solartron analytical / AMETEK

Solartron *Stand-Alone* Battery Cyclers



These unique battery cyclers from Solartron have specialized built-in circuitry that removes the need for costly and space consuming cabinets; allowing cycler modules to be positioned precisely where they are needed, close to climate chambers, test fixtures etc.

Advantages include:

- Much shorter cable runs vs. centralized cabinet-based systems – increasing lab space and EIS performance
- Easier cell connection
- Local data collection using desktop NAS drive, or centralized via Ethernet network connection as required
- Direct to disk data storage

SI-9300R-SA

- Power requirement – 3-phase power connection
- Regenerative power (high channel density, low operating cost)
- 1, 2, 3 or 4 channels per module
- ±200 A per channel (maximum ±800 A in parallel)
- +300 mV to +10 V
- EIS per channel (not multiplexed)
- Anode/Cathode DC/EIS
- All test types including arbitrary waveform

SI-6200

- Power requirement – standard single phase power outlet
- 10 channels per module
- ±200 mA per channel (maximum ±2 A in parallel)
- –3 V to +10 V
- EIS per channel (not multiplexed)
- All test types including arbitrary waveform

Locate test modules anywhere….

Regenerative technology –high channel density, efficiency, power savings

Multiple Current Ranges 300 A / 20 A / 2 A 24-bit ADC resolution

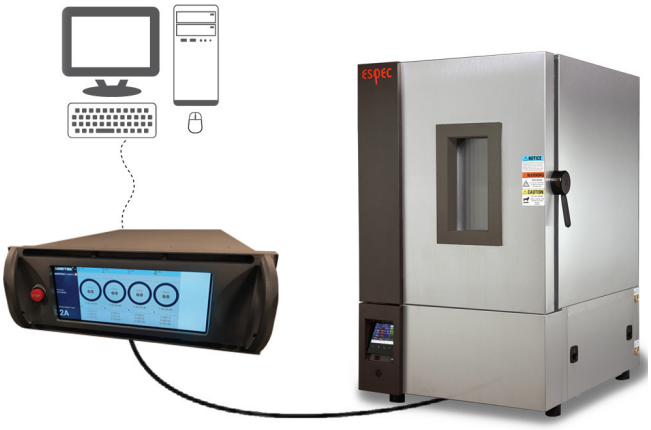
Impedance measurement per channel as standard (not multiplexed)

Direct-to-Disk patented technology – reliability and high data acquisition rates

Stand-Alone Battery Cyclers

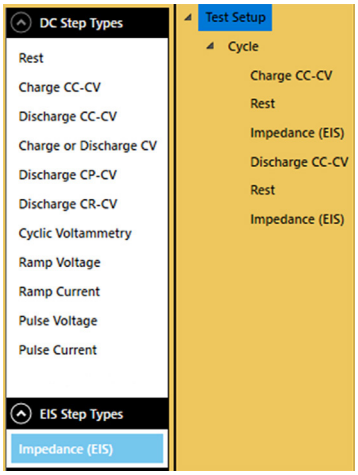
The SI-9300R-SA and SI-6200 battery cyclers offer stand-alone configuration. Cabinets are not required for these test systems, allowing them to be conveniently located close to test fixtures and climate chambers, minimizing cable lengths and maximizing EIS accuracy.

PC and data storage can either be located together with the cyclers, or, via Ethernet can be located separately as preferred.



Test Type

Solartron cyclers are able to run the complete range of test types to test batteries, fuel cells, electrolyzers and supercapacitors.



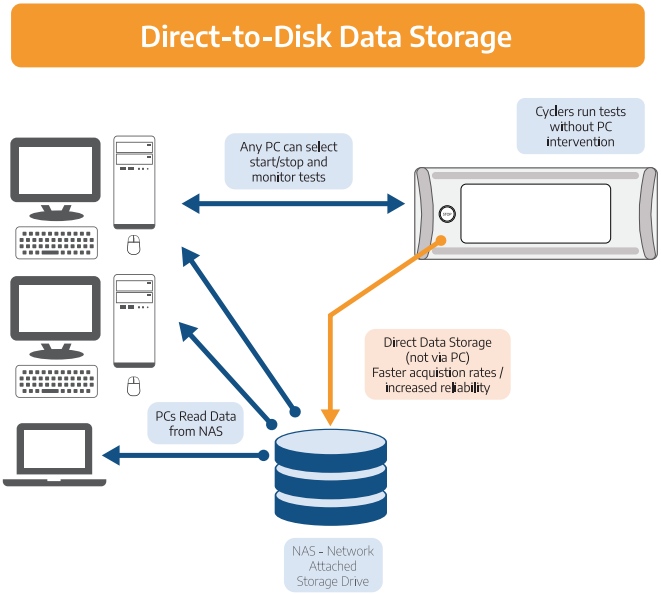
Floating Operation

External ground is provided as a standard facility that allows connections to cells that are connected to ground. This feature is also used when channels are grouped together for high current tests.

High-Speed Data Capture (All Channels)

Solartron cyclers use unique, patented, Direct-to-Disk technology to save data direct from cycler channels via Ethernet to network disk drive (without PC intervention). This provides the following advantages:

- Data can be collected and saved at full data rate (1000 samples/second) on ALL channels simultaneously. There is no system data rate limit, which enables detailed data to be collected on all channels from, for example, pulse tests.
- PC lockups have no effect on tests that are running, data is collected as normal as PC is not involved in data collection and storage to disk.



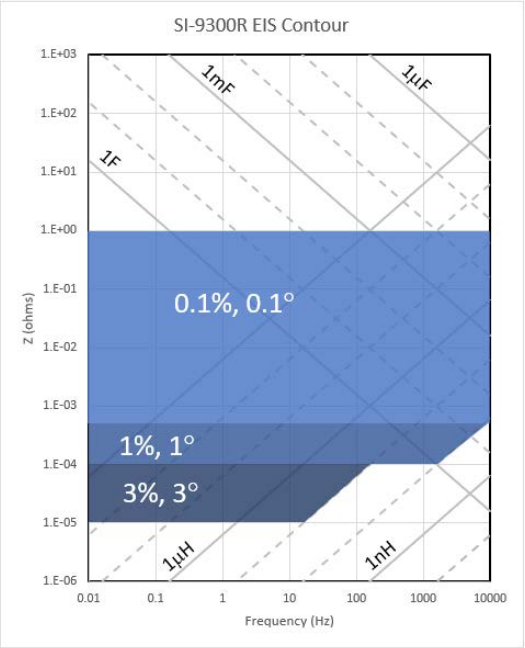
High Current Configurations

Solartron cycler modules are configurable in many ways, enabling fully independent tests to be run on each channel or alternatively, for multiple channels to be grouped enabling higher current tests. This provides a lot of flexibility for testing cells of different Ah capacity.

Advanced Capabilities:

Affordable, EIS per channel as Standard

Solartron renowned FRA technology on each measurement channel. Unlike expensive multiplexed solutions, Solartron has been able to deliver this capability without increasing system cost. Furthermore, each channel has two auxiliary voltage measurement channels as standard allowing impedance measurements on individual electrodes within a cell. The SI-9300R offers all of this plus the ability to live fit EIS data while tests are in progress for instant cell diagnostics.



Urban Profiles (FUDS cycles)

Direct-to-Disk technology is particularly suited to reproduction of Urban Profiles (arbitrary waveforms). The NAS drive can hold multiple arbitrary waveforms that are unlimited in length and have time resolution to 1 msec. Profiles are read directly by the cyclers one segment at a time. Multiple waveforms can be automatically sequenced and can even be sequenced with EIS and standard charge/discharge tests.

System Variables

Control parameters can be automatically sequenced in loops using variables. This makes it easy to create loops that partially charge or discharge cells and characterize EIS at each State of Charge (SoC).

Climate Chambers

The Aspire Energy PC software is compatible with climate chambers including those from ESPEC. The software is able to control temperature and humidity as part of integrated test setup including the full range of electrical tests CC-CV, CP-CV. . . and EIS. The climate chamber driver can easily be adapted to add more chamber options from other suppliers.

Temperature and humidity data collected from the chamber is automatically integrated with cycler data so that correlation of climate chamber events together with cycler data can easily be investigated from within the Aspire software package.





Data Loggers

The Aspire Energy PC software is compatible with data loggers including the EX1401 from VTI-Ametek. Temperature and voltage measurements from data loggers are fully integrated with cycler data allowing, for example, electrical and temperature events to be easily correlated within the Aspire software package.

A range of different thermocouples can be used.

Additional data logger types can easily be added as needed by adapting one of the existing drivers.

Key Specifications

	SI-9300R-SA	SI-6200
System architecture	Cabinet based or Stand-alone	Cabinet based or Stand-alone
Number of channels/modules	SI-9300R-SA-xCH Where “x” is 1 – 4	SI-6200 10 channels
DC measurement sample rate	Up to 1 kS/s	Up to 1 kS/s
Data storage	Direct-to-Disk	Direct-to-Disk
Voltage range	300 mV to 10 V	–3 V to 10 V
Voltage resolution	20 µV (24-bit ADC)	20 µV (24-bit ADC)
Current measurement	Flux-gate 3 ranges	Shunt 5 ranges
Current range per channel	±200 A (300 A pulse)	±200 mA
Current range parallel channels	±800 A	±2 A
Maximum current resolution	2 µA (24-bit ADC)	40 pA (24-bit ADC)
EIS capability	Built-in All Channels	Built-in All Channels
EIS frequency range	10mHz to 10 kHz	1 mHz to 20 kHz
Internal auxiliary inputs	2 inputs, each configurable as voltage or temperature (thermistor)	1 temperature (thermistor)
External auxiliary inputs	16 inputs per unit, each configurable as voltage or temperature	16 inputs per unit, each configurable as voltage or temperature
Integration 3rd party equipment	Data Loggers, Climate chambers	Data Loggers, Climate chambers
Power	Three phase 200 – 480 V AC 5.5 – 11 kW	Single phase 100 – 240 V AC 50/60 Hz, 200 VA

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