ACTIONPOWER

High Power Grid Simulator

Titan AC series

0V to 860V, 300kVA to 10MVA

Regenerative AC Source & Load

actionpowertest.com

HIGH POWER CAPACITY
WITH PARALLEL OPERATION

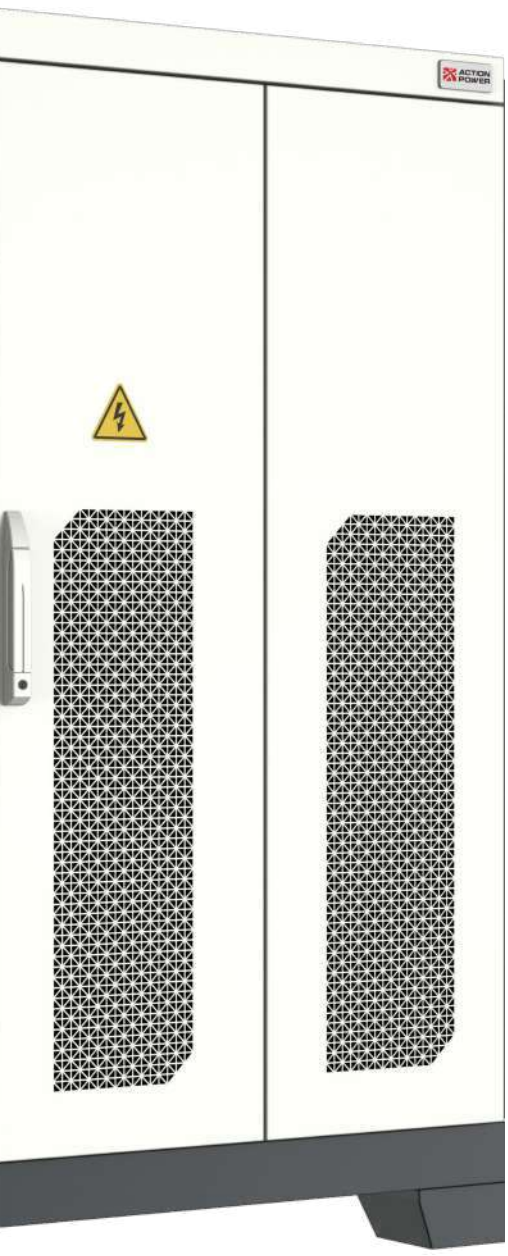
With 300kVA - 1MVA of unit capacity, the total capacity can be expanded up to 10MW by parallel connections.

860V
MAXIMUM AC OUTPUT VOLTAGE

10MVA
MAXIMUM AC OUTPUT POWER

MULTI-
OUTPUT MODE

Multiple AC power supply cabinets can individually operate in single mode to configure multi-channel output, or in Master/Slave mode to configure single-channel output with combined capacity.



FULLY TEST AC POWER
WITH 4-QUADRANT

Full four-quadrant control enables reliable and efficient conversion of desired voltage and current, and AC load function with power regenerated to the grid.

RLC
REGENERATIVE AC LOAD

0.1°
PHASE ANGLE RESOLUTION

359.9°
PHASE ANGLE CONTROL

COMPREHENSIVE
PHASE CONTROL

Simultaneous control of three phases up to 359.9° by unit angle of 0.1°, and phase angle of each of A, B, and C can be changed with the accuracy of 0.1%.

Ratings, types and voltages

Titan AC series Grid Simulator

Model	Output Power [kVA]	Voltage Range [V] @ L-N	Frequency Range [Hz]	Max. Current [A] @ 3 phase	Size (WHD) [mm]	Weight [kg]
TA300-450-05	300	0-450	40-70	500	2410x1955x1200	2,630
TA400-450-06	400	0-450	40-70	600	2410x1955x1200	2,920
TA500-450-08	500	0-450	40-70	800	3410x1955x1400	3,860
TA600-450-09	600	0-450	40-70	900	3410x1955x1400	4,410
TA750-450-12	750	0-450	40-70	1200	3410x1955x1400	5,310
TA1K0-450-16	1000	0-450	40-70	1600	6810x1955x1400	7,720
TA300-700-03	300	0-700	40-70	300	2410x1955x1200	2,560
TA400-700-04	400	0-700	40-70	400	2410x1955x1200	2,770
TA500-700-05	500	0-700	40-70	500	2410x1955x1200	2,960
TA600-700-06	600	0-700	40-70	600	3410x1955x1200	3,670
TA750-700-07	750	0-700	40-70	700	3410x1955x1400	5,080
TA1K0-700-10	1000	0-700	40-70	1000	3410x1955x1400	5,810
TA300-860-03	300	0-860	40-70	300	2410x1955x1200	2,560
TA400-860-04	400	0-860	40-70	400	2410x1955x1200	2,770
TA500-860-05	500	0-860	40-70	500	2410x1955x1200	2,960
TA600-860-06	600	0-860	40-70	600	3410x1955x1200	3,670
TA750-860-07	750	0-860	40-70	700	3410x1955x1400	5,080
TA1K0-860-10	1000	0-860	40-70	1000	3410x1955x1400	5,810

Ratings, types and voltages

Titan AC series Regenerative AC Source & Load

Output Power		Voltage Range [V] @ L-N	Frequency Range [Hz]	Max. Current [A] @ 3 phase	Size (WHD) [mm]	Weight [kg]
TA300-450-05L	300	0-450	40-70	500	2910x1955x1200	2,930
TA400-450-06L	400	0-450	40-70	600	2910x1955x1200	3,220
TA500-450-08L	500	0-450	40-70	800	4210x1955x1400	4,360
TA600-450-09L	600	0-450	40-70	900	4410x1955x1400	4,910
TA750-450-12L	750	0-450	40-70	1200	4410x1955x1400	6,160
TA1K0-450-16L	1000	0-450	40-70	1600	8410x1955x1400	8,720
TA300-700-03L	300	0-700	40-70	300	2910x1955x1200	2,860
TA400-700-04L	400	0-700	40-70	400	2910x1955x1200	3,040
TA500-700-05L	500	0-700	40-70	500	2910x1955x1200	3,260
TA600-700-06L	600	0-700	40-70	600	4210x1955x1200	4,170
TA750-700-07L	750	0-700	40-70	700	4210x1955x1400	5,880
TA1K0-700-10L	1000	0-700	40-70	1000	4410x1955x1400	6,610
TA300-860-03L	300	0-860	40-70	300	2910x1955x1200	2,860
TA400-860-04L	400	0-860	40-70	400	2910x1955x1200	3,040
TA500-860-05L	500	0-860	40-70	500	2910x1955x1200	3,260
TA600-860-06L	600	0-860	40-70	600	4210x1955x1200	4,170
TA750-860-07L	750	0-860	40-70	700	4210x1955x1400	5,880
TA1K0-860-10L	1000	0-860	40-70	1000	4410x1955x1400	6,610

Technical data

Titan AC series	Specification
AC Input	
Voltage, Phases	380V±15%, 3ph+PE
Frequency	47Hz to 63Hz
Harmonic current	<3%
Power factor	0.99
AC Output Voltage	
Accuracy	±0.1% F.S.
Resolution	0.01A
Load regulation	±0.05% F.S. @ Linear load
Line regulation	±0.05% F.S. @10%
Voltage slew rate	AC>1.0V/us
Response time	<1ms (10%-90%Umax)
Voltage distortion	Less than 0.5% @50Hz/60Hz ⩾ 220V for no-load
	Less than 1% @50Hz/60Hz ⩾ 220V for linear load
	Less than 1.0% @ other frequency ⩾ 220V for no-load
	Less than 1.5% @ other frequency ⩾ 220V for linear load
AC Output Current	
Accuracy	±0.2% F.S.
Resolution	0.01V
Output Frequency	
Accuracy	±0.01%
Resolution	0.001Hz
Range	40-70Hz
Phase Angle Control	
Accuracy	±0.3°
Resolution	±0.1°
Phase angle range	0 - 359.9°
Phase control	Single-phase, Three-phase, Three-phase independent
Voltage Ride Through	
Mode	ZVRT / LVRT / HVRT
Setting parameter	Voltage, frequency, phase, rise time, hold time, trigger phase angle and pulse output

Technical data

Titan AC series	Specification
Harmonic Injection	
Order	50th@50Hz/60Hz
Content	Max 40% for 2-10 single harmonics, less than 40% for 2-10 total harmonics
	Max 20% for 10-20 single harmonics, less than 20% for 10-20 total harmonics
	Max 10% for 21-30 single harmonics, and no more than 10% for total harmonics
	Max 5% for 31-50 single harmonics, and no more than 5% for total harmonics
	It can simultaneously synthesis 49 harmonics
Amplitude error	±5% harmonic of set value
Preview function	Harmonic synthesis waveform can be previewed
Editing mode	Import, export, read, storage
Inter Harmonic	
Frequency range	1Hz-3,000Hz, content <10%
Programming steps	100 steps
Programming parameters	Content, start frequency, end frequency, step length, execution time, interval time, cycle times and sequence
Editing mode	Add, delete, import, export, store, read
Flicker	
Flicker level	1.0-10.0, totally 10 levels in total, and one-key calling
Adjustment step length	1
Accuracy	±0.2
Preview function	Preview of flicker trend chart, pst can be visualized
Resolution	0.01V
Three-phase unbalance	
Adjustment mode	Three-phase voltage, single phase; unbalance factor
Unbalance factor range (%)	1~100
Unbalance factor step length (%)	1
Accuracy (%)	±0.5%
Preview function	Three-phase unbalance trend chart can be previewed
Measurement	
Voltage accuracy	±0.1% F.S.
Frequency accuracy	±0.01%
Current accuracy	±0.2% F.S.
Active power accuracy	±0.3% F.S.
Apparent power accuracy	±0.3% F.S.

Technical data

Titan AC series	Specification_Source Mode
AC input	
Voltage, Phases	380V±15%, 3ph+PE
Frequency	47Hz to 63Hz
Harmonic current	<3%
Power Factor	0.99
AC Output Voltage	
Accuracy	±0.1%
Resolution	0.01V
Load regulation	±0.1% F.S. @ Linear load
Line regulation	±0.1% F.S. @10%
Voltage slew rate	AC>1.0V/μs
Response time	<1ms (10%-90%Umax)
Voltage distortion	Less than 0.5% @50Hz/60Hz ⩾ 220V for no-load
	Less than 1% @50Hz/60Hz ⩾ 220V for linear load
	Less than 1.0% @ other frequency ⩾ 220V for no-load
	Less than 1.5% @ other frequency ⩾ 220V for linear load
AC Output Current	
Accuracy	±0.1%F.S.
Resolution	0.01A
Output Frequency	
Accuracy	±0.01%
Resolution	0.001Hz
Range	40-70Hz
Phase Angle Control	
Accuracy	±0.3°
Resolution	±0.1°
Phase angle range	0 - 359.9°
Phase control	Single-phase, Three-phase, Three-phase independent
Voltage Ride Through	
Mode	ZVRT / LVRT / HVRT
Setting parameter	Voltage, frequency, phase, rise time, hold time, trigger phase angle and pulse output

Technical data

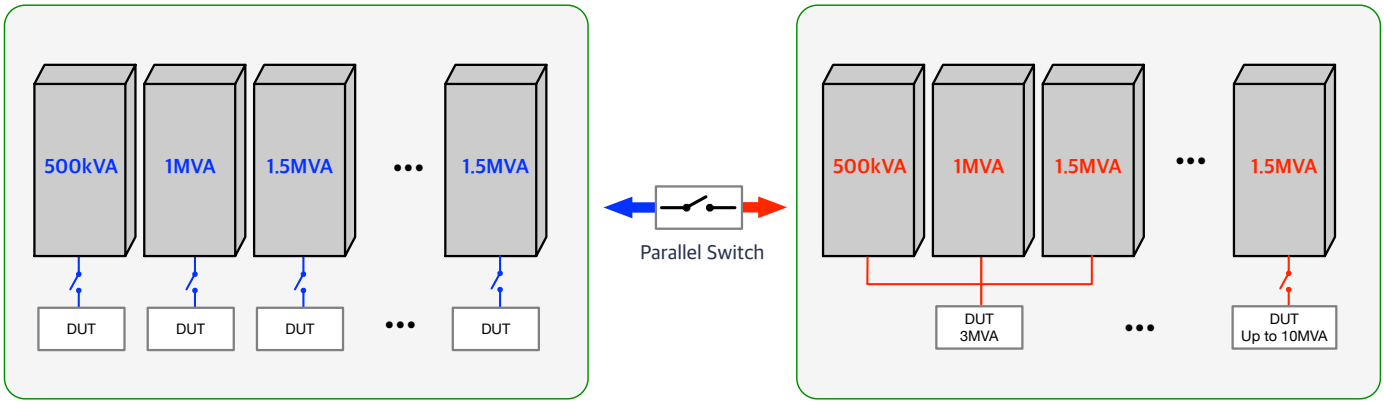
Titan AC series	Specification_Source Mode	
Harmonic Injection		
Order	50th@50Hz/60Hz	
Content	Max 40% for 2-10 single harmonics, less than 40% for 2-10 total harmonics	
	Max 20% for 10-20 single harmonics, less than 20% for 10-20 total harmonics	
	Max 10% for 21-30 single harmonics, and no more than 10% for total harmonics	
	Max 5% for 31-50 single harmonics, and no more than 5% for total harmonics	
	It can simultaneously synthesis 49 harmonics	
Amplitude error	±5% harmonic of set value	
Preview function	Harmonic synthesis waveform can be previewed	
Editing mode	Import, export, read, storage	
Inter Harmonic		
Frequency range	1Hz-3,000Hz, content <10%	
Programming steps	100 steps	
Programming parameters	Content, start frequency, end frequency, step length, execution time, interval time, cycle times and sequence	
Editing mode	Add, delete, import, export, store, read	
Flicker		
Flicker level	1.0-10.0, totally 10 levels in total, and one-key calling	
Adjustment step length	1	
Accuracy	±0.2	
Preview function	Preview of flicker trend chart, pst can be visualized	
Resolution	0.01V	
Three-phase unbalance		
Adjustment mode	Three-phase voltage, single phase; unbalance factor	
Unbalance factor range (%)	1~100	
Unbalance factor step length (%)	1	
Accuracy (%)	±0.5%	
Preview function	Three-phase unbalance trend chart can be previewed	
Measurement	**Accuracy**	**Resolution**
Voltage	±0.1% F.S.	0.01V
Frequency	±0.01%	0.001Hz
Current	±0.2% F.S.	0.1A
Active power	±0.3% F.S.	1W
Apparent power	±0.3% F.S.	-1.00~+1.00

Technical data

Titan AC series	Specification_Load
Load Mode	
Linear load	CC: Current, power factor, load type, current slope, output waveform CP: Apparent power, power factor, load type, power slope, output waveform CR: Resistance value RLC: RLC connection mode R+L+C, R//L//C, (R//C)+L, (R+L)//C, (R+C)//L Resistance value, inductance value and capacitance value can be set
Nonlinear load	Current, power, peak factor, current slope, power slope
Zero-voltage start	Simulate on-load start, switch seamlessly to CC or CP after start, with configurable switching condition
Voltage	
Voltage distortion limit	Uthd <10% below 20th
Current	
Resolution	0.01A
Accuracy	±0.2% F.S. @ CC mode
Waveform	Sine, square wave, triangular wave, clipping wave, customized waveform
Current distortion	<2%@50Hz@ full load under rated voltage
Current slew rate	10%~90% nominal current > 1A/us
Response time	< 1ms@10%~90% nominal current
Frequency	
Range	40.00–70.0Hz
Accuracy	±0.01Hz
Harmonic Injection	
Order	50th@50Hz/60Hz
Content	Max 40% for 2-10 single harmonics, and no more than 40% for 2-10 total harmonics
	Max 20% for 10-20 single harmonics, and no more than 20% for 10-20 total harmonics
	Max 10% for 21-30 single harmonics, and no more than 10% for total harmonics
	Max 5% for 31-50 single harmonics, and no more than 5% for total harmonics
Power	
Resolution	1VA
Resolution (VA)	±0.5% F.S. @ CP mode
Power Factor	
Power factor	-1 to 1(resistance inductance, resistance capacity and current direction can be set)
Resolution	0.01
Crest Factor	
Scope	1.414 to 4
Resolution	0.001

High Power Scalable Design

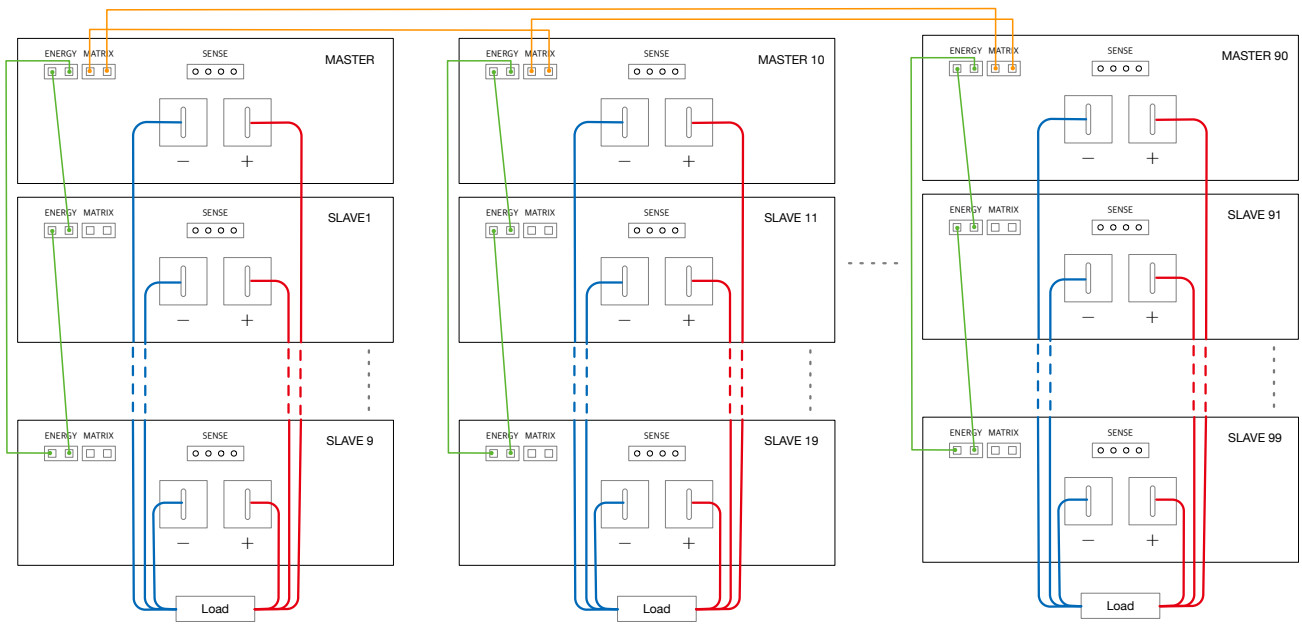
The Titan AC series support multi-unit parallel operation and adopts high-speed fiber optic communication technology, featuring strong anti-interference capability and zero latency. The system supports expansion up to 10MVA, with technical specifications equivalent to a single unit capacity of 300kVA - 1MVA. It enables multi-position, high-capacity, and multi-voltage level test setups, significantly improving testing efficiency for customers. In particular, the parallel-connected panels can be used in multi-output mode by separating the outputs according to the user's needs, allowing multiple test equipment to be tested at the same time, maximizing user convenience and saving a lot of costs.



Multi-Output Mode

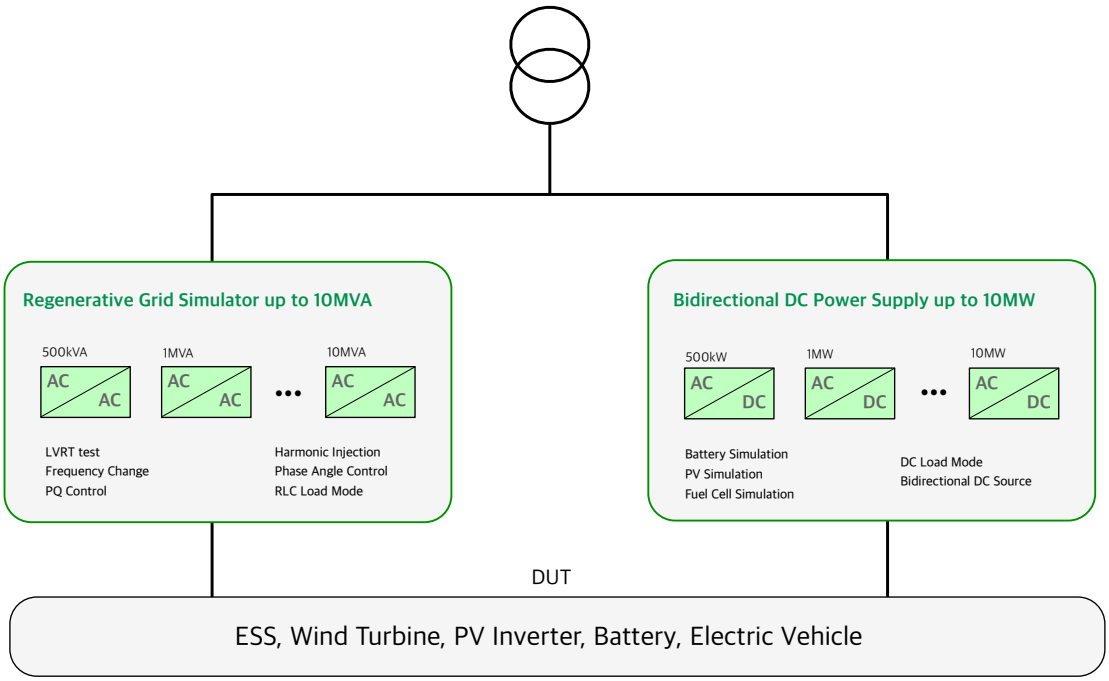
Parallel Mode

Output Expansion up to 10MVA with Master / Slave Control



Application

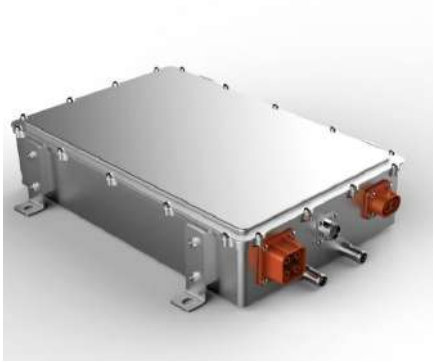
The Titan AC series is innovative ones used in a variety of applications due to its unique technology and optimal performance. It can perform bidirectional AC power supply and act as regenerative AC loads, which can be utilized for long-term reliability testing applications including tests for ESS, PV inverter, wind turbine, electric vehicle DC charging stations, and a variety of grid-connected systems. They are particularly well suited for applications that require accurate and extremely fast response times when simulating AC power characteristics.



ESS Testing

PV Inverter Testing

Wind Turbine Testing

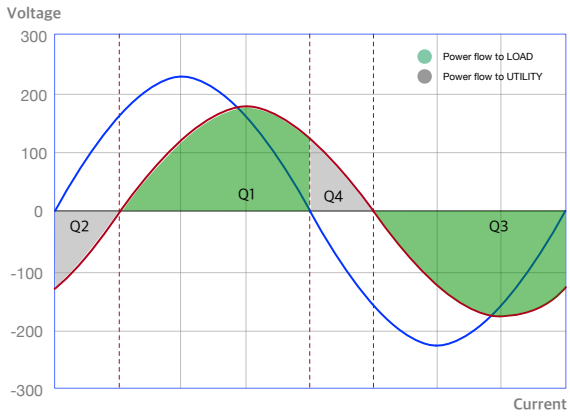


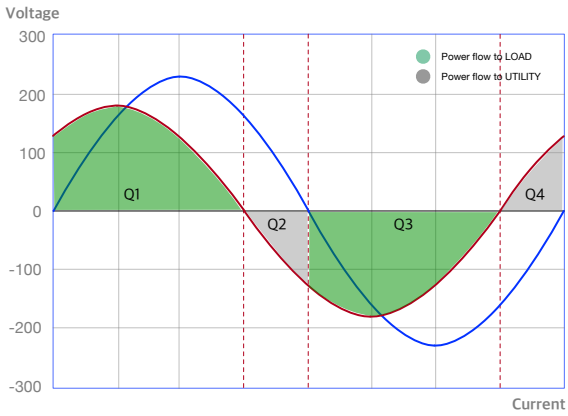
AC/DC Power Supply Testing

EV Charger & EVSE Testing

4-Quadrant Control

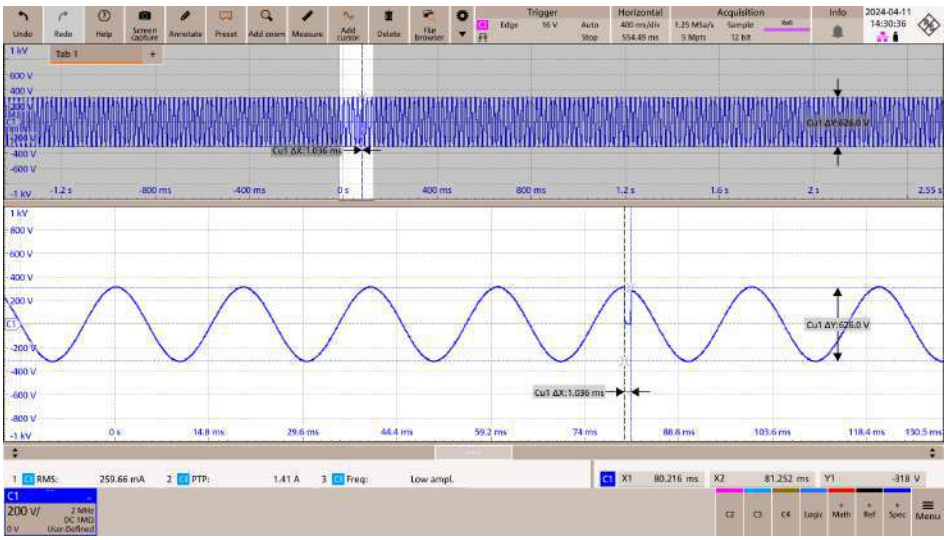
With four-quadrant control, Titan AC series can test PV inverters, V2G, EV chargers, EVSE, batteries, UPS, and AC/DC power supplies. It has a built-in load option as standard and can operate in any four-quadrant with programmable phase control. It can simulate inductive and capacitive loads, allowing you to test a full range of AC power loads.





High Dynamics

The output voltage slew rate of power supply is up to 1V/us, which can simulate the 1ms continuous interruption from the power grid.

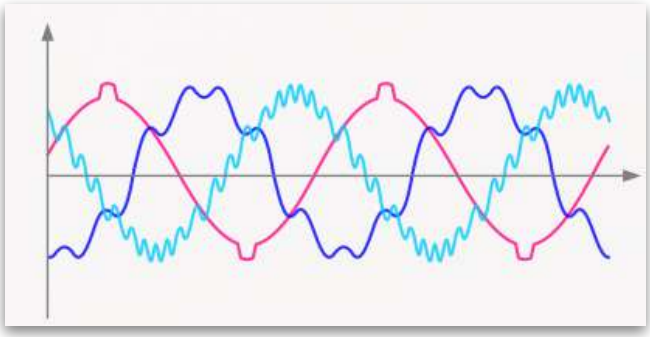


1ms Interruption

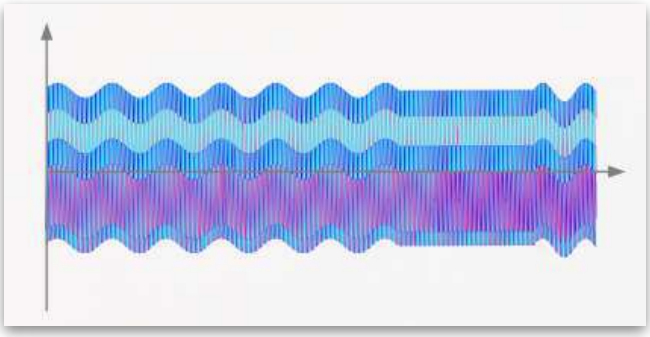
Harmonics / Inter-harmonics

The 49 harmonics can be superimposed simultaneously, and the total harmonic content can be set up to 40%

The power supply has two harmonic injection modes, the three-phase independent injection and the three-phase linkage injection, allowing the superimposition of 2-50th of harmonics with 50Hz or 60Hz basic frequency, or allowing the superimposition of 1Hz-3000Hz inter-harmonics to form the distorted waveform of output voltage. It can be used for the tests under GB/T 14549-1993, and GB/T 24337-2009. The power supply has 27 built-in DST waveforms and 100 customized waveforms that can be called by one click.

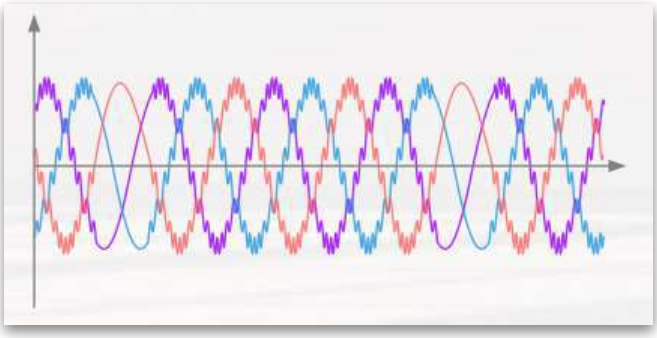


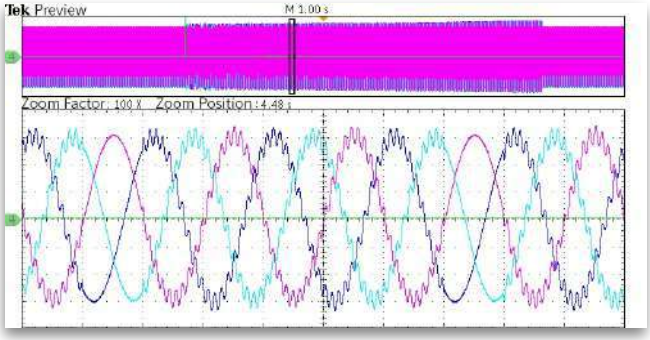
Harmonic Superposition Waveform



Inter-harmonic Superposition Waveform

Starting frequency, ending frequency, interval and the like can be set for inter-harmonics to test the inter-harmonic sweep frequency, so as to meet the tests of IEC61000-4-13 standard.



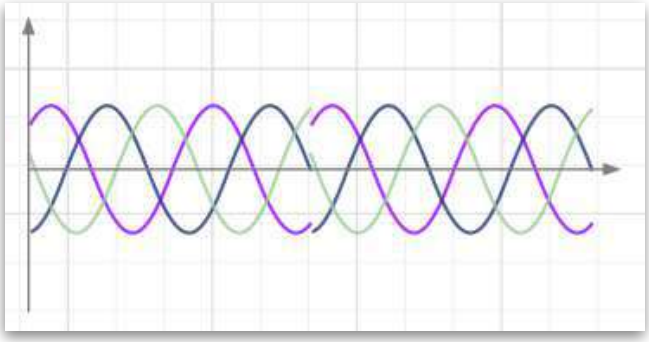


Inter-harmonic Sweep

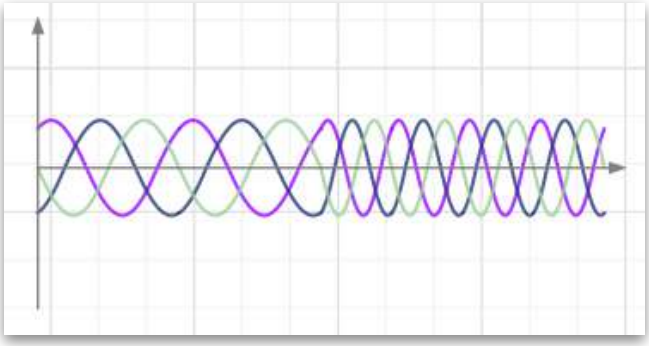
Independent setting of three phases

Simulate normal and abnormal characteristics of various power grids

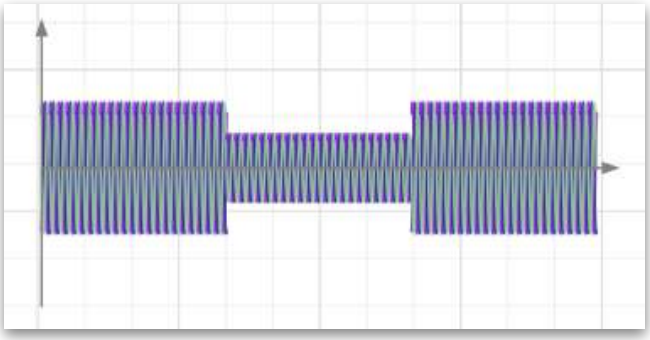
The three-phase output of the power supply can be set independently, which can simulate the normal and abnormal characteristics of three-phase balance or unbalance of various power grids. It can be set by individual or multiple programmable output on voltage, phase etc. of both single-phase and multi-phase.



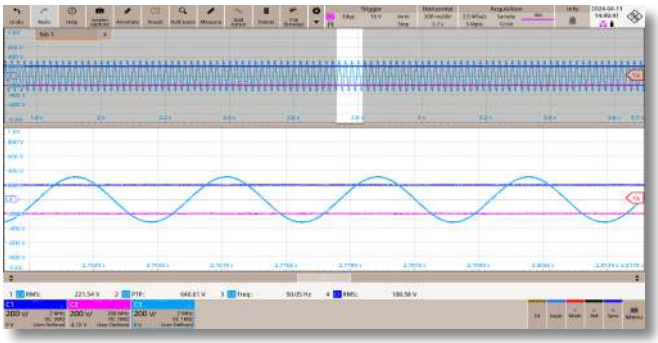
Phase Change



Frequency Change



Voltage Change

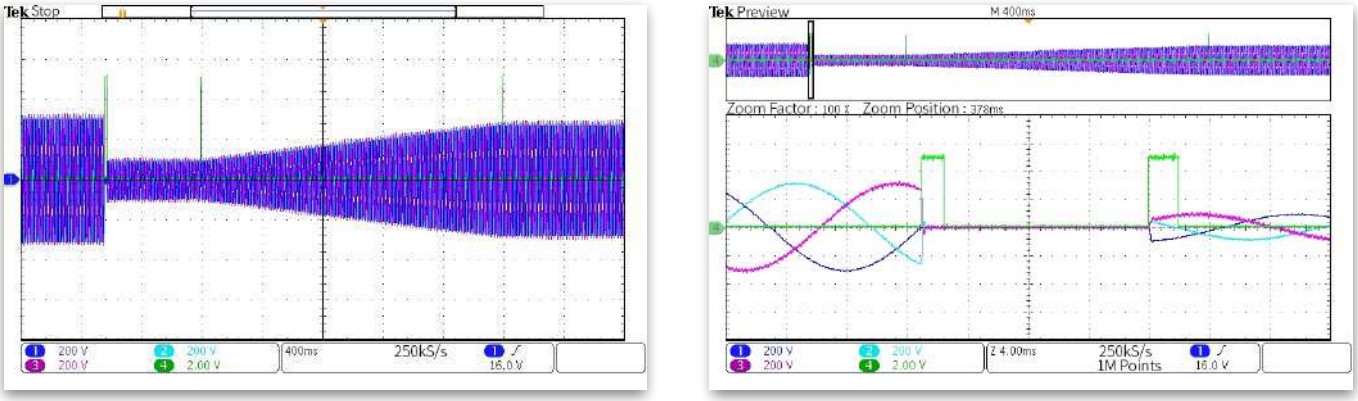


Phase Split

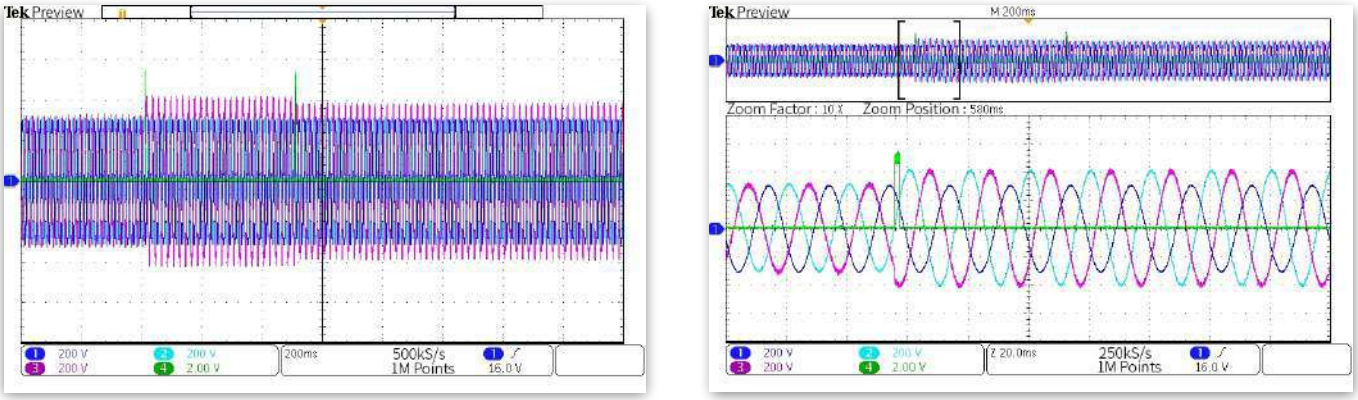
Voltage Ride Through

Typical rise / fall time within 1ms

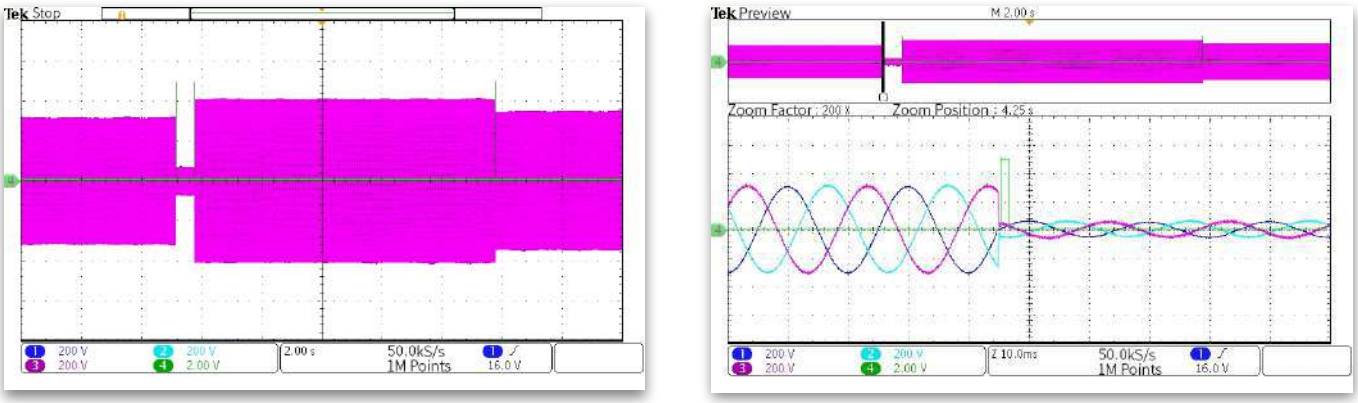
The single-phase, two-phase, and three-phase H/LVRT tests can be performed for the power supply. The trigger phase angles of the ride through points can be set for the power supply to meet the requirements of tests under various standards. The minimum setting voltage of power supply is less than 5V, and the rise/ fall time is 1ms.



Three-Phase Lowe Voltage Ride Through



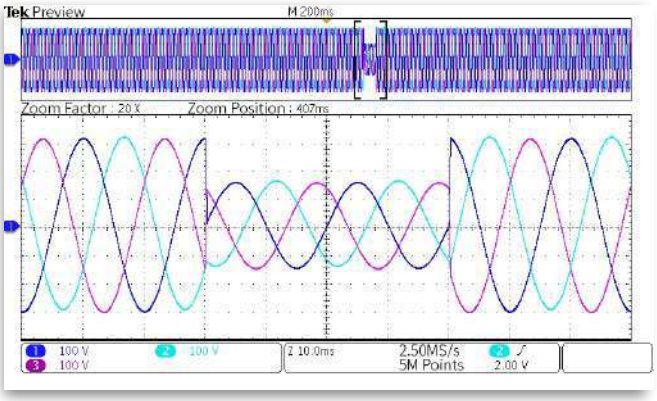
Single-Phase High Voltage Ride Through



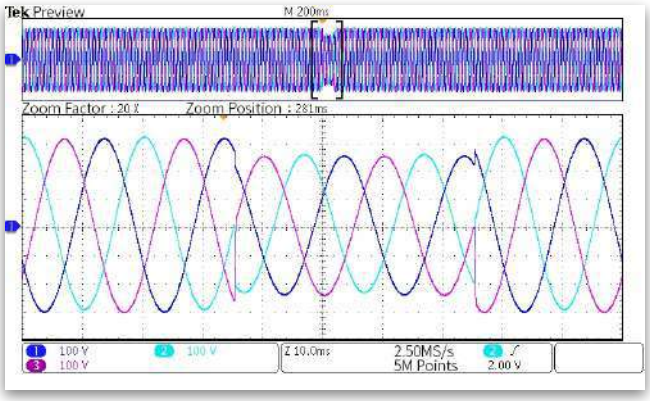
Three-Phase High Voltage Ride Through

Voltage Ride Through

Phase A, B and C can be changed at the same time for low voltage ride through, phase B and C can be switched for low voltage ride through, so as to meet the tests of VDE-AR-N 4105 regulations.



Three-Phase Change LVRT

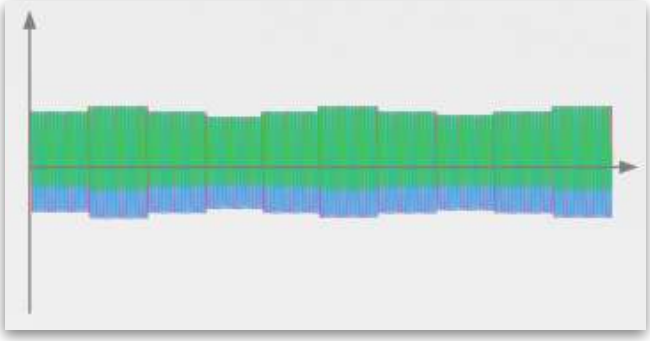


B-C Phase Shift LVRT

Flicker Simulation

Levels 1~10 can be called directly

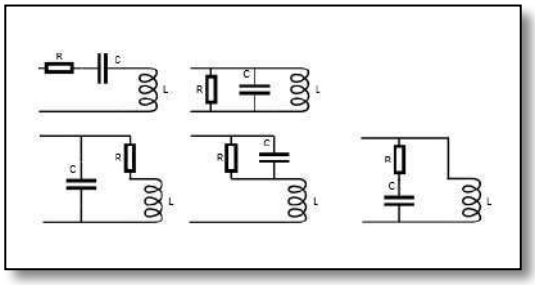
The power supply supports the setting of flicker levels: the flicker trend chart can be previewed, and the pst can be visualized. The flicker characteristics of the power grid can be easily simulated to test flicker adaptability of the test object.



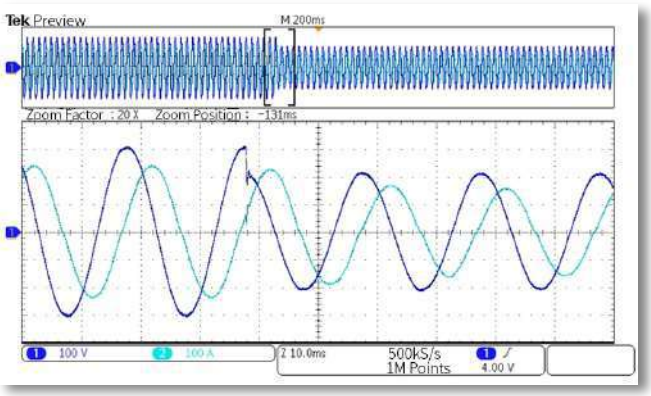
Flicker simulation waveform

Linear load characteristic simulation

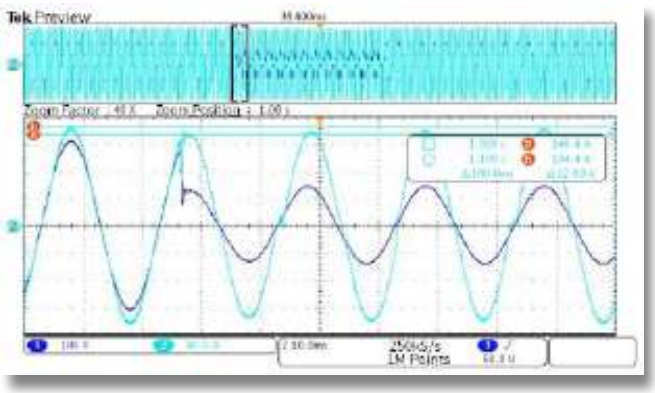
The Titan AC series feedback AC source & load integrated machine has 5 built-in RLC network models, which can flexibly adjust the parameters to simulate the linear load characteristics, in order to fully validate the product performance in different impedance modes.



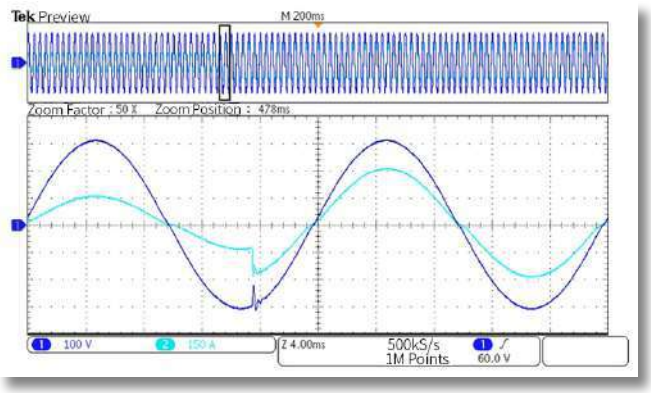
RLC Load Network Topology



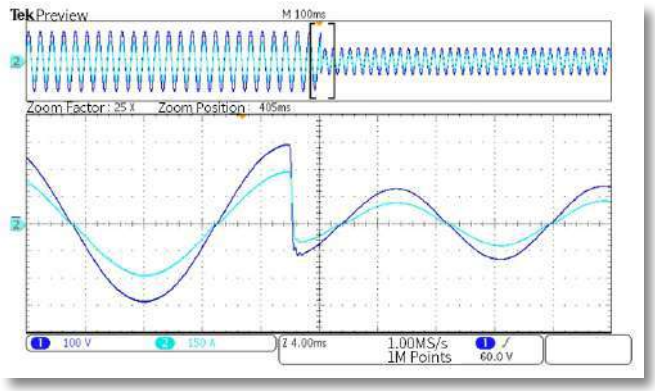
RLC mode : voltage amplitude transient change and power factor adjustment



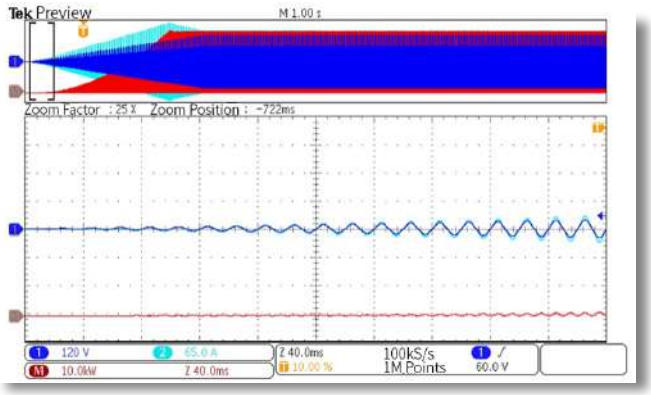
CR mode : voltage amplitude, phase, frequency Transient change



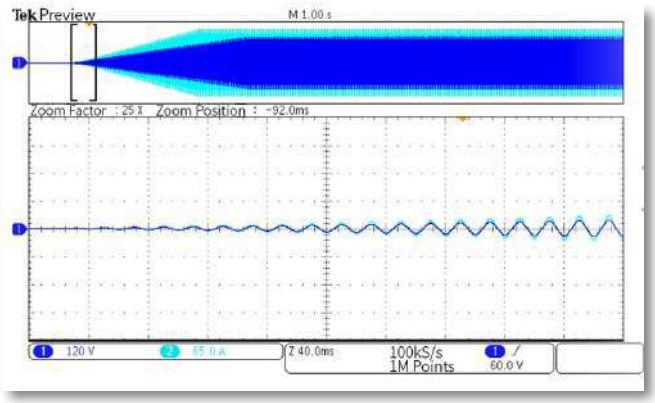
CR mode : resistance transient change



Voltage amplitude change in CC mode

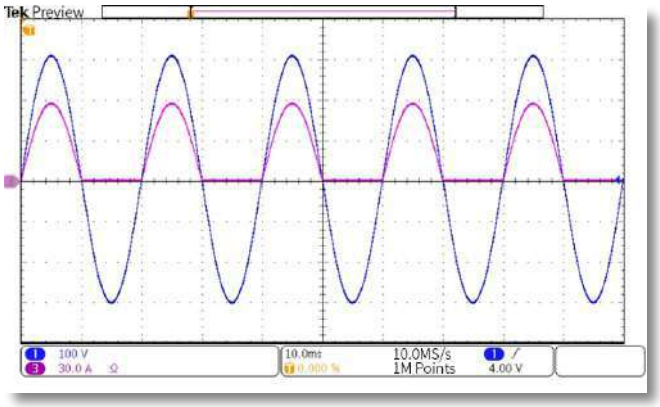


Zero-voltage startup to CP

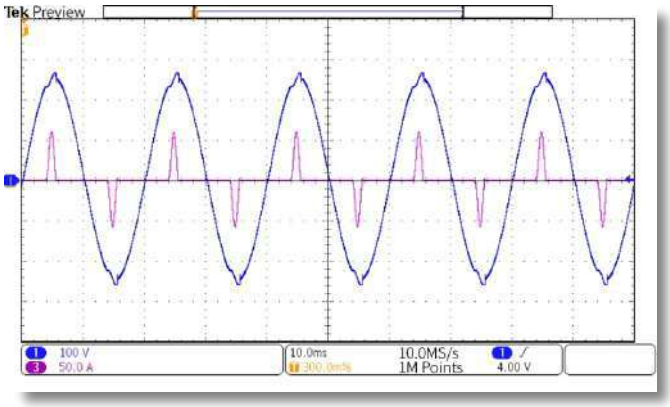


Zero-voltage startup to CC

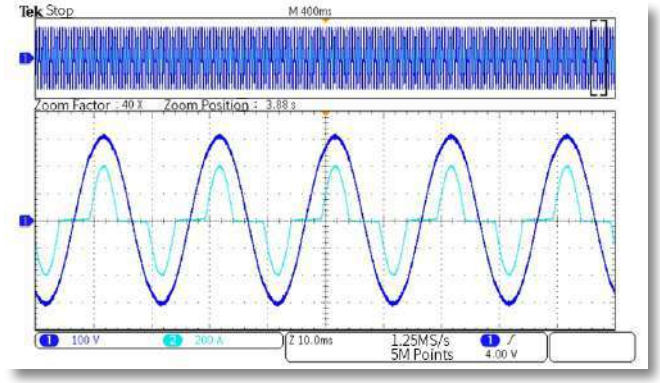
Nonlinear load characteristic simulation



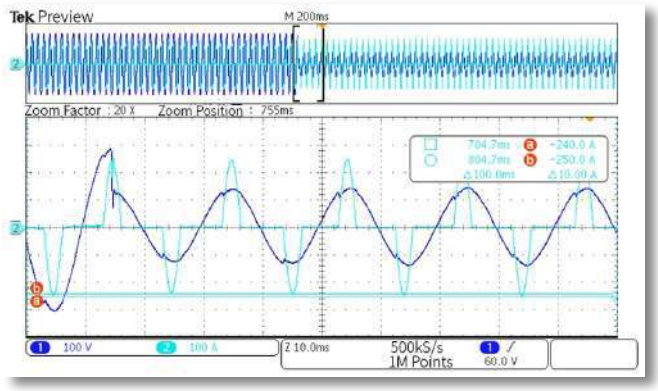
Rectified load : half-wave rectification waveform



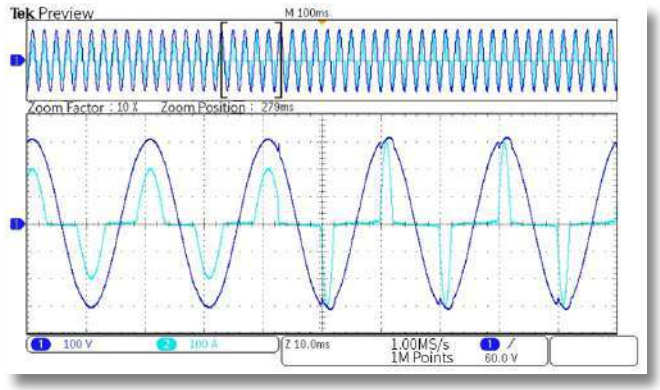
Rectified load : CF=4 waveform



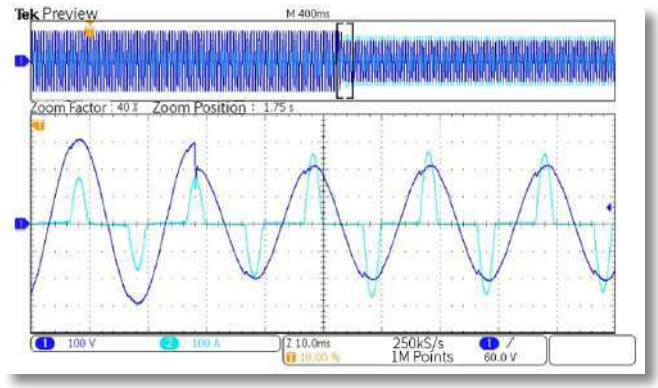
CF=2 single-phase current in CC mode



Rectified load in CC mode CF=2
Voltage amplitude transiently changes by 120V at 90° position

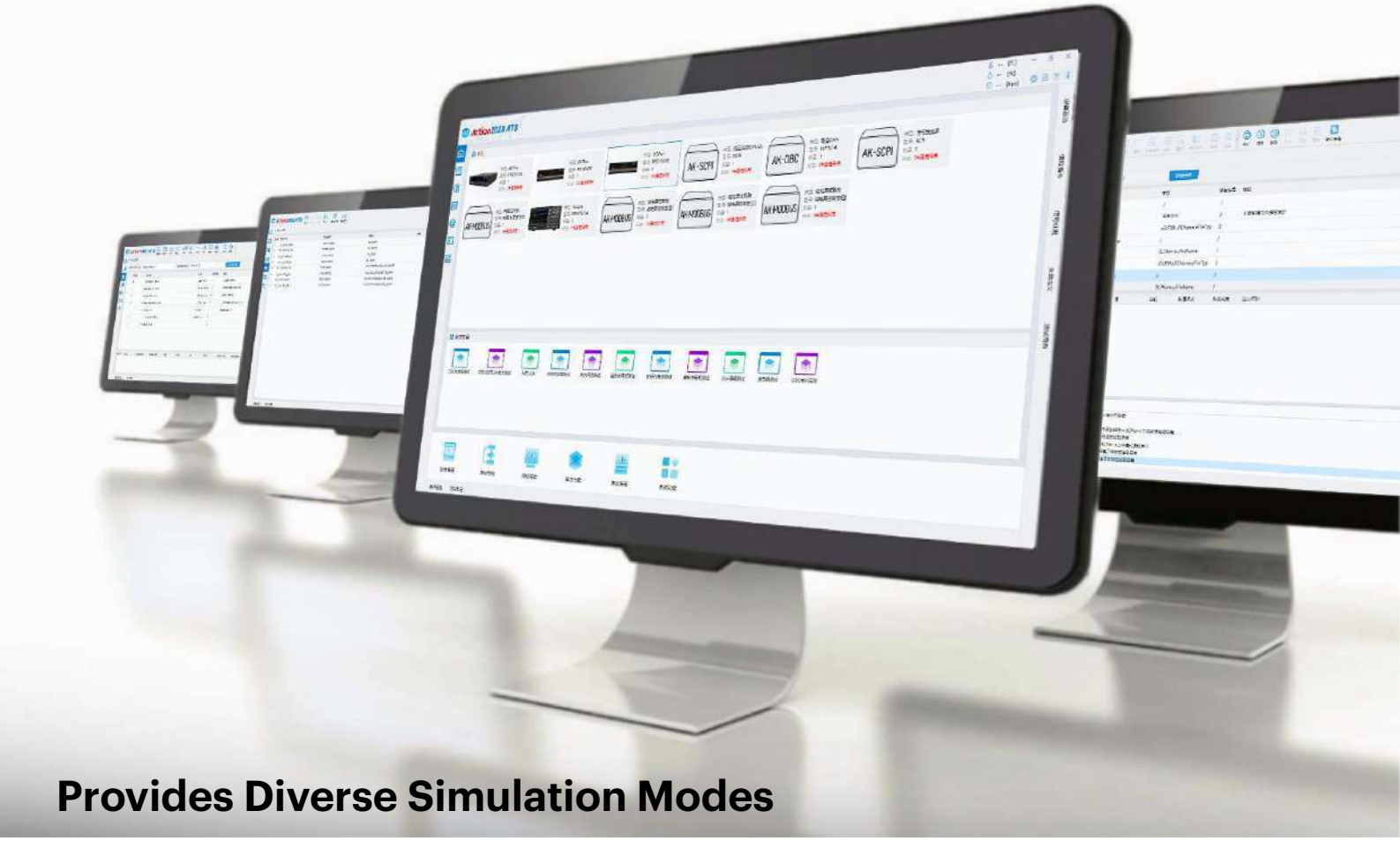


CF sudden change in CC mode :
CF changed from 2 to 3



CP mode : voltage amplitude transient change
CF=2.5

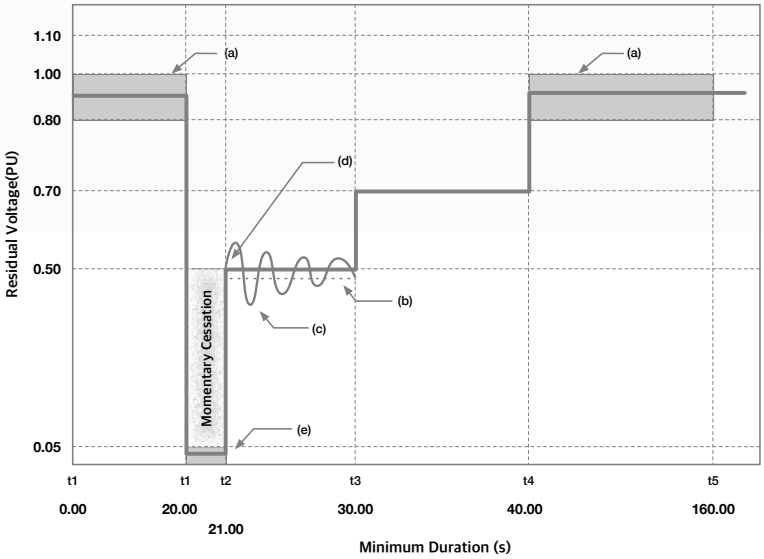
Powerful Software



Provides Diverse Simulation Modes

Low Voltage Ride-Through (LVRT) and Area Electrical Power System (EPS) Disturbance Simulation

The Titan AC series can easily simulate tests such as LVRT test patterns with provided software, accurately control user-defined waveforms, and add features depending on the test environments.



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