



TEST AND DEVELOPMENT CENTER FOR THE RAILWAY INDUSTRY

THE NUMBER ONE ADDRESS FOR COMPONENT AND MATERIALS TESTING FOR RAIL VEHICLE

As an independent and reliable development and testing centre for rail vehicles, we support manufacturers and suppliers in the development process and assist transport companies with damage analysis and product optimisation.

As such, we offer solutions that provide developers and engineers with reliable support in ensuring product and operational safety and quality assurance.

As such, we bring together engineers and technicians from several fields of expertise – measurement and control engineering, computing, construction, test design and assessment.

We aim to provide testing and engineering solutions that help customers to test forward-looking products thoroughly and validate them quickly, while complying with strict legal requirements.



IMA Dresden is an internationally recognised and accredited partner of the railway industry and supports the development departments of manufacturers and suppliers throughout the entire development of a product.

This means that we test and validate bogies, railcar bodies and lots of rail vehicle components in our testing halls, including electrical components. If required, we also uncover structural damage using non-destructive testing techniques, and analyse damage and material properties.

In addition, we conduct measurement runs, assess measured data and use these to define test programmes all over the world. We calculate and create virtual simulations of loads, assess the strength of products and areas of stress, and carry out strength and lifespan assessments. We also provide support for product development, taking strength-related, technological and structural boundary conditions into consideration.

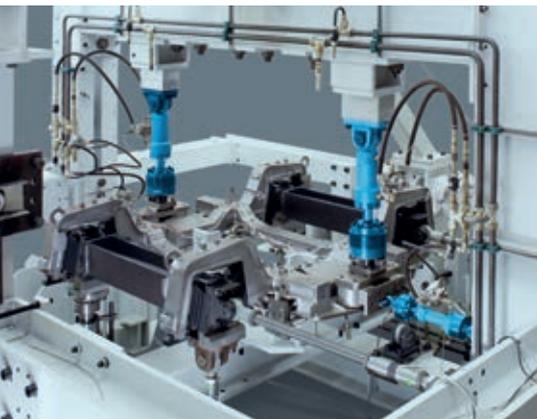
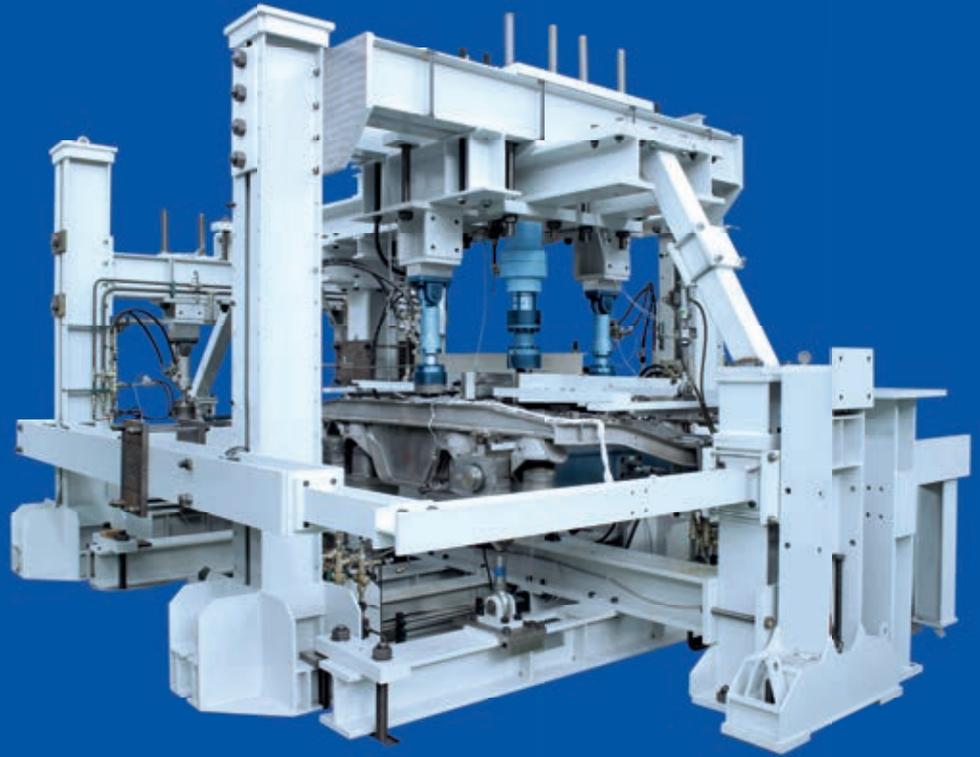
You can rely on us: our laboratories are certified according to DIN EN 9100, accredited according to ISO 17025. This therefore ensures that we can always provide tailor-made solutions for a wide range of structures and test requirements.

IMA Dresden – and it works:

- [Material testing](#)
- [Structure and component testing](#)
- [Non-destructive testing](#)
- [Electrical testing](#)
- [Materialography and damage analysis](#)
- [Simulation and strength verification](#)
- [Software systems for test and laboratory data](#)

IN FOCUS: BOGIES

Whether you need carrying or motor bogies for locomotives, freight or passenger trains, we offer complete execution of strength testing, including transport and structural analysis, for the approval and development of bogies and bogie frames.



We are an accredited and certified testing centre for approval testing in line with DIN EN 13749 (wheel sets and bogie determination procedures for bogie frame stability requirements) and the UIC regulations for the approval and examination of vehicles in accordance with Section 32 of the Ordinance on the Construction and Operation of Railways (Eisenbahn-Bau- und Betriebsordnung, EBO).

But even during the development and construction phase, our operating load tests, also called dynamic or endurance tests, provide clear readings and reliable results for potential product or manufacturing adjustments. It is important to have fast and reliable partners in the short-term development and procurement phases. With our extensive testing capacity and over 25 years of experience in rail vehicle testing, you are in safe hands. Make the most of our laboratory testing and increase your optimisation potential in relation to subsequent costs.

OUR TESTING OPTIONS

- Static or dynamic tests
- Two- or multiple-axle frames
- Normal and head-first position
- Up to 30 load components
- Ongoing damage control
- Measurement of strains and deformations, with visual measuring techniques on request
- All-round IMA service: we offer the full range of additional services that might interest you in our large testing facility, including non-destructive testing, damage analysis, test programme development, measuring runs, FEM analysis, and so on.

IN FOCUS: RAILCAR BODIES AND SUBSTRUCTURES

Our testing halls are a little bit like being in a train station: a car body drives out, and the next one drives in. Whether we're looking at double-decker cars, tram cars or middle carriages, our experience in all things strength testing is uniquely extensive, as is our testing capacity.



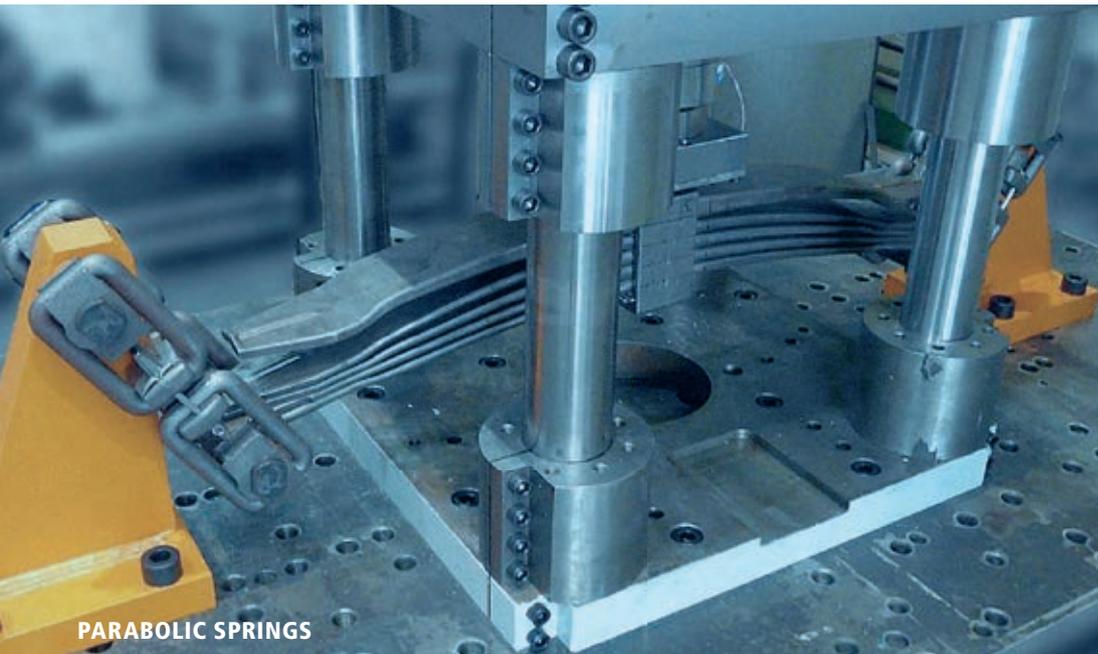
For car body structures, the focus is primarily on structural aspects, manufacturing techniques and lightweight construction. One thing is certain: our specialist areas allow us to support you far beyond the actual laboratory tests. By conducting appropriate measurements, measuring runs and continuous monitoring, we can record stresses that occur during real use. Load assumptions are created and serve as a basis for calculations using the finite elements method (FEM) and our various in-house tests. During the development phase, we make statements about the design of components and give you the chance to compare different types of design. Examining tension, deformation and stability allows us to evaluate their strength and safety.

OUR TESTING OPTIONS

- Static tests on car bodies in line with standard EN 12663 or other brand-specific standards such as APTA-PR-CS-S-034-99 for the US market.
- You own load requirements can also be taken into consideration
- Structural loads can be applied using servo-hydraulics or defined weights
- Longitudinal pressure is applied with servo-hydraulics or high-pressure hydraulic elements at a force of up to 5,000 kN
- We carry out dynamic testing with 32 servo-hydraulic load components or more
- Static and dynamic testing of the whole car body at concurrent temperature loads, e.g. up to +75°C

IN FOCUS: COMPONENTS

In terms of component testing, you couldn't be in better hands than with us. Every year, bogies and railcar bodies fill the IMA test halls. They are in good company here, with many further rail vehicle components such as axle-bearing housings, springs, swing arms, stabilisers, interior components, and so on and so forth.



PARABOLIC SPRINGS



COUPLINGS

FROM TEST PLANNING TO TEST REPORT

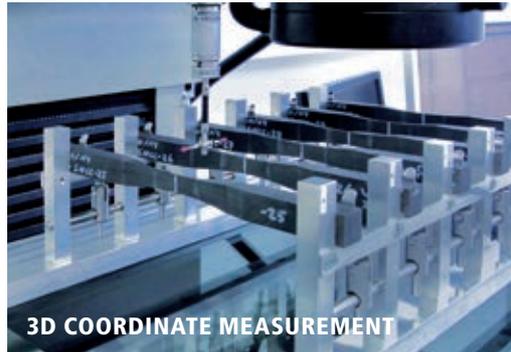
In order to ultimately prove the strength of the components and guarantee their stability, we devote the utmost attention to your railcar components, examining every detail you require and providing optimised testing scenarios. Important factors are your requirements and the present rules.

We not only implement computational and theoretical but also experimental simulations for static and dynamic loads on your component, develop test concepts and individual testing devices and elements for load introduction. From the dimensioning and design to the verification of stability our test and calculation engineers cooperate intensively – in terms of reliable results.

- Axle-box casings
- Axle guides
- Brake components
- Container bars
- Crash elements
- Absorbers
- Bogie frames
- Springs
- Back former carriers
- Cantilevers
- Couplings
- Longitudinal coupling elements
- Magnetic brake frames
- Wheel links
- Traverses
- Substructures
- Car bodies
- Torsion bars
- Bolsters

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

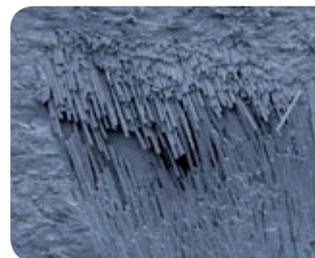
We will assume the comprehensive determination for your metals and non-metals material parameters as well as evaluating the loading capacity of metallic materials, jointed connections or hybrid material combinations.

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.

STRESS MEASUREMENTS AND TEST DRIVES

Utilising appropriate measurements, measuring runs and continuous monitoring enables us to record loads in actual applications – whether for approval trials and tests, calculation and simulation or for structure optimisation in problem cases.

We execute measurements of mechanical and electrical variables with static and dynamic loads under operating conditions, install complete measurement chains including the process adaptation. Our many years of experience guarantee effective problem solutions for status, condition and load analysis.

Irrespective of whether Helsinki or Melbourne, Düsseldorf and Dresden – we are never too far away. Our on-site measuring service can provide numerous possibilities: with high channel counts and sampling rates, harsh environmental conditions, autonomous measuring in the regular utilisation or under test conditions – we can provide you with as much measurement data as you require, you have the choice.

We can support you with long-term measurements for data acquisition in actual operation, for example for the assessment of the impact and effects on the service life or the operating strength verification.



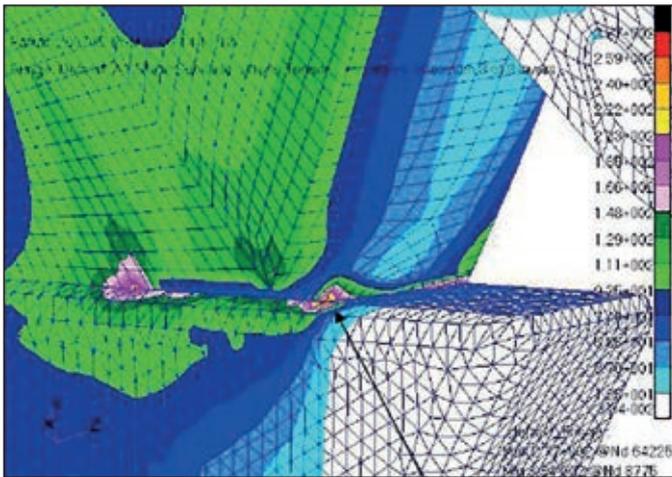
In addition to executing measuring runs, we can also provide you with customised complete solutions: Creating measuring concepts, FE analysis, application of sensor technology, dismantling, measurement data evaluation and derivation as well as implementation of appropriate test procedures.

MEASURING SERVICES

- Approval measurements
- Validation measurements
- Measuring for investigating damage cases and problem cases
- Driving technical measurements
- Load collective measurements
- Force measurements
- Measuring wheelsets
- Torsional vibrations
- Measuring brake systems
- Measuring railway noise and vibrations
- Electrical measurements
- Pantograph measurements
- Assuming railway operational services for measuring runs
- Modal analysis and operating vibration analysis
- Special measurements
- Structure monitoring

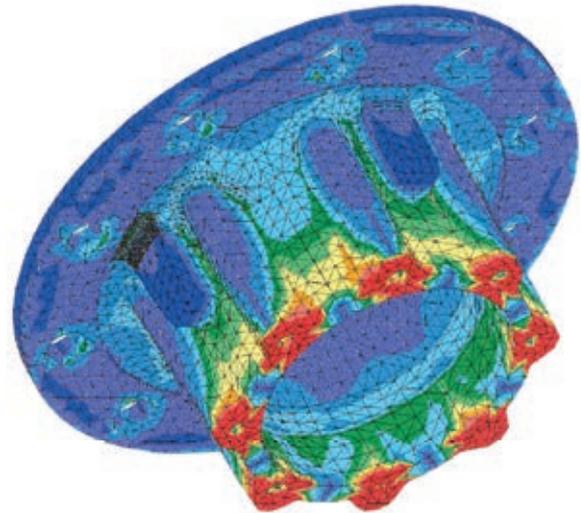
SIMULATION AND STRENGTH ASSESSMENT

Our engineering services support you taking the economic requirements for shorter production development times and innovative and high-quality design with better material efficiency and weight-optimised structures into account for optimal flow of forces.



During the development phase, we make statements about the design of components and give you the chance to compare different types of design. We make lifecycle assessments by establishing load assumptions, determining concrete production process-dependent component strengths, and examining stress, deformation and stability.

We use computational and experimental findings relating to the operational and permanent strength to determine how much dynamic stress a construction has to bear, which dimensions achieve the best strength values, and how the natural vibration and resonance behaviour affects the structural strength. We also calculate and assess the lifespan. Our results have helped you to optimise your components at the development stage.



FEM-ANALYSIS

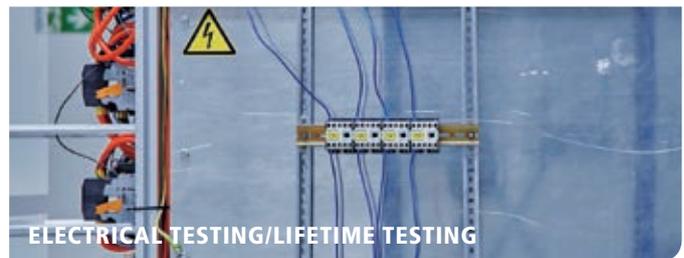
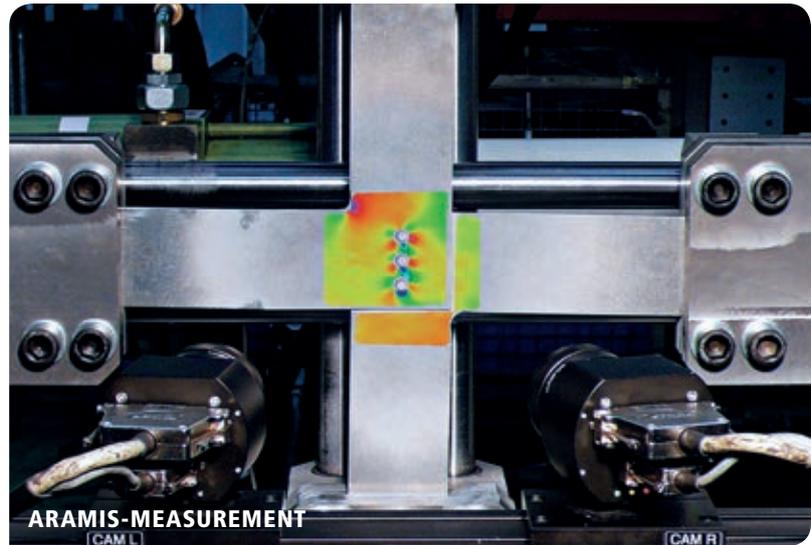
Experienced calculation engineers from the fields of statics, operational strength and dynamics are on hand to optimise your product by scaling its mass and form on the basis of FE analysis. We determine stresses and deformations, examine the stability behaviour, obtain static, operational and permanent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

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.



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.

ELECTRICAL TESTING IN LOW-VOLTAGE RANGE

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 25,000 A, alternating current at 1,000 V and 20,000 A, and direct current at 1,100 V. In spacious modern testing facilities, test currents are SPS-controlled and data such as the current-voltage curves and temperatures are recorded. The modern high-performance test bay offers versatile test applications up to 25,000 A, such as switching capacity, performance, electrical endurance and short-circuit testing.



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.



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.

BENEFIT FROM THE COMPETENCE OF IMA DRESDEN FOR YOUR RAIL 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 ima@ima-dresden.de



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