



Control unit SG-EFS 104/4L



EN | Operating instructions

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

Version 2

Mayser GmbH & Co. KG

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Original instructions



Safety first!



- Read the instructions carefully before use.
- The warnings in the instructions are there to warn you of any unexpected dangers. Always heed the warnings.
- Keep the instructions somewhere safe so you can refer to them throughout the product's entire service life.
- Pass the instructions on to every subsequent owner or user of the product.
- Add any supplement received from the manufacturer to the instructions.
- Observe the information under "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 Downloads section of our website: www.mayser.com.

EC type examination

The product has been tested by an independent institute. There is an EC type examination certificate to confirm conformity.

The EC type examination certificate is stored in the Downloads section of our website: www.mayser.com.

UL certification



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

• UL 508

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About these instructions

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

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

Target groupThese instructions are intended for the operating company and for electrically skilled
persons. The electrically skilled person must be familiar with installation and commis-
sioning.

Other applicable documents

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➔ Please also observe the following documents:

- Drawing of the sensor system (optional)

- Wiring diagram (optional)
- Installation instructions for the sensors used

Symbols used	Symbol	Meaning
	→	Action with one step or with more than one step where the order is not relevant.
	1	Action with more than one step where the order is rel- evant.
	• 	Bullets first level Bullets second level
	(see Installation)	Cross-reference

Danger symbols and	Symbol	Meaning
information	▲ DANGER	Immediate danger leading to death or serious injury.
	▲ WARNING	Imminent danger which may lead to death or serious injury.
		Possible danger which may lead to minor or moderate inju- ries.
	NOTE	Potential risk of damage to property or the environment. Information on easier and safer working practices.

Measurements used in drawings Unless stated otherwise, all measurements are in millimetres (mm).

Safety

Intended use

The control unit is designed for processing the signals of a pressure-sensitive protective device (PSPD). It evaluates the output signals of BK-type sensors. The integrated output signal switching devices (OSSD) transmit the evaluated safety signals directly to the downstream control.

The product complies with ISO 13849-1:2015 category 3 PL e. To prevent any reduction in the safety classification, the downstream control must be of the same category or higher.

Safety instructions

For your **own safety**, you must adhere to the following safety instructions.

Avoid electric shocks

To avoid electrical injuries when working on electrical systems, disconnect them from the power supply and secure them to prevent them being switched back on.

➔ Take care when setting up the interface

Overall safety is affected by the quality and reliability of the interface between the protective device and the machine. Take particular care when setting up the interface.

➔ Prevent the machine from restarting

Prevent the machine from restarting while a hazard exists, e.g. by using a starting lockout.

➔ 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 by decommissioning it.

➔ 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,** you must observe the following safety instructions.

➔ Do not open the control unit

Never open, tamper with or attempt to modify the control unit.

Observe protection class

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

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➔ Ensure sufficient clearance

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

Check supply voltage

Check the supply voltage. It must correspond to the connecting voltage $\rm U_{S}$ specified on the type plate.

➔ Observe correct terminal assignment

Observe the correct terminal assignment when connecting the supply voltage.

➔ Do not exceed maximum number of sensors

Do not connect more sensors to the control unit than the maximum number specified in the sensor installation instructions.

➔ Protect relay contacts

Risk of contact welding: provide the relay contacts with external fuse protection.

➔ 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 circuits) to the consumer.

➔ Do not interconnect control units

Do not combine control units by interconnecting them. Terminals Y11, Y12 and Y21, Y22 are not voltage-free.

➔ Continue redundancy

Make sure you wire the unit directly in the control circuit or that two channels continue to be used in the downstream control.

Residual dangers

There are no known residual dangers associated with this product.

Parts supplied

1× Control unit

Enclosure with electronics module and plug-in connectors.

1× Operating Instructions

- **1× Declaration of Conformity**
- Upon receipt, immediately check the parts supplied to ensure they are complete and in good condition.

Storage

- Store control units in the original packaging and in a dry place.
- → Observe the storage temperature in accordance with the technical data.

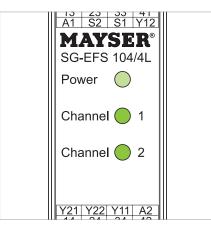
Product overview

Connections

Connections:	Terminals:
Supply voltage	A1, A2
BK-type sensor	Y11, Y12
	Y21, Y22
OSSD 1	13, 14
OSSD 2	23, 24
OSSD 3	33, 34
Signal output	41, 42
Bridge for automatic reset	S1, S2
Manual reset button	

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LEDs information



- Light-green "Power" LED: supply voltage connected
- Green "Channel 1" LED: relay K1 picked up
- Green "Channel 2" LED: relay K2 picked up



Function

The single-fault-safe electronics module has two channels (redundant). Each channel controls a force-guided 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 sensors. The control unit is operated with a voltage of AC/DC 24 V. When the supply voltage is connected, the light-green "Power" LED is lit.

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

Reset

Automatic reset

The control unit works without a reset function. If the protective device stops being actuated, the output signal switching device of the control unit automatically switches from the OFF state to the ON state after a delay t_w . Without an additional starting lockout, the machine would start up again immediately.

Manual reset

The control unit works with a reset function. If the protective device stops being actuated, the output signal switching devices of the control unit remain in the OFF state. This prevents the machine from restarting. Only a "Reset" command will change the state from OFF to ON.

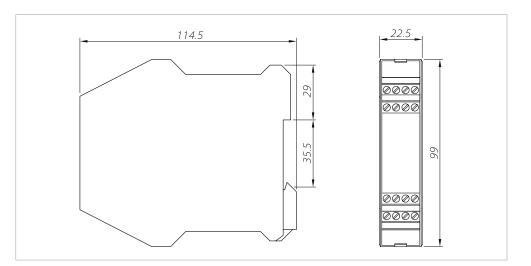
If the reset button is pressed, the OSSDs return to HIGH after a delay t_w .

Installation

For your own safety, you must also adhere to the following rules during installation:

- Disconnect from the power supply all devices and live parts that are located in the immediate vicinity.
- Secure them to prevent them being switched back on.
- Check that they are de-energised.
- 1. Fix the control unit in any position on a 35°mm mounting rail acc. to IEC 60715.

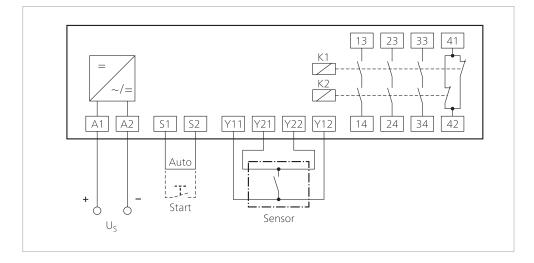




▲ Caution Impaired operation due to overheating

If the control unit overheats as a result of external heat, operation of the protective device may be impaired or it may fail completely.

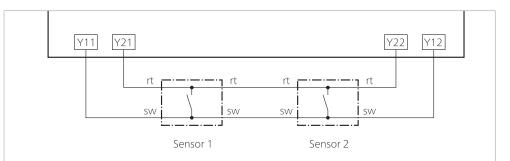
- → It is absolutely essential to ensure sufficient clearance from heat sources (at least 2 cm).
- 2. Wire the sensors, OSSDs and supply voltage to the cable terminals.



(UL: use 60/75 °C copper wire only)

 Tighten the screws of the cable terminals to a torque of between 0.5 and 0.6 Nm. (UL: overtorquing may cause enclosure breakage.) The two contact surfaces of the sensor act as bridges between connections Y11 and Y12 and connections Y21 and Y22 respectively. This is the only way to ensure proper monitoring of the sensor and detection of a cable break.

- ➔ Pay careful attention to paths that are supposed to have single-colour wiring from end to end, e.g. red wires at both Y21 and Y22.
- ➔ Always connect multiple sensors in series:



Colour coding:

BK Black BU Blue BN Brown RD Red WH White

Sensor	Y11	Y21	Y22	Y12
SL	BN	WH	WH	BN
SM, TS, SL, SP, SB	BK	RD	RD	BK
SM11	BN	BU	BU	BN
SM, SB	BK	BU	WH	BN
	SL SM, TS, SL, SP, SB SM11	SLBNSM, TS, SL, SP, SBBKSM11BN	SLBNWHSM, TS, SL, SP, SBBKRDSM11BNBU	SLBNWHWHSM, TS, SL, SP, SBBKRDRDSM11BNBUBU

Reset

Automatic reset

A bridge must be inserted to trigger an automatic reset (without the reset function).

→ Insert a bridge between cable terminals S1 and S2.

Reset via machine controls

In order for a manual reset to be performed via the machine controls (with the reset function), a NO contact of the controls must be connected.

→ Connect the wiring for the NO contact of the machine controls between cable terminals S1 and S2.

Manual reset

In order for a manual reset to be performed (with the reset function) a button must be connected.

→ Wire up a button between cable terminals S1 and S2.

Integrate the circuits for enabling the machine

 Connect the NC contacts of the external contactors to the reset button at cable terminals S1 and S2, ensuring they are connected in series (see Connection examples).

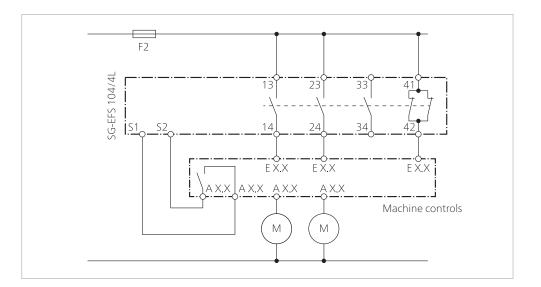
▲ Caution Automatic reset due to jammed/sticking reset button

If the protective device stops being actuated, the OSSDs automatically switch from the OFF state to the ON state. Risk of injury or property damage due to unexpected restart.

- → It is essential to use a high-quality button.
- → Test the function of the button regularly (at least once a month).

Connection examples

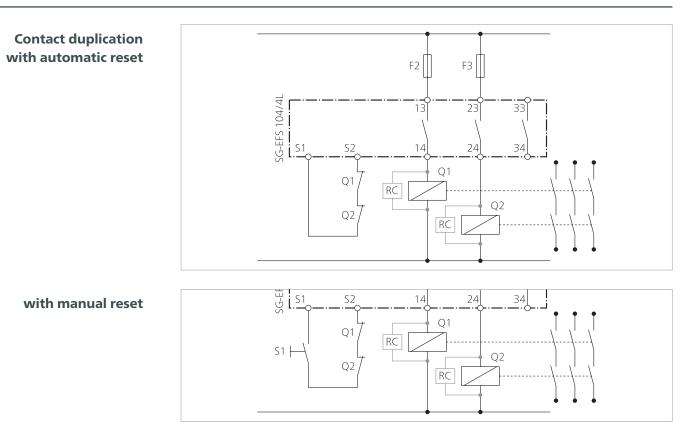
F2 F3 F4 Q1 Q2 -- (- Q2 Q2 , .-.€ Q3 Q1 Q1 Q2 SG-EFS 104/4L Q2 Q3 13 23 ัวว DSSD 3 OSSD 2 OSSD 1 14 Μ Μ Q1 Q2 Q3



Connection example 2

Connection example 1





Commissioning

➔ Connect the supply voltage.

▲ WARNING Danger of injury from electric shock

→ Never unplug plug-in connectors while live.

Function test: automatic reset

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

Function test: manual reset

- 1. Make sure no sensors are activated.
 - The green "Power" LED is lit
 - OSSDs 1, 2 and 3 are open
 - The signal output is closed
- 2. Activate the reset button.
 - The green "Power", "Channel 1" and "Channel 2" LEDs are lit
 - OSSDs 1, 2 and 3 are closed
 - The signal output is open

3. Activate the sensor.

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

Decommissioning

- Disconnect the protective device and secure it to prevent unintentional reconnection.
- Attach a clear notice to the protective device stating that it is temporarily or permanently out of service.

Recommissioning

→ Carry out the commissioning process (see Commissioning).

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Maintenance and cleaning

Maintenance

The control unit is maintenance-free.

➔ Repeat the function test monthly.

Cleaning

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

Troubleshooting and remedies

Prerequisites:

- The signal system has passed the latest test (see sensor installation instructions).
- The control unit is connected to the supply voltage and sensor.
- No sensor is activated.

Fault indication	Possible cause	Remedy
Light-green "POWER" LED not lit	No or incorrect supply voltage	1. Check supply voltage, compare with type plate
		2. Check terminal assignment
	If supply voltage is correctly connected: control unit is faulty	➔ Replace control unit
The green "Channel 1"	Manual reset: reset button not activated	➔ Activate reset button
and "Channel 2" LEDs are not lit	Manual reset: connection to button inter- rupted	➔ Check connection to button
	Manual reset: button jammed/sticking	→ Replace buttons on S1 and S2
	Automatic reset: bridge missing	➔ Connect bridge between S1 and S2
	runted	1. Disconnect sensor
		2. Bridge connections Y11, Y12 and Y21, Y22
		3. Activate reset button
		4. If LEDs are lit: replace sensor
	Control unit faulty	➔ Replace control unit
Only one green channel LED is lit: "Channel 1" or	Incorrect supply voltage	 Check supply voltage, compare with type plate
"Channel 2"	Control unit faulty	➔ Replace control unit

Still unable to resolve the fault?

- → Contact Mayser-Support: Tel. +49 731 2061-0.
- \rightarrow In the event of enquiries, have the information from the type plate to hand.

Type plate There is a type plate on the side of the control unit for identification purposes.

Replacement parts

▲ CAUTION Overall safety at risk

Failure to use original Mayser parts when replacing parts of the product can impair the function of the protective device.

➔ Only use original Mayser parts.

Disposal

Control unit The control units produced by Mayser are professional electronic tools exclusively intended for commercial use (known as B2B devices). Unlike the B2C (business-to-consumer) devices mainly used in private households, they must not be disposed of at the collection centres of public waste management 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

➔ When disposing of the product:

- Ensure compliance with the relevant national disposal regulations and statutory requirements.
- Ensure that any disposal company you use receives a list of the aforementioned materials along with the product.
- Ensure that the materials are recycled or disposed of in an environmentally friendly way.



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			
Nominal voltage	AC 24 V	DC 24 V	
Voltage tolerance	-10% to +10%	-10% to +10%	
Rated current	280 mA	86 mA	
Nominal frequency	50 to 60 Hz	_	
External fuse protection	_	_	
Power consumption	< 7 VA	< 3 W	
Times			
Reaction time t _a	< 50 ms	< 30 ms	
Restart time t	< 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	100 a	100 a	
DC _{avg}	90%	90%	
B _{10D} (load: DC 24 V / 2 A)	4× 10 ⁵	4× 10 ⁵	
n _{op} (assumption)	52560/a	52560/a	
CCF	Requirements met	Requirements met	
IEC 60664-1: creep distance and	Soiling degree 2, overvoltage	Soiling degree 2, overvoltage	
air gap	category III / 250 V, basic insulation	category III / 250 V, basic insulation	
Inputs			
Sensor	Y11, Y12 and Y21, Y22	Y11, Y12 and Y21, Y22	
Short-circuit resistance	≤ 400 ohms	≤ 400 ohms	
Line resistance	≤ 10 ohms	≤ 10 ohms	
Line length (max.)	100 m	100 m	
Switching thresholds			
Sensor activated	< 1k3 ohms	< 1k3 ohms	
Cable break	-	-	
Outputs			
OSSDs 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: utilisation	AC-12: 250 V / 5 A	AC-12: 250 V / 5 A	
category	DC-12:30 V / 5 A	DC-12: 30 V / 5 A AC 230 V DC 24 V	
Switching voltage (max.)	AC 230 V DC 24 V	AC 230 V DC 24 V 5 A 5 A	
Switching current (max.)	5 A 5 A		
Total current (max.) Switching capacity (max.)	13.8 A 13.8 A 1150 VA 120 W	13.8 A 13.8 A 1150 VA 120 W	
Switching capacity (max.) Switching operations, mechanical		> 1× 10 ⁷	
Switching operations, electrical	> 1× 10 ⁵ (DC 24 V / 2 A)	> 1× 10 ⁵ > 1× 10 ⁵ (DC 24 V / 2 A)	
External fuse protection	- IX IU (UC 24 V / 2 A)	- 1X 10 (DC 24 V / 2 A)	
for contacts			
NO contact	6.3 A quick-acting	6.3 A quick-acting	



Technical data

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	$1 \times 2.5 \text{ mm}^2 \text{ or } 2 \times 1.5 \text{ mm}^2$		
Strand with sheath	$1 \times 2.5 \text{ mm}^2 \text{ or } 2 \times 1.5 \text{ mm}^2$	$1 \times 2.5 \text{ mm}^2 \text{ or } 2 \times 1.5 \text{ mm}^2$		
Tightening torque	0.5 to 0.6 Nm	0.5 to 0.6 Nm		
IEC 60529: protection class	IP20	IP20		
Max. humidity (23 °C)	95%	95%		
Operating temperature	-25 °C to +55 °C (UL: up to +40 °C)	-25 °C to +55 °C (UL: up 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 \times H \times D)	22.5 × 99 × 114.5 mm	22.5 × 99 × 114.5 mm		
Weight	180 g	180 g		