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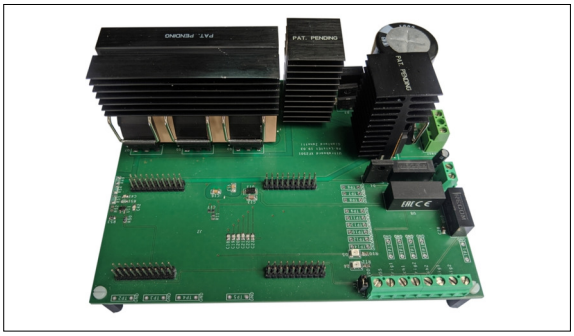
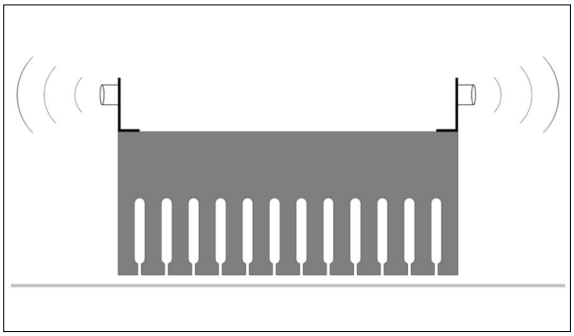
Subject Area	Energy and Environment

Converter and Sensor System for an Asynchronous Linear Induction Motor (ALIM)



PCB
Own presentment

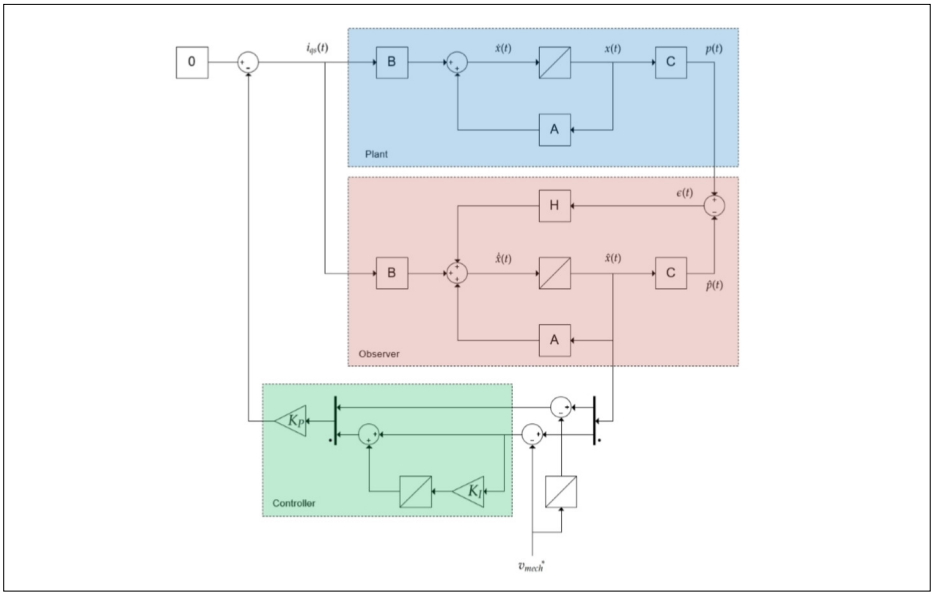


Position sensor system arrangement
Own presentment

Problem: The main topic of the project work is the implementation of a position control for an asynchronous linear induction motor, which includes the design and implementation of power electronics, development of an absolute position sensor system and the control design.

Approach: First, the power electronics were defined in order to properly operate the induction motor. The electronics were implemented in form of a self-developed 4 layer based PCB. The PCB was planned to be controlled through the RT-Box from Plexim or a TI microcontroller. The sensor system was defined through a comparison of different position sensing approaches. Finally, an ultrasound sensing method was defined for this project. The dual position sensor system was placed on top of the linear motor. In order to achieve a velocity control, the position derivation had to be implemented. As control method, the field oriented control (FOC) was defined and implemented. A PI controller is used to control the d/q-axis currents. A PI-controller was also designed as speed controller. As an alternative velocity control approach, an observer based control was examined and executed. The whole control and sensor system was tested with the PCB on the asynchronous linear induction motor.

Result: The PCB showed some initial problems, which could be solved and lastly, the full operation could be verified. Several improvements were made to the sensor system, such as measurement error compensation and optimised velocity calculation. This resulted in an accurate position sensing system.
The control of the motor proved very difficult due to the many unknown entities of the motor and test rail. However, a first quantitative velocity control approach could be achieved with a PI controller and as alternative, with an observer-based control.



Observer based control schematic
Own presentment