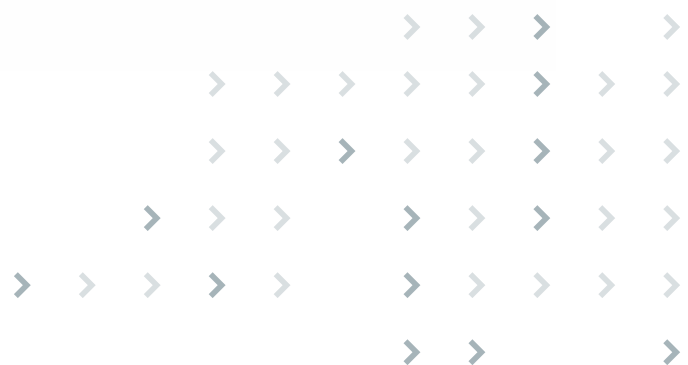




# EXPERIMENTAL FACILITIES FOR THE RAILWAY INDUSTRY



# WTTECH.CZ SPECIALISTS IN THE DEVELOPMENT, DESIGN, AND SUPPLY OF TEST RIGS AND TEST EQUIPMENT

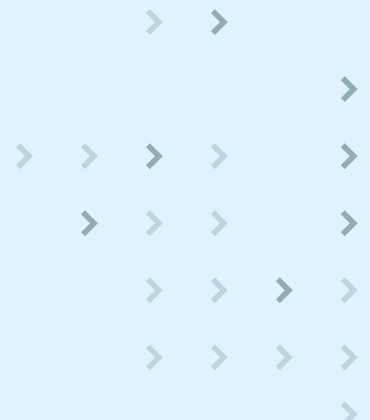
WTtech.CZ offers **unique test rigs and equipment**, including all research and development equipment in mechanical engineering, hydraulic engineering, and aerodynamic testing—the WTtech.CZ team consists of committed designers, engineers, constructors, and mechanical specialists. Thanks to our expert know-how and many years of experience, we can offer **solutions for any specialized project** completed under difficult circumstances.

**WTtech.CZ manufactures experimental facilities and test equipment** for many industries including **the railway industry**. We have recently completed significant projects for the rolling stock industry - bearing test equipment and test equipment to measure railway vehicles' braking systems.

We supply **experimental facilities developed and designed by** us including their modifications, and experimental facilities designed and constructed according to **the exact customer's conditions and requirements**. Our services are not limited to the equipment, we offer a comprehensive service including the supply of all equipment, programming of measuring and control software, project management, research project preparation, and expert consultation.

In addition to the experimental facilities' design and construction, WTtech.CZ is also well-versed in design **using the Creo 3D CAD system as well as CFD and FEM simulations**. We also offer specific measurement and control software, data processing, analysis for design optimization, and effective solutions to challenges in the testing facility field and beyond.

**Founded in 2009**, WTtech.CZ became an official National Instruments system integrator and the exclusive representative of Scanivalve Corp. for the Czech Republic, Slovakia, and Poland. This allowed us access to the latest technologies and cutting-edge research and measurement tools.



# THE USUAL PROCESS OF TEST EQUIPMENT IMPLEMENTATION

WTtech.CZ provides customers with a comprehensive testing equipment implementation service. This process usually consists of the following steps:

## 1. Project analysis

- Project study, feasibility study, budget estimate

## 2. Assignment analysis

- Identification of the requirements and standards that the experimental facility must meet
- Technology design proposal for all parts (mechanical, propulsion, measurement, control)

## 3. Identification of the construction project and its requirements

- Definition of the building requirements for the laboratory (foundations, spatial layout, air conditioning, soundproofing, control room)
- Definition of resource requirements (electricity, water, air, hydraulics)
- Preparation of a detailed building design or detailed specifications

## 4. Design

- Design in the Creo 3D CAD system, FEM, and CFD analysis
- Selection of sub-components (mechanical parts, sensors, pneumatic and electrical parts, etc.)
- Simultaneous preparation of electrical documentation and pneumatic/hydraulic schematics
- Risk analysis

## 5. Purchase of materials and components, production

- After customer approval, purchase of material, components/parts, and production, basic assembly and partial recovery of subsystems at the WTtech.CZ premises begins

## 6. Production of electrical parts

- Production of switchboards, measuring, and control systems
- Programming of measuring and control software (PLC, DAQ systems)

## 7. Installation and launch

- Transportation, installation, and launch of the test equipment at the customer's site
- Electrical inspections
- Calibration of the measuring chain in an accredited laboratory

## 8. Trial operation and handover

- Trial operation and training of customer operators
- Launch of live operation

## 9. Documentation

- Preparation of operating documentation, operating and maintenance manuals
- CE certificate issuance

## 10. Support

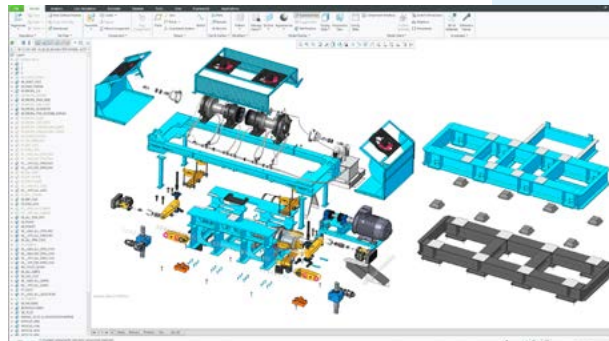
- After-sales support and consultation on all operation-related matters
- Remote device management and user support via a dedicated VPN connection

Structured management of each WTtech.CZ project ensures careful planning and execution of all steps and minimal risks, as well as excellent condition and reliability of the test equipment.

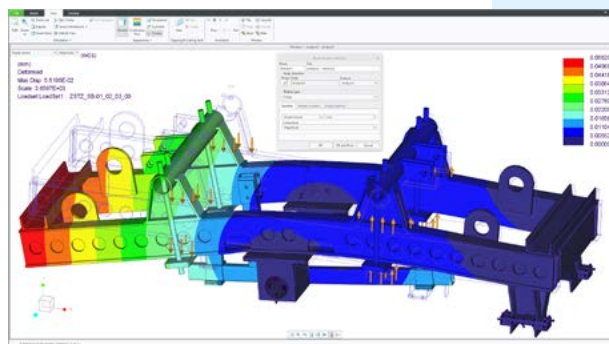
# TECHNOLOGIES USED TO DEVELOP AND CONSTRUCT EXPERIMENTAL FACILITIES

During development and construction, WTtech.CZ uses the latest technologies to ensure the test equipment's high quality, robustness, and accuracy.

1. Construction at WTtech.CZ is conducted exclusively in a **3D CAD** system using **Creo** software, which enables detailed design and modeling of all testing facility components. The design data is stored and managed in the **Windchill PDM system**, ensuring efficient product lifecycle management and easy access to all necessary information.



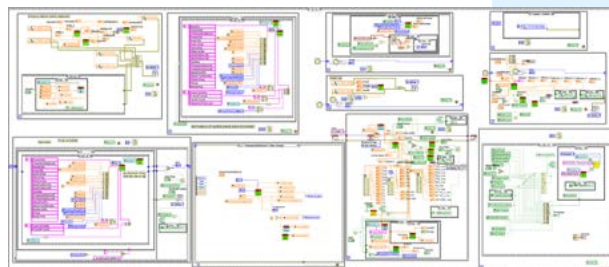
2. Design optimization includes **FEM** (Finite Element Method) and **CFD** (Computational Fluid Dynamics) analyses. These analyses allow the simulation of the components' mechanical and fluid behavior before they are manufactured, resulting in high product quality and reliability.



3. WTtech.CZ control and measuring systems are based on the **PLC** (Programmable Logic Controller) technology and measurement of selected parameters by industrial computers. This guarantees the resulting products' exceptional accuracy and reliability.



4. Testing facility control and measurement is usually implemented in the **LabVIEW** user interface. This enables efficient test automation, minimizes the need for human intervention, and increases efficiency and measurement accuracy while offering intuitive visualization and analysis of measured data.

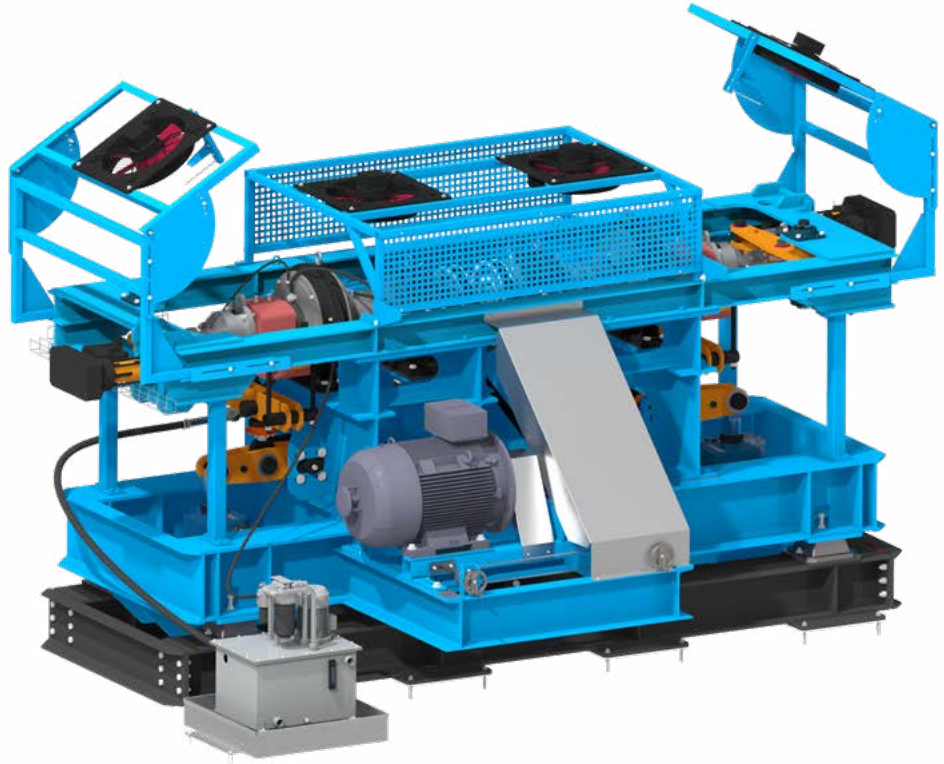


All WTtech.CZ devices meet the standards corresponding to the testing facilities and relevant industry standards. WTtech.CZ is ISO 9001 certified and is regularly audited by customers.

# SELECTED COMPLETED PROJECTS

## BEARING TEST RIG (BTR)

The bearing test rig (BTR) is one of the unique devices developed by WTtech.CZ. It is designed for testing the endurance of axle bearings and bearing houses. Bearing fatigue tests consist of loading the bearing with axial and radial forces at specific speeds. A BTR can simulate speeds up to 300 km/h, including the simulation of airflow around the bearing units according to the relevant standard.



The tests run almost uninterrupted for several months, which is why the BTR proposal focuses mainly on the high rigidity and durability of all components used and the reliability of the entire BTR in long-term operation. The BTR serves many customers, which enables us to continuously optimise the technology used and refine the measurement process.

### What can be tested using BTR?

- Axle bearings
- Bearing chambers
- Lubricants
- Other components

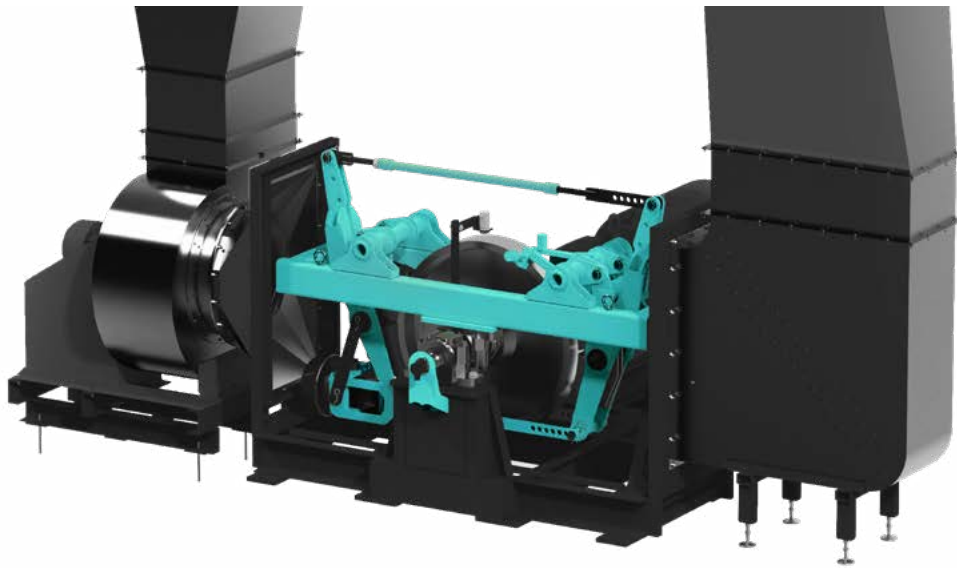
### Basic BTR parameters

- Tests according to the ČSN EN 12 082
- 24/ 7/ 365 Test mode for up to 9 months
- Simulated driving speed up to 300 km/h
- Controlled ambient temperature  $20\text{ °C} \pm 2\text{ °C}$
- Radial load up to 500 kN/axle
- Axial load  $\pm 30\text{ kN}$

Data is collected automatically after 100 milliseconds and the entire testing process is automated using software that allows intuitive application interface control. The high degree of test automation minimizes the need for human intervention and maximizes the accuracy and reliability of the results.

## BRAKES TEST RIG FOR THERMOMECHANICAL RAILWAY VEHICLE WHEELS TESTS

The Brake Test Rig (BrTR) is a device designed for railway vehicle wheel thermomechanical testing. It allows detailed simulation of the braking processes including long-term braking during driving and an accurate measurement of the resulting deformations and temperatures. Braking is simulated by attaching a loading device representing the mass of the trainset per wheel. The BrTR is equipped with an advanced ventilation system simulating the airflow around the wheel, and high-precision measuring instruments for continuous data acquisition and evaluation.



The BrTR uses an automated control and measurement system to ensure accurate and reliable analysis of the braking performance and mechanical behaviour of the wheels during testing. This system minimises the need for human intervention, increasing the tests' efficiency and accuracy.

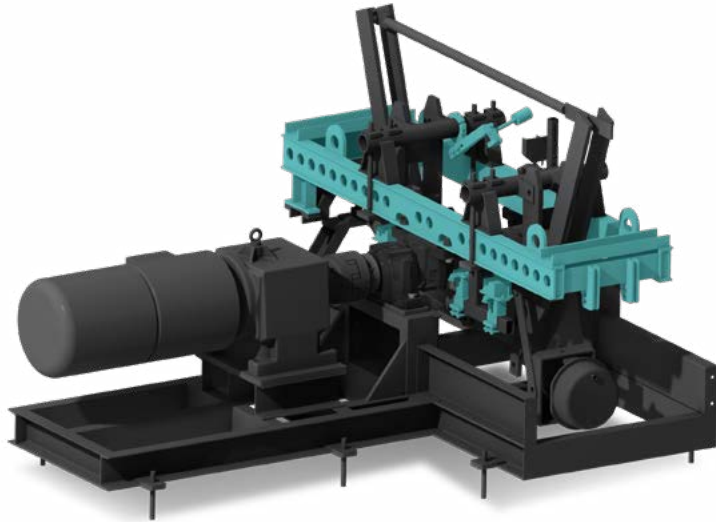
### What can be tested using BrTR?

Rail wheels according to ČSN EN 13 979-1, Attachment A

### Basic BrTR parameters

Simulated driving speed up to 60 km/h  
Braking power up to 50 kW at constant speed  
Time to reach test speed  $4 \text{ s} \pm 0.2 \text{ s}$   
Air velocity around the wheel of 8,4 m/s according to the relevant standard  
Measurement of wheel deformation:  
    Continuous, non-contact  
    Measures deformations up to 10 mm  
    Measurement accuracy of 0,1 mm  
Continuous surface temperature measurement up to 800 °C  
Single or double-sided braking configuration

# THE MECHANISM AND PROCESS OF THE BRAKE TEST RIG TEST



## Preparation

The test shaft with a pressed wheel is placed in the bearings and connected to the drive coupling  
After installing the brake shoes and verifying the location and operation of the sensors, the sample is covered with a cover box

## Calibration

A sample rotation and cooling air-blowing function test is carried out  
The sample is brought to operating speed while the blowing continues

## The Braking Process

The braking process with defined parameters is started and continues for 45 minutes according to the relevant standard  
Wheel deformation is measured continuously during the test

## Data Measurement and Evaluation

Wheel temperature (contact and non-contact), wheel speed, speed and airflow parameters, wheel deformation, and braking torque are measured  
All parameters are controlled and evaluated by a single system

The BrTB procedure allows the simulation of realistic braking conditions and provides a highly accurate braking performance analysis.



**WTTECHCZ**

**DESIGN, CONSTRUCTION, AND DELIVERY OF TEST EQUIPMENT FOR YOU:  
TAILORED TO YOUR SPECIFIC REQUIREMENTS AND CONDITIONS!**

