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www.abb.com/mediumvoltage
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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 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2014/35/EU). This conformity is the result of tests conducted by the third party testing laboratory Intertek in accordance with the product standard 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

<table>
<thead>
<tr>
<th>Document revision/date</th>
<th>Product connectivity level</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/2018-12-14</td>
<td>PCL1</td>
<td>First release</td>
</tr>
<tr>
<td>B/2019-08-15</td>
<td>PCL1</td>
<td>Content updated</td>
</tr>
<tr>
<td>C/2020-02-13</td>
<td>PCL2</td>
<td>Content updated to correspond to the product connectivity level</td>
</tr>
</tbody>
</table>

1.3.3 Related documentation

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.
• Menu paths are presented in bold. Select **Main menu/Settings**.
• Parameter names are shown in italics. The function can be enabled and disabled with the *Operation setting*.
• Parameter values are indicated with quotation marks. The corresponding parameter values are "On" and "Off".
• Input/output messages and monitored data names are shown in Courier font.
When the function starts, the START output is set to TRUE.

- This document assumes that the parameter setting visibility is "Advanced".
- Protective earthing is indicated in figures with the symbol ⬇️.
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 device.

The choice of materials and suppliers has been made according to the EU RoHS directive (2011/65/EU). This directive limits the use of hazardous substances.

Operational reliability and long life time have been ensured 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 device

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 device 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 1: Materials of the protection relay parts

<table>
<thead>
<tr>
<th>Protection relay</th>
<th>Parts</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Casted enclosure</td>
<td>Aluminium</td>
</tr>
<tr>
<td></td>
<td>Metallic plates</td>
<td>Aluminium</td>
</tr>
<tr>
<td></td>
<td>Screws, bushes</td>
<td>Steel</td>
</tr>
<tr>
<td></td>
<td>Plastic parts</td>
<td>PC&lt;sup&gt;1&lt;/sup&gt;, LCP&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>LHMI</td>
<td>Various</td>
</tr>
<tr>
<td>Package</td>
<td>Box</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Attached material</td>
<td>Manuals</td>
<td>Paper</td>
</tr>
</tbody>
</table>

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.
3. Attach the protective cover (supplied with the relay) on the top side of the relay for the installation phase.

Figure 2: Attaching the protective cover on the top of the relay

The cardboard packaging material is 100% recyclable.
3.2 Inspecting product and delivery items

3.2.1 Identifying product

1. Locate the protection relay's order number on the label attached to the protection relay'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.

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

- TX25 and TX30 screwdrivers for installing the protection relay with mounting kits
- TX25 and TX20 screwdrivers for mounting the LHMI

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 options

4.3.1 Mounting local HMI

4.3.1.1 Flush mounting local HMI

1. Make a cutout for the LHMI according to the dimensional drawing.
Section 4
Mounting

Figure 3: Making a cutout

A  188 ±1 mm
B  151 ±1 mm

2. Mount the LHMI to the cutout with the installation brackets and screws.
Figure 4: Mounting the LHMI to the cutout

1. LHMI
2. Installation brackets
3. Screws

3. Tighten the screws evenly to 3.5 Nm ±5%.
Figure 5: Tightening the screws

1 Screws
4.3.1.2 Surface mounting local HMI

1. Make a cutout for the LHMI and drill holes for the raising frame according to the dimensional drawing.
Figure 7: Making a cutout and drilling holes

A  197 ±1 mm
B  ∅ 6.0 mm
C  209 ±1 mm
D  179 ±0.4 mm
E  213 ±0.4 mm

2. Mount the raising frame to the panel with the M5 screws.
3. Tighten the screws to 4 Nm ±5%.
4. Mount the LHMI with the installation brackets
Figure 9: Mounting the LHMI

1 Installation brackets
Figure 10: Surface mounted LHMI

A 230.0 mm  
B 235.0 mm  
C 56.0 mm  
D 3.5 mm

4.3.1.3 Tilt/inclined mounting local HMI

1. Make a cutout for the LHMI and drill holes for the raising frame according to the dimensional drawing.
2. Mount the tilt frame to the panel with M5 screws.
Figure 12: Mounting the raising frame

1  Tilt frame
2  M5 screws

3. Tighten the screws to 4 Nm ±5%.
4. Mount the LHMI with the installation brackets
Figure 13: Mounting the LHMI

1 Installation brackets
4.3.2 Mounting protection relay

4.3.2.1 Wall mounting protection relay

1. Drill four M5 screw holes according to the dimensional drawing.
2. Mount the M5 screws in the upper holes, but do not tighten them. Leave them 3...4 mm open.
Figure 16: Mounting M5 screws in the upper holes

1. M5 screws

3. Attach the mounting bracket to the protection relay with M6 screws and tighten the screws to 9 Nm ±5%.
Figure 17: Mounting M6 screws

1. Mounting bracket
2. M6 screws

4. Lift the protection relay to its place on the existing screws on the panel.
5. Mount the M5 screws in the bottom holes.
6. Tighten all the M5 screws.
Figure 18: Mounting and tightening the M5 screws

1 M5 screws
4.3.2.2 Roof mounting protection relay

1. Drill M5 screw holes or through holes to the roof inside the cabinet according to the dimensional drawing.

A minimum of 50 mm space is needed between two kits.

Check the allowed minimum bending radius from the optical cable manufacturer.
A minimum of 50 mm space is needed from the back wall.

Figure 20: Drilling screw holes

- A 387.0 ±0.4 mm 1 M5 screw
- B ∅ 6.0 mm
- C 175.0 ±0.4 mm
- D 140.0 ±0.4 mm
- E min. 32.5 mm
- F min. 50 mm

2. Mount the roof mounting bracket to the roof with M5 screws using either the through holes on top of the cabinet or the M5 holes in the roof inside the cabinet.
3. Mount the M5 screws in the upper M5 holes of the roof mounting bracket, but do not tighten them. Leave them 3...4 mm open.
Figure 21: Mounting M5 screws

1. Upper M5 hole
2. Roof mounting bracket
3. M5 screws for holes on top of the cabinet
4. M5 screws for holes inside the cabinet

4. Attach the mounting bracket to the protection relay with M6 screws and tighten the screws to 9 Nm ±5%.
5. Lift the protection relay to its place on the existing screws on the roof mounting bracket.
6. Mount the M5 screws in the bottom holes.
7. Tighten the four M5 screws on the roof mounting bracket to 4 Nm ±5%.
Figure 23: Mounting and tightening the M5 screws

1 M5 screws
**4.3.2.3** Door mounting protection relay

1. Drill holes according to the dimensional drawing.
2. Mount the protection relay to the door or panel with the M6 screws.

Figure 25: Drilling holes

A  249 ±0.4 mm
B  Ø 7.0 mm
C  245 ±0.4 mm
Figure 26: Mounting the protection relay to the door

1. M6 screws

3. Tighten the four M6 screws to 9 Nm ±5%.
Figure 27: Tightening the M6 screws

1 M6 screws
Figure 28: Door mounted protection relay

A 264.8 mm  
B 304.0 mm  
C 242.2 mm with compression type CT/VT connectors  
254.1 mm with ring lug type CT/VT connectors  
274.0 mm with grounding bar

4.3.2.4 Rack mounting protection relay

1. Attach the protection relay to a 7U rack plate with M6 screws.  
2. Tighten the M6 screws to 9 Nm ±5%.
Section 4
Mounting

Figure 29: Mounting the protection relay to the rack plate

1. Mount the protection relay and rack plate to a 19" rack. The rack plate can also be mounted to the rack before the protection relay is attached to it.

2. Tighten the screws.

3. Mount the protection relay and rack plate to a 19" rack. The rack plate can also be mounted to the rack before the protection relay is attached to it.

4. Tighten the screws.
4.3.3 Mounting protection relay with local HMI

4.3.3.1 Door mounting protection relay with local HMI

1. Make a cutout for the LHMI and drill holes for the mounting bracket according to the dimensional drawing.

---

**Figure 30:** Rack mounted protection relay

A  482.60 mm (19")
B  310.35 mm (7U)
C  242.20 mm with compression type CT/VT connectors
    254.10 mm with ring lug type CT/VT connectors
    274.00 mm with grounding bar

Check the allowed minimum bending radius from the optical cable manufacturer.
2. Mount the LHMI and the mounting bracket to the door panel.
   2.1. Mount the LHMI with its own installation brackets to the LHMI cutout.
   2.2. Mount the mounting bracket to the door panel with the M5 screws.
   2.3. Tighten the M5 screws to 4 Nm ±5%.
   2.4. Mount the M5 screws in the upper holes of the mounting bracket, but do not tighten them. Leave them 3...4 mm open.
3. Attach the mounting bracket to the protection relay with the M6 screws.

Figure 32: Mounting the LHMI and mounting brackets

1. M5 screws
2. LHMI installation brackets
3. Mounting bracket
4. Tighten the M6 screws to 9 Nm ±5%.
5. Lift the protection relay to its place on the existing screws on the bracket.
6. Mount the M5 screws in the bottom holes.
7. Tighten the four M5 screws to 4 Nm ±5%.
Figure 34: Mounting and tightening the M5 screws

1 M5 screws
Figure 35: Door mounted protection relay with LHMI

A 265.0 mm
B 339.0 mm
C 313.2 mm with compression type CT/VT connectors
    325.1 mm with ring lug type CT/VT connectors
    345.0 mm with grounding bar
D 7.6 mm
E 212.5 mm
F 177.5 mm

4.3.3.2 Rack mounting protection relay with local HMI

1. Mount the LHMI and the mounting bracket to the rack plate.
   1.1. Attach the 7U rack plate to the rack frame.
   1.2. Mount the LHMI with its own installation brackets to the LHMI cutout.
   1.3. Mount the mounting bracket to the 7U rack plate with M5 screws.
   1.4. Tighten the M5 screws to 4 Nm ±5%.
   1.5. Mount the M5 screws in the upper holes of the mounting bracket, but do not tighten them. Leave them 3...4 mm open.
Figure 36: Mounting the LHMI and mounting bracket

1. M5 screws
2. 7U rack plate
3. LHMI installation brackets
4. Mounting bracket

2. Install the RJ-45 coupler with a cable to the panel cutout and connect the cable to the LHMI service port X1.2.
3. Attach the mounting bracket to the protection relay with M6 screws.
4. Tighten the M6 screws to 9 Nm ±5%.

Figure 37: Installing the RJ-45 coupler

1. RJ-45 coupler
Figure 38: Mounting M6 screws

1. Mounting bracket
2. M6 screws

5. Lift the protection relay to its place on the existing screws on the mounting bracket.
6. Mount the M5 screws in the bottom holes.
7. Tighten the four M5 screws on the mounting bracket to 4 Nm ±5%.
Figure 39: Mounting and tightening the M5 screws

1 M5 screws
4.3.4 Mounting grounding bar kit

1. Detach the module from the protection relay.
2. Place the grounding bar between the front plates' bendings and mount it to the front plate with M3 screws and washers.
Figure 41: Mounting grounding bar

1. Module
2. Grounding bar
3. M3 screws and washers
4. Edge with chamfer towards the module's collar screw

3. Tighten the M3 screws to 0.8 Nm ±5%.
4. Install the module back to the same slot in the protection relay.
5. Install connectors with cables to the module.

Use peeled cables to get contact to the grounding bar.
6. Install shield clamps to connect the cable sheathing to the grounding bar.

Figure 43: Installing connectors

1 Connectors with cables
4.3.5 Mounting lens sensors for an arc protection system

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

1. Drill a hole (Ø 10 mm) in the wall of the supervised space.
2. Fit the lens sensor into the hole and fasten it with a self-tapping M3 screw. Alternatively, the lens sensor can be fastened with a cable tie. To do this, secure the cable tie to a suitable point of attachment on the cubicle wall and wrap the cable tie tightly around the sensor.
Figure 46: Mounting the lens sensor

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

4.3.6 Arranging ventilation

- Reserve sufficient space round the protection relay to ensure adequate ventilation.
Section 5 Connecting

5.1 Required tools

Table 2: Tools for connector installation

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Tool for anchoring connector</th>
<th>Tool for connecting wire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slotted head (DIN 5264) (mm)</td>
<td>ISO 8764/2 (mm)</td>
</tr>
<tr>
<td>CT/VT connectors</td>
<td>Compression</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Ring lug</td>
<td>1.0x4</td>
</tr>
<tr>
<td>Signal connectors</td>
<td>Compression</td>
<td>PH 0, PZ 0</td>
</tr>
<tr>
<td></td>
<td>Ring lug</td>
<td>PH 2</td>
</tr>
<tr>
<td></td>
<td>Push-in</td>
<td>0.6x3.5</td>
</tr>
<tr>
<td>IRIG-B connector</td>
<td>IRIG-B</td>
<td>0.4x2.5</td>
</tr>
</tbody>
</table>

5.2 Connecting wires

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

1. Connect signal connector terminals.
2. Connect compression type (X1 and X2) terminals for CTs/VTs.
3. Connect the terminals on the communication module for IRIG-B.
4. Connect the RTD inputs and mA outputs using shielded stranded cables and connect the cable shield to GND rail.
5. Connect all the sensors of the same type 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 wires to screw-compression type connectors

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.

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Wire size (mm²)</th>
<th>Crimp ferrule (mm²)</th>
<th>Stripping length (mm)</th>
<th>Contact screw tightening torque (Nm)</th>
<th>Anchoring screw tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT/VT connectors</td>
<td>0.14...6</td>
<td>0.25...4&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>9</td>
<td>0.6...0.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Signal connector</td>
<td>0.2...4</td>
<td>0.2...2.5&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>7</td>
<td>0.4...0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Serial EIA-485 /IRIG-B connector</td>
<td>0.2...1.0</td>
<td>0.13...0.34</td>
<td>7...8</td>
<td>-</td>
<td>0.2</td>
</tr>
</tbody>
</table>

<sup>1)</sup> In case of insulated crimp ferrules, TWIN ferrules need to be used with daisy chain requirement (2x2.5 mm²), two conductors without crimp ferrule with the same cross section 0.14...1.5 mm²

<sup>2)</sup> For two wires 2x(0.2...1.5) mm²

## 5.2.2 Connecting wires to ring-lug type connectors

Terminal blocks of ring-lug type are used for electrical connections.

1. Connect a suitable ring lug to the cable.
2. Remove the contact screws from the connector, thread the ring-lug cable lug to the terminal screw and tighten the screw.
Table 4: Wire specifications for ring-lug type connectors

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Wire size (mm²)</th>
<th>Stripping length (mm)</th>
<th>Contact screw tightening torque (Nm)</th>
<th>Anchoring screw tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stranded</td>
<td>0.5...6</td>
<td>1)</td>
<td>1.2...1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Crimp ferrule</td>
<td></td>
<td>2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal</td>
<td>0.13...3.3³</td>
<td>3)</td>
<td>1.13</td>
<td>0.35</td>
</tr>
<tr>
<td>connectors</td>
<td></td>
<td>4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Depends on the cable lug
2) Recommended ring lug connectors: C-RCI 1.5/M4 3240018, C-RCI 2.5/M4 3240023 and C-RCI 6/M4 3240027
3) For two wires 2x(0.2...1.5) mm²
4) Insulated ring lug M3, max outside diameter 8 mm

5.2.3 Connecting wires to push-in type connectors

Terminal blocks of push-in type are used for electrical connections.

1. Connect the wire in one of the alternative ways.
   • When using stranded wire without ferrule, push the connector's release button while inserting the wire.
   • When using wire with end ferrule, insert the wire without pushing the release button.

Table 5: Wire specifications for push-in type connectors

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Wire size (mm²)</th>
<th>Stripping length (mm)</th>
<th>Contact screw tightening torque (Nm)</th>
<th>Anchoring screw tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal</td>
<td>0.2...2.5</td>
<td>10</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td>connectors</td>
<td>0.2...2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3 Connecting protective earthing

5.3.1 Connecting protective earthing to relay

Connect the protection relay to earth using a 16.0 mm² flat copper cable. Use an earth lead of maximum 1.5 m. Extra length is required for door mounting.

1. Using a TX30 screwdriver, loosen the protective earth screw to connect a separate earth protection lead.
Figure 47: Location of the protective earth pin

Each protection relay 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.
4. Tighten the protective earth screw to 6 Nm ±5%.
5. Support the earth lead so that it cannot break or weaken.
   Observe the mechanical, chemical or electrochemical conditions.

5.3.2 Connecting protective earthing to local HMI

Connect the LHMI to earth using an earth lead of at least 6.0 mm$^2$.

1. Loosen the protective earth screw T20 on the LHMI to connect a separate earth protection lead.
2. Tighten the protective earth screw to 1.5 Nm ±10%.

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 protection relay. The connector features an automatic short circuit mechanism for the current terminals. Therefore, detaching the connector from the unit does 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 color coded. The light gray pairs with short circuit facility are intended for CTs while the dark gray pairs without short circuit facility are for VTs. The counterpart connectors on the module have the same color coding.
Figure 49: Identifying CT/VT color coding

1. Light gray pairs with short circuit facility (CT), RAL7035
2. Dark gray pairs without short circuit facility (VT), RAL7042

Figure 50: Loose CT/VT connector coding

1. CT connector coding
2. VT connector coding
3. Empty connector
5.4.1 Connecting current and voltage inputs

Each terminal for CTs/VTs is dimensioned for one 0.5...6.0 mm² wire or for two wires of maximum 2.5 mm².

- Connect the wires from the CTs/VTs to the correct device according to the phase order and the connection diagram.
Figure 52: AIM1001
Figure 53: AIM1002
Figure 54: SIM1901
5.4.2 Connecting RTD and mA inputs

- Connect the wires from the transducers to the correct device. Each terminal for RTDs and mA inputs is dimensioned for one 0.5...2.5 mm² wire or for two 0.5...1.0 mm² wires.
5.4.2.1 Shielding RTD/mA instrument cables

1. Install connectors with cables to the module.
Strip the cables to ensure contact to the grounding bar. The cable position affects the stripping length and position.

Figure 57: Installing connectors

1. Connectors with cables A/B Examples of stripping length and position

2. Install shield clamps to connect the cable sheathing to the grounding bar.
Section 5
Connecting

5.5 Connecting binary signals

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

Figure 58: Installing shield clamps

1 Shield clamp
Figure 59: \textit{BIO1001/BIO1003}
Figure 60: BIO1002/BIO1004
5.6 Connecting power supply

The permitted auxiliary voltage range is found on the protection relay's sticker.

- Connect the protection relay's auxiliary voltage to slot G terminal X1:1-2.
- Connect the positive lead to terminal X1:1.
5.7 Connecting communication

- Before connecting communication, check that the HW module has the correct communication interfaces. The communication module is located in slot A2.

See the technical manual for the communication interfaces.

Check the allowed minimum bending radius from the optical cable manufacturer.
5.7.1 Connecting protection communication

Port X6/LD of the communication module is used for protection communication connection. As the optional SFP transceiver is not attached to the port at the time of delivery, it needs to be installed to port X6/LD if protection communication is used.

1. Remove the dust cap from port X6/LD to expose the SFP socket.
2. Plug the SFP transceiver into the socket and ensure that the transceiver is seated and latched properly, that is, the locking lever is on the upper position.
3. Remove the dust cap of the SFP transceiver.
4. Connect the fiber-optic cable to the SFP transceiver.

<i>Do not remove the dust cap from the SFP transceiver if the fiber-optic cable is not immediately connected to the SFP transceiver.</i>

5.8 Connecting external display module

<i>Only one LHMI module can be connected to a protection relay.</i>

1. Connect the LHMI’s power connector.
   1.1. Check the permitted auxiliary voltage range from the sticker found at the rear side of the LHMI.
   1.2. Connect the auxiliary voltage leads to the outermost terminals of the LHMI's power connector plug. The polarity is marked on the LHMI's rear plate close to connector X3.
   1.3. Push the power connector plug to the bottom.
   1.4. Turn the locking latches to lock position to secure the connector.
2. Connect the LHMI to the protection relay.
   2.1. Use a CAT6 S/FTP cable to connect the LHMI to the protection relay. See Accessories and ordering data for the cable options.
   2.2. Connect the cable to the X1.1/Main unit connector on the LHMI and to the X0/HMI connector on the protection relay's communication module.
Figure 63: LHMI connectors

1 USB port
2 RJ-45 ports
Section 6 Checking installation

6.1 Identifying hardware and software version

- Check the label on the case of the protection relay for the hardware and software version information.
- Check the module labels to identify the modules inside the protection relay.

6.2 Checking mounting

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

6.3 Energizing protection relay

Check all connections to external circuitry to ensure correct installation before energizing the protection relay and carrying out the commissioning procedures. Also, remove the protective film.

Figure 64: Removing the protective film
1. Energize the power supply of the protection relay and the optional LHMI. This can be done in a number of ways, from energizing a whole cubicle to energizing a single protection relay. The following sequence is expected when the protection relay is energized:
   - The green Ready LED starts flashing instantly on the power supply module of the protection relay.
   - Within 90 seconds both the green Ready LED of the power supply module and the Home button on the LHMI show a steady light which indicates a successful start-up.
   
   The start-up time depends on the size of the application configuration. Application configurations with less functionality have shorter start-up times.

2. Check the self-supervision function via the HMI path **Monitoring/IED status** to verify that the protection relay operates properly.

   If the green Ready LED of the power supply module and the Home button on the LHMI continue to flash after the start-up, the protection relay has detected an internal error. Navigate to **Monitoring/IED status** to investigate the error description.
Section 7 Removing, repairing and exchanging

7.1 Product life cycle

At some point of the product life cycle, 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 life cycle.

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

7.2 Checking protection relay's information

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

- Check the protection relay's information in one of the alternative ways.
  - Select Menu bar/Device information/Product identifiers on the HMI.
  - Select Device information/Product identifiers on the WHMI.

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 protection relay

- Before removing the protection relay, make sure that the 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 in the PartsOnLine system, see 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  Local HMI

Figure 65:  LHMI connectors

1  USB port
2  RJ-45 ports
8.2 Connector side

Figure 66: Connector side of the protection relay

1 Slot markings in enclosure (top and bottom)
2 Ready LED
8.3 Dimensions

Figure 67: REX640 main dimensions

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>304.0 mm</td>
</tr>
<tr>
<td>Height</td>
<td>264.8 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>With compression type CT/VT connectors 242.2 mm</td>
</tr>
<tr>
<td></td>
<td>With ring lug type CT/VT connectors 254.1 mm</td>
</tr>
<tr>
<td></td>
<td>With grounding bar 274.0 mm</td>
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<tr>
<td>Weight box</td>
<td>6.9...8.8 kg</td>
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</tbody>
</table>
### Table 7: Dimensions of the LHMI

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>212.5 mm</td>
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<tr>
<td>Height</td>
<td>177.5 mm</td>
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<tr>
<td>Depth</td>
<td>57.6 mm</td>
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<tr>
<td>Weight</td>
<td>1.6 kg</td>
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### 8.4 Enclosure class

### Table 8: Degree of protection of the protection relay

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front/connector side</td>
<td>IP 20 (with ring-lug signal connectors IP 00 or IP 10 depending on wiring)</td>
</tr>
<tr>
<td>Top and bottom</td>
<td>IP 30</td>
</tr>
<tr>
<td>Rear</td>
<td>IP 40</td>
</tr>
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</table>

### Table 9: Degree of protection of the LHMI

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>IP 54</td>
</tr>
<tr>
<td>Other sides</td>
<td>IP 20</td>
</tr>
</tbody>
</table>
Figure 68: REX640 sides

1 Side
2 Top
3 Rear
4 Front/connector side
5 Bottom
### Section 9  Accessories and ordering data

#### Table 10: Local HMI

<table>
<thead>
<tr>
<th>Item</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHMI</td>
<td>2RCA033008A0001</td>
</tr>
<tr>
<td>LHMI, conformal coated</td>
<td>2RCA033008A0901</td>
</tr>
<tr>
<td>1 m connection cable for LHMI</td>
<td>1MRS120549-1</td>
</tr>
<tr>
<td>2 m connection cable for LHMI</td>
<td>1MRS120549-2</td>
</tr>
<tr>
<td>3 m connection cable for LHMI</td>
<td>1MRS120549-3</td>
</tr>
<tr>
<td>5 m connection cable for LHMI</td>
<td>1MRS120549-5</td>
</tr>
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</table>

#### Table 11: Communication

<table>
<thead>
<tr>
<th>Item</th>
<th>Order number</th>
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</thead>
<tbody>
<tr>
<td>LC SFP plug-in connector for optical multimode media 100M</td>
<td>2RCA045621</td>
</tr>
<tr>
<td>LC SFP plug-in connector for optical single-mode media 100M, 20 km</td>
<td>2RCA045622</td>
</tr>
<tr>
<td>LC SFP plug-in connector for optical single-mode media 100M, 50 km</td>
<td>2RCA045623</td>
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</table>

#### Table 12: Mounting

<table>
<thead>
<tr>
<th>Item</th>
<th>Order number</th>
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</thead>
<tbody>
<tr>
<td>Back wall / side wall mounting kit</td>
<td>2RCA040872A0001</td>
</tr>
<tr>
<td>Roof mounting kit</td>
<td>2RCA040873A0001</td>
</tr>
<tr>
<td>Door mounting with LHMI</td>
<td>2RCA040882A0001</td>
</tr>
<tr>
<td>19&quot; relay rack mounting with LHMI</td>
<td>2RCA041125A0001</td>
</tr>
<tr>
<td>19&quot; relay rack mounting without LHMI</td>
<td>2RCA041127A0001</td>
</tr>
<tr>
<td>19&quot; rack mounting with LHMI and test switch, 6U</td>
<td>2RCA051496A0001</td>
</tr>
<tr>
<td>19&quot; rack mounting with LHMI and test switch, 7U</td>
<td>2RCA051503A0001</td>
</tr>
<tr>
<td>Surface mounting kit for LHMI</td>
<td>2RCA038783A0001</td>
</tr>
<tr>
<td>Tilt mounting kit for LHMI</td>
<td>2RCA038782A0001</td>
</tr>
<tr>
<td>Grounding bar kit for RTD module</td>
<td>2RCA039981A0001</td>
</tr>
</tbody>
</table>
### Table 13: Arc sensors

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>ARC lens sensor cable 1.5 m</td>
<td>2RCA040290A0001</td>
</tr>
<tr>
<td>ARC lens sensor cable 3 m</td>
<td>2RCA040290A0003</td>
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<tr>
<td>ARC lens sensor cable 5 m</td>
<td>2RCA040290A0005</td>
</tr>
<tr>
<td>ARC lens sensor cable 7.5 m</td>
<td>2RCA040290A0007</td>
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<tr>
<td>ARC lens sensor cable 15 m</td>
<td>2RCA040290A0015</td>
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<tr>
<td>ARC loop sensor cable 5 m (plastic fiber)</td>
<td>2RCA051658A0005</td>
</tr>
<tr>
<td>ARC loop sensor cable 10 m (plastic fiber)</td>
<td>2RCA051658A0010</td>
</tr>
<tr>
<td>ARC loop sensor cable 15 m (plastic fiber)</td>
<td>2RCA051658A0015</td>
</tr>
<tr>
<td>ARC loop sensor cable 20 m (plastic fiber)</td>
<td>2RCA051658A0020</td>
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<tr>
<td>ARC loop sensor cable 25 m (plastic fiber)</td>
<td>2RCA051658A0025</td>
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<tr>
<td>ARC loop sensor cable 30 m (plastic fiber)</td>
<td>2RCA051658A0030</td>
</tr>
<tr>
<td>ARC loop sensor cable 40 m (glass fiber)</td>
<td>2RCA041050A0040</td>
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<tr>
<td>ARC loop sensor cable 50 m (glass fiber)</td>
<td>2RCA041050A0050</td>
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<tr>
<td>ARC loop sensor cable 60 m (glass fiber)</td>
<td>2RCA041050A0060</td>
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<tr>
<td>Blind extension cable for ARC loop sensors, 2 m (to be used with plastic fiber loops only)</td>
<td>2RCA051662A0001</td>
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</table>

### Table 14: Connectors

<table>
<thead>
<tr>
<th>Item</th>
<th>Order number</th>
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<tbody>
<tr>
<td>Compression type signal connectors</td>
<td>SYJ-ZRK 2Z18P1</td>
</tr>
<tr>
<td>Ring lug type signal connectors</td>
<td>SYJ-ZRK 33X18</td>
</tr>
<tr>
<td>Push-in type signal connectors</td>
<td>SYJ-ZRK 53P18PM</td>
</tr>
<tr>
<td>1 CT-1 VT compression type connector</td>
<td>2RCA040474A0004</td>
</tr>
<tr>
<td>5 CT compression type connector</td>
<td>2RCA040474A0001</td>
</tr>
<tr>
<td>5 VT compression type connector</td>
<td>2RCA040474A0002</td>
</tr>
<tr>
<td>1 CT-4 VT compression type connector</td>
<td>2RCA040474A0003</td>
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<td>1 CT-1 VT ring lug type connector</td>
<td>2RCA041297A0004</td>
</tr>
<tr>
<td>5 CT ring lug type connector</td>
<td>2RCA041297A0001</td>
</tr>
<tr>
<td>5 VT ring lug type connector</td>
<td>2RCA041297A0002</td>
</tr>
<tr>
<td>1 CT-4 VT ring lug type connector</td>
<td>2RCA041297A0003</td>
</tr>
<tr>
<td>RS-485/IRIG-B connector</td>
<td>SYJ-ZRK 44P10</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>CT</td>
<td>Current transformer</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>HMI</td>
<td>Human-machine interface</td>
</tr>
<tr>
<td>HW</td>
<td>Hardware</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>LC</td>
<td>Connector type for glass fiber cable, IEC 61754-20</td>
</tr>
<tr>
<td>LCP</td>
<td>Liquid crystal polymer</td>
</tr>
<tr>
<td>LHMI</td>
<td>Local human-machine interface</td>
</tr>
</tbody>
</table>
| PC           | 1. Personal computer  
                 2. Polycarbonate |
| RJ-45        | Galvanic connector type |
| RoHS         | Restriction of hazardous substances |
| RTD          | Resistance temperature detector |
| SW           | Software |
| USB          | Universal serial bus |
| VT           | Voltage transformer |
| WHMI         | Web human-machine interface |