AVL SET

AVL Inverter TS™

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

DEVELOPING AND VALIDATING THE INVERTER – THE HEART AND BRAIN OF ANY PROPULSION SYSTEM

The advanced e-mobility market requires innovative, but reliable test methodologies for power electronics in their propulsion systems. The inverter, which can be found in every electric propulsion, is the key component as it controls the current flow between the battery and the electric motor.

The inverter is very complex, and its behavior and handling influences the mobility experience significantly. Therefore, it needs to be tested and developed without further influences of other components while meeting highest possible safety standards for different mobility applications. 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.

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 propulsion. 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 Cabinet (PAC) and the Signal Processing Cabinet (SPC). The UUT DC Supply Cabinet (USC) 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.

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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 failure situations and inverter behavior testing

The Inverter TS and its integrated Failure Emulation Cabinet (FEC) enables the testing of critical failure situations. Potentially occurring errors and the inverter's reaction can be emulated again and again to check the development progress. Failures 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.

TECHNICAL DATA

UUT* DC-link voltage in V	100 ... 1,000
Number of phases	3 2x3 6
Phase current, 3 ph in Arms	up to 2,400 + overload 30 % for 30 s
Phase current, 2x3 ph / 6 ph in Arms	up to 1,200 + overload 30 % for 30 s
DC current in Adc	up to 1,600 + overload 50 % for 30 s
System power in kW	up to 960 + overload 30 % for 30 s
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	model update rate 320 ns for non-linear
Max. Electrical Frequency in kHz	5
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

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