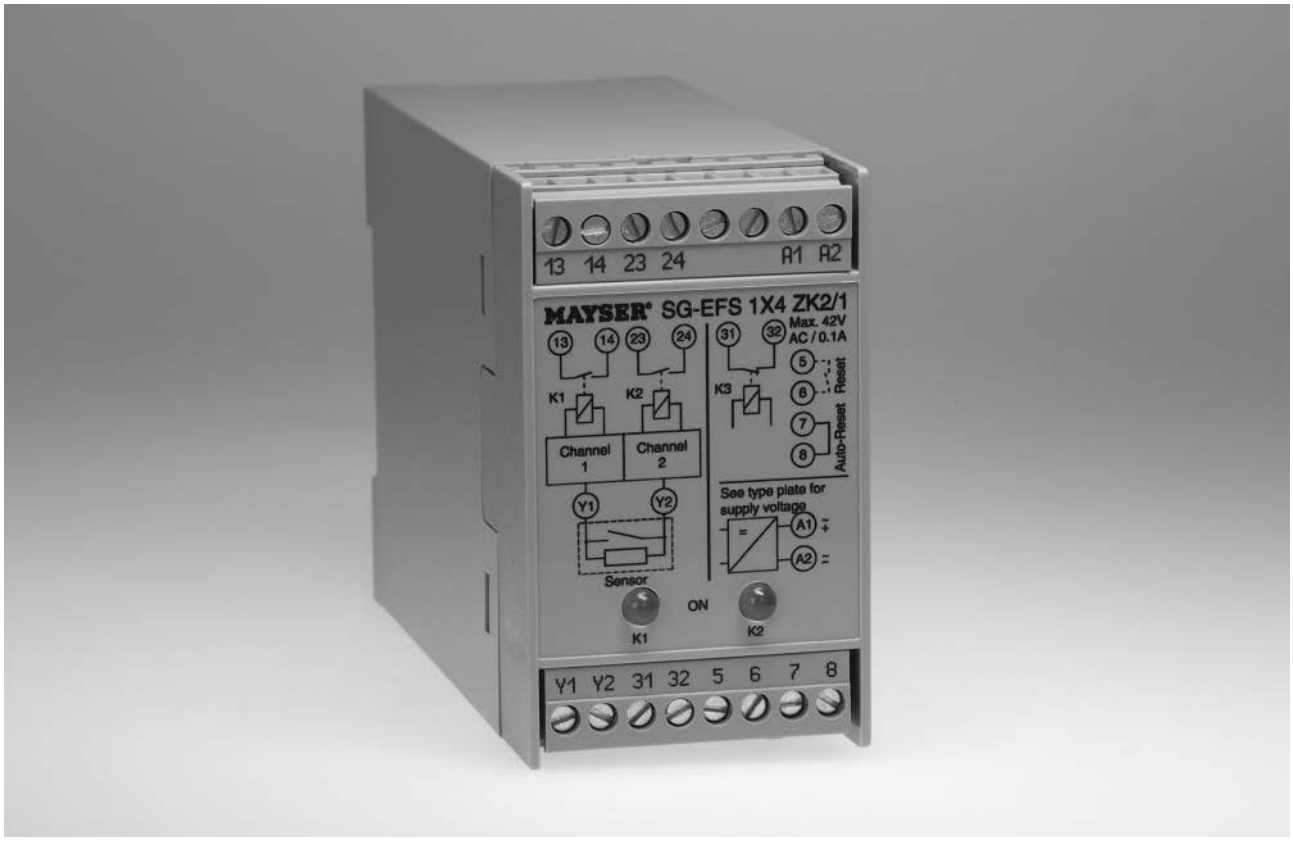
MAYSER®
Polymer Electric

Operating Instructions



Control Unit SG-EFS 1X4 ZK2/1 8k2

Version 3

1003100	SG-EFS 104 ZK2/1 8k2	24 V=/~
7500354	SG-EFS 134 ZK2/1 8k2	230 V~

Original instructions

MAYSER® GmbH & Co. KG
Polymer Electric
Örlinger Straße 1–3
89073 Ulm
GERMANY
Tel.: +49 731 2061-0
Fax: +49 731 2061-222
E-Mail: info.ulm@mayser.com
Internet: www.mayser.com

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About these operating instructions

These operating instructions are part of the product.
Mayser Polymer Electric accepts no responsibility or warranty claims for damage and consequential damage due to failure to observe the operating instructions.

➔ Read operating instructions carefully before use.

➔ Keep operating instructions for the complete service life of the product.

➔ Pass operating instructions on to every subsequent owner or user of the product.

➔ Add any supplement received from the manufacturer to the operating instructions.

Validity

These operating instructions are only valid for the products specified on the title page.

Target group

The target group of these operating instructions are operators and trained specialist personnel who are familiar with installation and commissioning.

Other applicable documents

➔ In addition to the operating instructions, 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 step or with more than one step where the order is not relevant.
1. ... 2. ... 3. ...	Action with more than one step where the order is relevant.
• ... - ...	Bullets first level Bullets second level
(see section *Installation*)	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.
	Information on easier and safer working practices.

Intended use

The Control Unit is designed for signal processing of a pressure-sensitive protective device (PSPD). It evaluates the output signals of sensors with monitoring resistor 8k2. The integrated output signal switching device (OSSD) transmits the evaluated safety signals directly to the downstream control.

The Control Unit complies with ISO 13849-1:2006 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

➔ **Do not open the Control Unit**
Never open, tamper with or alter the Control Unit.

➔ **Check supply voltage**
Check supply voltage. It must correspond with the connecting voltage U_S on the type plate.

➔ **Observe protection class**
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).

➔ **Observe pin assignment**
Observe pin assignment when connecting the supply voltage.

➔ **Protect relay contacts**
Risk of welding: Protect the relay contacts externally.

➔ **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 voltage free.

➔ **Do not overload Control Unit**
Ensure that the specified switching current is not exceeded.

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

➔ **In the event of a fault, put out of operation**
In the event of malfunctions and visible damage, put the Control Unit out of operation.

➔ **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.

Parts supplied

1× Control Unit
Enclosure with electronics module and plug-in connectors.
1× Operating Instructions
1× Declaration of Conformity

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

Transport and storage

Packaging and transport

The Control Units are packed individually in cardboard boxes. Several Control Units are stacked in one large cardboard box.
The documents are enclosed separately.

Storage

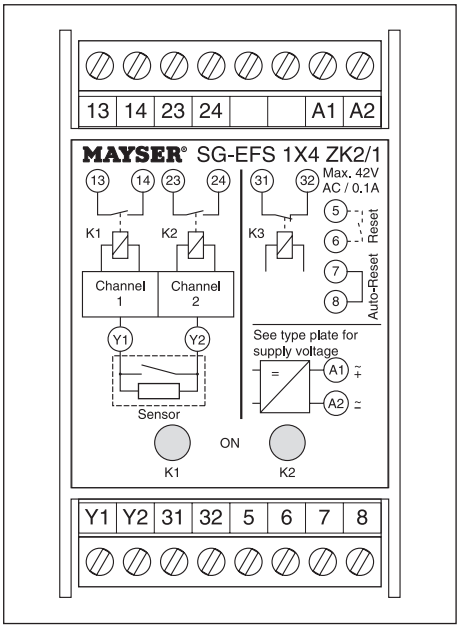
➔ Store the Control Units in the original packaging in a dry place.

➔ Observe the storage temperatures given in the technical specifications.

Product overview

Connections

Connections:	**Terminals:**
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



LEDs information

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

Function, installation and commissioning

Function

The single-fault-safe electronics module has dual channels (redundant). Each channel controls a forceguided 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.

Installation

WARNING

Danger of injury due to electrocution!

➔ Disconnect all devices and live parts in the immediate environment of the power supply and protect them against being switched on again (see relevant operating instructions).

➔ Check that all devices and parts are disconnected from the power supply.

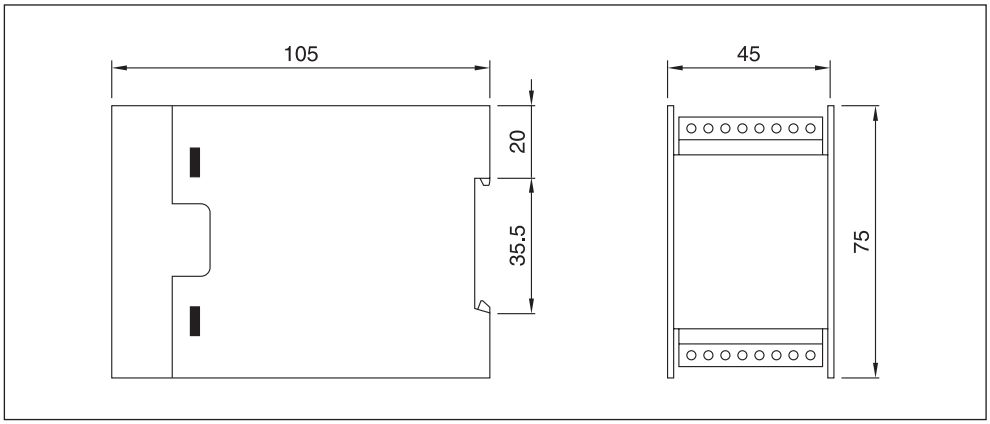
CAUTION

Impaired operation due to overheating or incorrect degree of protection
The operation of the protective device may be impaired due to overheating of the Control Unit or due to incorrect choice of degree of protection.

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

➔ Only use the Control Unit in zones that have a min. protection class of IP54 (eg. switch cabinet)

1. The enclosure of the Control Unit can be mounted in any position on a 35 mm IEC 60715 rail.

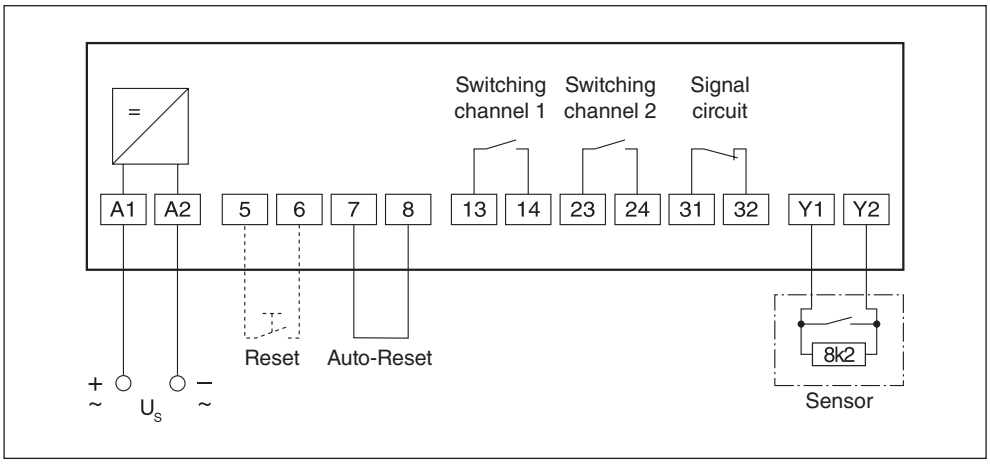


CAUTION

Overall safety endangered
The quality and reliability of the interface between the protective device and the machine influences the overall safety.

➔ Install the interface very carefully

2. Wire the sensors, switching channels, signal circuit and supply voltage to the terminals.



Automatic reset

A bridge is necessary for automatic reset (without reset). 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), a switch must be connected between cable terminals 5 and 6. The control unit reacts when the switch changes from “not activated“ to “activated“, i.e. if the switch sticks, no reset command is initialised.

➔ Remove the bridge between cable terminals 7 and 8.

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

Commissioning

1. Make sure the plug connections are firmly attached.

2. Connect the supply voltage.

WARNING

Danger of injury due to electrocution!

➔ Never disconnect terminals with the power on.

➔ Never unplug plug connections with the power on.

Test function: 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

Test function: 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

Recommissioning

WARNING

Danger of injury!

➔ Never start your machine as long as the risk remains.

Automatic reset

The Control Unit works without reset. If the sensor is enabled after actuation, relays K1 and K2 re-energise after a delay t_w

➔ Check for proper functioning after recommissioning (see section *Commissioning*)

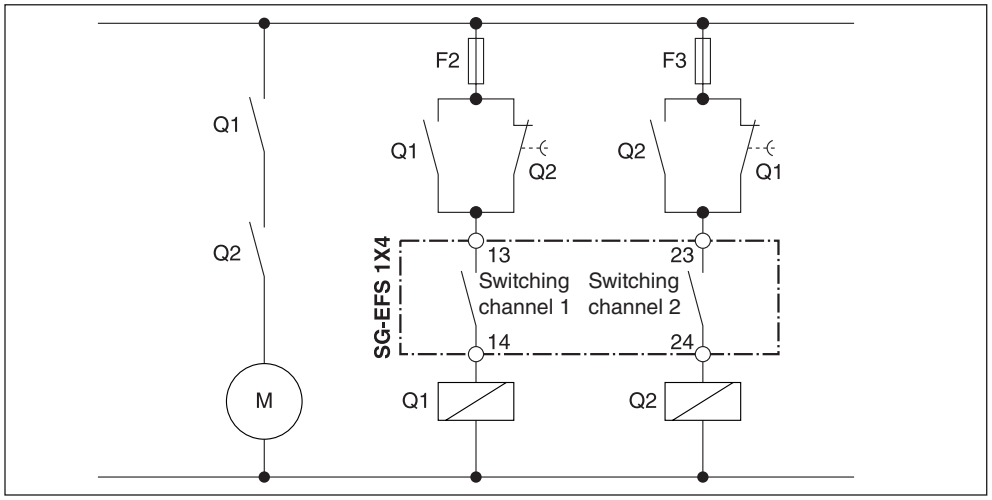
Manual reset

The Control Unit works with reset. Relays K1 and K2 are only energised after the reset switch is actuated.

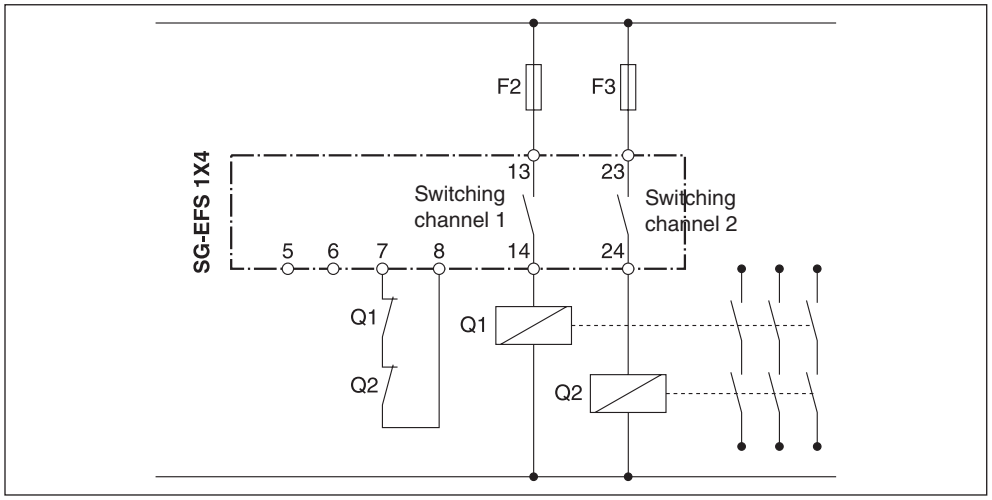
➔ Check for proper functioning after recommissioning (see section *Commissioning*)

Connection examples

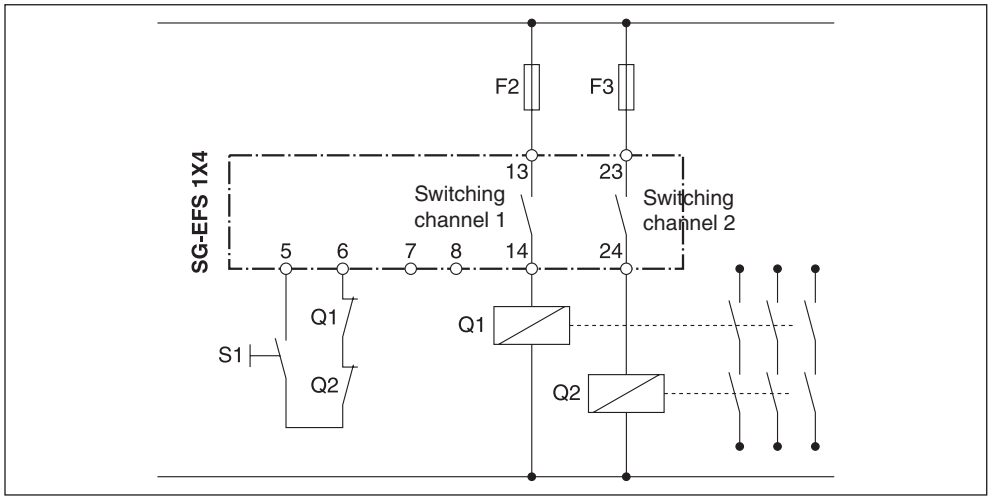
Contacts continued in two-channel mode



Contact duplication for automatic reset



Contact duplication for manual reset



Maintenance and cleaning

Maintenance

The Control Unit is maintenance-free.

➔ Repeat the operational test monthly.

Cleaning

WARNING

Danger of injury due to electrocution!

➔ Disconnect the Control Unit as well as all devices and live parts in the immediate environment of the power supply and protect them against being switched on again (see relevant operating instructions).

➔ Check that all devices and parts are disconnected from the power supply.

➔ 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“ are out	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 8k2
	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

Fault can still not be detected?

➔ Contact Mayser-Support: Tel. +49 731 2061-0.

Replacement parts

CAUTION

Overall safety endangered
If the sensor and Control Unit are not replaced with original parts from Mayser, operation of the protective device may be impaired.

➔ Only use original parts from Mayser.

Disposal

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

Conformity

CE

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

- 2006/42/EC (Safety of Machinery)
- 2004/108/EC (EMC)

The Declaration of Conformity is available in the Downloads section of the website:
www.mayser-sicherheitstechnik.de

EC Design Test

The product was tested by an independent institute.
An EC design type test certificate confirms conformity.

The EC design type test certificate is available in the Downloads section of the website:
www.mayser-sicherheitstechnik.de

Technical Data

SG-EFS 1X4 ZK2/1 8k2	AC 24 V / DC 24 V	AC 230 V
Testing basis	EN 12978, ISO 13849-1, ISO 13856-1, ISO 13856-2, ISO 13856-3	
Supply voltage U_S		
Voltage tolerance	-15% to +10% / -15% to +20%	-15% to +10%
Nominal current	220 mA / 112 mA	28 mA
Nominal frequency	48 to 62 Hz / –	48 to 62 Hz
External protection	250 mA slow-acting	250 mA slow-acting
Short-circuit current (max.)	–	–
Power consumption	< 6 VA / < 4 W	< 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
PFH_d	4.29× 10^{-8} 1/h	4.29× 10^{-8} 1/h
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
EN 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 8k2	AC 24 V / DC 24 V	AC 230 V
Inputs		
Sensor	Y1, Y2	Y1, Y2
Monitoring resistor	8k2 Ohm	8k2 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	< 3k9 Ohm	< 3k9 Ohm
Cable break	> 12k5 Ohm	> 12k5 Ohm
Outputs		
Switching channel 1 and 2 (NO contact)	13, 14 / 23, 24	13, 14 / 23, 24
Utilization category	AC-12: 250 V / 2 A	AC-12: 250 V / 2 A
as per EN 60947-5-1	DC-12: 24 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		
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
Degree of protection as per IEC 60529	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