



## // BATTERY TEST CENTER SAFETY TESTS



The mission of the battery test center is to conduct performance, lifetime, endurance, and safety tests on cells, modules, and batteries designed for portable, mobile, and stationary energy storage systems. A great deal of effort is devoted to characterizing batteries under various operating conditions and studying their behavior in response to abuse and crash.

*"In the eLaB we investigate, test, and analyze batteries and systems according to standards or by new innovative methods."*

Dr. Olaf Böse, Head of Department Accumulators



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## // SAFETY TESTS

### Electrical

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- Controlled high current load up to 1500A / -5V...20V for testing of cell strength and components
- Short circuit test equipment up to 15kA
- Overcharge and overdischarge tests in different ranges
- Cycling out of cell specification

### Thermal

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- Testing of temperature stability of cells and components up to 300°C
- High temperature exposition like flammability test

### Mechanical

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- Breaking strength
- Crack stability of the construction and the storage system
- Quasi static crush tests for cells, modules and battery pack systems
- Nail penetration test with different nail diameter and various penetration speed
- Identification of weak construction points by vibration and mechanical shock tests

### Evaluation of extreme stress situation

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- Investigation of the propagation effect of a failure mode through the battery system



Identification of weakly designed parts of a system



Cell with not controlled dissipation of power



Nail penetration test

# // EQUIPMENT AND INFRASTRUCTURE

## Test bunker

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- 3 specialized bunker for electrical, mechanic und thermal safety tests with 100m<sup>3</sup>

## Electric equipment

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- Battery test unit 1 x 0V...70V/250A
- Battery test unit 2 x -5V...+20V/750A (parallel max. 1500A)
- Battery test unit 3 x -18V...+18V/150A (parallel max. 450A)
- Battery test unit 4 x -18V...+18V/150A (parallel max. 600A)
- Battery test unit 4 x 5V...150V/30A (parallel max. 120A)
- Battery test unit 1 x 0V...60V/450V/300A Thy
- Short circuit switching device up to 15kA measurable and various pre resistors (1.0...200mΩ)

## Thermal equipment

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- 2 oven for cell size up to 300°C
- 1 temperature chamber -70...180°C
- Fire table (gas, real fire test)

## Mechanical equipment

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- Hydraulic multi cylinder press up to around 100 tons with different impact tools
- Nail penetration, various diameters and various feed speed (0.01 mm/s ...100 mm/s)
- Vibration and shock test machine

## Video system

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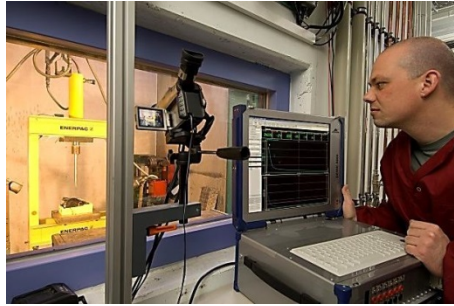
- 4K / 120fps Video recording system for recording from different positions
- ActionCams for inside use for special view of sample (optional)
- High speed image recording (optional)
- Thermal video (optional)

## Infrastructure

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- Gas scrubbing unit for gas cleaning (treatment of the emissions)
- Over pressure protection of the bunker
- Fire extinguishing systems (CO<sub>2</sub> and water based fire extinguisher)

## Safety Test Devices



Test bunker with mechanical press with 100 tons max. force and video observation



Short circuit equipment, max. current 15 kA / Oven with 200 l volume

## Mechanical Shock and Vibration Test Unit



Vibration table with acceleration force of 20 kN, load up to 50 kg, possibility of thermal and electrical superposition

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