

## **TEST TUTORIAL**

**EQUIPAMENT**: Protection Relay.

BRAND: ZIV.

MODEL: DLF.

FUNCTION: 67 or PIOC - Directional Overcurrent.

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

**OBJECTIVE:** tests on the directional overcurrent function to prove the operating time, pickup and its directionality.

#### **VERSION CONTROL:**



Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	31/05/2022	M.R.C.	G.C.D.P.



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#### Statement of responsibility

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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 OVERCURRENT 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

For the relay power supply, connect the positive terminal (red) of the Aux. Vdc Source of 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. Then I1, I2 and I3 go to terminals 11, 13 and 15 of the relay and their common to terminals 12, 14 and 16, respectively. The figure below shows the procedure.







#### 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 ( <i>Binary Inputs</i> )	DLF( <i>Slot A</i> )			
BI1	OUT 1 (07 e 08)			
BI2	OUT 2 (09 e 10)			







#### 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.





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

🎌 Identificat	ion	×
User	zivercom	
Password	xxx	
Access level		-
	ОК	Cancel
	Figure 5	

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

🐹 ZIVercomPlus-2.13.3.0 db[3.47.3.0]						
File	View	IEDs	IEDs Configuration Help			
		Installations				
			1- S/S Example			
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Select the default file "SubExamples.sds" and click "Edit".

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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.



Modify Installation	
Installation Text	
S/S Example	OK
Protocol: PROCOME30  Communication type: LAN	Cancel
SERIAL Baud rate and associated parameters	
Baud rate: 38400	
Data bits: 8 - Set default values	YES
Stop bits: Time First character time Time	e between retries
Parity: Even 🚽 Message time (ms) 80 Num	ber of retrys
PSTN	
Modem: Telephone	****
LAN	
Transparent VIP Address: 10.0.0.184 Po	ort: 32001
M	Message time (ms) 5000

#### Figure 8

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

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		Figure 9		

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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".



р Dirección: 0		×
User: (MAX=32)		
****		
(MAX=32)		
******	OK	Canad
L	UN	

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, nominal voltage as 115.0V, nominal phase current as 5.0A and nominal frequency as 60.00Hz must be set.







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

W ZIVercomPlus-2.13.3.0 db[3.47.3.0]					- 🗆 ×
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X	🔳 🗗 🗗 Group 1 🖃 Group	1 active 🛛 🐴 🚇	🖬 📽 🚳 📗	\S/S Example\000-DLFA-2A2473BZ000000XDX0-2010551\Set	tings\Nominal Values
S/S Example S/S Example S/	Text  P Rominal IABC P Nominal IG P Nominal IG P Nominal IGPAR P Nominal VABC P Nominal Freq.	11         Current value           #         5           #         5           #         5           #         110           #         50	New value           5           5           115           60	Units       Information         A       (Causes device reboot)min=1, max=5, inc=4,         A       (Causes device reboot)min=1, max=5, inc=1,         A       (Causes device reboot)min=50, max=230, inc         Hz       (Causes device reboot)min=50, max=60, inc=         Hz       (Causes device reboot)min=50, max=60, inc=	Cont/25/2021 13:49

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.

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E- Settings	- ab Division	-		Max cars=64, def=		
	- ab Zone	-		Max cars=64, def=		
Date and Time	- ab Description 1	÷		Max cars=64, def=		
E Synchronization	- ab Description 2	# 100 B		Max cars=64, def=		
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🗄 <sup>1</sup> 👘 General	- EP Phase 1 CT Ratio	#		min=1, max=100000, inc=0.01, def=1		
H	- 🖅 Phase 2 CT Ratio	*		min=1, max=100000, inc=0.01, def=1		
	- NP Phase 3 CT Ratio	2		min=1, max=100000, inc=0.01, def=1		
B <sup>2</sup> dan Protection	- 🖂 Ground C.T. Ratio	#		min=1, max=100000, inc=0.01, def=1		
E	- XP Parallel CT Ratio	#		min=1, max=100000, inc=0.01, def=1		
Breaker Supervision	- XV Phase VT Ratio			min=1, max=100000, inc=0.01, def=1		
Coil Circuit Supervision	- E Busbar VT Ratio	#		min=1, max=100000, inc=0.01, def=1		
Schedule of Time	- 🖙 Ground VT Ratio	#		min=1, max=100000, inc=0.01, def=1		
B Buttons P1-P6	- 🗄 Capacitive VT	-		0=No, 1=Yes, def=No		
	Phase Sequence	#		0=ABC, 1=ACB, def=ABC		
B G = Records	- 🖃 IG Type	#		0=IN, 1=IG, def=IG		
Control Develops	🕀 🎦 Angle Reference					
B-	De Di Invert Polarity	#				
	PLL Enable	#		0=No, 1=Yes, def=Yes		
	Simultaneous Commands	-		0=No, 1=Yes, def=Yes		
					O B01/25/2	021 12-55



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.



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System Impedances	- 🖙 Phase 2 CT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
Fault Locator	- 🖅 Phase 3 CT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
Protection	- 🖙 Ground C.T. Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
E Control	- 🖙 Parallel CT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
	- 🖅 Phase VT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
Coil Circuit Supervision	- 🖙 Busbar VT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
Schedule of Time     Decilorranhy	- 🖅 Ground VT Ratio	# 1	min=1, max=100000, inc=0.01, def=1	
⊞*∰u Buttons P1-P6	<ul> <li>          Capacitive VT</li></ul>	# No	0=No, 1=Yes, def=No	
Voltage Transducer Monitoring	<ul> <li>Phase Sequence</li> </ul>	# ABC	0=ABC, 1=ACB, def=ABC	
Hecords	- 🖬 IG Type	# IG	0=IN, 1=IG, def=IG	
	🕀 📑 Angle Reference	#		
Records	Invert Polarity	#		
	- 🖶 PLL Enable	# Yes	0=No, 1=Yes, def=Yes	
	Simultaneous Commands	# Yes	0=No, 1=Yes, def=Yes	
			TD 🔲 RD 📃 logs 🗸 🚧 01/25/2021	13:57

Figure 15

#### 3.3. Phase Instantaneous > 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 unit 1 with a pick-up value of 8.0A, operating time of 1.5s, choose "Direction" and "67F". Then send the adjustments by clicking on the icon highlighted in green.





Figure 16

Note: The relay has three polarization modes through the "Phase IOC Direct Unit" field.

- 1. 67F = Quadrature Voltage Polarization;
- 67P 67Q = For three-phase faults, it uses polarization by positive-sequence voltage and for other types of faults, it uses negative-sequence voltage;
- 3. 67P = Positive sequence voltage polarization.

#### 3.4. Current Directional

Click on the highlighted "+" sign until you reach the "*Current Directional*" option. Set the maximum phase torque angle in the "*Phase Characteristic Angle*" field.



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	🖪 🗗 🚭 Group 1 💽	Group 1 active 🛛 🐴 🕒	2 🖻	00XDX0-2010551\Settings\Pro	otection\Directional\Current Directional
🖃 📹 S/S Example 🔒 🔨 🔨	Text	1T Current value	New value	Units Information	
E - E + 000-DLFA-2A24738Z000000XDX0-2010551	- 🔛 Phase Characteristic Angle	15	70	<ul> <li>min=-90, max=90, inc=1, de</li> </ul>	.f=15
	- 🗷 Neutr./Gnd Characteristic Ang	gle 75	75	<ul> <li>min=-90, max=90, inc=1, de</li> </ul>	:f=75
🖶 📲 🦣 Settings	- 🗷 NegSeq Characteristic Angle	75	75	<ul> <li>min=-90, max=90, inc=1, de</li> </ul>	:f=75
	- 🖾 PosSeq Characteristic Angle	75	75	<ul> <li>min=0, max=90, inc=1, def=</li> </ul>	:75
Date and Time	<ul> <li>E Lack of direction blocking</li> </ul>	Yes	Yes	0=No, 1=Yes, def=Yes	
	- 🖙 Min. Phase Voltage	1	1	V min=0.05, max=150, inc=0.0	)1, def=1
	- 🖾 Min. Neutr Voltage	3	3	V min=0.05, max=150, inc=0.0	/1, def=3
🕀 🔤 General	- 🖾 Min. Gnd Voltage	3	3	V min=0.05, max=150, inc=0.0	/1, def=3
Inputs Dutputs LEDs	- 🖾 Min. Neg Seq Voltage	1	1	V min=0.05, max=150, inc=0.0	)1, def=1
Fault Locator	- 🖾 Min. Pos Seq Voltage	1	1	V min=0.05, max=150, inc=0.0	)1, def=1
🖨 📑 Protection	- 🖾 Coordinating Time	0	0	ms min=0, max=30, inc=1, def=	:0
	- 🖂 Neutr Volt. Comp.	0	0	min=0, max=50, inc=0.01, d	ef=0
	- 🖾 Gnd Volt. Comp.	0	0	min=0, max=50, inc=0.01, d	ef=0
i → ■ 🚰 ■ Close Onto Fault	- 🖾 NegSeq Volt.Comp.	0	0	min=0, max=50, inc=0.01, d	ef=0
- Fuse Failure	▼ Neutral/Ground V_POL type	Vn	Vn	0=Vn, 1=Vg, def=Vn	
Power Swing Detector					
Remote Open Breaker Detector					
Directional					
⊡— <sup>∎</sup> ∰∎ Overcurrent					
*🖶 Unit 2					
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				TD 🕅 RD 🕅	🛛 🔤 🐼 🗩 🖾 01/27/2021 09:47:03

Figure 17

#### 3.5. Outputs

In order to test both the pickup and the overcurrent directional actuation time, 2 relay output binaries will be used to collect these signals by the test set. In the following figure, configure the first output as the start of phases A, B and C of instantaneous unit 1.



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Dead Line Detector	<u> </u>			TD 🗖 RD 🗖 logs 🗸	₩ 🗩 🖾 01/27/2021 09:52:39

Figure 18

Clicking on the "None" option, highlighted in the previous figure, make the following adjustment.

Signal 1		×
Signals		
Overexcitation Unit 2 Pick Overexcitation Unit 3 Pick Overexcitation Unit 4 Pick Overfrequency Unit 1 Pick Overfrequency Unit 2 Pick Overfrequency Unit 3 Pick Overfrequency Unit 4 Pick Overreaching Zone Pick L Phase A Differential Unit P Phase A Instantaneous Di Phase A Instantaneous Di	Up Up Up Up Up Up ick Up iferential Unit Pick Up iferential Unit Pick Up	^
Phase A Instantaneous Ur Phase A Instantaneous Ur	nit 1 Pick Up Condition nit 2 Pick Up	~
Signals groups	🗖 All signals	
Pickup protection outputs		-
<·	OK →	Cancel

Figure 19

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

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File View IEDs Configuration Help										S
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S/S Example 🔒	Text		11	Current value	New value		Units	Information		
E 600-DLFA-2A24738Z000000XDX0-2010551	– 💌 Signal	1	#	None	Phase A Insta	ntaneous Unit 1 Pick Up				
Configuration	— 🖃 Signal	2	#	None	Phase B Insta	ntaneous Unit 1 Pick Up				
E Settings	– 🖃 Signal	3	#	None	Phase C Insta	ntaneous Unit 1 Pick Up				
	– 👻 Signal	4	#	None	None					
Date and Time	– 💌 Signal	5	#	None	None					
	– 💌 Signal	6	#	None	None					
	- 💌 Signal	7	#	None	None					
🗄 📲 General	- 🗟 Signal	8	#	None	None					
Inputs Outputs LEDs	- 🗟 Signal	9	#	None	None					
	- 🗟 Signal	10	#	None	None					
🖽 🔤 📲 Virtual Digital Inputs	- 🗟 Signal	11	#	None	None					
🗀 – 🖶 Outputs	- 🗟 Signal	12	#	None	None					
E Slot A	- Signal	13	#	None	None					
	Signal	14	#	None	None					
🕀 🗝 📲 Digital Output 2	G Signal	15	#	Nene	None					
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E	- 💌 signal	10		None	None					
ti										
🗄 🚥 📲 Digital Output 7										
😟 📲 Slot B										
🗈 📲 System Impedances										
Fault Locator										
Protection										
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Fuse Failure										
Press and the beautife beletion										
							TD	RD 📕 logs 🗹 🔆 🤅	🔎 <sup>1</sup> 01/27/2021	09:58:09

Figure 20

On the second output, the tripping signals of phases A, B and C of instantaneous unit 1 will be configured.





Figure 21

ZIVercomPlus-2.13.3.0 db[3.47.3.0]	_			-		×
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E E + 000-DLFA-2A2473BZ000000XD×0-2010551	— 모 Signal 1	# None	Phase A Instantaneous Unit 1 Trip			
Status	- 🖃 Signal 2	# None	Phase B Instantaneous Unit 1 Trip			
Settings	- 💌 Signal 3	# None	Phase C Instantaneous Unit 1 Trip			
Nominal Values	Signal 4	# None	None			
	- Signal 5	# None	None			
Communications	- ▼ Signal 6	# None	None			
Synchronization	Signal 7	# None	None			
🕀 📲 General	Signal 9	# None	None			_
	E Signal 0	# Nene	None			
Transducers		# None	None			_
Inputs     Inputs     Inputs     Inputs	Signal 10	# None	None			
B	Signal 11	* None	None			
🖨 📲 📬 Slot A	Signal 12	# None	None			
🖻 — 📲 🚰 Digital Output 1	- 🗹 Signal 13	# None	None			
Equip Logic UH signals	- 모 Signal 14	# None	None			
	- 💌 Signal 15	# None	None			
🕀 📲 Digital Output 3	🖵 🖃 Signal 16	# None	None			
🕀 — 📲 🚰 Digital Output 4						
E Tige Digital Output 5						
E Slot B						
庄 🃲 Slot C						
😐 📲 📲 Virtual Digital Outputs						
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System impedances						_
Protection						_
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Distance Supervision						
Fuse Failure						
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Figure 22

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#### 4. Application Manager

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



Figure 23

#### 4.1. Overcurrent software adjustments

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

	Conprove Test Ce	enter
CONPROVE	Version 2.02.171	
General General Tests	Secondary Secondary Tests	Measurement Applications for measurement
Quick QUICK CLUX Calibration	Differential  Power Directional  Distance	🧟 Multimeter
Test Plan     Remote Generation	Master ₩ Meter ₩ Power Quality ↓ PSB 0os ► PSB 0os	Setup Equipment Set. / Tests Settings
Primary Primary Tests & CT	Lamp ↓ Harmonic Restraint Sequencer ¥ Synchronism	Ø Update Firmware Software Language
<ul> <li>✓ VT</li> <li>◆ Transformer</li> <li>☑ Resistance</li> <li>♀<sub>n</sub> PMaster</li> </ul>	Overcurrent       Transducer       Transient Playback       "Hz	Support Documentation and assistance
	Other         Additional aplications	Control     Forum     Forum     User Manual     ✓     Quick Guide     ✓     Self-diagnosis     P::     Denote A access
	Statistical Analysis	모급 Remote Access

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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.

<ul> <li>I isplay Software Options</li> </ul>	6710 (0301018)	- 0 X ^ (3
Channels Direc Hrd Set & GOOSE Set & Sync. Set *, SV Set Hardware	Next Point Clear test     Filings     Kore and Clear all     Filings     Kore and	
Pickup Time Test Settings		1
Insert/Edit Points	General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections	•
Inset/Edt     General Options       Edit Line     Text Point       New Line     Mult Relative to INom       Fault Type:     A-B-C       Remove     I Fault:       Remove All     Fault Angle:       State     330.0	Overcurrent     Date:       Descr:     Directional Overcurrent       Date:     Identif:       Tested device:     Identif:       Identif:     23031982       Type:     Une Protection       Ine Protection     Model       DLF     V       Location:     Substation:       Substation:     Conprove       Bay:     1       Address:     Vaconde de Ouro Preto 75, Custódio Pretira	Fault A-B-C Angle 330,0 ° Legent: Tet Line Points Tested Colors: NT OK Error Information: Current Point
Nº Fault Multiple Rel to Multiple Currer	City: Uberländia  V State: MG  V Responsible:	-m: -t
	Name: Michel Rockembach de Carvalho 🗸	
	Sector: Engineering V Registry: 0001 V	
	Tool Test:	
Type: Groups V 🛛 Fault 💟 Multiple 💟 IFR (	CE-6710 Series Num.: 03010187CCM33222211U5HVRGLGLGL2Z0RXO	Mult/Pkp
Errors List Protection Status  ON Line New	Default V Preferences OK Cancel	

Figure 25

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.



#### Ajustes Х Inform, Gerais Sistema Notas & Obs. Figuras Explicativas Check List Outros Conexões Geral < NO01 > > Sobrecorrente Impedância Fonte a m C OForward OF Frequência: 60 Hz b -\_mm\_ ſ'n'n Seq. de Fase: ABC с otência 3φ: 47,80 MVA **1 3 ≥** 1o: 15,93 MVA OR 1 Tensão Primária (FF): 13,80 KV ⊘† ≾∣ (FN): 7,97 KV Corrente Primária: 2,00 kA ₹ া≾ Tensão Secund. (FF): 115,0 V (FN): 66,40 V rente Secundária: 5,00 A RTP F: 120,0 Terra E Fase F Neutro N Desloc. D RTC F: 400.0 Correntes RTP D / RTP F: 1,00 Ter sões Va 5 la k p/ V0: 1,00 RTC E / RTC F: 1,00 FN Vb F 6 lb k p/ V2: 1.00 erter Polaridade Vc lc TP's F TC's F k p/ I0: 1,00 F 8 IF TP D TC E D 4 VD EP 9 IFP k p/ l2: 1,00 Default 🗸 Cancelar OK

#### INSTRUMENTOS PARA TESTES ELÉTRICOS

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.

#### 4.2. Overcurrent Screen > Definitions

In this tab you can adjust the directionality, the type of polarization, the curves display mode, the scale used and the time, current and angle tolerances. These tolerances should be consulted in the relay manufacturer's manual (available in Appendix A).

Figure 26



Settings	
General Overcurrent	Definitions       Overcurrent Elements         General Options <ul> <li>General Options</li> <li>Image: Curves Composition:</li> <li>Curve with the lower time</li> <li>Pickup Mode Settings:</li> <li>Pickup Definition:</li> <li>Setting in Amperes</li> </ul> <ul> <li>ATTENTIO</li> <li>You can not test individual components (Phase, Residual, Seq+, Seq- and Seq0) with different polarizations. because the software only works with one reference polarization to generate tensions and evaluate the results.</li> </ul> <ul> <li>Pickup Definition:</li> <li>Setting in Amperes</li> <li>Reference Value for Pickup:</li> <li>1.00 A</li> </ul> <ul> <li>Multiples for Tests of Seq- and Seq0</li> <li>Negative Seq::</li> <li>Image: Scale:</li> <li>Automatic</li> <li>Intel Scale Factor:</li> <li>1.00 A</li> <li>Pinal Scale Factor:</li> <li>Image: Factor defines the multiplier to be applied to the lower Multiple</li> </ul> <ul> <li>Absolute:</li> <li>Image: Factor defines the multiplier to be applied to the lower Multiple</li> <li>Image: Factor defines the multiplier to be applied to the lower Multiple</li> </ul> <ul> <li>Image: Factor defines the multiplier to be applied to the lower Multiple</li> <li>Image: Factor defines the multiplier to be applied to the lower Multiple&lt;</li></ul>
Default V	Preferences <u>O</u> K <u>C</u> ancel

Figure 27

#### 4.3. Overcurrent Screen > Overcurrent Elements > Phase

Here the overcurrent directional element is configured. To do this click once on the highlighted "+" icon.





For the first element change the name to 67, choose the type of curve like definite time, pickup value, operating time and dropout factor.





Figure 29

This relay has a particularity for actuation of your pick-up that is worth 5% more than the adjusted value (1.05), click on the *"Single Characteristic"* tab and make the following adjustment.



-	[							
General	Definitions Overcurrent E	lements						
Overcurrent	Phase Residual Seq +	Seq - Seq 0					+	• - •
	Nº Enab Desc	Curve		Pkp	Pkp [A]	Dial/Time	Drp	Colo
	1 🗹 67	Defined Time	-	8,00 A	8,00 A	1,50 s	0,950	
	Total Characteristic Sin	ngle Characteristic	Individual Dire	ctionality				
	Desc: 67 Curve: Defined Time Dial Settings: ial Dial/Time: 1.50 s Pickup: 8,00 A Dropout: 0,950	10.00 Δt: 0 s	2,0					·····
	Desc: 67 Curve: Defined Time Dial Settings: ial Dial/Time: 1.50 s Pickup: 8.00 A Dropout: 0.950	Δt: 0 s	2,0	1.0 2.0	5,0	10	20	1 [A] 50

Figure 30

Click on the "Individual Directionality" tab and make the following adjustment.





Figure 31

#### 5. Channel Direction and Hardware Configurations

Click on the icon illustrated below.





Then click on the highlighted icon to configure the hardware.



Figure 33

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



#### Settings × Master Slave 1 Slave 2 Main Sampled Value Others Binary Outputs: Auxiliar Source: Model CE-6710 Serial Number 05011197CCM33222211U5HVRGLGLGL2Z0RXD Initial State Initial State 250 V B01: N0 ∨ B02: N0 ∨ BO3: NO ~ Analog Outputs: 220 V BO4: NO Standard - Voltages: 110 V O 4 x 300 V; 100 VA BO5 and BO6 type: 60 V V1 🔵 🔘 O 2 x 600 V; 180 VA -∎N1 Conventional BO5: NO ~ 48 V V2 C O 2 x 300 V: 150 VA BOG: NO 🔿 1 x 600 V; 350 VA 24 V O IRIG (BO5) /Clock (BO6) O 1 x 300 V; 250 VA Other Off Transistor $\bigcirc$ TTL 110,00 V O Customized Assoc Binary / Analog Inputs: Connect VTs Standard - Currents: BI - Contact BI1: BI - Contact 🗿 6 x 32 A; 220 VA BI2: BI - Contact BI3: 🔿 3 x 64 A; 400 VA BI - Contact BI4: 2 x 96 A: 550 VA BI5: BI - Contact O 2 x 10,00 A; 300 VA BI - Contact BI6: O 1 x 192 A; 1100 VA BI7: BI - Contact 🔿 1 x 6,00 A; 360 VA BI - Contact BI8: BI9: BI - Contact BI10: BI - Contact BI11: BI - Contact Electromechanical: BI12: BI - Contact O 1 x 75 A; 700 VA Al 1-6 : 2V; 20V; 600V Al 7-12 : 200mV; 2V; 600V Considers absolute values to Voltage-BI 1 x 50 A: 700 VA Customized Assoc. Range 1,25 A Connect CTs <u>C</u>ancel <u>0</u>K

INSTRUMENTOS PARA TESTES ELÉTRICOS

Figure 34

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

Cha	nels Direct.		- 0	×
Local	Model Reset for Hard. Connected Set O Advanced		Confirm	
otes	Serial Number:	So GOOSE	Cancel	
Rem	05011197CCM33222211U5HVRGLGLGL2Z0RXD V V ON Line	<sup>5</sup> <sub>V</sub> S. Value	Import Export	-6

Figure 35



#### 6. Test structure for function 67

#### 6.1. Test Settings

On this tab, you must configure the pickup and trip signal direction with the binary inputs, in addition to configuring the generation channels. Insert a pre-fault with rated voltage and current.



Figure 36

#### 6.2. Pickup Screen

In this tab, click on "New Point" and choose the type of fault (all types available) and may also test dropout. The software searches for pickup and dropout (if selected) fully automatically. In the figure below, the "Type of Fault" ABC was chosen with an angle of 0° (you must choose an angle greater than 340° and less than 160°).





Figure 37

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





#### 6.3. Final Result of the Pickup Test

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



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





#### 6.4. Time Screen

On this tab, directionality and operating times are evaluated. For convenience, a sequence of values will be inserted, with current and angle variation. The value 10.00A was chosen as the initial value, 15.00A as the final value and 5.00A as the increment step and the ABC fault. In the angles choose 0.0° as initial value, for the step choose 25° and final value choose 360.0°.





Figure 40

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







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





It is verified that all times in the operating region (direct) are within the range allowed by the relay manufacturer and that in the reverse region there is no actuation.

#### 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.



Presentation Setting	×
Languag∈ Inglês En-US ∨	
<ul> <li>All</li> <li>General Data Test</li> <li>General Data of Tested Device</li> <li>Local of Installation</li> <li>Reference Values</li> <li>Hardware Settings</li> <li>Test Settings</li> <li>Overcurrent Settings</li> <li>Test Results</li> <li>Selected Simulation Charts</li> <li>Notes and Observations</li> <li>Explanatory Figures</li> <li>Check List</li> <li>Connections</li> </ul>	
OK Canc	el

Figure 43

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, this last format allows editing through Microsoft Office Word, although the characteristics that make the report a fully produced document are lost by Conprove software.





Figure 44



#### 8. Appendix A - Manufacturer Tolerances

#### **Overcurrent Elements**

Pickup of Phases, Ground, Neutral and Negative Sequence (static test) **±**3% or **±10mA** of the theoretical value (the greater) (In = 1A and 5A)

Note: the pick-up of overcurrent units takes place with a current value equal to 1.05 times the pick-up setting.

Reset of Phases, Ground, Neutral and Negative Sequence 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  $\frac{1}{2}$  cycle.

Mode	Time	Times	Time Measurement *	
	Setting	Pick up	50Hz	60Hz
Fixed Time	0 s	1.5	±22 ms	±21 ms
		5	±13 ms	±13 ms
		15	±12 ms	±12 ms
Fixed Time	> 0 s		±1 % of the setting or	±25 ms (the greater)
Inverse Time			Class 2 (E = 2) or ±35m	s (the greater)
			(UNE 21-136, IEC 255-	4)
			(for measured currents	of 100mA or greater)

(\*) The trip time, when the setting is 0 s, is reduced up to 5 ms using digital HSHD outputs.

Measuring time of a curve depending overcurrent unit is influenced not only by the time tolerance but also by the current pickup so both tolerances will be taken into account to calculate the accuracy of the unit.

Figure 45

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#### 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 46





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

Table 2						
Overcurrent S	Software	ZIV DLF Relay				
Parameter	Figure	Parameter	Figure			
Pol. :	27	Phase IOC Direct Unit	16			
67 Pkp	29	Phase IOC Pickup	16			
67 Dial/Time	29	Phase IOC Delay	16			
Direc	31	Phase IOC Direction	16			
ATM	31	Phase Characteristic	17			