



Control unit SG-EFS 1X4 ZK2/1



EN | Operating instructions

Version 3

1000841	SG-EFS 104 ZK2/1	AC/DC 24 V
1001272	SG-EFS 114 ZK2/1	AC 115 V
1000842	SG-EFS 134 ZK2/1	AC 230 V

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Safety first!



- Read the manual carefully before use.
- Warning signs in the manual warn of unexpected dangers. Always observe warning signs.
- Retain the manual throughout the service life of the product.
- Pass the manual on to every subsequent owner or user of the product.
- Insert every supplement received from the manufacturer into the manual.
- **Observe chapter on Safety starting on page 5.**

Conformity



The design type of the product complies with the basic requirements of the following directives:

- 2006/42/EC (Safety of Machinery)
- 2011/65/EU (RoHS)
- 2014/30/EU (EMC)

The Declaration of Conformity is available in the download section of the website:
www.mayser.com/en/downloads

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Contents

About this manual	4
Safety	5
Intended use	5
Safety instructions	5
Residual dangers	6
Parts supplied	6
Storage	7
Product overview	7
Connections	7
LED indicators	7
Operation	7
Reset	8
Automatic reset	8
Manual reset	8
Installation	8
Reset	9
Automatic reset	9
Manual reset	9
Connection examples	10
Commissioning	11
Testing	11
Automatic reset	11
Manual reset	11
Pressure-sensitive protection device actuated	12
Automatic reset	12
Manual reset	12
Correlations	12
Decommissioning	13
Recommissioning	13
Maintenance and cleaning	13
Maintenance	13
Cleaning	13
Troubleshooting and remedies	14
Replacement parts	14
Disposal	15
Technical data	15

About this manual

This manual is an integral part of the product.
 Mayser will assume no liability and provide no guarantee whatsoever for damages and consequential damages resulting from failure to comply with the manual.

Validity

This manual is valid only for the product specified on the title page.

Target group

This manual is intended for the owner and electricians. The electrician must be familiar with the installation and commissioning.

Other applicable documents

- ➔ Also observe the following documents:
 - Drawing of the sensor system (optional)
 - Wiring diagram (optional)
 - Installation instructions of the sensors used

Symbols used

Symbol	Meaning
➔ ...	Action with one or more steps whose order is not relevant.
1. ...	Action with several steps whose order is relevant.
• ... - ...	Bullets first level Bullets second level
(see Section <i>Installation</i>)	Cross-reference

Danger symbols and information

Symbol	Meaning
 DANGER	Immediate danger leading to death or serious injury.
 WARNING	Imminent danger which may lead to death or serious injury.
 CAUTION	Possible danger which may lead to minor or moderate injuries.
NOTE	Potential danger of property damage or environmental degradation. Information on easier and safer working practices.

Dimensions in drawings

Unless otherwise indicated, all dimensions are stated in millimetres (mm).

Safety

Intended use

The control unit is designed for signal processing of a pressure-sensitive protective device. It evaluates the output signals of sensors with monitoring resistor 1k Ω . The integrated output signal switching device (OSSD) transmits the evaluated safety signals directly to the downstream control.

The product complies with ISO 13849-1:2015 Category 3 PL e. So that the safety classification is retained, the downstream control must be of the same or a higher category.

Safety instructions

For your **own safety** the following safety instructions apply.

➔ **Prevent electric shock**

When working on electrical systems, always disconnect them from the power supply and secure them against being switched on again, to prevent injuries from electric shock.

➔ **Ensure careful configuration of interface**

The quality and reliability of the interface between the safety device and the machine affects the overall safety. Take special care when setting up this interface.

➔ **Prevent restarting of the machine**

As long as a hazard continues to exist, take measures to prevent the machine from restarting, for example by means of a startup lockout.

➔ **Disable in case of error**

Disable the safety device in case of malfunctions or visible damage.

➔ **Do not use in ATEX zones**

Do not use the Control Unit in potentially explosive environments (ATEX). The control unit is not authorised for use in these zones.

To prevent irreparable damage to the **product**, the following safety instructions apply.

➔ **Do not open the control unit**

Never open, tamper with or alter the control unit.

➔ **Observe degree of protection**

Only use the control unit in rooms with a minimum degree of protection of IP54 (e.g. switch cabinet).

→ Maintain distance

When installing in the switch cabinet, ensure sufficient distance from heat sources (at least 2 cm).

→ Check supply voltage

Check supply voltage. It must correspond with the connecting voltage U_s on the type plate.

→ Observe pin assignment

Observe pin assignment when connecting the supply voltage.

→ Do not exceed the maximum number of sensors

Do not connect more sensors on the control unit, than the number specified in the installation instructions of the sensors.

→ Protect relay contacts

Risk of welding: Protect the relay contacts externally.

→ Do not overload control unit

Ensure that the specified switching current is not exceeded.

→ Fit spark absorbers

When connecting inductive loads, fit spark absorbers (RC modules) to the consumer.

→ Do not cross link control unit

Do not cross link the control unit with other control units.
Terminals Y1, Y2 and 5, 6 and 7, 8 are not potential-free.

→ Continue redundancy

Make sure you wire the unit directly in the control circuit or that the downstream control is also in dual channel mode.

Residual dangers

There are no known residual dangers associated with this product.

Parts supplied

1x Control Unit

Enclosure with electronics module and plug-in connectors.

1x Operating Instructions**1x Declaration of Conformity**

→ Upon receipt of the parts supplied, check immediately for completeness and good condition.

Storage

- ➔ Store the control units in the original package, in a dry place.
- ➔ Comply with the storage temperature specified in the technical data.

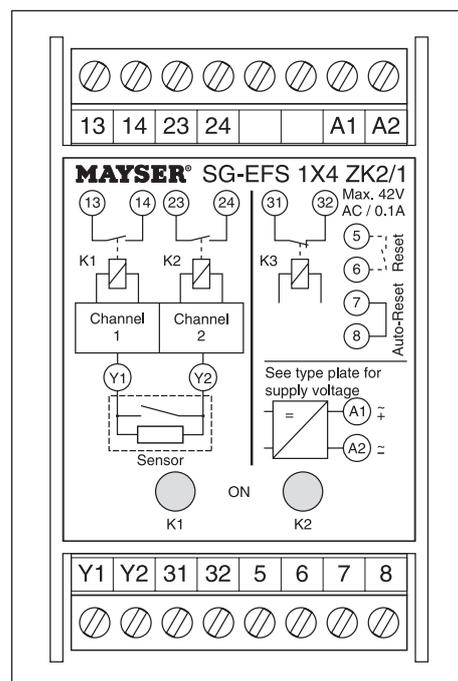
Product overview

Connections

Connections:

Supply voltage	A1, A2
Switching channel 1 (Channel 1)	13, 14
Switching channel 2 (Channel 2)	23, 24
Signal circuit	31, 32
Reset	5, 6
Auto-Reset	7, 8
Sensor	Y1, Y2

Terminals:



LED indicators

- yellow LED "K1 ON":
Sensor not activated
- yellow LED "K2 ON":
Sensor not activated

Operation

The single-fault-safe electronics module has dual channels (redundant). Each channel controls a force-guided relay and additionally monitors the relay of the other channel. The electronic system monitors the electrical resistance of the sensor with a defined zero signal current.

When the sensor is not actuated and after a reset, the relays K1 and K2 are energised. The yellow LEDs "K1 ON" and "K2 ON" are on, the switching channels 1 and 2 are closed and the signal circuit is open. When the sensor is actuated, the K1 and K2 relays are de-energised. The yellow LEDs "K1 ON" and "K2 ON" go out, the switching channels 1 and 2 are open, and the signal circuit is closed.

If the sensor cable breaks, relays K1 and K2 are de-energised. The yellow LEDs "K1 ON" and "K2 ON" go out, the switching channels 1 and 2 are open, and the signal circuit is closed.

The signal circuit works opposed to the switch channels 1 and 2.

Reset

Automatic reset

The control unit works without a reset function. If the sensor is enabled after actuation, relays K1 and K2 are energized again with a delay t_w (see reactivation time t_w in the chapter *Technical data*)

Manual reset

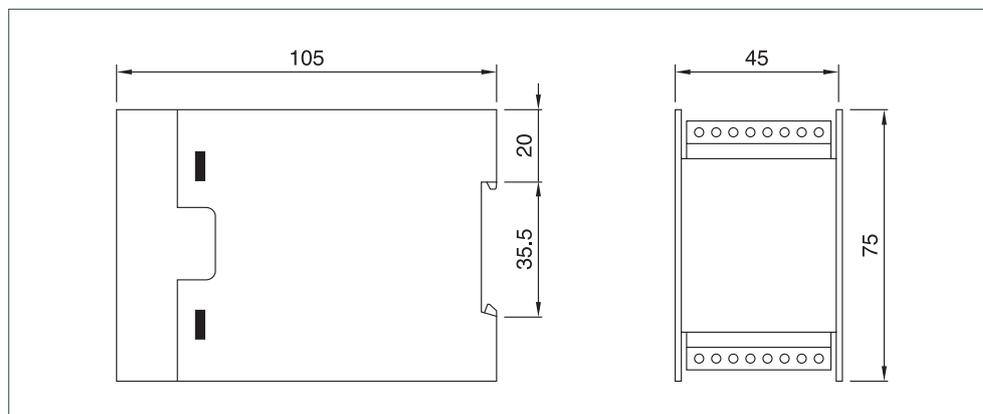
The control unit works with a reset function. Relays K1 and K2 do not energize until the reset button has been actuated.

Installation

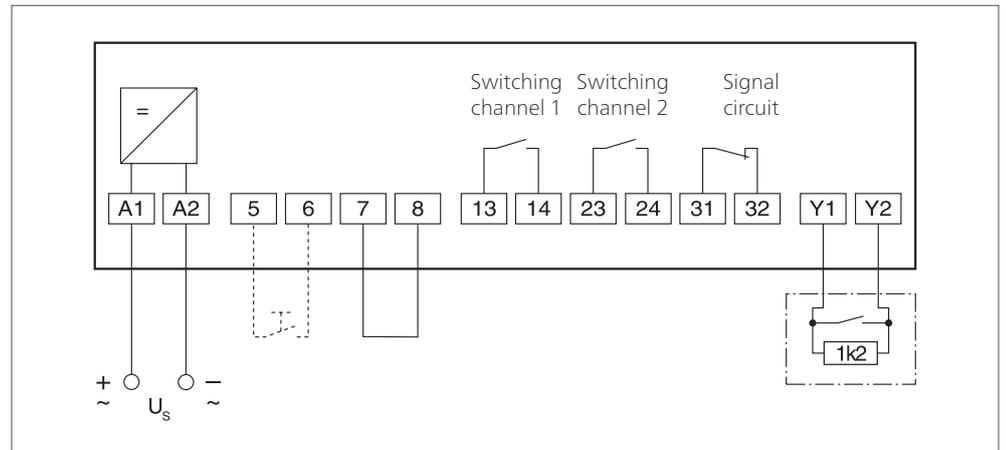
For your safety, the generally accepted safety rules also apply for assembly:

- Disconnect all devices and live parts in the immediate vicinity from the power supply.
- Ensure that all devices and live parts cannot be switched back on.
- Test to ensure that all devices and live parts are disconnected from the power supply.

1. Mount the control unit in any position on a 35 mm mounting rail type IEC 60715.



3. Wire the sensors, relay contacts and supply voltage to the cable terminals.



Reset

Automatic reset

A bridge is necessary for automatic reset (without reset function). The unit is supplied with a bridge already connected between cable terminals 7 and 8.

➔ Check if the bridge is set between cable terminals 7 and 8.

Manual reset

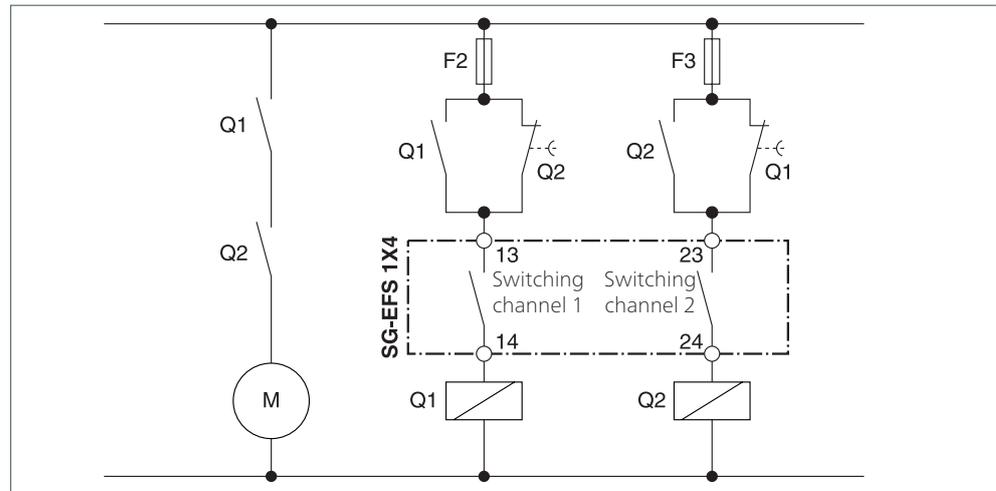
For manual reset (with reset function) a switch must be connected.

➔ Remove the bridge between cable terminals 7 and 8.

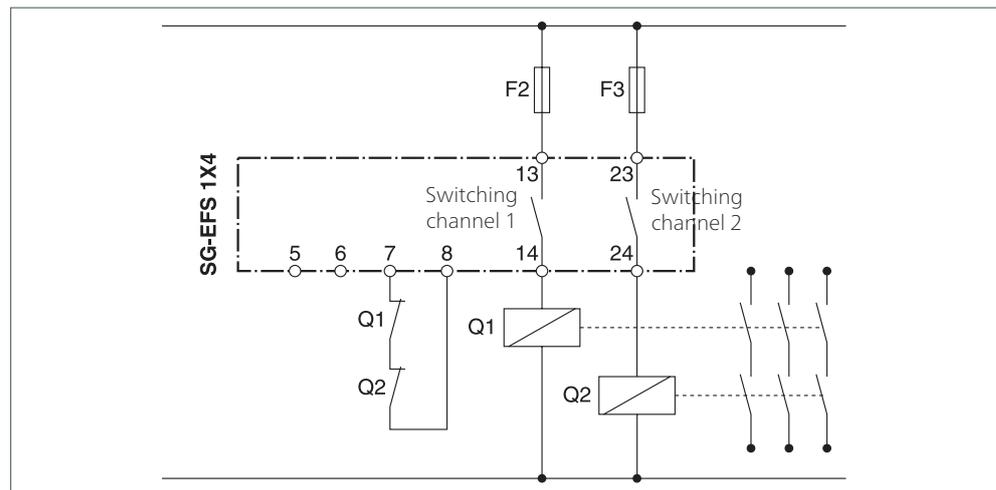
➔ Wire up a switch between cable terminals 5 and 6.

Connection examples

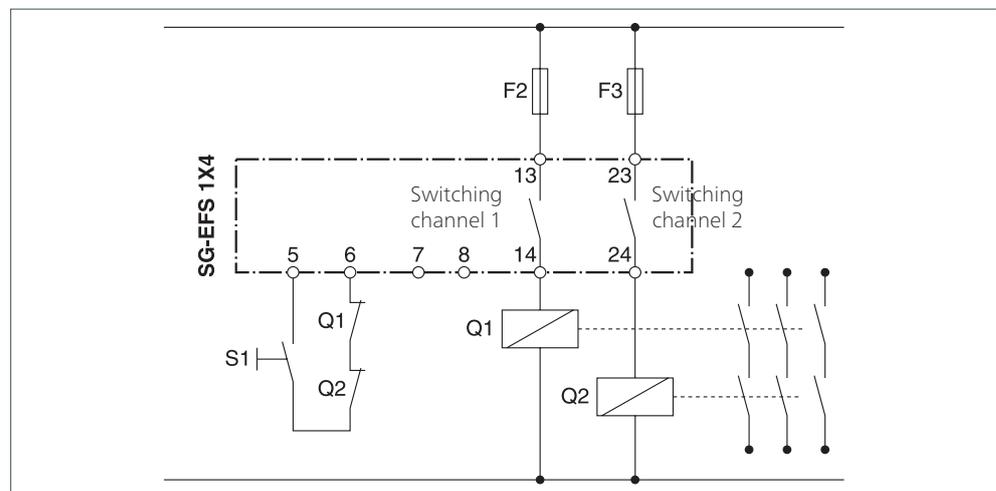
Contacts continued in two-channel mode



Contact duplication for automatic reset



Contact duplication for manual reset



Commissioning

1. Make sure the plug connections are firmly attached.
2. Connect the supply voltage.

⚠ WARNING: Danger of injury due to electrocution
➔ Never unplug plug connections with the power on.

Testing

Automatic reset

1. Make sure no sensors are activated.
 - yellow LEDs "K1 ON" and "K2 ON" are on
 - contacts of switching channels 1 and 2 closed
 - signal circuit open
2. Activate a sensor.
 - yellow LEDs "K1 ON" and "K2 ON" go off
 - contacts of switching channels 1 and 2 open
 - signal circuit closed
3. Repeat step 1.
4. Disconnect the sensor.
 - yellow LEDs "K1 ON" and "K2 ON" go off
 - contacts of switching channels 1 and 2 open
 - signal circuit closed

Manual reset

1. Make sure no sensors are activated.
 - yellow LEDs "K1 ON" and "K2 ON" are out
 - contacts of switching channels 1 and 2 open
 - signal circuit closed
2. Activate the reset switch.
 - yellow LEDs "K1 ON" and "K2 ON" are on
 - contacts of switching channels 1 and 2 closed
 - signal circuit open
3. Activate a sensor.
 - yellow LEDs "K1 ON" and "K2 ON" go off
 - contacts of switching channels 1 and 2 open
 - signal circuit closed

4. Repeat steps 1 and 2.
5. Disconnect the sensor.
 - yellow LEDs "K1 ON" and "K2 ON" go off
 - contacts of switching channels 1 and 2 open
 - signal circuit closed

Pressure-sensitive protection device actuated

As long as the pressure-sensitive protection device remains actuated, the output signal switching devices of the control unit remain in the safe OFF state.

If actuation of the pressure-sensitive protection device ends, different states are possible on the output signal switching devices of the control unit. This depends on the selected reset type.

Automatic reset

If the pressure-sensitive protection device is no longer actuated, the output signal switching device of the control unit automatically changes from the OFF state to the ON state. Without additional start interlock, the machine would start up again immediately.

Manual reset

If the pressure-sensitive protection device is no longer actuated, the output signal switching device of the control unit is in OFF state. This prevents restart of the machine. Only the manual reset command effectuates the change from the OFF state to the ON state.

Correlations

LEDs		Outputs			Meaning
K1 yellow	K2 yellow	13, 14	23, 24	31, 32	LED off: ○ LED on: ●
○	○	open	open	closed	no supply voltage
●	●	closed	closed	open	Control unit ready for operation
○	○	open	open	closed	Sensor activated
○	○	open	open	closed	Reset not active

Decommissioning

- ➔ Switch off the pressure-sensitive protection device and safeguard it from being switched back on unintentionally.
- ➔ Affix a clear warning on the pressure-sensitive protection device warning that states it is temporarily or definitively decommissioned.

Recommissioning

- ➔ Recommission the pressure-sensitive protection device as specified in the chapter Commissioning (see chapter *Commissioning*).

Maintenance and cleaning

Maintenance

The control unit is maintenance-free.

- ➔ Repeat the operational test monthly.

Cleaning

- ➔ Clean the outside of the enclosure with a dry cloth.

Troubleshooting and remedies

Prerequisite: the control unit is connected to the supply voltage and sensor. No sensor is activated.

Fault display	Possible cause	Remedy
yellow LEDs „K1 ON“ and „K2 ON“ do not light	No or incorrect supply voltage	1. Check supply voltage, compare with type plate 2. Check terminal connections
	Incorrect monitoring resistor on sensor	➔ Connect sensor with monitoring resistor 1k2
	If monitoring resistor is correct: sensor is faulty	➔ Replace sensor
	No sensor connected	➔ Connect sensor
	Sensor incorrectly connected	➔ Check terminal connections
	Cable break	➔ Replace sensor
	Manual reset: reset switch not actuated	➔ Actuate reset switch
	Manual reset: reset switch sticks	➔ Replace switches on terminals 5 and 6
	Automatic reset: bridge missing	➔ Connect bridge between terminals 7 and 8
	Control unit is faulty	➔ Replace control unit
Only one LED is on	Incorrect supply voltage	➔ Check supply voltage, compare with type plate
	Control unit is faulty	➔ Replace control unit

The fault can still not be removed?

- ➔ Contact Mayser support: Phone +49 731 2061-0.
- ➔ In case of queries, have the information on the type plate at hand.

Type plate

A type plate for identification of the control unit is affixed on the side.

Replacement parts

⚠ CAUTION Overall safety endangered

If the sensor is not replaced with original Mayser parts, operation of the protective device may be impaired.

- ➔ Only use original parts from Mayser.

Disposal

Control unit

The devices produced by Mayser are professional electronic tools exclusively intended for commercial use (so-called B2B devices). Unlike devices mainly used in private households (B2C), they may not be disposed of at the collection centres of public sector disposal organisations (e.g. municipal recycling depots). At the end of their useful life, the devices may be returned to us for disposal.

WEEE reg. no. DE 39141253

Packaging

- Wood, cardboard, plastics

➔ Observe the following with respect to disposal:

- Comply with the relevant national disposal regulations and legal stipulations for these materials.
- If you enlist the services of a disposal company, the company will need the aforementioned list of materials.
- Materials should be recycled or disposed of in an eco-friendly manner.

Technical data

SG-EFS 1X4 ZK2/1	AC 24 V / DC 24 V	AC 115 V / AC 230 V
Testing basis	EN 12978, ISO 13849-1, ISO 13856-1, ISO 13856-2, ISO 13856-3	
Supply voltage U_s		
Nominal voltage	AC 24V / DC 24V	AC 115V / DC 230V
Voltage tolerance	-15% to +10% / -15% to +20%	-15% to +10%
Nominal current	220 mA / 112 mA	48 mA / 28 mA
Nominal frequency	48 to 62 Hz / –	48 to 62 Hz
External protection	250 mA T	250 mA T
Power consumption	< 6 VA / < 4 W	< 7 VA / < 7 VA
Times		
Reaction time t_a	< 10 ms	< 10 ms
Re-start time t_w	< 190 ms	< 190 ms
Safety classifications		
ISO 13856: Reset	with/without	with/without
ISO 13849-1:2006	Category 3 PL e	Category 3 PL e
MTTF _d	313 years	313 years
DC _{avg}	90%	90%
B _{10d} (Load: DC 24 V / 2 A)	2× 10 ⁶	2× 10 ⁶
n _{op} (estimate)	52560 per year	52560 per year
CCF	Requirements fulfilled	Requirements fulfilled
IEC 60664-1: Creep distance and air gap	soiling degree 2, overvoltage category II / 230 V, basic insulation	soiling degree 2, overvoltage category II / 230 V, basic insulation

SG-EFS 1X4 ZK2/1	AC 24 V / DC 24 V	AC 115 V / AC 230 V
Inputs		
Sensor	Y1, Y2	Y1, Y2
Monitoring resistor	1k2 Ohm	1k2 Ohm
Short-circuit resistance	≤ 400 Ohm	≤ 400 Ohm
Line resistance	≤ 100 Ohm	≤ 100 Ohm
Line length (max.)	100 m	100 m
Switching thresholds		
Sensor activated	< 600 Ohm	< 600 Ohm
Cable break	> 1k8 Ohm	> 1k8 Ohm
Outputs		
Switching channel 1 and 2 (NO contact) EN 60947-5-1:Utilization category	13, 14 / 23, 24 AC-12: 250 V / 2 A DC-12: 24 V / 2 A	13, 14 / 23, 24 AC-12: 250 V / 2 A DC-12: 24 V / 2 A
Switching voltage (max.)	AC 250 V DC 24 V	AC 250 V DC 24 V
Switching current (max.)	2 A 2 A	2 A 2 A
Switching current (min.)	10 mA 10 mA	10 mA 10 mA
Switching capacity (max.)	500 VA 48 W	500 VA 48 W
Switching operations, mechanical	> 5× 10 ⁷	> 5× 10 ⁷
Switching operations, electrical	> 3× 10 ⁵ (AC 250 V / 2 A)	> 3× 10 ⁵ (AC 250 V / 2 A)
Contact fuse protection external	2 A quick-acting	2 A quick-acting
Signal circuit (NC contact)	31, 32	31, 32
Switching voltage (max.)	AC 42 V DC 42 V	AC 42 V DC 42 V
Switching current (max.)	100 mA 100 mA	100 mA 100 mA
Switching operations, mechanical	> 5× 10 ⁶	> 5× 10 ⁶
Switching operations, electrical	> 1× 10 ⁶ (AC 42 V)	> 1× 10 ⁶ (AC 42 V)
Contact fuse protection external	0.1 A quick-acting	0.1 A quick-acting
Mechanical operating conditions		
Cable terminals	2×8-pin-	2×8-pin
solid wire	1× 2.5 mm ² or 2× 1 mm ²	1× 2.5 mm ² or 2× 1 mm ²
strand without sheath	1× 2.5 mm ² or 2× 1.5 mm ²	1× 2.5 mm ² or 2× 1.5 mm ²
strand with sheath	1× 2.5 mm ² or 2× 1 mm ²	1× 2.5 mm ² or 2× 1 mm ²
IEC 60529: Degree of protection	IP20	IP20
max. humidity (23 °C)	95%	95%
Operating temperature	-20 to +50 °C	-20 to +50 °C
Storage temperature	-20 to +50 °C	-20 to +50 °C
Impact resistance in operation	2.5 g	2.5 g
Impact resistance transport	10 g	10 g
Dimensions (W × H × D)	45 × 75 × 105 mm	45 × 75 × 105 mm
Weight	180 g	282 g