

MAYSER®

Polymer Electric



Operating Instructions



Control Unit SG-EFS 104/2W

Version 0.9

1005196 SG-EFS 104/2W 24 V=~/~

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.de
Internet: www.mayser.com

Original instructions

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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 <i>Assembly</i>)	Cross-reference

Danger symbols and information

Symbol	Meaning
DANGER 	Immediate danger leading to death or serious injury.
CAUTION 	Possible danger which may lead to slight injury or damage to property.
	Information on easier or 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 1k Ω or 8k Ω . The integrated output signal switching device (OSSD) transmits the evaluated safety signals directly to the downstream machine controls. The Control Unit complies with ISO 13849-1:2006 Category 3 PL d. So that the safety classification is retained, the forwarding 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 Y3 as well as S1, S2 and S3 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

1x Control Unit

Enclosure with electronics module.

1x Operating Instructions

1x Declaration of Conformity

Check the scope of supply for completeness and the perfect condition of the product immediately after receipt.

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:

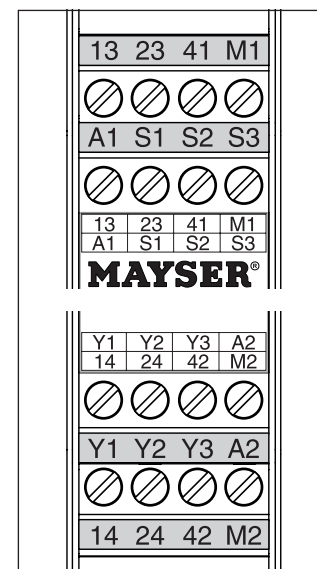
Supply voltage
 Sensor 1k2
 or 8k2
 Switching channel 1
 Switching channel 2
 Signal circuit
 Signal output with U_s AC
 Sensor
 Fault
 Signal output with U_s DC
 Sensor
 Fault
 Bridge for automatic reset
 Switch for manual reset

Terminals:

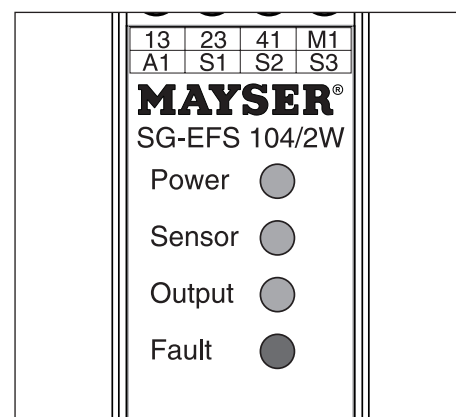
A1, A2
 Y1, Y2
 Y1, Y3
 13, 14
 23, 24
 41, 42

 M1, S1
 M2, S1

 M1, A2
 M2, A2
 S1, S2
 S1, S3



LEDs information



- green LED "Power": supply voltage connected
- green LED "Sensor": sensor not activated
- green LED "Output": Control Unit ready
- red LED "Fault": cable break

Operation, installation and commissioning

Operation

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

The control unit is powered with AC/DC 24 V. When the supply voltage is connected, the green "Power" LED is lit up. When the sensor is not activated, and after a reset, the K1 and K2 relays are energized. The green LEDs "Sensor" and "Output" are lit up, switch channels 1 and 2 are closed, and the signal output M1 is HIGH. If the sensor is activated or the cable on the sensor breaks, the K1 and K2 relays are de-energized. The green LEDs "Sensor" and "Output" go out, switch channels 1 and 2 are open, and the signal output M1 is LOW. The signal circuit functions opposed to the switch channels 1 and 2.

Installation

DANGER



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

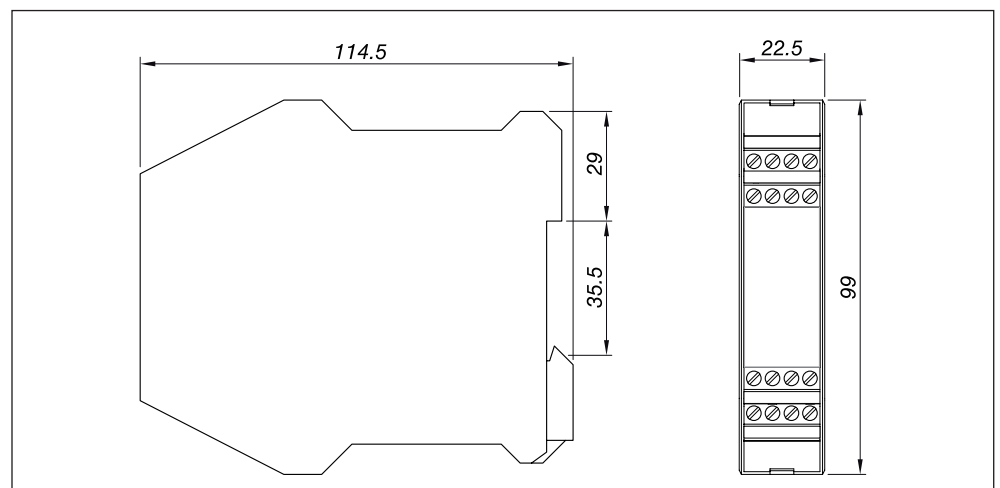
CAUTION



Impaired operation due to overheating

The operation of the protective device may be impaired due to overheating of the Control Unit.

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



1. The enclosure of the Control Unit can be mounted in any position on a 35 mm IEC 60175 rail.

CAUTION

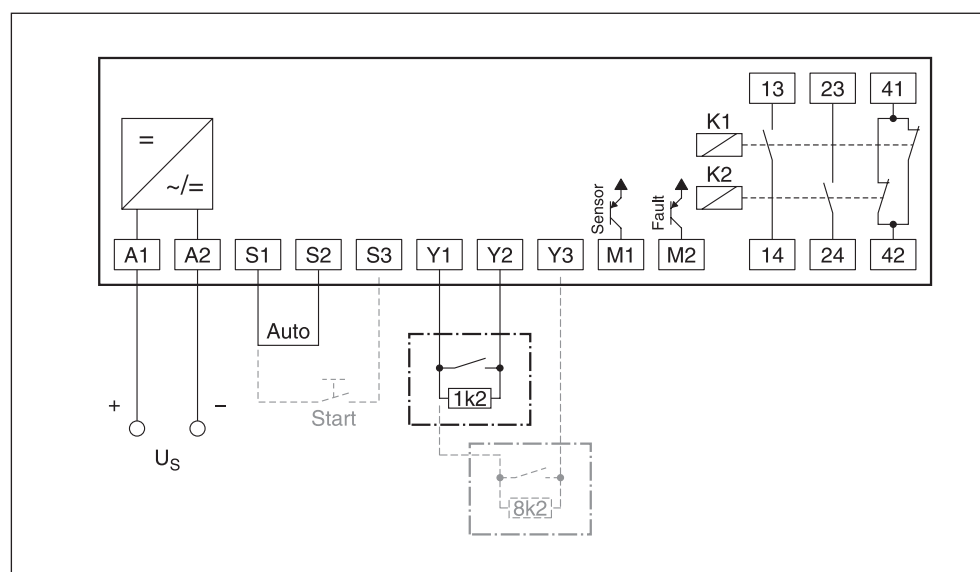


Overall safety endangered

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.



CAUTION



Malfunctioning due to incorrect sensor

Connecting up an incorrect sensor can impair the functioning of the protective device.

- ➔ Decide on one type of sensor: either with monitoring resistor 1k2 or 8k2.
- ➔ Connect a sensor with monitoring resistor 1k2 exclusively to terminals Y1 and Y2.
- ➔ Connect a sensor with monitoring resistor 8k2 exclusively to terminals Y1 and Y3.

Automatic reset

A bridge is necessary for automatic reset (without reset command). The unit is supplied with a bridge already connected between cable terminals S1 and S2 .

- ➔ Check if the bridge is set between cable terminals S1 and S2.

Manual reset

For manual reset (with reset command), a switch must be connected between cable terminals S1 and S3. 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 S1 and S2.
- ➔ Wire up a switch between cable terminals S1 and S3.

Signal output with U_s AC

The signal outputs M1 and M2 are semiconductor outputs (PNP) and short-circuit-proof. When they are at HIGH status, they have a voltage of 20 to 29 V, depending on load and supply voltage.

Signal output M1: Sensor

- ➔ Wire the load between cable terminals M1 and S1.

Signal output M2: Fault

- ➔ Wire the load between cable terminals M2 and S1.

CAUTION



Damage to the unit due to short circuit

- ➔ Ensure a galvanic separation between the systems is connected to the signal outputs and the connecting voltage U_s AC.
-

Signal output with U_s DC

The signal outputs M1 and M2 are semiconductor outputs (PNP) and short-circuit-proof. When they are at HIGH status, they have a voltage of 18 to 22 V, depending on load and supply voltage.

Signal output M1: Sensor

- ➔ Wire the load between cable terminals M1 and A2.

Signal output M2: Fault

- ➔ Wire the load between cable terminals M2 and A2



In an electromagnetic extreme case (EMC surge), the signal outputs may flicker. This does not affect the safety function.

- ➔ Protect the control unit from excessive EMC radiation.
-

Correlation

LEDs				Outputs				Remedy
Power green	Sensor green	Output green	Fault red	13, 14 23, 24	41, 42	M1, A2	M2, A2	LED off: ○ LED on: ●
○	○	○	○	open	closed	LOW	LOW	supply voltage off
●	●	○	○	open	closed	HIGH	HIGH	Supply voltage on; Sensor not activated; No reset-signal
●	●	●	○	closed	open	HIGH	HIGH	Control Unit ready
●	○	○	○	open	closed	LOW	HIGH	Sensor activated
●	○	○	●	open	closed	LOW	LOW	Faulty sensor (cable break)

Commissioning

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

DANGER



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.
 - green LEDs "Power", "Sensor" and "Output" are on
 - contacts of switch channels 1 and 2 closed
 - signal circuit open
2. Activate sensor.
 - green LEDs "Sensor" and "Output" go off
 - contacts of switch channels 1 and 2 open
 - signal circuit closed
3. Repeat step 1.
4. Disconnect the sensor.
 - green LEDs "Sensor" and "Output" go off
 - red LED "Fault" is on
 - contacts of switch channels 1 and 2 open
 - signal circuit closed

Test function: manual reset

1. Make sure no sensors are activated.
 - green LEDs "Power" and "Sensor" are on
 - contacts of switch channels 1 and 2 open
 - signal circuit closed
2. Activate the reset switch.
 - green LEDs "Power", "Sensor" and "Output" are on
 - contacts of switch channels 1 and 2 closed
 - signal circuit open
3. Activate a sensor.
 - green LEDs "Sensor" and "Output" go off
 - contacts of switch channels 1 and 2 open
 - signal circuit closed
4. Repeat steps 1 and 2.
5. Disconnect the sensor.
 - green LEDs "Sensor" and "Output" go off
 - red LED "Fault" is on
 - contacts of switch channels 1 and 2 open
 - signal circuit closed

Recommissioning

DANGER



Danger of injury!

- ➔ Never start your machine as long as the danger remains.
-

Automatic reset

The Control Unit works without a reset command. When the sensor is released after actuation, the relays K1 and K2 are re-energised after a delay t_w

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

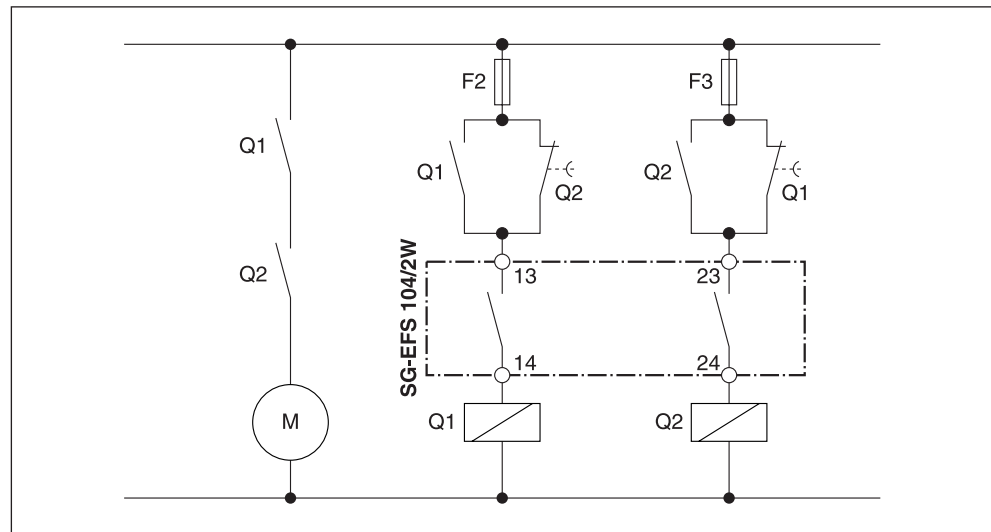
Manual reset

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

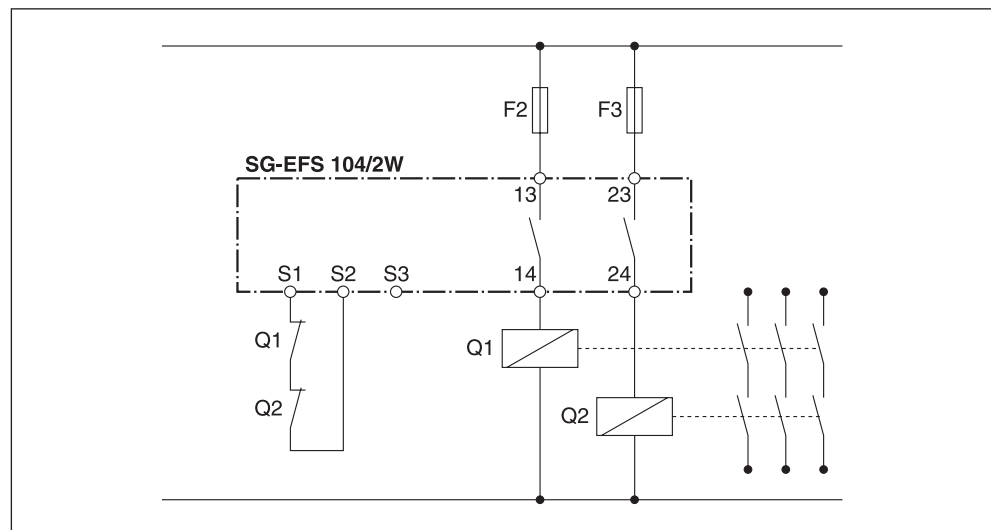
- ➔ Check for proper functioning after recommissioning (see section *Commissioning*)

Connection examples

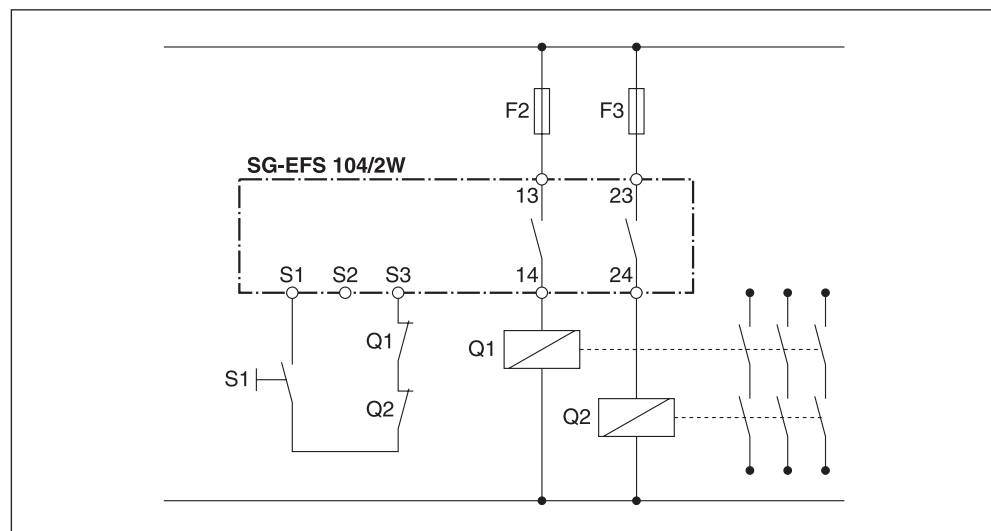
Contacts continued in two-channel mode



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

DANGER



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. The sensor is not activated.

Fault display	Possible cause	Remedy
green LED „Power“ off	No or incorrect supply voltage	1. Check supply voltage, compare with type plate. 2. Check terminal connections
	If supply voltage is correctly connected: Control Unit is faulty.	➔ Replace Control Unit.
green LED “Sensor“ off and signal output M1 is LOW	Incorrect monitoring resistor on the sensor	➔ Connect sensor with monitoring resistor 1k2 or 8k2
	Sensor incorrectly connected	➔ Check terminal connections ➔ Sensor with 1k2 connected to Y1 and Y2? ➔ Sensor with 8k2 connected to Y1 and Y3?
	If monitoring resistor is correct: Sensor is faulty	➔ Replace sensor
green LED “Output“ off	Incorrect monitoring resistor on the sensor	➔ Connect sensor with monitoring resistor 1k2 or 8k2
	Sensor incorrectly connected	➔ Check terminal connections ➔ Sensor with 1k2 connected to Y1 and Y2? ➔ Sensor with 8k2 connected to Y1 and Y3?
	If monitoring resistor is correct: Sensor is faulty	➔ Replace sensor

Fault display	Possible cause	Remedy
green LED "Output" off	Manual reset: Reset switch not activated	➔ Activate reset switch
	Manual reset: Connection to switch broken	➔ Check connection to switch
	Manual reset: Switch sticks	➔ Replace switches on S1 and S3
	Automatic reset: Bridge is missing	➔ Connect bridge between S1 and S2
	Control Unit is faulty	➔ Replace Control Unit
green LEDs "Power", "Sensor" and "Output" are on and switch channel K2 is open	Control Unit is faulty	➔ Replace Control Unit
red LED "Fault" is on and signal output M2 is LOW	No sensor connected	➔ Connect sensor
	Incorrect monitoring resistor on the sensor	➔ Connect sensor with monitoring resistor 1k2 or 8k2
	Sensor incorrectly connected	➔ Check terminal connections
		➔ Sensor with 1k2 connected to Y1 and Y2? ➔ Sensor with 8k2 connected to Y1 and Y3?
Cable break	➔ Replace sensor	

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 Control Units 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



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)
- 2006/95/EC (Low voltage)

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 104/2W	AC 24 V	DC 24 V
Test principles	EN 1760-1, EN 1760-2, EN 1760-3, EN 12978, ISO 13849-1	
Supply voltage U_s		
Voltage tolerance	-10% to + 10%	-10% to +10%
Nominal current	70 mA	60 mA
Nominal frequency	50 to 60 Hz	–
External protection	200 mA slow-acting	200 mA slow-acting
Power consumption	< 4 VA	< 3 W
Times		
Reaction time t_a	< 15 ms	< 15 ms
Re-start time t_w	< 50 ms	< 50 ms
Safety classifications		
EN 1760: Reset	with/without	with/without
ISO 13849-1:2006	Category 3 PL d	Category 3 PL d
MTTF _d	277 years	277 years
DC _{avg}	60%	60%
B _{10d} (Load: DC 24 V / 1 A)	1.8× 10 ⁶	1.8× 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 III / 250 V, basic insulation	soiling degree 2, overvoltage category III / 250 V, basic insulation

SG-EFS 104/2W	AC 24 V		DC 24 V	
Control Unit Inputs				
Sensor	Y1, Y2	Y1, Y3	Y1, Y2	Y1, Y3
Monitoring resistor	1k2 Ohm	8k2 Ohm	1k2 Ohm	8k2 Ohm
Short-circuit resistance	≤ 400 Ohm	≤ 400 Ohm	≤ 400 Ohm	≤ 400 Ohm
Line resistance	≤ 10 Ohm	≤ 10 Ohm	≤ 10 Ohm	≤ 10 Ohm
Line length (max.)	100 m	100 m	100 m	100 m
Switching thresholds				
Sensor activated	< 0.6 kOhm	< 4 kOhm	< 0.6 kOhm	< 4 kOhm
Cable break	> 1.8 kOhm	> 12 kOhm	> 1.8 kOhm	> 12 kOhm
Reset	S1, S2	S1, S3	S1, S2	S1, S3
Type	automatic	manual	automatisch	manual
Line length (max.)	3 m	30 m	3 m	30 m
Control Unit Outputs				
Switching channel 1 and 2 (NO contact)	13, 14 and 23, 24		13, 14 and 23, 24	
Signal circuit (NC contact)				
Utilization category	41, 42		41, 42	
as per EN 60947-5-1	AC-12: 250 V / 4 A		AC-12: 250 V / 4 A	
Switching voltage (max.)	DC-12: 24 V / 4 A		DC-12: 24 V / 4 A	
Switching current (max.)	AC 250 V	DC 24 V	AC 250 V	DC 24 V
Switching capacity (max.)	4 A	4 A	4 A	4 A
Switching operations, mechanical	1000 VA	96 W	1000 VA	96 W
Switching operations, electrical	> 1 × 10 ⁷		> 1 × 10 ⁷	
Contact fuse protection, external	> 3.6 × 10 ⁵ (DC 24 V / 1 A)		> 3.6 × 10 ⁵ (DC 24 V / 1 A)	
Line length (max.)	6.3 A quick-acting		6.3 A quick-acting	
Signal output (PNP)	30 m		30 m	
Type of signal	M1, S1	M2, S1	M1, A2	M2, A2
Voltage (DC)	Sensor	Fault	Sensor	Fault
Load current (max.)	20 to 29 V	20 to 29 V	18 to 22 V	18 to 22 V
Line length (max.)	100 mA	100 mA	100 mA	100 mA
	30 m	30 m	30 m	30 m
Mechanical operating conditions				
Cable terminals	4 × 4-poles		4 × 4-poles	
solid wire	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 × 1.5 mm ²		1 × 2.5 mm ² or 2 × 1.5 mm ²	
Degree of protection as per IEC 60529	IP20		IP20	
max. humidity (23 °C)	95%		95%	
Operating temperature	-25 °C to +55 °C		-25 °C to +55 °C	
Storage temperature	-25 °C to +55 °C		-25 °C to +55 °C	
Impact resistance in operation	2.5 g		2.5 g	
Impact resistance transport	10 g		10 g	
Dimensions (W × H × D)	114.5 × 99 × 22.5 mm		114.5 × 99 × 22.5 mm	
Weight	180 g		180 g	