

# Product Catalog

ZIVE Z#



**Multichannel Impedance Monitor**  
5 Cells Impedance Measurement  
with External Electronic Load  
or Potentiostat/Galvanostat



For  
Fuel Cell Stack  
Battery Pack  
Supercapacitor  
Solar Cell

## Feature

- For versatile AC impedance experiment of serial connected multi cells such as Fuel cell stack/ Battery pack etc.
- 6 signal input channel/1 signal output channel per set
- 5 series cells EIS measurement or 4 cells EIS with stack voltage EIS measurement
- Expandability of channels
- A flexible frequency generator/analyzer
- Generate various waveforms (eg. Sinusoidal etc)
- Designed for spectrum analysis in the electrochemical field
- Simulation and fitting with ZMAN™
- High current application with external load and/or potentiostat/galvanostat
- Software controlled function
- Graphic-based user-interface
- Dual real time graph (Bode, Nyquist, etc) during measurement

## Description

For the past two decades, Electrochemical Impedance Spectroscopy (EIS) has emerged as the most powerful of electrochemical techniques for defining reaction mechanisms for investigating corrosion processes, and for the characterization of batteries and fuel cells.

**Z#** multichannel impedance monitor has independent 6 channels AI (analog input) board. So it provides real multichannel EIS monitor function synchronized.

Some other commercial multichannel impedance monitors use multiplexer to measure EIS sequentially. This kind of instruments takes a long time to measure EIS. EIS measurement is time domain, therefore synchronized measurement is essential.

**Z#** series provides all tools for the application of fuel cell stack, battery pack, multi cells and general electrochemical that requires study of multichannel EIS for serial connected cells.

By employing electronic load, **Z#** can be used to determine the efficiency of fuel cell and anodic/cathodic process mechanisms by calculating impedance with the measurements of I and E at given frequency.

The complete system is software-controlled and all functions such as ranging, calibration, and measurements can be automated.

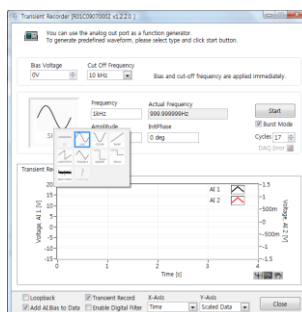
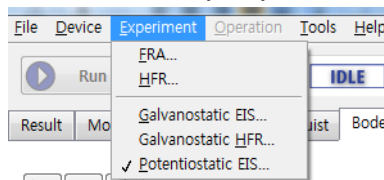
## Software (Z100 Navigator)



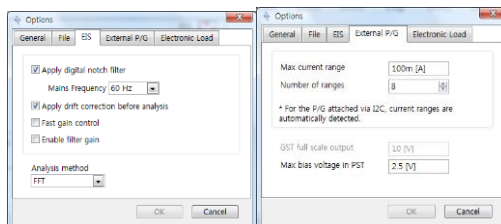
Z100 navigator is **Z#** control software. This can be used with external potentiostat/galvanostat or electronic load by setting for impedance measurement or waveform generator.

### List of Impedance Techniques with Zcon

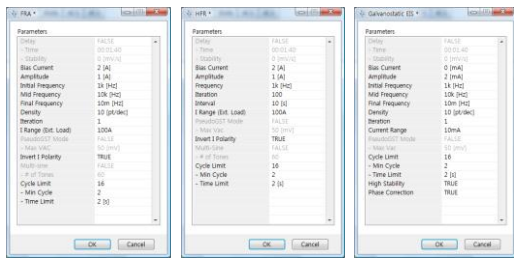
- Frequency response analyzer (FRA)
- High frequency resistometry (HFR)
- Galvanostatic electrochemical impedance spectroscopy (GEIS)
- Galvanostatic HFR (GHFR)
- Potentiostatic EIS (PEIS)



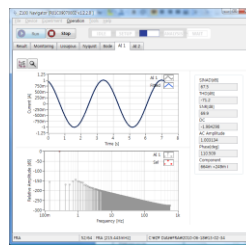
Transient recorder (waveform generator)  
DC/Sine/Cosine/Ramp/Sawtooth/Square/Triangular/Pulse/  
Multi-tone/ Arbitrary



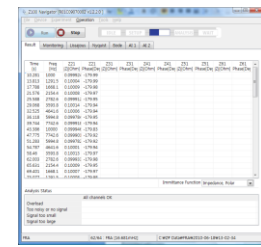
Environment setting menu



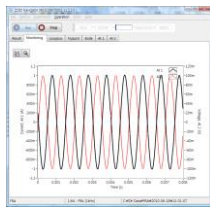
Parameter setting for each techniques



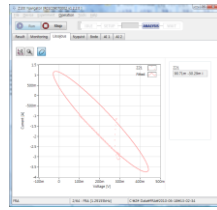
AC Signal Input (power spectrum)



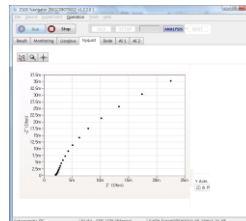
Result



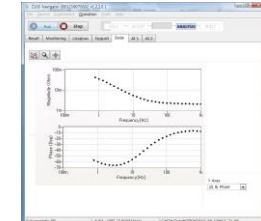
Monitoring



Lissajous plot



Real time Nyquist plot



Real time Bode Plot

- **ZMAN™ will be supplied for analysis of Z# data free of charge. Please refer to ZMAN introduction.**

## System Configuration

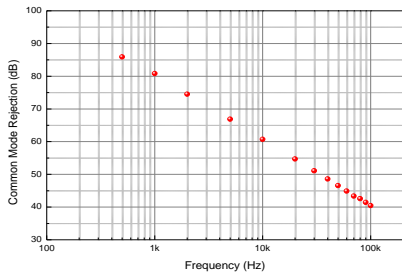
Hardware (controller), software, USB cable, Power adapter  
Electronic Load (option)

## EIS Data Analysis by ZMAN Software

Single PC Auth copy is supplied at free of charge for Z#. (Please refer to the separate ZMAN catalogue.)

## Specification

<b>Analog Out</b>	<b>as Signal Generator</b>	Reconstruction Filter	automatic gain selection
# of Channels	1	Gain Error	10 to 150 kHz 8th order low pass filter with 10kHz step or By-Pass < 0.5 %
configuration	Single-ended		
Maximum Output	-11.0 to +11.0 V (DC + AC)	<b>Analog In</b>	<b>as Frequency Analyzer</b>
Voltage Offset	< 0.5 mV, software corrected zero	# of Channels	Total 6, usually 1 for current input and 5 for voltage input
DC Bias	Range	Configuration	Maximum 60Ch in daisy chain configuration
	0.0 to 5.0 V	Maximum Input	Differential
	0.0 to +10.0 V	Voltage Offset	±100 V
	-5.0 to +5.0 V	Bandwidth	< 0.5 mV, software corrected zero
	-10 to +10.0 V	Input Impedance	550 kHz
	-2.5 to +2.5 V	Pre-Attenuation	110 kOhm
	-2.5 to +7.5 V	Post-Gain/Attenuation	-20dB (×0.1)
AC Waveform	Resolution	Anti-aliasing Filter	-44 dB to +40 dB (×100) with 6 dB step or ×200, ×400, ×800, ×1600
Predefined Type	0.076 mV		10 to 150 kHz 8th order low pass filter with 10 kHz step or By-Pass
Frequency Range	0.153 mV	CMRR	> 80 dB @ 1 kHz,
Frequency Accuracy	-5.0 to +5.0 V		> 60 dB @ 10 kHz,
Frequency Stability	-10 to +10.0 V		> 40 dB @ 100 kHz (refer to the below graph)
	-2.5 to +2.5 V		
	-2.5 to +7.5 V		
Amplitude	0.153 mV		
Post-Gain/Attenuation	Typ. 75 ppm, Max ±200 ppm		
	< 2 ppm @ 1 kHz		
	< 20 ppm @ 10 kHz		
	< 200 ppm @ 100 kHz		
	< 2000 ppm(0.2%) @ 1 MHz		
	1 mVpp to 5 Vpp		
	-44 dB to +40 dB with 6 dB step,		



**Expansion Ports**

I2C In & Out

Reserved for future

**General Interface Power**

Interface Power

USB 2.0 high speed  
External 50W AC-DC Adapters,  
+5/+15/-15VDC  
with AC Input of 100 to 240V,  
2A, 50/60 Hz

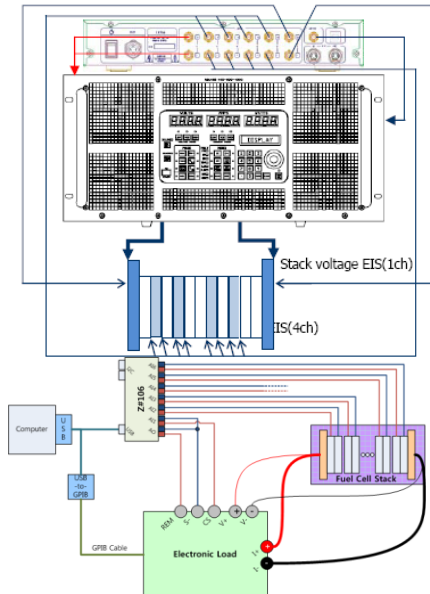
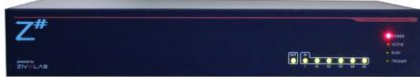
Operation Condition

0 to 50 °C, 0 to 90% humidity  
(non-condensing)

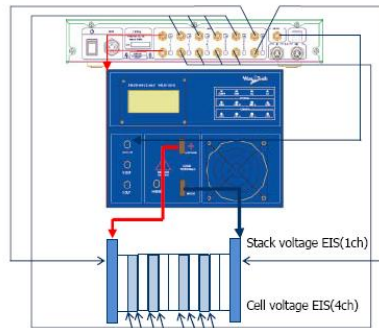
Warranty

1 year parts and labor on defects  
in materials and workmanship

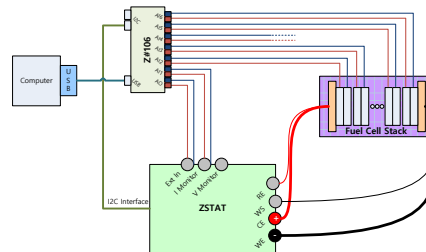
**Front Panel & Rear Panel**



Z#106 with Dynaload RBL488 series load



Z#106 with WonATech WEL series load



Z#106 with WonATech ED2 potentiostat/galvanostat

**Supporting External Load/Potentiostat**

- TDI dynaload RBL488/XBL series
- WonATech WEL Load
- ED2 potentiostat/galvanostat
- 3<sup>rd</sup> parties potentiostat/galvanostat

Above models are fully PC controlled with Z#.

Other model might need to set some of the parameters by manually.

Please contact with your regional distributor about other 3<sup>rd</sup> party products' availability with Z#.

**20 cell EIS measurement configuration (example)**



For 20 cells EIS measurement, 4 set of Z#106 is needed. Then you can measure EIS of 20 cells or 19 cells with one total fuel cell stack (or battery pack).

One Z#106 will work as master and other 3 set of Z#106 works as slaves.

Designed by  
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<http://www.zivelab.com>

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