SAFE-TWO-HAND

Functional Safety Module | Safe two-hand control unit up to SIL 3

The SAFE-TWO-HAND safety relay is an extremely compact, universal safety two-hand control unit. It complies with EN ISO 13851, Type IIIC, and is intended for use in safety circuits that are designed in accordance with EN 60204-1, e.g., on presses, punches and bending tools. Due to the internal error monitoring, the two-hand safety relay can be used for all applications up to the highest safety category 4 and PL e according to EN ISO 13849-1, SILCL 3 according to EN 62061 or Type III C according to EN ISO 13851.

FEATURES

- 2 non-delayed safety contacts
- Cyclical monitoring of the output contacts
- Connection of two-hand push buttons
- Feedback loop for external contactors or extension modules
- LED indicator for status
- Short-circuit monitoring and ground fault monitoring
- Up to PL e/SILCL 3/category 4/Type IIIC (EN ISO 13849-1/EN 62061/EN ISO 13851)

ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-TWO-HAND
Function	Safe two-hand control unit up to SIL 3 and TYPE IIIC
Product SKU/Order No.	SA-SAFE-TH-01-00 | 1 pc

TÜVRheinland CERTIFIED
Product Safety
Functional Safety
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Table of Content

1 Function

The safety relay SAFE-TWO-HAND is suitable for setting up and monitoring two-hand circuits and is used to protect the operators. Dangerous work steps can only be triggered when both two-hand push buttons connected are operated simultaneously, within 0.5 s.

It is to be ensured a single fault or a malfunction does not lead in the loss of the safety function and every fault is detected by the cyclic self-monitoring at the latest prior to the next actuation. When the operating voltage is applied to A1-A2 and the feedback loop X1-X2 is closed, the SAFE-TWO-HAND module is ready for use. To be able to initiate a switching operation, the output relays must be de-energized. The output relays only switch to the energized position when the two-hand push buttons are operated simultaneously within 0.5 s.

The output relays are not switched if:

- only one two-hand push button is actuated or the time between the actuation of both two-hand pushbuttons is greater than 0.5 s,
- the feedback loop is open (fault in the external contactor),
- another error (short circuit, cable break, error in the switching device) has occurred.

When one of two-hand push button is released, the output relays open immediately. In order to trigger a new operation, both two-hand push buttons must first be released, and the feedback loop must be closed.

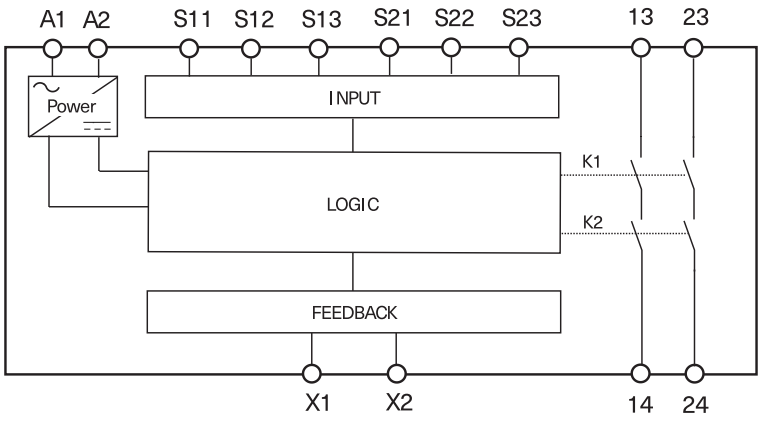

Fig. 1: Block diagram SAFE-TWO-HAND

2 Installation

As per EN 60204-1, the device is intended for installation in control cabinets with a minimum degree of protection of IP54. The following should be noted:

- Mounting on 35 mm rail according to EN 60715.
- Ensure sufficient heat dissipation in the control cabinet.

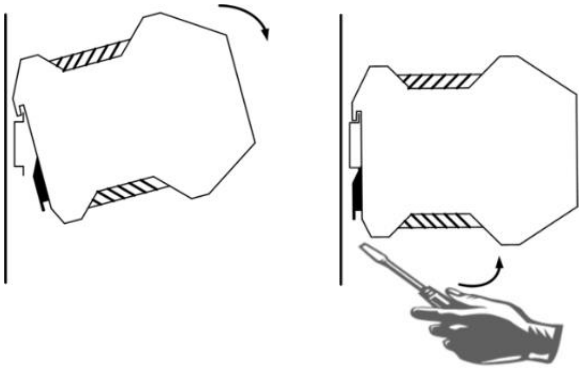

Fig. 2: Mounting / Demounting

3 Safety Precautions ⚠

- Installation and commissioning of the device must be performed only by authorized personnel and who has read and understood this operating instructions.
- 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 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.
- The contact protection and the insulation of the supply cables must be designed for the highest voltage to the device.
- 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 “Rev.”) 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.

4 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.
- Observe the instructions in the section Techical Data.
- If the device does not function after commissioning, it must be returned to the manufacturer unopened. Opening the device will void the warranty.
- External fusing of the safety contacts must be provided
- Use adequate protective circuit for inductive loads (e.g. free-wheeling diode)

A1: 24V DC Power Supply
A2: 0V Power Supply
S11: Control Line T1
S12: Control Line T1
S13: Control Line T1
S21: Control Line T2
S22: Control Line T2
S23: Control Line T2
X1; X2: Feedback Loop
13/14: Safety Relay Contact
23/24: Safety Relay Contact

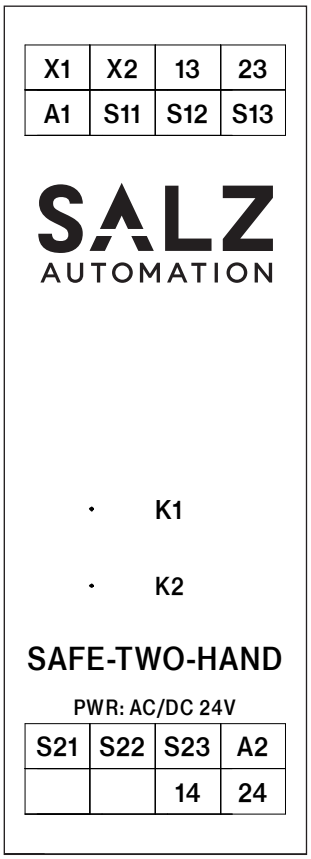

Fig. 3: Terminals

5 Operation Instructions

5.1 Applications

The arrangement of the two-hand buttons must be designed in accordance with the standards EN ISO 13851 and DIN EN ISO 13855 such that accidental actuation or simple bypassing of the safety function is excluded.

The SAFE-TWO-HAND unit is provided for the connection of two-hand push-buttons, with one normally open or one normally colsed contact.

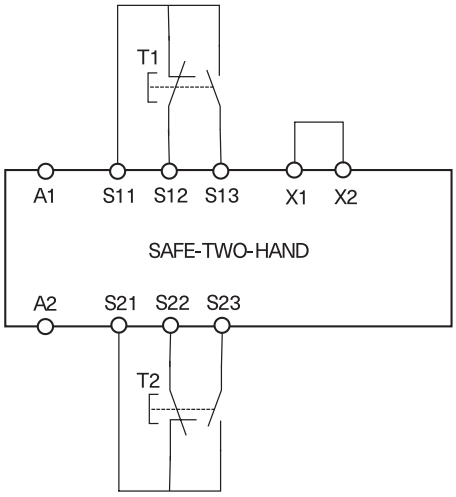

Fig. 4: Wiring of two-hand push buttons according to Type IIIC

5.2 Feedback Loop

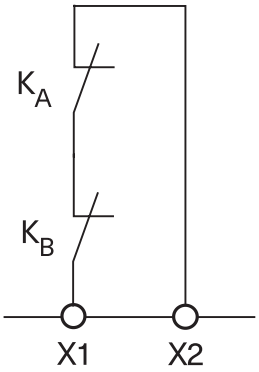

Fig. 5: Feedback loop for automatic start. The feedback loop monitors contactors or the expansion modules

5.3 Installation

Avoiding unintentional actuation or bypassing of the safety device
The arrangement of the two-hand buttons must be designed in accordance with the standard EN ISO 13851 such that accidental actuation or simple bypassing of the safety function is excluded. The operation of both buttons using one hand must be prevented by an adequate distance (at least 260 mm) or by a separating wall. Actuation using forearm, elbow, knee, hip or other parts of the body can be effectively prevented by a further in- crease in the distance between the two buttons, adequate distance from the floor and/or covers and/or separating walls.

Distance from the two-hand buttons to the danger area
It is necessary to maintain a minimum distance between the buttons for the two-hand circuit and the danger area on the machine or plant so that, after the release of one or both buttons, the machine or plant can only be reached once the dangerous movement has been interrupted or completed. According to the standard DIN EN ISO 13855, the distance is calculated with the following equation:

$$S = (K \cdot T) + C$$

S: Minimum distance from the nearest push button (two-hand push button) to the danger area.
K: Parameter in mm/s, derived from data on the approach speeds of the body or parts of the body, for two-hand circuits 1600 mm/s.
T: The overtravel of the overall system in seconds, that is the time from releasing the two-hand push button to the end of the dangerous movement.
C: Additional distance in mm that based on entry into the danger area prior to the triggering of the safety device for two-hand circuits.

Example
The overtravel time for the entire system is 90ms. Then the above equation gives for the minimum distance:

S = (1600 mm/s · 0.09 s) + 250 mm
S = 144 mm + 250 mm = 394 mm

If a suitable cover is used, S can be reduced to 144 mm (see above).

5.4 Commissioning Procedure

⚠ **ADVICE:** Follow the guidelines in “Electrical Connection” during the start-up.

1. **Wiring safety module:**
   Wire the SAFE-TWO-HAND module with the two-hand push button according to your application (see Fig. 4).

2. **Feedback loop:**
   If external contactors or extension modules are used, connect them according to Fig. 5.

3. **Power supply:**
   Connect the power supply to A1 and A2.
   ⚠ **CAUTION:** Power must not yet be activated.

4. **Starting the device:**
   Switch on the operating voltage.

5. **Switch to working condition:**
   Press the two push buttons T1 and T2 simultaneously, or within 0.5 seconds.
   The forced-guided relays switches on.

6. **Switch into hibernation:**
   Release the two push buttons T1 and T2.
   The forced-guided relays swiches off.

5.5 Check and Maintenance

Once per month, the device must be checked for proper function and for signs of tampering and bypassing of the safety function (to do this, 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.

5.6 What to do in Case of a Fault?

Device does not switch on:

- Check whether the two-hand push button of correct function.
- Check whether the wiring.
- Check the supply voltage on A1 and A2
- Is the feedback loop X1 / X2 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.

⚠ **Opening the device is impermissible and will void the warranty.**

5.7 Safety Characteristics according to EN ISO 13849-1

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

Load per contact	≤ 0,1A	≤ 1A	≤ 3A
Use duration T_{10d} [years]	20	20	20
Category	4	4	4
Performance Level PL	e	e	e
PFH_d [1/h] a	1.2×10^{-8}	1.2×10^{-8}	1.2×10^{-8}
nop [Cycles per year] DC 13, 24 V	≤ 400,000	≤ 100,000	≤ 22,500

6 Technical Data

In compliance with	EN ISO 13851, EN 60204-1, EN ISO 13849-1, EN 62061
Operating voltage	AC/DC 24 V +/- 10 %
Power consumption	AC 3.5 VA/DC 1.5 W
Rated supply frequency	50 to 60 Hz
Control voltage at S11 and S22	DC 24 V
Control current	typ. 2 x 40 mA
Safety contacts non-delayed	2 NO
Max. switching voltage	AC 250 V
Contact rating of safety contacts 6 switching cycles/min	AC: 250 V, 1,500 VA, 6 A for resistive load 250 V, 3 A for AC-15
	DC: 24 V, 144 W, 6 A for resistive load 24 V, 3 A for DC-13
Max. total current through all contacts	12 A
Minimum contact load	5 V, 10 mA
External fuses	10 A gG
Release time for the safety relays after release of a button	< 20 ms
Response delay after actuation of the buttons	< 20 ms
Synchronization time	0.5 s
Max. length of control line	1,000 m at 0.75 mm^2
Wire width	0.14 to 2.5 mm^2
Tightening moment (min./max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
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 pollution/overvoltage category	2/3 (DIN VDE 0110-0)
Protection	IP20
Temperature range ambient	-15 °C to +60 °C (max. +40 °C for AC use)
Temperature range storage	-15 °C to +85 °C
Max. altitude	≤ 2,000 m (above sea level)
Weight approx.	190 g
Mounting DIN rail according to EN 60715	TH35

7 Dimension Drawing

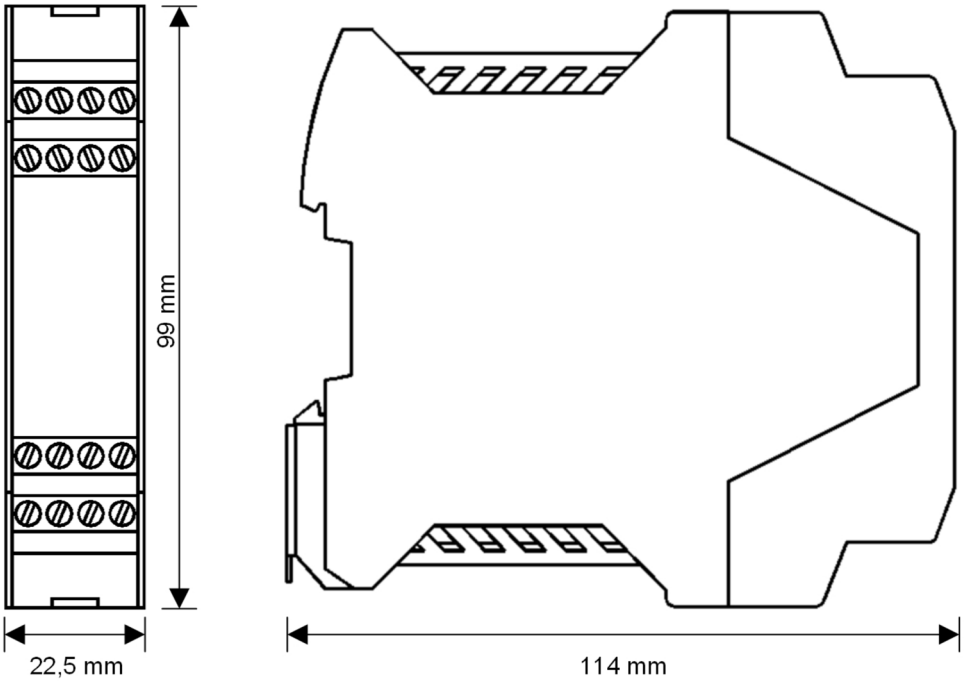

Fig. 6: Housing with Plug-In Terminal Blocks

8 Content of the EU Declaration of Conformity

The above mentioned product conforms with the most important requirements of the following directives and their modification directives:

2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2011/65/EU	RoHS Directive

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The complete EU declaration of conformity is available on the Internet at **www.salz-automation.com**