# NON-ISOLATED ON-BOARD-CHARGER FOR ELECTRIC AND HYBRID ELECTRIC VEHICLES

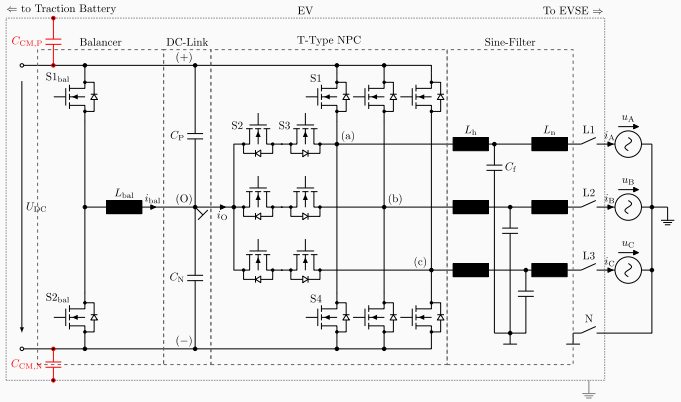
INCREASING THE EFFICIENCY OF ELECTRIC POWERTRAINS BY USING A NOVEL CHARGER

## STATUS QUO

Today, On-Board-Chargers are usually realized as a two-stage design consisting of an active frontend and an isolated DC/DC-converter. The second stage is mostly needed to avoid residual currents that would trip the residual current protective device (RCD). This comes at the cost that during conversion, the electric energy will have to pass through two powerelectronic converters, each producing losses and reducing efficiency.

## OUR TECHNOLOGY

This problem can be tackled by using a 3-level-active frontend together with a specialized modulation technique. This reduces the residual currents to an acceptable level. The technology can be used in single-phase or three-phase mode and covers the entire voltage range of common 800V battery packs. By eliminating the second converter stage, the power loss during charging is significantly reduced, thus leading to improved vehicle efficiency, reduced energy cost and a reduction of the ecologic impact of electric and hybrid mobility.




## BENEFITS

- Increased vehicle and charging efficiency
- Increased power density by eliminating transformer
- Reduced component cost due to lower complexity

## APPLICATION POSSIBILITIES

The technology can be used in all applications based on mobile battery storage, e.g. passenger cars and commercial vehicles. It is especially useful in applications where the battery is used as a bidirectional energy storage.

## COMMERCIALIZATION OPPORTUNITIES

There are various possibilities for cooperation between the industrial partner and TU Darmstadt: from an exchange with the know-how carriers of the technology up to a close cooperation in case of further development needs. The technology is protected by intellectual property rights and can be used by the industry partner after a sale or licensing agreement.

## CURRENT STAGE OF DEVELOPMENT TECHNOLOGY READINESS LEVEL (TRL)

| | |
|---|---|
| 9 | Product ready to launch |
| 8 | |
| 7 | Prototype |
| 6 | |
| 5 | |
| **4** | |
| 3 | Proof of Concept |
| 2 | |
| 1 | Idea |

**The technology development is at Level 4:**
Using a prototype, it has been shown that charging in single- and three-phase mode is reliably possible with realistic vehicle parameters and that the expected efficiency benefits can be reached

## YOUR CONTACT PARTNERS AT TU DARMSTADT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