

M-LB-(Ex-)2000-System Surge Protection Barriers

Manual



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1	Introduction	5
1.1	Content of this Document	5
1.2	Target Group, Personnel	6
1.3	Symbols Used	6
2	Product Specifications	7
2.1	Function	7
2.2	Application	8
2.3	Working Voltage	10
2.4	Surge Protection Barrier	11
2.5	Accessories	14
3	Installation	15
3.1	Mounting	15
3.2	Connection	19
3.3	Signal Loops Disconnection for Checking	24
4	Operation	26
5	Dismounting, Maintenance, and Repair	27
5.1	Signal Loops Disconnection for Checking	27
5.2	Disconnection of the Circuits	27
5.3	Dismounting	30
6	Technical Specifications	32
6.1	Technical Data	32
6.2	Model Number Description	33
6.3	Dimensions	34

1 Introduction

1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note

This document does not substitute the instruction manual.



Note

For full information on the product, refer to the instruction manual and further documentation on the Internet at www.pepperl-fuchs.com.



Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com.

The documentation consists of the following parts:

- Present document
- Instruction manual
- Datasheet

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Functional safety manual
- Additional documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismantling of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2 Product Specifications

2.1 Function

Surge protection barriers protect C&I circuits against voltage surges caused by lightning or switching operations.

The M-LB-(Ex-)2000 surge protection system offers a large number of surge protection barriers for a wide variety of applications:

- Protection of 2 signal lines
- Protection of grounded or not grounded signal lines
- Protection of intrinsically safe or non-intrinsically safe circuits
- Protection of circuits with rated voltage of 1 V or 24 V

A big advantage of using the M-LB-(Ex-)2000 surge protection system is that the devices are only 6.2 mm thick. This means that the space in the switch cabinet can be optimally used. Their narrow design allows the devices to replace the disconnect terminals in the cross connect level.

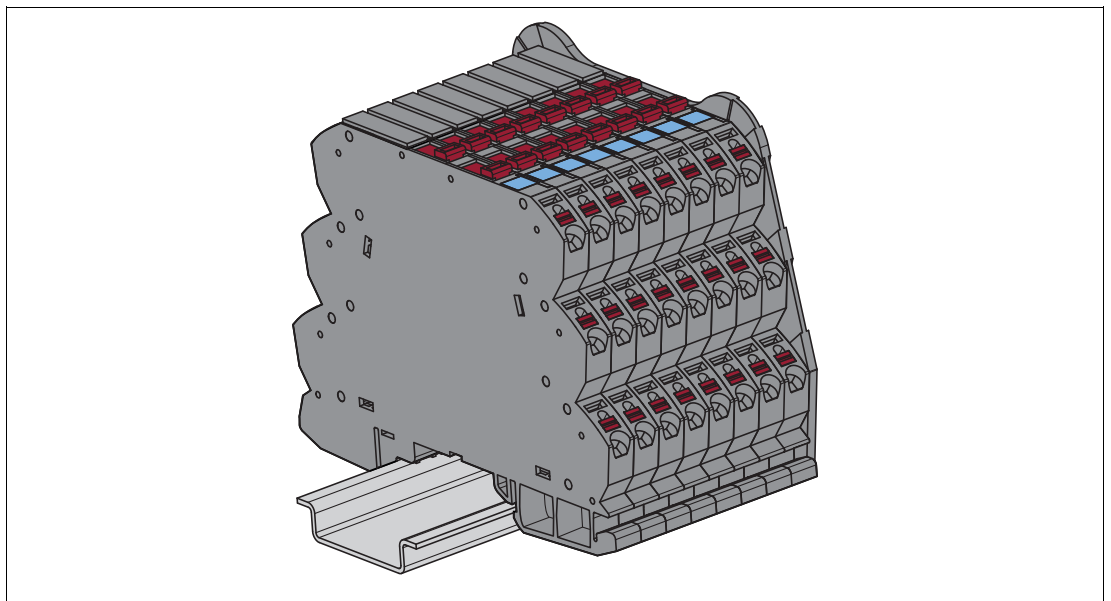


Figure 2.1 Example of surge protection system

2.2 Application

The following illustrations show typical applications in connection with isolators and zener barriers.

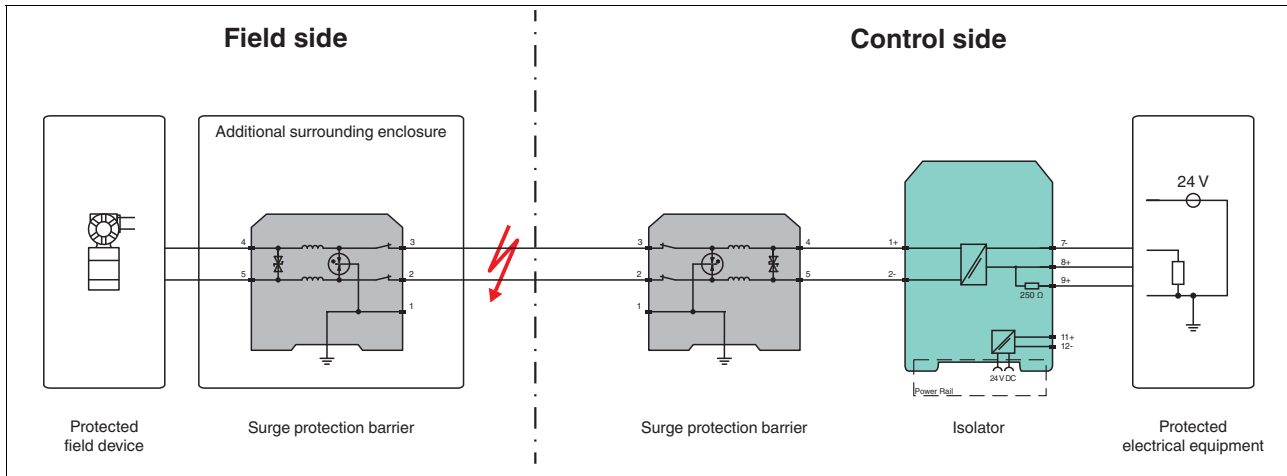


Figure 2.2 Example of an application with isolator

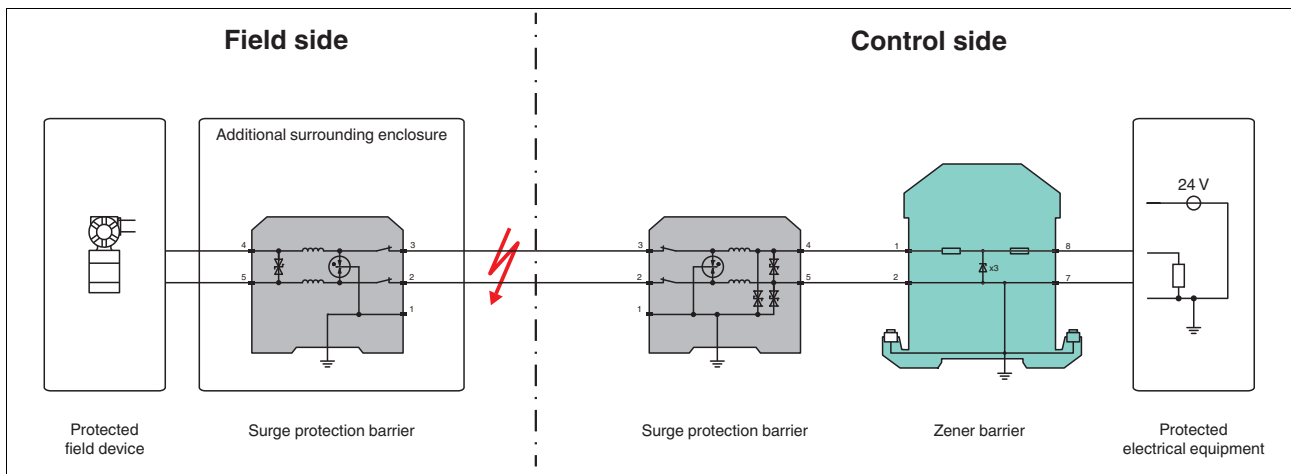


Figure 2.3 Example of an application with zener barrier

The surge protection system can also be used to protect field devices in the hazardous area of zones 0, 1 and 2 resp. 20, 21 and 22. The system components suitable for this application are marked in blue.

Note

For more information on mounting, installation and operation, refer to the following chapters.



2.2.1 Surge Protection Barriers for Grounded Signal Lines

Surge protection barriers for grounded signal lines provide a defined protection level from line to earth by connecting the signal lines to earth via suppressor diodes.

Use this surge protection barrier if the apparatus to be protected is not isolated from earth, e. g., in the case of applications in a non-hazardous area or for applications with zener barriers, see Figure 2.3.

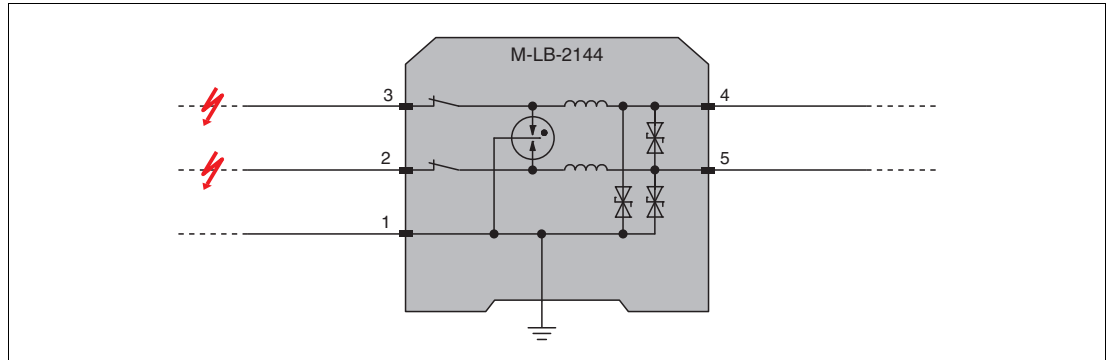


Figure 2.4 Example of a surge protection barrier for grounded signal lines

2.2.2 Surge Protection Barriers for Not Grounded Signal Lines

Surge protection barriers for not grounded signal lines are connected with earth via a gas discharge tube only. This results in a greater insulation voltage from line to earth.

Use these surge protection barriers if the device to be protected is operated in an unearthed signal loop. Typical applications for this device are galvanically isolated signal loops, which can be found after isolated barriers or signal conditioners, see Figure 2.2.

The breakdown voltage of the gas discharge tube is less than 500 V AC from line to earth. Observe the breakdown voltage for insulation tests.

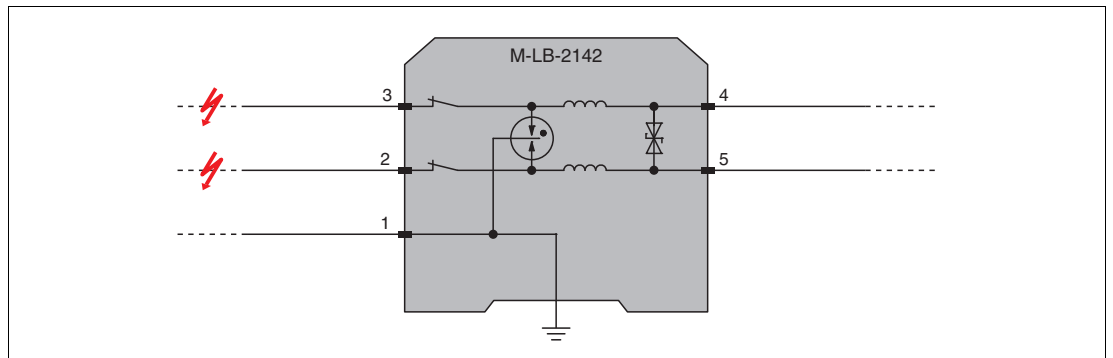


Figure 2.5 Example of a surge protection barrier for not grounded signal lines

2.3 Working Voltage

To ensure the best possible protection level, 2 different voltage versions are available.

- Rated voltage $U = 24 \text{ V DC}$, maximum continuous operating voltage $U_C = 30 \text{ V DC}$
The typical area of application for these surge protection barriers are 24 V signal loops, such as 4 mA ... 20 mA, digital inputs or digital outputs.
- Rated voltage $U = 1 \text{ V DC}$, maximum continuous operating voltage $U_C = 6 \text{ V DC}$
These surge protection barriers are optimized for applications with a small voltage increase in the mV range, such as resistance thermometers, thermocouples or strain gauge bridges.

2.4 Surge Protection Barrier

The device limits induced transients of different causes, e. g. lightning or switching operations. The limitation is achieved by diverting the current to earth and limiting the signal loop voltage during the duration of the overvoltage pulse.

The devices are distinguished:

- By their working voltage
- By their topology, see chapter 2.2
- By operating location and area of application
 - Devices with green marking and equipment protection level Gc for connection of non-intrinsically safe circuits
 - Devices with blue marking and equipment protection level Gb for connection of intrinsically safe circuits

The device is mounted on a 35 mm x 7.5 mm DIN mounting rail according to EN 60715.

The DIN mounting rail is used to attach the device in the switch cabinet and is responsible for grounding the surge protection barriers. The DIN rail mounting ensures a grounding connection with the lowest possible resistance of the device.

Assembly

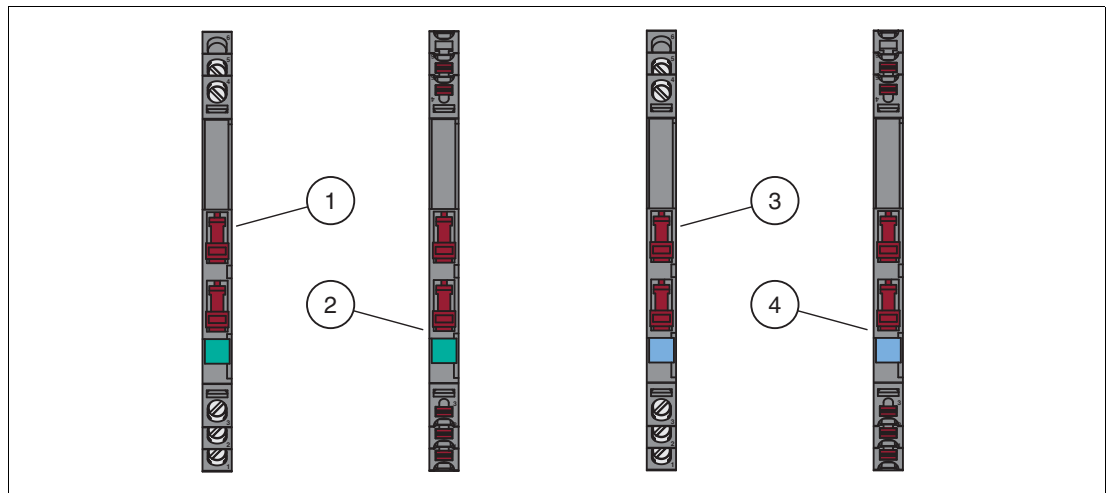


Figure 2.6 Device assembly

- 1 Surge protection barrier M-LB-21** with screw terminals and equipment protection level Gc for the connection of non-intrinsically safe circuits
- 2 Surge protection barrier M-LB-21**.SP with spring terminals and equipment protection level Gc for the connection of non-intrinsically safe circuits
- 3 Surge protection barrier M-LB-Ex-21** with screw terminals and equipment protection level Gb for the connection of intrinsically safe circuits
- 4 Surge protection barrier M-LB-Ex-21**.SP with spring terminals and equipment protection level Gb for the connection of intrinsically safe circuits

Connection

The device has the following connections:

- The unprotected signal lines are connected to terminals 2 and 3 (A). The protected signal lines are connected to terminals 4 and 5 (B). The specific connection layout depends on the topology of the connected module and on the operating location.

The connection terminals are screw terminals or spring terminals. The terminals offer a terminal compartment for conductors with a maximum core cross section of $1 \times 2.5 \text{ mm}^2$ (14 AWG).

- The device is equipped with a ground connection (C).
- An optional shielding or grounding can be connected to terminal 1 (D).

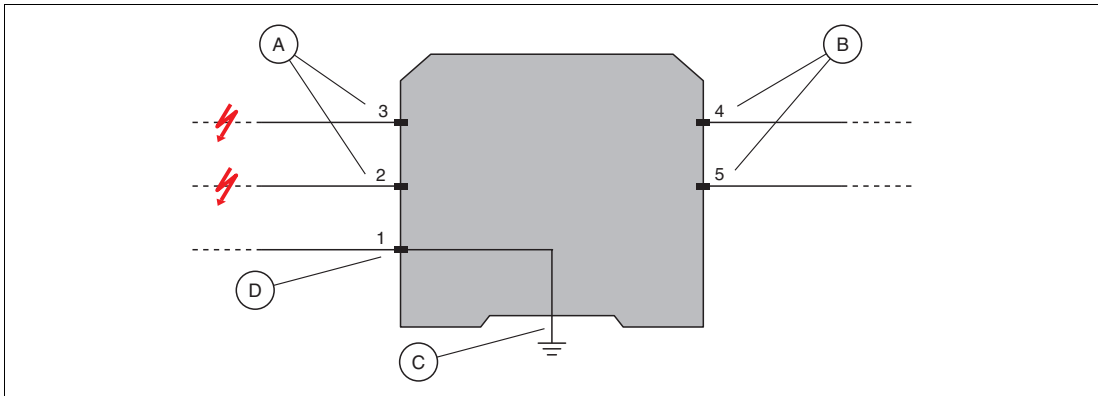


Figure 2.7 Device connections

- A** Connection of the unprotected signal lines
- B** Connection of the protected signal lines
- C** Ground connection
- D** Shield or ground connection (optional)

Operating Elements

The device has 2 disconnect levers. These disconnect levers can be used to disconnect the signal loops for the following checks.

- Insulation check of the cable on the unprotected side
- Check of the signal loops

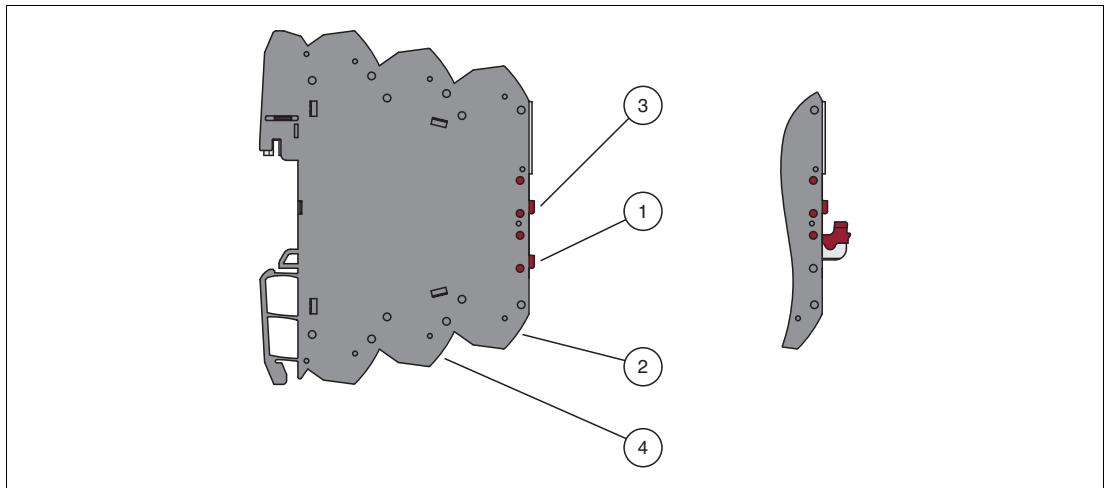


Figure 2.8

- 1 Disconnect lever 1 for terminal 3
- 2 Terminal 3
- 3 Disconnect lever 2 for terminal 2
- 4 Terminal 2



Note

See corresponding datasheets for further information.

2.5 Accessories

Insulation Spacer M-LB-2800

The insulation spacer M-LB-2800 is available as an accessory.

Use the insulation spacer in the following applications, see chapter 3.1:

- for optical or structural separation of individual device series
- as the termination of a device series for closing the open side wall

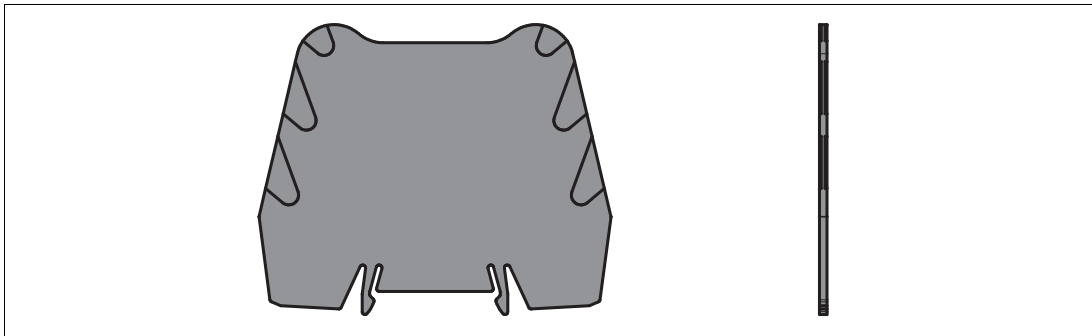


Figure 2.9 Insulation spacer M-LB-2800

DIN Mounting Rail, on the User Side

The device is mounted on a 35 mm x 7.5 mm DIN mounting rail according to EN 60715.

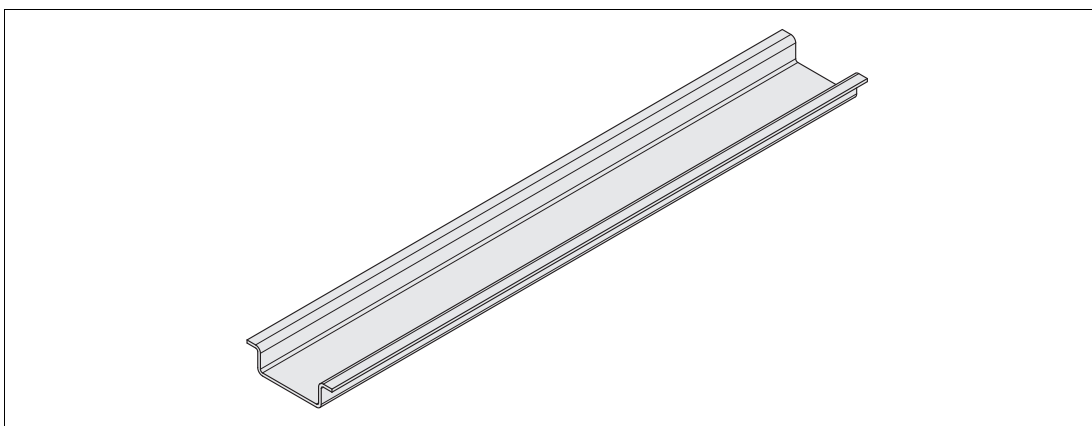


Figure 2.10 Example: DIN mounting rail (35 mm x 7.5 mm)

Note

See corresponding datasheets for further information.



3 Installation

3.1 Mounting



Danger!

Explosion hazard from wrong mounting

Mounting the device in the wrong way can impair the intrinsic safety of the signal loops. This can cause sparks that can ignite a potentially explosive atmosphere.

- Only use the blue marked devices for intrinsically safe circuits.
- Always mount the devices in the same orientation on the DIN mounting rail.
- Observe the derating of the current depending on the ambient temperature.
- The degree of protection IP20 can be achieved under the following conditions:
Mount the devices side by side on the DIN mounting rail. Use the insulation spacer.

Mounting in the Explosion Hazardous Area

Observe the following warnings when mounting or carrying out installations in the explosion hazardous area.



Danger!

Explosion hazard from wrong mounting

Mounting the device in the wrong way can impair suitability for specific temperature class. This can cause surface temperatures which can ignite a potentially explosive atmosphere.

Observe the derating of the current depending on the ambient temperature and the temperature class.



Danger!

Explosion hazard from wrong mounting of devices with equipment protection level Gc

The device safety can be impaired by external environmental influences and by mechanical stress. That can lead to sparking that can ignite a surrounding potentially explosive atmosphere.

Mount the device with equipment protection level Gc in a surrounding enclosure that complies with IEC/EN 60079-0 and that is rated with the degree of protection IP54 according to IEC/EN 60529.



Danger!

Explosion hazard from live wiring of non-intrinsically safe circuits

If you connect or disconnect energized circuits in a potentially explosive atmosphere, sparks can ignite the surrounding atmosphere.

Only connect or disconnect energized non-intrinsically safe circuits in the absence of a potentially explosive atmosphere.



Mounting the Surge Protection Barrier

Only use a 35 mm x 7.5 mm DIN mounting rail.

Clip the device (1) onto the DIN mounting rail (2).

↳ The device is fixed on the DIN mounting rail. The grounding connection is established.

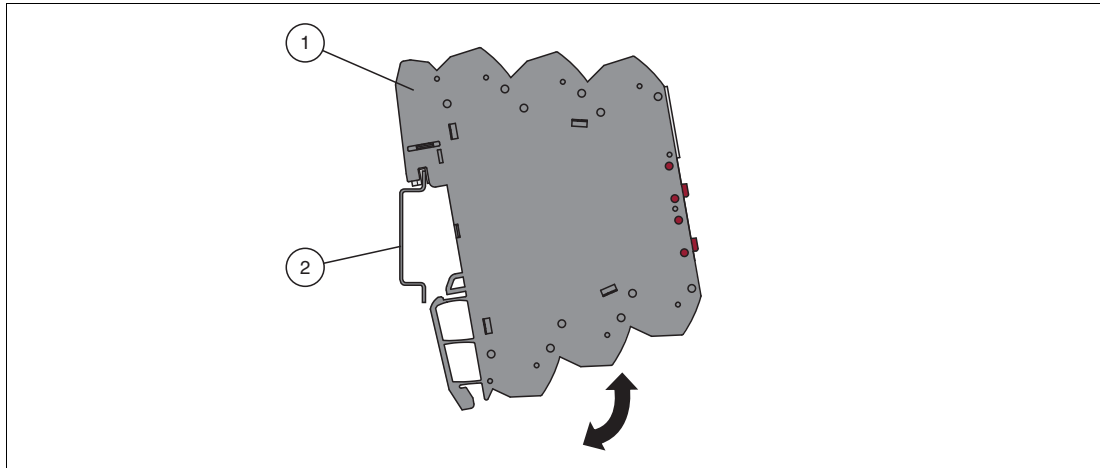


Figure 3.1 Mounting the device onto the DIN mounting rail

- 1 Surge protection barrier
- 2 DIN mounting rail



Mounting the Insulation Spacer between the Devices

1. Use the insulation spacer for optical or structural separation of individual device series (1), (4).
2. Clip the insulation spacer (2) onto the DIN mounting rail (3).

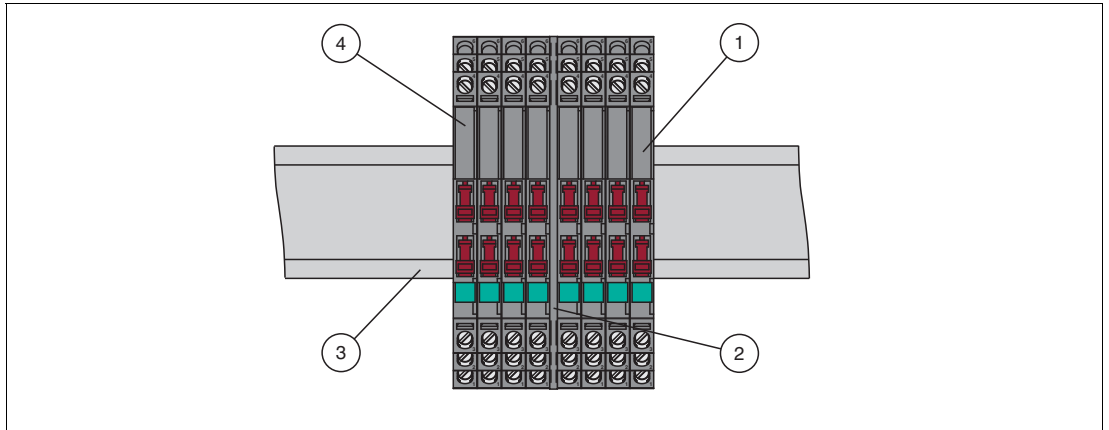


Figure 3.2 Mounting between the devices

- 1 Surge protection barriers
- 2 Insulation spacer M-LB-2800
- 3 DIN mounting rail
- 4 Surge protection barriers

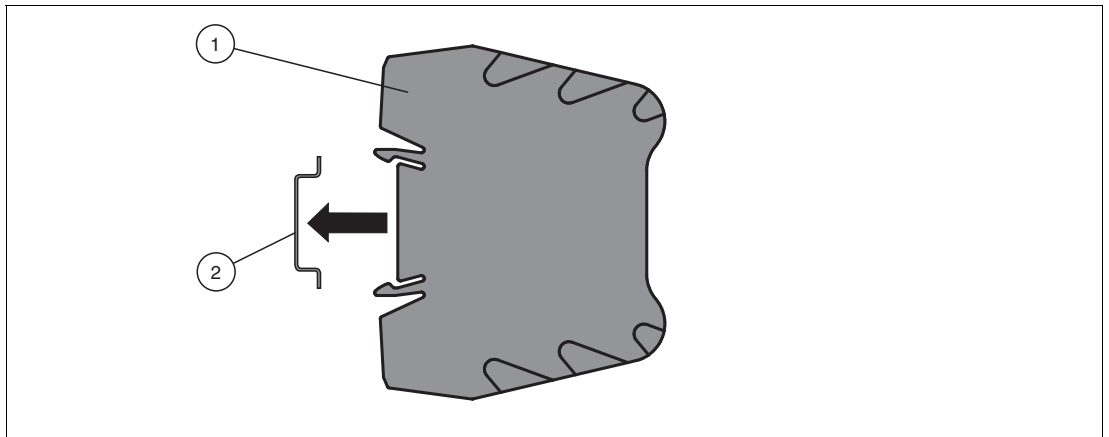


Figure 3.3 Mounting the insulation spacer onto the DIN mounting rail

- 1 Insulation spacer M-LB-2800
- 2 DIN mounting rail



Mounting the Insulation Spacer as Termination of a Device Series

Due to the small total width of the devices, the side walls of the devices are not completely closed. Some components are so thick that these components protrude into the housing. Therefore, a device series must be closed with a insulation spacer to cover the open side wall.

1. Use the insulation spacer as the termination of a device series (4) for closing the open side wall
2. Clip the insulation spacer (1) onto the DIN mounting rail (3).
3. Secure the insulation spacer on the DIN mounting rail against shifting or falling over. For example, use terminal block USLKG5 (2).

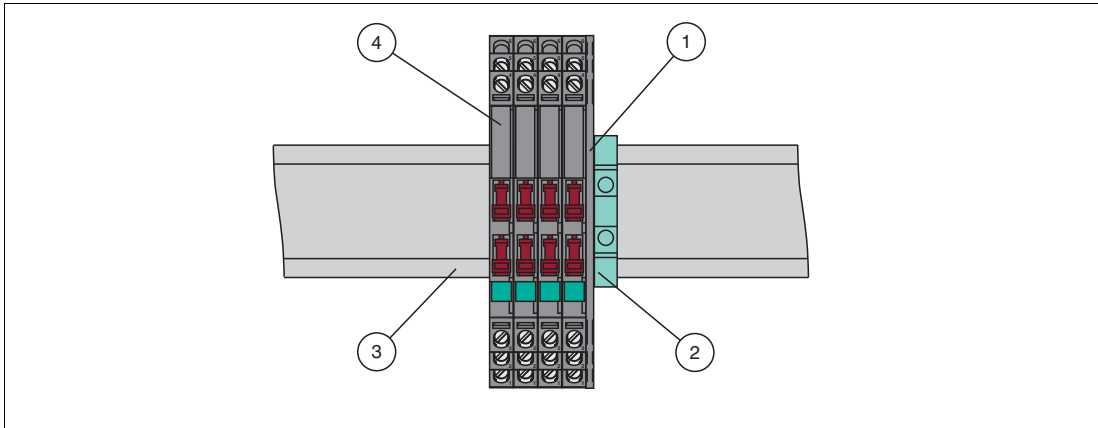


Figure 3.4 Mounting as termination of a device series

- 1 Insulation spacer M-LB-2800
- 2 Terminal block USLKG5
- 3 DIN mounting rail
- 4 Surge protection barriers

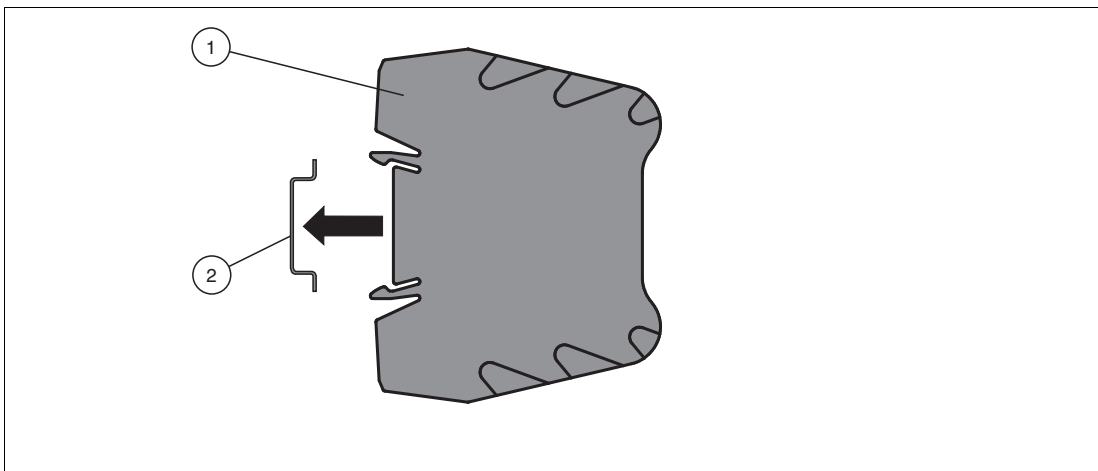


Figure 3.5 Mounting the insulation spacer onto the DIN mounting rail

- 1 Insulation spacer M-LB-2800
- 2 DIN mounting rail

3.2 Connection



Danger!

Explosion hazard from live wiring of non-intrinsically safe circuits

If you connect or disconnect energized circuits in a potentially explosive atmosphere, sparks can ignite the surrounding atmosphere.

Only connect or disconnect energized non-intrinsically safe circuits in the absence of a potentially explosive atmosphere.



Danger!

Danger to life from electric shock

Absent or insufficient insulation can result in electric shock.

Only connect circuits that provide protection against electric shock (e. g. SELV or PELV).

3.2.1 Connection of the Circuits



Danger!

Danger to life from incorrect installation

Incorrect installation of cables and connection lines can compromise the function and the electrical safety of the device.

- Observe the permissible core cross section of the conductor.
- When using stranded conductors, crimp wire end ferrules on the conductor ends.
- Use only one conductor per terminal.
- When installing the conductors the insulation must reach up to the terminal.
- Observe the tightening torque of the terminal screws.



Caution!

Property damage from use of inappropriate tool

Using an inappropriate tool may damage the screw heads.

- Use a slot-head screwdriver with a size of 3.0 x 0.5.
- Observe the tightening torque of the terminal screws.
The tightening torque is 0.5 Nm to 0.6 Nm.



Connecting the Circuits

1. Connect the protected signal lines to terminals 4 and 5.
2. Connect the unprotected signal lines to terminals 2 and 3.
3. If you do not ground the device via the DIN mounting rail, you can connect the grounding to terminal 1.
4. You can connect an optional shielding to terminal 1.

The terminals are screw terminals or spring terminals. See the figures below.



Connecting the Cable via the Screw Terminal

1. Plug the cable (C) into the terminal on the device (A).
2. Tighten the terminal screw with the slot-head screwdriver (B). Observe the tightening torque of the terminal screws. The tightening torque is 0.5 Nm to 0.6 Nm.

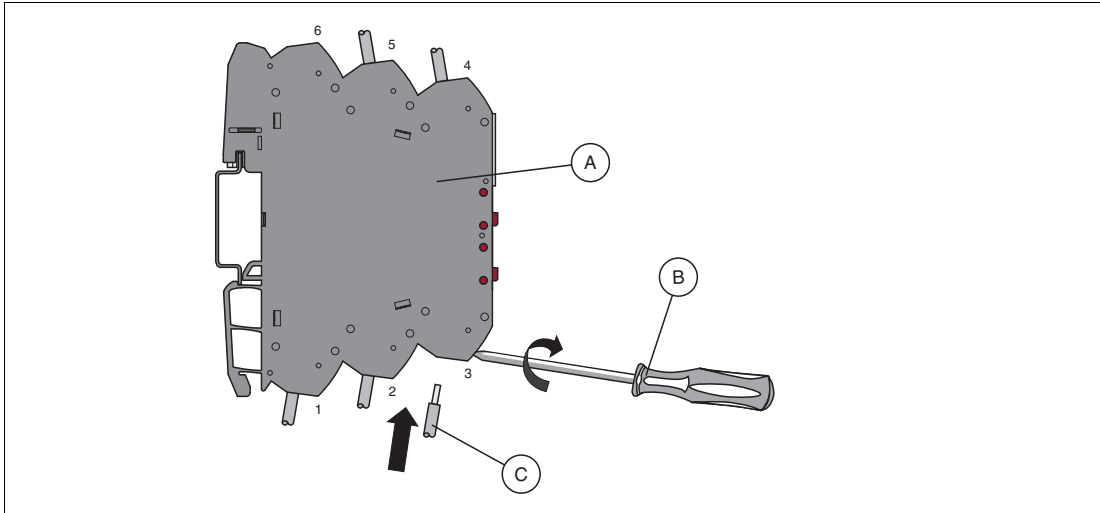


Figure 3.6 Screw terminal connection

- A** Device with screw terminals
- B** Slot-head screwdriver
- C** Cable



Connecting the Cable via the Spring Terminal

1. Push the cable (B) into the terminal on the device (A).
2. Check that the cable (B) is fixed.

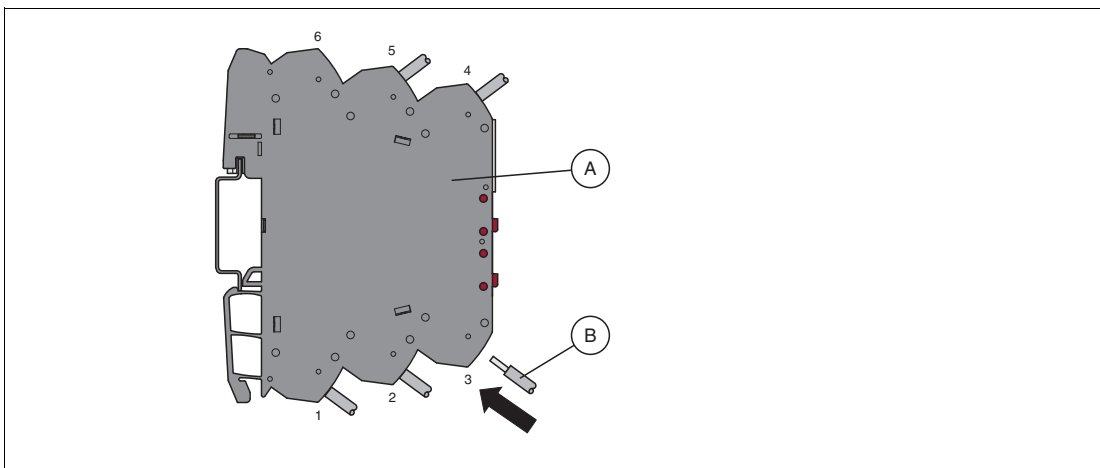


Figure 3.7 Spring terminal connection with push-in connection technology

- A** Device with spring terminals with push-in connection technology
- B** Cable



Note

See corresponding datasheets for further information.

3.2.2

Ground Connection of the Surge Protection System

Make sure that the unprotected cabling does not affect the protected cabling. When laying the cables, observe that there is a sufficient distance between the unprotected cabling connected to earth and the protected cabling. The following figures show examples of incorrect or correct ground connections.

Correct Ground Connection

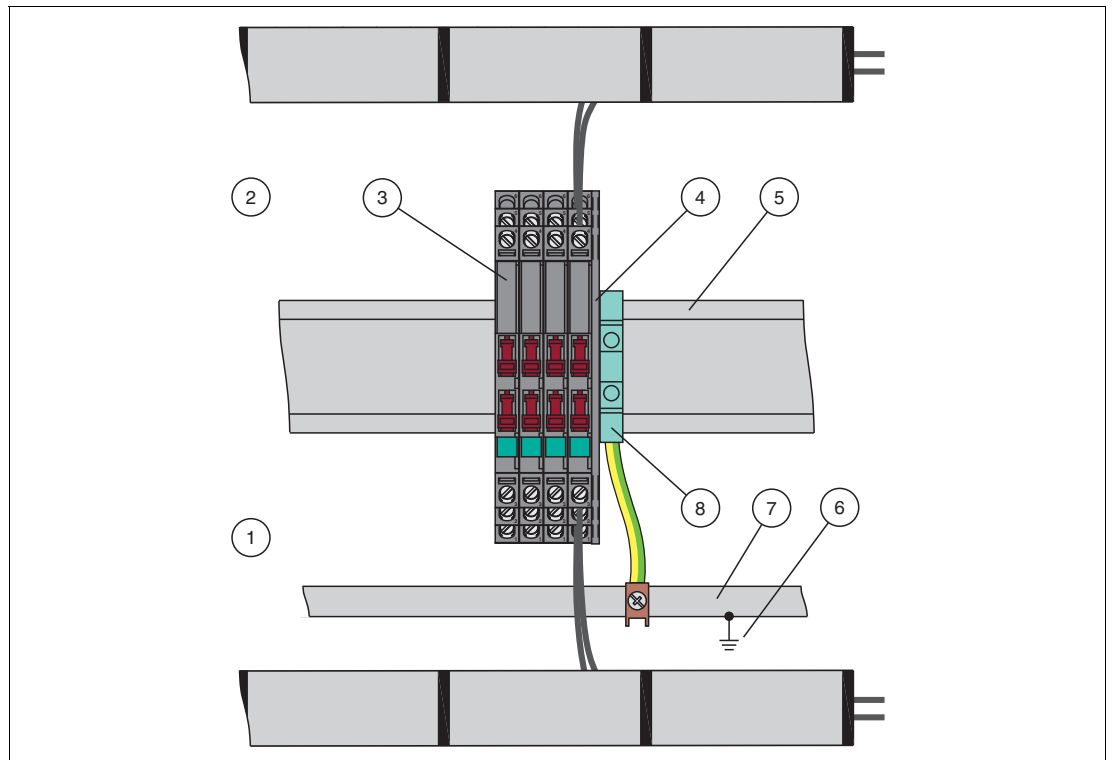


Figure 3.8

- 1 Unprotected side
- 2 Protected side
- 3 Surge protection barriers
- 4 Insulation spacer
- 5 DIN mounting rail
- 6 Earth connection
- 7 Equipotential bonding
- 8 Terminal block USLKG5

Incorrect Ground Connection

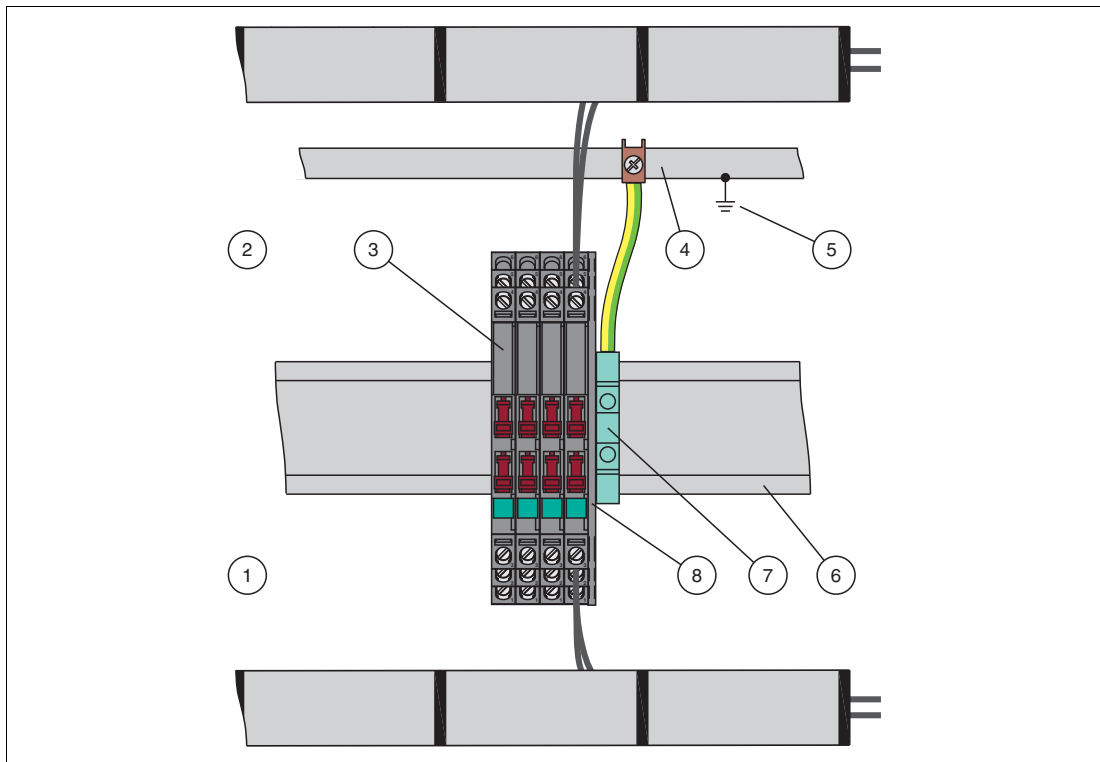


Figure 3.9

- 1 Unprotected side
- 2 Protected side
- 3 Surge protection barriers
- 4 Equipotential bonding
- 5 Earth connection
- 6 DIN mounting rail
- 7 Terminal block USLKG5
- 8 Insulation spacer

Incorrect Ground Connection

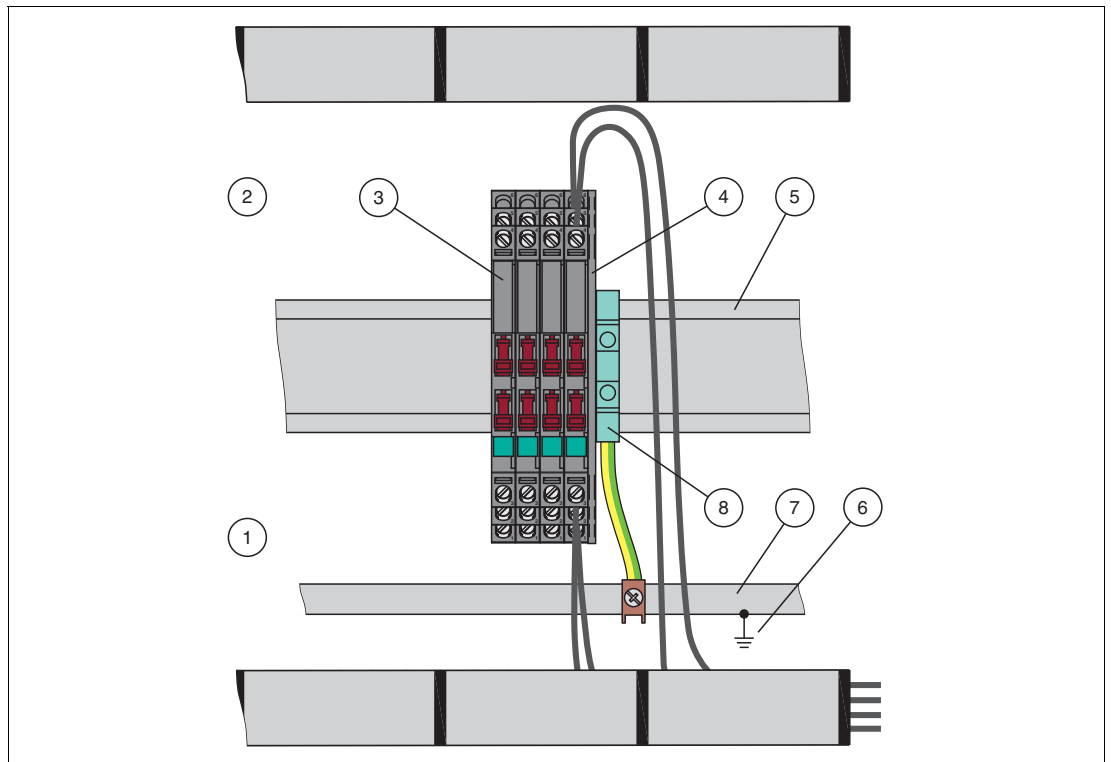


Figure 3.10

- 1 Unprotected side
- 2 Protected side
- 3 Surge protection barriers
- 4 Insulation spacer
- 5 DIN mounting rail
- 6 Earth connection
- 7 Equipotential bonding
- 8 Terminal block USLKG5

3.3 Signal Loops Disconnection for Checking

During commissioning, you can disconnect the signal loops for the following checks.

- Insulation check of the cable on the unprotected side
- Check of the signal loops



Danger!

Explosion hazard from sparking when using operating elements on devices with equipment protection level Gc

Using operating elements in a potentially explosive atmosphere can cause sparks that can ignite the surrounding atmosphere.

Only use operating elements (e. g., switch, slider, button, etc.) in the absence of a potentially explosive atmosphere.



Disconnecting the Signal Loops

Use a suitable screwdriver for disconnecting.

1. Insert the screwdriver (4) into the groove (5) of the disconnect levers.
2. To disconnect the unprotected side on terminal 3, lift disconnect lever 1 (3) until the lever reaches its end position.
3. To disconnect the protected side on terminal 2, lift disconnect lever 2 (2) until the lever reaches its end position.

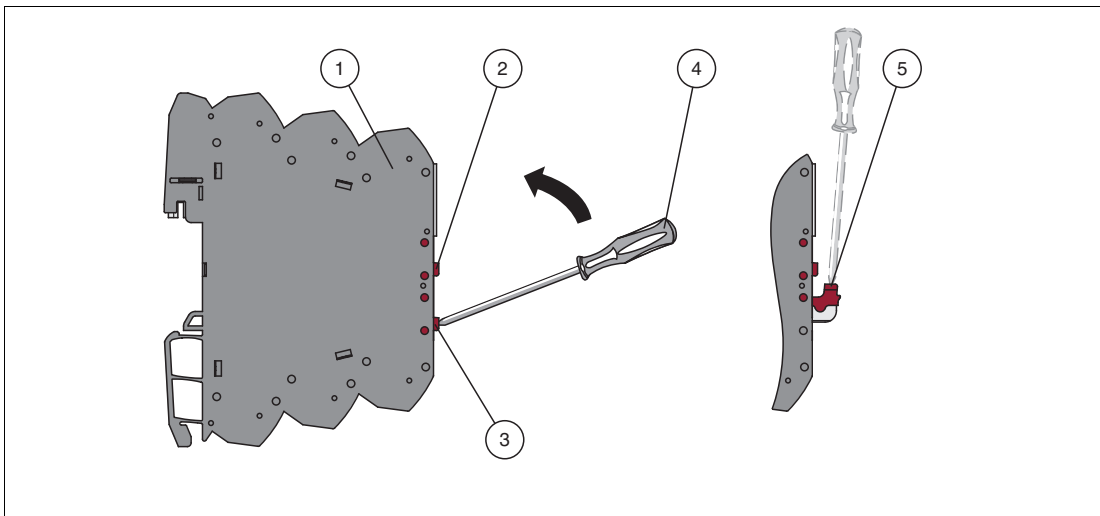


Figure 3.11

- | | |
|---|-----------------------------------|
| 1 | Device |
| 2 | Disconnect lever 2 for terminal 2 |
| 3 | Disconnect lever 1 for terminal 3 |
| 4 | Screwdriver |
| 5 | Groove |



Connecting the Signal Loops

Lower the disconnect levers again after testing is complete.

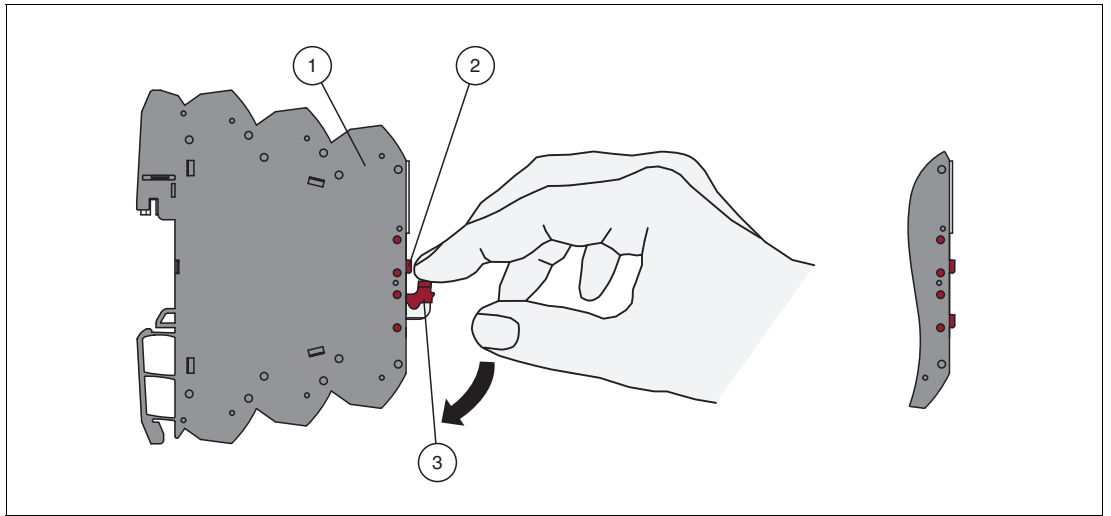


Figure 3.12

4 Operation



Danger!

Explosion hazard from live wiring of non-intrinsically safe circuits

If you connect or disconnect energized circuits in a potentially explosive atmosphere, sparks can ignite the surrounding atmosphere.

Only connect or disconnect energized non-intrinsically safe circuits in the absence of a potentially explosive atmosphere.



Danger!

Explosion hazard from sparking when using operating elements on devices with equipment protection level Gc

Using operating elements in a potentially explosive atmosphere can cause sparks that can ignite the surrounding atmosphere.

Only use operating elements (e. g., switch, slider, button, etc.) in the absence of a potentially explosive atmosphere.

5 Dismounting, Maintenance, and Repair



Danger!

Danger to life from using damaged or repaired devices.

Using a defective or repaired device can compromise its function and its electrical safety.

- Do not use a damaged or polluted device.
- The device must not be repaired, changed or manipulated.
- If there is a defect, always replace the device with an original device from Pepperl+Fuchs.



Caution!

Property damage from use of inappropriate tool

Using an inappropriate tool may damage the housing.

- Use a slot-head screwdriver with a size of 3.0 x 0.5.

5.1 Signal Loops Disconnection for Checking

During maintenance and repair, you can disconnect the signal loops for the following checks.

- Insulation check of the cable on the unprotected side
- Check of the signal loops



Note

See chapter 3.3 for further information.

5.2 Disconnection of the Circuits



Danger!

Explosion hazard from live wiring of non-intrinsically safe circuits

If you connect or disconnect energized circuits in a potentially explosive atmosphere, sparks can ignite the surrounding atmosphere.

Only connect or disconnect energized non-intrinsically safe circuits in the absence of a potentially explosive atmosphere.



Disconnecting Circuits

1. Disconnect the protected signal lines.
2. Disconnect the unprotected signal lines.
3. Disconnect the grounding or the shielding.

The terminals are screw terminals or spring terminals. See figures.



Remove the Cable from the Screw Terminal

1. Loosen the screw of the terminal with the slot-head screwdriver (B).
2. Pull the cable (C) out of the terminal.

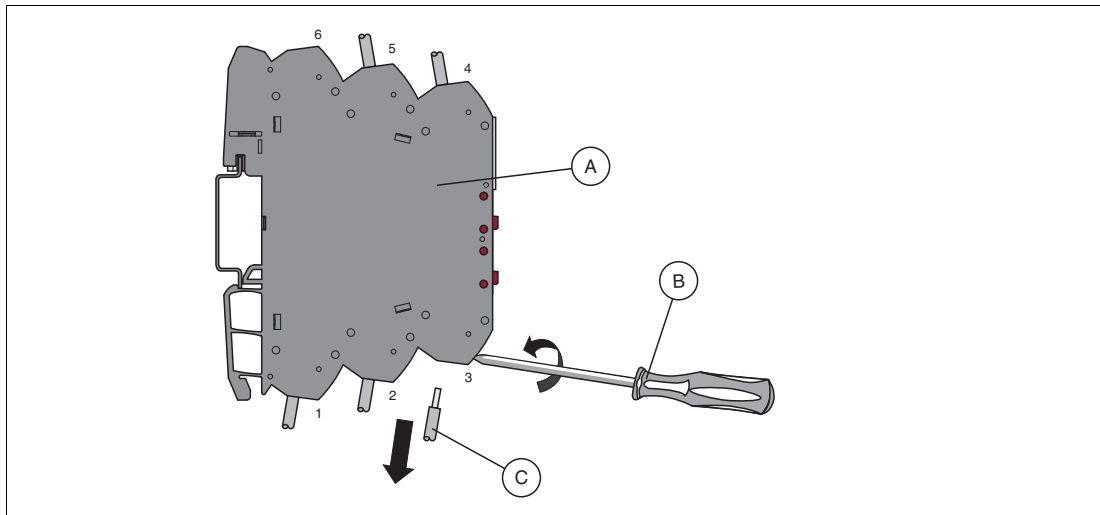


Figure 5.1 Screw terminal connection

- A** Device with screw terminals
- B** Slot-head screwdriver
- C** Cable



Remove the Cable from the Spring Terminal

1. Push the slot-head screwdriver (B) into the terminal on the device (A).
2. Pull the cable (C) out of the terminal.

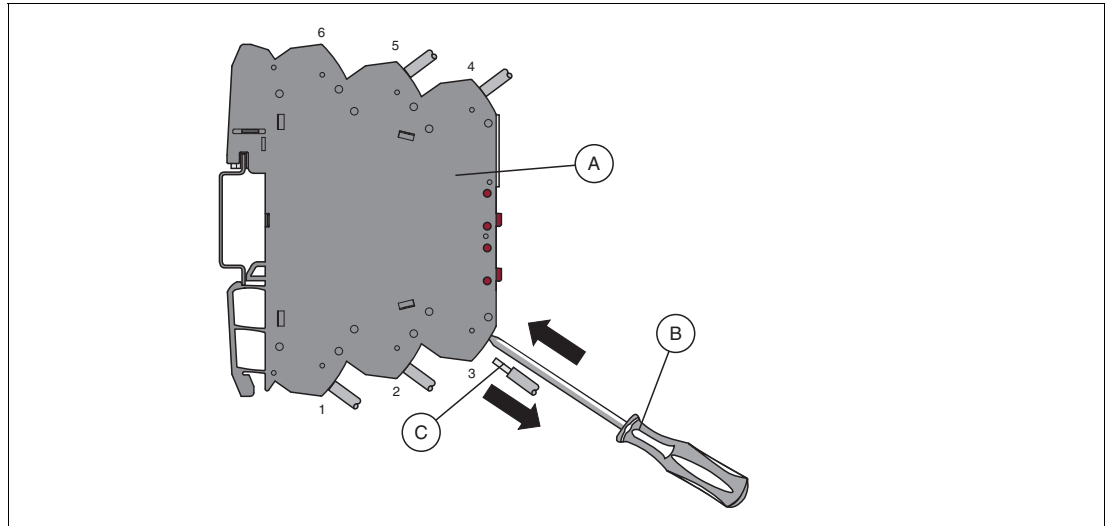


Figure 5.2 Spring terminal connection with push-in connection technology

- A Device with spring terminals with push-in connection technology
- B Slot-head screwdriver
- C Cable



Note

See corresponding datasheets for further information.

5.3 Dismounting



Dismounting the Insulation Spacer

1. Remove the insulation spacer (1) from the DIN mounting rail (2).

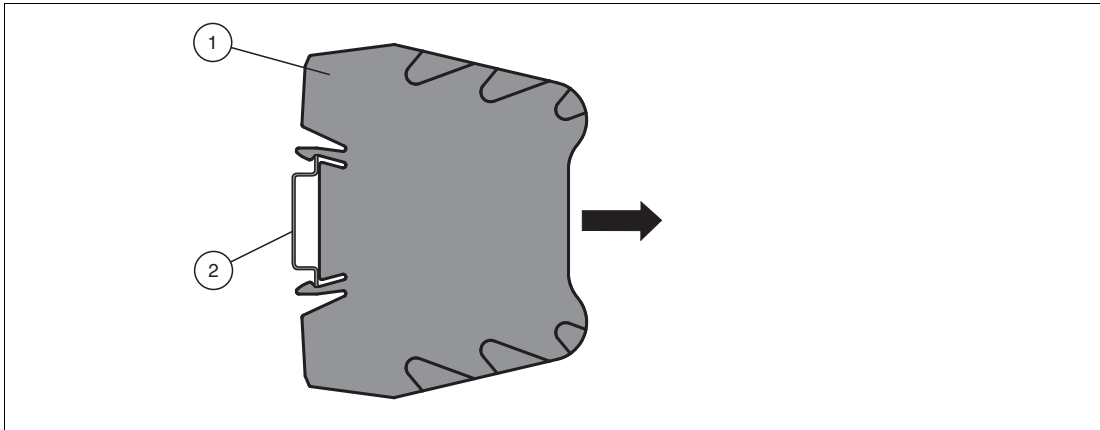


Figure 5.3

- 1 Insulation spacer M-LB-2800
- 2 DIN mounting rail



Dismounting the Surge Protection Barrier

Use a suitable slot-head screwdriver for dismounting the device.

1. Insert the screwdriver (2) into the groove of the mounting bracket (3).
2. Press the screwdriver (2) in the specified direction until the lock on the DIN mounting rail (4) opens, see figure.
3. Remove the device (1) from the DIN mounting rail (4).

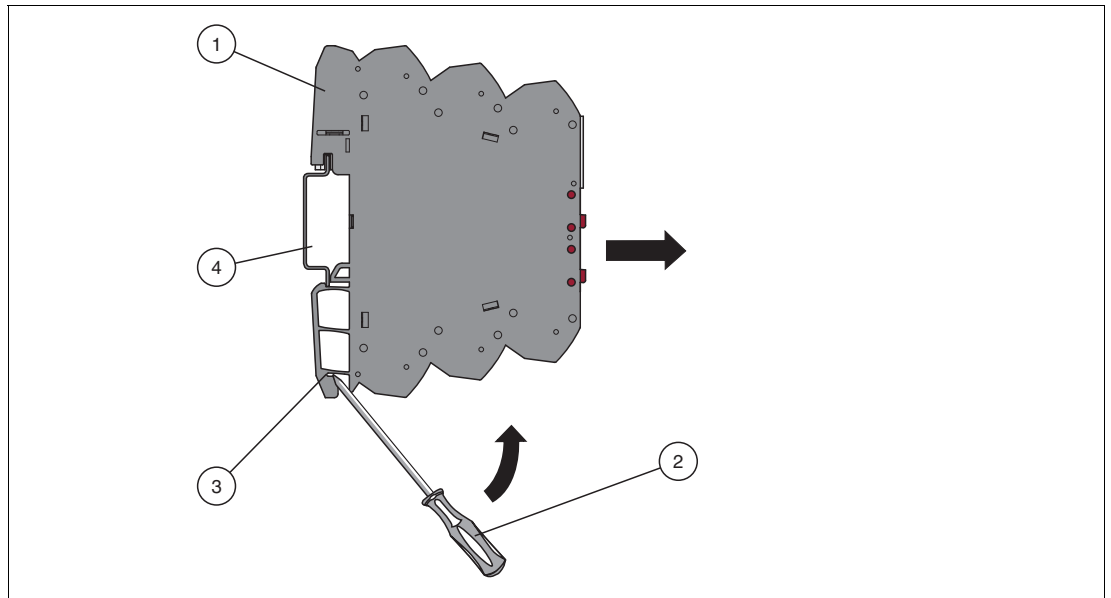


Figure 5.4 Dismounting the device from the DIN mounting rail

- | | |
|---|-----------------------|
| 1 | Device |
| 2 | Slot-head screwdriver |
| 3 | Mounting bracket |
| 4 | DIN mounting rail |

6 Technical Specifications

6.1 Technical Data

Electrical Data

See datasheets

Directive Conformity and Conformity

See datasheets

Ambient Conditions

Ambient temperature

-40 °C to 80 °C (-40 °F to 176 °F), exceptions can be found in the respective datasheets

Storage temperature

-40 °C to 85 °C (-40 °F to 185 °F)

Relative humidity

Max. 95 % without condensation

Corrosive gas durability

according to ISA-S71.04, group A, severity level G3 (harsh)

Altitude

max. 2000 m

Mechanical Data

Mounting

Mounting the device on 35 mm DIN mounting rail according to EN 60715.
Horizontal or vertical "side-by-side" mounting.

Housing material

Polyamide (PA)

Dimensions

For dimensional drawings see chapter 6.3.

Degree of protection

IP20 in accordance with EN 60529 after appropriate installation

Connection

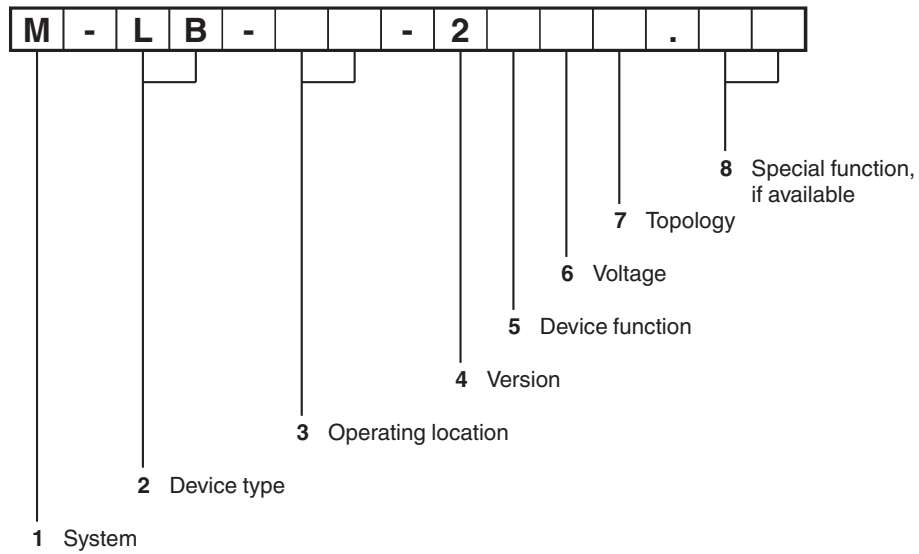
- Rigid cable: core cross section 1 x 2.5 mm² (14 AWG)
- Flexible cable with wire end ferrule: core cross section 1 x 1.5 mm² (16 AWG)

Note

See corresponding datasheets for further information.



6.2 Model Number Description



Position 1	M	M-System
Position 2	LB	Surge protection
Position 3	-	For connection of non-intrinsically safe circuits
	Ex	For connection of intrinsically safe circuits
Position 4	2	Nominal discharge current 5 kA, DIN mounting rail mounting, one-piece
Position 5	1	Surge protection barrier
	8	Insulation spacer
Position 6	0	Not specified
	1	Nominal voltage 1 V DC
	4	Nominal voltage 24 V DC
Position 7	0	Not specified
	2	2 protected signal lines, non-grounded
	4	2 protected signal lines, grounded
Position 8	-	No special function
	SP	Spring terminal connection with push-in connection technology

6.3 Dimensions

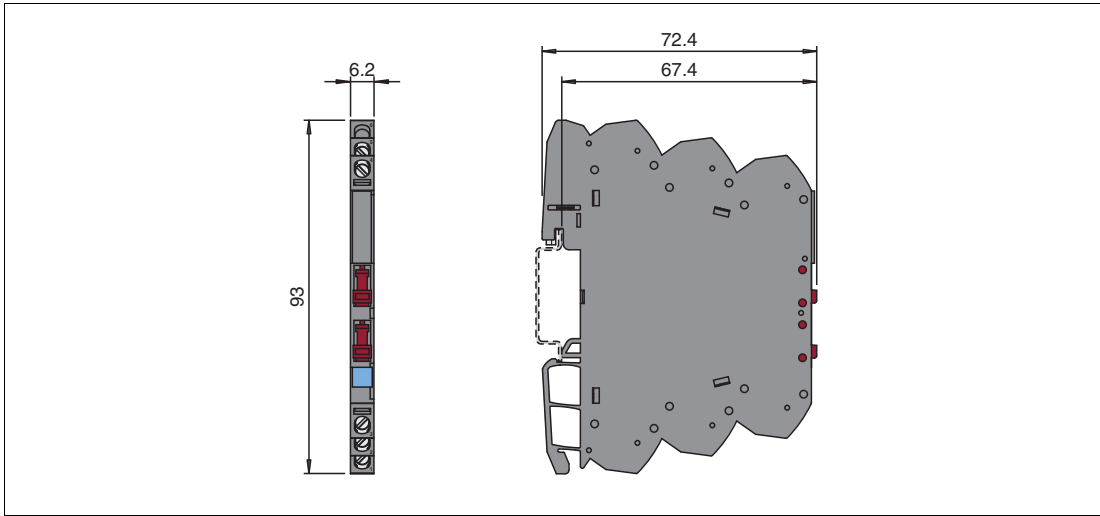


Figure 6.1 Dimensions of M-LB-(Ex-)21** surge protection barrier with screw terminals

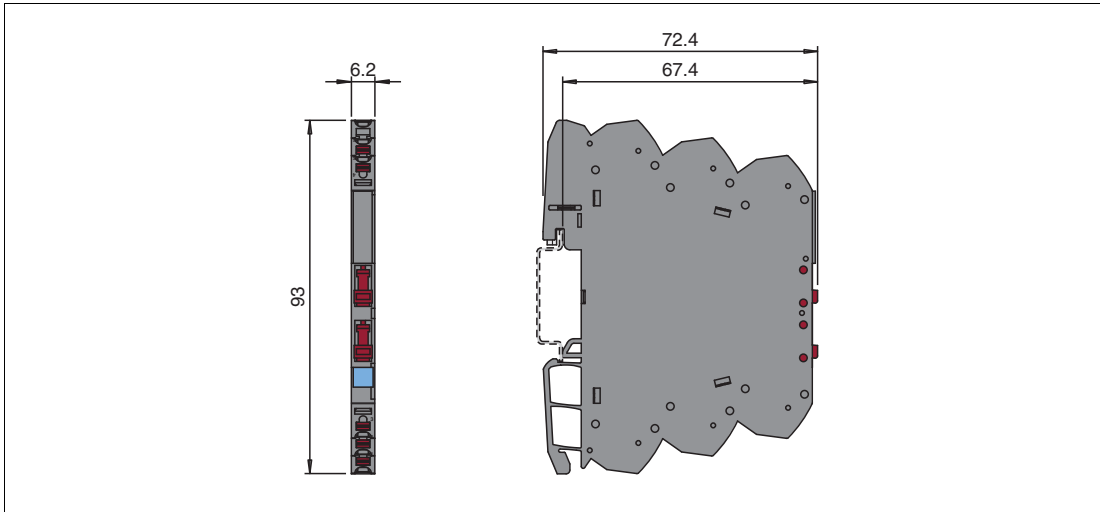


Figure 6.2 Dimensions of M-LB-(Ex-)21**.SP surge protection barrier with spring terminals

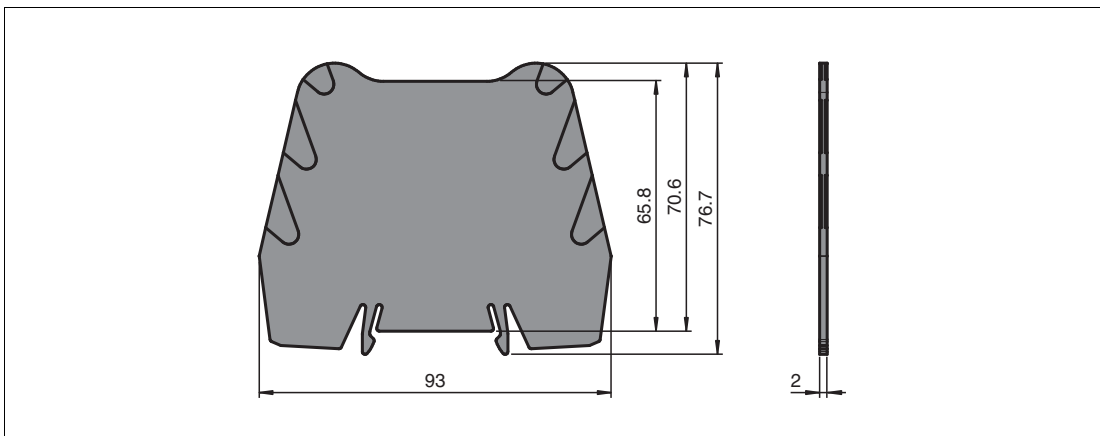


Figure 6.3 Dimensions of M-LB-2800 insulation spacer

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