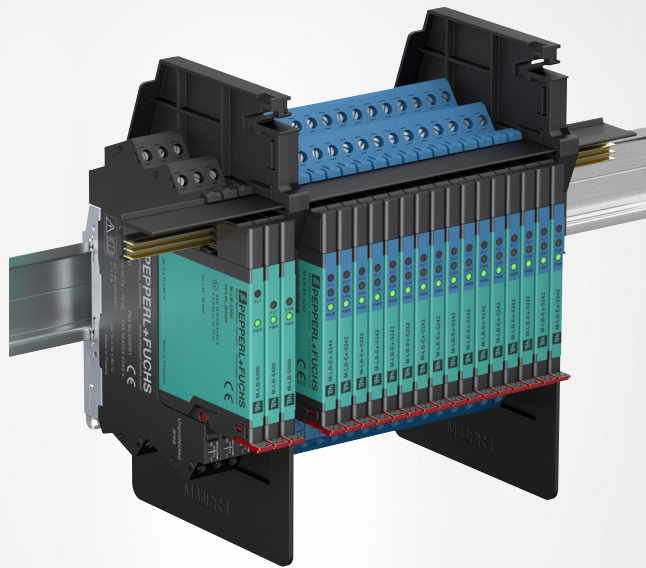


M-LB-(Ex-)5000-System Surge Protection Barriers

Manual



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Your automation, our passion.

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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.

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
- Additional documents

1.2 Target Group, Personnel

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

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting 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-)5000 surge protection system offers a large number of surge protection barriers for a wide variety of applications:

- Protection of 1 or 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
- With or without status indication

The use of the M-LB-(Ex-)5000 surge protection system has the following benefits:

- The devices of the surge protection system 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.
- The surge protection system is modular. The devices consist of a base module and a protection or function module. The protection or function module can be replaced without disconnecting the signal circuit. The signal circuit can be disconnected easily by inserting the protection module rotated 180°.
- The protection and function modules of the surge protection system are equipped with a status indication. This status indication allows the effort of the cyclic testing, which is prescribed according to the standard, to be minimized. The status indication not only shows the fault, but gives a warning before faults even occur. The status indication can be read intuitively due to its traffic-light design.

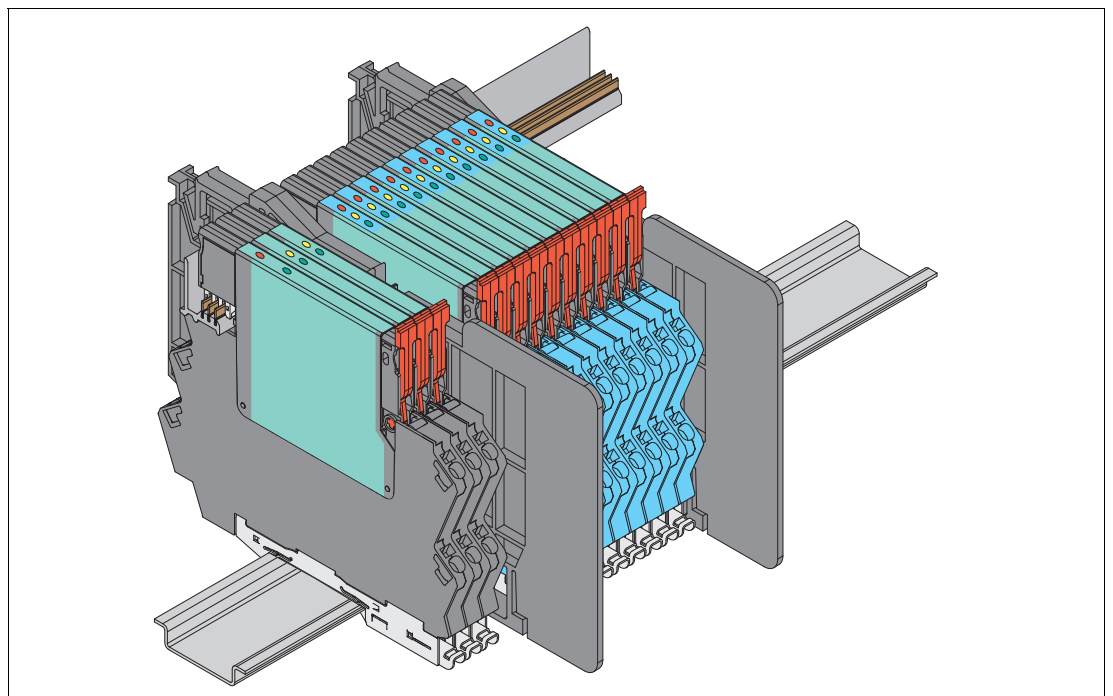


Figure 2.1 Example of surge protection system

2.2 Application

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

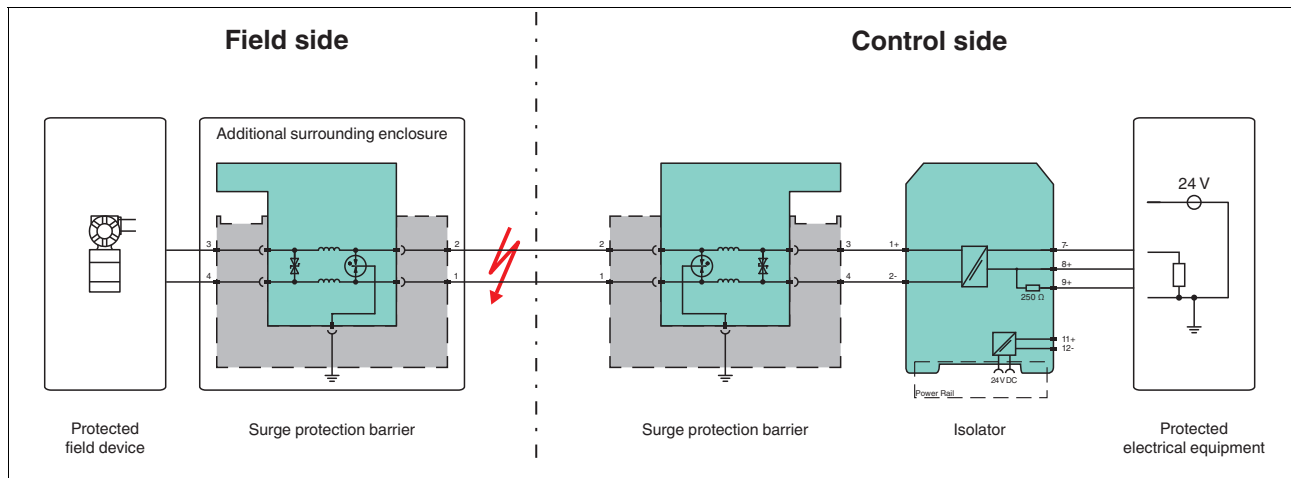


Figure 2.2 Example of an application with isolator

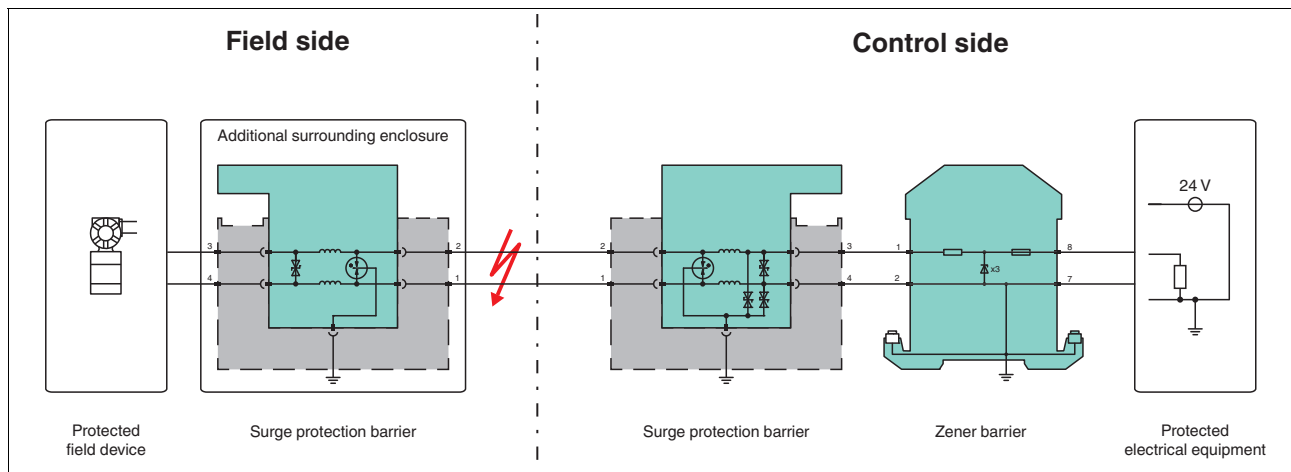


Figure 2.3 Example of an application with zener barrier

The surge protection system can also be used to protect field devices in the hazardous area of zones 0, 1 and 2. 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.

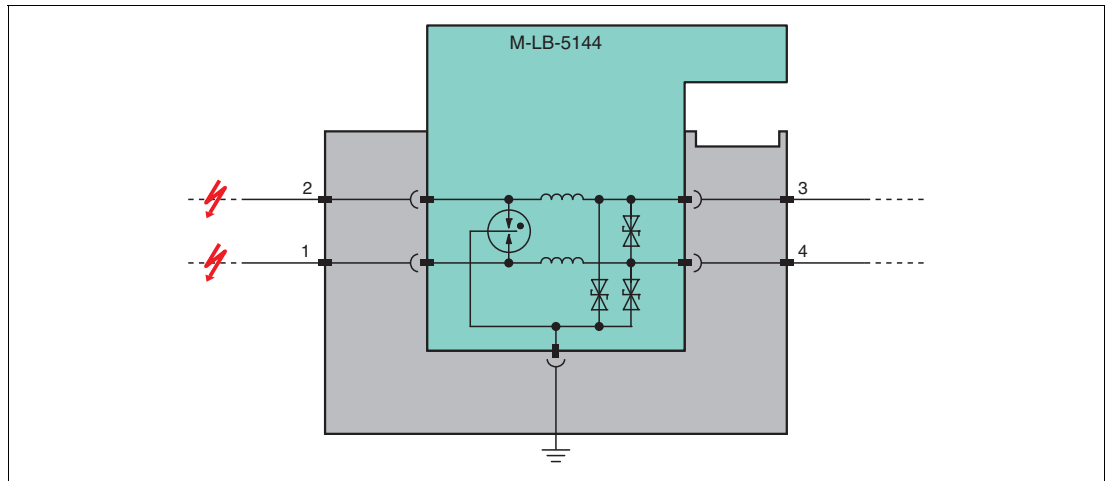


Figure 2.4 Example of a surge protection barrier for grounded signal lines

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 circuit. Typical applications for this device are galvanically isolated signal circuits, 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.

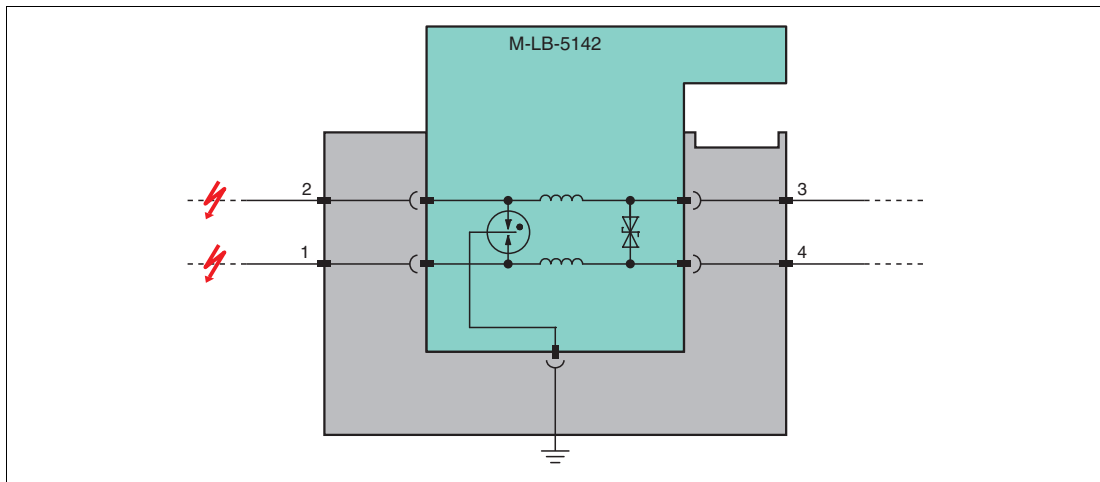


Figure 2.5 Example of a surge protection barrier for not grounded signal lines

2.2.3 Surge Protection Barriers with 2 Protected Signal Lines

Use these surge protection barriers to protect a measurement loop with 2 signal lines (2-wire signal).

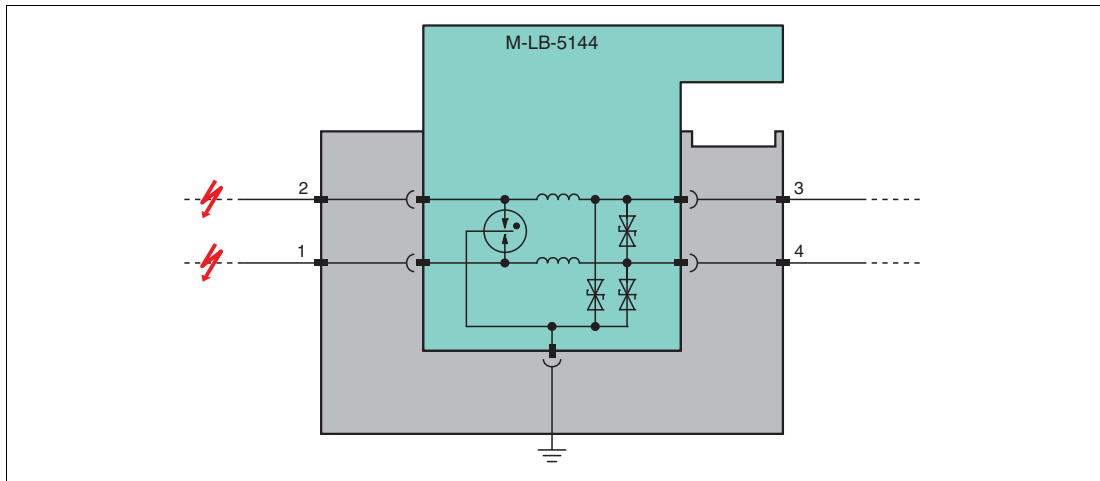


Figure 2.6 Example of a surge protection barrier with 2 protected signal lines

2.2.4 Surge Protection Barriers with 1 Protected Signal Line

Use these surge protection barriers to protect a measurement loop with 3 or more signal lines (multi-wire signal). To ensure a low protection level between all protected signal lines (line – line), several surge protection barriers are connected to each other.

Use these surge protection barriers for 3- or 4-wire resistance thermometers or strain gauge bridges for example.

Use a plug-in jumper for the connection of several surge protection barriers with 1 protected signal line. The plug-in jumper is available as an accessory. See chapter 2.6.

The following figure shows an example for the connection of several surge protection barriers with 1 protected signal line to a signal circuit with 3 protected signal lines for control side protection.

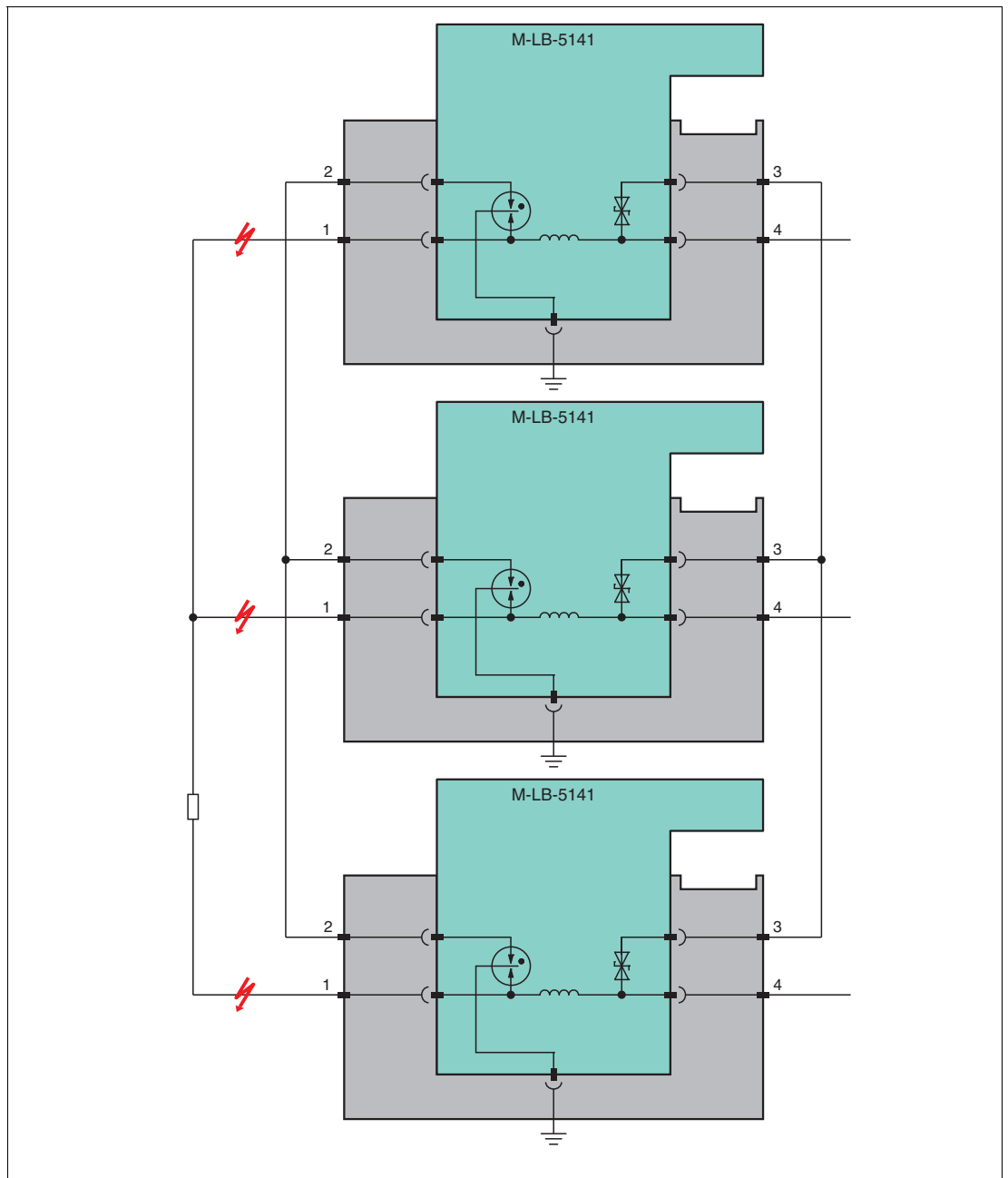


Figure 2.7

The following table shows various connection options.

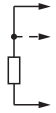

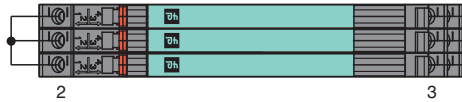
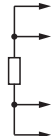
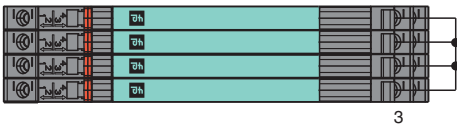
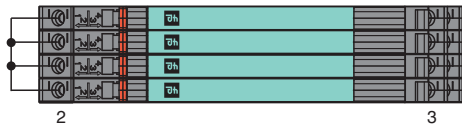
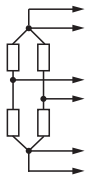
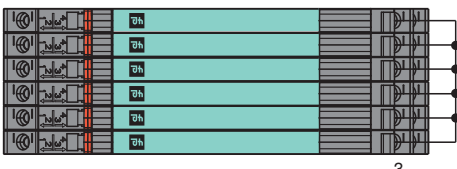

Field device	Connection with grounded signal lines ¹	Connection with not grounded signal lines ²
3-wire connection, e. g. 3-wire resistance thermometer 		
4-wire connection, e. g. 4-wire resistance thermometer 		
6-wire connection, e. g. strain gauge bridge 		

Table 2.1

¹ In the case of protection of several grounded signal lines, the terminals 3 of the base modules must be connected to each other.
² In the case of protection of several not grounded signal lines, the terminals 2 and 3 of the base modules must be connected to each other.

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 System Components

The surge protection system has a modular design and consists of various system components. These system components consist of a base module as a carrier and an inserted module. Depending on the function, the following modules are available:

- Protection module, forms the surge protection barrier together with the base module
- Function modules
 - Fault status module, forms the control interface together with the base module
 - Maintenance status module, forms the control interface together with the base module
 - Power feed module, forms the power supply together with the base module

For the operation of the surge protection system a 35 mm DIN mounting rail in accordance with EN 60715 on the user side is required.

Further system components are available optionally for the operation of the surge protection system:

- Universal Power Rail
- Separation wall
- Place-holder module
- Plug-in jumper

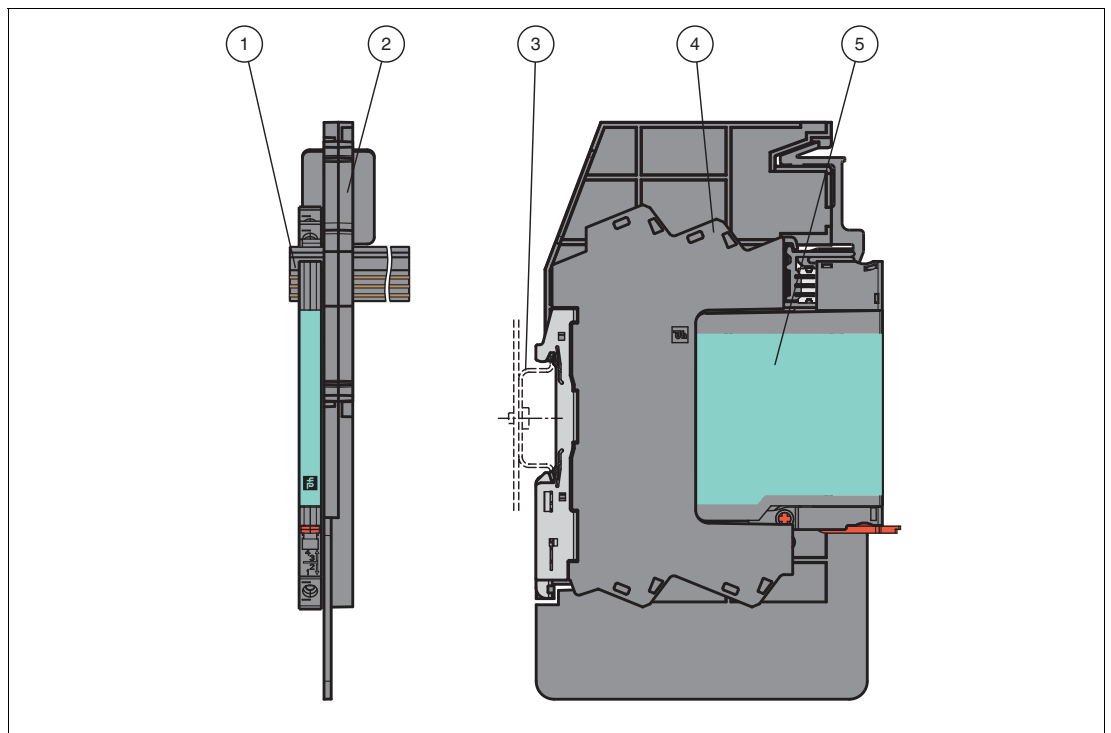


Figure 2.8 System components

- 1 Universal Power Rail
- 2 Separation wall
- 3 DIN mounting rail
- 4 Base module
- 5 Protection module, function module or place-holder module

Note

See corresponding datasheets for further information.



2.4.1 Protection Modules without Status Indication

Function

The protection module 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 circuit voltage during the duration of the overvoltage pulse.

The protection modules are distinguished:

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

The device is inserted onto the base module and forms the surge protection barrier together with the base module.

The device can be replaced without tools by a locking lever.

Assembly

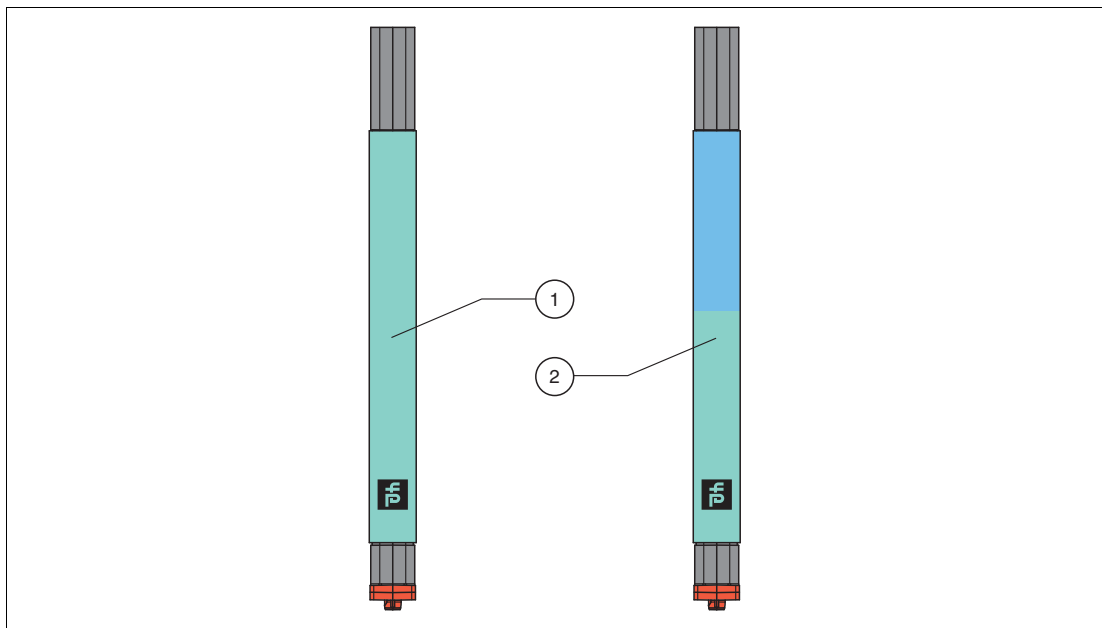


Figure 2.9 Protection modules without status indication

- 1 M-LB-51** protection module for equipment protection level Gc and for connection of non-intrinsically safe circuits
- 2 M-LB-Ex-51** protection module for equipment protection level Gb and for connection of intrinsically safe circuits

Connection

Signal lines (A) and the grounding (B) are directly connected via the plug contacts of the module. The specific connection layout depends on the topology of the module and on the operating location. All connections for module wiring are located on the base module.

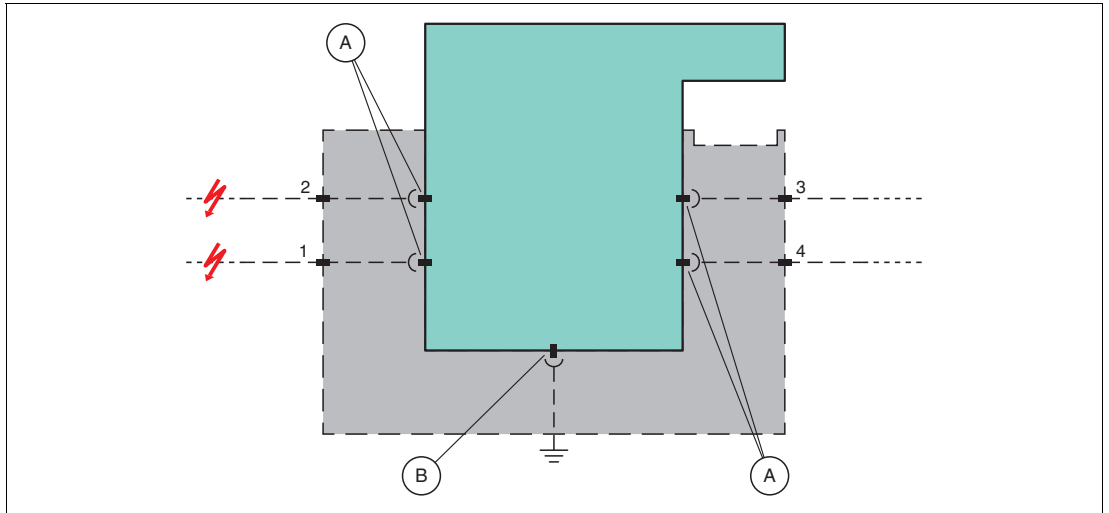


Figure 2.10 Connections of the protection modules without status indication

- A** Connection of the signal lines
- B** Ground connection

2.4.2 Protection Modules with Status Indication

Function

The protection module 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 circuit voltage during the duration of the overvoltage pulse.

The device has LEDs for the status indication. If required, this status is transferred to the corresponding function module via a status indication output.

The protection modules are distinguished:

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

The device is inserted onto the base module and forms the surge protection barrier together with the base module.

The device can be replaced without tools by a locking lever.

Assembly

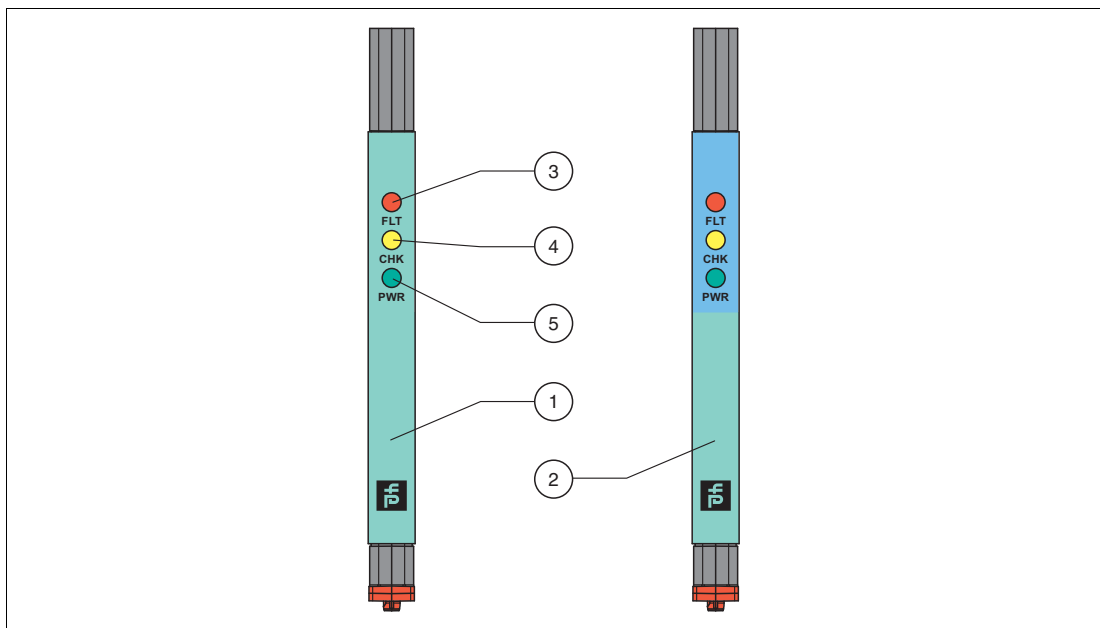


Figure 2.11 Protection modules with status indication

- 1 M-LB-52** protection module with status indication for equipment protection level Gc and for connection of non-intrinsically safe circuits
- 2 M-LB-Ex-52** protection module with status indication for equipment protection level Gc and for connection of intrinsically safe circuits
- 3 Red LED "FLT"
- 4 Yellow LED "CHK"
- 5 Green LED "PWR"

**Note**

For more information on the meaning of the status indications refer to the chapter 4.2.

Connection

These devices have the following connections:

- Signal lines (A) and the grounding (B) are directly connected via the plug contacts of the module. The specific connection layout depends on the topology of the module and on the operating location. All connections for module wiring are located on the base module.
- The modules also have connections to the Universal Power Rail (C). Via these connections the modules are supplied. The fault and maintenance messages are transmitted to the corresponding function module.

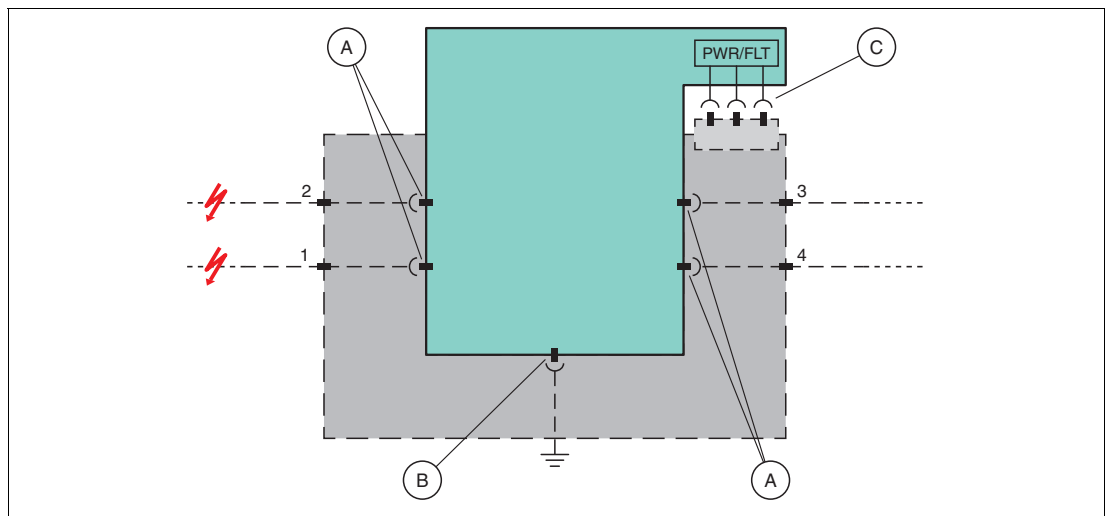


Figure 2.12 Connections of the protection modules with status indication

- A** Connection of the signal lines
B Ground connection
C Connection for fault signal, maintenance signal, and power supply

2.4.3 Power Feed Module

Function

The power feed module supplies the Universal Power Rail with voltage.

The device can supply up to 120 modules.

The device has LEDs for indicating supply status and fault status.

The device is plugged onto the base module and forms the power supply together with the base module.

The device can be replaced without tools by a locking lever.

The device meets the requirements for equipment protection level Gc.

Assembly

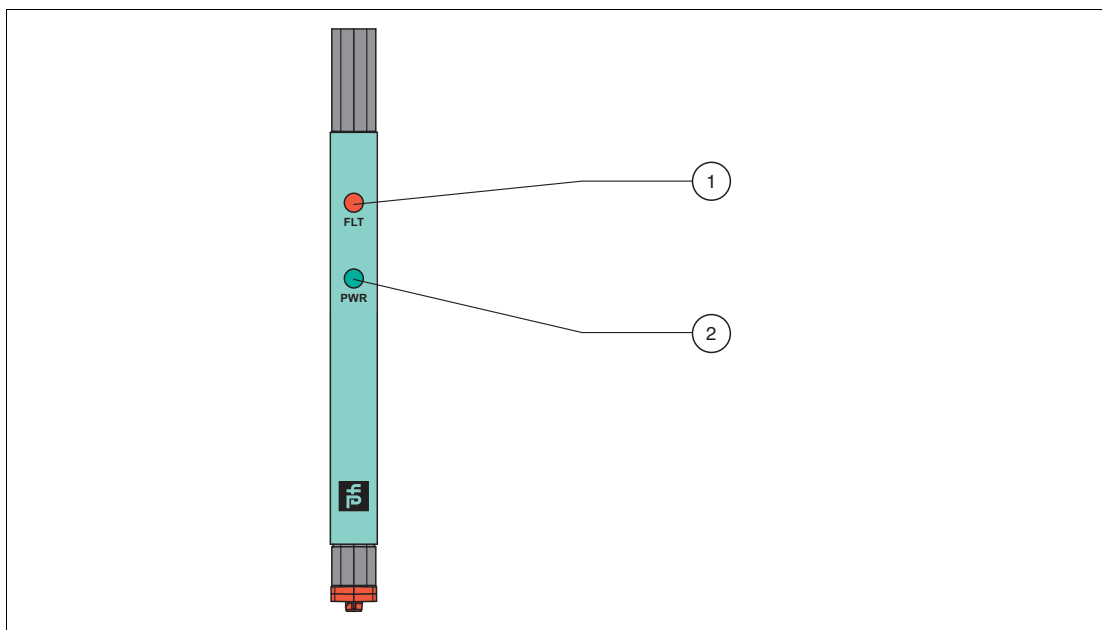


Figure 2.13 M-LB-5300 power feed module

- 1 Red LED "FLT"
- 2 Green LED "PWR"



Note

For more information on the meaning of the status indications refer to the chapter 4.2.

Connection



Caution!

Faulty status indication due to fault or fluctuation of the power supply

An unstable power supply of the power feed module can lead to faulty status indications on the fault status module or on the maintenance status module.

- Ensure that the power supply of the power feed module is stable and properly rated.
- Only use cables with a maximum length of 10 m.
- Only use cables with a minimum wire cross-section of 1 mm².

The device has the following connections:

- The power supply (A) is directly connected via the plug contacts of the modules. All connections for module wiring are located on the base module.
- The modules also have connections to the Universal Power Rail (B). Via these connections the fault status modules, maintenance status modules, and protection modules are supplied.

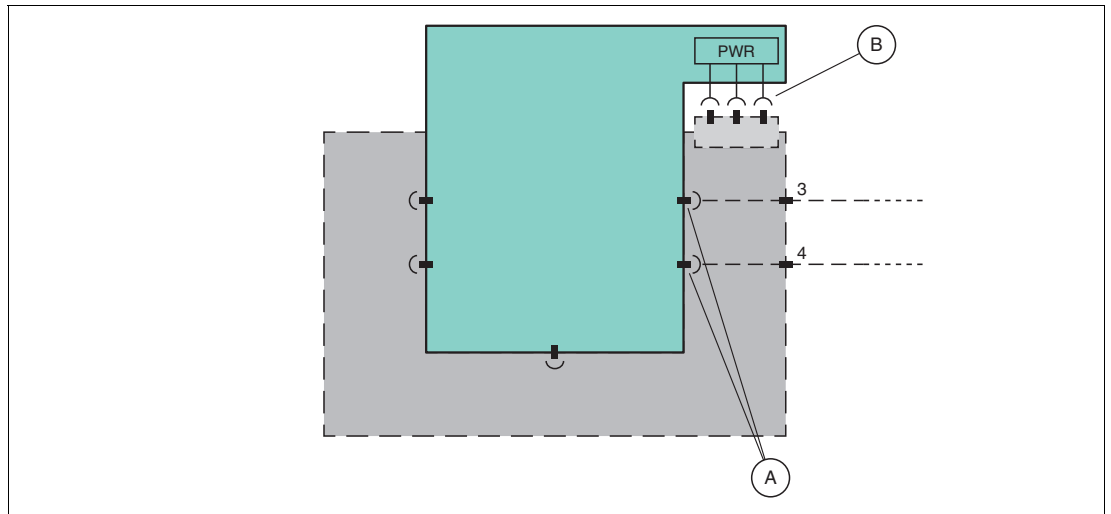


Figure 2.14 Connections of power feed module

- A** Power supply connection
B Power supply connection to the modules

2.4.4 Fault Status Module

Function

The fault status module indicates that a fault has occurred on one of the monitored protection modules.

The status indication is transmitted to the control via the status indication output. The status indication output is performed via a solid state relay.

The device switches if a fault is detected on one of the monitored protection modules.

The device has LEDs for indicating supply status and fault status.

The device is plugged onto the base module and forms the evaluation unit together with the base module.

The device can be replaced without tools by a locking lever.

The device meets the requirements for equipment protection level Gc.

Assembly

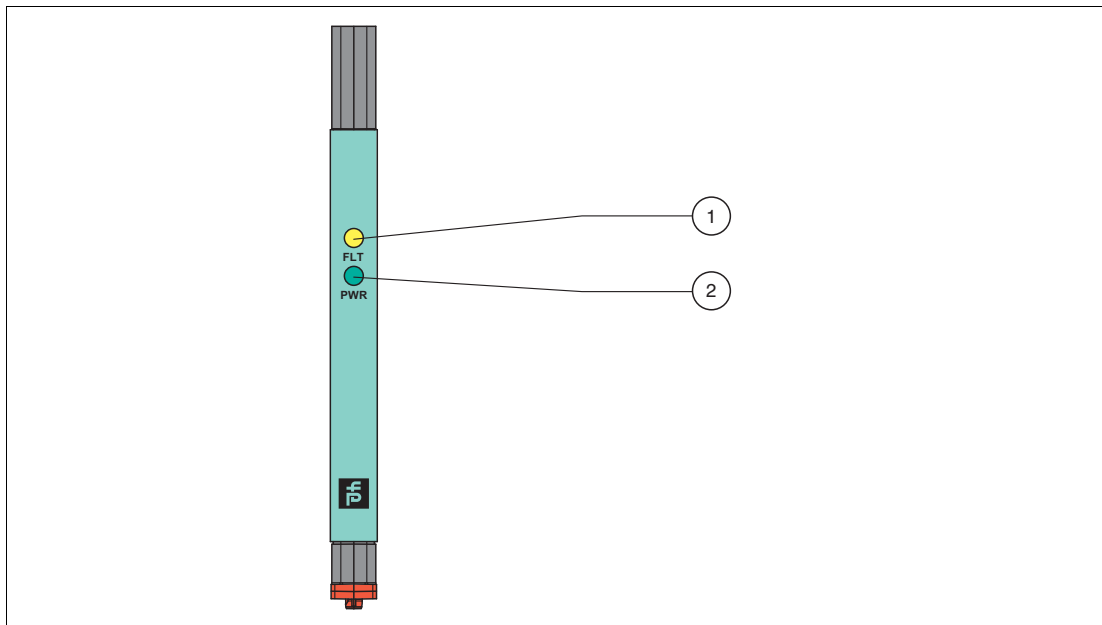


Figure 2.15 M-LB-5400 fault status module

- 1 Yellow LED "FLT"
- 2 Green LED "PWR"

Note

For more information on the meaning of the status indications refer to the chapter 4.2.



Connection

These device has the following connections:

- The status indication output (A) is directly connected via the plug contacts of the modules. All connections for module wiring are located on the base module.
- The modules also have connections to the Universal Power Rail (B). Via these connections the modules are supplied. The fault messages of the protection modules are transmitted.

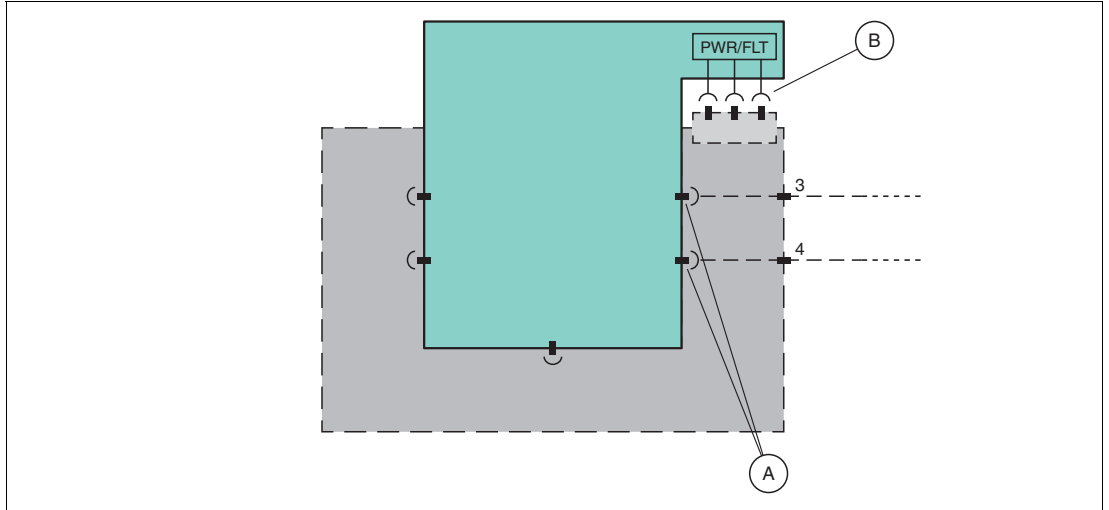


Figure 2.16 Connections of fault status module

- A** Connection of status indication output
- B** Connection for fault signal

2.4.5 Maintenance Status Module

Function

The maintenance status module indicates that the protective effect of one of the monitored protection modules is decreasing and that the protection module is at the end of its service life.

The status indication is transmitted to the control via the status indication output. The status indication output is performed via a solid state relay.

The device switches if a maintenance signal is detected on one of the monitored protection modules.

The device has LEDs for indicating supply status and maintenance status.

The device is plugged onto the base module and forms the evaluation unit together with the base module.

The device can be replaced without tools by a locking lever.

The device meets the requirements for equipment protection level Gc.

Assembly

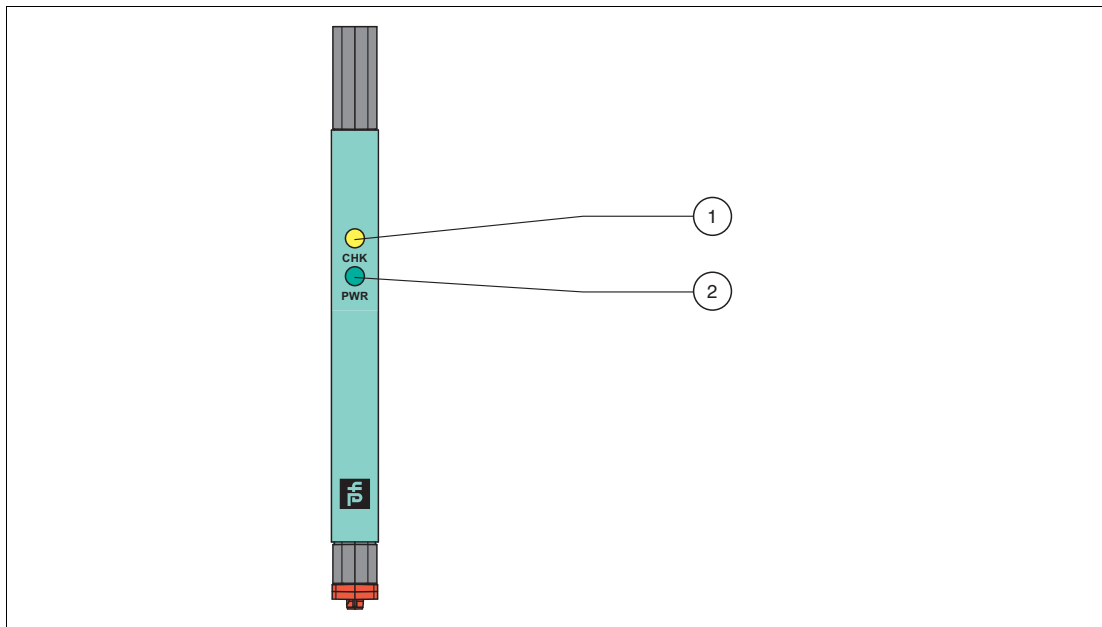


Figure 2.17 M-LB-5500 maintenance status module

- 1 Yellow LED "CHK"
- 2 Green LED "PWR"

Note

For more information on the meaning of the status indications refer to the chapter 4.2.



Connection

The device has the following connections:

- The status indication output (A) is directly connected via the plug contacts of the modules. All connections for module wiring are located on the base module.
- The modules also have connections to the Universal Power Rail (B). Via these connections the modules are supplied. The maintenance messages of the protection modules are transmitted.

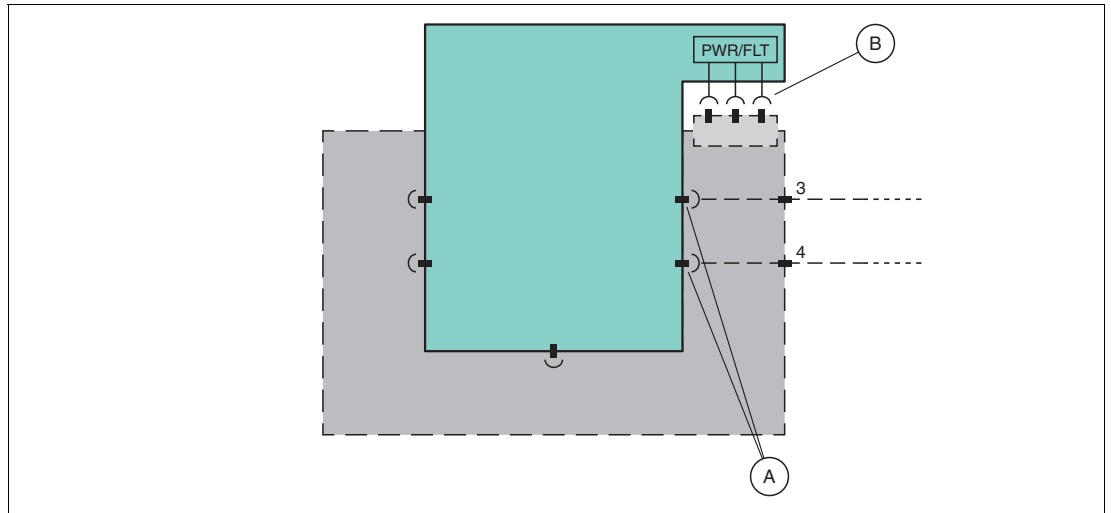


Figure 2.18 Connections of the maintenance status module

- A** Connection of status indication output
- B** Connection for maintenance signal

2.4.6 Base module

Function

The base module is the base for the modules of the surge protection system:

- Protection modules
- Function modules
- Place-holder modules

These modules are connected to the base module.

The base modules are distinguished:

- By the type of connection
 - Signal line connection via screw terminals
 - Signal line connection via spring terminals with push-in connection technology
- By operating location and area of application
 - Black base modules for equipment protection level Gc and for connection of non-intrinsically safe circuits
 - Blue base modules for equipment protection level Gb and for connection of intrinsically safe circuits

The base modules are 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 base module 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 base module.

The protected and unprotected signal lines are connected to the base module. The base module itself does not contain any components that are required for the protective circuit.

Assembly

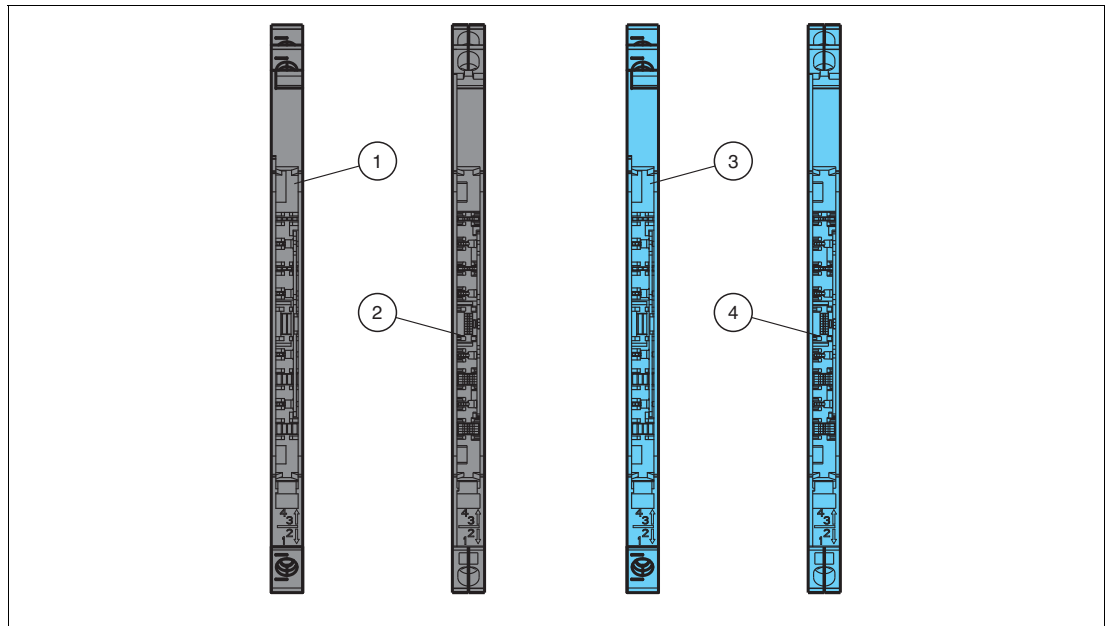


Figure 2.19 Base modules

- 1 M-LB-5000 base module with screw terminals for equipment protection level Gc and for connection of non-intrinsically safe circuits
- 2 M-LB-5000.SP base module with spring terminals for equipment protection level Gc and for connection of non-intrinsically safe circuits
- 3 M-LB-Ex-5000 base module with screw terminals for equipment protection level Gb and for connection of intrinsically safe circuits
- 4 M-LB-Ex-5000.SP base module with spring terminals for equipment protection level Gb and for connection of intrinsically safe circuits

Connection

The device has the following connections:

- The unprotected signal lines are connected to terminals 1 and 2 (A). The protected signal lines are connected to terminals 3 and 4 (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 terminals of the base module are suitable for the connection of conductors and plug-in jumpers.

- The base module is equipped with a ground connection (C). If the base module is plugged onto the DIN mounting rail, the grounding connection is established. The surge protection barrier is grounded.

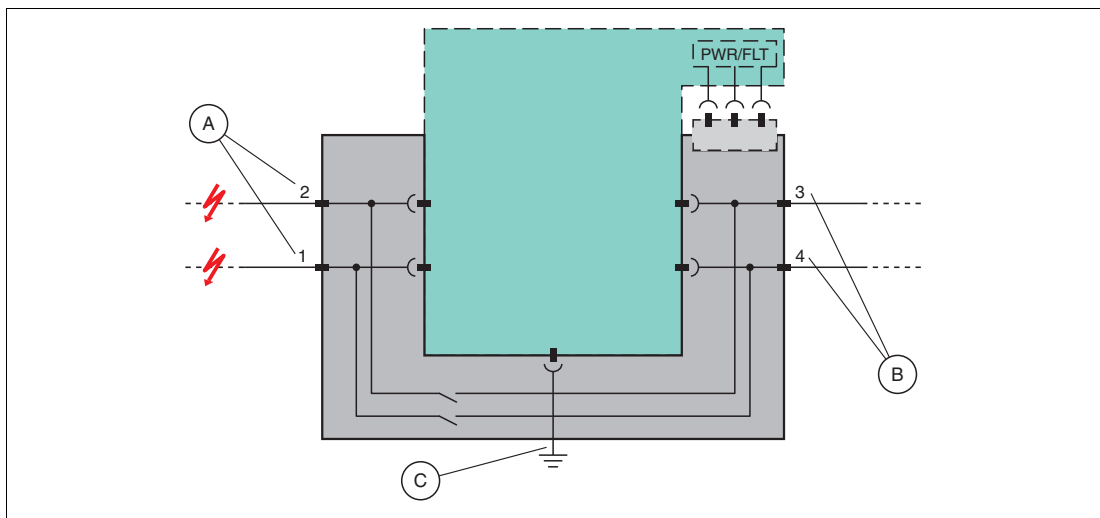


Figure 2.20 Base module connections

- A** Connection of the unprotected signal lines
- B** Connection of the protected signal lines
- C** Ground connection

2.5 Marking

The protection modules and the function modules come from the factory equipped with a marking in the form of a QR code. The marking is located on the locking lever and includes the serial number.

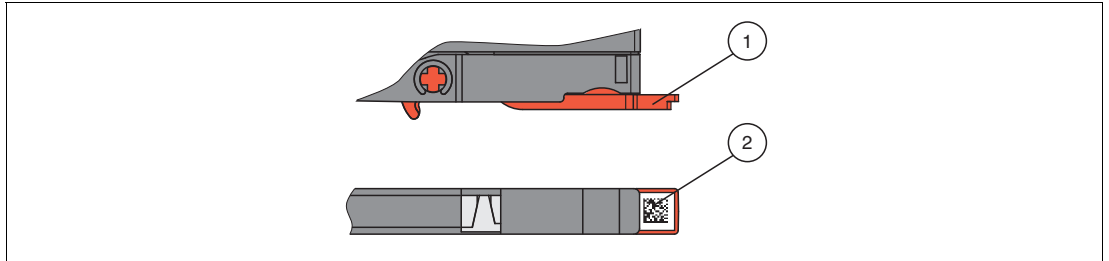


Figure 2.21 Marking

- 1 Locking lever
- 2 QR code

2.6 Accessories

Universal Power Rail

The Universal Power Rail connects the plugged modules of the surge protection system. The component transfers a fault or maintenance signal from the protection modules to the function modules.

The control interfaces and the protective modules with status indication are supplied with voltage via the Universal Power Rail.

The component is an insert with 3 conductors.

The component is supplied in a standard length of 0.8 m and can be shortened to any length.

The component is inserted into the base module and fixed in the base module using the fastener of the separation wall.

In conjunction with the modules of the surge protection system, the component can be mounted in areas requiring the equipment protection level Gc.

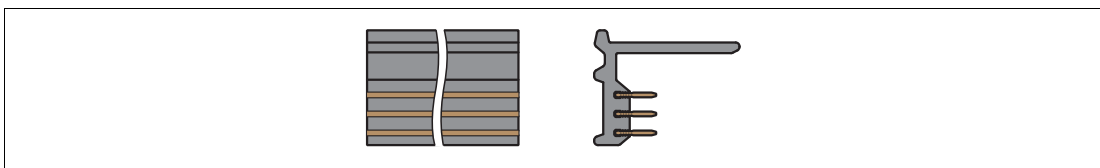


Figure 2.22 Universal Power Rail M-UPR-03-S

Separation Wall

The component is mounted on the DIN mounting rail between surge protection barriers, power supplies, and evaluation units, to ensure a separation distance of 50 mm between the intrinsically safe circuits and the non-intrinsically safe circuits.

A fastener is enclosed with the component. This fastener is required to fix the Universal Power Rail into the base module.

The component is mounted on a 35 mm DIN mounting rail according to EN 60715.

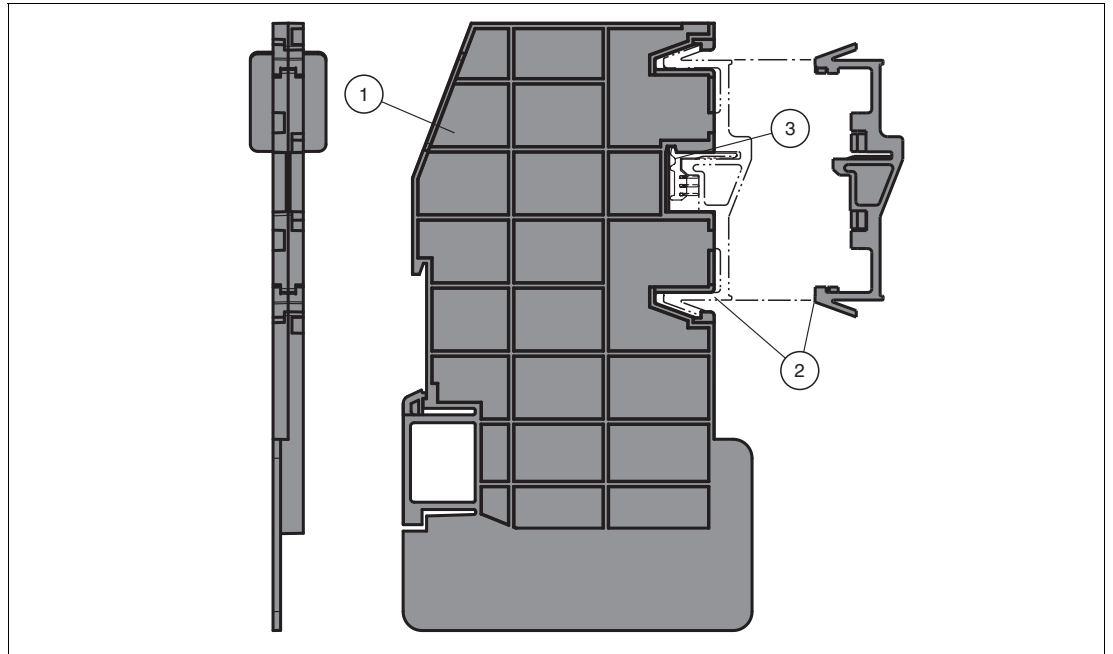


Figure 2.23 M-UPR-I separation wall with fastener

- 1 M-UPR-I separation wall
- 2 Fastener
- 3 Universal Power Rail M-UPR-03-S

Place-Holder Module

The device is a place holder for a protection module or a function module.
The device has no function.

The place-holder modules differ according to their field of application

- Place-holder modules with a green marking for equipment protection level Gc
- Place-holder modules with a blue marking for equipment protection level Gc or Gb

The place-holder module does not have any connections. The device has no function.

The device is inserted onto the base module and protects the wired base module against contamination.

The device can be replaced without tools by a locking lever.

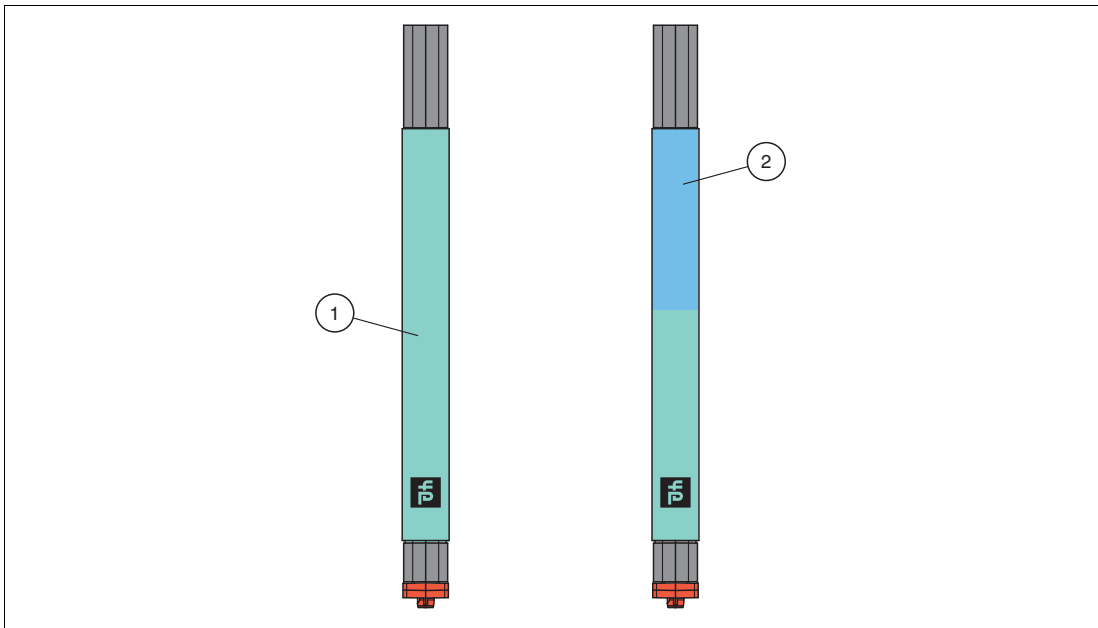


Figure 2.24 Place holder modules

- 1 M-LB-5900 place holder module for equipment protection level Gc
- 2 M-LB-Ex-5900 place holder module for equipment protection level Gc or Gb

Plug-In Jumper

The plug-in jumper connects multiple protection modules with 1 protected signal line.
The number of poles of the plug-in jumper is dependent on the number of protection modules to be connected, e.g., 3-wire measurement = 3 poles, 6-wire measurement = 6 poles.
See chapter 2.2.4.

Terminal Block

The USLKG5 terminal block is an accessory used for the equipotential bonding via the DIN mounting rail. See chapter 3.2.2.

DIN Mounting Rail, on the User Side

The base modules are mounted on a 35 mm DIN mounting rail according to EN 60715.

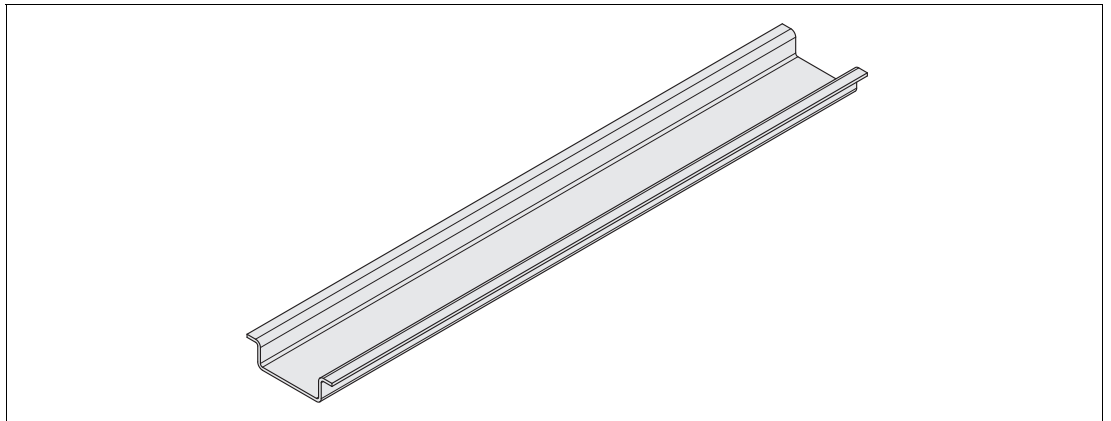


Figure 2.25 Example: DIN mounting rail (35 mm x 7.5 mm)



Note

See corresponding datasheets for further information.

3 Installation

3.1 Mounting of the System Components



Danger!

Explosion hazard from wrong mounting

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

- Only mount a surge protection barrier that is approved for this equipment protection level.
- Only mount a protection module that is approved for this equipment protection level. Only use approved system components for 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 combine a blue basic module with a blue marked protection module for intrinsically safe circuits.
- Ensure that you observe the separation distances between adjacent intrinsically safe circuits and non-intrinsically safe circuits according to IEC/EN 60079-14. Use the separation wall to maintain the separation distances.
- Always mount the base modules in the same orientation on the DIN mounting rail.
- Mount the surge protection barrier for intrinsically safe applications only in an environment that ensures a pollution degree 2 (or better) according to IEC/EN 60664-1.
- Observe the derating of the current depending on the ambient temperature.

Mounting in Non-Hazardous Areas

Mounting the Base Module

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

Clip the base module (1) onto the DIN mounting rail (2). See Figure 3.1.

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

Mounting the Separation Wall

Clip the separation wall (1) onto the DIN mounting rail (2). See Figure 3.2.

Installing the Universal Power Rail

1. The Universal Power Rail (3) is supplied in a standard length of 0.8 m. If you require a different length, shorten the Universal Power Rail.
2. Place the Universal Power Rail (3) into the slot on the base module (1). See Figure 3.3.
3. Secure the Universal Power Rail (3) by mounting the fastener (4) of the separation wall (2).



Mounting the Module



Caution!

Damage to the module during mounting

Incorrect mounting of the module may result in damage to the module.

Open the locking lever before inserting the module. See Figure 3.4

"Module" refers to all modules that can be plugged into the base module:

- Protection modules
- Function modules
- Place-holder modules

1. Observe the correct mounting position and the correct adjustment of the contacts on the Universal Power Rail (3). For other mounting positions of the protection modules see chapter 4.1.
2. Open the locking lever (5).
3. Carefully insert the module (4) into the base module (1) until the module engages. See Figure 3.4
4. Press the red locking lever (5) upward to the end position

↳ The module (4) is fixed into the base module (1).

Mounting in Areas that Require the Equipment Protection Level Gc

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



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 wrong mounting

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 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.



Mounting the Base Module

Clip the base module (1) onto the DIN mounting rail (2).

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

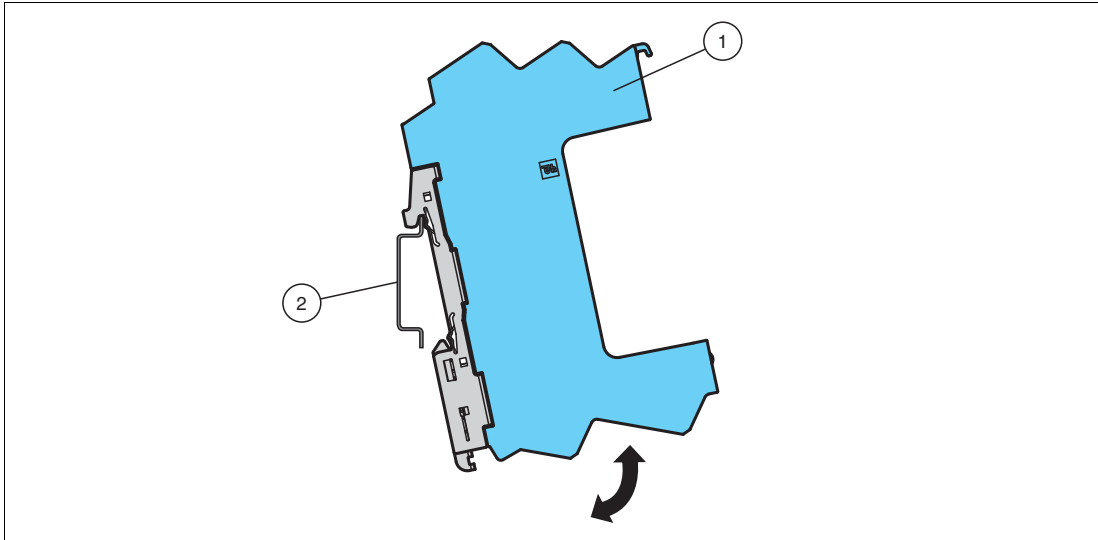


Figure 3.1 Mounting the base module onto the DIN mounting rail

- 1 Base module
- 2 DIN mounting rail



Mounting the Separation Wall

Clip the separation wall (1) onto the DIN mounting rail (2).

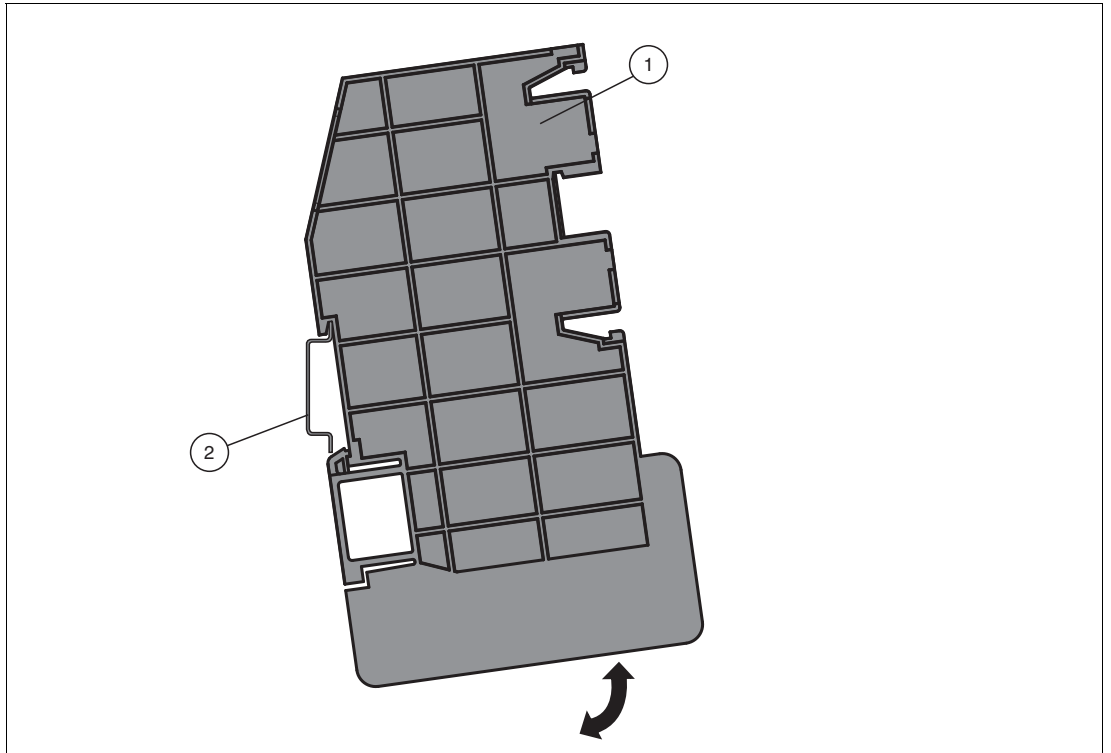


Figure 3.2 Mounting the separation wall onto the DIN mounting rail

- 1 M-UPR-I separation wall
- 2 DIN mounting rail



Installing the Universal Power Rail

1. The Universal Power Rail (3) is supplied in a standard length of 0.8 m. If you require a different length, shorten the Universal Power Rail.
2. Place the Universal Power Rail (3) into the slot on the base module (1). See the figure below.
3. Secure the Universal Power Rail (3) by mounting the fastener (4) of the separation wall (2).

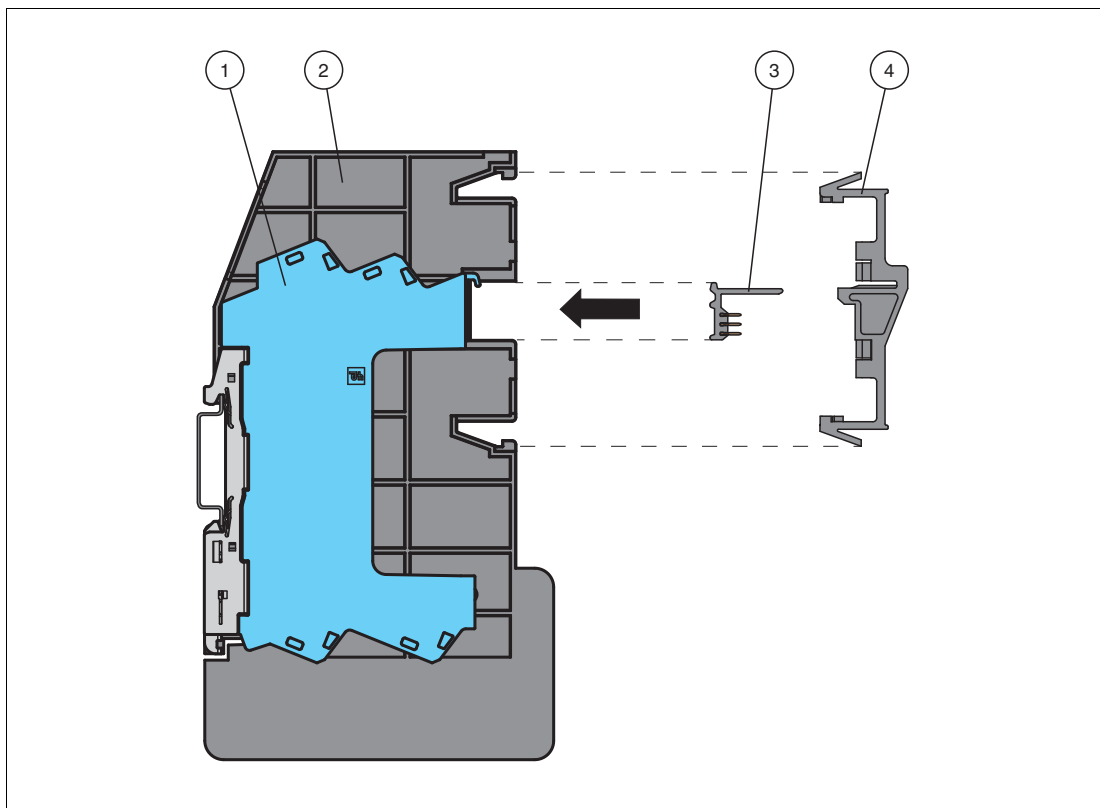


Figure 3.3 Mounting the Universal Power Rail

- 1 Base module
- 2 M-UPR-I separation wall
- 3 Universal Power Rail M-UPR-03-S
- 4 Fastener



Mounting the Module



Caution!

Damage to the module during mounting

Incorrect mounting of the module may result in damage to the module.

Open the locking lever before inserting the module. See Figure 3.4

"Module" refers to all modules that can be plugged into the base module:

- Protection modules
- Function modules
- Place-holder modules

1. Observe the correct mounting position and the correct adjustment of the contacts on the Universal Power Rail (3). For other mounting positions of the protection modules see chapter 4.1.
2. Open the locking lever (5).
3. Carefully insert the module (4) into the base module (1) until the module engages.
4. Press the red locking lever (5) up to the end position

↳ The module (4) is fixed into the base module (1).

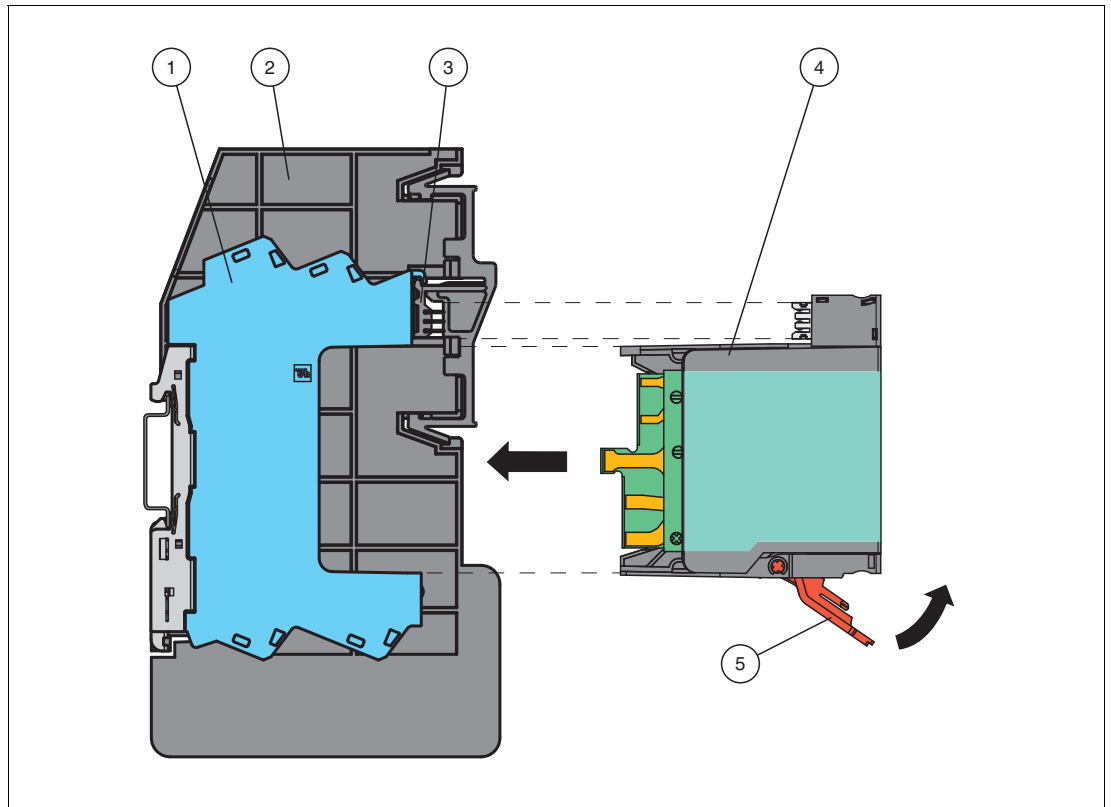


Figure 3.4 Mounting the module

- | | |
|---|---------------------------------|
| 1 | Base module |
| 2 | M-UPR-I separation wall |
| 3 | Universal Power Rail M-UPR-03-S |
| 4 | Module |
| 5 | Locking lever |

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 3.5 x 0.5.
- Observe the tightening torque of the terminal screws. The tightening torque is 0.5 Nm to 0.6 Nm.

Cable Specification of the Base Module in Conjunction with the Power Feed Module



Caution!

Faulty status indication due to fault or fluctuation of the power supply

An unstable power supply of the power feed module can lead to faulty status indications on the fault status module or on the maintenance status module.

- Ensure that the power supply of the power feed module is stable and properly rated.
- Only use cables with a maximum length of 10 m. Only use cables with a minimum core cross section of 1 mm².
- If you connect less than 33 modules, you can use cables with a maximum cable length of 20 m. If you want to use longer cables, adapt the core cross section proportionally.



Connecting the Circuits

1. Connect the protected signal lines of the protection modules to terminals 3 and 4 of the base module.
 2. Connect the unprotected signal lines of the protection modules to terminals 1 and 2 of the base module.
 3. Connect the function modules to terminals 3 and 4 on the base module.
- The connection 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 base module (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.

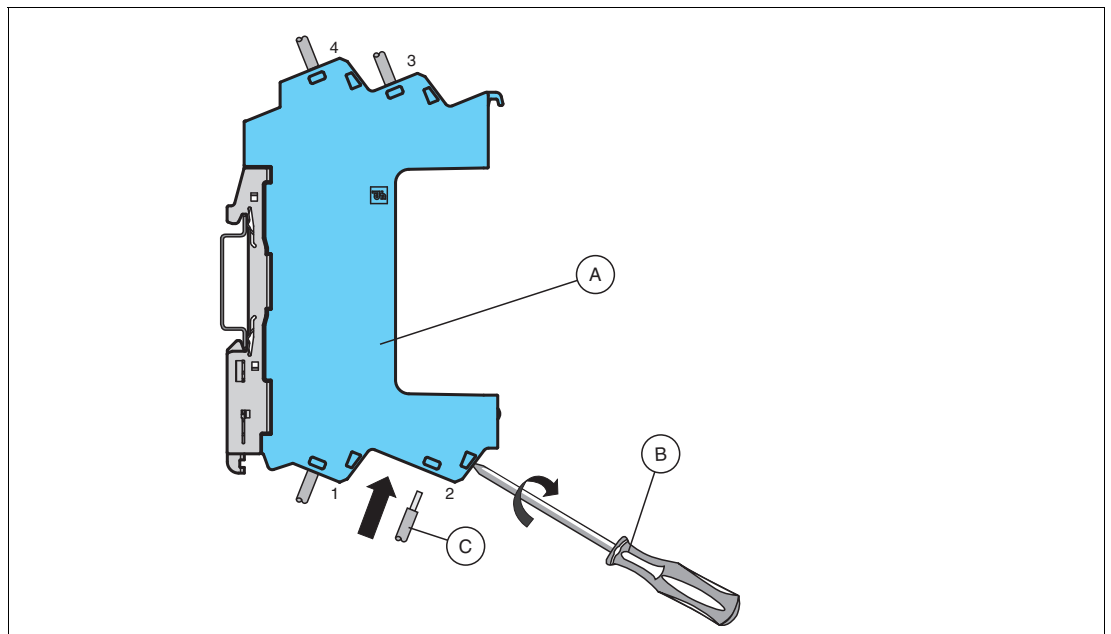


Figure 3.5 Screw terminal connection

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



Connecting the Cable via the Spring Terminal

Push the cable (B) into the terminal on the base module (A).

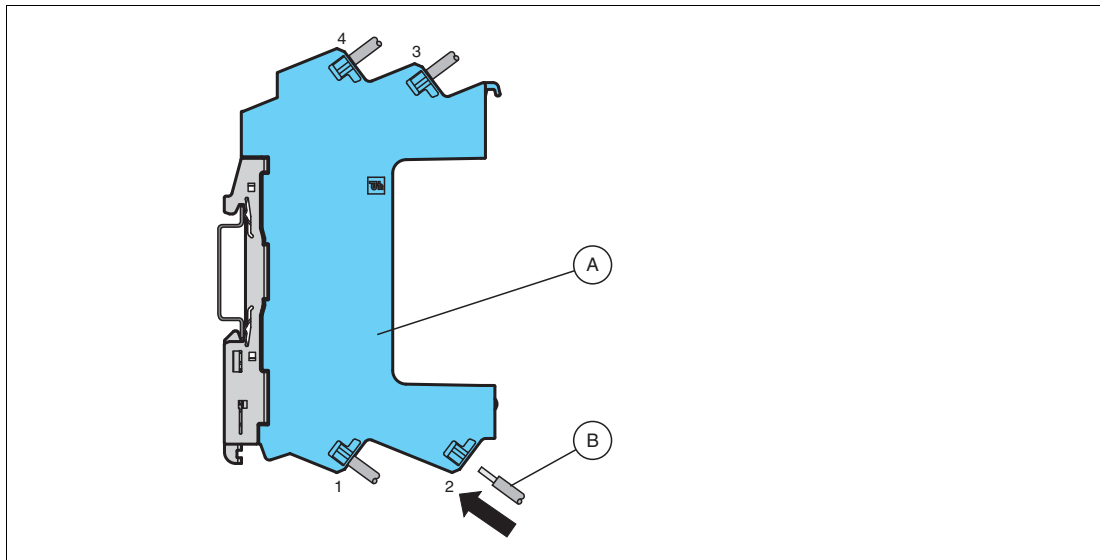


Figure 3.6 Spring terminal connection with push-in connection technology

A Base module 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

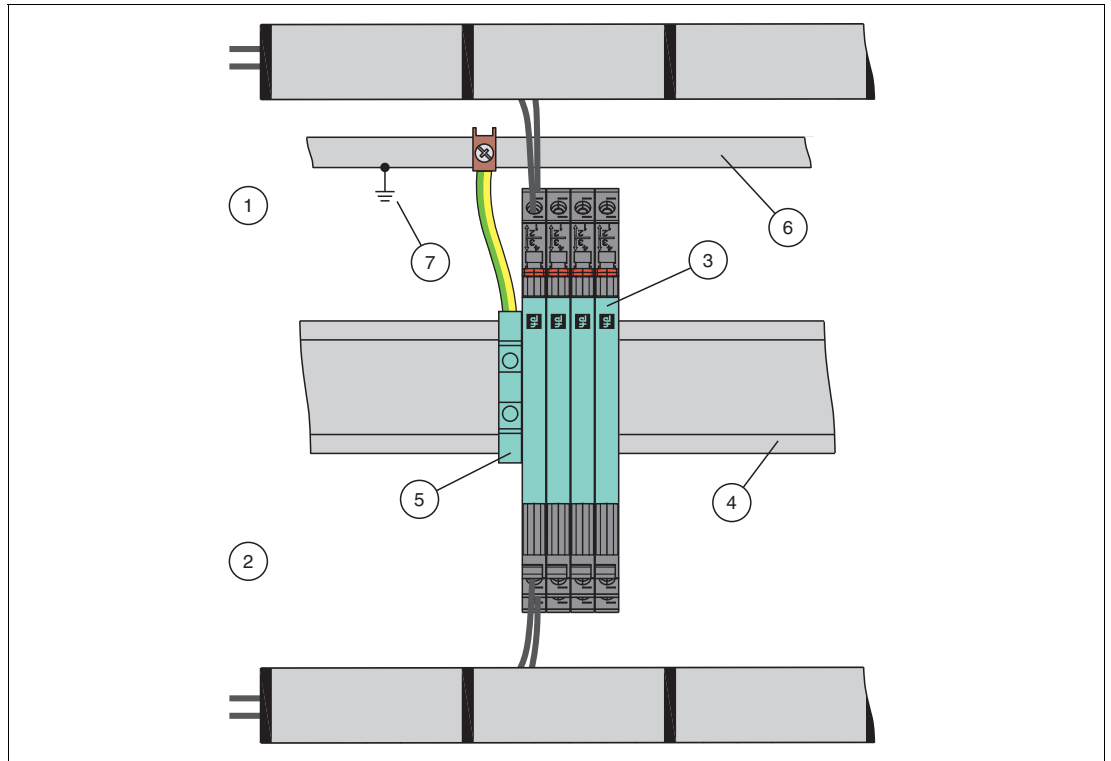


Figure 3.7

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

Incorrect Ground Connection

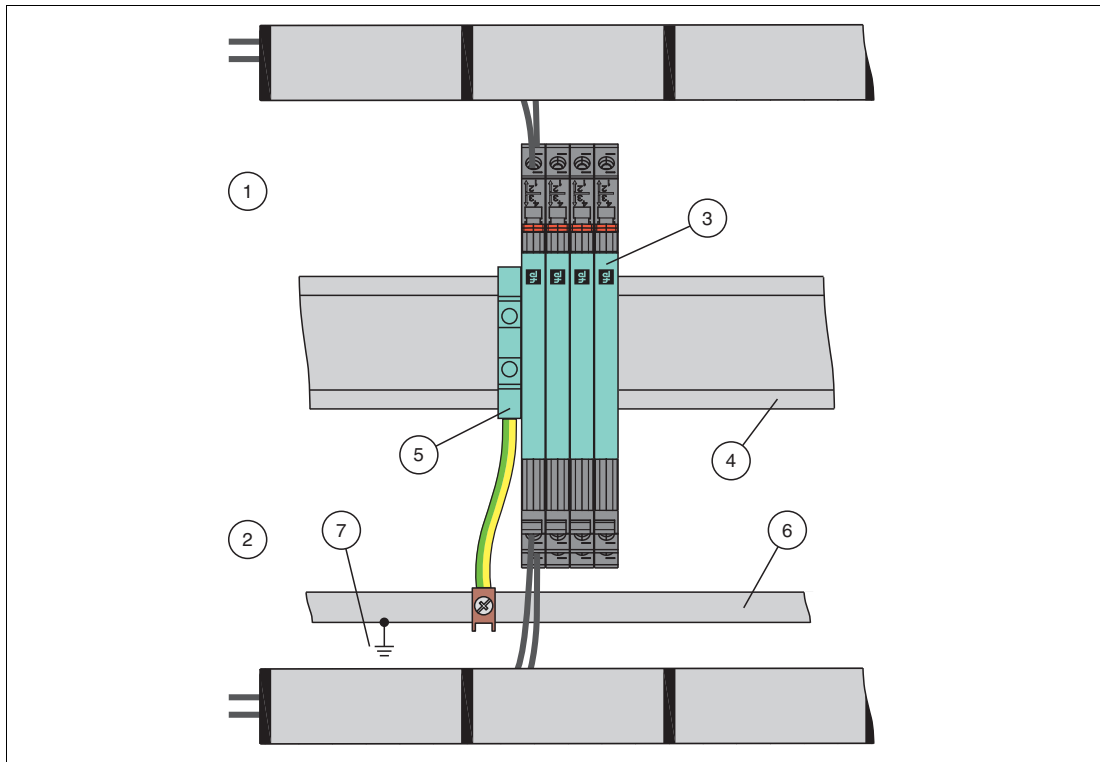


Figure 3.8

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

Incorrect Ground Connection

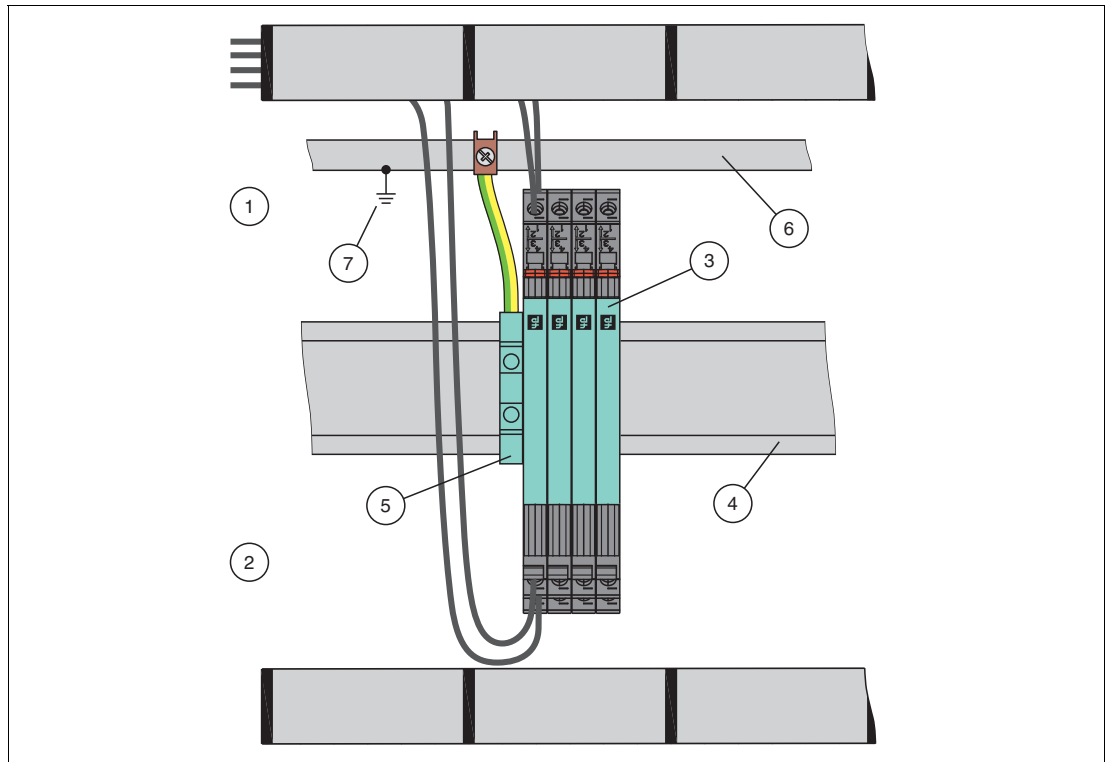


Figure 3.9

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

4 Operation

4.1 Operating Modes



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.

In addition to the surge protection function, the protection module and the base module assume the function of the loop separation. This function can be implemented as follows:

Signal Transmission via Protection Module (Normal Function)

The protection module is inserted. The signals are transmitted to terminals 3 and 4 via the protection module of terminals 1 and 2. The surge protection is active. The module can be removed during operation. During the extraction process, contacts in the base module ensure that the signals are transmitted without interruption.

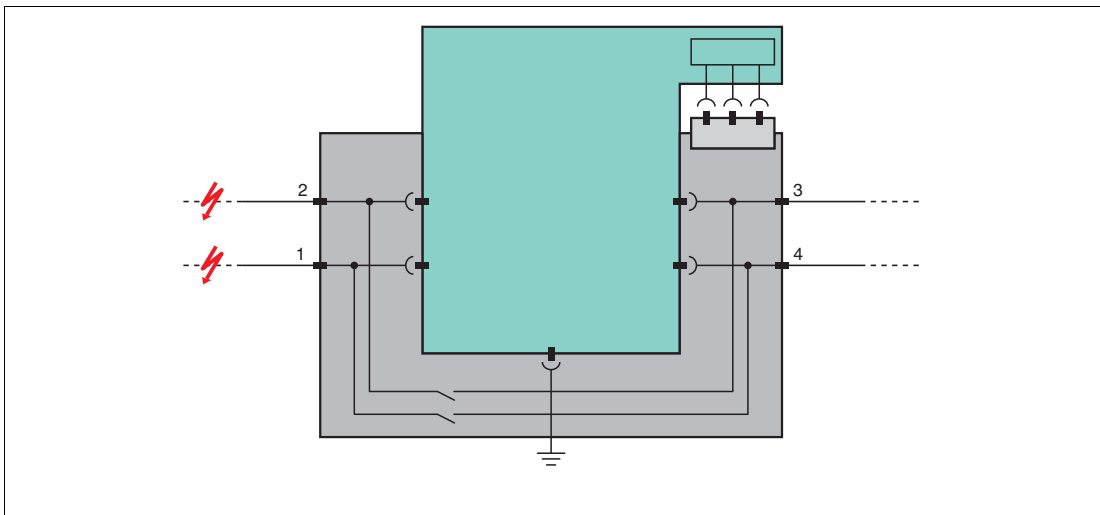


Figure 4.1

Signal Transmission via the Base Module

The protection module is removed. The signals are transmitted to terminals 3 and 4 via the base module of terminals 1 and 2.

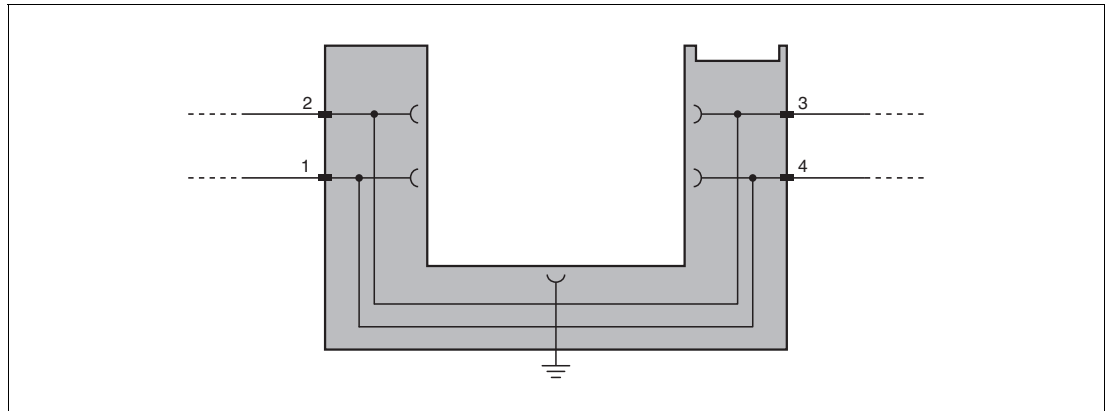


Figure 4.2

No Signal Transmission

The protection module is inserted while rotated 180°. No signals are transmitted. The signal circuit is interrupted. This function is used to find a fault or conduct an insulation test, for example.

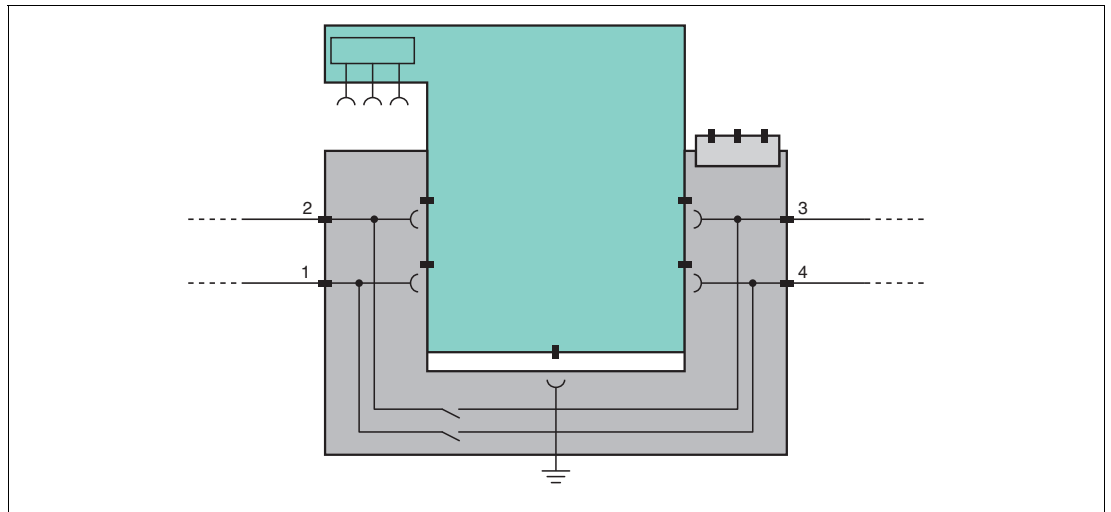


Figure 4.3

4.2 Status Monitoring

The protective effect of the installed surge protection barriers is permanently monitored. This monitoring increases the signal availability and helps to avoid unwanted process states.

The status of the protection modules is indicated by an status indication in traffic-light design on the front of the protection module. In addition, it is possible to transmit fault signals or maintenance signals to the control. See chapter 4.3.

The following devices are suitable for status monitoring:

- Protection module with status indication
- Power feed module
- Fault status module
- Maintenance status module

Depending on the device version, the following status indications are monitored:

Protection Module with Status Indication

LED	Display Function	Display	Meaning
Red LED "FLT"	Fault signal	On	Overloading of the protection module overload A device replacement is required.
		Off	No malfunction The protection module working properly.
Yellow LED "CHK"	Maintenance signal	On	Strong preloading of the protection module A device replacement is recommended.
		Off	No malfunction The protection module working properly.
Green LED "PWR"	Power supply	On	Power supply OK
		Off	Power failure or inadequate power supply The protection module is defective.

Table 4.1 Meaning of the status indication on the protection module

Power Feed Module

LED	Display Function	Display	Meaning
Red LED "FLT"	Fault signal	On	Fault on the power feed module A device replacement is required.
		Off	No malfunction The power feed module working properly.
Green LED "PWR"	Power supply	On	Power supply OK
		Off	Power failure or inadequate power supply The power feed module is defective.

Table 4.2 Meaning of the status indication on the power feed module

Fault Status Module

LED	Display Function	Display	Meaning
Yellow LED "FLT" flashing	Fault signal	On	One protection module or several protection modules overloaded A device replacement is required. The solid state relay contact is open.
		Off	No malfunction The protection modules working properly.
Green LED "PWR"	Power supply	On	Power supply OK
		Off	Power failure or inadequate power supply The fault status module is defective. The solid state relay contact is open.

Table 4.3 Meaning of the status indication on the fault status module

Maintenance Status Module

LED	Display Function	Display	Meaning
Yellow LED "CHK" flashing	Maintenance signal	On	One protection module or several protection modules strong preloaded or overloaded A device replacement is recommended. The solid state relay contact is open.
		Off	No malfunction The protection modules working properly.
Green LED "PWR"	Power supply	On	Power supply OK
		Off	Power failure or inadequate power supply The maintenance status module is defective. The solid state relay contact is open.

Table 4.4 Meaning of the status indication on the maintenance status module

4.3 Status Indication

The protection modules with status indication are powered via the Universal Power Rail. In addition, the status of the protection modules is transmitted via the Universal Power Rail to the fault or maintenance status module. The fault or maintenance status module evaluates the signal and forwards the signal to the control panel.

The switching function of the status indication output is performed via a solid state relay. In the case of a fault signal or a maintenance signal the solid state relay contact is open.

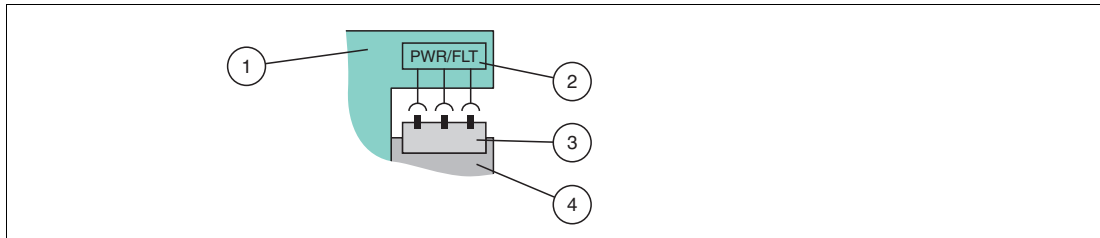


Figure 4.4

- 1 Protection module with status indication
- 2 Status indication output
- 3 Power Rail
- 4 Base module

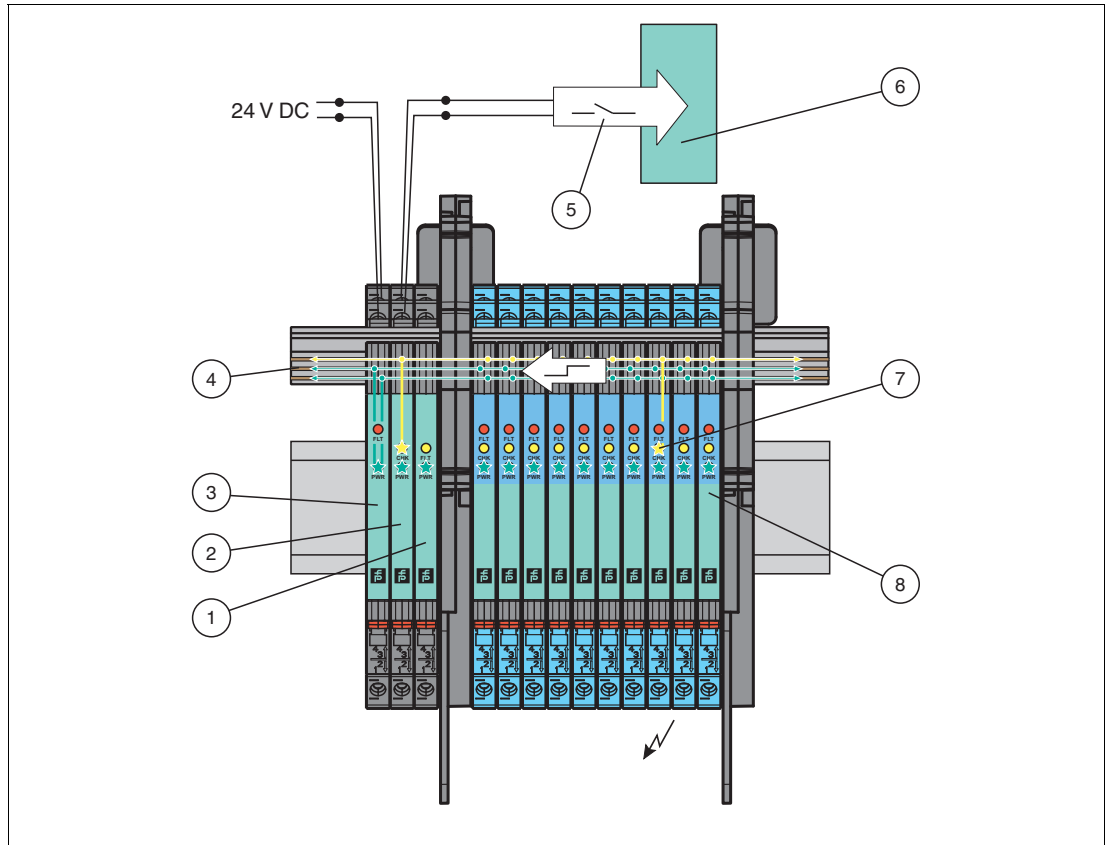


Figure 4.5 Maintenance indication

- 1 Fault status module M-LB-5400
- 2 Maintenance status module M-LB-5500, yellow LED is flashing
- 3 Power feed module M-LB-5300, green LED is on
- 4 Universal Power Rail M-UPR-03-S
- 5 Status indication output
- 6 Control panel
- 7 Maintenance indication at one of the protection modules: yellow LED is on
- 8 Protection modules with status indication, green LEDs are on

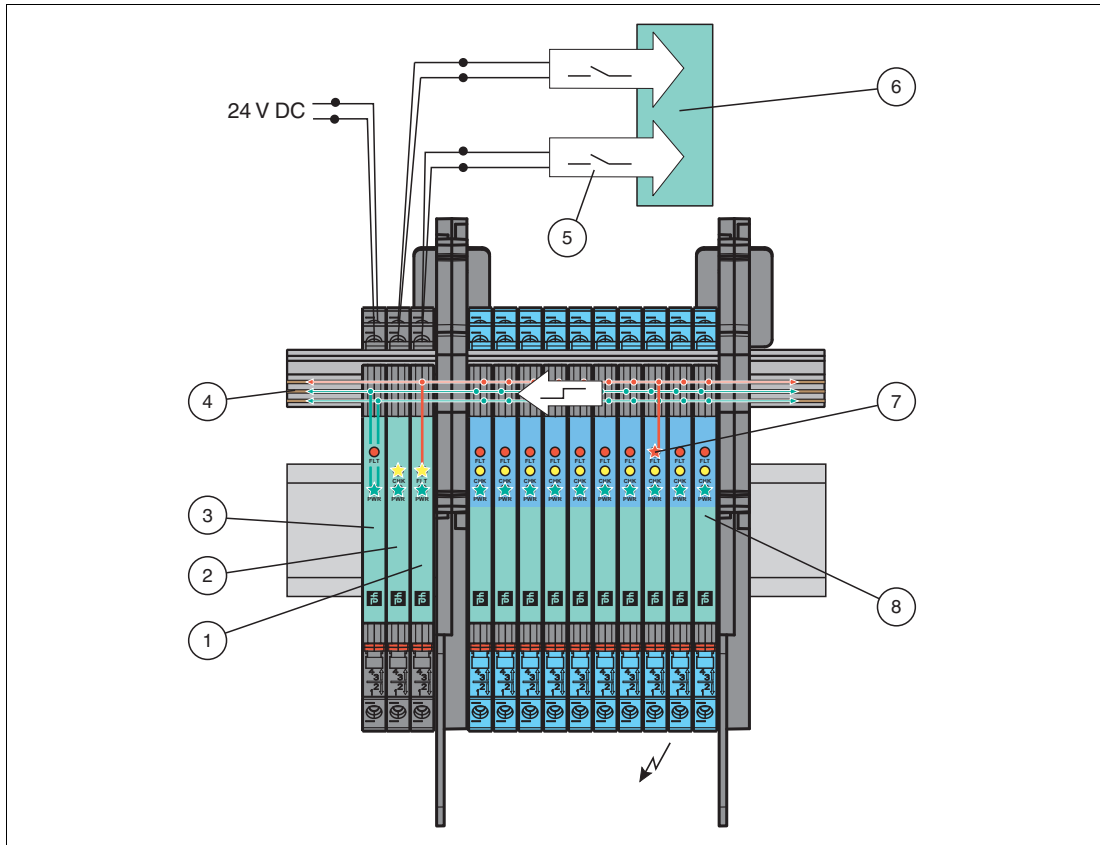


Figure 4.6 Fault indication

- 1 Fault status module M-LB-5400, yellow LED is flashing
- 2 Maintenance status module M-LB-5500, yellow LED is flashing
- 3 Power feed module M-LB-5300, green LED is on
- 4 Universal Power Rail M-UPR-03-S
- 5 Status indication output
- 6 Control panel
- 7 Fault indication at one of the protection modules: red LED is on
- 8 Protection modules with status indication, green LEDs are on

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 3.5 x 0.5.

5.1 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 power supply.
2. Disconnect the field circuit.
3. Disconnect the control circuit.

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



Remove the Cable from the Screw Terminal

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

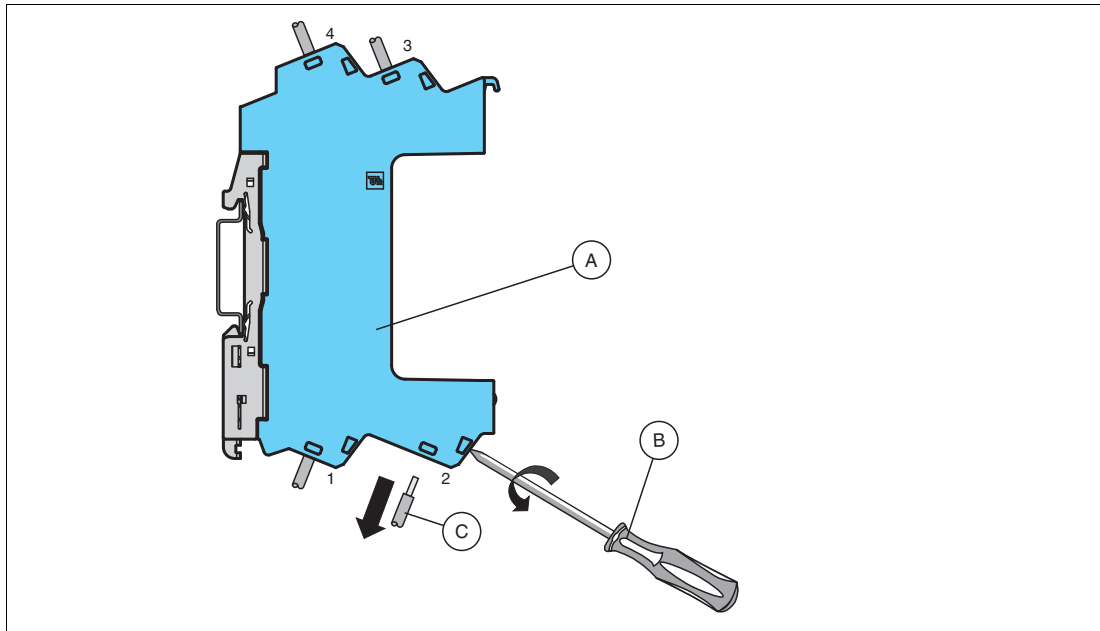


Figure 5.1 Screw terminal connection

- A Base module 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 base module (A).
2. Pull the cable (C) out of the terminal.

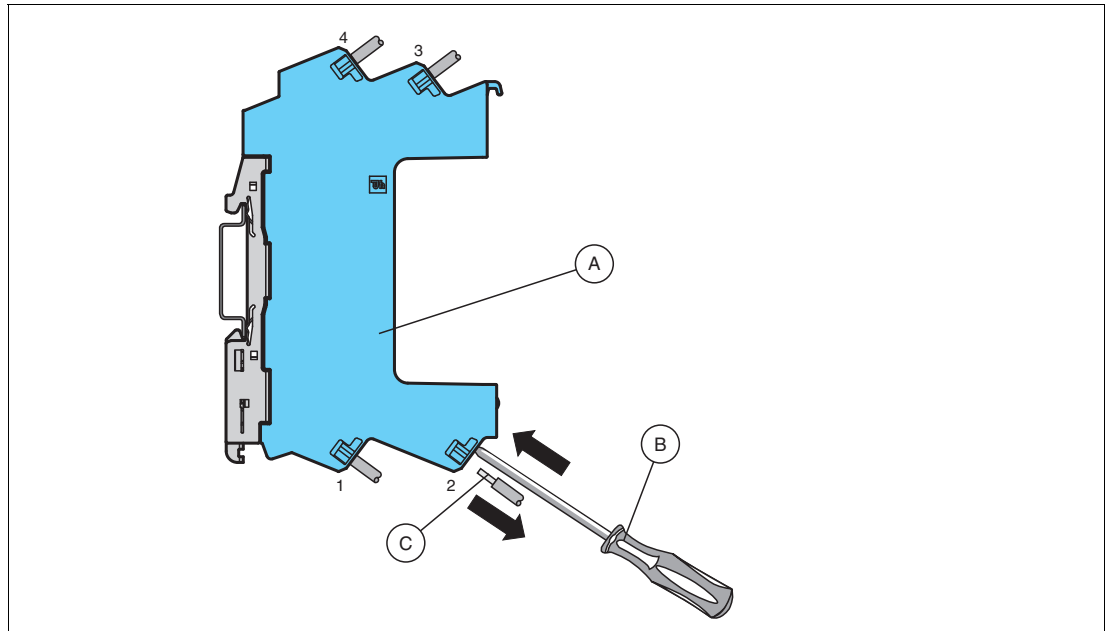


Figure 5.2 Spring terminal connection with push-in connection technology

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



Note

See corresponding datasheets for further information.

5.2 Dismounting of the System Components



Removing the Module

"Module" refers to all modules that can be plugged into the base module:

- Protection modules
- Function modules
- Place-holder modules

1. Press the red locking lever (5) down until the module disengages from the base module (1).
2. Remove the module (4).

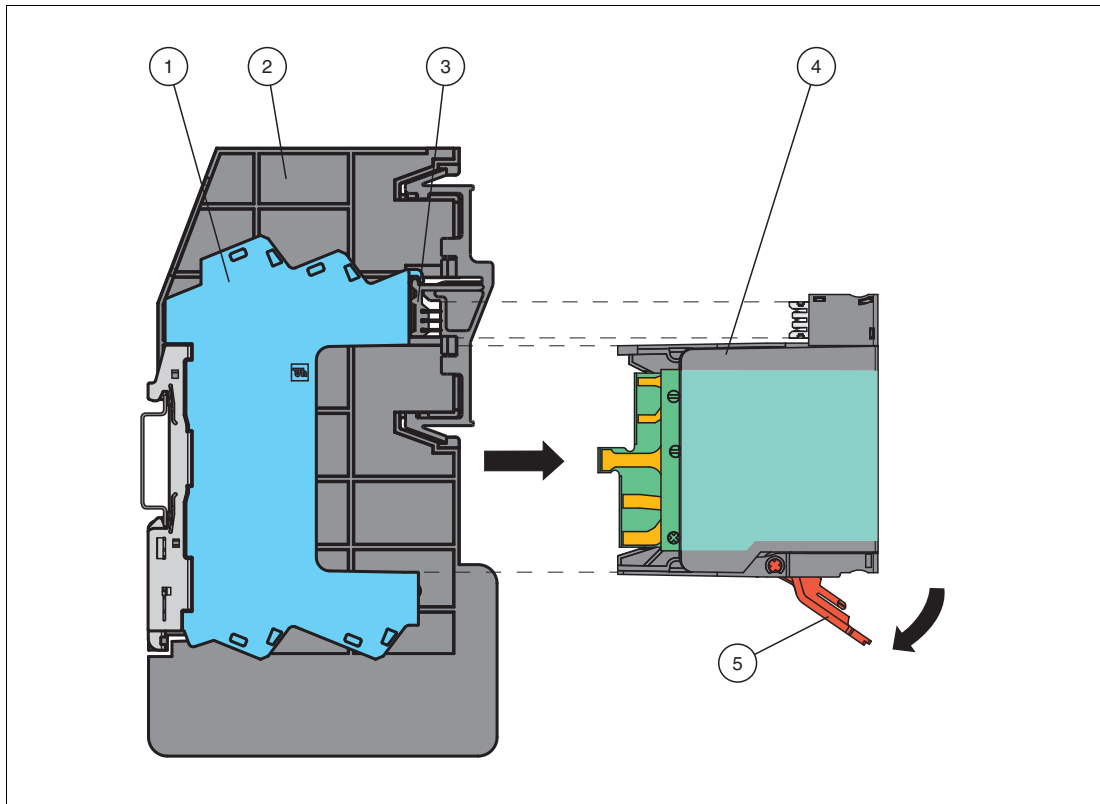


Figure 5.3 Dismounting the module

- | | |
|---|---------------------------------|
| 1 | Base module |
| 2 | M-UPR-I separation wall |
| 3 | Universal Power Rail M-UPR-03-S |
| 4 | Module |
| 5 | Locking lever |



Dismounting the Universal Power Rail

Before you dismount the Universal Power Rail, you must remove the modules.

1. Remove the fastener (4) from the separation wall (2).
2. Remove the Universal Power Rail (3) from the slot on the base module (1).

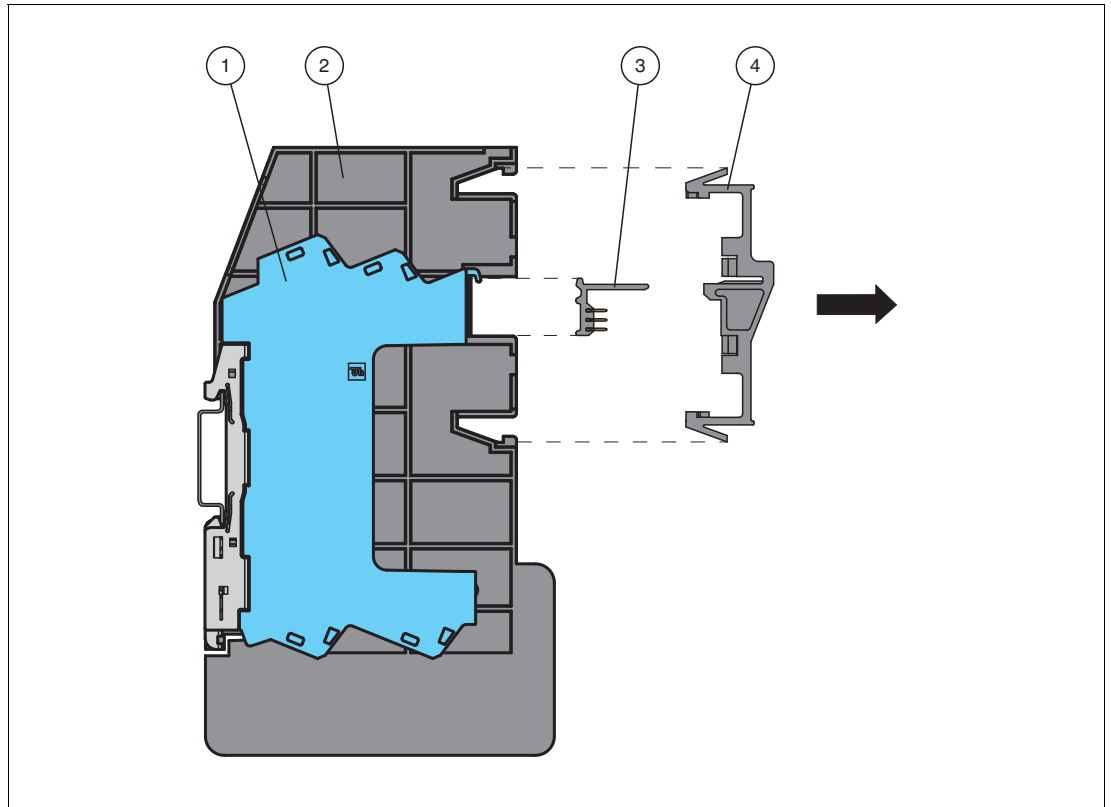


Figure 5.4 Dismounting the Universal Power Rail

- 1 Base module
- 2 M-UPR-I separation wall
- 3 Universal Power Rail M-UPR-03-S
- 4 Fastener



Dismounting the Separation Wall

Use a suitable slot-head screwdriver for dismounting the separation wall.

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 separation wall (1) from the DIN mounting rail (4).

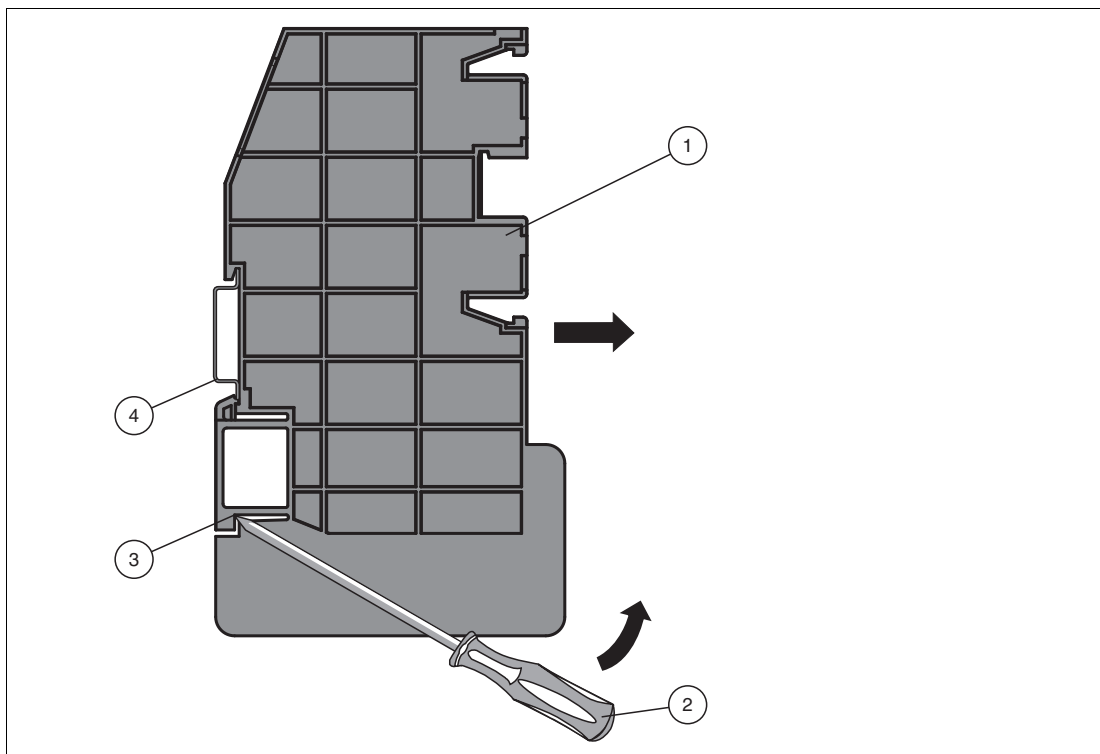


Figure 5.5 Dismounting the separation wall from the DIN mounting rail

- 1 M-UPR-I separation wall
- 2 Slot-head screwdriver
- 3 Mounting bracket
- 4 35 mm DIN mounting rail



Removing the Base Module

We recommend replacing the base module after three times that a mounted module is replaced. 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 (2) from the DIN mounting rail (4).

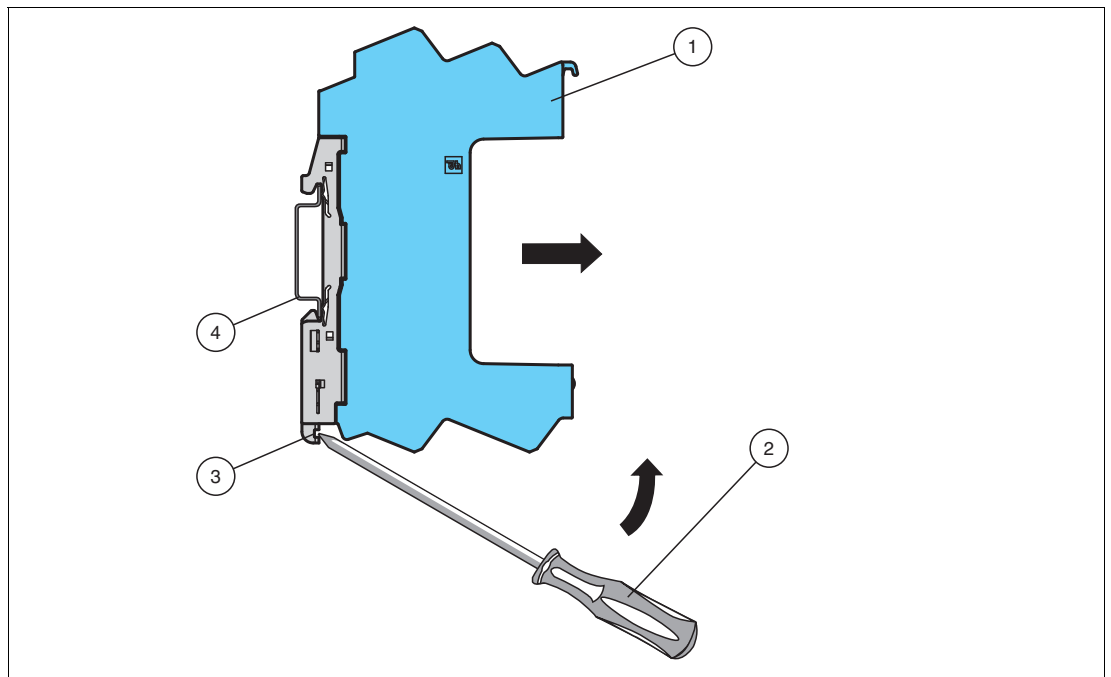


Figure 5.6 Dismounting the base module from the DIN mounting rail

- 1 Base module
- 2 Slot-head screwdriver
- 3 Mounting bracket
- 4 35 mm DIN mounting rail

6 Technical Specifications

6.1 Technical Data

Electrical Data

See datasheets

Directive Conformity and Conformity

See datasheets

Ambient Conditions

Ambient temperature

-20 °C ... 60 °C (-4 °F ... 140 °F), exceptions can be found in the respective datasheets

Storage temperature

-40 °C ... 85 °C (-40 °F ... 185 °F)

Relative humidity

Max. 95 % without condensation

Mechanical Data

Mounting

- Mounting the base module on 35 mm DIN mounting rail according to EN 60715. Horizontal or vertical "side-by-side" mounting is possible
- Modules are inserted onto the base module. Locking with the locking lever

Housing material

Polycarbonate (PC)

Dimensions

For dimensional drawings see chapter 6.3

Degree of protection

IP20 in accordance with EN 60529

Connection to base module

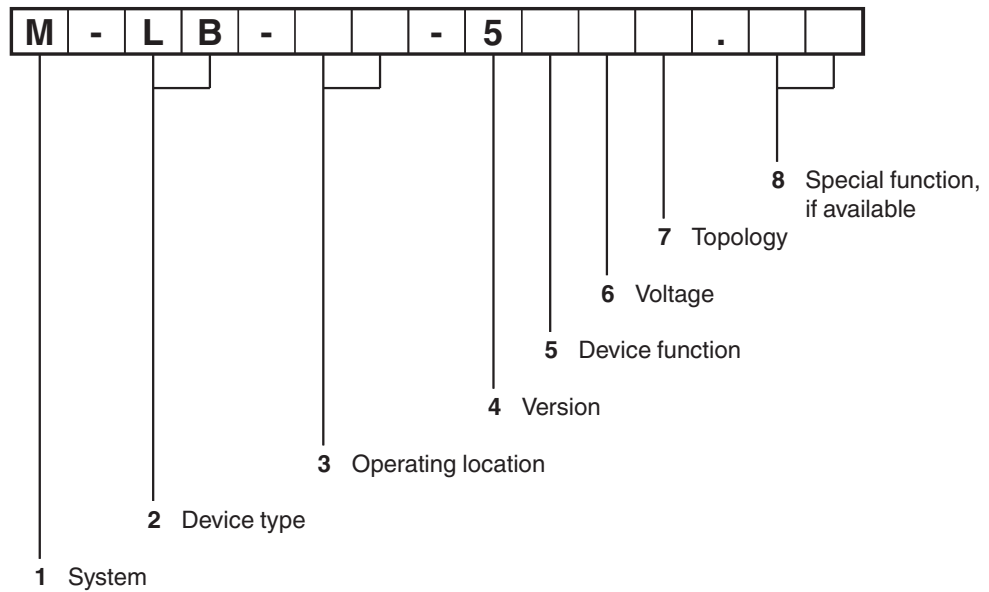
- Screw terminals, max. core cross section 1 x 2.5 mm² (14 AWG)
- Spring terminals, max. core cross section 1 x 2.5 mm² (14 AWG)

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	5	Nominal discharge current 5 kA, DIN mounting rail mounting, modular design
Position 5	0	Base module
	1	Protection module
	2	Protection module with status indication
	3	Power feed module
	4	Fault status module
	5	Maintenance status module
	9	Place holder module
Position 6	0	Not specified
	1	Nominal voltage 1 V DC
	4	Nominal voltage 24 V DC
Position 7	0	Not specified
	1	1 protected signal line, non-grounded
	2	2 protected signal lines, non-grounded
	3	1 protected signal line, grounded
	4	2 protected signal lines, grounded
Position 8	-	No special function
	SP	Spring terminal connection with push-in connection technology

6.3 Dimensions

Surge Protection System

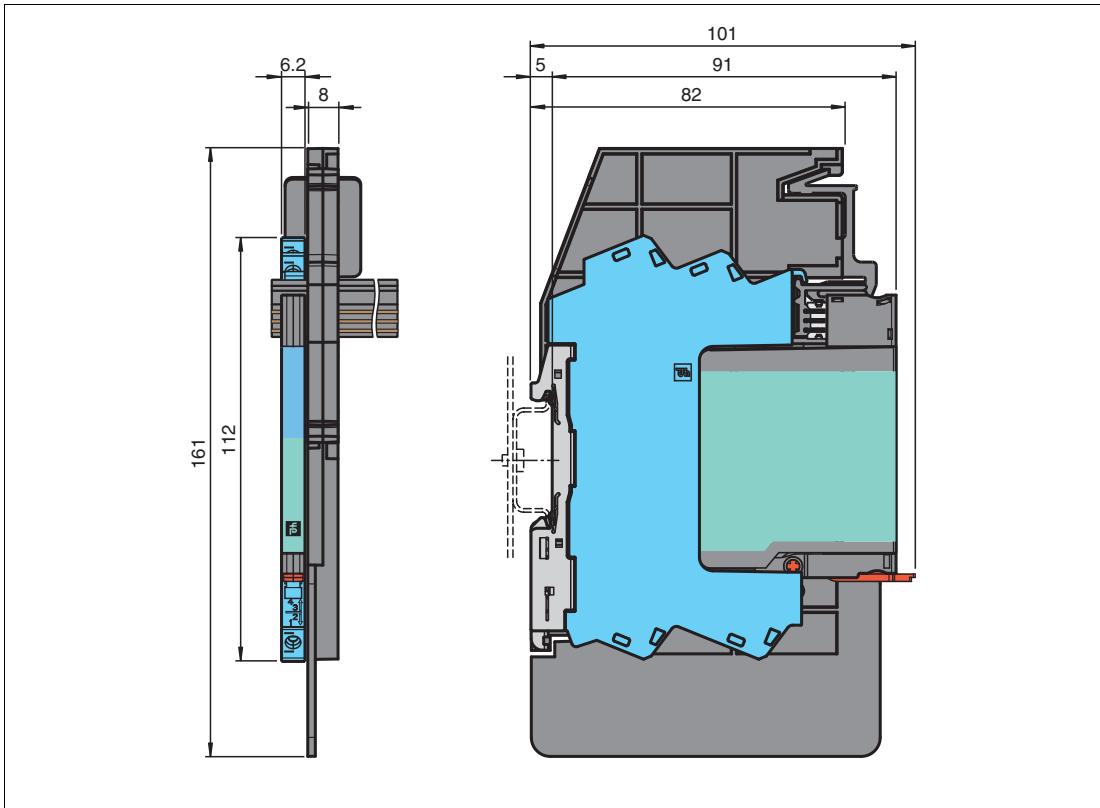


Figure 6.1 Dimensions of a surge protection system

Modules

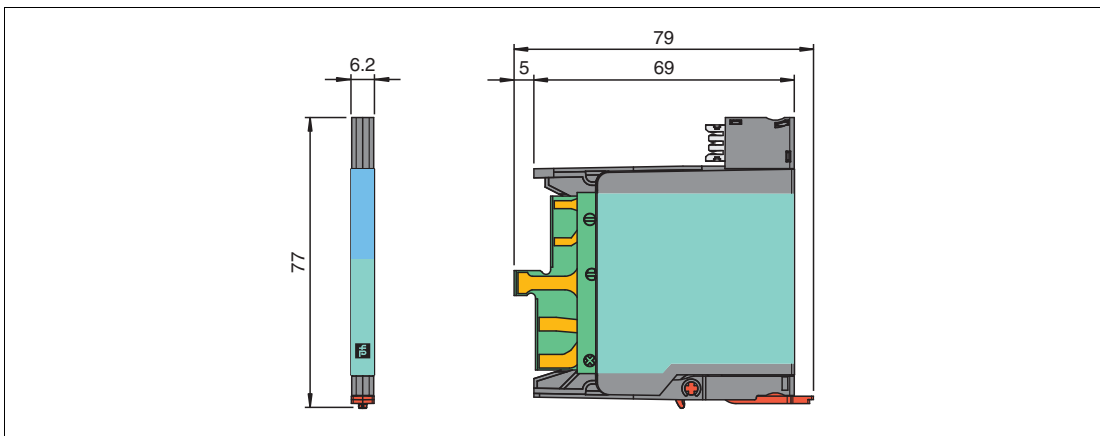


Figure 6.2 Dimensions of the protection modules and function modules

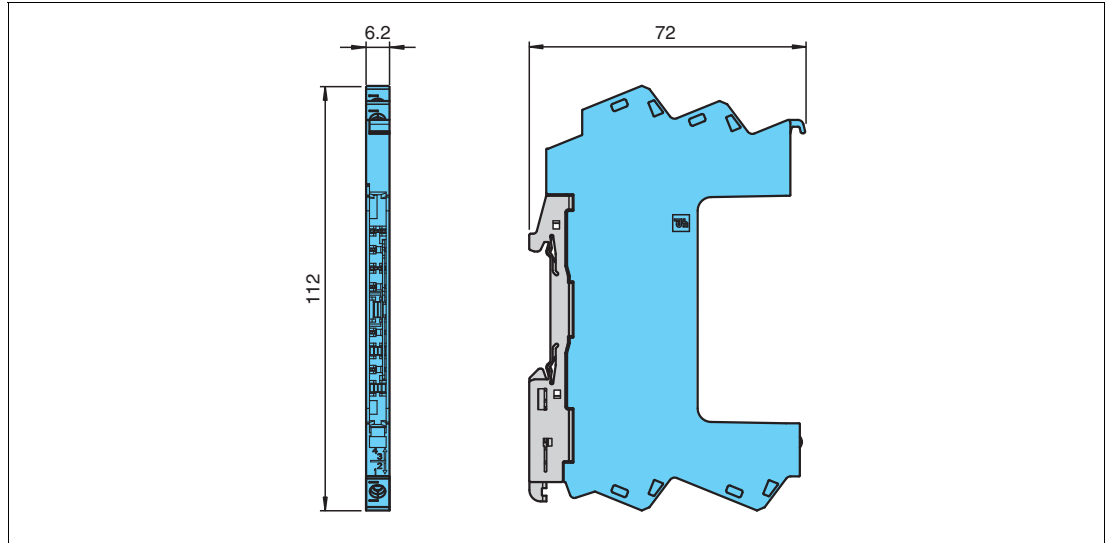


Figure 6.3 Dimensions of a base module

Accessories

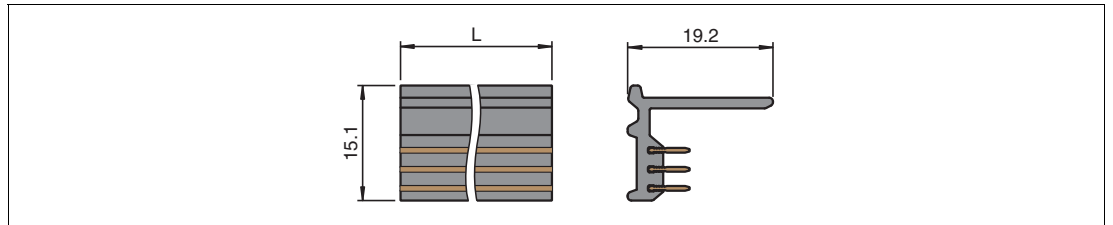


Figure 6.4 Dimensions of Universal Power Rail M-UPR-03-S

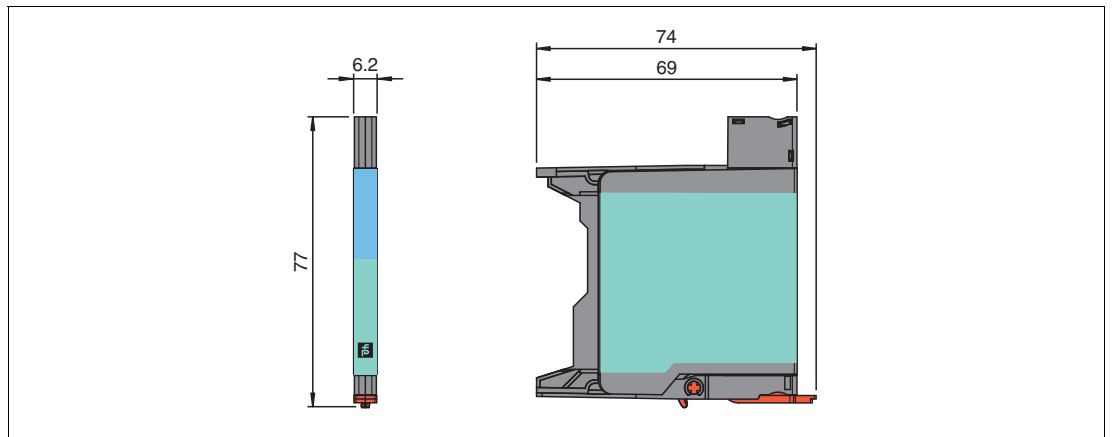


Figure 6.5 Dimensions of a place-holder module

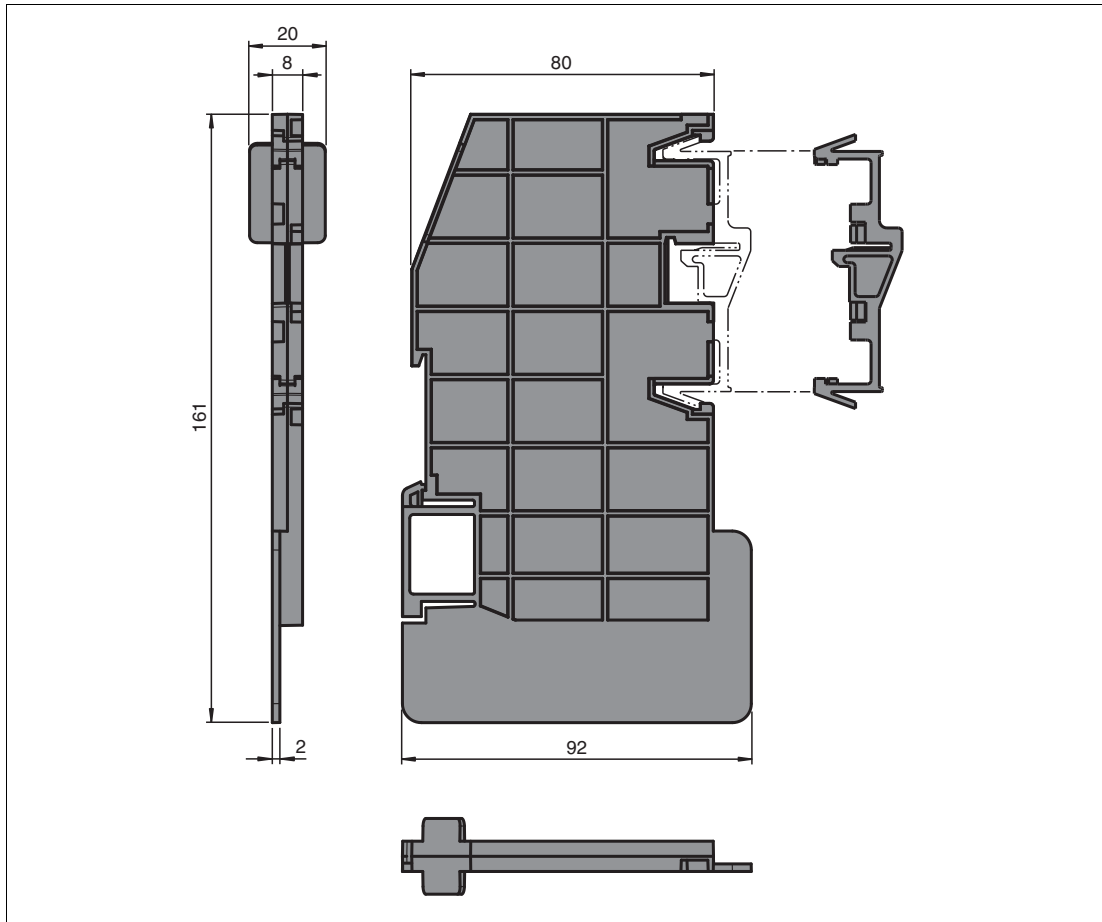


Figure 6.6 Dimensions of M-UPR-I separation wall

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