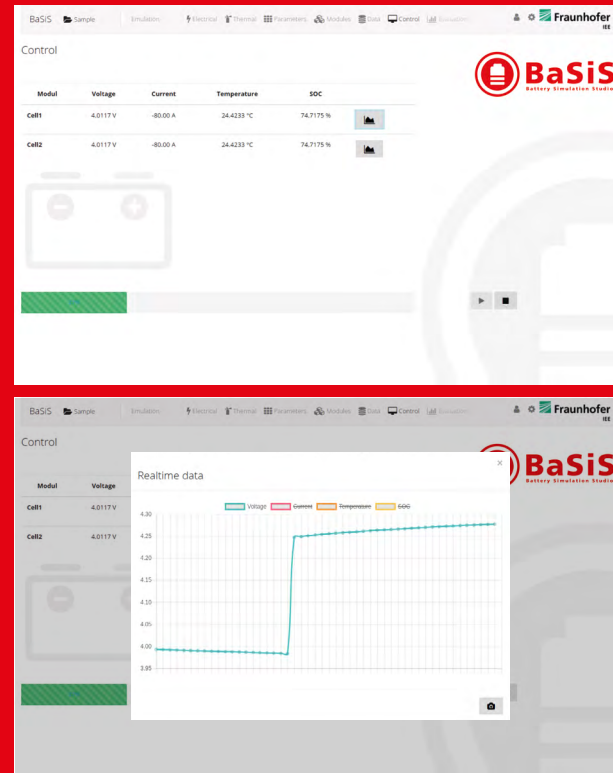


DEVELOPMENT OPTIMIZATION OF BATTERY SYSTEMS

The application of batteries has grown strongly over the past years in various industrial sectors. The efficient use and the smart system integration of batteries is crucial for the usability and the success of products and systems. This does not only affect vehicles on road, in water or in air, but also transport systems, power tools and our tiny electronic companions in everyday life such as smart phones, vacuum cleaners or mowing machines.

BaSiS has been developed in the past 20 years at the Fraunhofer IEE and provides a proven software for the simulation of batteries. Become independent of expensive laboratory infrastructure in your development process and save time and materials.

Due to the real-time capability integration in hardware-in-the-loop test benches is possible.



Make use of our software solution and our knowledge to optimize your development processes

BaSiS

BATTERY SIMULATION STUDIO



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The Fraunhofer Institute for Energy Economics and Energy System Technology IEE in Kassel researches for the national and international transformation of energy systems. The Institute emerged from the Energy System Technology branch of Fraunhofer IWES in 2018 and was founded as Institut für Solare Energieversorgungstechnik ISET in Kassel in 1988.

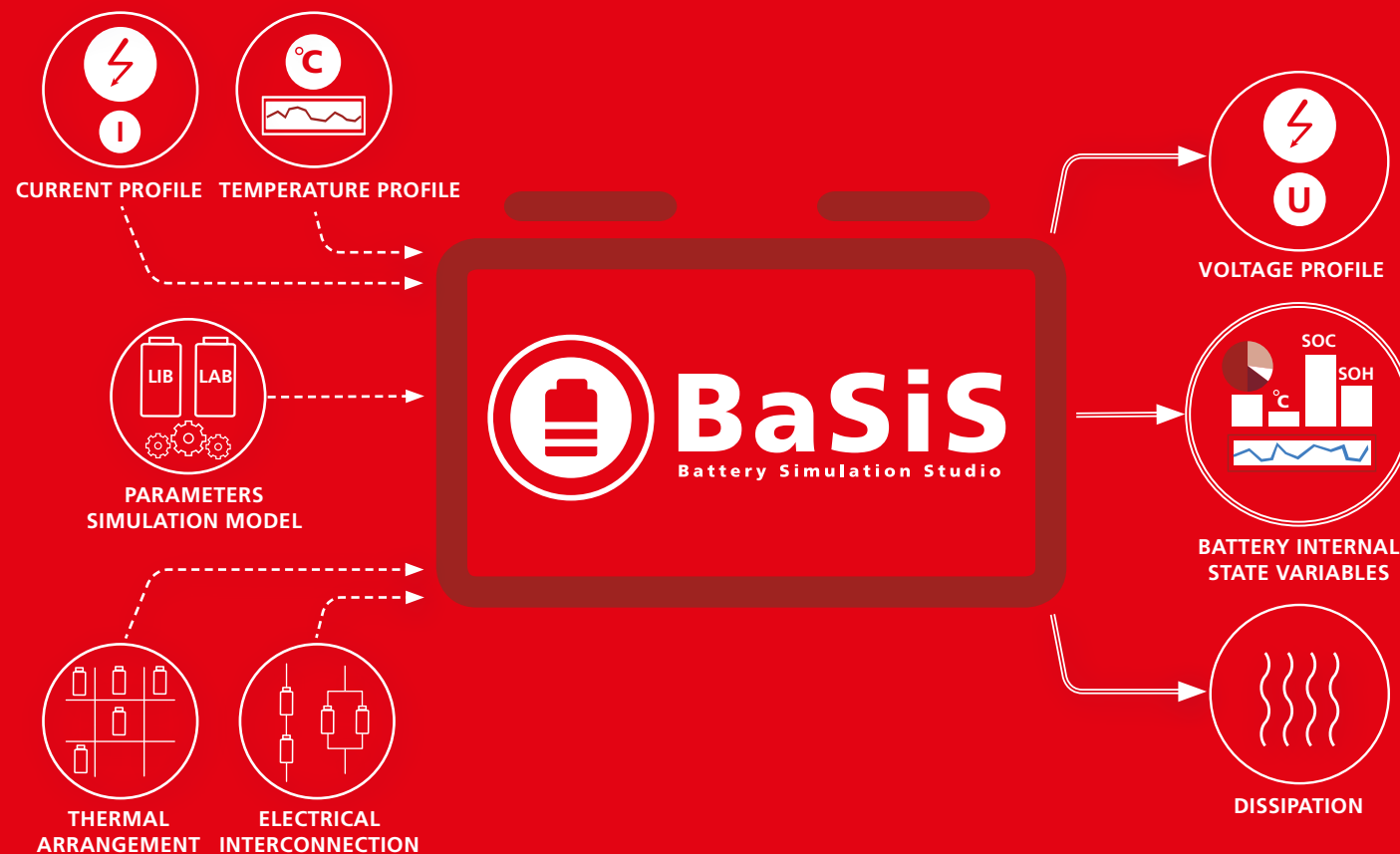
OUR RANGE FOR YOUR DEVELOPMENT

Use the software BaSiS for battery simulations and virtual batteries directly in your development and test environment. This will improve and accelerate your development cycles while optimizing costs.

- No sophisticated work with real batteries
- Preconditioning of all batteries on demand
- More tests in less time
- Easy scalability
- Flexible, fast and safe
- Knowledge and documentation of battery internal state variables
- Reproducibility of all results
- Interface to MATLAB/Simulink®
- Transparent evaluation and presentation
- Hard-to-perform tests are feasible with simulations (e. g., fault simulation)
- Transparent license model
- For decades in industrial use

BaSiS is used in the development and optimization of cells, batteries, packs and their components, as well as battery management systems, battery-powered devices, plants, vehicles and air/spacecrafts.

The fundament for BaSiS is provided by the software packages »ISET-LIB« and »ISET-LAB« developed at the Fraunhofer IEE (formerly Fraunhofer IWES Kassel).



DEVELOPING AND TESTING FASTER AND SAFER

ADVANTAGES

- Reproducible results
- Fast configuration of temperature, state of charge, state of health and further parameters
- Simulation of aging processes
- Thermal interaction within a battery pack
- Simulation and knowledge of battery-internal state variables
- Various battery geometries and arrangements

HIL-INTERFACE

- EtherCat
- CAN
- RS232
- Ethernet

BATTERY SIMULATION

Battery simulations save costly laboratory measurements and help to accelerate development processes of cells, batteries, packs and battery-based integrated systems.

BaSiS models the behavior of batteries with high precision on a physical and electrochemical level and can easily be integrated into MATLAB® / SIMULINK® and other simulation environments for complete system simulations. Furthermore, BaSiS can be used to study the impact of different constructive parameters on the battery behavior.

SIMULATION MODELS

- Lead-acid batteries
- Lithium-ion batteries
- Lithium-sulfur batteries*
- Solid-state batteries
- Redox-flow batteries*
- Further on demand

* in the planning stage

ADDITIONAL MODULES

- Interface to MATLAB® / SIMULINK®
- Real-time module for HIL-systems
- Parameter database for common battery types
- Individual emulator control
- Aging of lithium-ion batteries

SERVICES

- Individual parameter determination
- Individual adjustment of hardware and software interfaces
- Trainings and workshops
- Commissional simulations and studies

VIRTUAL BATTERY IN A HARDWARE-IN-THE-LOOP SYSTEM

The real-time module of BaSiS is used to model the terminal behavior of real batteries in Hardware-in-the-Loop test benches.

BaSiS enables fast, safe, cost-efficient und reproducible hardware testing. In so doing, you accelerate both the development and testing of battery management systems and of overall systems such as vehicles in emulator-based HIL environments. In contrast to real batteries, the test bench can additionally provide all internal quantities of the battery for the overall system development and can accelerate the development of state detection algorithms.

EXAMPLE AUTOMOTIVE INDUSTRY

In the automotive industry HIL systems are used to perform tests in a fast and cost-efficient way. Thereby, a real vehicle is connected to a virtual battery to adjust any battery states within a very short time and to test the behavior of the system under the altered conditions.

