PACIFIC POWER SOURCE

Microgrid Test Solutions

Product Guide

Testing Impacts of Micro Grid & DER on the Grid

Solar

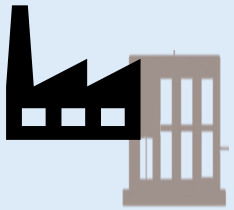
ESS

Wind

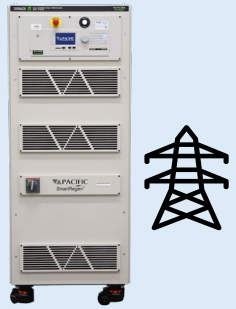
EV & V2G

Generator

Loads



Facility



Utility Grid

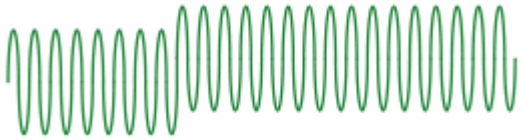
Test Compliance to Grid-Tied Standards

Test wind or solar inverters for compliance to both UL and IEC safety and EMI standards.

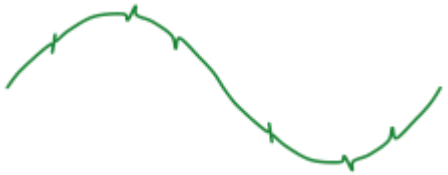
IEC 61727	VDE-AR-N4105	G83/G59
EN 50438	BDEW TG3/TG4/TG8	AS 4777.2
IEEE 1547.1	VDE AR-N 4110	GB/T 29319
UL 1741 including SA	VDE AR-N 4120	GB/T 19964
VDE 0126-1-1	CEI 0-16/CEI 0-21	

Grid Power Waveform Distortions Vary Widely

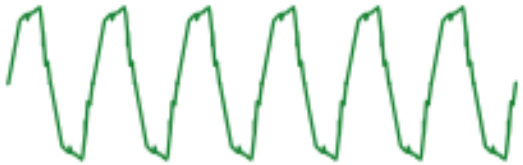
DC Offset



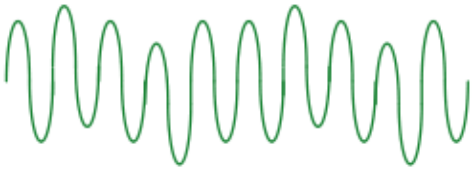
Notching



Harmonics & Interharmonics

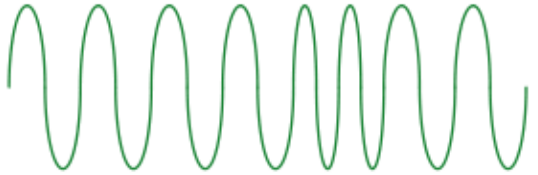


Voltage Fluctuation



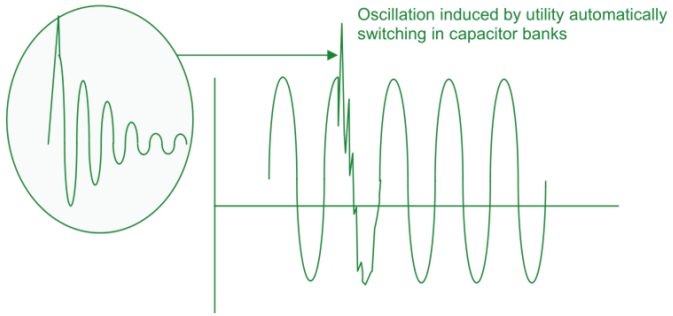
Noise

Frequency Variations

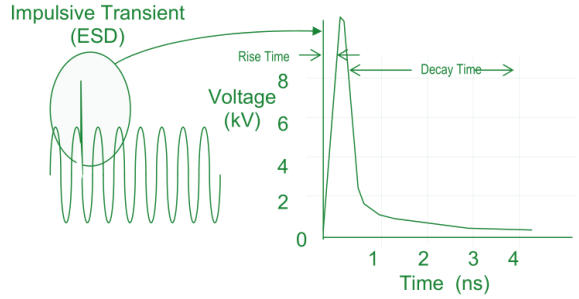


Dips & Interruptions

Oscillatory



Power Surge



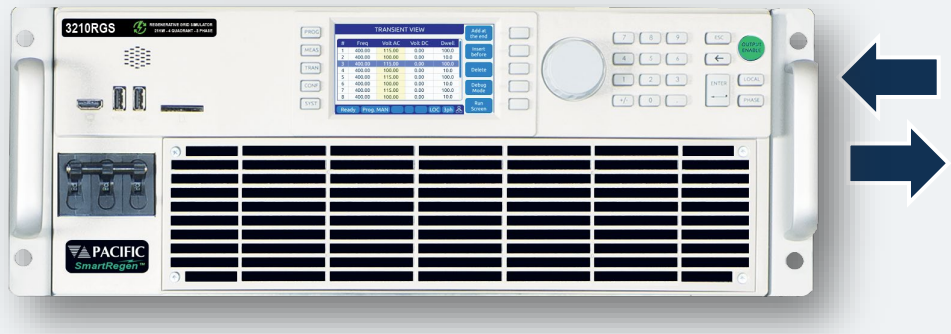
World-Wide Standards

Can your Grid Simulator support global test requirements?

- **Voltage** – High / Low Line Immunity testing
- **Frequency** – Frequency variations compliance
- **Phasing** – Three phase, split phase, single phase, phase reversal
- **International Safety Standards –** Compliance testing
- **Inrush Current** – Grid impedance simulation

Solar PV Inverter Testing

Micro, String, Commercial, Residential, etc.

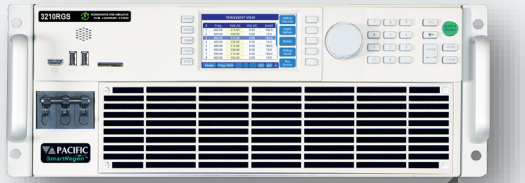


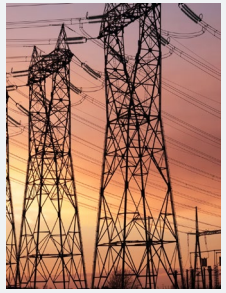
Grid Simulator

Grid-Inverter

Utility Grid Testing

Grid Simulator





Load Mode

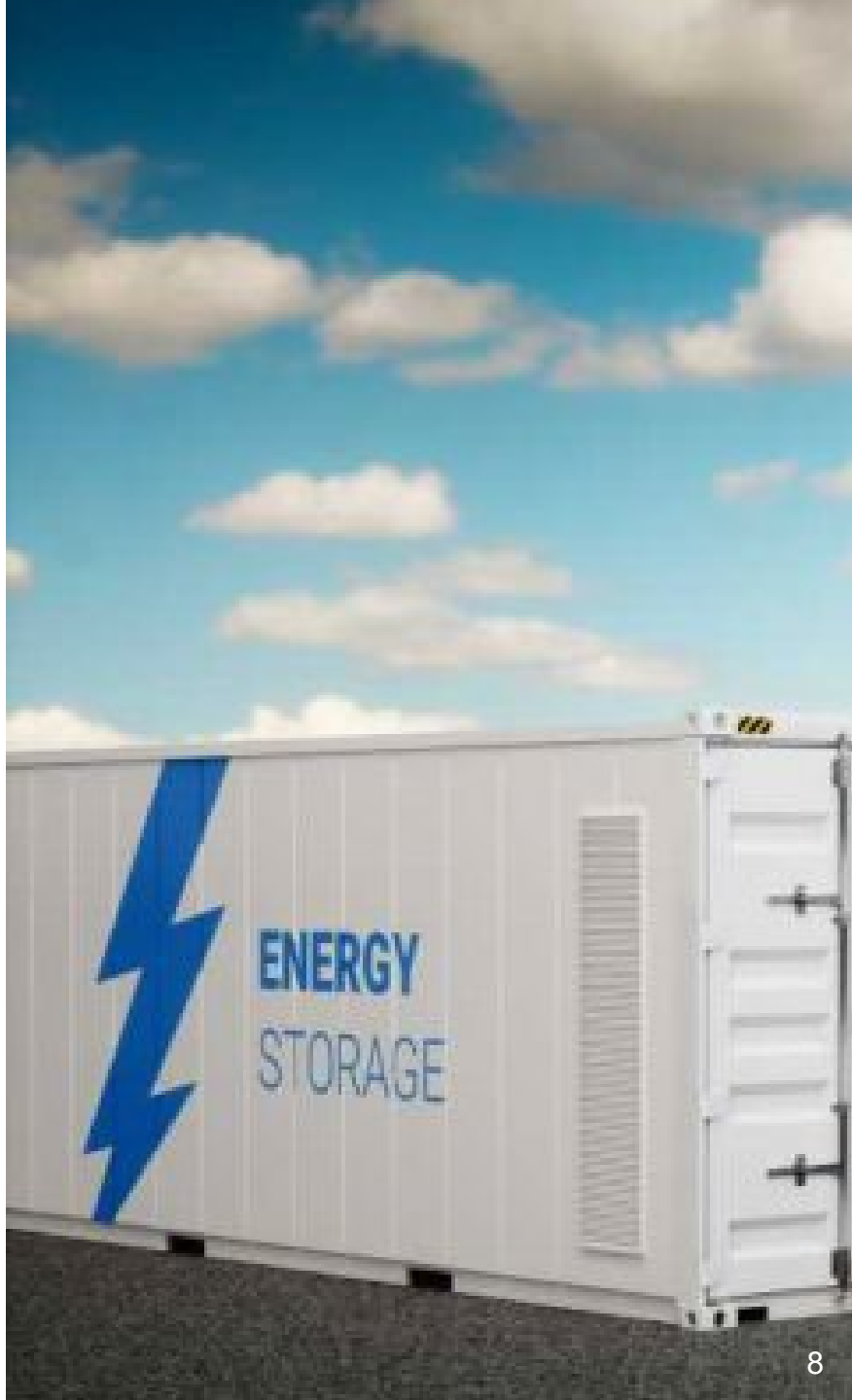
Utility Grid

Energy Storage Systems Testing

Load Mode

Grid Simulator

DC-AC Inverter



EV Charger Testing

Fast Charger, OBC, EVSE, V2G & more

Level 1/ Mode 1 – Very Slow AC Charging

Standard AC outlet (16A max)
Direct to onboard charger (OBC)
No Communication

Level 2/ Mode 2 – Slow AC

Home charging (32A max)
Uses EVSE & OBC
Protection via cable signaling

Level 2/ Mode 3 – Semi-Fast AC

Faster AC charge (80A max)
Fixed public charging stations & OBC
Signaling and communication

Level 3/ Mode 4 – Fast DC Charging

Fastest charging mode (50-300kW)
Direct to battery (bypasses OBC)
Signaling and communication

Testing PHIL Applications:
Could real-time simulation provide more testing capability?

Power Hardware In the Loop (PHIL)
Grid Simulation

Emulate real-world conditions with low latency

PACIFIC POWER SOURCE

Key Considerations

Regenerative AC/DC Power Sources

- Regenerative, Bidirectional Power
- Modular & Scalable Power
- AC+DC, Flexible Configurations
- Max Current
- Galvanic Isolation, Operator Safety
- Load or PHIL capabilities
- Smart Control

Regenerative Grid Simulator: Our Smart Source Differentiation

Regenerative > 90%
Greater than 90% energy efficiency. Source & sink to emulate bidirectional power.

Powerful Hardware
Robust topology for advanced applications.

Constant Power Dual Voltage Range
Seamless testing between voltage ranges. Test wide range of grid-tied products, low to high.

Ultra Flexible Output Configuration
Simultaneous AC and DC operation per phase AND automatic switching of outputs provides extensive flexibility.

SmartSource Suite Control
Embedded Real-Time Remote Control Platform to easily create, modify, and run test programs.

Programming Capability
Multiple control options, intuitive user interface, powerful waveform tools, and simplified set-up saves time.

Modular & Scalable Power
Modular power up to 440kVA/kW provides future-proofing. Upgrade modules later if needed.

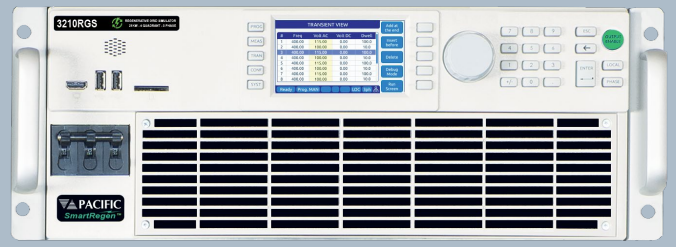
Optional PHIL & Load
2-in-1 AC/DC Load Option.

Optimized for PHIL(AZX Series Only) applications with high-speed analog I/O and low latency.

Smart Design & Safety
Built-in galvanic isolation, protection limits, air-filters provide added protection.

PACIFIC POWER SOURCE

RGS Series



2-1 Regenerative Grid Simulator & Optional Load

Grid Simulator w/ Load Option Available

Key Features

- **High Power Density** – 12kW up to 21kW in 4U
- **Modular & Scalable Power**
  - Parallel up to 8 modules per cabinet (168kVA)
  - Parallel multiple cabinets up to 252kW
- **Constant Power Voltage Range**:
  - 350Vac L-N/606Vac L-L or ±500Vdc
- **Grid Applications Frequency Range**:
  - DC, 15Hz - 200Hz; Extended 15Hz – 1200Hz
- **AC, DC, (AC+DC *Option*, AC/DC Load *Option)***
- **Ultimate Flexibility**
  - Single, Split, Three-Phase; Multi-Channel Mode
  - Galvanic Isolation (Inter-channel, input/output)
  - Simultaneous AC & DC Operation in a Single Phase
  - Automatic Switching of Output Modes
- **SiC Technology**
- Exceptionally **High AC Current**
- **Advanced** Waveform Digitizer
- Includes **Harmonics AND Interharmonics**
- **SmartSource Suite** Remote Control Software

PACIFIC POWER SOURCE

GSZ Series

3-1 Regenerative Grid Simulator & Optional Load

Grid Simulator w/ Load Option
PHIL Included

Key Features

- **Modular & Scalable Power Modules in** 30, 45, or 55 kVA/kW
  - Parallel multiple cabinets **up to 550kVA/kW**
- **Constant Power Voltage Range**:
  - AC Voltage Ranges: 0-240 Vac L-N / 0-415 Vac L-L and 0-480 Vac-LN / 0-830 Vac-LL
  - DC Voltage Ranges: 0-340 Vdc and 0-680 Vdc
- **Grid Applications Frequency Range**:
  - DC, 15Hz - 200Hz
- **AC, DC, (AC+DC *Option*, AC/DC Load *Option)***
- **PHIL Amplifier with High-Speed Analog I/O**
- **Ultimate Flexibility**
  - Single, Split, Three-Phase; Multi-Channel Mode
  - Galvanic Isolation (Inter-channel, input/output)
  - Simultaneous AC & DC Operation in a Single Phase
  - Automatic Switching of Output Modes
- **SiC Technology**
- Exceptionally **High AC Current**
- **Advanced** Waveform Digitizer
- Includes **Harmonics AND Interharmonics**
- **SmartSource Suite** Remote Control Software

Modular & Scalable Power

- ✓ Mobile-friendly, parallelable cabinets make it easy for set up and reconfiguration.
- ✓ Increase power when needed to meet future test requirements.
- ✓ Reduced downtime. Modularity increases up time during service and maintenance of individual cabinets.
- ✓ Top air-cooled vents allow the units to be placed against a wall or back-to-back to maximize floor space.

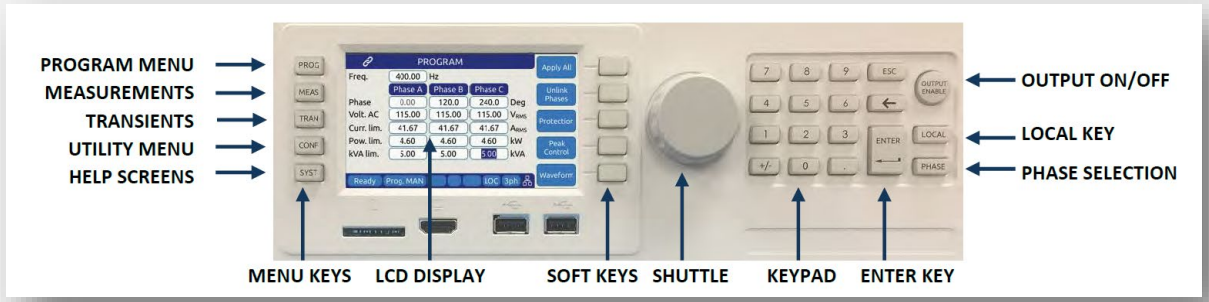
Power Hardware In the Loop (PHIL) Grid Simulation

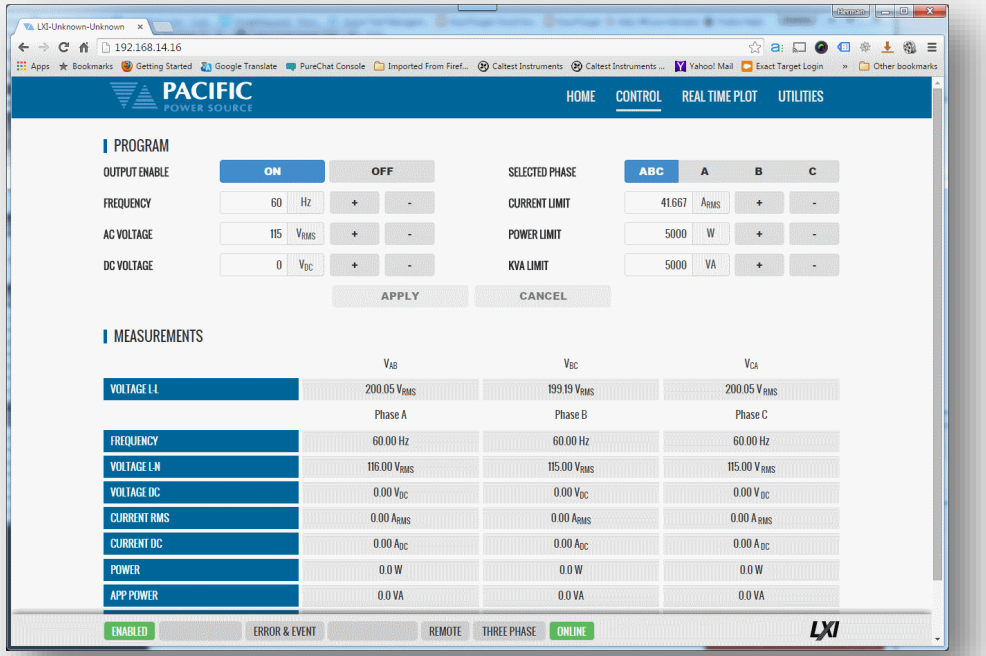
Emulate real-world conditions with low latency

Multiple Control Options

Powerful yet Easy to Use

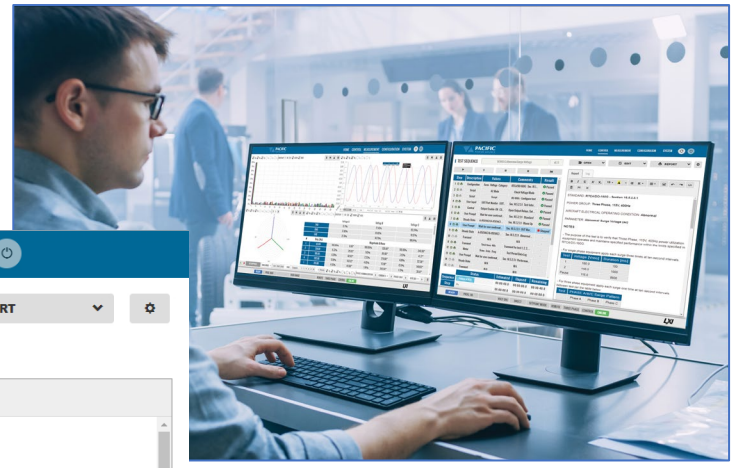
- ✓ Intuitive Menu and Soft-key Driven Operation
- ✓ LCD Color Screen Touch Panel
- ✓ Shuttle Knob, Numeric Entry Pad
- ✓ LAN, GPIB, RS232 & USB Interfaces, CAN/CAN FD/ModBus, Analog Control
- ✓ Supports external touch screen via Video output/USB connections
- ✓ **SmartSource Suite** – Embedded Web Server for Both LAN and USB Interface





SmartSource Suite Browser control multi-window views

Example IEC 61000-4 Immunity Test Sequence Options



PACIFIC POWER SOURCE

HOME | CONTROL | MEASUREMENT | CONFIGURATION | SYSTEM

TEST SEQUENCE: 4-11-Dips-Class2-Test v1.0.1

OPEN | EDIT | REPORT

RUN | PAUSE | STOP | STEP | RESTART

Step	Description	Values	Comments	Result
1	Configuration	Voltage/Form/Frequency	EN/IEC61000-4-11 - Voltage Dips Class 2 test	Passed
2	Script	AC Mode	Check Voltage Mode	Passed
3	User Input	UUT Part Number;UUT Serial Number;Company N...	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	Passed
4	Control	Output Enable,Off,CSC,Off	Open Output Relays, Set to 0.0VAC, CSC set to O...	Passed
5	User Prompt	Wait for user confirmation	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	Passed
6	Steady State	A-230[VAC]; f-50[Hz]	EN/IEC61000-4-11 - UUT Warm-Up	Passed
7	User Prompt	Wait for user confirmation	Please allow EUT to warm-up and press "Pass" to...	Passed
8	Steady State	A-230[VAC]; f-50[Hz]	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	Passed
9	Transient	Total time- 30s		Passed
10	Meter	Vrms;Irms	Measure power source output (V, I) - Duration of ...	Passed
11	Steady State	A-230[VAC]; f-50[Hz]	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	Passed
12	Transient	Total time- 30s		Passed
13	Meter	Vrms;Irms	Measure power source output (V, I) - Duration of ...	Passed
14	Steady State	A-230[VAC]; f-50[Hz]	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	Passed
15	Transient	Total time- 31s		Passed
16	Meter	Vrms;Irms	Measure power source output (V, I) - Duration of ...	Passed
17	User Prompt	Wait for user confirmation	Caution- Output Disable	-
18	Steady State	A-0[VAC]; f-50[Hz]	EN/IEC61000-4-11 - Dips and Interruptions, Class ...	-
19	Control	Output Enable,Off	Change Output Enable (Open Output Relays)	-

	Status	Estimated	Elapsed	Remaining
Sequence	Stopped at 8/19	00-01-31.8	00-00-00.0	00-01-31.8
Step	0%	00-00-00.0	00-00-00.0	00-00-00.0

* Report | Log

STANDARD: EN/IEC61000-4-11

NOMINAL VOLTAGE: 115 [VAC]
NOMINAL FREQUENCY: 60 [Hz]

TEST CASE: Table 1 - Class 2 Voltage Dips on Phase A

Table 1 - Preferred test level and duration for voltage dips

Class 2	0 % during 1/2 cycle	0 % during 1 cycle	70 % during 30 cycles

Step 1 - Configuration

EN/IEC61000-4-11 - Voltage Dips Class 2 test

Voltage : 230
Frequency : 50
Form : 1
Coupling : DIRECT
Phase : A

Passed - [10/24/2023 - 11:51:31]

Step 4 - Control

Open Output Relays, Set to 0.0VAC, CSC set to OFF

Item	Value
Output Enable	Off
CSC	Off

Passed - [10/24/2023 - 11:52:10]

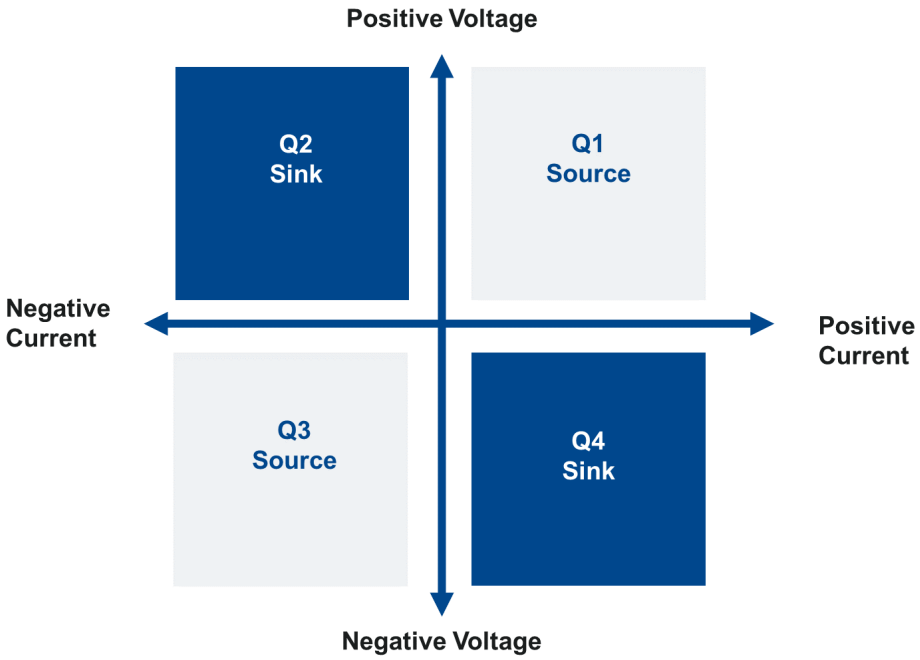
Step 3 - User Input

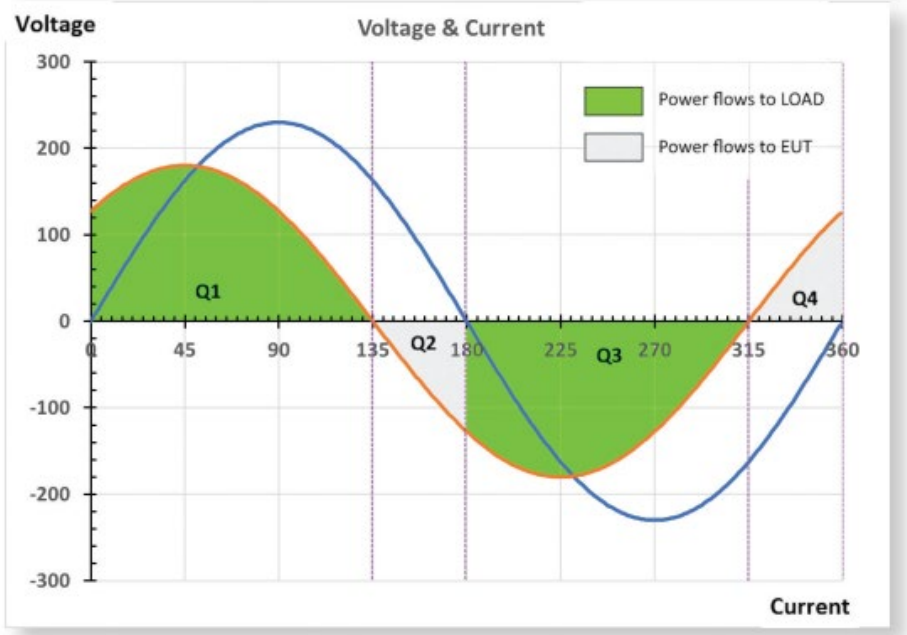
READY | PROG. MAN | ERROR & EVENT | VOLT SRC | TRANSFORMER | SETPOINT MODE | REMOTE | SINGLE PHASE | CONTROL | ONLINE

LXI

Optional Load Capability Provides 2-in-1 Functions

- Switch between Grid Simulator & Load
- Power Factor, Crest Factor simulation
- 4 Quadrant regenerative capability





The PPS Advantage

- High Performance & Reliability
- Best-in-Class User Experience
- Versatility & Future-Proofing
- Customized System Solutions
- Fast Lead Times
- Application Expertise
- Excellent Customer Service

Questions / Contact Us

Quick Links

- RGS Grid Simulator 12kVA to 252kVA
- GSZ Grid Simulator w/PHIL up to 440kVA
- SmartSource Suite Control Platform
- Regenerative Sources & Loads
- Request a Quote

- Email: sales@pacificpower.com

Worldwide Sales & Support Centers


PACIFIC
POWER SOURCE
The Power of Expertise.
PacificPower.com