



INSTRUMENTOS PARA TESTES ELÉTRICOS

Test Tutorial

Equipment Type: Protection Relay

Brand: SCHNEIDER (AREVA)

Model: P545

Function: 81u or PTUF – Underfrequency & 81o or PTOF – Overfrequency

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

Objective: Testing the pickup and operating time of the underfrequency and overfrequency elements using the Ramp software.

Version Control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	05/10/2022	M.R.C.	G.C.D.P.

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Statement of responsibility

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

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Sequence for testing the P545 relay in the Ramp software

1. Relay Connection to CE-6710

Appendix A-1 shows the relay terminal designations.

1.1 Auxiliary Source

Connect the positive (red terminal) of the Aux Source. Vdc to pin M2 on the relay terminal and the negative (black terminal) of the Source to pin M1 of the relay terminal.

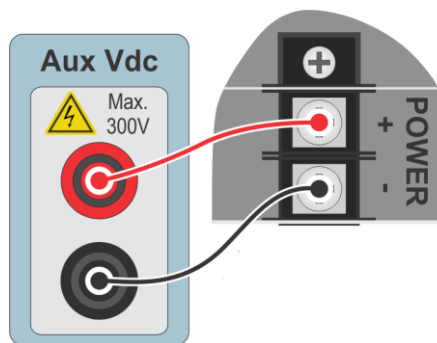


Figure 1

1.2 Voltage Coils

To establish the connection of voltage coils, connect channels V1, V2 and V3 with pins D19, D20 and D21 of the relay terminal and common to pins D22.

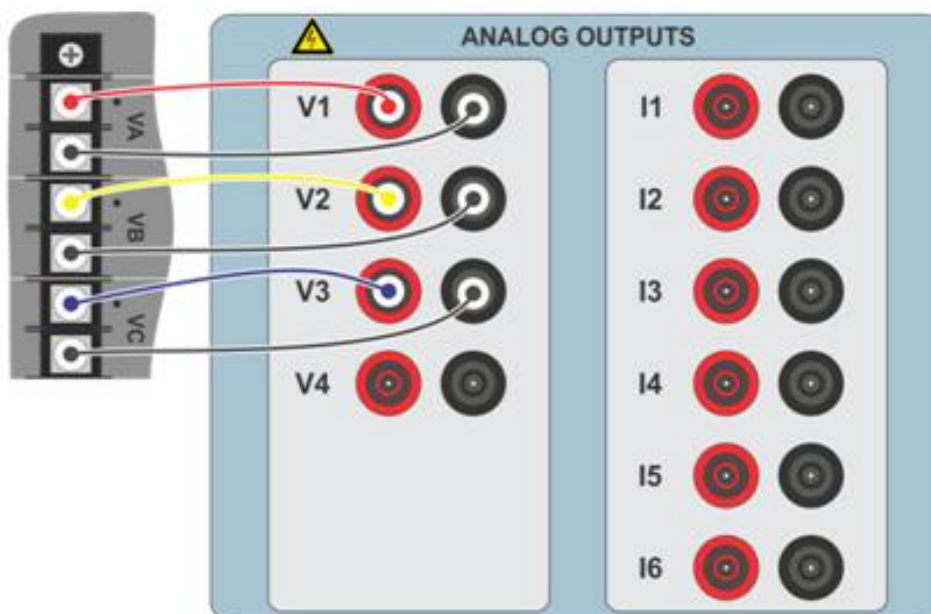


Figure 2

1.3 Binary Inputs

Connect the binary inputs of the CE-6710 to the binary outputs of the relay.

- BI1 to pin L1 and its common to pin L2.
- BI2 to pin L3 and its common to pin L4.
- BI3 to pin L5 and its common to pin L6.
- BI4 to pin L7 and its common to pin L8.

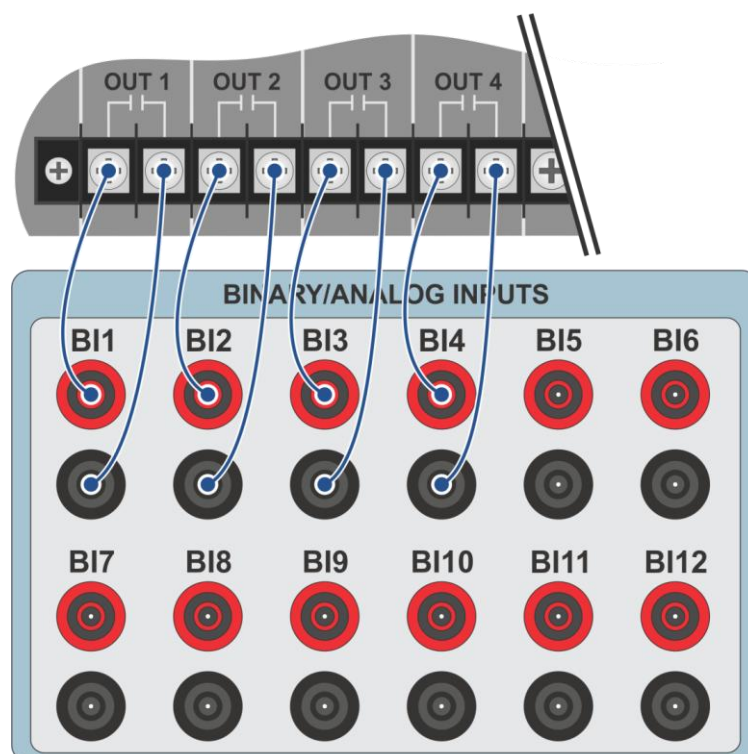


Figure 3

2. Communication with the Schneider P545 relay

First, open the Schneider Electric MICOM S1 Studio and connect a serial cable from the notebook to the relay. Then double click on the software icon.



Figure 4

Then click on the “Quick Connect” option. The relay software will automatically fetch the settings.

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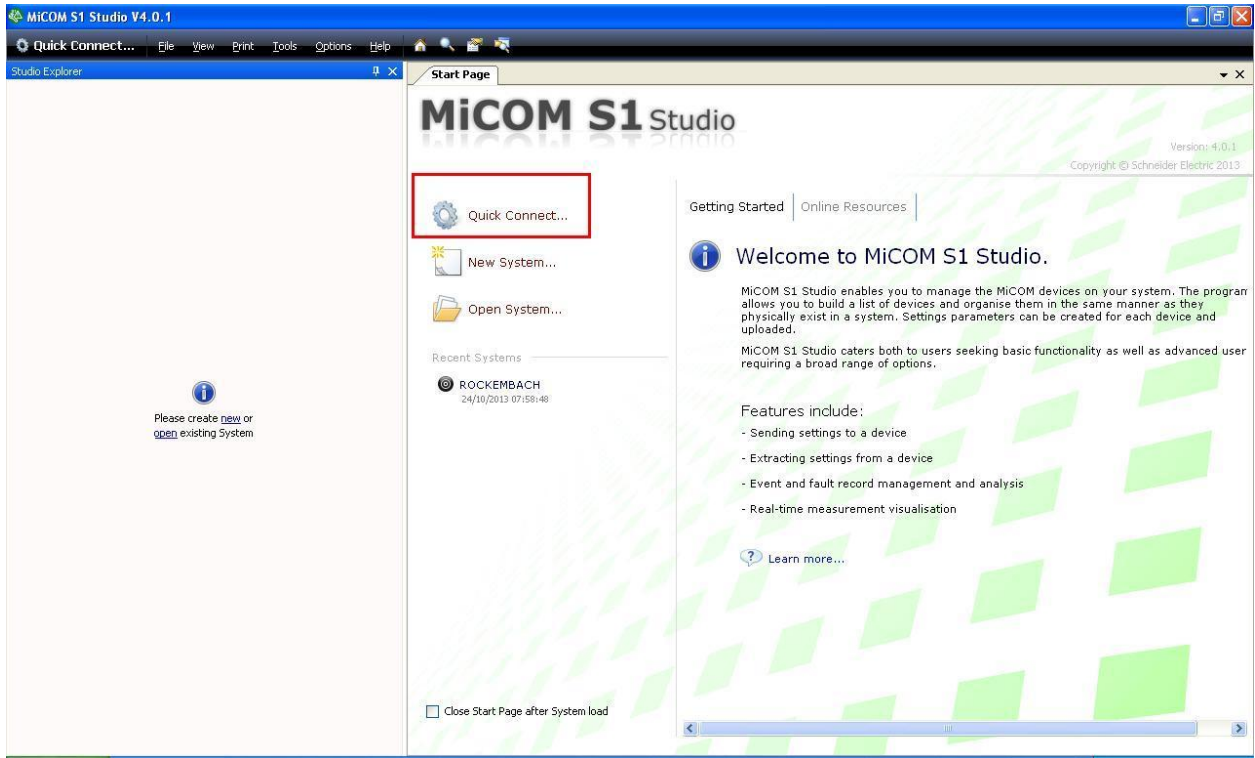


Figure 5

The next step is to create a new project and name it.

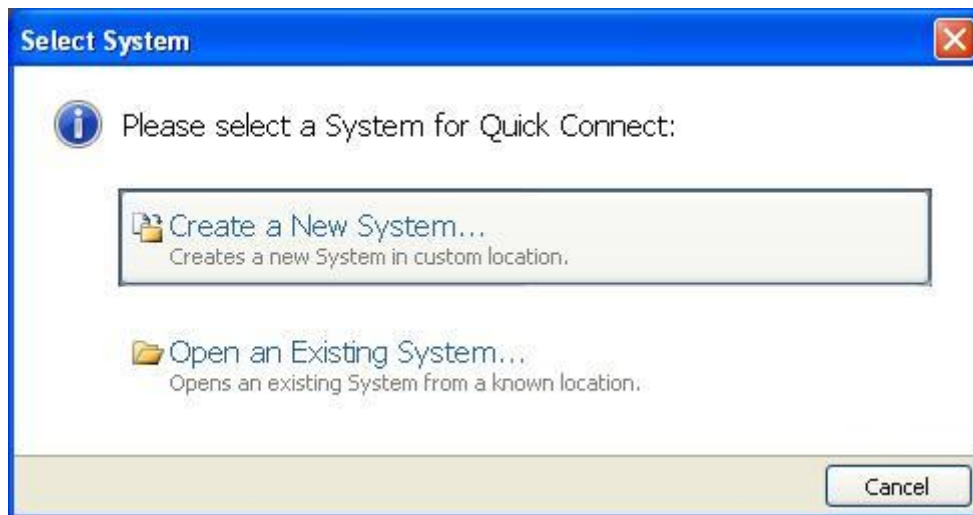


Figure 6

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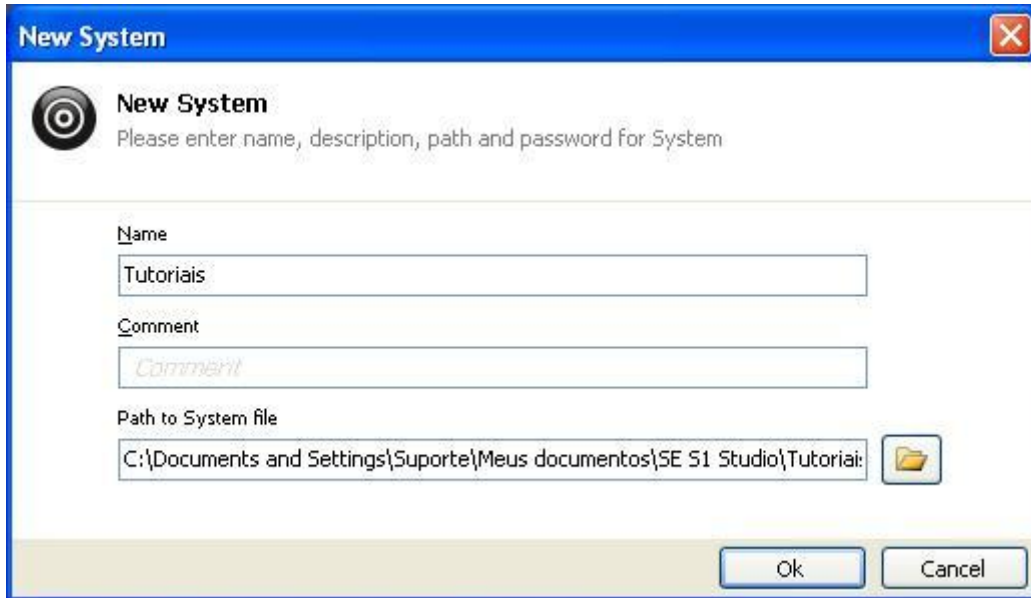


Figure 7

In the next window, choose the relay model. If you do not have the model, use the “Data Model Manager” software (installed together with Micom) to download it.



Figure 8

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Choose the way to communicate whether by serial port (back or front), by Ethernet or even via modem.

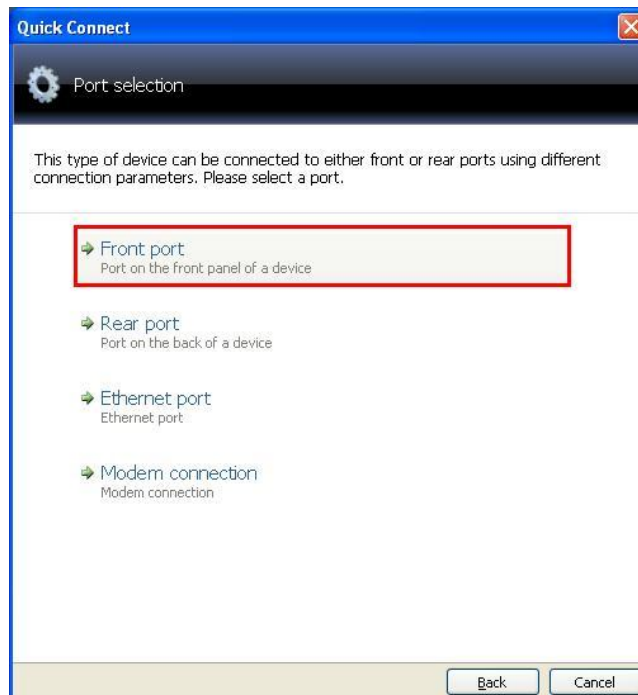


Figure 9

In the next window make sure which serial port “COM” is being used especially if you are using a USB/SERIAL converter and click on “Finish”.

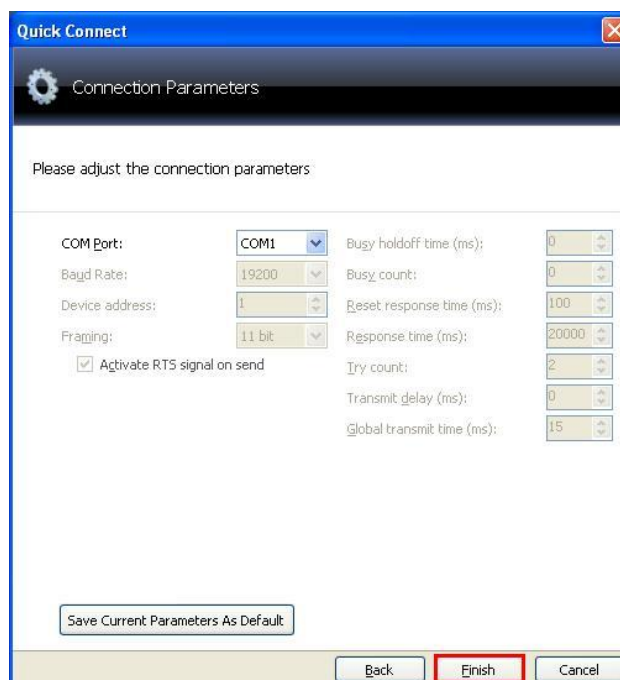


Figure 10

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The next screen shows that the connection was made successfully showing the relay type, model and serial number.

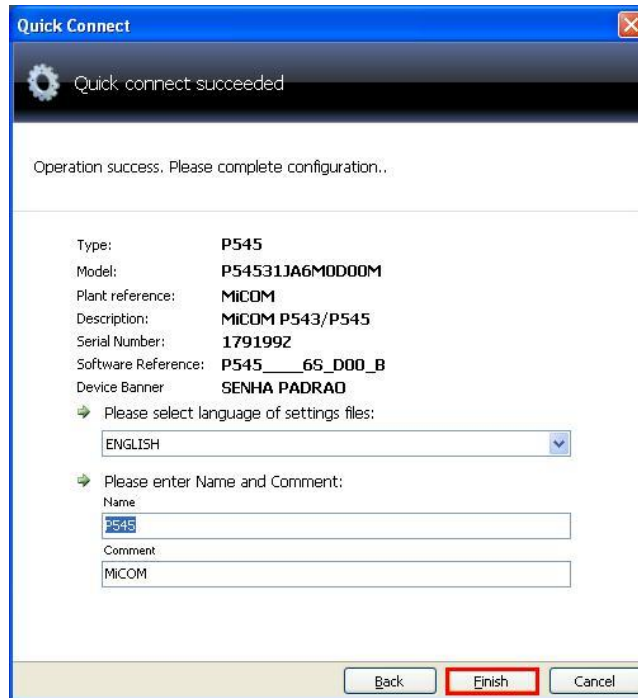


Figure 11

The next step is to extract all the information set in the relay. Right click on “Settings” and left click on “Extract Settings”.

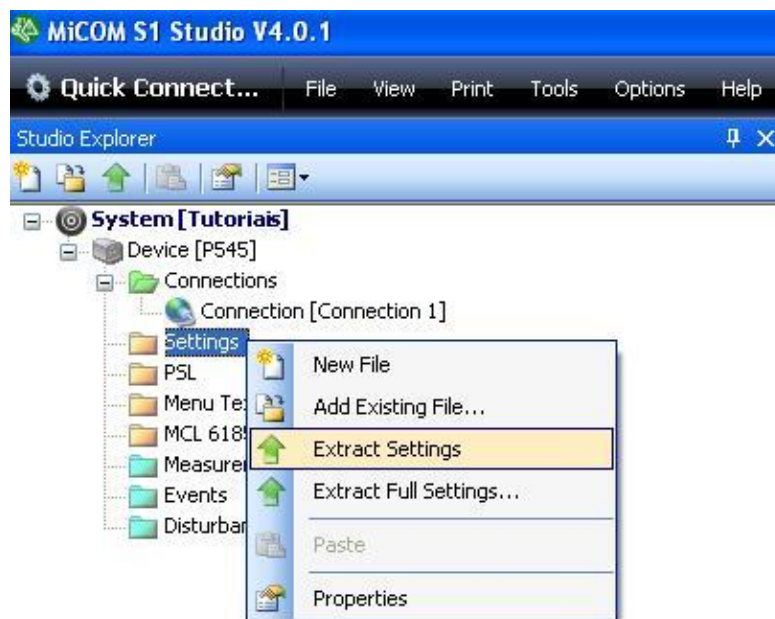


Figure 12

Enter the password with the default value for this relay being AAAA.

INSTRUMENTOS PARA TESTES ELÉTRICOS

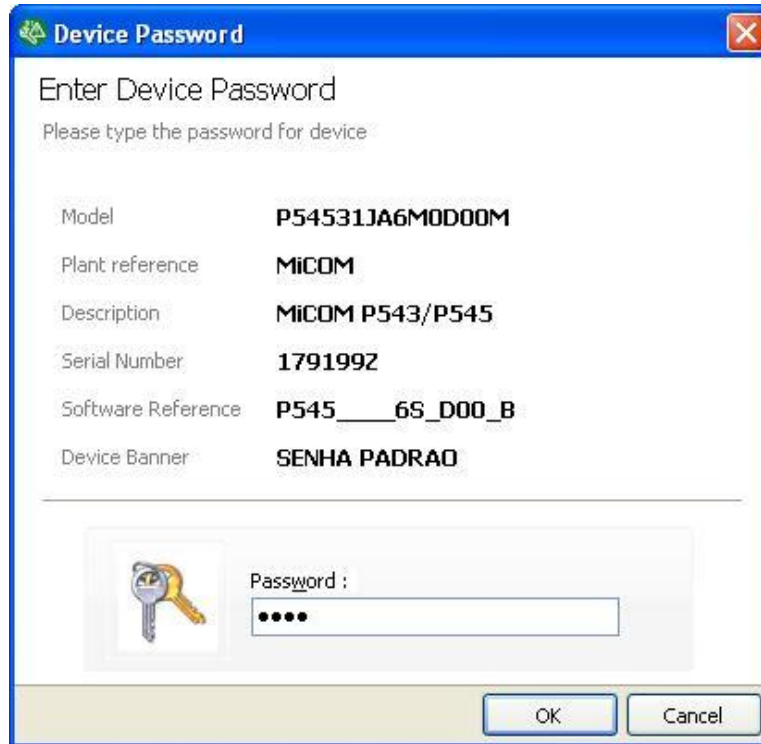


Figure 13

The reading of the settings will appear with the name of “000” and can be modified if necessary. In this case the file name was changed to “Sub_Sobrefrequencia”.

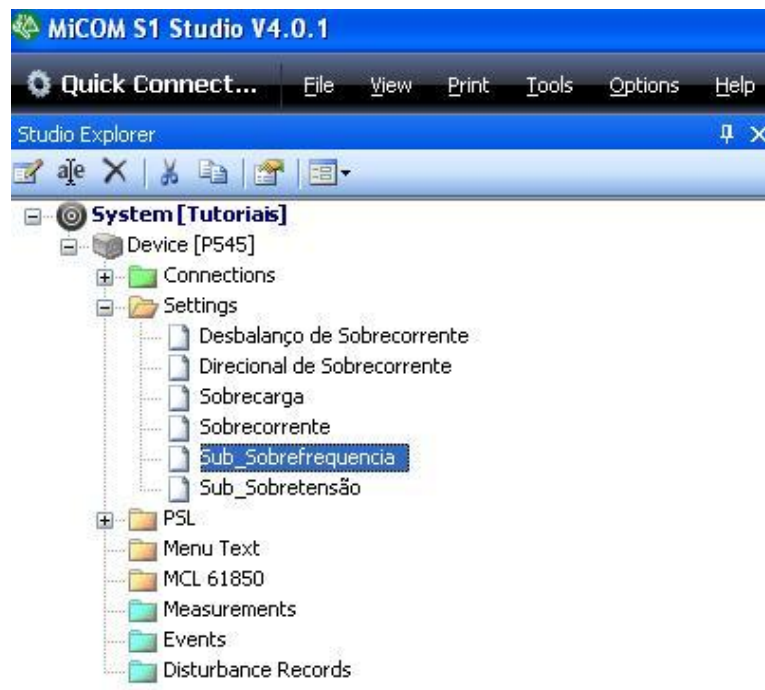


Figure 14

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3. Parameterization of the Schneider P545 relay

3.1 Frequency

After making a double click on the “Sub_Sobrequencia” file, enter “SYSTEM DATA”, and then “Frequency”. Make sure the adjusted value is 60.0Hz.

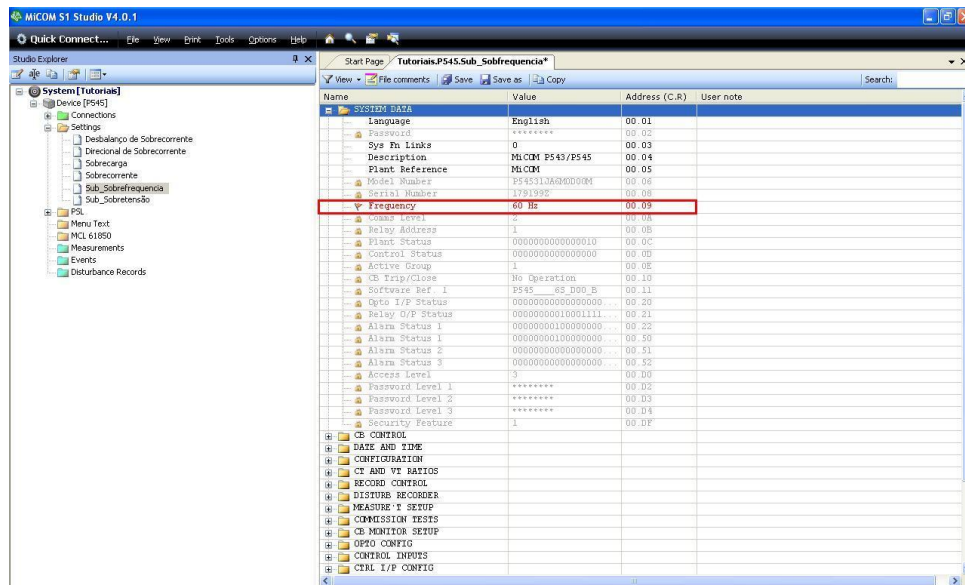


Figure 15

3.2 CONFIGURATION

Within the “CONFIGURATION” folder, group 1 and frequency protection are enabled. **NOTE: All other functions must be disabled.**

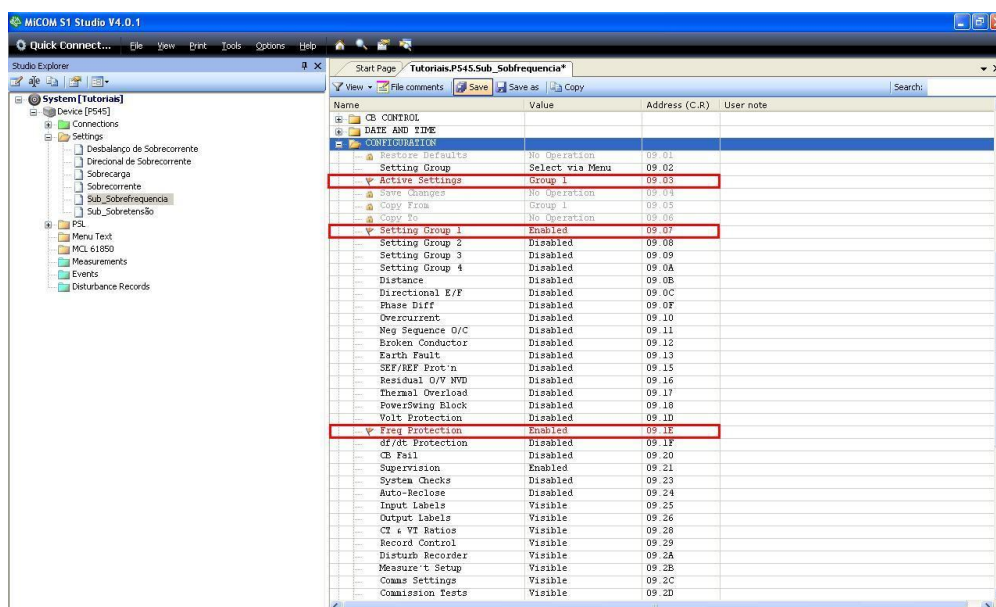


Figure 16

3.3 Setting Values

All parameterization will be done with values referenced to the secondary.

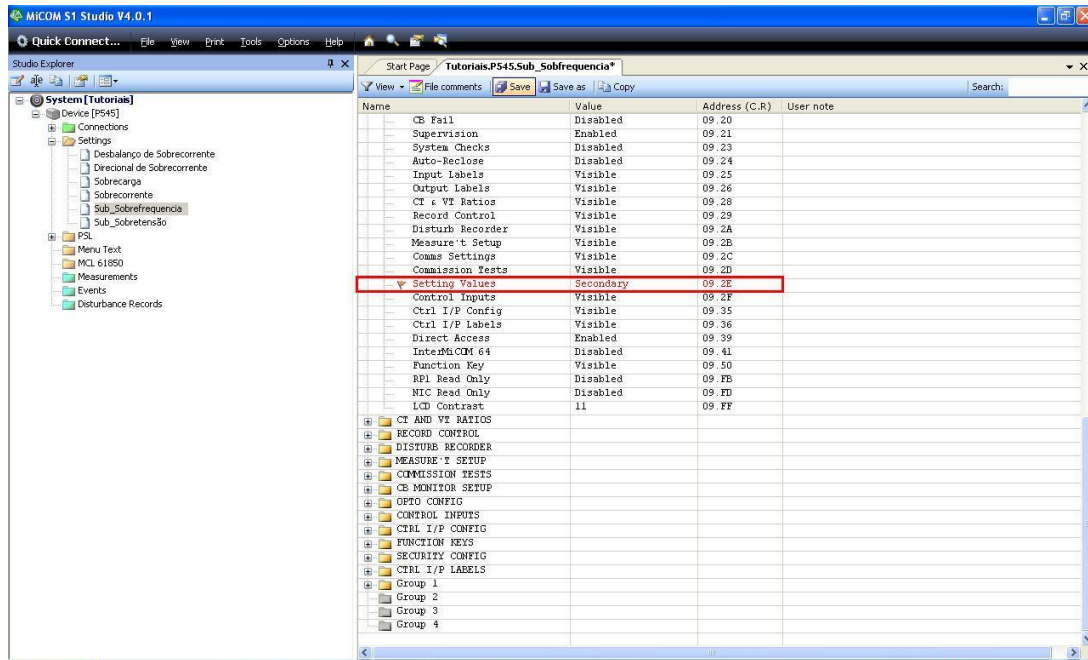


Figure 17

3.4 CT AND VT RATIOS

Adjust the VT primary and secondary voltage values.

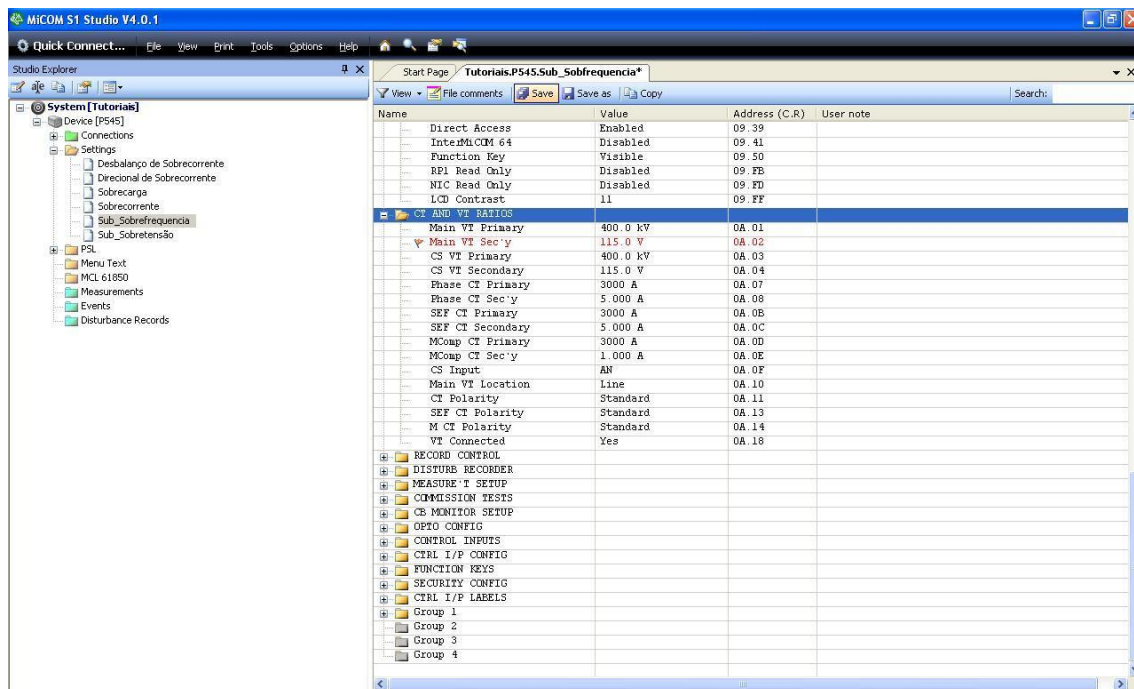


Figure 18

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3.5 Phase Sequence

Click the “+” sign under “GROUP” and “GROUP 1 LINE PARAMETERS”. In the “Phase Sequence” option, set the positive sequence.

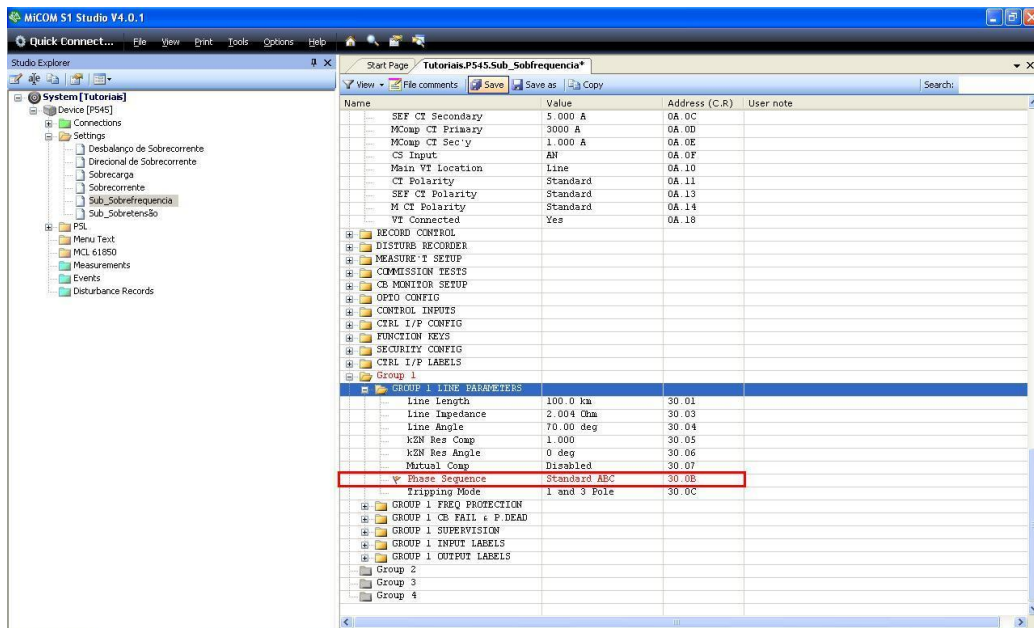


Figure 19

3.6 GROUP 1 FREQ PROTECTION

In this field the underfrequency and overfrequency functions are parameterized.

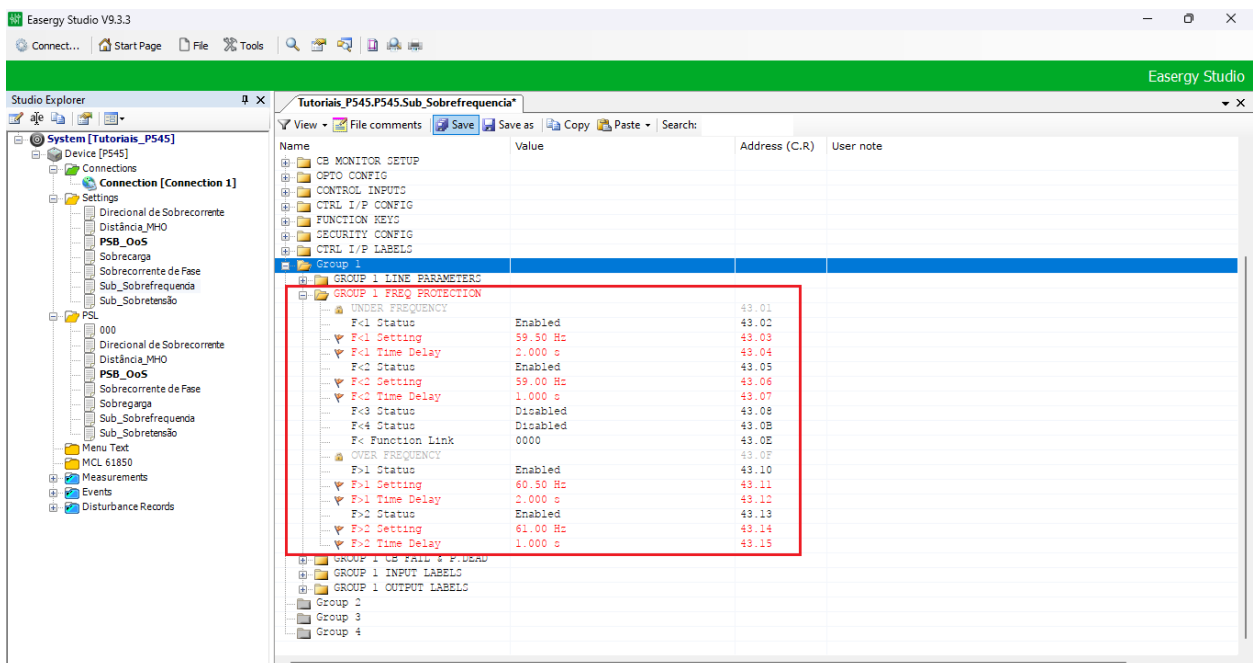


Figure 20

The next step is to click on the highlighted icon to save the configuration.

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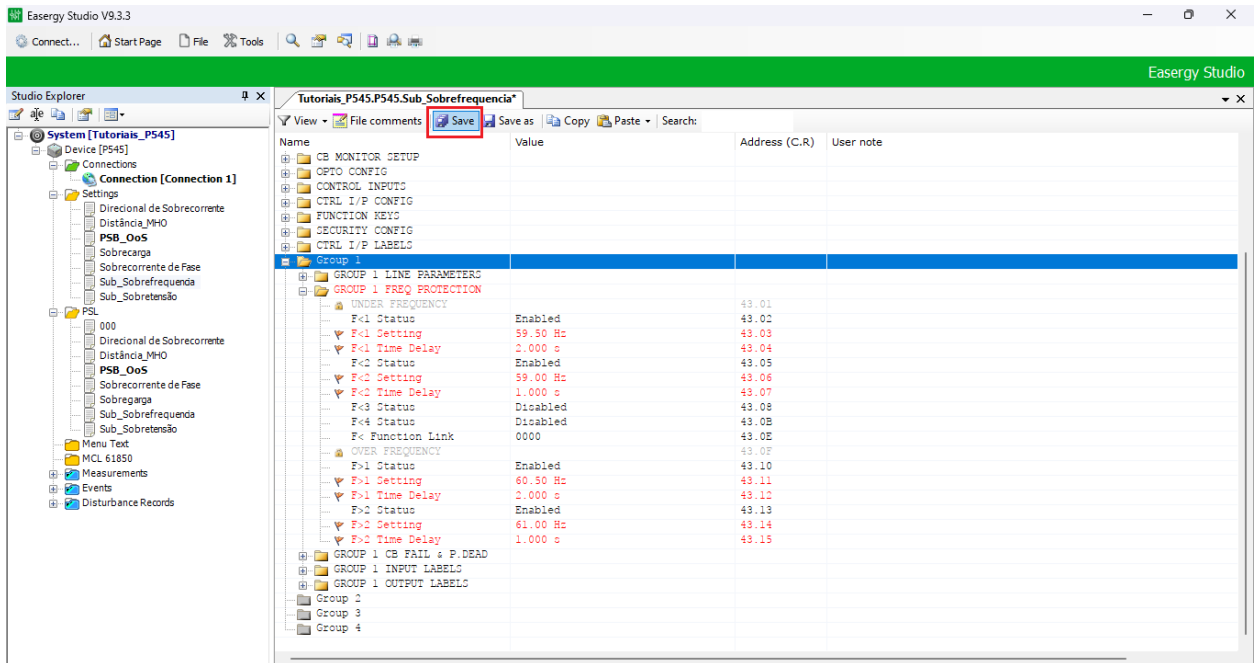


Figure 21

3.7 PSL

The configurations of the binary outputs are done through logic blocks being configured in another file. Right click on the “PSL” folder and then on “New File”.

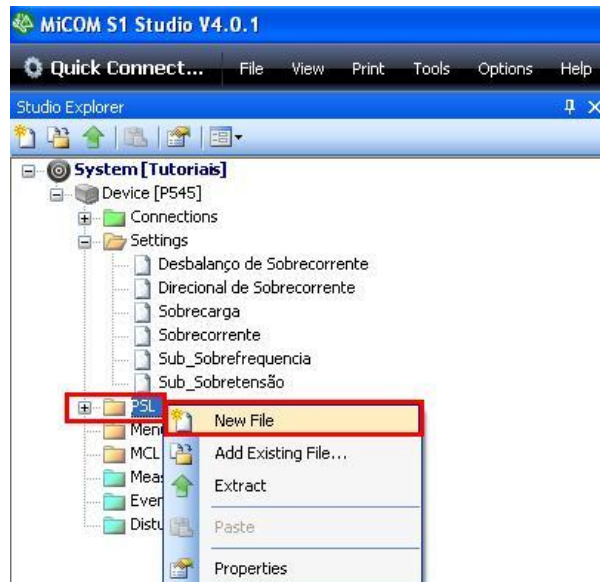


Figure 22

The file name appears as “000” change it to “Sub_Sobrefrequencia”.

INSTRUMENTOS PARA TESTES ELÉTRICOS

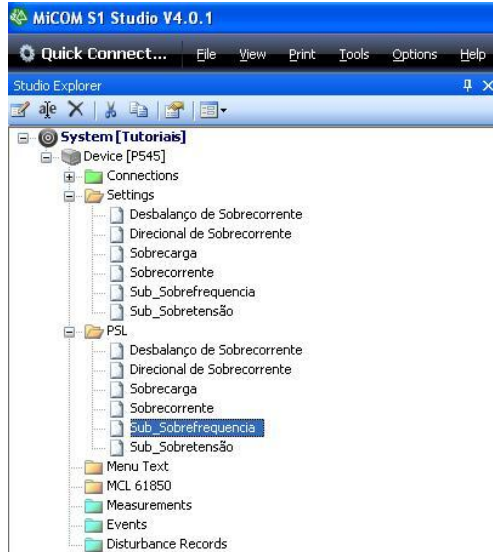


Figure 23

Double-click on this file to gain access to the logical blocks. Then click on the tool highlighted in red and zoom in on the region highlighted in green.

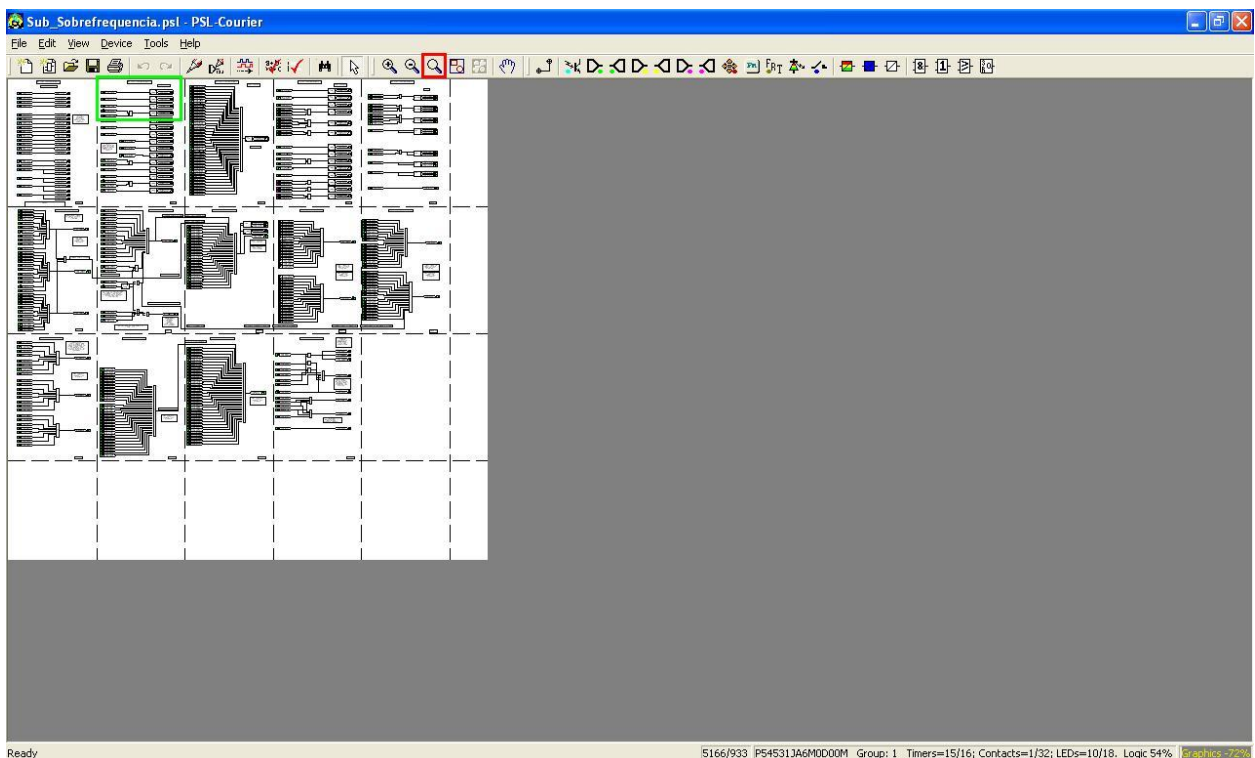


Figure 24

Note that the first 3 outputs appear in the figure below (highlighted in red). In this tutorial, the first 4 outputs will be used. As in the standard file, the fourth output is already being used, so it must be deleted for later use.

INSTRUMENTOS PARA TESTES ELÉTRICOS

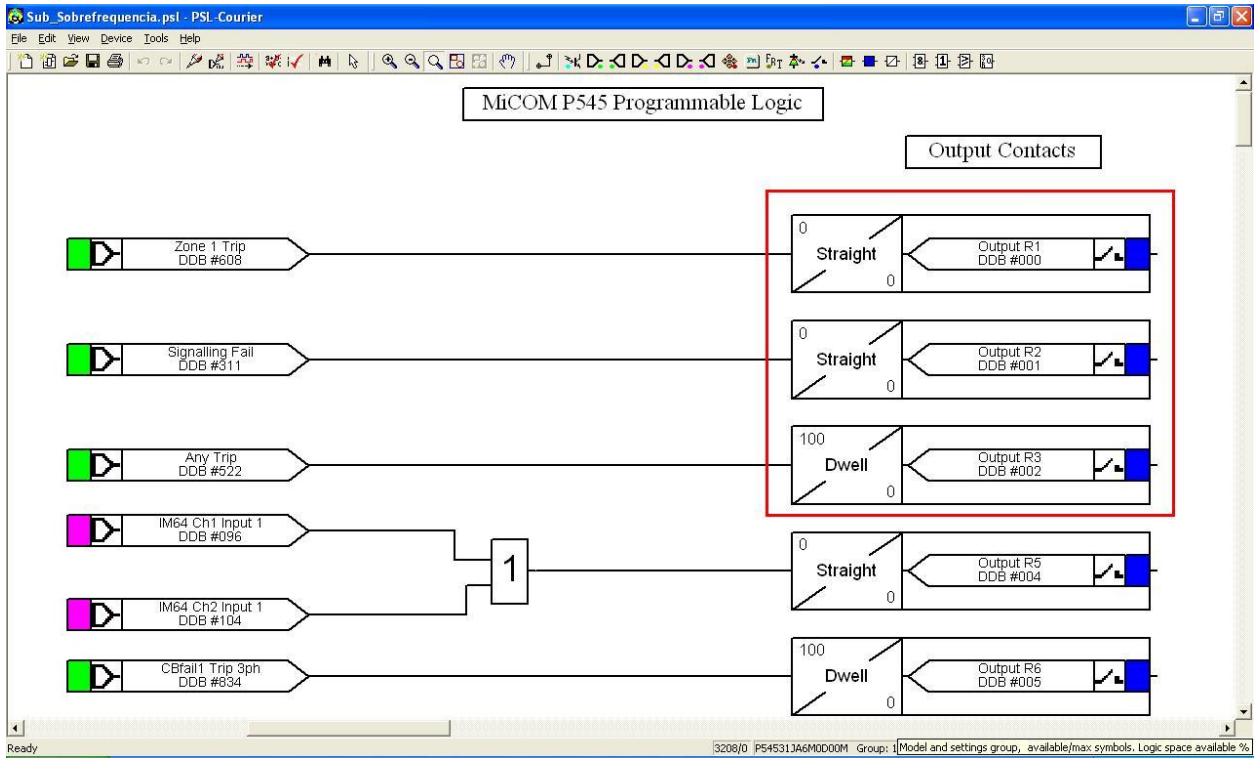


Figure 25

To find the fourth exit use the command “*Ctrl+F*”, type R4 and click the “*Find*” button.

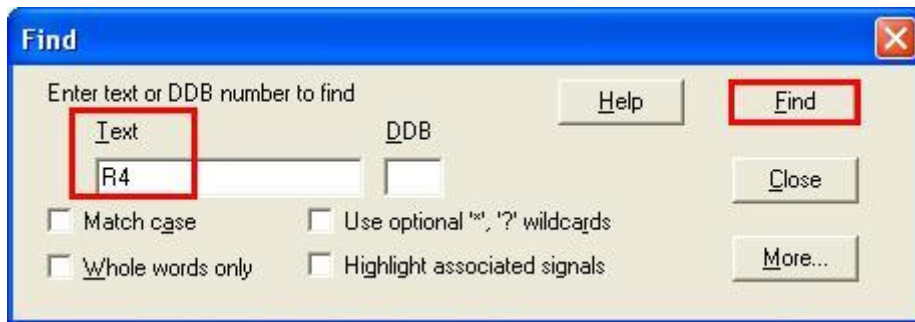


Figure 26

Click on the arrow icon and then on the block with the right button and choose “*Delete*”.

INSTRUMENTOS PARA TESTES ELÉTRICOS

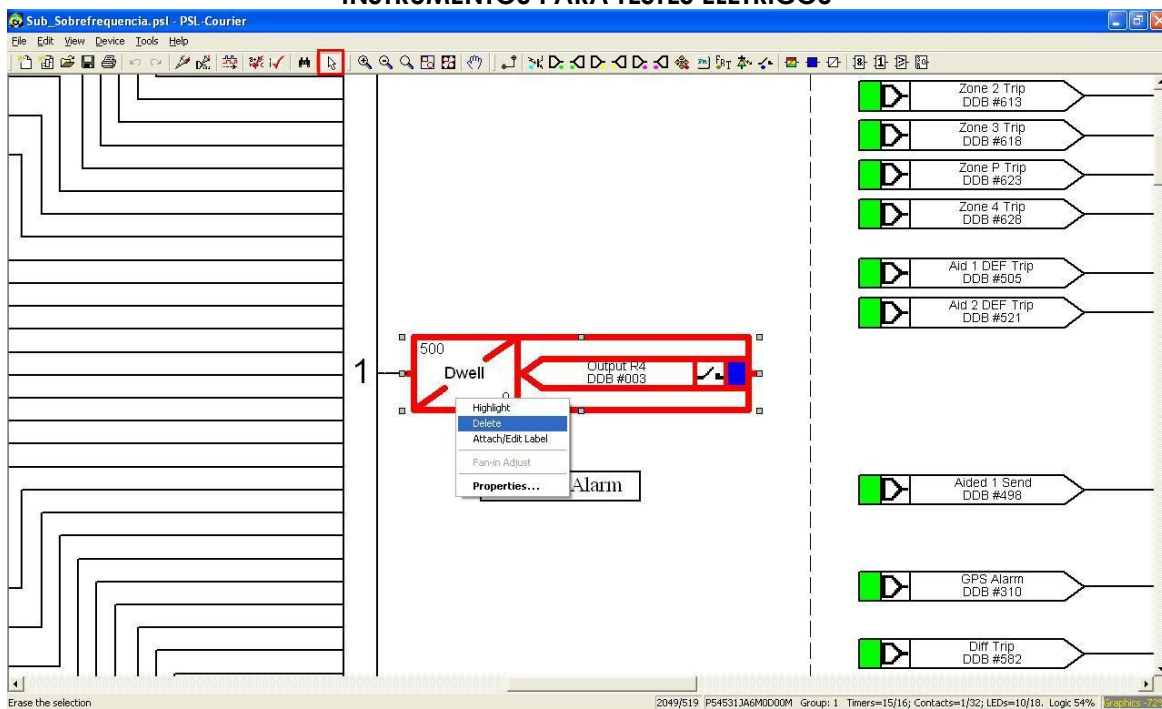


Figure 27

Return the first three outputs. Erase all other blocks connected with them.

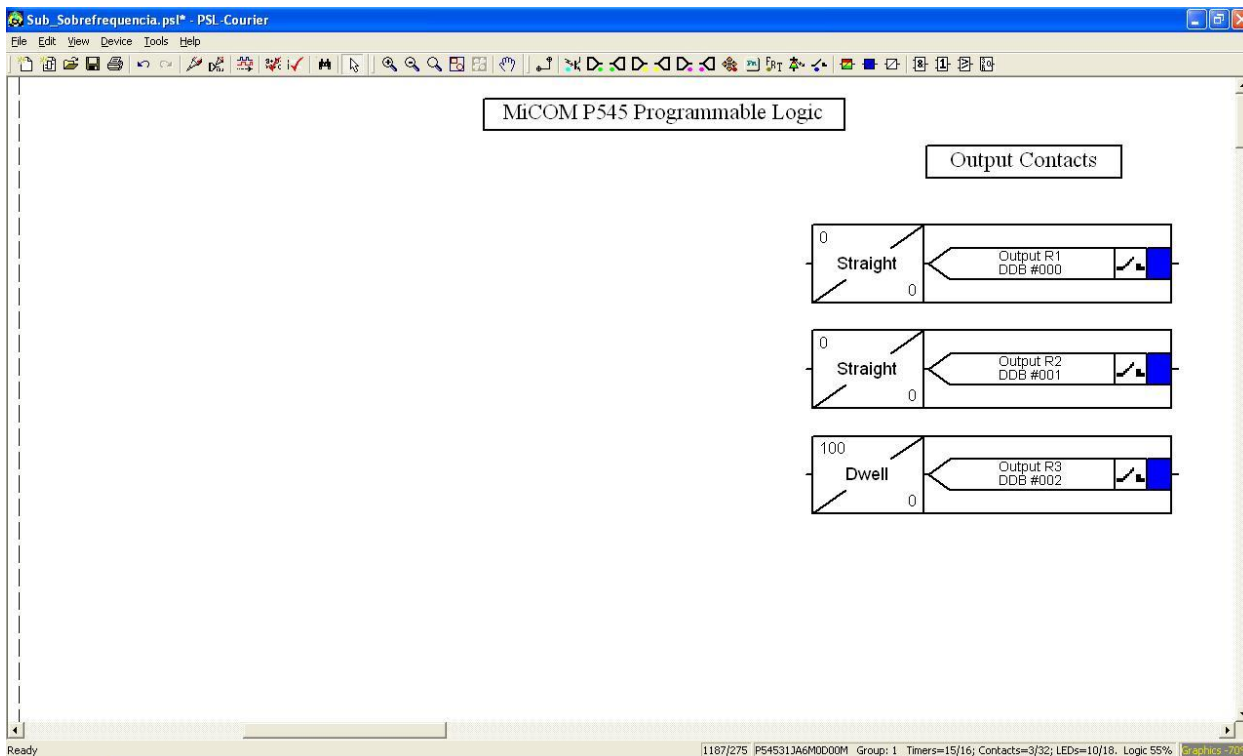


Figure 28

INSTRUMENTOS PARA TESTES ELÉTRICOS

Click on the R1 block and change the “Mode” to “pickup” and in the “Pickup Value(ms)” option, set the value to zero. Repeat the procedure for blocks R2 and R3.

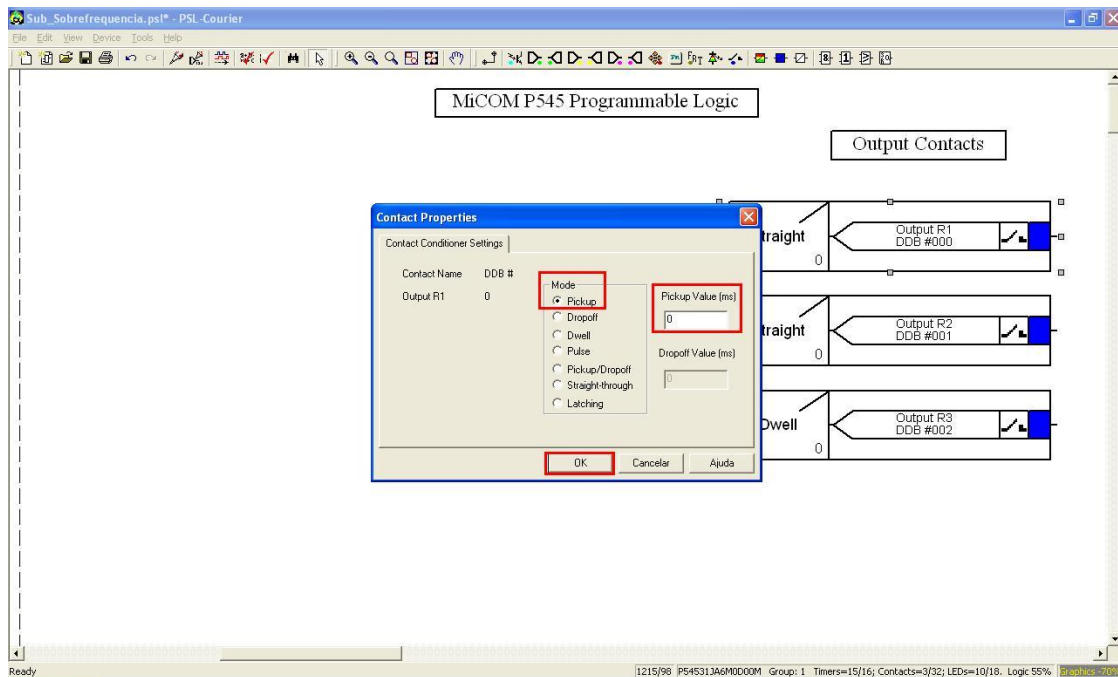


Figure 29

Click on the button highlighted in red and insert the R4 block with the same settings as the previous ones.

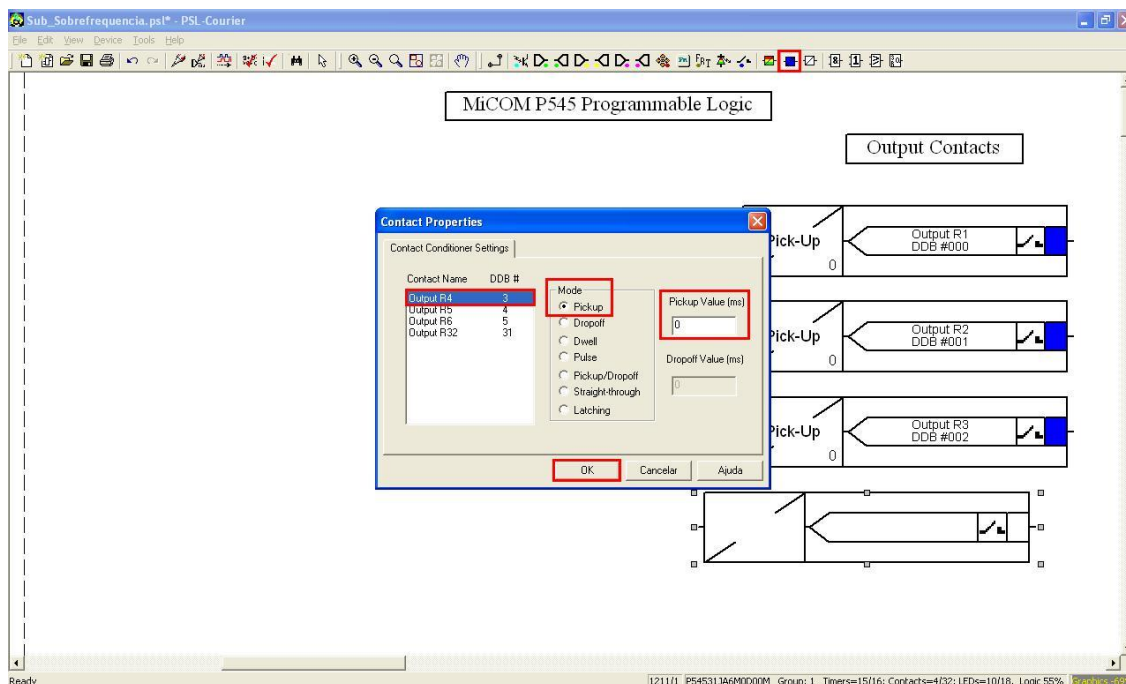


Figure 30

INSTRUMENTOS PARA TESTES ELÉTRICOS

The next step is to associate the signals to be monitored with the output blocks. Click the button highlighted in red and choose the following signal.

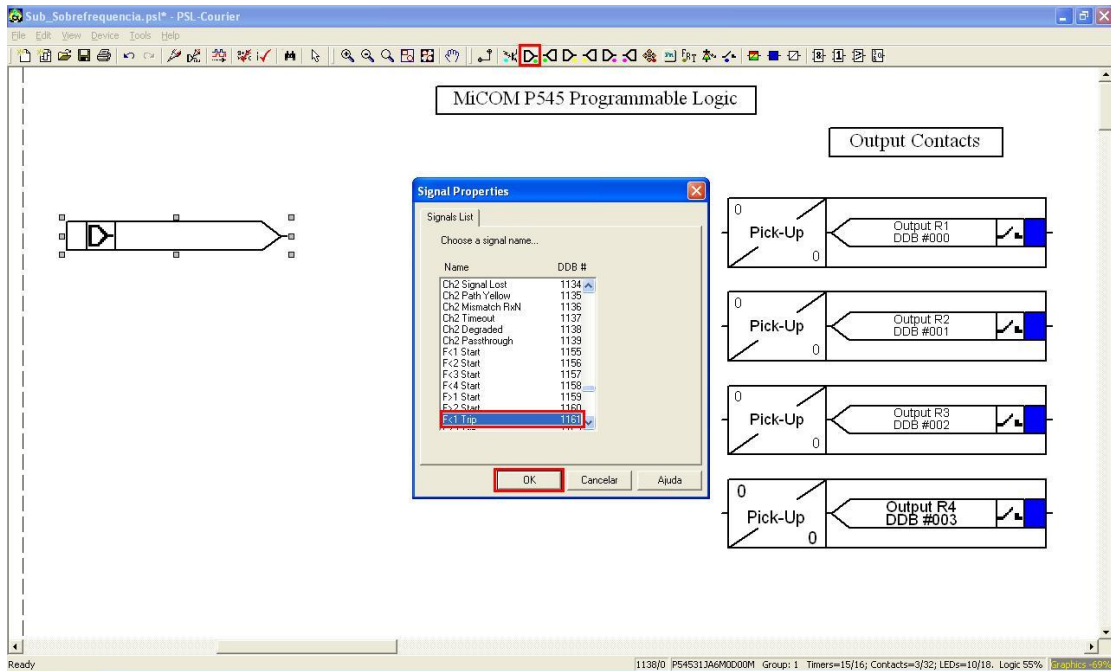


Figure 31

Repeat the previous procedure inserting three more blocks with the following signs “ $F < 2$ Trip”, “ $F > 1$ Trip” and “ $F > 2$ Trip”. Then click on the icon highlighted in red and connect the blocks.

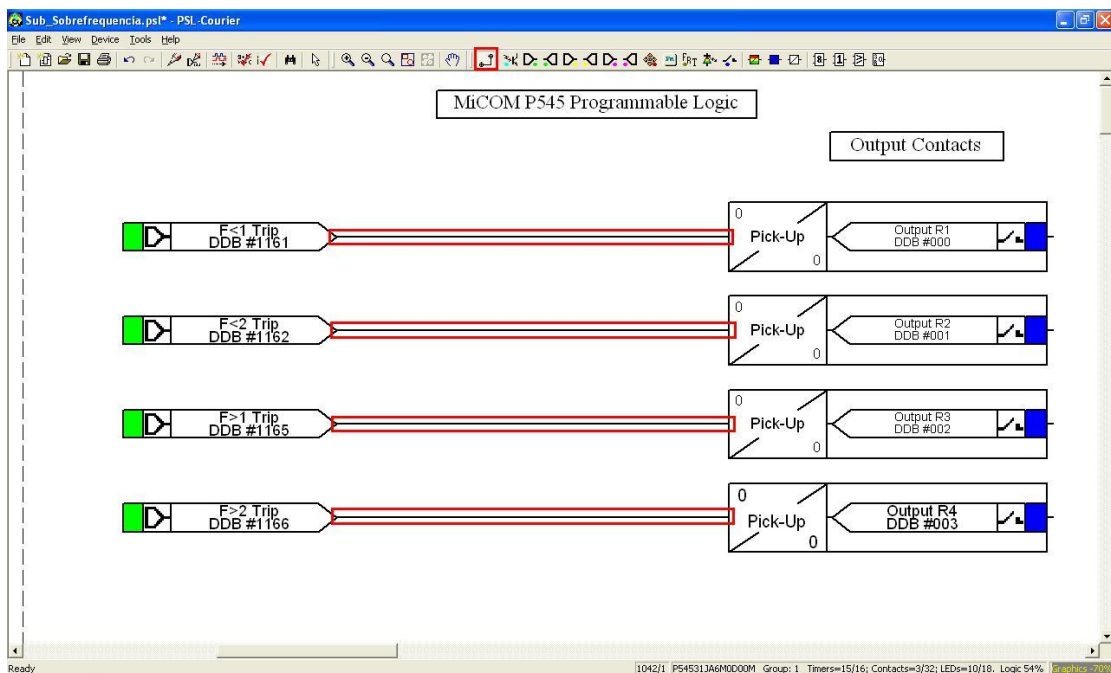


Figure 32

INSTRUMENTOS PARA TESTES ELÉTRICOS

Click on the highlighted icon to save the file, then close the logic block editor and return to the “MiCOM” software.

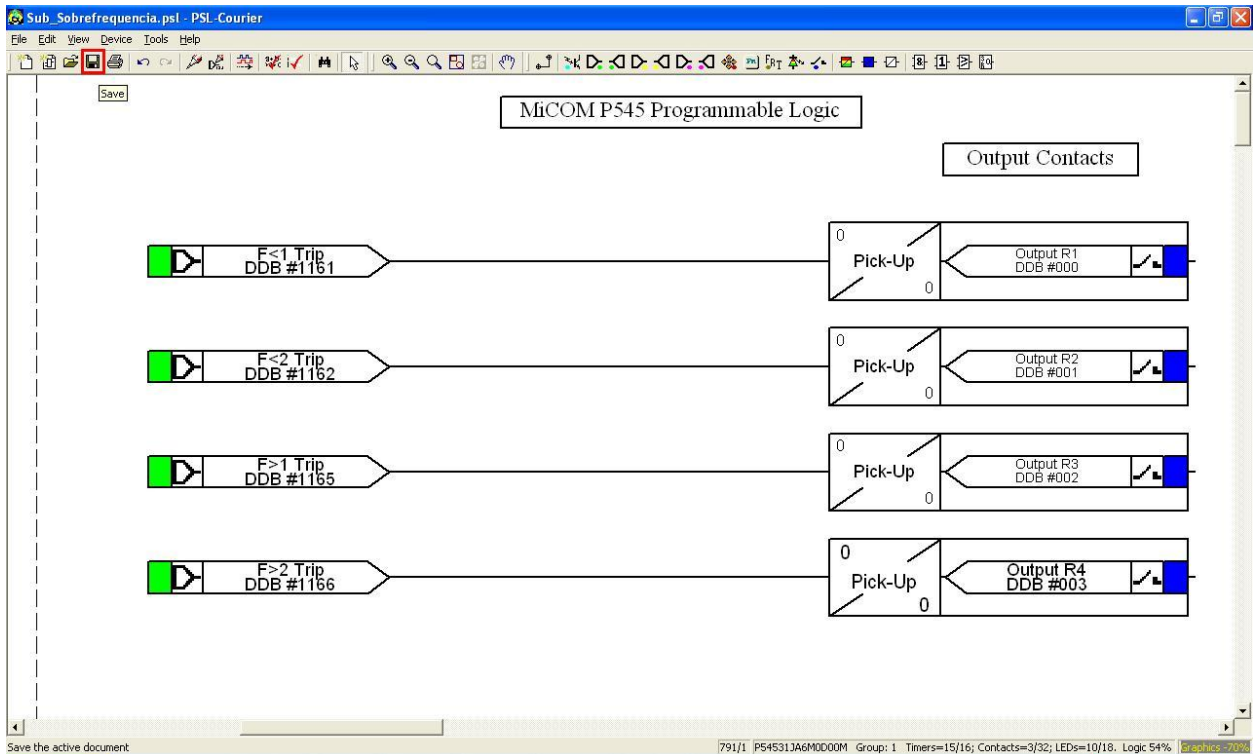


Figure 33

3.8 Sending Settings to the Relay

Click the “Device [P545]” icon then the icon highlighted in green.

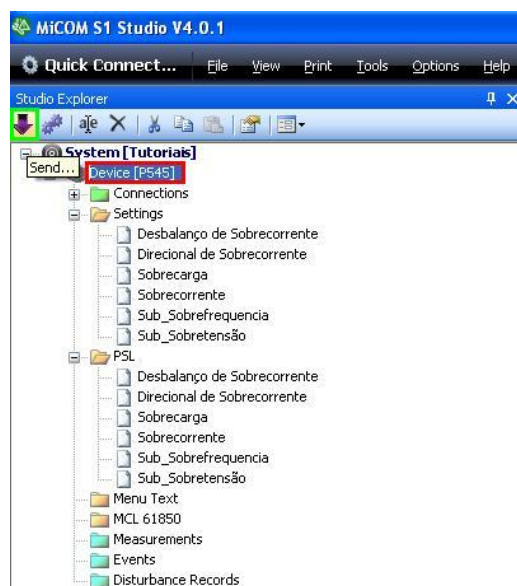


Figure 34

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Send both function settings and logic block.

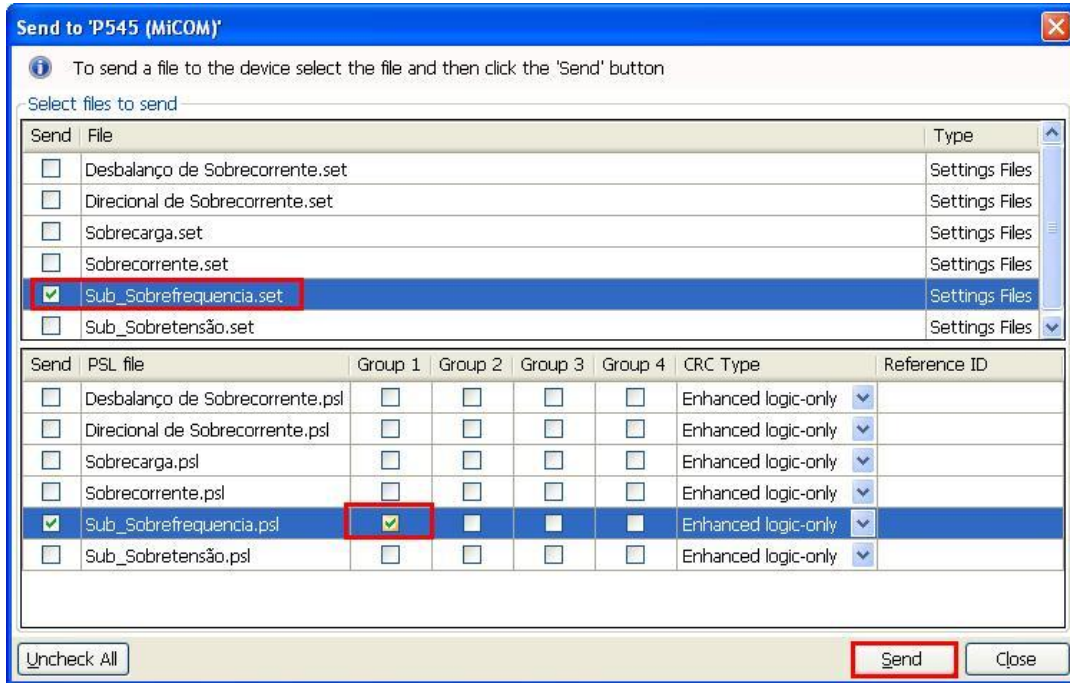


Figure 35

4. Ramp software adjustments

4.1 Opening the Ramp

Click on the “CTC” application manager icon.

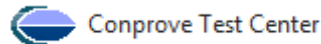


Figure 36

Click on the “Ramp” software icon.



Figure 37

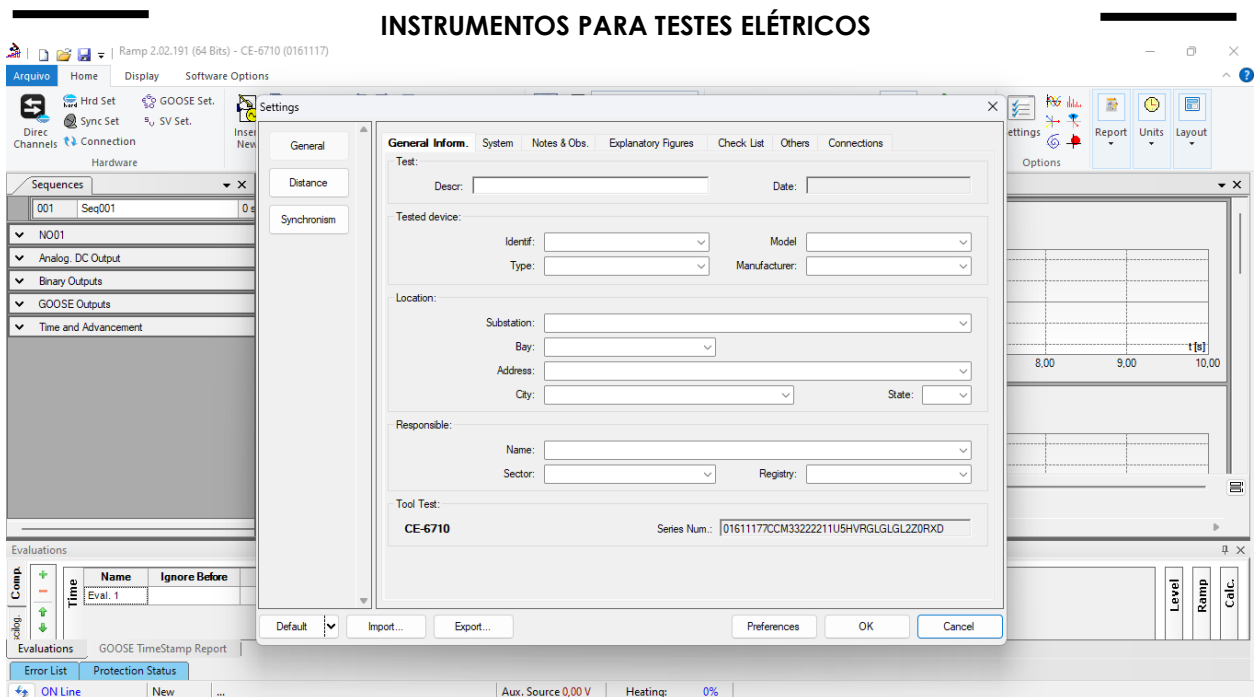


Figure 38

4.2 Configuring the Settings

When opening the software, the “*Settings*” screen will open automatically (as long as the “*Open Settings when Starting*” option found in the “*Software Options*” menu is selected). Otherwise click directly on the “*Settings*” icon.

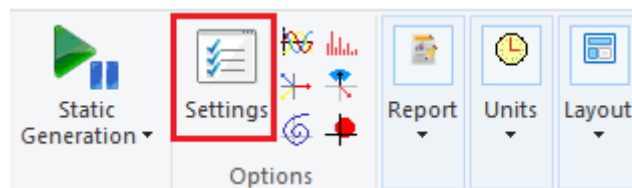


Figure 39

Inside the “*Settings*” screen, fill in the “*General Inform.*” with data on the “*Tested device*”, “*Location*” and the “*Responsible*”. This facilitates the elaboration of the report and this tab will be the first page to be shown in the report.

INSTRUMENTOS PARA TESTES ELÉTRICOS

Settings

General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections

Test:
 Descr: Under and Overfrequency Date:

Tested device:
 Identif: 23031982 Model: P545
 Type: Line Protection Manufacturer: Schneider

Location:
 Substation: Conprove
 Bay: 1
 Address: Visconde de Ouro Preto 75, Custódio Pereira
 City: Uberlândia State: MG

Responsible:
 Name: Michel Rockembach de Carvalho
 Sector: Engineering Registry: 00001

Tool Test:
CE-6710 Series Num.: 01611177CCM3322211U5HVRGLGLGL2Z0RXD

Default Import... Export... Preferences OK Cancel

Figure 40

4.3 System

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

INSTRUMENTOS PARA TESTES ELÉTRICOS

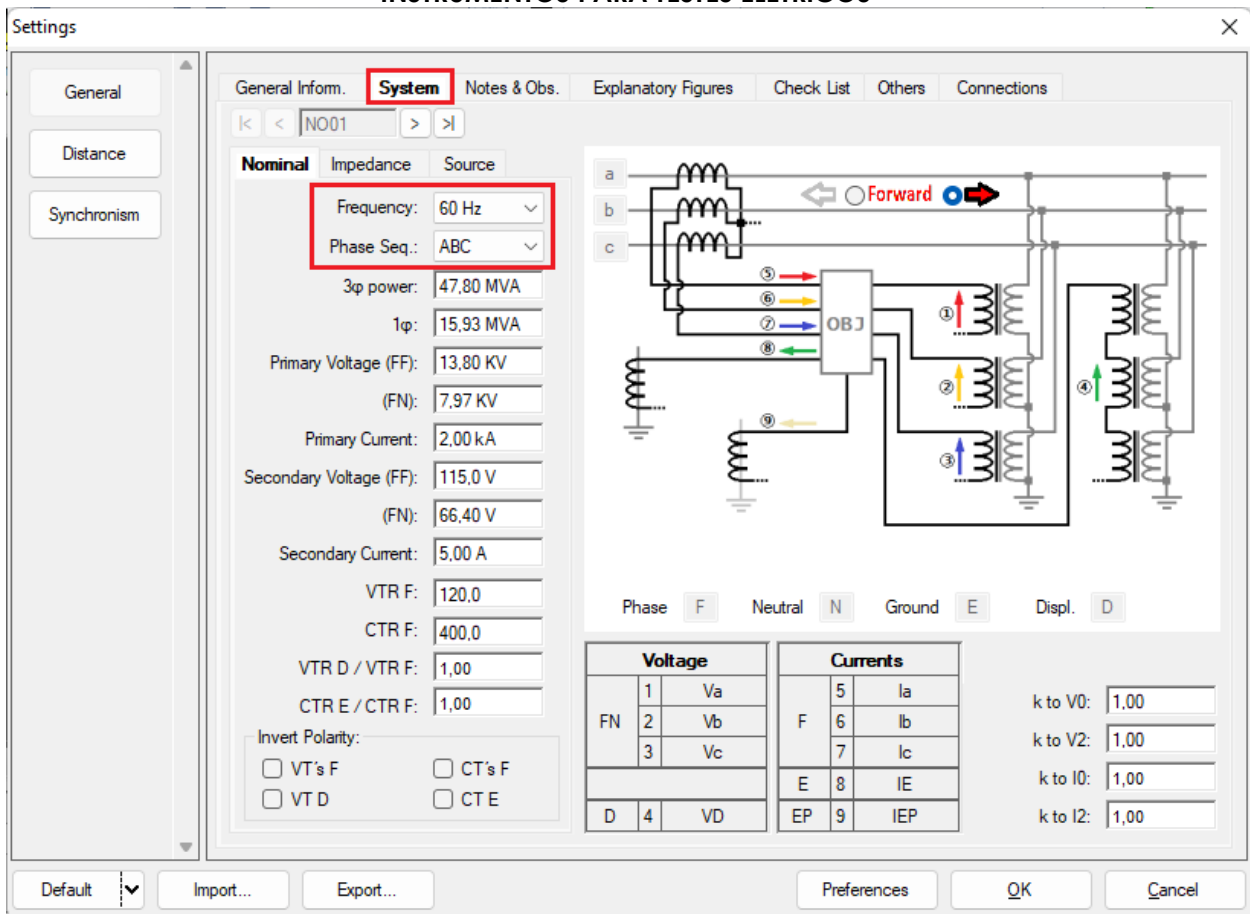


Figure 41

There are other tabs where the user can insert “Notes & Obs., Explanatory Figures”, can create a “Check List” of the procedures for carrying out tests and also create a schematic with all the connections between the test set and the test equipment.

5. Channel Direction and Hardware Configurations

Click on the icon illustrated below.

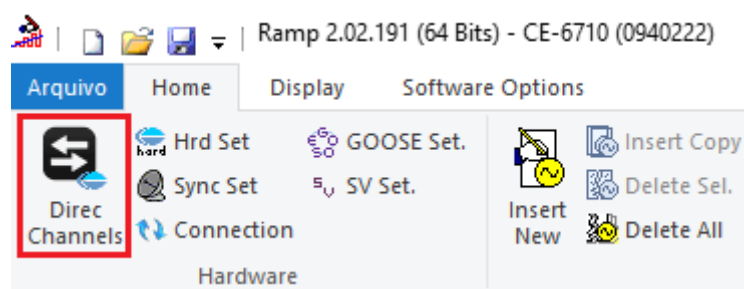


Figure 42

Then click on the highlighted icon to configure the hardware.

INSTRUMENTOS PARA TESTES ELÉTRICOS

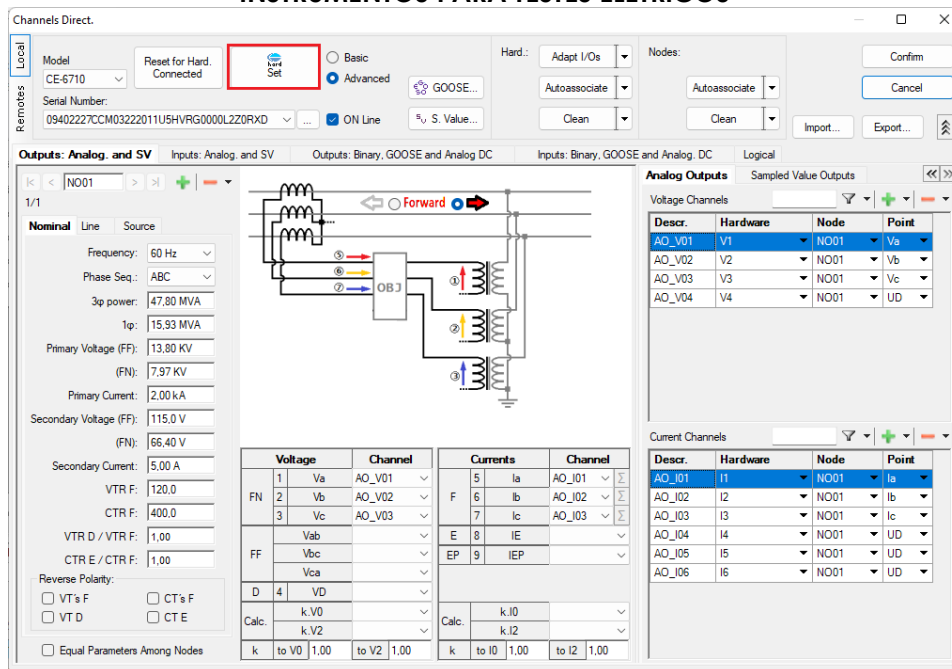


Figure 43

Choose channel configuration, adjust auxiliary source and stop method of binary inputs. Finally, click on “OK”.

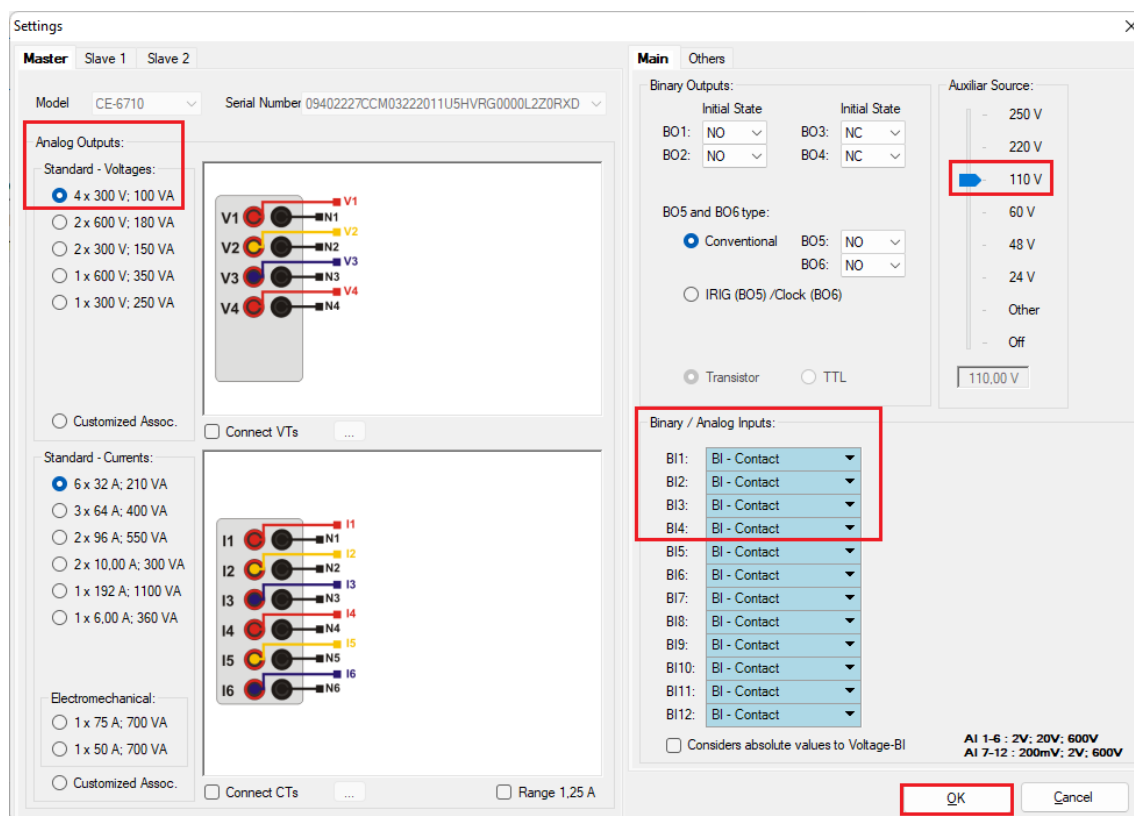


Figure 44

INSTRUMENTOS PARA TESTES ELÉTRICOS

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

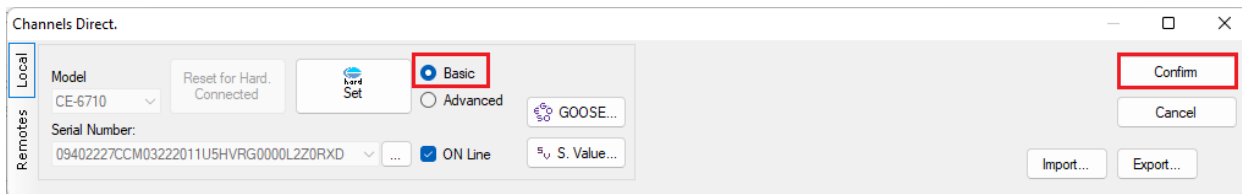


Figure 45

6. Restore Layout

Due to the great flexibility that the software presents, allowing the user to choose the windows that will be presented and their positions, the command is used to restore the default settings. Click on the “Layout” button and then on “Recreate Charts” repeat the process by clicking on “Layout” and on “Restore Layout”. During the test, windows that are not relevant are excluded.

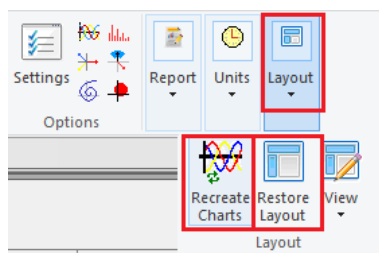


Figure 46

Following is the default structure after the previous commands.

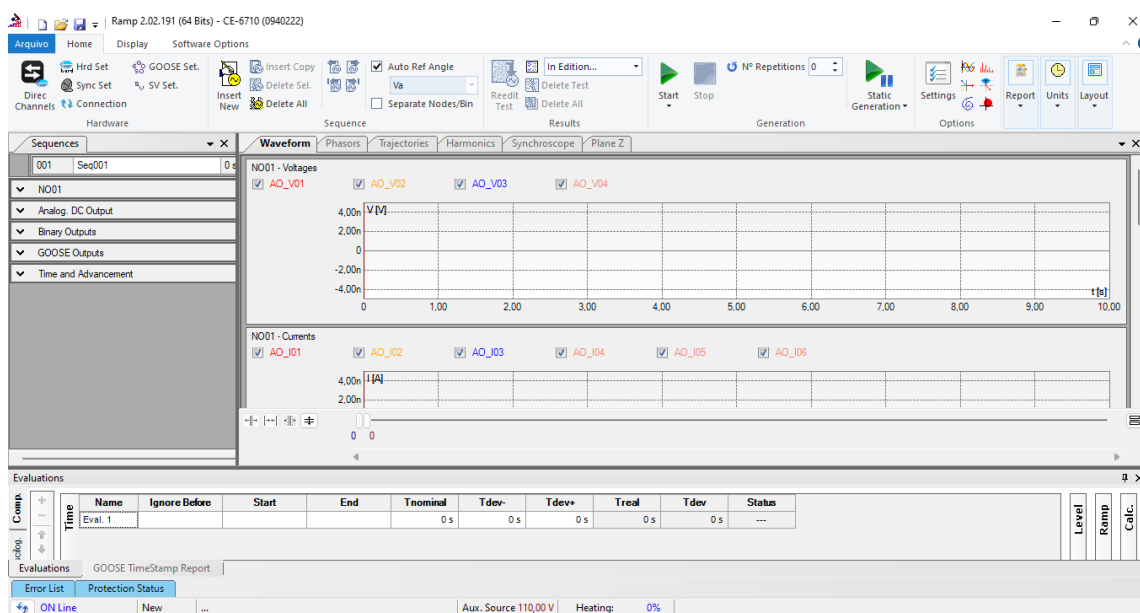


Figure 47

7. Test structure for function 81

Click the button highlighted in red until you create 4 test sequences.

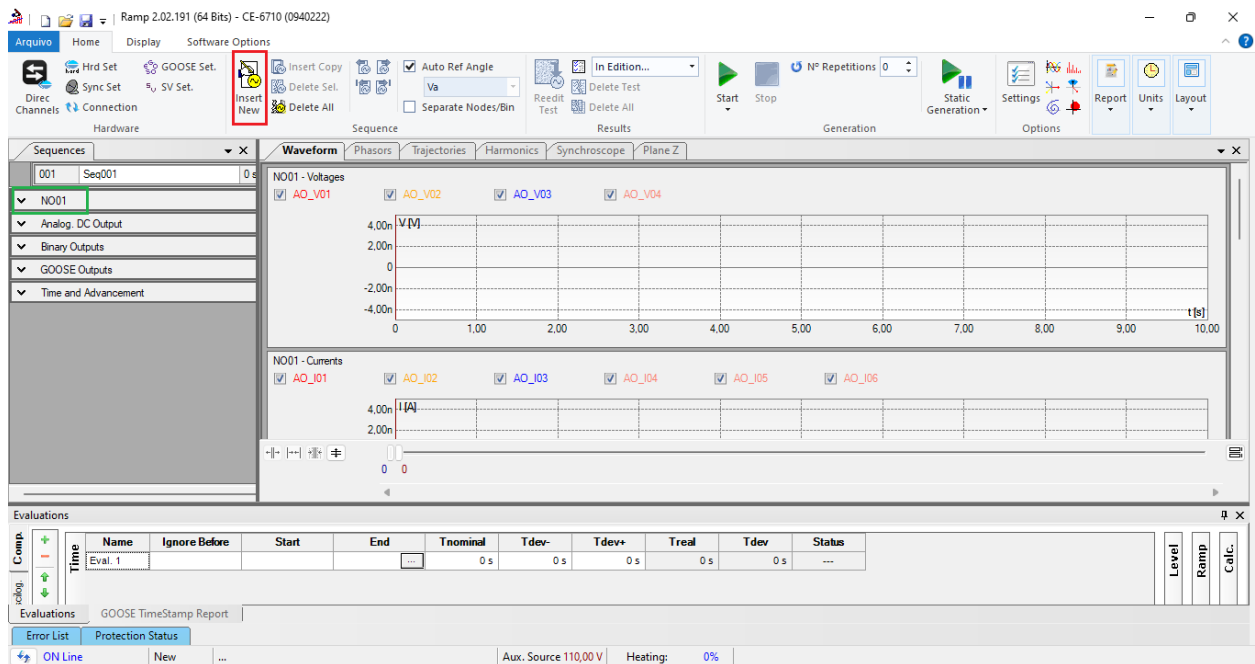


Figure 48

Click on the option “NO01” highlighted in green and decrease the size of the middle window for easier viewing.

7.1 Main Screen 81-1

In the first sequence, a situation is configured to verify the underfrequency of element 81 whose adjustment is at 59.5 Hertz and 2.0 seconds. In place of “Seq 001” write “81-1”. Then click on the highlighted blue button in the figure below.



Figure 49

7.2 Screen for incrementing 81-1

On this screen, in the “Ramp Type” field, choose the “Frequency” option and then select the “Pulsed” option. For the voltage value, either initial or reset use the nominal voltage of 66.4V balanced three-phase ABC. For the initial frequency use 59.52Hz and for the final frequency 59.48Hz with a step of -5.0mHz. In the field “Generation Time in Each Incr.” the user must configure a time that is always longer than the actuation time. In this case, a time of 2.25 seconds was chosen. “Reset Time” has been set to 0.25 seconds.

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Ramp

Ramp Type: Direct Pulsed

Frequency: [Dropdown]

Generation Time in Each Incr.: 2,25 s
Reset Time: 250,0 ms

Initial Values

Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	59,52 Hz
Vb	AO_V02	66,40 V	-120,0 °	59,52 Hz
Vc	AO_V03	66,40 V	120,0 °	59,52 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Limits and Increases

	Limit	Incr.	d/dt	N Steps	Time
<input checked="" type="checkbox"/> Va	59,48 Hz	-5,00 mHz	-2,22 mHz/s	19,00	22,75 s
<input checked="" type="checkbox"/> Vb	59,48 Hz	-5,00 mHz	-2,22 mHz/s	19,00	22,75 s
<input checked="" type="checkbox"/> Vc	59,48 Hz	-5,00 mHz	-2,22 mHz/s	19,00	22,75 s
<input type="checkbox"/> Ia					
<input type="checkbox"/> Ib					
<input type="checkbox"/> Ic					
<input type="checkbox"/> UD01					
<input type="checkbox"/> UD02					
<input type="checkbox"/> UD03					
<input type="checkbox"/> UD04					

Reset

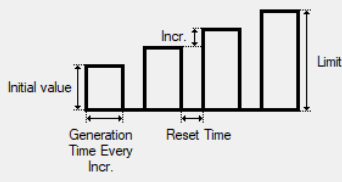
Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	60,00 Hz
Vb	AO_V02	66,40 V	-120,0 °	60,00 Hz
Vc	AO_V03	66,40 V	120,0 °	60,00 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Binary Outputs

Channel	Incr.	Reset
<input type="checkbox"/> BO01		
<input type="checkbox"/> BO02		
<input type="checkbox"/> BO03		
<input type="checkbox"/> BO04		
<input type="checkbox"/> BO05		
<input type="checkbox"/> BO06		
<input type="checkbox"/> BO07		
<input type="checkbox"/> BO08		

GOOSE Outputs

Channel	Incr.	Reset



OK Cancel

Figure 50

7.3 Main screen 81-2

In the second sequence, configure a situation to verify the underfrequency of the 81-2 element whose adjustment is at 59.0 Hertz and 1.0 second. In place of “Seq 002” write “81-2” then click on the highlighted button in the figure below:

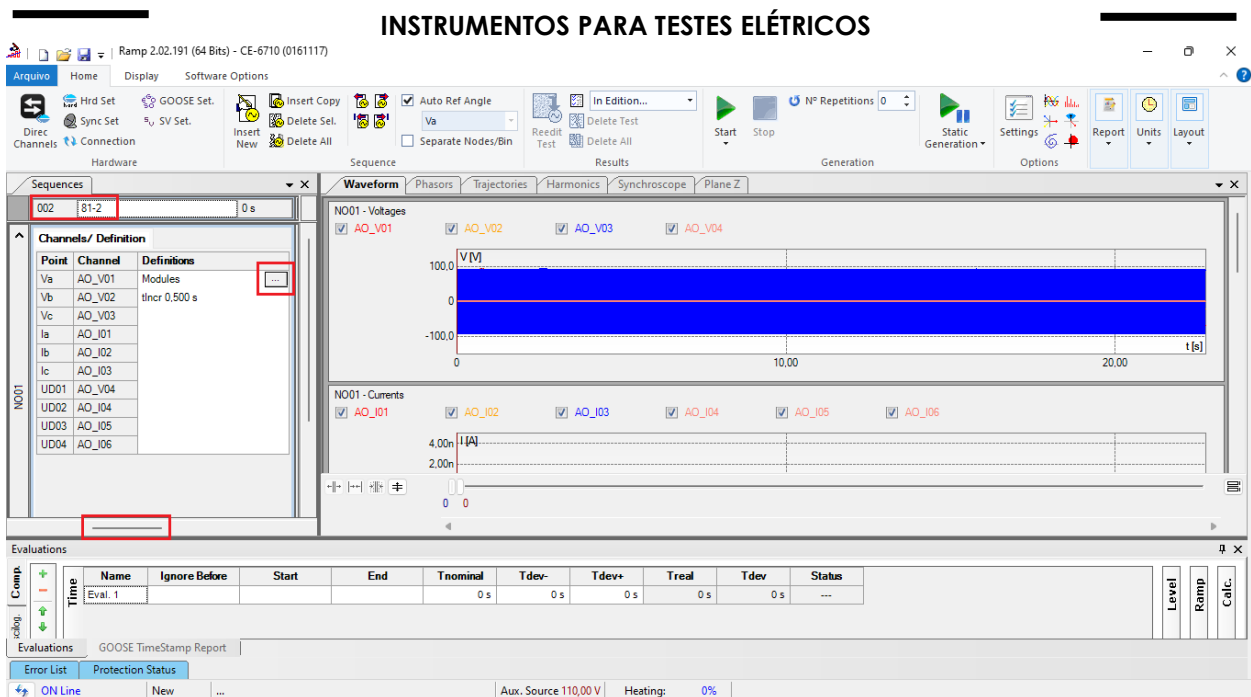


Figure 51

7.4 Screen for increment 81-2

On this screen, in the “Ramp Type” field, choose the “Frequency” option then select the “Pulsed” option. For the voltage value either initial or reset, use the rated voltage of 66.4V balanced three-phase ABC. For the initial frequency use 59.02Hz and for the final frequency 58.98Hz with a step of -5.0mHz. In the field “Generation Time in Each Incr.” the user must configure a time that is always longer than the actuation time. In this case, a time of 1.25 seconds was chosen “Reset Time” has been set to 0.25 seconds.

INSTRUMENTOS PARA TESTES ELÉTRICOS

Ramp

Ramp Type: Direct Pulsed
 Frequency:

Generation Time in Each Incr.: 1,25 s
 Reset Time: 250,0 ms

Initial Values

Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	59,02 Hz
Vb	AO_V02	66,40 V	-120,0 °	59,02 Hz
Vc	AO_V03	66,40 V	120,0 °	59,02 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Limits and Increases

	Limit	Incr.	d/dt	N Steps	Time
<input checked="" type="checkbox"/> Va	58,98 Hz	-5,00 mHz	-4,00 mHz/	19,00	13,75 s
<input checked="" type="checkbox"/> Vb	58,98 Hz	-5,00 mHz	-4,00 mHz/	19,00	13,75 s
<input checked="" type="checkbox"/> Vc	58,98 Hz	-5,00 mHz	-4,00 mHz/	19,00	13,75 s
<input type="checkbox"/> Ia					
<input type="checkbox"/> Ib					
<input type="checkbox"/> Ic					
<input type="checkbox"/> UD01					
<input type="checkbox"/> UD02					
<input type="checkbox"/> UD03					
<input type="checkbox"/> UD04					

Reset

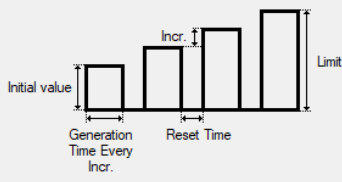
Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	60,00 Hz
Vb	AO_V02	66,40 V	-120,0 °	60,00 Hz
Vc	AO_V03	66,40 V	120,0 °	60,00 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Binary Outputs

Channel	Incr.	Reset
<input type="checkbox"/> BO01		
<input type="checkbox"/> BO02		
<input type="checkbox"/> BO03		
<input type="checkbox"/> BO04		
<input type="checkbox"/> BO05		
<input type="checkbox"/> BO06		
<input type="checkbox"/> BO07		
<input type="checkbox"/> BO08		

GOOSE Outputs

Channel	Incr.	Reset



OK Cancel

Figure 52

7.5 Main Screen 81-3

In the third sequence, configure a situation to check the overfrequency of element 81-3 whose adjustment is at 60.5Hz and 2 seconds. In place of “Seq 003” write “81-3”. Then click on the highlighted button in the figure below:

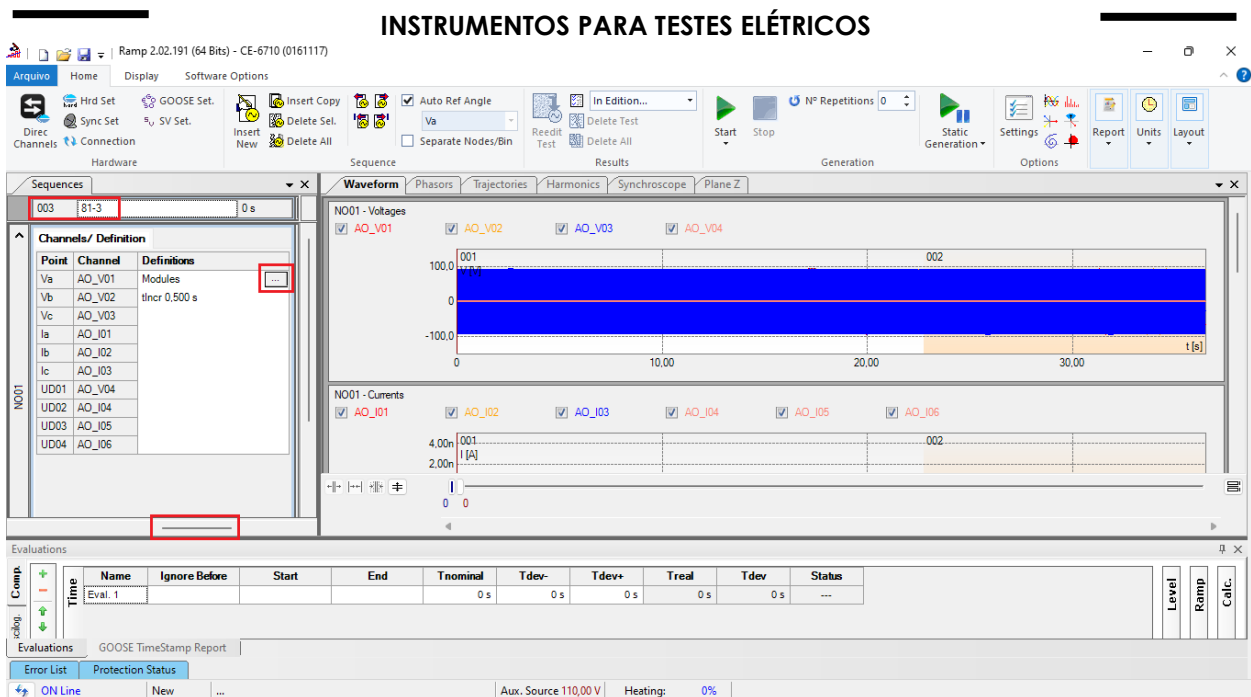


Figure 53

7.6 Screen for incrementing 81-3

On this screen, in the “*Ramp Type*” field, choose the “*Frequency*” option and then select the “*Pulsed*” option. For the voltage value either initial or reset, use the rated voltage of 66.4V balanced three-phase ABC. For the initial frequency use 60.48 Hz and for the final frequency 60.52Hz with a step of 5.0mHz. In the field “*Generation Time in Each Incr.*” the user must configure a time that is always longer than the actuation time. In this case, a time of 2.25 seconds was chosen. “*Reset Time*” has been set to 0.25 seconds.

INSTRUMENTOS PARA TESTES ELÉTRICOS

Ramp

Ramp Type: Direct Pulsed

Frequency:

Generation Time in Each Incr.: Reset Time:

Initial Values

Channels/ Definition					
Point	Channel	Mod.	Ang.	Freq.	
Va	AO_V01	66,40 V	0 °	60,48 Hz	
Vb	AO_V02	66,40 V	-120,0 °	60,48 Hz	
Vc	AO_V03	66,40 V	120,0 °	60,48 Hz	
Ia	AO_I01	0 A	0 °	60,00 Hz	
Ib	AO_I02	0 A	0 °	60,00 Hz	
Ic	AO_I03	0 A	0 °	60,00 Hz	
UD01	AO_V04	0 V	0 °	60,00 Hz	
UD02	AO_I04	0 A	0 °	60,00 Hz	
UD03	AO_I05	0 A	0 °	60,00 Hz	
UD04	AO_I06	0 A	0 °	60,00 Hz	

Limits and Increases

	Limit	Incr.	d/dt	N Steps	Time
<input checked="" type="checkbox"/> Va	60,52 Hz	5,00 mHz	2,22 mHz/s	19,00	22,75 s
<input checked="" type="checkbox"/> Vb	60,52 Hz	5,00 mHz	2,22 mHz/s	19,00	22,75 s
<input checked="" type="checkbox"/> Vc	60,52 Hz	5,00 mHz	2,22 mHz/s	19,00	22,75 s
<input type="checkbox"/> Ia					
<input type="checkbox"/> Ib					
<input type="checkbox"/> Ic					
<input type="checkbox"/> UD01					
<input type="checkbox"/> UD02					
<input type="checkbox"/> UD03					
<input type="checkbox"/> UD04					

Reset

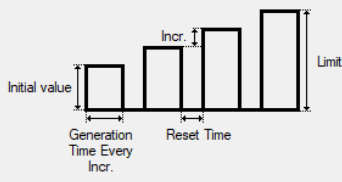
Channels/ Definition					
Point	Channel	Mod.	Ang.	Freq.	
Va	AO_V01	66,40 V	0 °	60,00 Hz	
Vb	AO_V02	66,40 V	-120,0 °	60,00 Hz	
Vc	AO_V03	66,40 V	120,0 °	60,00 Hz	
Ia	AO_I01	0 A	0 °	60,00 Hz	
Ib	AO_I02	0 A	0 °	60,00 Hz	
Ic	AO_I03	0 A	0 °	60,00 Hz	
UD01	AO_V04	0 V	0 °	60,00 Hz	
UD02	AO_I04	0 A	0 °	60,00 Hz	
UD03	AO_I05	0 A	0 °	60,00 Hz	
UD04	AO_I06	0 A	0 °	60,00 Hz	

Binary Outputs

Channel	Incr.	Reset
<input type="checkbox"/> BO01		
<input type="checkbox"/> BO02		
<input type="checkbox"/> BO03		
<input type="checkbox"/> BO04		
<input type="checkbox"/> BO05		
<input type="checkbox"/> BO06		
<input type="checkbox"/> BO07		
<input type="checkbox"/> BO08		

GOOSE Outputs

Channel	Incr.	Reset



OK Cancel

Figure 54

7.7 Main screen 81-4

In the fourth sequence, configure a situation to check the overfrequency of element 81-4 whose adjustment is at 61.0Hz and 1.0 second. In place of “Seq 004” write “81-4” then click on the highlighted button in the figure below:

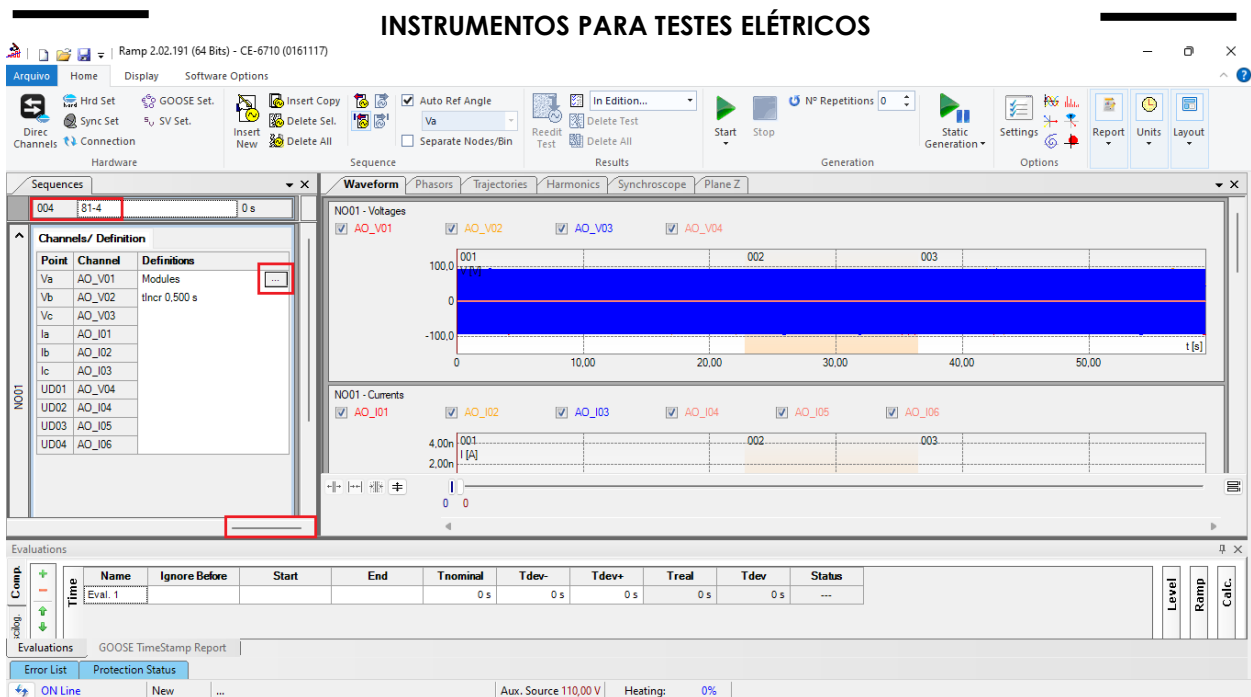


Figure 55

7.8 Screen for incrementing 81-4

On this screen, in the “Ramp Type” field, choose the “Frequency” option then select the “Pulsed” option. For the voltage value, either initial or reset use the nominal voltage of 66.4V balanced three-phase ABC. For the initial frequency use 60.98 Hz and for the final frequency 61.02 Hz with a step of 5,0mHz. In the field “Generation Time in Each Incr.” the user must configure a time that is always longer than the actuation time. In this case, a time of 1.25 seconds was chosen. “Reset Time” has been set to 0.25 seconds.

INSTRUMENTOS PARA TESTES ELÉTRICOS

Ramp

Ramp Type: Direct Pulsed

Frequency: [Dropdown]

Generation Time in Each Incr.: 1,25 s
Reset Time: 250,0 ms

Initial Values

Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	60,98 Hz
Vb	AO_V02	66,40 V	-120,0 °	60,98 Hz
Vc	AO_V03	66,40 V	120,0 °	60,98 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Limits and Increases

	Limit	Incr.	d/dt	N Steps	Time
<input checked="" type="checkbox"/> Va	61,02 Hz	5,00 mHz	4,00 mHz/s	19,00	13,75 s
<input checked="" type="checkbox"/> Vb	61,02 Hz	5,00 mHz	4,00 mHz/s	19,00	13,75 s
<input checked="" type="checkbox"/> Vc	61,02 Hz	5,00 mHz	4,00 mHz/s	19,00	13,75 s
<input type="checkbox"/> Ia					
<input type="checkbox"/> Ib					
<input type="checkbox"/> Ic					
<input type="checkbox"/> UD01					
<input type="checkbox"/> UD02					
<input type="checkbox"/> UD03					
<input type="checkbox"/> UD04					

Reset

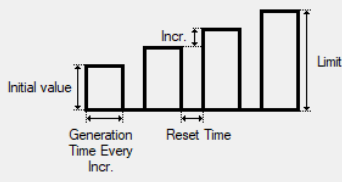
Point	Channel	Mod.	Ang.	Freq.
Va	AO_V01	66,40 V	0 °	60,00 Hz
Vb	AO_V02	66,40 V	-120,0 °	60,00 Hz
Vc	AO_V03	66,40 V	120,0 °	60,00 Hz
Ia	AO_I01	0 A	0 °	60,00 Hz
Ib	AO_I02	0 A	0 °	60,00 Hz
Ic	AO_I03	0 A	0 °	60,00 Hz
UD01	AO_V04	0 V	0 °	60,00 Hz
UD02	AO_I04	0 A	0 °	60,00 Hz
UD03	AO_I05	0 A	0 °	60,00 Hz
UD04	AO_I06	0 A	0 °	60,00 Hz

Binary Outputs

Channel	Incr.	Reset
<input type="checkbox"/> BO01		
<input type="checkbox"/> BO02		
<input type="checkbox"/> BO03		
<input type="checkbox"/> BO04		
<input type="checkbox"/> BO05		
<input type="checkbox"/> BO06		
<input type="checkbox"/> BO07		
<input type="checkbox"/> BO08		

GOOSE Outputs

Channel	Incr.	Reset



OK Cancel

Figure 56

7.9 Evaluation of pick-ups

Clicking on the “Ramp” field, as shown in the next figure, you can configure 4 pick-up evaluations as follows.

INSTRUMENTOS PARA TESTES ELÉTRICOS

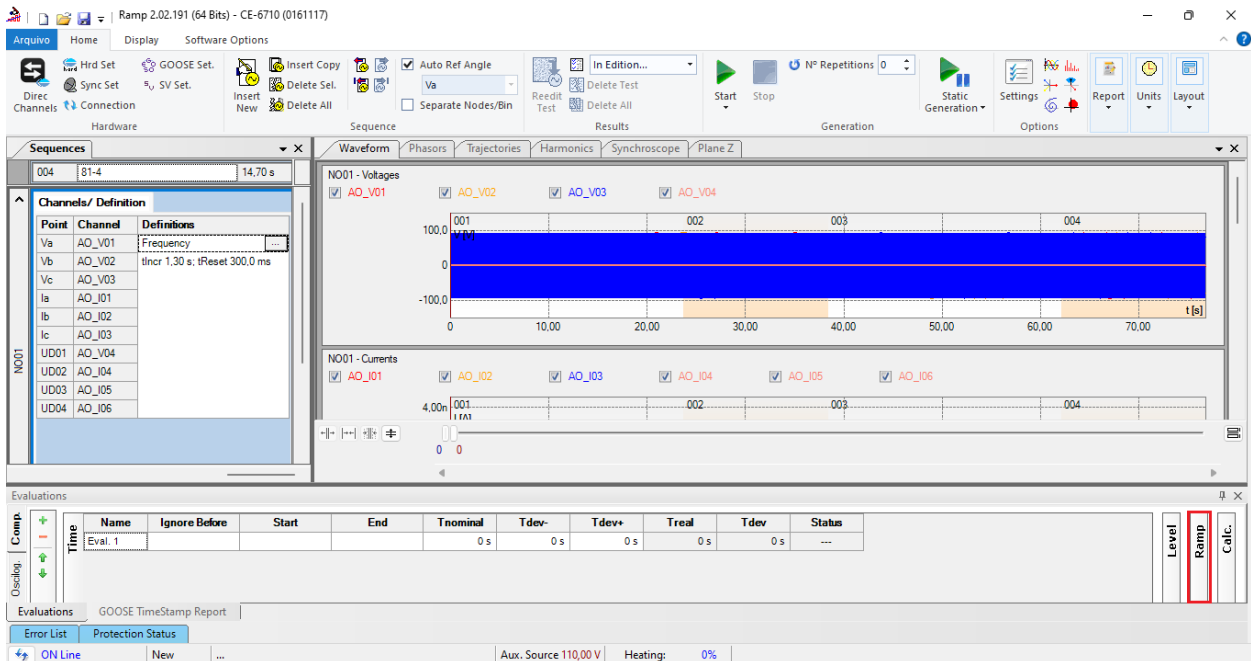


Figure 57

Instead of “Eval.1” write “81-1_pkp”, in Ramp select “81-1 > NO01” for “Condition” set “BI01 (↑)”, for “Type” choose “Frequency”, for “Output” set “Va”, in the field “Nom Value” set 59.50Hz and in the fields related to deviations set 10mHz.

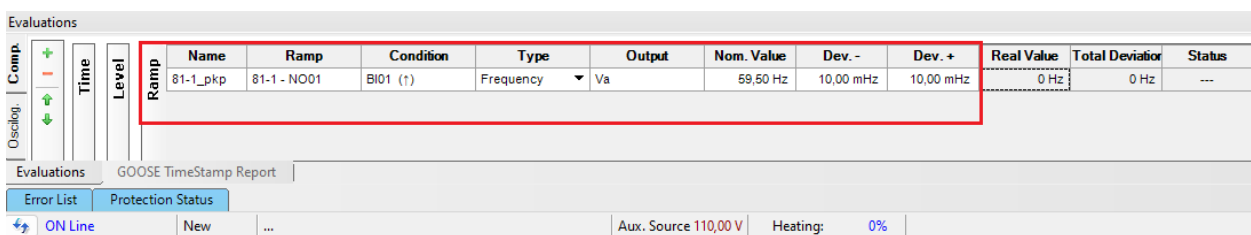


Figure 58

Clicking on the “+” icon of the previous figure inserts 3 more evaluations. The configuration must be done in a similar way to the first evaluation with changes in the binaries inputs and values of the pick-ups.

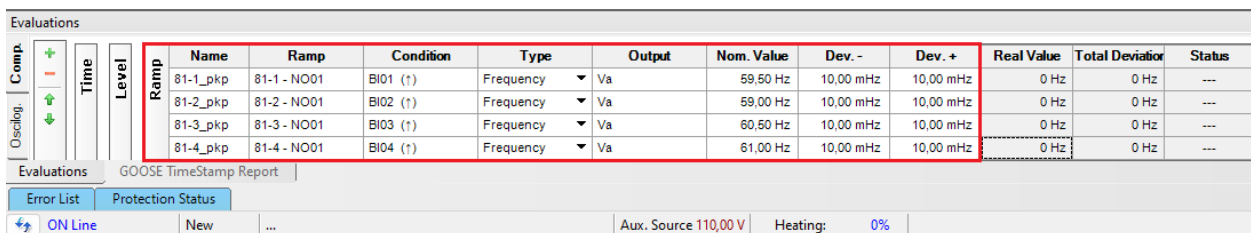


Figure 59

INSTRUMENTOS PARA TESTES ELÉTRICOS

7.10 *Adjusting graphics*

Double click on the “Waveform” option of the middle window and maximize the screen to choose the relevant signals and insert time analysis markings.

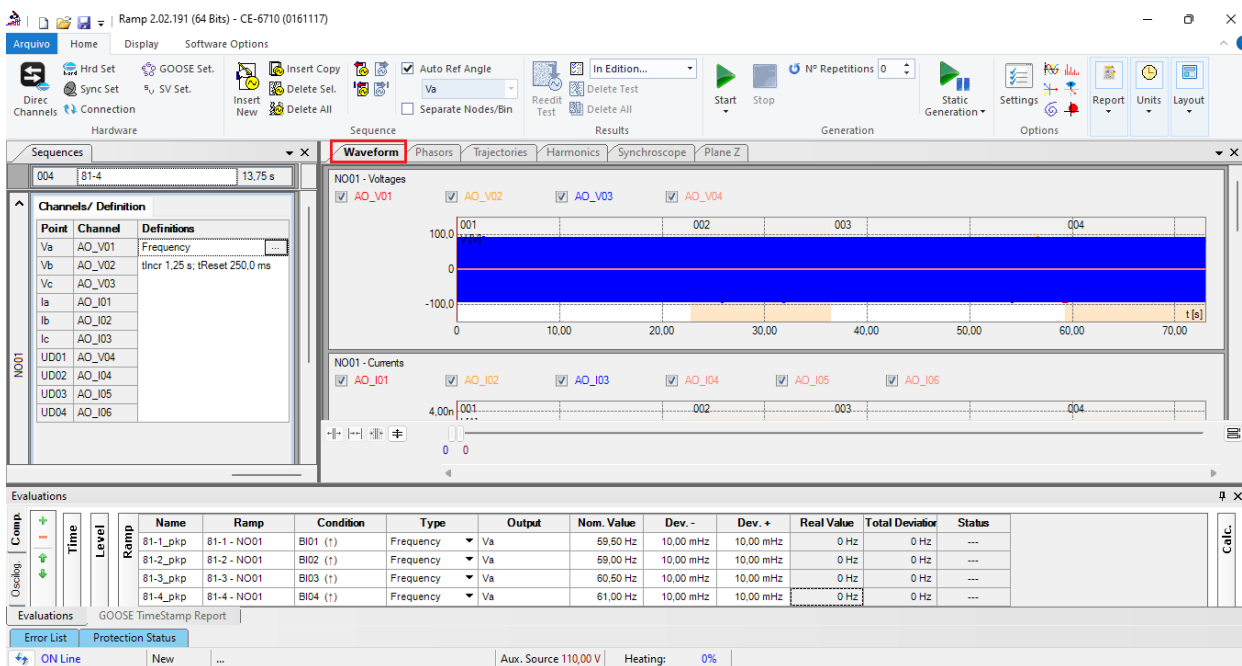


Figure 60

Right click on the voltage graph and choose the highlighted option.

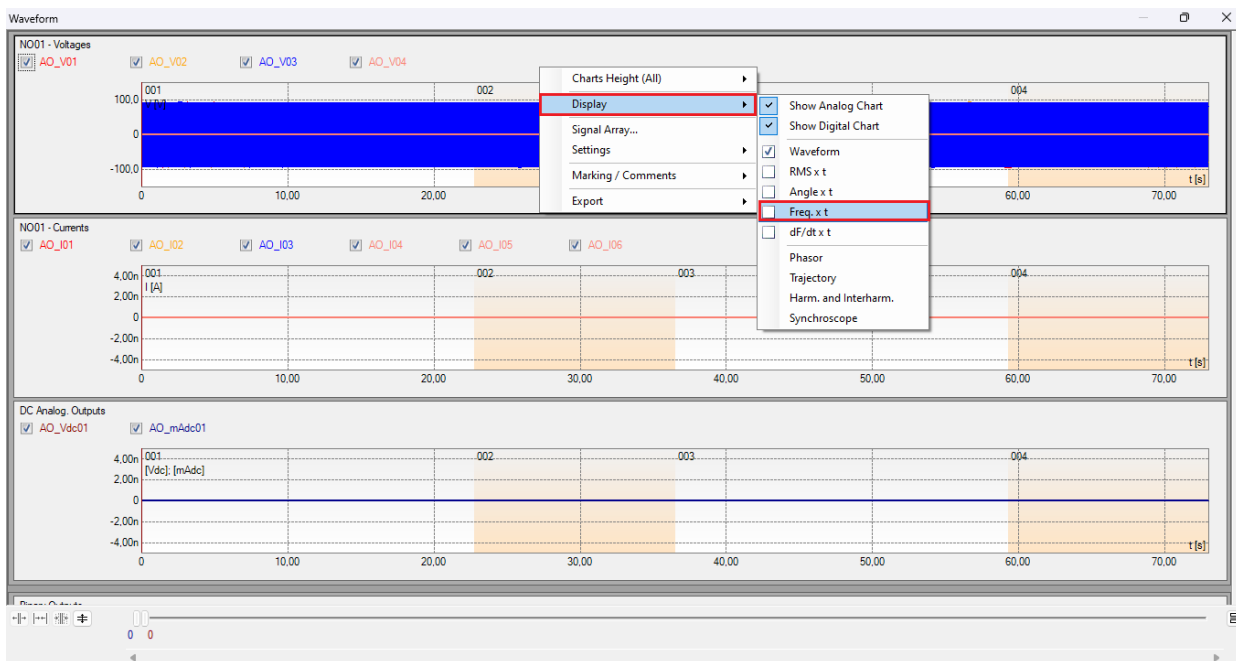


Figure 61

INSTRUMENTOS PARA TESTES ELÉTRICOS

Select the current graph and click on the “Delete” key repeat the procedure for the DC analog outputs and binary output graph. Uncheck the option “V04”.

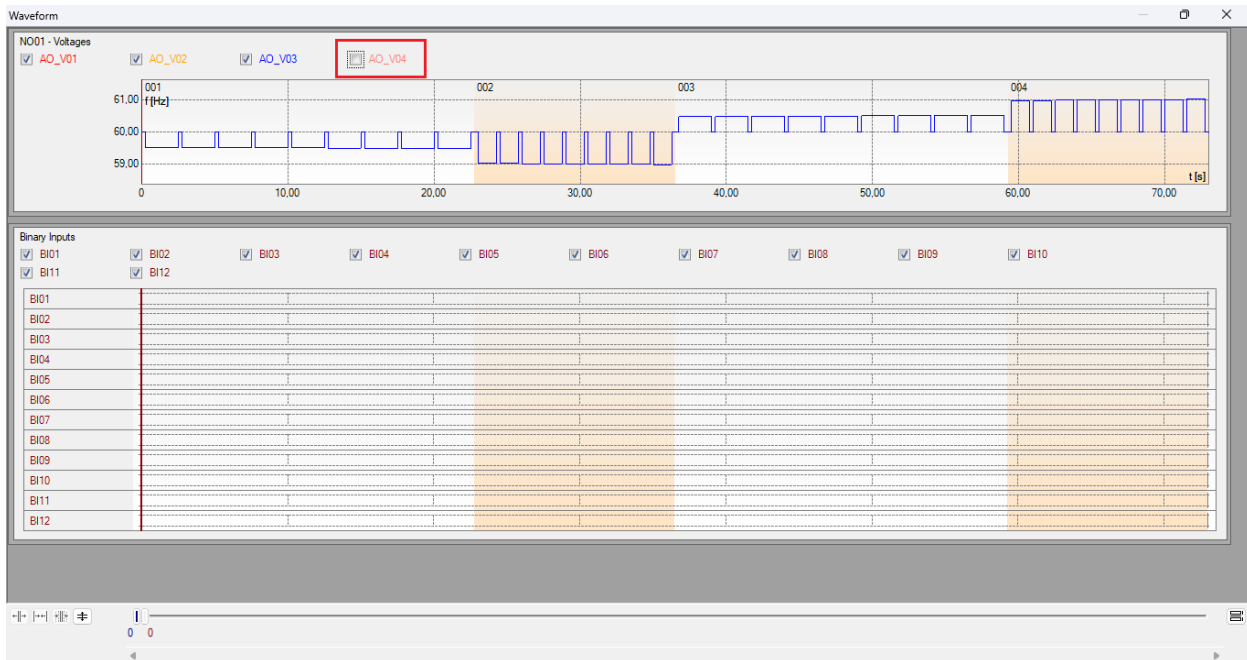


Figure 62

Right click and increase the height of the graphics. The next step is to select only the binaries “BI01”, “BI02”, “BI03” and “BI04”.

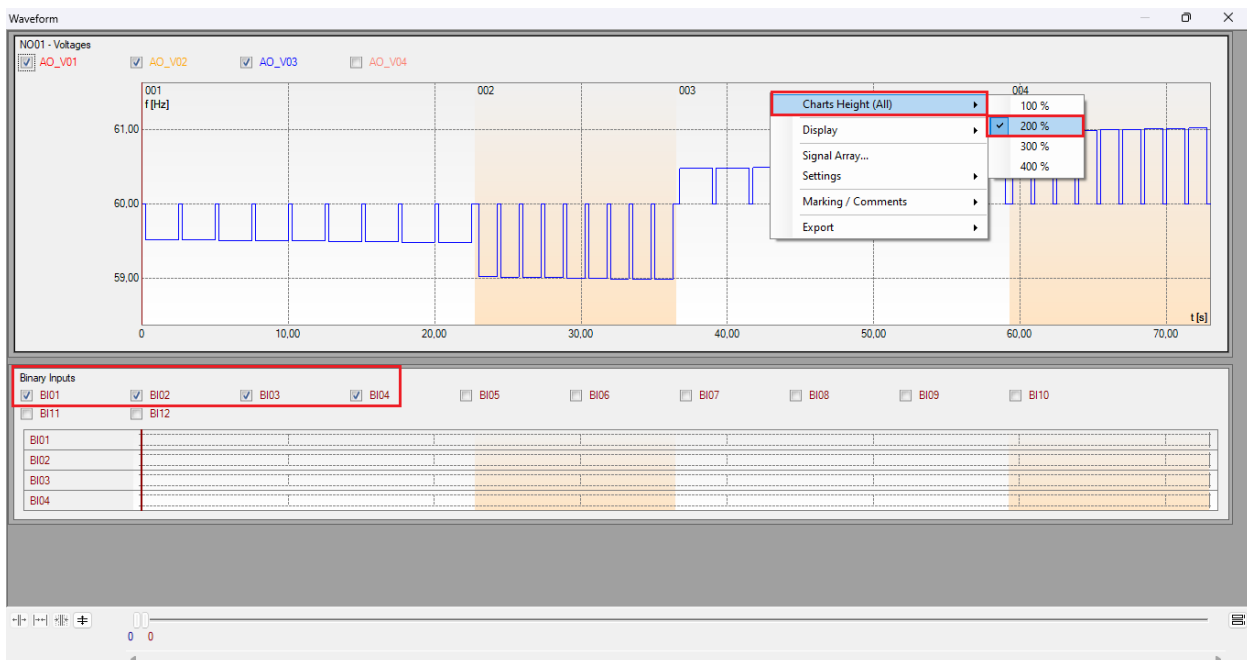


Figure 63

7.11 *Time analysis*

To evaluate the time, the value of the frequency where the last increment or decrement of each sequence occurs must be marked. To find these values, cursors are used. If necessary, a zoom can be performed to verify the moment of time where the marking must be carried out. To do this, left-click and drag the desired region. To remove the zoom, just double-click on the graph. The following figure shows the time for the first two elements.

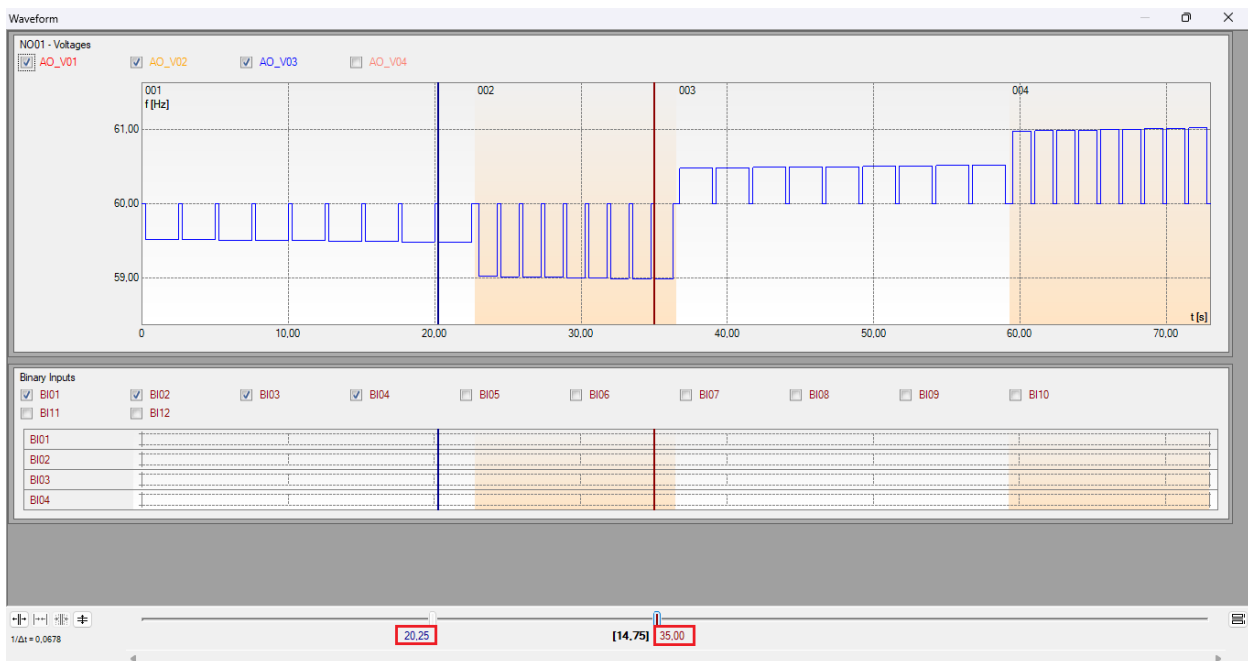


Figure 64

According to the previous figure, it can be concluded that the time for marking 1 is 20.25 seconds and for the second, 35.50 seconds. The next figure shows the position of the last two elements.

INSTRUMENTOS PARA TESTES ELÉTRICOS

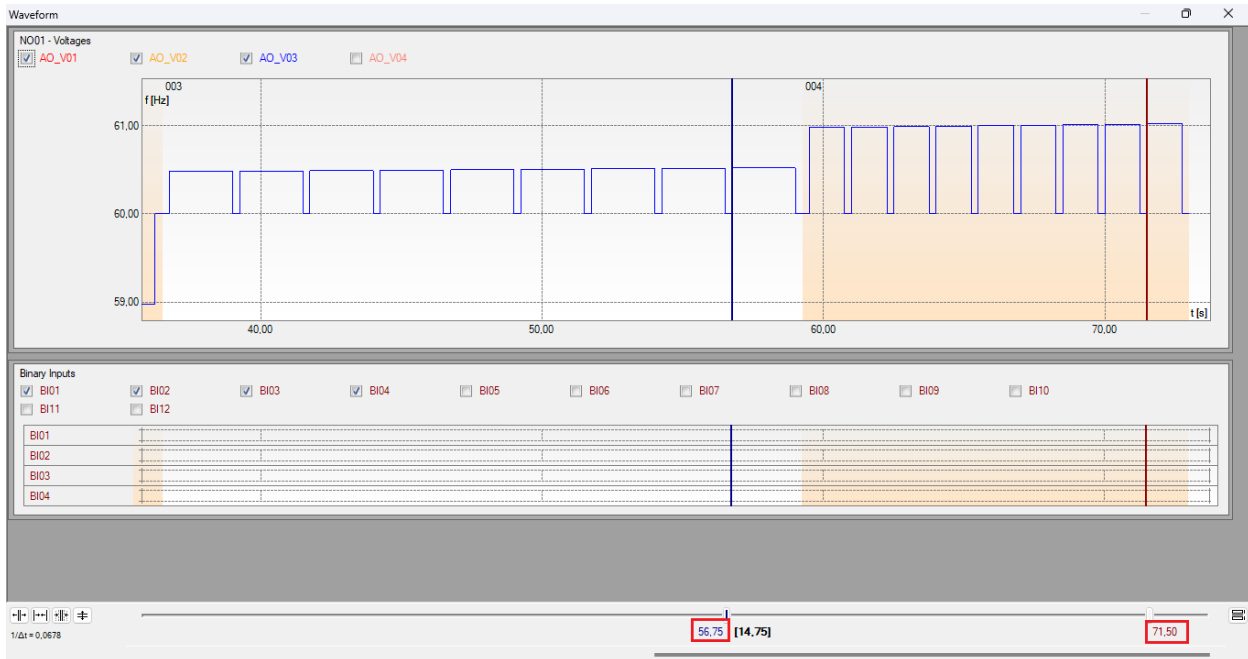


Figure 65

According to the previous figure, it can be concluded that the time for marking 3 is 56.75 seconds and for marking 4 it is 71.50 seconds.

7.12 *Inserting markup*

To insert the marking, right-click on the graphic and choose the following option.

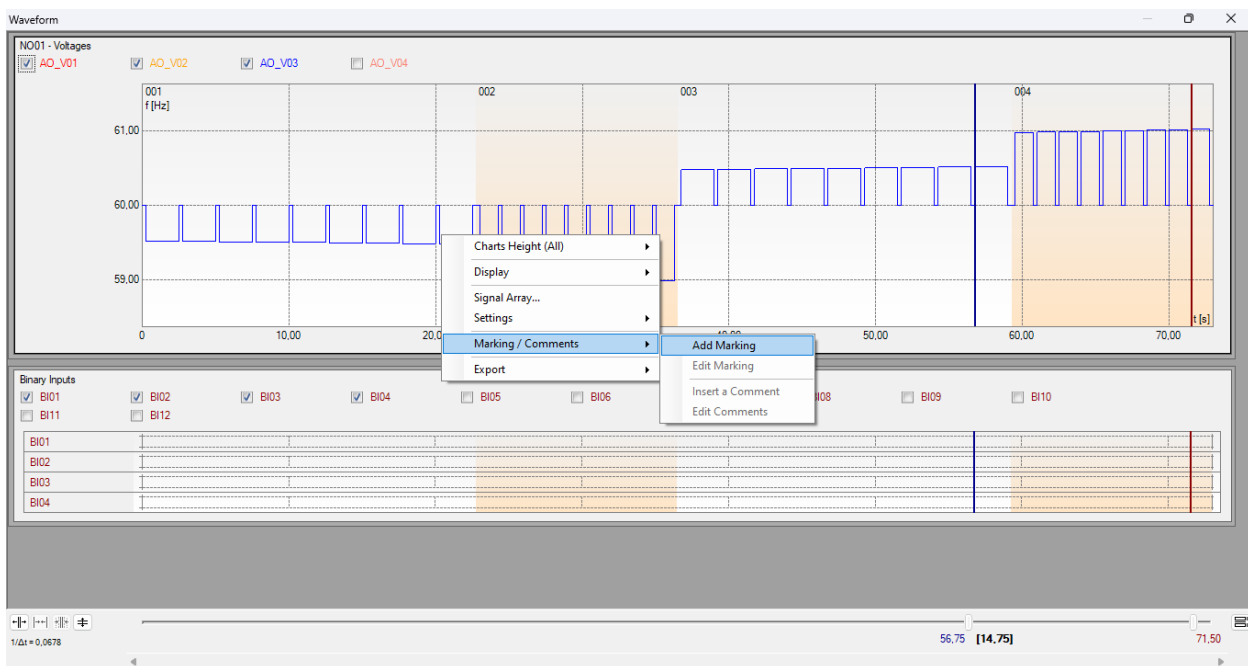
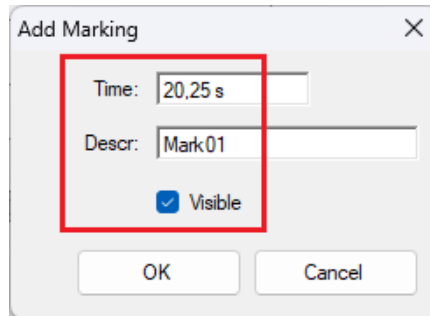


Figure 66

INSTRUMENTOS PARA TESTES ELÉTRICOS

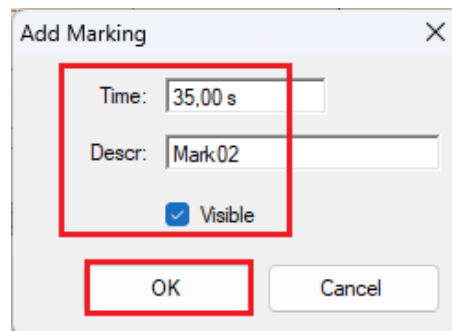
Adjust the first time and repeat the procedure for the other markings.



The dialog box 'Add Marking' contains the following fields and controls:

- Time: 20,25 s
- Descr: Mark01
- Visible
- OK button
- Cancel button

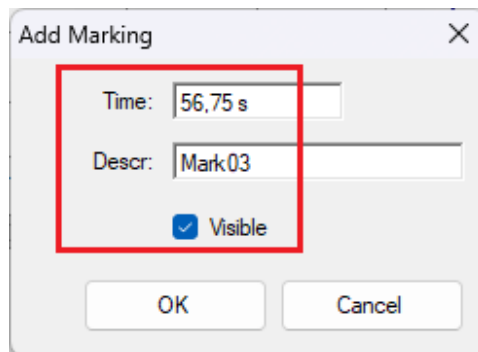
Figure 67



The dialog box 'Add Marking' contains the following fields and controls:

- Time: 35,00 s
- Descr: Mark02
- Visible
- OK button
- Cancel button

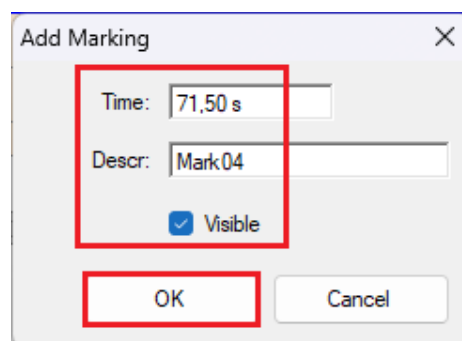
Figure 68



The dialog box 'Add Marking' contains the following fields and controls:

- Time: 56,75 s
- Descr: Mark03
- Visible
- OK button
- Cancel button

Figure 69



The dialog box 'Add Marking' contains the following fields and controls:

- Time: 71,50 s
- Descr: Mark04
- Visible
- OK button
- Cancel button

Figure 70

INSTRUMENTOS PARA TESTES ELÉTRICOS

The markings are shown in the following figure. To return this window to its initial position, double-click on the top bar (highlighted in green).

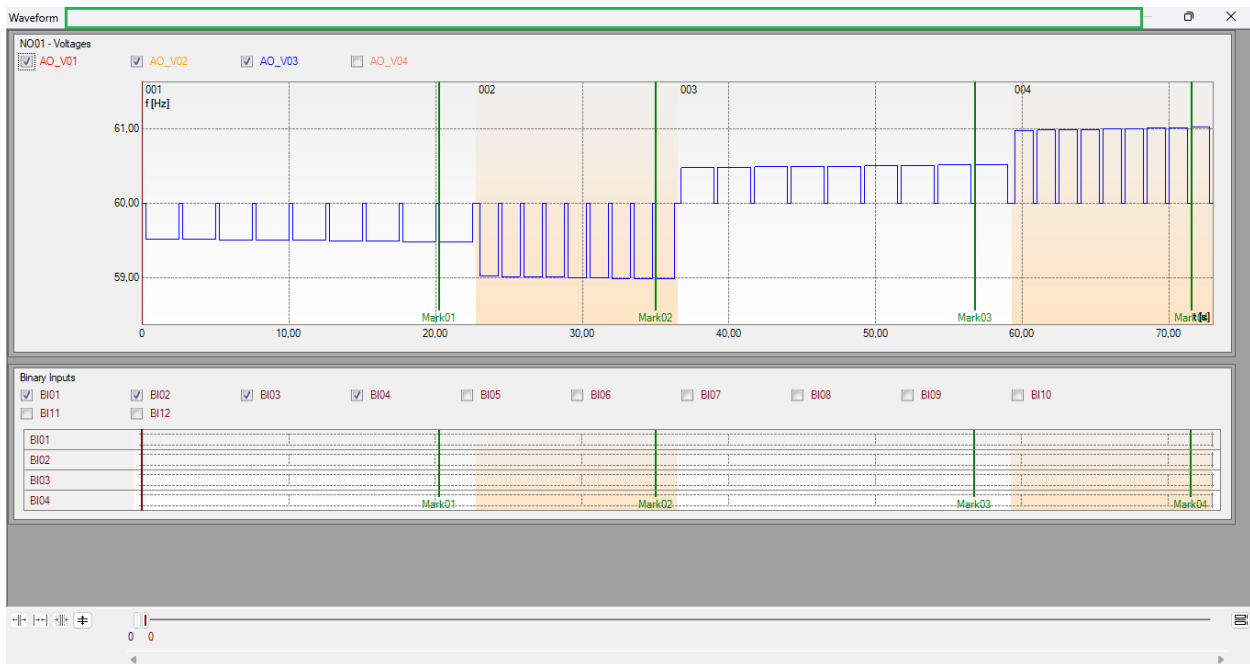


Figure 71

7.13 Time evaluation

Clicking on the “Time” field, as shown in the next figure, you can configure 4 time evaluations of operations as follows.

INSTRUMENTOS PARA TESTES ELÉTRICOS

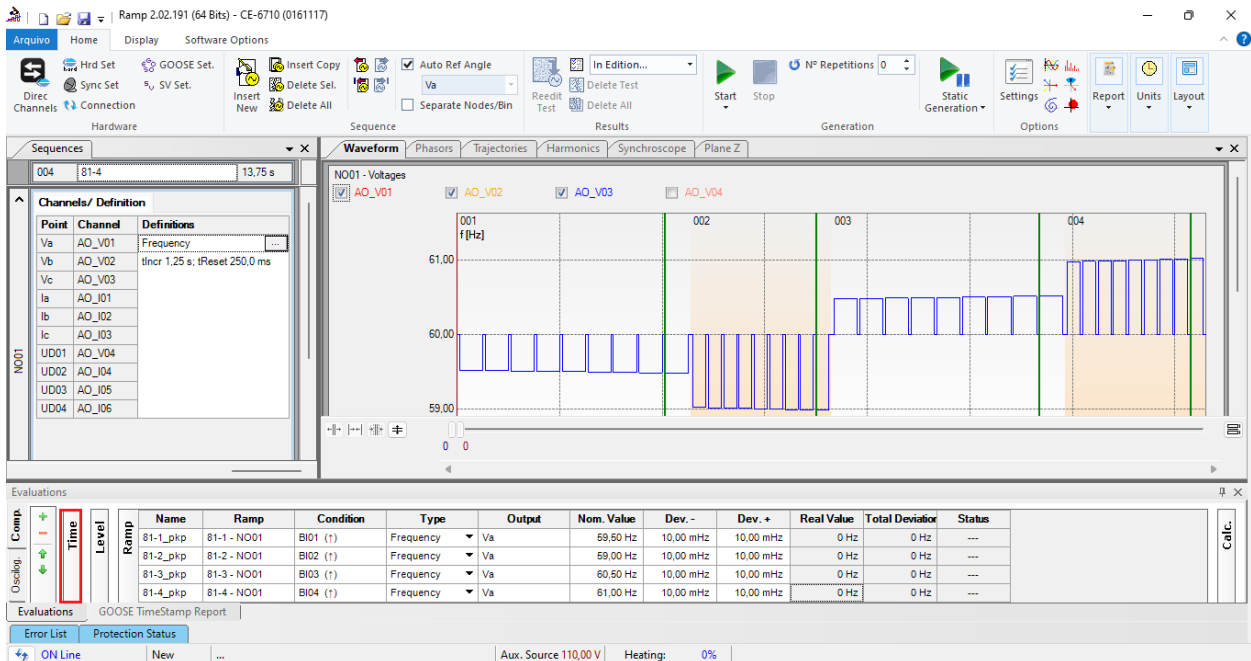


Figure 72

Change the name “Eval. 1” to “81-1_t” in the “Ignore before” option choose “Tagging> Mark01” in the “Start” option choose “Tagging > Mark01” in the “End” option choose “Binary Input > BI01 (↑)”. In nominal time, set 2.0s with deviations of 250ms. The figure below shows these settings

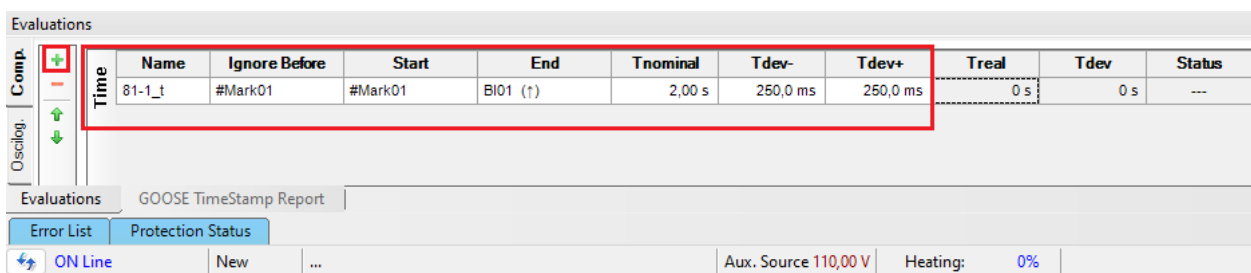


Figure 73

By clicking on the “+” icon, 3 more evaluations are added and their adjustments are made in a similar way to the first evaluation.

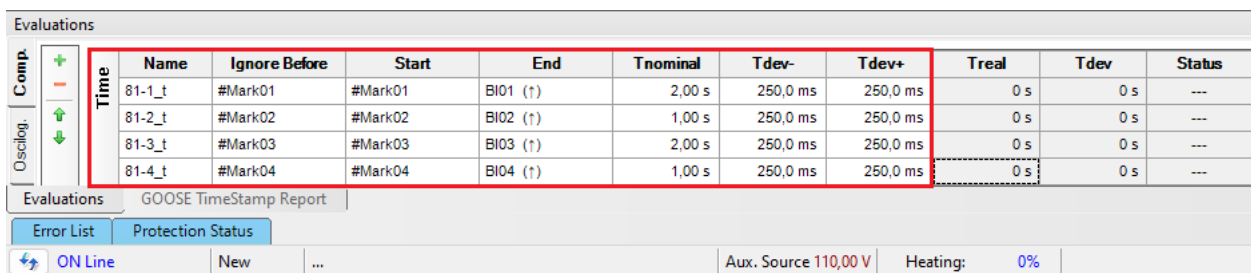


Figure 74

INSTRUMENTOS PARA TESTES ELÉTRICOS

Use the command “*Alt + G*” to start the generation. The next figure shows the result with the pickup values found.

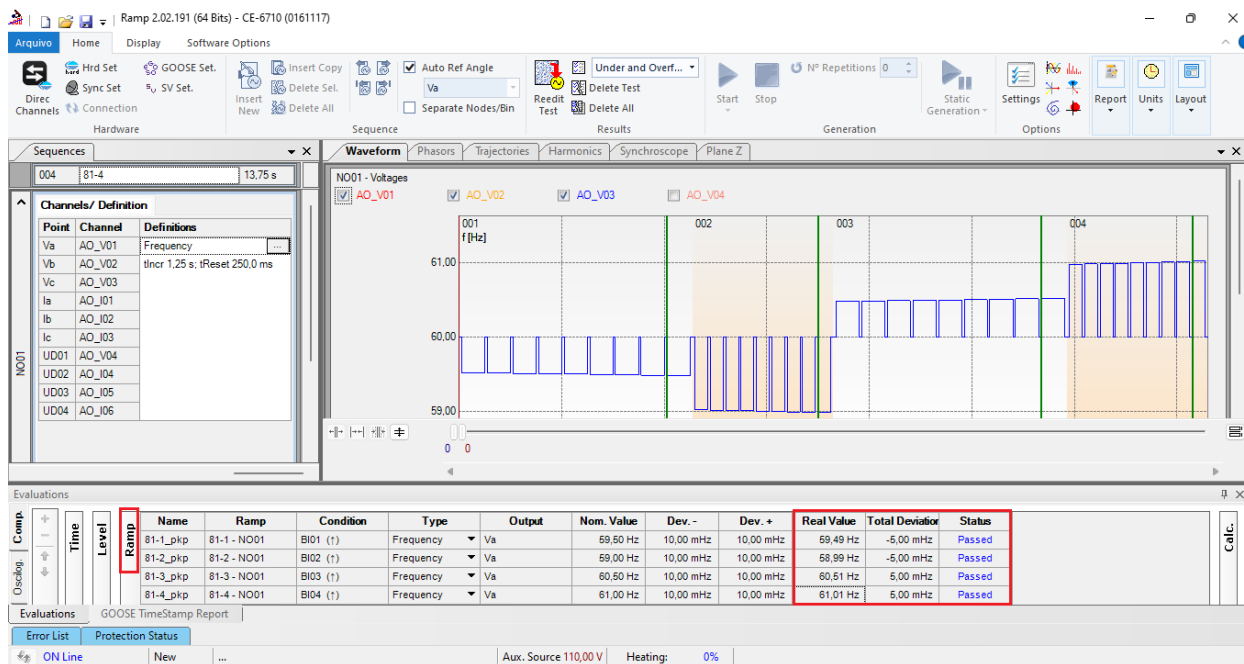


Figure 75

The following figure shows the operating times.

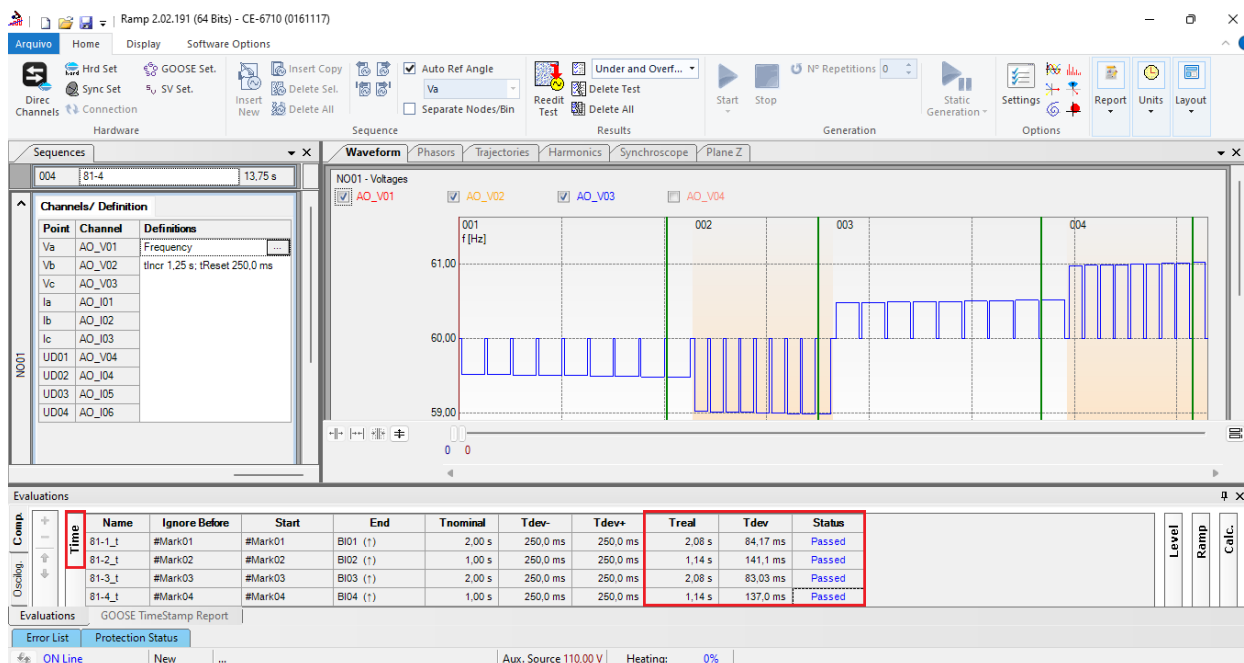


Figure 76

8. Report

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

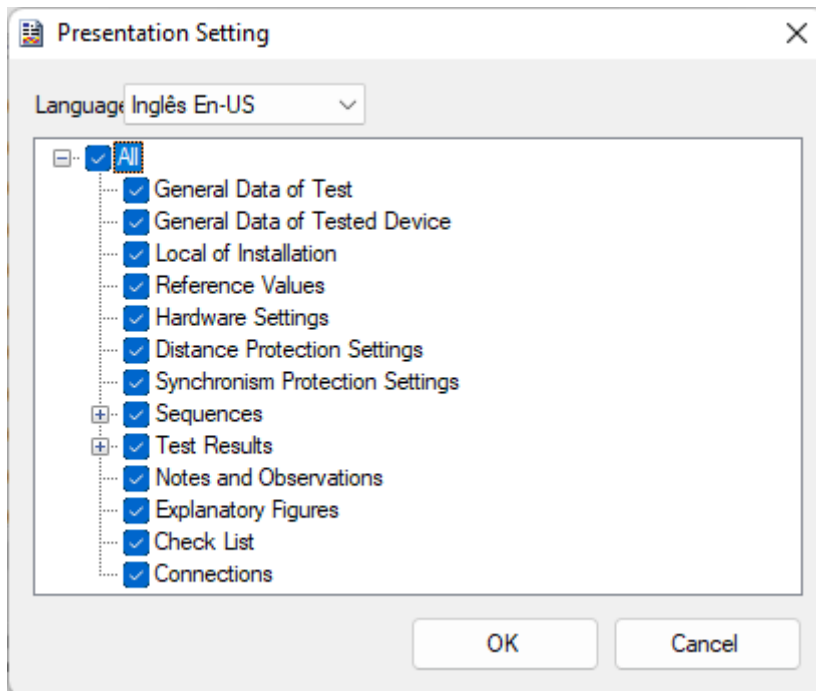


Figure 77

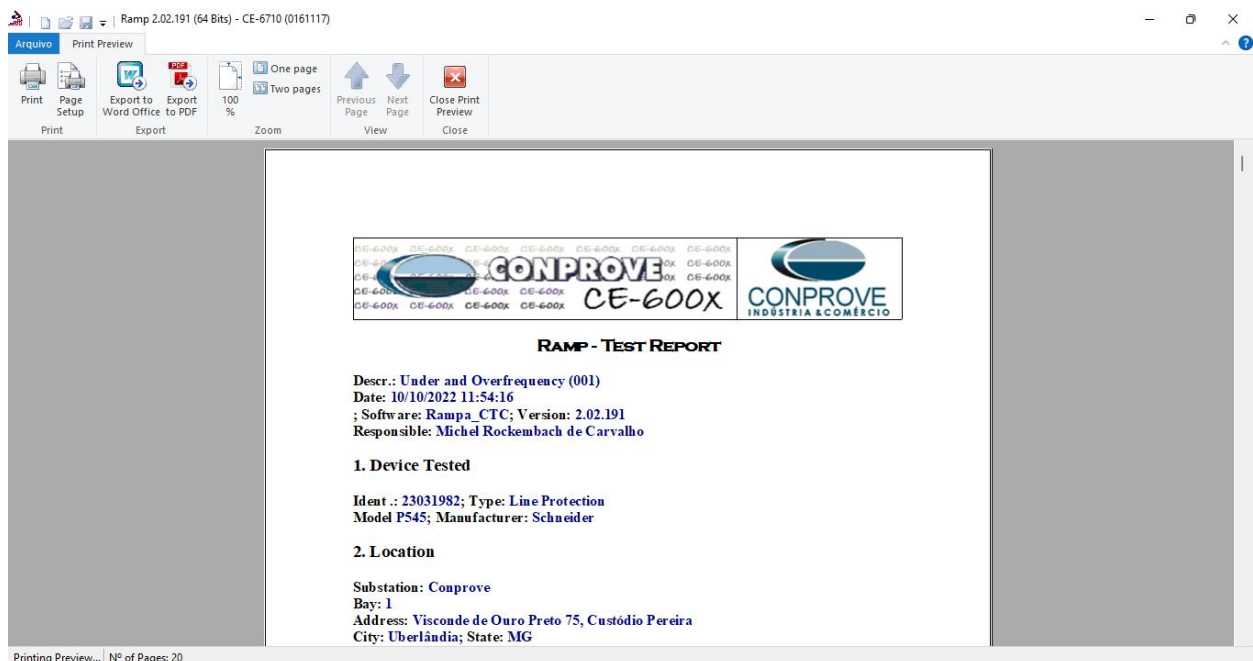
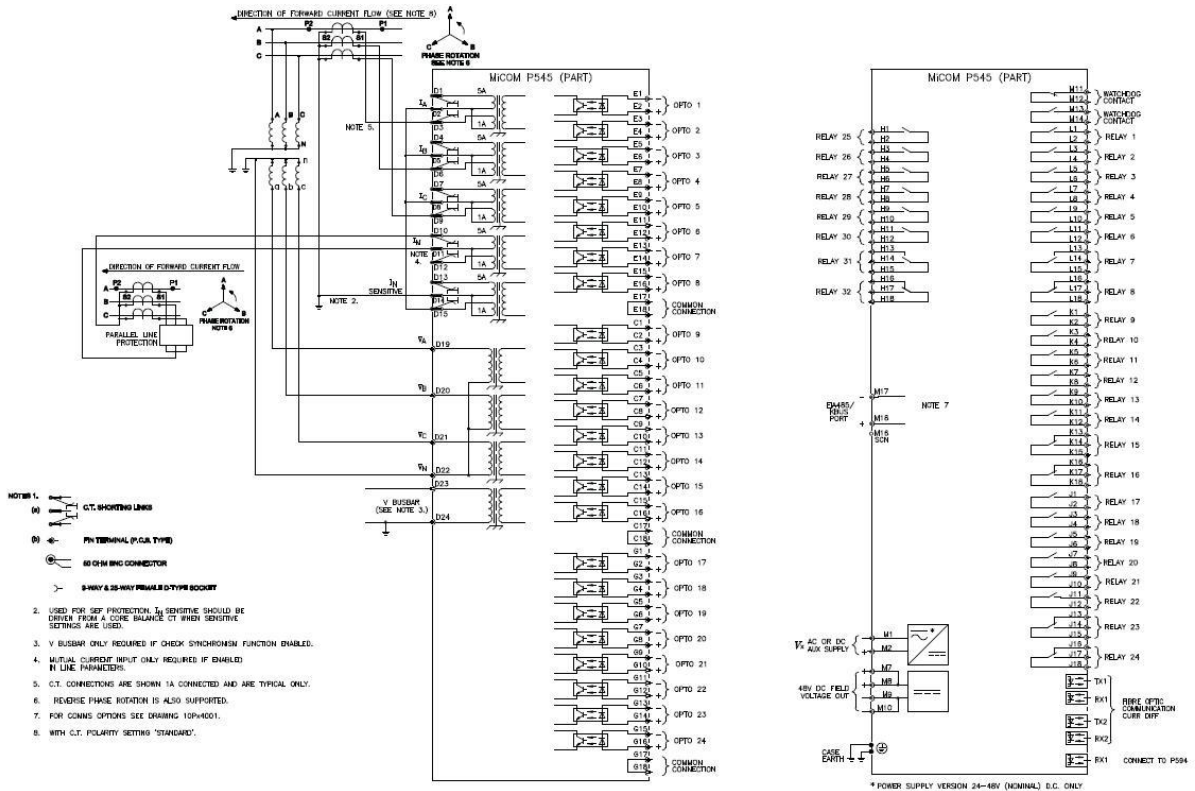


Figure 78

INSTRUMENTOS PARA TESTES ELÉTRICOS

APPENDIX A

A.1 Terminal Designations



Measurements and recording facilities

Accuracy

Typically $\pm 1\%$, but $\pm 0.5\%$ between 0.2 - 2In/Vn

Current: 0.05 to 3 In

Accuracy: $\pm 1.0\%$ of reading

Voltage: 0.05 to 2 Vn

Accuracy: $\pm 1.0\%$ of reading

Power (W): 0.2 to 2 Vn and 0.05 to 3 In

Accuracy: $\pm 5.0\%$ of reading at unity power factor

Reactive power (Vars): 0.2 to 2 Vn to 3 In

Accuracy: $\pm 5.0\%$ of reading at zero power factor

Apparent power (VA): 0.2 to 2 Vn 0.05 to 3 In

Accuracy: $\pm 5.0\%$ of reading

Energy (Wh): 0.2 to 2 Vn 0.2 to 3 In

Accuracy: $\pm 5.0\%$ of reading at zero power factor

Energy (Varh): 0.2 to 2 Vn 0.2 to 3In

Accuracy: $\pm 5.0\%$ of reading at zero power factor

Phase accuracy: 0° to 360°

Accuracy: $\pm 0.5\%$

Frequency: 45 to 65 Hz

Accuracy: ± 0.025 Hz

APPENDIX B

Equivalence of software parameters and the relay under test.

Table 1

Ramp Software		Schneider P545 Relay	
Parameter	Figure	Parameter	Figure
81-1_pkp	59	F<1 Setting	20
81-2_pkp	59	F<2 Setting	20
81-3_pkp	59	F>1 Setting	20
81-4_pkp	59	F>2 Setting	20
81-1_t	74	F<1 Time Delay	20
81-2_t	74	F<2 Time Delay	20
81-3_t	74	F>1 Time Delay	20
81-4_t	74	F>2 Time Delay	20