



# AVL Battery Lab Solutions

Electrifying the future from cell testing to full lab integration

As an independent market leader in battery technology, AVL offers a full package of innovative tailored solutions to address the challenge of clean e-mobility. Our dedicated products and services cover the entire battery development process – from the assessment and selection of a single cell to SOP of a fully validated battery pack.

## AVL OFFERINGS

- Testing laboratory consultancy and concept studies in combination with DVP – tailored to your needs from standalone products up to complete test systems and even test labs
- Complete turnkey R&D test lab solutions
- Integrated solution for hardware and software
- Focus on the long-term: service and support from a single source

## Lab Design Services

At AVL, we use our holistic understanding of development and testing as the basis for the design and development of state-of-the-art labs. From new construction to upgrading existing buildings; our team works closely with our customers to define tailored solutions, focused on planning optimized workflows that lead to efficient test operations.

Our front end planning services allow our customers to identify opportunities and risks at the very start of the project, defining test cell layouts and utility requirements.

## Lab Management Software

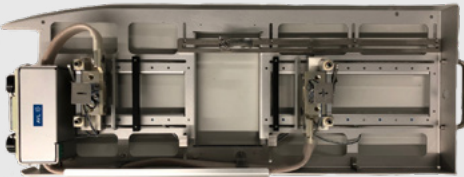
AVL Lab Management™ for Battery efficiently and effectively controls all aspects of the overall testing process. By creating a unique view of test data, this integrated solution provides accurate and up-to-date information that allows test labs to quickly respond to operations issues.



# AVL BATTERY LAB SOLUTIONS

## CELL FIXTURE

AVL's series of modular cell fixtures determine cell breathing and cell swelling during battery lifecycle testing in climate chambers. These cell fixtures are suitable for different pouch cell dimensions and can be used in either pressure measurement or displacement measurement. Each cell fixture is equipped with high quality cell tab contractors that are capable of transmitting 300A continuously. All measurements signals are acquired in real-time by our battery test automation software: AVL LYNX 2™.



## BATTERY TESTING CYCLER

AVL offers low voltage and high voltage technologies for pack, module, and cell testing. AVL's latest generation E-STORAGE SiC™ features a base unit of 275kW 1200V ±1000A in a compact footprint. Its flexible architecture allows systems to be parallelized up to 1.1MW. The AVL Cell Tester™ is a multi-channel, regenerative DC power supply that allows engineering teams to test and validate battery cells.



## BATTERY TEST AUTOMATION

AVL LYNX 2™, the industry's leading battery test automation platform, provides high-speed control and operation of cell, module, and pack power electronics, climatic chambers, chillers, measurement devices and other equipment from dozens of manufacturers while simultaneously performing rapid acquisition and monitoring of hundreds of channels through a network of high-speed measurement devices.



## e-POWER MEASUREMENT



The AVL X-ion™ e-Power analysis system is a modular data acquisition platform that is optimized for electric and hybrid applications. It gives you maximum flexibility and freedom in the development of all kinds of electrified powertrains. It provides the highest level of accuracy and quality results, along with the dynamic test cycle performance that the automotive industry requires.

## ENERGY FLOW CALCULATION



AVL X-meter™ Battery is a multi-channel device for use in certification testing that can measure up to 10 different electrical loads and sources, including batteries, external charging stations, generators and recuperating devices, to calculate electrical power and energy flow instantly and accurately. Data processing and calculations are done in the device itself with the results transferred to data management solutions such as PEMS or AVL PUMA™ via standard CAN or Ethernet connections.

## RIPPLE EMULATOR



The emulated ripple current on a testbed and the signals measured in a real electric vehicle are different, mostly due to the high dynamic ripple produced by inverters. The ripple current can influence battery lifetime and may cause other components to become unstable. At the testbed, the AVL Ripple Emulator™ superimposes an AC ripple current, to emulate the inverter behavior directly at the unit under test (UUT).

## CONDITIONING SYSTEMS

AVL can supply and integrate climatic chamber and conditioning systems to provide stable environmental conditions crucial to perform tests with high precision and reproducibility. These products simulate a wide range of extreme environmental conditions safely and reliably to deliver a high degree of flexibility while minimizing system downtime. Furthermore, thanks to their unique, application-based design with predefined interfaces, they guarantee fast and easy integration into the existing testbeds.



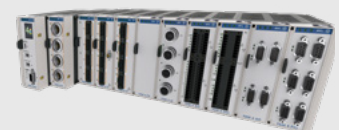
## EIS MEASUREMENT SYSTEM

AVL EIS Measurement System is used for impedance and harmonics analysis of battery and fuel cell electrochemical characteristics when subjected to AC voltage or current. Wide range of suitable applications from R&D to End of Line with an expandable channel count and configuration based on test requirements (up to 192 channels).



## DATA ACQUISITION MODULES

The AVL FEM 4™ product family meets emerging trends that require new measuring ranges, higher sampling and data throughput rates with versatile application modules – voltages, temperatures, analog inputs, digital inputs/outputs. Flexible test cell I/O with expanded capability range for ICE and electric vehicle development.



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