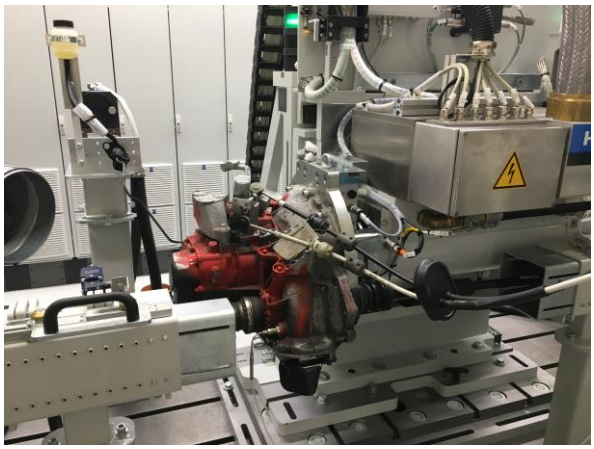
02_3-EM-Powertrain Test Rig



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

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 (on request)
Combination of those named before

Input Motor (Drive)

- Type: 3~ high-performance permanent-magnet synchronous motor
- 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
- 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

Measuring Units, Ranges and Tolerances

Primarily, speed and torque are measured at the 3-EM-Powertrain Test Rig related to input/output:

Measuring unit	Input (Drive)	Output (Brake)
Speed		
Type	BAUMER HMC16	BAUMER HMC16
Range	Up to 25,000 rpm	Up to 25,000 rpm
Accuracy	tbd	tbd
Torque		
Type	HBM T12HP 1 kNm	HBM T12HP 5 kNm
Range	Up to 1 kNm	Up to 5 kNm
Accuracy	> 0.02 %	> 0.02 %
Linearity error	< 0.03 %	< 0.03 %
Temperature stability	0.005 % each 10 K	0.005 % each 10 K

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 example: 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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