category 4, PL e, time-delayed safety contacts up to category 3, PL e.

Emergency stop circuit

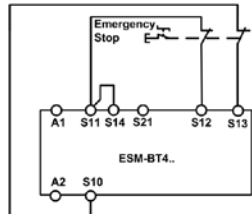


Fig. 5: Dual-channel emergency stop circuit with short circuit and ground fault monitoring (category 4, up to PL e).

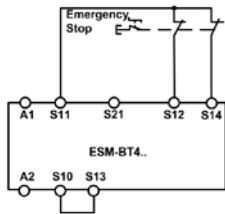


Fig. 6: Dual-channel emergency stop circuit with ground fault monitoring (category 3, up to PL d).

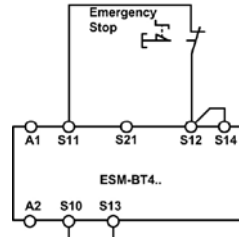


Fig. 7: Single-channel emergency stop circuit with ground fault monitoring (category 1, up to PL c).

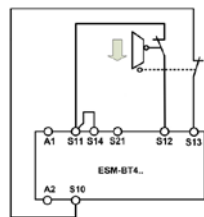


Fig. 8: Dual-channel sliding guard monitoring with short circuit and ground fault monitoring (category 4, up to PL e).

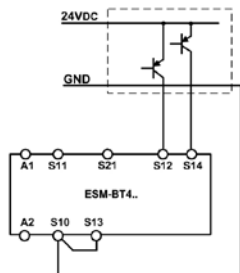


Fig. 9: Dual-channel emergency stop circuit with pnp semiconductor outputs/OSSD outputs with short circuit detection (category 4, up to PL e).

Notice:

In order to activate ground fault monitoring, the PE must be connected only to the power supply unit according to EN IEC 60204-1.

In order to activate ground fault monitoring, the power supply unit used must be grounded on the secondary side.

ATTENTION:

- It is to be ensured that any switch-on pulses emitted by the signaling device (light test) do not cause the safety relay to respond briefly and should therefore in principle be deactivated
- For applications as per Fig. 9, it is to be ensured that the reference potential of the signaling device and the ESM-BT4... is the same
- For correct operation, all safety contacts must have reached their initial state again before device restarting.

Starting behavior

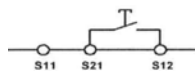


Fig. 10: Manual start.



Attention: Safety contacts switch immediately when the power supply is connected.

Fig. 11: Automatic start (e.g. for applications with a safety door). Max perm. delay during closing of the safety switches on S12 and S13: S12 before S13: 300 ms S13 before S12: any

Wire the start circuit in accordance with the application according to Fig. 10 or Fig. 11.

Feedback loop

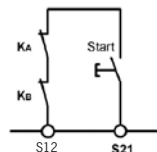


Fig. 12: Feedback loop with monitored manual start. Monitoring of externally connected contactors or expansion modules.

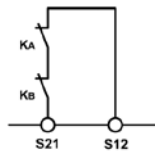


Fig. 13: Feedback loop with automatic start. Monitoring of externally connected contactors or expansion modules.

Power supply and safety contacts

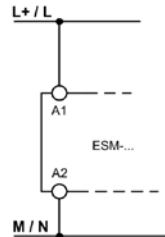


Fig. 14: Connection of the power supply to terminals A1 and A2 (power supply according to the technical data).

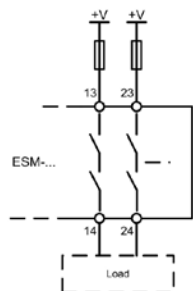


Fig. 15: Connection to switching loads on safety contacts (example contact configuration. Differing according to device type. Switching voltages +V corresponding to technical data).