

# **TEST TUTORIAL**

**EQUIPMENT TYPE**: Protection Relay.

BRAND: ZIV.

MODEL: Reyrolle 7SR10.

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

**OBJECTIVE:** Pickup and time testing of definite-time and inverse-curve phase overcurrent elements.



#### **VERSION CONTROL:**

Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	23/11/2021	M.R.C	M.P.S



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



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### INSTRUMENTOS PARA TESTES ELÉTRICOS PROCEDURE FOR TESTING THE REYROLLE 7SR10 RELAY ON OVERCURRENT SOFTWARE

#### 1. Relay Connection to CE-6710

This section covers all the connections needed to run the test in question. In appendix A of this document you can find the terminal designations of the 7SR10 relay

#### 1.1. Auxiliary Source

For relay power, connect the positive terminal (red) of the Aux. Vdc source of the test set to terminal 1 of slot X3 of the relay and the negative terminal (black) to terminal 2 of slot X3, as shown in the following figure.



Figura 1

#### 1.2. Analog Outputs

Connect the analog outputs I1, I2 and I3 of the CE-6710 to terminals 2, 5 and 8, and their common ones to terminals 1, 4 and 7 of slot X5 of 7SR10, respectively. The following figure shows the procedure.





Figure 2

#### 1.3. Binary Inputs

Connect the binary inputs to the relay binary outputs located in slot X4. Details of these connections are presented in the table and figure below:

CE-6710 ( <i>Binary Inputs</i> )	7SR10 (X4)
BI1	BO1 (1 and 3)
BI2	BO2 (4 and 6)
BI3	BO3 (7 and 8)





Figure 3

#### 2. First steps with the 7SR10 relay

#### 2.1. Communication between PC and relay

Communication with the relay is done through a USB cable connected between the front port of the relay and the computer that has the Reydisp Evolution 32 software. Run the software by double clicking on its icon.



Establish communication via the *"Connect"* option. Then, Ethernet or USB communication is chosen, as shown in the following figure:

![](_page_9_Picture_0.jpeg)

![](_page_9_Picture_2.jpeg)

Figure 5

#### 2.2. Creation of adjustments file

In this step, click on the *"Get Settings"* icon of the software and, after loading, click on number 1 on the following screen:

![](_page_9_Picture_6.jpeg)

Figure 6

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![](_page_10_Picture_0.jpeg)

#### 3. Parameterization of the 7SR10 relay

#### **3.1. SYSTEM CONFIG**

Having established the communication, in the left column of the screen, select the option *"System Config"* in *"Settings"*. Adjust the frequency to 60Hz and ensure that the current parameters configured for the display are referenced to the nominal, as shown below.

![](_page_10_Picture_5.jpeg)

![](_page_10_Figure_6.jpeg)

#### 3.2. CT/VT CONFIG

In the *"CT/VT CONFIG"* area configure the values referring to the CTs and the phase sequence, as shown in the figure below.

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![](_page_11_Picture_0.jpeg)

Reydisp Evolution - [Settings Editor	or (Group 1) (Untitled)]	– 🗗 🗙
🙀 File Edit View Relay Optio	ons Window Help	- 8 ×
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System Notes Config Settings	s Input Matrix Output Matrix LED Matrix	
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CT/VT CONFIG	This menu contains CT and/or VT configuration settings.	

Figure 8

#### 3.3. FUNCTION CONFIG

In this area, try to enable the phase overcurrent function (51/50). The respective function is highlighted in the figure below.

![](_page_12_Picture_0.jpeg)

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System Notes Config Settings Input Matrix Output Matrix LED Matrix	
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CURRENT PROTN	
Ø 75R100[23]-1[JKL],xx0-2CA0: 75R10 @ COM6:57600,n	

Figure 9

#### 3.4. PHASE OVERCURRENT

In the option *"PHASE OVERCURRENT"* it must be ensured that the measurements are made in RMS, as shown in the figure below.

![](_page_13_Picture_0.jpeg)

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		>
PHASE OVERCURRENT		
S 50 7	7SR100[23]-1[JKL]xx0-2CA0 : 7SR10 @ COM6:57600,n	

Figure 10

The next step is to adjust the overcurrent elements that will dictate the relay's actuation characteristic under a fault condition. A composition of 3 overcurrent curves, 1 inverse time and 2 definite time curves will be discussed.

#### 3.5. 51-1 - Inverse time curve phase overcurrent

In this area, enable inverse time curve 1 of function (51-1). Set the pickup to 1.0xln, opt for the IEC NI (Normally Inverse IEC) curve and set the time multiplier to 0.5. The remaining adjustments must be kept as shown in the figure below.

![](_page_14_Picture_0.jpeg)

Reydisp Evolution - [Settings Editor (Group)	up 1) (Untitled)]				- 0	×
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PHASE OVERCURRENT						
🍼 75	R100[23]-1[JKL]xx0-2CA0:7SR10 @ C	OM6:57600,n				

Figure 11

#### 3.6. 50-1 – Phase overcurrent in definite time curve

The adjustment of the first definite time curve must be done as directed in the sequence. Enable the timed element, set a pickup level of 5xln and an actuation time of 0.5 seconds.

![](_page_15_Picture_0.jpeg)

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System Notes Config Settings Input Matrix Output Matrix LED Matrix	
System Notes Config System Softer Config FUNCTION CONFI	
50-1	
7SR100[23]-1[JKL]xx0-2CA0:7SR10 @ COM6:57600,n	

Figure 12

#### 3.7. 50-2 – Phase overcurrent in definite time curve

For the fastest overcurrent element in terms of actuation, enable the curve, set the pickup to 6xIn and set an actuation time of 0 seconds, as is done in the following figure.

![](_page_16_Picture_0.jpeg)

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50-1 This	or teams in second s	
Ø :	75R100[23]-1[JKL]xx0-2CA0 : 75R10 @ COM6:57600,n	

Figure 13

Once the parameters that will characterize the action of the overcurrent function have been defined, it is necessary to direct the Pickup and Trip signals in the binary outputs of the relay. This way, when one of these binaries acts, the test set will be able to identify this condition in its input binaries.

#### **3.8. OUTPUT MATRIX**

Within *"OUTPUT CONFIG"*, in the *"OUTPUT MATRIX"* option, define lines 50-1, 50-2 and General Pickup as shown in the following figure. From these directions, it will be possible to perform pickup tests of each curve element in later steps.

![](_page_17_Picture_0.jpeg)

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MM Successful Man Close (20 Bit Binary)	
< > With New York Stored (20 bit Binary)	~
OUTPUT MATRIX	

Figure 14

#### 3.9. PICKUP CONFIG

Defined the output binaries that will provide the signal of *"General Pickup"* (B01) and Trips (50-1 and 50-2), in the *"PICKUP CONFIG"* area, configure so that element 51-1 is the only element to command the pickup signal at output B01, as shown below.

![](_page_18_Picture_0.jpeg)

![](_page_18_Figure_2.jpeg)

Figure 15

#### 3.10. TRIP CONFIG

For Trip signaling, select binary BO2 as a trip contact, as shown in the figure below. This way, whenever there is a trip in the relay, the standard trip LED of the relay will light up.

![](_page_19_Picture_0.jpeg)

Reydisp Evolution - [Settings Editor (G     Eile Edit ⊻iew Relay Options	(Group 1) (Untitled)) s <u>W</u> indow Help	- 0 ×
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Un E/F Inps No	o nep Available	
<b>Ø</b>	Address 0 @ COM5:57600,n	

Figure 16

#### 4. Sending the settings to the relay

As highlighted in the figure below, select the option *"Send All Settings"*, highlighted by square, and then choose Setting Group 1 and confirm the action and send the settings to the relay.

![](_page_19_Picture_6.jpeg)

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![](_page_20_Picture_0.jpeg)

#### 5. Overcurrent software adjustments

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

![](_page_20_Picture_4.jpeg)

#### 5.1. First Steps in Overcurrent

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

![](_page_20_Picture_7.jpeg)

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![](_page_21_Picture_0.jpeg)

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.

🗸   🗋 📴 📮   Overcurrent 2.02.162 (64 Bit:	s) - CE-6710 (0151117)		- 0 ×
Arquive         Home         Display         Software Option           Image: Second Se	t Stop	t Clear test Clear all Settings  Ko Waveform  Present  Fresent  F	^
Hardware	Settings	X	
Pickup Time Test Settings			
Insert/Edit Points	General	General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections	<b>.</b>
Insert/Edit General Options		Test:	E Fault A-B-C
Edit Point Test Point	Overcurrent	Descr: Phase Overcurrent Date:	
Enable the DropO		Tastad davina:	Angle U
Fault Type: A			Legend:
Sequence Multiple:			Test Line
Remove I Fault:		Type: Feeder Protection V Manufacturer: Heyrolie V	Pickup Found
Demous All		Location:	Dropout Found
Nemove All		Substation: CONPROVE	Colors: NT OK Error
Test Points		Bay: 1	Information:
Points Tested		Address: Visconde de Ouro Preto 75 - Custódio Pereira Neighborhood	Current Point:
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Nominal Min Max			-t
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		Name: Michel Rockembach de Carvalho v	
		Sector: Engineering V Registry: 00001 V	
		Tool Test:	
		CE-6710 Series Num - 015111770CM332222111/5HV/RGLGLGL 27/02YO	
			Mult Pkp
Type: Points V Fault & Angle Ref		20	
Errors List Protection Status	×		
1 ON Line New	Default 🗸	Preferences OK Cancel	

Figure 20

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.

![](_page_22_Picture_0.jpeg)

![](_page_22_Figure_1.jpeg)

Figure 21

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 test equipment.

#### 5.2. Overcurrent Screen > Definitions

This tab adjusts whether the function has directionality, the way to view the graph, the scale used and the tolerances for time, current and angle. These tolerances should be consulted in the relay manufacturer's manual (available in Appendix B).

![](_page_23_Picture_0.jpeg)

Settings		×
General	Definitions       Overcurrent Elements         General Options         Enable Directionality       Pol.:       V-90" (Square          Curves Composition:       Curve with the lower time           Pickup Mode Settings:           Pickup Definition:       Setting in Amperes           Reference Value for Pickup:       1.00 A          Curves Display Mode:           O I [A] xt -> I in Multiples           Multipliers for Tests of Seq: and Seq0           Negative Seq::       1          Zero Seq::       3          Current Tolerance       Relative:       4.00 %         Absolute:       0.01 In          Initial Scale Factor:       10.00          The scale factor defines the multiplier to be applied to the lower Multiple:       3.00 *	
Default 🗸	Preferences <u>Q</u> K <u>C</u> ancel	

Figure 22

#### 5.3. Overcurrent Screen > Overcurrent Elements > Phase

Here, the overcurrent elements for inverse time, definite time and instantaneous time are configured. To do this, click three times on the highlighted icon.

![](_page_24_Picture_0.jpeg)

![](_page_24_Figure_2.jpeg)

Figure 23

For the first element change the name to 51 choose the curve type, pickup value, time dial and dropout factor. For the second element change the name to 50-1 choose the type of curve like definite time, pickup value, operating time and dropout factor. Repeat the same procedure for the third element changing the name to 50-2.

![](_page_25_Picture_0.jpeg)

#### Settings × Definitions Overcurrent Elements General Phase Residual Seg + Seg -Seq 0 Overcurrent 🗅 🗸 🖪 + ~ - ~ Colo Nº Enab Desc Curve Pkp Pkp [A] Dial/Time Drp 1 51-1 IEC Normal Inv. 5,00 A 5,00 A 0,500 0,950 50-1 Defined Time 25,00 A 25,00 A 0,500 s 0,950 1 • 2 $\checkmark$ 50-2 Defined Time 30,00 A 30,00 A 0 s 0.950 Total Characteristic Single Characteristic Individual Directionality t [s] 78 28 5.0 2.0 1.50 rectionali t Enabled 78 0.50 1.0 2,0 5.0 10 20 50 ARP ~ Preferences Default <u>0</u>K Cancel

#### INSTRUMENTOS PARA TESTES ELÉTRICOS

![](_page_25_Figure_3.jpeg)

Due to a specific feature of the overcurrent function in Siemens Reyrolle relays of setting the timed curve pickup to a value of 1.05 x lpickup (pickup level set in the relay), we need the value set for curve 51-1 to be of 5.25A and not 5A. In this way, access the "Single Characteristics" tab, highlighted in the figure below, select the box "Mult for Pickup Test:" and type "1.05" in the space provided.

![](_page_26_Picture_0.jpeg)

![](_page_26_Figure_2.jpeg)

Figure 25

#### 6. Channel Targeting and Hardware Configurations

Click on the icon illustrated below.

![](_page_27_Picture_0.jpeg)

![](_page_27_Figure_2.jpeg)

Figure 26

Channels Direct. X Local Hard : O Basic Adapt I/Os 👻 Nodes Confirm Model Reset for Hard Connected Set CE-6710 Advanced So GOOSE ... Autoassociate -Autoassociate -Cance otes Serial Number 01511177CCM33222211U5HVRGLGLGL2Z0RX0 V ... V ON Line ⁵∪ S. Value... Clean -Clean -8 Import. Export. Inputs: Binary, GOOSE and Analog. DC Outputs: Analog. and SV Inputs: Analog. and SV Outputs: Binary, GOOSE and Analog DC Logical Analog Outputs Sampled Value Outputs  $\ll \gg$ + - m 7-+ -- -1/1 C O For vard 💿 📥 Voltage Channels ഹസ്പ Descr. Hardware Node Point Nominal Line m 60 Hz AO\_V02 ▼ NO01 V2 Vb • Phase Seq.: ABC ₀t ₹ AO V03 V3 NO01 ▼ Vc овј AO\_V04 V4 ▼ NO01 ▼ UD • 47,80 MVA 30 power 15,93 MVA N 1φ: Primary Voltage (FF): 13,80 KV (FN): 7,97 KV ₀t ≾ 2.00 kA imary Current: arv Voltage (FF): 115.0 V 7 + + + Current Channels (FN): 66,40 V Point Voltage Channel Currents Channel Descr. Hard Node ary Current: 5,00 A Va AO\_V01 la AO\_I01 5  $\sim$ VTR F: 120.0 FN Vb AO\_V02 F 6 lb AO\_102 AO 102 NO01 12 CTR F: 400,0 Vc AO\_V03 lc AO\_103 AO\_103 13 NO01 ▼ lc • • VTR D / VTR F: 1,00 Vab Е 8 IE AO 104 14 NO01 UD ▼ UD FF Vbc EP 9 IEP AO 105 15 NO01 • CTR E / CTR F: 1.00 ▼ UD • 16 NO01 Vca AO 106 rse Polaritv Rev D VD CT's F VT's F k.V0 k.10 VT D CT E Calo k.V2 k.|2 Equal Parameters Among Nodes to I2 1.00 k to V0 1.00 to V2 1,00 k to 10 1,00

Then click on the highlighted icon to configure the hardware.

Figura 27

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

![](_page_28_Picture_0.jpeg)

![](_page_28_Figure_2.jpeg)

Figure 28

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

Cha	nnels Direct.			-	- [		×
Local	Model Reset for Hard.	Basic			C	onfirm	
otes	CE-6/10 Serial Number:	Advanced	€so GOOSE		C	ancel	
Rem	01511177CCM33222211U5HVRGLGLGL2Z0RXO V	🗹 ON Line	<sup>s</sup> ⊍ S. Value	Import	Expor	t	
							.:

Figure 29

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![](_page_29_Picture_0.jpeg)

#### 7. Test Structure for 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.

🗸   🗋 📂 🔙	→   Overcurrent 2.02.1  Display Soft	62 (64 Bits) - CE-6710 (0	0151117)					- a ×
Channels Direc	Set €S GOOSE Se c. Set ₅, SV Set nnection	tt Start Stop >	Next Point 🧹 Clear tes Next Line 👹 Clear all	t Waveform	Present Report Report	rel Charts	Restore Layout	
Pickup Time	Test Settings						,	
Direction of the C	eneration Channels	Enable Pre-Fault 1		nable Pre-Fault 2	Enabl	e Post-Fault		Voltage Settings
Gen           Va         AO           Vb         AO_           Vc         AO_           Ia         AO_           Ib         AO_           Ic         AO_           IE         Image: Second	eration Channel V01 (Hrd: V1) V02 (Hrd: V2) V03 (Hrd: V3) V03 (Hrd: I1) U03 (Hrd: I2) Goose - Fault 0; 0; 0; 0; 0; 0 wave provided Value Error							Voltage LL Appl. in faults LL [57.50 V Voltage LN Appl. in other faults [32.20 V VTRNeutral/VTRPhase: [1.00 CTRGround/CTRPhase: [1.00 [IV. Phase VTs [IV. Neutral VT [IV. Neutral VT [IV. Neutral VT [IV. Phase CTs [IV. Ground CT]
Direction of Oper	ating Interfaces	-	Pickup	o Limits				Pickup Test
Phase Resi	dual Seq + Seq -	Seq 0	Initial NA VSec	ą-Min. 0∨				Initial step: Absolute Resolution: 100,00 mA
Nº Curve	Pickup I	nterf. Trip Interf	E. ISeq	- Min. 0 A Min. 0 V				Wat Time for each Incommentation: 0,10 %
1 51-1	BI01 (Hrd BI02 (Hrd	l:Bl1) ▼ Disab. l:Bl2) ▼ Disab	- 310 M	fin. 0A				Vvac Time for each incrementation. 0,73 s
3 50-2	BI03 (Hrd	: BI3) 🔻 Disab.	✓ VSec	q+Min. 0.V				Maximum Waiting Time of Nen Operation Region: 150.00 8
			ISeq	+ Min. 0 A				Waiting Overtime of Timed Curue: 100.00 me
Trigger Interf	Software	Trigger Logic	Limit:	s are applied to faults that mponents are present				Parallel Carve. 100,00 ms
myger inten.	Aquardar PPS	Trigger Delay 0.00	s					Based Unly in Generated Values 🗹 Cycle to Cycle Generation 📈
4) ONU:	New	ingge boudy bios			C 110 00 1	d theten	09/	
CIN Line	New			Aux	Source: 110,00 V	Heating:	076	

Figura 30

#### 7.2. Pickup screen

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

![](_page_30_Picture_0.jpeg)

![](_page_30_Figure_1.jpeg)

![](_page_30_Figure_2.jpeg)

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

![](_page_30_Picture_4.jpeg)

![](_page_30_Figure_5.jpeg)

#### 7.3. Pickup Test Final Result

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

![](_page_31_Picture_0.jpeg)

values, dropout factor, reference curve, angle and fault and the generated current and voltage values.

![](_page_31_Figure_3.jpeg)

![](_page_31_Figure_4.jpeg)

#### 7.4. Time screen

In this step, it will be necessary to change the output torques of the function in the relay. As shown in the figure below, change the operating/trip torques of elements 51-1, 50-1 and 50-2 to BO1 by accessing the *"OUTPUT MATRIX"* area in the relay software. As only one output binary was defined for the three elements, the curve with the shortest actuation time for the applied current value will be the basis for actuation of the function in time.

![](_page_32_Picture_0.jpeg)

Reydisp Evolution - [Settings Editor (Gro	up 1) (Untitled)] Mindaw Hala			0 ×
in 候 📁 🔚 😂 🖻 i	XIAAA	100 🔘 🎽		
System Notes Config Settings Inc	ut Matrix Output Matrix	LED Matrix		
	Parameter	Range	Value	
SYSTEM CONFIG	M Protection Healthy	(20 Bit Binary)	·	
	Active Setting Grp 1	(20 Bit Binary)		
CURRENT PROT'N	Active Setting Grp 2	(20 Bit Binary)		
PHASE OVERCURRENT	<b>XX</b> 51-1	(20 Bit Binary)	801	
51-1	<b>VM</b> 50-1	(20 Bit Binary)	801	
51-2	<b>VM</b> 50-2	(20 Bit Binary)	801	
	General Pickup	(20 Bit Binary)		
	General Trip	(20 Bit Binary)		
🗄 📁 CONTROL & LOGIC	M Trip Time Alarm	(20 Bit Binary)		
1 INPUT CONFIG	CB Open	(20 Bit Binary)		
OUTPUT CONFIG	CB Closed	(20 Bit Binary)		
	Close CB Blocked	(20 Bit Binary)		
BINARY OUTPUT CONFIG	CB Alarm	(20 Bit Binary)		
	VM Open CB	(20 Bit Binary)		
	VM Phase A	(20 Bit Binary)		
	VM Phase B	(20 Bit Binary)		
	MM Phase C	(20 Bit Binary)		
	Start Count Alarm	(20 Bit Binary)		
-	WW User Output 1	(20 Bit Binary)		
	WW User Output 2	(20 Bit Binary)		
	Ver Output 3	(20 Bit Binary)		
	User Output 4	(20 Bit Binary)		
	WW User Output 5	(20 Bit Binary)		
	WW User Output 6	(20 Bit Binary)		
	User Output 7	(20 Bit Binary)		
	Vser Output 8	(20 Bit Binary)		
	Manual Close CB	(20 Bit Binary)		
	CB Fail To Close	(20 Bit Binary)		
	Successful Man Close	(20 Bit Binary)		
	E/F Out	(20 Bit Binary)		
	New Wave Stored	(20 Bit Binary)		
	W New Fault Stored	(20 Bit Binary)		
DUTPUT MATRIX				
70	P1001221 11/1/1 June 2000 - 7	P10 @ COM6.57	500 p	

Figure 34

Once the relay has been adjusted, on the *"Test Settings"* tab, also change the test set input binaries that will receive the trip signals, as instructed in the figure below.

![](_page_33_Picture_0.jpeg)

	vare Options				
GOOSE Se GOOSE Se GOOSE Se Sync. Set ₅, SV Set Some Connection	Start Stop	lear test lear all Settings Waveform → Phasors	Present Report	Recreate Restore View Charts Layout	
Hardware	Generation	Options	Report Units	Layout	
Time Test Settings					
tion of the Generation Channels Generation Channel AO_V01 (Hrd: V1) AO_V02 (Hrd: V2) AO_V03 (Hrd: V3) AO_V03 (Hrd: V3) AO_U01 (Hrd: 11) AO_U02 (Hrd: 12) AO_U02 (Hrd: 13) V V V V V V V V V V V V V V V V V V V	Enable Pre-Fault 1	Enable Pre-Fault 2	☐ Enable Pc	et-Fault	Voltage Settings Voltage LL Appl. in foults LL [57,50 V Voltage LN Appl. in dother faults [33,20 V VTRNeutral/VTRPF [1,00 CTRGround/CTRPF [1,00 LINV. Network V [INV. Network V LINV. Network V LINV. Network V [INV. Phase CT
Simulate Sampled Value Error tion of Operating Interfaces ase Residual Seq + Seq -	Seq 0 Initial NA V	Pickup Limits VSeq-Min. 0 V ISeo-Min. 0 A			Pickup Test Initial step: Absolute Resolution: 100.00 mA Min. Resolution ∨ Relative Resolution: 0,10 %
PICKUD	▼ BI01 (Hrd; BI1) ▼	3V0 Min. 0 V			Wait Time for each Incrementation: 0,75 s
51-1 Disab.	▼ BI01 (Hrd: BI1) ▼	310 Min. 0 A			Logic of Directional Lock (Appl. in faults LL): Neither 🗸
51-1 Disab. 50-1 Disab.		VSeq + Min. 0 V			Maximum Waiting Time of Non-Operation Region: 150,00 s
51-1         Disab.           50-1         Disab.           50-2         Disab.	▼ BI01 (Hrd: BI1) ▼	ICas Min 0.4			
51-1         Disab.           50-1         Disab.           50-2         Disab.	▼ BI01 (Hrd: BI1) ▼	ISeq + Min. 0 A			Waiting Overtime of Timed Curve: 100,00 ms

Access the *"Time"* tab and choose to create a sequence of points to be tested. Click on the button *"Sequence"* in the tab *"Insert/Edit Points"* Select the type of fault to be executed as *"ABC"*, adjust the initial, step and final of the sequence and, finally, confirm the inclusion of the sequence in the graph. The following figure highlighted this process.

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#### INSTRUMENTOS PARA TESTES ELÉTRICOS

![](_page_34_Picture_0.jpeg)

![](_page_34_Figure_1.jpeg)

Begin the generation by clicking on the "Start" icon or using the command "Alt +G".

![](_page_34_Picture_3.jpeg)

Figure 37

#### 7.5. Final Result of the Test of Time

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![](_page_35_Picture_0.jpeg)

![](_page_35_Figure_1.jpeg)

# 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.

![](_page_36_Picture_0.jpeg)

Presentation Setting						
Language Inglês En-US 🗸 🗸						
All     General Data Test     General Data of Tested Device     Genevice     General Data of Tested Dev						
OK Cancel						

Figure 39

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's logo, for example. In addition, as the figure below highlights, it is possible to convert the report to .pdf and .rtf, therefore, this last format allows editing through Microsoft Office Word, even if the characteristics that make the report a fully produced document are lost by Conprove software.

![](_page_37_Picture_0.jpeg)

![](_page_37_Picture_2.jpeg)

Figure 40

![](_page_38_Picture_0.jpeg)

#### Appendix A - Terminal Diagram

![](_page_38_Figure_3.jpeg)

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![](_page_39_Picture_0.jpeg)

#### Appendix B - Technical Specifications

2 15 2	Operate	and	Reset	Level
	operate	CHI FOI	1100001	20101

	Attribute		Value
lop	Operate level		105 % I <sub>s</sub> , ±4 % or ±1 % I <sub>n</sub>
	Reset level		≥ 95 % lop
	Repeatability		±1%
	Variation	-10 °C to +60 °C	≤5%
	vanation	f <sub>nom</sub> ±5%	≤5%

#### 2.15.3 Operate and Reset Time

	Attribute		Value
	Starter operate time (2 2xls)		20 ms, ± 20 ms
		char = IEC-NI, IEC-VI, IEC-EI, IEC-LTI	$\begin{split} t_{op} &= \frac{K}{\left[\frac{I}{I_{e}}\right]^{\alpha} - 1} \times Tm , \\ \pm 5 \ \% \ \text{absolute or} \pm 40 \ \text{ms for TMS setting } (0.01 \ \text{to} \ 0.245) \\ \pm 5 \ \% \ \text{absolute or} \pm 30 \ \text{ms for TMS setting } (0.25 \ \text{to} \ 100) \\ \end{split}$ for char = IEC-NI : K = 0.14, $\alpha = 0.02$ IEC-VI : K = 13.5, $\alpha = 1.0$ IEC-EI : K = 80.0, $\alpha = 2.0$ IEC-LTI : K = 120.0, $\alpha = 1.0$
top	Operate time	char = ANSI-MI, ANSI-VI, ANSI-EI	$\begin{split} t_{op} &= \left[\frac{A}{\left[\frac{L}{lh}\right]^{p}-1} + B\right] \times Tm \;, \\ &\pm 5 \; \% \; \text{absolute or } \pm 40 \; \text{ms for TMS setting (0.01 to 0.245)} \\ &\pm 5 \; \% \; \text{absolute or } \pm 30 \; \text{ms for TMS setting (0.25 to 100)} \\ &\text{for char} = \; \text{ANSI-MI} : \; A = 0.0515, \; \text{B} = 0.114, \; P = 0.02 \\ &\; \text{ANSI-VI} : \; A = 19.61, \; \text{B} = 0.491, \; P = 2.0 \\ &\; \text{ANSI-EI} : \; A = 28.2, \; \; \text{B} = 0.1217, \; P = 2.0 \end{split}$
		char = DTL	ta, ± 1 % or ± 20 ms

Figure 42

#### Appendix C - Parameter Equivalence between Relay and Software

Table 2

Overcurrent S	oftware	Siemens Reyrolle 7SR1	0 Relay
Parameter Figure		Parameter	Figure
51-1 Curve	Figure 24	Gn 51-1 Char	Figure 11

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![](_page_40_Picture_0.jpeg)

51-1 Pkp	Gn 51-1 Setting	
51-1 Dial/Time	Gn Time Mult (IEC/ANSI)	
50-1 Pkp	Gn 50-1 Setting	Figure 12
50-1 Dial/Time	Gn 50-1 Delay	Figure 12
50-2 Pkp	Gn 50-2 Setting	Figure 12
50-2 Dial/Time	Gn 50-2 Delay	Figure 13