

## UE 43-2 MF – UE 43-2 MT Safety Relay Module

### 1 Safety

The UE 43-2 MF and UE 43-2 MT Safety Relay modules meet safety-related requirements up to and including Safety Category 4 (EN 954).

#### 1.1 Safety regulations

- Installation and electrical connection may only be carried out by technically qualified personnel.
- National and international legislative regulations apply to the use and installation of the Safety Switch and to the commissioning and any repetitive technical verification. These regulations embrace, in particular
  - the EU Directive 98/37 EG on machinery
  - the EU Directive 89/655 EWG on the use of operational equipment
  - Safety regulations and legislation, as well as
  - accident prevention regulations, and rules and guidelines on aspects of safety

Manufacturers and operators of machines, to which safety devices are fitted, are responsible in ensuring that all applicable and current valid safety regulations and legislation, are co-ordinated and observed in collaboration with the authorities concerned.

- The information and test specifications embodied in these Operating Instructions are to be unconditionally observed and applied at all times.
- Tests and checks are to be conducted by technically competent personnel or by specialist personnel specifically authorised and appointed for this purpose, the tests and checks being documented on each occasion for the purpose of traceability.
- The Operating Instructions are to be made available to the operator of the machine to which the Safety Relay module is fitted. The operator of the machine must be trained by technically qualified personnel.
- The Operating Instructions are to be suitably archived for future reference and use!

#### 1.2 Scope of application of the Safety Relay modules

##### 1.2.1 UE 43-2 MF

The Safety Relay module UE 43-2 MF is for exclusive use on potential-free safety sensors, such as:

- Emergency-Stop-Switch (EN 418): single- or dual-channel
- Safety interlocks (EN 1088): single- or dual-channel, such as safety doors
- Safety circuits according to EN 60 204-1, e.g. with moveable guards

##### 1.2.2 UE 43-2 MT

The UE 43-2 MT Safety Relay is designed exclusively for use in association with safety sensors listed in the applications for the UE 43-2 MF relays and for all normally closed contact actuators, which are used to protect individuals and personnel (EN 1760), such as:

- Pressure sensing mats

#### 1.3 Use in accordance with the regulations and conditions

If used in any other way than intended, or in the event that modifications have been made to the unit, or if the unit has been opened up – even during the course of assembly and installation – any claim made under the warranty upon SICK AG shall become null and void.

#### 1.4 Environmentally compatible disposal

Unusable and irreparable units must always be disposed of in accordance with current waste disposal regulations specific to the country concerned. SICK is able to offer assistance regarding disposal of any units.

## 2 Product Description

### 2.1 Construction and method of operation

Inputs of the Safety Relay modules UE 43-2 MF and UE 43-2 MT have been designed for connection to the respective safety sensors mentioned in the Section "Scope of application". Two separate input circuits control the relays of safe and non-safe output circuits. The two electrical output circuits serve as fail safe outputs. The signal circuit is not a fail safe output circuit.

#### 2.2 Mode of operation

With the input circuits open, the output circuits are effectively opened, closing the signal circuit.

**Manual resetting:** Closing the input circuits does not effect an immediate closing of the output circuits or the opening of the signal circuit. This is not done until the reset button is pressed. Depending upon the switching arrangement, the reset is accomplished with a trailing or leading edge of the Reset signal.

**Automatic resetting:** Closing the input circuits effects the immediate closing of the output circuits and opens the alarm circuit. This function is accomplished by appropriate wiring of the switch.

**Monitoring synchronisation:** Upon activating the input circuits, synchronisation is monitored. Only if the input circuit 2 closes by no later than 0.5 sec after input circuit 1, will the output circuits close

too. If input circuit 2 closes before input circuit 1, then no synchronisation monitoring occurs, and the output circuit will close (the signal circuit is thus open).

**Monitoring of the contactors:** Contactor monitoring system monitors the contactors controlled by the interface output circuits (e.g. motor contactors). By wiring the normally closed contacts of the contactors in series to the reset input, the output circuits only close (and the signal circuit only opens) if both contactors are de-energised.

**Short circuit detection:** A short circuit can be detected using dual channel switching of the input circuits only when different polarities are being switched. When connecting actuators with normally closed contacts to UE 43-2 MT Safety Relay (as used in pressure sensing mats), this function is employed to switch off the relay.

### 2.3 Indicators

The LEDs, fitted in the cover of the unit, indicate the following conditions:

Description	Colour	Function
SUPPLY	Green	Supply voltage present
K 1	Green	Relay K 1 energised
K 2	Green	Relay K 2 energised

### 3 Assembly

#### Control cabinet installation only!

The UE 43-2 MF and UE 43-2 MT Safety Switch modules are only suitable for installation into control cabinets having a minimum protective type of enclosure to Class IP 54. Installation of the units is made by snap-clipping on to a TS 35 (EN ISO 022) mounting rail (DIN rail).

### 4 Electrical installation

#### Switch off and electrically isolate the system from all supply voltage!

In order to prevent any inadvertent start up of the system or the creating an electrical hazard, the system is to be switched off and electrically isolated from all voltage supplies.

#### Protection against electrocution to EN 50 178

In order to secure protection from electrocution in accordance with EN 50 178, observe the instructions given in the Technical Data.

#### Instructions

- Wiring of the monitoring system for monitoring the contactors (signal contacts of the relay module) is to be made in the same installation housing used for the Safety Relay unit.
- To prevent the final switching device contacts from fusing, a fuse, rated to provide protection from short-circuits to max. 6 A (Operation Class gG), is to be incorporated in the output circuitry (refer to Fig. 2, fuses F2/F3).
- In the case of switching capacitive or inductive loadings, a spark suppression system should be used. It should be noted that some spark suppression systems can affect the response time of the overall safety system.
- The cables for carrying the input and output signals are to be wired externally of the installation housing to correspond to the category of safety to be applied (EN 954). For example, protected wiring, Single sheathed cable / wiring with screen, etc..
- The details given in the *Technical Data* are to be observed unconditionally and without reservation

#### 4.1 Wiring of connections

A 1	Voltage supply (DC-Mode: + 24 V)
A 2	Voltage supply (DC-Mode: 0 V)
S 11	+ 24 V DC (control voltage)
S 33	+ 24 V DC (control voltage)
S 21	0 V DC (control voltage)
S 34	Reset (Trailing edge pulse)
S 35	Reset (Leading edge pulse)
S 12	+ Input circuit 1 (K 1)
S 31	+ Input circuit 2 (K 2)
S 22	- Input circuit 2 (K 2)
13 - 14	Output circuit 1
23 - 24	Output circuit 2
31 - 32	Alarm circuit (non fail safe)

#### 4.2 Operating Modes

##### 4.2.1 Single channel operation

Wire links are to be made between S 12 & S 31 and S 21 & S 22. The safety sensor is connected between S 11 and S 12.

##### 4.2.2 Twin channel operation with cross connection detection system

A wire bridge is to be made between S 31 & S 33. The outputs of the safety sensor are to be connected between S 33 & S 12, and S 21 & S 22 respectively.

##### 4.2.3 Reset

###### Manual reset

A reset button having a normally closed contact is wired between contacts S 33 and S 34 (reset with a trailing edge pulse). A reset button having a normally open contact is wired between contacts S 33 and S 35 (reset with a leading edge pulse).

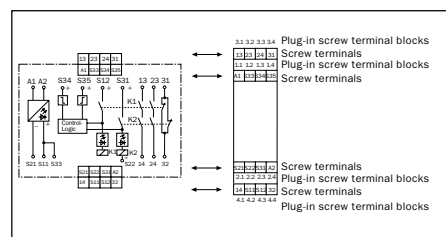


Fig. 1: Internal switching circuitry

The reset button is to be installed outside the danger zone in such a manner that it cannot be activated from within the danger zone. In addition, the operator must have full visual command of the danger zone.

#### Automatic reset

A wire link is to be made between S 12 and S 35.

#### 4.2.4 Monitoring of the contactors

Connecting the normally closed contacts of the external relay in series with the reset button ensures static monitoring of the contactors.

#### 4.3 4-Wire Devices (ie. Mats)

The outputs from the 4-wire device, in which detection occurs through the shorting of two circuits, are connected between S 21 & S 22, and S 11 & S 12.

## 5 Commissioning

#### Check the danger zone is clear!

Prior to commissioning, it must be ensured that the danger zone is free of personnel. The safety regulations and test instructions as described above are to be observed.

The following functional tests are to be carried out during commissioning:

##### 5.1 Manual reset, functional testing

After applying the supply voltage, the output circuits are open (LED SUPPLY indicator illuminates). If the connected sensors output circuits are closed, then the interface output circuits close and the signal circuit opens when the reset button is activated (LED K 1 and K 2 indicators illuminate).

Activation of the sensor (opening of one or both input circuits) initiates the opening of both interface output circuits (and the closing of the signal circuit): LED K 1 and K 2 indicators extinguish. By the closing of the input circuits and subsequent activation of the reset button, the output circuits close (and the signal circuit opens).

##### 5.2 Automatic reset, functional testing

After applying the supply voltage, the output circuits remain open (signal circuit closed) until the sensor closes its output circuits. The interface output circuits then close and the alarm circuit opens (LED K 1 and K 2 indicators illuminate).

Activation of the sensor (opening of one or both input circuits) opens

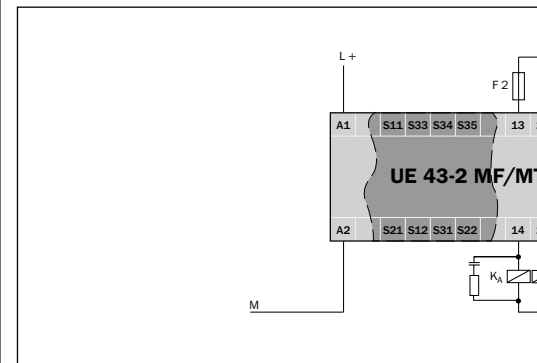


Fig. 2: Basic wiring: Voltage supply, dual channel output circuit (refer to *Technical Data*)

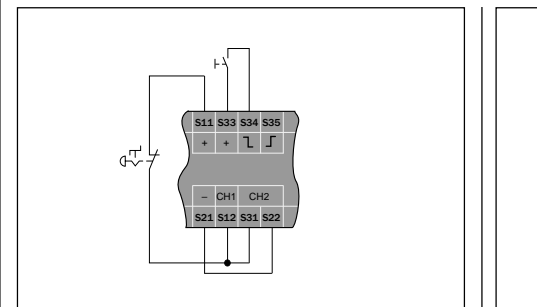


Fig. 3: Single channel emergency stop with manual reset

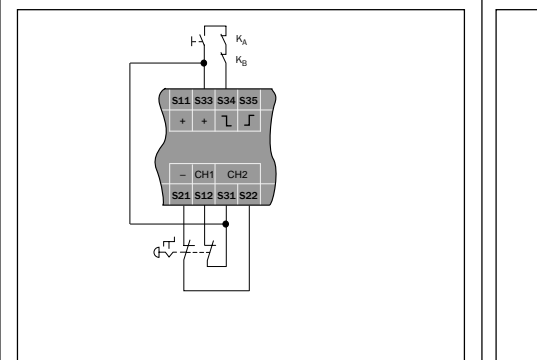


Fig. 5: Dual channel emergency stop with cross monitoring and manual reset and external device monitoring

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the two output circuits and closes the alarm circuit (LED K 1 and K 2 indicators extinguish).  
Upon the activation of the input circuits both output circuits close (and the signal circuit opens).

### 5.3 Regular inspection / testing of the safety equipment by trained technical personnel

- Inspect/test the system within the specified period in accordance with national applicable regulations!
- Following major modification work to the machine or the safety equipment, the system is to be tested as if being commissioned in accordance with the specification given above.

### 6 Maintenance

The UE 43-2 MF and UE 43-2 MT Safety Relay module don't need any maintenance.

### 7 Technical Data

see table

### 8 Ordering Data

#### 8.1 Ordering Data for MF version

Version	Type	Order No.
24 V AC/DC Screw terminals	UE 43-2 MF 2 D 2	6 024 893
24 V AC/DC Exchangeable Terminals	UE 43-2 MF 3 D 2	6 024 894

#### 8.2 Ordering Data for MT version

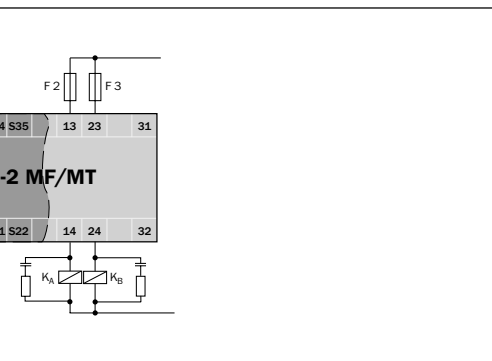
Version	Type	Order No.
24 V DC Screw terminals	UE 43-2 MT 2 D 3	6 024 895
24 V DC Plug-in screw terminal blocks	UE 43-2 MT 3 D 3	6 024 896

### 9 Appendix

#### 9.1 Approvals

BG, UL

#### 9.2 Wiring Examples



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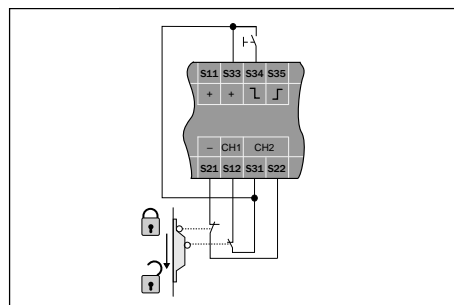


Fig. 4: Dual channel safety door with cross monitoring and synchronisation monitoring and manual reset

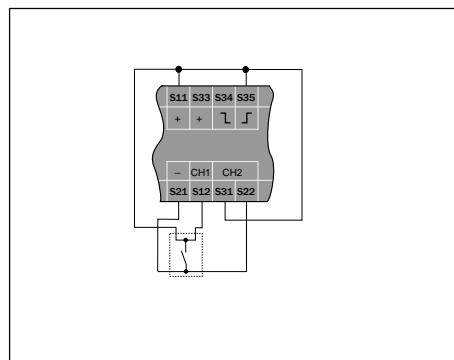


Fig. 6: Only for UE 43-2 MT, dual channel switch mat with automatic reset

### Technical Data

#### General System Data

	min.	typ.	max.
Safety Classification (EN 50 178)	Protection against electrocution as per DIN VDE 0106 Part 100		
Voltage supply to A 1 / A 2	PELV to A 1 / A 2 PELV or SELV to A 1 / A 2		
Output circuit > 25 V AC / 60 V DC			
Output circuit < 25 V AC / 60 V DC			
Safety category EN 954-1	4		
Supply voltage U <sub>n</sub>	20.4 V	24 V	26.4 V AC/DC
Consumption			
AC only for UE 43-2 MF	3.5 VA		
DC UE 43-2 MF (UE 43-2 MT)	1.5 (2.7) W		
AC Ripple during DC operation (within the limits of U <sub>n</sub> )	2.4 V <sub>ss</sub>		
Nominal frequency during AC operation	50 Hz	60 Hz	

#### Control voltage for S 33 / S 11 und S 21

Control voltage	24 V DC
Control Current	50 mA
Short-circuits between S 33 / S 11 und A 2)	2200 mA

#### Fuses / circuit breakers

UE 43-2 MF	PTC-resistance electronic circuit
UE 43-2 MT	

#### Response time for cross connection UE 43-2 MF (UE 43-2 MT)

Activation time upon detection of cross connection UE 43-2 MF (UE 43-2 MT)	2 s (5 ms)
Short-circuit control voltage S 33 - S 11 against S 21 for UE 43-2 MT	3 s (5 ms)

#### Short-circuit control voltage S 33 - S 11 against S 21 for UE 43-2 MT

Short-circuit voltage	20 V DC
Short-circuit current	100 mA

#### Electrical separation between A 1 / 2 and S 21, S 11, S 33

Electrical separation between A 1 / 2 and S 21, S 11, S 33	none
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#### Input circuits (S 12 and S 31 - S 22)

Input current for S 12 and S 31	30 mA
Output current for S 22	20 mA
Peak input current / half life	75 mA / 45 ms
Response time	40 ms
Reset time	
Trailing edge (S 34)	80 ms
Leading edge (S 35)	600 ms
Synchronisation time	500 ms
Activation period for reset button	50 ms
Input circuit interruption	50 ms
Activation time	500 ms
Line resistance at inputs (UE 43-2 MF)	< 70 Ohm
Safety mat resistance (UE 43-2 MT)	< 50 Ohm

#### Output circuits (13 - 14, 23 - 24, 31 - 32)

Relay contacts	2 Output circuits (closers / make-contacts) 1 Signal circuit (opener / break-contact)	
Contact type	positively guided	
Contact material	Silver alloy, gold-plated	
Load capability of contacts		
Switching voltage	10 V AC/DC	230 V AC / 30 V DC
Switching current	10 mA	6 A
Total switching current	12 A	
Application category to EN 60 947-5-1: 1991		
	AC-15 Ue 230 V AC, I <sub>e</sub> 6 A (3600 c/h) DC-13 Ue 24 V DC, I <sub>e</sub> 6 A (360 c/h) DC-13 Ue 24 V DC, I <sub>e</sub> 3 A (3600 c/h)	
Permitted switching frequency	3600 c/h	
Service life, mechanical (switch clearance tolerances)	1 x 10 <sup>7</sup>	
Electrical service life	2 x 10 <sup>6</sup>	

#### Operational data

Creepage and clearance distance between the electric circuits to DIN VDE 0110 Part 1:		
Measured transient/surge voltage (U <sub>imp</sub> )	4 kV	
Overload voltage category	III	
Contamination rating of the unit (EN 50 178)		
external	3	
internal	2	
Measured voltage	300 V AC	
Test voltage U <sub>di</sub> (50 Hz) EN 60 439-1	2.0 kV	
Type of protective enclosure		
Casing	IP 40	
Terminals	IP 20	
Interference emission to	EN 60 947-1 02/99	
Noise attenuation to	EN 60 947-1 02/99	
Ambient operating temperature	- 25 °C	+ 55 °C
Storage temperature	- 25 °C	+ 75 °C
Cross-sections of conductors		
Solid core wire (2x, identical cross-section)	0.14 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Solid core wire (1x)	0.14 mm <sup>2</sup>	2.5 mm <sup>2</sup>
Fine multi-stranded flex with terminal sleeves (2x, identical cross-section)	0.25 mm <sup>2</sup>	0.5 mm <sup>2</sup>
Fine multi-stranded flex with terminal sleeves (1x)	0.25 mm <sup>2</sup>	2.5 mm <sup>2</sup>
Weight	0.2 kg	

