

RELION® PROTECTION AND CONTROL

615 series

Installation Manual





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Conformity

This product complies with following directive and regulations.

Directives of the European parliament and of the council:

- Electromagnetic compatibility (EMC) Directive 2014/30/EU
- Low-voltage Directive 2014/35/EU
- RoHS Directive 2011/65/EU

UK legislations:

- Electromagnetic Compatibility Regulations 2016
- Electrical Equipment (Safety) Regulations 2016
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

These conformities are the result of tests conducted by the third-party testing in accordance with the product standard EN / BS EN 60255-26 for the EMC directive / regulation, and with the product standards EN / BS EN 60255-1 and EN / BS EN 60255-27 for the low voltage directive / safety regulation.

The product is designed in accordance with the international standards of the IEC 60255 series.

Safety information



Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected.



Non-observance can result in death, personal injury or substantial property damage.



Only a competent electrician is allowed to carry out the electrical installation.



National and local electrical safety regulations must always be followed.



The frame of the protection relay has to be carefully earthed.



When the plug-in unit has been detached from the case, do not touch the inside of the case. The relay case internals may contain high voltage potential and touching these may cause personal injury.



The protection relay contains components which are sensitive to electrostatic discharge. Unnecessary touching of electronic components must therefore be avoided.



Whenever changes are made in the protection relay, measures should be taken to avoid inadvertent tripping.

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1 Introduction

1.1 This manual

The installation manual contains instructions on how to install the protection relay. The manual provides procedures for mechanical and electrical installation. The chapters are organized in the chronological order in which the relay should be installed.

1.2 Intended audience

This manual addresses the communication system engineer or system integrator responsible for pre-engineering and engineering for communication setup in a substation from an protection relay perspective.

The system engineer or system integrator must have a basic knowledge of communication in protection and control systems and thorough knowledge of the specific communication protocol.

1.3 Product documentation

1.3.1 Product documentation set

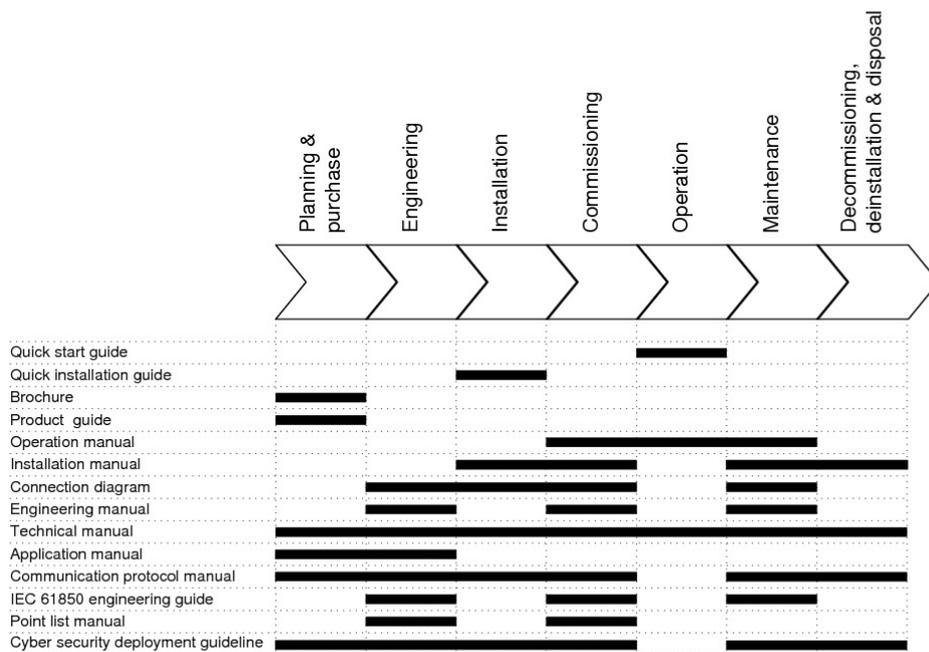


Figure 1: The intended use of documents during the product life cycle



Product series- and product-specific manuals can be downloaded from the ABB Web site www.abb.com/relion.

1.3.2 Document revision history

Document revision/date	Product series version	History
A/2007-12-20	1.0	First release
B/2008-02-08	1.0	Content updated
C/2008-07-02	1.1	Content updated to correspond to the product series version
D/2008-10-03	1.1	Content updated

Table continues on the next page

Document revision/date	Product series version	History
E/2009-03-04	2.0	Content updated to correspond to the product series version
F/2009-07-03	2.0	Content updated
G/2010-06-11	3.0	Content updated to correspond to the product series version
H/2011-09-14	3.0	Content updated
K/2012-05-11	4.0	Content updated to correspond to the product series version
L/2013-12-20	5.0	Content updated to correspond to the product series version
N/2015-10-30	5.0 FP1	Content updated to correspond to the product series version
P/2016-05-20	5.0 FP1	Content updated
R/2018-08-31	5.0 FP1	Content updated
S/2018-12-20	5.0 FP1	Content updated
T/2021-12-21	5.0 FP1	Content updated



Download the latest documents from the ABB Web site <https://www.abb.com/mediumvoltage>.

1.3.3 Related documentation

Product series- and product-specific manuals can be downloaded from the ABB Web site <http://www.abb.com/substationautomation>.

1.4 Symbols and conventions

1.4.1 Symbols



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The warning icon indicates the presence of a hazard which could result in personal injury.



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader of important facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push-button navigation in the LHMI menu structure is presented by using the push-button icons.

To navigate between the options, use  and .

- Menu paths are presented in bold.

Select **Main menu > Settings**.

- LHMI messages are shown in Courier font.

To save the changes in nonvolatile memory, select `Yes` and press .

- Parameter names are shown in italics.

The function can be enabled and disabled with the *Operation* setting.

- Parameter values are indicated with quotation marks.

The corresponding parameter values are "On" and "Off".

- Input/output messages and monitored data names are shown in Courier font.

When the function starts, the `START` output is set to `TRUE`.

- This document assumes that the parameter setting visibility is "Advanced".

2 Environmental aspects

2.1 Sustainable development

Sustainability has been taken into account from the beginning of the product design including the pro-environmental manufacturing process, long life time, operation reliability and disposing of the protection relay.

The choice of materials and the suppliers have been made according to the EU RoHS directive (2002/95/EC). This directive limits the use of hazardous substances which are the following:

Table 1: Maximum concentration values by weight per homogeneous material

Substance	Proposed maximum concentration
Lead - Pb	0.1%
Mercury - Hg	0.1%
Cadmium - Cd	0.01%
Hexavalent Chromium Cr (VI)	0.1%
Polybrominated biphenyls - PBB	0.1%
Polybrominated diphenyl ethers - PBDE	0.1%

Operational reliability and long life time have been assured with extensive testing during the design and manufacturing processes. Moreover, long life time is supported by maintenance and repair services as well as by the availability of spare parts.

Design and manufacturing have been done under a certified environmental system. The effectiveness of the environmental system is constantly evaluated by an external auditing body. We follow environmental rules and regulations systematically to evaluate their effect on our products and processes.

2.2 Disposal of a protection relay

Definitions and regulations of hazardous materials are country-specific and change when the knowledge of materials increases. The materials used in this product are typical for electric and electronic devices.

All parts used in this product are recyclable. When disposing of a protection relay or its parts contact a local waste handler who is authorized and specialized in disposing of electronic waste. These handlers can sort the material by using dedicated sorting processes and dispose of the product according to the local requirements.

Table 2: Materials of the protection relay parts

Protection relay	Parts	Material
Case	Metallic plates, parts and screws	Steel
	Plastic parts	PC ¹ , LCP ²
	Electronics plug in module	Various
Plug-in unit	Electronics plug in modules	Various
	Electronics LHMI module	Various
	Plastic parts	PC, PBT ³ , LCP, PA ⁴
	Metallic parts	Aluminium
Package	Box	Cardboard
Attached material	Manuals	Paper

¹ Polycarbonate

² Liquid crystal polymer

³ Polybutylene terephthalate

⁴ Polyamide

3 Unpacking, inspecting and storing

3.1 Removing transport packaging

Protection relays require careful handling.

1. Examine the delivered products to ensure that they have not been damaged during the transport.
2. Remove the transport packaging carefully without force.
3. Attach the protective film (supplied with the protection relay) on the top side of the unit for the installation phase.



Before connecting the auxiliary power, remove the protective film from top of the protection relay.



The cardboard packaging material is 100% recyclable.

3.2 Inspecting product and delivery items

3.2.1 Identifying product

1. Locate the protection relay's order number from the label on top of the plug-in unit.
2. Compare the protection relay's order number with the ordering information to verify that the received product is correct.

3.2.2 Checking delivery items

Check that all items are included in the delivery in accordance with the delivery documents.

3.2.3 Inspecting product

Protection relays require careful handling before installation on site.

- Check the protection relay to see if any damage occurred during transportation.

If the protection relay has been damaged during transportation, make a claim against the transport contractor, and notify the local ABB representative.

3.2.4 Returning a product damaged in transit

If damage has occurred during transport, appropriate actions must be taken against the latest carrier. Please inform the nearest ABB office or representative. Notify ABB immediately if there are any discrepancies in relation to the delivery documents.

3.3 Storing

If the protection relay is stored before installation, it must be done in the original transport packaging in a dry and dust free place.

Observe the environmental requirements stated in the technical manual.

4 Mounting

4.1 Checking environmental conditions and mounting space

The mechanical and electrical environmental conditions at the installation site must be within the limits described in the technical manual.

- Avoid installation in dusty, damp places.
Avoid places susceptible to rapid temperature variations, powerful vibrations and shocks, surge voltages of high amplitude and fast rise time, strong induced magnetic fields or similar extreme conditions.
- Check that sufficient space is available.
Sufficient space is needed at the front and rear of the protection relay to allow access to wires and optical fibers to provide sufficient ventilation to the protection relay and to enable maintenance and future modifications.
- Ensure that flush-mounted protection relays can be added and replaced without excessive dismantling.

4.2 Detaching and installing plug-in unit

4.2.1 Detaching plug-in unit



Before detaching the plug-in unit from the case, the auxiliary voltage must be disconnected.

1. Turn off the power.
2. Open the seal on the front panel by removing the sealing wire and screw the sealing screw all the way in.

3. Lift the handle to 90 degrees to release the latching mechanism.
The plug-in unit is pushed about 7 mm out of the case and the connectors are separated.
4. Pull the unit out of the case.

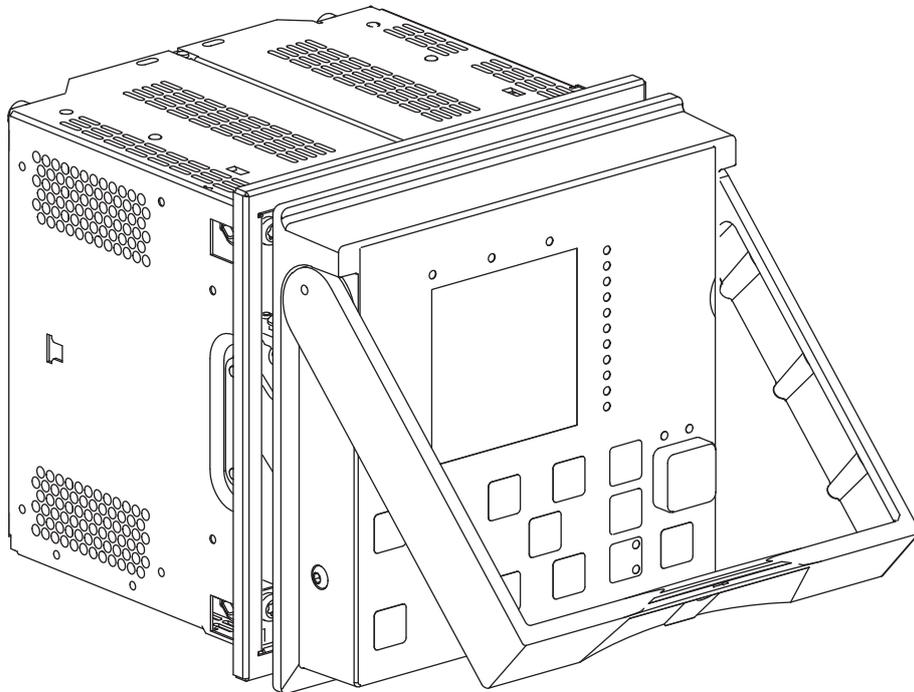


Figure 2: Detaching a plug-in unit from the case



The protection relay features an automatic short-circuit mechanism in the CT connector. Therefore, detaching the plug-in unit will not open the secondary circuit of the CT which could cause dangerously high voltages.



Do not touch terminals inside the case after removing the plug-in unit. Live terminals can be inside the case.



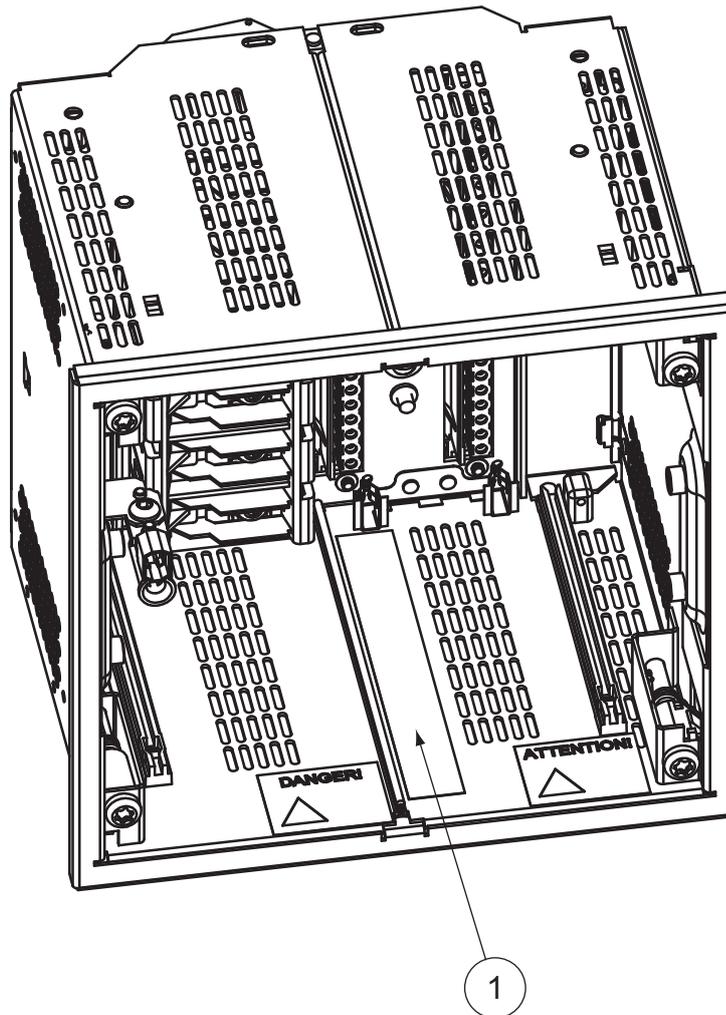
The signal connectors are left open when the plug-in unit is detached.

4.2.2 Installing plug-in unit

The protection relay is constructed in a way that a plug-in unit with voltage- or current-measuring inputs can only be plugged into a corresponding case. This prevents fitting an unsuitable plug-in unit into a wrong case.



Before fitting the plug-in unit into the case, check that the unit and the case have the same serial number.



1 Rating label with serial number

Figure 3: Serial number in the case



Forcing an unsuitable plug-in unit into the case can break both the plug-in unit and the case and may cause danger.

1. Lift the handle 90 degrees and push the plug-in unit into the case.

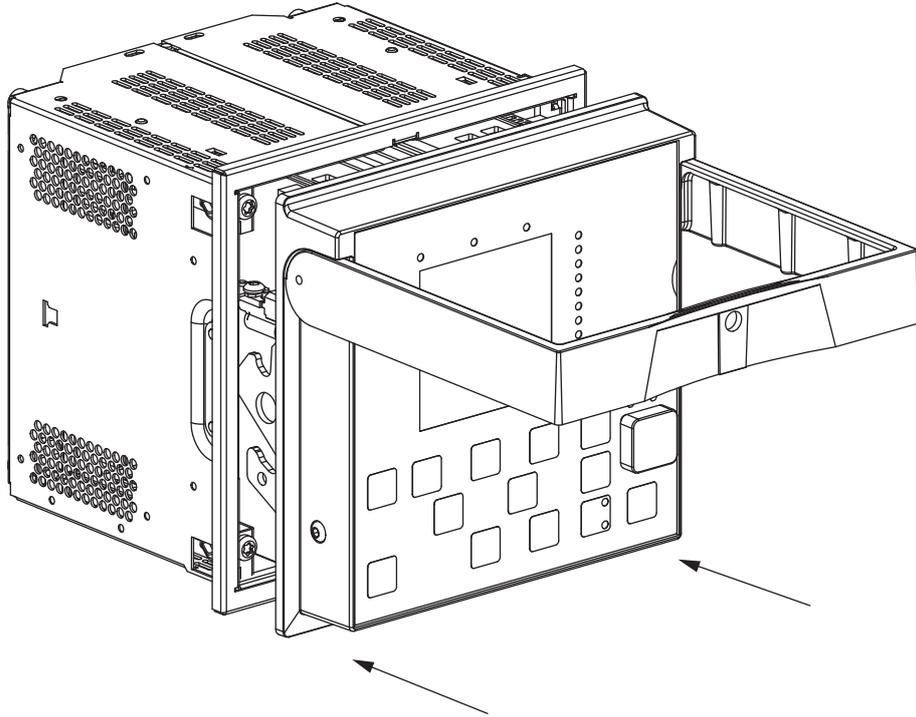
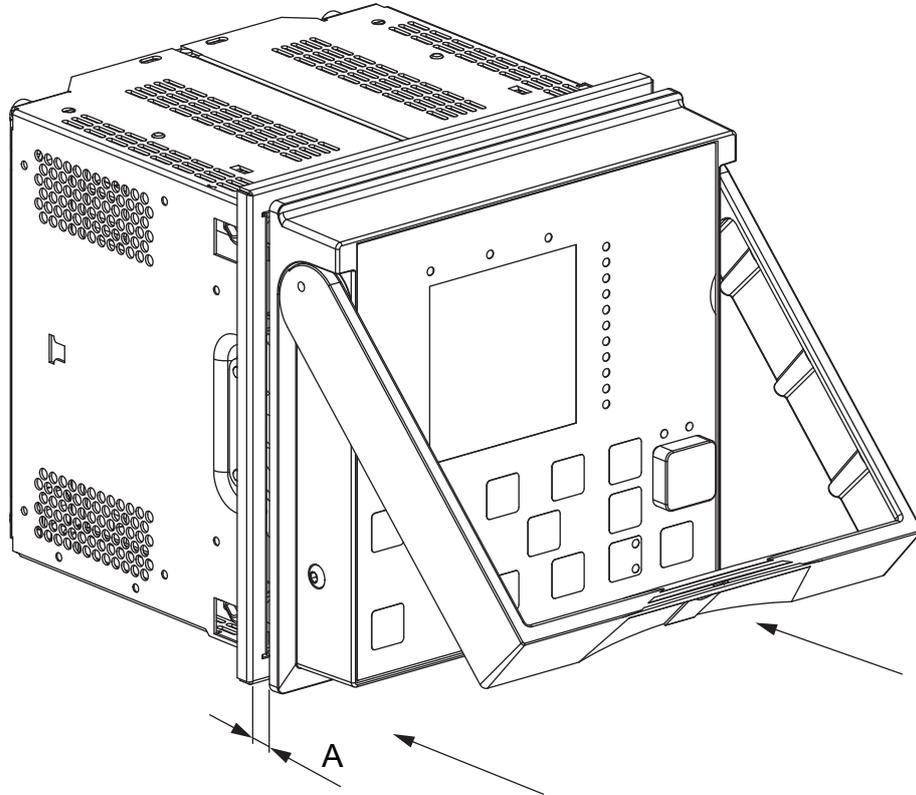


Figure 4: Installing a plug-in unit into the case

2. Let the handle swing down about 45 degrees. At the same time, push the plug-in unit into the case as far as it goes.
Plug-in unit stops at about 7 mm distance from the case.



A 7 mm

Figure 5: Pushing the plug-in unit into the case

3. Turn down the handle to push the plug-in unit into its final position in the case.

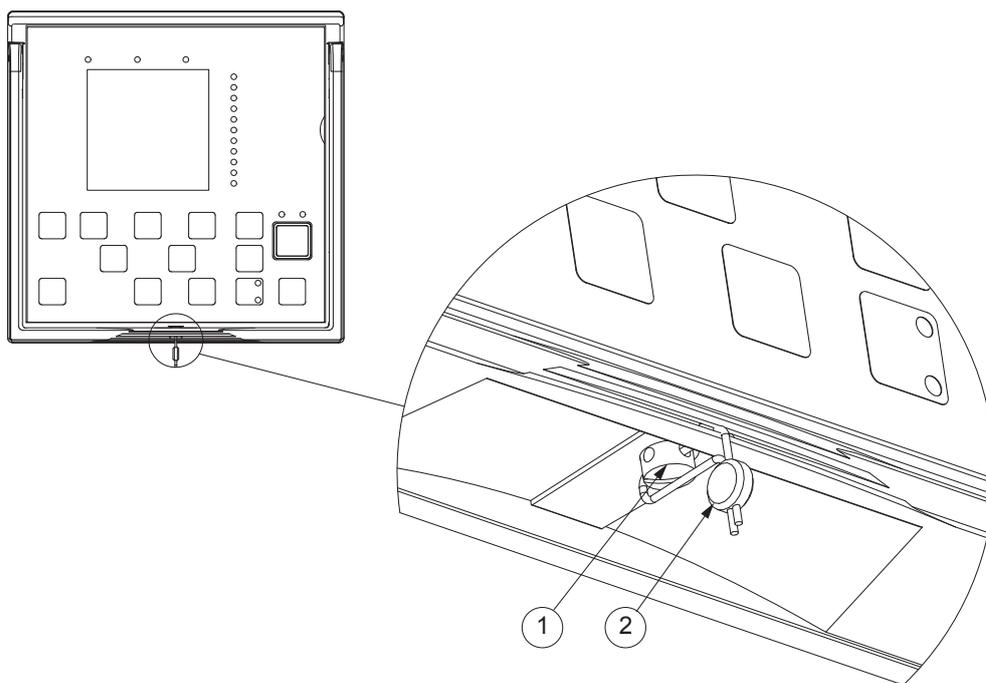


The handle must be locked or sealed to secure the mechanical performance under any conditions caused by vibration, pressure, shock or bump, seismic activity or other equivalent circumstances.

4.2.3 Sealing plug-in unit

The front panel of the protection relay has an integrated sealing screw. By default the screw is screwed all the way in and is not used when installing or detaching the plug-in unit.

1. Open the sealing screw about nine turns.
2. Thread a sealing wire through the holes in the sealing screw and the handle.



1 Sealing screw

2 Sealing wire and seal

Figure 6: Sealing screw

4.2.4 Securing handle

The front panel of the protection relay has an integrated sealing screw. By default, the screw is screwed all the way in and not used when installing or detaching the plug-in unit. Instead of sealing the plug-in unit, the sealing screw and the spacer supplied with the protection relay can be used for securing the handle in place.

1. Fully open the sealing screw and remove it.
2. Re-insert the sealing screw with the spacer.



The protection relay packaging includes a plastic bag containing loose parts such as the spacer.

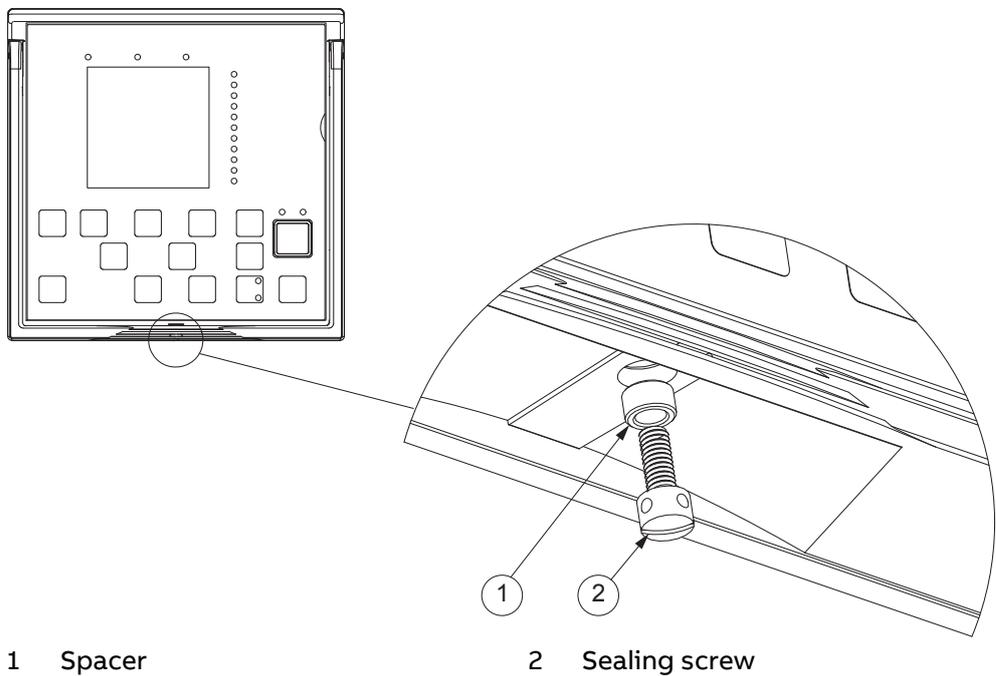


Figure 7: Sealing screw with spacer

4.3 Mounting protection relay

4.3.1 Required tools

- T25 Torx screwdriver for mounting the case
- T20 Torx screwdriver for connecting the protective earthing



Only use adjustable torque screwdrivers.

4.3.2 Flush mounting protection relay

All the mounting elements are integrated in the protection relay.

Requirements for installation:

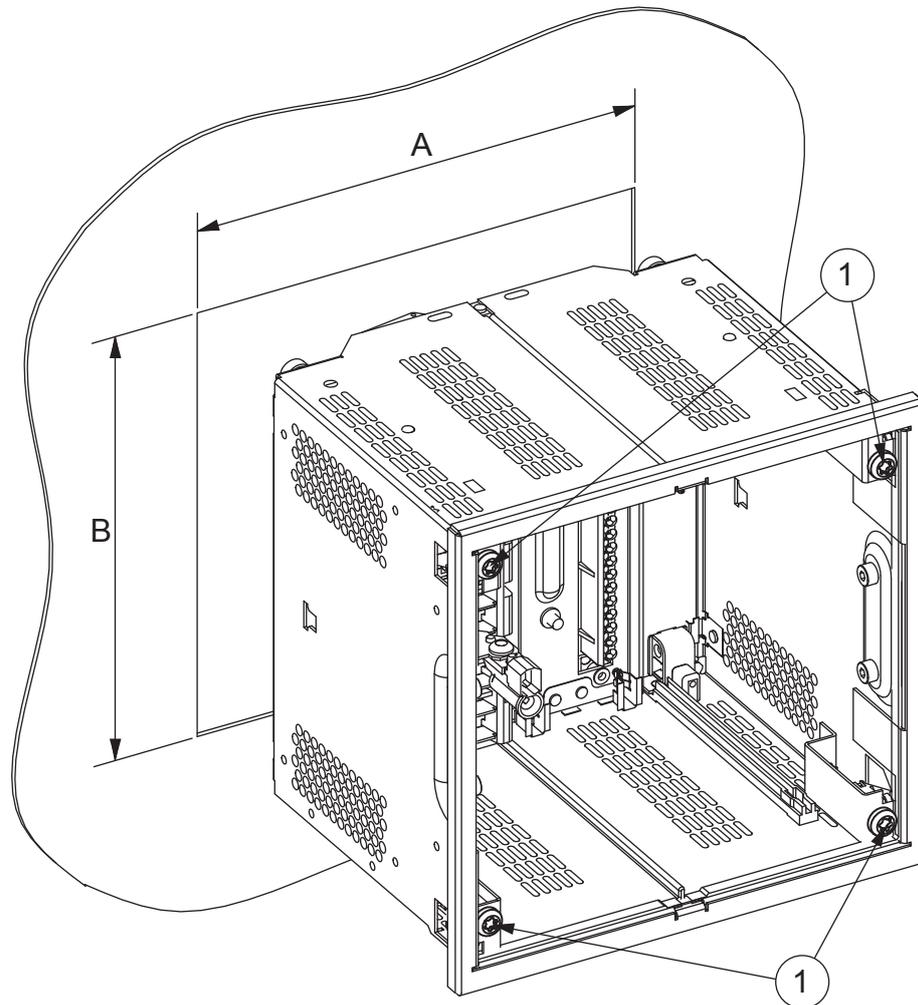
- Panel cut-out of 165.5 × 161.5 mm
- Depth behind the panel 153 mm



A protection relay equipped with optical connections requires a minimum depth of 180 mm. The allowed minimum bending radius has to be checked from the optical cable manufacturer.

1. Loosen the four M5 fixing screws in the case to fit the case into the panel cut-out.

2. Mount the case to the panel cut-out.



A 165.5 ±1 mm
B 161.5 ±1 mm

1 M5 fixing screws

Figure 8: Flush mounting a case into a panel cut-out

3. Tighten the M5 (T25) screws.



The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.

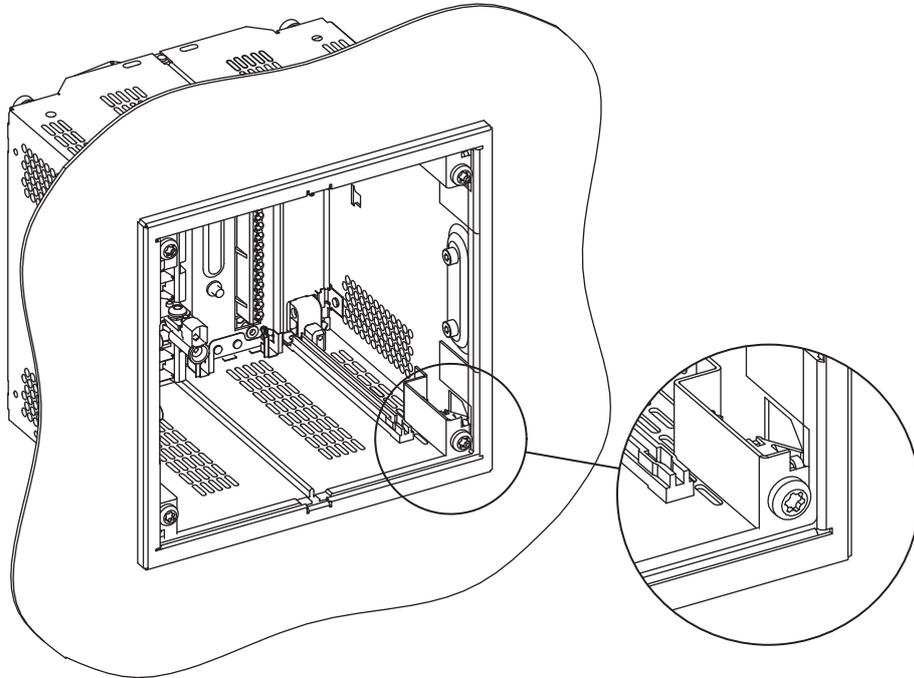
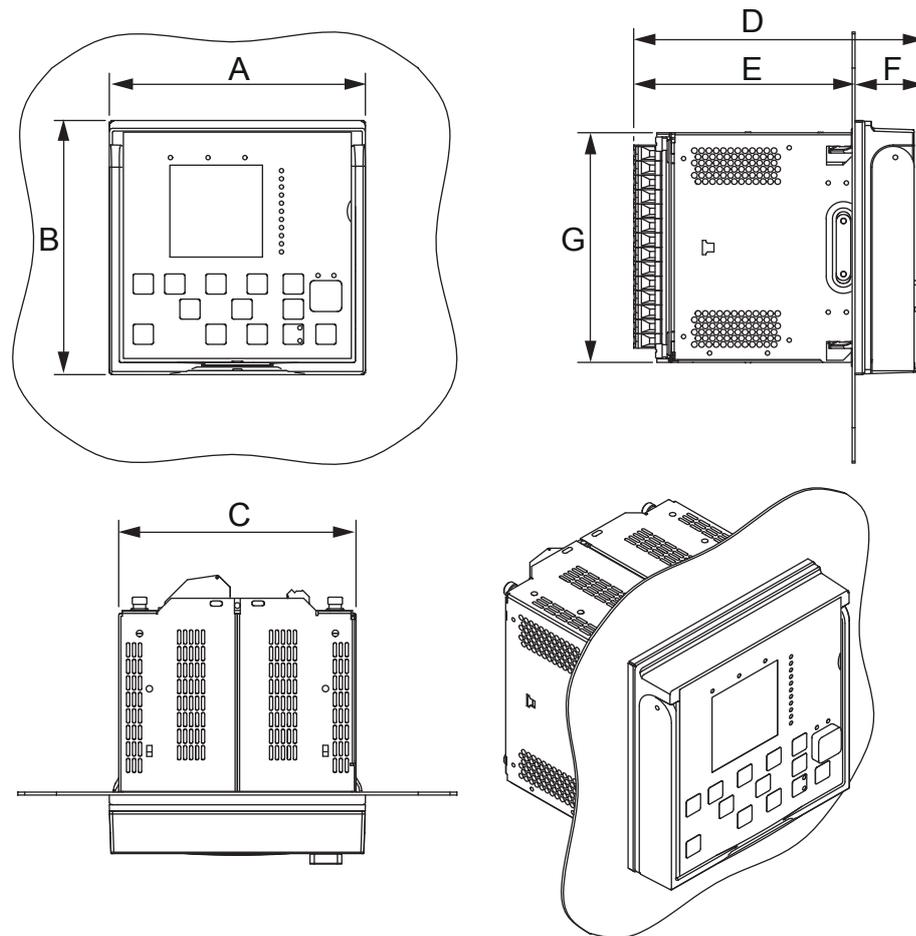


Figure 9: Flush mounted case, tightening the M5 fixing screws

4. Install the plug-in unit into the case.



A 177 mm
 B 177 mm
 C 164 mm
 D 201 mm

E 153 mm
 F 48 mm
 G 160 mm

Figure 10: Flush mounted case and plug-in unit

4.3.3 Semi-flush mounting protection relay

A mounting kit is needed for semi-flush mounting the protection relay. In addition to the detailed mounting instructions, the mounting kit includes:

- Raising frame
- Gasket
- Screws

Requirements for installation:

- Panel cut-out of 165.5 × 161.5 mm with mounting holes
- Depth behind the panel 103 mm
- When IP 54 degree of protection (according to IEC 60529) is required for the front side, a gasket has to be used in the installation.

1. Mount the raising frame into the panel cut-out with four M4 screws.

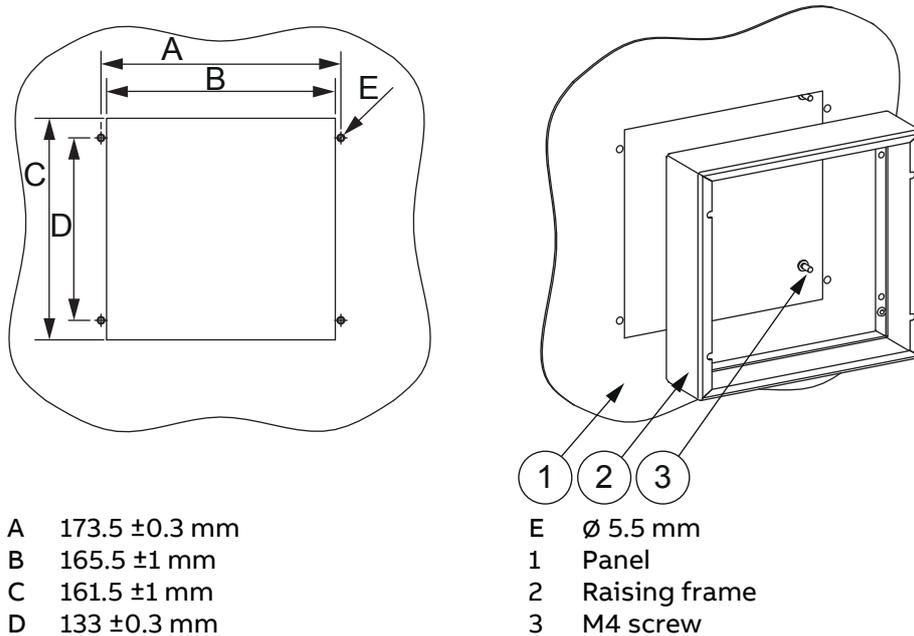


Figure 11: Mounting the raising frame

2. Loosen the four M5 fixing screws in the case to fit the case to the raising frame.
3. Remove the protective film temporarily from the top side of the case.
4. Mount the case to the raising frame.

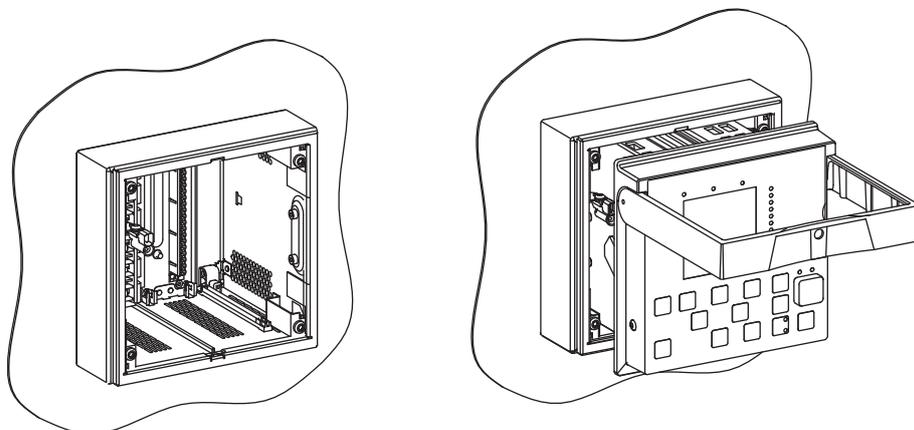


Figure 12: Mounting the case

5. Tighten the M5 screws.



The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.

6. Attach the protective film back on the top side of the case.
7. Install the plug-in unit into the case.

The purpose of the protective film is to prevent debris falling inside the unit while installing electrical wiring. Remove the protective film before energizing the protection relay.

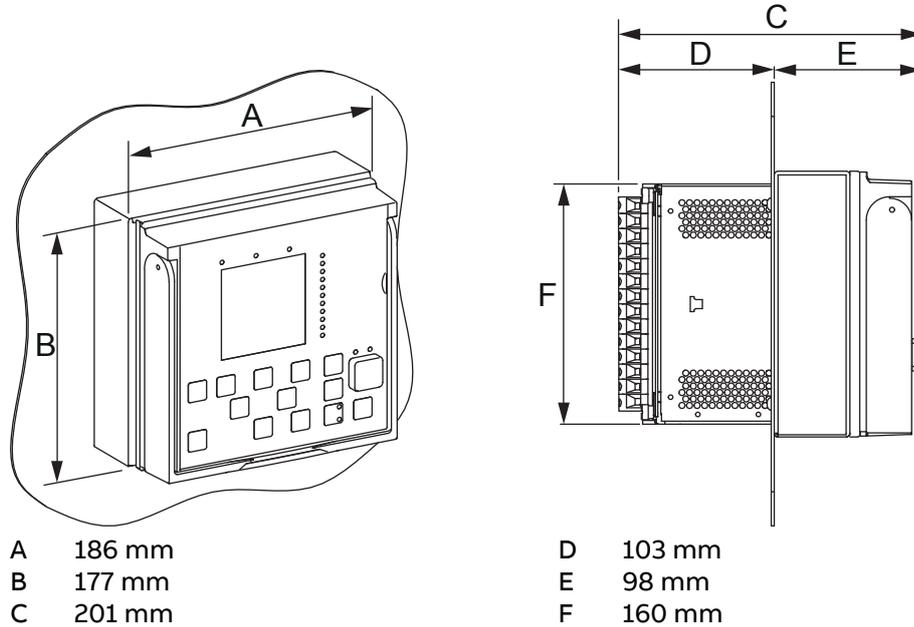


Figure 13: Semi-flush mounted protection relay



Check the allowed minimum bending radius from the optical cable manufacturer.

4.3.4 Semi-flush mounting protection relay inclined

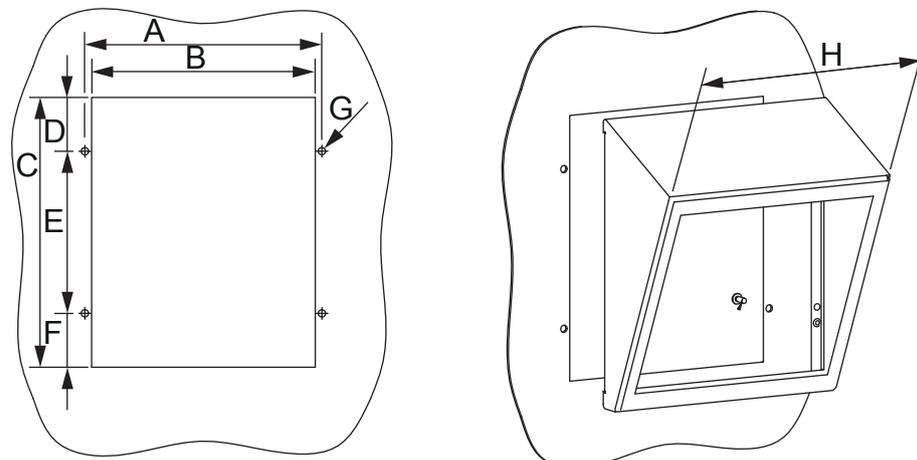
A mounting kit is needed for semi-flush mounting the protection relay inclined. In addition to the detailed mounting instructions, the mounting kit includes:

- Angle frame
- Gasket
- Screws

Requirements for installation

- Panel cut-out of 167 × 203 mm with mounting holes
- Depth behind the panel 107 mm
- When IP 54 degree of protection (according to IEC 60529) is required for the front side, a gasket has to be used in the installation.

1. Mount the angle frame into the panel cut-out with four M4 screws.



A 177 ±0.3 mm
 B 167 ±1 mm
 C 203 ±1 mm
 D 40.5 mm

E 122 mm
 F 40.5 mm
 G ø 5.5 mm
 H 190 mm

Figure 14: Mounting the angled frame

2. Loosen the four M5 fixing screws in the case to fit the case into the angle frame.
3. Mount the case to the angle frame.
 With the angled frame, the protection relay can be mounted inclined downward to a 25° angle.
4. Tighten the screws.



The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.

5. Install the plug-in unit into the case.

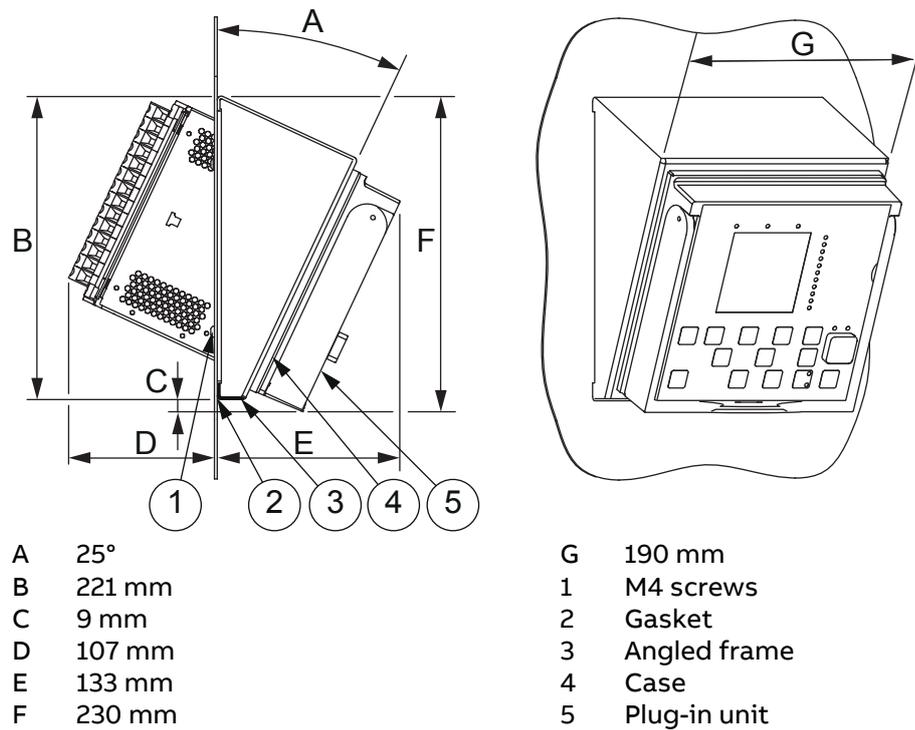


Figure 15: Protection relay semi-flush mounted inclined

4.3.5 Rack mounting protection relay

A mounting kit is needed for rack mounting the protection relay. In addition to the detailed mounting instructions, the 19" rack mounting kit includes:

- Mounting panel; the type of the mounting panel depends on the number of mounted devices
 - Screws
1. Mount the mounting panel to a 19" rack.
 2. Loosen the four M5 fixing screws in the case to fit the case into the panel cut-out.

3. Mount the case to the panel cut-out.

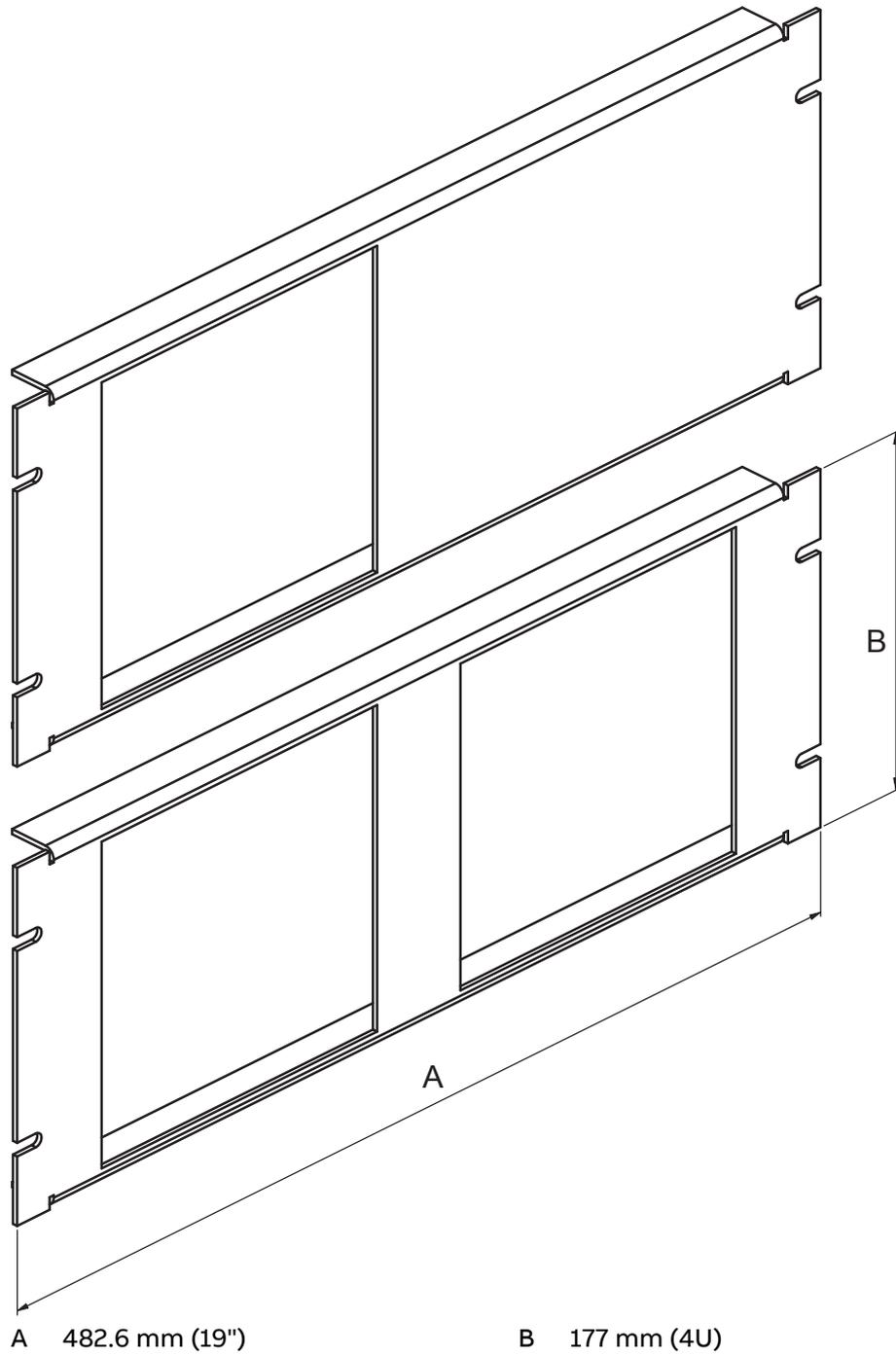


Figure 16: 19" rack mounting panels

4. Tighten the screws.



The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.

5. Install the plug-in unit into the case.

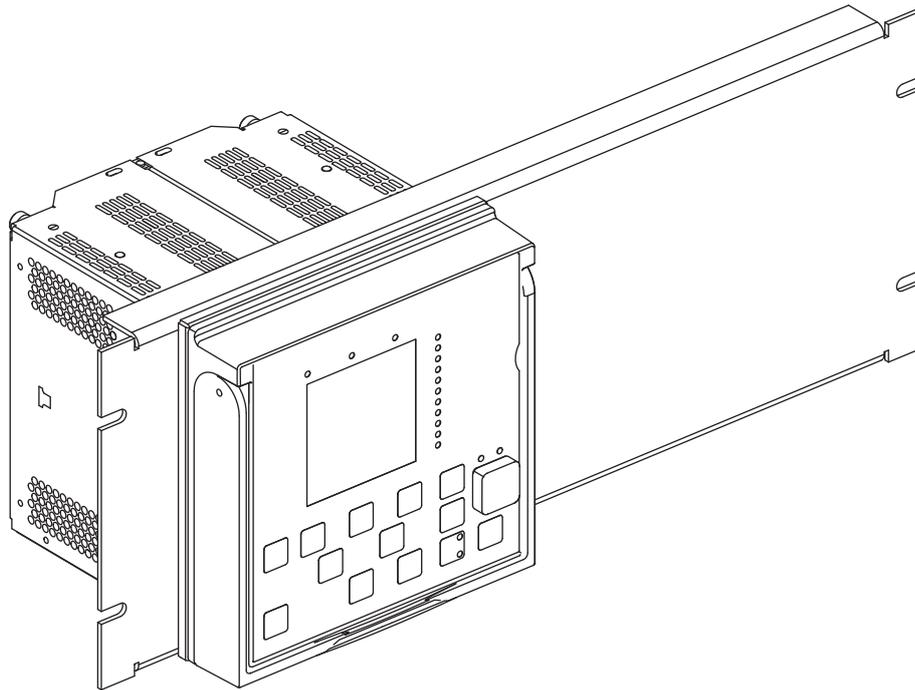


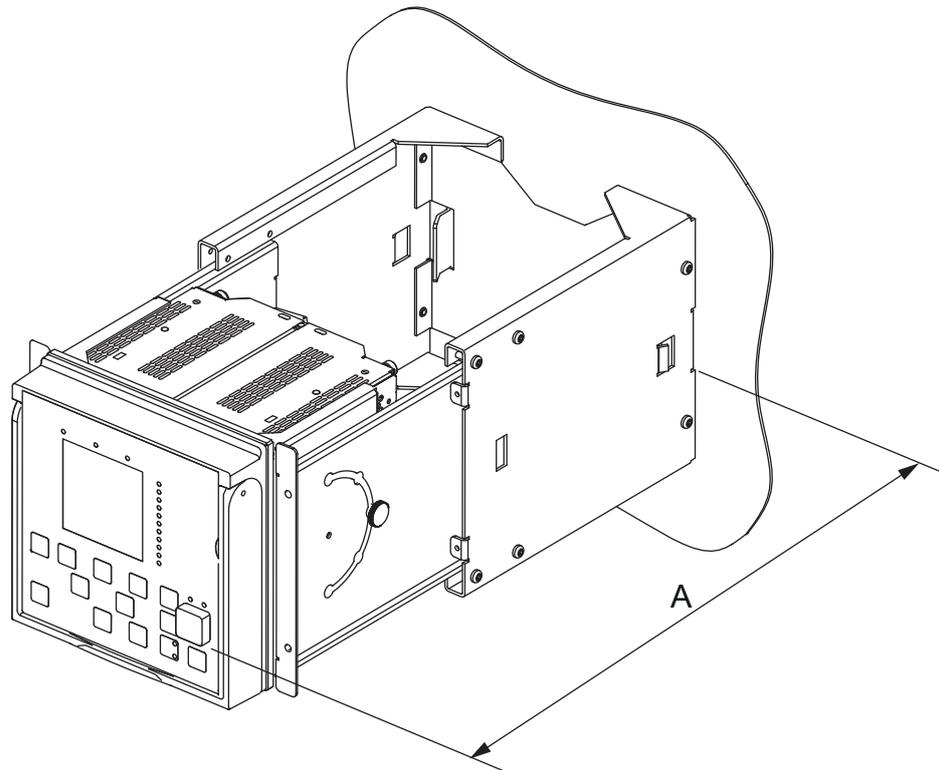
Figure 17: Rack mounted protection relay

4.3.6 Wall mounting protection relay

A mounting kit is needed for wall mounting the protection relay. In addition to the detailed mounting instructions, the wall mounting kit includes:

- Wall mounting frame and rail parts
 - Back plate
 - Screws
 - Dimensions for screw holes
1. Drill screw holes according to the dimensional drawing.
 2. Mount the wall mounting frame and the rails.
 3. Install the back plate.
 4. Loosen the four M5 fixing screws in the case to fit the case into the mounting frame.

5. Mount the case between the rails.



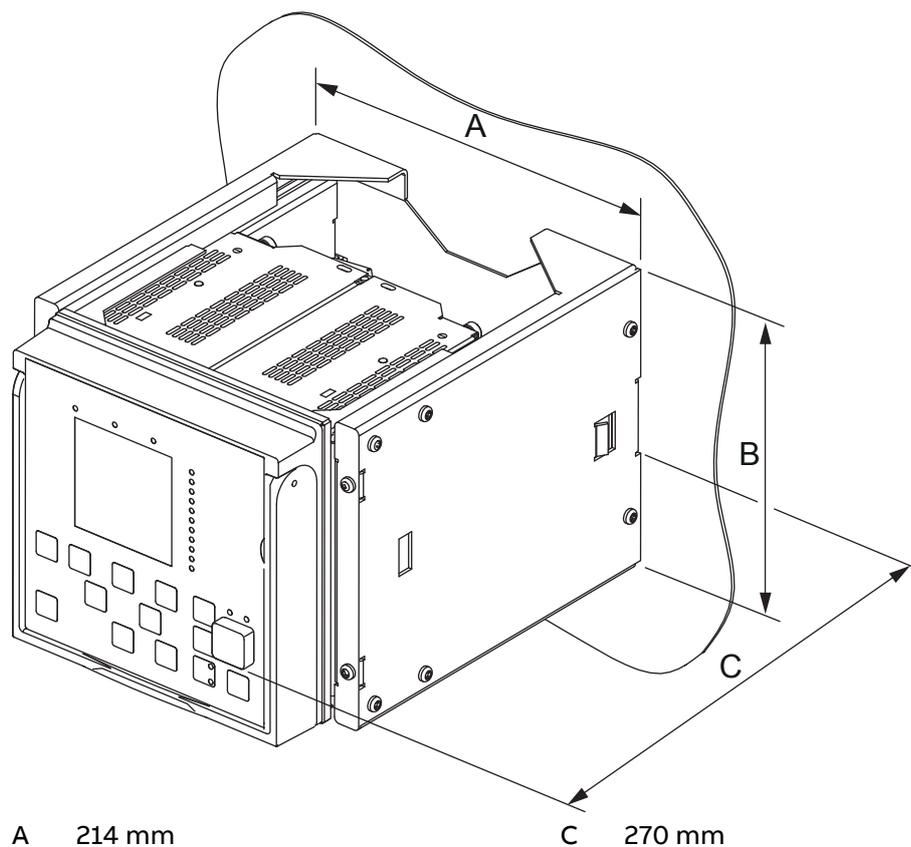
A 430 mm

Figure 18: Wall mounting the protection relay

6. Tighten the screws.



The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.



A 214 mm
B 177 mm

C 270 mm

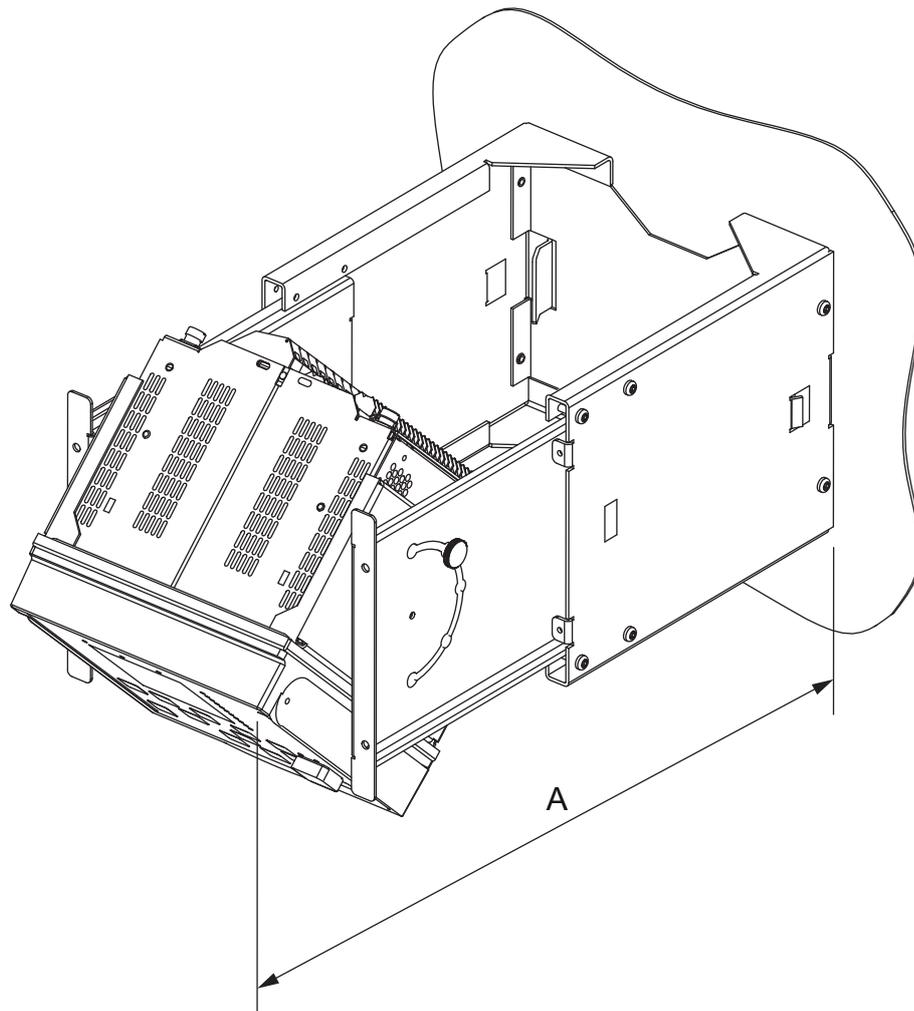
Figure 19: Wall mounted protection relay



Minimum of 50 mm space is needed between two kits.

When connecting the wires, a wall-mounted protection relay can be pulled out and turned 45° (or 90°) degrees downwards or upwards.

- To release the protection relay for pulling it out, push the locks beside the mounting frame.
- To rotate the protection relay, loosen the knurled-head screws in the rails.



A 455 mm

Figure 20: Wall mounted protection relay in rotated position



Minimum of 50 mm space is needed above and below the frame for rotating.

4.3.7 Rack mounting protection relay and test switch RTXP into 19" equipment frame

A mounting kit is needed for rack mounting the protection relay into a 19" equipment frame. In addition to the detailed mounting instructions, the mounting kit includes:

- Mounting panel
- Metallic frame for mounting the RTXP 18 or 24 test switch to the panel



A protection relay equipped with optical connections requires a minimum depth of 180 mm. The allowed minimum bending radius has to be checked from the optical cable manufacturer.

1. Mount the mounting panel into the 19" rack.

2. Loosen the four M5 fixing screws in the case to fit the case into the panel cut-out.
3. Mount the case to the panel cut-out.
4. Install the optional metallic frame to mount the RTXP 18 or 24 test switch to the panel.

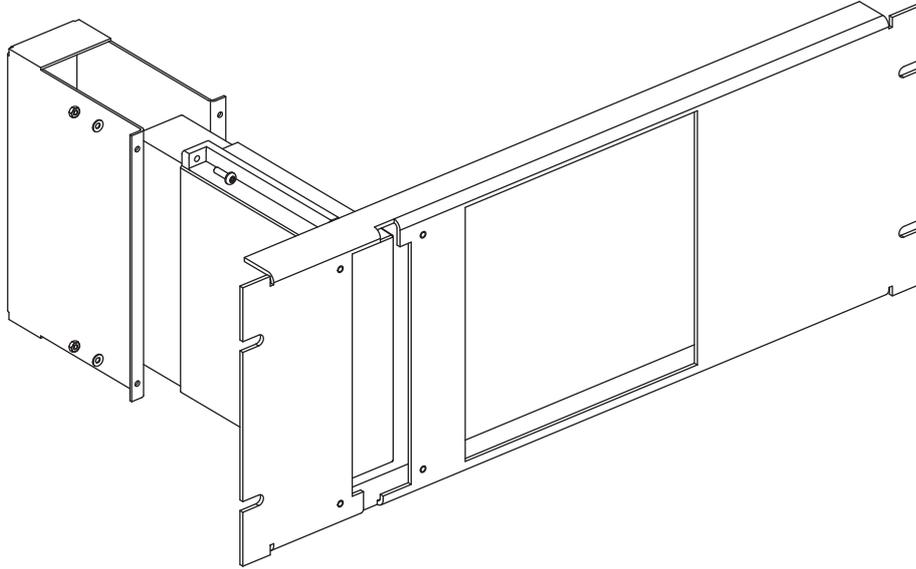


Figure 21: Mounting of the metallic frame for an RTXP 18 test switch

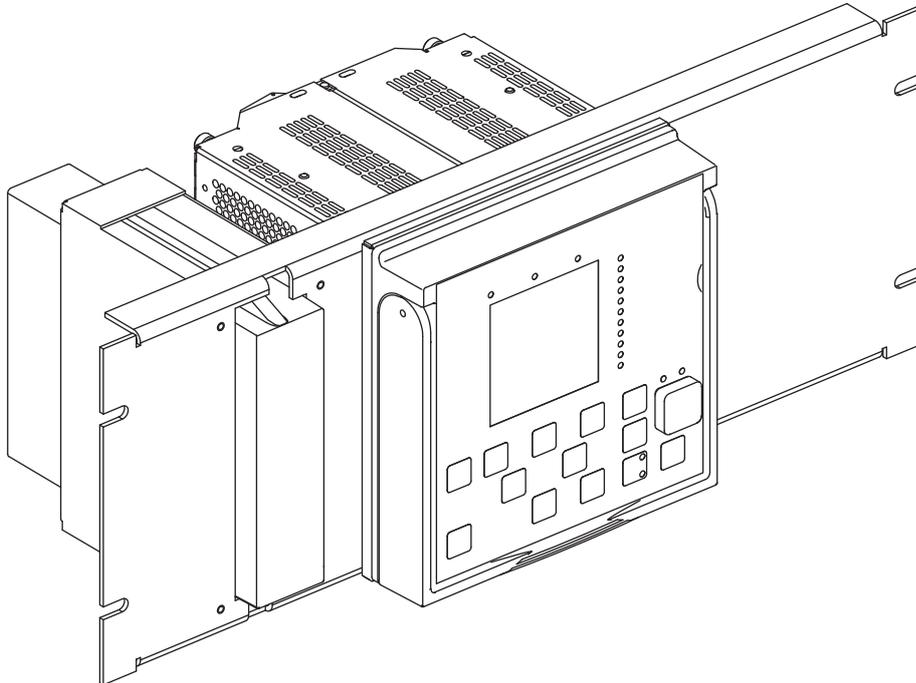


Figure 22: Protection relay and the test switch RTXP 18 mounted into a 19" equipment panel

4.3.8 Rack mounting protection relay into combiflex 19" equipment frame (Type RHGT 19" 4U variant C)

A mounting bracket is needed for rack mounting the protection relay into a combiflex 19" equipment frame, a different bracket is in installation with test switch. In addition to the detailed mounting instructions, the mounting kit includes:

- Mounting bracket for the case and optionally with RTXP test switch
1. Install the mounting bracket into the combiflex equipment frame by using tapping screws ST3.5x13 from rear side.

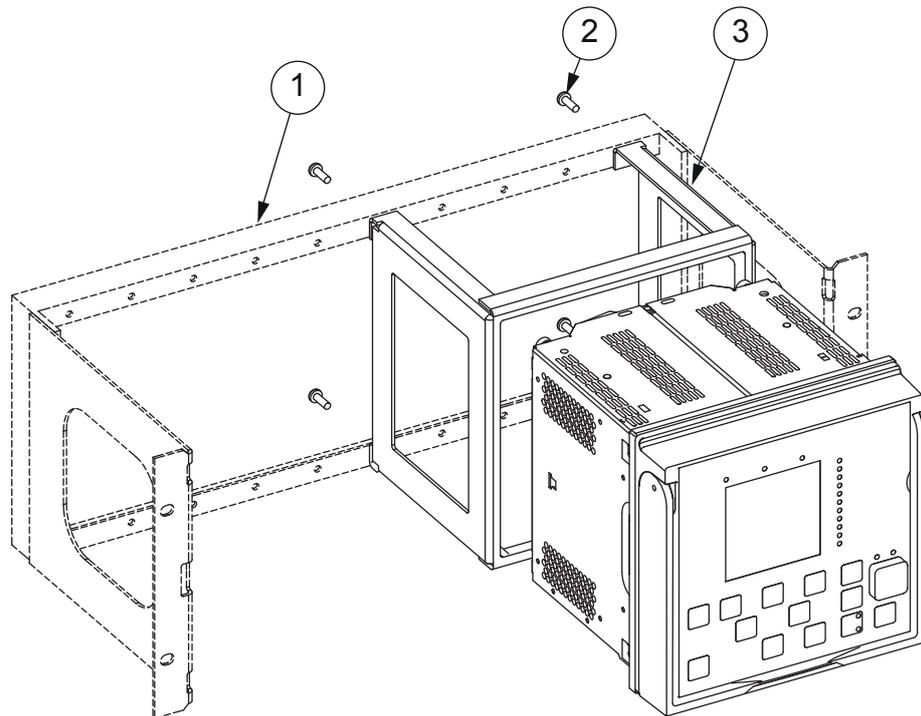


The type of mounting bracket to be used depends on whether the protection relay is installed into the frame on its own or with a test switch.

2. Loosen the four M5 fixing screws in the case to fit the case into the mounting bracket.
3. Mount the case to the mounting bracket.
4. Tighten the M5 screws.

The allowed range for the fixing screws' tightening torque is 0.7...1 Nm.

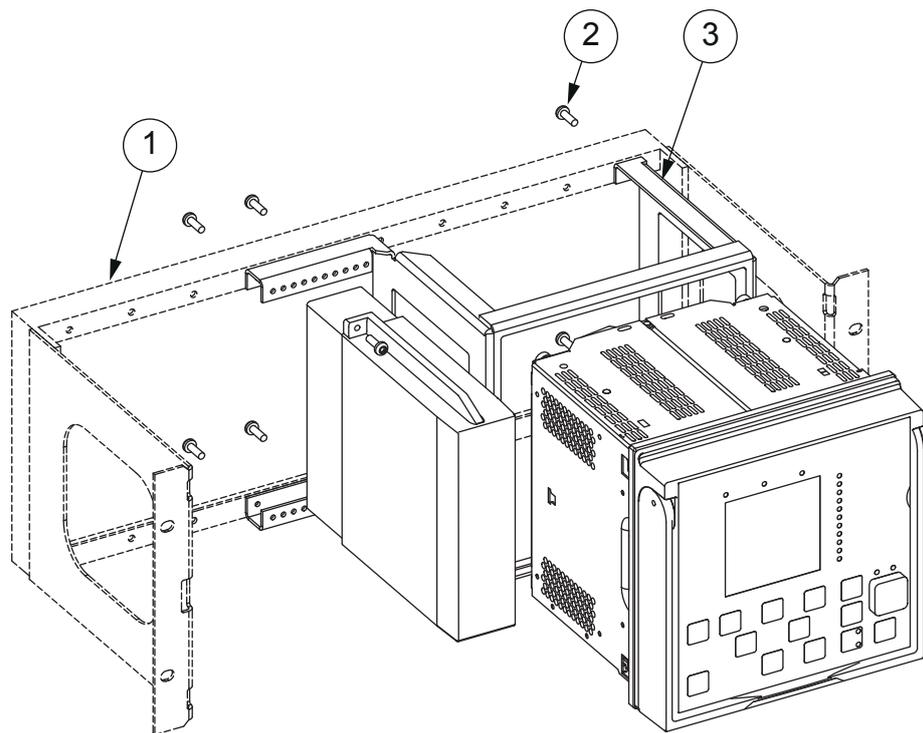
5. Install the plug-in unit into the case.



- | | | | |
|---|---|---|------------------|
| 1 | RHGT 19" 4U equipment frame,
variant C, with support frame | 3 | Mounting bracket |
| 2 | Tapping screw ST3.5x13 | | |

Figure 23: Mounting the protection relay into a 19" combiflex equipment frame

6. Install the optional RTXP 18 or 24 test switch.



- 1 RHGT 19" 4U equipment frame, variant C, with support frame
- 2 Tapping screw ST3.5x13
- 3 Mounting bracket for mounting with test switch RTXP 18

Figure 24: Protection relay and the test switch

4.3.9 Mounting lens sensors for an arc protection system

Arc protection is used to detect arc situations in air insulated metal-clad switchgear.

The arc protection system determines where in the switchgear cubicle the optional lens sensors are installed.

1. Drill a hole (Ø 10 mm) in the wall of the supervised space.

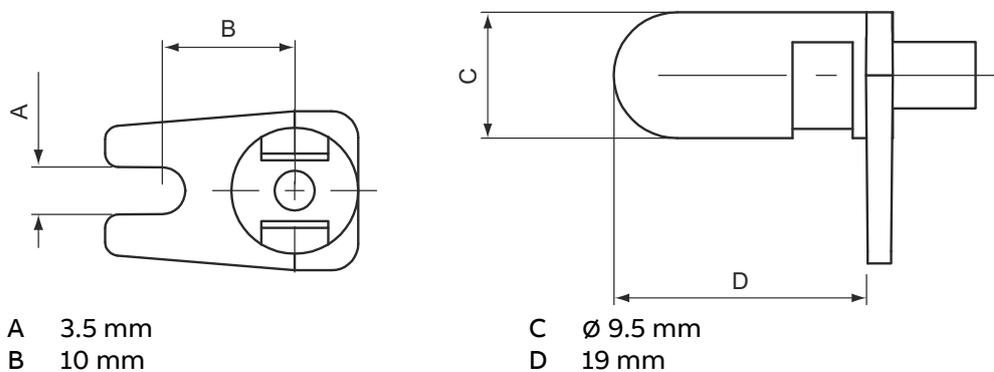


Figure 25: Dimensions of the lens sensor

- Fit the lens sensor into the hole and fasten it with a self-tapping M3 screw. Alternatively, the lens sensor can be fastened with a cable tie. To do this, secure the cable tie to a suitable point of attachment on the cubicle wall and wrap the cable tie tightly around the sensor.

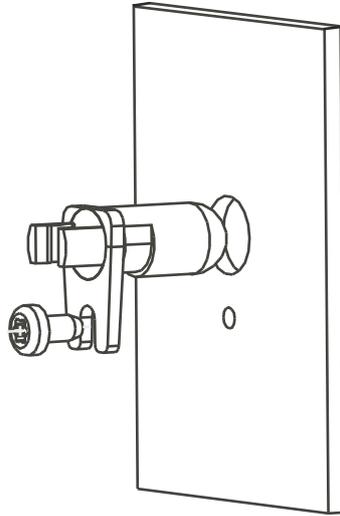


Figure 26: Mounting the lens sensor

- Make sure that the cable tie lies in the groove of the sensor to prevent it from blocking the light.

4.3.10 Replacing a Strömberg SP_J40 series relay by a 615 series IED

- Drill new screw holes ($\varnothing 4.5$ mm) to the panel according to the dimensional drawing.

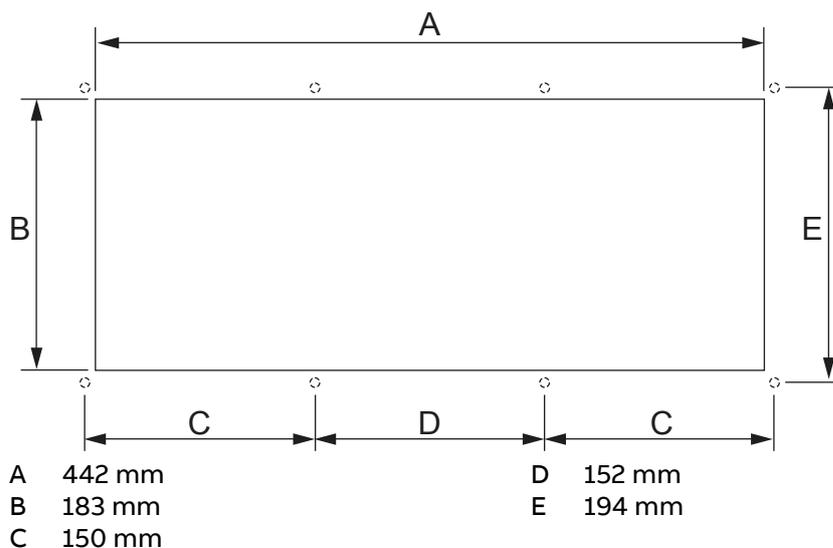
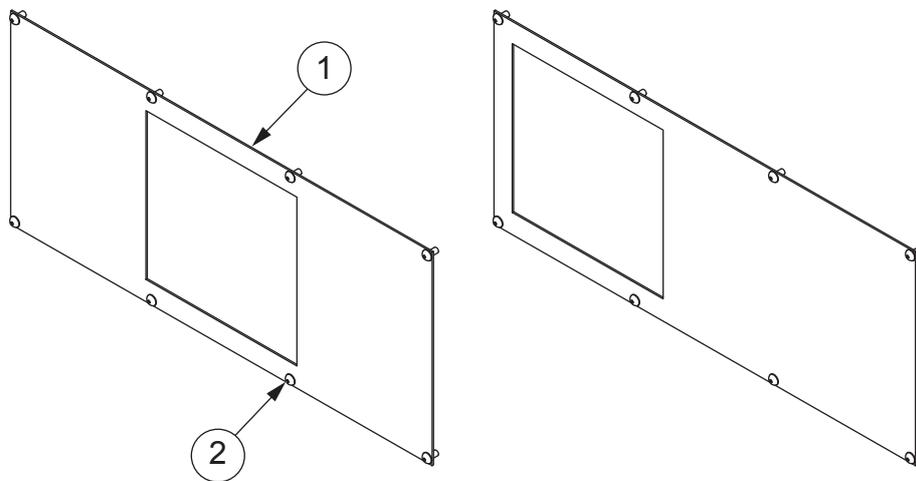


Figure 27: Screw hole and existing panel cut-out dimensions for replacing a SP_J40 series IED

2. Mount the installation plate to the existing panel cut-out with M5 thread forming screws.



1 Installation plate

2 Torx head screw M5x10

Figure 28: Installation plates for replacing SP_J40 relay

3. Tighten the screws.
4. Mount the new IED.



For ordering numbers, see the ordering number table.

4.3.11 Replacing two Strömberg SP_J3 series relays by a 615 series IED

1. Make a new panel cut-out to the existing mounting panel according to the dimensional drawing.

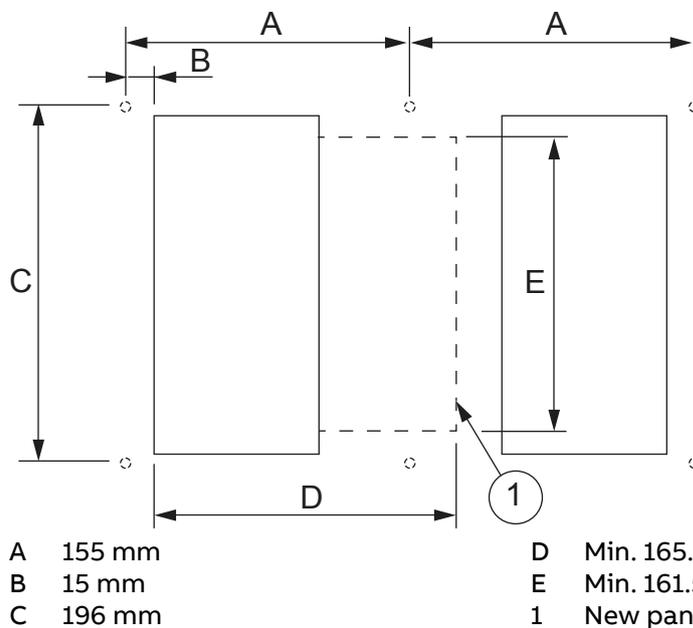
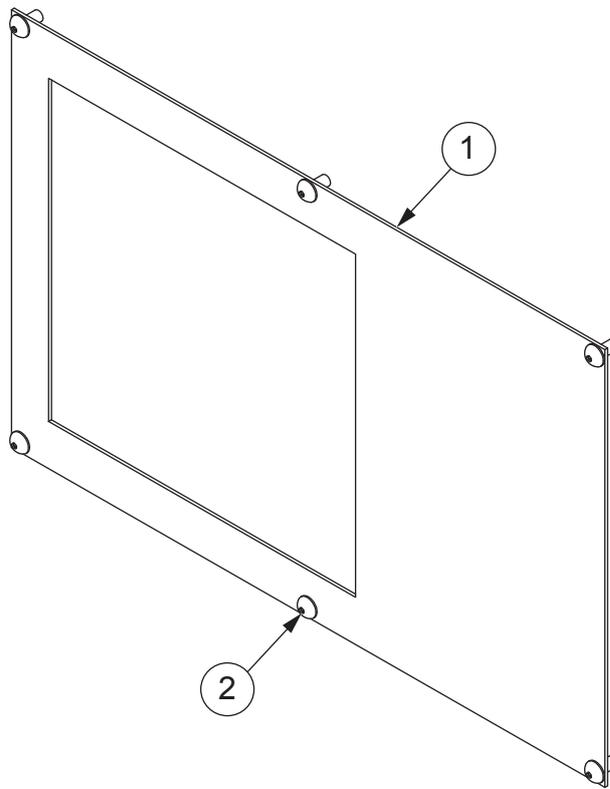


Figure 29: New panel cut-out and screw hole dimensions for replacing two SP_J3 series relays

2. Drill new screw holes ($\varnothing 4.5$ mm) to the panel according to the dimensional drawing.

3. Mount the installation plate to the panel cut-out with M5 thread forming screws.



1 Installation plate

2 Torx head screw M5x10

Figure 30: Installation plate for replacing two SP_J3 relays

4. Tighten the screws.
5. Mount the new IED.



For ordering numbers, see the ordering number table.

4.3.12 Replacing a Strömberg SP_J3/J6 series relay in 19" rack by a 615 series IED

1. Mount the installation plate to the existing panel cut-out with M6 screws and nuts.

Use the existing screw holes.

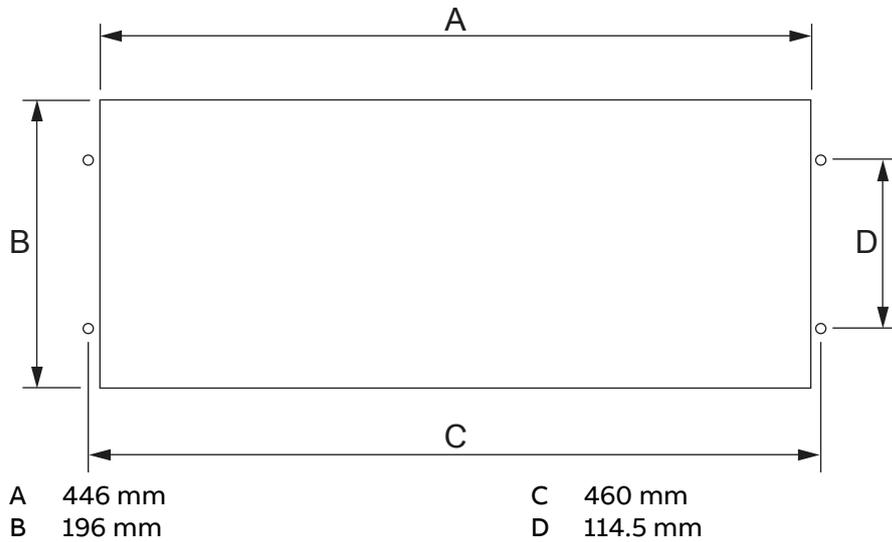
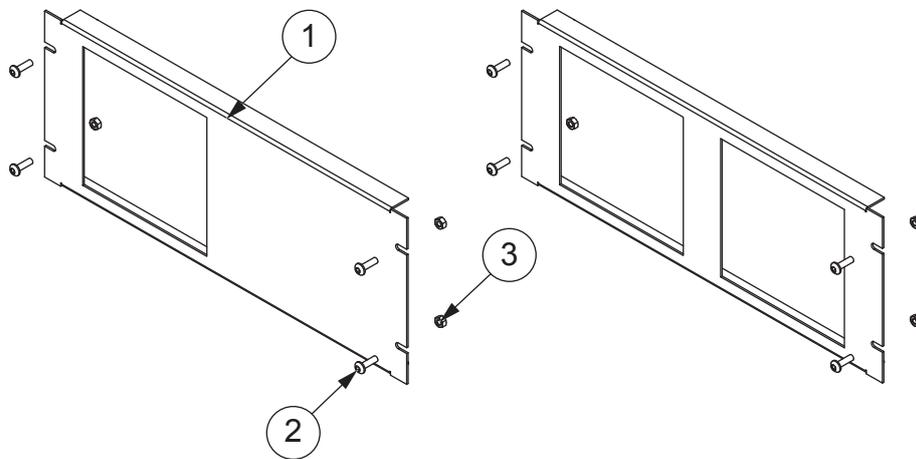


Figure 31: Screw hole and existing panel cut-out dimensions for replacing a SP_J3/J6 series relay



- | | | | |
|---|-----------------------|---|----------------|
| 1 | Installation plate | 3 | Hexagon nut M6 |
| 2 | Torx head screw M6x20 | | |

Figure 32: Installation plates for replacing SP_J3/J6 relay in 19" rack

2. Tighten the screws.
3. Mount the new IED with the mounting frame to the installation plate.



For ordering numbers, see the ordering number table.

4.3.13 Replacing a Strömberg SP_J6 series relay by a 615 series IED

1. Drill new screw holes ($\varnothing 4.5$ mm) to the panel according to the dimensional drawing.

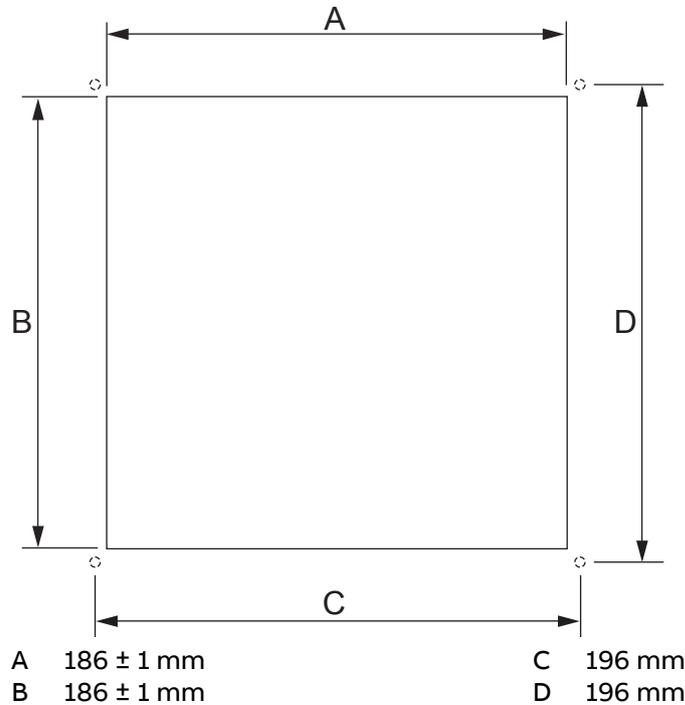
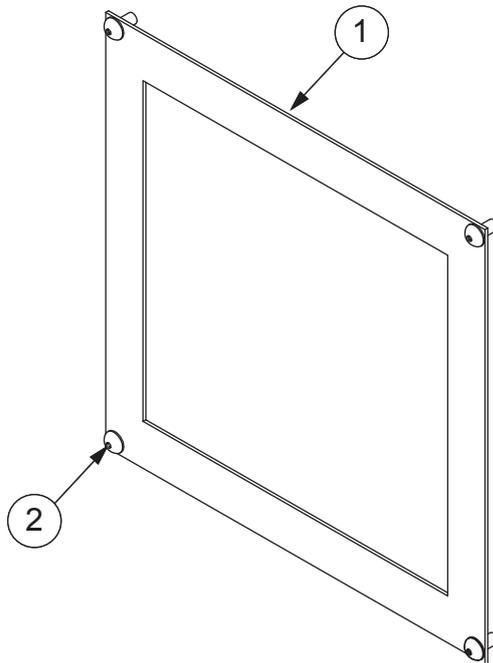


Figure 33: Screw hole and existing panel cut-out dimensions for a SP_J6 series relay

2. Mount the installation plate to the existing panel cut-out with M5 thread forming screws.



1 Installation plate

2 Torx head screw M5x10

Figure 34: Installation plate for replacing SP_J6 relay

3. Tighten the screws.
4. Mount the new IED.



For ordering numbers, see the ordering number table.

4.3.14 Replacing three BBC S_ series relays by a 615 series IED

1. Make a new panel cut-out to the existing mounting panel according to the dimensional drawing.

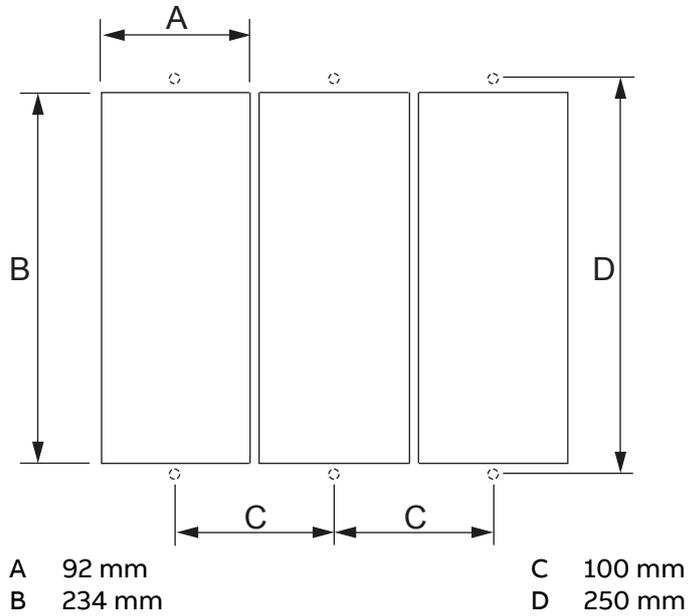
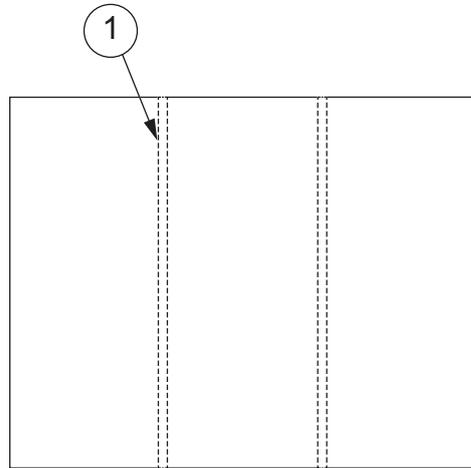


Figure 35: Existing panel cut-out and screw hole dimensions for three BBC S_ series relays



1 New panel cut-out line

Figure 36: New panel cut-out for replacing BBC S_ series relays

2. Mount the installation plate to the panel cut-out with M5 screws, nuts and washers.

Use the existing screw holes.

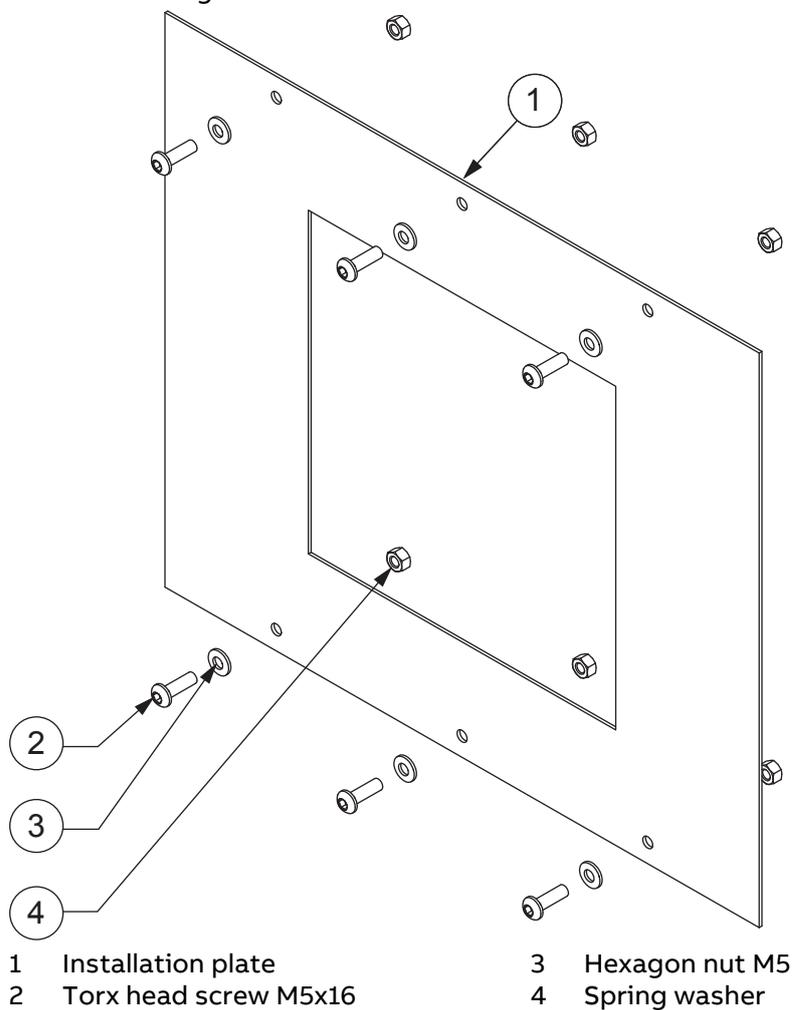


Figure 37: Installation plate for replacing three BBC S₁ relays

3. Tighten the screws.
4. Mount the new IED.



For ordering numbers, see the ordering number table.

5 Connecting

5.1 Required tools

Only use a screwdriver and insert bits for Phillips (PH 1) cross-recessed head screws (M3.5) when handling CT/ VT terminals (X120) of screw-compression type.

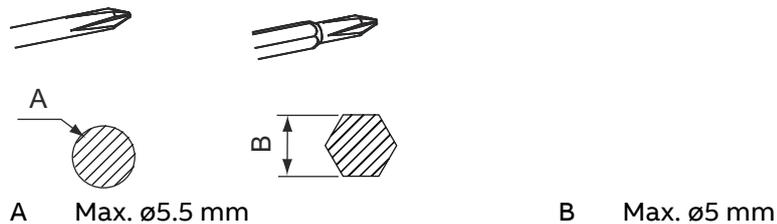


Figure 40: Screwdriver for CT/VT terminals of screw-compression type

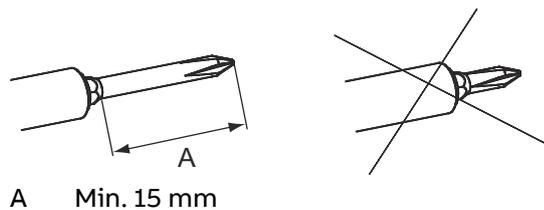


Figure 41: Insert bits for CT/VT terminals of screw-compression type

5.2 Connecting wires

All connections are made on the rear of the case. No soldering is needed.

- Open the screw-compression type terminals before inserting any wires. By default the terminals are closed at the time of delivery.
- Use fine wire in door mounting.



See the application manual for product-specific connection diagrams.

5.2.1 Connecting ring-lug type wires

Ring-lug type insulated terminal can be used for signal connector X120. The maximum outside diameter for the M4 ring-lug type terminals is 9 mm.

5.3 Connecting protective earthing



The earth lead must be at least 6.0 mm^2 . If the earth lead is long, the cross section of the wire must be increased.



Use fine copper wire as the earth lead.

1. Loosen the protective earth screw (T20) to connect a separate earth protection lead.

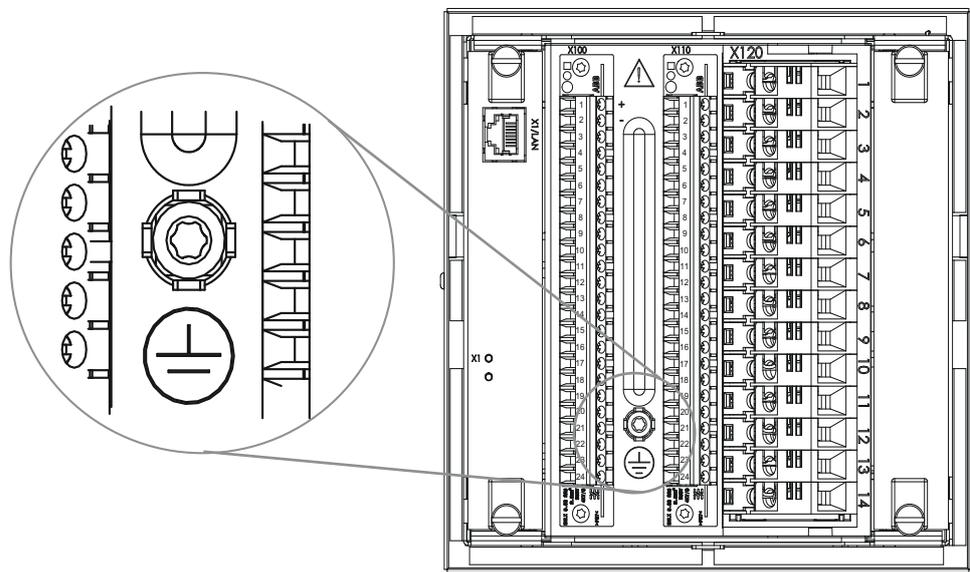


Figure 42: The protective earth screw is located between connectors X100 and X110



The earth lead should be as short as possible but extra length is required for door mounting.



Each protection relay must have its own earth lead connected to the earth circuit connector.

2. Connect the earth lead to the earth bar.
Use either stripped wire screwed between a washer cup and the protective earth screw or a ring lug.



Select a suitable ring lug to fit under the M4 screw.

3. Tighten the protective earth screw.
4. Support the earth lead so that it cannot break or weaken.
Be aware of the mechanical, chemical and electrochemical environment.

5.4 Connecting analog signals

A connection diagram is needed to connect the analog signals.

When using the ring-lug type for CT/VT terminals, follow these steps.

1. Open the lid that covers the ring-lug fixing screw with the tip of a screwdriver. Every fixing screw has its own lid.
2. Remove the fixing screw.
3. Slide the screw through the terminal lug and screw it back on.
4. Close the lid.

5.4.1 Connecting current and voltage inputs

- Connect the wires from the CTs/VTs to the correct device according to the phase order and the connection diagram.
 - Each terminal X120 for CTs/VTs is dimensioned for one 0.5...6.0 mm² wire or for two wires of maximum 2.5 mm².
 - Each terminal X130 for VTs is dimensioned for one 0.5...2.5 mm² wire.



SIM0002 and SIM0005 terminal X130 is dimensioned for one 0.5...2.5 mm² wire.



See the application manual for standard-configuration specific current and voltage inputs.

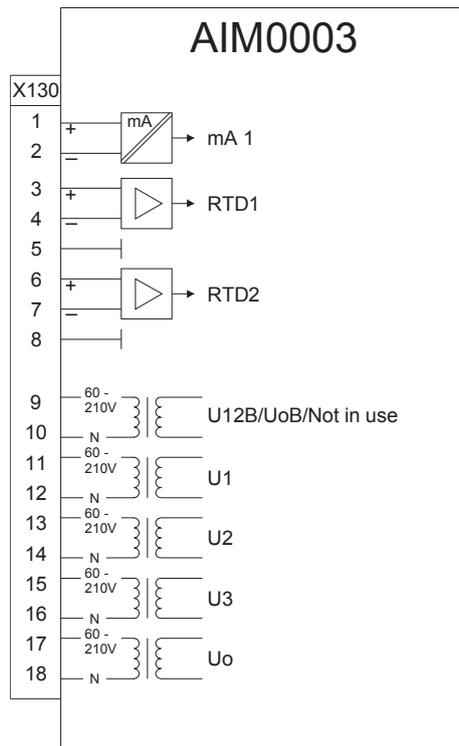


Figure 43: Example of AIM0003 card variant (5 U, 2 RTD + 1 mA channel)

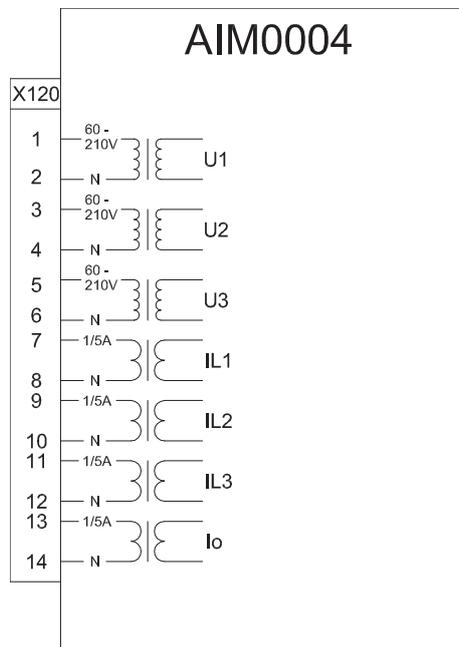


Figure 44: Example of AIM0004 card variant (4 I + 3 U with 1/5 A Io channel)

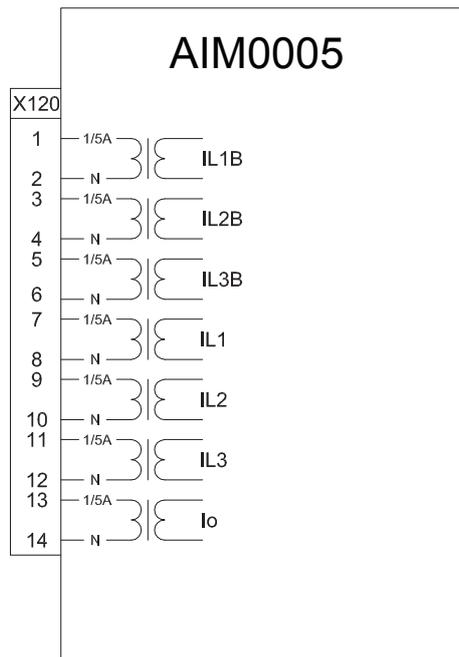


Figure 45: Example of AIM0005 card variant (7 I with 1/5 A Io channel)

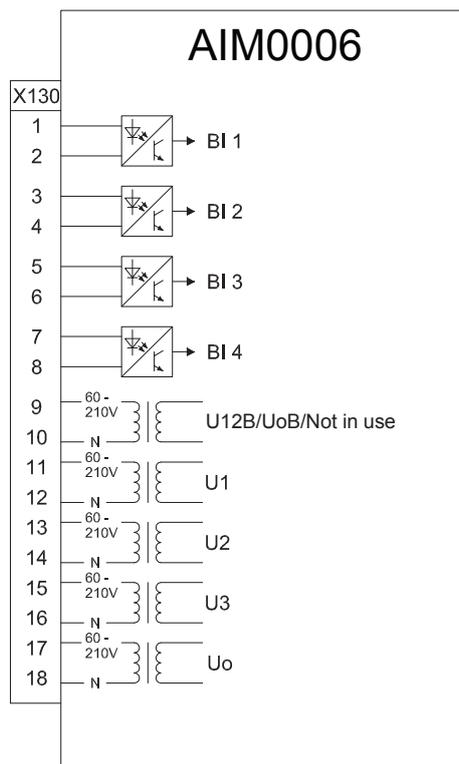


Figure 46: Example of AIM0006 card variant (5 U)

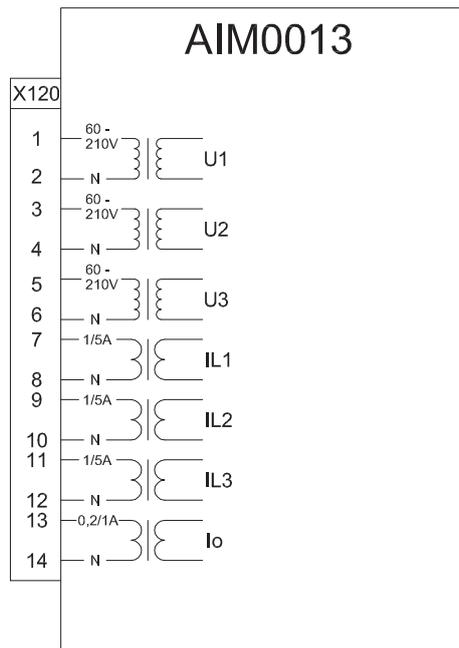


Figure 47: Example of AIM0013 card variant (4 I + 3 U with 0.2/1 A Io channel)

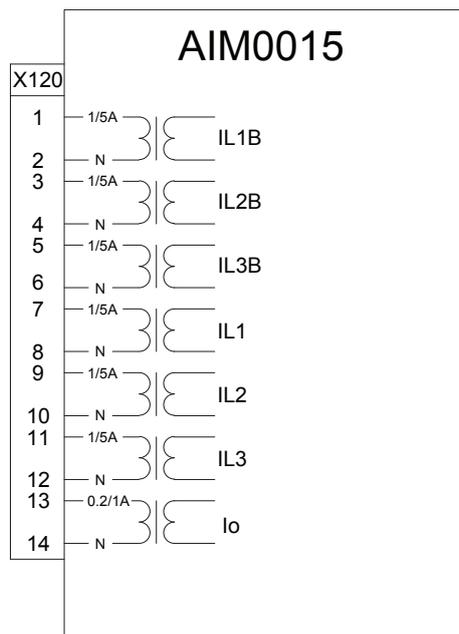


Figure 48: Example of AIM0015 card variant, (7 I with 0.2/1 A Io channel)

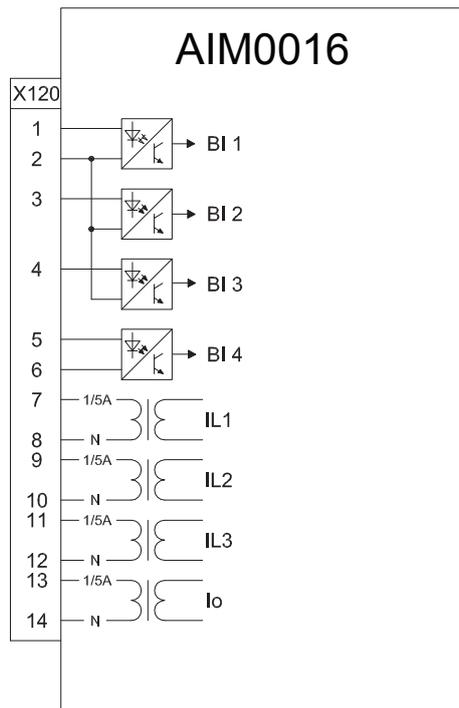


Figure 49: Example of AIM0016 card variant (4 I with 1/5 A Io channel)

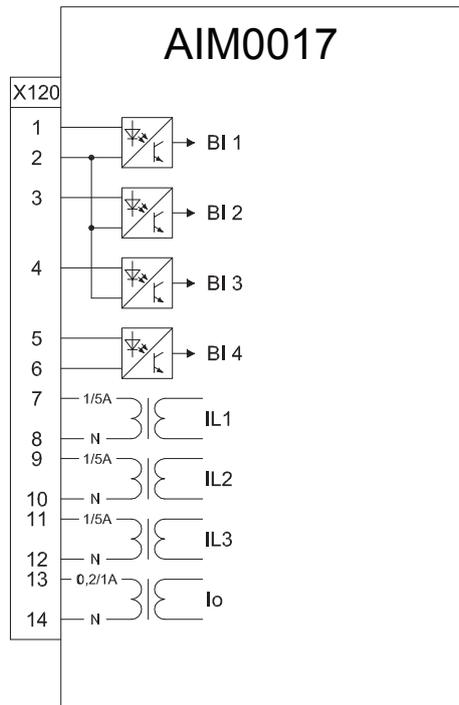


Figure 50: Example of AIM0017 card variant (4 I with 0.2/1 A Io channel)

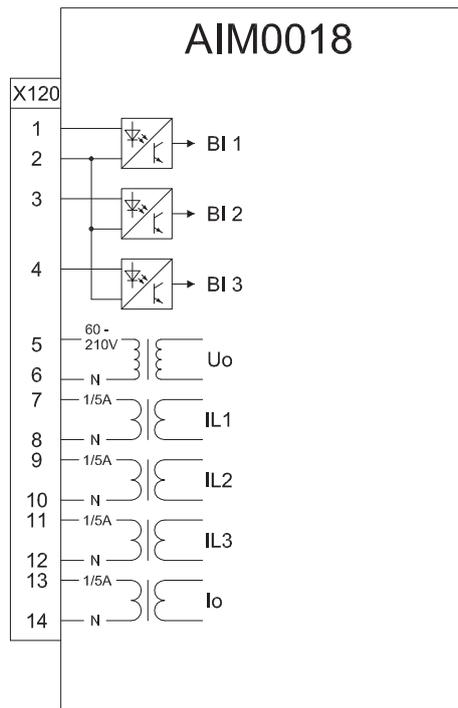


Figure 51: Example of AIM0018 card variant (4 I + U_o with 1/5 A I_o channel)

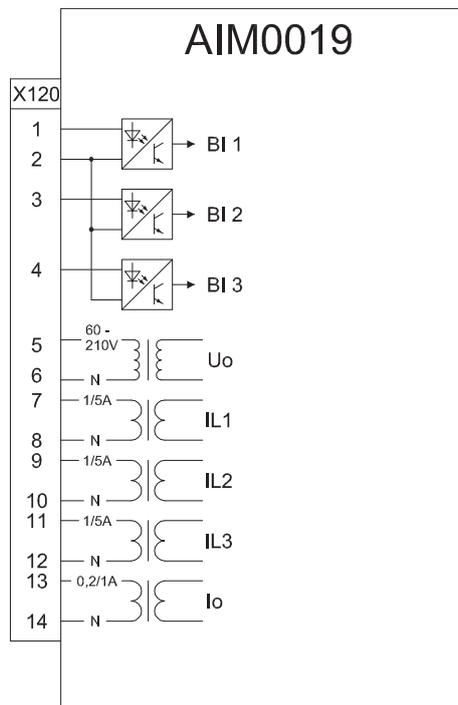


Figure 52: Example of AIM0019 card variant (4 I + U_o with 0.2/1 A I_o channel)

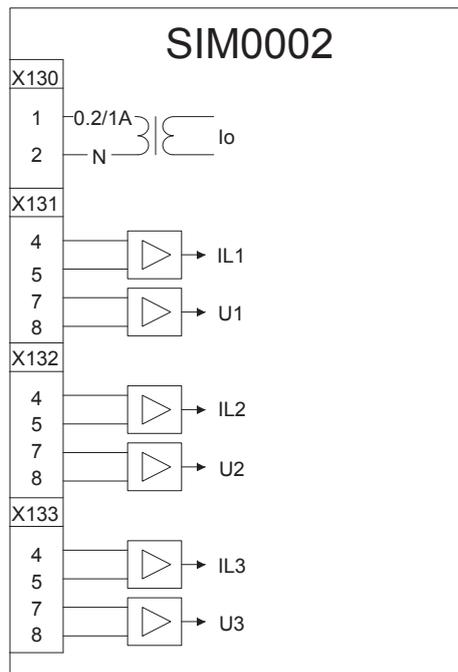


Figure 53: Example of SIM0002 card variant (4I+3U with 0.2/1 A Io channel)

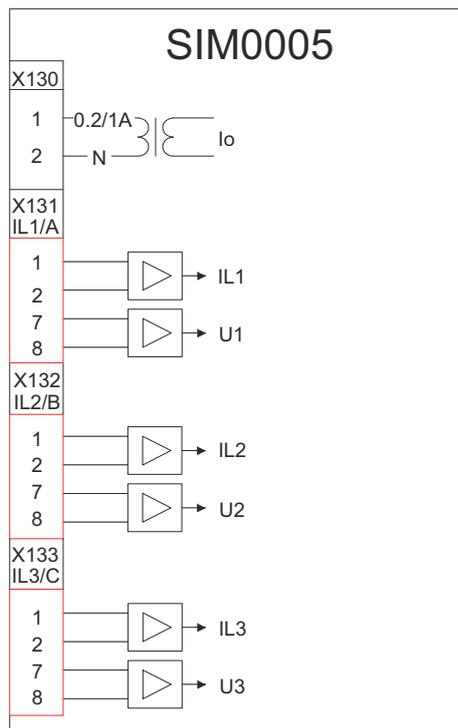


Figure 54: Example of SIM0005 card variant (4I+3U with 0.2/1 A Io channel). Including red sensor connectors.

5.4.2 Connecting RTD and mA inputs

- Connect the wires from the transducers to the correct device according to the connection diagram.

Each terminal for RTDs and mA inputs is dimensioned for one 0.5...2.5 mm² wire or for two 0.5...1.0 mm² wires.



In addition to the specific RTD card, RTD/mA inputs are available with the AIM0003 card. See the application manual for standard-configuration specific RTD and mA inputs.



Connect the RTD earth cable shield to the protective earth.

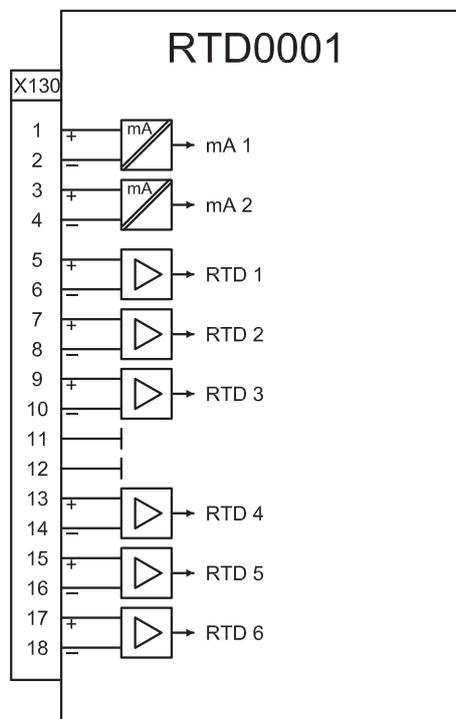


Figure 55: Example of RTD0001 card variant (6 RTD + 2 mA channel)

5.4.3 Connecting protection relay with a test switch

- When the protection relay is used with a test switch, connect the current and voltage transformers directly to the switch.

5.4.4 Shielding RTD/mA instrument cables

The RTD/mA inputs are connected by screened cables (1 mm²/AWG18), for example, Unitronic 300S (formerly Unitronic 300CY), manufactured by LAPP Group.



Other manufacturers' cables with similar technical features can also be used. When selecting a suitable sensor cable, observe also other possible customer installation requirements.

1. Prepare screened cable with a drain wire.
 - a) Select a drain wire (0.75 mm²) as short as possible.

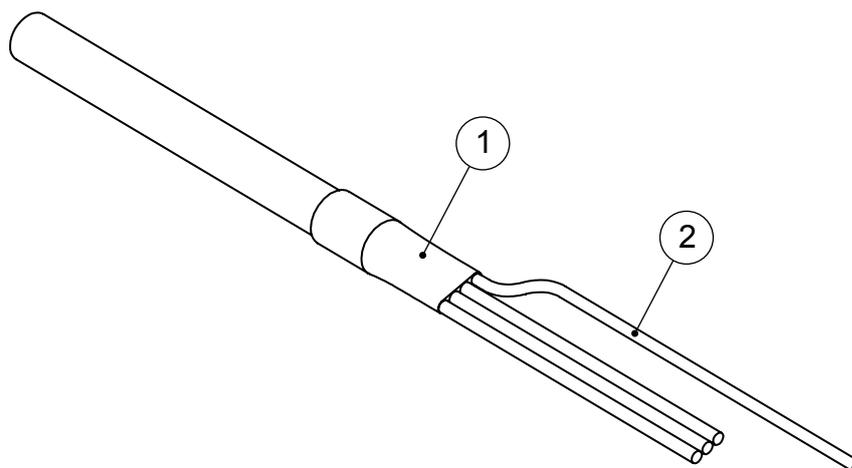


The wire combination green/yellow should not be used as the drain wire has no protective function.

- b) Install the drain wire.
The wire can be installed, for example, with a Shield-Kon one-piece connector (Thomas & Betts). For detailed instructions, see the manufacturer's manual.
- c) Protect the cable end with a heat shrinkable cap.

Table 3: Drain wire lengths

Wire from connector	Length
X110	~200 mm
X130	~300 mm

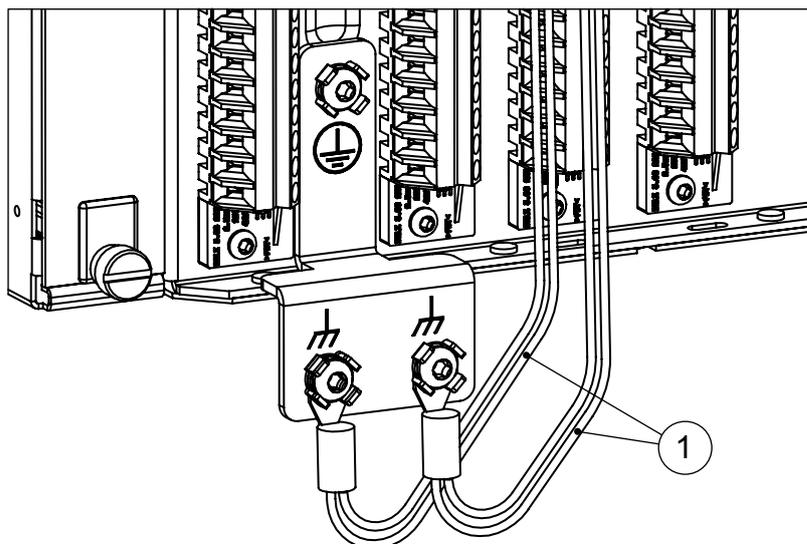


1 Heat shrinkable cap

2 Drain wire

Figure 56: Screenshot cable

2. Connect the functional earthing wires (drain wires) to the protection relay's body via a connection flange (2RCA036978A0001) to separate them from the protective earthing conductor.



1 Drain wires

Figure 57: Connection of drain wires

⁵ Cannot be used when the protection relay is mounted with the Combiflex 19" equipment frame (2RCA032826A0001)

5.5 Connecting binary signals

- Connect the wires for the binary signals to the correct device according to the connection diagram. Each terminal for binary input and output signal is dimensioned for one 0.5...2.5 mm² wire or for two 0.5...1.0 mm² wires.



In addition to specific BIO cards, BI/O signals are available with some AIM and PSM cards. See the application manual for standard-configuration specific binary signal options.

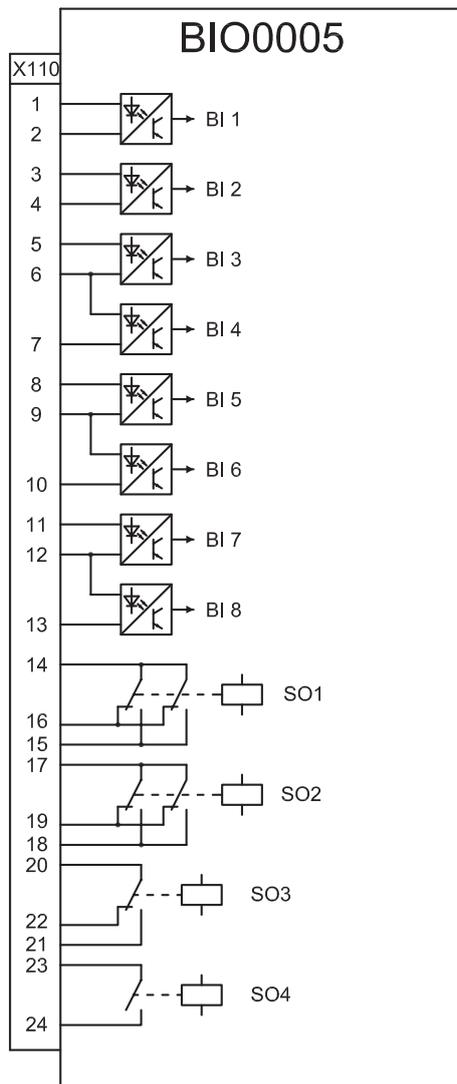


Figure 58: Example of BIO0005 card variant (8 BI + 4 BO)

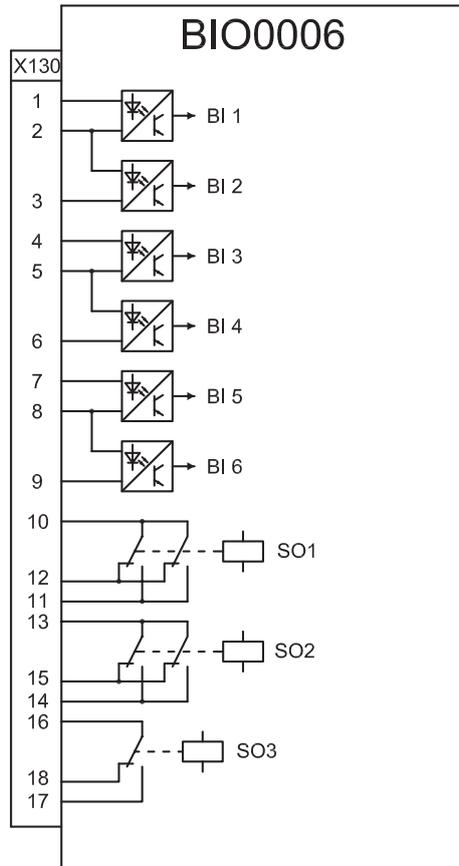


Figure 59: Example of BIO0006 card variant (6 BI + 3 BO)

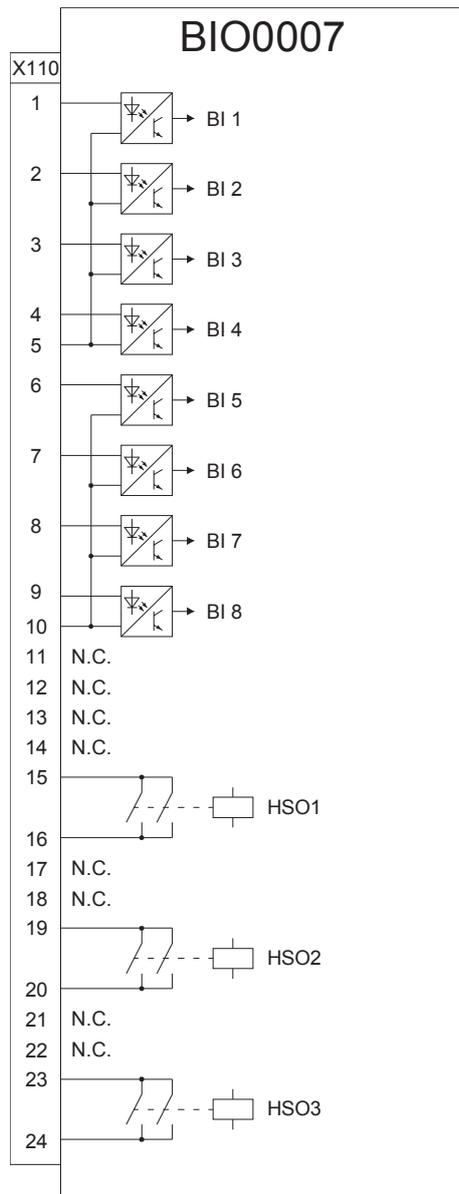


Figure 60: Example of BIO0007 card variant (8 BI + 3 BO)

5.6 Connecting power supply

The permitted auxiliary voltage range of the protection relay is marked on top of the protection relay's LHMI.

- Connect the protection relay's auxiliary voltage to terminals X100-1 and X100-2.
- Connect the positive lead to terminal X100-1.

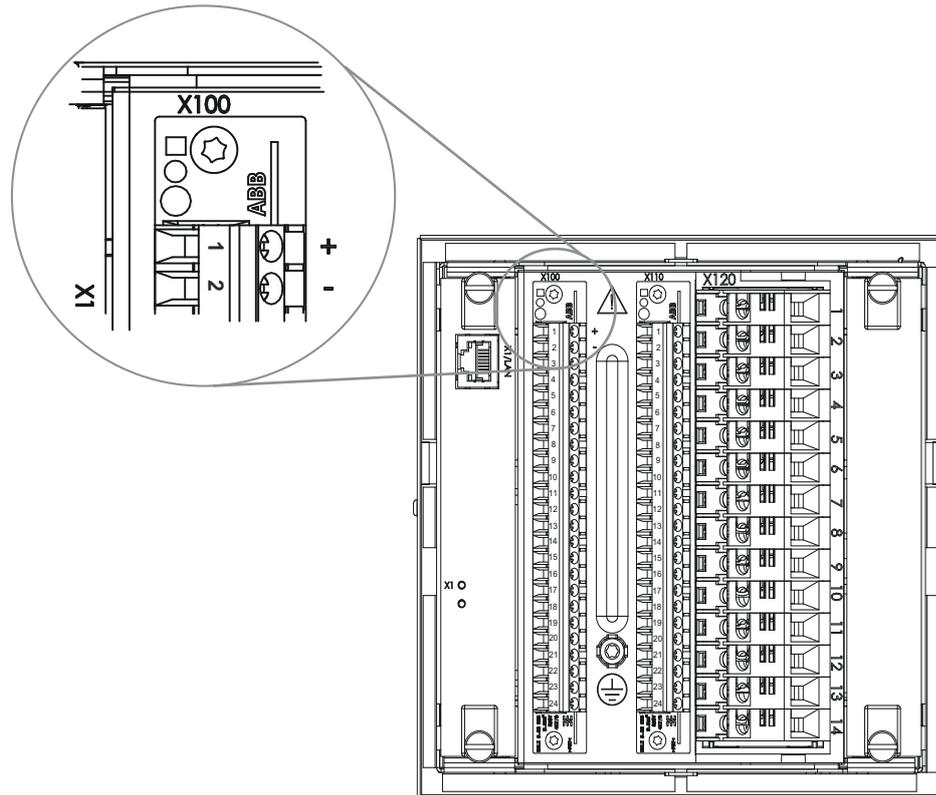


Figure 61: Connecting auxiliary voltage

5.7 Connecting communication

- Before connecting communication, check that the HW module has the correct communication interfaces.

The communication module is located on the left side of the protection relay when viewing the case from the rear.



See the technical manual for product-specific communication interfaces.

5.8 Energizing protection relay



Before connecting the auxiliary power, check that the protective film is removed from top of the protection relay.

- Before connecting the auxiliary power, check that the terminal strip is wired and placed correctly.
- Remove the protective film from the top side of the unit. Check that there is no debris visible in the ventilation holes.

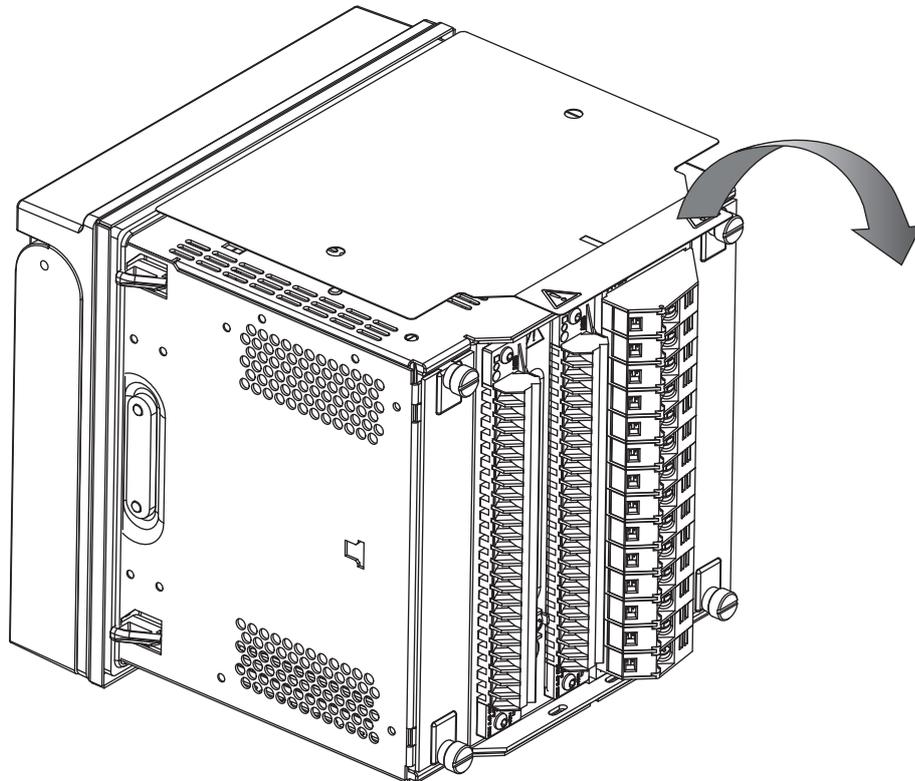


Figure 62: Removing the protective film

During the start-up, indications and self test procedures are shown in a certain order.

1. Green Ready LED starts to flash.
2. LCD lights up and ABB logo is displayed.
3. LCD test patterns are displayed and all the LEDs are lit for a short period.
4. The measurements view is displayed. A steady green Ready LED indicates a successful start-up.

If the protection relay detects a diagnostic error during start-up, the green Ready LED flashes and the internal fault code is displayed on the LCD.

6 Removing, repairing and exchanging

6.1 Product lifecycle

At some point of the product lifecycle, the protection relay is upgraded to a next generation unit. When selecting the original product, already consider the upgrading and extension possibilities that the specific product offers for its whole lifecycle.

Protection relay specific options can be found from Retrofit Solutions Database on the Internet www.abb.com by following the links within ABB Service Guide or via ABB Product Guide from the product specific Service & Support sheet.

6.2 Checking protection relay information

The protection relay information includes detailed information about the device, such as version and serial number. The protection relay information is shown on the display for a few seconds when the device starts up. The same information is found also in the protection relay menu.

1. Select **Main Menu > Information**.
2. Select a submenu with  and .
3. Enter the selected submenu with .
4. Browse the information with  and .

The **Product identifiers** submenu contains product related information like product type, serial number, order number, production date, configuration name, SW version, SW date and HW revision.

The **Site identifiers** submenu contains information about the site where the protection relay has been installed.

The **System identifiers** submenu contains the Technical key and IEC 61850 version. The Technical key is unique and cannot be changed.

The **HW modules** submenu contains information about the HW modules.

6.3 Removing protection relay

1. Turn off the power.
2. Detach the plug-in unit from the case.
3. Disconnect the wiring.
4. Loosen the four M5 fixing screws.

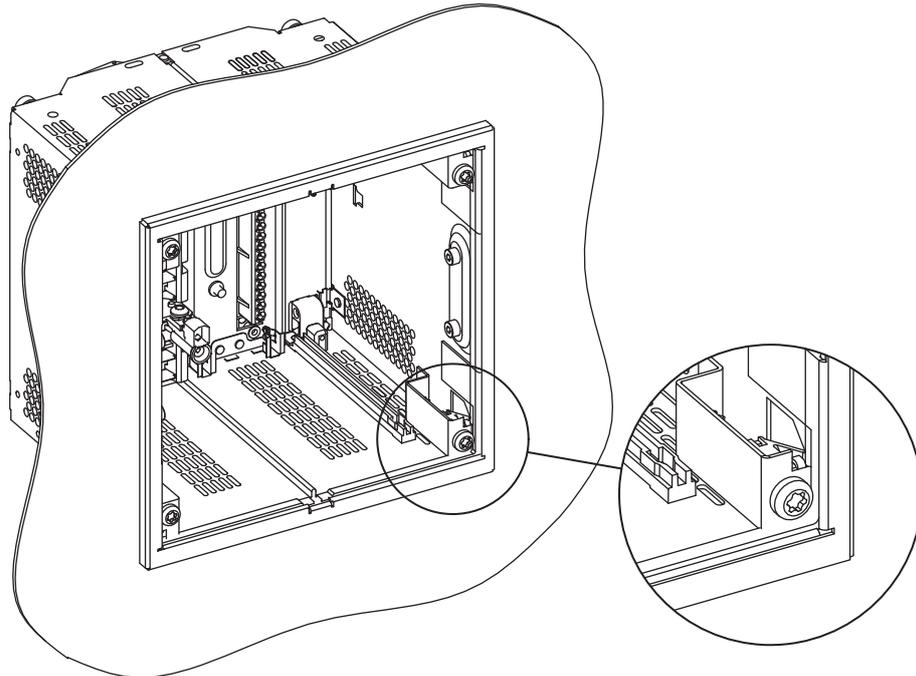


Figure 63: Loosening the M5 screws

5. Detach the case from the panel cut-out.

6.4 Sending protection relay for repair

- In case of product problems, contact the nearest ABB office or representative for consultation and instructions.

6.5 Exchanging protection relay

- To exchange the protection relay with another identical unit, remove the protection relay and install the new one.
The exchangeable units can be found from the PartsOnLine system, see www.abb.com/partsonline. Use of PartsOnLine requires user registration.

- To exchange a protection relay to a different unit, change the case and connect the wires.
- When replacing only the plug-in unit for maximum system availability, check that the order number of the case and the spare plug-in unit are equal to ensure the type compatibility.

The serial numbers of the original case and the spare plug-in unit are temporarily mismatched. For matching the serial numbers, replace also the case of the spare unit as soon as possible, for example, during the next scheduled maintenance break.

7 Technical data

7.1 Case and HMI display variants

7.1.1 Front side of the protection relay

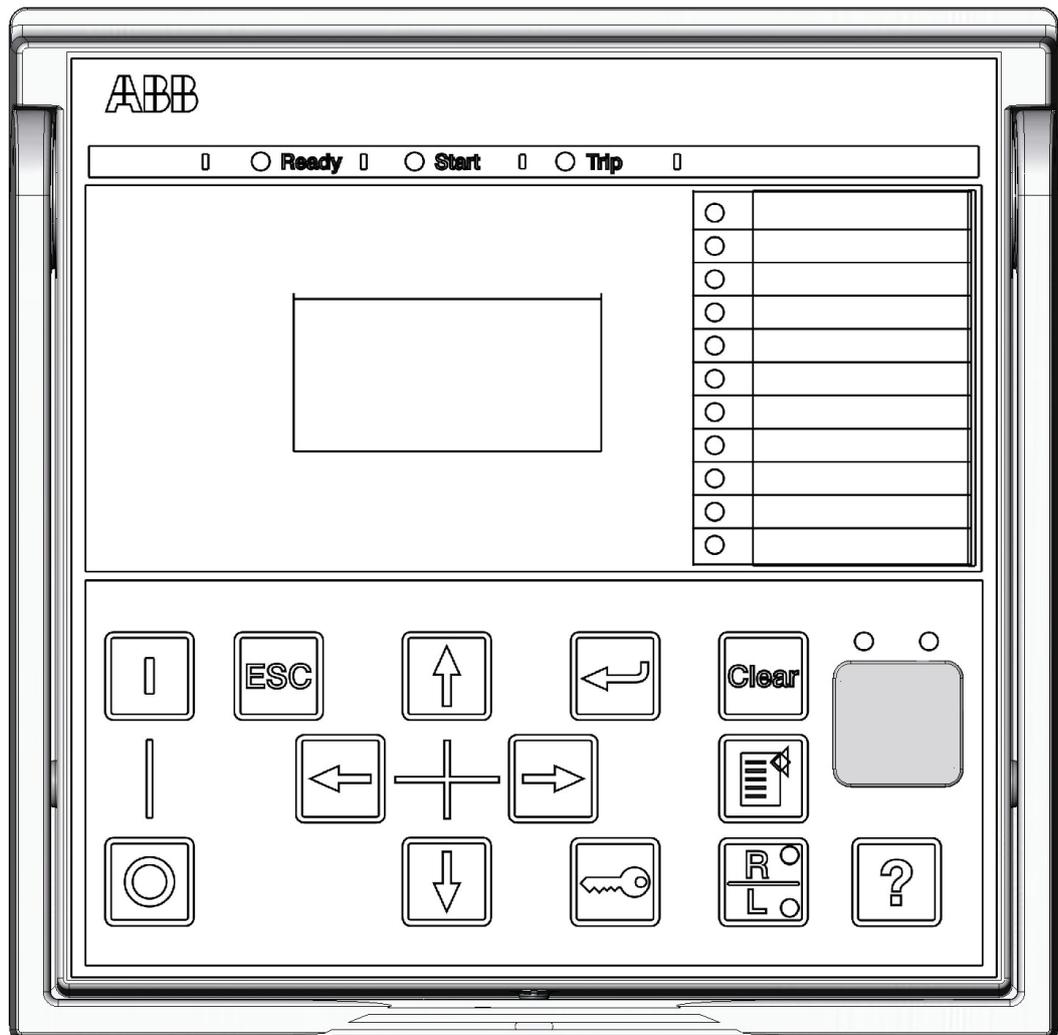


Figure 64: Small display (IEC variant)

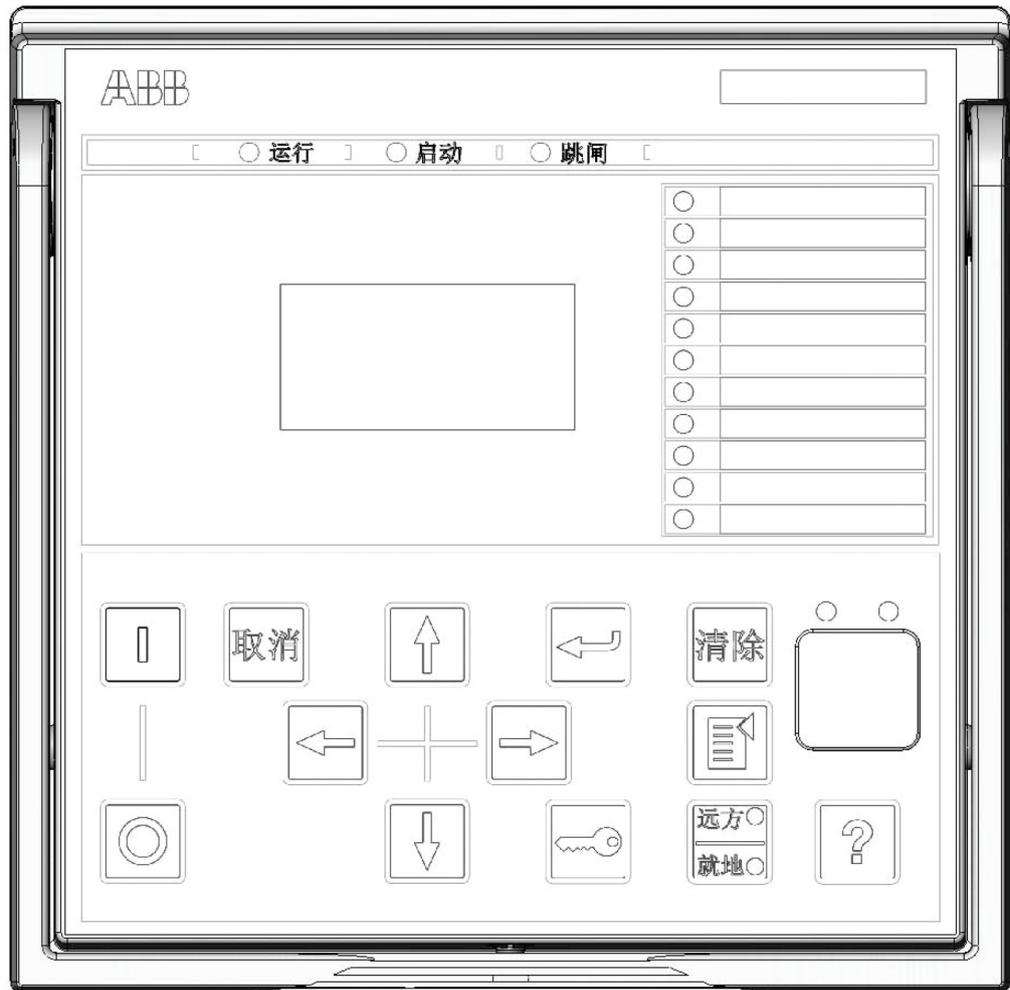


Figure 65: Small display (CN variant)

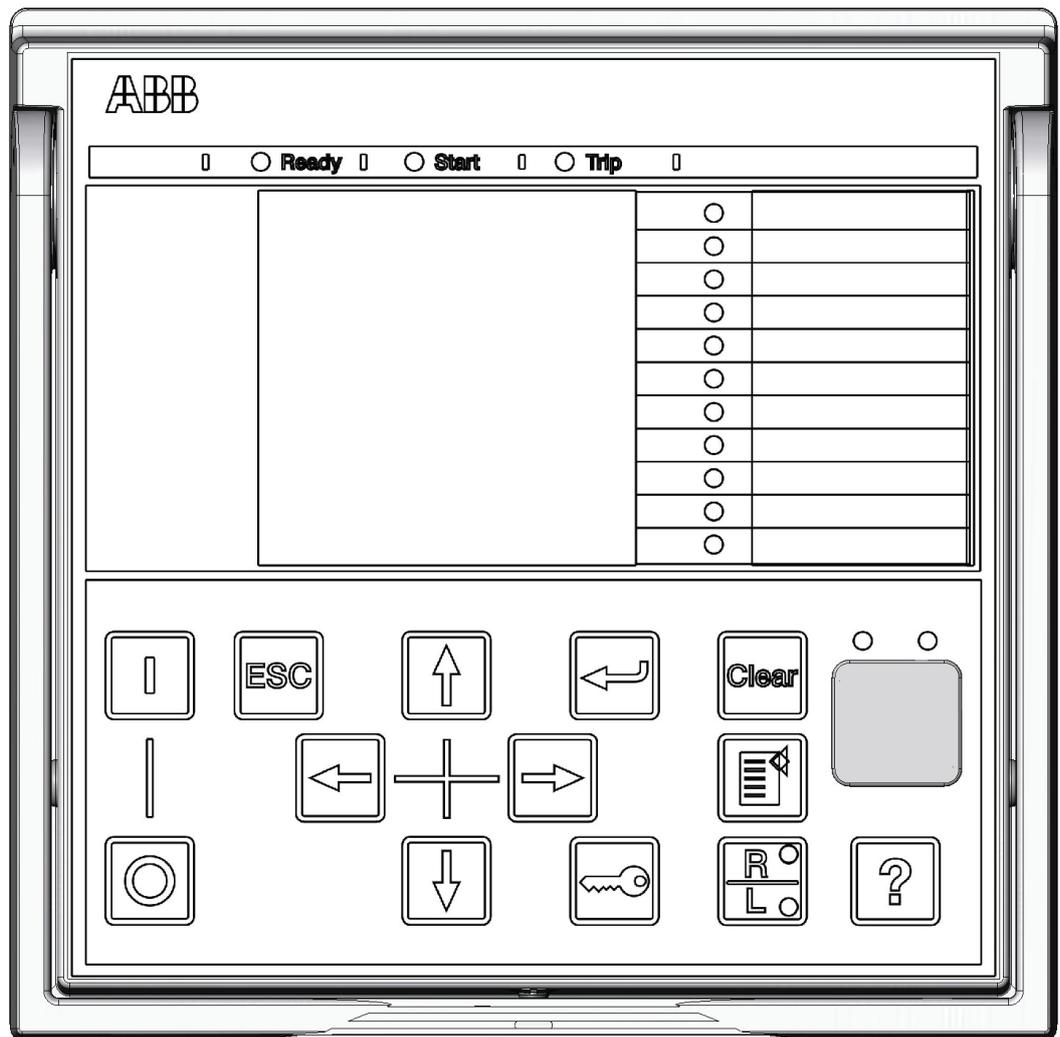


Figure 66: Large display (IEC variant)

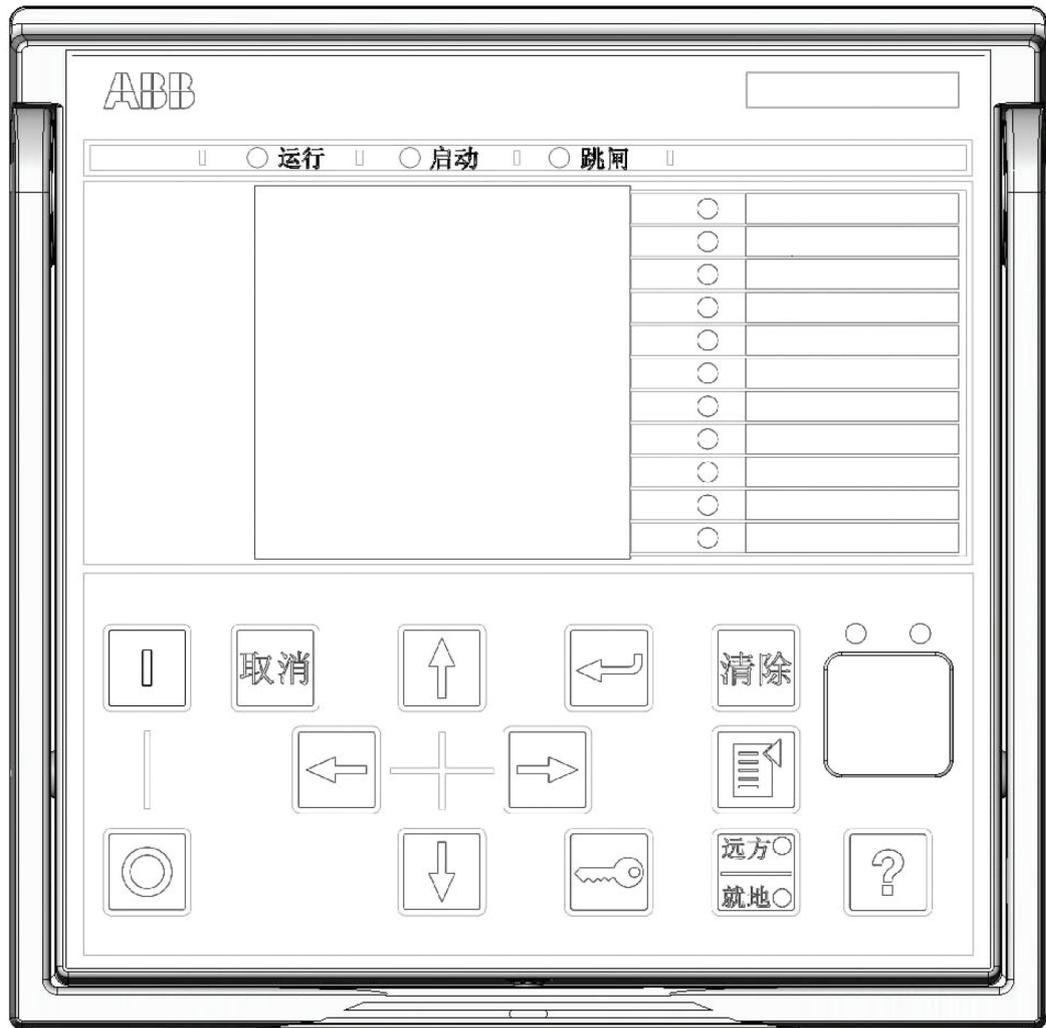


Figure 67: Large display (CN variant)

Table 4: Small display

Character size ⁶	Rows in the view	Characters per row
Small, mono-spaced (6 × 12 pixels)	5	20
Large, variable width (13 × 14 pixels)	3	8 or more

Table 5: Large display

Character size ⁷	Rows in the view	Characters per row
Small, mono-spaced (6 × 12 pixels)	10	20
Large, variable width (13 × 14 pixels)	7	8 or more

⁶ Depending on the selected language

⁷ Depending on the selected language

7.1.2 Rear side of the protection relay

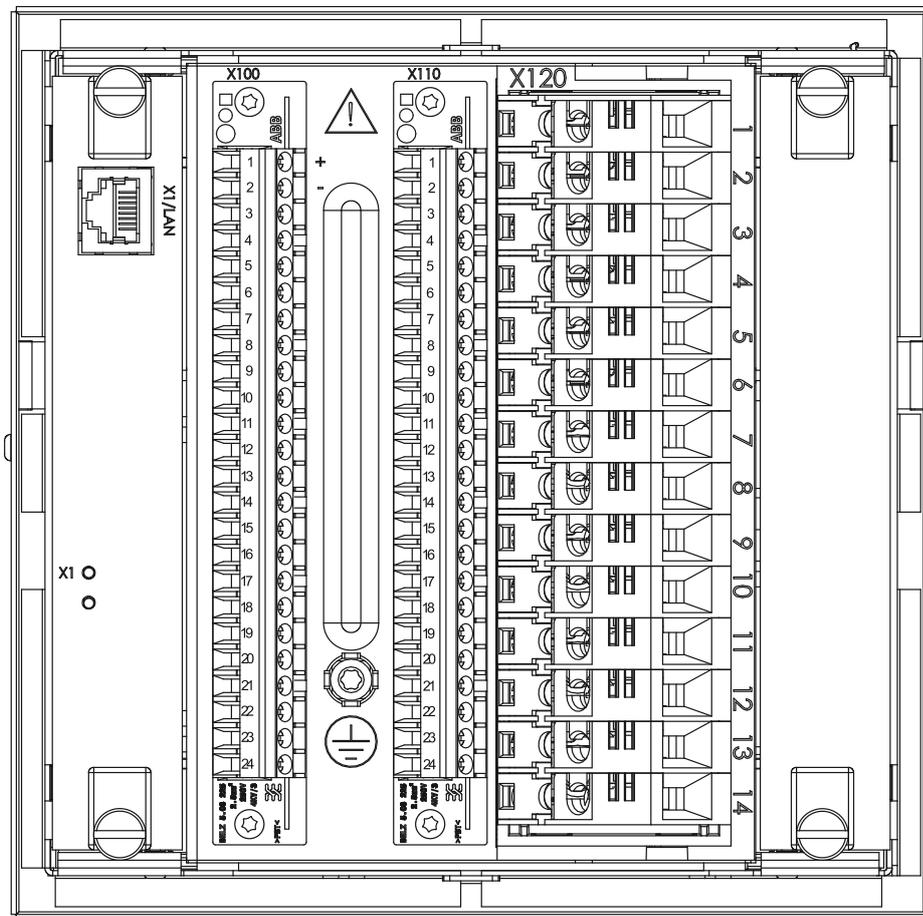


Figure 68: Rear view of a 615 series protection relay with communication module

7.2 Dimensions

Table 6: Dimensions

Description	Value
Width	Frame 177 mm
	Case 164 mm
Height	Frame 177 mm (4U)
	Case 160 mm
Depth	201 mm (153 + 48 mm)
Weight	Complete protection relay 4.1 kg
	Plug-in unit only 2.1 kg

7.3 Degree of protection of flush-mounted protection relay

Table 7: Degree of protection of flush-mounted protection relay

Description	Value
Front side	IP 54
Rear side, connection terminals	IP 20

8 Accessories and ordering data

Table 8: Cables

Item	Order number
Optical sensor for arc protection, cable length 1.5 m	1MRS120534-1.5
Optical sensor for arc protection, cable length 3.0 m	1MRS120534-3
Optical sensor for arc protection, cable length 5.0 m	1MRS120534-5
Optical sensor for arc protection, cable length 7.0 m	1MRS120534-7
Optical sensor for arc protection, cable length 10.0 m	1MRS120534-10
Optical sensor for arc protection, cable length 15.0 m	1MRS120534-15
Optical sensor for arc protection, cable length 20.0 m	1MRS120534-20
Optical sensor for arc protection, cable length 25.0 m	1MRS120534-25
Optical sensor for arc protection, cable length 30.0 m	1MRS120534-30

Table 9: Mounting accessories

Item	Order number
Semi-flush mounting kit	1MRS050696
Wall mounting kit	1MRS050697
Inclined semi-flush mounting kit	1MRS050831
19" rack mounting kit with cut-out for one relay	1MRS050694
19" rack mounting kit with cut-out for two relays	1MRS050695
Mounting bracket for one relay with test switch RTXP in 4U Combiflex (RHGT 19" variant C)	2RCA022642P0001
Mounting bracket for one relay in 4U Combiflex (RHGT 19" variant C)	2RCA022643P0001
19" rack mounting kit for one relay and one RTXP18 test switch (the test switch is not included in the delivery)	2RCA021952A0003
19" rack mounting kit for one relay and one RTXP24 test switch (the test switch is not included in the delivery)	2RCA022561A0003
Functional earthing flange for RTD modules ⁸	2RCA036978A0001
Replacement kit for a Strömberg SP_J40 series relay (cut-out in the center of the installation plate)	2RCA027871A0001
Replacement kit for a Strömberg SP_J40 series relay (cut-out on the left or the right of the installation plate)	2RCA027874A0001
Replacement kit for two Strömberg SP_J3 series relays	2RCA027880A0001
19" rack replacement kit for Strömberg SP_J3/J6 series relays (one cut-out)	2RCA027894A0001
19" rack replacement kit for Strömberg SP_J3/J6 series relays (two cut-outs)	2RCA027897A0001

Table continues on the next page

⁸ Cannot be used when the protection relay is mounted with the Combiflex 19" equipment frame (2RCA032826A0001)

Item	Order number
Replacement kit for a Strömberg SP_J6 series relay	2RCA027881A0001
Replacement kit for three BBC S_ series relays	2RCA027882A0001
Replacement kit for a SPA 300 series relay	2RCA027885A0001

9 Glossary

AIM	Analog input module
BI/O	Binary input/output
BIO	Binary input and output
CT	Current transformer
EMC	Electromagnetic compatibility
HW	Hardware
IEC	International Electrotechnical Commission
LCD	Liquid crystal display
LCP	Liquid crystal polymer
LED	Light-emitting diode
LHMI	Local human-machine interface
PA	Polyamide
PBT	Polybutylene terephthalate
PC	1. Personal computer 2. Polycarbonate
PSM	Power supply module
RoHS	Restriction of hazardous substances
RTD	Resistance temperature detector
SW	Software
VT	Voltage transformer



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