

Scienlab Battery Test System Pack Level – Up to 270 kW

SL1710A

SL1720A

SL1730A

SL1740A



Systems With an Output Power Range of 90 kW up to 270 kW

Highly efficient test of high-power components on a small footprint.

The Keysight's Scienlab Battery Test System – Pack Level with the new silicon carbide technology is a highly efficient system based on state-of-the-art technology and allows to realistically emulate the environment of the future battery pack application in order to test the high-power battery pack comprehensively and improve its functions and safety.

The test system is supplied with the advanced test and control software Scienlab Energy Storage Discover (ESD). It helps the user to draw conclusions about durability, range and efficiency, the communication, functioning, heating of the pack and the interaction with other components such as the SL1010A Scienlab BMS Environment (BMS).

The possible switching frequency of silicon carbide transistors is more than a factor ten greater than the switching frequency of IGBTs. This results in a significantly higher efficiency and, conversely, a lower cooling power requirement and lower energy consumption. This space-saving technology without the need for large cooling systems enables systems with small installation space.

- Smaller footprint compared to systems with similar power
- 1.5 MW power due to parallelization
- Up to 1500 V DC for high voltage batteries
- Based on new high-voltage silicon carbide (HV-SiC) technology
- Highly efficient with a recovery capability of up to 96%
- Reduced energy consumption and cooling water
- Pre-charge function¹

¹ Functionality to set the output voltage to the voltage level of the battery before a test starts, even while the battery contactors are open (open circuit).
By doing so, the battery recognizes a counter voltage and is able to close the contactors in order to start the actual test.

Specifications

In the following, a distinction is made in the technical data between specifications and supplemental characteristics. Unless otherwise noted, specifications are warranted over the ambient temperature range of 5 to 40 °C after a 30-minute warm-up period.

| | SL1710A | SL1720A | SL1730A | | SL1740A | | |
|------------------------------|--|---------|---------|-------|---------|-------|-------|
| Power stages | 1 | 1 | 2 | | 3 | | |
| Power options | 90 kW | 90 kW | 180 kW | | 270 kW | | |
| Current options ¹ | 300 A | 300 A | 300 A | 600 A | 300 A | 600 A | 900 A |
| Voltage options ² | 50 to 1000 V 50 to 1200 V 50 to 1500 V | | | | | | |

¹ Parallel connection of several systems possible to achieve higher currents. If two or more systems are connected in parallel, all output stages are supplied equally regardless of the actual current class of the individual systems. In this case, the cross-sections of the DC cables must be designed accordingly. Test up to 1.62 MW (3600 A) packs with a parallel connection of up to six systems e.g., by connecting the individual DC cables to a remote power terminal (RPT) or a power switch terminal (PST).

² Additional voltage range of 20 to 300 V with option [SL17X0A-F02](#).

| Voltage | 1000 V | 1200 V | 1500 V |
|-------------------------------|--|--------|--------|
| Voltage accuracy ¹ | ±0.03% of measured value, ±150 mV (offset) | | |

¹ Measurement and programming accuracy; Number of Power-Line-Cycles (NPLC) = 100.

| Current | 300 A | 600 A | 900 A |
|-------------------------------|--|-------|-------|
| Current accuracy ¹ | ±0.03% of measured value, ±150 mA (offset) | | |

¹ Measurement and programming accuracy; Number of Power-Line-Cycles (NPLC) = 100.

Supplemental Characteristics

Supplemental characteristics are not warranted but are descriptions of performance determined either by design or by type testing. Supplemental characteristics are typical unless otherwise noted and apply at the DUT in compliance to the specified load line length, with the sense terminals connected to the output terminals (local sensing).

| Current | 300 A | 600 A | 900 A |
|---------------------------------|--|---------------|---------------|
| Ripple | <1.0 A _{eff} | | |
| Rise and fall time ¹ | -300 → +300 A | -600 → +600 A | -900 → +900 A |
| | <1 ms @ 300 V DC measured from -90 → +90% ² | | |

¹ No switching times within power stage or channel at transition from positive to negative current and vice versa.

² 2x 10 m load lines, 185 mm² cable-cross section.

Data acquisition

| | |
|-------------|---------------------------------|
| Resolution | Single-precision floating-point |
| Sample rate | Max. 1 kHz |

System cabinet

| System | Weight | Height ¹ x Width x Depth ² |
|---------|---------|--|
| SL1710A | 980 kg | 2.15 x 1.51 x 0.6 m |
| SL1720A | 1350 kg | 2.15 x 2.41 x 0.6 m |
| SL1730A | 1600 kg | |
| SL1740A | 1850 kg | |

¹ Rollers increase the height by 4 cm.

² Depth incl. (emergency stop) push buttons.

Note: A magnetic signal lamp with a height of 40 cm can be mounted variably at the cabinet and therefore does not necessarily have an influence on the system height.

- Protection class I
- Degree of protection IP54
- Heat dissipation at the system max. 1 kW @ 270 kW full load
- Control cabinet color: RAL 7035
- Ambient temperature: 5 to 40 °C
- Air humidity: max. 80% relative humidity

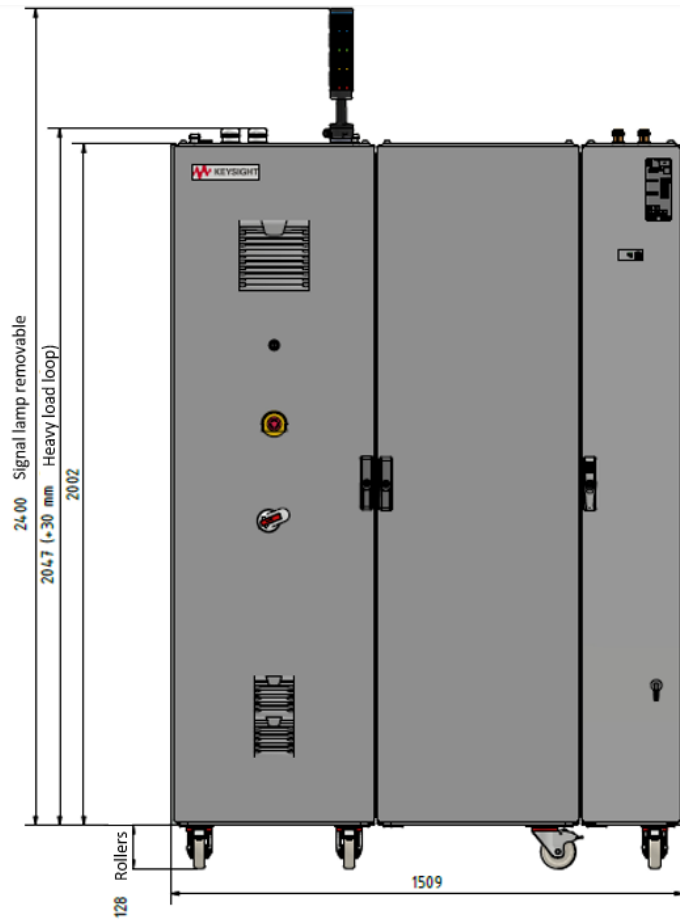


Figure 1. 90 kW System – front view incl. dimensions in mm.

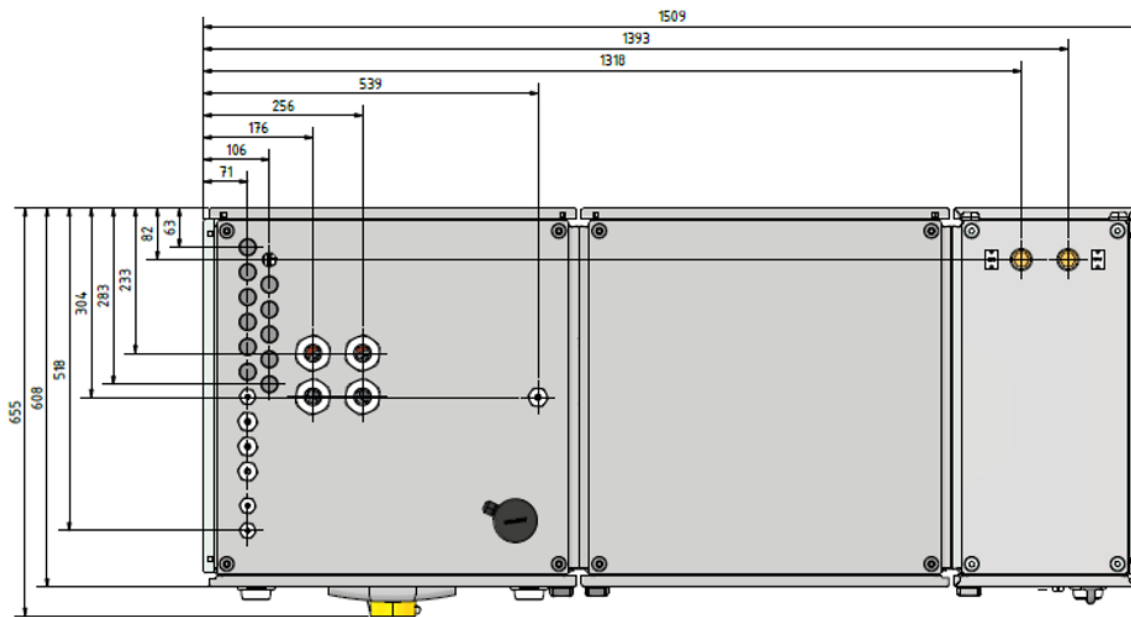


Figure 2. 90 kW System – top view incl. dimensions in mm.

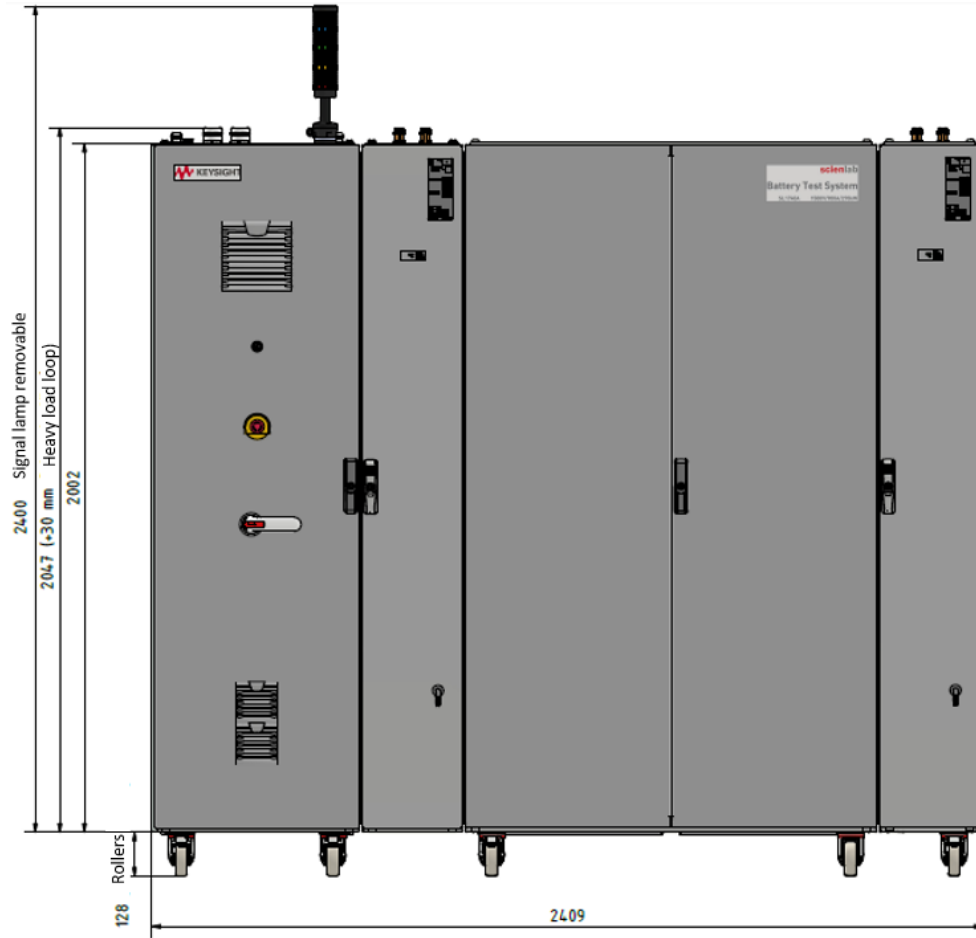


Figure 3. 270 kW System – front view incl. dimensions in mm.

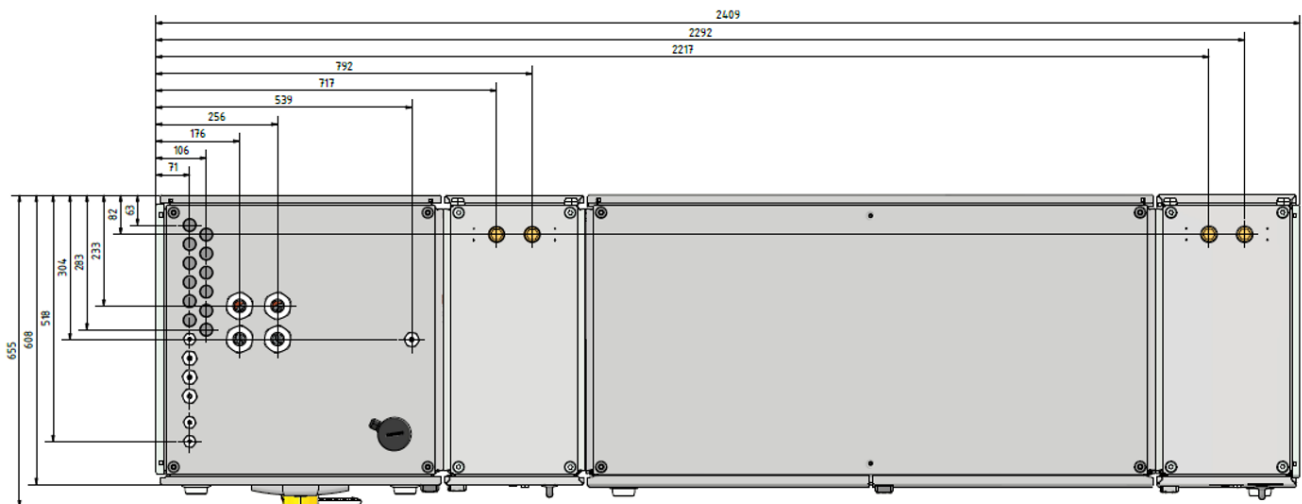


Figure 4. 270 kW System – top view incl. dimensions in mm.

System AC power and system cooling

System AC power

| | | | | |
|--|--|------------------|------------------|----------------|
| Efficiency | Up to 96% | | | |
| Mains supply | 3 ~, Protective Earth, 380/400/480 V, 50/60 Hz | | | |
| Input current In / Mains supply fuse provided on site¹ | 90 kW | 180 kW | 270 kW | |
| 380 VAC | 150 A / 160 A gG | 301 A / 315 A gG | 451 A / 500 A gG | |
| 400 VAC | 143 A / 160 A gG | 286 A / 315 A gG | 429 A / 500 A gG | |
| 480 VAC | 119 A / 125 A gG | 238 A / 250 A gG | 357 A / 400 A gG | |
| System cooling | SL1710A | SL1720A | SL1730A | SL1740A |
| Cooling type | Water/air heat exchanger | | | |
| Max. heat transfer @ ≥800 V | 3.6 kW | 3.6 kW | 7.2 kW | 10.8 kW |
| Cooling unit per system | 1 | 2 | | |
| Cooling water temperature | Internal thread, inlet | ¾", 7 to 22 °C | | |
| | Internal thread, outlet | ¾", max. 27 °C | | |
| Max. flow rate per cooling unit | 0.29 l/s | 0.14 l/s | 0.29 l/s | 0.43 l/s |
| Inlet pressure | 6 bar | | | |
| Pressure difference | >1 bar | | | |

¹ Values recommendation for European Union (EU); consider country-specific standards.

- Power contactors on the mains side ensure voltage-free operation
- Output contactors capable of disconnecting at full load current
- Emergency stop with PL=d according to EN ISO 13849
- Discharge of all internal high-voltage sources with regard to service
- Integration into Test Bench Software (ESD) and Test Bench Guard (TBG)
- Insulation resistance: ≥ 30 MΩ
- Inherent safety against overheating, overpower, short-circuit
- Reverse polarity protection
- Signal light with magnetic mounting
 - Red: Error; Yellow: Active, Green: Ready

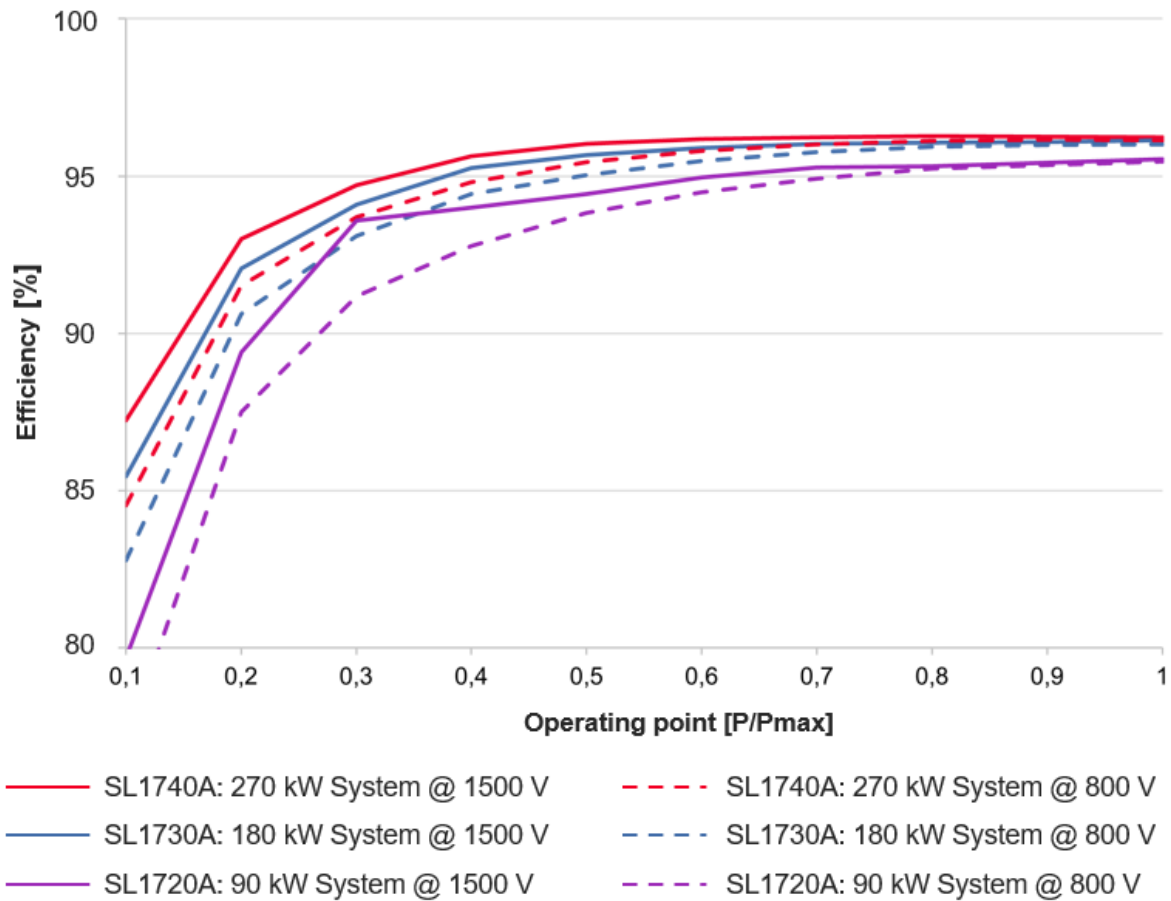


Figure 5. Efficiency curve SL1720A, SL1730A and SL1740A for 800 and 1500 V.

Documentation

- Operating instructions in English
- CE Declaration of Conformity
- UL Declaration of Conformity
- KC Declaration of Conformity

System design and realization according to applicable safety and regulatory requirements (such as EU Directives). Special customer standards are not taken into account by default and require explicit agreement and quotation.

System Options

System type

SL17X0A-HOS Host system with Test Bench Control System

Battery Test System with an integrated industrial PC to control the overall test stand via the automation Software Energy Storage Discover.

SL17X0A-MBX Member system 1 to 5

Additional Battery Test System for increasing the power/current/channels of the battery test system group.

Additional features

SL17X0A-F01 Fine current range (200 A)

- Measuring range: ± 200 A
- Accuracy: $\pm 0.03\%$ of measured value, ± 40 mA (offset)

SL17X0A-F03 Fine current range (50 A)

- Measuring range: ± 50 A
- Accuracy: $\pm 0.03\%$ of measured value, ± 10 mA (offset)

SL17X0A-F02 Fine voltage range (20 to 300 V)

- Voltage Range: 20 to 300 V
- Accuracy: $\pm 0.03\%$ of measured value, ± 45 mV (offset)

Cabinet base option class

SL17X0A-C01 Base stand

Battery Tester is placed on top of base stand.

SL17X0A-C02 Rollers

Battery Tester is placed on top of heavy-duty rollers and can be moved flexible.

Additional cabinet options

SL17X0A-C03 Mirrored cabinet layout

To provide a higher flexibility for the lab design a mirrored cabinet layout is available.

SL17X0A-C04 Halogen-free cables

Cabling inside the system cabinet with halogen-free material.

SL17X0A-C05 Cabinet interior lighting

Illumination of the output terminals in the control cabinet.

Safety functions

SL17X0A-T01 Insulation monitor

Insulation monitor Bender iso685 to supervise the isolation value of the connected DUTs.

SL17X0A-T02 Insulation monitor – key switch

Key switch for enable/disable the insulation monitor. The following operation modes are available:
0: Auto, 1: Off, 2: On

SL17X0A-T03 Test Bench Guard

Beckhoff Industrial PC and safety programmable logic controller (PLC) for operating a battery test stand in a safe and supervised condition. The individual safety matrix is the backbone of the system and defines the reaction of the safety measures in a certain situation. The safety matrix is always tailored to the customer's hazard and risk analysis.

SL17X0A-T04 Redundant current/voltage measurement

- Redundant DUT current and voltage measurement to maintain the safety of the test stand.
- Only available with Test Bench Guard.

Upgrade options

Power upgrades

Extension of the SL1720A or SL1730A system with additional 90 kW/300 A power stage.

- SL1700AU-PU1 Power upgrade (90 kW to 180 kW)
- SL1700AU-PU2 Power upgrade (90 kW to 270 kW)
- SL1700AU-PU3 Power upgrade (180 kW to 270 kW)

Voltage upgrades

Extension of the voltage range to 1200 V or 1500 V.

- SL1700AU-VU1 Voltage upgrade (1000 V to 1200 V)
- SL1700AU-VU2 Voltage upgrade (1000 V to 1500 V)
- SL1700AU-VU3 Voltage upgrade (1200 V to 1500 V)

Current upgrades

Increase the output current of a system. If the maximum achievable current is already reached (see table on page 3), further increase is only possible with additional hardware (power upgrade or an additional system connected in parallel).

- SL1700AU-CU1 Current upgrade (300 A to 600 A)
- SL1700AU-CU2 Current upgrade (300 A to 900 A)
- SL1700AU-CU3 Current upgrade (600 A to 900 A)

Project Management, Consulting and Installation Services

Service features depend on the facilities, customer expertise, and overall scope of the project. For that reason, it is not possible to give exact service efforts without knowing the customer's requirements and goals. Keysight offers the following services to secure a successful project execution and reduce ramp-up time for our customers.

PS-XPM-100-SL Project management services

Keysight recommends Project management services for each test bench project. By ordering the Project management services, an experienced project manager is dedicated to your project and acts as a direct communication interface from Keysight to the customer's project management team.

The project manager takes over the responsibility:

- To develop and manage the project plan.
- To track project progress and milestones.
- Communication project status regularly and ensure any unscheduled project events or project deviations are communicated and promptly discussed with the customer project team.
- To provide complete and accurate project documentation to the customer.

PS-XINS-100-SL Project installation services

These services provide installation expertise to manage, deliver and coordinate local facilities installation for the test bench. Specific installation efforts depend on the customer's individual facility, the locally available power and cooling and the test bench being delivered.

PS-XENG-100-SL Project engineering services

Project engineering services provide specialized engineering services during project development and implementation. The customer's project team will have access to engineering expertise to aid in various tasks specific to their project including but not limited to – safety matrix and test bench guard, facilities and lab layout, special power requirements, etc.

PS-XCOM-100-SL Project commissioning services

Project commissioning services for the test solution provide an experienced test bench engineer to validate and complete the test bench setup in readiness for the customer's initial usage. It includes validating specific hardware and software configurations per the project requirements and any specific consulting agreed to beforehand, given the test bench's customer-specific usage.

KeysightCare for Solutions

KeysightCare for Solutions services goes beyond basic warranty, providing a priority-one connection between our resources and your teams. Every support tier includes access to the Keysight Support Portal and Knowledge Center where you can find answers, manage service requests, and interact with Keysight experts familiar with the instruments and software you are using and the challenges you face. And all the packages offer onsite options for large systems which cannot be moved.

- Warranty Plus – Reduce risk and avoid project delays with technical support coverage.
- Assured – Increase supportability to match your application needs with a committed turnaround time.
- Enhanced – Keep your project schedules on track and receive priority support and even faster turnaround times for repairs and calibration to optimize your solution.

Service deliverables

| | KeysightCare for Solutions Warranty Plus | KeysightCare for Solutions Assured | KeysightCare for Solutions Enhanced |
|---|---|---|---|
| | Onsite Upgrade R-55T-005- X ¹ | Onsite Upgrade R-55U-005-X ¹ | Onsite Upgrade R-55V-006-X ¹ |
| Solution technical support (SW² & HW) | | | |
| Keysight Support Portal & Knowledge Center, 24x7 | • | • | • |
| Remote technical support response time ³ | 2 business days | 4 business hours | 2 business hours |
| Onsite Technical Support ⁴ | | • | • |
| Solution hardware support | | | |
| Repair service coverage | Onsite | Onsite | Onsite |
| Onsite response time | No commitment | 12 business days response time ⁶ | 5 business days response time ⁶ |
| Solution calibration ⁷ | | | Up to Keysight calibration + uncertainty + guard banding - Onsite |
| Calibration turnaround time | | | Scheduled |
| Application of service notes | Safety and recalls | Recommended - during service | Recommended - proactive |
| Preventative maintenance ⁵ | | | • |
| Proactive firmware release notifications | | • | • |

1 When ordering, update with the relevant (Solution Product Number (SPN) based on the length of service required (e.g. -1, -2, -3, or -5 for 1 year, 2 years, 3 years or 5 years).

2 KeysightCare Software Agreement required for software support.

3 Remote Technical Support Response time is measured from the time you contact the KTAS team to have an initial meaningful response from the case owner.

4 Onsite technical support is provided or at the discretion of Keysight.

5 3rd party products are excluded for assured and enhanced packages.

6 Response time is measured from the date the service request is received to the date Keysight arrives at your site.

7 Recommended re-calibration period is 12 months.

Find out more about KeysightCare Service and Support [here](#).

Extend the Capabilities of your Scienlab Battery Test System

Keysight provides battery test system software that starts with Scienlab Energy Storage Discover to control your individual battery test systems such as the SL1000A and extends to PathWave Lab Operations for Battery Test to manage and coordinate your entire battery testing laboratory with multiple systems used to test cells, modules, and battery packs.

SL1091A Scienlab Energy Storage Discover

Scienlab Energy Storage Discover (ESD) is the intuitive test-software environment for developing, performing, and analyzing tests for an individual test system.



Figure 6. Scienlab Energy Storage Discover controls individual test systems.

- Central controlling component for all Keysight Scienlab-brand energy storage test environments.
- Comprehensive overview, user-friendly operation, easy-to-learn.
- Powerful visualization of tests and results.
- ESD supports creating test programs even offline.
- Available simulation environment for offline test.
- Ethernet communication with the battery test system.
- Easy integration with external control and monitoring software via optional standardized remote interface.
- Holistic vehicle emulation from the perspective of battery cell, module and pack levels.
- Support for Windows 10. Single software license per workstation.
- Integration of external components into the test environment and process, such as environmental chambers, cooling and heating equipment, or optional Scienlab-brand Measurement and Control Modules.

Find out more about Scienlab Energy Storage Discover [here](#).

EP1150A PathWave Lab Operations for Battery Test

PathWave Lab Operations for Battery Test enables efficient planning and coordination of your entire battery test laboratory. It manages all resources, including test facilities, test systems, and your test objects or devices under test (DUTs). PathWave Lab Operations for Battery Test provides an integrated, web-based lab management platform that helps you modernize your test workflows, eliminating legacy paper-based processes, and increasing data integrity and traceability.

This powerful tool helps you to improve test throughput for all the cells and batteries you need to test, to fulfill the testing requirements for your projects on-schedule, and to optimize test asset utilization.

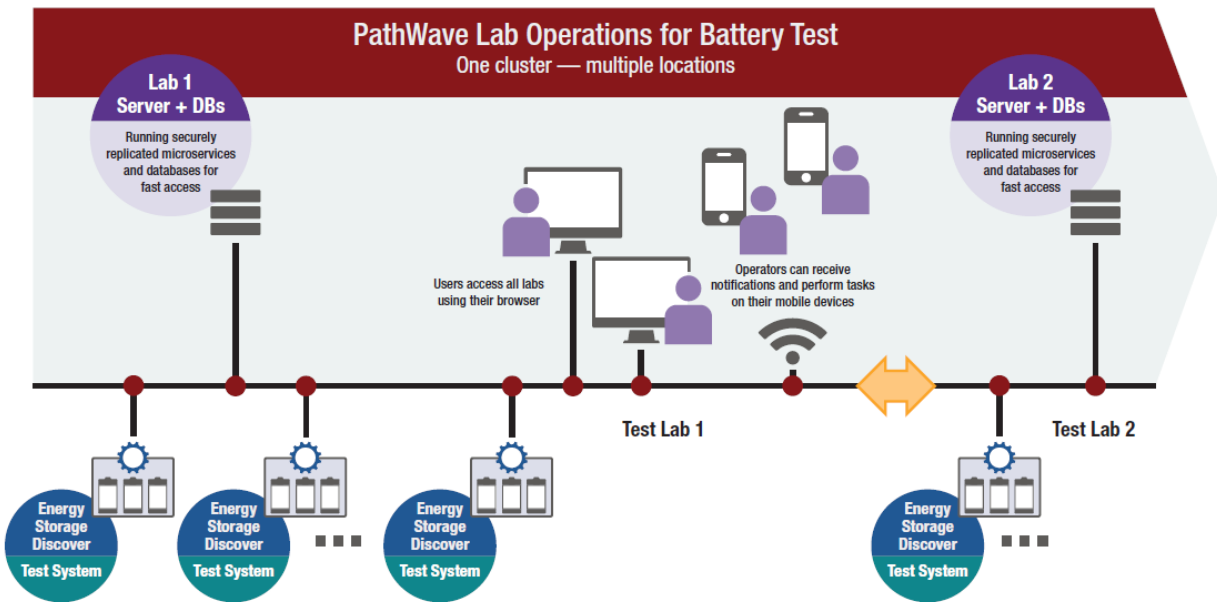


Figure 7. PathWave Lab Operations for Battery Test manages multiple test systems in a laboratory.

- Easily register and track test objects in your lab.
- Quickly analyze your data and statistics.
- Organize your test lab workflow, documents, lab orders, and tasks.
- Plan and optimize your test capacities and sequences.
- Share and control test plans, results, data, and other documents. Collaboration and discussion among lab staff become easy and productive.
- Remotely control your lab and its devices anywhere, anytime.
- Manage and route notifications to your preferred device or email service.
- Automated, networked, and scalable for any size of testing lab – up to thousands of channels.

Find out more about PathWave Lab Operations for Battery Test [here](#).

Meet the SL106XX Series Scienlab Measurement and Control Module

The Scienlab SL106XX Series covers a wide range of test, measurement, and control tasks. If required, you can combine your measurement task and scope.

They are ideal for carrying out challenging measurement tasks, even under difficult environmental conditions, for example, a climate chamber. The modules offer top quality, robustness, and easy and intuitive operation.

- Precise, reproducible, and time-synchronous measurement data recording
- Fully electrically isolated measurement channels up to 1000 V insulated between each channel
- Connection via open Ethernet interface; automatic detection of Scienlab Energy Storage Discover (ESD) software
- Easy to use in challenging test environment (-40 to +80 °C, IP20)
- Individual combination of different measurement module types

Find out more about the Scienlab Measurement & Control Modules [here](#).