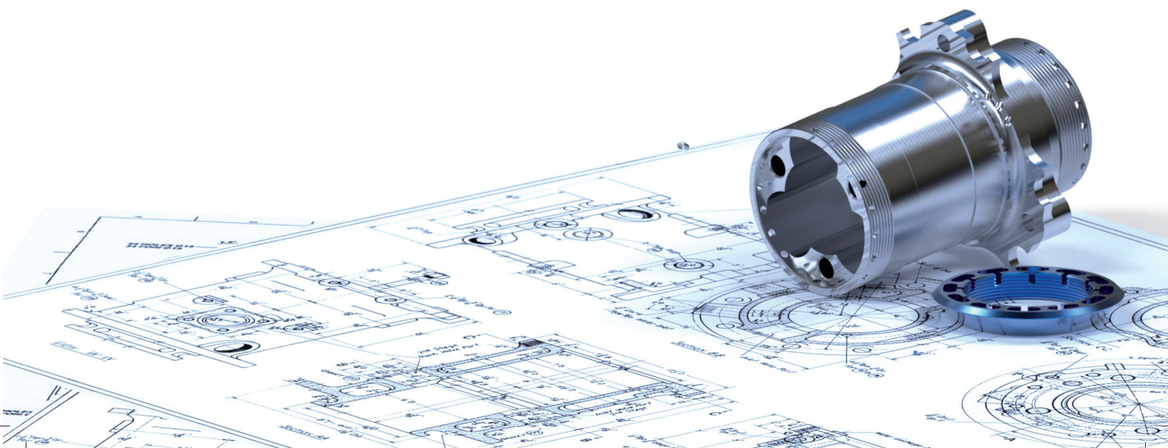
FACULTY OF MECHANICAL ENGINEERING
UNIVERSITY OF WEST BOHEMIA

REGIONAL TECHNOLOGICAL INSTITUTE

# REGIONAL TECHNOLOGICAL INSTITUTE

University of West Bohemia
Faculty of Mechanical Engineering



## The focus of the RTI center in research and development

- Digital engineering
- Additive production
- Materials engineering
- Road vehicles
- Rail vehicles
- Mechanical engineering

## RTI Laboratories







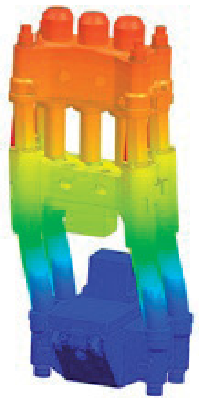
## REGIONAL TECHNOLOGICAL INSTITUTE

Regional Technological Institute (RTI) is an engineering and technology research centre at the Faculty of Mechanical Engineering of the University of West Bohemia. It was established with financial support from the European Regional Development Fund, the Operational Programme Research and Development for Innovation, Priority Axis 2: 'Regional R&D Centres'.

Construction of its premises began in the first half of 2011 and the Regional Technological Institute (RTI) opened its doors on 1 July 2015. Almost 120 researchers work in its laboratories, test rooms and facilities, operating the latest research equipment, software and computer technology.

# VIRTUAL PROTOTYPING LABORATORY

The laboratory for virtual prototyping is focused on virtual product development, virtual design and production verification. It uses the latest CAx systems for structural design and performs advanced computational analyzes. Thanks to the use of software optimization tools, it develops efficient designs and increases the utility value of existing solutions. The laboratory also provides a comprehensive set of project activities from the optimization of individual workplaces to the spatial arrangement of the entire production. The outputs of all development activities can be visualized using virtual or augmented reality.



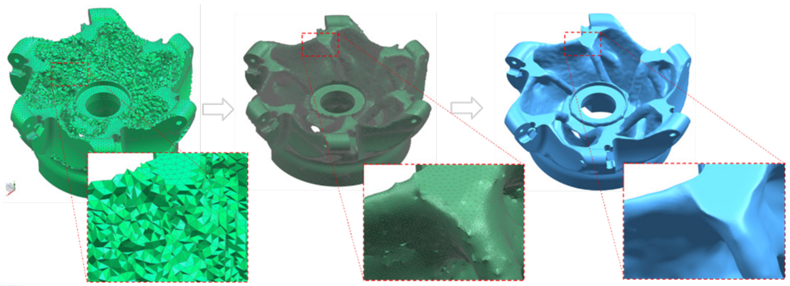
## Virtual simulations

The basic solved simulation is a structural calculation, which assumes loading in the field of linear statics. Most often, strength and deformation calculations of structures are performed using planar 2D elements or more complex volume models with 3D elements. It is possible to perform special calculations of structures made of composite material or sandwich structures, which respect the detailed properties of these materials. Modal analysis determines the natural frequencies and bending shapes of the solved structural unit, as an input calculation, which is necessary for the following dynamic calculations.

The Virtual Performance Solution tool is used to simulate fast dynamic processes with large deformations and complex contacts. It is also possible to use the "VIRTHUMAN" human body model to solve the probability of injury in the passive safety tasks of vehicle interiors.

## Topological optimization

Topological optimization allows you to find the optimal distribution of material within the specified volume with respect to the required load spectrum or working frequency range. In addition, the production technology (as are parting plane during casting, prismatic drawing of the material or additive production technology) can be taken into account while searching for the whished structure.

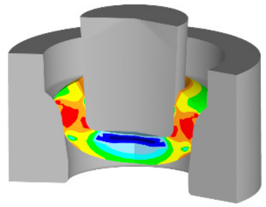


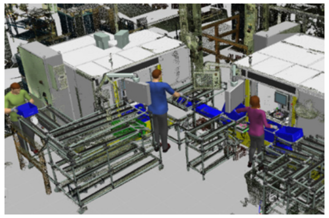
## 3D printing of plastic and composite parts

The laboratory designs or adapts parts intended for additive production technologies. It offers a wide range of modern AM technologies and is able to print prototypes using HP Jet Fusion, Markforged, Ultimaker or Formlabs printers for presentation purposes or as functional replacement parts. For this purpose, for example, polymers with reinforcement in the form of short glass or carbon and long fibers (glass, kevlar, carbon) are used.

## Simulation of forming, injection and tool development

The laboratory is able to describe in detail every moment of the technological process. Designs tools for both standard forging and precision stamping, as well as for injection molding. Thanks to the simulations, it is possible to optimize the tools with regard to the specific conditions of the technology used. After the development of tools, it provides support in their introduction into production. The laboratory is able to test molds on an Arburg Allrounder 470 E 1000 injection molding machine.





## Workplace optimization

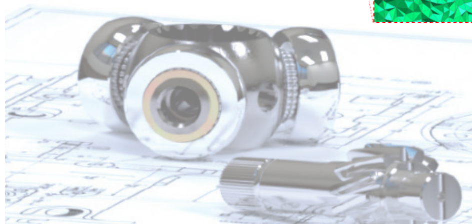
The laboratory offers the optimization of industrial workplaces with a special focus on ergonomics. For these studies, the so-called digital human models are used, with the help of which it is possible to verify both the existing and especially the newly designed workplace. Studies often include solutions for interaction with collaborative robots. Laser scanning technology is used to digitize the current state of the workplace.

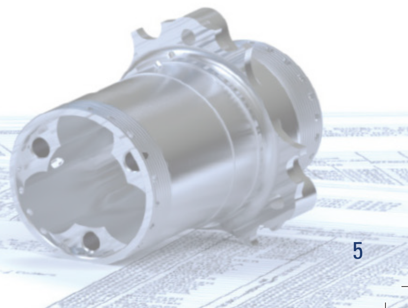
## Virtual tours and augmented reality

The outputs of all design and development activities can be visualized using virtual or augmented reality. All details and view designs can be visualize in the same quality as if they were already actually applied. Visualization can be performed either using headset displays (eg HTC VIVE) or using smart devices (mobile phones and tablets).

## Examples of projects:

- Development of tools for pressing preforms
- Research and development of hatches for airport areas
- Research innovations in prosthetics

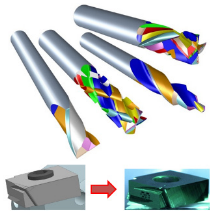




# METAL ADDITIVE MANUFACTURING LABORATORY

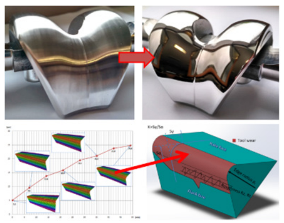
The Metal Additive Manufacturing Laboratory focuses on state-of-the-art engineering design and manufacture of cutting tools, including microgeometry adjustment and measurement. Its other fields include grinding of complex surfaces, surface polishing and treatment, comprehensive analysis and evaluation of surface parameters. Core activities also include additive manufacturing of metal parts (3D printing) with orientation on designing the supports for 3D printing and optimization of printing parameters.

## Design and manufacture of cutting tools



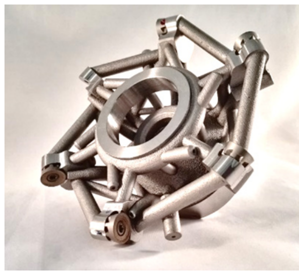
This laboratory is primarily involved in engineering design and manufacture of ordinary and special solid cutting tools of various materials (high-speed steels, cemented carbides, cermets). It also designs and optimizes cutting tools with tip inserts. The latest software tools are used for developing the designs, calculations of flute shapes and shapes of grinding wheels, stress analysis and simulations of grinding.

## Microgeometry preparation and surface polishing



Today's high-productivity cutting tools are unthinkable without cutting edge adjustment. The laboratory devotes much of its effort to this subject. For yearsit has been conducting analyses of relevant processes and their effects on cutting tool durability and the machined surface quality. Polishing the flute surface has proven to be a necessary step in improving the utility properties of a tool. Polishing can also be used on general shapes where roughness (Ra) of less than 0.02 μm can be achieved.

## Manufacture and optimization of 3D-printed metal parts



The laboratory develops designs and manufactures metal parts using DMLS additive manufacturing technology. To attain the desired quality, the appropriate build orientation and support structures are essential. In many cases, both internal and external supports must be provided and shaped to protect the build from distortion, excessive internal stresses and undesired surface roughness. Additive technologies and new research findings find use in engineering design and production of cutting tools.

## 3D printing of parts of Inconel 718, MS1, 316L

In this laboratory, intricate parts are manufactured which are well suited for manufacture by additive technologies. Advanced tools are used for preparing and processing the builds. The services include consultancy and tailoring models for additive manufacturing. The build space is 250 × 250 × 320 mm.

## ANCA MX7 tool grinding machine

The machine can grind solid tools with diameters starting at 0.5 mm. It has high-precision spindles and other accessories for meeting specified tolerances. Exchangeable cutting inserts and sections made from various materials, including aluminium and titanium alloys, can also be ground. The laboratory has all the relevant software and inspection equipment for these purposes.

## EOS M290 3D printer

This printer uses the Direct Metal Laser Sintering (DMLS) process. The printed object is built by depositing and sintering thin layers by a laser. Builds can have any external an internal shapes which are otherwise unachievable by conventional methods. The MS1 tool steel, Inconel 718 and 316L stainless steel are currently used for building metal components in the laboratory.

## IFM G4 scanning optical microscope

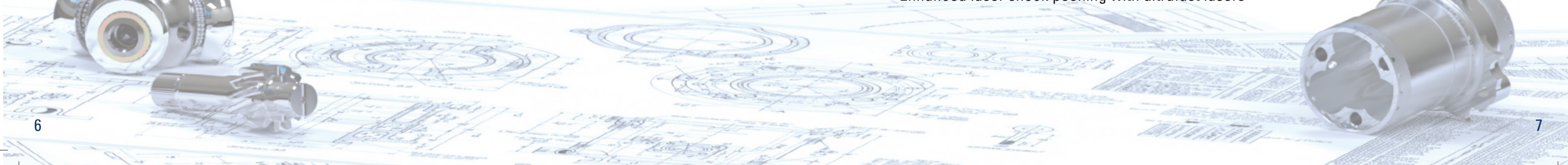
The IFM G4 captures the surface topography topography, including true colour information. The main strength of this instrument is the integrated measurement of shape and roughness in both 2D and 3D, in fact a fusion of several measuring devices. Its output is in the form of clearly arranged reports.

## OTEC DF 3 surface finishing equipment

This equipment for finishing surfaces and cutting edges of tools, including the polishing of helical flutes, uses the drag finishing process. The tool or workpiece is clamped in a rotary head which is lowered into a medium produces the desired surface finish by exerting pressure on the part. This head can be tilted at an angle to enable flute surfaces to be polished.

## Examples of projects:

- 3D printing of computationally optimized metal parts using DMLS technology
- Optimization of bar milling tool
- Enhanced laser shock peening with ultrafast lasers

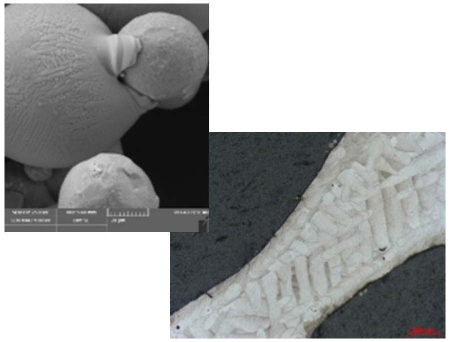


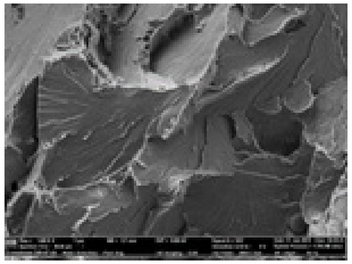
# METALLOGRAPHIC LABORATORY

The Metallography Laboratory conducts research into transformation processes, microstructure evolution in response to heat treatment and thermo-mechanical processing, and high-temperature behavior of materials. It intensively analyzes metal powders and microstructures formed during additive production. For these purposes, it uses state-of-the-art microscopes and instrumentation for in-situ deformation and temperature experiments and for measuring local mechanical properties.

## Structural analyzes

One of the main activities of the laboratory is structural analysis, which includes, for example, micropurity control, grain size determination, powder size distribution, surface layer thickness, control of microstructures and macrostructures of cast parts, forgings, welds, microstructure control after thermal, thermo-mechanical treatment and additive. production. Furthermore, control of local (EDS) and total chemical composition, hardness and microhardness (incl. Waveforms and maps).



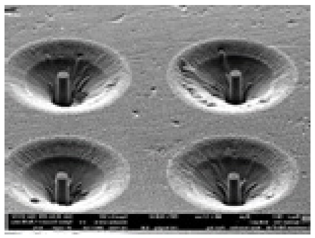


## Identification of types and causes of material failure

Detailed analyzes of fracture surfaces supplemented by macro and microstructural analyzes as part of more complex analyzes of material failure. Their goal is to determine the cause of imperfections, defects, premature fractures of components and to help solve production problems, etc.

## Assessment of surface layers, coatings and spray coatings

Evaluation of surface layers with the help of detailed metallographic analyzes states of chemical composition, evaluation of pin-on disk wear in dry and lubricated state, pressure tests of micro-pillars and thermographic evaluation of crack initiation under mechanical loading as well as micro-hardness development and mapping.

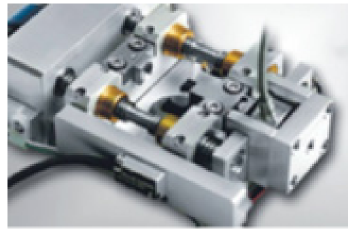


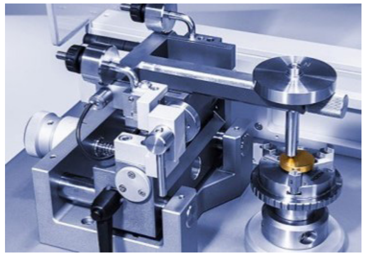
## SEM-FIB Cross Beam Auriga (Zeiss)

Ultra-high resolution scanning microscope with integrated ion beam. It features BSE, EBSD, EDX and STEM detectors and supports 2D and 3D chemical composition mapping. The ion beam can prepare micro-samples from selected locations in the microstructure. Such a specimens can be used for in-situ testing in tension, compression and bending.

## Deformation stage with heating up to 1200 ° C for SEM

Deformation and temperature experiments can be performed directly in an EVO 25 scanning electron microscope (Zeiss). During the experiments, changes in the microstructure, recrystallization and phase transformations can be monitored, and with the help of an EBSD detector, it is possible to quantify changes in crystal lattices, textures, etc.



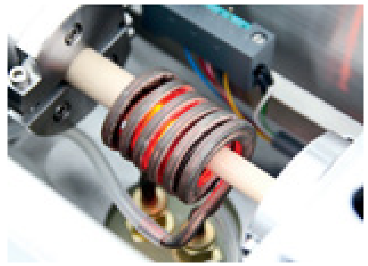


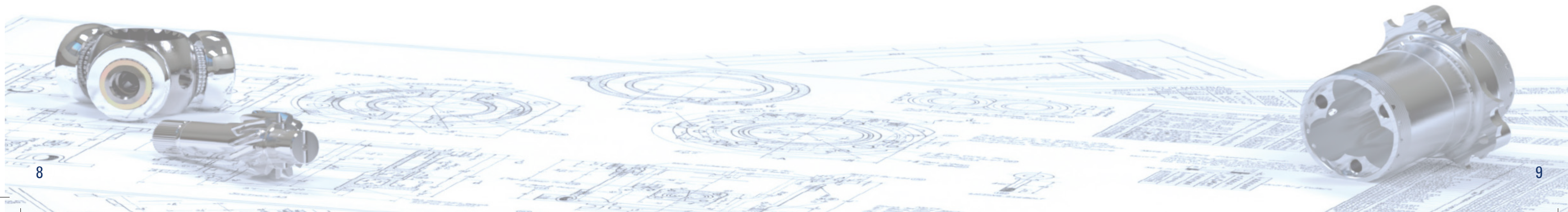
## Tribometer Anton Paar TRB3

Wear tests using the pin / ball-on-disk method with the possibility of measuring the coefficient of friction and subsequent evaluation of wear in accordance with ASTM G99, ASTM G133, and DIN 50324. Wear can be assessed by the method of weight loss or volume of material removed (from the groove shape), and do it dry or in a lubricant.

## Deformation hardening dilatometer Linseis L78 RITA

Determination of basic phase transition temperatures (eg Ac1, Ac3, Ms), experimental determination of austenite decomposition diagrams (ARA, IRA). Measurement in the temperature range -100 °C – 1600 °C. In addition to the different heating and cooling rates, it is also possible to describe the effect of deformation at higher temperatures on the subsequent course of phase transformations during cooling.

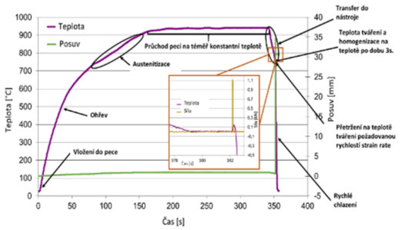




# EXPERIMENTAL FORMING LABORATORY

The Experimental Forming Laboratory works on heat treatment and thermomechanical treatment of metals and on testing new concepts in physical simulation of metalworking leading to optimization and integration of manufacturing processes. This effort can lead to extraordinary properties in materials and to greater effectiveness of manufacturing technologies.

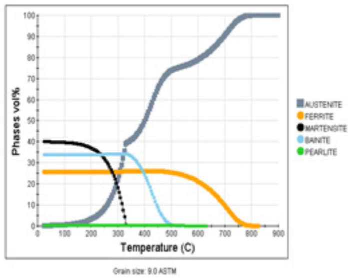
## Unconventional thermomechanical treatment of steels and alloys

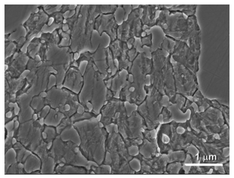



One of the core activities of the laboratory is the development of new thermomechanical treatment sequences and processes for high-strength low-alloy steels and alloys, in order to achieve unique mechanical properties. This results in sophisticated microstructures produced by means of unconventional metallurgical treatment for excellent strength and stress-strain characteristics.

## Comprehensive modelling of thermomechanical processes with extreme changes in gradients

Modelling and simulation techniques are closely associated with unconventional thermomechanical treatments of steels and alloys. Physical simulations in a thermomechanical simulator contribute to effective designing and optimization of forming and heat treatment processes. Changes to parameters of existing processes and products can be evaluated and insight gained into the properties and microstructure of a product under development. Complementary activities include FE calculations in DEFORM software and computation of materials properties using JMatPro software.



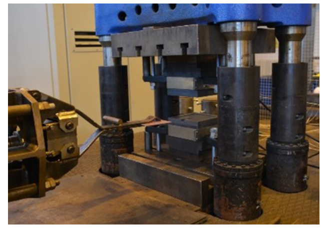
## Design of unconventional and unusual microstructures

Development of new metalworking processes is focused on creating unusual microstructures in ordinary materials. The new microstructures lead to enhanced properties, such as wear, corrosion, creep and fatigue resistance.

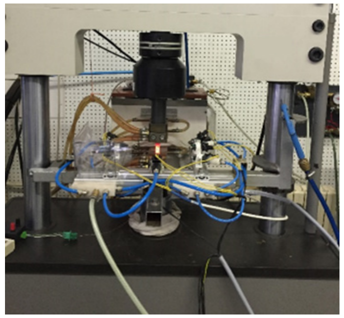
## Example of projects:

- Determination of principles and processes taking place during stabilization annealing in stainless austenitic steels used in nuclear energy
- Increased wear resistance of tool steels by a combination of semi-solid processing followed by hot forming and cryogenic processing

## Examples of novel ideas



One of the novel forming methods is the press-hardening (PH) process. PH routes are developed for high-strength steels (TRIP steels and PH steels). The products receive their final treatment directly in the forming tool and require no final heat treatment. For these purposes, the staff can design and develop special forming tools with the aid of materials simulations. Other novel concepts include Q&P processing combined with incremental forming or forging. With a combination of novel techniques, components with strengths exceeding 1950 MPa and elongation levels of 15 % were produced.

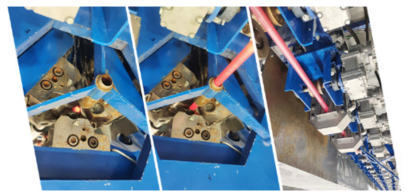


## Thermomechanical simulator

This test machine features high-frequency electric resistance heating which provides heating rates up to 200 °C.s$^{-1}$. Its sophisticated cooling system enables a broad range of heat treatment and thermomechanical treatment experiments to be performed. With accurate temperature, strain and force control, specimens can be treated using a variety of thermal and thermomechanical routes. The machine's capacity is 50 kN, the maximum deformation speed available is 2000 mm.s$^{-1}$ and the highest heating temperature is 1500°C. Physical simulations in this machine can replicate open die forging, wire rolling, incremental forming, press hardening and thermal and mechanical service loads on components in industrial applications. Furthermore, high-temperature mechanical properties and properties at high strain rates can be tested.

## Equipment for developing incremental forming processes

This HDQT-R 30-12 special machine uses cross rolling to reduce the diameter of round bar feedstock. Its individual modules (induction heating, cooling nozzles, water bath, tempering furnace), can be used for testing a variety of thermomechanical treatment routes on steel bars. The equipment can also produce stock of cylindrical, conical and other pre-defined rotation-symmetric shapes with a straight longitudinal axis. Acceptable input materials include a wide range of steels from carbon grades to stainless structural materials.



## Other equipment:

- CNC cutting machine – waterjet and plasma cutting
- Equipment for bending and brake bending of precision sheet metal parts
- MEBW-60/2 electron beam welder
- FASTCAM SA-X2 high-speed camera

# MECHANICAL TESTING LABORATORY

## LABORATORY ACCREDITATION IN ACCORDANCE WITH ČSN EN ISO/IEC 17025:2018

L 1726

The Mechanical Testing Laboratory carries out tension tests, compression and impact test, mainly on metals and plastics. Its research and development activities are focused on the manufacturing and testing of miniature specimens made of small amounts of material.

### Measurement of hardness

Conventional and instrumented hardness testing using fixed hardness testers (HV, HB, HRC). Field hardness testing using a portable hardness tester is available.

### Testing of resistance to brittle fracture

Tests are oriented on resistance of materials to brittle fracture under static and dynamic loads.

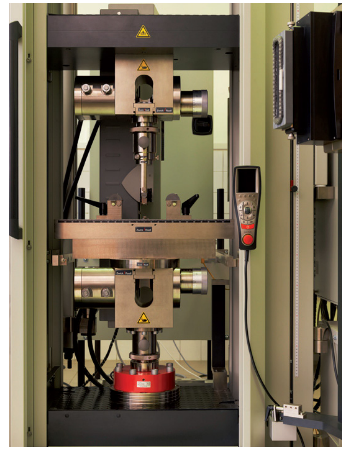
### Mechanical testing

Basic mechanical testing of metals, plastics, ceramics, wires, ropes, textile specimens etc. at temperatures between -80 °C and 1200 °C according to applicable standards. Tests can be performed on round bars with cylindrical threaded heads and on flat rods, up to the maximum force of 250 kN. Measurement of mechanical properties of structural parts and evaluation of residual life on non-standard miniature specimens.

### Fatigue testing

High-cycle fatigue testing from room temperature up to +900 °C. Construction of S-N curves, fatigue strength determination. Low-cycle fatigue testing at room temperature. Measurement of fatigue crack propagation rate (using the Paris-Erdogan law).



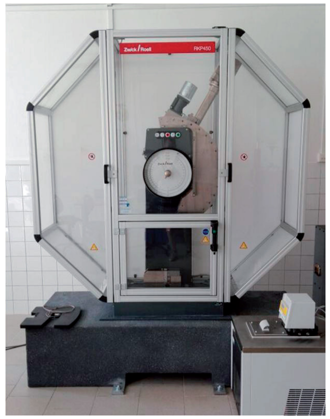


### ZWICK Z250 electromechanical testing machine

This 250 kN electromechanical machine offers tension testing from -80 °C to 1200 °C, compression and bending testing along with basic testing under cyclic loads at room temperature.

### Zwick Roell HFP50 vibrophore

The vibrophore with a maximum test load of 50 kN is used for acquiring source data for S-N curves by high-cycle fatigue testing.



### Instrumented Charpy pendulum 150 / 300 / 450 J

This instrumented pendulum impact tester with the maximum energy of 450 J provides testing at temperatures between -196 °C and 1200 °C.

### Universal hardness tester

The universal hardness tester is employed for Brinell, Vickers and Rockwell hardness testing. The Mechanical Testing Laboratory has its own workshop for making test pieces.

### Other equipment:

- Temperature chamber (-70 °C to 250 °C)
- Furnace with a temperature range up to 1200 °C

# STRENGTH AND FATIGUE LIFE TESTING LABORATORY

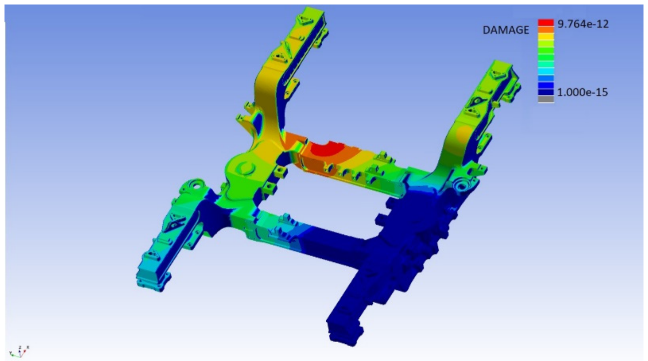
The laboratory houses a universal electrohydraulic loading system for the dynamic testing of structural parts and specimens. The laboratory staff focus on evaluating the life of components and probabilistic sizing methods.

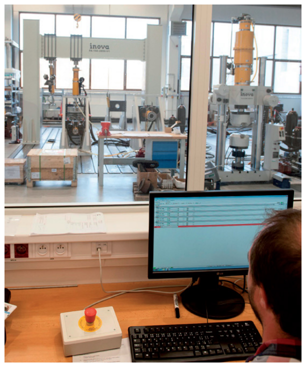
## Strength testing and fatigue life testing of structural parts and entire structures

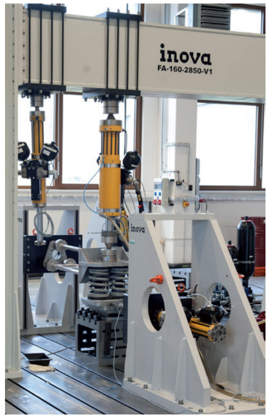
The laboratory conducts tests of mechanical properties of materials, structures and structural components with a focus on operational strength and fatigue life. It also performs simulations of service loads as well as accelerated tests. Furthermore, the stiffness, deformation, stress and acceleration of parts under loading are measured at the lab. Low-cycle fatigue properties of materials (Manson-Coffin curve, cyclic stress-strain curve) as well as high-cycle fatigue properties (S-N curve, Smith chart) are tested, along with properties under multi-axial loading.

## Fatigue analysis and service life calculations

A software tool is available for analysing operational and laboratory data from strain gauges and accelerometers, and for post-processing outputs from FE models. In collaboration with the Virtual Prototyping Laboratory, the facility is currently specializing in computer simulation of vibration fatigue tests for the automotive industry.






## Set of independent loading cylinders and support fixtures

- T-slotted clamping bed of 8 × 4 m size
- Ten independent loading cylinders, as indicated in the table
- Two-column frame with an adjustable crosshead for mounting up to two cylinders
- Four horizontal adjustable brackets for cylinders

| Static force | Cylinder dynamic force | Stroke – amplitude |
|---|---|---|
| 10 kN | 8 kN | ±50 mm |
| 25 kN | 20 kN | ±50 mm |
| 40 kN | 32 kN | ±125 mm |
| 100 kN | 80 kN | ±125 mm |
| 160 kN | 128 kN | ±125 mm |

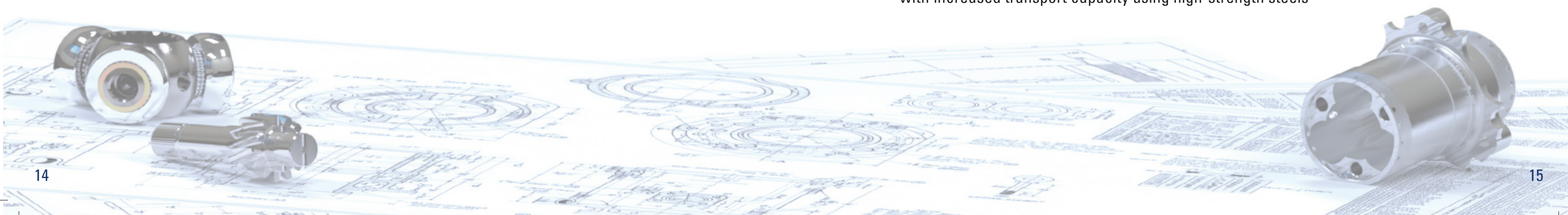
## FU-O-250 biaxial testing machine

- The machine is provided with a linear cylinder and a pivoting hydraulic cylinder for simultaneous loading by axial force and torque.
- Other features include jaws for flat and round specimens up to 32 mm, as well as a load cell, torque sensor, accelerometer and a uniaxial and biaxial extensometer. The machine can be adapted to different types of static and dynamic tests.
- Static and dynamic, single-axis and multiaxial tension-torsion-pressure tests.
- The basic parameters of the linear hydraulic motor: force ±250 kN and a stroke of 100 mm, the pivoting hydraulic motor: 2 kNm and a stroke of 100 °.

The crucial software packages include the commercial licences for nCode GlyphWorks, a tool for measurement data analysis, and nCode DesignLife, a finite element method post-processor. This is graphic-oriented software for fatigue analysis.

## Example of projects:

- Application of high-frequency mechanical vibration to increase the fatigue strength and service life of welded joints of rolling stock components
- Research and development of an articulated electric bus
- Research and development of a light, safe and environmentally sensitive tractor trailer with increased transport capacity using high-strength steels



# ENGINEERING MEASUREMENT LABORATORY

The laboratory supports research and development of manufacturing processes, materials, designing of unique solutions and new types of equipment, and production and testing of prototypes and functional samples. It offers advanced experimental instruments for measuring operating loads and responses, dynamic characteristics, noise, residual stresses in materials and heat effects on various objects.

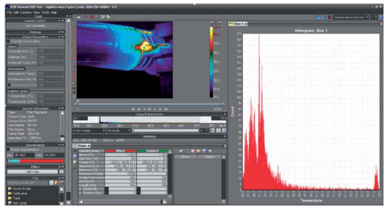
## Measurement of basic physical quantities

Extensive measurement of basic physical quantities using a wide range of force, torque and pressure transducers, temperature and rpm sensors and other devices. A measuring module features a large number of input ports and a backup power source.

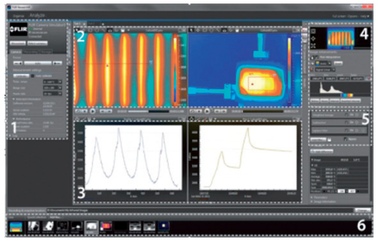
## Measurement of in-service static and dynamic loading and deformation in structures

Extensive strain-gauge measurement of stress in structures under load can be performed. The measuring module offers a large number of input ports. Defined loads can be applied to determine the fatigue life of parts. Fibre optic strain gauge sensors immune to electromagnetic interference are available.

## Extensive temperature measurement



Large numbers of measuring locations can be monitored using contact-type thermocouples or resistance sensors. Some measurements can be carried out at elevated temperatures of up to 650 °C.



## High-speed thermal imaging and other features

Measurement and monitoring of temperature fields at full resolution and a rate of 380 fps or at reduced resolution and rates up to 25,000 fps.

Vibration and noise measurement, experimental modal analysis and verification of computational models and analyses are performed.





## PULSE system for measuring dynamic phenomena, vibrations and acoustic variables

The system consists of modules that can work independently or in a group. Very rugged construction. Accessories also include an impedance tube for measuring the acoustic properties of materials.

- Programmable generator: 2 channels
- Up to 32 input channels
- FFT, Order, Envelope and Orbit Analysis, Two-plane Balancing, ODS Run-up/down, Modal Analysis Pro
- Order Analysis
- Modal hammers, accelerometers, microphones
- Electrical exciters for dynamic forces of 100 N, 440 N and 1000 N
- Impedance tube

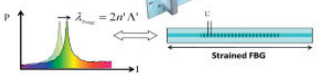

## FLIR SC 7550

A camera characterized by high flexibility, superior sensitivity, accuracy, spatial resolution and speed. It was specially designed for research and development applications in academic and industrial environments.

- InSb detector: 1.5 to 5.1 μm, cooled by a Stirling cooler
- Resolution: 320 × 256 pixels
- Measuring range: -20 °C to 3000 °C (calibrated for 5 °C to 1500 °C)
- Frame rate: max. 380 Hz full window, up to 28,800 Hz subwindow
- Temperature resolution: better than 0.025 °C
- Lenses: 25 mm: F/2 and 100 mm – F/2

## FBGUARD 1550 FAST

The unit can process and evaluate readings from FBG sensors. It is fully autonomous and contains a hard drive. Communication is provided via a web interface (remote access available).



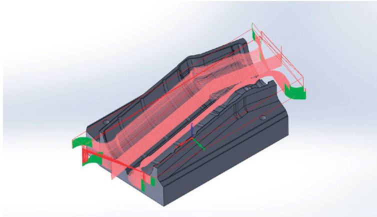

- Wavelength range: 1500–1588 nm
- Four independent optical channels with a switching option
- Up to 80 optical fibre sensors
- Scan frequency: two channels at 1500 Hz, four channels at 750 Hz
- Total dynamic range: up to 25 dB
- Optical connectors: FC/APC
- Temperature measurement range: -270 °C to 300 °C
- Length of connected sensors: on the order of kilometres

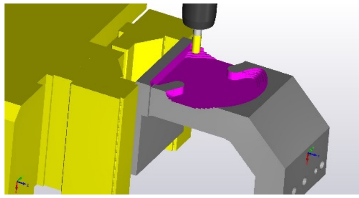
# MACHINING TECHNOLOGY LABORATORY

The Machining Technology Laboratory develops comprehensive solutions to manufacturing process problems, while focusing on cutting tool selection and fixtures for advanced machining strategies, programming of NC machines, new approaches to machining, and other related aspects.

## Development of machining strategies

Core activities of the laboratory include the development of machining strategies for advanced machining processes, and tool design. The strategies are tested on universal machines. Computational simulations are carried out using advanced CAM systems SolidCAM and Catia V6.



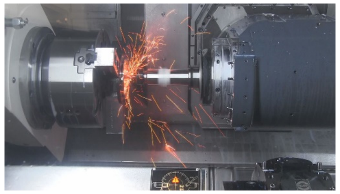


## Verification of technologies

Designing machining strategies is naturally and closely related to process verification. The proposed strategies are tested in the laboratory using universal machines and standard and special tools. Several variants are tested in order to select the solution which best meets the specification.

## Development of functional samples

New functional samples are developed alongside advanced machining strategies to verify a component's functions in relation to its design characteristics, material properties and life.



## Cutting tool trials

Full utilization of advanced processes and technologies demands not only conventional but also special cutting tools to be used. Trials of tailored cutting tools are carried out which enable the effectiveness of the cutting process to be improved.

## Example of projects:

- Development of a powerful tool for superalloys machining
- Milling technology of ARIANE 6 rocket launcher components

## CTX BETA 1250 multi-function turning centre

The unique concept of this 12-axis machine features a range of turning and milling options. One of its strengths is the synchronised operation of the milling spindle and the bottom turret. Automatic transfer between the main and auxiliary spindles offers the advantage of seamless machining with improved accuracy. Up to 100 bar of pressure is available for effective cooling.

## DMU 65 monoBLOCK multi-axis milling centre

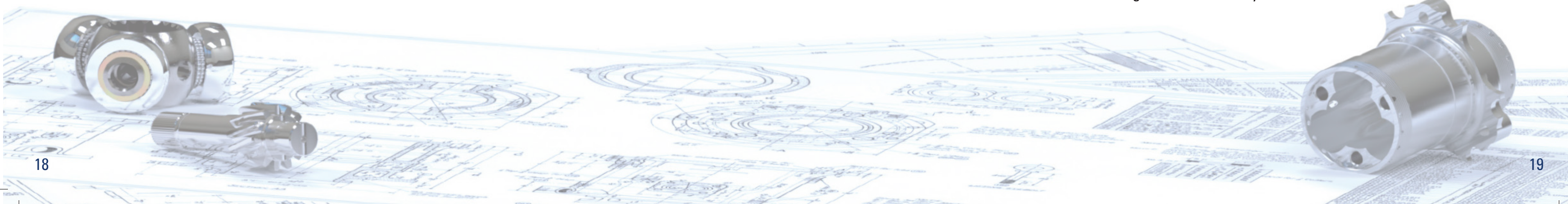
This 5-axis milling centre has a working space of 650 × 650 mm which can accommodate large workpieces. Positioning is provided by its cradle configuration and a ±360° rotary table (unlimited) for continuous 5-axis machining of sculptured surfaces. High-precision finishing is achieved with high spindle speeds (up to 18,000 rev/min).

## DMU 40 eVo linear milling centre

This machine performs well in continuous 5-axis machining and accurate positioning along all axes. It enables complex-shaped parts to be produced in single clamping. Linear drives provide accelerations up to 1 g and feed rates up to 80 m/s drive. Spindle speeds can reach 24,000 rev/min for high-precision finishing.


## MAZAK QUICK TURN NEXUS 250-II MY multifunctional turning centre

Thanks to its rugged construction and high stiffness, this multi-tasking turning centre can be used for verifying new advanced technologies. Its automation features are a major advantage. The machine's Y axis enables off-axis drilling and milling and other operations. To the existing family of control systems from HEIDENHAIN and Siemens, this machine adds an integrated Mazatrol system.



# METROLOGY LABORATORY

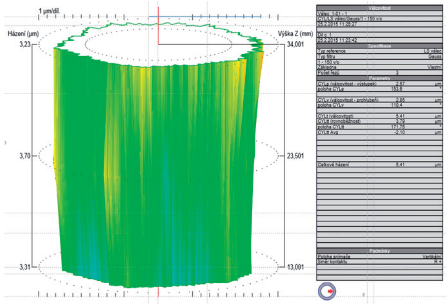
## LABORATORY ACCREDITATION IN ACCORDANCE WITH ČSN EN ISO/IEC 17025:2018

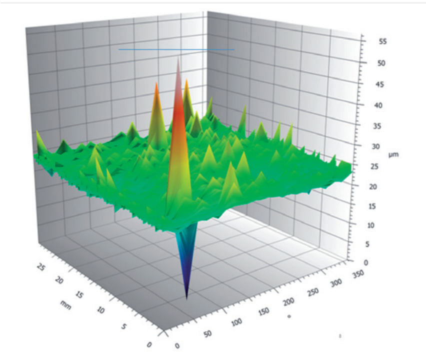
L 1718

The Metrology Laboratory concentrates on highly advanced metrological analyses of complex-shaped and high-precision components, the development of inspection strategies, the evaluation of measuring systems, contact and non-contact 3D scanning, digitisation for constructing models by reverse engineering, as well as some other activities.

### Development of measurement strategies

One of the core activities involves developing measurement strategies with the aid of advanced technologies and software tools. The strategies are then tested in a laboratory environment. Computational simulations are carried out using advanced Calypso software.



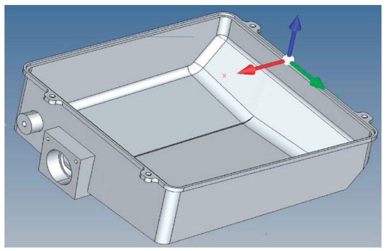


### Contact and non-contact 3D scanning

The proposed strategies are tested in the laboratory using universal machines and standard and special measuring instruments. Several variants are explored before selecting the solution which best meets the specification.

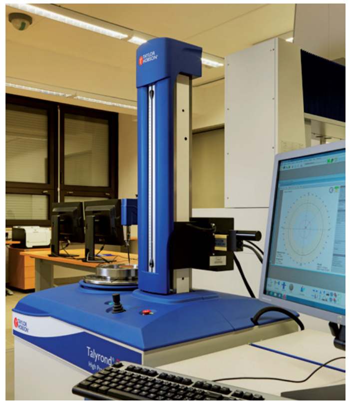
### Digitization for reverse engineering of components

Complex prototype components or parts for which 3D models cannot be obtained are scanned in order to develop models compatible with CATIA/SOLID.



### CMM Carl Zeiss Prismo 7 Navigator

Prismo Navigator from ZEISS is synonymous around the world with high-speed scanning and maximum accuracy in production environment. With a length measurement error of just 0.9 + L / 350 micrometres, the Zeiss Prismo 7 Navigator is ideal when strict demands on precision have to be met.



### High-precision roundness instrument Taylor Hobson Talyrond 585 Lt

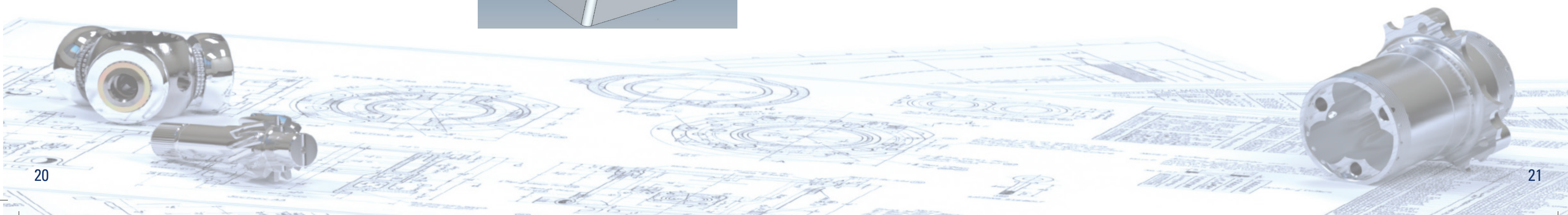
The machine is intended for measuring shape and position deviations, as well as linear and circumferential roughness. Cylindrical parts can be measured in 3D and analysed by means of Talymap system. It is a top-quality machine, with a deviation from LSCI of 0.015 + 0.00025 µm/mm.

### High-precision contour/surface roughness measuring machine Hommel Etamic T8000

Hommel-Etamic T8000 RC is a flexible solution for measuring geometric shapes, roughness and waviness of various component surfaces. The T8000 system has a modular configuration which enables various traverse units, probe types, columns and granite plates to be combined.

### Other equipment

Length reference standards for the calibration of gauges for absolute and comparative measurement. Absolute and comparative manual gauges with an accuracy of 1 µm. Clamping kits for clamping and positioning complex-shaped components.



# University of West Bohemia

The University of West Bohemia (UWB) is the only higher education institution based in the Pilsen Region. It has nine faculties with almost 60 departments and twelve thousand Czech and foreign students.

Besides providing education, the University is involved in scientific research, including basic and applied research, and pursues innovation and knowledge transfer activities.

**Faculties**

- Faculty of Applied Sciences (FAV)
- Ladislav Sutnar Faculty of Design and Art (FDU)
- Faculty of Economics (FEK)
- Faculty of Electrical Engineering (FEL)
- Faculty of Philosophy and Arts (FF)
- Faculty of Education (FPE)
- Faculty of Law (FPR)
- Faculty of Mechanical Engineering (FST)
- Faculty of Health Care Studies (FZS)

**Research centres**

- New Technologies for the Information Society (NTIS)
- Regional Innovation Centre for Electrical Engineering Contact (RICE)
- Regional Technological Institute (RTI)
- New Technology and Materials Centre (CENTEM)

**Institutes**

- Institute of Applied Language Studies (UJP)
- New Technologies - Research Centre (NTC)

## Faculty of Mechanical Engineering

Faculty of Mechanical Engineering is one of the oldest faculties of the University of West Bohemia. It is found on the main university campus on the south-west outskirts of Pilsen. Its premises include lecture halls, laboratories, departments and other facilities housed in closely-spaced buildings conveniently for students. Thanks to its close collaboration with foreign technical universities and industrial companies based in the Pilsen Region and elsewhere, the Faculty provides high-quality education with advanced engineering research and development experience.

### Research centres at the Faculty of Mechanical Engineering

- Regional Technological Institute
- Energy Research Centre

### Departments at the Faculty of Mechanical Engineering

- Department of Power System Engineering
- Department of Machine Design
- Department of Material Science and Technology
- Department of Industrial Engineering and Management
- Department of Machining Technology
- Department of Physical Education and Sport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