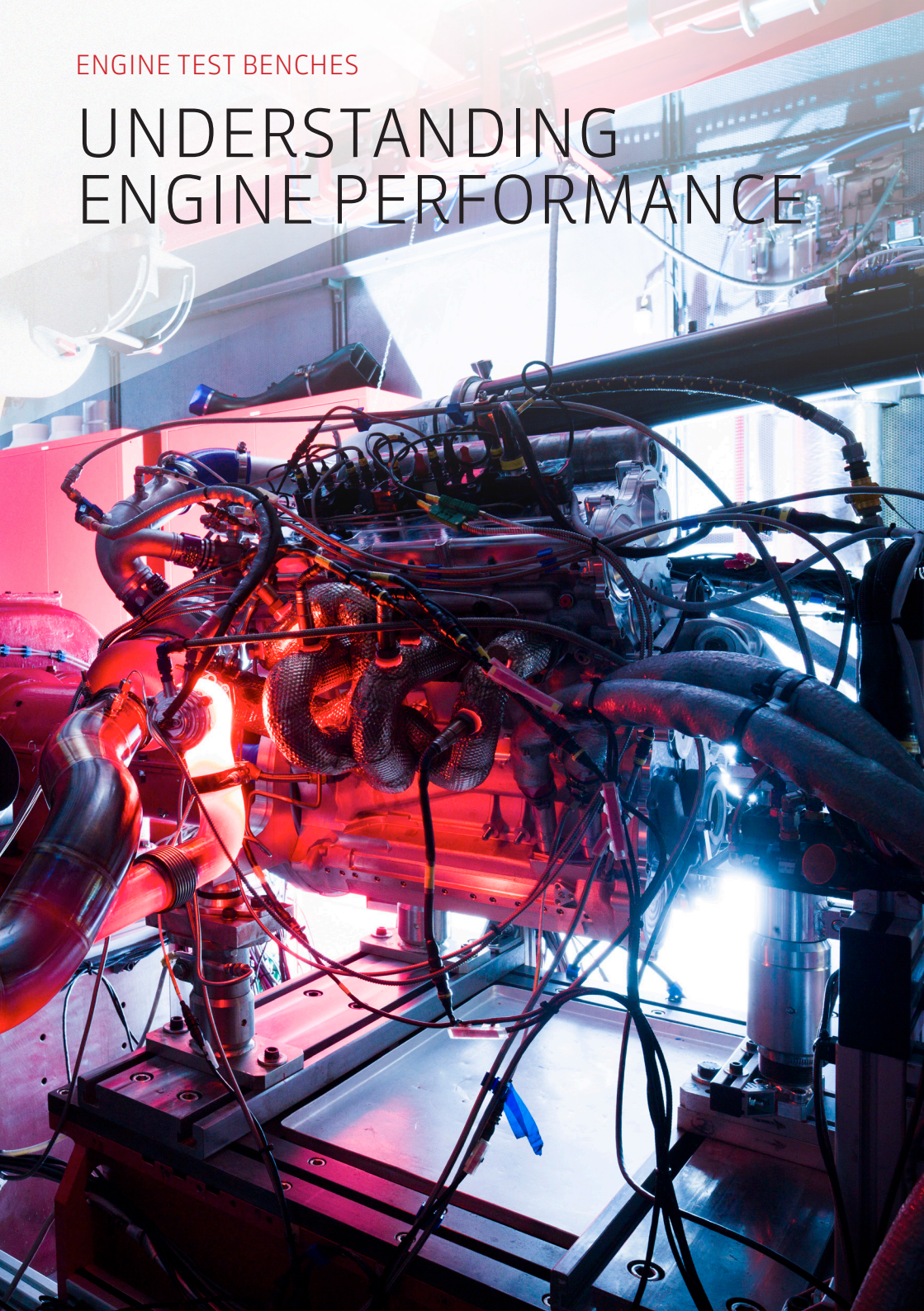
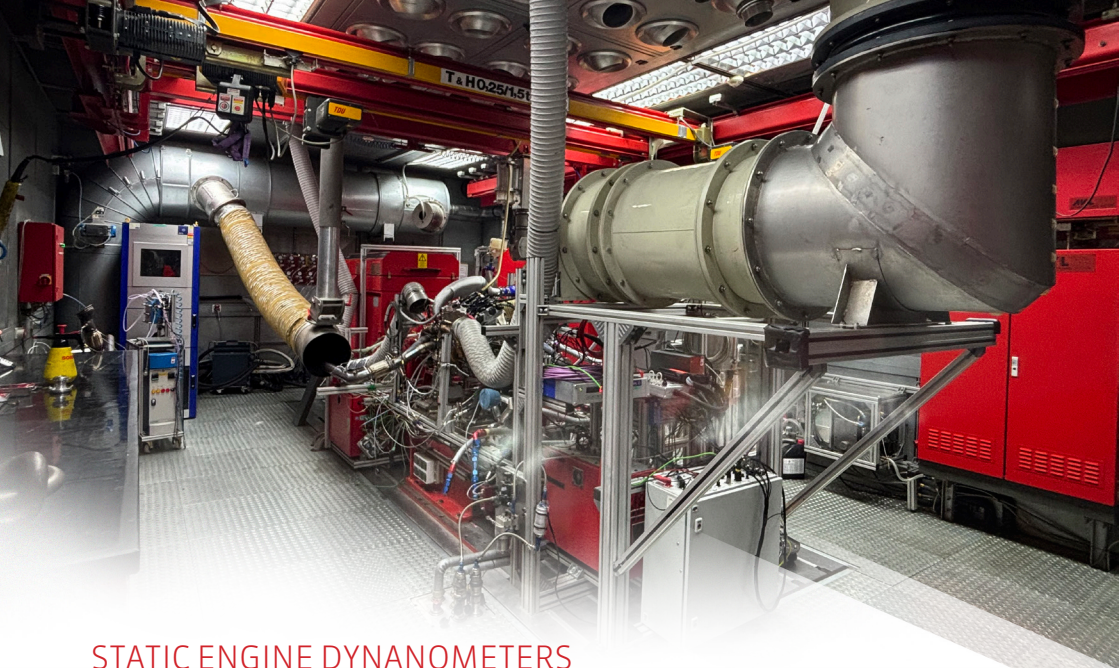


ENGINE TEST BENCHES

UNDERSTANDING ENGINE PERFORMANCE





STATIC ENGINE DYNAMOMETERS

TGR-E has three static dynamometers for engine-related test functions, each operating in a fully-conditioned environment for realistic results. Our dynamometers are located in secure private rooms with accompanying office space for monitoring and engineering support.

APPLICATIONS:

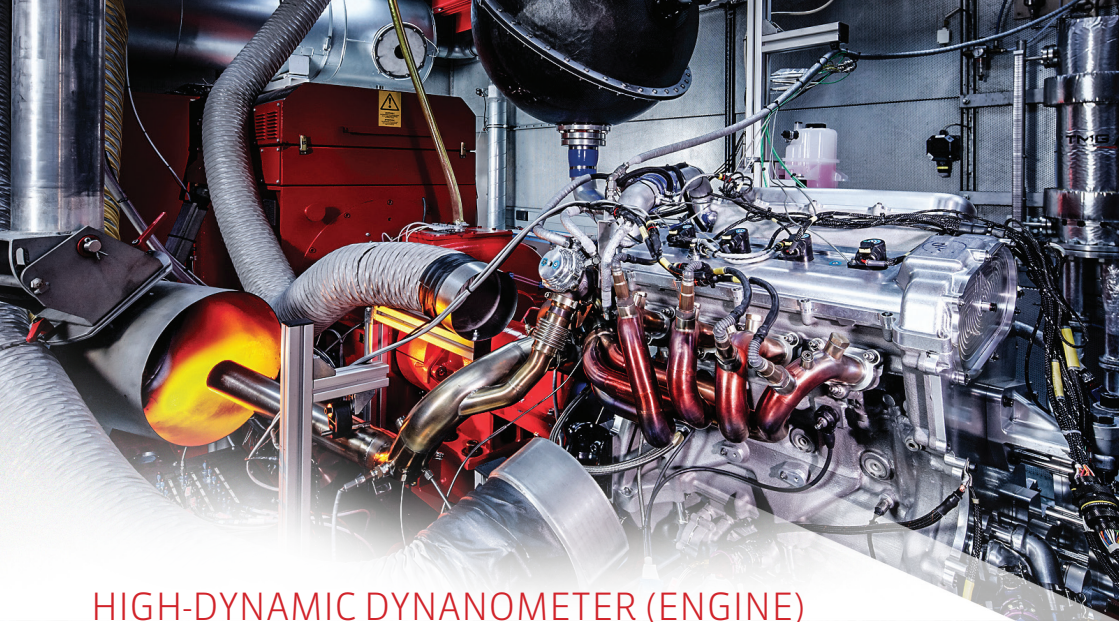
- Power and endurance testing
- Calibration and mapping (manual or automatic)
- Drivability and fuel efficiency tuning (static)
- Pressure indication of intake, combustion chamber, exhaust
- Emission measurement in static or dynamic mode with AVL i60
- Playback of profiles
- Testing of oil and various fuels incl. e-Fuel, biofuel

SPECIFICATIONS

Max. Speed	22,000 rpm
Max. Power	660kW
Playback Frequency	100Hz
Measurement Accuracy	~0.1%

FULLY-CONDITIONED ENVIRONMENT

Air	15°C to outdoor +40°C (combustion)
Humidity	50-95% at 20°C
Oil	30-150°C
Water	30-130°C
Fuel	10-60°C



HIGH-DYNAMIC DYNANOMETER (ENGINE)

This high-dynamic engine dynamometer is designed for investigation of all engine-related aspects and allows extremely high performance engines to be tested to their full potential. Additionally, the inertia of the dyno's electric motor is equal to that of a race car wheel for greater accuracy.

APPLICATIONS:

- High-performance efficiency and reliability investigations
- Ultimate power and torque analysis
- Exhaust reliability testing
- Hybrid or electric vehicle powertrain testing with battery simulator

SPECIFICATIONS

Max. Speed	21,000rpm
Max. Power	800kW
Max. Acceleration	200,000rpm/s
Playback Frequency	1000Hz
Measurement Accuracy	~0.1%
Combustion air flow	Car speed controlled

FULLY-CONDITIONED ENVIRONMENT

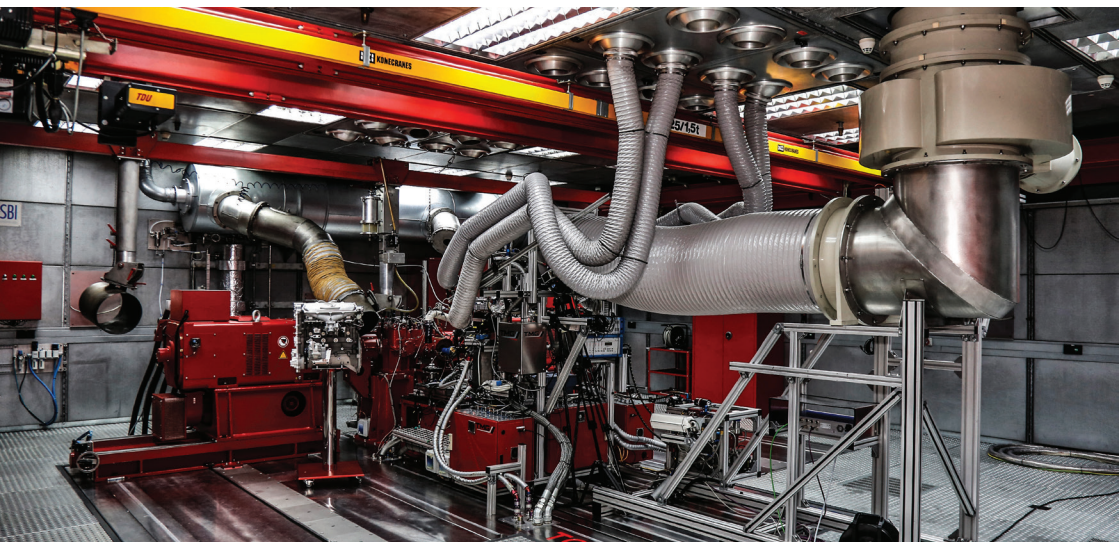
Air	15°C to outdoor +40°C (combustion)
Humidity	50-95% at 20°C
Oil	30-150°C
Water	30-130°C
Fuel	10-60°C

HIGH-DYNAMIC DYNAMOMETER (POWERTRAIN)

In addition to its suite of static dynamometers, TGR-E has specialist dynamic test benches designed to individual customer requirements. The dynamic two-wheel-drive powertrain dynamometer allows in-depth testing of all powertrain-related items.

APPLICATIONS:

- Powertrain efficiency and reliability investigations
- Gearshift testing and development with high shift gradients
- ECU testing and development
- Hybrid or electric vehicle powertrain testing with battery simulator



SPECIFICATIONS

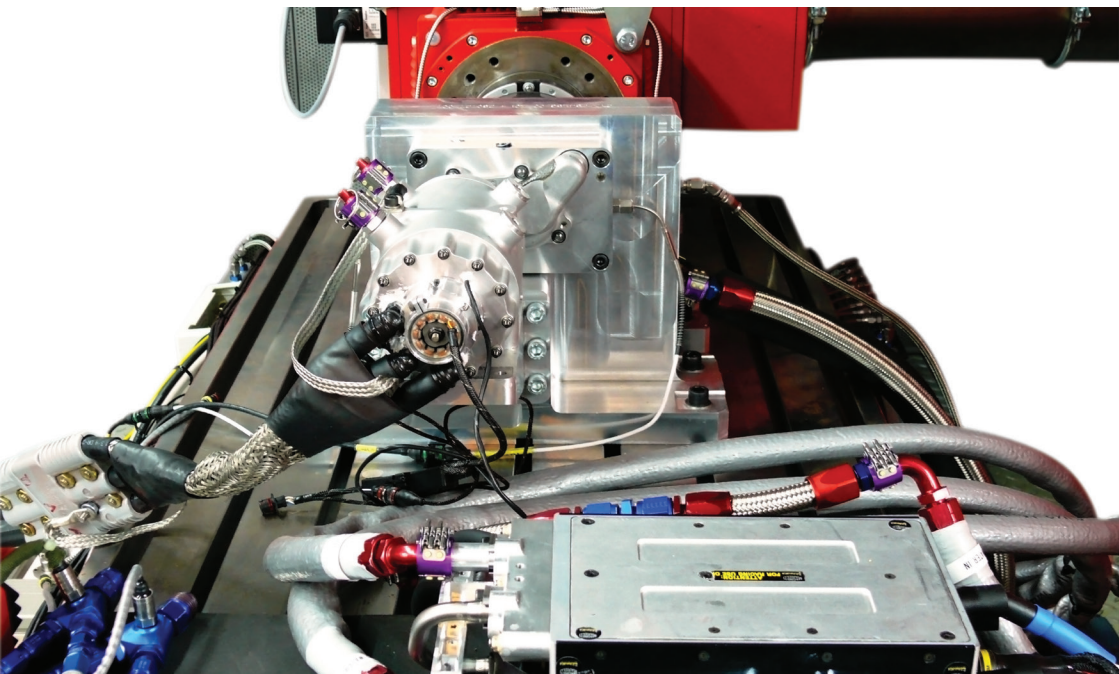
Max. Speed	21,000rpm
Max. Wheel Speed	3,000rpm
Max. Power	800kW
Playback Frequency	1000Hz
Measurement Accuracy	~0.1%
Combustion air flow	Car speed controlled

FULLY-CONDITIONED ENVIRONMENT

Air	15°C to outdoor +40°C (combustion)
Humidity	50-95% at 20°C
Oil	30-150°C
Water	30-130°C
Fuel	10-60°C

HIGH-DYNAMIC DYNAMOMETER (POWERTRAIN)

As a pioneer of high-performance electric powertrains, TGR-E has developed an exclusive test bench for hybrid or E.V applications. A DC battery simulator provides power at user-defined voltage and current levels, as well as charging the battery and supply a current converter.



APPLICATIONS:

- Component testing in isolation
- Power electronic unit testing with customer battery models
- Motor generator unit testing
- Battery testing and simulation
- Energy, capacity and efficiency analysis
- Hot and cold cycles
- Lifetime analysis

SPECIFICATIONS

Battery Output Voltage	800V
Battery Output Power	150kW
Battery Output Current	-800 to 800A