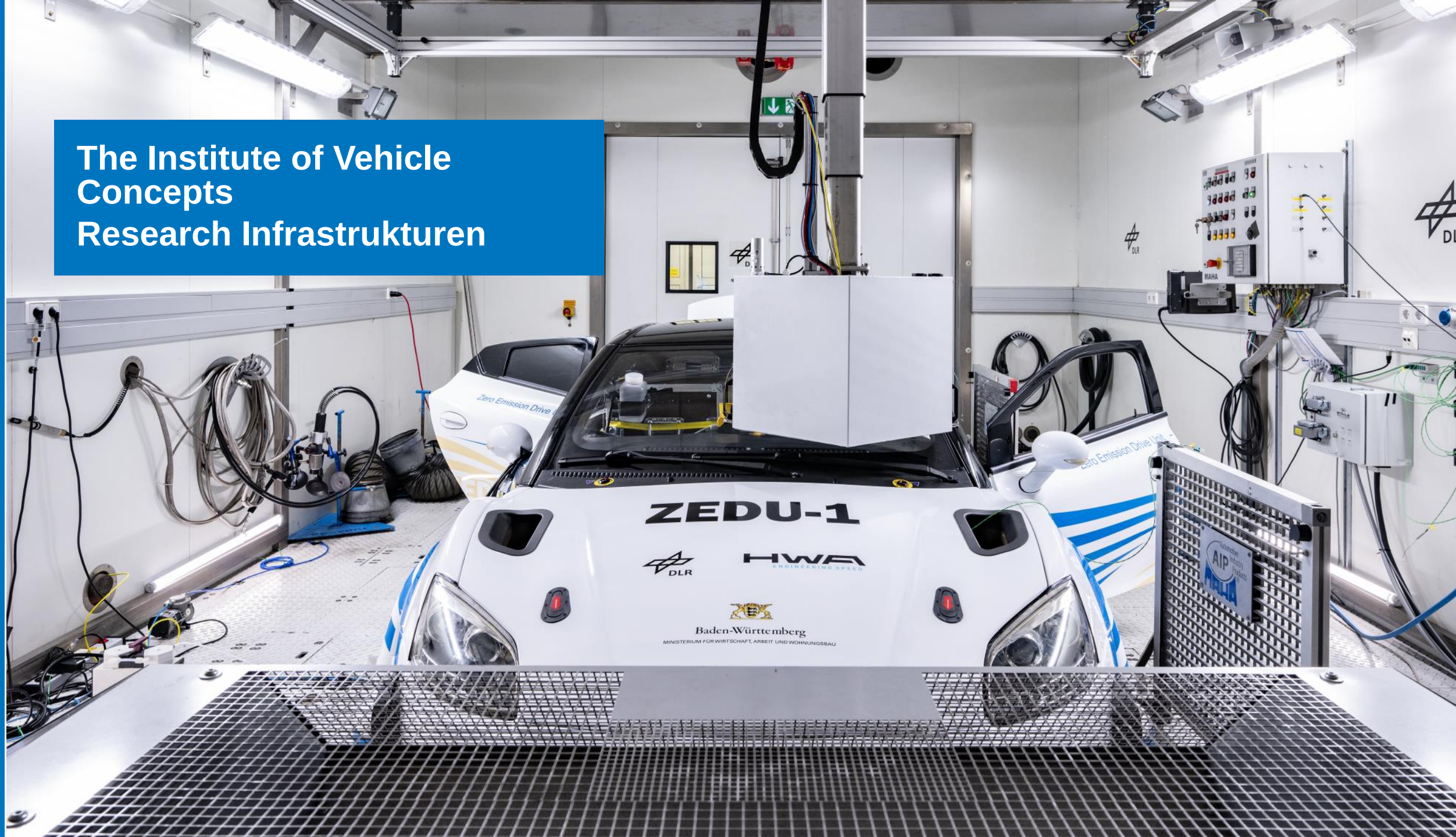
The Institute of Vehicle Concepts
Research Infrastrukturen



Vehicle Testing

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Four-Engine All-wheel Roller Rig with Climate Control and Exhaust Analysis

Performance

- Four individually driven 48″ rollers
- 100kW continuous power each
- Front, rear or all-wheel drive concepts
- Wheelbase from 1.6m to 4m
- Max. vehicle weight 4500 kg
- Max. speed 200km/h
- Regulated airflow up to 137km/h
- Air conditioning from -40°C to +60°C
- Relative humidity from 20% to 80%

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Stuttgart, 18th January 2025

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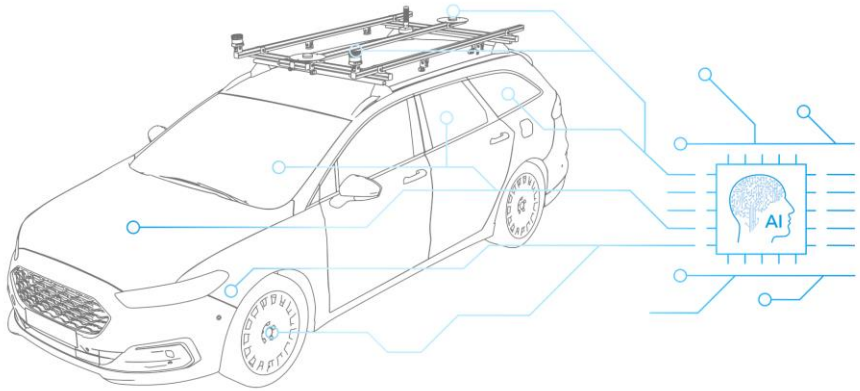
AI For Mobility Research Platform

Investigation and implementation of novel control methods based on artificial intelligence

Performance

- Hybrid electric vehicle (station wagon)
- Max. weight 2000 kg
- 18” rim with upsized tires 245/40 R18
- Hybrid (2 l petrol engine / electric engine)
- 187 HP (140 HP (petrol) + 47 HP (electrical))
- Continuously variable transmission (CVT)
- Max. speed 185 km/h
- Acceleration 11,6 s (0 – 100 km/h)



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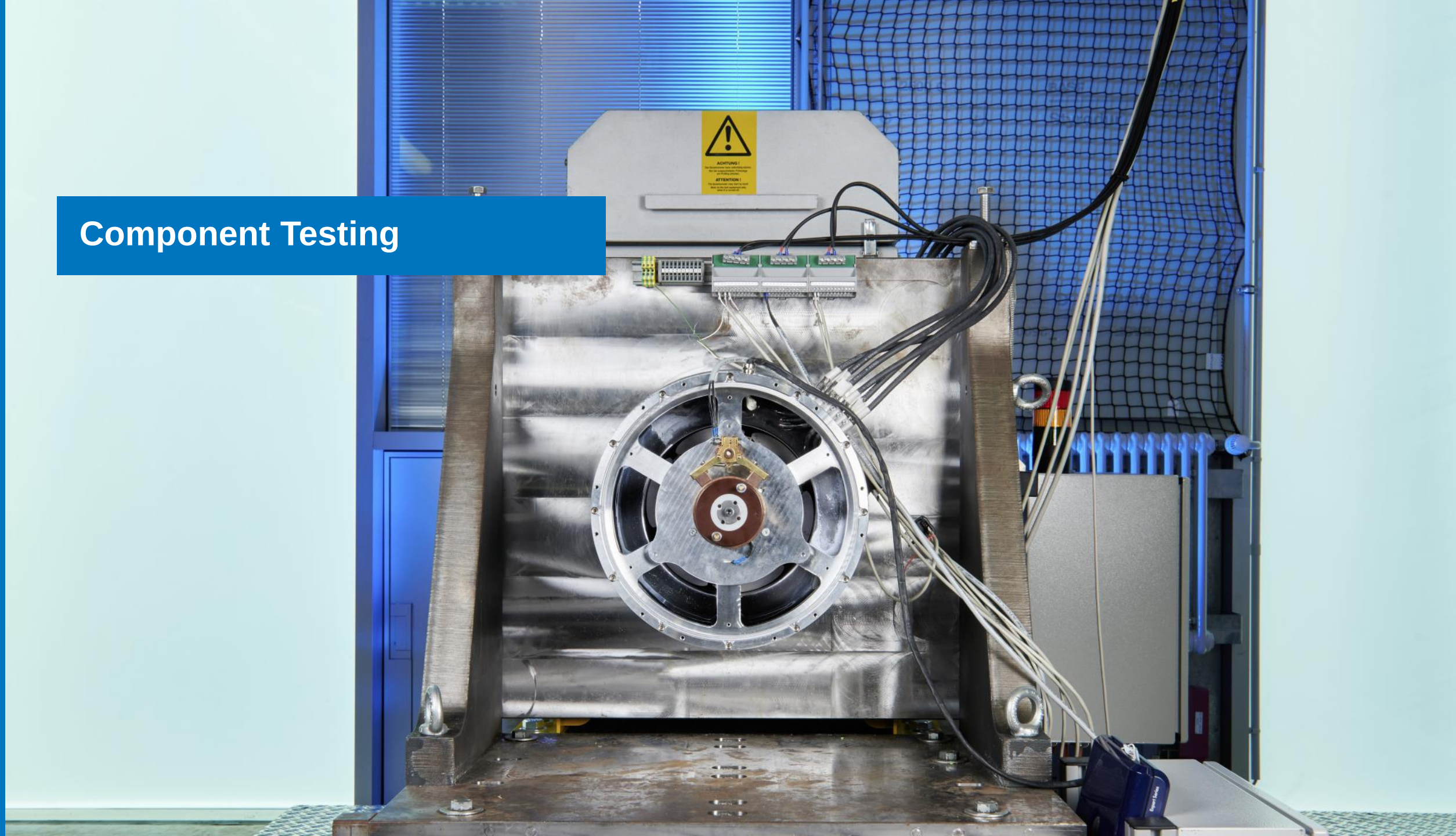
Component Testing



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Train Bogie Research Infrastructure

Project objectives

- Validation and demonstration of the three basic innovations for rail vehicle running gear proposed in the NGT project mechatronic track guidance
- Lightweight construction and wheel-oriented direct drive
- Enhancement of NGT project results for technology readiness level (TRL) 6
- **Video: The track guidance of the "Next Generation Train"**

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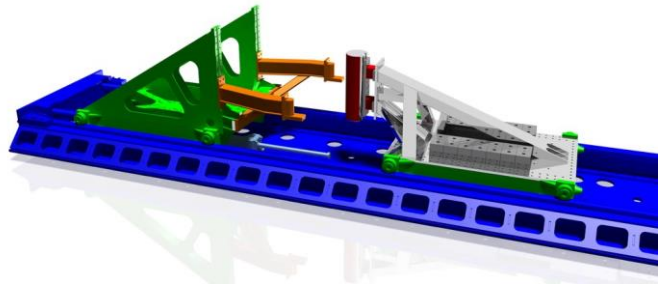
Dynamic High Strain Component Test Facility – Crash Test Facility

Performance

- Modular system for various crash configurations
- Linear guided sled system for scientific simulation/test alignment
- Construction of the crash system
  - Speed 64 km/h at 1300 kg
  - Crash energy max. 205 kJ
- Acceleration sensors, 3- and 6-axis force sensors (up to 400 kN)
- Strain gauges, draw-wire potentiometer
- Onboard data acquisition system (max. 100 kHz)
- 3D scan before and after test execution possible



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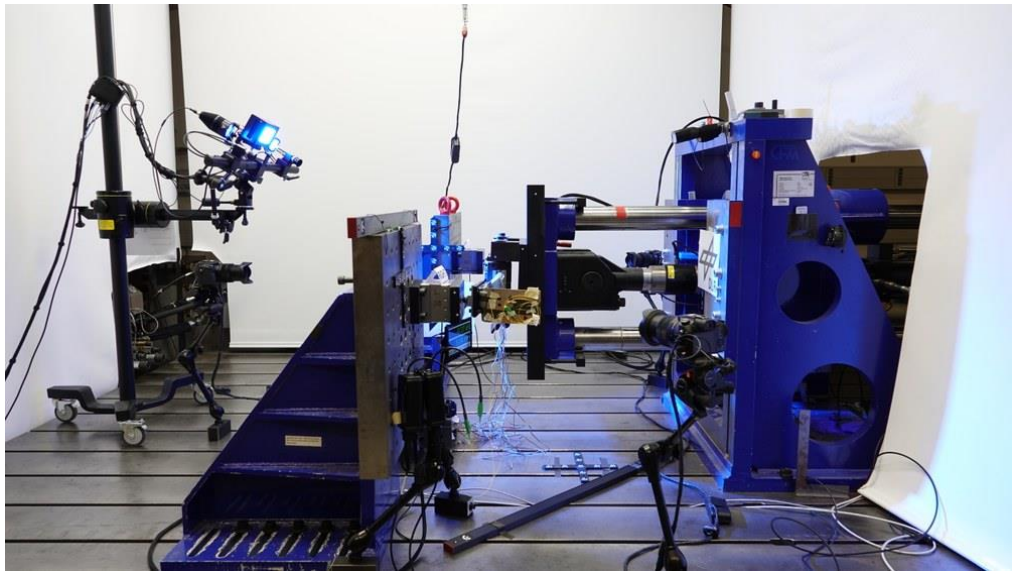
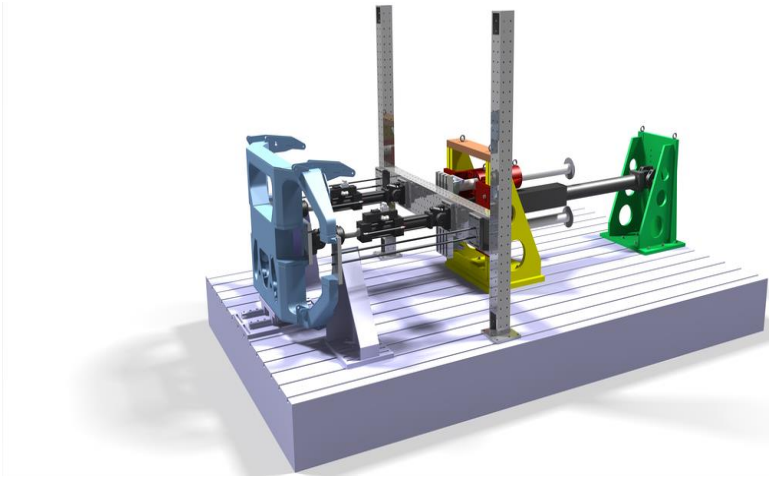
Quasi-static Component Testing Clamping Field

Performance

- Test room 6 x 3.5 x 2 m3 (L x W x H)
- Cylinder force 2 x 25 kN, 2 x 100 kN, 1 x 250 kN
- Maximum forces 250 kN compression, 160 kN tension
- Maximum speed 60 mm/s
- 4 compact cameras triggered via the system
- Recording of forces, strains and deformations with up to 30 channels





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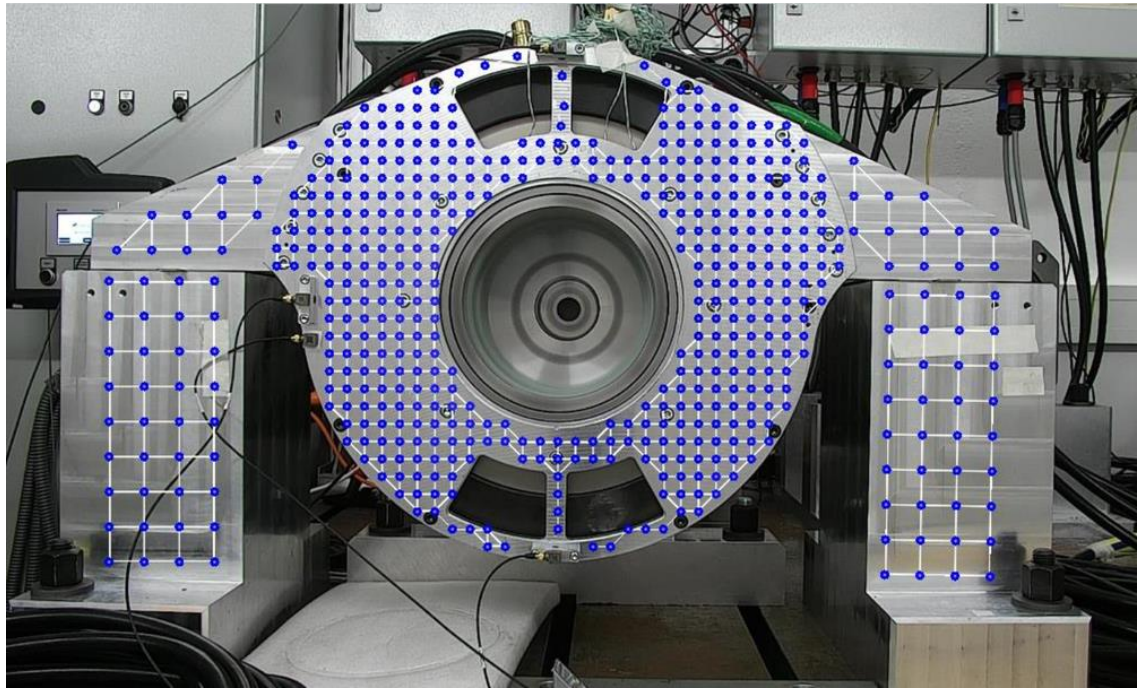
Electric Motor Test Bench (TU Ilmenau)

Performance

- Power and efficiency measurement of electrical machines
  - Maximum drive power: 400 kW
  - Maximum speed 8,000 rpm
  - Maximum torque 3,000 Nm
- NVH-Analysis/Vibration measurement
  - Vibration measurement
  - Harmonics of mechanical excitation
  - Harmonics of electromagnetic excitation
  - Evaluation of mechanical noise sources
  - Modal analysis



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Electric Motor Test Bench (Stuttgart)

Areas of application

- Electrical characterization of electrical machines and converters
- Mechanical measurements of rotating machines
- Power and efficiency measurement
- Thermal measurement, cycle evaluation, Energy Drive Lab

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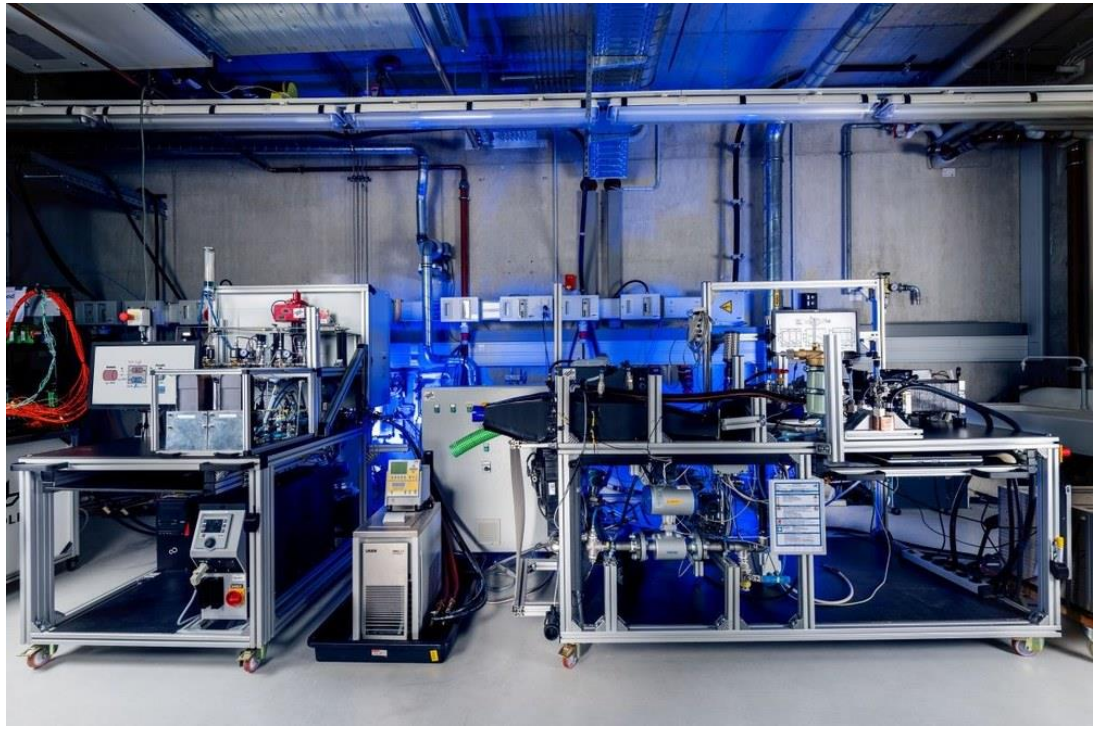
Hydrogen and Fuel Cell Test Bench

Performance

- Characterization of fuel cells or batteries using state-of-the-art methods
- Single cell, cell groups and system measurements possible
- Different operating conditions can be realized
- Can be flexibly extended to meet special test requirements
- Fuel cell test bench
- Stack testing and Health-Monitoring
- Impedance spectroscopy for analyzing batteries, rechargeable batteries, super caps, fuel cells and thermoelectric modules.



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Thermal High-Performance Heat Storage Test Bench

Performance

- Experimental investigation and measurement of heat storages with metallic phase change materials
- Endurance tests and cycling
- Mapping of heating systems in vehicles such as buses and trains
- Precise temperature measurement at high temperatures

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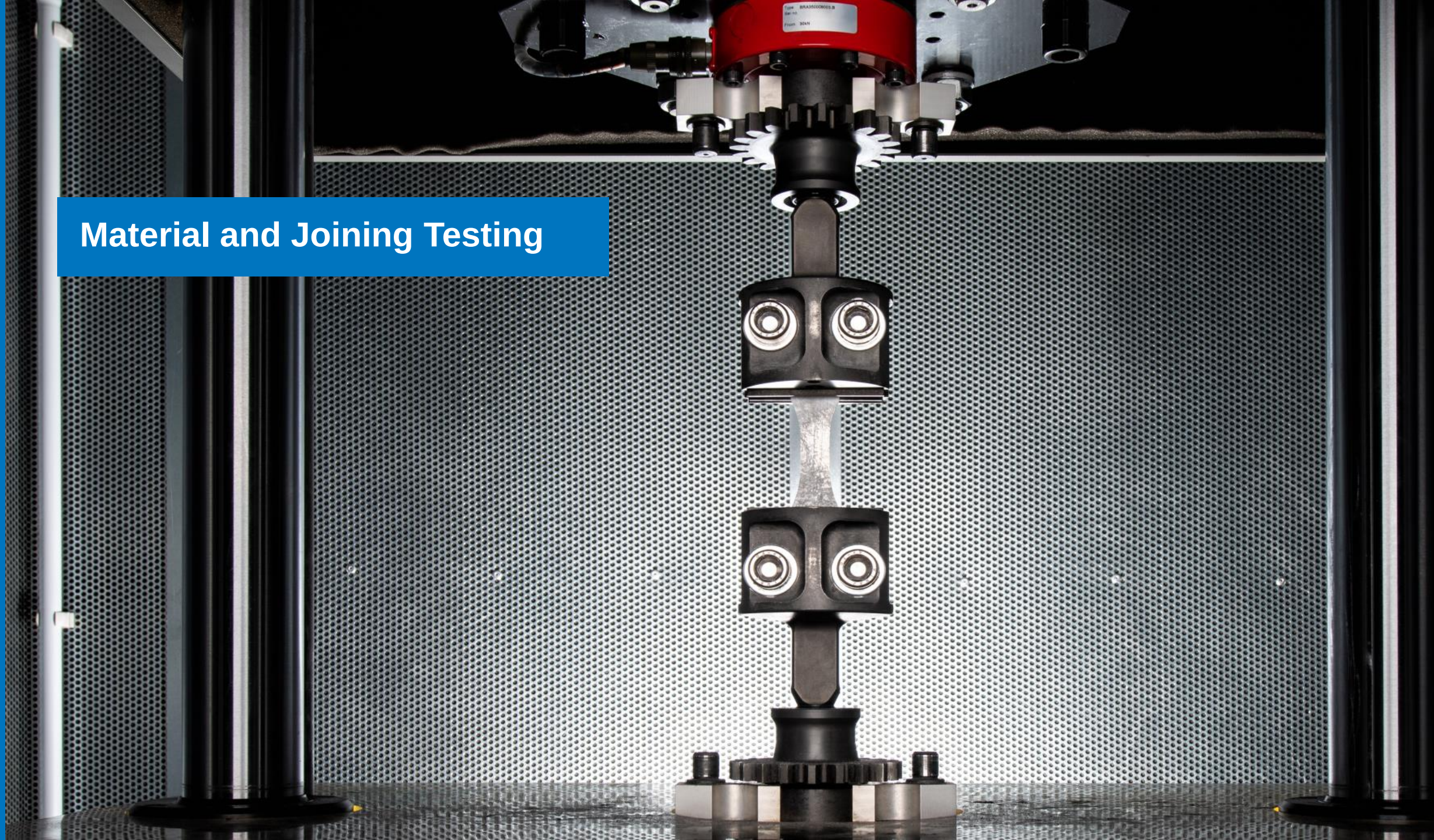
Material and Joining Testing



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Research Laboratory: Future Lab for Additive Manufacturing & Engineering (FLAME)

Performance

- AM-compatible component design (DfAM)
- integrate production data form of a digital component twin
- FLAME's integrated laboratory
  - automated material card derivation for crash simulation
  - Robotic Screw Extrusion Additive Manufacturing (RSEAM)
  - The High-Speed Sintering process (HSS)

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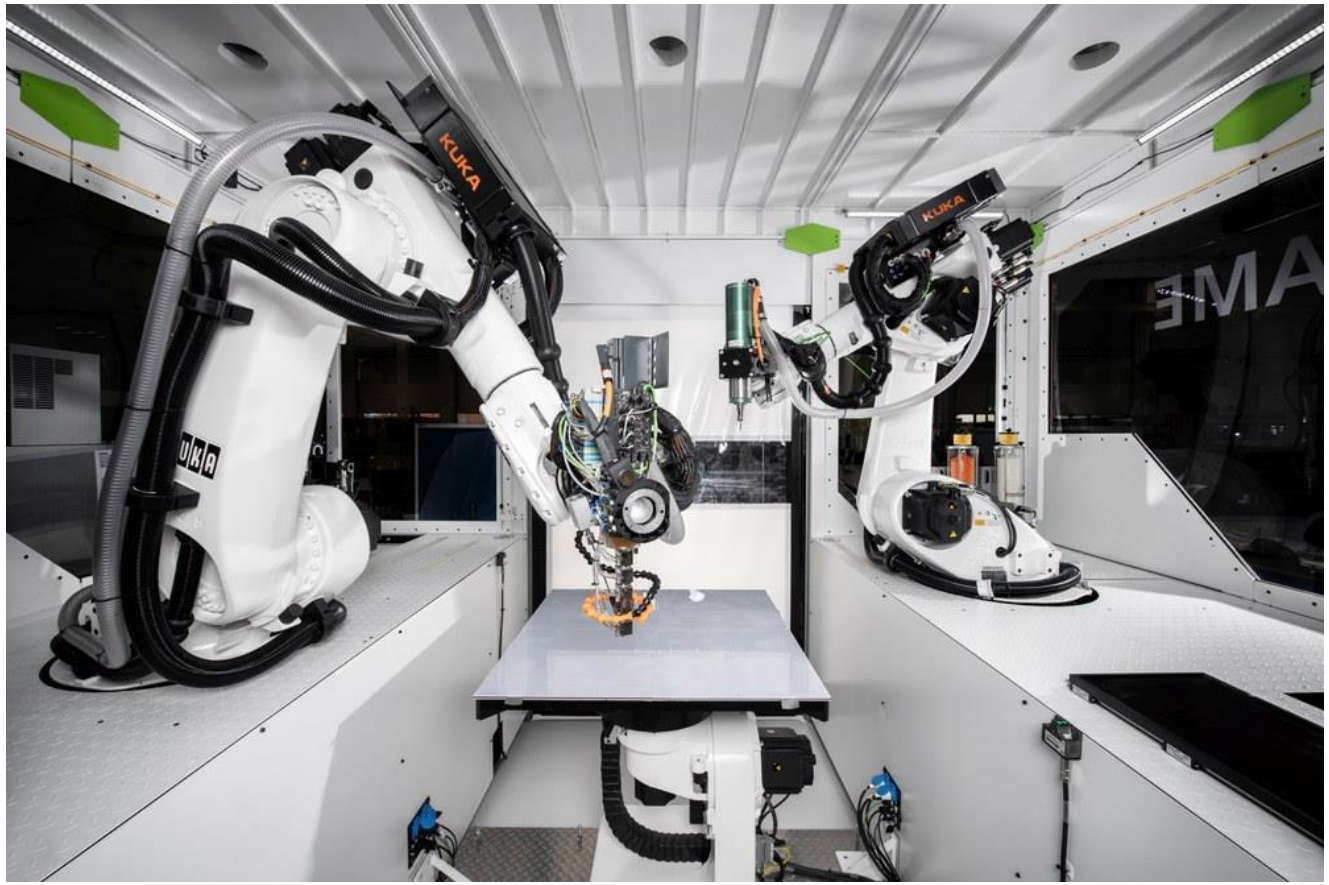
Robotic SEAM - Robotic Screw Extrusion Additive Manufacturing

Performance

- novel 3D printing process
- Yizumi SpaceA hybrid manufacturing cell
- cost-effective standard granulates
- high build-up rates



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Additive Manufacturing System Voxeljet VX200 HSS

Performance

- High-speed sintering process
- Powder-bed-based process
- tool-free generation of complex structures
- From prototypes to small series

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Load Test Laboratory Component and Sample Testing

Performance

- Quasi-static load testing up to 250 kN
- Dynamic loading at resonant frequency
- Ageing tests in the climate chamber
- Sample preparation

- Maximum test load 250 kN
- Working temperature range -40 °C to 250 °C
- Traversal speeds from 0.0005 mm/min to 600 mm/min

- Maximum test load ±30 kN
- Maximum dynamic load 30 kN (±15 kN)
- Frequency range 35 Hz to 300 Hz

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Corrosion Testing Laboratory

Areas of application and unique characteristics:

- Carrying out climate change, salt spray and condensation water tests
- VDA 233-102, ISO 3768, ISO 9227, DIN EN ISO 9227 or DIN EN ISO 6270-2 as well as climate change test standards
- Tests according to international standards
- Individual test conditions
- Corrosion Testing
  - Carrying out climate change, salt spray and condensation water tests
  - VDA 233-102, ISO 3768, ISO 9227, DIN EN ISO 9227 or DIN EN ISO 6270-2 as well as climate change test standards
  - Tests according to international standards
  - Individual test conditions

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Temperature and Strain Measurement using Fiber Optic Sensors

Performance

- Strain and temperature at high resolution
- Luna ODiSI 6102
- Simultaneously usable fiber optic channels: 2
- Local resolution: up to 1500 measuring points per meter of sensor fiber; adjustable measuring point distance
- Temperature measuring range: -40 to 200 °C
- Optical sensor fiber: Glass fiber with polyimide coating

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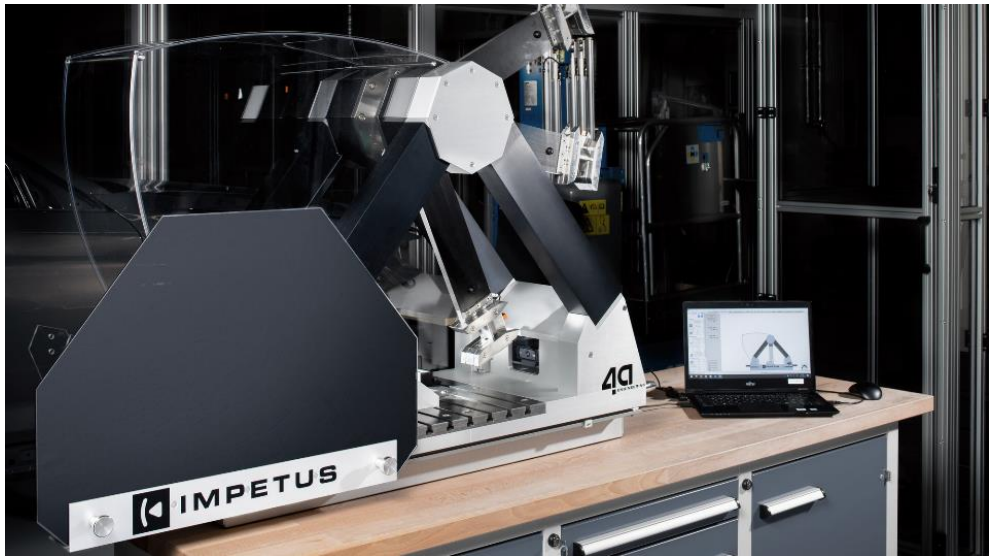
Automated Material Card Derivation for Crash Simulation

Performance

- Available test setups: 3-point bending, tensioned bending, dynamic tensile, puncture, compression and component tests
- Applicable for plastics, fiber-reinforced plastics, foams & aluminum alloys [in limited quantities steel]
- Measurement of different strain rates by adjusting the support distance and the connection boundary conditions
- Impact velocities between 0.5 - 4.4 m/s, a maximum impact mass of 5.5 kg [impact energies up to 50 J]
- Measurements can be carried out with Digital Image Correlation [DIC]Extension by user-specific material models and sample geometries possible
- Automated material map derivation for different FE solvers (LS-DYNA©, Pam-Crash©) possible



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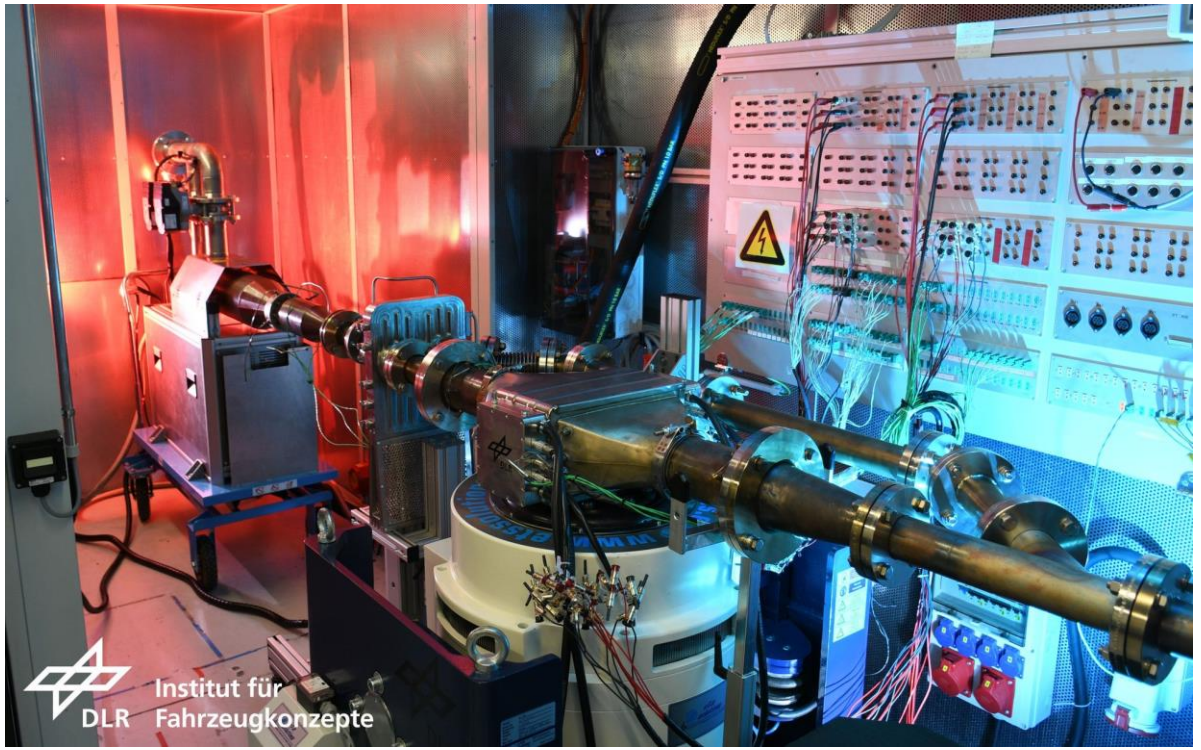
Hot Gas Test Bench

Performance

- Modular test bench enables the simulation of all relevant system components
- The component test stand is used to determine the thermal properties of individual components of the heat recovery systems
- Hot-gas burner
  - Output: 2-200 kW
  - Temperature range: 100-1200 °C
  - Mass flow: 30-1000 kg/h
- Further testing facilities:
  - Shaker
  - Long-term test bench



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Joining Laboratory

Testing facilities

- Blind riveting tool
- Hardness and strength testing machine
- High-speed bolt setting device
- Equipment for adhesive joining
- Flow-drill screwing System
- Self-piercing riveting and clinching system

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Vehicles

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The Sensor, Computer and Actuator Architecture of the Automotive Foundation Model (AFM)

Performance

- Full Drive-By-Wire Kit (DBW)
- High Performance Rapid Control Prototyping (RCP) System
- Multi GPU accelerated AI Computing Platform
- High Resolution Lidar Sensors
- Prototype Radar Sensor System (under development)
- Custom Prototype Semi-active Dampers Control System
- High Precision IMU/GNSS System
- Mobile Base Station for dGPS Signal Generation
- Intelligent Power Distribution System (PDS)

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AI For Mobility - RObOMObil

Performance

- DLR’s space-robotics electro-mobile
- Driven-by-wire research platform for mechatronic actuators
- research platform vehicle dynamics control,
- Human machine interfaces
- AI-based
- Autonomous driving

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Workshop for Vehicle Prototypes

Fully equipped vehicle workshop:

- Tire balancer
- Tire changer
- Large stock of hand machines and tools
- Conventional lathe
- Conventional milling machine
- Column drilling machine
- Launch diagnostic device
- Mobile lifting platform
- Brake bleeding device
- Air conditioning service unit
- Wheel aligner
- Quick start charger

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