INSTRUMENTOS PARA TESTES ELÉTRICOS

Test Tutorial

Equipment Type: Protection Relay

Brand: Schneider

Model: SEPAM T42

Function: 50 or PIOC- Instantaneous Overcurrent and 51 or PTOC – Time Overcurrent

Tool Used: CE-6003, CE- 6006, CE-6707, CE-6710, CE-7012 our CE-7024

Objective: Timed pickup/dropout test of the Phase units (51), timed curve survey, instantaneous pickup test of phase units (50).

Version control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	01/10/2021	M.R.C.	M.P.S

Summary

Statement of responsibility

The information contained in this tutorial is constantly verified. However, differences in description cannot be completely excluded; in this way, CONPROVE disclaims any responsibility for errors or omissions contained in the information transmitted.

Suggestions for improvement of this material are welcome, just user contacts us via email suporte@conprove.com.br.

The tutorial contains knowledge gained from the resources and technical data at the time was writing. Therefore, CONPROVE reserves the right to make changes to this document without prior notice.

This document is intended as a guide only; the manual of the equipment under tested should always be consulted.

ATTENTION!

The equipment generates high current and voltage values during its operation.
Improper use of the equipment can result in material and physical damage.

Only suitably qualified people should handle the instrument. It should be noted that the user must have satisfactory training in maintenance procedures, a good knowledge of the equipment to be tested and also be aware of safety standards and regulations.

Copyright

Sequence for testing the SEPAM T42 relay in the Overcurrent software

1. Relay connection to CE-6006

Appendix A-1 shows the relay terminal designations.

1.1 *Auxiliary Source*

Connect the positive (red terminal) of the Vdc Aux. Source to pin 1 on the CSH terminal of the relay and the negative (black terminal) of the Vdc Aux. Source to pin 2 of the CSH terminal of the relay.

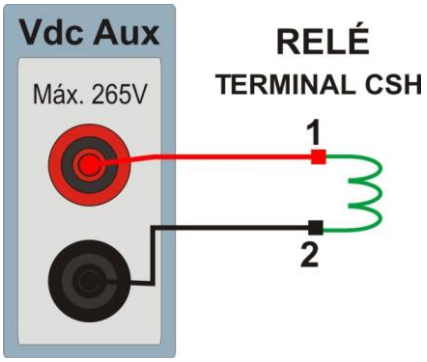


Figure 1

1.2 *Current Coils*

To establish the connection of the current coils, connect the current channels I1, I2 and I3 to pins 4, 5 and 6 of module B (Appendix A) of the relay and connect the common of the current channels to pins 1, 2 and 3 of relay module B.

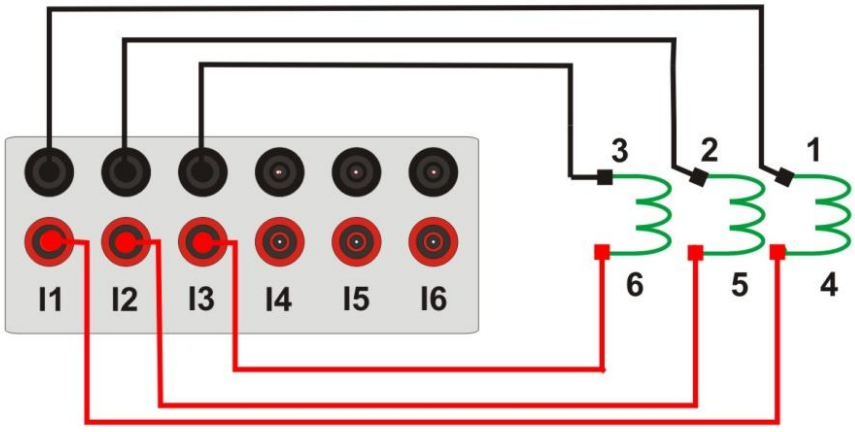


Figure 2

1.3 *Binary Inputs*

Connect the CE-6006 binary inputs to the binary outputs on the CSH terminal of the relay.

- BI1 to pin 05 and its common to pin 04;
- BI2 to pin 08 and its common to pin 07;
- BI3 to pin 11 and its common to pin 10;
- BI4 to pin 14 and its common to pin 13.

The following figure shows the details of these connections.

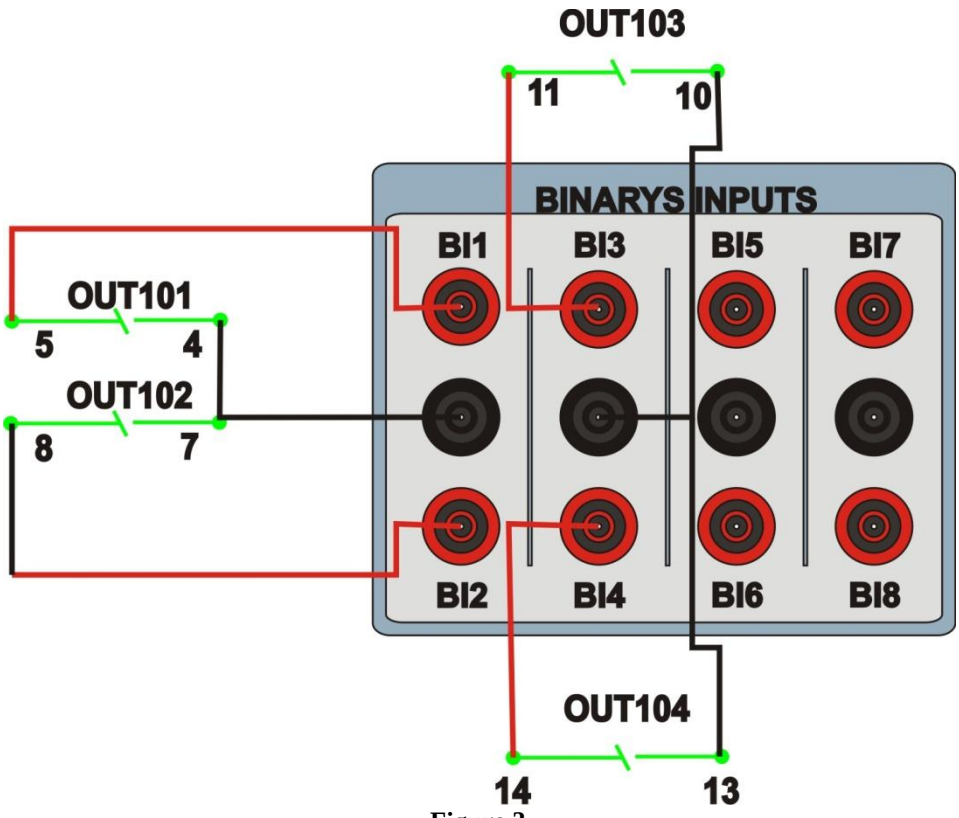


Figure 3

2. Communication with the SEPAM T42 relay

First, a serial cable from the notebook is connected to the relay. Then double-click on the SFT2841 software icon.

Figure 4

When opening the program, the following screen is shown:

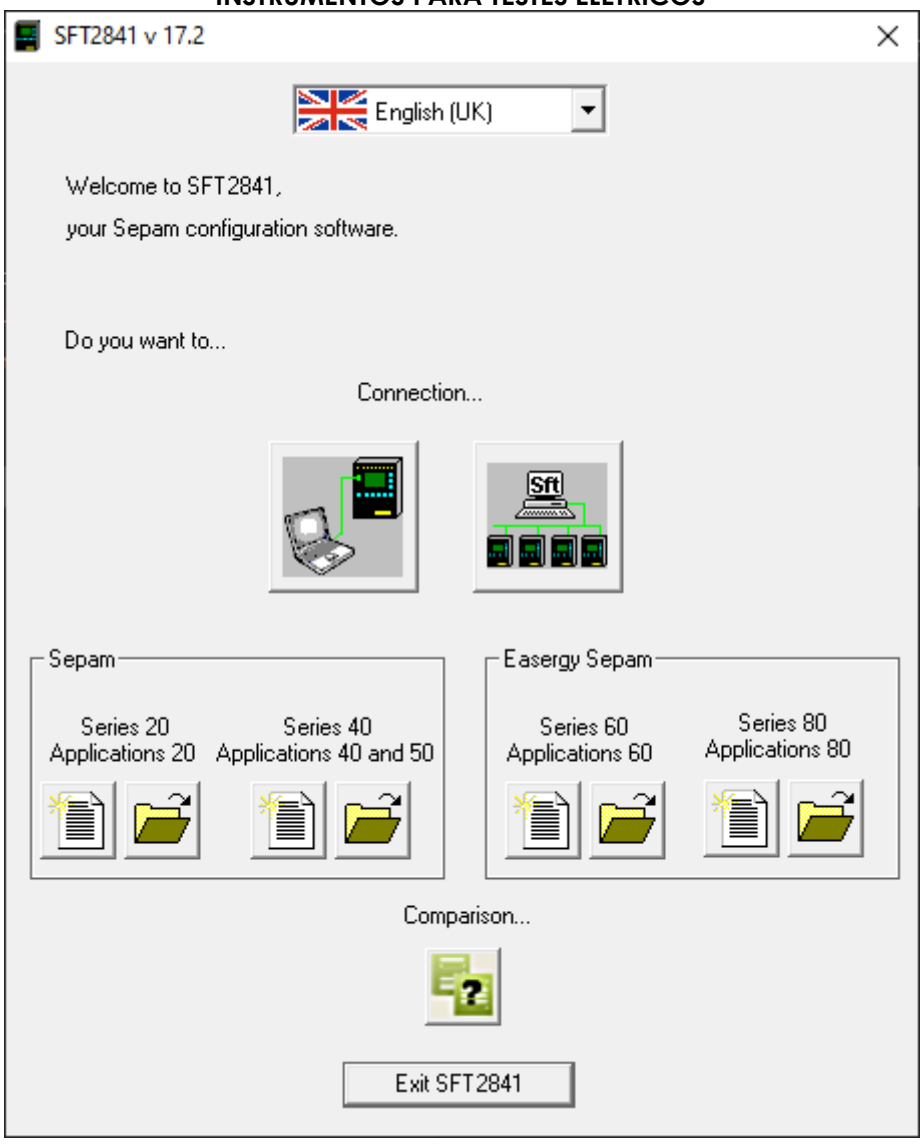


Figure 5

To start the communication click on the icon illustrated below:

Figure 6

Then the main screen appears where the tab “Sepam Hardware Configuration” is already selected. In this tab the user indicates if there are additional modules in the relay for the software. The relay used for this tutorial has the following settings:

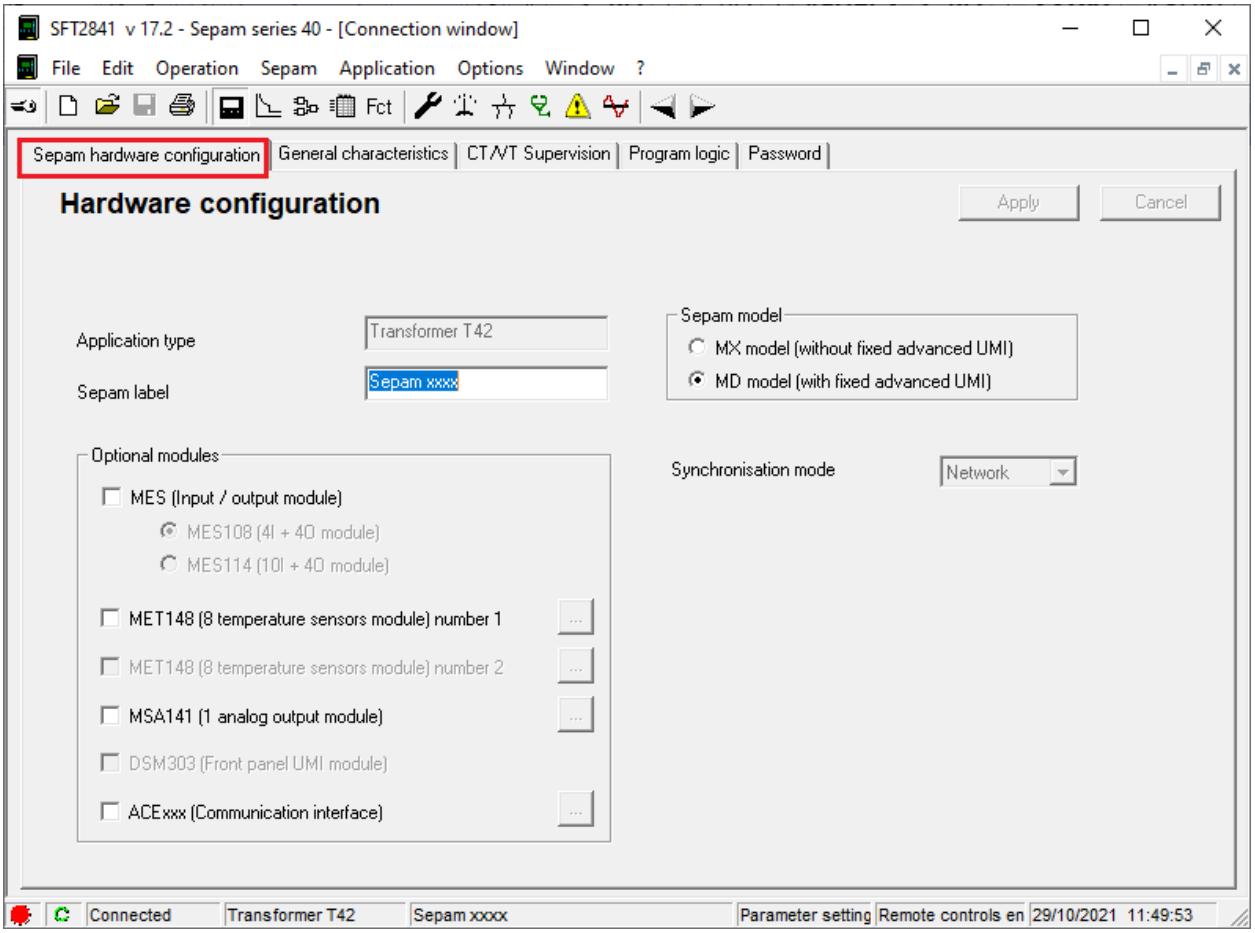


Figure 7

3. Parameterization of the SEPAM_T42 relay

The next step is to adjust the values of the nominal frequency, the nominal primary current and the nominal secondary current. The values of these parameters are in the table below:

Table 1

Network Frequency	60Hz
Rated primary current (In)	50A
Rated secondary current	5A

3.1 *General characteristics*

In this tab, the values described above are adjusted, in addition to other fields. What is highlighted in red needs special attention so that the test takes place properly.

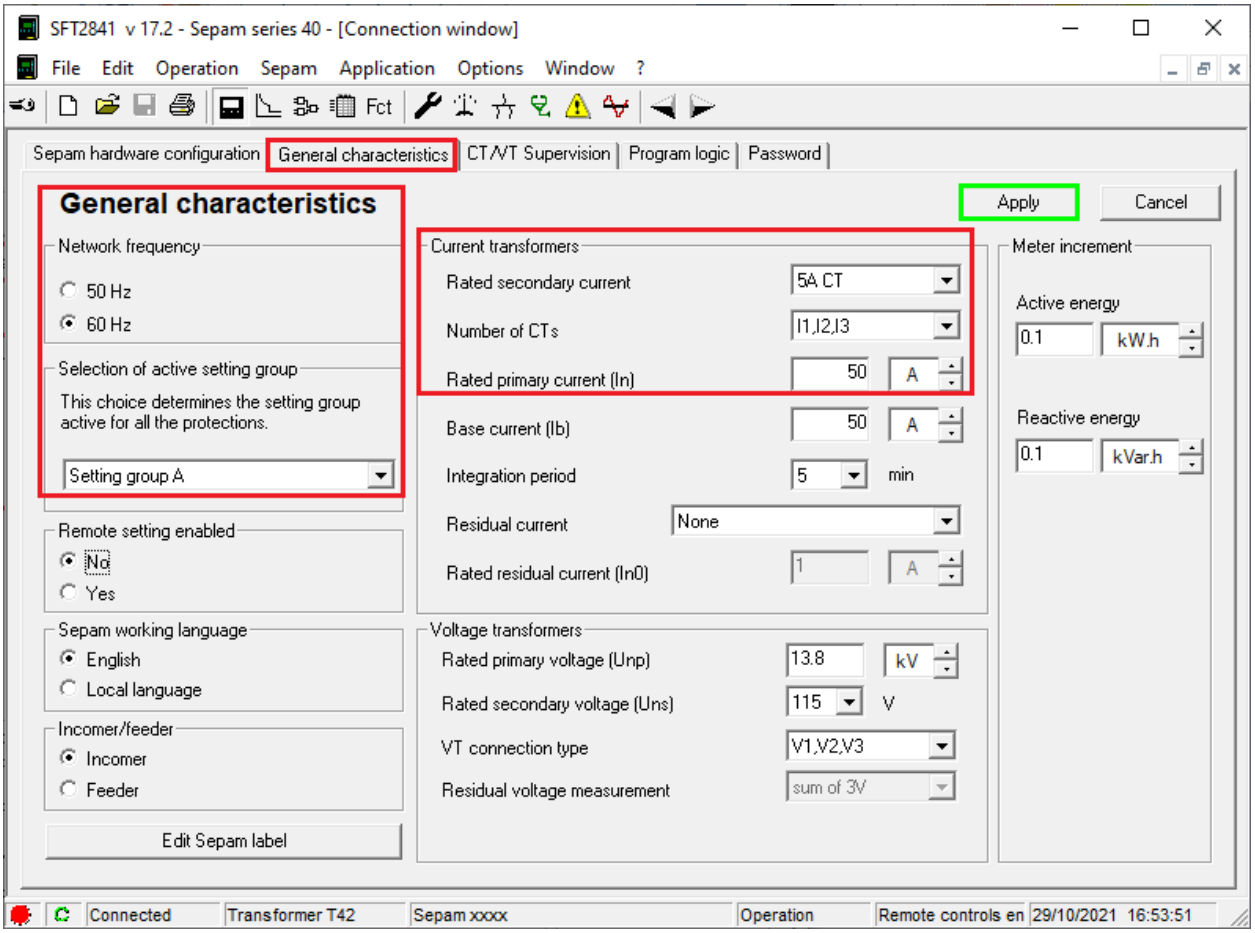


Figure 8

After configuring the settings, click on the *"Apply,"* icon highlighted in green in the previous figure, for the software to send the modifications to the relay. However before this happens a password is required.

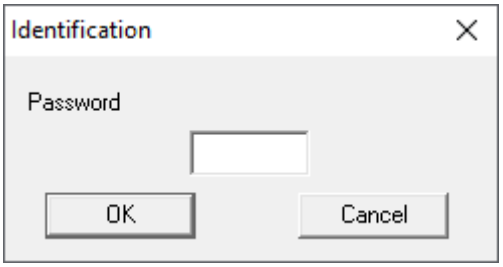


Figure 9

Enter your password. Whenever a parameter is changed its password must be entered.

Note: Remembering that the default password is 0000.

3.2 *CT/ VT Supervision*

In this field, disable all functions so that they do not interfere with the test.

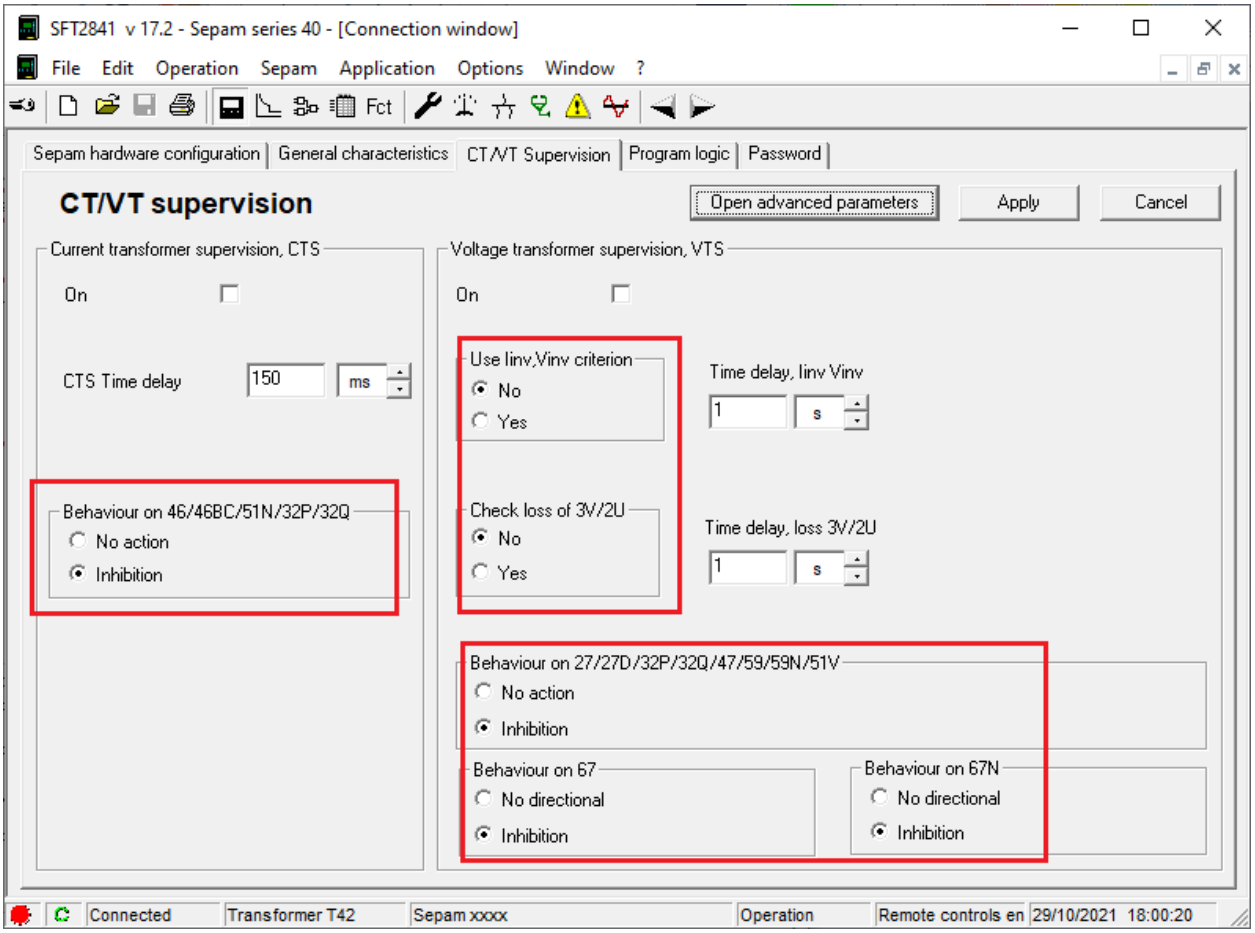


Figure 10

3.3 *Program logic*

In this field, the nominal state of the binary outputs is set.

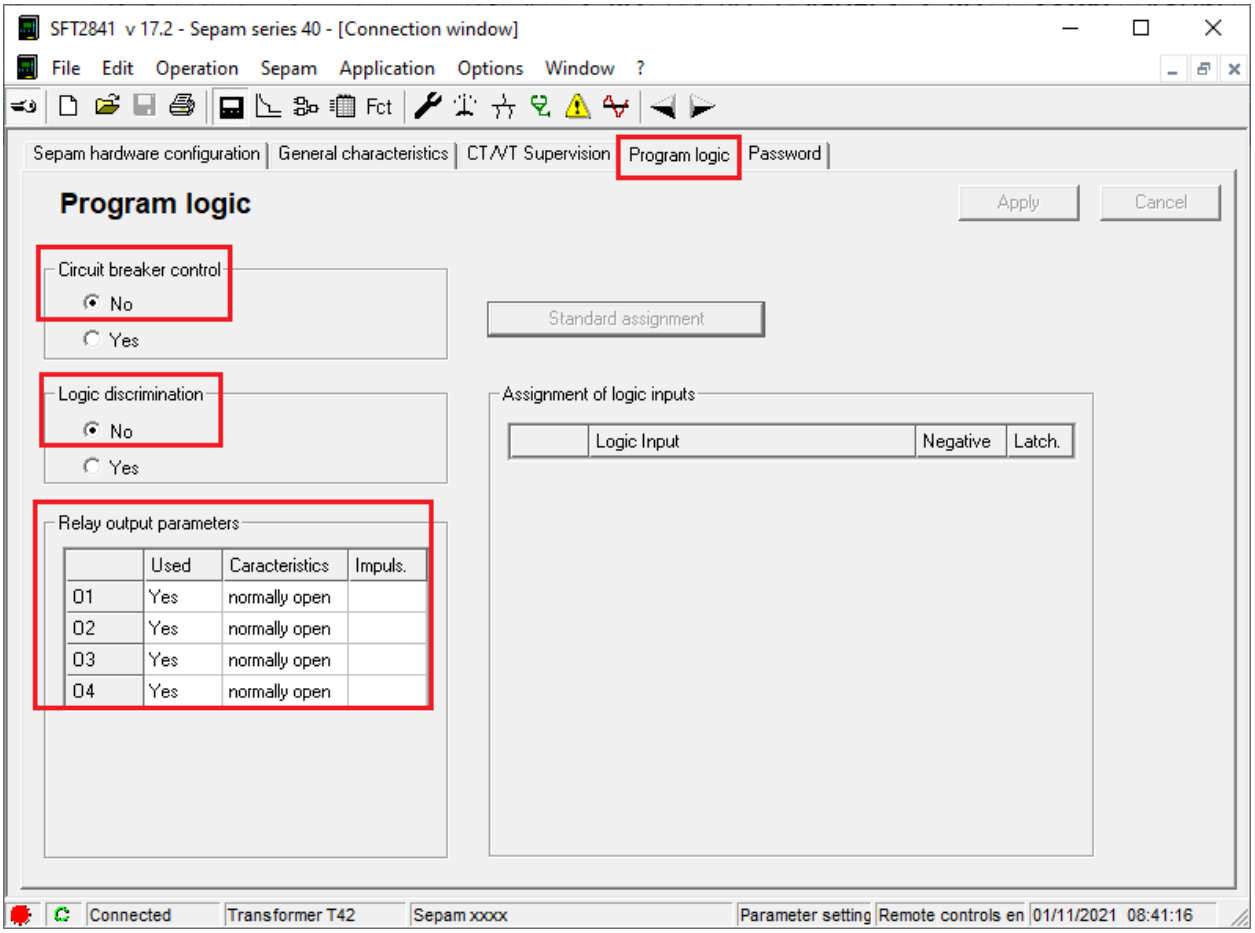


Figure 11

The next step is to adjust the overcurrent functions. To do this click on the icon below:

Figure 12

3.4 *50/51: Phase overcurrent*

For this function it is possible to set up to four stages. Each being configured as function 50 or 51. In this tutorial the first stage will be the timed function, the second stage will be instantaneous 1 and the third stage will be instantaneous 2. Unlike most relays the pick-up value setting is referenced to the primary. Therefore, the values found in the test will be divided by the Current Transform Ratio (CTR). As the current transformer is 50/5, the values found will be divided by a factor of 10. For the timed function, the following settings are configured:

Table 2

Current threshold	20A (primary)
Curve Standard	IEC
Curve Type	SI = Standard Inverse
Time dial	0,5

For the next two stages use the following settings:

Table 3

	Instantaneous -1	**Instantaneous -2**
Pick-up	140A (primary)	160A (primary)
Delay	200ms	0s

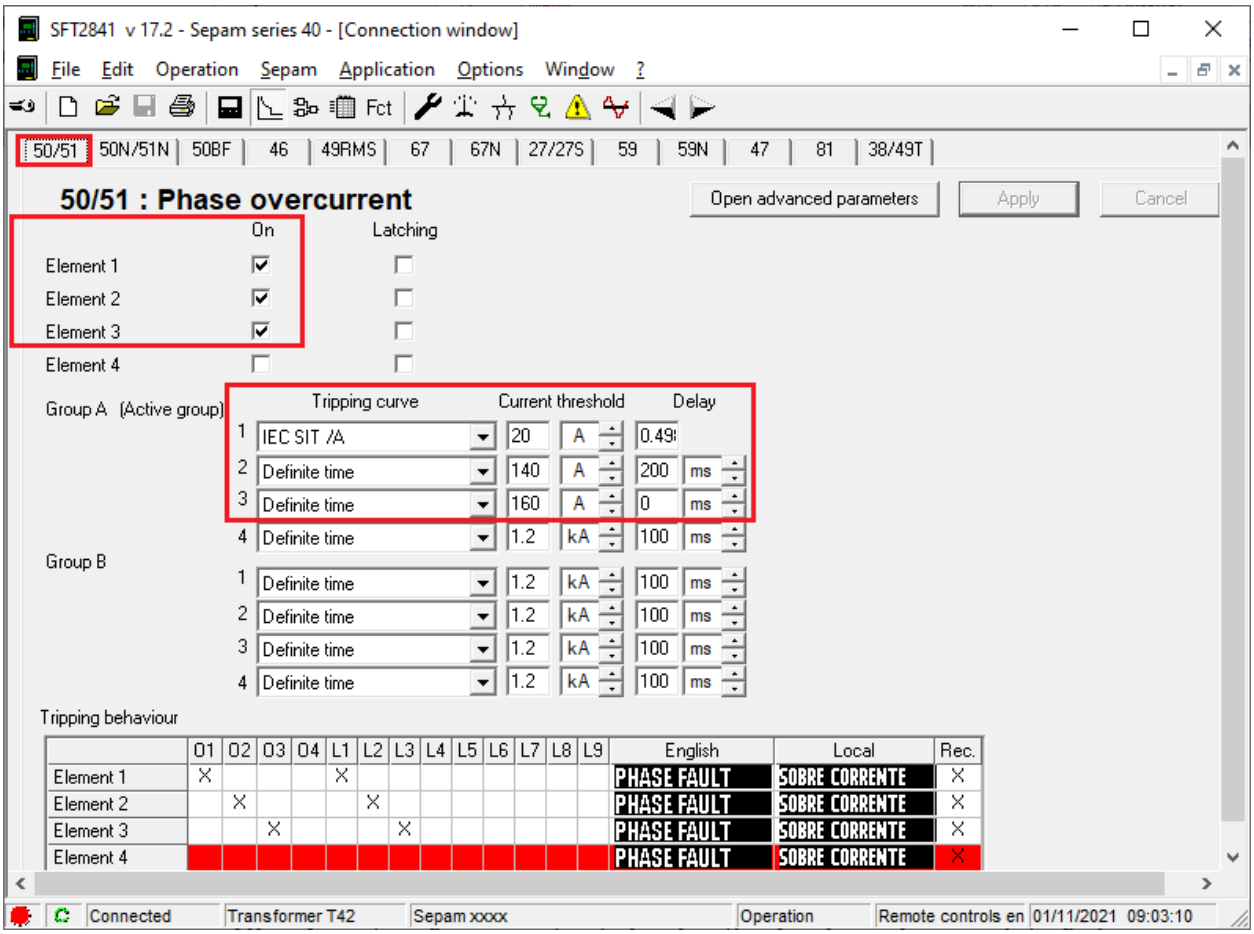


Figure 13

Note: The other functions are all disabled so as not to interfere with the 50/51 test.

3.5 *Control Matrix*

Click on the icon illustrated below to specify the binary output of each relay function.

Figure 14

In the *"Protections"* field and in the *"Outputs"* tab, configure the trip of each function with a certain binary output.

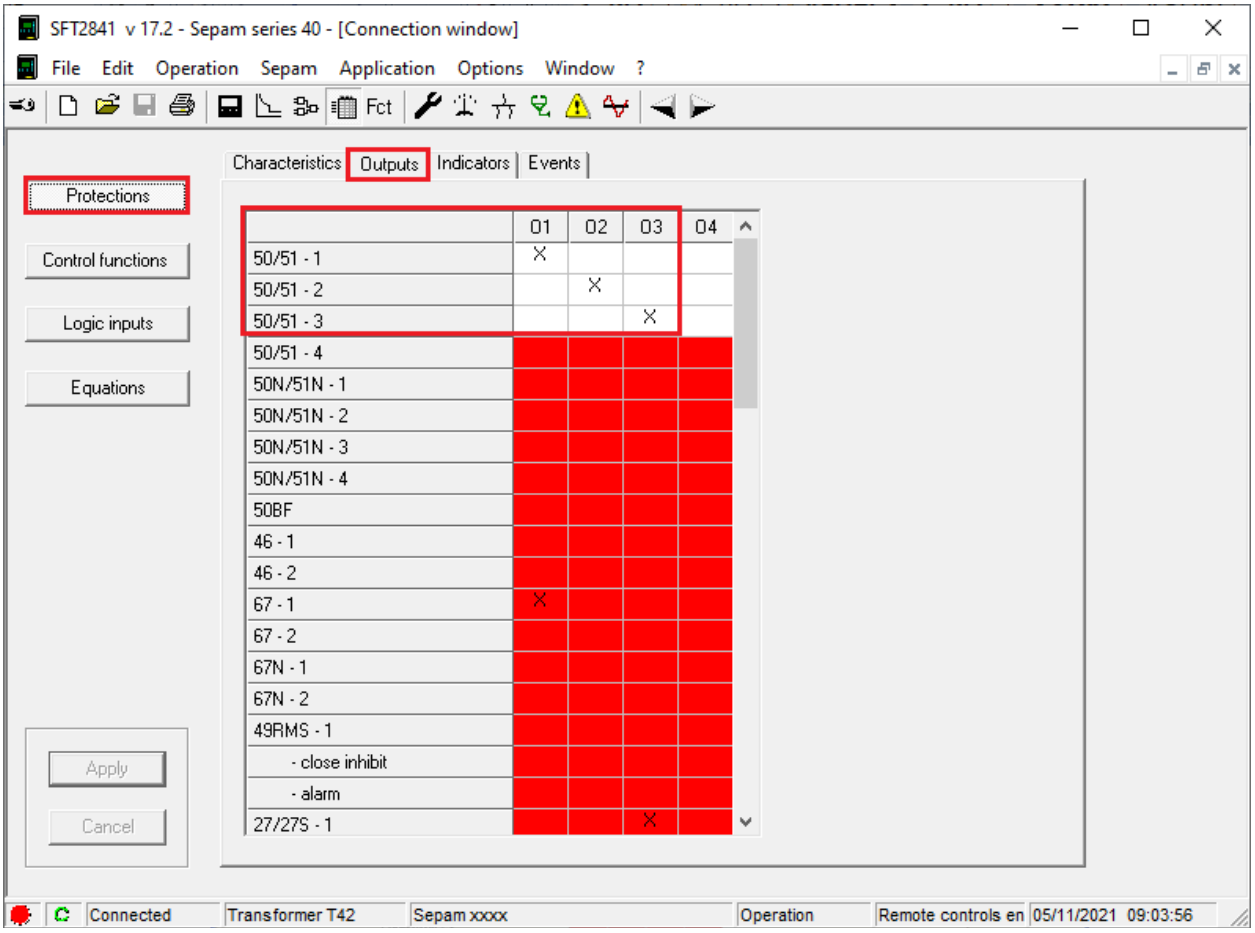


Figure 15

In the field *"Control functions"* configure output 4 to monitor the pick-up. This is necessary for us to test the pick-up of the timed element.

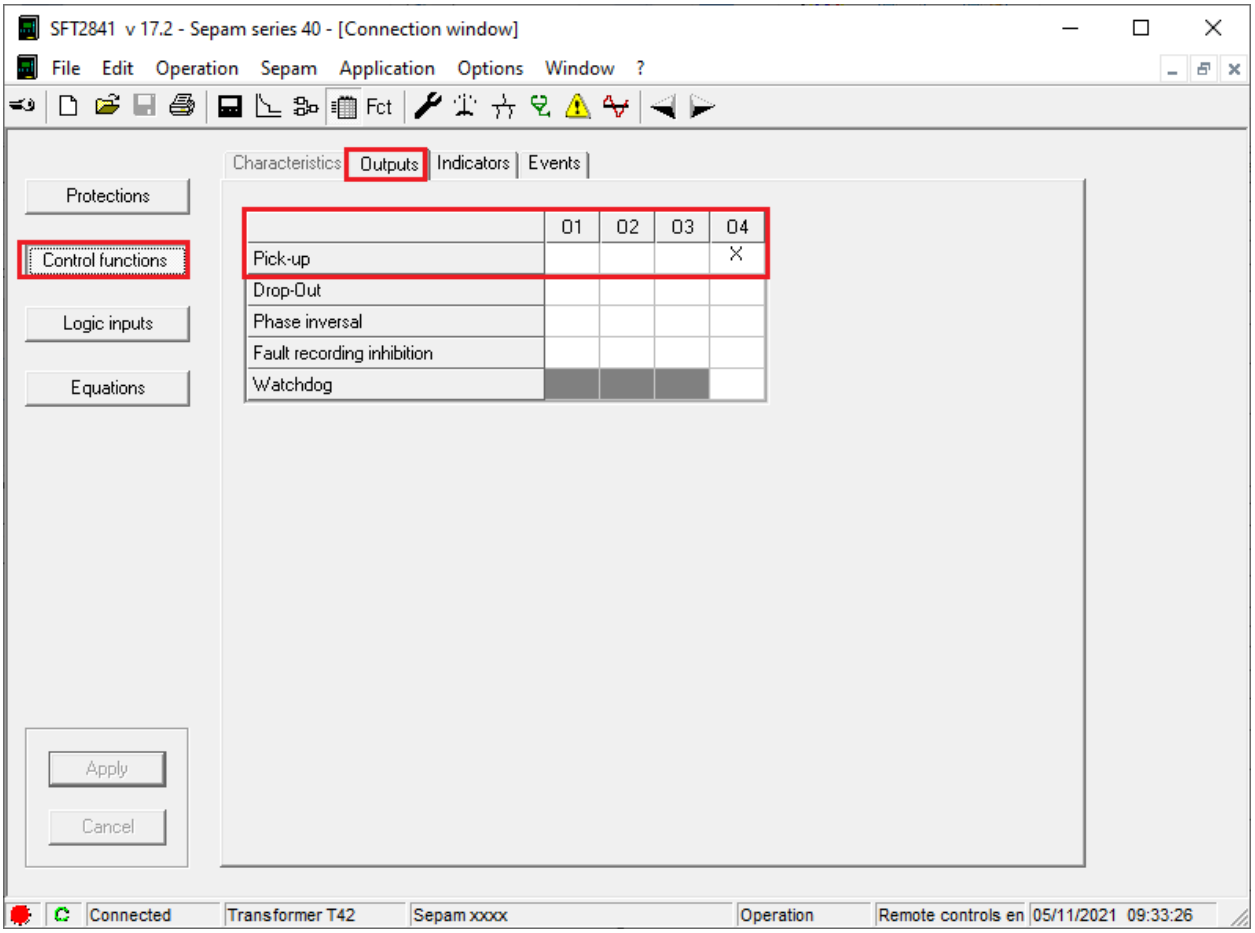


Figure 16

4. Overcurrent software adjustments

4.1 *Opening the Overcurrent*

Click on the *"Conprove Test Center"* application manager icon.

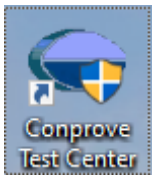


Figure 17

Click on the software icon *"Overcurrent"*.

.

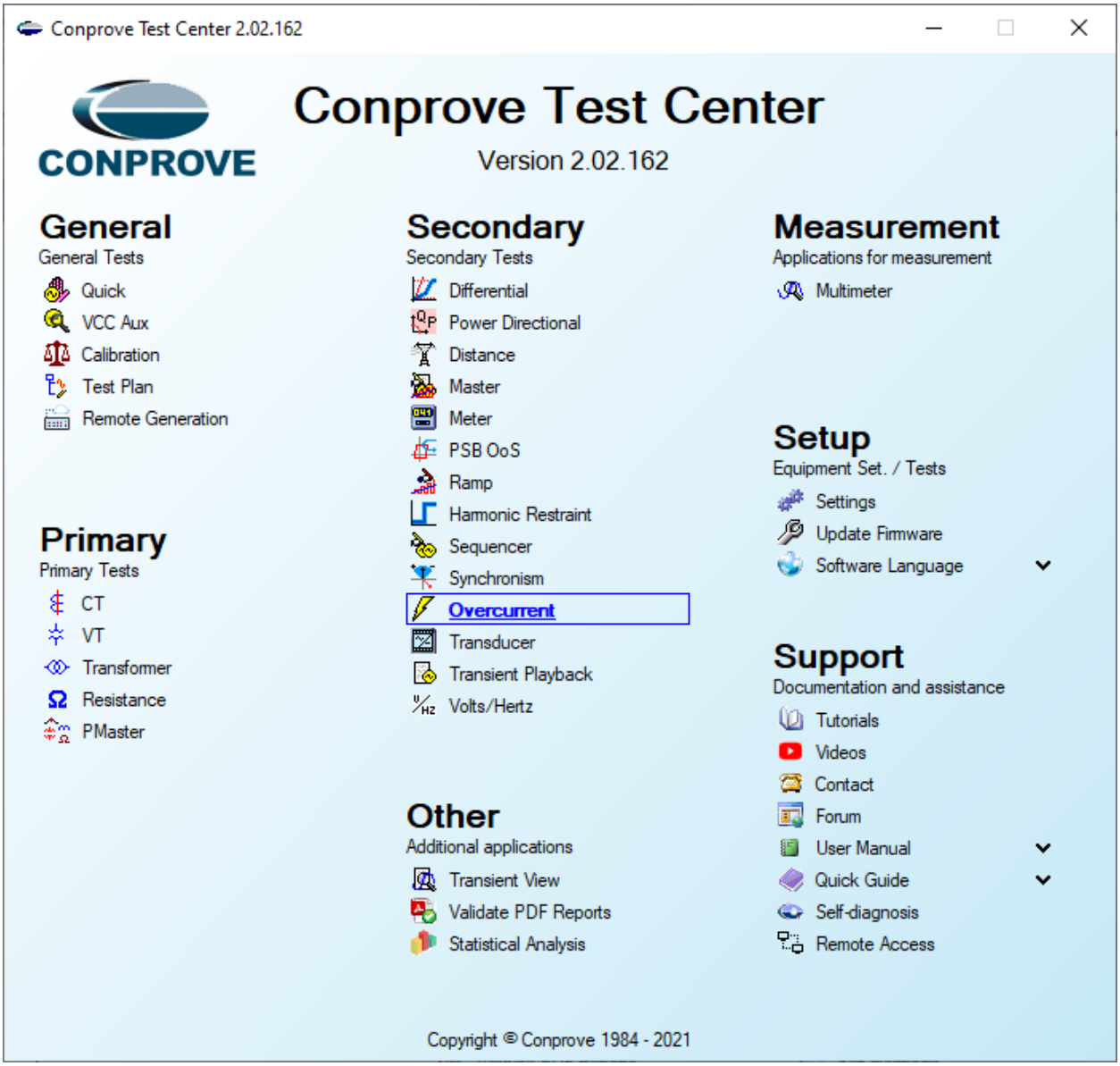

Conprove Test Center 2.02.162
CONPROVE
Conprove Test Center
Version 2.02.162
General
General Tests
Quick
VCC Aux
Calibration
Test Plan
Remote Generation
Primary
Primary Tests
CT
VT
Transformer
Resistance
PMaster
Secondary
Secondary Tests
Differential
Power Directional
Distance
Master
Meter
PSB OoS
Ramp
Harmonic Restraint
Sequencer
Synchronism
Overcurrent
Transducer
Transient Playback
Volts/Hertz
Other
Additional applications
Transient View
Validate PDF Reports
Statistical Analysis
Measurement
Applications for measurement
Multimeter
Setup
Equipment Set. / Tests
Settings
Update Firmware
Software Language
Support
Documentation and assistance
Tutorials
Videos
Contact
Forum
User Manual
Quick Guide
Self-diagnosis
Remote Access
Copyright © Conprove 1984 - 2021

Figure 18

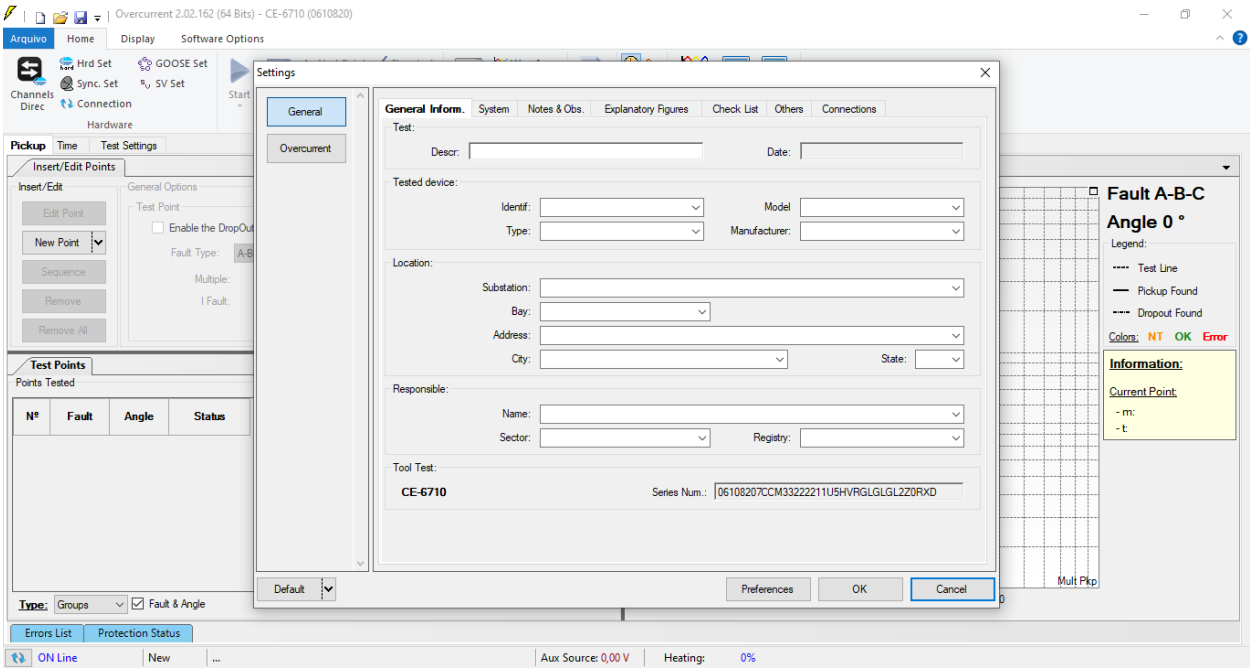


Figure 19

4.2 *Configuring the Settings*

When opening the software *"Settings"* screen will open automatically (provided that the option *"Open Settings when Start"* found in the *"Software Options"* menu is selected). Otherwise, click directly on the *"Settings"* icon.

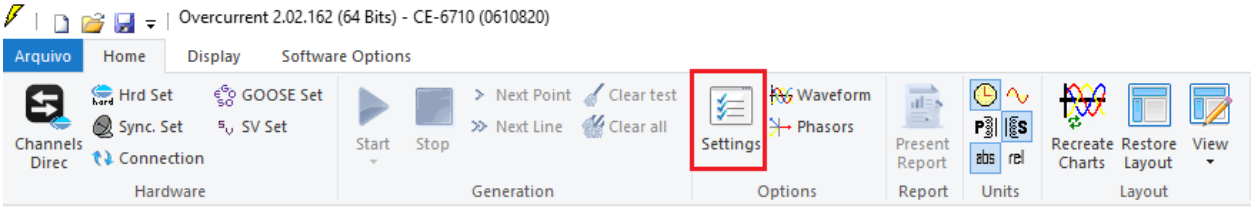


Figure 20

Inside the *"Settings"* screen, fill in the *"General Inform."* with details of the tested device, installation location and the person responsible. This does reporting easier, as this tab will be the first to be shown.

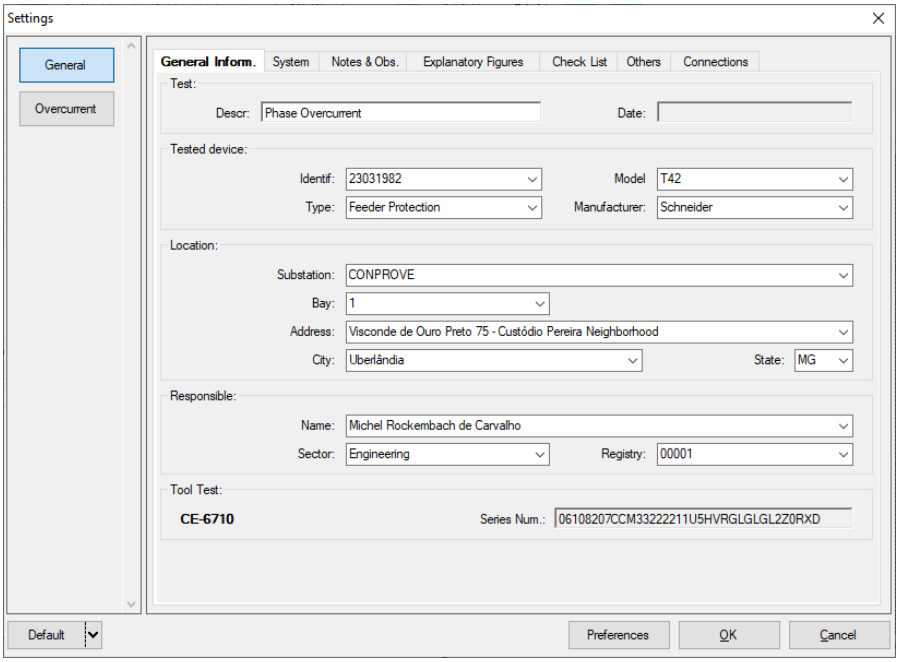


Figure 21

4.3 *System*

In the following screen, within the *"Nominal"* sub tab, the values of frequency, phase sequence, primary and secondary voltages, primary and secondary currents, transformation ratios of VTs and CTs are configured. There are also two sub-tabs *"Impedance"* and *"Source"* whose data are not relevant for this test.

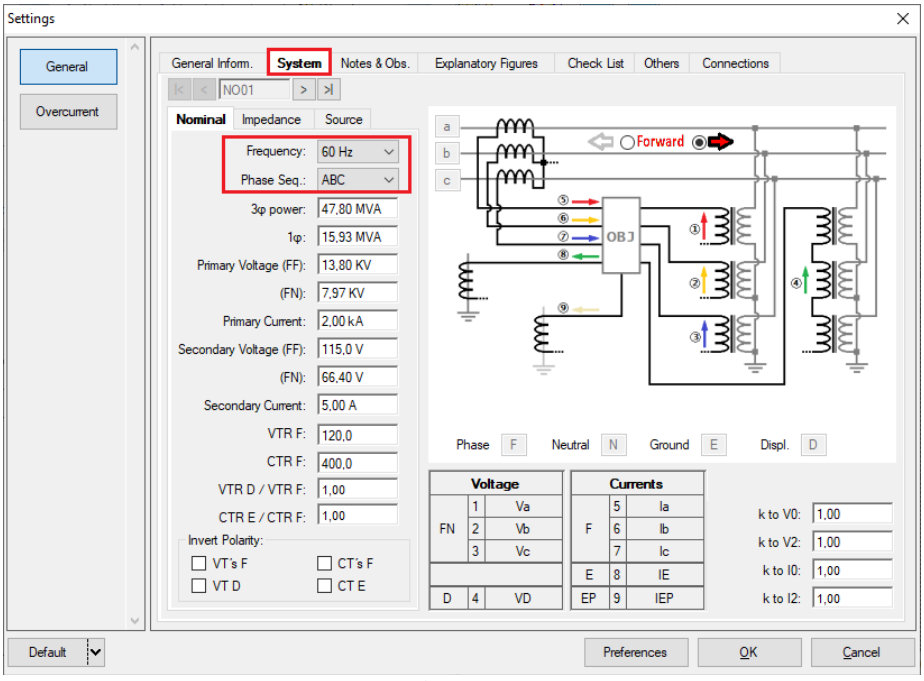


Figure 22

There are other tabs where the user can enter *"Notes & Obs., Explanatory Figures,"* can create a *"Check List"* of the procedures for carrying out the test and even create a diagram with all the schematic of the connections between the test set and the test equipment.

5. Overcurrent Adjustments

5.1 *Overcurrent Screen > Definitions*

This tab adjusts if the function has directionality, the way to view the current graph by time, the scale used and the tolerances by time, current and angle. These tolerances should be consulted in the relay manufacturer's manual.

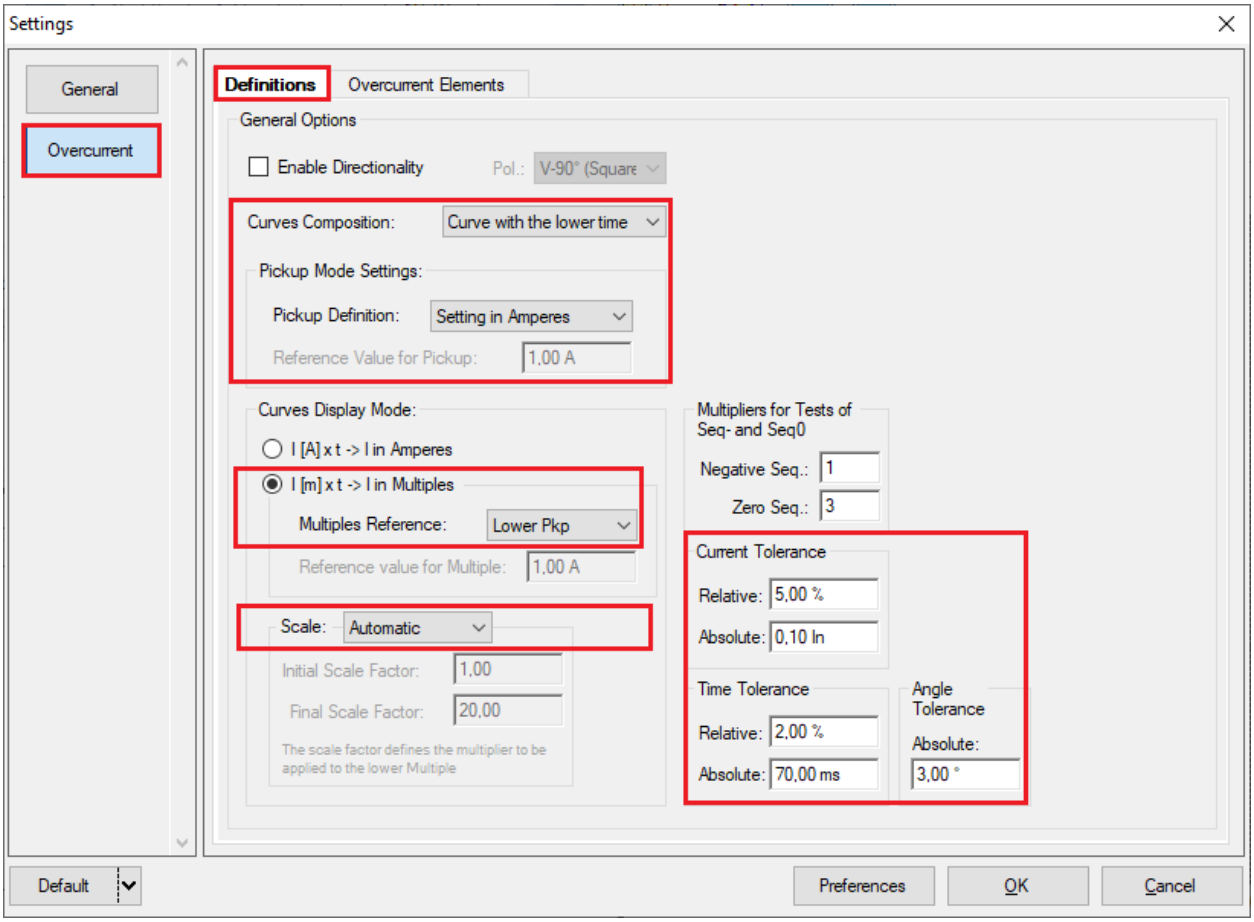


Figure 23

5.2 *Overcurrent Screen > Overcurrent Elements > Phase*

Here you must configure the three overcurrent elements, one with an inverse curve and two with definite time. To do this click three times on the highlighted icon.

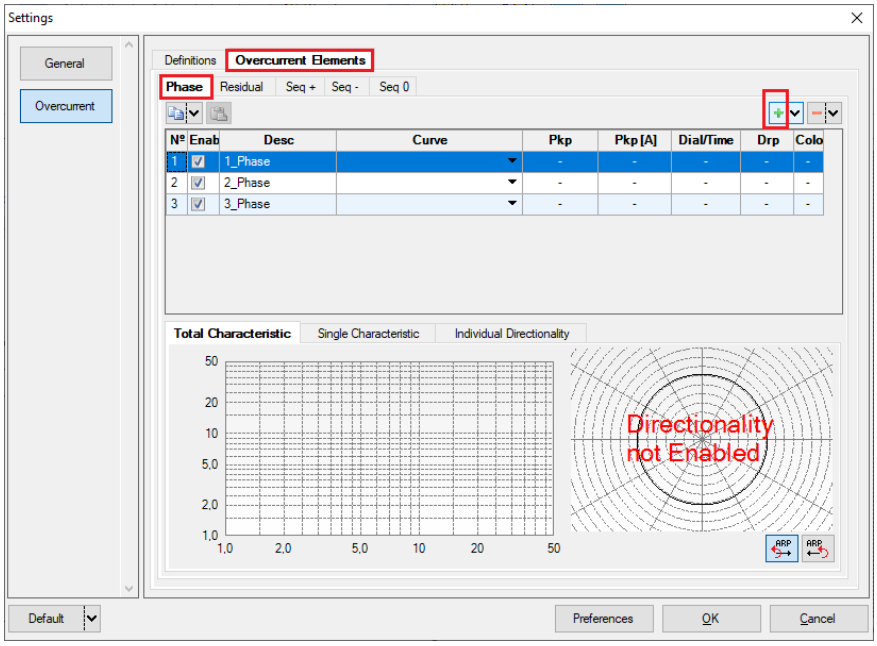


Figure 24

For the first element change the name to *"51"* choose the curve type, pickup value, time dial and dropout factor. Repeat the same procedure for the second element and third element changing the name to 50-1 and 50-2 choosing definite time and parameterizing the values of *"Pkp"*, *"Dial/Time"* and *"Drp"*.

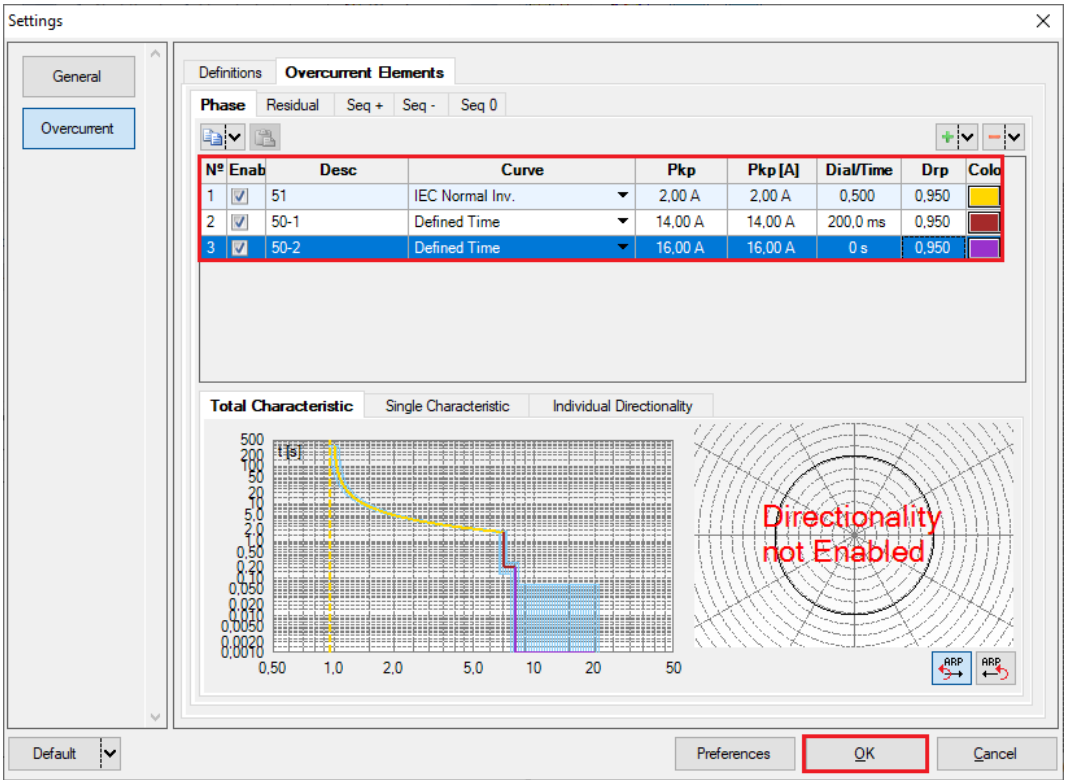


Figure 25

6. Channel Targeting and Hardware Configurations

Click on the icon illustrated below.

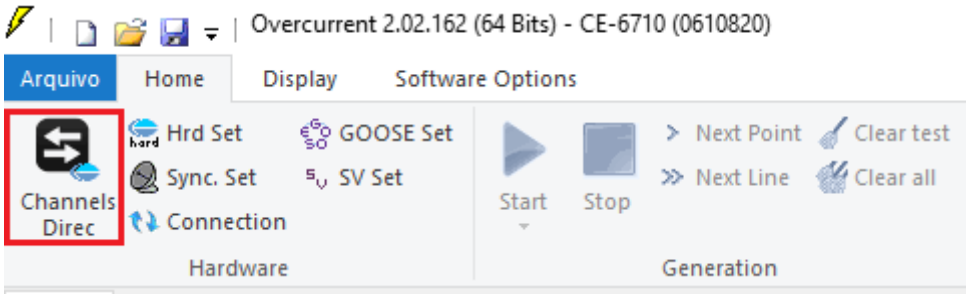


Figura 26

Then click on the highlighted icon to configure the hardware.

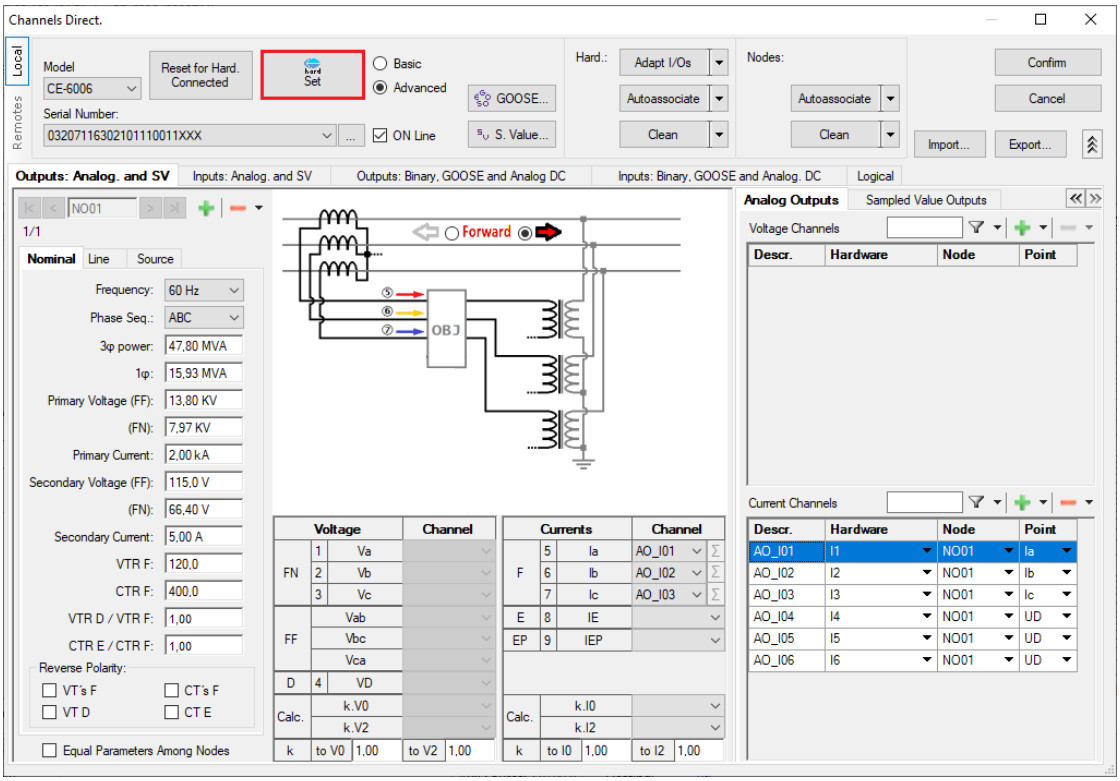


Figure 27

Choose the channel configuration; adjust the auxiliary source and the method of stopping the binary inputs. To finish click on *"OK"*.

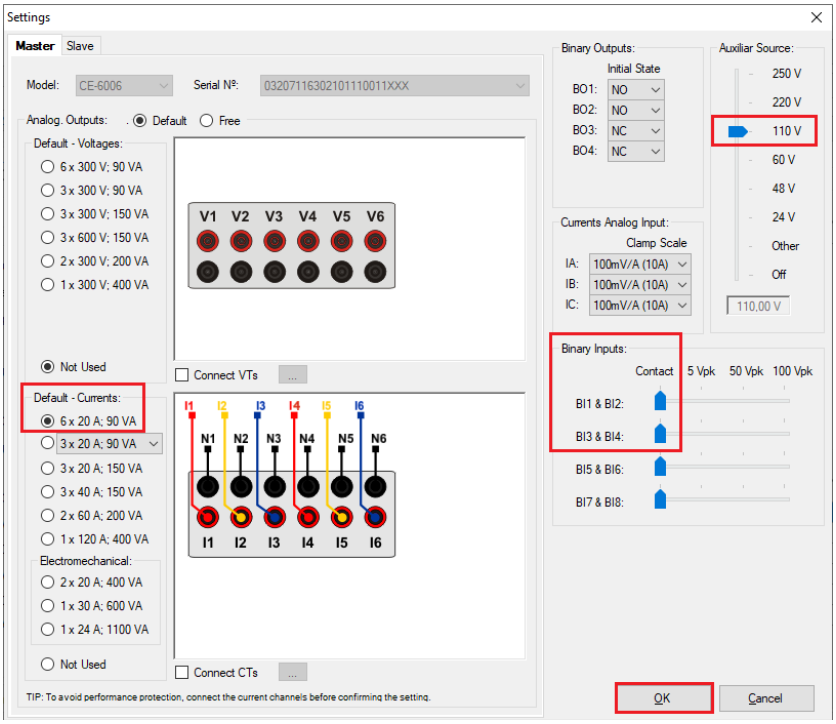


Figure 28

On the next screen choose *"Basic"* and on the next window (didn't shown) choose *"YES"*, finally click on *"Confirm"*.

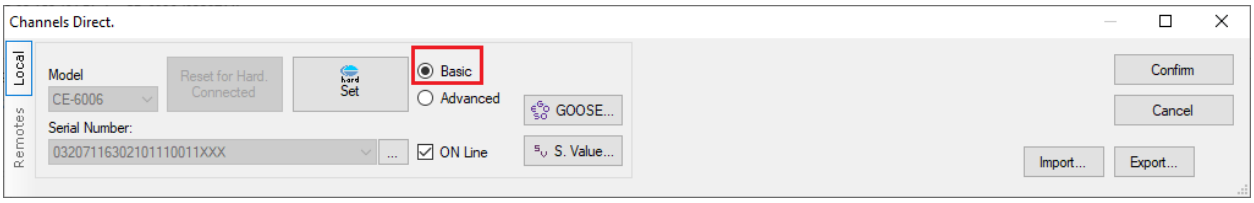


Figure 29

7. Test Structure for Function 50/51

7.1 *Test Settings*

On this tab you must configure the direction of pickup and trip signals with the binary inputs, in addition to configuring the generation channels. You can configure pre-faults and post-faults if necessary.

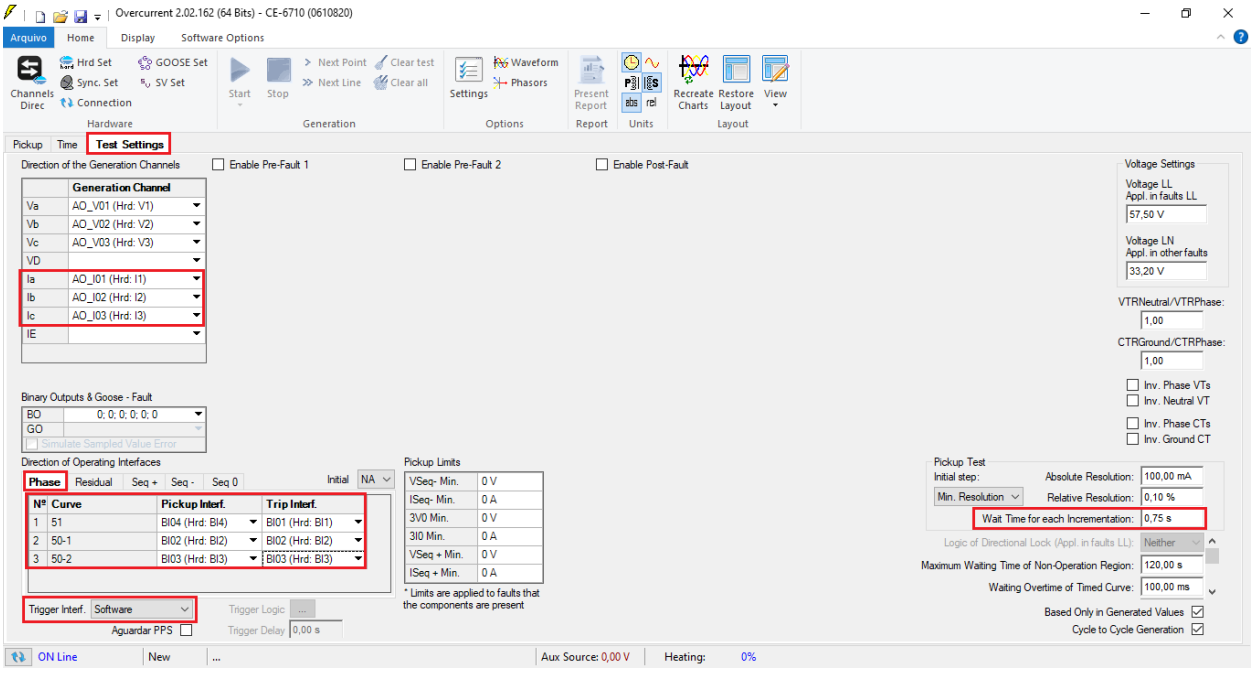


Figure 30

7.2 *Pickup screen*

On this tab click on *"New Point"* and choose the type of fault (it has all types), if you want to test dropout and the software searches for pickup and dropout fully automatically. In the figure below, the *"Fault Type"* ABC was chosen.

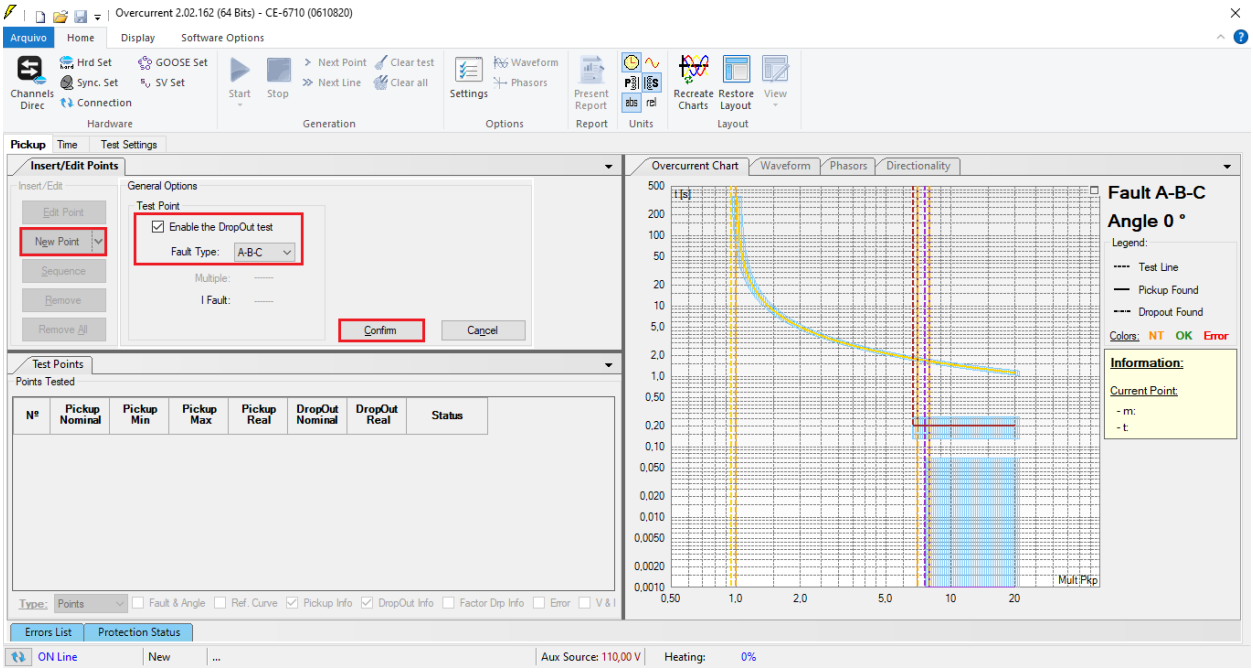


Figure 31

Start the generation by clicking on the icon highlighted below or using the command *"Alt +G"*.

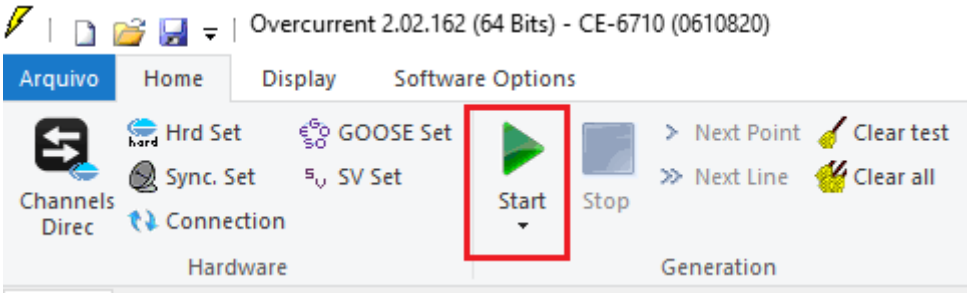


Figure 32

7.3 *Final Result of the Pickup Test*

In this test, the values found for pickup, dropout, and percentage and absolute errors can be viewed in order to pass or fail the test. Other options are generated values, dropout factor, reference curve, angle and fault.

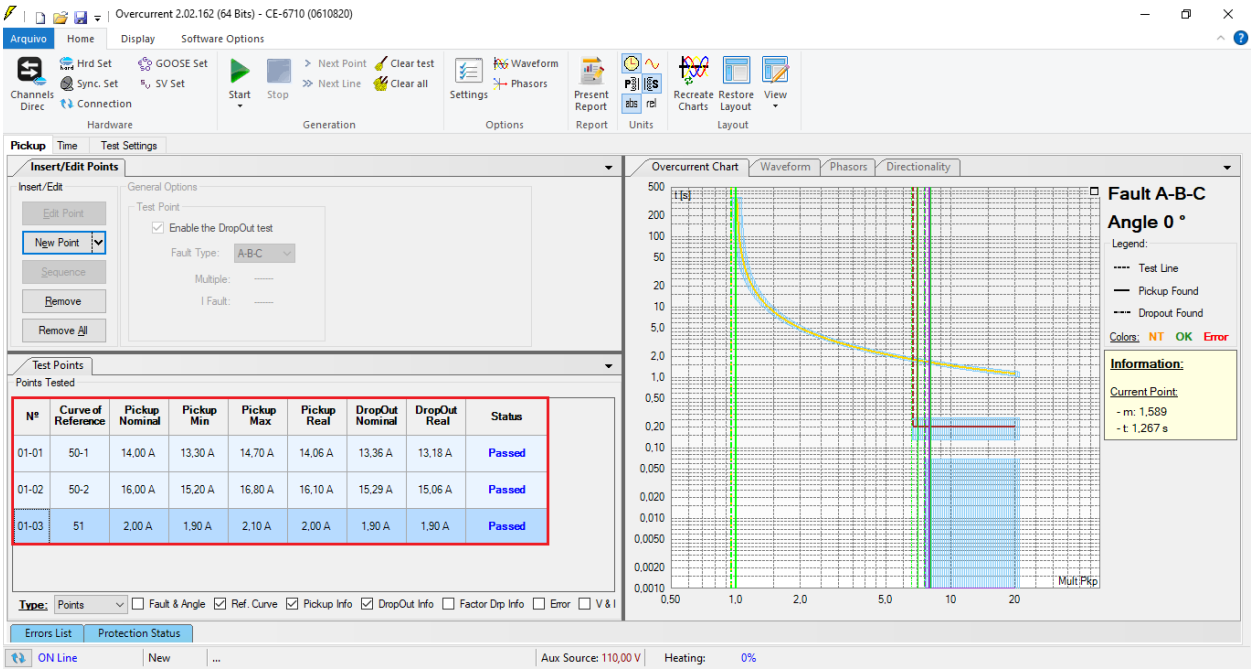


Figure 33

7.4 *Time screen*

On this tab, the operating times are evaluated. As the binary outputs of the curve and definite time are separated there will be two evaluations of time for evaluations greater than 14.00A and three evaluations for currents greater than 16 (one time for each element). For convenience, a sequence of current values will be inserted for time

evaluation. The value 4.50A was chosen as the initial value, 20.00A as the final value and 2.50A as the increment step and the ABC fault.

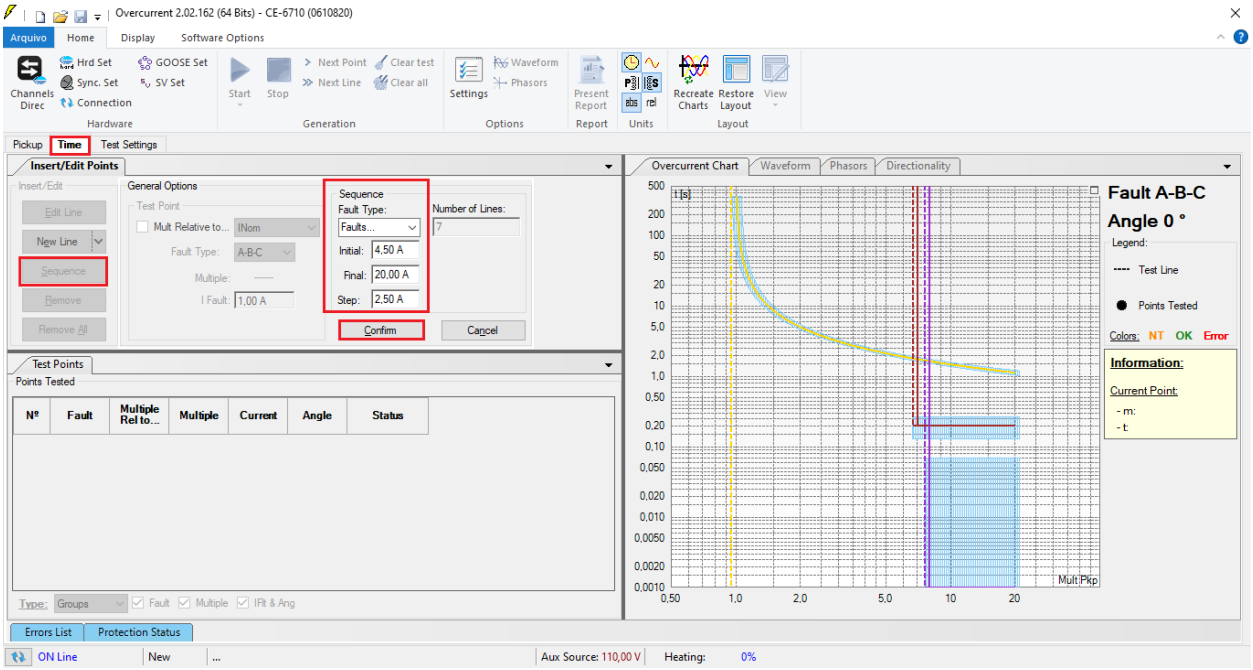


Figure 34

Start the generation by clicking on the icon highlighted below or using the command *"Alt +G"*.

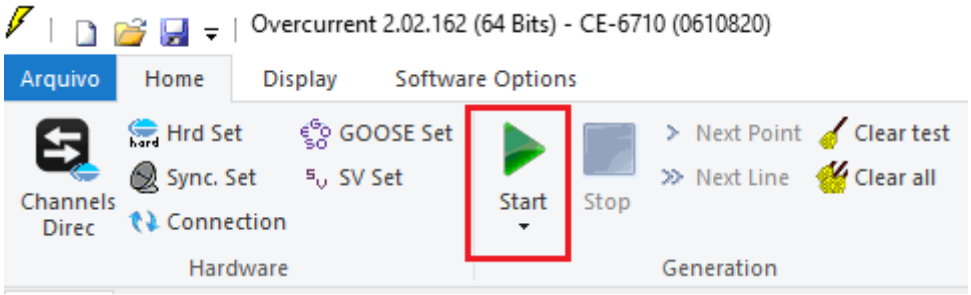
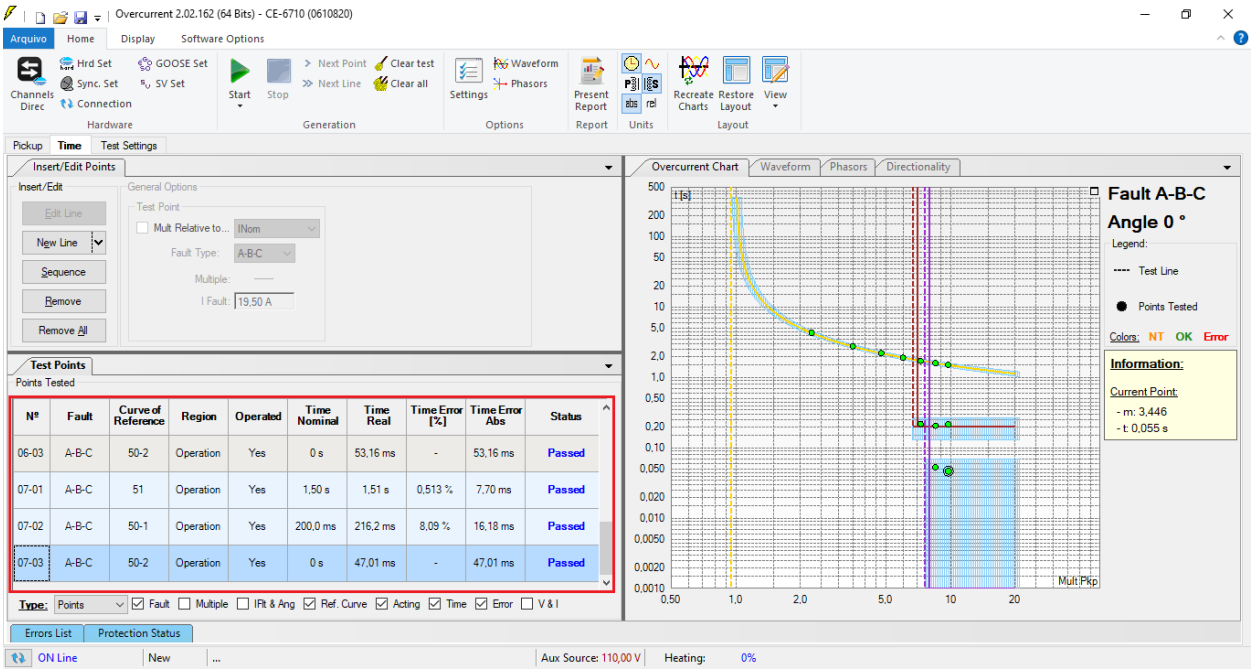


Figure 35

7.5 *Final Result of the Time Test*



Nº	Fault	Curve of Reference	Region	Operated	Time Nominal	Time Real	Time Error [%]	Time Error Abs	Status
06-03	A-B-C	50-2	Operation	Yes	0 s	53,16 ms	-	53,16 ms	Passed
07-01	A-B-C	51	Operation	Yes	1,50 s	1,51 s	0,513 %	7,70 ms	Passed
07-02	A-B-C	50-1	Operation	Yes	200,0 ms	216,2 ms	8,09 %	16,18 ms	Passed
07-03	A-B-C	50-2	Operation	Yes	0 s	47,01 ms	-	47,01 ms	Passed

Figure 36

It is verified that all operating times are within the range allowed by the relay manufacturer.

8. Report

After finishing the test, click on the *"Present Report"* icon in the previous figure or through the command *"Ctrl +R"* to call the report pre-configuration screen. Choose the desired language as well as the options that should be part of the report.

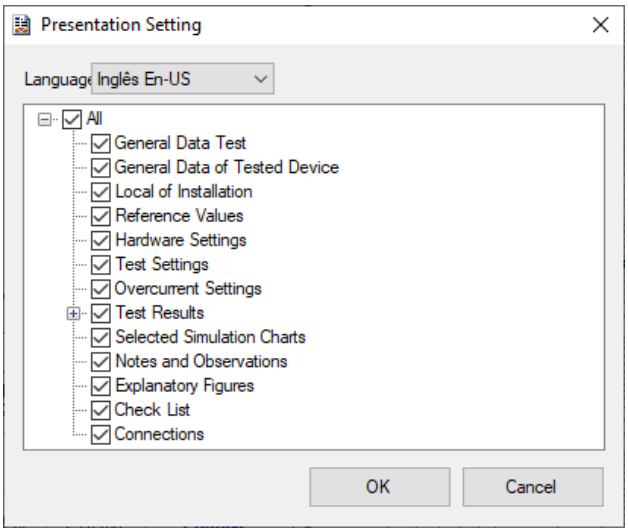


Figure 37

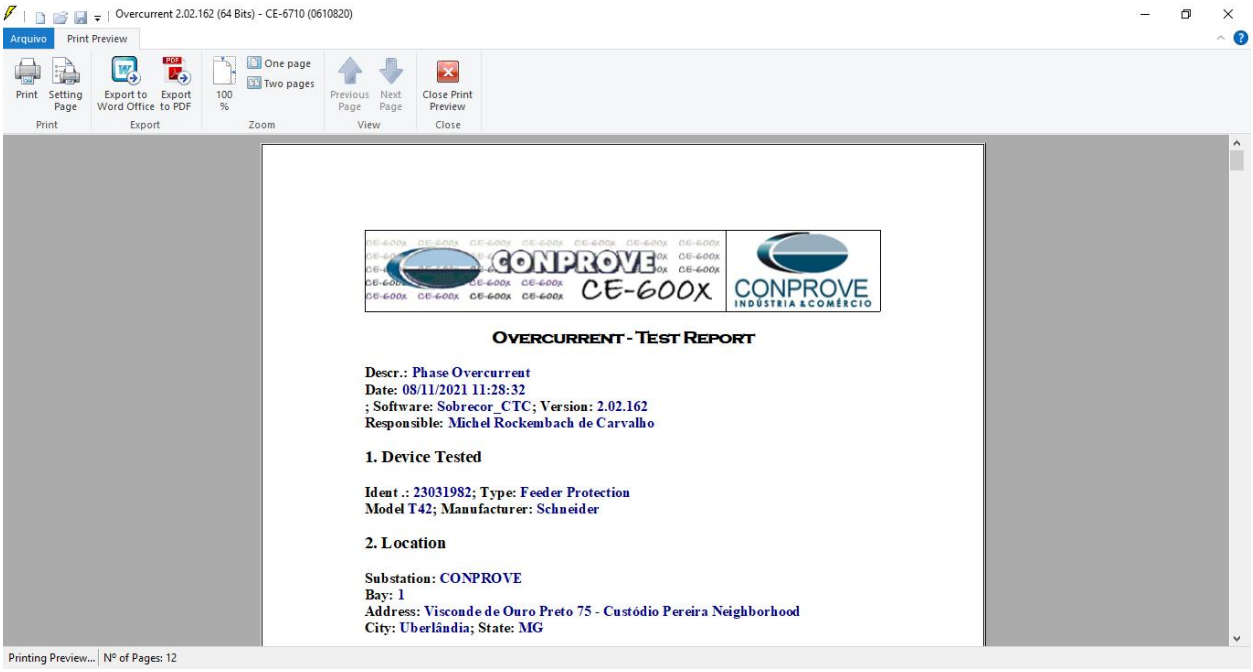

Overcurrent 2.02.162 (64 Bits) - CE-6710 (0610820)
Arquivo
Print Preview
Print
Setting Page
Export to Word Office
Export to PDF
100 %
One page
Two pages
Previous Page
Next Page
Close Print Preview
Print
Export
Zoom
View
Close
CONPROVE
CE-600X
CONPROVE
INDÚSTRIA & COMÉRCIO
OVERCURRENT - TEST REPORT
Descr.: Phase Overcurrent
Date: 08/11/2021 11:28:32
; Software: Sobrecor_CTC; Version: 2.02.162
Responsible: Michel Rockembach de Carvalho
1. Device Tested
Ident .: 23031982; Type: Feeder Protection
Model T42; Manufacturer: Schneider
2. Location
Substation: CONPROVE
Bay: 1
Address: Visconde de Ouro Preto 75 - Custódio Pereira Neighborhood
City: Uberlândia; State: MG
Printing Preview...
Nº of Pages: 12

Figure 38

APPENDIX A

A.1 Terminal Designations

Installation

Base unit
Connection

Sepam components

■ base unit ①
□ Ⓐ base unit connector:
- power supply
- output relay
- CSH30, 120, 200 or ACE990 input.

Screw-type connector shown (CCA620), or ring lug connector (CCA622)
□ Ⓑ 1/5 CT A current input connector (CCA630 or CCA634) or LPCT current input connector (CCA670)
□ Ⓒ communication module link connection (green)
□ Ⓓ remote inter-module link connection (black)
□ Ⓔ voltage input connection, screw-type connector shown (CCA626) or ring lug connector (CCA627)
■ optional input/output module ② (MES114)
□ Ⓛ Ⓜ MES114 module connectors
□ Ⓚ MES114 module connector.

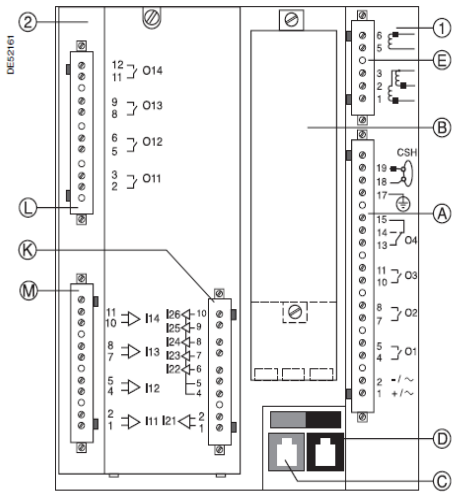


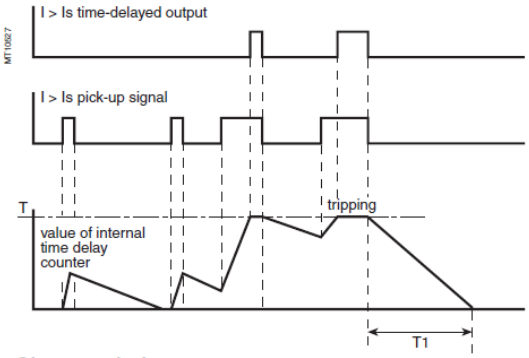
Figure 39

A.2 Technical data

Protection functions

Phase overcurrent
ANSI code 50/51

■ IDMT for IEC, IEEE and IAC curves.



Characteristics

Tripping curve		
Setting		Definite time, IDMT: chosen according to list on page 3/26
Confirmation		
Setting		by undervoltage (unit 1) by negative sequence overvoltage none, by confirmation
Is set point		
Setting	Definite time	0.1 In ⩽ Is ⩽ 24 In expressed in Amps
	IDMT	0.1 In ⩽ Is ⩽ 2.4 In expressed in Amps
Resolution		1 A or 1 digit
Accuracy (1)		±5 % or ±0.01 In
Drop out/pick-up ratio		93.5 % ±5 % or > (1 - 0.015 In/Is) x 100 %
Time delay T (operation time at 10 Is)		
Setting	Definite time	inst., 50 ms ⩽ T ⩽ 300 s
	IDMT	100 ms ⩽ T ⩽ 12.5 s or TMS (2)
Resolution		10 ms or 1 digit
Accuracy (1)	Definite time	±2 % or from -10 ms to +25 ms
	IDMT	Class 5 or from -10 ms to +25 ms
Timer hold delay T1		
Definite time (timer hold)		0; 0.05 to 300 s
IDMT (3)		0.5 to 20 s
Characteristic times		
Operation time		Pick-up < 35 ms at 2 Is (typically 25 ms)
		Confirmed instantaneous: ■ inst. < 50 ms at 2 Is for Is ⩾ 0.3 In (typically 35 ms) ■ inst. < 70 ms at 2 Is for Is < 0.3 In (typically 50 ms)
Overshoot time		< 35 ms
Reset time		< 50 ms (for T1 = 0)

(1) In reference conditions (IEC 60255-6).

(2) Setting ranges in TMS (Time Multiplier Setting) mode

Inverse (SIT) and IEC SIT/A:	*0.04 to 4.20*
Very inverse (VIT) and IEC VIT/B:	*0.07 to 8.33*
Very inverse (LTI) and IEC LTI/B:	*0.01 to 0.93*
Ext inverse (EIT) and IEC EIT/C:	*0.13 to 15.47*
IEEE moderately inverse:	*0.42 to 51.86*
IEEE very inverse:	*0.73 to 90.57*
IEEE extremely inverse:	*1.24 to 154.32*
IAC inverse:	*0.34 to 42.08*
IAC very inverse:	*0.61 to 75.75*
IAC extremely inverse:	*1.08 to 134.4*

(3) Only for standardized tripping curves of the IEC, IEEE and IAC types.

APPENDIX B

Equivalence of software parameters and the relay under test.

Table 4

Overcurrent Software		SEPAM T42 Relay	
Parameter	**Figure**	**Parameter**	**Figure**
Frequency	22	Network Frequency	08
51			
Pkp	25	Current threshold	13
Dial / Time	25	Delay	13
Curve	25	Tripping curve	13
50-1			
Pkp	25	Current threshold	13
Dial / Time	25	Delay	13
Drp	25	Drop out	A-2
50-2			
Pkp	25	Current threshold	13
Dial / Time	25	Delay	13
Drp	25	Drop out	A-2