

## Product Datasheet - Technical Specifications



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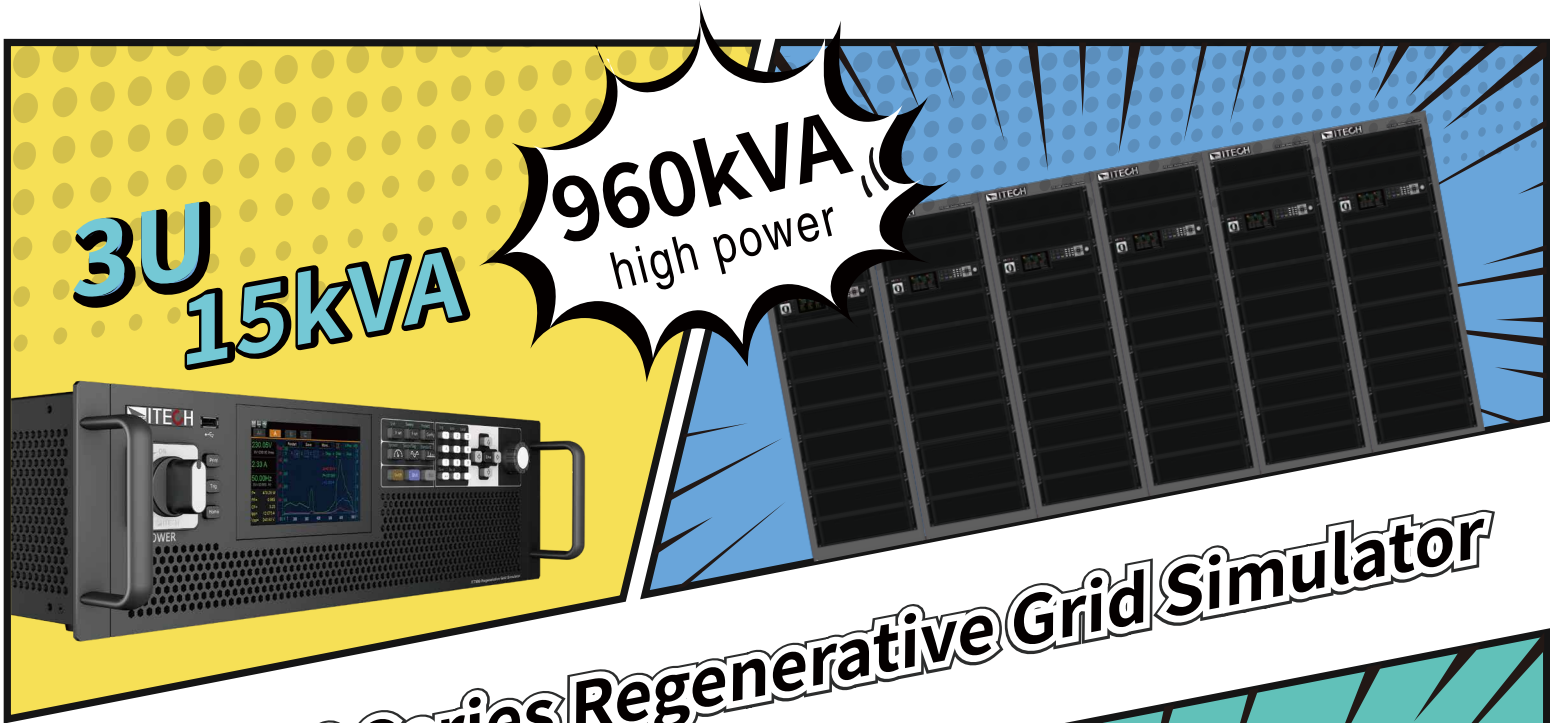
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# IT7900 Series Regenerative Grid Simulator



Four quadrant  
**Regenerative**

## Application fields

- Smart grid
- Electric and electronics
- Solar and energy storage
- Home appliances
- Universities & institutes
- EV

*Your Power Testing Solution*



Regenerative  
capability



960kVA



3U/15kVA



Touchscreen

# IT7900 Regenerative Grid Simulator



The IT7900 series is a programmable, four-quadrant grid simulator. It is also a four-quadrant power amplifier, which can be used to test various grid-connected equipment. For example, PCS, energy storage system, microgrid, BOBC (V2X), PHIL, etc. With the islanding mode (RLC settable), a single unit of IT7900 can realize the anti-islanding protection test. Besides, the power density of IT7900 series is very high, 15kVA in 3U. After parallel connection, the power can be extended to 960kVA at most.

## Highlighted Features

- High power density/minimum rack space, 3U up to 15kVA, 16Hz~150Hz
- Regenerative grid simulator & full 4-Quadrant AC&DC power sources
- Power Amplifier function for PHIL applications
- Professional anti-islanding test mode, can set and simulate the RLC (resistive-inductive-capacitive), active and reactive power circuit for anti-islanding detection
- Three working modes: CV/Current Limit/Power Limit
- AC, DC, AC+DC or DC+AC output capability
- Comprehensive working modes selectable: single-phase, three-phase, reversed phase and multi-channel\*2
- Programmable Output Impedance, allows simulation of Real-World Utility Grid Impedance\*1
- Compliance tests incl LVRT /Phase Jump/Frequency variation /Harmonic Injection
- Supported regulatory testing include IEC61000-4-11/4-13/4-14 /4-28 etc.

## Features

- Wide voltage ranges: 350V L-N and 500V L-N\*1
- Master-slave parallel with current sharing technology, up to 960kVA
- Intuitive touch screen; Built-in single/3-phase AC power meter; Scope function
- Fast response time and high accuracy 0.1%+0.2%FS
- Waveforms Library : Sine wave, Square wave, Triangle wave, Clipped sine waves, trapezoidal wave, self-defined waves
- Harmonics and Interharmonics waveform synthesizer
- Power line disturbance simulation testing by LIST programming/SWEEP/Surge&Sag functions
- The harmonic measurement function can measure 50th order harmonics of voltage and current\*3
- Output 0-360 ° start/stop phase angle can be set
- Front panel USB port for data and waveform import and export
- Provides various trigger input/output signals. When amplitude/frequency changes, trigger signals can be generated to synchronously capture the current waveform of DUTs
- Relay CTRL function, to cut off the connection between instrument and DUT
- Frequency lock and phase lock function, tracking the external signal frequency and phase, to achieve 6 phase& 12 phase power output
- Built-in USB/CAN/LAN/Digital IO interface, optional GPIB / Analog&RS232

\*1 Stay tuned

\*2 5kVA model only support single phase

\*3 Voltage and current harmonic analysis  
Voltage harmonic simulation

# Your Power Testing Solution

IT7900 Regenerative Grid Simulator

## Applications

### Electric transportation

Grid-connected inverter, electronic power regulating system

### New Energy Vehicles

OBC, AC charging pile, EV power supply equipment, BOBC(V2X)

### Energy Storage

PCS energy storage converters, home PV energy storage devices

### Research Institute

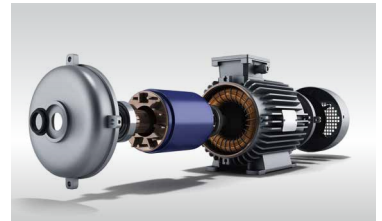
AC-DC power adapter, EMC test

### Power Electronics

Transformer, AC fan, UPS, AC motor



Electric Transportation



Model	Voltage range	Current range	Power	Phase
IT7905-350-30U	350 V L-N	30 A	5kVA	1Φ
IT7906-350-90	350 V L-N	90 A	6kVA	1Φ or 3Φ
IT7909-350-90	350 V L-N	90 A	9kVA	1Φ or 3Φ
IT7912-350-90	350 V L-N	90 A	12kVA	1Φ or 3Φ
IT7915-350-90	350 V L-N	90 A	15kVA	1Φ or 3Φ
IT7930-350-180	350 V L-N	180 A	30kVA	1Φ or 3Φ
IT7945-350-270	350 V L-N	270 A	45kVA	1Φ or 3Φ
IT7960-350-360	350 V L-N	360 A	60kVA	1Φ or 3Φ
IT7975-350-450	350 V L-N	450 A	75kVA	1Φ or 3Φ
IT7990-350-540	350 V L-N	540 A	90kVA	1Φ or 3Φ
IT79105-350-630	350 V L-N	630 A	105kVA	1Φ or 3Φ
IT79120-350-720	350 V L-N	720 A	120kVA	1Φ or 3Φ
IT79135-350-810	350 V L-N	810 A	135kVA	1Φ or 3Φ
IT79150-350-900	350 V L-N	900 A	150kVA	1Φ or 3Φ
IT79165-350-990	350 V L-N	990 A	165kVA	1Φ or 3Φ

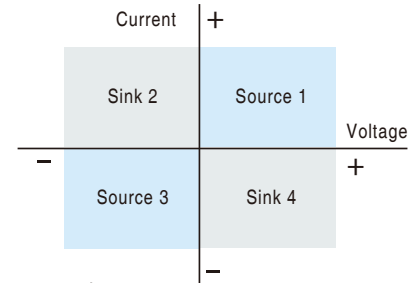
# Your Power Testing Solution

IT7900 Regenerative Grid Simulator

## Outstanding Features

### Regenerative 4-Quadrant AC Grid Simulator

The IT7900 series are four-quadrant grid simulators with 100% of power sinking and 88% energy recovery capability. The power generated by the DUT can be fed back to the grid, rather than being dissipated as heat, which protects the environment and save the cost of electricity, HVAC and cooling infrastructure.



Production: 24Hr/day x 365 day

R&D: 8Hr/day x 5 workday x 52 weeks

Power (kW)	Electricity saved (kWh)	Cost Saved*1*2 (USD)
15	115,632	115,632
90	693,792	693,792
165	1,271,952	1,271,952
960	7,400,448	7,400,448

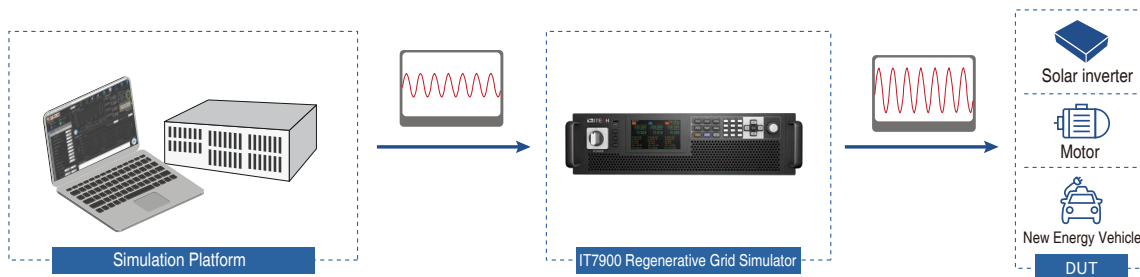
Power (kW)	Electricity saved (kWh)	Cost Saved*1*2 (USD)
15	27,456	3,844
90	164,736	23,063
165	302,016	42,282
960	1,757,184	246,006

\*1 Note: approximate electricity price 0.14USD/ kWh for industry facility in California

\*2 The extra cost of air conditioning is not included.

### Full 4-Quadrant Power Amplifier

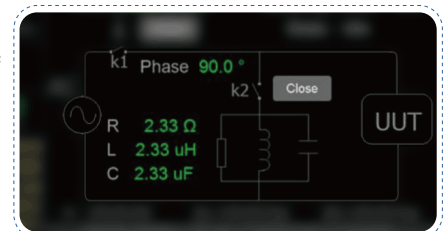
The IT7900 series regenerative grid simulator can be used as a power amplifier to complete power hardware in the loop (PHIL) applications for microgrids, energy storage and new energy vehicles. The digital I/O or a standard suite of analog signal can be input via an external analog interface (optional) and then amplified without distortion to a real power waveshape with an external analog response time of less than 200us.



### Professional Anti-islanding Test Mode

To meet the certification test of anti-islanding effect for grid-tied products, the IT7900 series provide a professional anti-islanding test mode. Users can adjust RLC parameters or configure the parameters of active power and reactive power to achieve the effect of simulating purely resistive or nonlinear grid loads, and further verify the anti-islanding protection response time of grid-tied DUTs under different equivalent impedances, three-phase load balancing and non-balancing conditions.

The solution helps engineers to simplify the test circuit and cost savings of additional equipment such as RLC load and power meter.



### Outstanding Features

#### Constant voltage/Current limit/Power limit

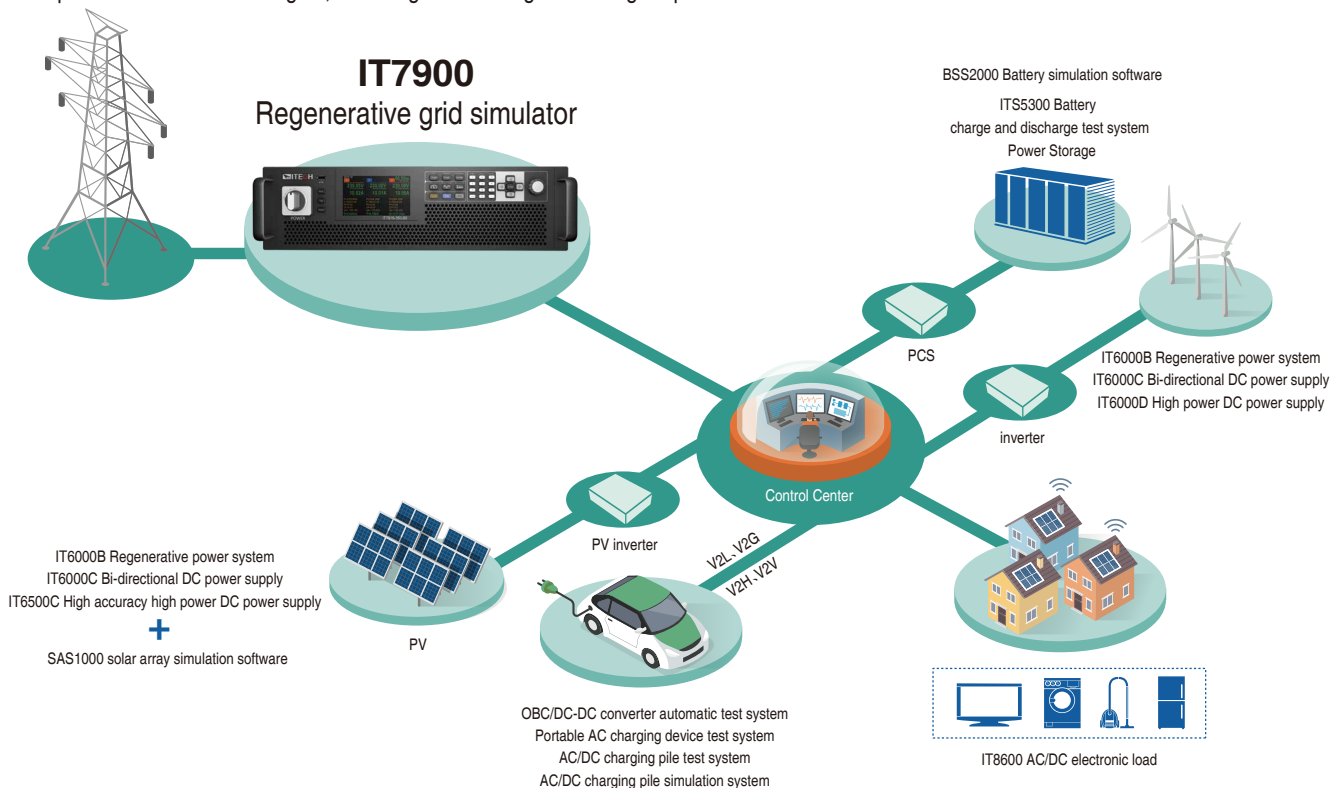
In order to meet the increasingly complex test requirements, the IT7900 regenerative grid simulator has included current limiting and power limiting modes besides the CV mode. Its output parameters (Vset/I limit/P limit) can be adjusted. When the loading current of the DUT exceeds the set current limit value, it will switch to the current limit mode and output at the current limit value while reducing the output voltage. The working principle under limited power mode is similar. Current limit and power limit mode are well applied to test of motors with high inrush current at the moment of starting or capacitive load testing.

#### Application

- DUT: Inductive or capacitive products
- Advantages: Traditional AC sources can only provide current RMS and current peak protection functions. When the starting inrush current of the DUT exceeds the rated current of the AC source, the overcurrent protection will be triggered immediately, leading to the failure of start. In this case, you have to choose a test instrument with a higher rated current to achieve the purpose of the experiment. The current limiting mode of IT7900 can solve this problem well. In the start-up phase of the DUT, the inrush current is limited and output at the maximum current limit until the DUT enters the normal working current state.

#### Application: Microgrid Testing

Microgrids can be seen as small power systems, but they are also a typical distributed generation system, so both equipment manufacturers and professional grid research laboratories need to establish simulation testing requirements. The IT7900 series not only meets the testing requirements of phase angle jump, low voltage ride-through, frequency variation and harmonic injection, but also feeds power back to the AC grid, meeting the microgrid testing requirements.



# Your Power Testing Solution

IT7900 Regenerative Grid Simulator

## High-power Density, Modular Design

### 15kVA/3U High-power Density

With PWM switching technology, the power density is up to 15kVA in a compact 3U size. Two different voltages of 350V-N and 500V-N are provided and the frequency range is 16Hz~150Hz. The size is only 1/12 of a conventional type of AC power supply, and the power could be expanded higher, saving a lot in space and cost.

3U  
15kVA

350V/  
500V

ATE  
set up

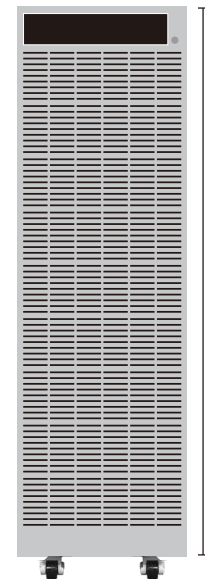
bench  
test



IT7900 Regenerative Grid Simulator  
15kVA



Traditional power supply  
15kVA



37U

### Master/Slave parallel, power up to 960kVA

IT7900 series can be master-slave paralleled to reach 960kVA output at most, flexible and convenient.

IT7900 comes with synchronous On/Off input and output signals, which ensure the synchronization of paralleling and ensures synchronous current sharing of multiple modules. After paralleling, all functions are retained and there's no loss of accuracy, making the construction of the power system faster, more flexible, and more economical, either it is a stand-alone test or ATE system.



960kVA  
High power

#### Application: UPS testing

- Testing purpose: the input and output testing of UPS, the AC input disturbance testing of UPS and etc.
- Application advantage: UPS modules are normally 10kVA-50kVA, by cascade connection, the UPS system can be MW, and they are used in power system, data center and etc. IT7900 series are very suitable for testing the DUT whose power will be expanded at any time without adding additional testing cost. IT7900 single module unit can test UPS module, when UPS capacity gets higher, IT7900 can still test it after paralleling.

### Easy-to-operate interface, abundant operation modes

#### Easy-to-operate interface, abundant operation modes

IT7900 series is equipped with innovative touch screen, simple and intuitive UI interface, and the keyboard knob design allows users to directly and quickly perform operations such as mode setting and waveform editing. The built-in digital oscilloscope function collects time-domain signals of voltage and current, phase relationship and performs waveform trigger functions. The oscilloscope sampling rate is up to 10us, and up to 6 oscilloscope curves can be displayed at the same time. Users can perform instantaneous analysis without an oscilloscope and save them in time.

#### AC,DC,AC+DC,DC+AC working mode

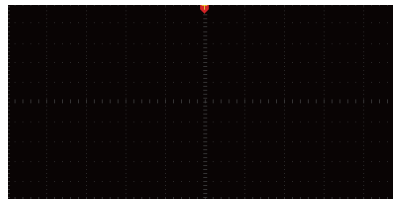
IT7900 series can be used as a "full four-quadrant AC/DC power supply" and provides four output modes: AC, DC, AC+DC, and DC+AC. Not only provide pure AC/DC output, use AC+DC and DC+AC output modes to realize "AC output superimposed DC bias" and simulate "DC output waveform with ripple" to meet the complex application requirements of engineers. In DC mode, the rated power in 100% AC mode can be achieved.



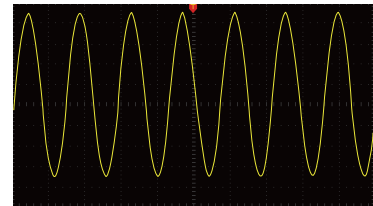
\* Stay tuned!



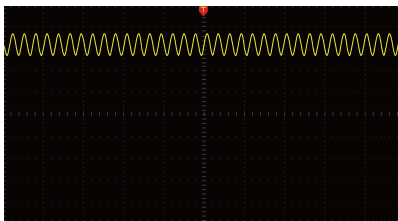
AC



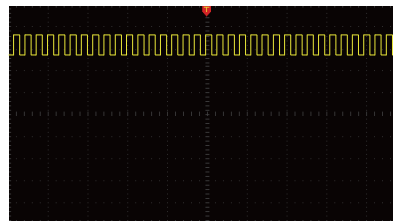
DC



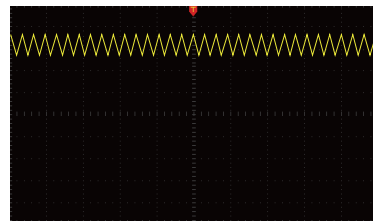
AC+DC  
Vac=45V, dc bias=10V



DC+AC  
Vdc=50V, sine ripple Vac=5V, frequency 150Hz



DC+AC  
Vdc=50V, square ripple Vac=5V, frequency 150Hz



DC+AC  
Vdc=50V, triangle ripple Vac=5V, frequency 150Hz

#### Single-phase, three-phase, reverse phase, multi-channel operation modes

IT7900 series has very flexible operation mode that single-phase, three-phase/ reverse phase /multi-channel output mode can be selected. Combined with the powerful programming function, it can simulate three-phase unbalance, phase loss and phase sequence reverse connection and so on. In the reverse phase mode, users can obtain a single-phase output voltage of up to 700V, and the power remains at 2/3 of the original. Multi-channel mode allows users to test 1-3 independent DUT at the same time. One device for multiple purposes, better equipment utilization, and reduces test costs for enterprises.

IT7900 Operation Mode		
CH1 (1-Phase)	CH2 (1-Phase)	CH3 (1-Phase)
1-Phase		
Reverse Phase		
3-Phase		



# Your Power Testing Solution

IT7900 Regenerative Grid Simulator

## Power Line Disturbance (PLD) test

### Built-in various type of distorted waveforms

In addition to sine waveform, IT7900 series provides various standard AC waveforms, such as triangular wave, sawtooth wave, square wave, trapezoidal wave and clipped sine wave. These waves can be easily recall from the menu and displayed in the LCD touch screen. Moreover, in combination with sequence programming function, users can realize multiple waveform continuous output, to cope with complex power line disturbance test.

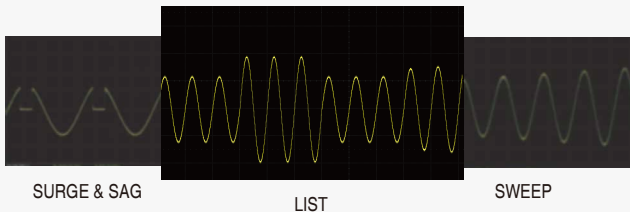


### LIST/SWEEP/Surge & Sag modes

The IT7900 series supports LIST/SWEEP/Surge&Sag modes, and through easy parameter configuration can quickly complete a variety of grid disturbance waveform simulation, such as instantaneous power down, surge and voltage slow rise and slow fall, etc. In LIST mode, a single file supports up to 2000 worksteps, and each workstep can select the waveform type, set the voltage, frequency, slope and start/stop phase angle parameters. During runtime, users can load a new LIST file online without stopping the current file or even interrupting the output. And when the output voltage or frequency jumps, the trigger signal can be generated to synchronize external devices, especially suitable for large test platforms with strict logic control and fast response time for inter-device linkage.

#### Application: Simulate Grid characteristics

Users can edit and simulate various power disturbance conditions through the IT7900 front panel or programmable software.

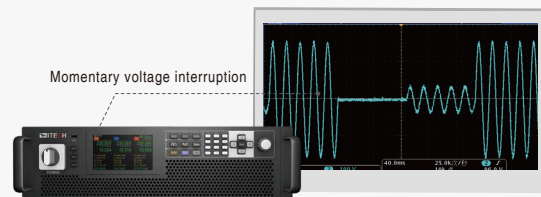


#### Application: LVRT test

LVRT is the ability of a power generation system, when a grid fault or disturbance causes a voltage dip within a certain voltage dip, it should continue to operate without disconnecting from the grid and even to provide some reactive power to the system to help restore voltage. The IT7900 series allows users to edit low voltage ride-through test conditions using LIST mode, with fast response time to fully meet LVRT testing requirements.

#### Application: Instantaneous power interruption simulation function

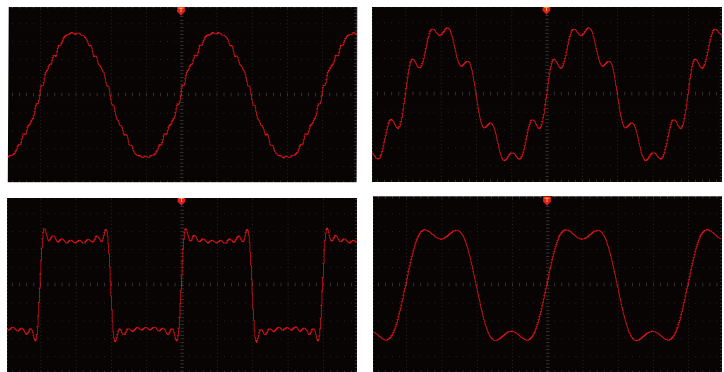
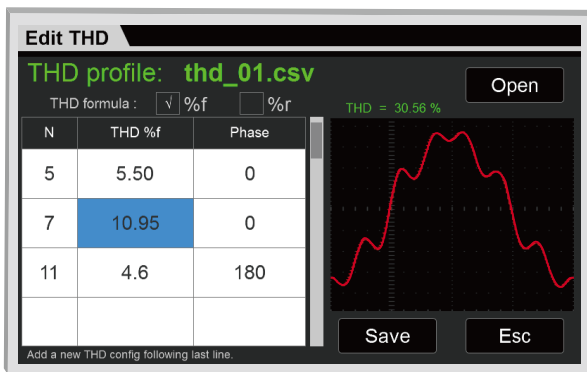
The IT7900 series can also effectively simulate various power interruption scenarios.



Powerful waveform editing function for grid-connected regulations and power electronics disturbance testing

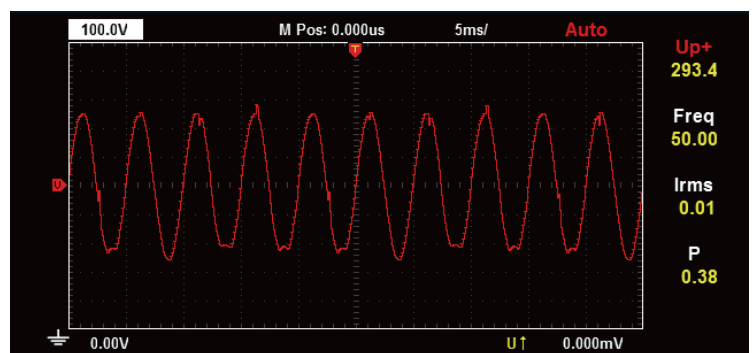
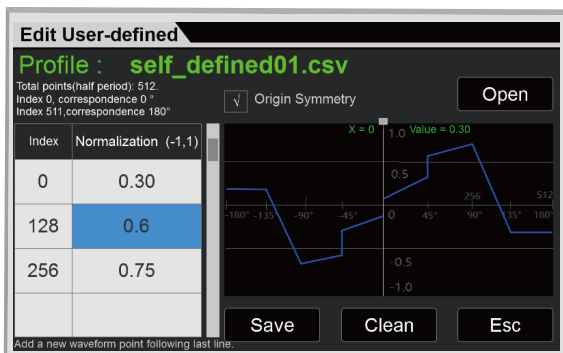
### Harmonic and inter-harmonic simulation

With high-speed DSP technology, IT7900 series is capable of simulating harmonic, inter-harmonic and harmonic synthesis. By setting the amplitude and phase, it can simulate up to 50th harmonics(fundamental frequency is 50Hz or 60Hz), creating a periodic distortion waveform. It also has built-in 30 types harmonic distortion waveforms for quick recall. Harmonic test is one of the important tests for EMC immunity, and single-phase harmonics, three-phase harmonics and three-phase harmonic unbalance output can be realized, also meet IEC regulations test requirements.



### User-defined waveform function

IT7900 series provides user-defined waveform editing function that allows users to simulate the effects of real AC or DC power supply systems on DUT's in different test environments by importing real waveform data into the device, it supports up to 1024 points of data import.



#### DUT: AC-DC power conversion module

- Reference test standard: IEC61000-4-13
- Testing advantages: For power electronic equipment, the design stage requires the developers to consider the impact of each harmonic in the grid on the power-using equipment. IT7900 series meets the IEC61000-4-13 standard for harmonic and inter-harmonic disturbance simulation requirements, the user can set the number of harmonics, harmonic phase angle, harmonic percentage through the configuration interface, it's easy to operate.

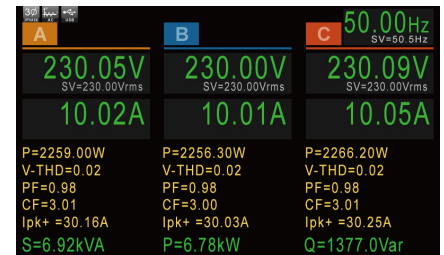
# Your Power Testing Solution

IT7900 Regenerative Grid Simulator

## Measurement and waveform collection

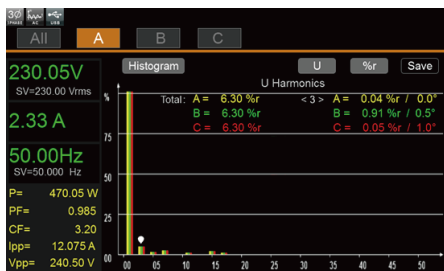
### Built-in power meter - current accuracy up to 0.1% + 0.2% FS

The IT7900 series integrates a data acquisition system which is based on an advanced digital signal processor. It provides the measurement and waveform analysis capabilities of oscilloscopes, power meters and digital multimeters commonly found in test systems. The current measurement accuracy is up to 0.1%+0.2%FS and voltage measurement accuracy is up to 0.1%+0.1%FS. The parameters that can be measured include voltage RMS, current RMS, frequency, active power and power factor, etc. Up to 6 waveform curves can be displayed simultaneously, saving cost and simplifying the operation.

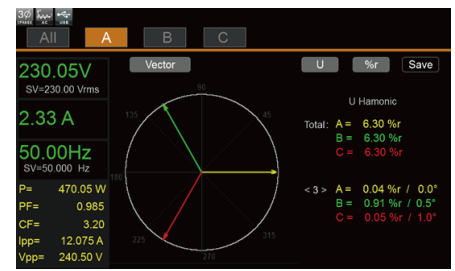


### Harmonic analysis and simulation

The harmonic analysis function of IT7900 series includes voltage harmonic measurement and current harmonic measurement. In the harmonic mode, the voltage and current harmonic distortion factor (THD) and the phase difference of the harmonic to the fundamental wave can be tested. In addition, it can measure multiple harmonics, and the results are displayed in tables, bar graphs or vector charts, making it easy to analyze test results at a glance.



N	Voltage	Angle	Thd %	Voltage	Angle	Thd %
0	0.0	0.0	0.0	0.0	0.0	0.0
1	230.0	0.0	100	230.0	0.0	100
2	0.0	0.0	0.0	0.0	0.0	0.0
3	20.5	0.0	9.0	120.0	1.1	5.3
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0



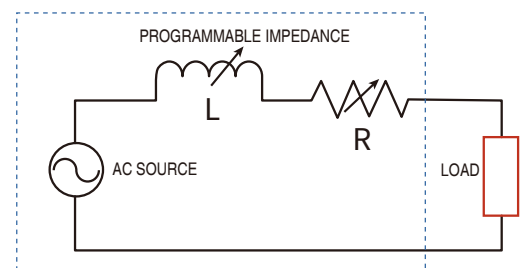
### Trend analysis

Thanks to the function of large data recording, IT7900 series is capable of recording up to 7 hours of continuous data at short intervals (fastest: 100ms). And it's easy to view the complete curve generating from the start to the end of the test by the mode 'trend'. There are six curves that can be displayed at the same time at most. In addition, you can slide the vernier calipers on the screen to check the exact data at a particular point in the current trend curves. It is useful for analyzing errors during test for a long time or inflection points during loading, etc. Besides, you can export the test data for further analysis by front panel USB interface.



### Programmable output impedance

The function of programmable output impedance allows you to edit the output R and L so as to simulate the impedance of the AC grid in accordance with IEC61000-3-3 and IEC61000-3-2 standards.



# Your Power Testing Solution

## IT7900 Regenerative Grid Simulator

IT7915-350-90				
Input Parameters				
AC input	Wiring connection	3 phase 3wire + ground(PE)		
	Line voltage	RMS	( 200 ~ 220 ) ±10% *1/ ( 380 ~ 480 ) ±10%	
	Line current	RMS	< 34A	
	Power factor	typ	0.98	
Output Parameters				
AC output	Output voltage	VLN	0 ~ 350V	
		VLL	0 ~ 606V (3phase) / 0 ~ 700V (reverse)	
	Output current	RMS	90A(1phase) / 30A(3phase/multichannel/reverse )	
		Peak	270A(1phase) / 90A(3phase/multichannel/reverse )	
		Crest Factor	3	
	Output power	Per Phase	5kVA	
		Max. Power	10kVA (reverse phase) / 15kVA (1phase/3phase/multichannel )	
	Voltage setting			
	AC output	Range	0 ~ 350V(1phase/3phase/multichannel)/0 ~ 700V(reverse)	
		Resolution	0.01V	
Accuracy		16Hz ~ 150Hz	0.1%+0.1% F.S	
Current setting				
AC output	Range	RMS	90A(1phase)/30A(3phase/multichannel/reverse )	
	Resolution	0.01A		
	Accuracy	16Hz ~ 150Hz	0.1%+0.2% F.S	
Frequency				
AC output	Range setting	16 ~ 150Hz		
	Resolution setting	0.01Hz		
	Accuracy setting	0.01%		
	Waveform Synthesis	50/60Hz	up to 50th-order	
	Phase			
AC output	Range setting	0 ~ 360°		
	Resolution setting	0.1°		
Voltage setting				
DC output	Range	-495 ~ 495Vdc(1phase/multichannel)/-990 ~ 990Vdc(reverse)		
	Resolution	0.01V		
	Accuracy	< 0.1%+0.1% F.S		
	Current setting			
DC output	Range	-30 ~ 30A(1phase/multichannel/reverse) / -90 ~ 90A(1phase)		
	Resolution	0.01A		
	Accuracy	< 0.3%+0.3% F.S		
Max. Power				
DC output	Phase power	Per Phase	5kW	
	Output power	Max. Power	10kW(reverse phase)/15kW(1phase/multichannel)	
Anti-islanding (R,L,C)	P Range	0 ~ 5kW(3phase/multichannel) / 0 ~ 15kW(1phase) / 0 ~ 10kW(reverse)		
	QL Range	0 ~ 5kVar(3phase/multichannel) / 0 ~ 15kVar(1phase) / 0 ~ 10kVar(reverse)		
	QC Range	0 ~ 5kVar(3phase/multichannel) / 0 ~ 15kVar(1phase) / 0 ~ 10kVar(reverse)		
	R Range	1 ~ 1000Ω(3phase/multichannel) / 0.333 ~ 333.333Ω(1phase) / 2 ~ 2000Ω(reverse)		
	L Range	1 ~ 5000mH(3phase/multichannel) / 0.333 ~ 1666.667mH(1phase) / 2 ~ 10000mH(reverse)		
	C Range	0.001 ~ 5mF(3phase/multichannel) / 0.003 ~ 15mF(1phase) / 0.001 ~ 2.5mF(reverse)		
Voltage Slew Rate, Typical	≥ 2 V/μs with full-scale programmed voltage step			
Output Isolation	550Vac			
Regenerative				
Max. Regenerative power	15kVA			
THD (current)	< 5%			

\*1 ( 200 ~ 220 ) ±10%, the power of 12kw and above is 60% of the rated.

\*2 For models of 30kW and above, it needs the sense remote measurement mode for testing

\*3 Test under DC mode, high speed level, DUT capacity is less than 10uf

\* This information is subject to change without notice

settable impedance	R Range	0 ~ 1Ω(3phase/multichannel) / 0 ~ 0.333Ω(1phase) / 0 ~ 2Ω(reverse)	
	L Range	0 ~ 1000uH(3phase/multichannel) / 0 ~ 333.333uH(1phase) / 0 ~ 2000uH(reverse)	
Voltage Stability	Line regulation	< 0.05% F.S.	
	Load regulation*2	DC, 16Hz ~ 150Hz	< 0.05% + 0.05% F.S.
	THD	16Hz ~ 150Hz	< 0.5%
	Voltage ripple	RMS	< 0.4V
	Dynamic response*3	typ	200us
Measurement parameters			
Voltage RMS		0.01V (resolution)/ < 0.1%+0.1% F.S.(Accuracy DC, 16~150Hz)	
Current RMS		0.01V (resolution)/ < 0.1%+0.2% F.S.(Accuracy DC, 16~150Hz)	
Peak current		0.01V (resolution)/ < 0.3%+0.6% F.S.(Accuracy DC, 16~150Hz)	
Output power		0.001kW (resolution)/ < 0.4%+0.4% F.S.(Accuracy DC, 16~150Hz)	
Harmonic measurement	Max.harmonic analysis	50/60Hz	up to 50th-order
	Others		
Efficiency	typ	88%	
Protection		OVP, OCP, OPP, OTP, FAN, ECP, Sense	
Working temperature		0 C -50 C	
Programming response time		2ms	

\*1 ( 200 ~ 220 ) ±10%, the power of 12kw and above is 60% of the rated.

\*2 For models of 30kW and above, it needs the sense remote measurement mode for testing

\*3 Test under DC mode, high speed level, DUT capacity is less than 10uf

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