

## 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. according to 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 60204-1
- ▶ 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. according to EN ISO 13849-2.
- ▶ 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 delay time (1 ... 30 s) or fixed delay time (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
- ▶ 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:
  - Monitored 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-delay 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 the emergency stop button is actuated.

It is ensured that a single fault or malfunction does not lead to a loss of the safety function and that every fault is detected by cyclical self-monitoring no later than when the system is switched off and switched on again.

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 delay time (ESM-BT4..-20S; ESM-BT4..-50S) when the emergency stop button is operated.

The power supply must be present during the time sequence.

## Mounting

As per EN 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 DIN EN 60715 TH35.

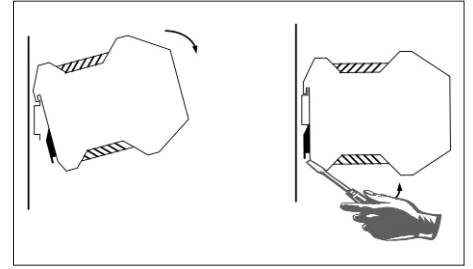


Fig. 2: Mounting/removing

## Electrical connection

- ▶ A safety transformer according to EN 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 mm<sup>2</sup> must not be exceeded.
- ▶ The conductor cross-section must not exceed 2.5 mm<sup>2</sup>.
- ▶ If the device does not function after setup, it must be returned to the manufacturer unopened. Opening the device will void the warranty.

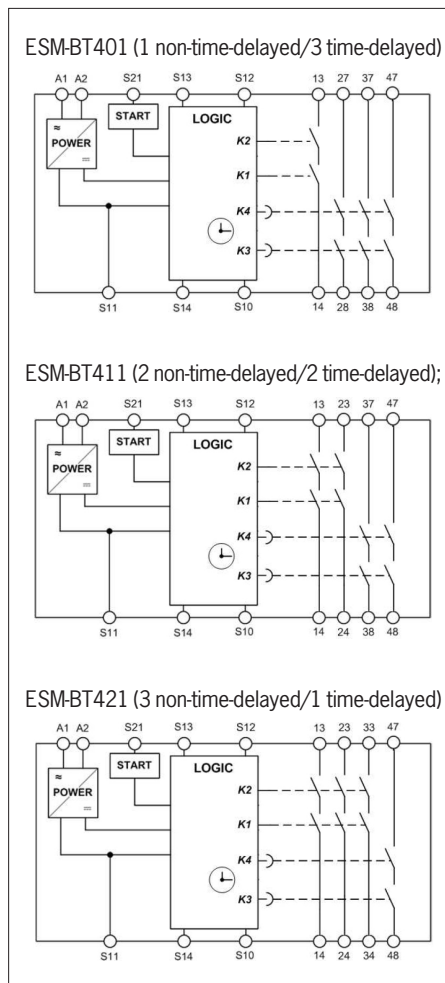


Fig. 1: Block diagrams ESM-BT4..

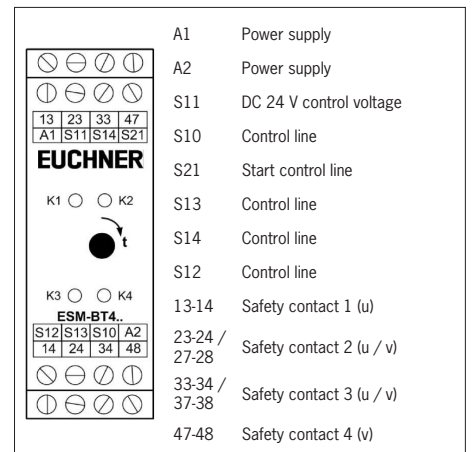


Fig. 3: Connections  
(u = non-time-delayed, v = time-delayed)

## 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 according to Fig. 10 or Fig. 11 to set the starting behavior.

**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 to the device according to 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 delay time:

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 delay time.

## 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 delay time.

## 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 delay time.

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

## Disposal

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

## EU declaration of conformity

The declaration of conformity is part of the operating instructions, and it is included as a separate sheet with the device.

The EU declaration of conformity can also be found at: [www.euchner.com](http://www.euchner.com)

## Service

If servicing is required, please contact:

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

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

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

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

## 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) 250 V, 3 A for AC-15 DC: 40 V, 320 W, 8 A for ohm resistive load (6 operating cycles/minute) 24 V, 3 A, for DC-13	
Max. cumulative current of all safety contacts	15 A <sup>1)</sup>	
Delay time		
- ESM-BT4..	1 ... 30 s	
- ESM-BT4..20S	2 s fixed	
- ESM-BT4..50S	5 s fixed	
Minimum contact load	24 V, 5 mA	
Contact fuses	10 A gG	
Conductor cross-section	0.14 - 2.5 mm <sup>2</sup>	
Max. length of control cable	1,000 m with 0.75 mm <sup>2</sup>	
Contact material	AgSnO <sub>2</sub>	
Mech. contact life	Approx. 1 x 10 <sup>7</sup>	
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 <sup>1)</sup>	
Degree of contamination	2 (DIN VDE 0110-1)	
Overvoltage category	3 (DIN VDE 0110-1)	
Weight	Approx. 250 g	
Mounting	Mounting rail according to DIN EN 60715 TH35	

### Reliability values according to EN ISO 13849-1 for all variants of the series ESM-BT4<sup>2)</sup>

Load (DC-13; 24 V)	≤ 0.1 A	≤ 1 A	≤ 2 A
n <sub>op</sub>	≤ 500,000 cycles	≤ 350,000 cycles	≤ 100,000 cycles
T <sub>10D</sub>	20 years		
Category			
- Safety contacts time-delayed	3		
- Safety contacts non-time-delayed	4		
PL	e		
PFH <sub>D</sub>			
- Safety contacts time-delayed	8.84 x 10 <sup>-8</sup> 1/h		
- Safety contacts non-time-delayed	4.22 x 10 <sup>-8</sup> 1/h		

1) If several ESM-BT4.. are closely spaced under load, the max. cumulative current 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.

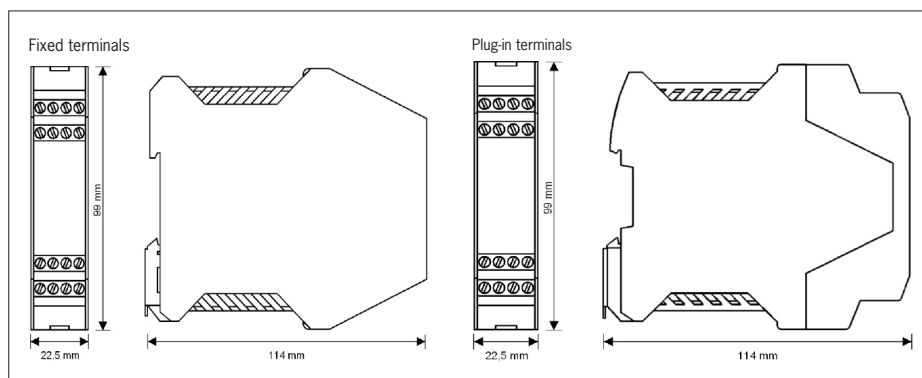


Fig. 4: Dimension drawing for ESM-BT4..

## Applications

Depending on the application or the result of the risk assessment according to DIN 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

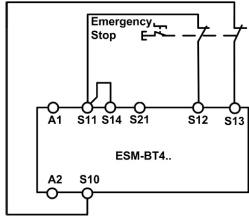


Fig. 5: Dual-channel emergency stop circuit with short circuit and ground fault monitoring (category 4, up to PL e).

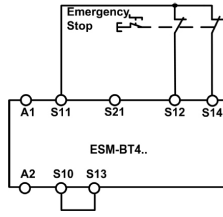


Fig. 6: Dual-channel emergency stop circuit with ground fault monitoring (category 3, up to PL d).

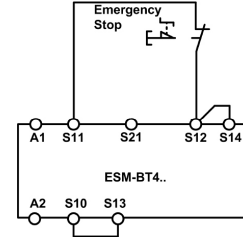


Fig. 7: Single-channel emergency stop circuit with ground fault monitoring (category 1, up to PL c).

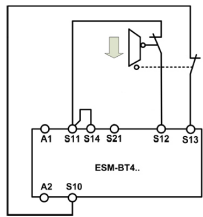


Fig. 8: Dual-channel sliding guard monitoring with short circuit and ground fault monitoring (category 4, up to PL e).

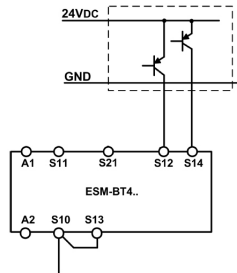


Fig. 9: Dual-channel emergency stop circuit with pnp semiconductor outputs / OSSD outputs with short circuit detection (category 4, up to PL e).

### Notice:

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

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

### Starting behavior

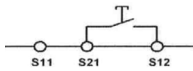
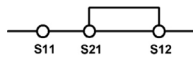


Fig. 10: Manual start.



**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

### Feedback loop

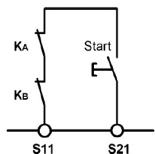


Fig. 12: Feedback loop with manual start. Monitoring of externally connected contactors or expansion modules.

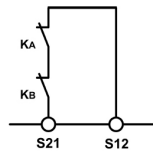


Fig. 13: Feedback loop with automatic start. Monitoring of externally connected contactors or expansion modules.

### Power supply and safety contacts

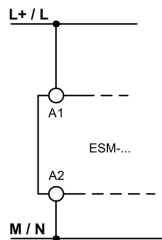


Fig. 14: Connection of the power supply to terminals A1 and A2 (power supply according to the technical data).

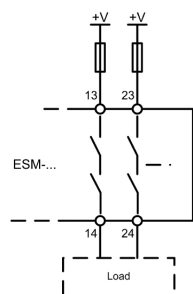


Fig. 15: Connection to switching loads on safety contacts (example contact configuration. Differing according to device type. Switching voltages +V corresponding to technical data).