

# CUSTOMIZED

Sector: Automotive industry / electric motors

## Test system for electric motors



### Challenge

Electric motors of mild hybrid vehicles shall be tested under as realistic conditions as possible. Besides different statistic and dynamic function tests, the 3-phase asynchronous motor, as well as the inverter, shall be cooled down to -20 °C and heated up to +70 °C afterwards. Thus, the demands on motors that can occur during operation of an electric / hybrid vehicle are simulated.

The test system is to be used in the analysis for persistent tests which are not possible in production due to low cycle times.

### Solution

To be able to test the motor, inverter and the end product (motor+inverter) separately, three single test stations were developed and combined in one compact system.

#### Motor test station:

The inlaid motor is operated by a 48 V inverter in different load-points and is tested whilst. The carried out tests include voltage measurement, current measurement up to 500 A at maximum, COS-Phi calculation (ratio between reactive power Q and apparent power S), performance calculation and the locked-rotor test. Here, the rotor is blocked with the help of a servo motor and a low voltage is applied to determine the short-circuit current of the motor.

#### Inverter station:

Inverter is connected to a motor simulation as well as to the cooling cycle of the system for the first time. Besides a voltage and current measurement up to 400 mA at maximum, a performance calculation and the correct communication of the CAN interface are tested.

#### Whole system station:

The DUT (inverter+motor) is connected to the 48 V supply and the cooling cycle. A load machine is connected to a pulley wheel and the complete test proceeds fully automatically. During testing and in addition to the load tests, an environment simulation is carried out where the DUT is cooled down to -20 °C and heated up to +70 °C afterwards. Thus, the DUT is tested under conditions as close to reality as possible. An automatic discharge per software follows to guarantee the personnel's security.

### Advantages

- + Test under "real" conditions
- + Compact combination of three test stations
- + Fully automatic test process after connection
- + Easy and intuitive operation
- + Easily possible to expand for future DUT
- + Maximum of flexibility due to a generous construction of all components
- + Possibility of expansion by further interfaces and work piece carriers
- + Possibility to configure tests for all three DUT components
- + DUT of different manufacturers can be tested on one system

### Technical Data

- Current measurement up to 500 A
- Persistent test with a cooling/heating cycle from -20 °C up to +70 °C
- Possibility to adjust load points over load machine (+/- 120 Nm, +/- 3000 U/min)
- Numerous interfaces of communication
- Electronically regulated voltage and current sources: +/- 385 A as well as 0-60 V