

WHY

Load tests with simulation of driving conditions and temperature for lithium-ion batteries in the world's largest test centre for high-voltage batteries for electric vehicles

HOW

Turnkey solution
According to LV 124
Including safety device (Hazard Level 4)

WHAT

Large shaker
With temperature unit
Electric traversing system (vertical/horizontal)

WHY - The challenge.

FEV Group GmbH has built the world's largest development and test centre for high-voltage batteries for electric vehicles in Saxony-Anhalt. A wide variety of tests are carried out on 15,500 square metres and in around 70 facilities.

These include vibration tests to examine the behaviour of the battery packs in simulated driving operation. In order to test the material properties and the function of the energy storage devices, mechanical and thermal loads are combined. In order to test complete battery packs including battery management systems (BMS), the vibration test system must be designed to be particularly powerful. In addition, it must allow vibration on the x, y and z axes.

The cold supply is provided by the central refrigeration system. The turnkey vibration test chamber shall be provided with safety equipment according to the determined hazard level.



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HOW - The idea.

The vibration test system, which was developed as a special construction, consists of a test chamber and a traversing unit. A 350 kN shaker is required to safely move the large mass of battery packs and to stress them realistically. The steel traversing system allows the test system to be moved to the positions for parking, vertical and horizontal shaker operation. There, the test chamber, which is open at the bottom, is connected to the respective chamber floor. In order to prevent the chambers from rocking at the maximum strokes and low frequencies, four pressure relief membranes are installed in the chamber ceiling.

In order to control the test system centrally via the customer's control room, it is operated in master-slave mode.



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WHAT - The solution.

The vibration temperature chamber has a test chamber made of stainless steel with a chamber volume of approx. 21 m³. Up to 3,000 kg of test material per m² can be placed in it.

It enables combined mechanical and electrical tests to be carried out at temperatures between -40 and +100 °C. The cooling and heating rates are 5 K/min each.

For moving the test chamber in vertical direction, the traversing system is equipped with a lifting system with spindle drive. Horizontal movements are realised via a rack and pinion drive.

Selected Product: WT 21/40-100/5/V-Li/HL 4

According to the risk assessment for tests with lithium-ion batteries, safety devices according to Hazard Level 4 were integrated.



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Design features:

- Insulated temperature test chamber made of sandwich prefabricated elements, with removable interchangeable floor
- Test chamber made of stainless steel
- Safety devices according to Hazard Level 4:
 - Electric door locking with emergency unlocking
 - Status display with signal lamp and horn
 - Reversible pressure relief flap to compensate pressure fluctuations in the test chamber
 - Pressure-resistant feed-throughs (125 mm diameter, with plug and plug protection on the outside)
- Emergency stop button in the test area and on the outside, signal column, warning buzzer
- Steel traversing system with spindle and rack drive and mobile operating unit