

Background information

TÜV Rheinland Automotive Component Testing: Services and Test Facilities

Drive battery testing for electric vehicles at a glance / State-of-the-art testing facilities for all common safety tests / Regulatory and manufacturer-specific testing of drive batteries for battery-electric vehicles / Testing against global standards

The market for testing drive batteries for electric vehicles is highly dynamic. This is demonstrated by the number of new registrations of battery-electric vehicles (BEVs). New registrations of purely electric vehicles continue to pick up, with 63,000 BEVs newly registered in Germany in 2019 and 194,000 in 2020. In 2021, the figure was already 356,000. According to the European Automobile Manufacturers' Association (ACEA), there were 878,000 new registrations of electric vehicles in the European Union. And the trend is continuing – with political encouragement and support too. According to the experts at TÜV Rheinland, the need for manufacturer-independent testing capacities for batteries will increase significantly over the coming years.

Various tests for electric vehicle batteries

The number of new BEV models is rising steadily too, and manufacturers are constantly broadening their range of vehicles. In these vehicles, the drive battery plays a key role in terms of both cost and economy as well as comfort, range and day-to-day use. For TÜV Rheinland, battery testing involves various aspects. On the one hand, for example, independent testing of the condition of drive batteries in used electric vehicles is playing an increasingly important role because batteries account for up to 50% of a vehicle's value. On the other hand, electric vehicles – like all vehicles – are subject to regular inspections as part of the standard general inspection.

Services at the Aachen battery testing center

A third, essential aspect of TÜV Rheinland's global testing services is the homologation (type-testing) of new vehicles and new vehicle components. Such market approvals are required around the world in various regulatory forms in order for new vehicle models to be launched on the market at all. This is precisely where TÜV Rheinland Automotive Component Testing comes in with its test center in Aachen/Heerlen. The aim of the experts there is to comprehensively test all current safety standards for drive batteries that are required on the market. The initial focus

will be on the rapidly growing test market for vehicle drive batteries. In the future, testing services will be extended to include other storage applications. When the test center opens, it will initially be capable of testing large battery units weighing up to 800 kilograms.

Specialist team for testing in accordance with international requirements

TÜV Rheinland is active worldwide in the testing of storage systems and batteries for almost all applications. The same applies to the international specialist team for the homologation of vehicles and vehicle components to obtain road approval for new types in all leading markets. The test laboratory in Aachen/Heerlen will therefore be integrated in the Engineering and Homologation business field of the Mobility business stream at TÜV Rheinland.

Successful testing ensures that manufacturers in the rapidly growing market for electric vehicles meet the factory and regulatory standards of major markets such as China, India, Japan, South Korea and the US. Within TÜV Rheinland's global specialist team, testing can be performed in accordance with numerous recognized standards. These include the international standards GTR 20, UN 38.3 and LV 124, the US standards SAE J 2224 and SAE J 2029, the essential ECE R100 for the EU and Japan, GB 38031 for China, KMVSS for South Korea and AIS-048 for India.

Various safety and environmental tests

Most drive batteries in modern electric vehicles are lithium-based batteries such as lithium-ion batteries. In TÜV Rheinland Automotive Component Testing's new laboratory, batteries weighing around 800 kilograms, measuring 230 centimeters in length, 160 centimeters in width and 40 centimeters in height and with capacities of up to 150 kWh can undergo all standard forms of testing. For comparison, most conventional vehicle batteries weigh between 300 and 600 kilograms.

The laboratory's range of services includes testing based on mandatory specifications for the type approval of new batteries. As mentioned, these include ECE R100 for the testing and approval of lithium-ion batteries and UN 38.3. for requirements regarding the transportation of drive batteries. Voluntary tests are also performed according to manufacturer specifications for additional quality assurance. Electrical safety and reliability, performance as well as special climate and environmental stresses are put to the test. Mechanical and durability tests are

also performed as well as abuse tests in order to determine the electrical, thermal or mechanical load limits of the battery units.

State-of-the-art technical equipment

The laboratory center has undergone a complete technological renovation and is one of the most modern of its kind. The technical equipment includes seven large climate chambers for simulating extreme temperature fluctuations and loads (-60°C to +90°C) as well as humidity from 10% to 95%, a salt corrosion chamber with two racks for test samples, a test rig for surge water (test chamber in accordance with LV124) and a test rig for simulating vibrations and shocks (shaker). The laboratory is also equipped with sixteen battery test stands for simulating service life and durability, including the charging and discharging of batteries, a stand for dust tests and an IP test chamber (test stand for IP protection class testing, IPX). The technical equipment is rounded off by a special bunker for drop tests, nail penetration, over-discharge and deep discharge, pressure, crushing and fire simulation (battery abuse center). This facility is 8 meters in length, 7 meters wide and 8 meters tall.

All information on battery testing is available from TÜV Rheinland at www.tuv.com/batterylab.

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