

**New 48-volt battery boosts mild-hybrid performance**

- MAHLE Powertrain presents new prototype 48-volt battery
- Increased charge and discharge rates enable significant savings potential thanks to optimized battery cooling and cell chemistry

Stuttgart/Germany, November 07, 2019 – With a new 48-volt battery optimized for use in mild-hybrid vehicles, MAHLE Powertrain is making it possible to maximize the recuperated energy that can be stored and released. This can significantly increase the efficiency of mild-hybrid vehicles, allowing a fuel saving of between 12 and 15 percent. With this development, MAHLE Powertrain is increasing the capabilities of 48-volt systems, which offer major safety and cost advantages when compared with high-voltage systems.

Mild-hybrid vehicles need to recover energy efficiently and at a relatively high power during deceleration events. High storage capacity is not required for these applications as the recuperated energy can be deployed during the next acceleration. Thus a compact and cost effective battery that is capable of high charge and discharge power levels relative to its storage capacity (high C-rates) is desirable. As there were no suitable low-cost, compact batteries able to deal with the necessary recharge and discharge cycles involving high currents, MAHLE Powertrain decided to develop its own. The LTO chemistry in the selected cells allows continuous charge / discharge rates of 10 kW and peak rates for short periods up to 20 kW from a battery pack that has only a 0.5 kWh storage capacity.

Optimal battery cooling guarantees charge/discharge performance and battery durability. However, the coolant needed to be

electrically isolated from the cells. MAHLE Powertrain settled on a robust cooling strategy, with simulations showing cooling performance to be exactly on target.

MAHLE Powertrain engineers paid a great deal of attention to the design of the busbars and electrical connections within the battery, as any high resistance in these components can be an additional heat source and limit the power capability of the system.

Testing of the first prototype is underway to verify that the pack can meet the performance targets. Initial results indicate that all temperatures within the pack remain within an acceptable range at a continuous discharge rate of over 10 kW and that it is capable of peak power levels in excess of 20 kW. The next step will be to install the prototype pack into MAHLE Powertrain's 48V eSupercharged extreme downsizing demonstrator vehicle.

**About MAHLE**

MAHLE is a leading international development partner and supplier to the automotive industry as well as a pioneer for the mobility of the future. The MAHLE Group is committed to making transportation more efficient, more environmentally friendly, and more comfortable by continuously optimizing the combustion engine, driving forward the use of alternative fuels, and laying the foundation for the worldwide introduction of e-mobility. The group's product portfolio addresses all the crucial issues relating to the powertrain and air conditioning technology—both for drives with combustion engines and for e-mobility. MAHLE products are fitted in at least every second vehicle worldwide. Components and systems from MAHLE are also used off the road—in stationary applications, for mobile machinery, rail transport, as well as marine applications.

In 2018, the group generated sales of approximately EUR 12.6 billion with more than 79,000 employees and is represented in more than 30 countries with 160 production locations. At 16 major

research and development centers in Germany, Great Britain, Luxembourg, Spain, Slovenia, the USA, Brazil, Japan, China, and India, more than 6,100 development engineers and technicians are working on innovative solutions for the mobility of the future.

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