Abuse and Performance Testing on Batteries and E-Vehicles

Based on our combined experience as world leader on vehicle safety and R&D testing we, Autoliv and RISE (Research Institutes of Sweden), are your ideal supplier of R&D testing as well as regulatory and standard testing on battery systems and E-Vehicles.

Mechanical Integrity Testing

<table>
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<th>Low Risk</th>
<th>Medium Risk</th>
<th>High Risk</th>
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<tr>
<td>Indoor crash track</td>
<td>Outdoor crash track</td>
<td>Sled crash track</td>
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- **Low Risk**
  - Payload: <8 tons
  - Frontal impact: <70 kph
  - Side impact: <70 kph
  - Rear impact: <90 kph
  - Roll-over: <70 kph

- **Medium Risk**
  - Car-to-car: <100 kph
  - Car-to-barrier: <100 kph
  - Fully wireless vehicle control

- **High Risk**
  - Sled weight: 200 kg
  - Load: <200 kg
  - Track length: 15 m
  - Sled speed: <100 kph
  - Crash energy: <75 kJ

Engineering teams for CAE simulations and crash tests with dummy batteries are available for preparatory evaluation of safety and risk levels.

Capabilities available for vehicle and component crash tests such as ECE R94/R95/R100, FMVSS 301/305 and NCAP
Autoliv Pyroswitch
Battery and E-Vehicle Testing

Safety & Performance Testing

Fire tests on battery packs & cells

Electrical abuse testing

Performance testing

Climatic
- Altitude simulation, thermal test

Electric
- Overcharge, external short circuit and over discharge
- HF (hydrogen fluoride) and POF3 (Phosphorus Oxyfluoride) during fire exposure

Emission
- UNECE Reg. 100 - E/ECE/324/Rev.2/Add.99/Rev.2, Annex 8E
- Heat Release Rate

Fire Safety
- Battery Management Systems in accordance with ISO 26262

Functional safety
- Battery life time and performance testing

Impedance
- Measurement on various battery types: Lead-acid, NiMH, Li-ion, future high-voltage Li-ion

Life time and performance
- Drop testing, vibration, shock, impact, earthquake conditions

Modelling
- Thermal runaway propagation

Battery safety testing can be performed in accordance with UN Transportation Testing (UN DOT 38.3) and IEC 62133.

In addition RISE is able to support the industry in sustainability issues, life cycle assessments, energy system modelling, EMC and cell chemistry.