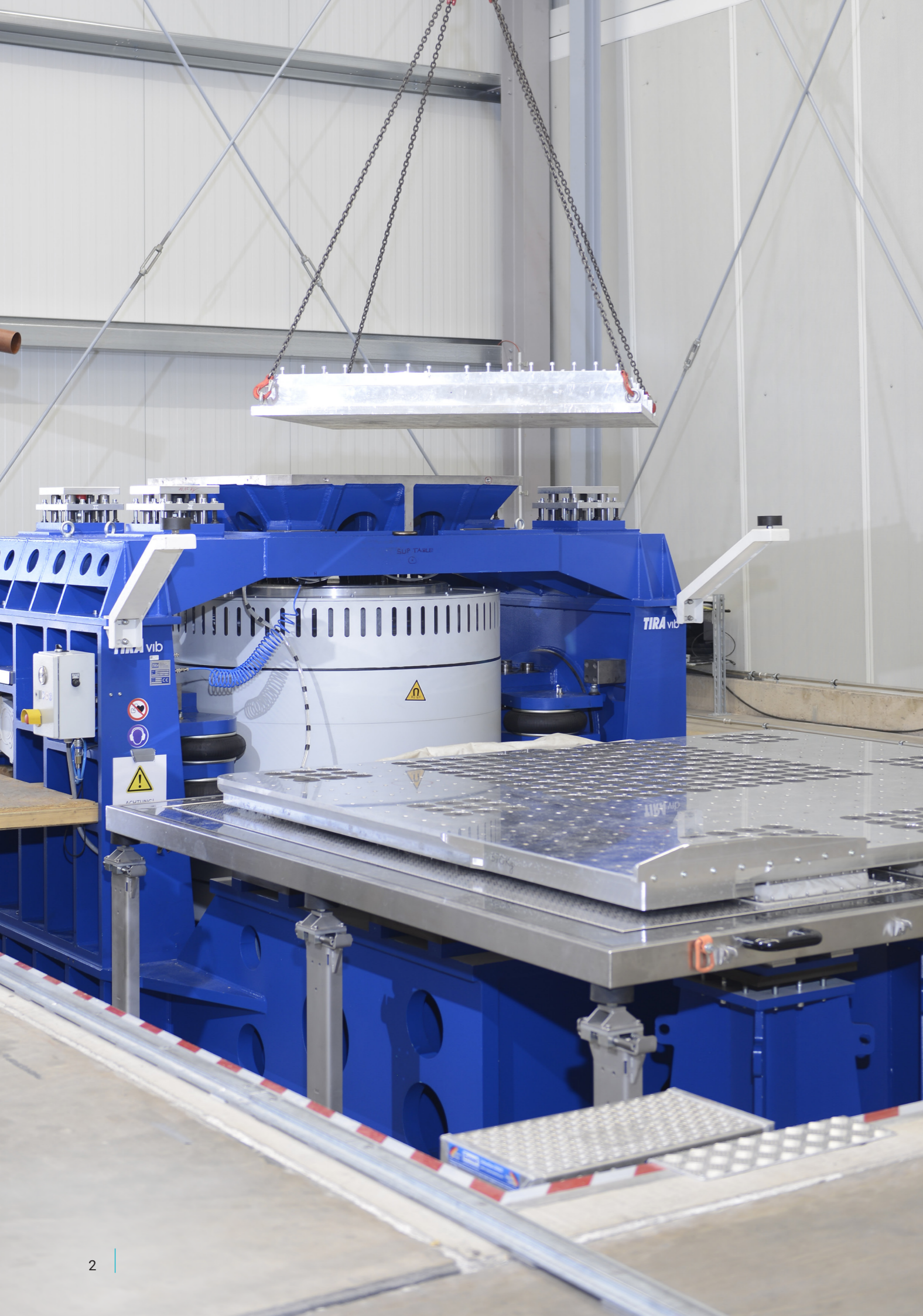


## Battery Safety

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**Evaluation of the conformity of lithium-ion batteries in our battery test laboratory**





## Battery safety for lithium-ion batteries

### Li-ion batteries, the batteries of the future

**cetecom advanced** supports battery and automotive manufacturers in the safety qualification of high-capacity lithium-ion battery systems with a state-of-the-art battery test center.

The test facilities consist of separately secured rooms that are equipped for extreme cases. The laboratory and test areas are continuously developed according to the latest standards and are operated exclusively by highly qualified battery specialists.

The safety of lithium-ion batteries, especially for use in electric vehicles and energy storage systems, is extremely important. In particular, the high energy density and a SOC (State of Charge) close to the maximum must be mastered even in extreme situations in order to avoid hazards.

### Accredited testing services

- IEC 62133-1 and -2
- IEC 62281
- IEC 60086
- IEC 62619
- IEC 63056
- IEC 63057
- IEC 61373
- IEC 62620
- UN 38.3
- VDE-AR-2510-50
- DIN EN 50604
- ECE R 100
- ECE R 136

In our battery test center, all safety-relevant disciplines and incidents that can occur when using lithium-ion batteries are tested and documented:

- **Mechanical stress**  
(nail penetration, crush tests, crash test, vibration; under various climatic conditions if necessary)
- **Electrical stress**  
(overcharging, short circuit)
- **Climatic stress**
- **Artificial ageing**
- **EMC - electromagnetic compatibility of the battery management system (BMS)**
- **LVD - Low Voltage Directive, electrical safety for high-voltage devices in battery systems**
- **Immersion/flooding**
- **Synchronized recording system for displaying the test results** (high-speed camera, infrared video camera, date recording)

### UN Transport Tests

Before a Li-ion battery can be released for transportation by various means (water, air, road, rail), it must be ensured that the battery system behaves safely in typical situations that may occur during transportation. **cetecom advanced** carries out the tests in accordance with the UN Transport Test Regulations STSGAC. 10-11, 38.3. These were drawn up by the United Nations and are internationally recognized:

- T1: Altitude simulation
- T2: Thermal testing
- T3: Vibration
- T4: Shock
- T5: External short circuit
- T6: Impact / Crush
- T7: Overcharge
- T8: Forced discharge

## ECE-R100 / ECE-R136

### Requirements for battery safety

ECE-R100 / ECE-R136 compiles uniform requirements for the homologation of vehicles and takes into account the specific requirements for the electric drive train. [cetecom advanced](#) is recognized by the German Federal Motor Transport Authority (KBA) as a technical service.

In our battery test center we offer the following battery safety tests according to ECE-R100 / ECE-R136:

- Vibration test
- Thermal shock and cycling test
- Mechanical shock
- Mechanical integrity
- Fire resistance
- External short circuit protection
- Overcharge protection
- Over-discharge protection
- Over-temperature protection
- Over-current protection

For recording the measured values and for video recording we have the following options:

- High-speed data logger
- HD video with multiple perspectives and IR camera
- DC power supply
- BMS/BUS logging

For tests which, due to their properties, can only be carried out in a explosion-proof environment, we have a high-security bunker. This is located on an external site and is connected to the infrastructure of a vehicle test site.

The following tests are carried out in this bunker:

- Propagation
- Short circuit
- Further tests on customer request

The range of our Abuse tests includes:

- Electrical,
- mechanical and
- climatic tests as well as
- a crash test bench.

With these methods we can stimulate the failure of a single cell during propagation tests:

- Overcharge and forced discharge
- Short circuit
- Nail test (also blunt nail test)
- Targeted overheating of a cell

” We have diverse climate chambers with different sizes and temperature ranges. Various test methods can be applied to electronic components, devices and systems.

### Climate test & climate shock test

Climatic conditions such as temperature and humidity have a significant influence on the usability and service life of products.

We offer climate tests according to the following standards:

- DIN EN IEC 60068-2-1, -2, -14, -30, -38, -41, -48, -78
- DIN ISO 16750-4

The following test methods can be used:

- Thermal shock tests
- Temperature cycling tests
- Tests under an inert gas atmosphere
- Condensation tests

### Diving tests

We use an immersion tank to carry out immersion tests for batteries attached to the underbody of vehicles. For example, immersion tests in accordance with IPX7 can be carried out on particularly large test specimens (dimensions up to 2.2 m x 1.5 m).

### Dust chamber for batteries

The dimensions of our dust chamber are adapted to those of the dip tank so that even particularly large test specimens can be accommodated. Arizona dust is used as standard, other dusts are available on request.

### Vibration & Shock

Vibration tables of various sizes are used to test the robustness of products against vibrations and mechanical shocks - with simultaneous climatic and electrical impact on the test specimens if required. With a 300 kN shaker (vibration test stand), very large and heavy test specimens can be tested in accordance with standards.

### Crash test stand

A crash test bench, situated in a fire-protected environment and operating based on the pneumatic principle, allows the testing of items weighing up to 600 kg. Depending on the mass of the test item, velocities of up to 70 km/h and peak accelerations reaching 70 g can be attained.

### Salt spray chamber

In the walk-in salt spray chamber, the corrosion behavior can be simulated when exposed to salty air, salt mist or salt spray.

Among other things, we test for:

- DIN EN ISO 9227
- DIN EN IEC 60068-2-11
- DIN EN IEC 60068-2-52
- ASTM B 117, etc.



## Environmental simulation tests

Our environmental simulation laboratory is accredited in accordance with DIN EN ISO/IEC 17025.

### Tests in the vacuum chamber

This test method enables the simulation of air freight under almost vacuum conditions. Space applications can also be tested.

- Vacuum up to 10 kPa
- Altitude simulation tests UN 38.3

### IP tests against dust & water

IP protection class tests show how protected electrical devices and products are against various environmental influences.

Testing of protection against the ingress of dust in accordance with the applicable IP standards:

- Talcum dust
- Arizona dust (fine or coarse)

Testing of protection against the ingress of water in accordance with the applicable IP standards

### Solar simulation

The environmental test includes sun simulation tests for products that are directly or indirectly exposed to the sun.

### Chemical testing

Chemical tests are carried out in accordance with the following standards and application methods:

- DIN EN 60068-2-74, DIN ISO 16750-5, VW 80000
- Spraying / Brushing / Wiping / Pouring / Dipping / Immersion

### Environmental simulations according to customer-specific requirements

In addition to the tests already described in accordance with specified standards, further tests are offered individually on customer request:

- Customer-specific test profiles based on DIN EN 60068-1
- Advice on service life tests, functional tests, etc.
- Development of individual test plans and specifications on customer request

### Battery pack development

The development of modern lithium-ion battery packs requires expertise and experience to achieve a balance between the required system load and the necessary reliability and safety. **cetecom advanced** supports battery pack manufacturers in the development of safe battery systems, regardless of the application. Solutions for battery manufacturers include:

- UN Transport Tests, IEC 62133-1/-2 (specified safety requirements for portable sealed cells for use in portable applications)
- DIN EN / IEC 62619

## 300 kN Shaker - electrodynamic vibration test system

Testing of components from the automotive, mechanical engineering & eMobility sectors

### Facts & figures

- Maximum travel up to 3 inches
- Sinusoidal acceleration up to 70 g at 195 kg or 11.2 g at 1,500 kg
- Shock tests with high payloads up to e.g. 1,500 kg in semi-sinusoidal shock
- Test specimen size up to approx. 2.5 x 2.5 m
- Mass of the test specimens up to approx. 2 t

### Special features in the design

- Sound decoupling from the surroundings by means of a special soundproof cabin (approx. 600 m<sup>3</sup>)
- Installation of the shaker (approx. 50 t) in a pit
- Vibration decoupling from the foundation by means of an air-bearing solid steel plate
- Base on micropiles



Further information can be found at  
<https://cetecomadvanced.com/en/testing/environmental-simulation/>



## Battery testing by cetecom advanced

Your partner for efficient and safe battery safety testing and environmental simulation services

cetecom advanced supports battery and automotive manufacturers in the safety qualification of high-performance Li-ion battery systems. The high energy density of batteries due to the chemical elements they contain and the very high electrical charge require a high level of safety. This plays a particularly important role in applications in electric vehicles and energy storage systems.

Comprehensive battery testing (abuse testing, etc.) in our laboratories enables us to professionally test and verify the level of battery safety required for market access.



Other standards are available on request.  
We are sure to find the right test case  
for your product.



“ We have various accreditations for environmental and durability testing and offer a wide range of test contents.

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