

Testing Technology for Development – Validation – Production of Li-Ion Battery Systems



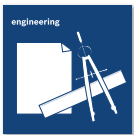
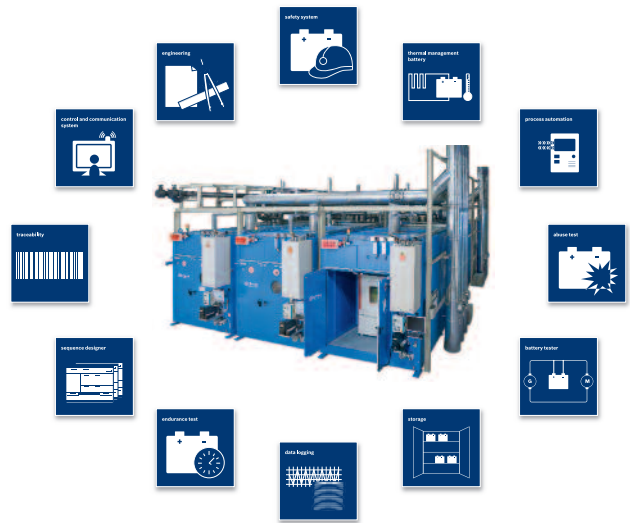
best testing – best quality

moehwald
Bosch Group

Comprehensive Solution

If you are looking for a comprehensive solution for your testing challenge, our support will lead to your success.

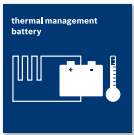
Get your solution from one source, starting from engineering for research tasks to establishing a complete production test line.



Engineering: Our expertise and our network to specialists will provide a customised solution to your testing challenge and safety needs.



Safety system: We provide solutions according to EUCAR Hazard-Levels up to 7. Please see page 5 for details.



Thermal management: Your demand in respect to the thermal management of the battery or what else you need for your periphery will find a solution.



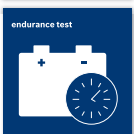
Traceability: If traceability through your processes is fundamental to you, our expertise in the production chain is your goal.



Data logging: You decide about the amount of data that has to be logged – we will realise.



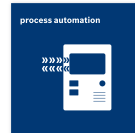
Abuse test and endurance test: Special dimensioning of our safety features will lead to your system for abuse tests and endurance tests.



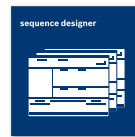
Control and communication system

(Manufacturing Execution System):

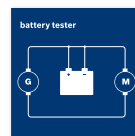
The MES system helps to optimise the technical order management in your production. This decreases cycle time, increases machine load factors and guarantees fast reactions.



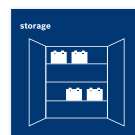
Process automation: The OpCon control technology guarantees an easy and standardised engineering process (IEC6-1131 tools) linked with a high connectivity to peripheral devices and subsystems like the integrated safety concept.



Sequence designer: The OpCon sequence designer is your easy to handle front end for creating test procedures regarding your batteries, your thermal management and your periphery.

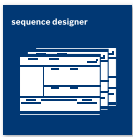


Battery tester: If you have already invested in your battery tester, we will implement it into the whole system. Otherwise we will find the battery test system which fits best to your demand.



Storage: Our storage systems vary from tempered and climatized conditioning storage to a safe disposal storage.

Comprehensive Software Solutions



OpCon PC software enables you to have a simple, fast and effective implementation of test cycles with its intuitive operating concept for your battery test system.

The transparent visualization of the complete system and of individual components allows you to create effective and convenient test cycles. Test parameters can be easily defined globally and variably, using the editor. This enables a flexible, user-specific and optimal control of the test environment.

The easy to understand measurement data analysis allows you to acquire the targeted test results smoothly and compare them with different test cycles.



Additional features are the integrated effortless control of external systems such as climate chambers, battery management systems via CAN or Data-Logger directly in the test cycle, and the construction of a comprehensive test library.

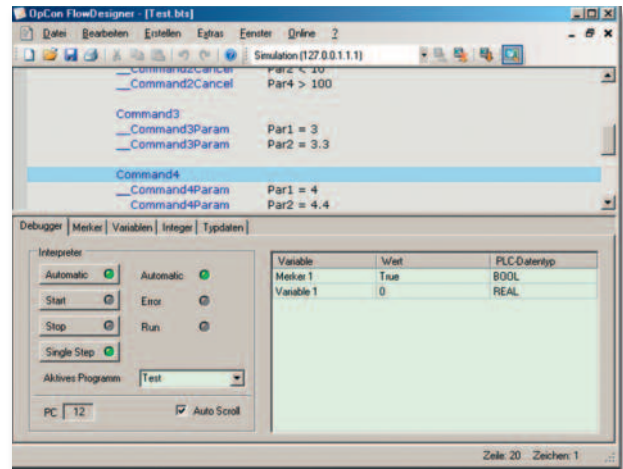


With this comprehensive data technical management of your test piece data, test programs and results data, we offer a universal data management system.

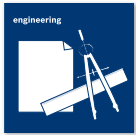
The data management system offers the following range of functions:

- Logistics terminals for managing test pieces
- Storage of all data in a database
- Assigning versions to test programs
- Recording, saving and management of results data
- Web-based access and database analysis

Using our data technology you achieve the highest level of data security and consistency.



The Modular Component System For Your Solution

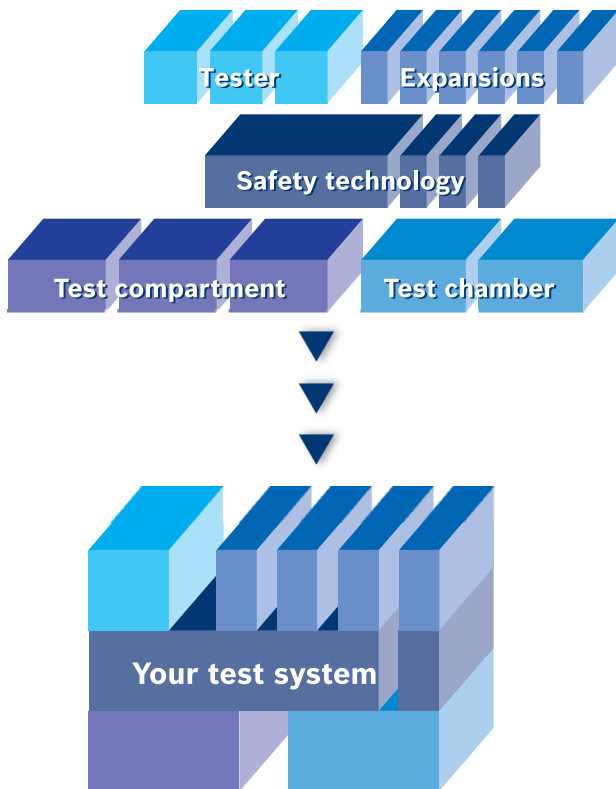


Configure your perfect solution for testing cells, modules or packs from the available components. Select a solution for external or interior area setups.

We will also gladly integrate the system into your laboratory environment. Using our turnkey systems, you profit from our extensive experience and basic developments of already installed testing equipment. Your coordination efforts with safety and fire protection experts is significantly reduced.



Configure Your Test Environment



Of course we are also happy to support you in planning and executing your complete specific and individual test systems. We can rely on our experience gained from many completed projects and we have an established network of specialists to bring in for planning your specific system.

To achieve efficient and safe operation of your test environment, we additionally offer you the following solutions:

- Safe storage concept for your battery systems
- Transport and loading systems for battery packs
- Optimized extinguishing media for lithium ion batteries
- Temperature unit for heat management of the battery system
- Concepts for connection to a safety alarm center
- Concepts for abuse tests

Safety First



We offer you turnkey test units for lithium ion battery systems of all hazard classes from EUCAR 0 to 7.

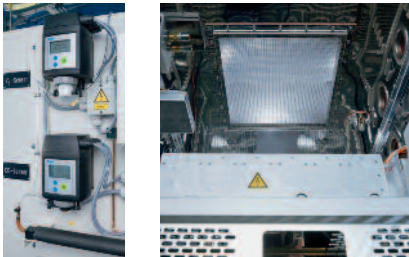
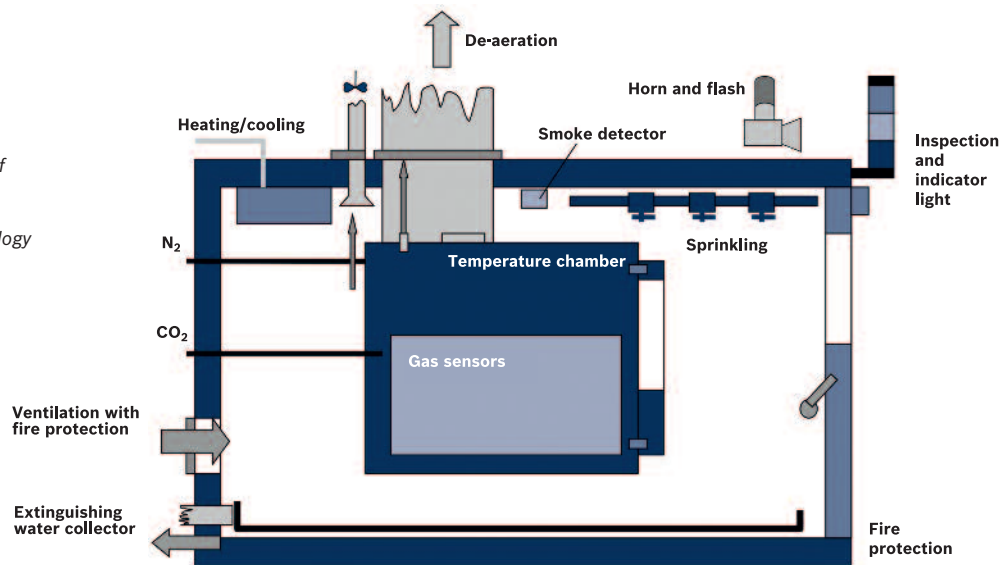
For this, we use your level of battery technology as the basis for designing safety technology.

This technology protects against electrical, physical and chemical hazards. The scalable design was

developed in close collaboration with TÜV Süd, a fire protection consultant and well-reputed research and testing institutes, and tested on actual systems.

Functional capability was ensured in close collaboration with a renowned battery manufacturer. Due to its scalability, it is guaranteed that the proper safety technology can be configured for you.

Schematic setup of the test system with safety technology



Safety elements

The EUCAR Hazard-Levels (Principle Description)

Level	Maximum Possible Hazard
Level 0	No effects
Level 1	Passive safety equipment triggers
Level 2	Defect, damage
Level 3	Leak, loss of mass < 50%
Level 4	Blowout, loss of mass > 50%
Level 5	Fire or flames
Level 6	Burst
Level 7	Explosion

These documents are a principle description and not an operating manual. Individual deviations in the description may exist compared to the operating manual. Proper implementation of the system must be carried out using the operating manual.

Contact Moehwald:

Gerd Wagner · Phone +49 6841-707-233

email: g.wagner@moehwald.de

www.moehwald.de

moehwald
Bosch Group