

# Contributions to the Development of Exhaust Gas Systems



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- Hot Gas Bending Cycle Test
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- 6-Axis LCF Test
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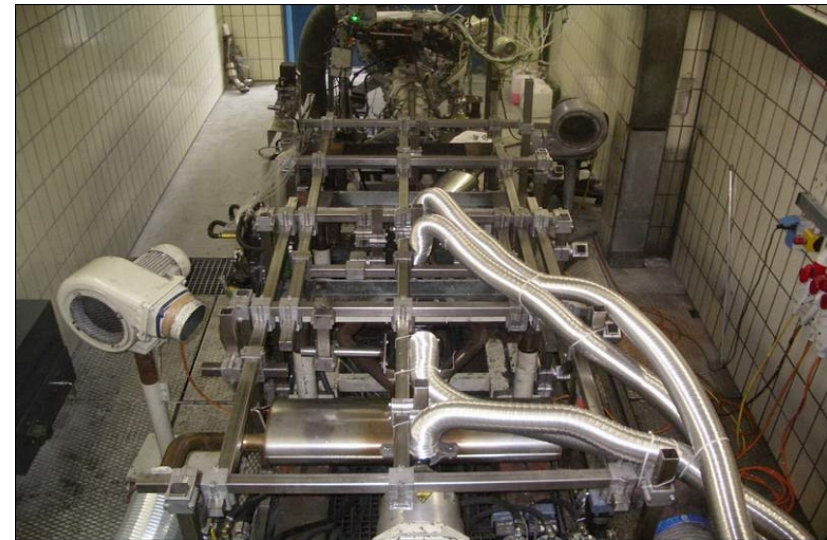
## Vehicle-Compliant Setup

### Engine

- Engine fitting position
- Transmission
- Engine carriers and mounting brackets

### Exhaust Gas Systems

- No mechanical modifications
- Original suspension components
- Leveling according to vehicle coordinates
- Stiff construction of mounting suspension



## Vibration Analysis

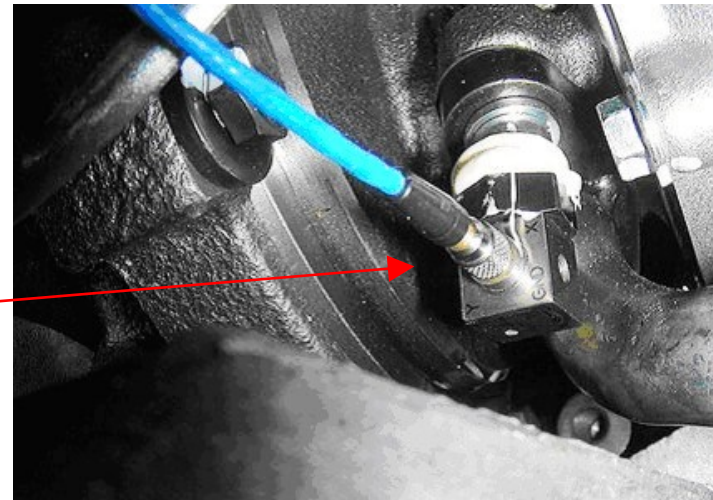
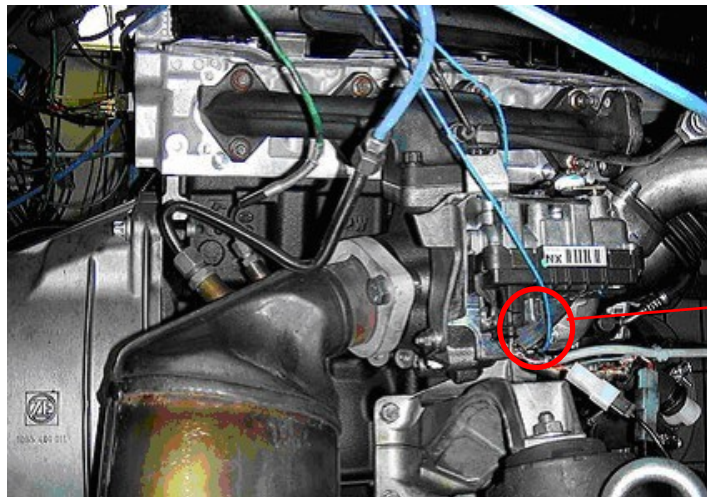
- Measurement system  
Müller-BBM
- Up to 160 channels  
simultaneously
- Vibration, strain, acoustics,  
temperature, analog  
variables
- 3 measurement systems for  
220 V and 12 V operation



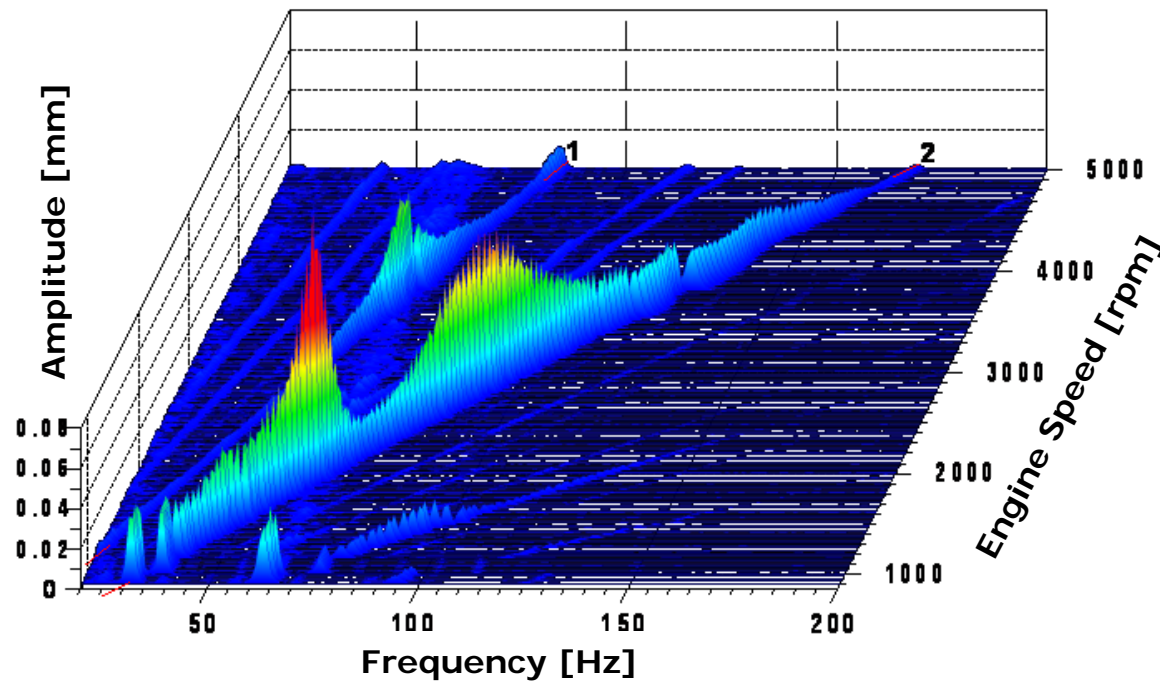
# Testing of Exhaust Gas Systems

## Vibration Analysis

Measurement system Müller-BBM,  
(max. 160 channels, setup with 3-axis miniature sensors)

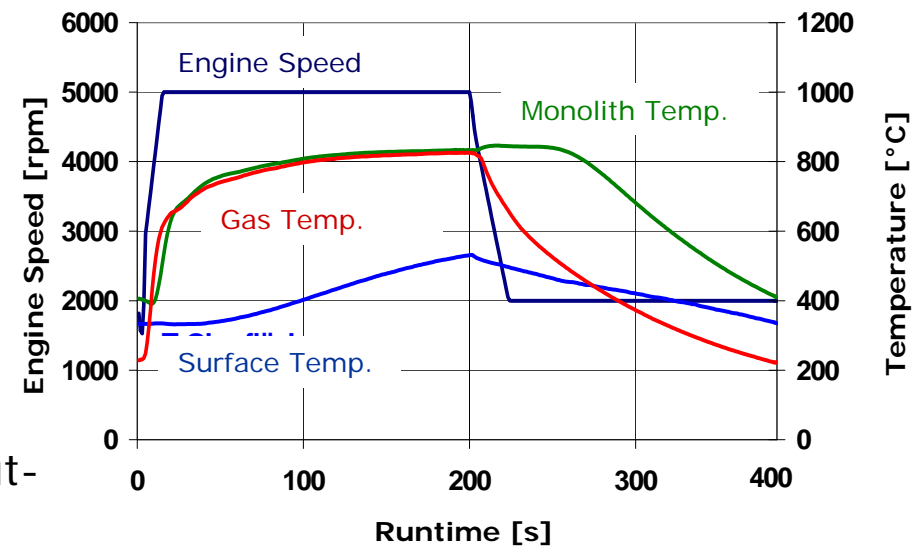


## Vibration Analysis

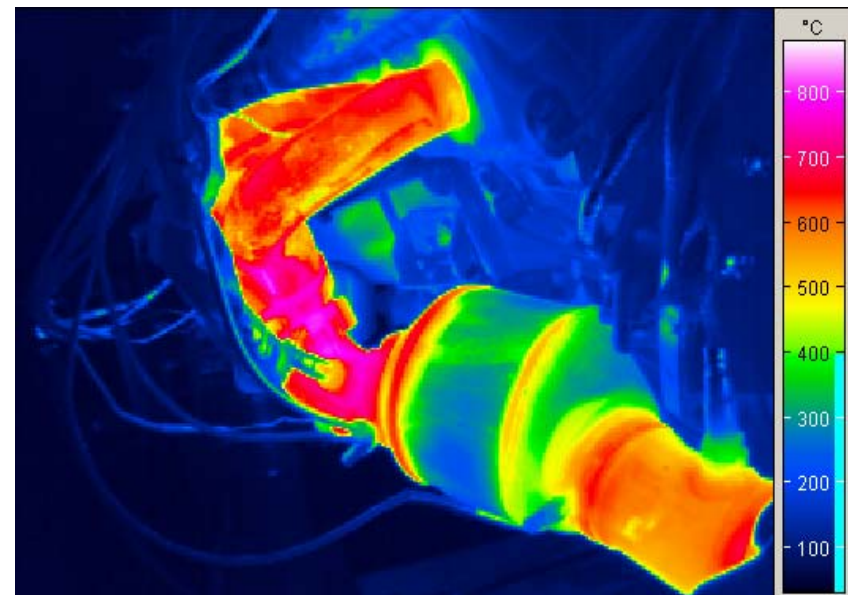
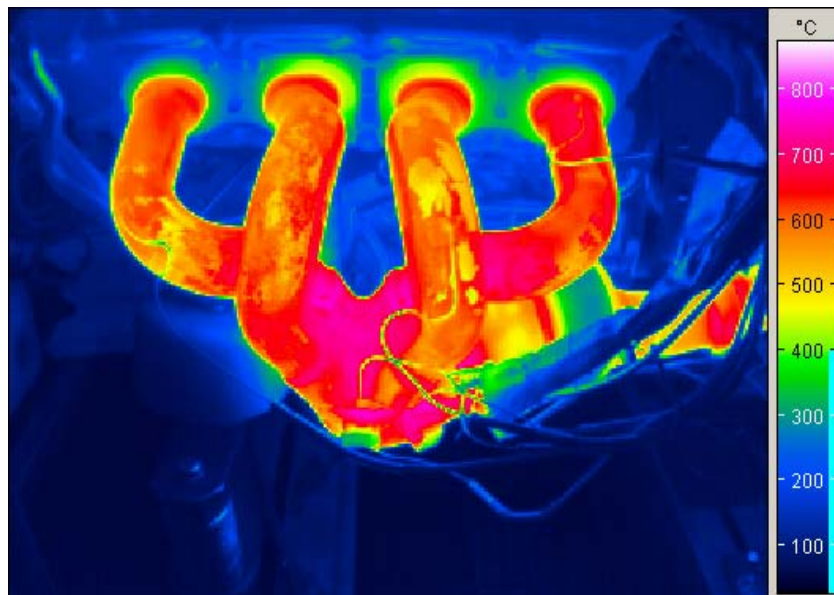


## Thermal Shock Testing on Engine Test Bench

- Phase of Hot Operation:  
Operating points with maximum exhaust gas temperature (dynamic driving cycles)
- Phase of Cold Operation:  
Standstill or idle (cooling down with or without test bench blower)  
Phases of coasting with overrun cut-off (internal cooling of catalysts and mufflers)



## Thermal Imaging of Exhaust Gas Components



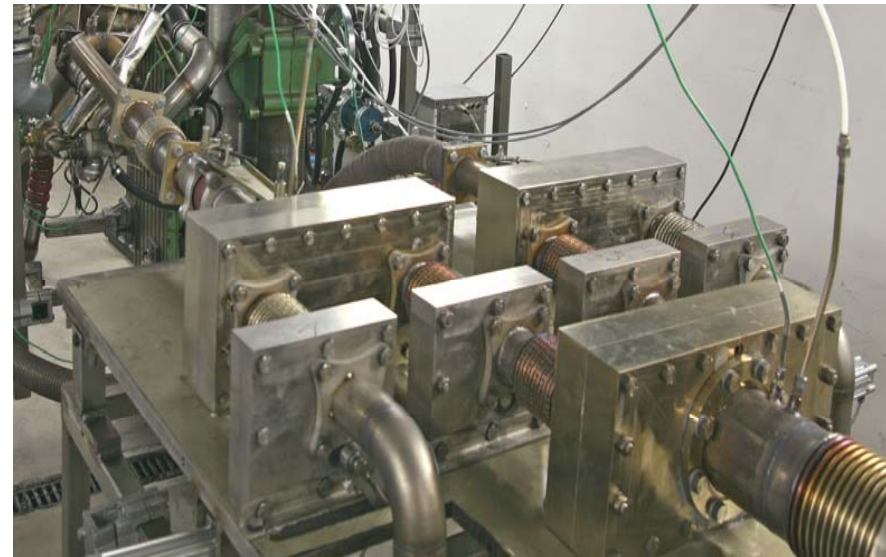
Temperatures at Nominal Output

# Testing of Exhaust Gas Systems

## Thermal Shock Testing / Hot Gas Generator

Gas temperature : Max. 1200 °C  
Operating supplement : Natural Gas  
Exhaust gas mass flow rate : Up to 1200 kg/h  
Exhaust gas back pressure : Max. 500 kPa

Truck Application :  
Increase of Mass Flow Rate via  
Interconnection



## 2-Axis Stimulation

- Traction : Max. 15 kN/Cyl.
- Amplitude : 0.1 - 150 mm
- Vibration frequency : Max. 100 Hz
- Gas temperature : Max. 1000 °C
- Fuel : Diesel
- Exhaust gas mass flow rate : Max. 250 kg/h

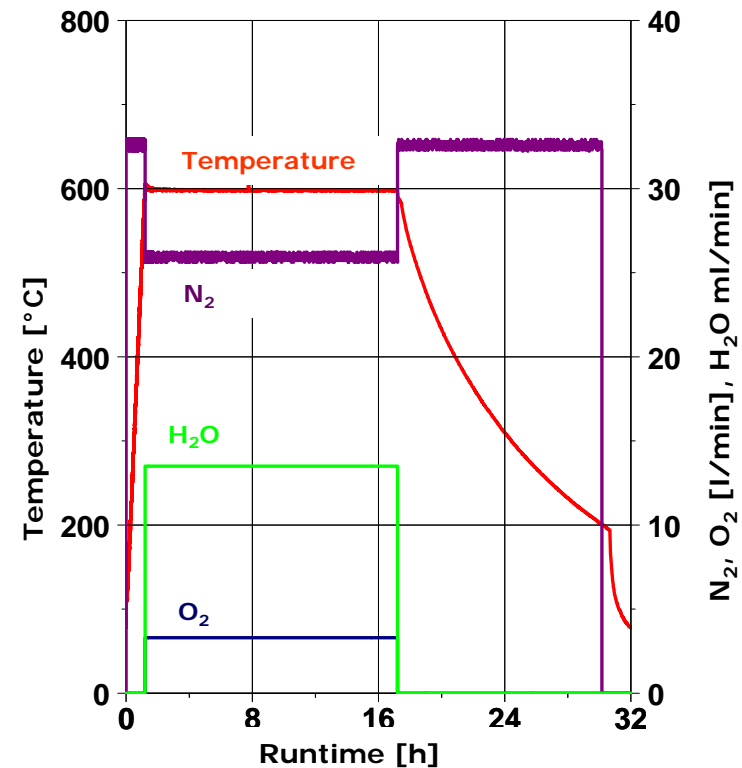


# High Temperature Oven

- Preconditioning
- Stabilization
- DPF regeneration
- DPF and catalyst ageing
- Artificial atmosphere

Technical data:

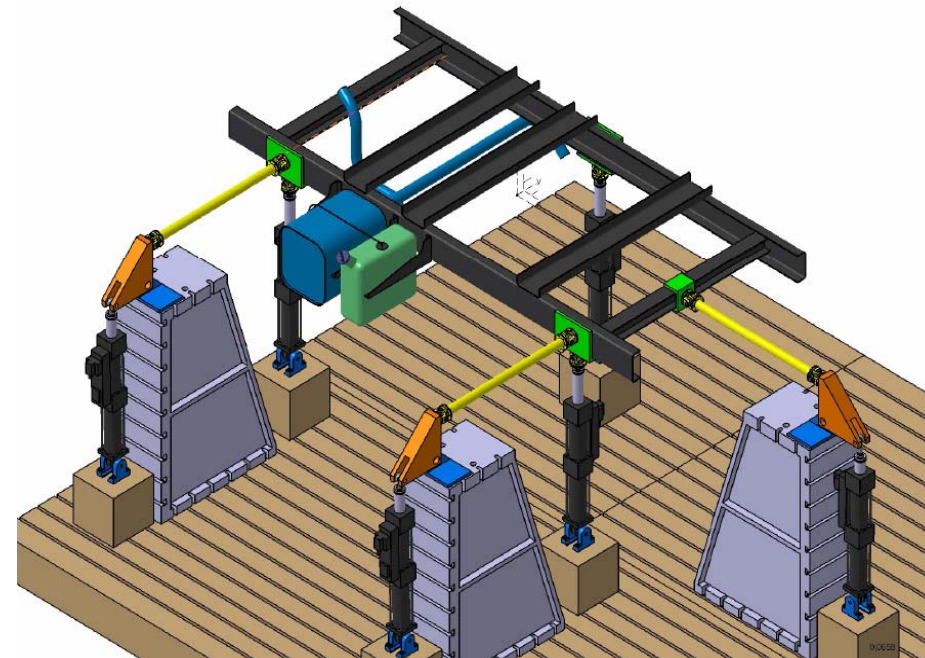
- Up to 1200 °C
- Usuable space: 50x50x70 cm
- Injection of N<sub>2</sub>, O<sub>2</sub> and H<sub>2</sub>O



Temperature Characteristics at DPF Preconditioning

# 6-Axis LCF Test

- Structure-dynamic analyses
- analyses for structural integrity of assemblies and components
- Dynamic simulation testing
- Lifetime and wear testing
- Optional: Hot gas testing with upstream burner



6-axis LCF Test for Exhaust Systems on Utility Vehicle Frame

# Supply of Fuels / Alternative Fuels

- Storage for 20 different fuels
- Storage equipment for supply of bio fuels
- LPG 8 bar / 20 bar
- CNG 70 bar / 200 bar



# Locations



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