TEST TUTORIAL

EQUIPAMENT: Protection Relay.

BRAND: ZIV.

MODEL: DLF.

FUNCTION: 27 or PTUV – Undervoltage & 59 or PTOV – Overvoltage.

TOOL: CE-6003, CE-6006, CE-6707, CE-6710, CE-7012 or CE-7024.

Objective: Test the pick-up and actuation time of the undervoltage and overvoltage elements using the Quick software.

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INSTRUMENTOS PARA TESTES ELÉTRICOS

VERSION CONTROL:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	26/07/2022	M.R.C.	G.C.D.P.

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INSTRUMENTOS PARA TESTES ELÉTRICOS

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 test 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 is noted that the user must have satisfactory training in maintenance procedures a good knowledge of the equipment under test and still be aware of safety rules and regulations.

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PROCEDURE FOR TESTING THE ZIV DLF RELAY IN QUICK SOFTWARE

1. Relay Connection to CE-6710

In this section, all the connections necessary to run the test in question are discussed. In appendix B of this document you can find the terminal designations of the ZIV DLF relay used.

1.1. Auxiliary Source

To power the relay, connect the positive (red) terminal of the Aux Vdc source in the test set to terminal 3 of slot A of the relay and the negative terminal (black) to terminal 2 of slot A, as shown in the following figure.

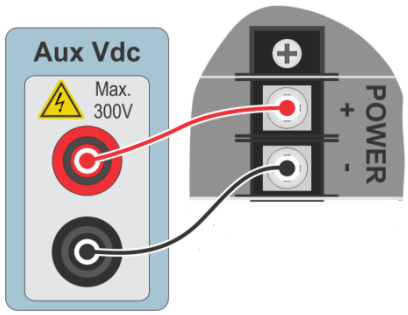

Figure 1

1.2. Analog Outputs

Connect the CE-6710's analog outputs V1, V2 and V3 to terminals 01, 03 and 05 of the relay's D slot and their common to terminals 02, 04 and 06. The figure below shows the procedure.

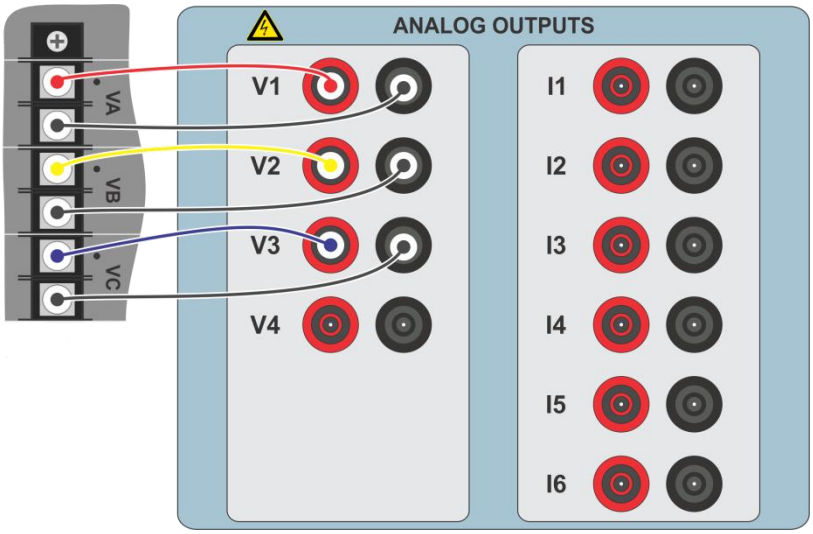

Figure 2

1.3. Binary Inputs

Connect the Binary Inputs to the binary outputs of the relay in slot A as shown in the table and figure below.

Table 1

CE-6710 (*Binary Inputs*)	DLF (*Slot A*)
BI1	OUT 1 (07 and 08)
BI2	OUT 2 (09 and 10)
BI3	OUT 3 (11 and 12)
BI4	OUT 4 (13 and 14)

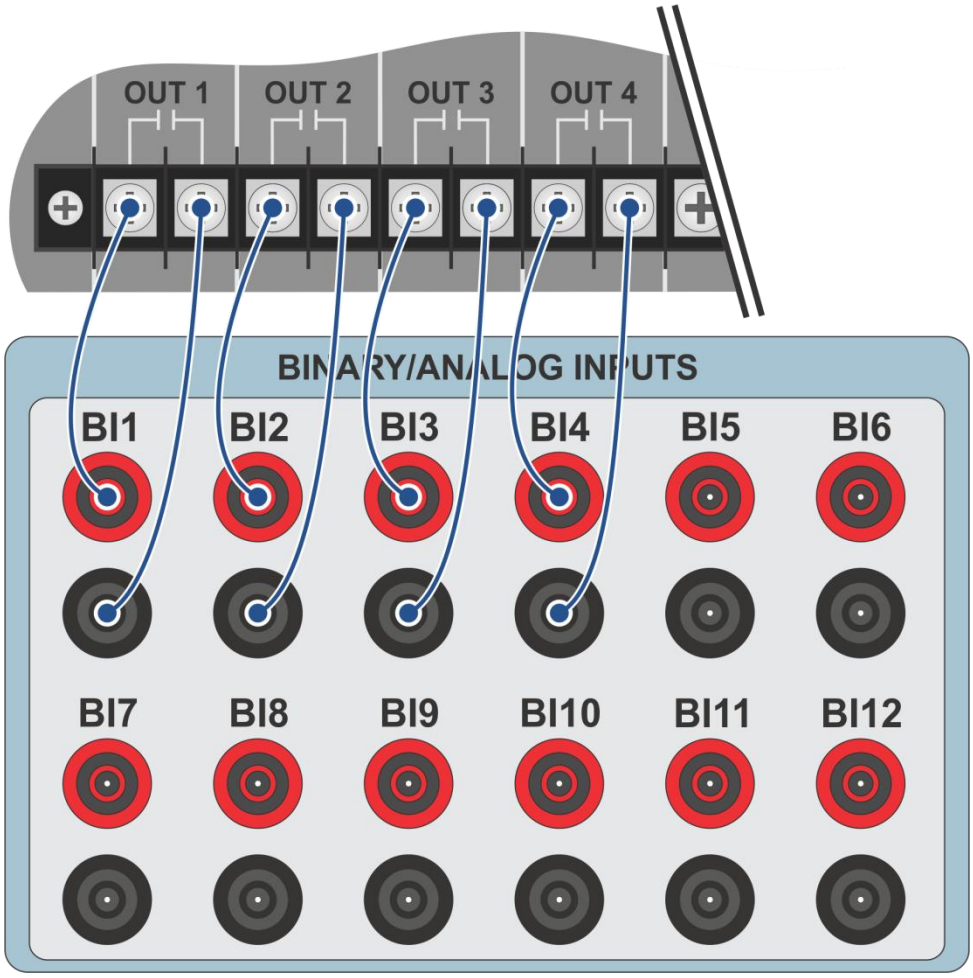

Figure 3

2. First steps with the DLF relay

2.1. Communication between PC and relay

Communication with the relay is done through an Ethernet cable connected between the relay and the computer that has the ZivercomPlus software. Double click on the relay software icon.

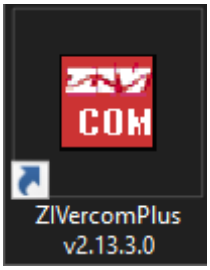

Figure 4

Enter the username and password. To gain access use ***"zivercom"*** and the password ***"ziv".***

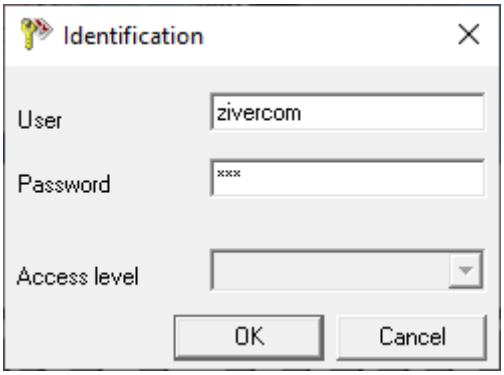

Figure 5

Then, from the main menu, go to *"IEDs" > "Installations".*

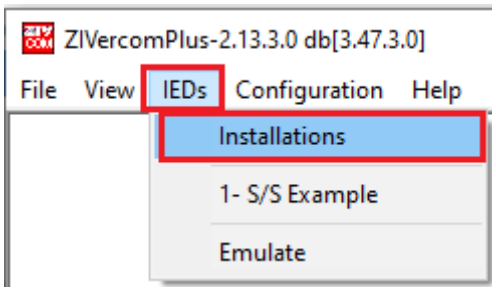

Figure 6

Select the default file *"SubExamples.sds"* and click *"Edit"*.

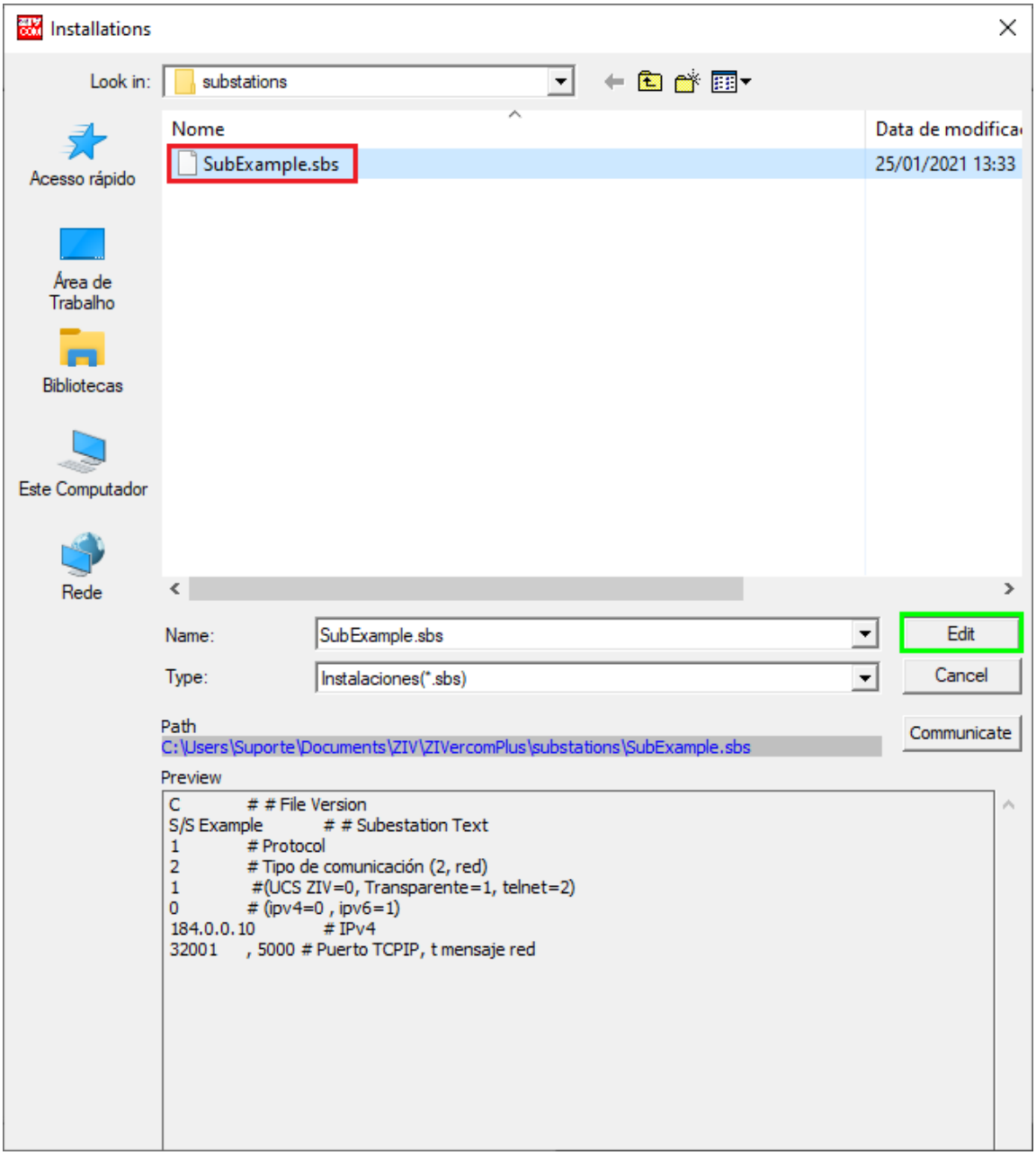

Figure 7

The next step is to check the data set for communication on the relay front panel. This data must be entered into the software for successful communication to occur.

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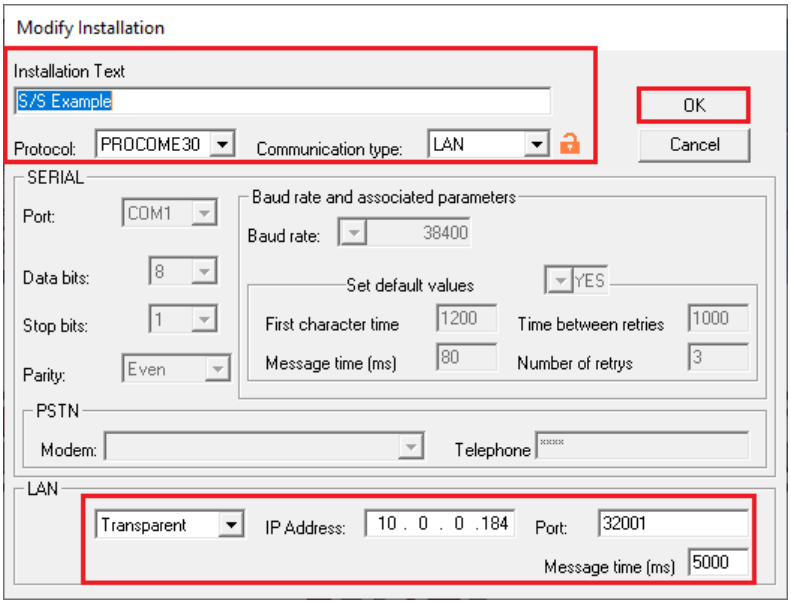

Figure 8

By clicking on the *"OK"* button, you will return to figure 7, select the file again and click on *"Communicate"*.

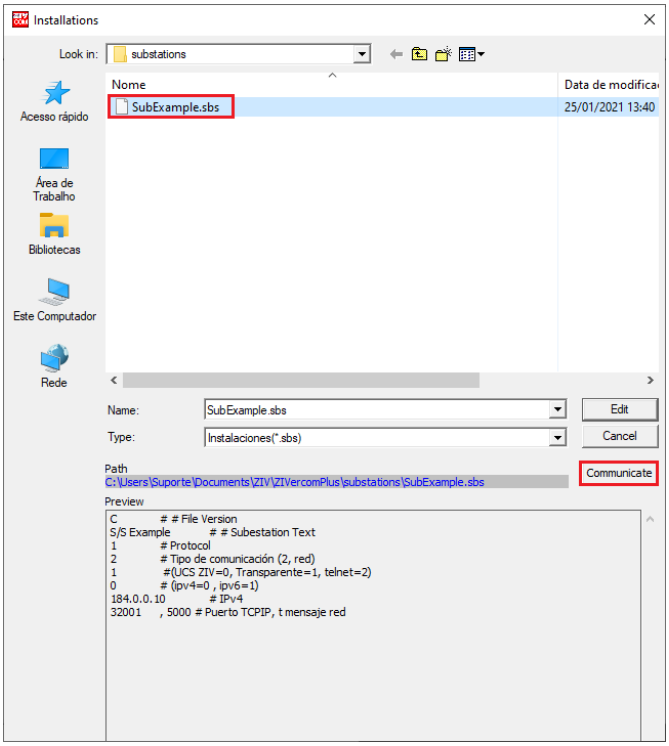

Figure 9

Click *"OK"* again.

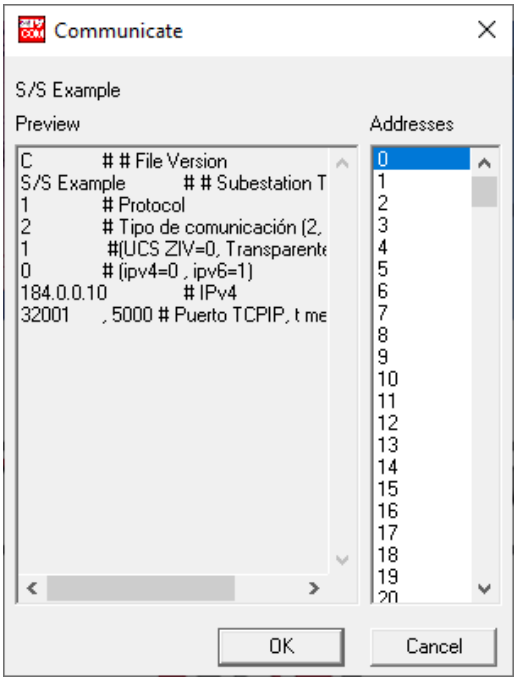

Figure 10

If the field *"Communications type"* is configured as *"LAN-TLS"*, a second level of access will be requested, use the default user ***"admin"*** and the default password ***"Passwd@02".***

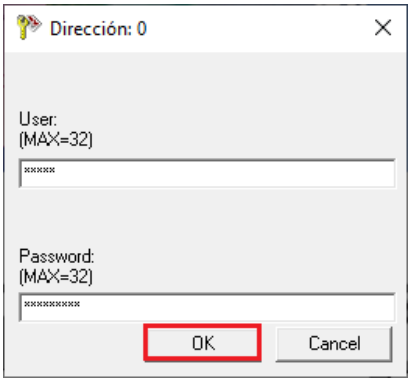

Figure 11

3. Parameterization of the ZIV DLF relay

3.1. Nominal Values

Click on the highlighted *"+"* signs until you reach the *"Nominal Values"* option. In this option, set the nominal voltage as 115.0V, nominal phase current as 5.0A and nominal frequency as 60.00Hz.

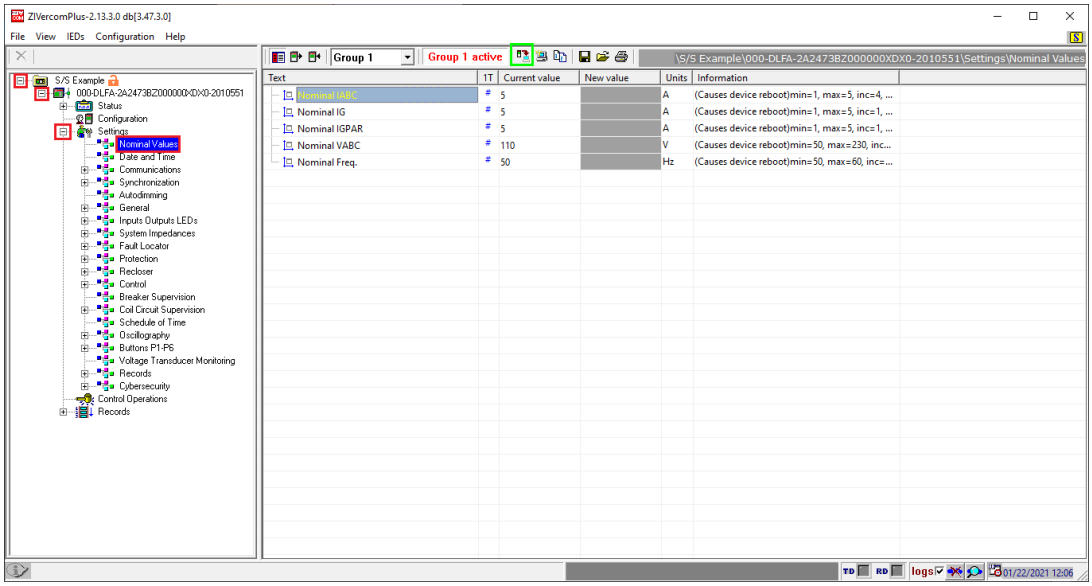

Figure 12

To change the voltage and frequency value, click on the icon highlighted in green in the previous figure.

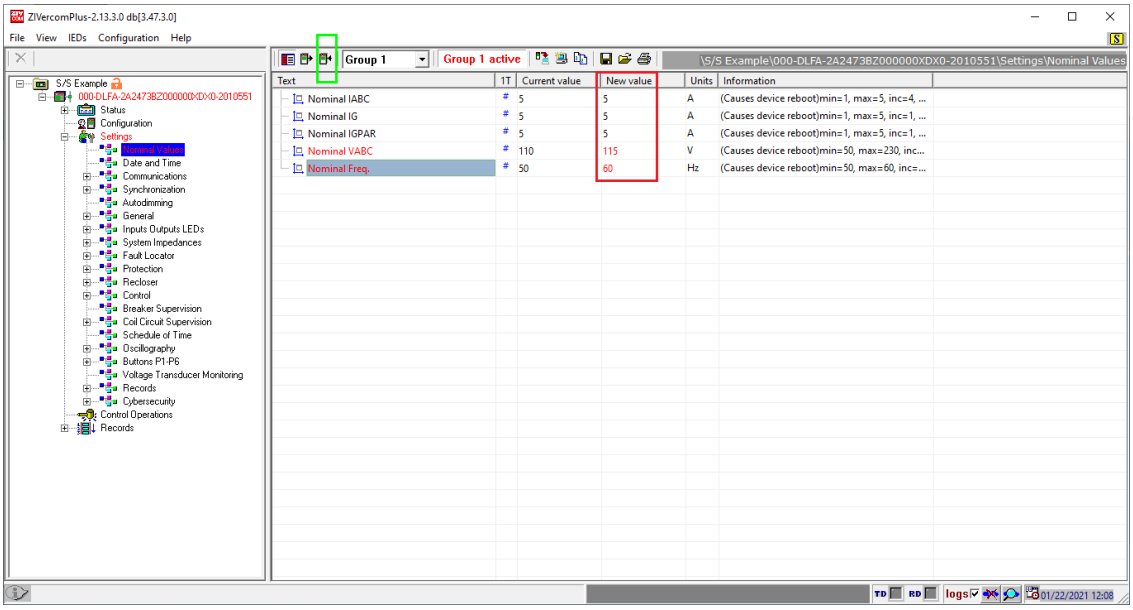

Figure 13

After changing the new values, click again on the icon highlighted in green in the previous figure to send the adjustment to the relay.

3.2. General

Click on the *"General"* option and configure the transformer ratios of the phase, neutral voltage transformer, current transformers and the phase sequence.

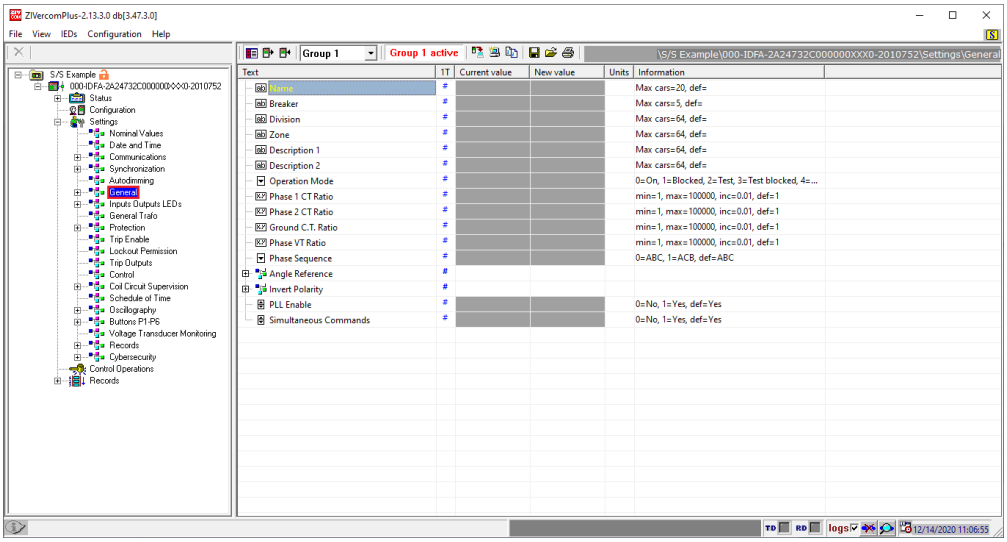

Figure 14

It can be seen in the previous figure that the values in the column *"Current Value"* and *"New value"* are hidden. To allow visualization and configuration click on the buttons highlighted in red and then green.

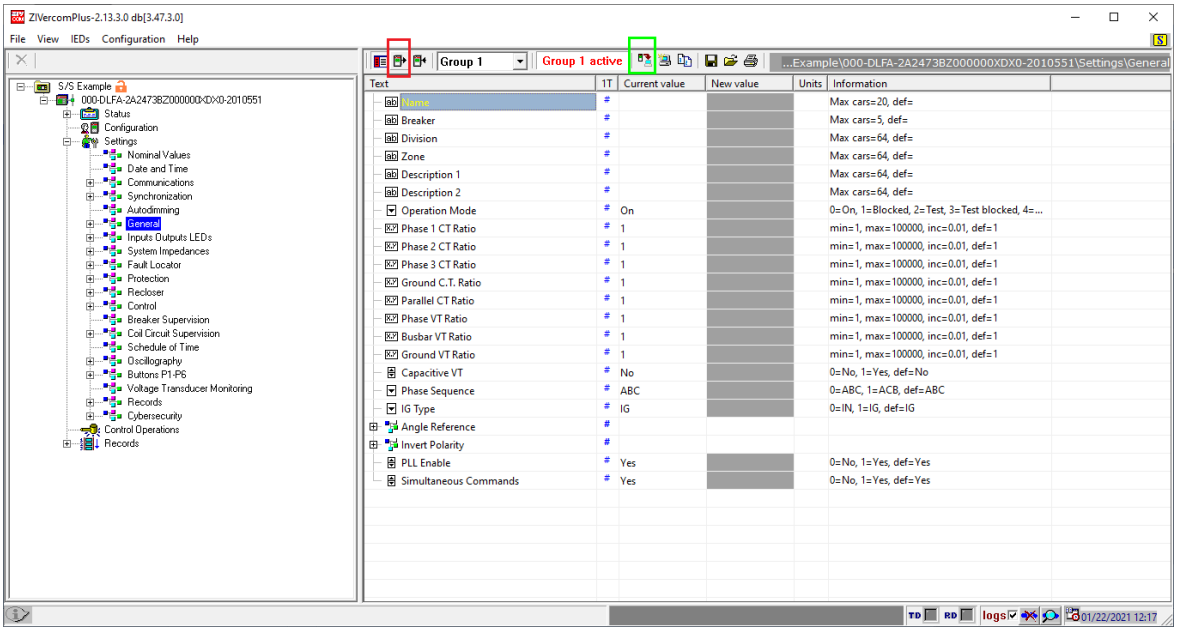

Figure 15

3.3. Phase Overvoltage > Unit 1

Click on the *"+"* signs until you reach the *"Unit 1"* option. In this option, the function must be activated and the pick-up and operating time values adjusted. Activate the unit with a pick-up value of 75.0V, operating time of 2.5s, choose the option *"Phase Voltage"* and *"OR"*. Submit the adjustments by clicking on the icon highlighted in green.

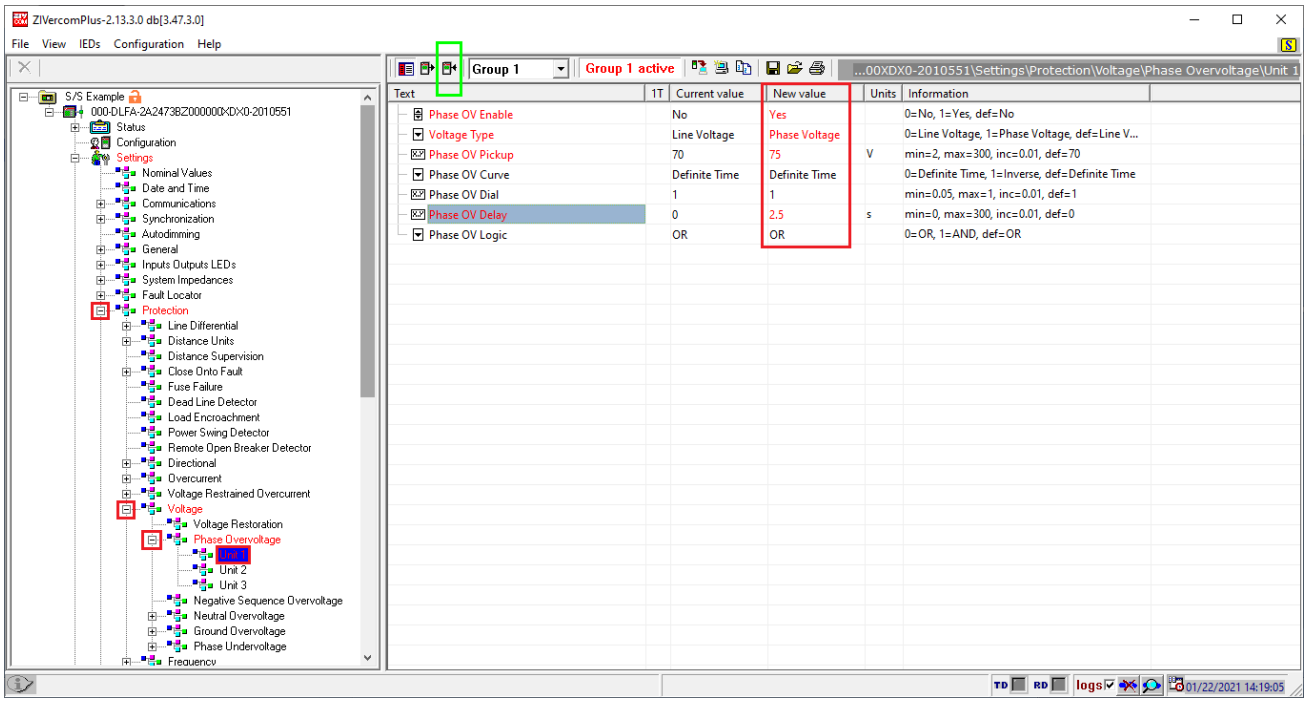

Figure 16

3.4. Phase Overvoltage > Unit 2

Select the *"Unit 2"* option, then activate the function and adjust the pick-up and operating time values. Activate the unit with a pick-up value of 95.0V, operating time of 1.5s, choose the option *"Phase Voltage"* and *"OR"*. Submit the adjustments by clicking on the icon highlighted in green.

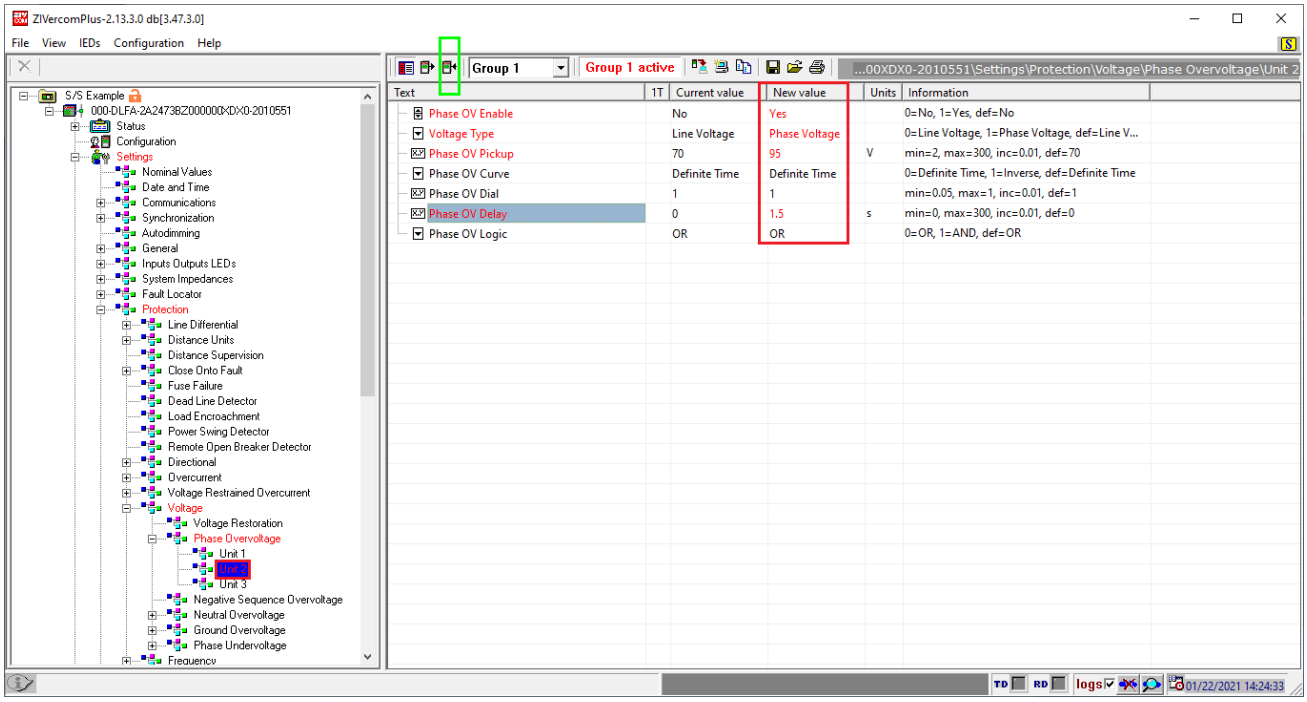

Figure 17

3.5. Phase Undervoltage > Unit 1

Click on the *"+"* signs until you reach the *"Unit 1"* option. In this option, the function must be activated and the pick-up and operating time values adjusted. Activate the unit with a pick-up value of 55.0V, operating time of 2.5s, choose the option *"Phase Voltage"* and *"OR"*. Submit the adjustments by clicking on the icon highlighted in green.

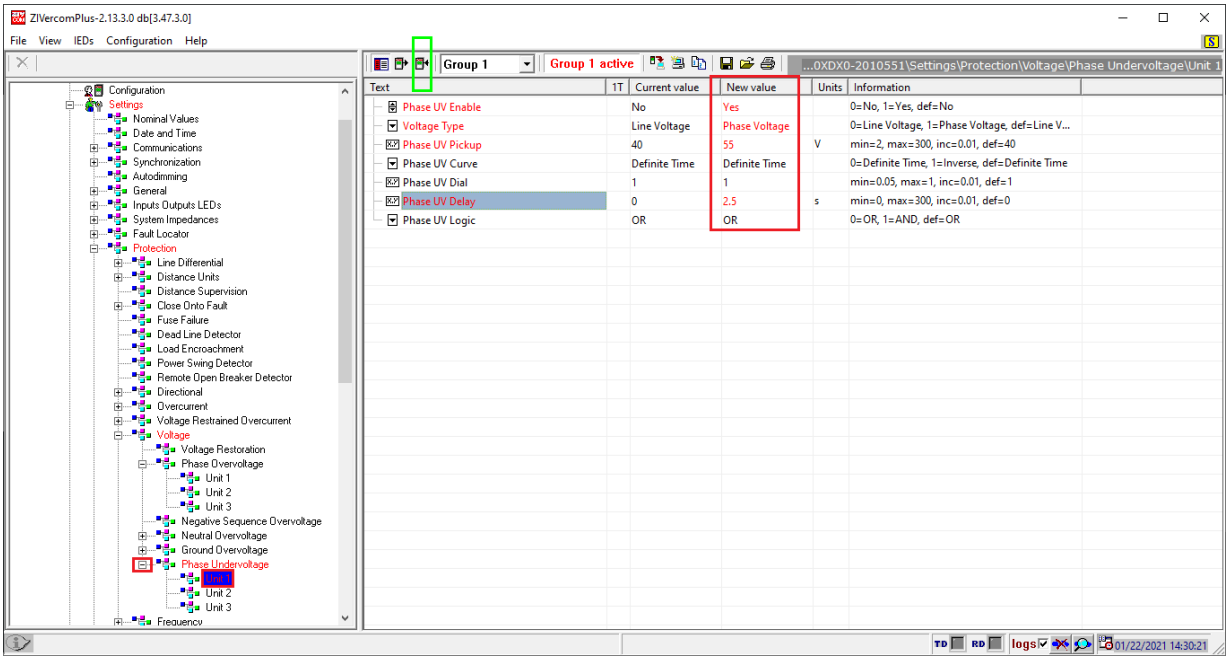

Figure 18

3.6. Phase Undervoltage > Unit 2

Select the *"Unit 2"* option, then activate the function and adjust the pick-up and operating time values. Activate the unit with a pick-up value of 35.0V, operating time of 1.5s, choose the option *"Phase Voltage"* and *"OR"*. Submit the adjustments by clicking on the icon highlighted in green.

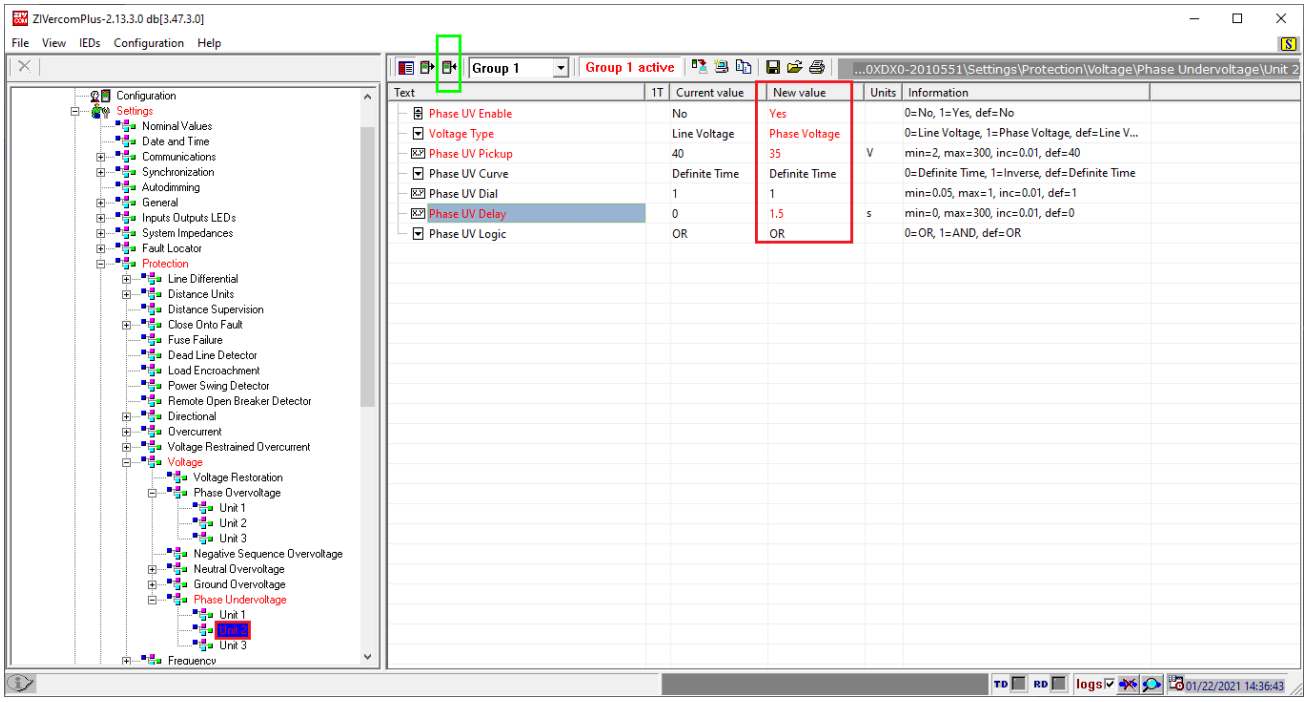

Figure 19

3.7. Outputs

In order to test the pickup and the operating time of the overvoltage and undervoltage functions, 4 relay output binaries will be used to collect these signals from the test set. In the figure below, the first output will be configured with the trip signals of phases A, B and C of unit 59-1.

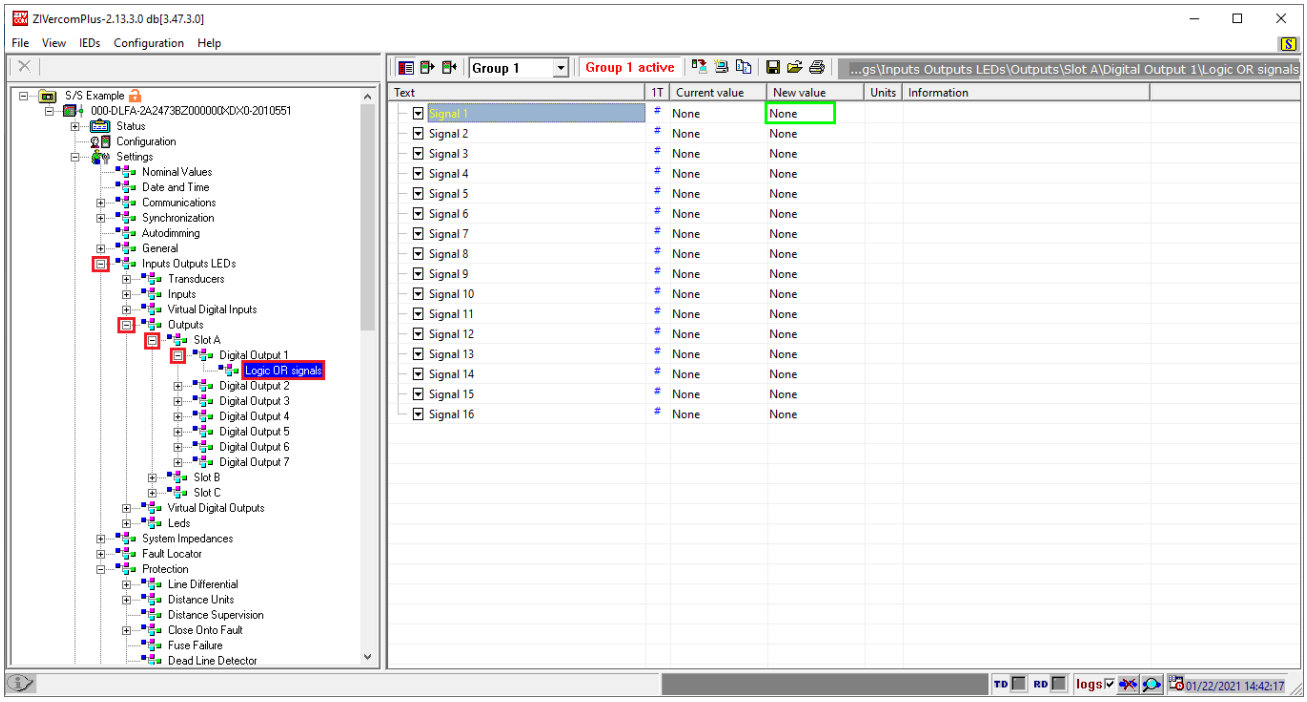

Figure 20

Clicking on the option *"None"* highlighted in the previous figure and makes the following adjustment.

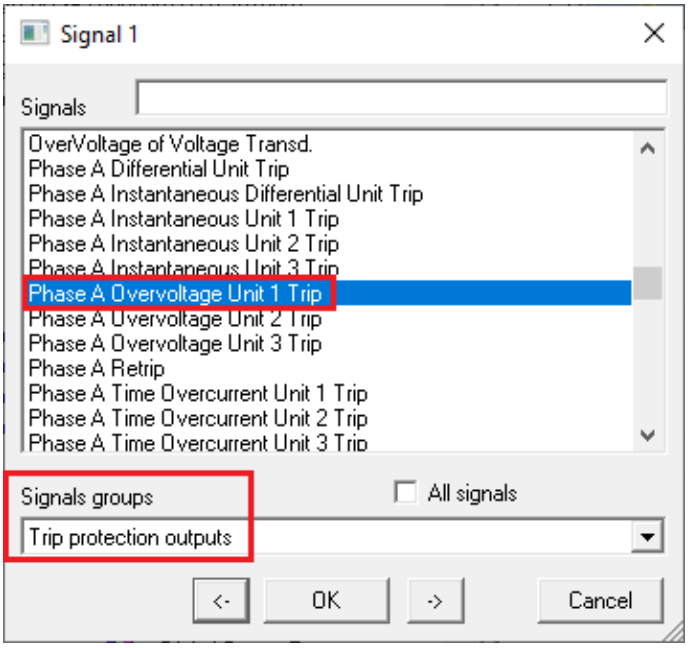

Figure 21

Repeat the previous procedure for phases B and C and send the settings to the relay.

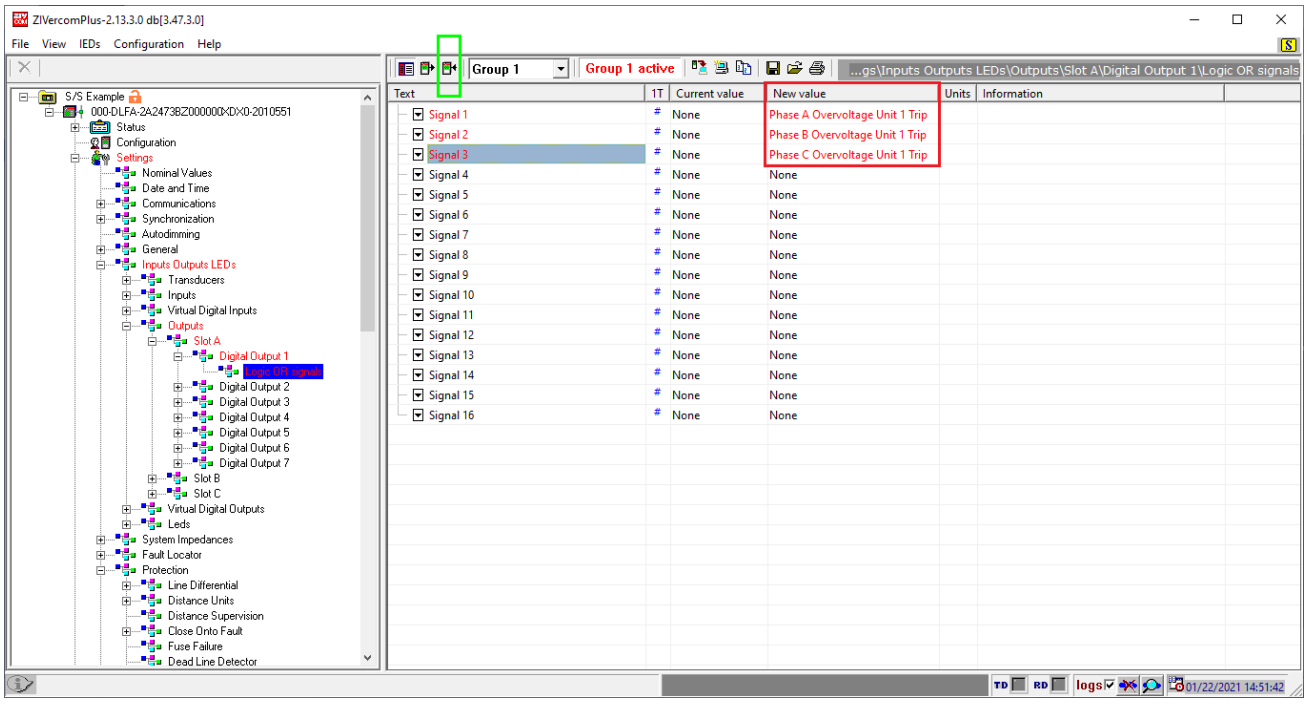

Figure 22

On the second output, configure the tripping signals of phases A, B and C of unit 59-2.

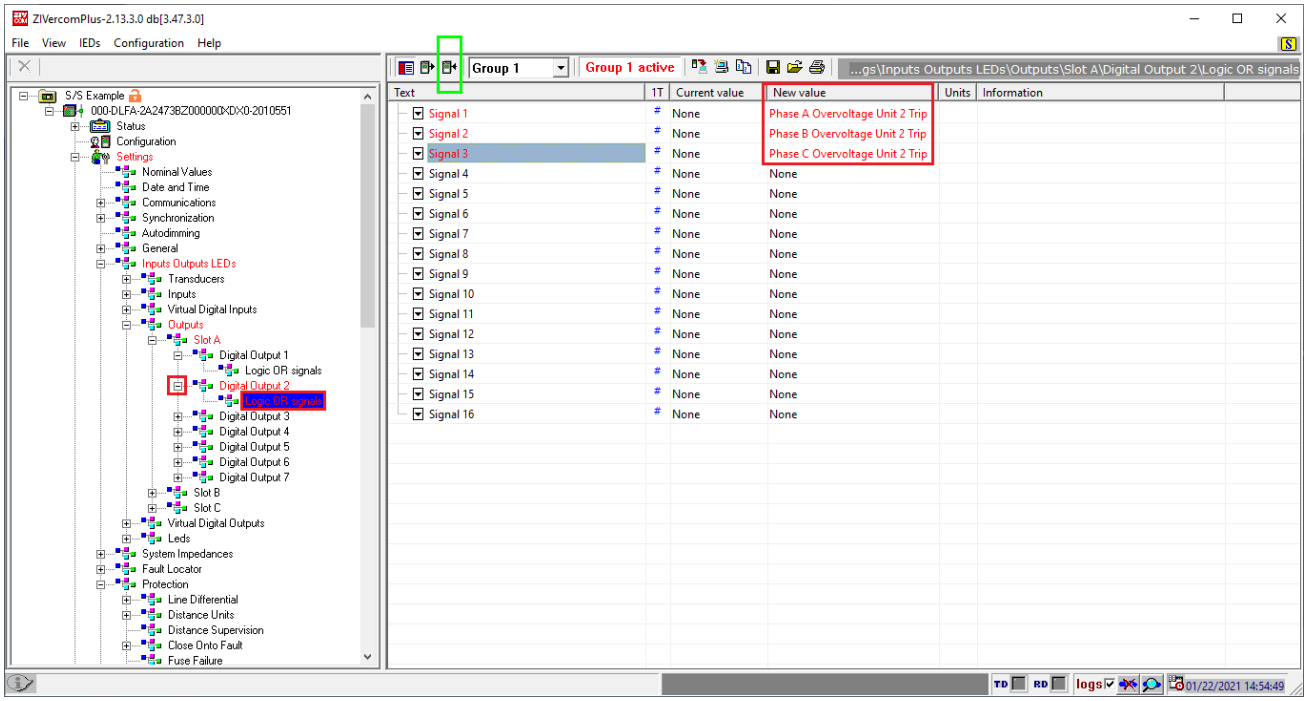

Figure 23

On the third output, the tripping signals of phases A, B and C of unit 27-1 are configured.

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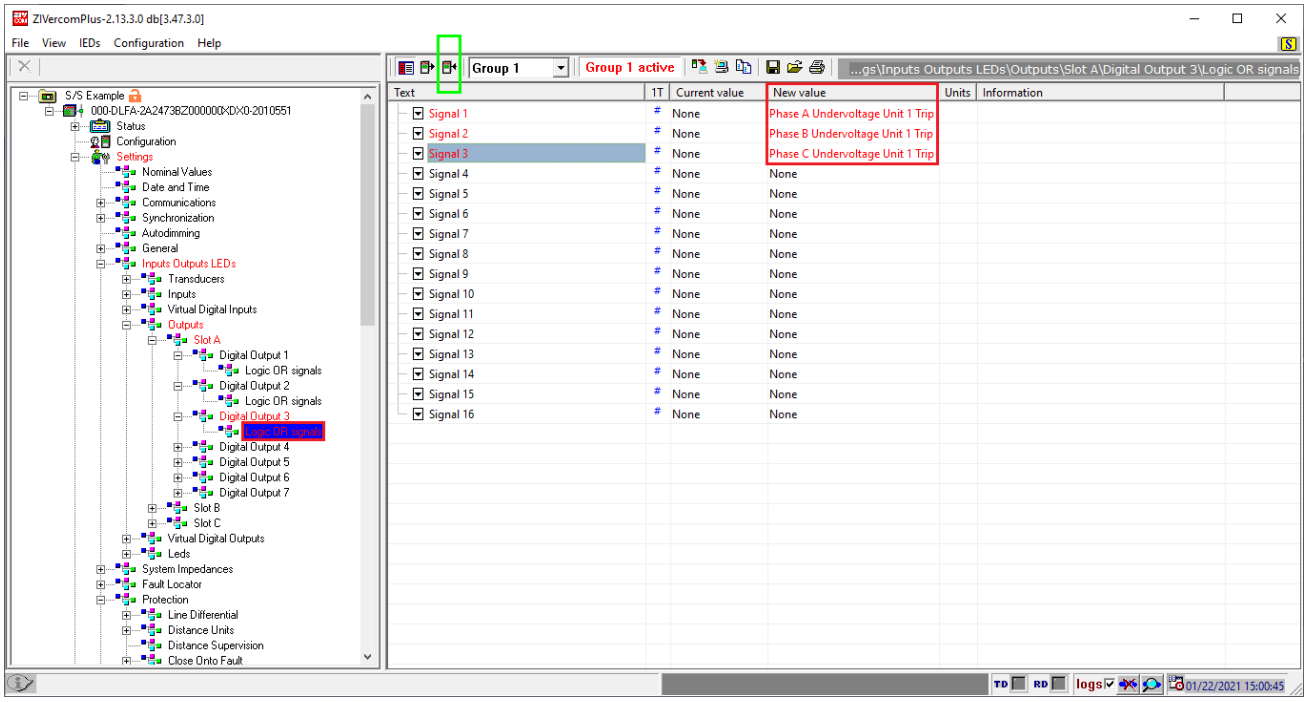

Figure 24

On the fourth output, configure the tripping signals of phases A, B and C of unit 27-2.

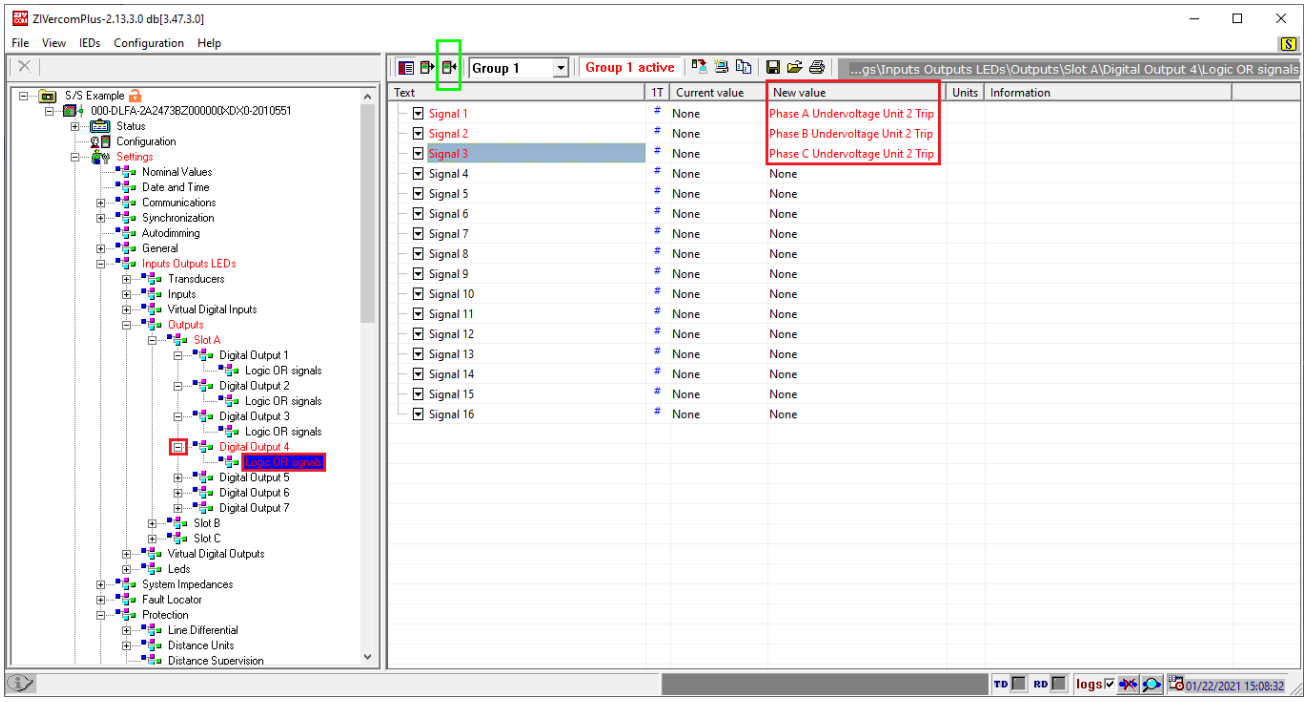

Figure 25

4. Application Manager

Open the *"Conprove Test Center (CTC)"* software, shown in the figure below.

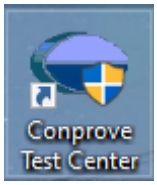

Figure 26

4.1. Quick software settings

Open the Quick software within the Conprove Test Center (CTC) software area, as shown in the figure below.

Figure 27

When opening the software, the *"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. Fill in the *"General Inform."* with details of the tested device, installation location and the person responsible. This facilitates the preparation of the report, and this tab will be the first to be shown.

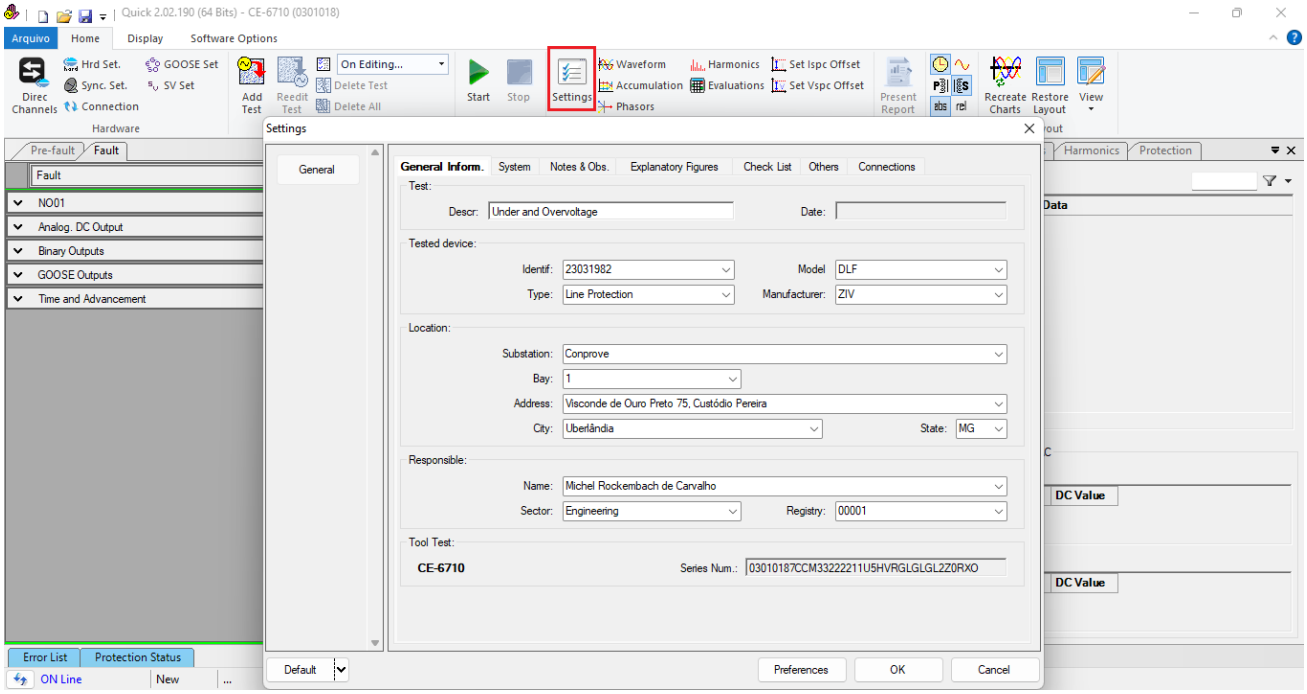

Figure 28

Also in the *"Settings"* area, there are other useful tabs for the user. In the figure below, within the *"System"* 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 is not used for this test.

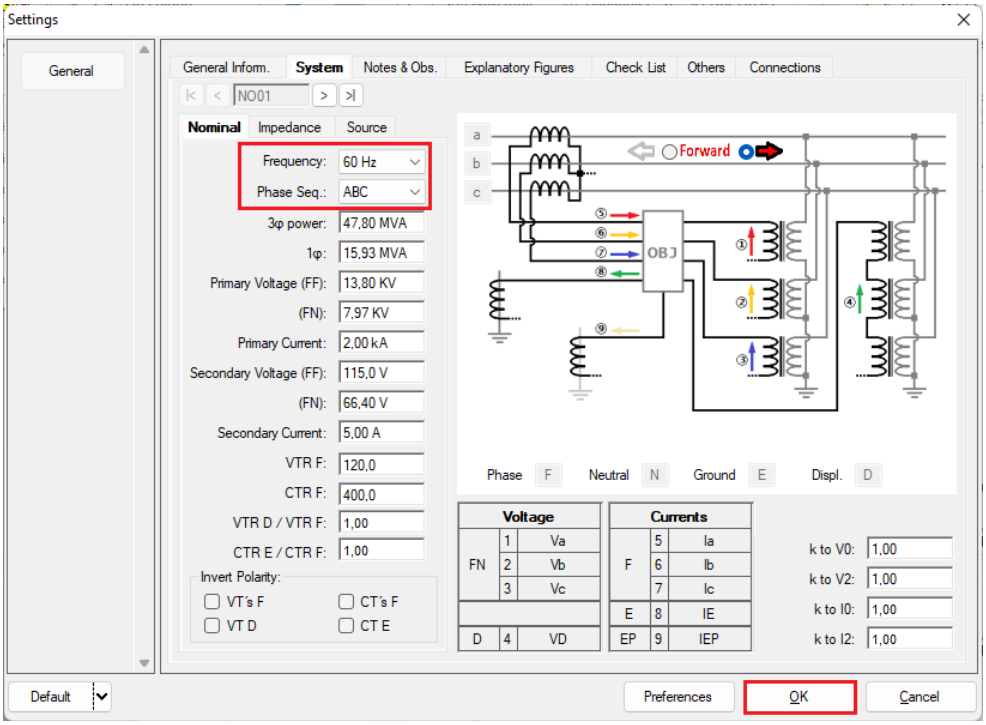

Figure 29

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 also create a schematic of the connections between the test set and the tested equipment.

5. Channel Direction and Hardware Configurations

Click on the icon illustrated below.

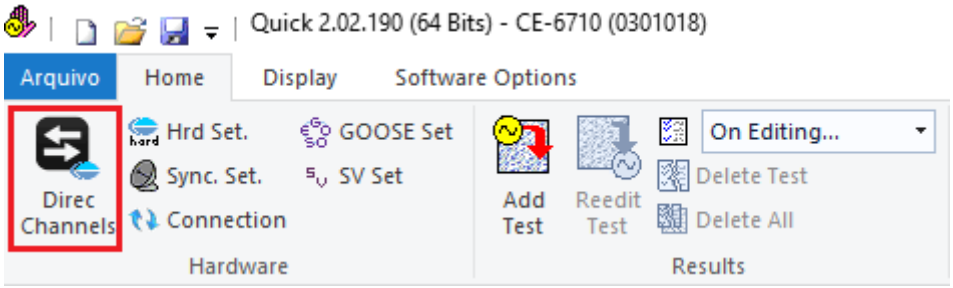

Figure 30

Then click on the highlighted icon to configure the hardware.

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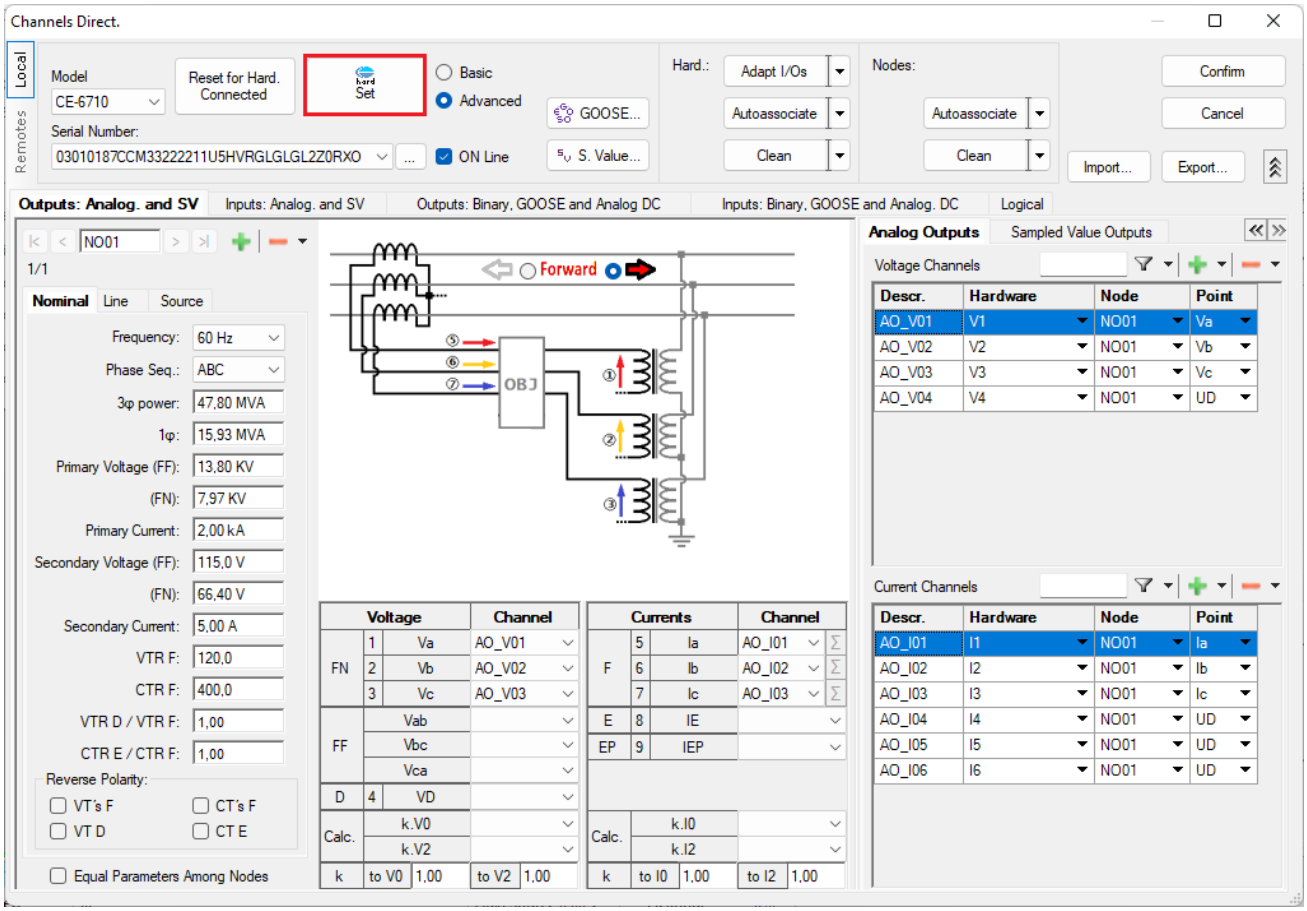

Figure 31

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

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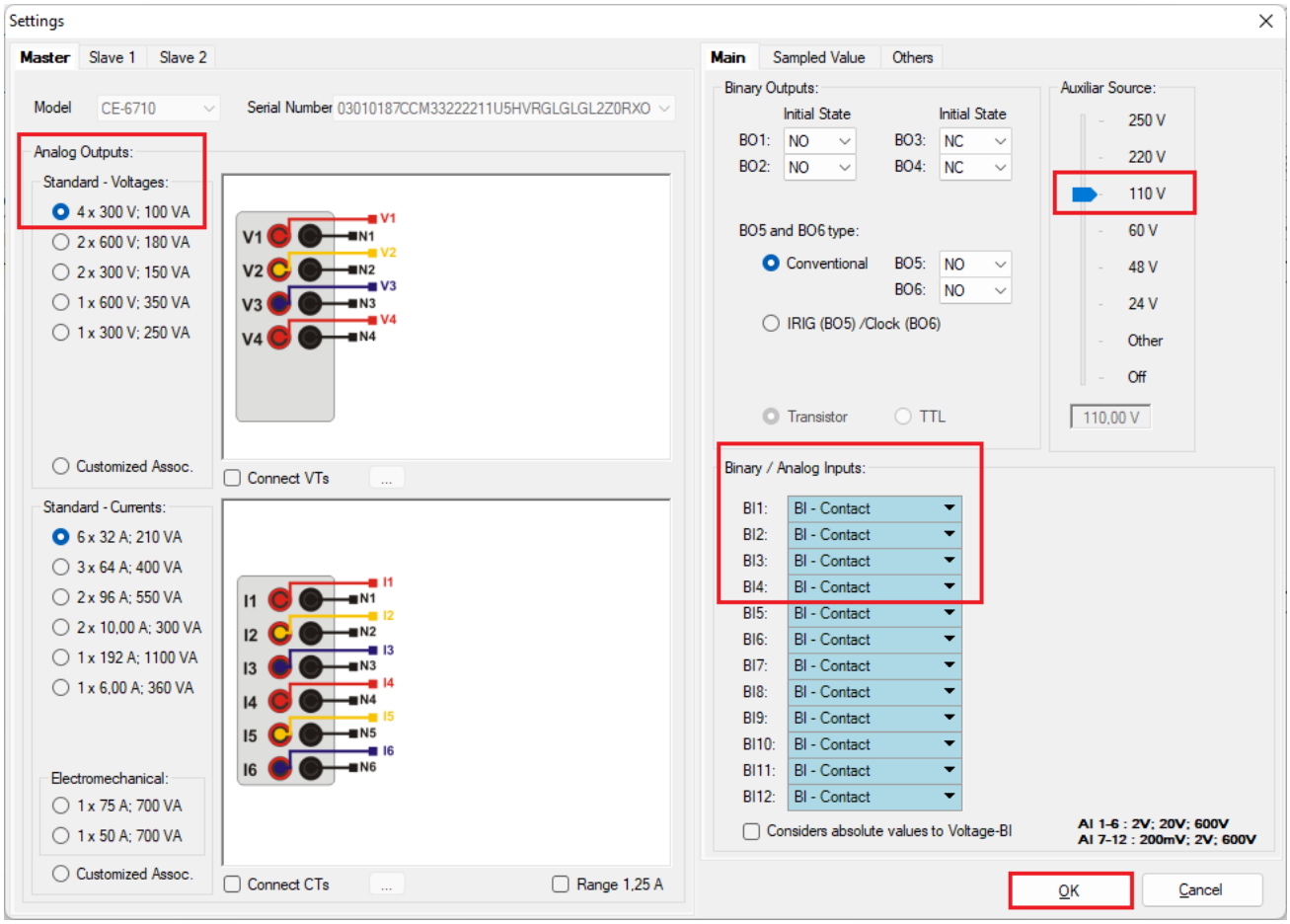

Figure 32

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

Figure 33

6. Test structure for function 27/59

6.1. Voltage x Time > Overvoltage screen

Click on the tab *"Protection > Voltage x time >Overvoltage"* so that the data set in the relay are configured in the software. Next to the voltage *"V"* choose a node as a reference, in this case *"AO_V01"*. Only after choosing the node are the fields for setting function 59 active.

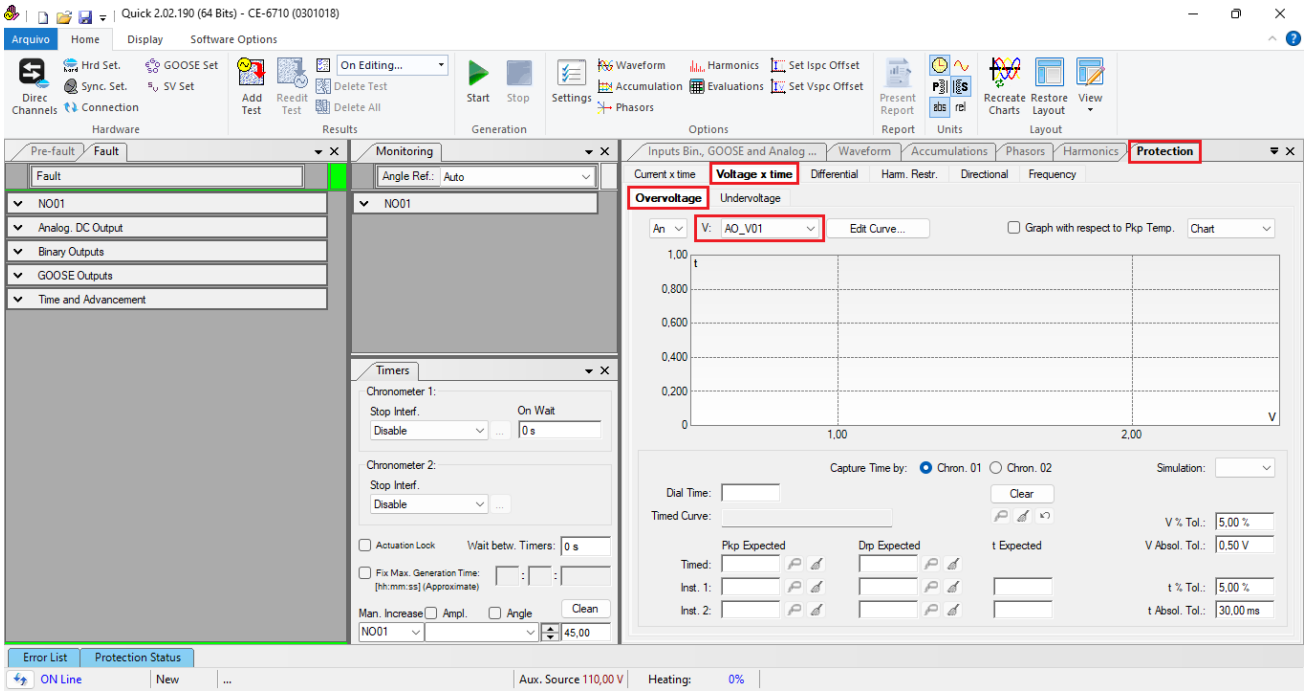

Figure 34

6.2. General Adjustments 59

According to the relay software settings, these values are entered in the *"Quick"* software. Element 59-1 pick-up equals 75.00V with actuation time equal to 2.5s and element 59-2 pick-up equals 95.0V with actuation time equal to 1.5s.

There are also fields where the absolute and relative tolerances for both voltage and time must be entered. These values are taken from Appendix A.2. There is also a field where the type of simulation is required, being possible single-phase-ground, two-phase and three-phase.

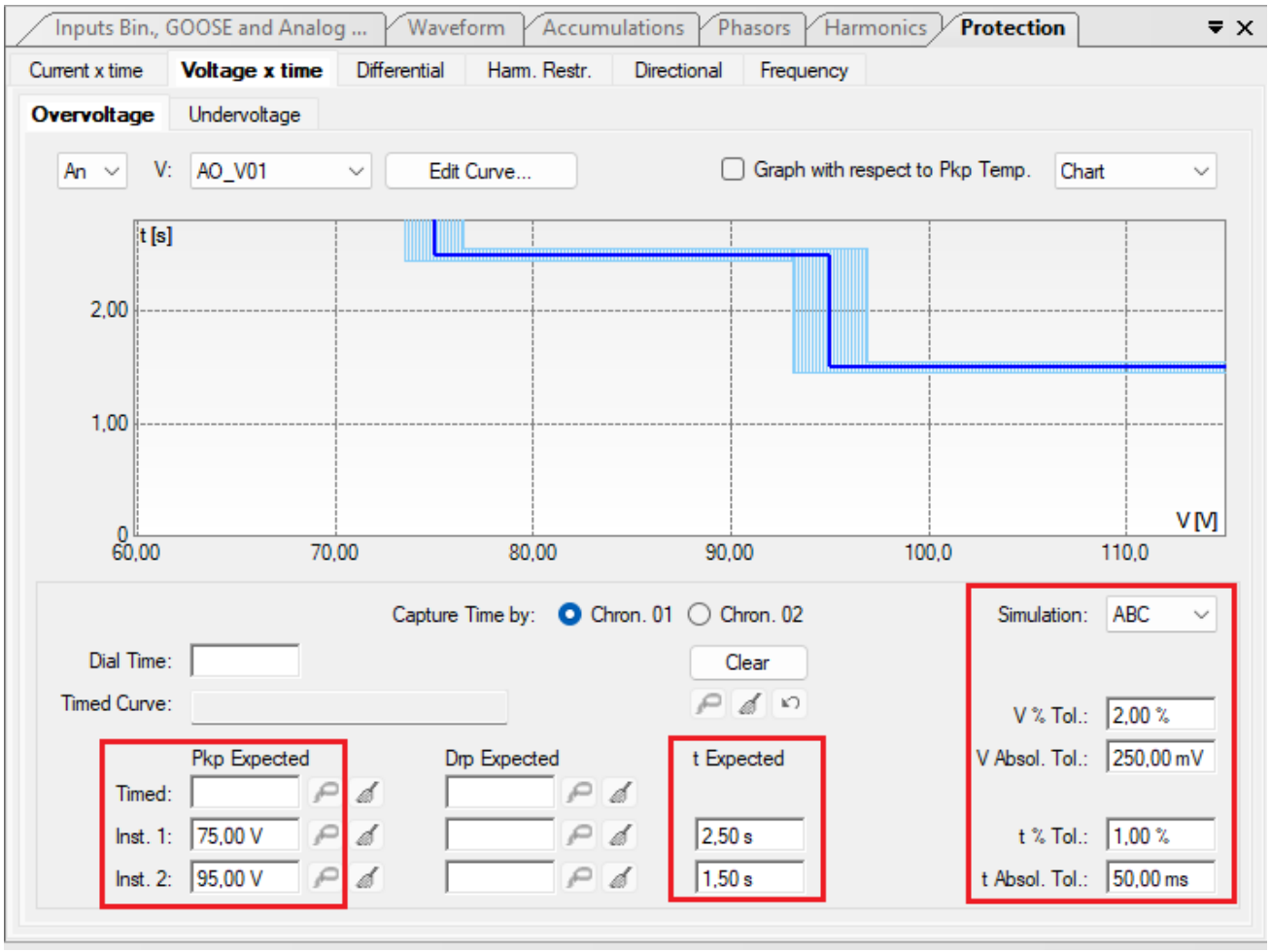

Figure 35

6.3. Timed Element 59-1 Pick-up Test

For the pick-up test, a ramp is used to increase the voltage value. To do this, choose the *"Ramp"* option on the *"Fault > N01"* tabs and click on the highlighted icon.

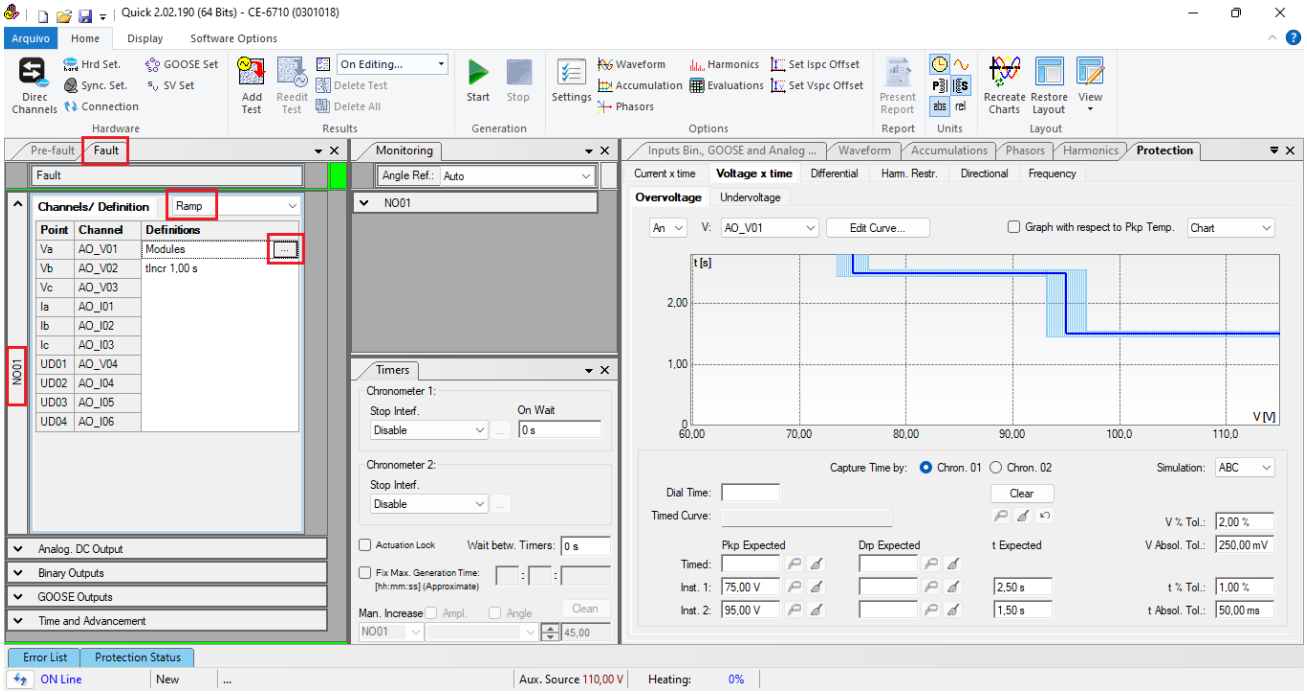

Figure 36

For the initial value, set 74.00V, for limit value 75.50V, with an increment of 100mV and a time of 3.0s.

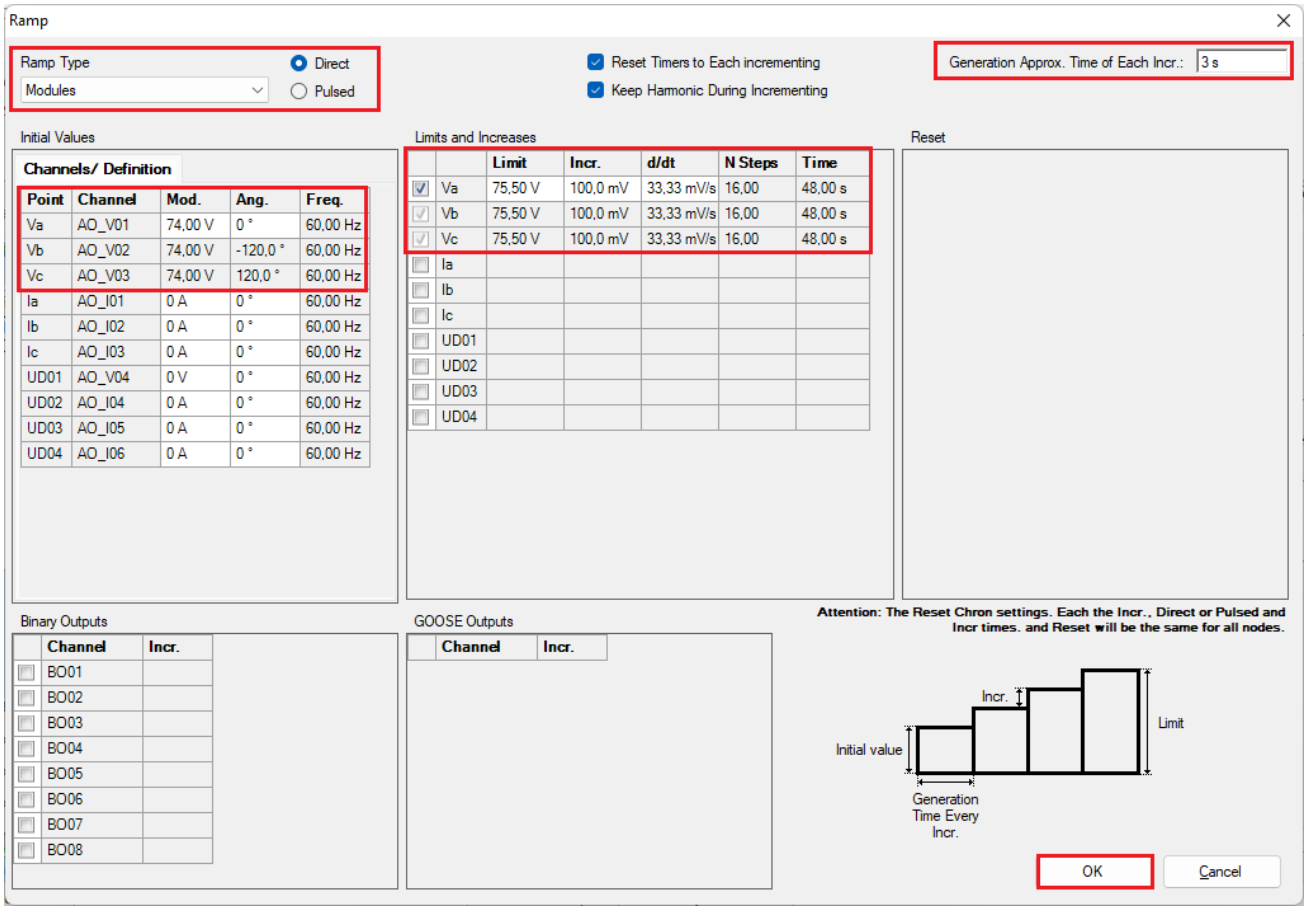

Figure 37

Set the stop interface, which in this case is *"BI01"* and start the generation by clicking on the icon highlighted below or using the shortcut *"Alt + G"*.

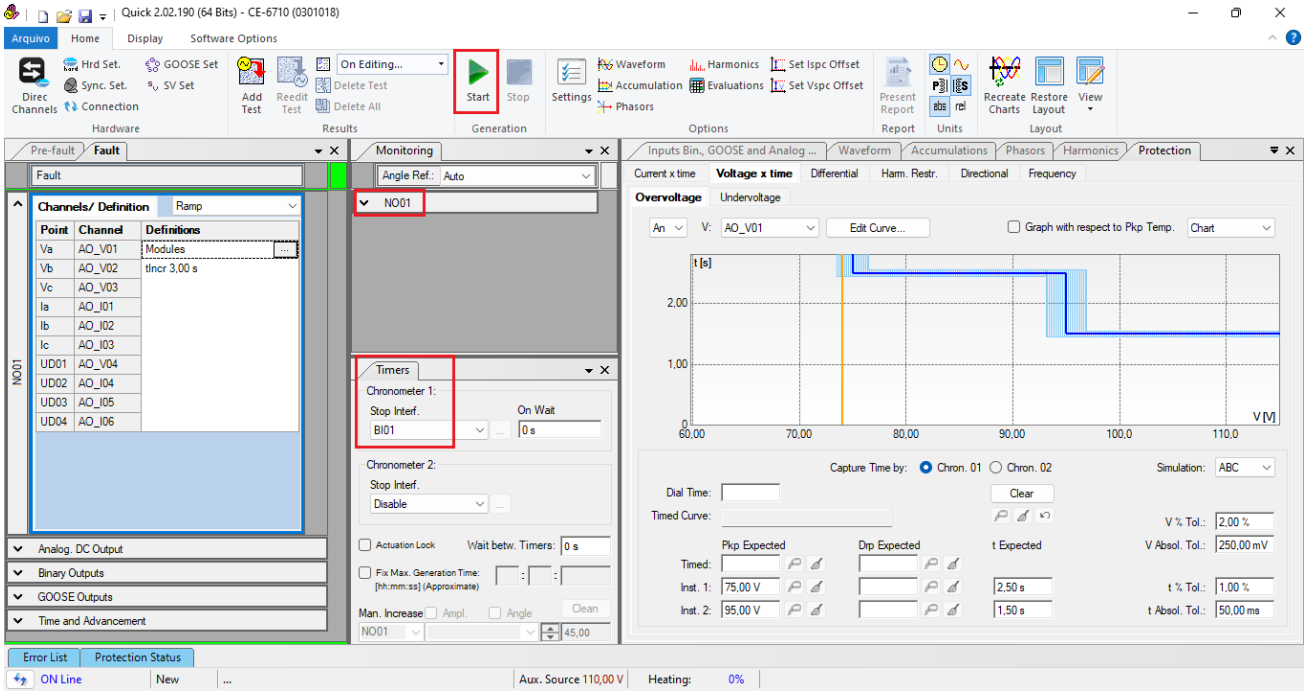

Figure 38

To view the values being generated, click on *"N01"* within the *"Monitoring"* tab. After the actuation click on the highlighted icon to capture the point.

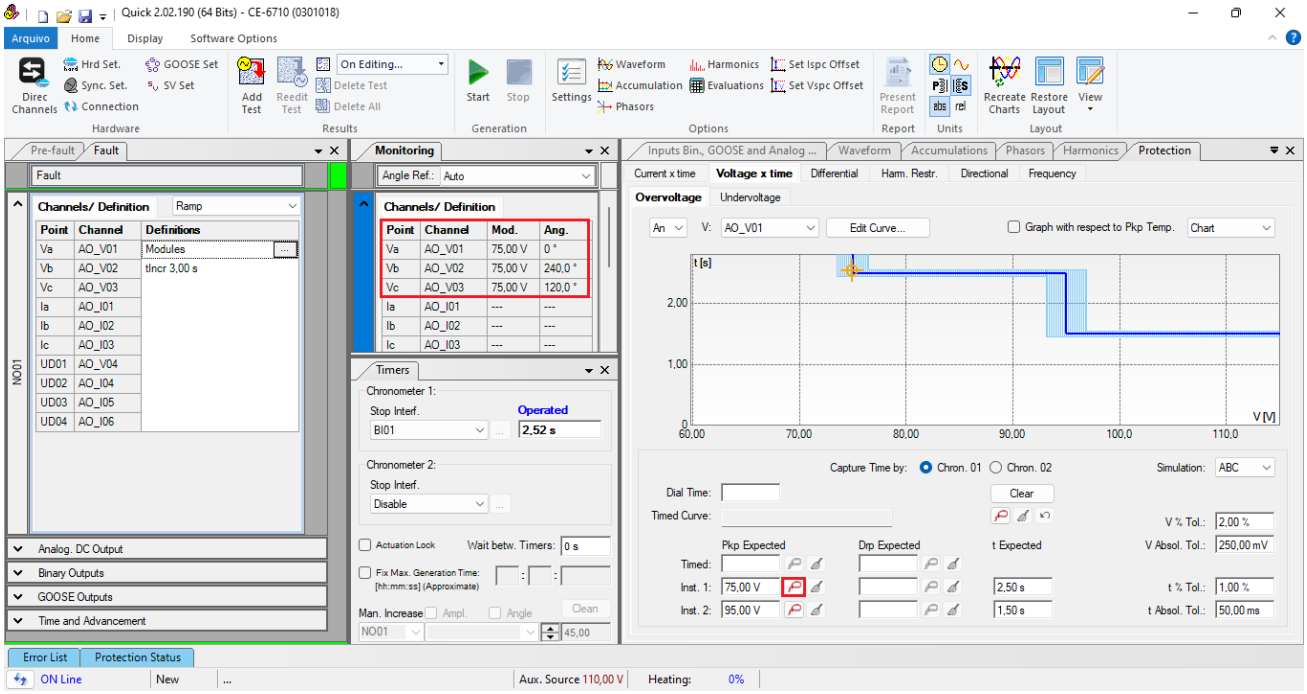

Figure 39

In this case, the pickup found was 75.00V, being exactly the value set in the relay.

6.4. Element 59-1 point test

To check the operating time of element 59-1, remove the *"Ramp"* by choosing the *"Direct"* option and inject voltage values above the pick-up value. Keep the stop interface at *"BI01"*. The following figure shows the value of 77.00V already captured and the value of 93.00V to be captured.

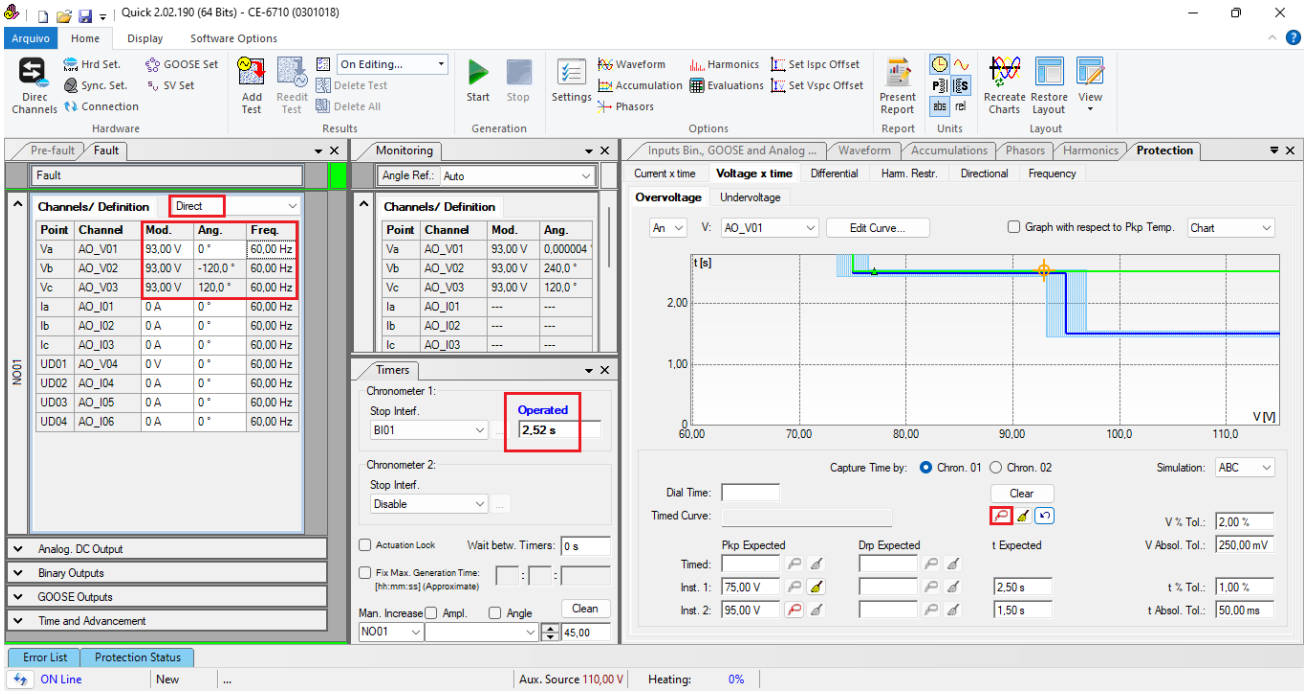

Figure 40

It is verified that the operating times are within the tolerance provided by the manufacturer.

6.5. Timed Element 59-2 Pickup Test

Click on the *"Fault"* tab, choose the *"Ramp"* option and the *"..."* icon and enter an initial value of 94.00V, limit value of 95.50V, with an increment of 100.0mV and a time of 2.0s.

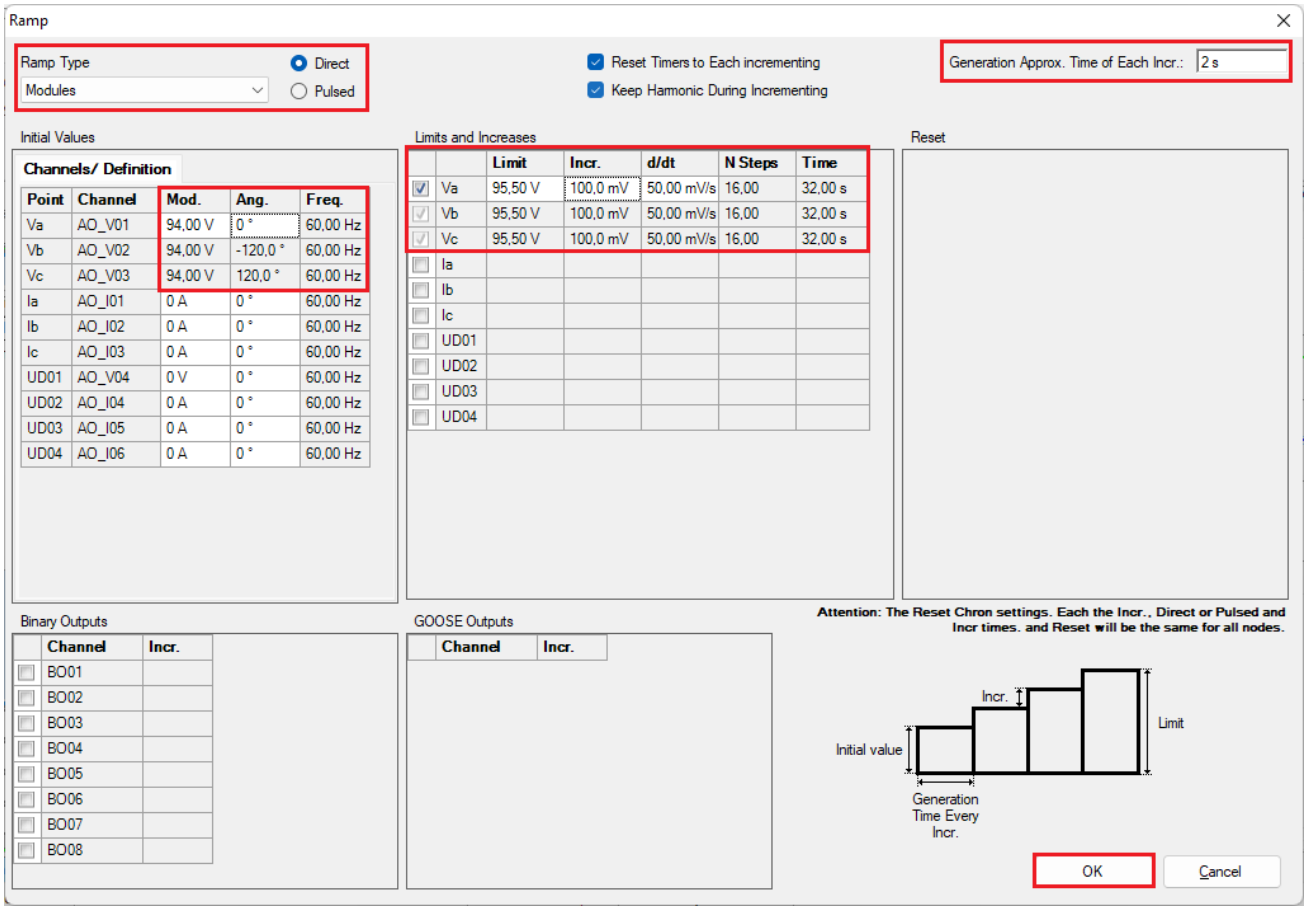

Figure 41

Change the interface to *"BI02"* and start the generation through the shortcut *"Alt + G"*.

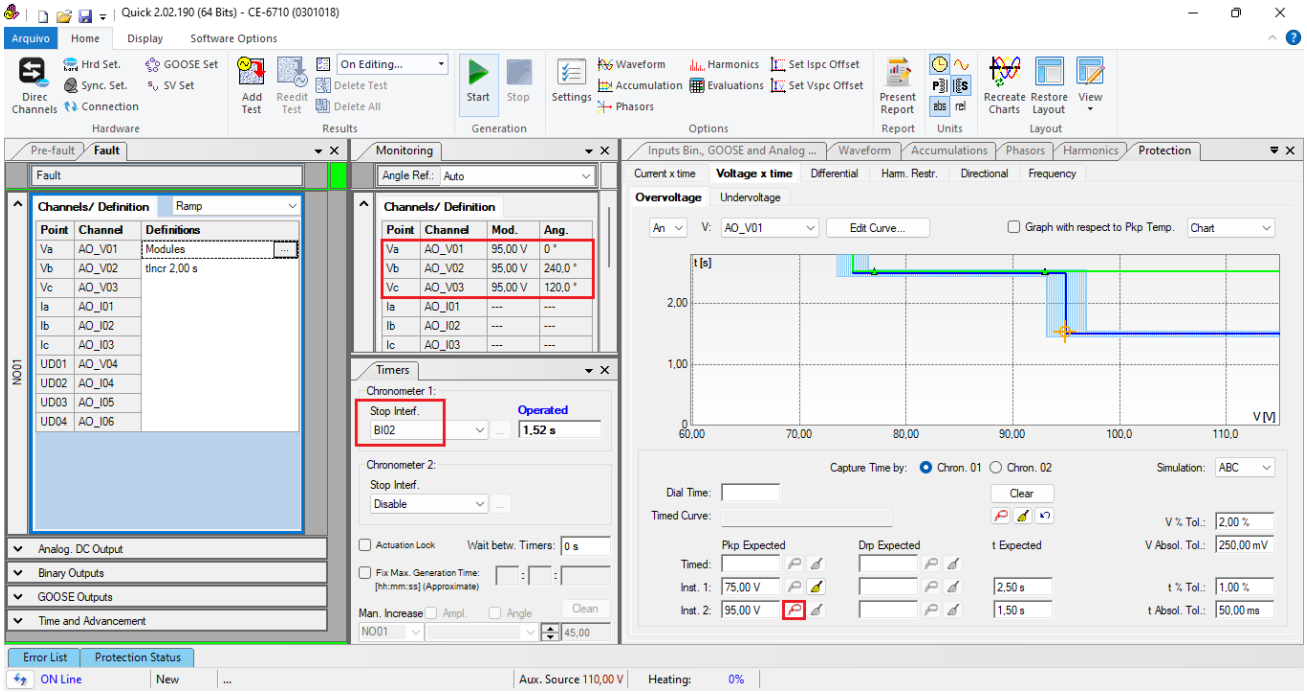

Figure 42

The pick-up value found for element 59-2 was 95.00V, being exactly the value set in the relay.

6.6. Element 59-2 point test

Return the *"Channels/Definition"* field to *"Direct"* to check the operating time of element 59-2. Points with voltage values above the pick-up must be tested. The following figure shows the value of 97.00V already captured and the value of 110.00V not yet captured.

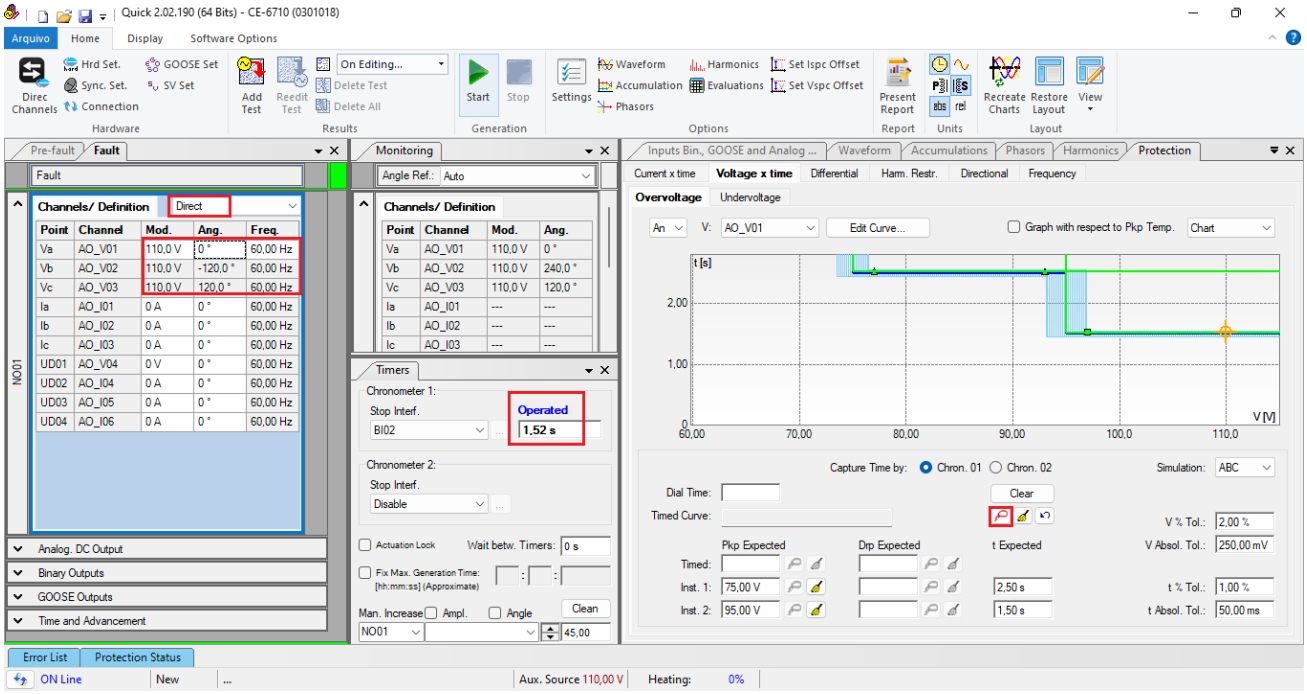

Figure 43

It is verified that the operating times are within the tolerance provided by the relay manufacturer.

6.7. Voltage x Time > Undervoltage screen

First, click on the tab *"Protection > Voltage x time > Undervoltage"* so that the data set in the relay are configured in the software. Next to the voltage *"V"* choose a node as a reference, in this case *"AO_V01"*. Only after choosing the node are the fields for setting function 27 active.

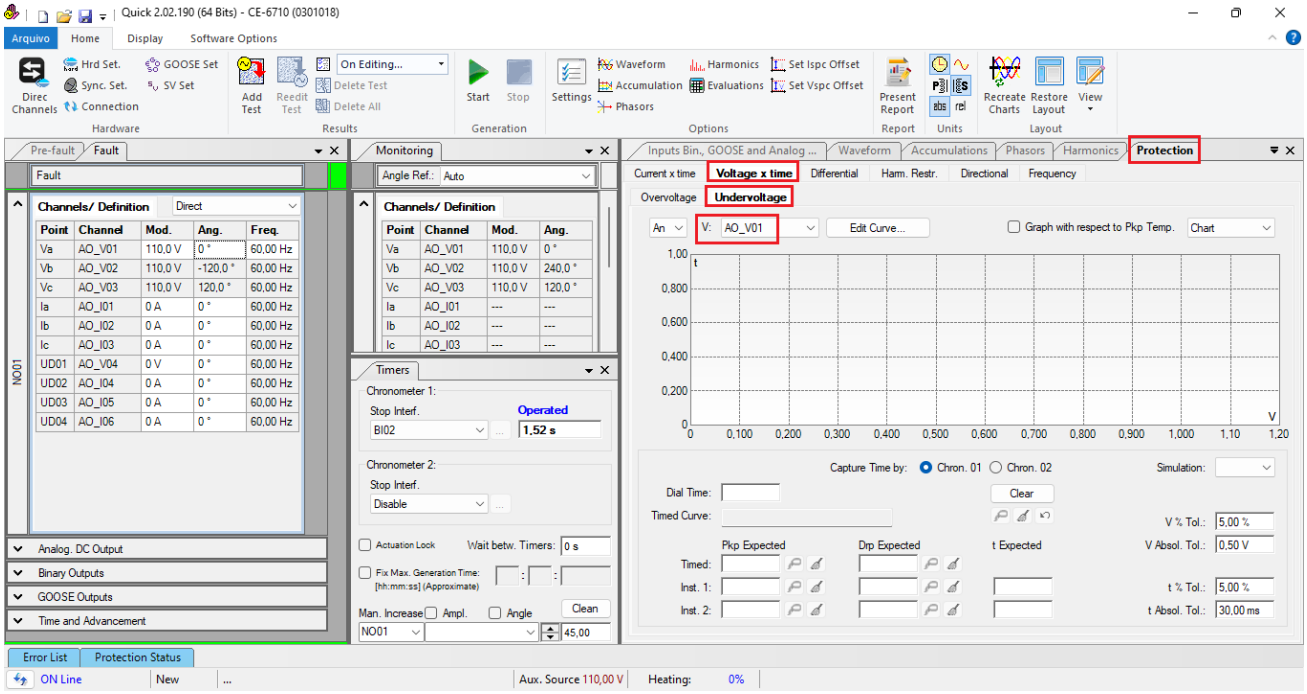

Figure 44

6.8. General Adjustments 27

According to the relay software settings, these values are entered in the Quick software. Element 27-1 pick-up equals 55.00V with actuation time equal to 2.5s and element 27-2 pick-up equals 35.00V with actuation time equal to 1.5s.

There are also fields where the absolute and relative tolerances for both voltage and time must be entered. These values are taken from Appendix A.

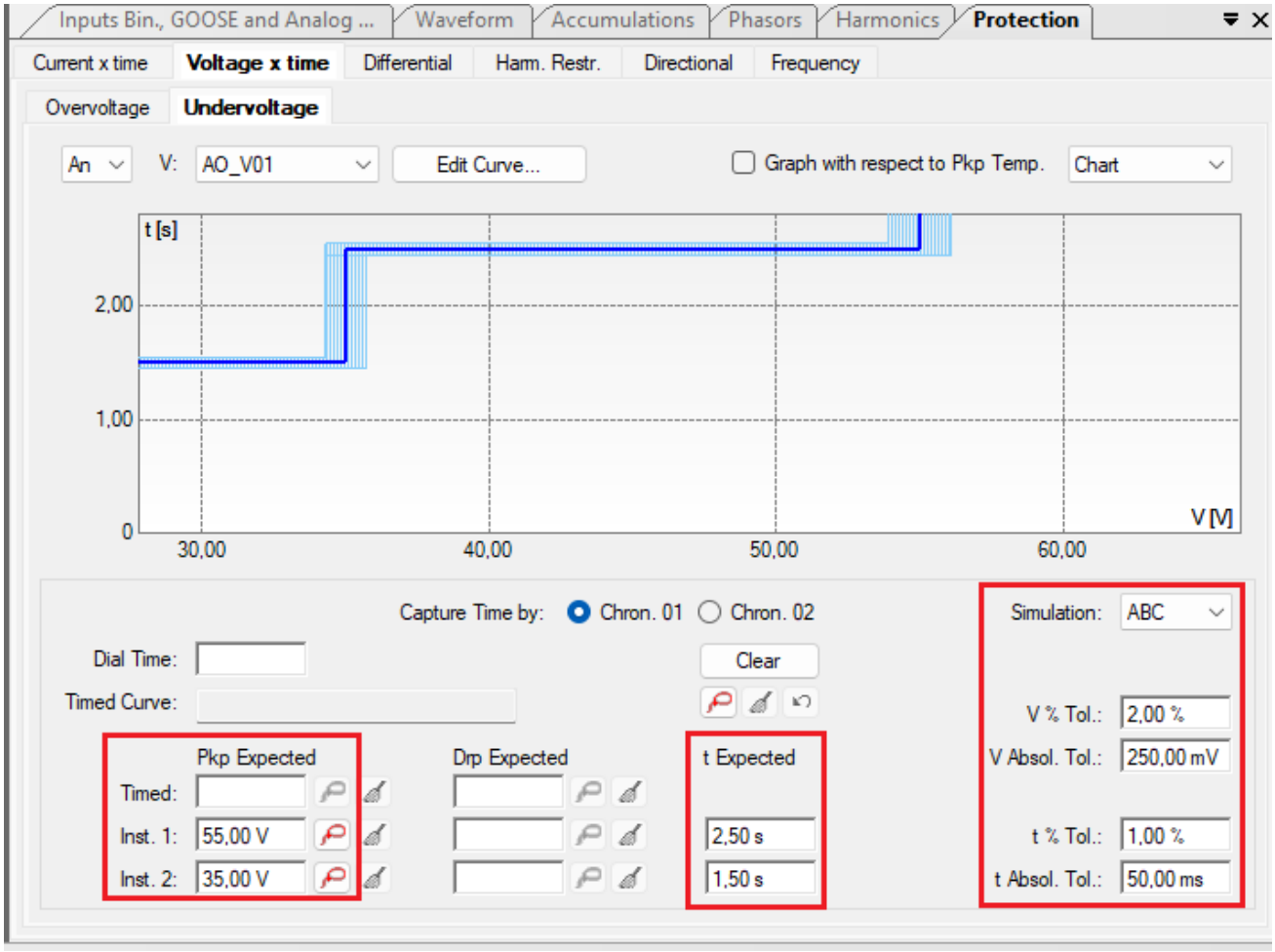

Figure 45

6.9. Timed Element 27-1 Pick-up Test

First change the stop binary to *"BI03"*. For the pick-up test, a ramp is used to decrease the voltage value. To do this, choose the *"Ramp"* option on the *"Fault > N01"* tabs and click on the highlighted icon.

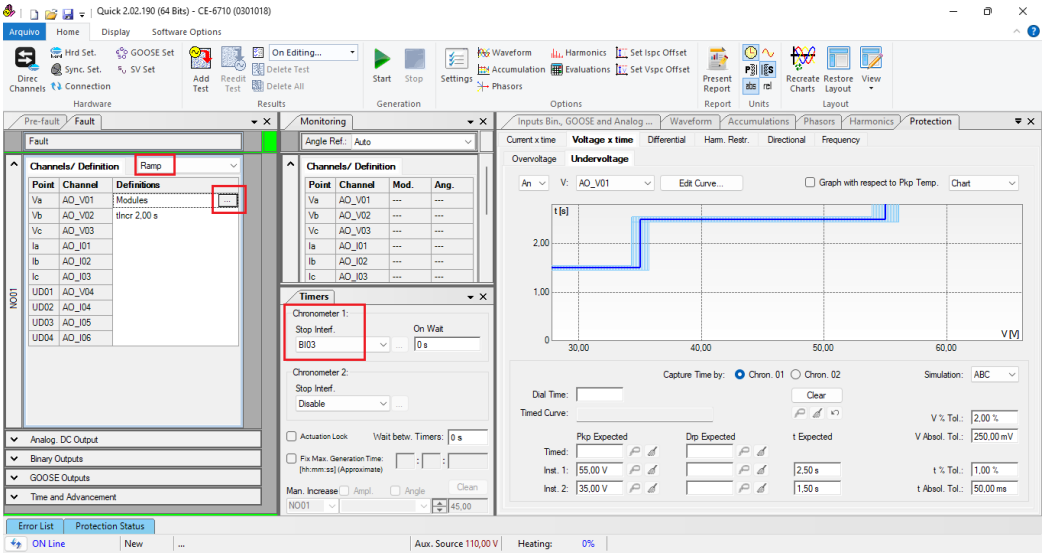

Figure 46

Enter an initial value of 55.5V, threshold value of 54.5V, with a decrement of -100.0mV and a time of 3.0s.

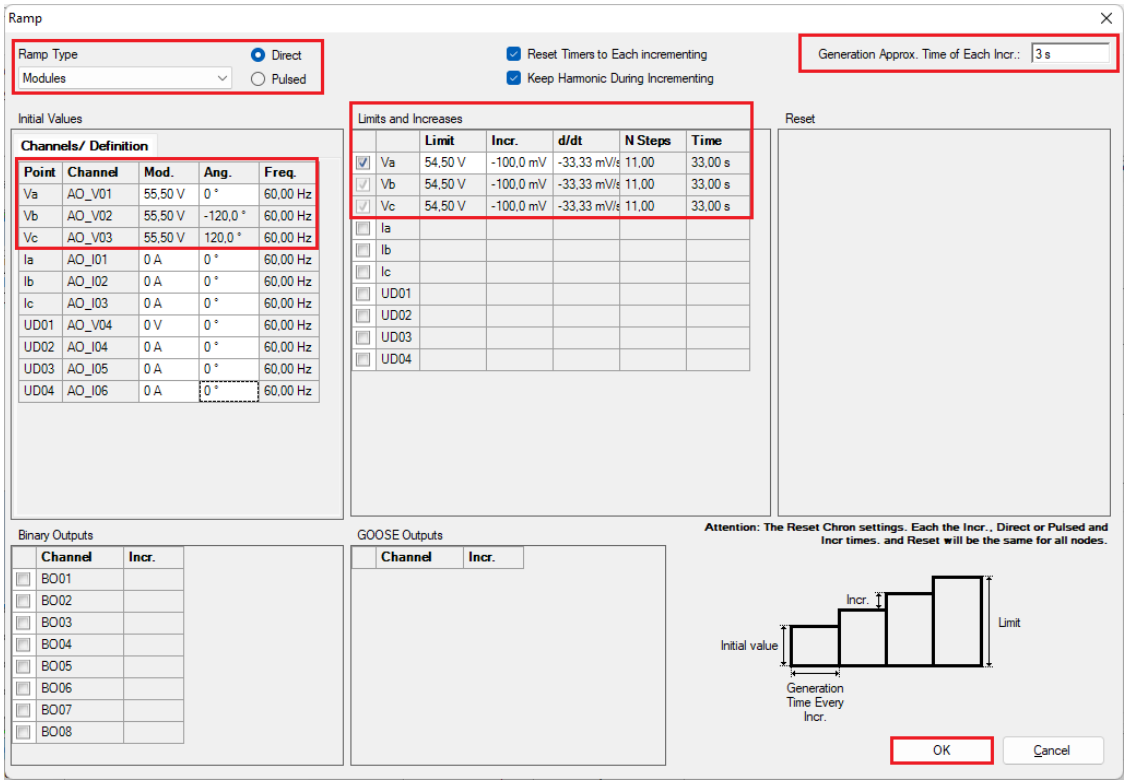

Figure 47

NOTE: An important detail is that pre-fault voltage must be entered so that the relay performs the drop-out. For this, click on *"Actuation Lock"*.

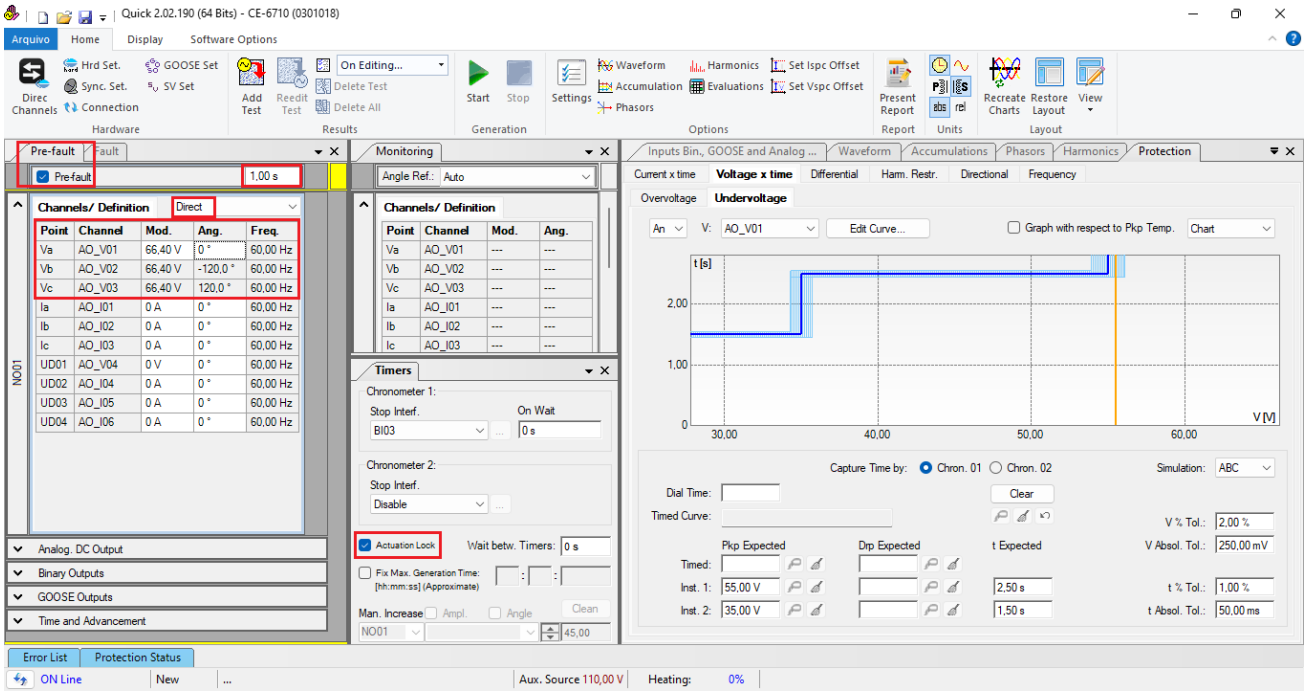

Figure 48

Start the generation by clicking on the *"Start"* icon or via the shortcut *"Alt + G"*.

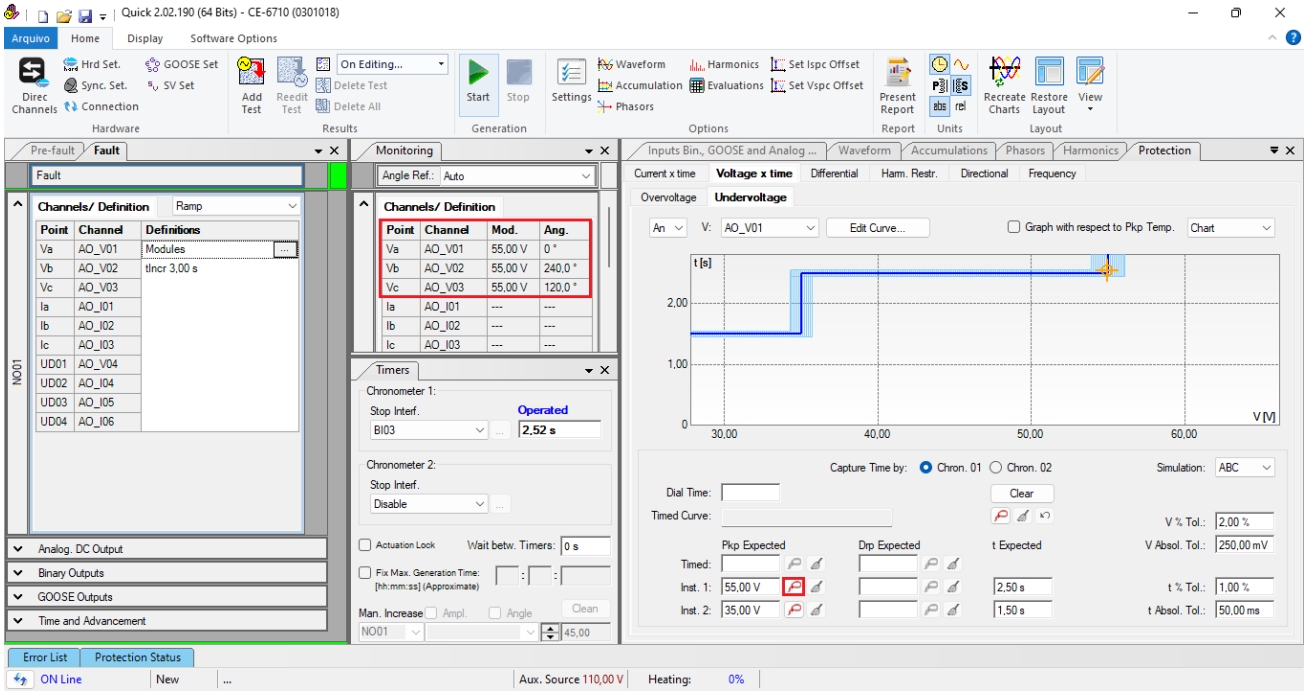

Figure 49

In this case, the pickup found was 55.00V, being exactly the value set in the relay.

6.10. Element 27-1 point test

Return the *"Channels/Definition"* field to *"Direct"* to check the operating time of element 27-1. Points with voltage values below the pick-up must be tested. The figure below shows the value of 53.00V already captured and the value of 37.00V not yet captured.

NOTE: Remember to always block the first actuation.

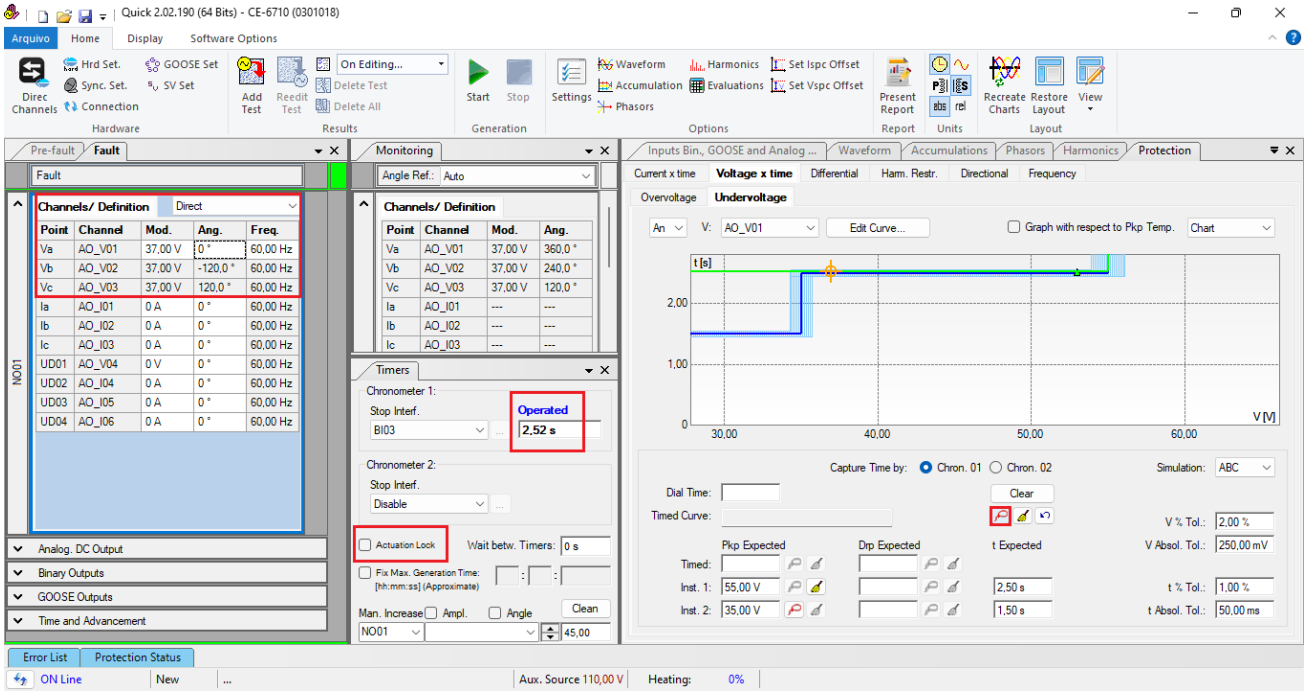

Figure 50

It is verified that the operating times are within the tolerance provided by the manufacturer.

6.11. Timed Element 27-2 Pick-up Test

Change the binary to *"BI04"*, click on the *"Fault"* tab, choose the *"Ramp"* option and the *"..."* icon and enter an initial value of 35.50V, limit value of 34.50V, with a decrement of -100.0mV and the time of 2.0s.

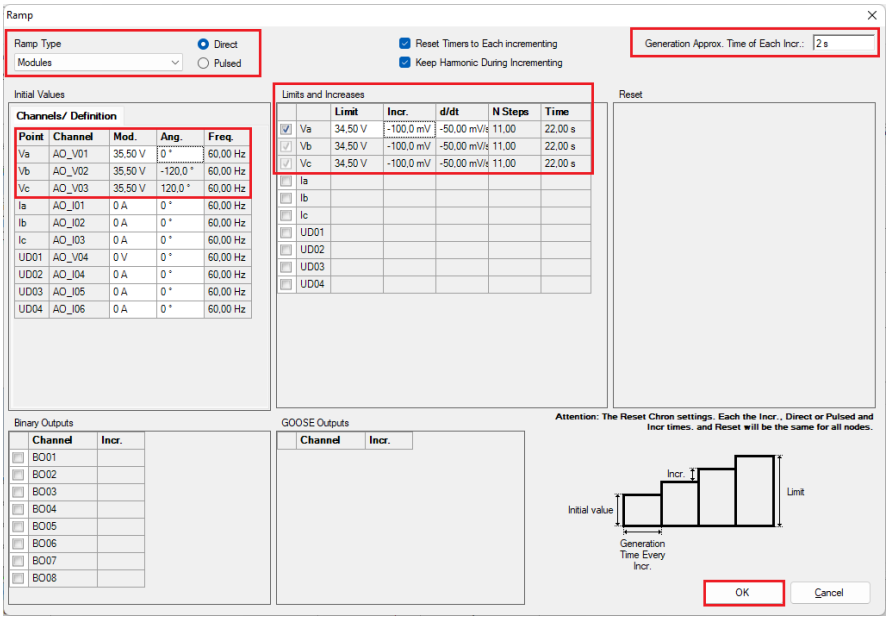

Figure 51

Check the field *"Actuation Lock"* and start the generation through the shortcut *"Alt + G"*.

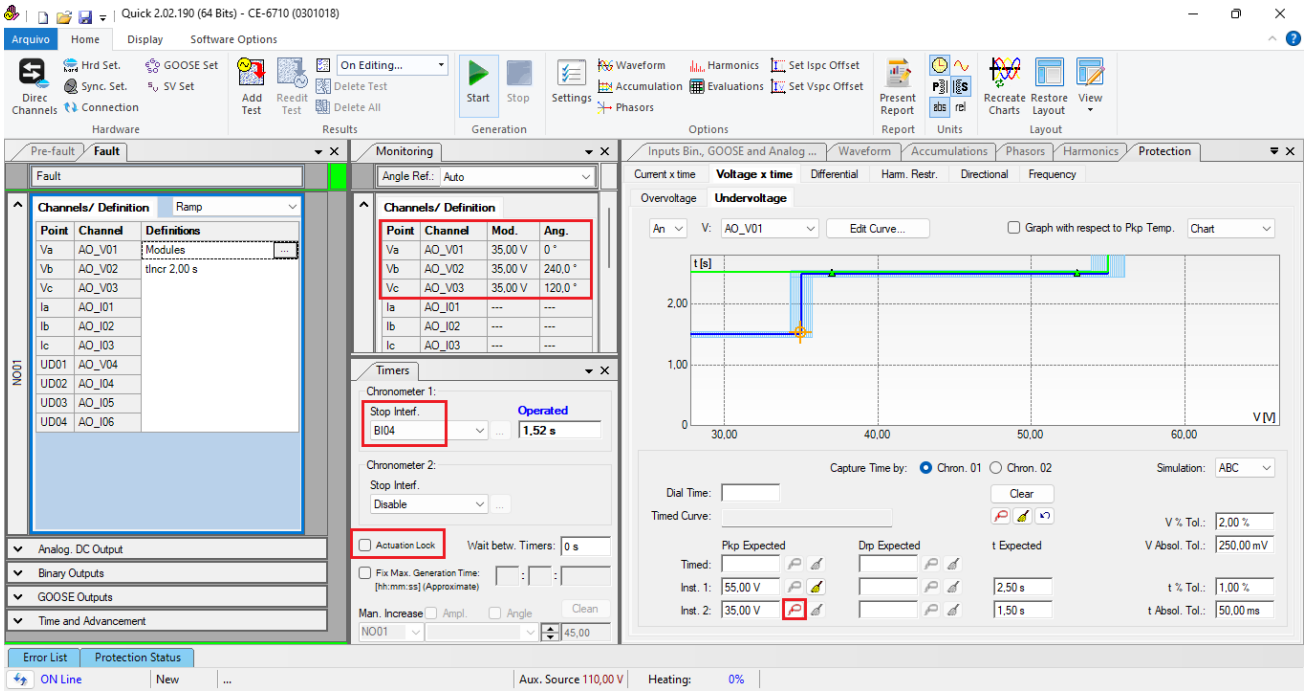

Figure 52

The pick-up found for element 27-2 was 35.00V, being exactly the value set in the relay.

6.12. Element 27-2 point test

The following figure shows the value of 33.00V already captured and the value of 28.00V not yet captured.

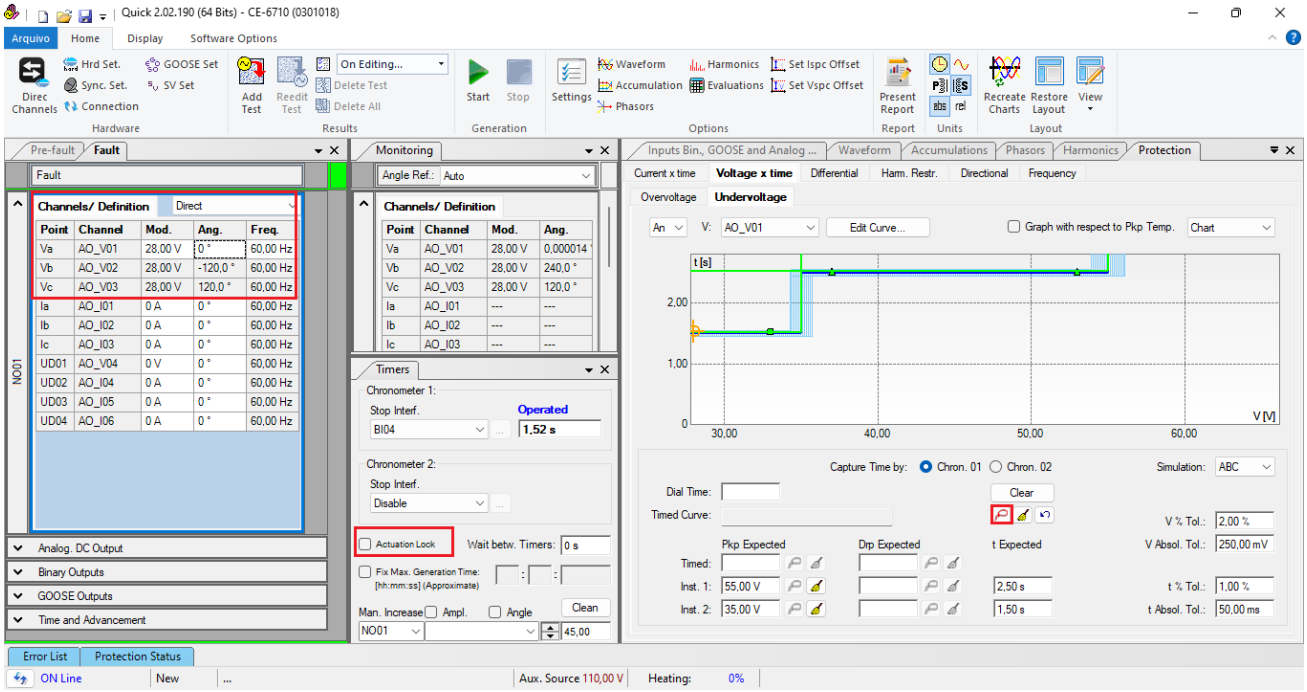

Figure 53

7. Report

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

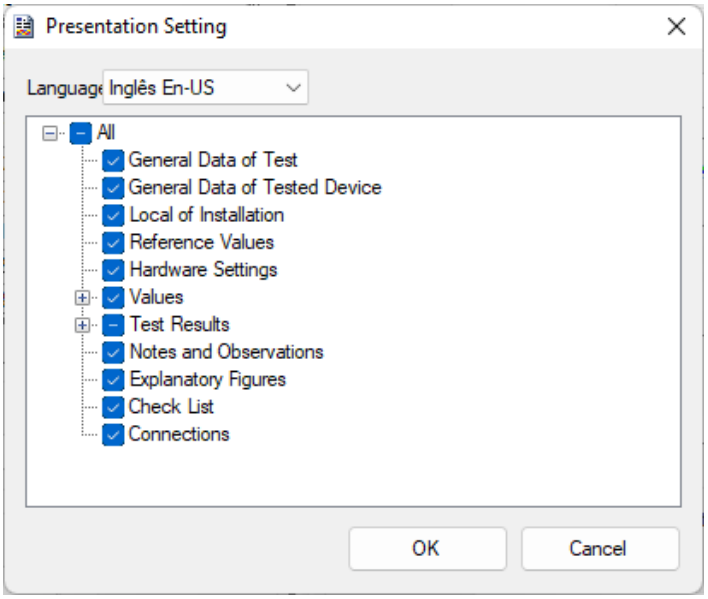

Figure 54

The figure below shows the beginning of a report. It is worth mentioning that within the Conprove Test Center (CTC) there is a tool called *"Preferences"*, which allows the user to insert a figure to fill the report header image with the company logo, for example. Furthermore, as the following figure highlights, it is possible to convert the report to .pdf and .rtf, therefore, the latter format allows editing through Microsoft Office Word, although the characteristics that make the report a fully produced document are lost by Conprove software.

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INSTRUMENTOS PARA TESTES ELÉTRICOS

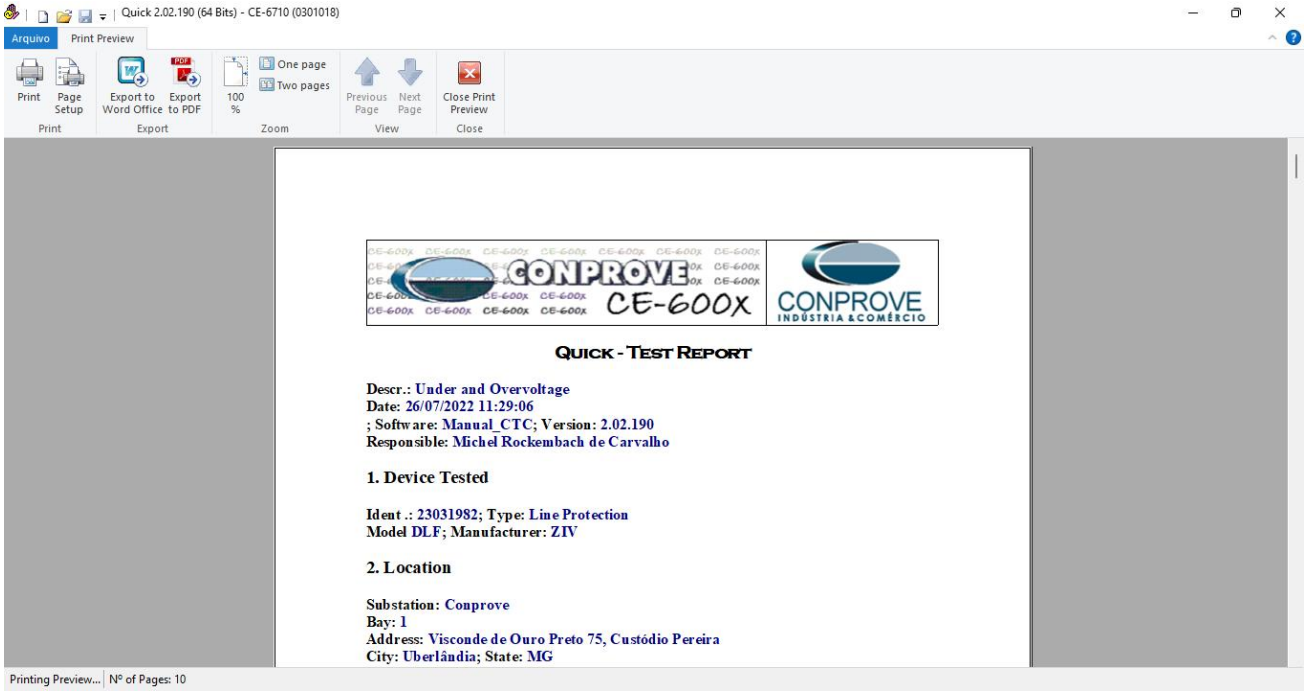

Figure 55

8. Appendix A - Manufacturer Tolerances

Overvoltage and Undervoltage Elements

Pickup (static test)	**±2%** or **±250 mV** of the theoretical value (the greater)
Reset	**1.5 cycles** for 50 and 60Hz (*)

(*) If the reset time is measured using electromechanical DOs there will be an extra increment of up to ½ cycle.

Measuring Times

Mode	Time Setting	Measuring Times (*)	
		50Hz	60Hz
Fixed Time	0 s	16 ms	14.5 ms
Fixed Time	> 0 s	±1% of the setting or ±25 ms (the greater)	

Figure 56

9. Appendix B - Terminal Diagram

- **Analog Channels DLF-A**

Magnitude	Analog Channels	Analog Channels description	SLOT (1/2 rack)	PINS
PHASE AG VOLTAGE	VA	VOLTAGE INPUT 1	D	1-2
PHASE BG VOLTAGE	VB	VOLTAGE INPUT 2	D	3-4
PHASE CG VOLTAGE	VC	VOLTAGE INPUT 3	D	5-6
SYNCHRONISM VOLTAGE	VSYNC	VOLTAGE INPUT 4	D	7-8
NEUTRAL VOLTAGE	VG	VOLTAGE INPUT 5	D	9-10
PHASE A CURRENT	IA	CURRENT INPUT 1	D	11-12
PHASE B CURRENT	IB	CURRENT INPUT 2	D	13-14
PHASE C CURRENT	IC	CURRENT INPUT 3	D	15-16
PARALLEL LINE NEUTRAL CURRENT	IPAR	CURRENT INPUT 4	D	17-18
GROUNDING CURRENT	IG	CURRENT INPUT 5	D	19-20

Figure 57

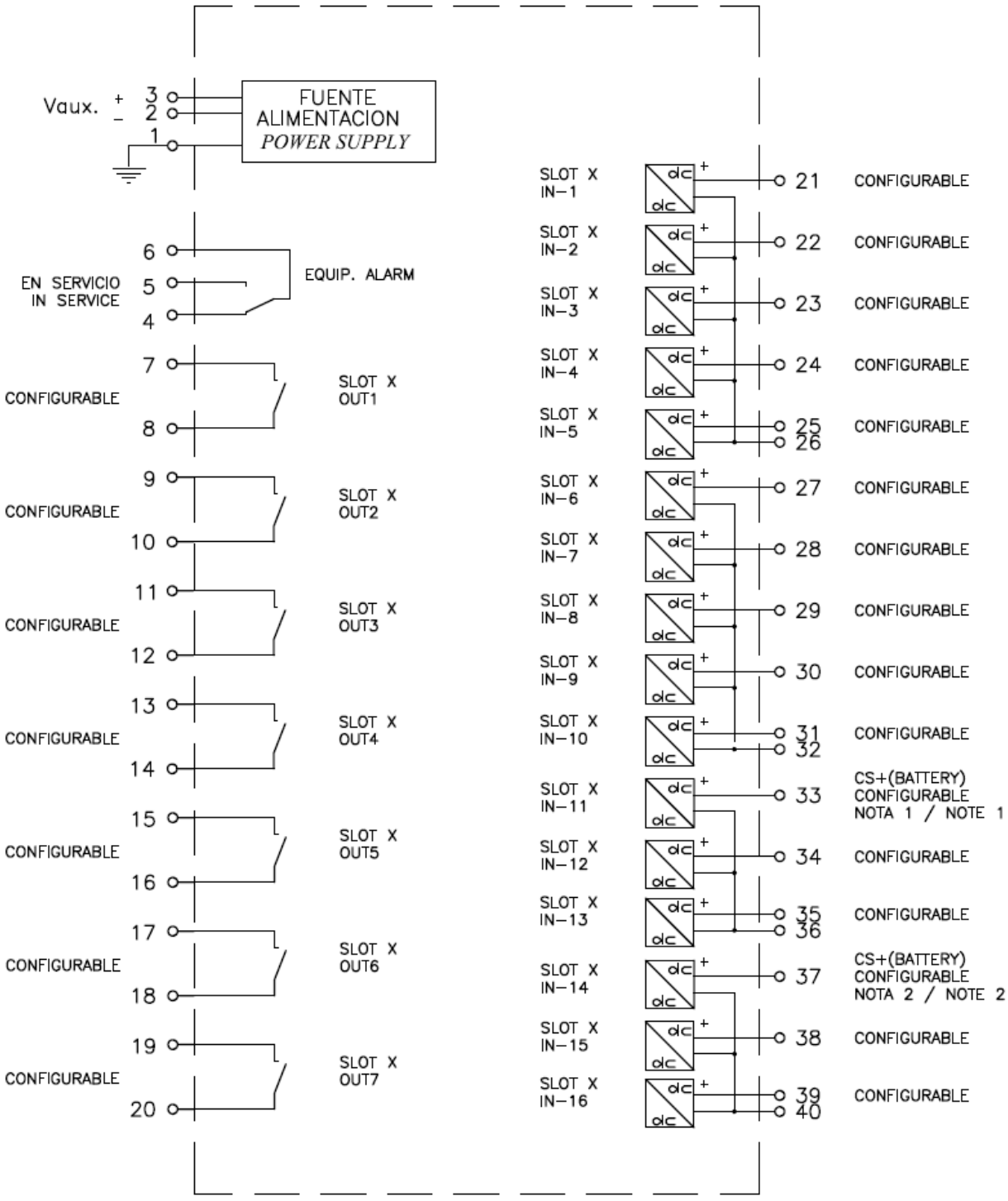
Vaux.
+
3
2
−
1
FUENTE
ALIMENTACION
POWER SUPPLY
6
5
4
EN SERVICIO
IN SERVICE
EQUIP. ALARM
7
8
CONFIGURABLE
SLOT X
OUT1
9
10
CONFIGURABLE
SLOT X
OUT2
11
12
CONFIGURABLE
SLOT X
OUT3
13
14
CONFIGURABLE
SLOT X
OUT4
15
16
CONFIGURABLE
SLOT X
OUT5
17
18
CONFIGURABLE
SLOT X
OUT6
19
20
CONFIGURABLE
SLOT X
OUT7
SLOT X
IN−1
21
CONFIGURABLE
SLOT X
IN−2
22
CONFIGURABLE
SLOT X
IN−3
23
CONFIGURABLE
SLOT X
IN−4
24
CONFIGURABLE
SLOT X
IN−5
25
26
CONFIGURABLE
SLOT X
IN−6
27
CONFIGURABLE
SLOT X
IN−7
28
CONFIGURABLE
SLOT X
IN−8
29
CONFIGURABLE
SLOT X
IN−9
30
CONFIGURABLE
SLOT X
IN−10
31
32
CONFIGURABLE
SLOT X
IN−11
33
CS+(BATTERY)
CONFIGURABLE
NOTA 1 / NOTE 1
SLOT X
IN−12
34
CONFIGURABLE
SLOT X
IN−13
35
36
CONFIGURABLE
SLOT X
IN−14
37
CS+(BATTERY)
CONFIGURABLE
NOTA 2 / NOTE 2
SLOT X
IN−15
38
CONFIGURABLE
SLOT X
IN−16
39
40
CONFIGURABLE
dc
dc

Figure 58

10. Appendix C - Parameter Equivalence between Relay and Software

Table 2

Quick Software		ZIV DLF Relay	
Parameter	Figure	Parameter	Figure
Overvoltage			
Pkp Inst.1	35	Phase OV Pickup	16
Pkp Inst.2	35	Phase OV Pickup	17
t Expect	35	Phase OV Delay	16
t Expect	35	Phase OV Delay	17
Undervoltage			
Pkp Inst.1	45	Phase OV Pickup	18
Pkp Inst.2	45	Phase OV Pickup	19
t Expect	45	Phase OV Delay	18
t Expect	45	Phase OV Delay	19