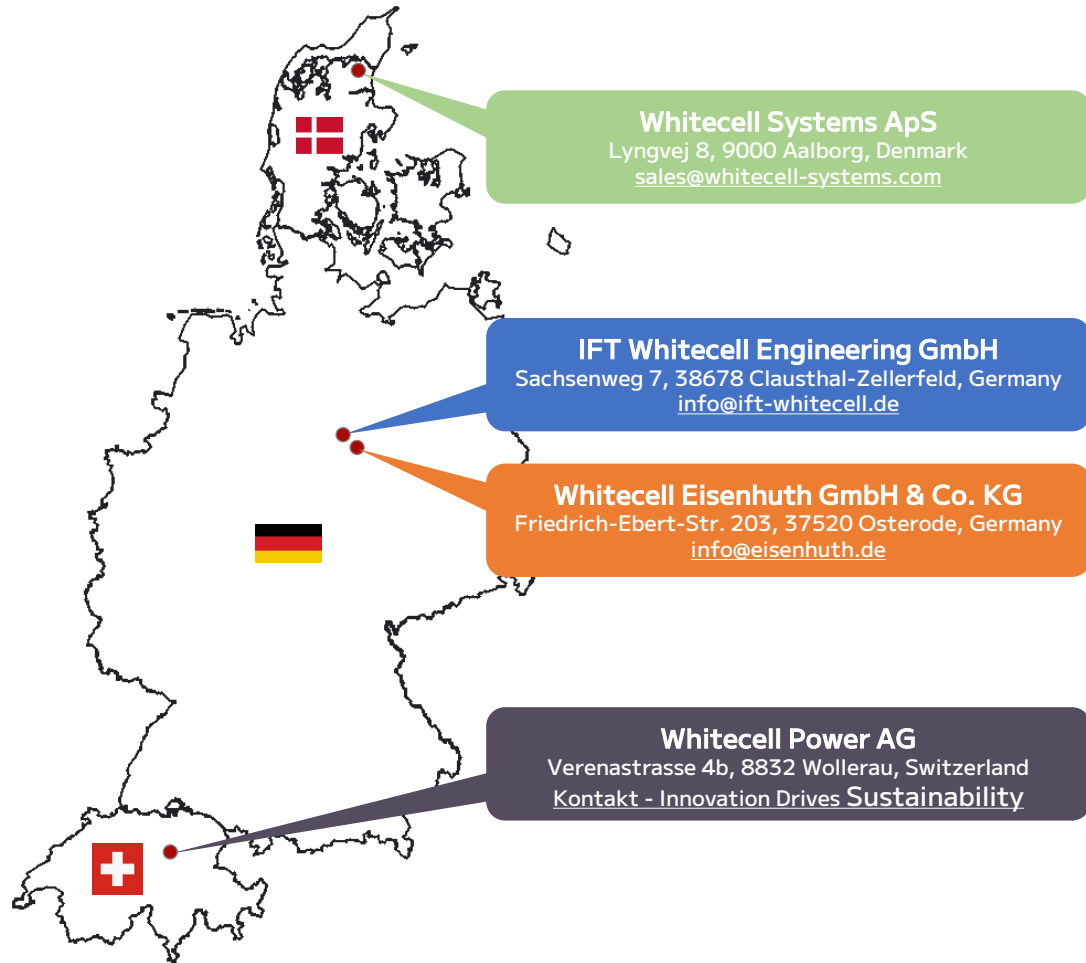




Clausthal-Zellerfeld



Whitecell Group

A total of 140 employees,
revenue approx. EUR 18 million (2025)

- ▶ **Whitecell Power AG:** Parent company.
- ▷ **Whitecell Systems:** Development and production of systems for the green methanol and hydrogen economy, and supplier of high-quality fuel cell and electrolyzer components.
- ▷ **IFT Whitecell Engineering:** Engineering and testing services for research and industry, offering development and testing expertise.
- ▷ **Whitecell Eisenhuth:** Production of components and stacks for fuel cells and electrolyzers, injection molding tools, small-series plastic, silicone & rubber parts, and 3D printing. Winner of multiple innovation awards in the fields of hydrogen and fuel cells.

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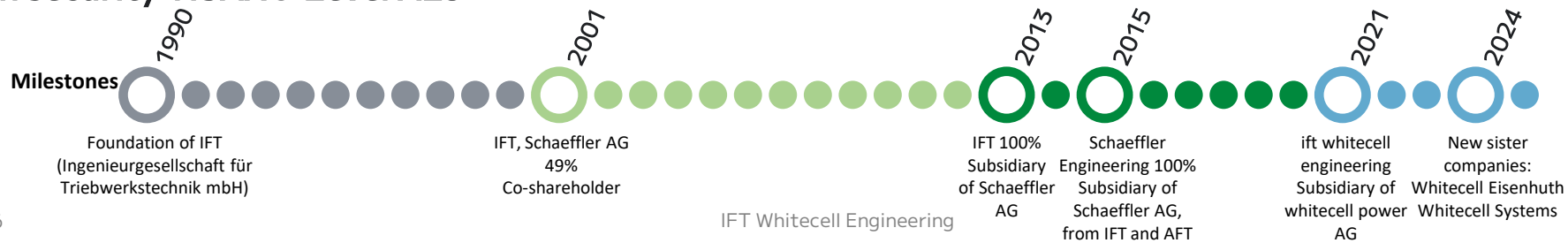
Profile

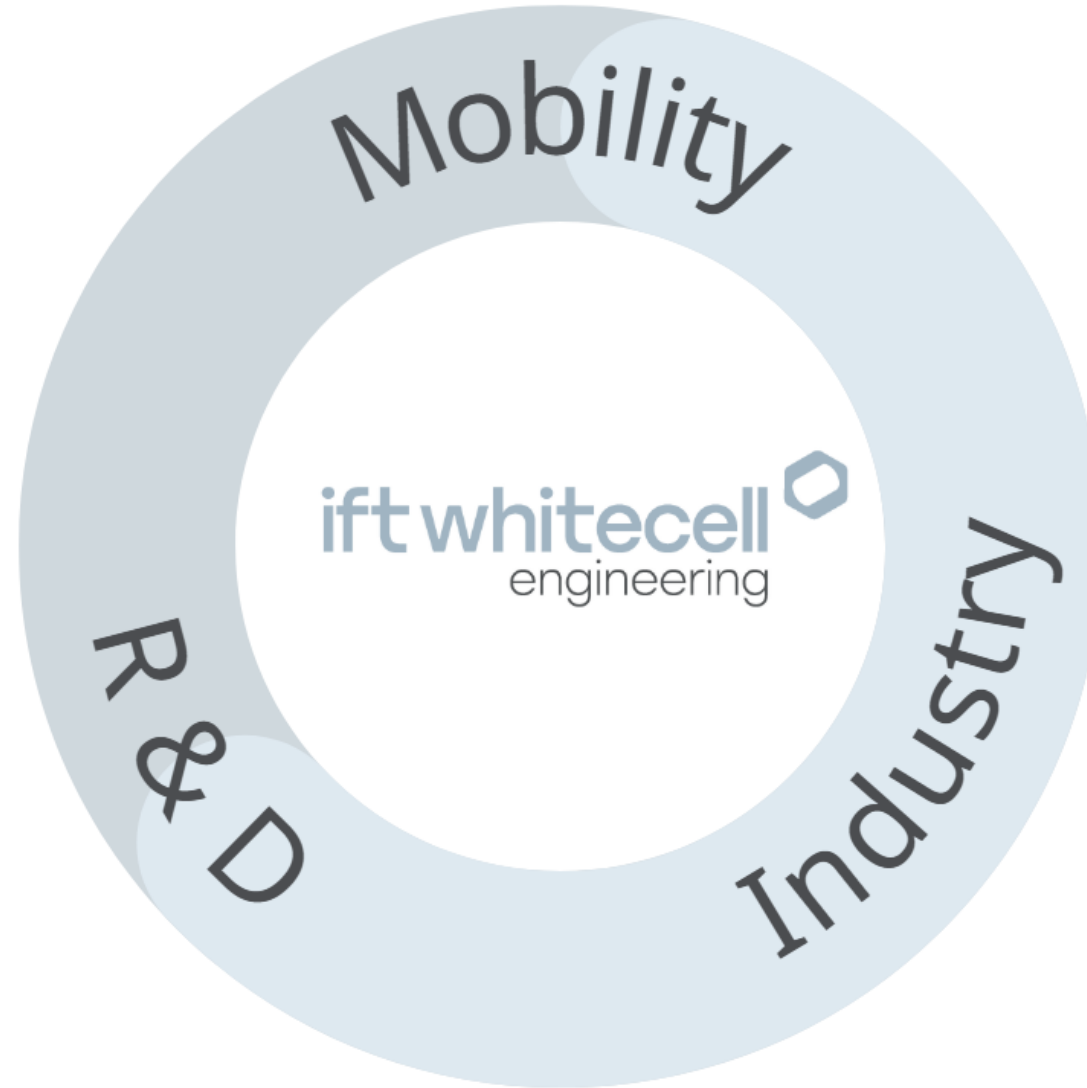
Engineering:

- ▶ 49 Employees
- ▶ Total area: 13.079 m²
- ▶ 800 m² Test field with >45 Test cabins
- ▶ Engineering
- ▶ Functions test
- ▶ Endurance test
- ▶ Environmental tests
- ▶ Fatigue Strength tests
- ▶ Tribology
- ▶ Analysis
- ▶ Test Rig Construction

Certified:

- ▶ DIN EN ISO 9001:2015
- ▶ Information security TISAX® Level AL3





Examples of business areas

Mobility:

- ▶ Internal combustion engines
- ▶ Fuel cells
- ▶ Electric motors
- ▶ Powertrains
- ▶ Components
- ▶ Assemblies
- ▶ ...

Industry:

- ▶ Robotics
- ▶ Rail transport
- ▶ Shipping
- ▶ Defense
- ▶ Medical technology
- ▶ Mechanical engineering
- ▶ Energy
- ▶ ...

R & D:

- ▶ Pre development
- ▶ Prototypes
- ▶ Samples
- ▶ Product improvement
- ▶ Analysis
- ▶ ...

Testing of:

- ▶ Internal combustion engines, for example passenger cars, motorcycles, chainsaws, rail vehicles, ...
- ▶ Electric motors and power electronics
- ▶ Powertrains of all kinds
- ▶ Components and assemblies such as valve trains, control units, auxiliary units, control chains, belts
- ▶ Electromechanical actuators
- ▶ Hoses
- ▶ Cables, connectors, circuit boards
- ▶ Thermal management and cooling system components
- ▶ Pumps
- ▶ Hydraulic components
- ▶ Generators
- ▶ Solar trackers
- ▶ Gearboxes
- ▶ Power distributors
- ▶ Rotary actuators for robotics
- ▶ Clutches
- ▶ Bearings
- ▶ Lubricants
- ▶ Air conditioning compressors
- ▶ Bearings
- ▶ Fuel cells, for example for critical infrastructure, power plants, shipping, range extenders, energy storage systems
- ▶ Reformers
- ▶ Innovative electric vehicles
- ▶ And much more

Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
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Component Test Field

High Dynamic Drives

Radionuclide Technology

Engine Test Field

Powertrain Test Field

Environment Test Field

Wear & Friction Test Rigs

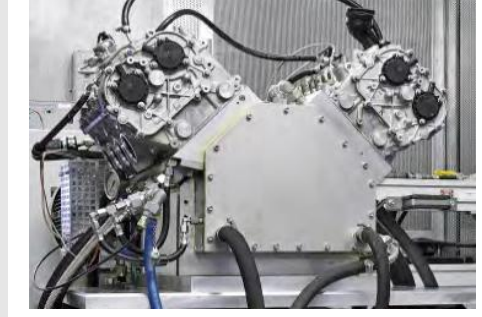
Material & Measuring Laboratory

Fatigue Strength Test Field



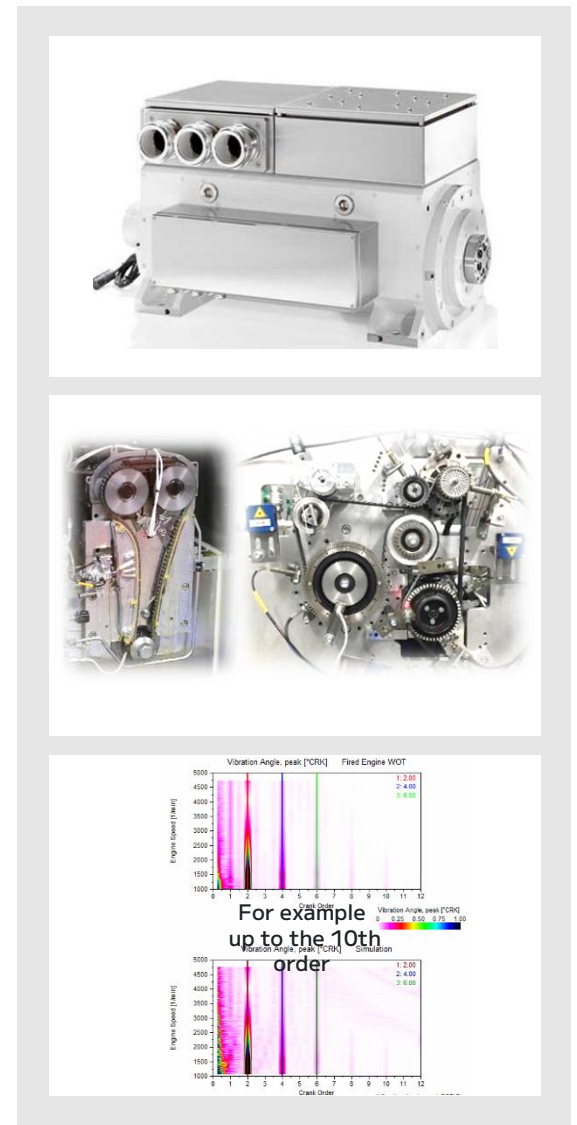
**Range of Services
Testing & Engineering**

Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment		Infrastructure		
Radionuclide Technology		<ul style="list-style-type: none"> • 45 test cells • 85 component test rigs • Powered up to 100kW • Speed up to 19.000 rpm • Modular test rig concept • 24/7 operation • High dynamic rigs 		<ul style="list-style-type: none"> • Cooling circuit -44°C • Energy recovery • Battery simulation 800V / 600A / 160kW • Own test bench construction for special applications 		
Engine Test Field		SPECIAL FEATURES				
Powertrain Test Field		Load		Measuring		
Environment Test Field		<ul style="list-style-type: none"> • Medium contamination: dirt, soot, foaming, fuel, acid • Thermal load: -40°C up to 160°C • Mechatronic load: high-speed, speed gradient > 10.000rpm/s • Test environment like mechanical, electrical and hydraulic operation parameters (Virtual ICE) 		<ul style="list-style-type: none"> • Mechanical, thermodynamic, hydraulic, acoustic, optical and electrical measurement • Delta analyzer • 10x ROTEC Measurements Systems for torsional vibrations, temperature, acceleration, velocity and sound • Pre- and post-analysis • Wear measurement via RNT • Micro movement via laser, encoder, RNT 		
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						

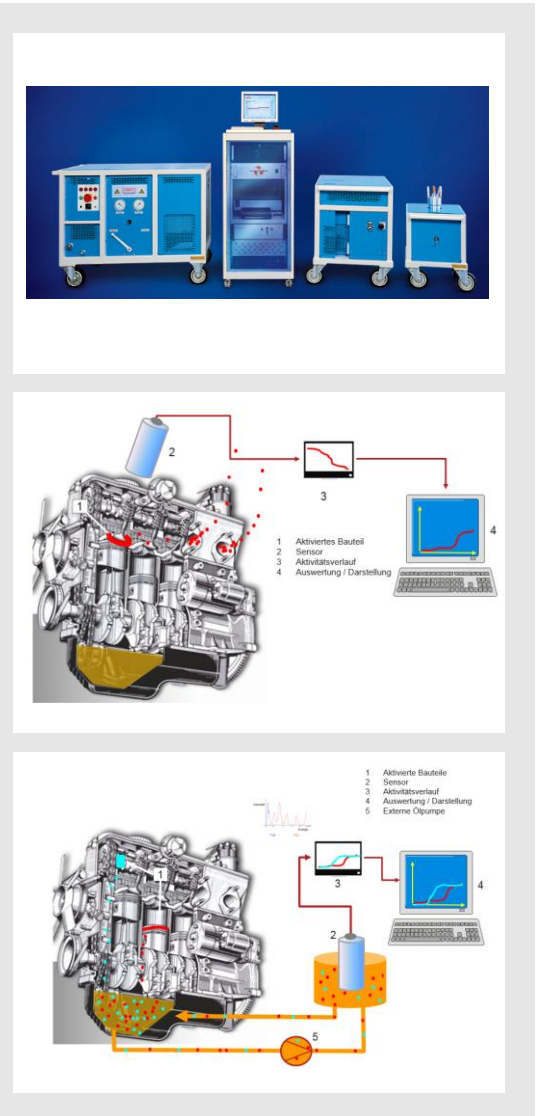


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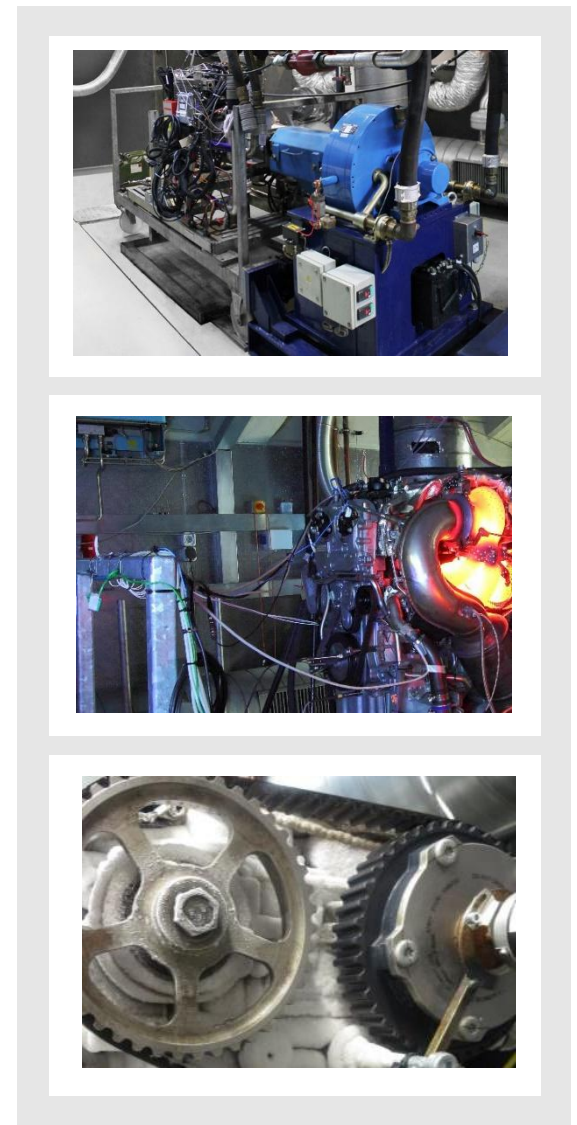
Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment <ul style="list-style-type: none"> ETAS Inca DiagRA Vispiron Rotec In-house developed programmable logic controller MATLAB® 		Infrastructure <ul style="list-style-type: none"> 3 High Dynamic Drives up to 600 kW +/- 1.200 Nm alternating torque Vibration velocity: 1,8 mm/s Very low rotor moment of inertia: 0.116 kgm² Gradient up to 60.000 1/min/s Rotational speed up to 10.000 1/min Battery simulation 800 V / 600 A / 160 kW 		
Radionuclide Technology		SPECIAL FEATURES				
Engine Test Field		Operations <ul style="list-style-type: none"> Angle-synchronous signal reproduction Full frequency spectrum < 500 Hz Adjustable Amplitudes (orders/frequencies) Combined operation with fired engine Reproduction of road surfaces/tyre types Functional & endurance tests Full path open ECU 		Measuring <ul style="list-style-type: none"> All physical measuring values Dynamics (angle-/time-based) NVH (acoustics & vibration) Torsional Vibration Wear measurement via surface scan Wear measurement via RNT Delta Analyzer 		
Powertrain Test Field						
Environment Test Field						
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment <ul style="list-style-type: none"> RNT handling permit for test field and measuring room Manufacturer: Zyklotron AG Karlsruhe (ZAG) Model: RTM 2000 3 x scintillation vendors 3 "x 3" NaJ (TI) 2 x measuring windows (Co-57 and Co-56, or comparable gamma energies) 		Infrastructure <ul style="list-style-type: none"> Concentration measuring system (KMA), for measuring the wear particles in the oil flow Filter measuring system (FMA), for measuring the particles separated in the oil filter Reference measuring system (RMA), for referencing a known sample with short half-lives 		
Radionuclide Technology		SPECIAL FEATURES				
Engine Test Field		Operations <ul style="list-style-type: none"> Ferrous materials Alloy metals, like Molybdenum, Tungsten, Vanadium, Non-Ferrous metals, e.g. Copper Bearing metals, e.g. Lead, tin, zinc Aluminium, if at least 5% copper is contained (activation takes place via the copper) Titanium Sintered metals, hard metals 		Measuring <ul style="list-style-type: none"> Ceramic materials (Al_2O_3, SiC, Si_3N_4, ZrO_2) Plastics and lubricating varnishes, DLC coatings via storage of Be-7 Thin film differential measurement method (DMV) Concentration measurement method (KMV) Wear measurements in the Nm/h range Motion measurements at optically inaccessible locations (piston ring rotation, floating bush rotation) 		
Powertrain Test Field						
Environment Test Field						
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						

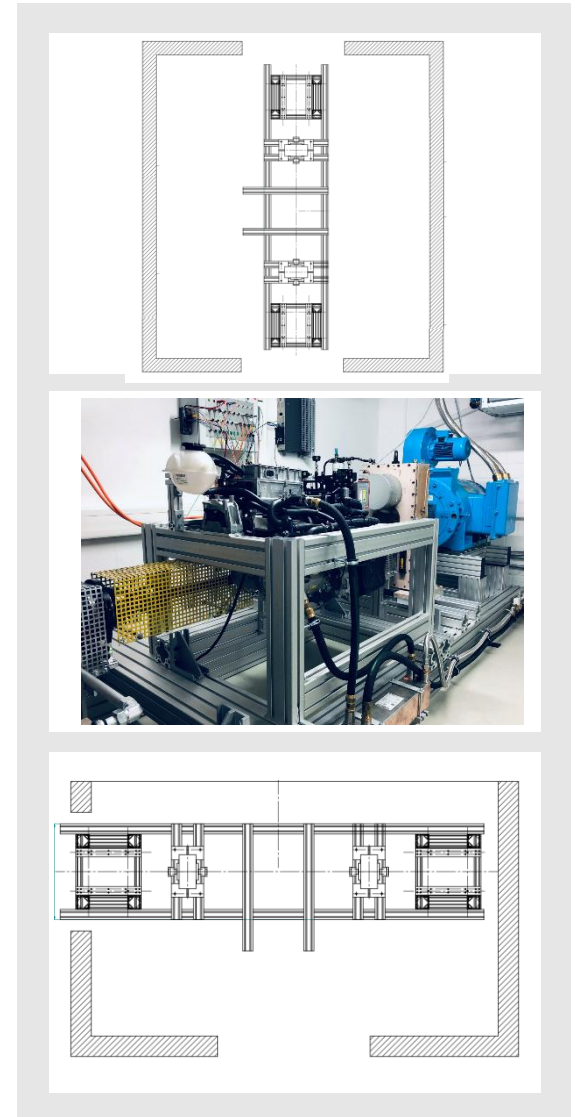


Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment		Infrastructure		
Radionuclide Technology		<ul style="list-style-type: none"> • 5 fired engine test rigs • 450kW / 1.000Nm / 10.000rpm • Battery simulation 800V / 600A / 160kW • automation: SARA & own system 		<ul style="list-style-type: none"> • Cooling chamber • Common/special fuel infrastructure • Battery simulation 800V / 600A / 160kW 		
Engine Test Field		SPECIAL FEATURES				
Powertrain Test Field		Operations		Measuring		
Environment Test Field		<ul style="list-style-type: none"> • Functional & endurance tests • Thermodynamic test rigs • High dynamic Rigs • Full engine / motored engine (parts) 		<ul style="list-style-type: none"> • All physical measuring values • All dedicated process values (online/offline) • Dynamics (angle-/time-based) • NVH (acoustics & vibration) • All relevant emissions • Delta analyzer • Torsional vibrations • Indicated pressure & knock detection • Wear measurement via surface scan • Wear measurement via RNT 		
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



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Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment		Infrastructure		
Radionuclide Technology		<ul style="list-style-type: none"> • 2 powertrain test rigs (2/3 EM) • Power-range up to 2.250Nm / wheel • Rig automation: SARA & own system 		<ul style="list-style-type: none"> • Cooling chamber • Battery simulation 800V / 600A / 160kW 		
Engine Test Field		SPECIAL FEATURES				
Powertrain Test Field		Operations		Measuring		
Environment Test Field		<ul style="list-style-type: none"> • Functional & endurance tests • High dynamic rigs for engine simulation • Driving Strategy • Transmission calibration • Powertrain validation • Vehicle testing 		<ul style="list-style-type: none"> • All physical measuring values • All dedicated process values (online/offline) • Dynamics (angle-/time-based) • NVH (Acoustics & Vibration) • All relevant emissions • Indicated pressure & knock detection • Wear measurement via surface scan • Wear measurement via RNT • Delta analyzer 		
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment		Infrastructure		
Radionuclide Technology		<ul style="list-style-type: none"> Climatic chambers -40° to 200°C Coolant or oil temperature -40° to 135 °C Independent control of ambient and medium Humidity control 0...100% Shaker up to 40 kN 		<ul style="list-style-type: none"> Cooling circuit -44°C Energy recovery Battery simulation 800V / 600A / 160kW Hydraulic power rail Own test bench construction for special applications 		
Engine Test Field		SPECIAL FEATURES				
Powertrain Test Field		Operations		Measuring		
Environment Test Field		<ul style="list-style-type: none"> Control of various actuators (LIN,CAN,SENT...) Functional & endurance tests LV124/VW80000 Vibration Mechanical shock Mechanical, electrical & hydraulic misuse 		<ul style="list-style-type: none"> All physical values All simulated values Simulation ↔ Rig All dedicated process values (online/offline) Dynamics (angle-/time-based) NVH (acoustics & vibration) Wear measurement via surface scan Wear measurement via RNT 		
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



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Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment <ul style="list-style-type: none"> • 15 wear test rigs (rotational, translational) • 1 tribometer MTM • Online wear: RNT (Radio Nuclide Technology) • High dynamic rotational friction rig • Micro friction & sealing rig 	Infrastructure <ul style="list-style-type: none"> • < 350 m² testing area for wear test & friction • High-resolution measuring technology & data evaluation • Own test bench construction for special applications • Own photo labs, measuring rooms, materials laboratory... 			
Radionuclide Technology		SPECIAL FEATURES				
Engine Test Field		Load <ul style="list-style-type: none"> • Medium contamination: dirt, soot, foaming, fuel, acid • Thermal load: -40°C up to 160°C • Mechatronical load: High-speed, speed gradient > 10.000rpm/s • Test environment similar to mechanical, electrical and hydraulic operation parameters (Virtual ICE) 	Measuring <ul style="list-style-type: none"> • All physical measuring values • All simulated values • Simulation ↔ Rig • All dedicated process values (online/offline) • Dynamics (angle-/time-based) • NVH (acoustics & vibration) • Wear measurement via surface scan • Wear measurement via RNT 			
Powertrain Test Field						
Environment Test Field						
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



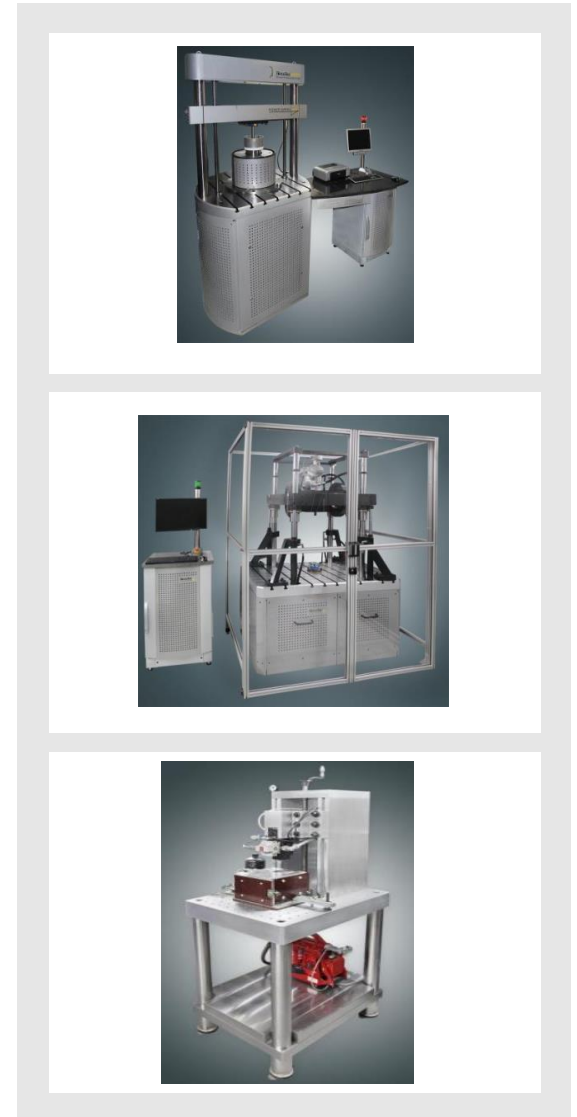
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Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment		Infrastructure		
Radionuclide Technology		<ul style="list-style-type: none"> • 3D measuring machine, Roundness, Straightness, Roughness measurement • Transmitted light measurement • Photo microscopes • Hardness measurement • Material-laboratory-Microscope • REM use on request 		<ul style="list-style-type: none"> • Materials laboratory with chemistry suction cupboard • Material Cutting Device • Embed and Grind Device • Photo laboratory 		
Engine Test Field		SPECIAL FEATURES				
Powertrain Test Field		Operations		Measuring		
Environment Test Field		<ul style="list-style-type: none"> • Return Part Analysis on individual components (timing chain, valve train, transmission ...) with system view and system understanding • Approval for measurement on RNT parts available 		<ul style="list-style-type: none"> • All physical measurements tactile and optical • Material examination and assessment 		
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						



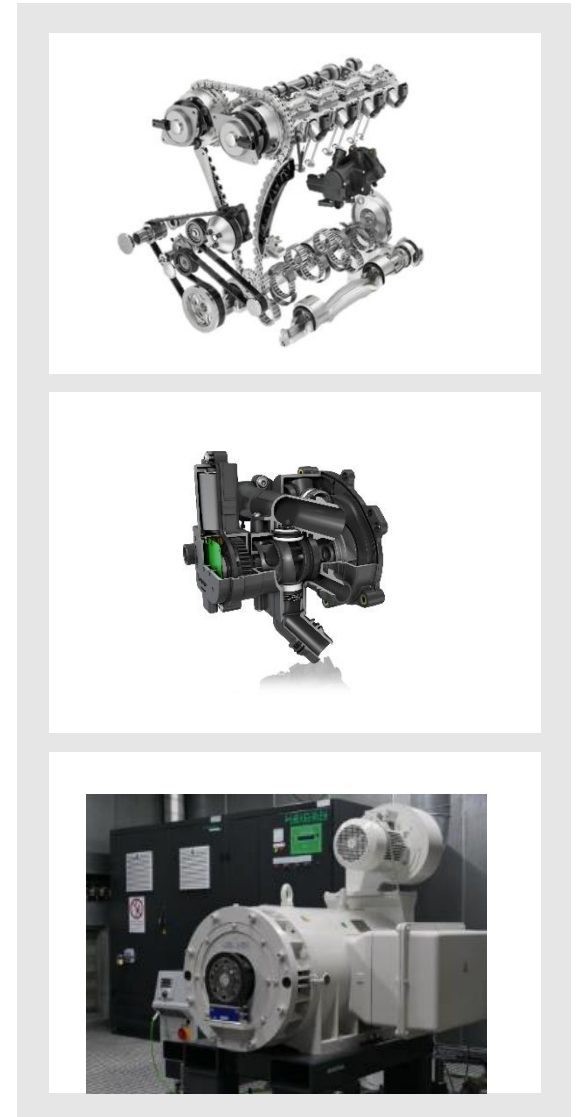
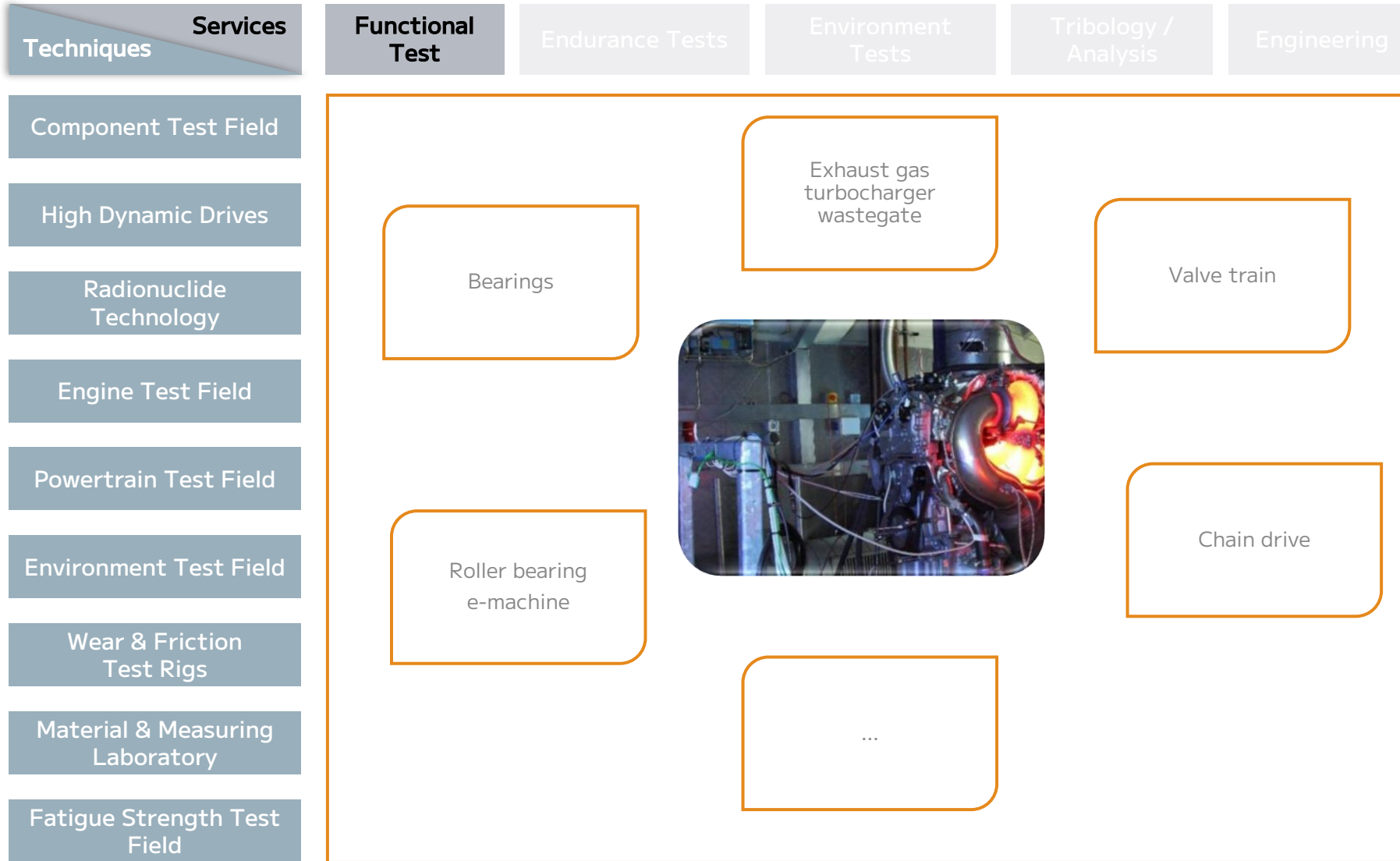
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Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
Component Test Field		TECHNIQUE				
High Dynamic Drives		Equipment <ul style="list-style-type: none"> • Resonance pulsators up to 20 kN • Resonance pulsators up to 100 kN • Resonance magnetic test system up to 20 kN • Hydraulic system up to 7 kN and 500 Hz • Hydraulic system up to 20 kN and 150 Hz 		Infrastructure <ul style="list-style-type: none"> • Own photo labs, measuring rooms, materials laboratory... 		
Radionuclide Technology		SPECIAL FEATURES				
Engine Test Field		Services for Automotive Customers <ul style="list-style-type: none"> • Dynamic strength tests • Service strength tests • Crack detection and damage analysis • Lifetime valuation • Environmental simulation (-40 up to 160°C) 		Measuring <ul style="list-style-type: none"> • All physical measurements tactile and optical • Material examination and assessment 		
Powertrain Test Field						
Environment Test Field						
Wear & Friction Test Rigs						
Material & Measuring Laboratory						
Fatigue Strength Test Field						

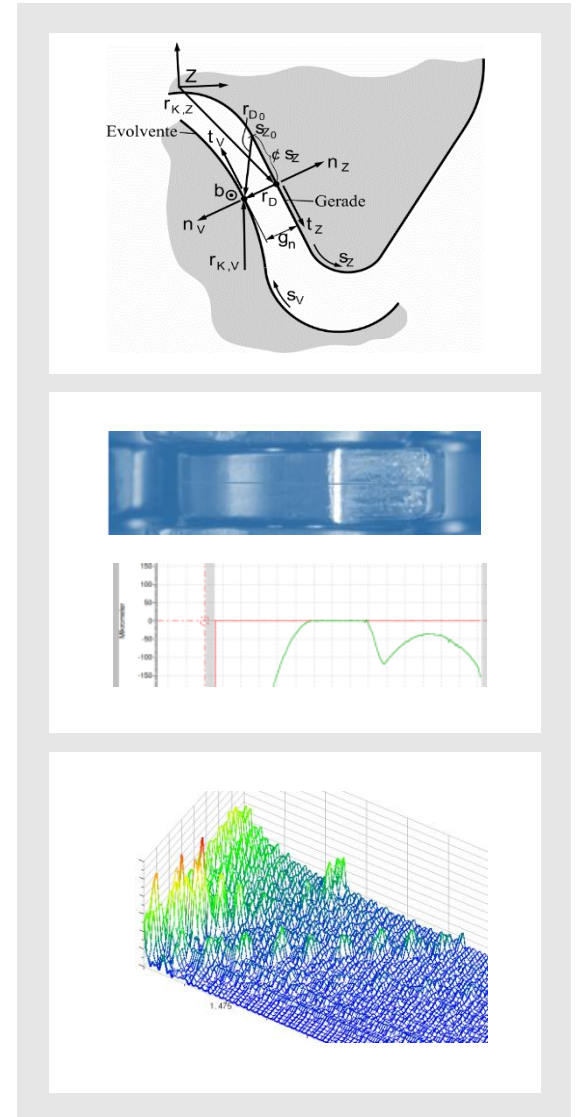
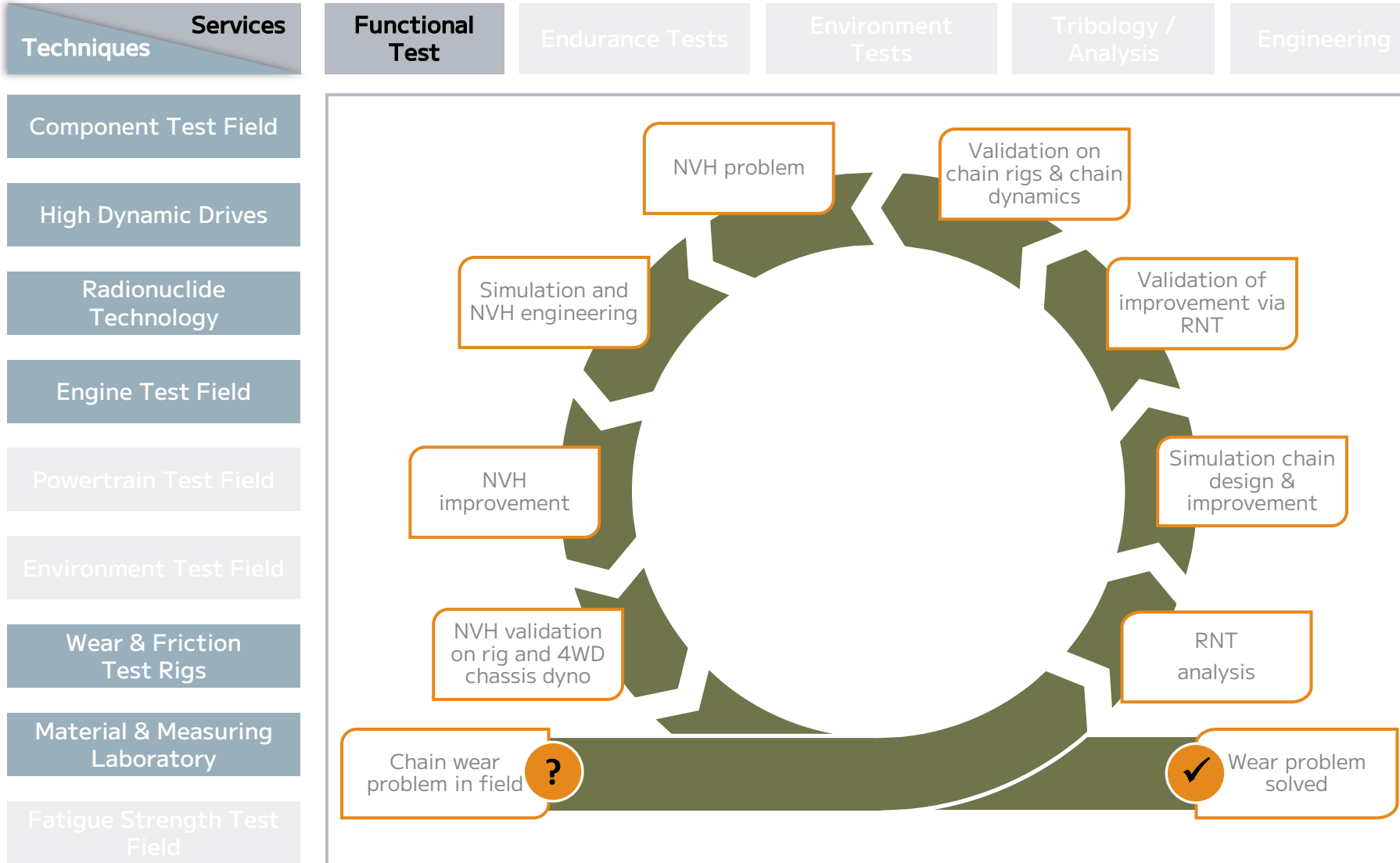


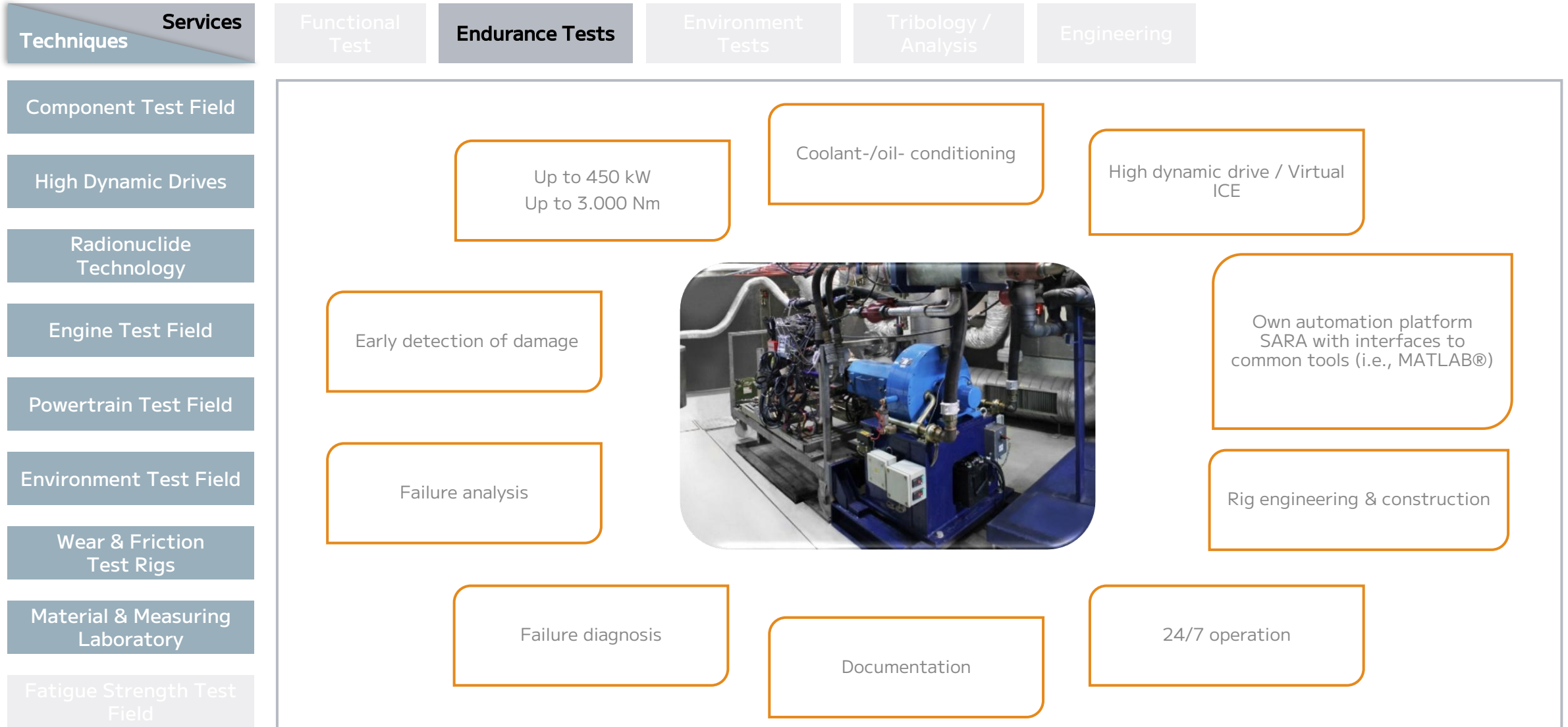
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Validation
Functional Test / Example



Validation Functional Test / Example



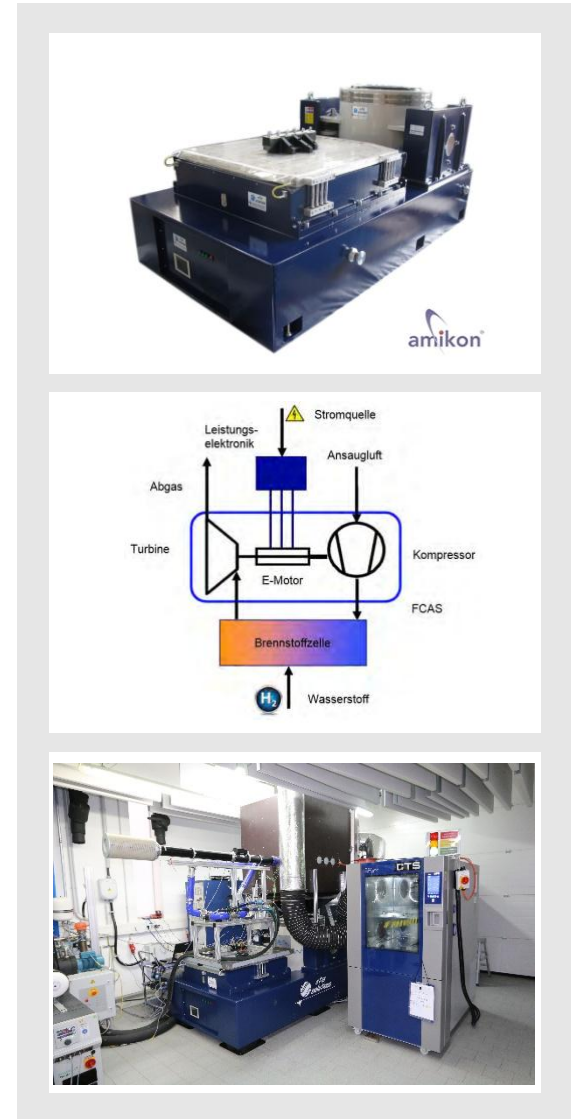
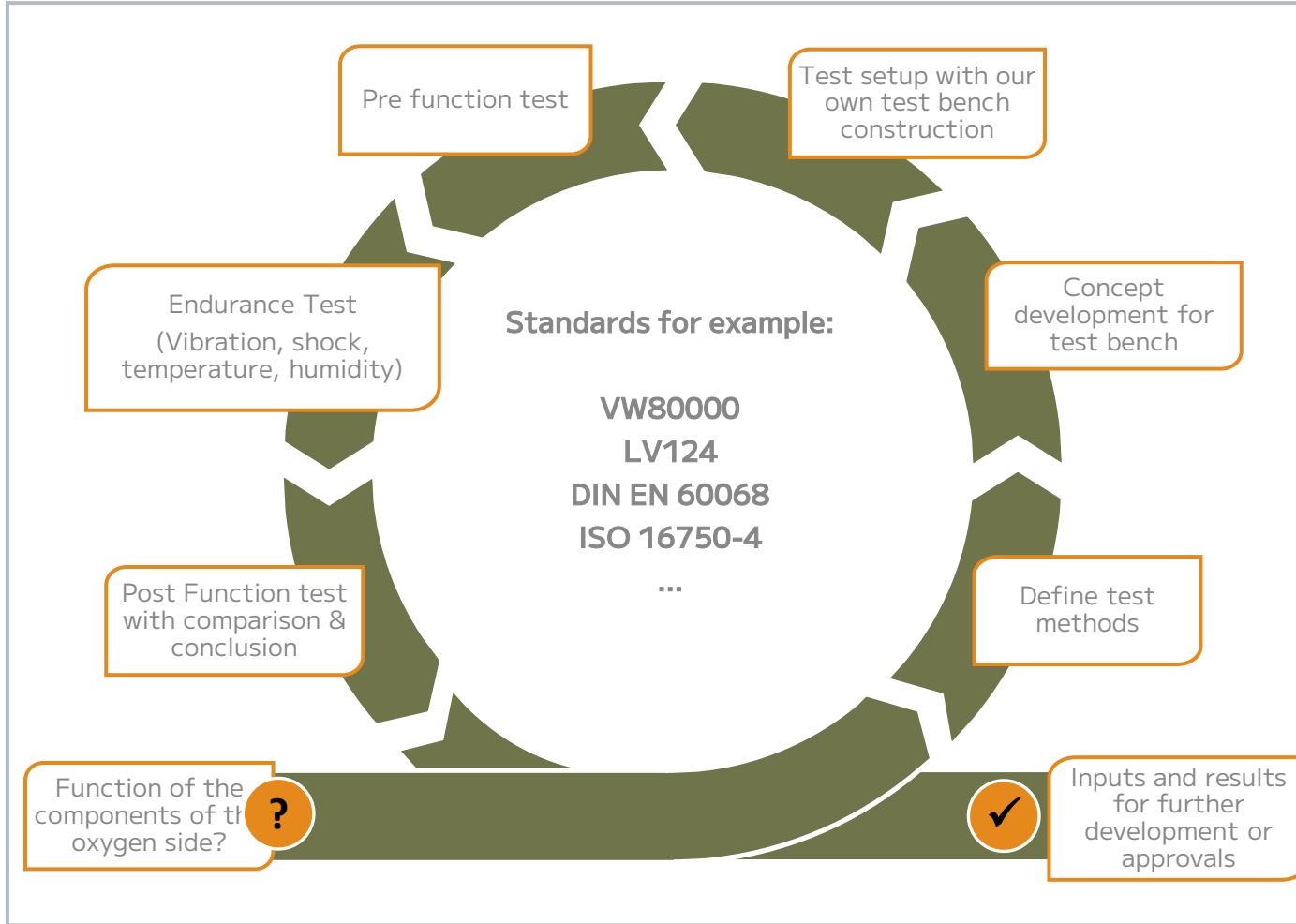


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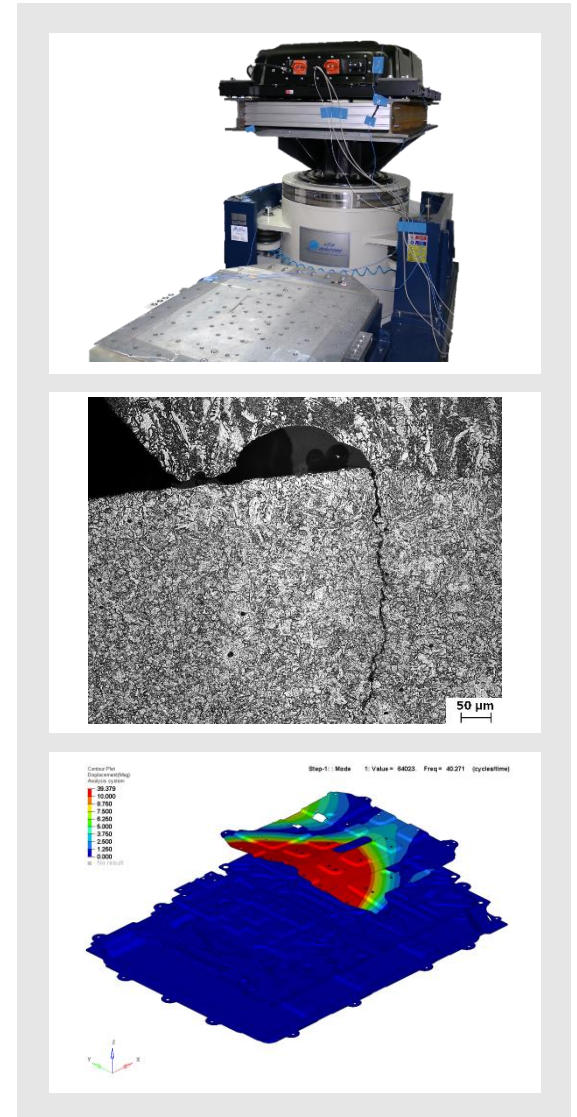
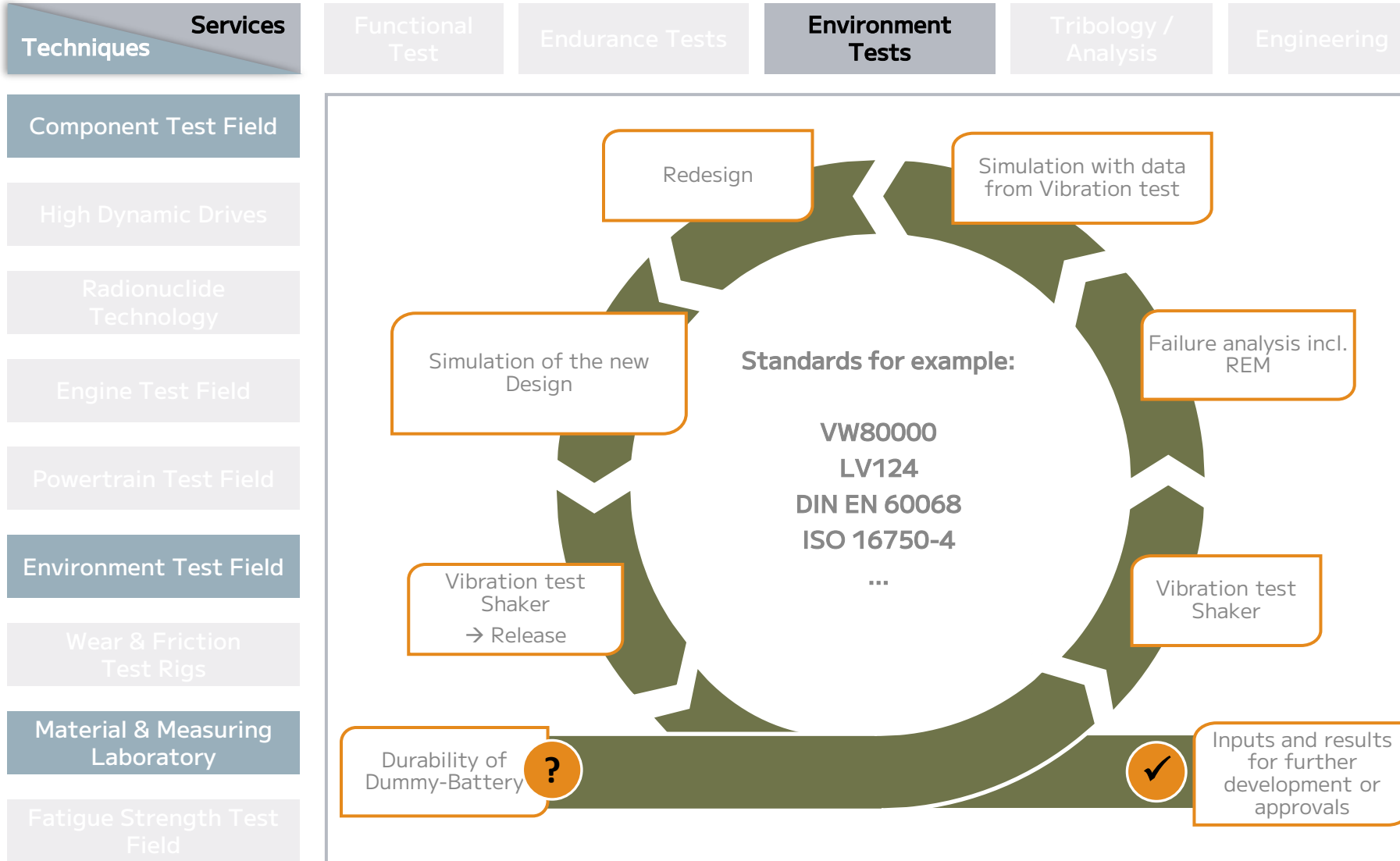
Environment Test / Example: Oxygen Supply for Hydrogen Fuel Cell

Techniques	Services				
	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering

- Component Test Field
- High Dynamic Drives
- Radionuclide Technology
- Engine Test Field
- Powertrain Test Field
- Environment Test Field**
- Wear & Friction Test Rigs
- Material & Measuring Laboratory
- Fatigue Strength Test Field



Environment Test / Example: Vibration test Dummy Battery



Tribology, Analysis / Example: Benchmark Wastegate Actuator



Component Test Field

High Dynamic Drives

Radionuclide Technology

Engine Test Field

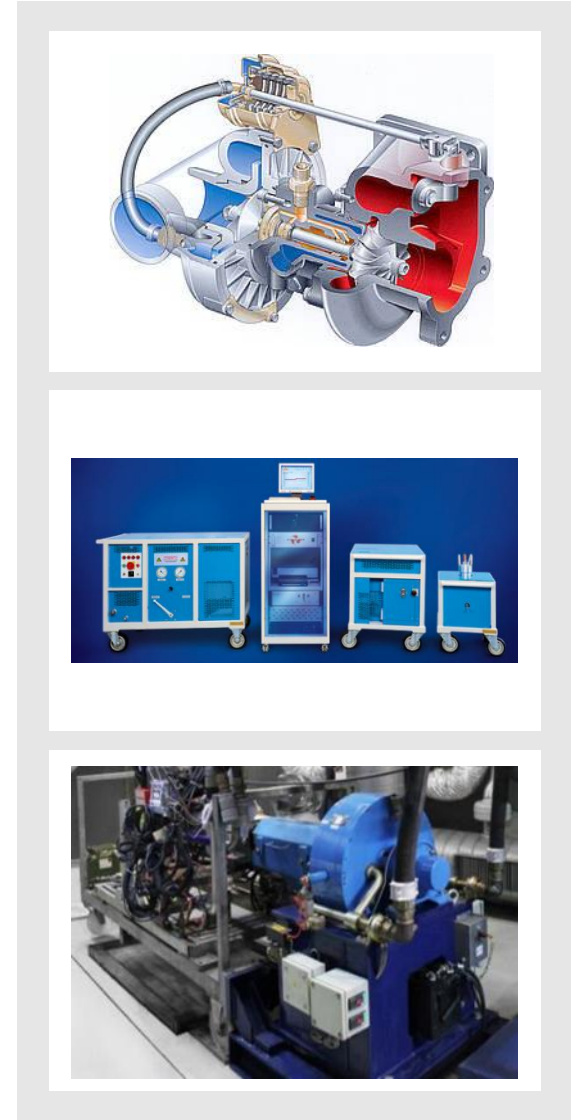
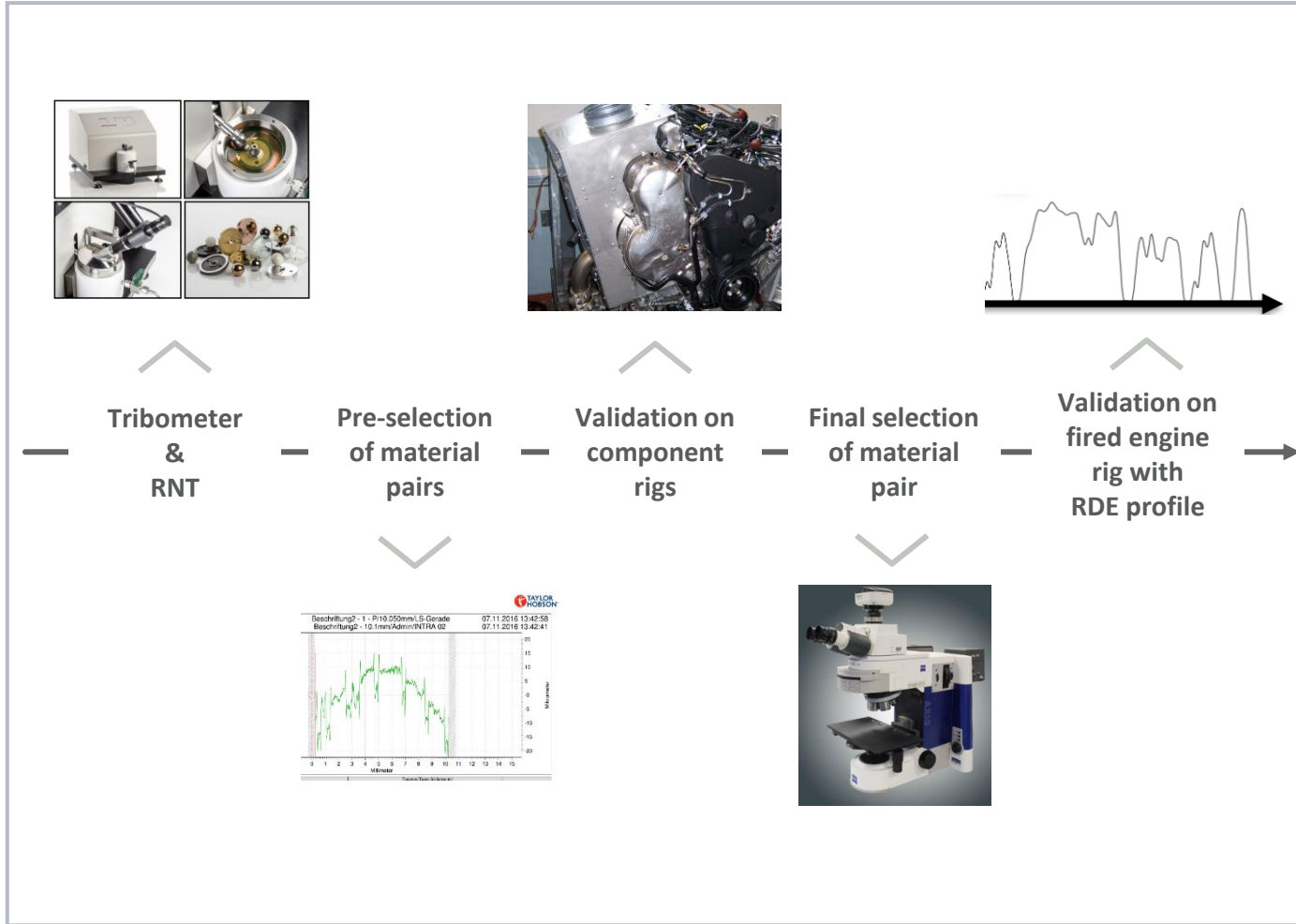
Powertrain Test Field

Environment Test Field

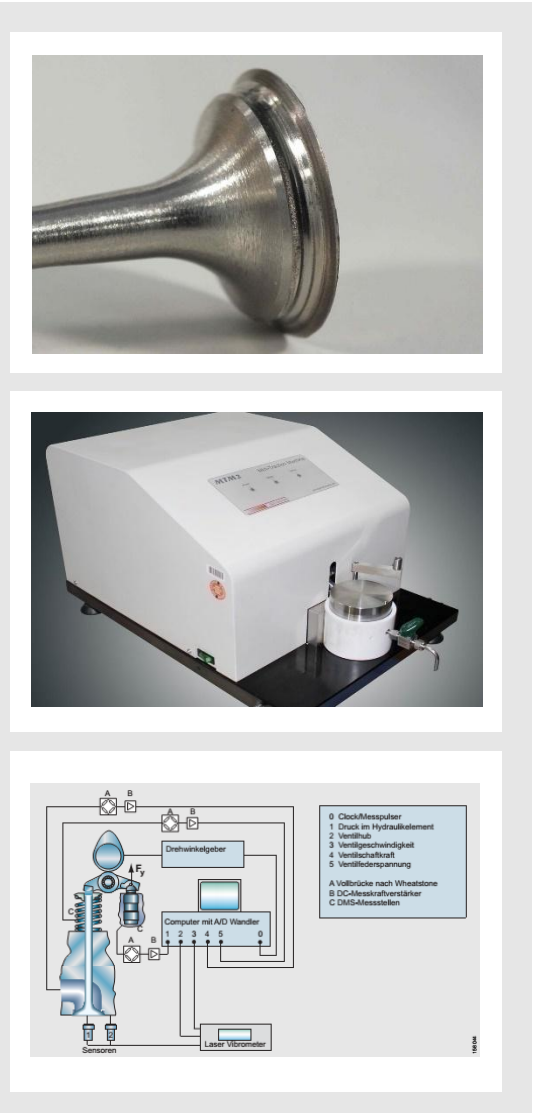
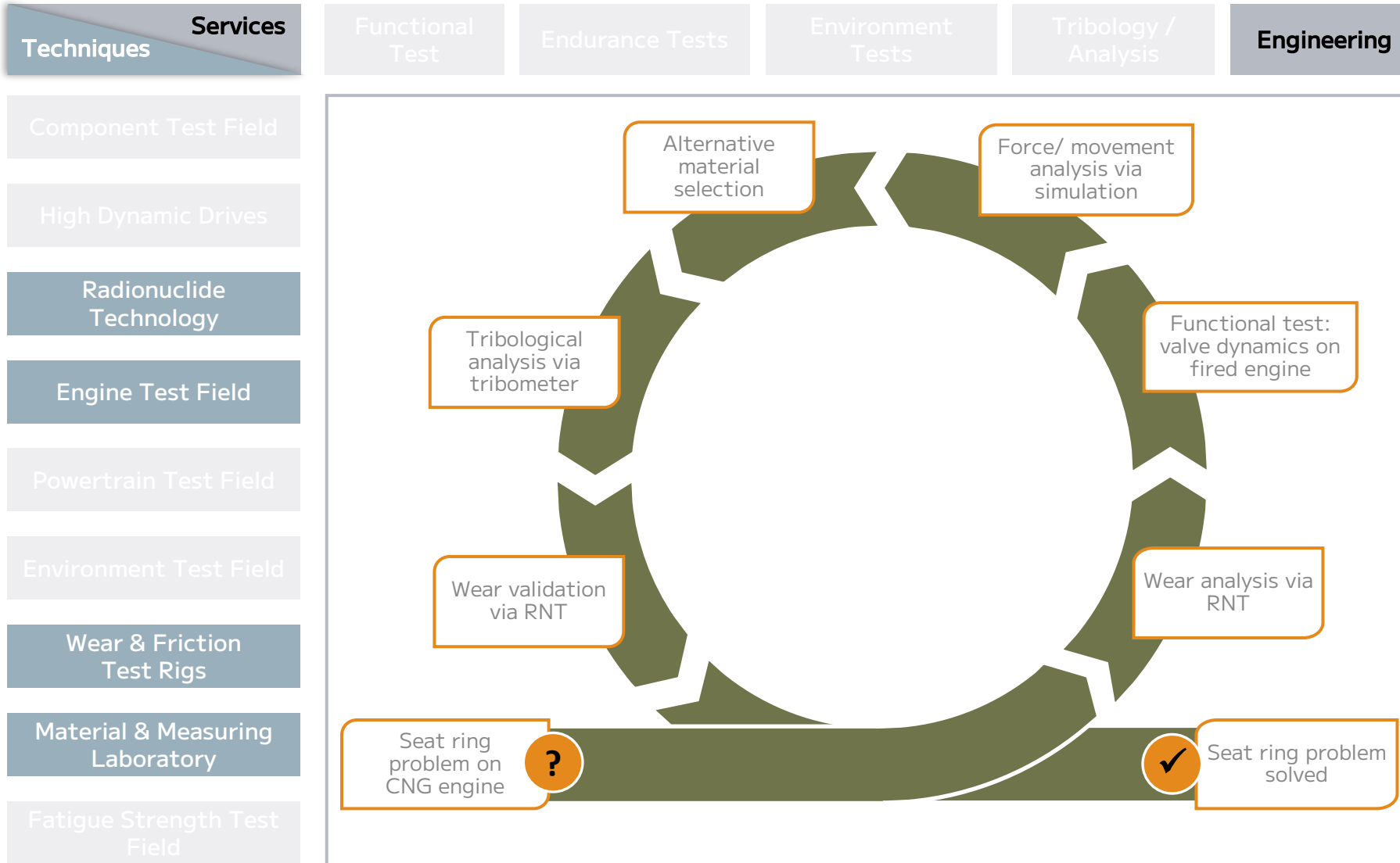
Wear & Friction Test Rigs

Material & Measuring Laboratory

Fatigue Strength Test Field



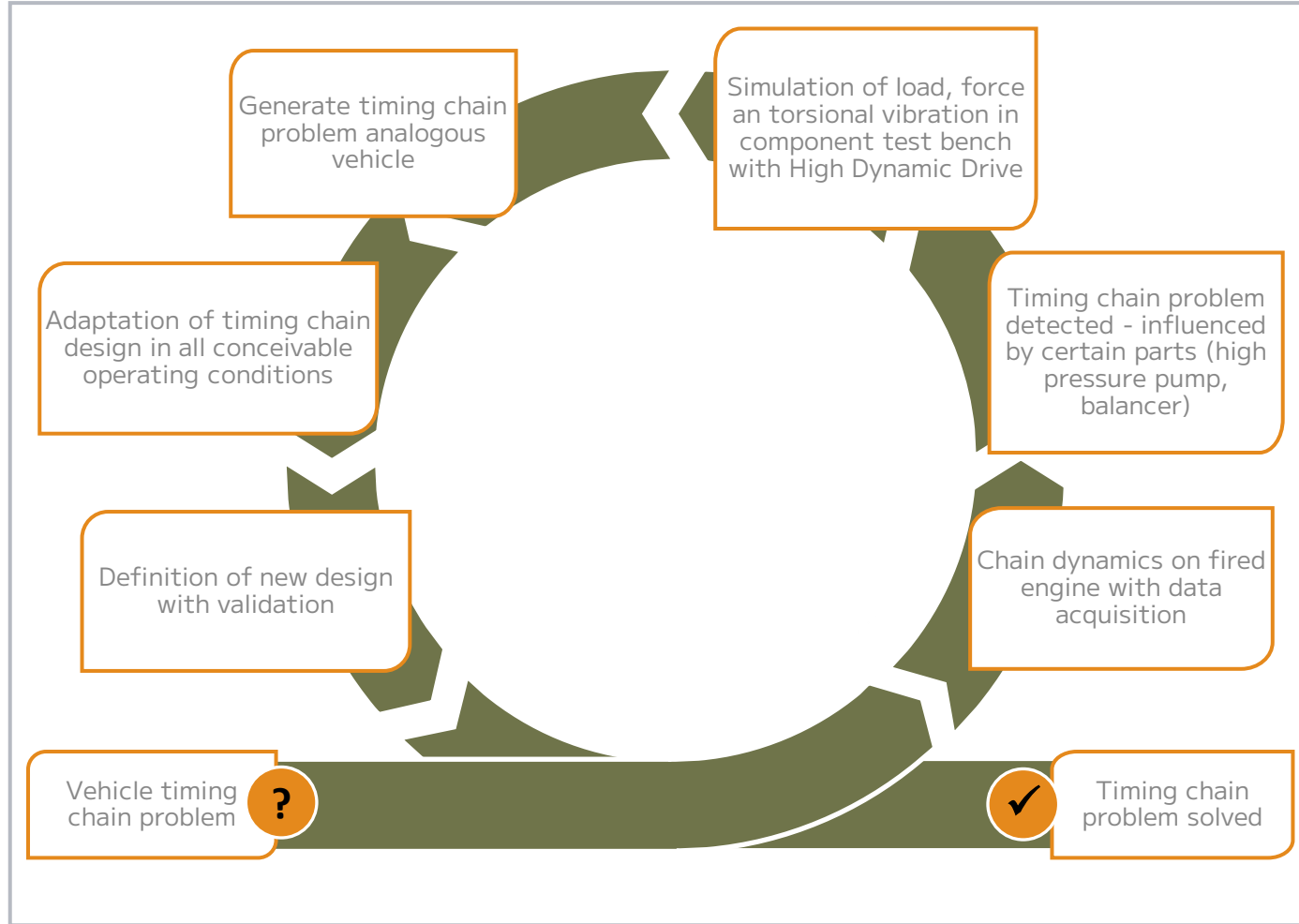
Validation Engineering / Example: Seat ring problem



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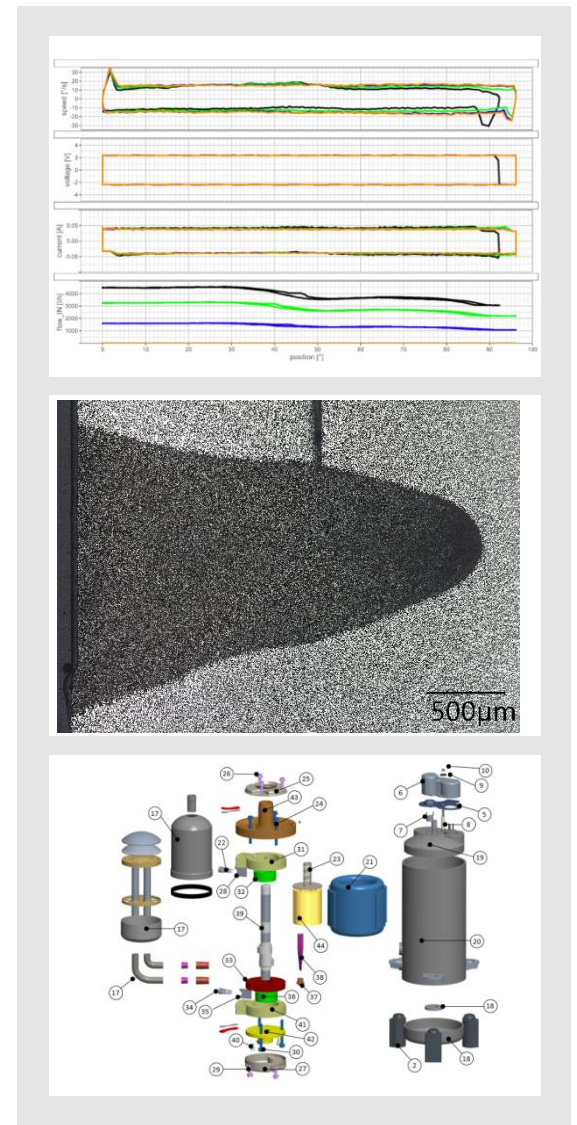
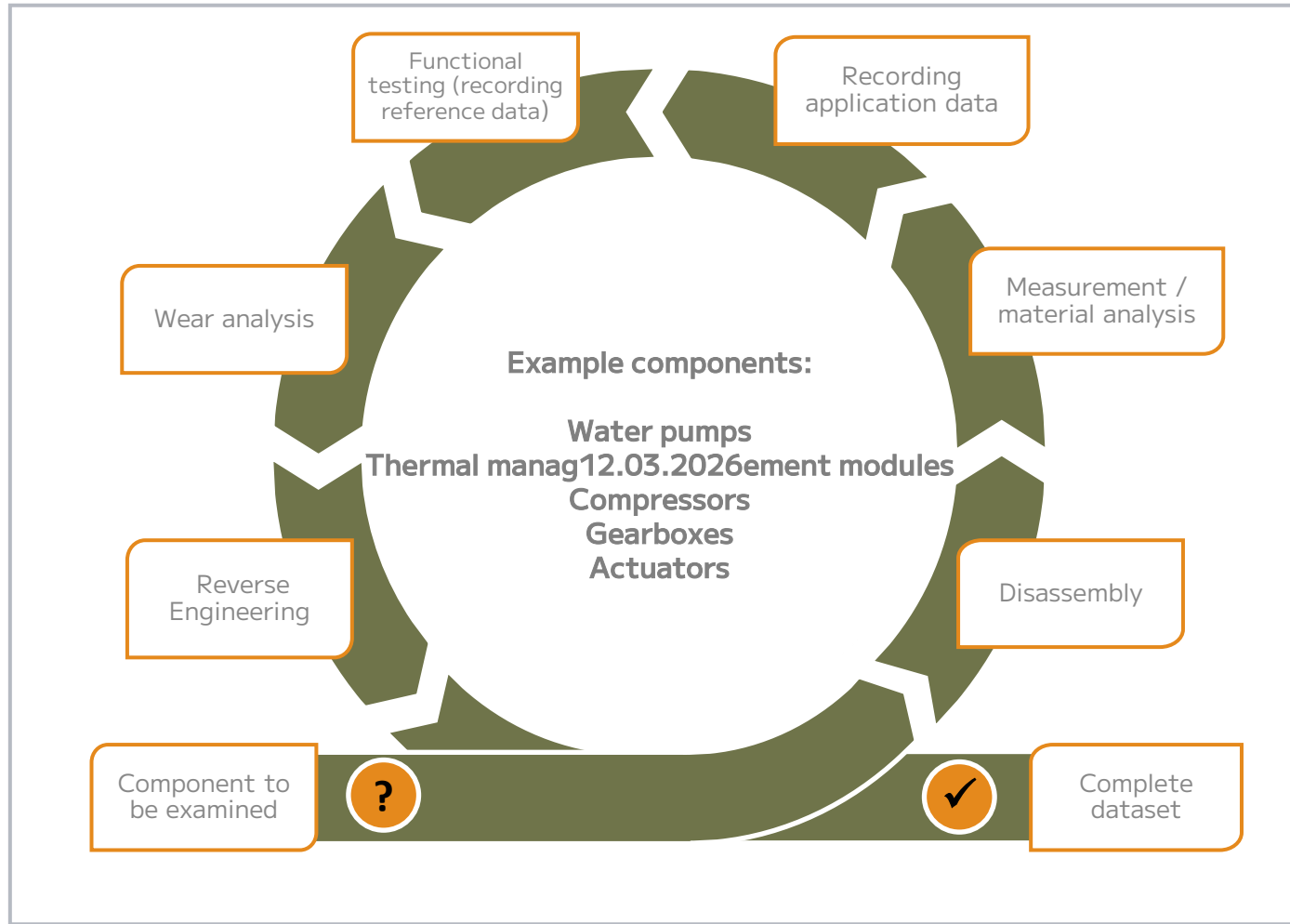
Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
	Component Test Field					

- Component Test Field
- High Dynamic Drives
- Radionuclide Technology
- Engine Test Field
- Powertrain Test Field
- Environment Test Field
- Wear & Friction Test Rigs
- Material & Measuring Laboratory
- Fatigue Strength Test Field



Techniques	Services	Functional Test	Endurance Tests	Environment Tests	Tribology / Analysis	Engineering
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- Component Test Field
- High Dynamic Drives
- Radionuclide Technology
- Engine Test Field
- Powertrain Test Field
- Environment Test Field
- Wear & Friction Test Rigs
- Material & Measuring Laboratory
- Fatigue Strength Test Field



Validation
Engineering / Example: EV Powertrain



Component Test Field

High Dynamic Drives

Radionuclide Technology

Engine Test Field

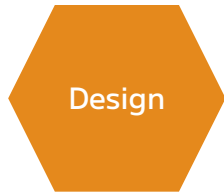
Powertrain Test Field

Environment Test Field

Wear & Friction Test Rigs

Material & Measuring Laboratory

Fatigue Strength Test Field





Component Test Field

High Dynamic Drives

Radionuclide Technology

Engine Test Field

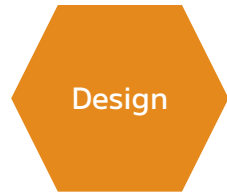
Powertrain Test Field

Environment Test Field

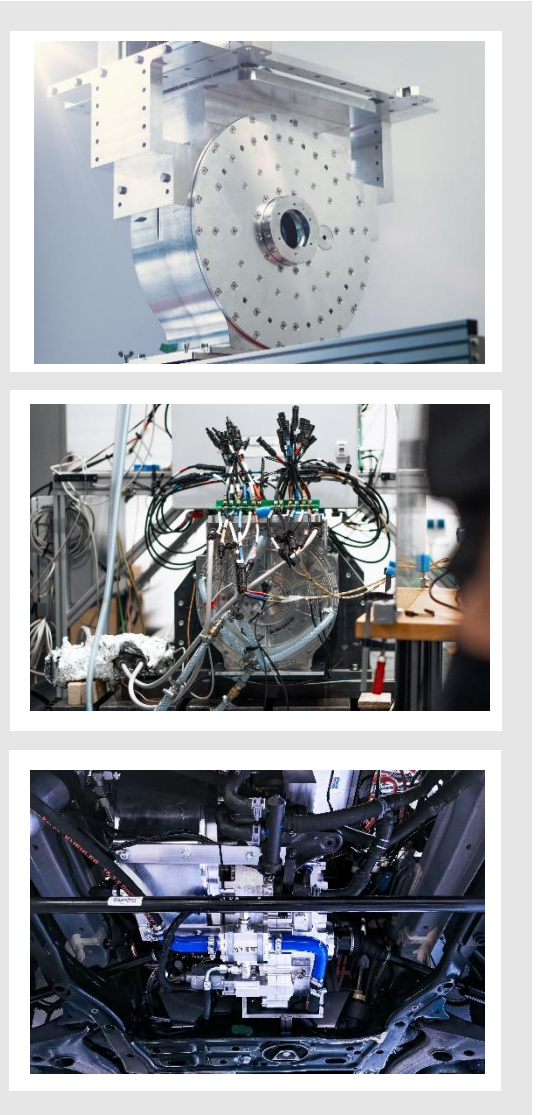
Wear & Friction Test Rigs

Material & Measuring Laboratory

Fatigue Strength Test Field



Construction Demo Car e-Crafter with newly developed Vaionic eDrive system



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Engineering / Example: Construction of innovative, CO₂-neutral and low-noise generators



- Component Test Field
- High Dynamic Drives
- Radionuclide Technology
- Engine Test Field
- Powertrain Test Field
- Environment Test Field
- Wear & Friction Test Rigs
- Material & Measuring Laboratory
- Fatigue Strength Test Field



Assembly of Whitecell Systems XGS-55 Generator with Methanol Fuel Cells



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Thank you.

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