TS3 Trip Unit Test Set
instructions manual
Index

1. Identification .................................................................................................................. 4
2. Safety notice.................................................................................................................... 4
   2.1 Notes for dielectric stiffness tests ............................................................................... 4
   2.2 Reference standards .................................................................................................. 4
3 Abbreviations .................................................................................................................. 5
4 Standard equipment ........................................................................................................ 6
5 Technical Specification .................................................................................................... 7
   5.1 General ....................................................................................................................... 7
   5.2 Mechanical characteristics ...................................................................................... 7
      5.2.1 Transport case .................................................................................................. 7
   5.3 Electrical Characteristics ......................................................................................... 8
   5.4 Environmental Characteristics ............................................................................... 8
   5.5 Input/Output .............................................................................................................. 8
      5.5.1 Test connector ................................................................................................ 8
      5.5.2 Alarms .............................................................................................................. 9
      5.5.3 Timer ................................................................................................................. 9
   5.6 Operating parameters .............................................................................................. 10
      5.6.1 Parameters ....................................................................................................... 10
      5.6.2 TS3 Setting .................................................................................................... 10
      5.6.3 User Data - Test Report ............................................................................... 11
   5.7 User interface .......................................................................................................... 12
      5.7.1 knob and keys use ........................................................................................ 13
      5.7.2 Default Settings ............................................................................................ 13
6 Putting into service ......................................................................................................... 14
   6.1 Procedure to Set the nominal power voltage ......................................................... 14
   6.2 Connections ............................................................................................................. 14
   6.3 Menu tree ................................................................................................................ 15
   6.4 Display ..................................................................................................................... 17
   6.5 Initial settings ......................................................................................................... 17
7 Operative instructions – step by step ........................................................................... 18
   7.1 Setup ......................................................................................................................... 18
      7.1.1 Setup Password ............................................................................................. 18
      7.1.2 Setup Report .................................................................................................. 18
      7.1.3 Preferences ................................................................................................... 19
      7.1.4 Frequency ....................................................................................................... 19
      7.1.5 System date and time .................................................................................... 19
   7.2 Trip unit selection .................................................................................................... 20
   7.3 CB Type, la and In selection ................................................................................... 20
   7.4 Test setup ............................................................................................................... 21
   7.5 Carrying out the TEST .......................................................................................... 22
   7.6 Test Report .............................................................................................................. 23
   7.7 Info Menu .............................................................................................................. 23
8 Test on protective functions ......................................................................................... 24
   8.1 S1 trip unit functional test ...................................................................................... 25
   8.2 S2 trip unit functional test ...................................................................................... 26
   8.3 AR1 trip unit functional test ................................................................................... 27
   8.4 PR1 trip unit functional test ................................................................................... 28
   8.5 PR111 trip unit functional test ................................................................................ 29
   8.6 PR112-PR113 trip unit functional test .................................................................. 30
   8.7 PR121-PR122-PR123 trip unit functional test ...................................................... 31
   8.7.1 PR121 installation ......................................................................................... 31
8.7.2 PR122-PR123 installation
8.8 PR331-PR332-PR333 trip unit functional test
8.8.1 PR331 installation
8.8.2 PR332-PR333 installation
8.9 PR231-PR232 trip unit functional test
9 TS3 Manager Installation
10 Upgrade Firmware
11 Troubleshooting table
11.1 In case of a fault
1. Identification

TS3 is a testing device that realizes functionality verification on Low Voltage ABB SACE air circuit breakers electronic trip units, with one-phase secondary current injection.

2. Safety notice

Read this manual carefully and completely.

WARNING: this symbol gives information about operations, actions or circumstances that can cause injuries to the personnel, damage to the unit or economic losses.

The use of this device should be reserved for qualified and expert personnel only.

If in doubt, about its safe usage, the unit must be put out of service to prevent any accidental use.

You must assume that safe usage is impossible if:
1. the unit shows visible signs of damage.
2. the unit does not function (for example the display does not switch on).
3. the unit has been damaged in transit.

WARNING: before proceed with any testing and control operation with the TS3 testing device, carefully read instructions and procedures in the following chapters.

ABB S.p.A. SACE Division disclaim all responsibility for damages to things or people, due to incorrect use of TS3 test unit or/and for negligence on the present instructions

WARNING: Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected

Further, all connected power supplies must be disabled.

2.1 Notes for dielectric stiffness tests

Dielectric stiffness tests on TS3, inputs and outputs, are not permitted.

In case dielectric test of any devices or circuit breakers connected to TS3, it is necessary to remove any connections between the TS3 and the device under test.

2.2 Reference standards

TS3 test unit is CE marked and is conform to the main international reference standards in terms of electromagnetic compatibility (EMC) and safety.

Immunity for industrial environments : IEC 61000-6-2 Standard.
Emission for industrial environments : IEC 61000-6-4 Standard.
Safety requirement for measurements, control and laboratory use electrical equipment: IEC 61010 Standard.
### 3 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR1</td>
<td>MEGAMAX series trip unit</td>
</tr>
<tr>
<td>CB</td>
<td>Circuit Breaker (for example Emax)</td>
</tr>
<tr>
<td>CBTYPE</td>
<td>Circuit breaker version and type</td>
</tr>
<tr>
<td>CS</td>
<td>Current sensor</td>
</tr>
<tr>
<td>DUT</td>
<td>Device under test (i.e. trip unit)</td>
</tr>
<tr>
<td>Emax</td>
<td>ABB SACE Air Circuit breaker series</td>
</tr>
<tr>
<td>FW</td>
<td>Firmware</td>
</tr>
<tr>
<td>F.S.</td>
<td>Full Scale</td>
</tr>
<tr>
<td>HW</td>
<td>Hardware</td>
</tr>
<tr>
<td>In</td>
<td>Trip unit nominal current</td>
</tr>
<tr>
<td>Iu</td>
<td>Circuit breaker nominal current</td>
</tr>
<tr>
<td>ltest</td>
<td>Test Current</td>
</tr>
<tr>
<td>MEGAMAX</td>
<td>ABB SACE Air Circuit breaker series</td>
</tr>
<tr>
<td>NOVOMAX</td>
<td>ABB SACE Air Circuit breaker series</td>
</tr>
<tr>
<td>PR030/B</td>
<td>PR12x, PR23x, PR33x battery unit</td>
</tr>
<tr>
<td>PR1</td>
<td>MEGAMAX series trip unit</td>
</tr>
<tr>
<td>PR11x</td>
<td>EMAX series trip units</td>
</tr>
<tr>
<td>PR120/B</td>
<td>PR112, PR113 battery units</td>
</tr>
<tr>
<td>PR12x</td>
<td>New EMAX series trip units</td>
</tr>
<tr>
<td>PR23x</td>
<td>Tmax T7 series trip units</td>
</tr>
<tr>
<td>PR33x</td>
<td>New EMAX X1 and Tmax T7 series trip units</td>
</tr>
<tr>
<td>Trip unit</td>
<td>Electronic protection release</td>
</tr>
<tr>
<td>S1</td>
<td>NOVOMAX series trip unit</td>
</tr>
<tr>
<td>S2</td>
<td>NOVOMAX series trip unit</td>
</tr>
<tr>
<td>SW</td>
<td>Software</td>
</tr>
<tr>
<td>TC</td>
<td>Trip Coil</td>
</tr>
<tr>
<td>Tmax</td>
<td>ABB SACE Molded Case Circuit Breaker series</td>
</tr>
<tr>
<td>TS3</td>
<td>Trip unit test set</td>
</tr>
<tr>
<td>TS3M</td>
<td>Software manager</td>
</tr>
</tbody>
</table>
4 Standard equipment

TS3 is provided with the following accessories:

- Power supply cable
- USB cable
- Test cable extension
- AR1,S1 test cable
- S2 test cable
- PR1 test cable
- PR11-PR112-PR113 test cable
- PR121, PR122, PR123 test cable
- PR231, PR232, PR331, PR332, PR333 test cable
- USB memory stick
- Test Key plug for PR121, PR122, PR123
- Test Key plug for PR232, PR331, PR332, PR333
- PR030/B
- S2 Bypass module
5 Technical Specification

5.1 General

TS3 test device performs functionality test on ABB SACE S1, S2, AR1, PR1, PR111, PR112, PR113, PR121, PR122, PR123, PR231, PR232, PR331, PR332, PR333 Low voltage electronic trip unit.
Tests have to be realized with circuit breaker in out of service, in safety condition and with trip unit removed from the circuit breaker.
The device is realized with microprocessor digital technology and it is utilizes as user interface a LCD display and membrane keyboard.
Unit parameters and functional modality are adjustable by the user using the front keyboard.
At every pressure of keys and at the end of the test, TS3 confirms with a beep signal
TS3 can work in horizontal and vertical position.

5.2 Mechanical characteristics

Overall dimensions : 590 x 438 x 320 mm.
Total weight (TS3 completed with accessories): 22 Kg.

5.2.1 Transport case

For a safe transport of TS3, the use of the trolley-transportation case is advised: the case is supplied by ABB S.p.A. SACE Division under request (ordering code 1SDA065705R1).
5.3 Electrical Characteristics

Power Supply: 115/230 Vac one-phase ±15% 50/60 Hz (adjustable by the user)
Protection fuse: T10AL250V
Maximum power consumption: 800VA

5.4 Environmental Characteristics

Operating temperature +5°C…+45°C
Storage temperature -5°C…+60°C
Relative humidity 0%…95% without condensation

5.5 Input/Output

5.5.1 Test connector

The TS3 input and output connections are available to the user by means of the frontal “Main Connector” (see chapter 5.7), to be connected at the extension cable and/or at the test cable (see chapter 4), both supplied with the test device. On this connector and consequently on the test cable, the following are available:

5.5.1.1 Generated current signal

<table>
<thead>
<tr>
<th>Trip Unit</th>
<th>In relè</th>
<th>Itest</th>
<th>Scale</th>
<th>Tolerances</th>
<th>I test max</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR1</td>
<td>250 … 6300 A</td>
<td>0.1 … 15 In</td>
<td>0…0.8In</td>
<td>0.8…10In</td>
<td>10…15In</td>
</tr>
<tr>
<td>AR1/S1</td>
<td>250 … 6300 A</td>
<td>0.1 … 15 In</td>
<td>0…0.8In</td>
<td>0.8…10In</td>
<td>10…15In</td>
</tr>
<tr>
<td>S2</td>
<td>250 … 6300 A</td>
<td>0.1 … 15 In</td>
<td>0…0.8In</td>
<td>0.8…10In</td>
<td>10…15In</td>
</tr>
<tr>
<td>PR11x</td>
<td>250 … 6300 A</td>
<td>0.1 … 12 In</td>
<td>0…0.4In</td>
<td>0.4…5.In</td>
<td>5…12In</td>
</tr>
<tr>
<td>PR12x</td>
<td>400 … 6300 A</td>
<td>0.1 … Ix(*) In</td>
<td>0…4830A</td>
<td>4830…48300A</td>
<td>3% f.s</td>
</tr>
<tr>
<td>PR23x</td>
<td>400 … 1600 A</td>
<td>0.1 …15In</td>
<td>0…5540A</td>
<td>5540…24000A</td>
<td>3% f.s</td>
</tr>
<tr>
<td>PR33x</td>
<td>200 … 1600 A</td>
<td>0.1 …15In</td>
<td>0…5540A</td>
<td>5540…24000A</td>
<td>3% f.s</td>
</tr>
</tbody>
</table>

Table 1
Accuracy specification

Note1: the max value to generable current Itest is indicated on the display.

Note2: Ix(*) = min \[ \frac{I test max }{In relè} , 15 In \]

Example:

If the In relè is 6300 A, being the Itest max 48300 A, then the Itest max will be 48000/ 6300 = 7.66 In
5.5.2 Auto protection

The time/current curve of the auto protection function is quoted here following:

Graph 1

The auto protection function, implemented on TS3, protects the trip unit under test for incorrect setting or/and cabling by the user.

5.5.2 Alarms

Here following, the alarms messages visualized by the display in case of anomalies on supply voltage or internal overheating of the instrument.

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Parameter</th>
<th>Description</th>
<th>Message on the Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overvoltage</td>
<td>Overvoltage (115 … 125% on the network supply voltage)</td>
<td>“OVERVOLTAGE”</td>
</tr>
<tr>
<td>2</td>
<td>Undervoltage</td>
<td>Undervoltage (75 … 85% on the network supply voltage)</td>
<td>“UNDERVOLTAGE”</td>
</tr>
<tr>
<td>3</td>
<td>Overheat</td>
<td>Internal temperature (75 °C ±10%)</td>
<td>“OVERHEAT”</td>
</tr>
</tbody>
</table>

*Table 2. Alarms.*

5.5.3 Timer

Technical characteristics

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Parameter</th>
<th>Value/range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Resolution</td>
<td>1 ms</td>
</tr>
<tr>
<td>2</td>
<td>Max Tolerances for timer stop after TC trip</td>
<td>2 ms ± of reading value</td>
</tr>
</tbody>
</table>

*Table 3. Timer Characteristics.*
5.6 Operating parameters

TS3 permits personalized operating parameters by the user, according to the characteristic of the tests to be performed. Few parameters can only be read, while the other can be edit too, and will be available on the display and on the test report, produced by the TS3 at every test.

The descriptions of the parameters are mentioned in the following tables:

5.6.1 Parameters

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Label</th>
<th>Description</th>
<th>Selectable values</th>
<th>READ</th>
<th>EDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Timeout</td>
<td>Adjustable timeout of current generation</td>
<td>0(0&lt;=x) ... 4,000,000 ms, step 1 ms</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Frequency</td>
<td>Output current frequency</td>
<td>50 / 60 Hz</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Table 4. Parameters.

5.6.2 TS3 Setting

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Label</th>
<th>Description</th>
<th>READ</th>
<th>EDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TS3 S/N</td>
<td>TS3 Serial Number</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>FW version</td>
<td>TS3 firmware version</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Date</td>
<td>Date (dd/mm/yyyy)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4</td>
<td>Time</td>
<td>Time (hh:mm:ss)</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Table 5. TS3 Setting
5.6.3 User Data - Test Report

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Label</th>
<th>Description</th>
<th>READ</th>
<th>EDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heading</td>
<td>Default Heading</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Test Nr</td>
<td>Test number (automatically proposed by TS3)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Date</td>
<td>Date of the Test</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hour</td>
<td>Time of the Test</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Test</td>
<td>Information defined by the user (ex. name)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>6</td>
<td>S/N</td>
<td>Information defined by the user (ex. Trip unit serial number)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>7</td>
<td>Name</td>
<td>Information defined by the user (ex. Operator name)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>8</td>
<td>Note</td>
<td>Information defined by the user (ex. Particular note, as electrical plant</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>I test</td>
<td>Test Current</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Phase</td>
<td>Name of the tested phase on trip unit (L1, L2, L3 or N)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Test Time</td>
<td>Test duration</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Stop by</td>
<td>Action that caused the test end (TC, User, timeout, auto-protection, No Load,</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>various alarms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Frequency</td>
<td>Supplied nominal frequency (50 or 60Hz)</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

Example of test report:

ABB SACE TS3/ABB
Report
Test Nr: 43/99
Date: 09.06.2007
Hour: 15.35.23
# Test: PR112/PD
# S/N: H6625Q07A
# Name: Rossi P.
# Note: Version 1.06
I test: 1749A
Phase: L2
Trip Time: 5217 ms
Stop by: TC
Freq. 50 Hz

With “#” are indicated the information manually given by the operator/user.
The others are automatically available.

Test report mentions the “User Data” in memory at the moment of the test.
5.7 User interface

**Figure 1. Frontal view TS3**

<table>
<thead>
<tr>
<th>Refer.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Type B USB connector for connection to PC</td>
</tr>
<tr>
<td>B</td>
<td>Main connector for ABB SACE test cable</td>
</tr>
<tr>
<td>C</td>
<td>“Output On” LED – Test ongoing</td>
</tr>
<tr>
<td>D</td>
<td>Start / Stop test pushbutton (immediate test stop)</td>
</tr>
<tr>
<td>E</td>
<td>Backlit LCD graphich display</td>
</tr>
<tr>
<td>F</td>
<td>Function keys (corresponding to the active SoftKey, in the display views)</td>
</tr>
<tr>
<td>G</td>
<td>Alfa-numeric keyboard for parameters introduction</td>
</tr>
<tr>
<td>H</td>
<td>Power supply plug</td>
</tr>
<tr>
<td>I</td>
<td>Power supply switch with Power On light</td>
</tr>
<tr>
<td>L</td>
<td>Fuse holder with power voltage selector (115V / 230V 50-60Hz AC)</td>
</tr>
<tr>
<td>M</td>
<td>Knob for parameters selection/movement and for adjustment of supplied current during test</td>
</tr>
<tr>
<td>N</td>
<td>ESC key for back command to the previous menu, and DEL to cancel entered data</td>
</tr>
<tr>
<td>O</td>
<td>Cursor movement keys</td>
</tr>
<tr>
<td>P</td>
<td>“ENTER” key to confirm data enter</td>
</tr>
</tbody>
</table>

*Legend of TS3 front panel*
5.7.1 knob and keys use

▲▼ : “UP” “DOWN” for unit value increase or for menus navigation.
◄► : “LEFT” “RIGHT” for menus navigation.
↑ : “Shift” to select alphabetic characters (grey area of keyboard)

Once in the require page, the adjustable values can be selected using the knob and/or the direction ▲▼◄► keys (the adjustable field is indicated with the cursor ➔), the parameter is highlighted by pressing the ENTER key, and modified using alphanumeric keys, and confirmed with ENTER key.

ESC : press ESC to exit the parameter changing phase, aborting the change and go back to previous menu.
DEL : press DEL to cancel the inserted parameters in alphabetic mode.
START/STOP : press START/STOP to start or stop immediately an ongoing test.
F1 F2 F3 F4 : press F1 F2 F3 F4 function keys to enter in soft key menus.

5.7.2 Default Settings

ABB SACE provides the TS3 with the following adjusted parameters:

<table>
<thead>
<tr>
<th>Label</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power Voltage</td>
<td>230Vac</td>
</tr>
<tr>
<td>Itest</td>
<td>0.4In</td>
</tr>
<tr>
<td>Phase</td>
<td>L1</td>
</tr>
<tr>
<td>Timeout</td>
<td>∞</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Beep</td>
<td>On</td>
</tr>
<tr>
<td>Password</td>
<td>00000</td>
</tr>
</tbody>
</table>

Table 7. Default setting
6 Putting into service

Immediately check the supply power voltage, before switching on the device, according the proper network voltage.

Do not supply the TS3 with 230V AC voltage if 115V AC is indicated in the front fuse-holder!

6.1 Procedure to Set the nominal power voltage

- Extract the fuse-holder cover from the TS3 (see chapter 5.7)
- Extract the fuse-holder from the cover, rotate it of 180° and re-insert it in the cover
- Re-insert the fuse-holder cover into the TS3
- Verify that the voltage value indicated is correct

![Figure 1](image)

The following screenshot will appear after the switching on the device.

![Figure 2](image)

6.2 Connections

For the connections under care of the user, it is advised to exclusively use test cable and power cable provided by ABB SACE and carefully follow what mentioned in the present manual. In this way, the TS3 test unit is able to comply with the international standards and guarantee a perfect functionality even in heavy electromagnetic ambient environments.
6.3 Menu tree
Connection Relé cable

PR23x/PR3x

= PR21
PR22
PR31
PR32
PR33

Select and press Exec

Device Test

CB Type: T/S

In: 800

h: 800

Select Grid: kVA or A

Note:

Press [Enter] to execute

Test Run

1300 ms

Min.

Max.

319 A

For Test

Note: To return previous menu, press "Back" [F4].
6.4 Display

TS3 automatically recognize the cable version connected to the main connector, ready to test the proper trip unit types.

Example.
After the connections of PR23X - PR33X test cable to the extension cable and to the frontal main connector, the following screen will be presented.

In the below Figure 3, is highlighted the subdivision in areas.

Main Area

![Figure 3](image.png)

Soft-Key corresponding to the function keys

Help information on the current function

In this Example, it is possible to access to Report, Setup, Info menu pressing the F1 F2 F3 keys.

6.5 Initial settings

⚠️ The correct selections of the necessary parameters are under user care.
Some parameters are directly accessible during Test setup phase, others a accessible on Setup menu, that can be reached with F2 key (see figure 3)
7 Operative instructions – step by step

7.1 Setup

The Setup menu is available after the user password insertion.

To return to previous menu press F4.

7.1.1 Setup Password

It is necessary to enter a password in order to modify some of the TS3 parameters; the default password is mentioned in chapter 5.7.2.

This password may be modified by the user, with a new one having a length between 1 to 5 characters; it is necessary to insert the old password, then the new one twice, to reconfirm it, and then save it pressing ENTER.

To remove the password, push ENTER as new password and reconfirm it.

7.1.2 Setup Report

With the “Setup report” functions, it is possible to reset the archive and archiving mode.

It is possible to archive the reports in circular mode; when necessary, the latest report will cover the oldest one.

In not circular mode, when reached the 99th report, the user is informed that the available memory is full and no other reports will be saved. The user shall then clear the memory or change into circular mode.
7.1.3 Preferences

On the preferences screen it is possible to select the following:

- Language (Italian, English, French, German e Spanish)
- Acoustic signal at key selections (beep)
- Acoustic signal at every event (ex. Start test, Stop test, etc.)

![Preferences](image)

7.1.4 Frequency

The user can select the output signal frequency: 50Hz or 60Hz.
The selection is realized by means of ▲▼ keys or knob. Press ENTER key to confirm the selection or ESC to cancel.

![Frequency](image)

7.1.5 System date and time

Device set up

![System Date and Time](image)

The selection is realized by means of ▲▼ keys or knob. Press ENTER key to insert the value using the alphanumeric keyboard and ENTER again to confirm the selection or ESC to cancel.
7.2 Trip unit selection

The TS3 is able to recognize the connected cable and automatically show the list of selectable trip units for the test. Press ▲▼ keys or the knob to select the correct trip unit, then confirm pressing ENTER.

The following figure shows the example with PR23x/PR33x family cable and the selection of PR231 trip unit.

![Figure 9](image.png)

Press F1, F2 ed F3 key, to enter the Report, Setup ed Info.

7.3 CB Type, Iu and In selection

After having selected the trip unit, it is possible to enter three characteristic that define the circuit breaker: CB Type, Iu and In. According to the choice made, the following valid selections are shown. The selection is realized by means of ▲▼ keys or knob. Press ENTER key to confirm the selection or ESC to cancel. Example of selection and parameter modification:

- Select the correct CB type with the arrow “=>”.
- Press ENTER.
- Selection with ▲▼ keys or knob.
- Press ENTER.
- Choose the correct “Iu” and “In” according to the selected CB and trip unit.

To enter the Test menu press F1.

![Figure 10](image.png)
7.4 Test setup

From the screen CB Type, Iu and In selection (see chapter 7.3) press the F1 key to enter the Test setup screen.

In the Test setup screen the following selections are available:

- Itest as multiple of In (relative current value) and the corresponding value in Ampere (absolute current value)
- Phase to be tested (L1, L2, L3, N)
- Max time for Itest current generation

It is also possible to realize an automatic sequential test on all phases (L1 then L2 then L3 and, if present, N) with a specific selection: L1>L2>L3 or L1>L2>L3>N

Inserted user informations are mentioned in the “User setting” area.

The item has to be selected using ▲ ▼ keys or knob.

The value incremental steps can be modified by means of ◀ ▶ keys of the selected item.

Example of setting of I test:

- Select Itest parameter with the with the arrow “=>”.
- Press ENTER to change parameter.
- Select the required value ▲ ▼ keys or knob.
- Press ENTER to confirm.

```
Setup test PR231
(T S 800 )
Itest : => 0.40 In ( 320 A )
Phase : L1
Time Out : 00
-------- User settings -------
In = 800 A
Test : PR231  SN : 
Name : Freq: 50 Hz
Note : Start to begin the test
```

Figure 11

Setup required phase and timeout.
Press F2 (User data) to enter in user information menu.

For each test, it is possible to insert a short Description, trip unit serial number, user name, and note for 124 characters.

```
User setup
Correspondence 1 h: 800 A
Test Description : => PR231
SerialNumber :
Username :
Frequency: 50 Hz
Note :
```

Figure 12
### 7.5 Carrying Out the TEST

The test stat once the START/STOP is pressed, and the selected Itest current is generated.

Pressing F1 key it is possible to adjust the generated current, by means of frontal knob.
Pressing F3 key it is possible to modify the time unit (ex. ms, s, min …)

The test is stopped by one of the following reasons:

**TRIP** When the protection release under test trips.

**AUTOPROTECTION** Stop the test according the auto-protection curve to avoid damages of the DUT (see chapter 5.5.1.2).

**USER STOP** After pressing the STOP button by the user.

**TIMEOUT** When the selected max time is reached.

**NO LOAD** In case of no load (ex. not correct connection to the trip unit)

The test result is visualized and stored in the Test Report. (see chapter 7.6)
7.6 Test Report

TS3 can store up to 99 reports.
To pass to previous or following test report use F2, F3 function key. The test numbering restarts from test report nr.1 when the available memory is full.
Reset or change of store mode (cyclic mode) can be done in the Setup Menu (see chapter 7.1).
To scroll the report screen use the ▲▼ keys or knob.

![Figure 14](image)

Report number / total reports in memory

Figure 14

7.7 Info Menu

To enter this function see menu tree (see chapter 6.3).
In this menu the following information are available: Firmware version and system settings.
8 Test on protective functions

Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected
Further, all connected power supplies must be disabled.

In order to remove and the following reinstallation of the trip unit on the CB, please refer to the instructions or manual of installation of the CB and to the instructions sheet of the trip unit. These documents are present in the USB key of the TS3
To verify the release of the documents, visit www.abb.com

The trip unit must only be tested in self-supply. Any connections to external supply or external battery must be removed (ex. PR030/B, PR120/B, etc.)

It is possible to realize tripping test on the L, S, I, G protective functions available on the trip units.

In the trip unit where it is set the presence of an external toroidal, an alarm for disconnection will be present on the display of the trip unit. To remove the massage it is necessary to disable the “external toroidal” function.

In the trip unit where is set the differental protection, an alarm “Gext sensor” for disconnection will be present on the display of the trip unit.

Note3: Pay attention to the adjustments on the different protection functions of the DUT
As an example, with the following settings $S_1^2 = 2In$, 400ms and $I = 4In$ and $I_{test} = 6In$, both functions S and I will be active, but the trip will be caused by the fastest function (I).
To test the S function, set the I protection = Off, or adjust a lower value of current (tolerances included).

Note4: As the TS3 is a one-phase secondary current generator, with the G function available and enabled, this will be always active; then in order to test the other protection functions it is necessary set the trip unit consequently.
As an example in order to test the L protection, set the G=Off.
8.1 S1 trip unit functional test.

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit ( DUT ) from the CB following the instructions in the installation manual of the CB n° 600600.002.
3. Take note of the settings present on the trip unit ( DUT ); these settings must be reset after the test.
4. Set the current and time values for the protection available on the DUT.
5. Connect the extension cable to TS3.
6. Connect the AR1/S1 test cable to the extension cable.
7. Connect the XK1 and TC connections to the DUT.

8. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.
9. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the technical catalogue n° 6000-3-84.
10. In case of changing of settings, insert the beginning value of threshold and time.
11. Reinstall the trip unit ( DUT ) on the CB as indicated in the instruction manual of the CB n° 600600.002

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>t=k/I^2</td>
<td>I2 = 0.5In MIN</td>
<td>3In</td>
<td>2s</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>t=k</td>
<td>I2 = 8In 0,45s</td>
<td>10In</td>
<td>0,45s</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>l</td>
<td>I3 = 12In</td>
<td>14In</td>
<td>≤ 60ms</td>
<td></td>
</tr>
<tr>
<td>G*</td>
<td>t=k</td>
<td>I4 = 0.5In</td>
<td>1In</td>
<td>0,45s</td>
<td></td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8.

NOTE 5: for the S1 trip unit with LSIG protection function, the only available tests are on the phases : L1, L2, L3.
8.2 S2 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n° 600600.002.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Do not disconnect the trip coil from the Trip Unit (DUT).
5. Set the current and time values for the protection available on the DUT.
6. Connect the extension cable to TS3.
7. Connect the S2 test cable to the extension cable.
8. Connect the S2 test cable the DUT.

**Figure 16**

9. If it is present G module, before testing L,S,I protection, remove G module and insert the bypass module.
10. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.
11. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the technical catalogue n° 6000-3-84.
12. In case of changing of settings, insert the beginning value of threshold and time.
13. Reinsert the G module if has been substituted by the bypass module.
14. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n° 600600.002

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>( t = k/t^2 )</td>
<td>( I_1 = 11n )</td>
<td>A</td>
<td>6ln</td>
<td>2s</td>
</tr>
<tr>
<td>S</td>
<td>( t = k )</td>
<td>( I_2 = 8In )</td>
<td>0.6s</td>
<td>10In</td>
<td>0.6s</td>
</tr>
<tr>
<td>I</td>
<td>( t = k )</td>
<td>( I_3 = 12In )</td>
<td>0.5s</td>
<td>14In</td>
<td>( \leq 60ms )</td>
</tr>
<tr>
<td>G*</td>
<td>( t = k )</td>
<td>( I_4 = 0.5In )</td>
<td>0.5s</td>
<td>11In</td>
<td>0.5s</td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8

**NOTA6:** The G protection can be verified by current injection on phase L1, L2, L3 only.
8.3 AR1 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n° 601534 003.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Set the current and time values for the protection available on the DUT.
5. Connect the extension cable to TS3.
6. Connect the AR1/S1 test cable to the extension cable.
7. Connect the XK1 and TC connections to the DUT.

8. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.
9. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the technical catalogue n° 649058.
10. In case of changing of settings, insert the beginning value of threshold and time.
11. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n° 601534 003.

Example of test:
Current generation on phase L1
Setting on the trip unit for L S or L I protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>( t = k/I )</td>
<td>( I_1 = 1I_n )</td>
<td>MIN</td>
<td>6I_n</td>
<td>2s</td>
</tr>
<tr>
<td>S</td>
<td>( t = k )</td>
<td>( I_2 = 8I_n )</td>
<td>0,45s</td>
<td>10I_n</td>
<td>0,45s</td>
</tr>
<tr>
<td>I</td>
<td>( I_3 = 12I_n )</td>
<td></td>
<td>15I_n</td>
<td>≤ 60ms</td>
<td></td>
</tr>
</tbody>
</table>

Table 10
8.4 PR1 trip unit functional test

1. Prior to operate and/or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n° 601534 003.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Set the current and time values for the protection available on the DUT.
5. Connect the extension cable to TS3.
6. Connect the PR1 test cable to the extension cable.
7. Connect the XK1 and TC connections to the DUT.

8. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.
9. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the document (ANNEX-PI3-15).
10. In case of changing of settings, insert the beginning value of threshold and time.
11. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n° 601534 003.

Example of test:
Current generation on phase L2
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>t=k/I^2</td>
<td>I1 = 1In</td>
<td>B</td>
<td>6In</td>
<td>5s</td>
</tr>
<tr>
<td>S</td>
<td>t=k</td>
<td>I2 = 6In</td>
<td>E</td>
<td>8In</td>
<td>0.6s</td>
</tr>
<tr>
<td>I</td>
<td>t=30In</td>
<td>I3 = 10In</td>
<td></td>
<td>12In</td>
<td>≤ 60ms</td>
</tr>
<tr>
<td>G*</td>
<td>t=k</td>
<td>I4 = 0.61In</td>
<td>E</td>
<td>1In</td>
<td>0.8 s</td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8
8.5 PR111 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n° RH0228002 ÷ RH0228005 or RH0109002 and in the instructions sheet n° 601933501.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Set the current and time values for the protection available on the DUT.
5. Connect the extension cable to TS3.
6. Connect the PR11x test cable to the extension cable.
7. Connect the XK1 and TC connections to the DUT.

In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.

9. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the instruction manual of the CB n° RH0228002 ÷ RH0228005 or RH0109002.
10. In case of changing of settings, insert the beginning value of threshold and time.
11. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n° RH0228002 ÷ RH0228005 and in the instructions sheet 601933501.

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>t=k/I₀</td>
<td>I₁= 0.4In</td>
<td>t₁ = 6s</td>
<td>2.4In</td>
<td>6s</td>
</tr>
<tr>
<td>S</td>
<td>t=k</td>
<td>I₂= 3In</td>
<td>t₂ = 0.25s</td>
<td>4.5In</td>
<td>0.25s</td>
</tr>
<tr>
<td>I</td>
<td>t=k</td>
<td>I₃= 6In</td>
<td>8In</td>
<td>≤ 60ms</td>
<td>0.96, s</td>
</tr>
<tr>
<td>G*</td>
<td>t=k/I₀</td>
<td>I₄= 0.8In</td>
<td>t₄ = 0.8s</td>
<td>1.2In</td>
<td>0.96, s</td>
</tr>
</tbody>
</table>

Table 12

* See Note4 in chapter 8
8.6 PR112-PR113 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.

2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n° RH0228002 ÷ RH0228005 or RH0109002 and in the instructions sheet n° 601933502 or 601933503.

3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.

4. Set the current and time values for the protection available on the DUT.

5. Connect the extension cable to TS3.

6. Connect the PR11x test cable to the extension cable.

7. Connect the XK1, XK2 and TC connections to the DUT.

8. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.

9. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the instruction manual of the CB n° RH0228002 ÷ RH0228005 or RH0109002.

10. In case of changing of settings, insert the beginning value of threshold and time.

11. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n° RH0228002 ÷ RH0228005 or RH0109002 and in the instructions sheet n° 601933502 or 601933503.

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>t=k/I²</td>
<td>I1 = 0.4In</td>
<td>t1 = 3s</td>
<td>1.2In</td>
<td>3s</td>
</tr>
<tr>
<td>S</td>
<td>t=k</td>
<td>I2 = 3In</td>
<td>t2 = 0.2s</td>
<td>4In</td>
<td>0.2s</td>
</tr>
<tr>
<td>I</td>
<td>t=5In</td>
<td>I3 = 5In</td>
<td></td>
<td>7In</td>
<td>≤ 60ms</td>
</tr>
<tr>
<td>G*</td>
<td>t=k</td>
<td>I4 = 0.61In</td>
<td>t4 = 0.5s</td>
<td>11In</td>
<td>0.5s</td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8
8.7 **PR121-PR122-PR123 trip unit functional test**

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the installation manual of the CB n°1SDH000460R0002 ÷ 1SDH000460R0005 or 1SDH000532R0002 and in the instructions sheet n°1SDH000460R0501, 1SDH000460R0502 or 1SDH000460R0503.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Remove the trip unit (DUT) from the CB, leaving the key plug connected to the CB *(That key plug must be reconnected to the trip unit after the test)*
5. Connect the Key plug indicated in Figure 21 to the corresponding connector on the back side of the DUT.

![Figure 21](image)

6. Connect the extension cable to TS3.
7. Connect the PR12x test cable to the extension cable.
8. Connect the Xk1 and TC connections to the DUT with proper key plug.

![Figure 22](image)

9. Connect the PR030/B on the front size of the trip unit.

### 8.7.1 PR121 installation

- Verify that configuration error is present, indicated with periodic blinking (1 blink every 0,5 s) of yellow led of L protection.
- Press “i Test” button for few seconds until all red leds flash on, confirming the installation.
- Remove the battery PR030/B.
- Set the current and time values for the protection available on the DUT.
- Reconnect the battery PR030/B.
- Verify that yellow led of L protection periodically switch on (1 blink every 3s)
- Remove the battery PR030/B.
- The trip unit is now ready for the test.
8.7.2 PR122-PR123 installation

- Enter in “Setting” menu of the trip unit
- Select “Circuit Breaker”
- Select “Unit installation”
- Insert the password
- Select “Install” and press “ENTER”
- Remove PR030/B when the red led will switch on and the display will give a “installation” message (installation error)
- Connect the XK4 connector to the DUT

* Figure 23

- Reconnect the battery PR030/B.
- Set the current and time values for the protection available on the DUT.
- Verify that no error is present on the display
- Remove the battery PR030/B.
- The trip unit is now ready for the test.

10. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5
11. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the instruction manual of the CB n°1SDH000460R0002 ÷ 1SDH000460R0005 or 1SDH000532R0002.
12. In case of changing of settings, insert the beginning value of threshold and time.

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>$t = k/I^2$</td>
<td>$I_1 = 1I_n$</td>
<td>$t_1 = 3s$</td>
<td>$3I_n$</td>
<td>$3s$</td>
</tr>
<tr>
<td>S</td>
<td>$t = k$</td>
<td>$I_2 = 4I_n$</td>
<td>$t_2 = 0,2s$</td>
<td>$5I_n$</td>
<td>$0,2s$</td>
</tr>
<tr>
<td>I</td>
<td>$I_3 = 6I_n$</td>
<td></td>
<td></td>
<td>$7,5I_n$</td>
<td>$\leq 60ms$</td>
</tr>
<tr>
<td>G*</td>
<td>$t = k$</td>
<td>$I_4 = 0,6I_n$</td>
<td>$t_4 = 0,8s$</td>
<td>$1I_n$</td>
<td>$0,8s$</td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8

13. Remove the key plug indicated in figure 21 used for testing.
14. Reinstall the trip unit (DUT) on the CB as indicated in the instruction manual of the CB n°1SDH000460R0002 ÷ 1SDH000460R0005 or 1SDH000532R0002 and in the instructions sheet n°1SDH000460R0501, 1SDH000460R0502 or 1SDH000460R0503.
15. Do the installation of the trip unit as indicated in the instruction manual of the CB n°1SDH000460R0002 ÷ 1SDH000460R0005 or 1SDH000532R0002
8.8 PR331-PR332-PR333 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the document n° 1SDH000529R0502, 1SDH000529R0503 or 1SDH000529R0504 and instructions sheet n° 1SDH000606R0001, 1SDH000606R0003 or 1SDH000606R0004 and getting started n° 1SDH000592R0001, 1SDH000593R0001.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.
4. Remove the trip unit (DUT) from the CB, leaving the key plug connected to the CB (That key plug must be reconnected to the trip unit after the test).
5. Connect the Key plug indicated in Figure 24 to the corresponding connector on the back side of the DUT.

![Figure 24](image)

6. Connect the extension cable to TS3.
7. Connect the PR33x test cable to the extension cable.
8. Connect the KM8 connector to the DUT.
9. Connect the PR030/B on the front size of the trip unit.

8.8.1 PR331 installation

- Verify that configuration error is present, indicated with periodic blinking (1 blink every 0.5 s) of yellow led of L protection.
- Press “i Test” button for few seconds until all red leds flash on, confirming the installation.
- Remove the battery PR030/B.
- Connect the KM4 connector to the DUT.
- Set the current and time values for the protection available on the DUT.

![Figure 25](image)

- Connect the PR030/B
- Verify that yellow led of L protection periodically switch on (1 blink every 3s)
- Remove the battery PR030/B.
- The trip unit is now ready for the test.
8.8.2 PR332-PR333 installation

- Enter in “Setting” menu of the trip unit
- Select “Circuit Breaker”
- Select “Unit installation”
- Insert the password
- Select “Install” and press “ENTER”
- Remove PR030/B when the red led will switch on and the display will give a “installation” message (installation error)
- Connect the KM4 connector to the DUT

![Figure 26](image)

- Reconnect the battery PR030/B.
- Verify that no error is present on the display
- Set the current and time values for the protection available on the DUT.
- Remove the battery PR030/B.
- The trip unit is now ready for the test.

10. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5.

11. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the instruction manual of the trip unit n° 1SDH000587R0002 \(\div\) 1SDH000587R0005.

Example of test:
Current generation on phase L1
Setting on the trip unit for L, S, I, G protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>(t=k/I^2)</td>
<td>(I_1=0.4I_n)</td>
<td>(t_1=3s)</td>
<td>1.2I_n</td>
<td>3s</td>
</tr>
<tr>
<td>S</td>
<td>(T=k)</td>
<td>(I_2=3I_n)</td>
<td>(t_2=0.2s)</td>
<td>4I_n</td>
<td>0.2s</td>
</tr>
<tr>
<td>I</td>
<td>(I_3=5I_n)</td>
<td>7I_n</td>
<td>60ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G*</td>
<td>(T=k)</td>
<td>(I_4=0.6I_n)</td>
<td>(t_4=0.4s)</td>
<td>1I_n</td>
<td>0.4s</td>
</tr>
</tbody>
</table>

* See Note4 in chapter 8

12. Remove the key plug indicated in figure 24 used for testing.

13. Reinstall the trip unit (DUT) on the CB as indicated in the document n° 1SDH000529R0502, 1SDH000529R0503, 1SDH000529R0504 and instructions sheet n° 1SDH000606R0001, 1SDH000606R0003, 1SDH000606R0004 and getting started n° 1SDH000593R0001.

14. Do the installation of the trip unit (DUT) as indicated in the instruction manual of the trip unit n° 1SDH000587R0002 \(\div\) 1SDH000587R0005.
8.9 PR231-PR232 trip unit functional test

1. Prior to operate and / or carry out any replacements on the CB, this must be open, with discharged springs and disconnected.
2. Remove the Trip unit (DUT) from the CB following the instructions in the instructions sheet n° 1SDH000529R0501 and in the document n° 1SDH000606R0001 or 1SDH000606R0003 and getting started n° 1SDH000591R0001.
3. Take note of the settings present on the trip unit (DUT); these settings must be reset after the test.

For PR231 follow procedure from point 4 on
For PR232 or PR231 with extracode:
   o Remove the key plug connected to the CB (That key plug must be reconnected to the tri unit after the test)
   o Connect the Key plug indicated in Figure 24 to the corresponding connector on the DUT

4. Connect the extension cable to TS3.
5. Connect the PR232x and PR33x test cable to the extension cable.
6. Connect the KM8 connector to the DUT.

7. Set the current and time values for the protection available on the DUT.
8. The trip unit is now ready for the test.
9. In order to set parameters and perform the test, follow the instructions in chapters 7.3, 7.4, 7.5
10. Verify that the tripping time indicated in the TS3 display is corresponding to the expected one, as indicated in the technical catalogue n° 1SDC210015D0202.
11. Remove the key plug indicated in figure 24 used for testing.
12. Reinstall the trip unit (DUT) on the CB as indicated in the instructions sheet n° 1SDH000529R0501 and in the document n° 1SDH000606R0001 or 1SDH000606R0003 and getting started n° 1SDH000591R0001.

Example of test on PR231:
Current generation on phase L1
Setting on the trip unit for L, S, I protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>t=k/I</td>
<td>I1 = 0.4In</td>
<td>t1 = 3s</td>
<td>2.4In</td>
<td>3s</td>
</tr>
<tr>
<td>S</td>
<td>t=k/I</td>
<td>I2 = 3In</td>
<td>t2 = 0.1s</td>
<td>3.6In</td>
<td>0.77s</td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>I3 = 5.5In</td>
<td></td>
<td>7In</td>
<td>≤60ms</td>
</tr>
</tbody>
</table>

Table 16
Example of test on PR232:
Current generation on phase L1
Setting on the trip unit for L, S, I protections.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Curve</th>
<th>Trip threshold</th>
<th>Trip time</th>
<th>I test</th>
<th>Expected tripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>$t=k/t^+$</td>
<td>$I_l = 0.4I_n$</td>
<td>3s</td>
<td>$2.4I_n$</td>
<td>3s</td>
</tr>
<tr>
<td>S</td>
<td>$t=k$</td>
<td>$I_2 = 5I_n$</td>
<td>$t_2 = 0.25s$</td>
<td>$6I_n$</td>
<td>$0.25s$</td>
</tr>
<tr>
<td>I</td>
<td>$t=k$</td>
<td>$I_3 = 7I_n$</td>
<td></td>
<td>$8.4I_n$</td>
<td>$\leq 60ms$</td>
</tr>
</tbody>
</table>

*Table 17*
To install the TS3 Manager, follow the instructions below.

In the USB memory stick, are stored the following folders:

- Curves
- Driver USB - RS485
- Iemax
- Meganax
- New EMAX
- Novonax
- T7-K1
- TS3 Firmware
- TS3 MANAGER
- TS3 Set instructions manual

In the TS3 MANAGER folder there are the following files:

- LVRunTimeEng.exe
- TS3 Manager ver 1.0.0.exe
- visa350runline.exe

run one by one the files to perform the installation.

To use the TS3Manager, see the TS3Manager User’s guide 1SDH000670R0003.
10 Upgrade Firmware

REMOVE THE POWER SUPPLY DURING THE LOADING OPERATION CAUSE FUNCTIONAL PROBLEMS TO THE INSTRUMENT

To check eventual FW version update, visit the web site http://bol.it.abb.com

To upgrade the FW

- connect the USB cable from PC to TS3 (if necessary install the USB-RS485 converter, the driver are present in the USB stick memory in the folder Driver USB-RS485),
- run the TS3 Manager and follow the instructions below.
1. Select Master Communication setting
2. Communication setting
3. COM Port Selection
4. Firmware selection
5. Firmware selection
6. Press START to begin the firmware upload
7. Turn on the TS3
8. Firmware loading
9. Finish firmware loading
10. Select Slave ad press START to begin the firmware upload

11. Turn on the TS3

12. Finish firmware loading
## Troubleshooting table
In the following table, a series of typical situations are indicated, useful to understand and solve faults or improper working.

**Note 7:** In case none of the following cases will help you to find a solution, please contact the nearest ABB service organization.

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Situation</th>
<th>Description</th>
<th>Suggestions</th>
</tr>
</thead>
</table>
| 1   | TS3 does not power on                  | The display does not switch on                                              | 1. Check the power cable is properly connected.  
2. Check that the power switch is in on position  
3. Check the presence of the fuse on fuse-holder, and that the fuse is not interrupted. |
| 2   | TS3 does not generate current          | “Output on” led does not switch on                                           | 1. Press Start/Stop button                                                                     |
|     |                                        | Message “NO LOAD” on the display                                             | Check that the test cable and extension are correctly connected to the trip unit.               |
|     |                                        | 1. Message “OVERVOLTAGE” on the display                                      | 1. Network voltage is over functional limits                                                  |
|     |                                        | 2. Message “UNDERVOLTAGE” on the display                                     | 2. Network voltage is below functional limits                                                 |
|     |                                        | 3. Message “OVERHEAD” on the display                                         | 3. Internal temperature is over operational limits                                            |
| 3   | TS3 does not stop the current generation| During the test of a Trip unit the TS3 does interrupt the current generation | 1. Check if DUT and TS3 settings are correct.  
2. Check if the Itest current is higher than the current threshold adjusted on the DUT, considering the tolerances  
3. Check the connections of testing cable                                                   |
| 4   | Unexpected current interruption        | During the test of a Trip unit the TS3 unexpectedly interrupts the current generation | 1. Check the connections of testing cable (verify that the message “NO LOAD” is not present on TS3 display) |
| 5   | Tripping times is longer or shorter that expected | TS3 stops the current generation earlier or later that expected              | 1. Check that the Itest current and adjusted parameters on DUT are correct  
2. Check that the output signal frequency is the same of what is adjusted on the DUT        |
| 6   | “Wrong Password”                       | Message “Wrong password” on the display                                     | Check the exactitude of the inserted password                                                  |
| 7   | Forgotten the Password                 | In case of lost personalized password                                        | Please contact the nearest ABB service organization                                            |
| 8   | The FW version of TS3 is 1.00          | In case of the FW version is 1.00 and missing the communication between the TS3 and PC | Install the TS3 Manager and perform the Firmware upgrade.  
Only from FW version 2.00 on it is possible to establish the communication.                |
| 9   | Communication problem                  | In case of missing communication between PC and TS3                           | 1. Check if the USB cable is connected between TS3 and PC.  
2. Install the driver USB-RS485 converter.  
3. Check which port COM is used.  
4. Check which version of FW is installed on TS3; only from version 2.00 on is possible to use the TS3 Manager.  
5. Check the ID number selected from TS3 Manager (the default number is 1). |
11.1 In case of a fault

If the TS3 is suspected of being faulty, there are signs of malfunctions, we advise you to strictly follow the recommendations below:

1. Take note of the type of fault
2. Take note of the Serial Number, TS3 SW version (see chapter 7.7).
3. Take note of the trip unit type.
4. Prepare a short description of the problem (which messages were present on the display? Which type of test were under test? When did it happen? How many times? Was it always under the same conditions? What current? Is the event reproducible?)
5. Send/communicate all information collected, together with CB circuit diagram, to your nearest ABB Customer Assistance service..

Delivering comprehensive, accurate information to ABB Assistance service will facilitate technical analysis of the problem encountered, and allow to promptly carry out all actions useful for the user.
Due to possible developments of standards as well as of materials, the characteristics and dimensions specified in the present document may only be considered binding after confirmation by ABB S.p.A. ABB SACE Division

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