

Test Tutorial

Equipment Type: Protection Relay

Brand: SIEMENS

Model: <u>7SA86</u>

Function: 25 or RSYN – Synchronism

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

Objective: <u>Test when two systems can be connected respecting</u> <u>voltage, frequency and angle limits, that is, if they are in</u> <u>synchronism.</u>

Version Control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial Version	28/09/2021	M.R.C.	M.P.S



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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 <u>suporte@conprove.com.br</u>.

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 testing the 7SA86 relay in the Synchronism 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 B1 in "*slot 2B*" of the relay and the negative (black terminal) of the Vdc Aux. Source to pin B2 of "*slot 2B*".



1.2 Voltage Coils

Connect the V1, V2, V3 and V4 voltage channels to pins B1, B3, B5 and B7 in "*slot 1B*" of the relay, then the four common voltage channels to pins B2, B4, B6 and B8 of the relay.





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1.3 Binary Inputs

Connect the CE-6006 binary inputs to the binary outputs in "slots 1B and 1C" of the relay terminal.

- BI1 to pin B09 and its common to pin B10;
- BI2 to pin B11 and its common to pin B12.

The following figure shows the details of these connections.



1.4 Binary Outputs

Connect the CE-6006 binary output to the auxiliary power supply red terminal. Connect auxiliary source common to relay pin D1. Finally connect the binary output common to pin C13 of the relay.







2. Communication with 7SA86 relay

First connect a USB cable from the notebook with the relay. Then double-click on the software icon and "*DIGSI 5*".



When opening the program, click on the "Project" option and choose the "New" option.



Figure 6

Enter a name for the project and then click "Create", as highlighted below.



Create a new project	×
Project name:	75A86_25
Path:	C:\Users\Suporte\Documents\Automation
Author:	Suporte
Comment:	<u>^</u>
	×
	Create

Figure 7

When creating the project, add the relay that will be tested, to do this double click on "Add New Device" as highlighted below.

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				Figure 9					

Figure 8

Enter the relay short code located on its side, then click "Verify" as highlighted below.



aa new aevice	
Step 1: Select device type	
Enter short product code (TNS) or paste long product code	P1A115092 Verify
or configure in Hardware and protocols Editor:	Configure
Step 2: Select device properties	
Voltage variant:	
Integrated Ethernet interface (port J):	
Significant feature:	
Select function-point class:	
Step 3: Select application template	
Application-template selection:	
Step 4: Select communication versions	
Communication configuration:	
Open Hardware and protocols Editor after device creation	
Update short product code (TNS) list	OK Cancel

Figure 9

Select the highlighted "*Template*" whose firmware version is consistent with that of the relay (To verify, just look at the relay HMI when it is turned on). Then click "*OK*".

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Figure 10

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Note that a generic relay has been added (highlighted in green below). The next step is to establish communication with the equipment, for that go to the "Online" menu and choose the option "Connect to device and retrieve data".





After establishing communication with the relay, it is necessary to read the parameterized configurations. Right-click on the relay icon (highlighted in green in the previous figure) and choose the option "Update configuration from target device".

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	Properties Alt+Enter		

Figure 12



Click "Yes" for the following message:





Update Update	configuration from target device X
Status	Update results
8	Successfully updated the offline configuration from the target device.
	Save result
	ок

Figure 14

Export the created file in .dex5 format in order to have a backup of the settings. Right-click on the relay icon and choose the *"Export..."* option.



Figure 15



There are other ways to extract information from Siemens Siprotec 5 relays, but the displayed mode is practical for those who will commission a relay already parameterized and installed in a panel.

3. Parameterization of the 7SA86 relay

3.1 Measuring-points routing

After the connection has been established, open the device section "7SA86". Then choose the "Measuring-points routing" option. Under "Voltage-measuring points" change the "Connection type" field to the "3 ph-to-gnd voltages" option.

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Figure 16

Click on the "Add new" button to add the fourth voltage channel choosing the "Type" as "1-phase".





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Set the voltage that will be used for synchronism, "VA" in this case.

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Figure 18

3.2 Function-group connections

Choose the option *"Function-group connections"* and configure who is system 1 and system 2 used for synchronism.

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Figure 19



3.3 Device Settings

After the connection has been established, open the device section "7SA86". Then open the "Settings" section, finally choose the "Device Settings" option. Check that group 1 is active, that the nominal frequency is 60Hz and that the minimum operating time is zero seconds.

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Figure 20

3.4 Power System - General

Open the "Power System" section and select the "General" option. Check the parameterized phase sequence.

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E-mail: conprove@conprove.com.br



3.5 Meas. Point V-3ph 1

Select the option "*Meas. Point V-3ph 1*". Adjust the values of primary, secondary voltages and magnitude compensation factor for the first winding and disable the supervision functions. Click on the "*Info*" tab to hide it and enlarge the settings window.

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Figure 23

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Figure 24

3.6 Meas. Point V-3ph 1

Select the option "Meas. Point V-1ph 1". Adjust the primary, secondary voltage values and magnitude compensation factor for the fourth voltage input.



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Figure 25

3.7 General

Open the "Line 1" option and double-click the "General" option to carry out the nominal adjustments for voltage and current. Configure line data.

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3.8 Inserting function 25

Click on the "Libraries" option and follow the path "Global DIGSI 5 Library > Types > Line protection > 7SA86 Distance prot. 3pole > FG Circuit breaker > 25 Synchronization". Drag the "25 Synchronization" sign onto the "Circuit breaker" icon and release.

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	Figure 27	

Figure 27

3.9 25 Synchronization

Double-click "25 Synchronization" to adjust the synchronism function. Initially set the angle of the power transformer, in this case equal to zero. Activate the "Synchrocheck 1" function configure the minimum and maximum voltage values and the synchronism check time.



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Figure 28

Set the minimum and maximum differences in voltages, frequencies and angles allowed for synchronism.

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Figure 29



3.10 Information Routing

The "Information Routing" option associates the command to check the synchronism and the synchronism command. For easier viewing maximize the window.

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Figure 30

The first columns are associated with the binary inputs of the relay. In this case, the following adjustment signal is used as "H", that is, when this input is with voltage, the relay checks the synchronism, if there is no voltage, it interrupts the synchronism check. Enter the options "*Circuit breaker 1* > 25 *Synchronization* > *Synchrocheck*".



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Associate the sign "*Release close cmd*." to exit 1.1. Look at the columns for this signal "*Destination* > *Binary output* > *Base module*".





The option "U" must be used, which means "Unlatched" (without seal), that is, the relay activates and when the fault ceases, it automatically returns to the initial binary state. If the user chooses the "L" or "Latched" option (with seal), the relay activates and remains activated even if the fault has been extinguished. (This option is not suitable for testing). For output 1.2 configure the following signals.



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Figure 33

Click on the "Start" option so that the "Project tree" window is shown again.

3.11 Sending adjustments

To send the parameterization changes, right-click on the "7SA86" relay icon and choose the option "Load configuration to device".

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Figure 34

Remembering the default password of Siemens SIPROTE 5: "222222".



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	ОК	Cancel	
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Figure 35

In the next two windows didn't shown, choose the option "Yes".

4. Synchronism software adjustments

4.1 Opening Synchronism

Click on the CTC application manager icon.



Click on the Synchronism software icon.



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K] 201 → K → K → K → K → K → K → K → K → K →	CE-6006 (1730616)	- ¤ × ^ (2)
Channels Direc Hrid Set & COOSE Set Sync. Set a, SV Set Connection Hardware	General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections	
Trigger Search Trajectory Test Settings	Synchronism Descr: Date:	
Insert/Edit Points General Options Insert/Edit Point System 1 Edit Point V.F.N: 66.40 V New Point 0: 0.00 * Sequence Check 3 Angle: 0.00 * Remove All Test Points Points Tested Points Tested	Tested device: ////////////////////////////////////	Legend: Points not Tested Points Tested Calors: NT OK Error 20.00° REF -20.00° df - 0.Hz
System Settin	Tool Test:	
No. V ΔV Freq Δi	CE-6006 Series Num.: 17306166302101110011XXX	
	Default V Preferences OK Cancel	AHZ [Hz]
Syst. 2 Brk Cmd Brk Close Reply		en er fi ert
Errors List Protection Status		
📢 ON Line New	Aux Source: 0,00 V Heating: 0%	
	Figure 38	

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.



Figure 39

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



eneral General Info	m. System	Notes & Obs.	Explanatory Figures	Check List	Othe	rs Connections		
Test:								
chronism Des	r: Synchronism	Check			Date:			
Tested devic	e:							
	Identif	23031982		~	Model	7SA86		~
	Туре	Line Protect	ion	✓ Manufa	acturer:	Siemens		~
Location:								
	Substation		E					~
	Bay	: 1		~				
	Address	Visconde de	e Ouro Preto, 75 - Custó	dio Pereira				~
	City	Uberlândia			~		State:	MG v
Responsible:								
	Name	Michel Rock	kembach de Carvalho					~
	Sector	Engineering		~ R	legistry:	00001		~
Tool Test:								
CE-6006			Series Nu	m.: 17306166	302101	110011XXX		
~								

Figure 40

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 is not relevant for this test.

Settings		×
General	General Inform. System Notes a	Obs. Explanatory Figures Check List Others Connections
Synchronism	Nominal Impedance Source Frequency: 60 Hz Phase Seq.: ABC 3φ power: 47.80 MV/z 1φ: 15.93 MV/z Primary Voltage (FF): 13.80 KV/z (FN): 7.97 KV Primary Current: 2.00 kA Secondary Voltage (FF): 115.0 V (FN): 66.40 V	
~	VTR F: 120.0 CTR F: 400.0 VTR D / VTR F: 1,00 CTR E / CTR F: 1.00 Invert Polarity:	Voltage Currents N 1 Va FN 2 Vb 3 Vc 7 E 8 IE D 4 VD
Default 🗸		Preferences QK <u>C</u> ancel

Figure 41

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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. Synchronism Adjustments

5.1 Synchronism > Systems Screen

In this tab you must enter the data of system one, specifying its composition: Singlephase, Three phase FN or Three phase FF. The reference voltage must be adjusted, and depending on the case, the phase shift inserted by the transformer must be compensated.

For system two, it must be configured similarly to system one with respect to its composition and reference voltage. In this same screen, the primary and secondary voltage values are adjusted, in addition to the primary and secondary currents. For the circuit breaker, the time value for its effective closing must be entered. There is also the *"Levels Equal to System 1"* field, which when selected, equals the voltages of system 2 to system 1.



Figure 42

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5.2 Synchronism Screen > Sync. Settings

This screen stipulates the differences in voltage, frequency and the maximum tolerable angle for synchronism to occur. The maximum and minimum permitted voltage and frequency values are also adjusted so that synchronism occurs. These values are adjusted as a percentage relative to the nominal values of system 1. Also set the maximum time for synchronism to occur, and the relative and absolute tolerances for voltage, frequency, time and the absolute tolerance for the angle. These adjustments must be made in accordance with the information given in the relay manufacturer's manual.

Settings	×
Settings General Synchronism	Systems Sync. Settings
	Hel: 2.00 % Abs: 1.00 V Freq Tolerance: Rel: 2.00 % Abs: 0.01 Hz Time Tolerance: Rel: 2.00 % Abs: 80.00 ms
Default 🗸	Preferences <u>OK</u> <u>Cancel</u>

Figure 43

6. Channel Targeting and Hardware Configurations

Click on the icon illustrated below.



🗮 | 🗋 🚔 🛃 🚽 | Synchronism 2.02.160 (64 Bits) - CE-6006 (1730616)



Then click on the highlighted icon to configure the hardware.



Figure 45

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



ter Slave	Binary Outputs:	Auxiliar Source:
	Initial State	- 250 V
	BO1: NO V	- 220 V
nalog. Outputs: . Default Free	BO3: NC V	■ 110 V
Default - Voltages:	BO4: NC V	60 V
6 x 300 V; 90 VA		00 0
O 3 x 300 V; 90 VA		- 48 V
O 3 x 300 V; 150 VA V1 V2 V3 V4 V5 V6	Currents Analog Input:	- 24 V
O 3 x 600 V; 150 VA	Clamp Scale	- Other
	IA: 100mV/A (10A) ~	- Off
O 1 x 300 V; 400 VA	IB: 100mV/A (10A) ∨	110.00.1/
N1 N2 N3 N4 N5 N6		1 110,00 V
V1 V2 V3 V4 V5 V6	Binary Inputs:	
Not Used Connect VTs	Contact 5	Vpk 50 Vpk 100 Vpk
Default - Currents:		
O 6 x 20 A; 90 VA	BIT & BIZ:	
○ 3 x 20 A; 90 VA ~	BI3 & BI4:	
O 3 x 20 A; 150 VA	BI5 & BI6:	
🔾 3 x 40 A; 150 VA		
O 2 x 60 A; 200 VA		
O 1 x 120 A; 400 VA 11 12 13 14 15 16		
Electromechanical:		
O 2 x 20 A; 400 VA		
O 1 x 30 A; 600 VA		
O 1 x 24 A; 1100 VA		
Not Used Connect CTs		

Figure 46

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

Cha	innels Direct.			_		\times
Local	Model Reset for Hard. CE-6006 V	Set O Advanced	22000 C		Confirm	1
Remotes	Serial Number: 17306166302101110011XXX	 ✓ … ✓ ON Line 	s₀ GUUSE	Import	Export]



7. Test Settings

In the *"Test Settings"* tab, the correct direction of the voltage generation channels and the stop interface must be done. During the tests, the BO1 must be closed so that the relay checks the synchronism. A pre-simulation is injected with nominal voltages, yet a lag 180°. The binary input responsible for the synchronism command is BI1 while for voltage and frequency differences BI2 is used.



🗮 🗋 🧀 🚽 Synchronism 2.02.	160 (64 Bits) - CE-6006 (1730616)				– 0 ×
Arquivo Home Display Softv	ware Options				^ ()
Channels Direc Hrd Set & Soc Set Sync. Set Channels Channels Channels Channels Channels Channels	t Development of the second se	Settings Sync. Options Repo	nt nt zbs rel	Recreate Restore View Charts Layout	
Trigger Search Trajectory Test Se	attinge				
Generation Channels Direction	Enable Pre-Simulation 1 En	able Pre-Simulation 2	Enable Post-Simula	tion	Inv. Phase VTs S1
	Made Nanial Not Care -		Endble Foot Similar		Div. Phase Vite S2
Binary Outputs & Goose - Simulation B0_V01 (Hird: V1) Vb_S1 A0_V02 (Hird: V2) Vb_S1 A0_V03 (Hird: V3) Vb_S1 A0_V04 (Hird: V4) Va_S2 A0_V03 (Hird: V3) Va_S2 A0_V03 (Hird: V4) Va_S2 A0_V04 (Hird: V4) Va_S2 A0_V04 (Hird: B0) Va_S2 B004 (Hird: B0) Va_S2 B004 (Hird: B0) Va_S2 B005 (Hird: B0) Va_S2 B004 (Hird: B1) Stop Interf. B01 (Hird: B1)	Node Notifial Plot Sync. V1 66,40 V V2 66,40 V V3 66,40 V V4 66,40 V Na 100,0 ° Na 100,0 ° Na 100,0 ° Na 100,0 ms Binary Outputs & Goose - Pre-Simulation 1 100,00 ms BO 0.0,0,0,0.0 0 GO 0.0,0,0.0 0 Threef.fb Bi02 (Hot: Bi2) Na Interf.fb Bi02 (Hot: Bi2) Stop Logic				Search Test Initial step: Mn. Resolution ~ Absol. 10.00 mHz Rel. Freq.: 100 % Wait time for every Incrementation: 300.00 ms Multiple of Tolerance for Verification Test 1.05 Reserve: 1.00 %
ngger Interf. Software V	Ingger Logic				Based Only on Values Generated 🗸
Wait for PPS	Trigger Delay 0,00 s				Cycle to Cycle Generation
🚯 ON Line New		Aux Source:	110,00 V Heatin	ig: 0%	
		Fig	gure 48		

8. Trigger Test

In the trigger test, points inside and outside the sync zone are tested. The points represent the difference in voltage and frequency with respect to system 1. You can also specify an angle difference for the two systems. To insert the points, click on *"New Point"* and choose a point directly on the graph and then on the item *"Confirm"*. Another option is to choose the voltage, frequency and angle difference values by writing these values in their respective fields. The last option would be to click on the *"Sequence"* option and choose an angle step so that several points are automatically created on the edges of the sync zone. The nominal values of voltage and frequency of system 1 must be set. The figure below illustrates this situation.



¥]] 22 ₪ - Arquivo Home	Synchronism 2.02.160 Display Software	(64 Bits) - CE-6006 (Options	1730616)								× ^ (2
Channels Direc Connect	୍ଟ୍ରେ GOOSE Set t ଞ୍ଜ SV Set tion	Start Stop >	Next Point 🧹 Clear to Next Line 👹 Clear a	est II Settings	laveform hasors inc. Re	esent eport abs rel	∆% Recreate Rest Charts Laye	tore View			
Hardy	vare Test Comise	Gei	neration	Option	s Re	eport Uni	ts Layo	ut			
Insert/Edit Point		5					Chart Way	eform Phasors	Synchonism		•
Inset/Edt Edt Point New Point Sequence Bemove Remove All Test Points	General Options System 1 V F-N: [66.00 Hz ∂: [0.00 Hz	Sequence S Number of	tep: 30.00 ⁺ Points: 24 <u>Confirm</u>	Capel			<u>4V[M</u> 10.00				Legend: Points not Tested Points Tested Colon: NT OK Error 20.00° REF -20.00°
Points Tested											dF: 0 Hz
No. V	Syster ΔV Freq	n Settings ∆Freq &	ŏ Δø _N	Reply Reply ominal Real	Time Sync.	Status					
Syst. 2 Birk Cri	nd 🗌 Brk Close 🗹 Re	ply					-10,00	-100.0m	0	ΔH: 100.0m	[]12]
Errors List Pro	tection Status										
🚯 ON Line	New				Aux Sour	ce: 110,00 V	Heating: 0%				
					17	• ,	0				

Figure 49

Choosing the sequence with a step of 30.00° , phase-neutral voltage of 66.40V, frequency of 60.00Hz and clicking on the "*Confirm*" button, the following points are created:



The next step is to start the generation through the "Start" button or the shortcut "Alt + G". The figure below shows the final test result.



Arquivo	🚰 🛃 ∓ Home	Synchronis Display	m 2.02.160 (Software	64 Bits) - CE- Options	6006 (173061	6)						- @ ×
Channe Direc	Hrd Set Sync. Si Connec Hard	et 🧐 GC et 🍕 SV tion ware	OOSE Set Set	Start Stop	> Next F >> Next L	oint 🧹 Cle ine 👹 Cle in	ar test ar all Set	₩ Wa H Ph tings ↓ Ph Syr Options	asors Pr nc. Re	esent eport eport	∼ I∰S rel Units	Ax Image: Charles Restore View Charles Layout It Layout
Trigger	Search T	rajectory	Test Setting	3								
Ins	ert/Edit Point	s									•	Chart Waveform Phasors Synchonism
Inset/	Edit Edit Point w Point equence Bemove emove <u>Al</u>	General V System V F-N: Ø: Cher Angle	Deptions 1 66,40 V 60,00 Hz 0,00 ° ck 3 : [-30,00 °	System	7 F-N: -6.08 210.5 9: -21.00	V DmHz *	V F-N: 60 f: 60 Ø: -2	.32 V .21 Hz 1,00 °				Legend:
/ Tes	t Points										-	
Points	lested											dF: 210,5 mHz
			System	n Settings								
No.	v	Δ٧	Freq	∆Freq	ø	ΔØ	Reply Nominal	Reply Real	Time Sync.	Statu	•	
23	60,92 V	-5,47 V	60,19 Hz	189,5 mHz	-21,00 °	-21,00 °	Sync.	Sync.	244,5 ms	Passe	d	-10.00
24	60,32 V	-6,08 V	60,21 Hz	210,5 mHz	-21,00 °	-21,00 °	Not Sync.	Not Sync.	-	Passe	d V	×
Syst	. 2 🔲 Brk Cr	nd 🗌 Brk (Close 🗹 Re	ply								-200,0m -100,0m 0 100,0m 200,0m
Error	s List Pro	otection Stat	tus									
(2) 0	N Line	Nev	/						Aux Sour	ce: 110,00	/ н	Heating: 0%
									T		51	51

Figure 51

It is verified that in the sync region there is the command and in the external region there is no command.

9. Search Test

The search test finds the limits of the sync region. For this test, the "Sequence" option is used with a step of 40° .



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Then click on the "Confirm" button, the figure below shows the lines created automatically:



The next step is to start the generation through the "Start" button or the shortcut "Alt + G". The figure below shows the final test result.

hannel: Direc	Hrd Set	ං ගේ t ෑ SV tion vare	Set	Start Stop	> Next >> Next Generati	Point 🧹 Cle Line on	ear test ear all Settings	Waveform Phasors Sync. Report Report Unit:	∆% Recr Chi	eate Restore Layout Layout	View					
	rt/Edit Point		Test Setting	,				-	Char	Wavefor	m Phasors	wnchonism				
Insert/E	idit dit Line w Line	General System V F-N: f: Ø:	Options 1 66.40 V 60.00 Hz 0.00 °	Start P	^P oint / F-N: -7,55 : 180,0	V 00 mHz	○ V F-N: 58,84 V ○ f: 60,18 H		10,00	ΔV [Ý]	•		•		•	Legend: Points not Tested: Points Found: Search Line: Colors: NT OK Error
Se E Re Test Points T	equence emove move <u>All</u> Points ested	Chk Start Ar	Sync after Se ig Evaluation: (0,00 °	inch Final P ΔV Δf:	Point F-N: -9,23 220,0	V OmHz	○ V F-N: 57.17 V ○ f: 60.22 H	-	0	•						20.00 * 2000 * 20.00 *
			Nomir	al Value					1	Î						dr. 152,0 mH2 ((dl.)
No.	v	Δ٧	Freq	∆Freq	ø	Δø	Status	^								
08	56.40 V	-10,00 V	60,04 Hz	35,27 mHz	0°	۰ 0	Passed			l					•	
09	58,00 V	-8,39 V	60,20 Hz	200,0 mHz	0 *	0 *	Passed	~	-10,00		•		•		AH2 [H	
Type:	Points	∨ 🗹 Non	Val 🗌 Re	al Value 🔲 E	Birk Cmd 🗌	Brk Close	Reply			-200,0m	-100,0m	Ó	1	00.0m	200,0m	

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10. Trajectory Test

This test has the same objective as the "*Trigger Test*", finding the moment of synchronism, however the difference is that the voltage and frequency values of system 2 vary over time. Differently from what happens in the "*Trigger Test*" where these values are fixed. To perform the test, use the "*Sequence*" option with the step equal to 45.0° reaching the following screen.



Clicking the "Confirm" button automatically creates the lines shown below:



¥ I 🗅	🧀 🔛 👳	Synchronis	m 2.02.160 (64 Bits) - CE-	6006 (17306)	6)											– ø ×
Arquivo	Home	Display	Software	Options													^ 🔮
Channel Direc	Sync. Se Sync. Se Connec Hards	ඳිං GC t ෑ SV tion vare	OOSE Set 'Set	Start Stop	> Next P >> Next L	oint 🧹 Cle ine 👹 Cle on	ar test ar all Set	ings R Syr	asors nc. R	resent eport Units	∆% Recreate R Charts L	estore ayout					
Trigger	Search T	ajectory	Test Settings	3													
Inse	ert/Edit Point	•								•	Chart W	aveform Phas	ors Synchor	nism			-
E	Edit Edit Line	General System V F-N: f:	Options 1 66,40 V 60,00 Hz	Start S ΔV Δf	ystem / F-N: -11,25 : 225,0	ov 0 mHz	V F-N: 55	15 V 23 Hz			ΔV [V]						Legend: Line not Tested: Line Tested
Ne	w Line 🔽	Ø: Genera Model:	0.00 ° tor Linear	 ΔΩ Final S ΔV 	9: -35,41 lystem F-N: 0.00 \		Ø: -35	40 V									20,00 ° REF -20,00 °
Re	<u>emove</u> emove <u>A</u> ll	d∆V/dt: d∆f/dt:	1,12 V/s 22,50 mHz/s	 Δf: ΔØ 	0,00 F	°) f: 60) Ø: 10	00 Hz			0						
Test Points T	✓ Test Points													=	dV: -11,25 V dA: -35,41 * dF: 225,0 mHz		
No.	v	Δ٧	Freq	∆Freq	ø	ΔØ	Reply	Reply Real	Time	Status ^							
07	54,40 V	-12.00 V	60,00 Hz	0 Hz	0°	0°	Sync.	-	-	NotTestex	-10.00						
08	55,15 V	-11,25 V	60,23 Hz	225,0 mHz	-35,41 °	-35,41 °	Sync.	-	-	Not Tester 🗸	· · · ·					ΔHz [Hz]	
Gene	erator ⊠ Sta	rt Syst.	Final Syst.	Brk Cmd	Brk Close	Reply					4	200,0m -10	0,0m	o 10	0,0m 200	0,0m	
	ulline.	Neu							Aury Sour	rea 110.00 V	Heating 09	,					
	* Line	INCO	•						- AUX 300		(v					

Figure 56

The next step is to start the generation through the "Start" button or the shortcut "Alt + G". The figure below shows the final test result.







11. 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.

Presentation Setting	×
Languag∉ Inglês En-US ∨	
 All General Data Test General Data of Tested Device Location Reference Values Hardware Settings Test Settings Synchonism Settings Test Results Charts of Selected Simulation Notes and Observations Explanatory Figures Check List Connections 	
OK Cancel	

Figure 58



Figure 59

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APPENDIX A

A.1 Terminal Designations



1) Technical data like type F, but switching time 10 ms

2) Use these terminals to root the binary inputs.

Positions for printed circuit board assemblies on the rear side

Figure 60



A.2 Technical Data

Times

Measuring time, after switching on the variables	Approx. 80 ms

Operating Range

Voltage	20 V to 340 V
Frequency	f_{rated} -4 Hz $\leq f_{rated} \leq f_{rated}$ +4 Hz

Tolerances

Tolerances of the voltage settings	2 % of the pickup value or 1 V
Voltage difference V2>V1; V2 <v1< td=""><td>1 V</td></v1<>	1 V
Frequency difference f2>f1; f2 <f1< td=""><td>10 mHz</td></f1<>	10 mHz
Angular difference $\alpha 2 > \alpha 1$; $\alpha 2 < \alpha 1$	1°
Tolerance of all time settings	10 ms
Max. phase displacement angle	5° for ∆f ≤ 1 Hz
	10° for $\Delta f > 1$ Hz



APPENDIX B

Equivalence of software parameters and the relay under test.

Table 1							
Synchronism Software	9	Siemens 7SA86 Relay					
	-						
Parameter	Figure	Parameter	Figure				
System 1		Power System Data 1					
Secondary Voltage (F-F)	41	Rated Secondary Voltage (Ph-Ph)	22				
Ref	42	Meas. Point V-1ph1	18				
Angle Transformer Ph. Shift	42	Angle adjust. (transform.)	28				
System 2		Power System Data 2					
Secondary Voltage (Ph-Ph)	42	Rated Secondary Voltage (Ph-Ph)	25				
Ref	42	Meas. Point V-1ph1	18				
(dVMax+) / √3	43	Max. Voltage diff. V2>V1	29				
(dVMax-) / √3	43	Max. Voltage diff. V2 <v1< td=""><td>29</td></v1<>	29				
dFMax+	43	Max. frequency diff. f2>f1	29				
dFMax-	43	Max. frequency diff. f2 <f1< td=""><td>29</td></f1<>	29				
dAngMax	43	Max. Angle diff.	29				
Max Time Sync.	43	Max. durat. Sync process	28				