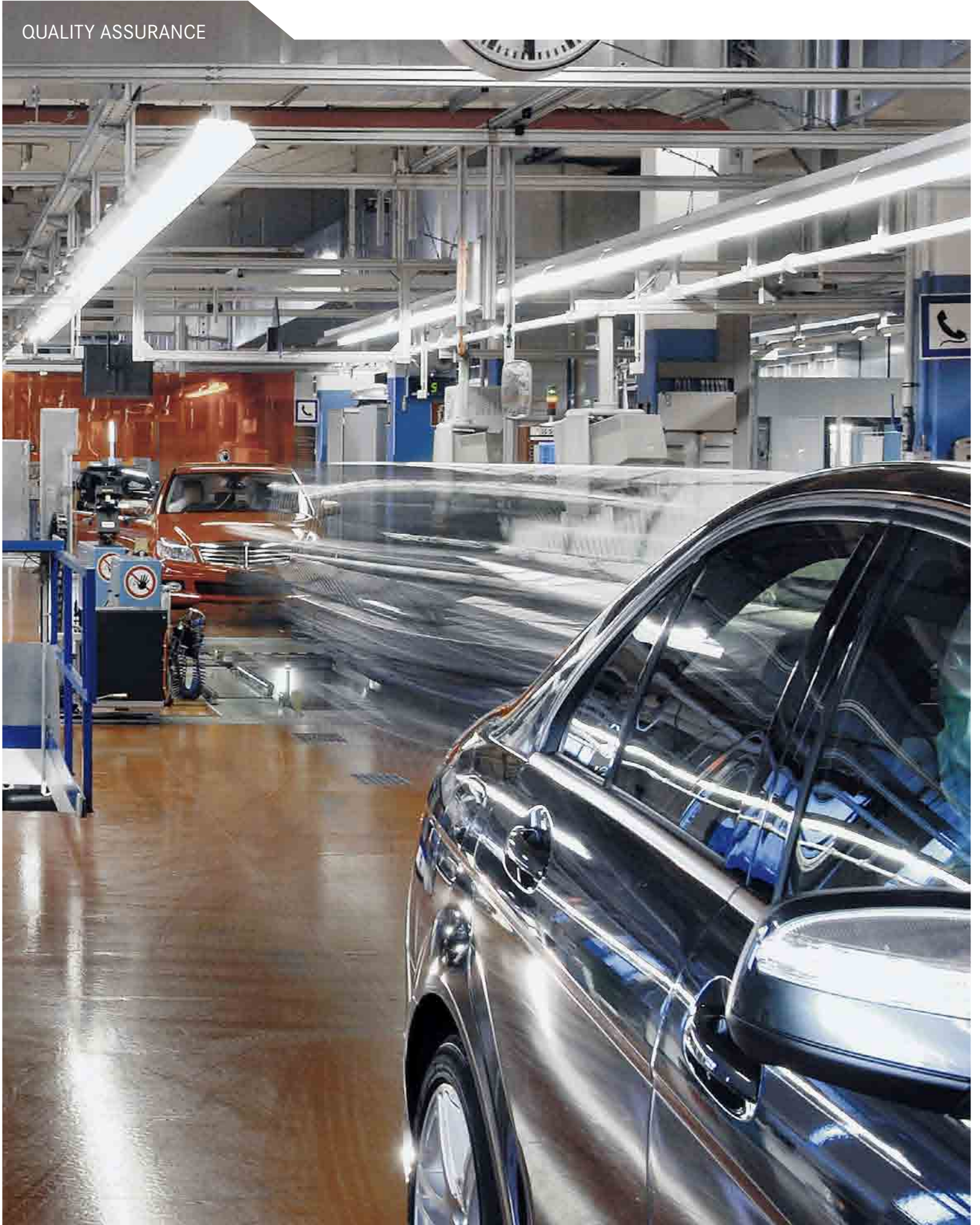


QUALITY ASSURANCE





ERROR-FREE — THANKS TO CTS

Automatic and ultra-precise checking
of the installation quality of telematics equipment

— In Assembly Hall 38 at the Mercedes-Benz plant in Sindelfingen, the chassis of C-Class vehicles are adjusted at the tuning station and the telematics installations are checked in passing.

“CTS measurements are ultra-precise and automatic, requiring no extra testing time. The system is robust and reliable.”

Johann-Friedrich Luy, Quality Analysis at Daimler Research



At the Ulm Research Center, the team developed and tested the measurement precision of the CTS. The tests included a sound check of the flush-fitted loudspeakers via a microphone in the steering wheel balance.

The Mercedes-Benz C220 CDI in assembly hall 38 of the Mercedes-Benz plant in Sindelfingen, Germany, has a comprehensive telematics package that includes the multimedia system COMMAND APS, cell phone equipment, and a surround sound audio system. Almost fully assembled, the car with the tenorite gray paint job waits to be moved to the next work station. A plant worker opens the driver door. With a cell phone in his pocket and a metal cross in his hands, he gets into the car and attaches the metal device, which is known as a “steering wheel balance.” He checks with a glance to see if everything is straight and inserts the cell phone into the docking port.

Thus prepared, he rolls with the car to the next station, where the chassis of the car is precisely adjusted. This process, which is facilitated by the steering wheel balance, takes less than two minutes, during which time strange sounds emanate from the car. Suddenly the cell phone rings, and someone seems to start playing around with the COMMAND system. It sounds as though an invisible hand is trying out the automatic station search. And shortly afterward, some unseen leprechaun seems to be doing a sound check with the loudspeakers.

Automatic installation testing The cause of all this activity is not at all supernatural. During the chassis adjustment, a test rig automatically checks the telematics equipment in the vehicle. Depending on the scope of the check, this can include up to ten test sets. The centerpiece of this rig, called the “Communications Testing System” (CTS), is an electronic tower with a display, control computer, antenna combining unit, and base station simulator for the radiotelephony.

The tower is connected with antennas in the upper section of the test rig. All the test signals are emitted into the car via these antennas. Through the diagnostic unit, the IS tester, the tower is also connected to the car via the onboard diagnostic interface. The job

of the IS tester is to read out the signals arriving in the vehicle. The computer in the test rack now compares the transmitted signals with the signals arriving in the car and then evaluates, for instance, whether the GSM antenna is working, whether the radio is correctly receiving the VHF transmitter, whether a mobile telecommunications connection can be established to the cell phone, and whether the speakers of the surround sound audio system are working flawlessly.

This fully automatic test system was conceived by engineers from the Quality Analysis unit of Daimler Research in Ulm. Says Johann-Friedrich Luy, head of the CTS project: “CTS measurements are ultra-precise and automatic, requiring no extra testing time. The system is robust and reliable.” Compared to previous tests, the CTS detects even the smallest signal attenuation, which is around 5 dB. Up to now, engineers have had to accept a range of up to 45 dB. And whereas an average of one in a hundred cars used to slip through the inspection with an installation defect, Luy now confidently asserts that CTS enables his team to “find every defect.” And that was the objective for the customer that ordered the system – the Production Planning department at Mercedes-Benz Cars.

Robust and precise Luy’s department developed the technical concept and devised a testing unit so sophisticated that it operates reliably even under the harsh conditions of final assembly. Two CTS units are being used in the South African plant in East London, where heat and high humidity threaten the electronic components. What’s more, the ultra-precise, high-frequency measurements don’t take place in a specially shielded laboratory but are carried out in an assembly hall, which is a babel of competing signals in the eyes of a high-frequency technician.

Currently, a total of 15 CTS units are being used in three Mercedes-Benz plants, where they check the telematics equipment of the

C and S-Class as well as the infotainment equipment of SLK and SL roadsters. The test racks are run by the units responsible for installing electrical and electronic equipment in their respective plants. Support for the systems currently in operation is provided by the specialists of the Technology, Diagnostics, and Production unit, whose expertise is required, for instance, when the IS tester requires adaptation for the new generation of COMMAND telematics, as is now the case.

Precise fault diagnosis For Luy, the advantages of the CTS extend beyond its economic efficiency and high testing accuracy. The results even indirectly show where installation processes have not been optimally planned. And with the help of colleagues in the Data Mining unit in Ulm, Luy is already planning the next coup: “When defects are noticed, we want to use the pattern of measurements to get clues that help us locate the gremlin.” In the past, this has been a tedious search that to some degree depends on the “intuition” of the tester.

Luy uses a malfunctioning cell phone to show how difficult troubleshooting is: “Where do you start looking? In the cell phone, docking station, cable or head unit connection? Or do you first check out the steering wheel control unit, antenna amplifier or external antenna and its wiring? But maybe the fault is in the CAN or the MOST bus...” ::

WEB TIP

For additional information regarding this article, please see the following items at HTR online:

- I-- CTS Graphic
- I-- Fast Growth of Communication Channels in Automobiles
- I-- Added Value from the Volumes of Data

www.daimler.com/innovation