Laagohmige interne weerstanden
Een must voor hoogwaardige batterijen

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Product Marketing Specialist
Hioki Europe

batenburg
applied technologies

de kracht van twee in één

Batenburg Mechatronica
Batenburg Adelco Electronics

We are on our way to a brighter tomorrow

POWER ELECTRONICS 2022

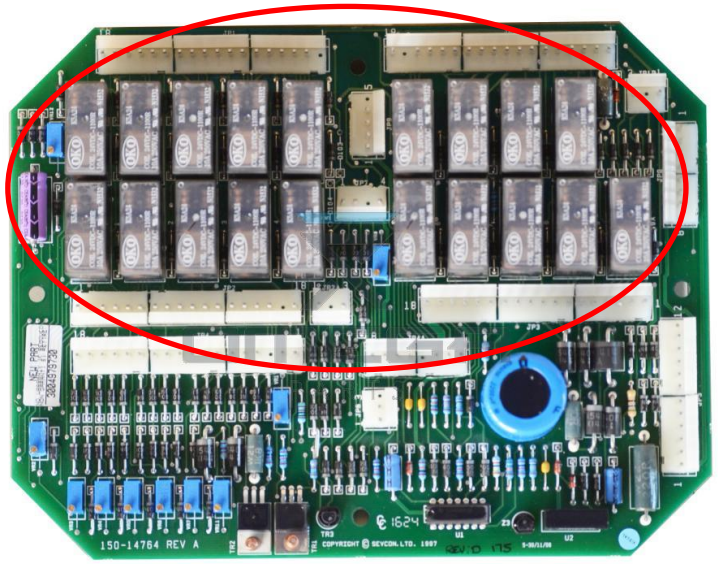
Power Electronics & Energy Storage event

14 juni 2022 | 1931 Congrescentrum 's-Hertogenbosch

ENERGY STORAGE EVENT 2022

First AC resistance meter

3225 AC Resistance Meter



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First LiB

Akira Yoshino

3225 AC Resistance Meter

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Battery production

Lithium-ion Battery Production Processes

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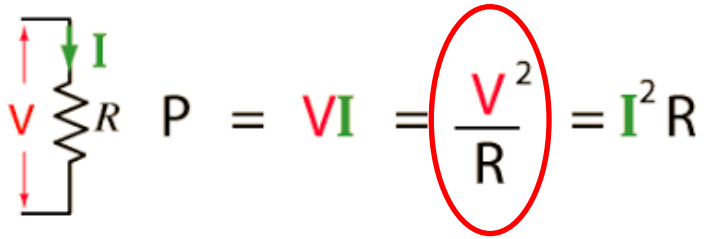
AC or DC resistance measurement

	DC resistance measurement	AC resistance measurement
Measurement signal	DC	AC
Advantages	Highly precise measurement is possible High sensitivity	Not affected by electromotive force. Suitable for Reactance measurement
Disadvantages	Affected by electromotive force since not capable of performing DC superimposed measurement (Thermal EMFs can be corrected by OVC function)	Less sensitive and accurate
Applications	DC resistance of windings, contact resistance, insulation resistance, PCB wiring resistance	Battery impedance, inductors, capacitors, electrochemical measurement
Measurement range	10^{-8} to 10^{16}	10^{-3} to 10^{8}
Type of instrument	Resistance meter, DMMs, Insulation resistance meters	Battery testers LCR meters

Importance of low resistance

$$I = \frac{V}{R}$$

I = Current in Amperes (A)
V = Voltage in Volts (V)
R = Resistance in Ohms (Ω)



$$P = VI = \frac{V^2}{R} = I^2R$$

$$Q = i^2 \times R \times t$$

Joule's Law

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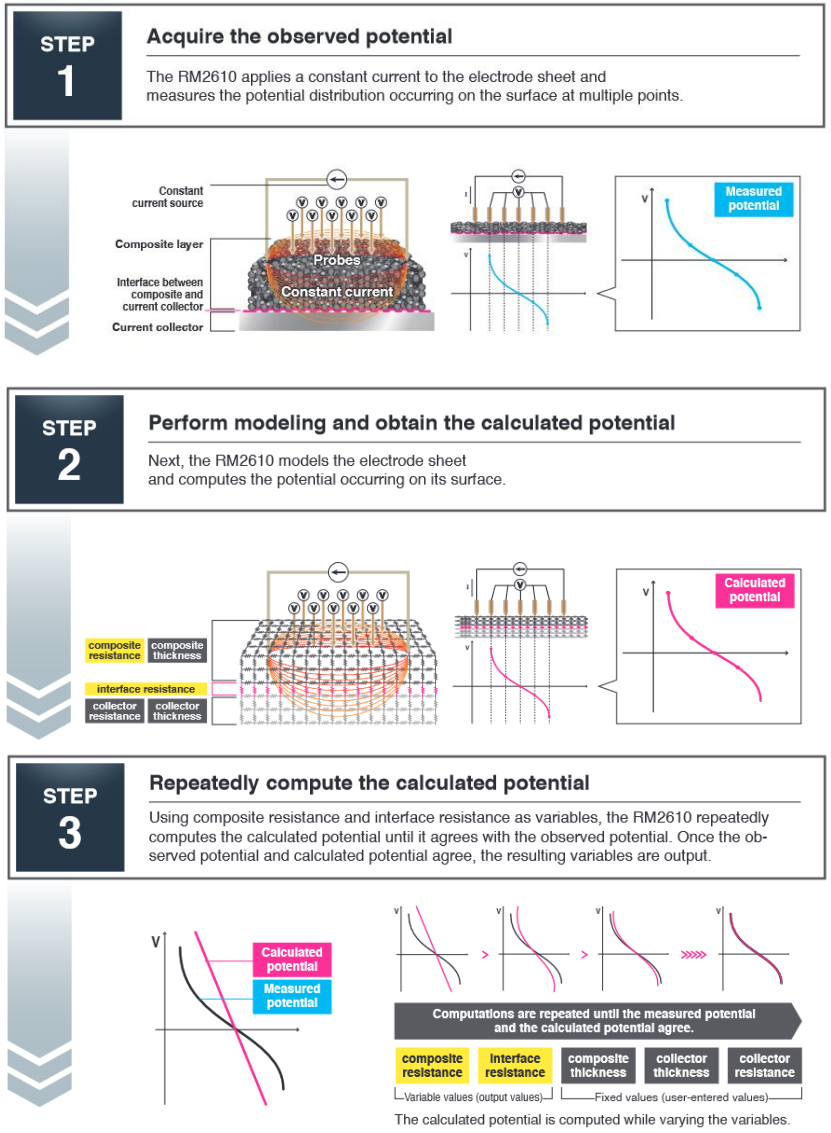
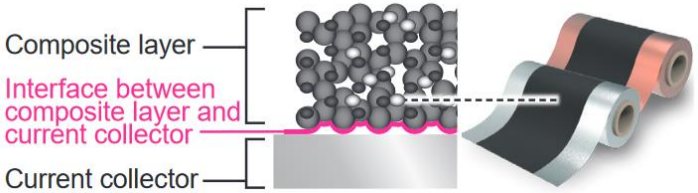
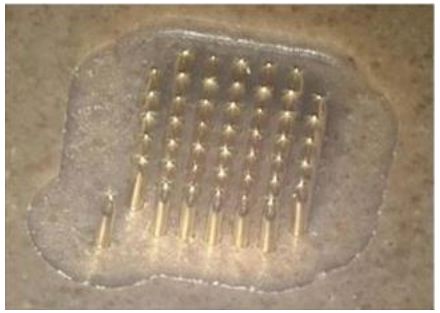
Battery production

Lithium-ion Battery Production Processes

Electrode resistance







RM2610 Electrode Resistance Measurement System

measures Composite <u>and</u> Interface resistance

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Connection resistance

Lithium-ion Battery Production Processes

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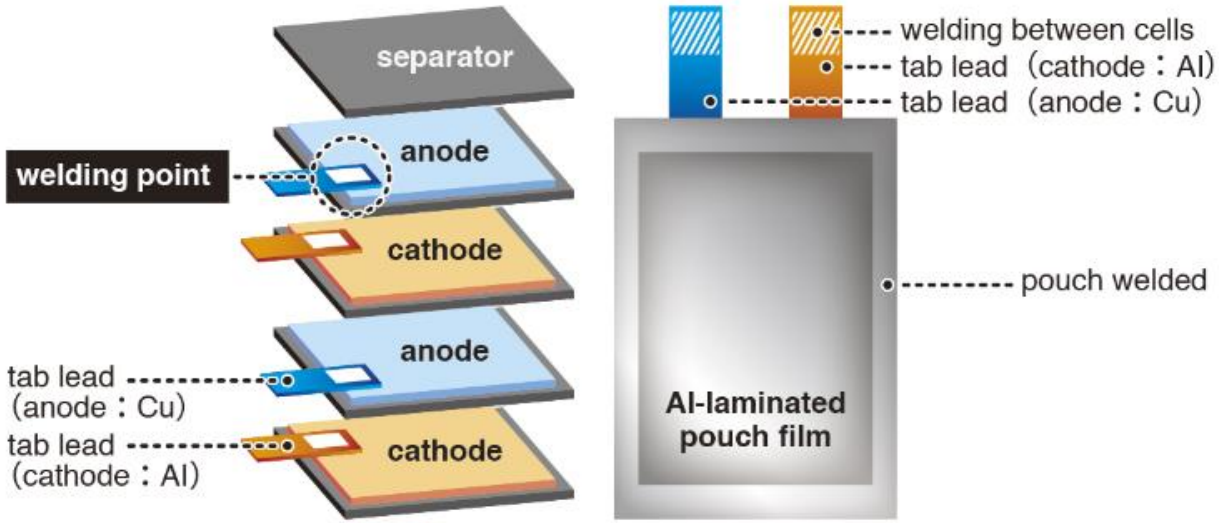
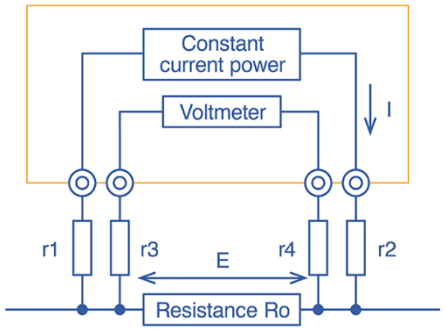
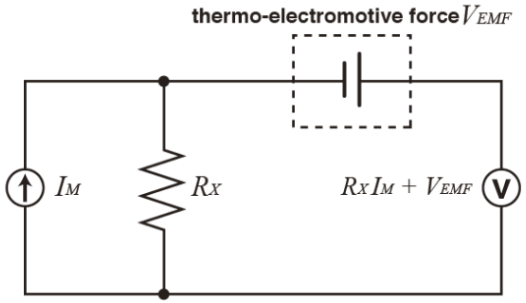
Connection resistance

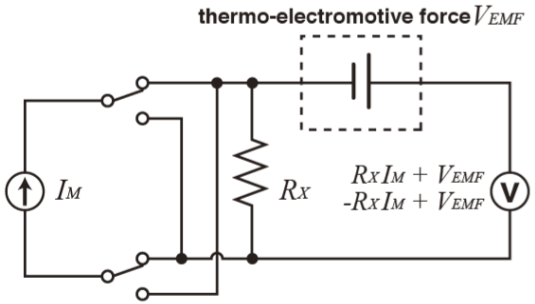


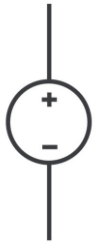
RM3545 Resistance Meter

Fast measurement, excellent repeatability









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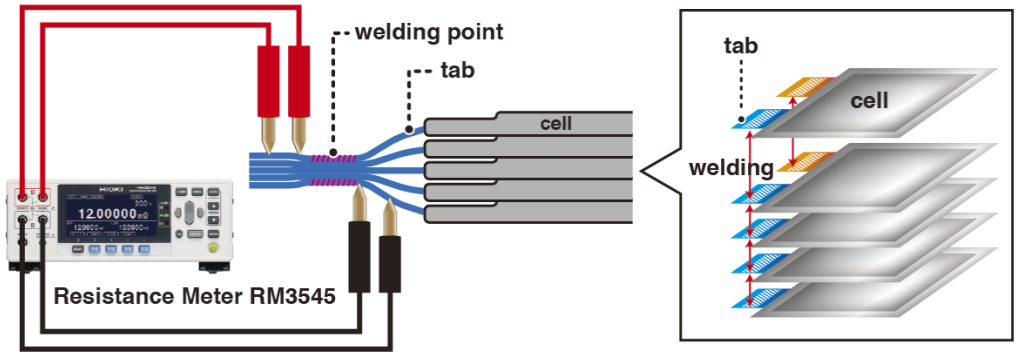
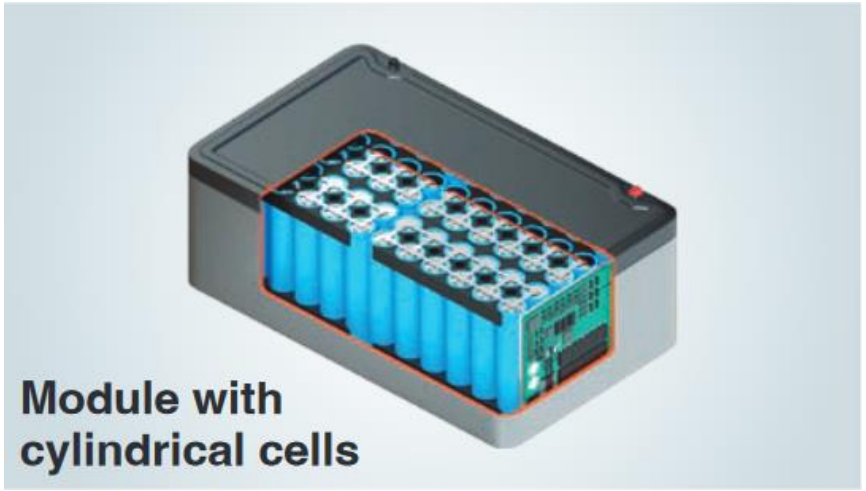
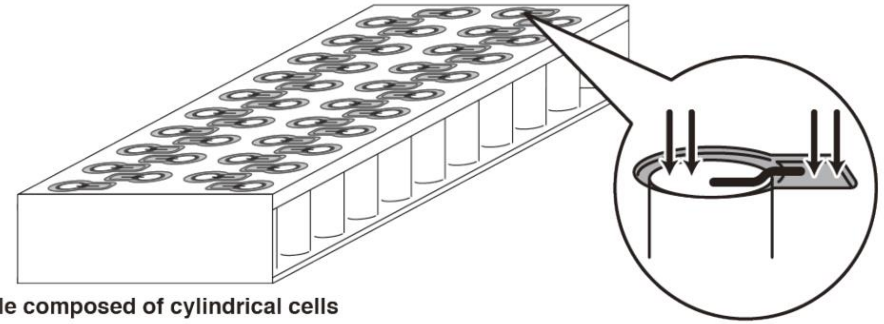
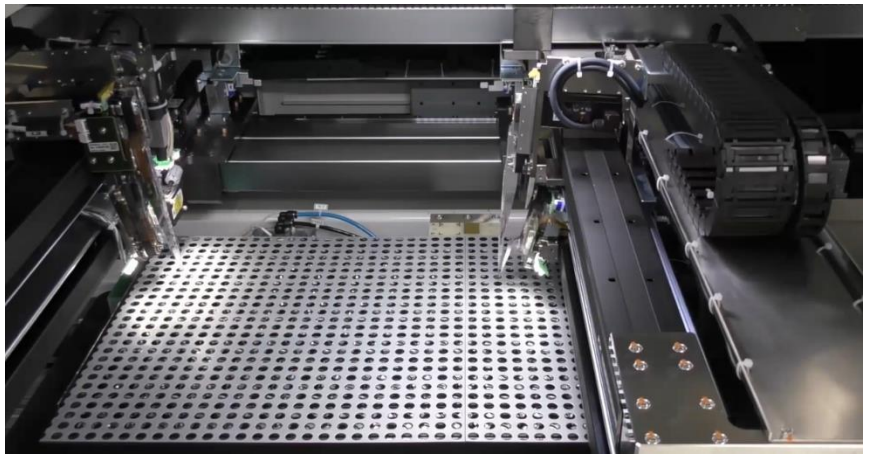
Connection resistance

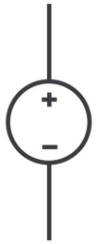




FT1240 Flying probe tester







https://www.youtube.com/watch?v=1uZEVTx-sPI&t=7s

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Cell and Pack resistance

Lithium-ion Battery Production Processes

BT3560 series Battery Tester

Measures OCV and resistance simultaneous

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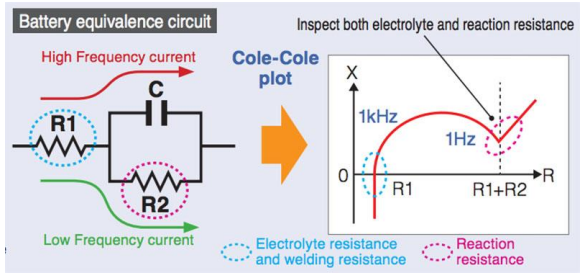
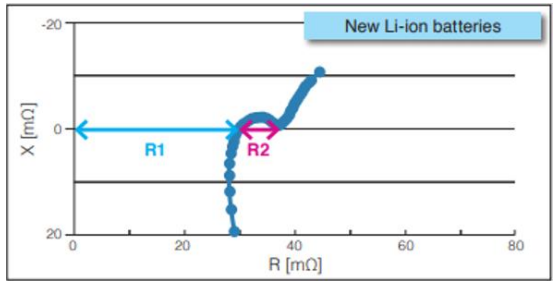
Cell and Pack resistance

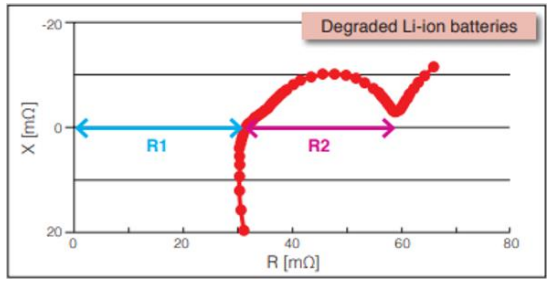
Lithium-ion Battery Production Processes

BT4560 Battery Impedance Meter

AC-IR measurement for more detailed characterization







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