Warranty: 24 months

Battery Measuring Module

AC/DC-IR measurement for 100% checking of battery cells in automation systems

MODEL 2511 NEW

Preliminary data sheet

PROFINET EtherCAT

Highlights

- Internal resistance ranges: 10 … 300 mΩ
- Frequency ranges: 1kHz, 100 Hz, 10 Hz, 1 Hz
- Resolution: up to 0.01 µΩ
- Single to multi-channel applications, temperature measurement via PT100
- Accuracy: from ±0.2 % of reading ±0.4 % d.A.
- Measuring and evaluation results in a few milliseconds
- Compact design, state of the art interfaces
- Voltage measurement: 0 … ±5 VDC
- Flexible fieldbus integration with EtherCAT or PROFINET

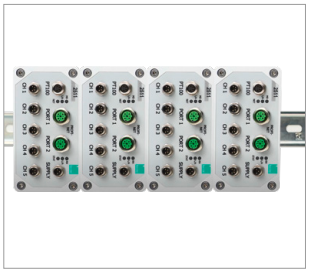
Options

- Desktop device with display
- Wall mounting
- Top hat rail mounting

Areas of application

- Quality assurance of battery cells
- Sorting processes

Display device



Multi-channel system with top-hat rail

AC-IR	Internal resistance measurement Effect on electrolytes detectable
DC-IR	Internal resistance measurement Effect on electrode detectable
OCV	Open circuit voltage measurement
°C	Temperature measurement

Product description

The 2511 battery measuring module is particularly suitable for fast, multi-channel measurement of battery cells in automation systems. The device operates in accordance with the well-tried four-conductor measuring method, and combines the functionality of a battery tester and a battery analyzer, making it possible to carry out rapid testing of batteries irrespective of the technology. Fast measurement and evaluation of important parameters takes place in just a few milliseconds (73 ms). The testing can be carried out with individually adjustable parameters.

The device corresponds with the latest CE directives, and is designed for laboratory operation and also for deployment under harsh industrial conditions in automation systems.

The variable fieldbus interfaces enable flexible process integration. Fully automatic testing can be carried out in this way.

Technical data

Operating modes and measuring times						
Operating mode		3 parameter slow	3 parameter standard	2 parameter standard	3 parameter fast	2 parameter fast
Parameters		U, 1 kHz, 1 Hz	U, 1 kHz, 10 Hz	U, 1 kHz	U, 1 kHz, 100 Hz	U, 1 kHz
Measuring time 1 channel/ms		1233	333	233	93	73
Measuring time 5 channel/ms		6215	1715	1215	515	415
Measuring principle		Internal resistance (ohmic component), discharging, polarity-independent				
Number of measuring channels		Up to 5 individual cells				
Internal resistance						
Measuring ranges		10 mΩ, 30 mΩ, 100 mΩ, 300 mΩ				
Measuring frequencies		1kHz, 100 Hz, 10 Hz, 1 Hz				
Resolution		0.1 µΩ				
Measuring current		200 mA				
Measuring error		from ±0.2 % of reading ±0.4 % d.A. (23 ±5 °C) (Standard measuring time)				
Temperature measurement (PT100)						
Measuring range		0 ... 100 °C				
Resolution		0.1 °C				
Measuring error		0.1 °C				
Temperature recording		via external PT100 sensor				
Voltage						
Measuring ranges		0 ... ±5 VDC				
Resolution		1 µV				
Measuring error		from ±0.01 % d.A. ± 0.005 % of reading				
Housing						
Material		Aluminum				
Dimensions (WxHxD)		104 x 54.6 x 120 mm				
Weight		approx. 500 g				
Protection type		IP54				
Connections		PROFINET, PT100, measuring inputs, USB				
General data						
Supply voltage		11... 30 VDC, galvanic isolation, inverse polarity protection, overvoltage protection				
Power consumption		Approx. 3 W				
Communication		PROFINET, EtherCAT				
Operating temperature range		0 °C ... +50 °C				
Storage temperature range		-10 °C ... +70 °C				
Humidity		0 ... 70 % non-condensing				
Installation		4 rubberized feet (fitted as standard) Wall mounting (accessory only for panel mounting) Mounting rail installation (accessory) (Mounting rail in accordance with DIN EN 50022)				

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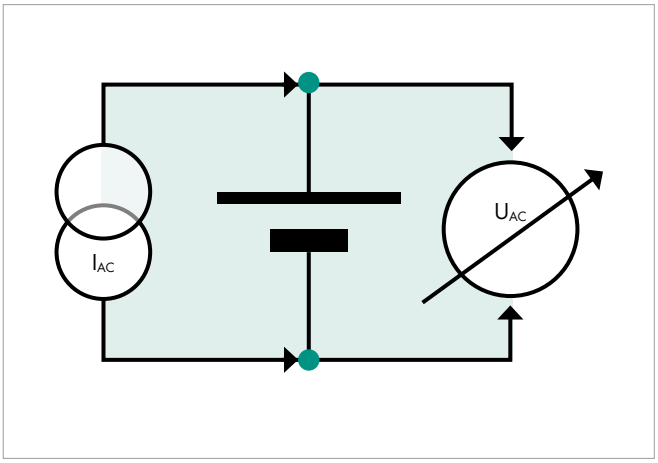
Principle of operation

Battery measuring module model 2511 is optimized for rapid testing of cells. It operates in accordance with the well-tried four-conductor method (Kelvin connection) and has 4 connections for impedance measurement: 2 cables for supplying the test current and 2 cables for the voltage measurement. The battery tester works as a current sink. It draws a relatively small DC current IDC from the test object (battery cell) in relation to the load current, converts this into an AC current IAC, applies this to the test object (battery cell) and measures the resulting voltage drop UAC in the mV range. The AC voltage measurement takes place selectively and synchronously, with results in accordance with the real and imaginary component. Dividing the AC voltage and the AC current results in the complex (AC current) impedance Z. The real component represents the ohmic component, whereby a negative imaginary component means capacitance, and a positive proportion means inductance. The input voltage is measured in parallel to this.



The 3 main battery parameters (AC internal resistance, DC internal resistance and battery voltage) are measured within < 0.1 seconds. Another measuring mode makes a temperature measurement and automatic temperature compensation possible.

Operating modes

The 2511 battery measuring module and the associated PC software provide a large number of measuring and evaluation functions.

3 parameters slow/fast
In this operating mode, the internal resistance is measured with 2 preset frequencies (1 Hz ... 1 kHz) and the open circuit voltage.

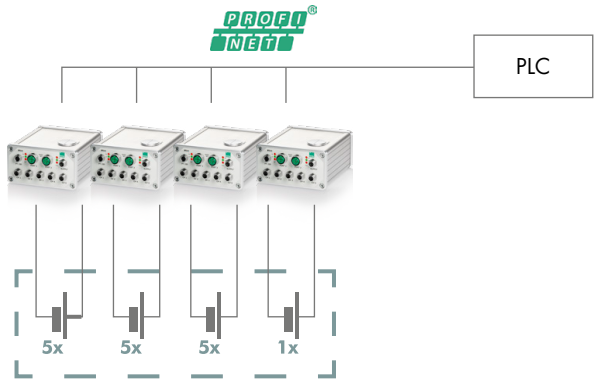
2 parameters slow/fast
In this operating mode, the internal resistance is measured with a preset frequency (1 Hz ... 1 kHz) and the open circuit voltage is measured.

Applications

16-channel high-speed application – 100 % monitoring in vehicle battery module received goods checking

Many battery cells are required to manufacture and install high-performance battery modules for electric vehicles. In the received goods checking area, important battery parameters of each individual cell must be reliably measured and evaluated within very short cycle times.

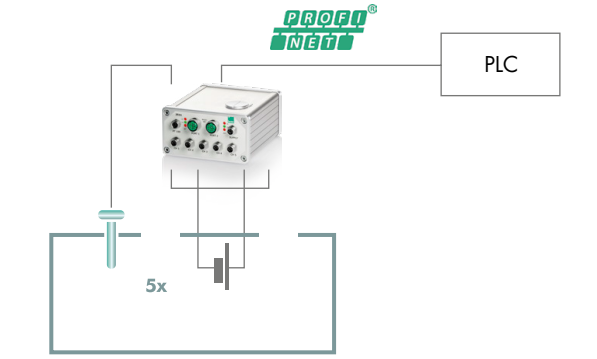
After contacting the prismatic cells, the internal resistance **with 1 kHz** and the cell and module voltage of **all 16 cells** are **measured and evaluated within approx. 0.5 s** with the cascadable battery measuring module and transferred to a PLC in real time.



Measuring and evaluation parameters
U_{cell} .....≈ 0…3.4 to 3.7 VDC
U_{module} .....≈ 54.4…59.2 VDC
R_{AC} (1 kHz) .....≈ 24.91…25.12 mΩ

5-channel application – matching of battery cells for large-scale storage

Many round cells are often used in battery operated large-scale storage systems. Before these are installed, different battery parameters of each individual cell must be exactly and quickly measured and evaluated in order to achieve qualitative matching. The contacting of the round cells takes place using the **four-conductor measuring method** (for each current and voltage cable). The two-frequency impedance measurement is used to determine the **series resistance (electrolyte)** and the **parallel resistance (electrodes)**. In parallel to this, the respective **cell voltage** and **temperature** are recorded and evaluated. At the control side, the data is transferred via PROFINET. All measuring and evaluation data is archived for traceability.



Measuring and evaluation parameters
U_{cell} .....≈ 0…3.3 to 3.8 VDC
R_{AC} (1 kHz) .....≈ 23.50…24.88 mΩ
R_{DC} (10 Hz) .....≈ 24.71 mΩ
ϑ .....≈ 22…28 °C

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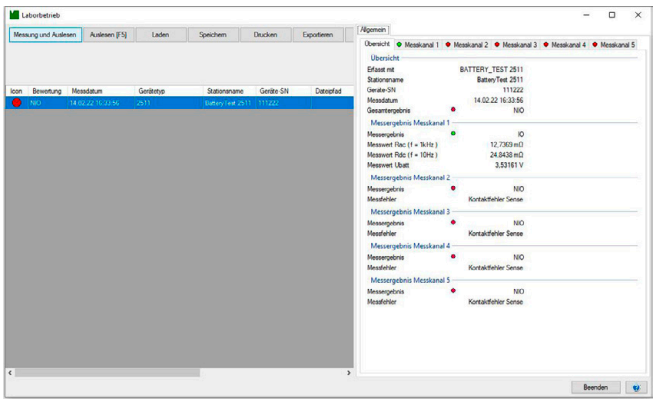
DigiControl PC software

The innovative, intuitively operated PC software for battery measuring module 2511 is used wherever diagnoses, battery condition determination or target/actual comparisons are to be carried out on battery cells.

- Convenient device configuration via USB interface
- Management/configuration of different operating modes
- Backup of settings
- Measurement data logging
- Entry of test object designations for measurement data logging
- Exporting the measurement data in an Excel file or as plain text
- Evaluation of the measuring results



Accessories

Order code		
9900-K251		Supply cable 2 m in length, 3-pin M8 socket, one end with free ferrules
9900-K252		Measuring cable 2 m in length, 4-pin M8 socket, one end with free ferrules
9900-K259		Pt100 temperature, 2 m in length, 4-pin M8 connector
2500-Z001		Single cell holder in four-wire design incl. Pt100 sensor for testing round cells 21700, 18650, ready for connection
2511-Z001		Mounting kit for wall mounting
2511-Z002		Mounting kit for mounting rail installation

Single cell holder Model 2500-Z001

Scope of delivery without cell

The round cell holder enables precise impedance, OCV and temperature measurements on 18650, 21700 cell formats. Contacting the test object using high-quality contact pins in four-wire technology.

Generate order code

						Standard			
						2	5	0	3
2	**5**	**1**	**1**	**–**	**V**	**2**		**0**	**3**

Housing	
■ Panel-mount unit without display 24 V/DC	2

Number of channels	
■ 1-channel	1
■ 2-channel	2
■ 3-channel	3
■ 4-channel	4
■ 5-channel	5

Fieldbuses	
■ EtherCAT	1
■ PROFINET	3

						Standard			
						1	2	0	3
2	**5**	**1**	**1**	**–**	**V**	**1**	**2**	**0**	**3**

Housing	
■ Desktop device with display 24 V/DC	1

Number of channels	
■ 2-channel	2

Fieldbuses	
■ EtherCAT	1
■ PROFINET	3

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