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ESM-BA 301

EN
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DE
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Emergency Stop Safety Relay ESM-BA3..

EUCHNER

User Information

Correct Use

The ESM-BA3.. is a universal emergency stop safety switching device with three safe relay outputs that can quickly and safely stop the moving parts of a machine or system in case of danger.

Applications for the ESM-BA3.. include single or dual-channel emergency stop circuits and guard monitoring on machines and systems.



Functional Safety Type Approved
TÜVRheinland CERTIFIED
www.tuv.com ID 0600000000

c UL us LISTED

Features

- *3 safe, redundant relay outputs*
  1 auxiliary contact (signaling contact)
- *Connection of:*
  - *Emergency stop buttons*
  - *Safety switches*
  - *Non-contact safety switches*
  - *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 start behaviors possible:*
  - *Monitored manual start*
  - *Automatic start*
- *Short circuit and earth fault monitoring*
- *Up to PL e, SILCL 3, category 4*

Function

The emergency stop safety switching device ESM-BA3.. is designed for safe isolation of safety circuits according to EN 60204-1 and can be used up to safety category 4, PL e according to EN ISO 13849-1.

The internal logical system closes the safety contacts when the start button is pressed.

When the safety switch is opened, the positively driven safety contacts are opened and safely switch the machine off. It is ensured that a single fault 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.

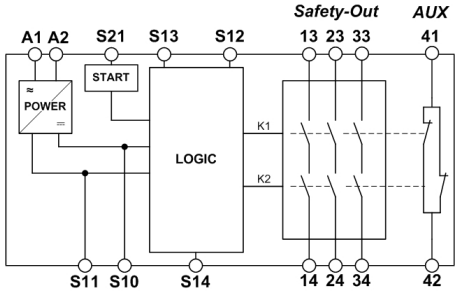


Fig. 1 Block diagram ESM-BA3..

Installation

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 DIN rail according to DIN EN 60715 TH35.

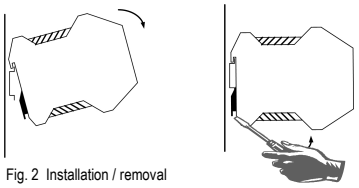


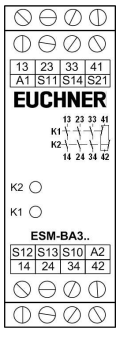
Fig. 2 Installation / removal

Safety Precautions

- Installation and commissioning 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 this user information, 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, serious injury and serious damage.
- Note down the version of the product (see label “Vx.x.x”) and check it prior to every commissioning of a new device. If the version has changed, the overall concept of the control system in which the device is incorporated must be validated again by the user.

Electrical Connection

- When the 24 V version is used, 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 (6A slow-blow or 8A quick-action or 10 A gG) must be provided.
- A maximum length of the control lines of 1000 meters with a line cross section of 0.75 mm^2 must not be exceeded.
- The line cross section must not exceed 2.5 mm^2.
- If the device does not function after commissioning, it must be returned to the manufacturer unopened. Opening the device will void the warranty.



A1:	*Power supply*
A2 :	*Power supply*
S11:	*DC 24V control voltage*
S10:	*Control line*
S21:	*Start control line*
S13:	*Control line*
S14:	*Control line*
S12:	*Control line*
13-14:	*Safety contact 1*
23-24:	*Safety contact 2*
33-34:	*Safety contact 3*
41-42:	*Auxiliary contact*

Fig. 3 Connections

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User Information

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. 1 to Fig. 11.

Emergency Stop Circuit

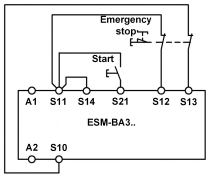


Fig. 1:
Two-channel emergency stop circuit with short circuit and earth fault monitoring.
(category 4, up to PL e)

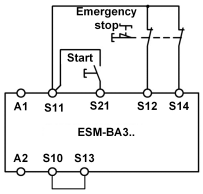


Fig. 2:
Two-channel emergency stop circuit with earth fault monitoring.
(category 3, up to PL d)

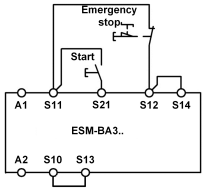


Fig. 3:
Single-channel emergency stop circuit with earth fault monitoring.
(category 1, up to PL c)

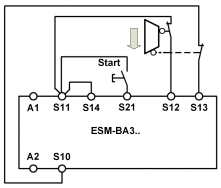


Fig. 4:
Two-channel sliding guard monitoring with short circuit and earth fault monitoring.
(category 4, up to PL e)

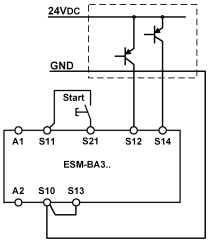


Fig. 5:
Two-channel emergency stop with pnp-outputs/OSSD-outputs ***with*** *short circuit monitoring.*
(category 4, up to PL e)

Notice:
In order to activate earth fault monitoring, S10 must be connected to PE (protective earth) on the AC115/230V devices. With AC/DC 24V, connect PE only to the power supply unit according to EN60204-1.

Starting Behavior

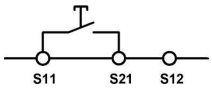
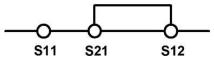


Fig. 6:
Monitored manual start.
It is monitored that the start button was opened before the emergency stop button closes. (Prerequisite: operating voltage must not be interrupted.)



Warning:
Safety contacts switch immediately when the

Fig. 7:
Automatic start.
Max perm. delay during closing of the safety switches on S12 and S13:
S12 before S13: 300 ms
S13 before S12: any

Feedback Loop

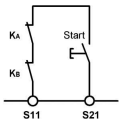


Fig. 8:
Feedback loop for monitored manual start:
The feedback loop monitors contactors or the expansion modules .

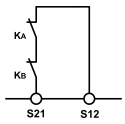


Fig. 9:
Feedback loop for automatic start:
The feedback loop monitors contactors or the expansion modules .

Power supply and Safety contacts

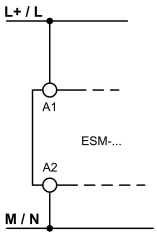


Fig. 10:
Power supply A1 and A2.
(Power supply according to techn. data)

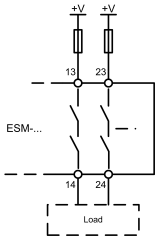


Fig. 11:
Connecting load to safety contacts.
(Figure shows example. Voltage „+V“ according to techn. data)

Commissioning Procedure

Note: *The items listed under “Electrical connection” must be observed during commissioning.*

1. Wiring emergency stop circuit:
Wire the emergency stop circuit according to the required Performance Level determined (see Fig. 1 to Fig. 5).

2. Wiring start circuit:
Wire the start circuit according to Fig. 6 or Fig. 7 to set the starting behavior.

Warning:
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.8 or Fig. 9.

4. Wiring power supply:
Connect the power supply to terminals A1 and A2 (Fig. 10).
Warning: Wiring only in de-energized state.

5. Starting the device:
Switch the operating voltage on.
Warning:
If the “Automatic start” starting behavior is set, the safety contacts will close immediately.
If the “Monitored manual start” starting behavior is set, close the start button to close the safety contacts.
LEDs ***K1*** and ***K2*** are lit.

6. Triggering safety function:
Open the emergency stop circuit by actuating the connected safety switch. The safety contacts open immediately.

7. Reactivation:
Close the emergency stop circuit. If “Automatic start” is selected, the safety contacts will close immediately.
If the “Monitored manual start” starting behavior is set, close the start button to close the safety contacts.

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User Information

Maintenance

The device must be checked once per month for proper function and for signs of tampering and bypassing of the safety function.

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

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 still exists, perform the steps listed under "Commissioning 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.

Safety Characteristics According to EN ISO 13849-1

The device is certified according to EN ISO 13849-1 up to a Performance Level of PL e.

Note:

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

Safety characteristics according to EN ISO 13849-1 for all variants of ESM-BA3

Load (DC-13; 24V)	**<= 0,1A**	**<= 1A**	**<= 2A**
T10d [years]	**20**	**20**	**20**
Category:	**4**	**4**	**4**
PL	**e**	**e**	**e**
PFHd [1/h]:	**1,2E-08**	**1,2E-08**	**1,2E-08**
nop [cycle / year]	**<= 500.000**	**<= 350.000**	**<= 100.000**

Techn. Data

Operating voltage	***ESM-BA301*** AC/DC 24V	***ESM-BA302*** AC 115V	***ESM-BA303*** AC 230V
Rated supply frequency	50-60 Hz		
Permissible deviation	+ / - 10%		
Power consumption	***DC 24V*** approx. 2.3 W	***AC 230V*** approx. 6.9 VA	
Control voltage at S11	DC 24 V		
Control current S11...S14	approx. 60 mA		
Safety contacts	3 NO contacts		
Auxiliary contacts	1 NC contact		
Max. switching voltage	AC 250 V		
Safety contact breaking capacity (13-14, 23-24, 33-34)	AC: 250 V, 2000 VA, 8 A for ohmic load, 250 V, 3 A for AC-15 DC: 50 V, 400 W, 8 A for ohmic load; 24 V, 3 A for DC-13 Max. total current through all 3 contacts 15 A (13-14, 23-24, 33-34) *)		
Auxiliary contact breaking capacity (41-42)	AC: 250 V, 500 VA, 2 A for AC-12 DC: 50 V, 100 W, 2 A for DC-12		
Minimum contact load	24 V, 5 mA		
Contact fuses	6 A slow-blow or 8 A quick-action or 10 A gG		
Line cross section	0.14 - 2.5 mm^2		
Max. length of control line	1000 m with 0.75 mm^2		
Contact material	$AgSnO_2$		
Contact service life	mech. approx. 1 x 10^7		
Test voltage	2.5 kV (control voltage/contacts)		
Rated impulse withstand voltage, leakage path/air gap	4 kV (DIN VDE 0110-1)		
Rated insulation voltage	250 V		
Degree of protection	IP20		
Temperature range	-15°C to +40°C *)		
Degree of contamination	2 (DIN VDE 0110-1)		
Overvoltage category	3 (DIN VDE 0110-1)		
Weight	approx. 230 g		
Mounting	DIN rail according to EN 60715TH35		

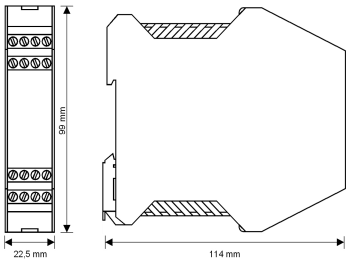
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*) If several ESM-BA3.. devices are closely spaced under load, the max. total current at the ambient temperature of T=20°C: 9A; at T=30°C: 3A; at T=40°C =1A. If these currents are exceeded, a spacing of 5 mm between the devices must be observed.

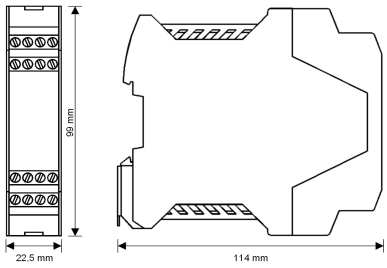
User Information

Dimension Drawing

Fixed Terminals



Plug-In Terminals



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