

Automobile, Transport machine, Electric storage facilities / Research and development, Quality assurance

Streamline Battery Management System (BMS) Testing with a Dedicated High-precision Generator

It can simulate a real battery with high accuracy and flexibility.



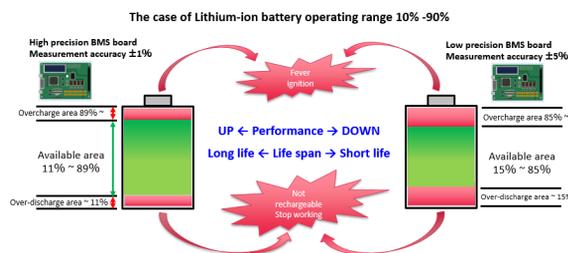
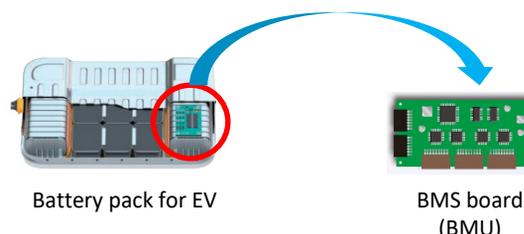
Battery Management System (BMS) and its testing

xEVs and electric storage systems use rechargeable batteries such as lithium-ion batteries.

BMS (also known as Battery Management Unit or BMU) is required to operate these rechargeable batteries with high efficiency, long life and safety.

It is required for BMS that Cell-to-cell voltage balancing, state of charge (SOC) estimation, state of health (SOH) estimation and abnormal detection.

Depending on the performance of the BMS, the operational efficiency of the rechargeable battery will vary greatly. Therefore, reliability evaluation tests to ensure BMS quality are important.



Issues faced by BMS reliability evaluation tests, and improving efficiency

The table on the right summarizes typical test methods and issues.

In Method 1 and Method 2, which combine real batteries and BMS, it is not possible to conduct tests under reliable verification conditions. This is an issue.

On the other hand, in Method 3, the power supply and digital multimeter are connected to the BMS as a battery cell emulator for testing. In addition to the complexity of control and wiring, the problem is the cost when there are many channels.

In the next page, we will introduce a method to solve these issues.

Quality	Details of confirmation
Cell balance operation	High-precision measurement of each cell voltage
Managing cell voltage/current/temperature	High-precision measurement of voltage/current/temperature
Abnormal detection of cell voltage/current/temperature	Normal operation of error detection
Managing cell remaining capacity/degradation	High-precision estimation of remaining capacity and degradation
Protection of cell and BMS circuit	Normal operation of the protection circuit

BMS quality check items

Method	Multiple Battery Cells + Multiple voltmeters
Issues	<ul style="list-style-type: none"> • Being careful when handling the actual battery. • Factor of measurement error due to individual battery differences • Measurement error factor due to battery deterioration • Difficult to Create Verification Conditions
Method	Single Battery + Divided voltage by resistance
Issues	<ul style="list-style-type: none"> • Being careful when handling the actual battery. • Measurement error factor due to resistance value variation • Measurement error is caused by divided voltage when the resistance value is variable. • Difficult to create verification conditions
Method	Multiple power supply + Multiple digital multimeter
Issues	<ul style="list-style-type: none"> • Increase in cost by the number of channels • Complicated control of each device and wiring processing • Enormous amount of maintenance for each device

Typical test methods and issues

Generator developed for BMS testing Battery Cell Voltage Generator SS7081-50

HIOKI "Battery Cell Voltage Generator SS7081-50" incorporates a DC power supply for 12 cells, voltage and current meters, and a simulated relay in a single housing. It can be connected to the BMS board as a battery cell simulator for testing.

In addition, cell balancing, charge/discharge simulation, and abnormality detection confirmation are possible by connecting to PC via LAN cable and using the supplied application.

Up to 1kV (17 units) can be supported by adding additional units and connecting each cell in series.

The following are the main features.

- Integrated 12-cell power supply, electronic load and digital multimeter into one unit
- Industry-leading voltage output precision and voltage and current measurement accuracy
- Safety and simple simulation functions
- Control and simulation by the attached PC application
- Reliable and reliable support by the International standard calibration organization

The performance of rechargeable batteries is improving every day. In conjunction with this, the requirements for BMS quality are expected to become increasingly stringent. Battery Cell Voltage Generator SS7081-50 has the capability to match such stringent requirements.

Can be mounted on a battery HILS

(HILS: Hardware-In-the-Loop Simulation)

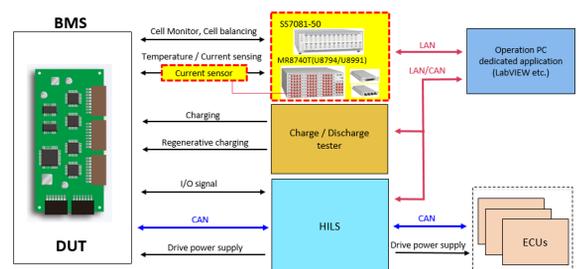
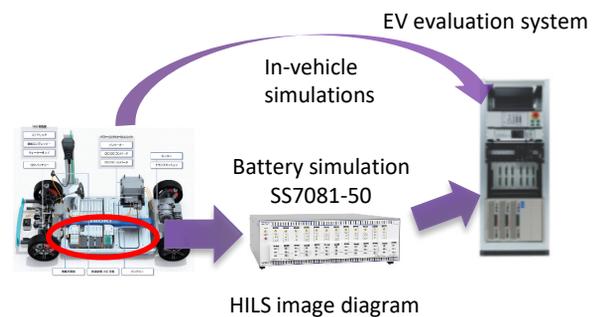
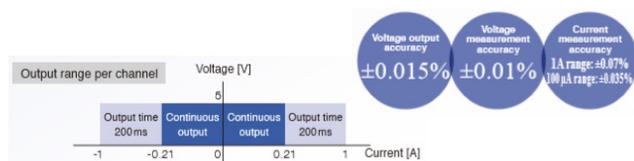
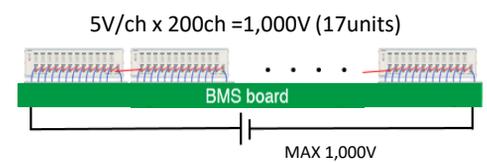
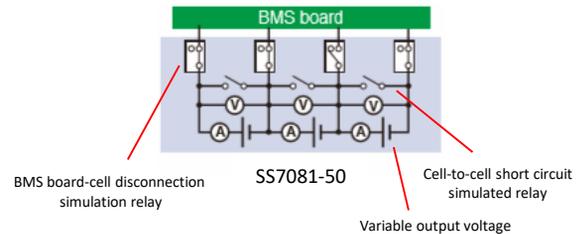
In the development of xEVs, virtual simulated evaluation HILS has become the mainstream instead of actual performance evaluation.

BMS development is also shifting to HILS development.

The SS7081-50 can be embedded in a battery HILS for linked evaluation testing.



SS7081-50



BMS development HILS configuration example

Products Used

- BATTERY CELL VOLTAGE GENERATOR SS7081-50 (Main unit, an application software)
- MEMORY HiCORDER MR8740T (Main unit, an application software)
- DIGITAL VOLTMETER UNIT U8991 (Installed in MR8740T)
- VIR GENERATOR UNIT U8794 (Installed in MR8740T)

Information valid as of March 2021. Specifications are subject to change and revision without notice.