



Control unit SG-EFS 104/4L



EN | Operating instructions

Version 2

1004128 SG-EFS 104/4L AC/DC 24 V

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Original instructions

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:

- 2014/30/EU (EMC)
- 2011/65/EU (RoHS)

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

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 download section of the website:
www.mayser.com/en/downloads

UL certification



The design type of the product conforms with the basic requirements of:
UL certification

- UL 508

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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 the signal processing of a pressure-sensitive protective device. It evaluates the output signals of sensors in the BK version. The integrated output signal switching devices (OSSD) pass the evaluated safety signals directly to the subsequent 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 Y3, Y4 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

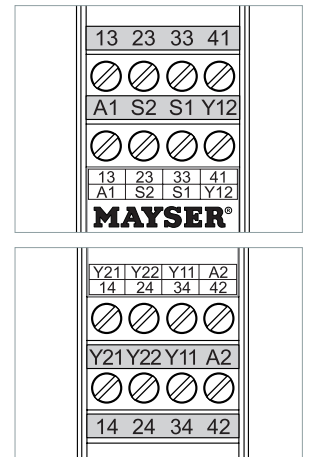
Connections

Terminals:

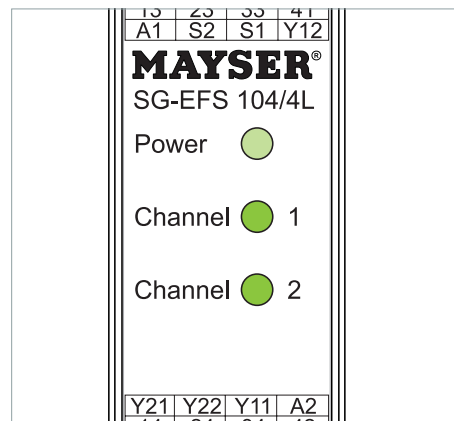
A1, A2
 Y11, Y12
 Y21, Y22
 13, 14
 23, 24
 33, 34
 41, 42
 S1, S2

Connections:

Supply voltage
 Sensor BK
 OSSD 1
 OSSD 2
 OSSD 3
 Signal output
 Bridge for automatic reset
 Switch for manual reset



LED indicators



- light green LED „Power“:
supply voltage connected
- green LED „Channel 1“:
Relay K1 is energised
- green LED „Channel 2“:
Relay K2 is energised

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 relays control OSSD 1 (terminals 13, 14), OSSD 2 (terminals 23, 24) and OSSD 3 (terminals 33, 34). The electronic system monitors the connected BK type sensor. The control unit is powered with AC/DC 24 V. When the supply voltage is connected, the light green "Power" LED is on.

When the sensor is not actuated and after a reset, the OSSDs 1, 2 and 3 are closed and the signal output is open. The green LEDs "Channel 1" and "Channel 2" are on. If the sensor is activated or the cable on the sensor breaks, the OSSDs 1, 2 and 3 are open and the signal output is closed. The green LEDs "Channel 1" and "Channel 2" go out.

The signal output functions contrary to the OSSDs.

Reset

Automatic reset

The control unit operates without a reset function. 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

The control unit operates without a reset function. 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.

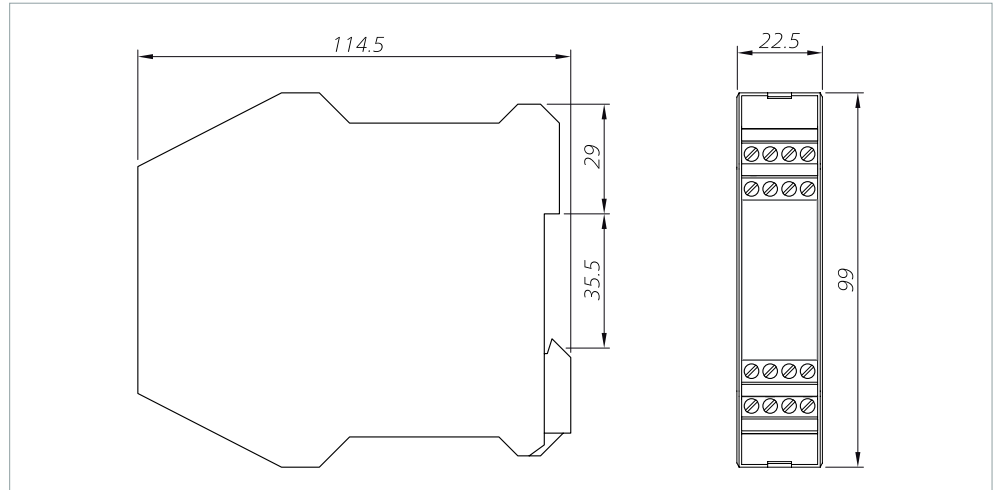
If the reset button is pressed, the OSSDs switch with a delay t_w back to HIGH.

Installation

For your safety, the well-known 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.



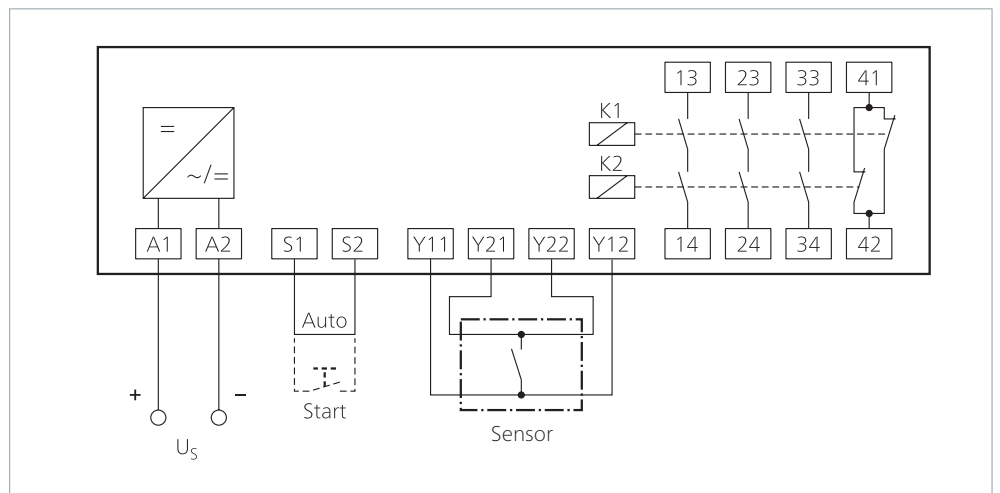
⚠ Caution: Functional impairment due to overheating

If the control unit is overheated due to the effects of external heat, this can result in functional impairment or failure of the pressure-sensitive protection device.

➔ Always ensure sufficient distance from heat sources (at least 2 cm).

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

(UL: Use 60/75 °C copper wire only)

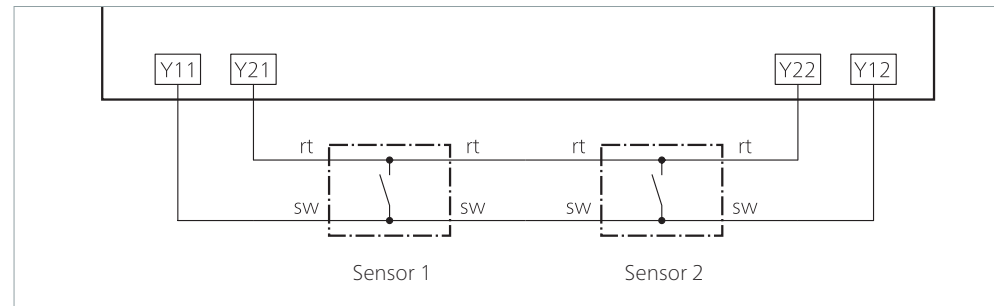


- ➔ Tighten the screws of the cable terminals to a torque of 0.5 to 0.6 Nm.
(UL: Overtorquing may cause enclosure breakage.)

The two contact surfaces of the sensor function as a bridge between the connections Y11 and Y12 as well as Y21 and Y22. This is the only way the sensor can be perfectly monitored and cable breaks detected.

➔ Watch out for wired paths with consistent colour, e.g. red strands on Y21 and Y22.

➔ Always connect several sensors in series:



Colour coding:

- BK Black
- BU Blue
- BN Brown
- RD Red
- WH White

Cable	Sensor	Y11	Y21	Y22	Y12
2× 2-core	SL	BN	WH	WH	BN
2× 2-core	SM, TS, SL, SP, SB	BK	RD	RD	BK
2× 2-core	SM11	BN	BU	BU	BN
1× 4-core	SM, SB	BK	BU	WH	BN

Reset

Automatic reset

A bridge is necessary for automatic reset (without resetting function).

➔ Insert a bridge between the cable terminals S1 and S2.

Reset via machine controller

For a manual reset (with reset function) by the machine controller, an NO contact must be connected to the control system.

➔ Wire the NO contact to the machine controller between the cable terminals S1 and S2.

Manual reset

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

- ➔ Wire up a button between cable terminals S1 and S2.

Machine release circuits integration:

- ➔ Connect the NC contact of the external contactors in series to the reset button on cable terminals S1 and S2 (see Chapter *Connection examples*).

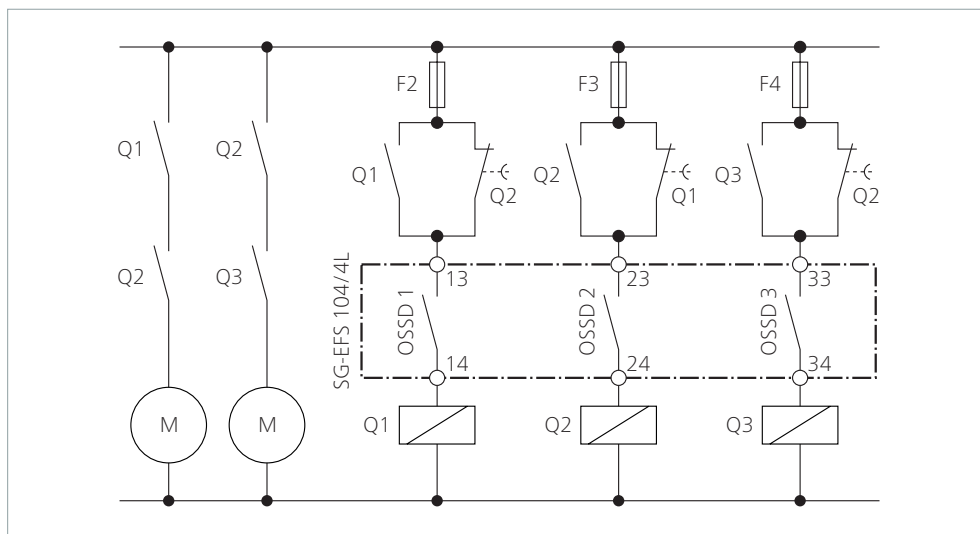
⚠ Caution: Automatic reset due to jammed reset button

If the pressure-sensitive protection device is no longer actuated, the OSSDs automatically switch from the OFF state to the ON state. Injury or material damage due to unexpected restart.

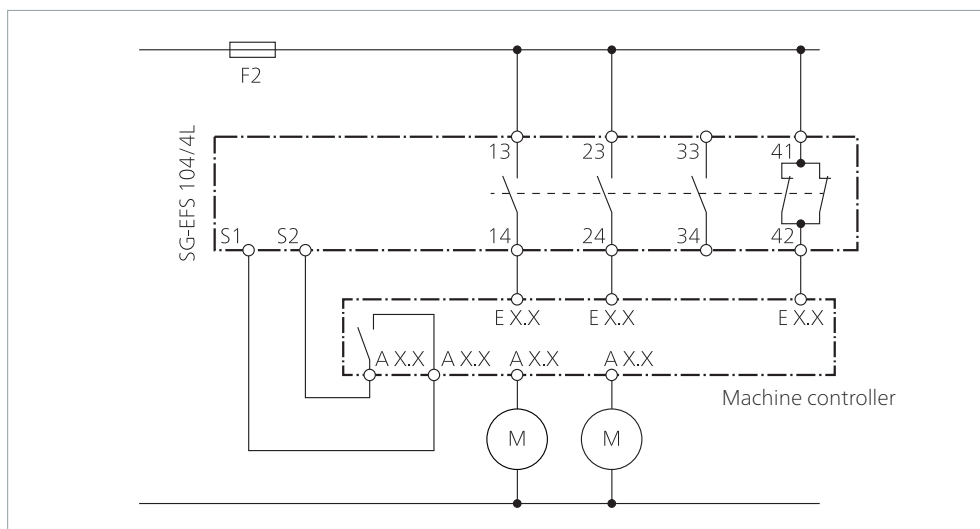
- ➔ Always use a high-quality button.
- ➔ Check button regularly (at least 1 time per month) to ensure that it is functioning correctly.

Connection examples

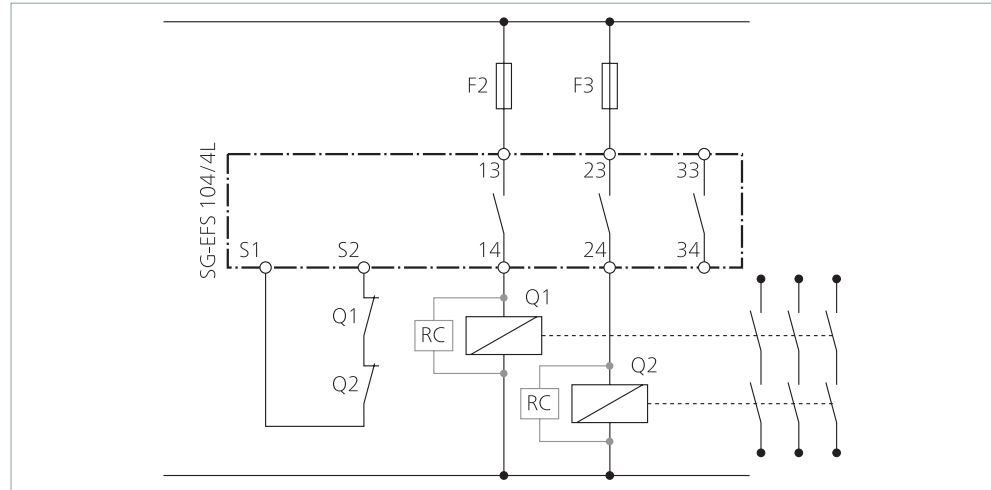
Connection examples 1



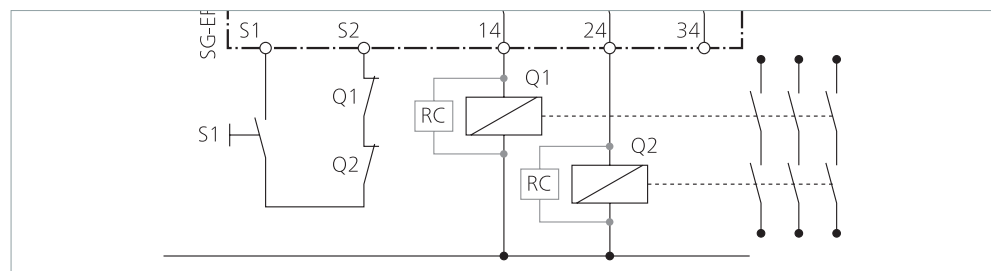
Connection examples 2



**Contact duplication
for automatic reset**



with manual reset



Commissioning

➔ Connect the supply voltage.

⚠ WARNING: Danger of injury due to electrocution

➔ Never unplug plug connections with the power on.

Test function: automatic reset

1. Make sure no sensors are activated.
 - green LEDs "Power", "Channel 1" and "Channel 2" are on
 - OSSDs 1, 2 and 3 are closed
 - signal output is open
2. Activate the sensor.
 - green LEDs "Channel 1" and "Channel 2" go out
 - OSSDs 1, 2 and 3 are open
 - signal output is closed
3. Disconnect the sensor.
 - green LEDs "Channel 1" and "Channel 2" go out
 - OSSDs 1, 2 and 3 are open
 - signal output is closed

Test function: manual reset

1. Make sure no sensors are activated.
 - green LED "Power" is on
 - OSSDs 1, 2 and 3 are open
 - signal output is closed

2. Activate the reset button.
 - green LEDs "Power", "Channel 1" and "Channel 2" are on
 - OSSDs 1, 2 and 3 are closed
 - signal output is open

3. Activate the sensor.
 - green LEDs "Channel 1" and "Channel 2" go out
 - OSSDs 1, 2 and 3 are open
 - signal output is closed

4. Repeat step 2.

5. Disconnect the sensor.
 - green LEDs "Channel 1" and "Channel 2" go out
 - OSSDs 1, 2 and 3 are open
 - signal output is closed

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
Light green LED "POWER" is off	No or incorrect supply voltage	<ol style="list-style-type: none"> 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 LEDs "Channel 1" and "Channel 2" are off	Manual reset: reset button not actuated	➔ Actuate reset button
	Manual reset: connection to button broken	➔ Check connection to button
	Manual reset: jammed button	➔ Replaces buttons on S1 and S2
	Automatic reset: bridge is missing	➔ Connect bridge between S1 and S2
	Sensor defective or connection to sensor interrupted.	<ol style="list-style-type: none"> 1. Disconnect the sensor 2. Bridge connections Y11, Y12 and Y21, Y22 3. Actuate reset button 4. If LEDs are lit: replace sensor
	Control unit is faulty	➔ Replace control unit.
Just one green LED "Channel 1" or "Channel 2" 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 104/4L	AC 24 V	DC 24 V
Testing basis	EN 12978, ISO 13849-1, ISO 13856-1, ISO 13856-2, ISO 13856-3	
Connecting voltage U_s		
Nominal voltage	AC 24 V	DC 24 V
Voltage tolerance	-10 % to +10 %	-10 % to +10 %
Nominal current	280 mA	86 mA
Nominal frequency	50 to 60 Hz	–
External protection	–	–
Power consumption	< 7 VA	< 3 W
Times		
Reaction time t_a	< 50 ms	< 30 ms
Restart time t_w	< 500 ms	< 500 ms
Safety classifications		
ISO 13856: Reset function	with/without	with/without
ISO 13849-1:2015	Category 3 PL e	Category 3 PL e
MTTF _D	100 a	100 a
DC _{avg}	90 %	90 %
B _{10D} (Load: DC 24 V / 2 A)	4× 10 ⁵	4× 10 ⁵
n _{op} (estimate)	52560/a	52560/a
CCF	Requirements fulfilled	Requirements fulfilled
IEC 60664-1: creep distance and air gap	Contamination level 2, overvoltage category III / 250 V, basic insulation	Contamination level 2, overvoltage category III / 250 V, basic insulation
Inputs		
Sensor	Y11, Y12 and Y21, Y22	Y11, Y12 and Y21, Y22
Short-circuit resistance	≤ 400 Ohm	≤ 400 Ohm
Line resistance	≤ 10 Ohm	≤ 10 Ohm
Line length (max.)	100 m	100 m
Switching thresholds		
Sensor actuated	< 1k3 Ohm	< 1k3 Ohm
Cable break	–	–
Outputs		
OSSD 1, 2 and 3 (NO contact)	13, 14 and 23, 24 and 33, 34	13, 14 and 23, 24 and 33, 34
Signal output (NC contact)	41, 42	41, 42
EN 60947-5-1: Utilization category	AC-12: 250 V / 5 A DC-12: 30 V / 5 A	AC-12: 250 V / 5 A DC-12: 30 V / 5 A
Switching voltage (max.)	AC 230 V DC 24 V	AC 230 V DC 24 V
Switching current (max.)	5 A 5 A	5 A 5 A
Net current (max.)	13.8 A 13.8 A	13.8 A 13.8 A
Switching capacity (max.)	1150 VA 120 W	1150 VA 120 W
Switching operations, mechanical	> 1× 10 ⁷	> 1× 10 ⁷
Switching operations, electrical	> 1× 10 ⁵ (DC 24 V / 2 A)	> 1× 10 ⁵ (DC 24 V / 2 A)
Contact fuse protection external		
NO contact	6.3 A quick-acting	6.3 A quick-acting
NC contact	4 A Neozed gL/gG	4 A Neozed gL/gG

SG-EFS 104/4L	AC 24 V	DC 24 V
Mechanical operating conditions		
Cable terminals	4× 4-pin	4× 4-pin
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
Tightening torque	0.5 to 0.6 Nm	0.5 to 0.6 Nm
IEC 60529: Degree of protection	IP20	IP20
max. humidity (23 °C)	95 %	95 %
Operating temperature	-25 °C to +55 °C (UL: to +40 °C)	-25 °C to +55 °C (UL: to +40 °C)
Storage temperature	-25 °C to +55 °C	-25 °C to +55 °C
Impact resistance in operation	2 g	2 g
Dimensions (W × H × D)	22.5 × 99 × 114.5 mm	22.5 × 99 × 114.5 mm
Weight	180 g	180 g