



Microgrid Test Solutions Product Guide

Testing Impacts of Micro Grid & DER on the Grid



Solar



ESS



Wind



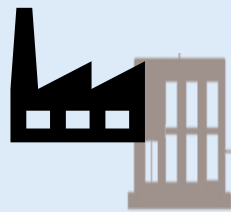
EV & V2G



Generator



Loads



Facility

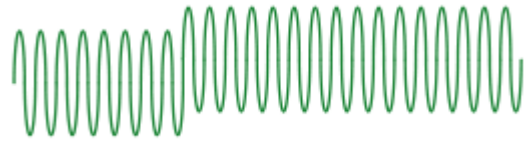


Utility Grid

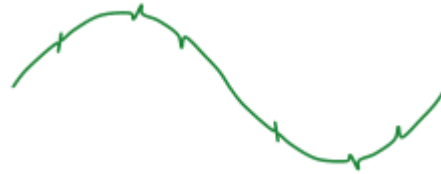


Grid Power Waveform Distortions Vary Widely

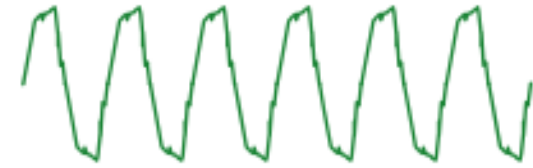
DC Offset



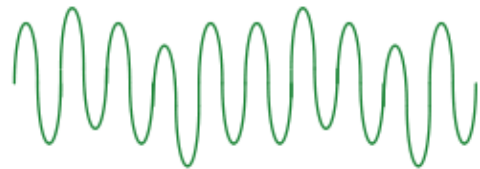
Notching



Harmonics & Interharmonics



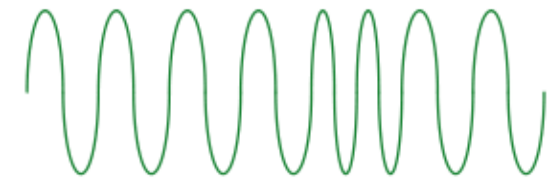
Voltage Fluctuation



Noise



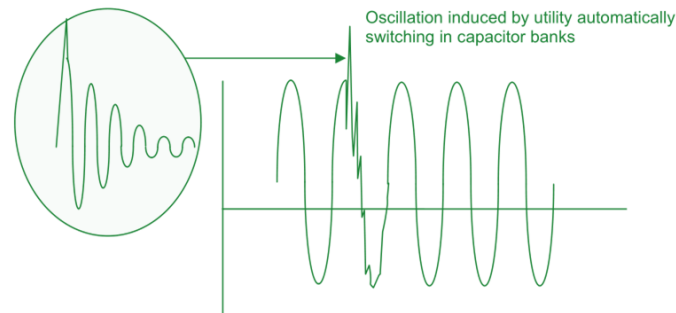
Frequency Variations



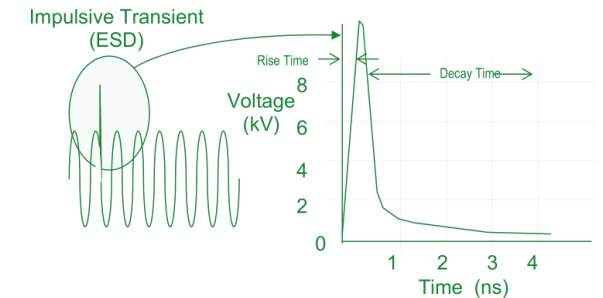
Dips & Interruptions



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

Grid Simulator



**DC-AC
Inverter**



Load Mode





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

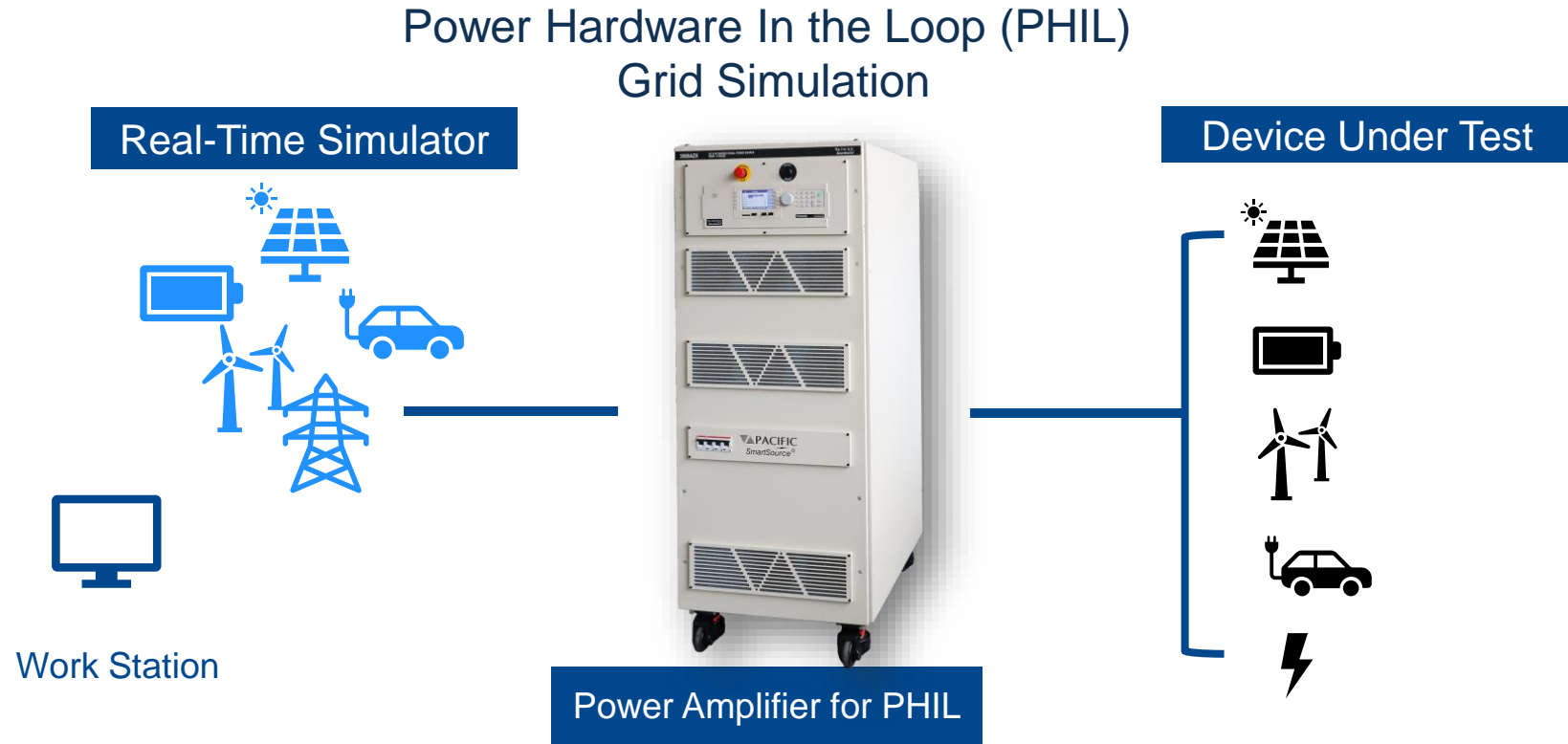
Level 3/ Mode 4 – Fast DC Charging

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



Testing PHIL Applications:

Could real-time simulation provide more testing capability?



Emulate real-world conditions with low latency

Key Considerations



Regenerative AC/DC Power Sources



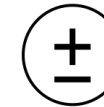
Regenerative,
Bidirectional Power



Modular & Scalable Power



AC+DC,
Flexible Configurations



Max Current



Galvanic Isolation, Operator
Safety



Load or PHIL capabilities



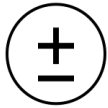
Smart Control

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.



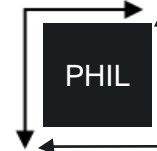
Programming Capability

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.

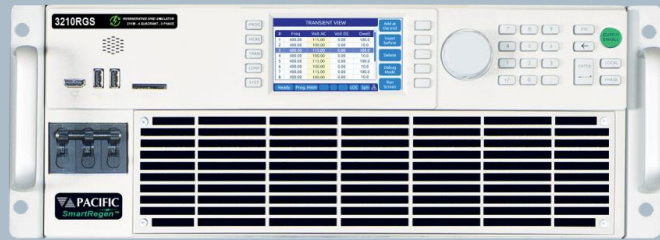
Optimized for PHIL(AZX Series Only) applications with high-speed analog I/O and low latency.



Smart Design & Safety

Built-in galvanic isolation, protection limits, air-filters provide added protection.

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 ± 500 Vdc
- **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



GSZ Series



3-1 Regenerative Grid Simulator & Optional Load

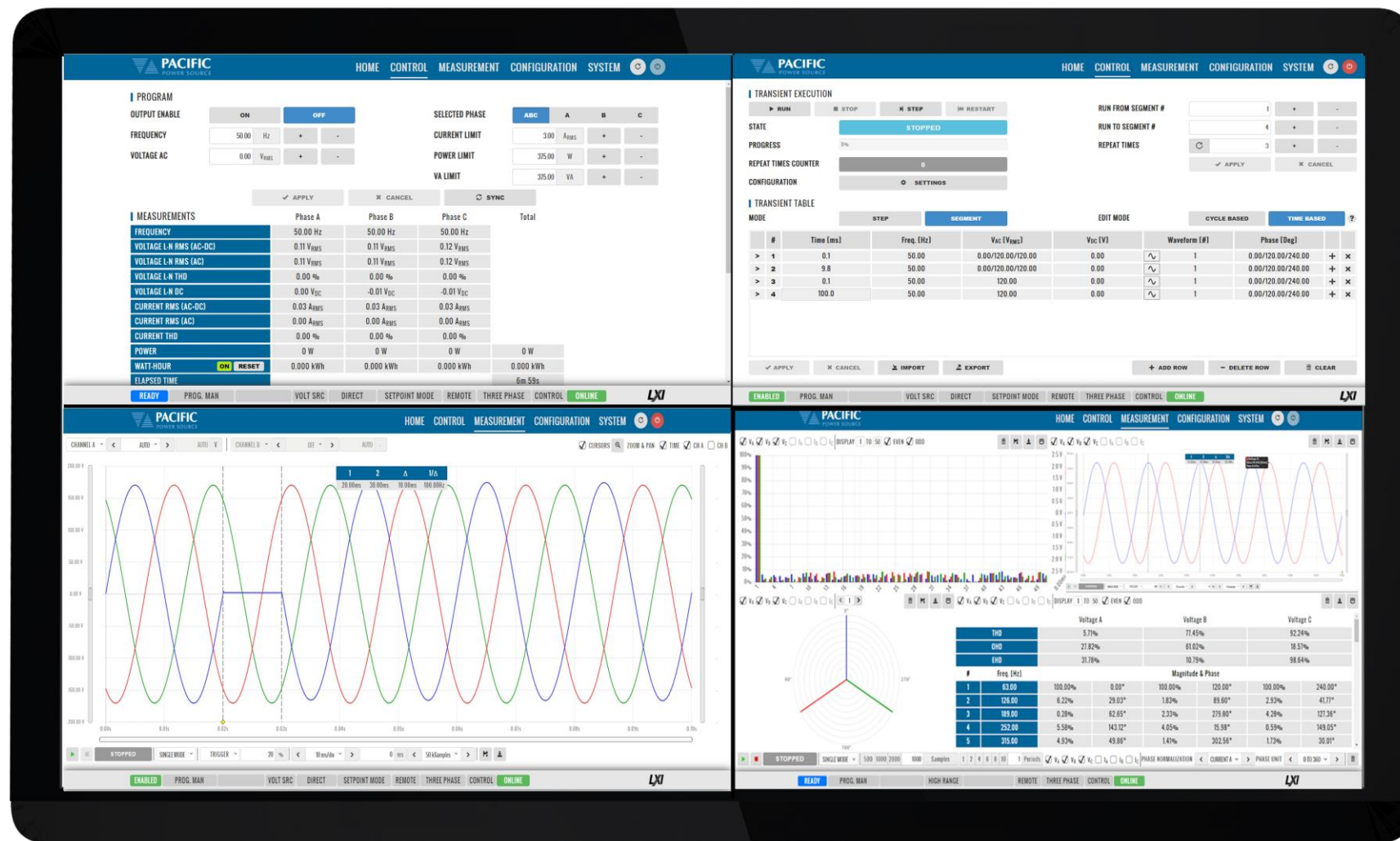
Grid Simulator w/ Load Option & PHIL Option Available

Key Features

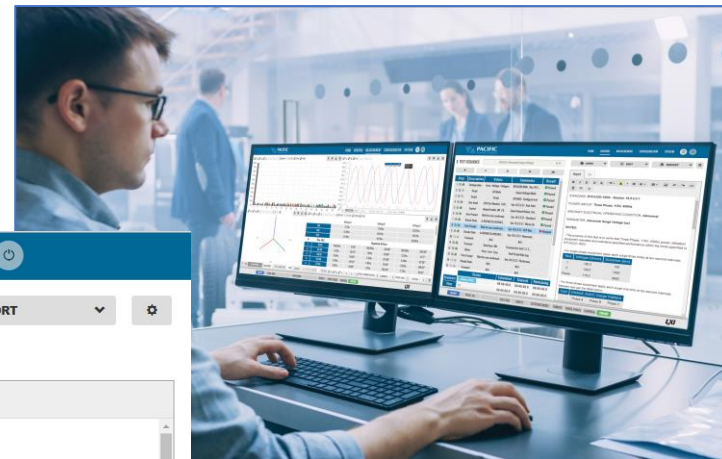
- **Modular & Scalable Power**
 - Available Modules in 30, 45, or 55 kVA/kW
 - Parallel multiple cabinets **up to 440kVA/kW**
- **Constant Power Voltage Range:**
 - AC Voltage Ranges: 0~225Vac and 0~440Vac
 - DC Voltage Ranges: 0~335Vdc and 0~650Vdc
- **Grid Applications Frequency Range:**
 - DC, 15Hz - 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



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

▶ 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 0... | 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) | - |

| Sequence | Status | Estimated | Elapsed | Remaining |
|----------|--------|------------|------------|------------|
| Step | 0% | 00-01-31.8 | 00-00-00.0 | 00-01-31.8 |

OPEN
EDIT
REPORT

* 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



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](#)
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