



Battery Test Bench

Acquisition of Automated Cell and Battery Test Stations

Final report

The Empa Laboratory for Electronics/Metrology/Reliability is involved in two recently started CCEM projects in the field of electro-mobility: Ultra-Fast Charge of Electrical Vehicles (UFCEV) and Customized Hybrid Powertrains (Cohyb). Both projects are directly related to energy storage systems, in particular Li-ion batteries.

In addition to the performance of batteries their reliability, safety and lifetime are of high relevance, and different for each battery technology and application. The Empa Laboratory for Electronics/Metrology/Reliability is well established to perform battery degradation and lifetime testing and modelling. The acquisition of an automated test stations will lead to unique capability for testing and analyzing cell packs and large batteries at Empa.

Status of project

CCEM has approved a considerable contribution for the purchase of equipment for testing and analyzing small cells (up to 5 V, 100 A/300 A) as well as large batteries used in hybrid and electric vehicles.

The large 500 kW (500 V, 1000 A) battery tester with grid feedback will be a unique facility in Switzerland for the characterization and stress testing of high power batteries used in electro-mobility (figure 3).

The battery under test is placed in a temperature controlled safety container ($-30\text{ }^{\circ}\text{C}/+30\text{ }^{\circ}\text{C}$) made inert with nitrogen (figure 1).



The 6-channel cell tester will be used to perform research on degradation and failure mechanisms of electrochemical storage units, i.e. mainly Li-ion-cell packs. The cell tester is equipped with a multiplexed frequency response

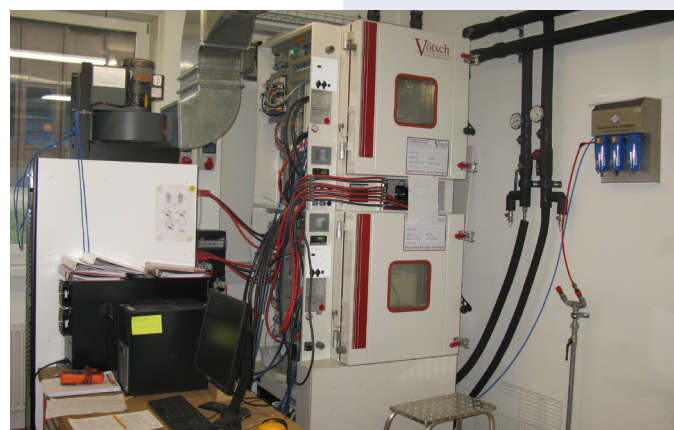


Figure 1 (upper left): Battery safety container.

Figure 2 (upper right): Cell tester with two 210 L-liter safety chambers.

analyzer (1 mHz to 30 kHz) for comprehensive impedance characterization (figure 2).

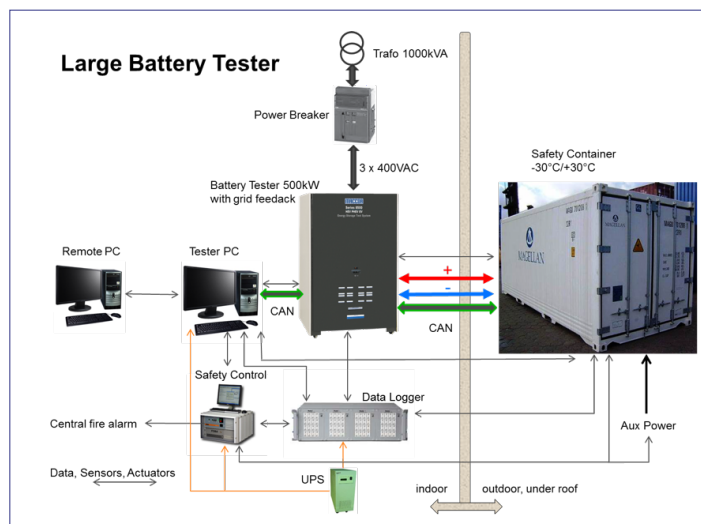
Sophisticated equipment such as SEM, TEM, Helium-FIB etc. and failure analysis know-how of the Empa reliability laboratory is provided for physical and electrochemical materials analysis down to the nano scale.

A key feature of both testers is the possibility of direct translation of measured vehicle battery drive loads into stress test programs.

Outlook

Cell tester fully operational since August 2012. Large battery tester installed and tested. Full operation February 2013.

Figure 3 (lower left): Schematic diagram of large battery tester.



Main Investigator

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Project Partners

Empa