
Relion[®] BIO-Tester 610-611-615-620

User 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 concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2014/35/ EU).

This conformity is the result of partial Safety Approval tests conducted by the third party testing laboratory SGS Fimko Oy in accordance with essential safety requirements as defined in the safety standards EN 61010-1: 2010/ A1:2019, IEC 61010-1: 2010 + AMD1:2016, EN IEC 61010-2-030: 2021, and IEC 61010-2-030: 2017.

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 trained and qualified persons are allowed to connect and operate Relion® BIO-Tester 610-611-615-620.



National and local electrical safety regulations must always be followed.



The necessary and required earthing connections must be made according to the product guidelines and regulations.



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



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

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1 Introduction

1.1 This manual

The user manual contains general information about the features of Relion® BIO-Tester 610-611-615-620. The manual presents the different parts of the device, operating guidelines and examples of using the tester in different applications.

1.2 Intended audience

This manual addresses system engineers and installation and commissioning personnel, who use technical data during engineering, installation and commissioning, and in normal service.

The system engineer must have a thorough knowledge of protection systems, protection equipment, protection functions and the configured functional logic in the protection relays. The installation and commissioning personnel must have a basic knowledge of handling electronic equipment.

1.3 Product documentation

1.3.1 Document revision history

Document revision/date	Product version	History
A/2021-06-09	1.0	First release
B/2022-05-02	1.0	Content updated



Download the latest documents from the ABB website
abb.com/mediumvoltage.

1.3.2 Related documentation



Relion® BIO-Tester 610-611-615-620 is intended for testing of Binary Inputs and Outputs of REX610, REF611, REM611, REB611, REU611, REF615, REM615, RET615, REG615, RED615, REU615, REV615, REC615, RER615, REF620, REM620, RET620, RER620 protection relays. See the relevant protection relay's documentation for detailed technical information. Download the latest documents from the ABB website abb.com/relion.



Refer to the Quick operation manual of Relion® BIO-Tester 610-611-615-620 for more information on the operation of the tester.

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 the 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.
- 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`.

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 device parts

Device	Parts	Material
Case	Case	PPC resin ¹
	Metallic parts and screws	Steel
	Plastic parts	PC ² , LCP ³
	Front panel	Aluminium
	Electronic plug-in module	Various
Package	Box	Cardboard

Table continues on the next page

¹ Polypropylene copolymer resin

² Polycarbonate

³ Liquid crystal polymer

Device	Parts	Material
	Filling	PE ⁴
Attached material	Manuals	Paper

⁴ Polyethylene

3 Unpacking, inspecting and storing

3.1 Removing transport packaging

The deliverables 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.

3.2 Inspecting product and delivery items

3.2.1 Identifying product

1. Locate the device's technical details on the label on top of the unit.
2. Compare the device's label with the ordering information to verify that the received product is correct.
3. Position the closed tester unit's case so that the information label is on the top and the handle is facing towards the user.

3.2.2 Checking delivery items

The deliverables require careful handling.

1. Check all delivered items.

- Relion® BIO-Tester 610-611-615-620 in a waterproof case includes:
 - Power supply cable
 - BIO-Tester REX610 A1, B cable
 - BIO-Tester REX610 X1, X2 cable
 - BIO-Tester 611-615-620 X100, X105/X110/X115 cable
 - BIO-Tester 611-615-620 X120, X130 cable
 - BIO-Tester 611-615-620 X120 connector terminal set (4 red + 2 black)



Use only original cables delivered together with the BIO-Tester. Cables are placed in the pocket inside the case. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



Figure 1: Relion® BIO-Tester 610-611-615-620 in a waterproof case



Figure 2: Required cables

2. Notify ABB immediately if there are any discrepancies in relation to the delivery documents.

3.2.3 Inspecting product

- Inspect the device for any visible damage.



Operation of damaged equipment may result in degraded process performance leading to personal injury or death.

If the device has been found damaged on receipt of delivery from ABB, make a claim against the transport company at the time of receipt of the device. Notify the local ABB representative immediately about the damage.

3.2.4 Returning a product damaged during transport

- Contact the local ABB representative and check the device return process for returning a damaged product.

3.2.5 Storing

If the device is stored before its use, it must be done in the original transport packaging in a dry and dust-free place.

- Observe the environmental requirements stated in the technical data.

3.2.6 Cleaning

1. Unplug the power cord from the power supply and unplug all connectors so that all hazardous live parts are disconnected and the device is switched off.
2. Use a dry cloth to clean the surface of Relion® BIO-Tester 610-611-615-620.

4 Relion® BIO-Tester 610-611-615-620

4.1 Application examples

The health of the protection system depends on the quality of work done in all project phases, such as engineering, installation and commissioning, as well as the care taken during routine periodical testing. It is also important to check different engineering, testing and commissioning aspects, such as the application configuration, including relay settings, and protection and control schemes. Applying good engineering practices improves the effectiveness of the protection system, which can prevent equipment damage, and most importantly, ensures personnel safety.

Protection relays are not intended only for protection, but they should also fulfill requirements regarding control, measurement and communication, for instance. Binary inputs and outputs (BIOs) play an important role in the overall operation of protection relays, for example, in various control and interlocking schemes and by generating alarm and trip signals to the circuit breaker. In addition to secondary injection testing of protection functions, it is advisable to check the health of important hardware such as BIOs. Incorrect operation of the control scheme may result in process or revenue loss, including safety threats to the personnel or damage to the equipment. BIOs can be checked already at the primary design stage to ensure the correctness of the logic as well as during routine maintenance and testing.

BIO testers have been developed to facilitate the testing of BIOs and provide several benefits.

- Save time in configuration testing
- Reduce the risk of configuration errors
- Safe to operate
- Easy to use
- Easy to bring on site due to small size
- Create new relay testing and repair service opportunities

Relion® BIO-Tester 610-611-615-620 is intended for testing of Binary Inputs and Outputs of REX610, REF611, REM611, REB611, REU611, REF615, REM615, RET615, REG615, RED615, REU615, REV615, REC615, RER615, REF620, REM620, RET620, RER620 protection relays. This easy-to-use and compact tester enables simulation of the protection and control scheme operation.

The testers can be used for troubleshooting during the application configuration design and for routine maintenance and testing. They help wiring the signals from the test equipment when testing the application configuration during the engineering period. Test switches and indication LEDs simulate process signals when testing the logic IED configuration. PCM600 Application Configuration in online mode and Testing and Commissioning pages of the relevant relay together with BIO-Tester offer many possibilities to test and verify the logic.

When planning periodical testing, it is assumed that the system is properly and comprehensively commissioned. The scope of the periodical testing usually includes injecting known current and voltage signals to verify measuring accuracy,

protection functionality and correct operation of input and output contacts. BIO-Tester enables testing without separate test switches or disconnecting terminal wires inside the installation. This approach speeds up the periodical testing.



The final trip test (operating the circuit breaker) should always be done as a part of final commissioning checks while the relay is installed on the switchgear panel.

4.2 Connector cables and interfaces

All the protection relay's binary input and output user interfaces are available on the BIO-Tester's front plate to be connected to the secondary terminals of selected relay. The marking of the interfaces corresponds to the markings of the protection relay's case rear connections and the related relay connection terminal drawings.

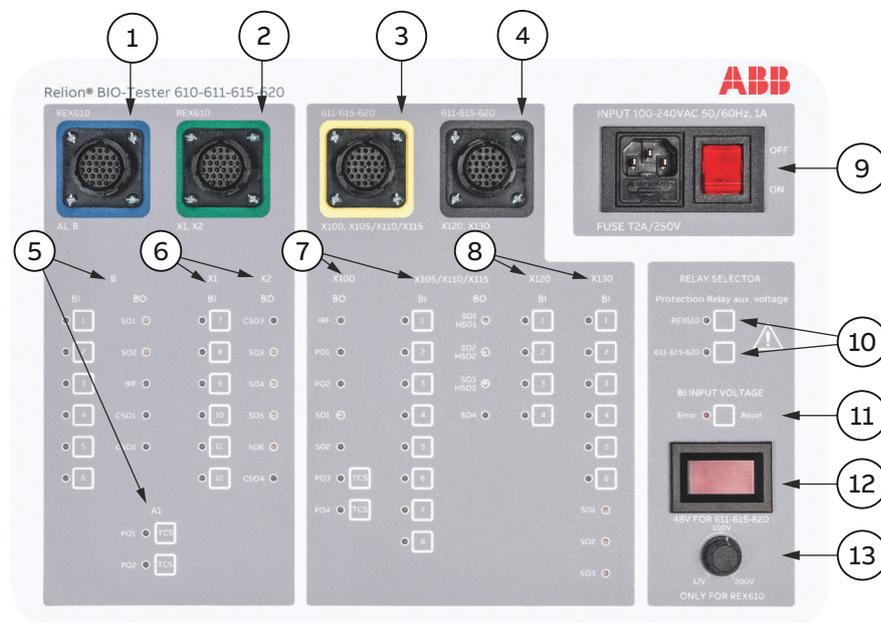


Figure 3: Front view of Relion® BIO-Tester 610-611-615-620

1. REX610 A1 and B connector
2. REX610 X1 and X2 connector
3. 611-615-620 X100 and X105/X110/X115 connector
4. 611-615-620 X120 and X130 connector
5. REX610 A1 and B test switches and indication LEDs
6. REX610 X1 and X2 test switches and indication LEDs
7. 611-615-620 X100 and X105/X110/X115 test switches and indication LEDs
8. 611-615-620 X120 and X130 test switches and indication LEDs
9. Main power switch and main's wall plug connector
10. Protection relay's auxiliary power supply selection: REX610 or 611-615-620
11. Error LED for indication of BI fault and RESET button for deactivation
12. Screen for displaying the selected binary input supply voltage
13. Potentiometer for selecting the correct binary input supply voltage value of REX610

Pre-wired connector cables are color coded and marked with the terminal number which enables easy identification of the relay terminals.

Table 2: Connector cables' color coding

Connector cable	Color
REX610 A1, B	Blue
REX610 X1, X2	Green
611-615-620 X100, X105/X110/X115	Yellow
611-615-620 x120, X130 (AIM, BIO)	Black



Follow the connectors' color coding when connecting the cables to BIO-Tester.

4.3 Terminal layouts and connection diagrams

BIO-Tester follows the same terminal description as in relevant protection relays. It is equipped with test switches and indication LEDs for power supply and BIO modules. Using pre-wired connectors, test switches can be wired to the protection relay's binary input terminals to simulate process signals connected to the protection relay, and indication LEDs can be wired to a protection relay' binary output terminal to indicate the binary output status.

The relay might have mandatory and optional slots. A mandatory slot always contains a module, while an optional slot may be empty, depending on the composition variant ordered for the relevant relay.



Refer to the technical and application manual of relevant relay for more information on the terminal layout and connection diagram.



If the RTD module has been installed, do not use BIO-Tester for testing RTD signals or any other output signals available in that RTD module, since the RTD module uses analog signals and BIO tester terminal connectors are not designed to test those signals.

Table 3: Relay modules and the corresponding BIO-Tester connectors, test switches and LEDs

Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
<p style="text-align: center;">A1</p>		

Table continues on the next page

Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
<p style="text-align: center;">B</p> <p>The diagram shows a vertical column of terminals labeled 'B' from 1 to 22. Terminals 1-6 are connected to relays BI1 through BI6. Terminals 10-12 are connected to SO1 (Signal). Terminals 13-15 are connected to SO2 (signal). Terminals 16-18 are connected to IRF. Terminals 19-21 are connected to CSO1 (Signal). Terminal 22 is connected to CSO2 (Signal).</p>	<p style="text-align: center;">REX610 A1, B</p>	<p style="text-align: center;">B</p> <p>BI BO</p> <p>● [1] SO1 ●</p> <p>● [2] SO2 ●</p> <p>● [3] IRF ●</p> <p>● [4] CSO1 ●</p> <p>● [5] CSO2 ●</p> <p>● [6]</p>

Table continues on the next page

Relay module	Relion® BIO-Tester 610-611-615-620																	
	Connector	Test switches and indication LEDs																
Note! This is for future use	<p>REX610</p>  <p>X1, X2</p>	<table border="0"> <tr> <td>X1</td> <td>X2</td> </tr> <tr> <td>BI</td> <td>BO</td> </tr> <tr> <td><input type="checkbox"/> 7</td> <td>CSO3 <input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> 8</td> <td>SO3 <input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> 9</td> <td>SO4 <input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> 10</td> <td>SO5 <input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> 11</td> <td>SO6 <input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> 12</td> <td>CSO4 <input type="checkbox"/></td> </tr> </table>	X1	X2	BI	BO	<input type="checkbox"/> 7	CSO3 <input type="checkbox"/>	<input type="checkbox"/> 8	SO3 <input type="checkbox"/>	<input type="checkbox"/> 9	SO4 <input type="checkbox"/>	<input type="checkbox"/> 10	SO5 <input type="checkbox"/>	<input type="checkbox"/> 11	SO6 <input type="checkbox"/>	<input type="checkbox"/> 12	CSO4 <input type="checkbox"/>
X1	X2																	
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<input type="checkbox"/> 11	SO6 <input type="checkbox"/>																	
<input type="checkbox"/> 12	CSO4 <input type="checkbox"/>																	

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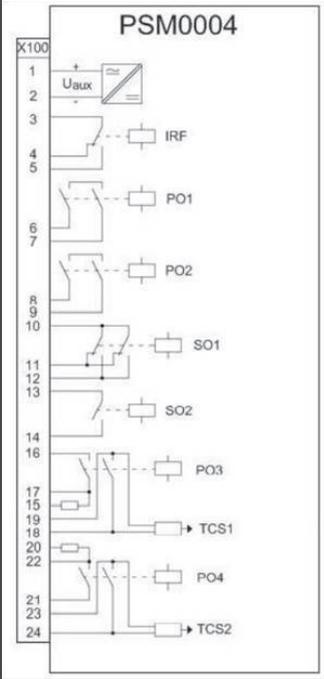
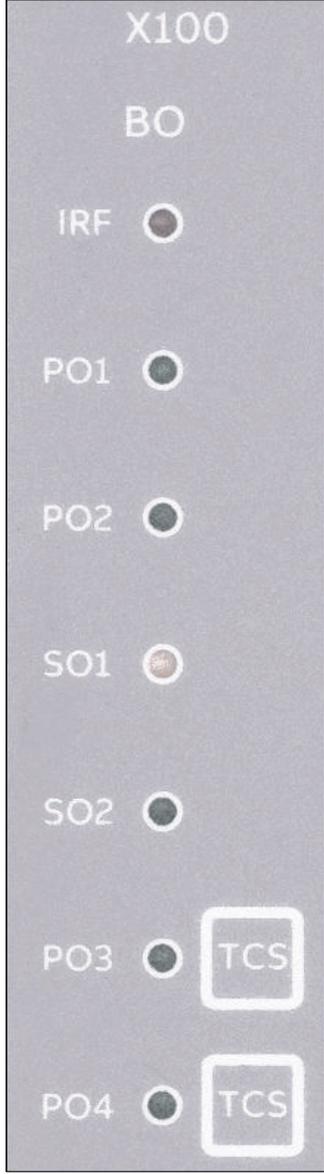
Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
<p>X100 For example, X100 in 615 series relays.</p> 	 <p>611-615-620 X100, X105/X110/X115</p>	

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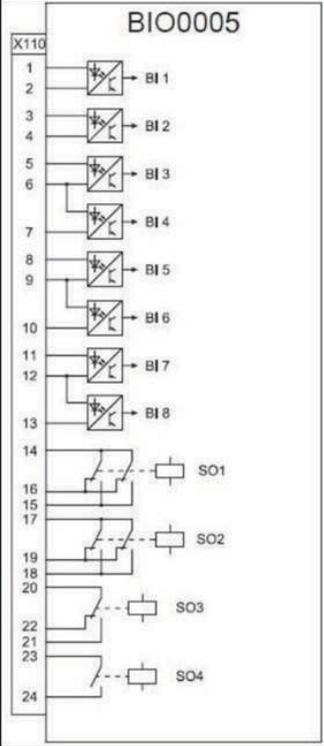
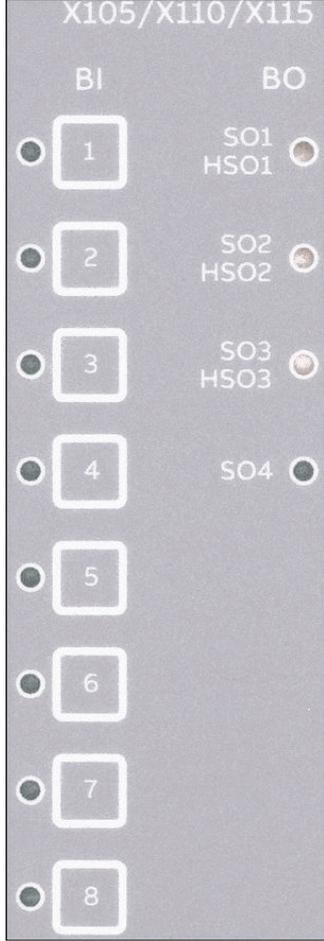
Relay module	Relion® BIO-Tester 610-611-615-620																			
	Connector	Test switches and indication LEDs																		
<p>X105/ X110/ X115 For example, X110 in 615 series relays.</p>  <p>The diagram shows a 24-pin connector labeled X110. Pins 1-13 are connected to BI 1-8. Pins 14-17 are connected to SO 1. Pins 18-21 are connected to SO 2. Pins 22-23 are connected to SO 3. Pin 24 is connected to SO 4.</p>	 <p>611-615-620 X100, X105/X110/X115</p>	 <p>X105/X110/X115</p> <table border="0"> <tr> <td>BI</td> <td>BO</td> </tr> <tr> <td>1</td> <td>SO1 HSO1</td> </tr> <tr> <td>2</td> <td>SO2 HSO2</td> </tr> <tr> <td>3</td> <td>SO3 HSO3</td> </tr> <tr> <td>4</td> <td>SO4</td> </tr> <tr> <td>5</td> <td></td> </tr> <tr> <td>6</td> <td></td> </tr> <tr> <td>7</td> <td></td> </tr> <tr> <td>8</td> <td></td> </tr> </table>	BI	BO	1	SO1 HSO1	2	SO2 HSO2	3	SO3 HSO3	4	SO4	5		6		7		8	
BI	BO																			
1	SO1 HSO1																			
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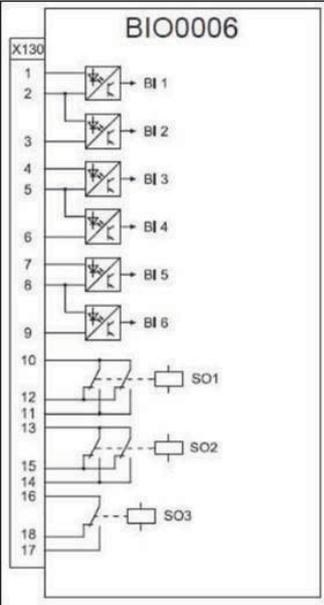
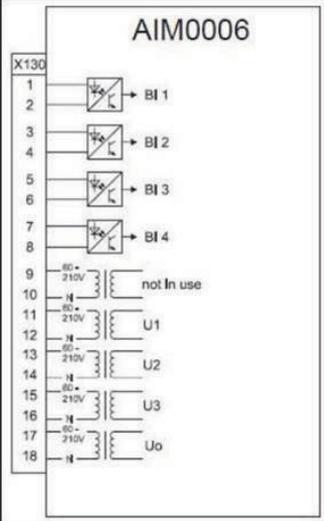
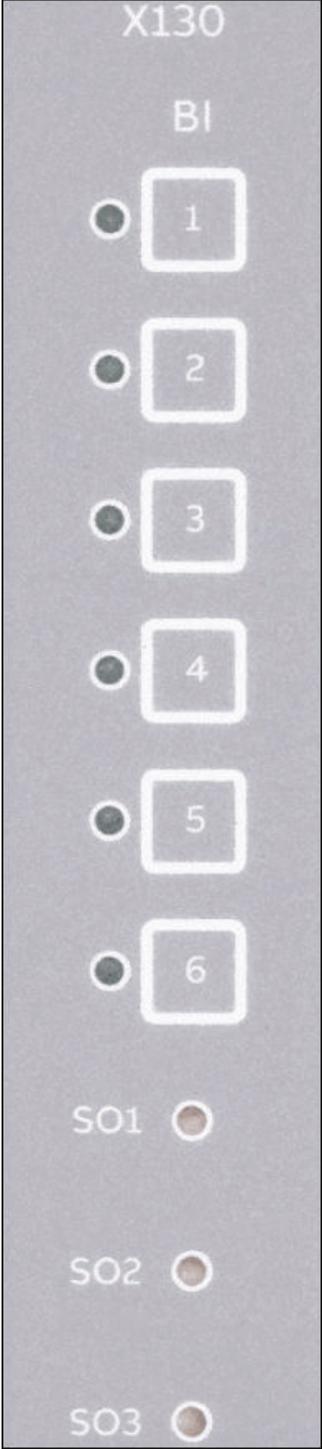
Table continues on the next page

Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
or		

Table continues on the next page

Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
<p style="text-align: center;">X120</p> <p style="text-align: center;">or</p>		

Table continues on the next page

Relay module	Relion® BIO-Tester 610-611-615-620	
	Connector	Test switches and indication LEDs
<p>X130 Binary I/O or Analog Input</p>  <p>BIO0006</p> <p>X130</p> <p>1 → BI 1 2 → BI 2 3 → BI 3 4 → BI 4 5 → BI 5 6 → BI 6 9 → SO1 12 → SO2 15 → SO3</p> <p>or</p>  <p>AIM0006</p> <p>X130</p> <p>1 → BI 1 2 → BI 2 3 → BI 3 4 → BI 4 9 → 60-210V not in use 11 → U1 13 → 60-210V U2 15 → 60-210V U3 17 → 60-210V U4 18 → 60-210V U0</p>	 <p>611-615-620</p> <p>X120, X130</p>	 <p>X130</p> <p>BI</p> <p>1 2 3 4 5 6</p> <p>SO1 SO2 SO3</p>



Refer to the technical and application manual of relevant relay for more information on the terminal and connection diagram of different hardware modules.



Connect the protective earthing before connecting the connectors to the relay. But **DO NOT** remove the existing earth lead. The earth lead is part of the yellow color connector cable: 611-615-620 X100, X105/X110/115. Note that REX610 does not have a separate earth protection lead of BIO-Tester. The functional earth is physically part of the connection terminal A pin 4.



Follow the connector label when connecting the cables between BIO-Tester and the protection relay.



Figure 4: Earth lead connected to the earth screw

4.4 Binary inputs and outputs

4.4.1 Binary inputs

The binary inputs can be used, for example, to generate a blocking signal, to unlatch output contacts, to trigger the disturbance recorder or for remote control of IED settings.

The binary input thresholds are selectable within the range 16...176 V DC by adjusting the binary input setting parameters.

4.4.1.1 Binary input threshold voltage

The threshold voltage for the relay's binary inputs must be set according to the used voltage level.

The binary input threshold voltage can be set with LHMI, WHMI or PCM600.

Relion® BIO-Tester 610-611-615-620 tester provides auxiliary supply voltage to the relay after setting the Relay Selector mode for relay under testing. The binary input voltage provided by tester is fixed 48V DC for 611, 615 and 620 series. So, it is important to select the binary input threshold voltage in the relay under testing below 48 V DC.

Table 4: Binary Input threshold voltage parameter settings, values and navigation path

Relay under testing	Navigation path (LHMI) Values	Navigation path (PCM600)	BI threshold voltage parameter setting values (Range)	To be adopted for relay under testing
REX610		IED Configuration / HW Configuration / DIO-AGGIO_3 (Parameter Setting) / Input pickup volt. DC	16...176V DC	Set according to used BI INPUT VOLTAGE value of BIO-Tester
For 611, 615 and 620 series relays under testing	Configuration/I/O modules/ Common settings/Threshold Voltage	IED Configuration / Configuration / I/O modules (Parameter Setting) / Threshold voltage	16...176V DC	Below 35 V DC

4.4.2 Binary outputs

The protection relay provides several binary outputs used for tripping, executing local or remote-control actions of a breaker or a disconnecter, and for connecting the protection relay to external annunciation equipment for indicating, signaling and recording.

Power output contacts are used when the current rating requirements of the contacts are high, for example, for controlling a breaker, such as energizing the breaker trip and closing coils.

The contacts used for external signaling, recording and indicating, the signal outputs, need to adjust to smaller currents, but they can require a minimum current (burden) to ensure a guaranteed operation.

The protection relay provides both power output and signal output contacts. To guarantee proper operation, the type of the contacts used are chosen based on the operating and reset time, continuous current rating, make and carry for short time, breaking rate and minimum connected burden. A combination of series or parallel contacts can also be used for special applications. When appropriate, a signal output can also be used to energize an external trip relay, which in turn can be configured to energize the breaker trip or close coils.

4.5 Energizing BIO-Tester and testing binary input and output operation

Refer to the local safety rules and regulations before starting any operations with Relion® BIO-Tester 610-611-615-620. Read the Quick operation guide together with this Relion® BIO-Tester 610-611-615-620 User manual.



The auxiliary supply voltage of the protection relay under the test needs to be switched off before the preparation.

4.5.1 Starting BIO-Tester

1. Ensure that only required cables are connected between BIO-Tester and the protection relay. Only one relay can be tested at a time so, do not connect cables that are not required. For example, for testing of REX610 relay, connect only REX610 relevant cables and remove/disconnect all other cables from the BIO-Tester.



Figure 5: Checking the cable connections

2. Power up BIO-Tester using the main's connection with supply rating 100...240 V AC and 50...60 Hz.

The protection relay does not start at the same time as BIO-Tester.



Figure 6: Main power switch and main's wall plug connector

3. Select the relay under testing namely, REX610 or 611-615-620 to extend the auxiliary supply voltage to the protection relay.



When selecting the relay, it is required to keep the correct selector button pressed for three seconds before the operation begins for the selected relay. If the relay selection should be changed after this three second time delay, switch the tester off and restart it. This three second delay in the selection of the relay avoids accidental choosing of wrong relay, and avoid the situation that two relays would get the supply voltage at the same time. Own supply voltage RELAY SELECTOR for REX610 and for 611-615-620 series relays enables automatic selection of the BI Input Voltage i.e. selectable 12-200 V DC for REX610 and fixed 48 V DC for 611-615-620 series relays.



Figure 7: Voltage selector for the relay's auxiliary supply voltage



For safety reasons, the operating voltage is 48 V DC. Only 1 relay can be tested at a time. RELAY SELECTOR option should be chosen according to the relay under testing.

4.5.2 Selecting IED test mode

The protection relay has to be in the test mode before the digital outputs and certain output signals of protection and other functions can be activated.

The test mode can be activated using the LHMI. The green Ready LED is flashing to indicate that the test mode is activated. By default, the test mode can only be changed from the LHMI. Activation by remote client is possible, see the technical manual.



The Ready LED also flashes if the protection relay detects a diagnostic failure. Check the test mode setting and the protection relay's IRF alarm contact status to find the reason for the failure.

The test mode is useful for simulated testing of functions and outputs without providing current inputs.

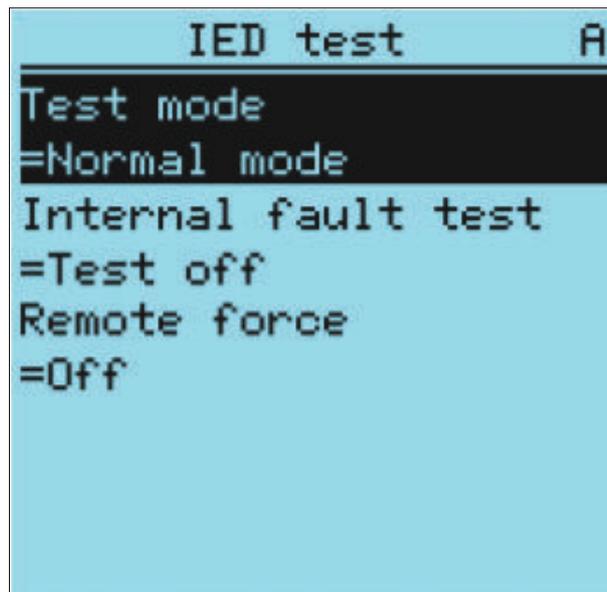


Figure 8: Selecting IED test mode

1. Select **Main menu/Tests/IED test/Test mode** and press .
2. Select the test mode status with  or .
3. Press  to confirm the selection.



If the test mode is not cancelled, it remains on and the Ready LED remains flashing.

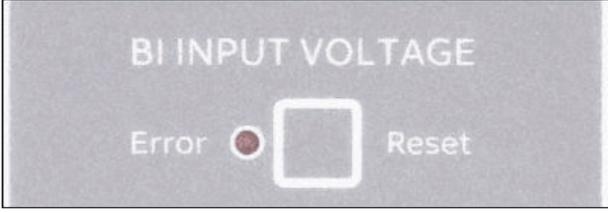
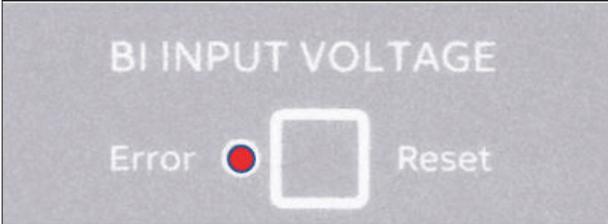


Refer to the relevant relay's operation manual for further details on setting the Test mode.

4.5.3 Testing binary inputs

The BI input voltage circuit is protected against binary input short circuits. For example, if binary inputs are damaged and shorted, the BI input voltage circuit detects the faulty condition, activates Error mode and the red Error LED lights up.

Table 5: Binary input error indication

LED	Color	Description
 <p>The image shows a control panel with the text "BI INPUT VOLTAGE" at the top. Below it, there is a small circular LED labeled "Error" which is currently off (dark). To the right of the LED is a square button labeled "Reset".</p>	Off	-
 <p>The image shows a control panel with the text "BI INPUT VOLTAGE" at the top. Below it, there is a small circular LED labeled "Error" which is currently lit with a red color. To the right of the LED is a square button labeled "Reset".</p>	Red	Activated

When binary inputs are tested one by one, the faulty binary input is the one that activates the Error LED. All the other binary inputs that were already activated via BIO-Tester return to the deactivate state (OFF state) after the activation of the Error LED.

The Error LED can be deactivated with the Reset button. It resets the detected BI fault situation and red colour Error LED turns off. It is important to take the needed corrective action on the detected faulty BIO modules of the relay under testing.

1. While testing REX610 relay, select the correct rated voltage by adjusting the potentiometer. Set the input supply voltage level above the set value of the binary *Input pickup volt. DC* setting.

The binary input's supply voltage level can be adjusted between 12...200 V DC.



Figure 9: Potentiometer for selecting the correct binary input supply voltage value and screen for displaying the selected binary input supply voltage



Fixed 48 V DC input supply voltage is available when protection relay aux. voltage mode is selected as 611-615-620. It is important to select the binary input threshold voltage in the relay under testing below 48 V DC. The binary input threshold in the protection relay is selected by adjusting the IED's parameter settings. Refer to the relevant relay's manual for further details. Potentiometer setting is applicable only for REX610 relay.



The selected voltage decreases slightly when the binary inputs are activated during testing.



The accuracy of used Panel Meter is ± 2 counts.



X130 RTD module: If the RTD module has been installed, do not use BIO-Tester for testing RTD signals or any other output signals available in that RTD module, since the RTD module uses analog signals and BIO tester terminal connectors are not designed to test those signals.



X120 AIM / Binary Input module: Depending on the relay, the X120 AIM module is provided with either 0, 3 or 4 binary inputs. The number of binary inputs can be checked from the configuration. If the X120 module is provided with binary inputs, testing requires the use of terminal adapters.



Figure 10: X120 terminal adapters



Turn off the power of the tester before connecting the terminal adapters to the relay to avoid accidental short circuit. After ensuring the disconnection of BIO-Tester power supply, connect the terminal adapters to the X120 module. After testing, always turn off the power of the tester before removing the cable and then the terminal adapters from X120 module.

2. Select **Main menu/Monitoring/I/O status/Binary input values** via the relay's LHMI to see a list of the binary input modules.
3. Select the module with the binary input to be tested.
4. Select the binary inputs to be tested using the BIO tester switches and activate them one by one.
5. Check the status of the binary inputs from **Main menu/ Monitoring/I/O status/Binary input values**.



Refer to the relevant relay's operation manual for further details on Monitoring the binary input values.

4.5.4 Testing binary outputs

BIO-Tester provides LED indication next to each binary output. When a binary output is activated from the LHMI, its LED lights up. This way, the status of activated binary outputs can be monitored on BIO-Tester.

If the contact type of the binary output is "Normally Open / Normally Close" (NO/ NC), its LED is yellow to indicate "Normal" mode and green when they are activated. If the binary output type is "Normally Open" (NO), activation of such a contact is indicated by a green LED.

Table 6: LED status of outputs

LED	Color	Description
	Off	-
	Yellow	Normal mode (NO/NC)
	Green	Activated (NO)
		Activated (NO/NC)

Internal fault signal output (change-over/form C) IRF is a single contact included in the power supply module of the protection relay. This IRF NO / NC type contact is shown green when it is in “Normal” mode and when it is activated, the LED is shown as red.

Table 7: IRF LED status

LED	Color	Description
	Off	-
	Green	Normal mode
	Red	Activated

The trip circuit supervision hardware includes constant current generator to provide trip circuit supervision (TCS) current and TCS input that can be connected to the TCS function with Application Configuration in PCM600. See trip circuit supervision function in the protection relay's technical manual for TCS connections.

When testing TCS connections, the TCS button needs to be pushed. The operation of TCS can be seen on the HMI. When testing TCS, its output (for example, PO1 in REX610 relay or PO3 in 611-615-620 relay) needs to be in inactive mode.

Table 8: LED status of PO3 output and the TCS button

LED	Color	Description
	Off	-
	Green	Activated

To test the binary outputs:

1. Select **Main menu/Tests/IED test/Test Mode** via the relay's LHMI and set the test mode to **ON**.
2. Go back to **Main menu** and select **Yes** to save the settings. The Ready LED starts to flash, indicating that the test mode has been activated.
3. Select **Main menu/Tests/Binary outputs** and select the output module to be tested.
4. Set the value of the output signal to **False** or **True**. The active output signal is lit in green on the BIO tester.

5. After completing the test, select **Main menu/Tests/IED test/Test Mode** and set the test mode to **OFF**.
6. Go back to **Main menu** and select **Yes** to save the changes. The Ready LED stops flashing, indicating that the test mode has been deactivated.



Refer to the relevant relay's operation manual for the procedure of selecting IED Test mode and to test the binary outputs.

4.5.5 Testing the internal fault (IRF) contact

The IRF connector of the relay is in the X100 power supply module. When an internal fault is detected by the self-supervision system or the auxiliary voltage is disconnected, the IRF LED of the BIO tester will be lit in red (the IRF LED is lit in green in normal operation). The closed contact drops off and the other contact closes. The green Ready LED of the relay starts flashing to indicate an internal fault, and a fault message will appear in the LHMI menu.

To test the internal fault (IRF) contact:

1. Select **Main menu/Tests/IED test/Test Mode** via the relay's LHMI and set the test mode to **ON**.
2. Go back to **Main menu** and select **Yes** to save the settings. The Ready LED starts to flash, indicating that the test mode has been activated.
3. Select **Main menu/Tests/IED tests/ Internal fault test** and set the internal fault test to **ON**. The IRF LED is lit in red.
4. After completing the test, select **Main menu/Tests/IED test/Test Mode** and set the test mode to **OFF**.
5. Go back to **Main menu** and select **Yes** to save the changes. The Ready LED stops flashing, indicating that the test mode has been deactivated.



Refer to the relevant relay's technical, application and operation manual for the connection diagram and test procedure.

4.6 Online testing with PCM600

PCM600 is ABB's common tool for configuring all Relion® products. The relay's application configuration can be tested in the Work Online mode.



Figure 11: PCM600

1. Activate the **Work Online** mode while testing the configuration.

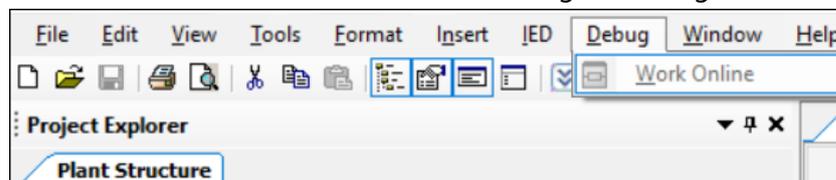


Figure 12: Activating the Work Online mode

2. Use BIO-Tester to simulate the binary signals.

5 Life cycle services

There are over one and a half million ABB distribution protection relays of different ages in use at utilities and industries all around the world. ABB provides product support for the users throughout the products' entire life cycle by providing high quality, global services.

Relays that have gone through systematic life cycle service operations are today efficient and long-lived products, and have become smarter and more environmentally-friendly in the last decades. The systematic usage of life cycle services for protection relays supports you in your efforts to secure and optimize your investment in a predictable, safe and low cost manner.

Contact the local ABB representative for more information on ABB's life cycle services for distribution protection and control relays.

5.1 Ordering data

Parts under warranty and accessories can be ordered separately from the local ABB representative.

Table 9: Relion® BIO-Tester 610-611-615-620 and accessories

Item	Order number
Relion® BIO-Tester 610-611-615-620 in a waterproof case includes, <ul style="list-style-type: none"> • Power supply cable • BIO-Tester REX610 A1, B cable • BIO-Tester REX610 X1, X2 cable • BIO-Tester 611-615-620 X100, X105/X110/X115 cable • BIO-Tester 611-615-620 X120, X130 cable • BIO-Tester 611-615-620 X120 connector terminal set (4 red + 2 black) 	2RCA054097
Spare parts	
Power supply cable	2RCA050928
BIO-Tester REX610 A1, B cable	2RCA054082
BIO-Tester REX610 X1, X2 cable	2RCA054084
BIO-Tester 611-615-620 X100, X105/X110/X115 cable	2RCA054085
BIO-Tester 611-615-620 X120, X130 cable	2RCA054086
BIO-Tester 611-615-620 X120 connector terminal set (4 red + 2 black)	2RCA054117

6 Technical data

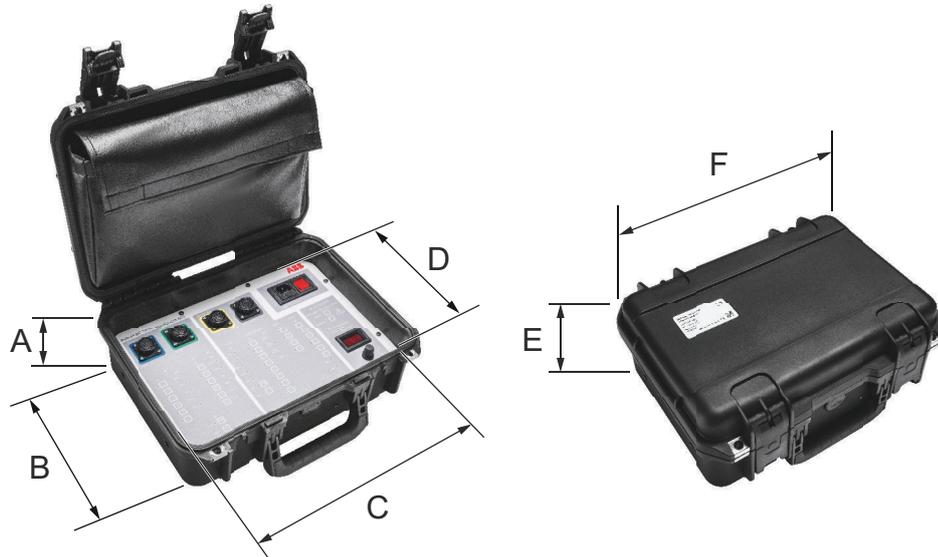


Figure 13: Main dimensions

A	1524 mm	D	2667 mm
B	3287 mm	E	1722 mm
C	3810 mm	F	4125 mm

Table 10: Dimensions

Description		Value
Width	Interior	2667 mm
	Exterior	3287 mm
Length	Interior	3810 mm
	Exterior	4125 mm
Depth	Interior	1524 mm
	Exterior	1722 mm
Weight	Complete device	7.8 kg

Table 11: Degree of protection of Relion® BIO-Tester 610-611-615-620

Description	Value
Closed lid	IP 67
Open lid	IP 20

Table 12: Environmental conditions

Description	Value
Application field	Indoor use
Operating temperature range	+5...50°C (+41...122°F)
Transport and storage temperature range	-25...+70°C (-13...+158°F)
Humidity range	Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C
Altitude	Up to 2000 m
Pollution degree	2

Table 13: Ratings of output connector terminals

Description		Value	
REX610, RE_611-620 U _{aux}	Rated voltage	48 VDC	
	Rated power	Max. 100 W	
REX610, A1, B, X1, X2 RE_611-620 X100, X105/X110/X115, X120, X130	Binary inputs	Rated voltage	REX610 12-200 VDC RE_611-620 48 VDC
		Rated power	Max. 15 W (200 VDC)
		SW fuse	~65 mA
	Binary outputs	Rated voltage	48 VDC
		Rated power	Max. 100 W

Table 14: Main power switch and main's wall plug connector

Description	Value
Rated frequency	50/60 Hz
Rated voltage	100...240 VAC
Rated power	Max. 230 W
Rated input current	1 A
Fuse type	T2A/250 V
Mains supply voltage fluctuations	+/-10 %

Table 15: Power cord

Description	Value
Type	Schuko to C13
Connector 1	Type F (CEE7/7)
Connector 2	Type C13 (IEC 60320-1)
Current rating	Max. 10 A
Voltage rating	Max. 250 V
Number of conductors	3

Table continues on the next page

Description	Value
Wire gauge	0.75 mm ²
Length	1.8 m
Color	Black

7 Glossary

611 series	Series of numerical protection and control relays for low-end protection and supervision applications of utility substations, and industrial switchgear and equipment
615 series	Series of numerical IEDs for low-end protection and supervision applications of utility substations, and industrial switchgear and equipment
620 series	Series of numerical IEDs for high- end protection and supervision applications of utility substations, and industrial switchgear and equipment
BI	Binary input
BIO	Binary input and output
BO	Binary output
HMI	Human-machine interface
IED	Intelligent electronic device
IRF	Internal relay fault
LCP	Liquid crystal polymer
LED	Light-emitting diode
LHMI	Local human-machine interface
NC	Normally closed
NO	Normally open
PC	1. Personal computer 2. Polycarbonate
PCM600	Protection and Control IED Manager
PE	1. Polyethylene 2. Protective earth
REX610	Numerical protection and control relays for protection and supervision applications of utility substations, and industrial switchgear and equipment
RoHS	Restriction of hazardous substances
RTD	Resistance temperature detector
SW	Software
TCS	Trip-circuit supervision



ABB Distribution Solutions
Electrification Service

P.O. Box 503
FI-65101 VAASA, Finland
Phone +358 10 22 11

abb.com/mediumvoltage