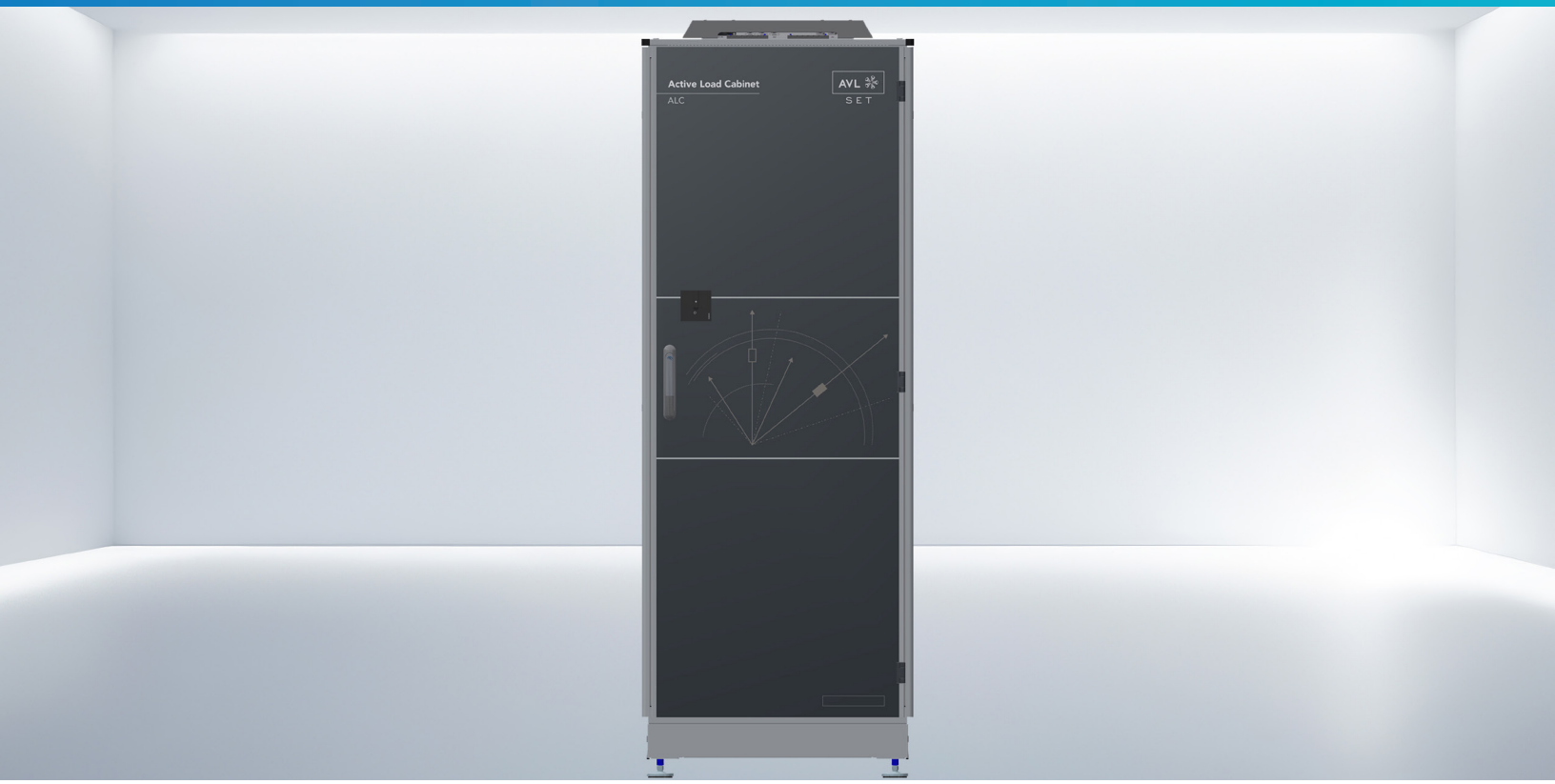


AVL Active Load Cabinet™ for Inverter Hardware Development

Perform a Wide Range of High-Voltage Functional and Validation Tests for R&D Applications

CHALLENGES WHEN DESIGNING THE INVERTER HARDWARE

In the early phase of inverter hardware development, stationary operating points are commonly used to stress the inverter and to qualify the hardware accordingly. Using fixed, passive loads, consisting purely of inductance, to stress the unit under test (UUT) results in major limitations including:
1. The installed components like diodes and switches are not stressed the same as in a real vehicle.
2. The DC side of the UUT is not stressed with active power.

This approach requires a great deal of effort and produces test results that are not necessarily correlated with actual use. To overcome these limitations, inverter hardware development tests could be carried out with a real e-motor or an e-motor emulator (EME). However, shifting to an active load testing device can reduce complexity and costs.

OUR SOLUTION: THE ACTIVE LOAD CABINET

The AVL Active Load Cabinet (ALC) provides a variable resistance-inductance (R-L) load to the inverter or other power electronic unit under test (UUT).

The Active Load Cabinet enables robust testing in short test times providing opportunity to detect failures at an early stage of development.

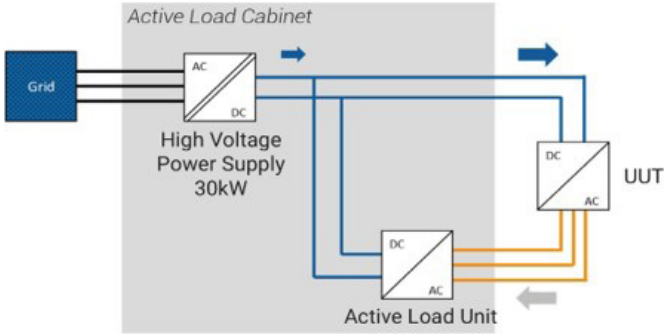
Thanks to open communication interfaces, the ALC can be easily integrated into your lab and existing test setup and automation systems. Common validation tests, such as common powered temperature endurance cycling (PTEC), can be run for months with minimal interaction or attention from test engineers.

In addition to operating as a variable R-L load, the ALC offers other operating modes that allow it to act as a calibrated current source for sensor calibration, or to test active short circuit functions of the UUT. The ALC also includes options to emulate the rotor position and temperature sensors of the real motor.

ADDED VALUE

1. **Fast UUT commissioning enabled by the easy test setup capability**: only 4 parameters must be defined to start the testing process.
2. **Easy and fast adjustment of several parameters**: R and L can be parametrized via mouse click during operation.
3. **Minimum facility requirements**: only 30kW AC connection for power and water connection for cooling is needed.
4. **Wide range of applications** thanks to additional options like one-phase current source mode and four-quadrant mode operation.
5. **Realistic testing with active power**: 4-quadrant-mode allows operation in all four quadrants of the torque/speed plane.

ACTIVE LOAD CABINET



The ALC and the UUT are connected to the same DC link. The power supply unit installed in the ALC supplies both: the UUT and the ALC itself. That reduces the facility interface as well as the consumed power.

TECHNICAL DATA

UUT DC Voltage in VDC	300–1,000
Phase current, nominal in ARMS	280 or 560
Phase current, maximal in ARMS (Overload)	400 or 800 for 34 s (up to 900 V)
Power (AC) in kW	Depending on the operating point and UUT
Ratio overload capacity - nominal load	1:20 at nominal load
Maximum power loss (ALC + UUT) in kW	30 or 60
Switching frequency UUT in kHz	Up to 20
Fundamental frequency in Hz	Up to 1,000
Adjustable virtual load resistance in Ohm	0-100
Adjustable virtual load inductance in µH	50–1,000
Interfaces	Automation system: Ethercat, Ethernet, XCPonEthernet Safety system: Profinet (optional)
Sensor emulation options	Digital encoder sensor emulator, Active magnetic sensor emulator, Resolver sensor emulator

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