DATA SHEET

# SL1200A Series

## Scienlab Regenerative AC Emulator, 3-Phase

SL1201A – 346$V_{L-N}$ / 600 $V_{L-L}$, 63 A, 30 kVA
SL1202A – 346$V_{L-N}$ / 600 $V_{L-L}$, 63 A, 45 kVA
SL1203A – 346$V_{L-N}$ / 600 $V_{L-L}$, 125 A, 90 kVA

SL1212A – 692 $V_{L-N}$ / 1200 $V_{L-L}$, 32 A, 45 kVA
SL1213A – 692 $V_{L-N}$ / 1200 $V_{L-L}$, 65 A, 90 kVA

SL1203A 90 kVA

Achieve up to 1200 VAC with full specifications, no reduction in performance, and **no transformer!**

KEYSIGHT TECHNOLOGIES

## Introduction

Today's energy/grid infrastructure is changing and growing rapidly. Variable renewable energy (VRE) and distributed energy resources (DERs) in the form of solar, wind, and battery storage are the dominant theme in global grid modernization initiatives. Within the automotive industry, the electrification of vehicles is expected to create significant demand on the grid for charging, while also expanding the opportunity for energy storage through vehicle-to-grid (V2G) power applications.

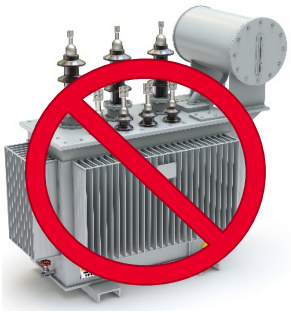
As the energy mix intensifies, so does the challenge of managing the way we produce, distribute, and consume electricity. "Smart" inverters with grid support functionality have emerged as a key enabler to overcoming such challenges. As a result, inverter manufacturers are required to adhere to a specific set of grid compliance/interconnection standards that necessitate the need for extensive test. To test, grid emulation equipment is required.

DERs are also moving to higher output voltages to reduce losses and costs, moving from 600 to 800 VAC, and potentially up to 1000 VAC in the future (IEC-LV directive allows up to 1000 VAC). The goal of higher voltages combined with the requirement to provide grid support functions, such as high-voltage ride-through (HVRT), creates the need to test to even higher than the 1000 VAC limit.

To achieve the high voltages needed to test new inverter/control designs, inverter engineers often must either connect multiple power supplies in series or use an external transformer. This leads to costly, complex test setups with an inability to easily expand, along with reduced performance, wasted space, and other additional downsides.

### Achieves high voltage without additon of large, expensive transformer

The SL1200A series was designed to handle all your 3-phase AC test needs up to 1200 VAC, from 30 kVA to 630 kVA without the need for a transformer. Two voltage ranges are available: 600 VAC and 1200 VAC. The 600 VAC models are ideal for low voltage inverter test as well as EV and EVSE charging test applications. The 1200 VAC models allow for (HVRT) testing at the IEC LV-AC limit without the need for a large, complex test setup.



### Key features of the SL1200A three-phase AC emulator

- High-Power 3-phase AC and DC power source; up to 1200 $V_{L-L}$; up to 130 A; up to 630 kVA
- 1200 $V_{L-L}$ is achieved at full specifications without extra equipment, such as a transformer
- Test to IEC 61000 standards and grid compliance standards, such as UL 1741 SA and IEEE 1547.1
- 100 % regenerative (bidirectional) power solution with > 85 % efficiency
- Get up and running immediately with intuitive soft front panel (SFP)
- A complete, one-vendor solution of hardware, software, consulting, and support services worldwide for all grid-edge applications, such as EVSE / EV charging test, solar / PV inverter test, battery energy storage system test (see page 4 for details)

### DC Operation (Option SDC)

All SL1200A models offer a DC output option. With this option, set the SL1200A to DC mode in the SFP and operate as a high-power, regenerative DC power supply / electronic load.

## SL1200A Regenerative AC Emulator Soft Front Panel (SFP)

The SL1200A Series of Regenerative AC Emulators are controlled using a user-friendly software front panel. All functions of the SL1200A are configured through the SFP's intuitive user interface.

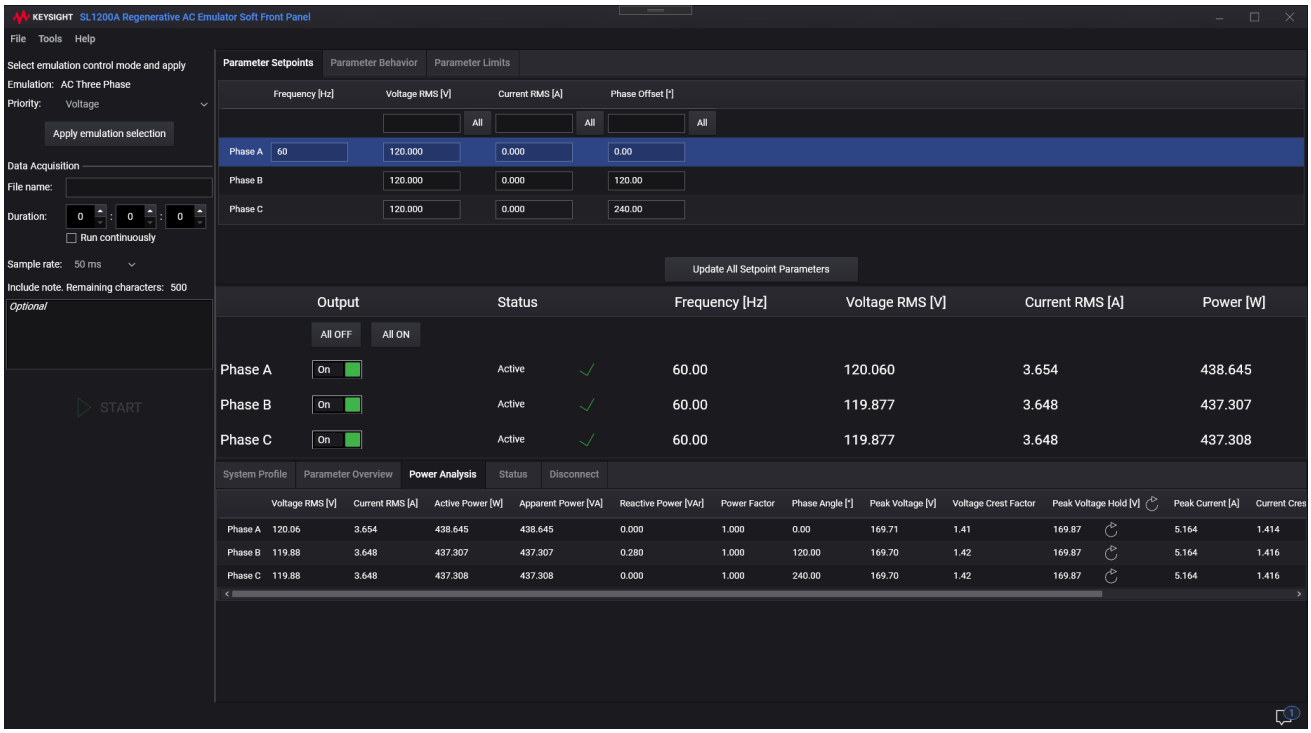



Figure 1. Parameter setpoint and power analysis tabs

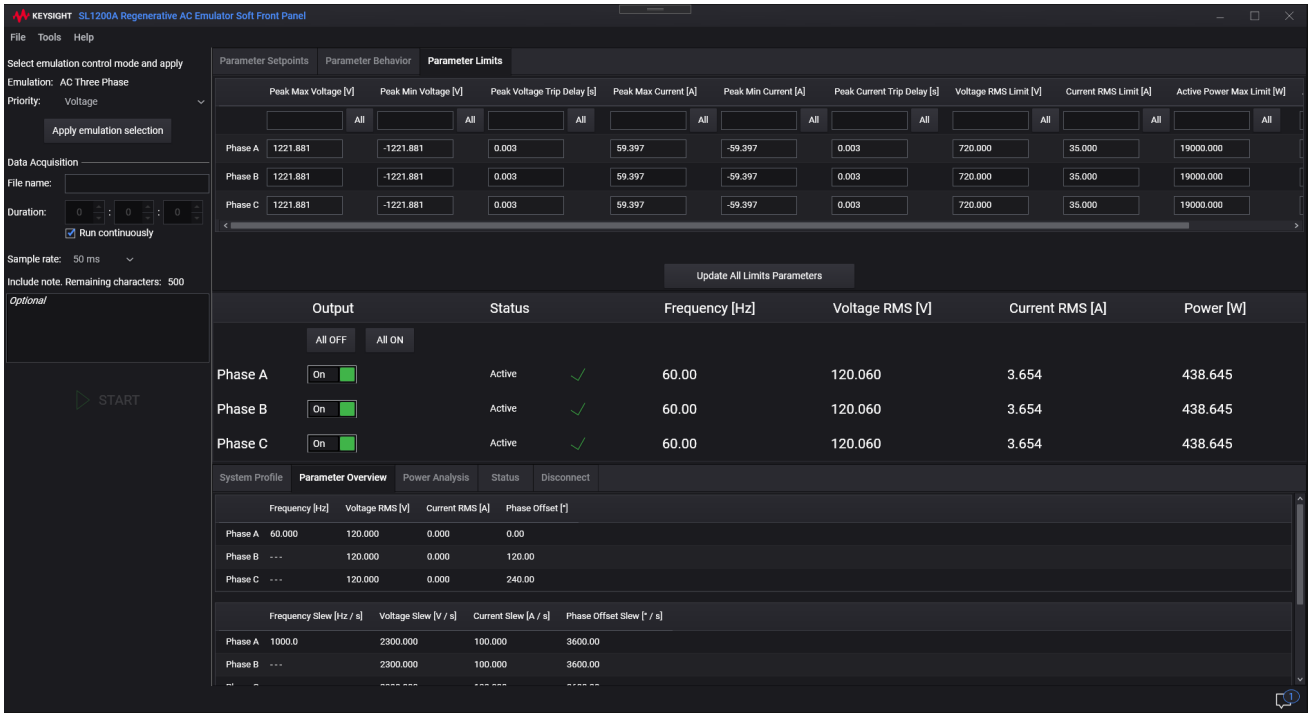



Figure 2. Parameter limits and overview tabs

## Complete Solutions for Automotive and Energy Applications

When paired with Keysight's energy test solutions, the SL1200A Series provides a complete solution for PV Inverter, Energy Storage System inverter, and Charging (EV and EVSE) test.

Keysight automotive and energy test solutions:

- Solar Array Simulation Solution for PV Inverter Test
- Charging Discovery System for EV and EVSE Charging Test
- DC Emulator for EV and EVSE Charging Test and Inverter Test
- Machine Emulator for Inverter Test


SL1202A 45 kVA AC Emulator with SL1040A Charging Discovery System for EV and EVSE charging test

## Specifications

Unless otherwise noted, specifications are warranted over the ambient temperature range of 10 to 40 °C after a 30-minute warm-up period. Specifications apply at the output terminals, with the sense terminals connected to the output terminals (local sensing).

| | SL1201A | SL1202A | SL1203A | SL1212A | SL1213A |
|---|---|---|---|---|---|
| **Operating Modes** | AC<br>DC[1] | | | | |
| **Output Connections** | L1, L2, L3, N, PE<br>DC+, DC-, PE | | | | |
| **AC Output Ratings** | | | | | |
| Output Phase | 1, 2, or 3 (3-phase selectable, 1-phase @ max power[2]) | | | | |
| Max Power[3] | 30 kVA | 45 kVA | 90 kVA | 45 kVA | 90 kVA |
| Max Power per phase[4] | 10 kVA | 15 kVA | 30 kVA | 15 kVA | 30 kVA |
| **Voltage (rms)** | | | | | |
| Range | 0 – 600 $V_{L-L}$<br>0 – 346 $V_{L-N}$ | 0 – 600 $V_{L-L}$<br>0 – 346 $V_{L-N}$ | 0 – 600 $V_{L-L}$<br>0 – 346 $V_{L-N}$ | 0 – 1200 $V_{L-L}$<br>0 – 692 $V_{L-N}$ | 0 – 1200 $V_{L-L}$<br>0 – 692 $V_{L-N}$ |
| Prog. Accuracy | 0.25 % FS | | | | |
| Prog. Resolution | 0.1 Vrms | | | | |
| **Current (rms)** | | | | | |
| Max current (3-phase) rms | 63 A | 63 A | 125 A | 32.5 A | 65 A |
| Current @ Max Voltage | 25 A | 40 A | 80 A | 20 A | 40 A |
| Max current (1-phase) rms | 189 A | 189 A | 375 A | 97.5 A | 195 A |
| **Frequency** | | | | | |
| Range[5] (source) | 40 to 75 Hz | | | | |
| Prog. Accuracy (source) | ±0.01 % | | | | |

[1] DC mode requires Option SDC
[2] In 1-phase mode all three phases are used in parallel to achieve the max power specification
[3] Parallel up to 630 kVA (Contact Keysight for solutions > 630 kVA)
[4] Max power spec available in single-phase mode
[5] Fundamental frequency up to 75 Hz with full specifications

| | |
|---|---|
| Prog. Res. (source) | 0.01 Hz |

## Specifications (continued)

| | SL1201A | SL1202A | SL1203A | SL1212A | SL1213A |
|---|---|---|---|---|---|
| **DC Output Ratings**[6] | | | | | |
| Voltage Range | ±500 V | ±500 V | ±500 V | ±1000 V | ±1000 V |
| Current | ±180 A | ±180 A | ±360 A | ±90 A | ±180 A |
| Current @ Max Voltage | ±80 A | ±120 A | ±240 A | ±60 A | ±120 A |
| Power | 40 kW | 60 kW | 120 kW | 60 kW | 120 kW |
| **Measurement (AC)** | Vrms, Vpk, Vinst, Arms, Apk, Ainst, W, VAR, VA, Hz, PF, kWh, phase angle, crest factor | | | | |
| Voltage Accuracy | 0.3% + 0.25 Vrms | | | | |
| Voltage Resolution | 0.01 Vrms | | | | |
| Current Accuracy | 0.2% + 0.5 Arms | | | | |
| Current Resolution | 0.1 Arms | | | | |
| Freq. Accuracy (load) | ± 0.01 % | | | | |
| Freq. Resolution (load) | 0.01 Hz | | | | |
| **Measurement (DC)** | | | | | |
| Voltage Accuracy | 0.03 % +75 mV | 0.03 % +75 mV | 0.03 % +75 mV | 0.03 % +150 mV | 0.03 % +150 mV |
| Voltage Resolution | 0.1 V | | | | |
| Current Accuracy | 0.03 % +6 mA | 0.03 % +6 mA | 0.03 % +12 mA | 0.03 % +3 mA | 0.03 % +6 mA |
| Current Resolution | 0.1 A | | | | |
| **Physical Specifications** | | | | | |
| Dimensions (H x W x D) | 1.33 x 0.6 x 1.15 m | 1.33 x 0.6 x 1.15 m | 1.73 x 0.6 x 1.15 m | 1.33 x 0.6 x 1.15 m | 1.73 x 0.6 x 1.15 m |
| Weight | ~400 kg | ~400 kg | ~700 kg | ~400 kg | ~700 kg |

[6] DC mode requires Option SDC

## Supplemental Characteristics

| | SL1201A | SL1202A | SL1203A | SL1212A | SL1213A |
|---|---|---|---|---|---|
| **Voltage** | | | | | |
| Load Regulation | 0.25 % FS | | | | |
| **Frequency** | | | | | |
| Meas. Bandwidth | 16 kHz | | | | |
| Prog. Accuracy (source) | ±0.01 % | | | | |
| Prog. Res. (source) | 0.01 Hz | | | | |
| **Phase Angle** | | | | | |
| Range | 0 to 360 deg | | | | |
| Meas. Accuracy | < ±2 deg | | | | |
| Meas. Resolution | 0.5 deg | | | | |
| Prog. Setpoint Accuracy | 1.5 deg | | | | |
| Prog. Setpoint Res. | 0.1 deg | | | | |
| **Peak Current** | | | | | |
| Meas. Accuracy (AC) <100 Hz | 0.5 % + 0.5 A | | | | |
| **AC Input Ratings (source & regen. operation)** | | | | | |
| Voltage | 380 to 480 VAC ±10 % | | | | |
| Connections | L1, L2, L3, N, PE | | | | |
| Current (Option STD) | 53.7 A | 80.5 A | 161 A | 80.5 A | 161 A |
| Current (Option SDC) | 72 A | 108 A | 216 A | 108 A | 216 A |
| Efficiency | 85 % (in both source and regen operation) | | | | |
| Power Factor | 0.99 | | | | |

## Input / Output Connections

All SL1200A models have input and output connections that are easy to access and connect. The image below shows the connection cabinets on the rear-top of the system. The left cabinet is for the AC and DC output connections providing power to the device under test. The right cabinet is for the AC input connections providing power to the SL1200A system.

Figure 1. Rear connection cabinets
(may differ slightly from actual product)

## How to Order

Each model in the SL1200A Regenerative AC Emulator Series has two options available: STD and SDC.

### SL12xxA-STD standard system

This is the standard system. It supports AC and AC + DC modes. The standard system does not support DC-only mode. Extra hardware is required for DC-only operation.

### SL12xxA-SDC standard system with DC option

This is the standard system with the hardware necessary to switch from AC to DC mode installed. The hardware allows the system to change from 3-phase AC mode to single-output DC mode at full power.

## Extend the Capabilities of your Test Solution

Keysight's Scienlab Charging Discovery System Series (CDS) is a breakthrough solution for holistic test of all AC and DC charging interfaces of electric vehicles (EV) and electric vehicle supply equipment (EVSE).

You can get further information to the Scienlab Charging Test Solutions here:

From left to right: SL1040A CDS – EMC Series, SL1040A CDS – Portable Series and SL1047A CDS – High-Power Series

## Meet the SL1040A Series

The Scienlab Charging Discovery System Series from Keysight enables you to test charging interfaces of electric vehicles (EVs) and EV supply equipment (EVSE). Thanks to its modular and innovative design, you can configure the CDS to customers' specific needs and replace multiple real EV/EVSE with one test solution to ensure an optimal price-performance ratio.

- Automated functional, conformance, interoperability and quality testing for R&D, end-of-line (EOL) and Electromagnetic Compatibility (EMC) applications.
- Time synchronous measurement and decoding of communication and power signals.
- Scalable and futureproof hardware design according to CharIN e.V. CCS Test System.
- CE, UL and KC-Mark conformance certified by CSA Group.
- Extensive Test Case Library for automated conformance testing of CCS, CHAdeMO and GB/T standard.

## Meet the SL1047A Series

The Scienlab Charging Discovery System – High-Power Series (HP CDS) from Keysight enables you to test charging interfaces of electric vehicles (EVs) and EV supply equipment (EVSE) during high-power charging up to 1,500 V DC and ±600 A DC. With the CDS can perform all necessary conformance and interoperability tests according to worldwide charging standards. Our new solution, which features the separate Scienlab Cooling Unit with interchangeable liquid-cooled charging adapters, also enables a high-power upgrade of the SL1040A Scienlab Charging Discovery System – Portable Series.

- Automated functional, conformance, interoperability and quality testing for R&D and EOL applications.
- Time synchronous measurement and decoding of communication and power signals.
- Scalable and future-proof hardware design according to CharIN e. V. CCS Test System.
- CE, UL, and KC-mark conformance.
- Extensive Test Case Library for automated conformance testing of CCS, CHAdeMO, and GB/T standard.

## Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES



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