INSTALLATION AND SYSTEM DESCRIPTION

FOR SSZ SAFETY RAILS

TYPE: SSZ-SSL 05NBR/EPDM
TYPE: SSZ-SSL 06NBR/EPDM
TYPE: SSZ-SSL 08NBR/EPDM
TYPE: SSZ-SSL 10NBR/EPDM

MADE IN GERMANY

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These operating instructions apply to the following safety rails:

- Type: SSZ-SSL05NBR/EPDM
  Type: SSZ-SSL06NBR/EPDM
  Type: SSZ-SSL08NBR/EPDM
  Type: SSZ-SSL10NBR/EPDM
- The safety category depends on the controller used.
- CAT2, Pl c: SSZ-CVS/N/2 24/230, or CAT3, Pl d with the controllers: SSZ-CVS/N/3 24/230, SSZ-RZ3, or SSZ-SMC Pld
- Response time < 20 ms
- Reset function - automatic or manual

The safety rail is a pressure-sensitive safety device use to implement the emergency stop function.

The identification and specifications of the rail (dimensions, cable outputs, labels on the machine or of the customers) can be obtained from the serial number in the hologram. This hologram is generally located on the side of the rubber profile.

To make identification later on easier, please note the serial number separately!

TABLE OF CONTENT

These instructions form an essential part of the product.

These instructions contains basic information that must be noted when installing the system. It is important that the personnel familiarize themselves with these instructions before installation and commissioning. The following documents from the purchaser also apply in addition to these instructions:

- The drawing of the configuration (optional)
- The cable diagrams (optional)

INFORMATION ON THE OPERATING INSTRUCTIONS

These operating instructions form is an essential part of the product. The SSZ GmbH is not liable for damage caused by or resulting from the use of the product when such use deviates from proper use as defined in these instructions. Before starting to use the product, the user must be familiar in detail with the operating instructions. The operating instructions must be stored at a location easily accessible to all users for the entire lifetime of the product.

The instructions must be provided to the following owners / users of the product. All updates from the manufacturers must be published. The operating instructions only apply to the product stated. The target group for these operating instructions includes the users of the product as well as correspondingly trained personnel who are authorized to use this product. The rail system + controller must be connected to the machine by correspondingly trained technical personnel.

In addition to the operating instructions, the information in the following should also be noted:

- The construction plan of the existing machine or plant of the customer (optional), the cable diagram.
- The installation plan for the devices contained in the SSZ sensor.

To ensure the proper function of the pressure-sensitive safety device and its installation according to the requirements in EN ISO 13856-2: 2013, the technical personnel must possess knowledge in the area of installation technology and of the operation of plants and safety systems.

Before installation and initial operation, you must familiarize yourself with all operating instructions as well as with the operating instructions of the individual controllers:

SSZ-CVS/N/2/3 operating instructions

SSZ-RZ3 operating instructions

NOTES

The safety devices may only be connected in series. Connecting the safety devices in parallel is NOT permitted!

The system must be checked for proper operation by the operator once per day.

The operator is required to follow the applicable safety rules of the accident prevention regulations.

The safety device may only be used in circuits that are classified in the same safety integrity level or a higher safety integrity level.

To ensure proper function, the safety device must be kept clean and free of dirt and grime.

IMPORTANT

The SSZ safety system only forms one part of the overall safety system of the machine or plant. When designing, planning, and building the safety concept, the user must follow all applicable provisions of the machinery directives and machinery standards

The rated contact loads of the relay outputs must never be exceeded.

All supply cables must be equipped with strain reliefs and be routed so that they are protected against damage.

All electrical connections must be tightened and checked. The electrical connections must be checked regularly.

Opening the controller enclosure can result in a lower level of safety. The enclosure should never be opened. All warranty claims are invalid if the hologram is damaged.

In case of a defect, the unit should be sent back to the the SSZ GmbH for repairs or to determine the amount of damage. The machine / system may not be operated (without safeguards) when defective.

Regardless of the circumstances, the occupational safety rules and all regulations must be followed at all times.

The machine may not be put into operation if there is a risk of danger!

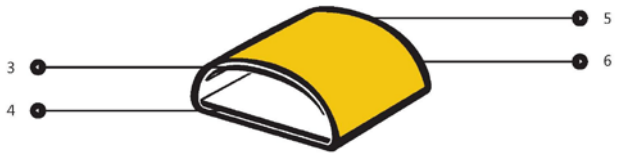
Ignoring this information can result in a risk of injury or death.

The EC Declaration of Conformity becomes invalid immediately if other components, transducers, or controllers (not from SSZ) are connected inside the system.

THE SYSTEM

The sensor used in all pressure-sensitive SSZ safety devices is manufactured from co-extruded, highly elastic plastic. For correct verification of the changes detected by the sensor, the SSZ transducer must be connected to an SSZ controller.

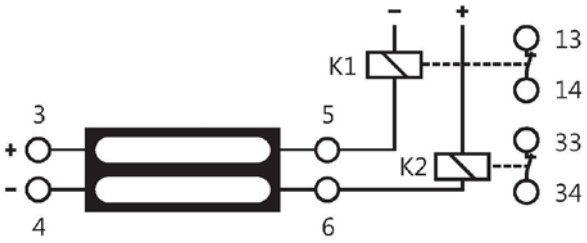
FIGURE 1. SENSOR ELEMENT



The conductive layers inside the sensor element that are separated from each other and kept a distance apart from each other, which are shown using a dark color in Figure 1, can be regarded as non-isolated resistors.

These resistors have connecting wires at the beginning and at the end of the sensor element. The connecting wires are routed to the controller user either 4-wire cables or two 2-wire cables. The “input” of the sensor element is connected to the controller using terminals 3 and 4 as shown in Figure 2.

BILD 2. NICHT AKTIVIERTES SENSORELEMENT



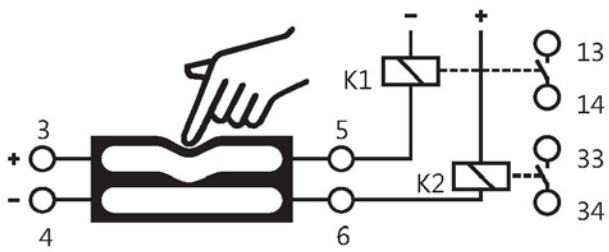
The “output” of the sensor element is connected to the controller using terminals 5 and 6. The user must ensure the cables are connected properly in this case. Wires 3 and 5 as well as 4 and 6 each form one signal path.

If the system is wired improperly or incorrectly, proper function of the system cannot be guaranteed!

If the sensor element is not activated, then current flows from connection 3 to connection 5 and from connection 4 to connection 6, which causes relays K1 and K2 to close their contacts and thus activate the output. To obtain a reliable output signal, the contacts of relays K1 and K2 have to be connected in series.

If the sensor element is activated, then the voltage levels on sensor inputs 5 and 6 of the controller will change.

FIGURE 3. THE ACTIVATED SENSOR ELEMENT



These changes cause the voltage on both output relays to drop, which then causes the output contacts to open.

The same reaction is caused by cross-circuits/short-circuits in the connection wires of the transducer.

If wires or a conducting section of the sensor element is broken, then at least one relays switches off.

Since the contacts of relays K1 and K2 are connected in series, the corresponding integrated circuit is switched off.

The connections of the SSZ safety devices contain wire labels and are color-coded. The following table provides you with information on which colors are assigned to which connections.

ONE 4-WIRE CABLE

Label	Safety rails Safety bumpers	Safety mats
3	GREEN	BLUE
4	BROWN	BROWN
5	YELLOW	BLACK
6	WHITE	WHITE

TWO 2-WIRE CABLES

Label	Colors
3	BROWN
4	WHITE
5	BROWN
6	WHITE

AREAS OF APPLICATION OF THE SSZ SAFETY RAILS

SSZ safety rails are pressure-sensitive safety devices used to protect people from hazardous movements of the machine.

SSZ safety rails are integrated into the emergency stop circuit of the machine so that when they are activated, the hazardous movement of the machine is stopped. A classic application is to safeguard against shearing and crushing edges like those found on automatic doors and gates, for example. When the automatic gate closes, a hazardous location arises between the entrance and the obstacle in the path or the end position (Figure 1).

Figure 1

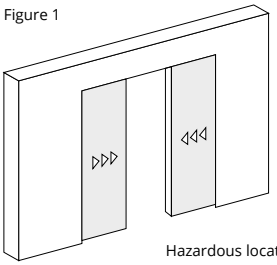
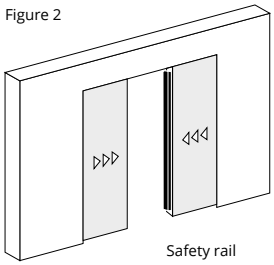


Figure 2



If the SSZ safety rail mounted on the main closing edge is activated now, then the output contacts of the SSZ controller monitoring the SSZ safety rail open, which initiates the emergency stop for the gate. This guarantees safe operation in the automatic mode.

The system, consisting of SSZ safety rail, connection cable, and SSZ controller, depending on type of SSZ controller, used, fulfill the requirements of category 2 or 3 and reached safety integrity level PLc or Pld according to EN ISO 13849-1, EN ISO 13856-2.

APPLICATION

SSZ safety rails are used especially to safeguard against moving parts, for example on electrically operated gates, doors, machine parts, and everywhere where there is a crushing or shearing hazard. When the SSZ safety rail is activated, a switching command is triggered in the SSZ controller, generally an emergency stop command, that stops the dangerous movement. Depending on the type of profile used, there are different profile heights with different over-travel distances, i.e. braking distances, available. The user must make absolutely sure when selecting the profile type that the over-travel distance of the profile is at least as large as the existing braking and stop distance of the dangerous device. All SSZ safety rail profiles contain the same SSZ transducer.

Profiles with inadequate over-travel distances may not be used since injuries can still occur even when the safety rail functions correctly!

According to the declaration, SSZ safety rails are pressure-sensitive safety devices with with a proximity function and may only be used in safety circuits in the same protection category or higher!

Permanent (continuous) activation in the “Idle” state are not permitted!

SELECTION OF AN SSZ SAFETY RAIL TYPE: SSZ-SSL XY

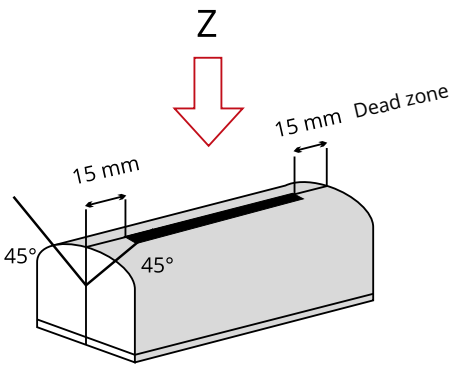
(X TYPE OF RUBBER PROFILE, Y MATERIAL OF THE TYPE)

THE PROCEDURE

The selection of a suitable profile type is depends on the application and the part of the body exposed to the risk of injury. The SSZ safety rails are used especially to protect the upper and lower extremities, including the fingers, wherever the movements of the machine could lead to amputation and/or general injuries.

When selecting an SSZ safety rail, the effective switching area and the inactive area on the edges (dead zones) must be taken into account.

FIGURE. 1 EFFECTIVE SWITCHING AREA: PERPENDICULAR TO THE Z AXIS DIRECTION OF ACTUATION +/- 45°



The effective length is the total length minus the 15 mm long inactive zones (dead zones) on both sides.

When determining the total length of the safety rail, the user must take the inactive areas on the edges on the left and right sides into account, i.e. 15 mm per side. The dead zones on the joints between adjacent safety rails is 30 mm (15+15 mm). Depending on the application, you may need to use a longer, single-piece rail to avoid the dead zones.

For applications designed to safeguard fingers, joints between safety rails are not permitted.

Additional criteria are:

- Safety category according to the EN ISO 13849-1 standard (PFH value or B10d value).
- Performance level
- Temperature range
- Protection according to IEC 60529 (higher protection levels must be check individually)
- Environmental influences such as: risk of damage, oil, coolant, atmospheric influences

ENVIRONMENTAL CONDITIONS

When using the SSZ safety rails, environmental influences that could impair the function of the system such as the following must be taken into account:

- Damage due to cold, heat, or other radiation
- Risk of heavy or sharp falling objects
- Spillage of hot and/or solidifying media
- Spillage of aggressive chemical compounds
- Constant or repeated contact with water or other liquids

INTEGRATION OF THE SYSTEM INTO THE MACHINE

The machine control system must fulfill the following conditions:

- The hazardous movements of the machine must be controlled electrically.
- The response time/time required to stop the machine must be sufficiently long.
- It must be possible to stop the hazardous movements of the machine at any time.
- The control system must be designed so that it is possible to estimate the risk (see the “Safety assessment” section of these instructions).

RISK ASSESSMENT

The people responsible for the selection of the protective equipment must consider the following:

- The severity of a potential injury.
- The frequency of occurrence of the risk.
- The possibilities for avoiding the risk.

The safety rails are intended for use in areas with a low or average risk where the following conditions are fulfilled:

- The severity of a potential injury is determined to be low or
- The potential risk of injury is determined to be serious, but the risk does not occur often and can be further restricted through the use of other appropriate means.

PROFILE TYPE

The material and the type of the profile must be determined. The selection is based on the required over-travel distance, the distance that is considered hazardous after triggering an emergency stop.

CHEMICAL RESISTANCE OF THE SSZ SAFETY RAILS

SSZ safety rail profiles are always available in EPDM or NBR material quality. EPDM exhibits high resistance to UV light and ozone. Where resistance against oils, coolants, or lubricants is required, we recommend NBR.

	EPDM	NBR
Exhaust gases	very high	with restrictions
Waste water	very high	adequate
Acetone	very high	low
Steam resistance	very high	high
Fuels	low	high
Solvents	low	high
Mineral oil	low	very high
Ozone	very high	satisfactory
Acids	high	satisfactory
Benzine	low	very high
Weather resistance	very high	high

The information in the table comes from the results of analyses conducted in our lab according to the best of our know knowledge and belief. The suitability of our products for your special application always needs to be examined by conducting your own application-oriented tests.

CALCULATION OF THE OVER-TRAVEL DISTANCE – SELECTION OF THE CORRESPONDING PROFILE

The stop distance of the dangerous movement is calculated according to the following formula:

$$s_1 = 1/2 \times v \times T \quad \text{where } T = t_1 + t_2$$

According to EN ISO 13856-2, the minimum over-travel distance of the safety rail is calculated according to the following formula:

$$s = s_1 \times C \quad \text{where } C = 1{,}2$$

s1 = stop distance of the dangerous movement (mm)

v = velocity of the dangerous movement (mm/s)

T = over-travel time of the overall system

t1 = response time of safety rail

t2 = stopping time of the machine

s = minimum over-travel distance of the safety rail so that the total forces are not exceeded (mm)

C = safety factor

CALCULATION EXAMPLE:

v = 10 mm / s (machine)

t2 = 250 ms (until complete stop)

t1 = 350 ms.

$S_1 = 1/2 \times v \times T$

where: $T = t_1 + t_2$

$S_1 = 1/2 \times 10$ mm/s (350 ms + 250ms)

$S_1 = 1/2 \times 10$ mm/s $\times$ 0,60s =3,0 mm

$S = S_1 \times C$ where: C = 1,2

S = 3,0 mm x 1,2 = 3,6 mm

The safety rail must have a minimum over-travel distance of s = 3.6 mm. The profile 06 EPDM has an over-travel distance of 9.5 mm. The safety rail with the 06 EPDM profile is therefore suitable in this case.

INSTALLATION

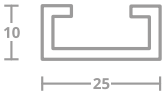
The installation, wiring, and commissioning of the SSZ safety rail and of the SSZ safety controller must be performed by correspondingly trained technical personnel.

The SSZ safety rails are installed on the intended location of the machine using an aluminum C-profile. The SSZ controller is installed in a control housing, in the control cabinet or in an installation location intended for this purpose.

C-PROFILE MADE OF ALUMINUM

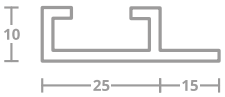
Type 2510 for profile 05 and 06

Height	10 mm
Width	25 mm
Thickness	2.5 mm
Length	6000 mm max.
Weight	300 g/m



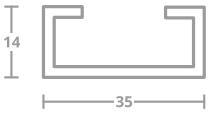
Type 4010 for profile 05 and 06

Height	10 mm
Width	40 mm
Thickness	2.5 mm
Length	6000 mm max.
Weight	420 g/m



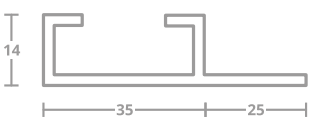
Type 3514 for profile 08 and 10

Height	14 mm
Width	35 mm
Thickness	2 mm
Length	6000 mm
max. Weight	440 g/m

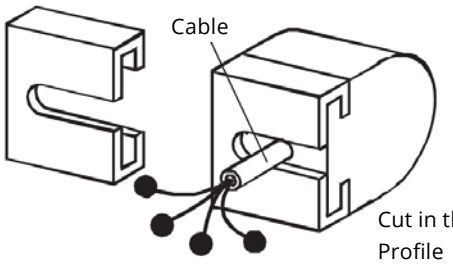


Type 6014 for profile 08 and 10

Height	14 mm
Width	60 mm
Thickness	2 mm
Length	6000 mm max.
Weight	560 g/m



The SSZ safety rail is delivered with a ready-to-mount aluminum profile with a size and length corresponding to that of the safety rail. The cut-out for the connecting cable as well as the mounting holes, possibly drilled according to the customer's specifications, are already present.



Cut in the Aluminium Profile

- The aluminum profiles must be installed on a level and clean surface. Under no circumstances shall aluminum profiles be bent to a radius less than the prescribed minimum bending radius.
- Mount the aluminum profile using suitable screws or rivets based on the drawing (if available) or according to customer requirements. The hole spacing may not exceed 300 mm.
- Route the connecting cable through openings equipped with protection to prevent damaging the cables.
- CAUTION! SSZ rubber safety rail profiles may only be "clipped in place" on the side. Sliding them in will damage the transducer on the inside and loss of the warranty.
- After installation, the SSZ safety rail must be checked for proper function with the help of a multimeter.

All other mounting methods are only permitted after obtaining our permission. The SSZ GmbH is not liable for damage resulting from incorrect installation and/or assembly.

The safety rail profile must be pressed into and clicked into place in the aluminum profile manually or with a dull tool. Sliding or pushing the rubber profile into place can lead to damage.

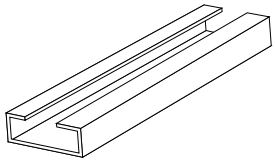
SSZ SAFETY RAIL ACCESSORIES

The following tools are needed to mount the rail: Drill to drill the mounting holes in the mounting surface, screwdriver / wrench to tighten the screws. In addition: adjustable wrench, level, tape measure, pencil to mark the correct position on the mounting surface. The rails are delivered ready for installation. You only need to mount the aluminum C profile, lay the connecting cable, and click the rubber profile into place.

The following is not permitted during installation of the safety rail:

- Bending the safety rail too far
- Pulling the safety rail on the cables

1



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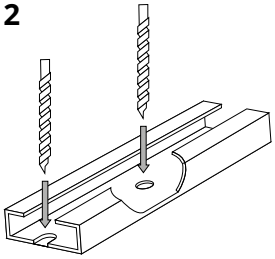

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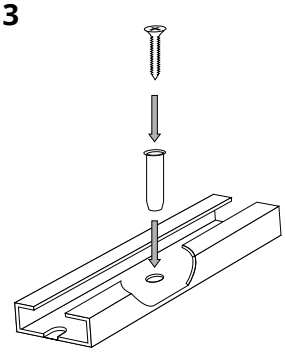

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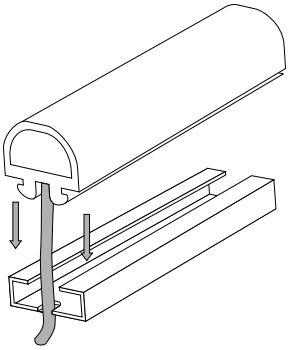
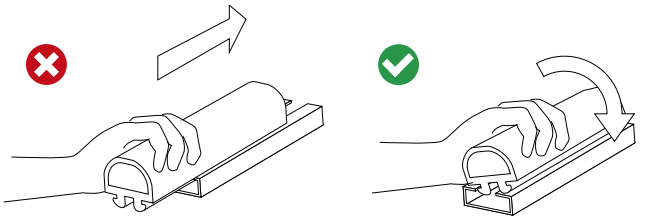
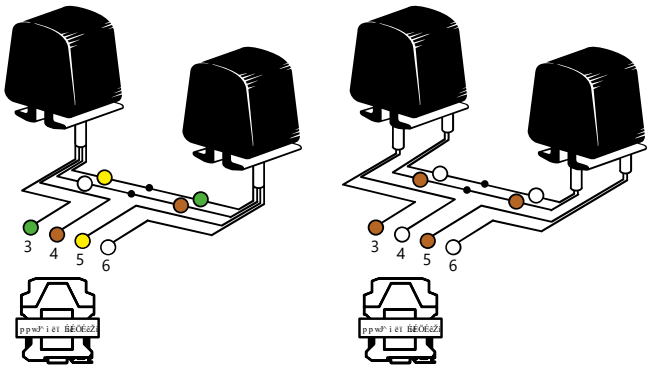




After completing installation, the function of the rail must be tested according to the description in the “Function test” section of these operating instructions.

After laying the connecting cables, the SSZ safety rail is connected to the SSZ controller. The connection cables are color-coded, and the wires in the cables are labeled. The wires are labeled 3/4/5 and 6 and must match connection terminals 3/4/5 and 6 of the controller, otherwise the device will not function properly.

CONNECTING MULTIPLE SSZ SAFETY RAILS TO AN SSZ CONTROL UNIT



Im Falle der Demontage und der erneuten Montage von SSZ-Sicherheitsschaltleisten muss man darauf Acht geben, dass alle Teile (z.B. Schnappverschlüsse, Klemmen, das Gehäuse, Befestigungen, die Verkabelung) so angeordnet werden wie vor ihrer Demontage. Im Falle der Nichtbefolgung der obigen Anweisung wird das System nicht richtig funktionieren.

CHECKING AND APPROVING THE SSZ SAFETY DEVICE

- Check the safety rail to ensure it is mounted properly according to the rules contained in the “Installation” section of these instructions.
- Check the safety rail to ensure it is mounted in the correct location, making sure to take the inactive areas on the edges into account.
- Check the resistance values of the rail according to the “Function test” section of these instructions.
- Check the wiring to ensure it is correct, including the wire connections between the rail and the SSZ controller, according to the “Connection to the controller” section of these instructions.

The installer must be familiar with the “operating instructions” of the corresponding control unit.

- Check the safety function for which the SSZ safety rail and the control unit connected to it are intended to fulfill based on the safety documentation.
- Measurement of the response time of the overall system until the dangerous movement has come to a complete stop. Check that the intake is blocked when the safety rail is activated. Compare the results obtained with the required values according to the documentation.

The same approval procedure applies when individual modules are replaced.

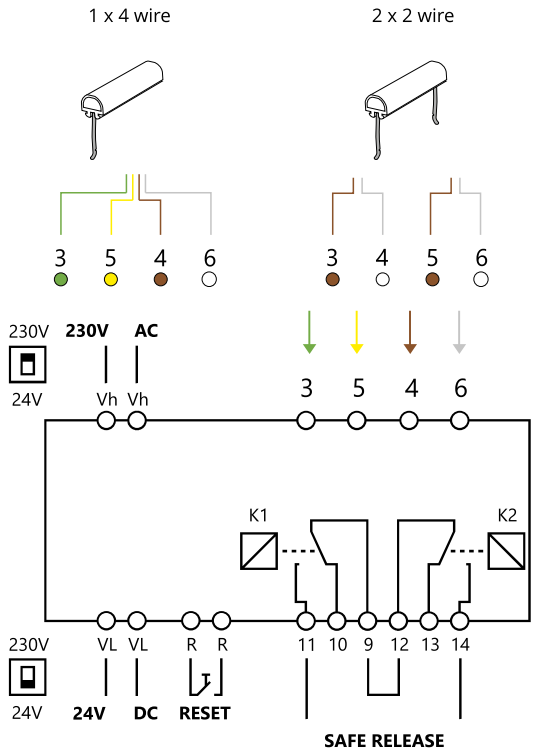
The installer should fill out a form identifying the device installed.

The machine may not be put into operation if there is a risk of danger!

During installation, the rules for work hygiene and ergonomics must be followed.

CONNECTION TO THE SSZ CONTROLLER

CONNECTION TO THE SSZ-CVS/N/2 24/230 CONTROLLER

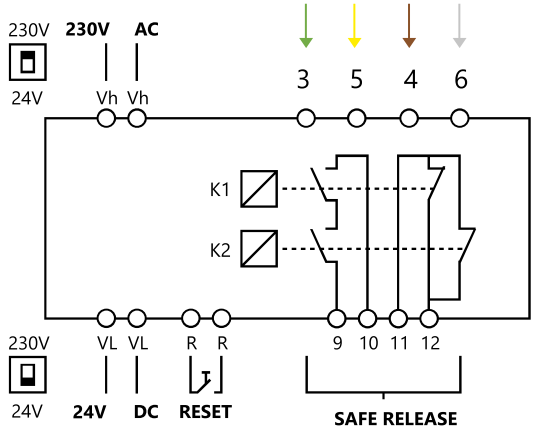


CAUTION!

To supply power with 230 V, set the voltage selector to 230V, and connect to VH (high voltage).

To supply power at 24 V, set the voltage selector to 24V, and connect to VL (low voltage).

CONNECTION TO THE SSZ-CVS/N/3/230 CONTROLLER

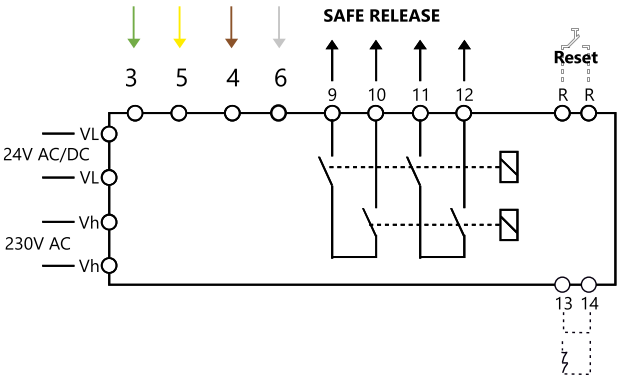


CAUTION!

To supply power with 230 V, set the voltage selector to 230V, and connect to VH (high voltage).

To supply power at 24 V, set the voltage selector to 24V, and connect to VL (low voltage).

CONNECTION TO THE SSZ-RZ3 24/230 CONTROLLER



CAUTION!

To supply power with 230 V, set the voltage selector to 230V, and connect to VH (high voltage).

To supply power at 24 V, set the voltage selector to 24V, and connect to VL (low voltage).

SSZ-RZ3
When the AUTORESET switch is in the position “I”, then the controller operates in the automatic reset operating mode. Otherwise the device will only be reset in case of a short circuit and when the R-R circuit opens.

RESET
Optional: automatically or by an external button that closes the R-R circuit.

SAFETY CIRCUIT
9-10 and 11-12

Colors of the cables:	Colors for safety rails with connection
3 - Green	3 - Blue
4 - Brown	4 - Brown
5 - Yellow	5 - Black
6 - White	6 - White

The terminals are not in chronological order! (3-5; 3-6) NOT 3-4, 5-6 If the system is functioning properly, the following switsch on after connecting the SSZ transducer

LED

The 24V versions of the SSZ-CVS/N/2, SSZ-CVS/N/3, and SSZ-RZ3 controllers do not have a voltage selector!

INTEGRATION OF THE SSZ SYSTEM IN THE MACHINE/DEVICE CONTROLLER

The emergency stop circuit is connected in series by the two output contacts of the SSZ controller. As long as the SSZ safety rail is not activated, the relay contacts, and therefore the emergency stop circuit, are closed. If someone activates the SSZ safety rail now, the relay contacts of the SSZ controller open and the hazardous movement is stopped. The same occurs in the event of a fault, i.e. when a cable breaks, there is a cross-circuit, or the SSZ safety rail is defective.

The SSZ safety system can be reset automatically or manually in this case. The reset mode is selected using a selector switch in the SSZ controller.

Control unit is configured to reset automatically by default.

In some applications, it may be required to use the manual reset, which is why the reset button is located outside of the entire hazardous area. The fault can only be acknowledged, i.e. reset, after the operator has ensured that there are no people in the hazardous area any more. The operator of the machine is responsible for deciding when the machine should be restarted/reset.

Information on the scope, characteristics, and layout of all input/output contacts as well as on the automatic and manual reset procedures can be found in the operating instructions of the corresponding controllers:

SSZ-CVS/N/2/3 operating instructions
SSZ-RZ3 operating instructions

THE FUNCTION TEST

The SSZ safety rails can be checked to ensure they are functioning properly using a multimeter or an ohmmeter. To check the function, you must disconnect the SSZ safety rail from the controller and the other safety components connected to it.

MEASURING POINTS AND THE MEASURING RANGE:

3 and 4 wires 5 and 6 open	20 megaohm	∞
3 and 4 wires 5 and 6 connected	400 kilohm	<280 kilohm
3 and 5	200 kilohm	<140 kilohm
4 and 6	200 kilohm	<140 kilohm

The results of the measurements on wires 3/ 5 and wires 4/ 6 are not the same, but the difference between the values measured may not exceed 20%!

To properly verify the function of the controller, you must be familiar with the operating instructions of the corresponding controller.

Description of the signal elements:

- If the system is functioning properly, the following switch on after connecting the SSZ transducer (using terminals 3,4,5,6):

  -red POWER diode
  -green OK 3/5 diode
  -green OK 4/6 diode

- After activating the SSZ transducer, the diodes will be in the following states:

  red POWER diode - on
  green OK 3/5 diode - off
  green OK 4/6 diode - off

  This state indicates that the SSZ transducer is working properly in connection with the SSZ controller. If the states of the diodes do not change after the pressure on the transducer is released, then a manual reset is necessary. You must press the reset key in this case.

- If the device does not reset even though the pressure has been released and the reset button was pressed (or only one of the green diodes is lit), then the cable connections on terminals 3,4,5,6 should be checked, followed by the wiring between the SSZ transducer and the SSZ controller.
- If none of the diodes are lit, then the power supply of the SSZ controller should be checked. If the device still does not work properly even though the wiring is correct and the power supply is working properly, then please contact us.
- The system is not equipped with an automatic test function. In accordance with safety integrity level PL d, the system is permanently controlled by the controller using the closed-circuit principle.

SSZ SAFETY RAILS–GENERAL TECHNICAL DATA

Height	Depending on the profile (see specification)
Length	Available on request (min. 150 mm max. 10 m)
Width	Depending on the profile (see specification)
Material	NBR/EPDM rubber
Surface	Smooth, black. The sensor does not require any covering.
Length of deformation	Depending on the profile (see specification)
Protection level of the rail IEC EN 60529:2003	IP:65
Operating temperature	+5°C - +50°C
Max. actuating force	600 N in the direction of actuation
Minimum activation force	< 150N
Min. response speed	10mm/sek
Actuation angle	+/- 45° (90°)
Number of activations	$>10^5$
Mounting	Aluminum C profile with mounting holes
Mounting position	All mounting positions are allowed.
Electrical connections	Standard: 2x2 (2-wire cable PVC 2x0.38 mm2 1x4 (4-wire cable PVC 4x0.38 mm2) The selection depends on the requirements of the customer.
Max. length of the connecting cable	100m
Max. cable length between rails	5m
Mass of the rail	Depending on the profile (see specification)
Weight of the controller	180g
Max. series connections per controller	Any number – total may not be more than 50 m
Inactive edge	15 mm at each end
Finger protection	Suitable for finger protection
Special applications	No special applications.
Usage restrictions	The standard version is not watertight and is only suitable for use in closed rooms. Intended for industrial use only. Not intended for use to safeguard children. Only series connections are permitted. No permanent deformations after long-term use were detected.

SSZ SAFETY RAILS
TECHNICAL DATA

TYPE: SSZ-SSL 05 NBR

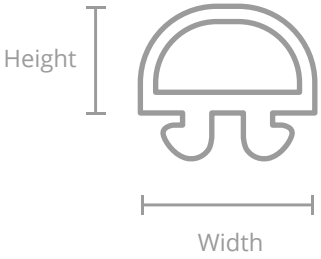
Height	15 mm
Width	25 mm
Material	NBR 65 rubber
Shore hardness	65 ± 5
Reaction time / force > 150 N	65ms

Pre-travel	
Test body D=10 mm	7 mm
Test body D=30 mm	7 mm

Working travel	
Test body D=10 mm/150 N	9 mm
Test body D=30 mm/150 N	8 mm

Over-travel distance	
Test body D=10 mm	2 mm
Test body D=30 mm	1 mm

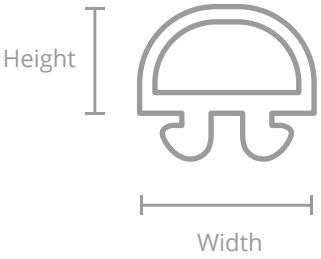
Responsive force	
Test body D=10 mm	32 N
Test body D=30 mm	36 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	380g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SSL 05 EPDM

Height	15 mm
Width	25 mm
Material	NBR 65 rubber
Shore hardness	65 ± 5
Reaction time / force > 150 N	65ms

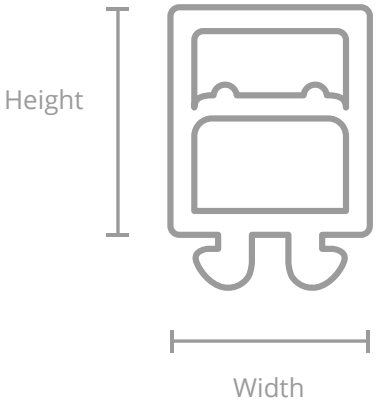


Dimensional tolerance according to ISO 3302-1 E2

Pre-travel	
Test body D=10 mm	7 mm
Test body D=30 mm	7 mm
Working travel	
Test body D=10 mm/150 N	9 mm
Test body D=30 mm/150 N	8 mm
Over-travel distance	
Test body D=10 mm	2 mm
Test body D=30 mm	1 mm
Responsive force	
Test body D=10 mm	32 N
Test body D=30 mm	36 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	380g/m

TYPE: SSZ-SSL 06 NBR

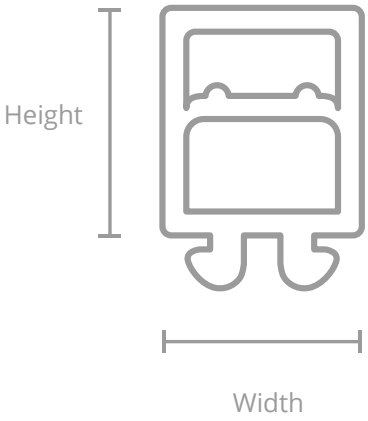
Height	28 mm
Width	25 mm
Material	NBR 65 rubber
Shore hardness	65 ± 5
Reaction time / force > 150 N	87 ms
Pre-travel	
Test body D=10 mm	4.5 mm
Test body D=30 mm	4.5 mm
Working travel	
Test body D=10 mm/150 N	19.5 mm
Test body D=30 mm/150 N	14 mm
Over-travel distance	
Test body D=10 mm	15 mm
Test body D=30 mm	9.5 mm
Responsive force	
Test body D=10 mm	47 N
Test body D=30 mm	58 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	620g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SSL 06 EPDM

Height	25 mm
Width	25 mm
Material	EPDM rubber
Shore hardness	60 ± 5
Reaction time / force > 150 N	34 ms
Pre-travel	
Test body D=10 mm	3 mm
Test body D=30 mm	2.5 mm
Working travel	
Test body D=10 mm/150 N	18 mm
Test body D=30 mm/150 N	12 mm
Over-travel	
Test body D=10 mm	15 mm
Test body D=30 mm	9.5 mm
Responsive force	
Test body D=10 mm	9 N
Test body D=30 mm	12 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	580g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SS L08 NBR

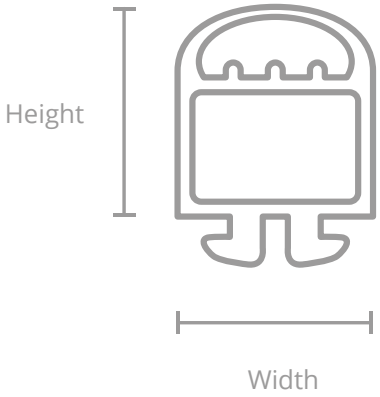
Height	36 mm
Width	35 mm
Material	NBR 65 rubber
Shore hardness	60 ± 5
Reaction time / force > 150 N	120 ms

Pre-travel	
Test body D=10 mm	3 mm
Test body D=30 mm	2.5 mm

Working travel	
Test body D=10 mm/150 N	8.5 mm
Test body D=30 mm/150 N	7.5 mm

Over-travel	
Test body D=10 mm	5.5 mm
Test body D=30 mm	5 mm

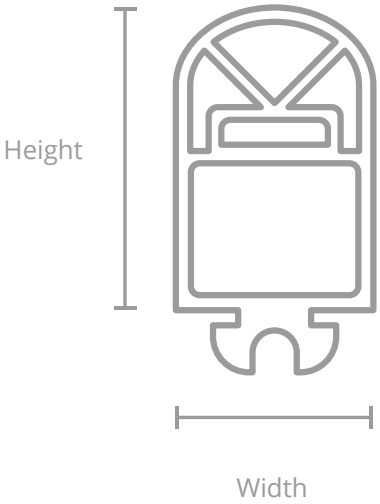
Responsive force	
Test body D=10 mm	12 N
Test body D=30 mm	10 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	800g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SSL 08 EPDM

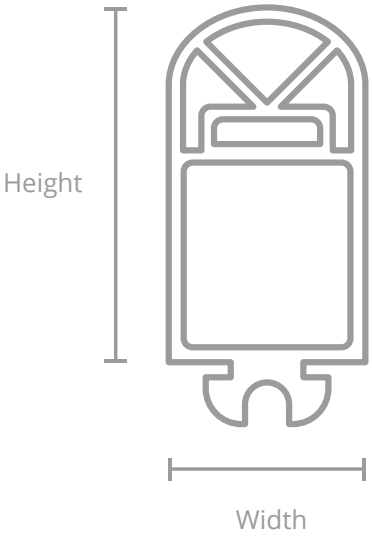
Height	46 mm
Width	35 mm
Material	NBR 65 rubber
Shore hardness	60 ± 5
Reaction time / force > 150 N	86 ms
Pre-travel	
Test body D=10 mm	11 mm
Test body D=30 mm	10 mm
Working travel	
Test body D=10 mm/150 N	31 mm
Test body D=30 mm/150 N	21.5 mm
Over-travel	
Test body D=10 mm	20 mm
Test body D=30 mm	11.5 mm
Responsive force	
Test body D=10 mm	36 N
Test body D=30 mm	37 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	940g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SSL 010 NBR

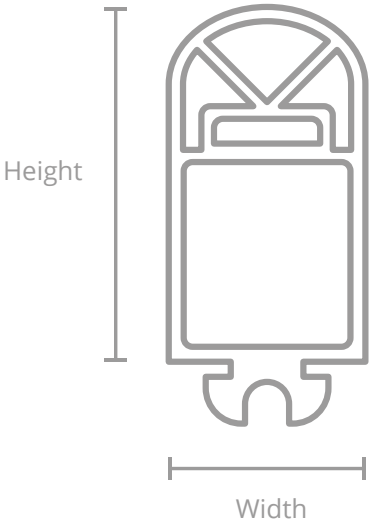
Height	60 mm
Width	35 mm
Material	NBR 60 rubber
Shore hardness	60 ± 5
Reaction time / force > 150 N	320ms
Pre-travel	
Test body D=10 mm	13.5 mm
Test body D=30 mm	12 mm
Working travel	
Test body D=10 mm/150 N	36 mm
Test body D=30 mm/150 N	29 mm
Over-travel	
Test body D=10 mm	22.5 mm
Test body D=30 mm	17 mm
Responsive force	
Test body D=10 mm	28 N
Test body D=30 mm	21 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	1200g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

TYPE: SSZ-SSL 010 EPDM

Height	60 mm
Width	35 mm
Material	NBR 60 rubber
Shore hardness	60 ± 5
Reaction time / force > 150 N	204 ms
Pre-travel	
Test body D=10 mm	10 mm
Test body D=30 mm	9.5 mm
Working travel	
Test body D=10 mm/150 N	39 mm
Test body D=30 mm/150 N	38 mm
Over-travel	
Test body D=10 mm	29 mm
Test body D=30 mm	28.5 mm
Responsive force	
Test body D=10 mm	18 N
Test body D=30 mm	20 N
Effective switching area	± 45°
Protection category	IP 65
Operating temperature	+5°C - +50°C
Electrical connections	Two-two wired x 0.38 mm^2 One-four wired x 0.38 mm^2
Weight of the rail	1280g/m



Dimensional tolerance according to DIN ISO 3302-1 E2

SSZ SAFETY RAILS IN CONNECTION WITH THE SSZ CONTROLLER

SSZ SAFETY RAILS IN CONNECTION WITH THE SSZ-RZ3 CONTROLLER

Power supply	24V AC/DC and 230V AC
The test basis	EN ISO 13856, EN ISO 13849-1
Properties of switchover at V=100 mm/s	
Switching cycles	$>10^6$
Reset	manual/automatic
Effective actuation angle	+/-45°
B10d	2×10^6
Load capacity of the output contacts	2A
Installation of the unit in the control cabinet	Yes
Max. Resistance of rail channels 1 and 2	250 kΩ
Max. Diff. in resistance between channels	20%
Max. Response time of the unit/system	15 ms/System*
Mechanical conditions	
Static load	600N
Safety category	Pld
Operating life	20 years
MTTFd	100 (and more)
DC (Diagnostic Coverage)	90%
CCF (Common Cause Failure)	75
PFHd (gem. IEC/EN 62061)	4.33^{E-8}
Nop	95040
SIL gem. IEC/EN 62061	SIL2
Performance Level gem. EN ISO 13849-1	Pld

* See the detailed data for the particular profile

SSZ SAFETY RAILS WITH THE SSZ-CVS/N3 CONTROLLER

Supply voltage	24V AC/DC sowie 230V AC
The test basis	EN ISO 13856, EN ISO 13849-1
Properties of switchover at V=100 mm/s	
Switching cycles	$>10^6$
Effective actuation angle	+/-45°
B10d	2×10^6
Load capacity of the output contacts	2A
Installation of the unit in the control cabinet	Ja
Max. Resistance of rail channels 1 and 2	250 kΩ
Max. Diff. in resistance between channels	20%
Max. Response time of the unit/system	<20 ms/System*
Mechanical conditions	
Static load	600N
Safety category	Pld
Operating life	20 Jahre
MTTFd	100 (and more)
DC (Diagnostic Coverage)	90%
CCF (Common Cause Failure)	80
PFHd (gem. IEC/EN 62061)	$4{,}29^{E-8}$
Nop	60.000
Kategorie gem. EN ISO 13849-1	3
Performance Level gem. EN ISO 13849-1	Pld
SIL gem. IEC/EN 62061	2
Protection class: Controller/SSL	IP30/IP54

* See the detailed data for the particular profile

SSZ SAFETY RAILS WITH THE SSZ-CVS/N2 CONTROLLER

Supply voltage	24V AC/DC and 230V AC
The test basis	EN ISO 13856, EN ISO 13849-1
Properties of switchover at V=100 mm/s	
Switching cycles	$>10^6$
Effective actuation angle	+/-45°
B10d	2×10^6
Load capacity of the output contacts	2A
Installation of the unit in the control cabinet	Yes
Max. Resistance of rail channels 1 and 2	250 kΩ
Max. Diff. in resistance between channels	20%
Max. Response time of the unit/system	<20 ms/System*
Mechanical conditions	
Static load	600N
Safety category	Plc
Operating life	20 years
MTTFd	high
DC (Diagnostic Coverage)	90%
CCF (Common Cause Failure)	80
PFHd (gem. IEC/EN 62061)	$2{,}29^{E-7}$
Nop	60.000
Kategorie gem. EN ISO 13849-1	2
Performance Level gem. EN ISO 13849-1	Plc
SIL gem. IEC/EN 62061	1
Protection class: Controller/SSL	IP30/IP54

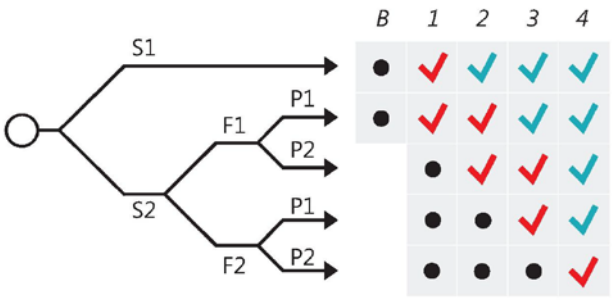
* See the detailed data for the particular profile

SAFETY ASSESSMENT

The safety assessment was performed according to the EN ISO 13849-1 standard. In light of the fact that none of the elements of the system can function independently or in conjunction with elements currently available on the market (e.g. the SSZ safety rails with a controller from a different manufacturer), the overall system (rail supply cable plus controller) were taken into account in the safety assessment.

Users must specify the safety integrity levels of their applications themselves.

The safety category and safety integrity level must be at least as high as the safety category and safety integrity level determined in the risk assessment.



✓ Preferred category

● Possible category which requires further measures

✓ Category that can be over dimensional

Type of injury

- S1 Light injuries
- S2 Serious injuries

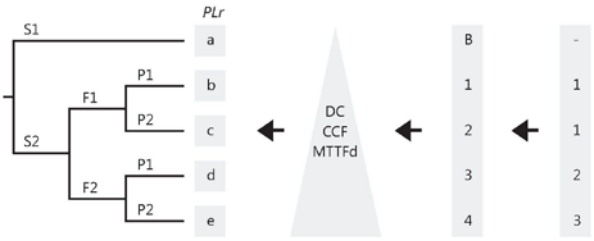
Frequency and/or duration of dangerous event

- F1 Rarely to more often and/or only for a short period
- F2 Frequently to permanently and/or for long

periods Possibility to avoid the danger

- P1 Possible under certain circumstances
- P2 Virtually impossible

THE RISK GRAPH, IEC 61508



Cat.	Requirement	Consequences for the system
B	The safety related parts of control systems and/or the protection devices and parts thereof must be designed, built, and selected so that they comply with the applicable standards and must be combined so that they can withstand all influences expected to be encountered.	An error can lead to the loss of the safety function.
1	The requirements of category B must be met. Proven components and safety principles must be used and applied, respectively.	The occurrence of an error can lead to the loss of the safety function, but the probability of occurrence of the error is lower than in category B.
2	The requirements of category B and 1 must be met. – The safety function must be tested at suitable intervals.	The occurrence of an error can lead to the loss of the safety function between the test intervals, but the error is detected by the test.
3	The requirements of category B and 1 must be met. Safety-related parts must be designed so that a single error in one of these parts does not lead to the loss of the safety function. The individual error, whenever it occurs, shall be detected using appropriate means.	When the single error occurs, the safety function remains intact. Some, but not all errors are detected. A series of undetected errors can lead to the loss of the safety function.
4	The requirements of category B and 1 must be met. Safety-related parts must be designed so that a single error in each of these parts does not lead to the loss of the safety function and the individual error is detected before or upon receiving the next request sent to the safety function. If this is not possible, then a series of errors may not lead to the loss of the safety function.	When errors occur, the safety function remains intact. The errors are detected promptly to prevent the loss of the safety function.

STORAGE AND TRANSPORT

The SSZ safety rails are packed in cardboard boxes. To prevent damage to the product, the product should only be transported and stored in its original packaging.

The packaging may not be opened using sharp tools! Otherwise the contents wll be damaged!

- Storage: Store in dry, closed rooms with a maximum humidity of 80%. Storage temperature range -10°C to +60°C
- Protect against moisture.
- Protect from direct sunlight.
- Please note: The SSZ control units have protection category IP 30.

After receiving the SSZ safety rails, they should be unpacked immediately and laid straight on a flat surface.

No other goods should be placed on the packages during transport and while storage.

MAINTENANCE AND INSPECTION

The maintenance instructions must be read before beginning any maintenance tasks!

The rail is maintenance-free, and it is monitored by the control unit. The function test of the overall system must be executed manually at least once per day. A visual inspection must be performed to determine if any damage has occurred. Damage to the rubber profile can lead to limited functionality. To keep the safety rail clean, it should be wiped off with a damp cloth. Additional adjustments and settings are not necessary.

The active surface of the rail must be checked at regular intervals using a test body with a diameter of 10 mm. The time between checks depends on how the rail is used. This interval should be specified by the operator according to the legal requirements of the country in which it is used.

The maximum time between the checks is 3 months. The regular checks should be performed according to the following items (checklist).

RAIL

- Was the surface of the rail damaged? (Was the damage caused by mechanical, environmental, or chemical influences?)
- Was the rail mounted correctly? (Are any screws “loose”?)
- Is the rail mounted firmly on the mounting surface?
- Does the rail function correctly? (A function test according to the “Function test” section of these operating instructions must be performed.)

CONNECTION

- Were the cables that connect the rail to the controller damaged? (Are there cracks or kinks in the cable?)
- Is the cable outlet of the rail still undamaged?

CONTROLLER

- Is the housing damaged?
- Has the controller been manipulated? (The SSZ hologram should be checked to ensure it is intact.)
- Does the system function correctly? (A function test according to the “Function test” section of these operating instructions must be performed).
- Was the controller mounted properly on the mounting rail in the control cabinet?
- Was the system connected correctly and according to the regulations to the machine or system?

After determining that the system functions properly without error and has been properly and correctly installed, the system: safety rail + controller can be approved for use (according to the applicable standards and regulations of the country of use).

The interval at which the tests should be performed depends on the user of the safety rail and must be specified by the operator according to the legal requirements of the country of use.

Warning: The machine or system may not be operated without the safety device!

In case of a defect in the safety device or parts thereof, the MACHINE MUST BE SHUT DOWN!

Only orginal part may be used! Modification, i.e. the installation of other components in the system, is prohibited. Only SSZ controllers may be used to monitor the SSZ rail. The use of components, rails, and/or controllers from other manufacturers will lead to technical safety hazards and personal injuries. Furthermore, the Declaration of Conformity becomes invalid immediately. The SSZ GmbH is not liable for any damage when components not approved by SSZ are used.

Modules can be replaced by the user. The modules should be replaced by correspondingly trained technical personnel who also have knowledge of technical safety issues relating to the installation and function of the corresponding machine or system.

All parts (e.g. the housing, snap locks, terminals, or fasteners) that were removed for maintenance purposes must be installed again after completing maintenance If the elements are not reinstalled or are installed improperly, then the system may operate unsafely or malfunction.

In case of technical problems, you should contact the manufacturer or the SSZ agent for your country. The current list of our agencies in foreign countries can be found on our home page: www.ssz-gmbh.de

TROUBLESHOOTING

Error	Possible cause	Solution
The diodes do not light up.	No power being supplied.	Check the power supply
The red diode and one green diode are lit.	Broken cable connection	Check if the sensor is connected correctly. Disconnect the sensor and measure it with the aid of a multimeter.
	Wires 3/4 or 5/6 swapped	Check if the sensor is connected correctly.
	Short circuit in the sensor caused by moisture penetration, for example.	Disconnect the sensor and measure it with the aid of a multimeter.
The red diode is lit. The two green diodes are off.	The sensor is permanently active or there is a broken wire in the supply cable.	Eliminate the permanent signal from the sensor. Fix the broken cable.
The sensor only switches partially.	Wires 3/5 or 4/6 are swapped	Check if the sensor is connected correctly.

The table below can be used for the electrical measurement of the transducer! The transducer must be disconnected from the controller before taking measurements.

The meter on wires	Meter range	Result of the measurement
3 and 4 wires 5 and 6 open	20 megaohm	∞
3 and 4 wires 5 and 6 connected	400 kilohm	<280 kilohm
3 and 5	200 kilohm	<140 kilohm
4 and 6	200 kilohm	<140 kilohm

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