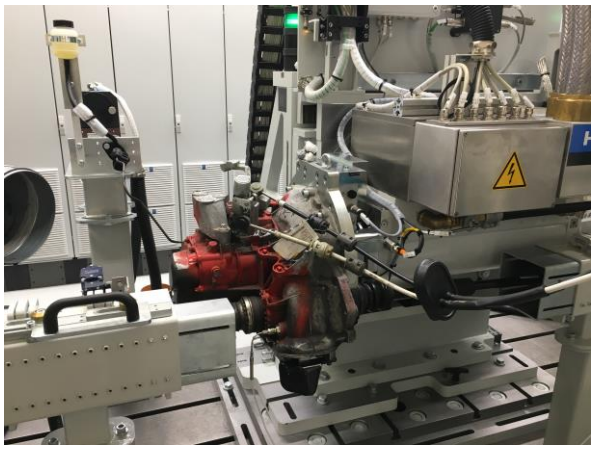
TECHNISCHE UNIVERSITÄT DRESDEN

LKT

02_3-EM-Powertrain Test Bed



Main Tasks

- Analysis of gear shift comfort
- Optimization of gearbox efficiency
- Investigation into Driveability by performing static, transient and dynamic test procedures
- Replication of test cycles (e.g. WLTC)
- Simulation of engine torque pulsation
- Simulation of wheel slip
- Control strategies and efficiency
- Analysis and optimization of electrified powertrains
- Inverter testing

Specimens

Main gearbox (manual, automated, transversely or longitudinally mounted)
Transfer gearbox
Axle drive (front/rear)
Side shafts, flywheels, clutches
Transmission Control Units (TCUs)
E-axle combined with battery simulation
Combination of those named before

Input Motor (Drive)

- Type: 3~ high-performance permanent-magnet synchronous motor
- Manufacturer: Krebs und Aulich GmbH
- Torque
  - Nominal: 450 Nm
  - Maximal: 720 Nm
- Speed
  - Maximal: 10,000 rpm
  - Max. gradient: 94,000 rpm/s
- Power
  - Nominal: 220 kW
  - Maximal: 352 kW
- Rotational moment of inertia J_{rot}: 0.035 kgm^2
- Cooling: water-cooled
- Overload by factor 1.6 acc. to S8: max. 60 s each 10 min

Output Motor (Brake = Wheel Machine)

- Type: 3~ high-performance permanent-magnet synchronous motor
- Manufacturer: Krebs und Aulich GmbH
- Torque
  - Nominal: 3.000 Nm
  - Maximal: 4.500 Nm
- Speed
  - Maximal: 3.000 rpm
  - Max. gradient: 29.000 rpm/s
- Power
  - Nominal: 340 kW
  - Maximal: 500 kW
- Rotational moment of inertia J_{rot}: 0.85 kgm^2
- Cooling: water-cooled
- Overload by factor 1.67 acc. to S8: max. 30 s each 10 min

Battery simulation

- Type: IGBT-based
- Manufacturer: HORIBA FuelCon GmbH
- Power
  - Nominal: 250 kW
- Current
  - Nominal: -1.000 ... 1.000 A
- Voltage
  - Nominal: 10 ... 1.000 V
- Cooling: water-cooled
- Battery models: Proprietary / Matlab/Simulink

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Measuring and Real-time Equipment

Measuring unit/Application	Eingesetzte (Mess-) technik
Torque	HBM T12 HP 1 kNm / 5 kNm
Angular speed	LTN RE-21 or Heidenhain ECN1313
Electrical power	HBK / HBM Genesis 7tA
Other basic units	IMC basic configuration CANSASflex
Real-time simulation platform	IPG CarMaker/TestBed (RT-Hardware: Xpack4)
Basis for restbus simulation	Vector VN1630A (CAN/LIN) and Vector VN8914/8970 (FR/CAN/LIN)

In addition, many other essential measuring units can be logged. For instance, the measurement of specimen- or test rig-related units (temperature, pressure etc.) to be stated. By taking advantage of different interfaces, further peripheral devices can be linked to the test rig (e.g. CAN-bus, Profibus, EtherCAT etc.).

Highlights

- Due to the usage of PM-motors, high dynamics can be realized (for instance: simulation of engine torque pulsation or wheel slip).
- User-friendly connection of further sensors or other peripheral devices to the HORIBA STARS platform (test rig-own test automation system).
- Opportunity to test e-axles with synchronized battery simulation.

Location

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Institute for Automotive Technologies Dresden – IAD
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