IABG

TESTS AND ANALYSES

Overview Test Facilities

Status 2023

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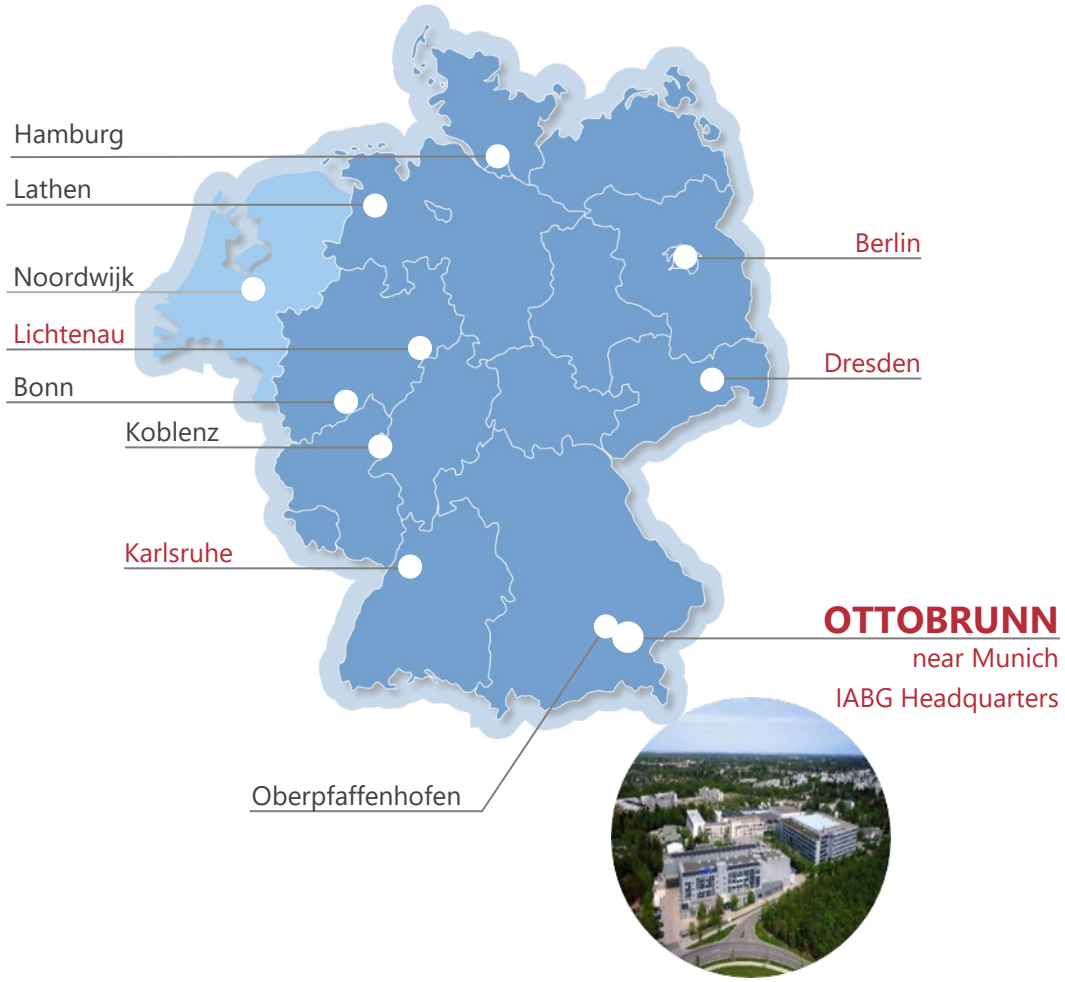
1 Overview sites & test centers

We work at 5 locations and operate 4 test centres.

TA: Locations and test centres.



Test Centre Ottobrunn

High Risk Testing Lichtenau

Test Centre Dresden - Hall 1

Test Centre Dresden - Hall 2

TA location

Testing from small components to entire aircrafts.

Test hall in Ottobrunn (headquarters).

Service description

- Various test areas (Strongfloor) and test facilities with extensive equipment for tests on components up to large structures
- In the immediate vicinity climate chambers, materials laboratory and space test center

Fields of application

- Industry-independent: for example aircraft tests on overall structures, automotive tests on clamping fields and test stands, vibration tests on vibrating tables

Technical specifications

- Base area: 5,600 m^2
- Height: 15 m
- Indoor crane (lifting capacity): 15 t and 20 t
- Infrastructure
  - Hydraulics: 3,740 l/min || 280 bar
  - Pneumatics: 160 m^3/min (4 x 40 m^3/min) || 7.5 bar

Benefit for our customers

All services for combined tests and aggregated services at headquarters for all sizes of test items

Reference customers/projects

OEMs and suppliers from various industries, such as aerospace, automotive, rail, energy and medical technology

Test hall for large structures.

Test hall 1 in Dresden.

Service description

- Continuous test area (strongfloor) and extensive equipment
- Variable test facility

Fields of application

- Primarily for large structure tests, such as aircraft (e.g. A380, A220)

Technical specifications

- Base area: 5,000 m^2
- Height: 23 m
- Hall crane (lifting capacity): 2 x 20 t
- Infrastructure
  - Hydraulics: 96,000 l/min || 280 bar
  - Pneumatics: 270 m^3/min || 7.5 bar

Benefit for our customers

Directly at the airport, good delivery options for large structures

Reference customers/projects

OEMs from the aviation industry, including tests on Airbus A380, A220 et al.

Test hall for large structures.

Test hall 2 in Dresden.

Service description

- Continuous test area (strongfloor) and extensive equipment
- Variable test facility

Fields of application

- Primarily for large structure tests, such as aircraft (e.g. A400M)

Technical specifications

- Base area: 1,800 m2
- Height: 17 m
- Indoor crane (lifting capacity): 22 t
- Infrastructure
  - Hydraulics: 2,100 l/min || 280 bar
  - Pneumatics: 100 m^3/min || 3.5 bar

Benefit for our customers

Directly at the airport, good delivery options for large structures

Reference customers/projects

OEMs from the aerospace industry, including Airbus A400M et al.

2 Tension fields

Clamping plate for customer-specific test setups.

Modular test facility (MTA).

Service description

- Clamping plate with a modular system for customer-specific test setups
- Flexible and quick setup of test stands
- Supply through four individual connection units

Fields of application

- Individual test setups, predominantly structural tests on components from the aerospace and automotive industries

Technical specifications

Torsion-resistant, even span (L x W): 10 m x 9 m

Load: max. 400 kN

Fixed connections for hydraulics, pneumatics and electrics

Two SRÜ cabinets with 20 control and monitoring channels each for force, pressure and displacement control

Measuring cabinet with 400 expanded channels

Benefit for our customers

Modular construction system for the flexible and quick construction of test scaffolding

Reference customers/projects

OEMs and suppliers in the aerospace and automotive industries

Clamping field for variable structures with climate simulation.

Clamping field (HYDRA/ELEKTRA).

Service description

- Independent individual tests in parallel
- Various flexible, mechanical structures for multi-dimensional test specimen loading, modeling in CAD/Solid Works
- Optional: stiffness optimization with FEM, environment simulation

Fields of application

- Function, strength and fatigue tests on components

Technical specifications

Torsion-resistant, level main span (L x W): 6 m x 3 m || secondary span (L x W): 3 m x 2 m || t-slots in a 250 mm grid

Servohydraulic cylinders: forces up to 1,200 kN || torques up to 4,000 Nm

Oil supply: 9 connections with 120 l/min each at 280 bar

Digital measuring, control and regulation system: digital controller with several control PCs, max. 16 control channels, various bridge amplifiers, analog/digital IOs

Optional simulation of the ambient conditions: temperature -70 °C to +180 °C || climate max. 90 % relative humidity at max. +80 °C || use of abrasive media

Benefit for our customers

- Short lead and changeover times thanks to modular design
- Individual, fast and cost-effective integration of test components

Reference customers/projects

OEMs and suppliers from various industries, such as aerospace, rail and power engineering

5-sided clamping field for customised test setups.

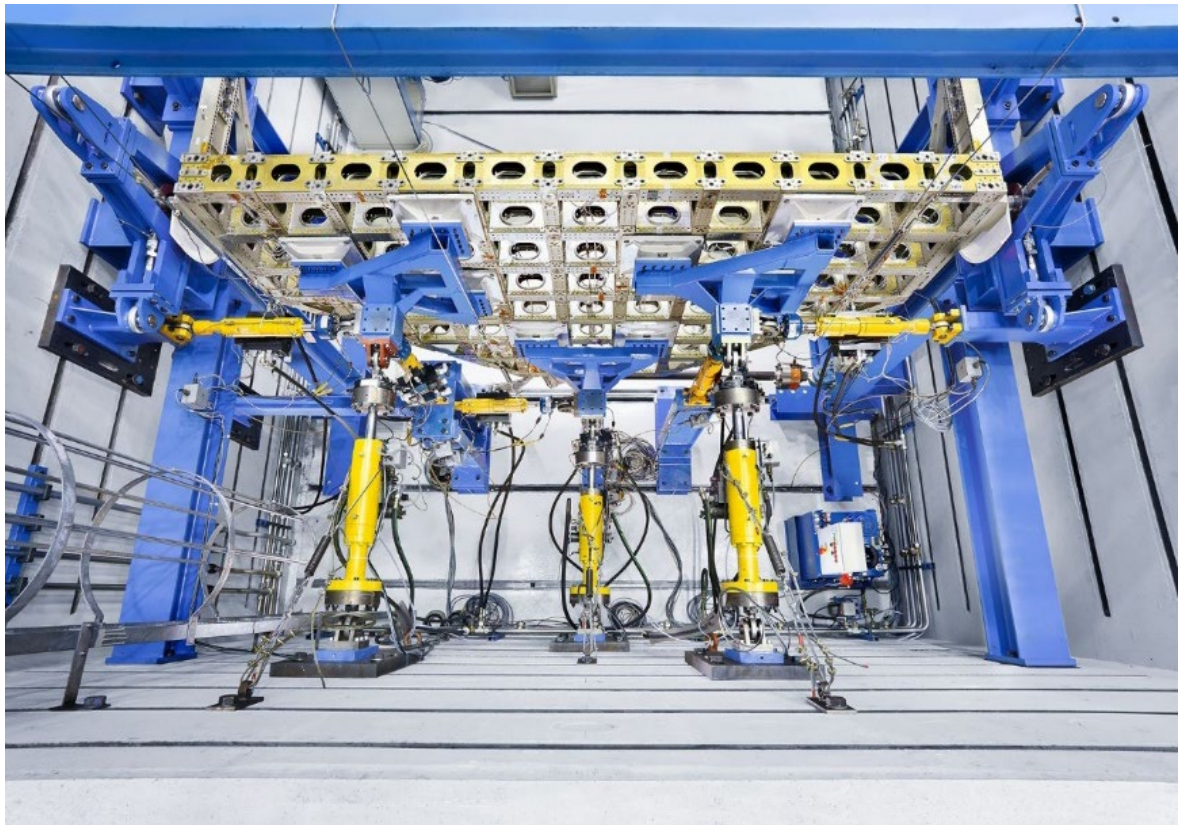
Test pit.

Service description

- Simplified customised test scaffolds using the rail systems in the floor and walls
- Suitable for tests with very high specimens

Fields of application

- Tests on aerospace structures



Technical specifications

Dimensions (L x W x H): 8 m x 6 m x 5 m

Foundation with reinforced concrete (thickness 1,000 mm)

Test piece height: max. 20 m

Load capacity of the anchor channels: max. 200 kN/m (tension) || max. 200 kN/m (compression) || max. 100 kN/m (shear)

Rail to rail distance of the anchor channels: wall 500 mm || floor 1,000 mm

Benefit for our customers

Time and cost savings for individual test equipment by integrating the rail systems into the floor and walls

Reference customers/projects

Ariane 5 upper stage, tests on aircraft landing gear

3 Large test benches

Test and qualification of car bodies.

Fatigue strength of car bodies.

Service description

- Static & dynamic test also taking into account environmental influences
- Creation of load assumptions & -collectives
- Online display of bending lines
- Optical absolute displacement measurement
- Measurement of strains & deformations

Fields of application

- Tests of end cars, medium cars, double-decker cars, tram modules or locomotive frames
- Investigation of car body structures against the background of new manufacturing technologies and lightweight construction
- Validation of designs in vehicle development

Technical specifications

- 2 wagon body test benches in parallel operation
- Each with up to 30 hydraulic cylinders
- Each with up to 500 measuring channels if required
- Longitudinal compressive forces up to 5,000 kN to cover US standards
- Car bodies and/or coupled tram modules with a length of up to 32 m

Benefit for our customers

- Static test according to DIN EN 12663, alternatively also according to regionally different applicable standards
- Accredited material laboratory for failure analysis and optimisation

Reference customers/projects

- OEMs and suppliers from the rail vehicle industry

Test and qualification of bogies.

Fatigue strength of bogies.

Service description

- Stat. & dynam. tests with individual load components, biaxial & multiaxial frames
- Permanent damage monitoring
- Opt. measurement; measurement of strains & deformations
- Additional services: NDT, failure analysis, measurement runs

Fields of application

- Approval testing of all types of bogies in accordance with DIN EN 13749, VDV152, UIC regulations and other standards
- Safeguarding novel bogie designs already in the development phase
- Production optimisation, choice of manufacturing processes

Technical specifications

- Static and dynamic tests on 12 bogie test benches, each with 30 cylinders in parallel operation
- Use of state-of-the-art measurement and control technology as well as iteration software to increase the test frequencies
- Two- and multi-axis frames with calculated control channels
- Bogie frame with passive and active tilting technology
- Simulation of internal pressure

Benefit for our customers

- Support during the entire qualification process
- Accredited materials laboratory for failure analysis and optimisation (materials database)

Reference customers/projects

OEMs and suppliers from the rail vehicle industry

Tests under high static load.

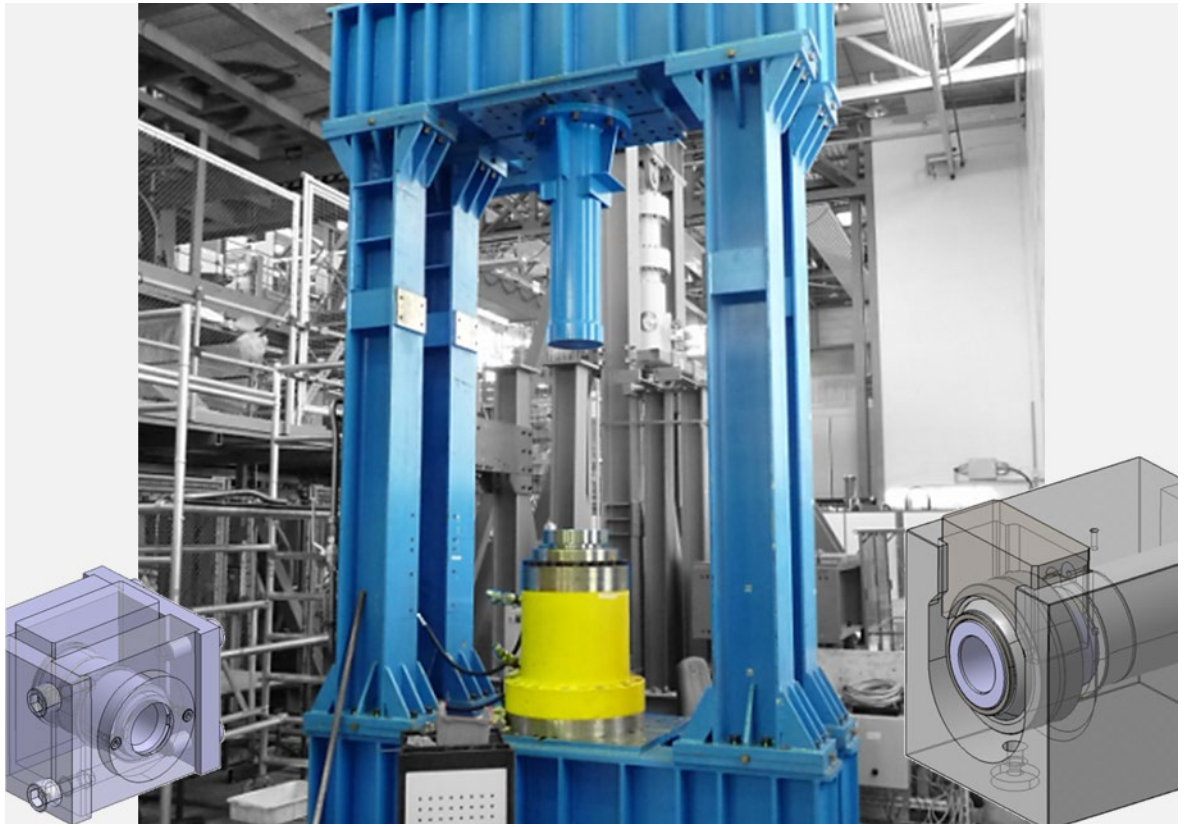
Loading frame with 400 t capacity.

Service description

- Simulation and measurement of all relevant test parameters (load, deformation and elongation) up to 2.5 kHz

Fields of application

- Performance of uniaxial load tests (static and dynamic)



Technical specifications

- Load
  - Static: max. 4 MN (compression) || max. 1.9 MN (tension)
  - Dynamic: max. 1.4 MN (compression)
- Measuring range of the load cell: max. 5 MN (compression)
- Test piece width: max. 1.6 m
- Test piece height: max. 1.7 m

Benefit for our customers

Flexible measurement of loads, deformation and strains

Reference customers/projects

OEMs and suppliers from various industries, such as aerospace and automotive, rail and power engineering

Testing the thermal fatigue strength of cylinder heads.

Cylinder head test bench II (ZKP II).

Service description

- Investigation of thermo-mechanical fatigue and fracture propagation behaviour in the combustion chamber roof of cylinder heads
- Automated operation with about 1,000 thermal shock cycles per day
- Automated fracture documentation

Fields of application

- Testing of cylinder heads for cars, trucks and buses as well as from shipbuilding and energy technology (stationary diesel and gas engines)

Technical specifications

- Firing with six oxygen/propane burners with 75 kW max. heating capacity each
- Coolant: water-glycol mixture || cold water max. 200 l/min and 26 °C || hot water max. 25 l/min and max. 80 °C || return temperature max. 120 °C
- Gas supply: 2.9 t propane || 24 t oxygen
- Compressed air supply: 600 m^3/h
- Ventilation system: circulation: 13,000 m^3/h || heat recovery from discharged air

Benefit for our customers

Time and cost savings through automated, realistic tests without driving tests

Reference customers/projects

Manufacturers of engines in the automotive, shipbuilding and power engineering sectors

Multi-axial simultaneous (6DOF) vibration tests.

Vibration table HyMAS (Heavy Multi-Axis Shaker).

Service description

- Experimental vibration investigation simultaneously over all six degrees of freedom (6 DOF)
- Tests for required safety certificates, e.g. environmental influences (EN 60068-3-3), seismic (IEEE 344, IEC 60980, RCC-E, IEEE 693) and others

Fields of application

- Simulation of earthquakes and transient events (gusts of wind, plane crushes on buildings)
- Vibration and shock tests
- Windmilling tests
- Certification of medical technology facilities (OSHPD listing)

Technical specifications

- Test item weight: max. 14,000 kg
- Frequency range: 0.5 Hz to 120 Hz
- Table dimensions outside / hole pattern (L x W): 4.1 m x 3.2 m / 3.0 m x 2.2 m
- Acceleration: vertical max. ±80 m/s^2 || longitudinal max. ±50 m/s^2 || lateral max. ±50 m/s^2
- Path: vertical max. ±75 mm || longitudinal max. ±125 mm || lateral max. ±125 mm
- Connection power: 700 l/min || 280 bar
- Measurement data acquisition: acceleration, paths, strains, temperature

Benefit for our customers

IABG is the only company in Europe to be listed with OSHPD and is therefore authorised to carry out certification processes for medical equipment

Reference customers/projects

Manufacturers of power plant technology and medical technology, power plant operators, OEMs and suppliers from the automotive, aviation and rail sectors

Multi-axial simultaneous vibration tests with climate simulations.

Vibration table LiMAS (Light Multi-Axis Shaker).

Service description

- Simultaneous vibration investigation over all six degrees of freedom in combination, optionally climatic environmental simulation
- Tests for required safety certificates, e.g. environmental influences (EN 60068-3-3), seismic (IEEE 344, IEC 60980,
  RCC-E, IEEE 693) and others

Fields of application

- Simulation of earthquakes and transient events (gusts of wind, plane crushes on buildings)
- Vibration and shock tests
- Windmilling tests
- Certification of medical technology facilities (OSHPD listing)

Technical specifications

- Test item weight: max. 1,000 kg | |Frequency range: 0.5 Hz to 200 Hz
- Table dimensions (L x W): 2.3 m x 2 m
- Acceleration (600 kg / 1,000 kg): vertical max. ±130 m/s² / ±100 m/s² || longitudinal max. ±80 m/s² / ±70 m/s² || lateral max. ±105 m/s² / ±70 m/s²
- Path/angle: vertical -160 mm to +135 mm / roll max. ±7.4° || longitudinal max. ±100 mm / pitch -8.2° to +7.0° || lateral max. ±115 mm / yaw max. ±5.2°
- Environmental conditions: -40 °C to +95 °C || max. 95 % relative humidity
- Simultaneous measurement data acquisition (64 measurement channels)

Benefit for our customers

- Simultaneous tests over all six degrees of freedom required safety certificates
- IABG is the only company in Europe authorised to carry out OSHPD certification processes for medical technology installations

Reference customers/projects

Manufacturers of power plant technology and medical technology, power plant operators, OEMs and suppliers from the automotive, aviation and rail sectors

Vibration tests on components.

Fast single cylinder I (SEZ I).

Service description

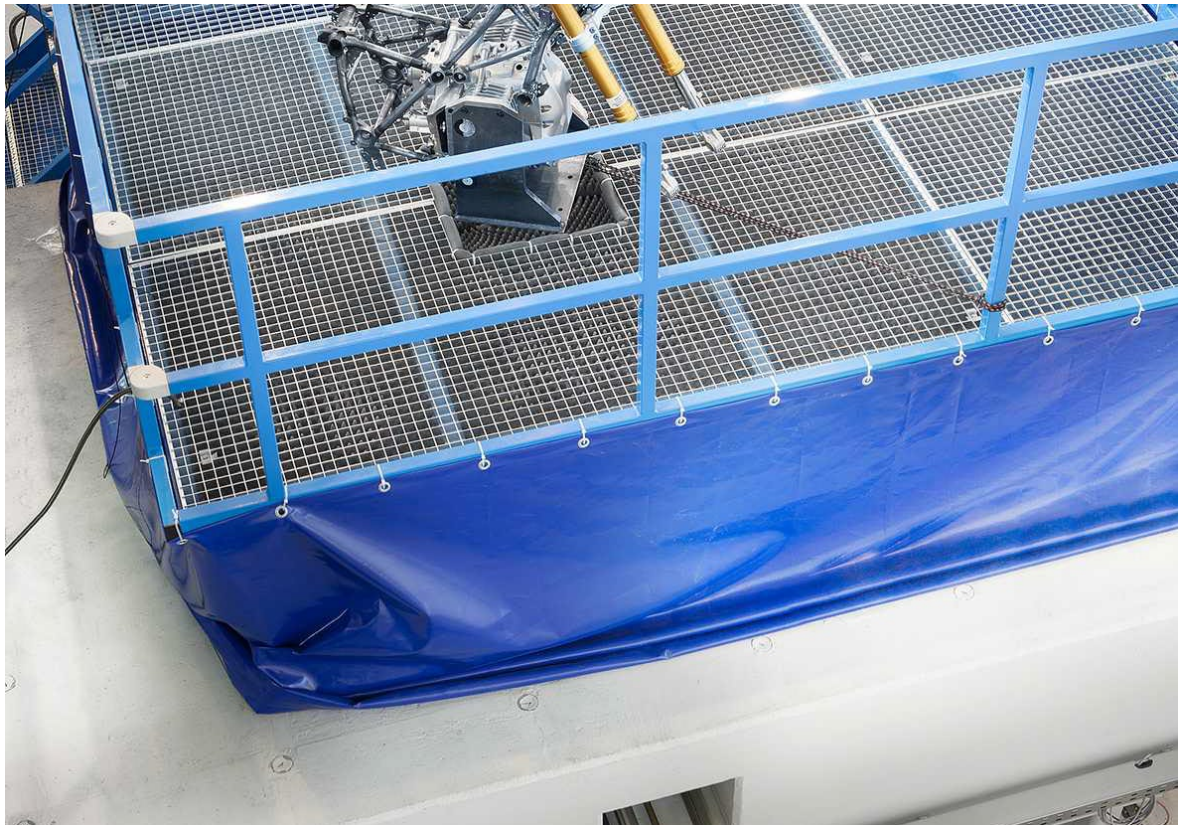
- Testing with vibration signals output on one axis (vertical effect)
- Test stand with vibration-insulated foundation
- Vibration tests
- Optional: combination with cold/heat

Fields of application

- Oscillation, impulse and vibration tests
- Sinusoidal vibrations (DIN EN 60068-2-6), combination of cold and vibration (DIN EN 60068-2-50) / heat and vibration (DIN EN 60068-2-51), broadband random (DIN EN 60068-2-64), mixed-mode vibration (DIN EN 60068-2-80)

Technical specifications

- Test item weight: max. 1,000 kg (40 m/s^2 at 3 Hz to 200 Hz)
- Frequency range: 0.5 Hz to 200 Hz
- Cylinder force (static / dynamic): ±50 kN / ±40 kN
- Cylinder path: ±200 mm
- Speed: max. 4 m/s
- Acceleration: max. 600 m/s^2 at 80 Hz
- Temperature range: -40 °C to +120 °C



Benefit for our customers

Cost-effective, meaningful tests on the dynamic behaviour and properties of test specimens or constructions under vertical influences (e.g. during transport)

Reference customers/projects

Manufacturers of power plant technology, power plant operators, OEMs and suppliers from the automotive, aviation and rail sectors

Tear-off tests for materials testing on components.

Fast single cylinder II (SEZ II).

Service description

- Carrying out high-speed tear-off tests

Fields of application

- Adhesive tensile test
- Materials testing: determination of tensile strength, elongation at break and determination of material characteristics

Technical specifications

Clear span: 900 mm
Test setup height: max. 1,600 mm
Velocity: max. 11 m/s
Test path: ±30 kN
Test force: ±200 mm

Benefit for our customers

- Determination of dynamic influences on material characteristics and joints
- Reproducible and cost-efficient testing

Reference customers/projects

Manufacturers of power plant technology, power plant operators, OEMs and suppliers from the automotive, aviation and rail sectors

Structural tests on vehicles with environmental simulations.

Vertical dynamic structural test bench (VESPA).

Service description

- Fatigue tests with climatic environmental simulation
- Noise detection under climatic stress
- Simulation of the ageing process
- Human-rated operation
- Operational load tests from vehicle measurements

Fields of application

- Various tests for fatigue strength on car bodies and motorbikes
- Functional verifications with combined tests under vertical vehicle excitation and climatic influences
- Suitable for tests on e-vehicles

Technical specifications

- Four electrodynamic vertical actuators with 41 kN, continuous operation (24/7) || velocity max. 4 m/s || frequency range 0 Hz to 150 Hz || dynamic stroke ±125 mm
- Vehicles up to 4,000 kg || wheel base 1,800 mm to 4,200 mm || track width 1,200 mm to 2,000 mm || vehicle height max. 2,000 mm
- Climate conditioning: temperature range -40 °C to +85 °C || max. 98 % rel. humidity || sun simulation with 1,050 W/m2
- Measurement technology: iteration capability of the test bench for strain gagues, acceleration and displacement transducers

Benefit for our customers

- Time saving by combining tests for operational stability, vibration and fatigue under climatic environmental simulation
- TISAX Level 3 certification allows testing on prototypes

Reference customers/projects

- OEMs and suppliers to the automotive industry
- Manufacturer of motorbikes

4 Impact and drop tests

Flexible drop test device with rolling drum.

Large drop test facility.

Service description

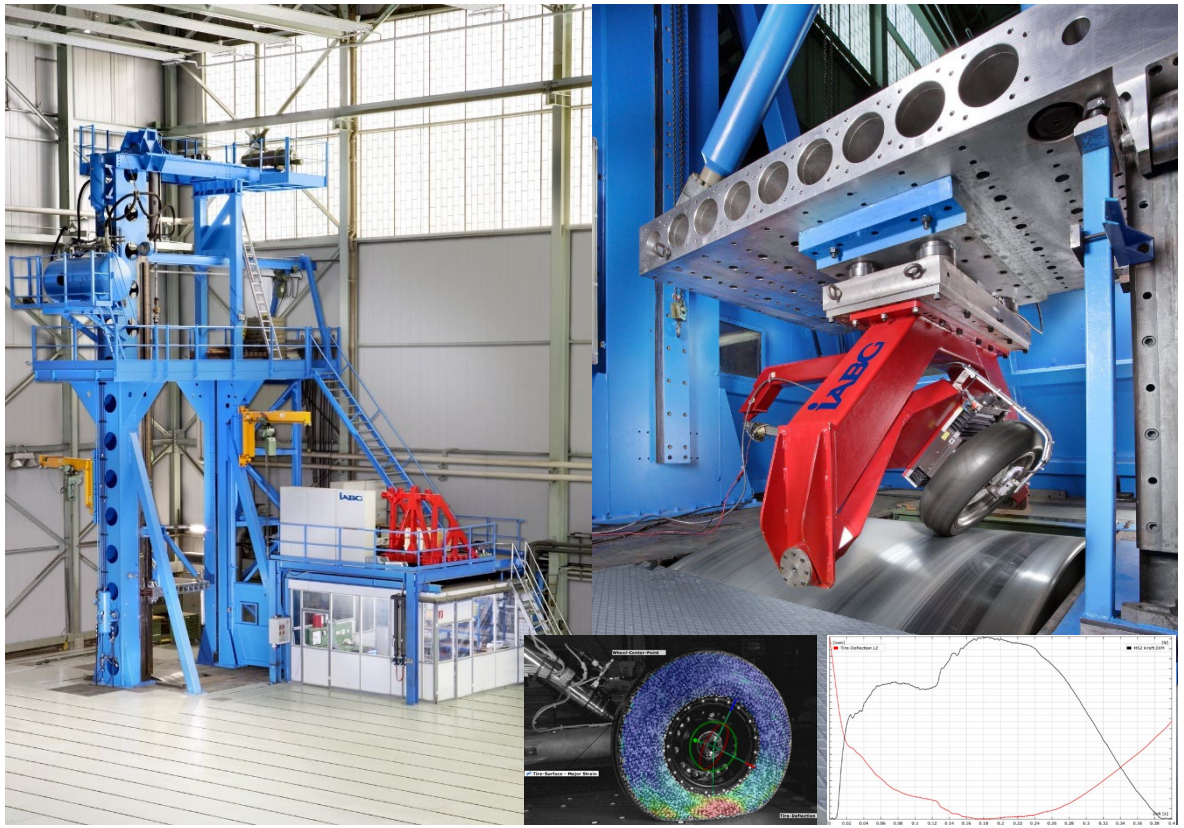
- Drop tests on aircraft landing gears
- Rolling, endurance, sliding, braking, resonance tests, tyre tests, tyre burst tests
- Impact strip and obstacle crossings
- Piezoelectric measurement of resulting forces

Fields of application

- Drop tests
- Development and qualification tests
- Crash tests
- Tests with simulation of forward speed (rotating drum), compensation of potential energies by special system

Technical specifications

- Peripheral speed: max. 400 km/h
- Drum width / diameter: 1.5 m / 4.0 m
- Drive line: 130 kW
- Load: vertical max. 560 kN || lateral max. 200 kN || tangential max. 400 kN
  Mass moment of inertia of the drum: 29,500 kgm²
- Drop mass / drop height: max. 14,000 kg / max. 11 m
- Falling speed with (without) mass compensation: 7 m/s (10 m/s)



Benefit for our customers

- Easily adaptable, multifunctional test setup for specific requirements
- Testing can be extended by further measurement techniques for comprehensive analysis

Reference customers/projects

- OEMs and suppliers to the aviation industry
- OEMs and suppliers to the automotive industry

Drop tests on particularly large, heavy and sensitive objects.

Large drop test facility (GFP).

Service description

- Drop tests of particularly large and heavy objects
- Preparation hall for instrumentation and, if necessary, air conditioning of the test sample
- High-speed metrology/video

Fields of application

- Drop tests for objects with high safety congestion
- Development and qualification tests
- Crash tests

Technical specifications

- Gantry crane height: 27 m
- Gantry crane load capacity: max. 130,000 kg, 2 hoists à 65,000 kg
- Drop weight: max. 65 t
- Lifting height: max. 22 m
- Impact force: max. 80 MN
- Mass of drop foundation: > 650 t
- Preparation hall: 16 x 18 m

Benefit for our customers

- Plant is located within a large security area
- From one source: Simulation and calculation, tests with data preparation and documentation, systematic damage analysis

Reference customers/projects

- Manufacturers and operators from the energy industry
- OEMs and suppliers to the aviation industry
- Customers from the military sector

Guided crash tests on fuel tanks (up to 20 m).

Large indoor drop test facility (Dresden).

Service description

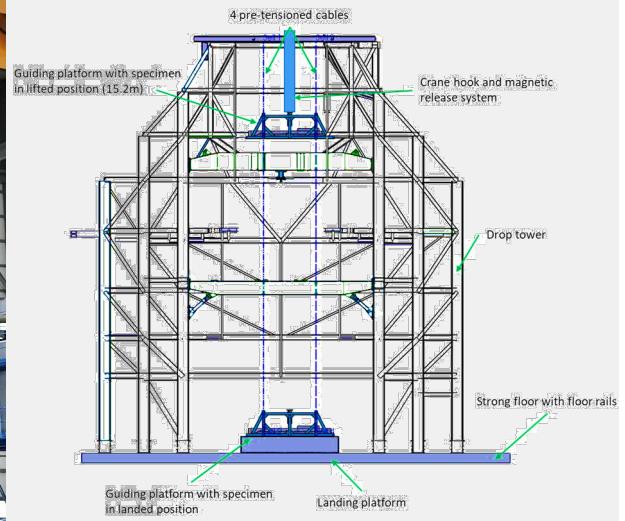
- Crash resistance of helicopter tanks in a guided free fall test
- Measurement of velocities, angles, braking accelerations, deformations
- High-speed video (up to 120,000 fps)
- Deformation measurement by means of high-speed photogrammetry

Fields of application

- Proof of crash resistance
- Tests according to approval regulation CS27.952 (a) "Fuel system crash resistance"
- Precise drop tests with high test repeatability

Technical specifications

- Drop height: max. 20 m
- Drop weight: scalable up to 40 t
- Mass of drop foundation: scalable up to 80 t
- Overhead Crane



Benefit for our customers

- Weather-independent test preparation and execution with high precision
- Complete service as a package from one source: test, data acquisition, evaluation, inspection

Reference customers/projects

- OEMs and suppliers to the aviation industry

Variable test stand for drop tests and impact tests.

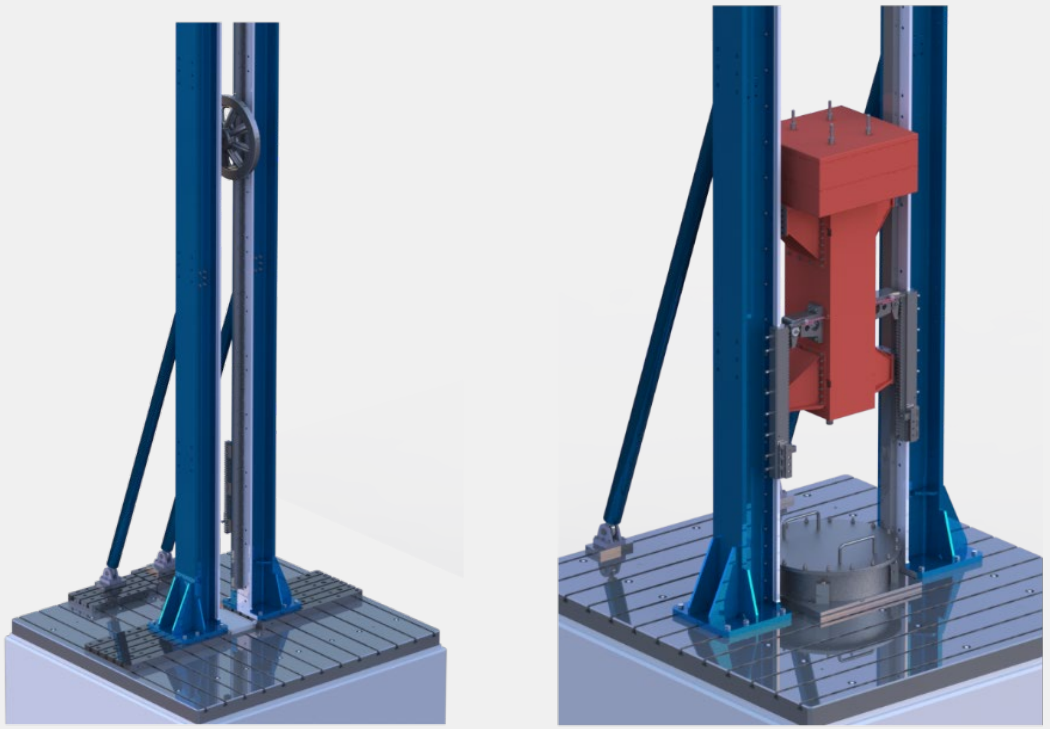
Modular guided drop test stand.

Service description

- Impact and drop tests for various applications and components
- Development of customized guiding devices and impactors
- Climatic cabinet directly next to the test bench

Fields of application

- Guided drop tests and impact tests
- Tests with temperature-controlled test specimens



Technical specifications

- Variable adjustment of the guide columns up to 2 m
- Drop height: max. 10 m
- Drop weight: max. 5,000 kg
- Large climatic chamber (useful size): approx. 1.5 x 1.5 x 1.5 m
- Temperature: max -40°C to 120°C

Benefit for our customers

- Modular and cost-effective adaptation to customer requirements
- Short set-up times

Reference customers/projects

- Manufacturers and operators from the energy industry
- OEMs and suppliers to the aviation industry
- OEMs and suppliers to the automotive industry

Drop tests on an unyielding 240 t foundation.

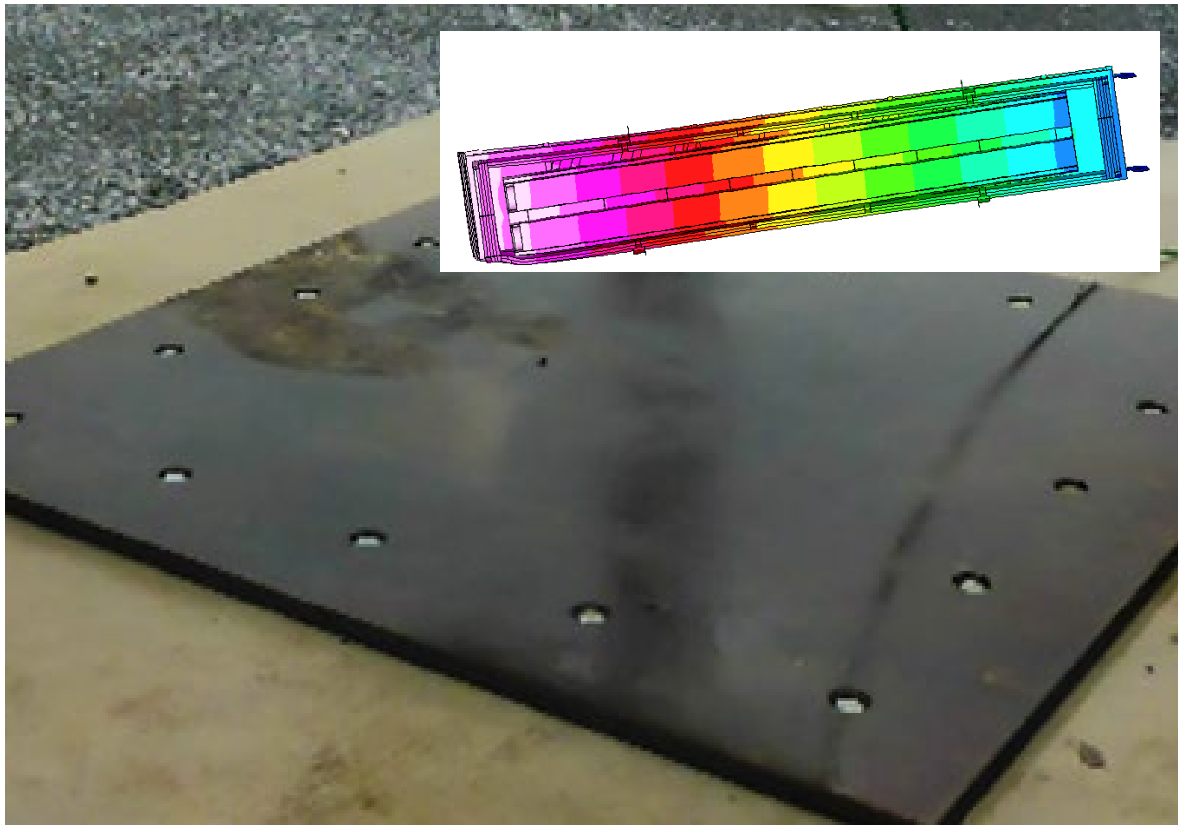
Large drop test facility (Lichtenau).

Service description

- Determination of the actual condition (visual, NDT, 3D scan) and instrumentation
- Leak test
- Air conditioning of the test sample
- Drop test with measurement data acquisition, processing of test results
- Tests according to customer specification

Fields of application

- Experimental verification of calculation models and for design (approval)
- Crash tests



Technical specifications

- Foundation: total mass: 240 t || baffle plate: 3 x 3 m || crane as required
- Measurement technology: imc CRONOSflex: 2 base modules á 2.000 kSamples || 5 universal measuring amplifiers || 7 DMS measuring amplifiers
- Video Measurement: 2 Photron SA-X2 || Photron Mini UX-100 || 5 HS Vision MacroVIS
- 3D metrology: Digitizing: GOM ATOS 5 || Deformation/motion analysis: GOM ARAMIS, LIMESS Istra 4D || 3D measurement: GOM TRITOP
- Additional capacity (3 x 3 x 3 m): Cooling down to -80° C || Heating up to 80° C

Benefit for our customers

- Plant is located within a large security area
- From one source: Simulation and calculation, tests with data preparation and documentation, systematic damage analysis

Reference customers/projects

- Manufacturers and operators from the energy industry
- OEMs and suppliers to the aviation industry
- OEMs and suppliers to the automotive industry

Simulator for obstacle crossings and radial impacts.

Universal Drop Tower / Impact RADIAS

Service description

- Impact tests for various applications and components
- Impact load on motorcycle forks & axle control arms, impact test on truck wheels (30° method)
- Radial impact test on passenger car wheels (tyres)
- Impact test 13°, according to AK-LH-08 and JIS D4103

Fields of application

- Strength and failure behaviour of crash elements
- Protection of the rim strength against breakage
- Preloading of wheels with impact loads for subsequent fatigue tests

Technical specifications

- Drop weight: 120 - 1.000 kg (expandable)
- Drop height: max. 8 m (depending on the component)
- Impact energy at 1 m drop height (150 kg): 1,471.5 J
- Falling speed (at 8 m): max. 12.5 m / s
- Impact force with force measurement in the middle of the fin: 150 kN (expandable)
- Fin: variable, flat, pointed, etc.
- Clamping of test specimens: Clamping field size 1 x 2 m || alternatively: vertical clamping by means of clamping wall

Benefit for our customers

- Modular and cost-effective adaptation of the impactor
- Short set-up times

Reference customers/projects

- OEMs and suppliers to the automotive industry, energy industry, medical technology, materials research and other industries

Drop tests for impact and elongation tests

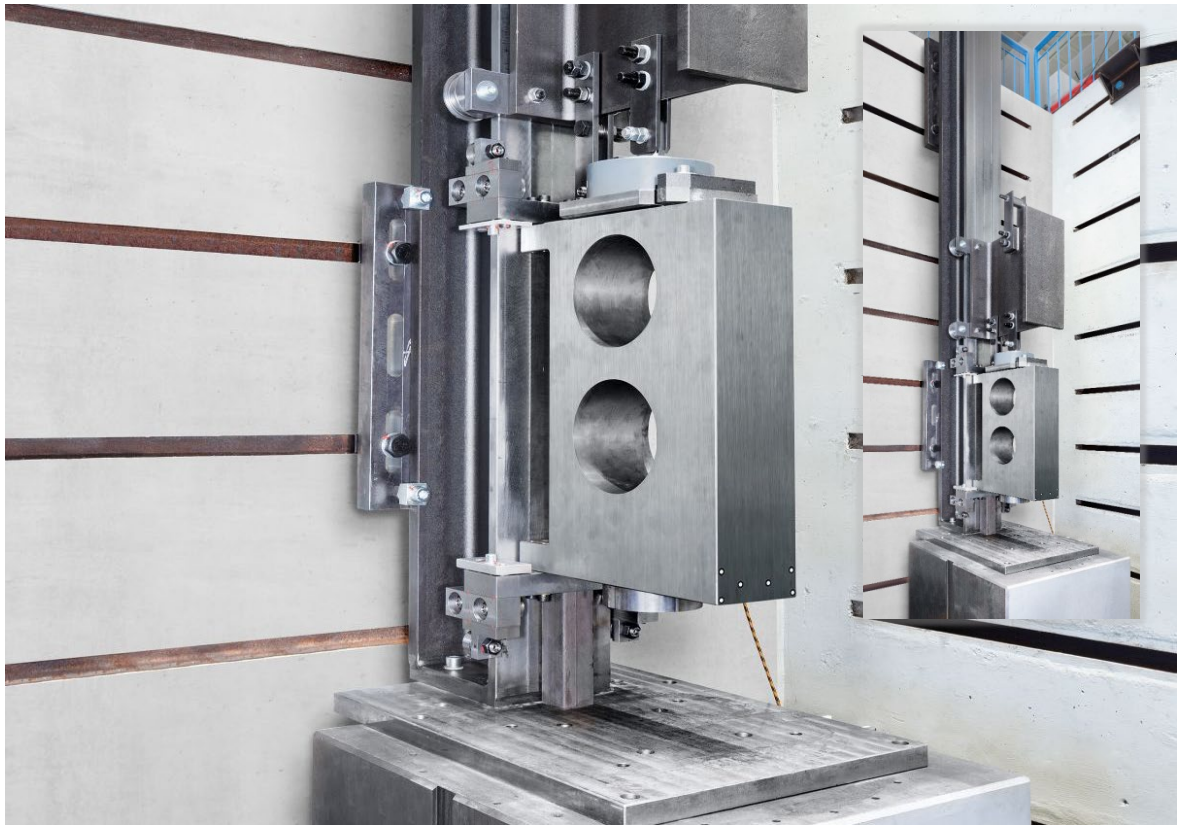
Drop tower with sledge.

Service description

- Impact and elongation tests on components and assemblies
- thermal testing
- Special insulating plate for special temperature conditions

Fields of application

- Strength and crash behaviour in combination with thermal conditions



Technical specifications

- Drop weight: 10 kg to 2,000 kg
- Drop height: max. 11.5 m
- Impact force: max. 2,000 kN
- Impactor geometry: as required
- Temperature: - 40 °C to 110 °C

Benefit for our customers

- Modular and cost-effective adaptation of the impactor
- Short set-up times

Reference customers/projects

- Manufacturers and operators from the energy industry
- OEMs and suppliers to the aviation industry
- OEMs and suppliers to the automotive industry

Portal hammer with flexible impactor positioning.

Little drop hammer.

Service description

- Drop and impact tests on components and assemblies
- Variable impactor positioning by shifting in x- and y-axis
- Pre-damage

Fields of application

- Material investigations in the aerospace and automotive sector
- High-voltage storage systems
- Pre-damage for modal analyses on closed systems
- Impact on large components

Technical specifications

- Drop height: max. 1,500 mm
- Falling masses: approx. 9 kg to 100 kg, depending on impactor geometry
- Impactor geometry: as required
- Measurement technology: force, displacement, time, acceleration

Benefit for our customers

- No changeover times due to one-time fixation of the test specimen and variable point-precise impactor positioning

Reference customers/projects

- OEMs and suppliers to the automotive industry, energy industry, medical technology, materials research and other industries

Impact tests with small masses.

Small impactor.

Service description

- Drop and impact tests on small components and assemblies with small masses
- Multiple impacts with variable impactor positioning (displacement in x- and y-axis) possible
- Pre-damage
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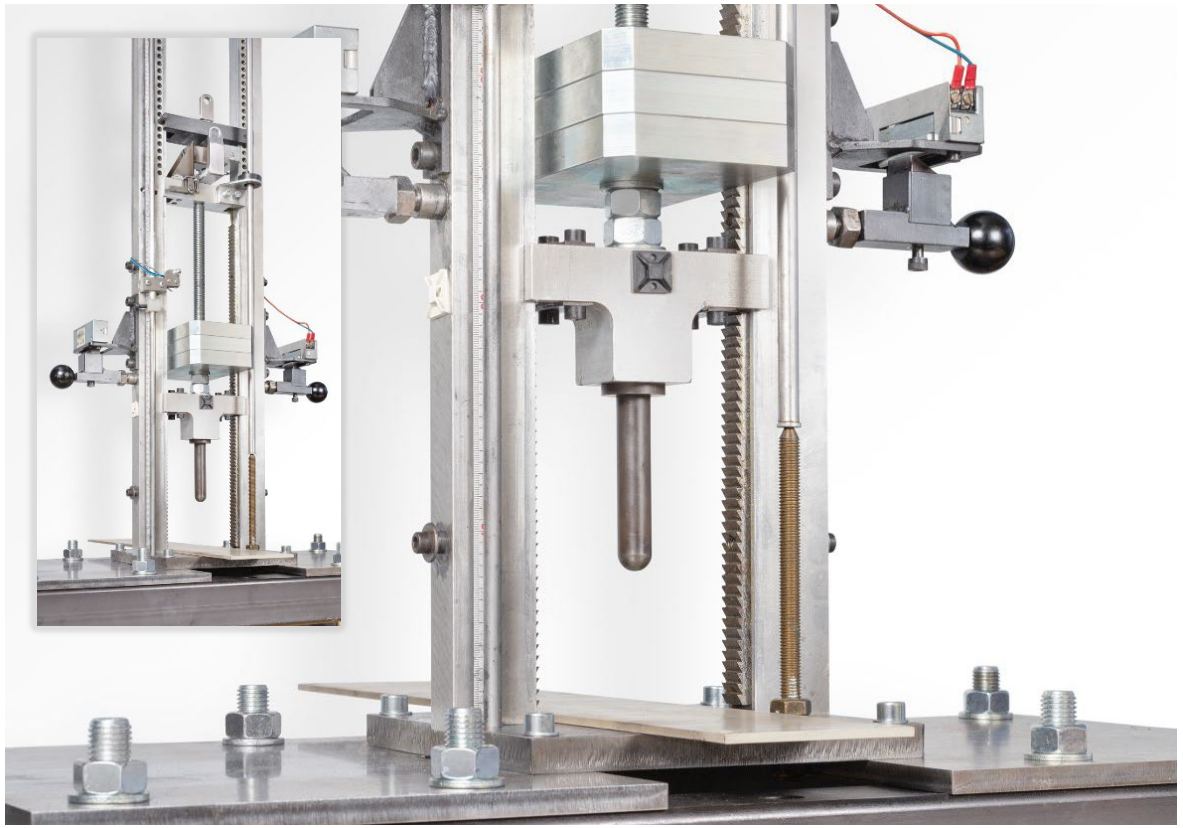
Fields of application

- Material investigations
- Pre-damage for modal analyses on closed systems
- Impact on small components



Technical specifications

- Drop height: max. 1,000 mm
- Falling masses: approx. 2 kg to 10 kg, depending on impactor geometry
- Impactor geometry: as required
- Measurement technology: force, displacement, time, acceleration

Benefit for our customers

- No changeover times due to one-time fixation of the test specimen and variable point-precise impactor positioning

Reference customers/projects

- OEMs and suppliers to the automotive industry, energy industry, medical technology, materials research and other industries

Simulation and testing services.

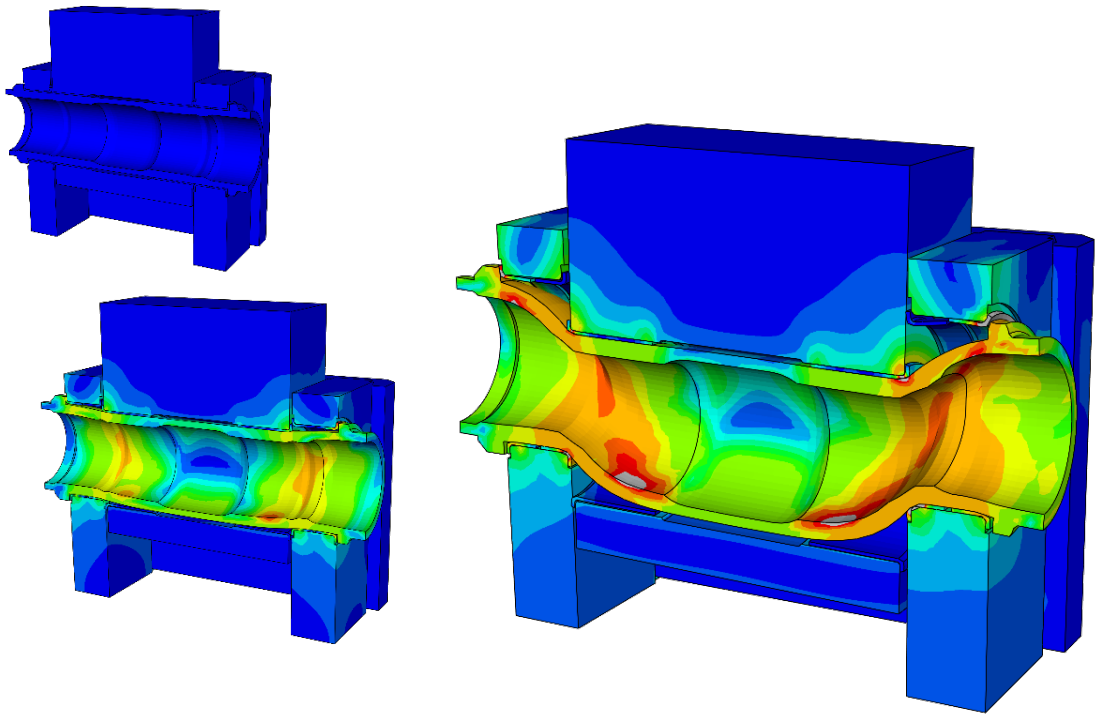
Simulation Impact.

Service description

- Simulation of drop tests on a rigid foundation
- Crash simulation of complex components to determine the collision behaviour
- Crash simulation
- Penetration simulation

Fields of application

- Qualification of fuel element casks
- Optimization of crash elements and collision behavior, e.g. of trains
- Crash simulations in the nuclear field, e.g. dismantling KKN



Technical specifications

- Structure solver DYNA3D
- Explicit 3D FEM Software
- Continuous development at LLBL (Lawrence Livermore National Lab.)
- Since 1996 part of the IABG software DYSMAS
- Validated against a wide range of tests

Benefit for our customers

- Early validation and optimization of components through digital twin
- From a single source: product optimization, experimental verification and systematic failure analysis

Reference customers/projects

- Manufacturers and suppliers from the automotive, rail and energy sectors
- On behalf of the state for the decommissioning of nuclear facilities

5 Test benches for springs and roll stabilizers

Vibration resistance of springy components.

Variable test rig for resilient components (VTRC).

Service description

- Testing of spring elements such as springs and stabilisers
- Parallel suspension or simulation of the axle kinematics
- Free body with complete vehicle axle
- Optional: testing at different temperatures, levels of humidity and types of corrosion

Fields of application

- Testing of springs, stabilisers in the replacement test, in assembly with original bearings and mounts or in complete axle assembly

Technical specifications

Weight of the test rig: 5.5 t
Dimensions (L x W x H) of the test rig: 3.20 m x 2.20 m x 2.85 m
Additional space required for control panel, power electronics and corrosion system
Number of test stations: max. 4 simultaneously
Load allowed per test station: max. 35 kN

Benefit for our customers

- Time saving due to flexible design of the test components
- Very high energy efficiency and independent of the hydraulic supply

Reference customers/projects

- Manufacturer of springs, stabilizers and axles
- OEMs in the automotive industry

Vibration resistance tests on springs under the influence of corrosion.

Corrosion spring testing machine (CSTM).

Service description

- Measurement of spring force and deflection
- Dry and wet vibration tests
- Corrosion simulation by intermittent spraying with salt water
- Wear simulation
- Components to be tested: all parallel or circular deformed springs

Fields of application

- Determination of the fatigue strength and setting behaviour of springs under salt water corrosion or normal laboratory atmosphere

Technical specifications

- Weight of the test rig: 3.5 t
- Dimensions (L x W x H) of the test rig: 1.8 m x 2.0 m x 2.6 m || additional space required for control panel, corrosion system, water treatment and pressurised oil supply
- Load allowed per test station: max. 40 kN
- Stroke (displacement control): 10 mm to 300 mm
- Spring length: max. 750 mm
- Test frequency: 0.23 to 0.33 $\sqrt{(n \times R)}$ [Hz] (f_o = 1.8 Hz to 15 Hz)

Benefit for our customers

Time and cost-saving determination of the fatigue strength of springs due to low energy consumption and possible test frequency

Reference customers/projects

- OEMs in the automotive, railway, special machinery and special vehicle construction sectors
- Spring manufacturer

N = number of springs to be tested simultaneously R = spring constant [N/mm]

Fatigue tests on large springs and leaf springs.

Large spring testing machine (LSTM).

Service description

- Fatigue tests under laboratory conditions with measurement of spring force and spring length
- Simultaneous testing of several resilient elements (limited by permissible maximum load and installation space)
- Components to be tested: parallel deformed springs of all kinds

Fields of application

- Determination of the fatigue strength of large springs and leaf springs under laboratory conditions

Technical specifications

- Weight of the test rig: 8.5 t
- Dimensions (L x W x H) of the test rig: 2.2 m x 2.2 m x 3.5 m || additional space required for operating console, control cabinet, pressure oil supply/hydraulic oil station
- Load allowed per test station: max. 200 kN
- Stroke (displacement controlled): 10 mm to 400 mm
- Spring length: max. 1 m
- Test frequency: 0.19 to 0.28 √(n × R) [Hz] (fo = 2 Hz to 20 Hz

Benefit for our customers

Time and cost-saving fatigue strength determination of springs in a laboratory atmosphere

Reference customers/projects

- OEMs in the automotive, railway, special machinery and special vehicle construction sectors
- Spring manufacturer

N = number of springs to be tested simultaneously R = spring constant [N/mm]

Vibration resistance of spring coils under external influences.

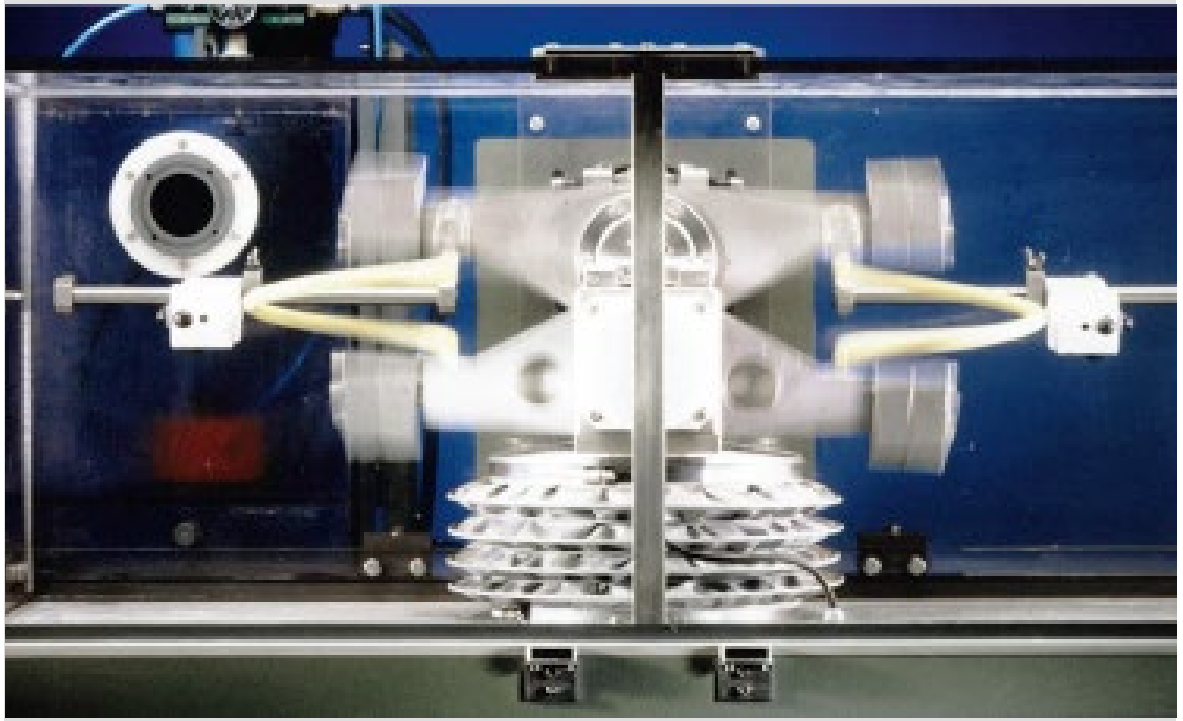
Spring coild testing machine (SCTM).

Service description

- Testing under temperature and corrosion in resonance principle
- Under corrosion also low test frequencies in slow drive
- Test specimens: two spring coils, taken from cylindrical car axle springs

Fields of application

- Fatigue strength tests under corrosion on individual spring coils
- Comparative fatigue strength tests with different influencing parameters on spring coils
- Simulation of corrosion by salt water sprinkling



Technical specifications

- Weight of the test rig without control cabinet: 1.0 t
- Dimensions (LxWxH) of test stand without control cabinet: 1.2 m x 1.1 m x 1.6 m
- Spring / wire diameter: 40 mm to 320 mm / max. 22 mm
- Test frequency
- Slow drive: 0.2 Hz to 1.5 Hz
- Fast drive: 8 Hz to 40 Hz
- Power consumption: max. 1 kW

Benefit for our customers

- Time- and cost-saving determination of the fatigue strength by resonance operation and under temperature and corrosion
- Short installation and changeover times

Reference customers/projects

- OEMs in the automotive industry
- Spring manufacturer

Ensuring the operational stability of stabilisers.

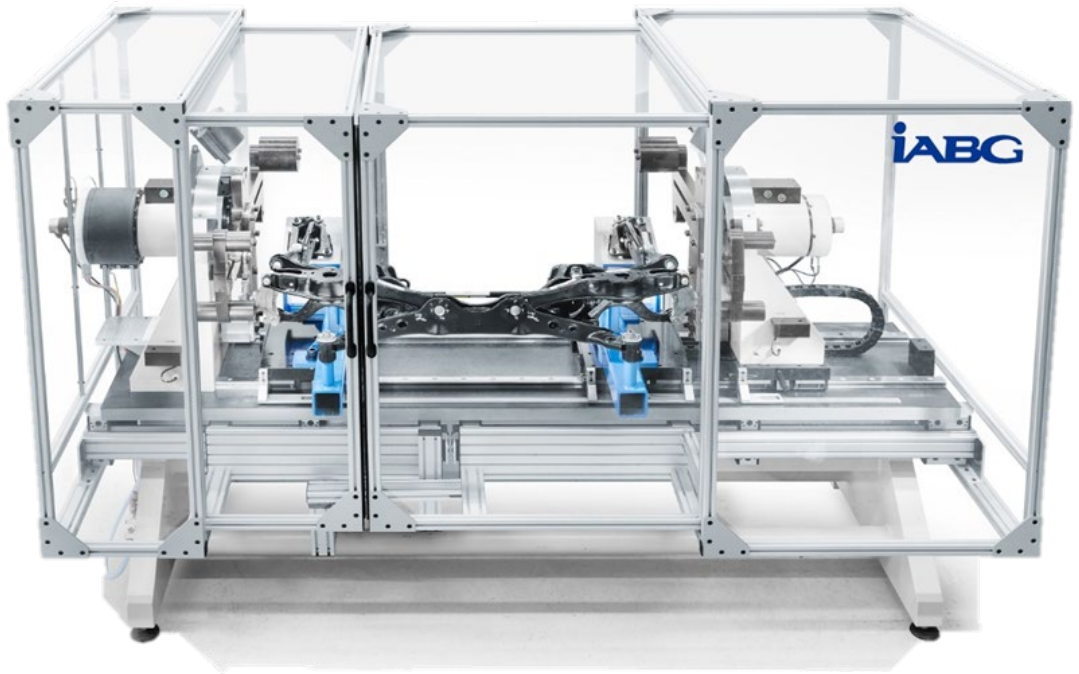
Stabilizer bar test machine (STAP).

Service description

- Testing according to the resonance principle
- Constructively free from forces and vibrations acting outwards
- Software-based test management, documentation and evaluation
- Conforms to the specifications of the Stabilisers & Springs Working Group

Fields of application

- Ensuring the fatigue strength of stabilisers for passenger cars and trucks
- Evaluation of measures to increase fatigue strength
- Type approval
- Investigation of the influence of different production parameters
- Vulnerability assessment



Technical specifications

- Weight of the test rig: 3.2 t
- Dimensions (L x W x H) of the test rig: 4.7 m x 1.5 m x 2.1 m
- Test specimens: car stabilisers of all kinds
- Diameter : 10 mm to 42 mm
- Length of test specimen: max. 2 m
- Test frequency: 1.5 Hz to 25 Hz
- Type of stress: constant and random variable amplitudes (collective tests) || purely alternating stress (R = -1)

Benefit for our customers

- Recognised by all car manufacturers
- Robust construction ensures reliability and low maintenance
- Stand-alone machine, as only one power connection is required

Reference customers/projects

- OEMs in the automotive industry
- Stabiliser and spring manufacturer

Simulation of defined and reproducible stone chip damage.

Grit impact simulator machine (GISM).

Service description

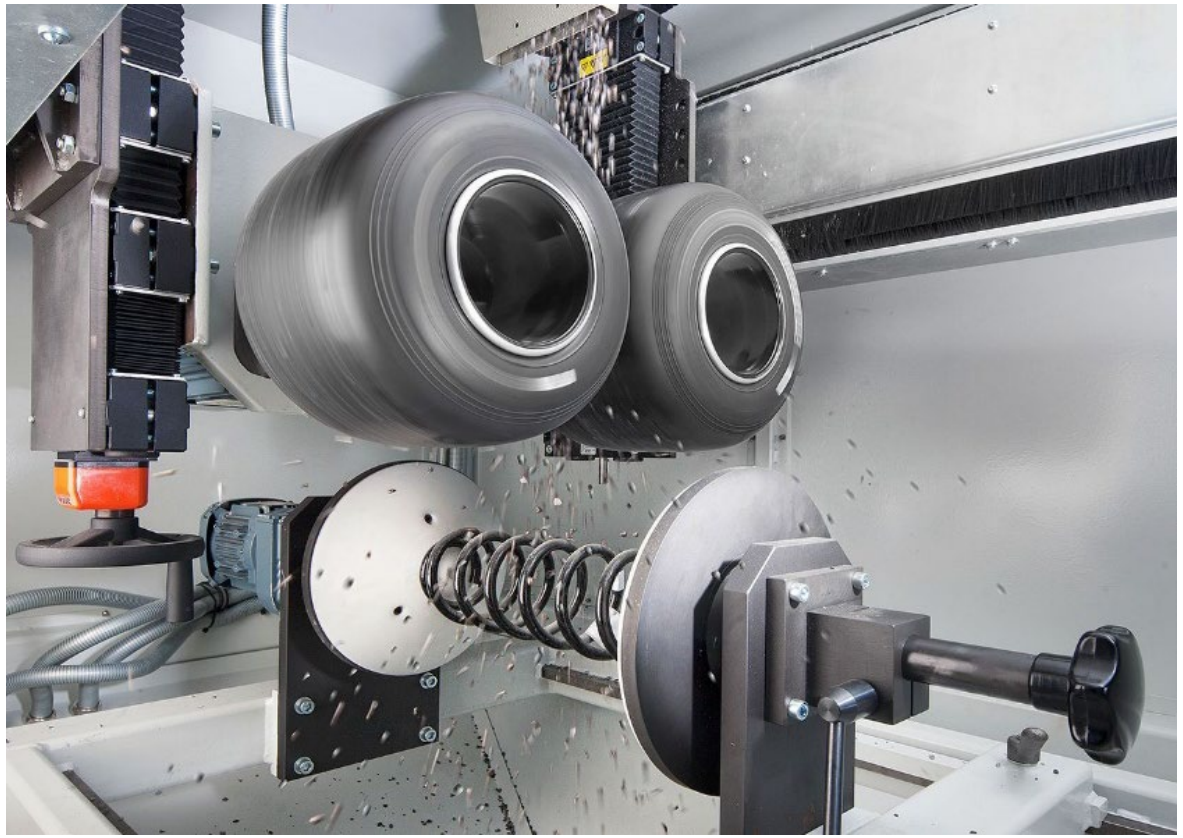
- Simulation of stone chip damage to components in a defined and reproducible manner
- Type and quantity of the blasting material as well as impact speed can be varied
- Defined speed of the blasting material independent of shape, size and weight

Fields of application

- Testing of axle springs, stabilisers, dampers, axle mounting parts, vehicle or rail vehicle fronts, body parts, fuel tanks, gearbox housings, oil pans, windscreens and wheelset shafts
- Simulation of hailstorms on wind turbine rotor blade tips or photovoltaic modules

Technical specifications

- Weight of the test rig without control cabinet: 0.8 t
- Dimensions (L x W x H) of the test rig without control cabinet: 2,300 mm x 1,300 mm x 2,000 mm
- Impact speed: max. 140 km/h (39 m/s) || max. 300 km/h (83 m/s)
- Angle adjustment horizontal/vertical
- Height adjustment up to 700 mm
- Grain size of the blasting material: max. 15 mm/max. 40 mm



Benefit for our customers

- Targeted and reproducible damage to components for safety-relevant assessment of behaviour/properties and service life
- Cost-effective verification/qualification compared to conventional methods

Reference customers/projects

- OEMs in the automotive industry
- Manufacturer of springs, stabilizers, components for the power engineering, automotive and the railway industries

Safeguarding mechatronic systems in existing test facilities.

Mechatronics rack.

Service description

- Extension of test environments for mechatronic DUTs
- dSpace Scalexio for residual bus simulation (CAN, FlexRay)
- On-board power supply simulation (12 V/48 V), bidirectional power supply
- Test automation by stand system or mechatronic rack as master

Fields of application

- Typical test items: EPS steering systems, rear axle steering systems, active roll stabilizers, drive systems,...
- Typical test scopes: Environmental simulations, life tests, functional and development tests, structure-borne sound analyses,...

Technical specifications

- Communication with DUT: CAN (2x), FlexRay (2x), switchable bus interruption
- Bidirectional power supply: 0 – 60 V, ±450 A, connections for two DUTs (200 A each), voltage and current measurement (2x), quiescent current measurement (2x), Kl.30/40 switchable (2x), Sense (1x), optional: SuperCaps, redundant power supply
- Logic supply: 0 – 30 V, 10 A, connections for two DUTs, voltage and current measurement (2x), Kl. 30 switchable (2x), Kl. 15 switchable (2x)
- Additional inputs and outputs: AI ±10 V (5x), AO ±10 V (5x), DI (4x), DO (4x), temperature (8x), CAN (5x)

Benefit for our customers

- Qualification and safeguarding of mechatronic systems
- Extensive equipment inventory: hydropulser, 4-poster, klima chambers,...
- Mechanical testing and environmental simulation from a single source

Reference customers/projects

- Dynamic testing of active rear axle steering systems, environmental conditions
- Functional testing of active roll stabilizers
- Life cycle tests on suspension actuators

6 Wheel testing

Multiaxial tests on wheels.

High-speed external drum test bench (HATOR).

Service description

- Multiaxial test bench (radial, skew and tyres
- Inteand camber) for wheel tests, brake discs, wheel compound gration of real-time signals possible

Fields of application

- Tests possible according to the following test specifications: AK LH 08, PV-5608, wheels rolling test, SAE J-328, FIAT Standard, Ford Standard, Land Rover Engineering Standard, JIS D 4103:1998 Japanese Industrial Standard, impact bar crossing, customer-specific requirements

Technical specifications

- Velocity: max. 300 km/h
- Brake pressure: max. 150 bar (dynamic)
- Axial load/ radial load: max. 40 kN
- Slip angle: ±15°
- Camber angle: ±5°
- Drum width / diameter: 500 mm / 2,000 mm
- Integrated measurement of up to 8 strain gauges via telemetry
- Four additional thermal channels

Benefit for our customers

- Qualification according to various test specifications for realistic simulation under various operating conditions
- Fast test processing through parallel operation at two stations

Reference customers/projects

- OEMs in the automotive industry
- Tyre manufacturer

Tyre measurements on car and motorbikes tyres.

Flat-Trac® III CT [MTS] flat track tyre test stand.

Service description

- Characteristic curve determination, stationary and dynamic measurements
- Determination of tyre parameters
- Data evaluation for parameterisation of different tyre models
- Special tyre measurements

Fields of application

- Carrying out tyre measurement tests on car and motorbike tyres

Technical specifications

- Wheel width / diameter: 450 mm / 910 mm
- Belt speed: 250 km/h
- Brakes / drive with separate spindle drive
- Skew angle: ±30
- Camber angle: -12° to +45°
- Forces and torques by means of a multi-component wheel measuring hub:
- Fx = 10,000 N || Fy = 15,000 N || Fz = 25,000 N (maximum values)
- Mx = 10,000 Nm || My = 2,800 Nm || Mz = 3,000 Nm (maximum values)

Benefit for our customers

Standardised and customised test procedures

Reference customers/projects

- OEMs in the automotive industry
- Tyre manufacturer

Determination of dynamic strength of vehicle wheels.

Rotating bending test machine for wheels.

Service description

- Stress due to a rotating bending moment until failure due to crack formation and / or breakage
- Rotating bending test possible for geometrically similar components (e.g. flywheels)

Fields of application

- Testing the fatigue strength of vehicle wheels, in particular the dynamic strength of the wheel dish under extreme lateral force loads

Technical specifications

- Rotating flyweight to implement different bending torques (up to 16 kNm)
- Wheel bolt control with embedded torque measurement system
- Velocity range: 500 rpm to 2,400 rpm
- Nominal wheel diameter: 10 inches to 28 inches
- Total weight: 2.000 kg

Benefit for our customers

Cost and time savings through fast test execution simultaneously at two test stations

Reference customers/projects

- OEMs and suppliers in the automotive sector
- Wheel manufacturer

Simulator for obstacle crossings and radial impacts.

Universal Drop Tower / Impact RADIAS

Service description

- Impact tests for various applications and components
- Impact load on motorcycle forks & axle control arms, impact test on truck wheels (30° method)
- Radial impact test on passenger car wheels (tyres)
- Impact test 13°, according to AK-LH-08 and JIS D4103

Fields of application

- Strength and failure behaviour of crash elements
- Protection of the rim strength against breakage
- Preloading of wheels with impact loads for subsequent fatigue tests

Technical specifications

- Drop weight: 120 - 1.000 kg (expandable)
- Drop height: max. 8 m (depending on the component)
- Impact energy at 1 m drop height (150 kg): 1,471.5 J
- Falling speed (at 8 m): max. 12.5 m / s
- Impact force with force measurement in the middle of the fin: 150 kN (expandable)
- Fin: variable, flat, pointed, etc.
- Clamping of test specimens: Clamping field size 1 x 2 m || alternatively: vertical clamping by means of clamping wall

Benefit for our customers

- Modular and cost-effective adaptation of the impactor
- Short set-up times

Reference customers/projects

- OEMs and suppliers to the automotive industry, energy industry, medical technology, materials research and other industries

7 Environmental simulation

Emission measurements in the altitude climate chamber.

High altitude chamber (GHK) – up to 3,800 m above sea level.

Service description

- High-altitude climatic chamber with roller test bench for vehicle dynamics testing under environmental conditions (altitude, temp., humidity)
- Performance of exhaust gas measurements
- Determination of emissions at the tailpipe and upstream of the catalyst

Fields of application

- Functional verifications on complete vehicles and motorbikes
- Tuning of engine control units
- Verification within the scope of the exhaust emission standard
- Securing the homologation of vehicles

Technical specifications

- Ambient conditions: temperature range -30 °C to +50 °C || controlled humidity max. 95 % relative humidity || ambient pressure approx. 630 hPa to 960 hPa (approx. 560 m to 3,800 m) || cooling capacity max. 180 kW
- Single roller dynamometer: Pmax= 210 kW || tractive force= 6 kN || vmax= 200 km/h || vehicle weight simulation max. 8,000 lbs || axle load max. 2 t
- Air fan: rear whel drive vehicle: max. 34,000 m3/h || max. 130 km/h || Front wheel drive vehicle: max. 26,000 m3/h || max. 100 km/h
- Dimensions (L x W x H): 8.5 m x 4.5 m x 4.3 m

Benefit for our customers

- Emission and application measurements without additional changeover times
- Suitable for HV vehicles due to integrated extinguishing device
- Conditioning cells allow parallel campaigns on several vehicles

Reference customers/projects

OEMs and development partners of the automotive industry

Start the test well prepared.

Soaking boxes & Preparation area.

Service description

- Pre-conditioning of vehicles for tests in the high altitude chamber, especially for emission measurements
- Preparation of the vehicles on a lifting platform (e.g. assembly of roller wheels, application of measuring technology or changing catalytic converters)

Fields of application

- Preparation of the vehicles for tests in the high altitude chamber

Technical specifications

- Conditioning cells
  - Temperature range: -25 °C to +50 °C
  - Independent temperature control of both cells
  - Test room dimensions (L x W x H): 5.70 m x 2.70 m x 2.35 m
- Preheating hall
  - Forklift truck to bring the vehicles into the test chamber
  - Equipped workshop with lifting platform

Benefit for our customers

- Short distances to test chambers for time-efficient test procedures
- Fast reaction in case of necessary repairs

Reference customers/projects

OEMs in the automotive industry

Accessible chamber for tests at extreme ambient temperatures.

Temperature chamber.

Service description

- Accessible temperature chamber for functional testing at high or low temperature
- Combined environmental simulations (temperature, rain, snow or ice)

Fields of application

- Functional verification of components and systems
- Cold start tests
- Endurance tests
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -70 °C to +150 °C || temperature gradient max. 1 K/min || cooling capacity max. 70 kW
- Floor loading: max. 5 kN/m^2
- Cable feedthrough (Ø): 100 mm (3x)
- Power supply: 230 VAC or 400 VAC (16 A, 32 A, 63 A and 125 A CEE)
- Air pressure supply: max. 25 bar
- Dimensions (L x W x H): 5.5 m x 4.5 m x 4.0 m
- Door dimensions (W x H): 4.5 m x 4.0 m

Benefit for our customers

Spacious temperature chamber allows testing of a complete system including simultaneous testing of all interactions of the individual components

Reference customers/projects

- OEMs in the automotive, aerospace, defence and railway industries
- Manufacturers in the energy sector

Accessible climate chamber for large test specimens.

Climate chamber.

Service description

- Accessible climate chamber for functional or endurance tests under combined environmental conditions (temperature, humidity, snow, ice or sun)
- Tests under special environmental conditions (humidity, argon, etc.)
- H2-compatible for hydrogen operation

Fields of application

- Climate tests on components and systems
- Blowing-rain and IP protection class tests
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -40 °C to +120 °C || temperature gradient max. 1 K/min || controlled humidity 10 % to 95 % relative humidity (temperature +10 °C to +80 °C) || cooling capacity max. 120 kW
- Cable feedthrough (Ø): 150 mm (2x)
- Power supply: 230 VAC or 400 VAC (16 A, 32 A, 63 A and 125 A CEE)
- Air pressure / water supply: max. 25 bar / well water (in- and outlet)
- Exhaust gas volume flow: max. 1,500 m^3/h
- Dimensions (L x W x H) / Door (W x H): 9.0 m x 4.5 m x 4.3 m / 4.0 m x 3.9 m

Benefit for our customers

Large chamber allows testing of a complete system including simultaneous testing of all interactions of the individual components

Reference customers/projects

- OEMs in the automotive, aerospace, defence and railway industries
- Nuclear and wind turbine manufacturers
- Tests on large control cabinets and plants

TISAX-certified temperature chamber with roller.

Vehicle chamber I (KFZ-I).

Service description

- Temperature chamber with roller test bench for carrying out functional tests at high or low temperature
- Temperature shock tests also for large test objects, e.g. control cabinets
- TISAX certified

Fields of application

- Functional verification of components and systems
- Tuning of control units
- Cold start test on vehicles
- testing standards: EN 60068-2-14 Na, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -70 °C to +80 °C || cooling capacity max. 190 kW
- Single roller dynamometer: P_{max} = 40 kW || v_{max} = 120 km/h
- Dimensions (L x W x H): 7.0 m x 3.5 m x 2.6 m

Benefit for our customers

- Cost and time savings through efficient qualification
- Tests on test specimens with high waste heat possible due to high cooling capacity of the chamber

Reference customers/projects

- OEMs in the automotive industry
- Manufacturers of electrical components and systems

TISAX-certified temperature chamber with roller.

Vehicle chamber II (KFZ-II).

Service description

- Temperature chamber with roller test bench for carrying out functional tests at high or low temperature
- Suitable for HV vehicles due to mobile extinguishing device
- Temperature shock tests also for large test objects
- TISAX certified

Fields of application

- Functional verification of components and systems
- Tuning of control units
- Cold start test on vehicles
- Driving dynamics measurements
- Testing standards: EN 60068-2-14 Na, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -40 °C to +60 °C || cooling capacity max. 110 kW
- Dynamometer: roller test bench with one roller (single axle roller VA or HA) || P_{max} = 53 kW || v_{max} = 120 km/h
- Driver guidance system (default driving curve)
- Air blower: 26,000 m3/h || v_{max} = 100 km/h
- H_2-capable, ex-protected for e.g. hydrogen-powered vehicles
- Useful space dimensions (L x W x H): 8.0 m x 5.0 m x 2.5 m

Benefit for our customers

Time and thus cost savings through parallelisation of different tests in one test run

Reference customers/projects

- OEMs in the automotive industry
- Manufacturers of fuel cells, electrical components and systems

Rapid temperature change tests.

Combination chamber.

Service description

- Walk-in climate chamber for carrying out functional and ageing tests at temperature and controlled humidity

Fields of application

- Functional verification of components and systems
- Ageing due to temperature and climate cycles
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -70 °C to +120 °C || temperature gradient max. 5 K/min || cooling capacity max. 70 kW || humidity max. 95 % relative humidity
- Cable feedthrough (Ø): 125 mm (3x)
- Power supply: 230 VAC or 400 VAC (16 A, 32 A, 63 A and 125 A CEE)
- Air pressure: max. 25 bar
- Water supply: well water (in- and outlet)
- Dimensions (L x W x H): 4.0 m x 2.2 m x 2.7 m

Benefit for our customers

- Numerous climatic conditions in one plant
- Powerful climate chamber for tests with high temperature gradient or high relative humidity

Reference customers/projects

- Manufacturers of (electrical) components from the automotive, defence, aerospace, rail vehicle and InfoCom industries

Time accelerated aging processes due to rapid temperature changes.

Themeral shock unit.

Service description

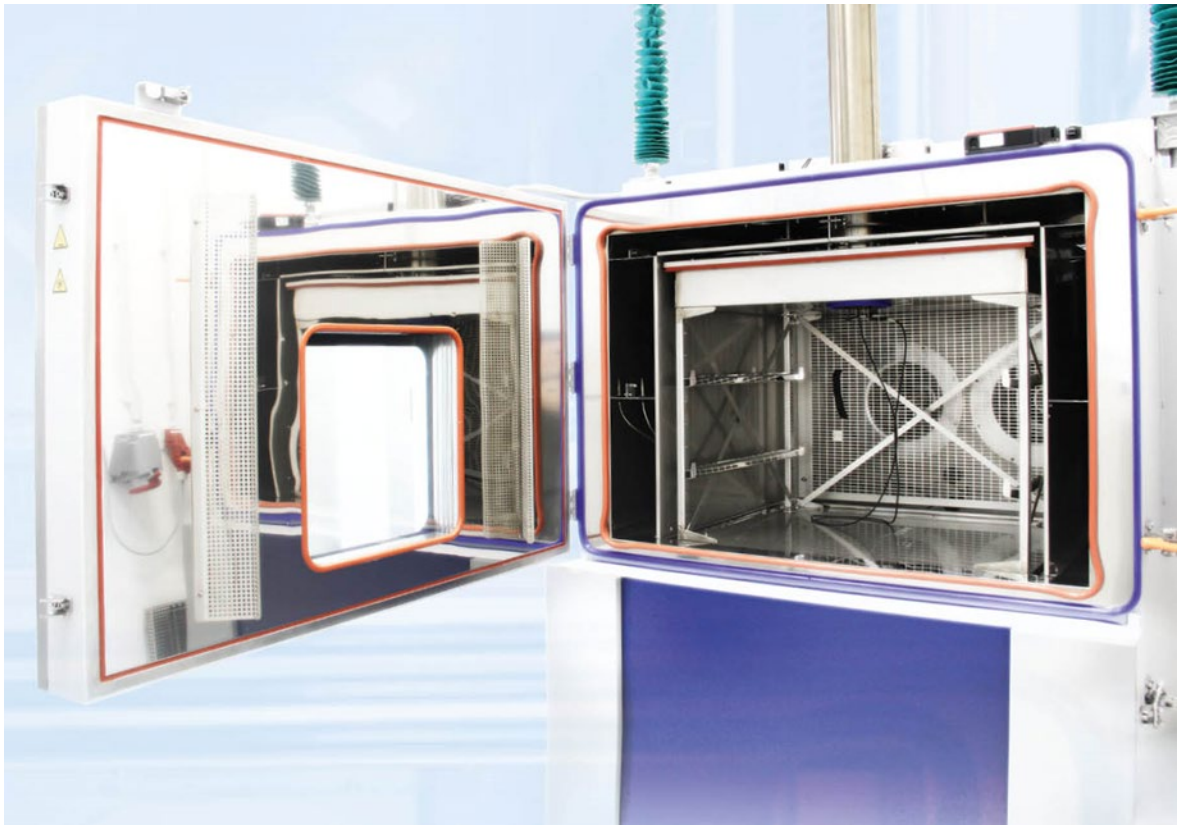
- Systems to evaluate the thermal schock resistance of components by shock-like temperature changes in a two-chamber process (air / air)

Fields of application

- Aging of electric motors and power electronics
- Safeguarding of the component with regard to thermally induced defect patterns, e.g. crack formation in soldered, glued and welded joints
- Testing standards: LV124, DIN EN 60068-2-14 Na, MIL-STD 810

Technical specifications

- Temperature range: -70 °C to +220 °C
- Transfer time: max. 10 s
- Cable bushing (Ø): 35 mm || 125 mm
- Test room dimensions of system 1 (L x W x H): 640 mm x 460 mm x 400 mm
- Test room dimensions of system 2 (L x W x H): 680 mm x 850 mm x 610 mm
- Test piece weight: max. 100 kg



Benefit for our customers

Time accelerated validation of development statuses

Reference customers/projects

Manufacturers of electronic components and assemblies from various industries

Climatic component tests for product qualification.

Temperature and climate test cabinets.

Service description

- Climatic chambers up to 1,500 litres volume for the qualification of electrical, electronic and mechatronic components and systems
- Operation of the test items by means of equipment directly at the test cabinet (control cabinet, notebook, power supply units etc.)

Fields of application

- Rapid temperature change tests
- Temperature and humidity tests
- Low and high temperature tests
- Icing tests
- Aging tests
- Testing standards: LV124, DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -70 °C to +180 °C || temperature gradient up to 15 K/min || humidity 10 % to 98 % relative humidity
- Cable feedthrough (Ø): 125 mm
- Test piece weight: max. 250 kg
- Test room dimensions of the climatic chambers:
  - Length: 450 mm to 1,600 mm
  - Width: 580 mm to 1,100 mm
  - Height: 750 mm to 950 mm

Benefit for our customers

- Extensive climatic and mechanical testing facilities in a test laboratory
- Functional checks of the test specimens during the tests are possible

Reference customers/projects

Manufacturers of sensors, actuators and electric motors from various industries

Tests under climatic conditions (sun, temperature and humidity).

Solar radiation unit.

Service description

- Sun simulation facility for conducting tests under artificial sunlight with realistic UV and infrared components and variable climatic environmental conditions (temperature and relative humidity) on components and systems

Fields of application

- Functional testing under extreme conditions
- Realistic ageing of components due to strong solar radiation and high temperatures
- Measurements of the temperature distribution on components
- Testing standards: DIN 75220, MIL-STD 810

Technical specifications

- Solar radiation: max. 1,200 W/m^2
- Temperature range: -30 °C to +90 °C
- Controlled humidity: max. 95 % relative humidity
- Variable distance to the solar panel
- Dimensions (L x W): 2 m x 3 m

Benefit for our customers

Realistic testing through variable environmental conditions

Reference customers/projects

- Manufacturers and OEMs in the automotive industry
- Sun simulation on headlights and other vehicle components

Validation of tightness of enclosures through splash water.

Splash water cabinet.

Service description

- Splash water system for the verification of the insensitivity to thermal shocks of components and systems in the splash area of the vehicle (hot test specimen - cold water)

Fields of application

- Splash water system for the verification of the insensitivity to thermal shocks of components and systems in the splash area of the vehicle (hot test specimen - cold water)
- Testing standards: ISO 16750-4, LV124

Technical specifications

- Temperature range (air): room temperature up to +120 °C
- Temperature range (water): 0 °C to +4 °C
- Number of nozzles: 2
- Surge range: approx. 700 mm
- Test medium: e.g. distilled water and Arizona dust
- Splash water cycle: 3 s every 30 min or every 60 min
- Test room dimensions (L x W x H): 800 mm x 1,200 mm x 800 mm

Benefit for our customers

Large surge area due to the use of two nozzles

Reference customers/projects

OEMs in the automotive industry

Dust tightness of large housings.

Dust test chambers.

Service description

- Exposure of objects to dust
- Tests for tightness, contamination, surface resistance and function
- Dust: Arizona dust, talcum

Fields of application

- Proof of protection against ingress of foreign bodies and solids
- Testing standards: IEC EN 60529, ISO 20653, LV124, IP protection class test

Technical specifications

- Dust test chamber 1
  - Test room dimensions (L x W x H): 2.9 m x 1.9 m x 1.9 m
  - Floor loading: max. 2,000 kg
  - Cable feedthrough (Ø): 100 mm
  - Electrical supply of the test item: 230 VAC or 400 VAC (16 A, 32 A)
- Dust test chamber 2 and 3
  - Test chamber 2: height 0.80 m || Ø 0.80 m
  - Test chamber 3: height 0.45 m || Ø 0.50 m

Benefit for our customers

- Fast and cost-effective verification of tightness and function
- Tests on heavy, large test objects, such as high-voltage storage devices and battery dummies, are possible

Reference customers/projects

Manufacturers of (electrical) components from the automotive, aerospace and rail vehicle industries and InfoCom

Product qualification under combined conditions for aviation.

Combination cabinet (BFV64).

Service description

- Test chamber to simulate combined environmental conditions (temperature, altitude and humidity)

Fields of application

- TAH-Test (Temperature, Altitude & Humidity)
- Under- and overpressure tests
- Icing tests
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160

Technical specifications

- Temperature range: -70 °C to +150 °C
- Ambient pressure: approx. 25 hPa to 1,000 hPa (abs.)
- Controlled humidity: max. 95 % relative humidity
- Cable feddthrough (Ø): 35 mm || 55 mm || 85 mm
- Power supply: 230 VAC or 400 VAC (16 A, 32 A, 63 A and 125 A)
- Air pressure supply: max. 25 bar
- Water supply: Well water (supply and return)
- Test room dimensions (L x W x H): 1.10 m x 0.79 m x 0.70 m

Benefit for our customers

- Cost-effective simulation of take-off and landing cycles
- Combination of several environmental parameters in a test chamber at negative pressure up to 20,000 m

Reference customers/projects

OEMs in the aviation industry

Functional verification at high altitude.

Vacuum chamber (UK) up to 20,000 m above sea level.

Service description

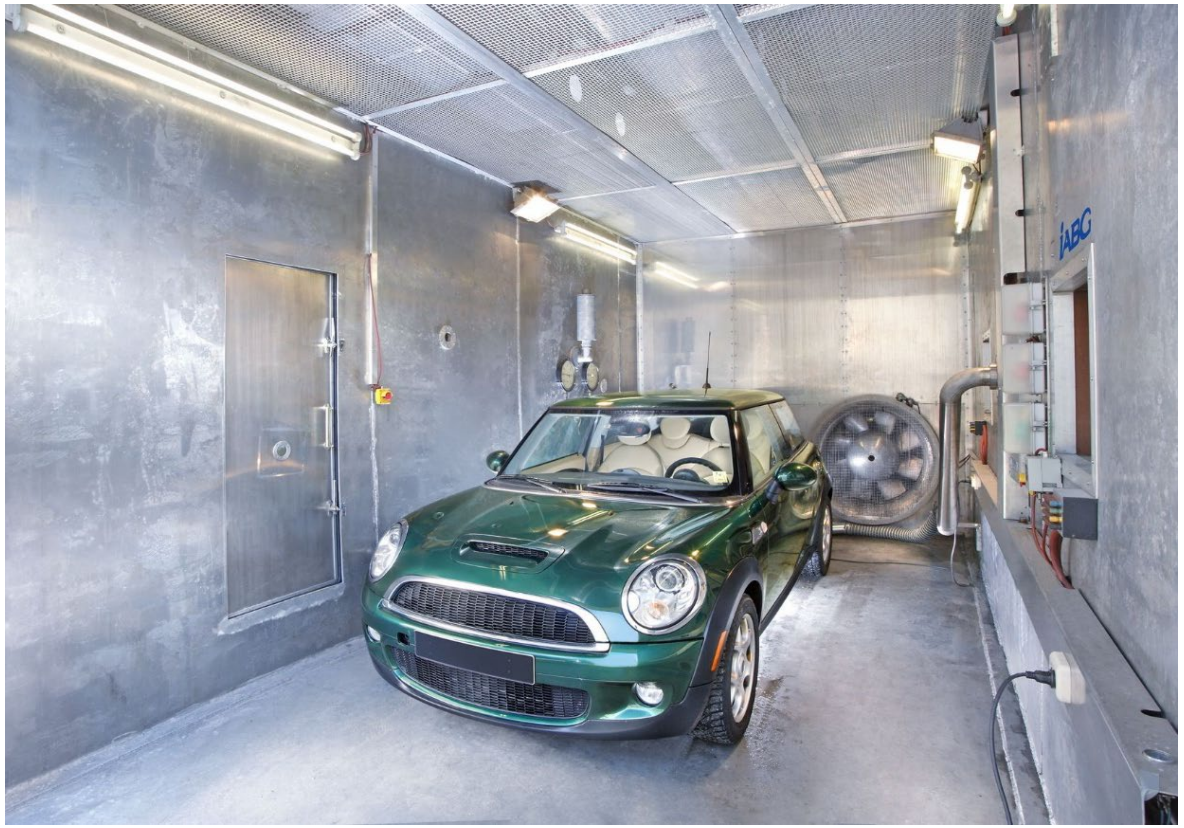
- Negotiable vacuum chamber with temperature control for carrying out function tests at high or low temperature in combination with height simulation (negative pressure)
- Suitable for HV vehicles due to mobile extinguishing device

Fields of application

- Functional and accurat verification for components and systems
- Simulation of transport requirements in the cargo hold
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, Various manufacturer standards

Technical specifications

- Ambient conditions: temperature range -70 °C to +80 °C || ambient pressure approx. 50 hPa to 960 hPa (approx. 560 m to 20,000 m) || cooling capacity max. 70 kW
- Cable feedthrough (Ø): 100 mm || 140 mm
- Power supply: 230 VAC or 400 VAC (16 A, 32 A, 63 A and 125 A)
- Compressed air / water supply: max. 25 bar / well water (in- and outlet)
- Exhaust extraction system: up to max. 4,500 m
- Dimensions (L x W x H): 5.5 m x 2.8 m x 2.9 m



Benefit for our customers

Combination of negative pressure tests with extreme temperatures in one test facility possible

Reference customers/projects

OEMs in the aerospace, defence, medical and automotive industries

Controlled rapid pressure changes for product qualification.

Pressure vessels.

Service description

- Effect of air pressure changes on technical systems
- Three pressure bells for tests with high or low air pressure

Fields of application

- Fast and explosive pressure drop test
- Under- and overpressure tests
- Testing standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160

Technical specifications

- Ambient pressure: 10 hPa to 2,500 hPa (abs.)
- Temperature range: Room temperature
- Test room dimensions:
  - Pressure bell 1: length 600 mm || Ø 345 mm
  - Pressure bell 2: length 1,300 mm || Ø 1,090 mm
  - Pressure bell 3: length 2,000 mm || Ø 1,580 mm
- Flange for connection of cables (Ø): max. 125 mm

Benefit for our customers

Functional tests at negative pressure up to 20,000 m, pressure loss and positive pressure on large components and systems during operation possible

Reference customers/projects

OEMs in the defence and aerospace industries

Influence of corrosive environment on surfaces.

Salt fog chambers.

Service description

- Systems for the simulation of the corrosion influence of saline environments on components

Fields of application

- Salt spray tests
- Temperature control, humidification
- Testing standards: RTCA / DO-160, MIL-STD 810, LV124, ASTM B 117, ISO 9227

Technical specifications

- Cyclic salt spray
- Climate tests: temperature range room temperature to +50 °C || humidity 20 % to 95 % relative humidity
- Drying / ventilating: temperature range room temperature to +50 °C || Humidity max. 30 % relative humidity
- Test room dimensions (L x W x H): 1,560 mm x 510 mm x 740 mm
- Floor loading: max. 100 kg
- Cable feedthrough by water basin

Benefit for our customers

Supplementary material tests enable a statement for product optimisation

Reference customers/projects

- OEMs and suppliers to the automotive and aviation industry
- Test execution on technical systems

Chemical resistance during defined treatment and storage.

Contamination devices.

Service description

- Fluid susceptibility and contamination tests to determine whether the materials or complete components can withstand the effects of various fluids

Fields of application

- Contamination with fluids
- Ageing at elevated temperature
- Testing standards: RTCA / DO-160, MIL-STD 810, LV124, ASTM B 117, ISO 9227

Technical specifications

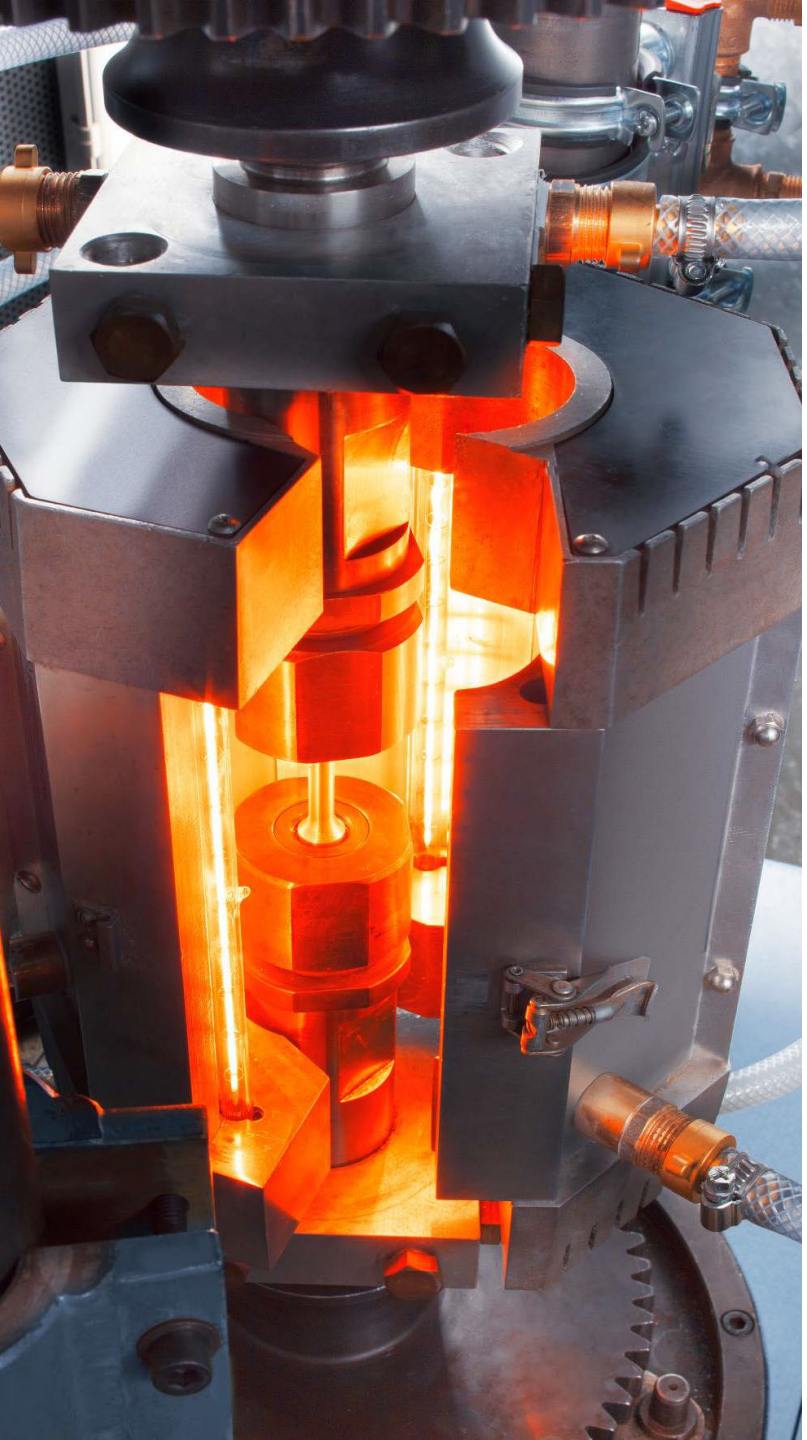
- Number of fluids for a contamination test: approx. 300 (e.g. insecticides, lubricating oils, hydraulic oils, solvents, detergents, alcohols, fuels, de-icing agents, greases, fire extinguishing agents)
- Fluid conditioning and temperature storage up to +180 °C possible

Benefit for our customers

Supplementary material tests enable a statement for product optimisation

Reference customers/projects

- OEMs and suppliers to the automotive and aviation industry
- Test execution on technical systems



8 Material testing, material fatigue

Mechanical material characterisation.

Fatigue strength laboratory for sample tests.

Service description

- Quasistatic / creep / relaxation tests
- High Cycle Fatigue (HCF)
- Low Cycle Fatigue (LCF)
- Complexe Low Cycle Fatigue (CLCF)
- Thermo Mechanical Fatigue (TMF)
- Comprehensive data recording options and control modes

Fields of application

- Performance of mechanical material characterisation and fatigue strength tests on metallic materials and fibre-plastic composites (tension, compression, bending, torsion)
- Determination of fracture mechanical parameters

Technical specifications

- Servo-hydraulic test systems: 10 kN to 100 kN
- High-frequency resonance test benches with 20, 100, 150 and 400 kN
- Spindle test bench: 100 kN
- Measuring sensors: Displacement sensor, load cell, strain / video extensometer
- Tempering: -196 °C to +950 °C in temperature chambers and radiation furnaces
- Inductive heating by means of high-frequency generator: 10 kW
- Defined cooling of the test specimens by controlled compressed air cooling
- Autonomous hydraulic supply

Benefit for our customers

- Independent testing for the comprehensive determination of the fatigue and fatigue strength (Wöhler tests) by means of material-specific tests
- Database for materials and their fracture mechanical properties available

Reference customers/projects

- OEMs in the automotive, wind power, energy and aerospace industries
- Research institutions

Service life of thermomechanically stressed components.

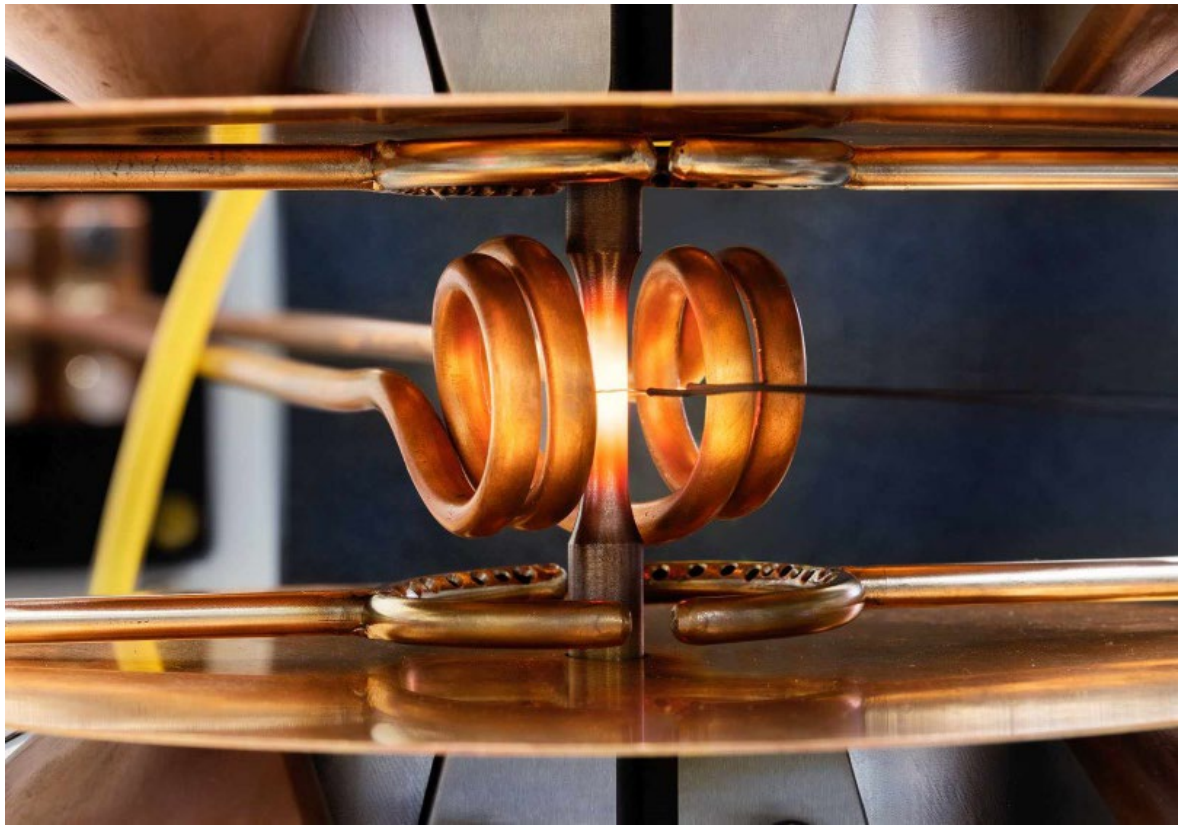
Thermomechanical fatigue test rig.

Service description

- Cyclic thermal and mechanical stress
- Testing according to the Code of Practice for Strain-Controlled Thermo-Mechanical Fatigue Testing
- Control of mechanical and plastic elongation or elongation hindrance

Fields of application

- Lifetime estimation and optimisation of thermomechanically stressed components
- Component design and optimisation
- Determination of material and component characteristics as a basis for the numerical design method



Technical specifications

- Test force: max. 100 kN
- Measuring ranges deformation measurement: ±2 mm
- Test length: min. 15 mm
- Measurement range of temperature controlling: +50 °C to +1,200 °C
- Heating rate: max. 10 °C/s
- Cooling rate: max. 10 °C/s

Benefit for our customers

- Meaningful TMF tests possible even on very small samples
- Time and thus cost savings through the possibility of accompanying material and damage modelling in house

Reference customers/projects

- OEMs in the automotive, aerospace and aviation industries
- Manufacturers of power plant components such as turbines and compressors

Fatigue tests on components.

High frequency pulser (HFP 20).

Service description

- Performance of fatigue strength tests on material samples and components under single-stage load or as a block programme
- Performance of crack propagation tests according to current standards

Fields of application

- Determination of cyclic material characteristics and component properties (Wöhler tests)
- Component tests from the automotive and aviation sectors (especially engine or control elements, connecting rods and crankshafts)

Technical specifications

- Test force: max. 20 kN
- Test frequency: max. 250 Hz
- Dynamic path: 4 mm (±2 mm)
- Clear span: 500 mm
- Test set-up height: max. 800 mm
- T-slotted floor plate to mount any type of component (L x W): 550 mm x 740 mm (T-slots M16, slot spacing 125 mm)

Benefit for our customers

Variable test setups for component testing possible

Reference customers/projects

OEMs from the automotive, aerospace and power plant industries

Fatigue tests on components.

High frequency pulser (HFP 400).

Service description

- Fatigue tests (DIN 50100, Wöhler curve) in the threshold, tension, compression and alternating load range
- Material fatigue tests and durability tests on standard specimens and components under single-stage load or with block program
- Detection of crack propagation

Fields of application

- Determination of cyclic material characteristics and component properties
- Components and parts that are exposed to vibrating loads during their service life

Technical specifications

- Test force / frequency: max. 400 kN / max. 200 Hz
- Dynamic path: 6 mm (±3 mm)
- Clear span: 600 mm
- Test set-up height: max. 1,200 mm
- Slot clamping area (L x W) / distance: 1,000 mm x 1,000 mm / 100 mm (T-slots M24)
- Positioning of the load cell at the top or bottom, use of grease or pressure oil lubrication

Benefit for our customers

- Short test times and a high sample throughput due to the high test frequency
- Database for material parameters available

Reference customers/projects

- OEMs in the automotive and aviation industries
- Manufacturers of components such as engine or drive elements, connecting rods and crankshafts

Electromechanical spindle testing machine.

Test bench EMP 100kN

Service description

- Quasistatic tests
- Thermal chamber
- Different clamping tools
- Low temperature measurements with liquid nitrogen (LN_2)
- High temperature application

Fields of application

- Fracture toughness according to ASTM-E1820
- Tensile test according to DIN EN ISO 6892 and DIN EN ISO 527
- Bending tests according to DIN EN ISO 7438
- Print tests
- Sample and component tests according to customer requirements

Technical specifications

Test force: max. 100 kN
Driveway: up to 50 mm
Mechanical and hydraulic clamping devices
Thermal chamber: -100 °C up to 250 °C
Radiation oven: 50 °C to 1,000 °C

Benefit for our customers

- Precise force, strain or displacement control at low test speeds
- Flexibility of sample size due to high traverse path

Reference customers/projects

- Casting qualification
- Fracture toughness in the aerospace industry
- Tensile tests on plastics / fibre composites from the automotive sector

Servo-hydraulic universal test stands (SHP).

Test benches SHP 1-10

Service description

- Variable clamping tools
- Thermal chamber
- Cryogenic applications
- Frequency range: 0.1 Hz up to 40Hz
- Cylinder speed: max. 1 m/s

Fields of application

- Fracture toughness according to ASTM-E1820
- Crack propagation tests
- Fatigue test according to DIN 50100 (tension / compression, axial bending, torsion)
- Sample and component tests according to customer requirements
- Fast train tests

Technical specifications

	SHP 1/3/9/10	SHP 2	SHP 4/5	SHP 8	SHP 6/7
Test force / kN	± 100	± 63	± 40	± 25	± 10
Clear width / mm	440 up to 640	350	430 up to 650	440	400 up to 440
Max. test assembly height / mm	850 up to 1500	900	850	850	850
Test track / mm	± 50 up to 125	± 50	± 125	± 125	± 50 up to 150

Benefit for our customers

- Precise force, strain or displacement control for fatigue tests
- Individual adaptation of the testing machines to the test requirement and specimen geometry

Reference customers/projects

- Casting qualification
- Fracture toughness in the aerospace industry
- Tensile tests on plastics / fibre composites from the automotive sector

High-frequency test benches in resonance mode (HFP).

Test benches HFP 1-6

Service description

- Variable clamping tools
- Thermal chamber
- Low temperature measurements with liquid nitrogen (LN_2)
- Corrosion chamber
- DC potential drop sensor for crack growth measurement
- Frequency range: 60 Hz up to 140 Hz

Fields of application

- Crack propagation tests according to ASTM E647
- Fatigue test according to DIN 50100 (tension / compression, axial bending, torsion)

Technical specifications

	HFP 1 / 2 / 3	HFP 4	HFP 5 / 6
Clear width / mm	400	525	400
Test height / mm	500	630	500
Test force / kN	± 150	± 100	± 10
Other	-	Clamping field for component testing	-

Benefit for our customers

- Precise force, strain or displacement control for fatigue tests
- Individual adaptation of the testing machines to the test requirement and specimen geometry

Reference customers/projects

- Casting qualification
- SN curves at room, high and low temperature
- Fatigue strength determination according to modified stair tread method

Deformation measurement.

Measuring equipment

Service description

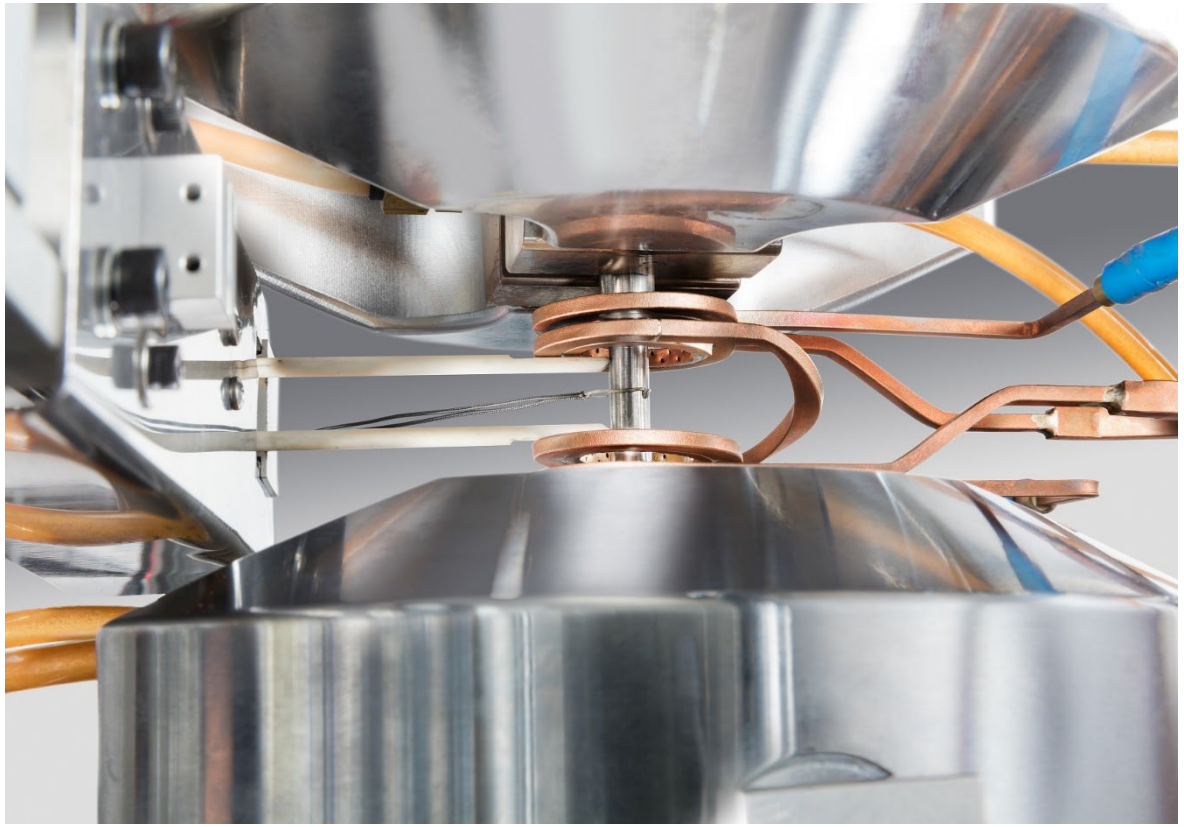
- Measurement of crack opening displacement
- Deformation measurement at room, high and low temperature
- Tactile strain measurement
- Optical strain measurement by means of video extensometer, DIC systems
- Strain gauges

Fields of application

- Fracture toughness according to ASTM-E1820
- Tensile test according to DIN EN ISO 6892 and DIN EN ISO 527
- Tailored test set-ups to customer requirements

Technical specifications

	Measurement of crack opening displacement	Deformation measurement room temperature	Deformation measurement high temperature	Deformation measurement low temperature	Optical strain measurement
Range of application	Room temperature	Room temperature	20°C up to 1,500 °C	-270 °C up to 20 °C	No restrictions on test temperature
Measuring ranges quasistatic	± 4 mm	-2.5 mm - 12.5 mm	± 4 mm	± 0.5 mm	0,0005 % up to 1,000 %
Dynamic measuring ranges	± 4 mm	± 5 mm	-1.2 mm - 2.4mm	± 0.5 mm	0,0005 % up to 1,000 %



Benefit for our customers

- Tailored measurement to customer requirements
- Comprehensive determination of material parameter

Reference customers/projects

- Determination of longitudinal and transverse strain on notched steel sheet specimens using DIC

Special equipment for particular measurements.

Service description

- Roughness measurements
- Direct current potential probe measurements (DCPD)
- Temperature measurement
- Deformation measurement

Fields of application

- Quality assurance
- Failure progress
- Temperature change in the test sequence
- Variable deformation measurement in defined test areas

Technical specifications

	Roughness measurement	Potential probe measurement	Temperature measurement	Strain gauge measurement	Strain measurement
Range of application	Room temperature	Room temperature	-196°C up to 1,500°C	-196°C up to 80°C	-10 mm up to 12.5 mm
Areas of application	Quality assurance in the testing process	Measurement of the Crack propagation in test specimens	Variable measurement of the temperature change in the test sequence	Variable deformation measurement on defined test item areas	Strain gauges / extensometer

Benefit for our customers

- Cost savings through simultaneous determination of different characteristic values
- Versatile test control (force, strain, displacement, crack length controlled)
- Supplementary before / after examinations by DIC systems

Reference customers/projects

- Material characterisation of epoxy resin samples with strain gauges
- Strain field adjustment by means of DIC to ± 45 ° fibre composite specimen for shear modul determination
- Insitu measurement and insitu control based on crack length variation

Rotational bending tests on rods, tubes and specimens.

Rotating bending test machine (RBTM).

Service description

- Testing machine for rotating bending testing on rods, tubes and samples
- Determination of the fatigue strength depending on the material properties
- Material optimisation (e.g. purity, type of material, heat treatment, shot peening parameters)

Fields of application

- Determination of the fatigue strength of high strength materials such as
  used in the manufacture of springs and stabilisers

Technical specifications

- Bar / tube (Ø): 8 mm to 30 mm
- Length bar / tube: 60 · Ø + 140 mm, or special sample shapes
- Test frequency: 5 Hz to 50 Hz (variable)
- Power consumption: max. 1 kW
- Weight: approx. 1.000 kg
- Dimensions (L x W x H): 2.6 m x 1.0 m x 1.5 m
- Circumferential bend, load input: convex, non-wearing plastic rings
- Bending moment: max. 3.6 kNm

Benefit for our customers

Efficient optimisation by comparing the fatigue strength of the raw material even before processing into the end product

Reference customers/projects

Manufacturer of tubes, spring wires, springs and stabilisers

Rotational bending tests on thin wires and samples.

Rotating bending test machine (RBTM) - 100 Nm.

Service description

- Testing machine for rotating bending testing on thin wires and Samples
- Determination of the fatigue strength depending on the material properties
- Material optimisation (e.g. purity, type of material, heat-treatment, shot peening parameters)

Fields of application

- Quality assurance
- Determination of the fatigue strength of high-strength materials for the production of springs or other highly designed components

Technical specifications

- Shouldered samples with clamping diameter (Ø): 3 - 20 mm
- Spring wire (Ø): 3 to 6 mm
- Test frequency: 5 Hz to 50 Hz (variable)
- Power consumption: max. 1 kW
- Weight: approx. 500 kg
- Circumferential bending, load input: quick-action chuck or domed, non-wearing plastic rings
- Bending moment: max. 100 Nm

Benefit for our customers

Efficient optimisation by comparing the fatigue strength of the raw material even before processing into the end product

Reference customers/projects

- Spring wire manufacturer
- Steel producer

Non-destructive materials testing.

X-ray inspection system micromex (2D/CT).

Service description

- Defect analysis 2D/µCT
- Assembly testing of complex devices
- Determination of real CAD data as a basis for calculation
- In-situ tests under electrical, thermal or mechanical excitation

Fields of application

- Non-destructive component testing
- All industrial sectors
- Wide range of materials
- Damage analysis according to VDI 3822

Technical specifications

- Microfocus tube: 180 kV || 20 W
- Cone angle: 180°
- Sample size (L x W x H): max. 680 mm x 635 mm x 170 mm
- Sample weight: max. 10 kg
- Geometric / total magnification: 2,160x / 23,320x
- Detail recognition / resolution: 0.5 m / max. 2.7 m
- Number of axes: 5
- View angle: 70°

Benefit for our customers

- Non-destructive component testing for product quality assurance
- Basis for the optimisation of a product development

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Non-destructive materials testing.

X-ray inspection system v|tome|x m (CT).

Service description

- Defect analysis µCT
- Assembly testing of complex devices
- Metrology
- Geometric data acquisition
- Volume testing
- PowderGenetics analyses

Fields of application

- Powder characterisation
- Non-destructive component testing
- All industrial sectors
- Wide range of materials
- Damage analysis according to VDI 3822

Technical specifications

- X-ray tubes: nanofocus tube 180 kV / 20 W || microfocus tube 300 kV / 500 W
- Resolution: nanofocus tube max. 500 nm || microfocus tube max. 2.7 µm
- Digital detector: 4,000 x 4,000 pixels
- Sample weight: max. 25 kg
- Sample dimensions: length max. 700 mm || Ø max. 500 mm
- Geometric / total magnification: max. 1.3x / 160x
- Number of axes: 5
- Detail recognition: nanofocus tube 0.7 µm || microfocus tube 7 µm

Benefit for our customers

- Non-destructive component testing for product quality assurance
- Basis for the optimisation of a product development
- Data basis for numerical analyses

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Non-destructive materials testing.

X-Ray inspection system nanotom m (CT).

Service description

- Defect analysis 2D/µCT
- Assembly testing of complex devices
- Determination of real CAD data as a basis for calculation
- In-situ tests under electrical, thermal or mechanical excitation

Fields of application

- Non-destructive component testing
- All industrial sectors
- Wide range of materials
- Damage analysis according to VDI 3822

Technical specifications

- Nanofocus tube: 180 kV || 20 W
- Sample dimensions: height max. 250 mm || Ø max. 240 mm
- Sample weight: max. 3 kg
- Detail recognition: 800 nm
- Geometric magnification: 1.5x to 300x
- Resolution: max. 500 nm
- Number of axes: 5
- Area detector: 3,072 x 2,400 pixels GE DXR500L

Benefit for our customers

- Non-destructive component testing for product quality assurance
- Basis for the optimisation of a product development
- Database for numerical analyses - reverse engineering

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Material characterisation of plastics and fibre composites.

Macro thermogravimetric analyzer LECO TGA 701.

Service description

- Quality assurance of fibre reinforced plastics (CFU, GFU) by determining the fibre and resin content
- Cost-effective alternative for wet chemical determination of the fibre volume content of fibre-reinforced plastics

Fields of application

- Determination of moisture, volatile components, ash, loss on ignition in plastics, organic materials of all kinds such as paper, food, coal, cement and binders
- Testing according to DIN EN 2564

Technical specifications

- Sample weight / sample count: max. 5 g / max. 19 (simultaneous measurement)
- Weighing accuracy: 0.1 mg
- Furnace control: 15 °C/min RT to 100 °C || 50 °C/min 100 °C to 1,000 °C
- Gas flow / pressure: 3.5 l/min to 10.0 l/min / 2.4 bar
- Electricity supply: approx. 230 V || single-phase || 50 Hz || 25 A
- Suction: 35 l/s to 75 l/s
- Environment: 15 °C to 35 °C || max. 80 % relative humidity
- Unit dimensions without computer (L x W x H): 520 mm x 610 mm x 560 mm

Benefit for our customers

Efficient determination of characteristic values through large sample volumes

Reference customers/projects

- OEMs and suppliers to the automotive industry
- Pharmaceutical manufacturer
- Cross-industry manufacturers of products made of fibre composites

Hardness testing in the laboratory.

Universal Hardness Tester Wolpert Diatestor 2Rc.

Service description

- Tests according to DIN EN ISO 17025
- Testing standards: DIN EN ISO 6506, DIN EN ISO 6507 and DIN EN ISO 6508

Fields of application

- Hardness testing according to Vickers (HV), Rockwell (HRC) and Brinell (HBW) in the range of macro hardness
- Determination of the material hardness of samples, components and component parts at their surface and prepared areas

Technical specifications

- Test forces 1kp to 250kp ll Testing height 0 to 290mm ll Magnification 70x and 140x
- Test load: 1; 2; 3; 5; 10; 15.6; 20; 30; 31.25; 40; 50; 60; 62.5; 100; 150; 187.5; 250 kp
- Diameter sample plate: 230 mm
- Robust machine base

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Hardness testing in the laboratory.

Hardness tester Emco DuraScan 70 GS.

Service description

- Tests according to DIN EN ISO 17025
- Testing standards: DIN EN ISO 6506, DIN EN ISO 6507 and DIN EN ISO 6508

Fields of application

- Hardness profiles, Determination of case hardness depth (CHD, DS), decarburization depth and nitriding hardness depth (Nht)
- Micro hardness according to Vickers (HV) until 1 kg test load
- Determination of the material hardness of samples, components and component parts

Technical specifications

- Test forces 0.01kp to 62.5kp ll Testing height 100mm ll Magnification 10 : 1, 25 : 1 and 500 : 1
- Test load: 1; 2; 3; 5; 10; 15.6; 20; 30; 31.25; 40; 50; 60; 62.5; 100; 150; 187.5; 250 kp
- Automatic Micro/Macro indentation Hardness testing System LECO AMH43
- Automatic revolver

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Hardness testing on an outpatient basis.

Mobile Hardness Tester SonoDur2.

Service description

- Tests according to UCI method, correspondents with DIN 50159, ASTM A1038
- Testing standards: ASTM A 1038 and DIN 50159-1, -2
- Automatic revaluation into HB, HK, HRA, HRB, HRC, HRF, HRD, HR45, HS, HK, MPa according to DIN EN ISO 18265 and ASTM E 140

Fields of application

- Determination of the material hardness of samples, components
- Fast hardness testing of serial production parts after the heat treatment, mobile weld inspection and determination of coating hardness
- UCI hardness test according to Vickers (HV)

Technical specifications

- Test load: Hand-held measuring probes: 10N, 49N, 98N
- Indenter: Vickers diamond 136°
- Material tables: According to EN ISO 18265
- Uncertainty of measurement: < 4 % (HV5, HV10)
- Repeatability: < 5 % (HV5, HV 10)
- Revaluation in tensile strength according to ASTM E140-12b$^{\varepsilon 1}$(2013) (Beuth: ASTM E140b:2012) und EN ISO 18265:2014.

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Hardness testing in the laboratory.

Hardness tester Shore.

Service description

- Tests according to DIN EN ISO 17025
- Testing standards: DIN ISO 7619-1, ISO 868
- High reproducibility of the determined values due to the construction
- Determination of exact and reproducible values

Fields of application

- Determination of Shore hardness scale A and scale D on plastics and plastic products, soft rubber, elastomers, natural rubber, hard rubber and thermoplastics

Technical specifications

- Robust machine base
- Max. sample thickness: 180 mm
- Test bench diameter: 98 mm
- Durometer type: Shore A
- Durometer type: Shore D
- Specifications: DIN ISO 7619-1, ISO 868

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Hardness testing in the laboratory.

Hardness tester IRHD.

Service description

- Tests according to DIN EN ISO 17025
- Specifications: ISO 48, ASTM D 1415
- Determination of the ball indentation hardness according to MICRO IRHD on samples made out of rubber and plastics
- IRHD-test device with O-Ring-centering device

Fields of application

- Determination of the relaxation- and recovery behavior of elastomers
- Testing of small, thin materials and O-Rings

Technical specifications

- Test Forces 153.3mN ll Measuring range: 30 to 100 Micro-IRHD ll Resolution: 0,1 IRHD ll Sample thickness: 1 mm to 5 mm (recommended), max. sample thickness 90 mm (without centering device)
- Fully automated test sequence
- O-Ring-centering device for string diameters between 0.6 and 8 mm, adjustable in 0.01 mm steps
- Creation of a test protocol and recording of the hysteresis curve

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Hardness testing on an outpatient basis.

Mobile Hardness Tester SonoDur2.

Service description

- Tests according to UCI method, correspondents with DIN 50159, ASTM A1038
- Testing standards: ASTM A 1038 and DIN 50159-1, -2
- Automatic revaluation into HB, HK, HRA, HRB, HRC, HRF, HRD, HR45, HS, HK, MPa according to DIN EN ISO 18265 and ASTM E 140

Fields of application

- Determination of the material hardness of samples, components
- Fast hardness testing of serial production parts after the heat treatment, mobile weld inspection and determination of coating hardness
- UCI hardness test according to Vickers (HV)

Technical specifications

- Test load: Hand-held measuring probes: 10N, 49N, 98N
- Indenter: Vickers diamond 136°
- Material tables: According to EN ISO 18265
- Uncertainty of measurement: < 4 % (HV5, HV10)
- Repeatability: < 5 % (HV5, HV 10)
- Revaluation in tensile strength according to ASTM E140-12b$^{\varepsilon 1}$(2013) (Beuth: ASTM E140b:2012) und EN ISO 18265:2014.

Benefit for our customers

Independent laboratory for fast hardness tests on serial parts

Reference customers/projects

OEMs and suppliers to the automotive, aviation, aerospace, mechanical engineering, medical technology, energy technology and rail sectors

Light Optical Microscope.

Axiovert 100 A.

Service description

- Tests within the scope of accreditation according to DIN EN ISO 17025
- Determination of grain sizes
- Determination of retained austenite
- Documentation of defects
- Purity determination of non-ferrous inclusions

Fields of application

- Contrasting of the microstructure for a quantitative and qualitative determination
- Image-analytical analysis of microstructures cast iron analysis, determination of porosity, evaluation of coating thickness)
- Analyzing of coating systems and joined connections

Technical specifications

- Inverted light microscopes: magnifications max. 1,000x ll differential interference contrast (DIK) ll grain size determination ll image access database for image acquisition, processing and evaluation
- Microscope camera Zeiss Progress Speed XTcore5 CCD

Benefit for our customers

Image analytical investigations for detection and product optimisation

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Light Optical Microscope.

Axio Imager Zeiss.

Service description

- Tests within the scope of accreditation according to DIN EN ISO 17025
- Determination of grain sizes
- Determination of retained austenite
- Documentation of defects
- Purity determination of non-ferrous inclusions

Fields of application

- Contrasting of the microstructure for a quantitative and qualitative determination
- Image-analytical analysis of microstructures cast iron analysis, determination of porosity, evaluation of coating thickness)
- Analyzing of coating systems and joined connections

Technical specifications

- Incident light microscope: magnifications max. 1,000x II differential interference contrast (DIK)
- Bright field, dark field, polarization, fluorescence
- Motorized cross table
- Motorized Z-Axes
- Digital camera

Benefit for our customers

Image analytical investigations for detection and product optimisation

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Light Optical Microscope.

Smartzoom 5 Zeiss.

Service description

- Roughness measurements (output in STL data format)
- Creation of overviews of complex geometries with a high level of depth focus
- Optical failure analysis in the magnification range 10x to 1011x

Fields of application

- Detection and documentation of macroscopic fracture features
- Macroscopic documentation of surfaces

Technical specifications

- Stereomicroscope: Maximal magnification: 1,011x (with a 17.5“ display diagonal and an aspect ratio of)
- Maximal resolution: ~ 1 µm
- FWD at Maximum Magnification: 30 mm
- FOV at Minimum Magnification: 40 mm
- Motorized Z-drive
- Adjustable objective head (-45° C to +45°C)

Benefit for our customers

Image analytical investigations for detection and product optimisation

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Scanning Electron Microscope.

Zeiss Merlin.

Service description

- Determination of elementary compositions (EDX)
- Spatially resolved element assignment (mapping)
- Microstructure analyses
- Crack Progress Analysis
- Particle analysis
- Fracture surface analysis

Fields of application

- Cross-industry topographical and analytical microstructure investigations for material characterisation

Technical specifications

- Sample chamber (L x W) / lock Ø : 330 mm x 270 mm / 80 mm
- Probe currents: max. 300 nA
- Acceleration voltage: 0.02 kV to 30 kV
- Resolution: 0.6 nm
- Magnification: 12x to 500,000x
- ASB detector
- Secondary electron detector (SE) || backscattered electron detector (BSE)
- Plasma cleaner

Benefit for our customers

- Microstructure analyses under high resolution
- Determination of damage mechanisms
- Optimisation of a product development

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Microstructure investigation for material characterisation.

CamScan.

Service description

- Determination of elementary compositions (EDX)
- Spatially resolved element assignment (mapping)
- Microstructure analyses
- Crack progress analysis
- Particle analysis
- Fracture surface analysis

Fields of application

- Cross-industry topographical and analytical microstructure investigations for material characterisation

Technical specifications

- High-resolution SEM with energy dispersive analysis
- Sample chamber: inner side length 300 mm || height 300 mm
- Correspondingly large sample airlock
- Motorised eucentric specimen stage with 5 axes || travels: ±50 mm (X) || ±25 mm (Y) || 50 mm (Z) || 5° to 90° specimen tilting and 360° rotation
- Secondary electron detector (SE) || backscattered electron detector (BSE)
- Magnification: 8x to 50,000x
- Acceleration voltage: max. 30 kV

Benefit for our customers

- Microstructure analyses under high resolution
- Determination of damage mechanisms
- Optimisation of a product development

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Residual Stress Analysis by X-Ray Diffraction (XRD).

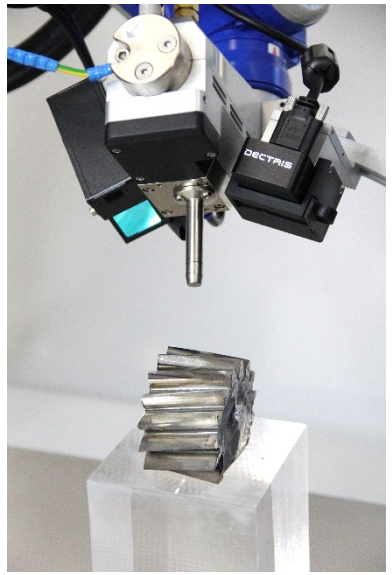
GNR StressX: Residual stress analysis on metal parts of all shapes, sizes and compositions.

Service description

- Non-destructive residual stress analysis with X-ray diffraction (XRD)
- On metal parts of all compositions and complicated geometries
- Uni-directional and multi-directional (full tensor) residual stress analysis
- Depth profiling by electrochemical polishing

Fields of application

- Determination of the existing residual stresses on relevant surfaces and in depth areas using X-ray diffraction (2-theta method)
- Characterisation of residual stress states in parts and components



Technical specifications

- Compact X-ray diffractometer mounted on a 6-axis anthropomorphic robot
- Anode materials (Mn, Cr, Cu) for analysis of various metals and alloys (e.g. steel, Ni, Cu, Ti, Al, etc.)
- Max. power: 300 W || 30 kV || 10 mA
- Monocapillary X-ray optics for high spatial resolution (spot size of 1 – 4 mm)
- Dectris Mythen2R microstrip solid-state detector with 13° angular range
- Detector distance: 120 mm
- Depth profiling by electrochemical polishing

Benefit for our customers

- Basis for the optimisation of production and manufacturing processes and definition of remedial measures

Reference customers/projects

OEMs and suppliers in the automotive, aviation, aerospace, mechanical engineering, medical technology, pharmaceuticals, electrical engineering, power engineering, rail, food industry and automation technology sectors

Load and burst tests on pipes under internal pressure.

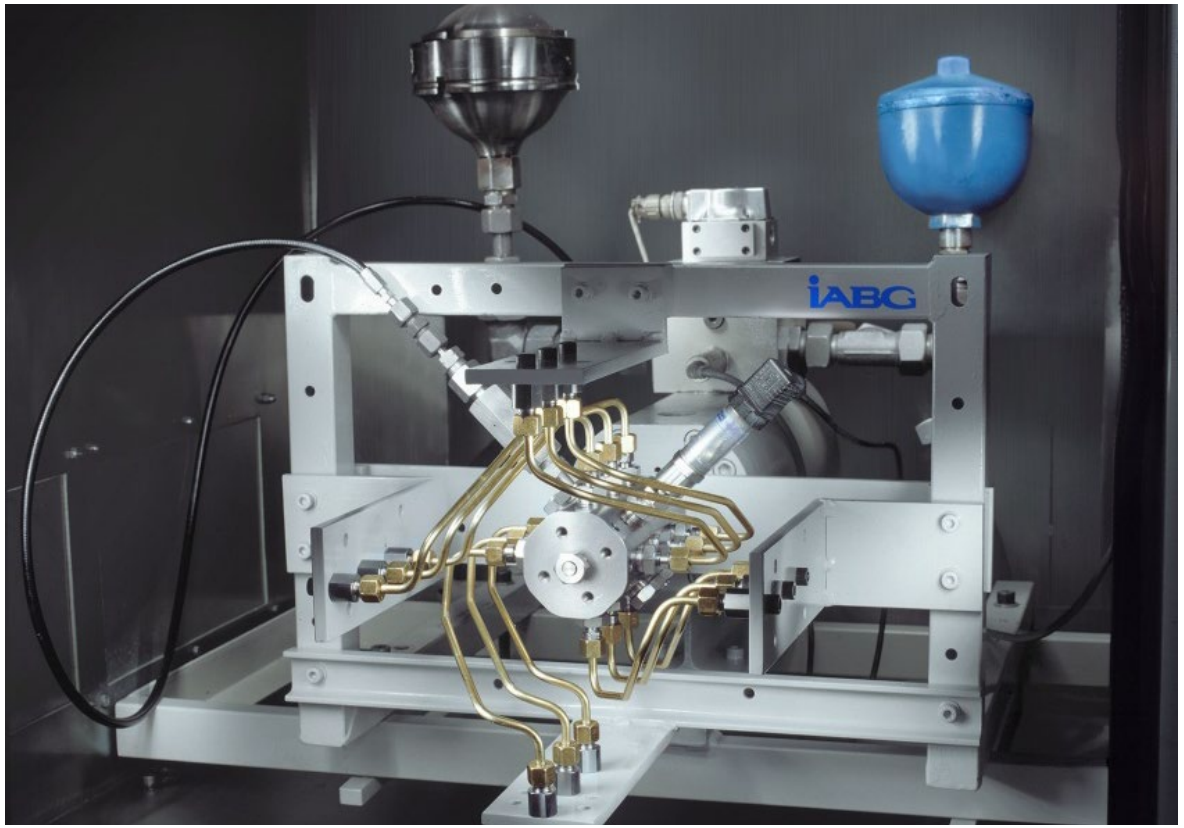
High and low pressure systems (HD / ND).

Service description

- Static load tests and burst tests
- Cyclic pressure cycling tests with variable centre load
- Adaptation of the test system to test objects
- Simulation of variable ambient temperatures

Fields of application

- Carrying out tests on the operational strength and fatigue strength of components and systems under internal pressure
- Various print media (e.g. water)



Technical specifications

- High pressure test
  - Pressure (static / cyclic): max. 4,000 bar / max. 3,000 bar
  - Test frequency: max. 5 Hz to 20 Hz, depending on test volume and vibration
  - Chamber (LxWxH) / air conditioning: 0.8 m x 0.8 m x 0.4 m / -40 °C - +120 °C
- Low pressure test
  - Pressure (static / cyclic): max. 280 bar
  - Test frequency: max. 10 Hz to 15 Hz, depending on test volume and vibration
  - Chamber (LxWxH) / air conditioning: 1.2 m x 0.7 m x 0.7 m / -40 °C - +180 °C

Benefit for our customers

Time saving through parallel testing of up to 18 test objects

Reference customers/projects

- OEMs in the automotive industry
- Tyre manufacturer