

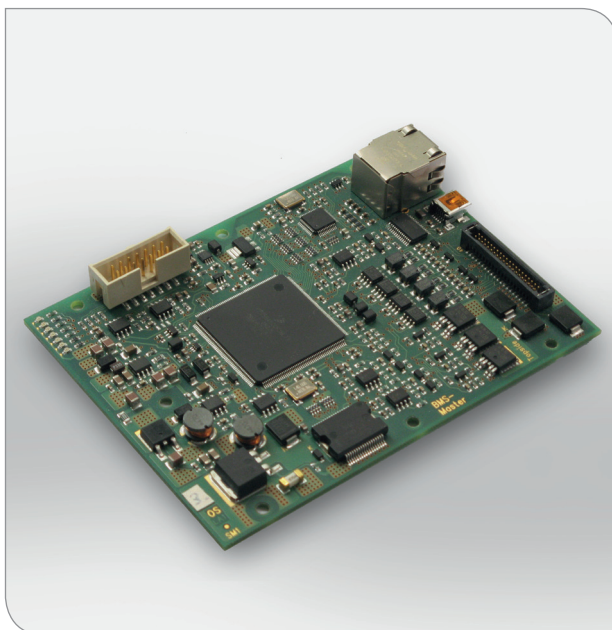
## Battery Management System (BMS) up to 1000 Volt

The battery management system (BMS) is a self-standing control unit ensuring function and general safety of an electric vehicle battery. The BMS developed at the Institute for Data Processing and Electronics (IPE) consists of several cascadable slave-modules and one master-board.

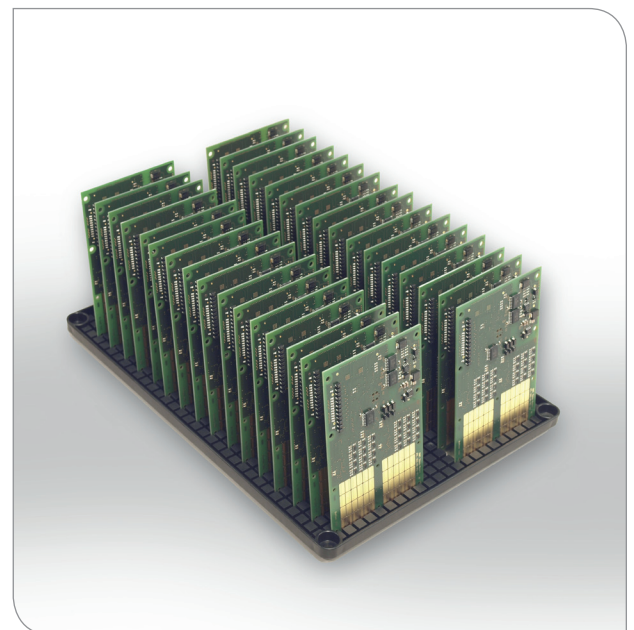
The master-board monitors and controls the whole battery system and communicates with the other control units of the vehicle. The major controlled parameters during the charging and the discharging phase are the state of charge (SOC), the state of health (SOH), the voltage, the current flow rate and the temperatures of the cells and the whole battery system. The master-board ensures a safe battery operation by opening the contactors when the limits of battery temperature and voltage are reached during operation. Furthermore the master-board logs the data of

the controlled parameters and balances the cells during charging. For these functions the master-board uses a dual-core-processor. This system architecture fulfills the requirements for safety critical applications in high voltage systems.

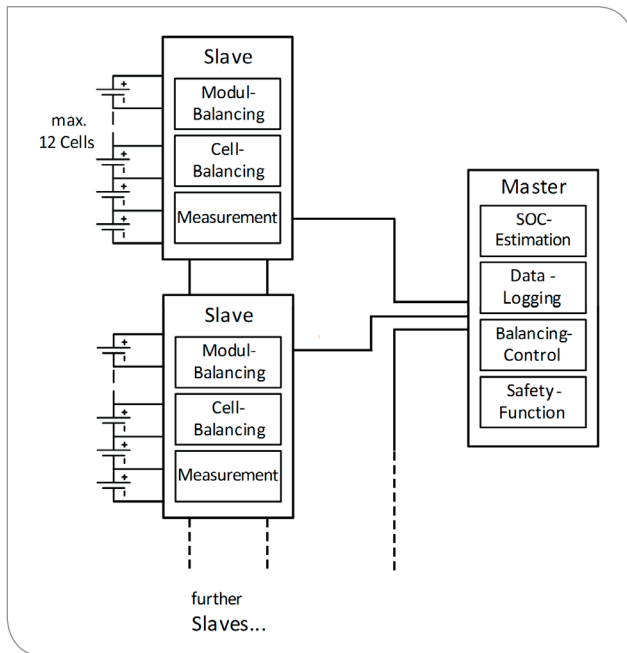
The slave modules are independent, processor controlled modules for measuring and monitoring up to 12 li-Ion cells. They monitor and balance continuously the SOC of each cell. Furthermore the slave-modules digitize the measured values and report them via CAN bus to the master-board. During operation the slave-modules monitor the voltage, the current and the temperature of the connected battery packs. The cascading of the slave-modules allows to monitor and measure a battery voltage level of up to 1000 V and  $\pm 200$  A.



Master-Board



Slave-Module



BMS block diagram

## Battery monitoring with consequent cell-orientation

KIT developed a consequent cell-oriented battery monitoring system for the monitoring of the individual cells. This board can be connected with the cells' conductors to measure its voltage level and temperature. The design of the board is for every cell identical and therefore it can be produced in high quantities reducing the costs and enabling a high degree of integration. Furthermore it can be implemented in the cell connectors reducing the effort for wiring and increasing functional safety.

The development of the e-city bus demonstrator was carried out within the scope of the project Competence E and funded by the Federal Ministry of Economics and Technology.



Prototype of a board for battery monitoring on cell-level

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