



Safety Relay Series UE 45-3 S 1

1 Safety

The UE 45-3 S 1 Safety Relay fulfils the specific Safety requirements up to Safety Category 4 (EN 954) for Stop Category 0 (EN 60 0204-1) and Safety Category 3 (EN 954) for Stop Category 1 (EN 60 0204-1).

1.1 Safety Regulations

- Installation and electrical connection must be carried out solely by technically qualified technicians.
 - For use and installation of Safety Relays and for commissioning and routine technical checks, the National and International legislative regulations shall apply, in particular
 - the Directive 98/37 EG on Machinery
 - the Directive 89/655/EWG on the use of operational resources
 - the Low Voltage Directive 73/23/EWG
 - Safety legislation and enactments, plus
 - accident prevention Regulations and Safety Regulations
- Manufacturers and operators of the machine, on which safety devices are used, are responsible for ensuring that all currently applicable Safety legislation and Safety Regulations are defined for them by the Authorities responsible and are heeded and observed.

- The instructions and test directives contained in this Operating Instructions are to be heeded and maintained without fail.
- The examinations and tests are to be carried out by technicians or by persons authorised and commissioned for this purpose in-house, and the results are to be documented in a manner that enables traceability to be effected at any time.
- The Operating Instructions are to be made available to the operator of the machine in which the Safety Switch is used. The operator of the machine is to be given induction instructions by a skilled technician.
- The Operating Manual is to be archived for later use and reference!

1.2 Application areas of the instruments

The UE 45-3 S 1 Safety Relay is used exclusively on potential-free safety sensors, such as:

- Emergency Stop Switches (EN 418): single-channel and dual-channel
- Safety interlocks (EN 1088): single-channel and dual-channel
- Electrical safety circuits to EN 60 204-1, such as for example on movable covers and guards

1.3 Use in accordance with the Regulations

In any other application or in the event of modifications to the unit, or if the unit has been opened, even as part of assembling or installation procedure, any claims against SICK shall become null and void.

1.4 Environmentally correct disposal

Unusable and irreparable units are, at all times, to be disposed of in accordance with the applicable waste disposal legislation specific to the country concerned. SICK will, if asked, gladly assist in disposing of units.

2 Product description

2.1 Construction and method of operation

The inputs of the UE 45-3 S 1 Safety Relays are prepared for connection to the safety sensors mentioned in the Section entitled "Application areas of the instruments". Two separate input circuits control the internal relays. The three electrical output circuits serve as safety outputs.

2.2 Functions of the unit

Opening the input circuits effects immediate opening of two electrical output circuits and a time lagged opening of a third electrical output circuit. The time delay can be infinitely set on the Safety Relay within the setting ranges.
 Release delayed of the electrical output circuit: This electrical output circuit opens in respect to the two standard electrical output circuit having an adjustable time delay of 0,15 - 3 sec respectively 1,5 - 30 sec.

Manual reset: Closing of the input circuits does not effect an immediate closing of the three electrical output circuits. This is not accomplished until the Reset button has been activated. Depending upon the wiring, resetting is effected with a falling edge or with an rising edge.

Automatic reset: Closing the input circuits effects the immediate closing of the three electrical release circuits. This function is accomplished by means of applying the appropriate method of switch wiring.

Monitoring synchronisation: Simultaneous closing of the input circuits is monitored. Only if input circuit 2 closes at the very latest by 0,5 sec after input circuit 1 closes, do the electrical release circuits close too. If the input circuit 2 closes before input circuit 1, no monitoring for synchronisation occurs, and the electrical output circuits close.

External Device Monitoring: The EDM-system monitors the switches (e. g. motor contactors) controlled by the electrical output circuits. By wiring of the alarm contacts of the actuators in series to the reset input, the electrical output circuits only close if all actuators are opened. This monitoring control is only activating upon resetting.
Cross connection detection: A cross connection is detected for dual-channel switching of the input circuits, when switching is effected with a variance in polarity.

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 / K 2	Green	Relays K 1 and K 2 energised
K 3 / K 4	Green	Release delayed relays K 3 and K 4 energised

3 Assembly

Danger: Operation only in the control cabinet!

The UE 45-3 S 1 Safety Switch is only suitable for installation in control cabinets having a minimum protective type of enclosure to Class IP 54.

Fitting of the units is effected by snap-clipping on to a TS 35 (EN 50 022) mounting rail.

4 Electrical installation

Danger: Switch off the system!

In order to exclude any inadvertent starting up of the system or the creating an electrical hazard, the system is to be switched off and electrically isolated from any voltage supply.

Danger: Protection against electrocution to EN 50 178

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

Instructions

- Wiring of the monitoring system for monitoring the contactors (alarm contacts of the switch elements) is to be effected in the same installation housing used for the Safety Switch-gear.
- To prevent fusion of the contacts of the installed relays, an electrical current overload circuit inceptor (fuse) rated to provide protection from short-circuiting to max. 6 A (Operation Class gG) is to be incorporated in the electrical output circuitry (refer to Fig. 2, fuses F 2 / F 3 / F 4).
- In the case of subjection to capacitive or inductive loadings of the electrical output circuits, a protective activation system (e. g. spark arrester) is to be provided. In so doing, attention is to be paid to ensure that the response delay periods are appropriately extended to accommodate the type of protective activation employed.
- 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 with a screen protection, etc..
- The details given in the *Technical Data* are to be heeded unconditionally without reservation

4.1 Wiring of connections

A 1	+ 24 V DC (voltage supply)
A 2	0 V DC (voltage supply)
S 11	+ 24 V DC (control voltage)
S 33	Supply for Reset
S 21	0 V DC (control voltage)
S 34	Resetting (evaluation of falling edge)
S 35	Resetting (evaluation of rising edge)
S 12	+ Input circuit 1 (K 1)
S 31	+ Input circuit 2 (K 2)
S 22	- Input circuit 2 (K 2)
13 - 14	Electrical output circuit 1
23 - 24	Electrical output circuit 2
37 - 38	Release delayed electrical release circuit

4.2 Operating Modes

4.2.1 Single channel operation

Wire bridges 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 Dual-channel operation with cross connection detection system

A wire bridge is to be effected between S 11 - S 31. The two zero potential state switches of the Safety sensor are to be connected between S 12 - S 31 and respectively between S 21 - S 22.

4.2.3 Reset

Manual reset

The Reset button having a NO contact is wired between contacts S 33 and S 34 (resetting with a falling edge).

The Reset button having an NC contact is wired between contacts S 33 and S 35 (resetting with an rising edge).

The Reset button is to be installed outside the danger zone in such a manner that it cannot be activated from the danger zone. In addition, the operator must be able to fully oversee the danger zone.

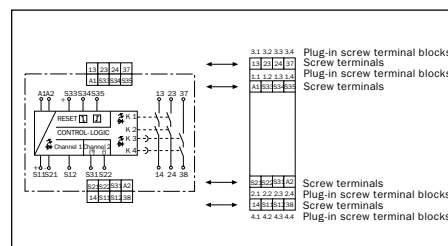


Fig. 1: Internal circuitry UE 45-3

Automatic reset

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

4.2.4 External Device Monitoring

Connecting the NC contacts of the external relay in series with the Reset button, effects static monitoring of the contacts.

5 Commissioning

Danger: Monitor the danger zone!

Prior to commissioning, it must be ensured that nobody is in the danger zone. The Safety Regulations and test instructions as described above are to be heeded.

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

5.1 Functional testing using manual resetting

After applying the supply voltage (LED SUPPLY indicator illuminates), the electrical release circuits are opened. If the connected sensor is not activated (i. e. input circuits closed), then the electrical output circuits close upon pressing the Reset button (LED for K 1 / K 2 and K 3 / K 4 indicators illuminate).

Activation of the sensor (opening of one or both input circuits) effects the immediate opening of both electrical output circuits (13 - 14 / 23 - 24), and the delayed release of the electrical release circuit (37 - 38) in accordance with the period of delay set (LED K 1 / K 2 indicators illuminating immediately and K 3 / K 4 indicators illuminating after a delay). By the closing of the input circuits and subsequent pressing of the Reset button, the electrical output circuits close.

5.2 Functional testing using automatic resetting

After applying the supply voltage (LED SUPPLY indicator illuminates), the electrical output circuits remain open until the sensor closes the input circuits. The electrical output circuits then close (LED K 1 / K 2 and K 3 / K 4 indicators illuminate).

Activation of the sensor (opening one or both input circuits) causes the two electrical output circuits (13 - 14 / 23 - 24) to open immediately and effects the delayed release of the electrical output circuit (37 - 38) in accordance with the delay period set (LED K 1 / K 2 indicators extinguish immediately and K 3 / K 4 indicators extinguish after a delay).

Upon the closing of the input circuits the electrical release circuits close.

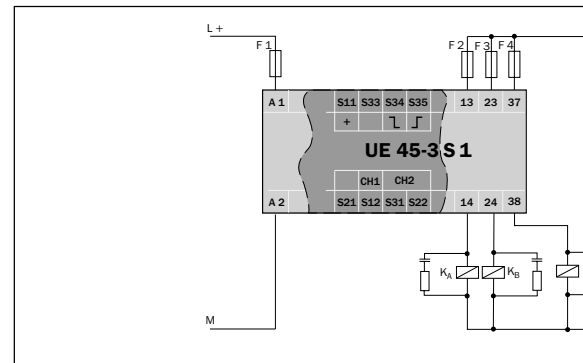


Fig. 2: Basic circuit: voltage supply, 3 channel output circuit, of which 1 is a release delayed

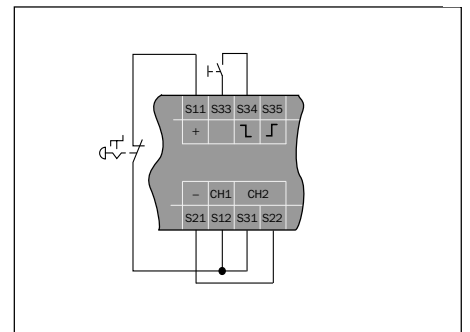


Fig. 3: Single-channel Emergency Off with manual reset facility

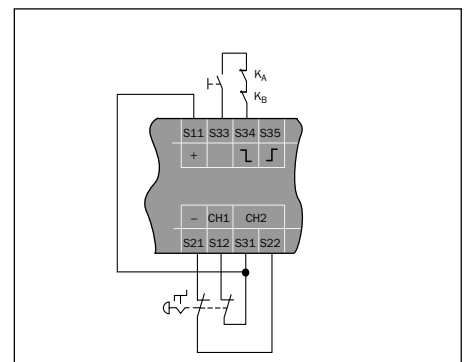


Fig. 5: Dual-channel Emergency Off with short circuiting monitoring, automatic reset, and contactor monitoring system

5.3 Regulatory training

- Inspect / accordance
- Following equipment commissioning

6 Maintenance

The UE 45-3 S maintenance

7 Technical

Refer to Table

8 Order

Version 24 V DC

With screw type (0,15 ... 3 s)
 With exchange (0,15 ... 3 s)

With screw type (1,5 ... 30 s)

With exchange (1,5 ... 30 s)

9 Appendix

9.1 Certificate

BG, UL

9.2 Examination

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 examined in accordance with the commissioning specification given above.

6 Maintenance

The UE 45-3 S 1 Safety Relays operate without the need for any maintenance to be carried out.

7 Technical Data

Refer to Table

8 Ordering data

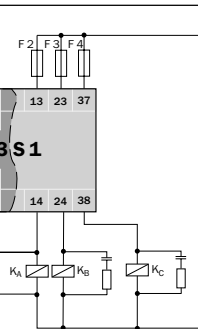
Version	Type	Part No.
24 V DC		
With screw type terminals (0,15 ... 3 s)	UE 45-3 S 12D3 3	6 024 911
With exchangeable terminals (0,15 ... 3 s)	UE 45-3 S 13D3 3	6 024 912
With screw type terminals (1,5 ... 30 s)	UE 45-3 S 12D3 30	6 024 913
With exchangeable terminals (1,5 ... 30 s)	UE 45-3 S 13D3 30	6 024 914

9 Appendix

9.1 Certification

BG, UL

9.2 Examples of circuitry



which 1 is a release delayed type (refer to Technical Data)

Technical Data

	min.	typ.	max.
General System Data			
Safety Classification (EN 50 178)	Protection against electrocution as per EN 50 178		
Voltage supply to A 1 / A 2	PELV to A 1 / A 2		
Output circuit > 25 V AC / 60 V DC	PELV or SELV to A 1 / A 2		
Output circuit < 25 V AC / 60 V DC			
Safety category EN 954-1	4		
Supply voltage U _v	20.4 V DC	24 V DC	26.4 V DC
Consumption	2.6 W		
AC Ripple (within the limits of U _v)			2.4 V _{ss}
Control voltage for S 11 - S 33 and S 21			
Control voltage	24 V DC		
Control Current	60 mA		
Short-circuits between S 11 and A 2)	2 200 mA		
Fuse / Circuit breakers	PTC-Widerstand		
Response time for short circuit	2 s		
Activation time upon detection of short circuit	3 s		
Electrical separation between A 1 / 2 and S 11 - S 21	nein		
Input circuits (S 12 and S 31 - S 22)			
Input current S 12 - S 31	25 mA		100 mA
Release delay K 1 / K 2 (activation time in effecting protection)	25 ms		
Release delay K 3 / K 4 (release delayed electrical output circuit)			
Units UE 45-3 S 1 xD3 3	0.15 s	3 s	
Units UE 45-3 S 1 xD3 30	1.5 s	30 s	
Input current S 33 / S 34 / S 35	40 mA		50 mA
Reset time			
Trailing edge (S 34)	30 ms		
Leading edge (S 35)	600 ms		
Synchronisation time	500 ms		
Activation period for reset button (S 34)	200 ms		
Activation period for Reset button (S 35)	750 ms		
Line resistance at inputs	85 Ohm		
Output circuits (13 - 14, 23 - 24, 37 - 38)			
Relay contacts	2 Output circuits (NO), Stop Cat. 0, Safety Cat. 4		
	1 Output circuit (NO), Stop Cat. 1, Safety Cat. 3		
Contact type	Positively guided		
Kontaktwerkstoff	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 _n 4 A (3600 c/h)		
	DC-13 Ue 24 V DC, I _n 5 A (360 c/h)		
	DC-13 Ue 24 V DC, I _n 3 A (3600 c/h)		
Permitted switching frequency	3600 Sch/h		
Service life, mechanical (switch clearance tolerances)	5 × 10 ⁶		
Electrical service life	2 × 10 ⁶		
Operational data			
Creepage and clearance distance between the electric circuits to DIN VDE 0110 Part 1:			
Measured transient/surge voltage (U _{Imp})	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 _{pr} (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 ²	0.75 mm ²	
Solid core wire (1x)	0.14 mm ²	2.5 mm ²	
Fine multi-stranded flex with terminal sleeves (2x, identical cross-section)	0.25 mm ²	0.5 mm ²	
Fine multi-stranded flex with terminal sleeves (1x)	0.25 mm ²	2.5 mm ²	
Weight	0,2 kg		

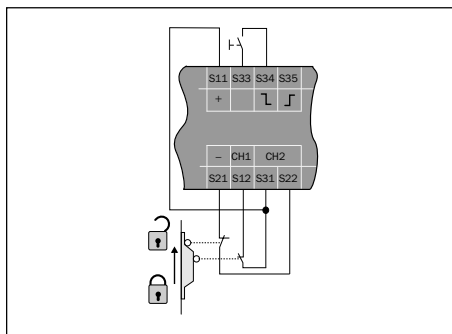


Fig. 4: Dual-channel safety door interlock monitoring with short circuit monitoring and synchronisation monitoring and manual reset facility

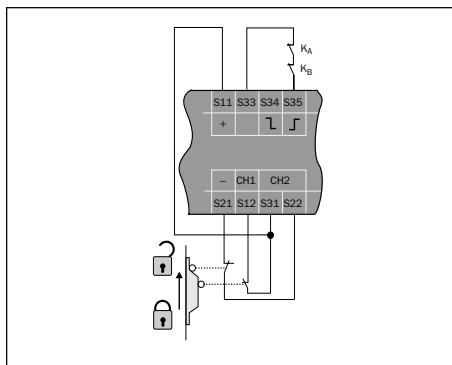


Fig. 6: Dual-channel safety door interlock monitoring with short circuit-monitoring and synchronisation monitoring and automatic reset facility with external device monitoring

