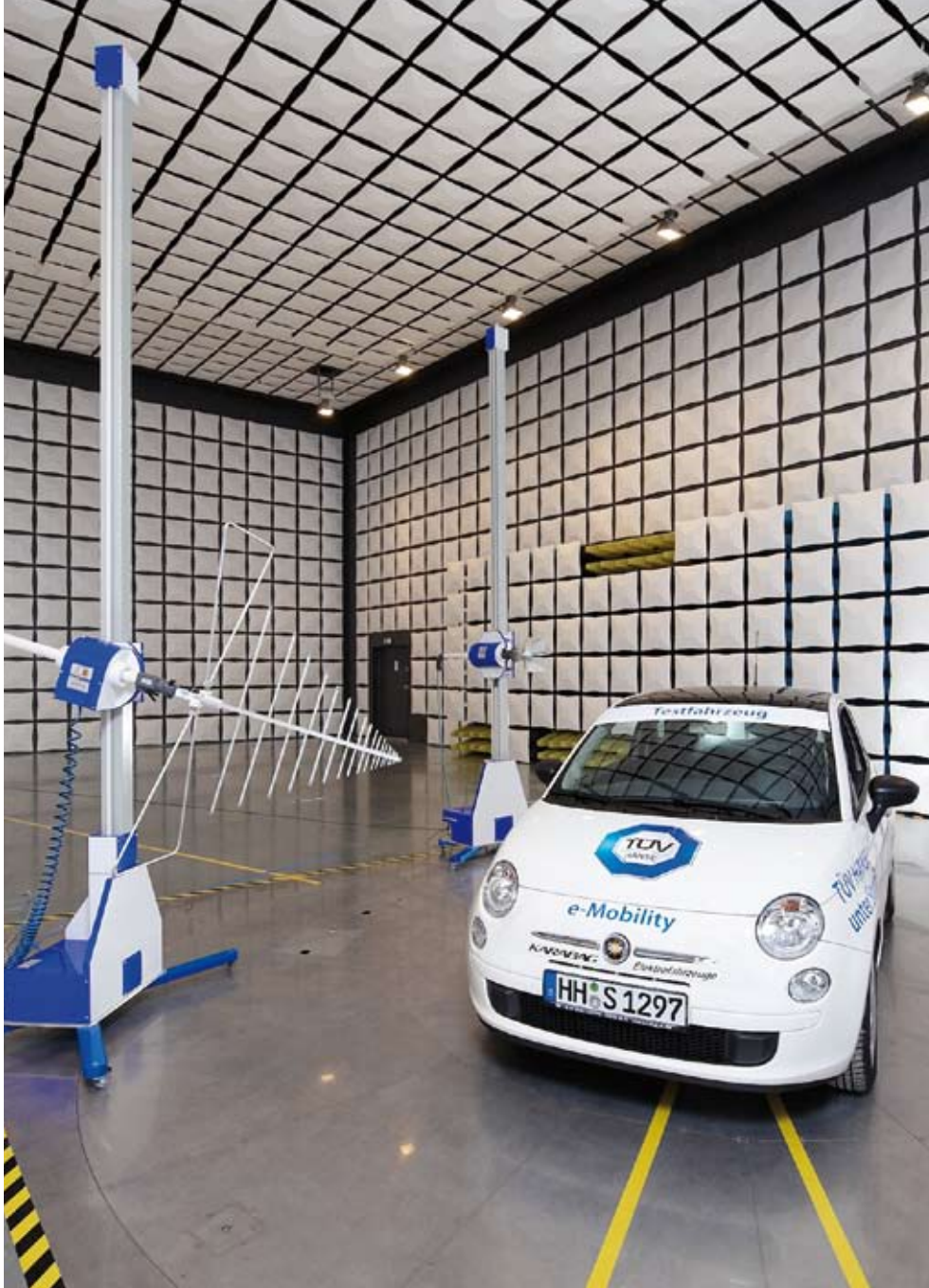




Choose certainty.
Add value.



e-mobility

We make the future safe

TÜV SÜD AG

TÜV®



TÜV SÜD makes the way safe for innovations, with their great experience in all the important aspects, and side-by-side with their customers to ensure compliance and safety.





e-mobility – we make the future safe

The mobility concept of the future focuses on electric-powered vehicles: an important step forward, especially on account of increased environmental awareness. Electric automobiles impose less of a burden on natural resources and the climate than conventionally powered vehicles, which burn fossil fuels. The introduction of electric motors opens up the possibility of introducing renewable sources of energy for transportation on a large scale as well.

Electric automobiles are free of all on-the-spot emissions, and run very quietly. This is a big advantage, particularly in urban regions. When combined with renewable sources of energy, operation of electric-powered vehicles can even be entirely emission-free. Thus individual motorised travel becomes climate-friendly and no longer relies on the combustion of limited fossil resources.

In many parts of the world, stricter environmental regulations and emissions standards will be coming into force in the next few years; local authorities may decide not to allow vehicles with internal combustion engines into city centres any more. This option is being discussed in Asian cities in particular, since local pollution emissions are rising with the growing number of motor vehicles. Noise and pollution are already a major problem for the people there, although the number of vehicles per capita is still well below that of Western cities.

For many vehicle manufacturers and infrastructure providers, this is reason enough to turn to the development of electric motors and the associated infrastructure, as the topics of climate protection and dependence on supplies of fossil fuels are attracting more attention not only in Europe. Manufacturers in Asia and the U.S., as well as in Europe, are developing new motor technology in order to capture future global market share. The more intense the competition, the more important attributes such as quality and safety become. For only safe, high-quality products guarantee success with customers.

TÜV SÜD is facing up to this challenge, side-by-side with its customers. With proven competence and many years of experience, TÜV SÜD advises, tests and certifies its customers in the field of electro-mobility. Electrical safety in particular, in stationary and mobile applications, has been an important core skill of TÜV SÜD for decades. We are pleased to put this skill at our customers' service.



Electric vehicles: advising, testing, and homologating

Several million electric-powered vehicles will be on the road worldwide by 2020. Regardless of whether these are battery-powered vehicles, serial or plug-in hybrids, or fuel-cell-powered vehicles, high-voltage components will be an integral part of these vehicles.

To ensure that all the new electric-powered vehicles offer maximum safety from the start, and that products can be ready for market promptly in a dynamic environment, TÜV SÜD offers an extensive range of services:

Safety of electric vehicles

Our specialists test and evaluate components, systems, and complete safety concepts. Our services include all aspects of technical safety: electrical, functional, chemical, and mechanical. After certification, TÜV SÜD awards a test mark which certifies the tested safety to manufacturers and customers alike.

Homologation and certification of electric vehicles

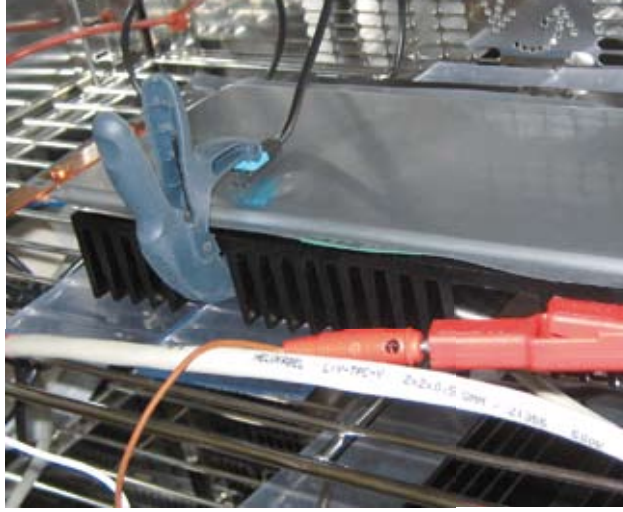
TÜV SÜD is accredited for more than 300 national and international testing methods. Thus we can provide homologation and certification services reliably to vehicle manufacturers and their suppliers in industrial regions throughout the world. Our services range from the certification of prototypes and small series to the homologation of mass production runs. We also provide our customers with advice even at early stages of development, based on the many years of expertise of our worldwide teams of engineers. Not least, this enables us to monitor final adherence to country-specific rules on series approval, i.e. homologation throughout the development of the vehicle. With this service, TÜV SÜD provides the foundation for safety-oriented development and successful production.

Main inspection of electric vehicles

Of course, we also perform main inspections (for roadworthiness certification) for electric vehicles. This includes the classical mechanical visual inspection, an electronic FSD inspection (Fahrzeugsystemdaten GmbH), testing of operational safety, and a function test of the high-voltage system.

Your advantages as a customer and partner of TÜV SÜD:

- Rapid and reliable homologation by recognised experts
- A “one-stop shop” for all services, from development to homologation
- A holistic view of safety by accredited inspection centres
- Assistance in development based on our know-how in high-voltage vehicles, systems, components, and energy storage



The battery: A core component of an electric drive

TÜV SÜD is very well prepared to check battery safety in electric vehicles: we have our own testing laboratories in Singapore, Great Britain, China, and the United States, as well as in Germany.

Since battery safety is one of the main factors in the overall safety of electric-powered vehicles, all kinds of batteries need to be tested in close collaboration with motor-vehicle and battery manufacturers and their suppliers. TÜV SÜD tests individual cells, and also battery modules and packs, to globally accepted test standards, as well as to specific customer requirements.

TÜV SÜD certifies to existing standards, such as UNDOT for transporting batteries. But since there are hardly any codes for uniform certification of battery systems as yet, we also draw up individualised testing programmes at customers' request, for which we then grant a TÜV SÜD test mark.

Our range of services covers all types of vehicles, such as cars, pedelecs (electric-power-assisted pedal cycles), commercial vehicles, and special-purpose vehicles such as forklift trucks. We also test and evaluate safety concepts for batteries and their control systems. Our experts test chemical and electrical safety, as well as the behaviour of the batteries in a crash. Abuse tests round off our range of services.

Our experts are always up-to-date on international developments of safety codes, and are often themselves members of the rule-making bodies. Thus TÜV SÜD is a strong partner in the world market. We already take all the foreseeable developments into account when advising our customers, saving you time in development and providing important added value. At TÜV SÜD, the customer has the advantage of first-hand expertise.

Vehicle and battery manufacturers benefit from TÜV SÜD – worldwide:

- Safe products from the start
- Comprehensive expertise from TÜV SÜD
- Comprehensive testing services from a neutral service provider
- Holistic approach to safety by accredited testing centres
- Test mark from neutral, widely recognised testing centres



Safe battery-charging infrastructure and certification of recharging units

Companies and local authorities seeking to lay the foundation for a battery-charging infrastructure can already create a safe basis for approval and operation of their electricity “filling stations” with TÜV SÜD as their worldwide certification partner. Our services range from advice on site selection, via testing and acceptance of the installation, to commissioning. At some sites, it is also a good idea to investigate the feedback effects of battery-charging units on the local power grid.

Safety experts from TÜV SÜD also advise manufacturers of electrical recharging units during development and international certification. Actively involving TÜV SÜD on both the consumer and manufacturer side ensures ideal coordination of product and location. It does not matter whether the recharging units transmit the electricity into the vehicle by cable or inductively.

All-inclusive service: the safety package

TÜV SÜD advises the operators of recharging stations on the selection of the sites, tests or certifies the recharging stations, handles the acceptance testing, and conducts the commissioning. Periodic inspections are documented by a clearly visible test mark, giving safety and confidence.

Your advantages as a customer and partner of TÜV SÜD:

- You obtain reliability in a field in which guidelines have not been finalised yet. TÜV SÜD's experience in the certification of electrical products and inspection of electrical plant helps to ensure safe operation.
- You can be a pioneer in a very promising market with maximum safety for the service providers and their customers.
- This forward-looking commitment gives a positive image to environmentally committed local authorities.



Training creates safety in high-voltage technology

The introduction of electric drives for road vehicles is a major change in technology in the automotive sector. It includes the use of high-voltage components at a couple of hundred volts in the motor vehicle and innovative technologies for energy storage. This includes not only the battery and the motor, but also the entire electronic controls, which have to handle high voltages and currents on the secondary side, as well. This involves lethal risks if repairs are not performed properly, both to the garage staff and to the customer. Improper handling of new-technology batteries can also cause a drastic reduction of their service life and performance.

To enable their customers to meet this new challenge with the necessary professional skill, TÜV SÜD offers an extensive set of courses and training programmes in high-voltage safety and in handling lithium-ion batteries. These are aimed at vehicle manufacturers wishing to train their staff, garages wishing to provide their staff with additional qualifications for electric vehicles, and also interested laypeople who wish to obtain the necessary know-how and confidence in handling the new technology.

A successful course concept

Depending on the prior knowledge of the participants, we offer various courses in working on high-voltage systems in motor vehicles:

- We train to the various official levels of qualification for electrical work.
- Vehicle manufacturers and their suppliers can qualify their staff to work on high-voltage systems in tailor-made training courses with instructors from TÜV SÜD.
- TÜV SÜD also trains its customers in the field of lithium-ion technology, from the design of battery packs to safe handling of this technology.

Benefit from the wealth of experience of TÜV SÜD engineers, who have seen and examined a wide range of vehicles, due to their work in testing, homologation, and individual approval of vehicles, and who are in constant contact with international testing centres.

TÜV SÜD further education courses provide participants with:

- The necessary knowledge of hybrid and fuel-cell technology
- The basis for working safely on high-voltage systems in electric-powered vehicles
- Thorough knowledge of conceptual and detailed design and safety of innovative energy-storage systems based on lithium-ion technology
- A considerably broader range of work and better opportunities in the labour market



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