BZA1000

Battery Impedance Analyser

- Impedance measurement of battery, battery pack, & ESS(energy storage system)
- DC voltage measurement up to 1000V
- Quick diagnosis of batteries
- Battery lifetime estimation
- LAN interface with PC
- ZMAN impedance analysis software
- Cell temperature monitoring

Electrochemical impedance spectroscopy (EIS) is a widely used experimental technique to gain a deeper insight into the electrochemical processes of batteries. EIS cannot only provide detailed kinetic information, but can also be used to monitor changes in battery properties. EIS is a very sensitive technique, and offers a useful information about battery systems such as :

· Battery lifetime
· Internal temperature
· Internal defect

State of charge (SoC) represents the available battery capacity and is one of the most important states that need to be monitored to optimize the performance and extend the lifetime of batteries. Meanwhile, the State of Health(SoH) is an indicator associated with the long-term cycle life of batteries. EIS is increasingly being used for estimation of the SoH & SoC of batteries and it can be approximated with circles on the Nyquist plane, where the imaginary and the real part of the impedance are plotted on the Y-axis and X-axis, respectively. According to Fig. 1, R_s is quantified as the horizontal distance between the zero and the point where the EIS spectrum crosses the real axis (high frequencies) and R_S, R_{CT} and R_w are calculated as the horizontal distances of the each depressed semicircle, respectively. In Fig. 2, C_{DL} represent a double layer capacitance, R_{CT} is the charge transfer resistance, R_W stands for the Warburg impedance and R_S is the electrolyte resistance.

As shown in Fig. 3, the R_S value increases as performance deteriorates due to aging of the battery. Therefore, R_S is a criterion for determining the SoH of the battery. On the other hand, R_{CT} is related to the electrochemical reaction rate in the battery, and C_{DL} represents the double layer capacitance between the electrode and the electrolyte. As the depth of discharge(DoD) of the battery increases, SoC decreases. In the Nyquist plot, it can be seen that the diameter of the semicircle increases (R_{CT} increase. Fig. 4). Therefore, R_{CT} and C_{DL} are the criteria for indicating the SoC of the battery.

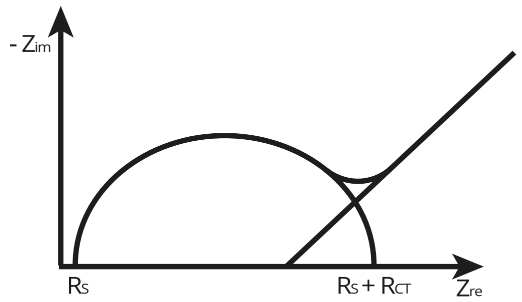


Fig. 1) Typical Nyquist plot

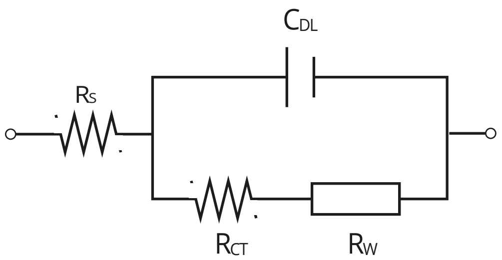


Fig. 2) Battery equivalent circuit model sample
C_{DL} : double layer capacitance
R_{CT} : charge transfer resistance
R_W : Warburg impedance
R_S : electrolyte resistance

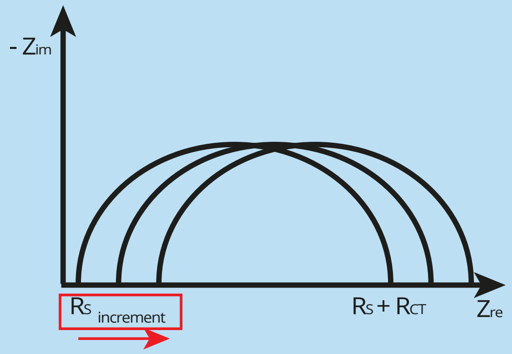


Fig. 3) As the battery is repeatedly charged and discharged, the R_S value shifts to the right.

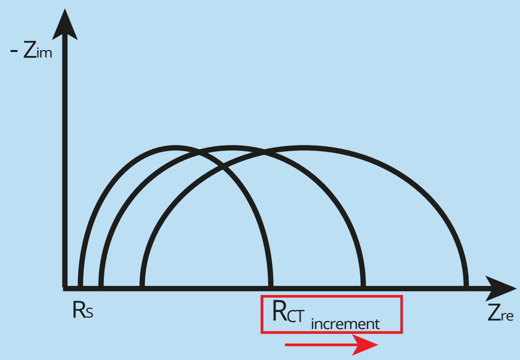


Fig. 4) The semicircle diameter corresponds to the charge-transfer resistance. As the number of cycles increase, it can be seen that the diameter of semicircle increases.

The BZA1000 Battery Impedance Analyzer, which covers a broad range of battery test functions ranging from DC voltage (up to 1000V) and impedance test (100uΩ ~ 100Ω), is an ideal test tool for performance testing of individual stationary batteries, battery banks and ESS(Energy Storage Systems).

The BZA1000 is designed to measure battery impedance, dc and ac voltage, ac current, frequency and battery temperature. The BZA1000 can obtain a Nyquist plot by measuring the impedance of the battery. This makes it easy to see changes in the R_s and R_{ct} values that correlate to the battery's state of health(SoH) and state of charge(SoC), allowing user to evaluate battery performance.

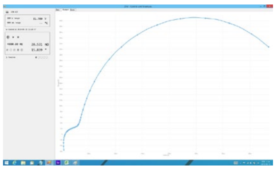
EIS data from BZA1000 can be analyzed with ZMAN impedance analysis software by automatic model searching and automatic fitting. Proper model library for user's batteries can be grouped to minimize the analysis time.

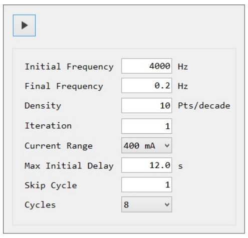
The user-friendly interface, compact design and rugged construction ensure optimal performance, test results and reliability.

BZA1000 Battery Impedance Analyser

Main Screen (Before the Experiment)

- tab to see Bode, Nyquist or raw data list
- real-time monitoring of current/voltage range, measured voltage value, and measured temperature value regardless of if a test is started. (data are not logged.)
- displaying frequency, impedance, phase date of current measured point





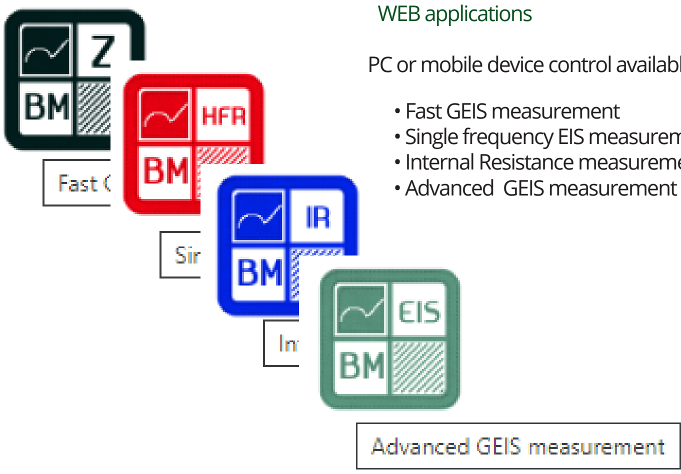
Parameter Input Box

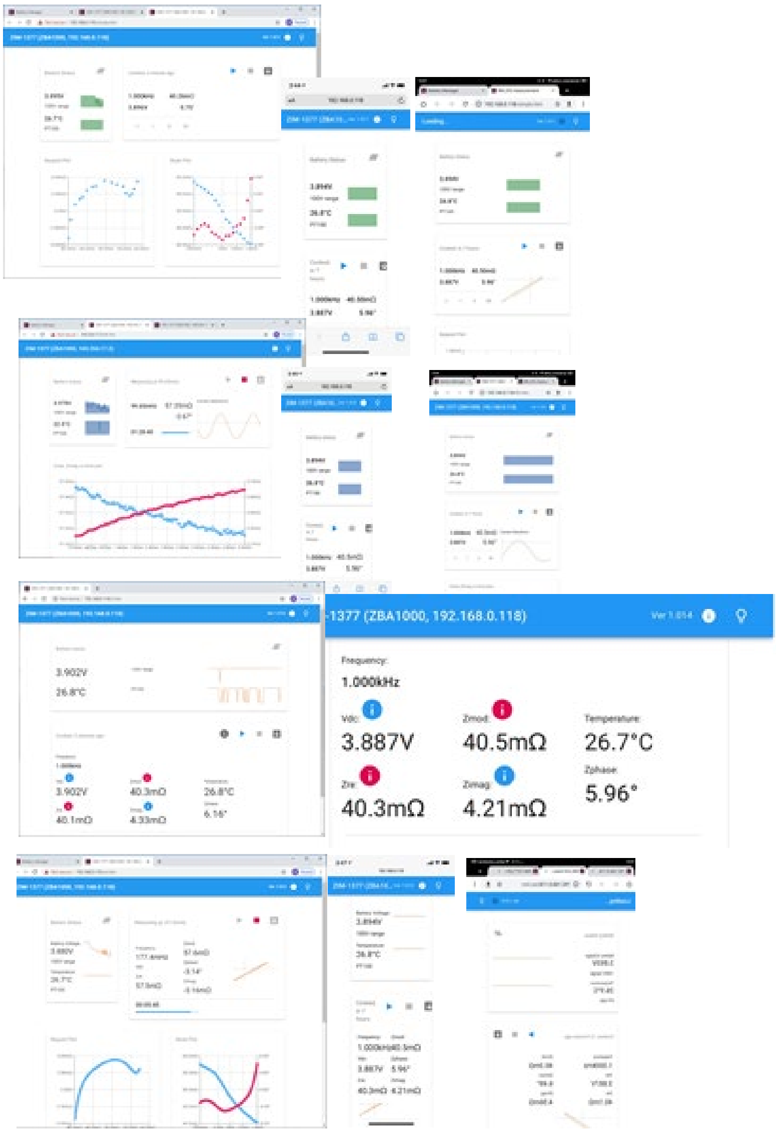
- galvanostatic EIS test
- bias and amplitude current range is automatically set according to current setting range.
- frequency range, number of data stored, number of repeated measurments, etc. can be set.

WEB applications

PC or mobile device control available

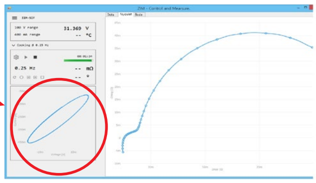
- Fast GEIS measurement
- Single frequency EIS measurement
- Internal Resistance measurement
- Advanced GEIS measurement





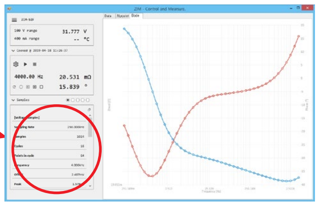
Readings During Measurement

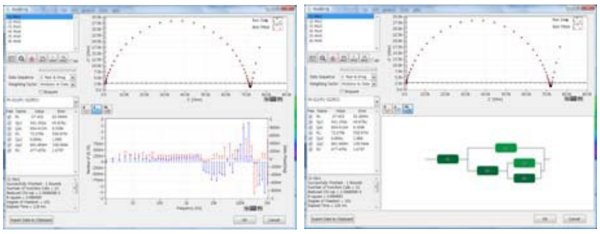
- dispaly a real-time Lissajous figure



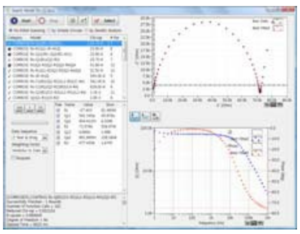
Main Screen After Measurement

- detailed information about data point (samples)

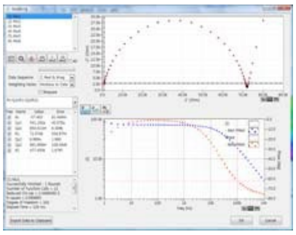




Fitting display



Automatic model searching



LEVM fitting

Option

- Low impedance cable
- Cell cable modification

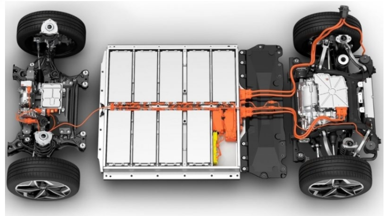
Note: For lower than 100V battery, Select economic BZA100 model

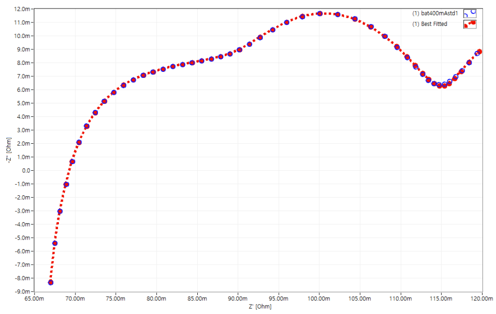
BZA1000 Battery Impedance Analyser

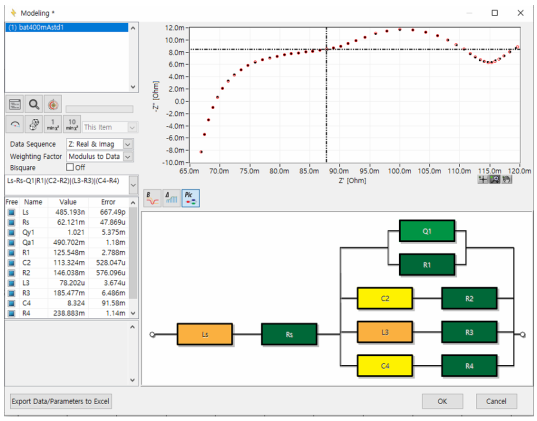
Specifications

Impedance Measurement	
Measurement range	100uΩ ~ 100Ω
Accuracy	1%, 1° (1mΩ ~ 100Ω)
Frequency range	0.05Hz ~ 4kHz
Current amplitude (p-p)	400uA ~ 2A
DC Voltage Measurement	
ADC resolution	24 bit
Input range	2ea (1000V, 100V)
AC Voltage Measurement	
ADC resolution	24 bit
Input range	±250mV
AC Current Measurement	
ADC resolution	24 bit
Current sensing resistors	4ea (2A, 200mA, 20mA, 2mA)
Sinewave Generator	
Frequency range	0.05Hz ~ 4KHz
Frequency accuracy	< 0.1%
Frequency resolution	0.01% or 5000 steps/decade
DAC resolution	10 bit
Output gain	2ea(X1, X0.2) total 8 current ranges (2A, 400mA, 200mA, 40mA, 20mA, 4mA, 2mA, 400uA)
Temperature Measurement	
Input	RTD probe (PT100)
Accuracy	Max 1°C
Communication	
Interface	LAN communication
General	
Weight	1.4 kg
Size	220mm x 68.1mm x 250mm (WxHxD)

All specifications are subject to change without notice.







Designed by
ZIVE LAB
www.zivelab.com

WonATech

WonATech Co., Ltd.
7 Neunganmal 1-gil, Seocho-gu,
Seoul, 06801, Korea
Tel: +82-2-578-6516 Fax: +82-2-576-2635
e-mail: sales@wonatech.com
website: www.wonatech.com

Local Distributor