2nd Edition

Electrochemical Instruments

Potentiostat/Galvanostat
Impedance Analyzer
Battery Test System
Fuel Cell Test System
Software
Accessories

Gateway to
Electrochemistry

WonATech

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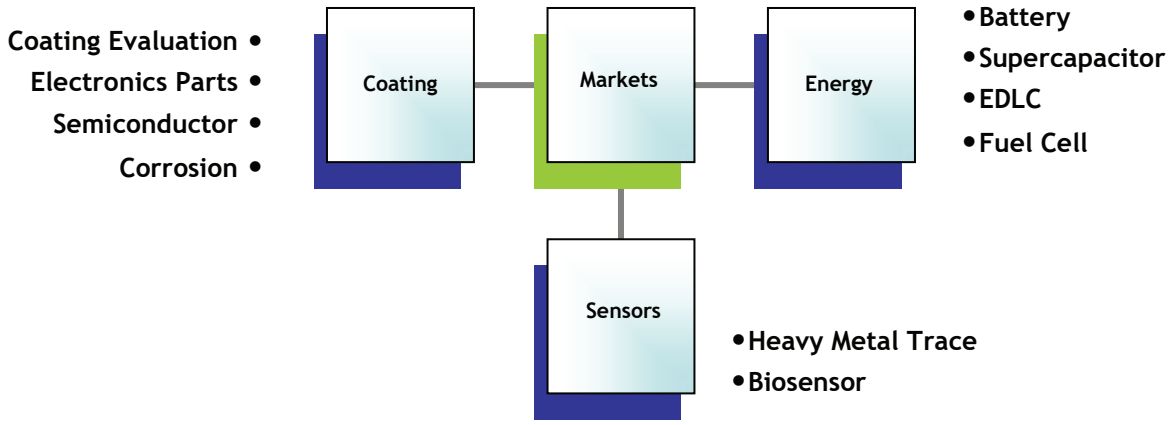
Cell Voltage & Temperature Monitoring System
Redox Flow Battery Test System
Zero Voltage Booster
Coin Cell Holder
Battery & Coin Cell Jig
Pouch Cell Jig
Power Booster

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 not 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

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

Battery Cycler System

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

Accessories

- For Fuel Cell Application : Fuel Cell Hardware Fixture, Membrane Conductivity Cell, Through-Plane Conductivity Test Jig, Zero Voltage Booster, Impedance Monitoring System, etc.
- For Battery Application : Battery Jig, Pouch Cell Jig, Coin Cell Holder, Cell Voltage & Temperature Monitoring System, Redox Flow Battery Test System, etc.
- For Corrosion Application : Corrosion Cell Kit, Flat Cell Kit, Plate Material Test Cell, etc.
- For Other Applications : Faraday Cage, Electrodes, Electrode Holder, Photoelectrochemical Cell Kit, H-Type Cell Kit, Black Box, Software, etc.

Single Channel Potentiostat/Galvanostat

WPG100 Series

The WPG series is an econmonical 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(option)
- LAN communication

Standard Type WPG100e

WPG100S Potentiostat/Galvanostat

WPG100H8 Potentiostat/Galvanostat

WPG100H12 Potentiostat/Galvanostat

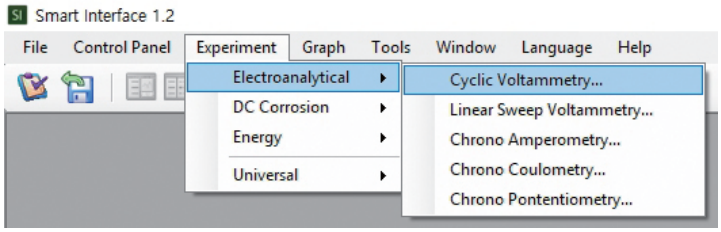
High Power Type WMPG1000HP

Specifications

	WPG100e	WPG100S	WPG100H8	WPG100H12	WPG100HP
• control voltage range	±10V	<±40V	<±40V	<±40V	<±40V
• voltage accuracy	±0.02% f.s.	±0.05% f.s.	±0.05% f.s.	±0.05% f.s.	±0.05% f.s.
• compliance voltage	±12V	<±40V	<±40V	<±40V	<±40V
• voltage resolution	0.3mV	0.0015% f.s.	0.0015% f.s.	0.0015% f.s.	0.0015% f.s.
• current range	1A, 8 ranges	6 ranges	3 ranges	3 ranges	3 or 1 ranges
• current accuracy	±0.02% f.s.	±0.05% f.s.	±0.1% f.s.	±0.1% f.s.	±0.1% f.s.
• current resolution	0.0015% f.s.	0.0015% f.s.	0.0015% f.s.	0.0015% f.s.	0.0015% f.s.
• sampling time	500usec	500usec	500usec	500usec	500usec
• max power	<50Watt	<400Watt	<800Watt	<1200Watt	<4000Watt

SI(Smart Interface) Software

- predefined technique menu
- virtual control panel
- safety limit & fail check function
- universal graphic function

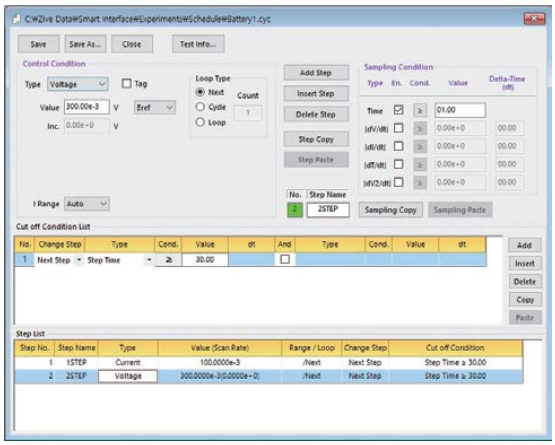


Pre-defined Technique Menu

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



Universal Test Mode

Single Channel Potentiostat/Galvanostat

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 sereis 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 2MHz.

Features

ZIVE SP5

ZIVE SP2

- 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
  - 50usec/sample (burst mode)
  - 1msec/sample (normal mode)
  - 2usec or 3usec/sample (fast sweep mode)
- 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	±1mV ±0.05% of setting(reading)	±1mV ±0.05% of setting(reading)	±1mV ±0.05% of setting(reading)
• current range (with gain)	100nA to 1A, 10 ranges (1nA & 10nA)	2nA to 2A, 12 ranges (20pA & 200pA)	20nA to 2A, 11 ranges (2nA & 200pA)
• current accuracy	±10pA ±0.1% f.s.(gain x1) >100nA	±10pA ±0.1% f.s.(gain x1) >200nA	±10pA ±0.1% f.s.(gain x1) >200nA
• compliance voltage	±12V	±12V	±20V
• slew rate	10V/µsec	15V/µsec	10V/µsec
• input impedance	$2x10^{13}\Omega\|\|4.5pF$	$2x10^{13}\Omega\|\|4.5pF$	$2x10^{13}\Omega\|\|4.5pF$
• frequency range	10µHz ~ 1MHz	10µHz ~ 2MHz	10µHz ~ 1MHz
• aux port	1 analog input: ±10V	digital: 3 output/2 input, analog: 1 output/3 input	digital: 2 output/1 input, analog: 1 output/3 input

Specifications

	ZIVE SP5	ZIVE SP5HC	ZIVE SP5H	ZIVE SP10
• control voltage range	±10V, ±1V, ±100mV		±40V, ±4V, ±400mV	±5V, ±500mV, ±50mV
• voltage accuracy	±1mV ±0.05% of setting(reading)		±1mV ±0.1% of setting	±1mV ±0.05% of setting(reading)
• current range (with gain)	5nA to 5A, 12 ranges (50pA & 500pA)	1nA to 1A, 12 ranges (10pA & 100pA)		10nA to 10A, 12 ranges (100pA & 1nA)
• current accuracy	±10pA ±0.1% f.s.(gain x1) >500nA	±10pA ±0.1% f.s.(gain x1) >100nA		±10pA ±0.1% f.s.(gain x1) >1uA
• compliance voltage	±10V	±40V		±10V
• slew rate	10V/µsec		7V/µsec	10V/µsec
• input impedance	$2x10^{13}\Omega\|\|4.5pF$		$2x10^{13}\Omega\|\|1pF$	$2x10^{13}\Omega\|\|4.5pF$
• frequency range	10µHz ~ 1MHz		10µHz ~ 600kHz	10µHz ~ 1MHz
• aux port	digital: 3 output/2 input, analog: 1 output/3 input			digital: 3 output/2 input, analog: 1 output/3 input

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.

Single Channel Potentiostat/Galvanostat

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

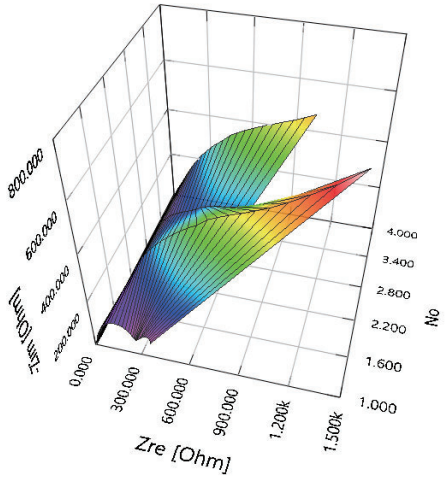
EIS Software Package

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

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

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	Id control
	Is	Is control
	OCP	OCP control
Step	GSTAT	current step control
	PSTAT	potential step control
Sweep	GSTAT	current sweep control
	FAST-G	fast current sweep control
	PSTAT	potential sweep control
	FAST-P	fast potential sweep control
EIS	GSTAT	galvanostatic EIS
	PSTAT	potentiostatic EIS
	OCP	OCP EIS
	PSUEDO	pseudo galvanostatic EIS
	HFR G	galvanostatic HFR
	HFR P	potentiostatic HFR
	MsineG	galvanostatic multisine EIS
	MsineP	potentiostatic multisine EIS
Rest		rest control
ZRA		ZRA control
Loop		loop control
Pulse	Vpulse	voltage pulse control
	Ipulse	current pulse control
	GSINE	current sine wave control
	PSINE	potential sine wave control

Control Task Parameters



Potentiostat EIS Measurement Plotted by ZMAN

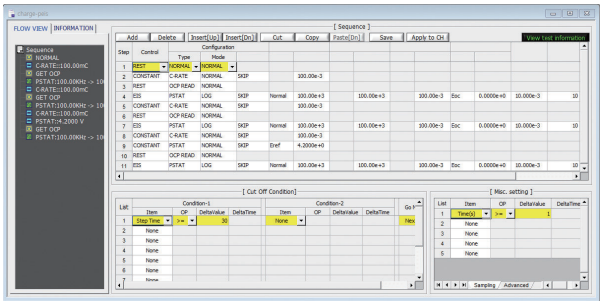
Electrochemical Analysis Software Package

- 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

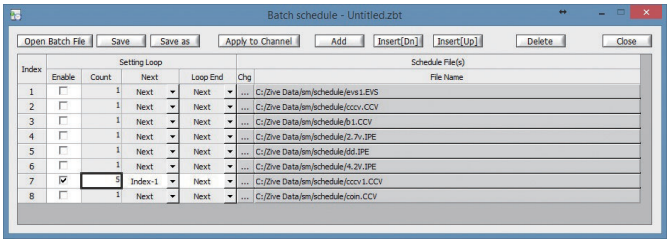
Corrosion* Software Package

- Tafel experiment
- Polarization resistance
- RpEc trend
- Potentiodynamic
- Cyclic polarization resistance
- Galvanodynamic
- Reactivation
- Galvanic corrosion
- Potentiostatic ECN
- Galvanostatic ECN
- ZRA mode ECN

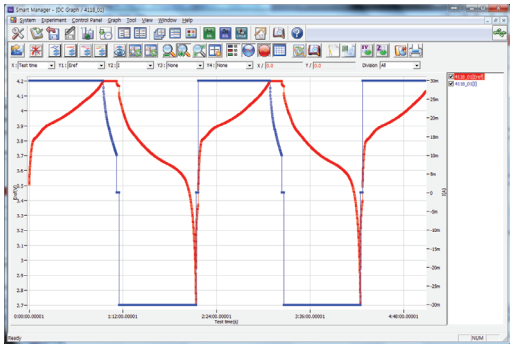
(*) Corrosion technique supports IR compensation.



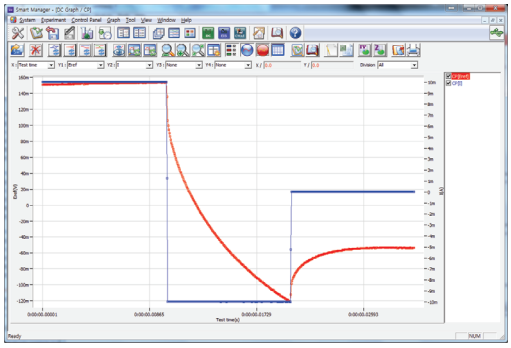
Sequence Editor



Batch Function



CC/CV Test



50usec sampling

Multi-Channel Potentiostat/Galvanostat

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

• max. power per channel*
50Watt

Low Current Type
WMPG1000L/WMPG1000Le

200mWatt(WMPG1000L)
2Watt(WMPG1000Le)

Mid Power Type
WMPG1000M1

100Watt(WMPG1000M1)

Mid Power Type
WMPG1000M2

200Watt(WMPG1000M2)

Dual Channel Type
WMPG1000D

• max. power per channel*
400Watt(WMPG1000D)

Power Type
WMPG1000H8

800Watt(WMPG1000H8)

Power Type
WMPG1000H12

1200Watt(WMPG1000H12)

High Power Type
WMPG1000HP

4kWatt(WMPG1000HP)

SI(Smart Interface) Software

- predefined technique menu
- virtual control panel
- safety limit & fail check function
- universal graphic function

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

Multi-Channel Potentiostat/Galvanostat

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
  - 50usec/sample (burst mode)
  - 1msec/sample (normal mode)
  - 2usec or 13usec/sample (fast sweep mode)
- 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
- The ZIVE MP2C is to support multiple working electrodes cell with one reference and one counter electrode configuration for sample characterization simultaneously or independently with the complete DC and impedance test.

ZIVE MP1
8 channel System

ZIVE MP1
4 channel System

ZIVE MP5

ZIVE MP2A

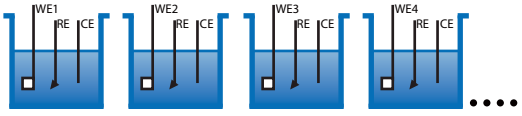
Specifications

	ZIVE MP1	ZIVE MP2A & MP2C	ZIVE MP5	ZIVE MP10
• control voltage range	±10V, ±1V, ±100mV	±10V, ±1V, ±100mV	±10V, ±1V, ±100mV	±5V, ±500mV, ±50mV
• voltage accuracy	±1mV ±0.05% of setting	±1mV ±0.05% of setting	±1mV ±0.05% of setting	±1mV ±0.05% of setting
• current range (with gain)	100nA to 1A, 10 ranges (1nA & 10nA)	2nA to 2A, 12 ranges (20pA & 200pA)	5nA to 5A, 12 ranges (50pA & 500pA)	10nA to 10A, 12 ranges (100pA & 1nA)
• current accuracy	±10pA ±0.1% f.s.(gain x1)	±10pA ±0.1% f.s.(gain x1)	±10pA ±0.1% f.s.(gain x1)	±10pA ±0.1% f.s.(gain x1)
• compliance voltage	±12V	±12V	±10V	±6V
• slew rate	10V/µsec	15V/µsec(MP2C:10V/µsec)	10V/µsec	10V/µsec
• input impedance	$2x10^{13}\Omega$||4.5pF	$2x10^{13}\Omega$||4.5pF	$2x10^{13}\Omega$||4.5pF	$2x10^{13}\Omega$||4.5pF
• frequency range	10µHz ~ 1MHz	10µHz ~ 2MHz	10µHz ~ 1MHz	10µHz ~ 1MHz
• aux port	1 analog input: ±10V	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

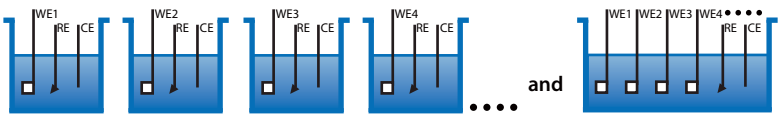
SM(Smart Manager) Software

- 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.

Cell Configuration available for ZIVE MP2A



Cell Configuration available for ZIVE MP2C



ZIVE MP2A

ZIVE MP2C

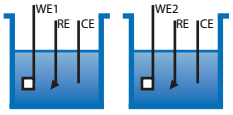
Dual-/Bi-Potentiostat

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. ZIVE BP2C is a bi-potentiostat system for dual cells as ZIVE BP2A does and supports two working electrode cell with one reference electrode and one counter electrode configuration.

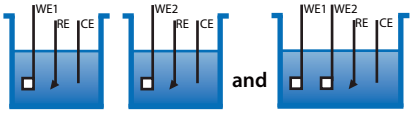
Features

- versatile high quality Potentiostat/Galvanostat/Impedance Analyzer
- compact size with full functions
- front panel LCD display
- ideal for bio sensor research, FET sensor, permeation test etc.
- 14 EIS techniques capability including multisine technique
- iR compensation and measurement
- high speed data sampling
- 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
- The ZIVE BP2C is to support two working electrodes cell with one reference and one counter electrode configuration

Cell Configuration available for ZIVE BP2A



Cell Configuration available for ZIVE BP2C



Portable Potentiostat/Galvanostat

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 labtop 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. PP1e's optional external battery pack can be used instead of AC/DC adapter.

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
  : burst mode(50usec/sample), normal mode(1msec/sample) & fast sweep mode(2usec or 3usec/sample)

ZIVE PP1e ZIVE PP3

- 3 measurement voltage ranges and 12(BP),11(PP3), 10(PP1e) 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

Specifications

	ZIVE BP2A/BP2C	ZIVE PP3	ZIVE PP1e
• control voltage range	±10V, ±1V, ±100mV	±10V, ±1V, ±100mV	±10V, ±1V, ±100mV
• voltage accuracy	±1mV ±0.05% of setting(reading)	±1mV ±0.05% of setting(reading)	±1mV ±0.05% of setting(reading)
• current range (with gain)	2nA~2A, 12 ranges (20pA & 200pA)	20nA~2A, 11 ranges (2nA & 200pA)	100nA ~ 1A, 10 ranges (1nA & 10nA)
• current accuracy	±10pA ±0.1% f.s.(gain x1)>200nA	±10pA ±0.1% f.s.(gain x1)>200nA	±10pA ±0.1% f.s.(gain x1)>100nA
• compliance voltage	±12V	±20V	±12V
• slew rate	15V/µsec	8V/µsec	10V/µsec
• input impedance	>2x10^{13}Ω||4.5pF	>2x10^{13}Ω||4.5pF	>2x10^{13}Ω||4.5pF
• frequency range	10µHz ~ 2MHz	10µHz ~ 1MHz	10µHz ~ 1MHz
• aux port	digital: 3 output/2 input, analog: 1 output/3 input	digital: 2 output/1 input, analog: 1 output/3 input	1 analog input: ±10V

SM(Smart Manager) Software

- software for ZIVE SP/MP/BP/PP series

Battery Test System

WBCS3000 Series

The battery cycler, WBCS3000 series, choose plug-in type module with independent power suppliers per 8 channel substation. Each substation can be used as independent system with optional Stand Alone 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 (except fixed specification system)
- auxiliary voltage, temperature measurement, current pulse capability option
- user friendly software and free upgrade
- LAN communication

Standard Type
WBCS3000S

- max. power per channel*

  50Watt(WBCS3000S)

Low Current Type
WBCS3000L/WBCS3000Le

Low Current Type
WBCS3000L32/WBCS3000Le32

100mWatt(WBCS3000L)
1Watt(WBCS3000Le)

Mid Current Type
WBCS3000M1K8

Dual Channel Type
WBCS3000D

- max. power per channel*

  400Watt(WBCS3000D)

Power Type
WBCS3000H8

800Watt(WBCS3000H8)

Power Type
WBCS3000H12

1200Watt(WBCS3000H12)

High Power Type
WBCS3000HP

4kWatt(WBCS3000HP)

Specifications
- fixed specification[*5]

	WBCS3000M1K8
• control voltage range	±5V
• voltage accuracy	±0.02% f.s.
• voltage resolution	0.15mV
• current range	10A, 4 ranges
• current accuracy	±0.05% f.s.
• current resolution	±0.0015% f.s.
• input impedance	10^{12} Ohm
• sampling time	10msec

*5: channel expansion is not available.

Mid Power Type
WBCS3000M1/WBCS3000M2

100Watt(WBCS3000M1)

200Watt(WBCS3000M2)

Battery Test System

SI(Smart Interface) Software

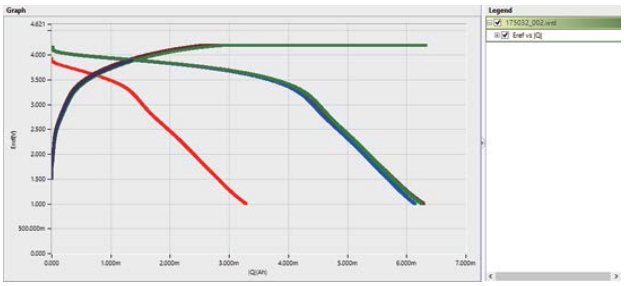
- predefined technique menu
- virtual control panel
- safety limit & fail check function
- universal graphic function

For Electroanalytical Measurement
- Cyclic voltammetry
- Linear sweep voltammetry
- Chrono-amperometry
- Chrono-coulometry
- Chrono-potentiometry

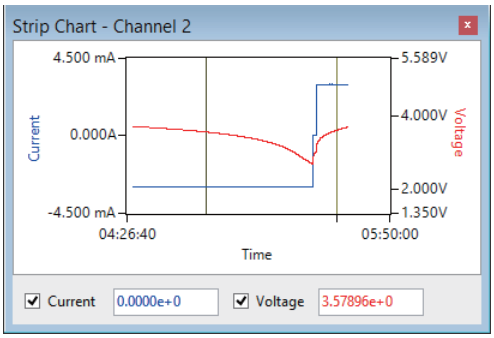
Corrosion Measurement
- Tafel plot
- Potentiodynamic
- Potentiostatic
- Galvanostatic
- Cyclic polarization
- Ecorr vs. time
- Linear polarization resistance

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

Multichannel real time graph

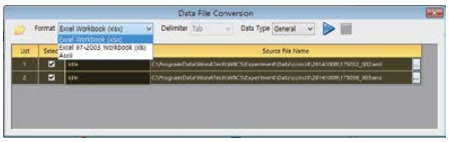


Voltage vs. |capacity| graph

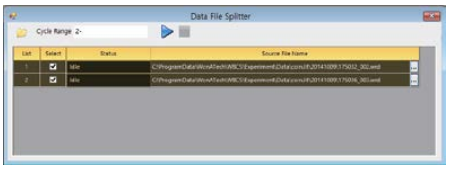


Single channel real time graph

Channel status display



Data conversion to ASCII & Excel



Data file split by cycle number

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
- two models are available depending on voltage range
  - Zcon : ±10 V
  - ZconH : ±100V

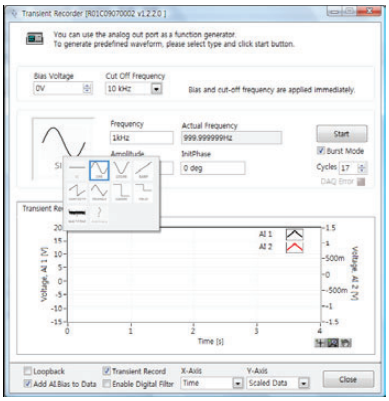
Zcon™ Impedance Analyzer

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)
• frequency range	1uHz to 100kHz		±100V(ZconH)
• frequency resolution	5000 steps/decade	• bandwidth	550kHz
• amplitude	1mVpp to 2Vpp	• input impedance	110kOhm

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)

Zcon™ supports external electronic load & potentiostat

• TDI Dynaload RBL488 series electonic load
• 3rd parties potentiostat/galvanostat

Impedance Monitor

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.

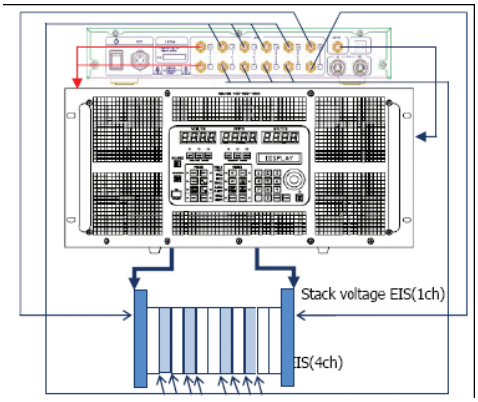
Features

- 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

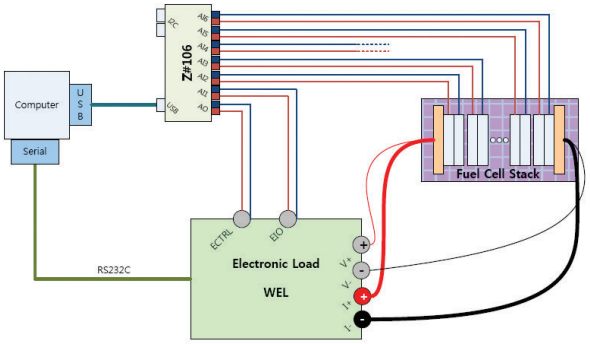
Z# Impedance Analyzer

Specifications

Analog Out (as single generator)		Analog In (as frequency analyzer)	
• no. of channel	1	• no. of channel	total 6, 1 for current input & 5 for voltage input
• configuration	single-ended	• configuration	differential
• max. output	-11.0 to +11.0 V(DC+AC)	• max.input	±100V
• frequency range	1uHz to 100kHz	• bandwidth	550kHz
• frequency resolution	5000 steps/decade	• input impedance	110kOhm
• amplitude	1mVpp to 5Vpp		



Z# with Dynaload RBL488 series electronic load



Z# with WonATech's electronic load

Z#™ supports external electronic load & potentiostat

• TDI Dynaload RBL488 series electonic load
• 3rd parties potentiostat/galvanostat

Fuel Cell Test Station

Smart2™ Series - 100Watt Fuel Cell Test System

The Smart2™ series are an advanced, reliable, compact fuel cell test equipment and hardware for testing single cells with options available for PEM FC, DM FC, 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 single cell (PEMFC, DMFC & PEM/DMFC)
- 3 models are available ; SMART2™, SMART2PEM™, & SMART2DM™
- automatic purge gas control
- external anode & cathode line and cell temperature control
- fully automatic operation by PC control
- max. 4 channel control by one PC
- accurate electronic load
- various safety functions including watch-dog function
- powerful software with independent data analysis software

Smart2DM™ for DMFC

- *with humidifier*
- *without humidifier*

Smart2PEM™ for PEMFC

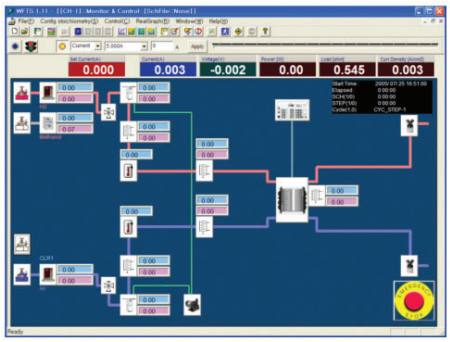
Standard Configuration

- MFCs for anode and cathode
- automatic water feeding system
- membrane type humidifier
- temperature controllers
  - for humidifier temperature control
  - for instrument inside & outside gas line
  - for stack or cell temperature control
- temperature monitor
  - for anode & cathode gas line inside
- liquid pump for methanol or ethanol
- back pressure regulator (manual type)
- internal load bank
- system controller with emergency switch
- pressure sensors & valves, etc.

Smart2™ for PEM/DMFC

Software

- quick and easy test configuration
- real-time graphic data output
- user friendly graphical user interface
- 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 Euiptments

- MFCs for anode and/or cathode for reformate
- MFC for nitrogen
- Hydrogen gas detectors
- additional temperature controller with measurement
- humidity measurement
- additional pressure measurement
- (multichannel) impedance monitor
- external potentiostat/galvanostat
- automatic back pressure regulator
- zero voltage booster
- stack cooling system
- stack multichannel temperature monitor (each cell)
- stack multichannel voltage monitor (each cell)
- differential pressure gauge
- moisture trap (auto/manual)
- DI water filter module
- conductivity measurement with DI water chamber
- L-type housing with/without fuel chamber
- fuel cell hardware fixture, stack jig, etc.

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

Flow Cell Controller

The FC1 Flow Cell Cntroller is a basic controller from SMART2 fuel cell test system controller family and it is specially designed for process control purposes. It is suitable for operating parameters for other devices such as MFC, heating device, solution supply pump, rotator, etc. For example, user can build his/her own system for monitoring flow cell performance by connecting relevant components and equipments.

It contains two general purpose AI(analog input)/AO(analog output) in the range of 0 ~ 10V, which are located on the front panel and other signal in/out ports on the back panel. And it communicates with a computer by the way of a Local Area Network(LAN).

The FC1 supports various safety features including watchdog, emergency button, limit values, etc. for both personal safety and instrument protection. A GUI(graphical user interface) provides an easy-to-use powerful interface for novice and adavanced users.

Features

- gas or liquid flow speed control
- flow on/off control
- temperature control
- external humidifier control
  (gas flowing on/off, dry/wet gas selection etc.)
- rotator control
- external potentiostat/galvanostat or electronic load control
- allows user to easily customize a truly unique controller for a flow cell system.
- comes with 2ea analog inputs and 2ea analog outputs
- a software with powerful graphical user interface.
- the various safety functions are provided to protect the cell and system from being damaged.
- LAN communication
- customized design avaliable

Flow Cell Controller, FC1

General Specifications

- analog to digital converter(ADC)
  - input voltage range : 10V
- digital to analog converter(DAC)
  - output voltage range : 10V
- max. sampling interval : 1 sec
- analog in(AI) port, 2ea
  - input voltage range : 0~10V
  - input impedance : 10 GOhms
- analog out(AO) Port, 2ea
  - output voltage range : 0~10V
- MFC port, 3ea
- temperature control port
- sensing port
- valve control port, 12ea

Additional Modules

- MFC module, GM1
- temperature module, TM1
- humidifier module, HM1

Main Board

Digital Input(DI)
- for emergency button
- for level sensing

Digital Output(DO)
- for SSR control
- for valve control

Analog Input(AI)
- for temperature measurement
- for flow rate measurement
- 2x universal analog input port (10V DC)

Analog Output(AO)
- for flow rate control
- 2x universal analog output port (10V DC)

Flow Cell Controller Usage Examples

Fuel Cell Test Application

System Configuration
- MFC(Mass Flow Controller)
- Methanol pump
- Humidifier
- Electronic load
- Back pressure regulator
- Temperature measurement
- Pressure measurement etc.

Redox Flow Batteries Application

System Configuration
- Liquid flow control
- Temperature control
- Potentiostat/Galvanostat

RDE(Rotating Disk Electrode) Test Application

- Rotating System(RPM Control)

Chlor-Alkali Process

- Pump control
- Temperature control etc.

Flow Cell for Electrochemical Synthesis

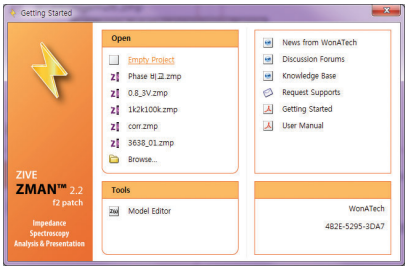
- Pump control
- Temperature control etc.

Solid State Battery Application

Software

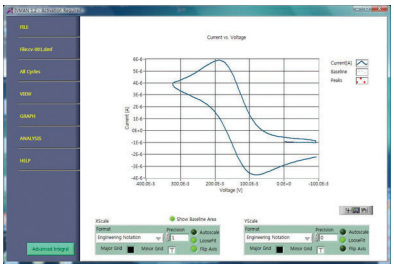
For Data Analysis Software

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.(needs license code)
- various weighting algorithm
- model library and user model
- KK plot
- batch fitting for project data
- impedance parameter simulation

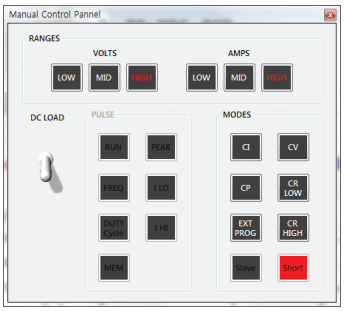
DC Data Analysis Software, IVMAN™



- electrochemical analysis software
- ideal for DC corrosion data analysis & electro-analytical data analysis
- initial guessing function on Tafel analysis
- automatic Tafel fitting
- polarization resistance fitting
- 3D graph
- find peak function
- interpolation, differentiation, integration etc.
- reporting function

For Instrument Control Software

Dynaload Control Software, LoadRunner™



- TDI's dynaload control software
- via IEEE488 & RS232C
- for TDI model RBL488, XBL, WCL series
- virtual front panel operation
- schedule file operation
- real time graphic
- excel file conversion
- GPIB card & cable is needed for IEEE488 interface

Ismatec Pump Control Software, Solution Mixer™

- MeOH concentration control for DMFC test
- control mixing pumps(Ismatec's piston pump) to generate target concentration
- automatic pump and pump head identification
- simple set-up & easy control
- setting parameters: concentration, flow rate, & dispensing volume

Accessories

Corrosion Cell Kit

- vial volume : 1 liter
  - CCK series : 100 ml to 1 liter
  - WCCK series : 200 ml to 1 liter
- material : Teflon®, Pyrex® and SUS316
- kit includes cylindrical metal sample, Luggin capillary, gas bubbler, glass vial, etc.*1
- counter electrode(graphite rod or Pt plate/mesh electrode) & reference electrode are not included.

*1: Can vary depending on cell kit.

Standard Type	Water Jacketed Type
	
CCK1 with optional flat specimen holder & theremometer	*WCCK1 with optional flat specimen holder & theremometer*

Type	Vial Volume	Part No.
Standard type	1 liter	CCK1
Standard type	500 ml	CCK05
Standard type	200 ml	CCK02
Standard type	100 ml	CCK01
Water-jacketed type	1 liter	WCCK1
Water-jacketed type	500 ml	WCCK05
Water-jacketed type	200 ml	WCCK02
Alkaline resistant cell	100 ml	CCK01T

*1: Components can vary depending on model.

Flat Cell Kit

- sample test area
  - one side : 1cm^2
  - The other side : 5 cm2, normally for counter electrode or 1 cm2, upon request
- sample thickness : up to 10mm
- cell volume : 300ml
- graphite plate as counter electrode is included.
- reference electrode is not included.
- material : Pyrex® & polycarbonate
- part number
  - standard type : FCK2
  - water-jacketed type : WFCK2

Standard Type	Water Jacketed Type
	
FCK2	*WFCK2*

Plate Material Testing Cell

PTC1

- sample size
  - width: >15mm
  - thickness: 0.1~10mm
- electrodes are not included.

PTC1

PTC2 / PTC015

- sample size
  - PTC015 : 29x29mm or more, >3mmT
  - PTC2 : 60x60mm or more, >7mmT
- electrodes are not included.

PTC015

PTC2

H-Type Cell

- consists of two glass cells which can be interconnected by a membrane or a permeation foil(user supply).
- electrodes are not included.
- vial volume : 1 liter x 2 or 100 ml x 2
- part number
  - 1 liter x 2 : HCELL1
  - 100 ml x 2 : HCELL01
- kit includes Luggin capillary, gas bubbler, glass vials, etc.*1
- counter electrode(graphite rod or Pt wire), and reference electrode are not included.

*1: Components can vary depending on model.

HCELL1 H-Type Cell with optional flag type Pt counter electrode

HCELL01 H-Type Cell

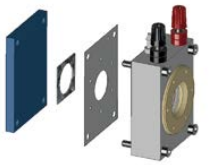
Accessories

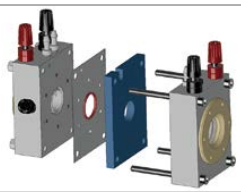
Permeation Cell Kit

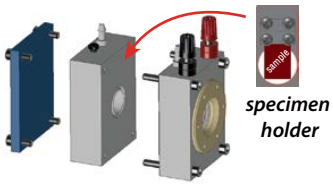
- for permeation test
- a membrane or a permeation foil can be placed between two glass half cells.
- vial volumne : 150ml x 2 ea
- two graphte plates as counter electrodes and two Luggin capilary are included as standard.
- membrane and reference electrode should be ordered separately.
- part number :
  - standard type : PMC1
  - water-jacketed type : WPMC1

PMC1
Permeation Cell Kit, Standard Type

Part No. / Description
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*







specimen holder

Photo Echem Cell Kit

- a wide optical window is designed to characterize electrode material under lighting condition.
- 2 or 3 electrode test is available
- a gas tight sealed cell
- based on a standard model, PCELL1, the attachments are interchangeable between cells according to user's applications.
- materials :
  - cell body: PEEK
  - optical window: quartz glass
  - others: SUS 304, Viton O-ring
- sample size :
  - for PCELL1&2
    width: >25mm
    height: 25~62mm
  - for PCELL3
    width: <8mm
    height: <22mm
- counter electrode : coiled Pt wire (included)
- reference electrode : 6mm OD electrode(option)

PCELL1
Standard Model

Pt Plate/Mesh Type Electrode

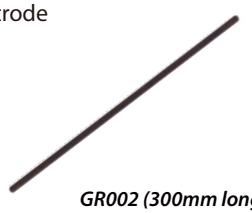
- the rod is isolated by a glass tube
- Pt plate/Pt mesh type available
- thickness : 0.2mm
- length : 250mm(rod + contact pin), exclusive Pt plate / Pt mesh
- stainless steel rod in isolated glass tube, 6mm OD

PFL25

Active Area	Part No. Pt Plate Type	Part No. Pt Mesh Type
1cm^2	PFL1	
4cm^2	PFL4	
5cm^2	PFL5	
9cm^2	PFL9	
16cm^2	PFL16	
25cm^2	PFL25	PFL25M

Graphite Rod

- can be used as counter electrode
- OD : 6mm
- Part No.
  - GR002H : 150mm long
  - GR002 : 300mm long

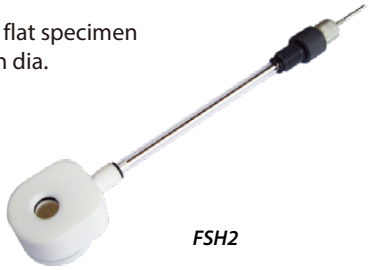


GR002 (300mm long)

Accessories

Flat Specimen Holder

• sample holder for a flat specimen
• Pyrex® tube : 6.3mm dia.



FSH2

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

Pt Gauze Electrode

• suitable for a bulk electrolysis experiment which requires large surface area working electrodes
• size : cylinder 50 mm high and 40 mm diameter with a 50 mm connecting wire
• material : Pt, 50mesh
• part number : PGE

PGE

Universal Electrode Holder

• max. hole size
  1x 10mm dia.
  1x 9.6mm dia.
  1x 6.2mm dia.
  1x 1.6mm dia.
• max. height : 150mm
• material : Teflon® & stainless steel
• part number : UEH1

UEH1

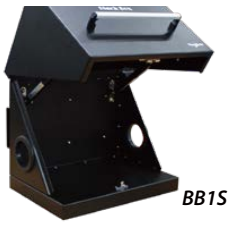
Faraday Cage

• dimensions
  - overall : 300Wx398Hx300Dmm
  - window : 100Wx300Hmm
• material
  - exterior : powder-coated steel
  - interior : powder-coated steel with Teflon®-coated bottom
  - window : fine SUS mesh embedded in acryl plates
• access
  - 2 holes, 10mm dia.
  - position : right hand side & back side
• part number : Farad2

Farad2

Black Box

• housing for spectroscopic experiments
• part number & size
  - BB1 : 603x300x330mm(WxDxH)
  - BB1S 297x245x250mm(WxDxH)

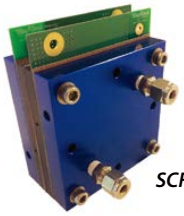


BB1S

BB1

Fuel Cell Hardware Fixture

• for PEMFC & DMFC
• max. temperature : <200˚C
• active area : 5, 10, 25, 50, 100 cm^2
• includes serpentine flow pattern, cartridge heater(2), current collector(2), cell graphite(2), end plate(2) & connector.
• MEA is not included.

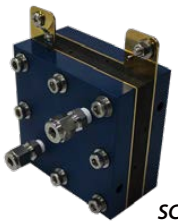


SCFC25

Serpentine Flow Pattern

• single serpentine
• for SCFC5 & SCFC10

• triple serpentine
• for SCFC25



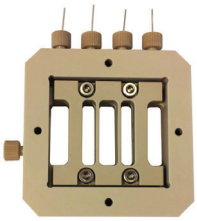
SCFC25H

Accessories

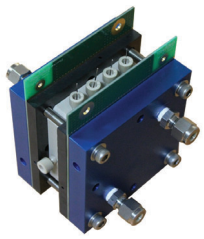
Active Area	Max. Temp.	Part No.
5cm^2	120˚C	SCFC5
9cm^2	120˚C	SCFC9
25cm^2	120˚C	SCFC25
50cm^2	120˚C	SCFC50
100cm^2	120˚C	SCFC100
5cm^2	180˚C	SCFC5H
9cm^2	180˚C	SCFC9H
25cm^2	180˚C	SCFC25H
50cm^2	180˚C	SCFC50H
100cm^2	180˚C	SCFC100H

Membrane Conductivity Cell

- for measuring conductivity of membrane embedded in a fuel cell
- 4 point probe type
- easy to assemble
- cell material : PEEK
- operating temperature : to 130˚C
- fuel cell hardware available :
  5, 9, 25 and 25 cm^2 fuel cell test hardware
  (not included, provided by WonATech)
- part number : MCC



MCC



MCC with fuel cell hardware

Through-Plane Conductivity Jig

- designed to measure through-plane conductivity of membranes
- sample size : >30mm dia.
- sample thickness : max. 40mm
- sample contact material : 304 stainless steel
- overall dimensions : 70 x 135 x 174mm(WxDxH)
- connection : 4mm banana plug
- part number : MCJ1

MCJ1

Cell Voltage & Temp Monitoring System

- combi module for voltage & temperature measurement
- 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 USB
- monitoring via USB

Voltage Monitoring	
voltage range	±10V or ±5V for each channel
voltage range in common mode	±275V for all channel
programmable scan rate	max. 100 sample per sec per channel
sampling time	10ms per channel
channel expansion	up to max. 128 channel
Temperature Monitoring	
sensor type	K-type thermocouple
resolution	14 bit, 0.25°C
sampling time	max. 10 samples/sec
channel expansion	up to max. 64 channel

Redox Flow Battery Test System

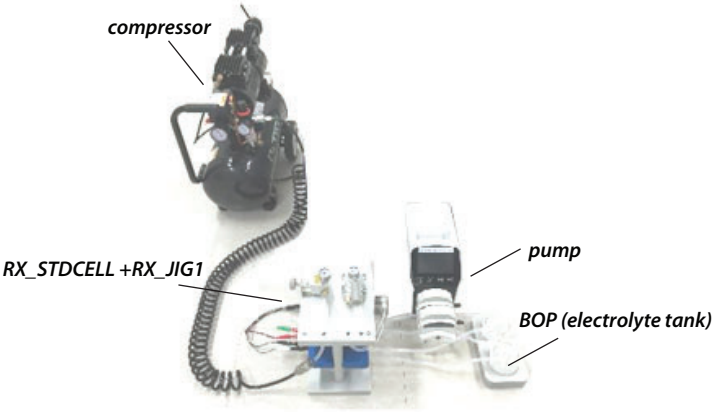
- for charge/discharge test of a single cell
- impedance measurement available
- temperature control and measurement
- electrolyte flow control with a dual channel peristaltic pump
- max. 4 channel control with a PC
- support various safety functions
- system configuration :
  ZIVE SP5 Electrochemical workstation + RFC1 flow cell controller

Pump *Cell & Jig* *ZIVE SP5* *PC*

Accessories

Cell & Jig

- manual flow control
- pump
  - for electrolyte circulation
  - 3 roller pump, 2-channel pump head
  - flow rate : max. 200ml/min
- BOP(electrolyte tank)
  - consists of : electrolyte tank, tube(Viton), one touch tube connector
  - material : PTFE body, PMMA head
  - volume : < 80ml
- compressor for jig
  - max. 8 bar
- electrolyte : Vanadium 1.7M, 3.5+



Redox Flow Battery Cell, RX_STDCELL

Jig for Test Cell, RX-JIG1

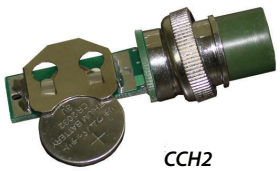
Zero Voltage Booster

- for 100Watt SMART series

Coin Cell Holder

For WPG/WMPG/WBCS Series

- direct connect to cell connector
- for 2016, 2025, 2032 coin cell
  - please specify coin cell size when ordering.



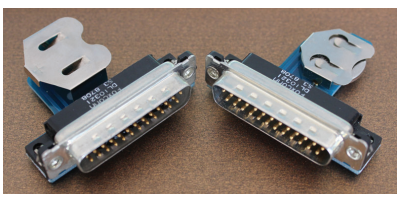
CCH2

CCH2L

Description	Part No.
For low current model - WMPG1000L, WBCS3000L, WBCS3000L32, & WBCS3000Le32 series	CCH2L
For standard current model - WPG, WMPG1000S, & WBCS3000S series	CCH2

For ZIVE Series

- direct connect to cell connector
- D-SUB connector type
- for ZIVE SP1, SP2, MP1, MP2, and BP2 model

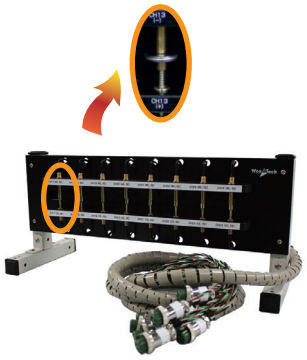


Description	Part No.
For 20mm dia. coin cell	CCH3-20
For 24mm dia. coin cell	CCH3-24

Accessories

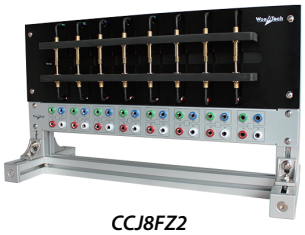
Battery & Coin Cell Jig

- easy to hold cylindrical cell and/or coin cell
- wide contact point with gold coated contact area
- 4 contact point type(Kelvin probe) is available to minimize voltage drop.
- individual channel operation is available.
- rack type is available.



CCH8F2

Rack Type Jig



CCJ8FZ2

CCJ4F2_2

CCJ48F2

UCJ1

Contact Type	Gap[1] Adjustment	Battery Type	Part No.
For WBCS Series Battery Cell Test System			
4 probe type	available	cylindrical cell / coin cell	UCJ*[2]
4 probe type	unavailable	coin cell	CCJ*F4[2]
4 probe type	unavailable	coin cell, for high temp.	CCJ*F4H[2]
2 probe type	unavailable	coin cell	CCJ*F2[2]
2 probe type	unavailable	coin cell, for high temp.	CCJ*F2H[2]
For ZIVE Series[4] , General Battery Cell Test System & Potentiostat[5]			
4 probe type	available	cylindrical cell / coin cell	UCJ*Z[2]
4 probe type	unavailable	coin cell	CCJ*FZ4[2]
2 probe type	unavailable	coin cell	CCJ*FZ2[2]
For WBCS & ZIVE Series, General Battery Cell Test System & Potentiostat[4]			
4 probe type	available	cylindrical cell / coin cell	UCJ1[3]

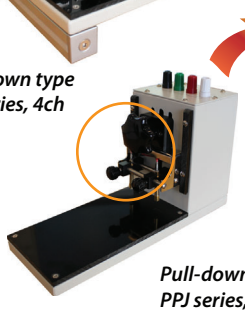
1) gap between pins 2) * : number of channels 3) for single cell
4) for ZIVE MP2, MP5 & MP5H models 5) general battery cycler and potentiostat having banana connector

Pouch Cell Jig

PPJ Series

- pull-down contact type
- 4 contact point type(Kelvin probe)

Pull-down type PPJ series, 4ch



Pull-down type PPJ series, 1ch

Pull down type PPJ24

APJ Series

- alligator clip contact type

Alligator clip type APJ64

Contact Type	Part No.
pull-down contact type	PPJ*[1]
alligator contact type	APJ*[1),2)]

1) * : number of channels, 2) * : mininum order channel for APJ series : 64 channel

Power Booster

- 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

ZB4 Series

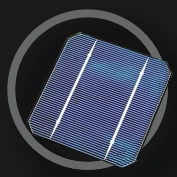
ZB3 & ZB2 Series

Designing the Solution for Electrochemistry

Find Your Solution with us . . .

Battery

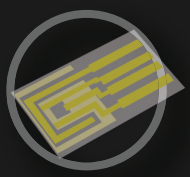
Super Capacitor



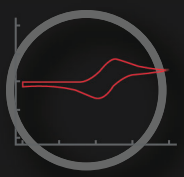
Solar Cell

Fuel Cell

Corrosion



Sensor



General Electrochemistry

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