

**Safety Relay
 Series UE 48-3 OS**

1 Safety

The UE 48-3 OS Safety Relay meets safety-specific requirements up to Safety Category 4 (EN 954-1) and those of Stop Category 0 (EN 60 204-1). The wires for the input and output signals shall be routed outside the control cabinet, according to the safety category to be used.

1.1 Safety regulations

- Assembly and electrical connection must only be carried out by competent persons.
- The national and international legal provisions apply to the use and installation of safety relays as well as to commissioning and routine technical checks, in particular
 - the Machinery Directive 98/37/EEC
 - the Provision and Use of Work Equipment Regulation 89/655/EEC
 - the Low Voltage Directive 73/23/EEC
 - the Safety Regulations, plus
 - the Accident Prevention Regulations and Safety Rules
- Manufacturers and users of the machine, on which the safety devices are used, are responsible for agreeing all current safety regulations and rules with their competent authority, and for observing them.
- The operating instructions are to be heeded and kept for future reference.
- The tests shall be carried out by competent persons or by persons specifically authorised and instructed, and they shall be documented so as they are traceable at any time.
- The operating instructions shall be made available to the user of the machine on which the safety relay is used. The user of the machine shall be instructed by competent persons.

1.2 Areas of application

- The UE 48-3 OS Safety Relay is intended for use with the following systems:
- Electro-Sensitive Protective Equipment (ESPE) with monitored active switch output (OSSD): single-channel, dual-channel (to EN 61 496-1)
 - Following SICK devices: C 2000, M 2000, C 4000, S 3000, MSL, FGS, PLS, LSI
 - Emergency Stop (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 movable guards
 - and is suitable for connecting to the output of a switching mat in accordance with DIN EN 1760-1, detecting short circuits, in 4-wire technology.

1.3 Use in accordance with the regulations

For any other use, and in the event of modifications to the unit, or if the unit has been opened, even as part of assembly and installation, any warranty claims against SICK AG shall become null and void.

1.4 Environmentally correct disposal

Unusable and irreparable units should always be disposed of in accordance with the applicable waste disposal regulations specific to the country concerned. SICK will be pleased to assist in disposing of units.

2 Product Description

2.1 Construction and operation of the unit
 The inputs of the UE 48-3 OS Safety Relay have been prepared for connection to the actuator or Safety Sensors, as described in the section 'Areas of application'. The two normally open outputs serve as safe outputs. The normally closed output is not a safety-related output.

2.2 Functions of the unit

Actuating the sensor or access into the protective field of the Electro-Sensitive Protective Equipment (ESPE) causes the NO-output to open. Manual or automatic Reset and EDM are implemented by means of external switching, depending on application (see 4.4 Reset and 4.5 External Device Monitoring EDM).

2.3 Indicators

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

3 Assembly

Danger! Only use in a control cabinet!
 The UE 48-3 OS Safety Relay is only suitable for assembling in control cabinets having a minimum protection of IP 54. The units are installed by snapping onto a mounting rail.

4 Electrical Installation

Danger! Isolate the system!
 The system shall be isolated, to prevent any inadvertent system startup or electrical hazard.

Contact protection to EN 50 178

To ensure contact protection to EN 50 178, observe notes in *Technical Data*.

Instructions

- Wiring of the contactor monitoring (normally closed contacts of the switching elements) shall be performed in the same control cabinet.
- To prevent the contacts of the final switching relays welding, an overcurrent protection device (short-circuit protection (Operating Class gG)) should be selected according to the appropriate utilisation category and incorporated into the output paths – see *Technical Data* (fig. 2, fuse F 2 / F 3 / F 4).
- If capacitive or inductive loads are connected to the output circuits, a protective circuit (spark suppression) shall be provided. In doing so, it shall be observed that the response times increase depending on the type of protection.
- The wires for the input and output signals shall be routed outside the control cabinet, according to the safety category to be used (EN 954). For example, protected routing,

single sheathed cable with screen etc.

- The details given in *Technical Data* must be observed.

Information for non-contact (ESPE) operation

- If the Electro-Sensitiv Protection Equipment connected has time-monitored contactor control, this must not be activated!
- If the Safety Relay and the ESPE connected are supplied from different voltage sources, a connection between S 21 and 0 volts on the Electro-Sensitiv Protection Equipment voltage supply must be made.
- Maximum length of wiring to the ESPE: see operating instructions of the ESPE
- With single-channel connection of Type-2-ESPE this Electro-Sensitiv Protection Equipment must be tested.

4.1 Wiring of connections

A 1	Voltage supply (DC-Mode: + 24 V)
A 2	Voltage supply (DC-Mode: 0 V)
S11	+ 24 V DC (Control voltage)
S21	0 V DC (Control voltage)
S12	+ Input circuit 1 (K 1)
S22	- Input circuit 2 (K 2)
S31	+ Input circuit 2 (K 2)
S33	for Reset-circuit (according S 12)
S33 - S34	Manual Reset
S12 - S35	Automatic Reset
13 - 14	Output 1 (safe)
23 - 24	Output 2 (safe)
33 - 34	Output 3 (safe)

4.2 Operating modes: ESPE (Electro-Sensitiv Protection Equipment)

4.2.1 Single-channel operation

The switch output of the ESPE is connected to terminal S 12. A wire link must be made between S 21 - S 22 and S 31 - S 33.

4.2.2 Dual-channel operation

Both switch outputs of the ESPE must be connected to S 12 or S 31. A wire link must be made between S 21 - S 22.

4.3 Operating modes: Tactile sensors

4.3.1 Single-channel operation

The voltage free switching element is connected between S 11 and S 12. Wire links are to be made between S 33 - S 31 and S 21 - S 22 (see Fig. 3).

4.3.2 Dual-channel operation

The two voltage-free switching elements of the safety sensor are to be connected between S 11 - S 12 resp. S 21 - S 22. A wire link is to be made between S 11 - S 31 (see Fig. 4 and 5).

4.4 Reset

Manual reset

A reset button having a normally opened contact is wired between contacts S 33 and S 34. The reset button is to be installed outside the hazardous area in such a manner that it cannot be activated from within the hazardous area. In addition, the operator must have full visual command of the hazardous area. Reset is monitored. Where Emergency Stop is activated, manual reset must be used.

Automatic reset

A wire link is to be made between S 33 - S 35.

4.5 External Device Monitoring (EDM)

This is only effective with Reset in operation. Connecting the normally closed contacts of the contact elements in series with the Reset button activates the EDM.

5 Commissioning

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 Function test

After applying the supply voltage (LED SUPPLY illuminated), the outputs are open. If the connected contact sensor is not activated or the protective field of the ESPE connected is clear (i.e. the input circuits are closed, switch output ESPE HIGH), the NO outputs close immediately when automatic reset is activated (LEDs K 1 and K 2 illuminate.)

With manual reset, this happens only after activation and release of the reset button. Activating the contact sensor or access into the protective field of the ESPE (opening of one of both input circuits) causes the NO outputs to open (LED K 1 and K 2 are off).

5.2 Regular inspection/testing of the safety devices by trained technical personnel

- Test the system within the specified period in accordance with current national regulations!
- Following major modifications to the machine or the safety device, the system shall be examined in accordance with the commissioning specification given above.

6 Maintenance

In operation, the UE 48-3 OS Safety Relay is maintenance-free.

7 Technical Data

Refer to *Table*

8 Ordering Data

Version	Voltage	Type	Switching elements	Order No.
Screw terminals	24 V AC/DC	UE 48-3 OS 2 D2	3 NO	6025089
Removable plug-in block terminals	24 V AC/DC	UE 48-3 OS 3 D2	3 NO	6025097

9 Appendix

9.1 Approvals

BG, GS, cUL_{US}

9.2 Examples of circuits

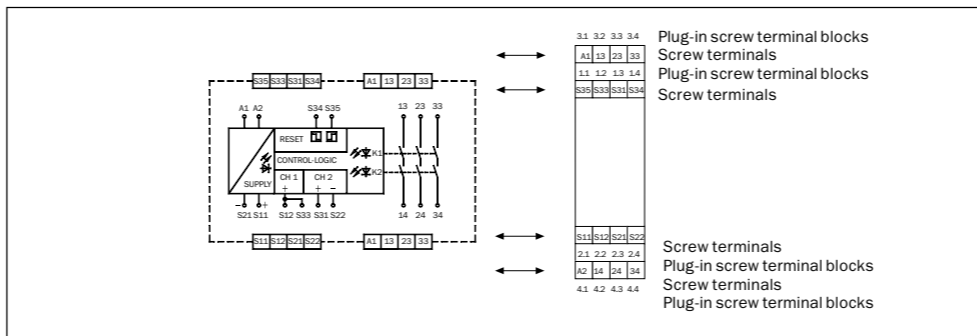


Fig. 1: Internal wiring UE 48-3 OS

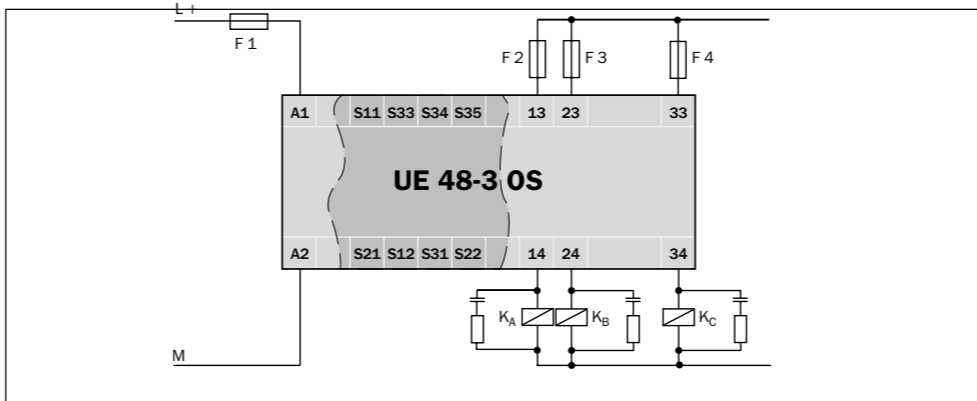
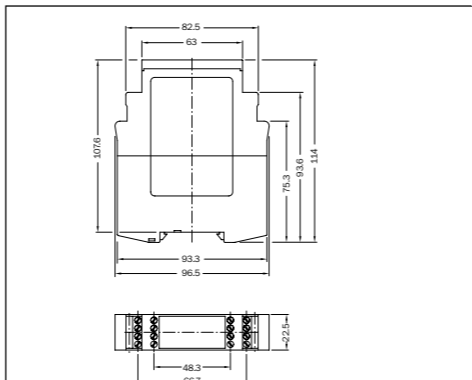
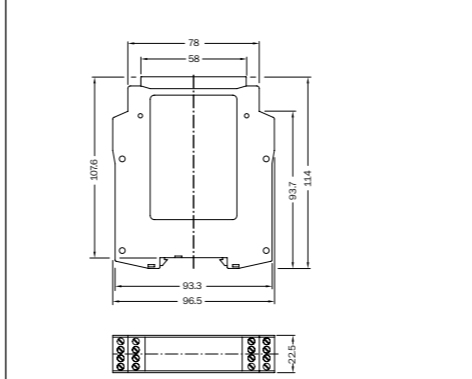


Fig. 2: Basic wiring UE 48-3 OS: Voltage supply, 3-channel output circuit (refer to *Technical Data*)



Housing A.1 (screw terminals)



Housing A.2 (removable plug-in block terminals)

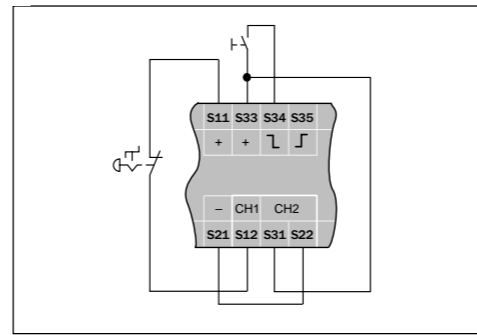


Fig. 3: Example of a single-channel Emergency Stop switch with manual reset

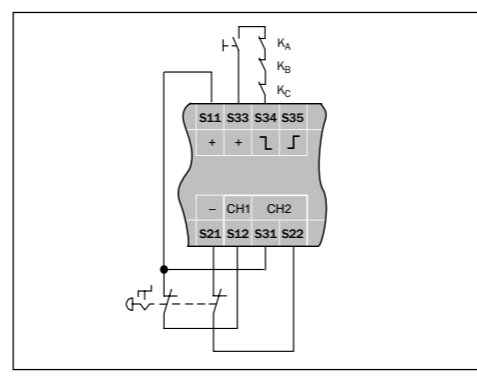


Fig. 4: Example of a dual-channel Emergency Stop switch with cross circuit monitoring, manual reset, contactor monitoring

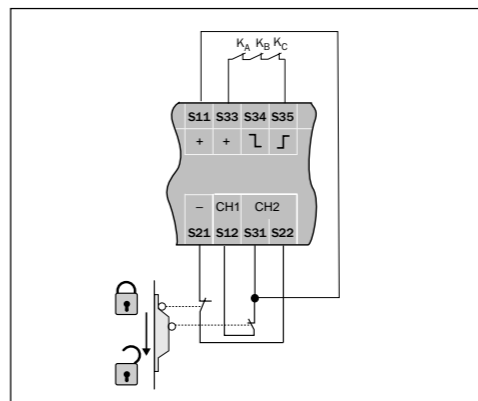


Fig. 5: Example for a dual-channel safety door protection with cross circuit monitoring and automatic reset

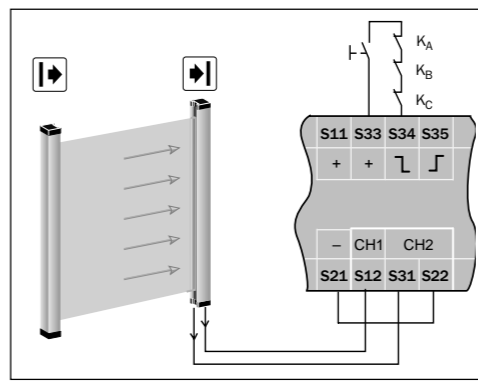


Fig. 6: Example for an electro-sensitive protective equipment (ESPE) with output switching device (OSSD), manual reset, external device monitoring

Technical Data UE 48-3 OS			
	min.	typ.	max.
General System Data			
Supply voltage (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	PELV or SELV to A 1 / A 2		
Safety category EN 954-1	4		
Stop category EN 60 204-1	0		
Supply voltage U _N (A 1 - A 2)	20.4 V AC/DC	24 V AC/DC	26.4 V AC/DC
Power consumption			
AC-Mode	4.6 VA		
DC-Mode	2.1 W		
AC Ripple during DC operation (within the limits of U _N)	2.4 V _{pp}		
Nominal frequency, AC operation	50 Hz		
Control voltage S 33 / S 11 and S 21			
Control voltage	17.4 V DC	22 V DC	
Control current	40 mA		
Short-circuits between S 33 / S 11 and S 21	300 mA		
Fuse	Electronic circuit		
Response time for cross connection	50 ms		
Activation time upon detection of cross connection	50 ms		
Electrical separation between A 1 / A 2 and S 21, S 11, S 33	No		
Input circuits (S 12, S 31, S 22, S 34, S 35)			
Input voltage (S 12 and S 31)			
HIGH	17.4 V DC	26.4 V DC	
LOW	-3 V DC	+5 V DC	
Input current S 12 and S 31 / S 22	40 mA		
Input current S 34 / S 35	5 mA		
Reset time			
Manual reset (S 34)	40 ms		
Automatic reset (ESPE: S 33 / S 35; tactile sensors: S 12 / S 35)	80 ms		
Activation period for reset button	50 ms		
Minimum Switch Off Time/Minimum Switch On Time	7 ms		
Allowed test pulse width / test frequency	1000 μs / 10 s ⁻¹		
Line resistance at inputs	35 Ohm		
Synchronisation time	200 ms		
Output circuits (13 - 14, 23 - 24, 33 - 34)			
Delay K 1 / K 2	25 ms		
Minimum Switch Off Time	70 ms	130 ms	
Relay contacts	3 Output circuits (NO), safe		
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		
Total current	12 A		
Application category to EN 60 947-5-1			
	AC-15 Ue 230 V AC, I _e 4 A (360 c/h)		
	AC-15 Ue 230 V AC, I _e 3 A (3600 c/h)		
	DC-13 Ue 24 V DC, I _e 4 A (360 c/h)		
	DC-13 Ue 24 V DC, I _e 2.5 A (3600 c/h)		
Mechanical service life (switching cycles)	1 x 10 ⁷		
Electrical service life	1 x 10 ⁵		
Operational data			
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 _{off} (50 Hz) EN 60 439-1	2.0 kV		
Type of protective enclosure			
Housing	IP 40		
Terminals	IP 20		
Interference emission according to	DIN EN 61 000-6-4		
Noise attenuation according	DIN EN 61 000-6-2		
Ambient operating temperature	-25 °C		
Storage temperature	-25 °C		
Humidity (non condensing)	15 %		
Cross-section of connections			
Solid core wire (2 x, identical cross-section)	0.14 mm ²	0.75 mm ²	
Solid core wire (1 x)	0.14 mm ²	2.5 mm ²	
Fine multi-stranded flex with terminal sleeves (2 x, identical cross-section)	0.25 mm ²	0.5 mm ²	
Fine multi-stranded flex with terminal sleeves (1 x)	0.25 mm ²	2.5 mm ²	
Weight	0.2 kg		

Safety Relay Series UE 48-3 OS

1 Safety

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The wires for the input and output signals shall be routed outside the control cabinet, according to the safety category to be used.

1.1 Safety regulations

- Assembly and electrical connection must only be carried out by competent persons.
- The national and international legal provisions apply to the use and installation of safety relays as well as to commissioning and routine technical checks, in particular
 - the Machinery Directive 98/37/EEC
 - the Provision and Use of Work Equipment Regulation 89/655/EEC
 - the Low Voltage Directive 73/23/EEC
 - the Safety Regulations, plus
 - the Accident Prevention Regulations and Safety Rules
- Manufacturers and users of the machine, on which the safety devices are used, are responsible for agreeing all current safety regulations and rules with their competent authority, and for observing them.
- The operating instructions are to be heeded and kept for future reference.
- The tests shall be carried out by competent persons or by persons specifically authorised and instructed, and they shall be documented so as they are traceable at any time.
- The operating instructions shall be made available to the user of the machine on which the safety relay is used. The user of the machine shall be instructed by competent persons.

1.2 Areas of application

The UE 48-3 OS Safety Relay is intended for use with the following systems:

- Electro-Sensitive Protective Equipment (ESPE) with monitored active switch output (OSSD): single-channel, dual-channel (to EN 61 496-1)
- Following SICK devices:
C 2000, M 2000, C 4000, S 3000, MSL, FGS, PLS, LSI
- Emergency Stop (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 movable guards
- and is suitable for connecting to the output of a switching mat in accordance with DIN EN 1760-1, detecting short circuits, in 4-wire technology.

1.3 Use in accordance with the regulations

For any other use, and in the event of modifications to the unit, or if the unit has been opened, even as part of assembly and installation, any warranty claims against SICK AG shall become null and void.

1.4 Environmentally correct disposal

Unusable and irreparable units should always be disposed of in accordance with the applicable waste disposal regulations specific to the country concerned. SICK will be pleased to assist in disposing of units.

2 Product Description

2.1 Construction and operation of the unit

The inputs of the UE 48-3 OS Safety Relay have been prepared for connection to the actuator or Safety Sensors, as described in the section 'Areas of application'. The two normally open outputs serve as safe outputs. The normally closed output is not a safety-related output.

2.2 Functions of the unit

Actuating the sensor or access into the protective field of the Electro-Sensitive Protective Equipment (ESPE) causes the NO-output to open. Manual or automatic Reset and EDM are implemented by means of external switching, depending on application (see 4.4 Reset and 4.5 External Device Monitoring EDM).

2.3 Indicators

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

3 Assembly

Danger! Only use in a control cabinet!

The UE 48-3 OS Safety Relay is only suitable for assembling in control cabinets having a minimum protection of IP 54.

The units are installed by snapping onto a mounting rail.

4 Electrical Installation

Danger! Isolate the system!

The system shall be isolated, to prevent any inadvertent system startup or electrical hazard.

Contact protection to EN 50 178

To ensure contact protection to EN 50 178, observe notes in *Technical Data*.

Instructions

- Wiring of the contactor monitoring (normally closed contacts of the switching elements) shall be performed in the same control cabinet.
- To prevent the contacts of the final switching relays welding, an overcurrent protection device (short-circuit protection (Operating Class gG)) should be selected according to the appropriate utilisation category and incorporated into the output paths – see *Technical Data* (fig. 2, fuse F 2 / F 3 / F 4).
- If capacitive or inductive loads are connected to the output circuits, a protective circuit (spark suppression) shall be provided. In doing so, it shall be observed that the response times increase depending on the type of protection.
- The wires for the input and output signals shall be routed outside the control cabinet, according to the safety category to be used (EN 954). For example, protected routing,

single sheathed cable with screen etc.

- The details given in *Technical Data* must be observed.

Information for non-contact (ESPE) operation

- If the Electro-Sensitive Protection Equipment connected has time-monitored contactor control, this must not be activated!
- If the Safety Relay and the ESPE connected are supplied from different voltage sources, a connection between S 21 and 0 volts on the Electro-Sensitive Protection Equipment voltage supply must be made.
- Maximum length of wiring to the ESPE: see operating instructions of the ESPE
- With single-channel connection of Type-2-ESPE this Electro-Sensitive Protection Equipment must be tested.

4.1 Wiring of connections

A 1	Voltage supply (DC-Mode: + 24 V)
A 2	Voltage supply (DC-Mode: 0 V)
S11	+ 24 V DC (Control voltage)
S21	0 V DC (Control voltage)
S12	+ Input circuit 1 (K 1)
S22	– Input circuit 2 (K 2)
S31	+ Input circuit 2 (K 2)
S33	for Reset-circuit (according S 12)
S 33 - S 34	Manual Reset
S 12 - S 35	Automatic Reset
13 - 14	Output 1 (safe)
23 - 24	Output 2 (safe)
33 - 34	Output 3 (safe)

4.2 Operating modes: ESPE (Electro-Sensitive Protection Equipment)

4.2.1 Single-channel operation

The switch output of the ESPE is connected to terminal S 12. A wire link must be made between S 21 - S 22 and S 31 - S 33.

4.2.2 Dual-channel operation

Both switch outputs of the ESPE must be connected to S 12 or S 31. A wire link must be made between S 21 - S 22.

4.3 Operating modes: Tactile sensors

4.3.1 Single-channel operation

The voltage free switching element is connected between S 11 and S 12. Wire links are to be made between S 33 - S 31 and S 21 - S 22 (see Fig. 3).

4.3.2 Dual-channel operation

The two voltage-free switching elements of the safety sensor are to be connected between S 11 - S 12 resp. S 21 - S 22. A wire link is to be made between S 11 - S 31 (see Fig. 4 and 5).

4.4 Reset

Manual reset

A reset button having a normally opened contact is wired between contacts S 33 and S 34.

The reset button is to be installed outside the hazardous area in such a manner that it cannot be activated from within the hazardous area. In addition, the operator must have full visual command of the hazardous area. Reset is monitored. Where Emergency Stop is activated, manual reset must be used.

Automatic reset

A wire link is to be made between S 33 - S 35.

4.5 External Device Monitoring (EDM)

This is only effective with Reset in operation. Connecting the normally closed contacts of the contact elements in series with the Reset button activates the EDM.

5 Commissioning

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 Function test

After applying the supply voltage (LED SUPPLY illuminated), the outputs are open.

If the connected contact sensor is not activated or the protective field of the ESPE connected is clear (i.e. the input circuits are closed, switch output ESPE HIGH), the NO outputs close immediately **when automatic reset** is activated (LEDs K 1 and K 2 illuminate.)

With manual reset, this happens only after activation and release of the reset button. Activating the contact sensor or access into the protective field of the ESPE (opening of one of both input circuits) causes the NO outputs to open (LED K 1 and K 2 are off).

5.2 Regular inspection/testing of the safety devices by trained technical personnel

- Test the system within the specified period in accordance with current national regulations!
- Following major modifications to the machine or the safety device, the system shall be examined in accordance with the commissioning specification given above.

6 Maintenance

In operation, the UE 48-3 OS Safety Relay is maintenance-free.

7 Technical Data

Refer to *Table*

8 Ordering Data

Version	Voltage	Type	Switching elements	Order No.
Screw terminals	24 V AC/DC	UE 48-3 OS 2 D2	3 NO	6025 089
Removable plug-in block terminals	24 V AC/DC	UE 48-3 OS 3 D2	3 NO	6025 097

9 Appendix

9.1 Approvals

BG, GS, _cUL_{US}

9.2 Examples of circuits

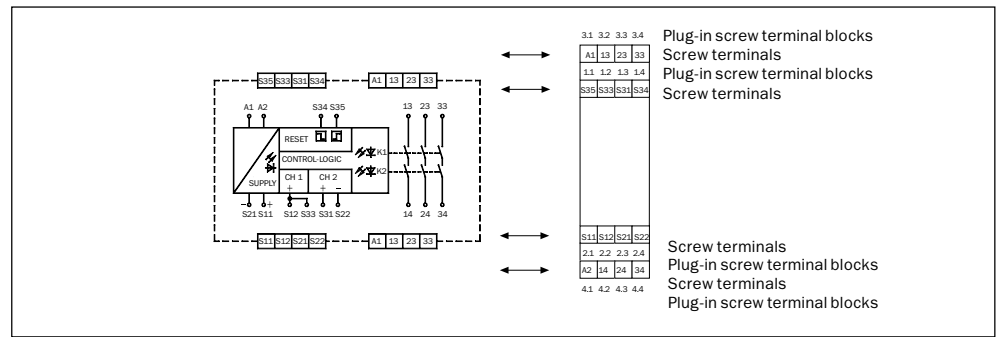


Fig. 1: Internal wiring UE 48-3 OS

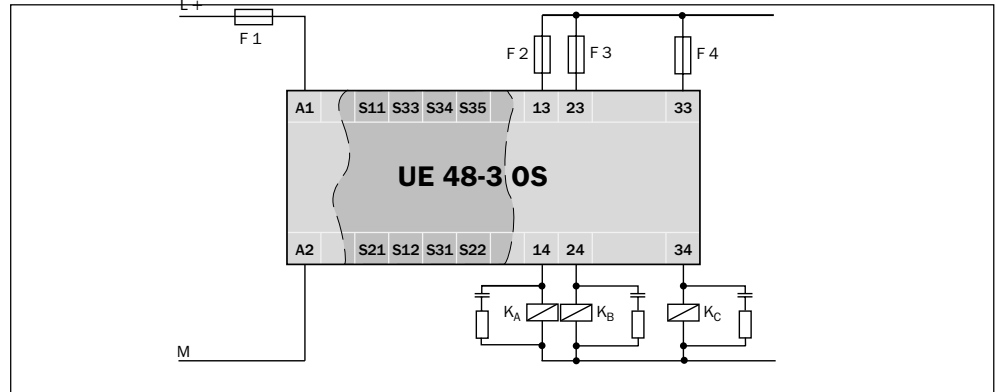


Fig. 2: Basic wiring UE 48-3 OS: Voltage supply, 3-channel output circuit (refer to *Technical Data*)

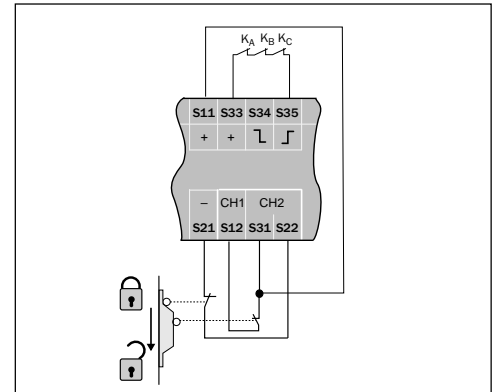
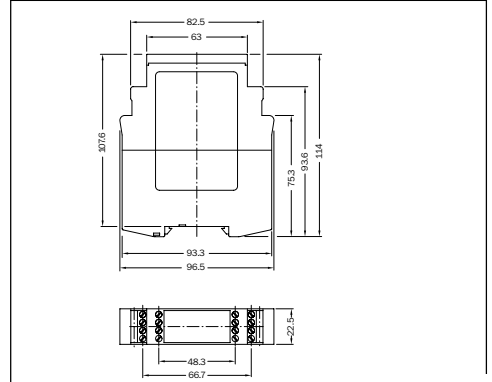


Fig. 5: Example for a dual-channel safety door protection with cross circuit monitoring and automatic reset



Housing A.1 (screw terminals)

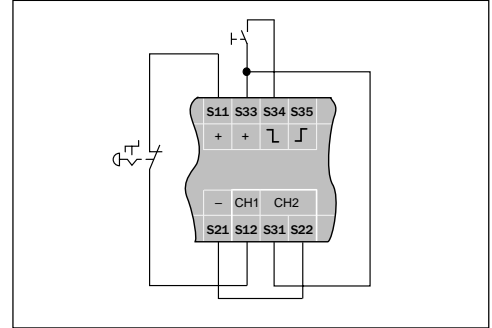


Fig. 3: Example of a single-channel Emergency Stop switch with manual reset

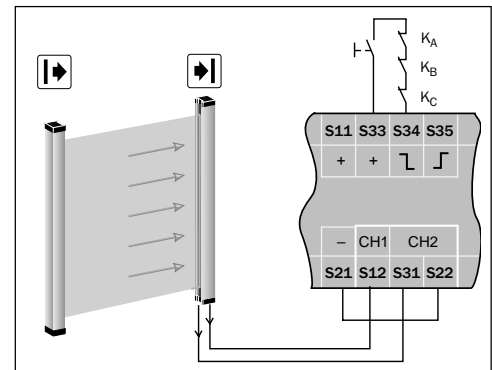
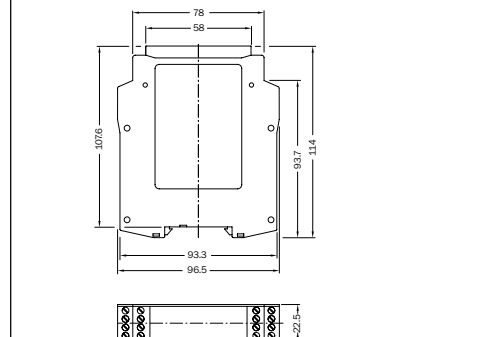


Fig. 6: Example for an electro-sensitive protective equipment (ESPE) with output switching device monitoring, manual reset, external device monitoring



Housing A.2 (removable plug-in block terminals)

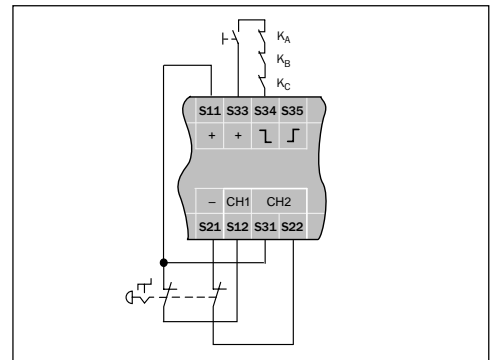


Fig. 4: Example of a dual-channel Emergency Stop switch with cross circuit monitoring, manual reset, contactor monitoring

Technical Data UE 48-3 OS

	min.	typ.	max.
General System Data			
Supply voltage (A 1 - A 2)			
Output circuit > 25 V AC / 60 V DC		PELV to A 1 / A 2	
Output circuit < 25 V AC / 60 V DC		PELV or SELV to A 1 / A 2	
Safety category EN 954-1			4
Stop category EN 60 204-1	0		
Supply voltage U_V (A 1 - A 2)	20.4 V AC/DC	24 V AC/DC	26.4 V AC/DC
Power consumption			
AC-Mode			4.6 VA
DC-Mode			2.1 W
AC Ripple during DC operation (within the limits of U_V)			2.4 V _{PP}
Nominal frequency, AC operation	50 Hz		60 Hz

Control voltage S 33 / S 11 and S 21

Control voltage	17.4 V DC	22 V DC	
Control current	40 mA		100 mA
Short-circuits between S 33 / S 11 and S 21			300 mA
Fuse	Electronic circuit		
Response time for cross connection			50 ms
Activation time upon detection of cross connection			50 ms
Electrical separation between A 1 / A 2 and S 21, S 11, S 33	No		

Input circuits (S 12, S 31, S 22, S 34, S 35)

Input voltage (S 12 and S 31)			
HIGH	17.4 V DC		26.4 V DC
LOW	-3 V DC		+5 V DC
Input current S 12 and S 31 / S 22		40 mA	100 mA
Input current S 34 / S 35		5 mA	50 mA
Reset time			
Manual reset (S 34)			40 ms
Automatic reset (ESPE: S 33 / S 35; tactile sensors: S 12 / S 35)			80 ms
Activation period for reset button	50 ms		
Minimum Switch Off Time/Minimum Switch On Time	7 ms		
Allowed test pulse width / test frequency			1000 μ s / 10 s ⁻¹
Line resistance at inputs			35 Ohm
Synchronisation time			200 ms

Output circuits (13 - 14, 23 - 24, 33 - 34)

Delay K 1 / K 2			25 ms
Minimum Switch Off Time	70 ms		130 ms
Relay contacts	3 Output circuits (NO), safe		
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 current			12 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I _e 4 A (360 c/h) AC-15 Ue 230 V AC, I _e 3 A (3600 c/h) DC-13 Ue 24 V DC, I _e 4 A (360 c/h) DC-13 Ue 24 V DC, I _e 2.5 A (3600 c/h)		
Mechanical service life (switching cycles)	1 x 10 ⁷		
Electrical service life	1 x 10 ⁵		

Operational data

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_{eff} (50 Hz) EN 60 439-1			2.0 kV
Type of protective enclosure			
Housing	IP 40		
Terminals	IP 20		
Interference emission according to	DIN EN 61 000-6-4		
Noise attenuation according	DIN EN 61 000-6-2		
Ambient operating temperature	-25 °C		+55 °C
Storage temperature	-25 °C		+75 °C
Humidity (non condensing)	15 %		95 %
Cross-section of connections			
Solid core wire (2 x, identical cross-section)	0.14 mm ²		0.75 mm ²
Solid core wire (1 x)	0.14 mm ²		2.5 mm ²
Fine multi-stranded flex with terminal sleeves (2 x, identical cross-section)	0.25 mm ²		0.5 mm ²
Fine multi-stranded flex with terminal sleeves (1 x)	0.25 mm ²		2.5 mm ²
Weight	0.2 kg		