



PW336i

Protection Relay Tester

PONOVO POWER CO., LTD.
www.ponovo.net





PW336i Protection Relay Tester



PW336i protective relay tester is the best economic model with 6 current channels and 4 voltage channels, capable of automatic testing different kinds of protection relays, such as distance, overcurrent, frequency, directional, time inversed, line-differential, differential relay easily without changing cable connection, etc.

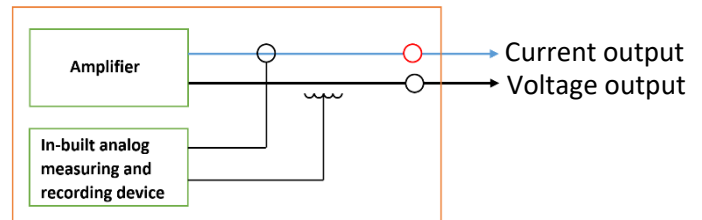
It's the ideal test device for all power utilities, power plants, relay manufacturers, panel manufacturers, research institutes, universities, testing companies, etc.

Product Features

- 6*15A, 4*150V
- Aux DC (0-300V)
- 8 binary inputs, 4 binary outputs
- Adjustable threshold (0-400V) for binary inputs or potential free
- In-built analog monitoring and recording function
- Can support the test of IEC61850 complied relay with GOOSE
- More than 500 relay templates offered freely to do automatic testings
- Support to import CSV, RIO and XRIO files

➤ In-Built Analog Monitoring & Recording Unit

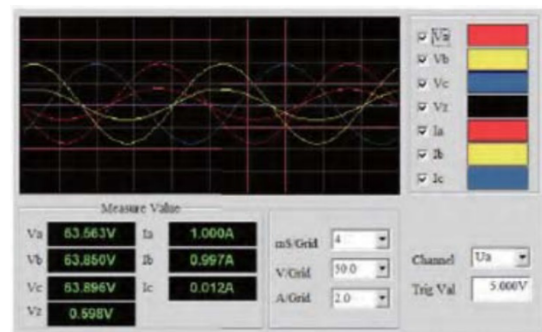
- ❖ This in-built analog monitoring and recording unit samples the actual current/voltage outputs and real-time output waveform can be displayed in the software.
- ❖ This makes it easy to check the correctness of wiring before the test and observe the output during the test process.



Principle

➤ Real-Time Outputs Display

- ❖ Real-time output waveform display helps the fast troubleshooting of wiring and test circuitry before test actual started.
- ❖ User can also use this provision to analyze the external signals, such as phase angle, power, harmonic, etc.



➤ IEC 61850 Function

- ❖ PW336i provides analog voltage/current signal to relay and the GOOSE message from relay is received and analyzed by relay test equipment.



Application

Relay test

Distance protection
 Differential protection
 Directional relay
 Time-inversed current relay
 Auto-reclosing, etc.

Measuring and control device

Synchronizer
 Energy meter, etc.

System simulation

Transient, steady-state fault simulation
 Playback of COMTRADE format file

Calibration

0.5 Class energy meter
 Disturbance recorder
 Indicating meters, etc.

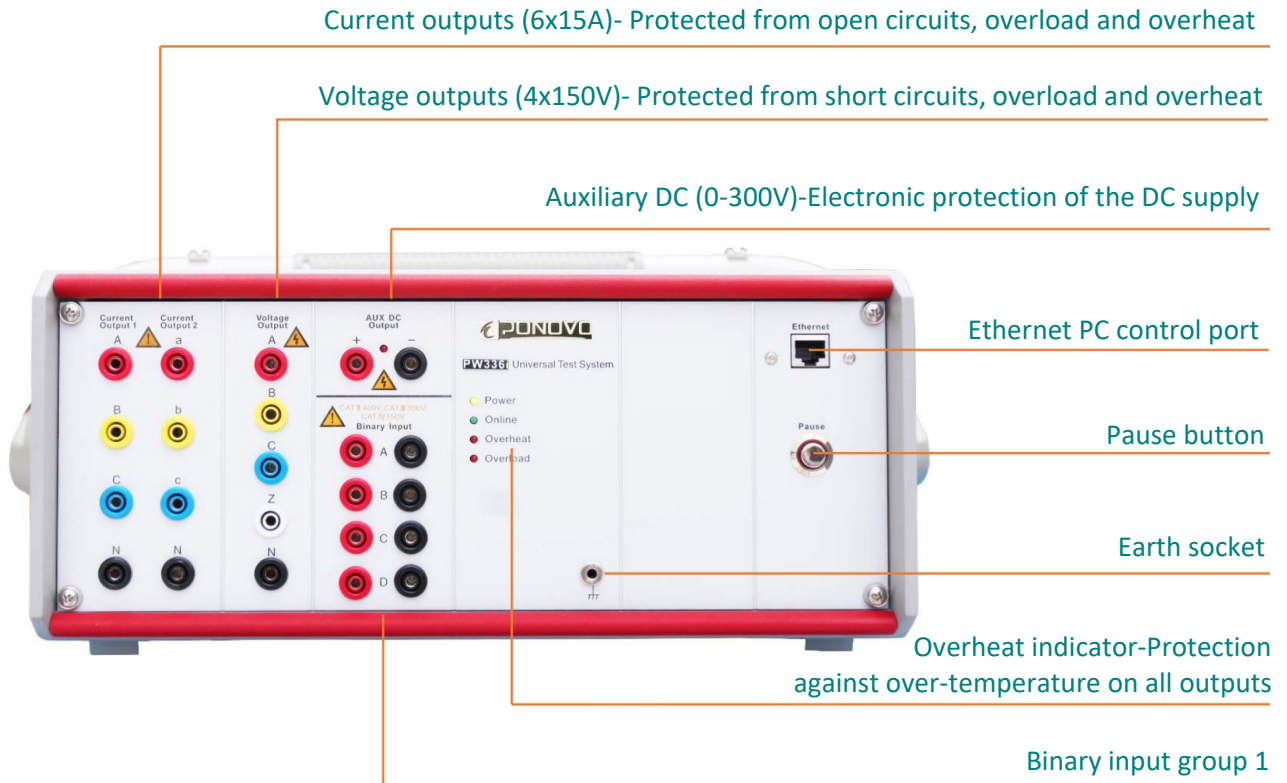


Test functions according to IEEE relay code

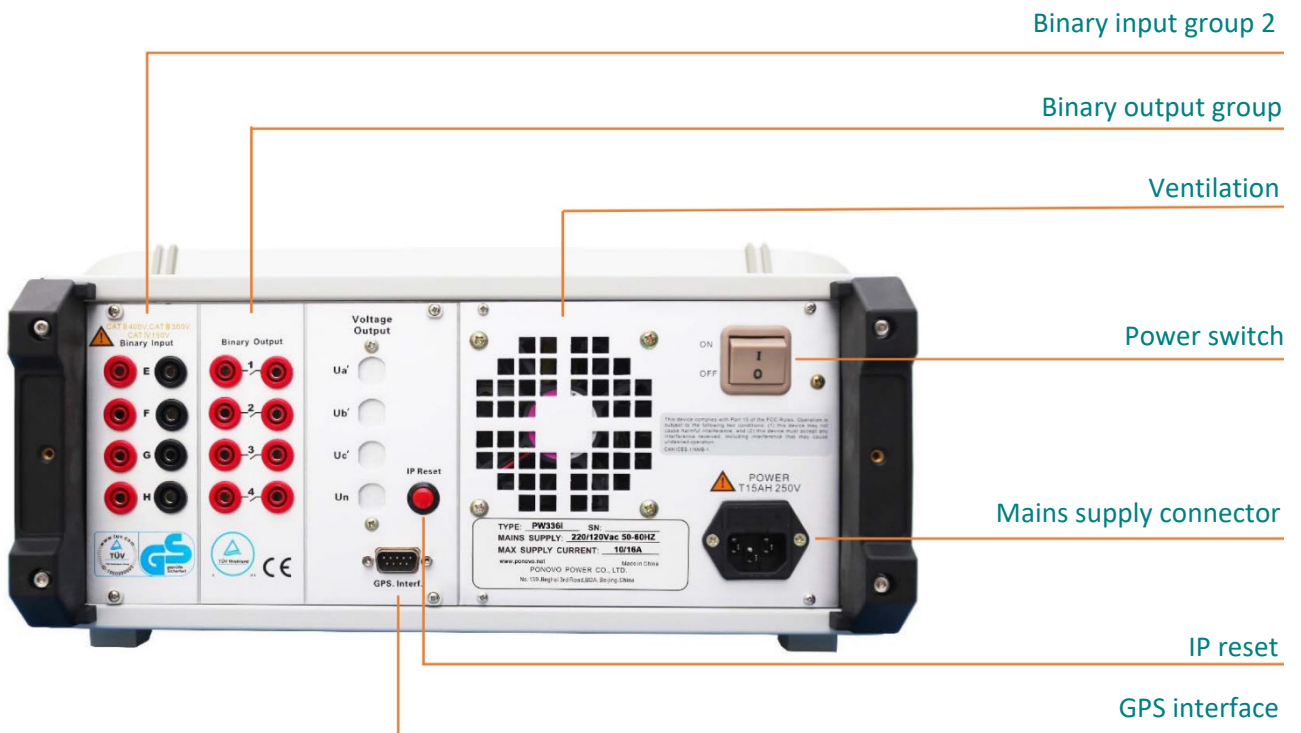
IEEE. NO.	DEVICE	IEEE. NO.	DEVICE
2	Time Delay Starting or Closing Relay	61	Density switch or sensor
21	Distance Relay	62	Time-Delay Stopping or Opening Relay
24	Volts per Hertz Relay	64	Ground Detector Relay
25	Synchronizing or Synchronism-Check Device	67/67N	AC Directional Overcurrent Relay
27/27N	Undervoltage Relay	68	Blocking or "out of step" Relay
30	Annunciator Relay	74	Alarm Relay
32	Directional Power Relay	76	DC Overcurrent Relay
36	Polarity or Polarizing Voltage Devices	78	Phase-Angle Measuring Relay
37	Undercurrent or Underpower Relay	79	AC-Reclosing Relay
40	Field (over/under excitation) Relay	81/81U/O/R	Frequency Relay
46	Reverse phase or Phase-Balance Current Relay	82	DC load-measuring reclosing relay
47	Phase-sequence or phase-balance voltage relay	85	Carrier or pilot-receiver relay
50/50N	Instantaneous Overcurrent	86	Lock-out relay
51/51N	AC Time Overcurrent Relay	87	Differential Protective Relay
52	AC Circuit Breaker	91	Voltage Directional Relay
53	Field Excitation Relay	92	Voltage and Power Directional Relay
55	Power Factor Relay	94	Trip Relay
56	Field Application Relay	Other Functions (Optional)	IEC61850 Energy meter
58	Rectification failure relay		
59/59N	Overvoltage Relay		
60	Voltage or Current Balance Relay		

PW336i Protection Relay Tester

Front Panel



Rear Panel



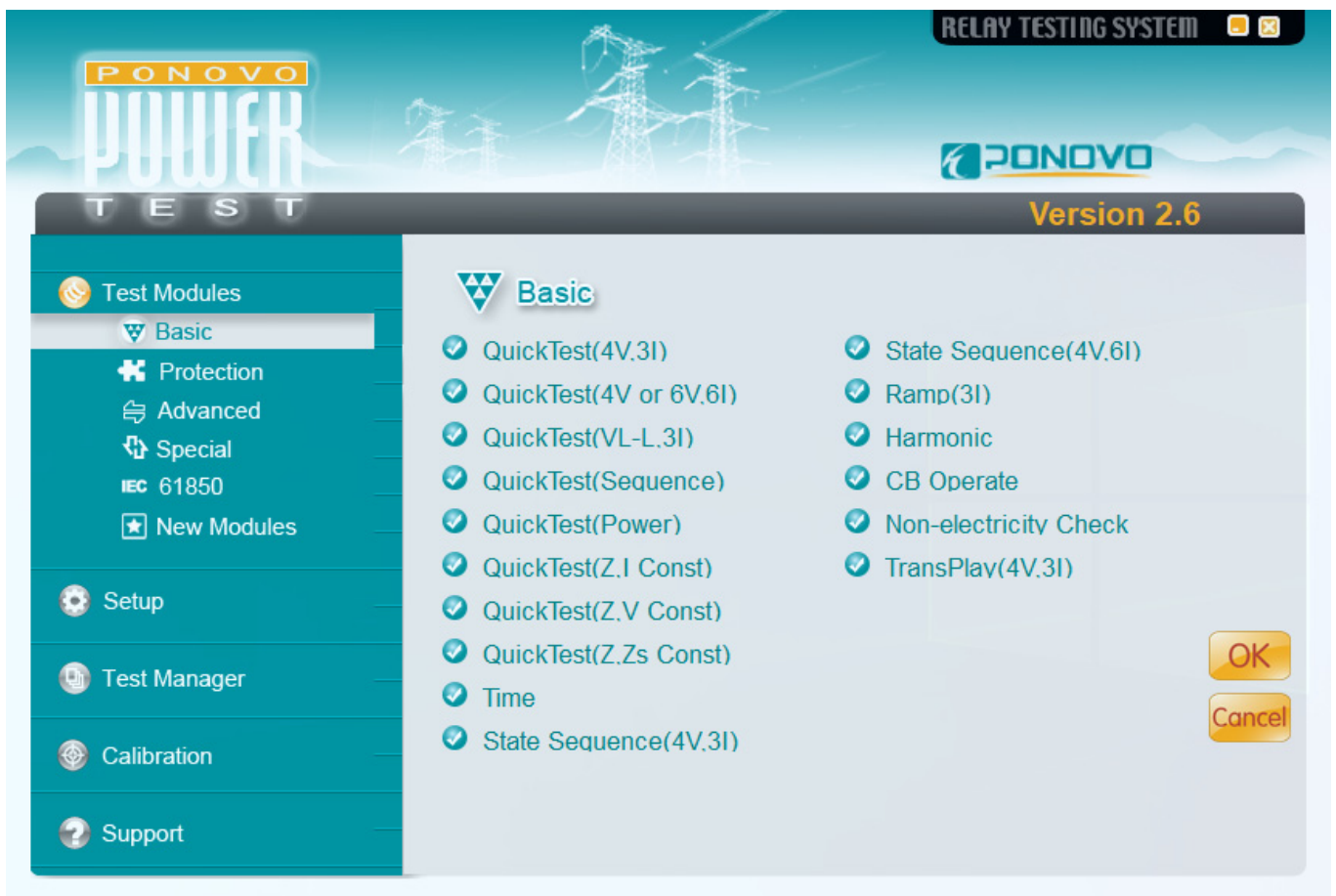


PowerTest - Relay Test Set Software

For all the three phase or six phase relay testers of PONOVO, one universal software can be used, the name is **PowerTest** software. PowerTest is a relay test software that includes different test packages, the **Basic** package, **Protection** package, **Advanced** package, **Special** package, **New Modules**, which packages includes different testing module, that can be used for all kinds of relay testing, and it also has the special package for more testing application, such as energy meter, etc.

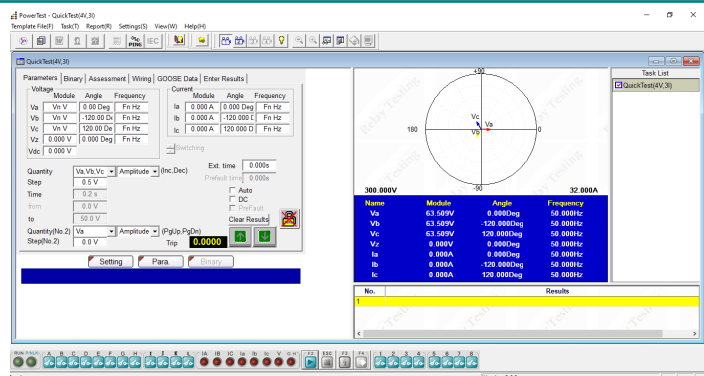
➤ Basic Package

In the **Basic** package, there are different Quick Test modules, Time module, State Sequence, Ramp, Harmonic, CB Operation, Non-electricity Check, and TransPlay for playing back the comtrade file.



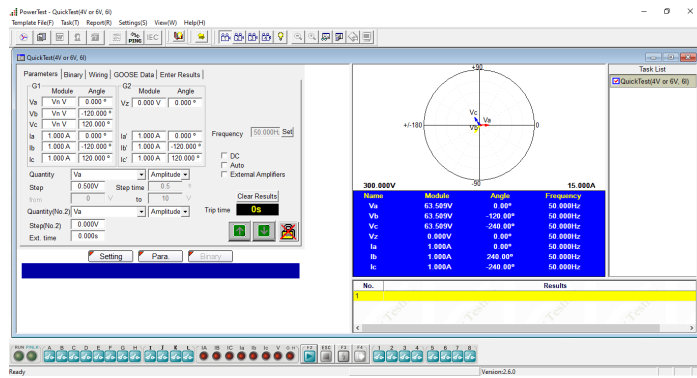
QuickTest (4V. 3I)

- ❖ 4 voltage and 3 current sources available for test relay
- ❖ Amplitude, phase angle and frequency of voltage and current sources can be controlled independently
- ❖ Test can be in manual or auto mode



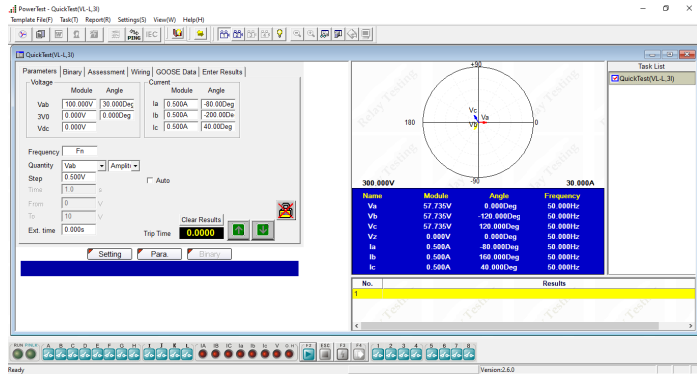
QuickTest (4V,6I)

- ❖ 4 voltage and 6 current sources available for test relay
- ❖ Amplitude, phase angle and frequency of voltage and current sources can be controlled independently
- ❖ Test can be in manual or auto mode



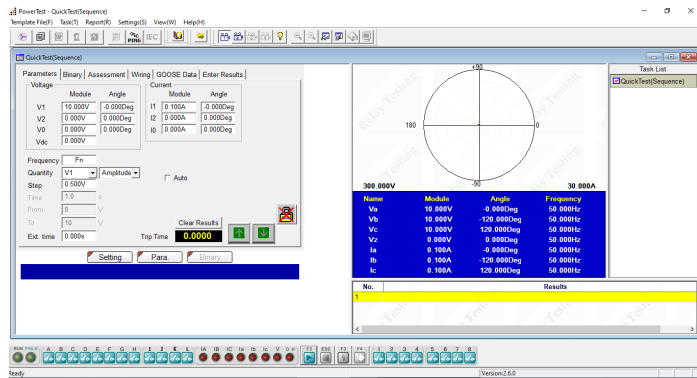
QuickTest (VL-L, 3I)

- ❖ Easy to control the phase-phase voltage, 3V0 (zero sequence voltage) and 3 currents
- ❖ Amplitude, phase angle and frequency of current sources and phase-phase voltage, zero sequence voltage can be controlled independently
- ❖ Test can be in manual or auto mode



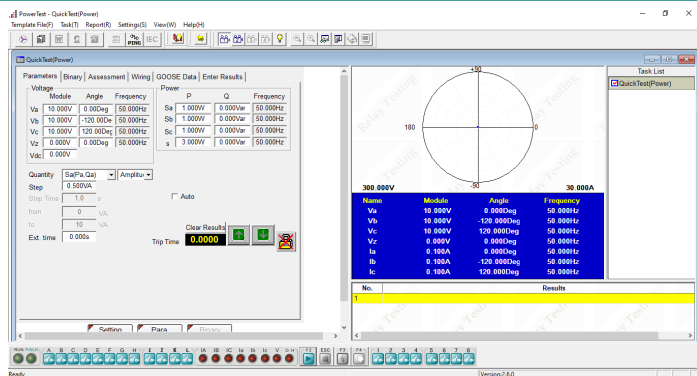
QuickTest (Sequence)

- ❖ Easy to control the sequence components (positive sequence, negative sequence and zero sequence) for voltage and current
- ❖ Amplitude and phase angle of the sequence components of voltage and current can be controlled independently
- ❖ Test can be in manual or auto mode



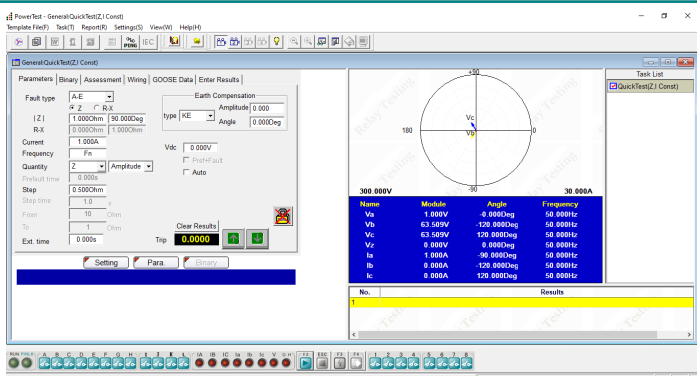
QuickTest (Power)

- ❖ Easy to control the output of power, including active power, reactive power and apparent power
- ❖ Amplitude of active power, reactive power and apparent power can be controlled independently
- ❖ Test can be in manual or auto mode



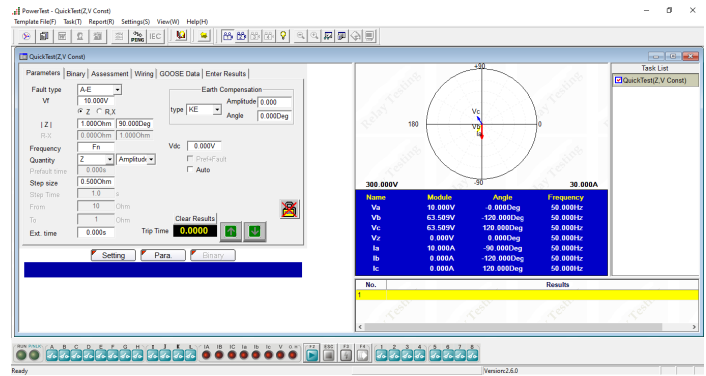
QuickTest (Z, I Const)

- ❖ Easy to test impedance relay with constant current
- ❖ Set the fault impedance and fault current, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



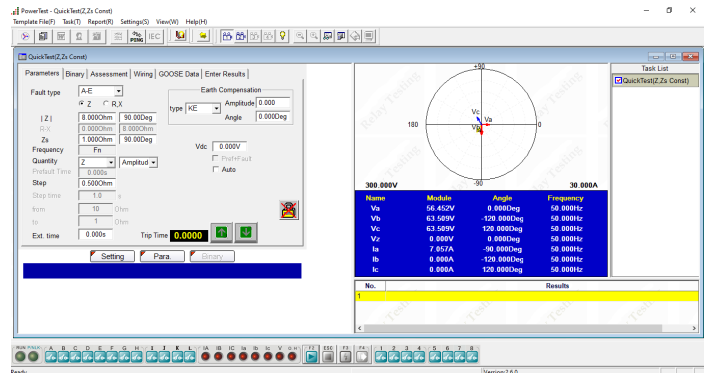
QuickTest (Z, V Const)

- ❖ Easy to test impedance relay with constant voltage
- ❖ Set the fault impedance and fault voltage, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



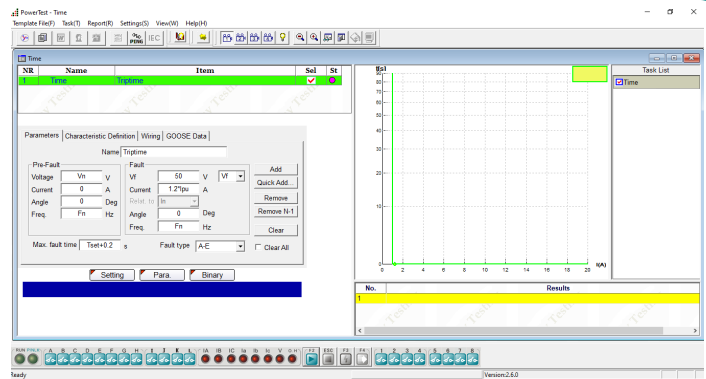
QuickTest (Z, Zs Const)

- ❖ Easy to test impedance relay with constant system impedance
- ❖ Set the fault impedance and system impedance, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



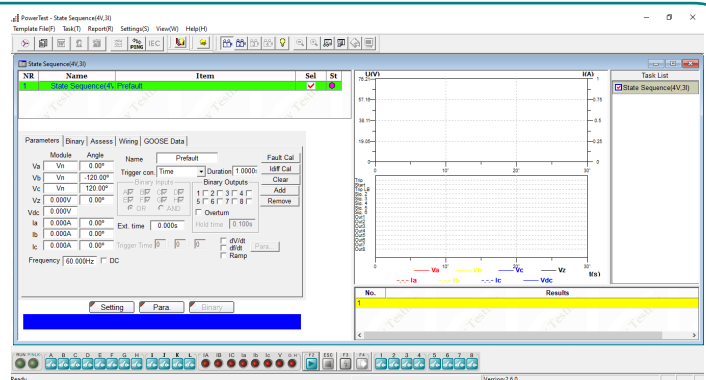
Time

- ❖ Time module is used to test trip delay time of protection relay
- ❖ Various value can be set separately, such as pick up value, delay time, pre-fault time, post-fault time, binary input/output, the voltage and current at pre-fault and fault state, characteristic definition, etc.



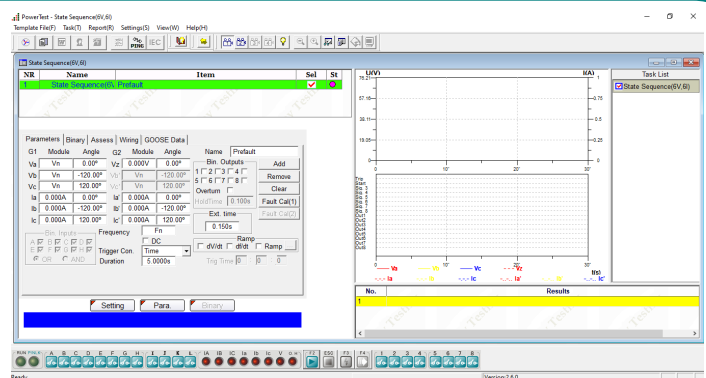
State Sequence (4V, 3I)

- ❖ Used to define multiple continuous state sequences for special test applications, such as generate a series of states to test the tripping time and close time
- ❖ 4 voltage and 3 current sources available for each state
- ❖ Trigger condition in each state can be set separately



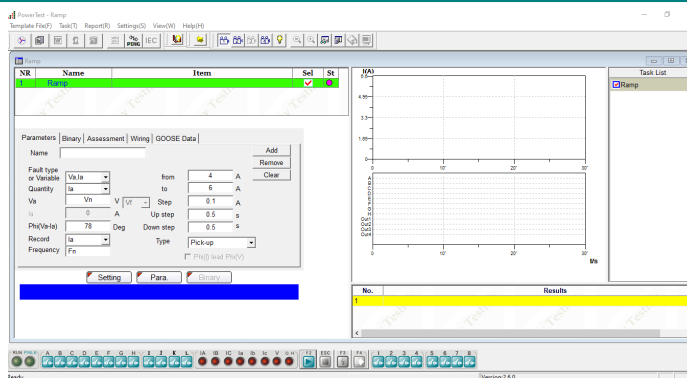
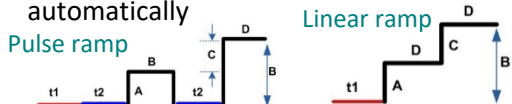
State Sequence (4V, 6I)

- ❖ Used to define multiple continuous state sequences for special test applications, such as generate a series of states to test the tripping time and close time
- ❖ 4 voltage and 6 current sources available for each state
- ❖ Trigger condition in each state can be set separately



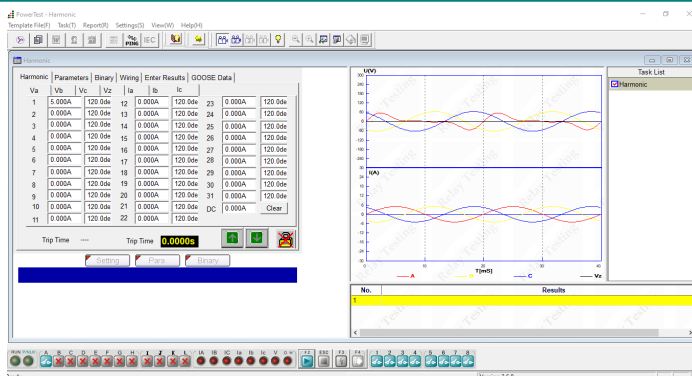
Ramp (3I)

- ❖ Specially designed to realize RAMP for different test applications, such as pick up/drop off value checking, directional relay testing, maximum torque angle checking etc.
- ❖ Both pulse ramp and linear ramp available
- ❖ Can search the relay operation value automatically



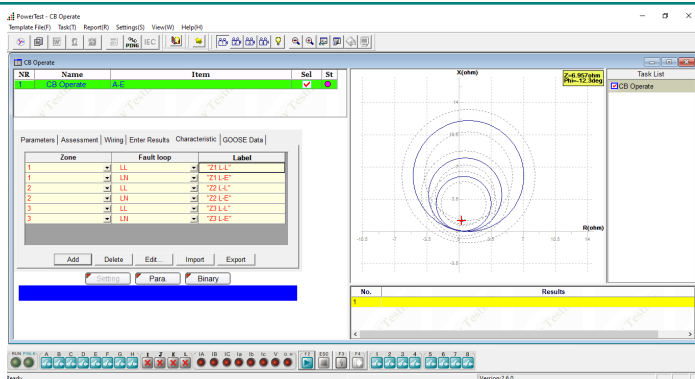
Harmonic

- ❖ Can generate harmonics for all voltage and current outputs
- ❖ Can check the 2nd /3rd / 4th /5th harmonic restraint of current differential
- ❖ Can check the harmonic measurement of the relay up to 31st harmonic
- ❖ Can set the harmonic for each channel separately



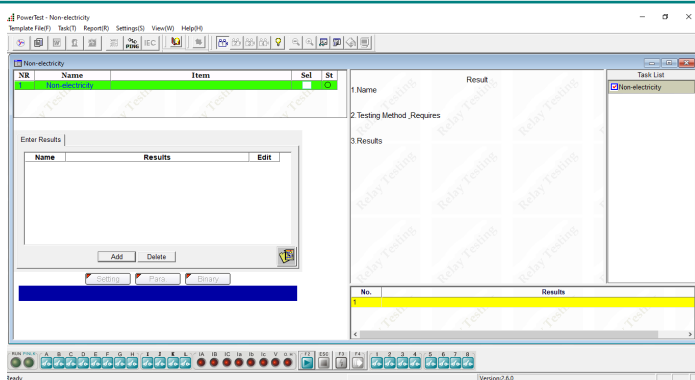
CB Operate

- ❖ Can check different types of line protection system, including over current, distance, etc.
- ❖ Can check the whole relay system, including auto-reclosing and circuit breaker simulate
- ❖ Can set different fault type
- ❖ Can do end-to-end test with GPS control mode



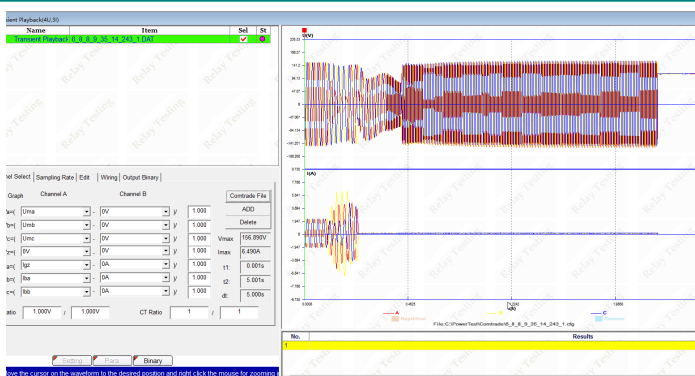
Non-electricity

- ❖ Give tips before and after testings to have test scheme prepared well and finished well
- ❖ Neither has any output value nor judge the binary input. It only generates a complete report for project check from appearance and safety.



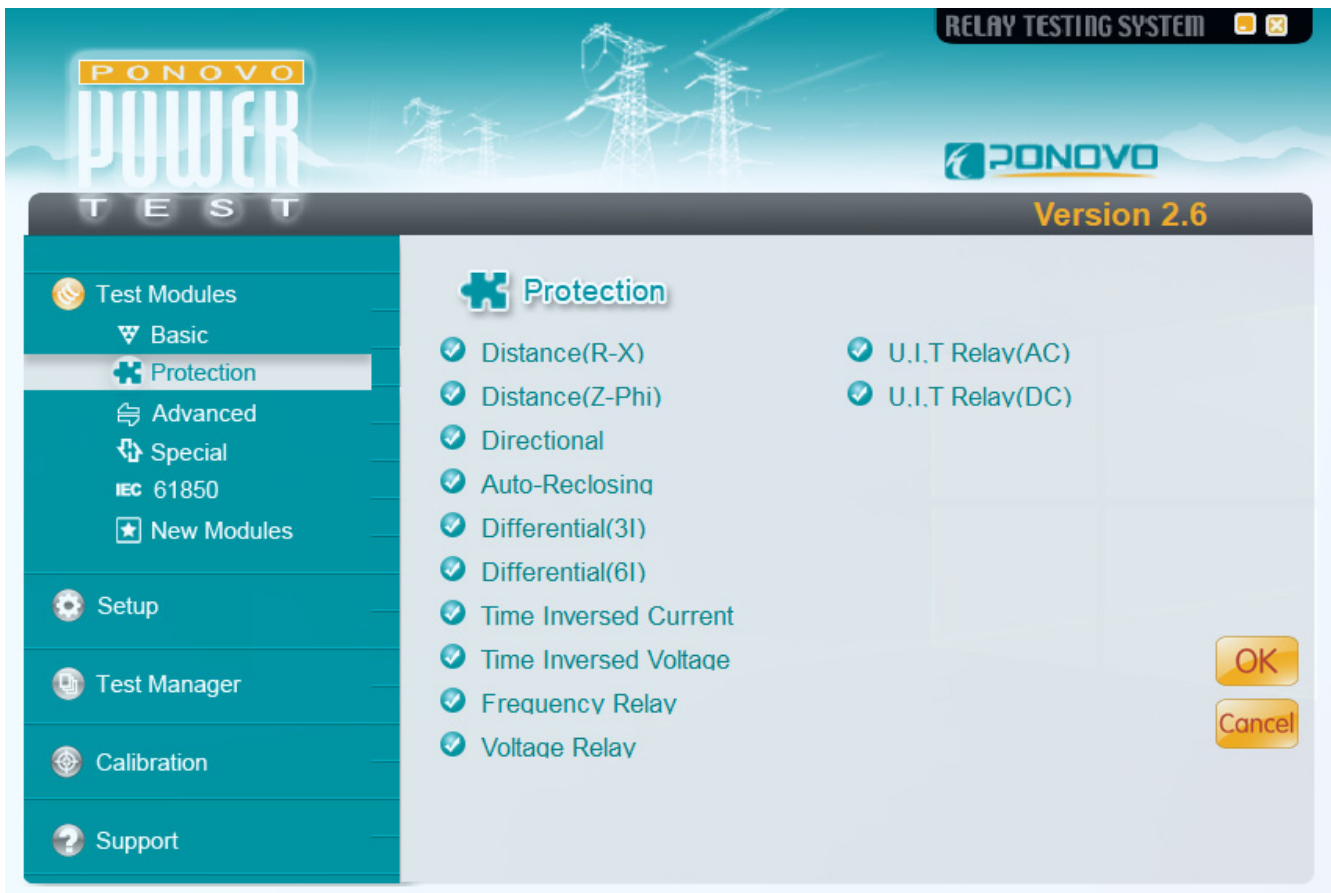
Transient Playback (4V,3I)

- ❖ Can play back the COMTRADE format file which records 4 voltage channels and 3 current channels
- ❖ Display the waveform and data of the imported COMTRADE file



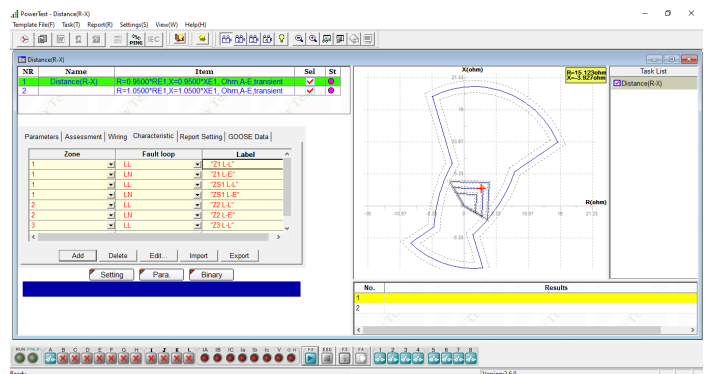
➤ Protection Package

In protection package, there are more testing modules for relay's characteristics testings, such as Distance, Differential, Directional, Time Inversed Current, Time Inversed Voltage, Frequency, Auto-Reclosing etc.



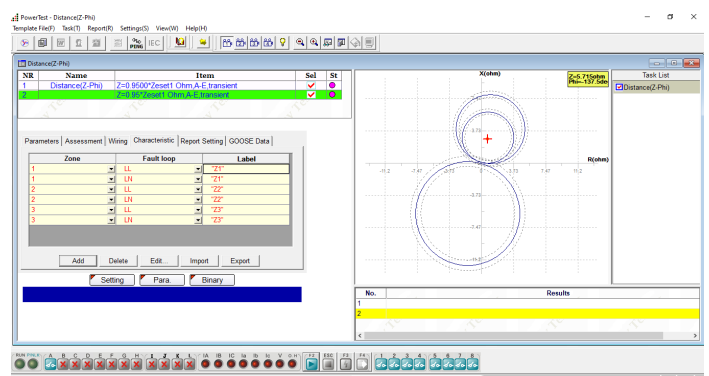
Distance (R-X)

- ❖ Can test impedance relay with R-X setting in different ways
- ❖ Input impedance characteristic to Z plain
- ❖ Associate the characteristic with relay settings
- ❖ Select test point/ items directly on Z plain or in setting box
- ❖ Zone verification
- ❖ Z-T test
- ❖ Edit new characteristic



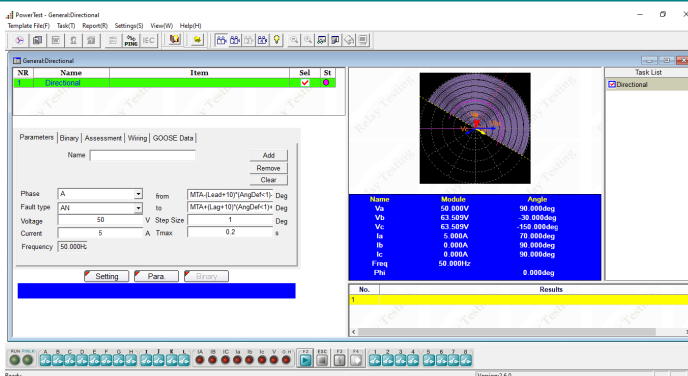
Distance (Z-Phi)

- ❖ Can test impedance relay with Z-Phi setting in different ways
- ❖ Input impedance characteristic to Z plain
- ❖ Associate the characteristic with relay settings
- ❖ Select test point/ items directly on Z plain or in setting box
- ❖ Zone verification
- ❖ Z-T test
- ❖ Edit new characteristic



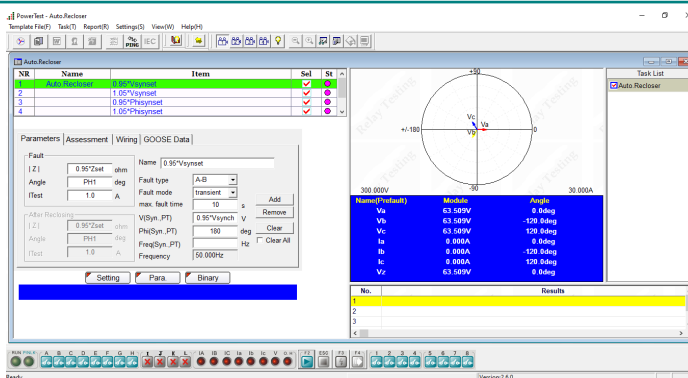
Directional

- ❖ Can search maximum torque angle and two boundary angles (Lead and lag angles)
- ❖ Can set angle define, V lead I or I lead V
- ❖ Can set fault type, single phase, phase-phase or three phase fault



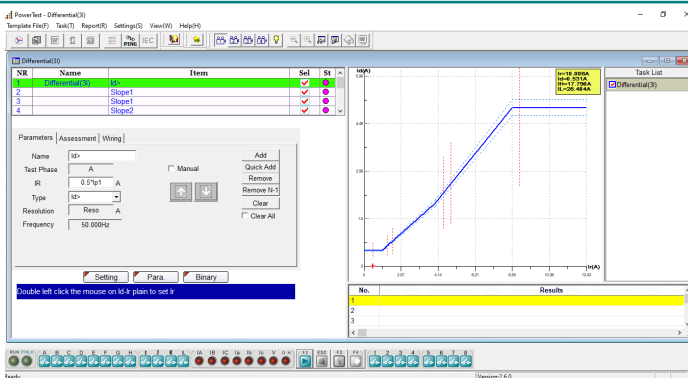
Auto-Reclosing

- ❖ Can test the reclose function
- ❖ Realize relay automatic reclosing with checking the difference between two systems, checking the synchronization setting, reclose set time checking and automatic evaluating of testing results.



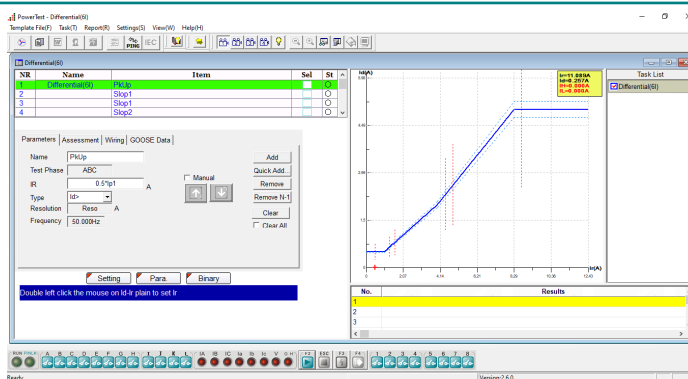
Differential (3I)

- ❖ Can search out the percentage restraint curve, harmonic restraint, trip time for single phase fault
- ❖ Can search the percentage restraint curve
- ❖ Can check 2nd harmonic restraint
- ❖ Can check 3rd harmonic restraint
- ❖ Can check 5th harmonic restraint
- ❖ Can check tripping time of set points



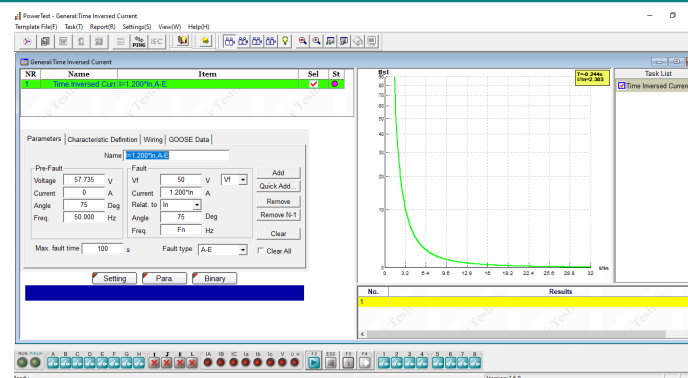
Differential (6I)

- ❖ Suitable for 6 output current channels' relay tester, such as transformer, generator and bus bar etc. differential protection equipment test
- ❖ Realize the two sides 3 phase/phase-phase/single phase test between relay tester and relay equipment.
- ❖ Can search the percentage restraint curve, harmonic restraint, trip time



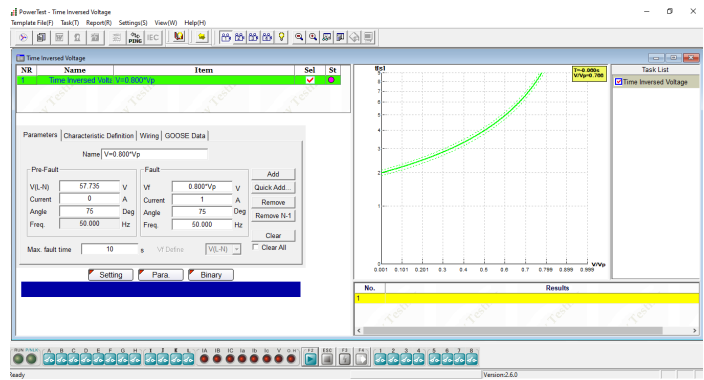
Time Inversed Current

- ❖ Realize the directional over-current test and non-directional over-current test
- ❖ Include testing positive sequence, negative sequence and zero sequence inverse-time over-current, definite-time over-current, over-heat protection.
- ❖ Can import the IEC and IEEE standard curve or user defined curve



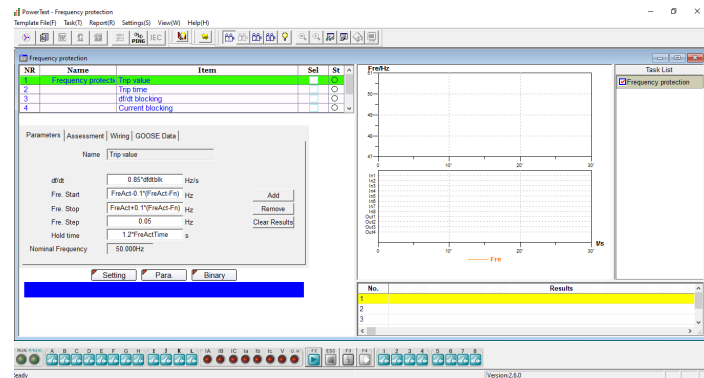
Time Inversed Voltage

- ❖ Can test time inversed over voltage and time inverse under voltage relay
- ❖ Include testing directional, time definite and with time delay voltage relay
- ❖ Can simulate three phase, phase-earth fault, and phase-phase fault



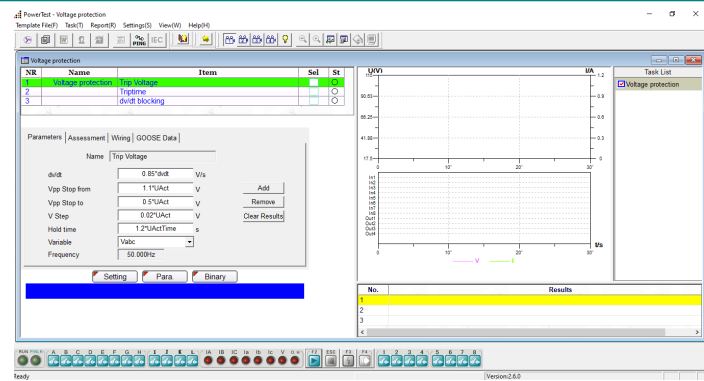
Frequency Relay

- ❖ Can test frequency protection relay, such as over frequency, under frequency, df/dt trip, df/dt blocking
- ❖ Including pick up frequency, trip time, df/dt setting value, voltage blocking value and current blocking value test



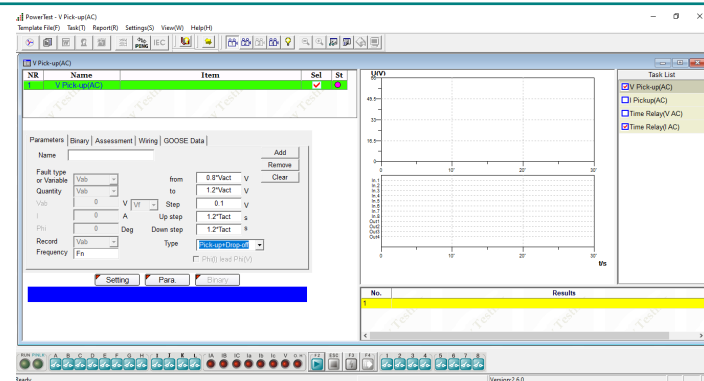
Voltage Relay

- ❖ Can test voltage protection relay including under voltage and over voltage
- ❖ Can test pick up voltage, trip time and dv/dt setting value



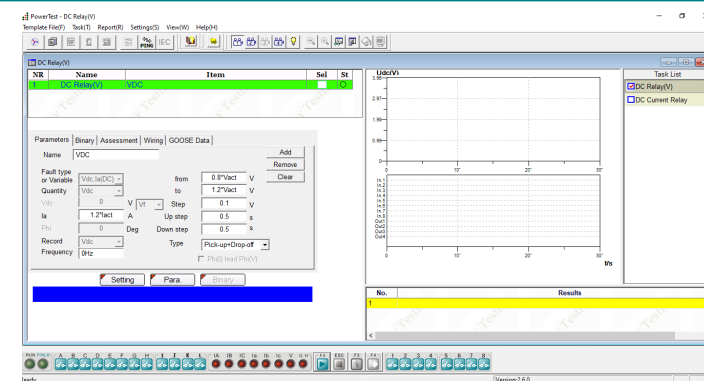
U. I. T Relay (AC)

- ❖ Can test AC type auxiliary/intermediate relay and AC type time relay
- ❖ Can test AC voltage type electromagnetic relay
- ❖ Can test AC current type electromagnetic relay
- ❖ Can test electromagnetic time relay picked-up by AC voltage
- ❖ Can test electromagnetic time relay picked-up by AC current



U. I. T Relay (DC)

- ❖ Can test DC type voltage relay. Auxiliary DC source Vdc is used for this test. Also DC current can be generated for some relays when it is required.
- ❖ Can test DC type current relay. Current source is used for this test. DC voltage can be generated for some relays when it is required.



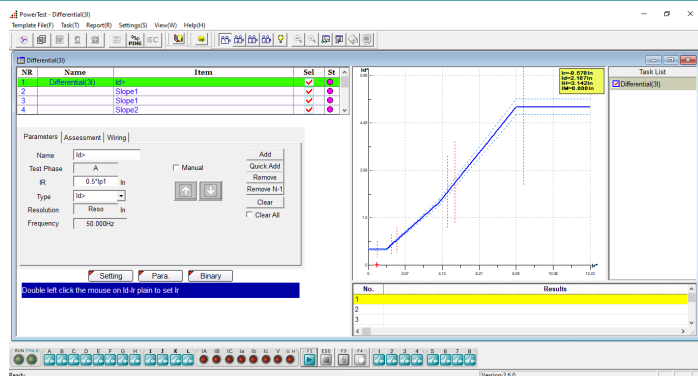
➤ Advanced Package

In the advanced package, the centralization testing the RX Characteristic Sweep, testing for distance relay, Advanced Differential, Advanced Transplay, Synchronization, etc.



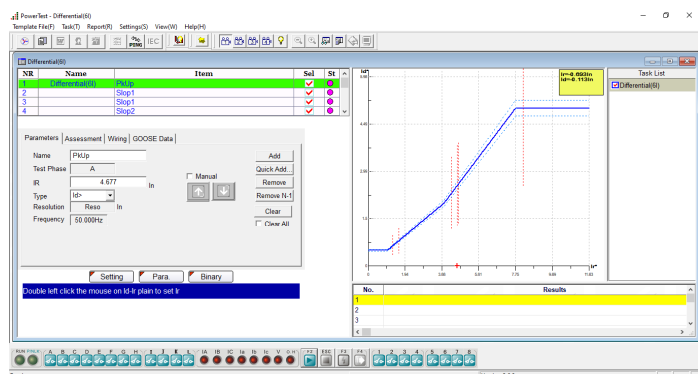
Advanced Differential (3I)

- ❖ Can search the percentage restraint curve, harmonic restraint, trip time for single phase fault
- ❖ Can automatic to calculate the matching factor via the transformer parameter and CT/PT parameter
- ❖ Only check single phase fault



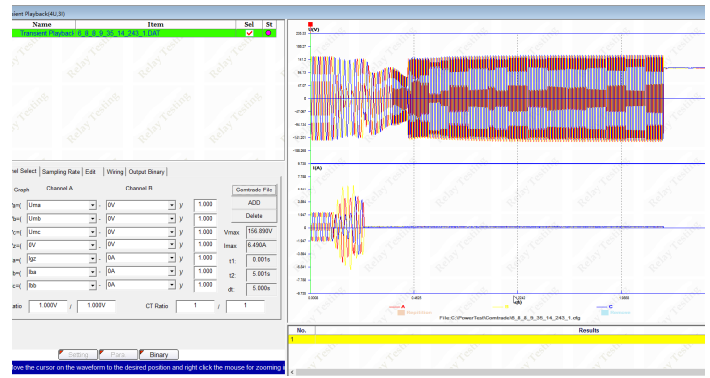
Advanced Differential (6I)

- ❖ Can search the percentage restraint curve, harmonic restraint, trip time
- ❖ Can automatic to calculate the matching factor via the transformer parameter and CT/PT parameter
- ❖ Can test single phase, phase-phase, three-phase fault



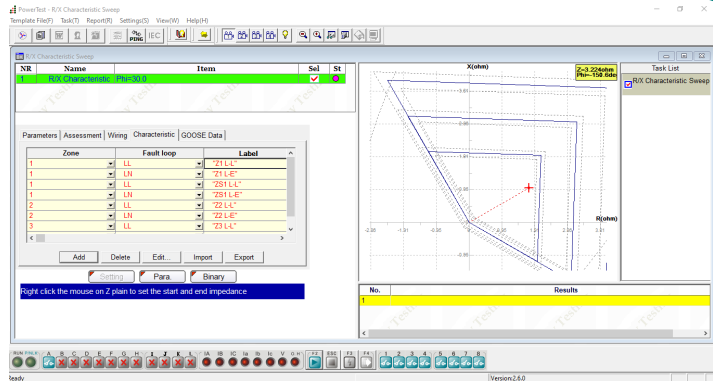
Advanced TransPlay(4V,3I)

- ❖ Can play back the COMTRADE format file, including CFG, which describe signal names, sampling frequencies, etc. and DAT which contains the sampling values for each channel.
- ❖ Can edit the COMTRADE data



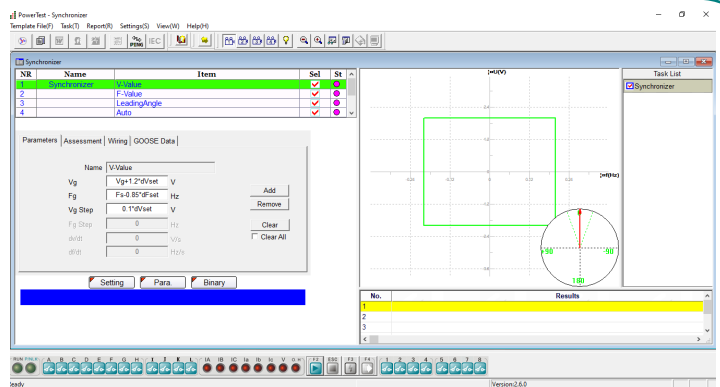
RX Characteristic Sweep

- ❖ Can search the characteristic boundary of the impedance relay
- ❖ Can find the boundary at different angles



Synchronizer

- ❖ Can check synchronizing relay
- ❖ Can check voltage difference
- ❖ Can check frequency difference
- ❖ Can check leading time and leading angle
- ❖ Can check pulse width for frequency adjustment
- ❖ Can check pulse width for voltage adjustment
- ❖ Can check auto-adjusting function with both voltage and frequency varying



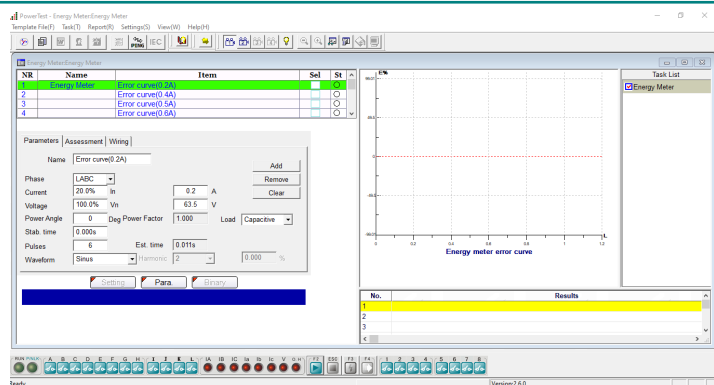
➤ Special Package

In the special package, there are energy meter module and power swing simulation module can be used by PW336i.



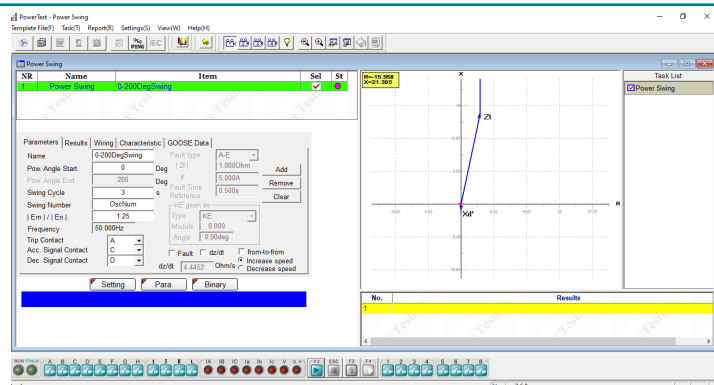
Energy Meter

- ❖ Can check the functionality and accuracy of energy meter with or without optional accessory PACB108
- ❖ 1-phase or 3-phase energy meters can be checked
- ❖ Active power meter, reactive power meter, and apparent power meter can be checked



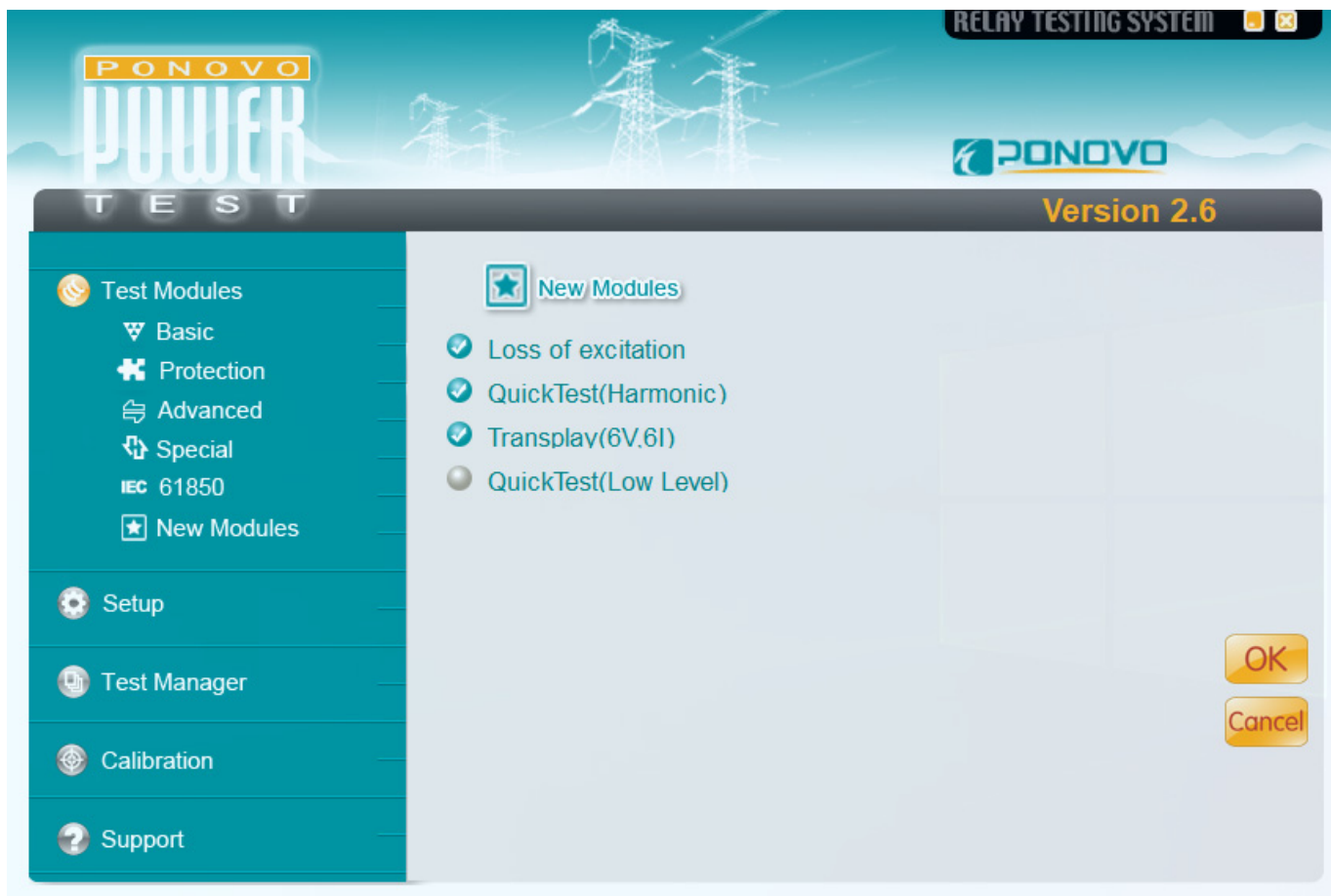
Power Swing Simulation

- ❖ Can really simulate the oscillations in power flow reference the power parameter
- ❖ Can simulate Out-Of-Step and Stable swing
- ❖ Can simulate increase and decrease swing
- ❖ Can be a tool for relay test engineer to observe the relay behavior during dynamic power swing process.



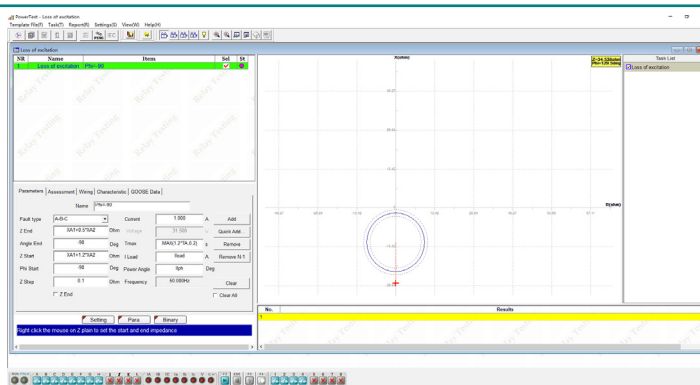
➤ New Modules Package

In the New Modules package, there are modules loss of excitation, QuickTest(harmonic) and Transply(6V, 6I) applied for PW336i.



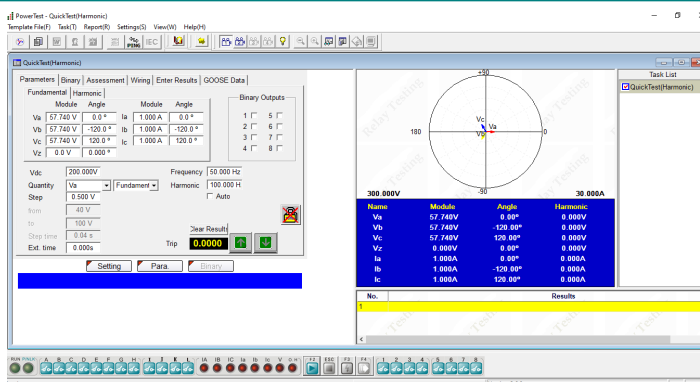
Loss of excitation

- ❖ Can search for two different excitation loss characteristics
- ❖ During the test process a series of shots will be generated to search out the boundary along this shot line. Then next shot at a different angle will be generated. In this way we can then find out the boundary at different angles.



QuickTest (Harmonic)

- ❖ Can automatically and manually superposition harmonics with user-defined frequency
- ❖ The fundamental and harmonic of voltage and current sources can be controlled independently



More Templates can be download from our website www.ponovo.net



- CAG17
- CTIG
- CTIGM
- CTMFM
- CTMM
- CTNM
- CTT
- CTTM
- CTU
- DIFB
- MFVUM
- Micromho
- MVAPM
- MWTU
- Optimho
- P111
- P115
- P120
- P121
- P122
- P123
- P124
- P127
- P141
- P142
- P143
- P144
- P145
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- P442
- P443
- P921
- P922
- P923
- P940
- P941
- P942
- P943
- PPX
- PVMM
- Quadromho
- SKE
- SKD
- VAGM22
- VAPM
- P632
- P633
- P634
- P642
- P643
- P643
- P645



- SEL300
- SEL351
- SEL587
- SEL311B
- SEL487B
- SEL487E
- SEL167
- SEL411
- SEL311C
- SEL311L
- SEL321
- SEL421
- SEL501
- SEL587



- 7RW600
- 7SA6XX
- 7SA511
- 7SA513
- 7SA518
- 7SA519
- 7SA522
- 7SD5
- 7SD52
- 7SD63
- 7SJ61
- 7SJ63
- 7SJ80
- 7SS52
- 7ST6
- 7UM61
- 7UM62
- 7UM512
- 7UM515



- LZ96
- REG100
- REL511
- REL531
- MSOC
- RAZFE
- REB670
- REC670
- REF542
- REG216
- REL300
- REL316
- REL350
- REL352
- REL356
- REL511
- REL512
- REL521
- REL531
- REL561
- REL650
- REL670



- PCS-902
- RCS-915
- RCS-931
- RCS-993
- RCS-902
- PCS-9611
- PCS-902H
- PCS-931D
- PCS-9611C



- SR489
- SR745
- F650
- SR750
- GT60
- D60
- DLPD
- G30
- L90
- GE345



- SEPAM 10
- SEPAM 80
- SEPAM 2000
- SEPAM S42
- T20



- MRA4
- MRDT4
- MRI4
- MRM
- MRN



- GRB100
- GRD110
- GRD140
- GRD150
- GRF100
- GRL100



- F_PRO
- L_PRO
- T_PRO



- VAMP 255
- VAMP 265



- 326GD



- PCT210





Optional Accessories

• PW-VP50 CT Polarity checker



2 units. Master machine injects pulse current to primary side of CT, slave machine receives and analysis the waveform of induced pulse current at the secondary side so as to judge the polarity is positive or negative automatically by the LED indicator on the kits.

• GPS synchronization (PGPS02/PGPS04i)



PGPS02

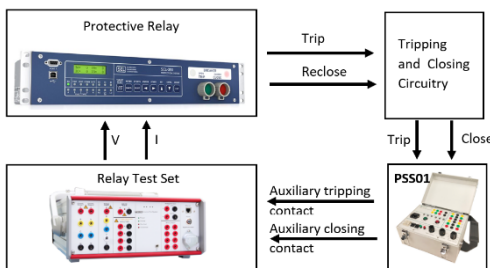
PGPS02: It provides GPS synchronization signal in PPS (pulse per second) or PPM (pulse per minute) for synchronized test. Trigger time can be set for end- to-end test application.



PGPS04i

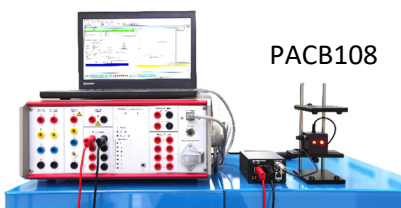
PGPS04i: The PGPS04i is a multi-functional time synchronization device that integrates with GPS time synchronization, IRIG-B (DC-TTL/DC-RS422/optical) outputs, IRIG-B (DC-TTL/DC-RS422/fiber) pulse input, 1PPS/1PPM (DC-TTL/DC-RS232 /fiber) pulse output, timing set of whole trigger points, real-time clock auto-generating and other relevant functions.

• Circuit breaker simulator (PSS01)



Working together with PONOVO relay testing device, PSS01 is to be used to simulate the circuit breaker operation for checking the relay scheme performance. Complicated software settings can be avoided by using this simple accessory.

• Scanning Head (PACB108)



PACB108

The passive optical scanning head PACB108 detects the status of an LED, that is either an optical pulse output from an energy meter or the binary status of a protective relay or other similar optical source.



PW336i

Protection Relay Tester



Specifications

Voltage generators

Setting range

4-phase ac(L-N)	4×0~150V
1-phase ac(L-L)	1×0~300V
dc (L-N)	4×±0~150V
dc (L-L)	1×±0~300V

Power

4-phase ac(L-N)	4×45VA at 150V
3-phase ac(L-N)	3×60VA at 150V
1-phase ac(L-L)	1×100VA at 300V
dc (L-N)	4×40W at 150 V

Accuracy

error < 0.08 % rd.+0.02 % rg. guar.
error < 0.04 % rd.+0.01 % rg. typ.

Ranges

150V

Resolution

5mV for 150Vac

Distortion

< 0.05 % typ., (< 0.1 % guar.)

Current generators

Setting range

6-phase ac(L-N)	6×0~15A
3-phase ac(2L-N)	3×0~30A
1-phase ac(6L-N)	1×0~90A
dc (L-N)	6×±0~15A
dc (6L-N)	1×±0~90A

Power

6-phase ac(L-N)	6×150VA at 15A
3-phase ac(2L-N)	3×240VA at 30A
1-phase ac(6L-N)	1×450VA at 90A
1-phase ac(L-L)	1×450VA at 30A

Max compliance

voltage(L-N)(L-L) 15Vpk/30Vpk

dc (L-N) 6×100W at 15A

dc (6L-N) 1×480W at 90A

Accuracy

error < 0.15 % rd.+0.05 % rg. guar.
error < 0.05 % rd.+0.02 % rg. typ.

Ranges

15A or 30A

Resolution

1mA

Distortion

< 0.05 % typ., (< 0.1 % guar.)

General

Frequency

Sine signal DC, 0.001Hz~1000Hz

Accuracy ±0.3ppm

Resolution 0.001Hz

Phase

Angle range -360°~+360°

Accuracy <0.05° typ., <0.1° guar.at 50/60Hz

Resolution ±0.001°

Auxiliary dc supply

Voltage range 0~300V

Power 88W at 110V, 176W at 220V,120W at 300V

Accuracy error < 0.1 % rg. typ. (<0.5 % rg. guar.)

Binary inputs

Number 8

Input characteristics 0~400Vdc/ac threshold or potential free

Time resolution 50µs

Max. measuring time Infinite

Debounce/Deglitch time 0~25ms

Counting function < 3kHz at pulse width>150µs

Binary output, relay

Number 4

Type Potential free relay contacts, software controlled

Break capacity ac Vmax: 300Vac /Imax: 8A/Pmax: 2000VA

Break capacity dc Vmax: 300Vdc /Imax:8A /Pmax: 150W

In-built monitoring and recording

Monitoring currents and voltage outputs

Recording analog outputs, binary inputs/outputs status

Mode real time monitoring, no external wiring is required

Recording length 16s

Power supply

Nominal input voltage 110~240Vac

Permissible input voltage 90~260Vac

Nominal frequency 50/60Hz

Permissible frequency 45~65Hz

IEC61850 Goose function(Optional)

Interpretation hardware is in-built. Please contact the supplier for options to activate the IEC61850 software support Goose function

Environmental conditions

Operation temperature 0~+50°C

Storage temperature -25~+70°C

Relative humidity 5~95% non-condensing

EMC(E&I) EN/IEC 61326-1 EN/IEC 61000-3-2/3

EN/IEC61000-4-2/3/4/5/6/8/11/18

Environment EN/IEC 60068-2-1/2/3/6/27

Safety EN/IEC 61010-1/1-12/2-030 EN/IEC 60255-25/27

Others FCC Part 15:Sub B ECS-001:2006 LVD EU

Others

PC connection Ethernet,10M/100M

GPS interface DB9/TTL

Ground Socket(earth) 4mm banana socket, front side

Weight 20kg

Dimensions (W x H x D) 360mm ×157mm×367mm

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PONOVO POWER CO., LTD.

No.139 Jinghai Third Road, BDA, Beijing, China. 100176

Tel : +86 (10) 59089666

Fax: +86 (10) 59089999

www.ponovo.net

info@relaytest.com

support@relaytest.com