

› High Voltage ECU for Electrical Air Conditioning Compressor

Pierburg GmbH (a brand of the Rheinmetall Automotive AG) is a global key player in the development of components and systems for sustainable drives and environmentally friendly mobility. The products are characterized by their high efficiency, durability and reliability. In electric vehicles, the thermal management system plays a central role in the heat distribution between components such as the battery, the traction drive and the vehicle interior. The heart of the thermal management system is an electrically driven air conditioning compressor. For this purpose, the adcos GmbH developed an integrated control unit together with the Pierburg GmbH.

The ECU was integrated in a space-optimized manner in a separate housing, which is mounted on the end face of the electric motor. In this way, the IGBT-based high-voltage inverter uses the motor and especially the compressor system connected to it for heat dissipation. For the implementation, both general component requirements and specific customer requirements were taken into account and verified during development, both through simulations and through corresponding test series. The result is a cost-effective single-board solution, which is simply connected to the motor and then screwed together.

The model-based functional software of the speed-controlled system uses a sensorless control method, which ensures robust and highly efficient operation of the electric motor. The software was fixed-point scaled using dSPACE TargetLink and integrated by automatic production code generation together with the basic software and corresponding drivers on the μC dsPIC33 from MicroChip.

Variants for two automotive voltage ranges were implemented:

- › HV2: 200 to 500 Vdc
- › HV3: 450 to 800Vdc

The ECU include the following safety mechanisms:

- › Galvanic isolation of the board power supply voltages
- › Passive and active discharge
- › Interlock
- › High voltage isolation management
- › Overcurrent protection

