



Control unit SG-RS 309-2



EN | Operating instructions

Version 1

1006747 SG-RS 309-2 24 to 36 V DC

Mayser GmbH & Co. KG

Örlinger Strasse 1–3

89073 Ulm

GERMANY

Tel.: +49 731 2061-0

Fax: +49 731 2061-222

E-mail: info.ulm@mayser.com

Website: www.mayser.com

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:

- 2006/42/EC (Safety of Machinery)
- 2011/65/EU (RoHS)
- 2014/30/EU (EMC)

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

EC type examination

The product was 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.



The design type of the product complies with the basic requirements of the following UK Statutory Instruments:

- 2008 No. 1597 (Machinery)
- 2012 No. 3032 (RoHS)
- 2016 No. 1091 (EMC)

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

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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 group These instructions are intended for the operating company and for electrically skilled persons. The electrically skilled person must be familiar with installation and commissioning.




Other applicable documents → 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 relevant.
• ... - ...	Bullets first level Bullets second level
(see <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 risk of damage to property or the environment. Information on easier and safer working practices.

Dimensions in drawings

Unless otherwise stated, all dimensions are in millimetres (mm).

Safety

Intended use

The control unit is designed for processing the signals of a pressure-sensitive protection device (PSPD). It evaluates the output signals of sensors with monitoring resistor 8k2 or 10k. The integrated output signal switching devices (OSSDs) transmit the evaluated safety signals directly to the downstream control.

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

The product has been developed taking EN 50155 into consideration and is suitable for rail applications.

The product is designed for installation in a switch cabinet.

Safety instructions

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

➔ **Avoid electric shocks**

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

➔ **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 alter 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).

➔ **Ensure sufficient clearance**

When installing the product in a switch cabinet, ensure sufficient clearance from heat sources (at least 2 cm ($25/32$ ")).

➔ **Check supply voltage**

Check the supply voltage. It must correspond to the connecting voltage 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 than 5 sensors in series to the control unit.

➔ **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 Y1, Y2 and Y3, Y4 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

1x control unit

Enclosure with electronics module and plug-in connectors.

1x operating instructions

1x Declaration of Conformity

➔ Upon receipt, immediately check the parts supplied to ensure they are complete and in good condition.

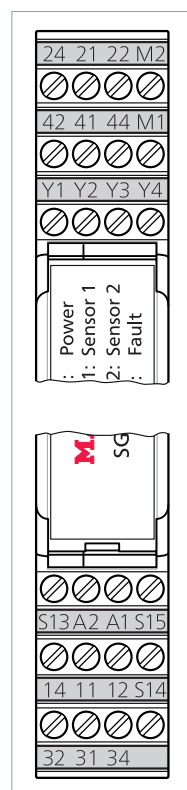
Storage

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

➔ Observe the storage temperature in accordance with the technical data.

Product overview

Connections



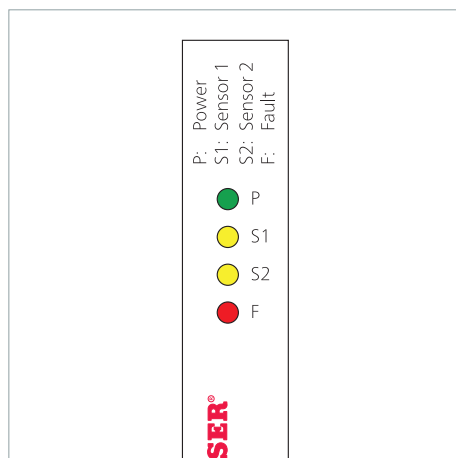
Terminals:

- A1, A2
- Sensor input
- Y1, Y2
- Y3, Y4
- Reset
- S13, S15
- S14, S15
- S13, S14
- S14
- Monitoring circuit 1 (sensor 1)
- 12
- 32
- M1
- Monitoring circuit 2 (sensor 2)
- 22
- 42
- M2
- 11, 14; 31, 34
- 21, 24; 41, 44

Connections:

- Supply voltage
- Sensor 1
- Sensor 2
- Bridge for automatic reset
- Bridge for automatic reset
- Manual reset button
- Controlled reset input
- Semiconductor output OSSD 1.1
- Semiconductor output OSSD 1.2
- Signal output
- Semiconductor output OSSD 2.1
- Semiconductor output OSSD 2.2
- Signal output
- Without function
- Without function

LED information



- Green "P" (Power) LED: supply voltage connected
- Yellow "S1" (Sensor 1) LED: sensor 1 activated
- Yellow "S2" (Sensor 2) LED: sensor 2 activated
- Red "F" (Fault) LED: fault/error

Function

The single-fault-safe electronics module has dual channels (redundant design). Two monitoring circuits each control two semiconductor outputs (OSSD 1.1, 1.2 and 2.1, 2.2) and regularly monitor them to make sure they are working. The electronics monitor the electrical resistance of the connected sensors which have a defined closed-circuit current.

Terminology: ON state, OFF state according to ISO 13856

Ready for operation

The control unit is operated with a voltage of 24 to 36 V DC. When the supply voltage is connected, the green "P" LED is lit up.

When the sensors are not activated, the OSSDs from monitoring circuit 1 (OSSD 1.1, OSSD 1.2) and monitoring circuit 2 (OSSD 2.1, OSSD 2.2) are in the ON state. The signal outputs from monitoring circuit 1 (M1) and monitoring circuit 2 (M2) are LOW.

If sensor 2 is not connected, then all specifications for monitoring circuit 2 can be ignored.

If the control unit is being operated with only one sensor (mode: "monitoring circuit 2 inactive"), the sensor needs to be connected to terminals Y1 and Y2. Terminals Y3 and Y4 must be left unconnected.

Sensor activated

If sensor 1 is activated, then the OSSDs from monitoring circuit 1 are in the OFF state, signal output M1 is HIGH. The yellow LED "S1" is lit up. If sensor 2 is activated, then the OSSDs from monitoring circuit 2 are in the OFF state, signal output M2 is HIGH. The yellow LED "S2" is lit up. If sensor 1 and sensor 2 are activated, then the OSSDs from monitoring circuit 1 and monitoring circuit 2 are in OFF state, signal outputs M1 and M2 are HIGH. The yellow LEDs "S1" and "S2" are lit up.

Sensor cable break

In the event of a cable break between **sensor 1** and the control unit, all OSSDs from monitoring circuits 1 and 2 are in the OFF state, signal outputs M1 and M2 are HIGH. The yellow "S1" LED and the red "F" LED are flashing.

In the event of a cable break between **sensor 2** and the control unit, all OSSDs from monitoring circuits 1 and 2 are in the OFF state, signal outputs M1 and M2 are HIGH. The yellow "S2" LED and the red "F" LED are flashing.

If a functioning sensor is connected again after a cable break, the device remains in fault mode. The respective yellow "S1" or "S2" LED and the red "F" LED continue flashing, the OSSDs of both monitoring circuits remain in the OFF state and the signal outputs at HIGH. A supply voltage interruption of at least 500 ms will reset the fault mode.

If a cable break is detected on monitoring circuit 2 but is not rectified, it will no longer be registered once the control unit has been restarted (supply voltage interruption of < 500 ms). Monitoring circuit 2 becomes inactive and its OSSDs remain in OFF state. The control unit is now in the mode: "Monitoring circuit 2 inactive".

Reset

Automatic reset

The control unit works without a reset function. If the protective device stops being activated, the OSSDs of the control unit automatically switch 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.

Controlled reset

The control unit works with a reset function. If the protective device stops being activated, the OSSDs 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 defined signal pulse of the higher-level control is applied to terminal S14, the OSSDs change from the OFF to the ON state again after a delay t_w .

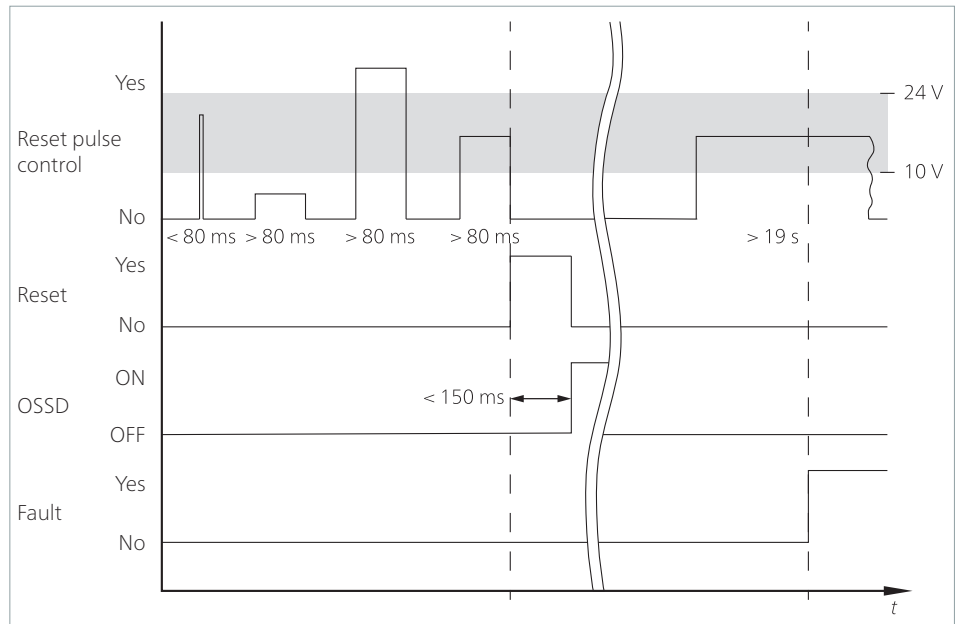
A HIGH signal at terminal S14 triggers a reset.

Conditions for the signal pulse of the higher-level control:

- Min. / max. pulse duration 80 ms / 19 s
- Min. / max. pulse voltage 10 V / 24 V

No reset will take place if the pulse duration is shorter than the minimum permitted or if the pulse voltage is incorrect.

If the max. pulse duration is exceeded, the control unit changes to the "Fault / System error" mode (see *Troubleshooting and remedies*).



Manual reset

The control unit works with a reset function. If the protective device stops being activated, the OSSDs of the control unit remain in the OFF state. This prevents the machine from restarting. Only a "Manual reset" command will change the state from OFF to ON.

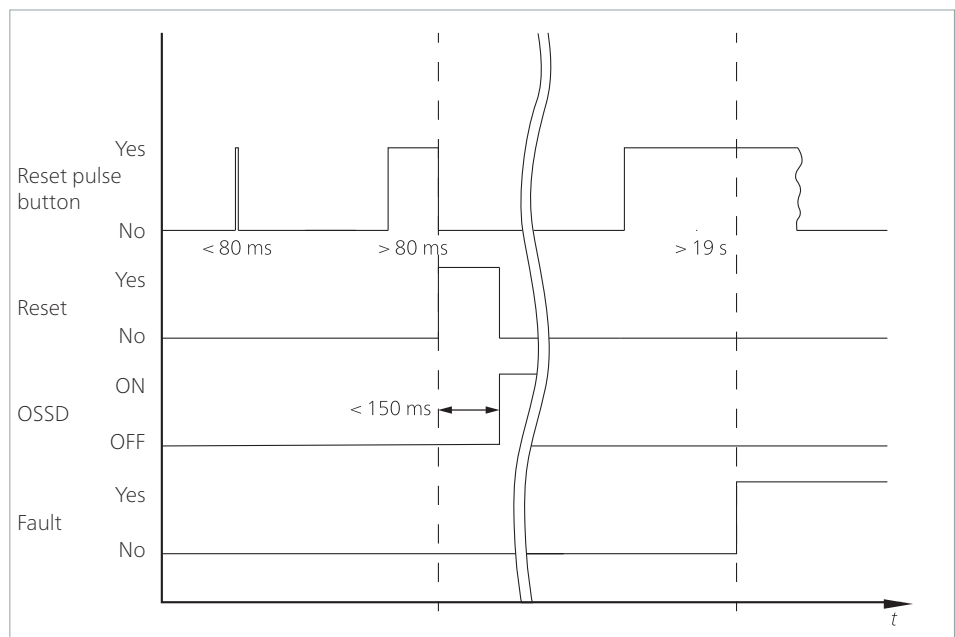
If the reset button is pressed, the OSSDs switch from the OFF state to the ON state after a delay t_w .

The control unit monitors the reset button and detects a malfunction via the actuation period. The conditions for this are:

- Min. / max. actuation period 80 ms / 19 s

If the actuation period is shorter than the minimum permitted, no reset will take place.

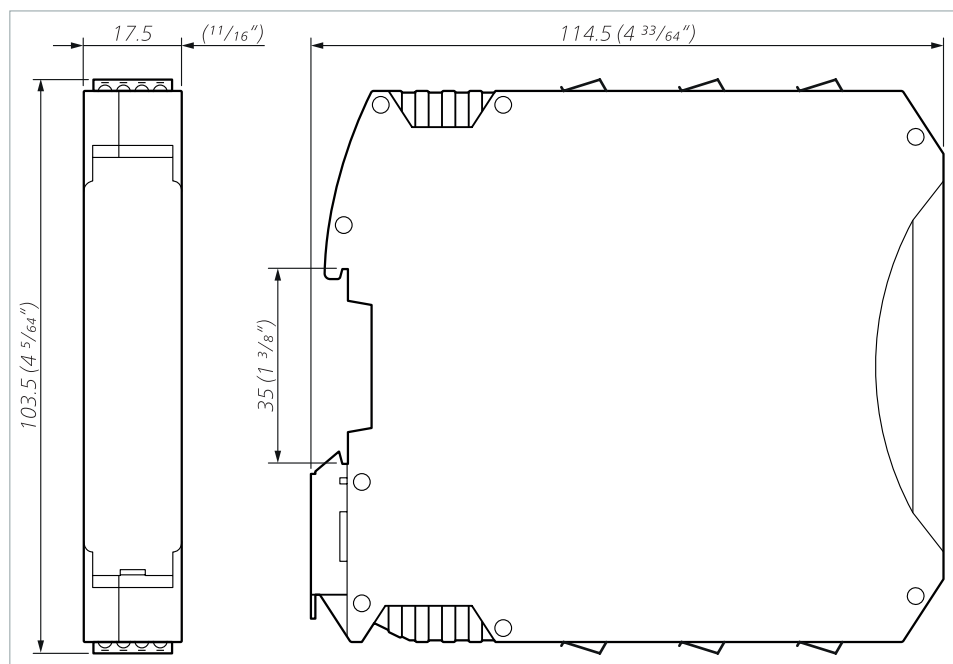
If the max. actuation period is exceeded, the control unit changes to the "Fault / System error" mode (see *Troubleshooting and remedies*).



Installation

For your own safety, you must also adhere to the following familiar 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.

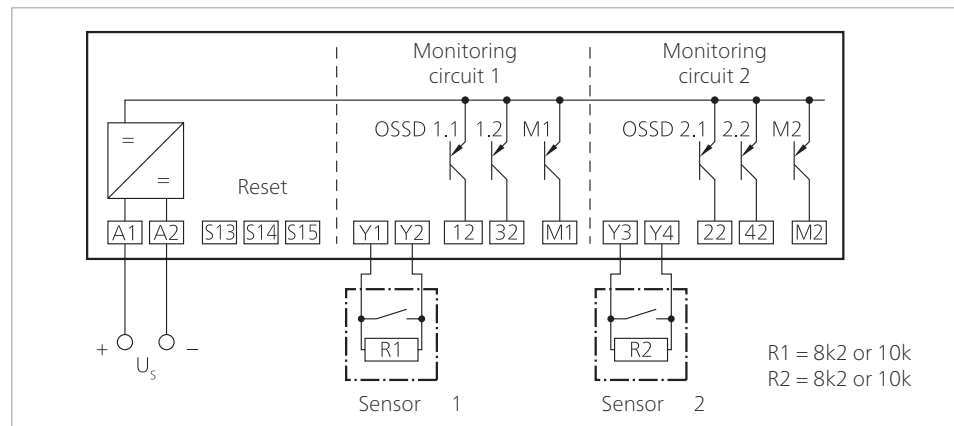


⚠ Caution Impaired operation due to overheating

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 (25/32")).

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



OSSDs 1.1, 1.2, 2.1 and 2.2 are semiconductor outputs (PNP) and short-circuit-proof. In the HIGH state (ON state), the voltage $U_s - 0.7\text{ V}$ is applied, depending on the load and supply voltage.

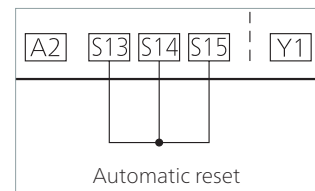
The following applies to the outputs:

➔ Wire the load between the output terminal and U_s- .

Reset

Automatic reset

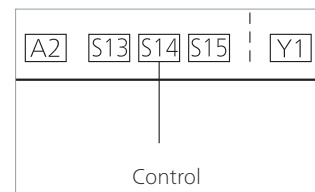
➔ Place bridges between cable terminals S13 and S15 and also between S14 and S15.



Controlled reset

➔ Wire the control output to cable terminal S14.

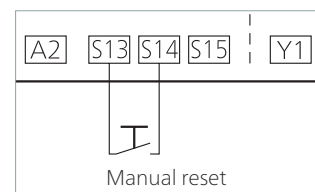
Terminals S13 and S15 remain unconfigured.



Manual reset

➔ Wire up a button between cable terminals S13 and S14.

Terminal S15 remains unconfigured.



Signal outputs

Signal outputs M1 (sensor 1) and M2 (sensor 2) are semiconductor outputs (PNP) and short-circuit-proof. In the HIGH state, the voltage $U_s - 0.7\text{ V}$ is applied, depending on the load and supply voltage.

The following applies to the signal outputs:

- ➔ Wire the load between the signal output terminal and U_s- .

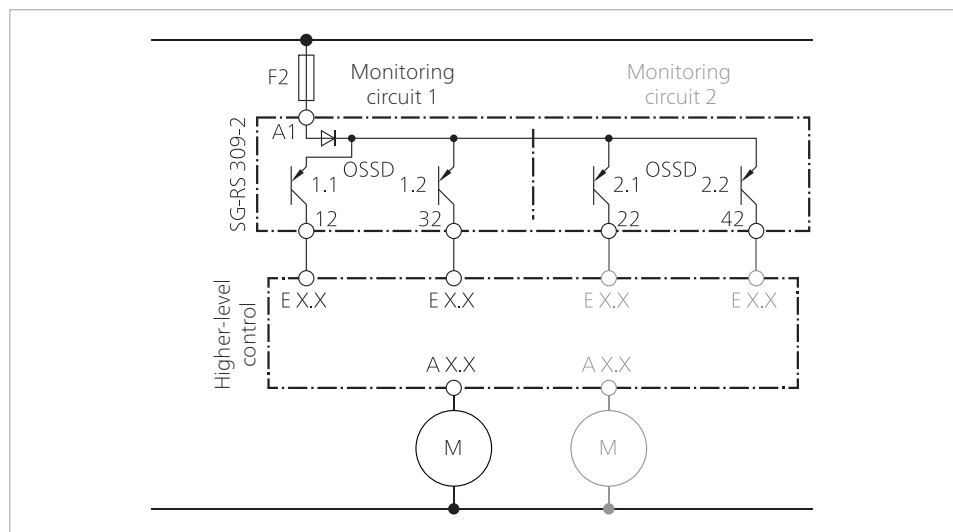
NOTE

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

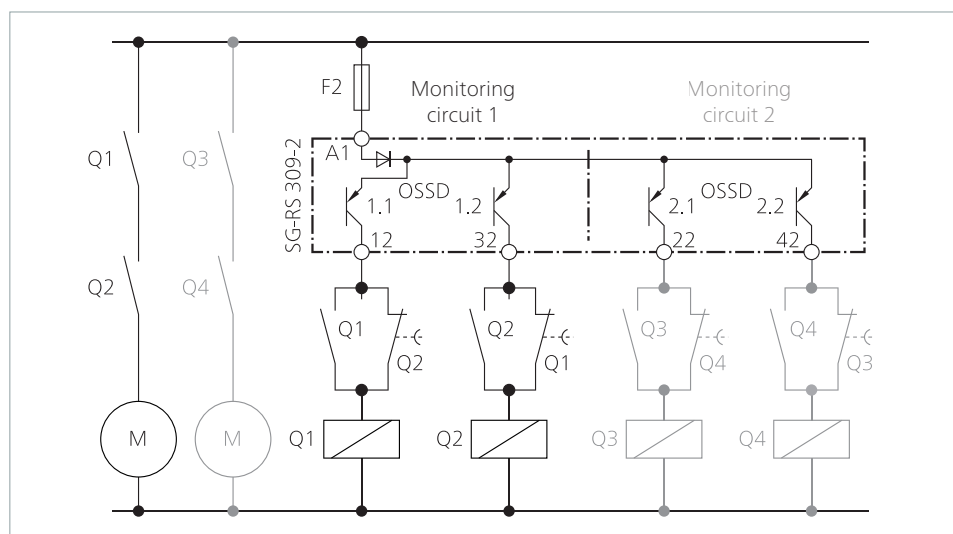
- ➔ Protect the control unit from excessive incoming electromagnetic radiation.

Connection examples

Connection example 1

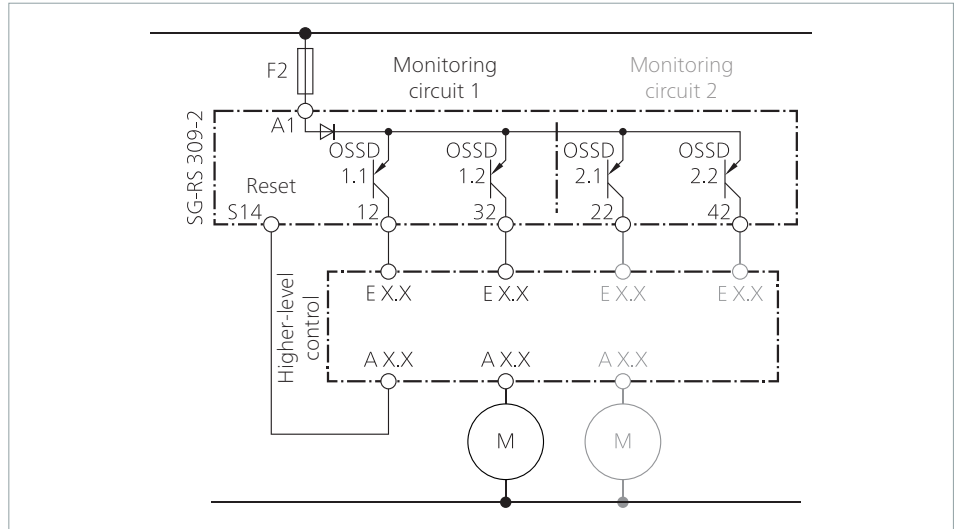


Connection example 2



Connection example 3

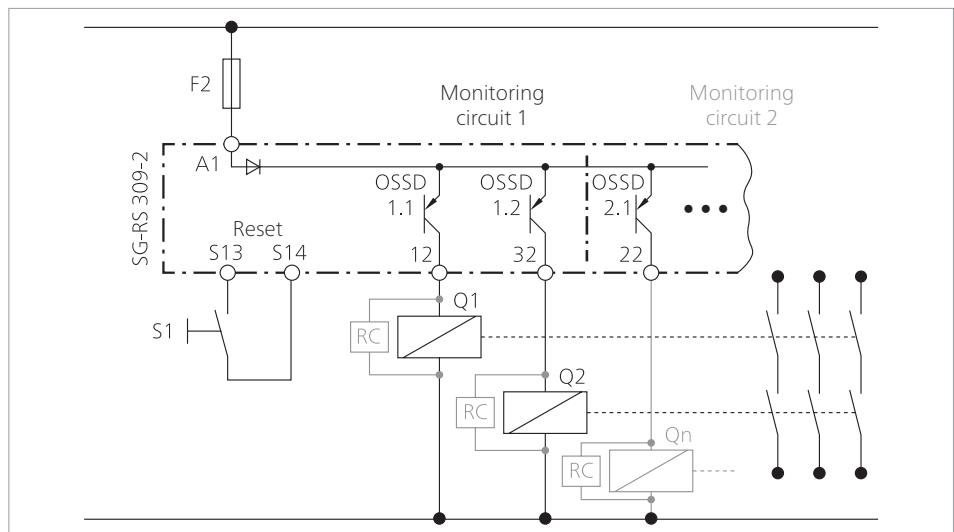
Controlled reset



Connection example 4

Manual reset

Contact multiplication



Commissioning

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

⚠ WARNING Danger of injury from electric shock

➔ Never unplug plug-in connectors while live.

Testing the function

Automatic reset

1. Make sure that everything is connected and no sensor is activated.
 - Green "P" LED is lit
 - OSSDs from monitoring circuit 1 and monitoring circuit 2 are in the ON state
 - Signal outputs M1 and M2 are set to LOW
2. Activate sensor 1.
 - Yellow "S1" LED is lit up
 - OSSDs from monitoring circuit 1 are in the OFF state
 - Signal output M1 is set to HIGH
3. Repeat step 1.
4. If connected, activate sensor 2.
 - Yellow "S2" LED is lit up
 - OSSDs from monitoring circuit 2 are in the OFF state
 - Signal output M2 is set to HIGH
5. Repeat step 1.
6. Disconnect sensor 1.
 - Yellow "S1" LED and red "F" LED are flashing
 - OSSDs from monitoring circuits 1 and 2 are in the OFF state
 - Signal outputs M1 and M2 are set to HIGH
7. Repeat step 1.
8. Interrupt the power supply for at least 500 ms.
The control unit will restart.

9. If connected, disconnect sensor 2.
 - Yellow "S2" LED and red "F" LED are flashing
 - OSSDs from monitoring circuits 1 and 2 are in the OFF state
 - Signal outputs M1 and M2 are set to HIGH
10. Repeat step 1.
11. Interrupt the power supply for at least 500 ms.
The control unit will restart.

Once the functional test has been successfully completed, the protective device is ready for operation.

If the functional test could not be completed correctly, see *Troubleshooting and remedies*.

Controlled reset and manual reset

1. Make sure that everything is connected and no sensor is activated.
 - Green "P" LED plus "S1" and "S2" LEDs are lit up
 - OSSDs from monitoring circuits 1 and 2 are in the OFF state
 - Signal outputs M1 and M2 are set to HIGH
2. Initiate a reset signal via the higher-level control or press the manual reset button.
 - Green "P" LED is lit
 - OSSDs from monitoring circuits 1 and 2 are in the ON state
 - Signal outputs M1 and M2 are set to LOW
3. Activate sensor 1.
 - Yellow "S1" LED is lit up
 - OSSDs from monitoring circuit 1 are in the OFF state
 - Signal output M1 is set to HIGH
4. Repeat steps 1 and 2.
5. If connected, activate sensor 2.
 - Yellow "S2" LED is lit up
 - OSSDs from monitoring circuit 2 are in the OFF state
 - Signal output M2 is set to HIGH
6. Repeat steps 1 and 2.
7. Disconnect sensor 1.
 - Yellow "S1" LED and red "F" LED are flashing
 - OSSDs from monitoring circuits 1 and 2 are in the OFF state
 - Signal outputs M1 and M2 are set to HIGH

8. Repeat step 1.
9. Interrupt the power supply for at least 500 ms.
The control unit will restart.
10. Repeat step 2.
11. If connected, disconnect sensor 2.
 - Yellow "S2" LED and red "F" LED are flashing
 - OSSDs from monitoring circuits 1 and 2 are in the OFF state
 - Signal outputs M1 and M2 are set to HIGH
12. Repeat step 1.
13. Interrupt the power supply for at least 500 ms.
The control unit will restart.
14. Repeat step 2.

Once the functional test has been successfully completed, the protective device is ready for operation.

If the functional test could not be completed correctly, see *Troubleshooting and remedies*.

Protective device activated

Throughout the entire time the protective device remains activated, the OSSDs stay in the OFF state.

If the protective device stops being activated, various states are possible for the OSSDs. This depends on which reset type is selected (see *Function, Reset*).

Correlations

LEDs				Outputs				Meaning
"P" green	"S1" yellow	"S2" yellow ¹⁾	"F" red	1.1, 1.2	2.1, 2.2 ¹⁾	M1	M2 ¹⁾	LED off: ○ LED on: ● LED flashing: ⊙
○	○	○	○	OFF	OFF	LOW	LOW	No supply voltage
●	○	○	○	ON	ON	LOW	LOW	Control unit ready for operation
●	●	○	○	OFF	ON	HIGH	LOW	Sensor 1 activated
●	○	●	○	ON	OFF	LOW	HIGH	Sensor 2 activated
●	⊙	○	⊙	OFF	OFF	HIGH	HIGH	Fault on sensor 1 (cable break)
●	○	⊙	⊙	OFF	OFF	HIGH	HIGH	Fault on sensor 2 (cable break)
●	●	●	⊙	OFF	OFF	HIGH	HIGH	Fault or system error
●	●	●	⊙	OFF, ON or ON, OFF	OFF	HIGH	HIGH	Fault on monitoring circuit 1; OSSD 1.1: OFF state and 1.2: ON state or OSSD 1.1: ON state and 1.2: OFF state
●	●	●	⊙	OFF	OFF, ON or ON, OFF	HIGH	HIGH	Fault on monitoring circuit 2; OSSD 2.1: OFF state and 2.2: ON state or OSSD 2.1: ON state and 2.2: OFF state

¹⁾ Only applies if sensor 2 is connected.

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*).

Maintenance and cleaning

Maintenance

The control unit is maintenance-free.

- ➔ Repeat the functional test monthly.

Cleaning

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

Troubleshooting and remedies

Prerequisites:

- The sensor 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
Green "P" LED not lighting up	No or incorrect supply voltage	<ol style="list-style-type: none"> 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
Yellow "S1" LED is lit up	Sensor 1 is faulty	<ol style="list-style-type: none"> 1. Measure resistance at sensor 1: target value = 8k\pm250 or 10k \pm250 2. Actual value \neq target value: sensor is faulty 3. Replace sensor
	Control unit faulty	<ol style="list-style-type: none"> 1. Connect an 8k2 or 10k resistor to terminals Y1, Y2 2. Fault not rectified: replace control unit
Yellow "S2" LED is lit up	Sensor 2 is faulty	<ol style="list-style-type: none"> 1. Measure resistance at sensor 2: target value = 8k\pm250 or 10k \pm250 2. Actual value \neq target value: sensor is faulty 3. Replace sensor
	Control unit faulty	<ol style="list-style-type: none"> 1. Connect an 8k2 or 10k resistor to terminals Y3, Y4 2. Fault not rectified: replace control unit

Fault indication	Possible cause	Remedy
Yellow "S1" LED and red "F" LED are flashing	Sensor not connected (or not connected correctly) to terminals Y1 and Y2	➔ Connect sensor
	Sensor 1 cable break	<ol style="list-style-type: none"> 1. Measure resistance at sensor 1: target value = $8k\Omega \pm 250$ or $10k\Omega \pm 250$ 2. Actual value > 1M: sensor is faulty 3. Replace sensor 4. Disconnect power supply for at least 500 ms
Yellow "S2" LED and red "F" LED are flashing	Sensor not connected (or not connected correctly) to terminals Y3 and Y4	➔ Connect sensor
	Sensor 2 cable break	<ol style="list-style-type: none"> 1. Measure resistance at sensor 2: target value = $8k\Omega \pm 250$ or $10k\Omega \pm 250$ 2. Actual value > 1M: sensor is faulty 3. Replace sensor 4. Disconnect power supply for at least 500 ms
Green "P", yellow "S1" and/or yellow "S2" LEDs are lit up	Automatic reset: bridges missing	➔ Place bridges between S13 and S15 as well as between S14 and S15
	Controlled reset: no reset signal from higher-level control or pulse duration is too short	➔ Trigger a signal pulse from the control system (≥ 80 ms)
	Controlled reset: connection to control interrupted	➔ Check connection
	Manual reset: reset button not pressed or not held down long enough	➔ Press reset button (≥ 80 ms)
	Manual reset: connection to reset button interrupted	➔ Check connection
	Control unit faulty	➔ Replace control unit
Green "P", yellow "S1" and yellow "S2" LEDs are lit up, red "F" LED flashes	Controlled or manual reset: duration of signal pulse from higher-level control is too long or reset button is jammed	<ol style="list-style-type: none"> 1. Check the duration of the signal pulse (≤ 19 s) from the higher-level control or replace the reset button at S13 and S14 2. Disconnect power supply for at least 500 ms
	Control unit faulty	➔ Replace control unit

Fault still cannot be resolved?

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

➔ 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 devices 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-RS 309-2	24 to 36 V DC
Testing basis	EN 45545, EN 50155, ISO 13849-1, ISO 13856-1, ISO 13856-2, ISO 13856-3
Connecting voltage U_s	
Nominal voltage	24 to 36 V DC
Voltage tolerance	-30 to +25%
Nominal current (outputs unloaded)	30 mA
EN 50155:	
Power supply switching class	C2
Power supply interruption class	S2
Power consumption (outputs unloaded)	< 1.5 W
Melting integral (I^2t)	4.5 A ² s
Line length (max.)	10 m (32')
Internal fuse protection	2.5 A time-lag
Times	
Reaction time t_a	< 15 ms
Start time (max.)	2 s
Restart time t_w	< 150 ms
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D	937 a
DC _{avg}	92%
n_{op} (assumption)	52560/a
CCF	Requirements met
Inputs	
Sensors 1 and 2	Y1, Y2 and Y3, Y4
Monitoring resistor	8k2 or 10 kilohms
Tolerance range (max.)	-5 to +10%
Switching thresholds	
Sensor activated	< 6 kilohms
Cable break	> 15.2 kilohms
Line resistance	< 10 ohms
Line length (max.)	30 m (98')
Reset	
Line length (max.)	10 m (32')
Outputs	
Monitoring circuits 1 and 2	12, 32 and 22, 42
EN 60947-5-1: utilisation category	DC-12: $U_s / 100$ mA
Switching voltage	$U_s - 0.7$ V
Switching current (max.)	100 mA
Switching current (min.)	> 0 mA
Line length (max.)	10 m (32')

SG-RS 309-2	24 to 36 V DC
Signal output M1 / M2 EN 60947-5-1: utilisation category Switching voltage Switching current (max.) Switching current (min) Line length (max.)	DC-12: $U_s / 100 \text{ mA}$ $U_s - 0.7 \text{ V}$ 100 mA > 0 mA 10 m (32')
Mechanical operating conditions	
Cable terminals Solid wire Wire without sleeve Wire with sleeve without plastic sleeve with plastic sleeve IEC 60529: degree of protection EN 50124: pollution degree Max. humidity (23 °C (+73.4 °F)) EN 50125: class of altitude range Operating temperature Storage temperature EN 50155: Operating temperature class Temperature change class EN 45545-2: suitable for Hazard level Set of requirements 2006/42/EC and UK S.I. 2008 No. 1597: emission sound pressure level EN 61373: shock and vibration Vibration fatigue limit Frequency range Amplitude Cycles per axis Protective coating Dimensions (W × H × D) Weight	6× 4-pin 1× 1.5 mm ² or 2× 0.5 mm ² (1× AWG16 or 2× AWG21) 1× 1.5 mm ² or 2× 0.75 mm ² (1× AWG16 or 2× AWG20) 1× 1.5 mm ² or 2× 0.34 mm ² (1× AWG16 or 2× AWG22) 1× 0.5 mm ² or TWIN 0.5 mm ² (1× AWG21 or TWIN AWG21) IP20 PD2 95% A1 -40 to +70 °C (-40 to +158 °F) -25 to +70 °C (-13 to +158 °F) OT3 H1 HL3 R24 < 70 dB(A) Category 1, class B 10 to 55 Hz 0.15 mm (<1/64") 10 Yes 17.5 × 103.5 × 114.5 mm (11/16" × 4 5/64" × 4 33/64") 115 g (3.95 oz)