PONOVO

Protection Relay Test Solutions
IEC61850 Test Solutions
CT/PT Test Equipment
Primary Injection Equipment
Amplifier for Power Simulation Application

POWER ADVANCED TECH CO LTD

About us

Power Advanced Tech Co Ltd was founded in 1998. For over 10 years we have been focusing on providing professional solutions to electrical power industries and has won the good reputation from over 5000 clients.

From 2008 we started to promote our products on international market with the brand name **PONOVO**.

Our product line covers the four areas:

- **Relay Testing System**
- **Intelligent Instrumentation**
- **Power Quality Monitoring and Control**
- **High Voltage Test and Diagnostic System**

1998: Foundation of Power Advanced Tech Co Ltd
1998: Launch of PS180, our first relay tester with 60A/channel output
1999: Launch of PA2000, the 200A/channel amplifier for RTDS application
2000: Launch of P41, the panel control type relay test system
2001: Launch of PWA, the relay test system with in-built output monitoring and recording function
2002: Launch of PW466A, the relay test system with 6 currents and 6 voltages
2003: Launch of PH01, the testing system for Traveling Wave Fault Locater
2004: Launch of PWS, the relay test system for subway used protective relays
2005: Launch of PWF, the relay test system for digital substation with IEC61850 protocol
2005: Launch of e40, the software for automatic test and management
2006: Launch of the relay test system for serial compensation system used relays
2007: Launch of PM605A, the universal calibrator and test system
2007: Announce the brand name of PONOVO
2008: Launch of T200A, the single phase universal tester which can provide 120s output time at 250A
2008: Launch of MR1200, the portable disturbance recorder with in-built oscilloscope function
2008: Launch of PowerTest relay test software
2009: Launch of the relay test system for 500KV DC converting station test application
2009: Launch of L336i, the compact relay test system with 6 currents and 4 voltages and has a weight of 9.4kg
2009: Launch of PCT100i, the CT/PT tester with a weight of 11kg
2009: Launch of HB-6000, the online DGA (dissolved gas analyzer) system for transformer
2009: Launch of PF3000, the test system for automatic test of power filters
2009: Launch of SSCS, the solid state composite switch for improving the performance of capacitor bank control
2009: Launch of T1000/T2000, the primary injection kit which can provide 120s output time at 1000A
2009: Launch of T4000, which can continuously supply 4000A DC current for testing CT of DC converting station

Headquarters Building

Contents

Products introduction

Part of realy testing equipment are shown bellow

PW460

- 6×15A, 4×300V
- Auxiliary DC (0-300V), DC measuring inputs
- 8 binary inputs and 8 binary outputs, 4 counter inputs, 12 low level outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay

PW636i

- 6×32A, 4×300V
- Auxiliary DC (0-300V), DC measuring inputs
- 8 binary inputs and 8 binary outputs, 4 counter inputs, 12 low level outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay

PW666i

- 6×32A, 6×150V
- Auxiliary DC (0-300V), DC measuring inputs
- 8 binary inputs and 4 binary outputs, 4 counter inputs, 12 low level outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay

PW336i

- 6×15A, 4×150V
- Auxiliary DC (0-300V)
- 8 binary inputs and 4 binary outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay

L336i

- 6×15A, 4×120V
- 8 binary inputs and 4 binary outputs
- Can be upgraded to support the test of IEC61850 complied relay
- Weight: 8.8kg
- Size: 256×110×395mm

PW430D

- 3×20A, 4×150V
- Auxiliary DC (0-300V), DC measuring inputs
- 8 binary inputs and 4 binary outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay
- Local control with color LCD display or controlled by external PC

PW431D

- 6×15A, 4×150V
- Auxiliary DC (0-300V), DC measuring inputs
- 8 binary inputs and 4 binary outputs
- Adjustable threshold for binary inputs
- In-built output monitoring and recording function
- Can be upgraded to support the test of IEC61850 complied relay
- Local control with color LCD display or controlled by external PC

S40A

- 3×40A, 3×150V
- Auxiliary DC (24V, 110V, 220V)
- 4 binary inputs and 1 binary outputs
- Local control with LCD display

S100A

- 1×100A, 3×120V
- Auxiliary DC (110V, 220V)
- 2 binary inputs and 1 binary outputs
- Local control with LCD display

T200A

- 1×250Aac, 1×20A ac/dc, 1×200mA ac/dc
- 1×500Vac, 1×120V ac/dc, 1×300Vdc
- Auxiliary DC (0-240V)
- 2 binary inputs and 1 binary outputs
- In-built voltmeter and ammeter
- Long output time: 120s at 250A

T1000

- 1×1000Aac/7000VA
- 1×250Vac/250VA
- 1×300Vdc/600W
- In-built ammeter function
- 120s continuous output time at 1000A
- Weight : 30kg

PWF

- Designed to test IEC61850 relay without analog inputs
- Simulating EVT/ECT outputs according to IEC61850-9-1/2 protocol
- Number of simulation of sampled value: 24 channels

Model PW460

Specifications

Voltage generators

Setting range

4-phase ac (L-N)	4×0~300V
1-phase ac (L-L)	1×0~600V
dc (L-N)	4×0~±300V

Power

4-phase ac (L-N)	4×85VA at 300V
	3×120VA at 300V
1-phase ac (L-L)	1×170 VA at 600V
	(two generators in series)
dc (L-N)	4×100 W at ±300 V

Accuracy	error < 0.08 % rd.+0.02 % rg. guar.
	error < 0.02 % rd.+0.01 % rg. typ.
Ranges	300V
Resolution	10mV for 300Vac
Distortion	< 0.05 % typ. (< 0.1 % guar.)

Current generators

Setting range

6-phase AC (L-N)	6×0~15A
3-phase AC (L-N)	3×0~30A
1-phase AC (3L-N)	1×0~90A
dc (L-N)	6×0~±10A
dc (3L-N)	1×0~±60A

Power

6-phase AC (L-N)	6×150VA at 15A
3-phase AC (L-N)	3×240VA at 30A
1-phase AC (3L-N)	1×450VA at 90A
1-phase AC (L-L)	1×450VA at 30A
Max compliance	
voltage (L-N) (L-L)	15Vpk/32Vpk
dc (L-N)	6×100W at ±10A
dc (3L-N)	1×540W at ±60A

Accuracy	error < 0.08 % rd.+0.02 % rg. guar.
	error < 0.02 % rd.+0.01 % rg. typ.
Ranges	15A or 30A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency

Sine signal	DC,1~1000Hz
Transient signal	dc~10.0 kHz
Accuracy	±1ppm
Resolution	0.001 Hz

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.)

Power supply

Nominal input voltage	110~240Vac
Permissible input voltage	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

Binary inputs Group1

Number	8
Input characteristics	0~400Vdc threshold or potential free
Sample rate	20kHz
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse width>150μs
Galvanic isolation	8 galvaincally isolated

Binary inputs Group2

Number	4
Input characteristics	0~+5Vdc or dry contact
Sample rate	100kHz
Time resolution	10μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Max. counting frequency	100kHz
Pulse width	< 3μs
Threshold voltage	2V
Voltage hysteresis	0.8V
Max. input voltage	+5V

Binary outputs, semiconductor

Number	4 (rear side)
Type	semiconductor
Break capacity dc	Vmax: 300Vdc /Imax: 0.5A /Pmax: 150W
Update rate	100μs
Imax	0.5A

Binary outputs, relay

Number	4 (front side)
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

DC voltage measuring input

Measuring range	0~±10V
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	100KΩ

DC current measuring input

Measuring range	0~±20mA
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	50Ω

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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

Low level outputs

Setting range	12×0~10Vpk
Max. output current	1mA
Accuracy	error < 0.025 % typ.(< 0.07 % guar.)at 1~10Vpk
Resolution	250μV
Distortion(THD+N)	< 0.05 % typ.(< 0.1 % guar.)
Connection	19 pin combination socket(rear side)

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0 ~+50°C
Storage temperature	-25~+70°C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet, 10M/100M
External amplifier interface	Circular connector
Current booster interface	Circular connector
Synchronization control interface	Coaxial cable connector
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360mm× 157mm× 367 mm

Model PW636i

Specifications

Voltage generators

Setting range	
4-phase ac (L-N)	4×0~300V
1-phase ac (L-L)	1×0~600V
dc (L-N)	4×0~±300V

Power	
4-phase ac (L-N)	4×85VA at 300V
	3×120VA at 300V
1-phase ac (L-L)	1×170 VA at 600V
	(two generators in series)
dc (L-N)	4×100 W at ±300 V

Accuracy	error < 0.08 % rd.+0.02 % rg. guar., at 0~300 V
	error < 0.03 % rd.+0.01 % rg. typ., at 0~300 V
Ranges	300V
Resolution	10mV for 300Vac
Distortion	< 0.05 % typ., (< 0.1 % guar.)

Current generators

Setting range	
6-phase AC (L-N)	6×0~32A
3-phase AC (2L-N)	3×0~64A
1-phase AC (6L-N)	1×0~180A
dc (6L-N)	1×0~±180A

Power	
6-phase AC (L-N)	6×450VA typ. at 32A
	6×400VA guar. at 32A
3-phase AC (2L-N)	3×800VA typ. at 64A
	3×700VA guar. at 64A
1-phase AC (6L-N)	1×1200VA typ. at 180A
	1×1000VA guar. at 180A
1-phase DC (6L-N)	1×1400W typ. at 90A
	1×1000W guar. at 90A
Max compliance voltage (L-N) (L-L)	21Vpk/42Vpk

Accuracy	error < 0.15 % rd.+0.05 % rg. guar., at 0~32A
	error < 0.05 % rd.+0.02 % rg. typ., at 0~32A
Ranges	32A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency	
Sine signal	DC,1~1000Hz
Transient signal	dc~10.0 kHz
Accuracy	±1ppm
Resolution	0.001 Hz

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.)

Power supply

Nominal input voltage	110~240Vac
Permissible tolerance	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

Binary inputs Group1

Number	8
Input characteristics	0~400Vdc threshold or potential free
Sample rate	20kHz
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse width>150μs
Galvanic isolation	8 galvanically isolated

Binary inputs Group2

Number	4
Input characteristics	0~+5Vdc or dry contact
Sample rate	100kHz
Time resolution	10μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Max. counting frequency	100kHz
Pulse width	<3μs
Threshold voltage	2V
Voltage hysteresis	0. 8V
Max. input voltage	+5V

Binary outputs, semiconductor

Number	4 (rear side)
Type	semiconductor
Break capacity dc	Vmax: 300Vdc /Imax: 0.5A /Pmax: 150W
Update rate	100μs
Imax	0.5A

Binary outputs, relay

Number	4 (front side)
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

DC voltage measuring inputs

Measuring range	0~±10V
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	100KΩ

DC current measuring inputs

Measuring range	0~±20mA
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	50Ω

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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

Low level outputs

Setting range	12×0~10Vpk
Max. output current	1mA
Accuracy	error < 0.025 % typ.(< 0.07 % guar.)at 1~10Vpk
Resolution	250μV
Distortion(THD+N)	< 0.05 % typ.(< 0.1 % guar.)
Connection	19 pin combination socket(rear side)

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0~+50°C
Storage temperature	-25~+70°C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet, 10M/100M
External amplifier interface	Circular connector
Current booster interface	Circular connector
Synchronization control interface	Coaxial cable connector
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360 mm× 157mm× 427 mm

Model PW336i

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

Power	
4-phase ac (L-N)	4×60VA at 150V
1-phase ac (L-L)	1×120 VA at 300V
	(two generators in series)
dc (L-N)	4×40 W at ±150 V

Accuracy	error < 0.08 % rd.+0.02 %
	rg. guar., at 0~150 V
	error < 0.04 % rd.+0.01 %
	rg. typ., at 0~150 V
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 (L-N)	3×0~30A
1-phase AC (3L-N)	1×0~90A
dc (L-N)	6×0~±10A
dc (3L-N)	1×0~±60A

Power	
6-phase AC (L-N)	6×150VA at 15A
3-phase AC (L-N)	3×240VA at 30A
1-phase AC (3L-N)	1×450VA at 90A
1-phase AC (L-L)	1×450VA at 30A
Max compliance	
voltage (L-N) (L-L)	15Vpk/32Vpk
dc (L-N)	6×100W at ±10A
dc (3L-N)	1×480W at ±60A

Accuracy	error < 0.15 % rd.+0.05 %
	rg. guar., at 0~15A
	error < 0.05 % rd.+0.02 %
	rg. typ., at 0~15A
Ranges	15A or 30A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency	
Sine signal	DC,1~2000Hz
Accuracy	±1ppm
Resolution	0.001 Hz

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 threshold or
	potential free
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse
	width>150μs

Binary outputs, 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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

Power supply

Nominal input voltage	110~240Vac
Permissible input voltage	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0~+50°C
Storage temperature	-25~+70°C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet, 10M/100M
Synchronization control interface	Coaxial cable connector
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360mm × 157mm× 367 mm

Model PW666i

Specifications

Voltage generators

Setting range	
6-phase ac (L-N)	6×0~150V
1-phase ac (L-L)	1×0~300V
dc (L-N)	6×0~±150V

Power	
6-phase ac (L-N)	6×60VA at 150V
1-phase ac (L-N)	1×120 VA at 300V
	(two generators in series)
dc (L-N)	6×40 W at ±150 V
Accuracy	error < 0.08 % rd.+0.02 % rg. guar., at 0~150 V
	error < 0.04 % rd.+0.01 % rg. typ., at 0~150 V
Ranges	150V
Resolution	5mV for 150Vac
Distortion	< 0.05 % typ., (< 0.1 % guar.)

Current generators

Setting range	
6-phase AC (L-N)	6×0~32A
3-phase AC (2L-N)	3×0~64A
1-phase AC (6L-N)	1×0~180A
dc (6L-N)	1×0~±90A

Power	
6-phase AC (L-N)	6×450VA typ. at 32A
	6×400VA guar. at 32A
3-phase AC (2L-N)	3×800VA typ. at 64A
	3×700VA guar. at 64A
1-phase AC (6L-N)	1×1200VA typ. at 180A
	1×1000VA guar. at 180A
1-phase DC (6L-N)	1×1400W typ. at 90A
	1×1000W guar. at 90A
Max compliance	
voltage (L-N) (L-L)	21Vpk/42Vpk
Accuracy	error < 0.15 % rd.+0.05 % rg. guar., at 0~32A
	error < 0.05 % rd.+0.02 % rg. typ., at 0~32A
Ranges	32A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency	
Sine signal	DC,1~2000Hz
Transient signal	dc~10.0 kHz
Accuracy	±1ppm
Resolution	0.001 Hz

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.)

Power supply

Nominal input voltage	110~240Vac
Permissible tolerance	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

Binary inputs Group1

Number	8
Input characteristics	0~400Vdc threshold or potential free
Sample rate	20kHz
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse width>150μs
Galvanic isolation	8 galvanically isolated

Binary inputs Group2

Number	4
Input characteristics	0~+5Vdc or dry contact
Sample rate	100kHz
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Max. counting frequency	100kHz
Pulse width	< 3μs
Threshold voltage	2V
Voltage hysteresis	0. 8V
Max. input voltage	+5V

Binary outputs, 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

DC voltage measuring input

Measuring range	0~±10V
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	100KΩ

DC current measuring input

Measuring range	0~±20mA
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	50Ω

Low level outputs

Setting range	12×0~10Vpk
Max. output current	1mA
Accuracy	error < 0.025 % typ.(< 0.07 % guar.)at 1~10Vpk
Resolution	250μV
Distortion(THD+N)	< 0.05 % typ.(< 0.1 % guar.)
Connection	19 pin combination socket(rear side)

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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0~+50°C
Storage temperature	-25~+70°C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet, 10M/100M
External amplifier interface	Circular connector
Current booster interface	Circular connector
Synchronization control interface	Coaxial cable connector
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360mm×157mm×427 mm

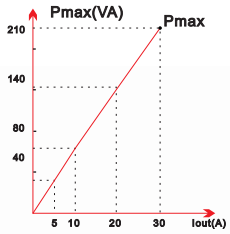
Model L336i

Specifications

AC Current outputs

Control	Independent control of amplitude, frequency and phase angle
Range	6×15Aor 3×30A
Accuracy	±1mA (<0.5A), ±0.1% (0.5A~20A)
	±0.2% (20A~30A)
Resolution	1mA (0.1A~10A), 10mA (10A~30A)
Output power	≥210VA(at 30A, LN)
	≥105VA(at 15A, LN)
	≥420VA(at 30A, LL)

Output characteristic

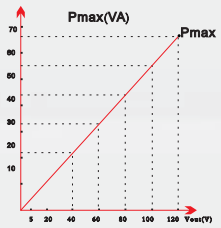


Output response time	<100μs
Distortion (THD%)	≤0.5% (0.5A~Imax)
Frequency range	10Hz ~1kHz
Frequency- Amplitude chacteristic	≤±0.1%~±0.5% (10Hz~1kHz)
Output time	continuous (<10A/channel)
	>70s (<10~20A/channel)
	>15s(<20~30A/channel)
Operation indication	Overload, distortion, open circuit, over heat

AC Voltage outputs

Control	
Fourth voltage (Uz)	Independent control of amplitude, frequency and phase angle
	Can be set as zero sequence voltage,
	line voltage, or any value
Range	4×120V
Accuracy	±2mV(0.2V~2V), ±0.1%(2V ~120V)
Resolution	1mV(0.2V~10V), 10mV(10V~120V)
Output power	≥60VA (at 120V)

Output characteristic



Output response time	<100μs
Distortion (THD%)	≤0.5% (2V~120V)
Frequency range	10Hz ~1kHz
Frequency- Amplitude chacteristic	≤±0.1%~±0.5% (10Hz~1kHz)
Output time	Continuous at rated output condition
Operation indication	Overload, distortion, short circuit, over heat

Frequency

Sine signal	10Hz~1000Hz
Accuracy	<1mHz (20 Hz ~65Hz)
	<10mHz (65 Hz ~450Hz)
	<20mHz (450 Hz ~1000Hz)
Resolution	0.001Hz
Output characteristic	Can simulate 2nd-20th harmonic or DC

Phase angle

Range	0~359.9°
Accuracy	±0.1°
Resolution	0.1°

DC current outputs

Range	3×0A~10A
Accuracy	±5mA (0.2A~1A)
	±0.5% (1A~10A)
Resolution	1mA (0.2A~10A)
Output power	300W (30A 10V)
Operation indication	Overload, distortion, open circuit, over heat

Synchronization time between current and voltage outputs ≤10μs

Binary inputs

Number	8
Characteristic	0-400Vdc threshold or potential free
Sample rate	10 kHz
Time resolution	100μs
Max. measuring time	1.50×10^5 s
Time measuring error	±1.0ms (0.001s~1.0 s)
	±0.1%(1.0 s ~1.50×10^5 s)
Debounce/Deglitch time	0~25ms
Gavalnic isolation	Independent isolation for 8 binary inputs
Threshold impedance(potential free mode)	3 kΩ… 5kΩ

Binary output

Number	4
Characteristic	Potential free relay contact (auto detection)
Break capacity ac	Vmax：250V(AC)/Imax：0.5A
Break capacity dc	Vmax：250V(DC)/Imax：0.5A

Communication port

Type	LAN, 10/100Base-TX (10/100Mbit)
LAN cable	category 5 twisted-pair
	Can be connected to optional
GPS port	PGPS02 GPS synchronizatio
	device or PIRIG-B01 device

IEC61850 upgrade

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

Power Supply

Input	110-240Vac
Frequency	40-60Hz
Max. current	10A

Others

Casing	Anti EMC/EMI aluminum casing
Dimension(WXHXD)	256 mm×110 mm×395mm(W×H×D)
Weight	8.8 kg

Model PW431D

Specifications

Voltage generators

Setting range	
4-phase ac (L-N)	4×0~150V
2-phase ac (L-L)	2×0~300V
dc (L-N)	4×0~±150V
dc (L-L)	1×0~±300V

Power	
4-phase ac (L-N)	4×60VA at 150V
2-phase ac (L-L)	2×120 VA at 300V
	(two generators in series)
dc (L-N)	4×40W at ±150 V
dc (L-L)	1×80W at ±300 V

Accuracy	error < 0.08 % rd.+0.02 %
	rg. guar., at 0~150 V
	error < 0.04 % rd.+0.01 %
	rg. typ., at 0~150 V
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 (L-N)	3×0~30A
1-phase AC (3L-N)	1×0~90A
dc (3L-N)	1×0~±60A

Power	
6-phase AC (L-N)	6×150VA at 15A
3-phase AC (L-N)	3×240VA at 30A
1-phase AC (3L-N)	1×450VA at 90A
1-phase DC (3L-N)	1×480W at 60A
Max compliance	
voltage (L-N) (L-L)	15Vpk/32Vpk

Accuracy	error < 0.15 % rd.+0.05 %
	rg. guar., at 0~15A
	error < 0.05 % rd.+0.02 %
	rg. typ., at 0~15A
Ranges	15A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency	
Sine signal	DC, 1~2000Hz
Transient signal	dc~10.0 kHz
Accuracy	±1ppm
Resolution	0. 001Hz

Phase	
Angle range	-360º~360º(Lead)
Accuracy	<0.05° typ.,<0.1° guar.at 50/60Hz
Resolution	±0.01°

Binary inputs

Number	8
Input characteristics	0~400Vdc threshold or potential free
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse width>150μs

Binary outputs, 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

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.)

DC voltage measuring inputs

Measuring range	0~±10V
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	100KΩ

DC current measuring inputs

Measuring range	0~±20mA
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	50Ω

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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

Power supply

Nominal input voltage	110~240Vac
Permissible input voltage	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0~+50° C
Storage temperature	-25~+70° C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet
Local display	color LCD, 4.7'
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360mm×157mm×367 mm

Model PW430D

Specifications

Voltage generators

Setting range	
4-phase ac (L-N)	4×0~150V
2-phase ac (L-L)	2×0~300V
dc (L-N)	4×0~±150V
dc (L-L)	1×0~±300V
Power	
4-phase ac (L-N)	4×60VA at 150V
2-phase ac (L-L)	2×120 VA at 300V
	(two generators in series)
dc (L-N)	4×40W at ±150 V
dc (L-L)	1×80W at ±300 V
Accuracy	error < 0.08 % rd.+0.02 %
	rg. guar., at 0~150 V
	error < 0.04 % rd.+0.01 %
	rg. typ., at 0~150 V
Ranges	150V
Resolution	5mV for 150Vac
Distortion	< 0.05 % typ., (< 0.1 % guar.)

Current generators

Setting range	
3-phase AC (L-N)	3×0~20A
1-phase AC (3L-N)	1×0~60A
dc (3L-N)	1×0~±45A
Power	
3-phase AC (L-N)	3×180VA at 20A
1-phase AC (3L-N)	1×420VA at 60A
1-phase DC (3L-N)	1×300W at 30A
Max compliance	
voltage (L-N) (L-L)	15Vpk/32Vpk
Accuracy	error < 0.15 % rd.+0.05 %
	rg. guar., at 0~20A
	error < 0.05 % rd.+0.02 %
	rg. typ., at 0~20A
Ranges	20A
Resolution	1mA
Distortion	< 0.05 % typ.(< 0.1 % guar.)

General

Frequency	
Sine signal	DC,1~2000Hz
Transient signal	dc~10.0 kHz
Accuracy	±1ppm
Resolution	0. 001Hz

Phase

Angle range	-360º~360º(Lead)
Accuracy	<0.05° typ.,<0.1° guar.at 50/60Hz
Resolution	±0.01°

Binary inputs

Number	8
Input characteristics	0~400Vdc threshold or potential free
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0~25ms
Counting function	< 3kHz at pulse width>150μs

Binary outputs, 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

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.)

DC voltage measuring inputs

Measuring range	0~±10V
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	100KΩ

DC current measuring inputs

Measuring range	0~±20mA
Accuracy	error <0.02% rg. typ. (<0.05% rg. guar.)
Input impedance	50Ω

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

External analog recording unit (optional)

Channel : 10

See details of optional accessory AR-10

Power supply

Nominal input voltage	110~240Vac
Permissible input voltage	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

IEC61850 upgrade

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

Environmental conditions

Operation temperature	0~+50° C
Storage temperature	-25~+70° C
Relative humidity	5~95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	Ethernet
Local display	color LCD, 4.7'
GPS interface	RS232
Ground Socket (earth)	4 mm banana socket; front side
Weight	20kg
Dimensions (W x H x D)	360mm×157mm×367 mm

Model S40A/S10A

Specifications

Voltage generators

Setting range

3-phase ac (L-N)	3×0. . . 150V
1-phase ac (L-L)	1×0. . . 300V
dc (L-L)	1×0. . . ±300V

Power

3-phase ac (L-N)	3 ×60VA at 150V
1-phase ac (L-L)	1× 120 VA at 300V
	(two generators in series)
dc (L-N)	4×48W at ±180 V

Accuracy	< 0.16% rd.+0.04 %rg. guar.,
	< 0.08% rd.+0.02 %rg. typ.,
Ranges	150V
Resolution	10mV
Distortion	0.1 %

Current generators

Setting range

Model	S40A	S10A
3-phase AC(L-N)	3×40A	3×10A
1-phase AC(L-N)	1×120A	1×30A
dc (L-N)	1×10A	1×5A

Low grade

1-phase AC (L-N)	1 × 0. . . 200mA
(S40A: 3VA at 200mA, S10A: 1.8VA at 200mA)	
dc (L-N)	1 × 0. . . 200mA
(S40A: 4W at 200mA, S10A: 2.5W at 200mA)	

Power

Model	S40A	S10A
3-phase AC(L-N)	3×75VA at 5A	3×50VA at 5A
1-phase AC(L-N)	3×520VA at 40A	3×100VA at 10A
dc (L-N)	90W at 10A	70W at 5A

Accuracy	< 0.16 rd.+0.04 %
	rg. guar., at 0~30A
	< 0.08 rd.+0.02 %
	rg. typ., at 0~30A
Harmonics	2nd
Distortion	0.1%
Resolution	5mA(1mA, low grade)

General

Frequency

Range	DC 40 to 100Hz
Accuracy	0.002%
Resolution	0.002 Hz

Phase

Angle range	0 . . . 360°
Accuracy	0.2°
Resolution	0.1°

Auxiliary dc supply

Voltage range	0, 24V, 110V , 220V
Power	110W at 220V, 55W at 110V, 12W at 24V

Binary inputs

Number	4
Input characteristics	0-+/-250Vdc or potential free
Max. measuring time	999999.999 s
Accuracy	1ms±0.1%
Resolution	1ms

Binary output, relay

Number	1
Type	Potential free relay contacts, software controlled
Break capacity ac	Vmax: 300Vac /Imax: 1A /Pmax: 125VA
Break capacity dc	Vmax: 300Vdc /Imax: 1A /Pmax: 60W

Power supply

Nominal input voltage	110~240Vac
Permissible input voltage	90~260Vac
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

Environmental conditions

Operation temperature	0 ...+50° C
Storage temperature	-25 ...+70° C
Relative humidity	5...95% non - condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC connection	USB
Ground Socket (earth)	4 mm banana socket; front side
Weight	18kg
Dimensions (W x H x D)	360mm × 157mm× 367 mm

Model S100A

Specifications

Voltage generators

range

Frequency	40Hz~60Hz
Phase angle	0~359.9°
AC voltage	3×0-120V
AC current	Source 1 0A-100A
	Source 2 0mA-200mA
DC voltage	0-300V (through Uab)
DC current	Source 1 0A-10A
	Source 2 0mA-200mA
Auxiliary DC	0V/110V/220V
Response time for V and I	< 100 us

Output power

AC Voltage	Max. 60VA
AC Current	Max. 800VA
Auxiliary DC	110W at 220V

Binary output

Number	1
Type	Dry contact
Break capacity AC	Vmax : 250V(AC)/Imax : 0.5A
Break capacity DC	Vmax : 250V(DC)/Imax : 0.5A

Dimension and weight

Aluminum casing

364 mm×155.5 mm×415mm (W×H×D) 18 kg

AC voltage

Range	0V~1V	1V~2V	2V~120V
Accuracy	±5mV	±0.5%	±0.2%

AC current

Range	0-200mA (source 2)	0A~1A	1A~2A	2A~40A
Accuracy	±0.4mA	±5mA	±0.5%	±0.2%

DC voltage

Range	0V~5V	5V~300V
Accuracy	±20mV	±0.5%

DC current

Range	0-200mA (source 2)	0.2A~1A	1A~10A
Accuracy	±0.2mA	±5mA	±0.5%
Auxiliary DC accuracy	±1%		
Phase angle accuracy	<0.2°		
Frequency accuracy	±2mHz		

Binary inputs

Number	2
Type	15V-250V(DC) or potential free
Sample rate	5KHz
Resolution	1ms
Debounce time	20ms
Isolation	Independent gavalnic isolation

Power supply

110/220V±15% 50Hz 10A

Model T200A

Features :

- Constant current design
- Long output time at 250A (120s)
- Can test all types high burden relay
- Automatic local test modules, such as df/dt, ramp, pick up, time, harmonic restraint check, directional relay, etc
- Can test also differential relay
- In-built CT test functions
- Test results can be transferred to external PC
- Optional PC control software available

Specifications

High power AC current output (I1)

Range	0.2A~8A	1A~40A	10~250A
Accuracy		±0.5%	
Output voltage	150V~100V	40V~30V	10V~8V
Power	800VA(8A)	1200VA(40A)	2000VA(250A)
Load time			
Output	250A	100A 50A	<50A
Time	120s	750s 3000s	continuous

High power AC voltage output (U1)

Range	10~500V	
Accuracy	±0.5%	
Power	1200VA(400V)	
Load time	<1A :	continuous
	1~3A :	Max 60min

High power DC voltage output (Udc)

Range	10~300V		
Accuracy	±0.5%		
Power (300V)	600W		
Load time	Output :	<1A	>1A
	Time :	continuous	Max 60min

Auxiliary DC voltage output (Aux Udc)

Range	20~240V
Accuracy	±1%
Power	55W at 110V/110W at 220V
Load time	continuous at 0.5A

AC/DC current output (I2)

Mode	AC output	DC output
Range	0~20A	0~20A
Accuracy	±0.5%	±0.5%
Power(20A)	200VA	200W
Frequency	20~420Hz	—
Phase angle	0~360°	—
Phase angle accuracy	0.5 °	—
Distortion 1A~20A	<0.5%	—
Transient response	500 μ s	500 μ s
Load time 20A :	60s	
10A :	240s	
<10A :	continuous	
Harmonic(2nd,3rd,5th,7th)accuracy	1%	

AC/DC voltage output (U2)

Mode	AC output	DC output
Range	0~120V	0~120V
Accuracy	±0.5%	±0.5%
Power(120V)	60VA	60W
Frequency	20~100Hz	—
Phase angle	0~360°	—
Phase angle accuracy	0.5 °	—
Distortion 5V~120V	<0.5%	—
Transient response	500 μ s	500 μ s

High precision AC/DC current output (I3)

Mode	AC output	DC output
Range	0~200mA	0~200mA
Accuracy	±0.5%	±0.5%
Power(200mA)	75 Ω	75 Ω
Frequency	20~100Hz	—

Binary inputs

Number	2
Input characteristics	30~250V DC, or dry contact
Time resolution	±1ms(0.001~1s) ±0.1%(1~9999.999s)
Max. measuring time	9999.999s

Binary output

Number	1
Type	Potential free relay contacts
Break capacity AC	Vmax 250V AC / Imax 8A / Pmax 2000VA
Break capacity DC	Vmax 250V DC/ Imax 8A / Pmax 150W

Power supply

Nominal input voltage	110/220Vac
Permissible tolerance	-20% ~+15%
Nominal frequency	50/60Hz
Permissible frequency	45~65Hz

Voltmeter

Range	0~600V AC/DC
Accuracy	±1%

Ammeter

Range	0~6A AC/DC
Accuracy	±1%

Certificates

EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

Operation temperature	−5 ~ +50°C
Operation humidity	5 ~95 %, non-condensing
Weight	20.7kg
Dimensions (W x H x D)	430 mm×250mm×250 mm
PC connection	USB
Ground Socket (earth)	4 mm banana socket; front side

PWF Fiber Digital Protection Tester

Applications

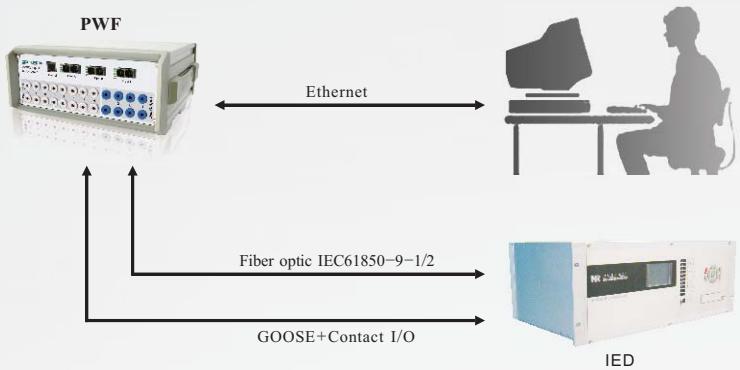
1. Test relays with optical fiber digital interface and GOOSE interface
2. Test relays with fiber optic digital interface and conventional operating scheme
3. Test differential relays with IEC61850 test scheme

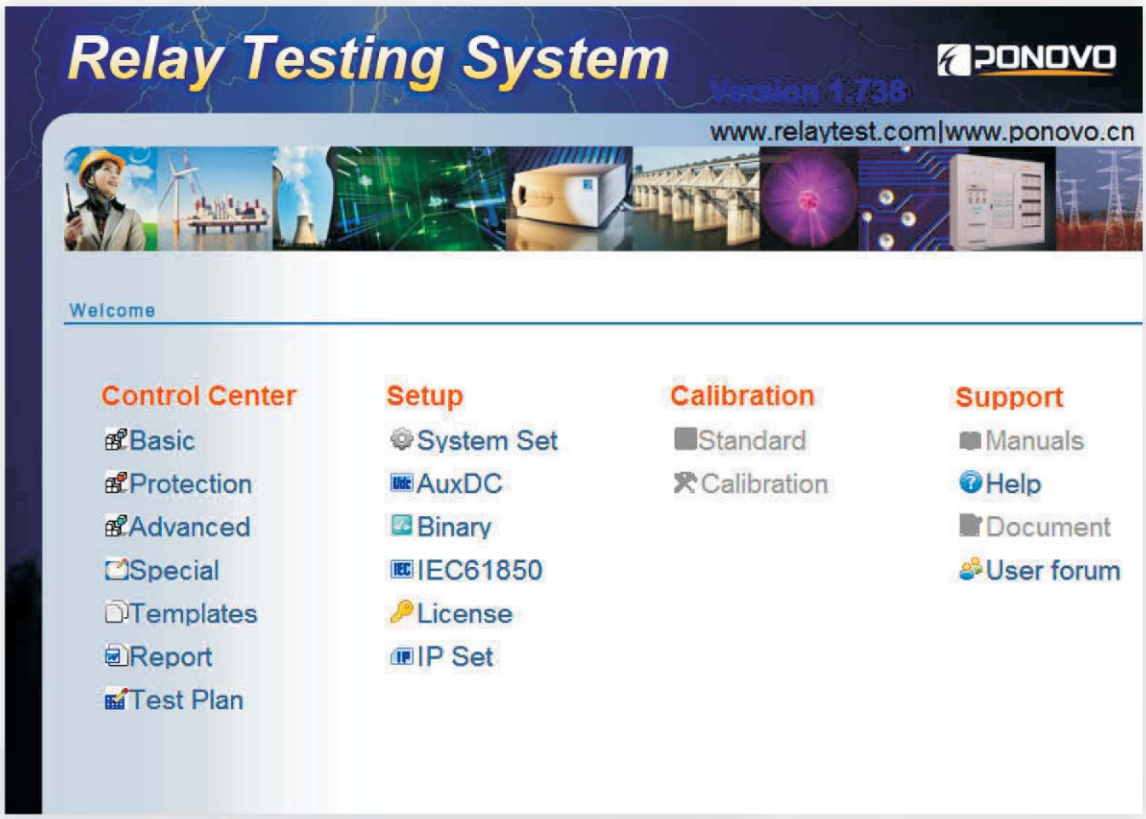
Features

- Emulation of fiber optic CT and PT output conforming IEC61850-9-1 and IEC61850-9-2 protocol
- Using powerful PowerTest test software to emulate power system condition with diversified test functions
- Providing 8 binary inputs and GOOSE message input for closed-loop relay test application
- Flexible configuration of channel number, ratio, ASDU number, sampling rate for easy interfacing to relays from different manufactures
- Allow user to generate its own test template for special test application
- Providing 3 groups fiber optic digital interfaces/GOOSE message interfaces for differential relay test application

Binary inputs	
Number	8
Input characteristic	30~250Vdc or potential free
Sampling frequency	10Hz
Time resolution	100μs
Max. measuring time	1.50×10^5s
Measuring error	±1.0ms (0.001s~1s)
	±0.1% (1.0s~1.50×10^5s)
Debounce time	0~25ms
Gavalnic isolation	Independent for all 8 binary inputs
Trigger impedance	5 kΩ··· 13kΩ
GPS synchronizing interface	Can connect to optional PGPS-02 (GPS) or PIRIG-B01 (B-code) synchronizing device
Main supply	
Nominal input voltage	220V (AC)
Permissible input voltage	100V~240V (AC)
Permissible frequency	50Hz
Nominal frequency	40~60Hz
Current	1A(max)
Dimension and weight	
Dimension	256×100×365 mm (W×H×D)
Weight	3.8 kg
Binary outputs	
Number	4
Type	Potential free contact, software controlle
Break capacity ac	Vmax：250V(AC)/Imax：0.5A
Break capacity dc	Vmax：250V(DC)/Imax：0.5A
Ethernet port	
Characteristic	10/100base-TX(10/100Mbit、twisted pair, crossover)
Number	1
Type	RJ45
Cable	category 5 twisted pair
Status indication	LED green lighted : effective connection
	LED yellow flashing : data transfer in process
Fiber optic port	
Characteristic	100Base-FX (fiber optic, full-duplex)
Number	3
Type	SC
Cable	50/125μ m or 62.5μ m (multimode fiber, orange)
wavelength	1300nm
Transmission distance	> 1Km
Status indication	SPD green lighted: effective connection Link\AcT yellow flashing: data transfer in process

Test application example with PWF





Software introduction

- PowerTest software provides comrehensive functions to manage the test work.
- General software package contains the common used modules which can meet the general relay test requirement.
- Advanced software package contains the optional modules for specific test

Software Classification

Basic package	
QuickTest (4V, 3I)	Manually or automatically control over 4 voltage and 3 current sources
QuickTest (4V, 6I)	Manually or automatically control over 4 voltage and 6 current sources
QuickTest (1V, 6I)	Manually or automatically control over 1 voltage and 6 current sources
QuickTest (VL-L, 3I)	Manually or automatically control over L-L voltages, and 3 current sources
QuickTest (Sequence)	Manually or automatically control over sequence voltages, including positive sequence, negative sequence and zero sequence voltages
QuickTest (Power)	Manually or automatically control over output power
QuickTest (Z, I Const)	Manually or automatically control over 4 voltage and 3 current sources
QuickTest (Z, V Const)	Manually or automatically control over 4 voltage and 3 current sources
QuickTest (Z, Zs Const)	Manually or automatically control over 4 voltage and 3 current sources
Ramp (3I)	Realize the ramping for different quantities in 3 current mode
Ramp (6I)	Realize the ramping for different quantities in 6 current mode
Time	Used to check the tripping time
State Sequence(1V,6I)	Edit more complicated state sequences, has in-built differential calculation tool
State Sequence(4V,3I)	Edit more complicated state sequences in 3 current mode
State Sequence(4V,6I)	Edit more complicated state sequences in 6 current mode
Harmonic	Edit harmonic components to the output
CB Operation	Simulate the whole test scheme
TransPlay (4V, 3I)	Play back COMTRADE format file
Check	Manual check module to be included in a test plan

Protection package	Basic package is included
Distance (Z-Phi)	Check zone settings (Z-Phi) of impedance relay
Distance (R-X)	Check zone settings (R-X) of impedance relay
Time Inversed Current	Check time inversed current relay based on IEC standard
Directional	Check directional current relay
Differential (6I)	Check IR/ID characteristic of differential relay
Differential (3I)	Check IR/ID characteristic of differential relay
Under_Frequency Relay	Check under frequency relay
Under _Voltage Relay	Check under voltage rela
U,I,T Relay (AC)	Check ac type auxiliary relay and time relayy
U,I,T Relay (DC)	Check dc type auxiliary relay and time relay
Auto-Reclosing	Check Auto-Reclosing function
Advanced package	**Basic and Protection packages are included**
RX Characteristic Sweep	Search out the boundary of impedance relay
Advanced Differential (3I)	Search out the IR/ID curve of differential relay
Advanced Differential (6I)	Search out the IR/ID curve of differential relay
Synchronizer	Test synchronizer device
Advanced TransPlay (4U, 3I)	Edit and play back COMTRADE format file
Special	
Power Swing Simulation	Simulate the power swing with pre-set dz/dt
Energy Meter	Check energy meters (PACB108 scanning head is required)
Transducer	Check Transducers
High Burden Relay	Test high burden relay (Phpc01 accessory is required)
IEC61850 functions	
GOOSE protocol tools	GOOSE configuration, interpretation and publishing
Relay settings synchronizer	Get relay settings from IEC61850 relay and update the settings in
	test template automatically (ready template for the relay under test
	is required)
New Test Modules	**Can be downloaded from the website after registered**
HV Current	Check current relay having different zones
SOTF Check	Switched-On-To-Fault check
Vf-If Check	Check the accurate working voltage/current of electromechanical and static type impedance relay
V-F Trip Relay	Check the over-excitation relay
Zero Sequence Relay	Check the zero-sequence relay
DC Time Relay	Check the time of DC relay
Differential Scheme Check (6I)	Check the scheme of differential relay

PONOVO

PowerTest Relay Test Software

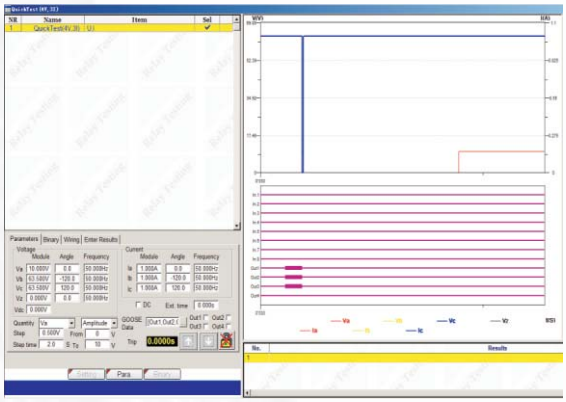
PowerTest software

1 Control center

- Run on Window98/XP/2000/Vista operating system
- 'Soft Plug-in' technology, providing great flexibility
- Ready modules for quick test and easy operation

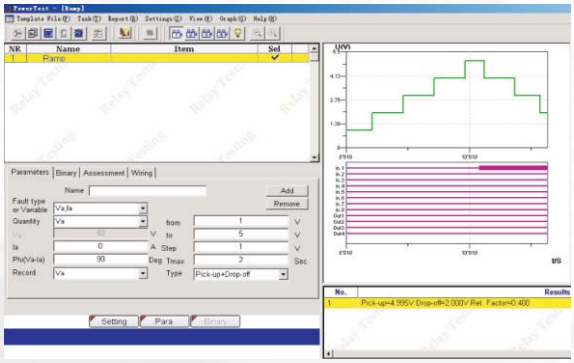
2 Quicktest

- Manual or auto control over all voltage and current sources. All test parameters, such as amplitude, phase, frequency, etc can be set separately.



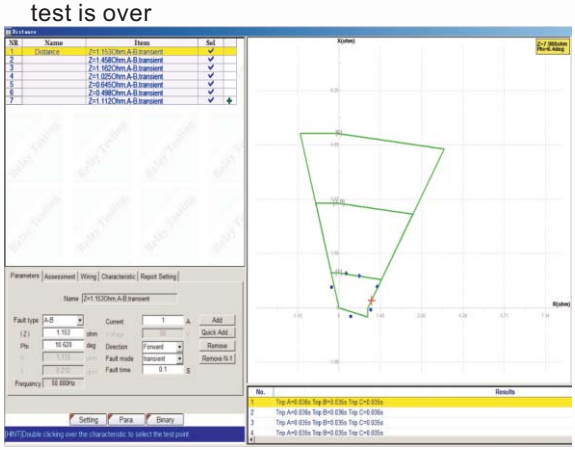
3 Ramp

- Linear or pulse ramp can be used for different test applications, such as directional relay, current relay, voltage relay, frequency, etc



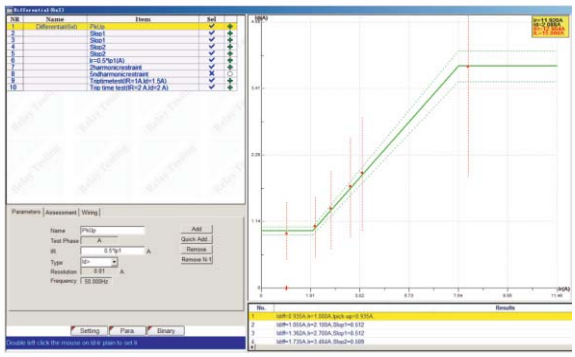
4 Distance

- The impedance characteristic can be uploaded on to the Z-plane and any points on Z-plain can be checked. Z-T diagram can also be got after test is over



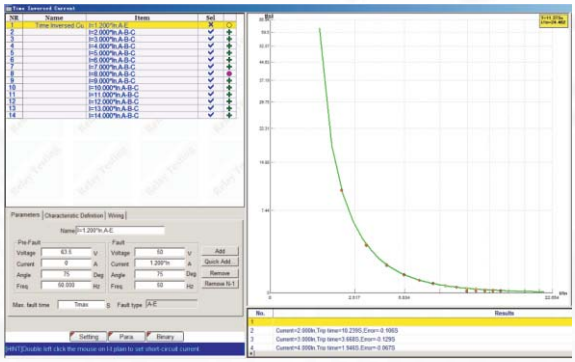
5 Differential

- This module allows user to test differential relay with 6 currents. Ir/Id curve can be defined easily based on relay setting. Harmonic restraint can also be checked.



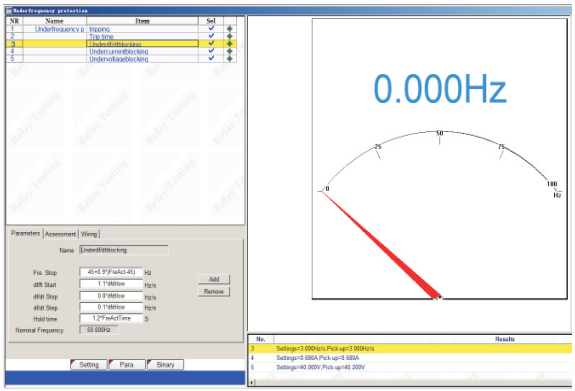
6 Inverse time overcurrent

- Test can be done based on actual over current characteristic. Assessment will be done automatically after test is over.



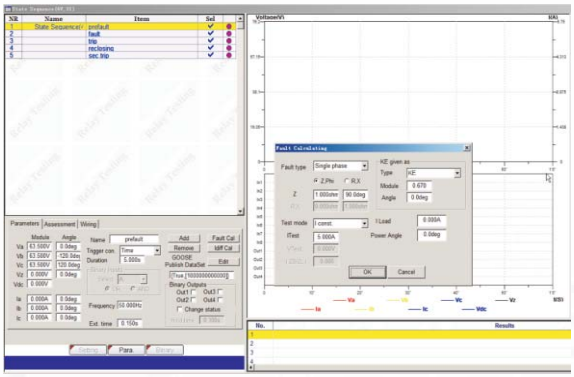
7 Under-frequency

- Different tests can be done for df/dt relay, including pick up , trip time, df/dt setting, under-voltage or under-current blocking.



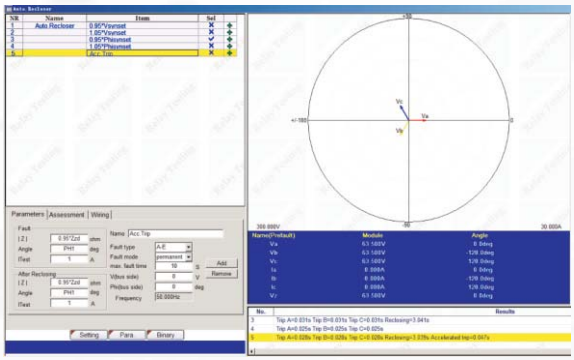
8 State sequence

- Here we can a sequence of states for special test application. A fault calculation tool is provided to set fault settings easily for each sequence.



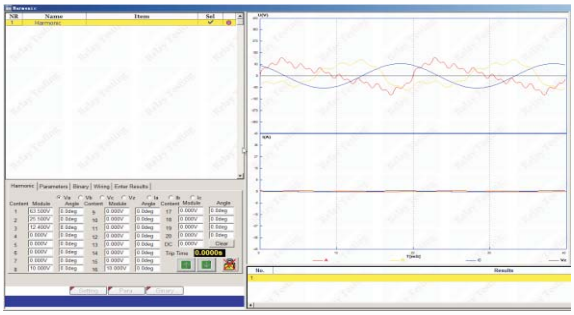
9 Auto-recloser

- This module makes the check of autoreclosure very easy. The tripping after the second fault can also be checked.



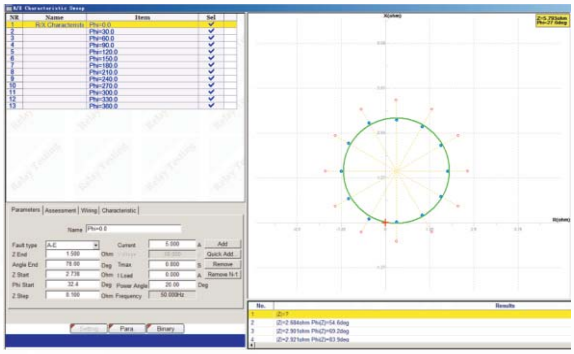
10 Harmonic

- Harmonic up to 20th can be defined here. Manual or auto control over each harmonic component can be done separately.



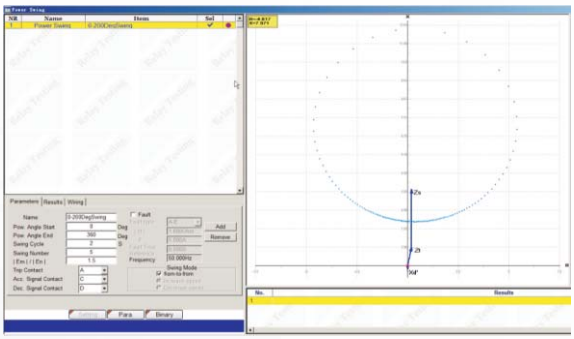
11 R/X characteristic sweep

- This module is used to map out the characteristic boundary of impedance relay and compare it with the principle characteristic.



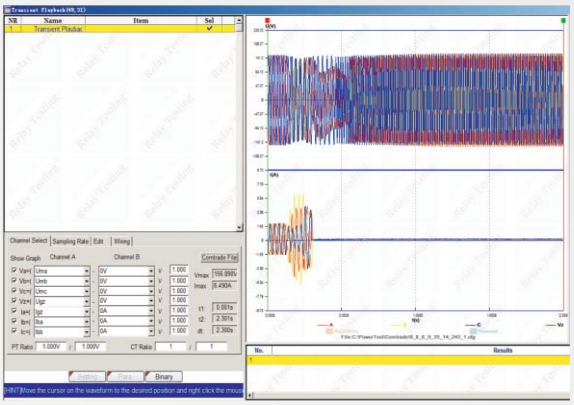
12 Power swing

- This module provides the tool to observe the relay behavior during dynamic power swing process. Power swing with fault can also be simulated.



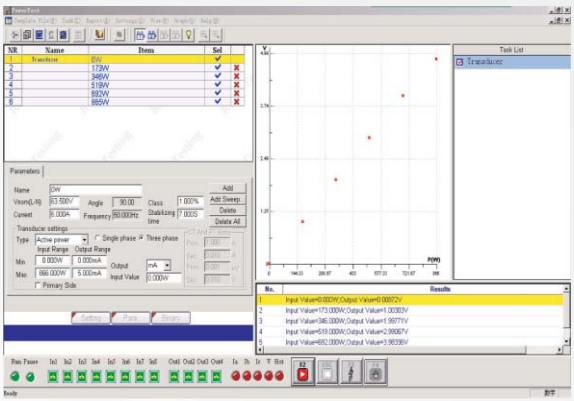
13 Transient playback

- COMTRADE file can be processed and played back here.



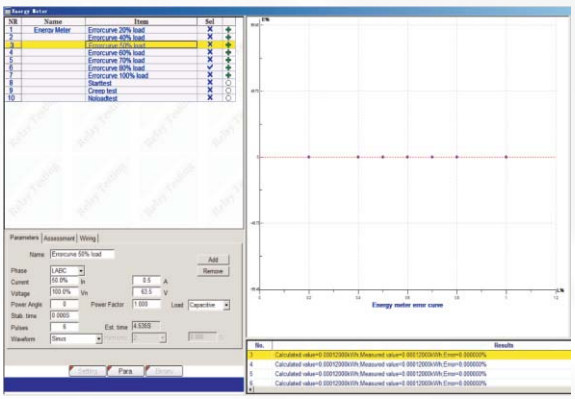
14 Transducer

- With this module we can easily check the functionality and accuracy of transducer.



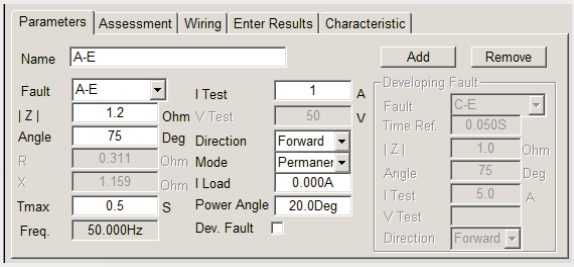
15 Energy meter

- With this module the functionality and accuracy of energy meter can be check. Optional scanning head will be used to convert LED flash into electrical pulses.



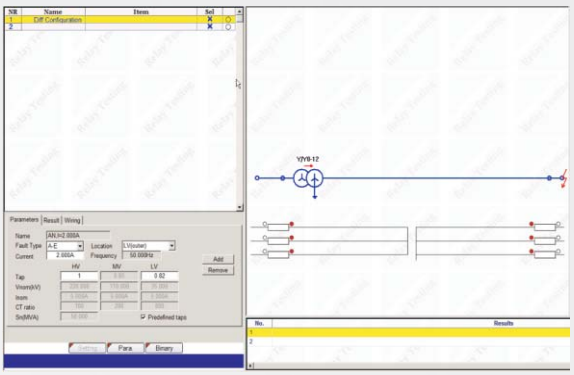
16 CB operate

- This module can be used to check different types of line protection system, including over current, line carrier, distance and zero-sequence over-current. The whole system, including auto-reclosing, tripping mechanism along with/or without circuit breaker can be check.



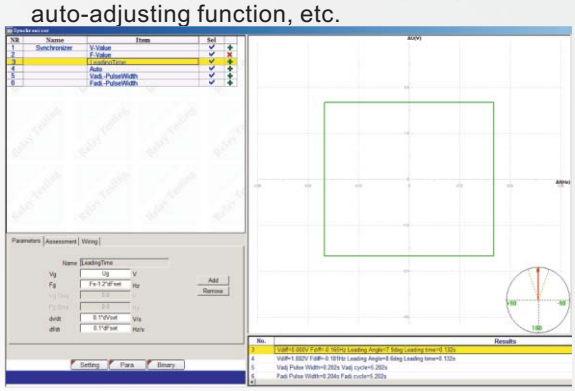
17 Diff configuration

- This module is used to check the entire differential protection system by simulating the fault within or outside the protection zone.



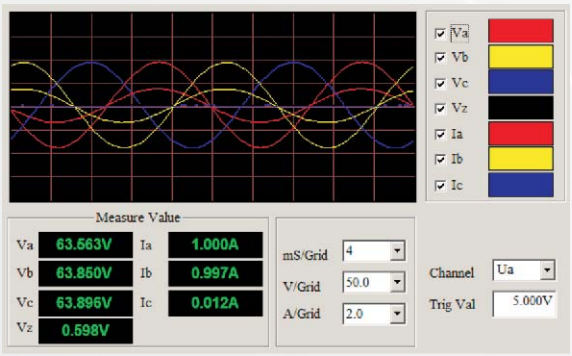
18 Synchronizer

- This module is used to check the synchronizer relay, including voltage and frequency difference check, leading time and leading angle check, auto-adjusting function, etc.



19 Output monitoring

❑ With this function user can observe the actual output current/voltage waveforms and readings which come either from in-built analog sampling device or from optional AR-10 analog measuring & recording device.



This function is very useful for checking the wiring correctness before starting the test.

Typical steps for checking cable connection:

❑ Make wiring
❑ Run relay test software
❑ Generate 3 phase small current and normal voltage
❑ Observe the output waveform and reading in our test software and see if they match the output settings
❑ Check the relay sampling readings and see if the amplitude, phase angle and frequency are matching the test settings

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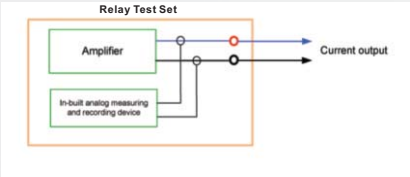
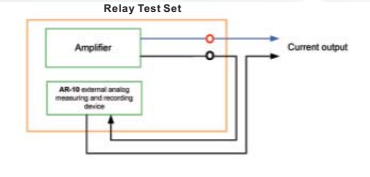
In-built analog monitoring & recording unit



With in-built sampling facility it's not required to make any external wiring

External analog monitoring & recording unit



Wiring is required to connect analog signal to the sampling input

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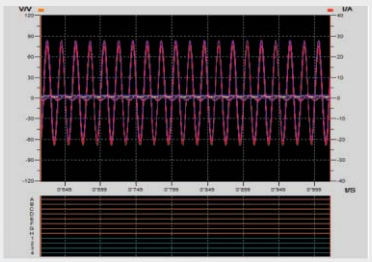
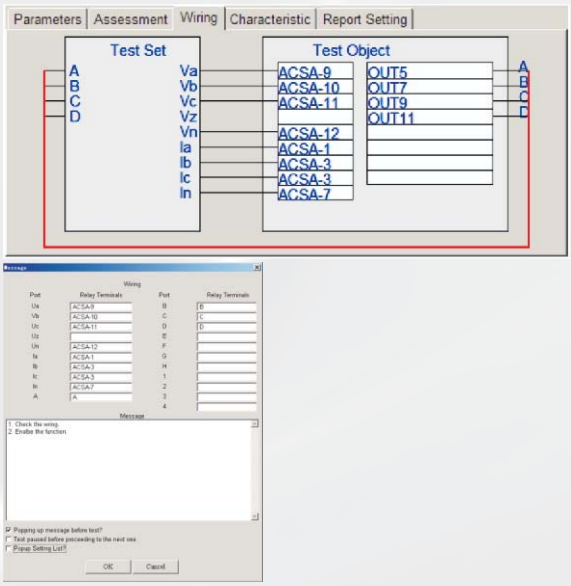
20 Test process recording

❑ With function test process can be recorded along with binary input/output status information.



21 Wiring diagram

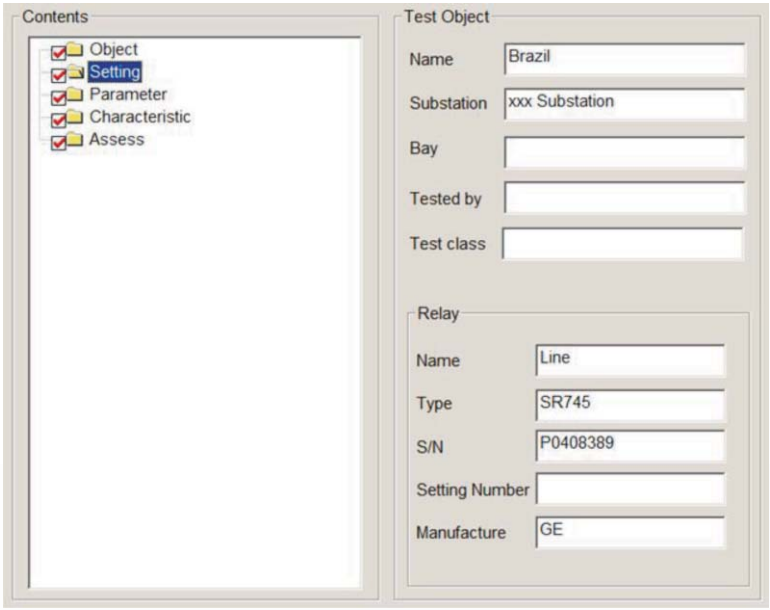
❑ Wiring information can be defined by customer to ease the test work at site. Comments and notes can also be edited.



22 Test report

❑ PowerTest test software provides the facility for user to organize his own test reports.

Different information related to the test process can be included in the report at users selection.



PONOVO

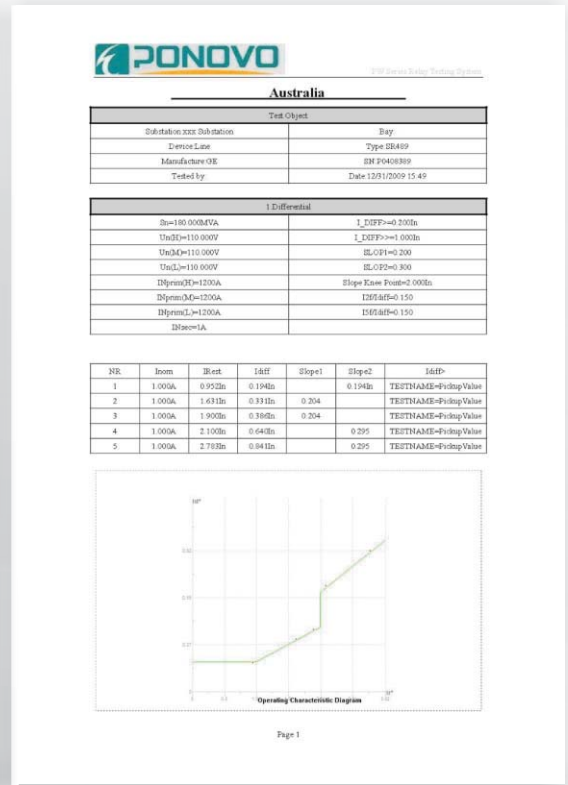
Brazil

Test Object	
Substation:AIS	Bay:RCP1330
Device:REL670	Type:21
Manufacture:ABB	SN:
Tested by:MIESCOR BUILDERS INC.	Date:07/22/2010 14:19

1.Z Value	
Tprepare=2.000S	Tprefault=2.000S
Tpostfault=2.000Sec	PT at:Bus
CT Polarity:Line	CB Simu.:No
Open Time=200ms	Close Time=100ms
Fault Inc. Mode:random	Fault Angle=90.0Deg
DC-offset:Yes	Test Mode:IConst
Zs=8.000Ohm	Phis=90.0Deg
|KE| or Re(KE)=0.000	Phi(KE) or Im(KE)=0.000

NR	Fault	Z	Angle
1	C-E	11.310ohm	8.8deg
2	C-E	11.465ohm	8.7deg
3	C-E	21.622ohm	20.9deg
4	C-E	15.285ohm	29.9deg
5	C-E	12.439ohm	37.6deg
6	C-E	14.748ohm	19.8deg
7	C-E	16.430ohm	19.8deg
8	C-E	19.638ohm	19.8deg
9	C-E	19.451ohm	23.3deg

Page 1



PONOVO

Australia

Test Object	
Substation:xxx Substation	Bay:
Device:Line	Type:SR489
Manufacture:GE	SN:P0408389
Tested by:	Date:12/31/2009 15:49

1.Differential	
Sn=180.000MVA	I_DIFF>=0.200In
Un(H)=110.000V	I_DIFF>>=1.000In
Un(M)=110.000V	SLOP1=0.200
Un(L)=110.000V	SLOP2=0.300
INprim(H)=1200A	Slope Knee Point=2.000In
INprim(M)=1200A	I2f/Idiff=0.150
INprim(L)=1200A	I5f/Idiff=0.150
INsec=1A	

NR	Inom	IRest	Idiff	Slope1	Slope2	Idiff>
1	1.000A	0.952In	0.194In		0.194In	TESTNAME=PickupValue
2	1.000A	1.631In	0.331In	0.204		TESTNAME=PickupValue
3	1.000A	1.900In	0.389In	0.204		TESTNAME=PickupValue
4	1.000A	2.100In	0.640In		0.295	TESTNAME=PickupValue
5	1.000A	2.703In	0.841In		0.295	TESTNAME=PickupValue

Operating Characteristic Diagram

Page 1

23 Relay templates

- PONOVO relay templates solution is aimed to simplify and ease the relay test process at fields.
- PONOVO relay template is made based on each relay model
- PONOVO relay template can be downloaded from Customer Area of PONOVO website
- PONOVO is providing two types of relay templates as mentioned bellow:

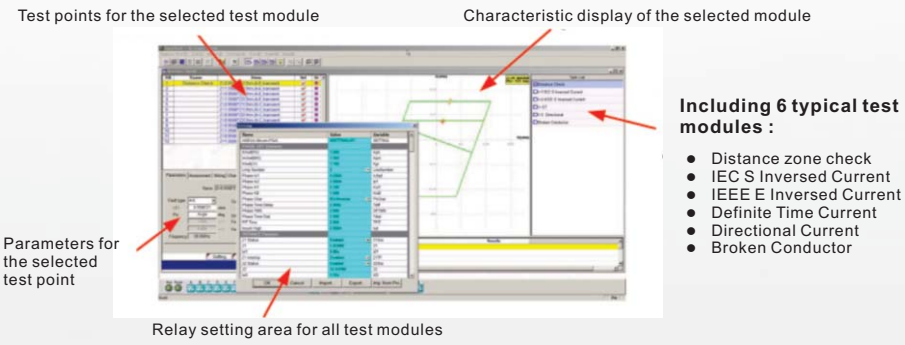
Basic Relay Templates

- ❑ Designed to test basic functions of the relay
- ❑ Relay setting names are same as what they are in the relay
- ❑ Wiring information and test precautions can be edited in the template
- ❑ Template can be saved as RIO file and be opened in other test modules
- ❑ User can use it to make his own templates by combining other templates and/or test modules
- ❑ Free download from website and no license file is required

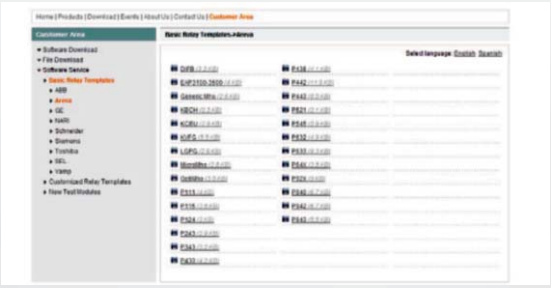
Customized Relay Templates

- ❑ Designed according to customer or relay manufacture test procedure
- ❑ Contains different test modules required for testing multi-functional relay
- ❑ Relay setting names are same as what they are in the relay
- ❑ One setting area for all test modules
- ❑ Wiring information and test precautions can be edited in the template
- ❑ Selected test modules can be executed automatically
- ❑ User can modify the template and save it as a new template
- ❑ Templates for typical relays are available and license file is required

Example : Customized Relay Template for AREVA Micom P545 line protection relay



Example : Download area for basic relay templates on **PONOVO** website



Analog Recording Unit

AR-10

SAR0101

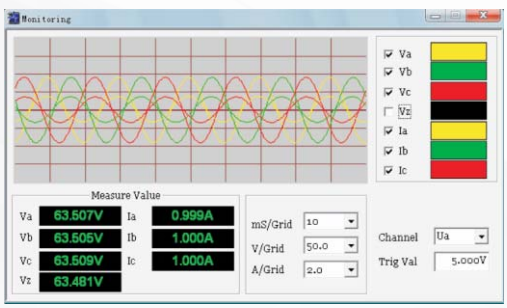
AR-7D

SAR0201

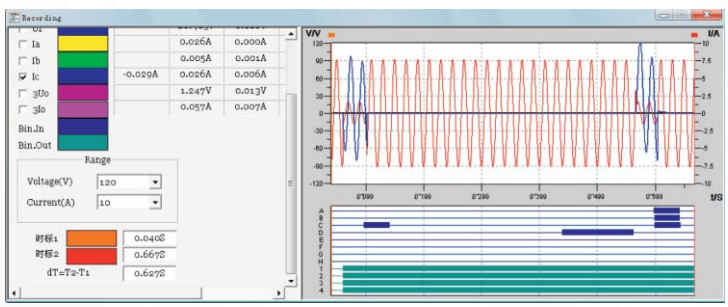
The optional AR-10/AR-7D Analog Recoding Unit provides user an independent facility to record external analog signals. The current signals can be measured directly withou current clamp. One important application of this recording unit is to monitor the current/voltage outputs and binary input/ output status during the relay test process, enabling the fast trouble shooting of wiring and test circuitry. We can also use this provision to analyze the external signals, such as phase angle, power, harmonic, etc.

AR-10/AR-7D Analog Recording Unit

	AR-10	AR-7D
Number of analog recording channel	10	7
Voltage input range (RMS)	0-300Vac	
Current input range (RMS)	0-30Aac	
Current measuring type	direct measuring,no current clamp is required	
Amplitude accuracy	error <0.5%	
Bandwidth	DC-1kHz	
Sampling frequency	3.5kHz	
Voltage input impedance	300 kΩ	
Transient input buffer at 3 kHz	15s for all 10 input channels simultaneously	
	15s for all 7 input channels simultaneously	
Transient trigger	threshold voltage or current, manual	
Measurement functions	I (AC), V (AC), phase, frequency, power, energy,	
	harmonics, transient recording, event recording	
Input overload indication	Yes	
Input protection	Yes	
Galvanic isolation	Independent isolation for all 10 inputs	



Monitoring the output waveform and value during the test process.



Analog recording function enables the record of both waveform and binary inputs/outputs status for the whole test process.

PGPS02- GPS-based synchronization device

It provides GPS synchronization signal in PPS (pulse per second) or PPM (pulse per minute) for synchronized test. Trigger time can be set locally.

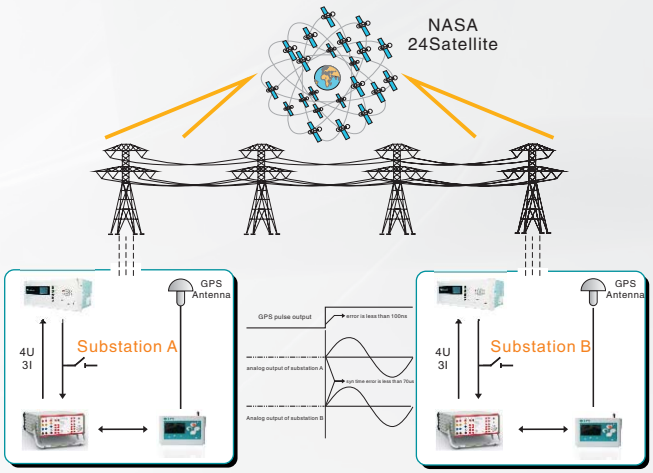
SAG0101

Specification

Timing Pulse Signal	
Pulse Signal Level	TTL or RS-232
Timing Error between Two RT GPS	TYP.< 100ns MAX.< 500ns
Pulse Polarity	Positive
Pulse Width	100ms

GPS Locking Time	
Local First Power-on	> 34s, < 50s
Restart After Instantaneous Power-off	< 5s
Restart When Position Unchanged	< 5s
Restart When Position Changed	> 34s, < 50s

General	
Weight	640g
Dimensions（W×H×D）	95mm×45mm×160mm



PIRIG-B01 IRIG-B based synchronization device

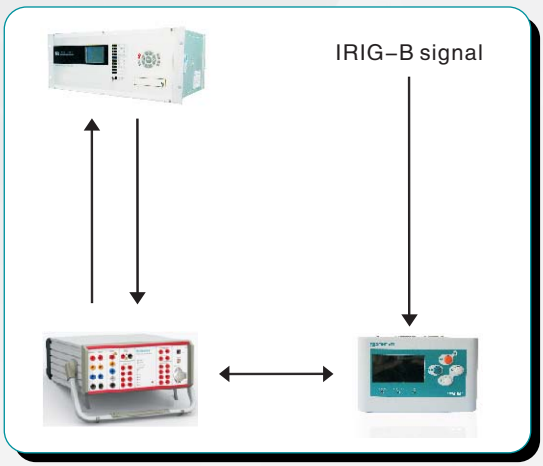
It converts external IRIG-B signal into trigger pulse to synchronize several of our relay test equipment for synchronized test application.

Input signal
IIRIG-B (DC level shift protocol B00X): TTL, RS232, RS422
IPPS, PPM: dry contact, TTL

Output signal
IInstrument port: TTL
IComputer: RS232
IPPM: TTL, RS232

Delay to source: <100 ns
Synchronization error: <70 us
Weight: 0.645kg
Dimension (WxHxD): 160mmx45mmx95mm

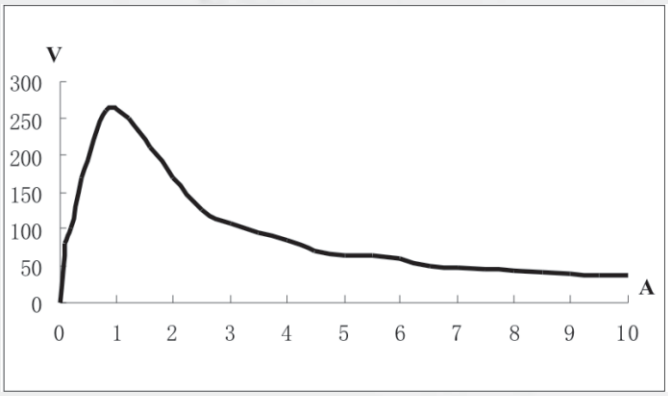
SAG0102



Phpc01-current booster

Phpc01 current booster is designed to supply high compliance voltage even at small current range, suitable for testing high burden electromagnatic current relays.

Setting range: 0～10A
Accuracy: 0.15% rd.+0.05% rg. typ.,
0.4% rd.+0.1% rg. guar.
Ranges : 10A/8A/6A/4A/2A
Frequency : 40-65Hz

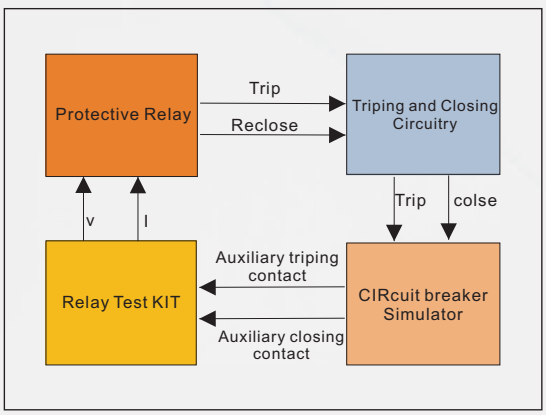


SAH0101

PSS01 - Circuit Breaker Simulator

- Emulation of circuit breaker operation for all voltage levels
- Can select 3 pole or 1 pole tripping
- Separate coil for single closing and single tripping
- Can emulate circuit breaker failure
- Separate settings for tripping and closing time available
- Separate settings for tripping and closing current available
- Providing 12 circuit breaker auxiliary contacts for complex test applications
- Portable design

SAB0101



Trip and close operation Voltage	DC 220V or DC 110V
Trip time selection	20ms、30ms、40ms、50ms、60ms、70ms、80ms、90ms、100ms、110 ms
	error ±5 ms
Close time selection	40ms、70ms、120ms、240ms
	error ±10ms

Trip current selection	0.25A、0.5A、0.75A、1A、1.5A、2A
Close current selection	0.25A、0.5A、0.75A、1A、1.5A、2A
Auxiliary contact	12
	Capacity：DC-0.5A/220V，AC-5A/220V
Size and weight	230x176x141mm 3.5kg
Power supply Voltage	AC 220V10% 50Hz or 60Hz

■ PACB108 - Scanning head package

- Precisely count the black mark or red LED pulse from energy meter
- Output pulse: 5V or 24V
- Sampling distance: 10-30mm
- Maximum sampling pulse: 100pulses/second

SAS0101

■ Transportation Casing

- Heavy-duty
- Environmentally friendly
- Fireproof material
- Smooth rolling rubber tires
- Folding hand
- Weight: 9.5 kg

SAC0105

SAC0106

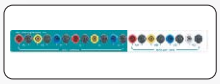
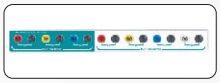
Standard accessories

			PW460	PW636i	PW666i	PW336i	PW430D	PW431D	L336i	S40A	S10A	S100A
	SAW0201	Color coded current cable with 4 mm safety plugs 1#(2.5mm²×3m)	8	8	8	8	4	8	8	4	4	
	SAW0202	Color coded voltage cable with 4 mm safety plugs (2.5mm²×3m)	5	5	5	5	5	5	5	5	5	5
	SAW0203	Color coded current cable with 4 mm safety plugs 2# (2.5mm²×0.5m)	4	4	4	4	4	4	4	4	4	
	SAW0204	Signal cable with 4 mm safety plugs1# (1mm²×3m)	4	4	4	4	4	4	4	4	4	2
	SAW0205	Signal cable with 4 mm safety plugs2# (1mm²×0.5m)	4	4	4	4	4	4	4	4	4	2
	SAW0206	Flexible terminal adapters for screw-type terminals(2.5mm²×0.1m)	20	20	20	20	20	20	20	20	20	20
	SAW0207	Flexible jumpers for paralleling current triples or shorting neutrals of binary inputs(2.5mm²×0.1m)	4	4	4	4	4	4	4	4	4	4
	SAW0208	Crocodile clips(Jaws open 20mm)	8	8	8	8	8	8	8	8	8	8
	SAW0209	U clamps 1# (for 4mm screws)	20	20	20	20	20	20	20	20	20	20
	SAW0210	U clamps 2#(for 5mm-7mm screws)	10	10	10	10	10	10	10	10	10	10
	SAW0211	Pin clamps	8	8	8	8	8	8	8	8	8	8
	SAW0022	Color coded current cable with 4 mm plugs (10mm²×3m)										2
	SAW0009	Power cord (250V/10A, 2m)	1	1	1	1	1	1	1	1	1	1
	SAW0018	Earthing lead (2.5mm²×4m)	1	1	1	1	1	1	1	1	1	1
	SAW0012	PC control cable (LAN)	1	1	1	1	1	1	1			
	SAW0011	Data cable (USB)								1	1	1
	SAC0105	Transportation case	1	1	1	1	1	1	1	1	1	1

Standard accessories

			T200A
	SAW0001	Color coded current cable(16mm²×3m)	2
	SAW0002	Color coded voltage cable(2.5mm²×4m)	4
	SAW0003	Signal cable(0.75mm²×4m)	6
	SAW0004	Signal cable(0.75mm²×0.5m)	4
	SAW0005	Crocodile clips(Jaws open 10mm)	8
	SAW0006	Crocodile clips(Jaws open 20mm)	4
	SAW0007	U clamps (Jaws open 10.5mm)	2
	SAW0008	Pin clamps	8
	SAW0009	Power cord (250V/10A, 2m)	1
	SAW0018	Earthing lead (2.5mm²×4m)	1
	SAW0011	Data cable (USB)	1
	SAC0106	Transportation Case	1
 	SAW0023	Color Coded High Current Plier	2

Optional accessories

			PW460	PW636i	PW666i	PW336i	PW430D	PW431D	L336i	T200A	S40A	S10A	S100A
	SAR0101	AR-10 analog recording unit	✓	✓	✓	✓	✓	✓					
	SAR0201	AR-7 analog recording unit	✓	✓	✓	✓	✓	✓					
	SAG0101	PGPS02 GPS based synchronization device	✓	✓	✓	✓	✓	✓	✓				
	SAG0102	IRIG-B based synchronization device	✓	✓	✓	✓	✓	✓	✓				
	SAB0101	PSS01 Circuit Breaker Simulator	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SAH0101	Phpc01 Current Booster	✓	✓	✓								
	SAS0101	PACB108 scanning head	✓	✓	✓	✓	✓	✓	✓				
	SAW0014	Low level output and counter input cable	✓	✓	✓								
	SAW0015	Synchronization control cable	✓	✓	✓	✓	✓	✓	✓				
	SAW0016	Fiber optic cable(MTRJ-ST,3M)	✓	✓	✓		✓	✓	✓				
	SAW0017	Fiber optic cable(MTRJ-MTRJ,3M)	✓	✓	✓		✓	✓	✓				

PM605A Multi-function Calibrator

Model PM605A

The PM605A is a three phase high accuracy and high stability Multi. Function Calibrator, With built in manual controller, colour display and function keys the PM605A provides sophisticated operation and display of results.

The PM605A has 3 high accuracy(0.05%)Voltage and 3 high accuracy(0.05%)Current outputs and a high accuracy(0.05%)DC voltage 5 binary inputs and 4outputs, making the PM605A a versatile and easy to use calibra-tion tool.

Used in……

§AC voltage, current, frequency, phase angle,power factor and power calibration
§DC voltage, current and power calibration
§Electronic transducer calibration
§Energy meter test(optional)

Specifications

	range	% rd.
AC voltage(3-phase)	0V~10V	0.0 + 5mV
	10V~150V	0.05
AC current (3-phase)	0 mA ~ 100mA	0.0 + 50μA
	100 mA~ 6 A	0.05
DC voltage	0V~±50mV	0.0 + 25μV
	±50mV~±10V	0.05
DC current	0 mA~ 0.2mA	0.0 + 0.1μA
	0.2mA ~ 20mA	0.05
380V AC voltage(Optional)	0V~50V	0.0 + 50mV
	50V~456V	0.1
300V DC voltage(Optional)	0V~30V	0.0 + 30mV
	30V~300V	0.1

Stability

AC voltage/current	0.01% rd.3min
DC voltage/current	0.01% rd.3min
380V AC voltage	0.05% rd.3min

Distortion

AC voltage / current	<0.05% rd.
380V AC voltage	<0.1% rd.

Power per phase

AC voltage / current	30VA
380V AC voltage	30VA
DC voltage	5W
DC current	0.2W

Active / Reactive Power

accuracy	0.05% rd.
stability	0.01% rd. /3min

Frequency

Range	40 Hz ~ 100Hz
Accuracy	0.001 Hz
Stability	0.0005 Hz /3min

Phase angle

Range	0°~360°
Accuracy	0.05°
Stability	0.01°/3min

Power factor

Range	-1~0~+1
Accuracy	0.0005
Stability	0.0001 /3min

Multimeter

	range	uncertainty
DC voltage	0 - ±1V, ±5V, ±10V	0.05 % rg.
DC current	0 - ±1mA, ±10mA, ±20mA	0.05 % rg.

Binary Input / Output

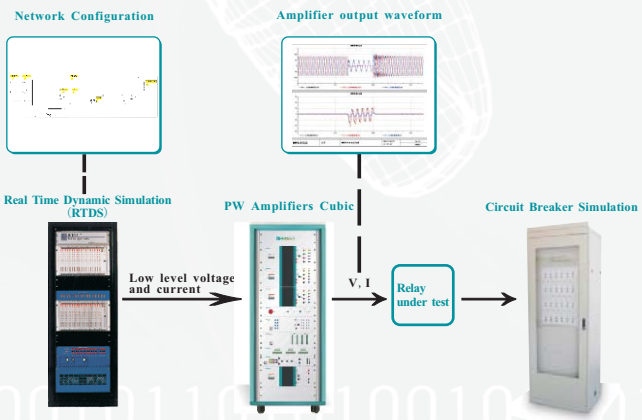
	quantity	Time accuracy
Binary In	5	0.1ms
Binary Out	4	1ms

PC Interface:	Ethernet 10/100M
Power Supply:	220V ±15%, 40 to 60Hz
Temperature:	-10° to + 45°
Dimensions:	360mm ×157mm ×367mm (W×H×D)
Weight:	15kg

Power Amplifier for Real Time Digital Simulation

PA series amplifiers are specially designed for power network real time simulation applications,which requires large power output,high accuracy even at high current output for all kinds of load.It can be used together with RTDS to compose a complete power network real time dynamic simulation system.

Example: working together with RTDS



Specifications and typical configurations

Panel mount type

Model	Output	Type	Notes
PAC2000B	1×200A RMS, 2400VA/phase	4U	Requires PAP-01 power unit
PAC2000C	1×200A RMS, 3600VA/phase	4U	Requires PAP-01 power unit
PAC60Bi	3×60A RMS, 800VA/phase	4U	3 phase 380VAC±10%,47-63Hz
PAC60Ci	6×30A RMS, 450VA/phase	4U	3 phase 380VAC±10%,47-63Hz
PA30Bi	3×30A RMS, 450VA/phase ,4×120v RMS ,60VA/phase,	4U	3 phase 380VAC±10%,47-63Hz
PA30Bi-H	3×30A RMS 450VA/phase,4×250v RMS 75VA/phase	4U	3 phase 380VAC±10%,47-63Hz
PAC60Ti	Static: 6x210VA,30A rms; 3x400VA,60A rms ;2x600VA,90A rms Transient: output time 2s 6x300VA,60A rms, 3x600VA,120A rms;2x800VA,180A rms	4U	3 phase 380VAC±10%,47-63Hz
PAV250Bi	6 x 250v RMS,75VA/phase	4U	3 phase 380VAC±10%,47-63Hz
PAV120Bi	6 x 120v RMS,60VA/phase	4U	3 phase 380VAC±10%,47-63Hz
PWF-2T	IEC61850 simulating device (3 fiber outputs, 12 analog signal sampling, ±10V input, 12 analog signal recording, GOOSE interpretation and publishing, support IEC61850-9-1, IEC61850-9-2)	2U	220V AC

Portable Type

PAC60Cip	6×30A RMS,400VA/phase	4U	110V or 220V AC
PAC60Bip	3×60A RMS,210VA/phase	4U	110V or 220V AC
PA30Bip	3×30A RMS,210VA/phase ; 4×120v RMS,60VA/phase	4U	110V or 220V AC
PA30Bip-H	3×30A RMS,210VA/phase; 4×250v RMS,75VA/phase	4U	110V or 220V AC
PAV250Bip	6 x 250v RMS,75VA/phase	3U	110V or 220V AC
PAV120Bip	6 x 120v RMS,60VA/phase	3U	110V or 220V AC

Optional Accessories

PAD24	Binary input & output converter Number: 12; type: NC (300V,0.5A)	2U	220V AC
PAP01	Three phase main power supply for PAC2000	Rack	3 phase 380VAC±10%, 47-63Hz
PAP02	Three phase main power supply for PA series amplifiers	Rack	3 phase 380VAC±10%, 47-63Hz
PSS01B	Circuit Breaker Simulator(single tripping coil)	3U	220V AC
PSS02B	Circuit Breaker Simulator(two tripping coils, 2.5A)	3U	220V AC
PSS05B	Circuit Breaker Simulator(two tripping coils, 5A)	3U	220V AC
PAT01	Control unit(limit high current output, protect relay under test, reference base signal for calibrating amplifier source)	2U	220V AC

Power Amplifier for Real Time Digital Simulation

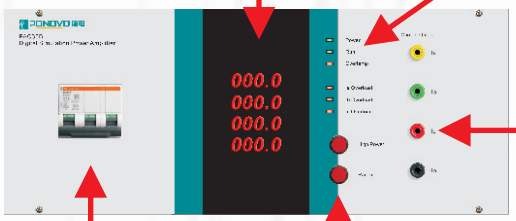
Panel Configuration for panel mount type amplifier

Amplifier output display

The in-built sampling unit in the amplifier is designed to sample the real time output signal and the output value for each current/voltage channel will be displayed in the display area.

LED indicator for amplifier working status

a) Power On display
b) Operation display
c) Overheat display
d) Current open circuit display
e) Voltage short circuit display



Amplifier outputs

Three phase power supply switch

Panel control button

a) High power output button
b) Output pause button

Main Customers

Customer Name	Time of Operation	Voltage Source	Current Source
VNIIR,JSC (Russia)	2008	12*120V	9*200A
Beijing Jiaotong University	2009	14*120V	9*60A/6*30A
China Agricultural University	2009	18*120V	9*60A/6*30A/3*200A
North China Electric Power University	2009	18*120V	12*60A/6*200A
Xi'an Jiaotong University	2004	18*120V	6*60A/3*200A
Tianjin University	2005	16*120V	12*60A
South China University of Technology	2006	12*120V	9*60A
Tsinghua University	2008	6*120V	3*30A/3*30A/6*200A
Zhejiang University	2008	24*120V	18*30A
China EPRI	2005/2008/2009	64*120V	24*60A/12*30A/15*200A
North China EPRI	2003	28*120V	12*60A/12*30A/6*200A
East China Electric Power Test & Research Institute	2003/2005	24*120V	9*60A/6*200A
Sichuan EPRI	2002	18*120V	9*60A/3*200A
Fujian EPRI	2004	14*120V	6*30A/3*200A
Shandong EPRI	2003	12*120V	9*60A
Jiangsu EPRI	2004	20*120V	9*60A/6*200A
Jiangxi EPRI	2008	16*120V	24*60A
Hebei Province EPRI	2007	24*120V	12*60A/6*30A/3*200A
Shanxi Province Electric Power Research Institute	2007	6*120V	6*200A
Inner Mongolia EPRI	2008	24*120V	8*60A/12*30A
Chongqing EPRI	2008	12*120V	24*60A/6*200A
Anhui Power Electric Test & Research Institute	2008	16*120V	12*60A/9*30A
Shanxi Province North West Grid Technology Center	2009	10*120V	6*60A/3*200A
China Southern Power Grid CO.,LTD	2005	52*120V	39*60A/6*200A
State Grid Nanjing Automation CO.,LTD	2003/2007	60*120V	27*60A/12*200A
Beijing Yiqun Engineering Consultant Co., LTD	2003/2007/2008	12*120V	63*30A
Nari-Relays Electric CO.,LTD	2005/2006/2007/2008	108*120V	48*60A/24*30A/24*10A/3*200A
State Grid Nanjing Automation Research Institute	2003/2007	196*120V	27*60A/56*30A
XJ Group CO.,LTD	2003/2005/2007/2009	26*120V	48*60A/3*200A
Shanghai Electric Power Transmission & Distribution Group	2007	14*120V	6*60A/3*200A
State Grid Consrtuction Company Limited	2003/2009	60*120V	66*30A/30*60A
Beijing Sifang Automation Co.,LTD	2004/2005	16*120V	12*60A/6*200A

Primary Injection and Test Equipment

Features

- 2 minutes continuous output at 1000A
- Manual and Ramp control
- CT test functions available
- Independent Aux DC supply
- In-built multi-meter funtion
- Weight : 37kg

Model T1000

Specifications

High power AC current output (I1)

Range	2A~50A, 50A~1000A
Output voltage	20V 7V
Accuracy	±0.5%
Power	7000VA
Load time	120s at 1000A

High power AC voltage output (U1)

Range	10~250V
Accuracy	±0.5%
Power	750VA(250V)
Load time	continuous

High power DC voltage output (Udc)

Range	10~300V	
Accuracy	±0.5%	
Power	750W(300V)	
Load time	Output :	<1A >1A
	Time :	continuous Max 60min

Auxiliary DC voltage output (Aux Udc)

Range	20~240V
Accuracy	±1%
Power	55W at 110V/110W at 220V
Load time	continuous at 0.5A

Ammeter

Range	0~6A AC direct measurement
	0~2000A AC with external CT
Accuracy	±1%

Voltmeter

Range	0~600V AC/DC
Accuracy	±1%

Binary inputs

Number	2 (auto detection)
Input characteristics	±30~±250Vdc, or potential free
Time resolution	±1ms(0.001~1s) ±0.1%(1~9999.999s)
Max. measuring time	9999.999s

Binary output

Number	1
Type	Potential free relay contacts
Break capacity AC	Vmax 250V AC / Imax 5A / Pmax 1250VA
Break capacity DC	Vmax 250V DC/ Imax 5A / Pmax 150W

Power supply

Nominal input voltage	220VAC±15%
frequency	45~65Hz

Others

Operation temperature	−5 ~ +50°C
Operation humidity	5 ~95 %, non-condensing
Weight	37kg
Dimensions (W x H x D)	260 ×330×500 mm
PC connection	USB
Ground Socket (earth)	4 mm banana socket; front panel

Certificates

EMC (Emission)	IEC-61000-3-2/3
EMC (Immunity)	IEC 61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Primary Injection and Test Equipments

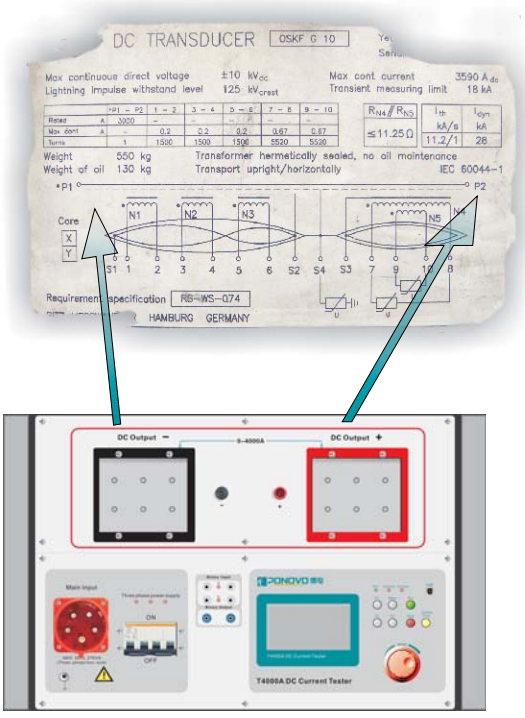
Features and application

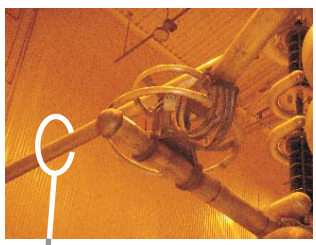
- Large DC current output : 0-4000A
- High precision : 0.1%
- Long output time : max. 60s at 4000A
- Easy panel control withy LCD display
- Manual and Ramp control
- Optional external PC control via USB port
- Can be used to test DC CT for DC converting station

Model T4000

Rated power	20kVA
Rated current output	4000A DC
Rated output voltage	5V
Typical error	≤0.1%
Typical distortion	<0.5%

1 Binary output	Vmax 250V AC / Imax 8A / Pmax 2000VA
	Vmax 250V DC/ Imax 8A / Pmax 150W
2 Binary inputs	Dry or wet (30-250Vdc)
Control	Local control or via external PC
Protection	Phase missing of main supply, overload, overheat
Main supply	3×380V AC /40 ~ 60Hz/30KVA/3P4W
Weight	100kg

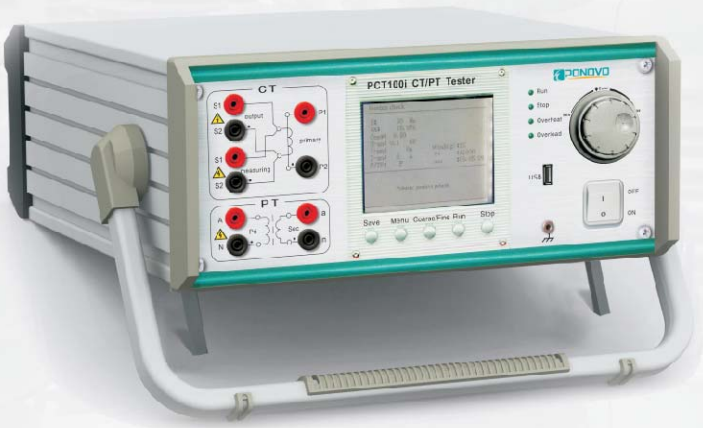




Aluminum Stranded

Tube basbar or aluminum stranded connector

PCT100i CT/PT Tester



Features

- Test standard: IEC60044-1, IEC60044-6
- Can test casing CT and GISCT
- Ratio check up to 30,000:1
- Knee point voltage check up to 20,000V (low frequency sine signal test)
- Save report via USB port
- Weight: 11kg

CT Test

- Burden
- Winding resistance
- Polarity
- Excitation
- Ratio, percentage error, phase angle

PT Test

- Ratio
- Polarity
- Excitation
- Burden

Technical specifications

Test source and measurment	
Model	PCT100i
Voltage output range	0 ~ 120V
Current output range	0 ~ 5Arms(15Arms)
Output accuracy	±0.2%
Max. ratio	30,000:1,45000:5
Max. knee point voltage	20,000V
Burden measuring range	0.1 ~ 100Ω
Burden measuring accuracy	0.2%±1mΩ
Winding resistance measuring range	0.1 ~ 100Ω
Winding resistance measuring accuracy	0.2%±1mΩ
Current measuring accuracy	0.2%+0.2mA
Voltage measuring accuracy	0.2%+0.2mV
Power supply	
Input voltage	110-240Vac
Frequency	50/60Hz
Others	
Dimmension	320mm x364mm x 155mm
Weight	11kg

PCT200i CT/PT Testing System

Main Features

- Can test M/P/TP type, bushing and GIS type CT
- Ratio check up to 30 000 : 1 and 45 000 : 5
- Knee point check up to 30 000V
- Standards : IEC60044-1, IEC60044-6, ANSI/IEEE C57.13
- Results saved directly in Excel format
- Report can be transferred to flash disk via USB port
- Weight : 10kg

Following PT tests can be done automatically

- Polarity
- Ratio
- Excitation
- Burden

More than 20 CT tests can be performed automatically in one time

- Burden
- Winding resistance
- Excitation
- Polarity
- Ratio
- Ratio error and phase displacement
- Saturated inductance (Ls)
- Unsaturated inductance (Lu)
- Remanence flux (Kr)
- Secondary time constant (Ts)
- Accuracy limiting factor (ALF)
- Instrument security factor (FS)
- Transient dimensioning factor (Ktd)
- Peak instantaneous error ($\hat{\varepsilon}$)
- Composite error
- Demagnetization

Technical specifications

Output voltage range	0~120V
Output current range	0.0001A~5A RMS (15A peak)
Output power	0.0001VA~500VA RMS (1500VA peak)
Ratio measurement	range: 1~30 000
	accuracy: 0.1%
Phase measurement	accuracy: 3 min (0.05 deg)
	resolution: 0.1min (0.0017 deg)
Current measurement	range: 0~15 A (auto ranging)
	accuracy: 0.1%
Voltage measurement	range: 0~120V (auto ranging)
	accuracy: 0.1%

Winding resistance measurement	range: 0.05~200Ω
	accuracy: 0.1% +1 mΩ
	resolution: 1 mΩ
Burden measurement	range: 0.05~200Ω
	accuracy: 0.1% +1mΩ
	resolution: 1mΩ
Communication port	USB
Dimemsion	470*200*245mm (WxHxL)
Weight	11kg
Main supply	110-240Vac/50-60Hz (norminal)
	90-260Vac/45-65Hz (permissible)
Operation temperature	-10-50° C

PF3000 Power Filter Characteristic Tester

Main Functions

- Precisely and automatically complete power filter amplitude frequency and phase frequency characteristic measurement
- Automatically measure power filter by parameters of reactor, capacitor and resistor
- Compensate and measure capacitor group unbalanced current 0.01 mA—10 mA

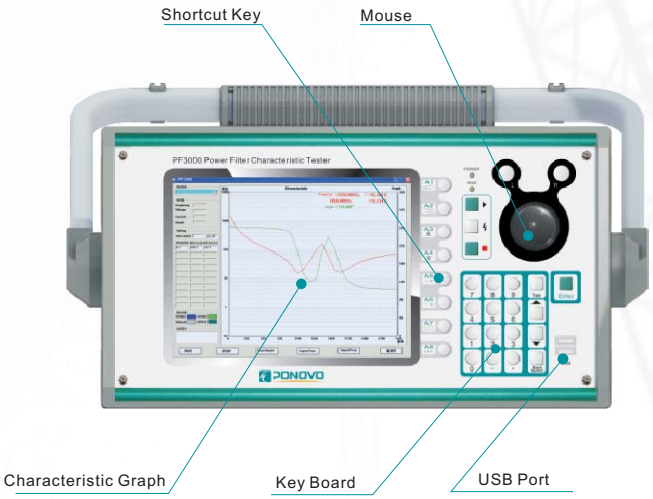
Technical Parameters

Signal source technical parameters

Max output voltage	60V RMS
Max output ccurrent	5A
Output frequency	5Hz—3000Hz
Frequency control step	0.1 Hz

Measurement system technical parameters

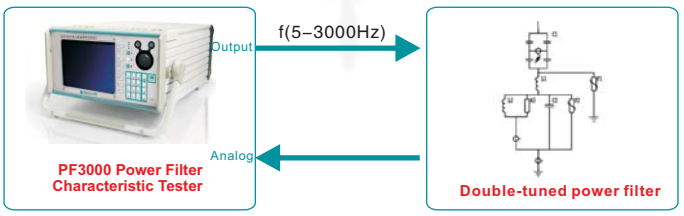
Voltage	
Accuracyq	0.5%
Frequency	5Hz—3000Hz
Amplitude	0.2V—60V
Current	
Accuracy	0.5%
Frequency	5Hz—3000Hz
Amplitude	0.01 A—10 A
Impedance measurement accuracy	0.5%
Phase measurement accuracy	1°
Inductance measurement accuracy	0.5%
Capacitance measurement accuracy	0.5%
Unbalance current measurement accuracy	0.5%
Frequency output	100Hz—3000Hz
Amplitude output	0.01 mA—10 mA



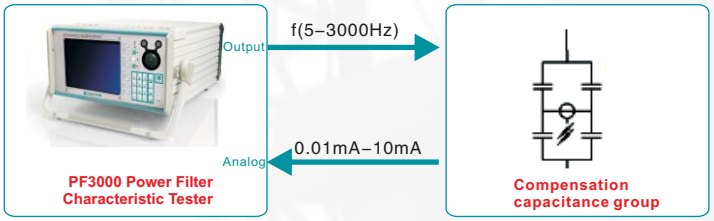
Other	
Operation	Off-line operation/External PC operation
Conmunication Port	USB/100M Ethernet
Self Protection	Overload/Overheat
Report	1000 Reports

Report	1000 Reports
LCD	8.4" TFT
Dimension	364 mm×200 mm×475mm (W×H×D)
Weight	11.8kg

Impedance frequency, phase frequency, resistance, inductance and capacitance measurement.



Unbalanced current measurement



MR1200 Waveform Monitoring and Recording System

Model
MR1200

General Description

The recorder can show and record the voltage, current waveform with full channel, high sampling rate and analysize harmonic component and vector graph.

The value recorded is the orignal data but calculation value or parameter, so it can display and record the waveform characteristics in real time and undistortedly.

The product aims on data collection and analysis of long-time high sampling rate for substaiton, power-plant no-load, short-circuit chacteristic test, excitation test and etc. electric test and fault recording, real-time and undistorted recording and oscilloscope with full-channel and high sampling rate in laboratory.

Product Features

- Integrated with the functions of digital oscilloscope and high sampling rated oscilloscope that oscilloscopes as well as recording.
- Continuous recording original data in a long-time; recording and making samples synchronously, when the sampling rate is 10K/s, the recording time is not less than 300 hous.
- The sampling rate is as high as 100K/s when there is full channel and high sampling rate.
- Based on high precision, high linearity, low temperature drift and low zero drift transducer, it shows and records DC component current and voltage signal waveform exactly.
- Adopting modularization design in channel configuration, the user can choose the accessories and the software identifies automatically.
- Supports GPS B code to record absolute time.

MR1200 Waveform Monitoring and Recording System

Specifications

Configuration

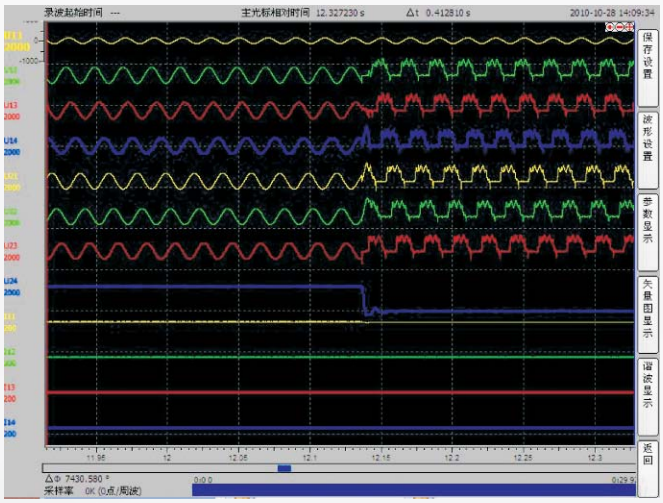
	MR1200 S	MR1200 M	MR1200 L	MR1200 D
AC/DC Voltage Channels	4×1000V	4×1000V	4×1000V	4×1000V
AC/DC Current Channels	4×100A	8×100A	4×100A	3×200A
AC/DC current Clamp			4×100A(AC)/ 4×300A(AC/DC)	3×100A
DC channel				1x ±1000V 1x -10~10V
				1x 0~200mV 1x 4~20mA
Binary sampling channel number	16	16	16	16
Max. sampling rate	50KHz	100KHz	100KHz	100KHz
Max. recording capacity	200GB	200GB	200GB	200GB

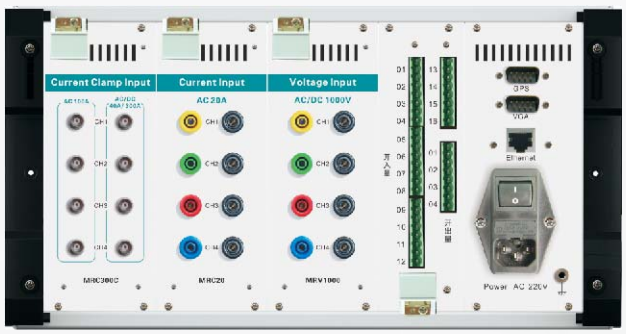
Max. Record Time (Example:8 channels analog inputs, 16 binary inputs)

Rate	MR1200 S	MR1200 M	MR1200 L	MR1200 D
50K/s	60hr	60hr	60hr	60hr
10K/s	300hr	300hr	300hr	300hr
1K/s	3000hr	3000hr	3000hr	3000hr

Others

	MR1200 S	MR1200 M	MR1200 L	MR1200 D
Screen(Can use external monitor)	8.4″TFT	8.4″TFT	8.4″TFT	8.4″TFT
GPS B Code Support	Disbale	Enable	Enable	Enable
Communication Port	USB RJ45	USB RJ45	USB RJ45	USB RJ45

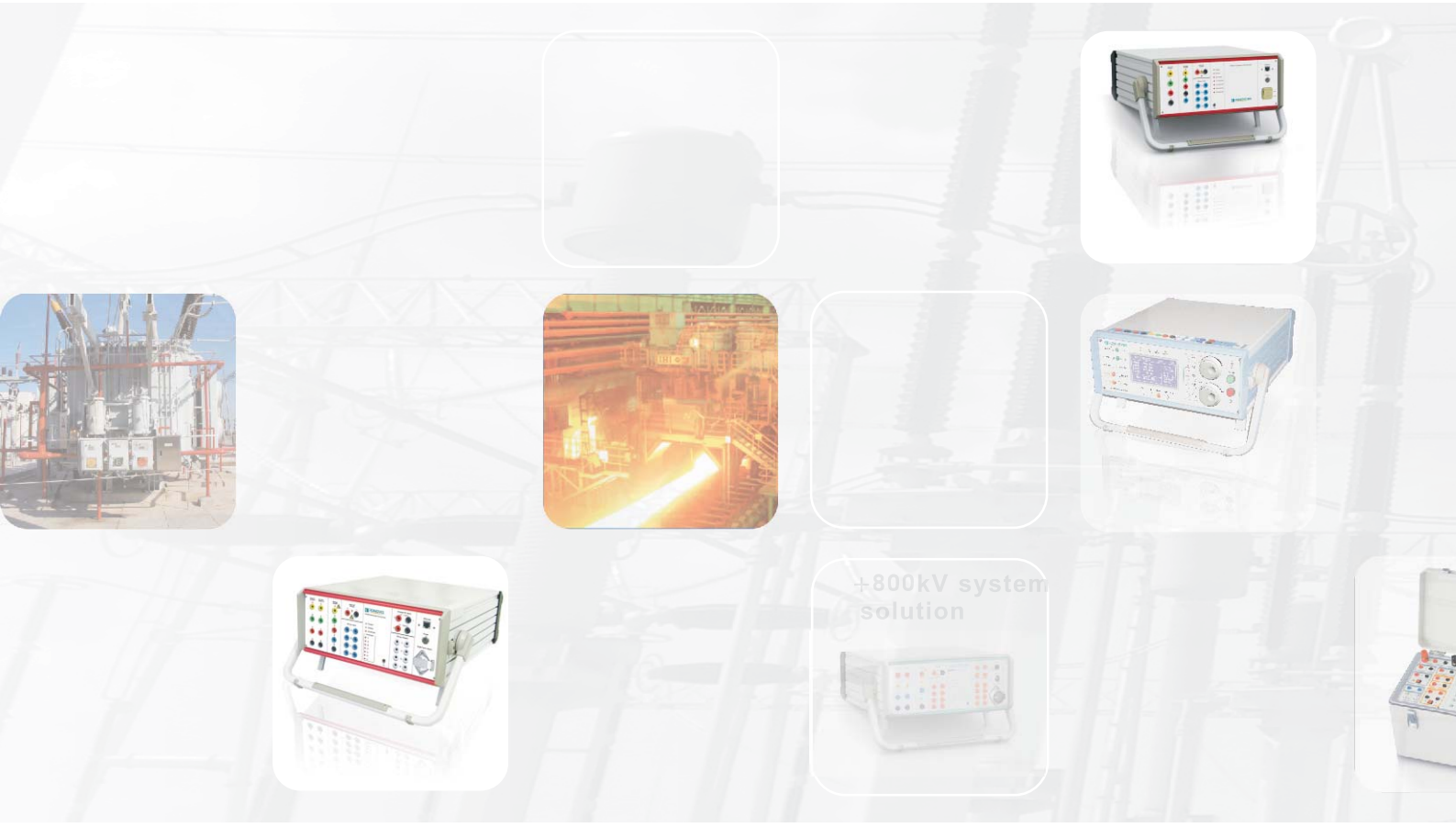




MR1200 rear view

R10

Professional Solution Provider For Protection Relay Test



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