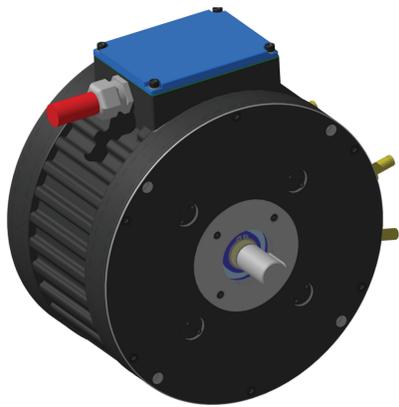


Electric Drive

Introduction

Developing an electric drive is a complex task with many challenges. It is not only an electric motor, an energy storage and power electronics per se, which gets a Formula Student Electric Car running. For a safe and powerful drive these components have to be matched together with an exact setup in many individual controlling tasks.



Source: PERM Motor GmbH

PMSM for season 2011

Motor

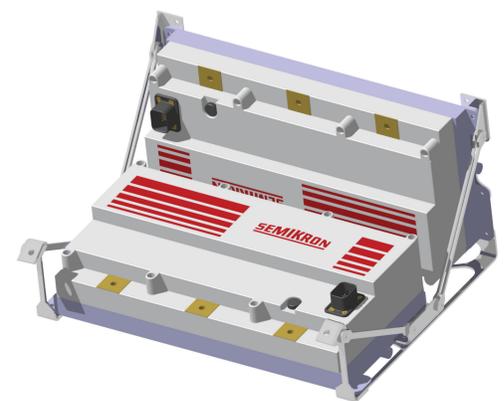
Our drive units are two permanent magnet excited synchronous machines (PMSM), which propel our rear wheels individually. These drive units excel by a high efficiency factor and a low moment of inertia; especially PMSM units don't need electrical excitation and are therefore perfect for vehicle drive systems.

Motor Data	
Voltage	260 V
Power	30 kW
Rotation Speed	6000 rpm
Torque	50 Nm
max. Torque	80 Nm
Cooling	Water
Mass	30 kg

Inverter Data	
Voltage	450 V
Current	400 A
Power	150 kW
DC Link	1 mF
Cooling	Water
Mass	8,2 kg
Communication	CAN

Power Electronics

For controlling our electric motors we use two inverters built by Semikron. With this setup we are able to control each motor separately, which allows us to implement a drive torque distribution.



Inverter Package for season 2011

Accumulator

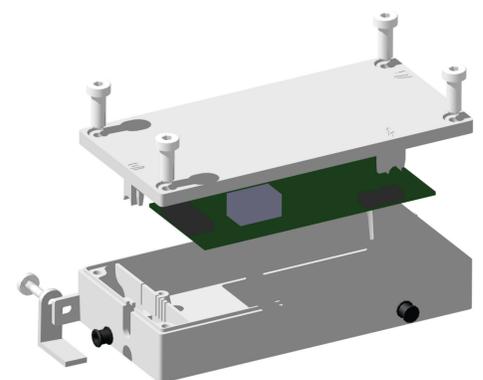
Our energy storage contains LiFe-PO4 Cells type ANR26650 made by A123 Systems. 924 of these cells are stored in two accumulator cases. A Battery Management System (BMS), developed by the TU Dresden, constantly monitors voltages and the temperatures of the cells. This setup guarantees, that they are in no critical state at all time.



Accumulator Case for season 2011

Insulation Monitoring

Of course, for driving in a race car accompanied by more than 400 V direct current, several safety requirements are needed. Besides high IP protection classes of all electrical components, an additional error control is included. An insulation monitoring device built by Bender monitors the galvanic insulation of our high-voltage system and the 24 V on-board power supply. If an error occurs, the high-voltage accumulators will be shut down.



Insulation Monitoring Device for season 2011