Optimized inverters

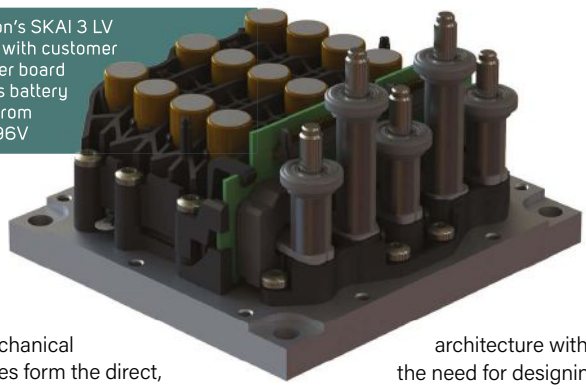
A smartly designed interface and structure form the key building blocks of a convenient inverter design

The electrification of vehicles and machines using battery voltages between 24V and 96V is moving fast. This affects existing applications, such as forklift trucks, where Li-ion batteries with new voltage levels replace combustion engines, as well as newer vehicle types such as quads or motorbikes, where special solutions are of interest. It is this dedicated motor design and specific requirements of the various applications that drives the need for new inverter solutions.

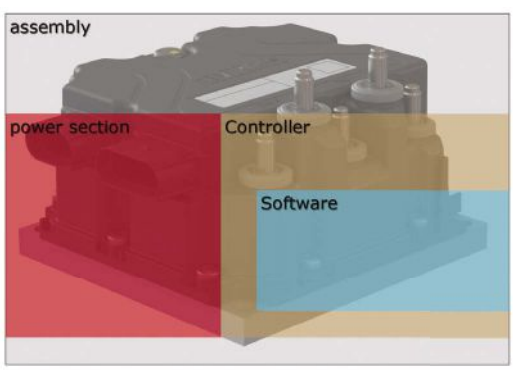
The standard 3-phase technology for low-voltage motors is the optimum solution when balancing performance and cost. However, new concepts in motor design and control-schemes raise the standards for power inverters. An application optimized controller and software connected to a high performance power-stage provides a good starting point for the next generation of vehicles.

Motor control inverters are a composition of elements using four different technologies: the controller, the application and control software, the power section, and the overall assembly. The application requirements define the individual functional challenges for each element, technological complexity of the design and industrialization challenge time to market and cost. Electrical and mechanical interfaces connect these blocks. Understanding the requirements and functionality of an interface is crucial to designing an individual element of a complex system. Smartly designed interfaces are therefore interfaces with little complexity. They allow full functionality without compromising on performance or time to market.

The SKAI 3 LV inverter is a power platform designed to be the base for application-optimized inverters. It covers the two building blocks of power section and assembly, without limiting the users in the design of their application-optimized controller and software. The SKAI 3 LV forms a pre-qualified and tested high performance power platform, complete with power-switches, DC-link capacitors, gate-driver, current- and temperature-sensors, AC and DC power connectors and cooler. In this configuration, the electrical, logic and physical interfaces are in the same position. All signals are separately available at the interface, without any need of programming the gate-driver or adjusting the switching behavior of the power switches, which makes it very easy to connect to the power stage and also to change or modify control schemes. Connectors with high mechanical tolerances form the direct, cable-free interface between the gate driver board and the customer-designed control board offering greater simplicity to assemble without the risk of a poor connection.



Semikron's SKAI 3 LV inverter with customer controller board supports battery ranges from 24V to 96V



The building blocks of a power inverter feature four different technologies: the controller, the application and control software, the power section, and the overall assembly

The innovative low-loss design of the SKAI 3 LV power stage supports switching frequencies of 24 kHz making it an ideal fit for new motor designs and special application requirements, such as reduced audible noise, or optimized control schemes.

In this way, the SKAI3 LV supports fast time to market for new inverter designs that are optimized to fit into a given system architecture without the need for designing and validating a complete new power-section. With a power-density of more than 30 kVA/l and a total volume of less than 1.8l, it fits into many applications with its standard IP66 rated case. The SKAI3 LV product family supports battery voltages with a wide range of input voltages, ranging from nominal 24V up to 96V DC and delivers peak currents of 600Arms covering all typical power-needs in industrial applications and many other vehicle applications.

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