

Three-phase relay test SET AK30 / AK31

Product families AK30, AK31



**Three-phase relay test SET
AK30 / AK31**

Three-phase relay test SET AK30 / AK31

- Able to analyze and test universal relays.
 - IEC 61850 test tool.
- Robust and lightweight design.
- Friendly and simple software.

amperis

www.amperis.com

AMPERIS PRODUCTS S.L
Agricultura, 34
27003, Lugo, España

✉ Contacto

+T [+34] 982 20 99 20 | F [+34] 982 20 99 11
info@amperis.com | www.amperis.com

The Amperis AK30 and AK31 family are relay test equipment compatible with the IEC 61850 standard, which have 10 and 13 channels respectively and have a DC source that can be used simultaneously. The sources of voltage, current, and the power simulator for the relay are independent.

It has complete self-protection and alarm indicators due to: overload, overheating, short circuit, open circuit or incorrect connection. It offers us the possibility to adjust continuously and independently: amplitude, frequency and phase angle.

The AK30 and AK31 are capable of analyzing all generations and types of relays (current, voltage, frequency, power, impedance, harmonics, distance, etc.). Capable of testing high load electromechanical relays with very high power demand.

The equipment gives the possibility to carry out checks of wiring of the current transformers. They have the advanced function of the GPS trip and are controlled through the PC via RJ45 Ethernet interface. Import and export of RIO / XRIO.

Models of the AK30 and AK31 family

AK30				
MODEL	CURRENT		TENSION	
	Nº OF INJECTORS	MAXIMUN POWER	VOLTAGE	MAXIMUN POWER
AK3030i	3x30A	450VA	4x300V	120VA
AK3063i	6x30A 3x60A	450VA 850VA	4x300V	120VA
AK3066i	6x30A 3x60A	450VA 850VA	7x300V	90VA
AK31				
MODEL	CURRENT		TENSION	
	Nº OF INJECTORS	MAXIMUN POWER	VOLTAGE	MAXIMUN POWER
AK3130i	3x32A	450VA	4x310V	124VA
AK3163i	6x32A 3x64A	450VA 850VA	4x310V	124VA
AK3166i	6x32A 3x64A	450VA 850VA	7x310V	90VA

The following table shows the available models of the AK30 family:

AK 3030i			AK 3063i		
VOLTAGE OUTPUT			VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0...300V	120 VA max. each	OUTPUT RANGE AND POWER	AC(L-N) 4x0...300V	90 VA max. each
	AC(L-L) 2x0...600 V	240 VA max. each		AC(L-L) 2x0...600 V	180 VA max each
	DC(L-N) 3x0...300 V	120 W max. each		DC(L-N) 3x0...300 V	90 W max each
CURRENT OUTPUT			CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 3x0...30A	450VA max. each	OUTPUT RANGE AND POWER	AC(L-N) 3x0...30A	450VA max. each
	AC(3L-N) 1x0...90A	1000VA max.		AC(2L-N) 3x0...60A	850VA max. each
	DC(L-N) 3x0...20A	300W max. each		AC(6L-N) 1x0...100A	1200VA max.
				DC(L-N) 3x0...20A	300W max. each

AK 3066i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 7x0...300V	90 VA max. each
	AC(L-L) 3x0...600 V	180 VA max each
	DC(L-N) 3x0...300 V	90 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 6x0...30A	450VA max. each
	AC(2L-N) 3x0...60A	850VA max. each
	AC(6L-N) 1x0...100A	1200VA max.
	DC(L-N) 3x0...20A	300W max. each

Common technical specifications family AK30

VOLTAGE OUTPUT			BINARY INPUT	
ACCURACY	± 2mV @ 0.2~2V ac <0.07% Rd.+0.03% Rg Guar. a 2~300Vac <0.03% Rd.+0.01% Rg Typ. a 2~300Vac		QUANTITY	8 pairs
			CHARACTERISTICS	0~400Vdc / Potential free
			TIME RESOLUTION	<0.1ms
	± 10mV @ 0.5~5V dc ± 0.5% @ 5~300V dc		MAX. MEASURING TIME	Infinite
DISTORSION	<0,1% Guar. / <0,05% Typ.		DEBOUNCE TIME	0~25ms
RESOLUTION	1mV		INSULATION	Operation: -10/+50 °C Storage: -10/+70 °C
CURRENT OUTPUT			BINARY OUTPUT	
ACCURACY	± 1mA @ 0.2-0.5A ac <0.15% rd.+ 0.05% rg. a 0.5~30A ac <0.05% rd.+ 0.02% rt. a 0.5~ 30A ac		QUANTITY	4 pairs
			TYPE	Potential free relay contacts, software controlled.
			BRAK CAPACITY	Vmax:300V ac / Imax:4A / Pmax:1000VA
	± 5mA @ 0.2~1A dc ± 0.5% @ 1~20A dc		SYNCHRONIZATION	
DISTORSION	<0.1% Guar./ <0.05% Typ		MODE	GPS, SMA type antenna connector.
RESOLUTION	1mA		HARMONIC	
GENERAL GENERATOR			SUPERIMPOSED NUMBERS	2~20times
FREQUENCY	Range	5~1000 Hz	AUX. DC VOLTAGE SOURCE (BATTERY SIMULATOR)	
	Resolution	0.001Hz	RANGE	0~300V @ 120W max
	Accuracy	<1ppm @ 5~65 Hz <10ppm @ 65~450 Hz <20ppm @ 450~1000 Hz	POWER SUPPLY	
PHASE	Range	-360°~360°	NOMINAL INPUT VOLTAGE	100~240Vac
	Resolution	0.001°	PERMISSIBLE INPUT VOLTAGE	85~264Vac, 125~350Vdc
	Accuracy	<0.05° Typ. / <0.1° Guar.	NOMINAL FREQUENCY	50/60 Hz
			PERMISSIBLE FREQUENCY	45Hz~65Hz
			POWER CONSUMPTION	1500 VA max.
			CONNECTION TYPE	Standard AC socket 60320

ENVIRONMENTAL CONDITIONS	
OPERATING TEMPERATURE	0°C~55°C
STORAGE TEMPERATURE	-20°C~70°C
HUMIDITY	<95%RH, non-condensing
OTHERS	
WEIGHT	17.5 kg
DIMENSIONS	360x450x140 (mm)
PC CONNECTION	RJ45 Ethernet, 10/100/1000M
GROUNDING TERMINAL	4 mm banana socket

ADDITIONAL INFORMATION (OPTIONAL MODULES)

DC MEASUREMENT INPUT (TRANSDUCER CALIBRATOR)		
VOLTAGE INPUT	Range	0~±10V dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Input Impedance	100 Kohm
CURRENT INPUT	Range	0~±20mA dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Input Impedance	50 ohm
AC MEASUREMENT INPUT (STANDARD METER)		
VOLTAGE RANGE	0~130V ac, <0.2%Rg	
CURRENT RANGE	0 ~ 5 A ac (Clamp CT Connection), <0.5% Rg	
FREQUENCY RANGE	45~65Hz, < 0.01Hz	
PHASE	0~360°, <0.2°	
HARMONIC	2~20 times	
ENERGY METER CALIBRATION		
SENSOR USAGE	Mechanical meters / Electronic meters.	
SENSOR OUTPUT	High Level:> 4.5V Low level: <0.2V	
PULSE INPUT	1 pulse input port.	
PULSE RANGE	500KHz pulse input Max.	
PULSE OUTPUT	1 Transistor output.	

Rd: Reading

Rg: Range

Typ: Typical

Guar: Guaranteed

The following table shows the available models of the AK31 family

AK 3130i			AK 3163i		
VOLTAGE OUTPUT			VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0...310V	124 VA max. each	OUTPUT RANGE AND POWER	AC(L-N) 4x0...310V	124 VA max. each
	AC(L-L) 2x0...620 V	248 VA max each		AC(L-L) 2x0...620 V	248 VA max each
	DC(L-N) 3x0...350 V	140 W max each		DC(L-N) 3x0...350 V	140 W max each
CURRENT OUTPUT			CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 3x0...32A	450VA max. each	OUTPUT RANGE AND POWER	AC(L-N) 6x0...32A	450VA max. each
	AC(2L-N) 3x0...64A	850VA max. each		AC(2L-N) 3x0...64A	850VA max. each
	AC(6L-N) 1x0...100A	1200VA max.		AC(6L-N) 1x0...100A	1200VA max.
	DC(L-N) 3x0...20A	300W max. each		DC(L-N) 3x0...20A	300W max. each

AK 3166i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 7x0...310V	90 VA max. each
	AC(L-L) 3x0...620 V	180 VA max each
	DC(L-N) 3x0...350 V	140 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 6x0...32A	450VA max. each
	AC(2L-N) 3x0...64A	850VA max. each
	AC(6L-N) 1x0...100A	1200VA max.
	DC(L-N) 3x0...20A	300W max. each

Common technical specifications family AK31

VOLTAGE OUTPUT		IEC61850		
ACCURACY	<0.07% Rd.+0.03% Rg Guar. (AC) <0.03% Rd.+0.01% Rg Typ. (AC)	FIBER PORTS	2 x 100Base-FX Full Duplex, LC type (Optional to 10/100Mbit, Ethernet RJ45 type)	
	± 10mV @ <5V (DC) ± 0.5% @ ≥5V (DC)	FIBER TYPE	62.5/125µm (multiple optical fiber, Orange Red)	
DISTORSION	<0,1% Guar. / <0,05% Typ.	WAVELENGTH	1310nm	
RESOLUTION	1mV	TRANSMIT DISTANCE	>1Km	
CURRENT OUTPUT		INDICATOR	Green light: valid connexion Yellow blinking: data exchanging	
ACCURACY	<0.15% Rd.+ 0.05% Rg Guar. (AC) <0.05% Rd.+ 0.02% Rg Typ. (AC)	NOTE	All hardware of this module are ready for active	
	± 5mA @ <1A (DC) ± 0.5% @ ≥1A (DC)	GENERAL GENERATOR		
DISTORSION	<0.1% Guar./ <0.05% Typ	FREQUENCY	Range	CC~1KHz, 3KHz transient
RESOLUTION	1mA		Resolution	0.001Hz
LOW LEVEL CHANNEL OUTPUTS			Accuracy	±1ppm
QUANTITY	13 Channels, 16 pin aviation socket	PHASE	Range	-360°~360°
VOLTAGE OUTPUTS RANGE	AC 0~8V DC 0~10V		Resolution	0.001°
CURRENT OUTPUTS RANGE	Nominal 2mA Transient 10 mA max.		Accuracy	<0.05° Typ. / <0.1° Guar. 50/60Hz
OUTPUT POWER	≥0.5VA	BINARY OUTPUT		
ACCURACY	(0.01~0.8 Vrms):<0.05% Typ. / <0.1% Guar. (0.8~8 Vrms): <0.02% Typ. / <0.05% Guar.	QUANTITY	8 pairs	
RESOLUTION	0.25mV	TIPE	wet/dry measurement	
DISTORTION (THD%)	<0.05% Typ. / <0.1% Guar.	THRESHOLD	10~600Vdc or potential free, programmable.	
		TIME RESOLUTION	100 µs	
		TIME RANGE	Infinito	
		TIME ERRORS	±1ms @ 0.001~1s, ±0.1% @ >1s	
		DEBOUNCE TIME	0~25ms (software controlled)	
		GALVANIC ISOLATION	4 isolated with each 2 pairs.	

BINARY OUTPUT (RELAY TYPE)		ENVIRONMENTAL CONDITIONS		
QUANTITY	4 pairs	OPERATING TEMPERATURE	-10°C~55°C	
TYPE	Potential free relay contacts, software controlled.	STORAGE TEMPERATURE	-20°C~70°C	
BREAK CAPACITY	Vmax:400V ac / Imax:8A / Pmax:2500VA	HUMIDITY	<95%RH, non-condensing	
	Vmax:300V dc / Imax:5A / Pmax:150W	OTHERS		
BINARY OUTPUT (SEMICONDUCTOR TYPE)		WEIGHT	18 kg	
QUANTITY	4 pairs	DIMENSIONS	368x375x164 (mm)	
TYPE	Open-collector, 14 pin aviation socke	PC CONNECTION	RJ45 Ethernet, 10/100/1000M	
BRAK CAPACITY	5~15 V cc / 5mA, 10 mA max.	GROUNDING TERMINAL	4 mm banana socket	
	AC not permit			
RESPONSE TIME	100μs	ADDITIONAL INFORMATION (OPTIONAL MODULES)		
SYNCHRONIZATION		DC MEASUREMENT INPUT (TRANSDUCER CALIBRATOR)		
MODE	GPS, SMA type antenna connector IRIG-B, FT3 IEEE1588	VOLTAGE INPUT	Range	0~±10V dc
			Accuracy	<0.02% rg Typ. <0.05% rg Guar.
AUX. DC VOLTAGE SOURCE (BATTERY SIMULATOR)			Max Input	±11V dc
RANGE	0~350V @ 140W max		Input Impedance	1Mohm
ACCURACY	0.5% Rg Guar.	CURRENT INPUT	Range	0~±20mA dc
POWER SUPPLY			Accuracy	<0.02% rg Typ. <0.05% rg Guar.
NOMINAL INPUT VOLTAGE	100~240Vac		Max Input	600mA
PERMISSIBLE INPUT VOLTAGE	85~264Vac, 125~350Vdc		Input Impedance	15 ohm
NOMINAL FREQUENCY	50/60 Hz			
PERMISSIBLE FREQUENCY	45Hz~65Hz			
POWER CONSUMPTION	1500 VA max.			
CONNECTION TYPE	Standard AC socket 60320			

AC/DC MEASUREMENT INPUT (STANDARD METER)	
INPUT QUANTITY	8 inputs (blend with binary input pairs)
VOLTAGE RANGE	0~600Vrms (Rg:0.1V, 1V, 10V, 60V, 600V)
VOLTAGE ACCURACY	<0.1% Rg
CURRENT RANGE	0 ~ 5 Arms (clamp input)
CURRENT ACCURACY	<0.1% Rg
SAMPLE RATE	10KHz
INPUT IMPEDANCE	600KΩ
FREQUENCY RANGE	45~65Hz, Accuracy < 0.01Hz
PHASE ACCURACY	0~360°, <0.2° Typ.
TRANSIENT RECORDER	
QUANTITY	8 input channels (blend with binary input pairs)
RECORDER TIME	Max 50 Sec.
ENERGY METER CALIBRATION	
SENSOR USAGE	Mechanical meters / Electronic meters
SENSOR OUTPUT	High level:> 4.5V Low level:<0.2V
PULSE INPUT	1 pulse input port
PULSE RANGE	500KHz entrada de pulso max.
PULSE OUTPUT	1 transistor output Open collector 5-15V dc / 5mA

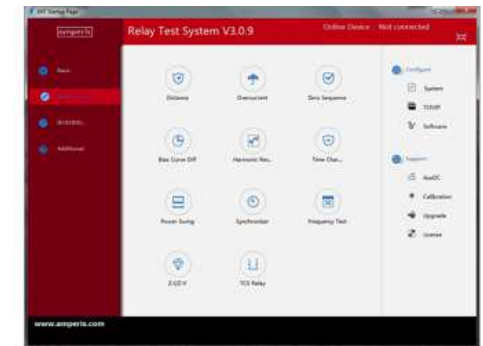
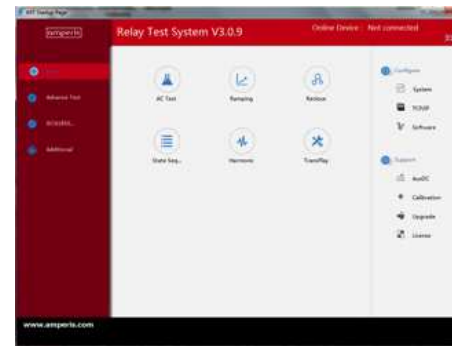


Test equipment for family relays
AK30 and AK31 respectively.

ITEMS	ANSI® No.
IEC61850 numerical IEDs relay & merge unit	
Distance protection relay	21
Synchronising or synchronism-check relays	25
Undervoltage relays	27
Directional Power relays	32
Undercurrent or underpower relays	37
Negative sequence overcurrent relays	46
Overcurrent/ground fault relays	50
Inverse time overcurrent/ground fault relays	51
Power factor relays	55
Overvoltage relays	59
Voltage or current balance relays	60
Directional overcurrent relays	67
Directional ground fault relays	67N
DC overcurrent relays	76
Phase-angle measuring or out-of-step protection relays	78
Automatic reclosing devices	79
Frequency relays	81
Motor overload protection relays	86
Differential protection relays	87
Directional voltage relays	91
Voltage and power directional relays	92
Tripping relays	94
Voltage regulating relays	
Overimpedance relays, $Z>$	
Underimpedance relays, Z	
Time-delay relays	

Software features:

- All-in-one software.
- Generates automatic reports.
- You can create, maintain and distribute complete test plans.
- Control of 10 or 13 sources independently.
- Power system modeling for dynamic tests.
- Automatic comparison of current and expected characteristics.
- Easy import and export of data (RIO, XRIO and COMTRADE compatibility for transient data exchange).
- Trigger, search and test by mouse-over.
- Fast, automatic and manual testing.
- Graphics modules and templates for pre-installed relay testing.



Basic software test modules:

1. AC & DC test: This module allows to generate different values of voltage and current through the output channels in a direct way, for testing different types of relays.

2. Ramping Test: This module allows to generate different ramps in the output variables, as well as the conditions (or triggers) that activate them. Min. and max. of start currents, power, direction ... It is possible to define tolerance ranges for the final result, as well as complex time calculations.

3. Overcurrent Test: This module is a specific module to quickly and easily test overcurrent curves.

4. State Sequence: This module allows to define different states for tests of complex logic with relays, especially indicated for test like multiple auto re-closures. There are 8 controllable test states to be used for the purpose of the operator.

5. Distance Protection: This module allows you to calibrate the fixed parameters of the distance relays and an analysis of the sensitivity and reliability of the action of each section of the distance protection. The parameterization consists of three parts: Configuration of parameters in the RIO file, configuration of the test, configuration of the inputs and binary outputs.

6. Differential Rate Protection This module allows to test the reverse braking feature automatically, of a digital transformer, generator and electromotor.

7. Reclose test: This module is primarily used for distance, zero sequence and other line protection features simulating a wide variety of single phase, biphasic and three phase systems, including transient and permanent failures for whole group testing.

8. Synchronizer test: This module is mainly used to test the action on voltage and frequency, angle, time, pulse control, auto-synchronization devices ...

9. Fault Recurrence: This module is used for the reproduction of standard COMTRADE (Common Format for Transient Data Exchange) format files through the outputs of the equipment.

10. Time Features: This test module contains items to test the time characteristic of the frequency and voltage relay and to test overexcitation.

Special test modules (optional):

11. Power Swing: This module is used to test generators outside the protection range, cutting devices, relaying of distance relays ...

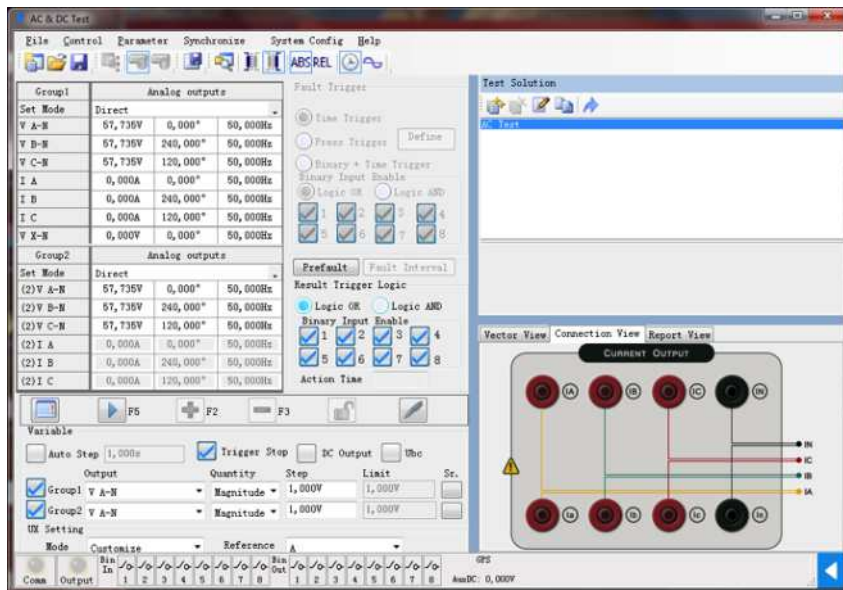
12. Frequency Test: This module is mainly used for frequency protections, low voltage load disconnects, low current load disconnects ...

13. Standard Meter (Medidor multifuncional): This optional module acts as a multi-function meter and allows you to collect current and voltage input values and display them on the screen. Current, voltage, phase and frequency are displayed in real time.

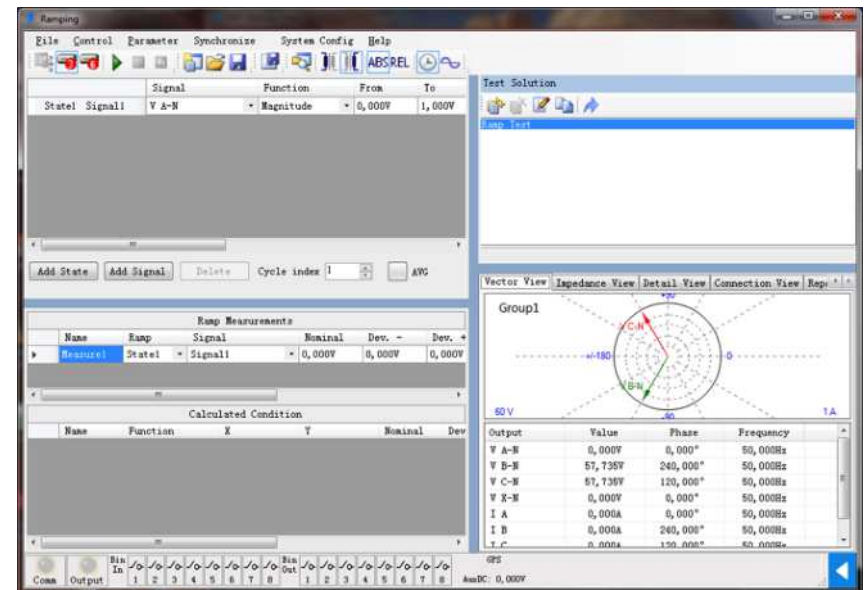
14. Recorder (Grabador de transitorios): This optional module acts as a recorder before and during the fault, for various changing electrical conditions. It is used to analyze the causes of a certain electrical problem and the performance of the protection devices.

15. Energy Meter Calibration: This module allows calibrating electronic or electromechanical energy meters.

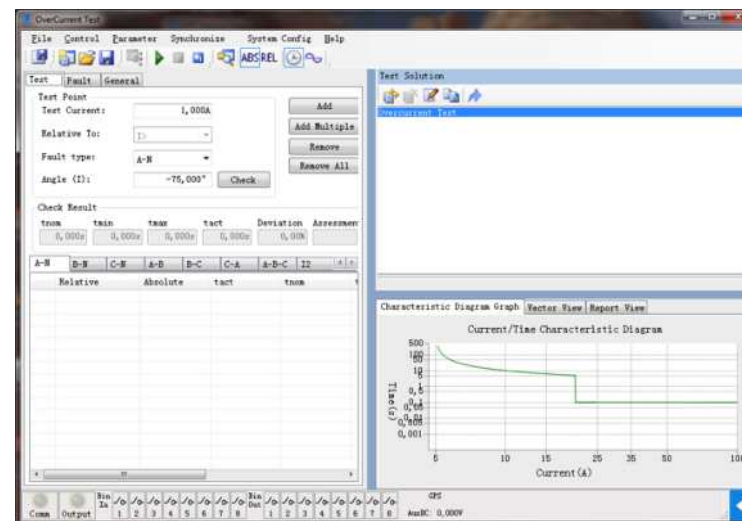
16. Transmitter Calibration: This optional module allows calibrating standard and multifunction power transducers, three-phase and single-phase.



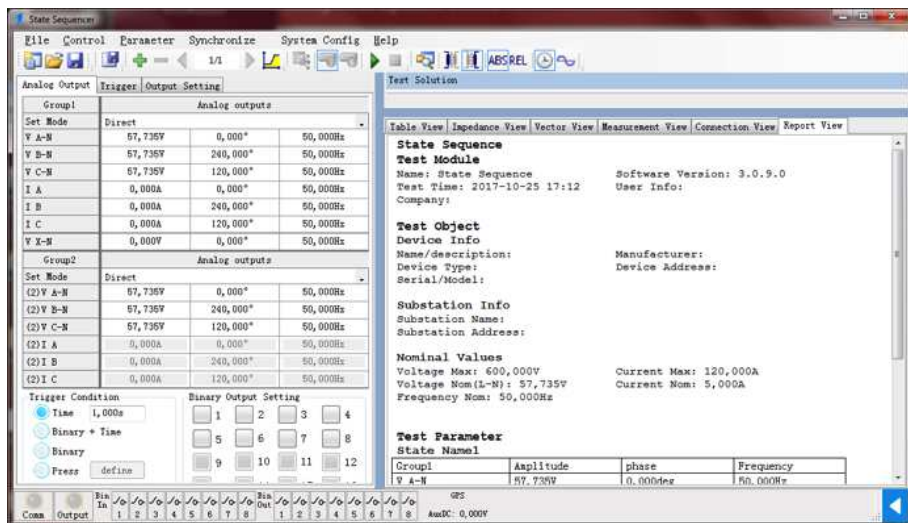
SCREENSHOT OF THE AC/CC TEST.



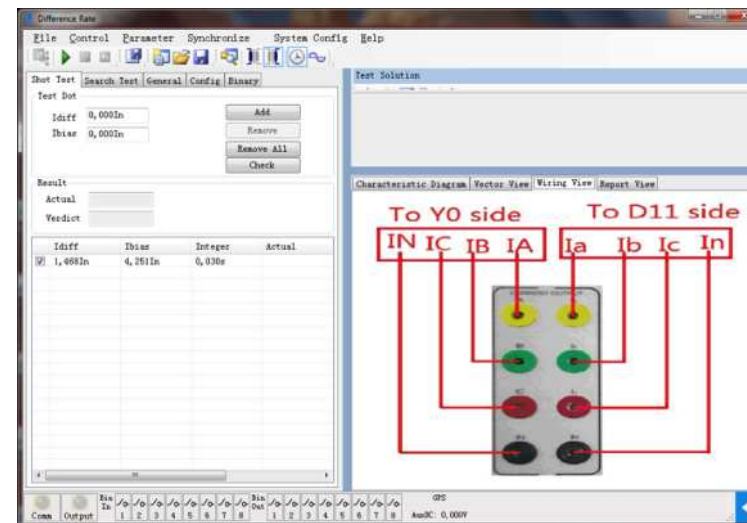
SCREENSHOT OF RAMPING TEST.



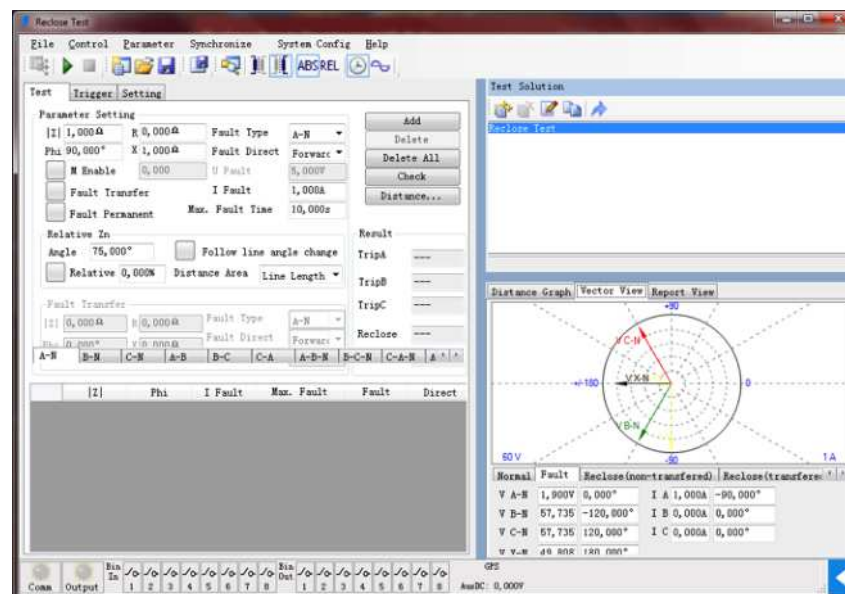
SCREENSHOT OF THE OVERCURRENT TEST.



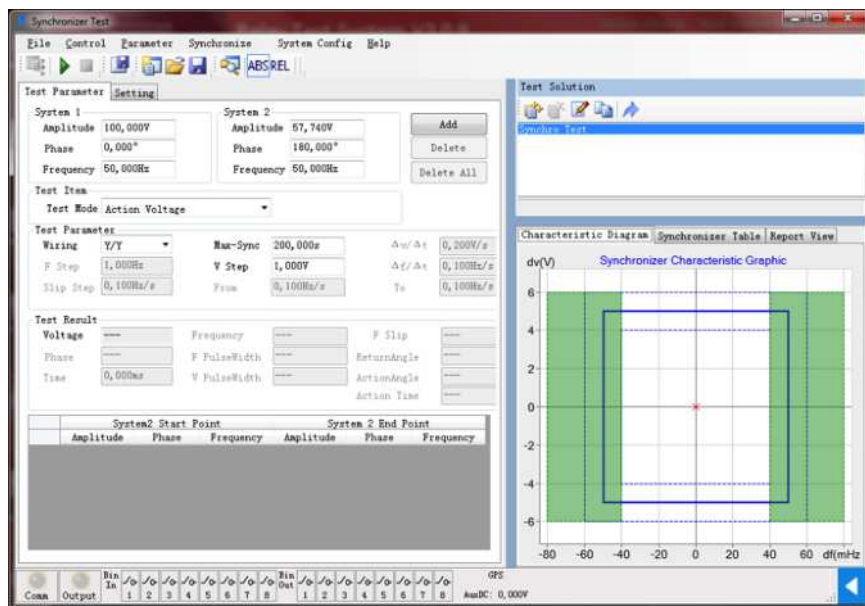
SCREENSHOT OF THE STATE SEQUENCE TEST MODULE.



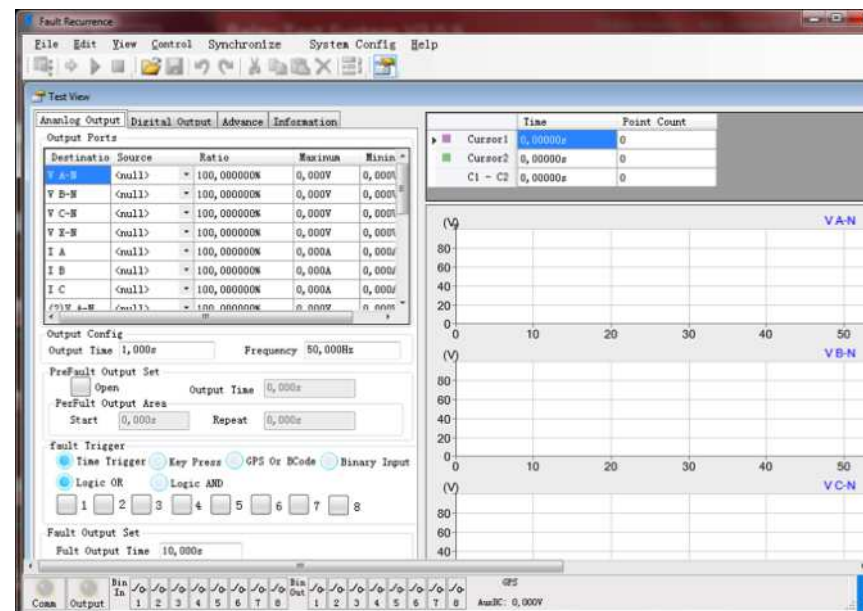
SCREENSHOT OF THE DIFFERENTIAL PROTECTION MODULE.



SCREENSHOT OF THE RECLOSER TEST.



SCREENSHOT OF THE SYNCHRONIZATION TEST.



SCREENSHOT OF THE CONTRADE TRANSIENT ANALYSIS MODULE.

amperis

www.amperis.com

AMPERIS PRODUCTS S.L
Agricultura,34
27003, Lugo, España

✉ Contacto

+T [+34] 982 20 99 20 | F [+34] 982 20 99 11
info@amperis.com | www.amperis.com