

RELION® PROTECTION AND CONTROL

# 630 series

## Installation Manual







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## Conformity

This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. 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.



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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# Section 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 personnel responsible for installing the product hardware.

The installation personnel must have basic knowledge of handling electronic equipment.

## 1.3 Product documentation

### 1.3.1 Product documentation set

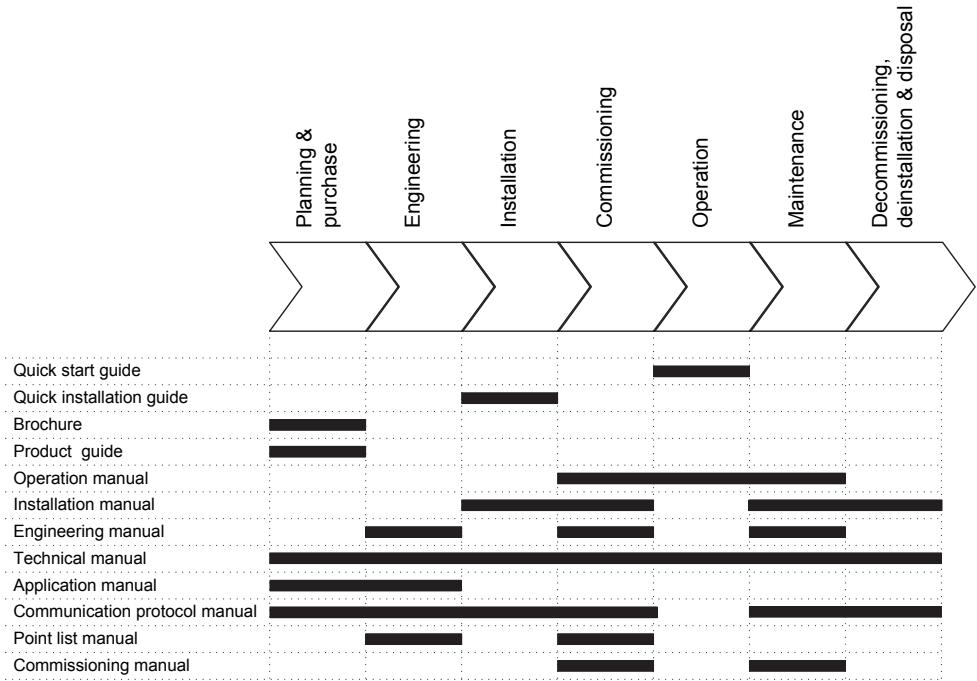


Figure 1: The intended use of documents during the product life cycle



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

### 1.3.2 Document revision history

Document revision/date	Product series version	History
A/2009-09-15	1.0	First release
B/2009-12-29	1.0	Content updated
C/2011-02-23	1.1	Content updated to correspond to the product series version
D/2011-05-20	1.1	Content updated
E/2012-08-29	1.2	Content updated to correspond to the product series version
F/2014-11-28	1.3	Content updated to correspond to the product series version
G/2019-02-25	1.3	Content updated



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

### 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**.
  - WHMI menu names are presented in bold.  
Click **Information** in the WHMI menu structure.
  - 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.
  - The ^ character in front of an input or output signal name in the function block symbol given for a function, indicates that the user can set an own signal name in PCM600.
  - The \* character after an input or output signal name in the function block symbol given for a function, indicates that the signal must be connected to another function block in the application configuration to achieve a valid application configuration.

## Section 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
Unit	Metallic plates, parts and screws	Steel
	Plastic parts	PC <sup>1)</sup> , LCP <sup>2)</sup>
	LHMI display module	Various
Package	Box	Cardboard
Attached material	Manuals	Paper

- 1) Polycarbonate
- 2) Liquid crystal polymer

---

## Section 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.



The cardboard packaging material is 100% recyclable.

### 3.2

### Inspecting product and delivery items

#### 3.2.1

#### Identifying product

1. Locate the IED's order number from the label attached to the IED's case.
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.

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### **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.

---

## Section 4      Mounting

### 4.1      Required tools

Use Torx TX10 and TX15 screwdrivers when attaching the mounting kits to the IED.  
Use a 2.5 mm Allen Key when mounting the external display module.

### 4.2      Checking environmental conditions and mounting space

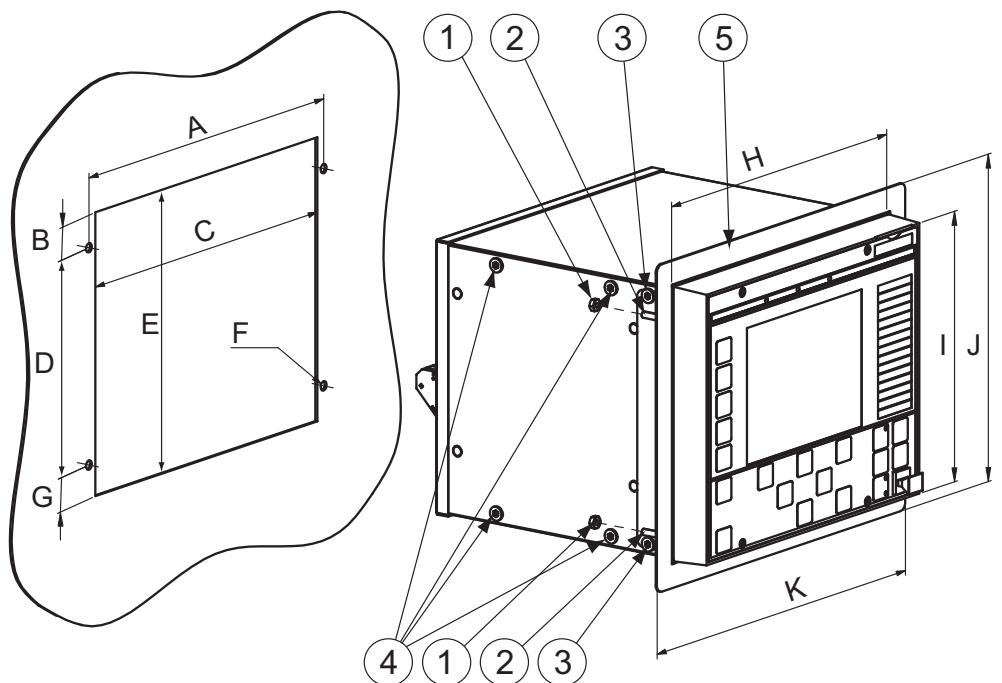
The mechanical and electrical environmental conditions at the installation site must be within the limits described in the technical manual.

- 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.

### 4.3      Mounting the IED

#### 4.3.1      Flush mounting the IED

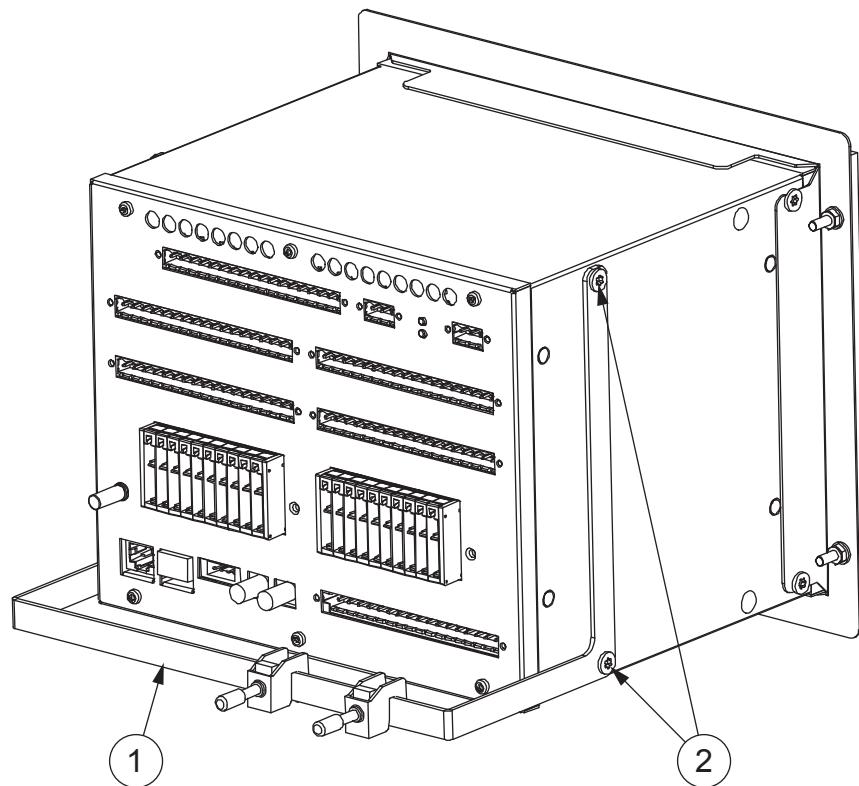
1. Make a panel cut-out and drill four holes according to the dimensional drawing.
2. Place the IED securely in the mounting frame using the required screws.
3. Tighten the screws.
4. Mount the IED with the mounting frame to the panel cut-out.



*Figure 2: Flush mounting the IED into a panel cut-out*

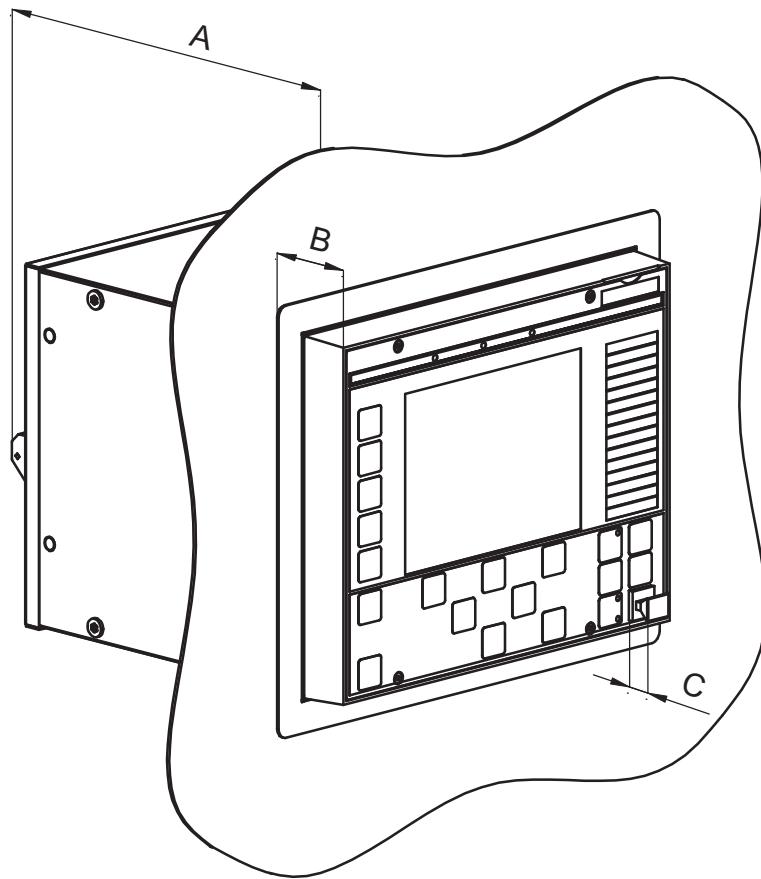
A	240 mm	1	M4 nuts and washers
B	21.5 mm	2	Threaded studs
C	227 mm	3	M5 countersunk screws
D	140 mm	4	Plastic plugs
E	183 mm	5	Mounting frame
F	Ø6 mm		
G	21.5 mm		
H	220 mm		
I	177 mm		
J	211 mm		
K	254 mm		

5. Place a M4 nut and a washer on each threaded studs.
6. Tighten the nuts.
7. If the optional RTD module is present, mount the cable shield rail:
  - 7.1. Remove the four rear plastic plugs from each side of the IED.
  - 7.2. Place the cable shield rail to the rear side of the IED.
  - 7.3. Locate the rail to the IED using the required M5 screws.
  - 7.4. Tighten the screws.



*Figure 3: Mounting the optional cable shield rail*

- 1 Cable shield rail
- 2 M5 screws



*Figure 4: Flush mounted IED*

A 222 mm without a cable shield rail  
271 mm with a cable shield rail

B 27 mm

C 13 mm



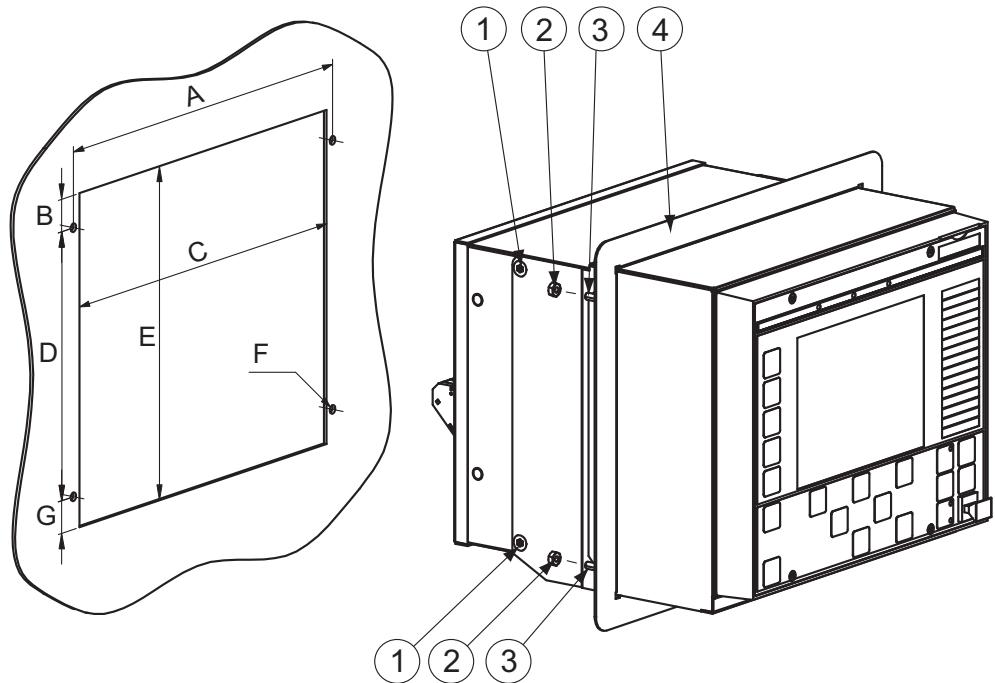
Check the allowed minimum bending radius from the optical cable manufacturer.

### 4.3.2

### Semi-flush mounting the IED

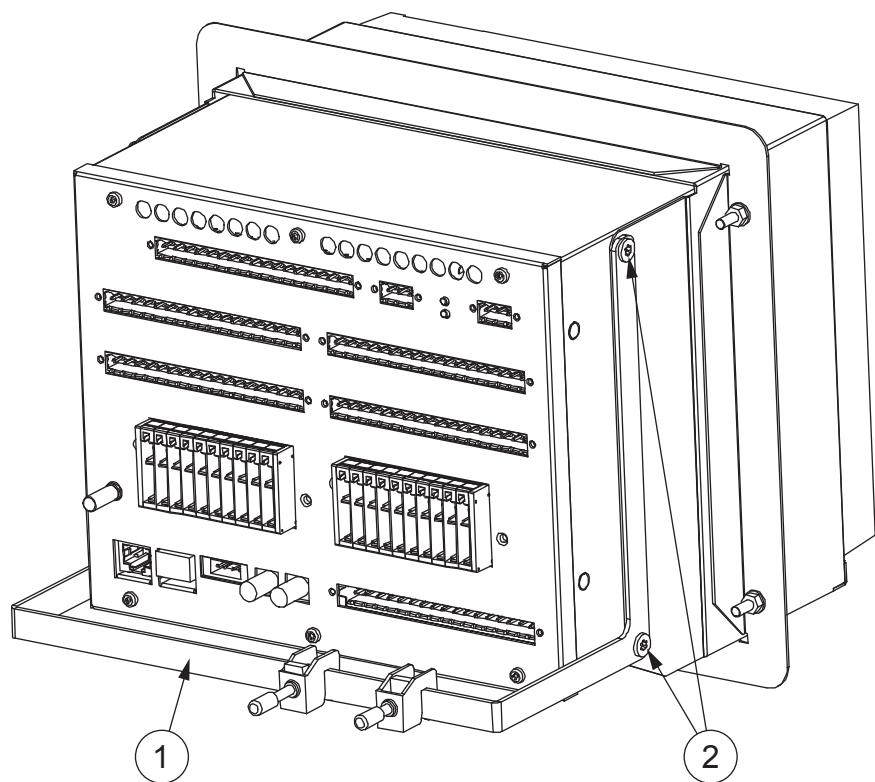
1. Make a panel cut-out and drill screw holes according to the dimensional drawing.
2. Mount the rising frame to the panel cut-out.
3. Place a M4 nut and a washer on each threaded studs.

4. Tighten the nuts.
5. Remove the plastic plugs from the side of the IED and locate it securely in the rising frame using the required M5 screws. If the optional RTD module is present, mount the cable shield rail:
  - 5.1. Place the cable shield rail to the rear side of the IED.
  - 5.2. Locate the rail to the IED using the required M5 screws.
  - 5.3. Tighten the screws.
6. Tighten the screws.



*Figure 5: Semi-flush mounting the IED into a panel cut-out*

A	240 mm	1	M5 screws
B	19 mm	2	M4 nuts and washers
C	229 mm	3	Threaded studs
D	157 mm	4	Raising frame
E	195 mm		
F	Ø6 mm		
G	19 mm		



*Figure 6: Mounting the optional cable shield rail*

- 1 Cable shield rail
- 2 M5 screws

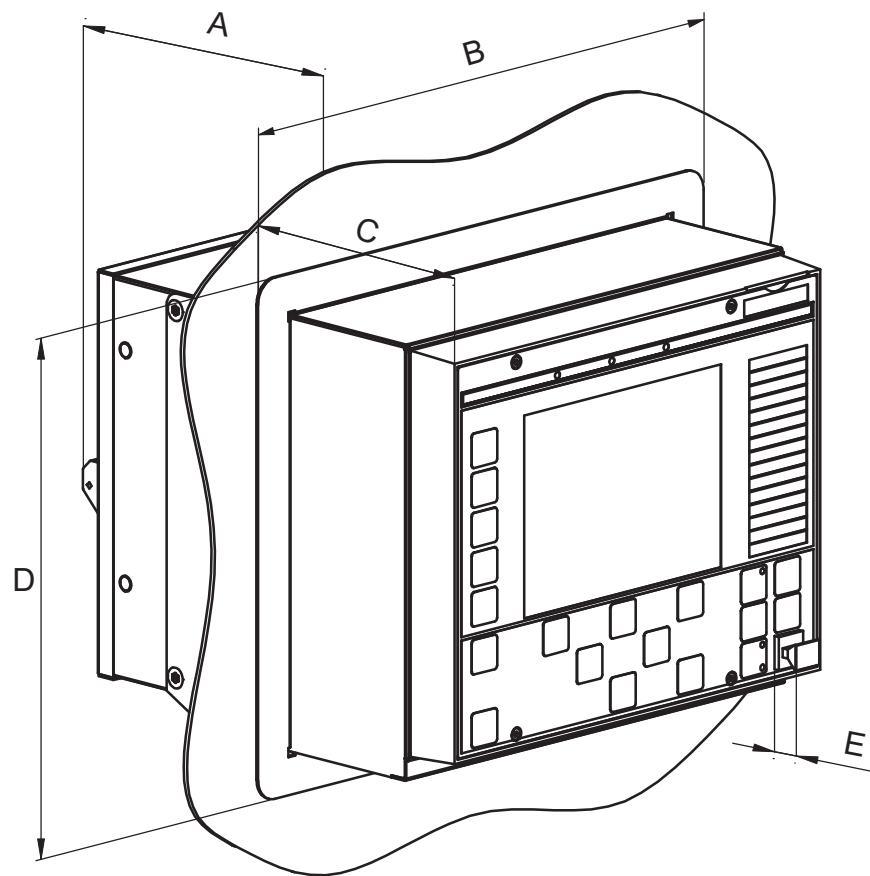


Figure 7: Semi-flush mounted IED

- A 154 mm without a cable shield bar  
203 mm with a cable shield bar
- B 265 mm
- C 95 mm
- D 227 mm
- E 13 mm



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

## 4.3.3 Rack mounting the IED

### 4.3.3.1 Rack mounting a single IED

1. Remove the four plastic plugs from the left-hand side of the IED and attach the left mounting panel securely using the required M5 screws.
2. If the optional RTD module is present, mount the cable shield rail:
  - 2.1. Place the cable shield rail to the rear side of the IED.
  - 2.2. Locate the rail to the IED using the required M5 screws.
3. Tighten the screws.

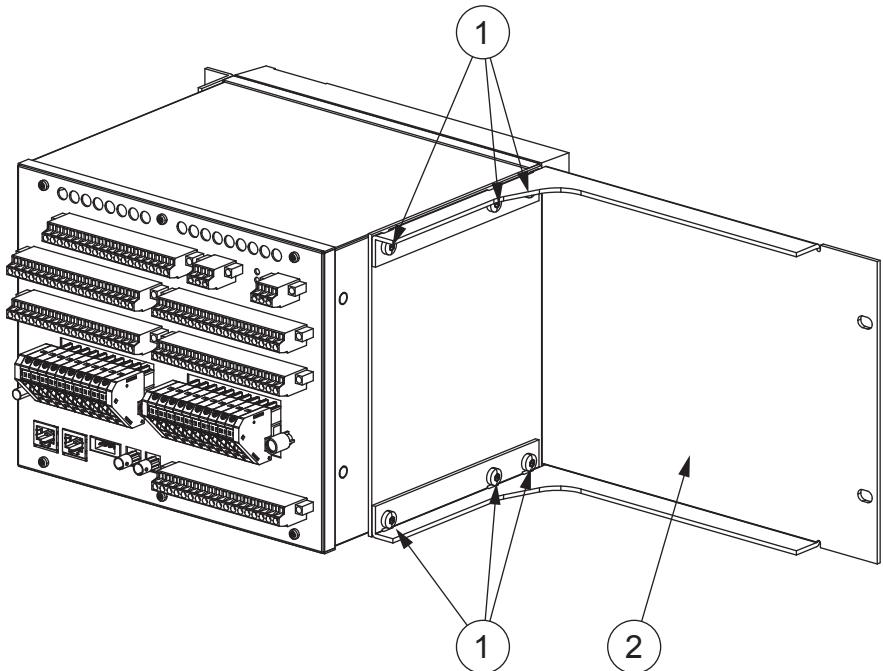
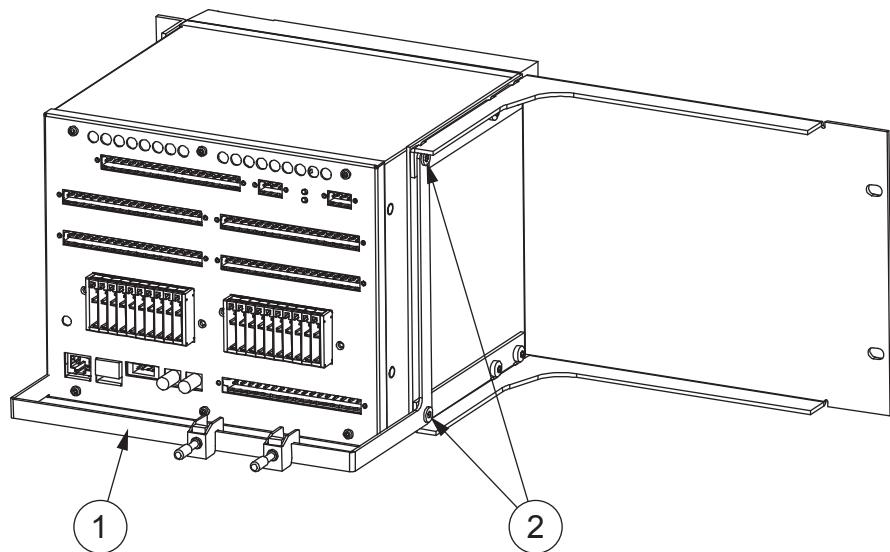


Figure 8: Mounting the bracket

- 1 M5 screws
- 2 Left mounting bracket



*Figure 9: Mounting the optional cable shield rail*

- 1 Cable shield rail
- 2 M5 screws

4. Attach the right mounting bracket to the right-hand side of the IED using the required M5 screws.
5. Mount the IED with the rack mounting panels to the 19" rack.
6. Tighten the screws.

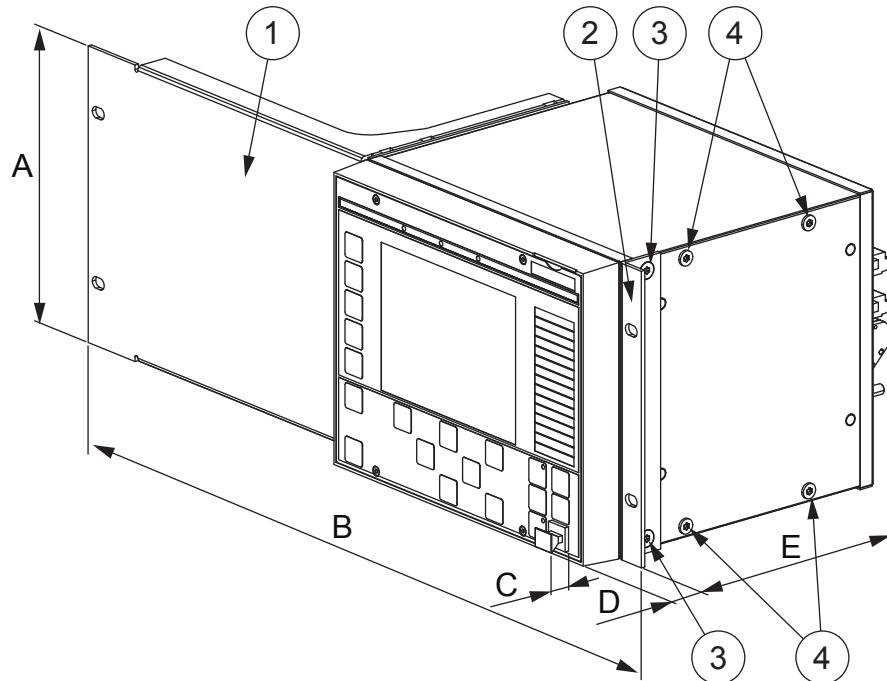


Figure 10: Rack mounted IED

A	177 mm (4U)	1	Left mounting bracket
B	482.6 mm (19")	2	Right mounting bracket
C	13 mm	3	M5 countersunk screws
D	25.5 mm	4	Plastic plugs
E	224 mm without a cable shield rail 273 mm with a cable shield rail		



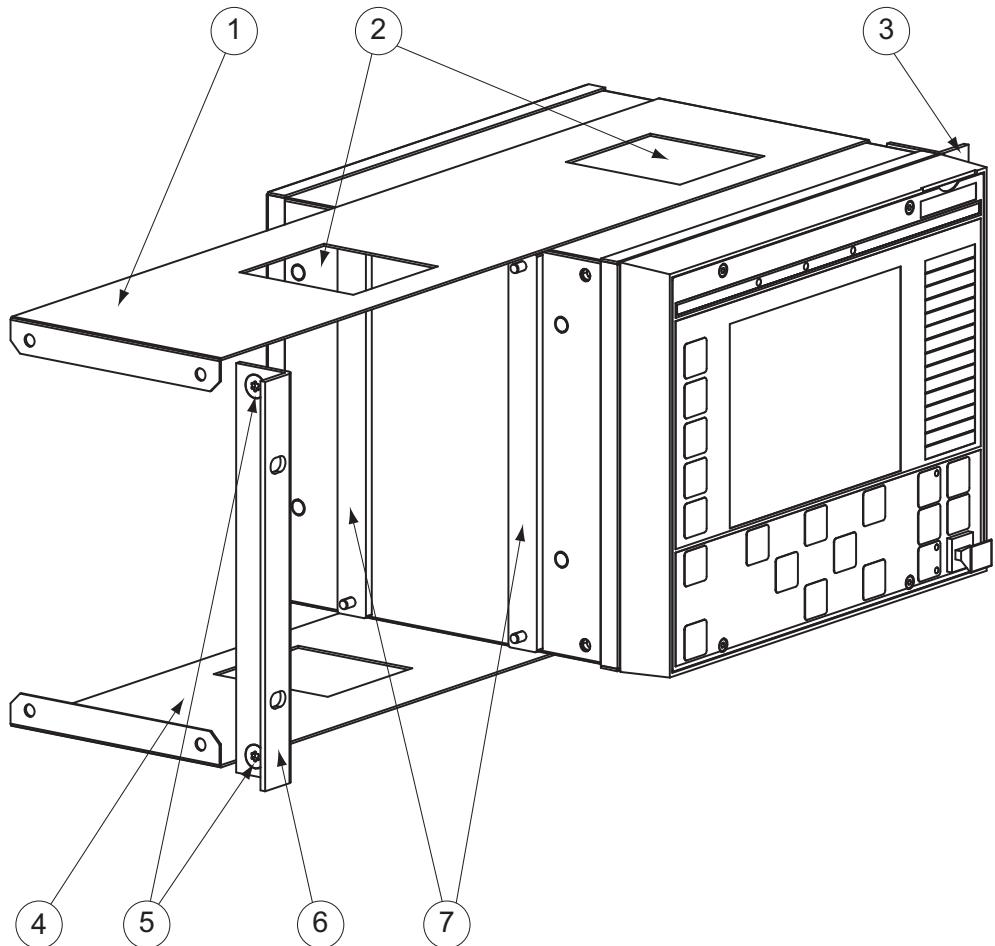
Check the allowed minimum bending radius from the optical cable manufacturer.

### 4.3.3.2

### Rack mounting two IEDs

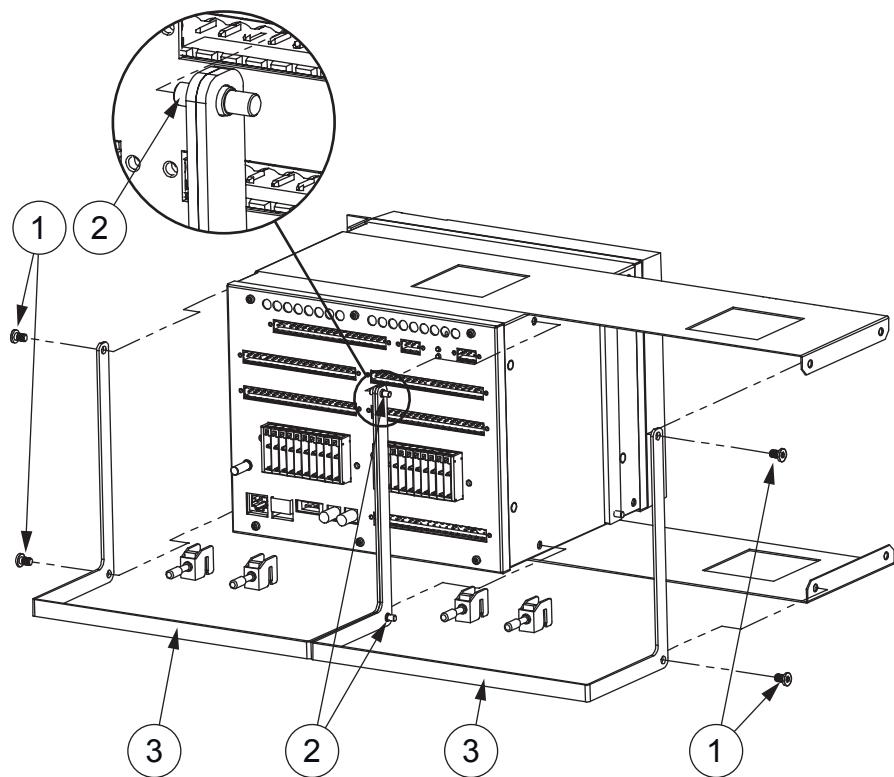
1. Remove the plastic plugs from the side of the case on both of the two IEDs.
2. Locate the pins on the front middle mounting bracket to the holes on the sides of the two IEDs.
3. Locate the pins on the rear middle mounting bracket to the holes on the sides of the two IEDs. If the optional RTD module is present, instead of the rear middle mounting bracket, mount the cable shield rails.

- 3.1. Place the cable shield rails to the rear side of the IEDs.
- 3.2. Locate the rails to the IEDs using the two required combination adapter pins.
4. Mount the upper and lower mounting brackets to the two IEDs using the M5 screws at the required location.  
Make sure that the lower venting hole on the IEDs line up with the venting hole in the lower mounting bracket.



*Figure 11: Mounting IEDs*

- 1 Upper mounting bracket
- 2 Vent holes
- 3 Right mounting bracket
- 4 Lower mounting bracket
- 5 M5 countersunk screws
- 6 Left mounting bracket
- 7 Middle mounting brackets



*Figure 12: Mounting the optional cable shield rails*

- 1 M5 screws
- 2 Combination adapter pins
- 3 Cable shield rails

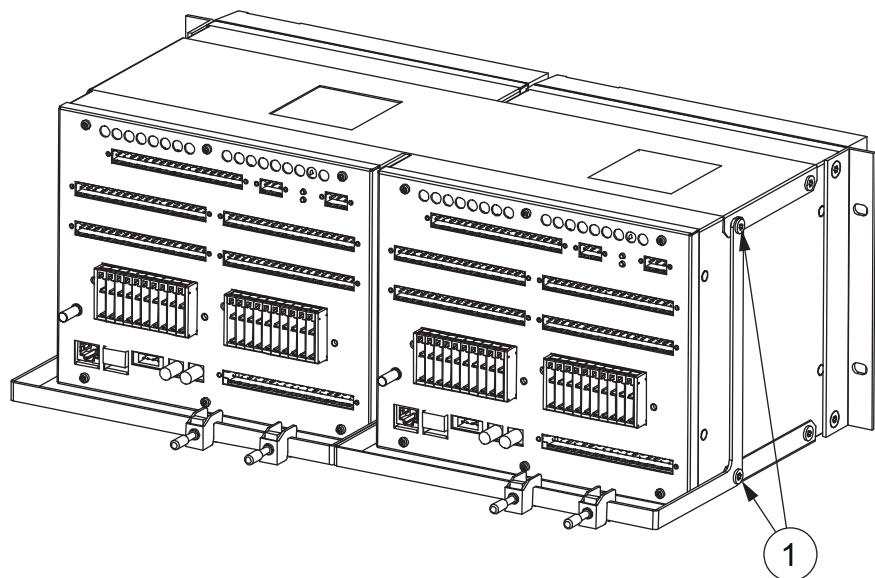


Figure 13: Two rack mounted IEDs with cable shield rails side by side

1 M5 screws

5. Tighten the screws.
6. Mount the left and right mounting brackets to both sides of the IED assembly using fixing screws.
7. Tighten the screws.
8. Mount the IEDs with the rack mounting panels to the 19" rack.
9. Tighten the screws.

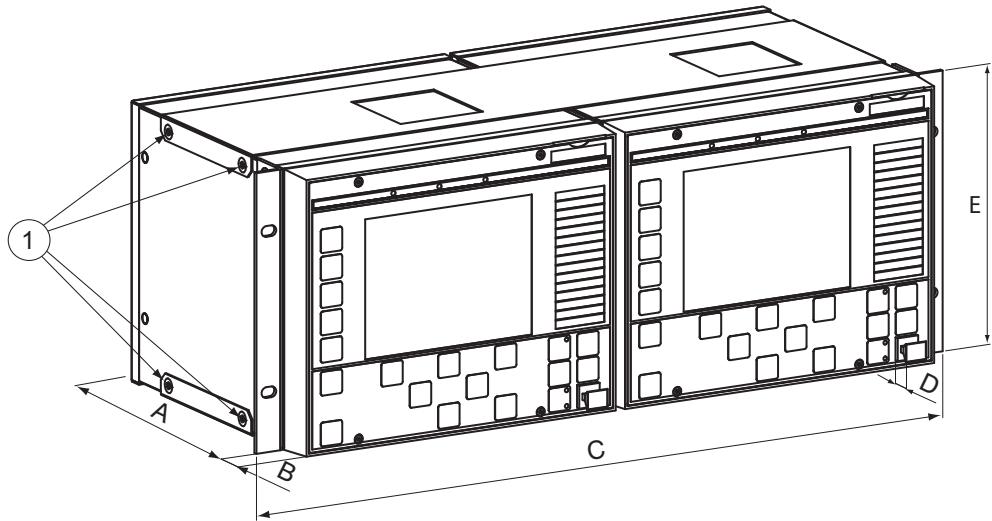


Figure 14: Two rack mounted IEDs side by side

- A 224 mm without a cable shield bar 1 M5 screws  
273 mm with a cable shield bar
- B 25.5 mm
- C 482.6 mm (19")
- D 13 mm
- E 177mm (4U)



Make sure that the lower venting holes in the IED is not obstructed.



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

### 4.3.3.3

### Rack mounting a single IED and test switch RTXP

1. Attach the mounting bracket to the right-hand side of the IED using the required M5 screws.
2. Tighten the screws.
3. Remove the four plastic plugs from the left-hand side of the IED and attach the mounting bracket securely using the required bracket and screws. If the optional RTD module is present, instead of the bracket, mount the cable shield rail.

- 3.1. Place the cable shield rail to the rear side of the IED.
- 3.2. Locate the rail to the IED using the required M5 screws.
4. Tighten the screws.
5. Mount the IED with the rack mounting panels to the 19" rack.
6. Tighten the fixing screws.
7. Install the RTXP 8, 18 or 24 test switch.
8. Attach the front cover over to the test switch.

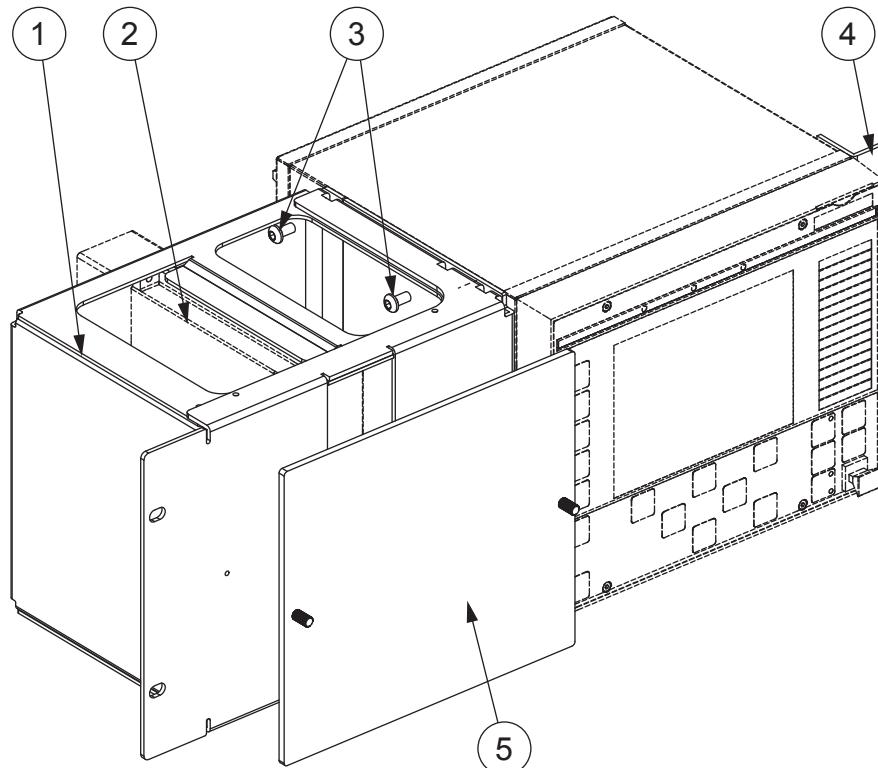
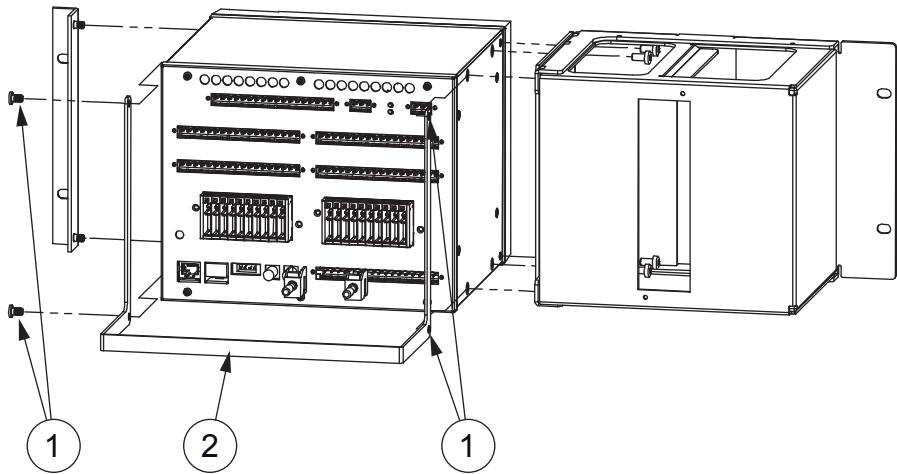


Figure 15: IED mounted with test switch RTXP 18

- 1 Left mounting bracket
- 2 Test switch
- 3 M5 screws
- 4 Right mounting bracket
- 5 Plastic front cover



*Figure 16: Mounting the optional cable shield rail*

- 1 M5 screws
- 2 Cable shield rail



An IED equipped with optical connections requires a minimum depth of 180 mm. Check the allowed minimum bending radius from the optical cable manufacturer.

### 4.3.4 Wall mounting the IED

1. Drill four screw holes according to the dimensional drawing.
2. Mount the mounting brackets using the required screws.
3. Remove the plastic plugs from the side of the IED.
4. Fit the IED securely between the mounting brackets using the required screws.  
If the optional RTD module is present, mount the cable shield rail.
  - 4.1. Place the cable shield rail to the rear side of the IED.
  - 4.2. Locate the rail to the IED using the required M5 screws.
5. Tighten the screws.

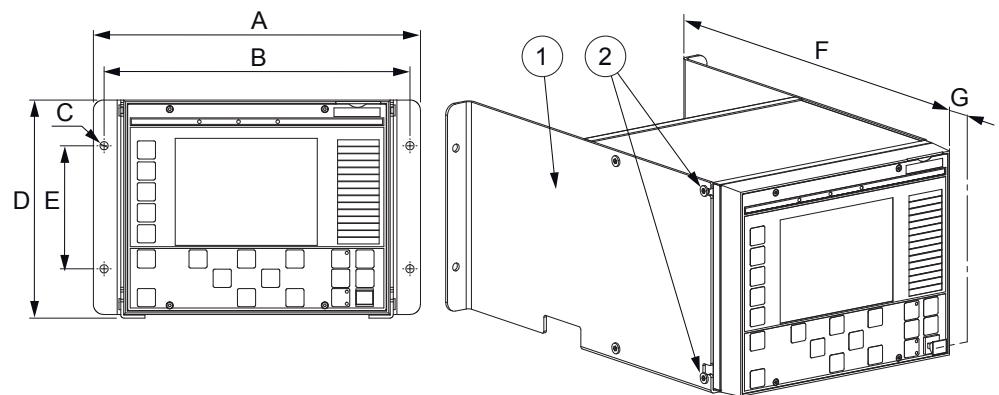


Figure 17: Wall mounting the IED

A 270 mm 1 Mounting bracket

B 252.5 mm 2 M5 screws

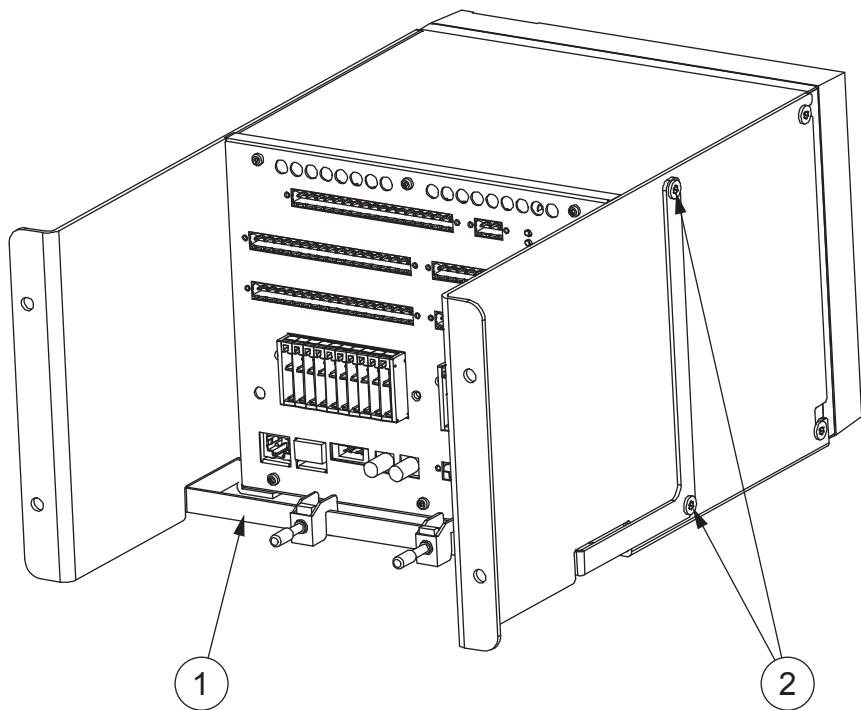
C Ø6.8 mm

D 180 mm

E 101.6 mm

F 366 mm

G 13 mm



*Figure 18: Mounting the optional cable shield frame*

- 1 Cable shield rail
- 2 M5 screws



Minimum of 50 mm space is needed between the two kits.

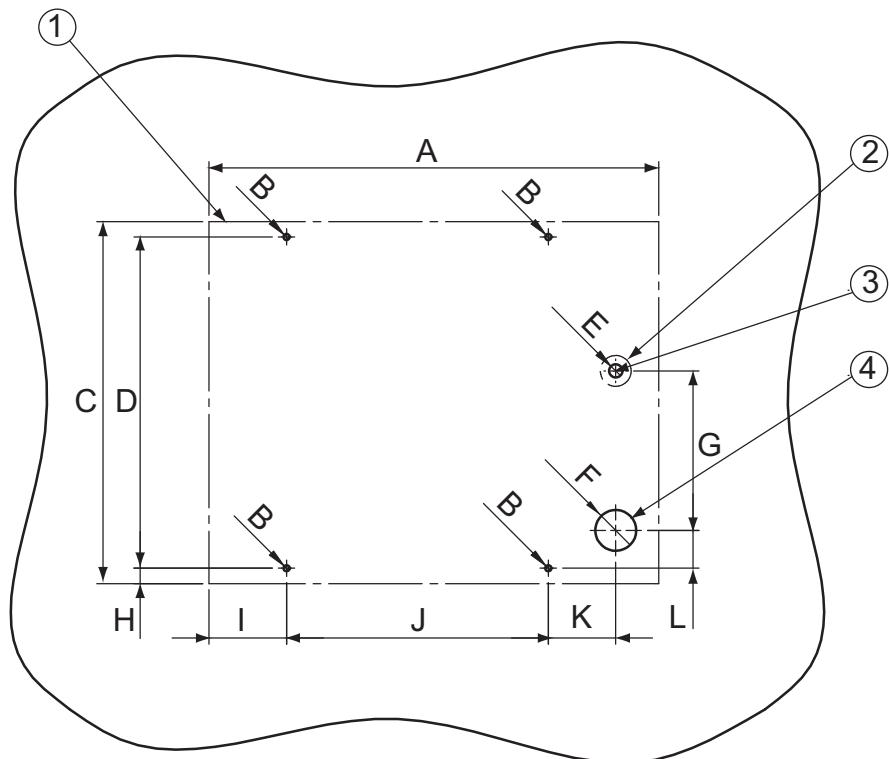


Check the allowed minimum bending radius from the optical cable manufacturer.

### 4.3.5 Ceiling and wall mounting with external display module

#### 4.3.5.1 Mounting the external display module

1. Drill holes according to the dimensional drawing.



*Figure 19: Drill plan for the LHMI*

A	220 mm	1	LHMI outline
B	M3	2	Surface coating on rear side of panel must be removed Ø15 mm
C	177 mm	3	Hole for GND connection
D	162 mm	4	Hole for cable from IED to LHMI
E	Ø6.5 mm		
F	Ø20 mm		
G	78 mm		
H	7.5 mm		
I	38 mm		
J	128 mm		
K	33 mm		
L	18.5 mm		

2. Thread the four holes for the M3 screws.
3. Remove surface coating from the rear side of the panel for the GND screw.
4. Draw the LHMI cable through the hole for cable from IED to LHMI.
5. Connect the cable to the LHMI.
6. Mount the external LHMI display using four M3 screws.
7. Tighten the four M3 screws.
8. Ground the LHMI.

- 8.1. Use a  $16.0 \text{ mm}^2$  flat braided copper cable.
- 8.2. Insert the M5 GND screw with a washer through the grounding clamp and ground cable.  
Use a GND screw that is equal or shorter than the thickness of the washer, grounding clamp, braided copper cable and panel +4 mm.
- 8.3. Use a spring lock washer.
- 8.4. Connect the other end of the ground cable to the cabinet door as near as possible to the LHMI ground.
- 8.5. Tighten the GND screws.

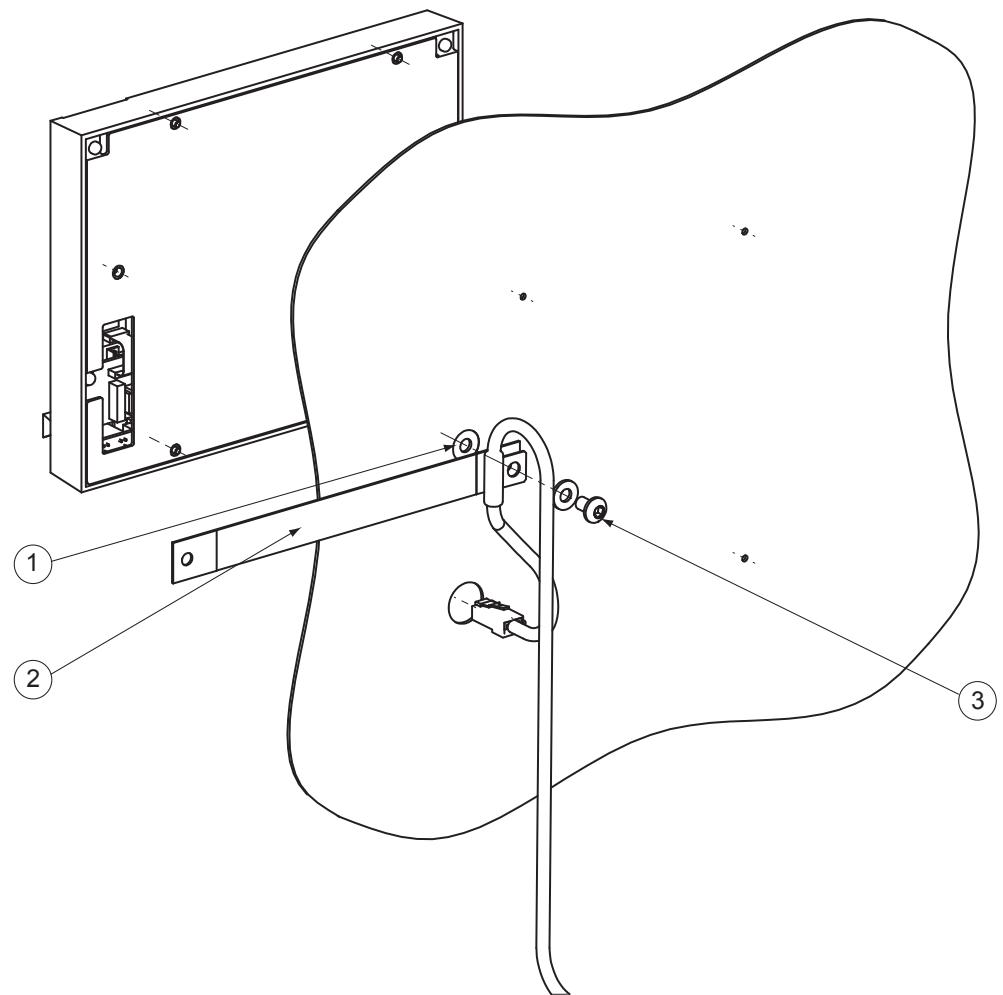


Figure 20: LHMI grounding

- 1 Surface coating removed  $\varnothing 15 \text{ mm}$
- 2 Ground cable
- 3 M5 screw and washer for grounding LHMI and cable to the panel



When the LHMI is installed on the cabinet door, earth the door with a 16.0 mm<sup>2</sup> flat copper cable.



The display module is connected to the main unit of the IED using the RJ-45 cable that is included in the delivery of the IED.



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



The LHMI cable must be grounded to the LHMI grounding point. Use only the cable delivered with the IED.

#### 4.3.5.2

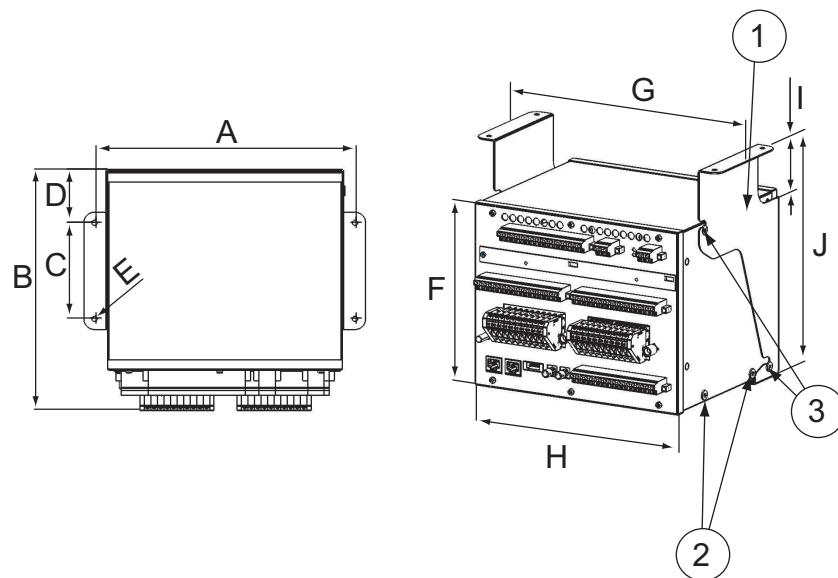
#### Ceiling mounting the main unit

1. Drill four screw holes according to the dimensional drawing.
2. Mount the mounting bracket on the ceiling at the required location.



A minimum of 50 mm space is needed between the IED and the ceiling for the cables.

3. Remove the upper four plastic plugs, two on each side, on the case of the main unit and locate the it securely in the mounting frame.
4. If the optional RTD module is present, mount the cable shield rail:
  - 4.1. Remove the two lower plastic plugs, one on each side, from the IED.
  - 4.2. Place the cable shield rail to the rear side of the IED.
  - 4.3. Locate the rail to the IED using the required M5 screws.
  - 4.4. Tighten the screws.



*Figure 21: 4U half 19" Ceiling mounting with cable space on top*

A	244.5 mm	1	Mounting bracket
B	226 mm without a cable shield bar 275 mm with a cable shield bar	2	Plastic plugs
C	90 mm	3	M5 screws
D	50 mm		
E	Ø5 mm		
F	177 mm		
G	264.5 mm		
H	220 mm		
I	51.5 mm		
J	232 mm		

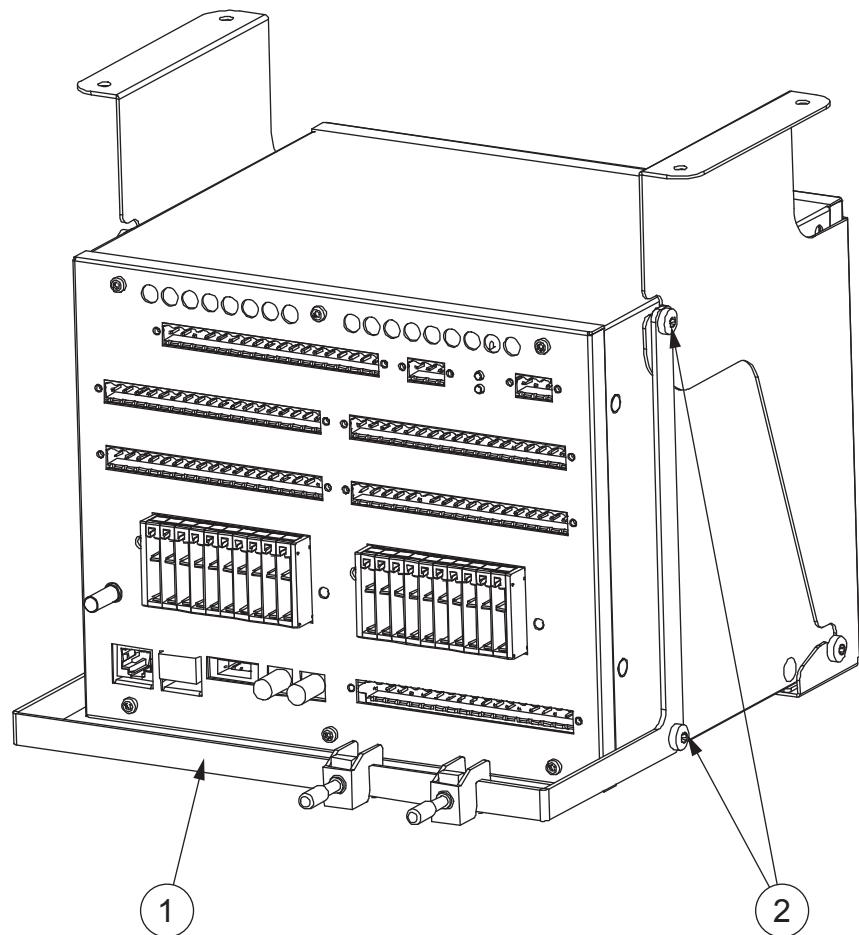
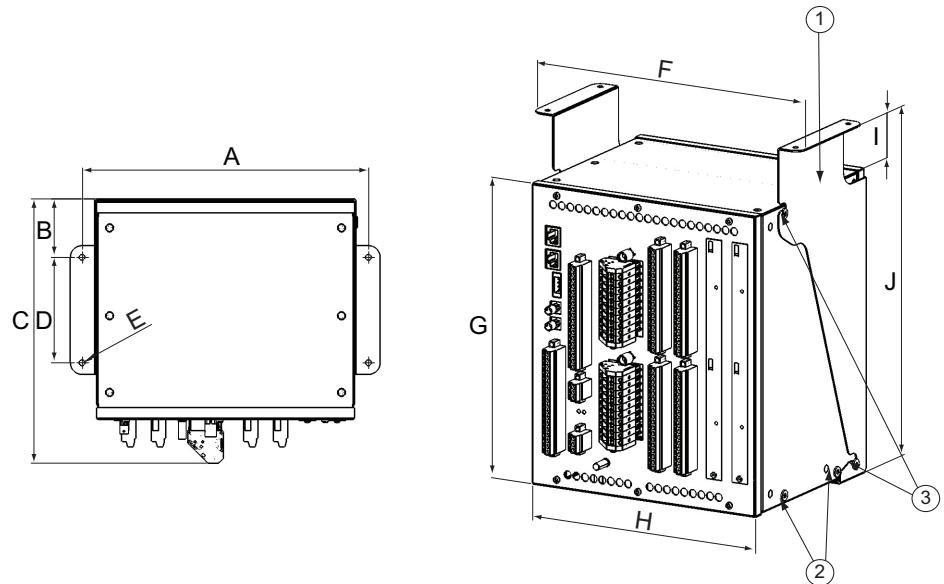


Figure 22: 4U half 19" Mounting the optional cable shield rail

1 Cable shield rail

2 M5 screws



*Figure 23: 6U half 19" Ceiling mounting with cable space on top*

A	244.5 mm	1	Mounting bracket
B	50 mm	2	Plastic plugs
C	226 mm without a cable shield bar 275 mm with a cable shield bar	3	M5 screws
D	90 mm		
E	Ø5 mm		
F	264.5 mm		
G	265.9 mm		
H	220 mm		
I	51.5 mm		
J	321 mm		

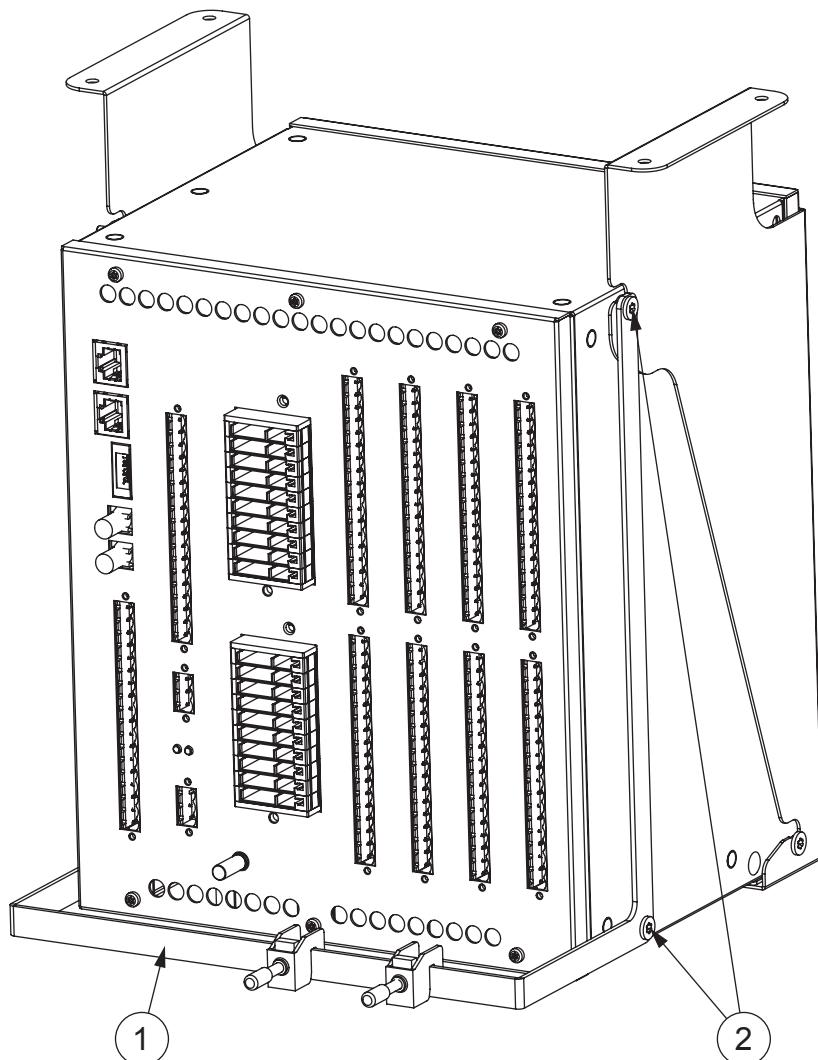


Figure 24: 6U half 19" Mounting the optional cable shield rail

- 1 Cable shield rail
- 2 M5 screws

5. Tighten the screws.
6. Connect a cable to the RJ-45 connection on the front panel of the main unit to the corresponding connection on external LHMI display module.



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

### 4.3.5.3

### Wall mounting the main unit

1. Drill screw holes according to the dimensional drawing.
2. Mount the mounting brackets using the required screws.
3. Fit the main unit of IED securely between the mounting brackets by using the required M5 screws.

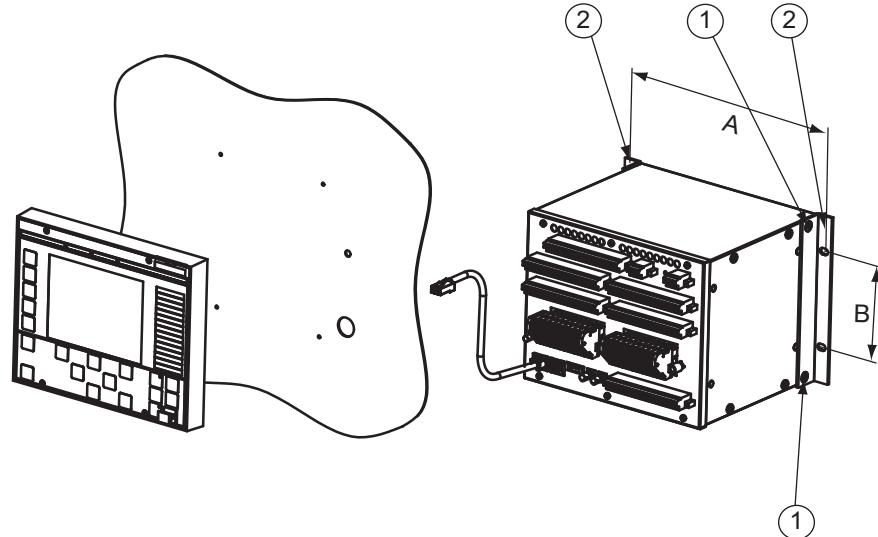
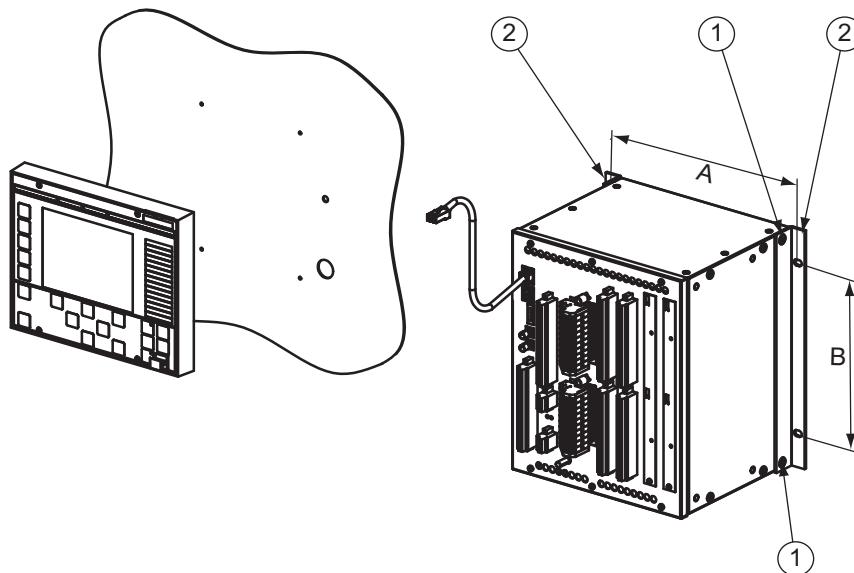


Figure 25: 4U main unit and external LHMI display

A 241.1 mm 1 M5 countersunk screws

B 101.6 mm 2 Mounting brackets



*Figure 26: 6U main unit and external LHMI display*

A 241.1 mm 1 M5 countersunk screws

B 190.5 mm 2 Mounting brackets



The width of the 4U and 6U main units is 224 mm.

4. Tighten the screws.
5. If the optional RTD module is present, mount the cable shield rail:
  - 5.1. Remove the four rear plastic plugs from each side of the IED.
  - 5.2. Place the cable shield rail to the rear side of the IED.
  - 5.3. Locate the rail to the IED using the required M5 screws.
  - 5.4. Tighten the screws.

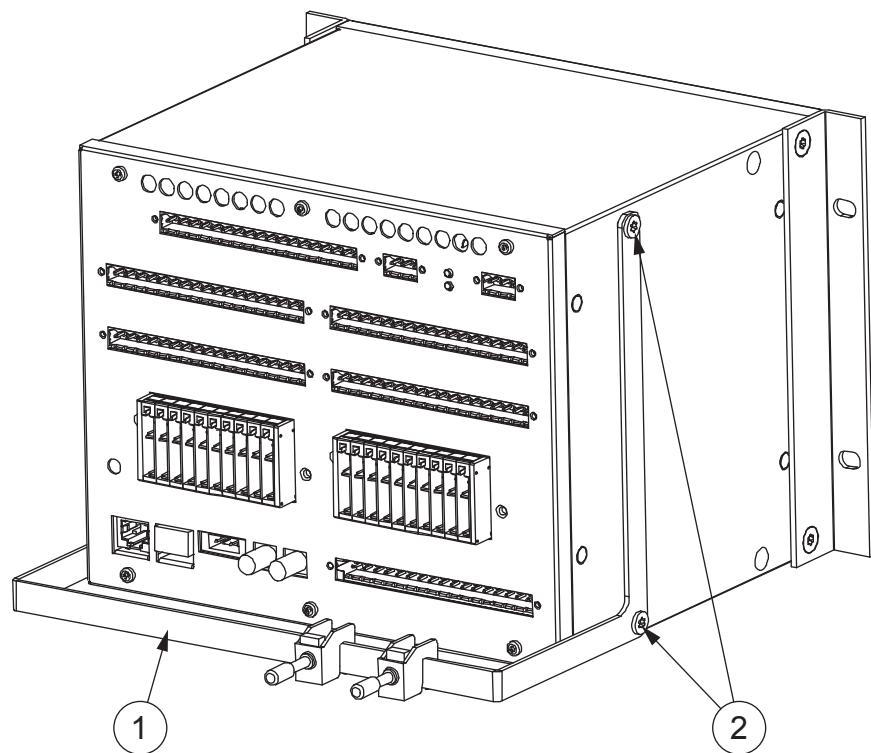


Figure 27: 4U main unit with optional cable shield rail mounted

- 1 Cable shield rail
- 2 M5 screws

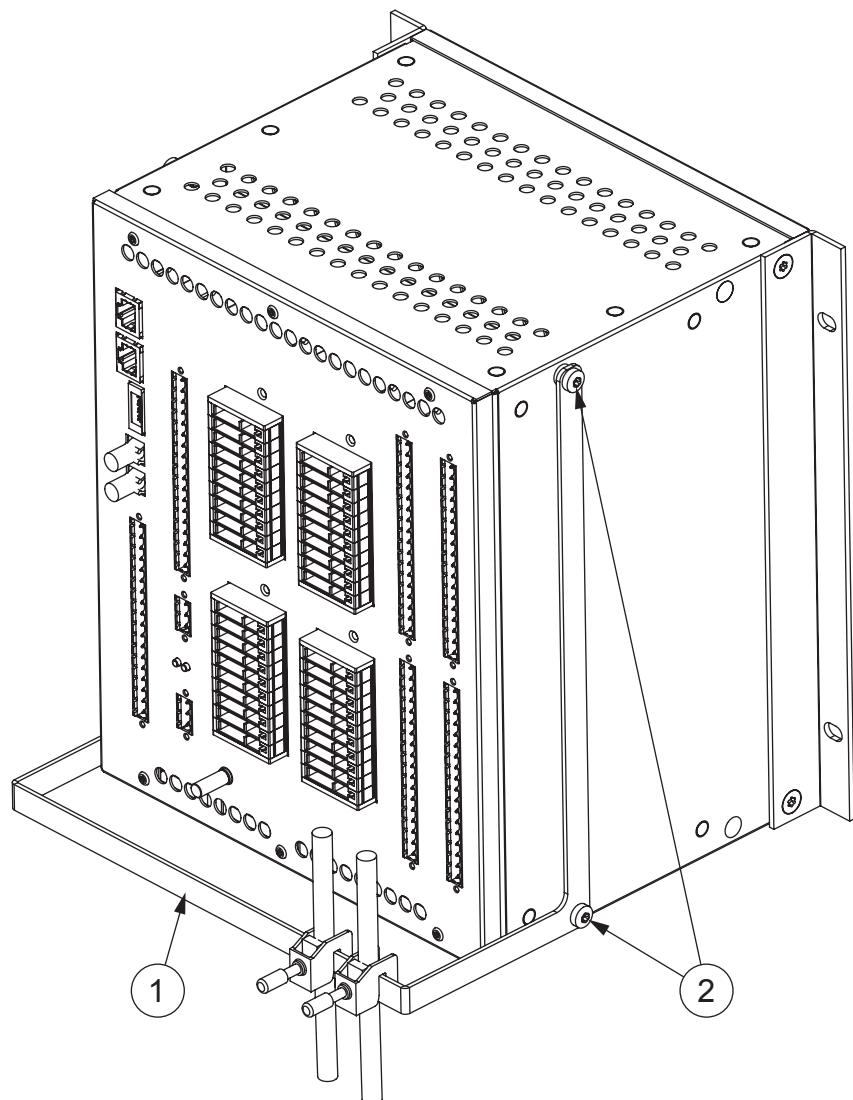
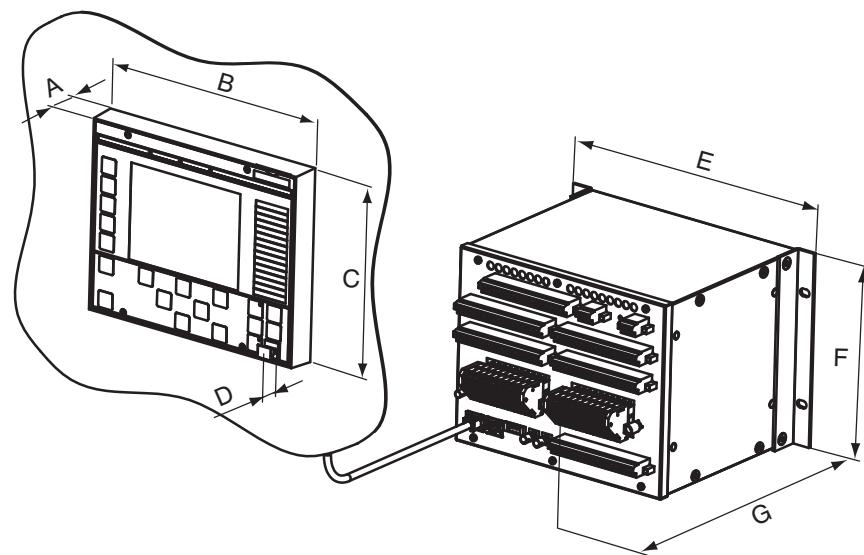


Figure 28: 6U main unit with optional cable shield rail mounted

- 1 Cable shield rail
- 2 M5 screws

6. Connect the delivered cable to the RJ-45 connection on the front panel of the main unit to the corresponding connection on external LHMI display module.



*Figure 29: External LHMI display wall mounted and connected to the 4U main unit*

- A 25.5 mm
- B 220 mm
- C 177 mm
- D 13 mm
- E 258.6 mm
- F 177 mm
- G 224 mm without a cable shield rail  
273 mm with a cable shield rail

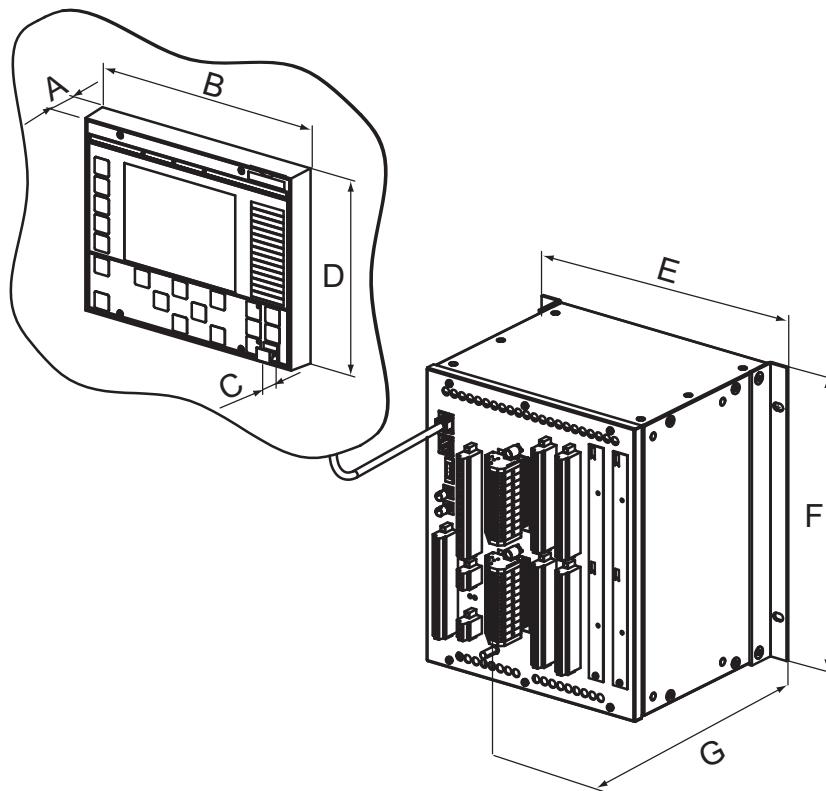


Figure 30: External LHM display wall mounted and connected to the 6U main unit

- A 25.5 mm
- B 220 mm
- C 13 mm
- D 177 mm
- E 258.6 mm
- F 265.9 mm
- G 224 mm without a cable shield rail  
273 mm with a cable shield rail



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

#### 4.3.6

#### Replacing SPAC 510, SPAC 520 and SPAC 530 by a 630 series IED

1. Make a new panel cut-out to the existing mounting panel according to the dimensional drawing.
2. Drill new screw holes to the panel according to the dimensional drawing.
3. Mount the new IED, see the rack mounting instructions.

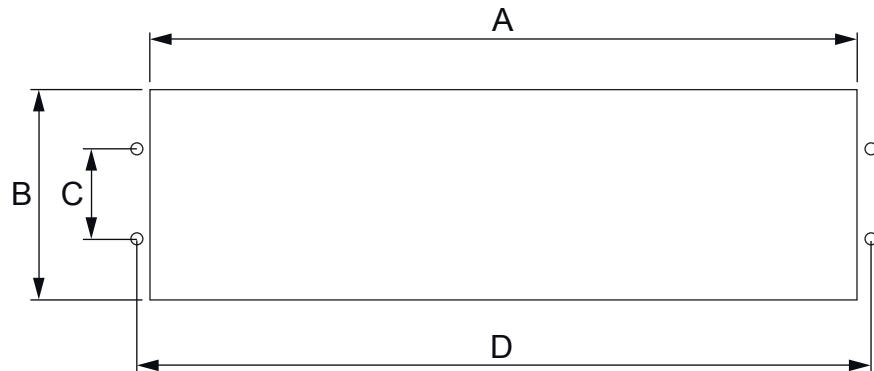
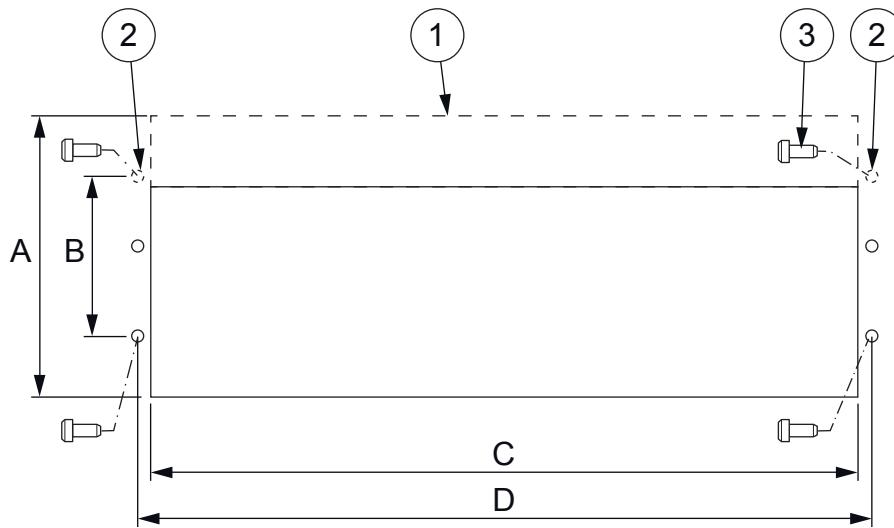


Figure 31: Existing panel cut-out dimensions for SPAC 510, SPAC 520 and SPAC 530

A 448 mm  
B 133 mm  
C 57.1 mm  
D 465 mm



*Figure 32: New panel cut-out and screw hole dimensions for replacing SPAC 510, SPAC 520 and SPAC 530*

- |            |                            |
|------------|----------------------------|
| A 178 mm   | 1 New panel cut-out line   |
| B 101.6 mm | 2 New screw holes          |
| C 448 mm   | 3 M6 fixing screws (4 pcs) |
| D 465 mm   |                            |



For ordering numbers, see the ordering number table.

#### 4.3.7

#### Replacing SPAC 630 by a 630 series IED

1. Locate the IED securely in the mounting frame by using the required screws.
2. Tighten the screws.
3. Mount the IED with the mounting frame to the panel cut-out.
4. Place a screw, nut and a washer to each screw hole.
5. Tighten the screws.

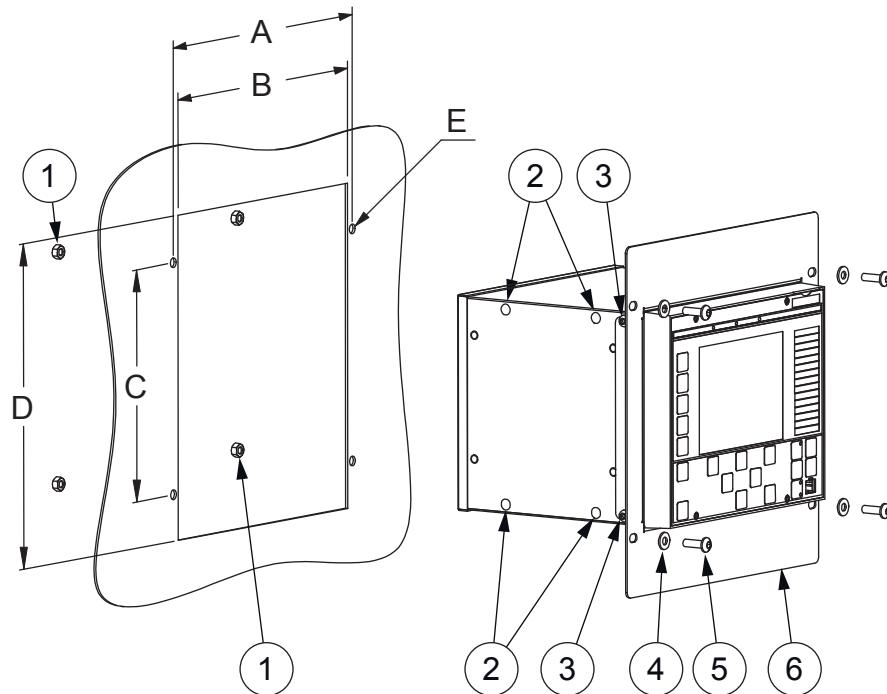


Figure 33: SPAC 630 replacement

- A 251.5 mm 1 M6 nuts
- B 238 mm 2 Plastic plugs (4 pcs)
- C 190.5 mm 3 Screws (4 pcs)
- D 267 mm 4 Washers (4 pcs)
- E ø 7 mm 5 M6 fixing screws (4 pcs)
- 6 Mounting frame



For replacement kit ordering numbers, see the ordering number table.

### 4.3.8 Arranging ventilation

Ventholes are located at the bottom and on the back plate of the IED. Reserve sufficient space round the IED to ensure adequate ventilation.

---

## Section 5      Connecting

### 5.1      Required tools

Only use a screwdriver and insert bits for slotted (Nr.1 / 3.5 mm) blade when handling 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.

1. Connect each signal connector terminal with one 0.5...2.5 mm<sup>2</sup> wire or with two 0.5...1.0 mm<sup>2</sup> wires.
2. Connect each compression type (X101 and X102) terminal for CTs/VTs with one 0.5...6.0 mm<sup>2</sup> wire or with two of maximum 2.5 mm<sup>2</sup> wires.
3. Connect terminals on the communication module for IRIG-B with one 0.2 - 1.5 mm<sup>2</sup> wire.
4. Connect RTD inputs and mA outputs using shielded stranded cables and connect cable shield to GND rail.
5. Connect all same type sensors to adjacent channels.



The cable shield is to be earthed at only one end of the cable with RTD cable shield rail.



Use fine wire in door mounting.



See the technical manual for product-specific terminal diagrams.

#### 5.2.1

#### Connecting screw-compression type wires

Terminal blocks of screw-compression type are used for electrical connections.

1. Open the screw terminal before inserting a wire into it for the first time. To open the screw terminal, turn the fixing screw anti-clockwise until the terminal hole is wide open (the inside of the terminal hole is surrounded by metal).
2. Insert the wire and turn the fixing screw clockwise until the wire is firmly fixed.

### 5.3

### Connecting protective earthing

Connect the IED to earth using a 16.0 mm<sup>2</sup> flat copper cable. Use an earth lead maximum 1500 mm. Notice that extra length is required for door mounting.



When the LHMI is installed on the cabinet door, earth the door with a 16.0 mm<sup>2</sup> flat braided copper cable.

1. Loosen the nut from the protective earth pin to connect a separate earth protection lead.

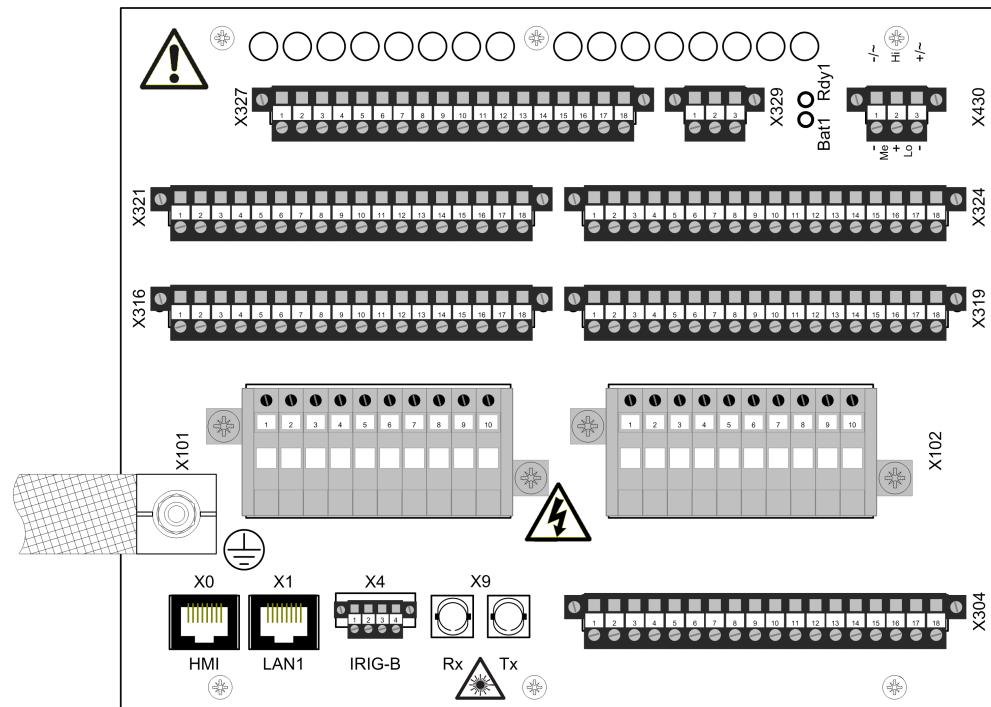
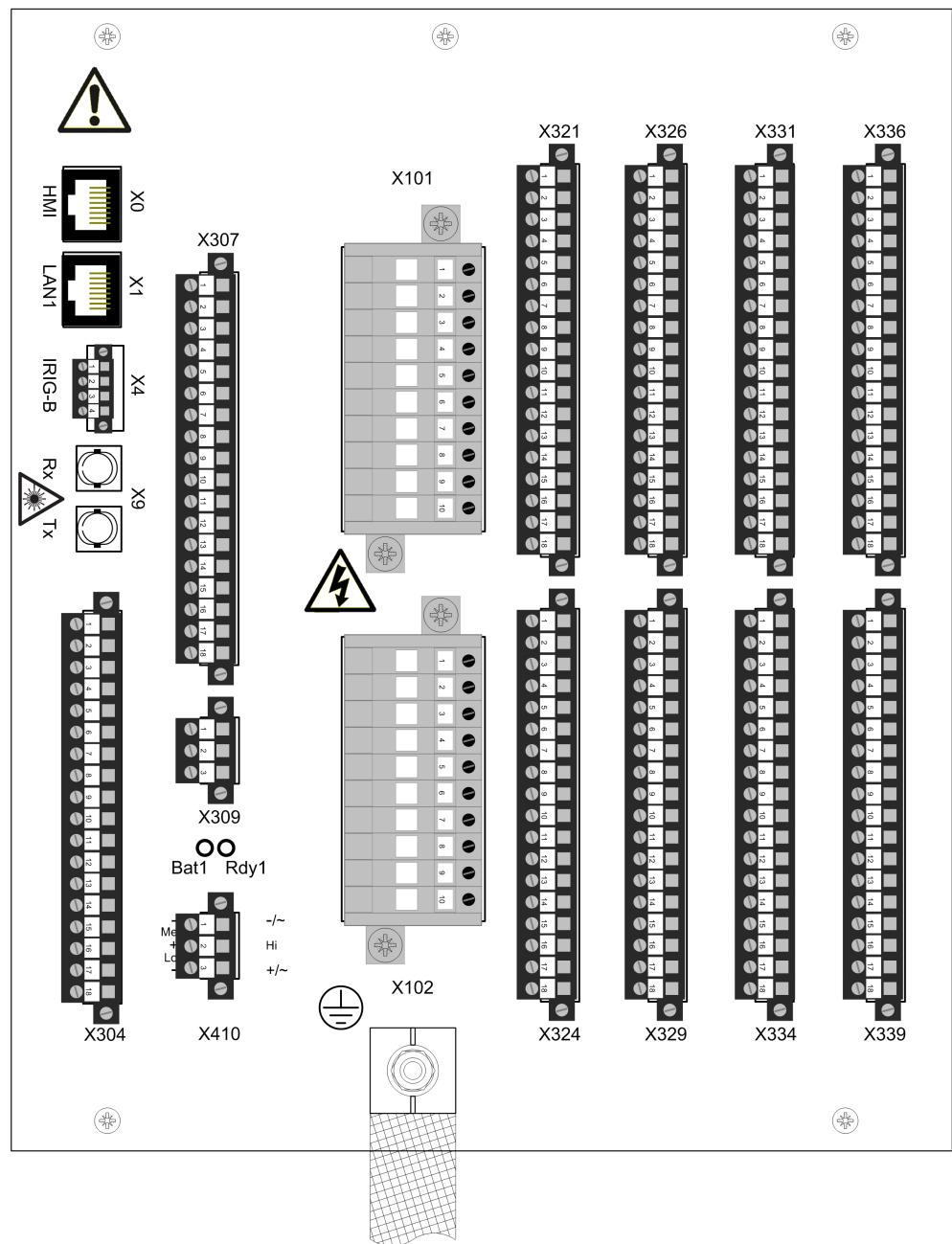


Figure 34: The protective earth pin is located to the left of connector X101 on the 4U half 19" case



*Figure 35:* The protective earth pin is located below connector X102 on the 6U half 19" case



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

2. Connect the earth lead to the earth bar.
3. Thread the copper cable on the protective earth pin.
4. Tighten the nut on the protective earth pin.
5. Support the earth lead so that it cannot break or weaken.

Observe the situations for mechanical, chemical or electrochemical conditions.

### 5.4

### Connecting analog signals

A connection diagram is needed to connect the analog signals.

Use the compression type for CT/VT terminals.

The wires for the analog signals can be connected to the CT/VT terminals before the connector is connected to the IED. The connector features an automatic short-circuit mechanism for the current terminals. Therefore, detaching the connector from the unit will not open the secondary circuit of the CT which otherwise could cause dangerously high voltages.

To avoid a mismatch between CT and VT connections the connectors are ‘pre-coded’.

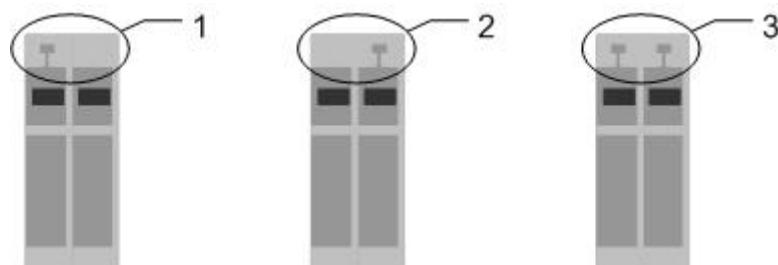
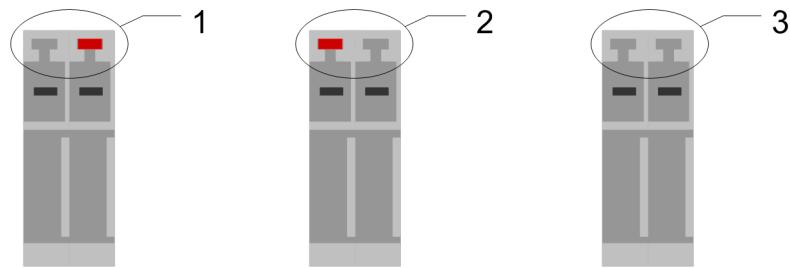


Figure 36: Loose CT/VT connector coding

- 1 CT connector coding
- 2 VT connector coding
- 3 Empty connector



*Figure 37: Fixed CT/VT Connector coding*

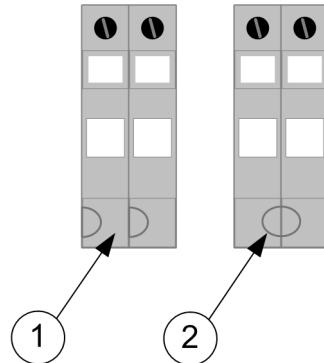
- 1 CT connector coding
- 2 VT connector coding
- 3 Empty connector

#### 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 for CTs/VTs is dimensioned for one  $0.5\ldots6.0\text{ mm}^2$  wire or for two wires of maximum  $2.5\text{ mm}^2$ .

To help connecting the current and voltage inputs, the connector pair is marked with symbols. For a current input, the connector pair forms a circle. But in the case of a voltage input, the connector pair forms two half-circles.



*Figure 38: CTVT connector symbols*

- 1 VT symbol
- 2 CT symbol

*Table 3:* REF630 modules

Terminal	AIMA01A 1KHL178012R0008	AIMA03A 1KHL178012R0009	AIMA02A 1KHL178012R0010
X101-1, 2	CT	CT	CT
X101-3, 4	CT	CT	CT
X101-5, 6	CT	CT	CT
X101-7, 8	CT	None	CT
X101-9, 10	None	CT <sub>S</sub> <sup>1)</sup>	CT <sub>S</sub> <sup>1)</sup>
X102-1, 2	VT	VT	None
X102-3, 4	VT	VT	VT
X102-5, 6	VT	VT	VT
X102-7, 8	VT	VT	VT
X102-9, 10	VT	VT	VT

1) Current Transducer for 0.1 A / 0.5 A

*Table 4:* REG630 and REM630 modules

Terminal	AIMA02A 1KHL178012R0010	AIMA04A 1KHL178012R0005	AIMA05A 1KHL178012R0013
X101-1, 2	CT	CT	CT
X101-3, 4	CT	CT	CT
X101-5, 6	CT	CT	CT
X101-7, 8	CT	CT	CT
X101-9, 10	CT <sub>S</sub> <sup>1)</sup>	CT	CT
X102-1, 2	None	CT	CT
X102-3, 4	VT	CT	CT
X102-5, 6	VT	VT	CT
X102-7, 8	VT	VT	VT
X102-9, 10	VT	VT	VT

1) Current Transducer for 0.1 A / 0.5 A

*Table 5:* RET630 modules

Terminal	AIMA04A 1KHL178012R0005	AIMA06A 1KHL178012R0012	AIMA05A 1KHL178012R0013
X101-1, 2	CT	CT	CT
X101-3, 4	CT	CT	CT
X101-5, 6	CT	CT	CT
X101-7, 8	CT	CT	CT
X101-9, 10	CT	CT	CT
X102-1, 2	CT	CT	CT

Table continues on next page

Terminal	AIMA04A 1KHL178012R0005	AIMA06A 1KHL178012R0012	AIMA05A 1KHL178012R0013
X102-3, 4	CT	CT	CT
X102-5, 6	VT	CT <sub>S</sub> <sup>1)</sup>	CT
X102-7, 8	VT	VT	VT
X102-9, 10	VT	VT	VT

1) Current Transducer for 0.1 A / 0.5 A



See the technical manual for the specific card variants.

## 5.4.2

### Connecting RTD input and mA outputs

*Table 6: Module inputs, 4U half 19"*

Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X316 – 1,2,3	Sensor/ R/ V/ mA input	RTD_3	AI1
X316 - 4	GND		
X316 – 5,6,7	Sensor/ R/ V/ mA input	RTD_3	AI2
X316 – 8,9,10	Sensor/ R/ V/ mA input	RTD_3	AI3
X316 – 11	GND		
X316 – 12,13,14	Sensor/ R/ V/ mA input	RTD_3	AI4
X316 – 15,16,17	Sensor/ R/ V/ mA input	RTD_3	AI5
X316 – 18	GND		

*Table 7: Module inputs, 4U half 19"*

Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X319 – 1,2,3	Sensor/ R/ V/ mA input	RTD_3	AI1
X319 – 4,5,6	Sensor/ R/ V/ mA input	RTD_3	AI2
X319 – 7	GND		
X319 – 8,9,10	Sensor/ R/ V/ mA input	RTD_3	AI3

**Table 8:** *Module inputs, 6U half 19"*

Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X321 – 1,2,3	Sensor/ R/ V/ mA input	RTD_3	AI1
X321 - 4	GND		
X321 – 5,6,7	Sensor/ R/ V/ mA input	RTD_3	AI2
X321 – 8,9,10	Sensor/ R/ V/ mA input	RTD_3	AI3
X321 – 11	GND		
X321 – 12,13,14	Sensor/ R/ V/ mA input	RTD_3	AI4
X321 – 15,16,17	Sensor/ R/ V/ mA input	RTD_3	AI5
X321 – 18	GND		

**Table 9:** *Module inputs, 6U half 19"*

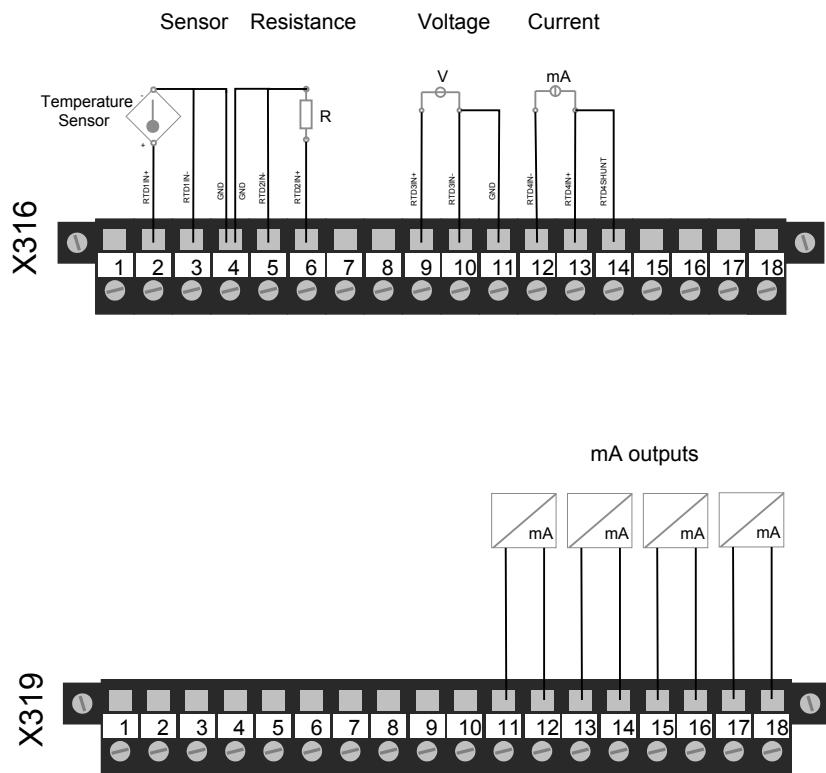
Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X324 – 1,2,3	Sensor/ R/ V/ mA input	RTD_3	AI1
X324 – 4,5,6	Sensor/ R/ V/ mA input	RTD_3	AI2
X324 – 7	GND		
X324 – 8,9,10	Sensor/ R/ V/ mA input	RTD_3	AI3

**Table 10:** *Module outputs, 4U half 19"*

Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X319 – 11,12	mA output	RTD_3	AO1
X319 – 13,14	mA output	RTD_3	AO2
X319 – 15,16	mA output	RTD_3	AO3
X319 – 17,18	mA output	RTD_3	AO4

**Table 11:** Module outputs, 6U half 19"

Terminal	600RTD01	ACT info	
		Hardware module instance	Hardware channel
X324 – 11,12	mA output	RTD_3	AO1
X324 – 13,14	mA output	RTD_3	AO2
X324 – 15,16	mA output	RTD_3	AO3
X324 – 17,18	mA output	RTD_3	AO4

**Figure 39:** Connection example with 4U housing

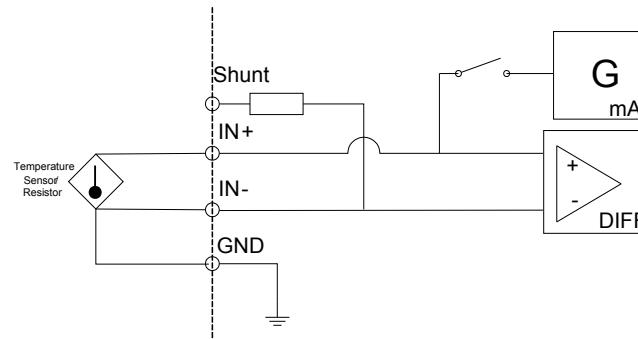


Figure 40: Three-wire connection RTD sensors and resistance

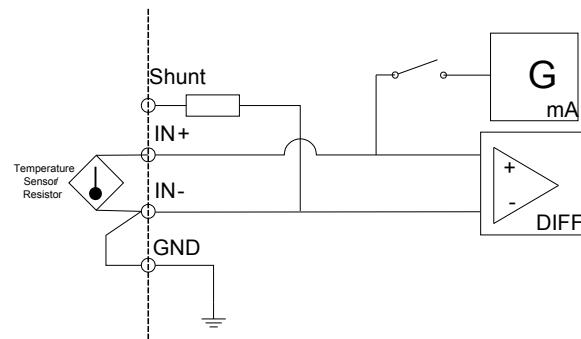


Figure 41: Two-wire connection RTD sensors and resistance

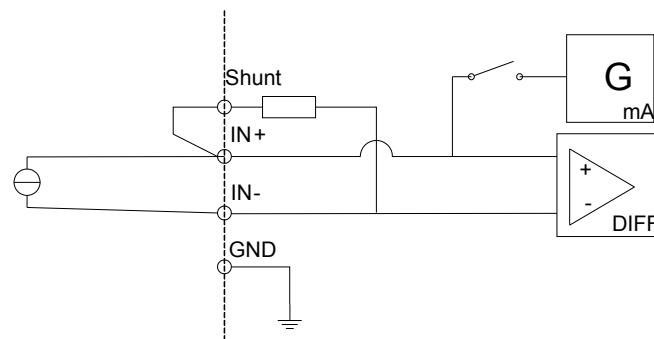
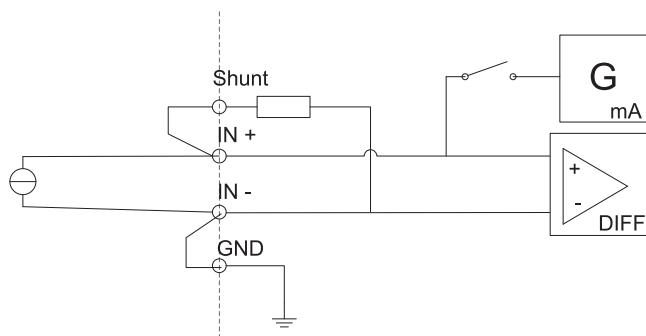
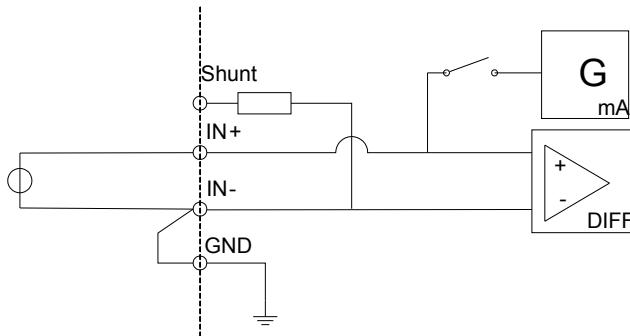


Figure 42: Current connection



*Figure 43:* Current connection to be used when only floating or isolated mA sources are connected



*Figure 44:* Voltage connection

### 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.

## 5.5

### Connecting binary signals

Each signal connector terminal is dimensioned for one 0.5...2.5 mm<sup>2</sup> wire or for two 0.5...1.0 mm<sup>2</sup> wires.



Use only DC power for the binary inputs. Use of AC power, including full- or half-wave rectified AC power, may cause damage to the binary input modules.

**Table 12:** *Binary inputs X304, 4U half 19" and 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X304-1	Common - for inputs 1-4		
X304-2	Binary input 1 +	COM_101	BI1
X304-3	Binary input 2 +	COM_101	BI2
X304-4	Binary input 3 +	COM_101	BI3
X304-5	Binary input 4 +	COM_101	BI4
X304-6	Common - for inputs 5-8		
X304-7	Binary input 5 +	COM_101	BI5
X304-8	Binary input 6 +	COM_101	BI6
X304-9	Binary input 7 +	COM_101	BI7
X304-10	Binary input 8 +	COM_101	BI8
X304-11	Common - for inputs 9-11		
X304-12	Binary input 9 +	COM_101	BI9
X304-13	Binary input 10 +	COM_101	BI10
X304-14	Binary input 11 +	COM_101	BI11
X304-15	Common - for inputs 12-14		
X304-16	Binary input 12 +	COM_101	BI12
X304-17	Binary input 13 +	COM_101	BI13
X304-18	Binary input 14 +	COM_101	BI14

**Table 13:** *Binary inputs X319, 4U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X319-1	- for input 1	BIO_3	BI1
X319-2	Binary input 1 +	BIO_3	BI1
X319-3	-		
X319-4	Common - for inputs 2-3		
X319-5	Binary input 2 +	BIO_3	BI2
X319-6	Binary input 3 +	BIO_3	BI3
X319-7	-		
X319-8	Common - for inputs 4-5		
X319-9	Binary input 4 +	BIO_3	BI4
X319-10	Binary input 5 +	BIO_3	BI5
X319-11	-		
X319-12	Common - for inputs 6-7		
X319-13	Binary input 6 +	BIO_3	BI6
X319-14	Binary input 7 +	BIO_3	BI7
Table continues on next page			

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X319-15	-		
X319-16	Common - for inputs 8-9		
X319-17	Binary input 8 +	BIO_3	BI8
X319-18	Binary input 9 +	BIO_3	BI9

**Table 14:** *Binary inputs X324, 4U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X324-1	- for input 1	BIO_4	BI1
X324-2	Binary input 1 +	BIO_4	BI1
X324-3	-		
X324-4	Common - for inputs 2-3		
X324-5	Binary input 2 +	BIO_4	BI2
X324-6	Binary input 3 +	BIO_4	BI3
X324-7	-		
X324-8	Common - for inputs 4-5		
X324-9	Binary input 4 +	BIO_4	BI4
X324-10	Binary input 5 +	BIO_4	BI5
X324-11	-		
X324-12	Common - for inputs 6-7		
X324-13	Binary input 6 +	BIO_4	BI6
X324-14	Binary input 7 +	BIO_4	BI7
X324-15	-		
X324-16	Common - for inputs 8-9		
X324-17	Binary input 8 +	BIO_4	BI8
X324-18	Binary input 9 +	BIO_4	BI9

**Table 15:** *Binary inputs X324, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X324-1	- for input 1	BIO_3	BI1
X324-2	Binary input 1 +	BIO_3	BI1
X324-3	-		
X324-4	Common - for inputs 2-3		
X324-5	Binary input 2 +	BIO_3	BI2
X324-6	Binary input 3 +	BIO_3	BI3
X324-7	-		

Table continues on next page

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X324-8	Common - for inputs 4-5		
X324-9	Binary input 4 +	BIO_3	BI4
X324-10	Binary input 5 +	BIO_3	BI5
X324-11	-		
X324-12	Common - for inputs 6-7		
X324-13	Binary input 6 +	BIO_3	BI6
X324-14	Binary input 7 +	BIO_3	BI7
X324-15	-		
X324-16	Common - for inputs 8-9		
X324-17	Binary input 8 +	BIO_3	BI8
X324-18	Binary input 9 +	BIO_3	BI9

*Table 16: Binary inputs X329, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X329-1	- for input 1	BIO_4	BI1
X329-2	Binary input 1 +	BIO_4	BI1
X329-3	-		
X329-4	Common - for inputs 2-3		
X329-5	Binary input 2 +	BIO_4	BI2
X329-6	Binary input 3 +	BIO_4	BI3
X329-7	-		
X329-8	Common - for inputs 4-5		
X329-9	Binary input 4 +	BIO_4	BI4
X329-10	Binary input 5 +	BIO_4	BI5
X329-11	-		
X329-12	Common - for inputs 6-7		
X329-13	Binary input 6 +	BIO_4	BI6
X329-14	Binary input 7 +	BIO_4	BI7
X329-15	-		
X329-16	Common - for inputs 8-9		
X329-17	Binary input 8 +	BIO_4	BI8
X329-18	Binary input 9 +	BIO_4	BI9

**Table 17:** *Binary inputs X334, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X334-1	- for input 1	BIO_5	BI1
X334-2	Binary input 1 +	BIO_5	BI1
X334-3	-		
X334-4	Common - for inputs 2-3		
X334-5	Binary input 2 +	BIO_5	BI2
X334-6	Binary input 3 +	BIO_5	BI3
X334-7	-		
X334-8	Common - for inputs 4-5		
X334-9	Binary input 4 +	BIO_5	BI4
X334-10	Binary input 5 +	BIO_5	BI5
X334-11	-		
X334-12	Common - for inputs 6-7		
X334-13	Binary input 6 +	BIO_5	BI6
X334-14	Binary input 7 +	BIO_5	BI7
X334-15	-		
X334-16	Common - for inputs 8-9		
X334-17	Binary input 8 +	BIO_5	BI8
X334-18	Binary input 9 +	BIO_5	BI9

**Table 18:** *Binary inputs X339, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X339-1	- for input 1	BIO_6	BI1
X339-2	Binary input 1 +	BIO_6	BI1
X339-3	-		
X339-4	Common - for inputs 2-3		
X339-5	Binary input 2 +	BIO_6	BI2
X339-6	Binary input 3 +	BIO_6	BI3
X339-7	-		
X339-8	Common - for inputs 4-5		
X339-9	Binary input 4 +	BIO_6	BI4
X339-10	Binary input 5 +	BIO_6	BI5
X339-11	-		
X339-12	Common - for inputs 6-7		
X339-13	Binary input 6 +	BIO_6	BI6
X339-14	Binary input 7 +	BIO_6	BI7
Table continues on next page			

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X339-15	-		
X339-16	Common - for inputs 8-9		
X339-17	Binary input 8 +	BIO_6	BI8
X339-18	Binary input 9 +	BIO_6	BI9

*Table 19: Output contacts X307, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X307-1	Power output 1, normally open (TCS)		
	-	PSM_102	BO1_PO_TCS
X307-2	+		
X307-3	Power output 2, normally open (TCS)		
	-	PSM_102	BO2_PO_TCS
X307-4	+		
X307-5	Power output 3, normally open (TCS)		
	-	PSM_102	BO3_PO_TCS
X307-6	+		
X307-7	Power output 4, normally open	PSM_102	BO4_PO
X307-8			
X307-9	Power output 5, normally open	PSM_102	BO5_PO
X307-10			
X307-11	Power output 6, normally open	PSM_102	BO6_PO
X307-12			

*Table 20: Output contacts X316, 4U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X316-1	Power output 1, normally open	BIO_3	BO1_PO
X316-2			
X316-3	Power output 2, normally open	BIO_3	BO2_PO
X316-4			
X316-5	Power output 3, normally open	BIO_3	BO3_PO
X316-6			

**Table 21:** Output contacts X321, 4U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X321-1	Power output 1, normally open	BIO_4	BO1_PO
X321-2			
X321-3	Power output 2, normally open	BIO_4	BO2_PO
X321-4			
X321-5	Power output 3, normally open	BIO_4	BO3_PO
X321-6			

**Table 22:** Output contacts X321, 6U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X321-1	Power output 1, normally open	BIO_3	BO1_PO
X321-2			
X321-3	Power output 2, normally open	BIO_3	BO2_PO
X321-4			
X321-5	Power output 3, normally open	BIO_3	BO3_PO
X321-6			

**Table 23:** Output contacts X326, 6U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X326-1	Power output 1, normally open	BIO_4	BO1_PO
X326-2			
X326-3	Power output 2, normally open	BIO_4	BO2_PO
X326-4			
X326-5	Power output 3, normally open	BIO_4	BO3_PO
X326-6			

**Table 24:** Output contacts X327, 4U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X327-1	Power output 1, normally open (TCS)	PSM_102	BO1_PO_TCS
	-		
X327-2	+		
X327-3	Power output 2, normally open (TCS)	PSM_102	BO2_PO_TCS
	-		

Table continues on next page

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X327-4	+		
X327-5	Power output 3, normally open (TCS)	PSM_102	BO3_PO_TCS
X327-6	-		
X327-7	Power output 4, normally open	PSM_102	BO4_PO
X327-8	+		
X327-9	Power output 5, normally open	PSM_102	BO5_PO
X327-10			
X327-11	Power output 6, normally open	PSM_102	BO6_PO
X327-12			

*Table 25: Output contacts X331, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X331-1	Power output 1, normally open	BIO_5	BO1_PO
X331-2			
X331-3	Power output 2, normally open	BIO_5	BO2_PO
X331-4			
X331-5	Power output 3, normally open	BIO_5	BO3_PO
X331-6			

*Table 26: Output contacts X336, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X336-1	Power output 1, normally open	BIO_6	BO1_PO
X336-2			
X336-3	Power output 2, normally open	BIO_6	BO2_PO
X336-4			
X336-5	Power output 3, normally open	BIO_6	BO3_PO
X336-6			

**Table 27:** Output contacts X307, 6U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X307-13	Signal output 1, normally open	PSM_102	BO7_SO
X307-14			
X307-15	Signal output 2, normally open	PSM_102	BO8_SO
X307-16			
X307-17	Signal output 3, normally open	PSM_102	BO9_SO
X307-18			

**Table 28:** Output contacts X316, 4U half 19"

Terminal	Description	ACT info	
		Hardware Module instance	Hardware channel
X316-7	Signal output 1, normally open	BIO_3	BO4_SO
X316-8	Signal output 1		
X316-9	Signal output 2, normally open	BIO_3	BO5_SO
X316-10	Signal output 2		
X316-11	Signal output 3, normally open	BIO_3	BO6_SO
X316-12	Signal output 3		
X316-13	Signal output 4, normally open	BIO_3	BO7_SO
X316-14	Signal output 5, normally open	BIO_3	BO8_SO
X316-15	Signal outputs 4 and 5, common		
X316-16	Signal output 6, normally closed		
X316-17	Signal output 6, normally open	BIO_3	BO9_SO
X316-18	Signal output 6, common		

**Table 29:** Output contacts X321, 4U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X321-7	Signal output 1, normally open	BIO_4	BO4_SO
X321-8	Signal output 1		
X321-9	Signal output 2, normally open	BIO_4	BO5_SO
X321-10	Signal output 2		
X321-11	Signal output 3, normally open	BIO_4	BO6_SO
X321-12	Signal output 3		
X321-13	Signal output 4, normally open	BIO_4	BO7_SO
X321-14	Signal output 5, normally open	BIO_4	BO8_SO
X321-15	Signal outputs 4 and 5, common		
Table continues on next page			

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X321-16	Signal output 6, normally closed	BIO_4	BO9_SO
X321-17	Signal output 6, normally open		
X321-18	Signal output 6, common		

*Table 30: Output contacts X321, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X321-7	Signal output 1, normally open	BIO_3	BO4_SO
X321-8	Signal output 1		
X321-9	Signal output 2, normally open	BIO_3	BO5_SO
X321-10	Signal output 2		
X321-11	Signal output 3, normally open	BIO_3	BO6_SO
X321-12	Signal output 3		
X321-13	Signal output 4, normally open	BIO_3	BO7_SO
X321-14	Signal output 5, normally open	BIO_3	BO8_SO
X321-15	Signal outputs 4 and 5, common		
X321-16	Signal output 6, normally closed	BIO_3	BO9_SO
X321-17	Signal output 6, normally open		
X321-18	Signal output 6, common		

*Table 31: Output contacts X326, 6U half 19"*

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X326-7	Signal output 1, normally open	BIO_4	BO4_SO
X326-8	Signal output 1		
X326-9	Signal output 2, normally open	BIO_4	BO5_SO
X326-10	Signal output 2		
X326-11	Signal output 3, normally open	BIO_4	BO6_SO
X326-12	Signal output 3		
X326-13	Signal output 4, normally open	BIO_4	BO7_SO
X326-14	Signal output 5, normally open	BIO_4	BO8_SO
X326-15	Signal outputs 4 and 5, common		
X326-16	Signal output 6, normally closed	BIO_4	BO9_SO
X326-17	Signal output 6, normally open		
X326-18	Signal output 6, common		

**Table 32:** Output contacts X327, 4U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X327-13	Signal output 1, normally open	PSM_102	BO7_SO
X327-14			
X327-15	Signal output 2, normally open	PSM_102	BO8_SO
X327-16			
X327-17	Signal output 3, normally open	PSM_102	BO9_SO
X327-18			

**Table 33:** Output contacts X331, 6U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X331-7	Signal output 1, normally open	BIO_5	BO4_SO
X331-8	Signal output 1		
X331-9	Signal output 2, normally open	BIO_5	BO5_SO
X331-10	Signal output 2		
X331-11	Signal output 3, normally open	BIO_5	BO6_SO
X331-12	Signal output 3		
X331-13	Signal output 4, normally open	BIO_5	BO7_SO
X331-14	Signal output 5, normally open	BIO_5	BO8_SO
X331-15	Signal outputs 4 and 5, common		
X331-16	Signal output 6, normally closed	BIO_5	BO9_SO
X331-17	Signal output 6, normally open		
X331-18	Signal output 6, common		

**Table 34:** Output contacts X336, 6U half 19"

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X336-7	Signal output 1, normally open	BIO_6	BO4_SO
X336-8	Signal output 1		
X336-9	Signal output 2, normally open	BIO_6	BO5_SO
X336-10	Signal output 2		
X336-11	Signal output 3, normally open	BIO_6	BO6_SO
X336-12	Signal output 3		
X336-13	Signal output 4, normally open	BIO_6	BO7_SO
X336-14	Signal output 5, normally open	BIO_6	BO8_SO
X336-15	Signal outputs 4 and 5, common		
Table continues on next page			

Terminal	Description	ACT info	
		Hardware module instance	Hardware channel
X336-16	Signal output 6, normally closed	BIO_6	BO9_SO
X336-17	Signal output 6, normally open		
X336-18	Signal output 6, common		

### 5.6

### Connecting power supply

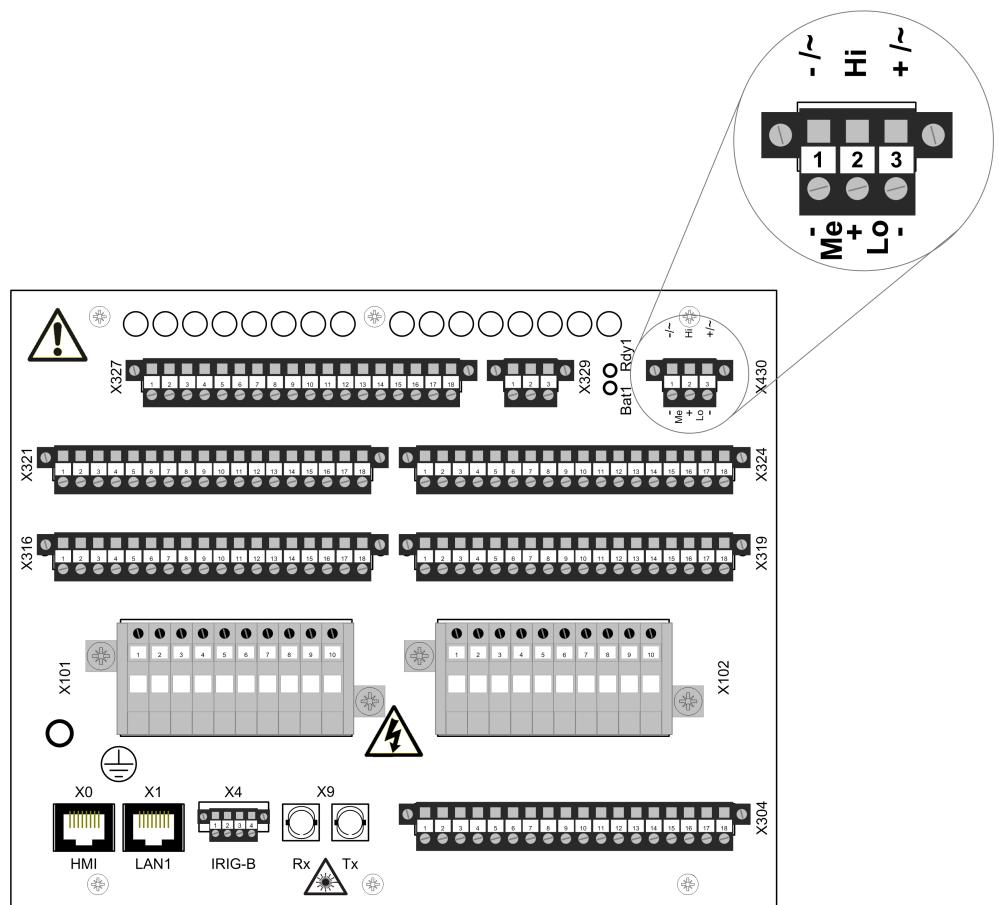
When using power supply 110-250 VDC or 100-240 VAC, connect the IED's auxiliary voltage to terminals X430-1 and X430-3 (4U half 19") and to terminals X410-1 and X410-3 (6U half 19"). When using a DC supply, connect the positive lead to terminal X430-3 (4U half 19") or X410-3 (6U half 19").

When using power supply 48-125 VDC, the IED's auxiliary voltage is connected to terminals X430-1 and X430-2 (4U half 19") and X410-1 and X410-2 (6U half 19") with the positive lead connected to terminal X430-2 (4U half 19") or X410-2 (6U half 19").

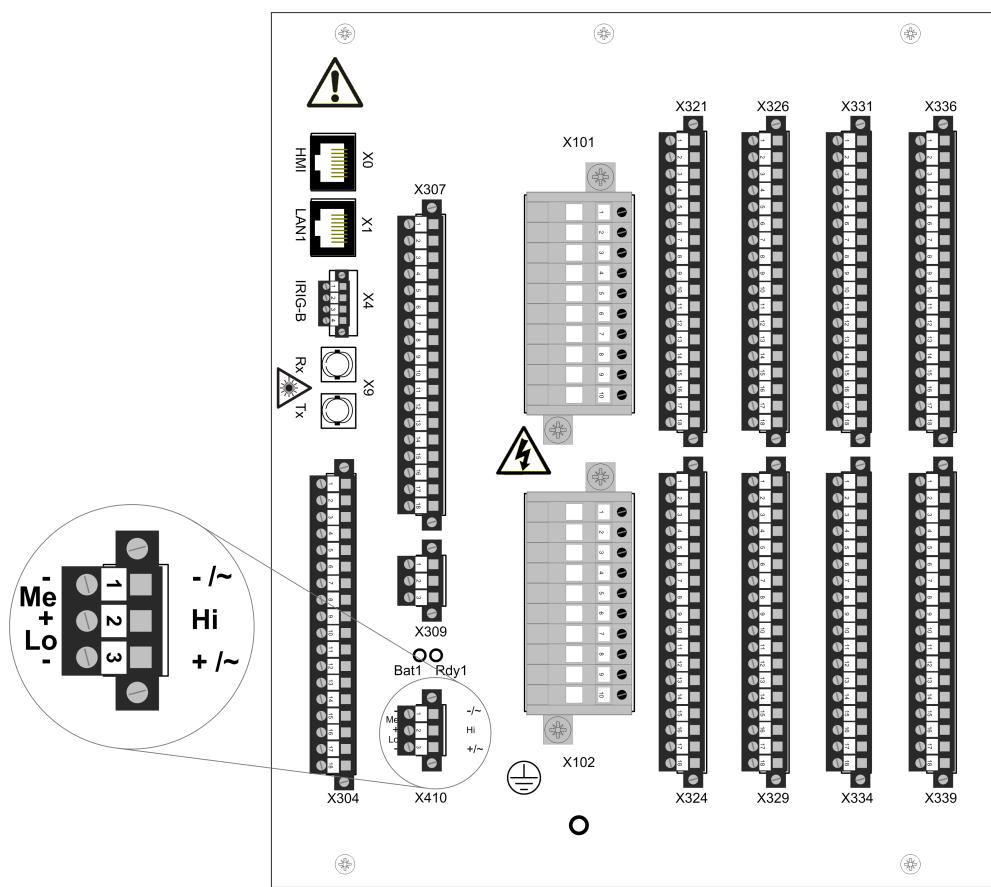
The permitted auxiliary voltage range is found from the IED sticker.



Connect power supply to connector X430 (4U half 19") and X410 (6U half 19"). Do not connect the power supply to connectors X329 or X309.



*Figure 45: Connecting auxiliary voltage on a 4U half 19" unit*



*Figure 46: Connecting auxiliary voltage on a 6U half 19" unit*

Connect the terminals on the auxiliary voltage connector correctly. Different power supplies use different terminals.

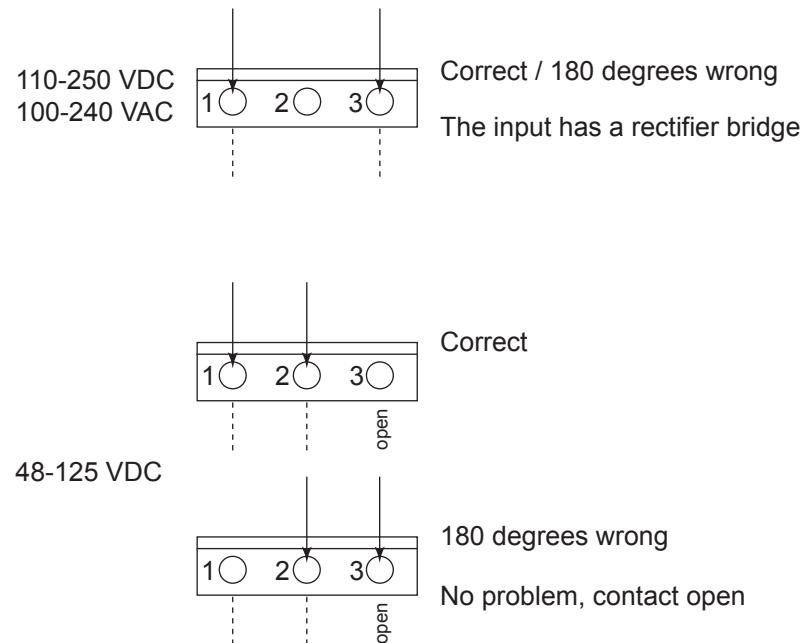


Figure 47: Connecting the auxiliary voltage connector

## 5.7

## Connecting communication

- Before connecting communication, check that the HW module has the correct communication interfaces.  
The communication module is located at the bottom of the protection relay for the 4U half 19" case and on the left side of the IED for the 6U half 19" case when viewing the case from the rear.



See the technical manual for product-specific communication interfaces.



The allowed minimum bending radius has to be checked from the optical cable manufacturer.



Ethernet devices shall not be connected into rear HMI port. This can damage the IED or the connected Ethernet device.

## 5.8

## Connecting external display module

Connect the display module to the main unit with the cable included in the delivery of the main unit. The cable is connected to the RJ-45 connection (connector X0/HMI) on the rear panel of the main unit and to the corresponding connection on the display module.



Only one LHMI module can be connected into an IED. Connecting an external display module into an IED with integrated LHMI causes the integrated LHMI to shut down.

---

## Section 6      Checking installation

### 6.1 Identifying hardware and software version

Hardware and software version information can be found from the label that is attached on the case of the IED. There is also module labels that can be used to identify modules inside the IED.

### 6.2 Checking mounting

Check that all fixing screws are tight and that all cables are connected.

### 6.3 Energizing the IED

#### 6.3.1 Checking the IED operation

Check all connections to external circuitry to ensure correct installation, before energizing the IED and carrying out the commissioning procedures.

#### 6.3.2 IED startup sequence

The following sequence is expected when the IED is energized.

- The green Ready LED starts flashing instantly and the ABB logo is shown on the LCD.
- After approximately 30 seconds, "Starting" is shown on the LCD.
- Within 90 seconds, the main menu is shown on the LCD and the green Ready LED shows a steady light, which indicates a successful startup.



The startup time depends on the size of the application configuration. Application configurations with less functionality have shorter startup times.

If the green Ready LED continues to flash after the startup, the IED has detected an internal error. Navigate via **Main menu/Monitoring/IED status** to investigate the error description.



---

## Section 7

# Removing, repairing and exchanging

### 7.1

## 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](http://www.abb.com) by following the links within ABB Service Guide or via ABB Product Guide from the product specific Service & Support sheet.

### 7.2

## Checking IED information

The IED information includes detailed information about the device, such as version and serial number.

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 including product type, serial number, order number, production date and SW version.

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

### 7.3

## Removing the IED

Before removing the IED, make sure that auxiliary power is turned off and all wiring is disconnected.



Check with your local ABB if the protection relay can be upgraded.

## 7.4

### Sending protection relay for repair

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

## 7.5

### 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](http://www.abb.com/partsonline). Use of PartsOnLine requires user registration.



Check with your local ABB if the protection relay can be upgraded.

# Section 8      Technical data

## 8.1           Case and HMI display variants

### 8.1.1        Front side of the IED

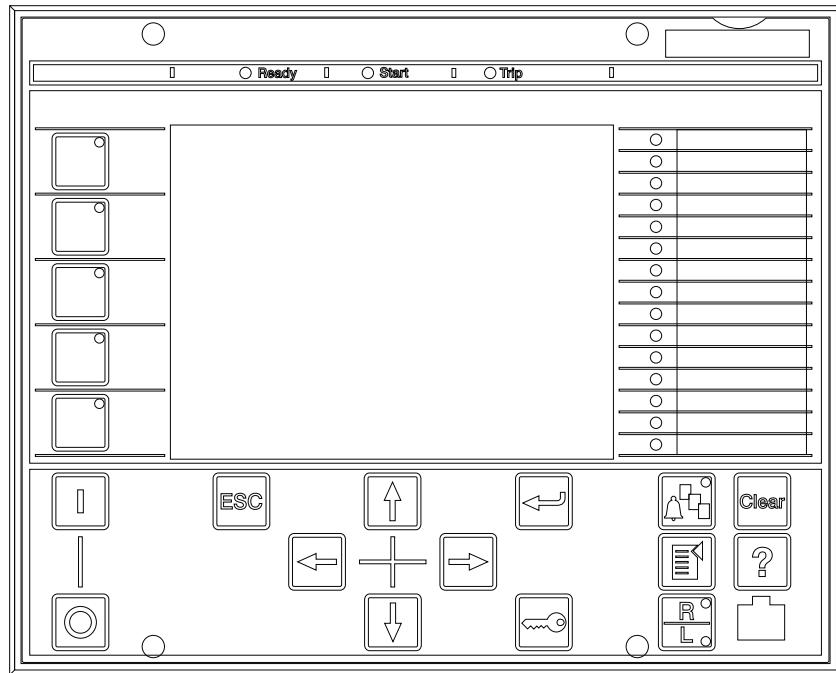


Figure 48:     Front view of 4U half 19" IED

The LHMI includes a monochrome LCD of  $320 \times 240$  pixels.

## 8.1.2

### Rear side of the protection relay

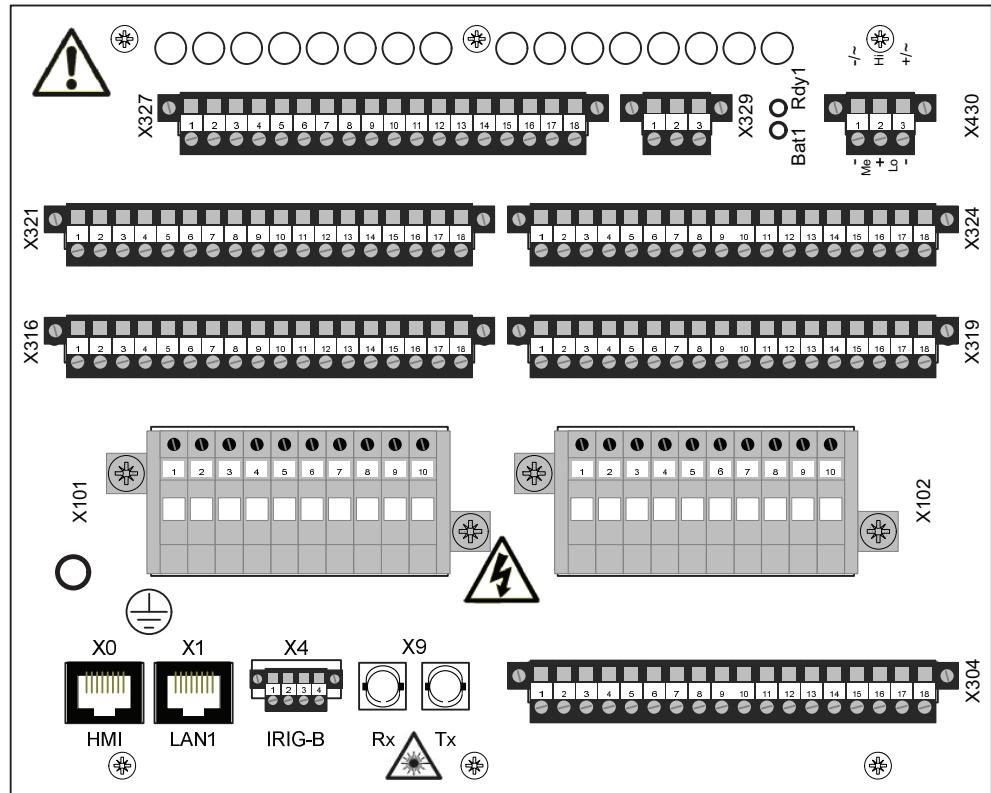


Figure 49: Rear view of 4U half 19"

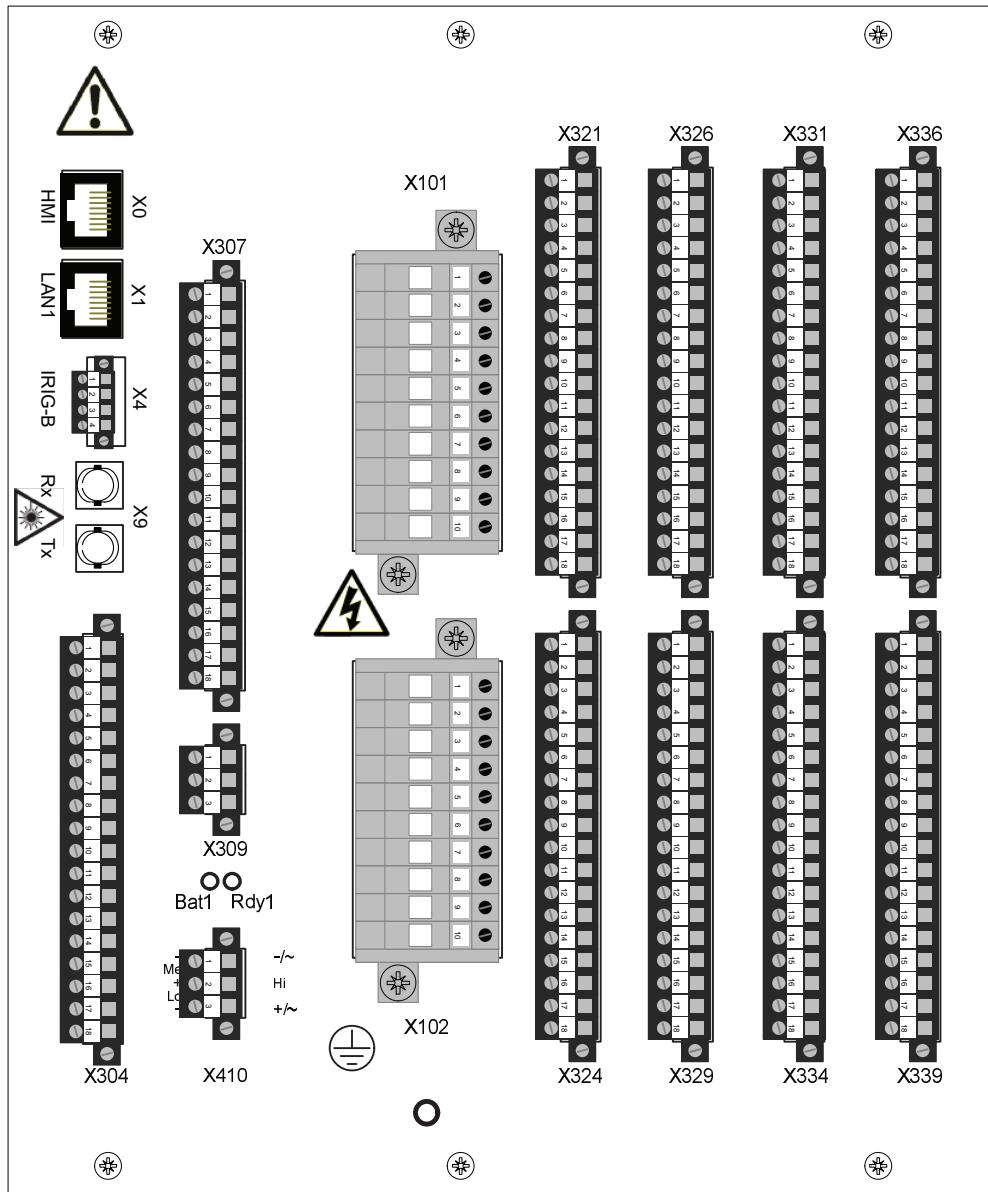


Figure 50: Rear view of 6U half 19"

Table 35: Dimensions of the IED - half 19" rack

Description	Value
Width	220 mm
Height	177 mm (4U) 265.9 mm (6U)
Depth	249.5 mm
Weight box	6.2 kg (4U) 5.5 kg (6U) <sup>1)</sup>
Weight LHM	1.0 kg (4U)

1) Without LHM

## 8.2

## Enclosure class

*Table 36: Degree of protection of flush-mounted protection relay*

Description	Value
Front side	IP 40
Rear side, connection terminals	IP 20

*Table 37: Degree of protection of the LHMI*

Description	Value
Front and side	IP 42

---

## Section 9      Accessories and ordering data

### 9.1            Mounting kits

#### 9.1.1        Flush mounting kit

- Mounting frame
- Screws
- Nuts and washers
- Dimensions for screw holes

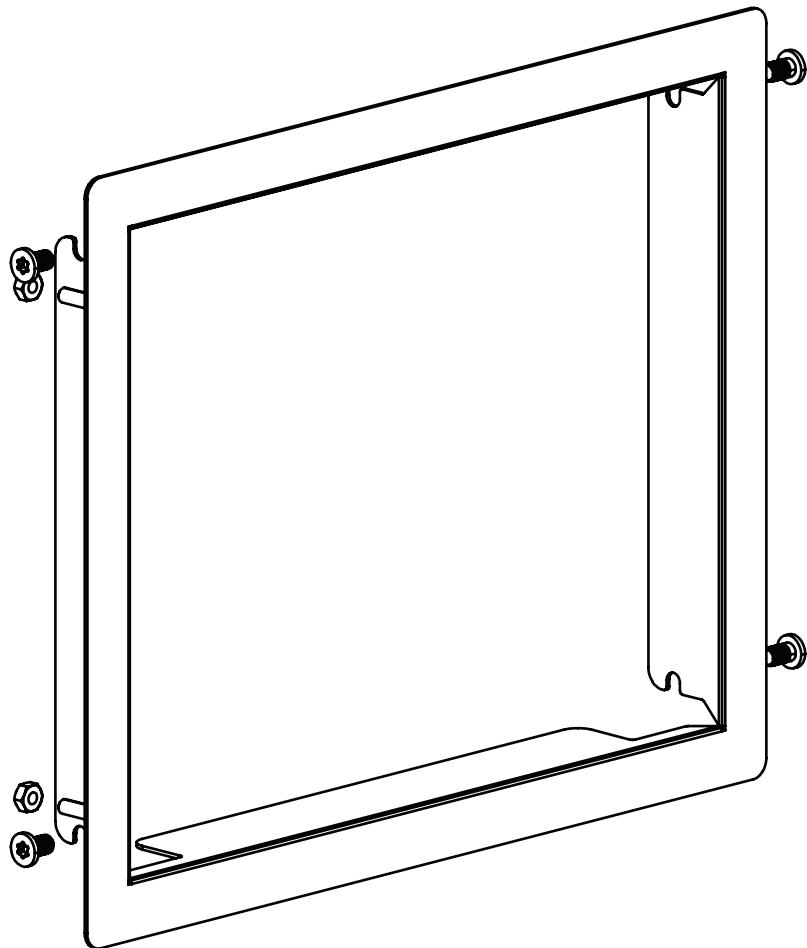


Figure 51:     Flush mounting frame

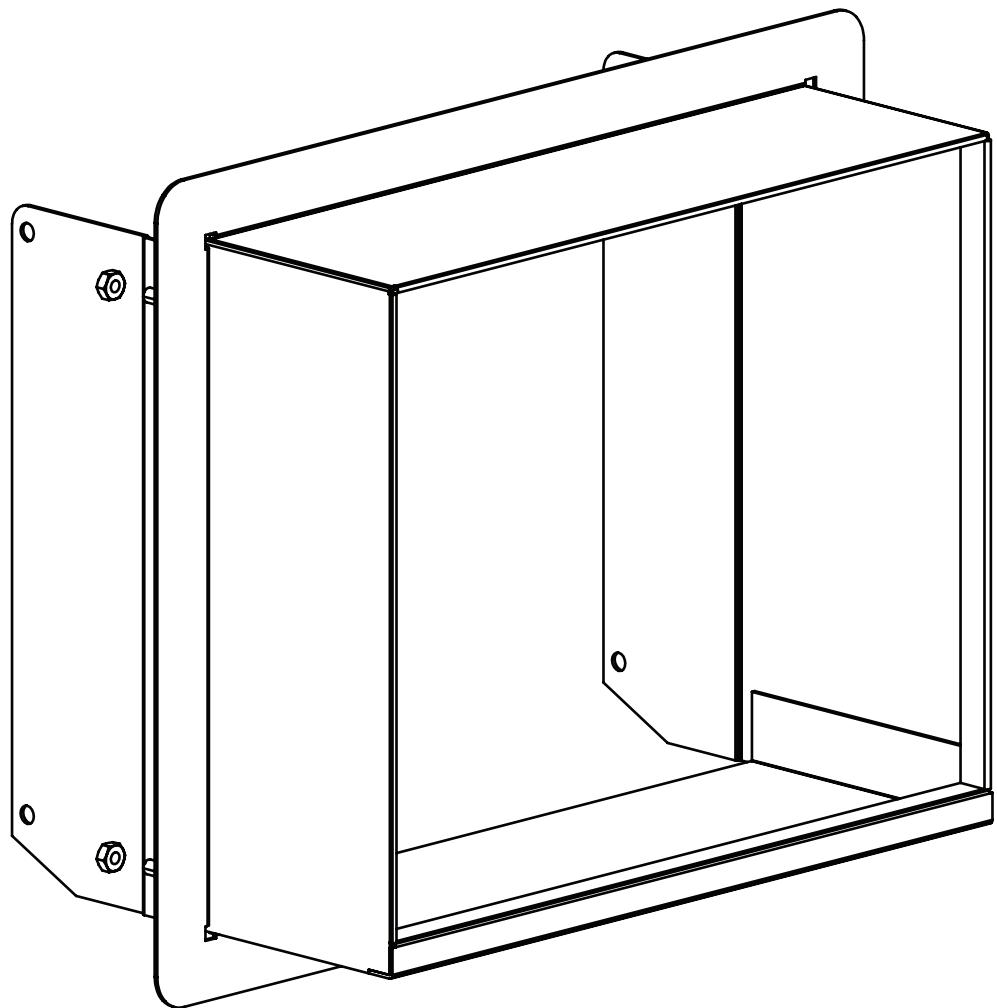
*Table 38:*      *Mounting kit*

Items	Order number
Flush mounting kit for one 4U half 19" housing IED	1KHL400040R0001

### 9.1.2

### Semi-flush mounting kit

- Raising frame
- Screws
- Nuts and washers
- Dimensions for screw holes



*Figure 52:*      *Raising frame*

*Table 39:*      *Mounting kit*

Items	Order number
Semi-flush mounting kit for one 4U half 19" housing IED	1KHL400444R0001

### 9.1.3

#### Rack mounting kit for a single IED

- Mounting brackets
- Screws

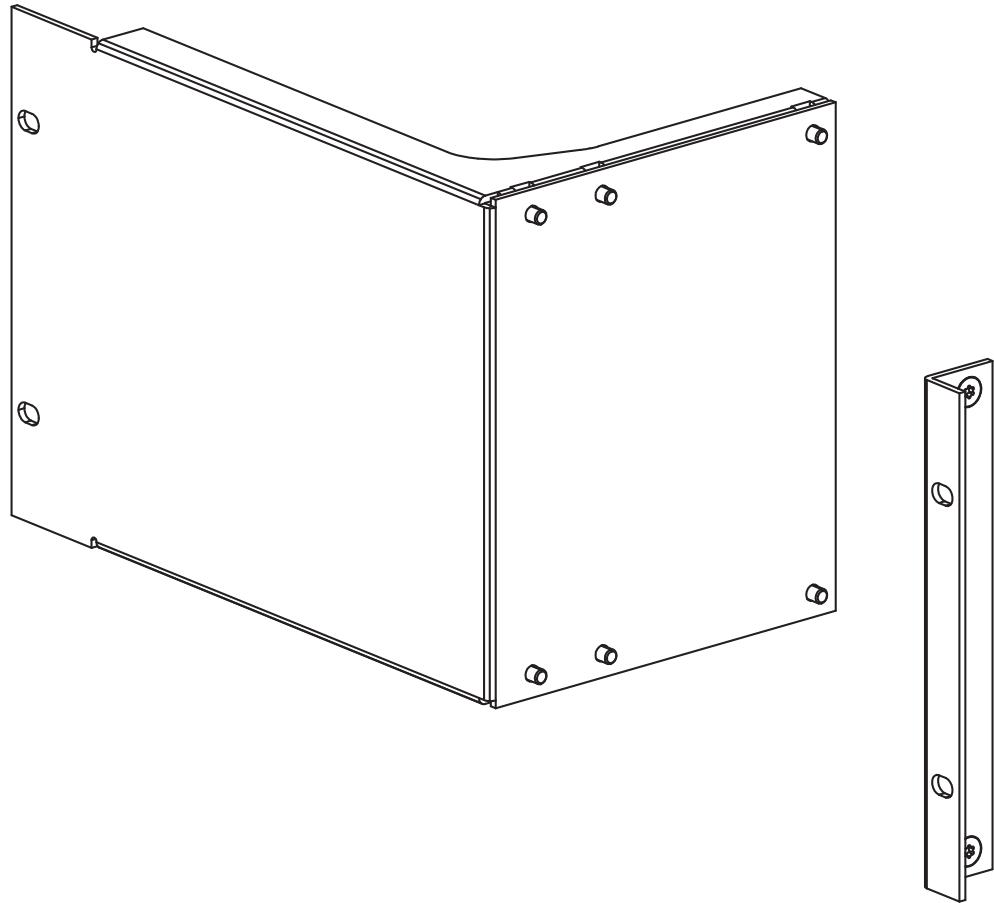


Figure 53: 19" rack mounting panels

Table 40: Mounting kit

Items	Order number
19" rack mounting kit for one 4U half 19" housing IED	1KHL400236R0001

### 9.1.4

#### Rack mounting kit for two IEDs

- Combination adapter pins
- Mounting brackets
- Screws

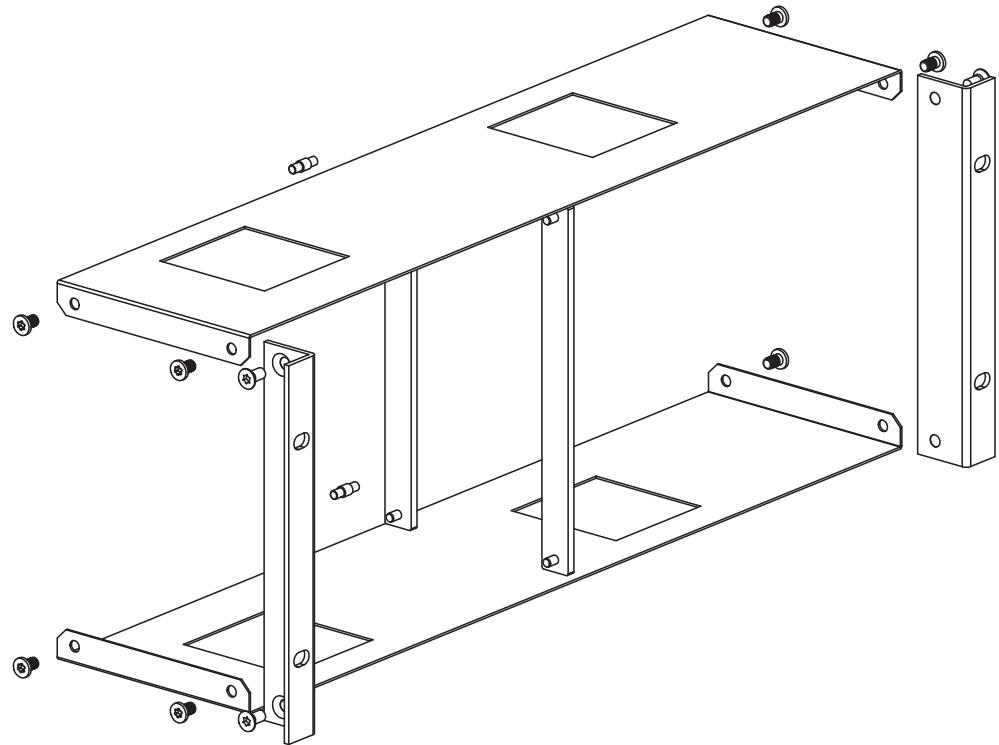


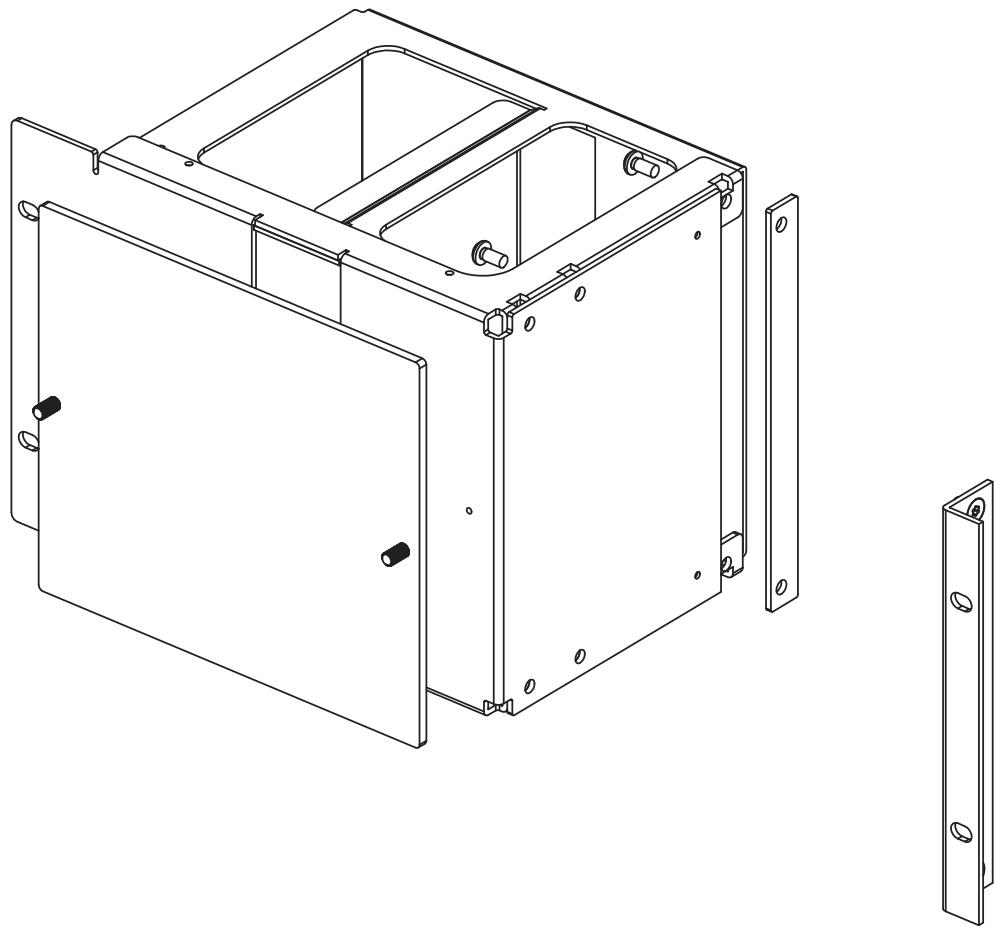
Figure 54: 19" Rack mounting parts for two IEDs

Table 41: Mounting kit

Items	Order number
19" rack mounting kit for two 4U half 19" housing IEDs	1KHL400237R0001

### 9.1.5 Test switch

- Mounting brackets
- Screws
- Front cover



*Figure 55:* 4U mounting bracket for test switch

*Table 42:* Test switch mounting accessories

Item	Order number
19" rack mounting kit for one RTXP8 test switch (the test switch is not included in the delivery)	1KHL400465R0001
19" rack mounting kit for one RTXP18 test switch (the test switch is not included in the delivery)	1KHL400467R0001
19" rack mounting kit for one RTXP24 test switch (the test switch is not included in the delivery)	1KHL400469R0001

### 9.1.6

### Wall mounting kit for an IED

- Mounting brackets
- Screws
- Dimensions for screw holes

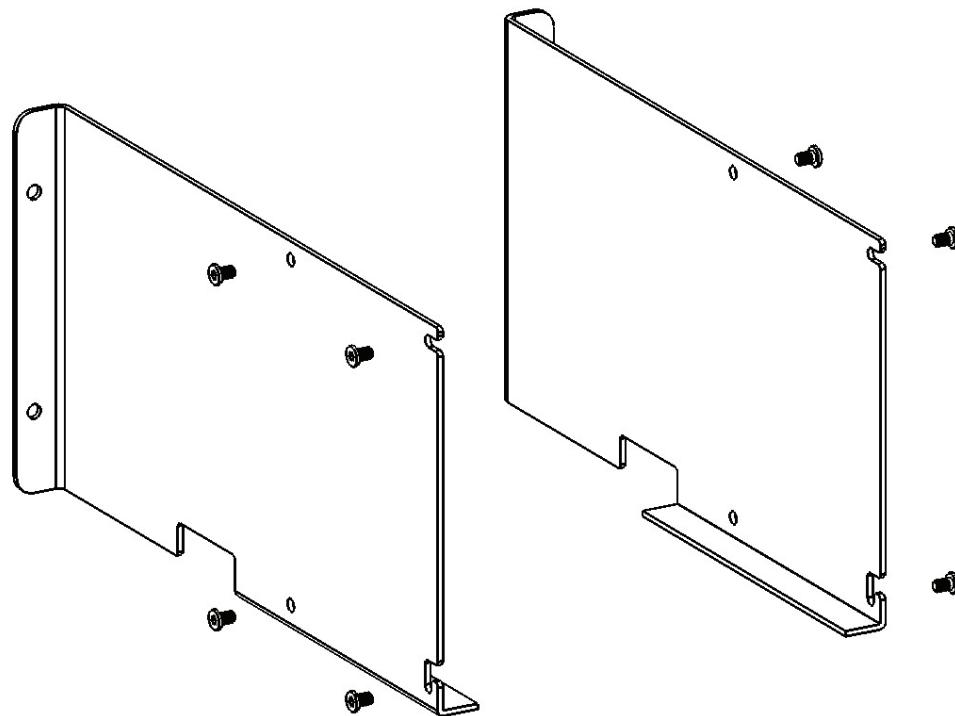


Figure 56: 4U wall mounting brackets

Table 43: Mounting kit

Items	Order number
Wall-mounting kit (cabling towards the mounting wall) for one 4U half 19" housing IED	1KHL400067R0001

### 9.1.7

### Ceiling mounting kit for a main unit

- Mounting bracket
- Screws
- Dimensions for screw holes

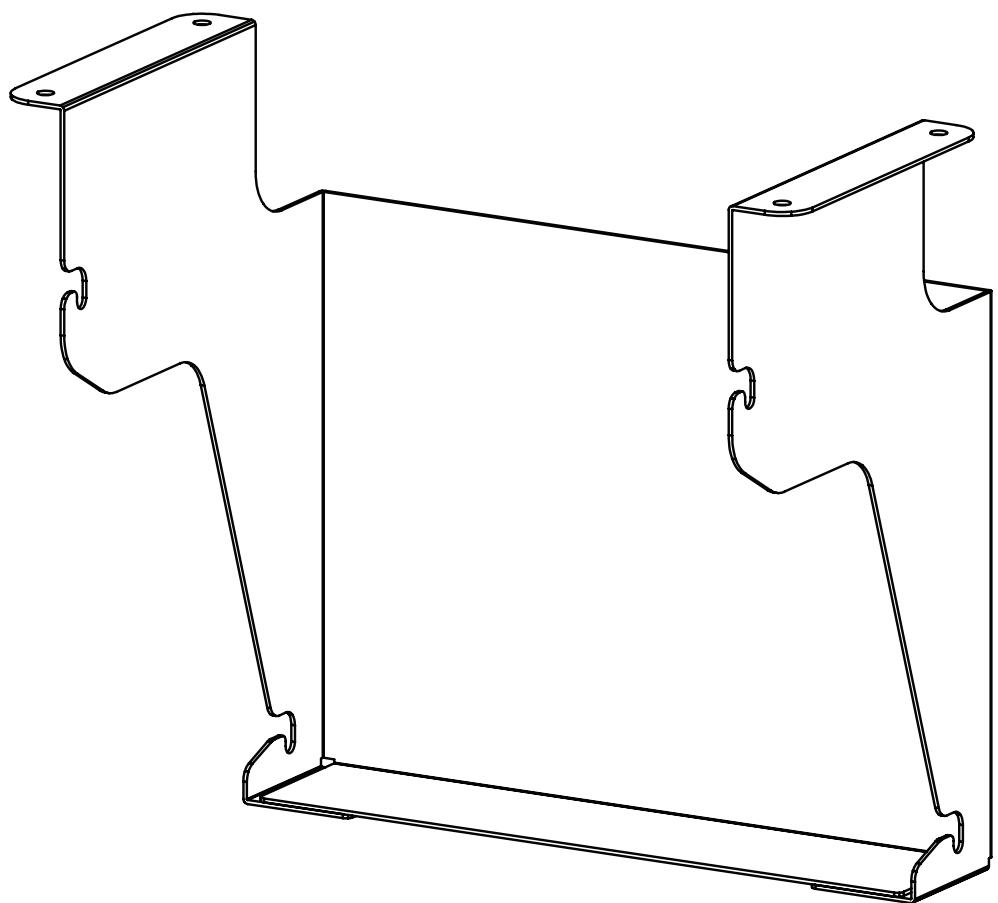


Figure 57: 4U half 19" ceiling mount

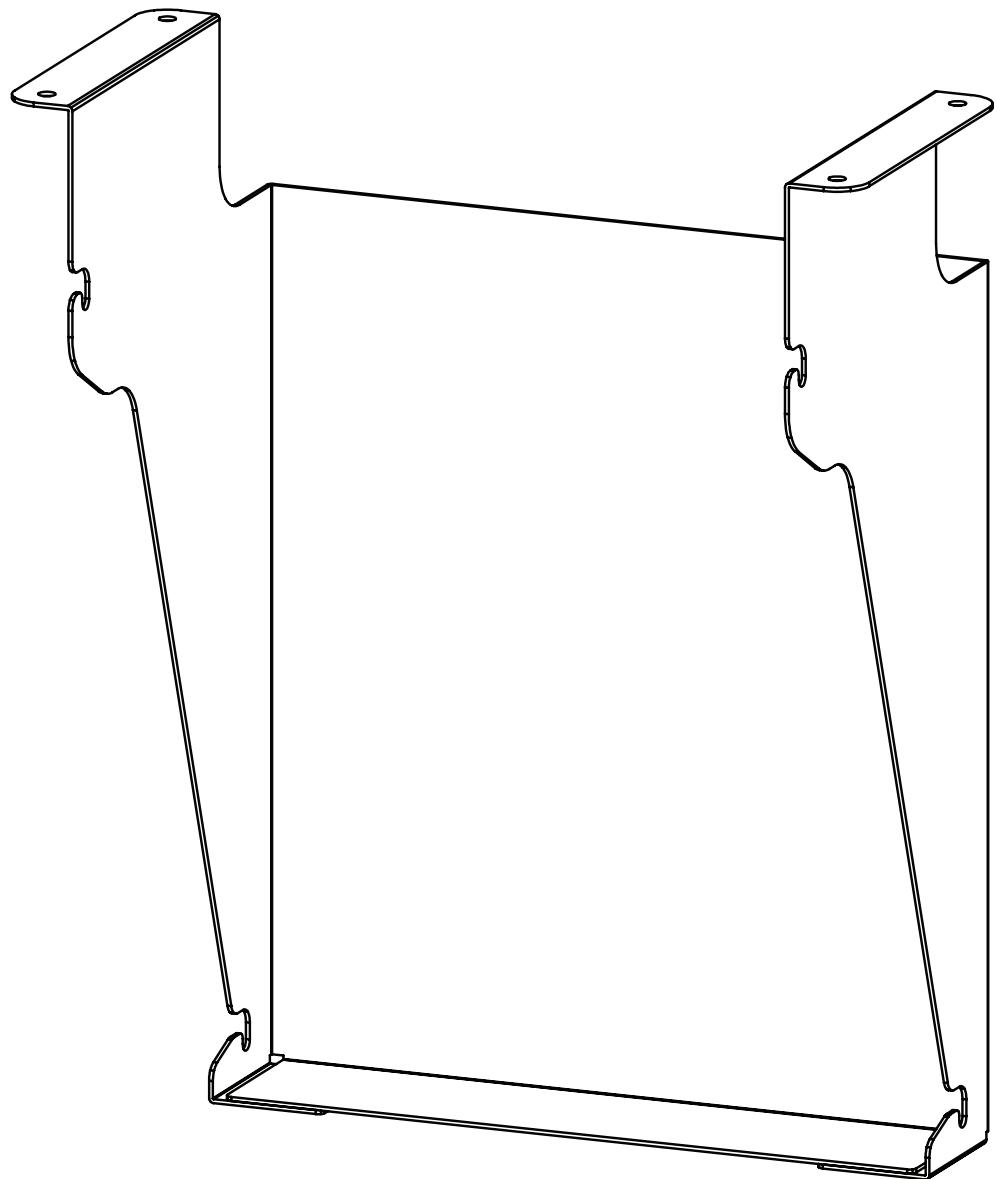


Figure 58: 6U half 19" ceiling mount

Table 44: Mounting kits

Items	Order number
Overhead/ceiling mounting kit (with cable space) for one 4U half 19" housing IED	1KHL400450R0001
Overhead/ceiling mounting kit (with cable space) for one 6U half 19" housing IED	1KHL400464R0001

### 9.1.8

### Wall mounting kit for a main unit

- Mounting brackets
- Screws
- Dimensions for screw holes

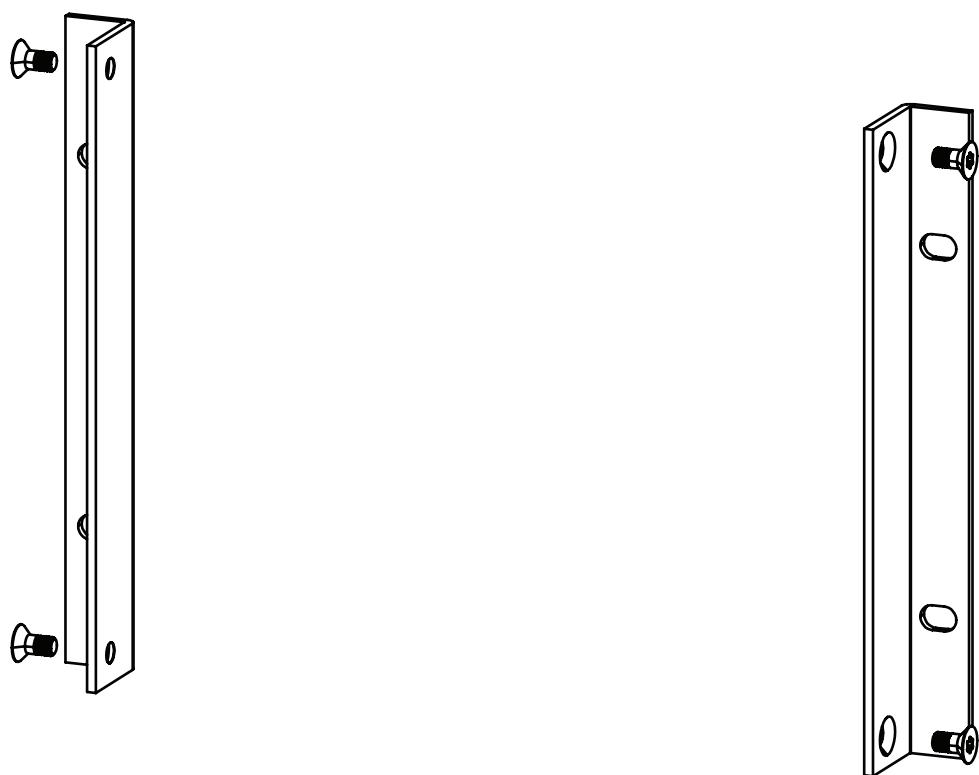


Figure 59: 4U wall mounting brackets

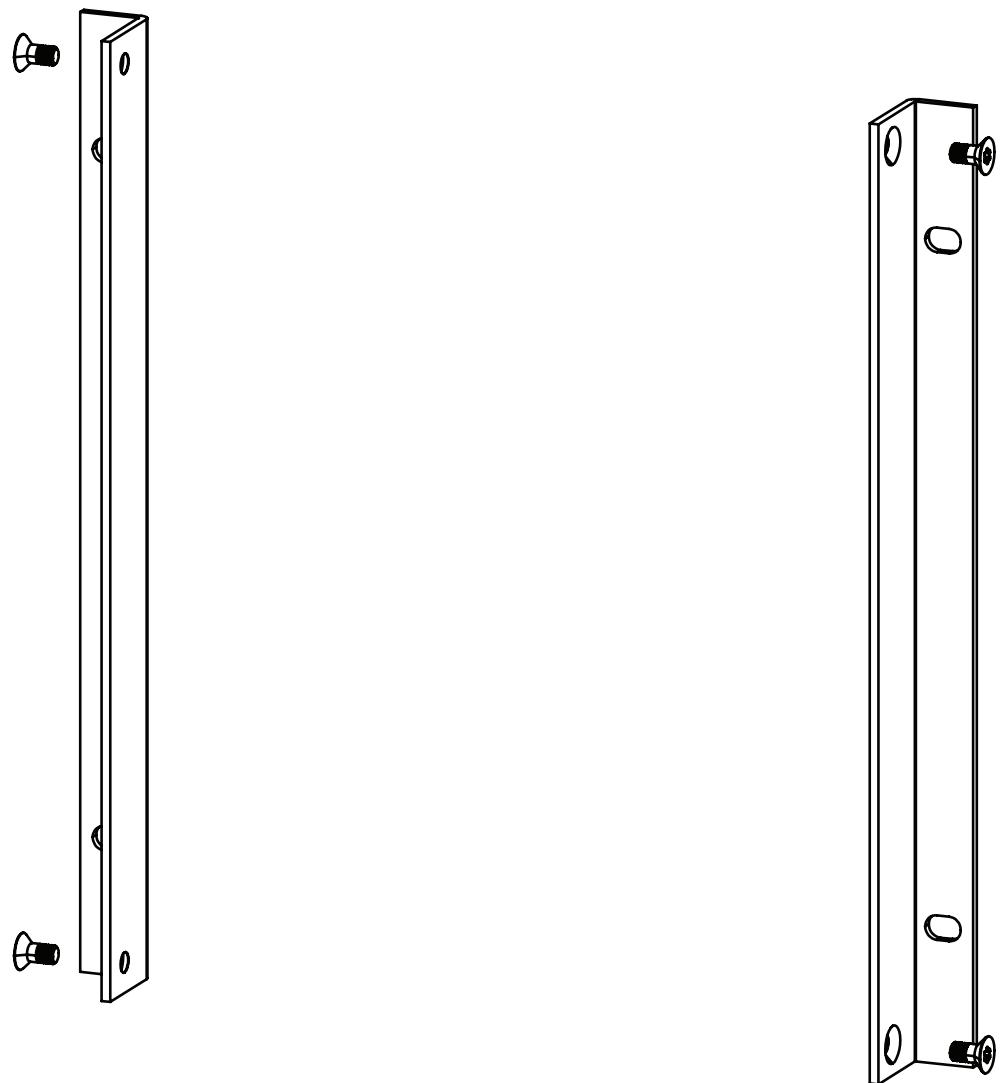


Figure 60: 6U wall mounting brackets

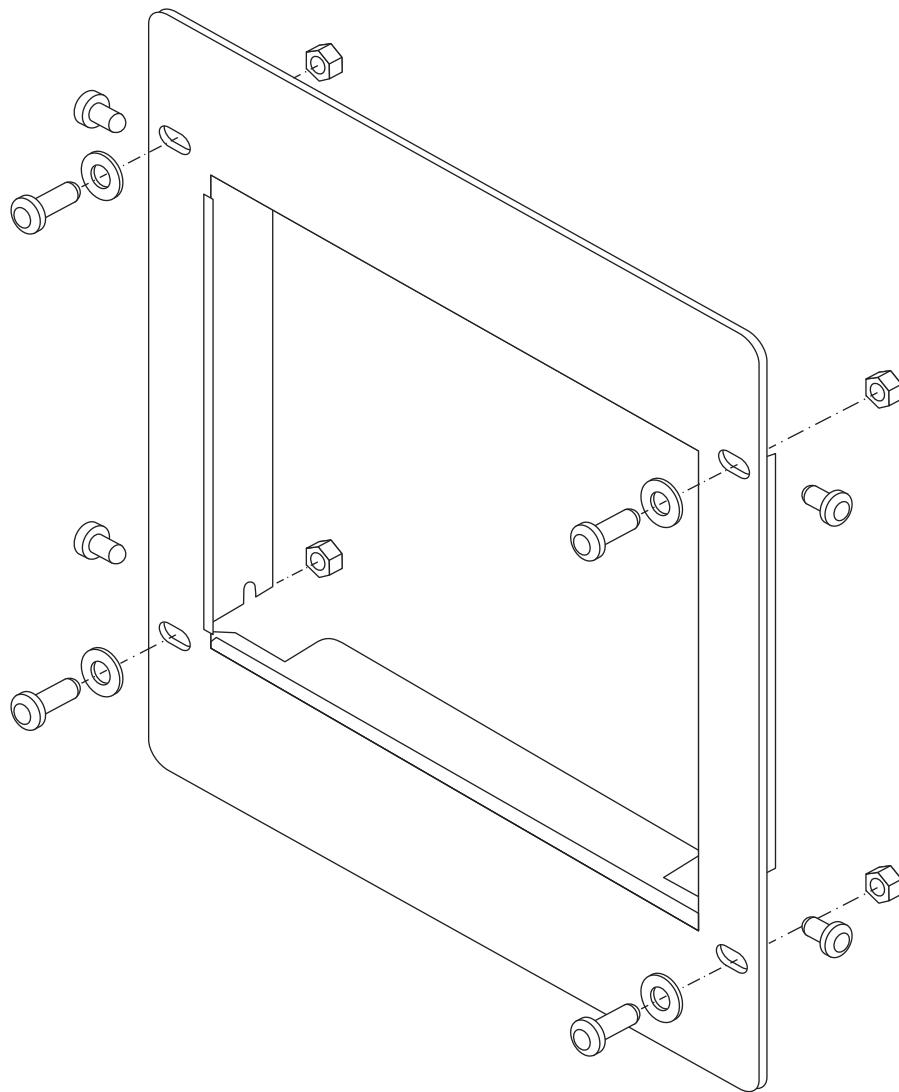
Table 45: Mounting kits

Items	Order number
Wall-mounting kit (cabling to the front) for one 4U half 19" housing IED	1KHL400449R0001
Wall-mounting kit for direct rear wall mounting (with cabling to the front) of one 6U half 19" housing IED	1KHL400452R0001

### 9.1.9

### SPAC 630 replacement kit

- Mounting frame
- Screws
- Nuts and washers



*Figure 61:* Mounting frame

*Table 46:* Replacement kit

Items	Order number
SPAC 630 replacement kit	2RCA027888A0001

## 9.2

## Connector sets

*Table 47:* Connector sets for REF630

Item	Order number
Connector set for one 4U housing the protection relay including analog input variant 4I + 5U or 5I + 4U	2RCA021735
Connector set for one 6U housing the protection relay including analog input variant 4I + 5U or 5I + 4U	2RCA021736

**Table 48:** *Connector sets for REG630 and REM630*

Item	Order number
Connector set for one 4U housing the protection relay including analog input variant 4I + 5U or 5I + 4U	2RCA021735
Connector set for one 6U housing the protection relay including analog input variant 4I + 5U or 5I + 4U	2RCA021736
Connector set for one 4U housing the protection relay including analog input variant 7I + 3U	2RCA023041
Connector set for one 6U housing the protection relay including analog input variant 7I + 3U	2RCA023042
Connector set for one 4U housing the protection relay including analog input variant 8I + 2U	2RCA023039
Connector set for one 6U housing the protection relay including analog input variant 8I + 2U	2RCA023040

**Table 49:** *Connector sets for RET630*

Item	Order number
Connector set for one 4U housing the protection relay including analog input variant 7I + 3U	2RCA023041
Connector set for one 6U housing the protection relay including analog input variant 7I + 3U	2RCA023042
Connector set for one 4U housing the protection relay including analog input variant 8I + 2U	2RCA023039
Connector set for one 6U housing the protection relay including analog input variant 8I + 2U	2RCA023040

## 9.3 Cables

**Table 50:** *Optional cables for external display module*

Items	Order number
LHMI cable (1 m)	2RCA025073P0001
LHMI cable (2 m)	2RCA025073P0002
LHMI cable (3 m)	2RCA025073P0003
LHMI cable (4 m)	2RCA025073P0004
LHMI cable (5 m)	2RCA025073P0005

## Section 10      Glossary

<b>ACT</b>	1. Application Configuration tool in PCM600 2. Trip status in IEC 61850
<b>CT</b>	Current transformer
<b>EMC</b>	Electromagnetic compatibility
<b>Ethernet</b>	A standard for connecting a family of frame-based computer networking technologies into a LAN
<b>GND</b>	Ground/earth
<b>HMI</b>	Human-machine interface
<b>HW</b>	Hardware
<b>IEC</b>	International Electrotechnical Commission
<b>IED</b>	Intelligent electronic device
<b>LCD</b>	Liquid crystal display
<b>LCP</b>	Liquid crystal polymer
<b>LED</b>	Light-emitting diode
<b>LHMI</b>	Local human-machine interface
<b>PC</b>	1. Personal computer 2. Polycarbonate
<b>RJ-45</b>	Galvanic connector type
<b>RoHS</b>	Restriction of hazardous substances
<b>SW</b>	Software
<b>VT</b>	Voltage transformer
<b>WHMI</b>	Web human-machine interface





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**ABB Distribution Solutions****Distribution Automation**

P.O. Box 699

FI-65101 VAASA, Finland

Phone +358 10 22 11

[www.abb.com/mediumvoltage](http://www.abb.com/mediumvoltage)

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