

Universal power electronics hardware trainer for teaching the DC grid

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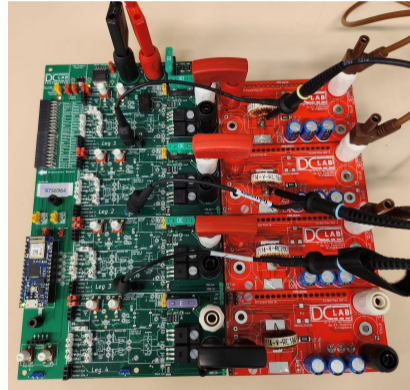
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Task: Develop an universal power electronics hardware trainer

- Flexible for many applications
- Student's proof
- Easy to configure
- Safe for students ($< 48\text{volt}$)



Teaching the DC grid required a typical power electronics trainer

- Power Electronics for interfacing solar and battery
- Understanding the droop control
- Combination of lecture and laboratory assignment

Oral Lectures have to be combined with laboratory assignments

- Textbook
- Cheat-sheets
- Solved problems
- Oral presentation slides
- Online design tool
- Online simulation
- Simulation & Animation

Student's Progress has to be monitored to keep them on track

- Written examinations (No fun for the students)
- Fulfill Assignments (Improvement is checked via assignment)

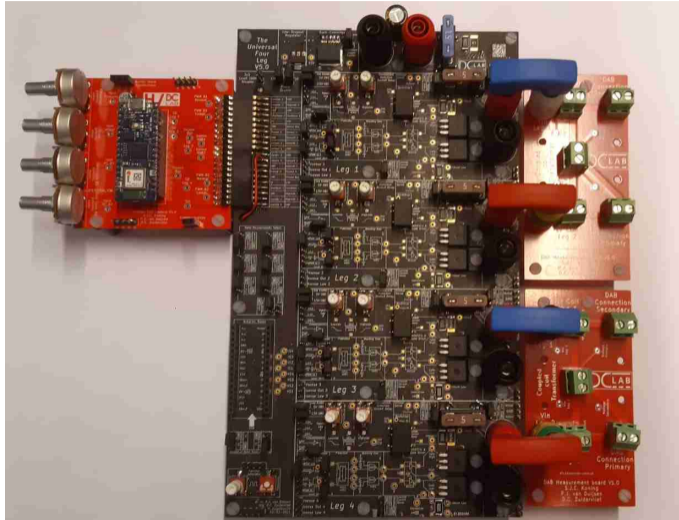
Practical Laboratory assignments gives a better understanding

- Live Demonstration during oral lectures
- Hand-On Laboratory assignments

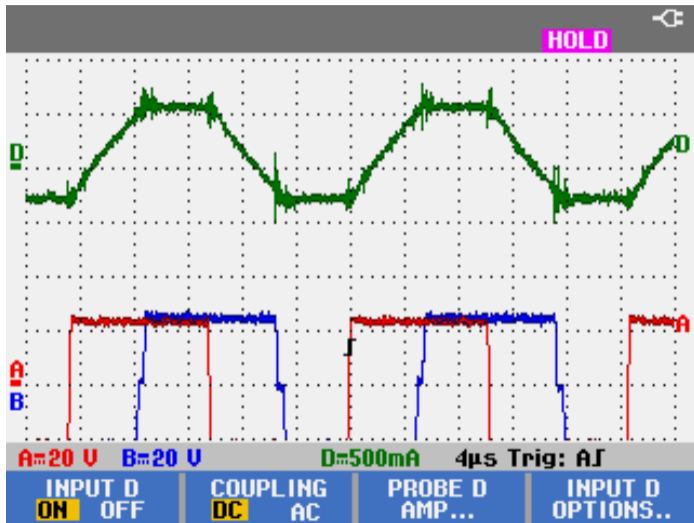
Typical Applications

- Power Electronics
- DC Grids
- Electric Motor drives
- Inverter modulation

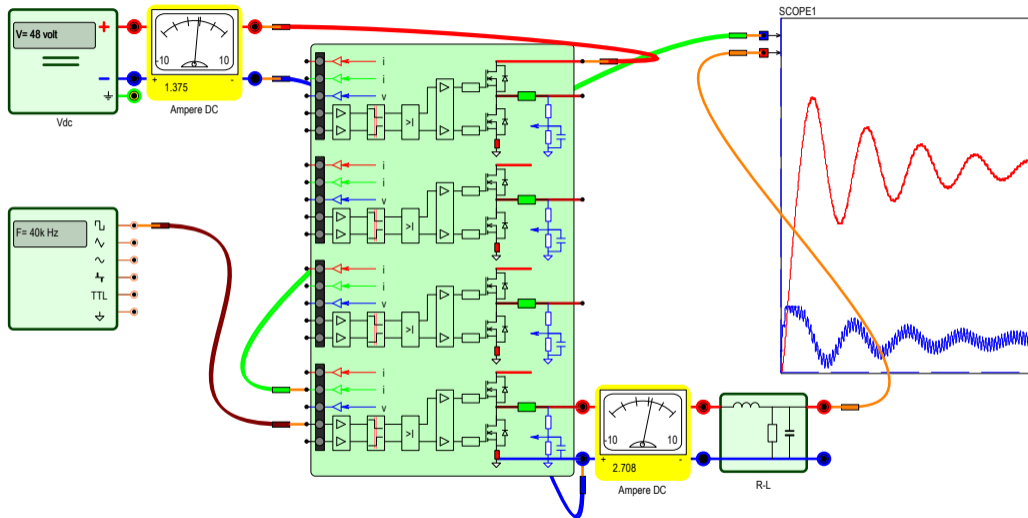
Dual Active Bridge



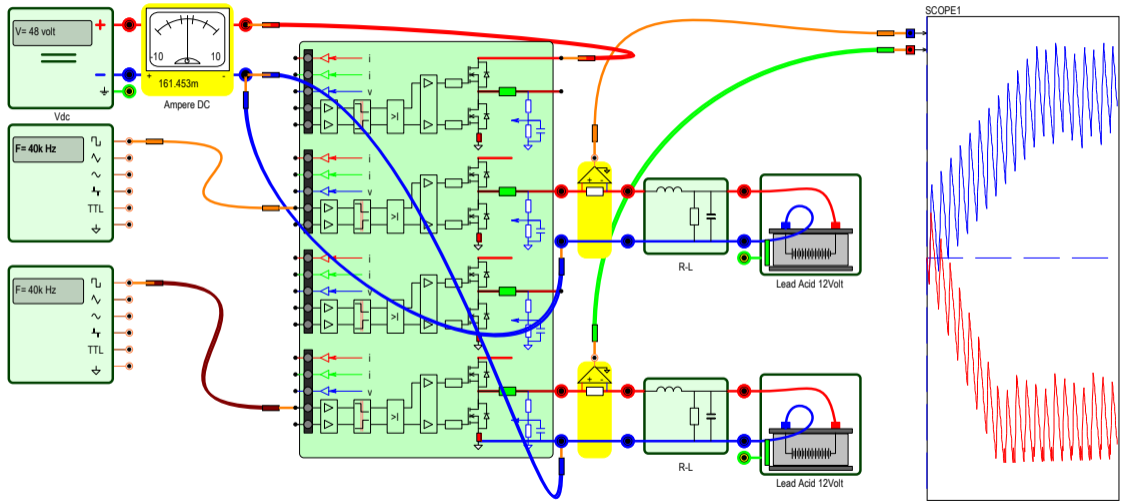
Dual Active Bridge hardware trainer



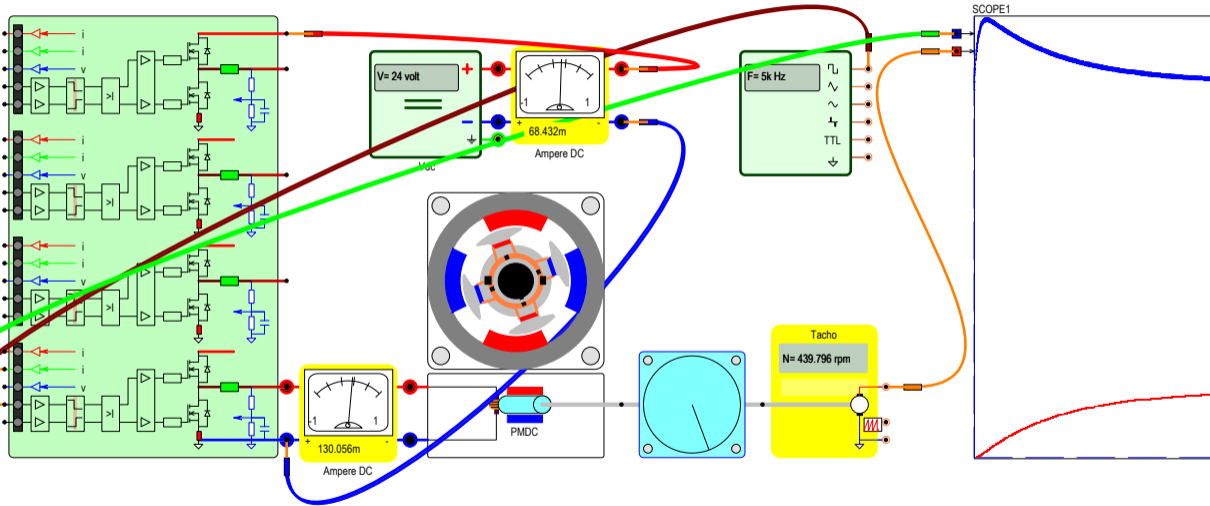
Dual Active Bridge measurement signals



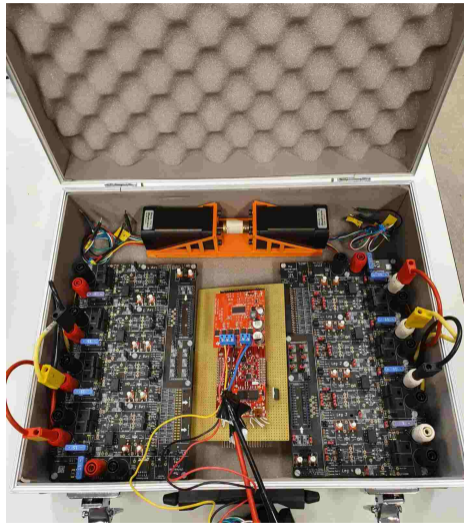
Voltage control by using the U4L as Synchronous Buck Converter



Charging and discharging batteries.



Control of a DC motor.



Portable dual motor control.

- Universal Power Electronics Trainer
- Especially designed for droop control using power electronics
- ...but.... can also be used for other topics

Thank you!
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