



All-wheel acoustic dynamometers equipped with Siemens components

Acoustic dynamometers make people listen

For more than 15 years, Akustikzentrum Lenting (AZL) has been a partner to the automotive industry, serving all its acoustic and vibrational testing needs. From the drive technology to the controllers, the new all-wheel acoustic dynamometer is equipped with Siemens components exclusively.



Greater driving comfort – ensured by the ultramodern dynamometer from AZL equipped with Siemens components

For most car buyers – sports car fans aside – a quiet and smooth driving experience is an expected characteristic of a new car.

This inconspicuousness not only translates into greater driving comfort, it also represents quality in manufacture. This requirement poses a challenge for automobile manufacturers. Fortunately, specialized companies such as Akustikzentrum Lenting (AZL) provide the necessary expertise, the technical equipment, and effective processes to detect unwanted noise and vibration and their causes already during the development of new vehicle models.

In addition to well-grounded technical consultation and acoustic dynamometer rentals, the comprehensive services offered by AZL include building dynamometers for use at the customer's location. "For equipment manufacturers that want to modernize their dynamometers, space is a particularly

big issue," says AZL managing director Michael Zehner. "With our compact design, we offer them an additional crucial advantage."

Compact test technology for special requirements

AZL recently began using a new, ultramodern dynamometer. One of the most compact all-wheel acoustic dynamometers in the world, it was developed in close cooperation with Siemens. Zehner explains: "We chose Siemens for the automation, the low-voltage switchgear, the drive technology, the user interface, and the controllers because we have had good experiences with the company from the start and because for our customers it is also important to have high-quality products built in, for which there will still be spare parts available even in 10 years, if necessary." The compact design of the new dynamometer was made possible through the four Simotics T-1FW3 water-cooled

The compact dynamometer with torque motors from the Simotics T-1FW3 series, seen from below



The acoustic dynamometer at Akustikzentrum Lenting



torque motors that are mounted directly on the drums as individual direct drives. The four permanent-magnet synchronous motors form one complete system, which, according to Zehner, “is unique and ensures extremely high control quality due to the rigid connection.” The control quality is a critical factor, because acoustic tests in the automotive sector are especially demanding in this regard.

For example, the operation of the rollers must be absolutely synchronous. The rollers are equipped with various coverings or small obstacles to simulate different road surface conditions. Just as important is the ability to precisely control the rollers separately, in order to also detect noises and vibrations of the car in curves.

Realistic conditions wanted

The engine starts. A powerful car, midsize luxury class. Automatic transmission. Within seconds, freeway travel speed has been reached. How will

bumps be experienced in the vehicle at 130 kph? And at 190 kph? Zehner and his team are collecting important data and insights in these seconds. “When we attach what is referred to as beater strips to the rollers to simulate bumps, they have to touch the left and the right wheel at precisely the same time,” Zehner explains. “Otherwise, the effect is not reproducible and sounds different each time.” The important thing here is that the Sinamics drives adjust the roller movement to the nearest millimeter – even at high speeds.

The heart of the control technology is a drive-based Simotion D435-2 DP/PN with an integrated control unit that communicates with the power unit of the Sinamics S120 via the Drive-Cliq drive bus. The regenerative multi-axis topology of the Sinamics S120 allows the direct drives to exchange energy already in the intermediate circuit. This means that the total connected load can be dimensioned lower than when using separate frequency converters. If needed, the highly dynamic control unit of the



Siemens AG / IW Geyer

Test situation inside the vehicle to be tested, with a Simatic Mobile Panel

Sinamics converter switches between motor operation and generator operation with absolutely no shock or delay. Because of the motion control technology and control functions integrated directly into the drive, the overall system reacts especially quickly. Simotion controls the four axes and the various operation modes. The auxiliary equipment and the safety program run via the ET 200S distributed I/O system.

The communication of the individual modules takes place via Profinet with the Profisafe profile for fail-safe activation of the integrated safety function of the multi-axis converter. The dynamometer is operated from the control room via a Simatic IPC427C microbox PC. Of course, the test-driver can also influence the dynamometer, because many functions and parameters can be controlled directly from inside the vehicle via the 277F IWLAN Simatic Mobile Panel. And the panel has an emergency stop button for maximum safety.

The unique dynamometer goes into production

The prototype of the all-wheel acoustic dynamometer from AZL has been successfully and reliably proving its worth in vehicle development from the first day. An installation of almost exactly the same design has been delivered to a customer in the automotive industry, and the unique drive and automation concept of the dynamometer has found further buyers as well. Thanks to the modular structure of the dynamometer projects, Zehner and his team at AZL are able to meet very differing customer requirements. ■

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