

INSTRUMENTOS PARA TESTES ELÉTRICOS Test Tutorial

Equipment Type: Protection Relay

Brand: Schneider (Areva)

Model: <u>P632</u>

Function: 87 or PDIF Differential Percentage

Tool Used: CE-6006; CE-6710; CE-7012 or CE-7024

Objective: <u>Test Settings, Testing Point and Survey of</u> <u>Feature Slope</u>

Version control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial release	09/09/2021	M.R.C.	M.P.S



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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 tested should always be consulted.



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 tested and also be aware of safety standards and regulations.

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INSTRUMENTOS PARA TESTES ELÉTRICOS Sequence for 7UT61 relay tests in Differential software

1. Relay connection to CE-6006

Appendix A shows the relay terminal designations.

1.1 Auxiliary Source

Connect the positive (red terminal) of the Vdc Aux. Source to pin 7 on relay terminal (module X093) and the negative (black terminal) of Vdc Aux. Source to pin 8 of relay terminal (module X093).



1.2 Current Coils

To establish the connection of the current coils, connect I1, I2 and I3 channels to pins 1, 3 and 5 of the relay terminal (module X032) and those common to pins 2, 4 and 6 (module X032) . Connect I4, I5 and I6 channels to pins 1, 3 and 5 of the relay terminal (module X052) and the common ones to pins 2, 4 and 6 (module X052).



Figure 2



1.3 Binary Inputs

Connect the CE-6006 binary inputs to the relay binary outputs.

• BI1 to pin 2 and its common to pin 1 of relay module X092.

The following figure shows the details of the connections.



2. Communication with P632 relay

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



Then make the connection with the relay. The next step is to extra go all the information set in the relay. Right-click "Settings" and "Extract Settings".





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 "Diferenc".



3. Parameterization of the P632 relay

3.1 Function group DIFF

After double-clicking on the file, go to *"Parameters > Config. Parameters"* and then *"Function group DIFF"*. This option allows working with the differential.



Figure 7



3.2 *Main*

Click on the "+ > Functional parameters > Main". This screen adjusts the nominal frequency, the phase sequence, primary currents and voltages, and the secondary currents and voltages.

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3.3 PPS

Figure 8

Make sure that group one is active, click on the "*PPS*" option and make the following adjustment:

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3.4 Main

Click on the "+ > General functions > Main". In this option, the nominal voltages on each side of the transformer are adjusted.

MiCOM S1 Studio V3.4.1					
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🗉 🎯 System [Rockembach]	Name	Value	Address (X Y)	User pote	
😑 🧐 Device [P632]	Fct assign block 2	Without function	021 022		
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- Constructions	Trip cmd.block. USER	No	021.012		
Diferenc	Fct.assig.trip cmd.1	LOGIC Output 1 (t	021.001		
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- Hrequencia	Fct.assig.trip cmd.3	Without function	021.046		
Sobrecorrente	Fct.assig.trip cmd.4	Without function	021.047		
🔄 🗋 Sobretensão	Min.dur. trip cnd. 1	0.10 s	021.003		
MCL 61850	Min.dur. trip cnd. 2	0.25 s	021.004		
Measurements	Min.dur. trip cnd. 3	0.25 s	021.032		
Log Records	Min.dur. trip cnd. 4	0.25 s	021.033		
Disturbance Records	Latching trip end, 1	No	021.023		
	Latching trip cmd. 2	No	021.024		
	Latching trip end 3	No	021 025		
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>					
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3.5 *Diff*

Figure 10

In this field, the nominal power of the transformer is set.

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Bod	Latching trip cmd 1	No	021 023		
Direrenc	Latching trip cmd 2	No	021 024		
Frequência	Latching trip cmd 3	No	021 025		
Sobrecorrente	Latching trip cmd 4	No	021 026		
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	- W Evaluation IN, end b	Calculated	016.097		
	Hold time dyn.param.	Blocked	018.009		
	😑 🥭 DIFF				
	General enable USER	ies	019.080		
	W Reference power Sref	38.1 MVA	019.016		
	🛛 🖾 Ref. curr. Iref.a	0.200 KA	019.023		
	- 🙃 Ref. curr. Iref,b	2.000 KA	019.024		
	🏠 Matching fact. kan,a	1.000	004.105		
	🔬 Matching fact. kan,b	1.000	004.106		
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	🔒 🛅 Parameter subset 3				
	🕀 📴 Parameter subset 4				
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	🕀 🧫 Events				

Figure 11

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3.6 Main

Click on the " $+ > Parameter \ subset \ l > Main$ " to adjust the CT connections.

System [Rockembach] Connections	View + ZF	ChiPoszibilerenc Rockenba	chiroban requeitica			
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Connection Connectic		Latching trip cmd. 3	No	021.025		
🕞 🍋 Settings		Latching trip cmd. 4	No	021.026		
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Subrecorrente		🛶 🦞 Param subs.sel. USER	Parameter subset 1	003.060		
Sobretensão		Keep time	Blocked	003.063		
MCL 61850	B-0	SEMON				
Measurements	· · · ·	FT_RC				
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🔤 🛅 Disturbance Records	B-1	늘 MAIN				
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		- 🌱 Vnom prim., end b	11.0 kV	019.018		
		🖤 Evaluation IN, end a	Calculated	016.096		
		—	Calculated	016.097		
		Hold time dyn.param.	Blocked	018.009		
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		- V General enable USER	Yes	019.080		
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	Events	2000				
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3.7 *DIFF*

Click on the "+" sign near to "*Diff*" and then adjust the lag between the windings, percentage differential values, instantaneous differential, slopes and knee point.

MiCOM S1 Studio V3.4.1								
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à 🚰 🗐 •	View • 27 File comments 20 Save as 12 Core barameter subset							
= 🔘 System [Rockembach]	Name	Value	Address (X.Y)	User note				
Device [P632]	Hold time dyn.param.	Blocked	018.009					
😑 🦢 Connections	DIFF							
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	Op.mode rush rst.PS1	Without	072.148					
	RushI(2f0)/I(f0) PS1	20 %	072.159					
	0-seq. filt.a en.PS1	Yes	072.155					
	0-seq. filt.b en.PS1	Yes	072.156					
	Overflux.bl. en. PS1	No	072.158					
	Ov. I(5f0)/I(f0) PS1	20 %	072.160					
	Op.del.,trip sig.PS1	0.00 s	010.162					
	Hyst. effective PS1	Yes	072.006					
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	😠 🛅 Parameter subset 3							
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	🕫 🛅 Operation							
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	<		10		>			

Figure 13

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3.8 OUT

Click on "*Config. Parameters*" and then "*OUT*". In this option, the binary outputs are designated with the trip signals.

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	FCt. assignm. K 902	without function	150.196		
	FCt. assignm. K 903	Without function	150.199		
	- V Fct. assignm. K 904	DIFF Trip signal	150.202		
	Y Fct. assignm. K 905	Without function	150.205		
	Fct. assignm. K 906	Without function	150.208		
	Fct. assignm. K 907	Without function	150.211		
	Fct. assignm. K 908	Without function	150.214		
	Oper. mode K 901	ES updating	150.194		
	Oper. mode K 902	ES updating	150.197		
	Oper. mode K 903	ES updating	150.200		
	Oper. mode K 904	ES updating	150.203		
	Oper. mode K 905	ES updating	150.206		
	Oper. mode K 906	ES updating	150.209		
	Oper. mode K 907	ES updating	150.212		
	Oper. mode K 908	ES updating	150.215		
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Figure 14

After making all the adjustments, right-click on the *"Parameters"* folder and send the changes to the relay.

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4. Differential software settings

4.1 Opening the Differential

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



Make a click on the software icon "Differential".



Figure 17

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🔟 🗋 💕 🛃 🚽 Differential 2.02.160 (64 Bits)) - CE-6006 (1730616)	- 0 ×
Channels Direc. Connection	Settings X General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections	
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	Tool Test:	
✓ IDiff and iRest ✓ Operating Region	Default V Preferences OK Cancel	
Errors List Protection Status ON Line New	Aux Source: 0,00 V Heating: 0%	

Figure 18

4.2 Configuring the Settings

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.

💯 🗋 🗃 🚽 Differential 2.02.160 (64 Bits) - CE-6006 (1730616)							
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Channels Direc.	Start Stop Next Point	Image: Waveform Image: Waveform <td< th=""></td<>					
Hardware	Generation	Options					



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



General	General Inform.	System N	otes & Obs. Explanatory Figures	Check List Othe	rs Connections	
	Test:					
Differential	Descr:	Differential Fun	oction	Date:		
	Tested device:					
		Identif:	23031982	Model	P632	~
		Type:	Transformer Protection	Manufacturer:	Areva Schneider	~
	Location:					
		Substation:	CONPROVE			~
		Bay:	1	~		
		Address:	Visconde de Ouro Preto, 75 - Custóo	dio Pereira		~
		City:	Uberlândia	~	Sta	ate: MG ∨
	Responsible:					
		Name:	Michel Rockembach de Carvalho			~
		Sector:	Engineering	 Registry: 	00001	\sim
	Tool Test:					
	CE-6006		Series Nur	n.: 17306166302101	110011XXX	
¥						

Figure 20

4.3 System

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

Settings		×
General	General Inform. System Notes & Ol	bs. Explanatory Figures Check List Others Connections
	Nominal Impedance Source Frequency: 60 Hz ~ Phase Seq.: ABC ~ 3φ power: 4.78 MVA 1ψ: 1φ: 1.59 MVA 1ψ: Primary Voltage (FF): 13.80 KV (FN): (FN): 7.97 KV Primary Current: Secondary Voltage (FF): 115.0 V (FN): G6.40 V Secondary Current: 1.00 A	
v	VTR F: 120.0 CTR F: 200.0 VTR D / VTR F: 1.00 CTR E / CTR F: 1.00 Invert Polarity: VT's F CT's F VT D CTE	Phase F Neutral N Ground E Displ. D Voltage 1 Va 5 Ia k to V0: 1.00 FN 2 Vb 3 Vc F 6 Ib k to V2: 1.00 J Vc E 8 IE k to I0: 1.00 D 4 VD EP 9 IEP k to I2: 1.00
Default 🗸		Preferences QK Cancel

Figure 21

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There are other tabs where the user can enter notes and observations, explanatory figures, can create a *"check list"* of the procedures for carrying out the test and even create a schematic with all the schematic of the connections between the test set and the test equipment.

5. Differential Adjustment

5.1 Differential Screen > Protected Equipment/CTs

This tab should - inform the protected equipment, the number of windings, nominal voltage, nominal power, the primary and secondary currents of the main CT's and the currents of the auxiliary CT if necessary. This test uses the settings for a relay that is protecting a transformer. However, it is possible to test protections of bus, generator, motor and line. For transformer protection there is the possibility of testing up to four windings automatically.

ettings		-					×
General	Protected Equipment/CTs	Adjust Prot. Di	fferential				
Differential	- Protected B	Equipment					
Differential	Equipme	ent Transformer//	Auto Transf 🗸 🗸	Nº of Phases	s: 3Ø ∨ Nº of	Wnd.: 2 🗸	
	Descripti	on Voltage	Power	Connection	Vector Group G	rounded	
	Wnd. 1	110,0 KV	38,10 MVA	D 🔻			
	Wnd. 2	11,00 KV	38,10 MVA	у 🗸	1 (30°) 🔻 📝	Yes	
	CTs Main CT	s Auxiliary CTs	3	Enable A	uxiliary CTs		
	Wnd, 1	200.0 A	200.0 A	1.00 A	Yobi 🔻	tor Grou	
	Wnd. 2	2,00 kA	2,00 kA	1,00 A	Yobj 💌		
~							
Default 🗸					Preferences	<u>О</u> К	<u>C</u> ancel

5.2 Differential Screen > Adjust Prot. Differential > Settings



The initial default for the "*Data Entry*" field is set to "*User*", thus all other settings such as TAP, lag compensation, mismatch correction, measurement current type, reference winding for calculations and Zero sequence elimination options are enabled so that the user can, according to the relay, perform the adjustment correctly (Free Configuration). This method allows the user to test any type of differential relay, but it requires more knowledge of the relay.

To facilitate data entry, the settings of the main relays available on the market have already been standardized. When selecting one of the lists of relays, only the configurable settings are enabled. Choose the "AREVA MiCOM P631/P632" mask.

Settings			>
General Protected B	Equipment/CTs Adju	st Prot. Differential	
Settings	Slope Definition		
Differential	Data Entry:	AREVA MiCOM-P631/P632	~
	Differential Settings	User ABB REB-670 (BCZTPDIF, BCZSPDIF)	Current Tolerance
	Pickup: 0,30 In	ABB REB-670 (BUTPTRC, BUSPTRC) ABB RET/REG-316 (BETA)	Relative: 5.00 %
	Time: 0,00 s	ABB RET-521 (BETA) ABB RET-543	Absolute: 0,10 In
	Restriction Current	ABB RET/RED-615 ABB RET/REG-620/630	Time Tolerance
	(lp + ls) / K	ABB RET/REG/RED-6/0 ABB SPAD-346C	Relative: 10.00 %
	K: 2	AREVA KBCH 120, 130, 140 AREVA MICOM-P34X	Absolute: 50,00 ms
	General Options	AREVA MICOM-P631/P632 AREVA MICOM-P633/P634 MICOM-P54X (RETA)	
	TAPs: CTs INominal	MICOM-P64X GE 345 (BETA)	nsation:
		GE 489 GE 845/869/889	 Before Leq: After 1 2 3 4 5
	Reference Wnd.for Calculations (In):	GE DTP GE SB745	
	Mismatala Calaulata	GE SR745 (Firmware até 1999) GE T60 (Firmware até 3.5)	
	Reference Wood for	GE T60/G60/M60 INGETEAM PD250	
	Mismatch Correction:	NARI PCS-978 Revrolle 7SG14 DUOBIAS-M	
	Use in correction (SCHNEIDER P3T32 SCHNEIDER Sepam 80 (T)	
	Zero Sequence E	SCHNEIDER Sepam 80 (M) (BETA)	<u> </u>
Defention		Γ	
			Preferences <u>UK</u> <u>Cancel</u>

Figure 23

Parameterize the "*Differential Settings*" and "*Instantaneous Settings*". Set the time to 0.0s. Use the tolerances for current and time given in the Appendix A.



neral Protected	Equipment/CTs Adjust Prot. Differential
Settings	Slope Definition
erential	Data Entry: AREVA MiCOM-P631/P632 ~
	Differential Settings
	Pickup: 0.30 lp Pickup: 5.00 lp Relative: 5.00 %
	Time: 0,00 s Time: 0,00 s Absolute: 0,10 ln
	Restriction Current Angle Time Tolerance
	(lp + ls) / K Relative: 10.00 %
	ADSolute: X: 2 3.00 ° Absolute: 50.00 ms
	General Options Phase Shift Compensation:
	TAPs: CTs INominal Fixed Angle 1 Before Leg: Side:
	Reference Wnd, for Calculations (in):
	Mismatch: Calculated V
	Reference Wnd. for Mismatch Correction: NO
	Use in correction O CTR Iprim CTs
	Zero Sequence Elimination
~	
~	Preferences <u>O</u> K

5.3 Differential Screen > Adjust Prot. Differential > Slope Definition

On this screen, the values of the slopes and the "*Ir*,*m*2" must be entered.



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6. Channel Direction and Hardware Configurations

Click on the icon illustrated below.



Figure 26

Then click on the highlighted icon to configure the hardware.

Channels Direct.							– 🗆 X
Model Reset for Hard. CE-6006 CE-6006 Connected Serial Number: 03207116302101110011XXX	Set	O Basic ● Advanced ♥ ON Line [©] S	GOOSE 3. Value	Adapt I/Os Autoassociate Clean	Nodes: Autoasso Clear	ciate 💌	Confim Cancel
Outputs: Analog. and SV Inputs: Analog.	and SV O	utputs: Binary, GOOSE and	d Analog DC	Inputs: Binary, GOOSE	and Analog. DC	Logical	
K < NO01 > >					Analog Outputs	Sampled Value Out	puts 🔍 🚿
1/18		Corward Cor	rd 💿 🜩 🛛 [Voltage Channels		$ \mathbf{Y} \cdot + \mathbf{v} = \mathbf{v}$
Nominal Line Source			[[_		Descr. Ha	rdware Noo	le Point
Frequency: 60 Hz 🗸		3 					
Phase Seq.: ABC 🗸	Ц		36				
3φ power: 4,78 MVA		h					
1φ: 1,59 MVA			3E				
Primary Voltage (FF): 13,80 KV							
(FN): 7,97 KV		_	3E				
Primary Current: 200,0 A							
Secondary Voltage (FF): 115,0 V			-				
(FN): 66,40 V					Current Channels		𝛛 ▾ ┿ ▾ ━ ▾
Secondary Current: 1,00 A	Voltage	Channel	Currents	Channel	Descr. Ha	rdware Noo	le Point
VTR F: 120,0	1 V	a ~	5 la	$AO_{101} \sim \Sigma$	AO_101 11	 NO0)1 💌 la 💌
CTR F: 200.0			7 10	AO_102 V Z	AO_102 12		
VTB D / VTB F: 100	Vab	· · · · · · · · · · · · · · · · · · ·	E 8 IE		AO 104 14	▼ NO0	12 ▼ la ▼
	FF Vbc	~	EP 9 IEP	~	AO_105 15	▼ NO0	12 🕶 lb 💌
Reverse Polarity	Vca	\sim			AO_106 16	▼ NO0	12 🔻 Ic 💌
VT'sF □CT'sF	D 4 V) v					
	Calc. k.V	~	Calc. k.I0	~			
	k.V2		k.l2	~			
L Equal Parameters Among Nodes	k to V0 1.	00 to V2 1,00	k to 10 1,00	to 12 1,00	ļ		

Figure 27

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





Figure 28

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

Cha	nnels Direct.			— 🗆 X
Local	Model Reset for Hard.	Basic		Confirm
v	CE-6006 V Connected	Set O Advanced	Se GOOSE	Cancel
ote	Serial Number:		50	
Ren	03207116302101110011XXX	ON Line	s _☉ S. Value	Import Export
				• •

Figure 29

7. Test Structure for Function 87

7.1 Test Settings

In this tab, the trunk channels are associated with the relay phases; the trip signal is configured with the binary input.



💯 🗋 📷 🔙 🚽 Differential 2.02.16	50 (64 Bits) - CE-6006 (1730616)				– ō ×
Arquivo Home Display Soft	ware Options				~ ()
Channels Direc.	et Start Stop Vext Point	Settings Waveform System Hears Relay Image: SEL System	Present Report	Recreate Restore Charts Layout	
Hardware	Generation	Options	Report Units	Layout	
Test Set Point Test Search Test	Test Settings				
Generation Channels Direc.	Enable Pre-Fault 1	Enable Pre-Fault 2			Test Set
Wnd Phas Gen. Channel	-				Wait Time for Data Entry: 60,00 s
01 lb AO I02 (Hrd: I1)	-				Mult. Tolerance: 1,00
01 lc AO_I03 (Hrd: I3)	-				Point Test
02 Ia AO_I04 (Hrd: I4) -					Wait Time for Operation: 100.00 ms
02 Ib AO_105 (Hrd: 15) 🕶					
02 lc AO_106 (Hrd: 16) -	ļ				Search Test
01 Va ·	-				Initial step: Absolute Resolution: 100,00 mA
01 Vc	-				Min. Resolution > Relative Resolution: 0,50 %
02 Va	-				Wait Time for Operation: 400,00 ms
02 Vb 👻					Disconsider the characteristic in Search
02 Vc 👻					Pulsed Search (Stop every increment)
Binary Outputs & Goose - Fault	_				Multiple of Tolerance for Verification Test: 1,10
BO 0; 0; 0; 0; 0 •	•				General Reset Time: 100,00 ms
Simulate Sampled Value Error					Nº of repetitions in case of generation error: 2 ~
Generation Limits	Test Mode	_			Stop the test at the first failure
I Max. Gen. per Chn. by hard	Mode Intelligent	*			Protection Status Verification Start/End of Test 🗸
Use Hardware Limit	Variation of RMS and Angle	_			Ignore Pre-Fault operation
Stop Interf. BI01 (Hrd: BI1) V	Stop Logic Initial NA	~			
Trigger Interf. Software 🗸	Trigger Logic				Based Only on Generated Values
Wait for PPS	Trigger Delay 0,00 s				Cycle to Cycle Generation
🚯 ON Line New		Au	x Source: 110,00 V	leating: 0%	
				_	

Figure 30

8. Point Test

For the point test, click on the "New Point" field and choose the fault type, and the differential and restraint current values. Then click on the confirm button.

💴 🗋 📂 💭 🔫 Arquivo Home	Differential 2.02.160 Display Softw) (64 Bits) - CE-600 are Options	06 (1730616)										× ^ 🛛
Channels Direc.	్టిం GOOSE Set t ్ర SV Set ion rare	Start Stop	> Next Point Clear test Clear all eration	Settings SEL Options	m \infty System 🗃 Relay	Present Report Report	Cycles	Recreate Charts Layou Layou	re View tt ×				
Test Set Point Test	t Search Test	Test Settings					_						
Insert/Edit Points Insert/Edit Points Edit Point Edit Point New Boint Sequence Bemove Remove All	General Options Data Entry: Source Location: Winding1 Fault Location: Winding2 Fault Type: A-B-C	IDiff and iRe	est	Currents IE IRe <u>C</u> onfi	Niff: 1.00 In est: 2.00In Check	Cancel	 Syster 9,00 8,00 7,00 6,00 5,00 	n / Relay Deta	ls (Diagram)	Chart	Waveform Y P	hasors I	Legend: Points Not Tested Points Tested Colors: Not Test. Passed Fail Information: Current Point - Diff.
Test Points Points Tested No Fault	Diff IRes	t Region	Operated	Time Time	Status		4,00	/					- Nest
				Nominal Real	5,0005		3,00 - 2.00 - 1,00 -	+				iRest	
🗹 IDiff and iRest 🗹	Operating Region	Z Time					0			10,0	00	20,00	
Errors List Prot	tection Status												
🚯 ON Line	New				Au	ix Source: 1	110,00 V He	ating: 0%					
						Fig	ure 31						

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Another way is to use the *"Sequence"* feature of points by choosing the values of *"Initial"*, *"Final"* and *"Step"*. This way the software automatically creates the points.



Click on the icon highlighted below or use the command "Alt + G".



It is verified that all points were successfully approved.



<u>//</u> D	💕 🛃 👳 l	Differentia	I 2.02.160 (64	1 Bits) - CE-600	6 (1730616)																	- 0	×
Arquivo	Home	Display	Software	Options																			~ 🤇
Channels Direc.	Hrd Set	et 🧐 GC et 🔍 SV	DOSE Set / Set	Start Stop	> Next Poin Clear test	t 🗲 Settings	₩ Waveform → Phasors SEL	🐼 System	Present Report	Seconds	Recreate Charts	Restore Layout	View										
	Hard	ware		Gene	ration		Options		Report	Units		Layout											
Test Set	Point Ter	st Search	Test Tes	t Settings																			
Inse	rt/Edit Point	s								✓ Syste	n Rela	y Details	Diagram	Cha	rt 🛛	/avefor	m	hasors					-
Insert/Ed New Sequ Rem C Test Points Ti	it Points Point Point Point Point Point Points ested	General O Data En Source Le Winding1 Fault Loca Winding2 Fault Type A-B-C	ptions try: cocation:	IDiff and iRe	est		Currents IDH IRes	ř: 5.27 ln 4: 11.50 ln		6,00 5,00 ↓ ↓ 3,00	Dif [In]					•	•	•	•	•	•	Legend: Points Not Tee Points Tested Colors: Not Test. Passed Fail Information: Current Point: - IDiff. - Rest	sted
No.	Fault	IDiff	IRest	Region	Operated	Time Nominal	Time Real	Status		^					/	Ó							
22	ABC	4,72 In	10,50 In	No Operation	No	-	-	Passed		2,00		/		/	•								
23	ABC	5,27 In	10,50 In	Operation	Yes	0 s	24,73 ms	Passed		1.00													
24	ABC	4,72 In	11,50 In	No Operation	No	-		Passed		1.00													
25	ABC	5,27 In	11,50 In	Operation	Yes	0 s	24,34 ms	Passed		~ ₀	•									IRe	st [In]		
Diff a	and iRest] Operating I	Region 🗹	Time						0	1,00	2.00 3	,00 4,0	0 5.00	6,00	7,00) 8,00	0 9.00	0 10,0	00 11.0	0 12.		
		Lection 3ta										00/											
C# UN	Line	INEV	v					AL	ix source:	H 0,00 V	aung:	0%											



9. Search Test

To carry out the search test, click on the "New Line" field, choose the type of fault, the restraint current value and confirm.

💯 🗋 💕 🔙 🗸 D	ifferential 2.02.160 (6	i4 Bits) - CE-6006 (1730616)										×
Arquivo Home	Display Software	e Options										^ 🕐
Channels Direc.	୍ଟ୍ରେ GOOSE Set ୭ _୦ SV Set	Start Stop Clear all	Settings	Present Report	Seconds Cycles	Recreate Restore Charts Layout	View					
Hardwa	re	Generation	Options	Report	Units	Layout						
Test Set Point Test	Search Test Te	st Settings										
Insert/Edit Points				-	System	m Relay Details ((Diagram)	Chart W	aveform Pha	sors		-
Inset/Edt Lines Line Edt New Line Sequence Remove Al Test Points Points Tested Ne Fault I	General Options Data Entry: Source Location: Winding1 ~ Fault Location: Winding2 ~ Fault Type: A-BC ~ Rest IDiffNom	IRest IRes	t; 2.50 h	1.00 In Points 10 Cancel	6.00 - 5,00 - 4,00 - 3,00 - 2,00 -	Dif [in]						egend: • Found Points • Found Points Colon: Not Test. Passed Fail nformation: Jurrent Point: • IDiff: • Rest:
Diff Nom. V IDiff I	Real				02	1,00 2,00 3	3,00 4,00	5,00 6,00	7,00 8,00	9,00 10,00	11,00 12,	
Errorr Lict Drote	ustion Status											
ON Line	New		Au	x Source: 110,0	00 V He	ating: 0%						
L				Figu	re 35							



There is also another way to add test lines, by adding a search string. To do this, just click on the *"Sequence"* button and select the initial and final restriction currents of the search and the step between them.



Click on the icon highlighted below or use the command "Alt + G".



It is verified that all lines were successfully approved.







10. Report

After finishing the test, click on the icon highlighted 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.

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

Figure 39





Figure 40



APPENDIX A

A.1 Terminal Designations



Figure 41





Figure 42



A.2 Technical Data

Differential protection

 $\frac{\text{Measuring System}}{\text{Deviation for } I_{\text{diff}} \ge 0.2 I_{\text{ref}}: \pm 5 \%$

Inrush Stabilization Deviation: ± 10 %

Figure 43

Differential Protection Operating time at I_d = 10·I_{diff}> with harmonic blocking disabled or at I_d > I_{diff}>>>: min. 13 ms / typ. 15 ms Operating time at I_d = 2.5·I_{diff}> with harmonic blocking disabled: min. 19 ms / typ. 21 ms Operating time at I_d = 2.5·I_{diff}> with harmonic blocking enabled: min. 30 ms / typ. 33 ms

Figure 44

APPENDIX B

Equivalence of software parameters and the relay under test.

Table 1				
Differential Software		Areva P632 Relay		
Parameter	Figure	Parameter	Address	Figure
Voltage (Wind. 1)	22	Vnom prim. , end a	019.017	10
Voltage (Wind. 2)	22	Vnom prim. , end b	019.018	10
Power (Wind. 1 and 2)	22	Reference power Sref	019.016	11
Vector Group (Wind. 2)	22	Vec. Gr. end a-b	019.010	13
l Prim (Wind. 1)	22	Inom C.T. prim. , end	019.020	08
		а		
l Prim (Wind. 2)	22	Inom C.T. prim. , end	019.021	08
		b		
I Sec (Wind. 1)	22	Inom device, end a	010.024	08
I Sec (Wind. 2)	22	Inom device, end b	010.025	08
Differential Settings (pickup)	24	ldiff >	072.142	13
Instantaneous Settings	24	ldiff >>>	072.144	13
(pickup)				
m1	25	m1	072.145	13
m2	25	m2	072.146	13
IR, m2	25	IR, m2	072.147	13