

Safety mats SM8



EN | Installation instructions

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Contents

About these installation instructions	3
Safety	4
Intended use	4
Limits	4
Exclusions	4
PL according to ISO 13849	5
Handling of the product	5
Residual dangers	5
Applicable standards.....	6
Technical data	7
Transport and storage	7
Packaging and transport	7
Storage.....	7
Installation	8
Preparing the installation site	9
Unpacking the product.....	9
Laying out the sensors	10
Cutting the cable exit free.....	11
Cutting off ramps	11
Fastening the sensor	13
Laying cables	15
Testing.....	17
Troubleshooting and remedies	18
Replacement parts.....	18
Maintenance and cleaning	19
Disposal	19

Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION**. Only use the product for the purpose described in the product information.

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About these installation instructions

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

- ➔ Read the installation instructions carefully before use.
- ➔ Keep the installation instructions for the complete service life of the product.
- ➔ Pass the installation instructions on to every subsequent owner or user of the product.
- ➔ Add any supplement received from the manufacturer to the installation instructions.

Validity

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

Target group

The target group of these installation instructions are operators and trained specialist personnel who are familiar with installation and commissioning.





Other applicable documents

- ➔ The following documents are to be observed in addition to the installation instructions:
 - drawing of the sensor system (optional)
 - wiring diagram (optional)
 - operating instructions of the control unit 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 <i>Installation</i>)	Cross-reference

Danger symbols and information

Symbol	Meaning
<p>DANGER</p> 	Immediate danger leading to death or serious injury
<p>WARNING</p> 	Imminent danger which may lead to death or serious injury
<p>CAUTION</p> 	Possible danger which may lead to minor or moderate injuries
	Information on easier and safer working practices

Safety

Intended use

The product is designed as a pressure-sensitive protective device for protecting areas. Individual sensors are activated by persons weighing more than 20 kg stepping on them. Combinations of sensors are activated by persons weighing more than 35 kg.

Limits

- Max. 10 sensors type BK on one control unit
- System size max. 15 m²
= max. number × max. sensor size

Exclusions

Sensors are not suitable

- for detecting walking aids.
- for detecting individuals who weigh less than 20 kg.
- for navigating with industrial trucks.

Sensor combinations are not suitable

- for detecting individuals who weigh less than 35 kg.

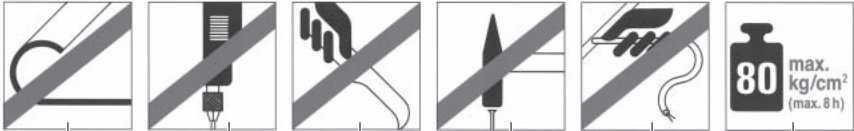
PL according to ISO 13849

The PL was determined during a simplified procedure according to ISO 13849-1. Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case, the sensor will no longer be taken into account in determining the PL. The overall system safety mat (Pressure-sensitive protection device) can reach a maximum of PL d.

Is the safety device suitable?

- ➔ Define the required PL for the hazard.
- ➔ Check whether the category and the PL of the safety device are suitable.

Handling of the product

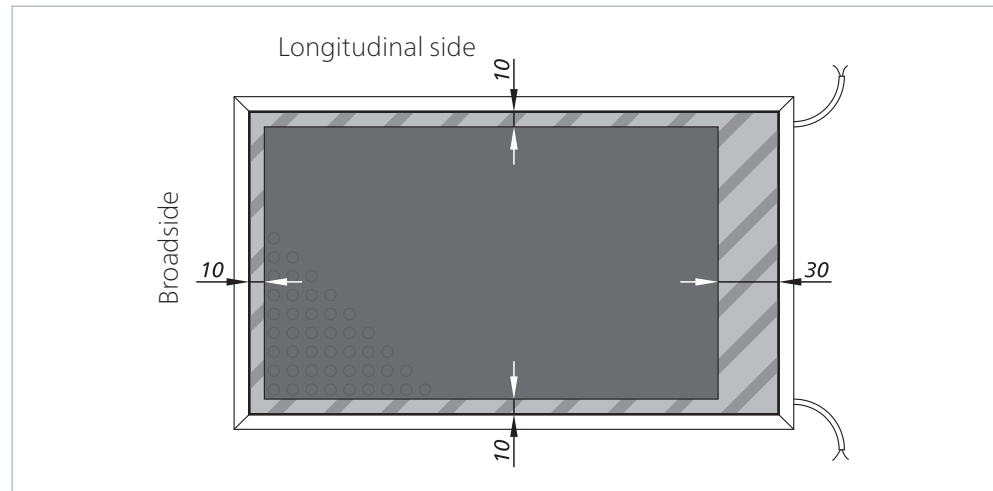


- 1 Do not bend the sensor or allow it to sag.
- 2 Do not make any holes or recesses in the sensor.
- 3 Do not cut or trim the sensor.
- 4 Do not hammer or screw objects (nails, screws, etc.) into the sensor.
- 5 Do not use the cable as a carrying handle.
- 6 The maximum load capacity of the sensor is 80 kg/cm² (up to 8 h).

Residual dangers

Non-sensitive areas

The end areas of the sensor are not sensitive (30 mm on cable exit side, 10 mm on remaining three sides). When non-sensitive areas are stepped on, the protective function of the sensor is not active.



- ➔ Mount the sensor as close as possible to the hazard source.
- ➔ When installing multiple sensors, make sure that only the long sides are next to each other.
- ➔ At the danger source, place a covering over parts (surfaces, cross struts etc.) which could be used as a tread.
- ➔ When positioning the sensors, observe the standard EN ISO 13855 "Safety of machinery – Positioning of safeguards with respect to the approach speeds of parts of the human body."

Applicable standards

The construction type of the product complies with the EC Machinery Directive 2006/42/EC and EMC Directive 2014/30/EU.

Applicable standards:

- IEC 13849 "Safety of Machinery – Safety-related parts of control systems"
- ISO 13856-1 "Safety of Machinery – Pressure-sensitive protective devices – Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors"

This manual was prepared in compliance with IEC 82079-1 "Creating user manuals – Structure, content and presentation – Part 1: General principles and detailed requirements".

Technical data

IEC 60529: Sensor degree of protection	IP65
Actuation forces for signal triggering	According to ISO 13856-1
Response time (with SG-EFS 104/4L)	38 ms
Error behaviour (with SG-EFS 104/4L)	ISO 13849-1:2006 Category 3 PL d
Operating temperature individual sensors combination of sensors	-25 to +55 °C +5 to +55 °C
Storage temperature	-25 to +55 °C
Static load (up to 8 hrs)	≤ 800 N/cm ²
Weight of sensor	13.0 kg/m ²

Type plate

A type plate is attached to the cable exit on the underside of the sensors for identification of the sensor type. In the event of enquiries, have the specified information to hand.

Transport and storage

Packaging and transport

The sensors are packed in wooden crates (max. 10 sensors per crate) and can be transported to the installation site with a crane or lifting truck. Depending on the scope of supply, the installation accessories are either included with the sensors or packed separately.

WARNING



Danger of injury by falling components!

- ➔ Only use tested, suitable load bearing equipment.
- ➔ Use appropriate load securing devices (e.g. transport belts, anti-slip devices).
- ➔ Do not step or stand under suspended loads.

Storage

- ➔ Store sensors in the original packaging in a dry place.
- ➔ Note and observe storage temperature in accordance with the technical data.

Installation

Overview

Install sensors in the following order:

1. Prepare the installation site.
2. Unpack the product.
3. Lay out the sensor:
4. Cut the cable exit free.
5. Cut off ramps.
6. Fix the sensor.
7. Lay cables.
8. Test function.

Preparing the installation site

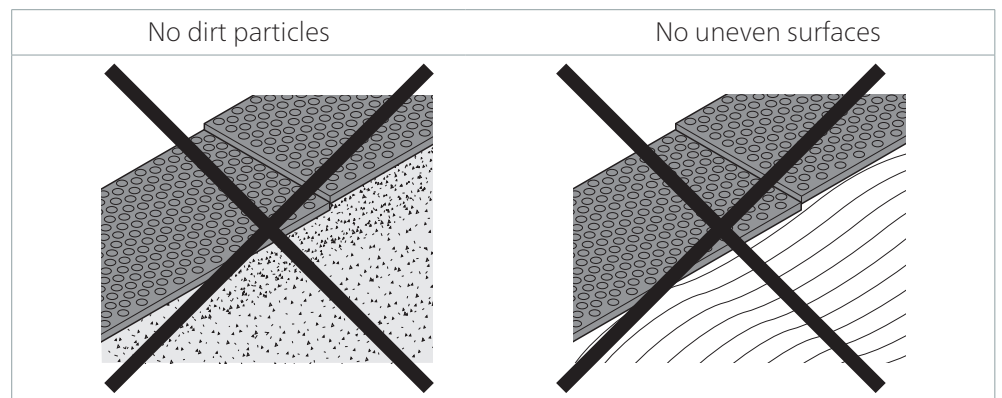
WARNING



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.

- ➔ Prepare the installation surface:
 - Create a level surface where necessary (e.g. screed). There must be no holes with a diameter of more than 20 mm nor any variations in floor height.
 - Remove any dirt particles.
 - Ensure that the surface is dry.



- ➔ Keep the necessary tools ready.

Unpacking the product



Damage to property due to incorrect handling

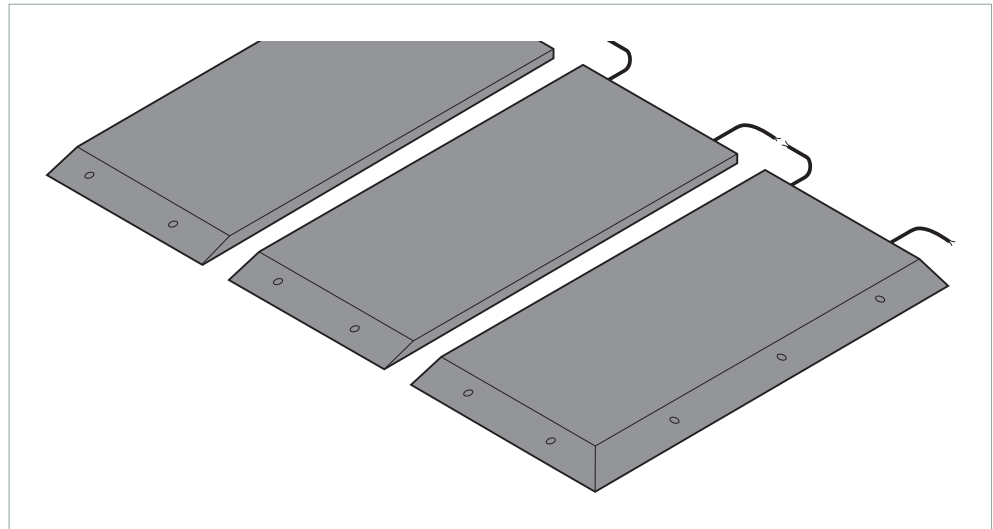
Sensors can be damaged by bending or due to the effects of sharp objects.

- ➔ Always transport sensors upright to prevent sagging.
- ➔ Sensors should be carried by two people.
- ➔ Always place sensors on flat, clean and dry surfaces.
- ➔ Do not use the connection cable of the sensors as a carrying handle.

- ➔ Check that the contents of the packaging are undamaged.

Laying out the sensors

1. Roughly position the sensors (based on the drawing of the sensor system, if available). Observe the following:
 - Lay the sensors in such a way that the structured side is face up and the type plate is face down.
 - Position the sensors so that the cable exits point in the direction of the hazard source.
 - Place sensors next to each other only lengthwise.



Single sensor OK?

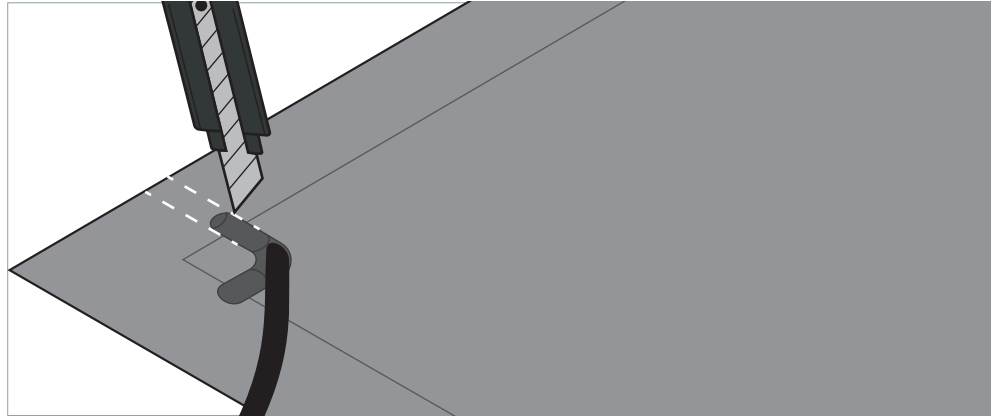
2. Check the resistance between the two wire ends of the cable of each sensor with an ohmmeter.
The measured resistance must have the following value:
 - Sensor BK: > 1 MOhm



BK type: ensure that no short circuit can ensue between the strands of the second cable!

Cutting the cable exit free

1. Determine the suitable side for the cable exit.
2. Flip the sensor.
3. Continue the cable exit that was started on the bottom. To do so, cut a hole in the slanted surface of the ramp.



4. Flip the sensor again.
5. Feed the cable through the hole.

In the case of single sensors, the cable exit can also be on the long side.



For sensor combinations, only the cable exit on the broad side can be used. Cutting off the ramp edge makes the cable exit on the long side unusable.

Cutting off ramps

This section applies only to sensor combinations, not to single sensors. In sensor combinations, only the long sides can be next to each other. For an even abutting edge, the integrated ramp must be removed on the long side. This results in a non-sensitive area of only 20 mm on the abutting edges. This is not critical for the safety function.

CAUTION

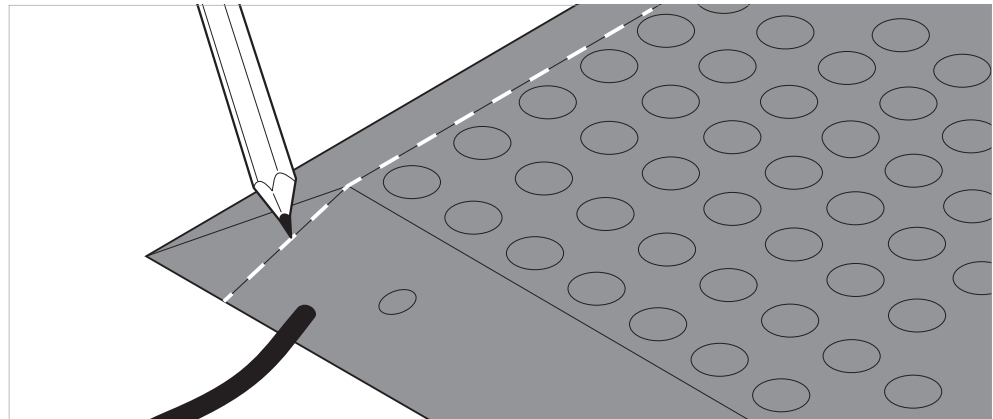


Tripping hazard

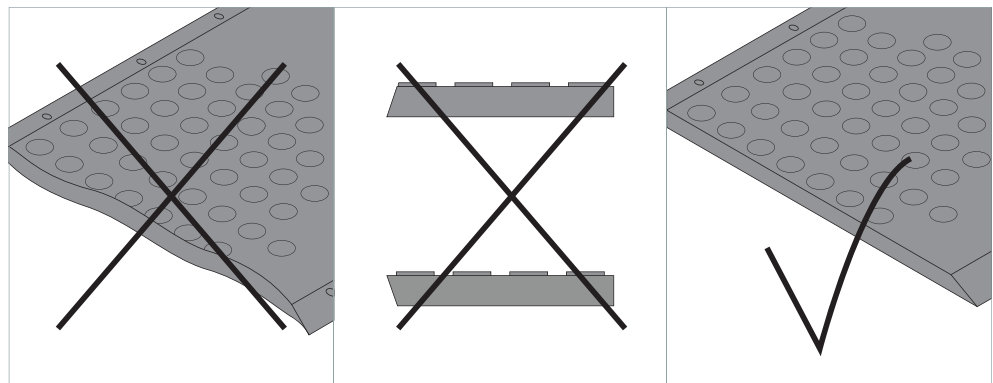
An imprecise cut (wavy, non-orthogonal) holds the long-term risk of expansion in and below the abutment due to the accumulation of dirt.

➔ Make sure that the abutting edge is as even as possible.

1. Mark the extension of the upper ramp edge in the slanted surface of the ramp on the broad sides.



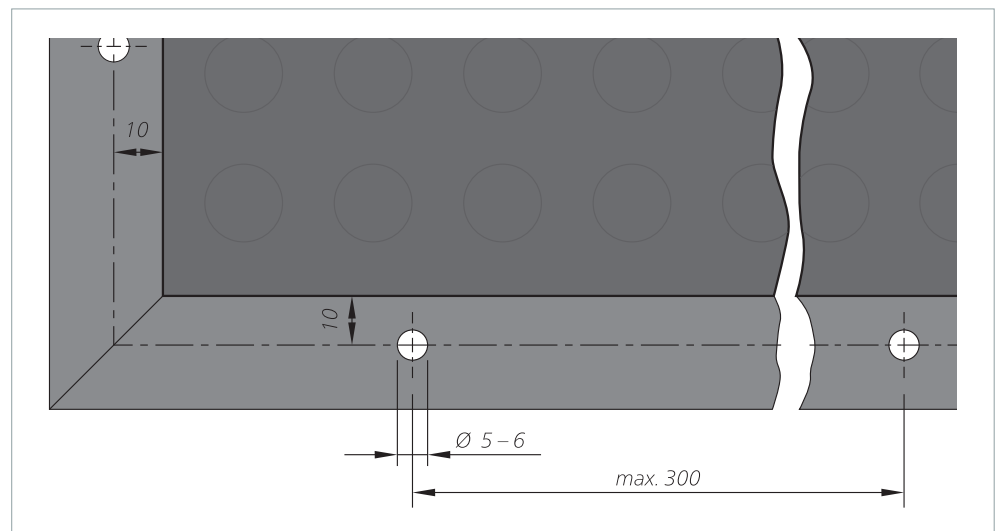
2. Use a suitable tool (a cutter or carpet knife) to cut along the marking and the upper ramp edge:
 - with no waves and
 - perpendicular (orthogonal) to the actuation area.



Tip: For a smooth cut, use a **solid steel edge as a guide**. The smoother the cut, the more even the abutment and the less danger of expansion due to the accumulation of dirt in and below the abutment.

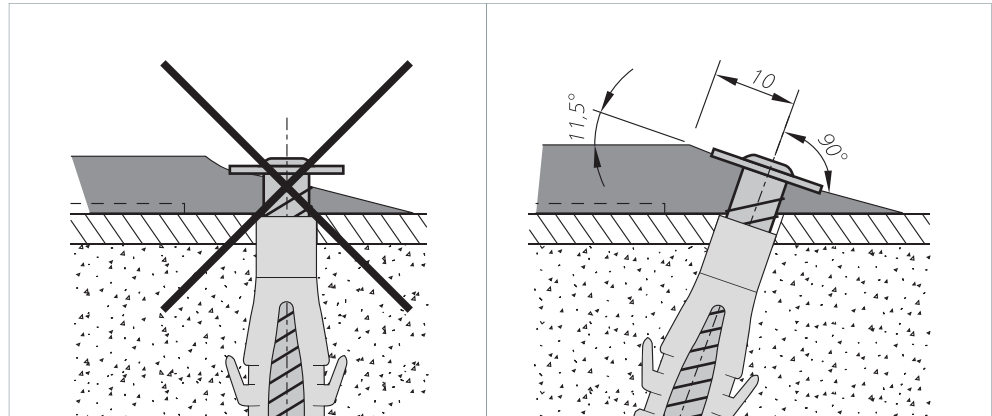
Fastening the sensor

1. Place all sensors at the final position. Observe the following:
 - Install all cable exit sides in the same direction.
 - Make sure that the distances between the sensors in sensor combinations is not more than 1 mm.
 - Do not compress or bend sensors.
 - Make sure that there are no steps on the abutments of combined sensors.



2. Use slight pressure for drilling all mounting points through the integrated ramps. Observe the following:
 - Drill into the ramp 10 mm from the upper ramp edge.
 - Drill at a right angle to the slanted surface of the ramp.
 - Required screw diameter: 5 to 6 mm.
 - Maximum distance between the mounting points: 300 mm.
 - Drill into the mounting surface only slightly (observe markings).
3. Remove all sensors.
4. Remove the drill cuttings and projections from the sensors.

5. Make markings on the mounting surface for anchors at right angles to the ramp surface for screws with a length of at least 50 mm.



6. Remove the drill cuttings (with a vacuum cleaner, for example).
The drill cuttings could otherwise accumulate beneath the sensor, which would result in an uneven surface.
7. Place all sensors at their correct position.
There must be an anchor under each hole in the ramp.

CAUTION**Tripping hazard**

Protruding screw heads on the ramp will cause a tripping hazard.

The use of standard countersunk head screws can cause the head to slip through, which means the sensor will not be mounted properly and can rise at the edges.

➔ Use suitable screws for safe mounting of the sensor.

8. Fasten the sensors with screws (minimum length: 50 mm) to the mounting surface.
9. Make sure not to screw the screws through the ramp.



Tip: For mounting sensors we recommend anchors with a diameter of 8 mm and size 6 x 50 feather head screws. The use of feather head screws will prevent the head from slipping and minimise the hazard of tripping.

Laying cables

The type of cabling depends on the operation principle of your system.

1. Wire up the sensors in accordance with wiring diagram (optional) or in accordance with the wiring technologies described below. Observe the following:
 - Connect the wire ends of the sensors in accordance with the colour coding.
 - Insulate soldering points and seal with heat-shrinkable sleeves.



Damage to cables due to incorrect laying

- ➔ Do not pinch or bend cables.
-

Is sensor system correctly wired?

2. Lay the cables and route them to the control unit.
Do not wire the control unit yet.
3. Use an ohmmeter to check the electrical resistance between the ends of the wires on sensors, both on-load and off-load.
The measured resistance must have the following values:
 - On-load (activated) sensor system: < 150 Ohm
 - Off-load (not activated) sensor system:
 - Without terminating resistor: > 1 MOhm
 - With terminating resistor: dependent on the connected control unit
4. Wire the sensor system to the control unit (see operating manual for the particular control unit).

Key to the following wiring diagrams

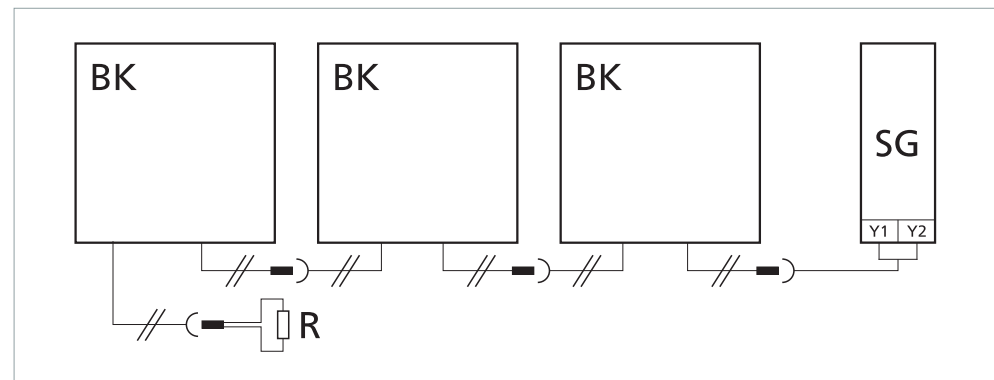
- BK Sensor with two-sided cables as feed-through sensors or for connection of an external monitoring resistor
- R Resistance for monitoring the function of the system based on the connected control unit
- SG Control unit
- D Sub-distribution with series terminals

Colour coding

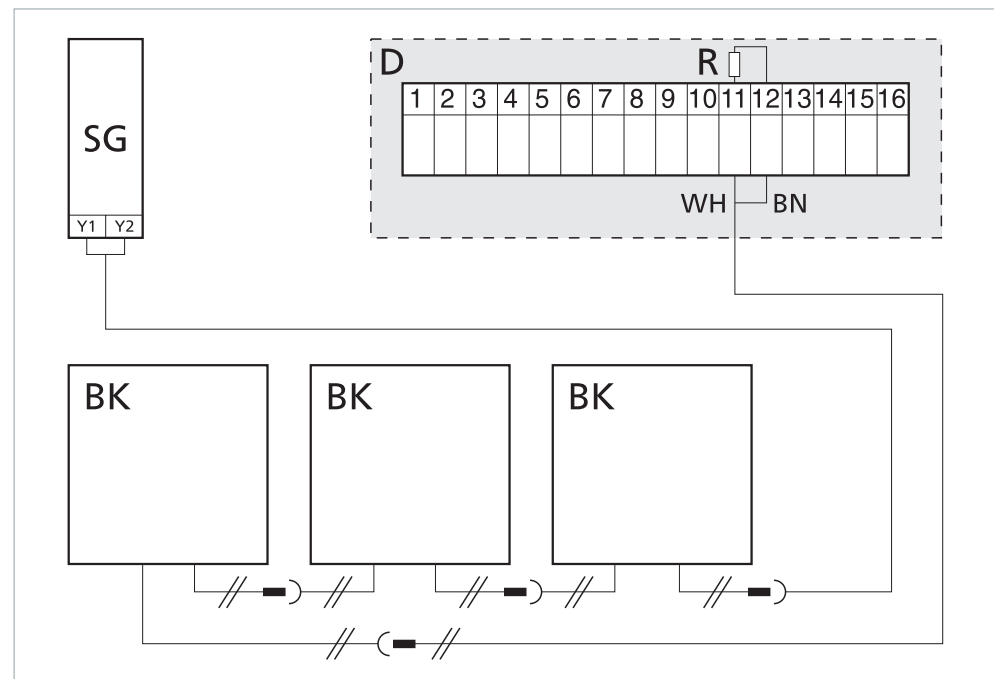
BN Brown

WH White

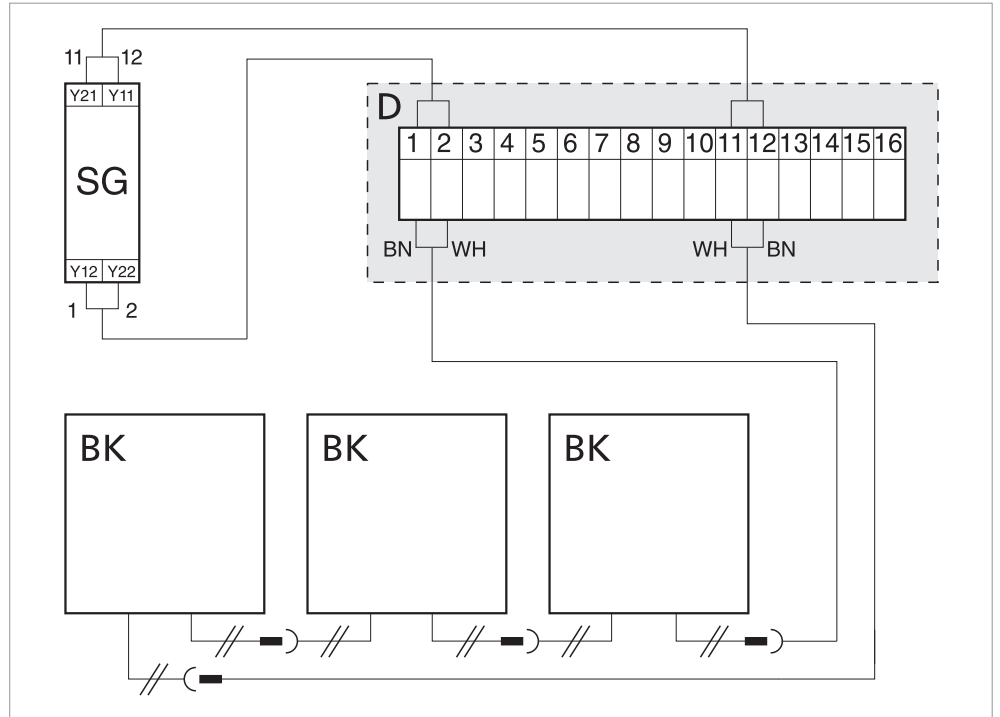
**Sensor type BK:
2-wire-technology
wired straight to the
control unit**



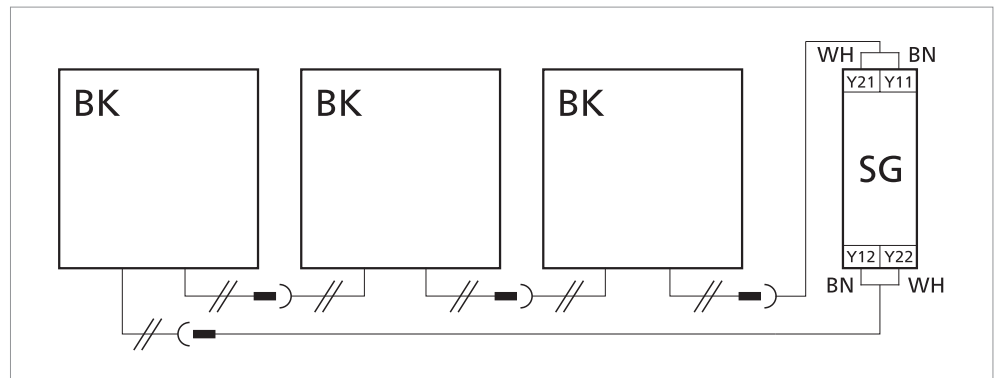
**Sensor type BK:
2-wire-technology
via sub-distribution
system**



**Sensor type BK:
4-wire-technology
via sub-distribution
system**



**Sensor type BK:
4-wire-technology
wired straight to the
control unit**



CAUTION



Overall safety at risk

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

➔ Take special care when setting up the interface.

Testing

1. Put the safety device into operation (see operating manual for the particular control unit)
2. Check the function of the safety device by applying the test piece (see operating manual of the particular control unit)

Troubleshooting and remedies

Fault display	Possible cause	Elimination
Resistance values deviate from specifications	Cables of the single sensors are not correctly connected	➔ Check connections between the sensors
	Cables are kinked or damaged	➔ Replace affected sensors
	Sensors are not flat on the floor	➔ Check mounting surface under the sensors ➔ Eliminate unevenness and remove dirt particles
	Sensor faulty	➔ Replace the sensor



Refer also to the Section *Troubleshooting and remedies* in the operating manual for the 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.

Maintenance and cleaning

The sensors are virtually maintenance-free.

Regular inspections

- ➔ Inspect sensor surfaces for damage at regular intervals.

WARNING



If damaged, the safety function will not work

- ➔ Discontinue use of the pressure-sensitive safety device immediately if you detect damage that could affect safe operation.

-
- ➔ Check safety function of the sensors at regular intervals.

Cleaning

- ➔ Clean the surface of the sensors at regular intervals using mild detergents.
- ➔ After cleaning, remove any remaining fluid.

Disposal

The products included in the scope of supply contain the following materials:

Sensor

- Plastics
- Aluminium (interior of sensor, depending on type)
- Copper (cables)

Packaging

- Wood, cardboard, plastics

When disposing of these materials:

- ➔ Observe all relevant national disposal regulations and statutory conditions.
- ➔ Provide the material list given above when using a disposal company.
- ➔ Recycle or dispose of materials in an environmentally friendly way.