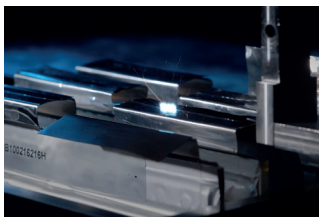
Fraunhofer
BATTERY

Fraunhofer Battery Alliance

System and integration

Battery system and battery management system (BMS) (© Fraunhofer IISB)

The 26 member institutes of the Fraunhofer Battery Alliance develop technical and conceptual solutions along the entire value chain of electrochemical energy storage systems up to the application level on behalf of customers or in publicly funded projects together with industry. Our expertise and many years of experience range from materials development to system integration of mobile and stationary storage systems.

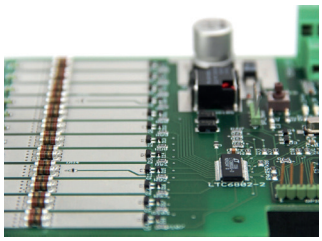


Welding (connecting) of pouch cells (© Fraunhofer ILT)

Competences and field of work

In the Fraunhofer Battery Alliance, individual battery cells based on different technological variations can be developed into battery modules and complete battery systems for various applications, including electromobility, stationary energy storage devices and specialized applications, according to our customers' needs. A wide range of battery technologies such as lithium-ion, lithium-based, lead-acid, sodium, high-temperature batteries, and redox-flow systems are addressed as well as hybrid battery systems.

The interfaces of the modular battery systems are configured to facilitate system integration in terms of both performance and communication.



Battery management system of a lithium-ion battery module (© Fraunhofer ISE)

Examples of applications

Electromobility: Safe integration of traction batteries

The Fraunhofer Battery Alliance pursues the development of safe and reliable battery integration solutions for electric vehicles. On the one hand, traction batteries represent a potential hazard to vehicle passengers and the environment, and therefore require special protection. On the other hand, extra weight reduces the range of electric vehicles. Therefore, it is of relevance to optimize the batteries' mounting and protective casings with regard to durability, reliability and crash resistance, while at the same time reducing the system weight. The construction and design of these components are supported by the use of computational methods. Expertise in material characterization and modeling, in component optimization and evaluation as well as experimental verification complete the service portfolio of the Fraunhofer Battery Alliance.

Stationary storage for renewable energies and grid stabilization

The rapidly increasing share of renewable energies requires stationary storage systems for different applications such as grid stabilization, for intermediate storage of regeneratively generated electricity, for so-called behind-the-meter applications or for increasing self-consumption and the solar coverage rate as well as in solar and wind farms to equalize and feed energy to the grid according to demand. The Fraunhofer Battery Alliance develops optimized battery systems for applications from a few kWh to MWh output. Of particular importance are key attributes such as a long calendar life, a large number of operating cycles with maximum depth of discharge, high system efficiencies as well as reliability and safety. Another important factor is cost reduction, for example through optimized module and system design, efficient cooling systems, the use of model-based battery management systems or new production solutions from the cell to the system. In addition, battery systems are designed for easy integration into the system environment. This includes the connection to the power electronics (for example battery inverters) and the possibility of data exchange between the battery management systems and higher energy management systems.

Please feel free to contact us – with many years of experience and expertise, we will collaborate with you to develop customized solutions tailored to your needs.

Our offer

- Prototype development: battery packs and modules for different applications
- Safety-related design of the battery system
- Design of battery modules and systems supported by different simulation tools
- Development of adapted joining techniques such as laser welding processes for cell connection/ contacting
- Development of highly efficient cooling and (pre)heating systems
- Development and design of battery management systems on chip, cell and module level
- Electronic components on chip and module level (current sensors, safety circuits, capacity monitor)
- Wired/ wireless integrated sensors (U, I, p, T, gas)
- Algorithms for state-of-charge and aging determination as well as lifetime prediction
- Optimized charging and operation management strategies including cell balancing methods and predictive control for thermal management
- Integration into and connection to energy systems
- Safety analyses and concepts, hazard analyses
- Testing, validation and evaluation of batteries and battery systems
- Proof of compliance with technical requirements regarding reliability and safety
- Studies, roadmaps und techno-economic evaluation

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