



PSS u2

PILZ
THE SPIRIT OF SAFETY

- ▶ Control system PSS u2
- ▶ Remote I/O system PSS u2

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SD means Secure Digital

1	Introduction	5
1.1	Validity of documentation	5
1.2	Definition of symbols	5
2	Safety	6
2.1	General safety guidelines	6
2.2	Use of qualified personnel	6
2.3	Safety during installation	7
2.3.1	Supply voltage	7
2.3.2	Installation	8
2.3.3	ESD	8
3	Electromagnetic Compatibility (EMC)	9
3.1	Overview	9
3.2	Making the installation EMC-compliant	10
3.2.1	Connecting the earth cables	10
3.2.2	Cabling	11
3.2.3	Connecting the fieldbuses	11
3.2.4	Equipotential bonding	12
3.2.5	Screening	12
3.2.6	Suppression on inductive loads	13
3.2.7	Installing within an enclosure or wall-mounting	14
3.2.8	Lighting in the control cabinet	14
3.3	Testing the EMC-compliance of an installation	14
4	Installation	16
4.1	Modular structure	16
4.2	Module layout	17
4.3	Installation in a protected space	18
4.3.1	Mounting distances	19
4.4	Installation of the PSS u2 system	20
4.4.1	Install backplane	21
4.4.2	Install protective plate	22
4.4.3	Installing the head module	23
4.4.4	Installing the electronic module	25
4.4.4.1	Inserting an electronic module	26
4.5	Uninstalling the PSS u2 system	27
4.5.1	Uninstalling the electronic module	29
4.5.1.1	Removing an electronic module	29
4.5.1.2	Remove coding element	29
4.5.2	Uninstalling the backplane	30
4.5.3	Removing the head module	30
4.6	Changing an electronic module during operation	30
5	Connection of the PSS u2 system	32
5.1	Supply voltages	32
5.2	Power supplies	35
5.3	Earthing	38

5.4	Supply groups	40
5.5	Wiring the connection terminals	43
5.5.1	Cable requirements	43
5.5.2	Connecting FS inputs and outputs	43
5.6	Wiring test and function test	44
6	Accessories	45
6.1	Install shield connection element (optional)	45
6.2	Mounting the labelling bracket for the backplane	45
6.3	Using the protective coding in the terminal block	47
6.4	Use coding element	48
6.5	Mounting colour marking of the connection levels	50
6.6	Mounting the labelling bracket for modules	51

1 Introduction

1.1 Validity of documentation

This installation manual contains all the information you need to install a PSS u2 system.

The modules for the PSS u2 are described in detail in the respective operating manuals.

This documentation is intended for instruction, and should be retained for future reference.

This documentation is valid for the PSS u2 system.

It is valid until new documentation is published. The latest documentation is always enclosed with the unit.

1.2 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.



INFORMATION

This gives advice on applications and provides information on special features.

2 Safety

2.1 General safety guidelines

Please note the following general safety guidelines:

- ▶ Ensure VDE and local regulations are met, especially those relating to safety. The relevant safety regulations for the respective application must also be met.
- ▶ The PSS u2 is designed exclusively for use in an industrial environment. Interference may occur if used in other areas.
- ▶ The requirements for safe operation of the devices must be assessed in conjunction with the certification body responsible for safety (e.g. BG, TÜV).
- ▶ In particular please observe the wiring regulations.
- ▶ If the modules are altered in any way, such as exchanging a component or carrying out soldering work, the guarantee, and any approval, will be rendered invalid.
- ▶ The date of manufacture can be found on the housing.
- ▶ Modules must be disposed of properly when they reach the end of their service life.

2.2 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by competent persons.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- ▶ Are familiar with the basic regulations concerning health and safety / accident prevention,
- ▶ Have read and understood the information provided in the section entitled Safety
- ▶ Have a good knowledge of the generic and specialist standards applicable to the specific application.

2.3 Safety during installation

2.3.1 Supply voltage

Please refer to the technical details of the head modules or supply voltage modules.

PSS u2 requires a 24 VDC supply. Check that the external power supply provides this voltage.

The tolerance of the supply voltage must correspond to the technical details of the head modules or supply voltage modules. The correct operation of the PSS u2 cannot be guaranteed outside this range.

Overvoltage and interference spikes can damage the PSS u2. You should therefore ensure that appropriate EMC measures are taken.

To achieve the lowest possible residual ripple ($< \pm 1.2 \text{ V}$), we recommend that you install a three-phase bridge rectifier or regulated supply.

Protect the cabling and the connectors on the control system with a fuse between the external power supply and the control system. The size of the fuse depends on the cable cross-section and the load capacity of the connectors on the control system.



WARNING!

Risk of electrocution!

Safe electrical isolation must be ensured for the external power supply that generates the supply voltage. Power supplies must meet the requirements of the standards, such as EN 62368-1 or EN 61010-2-201, for example.

Connect together the 0V connections on all the 24 V power supplies and earth the 0 V mains at a single point, or ensure that measures are in place to monitor for earth faults.

The connection of the 0 V supply to the central earth bar or earth fault monitor must be in accordance with national regulations (such as EN 60204-1, NFPA 79, NEC: Article 250 for example).



WARNING!

Risk of electrocution!

If voltages higher than 50 VAC or 120 VDC are connected to the PSS u2, e.g. to switch contacts on relay modules, please note the following:

- Specific accident prevention regulations apply.
- Only the functional earth (FE) may be connected to the shield connection element.
- When laying cables alongside or above modules, the dielectric strength of the cable insulation should be $\geq 1500 \text{ VAC}$.

2.3.2 Installation

Note:

- ▶ The PSS u2 should be installed in an enclosure, e.g. control cabinet.
- ▶ The control cabinet must conform to the protection class required for the environment.
- ▶ Refer to the technical details of the relevant modules when installing them in the control cabinet.
- ▶ Ensure there is sufficient ventilation to prevent heat building up within the control cabinet. Monitor the ambient temperature to ensure it complies with the values stated in the modules' technical data.



CAUTION!

Risk of burns!

If a PSS u2 system is operated at an ambient temperature of more than 45 °C, surface temperatures on the housing may reach more than 90 °C at full load.

Do not touch the housing!

- ▶ In extreme ambient conditions, additional measures such as control cabinet air conditioning may be required in order to keep within the prescribed value range.
- ▶ Sufficient protection must be provided to prevent the built-in controller from being touched unintentionally.
- ▶ Further information on installation can be found in the chapter entitled [Installation](#) [ 16].

UL requirement: Suitable fire and electrical enclosure must be provided in the end unit application

2.3.3 ESD



NOTICE

Damage due to electrostatic discharge!

Electrostatic discharge can damage components. Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

3 Electromagnetic Compatibility (EMC)

3.1 Overview

The PSS u2 is designed for use in an industrial environment. To ensure electromagnetic compatibility the correct procedures must be carried out when installing the PSS u2.

A device is electromagnetically compatible if

- ▶ It functions without error in a given electromagnetic environment.
- ▶ It does not adversely affect its own environment.

Electromagnetic interference can reach the PSS u2 through:

- ▶ Fields
- ▶ Power supplies
- ▶ Earth cabling
- ▶ Bus connections
- ▶ Interfaces
- ▶ Input and output cables

The interference can be transferred from the source to the receiver (interference sink) via the coupling routes.

Interference reaches the interference sink (e.g. the PSS u2) in various ways:

- ▶ DC coupling:
DC coupling occurs if the source and sink of interference have common cable connections. The common cable presents complex resistances, inducing potential differences.
 - Typical sources of interference are switches/relays, running motors or varying potentials for other systems on the same power supply.
- ▶ Capacitive (electrical) coupling:
A different potential between the source and interference sink (e.g. two cables) creates an electrical field. Coupling is proportional to the rate of voltage change.
 - Typical sources of interference are contactors, static discharge, parallel signal cables.
- ▶ Inductive (magnetic) coupling:
A live cable produces a magnetic field which also surrounds adjacent cables. Interference voltage is induced. Coupling is proportional to the rate of current change.
 - Typical sources of interference are mains cables running in parallel, live cables, high frequency cables, inductors, transformers, motors.

► Electromagnetic coupling

A cable can emit a signal as a radio wave. This wave is then picked up by another cable.

- Typical sources of interference are transmitters such as radios, sparks from spark plugs, welding equipment, etc.



NOTICE

Powerful HF transmitters should only be operated at a distance of more than 0.6 m.

► Static discharge:

Static discharge occurs where there are very high differences in potential between two points. If the two points are brought closer together or if the potential difference is increased, discharges can occur in the air gaps.

- Typical source of interference: people who are statically charged from a synthetic carpet, for example.

3.2 Making the installation EMC-compliant

3.2.1 Connecting the earth cables

Please note:

- A conductor cross section of at least 2.5 mm² should be used for the connection to the central earth bar. Connections should be kept as short as possible.
- Connections to the earth bar should always be in star form.
- Connect together the 0V connections on all the 24 V power supplies and earth the 0 V mains at a single point, or ensure that measures are in place to monitor for earth faults.
- Earthed supply voltages offer the best noise immunity.
- The connection of the 0 V supply to the central earth bar or earth fault monitor must be in accordance with relevant national regulations (such as EN 60204-1, NFPA 79, NEC: Article 250).
- Define a central earthing point.
- Make sure that the control system and motor are earthed correctly.
- Earth the mounting plate.
- Connections should be protected from corrosion.
- Flexible earthing straps should be used on moving earth parts (e.g. machine parts, gates). Ensure these earthing straps are as short and wide as possible.

3.2.2 Cabling

It is possible to differentiate between cables according to their function. The following groups exist:

- ▶ Group 1: Data and supply lines for DC voltages below 60 V and AC voltages below 25 V
- ▶ Group 2: Data and supply lines for DC voltages from 60 V to 400 V and AC voltages from 25 V to 400 V.
- ▶ Group 3: Supply lines above 400 V

Cabling inside buildings

- ▶ The cable groups listed above should be laid separately.
- ▶ Cables of the same group can be laid within the same cable duct.
- ▶ Cables from group 1 and group 2 should be laid in separate groups or in cable ducts which are at least 10 cm apart.
- ▶ Cables from group 1 and group 3 should be laid in separate groups or in cable ducts which are at least 50 cm apart.
- ▶ Data and signal lines should be laid as close as possible to an earthed surface.

Cabling to open air systems

- ▶ As far as possible use metal conduits. These should be electrically connected and earthed.
- ▶ Ensure there is sufficient protection against lightning by using metal conduits earthed at both ends, or concrete cable ducts with reinforcements connected across the joints.

3.2.3 Connecting the fieldbuses

Please note:



INFORMATION

To connect the available fieldbus systems, please refer to the operating manual for the respective head module and the guidelines published by the user group or manufacturer.

3.2.4 Equipotential bonding

Potential differences may occur if the PSS u2 system and its periphery devices are connected to different earth connections. Equalising currents can flow through cable shields that are connected at either end and have different earth connections. These equalising currents can cause interference or destroy the cable shield. In order to avoid interference, equipotential bonding cables must be installed. Please note:

- ▶ Select a low impedance equipotential bonding cable.
- ▶ Select the following as standard values for the cross section of the equipotential bonding cables:
 - 16 mm² for equipotential bonding cable up to 200 m in length
 - 25 mm² for equipotential bonding cable over 200 m in length
- ▶ If the PSS u2 system and periphery devices are connected with shielded signal cables which are earthed at either end, the impedance is calculated as follows:
 - Impedance equipotential bonding cable = 10 % of shield impedance
- ▶ Use copper or galvanised steel equipotential bonding cable.
- ▶ Connect equipotential bonding cables to the earth bar over as wide a surface area as possible.
- ▶ As short a distance as possible should be kept between the equipotential bonding cable and signal cable.

3.2.5 Screening

Interference currents must be removed to cable shields via shield bars, earth bars or the [shield connection element](#).  45]

Please note:

- ▶ Connect the cable shields at low-impedance to the shield bar, the earth bar or the shield connection element.
- ▶ Use cables with braided shield, with a minimum cover area of 80 %.
- ▶ When laying cables without equipotential bonding or using foil shields: Connect the shield at one end.
- ▶ If possible, use metal or metallised plugs to connect cables for serial data transfer. Always refer to the regulations relating to the fieldbus systems.
- ▶ If the shield is not to be connected at the end of the cable, it must have no connection to the connector housing.
- ▶ At the point where the cable enters the cabinet, connect the shield to the earth bar, without making a break in the cable. Use metal cable clamps which cover the shield over a wide surface area. Take the shield as far as the PSS u2, but do not lay it on top of the PSS u2.

Digital inputs and outputs on the PSS u2 system do not need shielded cables. However, if the connection cables have a shield, it should be connected at one end.

Shielded cables must always be used to connect analogue modules.

- ▶ Analogue input modules detect even very small signal changes. They are therefore much more sensitive than digital inputs. In a particularly disturbed environment it can happen that signal changes caused by interferences are also detected.

In these cases, we recommend the following measures:

- Earth the mounting rail on both sides of the modules.
- Earth the shield connection of the cables on both sides (on the sensor and either on the module or directly on the point where the cable enters the control cabinet).
- Ensure that no transient currents flow across the cable screening, which may damage the cables or the connectors.

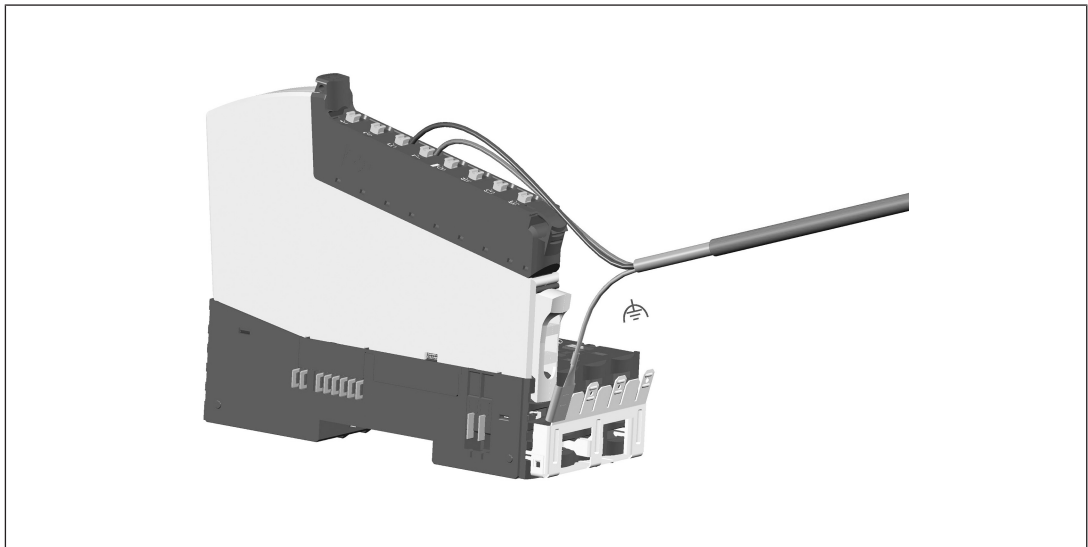


Fig.: Connection of the cable shield on the shield connection element

3.2.6 Suppression on inductive loads

Suppression should not be used to protect the digital semiconductor outputs.

Digital semiconductor outputs on the PSS u2 do not need suppression. With FS semiconductor outputs on the PSS u2, suppression can lead to errors on the on/off tests and test pulses.

However, relay outputs on the PSS u2 should still be wired with suppression elements.

However, inductive loads that are not switched by the PSS u2 should be wired with suppression elements for EMC reasons.

3.2.7 Installing within an enclosure or wall-mounting

You must carry out rack or wall installation in a protected mounting area that is rated at a minimum of IP54 (see also [Installation in a protected space](#) [18]).

Care must be taken to avoid interference when installing the unit within an enclosure or wall-mounting:

- ▶ Earth bars, earth conductors and the housing should be attached to metal parts in order to divert any coupled interference on to large metal areas. For wall-mounting we recommend: that the overall potential surfaces are made of steel.
- ▶ For varnished or anodised metal parts you should use special contact plates or remove the protective coating.
- ▶ Install an earth bar for the cable shields.
- ▶ The earth bar can also be used as the ground conductor bar.
- ▶ Connect the earth bar or earth conductor to the mounting plate over a wide surface area and with low impedance. If the bar is to be used as the earth conductor, comply with the latest regulations for earthing the bar.

3.2.8 Lighting in the control cabinet

Use low interference panel lighting for inside the control cabinet.

3.3 Testing the EMC-compliance of an installation

You can use the list below to check that the installation of the PSS u2 is EMC-compliant.

Check	Action	Done
Are there areas with a high probability of interference? (e.g. computers running, process control areas, distribution cabinets, cable casing, frequency converters, hand-held radios etc.)	EMC protection in these areas should be planned with particular care.	
Are areas where computers are running or areas such as process control rooms sufficiently shielded from electromagnetic coupling?	If necessary shield the whole area.	
Does the cable layout take into account the principles of EMC compliance?	Some important points: Lay cables close to earth, keep clear of other electrical equipment, keep cables in ducts separate from other parts of the installation, keep cables as short as possible.	
Is the supply voltage free of interference?	Supplies with interference voltages should be fitted with a mains filter.	
EMC characteristics of individual units / all units once installed?	Test under operating conditions, e.g. while hand-held radios are in use, or HF frequency generators are close by. Test static discharge with operating personnel, test mutual interference between units under different operating conditions.	

Check	Action	Done
Earthed parts connected correctly?	Most important are the connections to the PSS u2 housing, racking bars, earth conductors and earth bars; inactive metal parts should be connected over a wide surface area and earthed at a central point; with insulated metal: Remove insulation or use special contact fixings; protect the connection from corrosion; connect the cabinet doors to the body of the cabinet using earthing straps	
Cable groups laid separately?	Separate cables into groups. Supply and signal leads should be laid separately	
Are the shields connected correctly?	Use shielded cables for analogue and data leads; use metallic plugs; connect cable shields to shield bar at point of entry to cabinet; connect cable shields over a wide surface area and with low impedance	
Equipotential bonding carried out?	If the installation extends over a wide area: lay equipotential bonding cable.	
Are inductive loads switched?	Inductive loads that are not switched by digital outputs on the PSS u2 must be wired with suppression elements.	
24 VDC power supply?	Power supplies must meet the requirements of the standards, such as EN 62368-1 or EN 61010-2-201, for example.	

4 Installation

4.1 Modular structure

A PSS u2 system is a modular system with a fieldbus interface (e.g. PROFINET/PROFINET with PROFIsafe). The PASconfig system software is available for PSS u2 systems. The system software provides support as you select, configure and commission components. A PSS u2 system consists of:

- ▶ A head module
- ▶ Input/output modules for standard and failsafe applications
- ▶ Backplanes
- ▶ Terminal blocks

Head module

- ▶ Connects the sensor/actuator level for standard applications with standard fieldbus systems
- ▶ Connects the sensor/actuator level for failsafe applications with failsafe fieldbus systems
- ▶ Co-ordinates the entire process data traffic

Designs

Electronic modules, terminal blocks and backplanes:

The electronic modules determine the function of the supply voltage or input/output module.

- ▶ Electronic modules
 - Are plugged into the backplane
 - Communicate with the head module via the module bus
- ▶ Backplanes
 - Are the carrier units for the electronic modules.
 - They are available as:
 - 1-port backplane
 - 4-port backplane
- ▶ Terminal blocks
 - Are used to connect the field wiring
 - Are available with the following connection types:
 - Push-in spring-loaded terminals

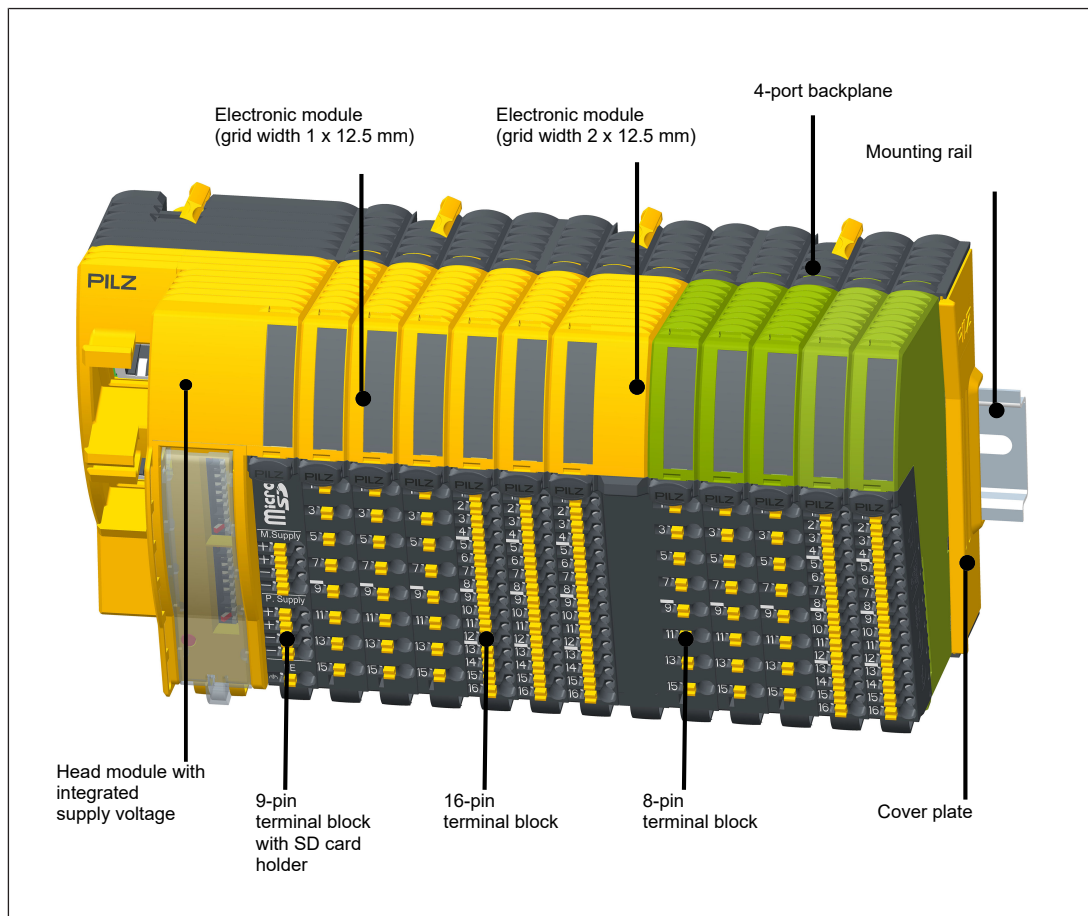


Fig.: Modular structure of the PSS u2 system

4.2

Module layout

- ▶ The first module on a PSS u2 system is always a head module.
- ▶ Backplanes are installed to the right of it
- ▶ The input/output modules for FS and ST applications are plugged into the backplane.
 - The input/output modules may be installed in any order.
 - Free slots may be left between the modules.
 - Input/output modules for FS applications and ST applications may be combined as required.
 - However, if modules of the same function are combined into groups it makes things clearer and simplifies the wiring.
 - The maximum number of input/output modules is determined through the defined system limits.
 - Input/output modules for FS applications cannot be used on head modules that do not have an FS section.
- ▶ Additional supply voltage modules may be required in order to refresh the periphery supply. The supply voltage module may not be the last module in a PSS u2 system.
- ▶ Supply groups require an additional voltage supply module at the start of each group. The modules belonging to the supply group will then follow to the right.

4.3 Installation in a protected space

You must install a PSS u2 system in a mounting area with a protection type of at least IP54, e.g. in a control cabinet. Use a zinc-plated DIN-rail in accordance with DIN EN 50022 as the mounting rail (top hat rail). Dimensions:

- ▶ 35 x 7.5 mm or 35 x 15 mm

When installing, please note the following:

- ▶ Where vibration and shock stress place increased requirements on the system fastenings, we recommend that the mounting rail is screwed to the mounting plate approximately every 200 mm.
- ▶ Fit the PSS u2 system on a horizontal mounting rail.
- ▶ We strongly recommend that you comply with the mounting distances stated in the chapter entitled Mounting distances. This will enable modules to be exchanged and guarantee sufficient heat dissipation.

4.3.1 Mounting distances

The values shown in the diagram for mounting distances are minimum specifications.

The ambient temperature of the PSS u2 system in the control cabinet must not exceed the figure stated in the technical details for the modules. Air conditioning may otherwise be required.

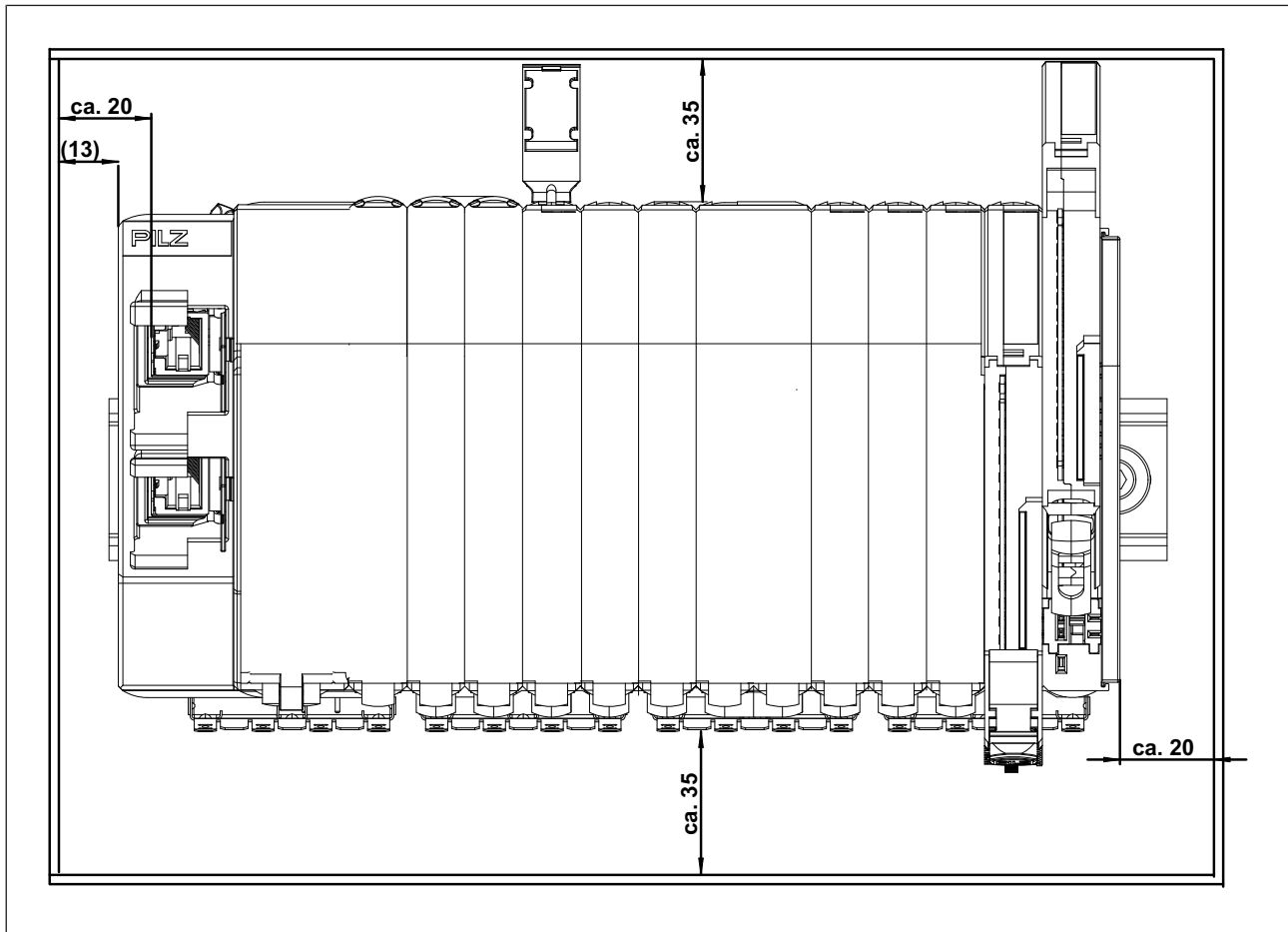


Fig.: Front view, mounting distances in mm

4.4 Installation of the PSS u2 system

We recommend the following procedure to install the PSS u2. The individual steps are described in detail on the pages that follow.



WARNING!

Risk of electrocution!

When voltage is applied, contact with live components could result in serious or even fatal injury from an electric shock.

Switch off all voltages to the connection terminals and power supply prior to installation. You should also switch off all voltages before inserting and removing a terminal block!

Prerequisite

- ▶ The mounting rail must be installed in the control cabinet.

Procedure:

- ▶ Install a shield connection element (optional) [45]
- ▶ Install a backplane. [21]
- ▶ Labelling bracket for the backplane (optional) [45]
- ▶ Remove ESD protection plate from the head module [22]
- ▶ Install the ESD protection plate on the right-hand side, on the last backplane [22]
- ▶ Install the head module [23]
- ▶ Insert the electronic modules into the backplane [26]
- ▶ Wire up the terminal blocks with no voltage applied [43]
- ▶ Protective coding for terminal block (optional) [47]
- ▶ Coding element for terminal block (optional) [48]
- ▶ Plug in the terminal blocks of the electronic modules [26]
- ▶ Colour marking of the connection levels (optional) [50]
- ▶ Labelling bracket for modules (optional) [51]

4.4.1

Install backplane



CAUTION!

Risk of material damage

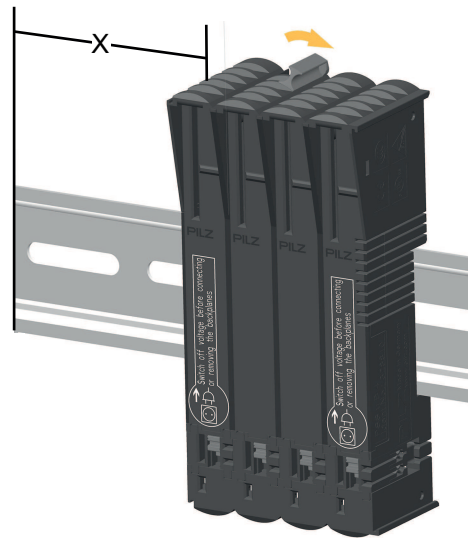
Backplanes may only be inserted or removed when the supply voltage is switched off.

Switch off the supply voltage before inserting or removing the backplane.

1. Insert the backplane on to the mounting rail. Leave enough distance [X] to the left to enable the head module to be installed. This distance will depend on the width of the head module.

The mounting rail interlock must be in the open position, to the left.

2. Turn the mounting rail interlock to the right to lock the backplane on to the mounting rail.



4.4.2 Install protective plate

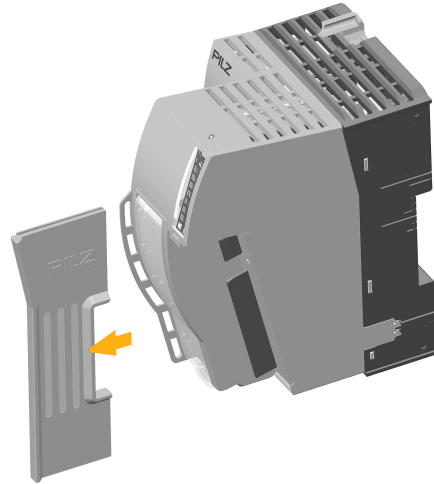


NOTICE

Damage due to electrostatic discharge!

Electrostatic discharge can damage components. Make sure that the yellow cover plate is fitted at the end of the backplane block. The yellow cover plate is an integral part of the head module.

1. Remove the yellow cover plate from the head module.



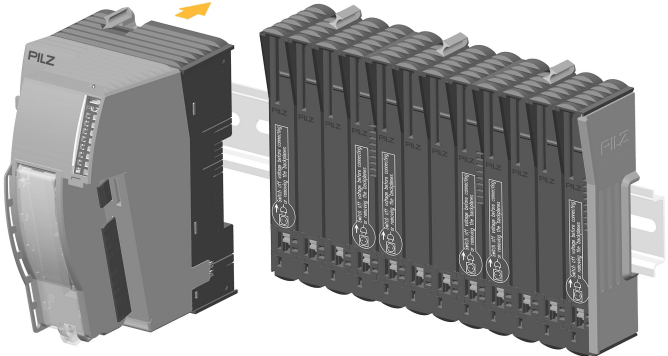
2. Attach the yellow ESD cover plate to the last backplane.



4.4.3 Installing the head module

Prerequisite:

The mounting rail must be installed.

1. Plug the head module on to the mounting rail. Please note: The mounting rail interlock must be in the open position, to the left.	
2. Rotate the mounting rail interlock to the right to lock the head module on the mounting rail	

You can optionally fasten the data cable and lock the connector using cable ties



INFORMATION

With the plug-in connection, please note that the data cable and connector have a limited mechanical load capacity. Appropriate design measures should be used to ensure that the plug-in connection is insensitive to increased mechanical stress (e.g. through shock, vibration). Such measures include, for example, fixed installation and strain relief (see graphic "Options for attaching the data cable to the head module").

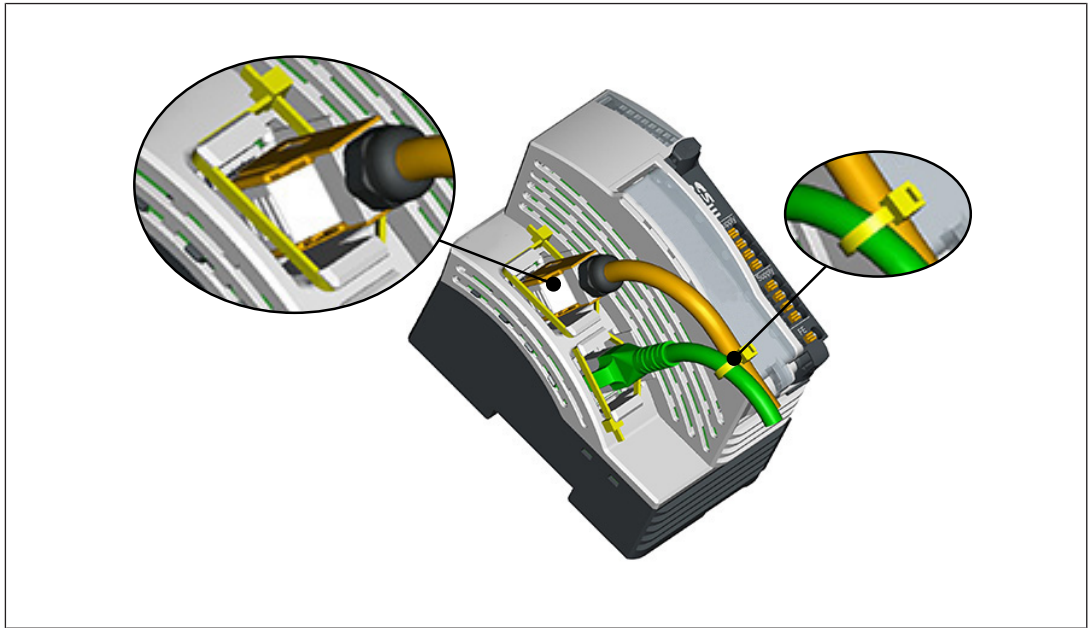


Fig.: Additional options for fastening the data cable on the head module and locking the connector using cable ties

- Remove the cable ties before pulling the plug.

Seal unused RJ 45 sockets and the protective screen

Sealing protects from unauthorised access.

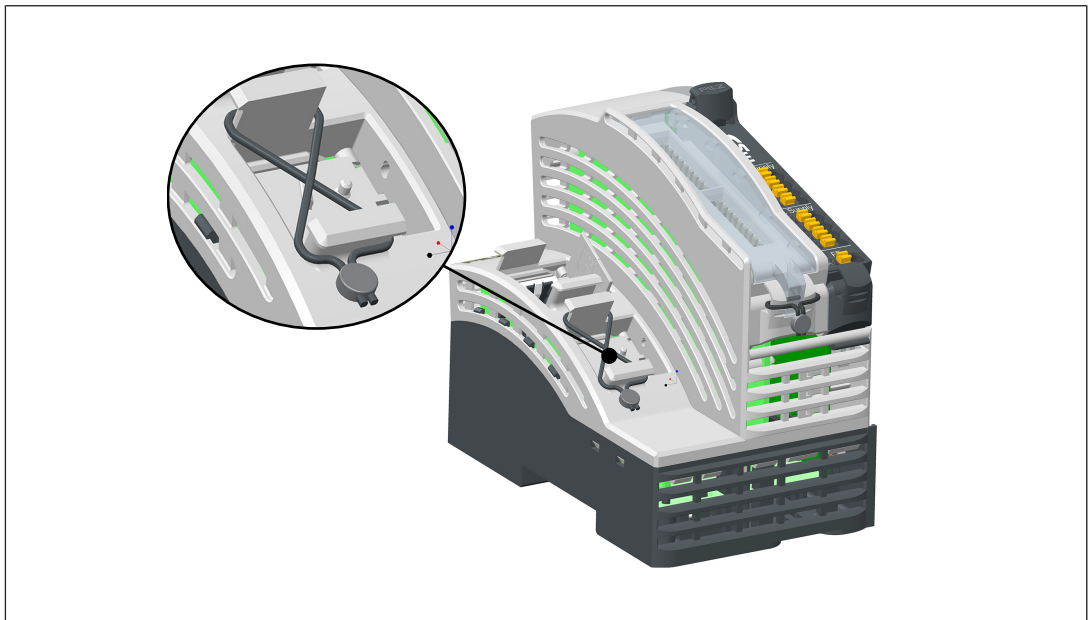


Fig.: Sealing the RJ 45 sockets and the protective screen

4.4.4 Installing the electronic module

Please note:

- ▶ Backplane must be installed first.
- ▶ Electronic modules may only be plugged or unplugged if the terminal block has been removed first.
- ▶ The mechanics of the electronic modules are designed for 20 plug in/out cycles.

The terminal blocks have the following properties:

- ▶ Can be plugged in with the field wiring
- ▶ Connections to the terminals should be made with spring-loaded terminals
- ▶ Can be coded (see [Use coding element](#)  48])
- ▶ Also available for 230 V (see [Using the protective coding in the terminal block](#)  47])
- ▶ Have a tab for cable strain relief

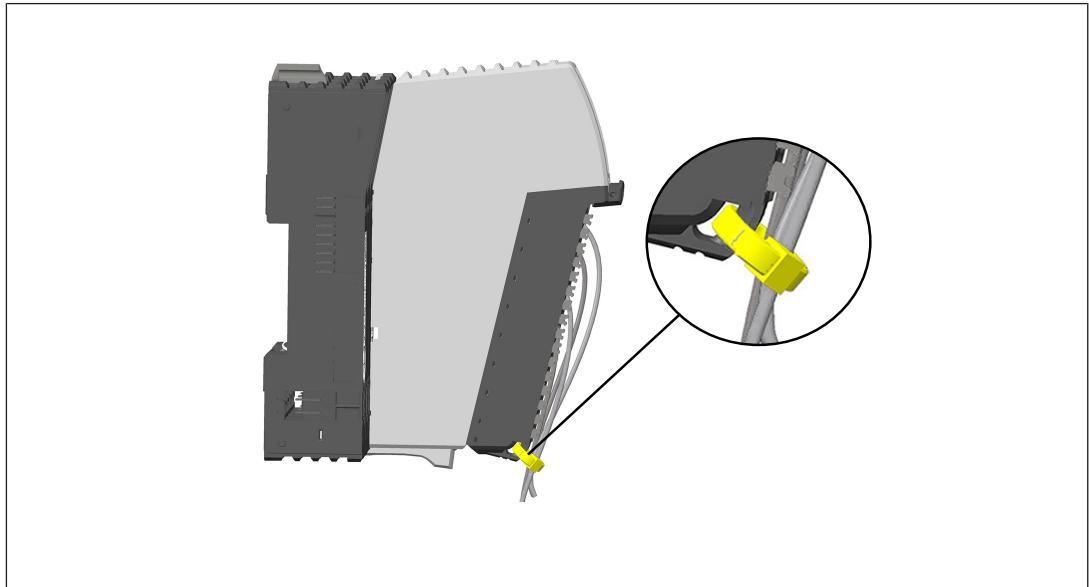
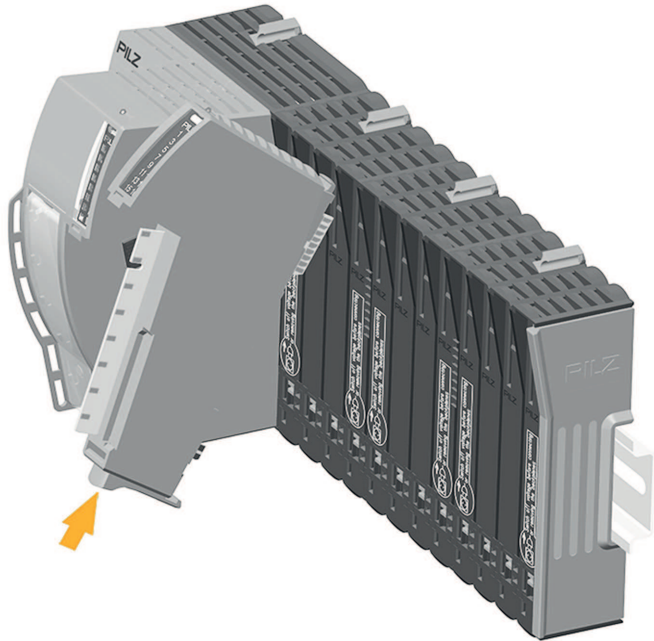


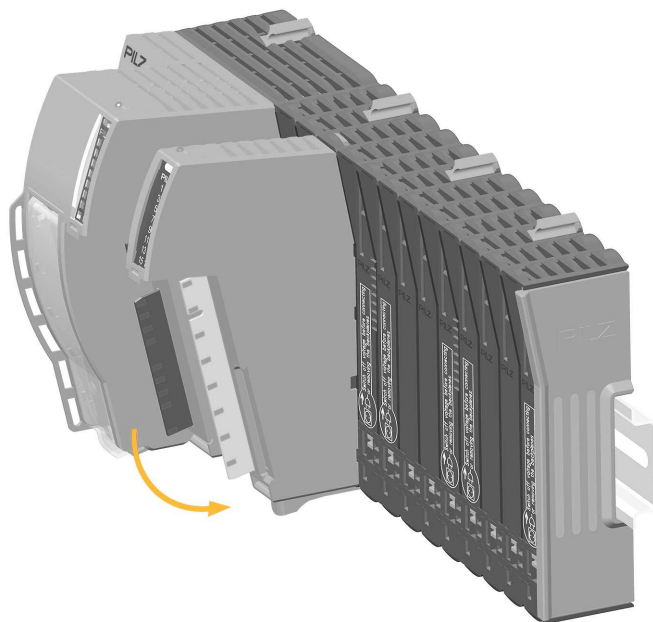
Fig.: Cable strain relief

4.4.4.1 Inserting an electronic module

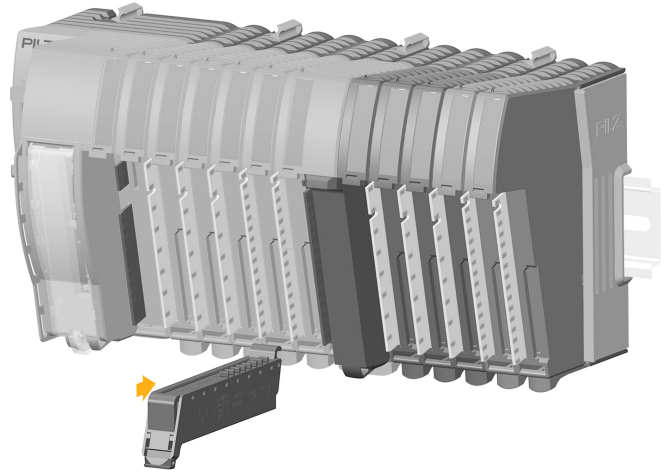
1. Insert the electronic module into the suspension lug on the back-plane.



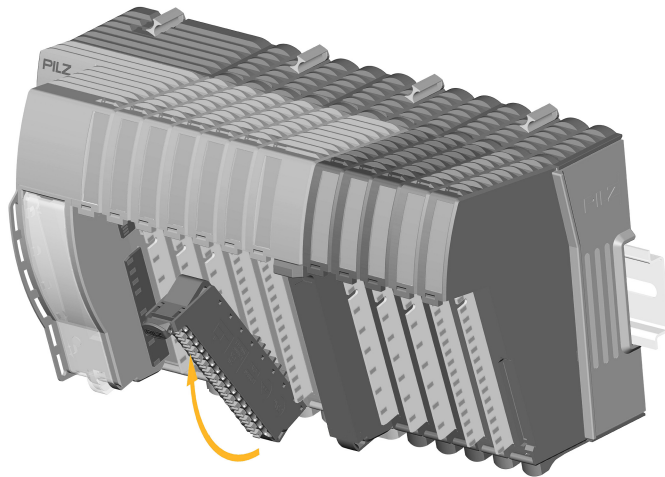
2. Swivel the electronic module downwards until you hear it click into place.



3. Insert the terminal block into the suspension lug on the module.



4. Swivel the terminal block upwards until you hear it click into place.



4.5 Uninstalling the PSS u2 system

We recommend the following procedure to uninstall a PSS u2. The individual steps are described in detail on the pages that follow.



CAUTION!

Risk of material damage

Backplanes may only be inserted or removed when the supply voltage is switched off.

Switch off the supply voltage before inserting or removing the backplane.



WARNING!

Risk of electrocution!

When voltage is applied, contact with live components could result in serious or even fatal injury from an electric shock.

Switch off all voltages to the connection terminals and power supply prior to removal. You should also switch off all voltages before inserting and removing a connector!

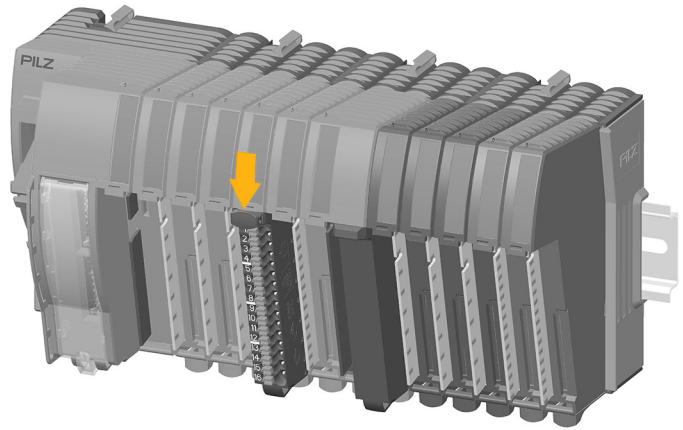
Procedure:

- ▶ Remove the terminal block on the head module
- ▶ Remove the terminal blocks with the wiring
- ▶ [Remove the electronic modules from the backplane](#) [ 29]
- ▶ [Uninstall the backplane \(not energised\)](#) [ 30]
- ▶ [Remove the head module](#) [ 30]

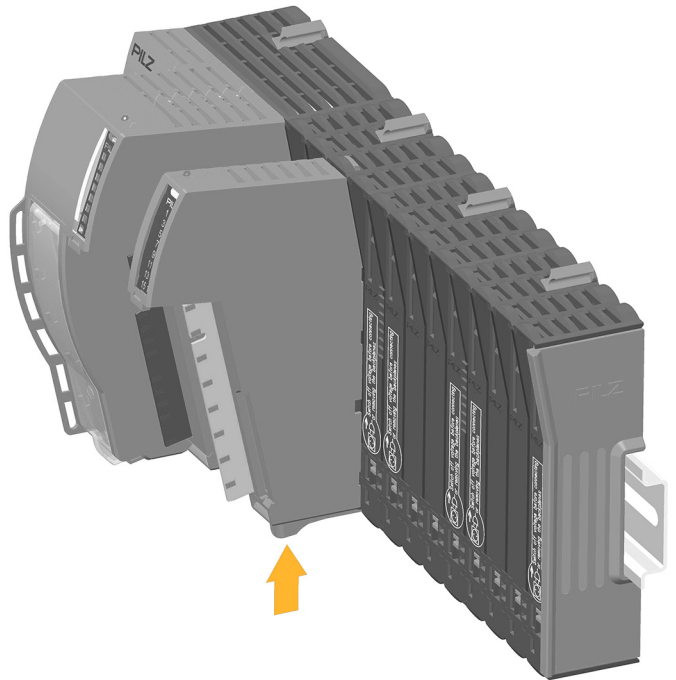
4.5.1 Uninstalling the electronic module

4.5.1.1 Removing an electronic module

1. Press the unlocking mechanism on the terminal block that is shown by the arrow and pull off the terminal block forward.

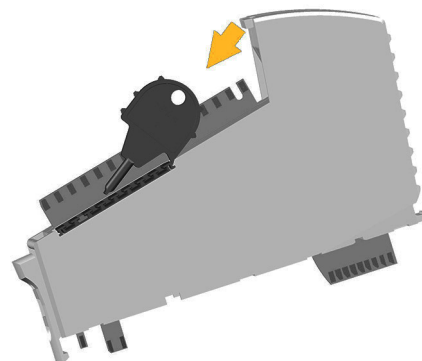


2. Press the unlocking mechanism that is shown by the arrow and pull off the electronic module upwards.



4.5.1.2 Remove coding element

► Remove the coding elements using the existing coding tool or a screwdriver.



4.5.2 Uninstalling the backplane

Prerequisite:

- ▶ The supply voltage must be switched off.
- ▶ The electronic modules have been removed.

Procedure:

1. Turn the mounting rail interlock to the left to unlock the backplane on the mounting rail.
2. Pull the backplane off the mounting rail.

4.5.3 Removing the head module

Prerequisite:

- ▶ The supply voltage must be switched off.
- ▶ The plugs for the field bus connections must be removed.
- ▶ All the wiring must be removed.
- ▶ At least the first electronic module has been removed.

Procedure:

1. Rotate the mounting rail interlock to the left to unlock the head module on the mounting rail.
2. Pull the head module off the mounting rail.

4.6 Changing an electronic module during operation

An electronic module can be hot swapped.

Effects:

- ▶ Module bus communication between the other modules is not interrupted.
- ▶ The configuration data is retained.
- ▶ The module is detected automatically as soon as the module is re-inserted.

Procedure:

1. [Removing an electronic module](#)  29]
2. [Inserting an electronic module](#)  26]

A new electronic module can be inserted during operation.

Procedure:

- ▶ [Inserting an electronic module](#)  26]

Effects:

- ▶ Module bus communication between the other modules is not interrupted.
- ▶ To detect the new module the following steps can be necessary:
 - Creating a new configuration or changing an existing configuration
 - Download of the configuration to the head module
 - Restart of the head module. After a restart, the system behaves as after a warm reset using a reset pushbutton (see operating manual of the head module, chapter "Reset pushbutton", section "Carrying out a warm reset (restart)").

5 Connection of the PSS u2 system

5.1 Supply voltages

The supply voltage for the module supply and periphery supply is fed in via the head module. The periphery supply can be fed in again at a separate voltage supply module. The voltages are distributed to the modules via the module bus.

- ▶ Supply voltage for module supply

The supply voltage for module supply is fed in at the terminals labelled "M-Supply" and is passed on to the module bus by the head module on a potentially isolated basis.

- ▶ Supply voltage for periphery supply

The supply voltage for periphery supply is fed in at the head module or a supply voltage module at the terminals labelled "P-Supply".

- ▶ Module supply

The module supply is the internal supply voltage for the head module and electronic modules. It is galvanically isolated from the power supply for the periphery supply. On analogue input/output modules, the module supply is galvanically isolated from the inputs/outputs.

- ▶ Periphery supply

The periphery supply supplies 24 VDC to the sensors and actuators on input/outputs on electronic modules. On analogue input/output modules, the periphery supply is galvanically isolated from the inputs/outputs.

The connection on the backplane can be disconnected in order to form supply groups. On digital failsafe modules, the periphery supply is used to provide test pulses. Failsafe input/output modules will not start until the periphery supply is connected correctly.

- ▶ Shield connection element

The shield connection element should be connected directly to the mounting rail. Permitted infeed at the shield connection element:

- Shield

- ▶ Earth (Ground)

The supply voltage for module supply and the supply voltage for periphery supply have a common connection for the respective potential earth (ground).

- ▶ Functional earth

A contact spring on the backplanes connects the modules' functional earth to the mounting rail.

The supply voltages for module supply and periphery supply must be extra low voltages with safe electrical separation (PELV or SELV) in accordance with VDE 0100, Part 410.

UL requirement: The supply voltages for module supply and periphery supply must be extra low voltages with safe electrical separation (PELV or SELV) in accordance with UL 61010-2-201 (IEC 61010-2-201:2013).

Further requirements of the power supplies can be found in the data sheets for the supply voltage modules or head modules.

When the supply voltages are fed in separately using two power supplies, the supply voltage for module supply and the supply voltage for periphery supply are galvanically isolated. If galvanic isolation is not necessary, a common power supply may be used for the supply voltage for periphery supply and the supply voltage for module supply.

Separate power supplies for the supply voltage for module supply and periphery supply increase availability: In the case of a short circuit in the supply voltage for periphery supply, the supply voltage for module supply is maintained and the head module can continue to exchange data with fieldbus systems, e.g. for diagnostic purposes.



WARNING!

Risk of electrocution!

Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

A base-insulated device with a supply voltage of more than 50 VAC or 120 VDC may not be connected parallel to the module supply.

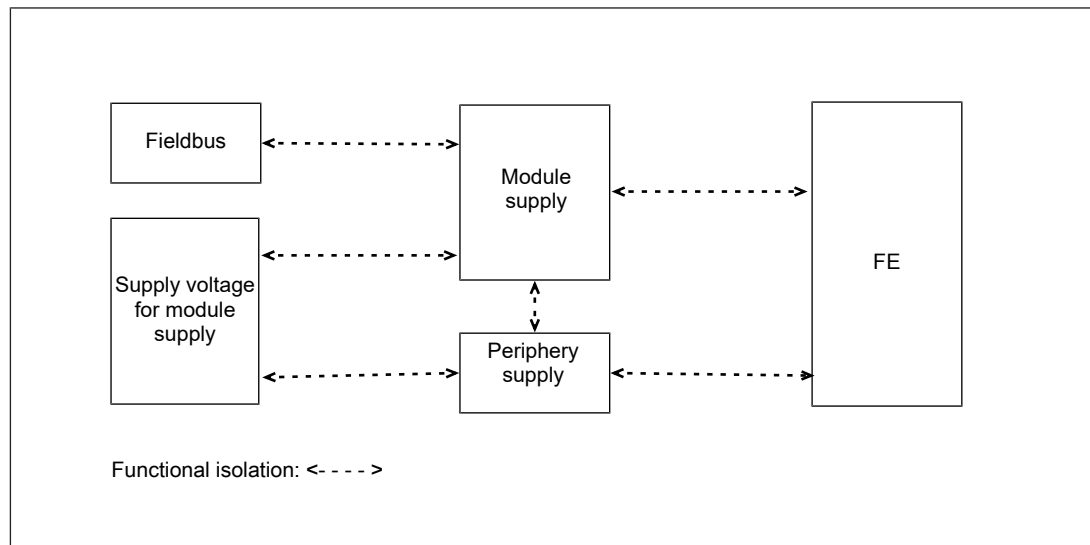


Fig.: Potential isolations



WARNING!

Risk of electrocution!

If voltages higher than 50 VAC or 120 VDC are connected to the PSS u2, e.g. to switch contacts on relay modules, please note the following:

- Specific accident prevention regulations apply.

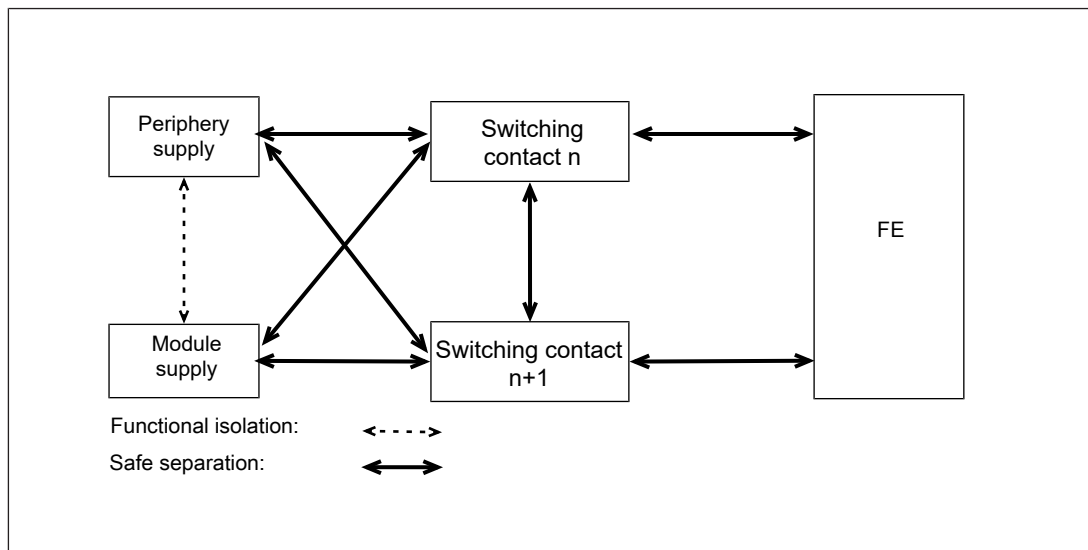


Fig.: Additional potential isolations in the case of modules for voltages above 50 V AC or 120 V DC

5.2 Power supplies

- ▶ The external power supplies must conform to EN 60950-1, 02/2011, section 2.3, EN 61558-1, 11/2006 or EN 50178, 10/97.
- ▶ On supply groups with an earthed supply: The supply voltages for module supply and periphery supply need a common 0 V reference potential.
 - Connect together the 0 V connections on all the external power supplies and earth the 0 V mains at a single point.
 - Earthed supply voltages offer the best noise immunity.
- ▶ On floating supply groups: Do not earth the 0 V potential of the supply voltages for the module supply and periphery supply.
 - Please note the regulations on insulation monitoring and safe electrical isolation.
- ▶ Connection of the 0 V supply to the central earth bar or earth fault monitor must be in accordance with national regulations (e.g. EN 60204-1, NFPA 79, NEC: Article 250).
- ▶ Protect the cabling and the connectors on the control system with a fuse between the external power supply and the control system. Use the following fuses:
 - Module supply: max. 6 A characteristic B/C
 - Periphery supply: max. 10 A characteristic B/C

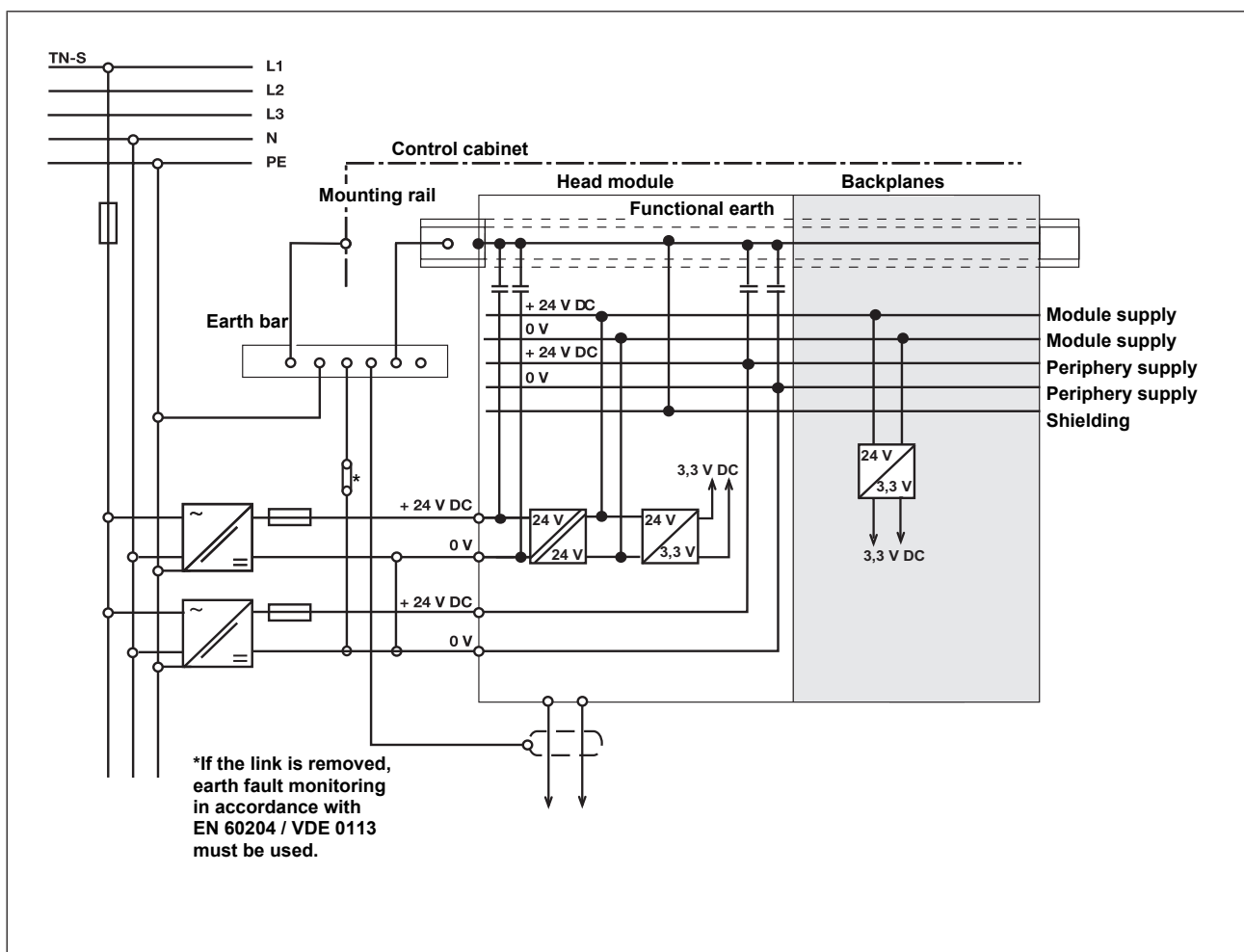


Fig.: Supply voltages for module supply and periphery supply from separate power supplies, earthed supply group

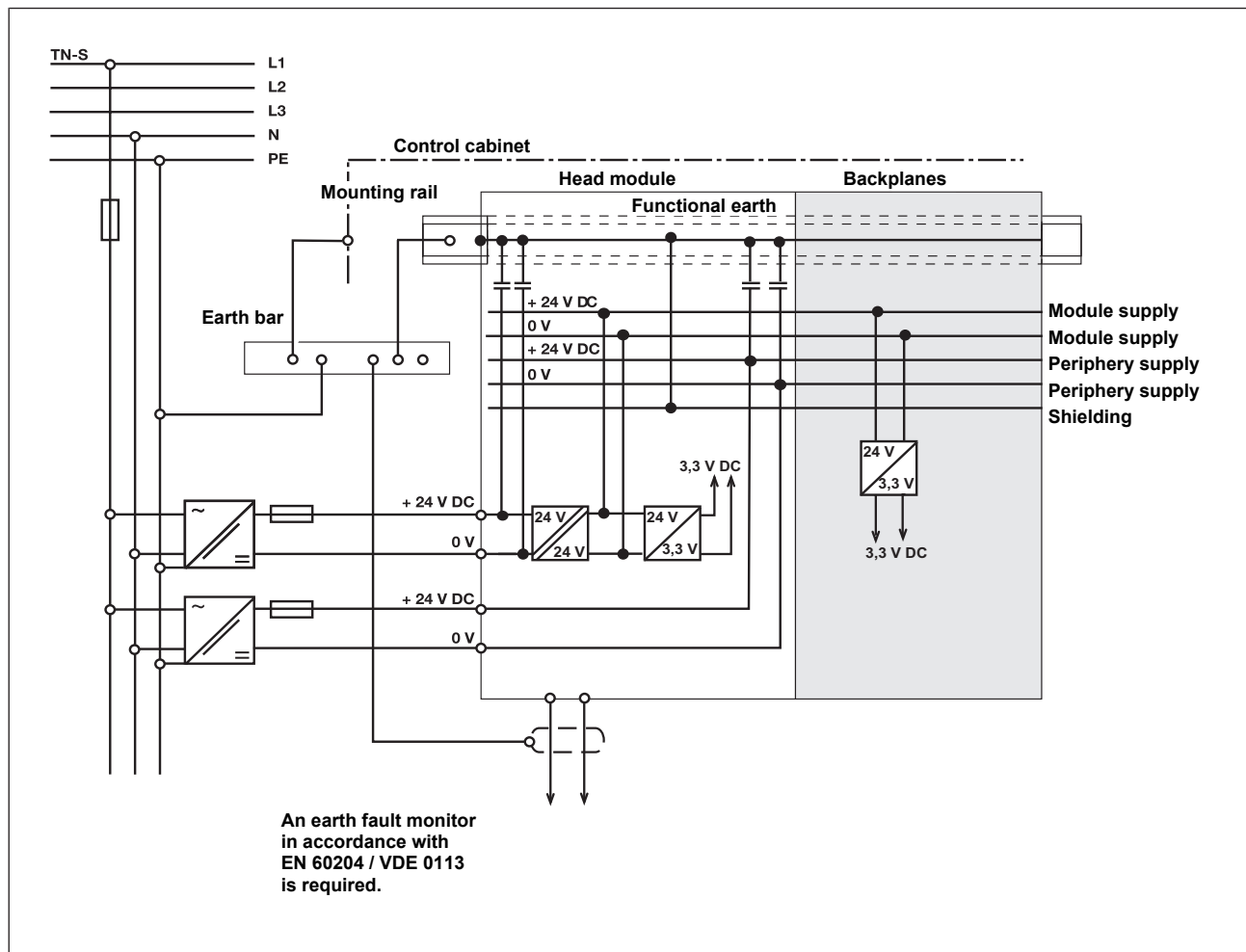


Fig.: Supply voltages for module supply and periphery supply from separate power supplies, floating supply group

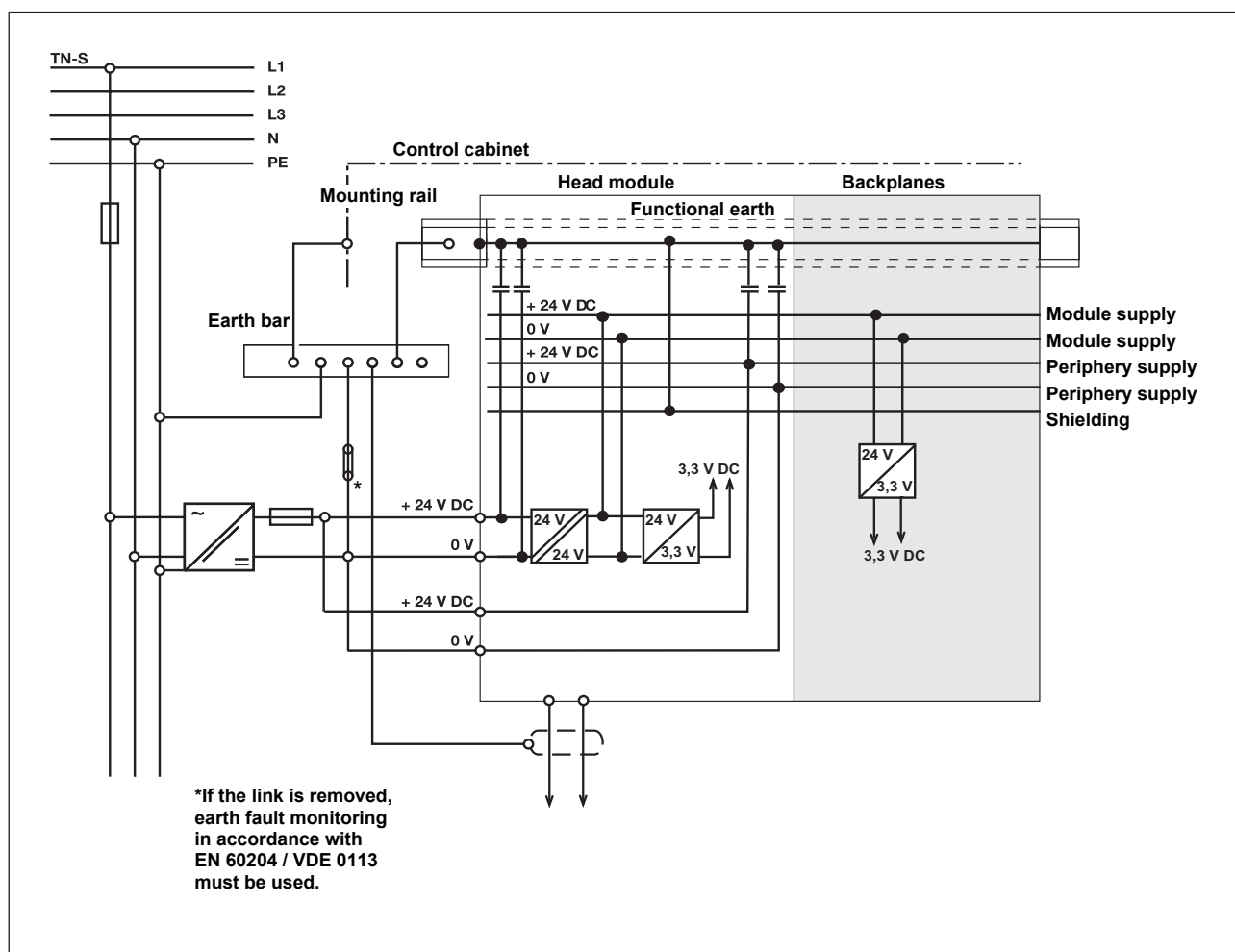


Fig.: Supply voltage for module supply and periphery supply from a common power supplies, earthed supply group

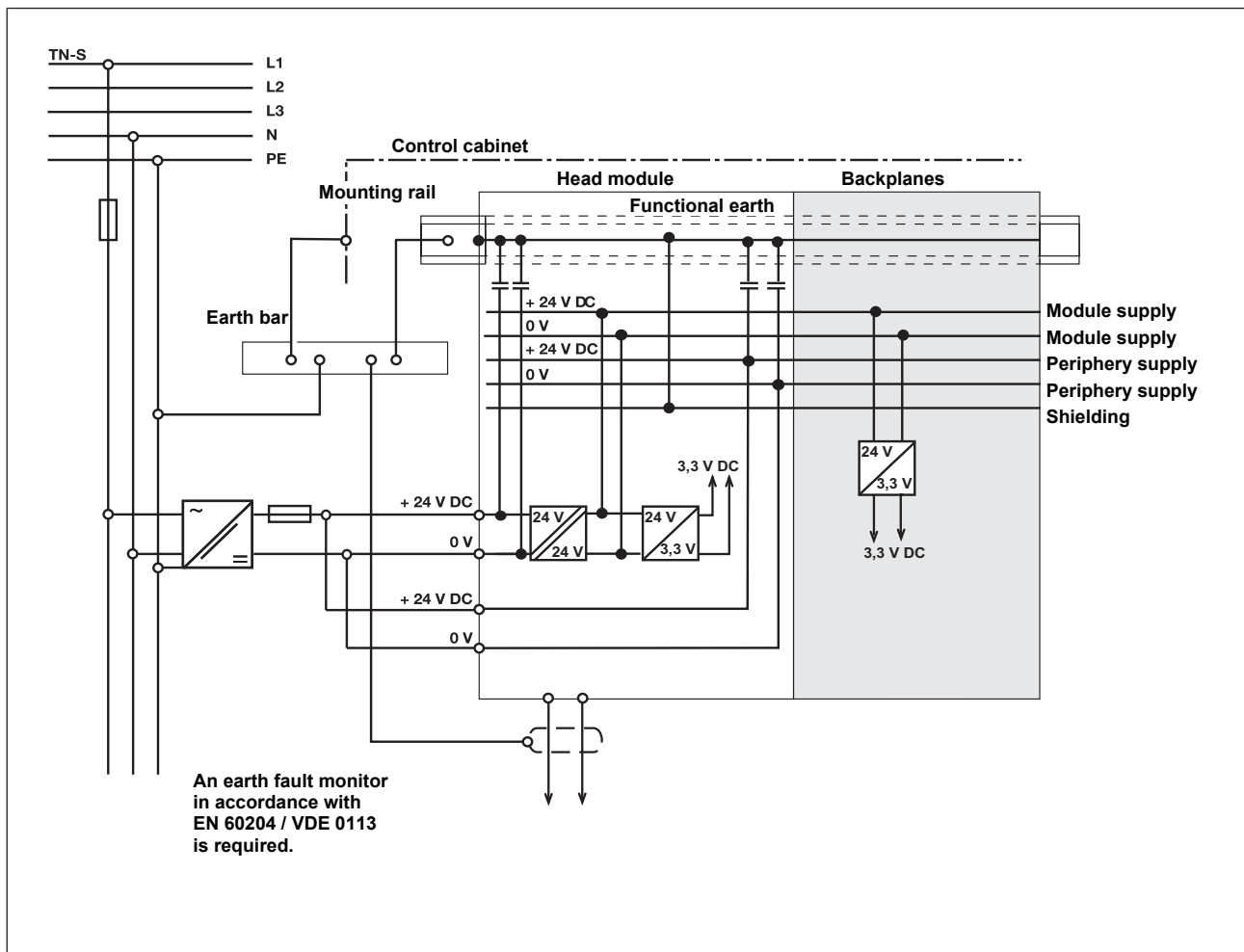


Fig.: Supply voltage for module supply and periphery supply from a common power supplies, floating supply group

5.3 Earthing

When the backplane is attached to the mounting rail, a contact spring makes the electrical contact between the backplane's functional earth and the mounting rail.

When the modules are attached to the backplane, a contact makes the connection between the module's functional earth and the functional earth on the backplane.

The earthing terminal is available as an accessory. The mounting rail must be properly earthed to ensure interference-free operation in accordance with EMC regulations.

The mounting rail should preferably be attached to a metallic backplane/mounting plate. Earthing should be low impedance and should preferably be executed in several places.

The supplies on the PSS u2 module bus (module supply, periphery supply) are not connected to the functional earth through the contact spring.

The optional shield connection element (see [Install shield connection element \(optional\)](#) [45]) establishes a direct connection to the mounting rail.

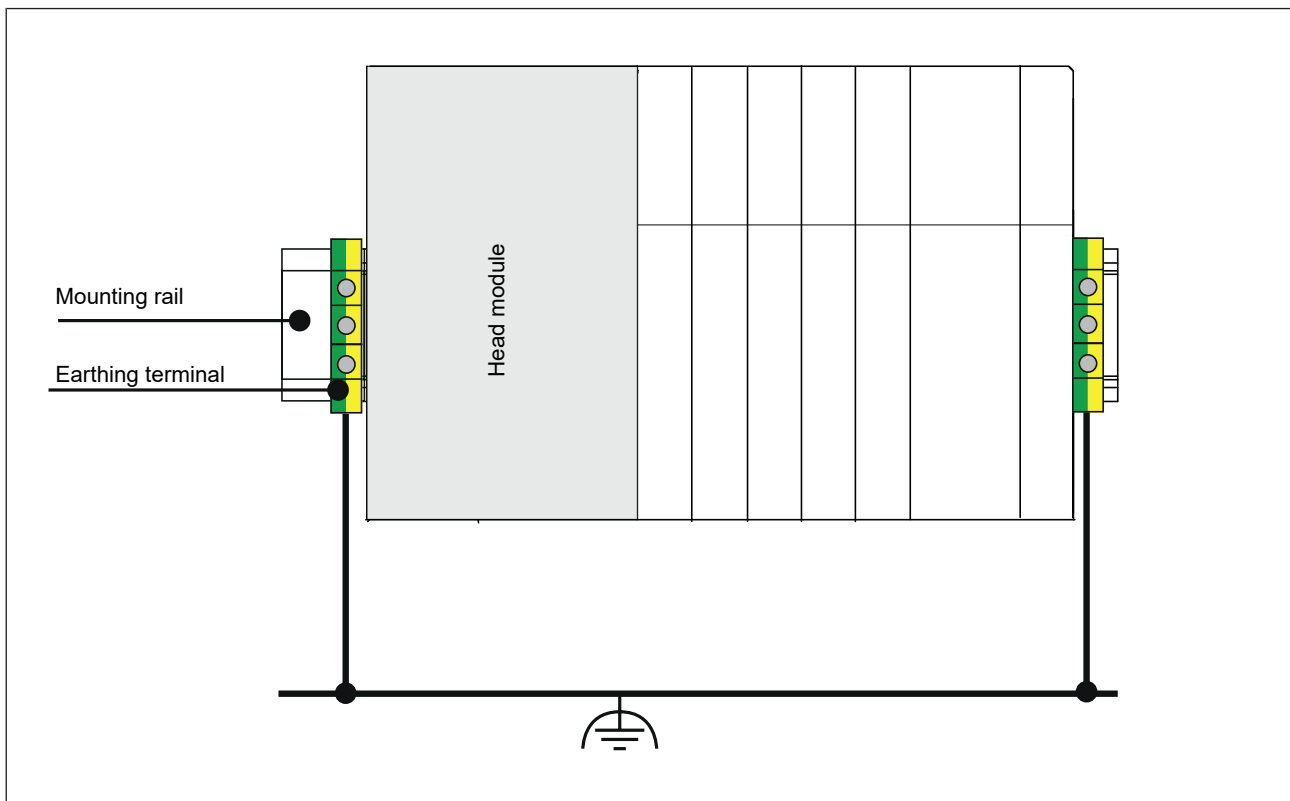


Fig.: Earthing the mounting rail

5.4 Supply groups

For potential isolation, the supply (Periphery Supply) of the upstream (left-hand) modules on the backplane is interrupted and is refreshed for the downstream (right-hand) modules at a supply voltage module.

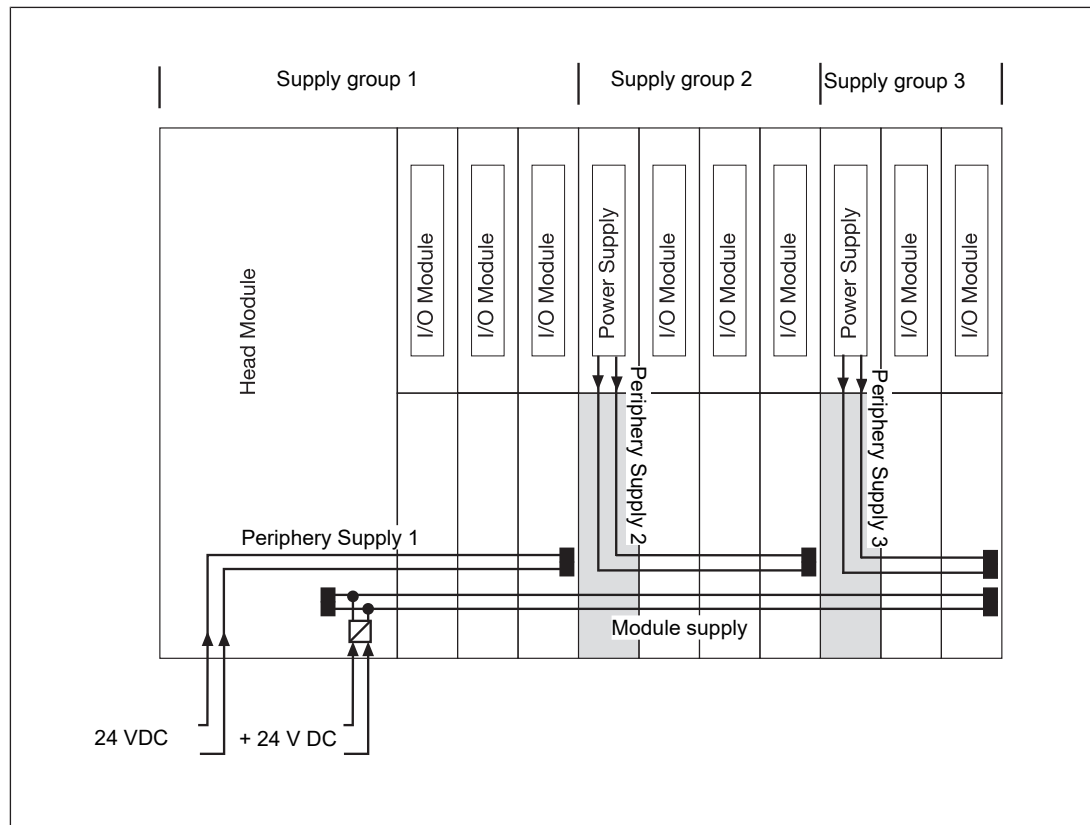
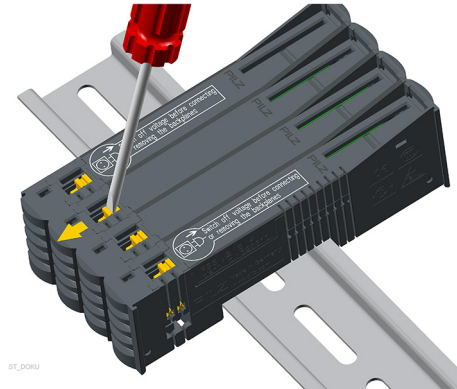


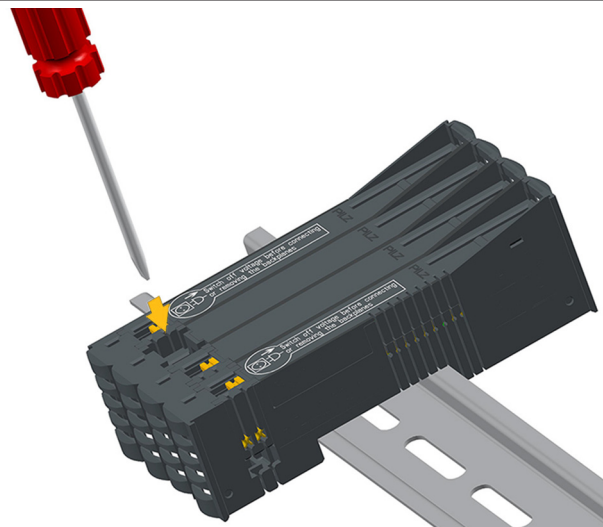
Fig.: Formation of supply groups

Interrupting the electrical connection to the left-hand module

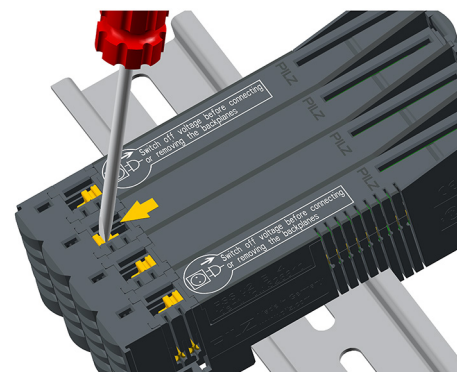
1. Use a screwdriver to move the yellow contact block into the central position



2. Use a screwdriver to press the yellow contact block downwards. The yellow contact block is countersunk.



3. Use a screwdriver to move the yellow contact block into the position shown.



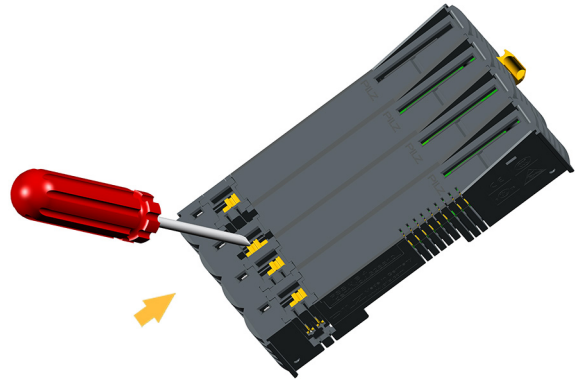
Restoring the electrical connection to the left-hand module

Prerequisite:

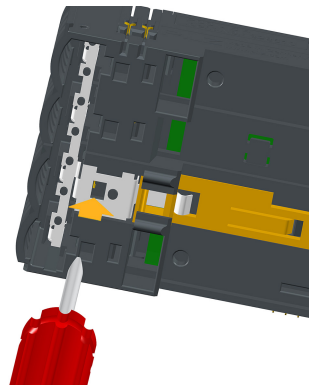
Supply voltage is switched off. Backplanes may only be inserted or removed when the supply voltage is switched off.

The backplane is uninstalled from the mounting rail.

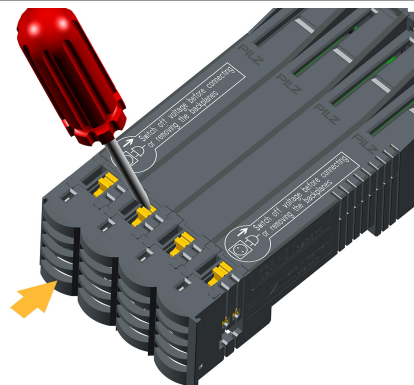
1. The yellow contact block is countersunk. Use a screwdriver to move the yellow contact block into the central position.



2. Turn the backplane to the rear. Use a screwdriver to press the yellow contact block back into its start position.



3. Move the yellow contact block into the position shown. The electrical connection to the left-hand slot is now established.



5.5 Wiring the connection terminals

Procedure:

- ▶ Use a flat head screwdriver.
- ▶ Strip the wire back 9 mm.
- ▶ Feed the stripped cable as far as it will go into the opening for the spring-loaded terminal.
- ▶ Check that the cable is firmly seated.

5.5.1 Cable requirements

Please note:

- ▶ The minimum cable cross section for field connection terminals on the terminal blocks is 0.15 mm² (AWG26).
- ▶ The maximum cable cross section for field connection terminals on the terminal blocks is 1.5 mm² with ferrules (AWG14)
- ▶ Use copper wiring.
- ▶ The thermal requirement for the connection cable depends on the operating voltage, operating current, connection cross-section and mounting position. Due to these dependencies, temperatures of up to 100 °C occur on the connection cables. The operator is responsible for measuring and determining the operating temperature and for selecting the thermal properties for the connection cable in each application.

5.5.2 Connecting FS inputs and outputs

In FS applications, it is essential that short circuits and open circuits are unable to cause a hazardous condition within a plant.

The way in which this is done will depend on the degree of hazard from the plant section, the switching frequency of the sensors and the level of safety of the sensors and actuators. These points must be assessed in conjunction with the certification body responsible for safety (e.g. BG, TÜV).

Depending on the application area and its respective regulations, the FS section can be used up to SIL CL 3 of EN 62061 and up to PL e (Cat 4) of ISO 13849-1.

Various tests may be configured on FS input/output modules. These tests can be used to detect many short circuits and open circuits. Examples of such tests are:

- ▶ Off tests for outputs that are switched on
- ▶ On tests for outputs that are switched off
- ▶ Tests for shorts between the outputs
- ▶ Test pulses for detecting shorts between contacts on inputs

Wiring guidelines and connection examples are available in the operating manuals or data sheets for the input/output modules.

5.6 Wiring test and function test



CAUTION!

The PSS u2 may be damaged by wiring errors or by modules being inserted incorrectly.

For this reason, please follow the correct sequence when commissioning.

Prerequisite:

- ▶ Mechanical structure is complete.
- ▶ Wiring is finished.
- ▶ Voltage is not yet applied.

Procedure:

- ▶ Apply the supply voltage for the module supply. Download configuration data to the PSS u2.
 - The head module checks that the hardware registry is correct. If an electronic module is inserted incorrectly, this will be detected and will lead to an error message.
- ▶ In the case of an error: Correct the invalid hardware registry.
- ▶ Check the functions of the inputs and outputs. Most wiring errors can be detected in this way.
- ▶ In the case of an error: Correct the wiring.



WARNING!

Risk of electrocution!

If voltages higher than 50 VAC or 120 VDC are connected to the PSS u2, e.g. to switch contacts on relay modules, please note the following:

- Specific accident prevention regulations apply.

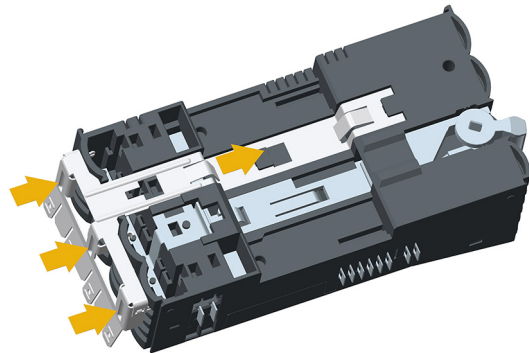
- ▶ If relay modules with 230 V outputs are used: Connect 230 V.

6 Accessories

6.1 Install shield connection element (optional)

A shield connection element can be installed on the 4x backplane as an option. The shield connection element generates the direct contact to the mounting rail. The shield connection element is not supplied with the device; see chapter entitled Accessories).

1. Attach the shield connection element to the rear of the backplane and push it in the direction of the arrow that is shown until it clicks in place at the locations indicated by the arrows.



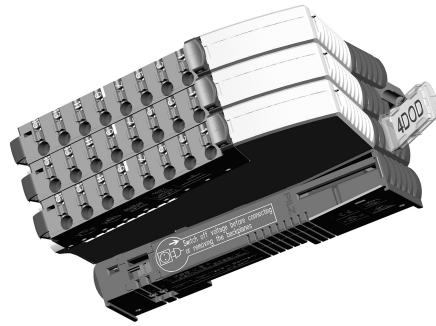
6.2 Mounting the labelling bracket for the backplane

First mounting variant

1. Insert the labelling strips into the labelling bracket and lock the labelling bracket in place on the backplane.



2. The labelling bracket is completely mounted.

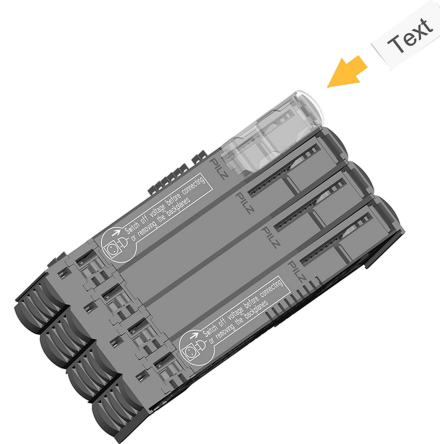


Second mounting variant

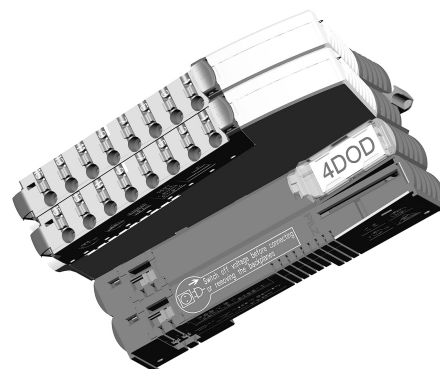
1. Lock the labelling bracket in place on the backplane.



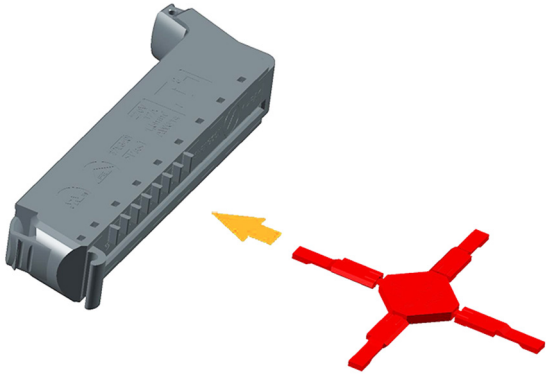
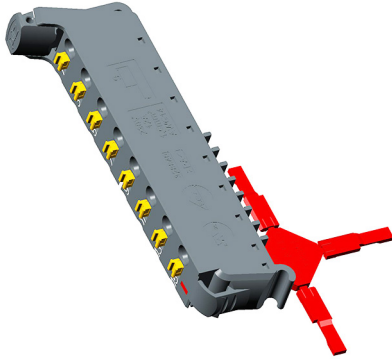
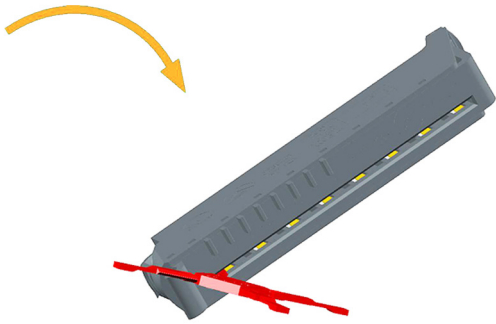
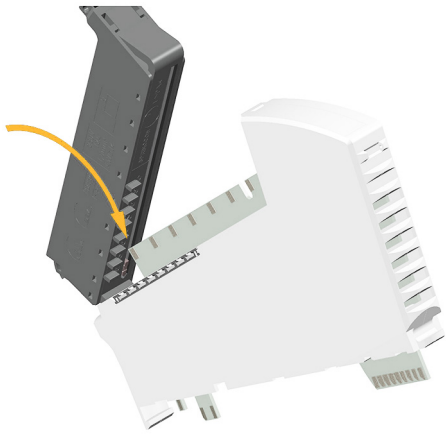
2. Insert the labelling strips into the labelling bracket.



3. The labelling bracket is completely mounted.

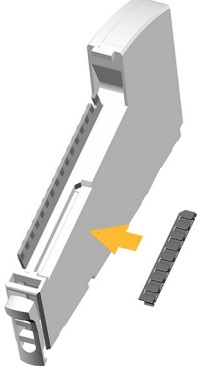
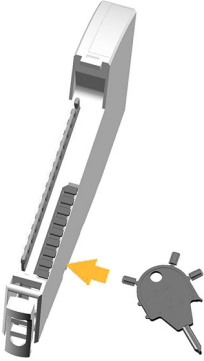
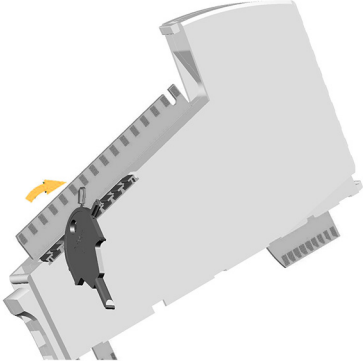
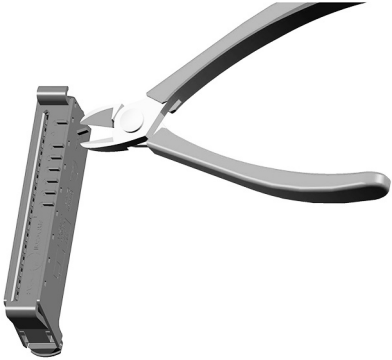


6.3 Using the protective coding in the terminal block

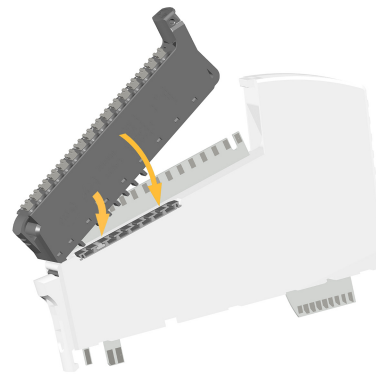
1. Insert the protective coding into the 8-pin terminal block	
2. The protective coding must be visible on the terminal side	
3. Rotate the protective coding until it is embedded within the terminal block.	
4. Plug the coded terminal block into the module.	

6.4 Use coding element

Coding stops an incorrect terminal block being plugged into an electronic module. Once an electronic module has been coded, it will only take terminal blocks with the same mechanical coding.

1. Insert the coding strip into the recess on the module	
2. Insert a coding element into the coding strip.	
3. Break off the coding element.	
4. Trim encoding on the terminal block at the appropriate place.	

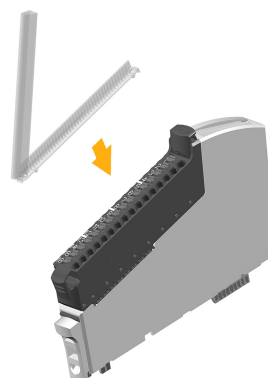
5. Assemble the coded terminal block on the module.



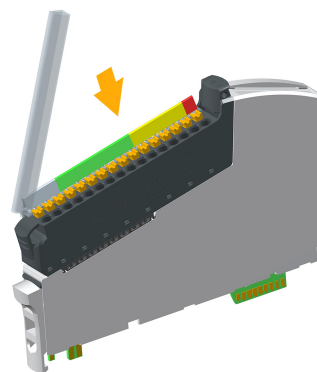
6.5 Mounting colour marking of the connection levels

The colour marking helps with wiring. The colour marking consists of a transparent plastic clip and printable labelling strips. Colour marking can be used to identify different potentials or modules with the same function.

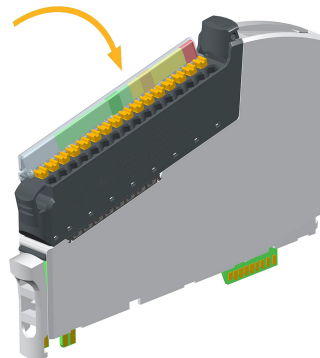
1. Insert the labelling strips onto the terminal block.



2. Insert the printed labelling strips.



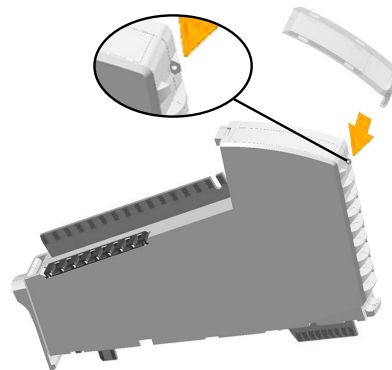
3. Close the cover of the plastic clip.



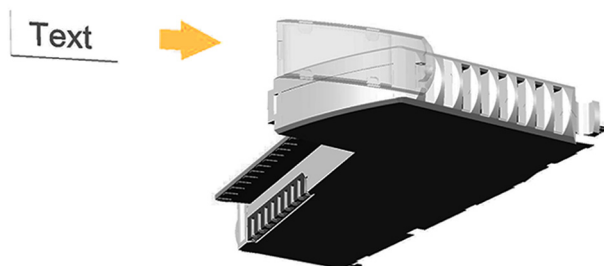
6.6 Mounting the labelling bracket for modules

Mounting the short (23.5 mm) labelling bracket

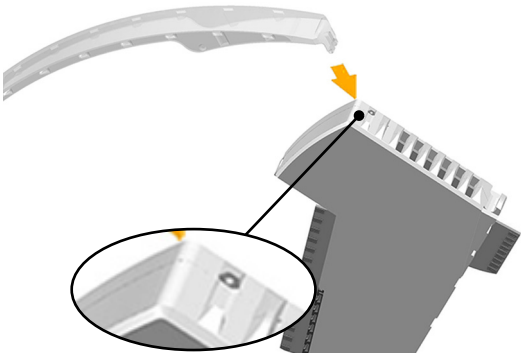
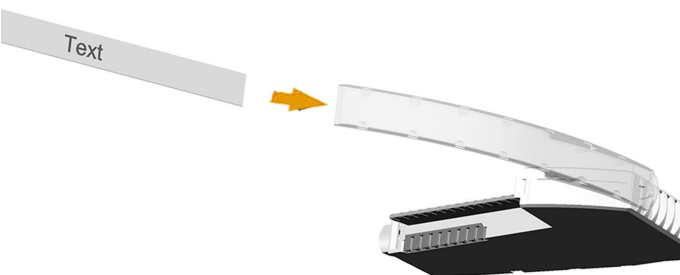
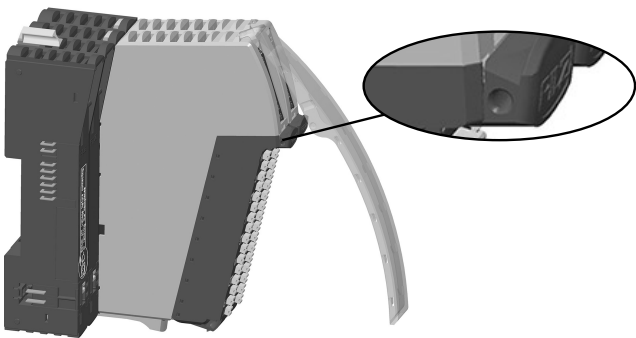
1. Lock the labelling bracket in place on the module at the top.



2. Insert the labelling strips into the labelling bracket.



Mounting the long (103 mm) labelling bracket

1. Lock the labelling bracket in place on the module at the top. We recommend locking the labelling bracket in place before you mount the modules on the backplane.	
2. Insert the labelling strips into the labelling bracket.	
3. Mount the terminal block and additionally lock the labelling bracket in place on the terminal block.	

► Support

Technical support is available from Pilz round the clock.

Americas

Brazil

+55 11 97569-2804

Canada

+1 888 315 7459

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+1 877-PILZUSA (745-9872)

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Austria

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Headquarters: Pilz GmbH & Co. KG, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: info@pilz.com, Internet: www.pilz.com

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