

MVGS Series Programmable AC Power Supply

Medium-voltage grid simulator for megawatt-scale power electronics testing

At a Glance

The MVGS series is a four-quadrant programmable AC power source engineered for the testing and certification of megawatt-scale power electronics, using a modular Power Cell Cascaded topology to deliver direct medium-voltage output.

By eliminating bulky external step-up transformers, it supports direct medium-voltage output from 5 kV to 35 kV with THD below 1 percent, plus regenerative operation that can return up to 100 percent of energy back to the grid.

Configurable 10 kV, 13.8 kV, 34.5 kV, and 35 kV class inputs, ride-through and power-quality testing functions, and scalable 1 MVA to 20 MVA+ system expansion position the platform for inverter, PCS, SST, and renewable-energy laboratory work.



MVGS Series Programmable AC Power Supply

Product Overview

The MVGS series is a high-performance four-quadrant programmable AC power supply specifically engineered for the testing and certification of megawatt-scale power electronics. Developed on a proven high-power technology platform, it uses an advanced modular Power Cell Cascaded topology to achieve direct medium-voltage output.

By eliminating the need for bulky external step-up transformers, the MVGS provides direct medium-voltage output from 5 kV to 35 kV. This architecture ensures superior waveform quality with THD below 1 percent.

Designed for versatility in large-scale laboratory environments, the platform offers configurable medium-voltage inputs such as 10 kV, 13.8 kV, 34.5 kV, and 35 kV for seamless integration into local power systems. With full four-quadrant regenerative capability, it can operate as both a grid simulator and a regenerative AC load while recycling up to 100 percent of energy back to the grid.

The MVGS series is suited to complex grid-condition simulation including LVRT, HVRT, ZVRT, harmonic injection, and frequency disturbances for applications such as AI data center solid-state transformers, megawatt-scale energy-storage PCS, and high-power renewable-energy systems.





Main Features

- **Configurable Medium-Voltage Input and Output**

Supports configurable medium-voltage laboratory interfaces and direct medium-voltage output without an external step-up transformer.

- **Advanced Power Cell Cascaded Topology**

Uses a modular Power Cell Cascaded architecture built on a proven high-power platform.

- **Four-Quadrant Regenerative Operation**

Acts as both a programmable grid simulator and a regenerative AC load with energy returned to the grid.

- **Comprehensive Grid Fault Simulation**

Covers LVRT, HVRT, ZVRT, dips, sags, swells, and other voltage or frequency disturbance tests.

- **Sophisticated Power Quality Injection**

Supports independent three-phase control plus harmonic and inter-harmonic injection up to the 50th order for IEC-related immunity and unbalance testing.

- **Flexible System Expansion**

Master-slave parallel operation scales capacity from 1 MVA up to 20 MVA and above, with forced-air or liquid-cooling options.

Grid Simulation Functions

Configurable Input and Output Ranges

The MVGS series is designed for flexibility in large-scale laboratory environments. Unlike standard low-voltage systems, it supports configurable medium-voltage inputs such as 10 kV, 13.8 kV, 34.5 kV, and 35 kV to match local power distribution without requiring additional step-down transformers.

For the output side, it uses a modular Power Cell Cascaded topology to achieve direct medium-voltage output up to 35 kV. System capacity ranges from 1 MVA to 10 MVA and can scale to 20 MVA and above through master-slave parallel operation.

Sequence Output for Voltage and Frequency Disturbances

- **Programmable parameters**

Users can define output voltage, frequency, slew rates, dwell times, and switching times for each sequence step.

- **Transient simulation**

The system can precisely simulate grid fluctuations, dips, sags, and swells.

- **Dynamic performance**

Voltage step response is below 1 ms and the programmable RoCoF exceeds 5 Hz/s for reproduction of extreme transient grid faults.

Standard		Sequence		Harmonic	Inter-harmonic					
No.	Ampl.A	Ampl.B	Ampl.C	Phase A	Phase B	Phase C	F(Hz)	Ramp(ms)	Duratio	
☒ 1	10000	10000	10000	0	-120	-240	50.00	100	100	
☐ 2	10000	10000	10000	0	-120	-240	50.00	100	100	
☐ 3	10000	10000	10000	0	-120	-240	50.00	100	100	

POWER ON

OUTPUT O

MCB ON

SET

CLS

DEL

INC

SAVE

IMPORT

RESET

Independent Three-Phase Control for Unbalance Simulation

To simulate realistic and degraded grid conditions, the MVGS provides fully independent three-phase control.

The voltage amplitude, frequency, and phase angle of phases A, B, and C can be programmed independently, with 0.1 degree phase resolution, to simulate three-phase unbalance and single-phase grounding faults.

Harmonic and Inter-harmonic Generation

- **Harmonics**

Supports harmonic generation up to the 50th order.

- **Inter-harmonics**

Allows superimposition of non-integer inter-harmonics to meet demanding immunity-testing requirements.

- **Customization**

Users can program the phase angle and amplitude of each harmonic component through the software interface.

Standard		Sequence		Harmonic		Inter-harmonic		
No.	Order	A(%)	B(%)	C(%)	Phase A	Phase B	Phase C	
✓ 1	2	0	0	0	0	0	0	
✓ 2	3	0	0	0	0	0	0	
✓ 3	4	0	0	0	0	0	0	
✓ 4	5	0	0	0	0	0	0	
✓ 5+	6	0	0	0	0	0	0	



POWER ON

OUTPUT ON

MCB ON

RESET

SET

CLS

DEL

SYN:A

SAVE

IMPORT

Grid Support, Control and Reliability

Low and High Voltage Ride-Through (LVRT/HVRT)

The MVGS is a critical tool for certifying renewable-energy inverters and PCS systems against grid-tie regulations.

Fault templates: It includes built-in programmable curves for Low Voltage Ride-Through, High Voltage Ride-Through, and Zero Voltage Ride-Through testing.

Overvoltage capability: For HVRT testing, the system supports an overvoltage mode reaching 1.3 times rated voltage through the -HV option.

Support verification: It verifies the EUT's active and reactive power support capabilities during grid-fault events.

Compliance with Global Testing Standards

The MVGS series is engineered to satisfy a wide array of international and regional standards for grid-connected equipment, including GB/T 19964, IEEE 1547, UL 1741, IEEE 519, IEC 62116, and CE conformity requirements.

Advanced Graphical User Interface (GUI)

The system is controlled through an intuitive Windows-based GUI installed on a 15.6-inch industrial TFT touch panel.

Comprehensive control: Provides full access to output settings, sequence programming, and hardware limits.

Real-time monitoring: Displays input and output voltage, current, power, and internal IGBT temperatures.

Data tools: Supports high-speed waveform capture up to 10 kS/s, real-time browsing, and historical data logging for post-test analysis.

High Power Supply Reliability

Designed for the rigors of high-power testing, the MVGS integrates multiple layers of protection and diagnostic tools.

Real-time diagnostics: Continuously monitors all critical nodes and helps users locate issues through fault codes such as OVP, OCP, OTP, and module communication errors.

Robust architecture: Uses optical-fiber communication between internal modules to ensure high noise immunity and system safety.

Safety mechanisms: Includes emergency-stop functions, insulation monitoring, and hardware interlocks tailored for medium-voltage environments.

General Specifications

Input	
AC Input Voltage	10 kV, 13.8 kV, 34.5 kV, 35 kV (AC 3-phase) +/-10% (Configurable)
Frequency	50 Hz / 60 Hz +/-10%
Efficiency	>=90%
Power Factor	0.95
THDi	<=3%
Output	
Output Modes	AC, DC, AC+DC (standard/optional)
Power Level	1 MVA to 10 MVA (Expandable to 20 MVA+)
Voltage Range	Up to 35 kV (Line-to-Line, Configurable)
Overvoltage Mode	1.3 x Rated Voltage (Dedicated for HVRT testing)
Frequency Range	30 Hz to 70 Hz (Standard); Custom wide range available
Phase Output	Phase B/C relative to Phase A: 0.0 to 360.0 deg
Voltage Rise/Fall Time	< 1 ms (0% to 90% / 90% to 0%)
Frequency Change Rate	> 5 Hz/s (Programmable RoCoF control)
Harmonic Generation	Up to the 50th order
Load Regulation	0.2% F.S.
Line Regulation	0.1% F.S.
Output Voltage THD	<= 1.0% (Linear Load, at base frequency)
Voltage Accuracy	<= 0.2% F.S.
Current Accuracy	<= 0.3% F.S.
Frequency Accuracy	0.01 Hz
Phase Accuracy	+/-0.3 deg @ 50 Hz
Measurements	
Power Accuracy	0.3% F.S.
Voltage Accuracy	0.2% F.S.
Current Accuracy	0.3% F.S.
Frequency Accuracy	0.01 Hz
Others	
Standard Interface	LAN, RS485 (Modbus RTU), Fiber optic sync interface
Optional Interface	Analog I/O (0 to 5 V / 0 to 10 V for HIL), RS232
Protection	Input OVP/UVP, Output OCP, OVP, OPP, OTP, SCP, Insulation Monitoring, Module Fault Detection
Cooling	Forced Air Cooling or Liquid Cooling (-W option)
Temperature	Operating: 0 to 40 C; Storage: -20 to 85 C
Operating Humidity	20 to 90% RH (Non-condensing)

Options and Model Configuration

Options:

- HV: Increase max output voltage for HVRT test
- W: Water Cooling

Model Configuration:

MVGS AAA-BBB-CCC-DDD-EEE

AAA: Rated Output Power

BBB: Rated Output Voltage (L-L)

CCC: Rated Output Current (A)

DDD: Options

EEE: Input Voltage (L-L)

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Specifications subject to change without notice. Per AS/NZS standards.