

Bachelor's / Master's Thesis

Mechanical Design and Initial Prototype Construction of a Custom-Developed Formula Student Electric Motor

Motivation

Formula Student is a global engineering competition where university students design, build and race small formula-style cars. Teams must balance performance, efficiency, reliability and innovation within a limited budget and timeframe. This project focuses on the mechanical realization of a fully custom-developed electric motor for the TUG Racing Team's drivetrain. The electromagnetic design (magnet arrangement, electrical design) has already been successfully completed in a previous master's thesis. The goal of this work is to translate this theoretical design into practice: the focus lies on the mechanical design under extreme lightweight requirements, the development of an efficient thermal concept (cooling), as well as accompanying the manufacturing and assembly of the first physical prototype.

Research Questions

- How can the existing, highly efficient electromagnetic design be translated into a mechanically robust and manufacturable geometry (housing, shaft, bearings) while meeting strict packaging and lightweight constraints?
- Which cooling and sealing concepts are best suited to reliably dissipate the high thermal losses of the motor during race conditions (endurance events)?

Tasks

- Analysis of the existing electrical design and derivation of the mechanical and thermal requirements for high-performance operation.
- Mechanical CAD design and FEM analysis of the motor components, as well as development of the motor cooling system (depending on the scope of the thesis, the cooling system can also be treated as a separate work package).
- Supervision of manufacturing, assembly, and functional commissioning (testing) of the first motor prototype on the test bench.

Further Information

- In cooperation with the TUG Racing Team
- Start: As soon as possible (according to agreement with the TUG Racing Team)

Contact

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