Relion® Protection and Control

650 series
Installation Manual

Power and productivity
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Warranty

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ABB AB

Substation Automation Products

SE-721 59 Västerås

Sweden

Telephone: +46 (0) 21 34 20 00

Facsimile: +46 (0) 21 14 69 18

http://www.abb.com/substationautomation

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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 proved by tests conducted by ABB AB in accordance with the generic standard EN 50263 for the EMC directive, and with the standards EN 60255-5 and/or EN 50178 for the low voltage directive.

This product is designed and produced for industrial use.

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 IED has to be carefully earthed.

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

Whenever changes are made in the IED, 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 IED. The manual provides procedures for mechanical and electrical installation. The chapters are organized in chronological order in which the IED 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

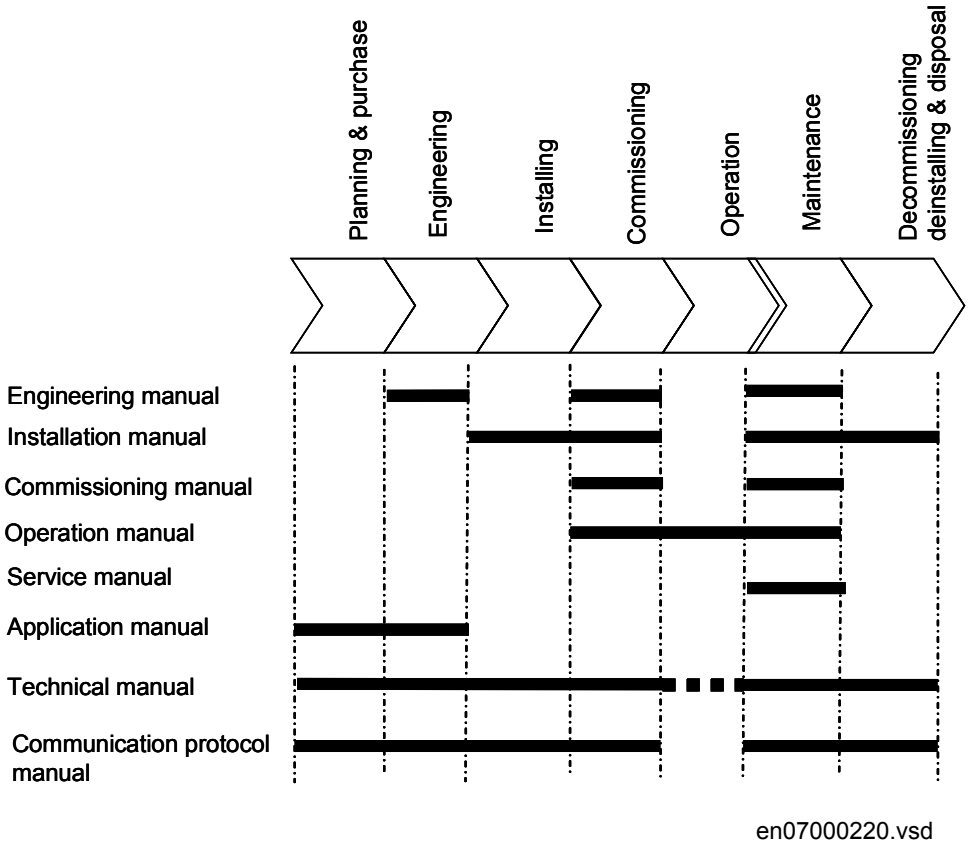

Figure 1: The intended use of manuals in different lifecycles

The engineering manual contains instructions on how to engineer the IEDs using the different tools in PCM600. The manual provides instructions on how to set up a PCM600 project and insert IEDs to the project structure. The manual also recommends a sequence for engineering of protection and control functions, LHMI functions as well as communication engineering for IEC 61850 and DNP3.

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

The commissioning manual contains instructions on how to commission the IED. The manual can also be used by system engineers and maintenance personnel for assistance during the testing phase. The manual provides procedures for checking of external circuitry and energizing the IED, parameter setting and configuration as well as verifying settings by secondary injection. The manual describes the process

of testing an IED in a substation which is not in service. The chapters are organized in chronological order in which the IED should be commissioned.

The operation manual contains instructions on how to operate the IED once it has been commissioned. The manual provides instructions for monitoring, controlling and setting the IED. The manual also describes how to identify disturbances and how to view calculated and measured power grid data to determine the cause of a fault.

The service manual contains instructions on how to service and maintain the IED. The manual also provides procedures for de-energizing, de-commissioning and disposal of the IED.

The application manual contains application descriptions and setting guidelines sorted per function. The manual can be used to find out when and for what purpose a typical protection function can be used. The manual can also be used when calculating settings.

The technical manual contains application and functionality descriptions and lists function blocks, logic diagrams, input and output signals, setting parameters and technical data sorted per function. The manual can be used as a technical reference during the engineering phase, installation and commissioning phase, and during normal service.

The communication protocol manual describes a communication protocol supported by the IED. The manual concentrates on vendor-specific implementations.

The point list manual describes the outlook and properties of the data points specific to the IED. The manual should be used in conjunction with the corresponding communication protocol manual.

The service manual is not available yet.

1.3.2 Document revision history

Document revision/date	Product series version	History
-/September 2009	1.0	First release

1.3.3 Related documents

Documents related to REC650	Identity number
Commissioning manual	1MRK 511 209-UEN
Technical manual	1MRK 511 204-UEN
Application manual	1MRK 511 203-UEN

Table continues on next page

Documents related to REC650	Identity number
Product Guide, configured	1MRK 511 211-BEN
Type test certificate	1MRK 511 211-TEN

Documents related to REL650	Identity number
Commissioning manual	1MRK 506 307-UEN
Technical manual	1MRK 506 304-UEN
Application manual	1MRK 506 305-UEN
Product Guide, configured	1MRK 506 308-BEN
Type test certificate	1MRK 506 308-TEN

Documents related to RET650	Identity number
Commissioning manual	1MRK 504 109-UEN
Technical manual	1MRK 504 106-UEN
Application manual	1MRK 504 107-UEN
Product Guide, configured	1MRK 504 110-BEN
Type test certificate	1MRK 504 110-TEN

650 series manuals	Identity number
Operation manual	1MRK 500 088-UEN
Communication protocol manual, DNP3	1MRK 511 224-UEN
Communication protocol manual, IEC 61850	1MRK 511 205-UEN
Engineering manual	1MRK 511 206-UEN
Installation manual	1MRK 514 013-UEN
Point list manual, DNP3	1MRK 511 225-UEN

1.4 Symbols and conventions

1.4.1 Safety indication 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 to 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 should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Manual conventions

Conventions used in IED manuals. A particular convention may not be used in this manual.

- Abbreviations and acronyms in this manual are spelled out in Glossary. Glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons, for example:
  To navigate between the options, use  and  .
- HMI menu paths are presented in bold, for example:
  Select **Main menu/Settings**.
- LHMI messages are shown in Courier font, for example:
  To save the changes in non-volatile memory, select `Yes` and press  .
- Parameter names are shown in italics, for example:
  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 IED.

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 Disposing of the IED

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 cast-off IEDs or its parts, contact the local entrepreneurs who are authorized and specialized in

handling electrical/electronics waste. These partners can sort the material by using dedicated sorting processes and dispose of the product according to the local requirements.

Table 2: Materials of the IED parts

IED	Parts	Material
Unit	Metallic plates, parts and screws	Steel
	Plastic parts	PC[1], LCP[2]
	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

IEDs require careful handling.

1. Examine the delivered products to ensure that they have not been damaged during the transport.
2. Remove the transport packing carefully without force.

The cardboard packaging material is 100% recyclable.

3.2 Inspecting the product

3.2.1 Identifying the product

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

IEDs require careful handling before installation on site.

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

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

3.2.4 Returning an IED 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. ABB should be notified immediately if there are any discrepancies in relation to the delivery documents.

3.3 Storing

If the IED 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.

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 IED to allow access to wires and optical fibres and to enable maintenance and future modifications.
- Flush mounted IEDs should be possible to be added or 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. Locate 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.

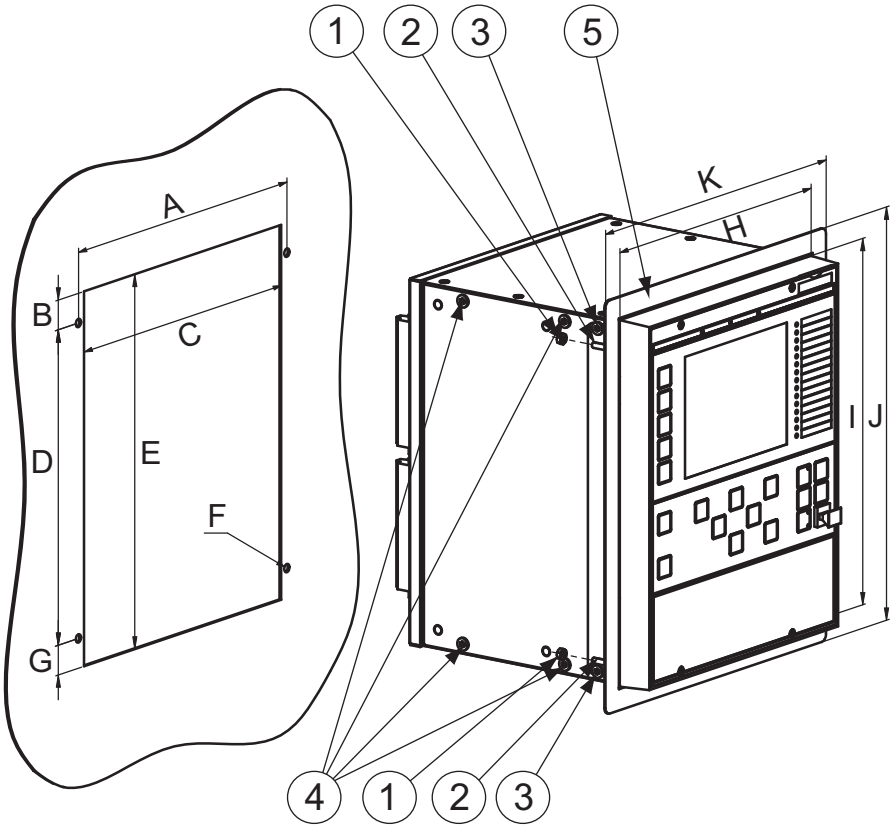

Figure 2: Flush mounting the IED into a panel cut-out

A	240 mm	1	Nuts and washers
B	21.55 mm	2	Threaded studs
C	227 mm	3	Screw
D	228.9 mm	4	Plastic plugs
E	272 mm	5	Mounting frame
F	∅6 mm		
G	21.55 mm		
H	220 mm		
I	265.9 mm		
J	300 mm		
K	254 mm		

5. Place a nut and a washer on each threaded studs.
6. Tighten the nuts.

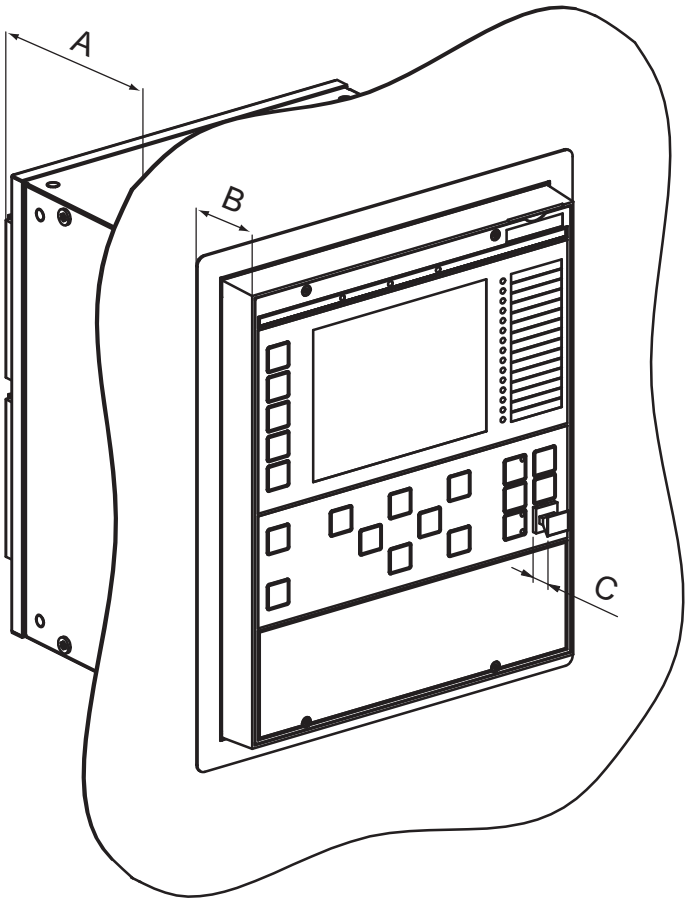

Figure 3: Flush mounted IED

A 222 mm + 12 mm with ring-lug connector

B 27 mm

C 13 mm

4.3.2 Semi-flush mounting the IED

1. Make a panel cut-out and drill screw holes according to the dimensional drawing.
2. Remove the plastic plugs from the side of the IED and locate it securely in the rising frame using the required screws.
3. Tighten the screws.
4. Mount the IED with the rising frame to the panel cut-out.

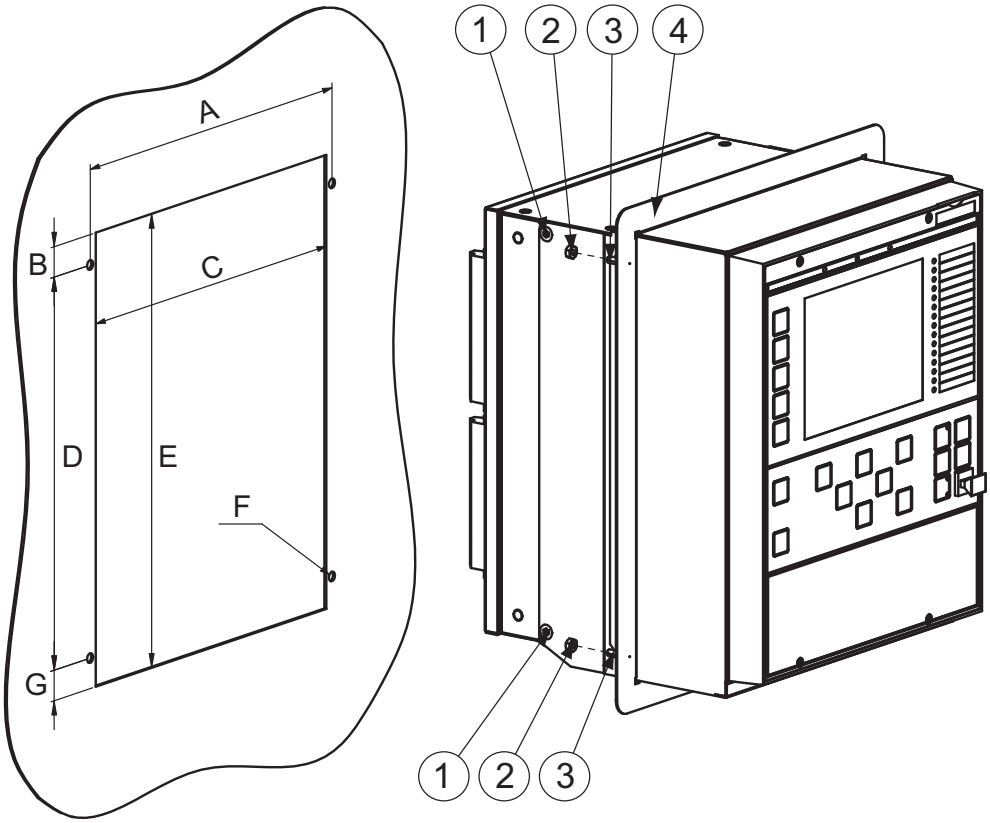

Figure 4: Semi-flush mounting the IED into a panel cut-out

A	240 mm	1	Screws
B	19.05 mm	2	Nuts and washers
C	229 mm	3	Threaded studs
D	245.9 mm	4	Raising frame
E	284 mm		
F	∅6 mm		
G	19.05 mm		

5. Place a nut and a washer on each threaded studs.
6. Tighten the nuts.

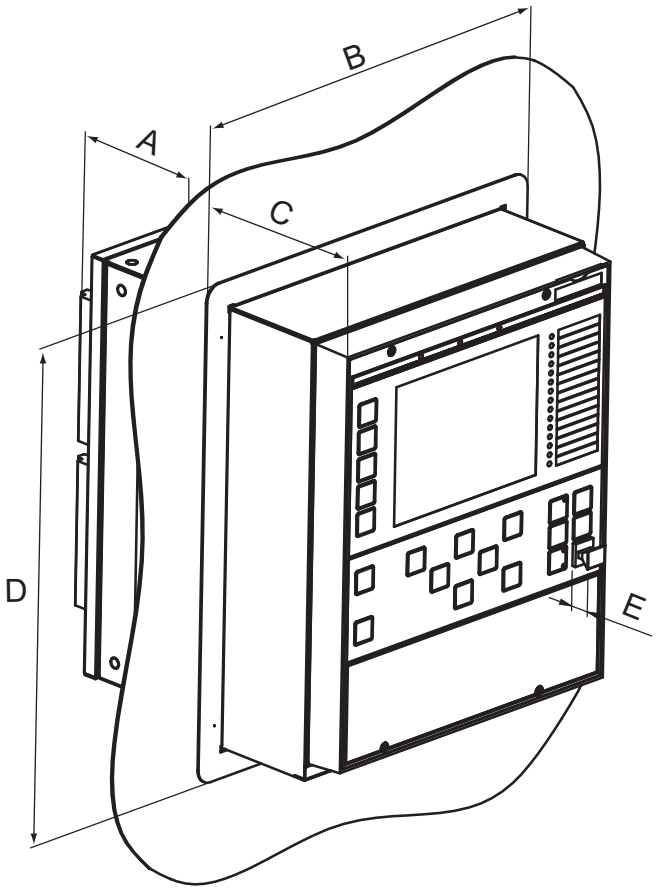

Figure 5: Semi-flush mounted IED

A 154 mm + 12 mm with ring-lug connector
B 265 mm
C 95 mm
D 315.9 mm
E 13 mm

4.3.3 Rack mounting the IED

4.3.3.1 Rack mounting a single IED

1. Remove the four plastic plugs from the right-hand side of the IED and attach the right mounting panel securely using the required screws.
2. Tighten the screws.

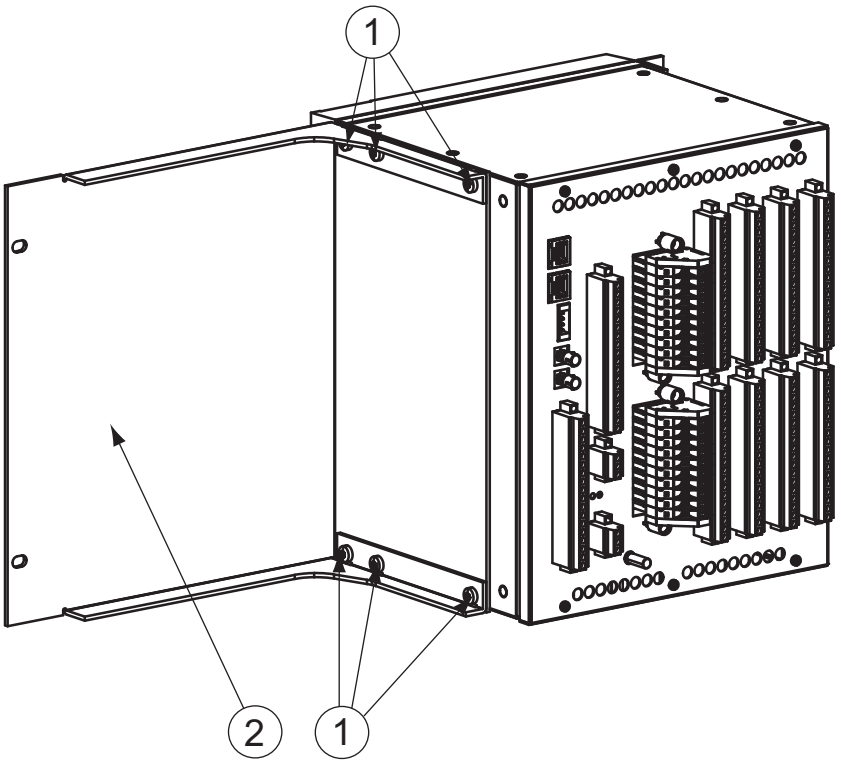

Figure 6: Mounting the bracket

1 Screws
2 Right mounting bracket

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

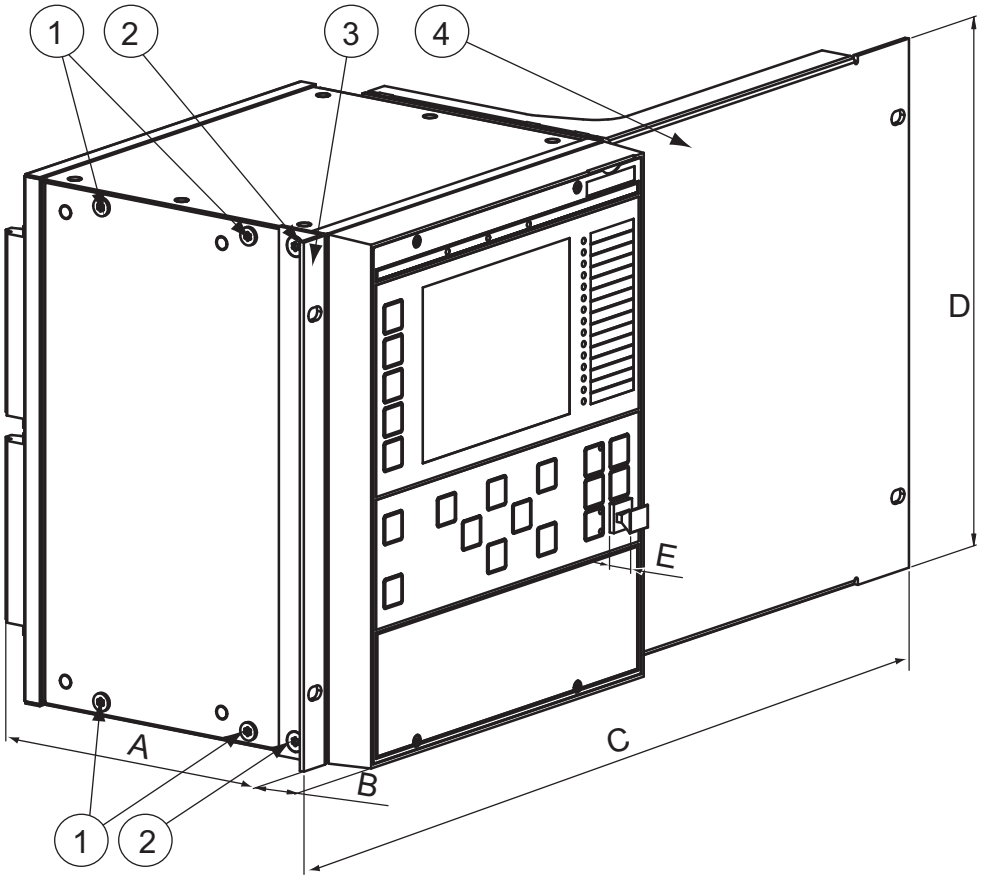

Figure 8: Rack mounted IED

A	224 mm + 12 mm with ring-lug connector	1	Plastic plugs
B	25.5 mm	2	Screws
C	482.6 mm (19")	3	Left mounting bracket
D	265.9 mm (6U)	4	Right mounting bracket
E	13 mm		

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 two middle mounting brackets to the holes on the sides of the two IEDs.
3. Mount the upper and lower mounting brackets to the two IEDs using the screws at the required location.
   See that the lower venting hole on the IEDs line up with the venting hole in the lower mounting bracket.

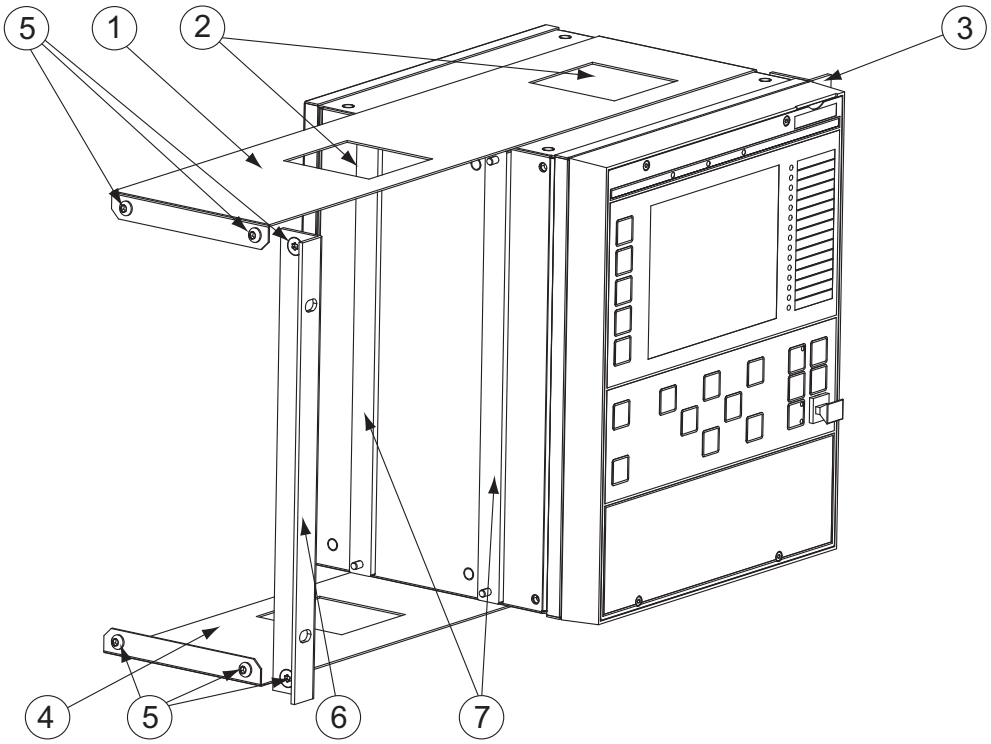

Figure 9: Mounting IEDs

1 Upper mounting bracket
2 Vent holes
3 Right mounting bracket
4 Lower mounting bracket
5 Screws
6 Left mounting bracket
7 Middle mounting brackets

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

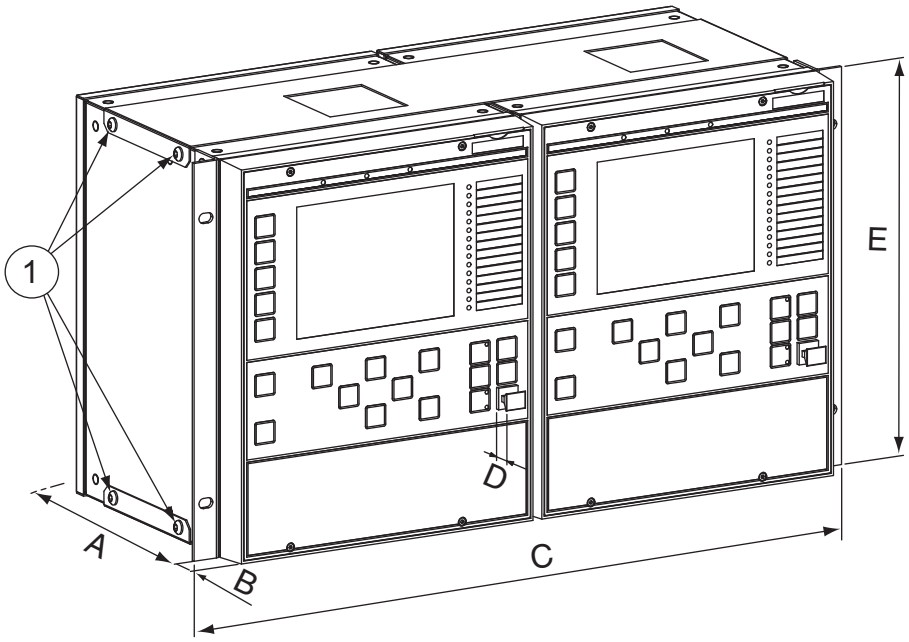

Figure 10: Two rack mounted IEDs side by side

A 224 mm + 12 mm with ring-lug connector
B 25.5 mm
C 482.6 mm (19")
D 13 mm
E 265.9 mm (6U)
1 Screws

See that the lower venting holes in the IED is not obstructed.

4.3.3.3 Rack mounting a single IED and test switch RTXP

1. Attach the mounting bracket to the left side of the IED using the required screws.
2. Tighten the screws
3. Remove the four plastic plugs from the right side of the IED and attach the mounting bracket securely using the required 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.

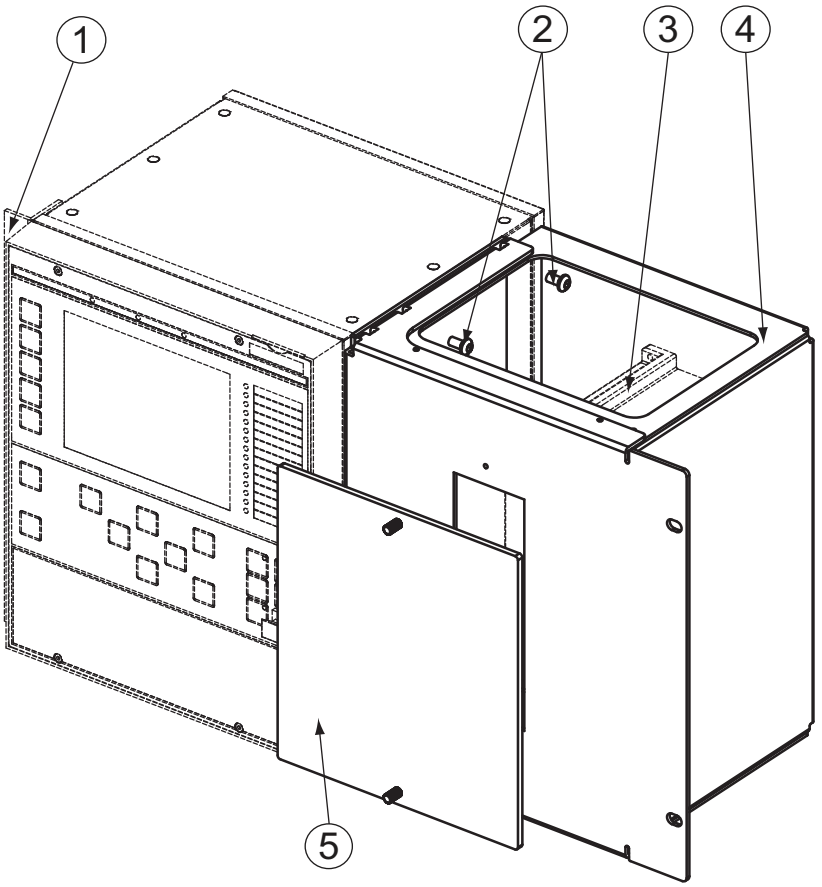

Figure 11: IED mounted with test switch RTXP 18

1 Left mounting bracket
2 Screws
3 Test switch
4 Right mounting bracket
5 Plastic front cover

The allowed minimum bending radius has to be checked 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 by using the required screws.
5. Tighten the screws.

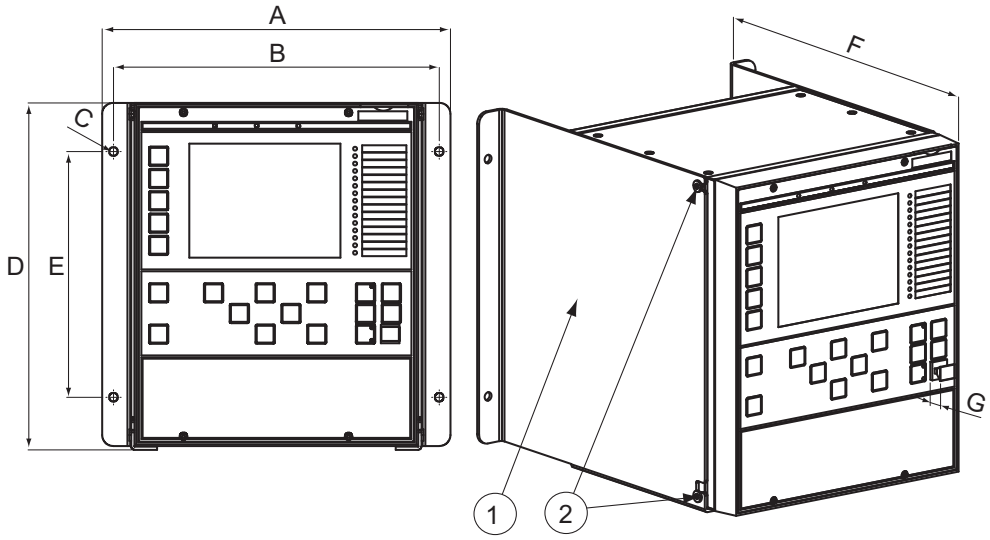

Figure 12: Wall mounting the IED

A	270 mm	1	Mounting bracket
B	252.5 mm	2	Screw
C	∅6.8 mm		
D	268.9 mm		
E	190.5 mm		
F	296 mm		
G	13 mm		

Minimum of 50 mm space is needed between two kits.

It is recommended to connect wires and terminal strips before IED is fitted on mounting brackets.

4.3.5 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.

- Reserve at least 1U below and above the unit.
- Reserve for rack mount approximately 10 cm behind the unit, measured from the surface of the cover.
- Ensure sufficient space for the wiring and the installation of cable ducts.

Section 5 Connecting

5.1 Required tools

Only use a screwdriver and insert bits for slotted (Nr.1 / 3.5mm blade) when handling CT/VT terminals of screw-compression type and slotted 4.5 mm blade when handling CT/VT terminals of ring-lug 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^2 wire or with two 0.5...1.0 mm^2 wires.
2. Connect each compression type (X101 and X102) terminal for CTs/VTs with one 0.5...6.0 mm^2 wire or with two of maximum 2.5 mm^2 wires.
3. Connect terminals on the communication module for IRIG-B with one 0.2 - 1.5 mm^2 wire.

Use multi-strand 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.

5.2.2 Connecting ring-lug type wires

Ring-lug type insulated terminal can be used for signal connectors X101 and X102. The maximum outside diameter for the M4 ring-lug type terminals is 9 mm.

5.3 Connecting protective earthing

Earth the IED to earth using a 16.0 mm^2 flat copper cable. The earth lead should be as short as possible, the length should be less than 1500 mm but 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^2 flat braded copper cable.

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

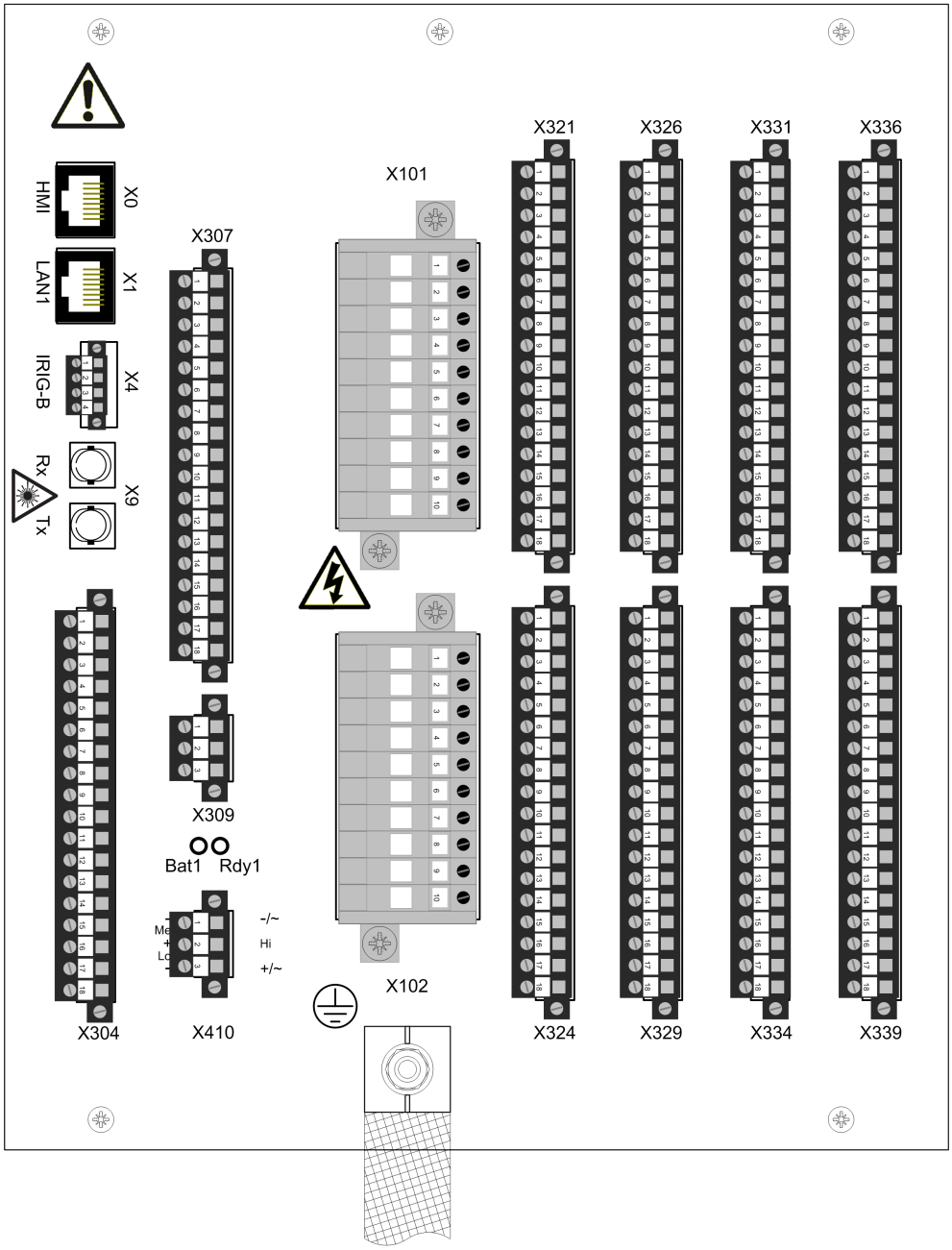

Figure 14: The protective earth pin is located below connector X102 on the 6U half 19" case

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 reasons.

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’.

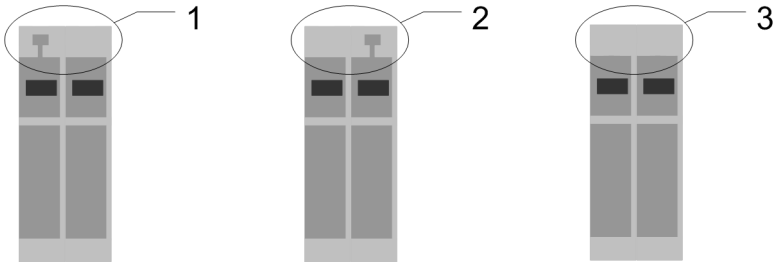

Figure 15: Loose CT/VT connector coding

1 CT connector coding
2 VT connector coding
3 Empty connector

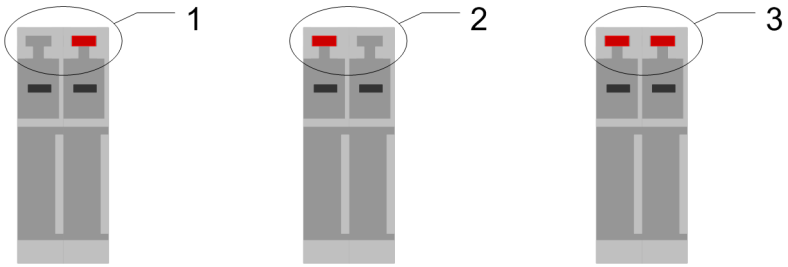

Figure 16: Fixed CT/VT Connector coding

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...6.0 mm^2 wire or for two wires of maximum 2.5 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. Whereas a voltage input, the connector pair forms two half-circles.

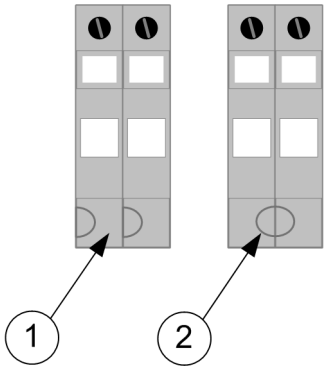

Figure 17: CTVT connector symbols

1 VT symbol
2 CT symbol

Table 3: *Analog input modules*

Terminal	TRM 6I + 4U	TRM 8I + 2U	TRM 4I + 1I + 5U	AIM 6I + 4U	AIM 4I + 1I + 5U
X101-1, 2	1/5A	1/5A	1/5A	1/5A	1/5A
X101-3, 4	1/5A	1/5A	1/5A	1/5A	1/5A
X101-5, 6	1/5A	1/5A	1/5A	1/5A	1/5A
X101-7, 8	1/5A	1/5A	1/5A	1/5A	1/5A
X101-9, 10	1/5A	1/5A	0.1/0.5A	1/5A	0.1/0.5A
X102-1, 2	1/5A	1/5A	100/220V	1/5A	100/220V
X102-3, 4	100/220V	1/5A	100/220V	100/220V	100/220V
X102-5, 6	100/220V	1/5A	100/220V	100/220V	100/220V
X102-7, 8	100/220V	100/220V	100/220V	100/220V	100/220V
X102-9, 10	100/220V	100/220V	100/220V	100/220V	100/220V

See the connection diagrams for information on the analog input module variant included in a particular configured IED.

5.4.2 Connecting IED with a test switch

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

5.5 Connecting power supply

When using power supply 110-250 VDC or 100-240 VAC, connect the IED's auxiliary voltage to terminals X410-1 and X410–3. When using a DC supply, connect the positive lead to terminal X410–3.

When using power supply 48-125 VDC, the IED's auxiliary voltage is connected to terminalsX410-1 and X410–2 with the positive lead connected to terminal X410–2.

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

Connect power supply to connector X410. Do not accidentally connect the power supply to connector X309.

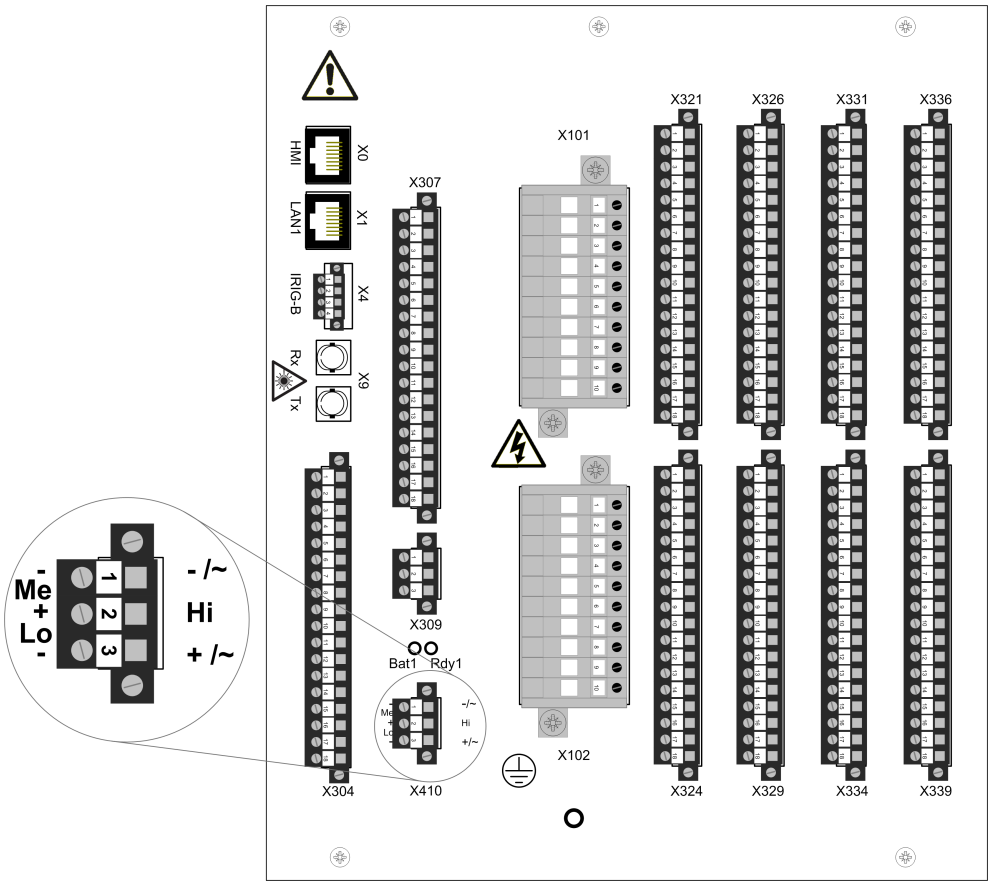

Figure 18: Connecting auxiliary voltage on a 6U half 19" unit

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

No damage will occur when the plug is inserted 180 degrees turned.

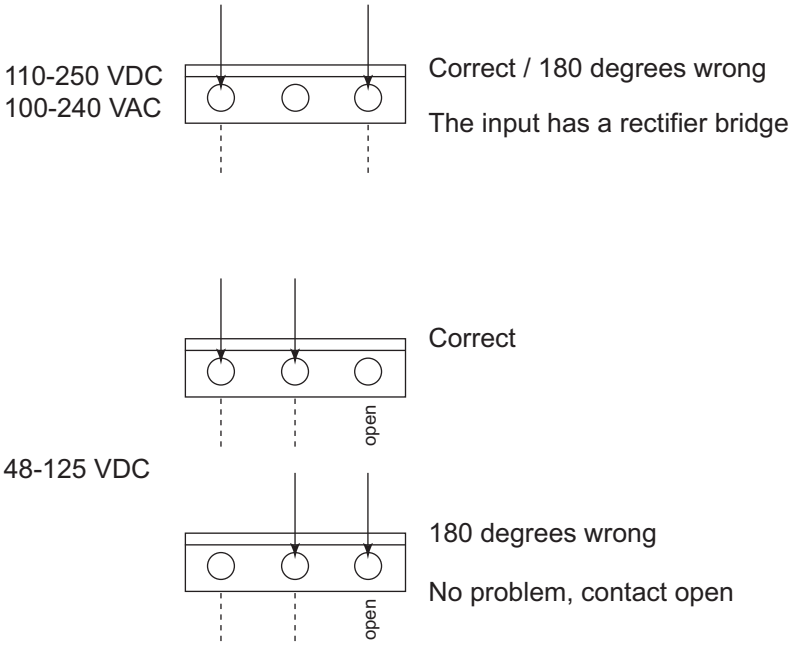

Figure 19: Connecting the auxiliary voltage connector

5.6 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 IED when viewing the case from the rear.

The fiber optical cables are very sensitive to handling. Do not bend too sharply. If cable straps are used to fix the cables, apply with loose fit.

Always hold the connector, never the cable, when connecting or disconnecting optical fibers. Do not twist, pull or bend the fiber. Invisible damage may increase fiber attenuation thus making communication impossible. Strictly follow the instructions from the manufacturer for each type of optical cables/connectors.

See the technical manual for product-specific communication interfaces.

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

Before you connect the auxiliary power, check that the terminal strip is wired and placed correctly.

During the start-up all LEDs are lit for a short period.

- Green Ready LED starts to flash
- LCD lights up and `starting...` is displayed
- The main menu is displayed. A steady green Ready LED indicates a successful start-up.

If the IED detects a self-supervision error during start-up, the green Ready LED flashes. Cause for the internal failure can be checked via the LHMI.

Section 7 Removing, repairing and exchanging

7.1 Product lifecycle

In the product lifecycle, there is going to be a time to upgrade the IED to a next generation unit. Although this is not relevant until some 20 years after the installation, it is wise to already consider the product lifecycle when investing on the original product.

7.2 Checking IED information

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

1. Select **Main Menu/Diagnostics/IED status**.
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 and SW version.

The **Installed HW** 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 IED can be upgraded.

7.4 Sending the IED for repair

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

7.5 Exchanging the IED

To exchange the IED with another identical unit, remove the IED and install the new one. Contact your local ABB for information about exchangeable units.

Check with your local ABB if the IED can be upgraded.

Section 8 Technical data

8.1 Case and HMI display variants

8.1.1 Front side of the IED

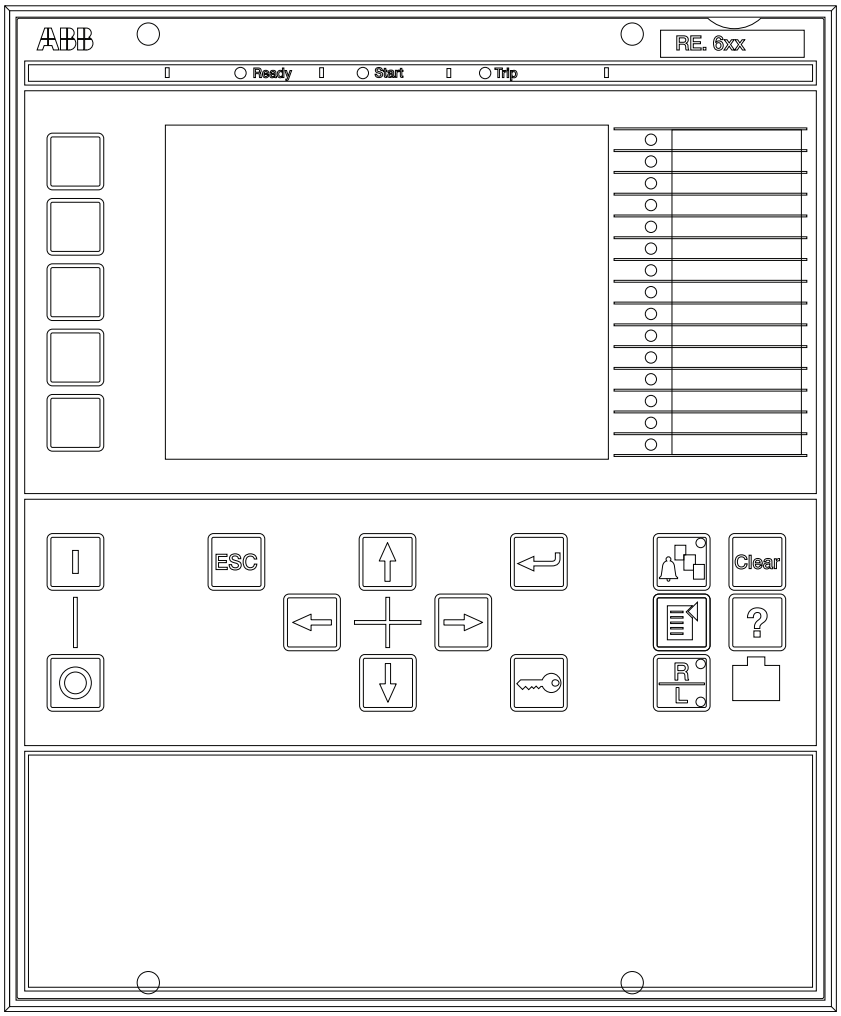

Figure 20: Front view of 6U half 19” IED

The LHMI includes a monochrome LCD of 320x240 pixels.

8.1.2 Rear side of the IED

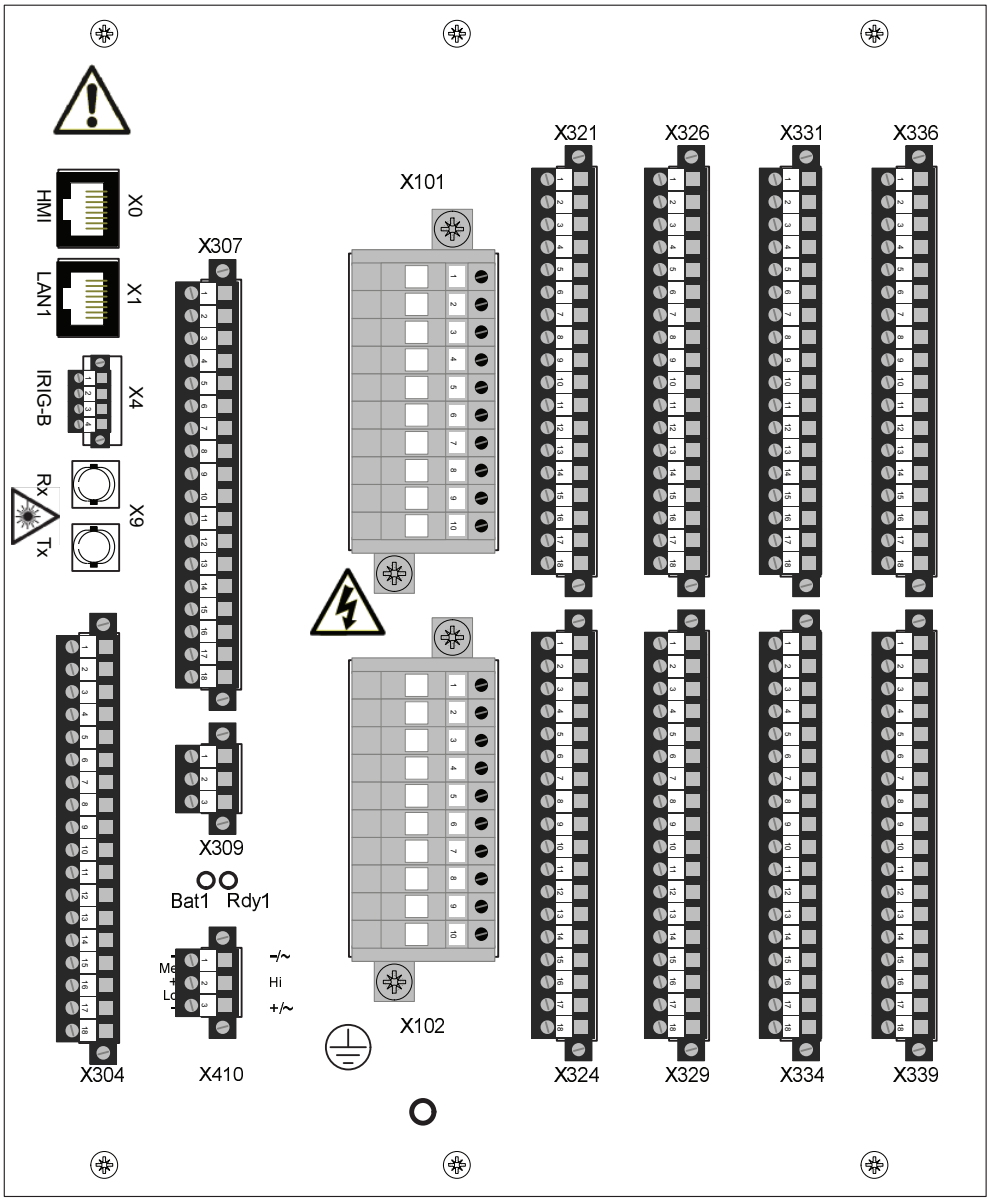

Figure 21: Rear view of 6U half 19”

8.2 Dimensions

Table 4: Dimensions of the IED

Description	Type	Value
Width	half 19"	220 mm
Height	half 19"	265.9 mm (6U)
Depth	half 19"	249.5 mm
Weight	half 19" box	<10 kg (6U)
	half 19" LHMI	1.3 kg (6U)

8.3 Enclosure class

Table 5: Degree of protection of flush-mounted IED

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

Table 6: 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

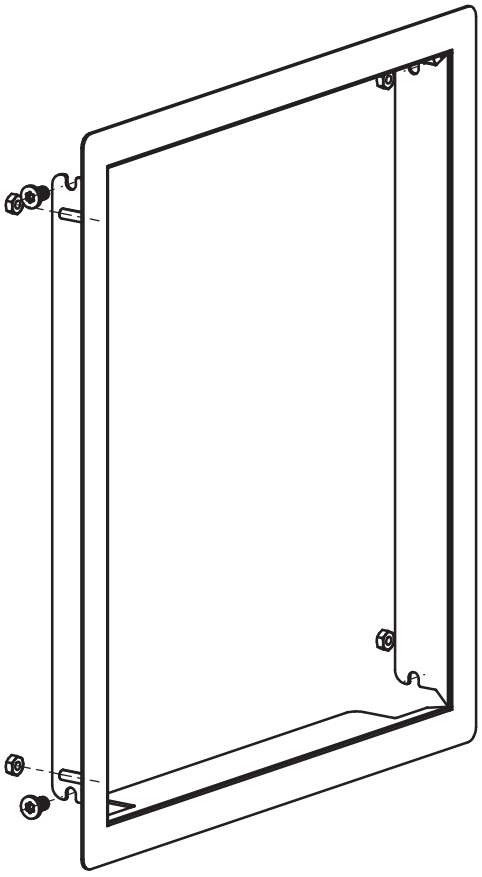

Figure 22: Flush mounting frame

Table 7: Mounting kit

Items	Order number
Flush mounting kit for one 6U half 19” housing IED	1KHL400228R0001

9.1.2 Semi-flush mounting kit

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

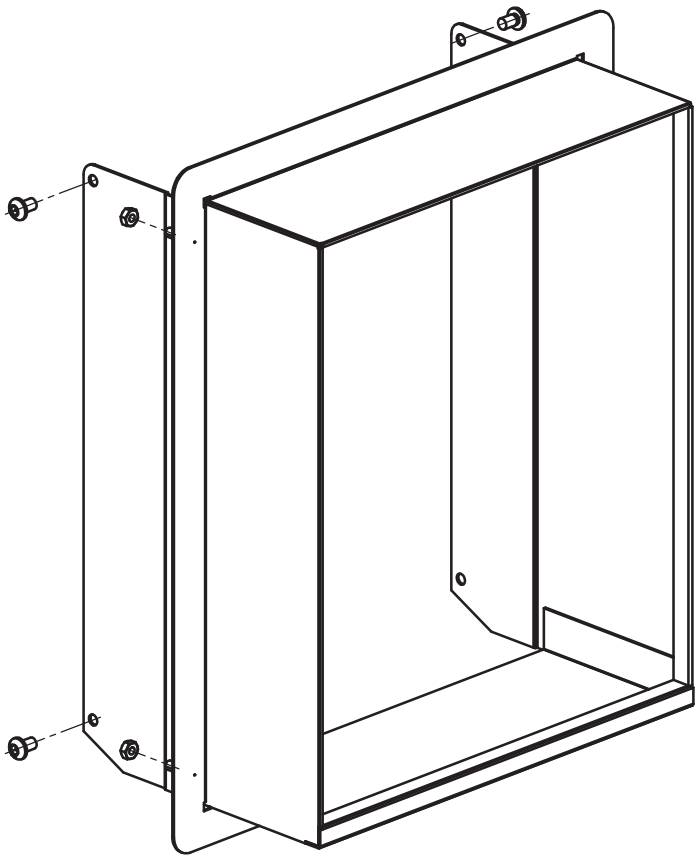

Figure 23: Raising frame

Table 8: Mounting kit

Items	Order number
Semi-flush mounting kit for one 6U half 19” housing IED	1KHL400229R0001

9.1.3 Rack mounting kit for a single IED

- Mounting brackets
- Screws

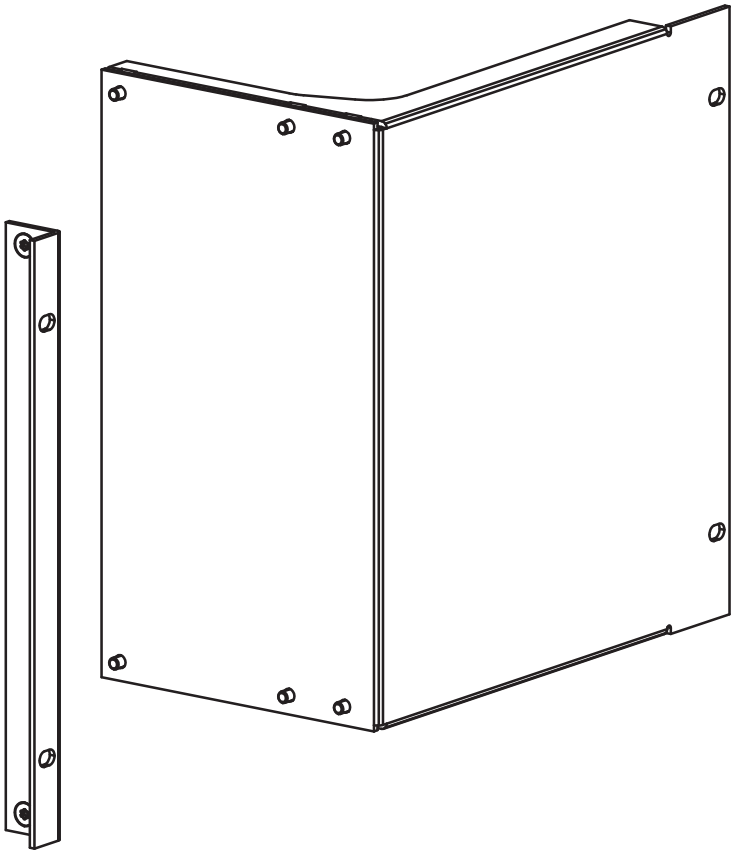

Figure 24: 19” rack mounting panels

Table 9: Mounting kit

Items	Order number
19" rack mounting kit for one 6U half 19” housing IED	1KHL400239R0001

9.1.4 Rack mounting kit for two IEDs

- Mounting brackets
- Screws

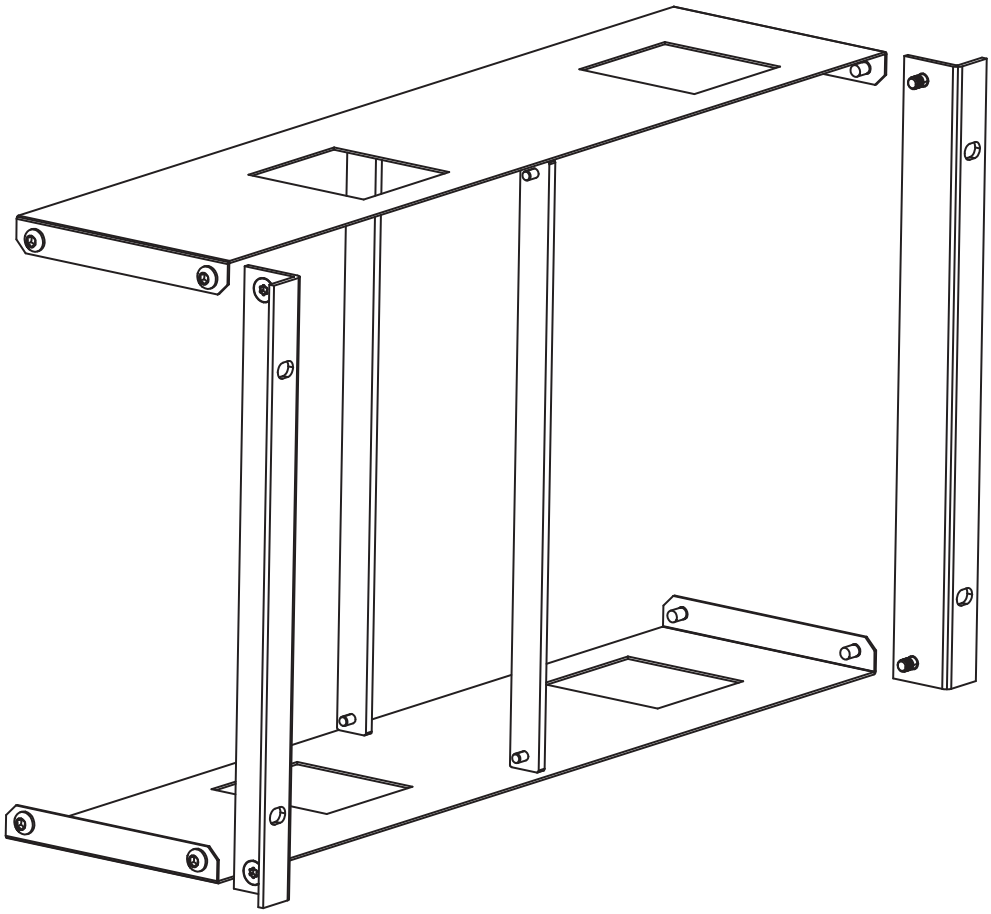

Figure 25: 19” rack mounting parts for two IEDs

Table 10: Mounting kit

Items	Order number
19" rack mounting kit for two 6U half 19” housing IEDs	1KHL400240R0001

9.1.5 Test switch

- Mounting bracket
- Screws
- Front cover

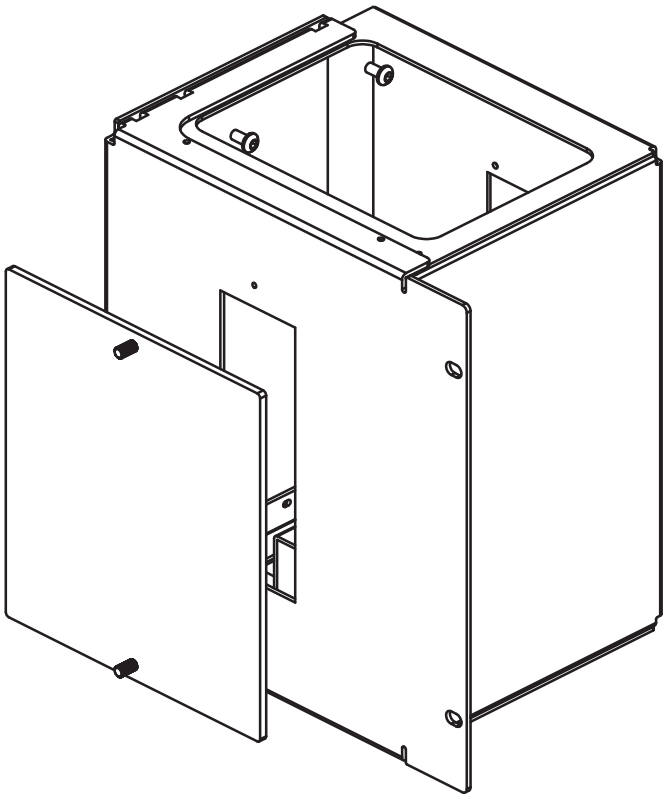

Figure 26: 6U mounting bracket for test switch

Table 11: Test switch mounting accessories

Items	Order number
19" rack mounting kit for one RTXP8 test switch (the test switch is not included in the delivery)	1KHL400180R0001
19" rack mounting kit for one RTXP18 test switch (the test switch is not included in the delivery)	1KHL400181R0001
19" rack mounting kit for one RTXP24 test switch (the test switch is not included in the delivery)	1KHL400253R0001

9.1.6 Wall mounting kit for an IED

- Mounting brackets
- Screws
- Dimensions for screw holes

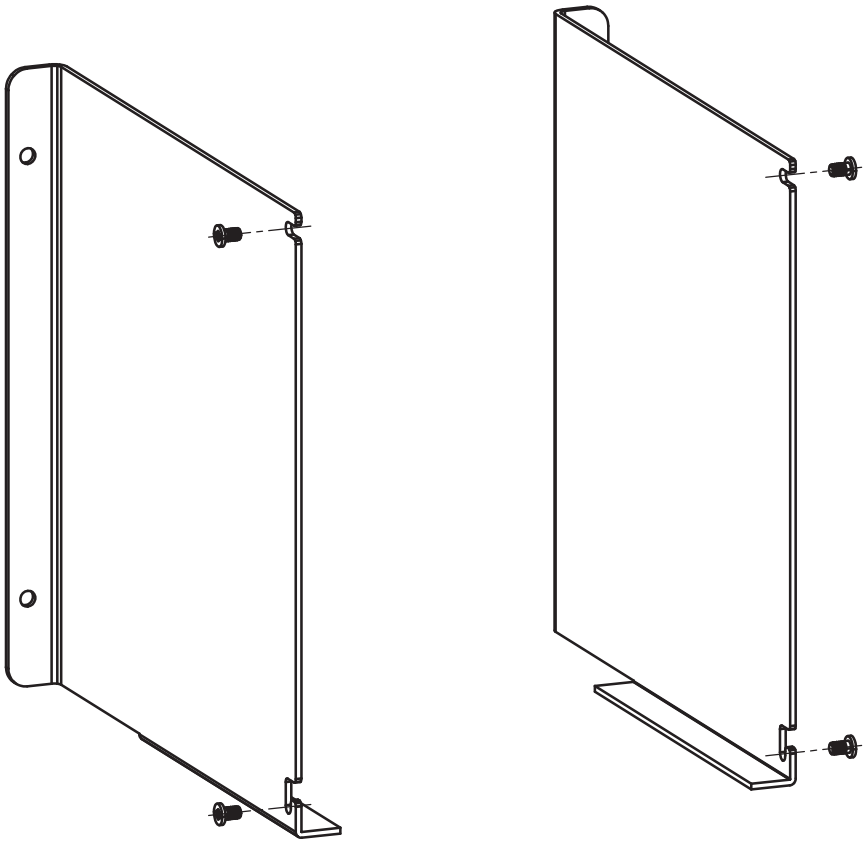

Figure 27: 6U wall mounting brackets

Table 12: Mounting kit

Items	Order number
Wall-mounting kit (cabling towards the mounting wall) for one 6U half 19” housing IED	1KHL400200R0001

Section 10 Glossary

AC	Alternating current
ACT	Application configuration tool within PCM600
A/D converter	Analog to digital converter
ADBS	Amplitude dead-band supervision
ANSI	American National Standards Institute
AR	Autoreclosing
ASCT	Auxiliary summation current transformer
ASD	Adaptive signal detection
AWG	American Wire Gauge standard
BR	External bi-stable relay
BS	British standard
CAN	Controller Area Network. ISO standard (ISO 11898) for serial communication
CB	Circuit breaker
CCITT	Consultative Committee for International Telegraph and Telephony. A United Nations sponsored standards body within the International Telecommunications Union.
CCVT	Capacitive Coupled Voltage Transformer
Class C	Protection Current Transformer class as per IEEE/ ANSI
CMPPS	Combined mega pulses per second
CO cycle	Close-open cycle
Co-directional	Way of transmitting G.703 over a balanced line. Involves two twisted pairs making it possible to transmit information in both directions
COMTRADE	Standard format according to IEC 60255-24
Contra-directional	Way of transmitting G.703 over a balanced line. Involves four twisted pairs of with two are used for transmitting data in both directions, and two pairs for transmitting clock signals
CPU	Central processor unit
CR	Carrier receive
CRC	Cyclic redundancy check
CS	Carrier send

CT	Current transformer
CVT	Capacitive voltage transformer
DAR	Delayed auto-reclosing
DARPA	Defense Advanced Research Projects Agency (The US developer of the TCP/IP protocol etc.)
DBDL	Dead bus dead line
DBLL	Dead bus live line
DC	Direct current
DFT	Discrete Fourier transform
DIP-switch	Small switch mounted on a printed circuit board
DLLB	Dead line live bus
DNP	Distributed Network Protocol as per IEEE/ANSI Std. 1379-2000
DR	Disturbance recorder
DRAM	Dynamic random access memory
DRH	Disturbance report handler
DSP	Digital signal processor
DTT	Direct transfer trip scheme
EHV network	Extra high voltage network
EIA	Electronic Industries Association
EMC	Electro magnetic compatibility
EMF	Electro motive force
EMI	Electro magnetic interference
EnFP	End fault protection
ESD	Electrostatic discharge
FOX 20	Modular 20 channel telecommunication system for speech, data and protection signals
FOX 512/515	Access multiplexer
FOX 6Plus	Compact, time-division multiplexer for the transmission of up to seven duplex channels of digital data over optical fibers
G.703	Electrical and functional description for digital lines used by local telephone companies. Can be transported over balanced and unbalanced lines
GCM	Communication interface module with carrier of GPS receiver module
GDE	Graphical display editor within PCM600

GI	General interrogation command
GIS	Gas insulated switchgear
GOOSE	Generic object oriented substation event
GPS	Global positioning system
HDLC protocol	High level data link control, protocol based on the HDLC standard
HFBR connector type	Plastic fiber connector
HMI	Human machine interface
HSAR	High speed auto reclosing
HV	High voltage
HVDC	High voltage direct current
IDBS	Integrating dead band supervision
IEC	International Electrical Committee
IEC 60044-6	IEC Standard, Instrument transformers – Part 6: Requirements for protective current transformers for transient performance
IEC 61850	Substation Automation communication standard
IEEE	Institute of Electrical and Electronics Engineers
IEEE 802.12	A network technology standard that provides 100 Mbits/s on twisted-pair or optical fiber cable
IEEE P1386.1	PCI Mezzanine card (PMC) standard for local bus modules. References the CMC (IEEE P1386, also known as Common mezzanine card) standard for the mechanics and the PCI specifications from the PCI SIG (Special Interest Group) for the electrical EMF Electro Motive Force.
IED	Intelligent electronic device
I-GIS	Intelligent gas insulated switchgear
Instance	When several occurrences of the same function are available in the IED they are referred to as instances of that function. One instance of a function is identical to another of the same kind but will have a different number in the IED user interfaces. The word instance is sometimes defined as an item of information that is representative of a type. In the same way an instance of a function in the IED is representative of a type of function.
IP	1. Internet protocol. The network layer for the TCP/IP protocol suite widely used on Ethernet networks. IP is a connectionless, best-effort packet switching protocol. It

	provides packet routing, fragmentation and re-assembly through the data link layer. 2. Ingression protection according to IEC standard
IP 20	Ingression protection, according to IEC standard, level 20
IP 40	Ingression protection, according to IEC standard, level 40
IP 54	Ingression protection, according to IEC standard, level 54
IRF	Internal fail signal
IRIG-B:	InterRange Instrumentation Group Time code format B, standard 200
ITU	International Telecommunications Union
LAN	Local area network
LIB 520	High voltage software module
LCD	Liquid crystal display
LDD	Local detection device
LED	Light emitting diode
MCB	Miniature circuit breaker
MCM	Mezzanine carrier module
MVB	Multifunction vehicle bus. Standardized serial bus originally developed for use in trains.
NCC	National Control Centre
OCO cycle	Open-close-open cycle
OCP	Overcurrent protection
OLTC	On load tap changer
OV	Over voltage
Overreach	A term used to describe how the relay behaves during a fault condition. For example a distance relay is over-reaching when the impedance presented to it is smaller than the apparent impedance to the fault applied to the balance point, i.e. the set reach. The relay “sees” the fault but perhaps it should not have seen it.
PCI	Peripheral component interconnect, a local data bus
PCM	Pulse code modulation
PCM600	Protection and control IED manager
PC-MIP	Mezzanine card standard
PISA	Process interface for sensors & actuators
PMC	PCI Mezzanine card
POTT	Permissive overreach transfer trip

Process bus	Bus or LAN used at the process level, that is, in near proximity to the measured and/or controlled components
PSM	Power supply module
PST	Parameter setting tool within PCM600
PT ratio	Potential transformer or voltage transformer ratio
PUTT	Permissive underreach transfer trip
RASC	Synchrocheck relay, COMBIFLEX
RCA	Relay characteristic angle
REVAL	Evaluation software
RFPP	Resistance for phase-to-phase faults
RFPE	Resistance for phase-to-earth faults
RISC	Reduced instruction set computer
RMS value	Root mean square value
RS422	A balanced serial interface for the transmission of digital data in point-to-point connections
RS485	Serial link according to EIA standard RS485
RTC	Real time clock
RTU	Remote terminal unit
SA	Substation Automation
SC	Switch or push-button to close
SCS	Station control system
SCT	System configuration tool according to standard IEC 61850
SMA connector	Subminiature version A, A threaded connector with constant impedance.
SMT	Signal matrix tool within PCM600
SMS	Station monitoring system
SNTP	Simple network time protocol – is used to synchronize computer clocks on local area networks. This reduces the requirement to have accurate hardware clocks in every embedded system in a network. Each embedded node can instead synchronize with a remote clock, providing the required accuracy.
SRY	Switch for CB ready condition
ST	Switch or push-button to trip
Starpoint	Neutral point of transformer or generator
SVC	Static VAr compensation
TC	Trip coil

TCS	Trip circuit supervision
TCP	Transmission control protocol. The most common transport layer protocol used on Ethernet and the Internet.
TCP/IP	Transmission control protocol over Internet Protocol. The de facto standard Ethernet protocols incorporated into 4.2BSD Unix. TCP/IP was developed by DARPA for internet working and encompasses both network layer and transport layer protocols. While TCP and IP specify two protocols at specific protocol layers, TCP/IP is often used to refer to the entire US Department of Defense protocol suite based upon these, including Telnet, FTP, UDP and RDP.
TNC connector	Threaded Neill Concelman, A threaded constant impedance version of a BNC connector
TPZ, TPY, TPX, TPS	Current transformer class according to IEC
Underreach	A term used to describe how the relay behaves during a fault condition. For example a distance relay is under-reaching when the impedance presented to it is greater than the apparent impedance to the fault applied to the balance point, i.e. the set reach. The relay does not “see” the fault but perhaps it should have seen it. See also Overreach.
U/I-PISA	Process interface components that deliver measured voltage and current values
UTC	Coordinated universal time. A coordinated time scale, maintained by the Bureau International des Poids et Mesures (BIPM), which forms the basis of a coordinated dissemination of standard frequencies and time signals. UTC is derived from International Atomic Time (TAI) by the addition of a whole number of "leap seconds" to synchronize it with Universal Time 1 (UT1), thus allowing for the eccentricity of the Earth"s orbit, the rotational axis tilt (23.5 degrees), but still showing the Earth"s irregular rotation, on which UT1 is based. The Coordinated Universal Time is expressed using a 24-hour clock and uses the Gregorian calendar. It is used for aeroplane and ship navigation, where it also sometimes known by the military name, "Zulu time". "Zulu" in the phonetic alphabet stands for "Z" which stands for longitude zero.
UV	Undervoltage
WEI	Weak end infeed logic
VT	Voltage transformer
X.21	A digital signalling interface primarily used for telecom equipment

$3I_O$	Three times zero-sequence current. Often referred to as the residual or the earth-fault current
$3U_O$	Three times the zero sequence voltage. Often referred to as the residual voltage or the neutral point voltage

Contact us

ABB AB
Substation Automation Products
SE-721 59 Västerås, Sweden
Phone +48 (0) 21 34 20 00
Fax +48 (0) 21 14 69 18

www.abb.com/substationautomation

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