# Operating instructions
# 2-Hand Safety Relay ESM-2H2..

EUCHNER

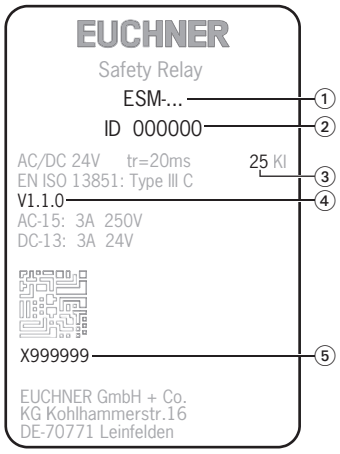
## Scope

These operating instructions apply to all two-hand safety devices ESM-2H2...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 (2109071) | (this document) | www |
| Declaration of conformity | Declaration of conformity | www |
| Any additions to the operating instructions | Take any associated additions to the operating instructions or data sheets into account. | www |

**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

The ESM-2H2.. is an extremely compact, universal two-hand safety device. It complies with EN ISO 13851, type III C, and is intended for use in safety circuits that are designed according to EN IEC 60204-1, e.g. on presses, punches and bending tools.

Due to the internal error monitoring, the ESM-2H2.. can, despite its very compact dimensions, be used for all applications up to the highest category, safety category 4, PL e according to EN ISO 13849-1, SILCL 3 according to EN IEC 62061 or type III C according to EN ISO 13851.

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

- 2 safe, redundant relay outputs
- Cyclical monitoring of the output contacts
- Additional, non-safe function: feedback loop for monitoring downstream contactors or expansion modules
- Short circuit and ground fault monitoring
- Extremely compact design
- Use up to PL e, SILCL 3, category 4 or type III C according to EN ISO 13851

## Function

The two-hand relay ESM-2H2.. is suitable for setting up and monitoring two-hand circuits and is used to protect the operating personnel. Dangerous work steps can only be triggered when both two-hand buttons connected are actuated simultaneously, i.e. within 0.5 s.

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.

When the operating voltage is applied to *A1* and *A2* and the feedback loop *X1* and *X2* closed, the ESM-2H2.. 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 buttons *T1* and *T2* are actuated simultaneously, i.e. within 0.5 s.

The output relays are not switched if:

- Only one two-hand button is actuated or the time between the actuation of the two two-hand buttons is > 0.5 s,
- The feedback loop is open (error in external contactor or contact expansion),
- Another error (short circuit, cable break, error in the switching device) has occurred.

When *T1* and/or *T2* are/is released, the output relays change to the open (safe) state immediately. In order to trigger a new operation, both two-hand buttons must first be released and the feedback loop must be closed.

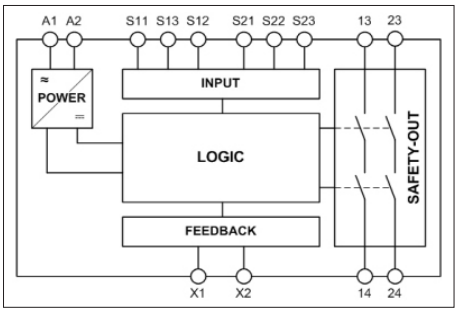



*Fig. 1: Block diagram for ESM-2H2..*

## 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.

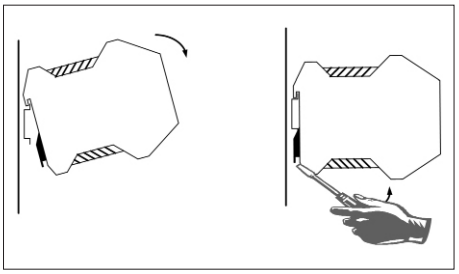


*Fig. 2: Mounting/removing*

## Installation

**Prevent unintentional actuation or bypassing of the safety function**

The two-hand buttons must be arranged as per the standard EN ISO 13851 such that unintentional actuation or simple bypassing of the safety function is excluded.

As such the operation of both buttons using one hand must be prevented by a sufficient distance (at least 260 mm) or by a separating wall.

Actuation using the forearm, elbow, knee, hip or other parts of the body can be effectively prevented by further increasing the distance between the two buttons, sufficient distance from the floor and/or covers and/or separating walls.

**Distance between the two-hand buttons and the danger area**

It is required that a minimum distance between the buttons for the two-hand circuit and the danger area of the machine or installation is maintained so that, after the release of one or both buttons, the danger area can only be reached when the dangerous movement has been interrupted or ended.

According to the standard DIN EN ISO 13855 this distance is calculated using the following equation:

**S = (K x T) + C**

**S**: Minimum distance from the nearest pushbutton (two-hand button) to the danger area.

**K**: Parameter in mm/s, derived from data on the approach speed of the body or parts of the body, for two-hand circuits 1,600 mm/s.

**T**: The stopping time for the entire system in seconds, that is the time from the release of the two-hand buttons to the end of the dangerous movement.

**C**: Additional distance in mm related to intrusion into the danger area before the safeguard activates. For two-hand circuits this distance is 250 mm, if the buttons are covered appropriately it can also be set to 0 mm , however **S** must then be at least 100 mm.

**Example**

The stopping time of the overall system is 90 ms. Then from the above equation the minimum distance is:

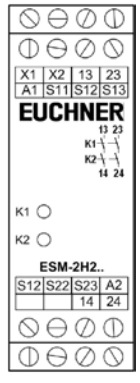
**S = (1,600 mm/s x 0.09 s) + 250 mm**

**S = 144 mm + 250 mm = 394 mm**

If a suitable cover is used, **S** can be reduced to 140 mm.

## Electrical connection

- When the 24 V version is used, 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.




| | |
|---|---|
| A1 | Power supply |
| A2 | 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 contact 1 |
| 23-24 | Safety contact 2 |

*Fig. 3: Connections*

## Setup procedure

**Notice**

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

**1. Wiring ESM-2H2.. to two-hand buttons:**

Wire the ESM-2H2.. to the two-hand buttons as per Fig. 5.

**2. Wiring feedback loop:**

If your application provides for external contactors or expansion modules, connect them as shown in the examples in Fig. 6.

**3. Wiring power supply:**

Connect the power supply to terminals *A1* and *A2* (see Fig. 7).

**Attention:** Wiring only in de-energized state.

**4. Starting the device:**

Switch the operating voltage on.

**5. Switching to the operating status:**

Actuate the two buttons *T1* and *T2* simultaneously, or within 0.5 s.

The positively driven relays switch on.

**6. Switching to the idle status:**

Release the two buttons *T1* and *T2*.

The positively driven relays switch off.

## 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 two-hand buttons used for correct function and adjustment.
- Check the operating voltage at *A1* and *A2*.
- Is the feedback loop closed or a jumper fitted?

**Device cannot be switched on again after an emergency stop:**

- Check the two-hand buttons used for correct function.
- Check the wiring (short circuits or similar?)
- 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. 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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www.euchner.com

## Technical data

| Parameter | Value | | |
|---|---|---|---|
| Version | **ESM-2H201** | **ESM-2H202** | **ESM-2H203** |
| Operating voltage | AC/DC 24 V | AC 115 V | AC 230 V |
| Rated supply frequency | 50 - 60 Hz | | |
| Permissible deviation | ± 10% | | |
| Power consumption | DC 24 V<br>Approx. 1.5 W | AC 230 V<br>Approx. 3.7 VA | |
| Control voltage at S12/S13 and S22/S23 | DC 24 V | | |
| Control current (both buttons) | Approx. 2 x 40 mA | | |
| Release time of the safety relay after releasing a button | < 20 ms | | |
| Response delay after actuation of the buttons | < 20 ms | | |
| Synchronization time | < 0.5 s | | |
| Safety contacts | 2 NO contacts | | |
| Max. switching voltage | AC 250 V | | |
| Breaking capacity | AC: 250 V, 1,500 VA, 6 A for ohm resistive load (6 operating cycles/minute)<br>250V, 3A for AC-15 | | |
| | DC: 24 V, 144 W, 6 A for ohm resistive load (6 operating cycles/minute)<br>24V, 3A, for DC-13 | | |
| Max. cumulative current of the safety contacts | 12 A | | |
| 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 | | |
| 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 | DC 24 V: -15 °C to +60 °C | | |
| | AC 230 V/115 V/24 V: -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 | Mounting rail acc. to EN IEC 60715 TH35 | | |
| **Characteristics according to EN ISO 13849-1 for all variants of the series ESM-2H2** [1] | | | |
| Load (DC-13; 24 V) | **≤ 0.1 A** | **≤ 1 A** | **≤ 3 A** |
| $n_{op}$ | ≤ 400,000 cycles | ≤ 100,000 cycles | ≤ 22,500 cycles |
| $T_{10D}$ | 20 years | | |
| Category | 4 | | |
| PL | e | | |
| PFH | 1.2 x $10^{-8}$ 1/h | | |

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

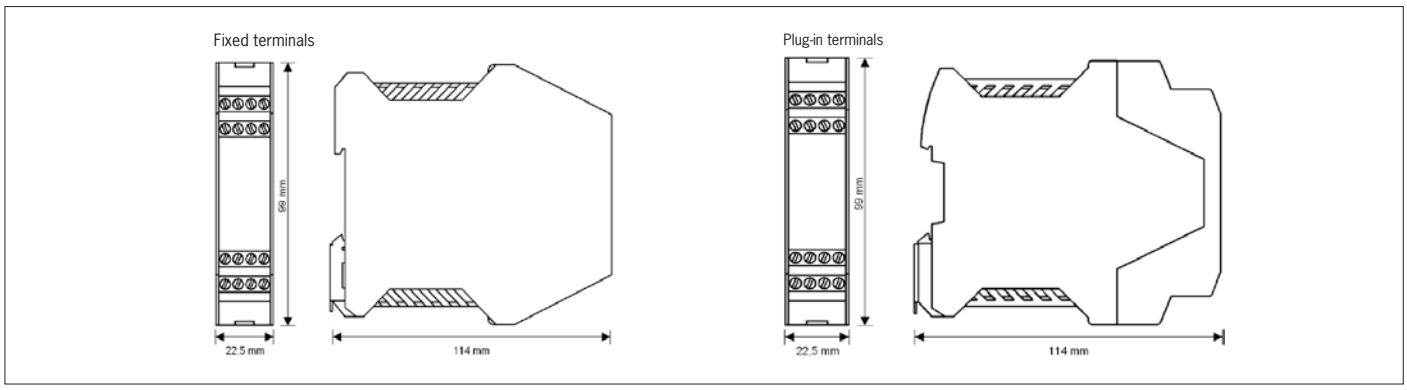


*Fig. 4: Dimension drawing for ESM-2H2..*

## Application

The buttons in the two-hand circuit must be arranged and be such that accidental operation is prevented and the protective action cannot be easily bypassed. Here the regulations in the applicable standards, in particular EN ISO 13851 and EN ISO 13855, are to be observed.
The ESM-2H2.. is intended for the connection of two-hand buttons each with one NC contact and one NO contact.

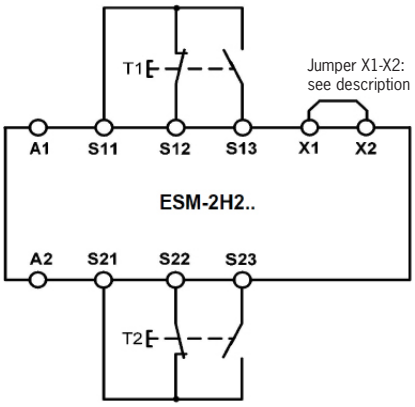


*Fig. 5: Wiring for the ESM-2H2.. with two-hand buttons (NC/NO contact)*

**Feedback loop**

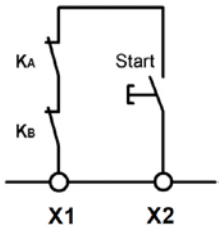


*Fig. 6: If an external contactor or expansion module (e. g. ESM-ES3..) is to be connected to ESM-2H2.. to increase the rating of the contacts or the number of contacts, its positively driven monitoring contacts (NC contacts) are to be connected in series and connected to the connections for the feedback loop X1 and X2.*

**Power supply**

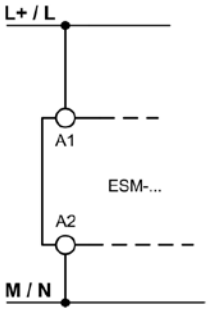


*Fig. 7: Connection of the power supply to terminals A1 and A2 (power supply according to the technical data).*