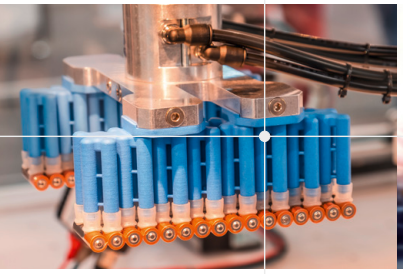
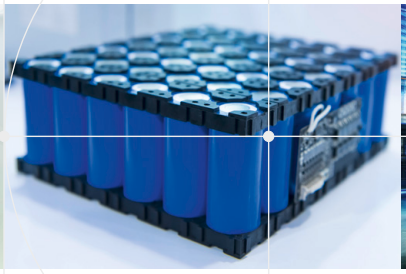
Complete quality assurance in battery mass production

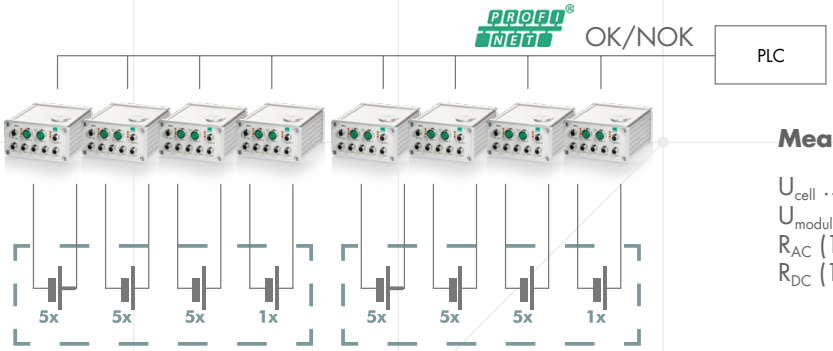
Boost your productivity with cost-efficient solutions for uncompromising zero-defect assembly





Hundreds of round cells per vehicle are required in the manufacture and assembly of lithium-ion battery packs for pure electric vehicles. One battery module consists of 32 cells. Before a complete module is transferred to the downstream process, 100 % quality control is carried out for each cell during a parallel completion process. Key battery parameters are checked to rule out possible causes of failure in advance. Self-heating, capacity losses or accelerated aging processes could have a serious impact on battery lifespan or even cause a fire.

32 round cells are measured in just a few milliseconds per cell with burster series 2511 battery measuring modules. In addition to the open-circuit and module voltage, the four-wire measurement method is used to precisely record the real part of the complex impedance via combined AC/DC internal resistance measurement at 1 kHz and 10 Hz. This enables conclusions about the electrolyte quality and electrode properties. The respective measured values and evaluation results are transmitted to the higher-level control system in real time via a PROFINET interface.

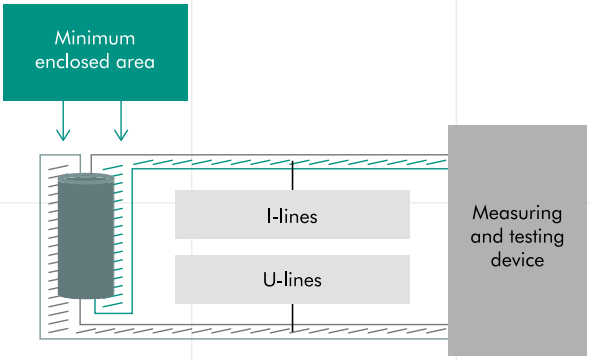


Measurement and evaluation parameters

U_{cell} ..... ≈ 3,66 ... 3,67 VDC
U_{modul} ..... ≈ 58,62 ... 58,82 VDC
R_{AC} (1 kHz)..... ≈ 7,95 ... 8,36 mΩ
R_{DC} (10 Hz) ..... ≈ 12,44 ... 13,10 mΩ

To achieve reproducible and reliable results, care must be taken that only a minimum area is enclosed between the U/I leads, and the measuring leads should be twisted until shortly before the test object. Precise positioning and consistent, stable contact force are of elementary importance in the connection and measurement process.

Thanks to their very small dimensions (104 x 54.6 x 120 mm per unit), IP54 protection and low weight, the battery measuring modules are installed in the immediate vicinity of robots.



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Battery measuring module 2511

Highlights

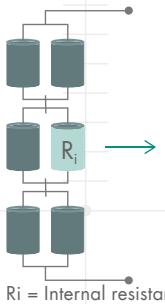
- 100% monitoring of cell electrolyte and electrode properties via AC/DC internal resistance measurementat 1 kHz and 10 Hz
- High-speed precise measurement and evaluation in just a few milliseconds
- Easy control system integration via fieldbus
- Single and multi-channel applications in automated systems (e.g. BoL)
- Compact, control cabinet / wall mounting, stand alone, IP54

Features

- Four-wire measurement method for highest precision
- Measurement range 0 … 10 mΩ/30 mΩ/100 mΩ/300 mΩ
- Voltage measurement 0 … ±5 V DC
- Temperature measurement 0 °C … +100 °C

100% monitoring for known weaknesses at an early stage in the process

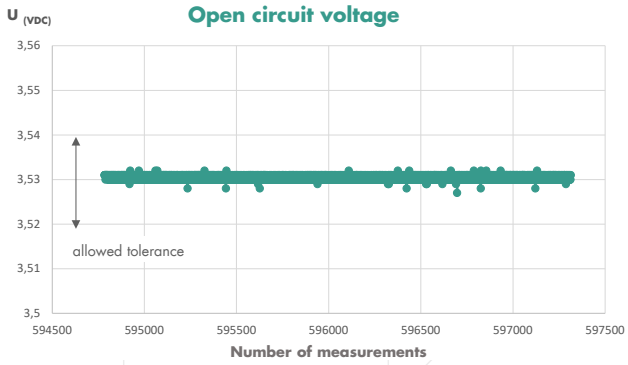
High-performance battery modules consist of a large number of individual cells connected in parallel or series.

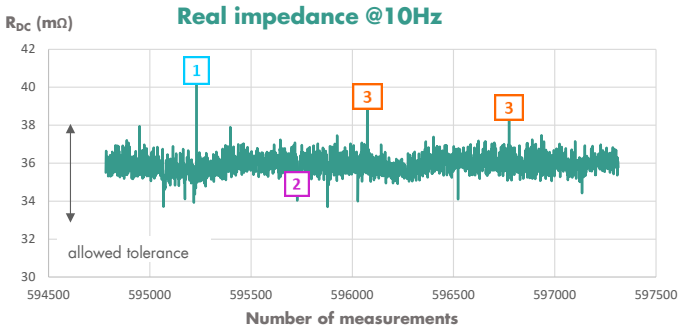


Ri = Internal resistance of a cell / battery group 3S2P

Because different internal resistances (R_i) cause different charge/discharge behaviors, increased internal resistance in one battery cell has serious effects: accelerated aging, greater self-heating, reduced capacity and a shorter lifespan.

A complex battery assembly is only as strong as the weakest cell!

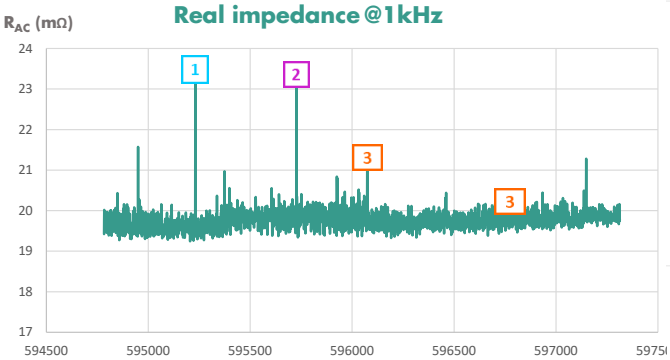




1 = Offset error on cell **NOK** (cause → poor contact; measure → reject, investigate)

2 = Electrolyte (ohmic) in cell **NOK** (cause e.g. corroded terminals, poor conductivity; measure → reject)

3 = Electrodes (ohmic) on cells **NOK** (cause e.g. change in the electrode microstructure of the active mass; measure → reject)



The open circuit voltage (OCV) measurement alone is not always meaningful!

Only the measurement of both real impedance values (at 10 Hz and 1 kHz) can provide information about the battery quality!

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