



8th EDITION

# ELECTROCHEMICAL INSTRUMENTS ACCESSORIES

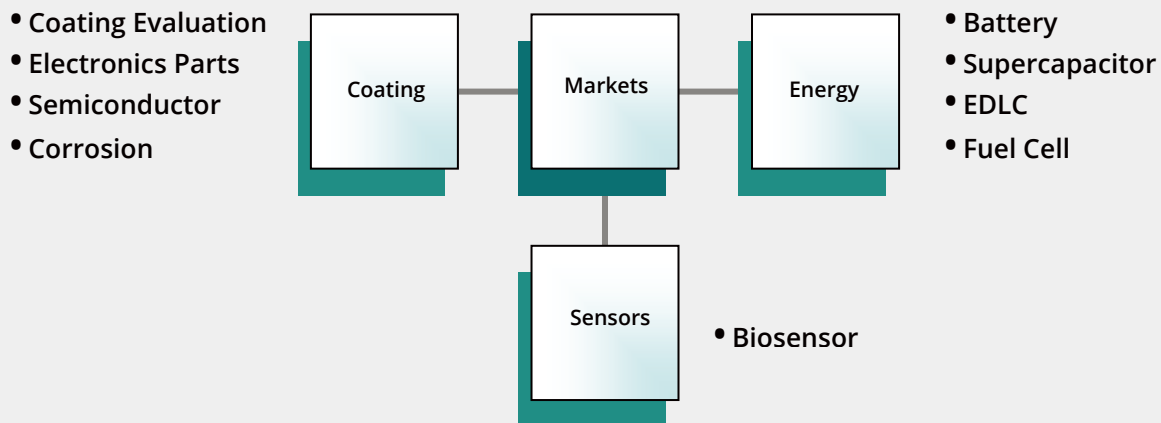
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## Who We Are

Since we were established in 1991, we have concentrated our efforts in the development of products related to electrochemical application. With our sales and marketing know-how, we have been providing flexible solution to our customers but also playing a leading role in this field of business.

## Applications



## Product Line

With the constant effort to achieve excellent quality and competitive edge of our products, we have been designing high value added products listed below.

### Potentiostat/Galvanostat/(EIS)

- Single & Multichannel Potentiostat/Galvanostat
- Dual-/Bi-Potentiostat
- Single & Multichannel Electrochemical Workstation
- Portable Potentiostat/Galvanostat

### Battery Cycler System

- Standard Type / Low Current Type / Mid Power Type / High Power Type / Rack Type

### Impedance Monitoring System

- Multichannel Impedance Monitor(Z#) / Single channel Impedance Monitor(Zcon)

### Battery Impedance Analyzer

- High Voltage Battery Impedance Analyzer (BZA1000/BZA500M) / General Battery Impedance Analyzer(BZA60/BZA60M)

### Fuel cell test system

- Single Cell PEMFC Test System / Single Cell DMFC Test System / Single Cell PEMFC,DMFC Hybrid Test System

### Cell Voltage/Temperature monitor

- Cell voltage/Temperature Combi Monitor / Cell Voltage Monitor / Cell Temperature Monitor

### Accessories

- For Battery Application : Battery Jig, Pouch Cell Jig, Coin Cell Holder etc.
- For Corrosion Application : Corrosion Cell Kit, Flat Cell Kit, Plate Test Cell Kit, etc.
- For Other Applications : Faraday Cage, Electrodes, Electrode Holder, Photoelectrochemical Cell Kit, Software, etc.
- Options for WonaTech Instruments : Cables, Temperature Sensor, Thermocouple, etc.

## WPG100 Series

The WPG series is an economical potentiostat/galvanostat and it can be used for standard techniques such as cyclic voltammetry, controlled potential electrolysis, constant potential amperometry and potentiometry, square wave voltammetry, battery cycling test etc.

### Features

- Economical type
- 16 bit ADC, DAC
- For long term experiment
- Accurate control & measurement
- Importing/exporting data file
- SI software : user friendly software and free upgrade
- Temperature & auxiliary voltage measurement
- LAN communication

Standard Type  
WPG100ex



Mid power type  
WPG100S



Mid power type  
WPG100H8



Mid power type  
WPG100H12



High Power Type  
WPG100HP

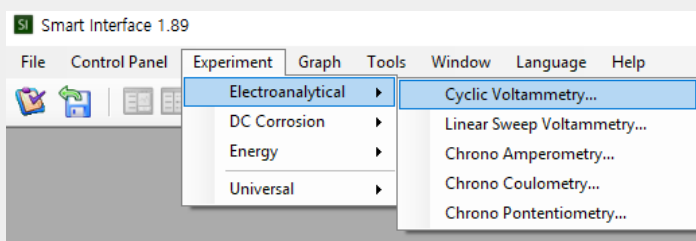


### Specifications

| Specifications          | WPG100ex                                      | WPG100S                          | WPG100H8                         |
|-------------------------|---|----------------------------------|----------------------------------|
| • control voltage range | ±10V(standard)<br>or customer specified range | customer specified range (<±45V) | customer specified range (<±45V) |
| • voltage accuracy      | ±0.02% f.s.                                   | ±0.05% f.s. (<10V)               | ±0.05% f.s. (<10V)               |
| • current range         | 8 ranges<br>or customer specified range       | 6 ranges                         | 6 ranges                         |
| • current accuracy      | ±0.02% f.s.                                   | ±0.05% f.s.                      | ±0.1% f.s.                       |
| • compliance voltage    | ±12V(standard)                                | customer specified range (<±45V) | customer specified range (<±45V) |
| • sampling time         | 1msec   | 1msec                            | 1msec                            |
| WPG100H12               |   |                                  |                                  |
| • control voltage range | customer specified range (<±45V)              | customer specified range (<±45V) |                                  |
| • voltage accuracy      | ±0.05% f.s. (<10V)                            | ±0.1% f.s.                       |                                  |
| • current range         | 4 ranges                                      | 1 or 3 ranges depending on power |                                  |
| • current accuracy      | ±0.1% f.s.                                    | ±0.1% f.s.                       |                                  |
| • compliance voltage    | customer specified range (<±45V)              | customer specified range (<±45V) |                                  |
| • sampling time         | 1msec   | 1msec                            |                                  |
| WPG100HP                |   |                                  |                                  |
| • control voltage range | customer specified range (<±45V)              | customer specified range (<±45V) |                                  |
| • voltage accuracy      | ±0.05% f.s. (<10V)                            | ±0.1% f.s.                       |                                  |
| • current range         | 4 ranges                                      | 1 or 3 ranges depending on power |                                  |
| • current accuracy      | ±0.1% f.s.                                    | ±0.1% f.s.                       |                                  |
| • compliance voltage    | customer specified range (<±45V)              | customer specified range (<±45V) |                                  |
| • sampling time         | 1msec   | 1msec                            |                                  |

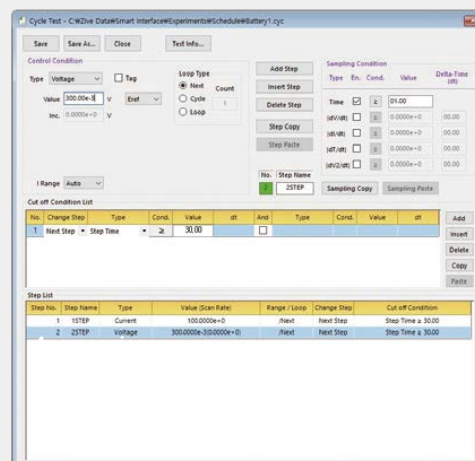
### SI(Smart Interface) Software

- 32bit/64bit OS environment
- TCP/IP communication
- Max. 200 steps
- Max. 10 cutoff(vertex) condition
- Max. 300,000 data point memory on control board
- Virtual control panel
- Various real time plots & universal axis graphs
- Data backup function
- WYSIWYG graphics
- User friendly software



## Single Channel Potentiostat/Galvanostat

- For Electroanalytical Measurement
  - Cyclic voltammetry
  - Linear sweep voltammetry
  - Chrono-amperometry
  - Chrono-coulometry
  - Chrono-potentiometry
- For Energy Test
  - Charge/Discharge(CC/CV) Test
  - Constant Current Charge/Discharge(CC/CC) Test
  - Steady state CV
  - Pstat IV curve
  - Gstat IV curve
  - Electrochemical Voltage Spectroscopy(EVS) Test
  - Galvanostatic Intermittent Titration Technique(GITT) Test
  - Potentiostatic Intermittent Titration Technique(PITT) Test
- Corrosion Measurement
  - Tafel plot
  - Potentiodynamic
  - Potentiostatic
  - Galvanostatic
  - Cyclic polarization
  - Ecorr vs. time
  - Linear polarization resistance



Universal Test Mode

## ZIVE SP Series

The outstanding potentiostat/galvanostat/FRA, ZIVE SP series, are the best choice for the complete DC and impedance characterization of various electrochemical applications. The ZIVE SP series is equipped with a frequency response analyzer(FRA) for system as standard and it provides high performance impedance measurements over the frequency range up to 1MHz(2MHz).

### Features

- Versatile high quality Potentiostat/Galvanostat/Impedance Analyzer
- Compact size with full functions
- Front panel LCD display
- Wide current ranges for various applications
- Optional power booster for high current application is available upon request
- 14 EIS techniques capability including multisine technique
- iR compensation and measurement
- High speed data sampling time
  - 2usec or 3usec depending on data point number
- Voltage pulse or current pulse charge/discharge test(GSM,CDMA etc.)
- Sine wave function for ripple simulation in battery test package
- Internal 542,000 data point storage and continuing experiment regardless of PC failure
- Full software package supplied as standard for EIS, Energy Test, Electrochemical Analysis and Corrosion application



### Specifications

|                             | ZIVE SP1                            | ZIVE SP2  | ZIVE SP3  |
|-----------------------------|-------------------------------------|---|---|
| • control voltage range     | ±10V, ±1V, ±100mV                   | ±10V, ±1V, ±100mV                                     | ±10V, ±1V, ±100mV                                     |
| • voltage accuracy          | ±0.02% f.s.(gain x1)                | ±0.02% fs (gain x1)                                   | ±0.02% fs (gain x1)                                   |
| • current range (with gain) | 100nA to 1A, 9 ranges (10nA)        | 2nA to 2A, 11 ranges (200pA)                          | 20nA to 2A, 10 ranges (2nA)                           |
| • current accuracy          | ±0.05% f.s.(gain x1)<br>>100nA f.s. | ±0.02% f.s.(gain x1)<br>>200nA f.s.                   | ±0.02% fs (gain x1)                                   |
| • compliance voltage        | ±12V                                | ±12V  | ±20V  |
| • slew rate                 | 10V/μsec                            | 15V/μsec  | 8V/μsec   |
| • input impedance           | 2x10 <sup>13</sup> Ω   4.5pF        | 2x10 <sup>13</sup> Ω   4.5pF                          | 2x10 <sup>13</sup> Ω   4.5pF                          |
| • frequency range           | 10μHz ~ 1MHz                        | 10μHz ~ 2MHz  | 10μHz ~ 1MHz  |
| • aux port                  | 1 analog input: ±10V                | digital: 3 output/2 input<br>analog: 1 output/3 input | digital: 3 output/1 input<br>analog: 1 output/3 input |
| • size(WxDxH)               | 160x330x81mm                        | 93x305.7x158mm  | 195x313x105mm   |
| • weight                    | 2.05kg                              | 2.95kg  | 3.7kg   |

## Specifications

### ZIVE SP5

### ZIVE SP5H

### ZIVE SP5HC

### ZIVE SP10

|                             |   |   |   |   |
|-----------------------------|---|---|---|---|
| • control voltage range     | ±10V, ±1V, ±100mV                                   | ±40V, ±4V, ±400mV                                   | ±10V, ±1V, ±100mV                                   | ±5V, ±500mV, ±50mV                                  |
| • voltage accuracy          | ±0.02% fs(gain x1)                                  | ±4mV ±0.1% of setting                               | ±1mV ±0.05% of setting                              | ±0.02% fs(gain x1)                                  |
| • current range (with gain) | 5nA to 5A, 11 ranges (500pA)                        | 1nA to 1A, 11 ranges (100pA)                        | 1nA to 1A, 11 ranges (100pA)                        | 10nA to 10A, 11 ranges (1nA)                        |
| • current accuracy          | ±0.02% f.s.(gain x1)>500nA                          | ±0.1% f.s.(gain x1) >100nA                          | ±0.05% f.s.(gain x1) >100nA                         | ±0.03% f.s.(gain x1)>1uA                            |
| • compliance voltage        | ±10V  | ±40V  | ±40V  | ±6V   |
| • slew rate                 | 10V/μsec  | 7V/μsec   | 10V/μsec  | 10V/μsec  |
| • input impedance           | 2x10 <sup>13</sup> Ω    4.5pF                       | 2x10 <sup>13</sup> Ω    4.5pF                       | 2x10 <sup>13</sup> Ω    4.5pF                       | >2x10 <sup>13</sup> Ω    4.5pF                      |
| • frequency range           | 10μHz ~ 1MHz  | 10μHz ~ 600kHz                                      | 10μHz ~ 1MHz  | 10μHz ~ 1MHz  |
| • aux port                  | digital: 3 output/2 input, analog: 1 output/3 input | digital: 3 output/2 input, analog: 1 output/3 input | digital: 3 output/2 input, analog: 1 output/3 input | digital: 3 output/2 input, analog: 1 output/3 input |
| • size(WxDxH)               | 179x378.4x270mm                                     | 179x378.4x270mm                                     | 179x378.4x270mm                                     | 240x372x241mm                                       |
| • weight                    | 7.65Kg  | 7.65Kg  | 7.65Kg  |   |

## SM(Smart Manager) Software

- User defined test sequence using sequence file, technique menu and batch file
- Batch file : multiple combination of technique files and/or sequence files
- Easy to use and supports various electrochemical experiments including functions of system control, schedule file editor, real time graph, analysis graph, user calibration, and data file treatment etc.

### Basic Techniques

- Potentiostatic
- Galvanostatic
- Double step potentiostatic
- Double step galvanostatic
- OCP measurement
- Potential sweep
- Current sweep
- Cyclic voltammetry
- Fast potential sweep
- Potentiostatic Ru measurement
- Galvanostatic Ru measurement
- Pulse mode for GSM & CDMA profile

### EIS Software Package

- Potentiostatic EIS
- Galvanostatic EIS
- Pseudo galvanostatic EIS
- OCP\* EIS
- Potentiodynamic PEIS
- Galvanodynamic GEIS
- Potentiodynamic HFR
- Galvanodynamic HFR
- Potentiostatic HFR
- Galvanostatic HFR
- Multisine potentiostatic EIS
- Multisine galvanostatic EIS
- Intermittent potentiostatic EIS
- Intermittent galvanostatic EIS
- RTI potentiostatic EIS
- RTI galvanostatic EIS

(\* The system measures open circuit potential before each frequency change and applies AC sine wave on this potential.

### Battery Software Package

- CC/CV test
- CC/CC test
- Discharge test
- EVS test
- Variable scan rate CV
- Pstat IV curve
- Gstat IV curve
- Steadystate CV
- GITT test
- PITT test

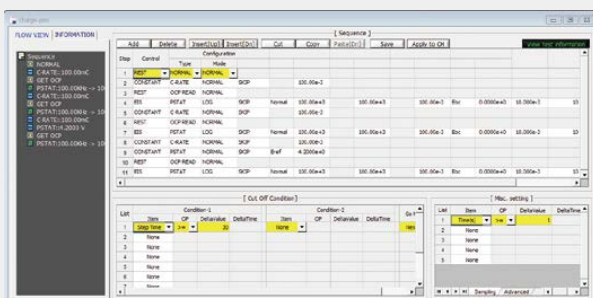
### Electrochemical Analysis Software Package

- Chronoamperometry
- Chronocoulometry
- Chronopotentiometry
- Linear sweep voltammetry
- Sampled DC voltammetry
- Fast CV
- Fast LSV
- Differential pulse voltammetry
- Square wave voltammetry
- Differential pulse amperometry
- Normal pulsed voltammetry
- Reverse normal pulse voltammetry
- Differential normal pulse voltammetry
- AC voltammetry

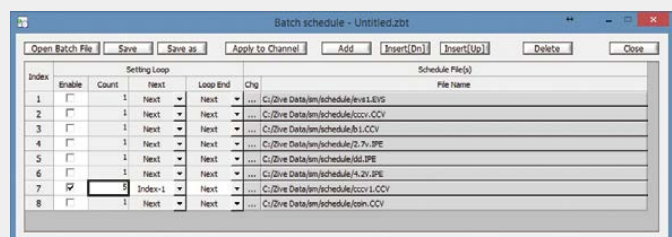
### Corrosion\* Software Package

- Tafel
- Polarization resistance
- Potentiodynamic
- Galvanodynamic
- Cyclic polarization
- Ecorr vs. time
- Galvanic corrosion
- RpEc trend
- Reactivation potential
- Potentiostatic ECN
- Galvanostatic ECN
- ZRA mode ECN

(\* Corrosion technique supports IR compensation.



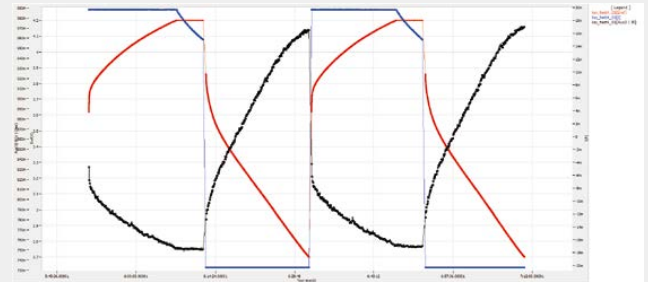
Sequence Editor



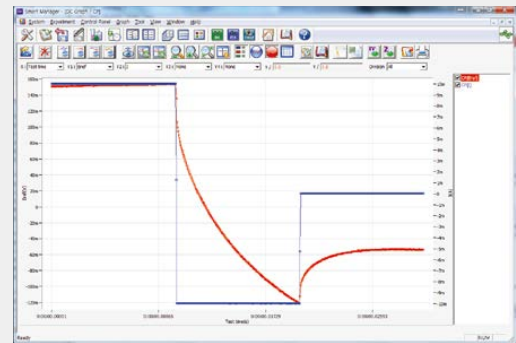
Batch Function

| Control Mode |                |   |                        |
|--------------|----------------|---|------------------------|
| constant     | GSTAT          | constant current control                  |                        |
|              | Crate          | constant Crate control                    |                        |
|              | PSTAT          | constant voltage control                  |                        |
|              | POWER          | constant power control                    |                        |
|              | LOAD           | constant load control                     |                        |
|              | CC-CV          | constant current constant voltage control |                        |
|              | Crate-CV       | Crate constant voltage control            |                        |
|              | CP-CV          | constant power constant voltage control   |                        |
|              | CL-CV          | constant load constant voltage control    |                        |
|              | Id             | constant current density control          |                        |
|              | Is             | constant specific current control         |                        |
|              | OCV            | OCV control                               |                        |
|              | Step           | GSTAT                                     | current step control   |
|              |                | PSTAT                                     | potential step control |
| GSTAT        |                | cyclic step current control               |                        |
| PSTAT        |                | cyclic step potential control             |                        |
| Sweep        | GSTAT          | current sweep control                     |                        |
|              | FAST-G         | fast current sweep control                |                        |
|              | PSTAT          | potential sweep control                   |                        |
| EIS          | GSTAT          | galvanostatic EIS                         |                        |
|              | PSTAT          | potentiostatic EIS                        |                        |
|              | OCV            | OCV EIS                                   |                        |
|              | PSUEDO         | pseudo galvanostatic EIS                  |                        |
|              | HFR G          | galvanostatic HFR                         |                        |
|              | HFR P          | potentiostatic HFR                        |                        |
|              | M sine G       | galvanostatic multisine EIS               |                        |
|              | M sine P       | potentiostatic multisine EIS              |                        |
|              | RTIP           | potentiostatic real time EIS              |                        |
|              | RTIG           | galvanostatic real time EIS               |                        |
| ACV          | AC voltammetry |   |                        |
| Rest         |                | rest control                              |                        |
| ZRA          |                | ZRA control                               |                        |
| Loop Pulse   | PSTAT          | voltage pulse control                     |                        |
|              | GSTAT          | current pulse control                     |                        |
|              | GSINE          | current sine wave control                 |                        |
|              | PSINE          | potential sine wave control               |                        |

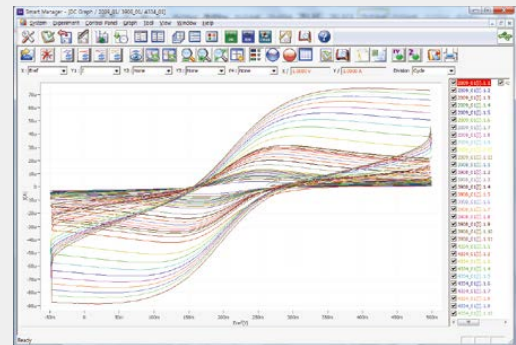
Control Task Parameters



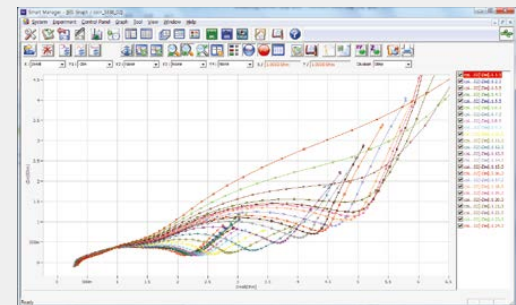
IR measurement(black line) during CC/CV Test



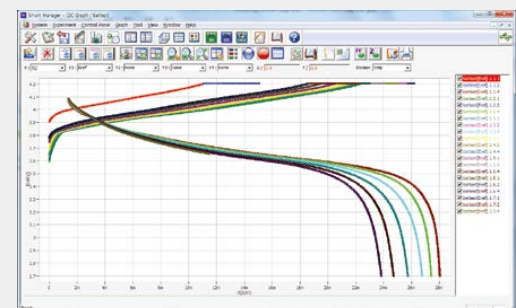
50usec sampling



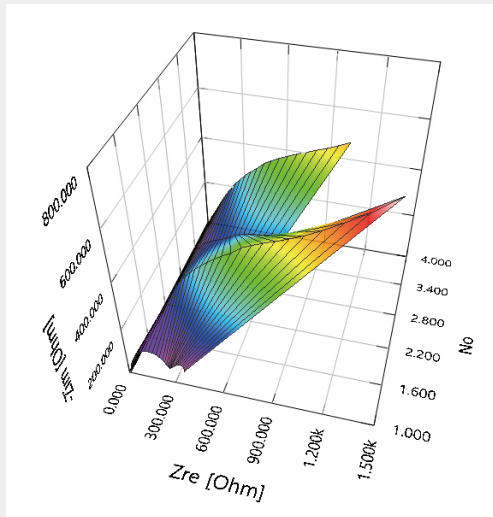
DC graph



EIS graph



BAT graph



Potentiostat EIS Measurement Plotted by ZMAN

## WMPG1000 Series

The WMPG series chooses plug-in type module with independent power suppliers per 8 channel substation. Each substation can be used as independent system with optional "StartUp Kit" or can be built up integrated system as add-on. These give flexibility to user's application.

### Features

- 4 probe type true potentiostat/galvanostat circuit
- 16 bit ADC, DAC
- Easy channel expansion up to 128 channels
- Accurate control & measurement
- A system with fixed specification is available at affordable price
- SI software : user friendly software and free upgrade
- Optional temperature monitoring and auxiliary voltage monitoring available

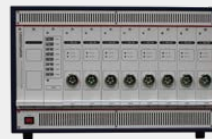
**Standard Type**  
WMPG1000S



**Low Current Type**  
WMPG1000Ls/WMPG1000Le



**Mid Power Type**  
WMPG1000M1



**Mid Power Type**  
WMPG1000M2



**Dual Channel Type**  
WMPG1000D



**Power Type**  
WMPG1000H8



**Power Type**  
WMPG1000H12



**High Power Type**  
WMPG1000HP



| Specifications             | WMPG1000Ls<br>WMPG1000Le  | WMPG1000S                   | WMPG1000M1<br>WMPG1000M2  | WMPG1000D                   | WMPG1000H8                  | WMPG1000H12                 | WMPG1000HP                 |
|----------------------------|---|-----------------------------|---|-----------------------------|-----------------------------|-----------------------------|----------------------------|
| • control voltage range*1  | ±10V(standard)  | ±10V(standard)              | ±10V(standard)  | customer specified range    | customer specified range)   | customer specified range    | customer specified range   |
| • voltage accuracy         | ±0.02% f.s.   | ±0.02% f.s.                 | ±0.02% f.s.   | ±0.05% f.s.                 | ±0.05% f.s                  | ±0.05% f.s                  | ±0.1% f.s.                 |
| • voltage resolution       | 16 bit(0.0015% f.s)   | 16bit(standard)             | 16bit(standard)   | 16bit                       | 16bit                       | 16bit                       | 16bit                      |
| • current range*2          | 5 ranges<br>Max. ±10mA@10V(WMPG1000Ls)<br>Max. ±100mA@10V(WMPG1000Le) | 5 ranges<br>Max. ±5A        | 5 ranges<br>Max. ±5A@10V(WMPG1000M1)<br>Max. ±10A@10V(WMPG1000M2) | 5 ranges                    | 5 ranges                    | 4 ranges                    | 3 or 1 range               |
| • max. power per channel*3 | 200mWatt(WMPG1000Ls)<br>2Watt(WMPG1000Le)                             | 50Watt                      | 100Watt(WMPG1000M1)<br>200Watt(WMPG1000M2)                        | 400Watt                     | 800Watt                     | 1200Watt                    | 4kWatt                     |
| • current accuracy         | ±0.02% f.s.   | ±0.02% f.s.                 | ±0.05% f.s.   | ±0.05%f.s                   | ±0.1% f.s.                  | ±0.1% f.s.                  | ±0.1% f.s.                 |
| • current resolution       | 16 bit(0.0015% f.s)   | 16 bit(0.0015% f.s)         | 16 bit(0.0015% f.s)   | 16 bit(±0.0015% f.s)        | 16 bit(±0.0015% f.s)        | 16 bit(±0.0015% f.s)        | 16 bit(±0.0015% f.s)       |
| • input impedance          | 10 <sup>12</sup> Ohm  | 10 <sup>12</sup> Ohm (<10V) | 10 <sup>12</sup> Ohm (<10V)                                       | 10 <sup>12</sup> Ohm (<10V) | 10 <sup>12</sup> Ohm (<10V) | 10 <sup>12</sup> Ohm (<10V) | 10 <sup>12</sup> Ohm(<10V) |
| • sampling time            | *4  | *4                          | *4  | *4                          | *4                          | *4                          | *4                         |

\*1: User can specify the voltage range within <80V for difference between high and low voltage

\*2: Depending on system specification.

\*3: power = max. voltage x max. current x 2

\*4: - Without option  
8-40 channels: 10msec  
41-64 channels: 20msec (2 SIF boards required)  
- With option  
8-16 channels: 10msec  
17-40 channels: 10msec (2 SIF boards required)  
41-64 channels: 20msec (2 SIF boards required)



SI(Smart Interface) Software

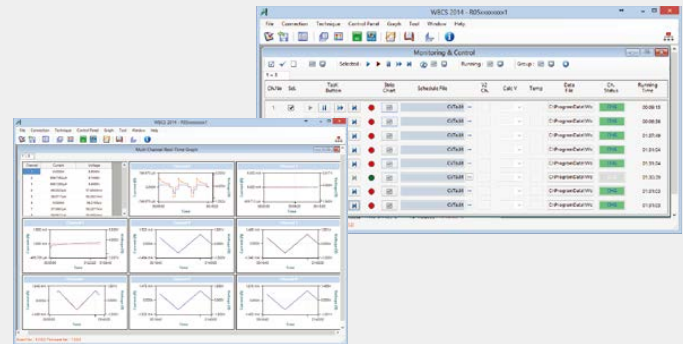
- 32bit/64bit OS environment
- TCP/IP communication
- Max. 200 steps
- Max. 10 cutoff(vertex) condition
- Max. 290,000 data point memory on control board
- Virtual control panel
- Various real time plots & universal axis graphs
- Data backup function
- WYSIWYG graphics
- User friendly software

• For Electroanalytical Measurement

- Cyclic voltammetry
- Linear sweep voltammetry
- Chrono-amperometry
- Chrono-coulometry
- Chrono-potentiometry

• Corrosion Measurement

- Tafel plot
- Potentiodynamic
- Potentiostatic
- Galvanostatic
- Cyclic polarization
- Ecorr vs. time
- Linear polarization resistance



• For Energy Test

- CC/CV (Lithium battery) test menu
- CC/CC (NiCd(NiMH) battery) test menu
- Steady state CV
- Pstat IV curve
- Gstat IV curve
- Electrochemical Voltage Spectroscopy(EVS) Test
- Galvanostatic Intermittent Titration Technique(GITT) Test
- Potentiostatic Intermittent Titration Technique(PITT) Test

ZIVE MP Series

The outstanding multichannel potentiostat/galvanostat/FRA, ZIVE MP series, is the best choice for the complete DC and impedance characterization of corrosion, coatings, sensors and other fundamental electrochemical analysis. And also, its versatile functions make it suited to other application including various energy sources and storage such as fuel cells, batteries, solar cells, and super capacitors.

Features

- Versatile high quality Potentiostat/Galvanostat/Impedance Analyzer
- Wide current ranges for various applications
- Optional power booster for high current application is available upon request
- 14 EIS techniques capability including multisine technique
- iR compensation and measurement
- High speed data sampling
  - : 2usec or 3usec depending on data point number
- Voltage pulse or current pulse charge/discharge test(GSM,CDMA etc.)
- Sine wave function for ripple simulation in battery test package
- Internal 542,000 data point storage and continuing experiment regardless of PC failure
- Full software package supplied as standard for EIS, Energy Test, Electrochemical Analysis and Corrosion application



ZIVE MP1  
8 channel System

ZIVE MP1  
4 channel System

ZIVE MP2A

ZIVE MP2F  
4 channel System

ZIVE MP5 & MP5H & MP5HC

ZIVE MP10

| Specifications            | ZIVE MP1   | ZIVE MP2A/MP2F   | ZIVE MP5   |
|---------------------------|--|--|--|
| channel No/module         | 4 or 8channel/module                                   | 8channel/module (MP2A)<br>4channel/module (MP2F)   | 8channel/module  |
| control voltage range     | ±10V, ±1V, ±100mV                                      | ±10V, ±1V, ±100mV  | ±10V, ±1V, ±100mV                                      |
| voltage accuracy          | 0.02% fs (gain x1)                                     | ±0.02% fs (gain x1)  | ±0.02% fs (gain x1)                                    |
| current range (with gain) | 100nA to 1A, 9 ranges(10nA)                            | 2nA to 2A, 11 ranges (200pA) (MP2A)<br>1nA to 1A, 10 ranges (1nA) (MP2F)                   | 5nA to 5A, 11 ranges (500pA)                           |
| current accuracy          | ±0.05% f.s.(gain x1) >100nA                            | ±0.02% f.s.(gain x1)>200nA (MP2A)<br>±0.03% f.s.(gain x1)>100nA f.s. (MP2F)                | ±0.02% f.s.(gain x1)>500nA                             |
| compliance voltage        | ±12V   | ±12V   | ±10V   |
| slew rate                 | 10V/μsec   | 15V/μsec(MP2A)   10V/μsec(MP2F)  | 10V/μsec   |
| input impedance           | 2x10 <sup>13</sup> Ω     4.5pF                         | 2x10 <sup>13</sup> Ω     4.5pF   | 2x10 <sup>13</sup> Ω     4.5pF                         |
| frequency range           | 10μHz ~ 1MHz   | 10μHz ~ 2MHz(MP2A)/1MHz(MP2F)  | 10μHz ~ 1MHz   |
| aux port                  | 1 analog input: ±10V                                   | digital: 3 output/2 input(MP2A)<br>3 output/1 input(MP2F)                                  | digital: 3 output/2 input,                             |
| size(WxDxH)               | 199x455x388mm(4ch system)<br>448x426x208mm(8ch system) | analog: 1 output/3 input<br>448.7x535.4x188.4mm (MP2A)<br>199x455x388mm (MP2F 4ch housing) | analog: 1 output/3 input<br>448.7x535.4x277.3mm        |
| weight                    | 13.9kg(4ch)  | 23.3kg(MP2A 8ch)   | 29kg(8ch)  |
|                           | ZIVE MP5H  | ZIVE MP5HC   | ZIVE MP10  |
| channel No/module         | 8channel/module  | 8channel/module  | 4channel/module  |
| control voltage range     | ±40V, ±4V, ±400mV                                      | ±10V, ±1V, ±100mV  | ±5V, ±500mV, ±50mV                                     |
| voltage accuracy          | ±4mV ±0.1% of setting                                  | ±1mV ±0.05% of setting   | ±0.02% fs (gain x1)                                    |
| current range (with gain) | 1nA~1A, 11 ranges (100pA)                              | 1nA to 1A, 11 ranges (100pA)   | 10nA to 10A, 11 ranges (1nA)                           |
| current accuracy          | ±0.1%f.s.(gain x1) >100nA                              | ±0.05% f.s.(gain x1)>100nA   | ±0.03% f.s.(gain x1)>1uA                               |
| compliance voltage        | ±40V   | ±40V   | ±6V  |
| slew rate                 | 7V/μsec  | 10V/μsec   | 10V/μsec   |
| input impedance           | 2x10 <sup>13</sup> Ω     1pF                           | 2x10 <sup>13</sup> Ω     4.5pF   | 2x10 <sup>13</sup> Ω     4.5pF                         |
| frequency range           | 10μHz ~ 600kHz   | 10μHz ~ 1MHz   | 10μHz ~ 1MHz   |
| aux port                  | digital: 3 output/2 input,<br>analog: 1 output/3 input | digital: 3 output/2 input,<br>analog: 1 output/3 input                                     | digital: 3 output/2 input,<br>analog: 1 output/3 input |
| size(WxDxH)               | 448.7x535.4x277.3mm                                    | 448.7x535.4x277.3mm  | 465x545x286mm  |
| weight                    | 29kg(8ch)  | 29kg(8ch)  | 25kg(4ch)  |

## SM(Smart Manager) Software for multichannel

- User defined test sequence using sequence file, technique menu and batch file
- Batch file : multiple combination of technique files and/or sequence files
- Easy to use and supports various electrochemical experiments including functions of system control, schedule file editor, real time graph, analysis graph, user calibration, and data file treatment etc.



| CH01         | CH02         | CH03         | CH04         |
|--------------|--------------|--------------|--------------|
| READY        | READY        | READY        | READY        |
| TIME 0:01:07 | TIME 0:04:17 | TIME 0:01:08 | TIME 0:01:08 |
| VOLT 0.0000V | VOLT 0.2000V | VOLT 0.2000V | VOLT 0.0000V |
| CURR 0.0000A | CURR 0.0000A | CURR 0.0000A | CURR 0.0000A |
| COPA 0.0000A | COPA 0.0000A | COPA 0.0000A | COPA 0.0000A |

## Dual Channel Potentiostat

The dual channel potentiostat/galvanostat/FRA, ZIVE BP2A, is designed to support dual cells and each cell consists of one working electrode, one reference electrode and one counter electrode. It is suitable for sample characterization simultaneously or independently with the complete DC and impedance test.

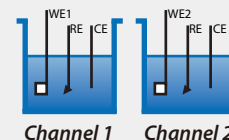
### Features

- Versatile high quality Potentiostat/Galvanostat/Impedance Analyzer
- Compact size with full functions
- Front panel LCD display
- Ideal for biosensor research, FET sensor, permeation test etc.
- 14 EIS techniques capability including multisine technique
- iR compensation and measurement
- High speed data sampling  
: 2usec or 3usec depending on data point number
- Internal 542,000 data point storage and continuing experiment regardless of PC failure
- Full software package supplied as standard for EIS, Energy Test, Electrochemical Analysis and Corrosion application



BP2A

### Cell configuration



The ZIVE BP2F, a dual channel potentiostat/galvanostat/FRA, is to support dual-working-electrode cell with one reference and one counter electrode configuration (bi-potentiostat) for sample characterization. Each channel can conduct DC and impedance test simultaneously and/or independently. The ZIVE BP2F can be setup to run 2-electrode, 3-electrode, or 4-electrode measurements with a simple setup change.

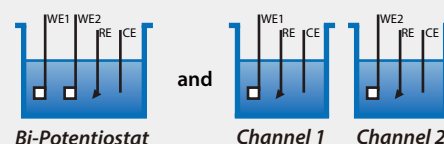
## Features

- Versatile high quality dual channel potentiostat/galvanostat/impedance analyzer
- Bi-potentiostat
  - two fully independent channels
  - dual working electrodes with one reference and one counter electrode configuration available
- Compact size with full functions
- Front panel LCD display
- Ideal for biosensor research, FET sensor, permeation test etc.
- 14 EIS techniques capability including multisine technique
- iR compensation and measurement
- High speed data sampling
  - : 2usec or 3usec depending on data point number
- Internal 542,000 data point storage and continuing experiment regardless of PC failure
- Full software package supplied as standard for EIS, Energy Test, Electrochemical Analysis and Corrosion application



BP2F

Cell configuration



# Portable Potentiostat/Galvanostat/EIS

The portable potentiostat/galvanostat/FRA, ZIVE PP1e & PP3 are for use in the laboratory or in the field. The system is housed in a plastic case which is guaranteed waterproof to 5 meters under water. Though a slim style tablet PC is included as standard, you can also use your own laptop computer. Multiple PP1e or PP3 units can be linked together for multichannel system configuration. PP3's internal potentiostat/galvanostat circuit is floating type to enable pipe corrosion measurement.

## Features

- Portable high quality Potentiostat/Galvanostat/Impedance Analyzer
- Light weight and compact size with full functions
- Wide current ranges for various applications such as corrosion, general electrochemistry, sensor, battery, fuel cell, super capacitor, solar cell application etc.
- 14 EIS techniques capability(option) including multisine technique
- High speed data sampling
  - : 2usec or 3usec depending on data point number
- 3 measurement/control voltage ranges & 9(PP1e), 10(PP3) measurement/control current ranges
- Internal 542,000 data point storage and continuing experiment regardless of PC failure
- Full software package supplied as standard for EIS, Energy Test, Electrochemical Analysis and Corrosion application



ZIVE PP1e

ZIVE PP3

## Specifications

### ZIVE BP2A/BP2F

### ZIVE PP1e

### ZIVE PP3

|                             |  |                               |  |
|-----------------------------|--|-------------------------------|--|
| • control voltage range     | ±10V, ±1V, ±100mV  | ±10V, ±1V, ±100mV             | ±10V, ±1V, ±100mV                                      |
| • voltage accuracy          | ±0.02% fs(gain x1)   | ±0.02% f.s(gain x1)           | ±0.02% f.s(gain x1)                                    |
| • current range (with gain) | 2nA ~ 2A, 11 ranges (200pA) (BP2A)<br>10nA ~ 1A, 10 ranges (1nA) (BP2F)                | 100nA ~ 1A, 9 ranges (10nA)   | 10nA ~ 1A, 10 ranges (1nA)                             |
| • current accuracy          | ±0.02% f.s.(gain x1)>200nA(BP2A)<br>±0.02% f.s.(gain x1)>100nA(BP2F)                   | ±0.05% f.s.(gain x1)>100nA    | ±0.03% f.s.(gain x1)>100nA                             |
| • compliance voltage        | ±12V   | ±12V                          | ±20V   |
| • slew rate                 | 15V/μsec (BP2A)<br>10V/μsec (BP2F)   | 10V/μsec                      | 8V/μsec  |
| • input impedance           | >2x10 <sup>13</sup> Ω   4.5pF  | >2x10 <sup>13</sup> Ω   4.5pF | >2x10 <sup>13</sup> Ω   4.5pF                          |
| • frequency range           | 10μHz ~ 1MHz   | 10μHz ~ 1MHz                  | 10μHz ~ 1MHz   |
| • aux port                  | digital: 3 output/2 input(BP2A),<br>2 output/1 input(BP2F)<br>analog: 1 output/3 input | 1 analog input: ±10V          | digital: 3 output/1 input,<br>analog: 1 output/3 input |
| • size(WxDxH)               | 209X378X270mm (BP2A)<br>232.6X324.6X243.3mm (BP2F)                                     | 411x321x165mm                 | 411x321x165mm  |
| • weight                    | 9.25Kg (BP2A)  | 4.4Kg                         | 4.4Kg  |

# Battery Test System

## WBCS3000 Series

The battery cycler, WBCS3000 series, chooses plug-in type module with independent power suppliers per 8 channel substation. Each substation can be used as independent system with optional "StartUp Kit" or can be built up integrated system as add-on. These give flexibility to user's application.

### Features

- 4 probe type true potentiostat/galvanostat circuit
  - for battery test (Li battery, Ni-MH, NiCd etc), supercapacitor test and fuel cell test etc.
  - can perform general electrochemical experiment such as cyclic voltammetry
  - no switching time between charge and discharge step
- 16 bit ADC, DAC : accurate control & measurement
- Easy channel expansion up to 128 channels
- Auxiliary voltage, temperature measurement option
- User friendly software and free upgrade
- LAN communication

*Low Current Type  
WBCS3000Ls/WBCS3000Le*



*Low Current Type(32CH)  
WBCS3000Ls32/WBCS3000Le32*



*Low Current Type(32CH)  
WBCS3000Lx32*



*Standard Type  
WBCS3000S*



*Mid Power Type  
WBCS3000M1*



*Mid Power Type  
WBCS3000M2*



*Dual Channel Type  
WBCS3000D*



*Power Type  
WBCS3000H8*



*Power Type  
WBCS3000H12*



*High Power Type  
WBCS3000HP*



| Specifications             | WBCS3000Ls(32)<br>WBCS3000Le(32)  | WBCS3000Lx32                    | WBCS3000S                 |
|----------------------------|---|---------------------------------|---------------------------|
| • control voltage range    | ±5V(standard)   | -1V to +5V(Lx) (standard)       | ±5V(standard)*1           |
| • voltage accuracy         | ±0.02% f.s.   | ±0.02% f.s.                     | ±0.02% f.s.               |
| • voltage resolution       | 0.15mV(standard)  | 0.15mV(standard)                | 0.15mV(standard)*1        |
| • current range            | 4 ranges<br>Max. ±10mA@5V(WBCS0000Ls,Ls32)<br>Max. ±100mA@5V(WBCS3000Le,Le32) | 4 ranges<br>Max. ±1A@-1V to +5V | 4 ranges<br>Max. ±5A@5V*2 |
| • max. power per channel*3 | 200mWatt(WBCS3000Ls,Ls32)<br>2Watt(WBCS3000Le,Le32)                           | 6Watt                           | 50Watt                    |
| • current accuracy         | ±0.02% f.s.   | ±0.02% f.s.                     | ±0.02% f.s.               |
| • current resolution       | 16 bit(0.0015% f.s)   | 16 bit(0.0015% f.s)             | 16 bit(0.0015% f.s)       |
| • input impedance          | 10 <sup>12</sup> Ohm  | 10 <sup>12</sup> Ohm            | 10 <sup>12</sup> Ohm      |
| • sampling time            | *4  | *4                              | *4                        |

\*1: User can specify the voltage range within <80V for difference between high and low voltage

\*2: Depending on system specification.

\*3: power = max. voltage x max. current x 2

\*4: - Without option

8-40 channels: 10msec

41-64 channels: 20msec

81-124 channels: 50msec

- With option

8-16 channels: 10msec

17-40 channels: 20msec

41-80 channels: 50msec

81-124 channels: 50msec (2 SIF boards required)

## Specifications

|  | WBCS3000M1  | WBCS3000M2   | WBCS3000D   |
|--|---|--|---|
| <ul style="list-style-type: none"> <li>control voltage range*1</li> <li>voltage accuracy</li> <li>current range*2</li> <li>max. power per channel*3</li> <li>current accuracy</li> <li>current resolution</li> <li>input impedance</li> <li>sampling time*4</li> </ul> | <ul style="list-style-type: none"> <li>±5V(standard)</li> <li>±0.02% f.s.</li> <li>4 ranges</li> <li>100Watt</li> <li>±0.05% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm</li> <li>*4</li> </ul>                              | <ul style="list-style-type: none"> <li>±5V(standard)</li> <li>±0.02% f.s.</li> <li>4 ranges</li> <li>200Watt</li> <li>±0.05% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm</li> <li>*4</li> </ul>                               | <ul style="list-style-type: none"> <li>customer specified range</li> <li>±0.05% f.s.(&lt;10V)</li> <li>4 ranges</li> <li>400Watt</li> <li>±0.05% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm (&lt;10V)</li> <li>*4</li> </ul>            |
|  | WBCS3000H8  | WBCS3000H12  | WBCS3000HP  |
| <ul style="list-style-type: none"> <li>control voltage range*1</li> <li>voltage accuracy</li> <li>current range*2</li> <li>max. power per channel*3</li> <li>current accuracy</li> <li>current resolution</li> <li>input impedance</li> <li>sampling time*4</li> </ul> | <ul style="list-style-type: none"> <li>customer specified range</li> <li>±0.05% f.s.(&lt;10V)</li> <li>4 ranges</li> <li>800Watt</li> <li>±0.1% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm (&lt;10V)</li> <li>*4</li> </ul> | <ul style="list-style-type: none"> <li>customer specified range</li> <li>±0.05% f.s.(&lt;10V)</li> <li>3 ranges</li> <li>1200Watt</li> <li>±0.1% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm (&lt;10V)</li> <li>*4</li> </ul> | <ul style="list-style-type: none"> <li>customer specified range</li> <li>±0.1% f.s.</li> <li>3 or 1 range depending on power</li> <li>4kWatt</li> <li>±0.1% f.s.</li> <li>16 bit(0.0015% f.s)</li> <li>10<sup>12</sup> Ohm (&lt;10V)</li> <li>*4</li> </ul> |
| <p>*1: User can specify the voltage range within &lt;80V for difference between high and low voltage</p> <p>*2: Depending on system specification.</p> <p>*3: power = max. voltage x max. current x 2</p>  |   | <p>*4: - Without option<br/>8~40 channels: 10msec<br/>41~64 channels: 20msec<br/>81~124 channels: 50msec</p>   | <p>- With option<br/>8~16 channels: 10msec<br/>17~40 channels: 20msec<br/>41~80 channels: 50msec<br/>81~124 channels: 50msec (2 SIF boards required)</p>  |

## SI(Smart Interface) Software

- 32bit/64bit OS environment
- TCP/IP communication
- Max. 200 steps
- Max. 10 cutoff(vertex) condition
- Max. 300,000 data point memory on control board

- Virtual control panel
- Various real time plots & universal axis graphs
- Data backup function
- WYSIWYG graphics
- User friendly software

### For Electroanalytical Measurement

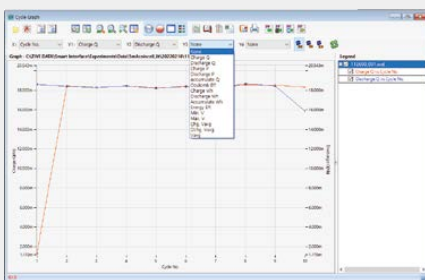
- Cyclic voltammetry
- Linear sweep voltammetry
- Chrono-amperometry
- Chrono-coulometry
- Chrono-potentiometry

### Corrosion Measurement

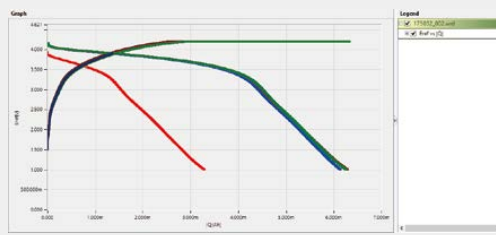
- Tafel plot
- Potentiodynamic
- Potentiostatic
- Galvanostatic
- Cyclic polarization
- Ecorr vs. time
- Linear polarization resistance

### For Energy Test

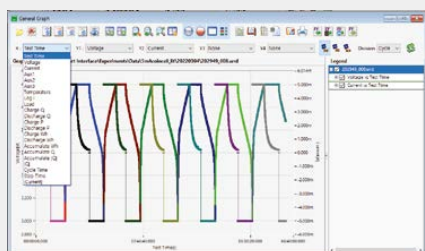
- Charge/Discharge(CC/CV) Test
- Constant Current Charge/Discharge(CC/CC) Test
- Steady state CV
- Pstat IV curve
- Gstat IV curve
- Electrochemical Voltage Spectroscopy(EVS) Test
- Galvanostatic Intermittent Titration Technique(GITT) Test
- Potentiostatic Intermittent Titration Technique(PITT) Test



Cycle graph



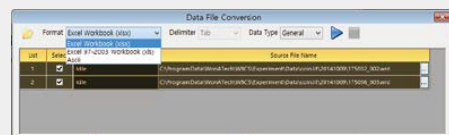
Voltage vs. |capacity| graph



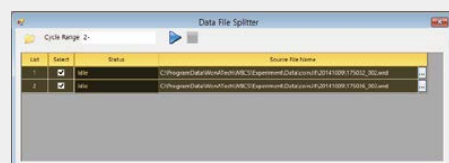
General graph



Channel status display



Data conversion to ASCII & Excel



Data file split by cycle number

## Smart2™ Series - Fuel Cell Test System for single cells

The Smart2™ series are an advanced, reliable, compact fuel cell test equipment and hardware for testing single cells with options available for PEMFC and PEM/DM FC testing services. Our control and measurement software with powerful graphical user interface makes you easy to operate the system.

### Features

- Fully integrated compact size
- Suitable for 100Watt single cell
- 3 models are available
- Automatic purge gas control
- External anode & cathode line and cell temperature control
- Fully automatic operation by PC control
- Built-in electronic load
- Stoichiometric control is available
- Nafion™ membrane type humidifiers (Smart2 PEM/DM, Smart2 PEM model only)
- Various safety functions including watch-dog function
- Powerful software with independent data analysis software

\*\* The Smart™ series can be exported to countries where factory trained engineers can support customers.

### Standard Configuration - Smart2™ PEM/DM & Smart2™ PEM

- Solenoid valve : 5ea
  - fuel gas, oxidant gas, purge gas, water refill control for humidifiers
- MFC for Anode and Cathode (2set)
- Check valve : 6ea
  - each MFC has two check valve at in & out
  - purge gas for anode & cathode
- 3 Way valve : 2ea for wet gas or dry gas selection
- Methanol pump: 1et (Smart2 PEM/DM model only)
- Humidifier : 2set & Automatic water feeding for humidifier: 1ea
- Back pressure regulator : 2ea & Pressure sensor: 2ea
- Temperature controller(with line heater & thermocouples) : 7set
  - humidifier Temperature controller : 2set
  - gas line temperature controller for inside the instrument : 2set
  - gas line temperature controller for outside the instrument : 2set
  - cell temperature controller : 1set
- Temperature monitor only : 2 points with thermocouples
  - inside the anode & cathode gas line
- Electronic Load : 1set
- System controller including DAQ system with emergency button
- Control PC(option) with Smart software
- Interface boards with LAN cables



Smart2 PEM/DM



Smart2 PEM

### Standard Configuration - Smart2™ DM

- Solenoid valve : 2ea
  - oxidant gas, purge gas
- MFC for Anode and Cathode : 2set
- Check valve : 3ea
- Temperature controller(with line heater & thermocouples) : 5set
  - gas line temperature controller for outside the instrument : 2set
  - humidifier&gas line temperature controller for inside the instrument : 2set
  - cell Temperature controller: 1set
- Electronic Load : 1set
- System controller including DAQ system with emergency button
- Control PC(option) with Smart software
- Interface boards with LAN cables



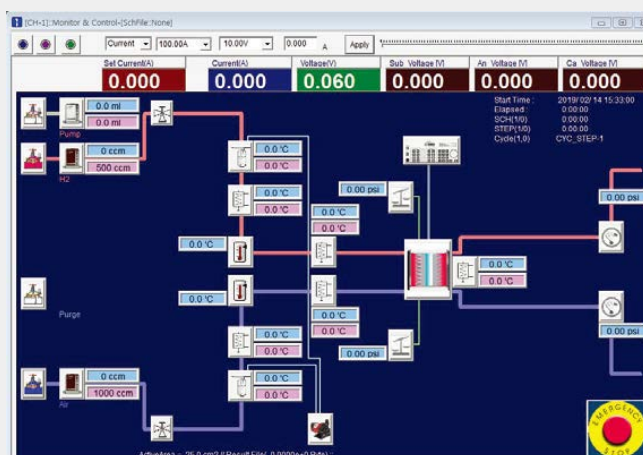
Smart2 DM

## Software

- Simple and easy operation
- Real-time graphic data output
- User friendly graphical user interface(GUI)
- Continuous data logging
- Background server program
- Independent data managing software
- Button click & play mode
- VOI(Value of Interest) displaying selection
- Colorful display of each module status

## Optional Equipments

- Impedance Monitor
- External potentiostat/galvanostat
- Zero voltage booster
- Fuel cell hardware fixture
- Conductivity Cell
- Conductivity Jig



# Impedance Monitor

## Zcon™ Single Channel Impedance Analyzer

The Zcon™ is an impedance analyzer for single channel application and provides all tools for the application of fuel cell stack, battery pack, and general electrochemical study requiring EIS measurement using external electronic load or potentiostat/galvanostat. By employing electronic load, Zcon™ 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.

## Features

- Designed for spectrum analysis in the electrochemical field
- For versatile AC impedance experiment using external electronic load or potentiostat/galvanostat.
- 2 signal input channel(current & voltage)/1 signal output for sinewave
- Flexible frequency generator/analyzer
- Generate various waveforms(e.g. sinusoidal etc.)
- 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
- Free analysis using ZMAN impedance analysis software without license code
- Two models are available depending on voltage range
  - Zcon : ±10 V
  - ZconH : ±100V

Zcon™ Impedance Analyzer



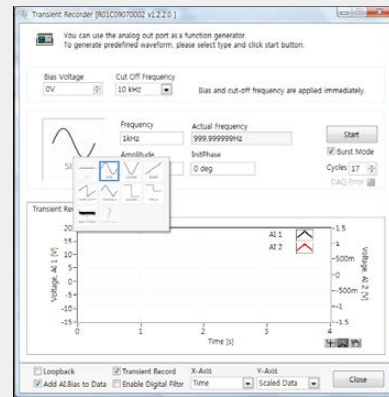
Zcon™ supports external electronic load & potentiostat  
 • TDI Dynaload XBL series electronic load  
 • 3rd parties potentiostat/galvanostat

## Specifications

| Analog Out (as single generator) |                         | Analog In (as frequency analyzer) |                                      |
|----------------------------------|-------------------------|-----------------------------------|--------------------------------------|
| • no. of channel                 | 1                       | • no. of channel                  | 2 (each for current & voltage input) |
| • configuration                  | single-ended            | • configuration                   | differential                         |
| • max. output                    | -11.0 to +11.0 V(DC+AC) | • max. common mode voltage        | ±10V(Zcon)<br>±100V(ZconH)           |
| • frequency range                | 1uHz to 100kHz          | • bandwidth                       | 550kHz                               |
| • frequency resolution           | 5000 steps/decade       | • input impedance                 | 110kOhm                              |
| • amplitude                      | 1mVpp to 2Vpp           |                                   |                                      |

## Software - Z100 Navigator

- Operation software for Zcon™ and Z#™ system
- It 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)

## Z#™ Multichannel Impedance Analyzer

The Z#™ series provide all tools for the application of fuel cell stack, battery pack, multi-cells and general electrochemical study requiring multichannel EIS for serial connected cells. It has independent 6 channel AI(analog input) board. So it can provide real synchronized multichannel EIS monitor function. Some other commercial multichannel impedance monitors use multiplexer to measure EIS sequentially. This kind of instruments take long time to measure EIS. Because EIS measurement is time domain, synchronized measurement is essential.

### Features

- Designed for spectrum analysis in the electrochemical field
- 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
- Measuring fuel cell stack EIS and simultaneously recording up to 4 individual cells from the stack
- Channel expandable up to 30
- Flexible frequency generator/analyzer
- High current application with external load and/or potentiostat/galvanostat
- Generate various waveforms (e.g. Sinusoidal etc.)
- Simulation and fitting with ZMAN™
- Software controlled function
- Graphic-based user-interface
- Dual real time graph (Bode, Nyquist, etc.) during measurement



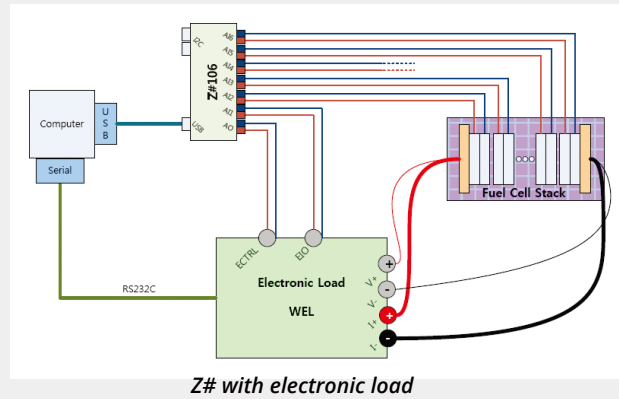
Z# Impedance Analyzer

Z#™ supports external electronic load & potentiostat  
 • TDI Dynaload XBL series electronic load  
 • 3rd parties potentiostat/galvanostat



## Specifications

| Analog Out (as single generator) |                         | Analog In (as frequency analyzer) |   |
|----------------------------------|-------------------------|-----------------------------------|---|
| • no. of channel                 | 1                       | • no. of channel                  | voltage input                             |
| • configuration                  | single-ended            | • configuration                   | maximum 60Ch in daisy chain configuration |
| • max. output                    | -11.0 to +11.0 V(DC+AC) | • max.input                       | differential                              |
| • frequency range                | 1uHz to 100kHz          | • bandwidth                       | ±100V                                     |
| • frequency resolution           | 5000 steps/decade       | • input impedance                 | 550kHz                                    |
| • amplitude                      | 1mVpp to 5Vpp           |                                   | 110kOhm                                   |



# Battery Impedance Analyzer

## Single/Multi Channel Battery Impedance Analyzer

The BZA Series are battery impedance analyzers. These can measure battery impedance. Fixed frequency impedance or whole impedance spectra. Also, these can measure open circuit potential and battery temperature using optional PT100 sensor. Independent impedance analysis software package ZMAN™ can read the data file and fit the equivalent circuit models automatically so user can determine the battery status.

### Features

- Impedance measurement of battery, battery pack, & ESS(energy storage system)
- Quick diagnosis of batteries
- Battery lifetime estimation
- LAN interface with PC
- Cell temperature monitoring
- Automatic equivalent circuit searching and various impedance analysis functions are possible using ZMAN™ impedance analysis software
- Expandable up to 32 channels (Multi channels model)



Single channel  
BZA60(Max. 60V)



Single channel  
BZA1000A(Max. 1000V)



Multi channel  
BZA60M(Max. 60V)



Multi channel  
BZA500M(Max. 500V)

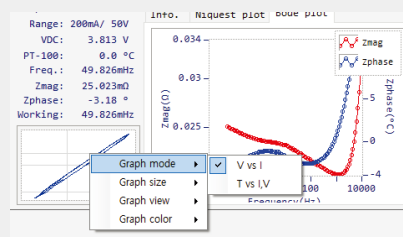
| Specifications   | BZA60/60M   | BZA500M   | BZA1000  |
|--|---|---|--|
| <ul style="list-style-type: none"> <li>Impedance measurement                             <ul style="list-style-type: none"> <li>measurement range</li> <li>accuracy</li> </ul> </li> <li>frequency range</li> <li>current amplitude (p-p)</li> </ul>                       | 500uΩ ~ 50Ω<br>±1% magnitude (1mΩ - 50Ω)<br>±1° phase<br>0.05Hz ~ 10kHz<br>400uA ~ 2A   | 500uΩ ~ 50Ω<br>±1% magnitude (1mΩ - 50Ω)<br>±1° phase<br>0.05Hz-4kHz<br>400uA ~ 2A  | 500uΩ ~ 50Ω<br>±1% magnitude (1mΩ - 50Ω)<br>±1° phase<br>0.05Hz-4kHz<br>400uA ~ 2A   |
| <ul style="list-style-type: none"> <li>DC voltage measurement                             <ul style="list-style-type: none"> <li>ADC resolution</li> <li>input range</li> </ul> </li> </ul>  | 24 bit<br>60V/6V (dual range)   | 24 bit<br>500V/50V (dual range)   | 24 bit<br>1000V/100V (dual range)  |
| <ul style="list-style-type: none"> <li>AC voltage measurement                             <ul style="list-style-type: none"> <li>ADC resolution</li> <li>input range</li> </ul> </li> </ul>  | 24 bit<br>±250mV  | 24 bit<br>±250mV  | 24 bit<br>±250mV   |
| <ul style="list-style-type: none"> <li>AC current measurement                             <ul style="list-style-type: none"> <li>ADC resolution</li> <li>input range</li> </ul> </li> </ul>  | 24 bit<br>4ea (2A, 200mA, 20mA, 2mA)  | 24 bit<br>4ea (2A, 200mA, 20mA, 2mA)  | 24 bit<br>4ea (2A, 200mA, 20mA, 2mA)   |
| <ul style="list-style-type: none"> <li>Sinewave generator                             <ul style="list-style-type: none"> <li>frequency range</li> <li>frequency accuracy</li> <li>frequency resolution</li> <li>DAC resolution</li> <li>output gain</li> </ul> </li> </ul> | 0.05Hz ~ 10KHz<br>< 0.1%<br>65535/decade<br>10 bit<br>2ea(X1, X0.2)<br>total 8 current ranges<br>(2A, 400mA, 200mA, 40mA,<br>20mA, 4mA, 2mA, 400uA) | 0.05Hz ~ 10KHz<br>< 0.1%<br>65535/decade<br>10 bit<br>2ea(X1, X0.2)<br>total 8 current ranges<br>(2A, 400mA, 200mA, 40mA,<br>20mA, 4mA, 2mA, 400uA) | 0.05Hz ~ 4KHz<br><0.1%<br>65535/decade<br>10 bit<br>2ea (X1, X0.2)<br>total 8 current ranges<br>(2A, 400mA, 200mA, 40mA,<br>20mA, 4mA, 2mA, 400uA) |
| <ul style="list-style-type: none"> <li>Temperature measurement                             <ul style="list-style-type: none"> <li>input</li> <li>accuracy</li> </ul> </li> </ul>   | RTD probe (PT100)<br>Max 1°C  | RTD probe (PT100)<br>Max 1°C  | RTD probe (PT100)<br>Max 1°C   |
| <ul style="list-style-type: none"> <li>Size(WxHxD)</li> </ul>  | 160 x 60 x 180 mm (BZA60)<br>207 x 234 x 280mmmm (BZA60M)   | 270 x 309 x 302mm   | 300mm x 60mm x 300mm   |

## ZM(Impedance Manager) Software

- Independent examination from the PC is available after the test starts.
- A various scope of parameters for the test is adjustable that are used in the test.
- Even if you lose connection of BZA and PC, if the device is powered on, the device will continue experiment. Memory can be saved after the connection recovers.
- Data is saved in the form of binary format that is compatible with the ZMAN software thus can be transformed into the text (CSV, TXT).

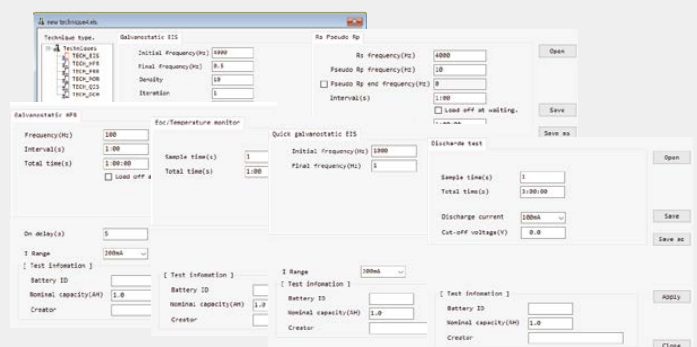
### Real time plot and data monitoring

- Lissajous plot/ current, voltage vs. time for AC waveform
- Galvanostatic EIS (Quick galvanostatic EIS)
  - Nyquist plot / Bode Plot
- Rs-psuedo Rp/ HFR both
  - Cs, Cp vs time graph
- Zre, Vdc vs time graph (HFR)
- Rs-psuedo Rp vs time graph (Rs-psuedo Rp measurement)
- Vdc, Temperature vs time graph (Discharge test)
- Eoc, Temperature vs time graph (Eoc\_temp monitor)



### Technique selection & Parameter Input Box

- Galvanostatic Electrochemical Impedance Spectroscopy
  - Bias & amplitude value is determined by current range setting
  - Parameters: Frequency range, data density, iteration
- Rs-psuedo Rp measurement
  - Rs frequency, psuedo Rp frequency setting
  - Interval & Total time setting
- High frequency resistance measurement(HFR)
  - HFR frequency setting
  - Interval & Total time setting
- Eoc - Temperature monitor
- Quick galvanostatic EIS for screening
- Constant current Discharge test



## Multichannel Voltage/Temperature Monitoring System

The cXM is a flexible systems to monitor voltage and/or temperature, suitable for use in a wide variety of applications. The system can equip max 128 input signal (voltage or temperature) channels. You can order 8ch temperature input with 16 channel voltage input combi module or 32 channel voltage or temperature input module.

eg.)

- 1) 4 set of 32 channel voltage input:  
Total 128ch voltage monitoring
- 2) 2set of 32 channel voltage input and 2set of 32 channel temperature input:  
64ch voltage and 64 channel temperature monitoring
- 3) 4 set of combi module:  
32 channel temperature and 64 channel voltage monitoring

For safety purposes, when it detects that the operating voltage/temperature is out of the defined range, alarm will be activated.

### Features

- Combi module for Voltage & Temperature Measurement
- CVM(cell voltage monitoring) configuration or CTM(cell temperature monitoring) configuration available
- Battery Pack Potential /Temperature Measurement
- Corrosion Potential Measurement
- Cell Voltage Monitoring Of Electrolyzers Or Other Electrochemical Multicells
- Environmental Monitoring
- Modular, Low Profile Mechanical Design
- Independent Monitoring System With PC Via LAN (USB option)
- Max 128 signal input per system is available

### Voltage Monitoring

- Voltage range :  $\pm 10V$  or  $\pm 5V$  for each channel
- Voltage range in common mode :  $\pm 275V$  for all channel
- Resolution : 14 bit (16 bit option)
- Sampling time : 100ms per channel
- Input impedance
  - differential : 800kOhm
  - common mode : 200kOhm
- 10/100 Ethernet PC direct  
(Full speed USB 2.0 interface, option)



16ch temperature input & 32ch voltage input



64ch voltage input



32ch temperature input & 64ch voltage input

### Temperature Monitoring

- Sensor type : insulation K-type thermocouple
- Resolution : 14bit, 0.25°C
- Detects thermocouple shorts to GND or VCC
- Sampling rate : max. 100 samples/sec
- 8channel in combi module or 32ch in temperature module (32ch module's connector is Dsub)

### cX Software

- Works with PC application software
- LAN communication
- Alarm safety & cut-off condition
- Supply .ini files to control cX software(option)

Power Booster for ZIVE series

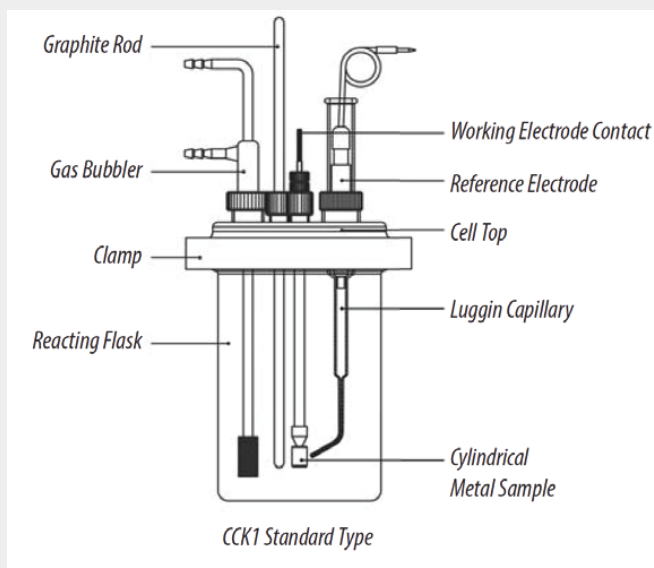
- For ZIVE series
- For high voltage/high current application
- Modular type design
- EIS capability
- Sine wave simulation available
- Simple operation and accurate result
- Safety features for user and instrument itself
- Part number : ZB series



| Housing (Size)        | Model          | Max. V | Max. I (>-1V or 2V) | Max. I (Bipolar) | Power Dissipation(Watt) |
|-----------------------|----------------|--------|---------------------|------------------|-------------------------|
| ZB1<br>(229x388x550)  | ZB530B         | 5V     |                     | 30A              | 450                     |
|                       | ZB1030U/1020B  | 10V    | 30A                 | 20A              | 459/480                 |
|                       | ZB2015U/2010B  | 20V    | 15A                 | 10A              | 409/480                 |
|                       | ZB408U/405B    | 40V    | 8A                  | 5A               | 410/480                 |
| ZB2<br>(273x388x550)  | ZB560B         | 5V     |                     | 60A              | 900                     |
|                       | ZB1060U/1040B  | 10V    | 60A                 | 40A              | 918/960                 |
|                       | ZB2035U/2020B  | 20V    | 35A                 | 20A              | 955/960                 |
|                       | ZB4015U/4010B  | 40V    | 15A                 | 10A              | 770/960                 |
| ZB3<br>(403x388x550)  | ZB1090U/1060B  | 10V    | 90A                 | 60A              | 1,377/1,440             |
|                       | ZB2050U/2030B  | 20V    | 50A                 | 30A              | 1,365/1,440             |
|                       | ZB4025U/4015B  | 40V    | 25A                 | 15A              | 1,283/1,440             |
| ZB4<br>(533x388x550)  | ZB1080B        | 10V    |                     | 80A              | 1,920                   |
|                       | ZB2060U/2040B  | 20V    | 60A                 | 40A              | 1,683/1,920             |
|                       | ZB4030U/4020B  | 40V    | 30A                 | 20A              | 1,539/1,920             |
| ZBR2<br>(682x982x750) | ZB5190B        | 5V     |                     | 190A             | 3,800                   |
|                       | ZB10160B       | 10V    |                     | 160A             | 3,840                   |
|                       | ZB20120U/2080B | 20V    | 120A                | 80A              | 3,480/3,840             |
|                       | ZB3090U/3030B  | 30V    | 90A                 | 30A              | 3,447/2,160             |
|                       | ZB4070U/4035B  | 40V    | 70A                 | 35A              | 3,591/3,360             |

Model Name \*\*\*\*B is for voltage bipolar type, \*\*\*\*U is for voltage unipolar type [minimum voltage -1V or -2V(ZB20120U)]  
 \* Customized specification is available. Please contact WonATech sales team.

The CCK series corrosion cell kit is based on a standard glass reaction flask, 1 liter ~ 500ml. All wetted parts are made of chemically resistant materials such as Teflon, Pyrex and SUS 316. The standard cell configuration consists of a cylindrical metal sample working electrode, a gas bubbler, and a luggin capillary. A graphite rod as counter electrode, a reference electrode and a flat specimen holder could be ordered separately as an option. The water-jacketed type corrosion cell kit made with Teflon are also available.



CCK1, Standard Type  
With  
Optional FSH2 & Thermometer



WCCK1, Water-Jacketed Type  
With  
Optional FSH2 & Thermometer

## Specifications

|                                    |   |
|------------------------------------|---|
| Vial volume (depending on model)   | CCK series : 500 ml & 1 liter<br>WCCK series : 500 ml & 1 liter |
| Cylindrical sample holder material |   |
| Tube                               | Pyrex®, 6.35 mm dia.  |
| Compression gasket                 | Teflon®   |
| Cylindrical metal sample           | Steel   |
| Chemical compatibility             |   |
| Wetted materials                   | Pyrex®, Teflon®   |
| Non-wetted materials               | Above, plus stainless steel and Viton®                          |
| Reference electrode(option)        |   |
| Type                               | SCE or Ag/AgCl reference electrode                              |
| Size                               | 9 mm diameter OD, 110 mm long                                   |
| Counter electrode(option)          |   |
| Graphite rod                       | 6 mm diameter, 30 cm long                                       |
| Flat specimen holder(option)       |   |
| Specimen diameter                  | FSH2 : 15.5 mm ~ 22 mm<br>FSH15 : 18.5 mm~25 mm dia.            |
| Specimen thickness                 | 0.3 ~ 5.8 mm  |

All specifications are subject to change without notice.

## Parts Included For CCK1 & WCCK1

|  |   |
|--|---|
| Cell vial  | Pyrex®, 1L                                |
| Cylindrical metal sample & tube                    | Steel / Pyrex®, 6.35mm dai. x 4.35mm dia. |
| Cell clamp   | Stainless steel                           |
| Luggin capillary                                   | Pyrex®                                    |
| Gas bubbler  | Pyrex®                                    |
| Cell Top   | Teflon®                                   |
| Other miscellaneous parts such as stopper / O-ring | MC Nylon® / Viton®                        |

Please contact us for other replacement parts.

## Ordering Guide

| Description         | Part No. |
|---------------------|----------|
| Standard type       |          |
| 1 liter volume      | CCK1     |
| 500 ml volume       | CCK05    |
| Water-jacketed type |          |
| 1 liter volume      | WCCK1    |
| 500 ml volume       | WCCK05   |

Components can vary depending on the type of cells.

## Optional Items

| Description                                   | Part No. |
|---|----------|
| Flat specimen holder                          |          |
| Active area : 11.28 mm dia.                   | FSH2     |
| Active area : 15 mm dia.                      | FSH15    |
| Counter electrode                             |          |
| Graphite rod, 150mm long                      | GR002H   |
| Graphite rod, 300mm long                      | GR002    |
| Reference electrode                           |          |
| Saturated calomel reference electrode         | WA1001   |
| Ag/AgCl reference electrode                   | WA1004   |
| Mercury/Mercurous Sulfate Reference Electrode | WA1005   |



FSH2



GR002



WA1001

## Replacement Parts

| Description  | Part No. |
|--|----------|
| Cylindrical specimen rod<br>For CCK1, WCCK1, CCK5, WCCK5 | CSH2     |
| Luggin Capillary<br>For CCK1, WCCK1, CCK5, WCCK5         | LGCK1    |
| Glass vial<br>For CCK1                                   | GVCK1    |
| For WCCK1  | GVWCCK1  |
| For CCK05  | GVCK05   |
| For WCCK05   | GVWCCK05 |
| Gas bubbler<br>For CCK1, WCCK1                           | GBCK1    |
| For CCK05  | GBCK05   |
| Clamp<br>For CCK1, WCCK1                                 | CLCK1    |
| For CCK05, WCCK05  | CLCK05   |

|                                       |          |
|---------------------------------------|----------|
| Teflon cell top 1<br>For CCK1, WCCK1  | CTCK1    |
| For CCK05, WCCK05                     | CTCK05   |
| Teflon cell top 2<br>For CCK1, WCCK1  | CTCK1-2  |
| For CCK05, WCCK05                     | CTCK05-2 |
| Flat specimen holder head<br>For FSH2 | FSH2H    |
| For FSH15                             | FSH15H   |



# Flat Cell Kit

The flat cell kit was designed to evaluate plate material such as metal(coupons), semi-conducting plate, etc. A sample plate will be placed one sample holder by fixing knob and maximum 300ml sample volume is acceptable. A water jacketed version is also available. A graphite plate which is placed in one side of the cell is supplied with a cell and can be used as a counter electrode. A Luggin capillary is also included while a reference electrode should be purchased separately. Instead of graphite plate, a platinum wire can be also used as counter electrode by putting through either of the ports on the cell body. You can select PTC1 or PTC2 plate test cell kit for small solution volume, which is explained on next page.



FCK2 Standard Type



WFCK2 Water-Jacketed Type

## Features

- Ideal for testing of flat specimen
- Easy to use
- Fast and easy disassembly
- Detachable counter electrode
- Two opening areas

## Specifications

|                  |                   |
|------------------|-------------------|
| Sample test area |                   |
| One side         | 1 cm <sup>2</sup> |
| The other side   | 5 cm <sup>2</sup> |
| Sample thickness | Up to 20 mm       |
| Cell volume      |                   |
| FCK15            | up to 150 ml      |
| FCK2&WFCK2       | up to 300 ml      |
| Material         |                   |
| Cell body        | Pyrex®            |
| Cell end         | Polycarbonate     |
| O-ring           | Viton®            |

All specifications are subject to change without notice.

## Applications

- Polarization test
- Galvanic corrosion
- Electrochemical noise measurement
- EIS measurement
- Cyclic voltammetry

## Ordering Guide

| Description         | Part No. |
|---------------------|----------|
| Standard type       |          |
| Cell volume, 150ml  | FCK15    |
| Cell volume, 300ml  | FCK2     |
| Water-jacketed type |          |
| Cell volume, 300ml  | WFCK2    |

## Flat Cell Kit

Accessories

### Optional Items

| Description                                   | Part No. |
|---|----------|
| Reference electrode                           |          |
| Saturated calomel reference electrode         | WA1001   |
| Ag/AgCl reference electrode                   | WA1004   |
| Mercury/Mercurous Sulfate Reference Electrode | WA1005   |

### Replacement Parts

| Description                             | Part No. |
|---|----------|
| Glass vial                              |          |
| For FCK15                               | GVFCK15  |
| For FCK2                                | GVFCK2   |
| For WFCK2                               | GWWFCK2  |
| Luggin capillary for FCK15, FCK2, WFCK2 | LGFCK    |
| Graphite plate electrode for FCK2       | GR001    |



LGFCK



GR001

## Plate Cell Kit

Accessories

The plate test cell kit, PTC1, is designed to evaluate plate material such as metal (coupons), semi-conducting plate, etc. In evaluation, a sample plate will be placed between two cell blocks. A counter electrode (graphite rod or Pt wire type) and a reference electrode should be ordered separately.

- PTC1 has an electrode holder part, a solution block part, a bottom block part and a thickness adjustment dial knob.
- The active area, which is to be exposed to electrolyte, can be selected by O-ring's position.



PTC1



Active area will be determined by O-ring's position.

### Specifications

|                    |                                   |
|--------------------|-----------------------------------|
| Sample test area   | width: >15mm, thickness: 0.1~10mm |
| Materials          | Teflon®                           |
| Active area        |                                   |
| Using small O-ring | 1 cm <sup>2</sup>                 |
| Using large O-ring | 5 cm <sup>2</sup>                 |

All specifications are subject to change without notice.

### Ordering Guide

| Description     | Part No. |
|-----------------|----------|
| Plate test cell | PTC1     |

### Optional Items

| Description   | Part No. |
|---|----------|
| Reference electrode   |          |
| Saturated calomel reference electrode<br>- 9mm OD, KT glass tip | WA1001   |
| Ag/AgCl reference electrode<br>- 9mm OD, KT glass tip           | WA1004   |
| Counter electrode   |          |
| Graphite rod<br>- 6mm dia. 15cm long                            | GR002H   |

## Plate Cell Kit

Accessories

The plate test cell, PTC2, is a simple cell for electrochemical testing of coated samples. Also it can be a perfect choice for measuring EIS(Electrochemical Impedance Spectroscopy) of painted metal specimens. The PTC2 is very easy to assemble.

### Specifications

|                              |                            |
|------------------------------|----------------------------|
| Sample                       |                            |
| Size                         | 60x60mm or more            |
| Thickness                    | >7mm                       |
| Dimensions                   |                            |
| Base                         | Approx. 132x90x10mm(WxDxH) |
| Cell body                    |                            |
| - internal diameter & length | 31.5mm, 80mm long          |
| Hole diameter                | 9.3mm dia. & 6.5mm dia.    |

All specifications are subject to change without notice.

### Parts Included

|                   |                 |
|-------------------|-----------------|
| Cell body         | Pyrex®          |
| Base and cell top | Teflon®         |
| Cell clamp        | Stainless steel |
| O-ring            | Viton®          |

### Ordering Guide

| Description     | Part No. |
|-----------------|----------|
| Plate test cell | PTC2     |



PTC2

### Optional Items

| Description   | Part No. |
|---|----------|
| Reference electrode   |          |
| Saturated calomel reference electrode<br>- 9mm OD, KT glass tip | WA1001   |
| Ag/AgCl reference electrode<br>- 9mm OD, KT glass tip           | WA1004   |
| Counter electrode   |          |
| Graphite rod<br>- 6mm dia. 15cm long                            | GR002H   |

### Replacement Parts

| Description     | Part No. |
|-----------------|----------|
| Clamp           | CLPTC2   |
| Glass vial      | GVPTC2   |
| Teflon cell top | CTPTC2   |

## Permeation Cell Kit

Accessories

The permeation cell kit, PMC1, is a spinoff of flat specimen cell kit, FCK2 series, and is designed for permeation test. A membrane or a permeation foil can be placed between two glass half cells.

Two graphite plates which can be used as counter electrode and two Luggin capillary are included as standard. Membrane and reference electrode should be ordered separately.

### Specifications

|                        |                       |
|------------------------|-----------------------|
| Sample test area       |                       |
| One side               | 1 cm <sup>2</sup>     |
| The other side         | 5 cm <sup>2</sup>     |
| Dimensions             |                       |
| Cell vial volume       | 150ml x 2 ea          |
| Chemical Compatibility |                       |
| Wetted materials       | Pyrex®, Polycarbonate |

All specifications are subject to change without notice.

### Ordering Guide

| Description                                  | Part No. |
|--|----------|
| Permeation Cell Kit<br>- Standard type       | PMC1     |
| Permeation Cell Kit<br>- Water-jacketed type | WPMC1    |



Permeation Cell Kit, Standard Type



Permeation Cell Kit, Water-Jacketed Type



The photoelectrochemical cell having a wide optical window is designed to characterize electrode material under lighting condition. The 2 or 3 electrode test is available. Based on a standard model, PCELL1, the attachments are interchangeable between cells according to user's applications. It is a gas tight sealed cell.



**PCELL1**  
- Standard Model

### Specifications

|                     |  |  |
|---------------------|--|--|
| Materials           | Cell body: PEEK<br>Optical window: quartz glass<br>Others: SUS 304, Viton O-ring |  |
| Dimensions          | optical window dia. 18mm<br>cell dimensions 74.3x40x110mm(WxDxH) (PCELL1)        |  |
| Electrolyte volume  | Max. 6ml (PCELL1)  |  |
| Sample size         | for PCELL1&2<br>Width: >25mm<br>Height: 25~62mm                                  | for PCELL3&4<br>Width: <8mm<br>Height: <22mm |
| Counter electrode   | Coiled Pt wire (included)  |  |
| Reference electrode | 6mm OD electrode available (option)  |  |

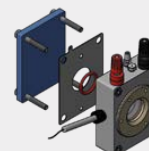
All specifications are subject to change without notice.

### Ordering Guide

#### Description/Part No.

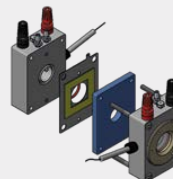
PCELL1 - Standard

- Standard type
- One optical window mounted in front of electrolyte chamber



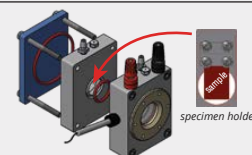
PCELL2

- Two optical windows arranged to face each other
- Suitable for absorbance measurement with a transparent electrode



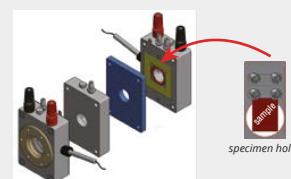
PCELL3

- Cell kit with a specimen holder
- Small sample can be fixed inside the electrolyte chamber



PCELL4

- Cell kit with a specimen holder
- Small sample can be fixed inside the electrolyte chamber



# Electrode Holder

## Universal Electrode Holder

The universal electrode holder, UEH1, is designed to hold various sizes of electrode. The UEH1 has 4 holes to hold electrodes and three of them have a screw to adjust its hole size. The hole size is available from 1.6mm to 10mm. The material of plate is Teflon®, which has high resistance to chemicals and its white color helps user to recognize a tiny change of samples during experiments.

### Specifications

|        |  |  |
|--------|--|--|
| Holes  | Number of holes 4<br>Hole size 1.6mm dia. x 1ea<br>6.2mm dia. x 1ea<br>9.6mm dia. x 1ea<br>10mm dia. x 1ea |  |
| Rod    | Material Stainless steel<br>Diameter 6mm diameter  |  |
| Length | Max. 150mm   |  |

All specifications are subject to change without notice.



*Universal electrode holder, UEH1, with optional electrodes and glass vial*

### Ordering Guide

| Description                | Part No. |
|----------------------------|----------|
| Universal electrode holder | UEH1     |

## Electrode Holder

Accessories

## Flat Specimen Holder

The FSH series are sample holders to accommodate flat specimens.

- Pyrex® tube : 6.3mm dia.



### Ordering Guide

| Description  | Part No. |
|--|----------|
| Flat Specimen Holder<br>Active area : 11.28mm dia.<br>Sample size : 15.5mm~22mm dia. / 0.3~5.8mm thickness | FSH2     |
| Flat Specimen Holder<br>Active area : 15mm dia.<br>Sample size : 18.5mm~25mm dia. / 0.3~5.8mm thickness    | FSH15    |

All specifications are subject to change without notice.

### Replacement Parts

| Description                         | Part No. |
|-------------------------------------|----------|
| Flat specimen holder head for FSH2  | FSH2H    |
| Flat specimen holder head for FSH15 | FSH15H   |

## Faraday Cage

Accessories

The faraday cage, Farad2, is an essential item for electroanalytical experiments. It is well designed to block out external EMI noise and firmly enclosure all the components of electrochemical cell (electrodes, vials, etc.). The spacious interior allows you to set up electronic components or systems easily.



### Specifications

|                 |  |
|-----------------|--|
| Material        |  |
| Exterior        | powder-coated steel                            |
| Interior        | powder-coated steel with Teflon®-coated bottom |
| Window          | fine SUS mesh embedded in acryl plates         |
| Access          |  |
| Number of holes | 2  |
| Size            | 10mm dia.                                      |
| Position        | right hand side and back side                  |
| Dimensions      |  |
| Overall         | 300 x 398 x300mm(WxHxD)                        |
| Window          | 100x300mm(WxH)                                 |

All specifications are subject to change without notice.

### Ordering Guide

| Description  | Part No. |
|--------------|----------|
| Faraday cage | Farad2   |

Battery Jig

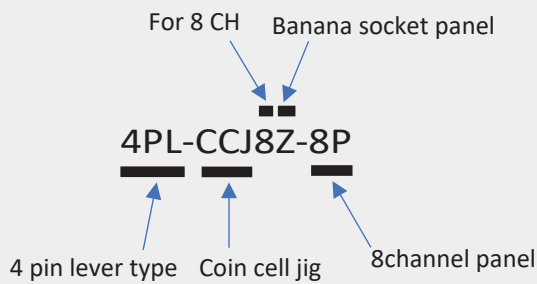
Features

- Holds different sizes of cylindrical cell, coin cell, pouch cell, prismatic cell
- Wide contact point with noble coated contact area
- 4 contact point type(Kelvin probe) is available to minimize voltage drop for high current application.
- Individual channel operation is available.
- Can be moved to fit cell size

Ordering Guide

|     | Part No.    | Description                    |
|-----|-------------|--------------------------------|
| 1st | 4PL         | 4 Pin Lever type               |
|     | 4PK         | 4 Pin Knob type                |
| 2nd | CCJ         | Coin cell jig                  |
|     | UCJM        | Universal cell jig             |
|     | UCJH        | Universal jig for high current |
|     | PCJ         | Pouch cell jig                 |
| 3rd | Channel No. | Channel Quantity               |
| 4th |             | Normal type                    |
|     | Z           | Banana socket panel            |
| 5th | 4P          | 4ch per panel                  |
|     | 8P          | 8ch per panel                  |

ex)



- 4PL-CCJ8Z-8P**
- 8 channel Coin Cell Jig
  - 4pin lever type
  - banana socket panel (without jig cable)
  - 8ch per pannel



- 4PL-UCJM8Z-8P**
- 8 channel Universal Cell Jig
  - 4 pin lever type
  - banana socket panel (without jig cable)
  - 8ch per pannel



- 4PK-UCJH4-4P**
- 4 channel universal jig for high current
  - 4 pin knob type
  - 4ch per panel



- 4PL-PCJ8-4P**
- 8 channel Pouch Cell Jig
  - 4 pin lever type
  - 4ch per pannel
  - including 3m jig cables



- UCJ1A**
- 1 channel universal jig
  - 4pin lever type



- PCJ1**
- 1 channel Pouch Cell Jig
  - 4pin lever type
  - For small size pouch cell

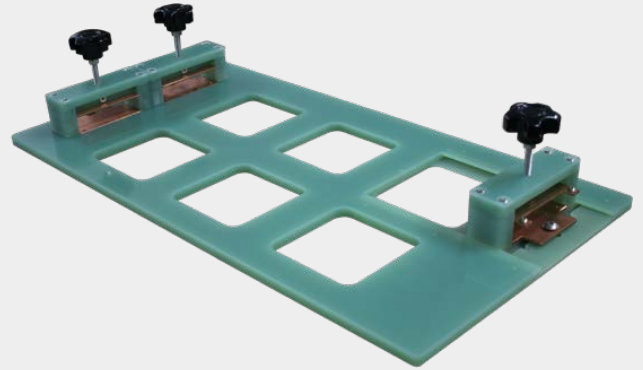


- PRCJ1**
- 1 channel Prismatic Cell Jig
  - 4 pin probe knob
  - For prismatic battery or pouch cell

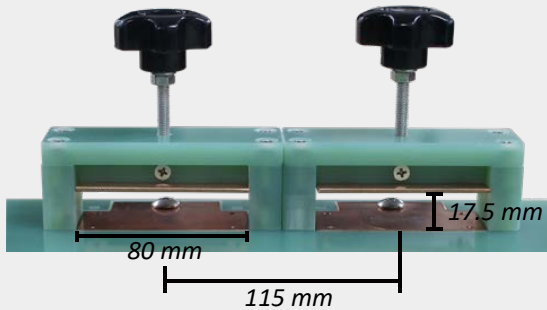
## Knob type Dual Direction Pouch Cell Jig

### Features

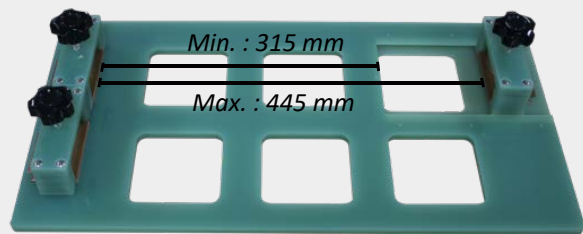
- Easy to hold pouch cell using Knob
- Kelvin probe type 4pin contact
- Bidirectional and unidirectional measurements available
- Epoxy material with excellent chemical resistance and heat resistance



Cell size - Uni direction



Cell size - Bi direction



## High current cylindrical battery jig

These battery jig is for single cell high current cylindrical battery test and having length adjustable function. For this purpose these should be designed for kelvin type 4 probe connection to minimize voltage drop by cable resistance and/or contact resistance etc. Max current is 30Amp.

There are two type of High current Cylindrical Battery Jig by battery length One is model HCCBJ65L for standard size battery up to 65mm length and the other is model HCCBJ100L for long size battery up to 100mm length.



HCCBJ65L



HCCBJ100L

### Specifications

| Model                            | HCCBJ65L          | HCCBJ100L       |
|----------------------------------|-------------------|-----------------|
| Maximum battery diameter         |                   | 30 mm           |
| Minimum battery contact diameter |                   | 14 mm           |
| Maximum battery length           | 65mm              | 100mm           |
| Current path diameter            |                   | 14mm            |
| Minimum battery length           |                   | 1mm             |
| Length × Width × Height          | 136 x 24 x 43mm   | 172 x 24 x 43mm |
| Cable Connectors                 | 4ea of 4mm banana |                 |
| Weight                           | 208g              | 240 g           |

All specifications are subject to change without notice.

### Ordering Guide

| Description   | Part No.  |
|---|-----------|
| High current cylindrical battery jig<br>- max. battery length : 65mm  | HCCBJ65L  |
| High current cylindrical battery jig<br>- max. battery length : 100mm | HCCBJ100L |

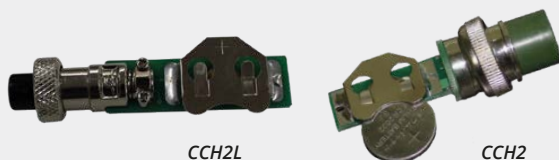
## Coin Cell Holder & Clamp Cable

Accessories

### Coin Cell Holder

#### For WMPG/WBCS System

- Direct connect to cell connector



#### Ordering Guide

| Description   | Part No. |
|---|----------|
| For low current model<br>- WMPG1000Ls/Le/Lx, WBCS3000Ls/Le/Lx | CCH2L    |
| For standard current model<br>- WPG, WMPG, WBCS3000S          | CCH2     |

#### For ZIVE System

- D-SUB connector type



#### Ordering Guide

| Description   | Part No. |
|---|----------|
| For 20mm dia. coin cell<br>- ZIVE SP1, SP2, MP1, MP2, BP2 | CCH3-20  |
| For 24mm dia. coin cell<br>- ZIVE SP1, SP2, MP1, MP2, BP2 | CCH3-24  |

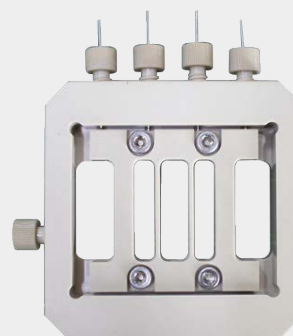
## Membrane Conductivity Cell

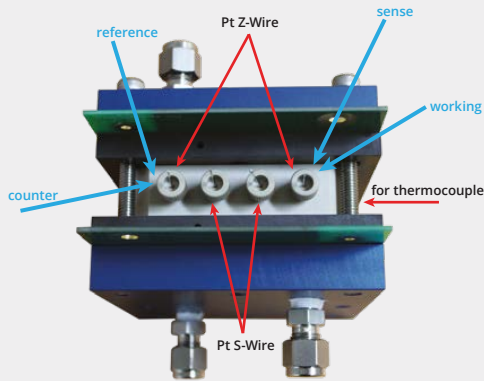
Accessories

The membrane conductivity cell, MCC, is designed to measure ionic conductivity by simply loading a membrane into cell hardware. The MCC adopts a 4 point probe for measuring conductivity. By passing current through two outer electrodes and measuring the voltage through the inner electrodes, it allows the measurement of the conductivity. In the 4-electrode configuration, there is virtually no current flow at the inner voltage sensing electrodes. Therefore, polarization does not occur. The second benefit of the 4-electrode sensor is its tolerance of electrode coating. Since the 4-electrode technique measures potential drop rather than resistance, the measurement remains accurate, despite minor coating. The 2 probe measurement is also available by attaching the working and sensing electrical connections to the cathode side while attaching the counter and reference electrical connections to the anode side. Please see the configuration below.

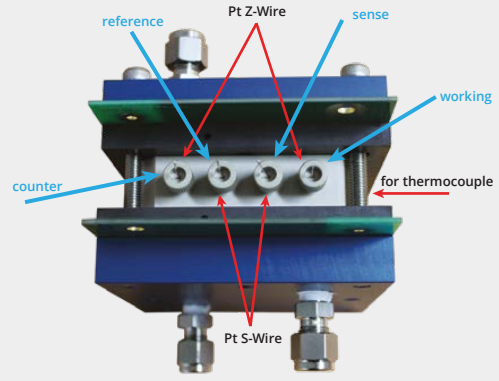
By placing the conductivity cell between the anode and cathode conduction plate, you can simply assemble the conductivity cell into your fuel cell hardware.

- Supports 2 or 4 electrode measurement
- Material
  - Cell body : PEEK
  - Wire : platinum
- Operating temperature : to 130 °C
- Fuel cell hardware available
  - : 5, 25 cm<sup>2</sup> fuel cell test hardware (not included, provided by WonATech)
- Easy to assemble





Connecting for a 2-electrode measurement



Connecting for a 4-electrode measurement

## Specifications







| Material                     |                           |
|------------------------------|---------------------------|
| Cell, clamp & nut            | PEEK                      |
| Electrode(S-wire/Z-wire)     | Platinum                  |
| Dimensions                   |                           |
| Conductivity cell            | 76.2x76.2x20 mm(WxHxD)    |
| Conductivity clamp           | 48x50x7 mm(WxHxD)         |
| S-wire (inner electrodes)    | 84 mm long x 1.0 mm dia.  |
| Z-wire (outer electrodes)    | 120 mm long x 1.0 mm dia. |
| Access                       |                           |
| Voltage measurement (S-wire) | two, inner ports          |
| Current measurement (Z-wire) | two, outer ports          |
| Temperature measurement      | one, side port            |

All specifications are subject to change without notice.

## Ordering Guide

| Description                | Part No. |
|----------------------------|----------|
| Membrane conductivity cell | MCC      |







## For WPG/WMPG/WBCS System

|  |  |
|--|--|
|   |   |
| <i>Shield Cell Cable for WBCS3000S/WMPG1000S</i>                                   | <i>Shield Cell Cable for WBCS3000L(Le,Lx)/WMPG1000L(Le)</i>                        |
|   |   |
| <i>Shield Cell Cable for WBCS3000M/WMPG1000M</i>                                   | <i>Shield Cell Cable for WPG100ex</i>  |
|  |  |
| <i>BNC to alligator cable for WPG/WMPG/WBCS series</i>                             | <i>Rack 8channel cell cable for rack mount</i>                                     |

### Ordering Guide

| Description  | Part No. |
|--|----------|
| Shield Cell Cable for WBCS3000S/WMPG1000S            |          |
| 1M   | BC1      |
| 1.5M   | BC1.5    |
| 2M   | BC2      |
| 3M   | BC3      |
| Shield Cell Cable for WBCS3000L(Le,Lx)/WMPG1000L(Le) |          |
| 1M   | BCL1     |
| 1.5M   | BCL1.5   |
| 2M   | BCL2     |
| 3M   | BCL3     |
| 4M   | BCL4     |
| Shield Cell Cable for WBCS3000M/WMPG1000M            |          |
| 1M   | MBC1     |
| 1.5M   | MBC1.5   |
| 2M   | MBC2     |
| 3M   | MBC3     |
| 5M   | MBC5     |
| Shield Cell Cable for WPG100ex                       |          |
| 1.5M   | PC1.5    |
| BNC to alligator cable for WPG/WMPG/WBCS series      |          |
| 1M   | BN1      |
| 1.5M   | BN1.5    |
| 2M   | BN2      |
| 3M   | BN3      |
| Rack 8channel cell cable (3m) for rack mount         | RACK8C   |

## For ZIVE System

|   |  |
|---|--|
|   |   |
| <i>cell cable for SP1/MP1/PP1e</i>  | <i>cell cable for SP2/MP2A/BP2A/SP3/PP3</i>  |
|   |   |
| <i>cell cable for SP5/SP5H/SP5HC/MP5/MP5H/MP5HC/SP10/MP10</i>                       | <i>Aux cable</i>   |
|  |  |
| <i>ZRA cable</i>  | <i>FRA cable</i>   |

### Ordering Guide

| Description  | Part No. |
|--|----------|
| Cell cable (10cm) for SP1/MP1/PP1e/SP2/MP2A/BP2A/SP3/PP3 | ZC10     |
| Cell Cable for SP1/MP1/PP1e                              |          |
| 1M   | ZC1C100  |
| 2M   | ZC1C200  |
| 3M   | ZC1C300  |
| Cell Cable for SP2/MP2A/BP2A/SP3/PP3                     |          |
| 1M   | ZC2C100  |
| 2M   | ZC2C200  |
| 3M   | ZC2C300  |
| Extention Cell cable(4 meter) for SP2/MP2A/BP2A          | ZC2C400E |
| Cell Cable for SP5/SP5H/SP5HC/MP5/MP5H/MP5HC/SP10/MP10   |          |
| 1M   | ZC5C100  |
| 2M   | ZC5C200  |
| 3M   | ZC5C300  |
| Aux cable (1.5 meter)                                    | ZAUXC    |
| ZRA cable(1.5m)  | ZRAC     |
| FRA cable(1.5m)  | FRAC     |

For High Power Cell Cable

Ordering Guide For WPG/WMPG/WBCS/ZIVE

| Description                      | Part No.  |
|----------------------------------|-----------|
| High power cell cable for 10Amp  |           |
| 1.5M                             | H10BC1.5  |
| 3M                               | H10BC3    |
| High power cell cable for 50Amp  |           |
| 1.5M                             | H50BC1.5  |
| 3M                               | H50BC3    |
| High power cell cable for 100Amp |           |
| 1.5M                             | H100BC1.5 |
| 3M                               | H100BC3   |
| High power cell cable for 200Amp |           |
| 1.5M                             | H200BC1.5 |
| 3M                               | H200BC3   |

For Booster Interface Cable

Ordering Guide For ZIVE

| Description   | Part No. |
|---|----------|
| Booster I/F cable (2M) including I2C for SP1,MP1                                  | ZBIFC1   |
| Booster I/F cable set (ZC2 to booster I/F and I2C cable for SP2,MP2,SP3,BP2F,MP3) | ZBIFC2   |
| Booster I/F cable set (ZC5 to booster I/F and I2C cable for SP5,MP5,SP10,MP10)    | ZBIFC5   |
| ZC2 to booster Interface  | ZC2BIF   |
| ZC5 to booster Interface  | ZC5BIF   |
| Booster I2C cable (2M)  | ZBI2C    |



Booster I/F cable including I2C for SP1,MP1



ZC2 to booster I/F cable for SP2,MP2,SP3,BP2F,MP3



ZC5 to booster I/F cable for SP5,MP5,SP10,MP10



Booster I2C cable

For cXM

Ordering Guide

| Description                                  | Part No.  |
|--|-----------|
| CX voltage input cable (16ch) 3meter length  | CX_V16C3  |
| CX voltage input cable (16ch) 2meter length  | CX_V16C2  |
| CX voltage input cable (16ch)1.5meter length | CX_V16C15 |

For Z#



Z# AO cable

Z# AI cable

Ordering Guide

| Description            | Part No. |
|------------------------|----------|
| Z# AO cable (1.5meter) | Z#AOC    |
| Z# AI cable (1.5meter) | Z#AIC    |



Cable

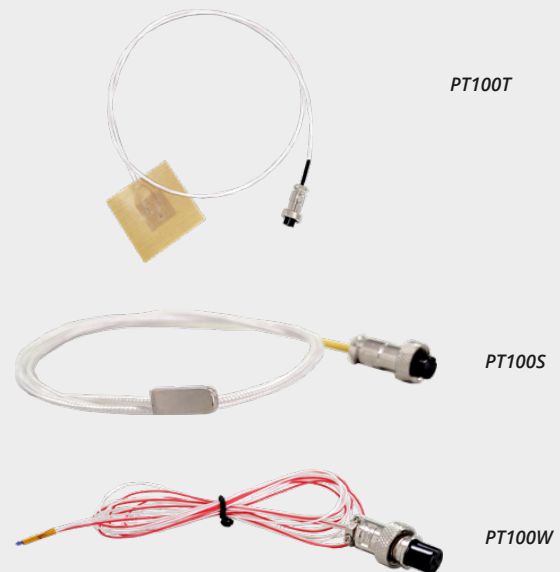
For BZA100&1000

|   |  |
|---|--|
|    |   |
| <i>BZA60 cell cable</i>   | <i>BZA1000 cell cable</i>  |
|    |   |
| <i>Large alligator cable</i>  | <i>Small size Kelvin alligator cable</i>   |
|   |  |
| <i>Medium size Kelvin alligator cable</i>   | <i>Large alligator clip</i>  |
|  |  |
| <i>Mid alligator clip</i>   |  |

Ordering Guide

| Description                             | Part No.  |
|---|-----------|
| BZA100 cell cable(1M)-banana connector  | BZA60C1   |
| BZA1000 cell cable(1M)-banana connector | BZA1000C1 |
| Large alligator cable 1M                | LKAC      |
| Small size Kelvin alligator cable 1M    | SKAC      |
| Medium size Kelvin alligator cable 1M   | MKAC      |
| Large alligator clip (CATIII1000V) 99mm | LAC       |
| Mid alligator clip (CATIII1000V) 84.3mm | MAC       |

PT100 Temperature Sensor



Ordering Guide

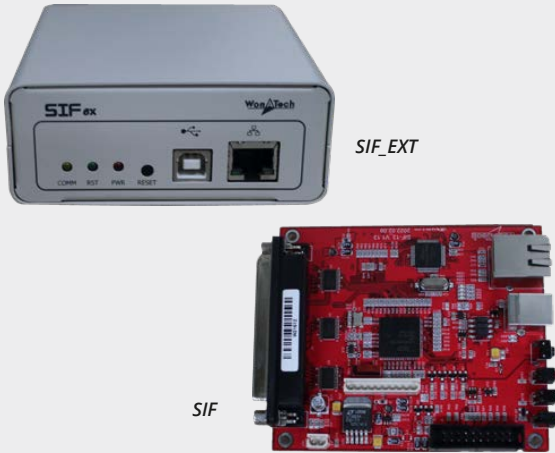
| Description              | Part No. |
|--------------------------|----------|
| PT100 temperature sensor |          |
| tablet type              | PT100T   |
| sheet type               | PT100S   |
| wire type                | PT100W   |

BZA Portable Option

Ordering Guide

| Description   | Part No. |
|---|----------|
| BZA Portable Option   |          |
| for BZA60   | BZAP60   |
| - including: Battery Pack (20,000mAh),<br>Fiber Plastic Bag, Wireless Lan kit |          |
| for BZA1000   | BZAP1000 |
| - including: Battery Pack (20,000mAh),<br>Fiber Plastic Bag, Wireless Lan kit |          |

SI Interface For WMPG/WBCS



Ordering Guide

| Description         | Part No. |
|---------------------|----------|
| SIF external module | SIF_EXT  |
| SIF board           | SIF      |

Channel Extension Board For WMPG/WBCS

Ordering Guide

| Description                                 | Part No. |
|---|----------|
| Channel Extension Board & cable per channel |          |
| For WBCS3000S/WMPG1000S                     | EXT      |
| For WBCS3000M1/WMPG1000M1                   | EXTM1    |
| For WBCS3000M2/WMPG1000M2                   | EXTM2    |

Aux Voltage Measurement For WMPG/WBCS



Ordering Guide

| Description                          | Part No. |
|--------------------------------------|----------|
| Aux Voltage Measurement              |          |
| 8ch module                           | AUX8     |
| 8ch module for M1 module             | AUX8/M1  |
| 8ch module for M2 module             | AUX8/M2  |
| 8ch module for high power controller | AUX8/H   |

Does not include auxiliary cable(BA).

Temp Measurement For WMPG/WBCS



Ordering Guide

| Description                          | Part No. |
|--------------------------------------|----------|
| Temp Measurement                     |          |
| 8ch module                           | TEMP8    |
| 8ch module for M1 module             | TEMP8/M1 |
| 8ch module for M2 module             | TEMP8/M2 |
| 8ch module for high power controller | TEMP8/H  |

Includes K-type thermocouple(1.5m).

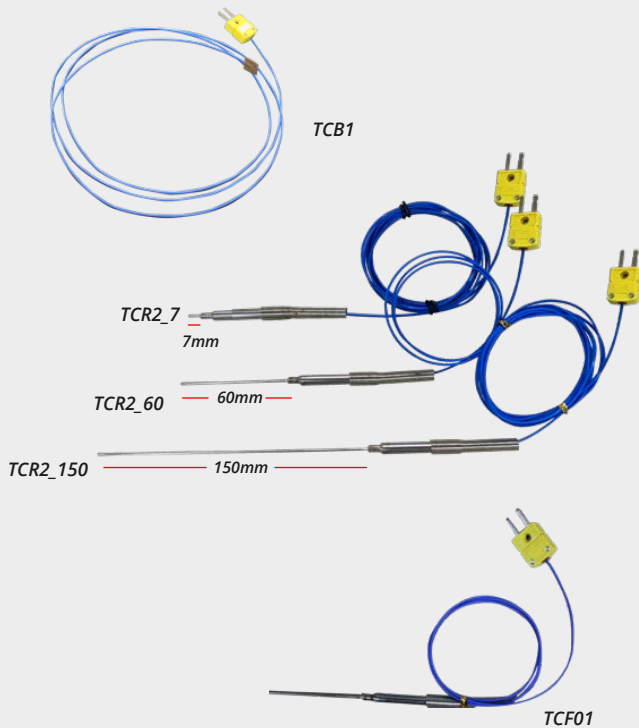
PC mounting For Ls/Le rack model only



Ordering Guide

| Description                           | Part No. |
|---------------------------------------|----------|
| PC mounting option without PC/Monitor | RACK_PC  |
| Ls, Le rack model only                |          |

Thermocouple



Ordering Guide

| Description  | Part No. |
|--|----------|
| Thermocouple-Ktype bead terminal                   |          |
| 1M   | TCB1     |
| 1.5M   | TCB1.5   |
| 3M   | TCB3     |
| Thermocouple-Ktype(rod type) 2M                    |          |
| 7mm rod type                                       | TCR2_7   |
| 60mm rod type                                      | TCR2_60  |
| 150mm rod type                                     | TCR2_150 |
| Thermocouple-K type for fuel cell hardware fixture | TCF01    |

Zero Voltage Booster For Smart2

Ordering Guide

| Description          | Part No. |
|----------------------|----------|
| Zero voltage booster | TCB1     |
| inside machine       | ZVBi     |
| outside machine      | ZVBo     |

Power Adapter



SP1PA

SP2PA

Ordering Guide

| Description     | Part No. |
|-----------------|----------|
| Power adapteppr |          |
| for SP1         | SP1PA    |
| for SP2         | SP2PA    |

Dummy Cell

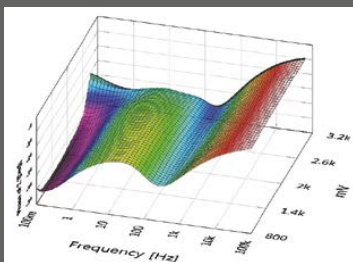


Ordering Guide

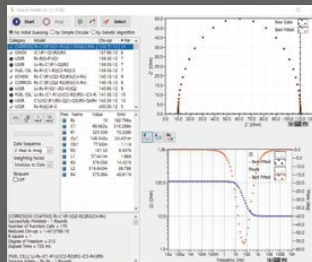
| Description | Part No. |
|-------------|----------|
| Dummy Cell  | Dummy1   |

EIS Data Analysis Software, ZMAN™

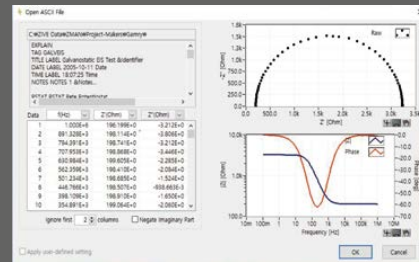
- Model simulation and fitting
- 2D- and 3D-Bode- and Nyquist plots
- Automatic equivalent circuit model search function
- Project concept to handle multiple EIS data analysis
- parameter plot from fitted elements value
- compatible with data format from Zahner, Gamry, Ametek etc. (License code is needed)
- Various weighting algorithm
- Model library and user model
- KK plot
- Batch fitting for project data
- Impedance parameter simulation
- Interpolate bad data
- Black-Nichols plot
- 3D graph setting option
- Improved model editor
- Application model library for automatic searching
- Parameter simulation of model
- Genetic algorithm option for initial guessing
- Automatic initial guessing
- Trace movie function on fitting
- Free for ZIVE's data format(\*.seo, \*.wis) analysis (no license code required)
- Circle fitting
- Data editing available (insert, delete, edit)
- Add/subtract element parameters
- Add/subtract model parameters
- Impedance, Z in polar, admittance, Y in Polar, modulus, M in polar, dielectric constant, E in polar. data display
- Empty cell capacitance calculation
- Find file function
- Data replacement by formula function
- Cursor data display
- Cursor data display
- Model finding result automatic sorting by Chi square value
- R, C R, L R, Q preview & graphic
- ZHIT function
- Mott-Schottky analysis
- Donor density vs. Vfb graph
- C vs. voltage graph



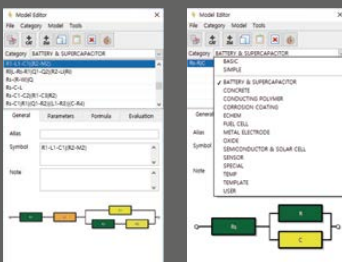
3D Bode plot for series measurement



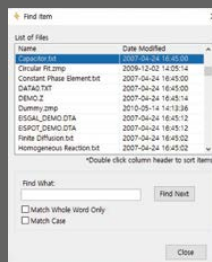
Automatic model searching



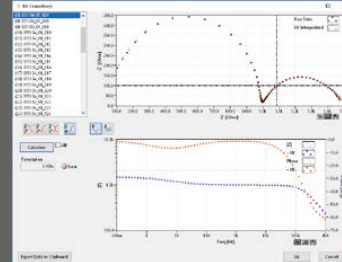
Importing 3rd parties ASCII data file



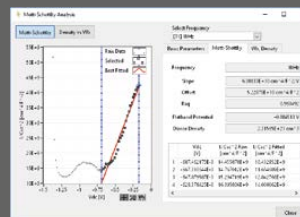
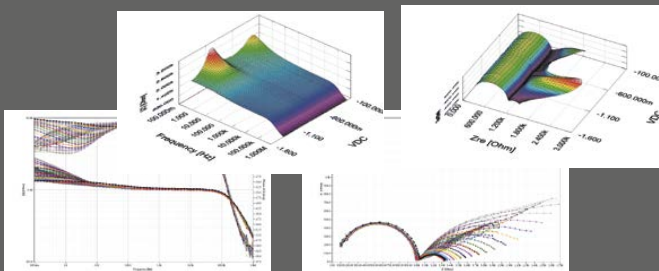
Model editor & model library



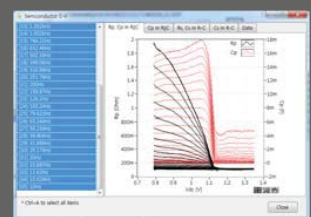
Finding data file menu



KK consistency



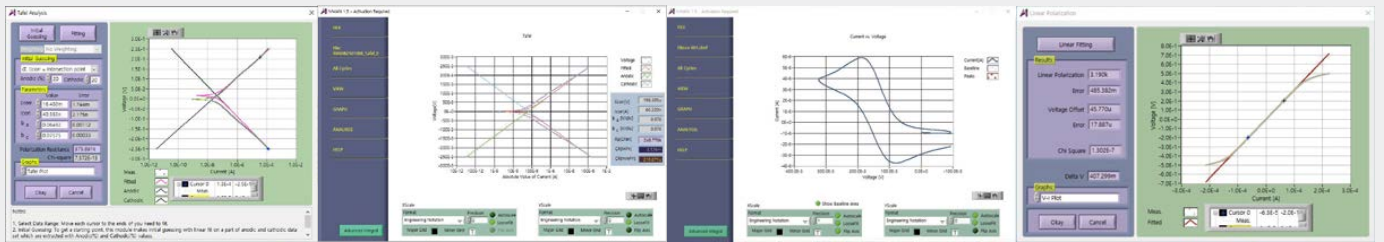
Mott-Schottky analysis window



C/R-V graph

DC Data Analysis Software, IVMAN™ Main Software

- Electrochemistry data(CV, Tafel, etc.) analysis software
- Tafel analysis function
  - Initial guessing
  - Automatic fitting
  - Corrosion rate calculation
- Linear polarization automatic fitting and analysis function
- Peak search function
- Support various graph function
- Various analysis functions as simple math, interpolation, smoothing, (semi) derivative, (semi) integral, etc.
- Report function
- 3rd party product data analysis (needs license code)
- Free for WonATech products data format analysis (no needs license code)

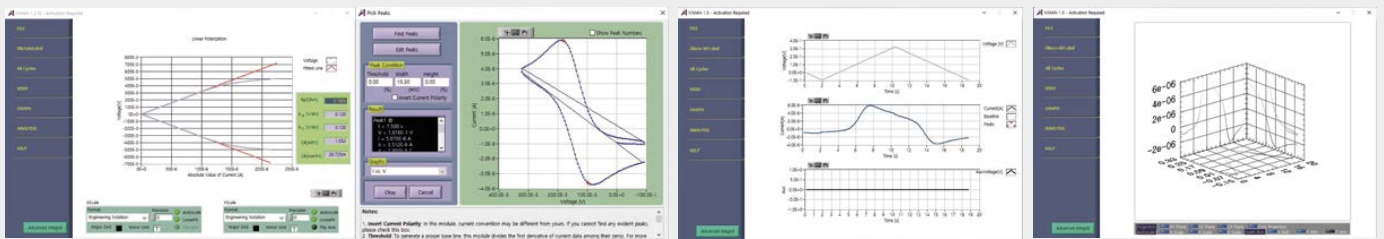


Tafel fitting

Tafel graph after analysis

CV graph

Linear polarization fitting



Linear polarization graph after analysis

Find peak

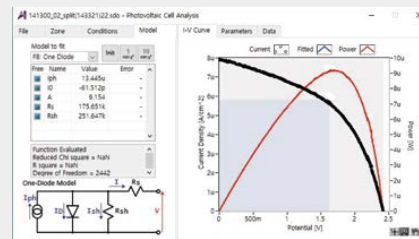
Voltage/Current/Temperature vs. Time graph

3D graph

Optional Software for WonATech data, IVMAN™ Option Software

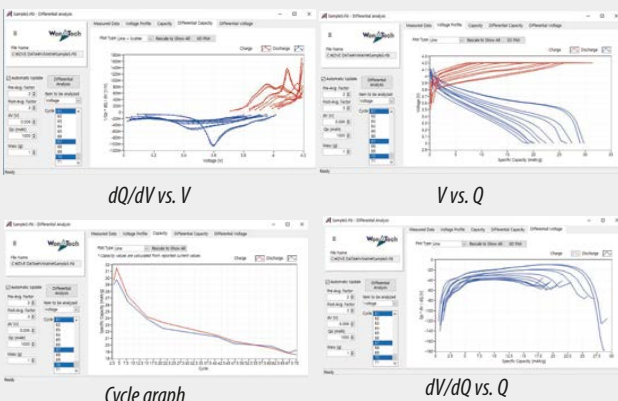
- IVMAN Optional packages are scientific software packages for WonATech data files only.
- IVMAN™ option software packages include;
  - 1) IVMAN Differential analysis software
  - 2) IVMAN Tafel analysis software
  - 3) IVMAN Photo voltaic cell analysis.
  - 4) IVMAN Peak find module
  - 5) IVMAN Extractor
- No needs license code

2) IVMAN™ Photovoltaic Cell Analysis



1) IVMAN DA™ Battery Test Data Analysis Software

- Battery test data analysis
- Electrochemical voltage spectroscopy (dQ/dV vs. V)
- Voltage vs. Capacity analysis (V vs. Q)
- Cycle graph (Q vs. cycle)
- Differential voltage graph(dV/dQ vs. Q)



dQ/dV vs. V

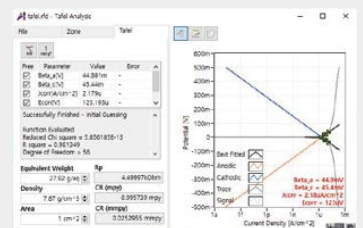
V vs. Q

Cycle graph

dV/dQ vs. Q

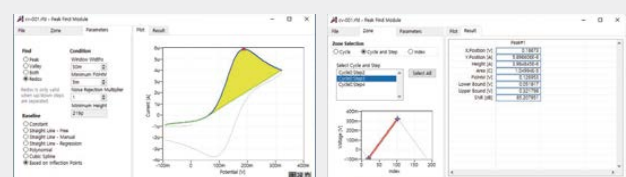
3) IVMAN TA™ Tafel Analysis

- Simple Tafel calculation



4) IVMAN PF™ Peak Find Module

- Independent peak finding software

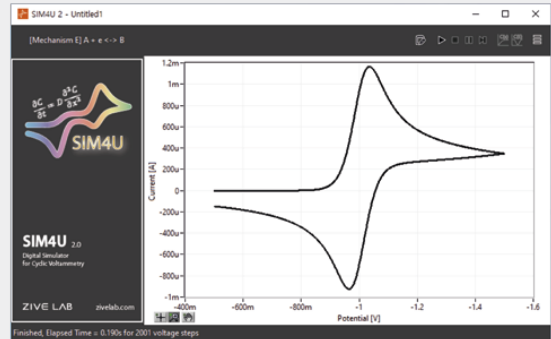


5) IVMAN EX™ Extractor

- Extracting data by cycle number or step
- Exporting ASCII file

Simulation Software for Cyclic Voltammetry, SIM4U **Freeware**

- Single or multiple charge transfer steps and first and second-order chemical steps can be used.
- Cyclic voltammetry method is used for simulation.
- 1D simulation of semi-infinite diffusion processes is used
- The pre-equilibrium can be applied before simulation.
- The effect of uncompensated resistance and double layer capacitance can be simulated.
- Measured data and simulated data can be seen together in the plot.

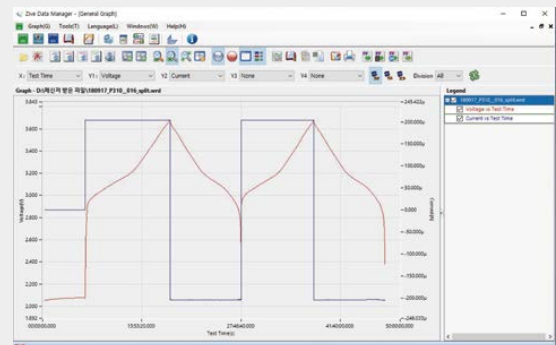


\* Downloaded for free from [www.zivelab.com](http://www.zivelab.com).

Software for SI data & SM data set, ZIVE Data Manager **Freeware**

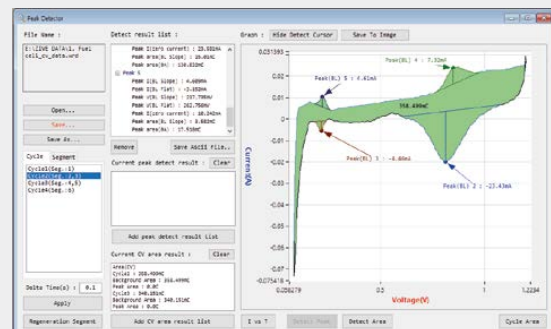
Main functions

- Split data file by cycle or batch
- Resampling function
- Multi working electrodes data format convert
- Subtract current function between two data files
- DC graph, cycle graph, EIS graph function
- Data exporting to Excel or ASCII format
- Data overlay with SI data and SM data



Peak Detector (CV analysis)

- Voltammogram peak finding and analysis
- Cycle area measurement
- IV curve, It curve display



\* This software is only for WonATech data files.  
Downloaded for free from [www.zivelab.com](http://www.zivelab.com).

# *Find Your Solution With Us...*



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