

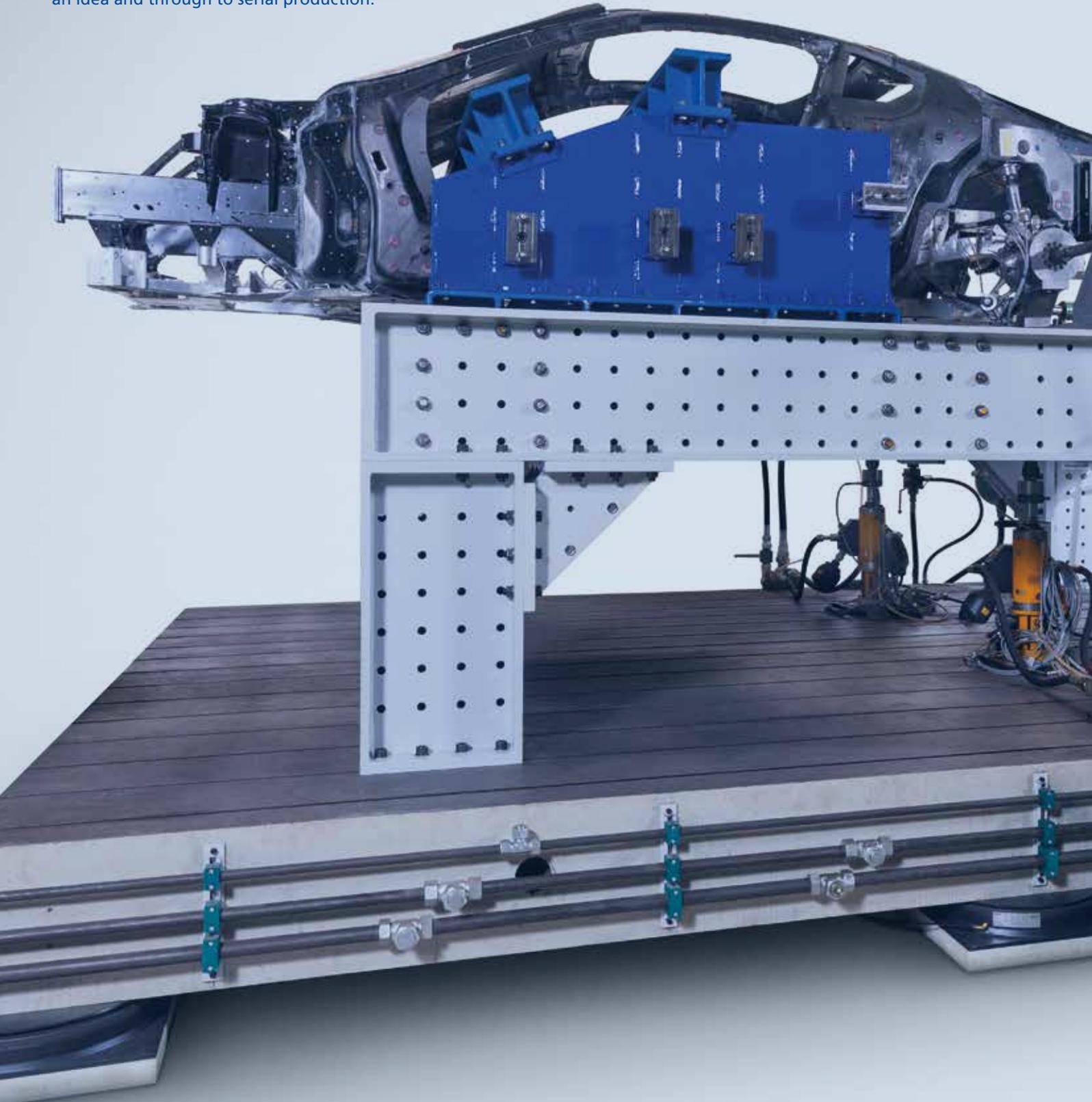


# TEST AND DEVELOPMENT CENTER FOR THE AUTOMOTIVE INDUSTRY

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# THE NUMBER ONE ADDRESS FOR COMPONENT AND MATERIALS TESTING FOR PASSENGER AND COMMERCIAL VEHICLES

A strong automotive industry requires a performance-capable and reliable partner who can be relied on completely for the development of aircraft structures and components commencing with an idea and through to serial production.





IMA Materialforschung und Anwendungstechnik GmbH, in short IMA Dresden, is the development and test centre for manufacturers and the entire supplier's industry and enables new developments to be capable for market launches more quickly.

For this purpose, IMA engineers test, simulate or compute the respective design and structural groups of an vehicles such as e.g. complete vehicles and vehicle bodies, chassis, engines, transmission, media-conducting systems, electrical components and materials. With such tests, we offer possibilities to experimentally examine different influences on the strength, to compare material use and design principles, and to verify calculation methods.

You can rely on us: our laboratories are certified according to DIN EN 9100, accredited according to ISO 17025. This therefore ensures that we can always provide tailor-made solutions for a wide range of structures and test requirements.

IMA Dresden – and it works:

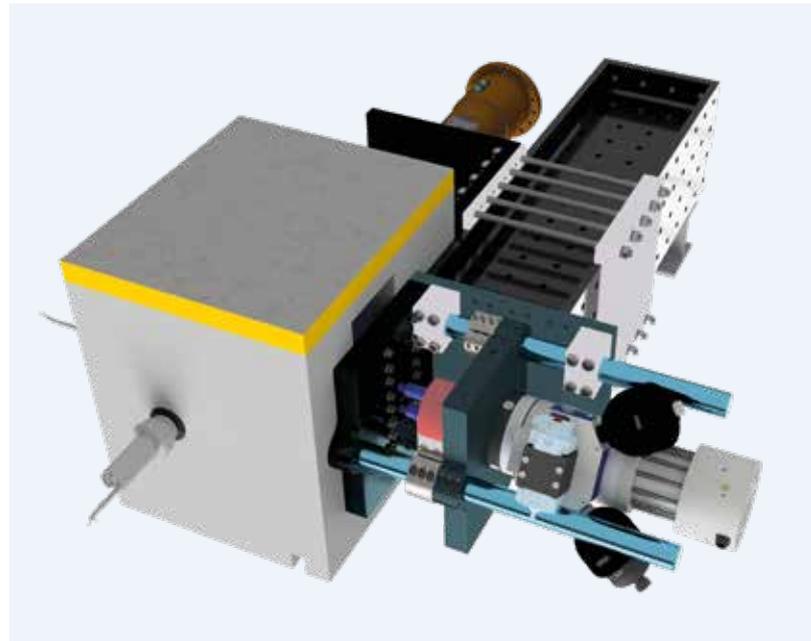
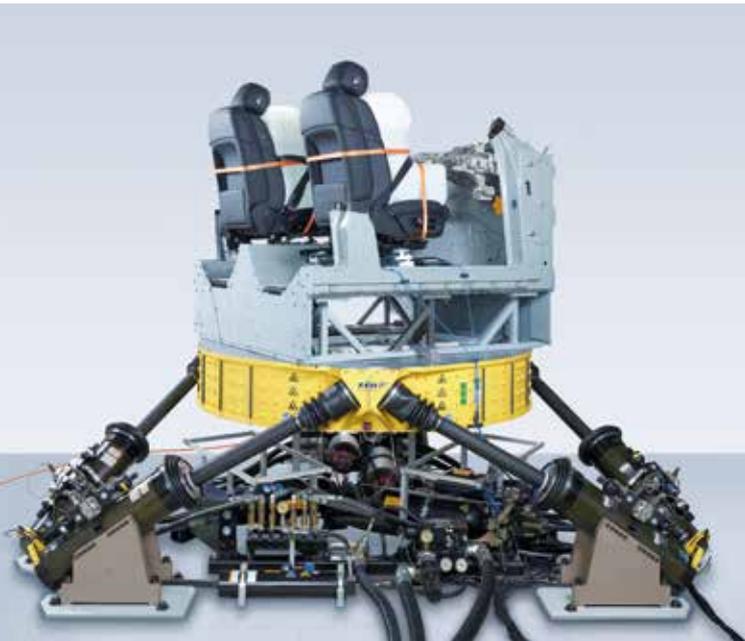
- Structure and component testing
- Testing of media-conducting systems
- Vibration testing
- Pressure pulse testing
- Material testing
- Non-destructive testing
- Electrical testing
- Materialography and damage analysis
- Simulation and strength verification
- Software systems for test and laboratory data

## FROM MATERIAL TO COMPLETE VEHICLE – EQUIPPED FOR A LONG DISTANCE



# IN FOCUS: VEHICLE STRUCTURES AND COMPONENTS

We bring the road to the lab for you. To determine the service life through experiments, we offer fatigue testing in which the loads that occur during driving are simulated in a realistic manner.



## COMPLETE VEHICLES AND VEHICLE BODIES

Experimental verification of operational stability is carried out on complete vehicles and body components:

- roof systems, whole vehicle structures
- front / rear vehicle structures
- body substructures (e.g. body strut dome)

Our engineers, measurement technicians and test mechanics offer you extensive experience in operational load simulation, where real-time signals are measured on the multi-channel test bench. Whether you want to look at cornering, poor conditions, braking torque or steering manoeuvres, in the laboratory we simulate all possible load on the vehicle structures.

The range of services includes the computer-aided design of specific test stand set-ups and simulation. In the design phase of the development process, we can also support you by providing measurements for determining load data and put together load configurations for experimental simulations.

For instance, our flexible test stands allow us to reproduce accelerations on a course with poor conditions and fully feed them into the structure. The frequency range that can be reproduced in the test stand is between approx. 3 and 50 Hz and covers all critical conditions. All regular operating loads, single incidents and even instances of misuse are included in the load simulation tests.

The complex load conditions of real driving are simulated. In the process, a vehicle's whole service life is traversed as quickly as possible, with reliable conclusions drawn about its system reliability.

## CHASSIS AND CHASSIS COMPONENTS

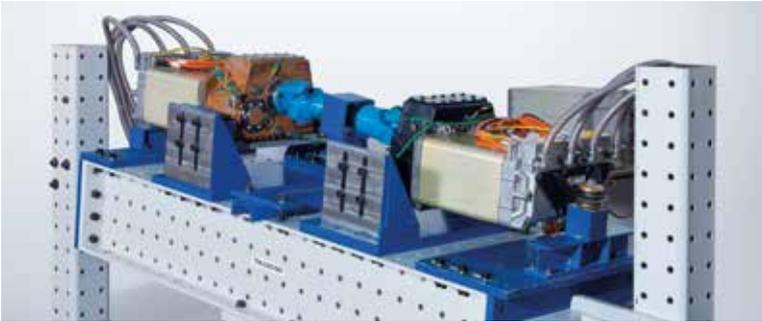
We help suppliers in the automobile industry to ensure quality with required proof of service life. Our experimental examinations of chassis components and trials of all kinds using different modes offer you the chance to evaluate different design, technology and material options. Of course, we offer the whole service under different climatic and environmental influences.



## ENGINES AND ENGINE COMPONENTS

We offer innovative test stand solutions for strength tests on engine components:

- one- and two-channel strength testing of crankcases
- strength testing of connecting rods, crankshafts and camshafts
- wear testing of camshafts



## TRANSMISSION COMPONENTS

IMA Dresden can support you as a skilled, experienced partner in the development of vehicle transmission by providing the following services

- Development, construction and operation of customised special test stands
- Implementation of various test scenarios: continuous operation, load cycles, determination of sound emissions, low and high temperature test, impermeability
- Early detection of damage through continuous monitoring by means of vibro-acoustic diagnosis

- Auxiliary frame and wishbone
- Half-axes
- Axles, front axle, rear axle (single and multichannel)
- Spring damper systems
- Stabilisers
- Brakes, brake components
- Chassis pivot joints as per AK-LH 14

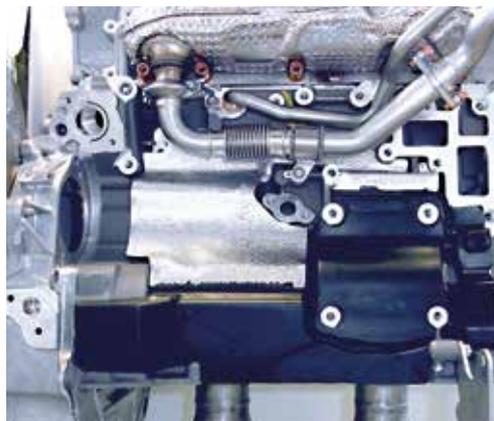
This enables the implementation of one-stage loads, block programmes and real-time signals in our test stands. The tests are carried out under the influence of matter such as salt spray or under different climate conditions.

## EXHAUST SYSTEMS

For exhaust systems and exhaust gas-carrying components we use a hot shaker test stand for operational load simulation, whose main components are a multi-axle vibration table and a hot gas generator. Using the multi-axle vibration table, it is possible to generate controlled loads from mechanical vibrations. The hot gas generator is capable of generating variable thermo-mechanical loads for components. Combining both systems allows the overlaying of stresses through experimental simulation.

# IN FOCUS: TANKS, FLUID TECHNOLOGY AND MEDIUM-CONDUCTING SYSTEMS

In our efficient laboratories, fitted with modern equipment and explosion protection, we determine the behaviour of your test specimen under the real driving load, combined with temperature changes, pressure changes, volumetric flow and vibration simulation. Special media are applied according to your specifications, regardless of whether we are testing individual circuits, components, units (pressure generators, pressure consumers) or whole systems.



We can inspect the loading capacity of your test objects under real and extreme conditions in our test laboratory in accordance with generally accepted standards, OEM specifications or for your individual specifications.

Irrespective of fuel systems using SCR systems or brake and lubrication systems, there are many test examples: Tanks, fuel lines, rails, connections, valves, seals, pressure regulators, radiators, heat exchangers, evaporators, condensers, auxiliary heaters, electric heaters, independent vehicle heaters, expansion tanks, circuits, tubes, filler pipes, SCR circuits, intercoolers, charge air pipes.

## TESTING METHODS

- Impermeability with excess pressure and/or vacuum
- Internal high-pressure testing of fuel-carrying systems
- Tightness test using total pressure change methods (Group D – DIN EN 13184)
- Flow measurement
- Pressure threshold testing
- Bursting pressure testing
- Motion simulation
- Function testing

## TESTING METHODS FOR TANKS AND TANK SYSTEM TESTING

- Fuel permeation for tank systems in accordance with GS 97014 (SHED test)
- Pressure / vacuum test
- Pressure change loading
- Slosh testing on car tank system (starting and stopping)
- Vibration testing
- Tightness testing, including with helium

## ELECTRICAL TESTING

Operating behaviour is decisively influenced in fluid technology due to the increasing use of electrical /electronic systems and components within the sensors and actuators periphery. It is therefore important to ensure the safe and reliable use of components. We can inspect the performance capability under specified loads.

- Electrical supply for components according to the technical specification requirements with voltages up to 24V / high voltage up to 1000 V
- Signal recording
- Characteristic curve evaluation

# IN FOCUS: VIBRATION TESTING AND ENVIRONMENTAL SIMULATION

Real measured external influences such as vibration, shock, cold, heat, moisture, or splashing water can be mapped on vibrating tables and in climatic chambers.



There is a vast field of work for you between development, quality assurance and the approval certification in all industries, including vibration testing, shock testing, climatic testing, Wöhler curve evaluation, pressure impulse testing, burst pressure testing, leakage testing, corrosion testing and transport simulation. A probit test, stair step process and a test for fuel resistance complement the portfolio.

We evaluate via experimental paths in order to verify the reliability of your product dynamic characteristics such as resonances, spring coefficients, damping variables as well as mass distributions, horizontally excited up to 2000kg and vertically excited up to 1000 kg.

## TEST SPECTRUM

- Vibration testing
- Vibration examinations
- Oscillation tests
- Combination tests with oscillation, vibration, shock and climate
- Pressure impulse tests, burst pressure tests
- Tightness test
- Corrosion testing
- Transport simulation
- Probit test
- Wöhler curve evaluation
- Stair step procedure
- Sonic fatigue test
- Testing for fuel resistance



## MULTIAXIAL VIBRATION TEST WITH/WITHOUT THERMAL LOADING

For operating load simulation for transport stress, we utilise a shaker test bench within the framework of the operating strength examination for the automotive industry, whose main components are a multi-axle oscillation table and a combinable hot gas generator. Utilising the multi-axial oscillation table makes it possible to generate the loads from mechanical oscillations as regulated, whether for the simulation of the operating loads such as unevenness on roads, steering and braking loads, load interchanging and vertical and roll motions.

This test equipment is particularly suitable for testing components, modules, assemblies and subsystems such as, for example, tanks, attachment and dismantling parts, exhaust systems, roof and rear-mounted carrier systems, front-end modules, cooling systems and much more.

## PRESSURE PULSE TEST

We can execute pressure pulse testing, leak tests, burst pressure tests on hydraulic components, pipework, fittings, fixtures, fuel lines, injection systems and rails. This enables the pressure pulse strength to be tested with indoor dynamic tests. Combining pressure pulse tests and vibration tests in accordance with IACS and DNVGL Type Approval also enables hydraulic fittings to be tested for bending with loads for internal pressure. Certification tests for hydraulic systems are just one part of our testing spectrum as well as comprehensive validation inspections e.g. for fuel rails.

## TEST SPECTRUM

- Pressure impulse testing
- Hydro pulse tests
- Combined pressure pulse testing and vibration testing (IACS, DNVGL)
- Bursting pressure test
- Leakage tests with various media (oil, water, nitrogen, helium among others)
- Pull-Out-Test
- Vacuum testing

## IN FOCUS: ELECTRICAL TESTING

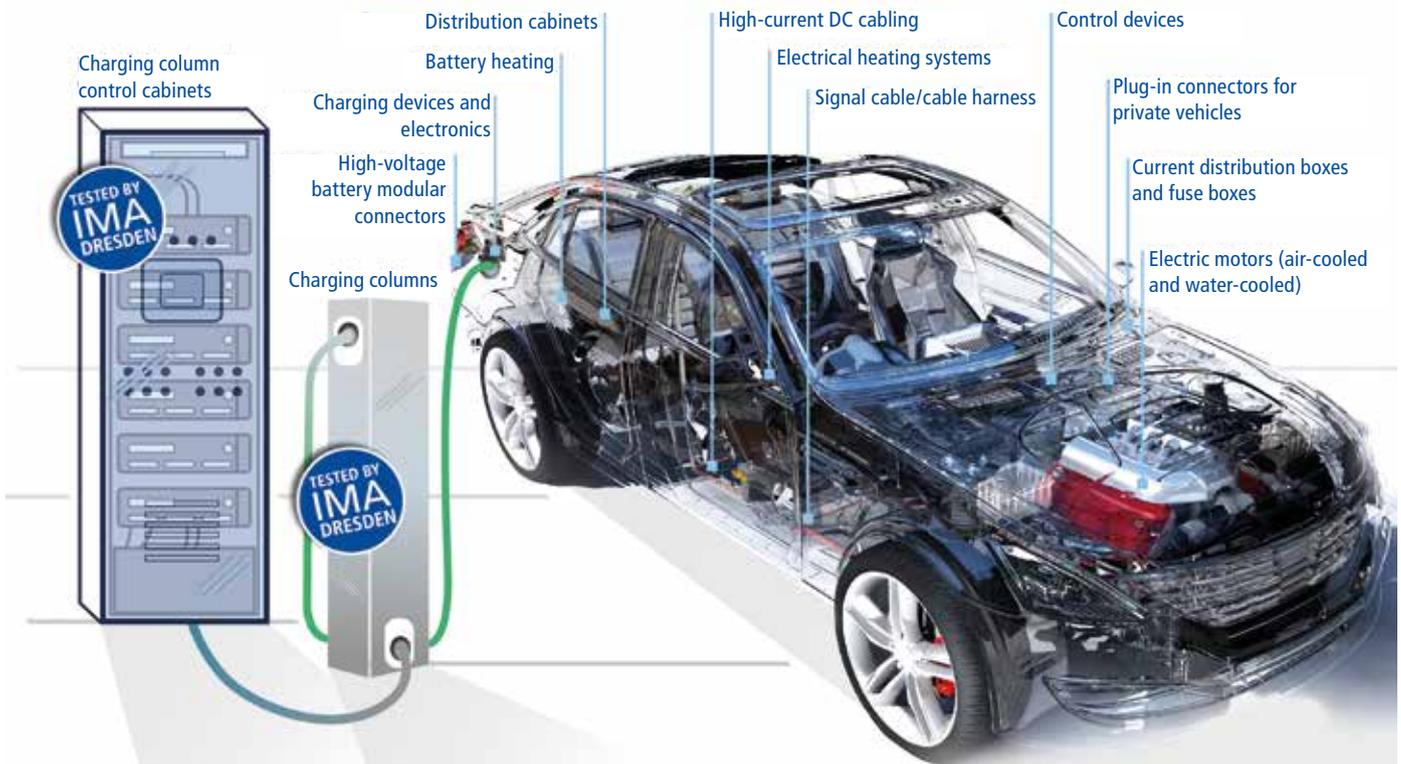
Whether you need short-circuit, short-time withstand current capacity, switching capacity or continuous current testing, with its in-house transformers IMA Dresden can offer testing services with test currents of up to 30,000 A, alternating current at 1,000 V and 30,000 A, and direct current at 1,100 V.

### LV 124 / LV 214 - TESTED ELECTRICAL AND ELECTRONIC COMPONENTS

Electrical components and e.g. plug-in connectors have to withstand electrical, climatic, mechanical and corrosive stress scenarios during tests according to the LV 124 and LV 214 Standards.

We bring engineers and technicians from numerous fields of competence together for this purpose: Tests for vibration, oscillation and shock, electrical operating durability, media conducting tests and IP protection.

For example, we test control devices and components from the fields for comfort electronics, engine and interior cooling systems, high-voltage power electronics and electric drive motors in precise detail according to OEM specifications and also provide additional special tests.



### CLIMATE

- High and low temperature storage
- Staged temperature test
- Temperature shock
- Moist heat, cyclical (with frost)
- Low-temperature operation

### ELECTRICAL TESTS

- Power supply / current curves
- Voltage curves
- Excess current
- Short-circuit
- Insulation

### VIBRATION, OSCILLATION AND MECHANICAL REQUIREMENTS

- Free fall
- Vibration
- Mechanical shock
- Multiple-axial oscillation in 6 degrees of freedom

### MEDIUM-CONDUCTING SYSTEMS

- Complete circuits, fuel pipework, coolants...
- Slosh test on private vehicle tank systems
- Leak and airtight tests, pressure pulse
- Chemical test

# STARTING POINT: MATERIALS AND CONNECTIONS

As a manufacturer or processor of materials, we will provide you with comprehensive engineering expertise regarding resistance, strength and reliability studies on standardised samples up to, and including, complex components.



## MATERIAL STRENGTH BY EXPERIMENT

We will assume the comprehensive determination for your metals and non-metals material parameters as well as evaluating the loading capacity of metallic materials, jointed connections or hybrid material combinations.

Depending on the requirement, these tests can be executed at low and high temperatures as well as under media influence. We determine the lifetimes and character of adhesives, of welded and other mechanical joint connections and determine and analyse the inter fibre breakage behaviour of FRP and we test friction and strength for static and cyclical demands. Finally, we offer you acceptance and approval tests for materials and monitor your manufacture. Flexible accreditation by DAkkS allows us to inspect materials in accordance with diverse standards and to develop new testing procedures.

We have extensive standard testing technology resources and experience in the design, construction and operation of special test benches for material and component testing processes. Please feel free to contact us when you require a special solution for your testing requirements. Our experienced engineers will always be pleased to advise and support you. Starting with consulting, test planning and manufacturing samples through to testing and on to the finished test report and supporting you moreover with the optimisation process.

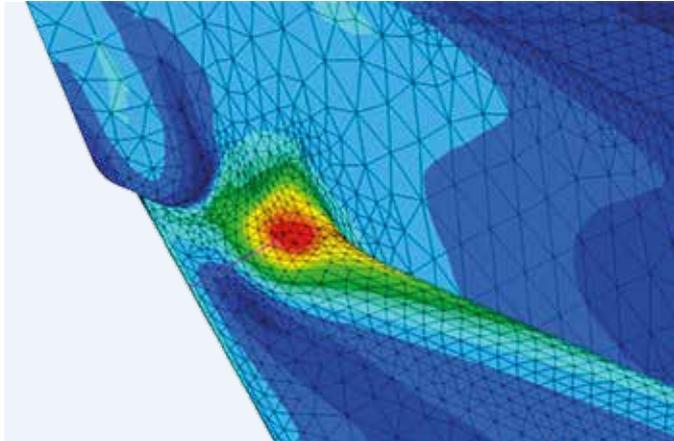
## MATERIALOGRAPHY

Countless new products are based on new materials and innovative manufacturing processes, whose success would not have been possible without materialography, i.e. the visual representation and evaluation of inner microstructures, the associated improvement of material properties, optimisation of processes and quality assurance in production. Whether the objective is quality assurance, damage analysis or research and development, in our accredited materialography laboratories we examine both metallic and non-metallic materials of different compositions using the appropriate qualitative and quantitative characterisation procedures. This includes the test preparation process and the use of all microscopic methods from light to electron microscopy for the analysis, evaluation and documentation of microscopic research results. The investigations can be supported and supplemented by further materials analysis, technological and physical procedures on request.



Verifying the reliability and safety of the material for the service life of a component with a wide variety of types of load is a demanding task – for us it is a core competence.

# THE FULL SERVICE TEST CENTER



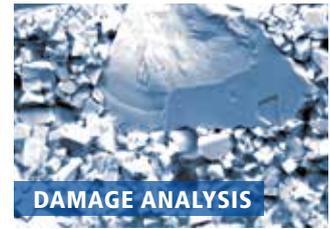
## DAMAGE ANALYSIS

Is it because of an unfavourable distribution of forces? Lacking characteristics of the material or technology? Improper heat treatment, overstressing, friction or wear? Our experienced engineers can assist you to explore undesirable damage phenomena down to the last detail – for example by means of materialography and acoustic damage detection.

## NON-DESTRUCTIVE TESTING

The interdisciplinary area of Non-Destructive Testing at IMA Dresden examines structures and components in the test phase and in real use in cases of damage. Moreover, it examines when and where damage occurs, how it develops and how a structure reacts to cyclic loads after an impact. Delaminations, material deviations, tears or foreign material that has entered are made visible, allowing conclusions to be drawn about materials, technology, processes, operation and optimisation. Our qualified inspectors offer extensive experience in planning, coordinating and implementing large-scale testing and inspection activities, from coupon testing to across-the-board permanent monitoring of technical equipment.

In our own laboratories, but also at your premises, we can make statements regarding the quality of your test item. Our test personnel are qualified according to the ISO 9712 and EN 4179 standards and offer many procedures that allow non-destructive testing. We work according to German and international standards and guidelines (DIN, ASTM, ISO, etc.), or in accordance with factory settings.



For this we use the very latest testing techniques and tailor-made testing concepts. Alongside the traditional methods that make use of manual testing, we also use special procedures such as the immersion technique, the phased array technique on CFK, GFK und GLARE® and the four-frequency rototest. Our specialists in non-destructive testing will help you with the most suitable procedure for your Needs.

## FEM ANALYSIS

Experienced calculation engineers from the fields of statics, operational strength and dynamics are on hand to optimise your product by scaling its mass and form on the basis of FE analysis. We determine stresses and deformations, examine the stability behaviour, obtain static, operational and permanent strength verifications, evaluate natural modes and resonances, and analyse and assess damage.



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## STRENGTH EVALUATIONS

IMA Dresden is there for you, with high-performance technology, ready to analyse the stress and reliability of components and structures using the finite elements method and carry out strength tests. We make statements about the safety of designs, in the form of static strength verification, operational strength verification, fatigue strength verification and drive comfort investigations on the basis of calculated and measured stresses. The complete knowledge on strength assessment is also available for measuring data analysis and the creation of test loads for strength tests. We calibrate our calculations against our own measuring results, optimise masses and shapes for both static and dynamic behaviour, and analyse and assess damage.



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## WIAM® FATIGUE RIFEST

WIAM® fatigue RIFEST is software for the design process and component stress analysis, and displays the guideline-compliant strength test results at verification points for non-welded and welded components according to FKM Guidelines, 2012 edition. The guidelines apply to machine components and was first developed in 1994 under the management of IMA Materialforschung und Anwendungstechnik GmbH.



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## FIND INFORMATION, MANAGE DATA, NETWORKING KNOWLEDGE: WIAM® ICE

The structuring, processing and management of information helps to ensure expert technological know-how in the long term, streamline processes and thus increase quality and efficiency. The standard WIAM® ICE product promotes the flow of knowledge, simplifies areas of complexity and ensures added value and innovative strength. Having originated in the field of Material Sciences, the generic WIAM data model can now manage all kinds of knowledge and information. With WIAM® ICE, you can record, research, link, visualise, compare and evaluate diverse data easily and clearly.

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## BENEFIT FROM THE COMPETENCE OF IMA DRESDEN FOR YOUR VEHICLE COMPONENTS.

As an independent test provider we guarantee reliable results and strict confidentiality. Our credo of thinking and acting like our customers was not carelessly formulated. It contains an earnest pursuit of engineering perfection, which merges intelligent solutions with sustainable usable result at fair prices. This, of course, also includes the flexibility to respond to all kinds of request and, in doing so, to provide peak performances which are not possible elsewhere. Each of our employees bears a portion of this responsibility.

Please do not hesitate to contact us for any questions or inquiries at [sales@ima-dresden.de](mailto:sales@ima-dresden.de)



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