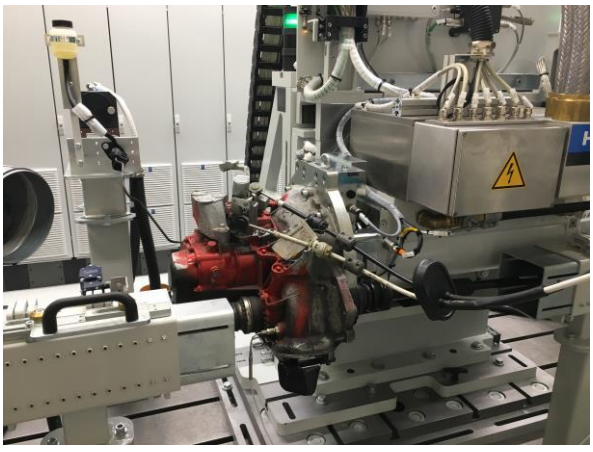
# 02_ 3EM–Powertrain Test Bench

## Main Application

- Shift Comfort Tests
- Efficiency Optimization
- Analysis of Driveability based on static, transient and dynamic Manoeuvres
- Tracking Test Cycles (e.g. WLTP)
- Simulation of the Torque Pulsation of an Internal Combustion Engine
- Wheel Slip Simulation
- Operating Strategies and Efficiency

## Specimen

| |
|---|
| Main Gearbox (manual, automated, transverse and longitudinal Installation possible) |
| Transfer Case |
| Axle Drive (front/rear Axle) |
| Side Shafts, Flywheels, Clutches |
| Transmission Control Units (TCUs) |
| E-Axes with Battery Simulation (on Request) |
| Combinations of the previously mentioned |

## Input Machine (Drive)

- Type: 3 ~ permanent magnet synchronous Motor
- Torque
  - Nominal: 450 Nm
  - Maximum: 720 Nm
- rotational Speed
  - Maximum: 10.000 rpm
  - max. Gradient: 94.000 rpm/s
- Power
  - Nominal: 220 kW
  - Maximum: 352 kW
- Moment of Rotational Inertia $J_{rot}$: 0,035 kgm2
- Cooling: Water Cooled
- Overload with Factor 1.6 according to S8: max. 60 s every 10 min

## Output Machine (Output = Wheel Machine)

- Type: 3 ~ permanent magnet synchronous Motor
- Torque
  - Nominal: 3.000 Nm
  - Maximum: 4.500 Nm
- rotational Speed
  - Maximum: 3.000 rpm
  - max. Gradient: 29.000 rpm/s
- Power
  - Nominal: 340 kW
  - Maximum: 500 kW
- Moment of Rotational Inertia $J_{rot}$: 0,85 kgm2
- Cooling: Water Cooled
- Overload with Factor 1.67 according to S8: max. 30 s every 10 min

## Measured Values, Measuring Ranges and Tolerances

Primarily, the measured Values for Speed and Torque are determined at the Powertrain Test Bench on the input and output Side:

| **Measured Value** | **Input (Drive)** | **Output** |
|---|---|---|
| **Rotational Speed** | | |
| Type | BAUMER HMC16 | BAUMER HMC16 |
| Measuring Range | up to max. 25.000 rpm | up to max. 25.000 rpm |
| Accuracy | tbd | tbd |
| **Torque** | | |
| Type | HBM T12HP 1 kNm | HBM T12HP 5 kNm |
| Measuring Range | up to 1 kNm | up to 5 kNm |
| Accuracy Class | > 0,02 % | > 0,02 % |
| Linearity Error | < 0,03 % | < 0,03 % |
| Temperature Stability | 0,005 % per 10 K | 0,005 % per 10 K |

In addition, other important measured Variables are recorded. These include, for Example, the Recording of Test Item or Test stand-related Temperature and Pressure Parameters. Other peripheral Elements can also be connected via Various Interfaces (CAN bus, Profibus, EtherCAT, etc.).

## Characteristics

- Since all E-Machines are PM motors, very high dynamics can be represented (e.g. relevant for Torque Pulsation, Wheel Slip Simulation).
- Easy Connection of additional Sensors or other Peripherals to the open HORIBA-STARS Platform (Test Automation System).
- Possibility to test E-Axes with simultaneous Battery Simulation.