AVL SET

AVL Inverter TS™

Full test coverage for drive inverters makes the difference in power electronics testing

Developing and validating the inverter – the heart and brain of any electric vehicle

The drive inverter, which can be found in every xEV, is the key component of the electrified powertrain. It is an intelligent mini-computer that converts DC current into a rotating multi-phase AC current and controls the torque of the actuator (e-motor).

The inverter is very complex, and its behavior and handling influences the driving experience significantly. Therefore, it needs to be tested and developed without further influences of other components. That is why a dedicated test system is required which enables the testing of the inverter – independently from the e-motor and already in an early development phase. Such an optimized testing environment results in an efficient verification process and shorter time needed compared to the testing of the Unit Under Test (UUT) in a real-world prototype vehicle.

E-Motor Emulation Technology

The Inverter TS enables the independent testing of the inverter while optimizing the integration with all other components in the electrified powertrain. The test system is based on e-motor emulation technology with real-time simulation. This leads to highly accurate results when testing the inverter with required battery voltage and e-motor current.

For such a testing setup, exact copies of the e-motor and the battery are required. Within the Inverter TS, the e-motor is replaced very accurately with the Power Amplifier and the Signal Processing Cabinet. The UUT DC Supply Cabinet represents a digital copy of the battery. As a result, an efficient and flexible test equipment for the testing of inverters is available, which – in contrast to an active load cabinet – emulates with highest accuracy the real physics of an e-motor directly at the terminals.

THE ADDED VALUE

- Reliable and reproducible test results – globally

As a technology leader in e-motor emulation, we have built up comprehensive application know-how. This enables the realistic mapping of inputs as outputs on the UUT via software and hardware which is the only way to ensure highest accuracy in the emulation. Thereby, our customers get real, valuable and reproducible test results

- Flexible, accurate and fast mapping of all common motor concepts

The Inverter TS must fit for many different powertrain configurations. Thanks to the validated and implemented motor models of our inverter test system, this can be ensured quite simply with a mouse-click. The motor data serve as input, which are evaluated as parameters in the motor model. To start the inverter tests, only a few motor values are required. The better the database, the higher the emulation quality and the greater the added value of the virtual e-motor. Simple, easy to get started and accurate!

- Emulating fault situations and inverter behavior testing

The Inverter TS and its integrated Failure Emulation Cabinet (FEC) enables the testing of critical fault situations. Potentially occurring errors and the inverter's reaction can be emulated again and again to check the development progress. Faults such as cable breaks or short circuits at the motor phases, and many more, can be emulated. The Inverter TS offers a simple, safe and fast way to safeguard and test these situations.

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TECHNICAL DATA

UUT* DC-link Voltage in V	• 100 … 1,000
Number of phases	• 3 • 2x3 • 6
Phase current, 3 ph in A_{RMS}	• up to 1,600
Phase current, 2x3 ph / 6 ph in A_{RMS}	• up to 800
System power in kW	• up to 1,000
Emulated motor types	• PMSM • IM • EESM
Additional control features	• Current control • Voltage control • Temperature dependency • Harmonics
Channels / number of UUT	• Single-channel (1 UUT) • Multi-channel (2 UUT)
Emulation via high performance electronics	• 320 ns model
Failure insertion on power level	• Active shorts • Phase shorts • Phase breaks • DC breaks • Potential
Specific built-in tools	• Inverter protection • Signal scope • Parameter Wizard • Dedicated safety system

UUT* = Unit Under Test, e.g. inverter

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FIND OUT MORE

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