

# Datasheet: ZGX Series

ZGX Series High Performance High Power  
Bidirectional AC/DC Power Source & Load



up to 22.5kVA in 4U

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# > ZGX SERIES

## AC/DC POWER SOURCE & LOAD



The ZGX series is a compact, modular, and fully integrated AC/DC source and electronic load. It utilizes a SiC-based, interleaved PFC topology to achieve an effective switching frequency of 160kHz. The unit is equipped with comprehensive simulation capabilities for power electronics, including grid simulation, regenerative AC/DC loading, BiPolar DC power supply operation, regenerative RLC loading, and power amplification for Hardware-in-the-Loop (HIL) testing.

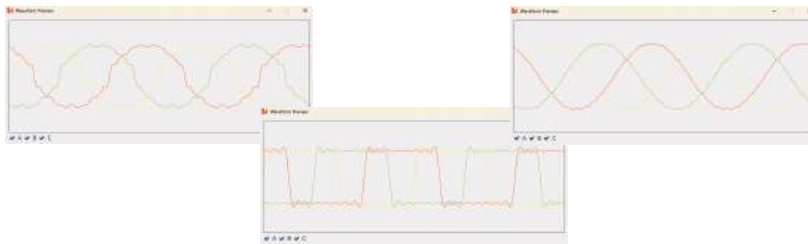
A single ZGX unit provides a maximum rated output power of 22.5kW within a compact 4U chassis with only 670mm depth design. It supports power expansion through a master-slave parallel interface. Its output capabilities are as follows: In AC mode, it can deliver up to 450V(L-N), 35A per phase, with a frequency range from DC to 1kHz. In DC mode, it can output 636V and 105A.

### Features

- Single-phase and selectable three-phase 208V, 230V, 380V, 400V (L-L) input
- AC, DC, and AC+DC output
- 4-Quadrant Operation
- Regenerative AC/DC source and load
- Regenerative RLC /RCD electronic load
- BiPolar DC power supply
- Single-phase/three-phase/split-phase/reverse-phase/ multi-channel output, each phase independently controllable
- Up to 100th harmonic waveform generation
- Supports low/high voltage ride-through and continuous fault ride-through
- Programmable phase angle jump
- Current-limiting output for short-circuit testing
- TTL trigger signal output with voltage or frequency changes
- Line impedance (RL) simulation
- Fast dynamic response
- High voltage output mode
- True current source
- User-defined waveforms
- Soft-start function, suppresses inrush current
- Low leakage current (<10mA)
- Compact design (67 cm depth), suitable for desktop installation
- Modbus/SCPI communication
- Standard LAN interface
- USB interface on the front panel for file transfer
- Remote Sense
- Fault localization
- Remote emergency stop interface

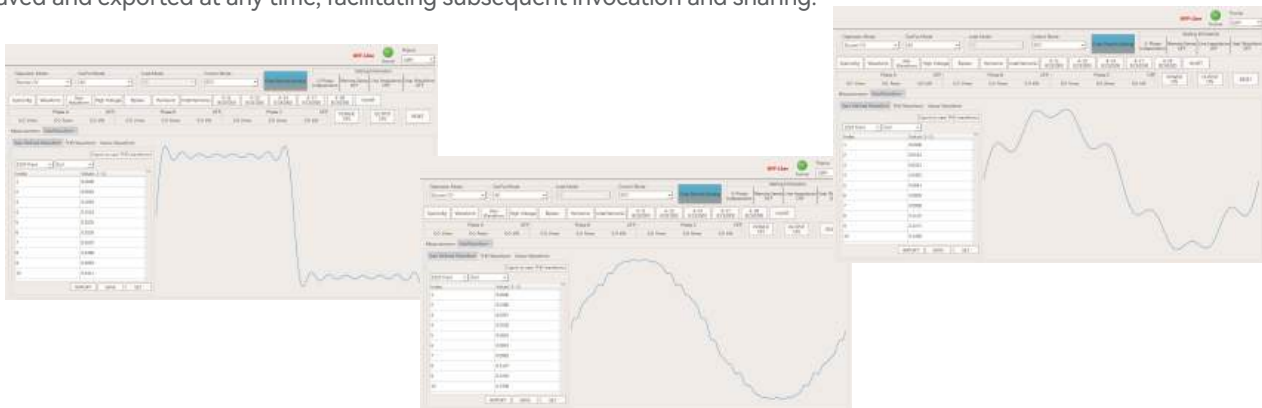
## ➤ Harmonic and inter-harmonic waveforms generation

The ZGX series utilizes a dual-DSP control architecture, delivering exceptional waveform generation capabilities that enable precise simulation of harmonics and inter-harmonics. Users can independently configure the amplitude and phase for up to the 100th harmonic relative to a 50Hz or 60Hz fundamental frequency, allowing flexible creation of various periodic distorted test waveforms. To enhance testing efficiency, the series also incorporates 30 preset harmonic distortion waveforms for quick user access, significantly streamlining the configuration process for complex test environments.



## ➤ User defined waveform

The ZGX series offers a flexible user-defined waveform function, supporting high-precision import and editing of waveforms with lengths of 1024, 2048, and 4096 points. This feature provides four waveform processing modes: full, 1/4 symmetric, symmetric, and asymmetric, and enables generation of harmonic and vector waveforms based on user-defined inputs. Edited waveform data can be saved and exported at any time, facilitating subsequent invocation and sharing.



## ➤ High Voltage Mode

The ZGX series offers a High Voltage Mode that doubles the output voltage range compared to standard operation. This mode utilizes the unit's reverse phase output capability, with the phase angle between two outputs set to a 180-degree shift. In AC mode, it delivers 900V L-N from a 450V L-N range; in DC mode, it provides 1272V output based on a 636V range, meeting higher voltage testing requirements.

## ➤ Regenerative Electronic Load

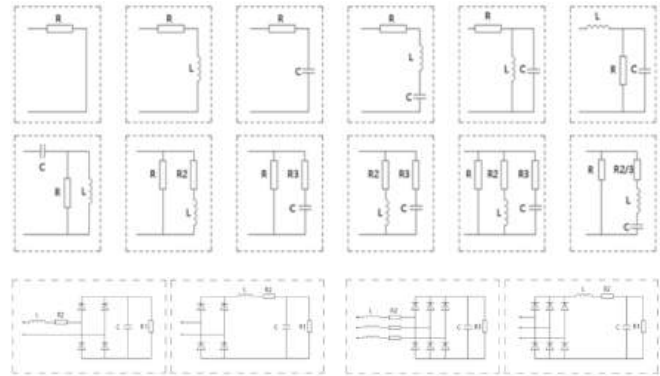
The ZGX Series power supplies integrate regenerative AC and DC electronic load functionality. In AC load mode, four operating modes are provided: Constant Resistance (CR), Constant Current (CC), Constant Power (CP), and Rectification. Constant Resistance (CR) mode can simulate three-phase resistive loads, allowing users to set resistance values for each phase individually and supporting sequence simulation function. Constant Current (CC) and Constant Power (CP) modes can simulate sinusoidal current loads, enabling users to set current or power values and adjust the phase angle from  $-90^\circ$  to  $+90^\circ$  to accurately emulate the leading or lagging phase relationship between voltage and current in capacitive or inductive loads. Rectification mode is suitable for non linear rectifier load testing, supporting parameter configuration under CC or CP mode, and allowing users to set the WF (waveform factor) parameter (range: 0-2.121,  $CF=WF*1.414$ )

In DC load mode, Constant Current (CC) and Constant Power (CP) operating modes are supported, featuring sequence simulation function, along with configurable output impedance and minimum operating voltage.

## > RLC/RCD Load

The ZGX series offers advanced RLC load simulation functionality, capable of accurately simulating complex impedance loads composed of resistance (R), inductance (L), and capacitance (C), thereby realistically replicating complex load conditions. The system supports 12 classic RLC topological structures and features independent per-phase programming capability, allowing R, L, and C parameters to be configured individually for each phase. Users can flexibly construct diverse load models according to testing requirements, making it suitable for a wide range of testing scenarios including three-phase power supplies, renewable energy inverters, motor drives, and grid simulation.

In addition, the ZGX provides four types of RCD nonlinear load simulation functions, designed specifically for performance testing and reliability evaluation of devices such as UPS systems, inverter power supplies, and frequency converters. It enables accurate simulation of the dynamic characteristics of nonlinear loads, comprehensively verifying the response performance and stability of the equipment under test in harsh real-world operating conditions.



## > BiPolar DC Power Supply

The ZGX series supports bipolar DC output functionality, offering both two-port and three-port connection modes to accommodate diverse testing and application requirements.

In two-port mode, users can flexibly select any two phases from the ABC three-phase system as output terminals and set their voltage polarity via software. For instance, phase A can be configured as the positive voltage output and phase B as the negative voltage output. The output polarity can be easily reversed by reconfiguring phase A as negative and phase B as positive, enabling rapid polarity switching.

In three-port mode, phase A serves as the positive voltage output terminal, phase B as the negative voltage output terminal, while the neutral terminals of phases A and B are connected together to serve as the protective earth (PE). This mode supports independent setting of positive and negative output voltages, allowing for either equal or unequal magnitude outputs, thus providing enhanced flexibility in voltage configuration.



## > High-Speed Dynamic Output Performance

The ZGX series delivers excellent dynamic output performance, with a voltage slew rate up to 3V/ $\mu$ s and a current slew rate up to 0.4A/ $\mu$ s, making it suitable for test applications that require stringent dynamic response.

In DC voltage mode under no-load conditions, both the rise time from 0 V to 636 V and the fall time from 636 V to 0 V are less than 200  $\mu$ s. In current mode, the rise time from 0 A to 90% of full scale (FS) and the fall time from 90% FS to 0 A are each within 120  $\mu$ s. The ZGX series is designed to meet the rigorous demands of high dynamic testing applications.

## › Low Leakage current

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The ZGX power supply series features low leakage current. Under three-phase 220V (L-N) output conditions, the unit's ground leakage current remains below 10 mA, complying with international and domestic safety standards including IEC 60364-7-722, UL 2231, GB/T 18487.1-2023, and IEC 62752.

This characteristic makes it suitable for electric vehicle onboard charger (OBC) testing, as well as the testing and validation of various highly sensitive electrical equipment. It effectively prevents unintended tripping of RCD protection circuits, ensuring safe and stable testing operations.

## › Power Hardware-in-the-Loop

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The ZGX series operates in four-quadrant mode with an output frequency range from DC to 1 kHz and a small-signal bandwidth of 10 kHz, featuring rapid dynamic response capabilities. An optional analog programming interface (Model: EXDA) is available, providing an output response time of less than 20  $\mu$ s. Its performance meets the technical requirements for power amplifiers in Power Hardware-in-the-Loop (PHIL) testing applications, making it suitable for such scenarios.

## › Power Expansion

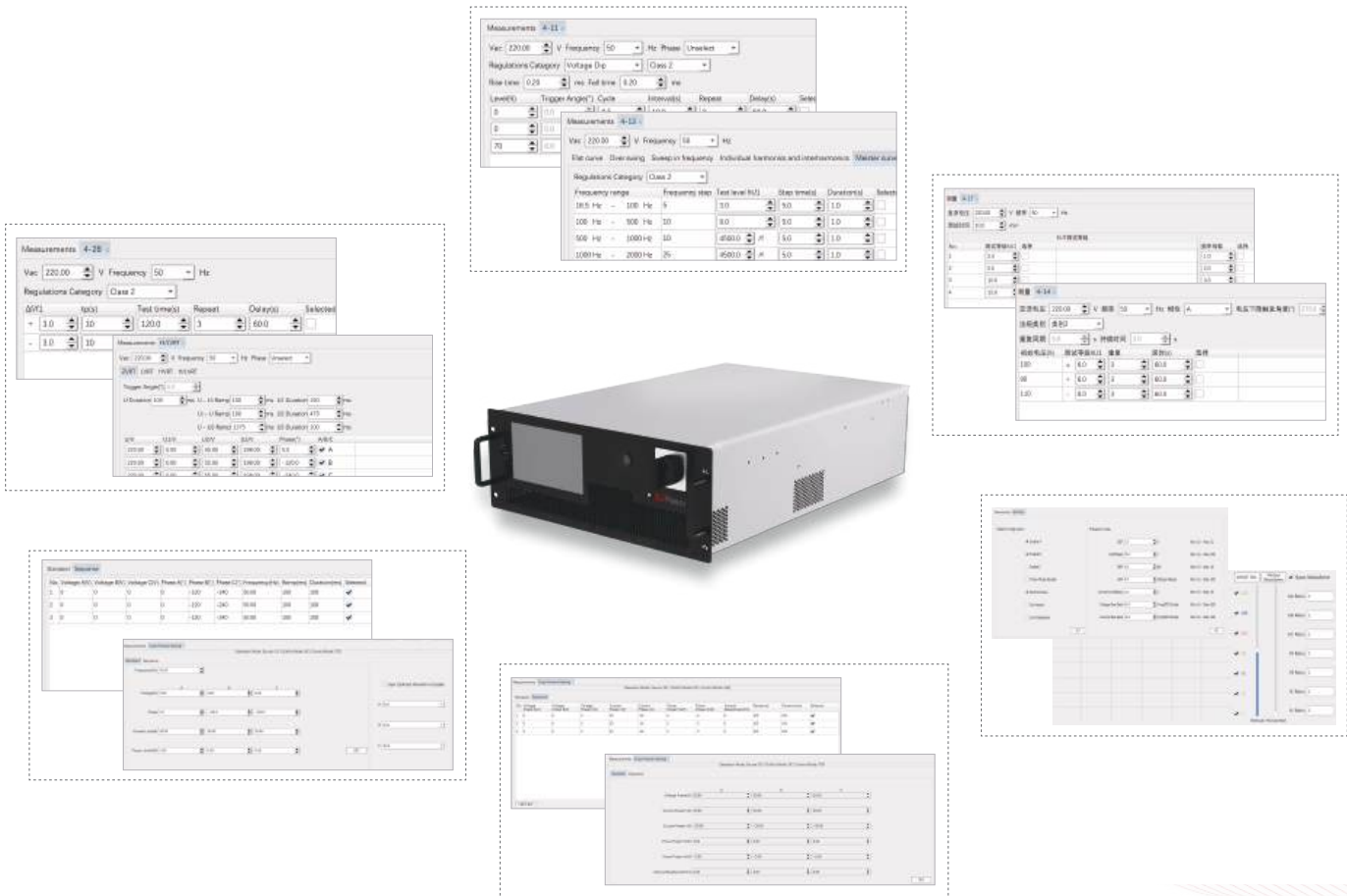
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The ZGX series supports master-slave parallel operation for power expansion. A single standard ZGX unit delivers up to 22.5 kW, and the system supports parallel connection of up to 10 units of the same model. For higher power requirements, a factory-configured, high-power system is available. Based on a single ZGX unit, this factory-integrated system offers a maximum output of 225kW per unit. Furthermore, these high-power systems also support parallel operation of up to 10 units for further expansion.



## ➤ User-Friendly GUI Software

The ZXG series comes standard with a graphical user interface (GUI) software that enables remote control, programming communication, and real-time monitoring. The software provides functions including system configuration, output mode and parameter settings, data measurement, and waveform display. It also integrates test items with IEC 61000-4-11, IEC 61000-4-13, IEC 61000-4-17, and IEC 61000-4-28 standards, and supports high-voltage and low-voltage ride-through (HVRT/LVRT) testing.



## Output Ranges

Model	ZGX 5		ZGX 15		ZGX 20		ZGX 22.5		
<b>Output Power Range</b>		5KW		15KW		20KW		22.5KW	
<b>Output Voltage Range</b>	DC Source and Load		0~450V L-N @ 0.01~70Hz; 0~300V L-N @ 70~1kHz						
	AC Source and Load		0-636V						
<b>Output Current Range</b>	AC Source and Load	Single-Phase Mode	0~30A		0~90A		0~105A		
		3-Phase Mode	-		0~30A/ph		0~35A/ph		
	DC Source and Load	Single Channel	-30A~30A		-		-35A~35A		
		Three Channels in Parallel	-90A~90A		-		-105A~105A		
<b>High Voltage Mode - AC (Single-phase mode only)</b>	Output Voltage Range		-		0~900V L-N @ 0.01~70Hz; 0~600V L-N @ 70~1kHz				
	Output Current Range		-		0~30A		0~35A		
<b>High Voltage Mode - DC</b>	Output Voltage Range		-		0~1272V				
	Output Current Range		-		-30A~30A		-35A~35A		
<b>Bipolar DC Output</b>	Output Voltage Range	Positive Voltage	-		636V				
		Negative Voltage	-		-636V				
	Output Current Range		-		-30A~30A		-35A~35A		

Note: When AC is superimposed in AC+DC output, the output power, voltage, and current ranges are the same as those in DC mode.

## General Specifications

AC input	
Voltage	1φ, 220VL-N, 230VL-N; 3φ, 3P+GND, 380VL-L, 400VL-L
Frequency	47-63Hz
Efficiency	≥90%
Power Factor @ Rated Power	>0.99
THDi	<1%
Output	
Output Mode	AC, DC or AC+DC
Load Regulation	0.1%FS
Line Regulation	0.10%
AC Mode	
Frequency Range	0.01 ~ 1000Hz
Phase Angle	Phase B/C relative to phase A, 0.0~360.0°
THD	<0.5% @DC~400Hz; <1% @400~1000Hz (measured at 250VL-N, Resistive Load)
Harmonic Generation	100th@50/60Hz; 25th@400Hz
Voltage Slew Rate	≤3V/us
Current Slew Rate	≤0.4A/us
Small-Signal bandwidth	10kHz
Power Accuracy	0.2%FS
Voltage Accuracy	0.1%FS
Current Accuracy	0.4%FS(<30Hz); 0.2%FS(30~350Hz); 0.3%FS(350.01~500Hz);
	0.3%+(0.7%*kHz)FS(500.01~1000Hz)
Frequency Accuracy	0.01%+0.01Hz
Phase Accuracy	<1° (@50Hz)
Power Resolution	0.001kW
Voltage Resolution	0.1V
Current Resolution	0.01A
Frequency Resolution	0.01Hz (~100Hz), 0.05Hz (>100Hz)
Phase Resolution	<0.1°
Leakage Current	<10mA @230V L-N
DC Mode	
Operating Mode	CV, CC, CP, CR, Bipolar DC Output
Voltage Accuracy	0.1%FS
Voltage Resolution	0.1V
Current Accuracy	0.1%FS
Current Resolution	0.01A
Voltage Ripple	0.1%FS

Measurement	
AC Source Measurement Accuracy	0.2%FS
AC Voltage Measurement Accuracy	0.1%FS
AC Current Measurement Accuracy	0.1%FS(<30Hz); 0.2%FS(30~350Hz); 0.1%+0.3%FS(350.01~500Hz); 0.3%+(0.7%*kHz)FS(500.01~1000Hz)
DC Voltage Measurement Accuracy	0.1%FS
DC Current Measurement Accuracy	0.1%FS
Frequency Measurement Accuracy	0.01%+0.01Hz
RLC / RCD Load Simulation	
R	Range: 0.1~1000Ω. Resolution: 0.1Ω. Accuracy: ±0.1%FS
L	Range: 0.01~500mH. Resolution: 0.01mH. Accuracy: ±0.1%FS
C	Range: 0.001~50mF. Resolution: 1uF. Accuracy: ±0.1%FS
Others	
Standard Interfaces	LAN
Protection	OVP, OCP, OPP, OTP
IP Ingress protection	IP21
Cooling	Forced Air Cooling
Temperature	Operating: 0~40°C Storage: -20~85°C
Operating Humidity	20~90%RH (None Condensing)
Dimensions (W * D * H, mm)	440*670*178
Weight (kg)	ZGX 5: <40kg ZGX 15: About 47kg ZGX 20: About 50kg ZGX 22.5: About 50kg

- When a single-phase input is used, the rated three-phase output power of the ZGX 15, ZGX 20, and ZGX 22.5 models is reduced to 5.0 kW, 6.6 kW, and 7.5 kW, respectively.
- The optional 208/230V L-L, three-phase input is offered exclusively on the ZGX5 and ZGX15.

## Options

-S Slave Unit, only available for ZGX15 and ZGX20

## AC Input Configuration

/380, Input Voltage 380VLL±10%, 3P+PE  
/400, Input Voltage 400VLL±10%, 3P+PE  
/208, Input Voltage 208VLL±10%, 3P+PE  
/230, Input Voltage 230VLL±10%, 3P+PE



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