**Leistungselektronik und Elektrische Antriebstechnik**

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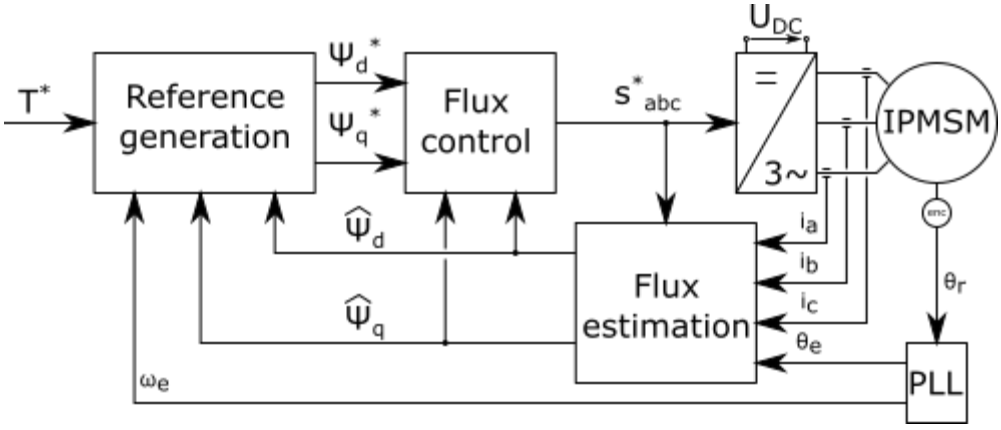
## Bachelor / student / project / master thesis

# Development and evaluation of a flux-based control strategy for interior permanent magnet synchronous machines

Interior permanent magnet synchronous machines are preferred for electric automobiles due to their high power and torque density. The standard drive configuration for traction applications consists on such a machine together with a 3-leg 2-level inverter. There are multiple approaches that may be taken for controlling these drives, with current vector control of field-oriented control being the industry standard. However, such control structures are limited in their capabilities, especially regarding operation near the voltage limit and in the higher speed range, where the maximum torque per flux (MTPF) path should be followed. Alternative control methods are continuously being developed, revisited or repurposed in order to supplement or substitute the current state of the art.

The aim of this thesis is to develop a simple flux-based control structure, following the lines of standard field-oriented control but using flux and not current as a control variable. For this purpose, a critical part of the development must be a sufficiently accurate flux estimation with the use of a flux observer. Ultimately, the benefits of using such a structure must be analyzed, with special emphasis on the flux weakening region and the operation around MTPF. For this last part, the square-root-condition method will be considered.




## ▶ Task and goals

- Research and literature review on flux-based control strategies
- Design of a basic field-oriented flux-based control, with special emphasis on accurate flux estimation, and reference generation for flux weakening and MTPF operation
- Implementation and evaluation of the control structure in MATLAB-Simulink
- Experimental evaluation of the control structure
- Documentation of the project in the form of a final thesis

## ▶ Requirements

- Above average performance in the field of electric drives
- Prior knowledge of MATLAB-Simulink
- Prior knowledge of basic control theory

## ▶ Contact

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