CARISSMA
Institute of Electric, Connected and Secure Mobility

Technische Hochschule Ingolstadt

June 2022


# Abschlussarbeit

## "Development of a battery management system for second-life batteries"

### *Beschreibung:*

The increasing number of electric vehicles will also increase the number of batteries available for reuse and recycling. Batteries are used in electric vehicles until they reach 80% of their rated capacity. After that, vehicle manufacturers recommend that batteries be removed from electric vehicles because these batteries no longer meet the requirements for acceleration, range and charging time. The main novelty of the work is the development of an energy management system capable of controlling current, voltage and temperature parameters of aged cells. In this thesis the student can evaluate the impact of parameter control considering different electrical architectures that will be connected in series and/or in parallel. The student/researcher will be able to build small battery packs composed of 4 to 6 aged cells. Cells can be connected in series, parallel or in a hybrid configuration. The BMS can be validated by comparing the performance of an aged battery module with a battery module built with fresh cells in a secondary application. If necessary, the student can conduct a study on the influence of second life profiles on battery aging. If time is available and student interest is available, the system can be tested to reliably and safely isolate defective cells, as well as insert new cells if necessary. Some types of security failure events can be simulated to assess whether the BMS will be able to control system parameters safely and reliably. Another type of study can be to develop an algorithm to control battery parameters considering the heterogeneity of battery modules.

### *Ihre Aufgaben:*

- First Phase: Benchmarking of commercial cells on the market, acquisition of cells, the definition of experiments.
- Second Phase: Development of a Battery Management System (BMS).
- Third Phase: Writing the text document of the thesis, representing/presenting the results.

### *Ihr Profil:*

- MatLab or Python experience and knowledge are desirable but not required.
- Basic knowledge of battery systems would be desirable.
- Confident use of MS Office.
- Excellent communication and organizational skills.

### *Interesse? Fragen? – Kontaktieren Sie uns!*

### *Kontakt:*

Carlos Antônio Rufino Júnior
E-Mail: carlos.rufino@carissma.eu

Prof. Dr. Hans-Georg Schweiger
Hans-Georg.Schweiger@thi.de