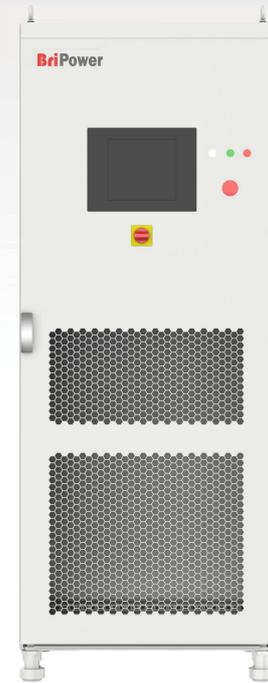


# ➤ ESA SERIES HIGH-POWER AC POWER SUPPLY

The ESA Series high-power AC power supply features a modular design with optional functions, delivering highly configurable power solutions, offering flexible output performance and multiple control methods, including communication interfaces and graphical software, to meet diverse testing and power supply requirements. ESA Series is widely used in applications such as new energy testing, power electronics R&D, motor drive systems, industrial manufacturing, and scientific research.



## ➤ Product Features

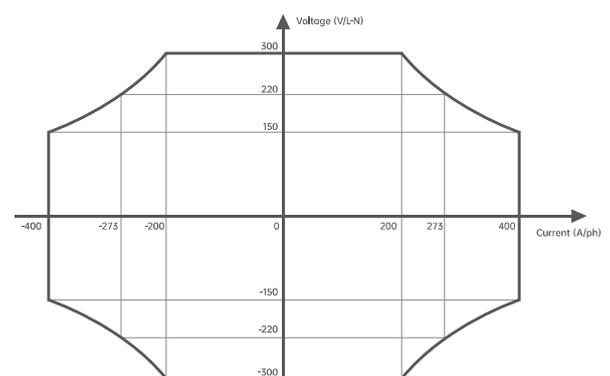
- Configurable output power, voltage, current, and frequency ranges
- Master-slave parallel operation for system expansion
- Programmable voltage/frequency sequences via GUI with controllable slew rates
- Optional DC output mode
- Built-in soft-start function to suppress inrush current
- Custom waveform output (clipped wave, rectified wave)
- Optional air-cooling or liquid-cooling configurations
- Grid simulator
- Regenerative electronic load
- RLC electronic load
- Touchscreen with GUI software
- LAN and RS485 interfaces
- Optional analog I/O interfaces
- Modbus and SCPI protocol
- Remote sense

## ➤ Four-Quadrant Operation

The "-R" option provides four-quadrant operation, allowing for bidirectional energy flow.

## ➤ Constant Power Auto-Ranging Output

The ESA Series provides configurable output power, voltage, and current ranges. It operates in a constant-power mode, automatically adjusting the voltage and current output within the limits.



ESA 180KVA,300V,400/ph Output IV Curve

## > Grid Simulator

The ESA Series with the -R option functions as a grid simulator via its four-quadrant operation, capable of compliance testing for distributed generation. Key capabilities include simulating voltage and frequency fluctuations, dips, (LVRT/HVRT), three-phase unbalance, and harmonics.

- **Three-Phase Independent Output**
- **Programmable Voltage/Frequency/Phase Sequences**
- **Up to 50th Harmonic Waveform Generation**
- **LVRT/HVRT and continuous fault ride-through**
- **Islanding Mode:**  
RLC load simulation for anti-islanding testing
- **Programmable Phase Angle Jumps**
- **Current-Limited Output Mode:**  
Supports short-circuit testing at output terminals
- **TTL Trigger Signal Output:**  
Activates during voltage/frequency transitions
- **Line Impedance (RL) Simulation**

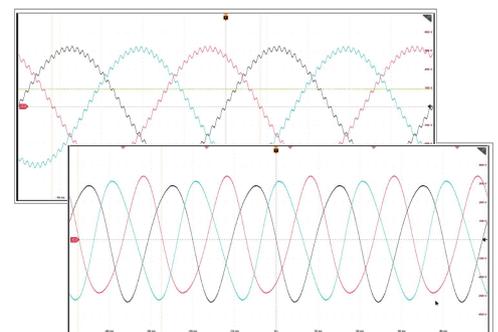
## > Programmable Voltage/Frequency/Phase Sequences

The GUI allows precise programming of output parameters including voltage, frequency, slew rates, and phase angles with full independent control over all three phases.

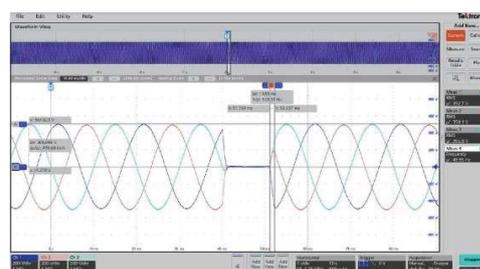
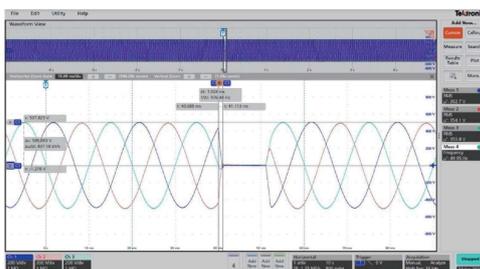


## > Harmonic & Interharmonic Generation

The ESA Series generates harmonics up to the 50th order and supports interharmonic editing. The GUI software allows precise programming of phase angles and amplitudes, allowing for independent three-phase waveform generation.



## > High/Low Voltage Ride-through



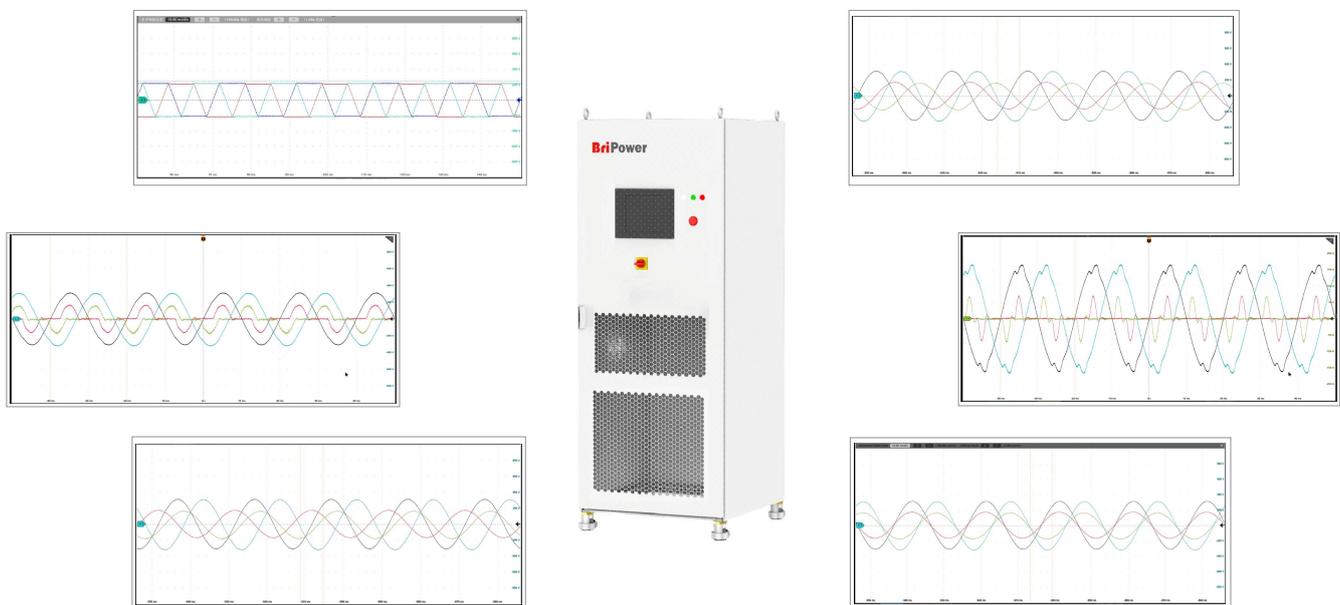
## ➤ Re-generative AC Load (-LD option) <sup>1,2</sup>

With the -LD option, the ESA Series operates as a regenerative AC load, featuring four operational modes:

**Constant Resistance (CR) Mode:** Simulates three-phase resistive loads. Users can configure CR mode and set three-phase resistance parameters, enabling resistance sequence simulation.

**Constant Current (CC) & Constant Power (CP) Modes:** Simulate sinusoidal current loads. Users can adjust load current/power and phase angle (adjustable from  $90^\circ$  to  $-90^\circ$ ), replicating leading/lagging voltage-current phase relationships in inductive/capacitive loads.

**Rectifier Load Simulation Mode:** Designed for nonlinear rectifier load testing. Users can configure CC/CP modes and set waveform parameters (e.g., Waveform Factor:  $0-2.121$ ,  $CF=WF*1.414$ ).



## ➤ Extends to Independent DC output (-DC option)

DC output mode is available with the -DC option. The output will be DC and AC 0~100Hz. There is up to 50% output power and current derating below 30Hz.

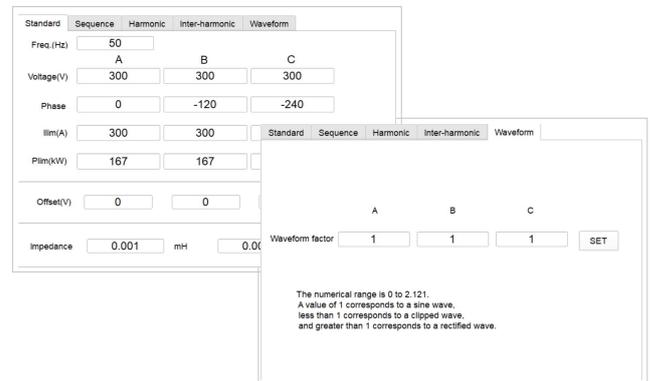
## ➤ Line impedance (RL) Simulation (-IMP option)

-IMP option is designed to simulate line impedance by setting R and L value. The setting range is:  $R_{max}=0.2U_{rated}/I_{rated}$ ;  $L_{max}=R_{max}/314$

1. ESA-LD as regenerative eLoad is design for sine waveform input, if the input is not a pure sine waveform, the output current waveform could be distorted. The -LD option must be used in combination with the -R option.  
2. When  $WF=1$ , the output waveform is a sine wave; when  $WF<1$ , the output waveform is a clipped wave; when  $WF>1$ , the output waveform is a rectified wave.

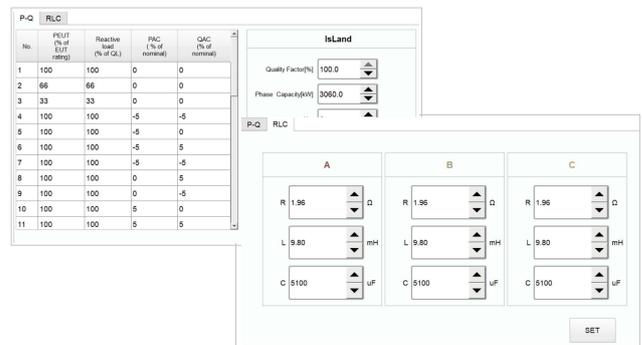
## ➤ Custom waveform

Custom waveforms including clipped sine wave and rectified wave are available with ESA series. The waveform is programmable by modifying waveform factor. Waveform factor (WF) refers to the ratio of the peak value of a custom waveform to that of standard sine wave. When  $WF=1$ , the output waveform is a sine wave; when  $WF<1$ , the output waveform is a clipped wave; when  $WF>1$ , the output waveform is a rectified wave. This function is available in CV mode when ESA is used as source, and also in rectifier mode when ESA is used as eLoad.



## ➤ Island mode for IEC 62116 anti-island test(-62116 Option)<sup>3</sup>

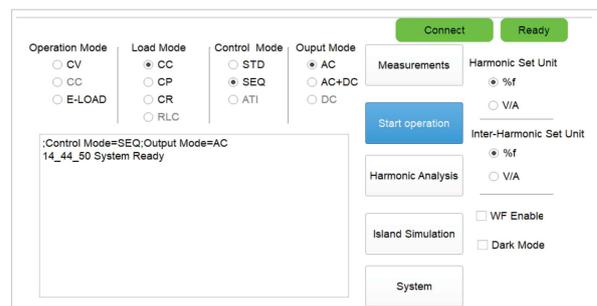
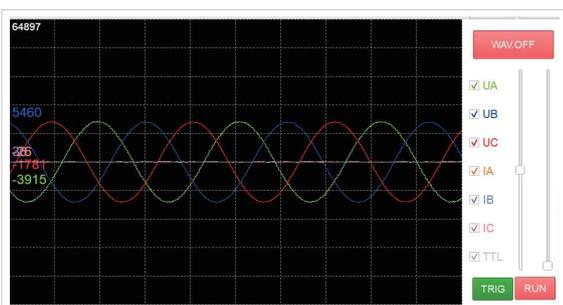
Island mode of ESA simulates RLC load behavior for anti-island test. Two simulation modes are provided, which are setting parameters of PAC, QAC, PEUT and QL in mode 1, and setting R, L, C Value in mode 2.



## ➤ Graphical User Interface

GUI software is installed in front touch panel, which uses Windows OS. The software provides following functions:

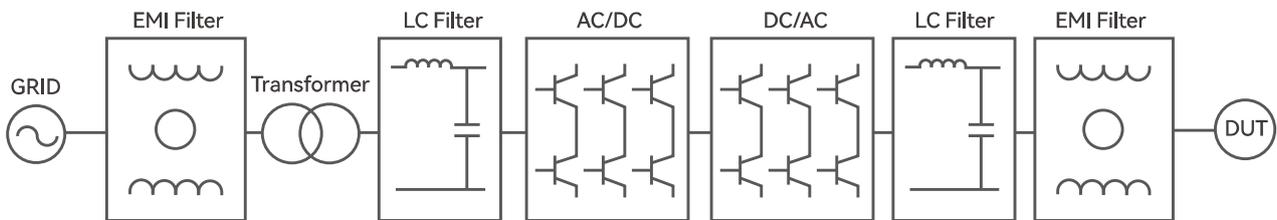
- Output settings and limits
- Sequence output settings
- Generate harmonic and inter-harmonic waveforms
- Display measurements: voltage, current, power, etc
- Capture, display and save output voltage and current waveforms
- Display power source faults



3. ESA-62116 can only simulate RLC load for sine waveform, 50/60Hz input.

## > Block Diagram

The topology of standard ESA is shown in Figure. The transformer for isolation and phase-shift is on the front by default, and then the 3-phase AC input is rectified by four quadrant PWM converters for DC bus, which is followed by DC/AC power modules. Three channels of DC/AC power modules are used for independent 3-phase AC output.



Note: The ESA series AC power supply topology with -TR option is different from the above figure.

## > General Specification (customized unit specification will be shown in the proposal)

| Input                      |  |
|----------------------------|--|
| AC input Voltage           | 3P+N+PE, 380VLL±10%(std)                       |
| Frequency                  | 47-63Hz  |
| Efficiency                 | ≥90%   |
| Power Factor               | 0.95   |
| THDi                       | ≤3%  |
| Output                     |  |
| Output Mode                | AC (std),DC,AC+DC (-DC option)                 |
| Power Range                | Configurable, from 30KVA~10MVA                 |
| Voltage Range              | Configurable, 0~300V L-N (std), 50kV L-N (max) |
| Current Range              | Configurable, up to 10kA/ph                    |
| Frequency range            | 30~100Hz (std), 40~70Hz (TR option)            |
| Phase output               | Phase B/C relative to phase A, 0.0~360.0°      |
| Voltage Rise Time (0%~90%) | <1ms (std), <2ms (TR option)                   |
| Voltage Fall Time (90%~0%) | <1ms (std), <2ms (TR option)                   |
| Harmonic Generation        | Up to 50th                                     |
| Load Regulation            | 0.2%FS   |
| Line Regulation            | 0.1%FS   |
| Output Voltage THD         | <1%FS (Resistive Load, @50/60Hz)               |
| Power Accuracy             | 0.3%FS   |
| Voltage Accuracy           | 0.1%FS (std), 0.2%FS (TR option)               |
| Current Accuracy           | 0.2%FS   |
| Frequency Accuracy         | 0.01Hz   |
| Phase accuracy             | ±0.3° @50Hz                                    |
| Power Resolution           | 0.1kW  |
| Voltage Resolution         | 0.01V  |
| Current Resolution         | 0.1A   |
| Frequency Resolution       | 0.01Hz   |
| Phase Resolution           | 0.1°   |

## > General specifications

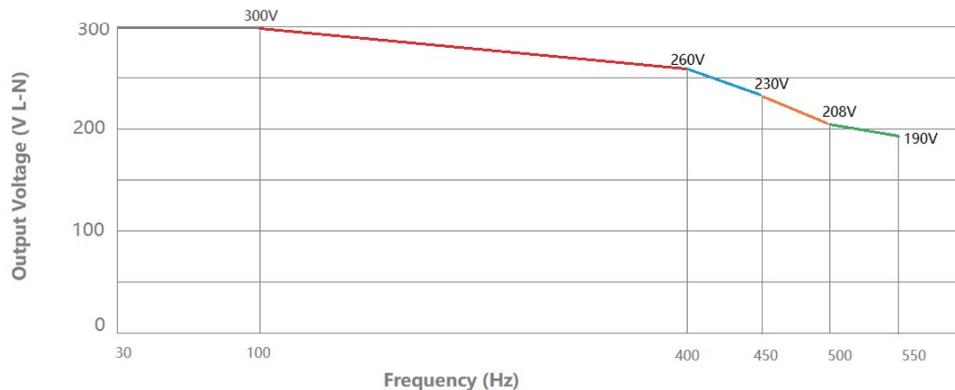
| Measurements       |                                     |
|--------------------|-------------------------------------|
| Power Accuracy     | 0.3%FS                              |
| Voltage Accuracy   | 0.1%FS(std), 0.2%FS (TR option)     |
| Current Accuracy   | 0.2%FS                              |
| Frequency Accuracy | 0.01Hz                              |
| Phase accuracy     | ±0.3° @50Hz                         |
| Others             |                                     |
| Standard Interface | LAN/RS485                           |
| Optional Interface | ATI/RS232                           |
| Protection         | OVP, OCP, OPP, OTP                  |
| CE Conformity      | EN 62040-1, EN 62040-2              |
| Cooling            | Forced Air Cooling                  |
| Temperature        | Operating: 0~40°C Storage: -20~85°C |
| Operating Humidity | 20-90%RH (None Condensing)          |

## > Standard Models Specification

| Model           | Power  | Voltage | Current | Dimension (W*D*H mm) | Weight(kg) |
|-----------------|--------|---------|---------|----------------------|------------|
| ESA 45-300-68   | 45kVA  | 300V    | 69A     | 800*800*2000         | 770        |
| ESA 60-300-91   | 60kVA  | 300V    | 91A     | 800*800*2100         | 980        |
| ESA 120-300-182 | 120kVA | 300V    | 182A    | 1600*900*1700        | 1400       |
| ESA 180-300-273 | 180kVA | 300V    | 273A    | 1600*900*2100        | 1800       |
| EAS 240-300-364 | 240kVA | 300V    | 364A    | 1800*900*2100        | 2100       |
| ESA 300-300-455 | 300kVA | 300V    | 455A    | 2000*1000*2100       | 2700       |

## > Options

|                     |   |
|---------------------|---|
| -232                | RS232 program interface   |
| -LD                 | Regenerative AC load function                                     |
| -R                  | Regenerative mode   |
| -ATI                | Analog control interface (0~5V)                                   |
| -DC                 | Extend to Independent DC output (&-1P 3-ph output DC in parallel) |
| -1P                 | Add single phase output   |
| -IMP                | Line impedance (RL) simulation                                    |
| -MS                 | Master-Slave interface  |
| -W                  | Use water-cooling   |
| -TR                 | Change to transformer output topology                             |
| -62116              | Island mode for IEC 62116 anti-island test                        |
| -HFXXX <sup>4</sup> | AC output frequency extended to XXXHz (only for CV mode)          |
| -FHR                | Frequency resolution 0.005Hz (max frequency: 70Hz)                |



## > AC Input Configuration<sup>5</sup>

Please specify the input voltage (L-L)

/380, Input Voltage 380VLL±10%, 3P+N+PE/3P+PE

/400, Input Voltage 400VLL±10%, 3P+N+PE/3P+PE

/480, Input Voltage 480VLL±10%, 3P+N+PE/3P+PE

<sup>4</sup> Max VF Derating 300V L-N Range

<sup>5</sup> Other AC input is available, please consult factory.

## > Model Configuration

**ESA AAA-BBB-CCC-DDD/EEE**

AAA: Power, KVA

BBB: Voltage (L-N), V (std, 300V L-N)

CCC: Current (per Phase), A

DDD: Option

EEE: Input configuration