MAYSER®

Innovative by tradition.

Operating instructions

Control unit SG-EFS 104/4L

Version 2

1004128 SG-EFS 104/4L 24 V=/~

Mayser GmbH & Co. KG
Örlinger Straße 1–3
89073 Ulm
GERMANY
Phone: +49 731 2061-0
Fax: +49 731 2061-222
E-mail: info.ulm@mayser.com
Internet: www.mayser.com

Original instructions

Contents

About these operating instructions

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

➔ Read the operating instructions carefully before use.

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

➔ Pass the 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 or more steps whose order is not relevant.
1. ... 2. ... 3. ...	Action with several steps whose 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 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 control unit complies with ISO 13849-1:2006 Category 3 PL e. For the safety classification to be retained, the downstream control must be of the same or a higher category.

Safety instructions

➔ **Do not open the control unit**
Never open, alter or tamper with the control unit.

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

➔ **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 to 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 Y11, Y12 and Y21, Y22 as well as S1, S2 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 down-stream 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.
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

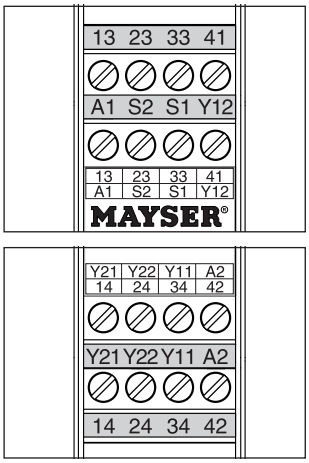
➔ Store the control units in the original packaging in a dry place.

➔ Observe the storage temperatures given in the technical specifications.

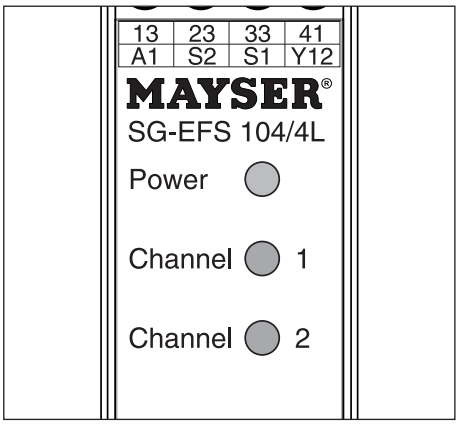
Product overview

Connections

Connections:	**Terminals:**
Supply voltage	A1, A2
Sensor type BK	Y11, Y12
	Y21, Y22
Switching channel 1	13, 14
Switching channel 2	23, 24
Switching channel 3	33, 34
Signal circuit	41, 42
Bridge for automatic reset	S1, S2
Button for manual reset	S1, S2



LEDs information



- Light green LED “Power”: supply voltage connected
- Green LED “Channel 1“: Relay K1 is energised
- Green LED “Channel 2“: Relay K2 is energised

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 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 relays K1 and K2 are energised. The green LEDs “Channel 1“ and “Channel 2“ are on, the switch channels 1, 2 and 3 are closed and the signal circuit is open.
If the sensor is activated or the cable on the sensor breaks, the K1 and K2 relays are de-energized. The green LEDs “Channel 1“ and “Channel 2“ go out, switch channels 1, 2 and 3 are open, and the signal output is closed.
The signal circuit functions contrary to the switch channels 1, 2 and 3.

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.

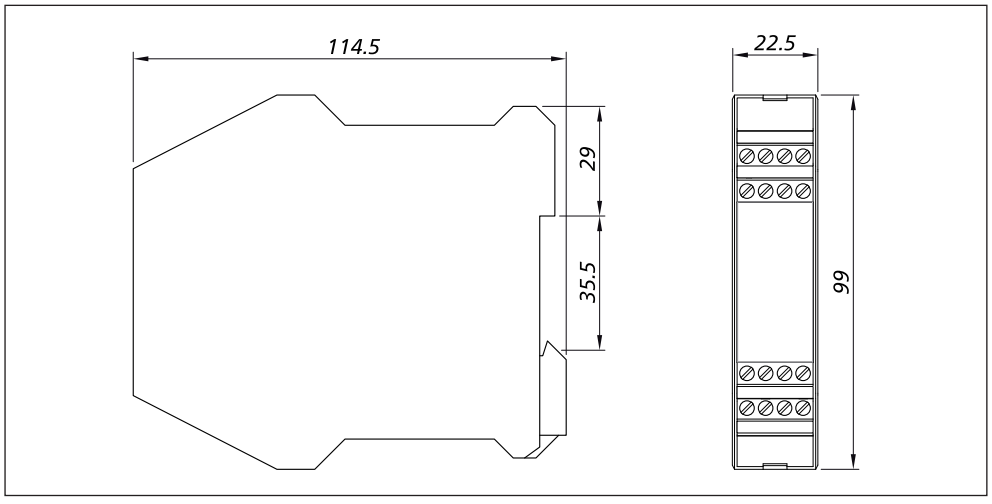
CAUTION

Impaired operation due to overheating or incorrect degree of protection

The operation of the 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 to heat sources (at least 2 cm)

➔ Only use the control unit in zones that have a min. degree of protection 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.

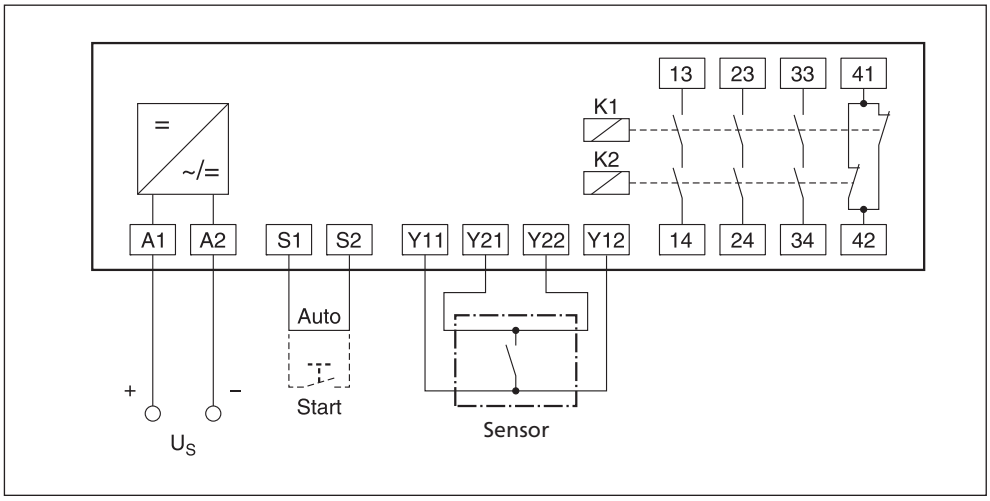
CAUTION

Overall safety endangered

The quality and reliability of the interface between the protective device and the machine influence the overall safety.

➔ Install the interface very carefully

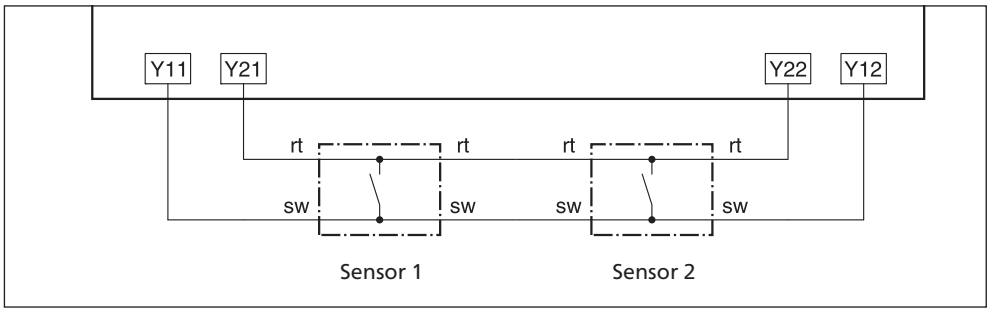
2. Wire the sensors, relay contacts and supply voltage to the cable terminals.



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:

bl	Blue	sw	Black
br	Brown	ws	White
rt	Red		

Cable	Sensor	Y11	Y21	Y22	Y12
2× 2-core	SL	br	ws	ws	br
2× 2-core	SM, TS, SL, SP, SB	sw	rt	rt	sw
2× 2-core	SM11	br	bl	bl	br
1× 4-core	SM, SB	sw	bl	ws	br

Automatic reset

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

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

Manual reset

For manual reset (with resetting function), a button must be connected between cable terminals S1 and S2.

➔ 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

Functional impairment through jammed buttons

Jammed buttons result in an automatic reset.

➔ Use a preferably high-quality button.

Commissioning

➔ Connect the supply voltage.

WARNING

Danger of injury due to electrocution

➔ Never disconnect terminals with the power on.

Test function: automatic reset

1. Make sure no sensors are activated.
   - green LEDs “Power“, “Channel 1“ und “Channel 2“ are lit
   - contacts of switch channels 1, 2 and 3 closed
   - signal circuit open

2. Activate the sensor.
   - green LEDs “Channel 1“ and “Channel 2“ go out
   - contacts of switch channels 1, 2 and 3 open
   - signal circuit closed

3. Disconnect the sensor.
   - green LEDs “Channel 1“ and “Channel 2“ go out
   - contacts of switch channels 1, 2 and 3 open
   - signal circuit closed

Test function: manual reset

1. Make sure no sensors are activated.
   - green LED “Power“ is lit
   - contacts of switch channels 1, 2 and 3 open
   - signal circuit closed

2. Activate the reset button.
   - green LEDs “Power“, “Channel 1“ and “Channel 2“ are lit
   - contacts of switch channels 1, 2 and 3 closed
   - signal circuit open

3. Activate the sensor.
   - green LEDs “Channel 1“ and “Channel 2“ go out
   - contacts of switch channels 1, 2 and 3 open
   - signal circuit closed

4. Repeat step 2.

5. Disconnect the sensor.
   - green LEDs “Channel 1“ and “Channel 2“ go out
   - contacts of switch channels 1, 2 and 3 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 a resetting function. 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*).

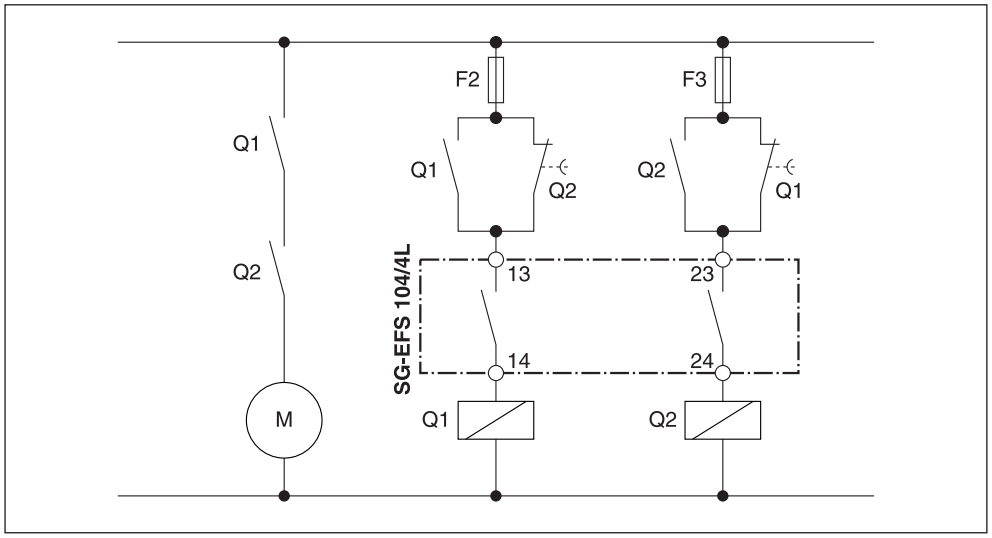
Manual reset

The control unit works with a resetting function. Relays K1 and K2 are energised only after the reset button is actuated.

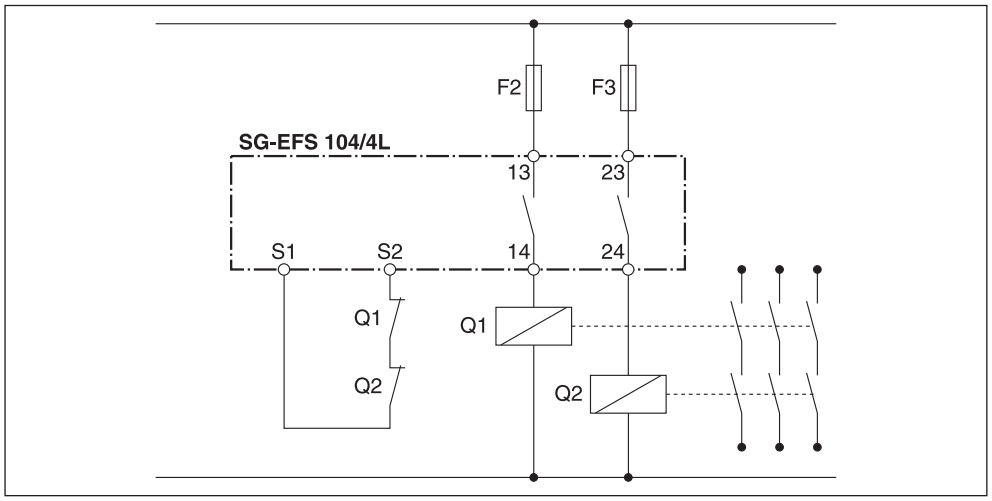
➔ Check for proper functioning after recommissioning (see Section *Commissioning*).

Connection examples

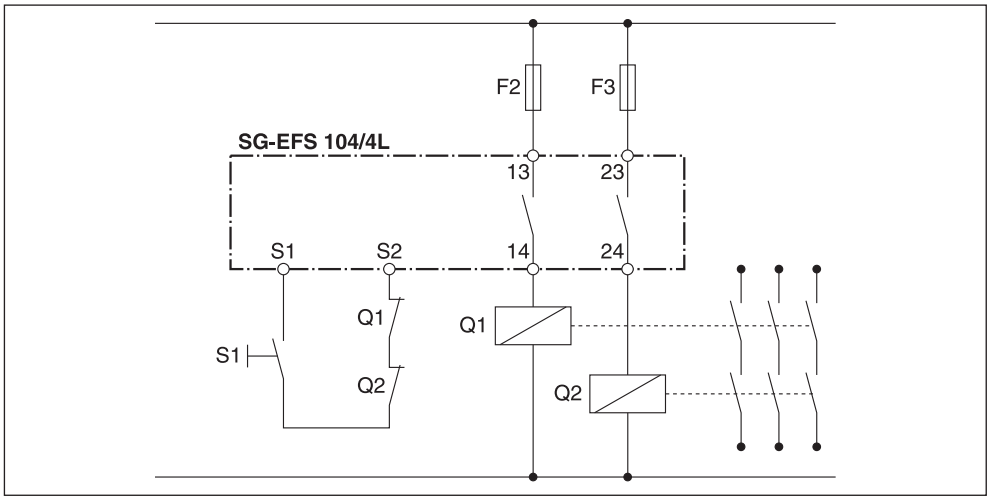
Contacts continued in two-channel mode



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
Light green LED "POWER" is 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 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.	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 lit	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 the Mayser support: phone +49 731 2061-0.

Replacement parts

CAUTION

Overall safety endangered

If the sensor and control unit are not replaced with original Mayser parts, 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)
- 2006/95/EC (Low voltage)

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

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

UL certification

US LISTED IND.CONT.EQ 51BA

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

- UL 508

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	
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 bis 60 Hz	–
External protection	–	–
Power consumption	< 7 VA	< 3 W
Times		
Reaction time t_a	< 30 ms	< 30 ms
Restart time t_w	< 500 ms	< 500 ms
Safety classifications		
ISO 13856: reset	with/without	with/without
ISO 13849-1:2006	Category 3 PL e	Category 3 PL e
$MTTF_d$	73 a	73 a
DC_{avg}	90 %	90 %
B_{10d} (Load: DC 24 V / 2 A)	4× 10^5	4× 10^5
n_{op} (estimate)	52560 per year	52560 per year
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
in BK version		
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		
Switching channel 1, 2 and 3 (NO contact)	13, 14 and 23, 24 and 33, 34	13, 14 and 23, 24 and 33, 34
Signal circuit (NC contact)	41, 42	41, 42
Utilization category	AC-12: 250 V / 5 A	AC-12: 250 V / 5 A
according to		
EN 60947-5-1	DC-12: 30 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
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 mm² or 2× 1.5 mm²	1× 2.5 mm² or 2× 1.5 mm²
Strand with sheath	1× 2.5 mm² or 2× 1.5 mm²	1× 2.5 mm² or 2× 1.5 mm²
Degree of protection according to 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 (B × H × T)	22.5 × 99 × 114.5 mm	22.5 × 99 × 114.5 mm
Weight	180 g	180 g