ACTION POWER

Technical Specifications Sheet

CORTEX
AC SERIES

Regenerative Programmable
AC Source/Load Integrated Unit



CONTENTS

01 PRODUCT OVERVIEW 01

02 MODEL SELECTION 01

03 OPTIONS 02

04 AC LOAD ADVANTAGES AND FUNCTIONS 03

- Integrated Source/Load, Full-Power Four-Quadrant Operation
- Load Operating Modes
- Anti-Islanding Protection Characteristic Test Function
- RLC Network Simulation
- Nonlinear Load Simulation Function
- Power Hardware-in-the-Loop Simulation (PHIL)

05 AC SOURCE ADVANTAGES AND FUNCTIONS 07

- High-Accuracy Measurement Functions
- Multiple output modes
- Current and power limiting functions
- Automatic three-phase/single-phase switching
- Internal RL Impedance Adjustment
- Extensive Programming Functions
- Comprehensive Standard Waveform Library

06 APPLICATIONS 15

07 PRODUCT APPEARANCE 16

08 TECHNICAL SPECIFICATIONS TABLE 17

01 | PRODUCT OVERVIEW

The CORTEX AC Series is a new-generation Regenerative Programmable AC Source/Load Integrated Unit launched by ActionPower, integrating both AC source and AC load functions. Its unique AC source/load integrated design once again defines the development direction of the next generation of AC power supplies.

The CORTEX AC Series supports four-quadrant operation. As an AC source, it meets the requirements of general grid compliance testing; as an RLC Load, it meets Anti-Islanding Protection performance testing requirements in the new energy industry, as well as off-grid load application requirements. No optional accessories are required to realize dual source/load functionality in a single unit. It can regenerate 100% of output current back to the grid, with energy recovery efficiency of up to 91%. This reduces users' equipment investment and energy costs, while better aligning with dual-carbon objectives.

02 | MODEL SELECTION

Model	Power (kVA)	Max. Voltage (V_rms)	Frequency Range (Hz)	Max. Three-Phase Current (A_rms)	Max. Single-Phase Current (A_rms)	Max. Voltage (A_DC)	Max. Current (A_DC)	Dimensions	Weight (kg)
CA06-450	6	450	DC,0.001-200	30	90	±636	±90	3U	35
CA7.5-450	7.5	450	DC,0.001-200	30	90	±636	±90	3U	35
CA09-450	9	450	DC,0.001-200	35	105	±636	±105	3U	35
CA12-450	12	450	DC,0.001-200	35	105	±636	±105	3U	35
CA15-450	15	450	DC,0.001-200	35	105	±636	±105	3U	35
CA20-450	20	450	DC,0.001-200	35	105	±636	±105	3U	35
CA22-450	22	450	DC,0.001-200	35	105	±636	±105	3U	35

Note

The peak current in single-phase/three-phase mode is 3 times the RMS current.

03 | OPTIONS

Option Name	Model	Features	Dimensions (mm) W × H × D
GPIB Communication Interface Box	CORTEX AC-A2002	Installs on the CORTEX AC bidirectional programmable AC source to enable GPIB communication	
Trigger Terminal Adapter Box	CORTEX AC-A2006	Expands trigger signal interfaces for direct connection to an oscilloscope	
Optional Interfaces	Magic-Bus	MagicBus supports LAN/RS485/CAN interface expansion	
26U Cabinet ①	CORTEX AC-26U	Suitable for parallel operation of 2–5 units	600×800×1338
42U Cabinet ②	CORTEX AC-42U	Suitable for parallel operation of 5–8 units	600×800×2050

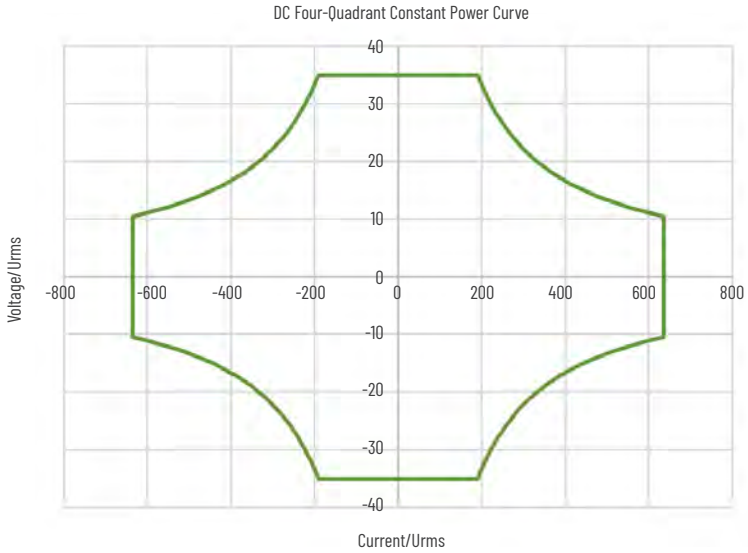
Note

① ② The cabinet includes input cables and output parallel cables; external parallel cables, copper busbars, etc. are not included.

04 | AC LOAD ADVANTAGES AND FUNCTIONS

● Integrated Source/Load, Full-Power Four-Quadrant Operation

The CORTEX AC Series combines a bidirectional programmable AC source and a regenerative programmable AC electronic load in a single unit, enabling source/load integrated operation without any optional accessories. Capable of regenerating 100% of energy back to the grid, with regeneration efficiency up to 91%.



● Load Operating Modes

In load mode, CC, CP, CR, RLC, and PQ modes are available

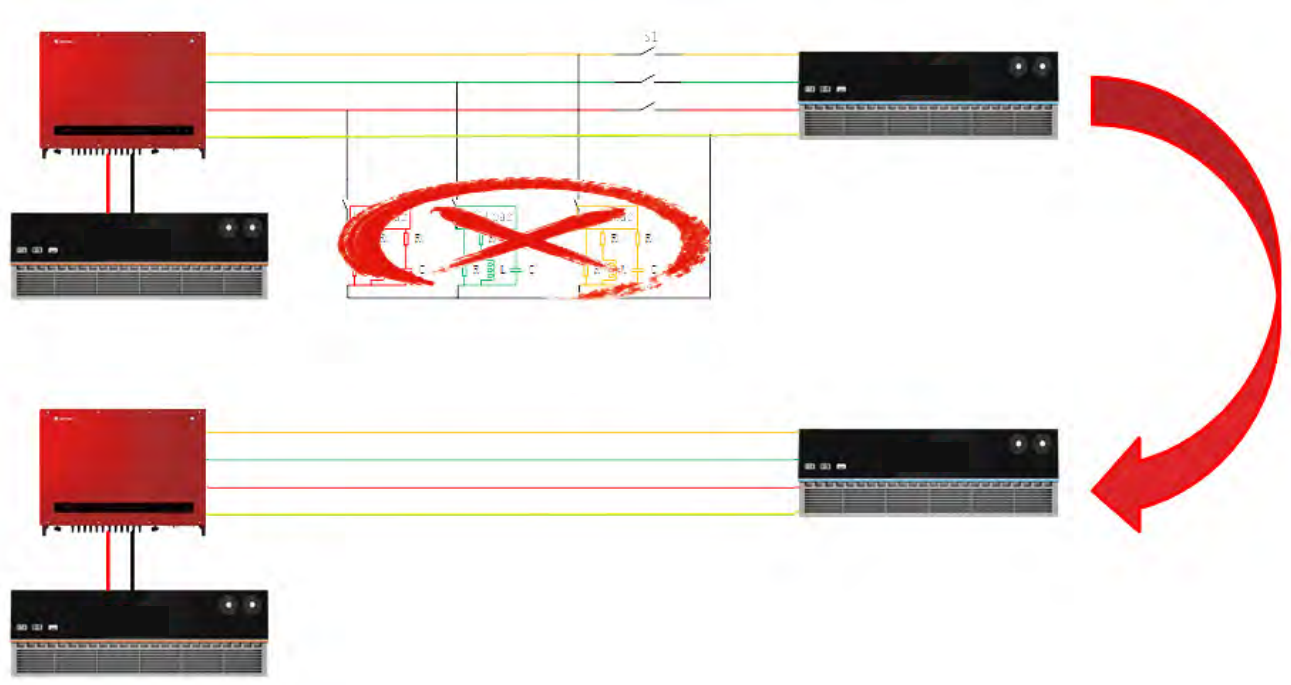


Load Mode Setup Interface

● Anti-Islanding Protection Characteristic Test Function

In new energy industries, such as PV inverters, energy storage systems (ESS), power conversion systems (PCS), microgrids, on-board chargers (OBC/BOBC), and uninterruptible power supplies (UPS), linear load testing is required, including Anti-Islanding Protection test requirements.

The RRE20 Series provides an Anti-Islanding Protection test function for anti-islanding performance testing of inverters or conve.



Differences Between Traditional Anti-Islanding Protection Testing and CORTEX AC Series Anti-Islanding Protection Testing

RLC Network Simulation

In addition to Anti-Islanding Protection testing, the RRE20 Series also supports linear load testing and can regenerate energy back to the grid, increasing test capability without requiring additional facility power distribution capacity.

The CORTEX AC Series features up to 12 built-in RLC network models with flexible parameter adjustment to simulate linear load characteristics, enabling comprehensive performance testing of the device under test under different impedance conditions and in three-phase balanced and unbalanced load modes.

For products requiring off-grid testing, such as BOBC, UPS, and energy storage converters, the RLC Load function of the CORTEX AC Series enables single-unit source/load switching, greatly simplifying ATE hardware configuration while supporting V2G, V2L, and V2H testing.

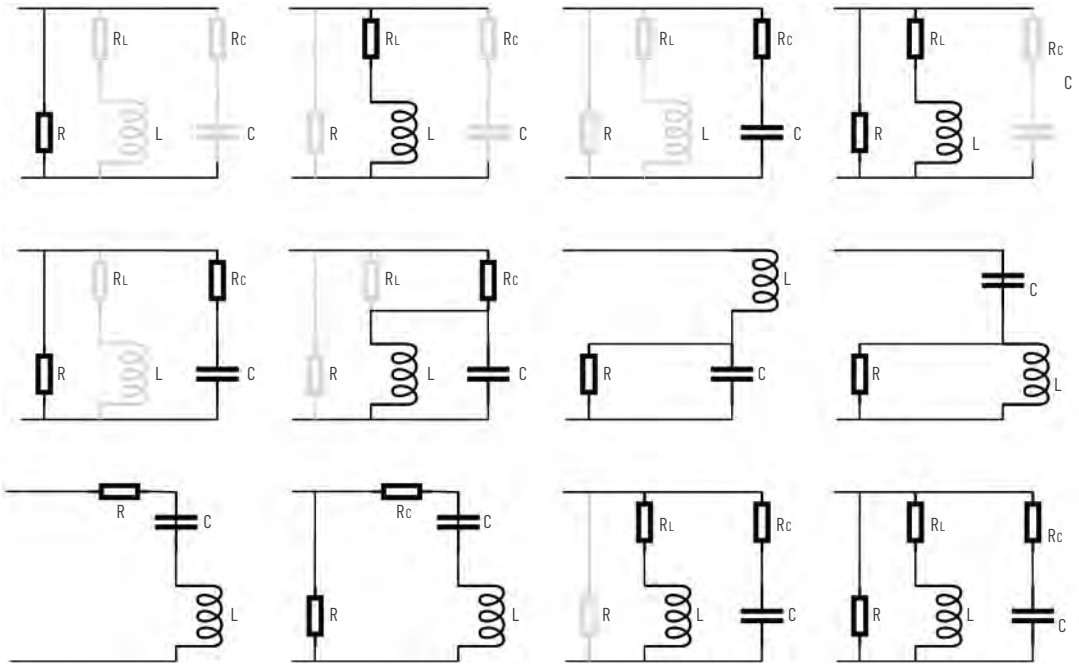
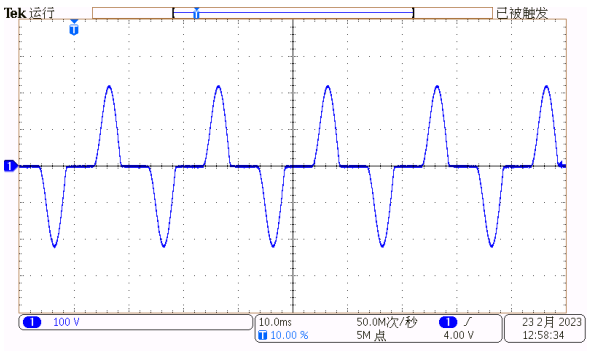


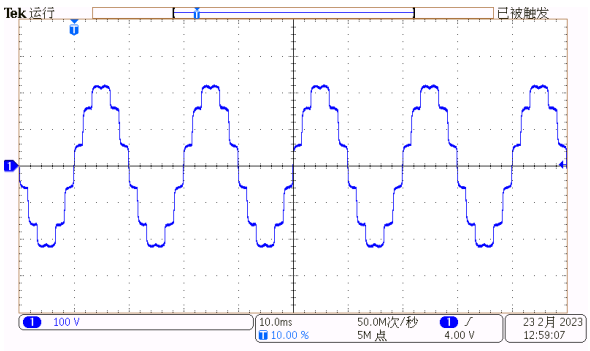
Figure of RLC load network topology

Nonlinear Load Simulation Function

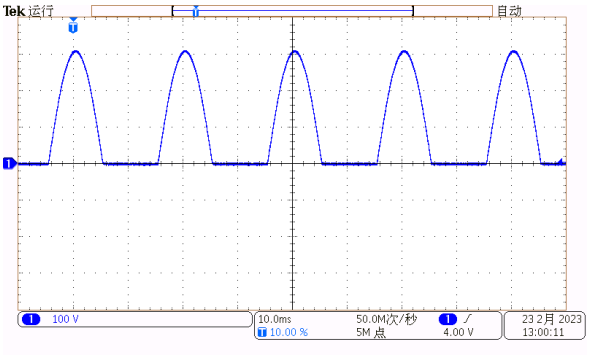
In load mode, CORTEX AC Series products can also simulate nonlinear loads, with built-in 2-pulse, 6-pulse, 12-pulse, 18-pulse, and 24-pulse modes, as well as positive half-wave, negative half-wave, leading-edge half-wave, and trailing-edge half-wave modes; CF setting range: 1.414-5.



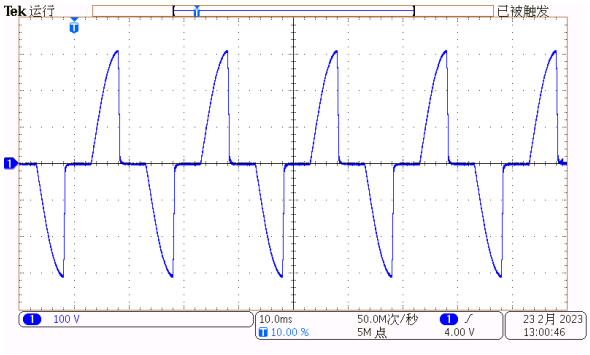
2-pulse



12-pulse



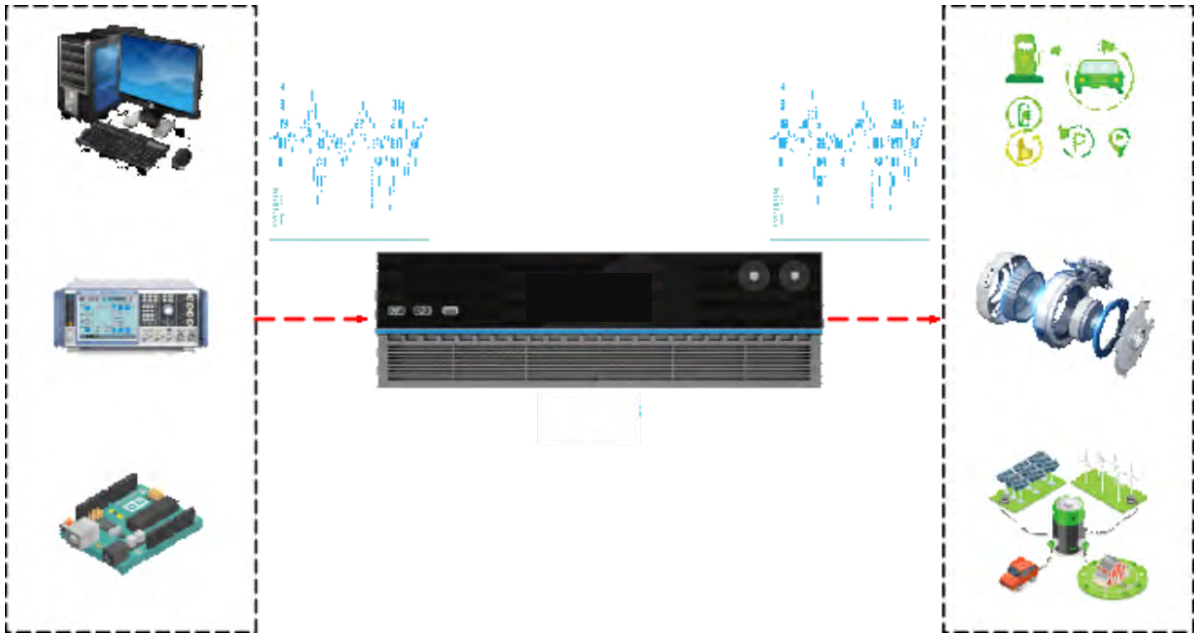
Positive half-wave



Trailing-edge half-wave

Power Hardware-in-the-Loop Simulation (PHIL)

The CORTEX AC Series features exceptionally high dynamic response and bandwidth, with a small-signal bandwidth of 10 kHz, a large-signal bandwidth of 2000 Hz, and a response time of 70 μs. It can amplify and output signals from simulation systems, signal sources, or control boards to the device under test, enabling Power Hardware-in-the-Loop Simulation (PHIL).



Power Hardware-in-the-Loop Simulation Schematic

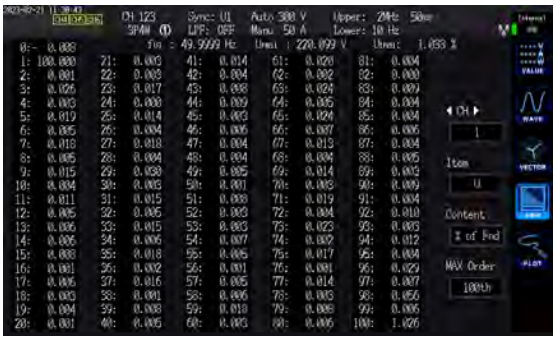
05 | AC SOURCE ADVANTAGES AND FUNCTIONS

● High-Accuracy Measurement Functions

The CORTEX AC Series provides high-accuracy voltage and current measurement. Its built-in harmonic analysis function supports analysis up to the 100th order @ 50 Hz/60 Hz. Data accuracy and reliability far exceed those of comparable products. In production-line ATE or certain R&D test conditions, it helps users reduce the need for additional measuring instruments.

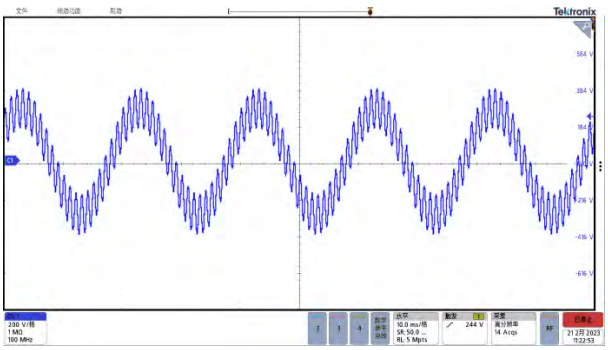


CORTEX AC measured voltage accuracy



100th-harmonic output accuracy @220V/50Hz

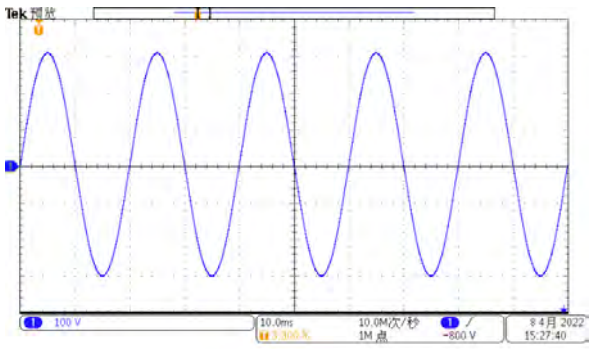
CORTEX AC Series products support harmonic extension up to the 100th order over 40Hz-70Hz, while maintaining excellent output accuracy.



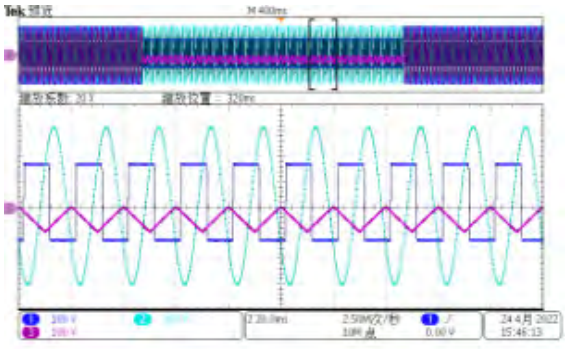
50Hz waveform with 40% 20th-harmonic content

Multiple Output Modes

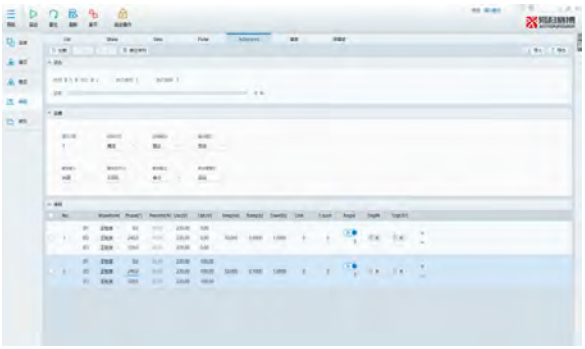
CORTEX AC Series products support four output modes: AC, DC, AC+DC, and DC+AC. Full output power is available in all modes.

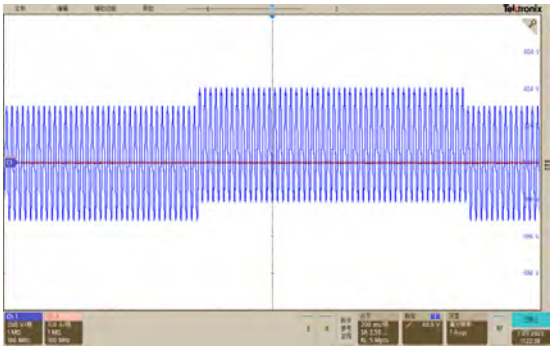


Standard 220V@50Hz waveform

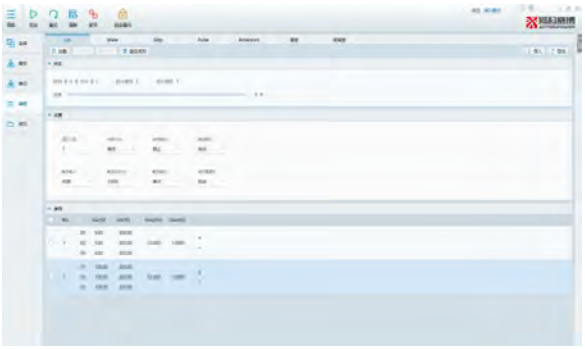


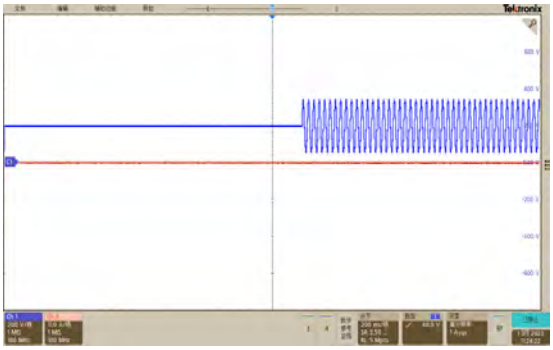
Different waveforms on three phases





AC+DC: 220V/50Hz with 100Vdc superimposed, 0° trigger

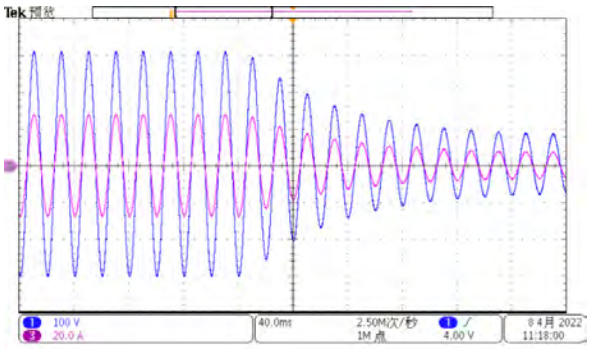




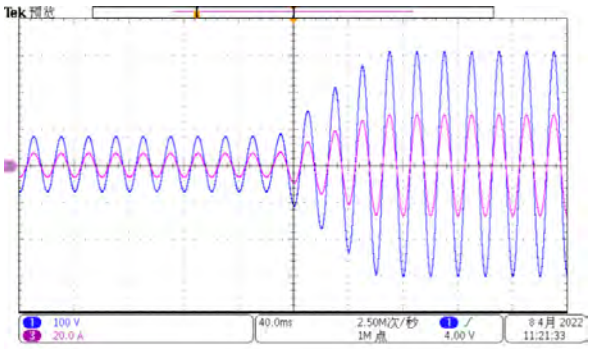
DC+AC: DC 200V with AC 100V superimposed

Current and power limiting functions

The CORTEX AC Series is equipped with current and power limiting functions for R&D and test applications. When this function is enabled, if the current or power exceeds the set limit, the output voltage is reduced to protect the unit under test. When this function is disabled, the power supply can still deliver peak current up to 3 times the rated current and sustain this condition. In combination with the RMS overcurrent protection delay setting, the actual inrush current of the unit under test can be obtained and recorded.



Normal transition into current limiting



Recovery from current limiting to normal operation

Automatic three-phase/single-phase switching

The CORTEX AC Series is designed with both a parallel switch and a load switch. The parallel switch is linked to single-phase mode, enabling automatic switching between three-phase output and single-phase output [01], reducing operational complexity and preventing faults caused by failure to remove the external shorting link. The load switch is interlocked with the OUT function, enabling isolation between the output and the load [02], thereby improving safety when switching DUTs in R&D testing and production-line ATE.

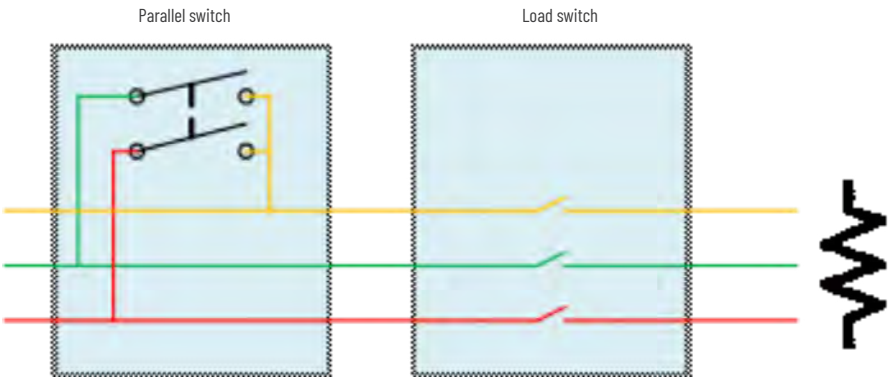


Figure of Automatic Three-Phase/Single-Phase Conversion Function

[01] The output terminals support a maximum RMS current of 50 A_rms per port. For currents exceeding 50 A_rms, external short-circuiting is required, and the N line must also be short-circuited.

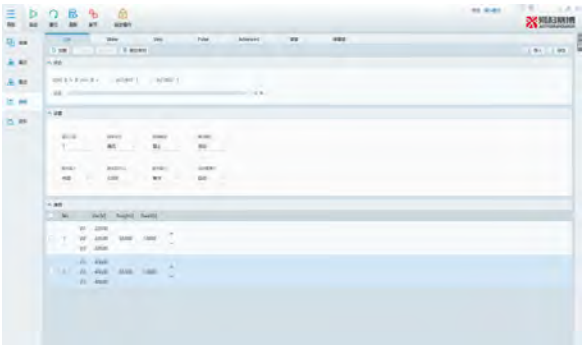
[02] Only phase lines A, B, and C are isolated from the load; the N line is not isolated from the load.

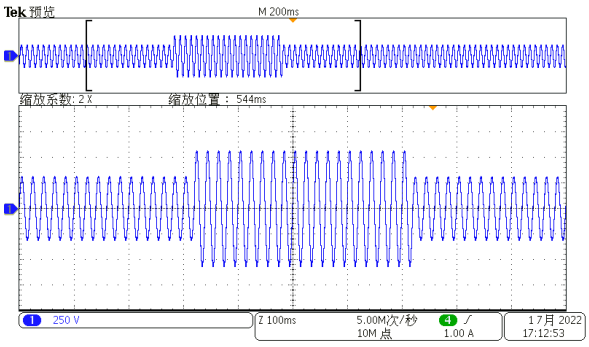
Internal RL Impedance Adjustment

CORTEX AC Series products integrate R and L impedance adjustment functions, correlating the output voltage and current with the R and L parameters to simulate the cable impedance functions specified in IEC 61000-3-2 and IEC 61000-3-3.

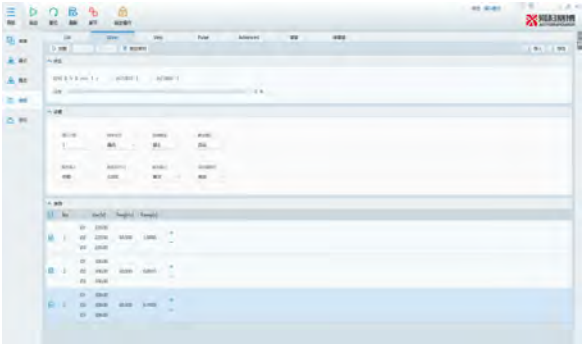
Extensive Programming Functions

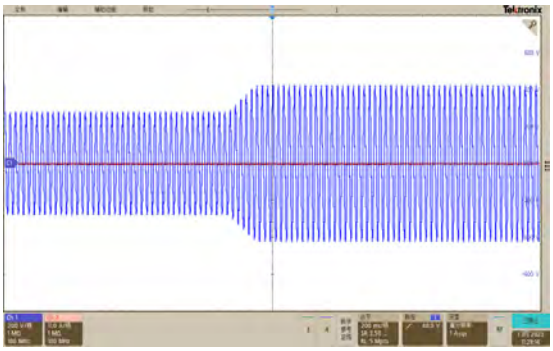
The CORTEX AC Series supports multiple programming modes, including List, Wave, Step, Pulse, and Advanced. It also supports simulation programming for harmonics and interharmonics, with up to 100 user-defined waveforms.



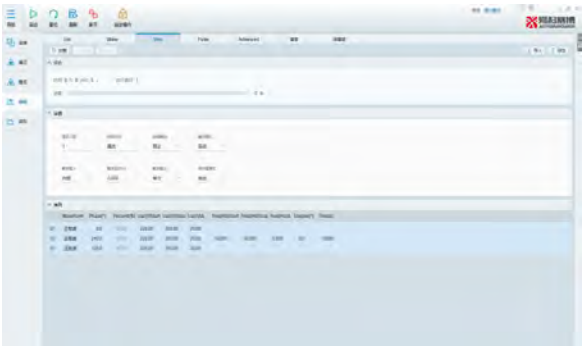


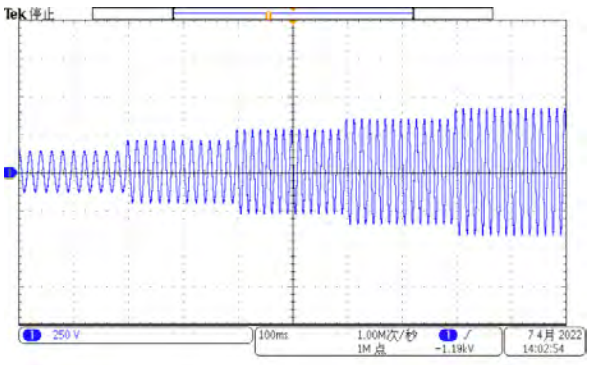
List programmed waveform



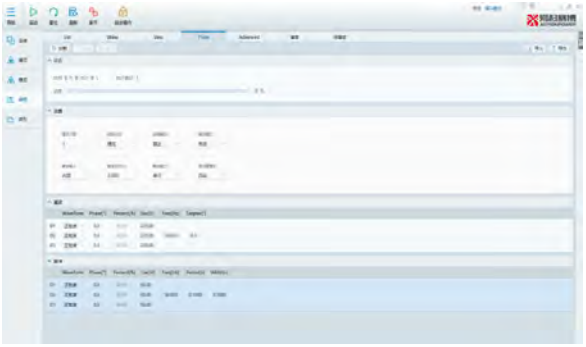


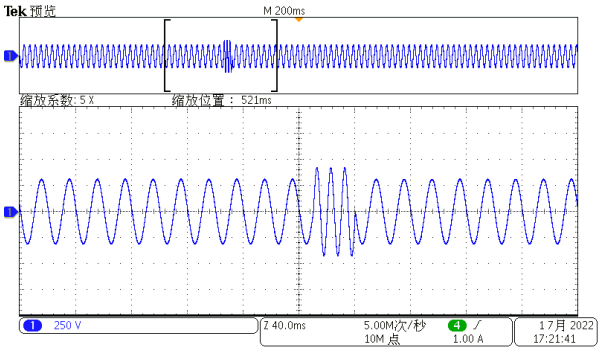
Wave programmed waveform



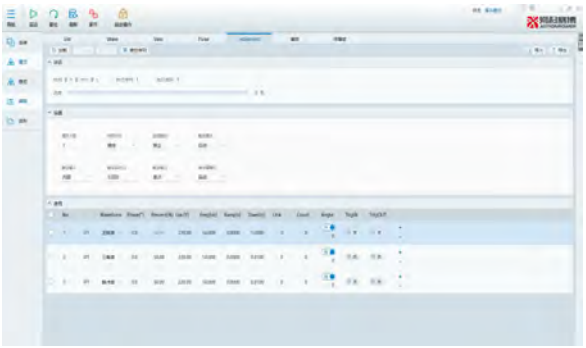


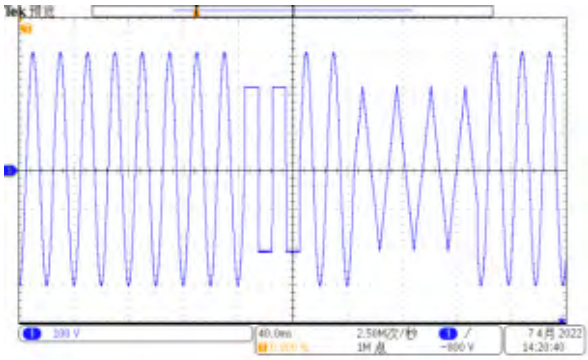
Step programmed waveform



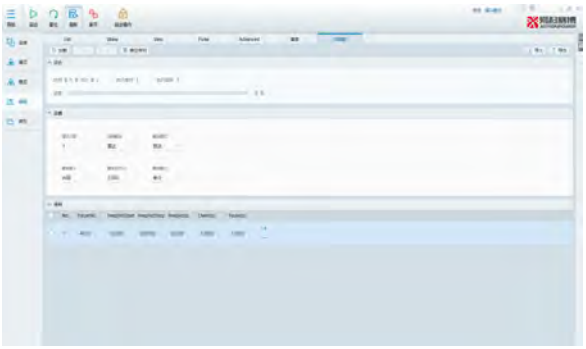


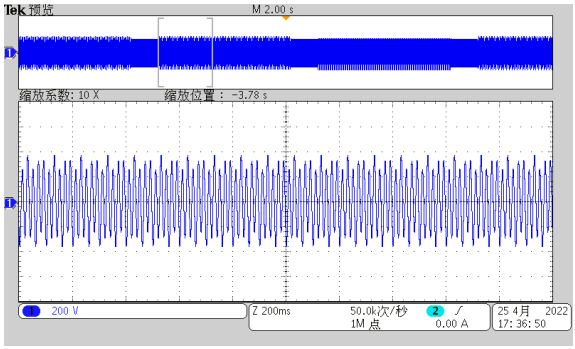
Pulse edited waveform





Advanced custom waveform



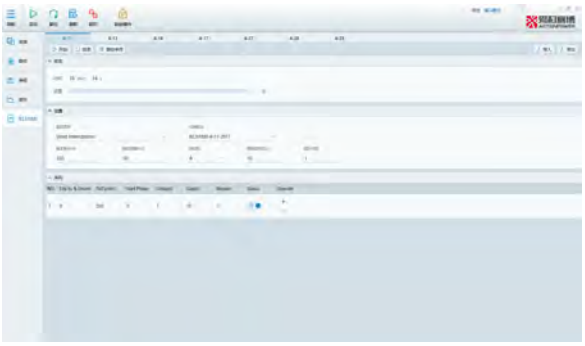


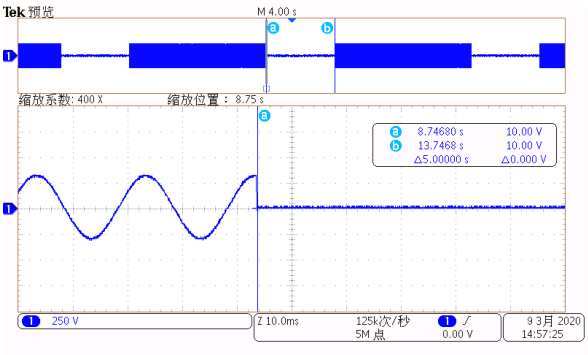
Interharmonic frequency sweep

Comprehensive Standard Waveform Library

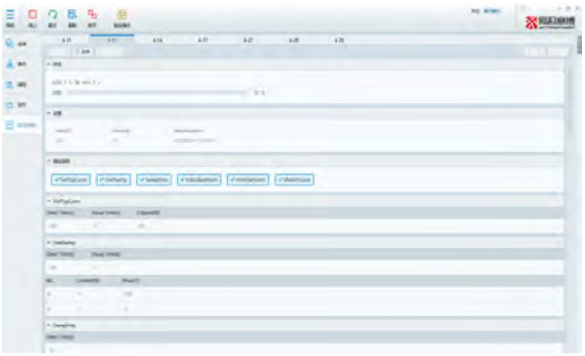
The CORTEX AC Series is capable of testing to distributed energy standards including UL1741SA, IEEE1547, IEC62116, and NB/T32004, as well as the switch-mode power supply standard T/CPSS1007-2020;

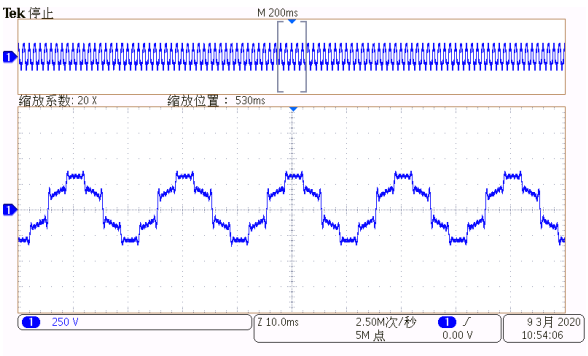
The host software includes selected IEC61000-4 standard test items for one-click recall, meeting the integration and development requirements of most automated test systems; Specific test items: IEC 61000-4-11, 4-13, 4-14, 4-27, and 4-28 AC standards; Supports IEC 61000-4-17 and 4-29 DC standards; 30 DST waveforms are built in and can be recalled with one click for harmonic injection testing in accordance with the relevant standards.



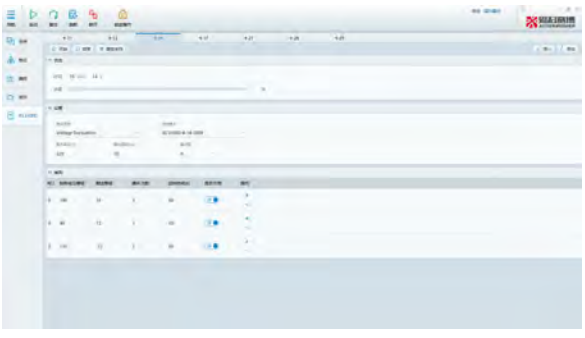


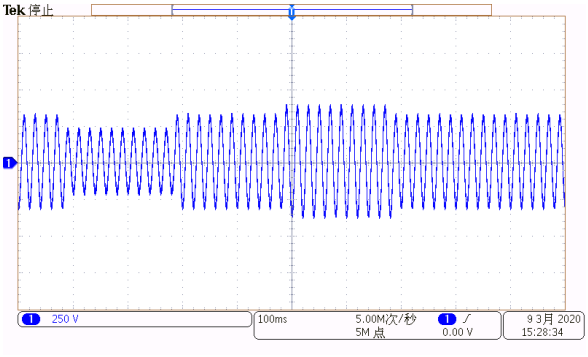
IEC 61000-4-11 interruption, 90°@ class 2/50Hz



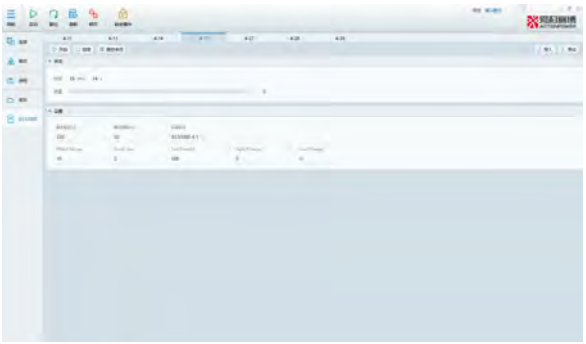


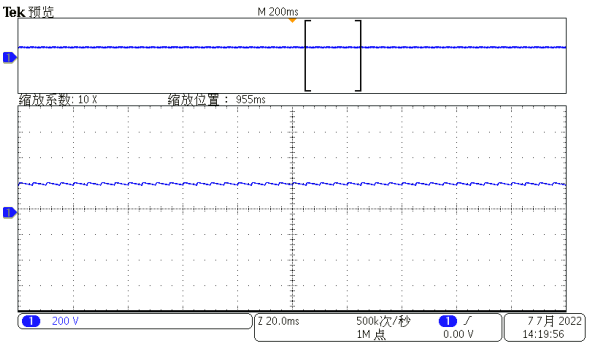
IEC 61000-4-13 non-triplen odd harmonics @ class 3/50Hz



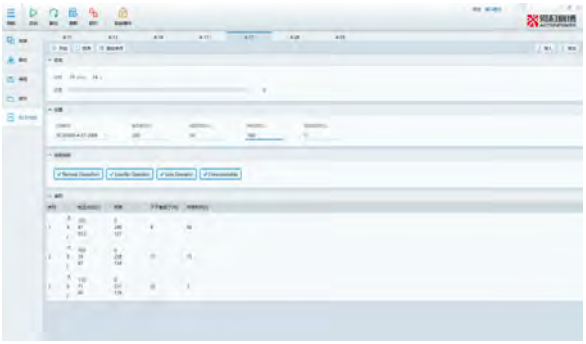


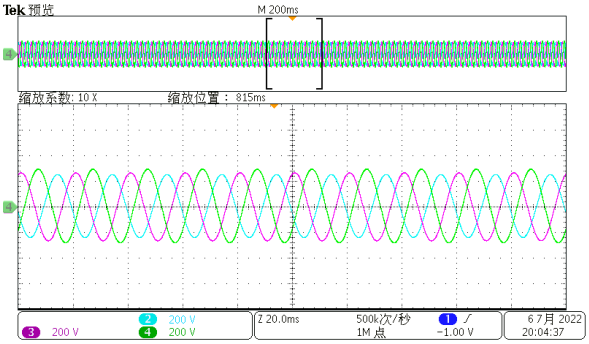
IEC 61000-4-14 +20% / -30% voltage fluctuation interval: 0.2s @ class 3/50Hz



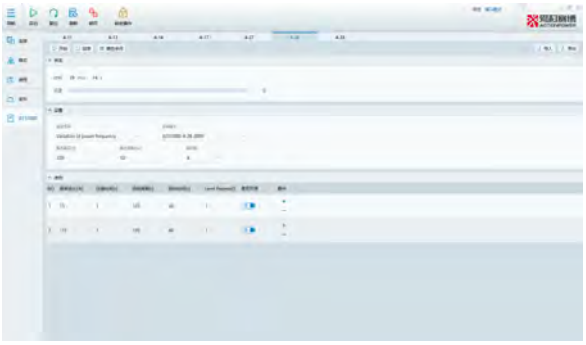


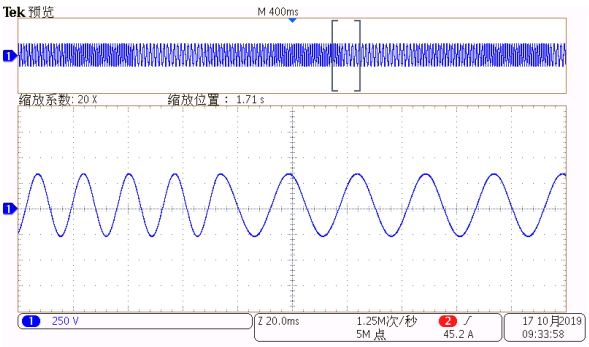
IEC 61000-4-17 DC ripple voltage @class 3



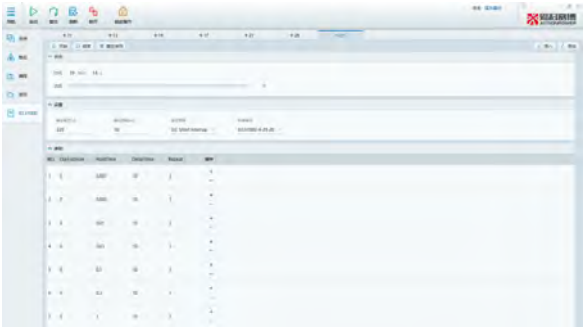


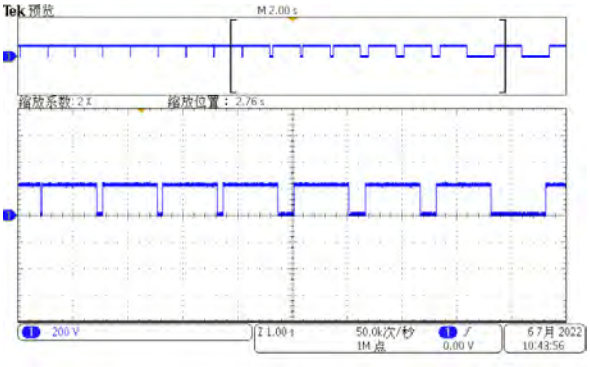
IEC 61000-4-27 voltage unbalance @class 3





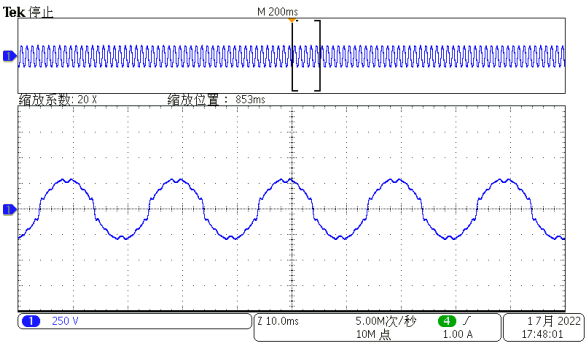
IEC61000-4-28 Power Frequency Variations @class 4





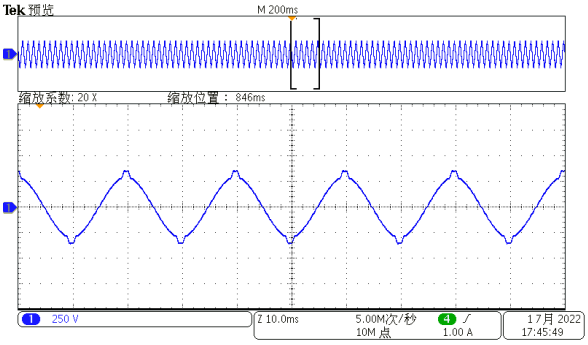
IEC61000-4-29 DC interruptions



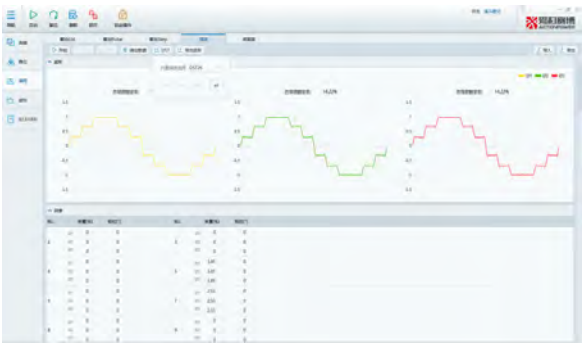


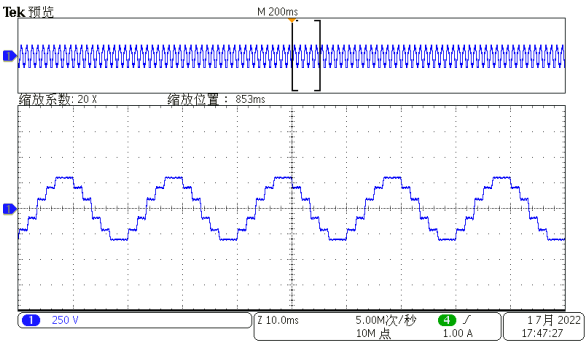
DST10 waveform





DST23 waveform





DST26 waveform

06 | APPLICATIONS

New Energy Generation	Photovoltaics, energy storage, hydrogen fuel
Electric Vehicles	Charging stations, BOBC/DCDC, traction batteries, relays, motors, and motor control
Avionics	Power modules, motors, converters
Power Electronics Equipment	Site power supplies, AI servers, modular power supplies, UPS systems, electronic components;


New Energy Generation


Electric Vehicles


Avionics


Power Electronic Equipment

07 | PRODUCT APPEARANCE

● CORTEX AC Series Products

The enclosure conforms to the standard 19-inch chassis format and supports paralleling of up to 10 units. In practical applications, it can be integrated into a standard rack system or placed on a test platform. Single-module dimensions are 435 mm × 132 mm × 820 mm (W × H × D) with the weight of 40kg. The dimensions of the single-mod-ule unit and cabinets are shown in the Figure below.



CORTEX AC Standalone Unit　CORTEX AC-26U　CORTEX AC-42U

Cabinet Dimensions	Dimensions (mm) W × D × H	Applications
26U Cabinet	600×800×1338	Suitable for parallel operation of 2-5 units
42U Cabinet	600×800×2050	Suitable for parallel operation of 5-8 units

08 | TECHNICAL SPECIFICATIONS TABLE

Category	CORTEX AC Series
Basic Parameters	
Output Mode	AC, DC, AC+DC, DC+AC
Operating Mode	Bidirectional Regenerative Source
Number of Output Phases	Three-phase, split-phase, single-phase
Parallel Expansion	Up to 10 units in parallel
AC Output	
Voltage	
Voltage Range (Vrms)	L-N/0-450@0.001-200.00Hz
Programmable Resolution (V)	0.01
Accuracy 01	±(0.01%+0.05% F.S.)
Waveforms	Sine wave, triangle wave, pulse wave, clipped wave, half-wave, multi-pulse wave, 30 DST groups, user-defined waveforms
DC Component (mV) 02	<20
Voltage Distortion 03	<0.3%@50Hz/60Hz <0.3%@50Hz/60Hz
Load Regulation	±0.05% F.S.
Line Regulation	±0.01% F.S.@10% change
Remote Sense	Adaptive
Voltage Slew Rate	AC>3.0V/μs
Frequency	
Frequency Range (Hz)	DC, 0.001-200
Resolution (Hz) 04	0.001
Accuracy	±0.01%
Phase	
Range	A = 0°, B = 240°, C = 120° (default); Programmable range: 0°-359.9°
Accuracy 05	±0.1°@0.001-200Hz
Setting Resolution	±0.1°

Harmonics	
Order	00th order@fundamental frequency 40-70Hz 25th order@fundamental frequency 70-200Hz
Content [06]	40%
Magnitude Error	±5% of setting value or 0.1% of fundamental value
Phase Angle Range	0°-359.9°
Current	
Programming Resolution (A)	0.01
Crest Factor [07]	1.414-5
Accuracy [08]	±(0.1%+0.1% F.S.) @15-200Hz
DC Output	
Voltage	
Programmable Resolution (V)	0.01
Output Accuracy [09]	±(0.01%+0.05% F.S.)
Output Ripple (V_rms) [10]	<0.35@ (DC-300kHz)
Load Regulation	±0.05%F.S.
Line Regulation	±0.01% F.S.@10% Change
Output Slew Rate	DC>3.0V/μs
Current	
Programming Resolution (A)	0.01
Accuracy	±(0.1%+0.1% F.S.)
Transient	
Programming	
Mode	List, Wave, Step, Pulse, Advanced, Harmonics, Interharmonics
Minimum Programming Time Step	100μs
Number of Programmable Waveforms	50
Sync Source/Trigger Source	Internal, External
Data Source	Edit, Import, Export
Analog Programming	RMS Value, Amplitude, Instantaneous Value (Power Amplifier Mode)
Built-in Standard	
AC IEC61000	4-11, 4-13, 4-14, 4-27, 4-28
DC IEC61000	4-17, 4-29

Output Impedance Mode	
R Range (Ω) [11]	0-10
L Range (mH)	0-2
Setting Resolution	0.001
Accuracy	0.1%+0.2% F.S.
RLC Load	
Resistance	
Range (Ω)	0.001-1000
Setting Resolution (Ω)	0.001
Accuracy	±0.1% F.S.
Inductance	
Range (mH)	1-5000
Setting Resolution (mH)	0.001
Accuracy	±0.1% F.S.
Capacitance	
Range (μF)	1-5000
Setting Resolution (μF)	0.001
Accuracy	±0.1% F.S.
Crest Factor	
Range	1.414-5
Resolution	0.001
Power Factor	
Range	-1.000-1.000
Resolution	0.001
Measurement Parameters	
AC Voltage	
Resolution (V_rms)	0.01
Accuracy	±(0.01%+0.05% F.S.)
Frequency	
Resolution (Hz)	0.001
Accuracy	±0.01%

AC Current	
Resolution	0.01
Accuracy	±(0.1%+0.2% F.S.)
Peak Current	
Resolution (A)	0.01
Accuracy	±2% F.S.
Crest Factor	
Range	1.00-6.00
Resolution	0.001
Accuracy	±2% F.S.
Active Power	
Resolution (W)	1
Accuracy [12]	±0.2% F.S.
Apparent Power	
Resolution (VA)	1
Accuracy [12]	±0.2% F.S.
Power Factor	
Range	0.000-1.000
Resolution	0.001
DC Voltage	
Resolution (V)	0.01
Accuracy	0.1% F.S.
DC Current	
Resolution (A)	0.01
Accuracy	±(0.1%+0.2% F.S.)
Input	
Wiring Configuration	Three-phase four-wire ABC+PE
Frequency (Hz)	47-63
Voltage Range (V) [13]	304-480
Harmonic Current	<3%
Input Peak Current (A)	< 1.5 × rated current

Power Factor	> 0.99
Efficiency [14]	> 0.91
Interfaces	
General-Purpose Interface	Type-B, USB,LAN
Multifunction Interface	"Anyport"; see the user manual for detailed definitions
Environment	
Operating Temperature Range (°C)	-10-50
Storage Temperature Range (°C)	-20-70
Humidity	≤80%
Insulation	
Insulation Resistance	Apply 500 Vdc for 1 minute; insulation resistance shall be not less than 10 MΩ.
Dielectric Strength	Apply DC 3100 V with a rise time of 5 s and hold for 2 s, with no flashover or breakdown.

Note

[01] In the parameter table, all occurrences of F.S. for parameters related to AC output voltage refer to the maximum AC voltage of 450 V; all performance specifications in the table are measured at RMS values above 15 V.

[02] The DC component is tested under no-load conditions with the output voltage set to 220 VAC and the frequency set to 50 Hz.

[03] Output voltage distortion is tested with the output voltage set to 250 VAC and a purely resistive load up to rated power.

[04] Resolution is 0.001 or 0.01% of the present setting, whichever is greater;

[05] Phase accuracy is measured under no-load conditions with the three-phase output voltage set to 220 V and the three-phase angles set to the default values;

[06] The maximum individual harmonic content is 40%;

[07] Crest factor is the ratio of peak current to RMS current. The typical value for a standard sine wave is 1.414, and the maximum allowable value is 6. However, the peak current shall not exceed the maximum current of a single unit; this does not indicate the crest factor under rated conditions;

[08] In the parameter table, all instances of F.S. related to AC current parameters refer to the maximum peak current of the corresponding model;

[09] In the parameter table, F.S. for all parameters related to DC output voltage refers to the maximum DC output voltage of 636 V;

[10] Output ripple voltage is specified with the DC output voltage set to 500 V, under no-load conditions, using AC coupling and a 20 MHz bandwidth limit on the oscilloscope;

[11] Output impedance refers to the impedance under steady-state voltage-source output conditions;

[12] In active power and apparent power accuracy specifications, F.S. refers to the maximum measurable power of the corresponding model;

[13] Input operating voltage range: 304 Vac - 480 Vac;

[14] Power factor and efficiency are tested at a three-phase input voltage of 380 V, output set to 220 V, and with a purely resistive load up to rated output power.

Empowering Future with Action

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