Bachelor-/Masterthesis/FP/IP

Technische Universität München

EI MST

Fakultät für
Elektro- und Informationstechnik
Lehrstuhl für
Messsystem- und Sensortechnik

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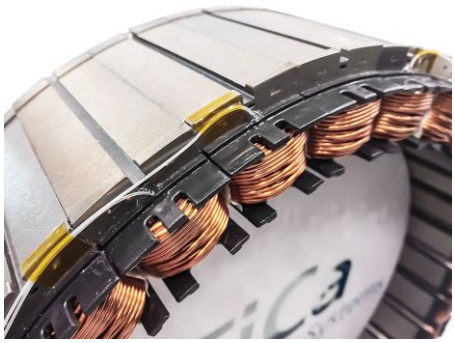
Optimization on a fiber optic temperature sensor for E-Mobility

Besides autonomous driving, the E-mobility is biggest innovation and challenge for today's car industry. Modern electric motors are faced with demanding requirements: high torque, long service life, low self-heating. Many tests and measurements are necessary during development to succeed. Important knowledge is gained if engineers manage to observe the winding temperature of the motor or batteries in active operation. Any temperature measurement in the electric car's drive train could hardly be accomplished so far with classic high-voltage thermocouples. On the one hand the strong electric and magnetic fields frequently lead to errors in the measurement signals due to EMI and ESD interference. On the other hand the placement of large high-voltage sensor probes alters the winding geometry and distorts the field distribution. This can disturb symmetry and the motors concentricity and even lead to resulting additional noise.

The developed fiber optic temperature sensors have the potential to fill this gap. Thanks to the optical measurement principle of measuring temperature depending Fiber Bragg wavelengths in combination with a robust edge filter interrogator, this technology is immune to electrostatic and electromagnetic interference. Additionally, fiber optic measurement makes testing in high-voltage environments safer and easier, because when working at voltages beyond 50V, comprehensive protective measures are mandatory.



fos4X, a former spin-off of the TUM MST, is developing such a fiber optic measurement system with its partner IMC for the car industry.

The industrialized low-cost and reliable temperature sensor has to be optimized, minimizing the absolute measurement uncertainty, increasing sensitivity and improving robustness. The proposed scientific work is involving advanced sensor development, characterization and evaluation of the calibration and optimization. The activities will take place at the company fos4X, Munich. Experience with fiber optics is an advantage but not mandatory. The work also offers a good balance between theory and practical development.