

INTELLIGENT BATTERY SENSORS

INNOVATIVE AND FORWARD-LOOKING TECHNICAL CONCEPT

MAJOR FEATURES

Motivation

- Guarantee an electrical supply regardless of how many electronic devices exist
- Increase the reliability of the vehicle power network
- Reliable energy source for driver assistance systems for improved driving comfort and safety
- Strict legislation (e.g. SULEV) can be fulfilled through further reductions of emissions and power consumption

Energy Management

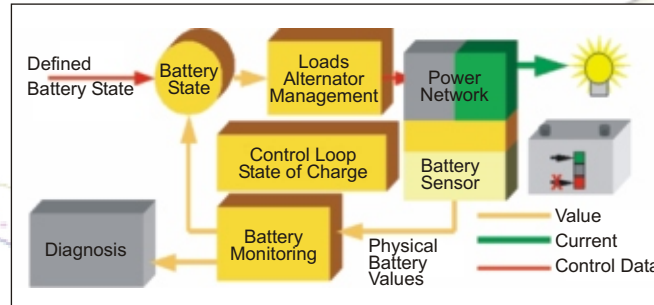
- Increased battery life through controlled charging and discharging
- Intelligent energy distribution allows for an optimized balance of the complete power network of the vehicle
- Engine cranking guaranteed through the balancing of the generated, stored and consumed energy

Battery Monitoring and Diagnosis

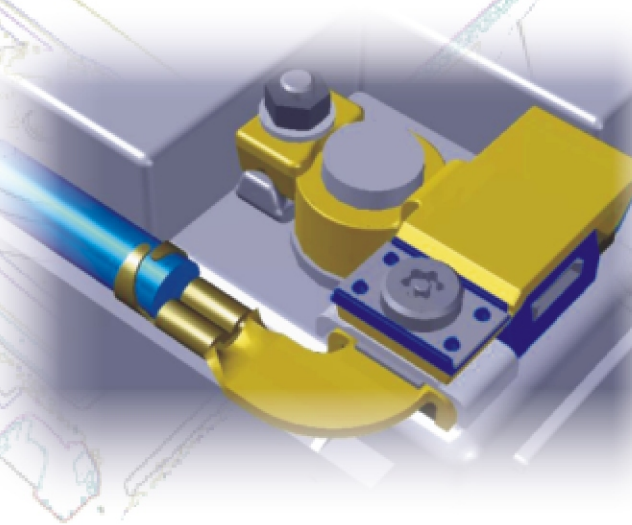
- Monitoring the state of charge (SOC) and state of health (SOH) of the battery
- Indication of the actual state of charge of the battery

Battery Sensors

- Physical battery data defined as an optimal and reliable pre-requisite for the closed-loop regulation of the battery condition
- "One size fits all" sensor concept: sensor works with any battery in any vehicle
- Battery sensor integrated into the battery terminal in order to realize a modular energy management system independent of the vehicle platform and OEM



The Intelligent Battery Sensor, as in production today, is a key element in the regulation of energy generation, distribution and storage. It fits into a standard battery terminal as used in all of today's vehicles.



Parameter sensing

- Precise measurement of current, voltage and battery temperature
- Simultaneous sensing of voltage and current by two parallel A/D converters
- Bidirectional current sensing over a wide current range without a need to switch between ranges (mAmps to kAmps)
- Variable sampling rate up to the kHz range with a superior signal-to-noise ratio

System features

- Programmable current threshold monitoring with minimal quiescent current consumption
- Wake-up ability for monitoring all vehicle conditions
- Programmable sleep timer from seconds up to several hours
- LIN / BSD bus capability

Design concept

- Sensor directly integrated onto the shunt guarantees the most precise measurement possible
- Internal losses minimized due to inter-metallic connection of all current carrying components (incl. 100 $\mu\Omega$ -shunt)
- Electronics are mechanically protected through the integration into the battery terminal and sealed with hot melt

Packaging

- Highly integrated mechatronic component packaged into a standard battery terminal makes the assembly of this battery sensor possible in all vehicles
- Direct mounting to the negative battery terminal guarantees an optimal thermal connection to the battery and thereby precise sensing of the battery temperature

Development/Process Advantages

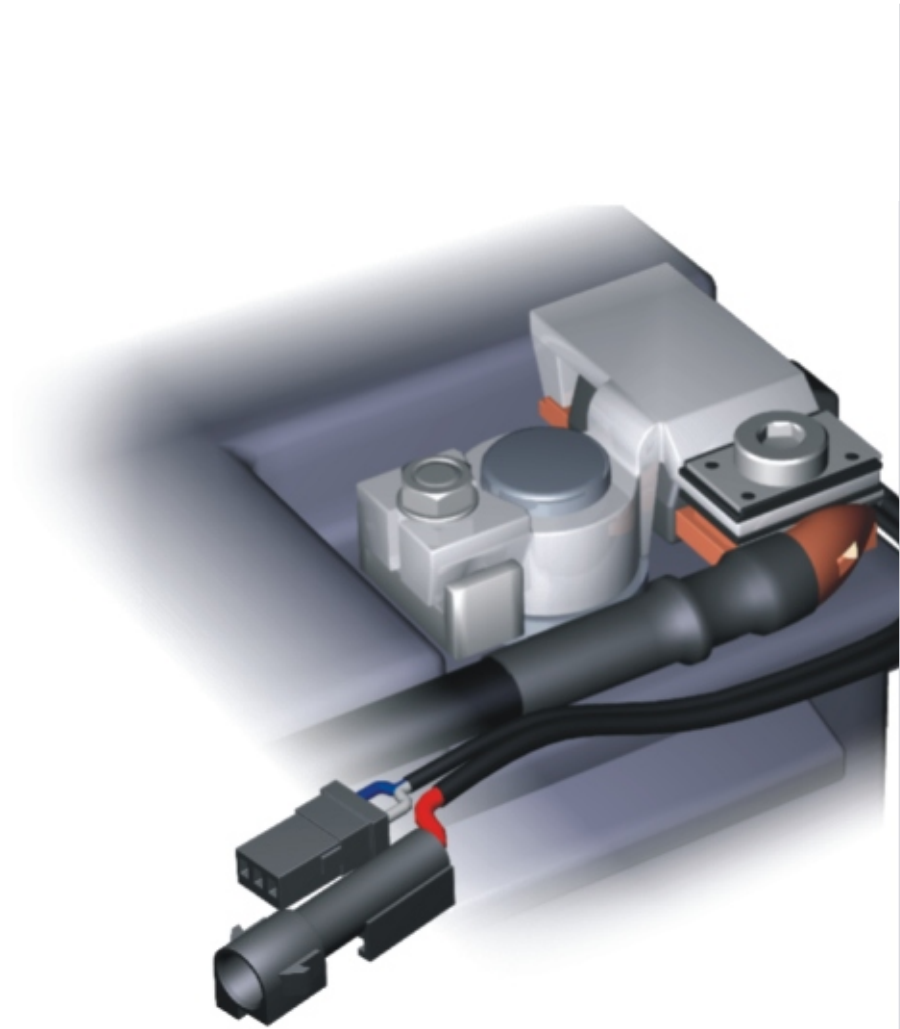
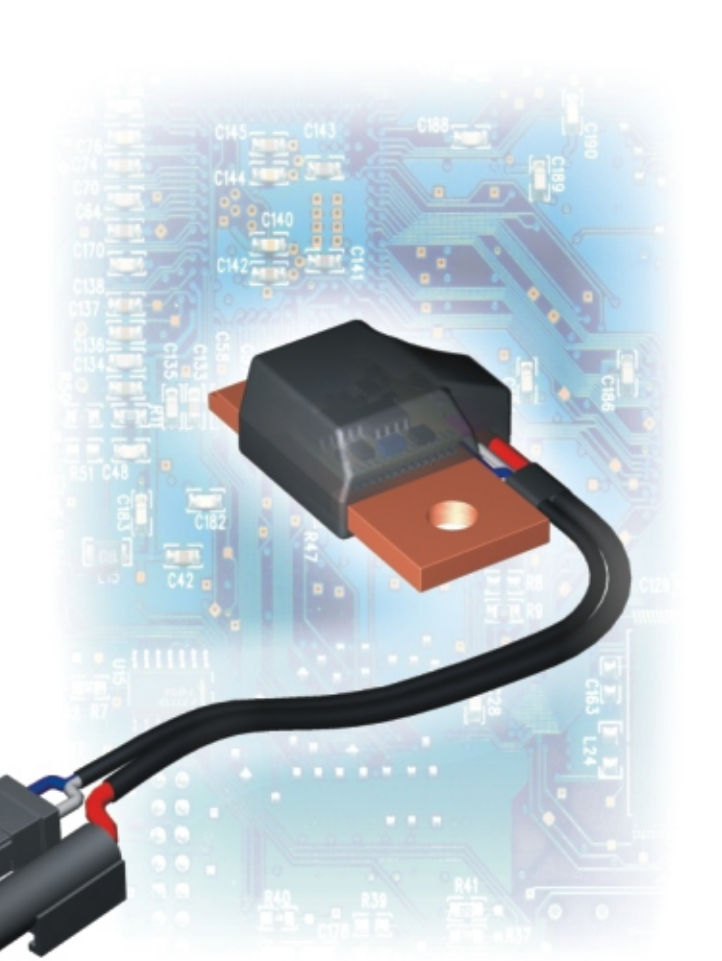
- Battery diagnosis: Continuous and precise definition of the fundamental battery parameters over a wide range of operating conditions with high accuracy
- Resource protection: Optimization of fuel consumption as well as further potential weight savings through the use of a dynamic adaptable alternator output
- Conservation: Guarantee the engine cranking ability despite long periods parked or through the use of electrical loads without the motor running. Eliminated service call cost required by unintentional discharging of the battery

Production Advantages

- Cost Saving: by eliminating today's expensive measurement of voltage and current in the production facility
- Quality Assurance: the monitoring of quiescent current by a battery sensor allows for immediate detection of defective electronic devices during assembly of the vehicle
- State of charge: guarantees an optimal state of charge during shipment

Service Advantages

- Continuous quiescent current monitoring allows for detection of defective electronic control units in the vehicle
- Battery diagnosis provides data on battery state-of-charge and state-of-health



TECHNICAL DATA

- Voltage sensing range:** 6...60V
- Resolution: 0,1mV
 - Linearity: < 0,2%
 - Offset: ± 1mV
- Current sensing range:** 0... ±1200A
- Resolution: 3mA
 - Linearity: < 0,5%
 - Offset: ± 6mA
- Operating temperature:** -40...125°C
- Deviation: ± 3K
- Quiescent current:** < 100µA



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*Ideas today for
the cars of tomorrow*

The Intelligent Battery Sensor
integrated into the
Battery Terminal

An innovative and
trend-setting
Sensor Solution

