

Design and control of a three-phase inverter

For laboratory training and demonstration purposes

Graduate



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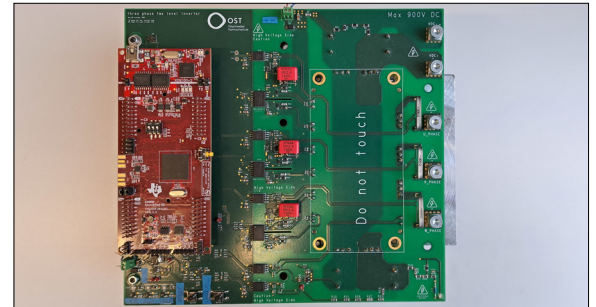
Donat Rohweder

Introduction: Applications that previously used fossil fuels are now more and more powered by electricity. Renewable energy is increasingly generated by solar power plants, which produce direct current (DC). The DC must be accordingly transformed into alternating current (AC) before being fed into the three-phase grid. This transformation also occurs in most electric cars, where batteries power the three-phase motor. Consequently, three-phase inverters will become more important in the future.

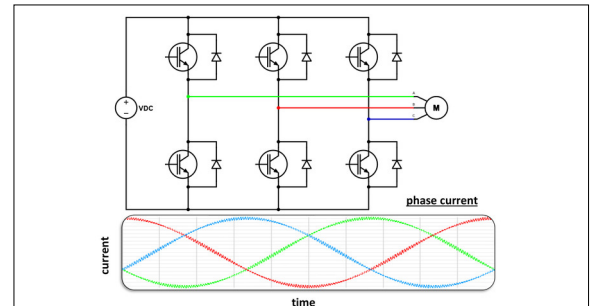
Definition of Task: This bachelor thesis analyses and develops a three-phase inverter that can drive synchronous and asynchronous motors with DC voltages up to 800 V. The three-phase inverter is to be designed as a demonstration object and teaching device in the power electronics lab at the Eastern Switzerland University of Applied Sciences. The hardware is to be implemented on a printed circuit board (PCB) that contains a microcontroller. The software running on the microcontroller is a C project generated from a PLECS module. The software has to be tested with the PLECS Real-Time Box (RT Box) before running it on the inverter to minimise possible damage to the components.

Result: In this work, the hardware of a three-phase inverter was realised using the E-CAD tool OrCAD. The software was implemented and successfully tested using the RT-Box from Plexim. In the power electronics class at OST, students will use the three-phase inverter in the lab to learn the basics of power inverters. The inverter can be directly controlled and evaluated using a PLECS module. Students will be able to test different modulation methods in real time and see the advantages and disadvantages of the varying operation of the semiconductor switches.

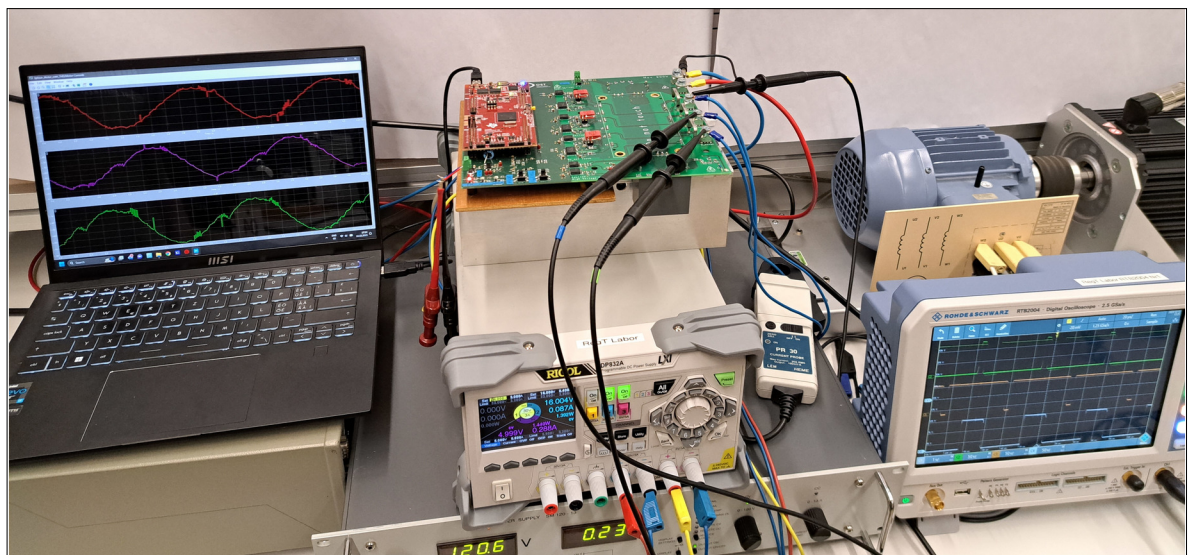
PCB of the Inverter with the Microcontroller
Own presentation



Three-Phase Inverter - Schematic
Own presentation



Test Setup of the Inverter
Own presentation



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Subject Area
Power Electronics