

Movement by Perfection



The Royal League in **ventilation**, control and drive technology

Tested Innovation

Test benches, technical data and standards
in ventilation technology

Tested innovation in ventilation technology

From development to individual application

To be a trendsetter and technology leader, you need the most accurate testing and measurement equipment. When it comes to ZIEHL-ABEGG ventilation technology, the heart of this technology can be found in InVent. By name, InVent is a fusion of the words "innovation" and "ventilation".

Over 100 engineers and technicians work at InVent on an area of around 5,000 square metres to improve existing products and develop new innovations.

In terms of its design, the structure is a centre of pioneering technology, measuring 97 metres in length by 10 metres in height housing the test set-up and state-of-the-art test rigs, including the world's largest combined fan test rig to date for acoustics and air performance.



Overview of our ventilation technology test laboratories

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High quality standards as per VDE, TÜV-SÜD,
AMCA and UL





Acoustics and air handling capacity

Combined measurement

The world's largest and most modern fan air and acoustic test rig to date is where fan units are tested and all possible combinations measured. Large 2.5 m air channels can be used here to measure air flows up to 100,000 m³/h and pressures up to 3,000 Pa.

Aim of testing:

For all ventilation system products of ZIEHL-ABEGG SE, the required ventilation system, acoustic and electrical data are ascertained on both combined test rigs with the greatest possible accuracy.

- 2 test rigs for volume flow rates up to 100,000 m³/h
- Static pressure up to 3,000 Pa
- Fan diameters up to 1,800 mm
- Unit measurement up to a size of 4 x 2.5 m
- Weight of test specimen up to 1,000 kg
- Third-octave band analysis from 50 Hz to 20 kHz
- Idle level of approx. 15 dB(A)
- Combined fan characteristic curve measurement with air performance, acoustics and electrical data
- Standards: DIN EN ISO 3745 (Class 1); ISO 5801; ISO 13347-3; AMCA 210; DIN 24163



Air handling capacity measurement

The development area contains inlet air performance test rigs for new developments and prototype measurements. Prototypes are inspected and modified, new motor/im-peller combinations tested and parameter optimisations and heating runs conducted on four chamber test rigs.

Aim of testing:

The ventilation system data of prototypes and new products are checked here and the temperature behaviour is ascertained.

- 4 test rigs for volume flow rates up to 35,000 m³/h
- Static pressure up to 3,000 Pa
- Fan diameters up to 1,250 mm
- Fan characteristic curve measurements (volume flow rate pressure)
- Standards: ISO 5801; DIN 24163; AMCA 210



Motor measurement

The motor test benches can be used to test the functions and durability of motors. These inspections measure and record outputs, characteristic curves and temperature behaviour.

Aim of testing:

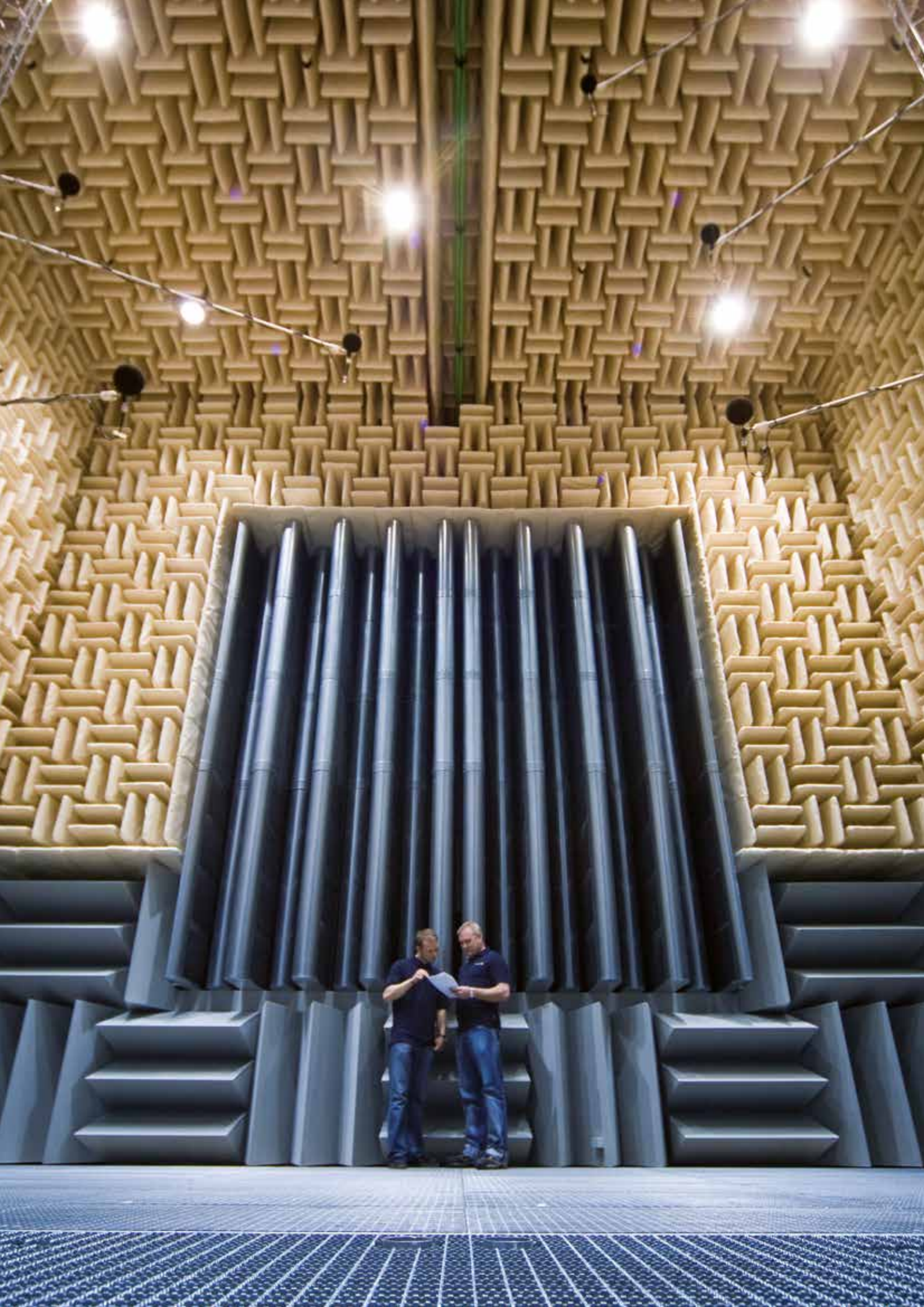
To verify compliance with specified setpoints and the optimisation of characteristics such as efficiency, energy consumption, output, thermal strength and environmental stress.

Inspection of motor overload capability:

In this case, the motors are operated under extreme conditions, in order to detect and resolve weak points in motor components in a much shorter time than would be possible with normal use.

- 7 test rigs for outputs up to 80 kW
- Torques from 0.1 to 300 Nm
- Performance measurements (speed torque)
- Heating characteristic curves class F 155°C and H 180°C
- Standards: DIN 60034





Movement on the test rig

ZIEHL-ABEGG products are used in a wide range of sectors. From air-conditioning units in buildings to cooling of electronics and motors. When operating, they are subjected to various environmental influences. In addition to the reaction of components to external influences, the performance limits also have to be tested in a range of test procedures.

Vibration measurement

To measure vibration, acceleration sensors are attached at various measuring points of the respective test specimen, for example on assembly parts and on the motor. The sensors thus record the vibrations at various points in the required directions across the required speed range.

Aim of testing:

To record vibration values via the speed and thus to identify resonances or problems of order.

If the vibration values are too high, design changes must be made. Without this test, the fan could become a disturbance due to too high noise levels and vibrations.



- Rigid and free suspension of test specimen
- Run-up measurement up to n-max
- Evaluation as waterfall graph or colour chart
- Frequency range of 10 Hz to 1,000 Hz
- FFT, modal and operational vibration analysis
- Standards: ISO 14694

Overspeed test

In order to ensure the necessary and calculated speed by means of experiment, the impellers and rotors are mounted on a specially designed shaft and accelerated to breakage or plastic deformation.

Aim of testing:

Verification of the calculated strength including calculated safety and determination of the speed at which component failure occurs.



- Speeds up to 14,000 rpm
- Recording of vibration velocities
- Determination of max. speed before plastic deformation
- Recording of strain and tension with strain gauges and telemetry

Extreme conditions

Biting cold, tropical heat and the whole climatic range in between. When used around the world in a range of climate zones, ZIEHL-ABEGG products are exposed to everything that nature can throw at them. The external influences affect the ageing of the materials used, the electronics and the surface quality. Targeted stress tests are used to simulate climate conditions and investigate their effect on the products.



- Interior dimensions of test chamber: 2,800 x 2,200 x 3,000 mm (W x H x D)
- Temperature range -60°C to +85°C
- Rel. humidity from 10 % to 95 % (at 10°C...70°C)
- Temperature changes of approx. 2 K/min.
- Max. thermal load of 15 kW at -40°C
- Start-up behaviour, embrittlement, ageing
- Standards: DIN EN 60068-2-(1; 2; 14; 30; 38; 78)

Climate test

Determining component properties

Components, assemblies and devices can only function safely and the desired service life be achieved by also taking account of environmental influences in the development process such as varying temperature and air humidity. In doing so, climate conditions from a variety of climate zones are taken into account. Testing is speeded up by the in-house climate chamber.

Aim of testing:

To check the functioning and resistance of fans in a wide variety of climate conditions.

Temperature change test (DIN EN 60068 -2-14)

The aim is not just to test extremely high and low temperatures, but also to put stress on components by means of a fast significant temperature change. This ensures that such components fulfil their function even in more extreme conditions. Such temperature changes are especially used for electronics components and plastic parts of any kind, the latter also being used to produce artificial ageing.



Damp heat (DIN EN 60068-2-78)

During testing as per DIN EN 60068-2-78, the ZIEHL-ABEGG products are subjected to constantly high temperatures in connection with high air humidity. High temperatures are particularly harmful to plastic components. High air humidity combined with heat has a particularly severe effect on the electronics. In reality such climatic conditions are found in tropical regions.

Salt spray test

The salt spray test subjects components to corrosive conditions. The salt spray test is a standardised test with a required test duration depending on the application area.

At the end of the test duration, the corrosive effects on the samples are assessed, e.g. according to degree of rusting and blistering and infiltration of corrosion (e.g. in the case of organic coatings).

Aim of testing:

To check resistance to corrosion of a product.

After successful completion of the tests, the products are divided into resistance classes in accordance with the ZIEHL-ABEGG guideline. Depending on the resistance class, products can be approved for special application areas such as transformer ventilation, agriculture, near shore or even offshore.

Dry heat (DIN EN 60068-2-2)

Constantly high temperatures. High temperatures can lead to accelerated ageing of the plastic, for example. Tests with corresponding temperatures help to detect weak points and verify calculated limit values. In reality, this would cover dry and hot climate zones, such as the Middle East.



- Interior dimensions of test chamber: 1,650 x 740 (1,190) x 570 mm (W x H x D)
- Testing of materials, surfaces and coatings
- Test duration 1,440 h (240 h, 480 h, 720 h, 1,000 h)
- Evaluation of degree of blistering and rusting, infiltration and adhesion
- Standards: DIN EN ISO 9227; DIN EN ISO 4628 - (2-8); DIN EN ISO 2409; DIN EN ISO 6270 - 2; DIN EN 60068-2-11; DIN EN 60068-2-52.



Outdoor, indoor endurance tests

In outdoor and indoor endurance tests in our special endurance test rooms, our products are checked for their wear resistance by means of higher loads at an accelerated pace. These tests can be done in continuous operation or in coordinated operation cycles depending on the application. Last but not least, there is the product weathering loading in outdoor endurance tests.



Endurance test

ZIEHL-ABEGG fans are used in different climate zones. The free field tests are specially designed accordingly. High UV exposure, cold or hot climate with corresponding varying air humidity (also icing) and contamination have to be taken into account.

Aim of testing:

To test the quality and durability of the ZIEHL-ABEGG products under real conditions of use, depending on the climate zone even in extremer climatic conditions.

Endurance test in temperate climate zones:

- Location: Künzelsau and Kupferzell
- ECblue and AC motors with different impellers in a variety of installation positions in continuous and switching mode, End of life tests.
- Openly exposed to the elements

Endurance testing in agricultural applications:

- ZIEHL-ABEGG agricultural fans, such as fans of the FF model range with EC116 motors, are tested for years partly also during development in cooperation with regional pigsties and chicken coops in their later area of use.

- This area of application is characterized by severe contamination and corrosion, thus presenting a special challenge.

Monitoring and recording of relevant data during fan endurance testing take place online in global areas of application. After completion of endurance testing, the fans are completely disassembled with the condition of individual components being evaluated.

All fans are constantly monitored during endurance tests. These fans are also completely disassembled after completion of the endurance tests with the condition of individual components being evaluated.

- Motor and fan stress testing
- Endurance tests for several years
- End of life tests

Temperature spin test (SX boxes)

Extensive tests are also carried out in special endurance test rooms. These rooms are also suitable for tests with very high mechanical loads, which have to be specially safeguarded accordingly. Fans are subjected to extreme stress in continuous and switching mode at overtemperatures and speeds and are overloaded until failure.

- Speeds up to 6,000 rpm
- Temperatures up to 105°C
- Fan diameters up to 1,250 mm



Creep test (temperature container)

In the same way as in the SX boxes, the test specimens are exposed to extreme temperatures in order to test the creep behaviour of plastic impellers, measured and documented regularly. In order to release new materials or tool changes, the fans are operated for several cycles under extreme heat and are constantly monitored.

- Temperatures up to 100°C
- Fan diameters up to 1200 mm
- Long-term tests



Vibration test

Shock test (Shaker)

ZIEHL-ABEGG products are used in a wide range of applications and are exposed to a wide range of influences, including varying vibration excitation. In order to meet the high requirements of our products, all components must be tested under defined load profiles under extreme climatic conditions



"Shaker" shock test rig with sliding table and climate chamber up to 35 kN.

The "Shaker" shock test rig can be used to optimally simulate various environmental influences in the form of vibrations at the installation locations of our products. For example in railway applications or transport simulations covering noise, sine and shock tests. In addition, the test samples can be exposed to climatic conditions during the series of experiments.

- Frequencies from 5 Hz to 2300 Hz
- Acceleration up to 50 g (shock test up to 150 g)
- Excitation up to 35 kN (max. force)
- Temperature range -40 °C to +180 °C
- Relative humidity from 10 % to 95 % (at 10 ... 95°C)
- Standards: DIN EN 60721; DIN EN 61373;
DIN EN 60068-6; DIN EN 60068-27;
DIN EN 60068-64

UV test chamber and sample construction

Sunlight simulation (UV test chamber)

ZIEHL-ABEGG materials are subjected to tough outdoor use due to exposure to Xenon lamps, a permanently humid environment and cyclic spraying with pure water. This weathering test achieves a highly accelerated ageing process. In fans, particularly plastics, paints, sealing materials, prints and name plates or labels are subjected to UV light and the weather conditions.



Interior with 3,000 cm² exposure area



The weathering chamber is also suitable for 3-dimensional test specimens or cut-outs of excessively large test specimens.

In order to qualify materials and subject them to quality control with regard to UV stability, these tests are necessary and can guarantee consistent test conditions. These results can be correlated with exhibits on open spaces, e.g. the roof of the company building.

Thanks to the large test chamber, smaller motors and also parts of impellers can be tested directly in the processed final state, thus providing realistic test results. The lighting and weather conditions of ZIEHL-ABEGG products are also tested in accordance with the internationally common "Florida test", which is also defined in DIN EN ISO 4892-2+A1 and guarantees meaningful results at an accelerated pace. Here, the test chamber is permanently controlled and monitored for a test room temperature of 38°C, 50% relative air humidity, 60W/m² at 300-400nm UV radiation and 18min rain during a 2h cycle in continuous loops.

- DIN EN ISO 4892-2+A1
- DIN EN ISO 4892-2+B2
- DIN EN ISO 16474-2+B2
- DIN EN ISO 11431

Rapid prototyping

Various prototype parts, such as impellers, blades, housing parts or guard grilles, are made from plastic in an FDM (Fused Deposition Modeling) process. With these prototypes the respective designs can be verified, e.g. by measuring initial characteristic curves. In addition, the functioning and accuracy of fit of new components are checked. In this way, any design errors are recognized at a very early stage, making tool investments safer.



- Two 3D printers (FDM process for STL files)
- Installation space up to 40 x 40 x 35 cm
- Construction of models in coat thicknesses of 0.16 mm
- Printing of sample components and prototypes

Quality assurance

Tension/compression test (universal test machine)



The universal testing machine can be used to perform tensile, compression, shear or bending tests on specimens as well as on real components. This allows materials to be investigated according to their application. The measured data can serve as a basis for future component configurations or for quality assurance. The aim is to determine material and composite parameters.



- Force range up to 200 kN
- Test stroke up to 1,500 mm
- Test temperature from -40 to +200°C
- Accuracy class 1 in the range 0.4 - 100%
- Standards: DIN EN ISO 7500-1; DIN EN ISO 527; DIN 53504; ISO 6892 and ISO 37

IP protection class test (sprinkler system)

The sprinkler system allows products, components or components to be checked for watertightness. A rotary plate and swivel arm, which moves around the test specimen depending on the degree of protection, produce a uniform sprinkling that hits from all directions.

- DIN EN 60529
- IP protection class test IPX3 and IPX4



Electronics laboratory

Interference emission and interference immunity (EMC test chamber)



*Shielded absorber cabin
(Fully Anechoic Room) for 3 m
distance.*

The Electrical Systems development area provides standard-compliant measuring stations for measuring HF interference emission via line and housing for measurements relevant to development and approval. At three measuring stations, the irradiation via the supply mains and housing, as well as the harmonics currents at nominal load, can be measured. The interference immunity against ESD, SURGE, BURST, DIPS and power-related high-frequency interference can be tested at four measuring stations.

- Cylinder test volume Ø 1.2 m and height 1.0 m
- Rotary disk Ø 2.0 m to max. 1,000 kg
- Frequency range of interference emission 30 MHz up to 2 GHz
- Interference voltage 9 kHz to 30 MHz
- Standards: EN 55011; EN 55014; EN55016-1; EN 55016-2 EN 55022; EN 61000-3 and EN 61000-4; EN 61000-6-4

Surface testing (digital microscope)

Thanks to the very high depth of focus of the digital microscope, sharp images can be created in complex surface structures, even at several levels. In contrast to a normal stereo microscope, concave or convex surfaces can also be viewed.

Electronic circuit boards and components are digitally measured, glass fibre distributions in the granulate are considered, but causes of ball bearing damage and fracture characteristics on mechanical components are also investigated.

- 2 lenses and different magnification
- 20 - 200 x magnification
- 100 - 1000 x magnification



Certificates and standards

TÜV-SÜD DIN 24163/ISO 5801

Large combined test rig

Air flow range of 4,000 m³/h to 91,000 m³/h
and a pressure range up to 2,500 Pa.

Small combined test rig

Air flow range of 150 m³/h to 23,000
m³/h and a pressure range up to
2,500 Pa.

LMS-3 air handling capacity test rig

Air flow range of 630 m³/h to 28,000 m³/h
and a pressure range up to 1,600 Pa.



General certification

Railway application, welding of railway vehicles and railway vehicle parts as per DIN EN 15085 CL1

Approval of the new construction of parts or
components for railway vehicles including design,
purchase, assembly and resale.

Quality requirements for fusion welding as per DIN EN ISO 3834-2

DIN EN ISO 3834-2 sets forth extensive require-
ments for fusion welding (e.g. personnel requirements,
operational facilities, welding-related production and
quality assurance, etc.).



Allianz Arena Munich:
Over 100 free-running ER..C centrifugal fans ensure a comfortable climate for 75,000 spectators.



VDE TDAP

Test Data Acceptance Program
Certificate of acceptance of the
Ziehl-Abegg test laboratory by
the VDE Institute.



DIN EN ISO 9001:2015

ZIEHL-ABEGG SE and ZIEHL-ABEGG Automotive GmbH

Quality management system as per DIN EN ISO
9001:2015 has been introduced and is being
applied.



VDE

as per certification in accordance with domestic appliance standard IEC/EN 60335-1

The manufacturing plant is monitored in accordance
with the European Factory Inspection Procedure as per
ECS/CIG 021 – 024: 2014.



ATEX directive

The ATEX directive confirms that the fundamental health and safety requirements laid out in the ATEX directive are observed and fulfilled with an appropriate conformity assessment process.



CCC

The China Compulsory Certification (CCC) is a certification system used in China. Products requiring certification may only be imported, sold and used commercially in China after being granted a CCC certification.



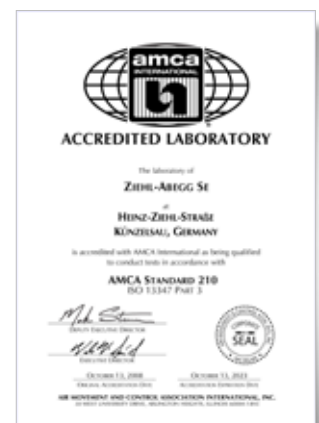
UL Underwriters Laboratories Inc.

The UL quality mark proves that UL-representative samples of the corresponding product have been tested and their compliance with the valid UL safety requirements confirmed.



amca

Large combined test rig
Small combined test rig
LMS-3 air handling capacity
test rig



*A seed bank on the Svalbard islands in Norway:
Seeds from around the world are stored in a 93 m long and 100 m deep
tunnel to act as an agricultural reserve for the future. In these extreme
icy temperatures, ZIEHL-ABEGG fans have to meet the toughest
requirements.*



The Royal League

