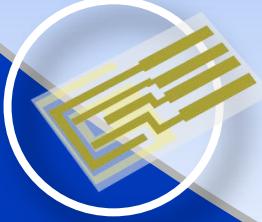
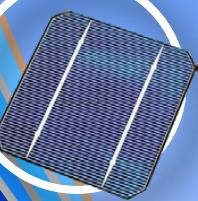


Product Catalog

WPG Series
Potentiostat/Galvanostat



For
Corrosion
Material Testing
Sensor/Bioelectrochemistry
Battery/Fuel Cell
Supercapacitor/Solar Cell

Potentiostat/Galvanostat WPG Series

Potentiostat/Galvanostat

- Economical price
- 16bit ADC, DAC
- For long term experiment
- Accurate control & measurement
- User friendly software
- Free software upgrade
- Local area network(LAN) for communication
- Current ranges: 8 ranges for WPG100e,
6 ranges for WPG100S, 3 ranges for WPG100H
& 3 or 1 current ranges for WPG100HP Series
- Importing/exporting data file

The WPG series are well suited for general electrochemical experiments including battery testing, corrosion measurements and electrochemical research applications.

For Stable and Accurate Target

- 4 Kelvin probe type true Potentiostat/Galvanostat circuit
- With 16bit ADC, DAC, this system provides 0.0015% f.s. high resolution in control and data acquisition.
- Multiple current ranges(auto/manual selection)
 - WPG100e: 8 ranges
 - WPG100S: 6 ranges
 - WPG100H series: 3 ranges
 - WPG100HP: 3 or 1 range depending on system
- User specification is available from low current to high current
- Temperature measurement: K-type thermocouple(option)
- Auxiliary voltage measurement(option)
- Shield cell cable to protect EMI noise
- Automatic firmware upgrade
- LAN communication network
- This system can be used for battery cycler.
- User calibration is available using software function.

Safety Limit & Fail Check Functions

- To protect hardware, this system stops the experiment automatically when it meets or exceeds the hardware specification or user defined safety limit.
- User defined safety condition setting: User can input safety level depending on chemical properties of reactants in test cell.
- Unique "Fail check" function: To protect the system and cell itself, the experiment will be stopped automatically when the measured value is different from control value due to battery failure or wrong cell connection, etc.
e.g. Control value: 1Amp, Measured value: 500mA Then the potentiostat will stop automatically.
- Automatic cell connection check: Before experiment, if the cell voltage value is over the range of setting value, program gives the warning message for the operator to check the cell connection.
- If operator does press stop button by mistake, confirmation message box appears.
- If main program is down by unstable operating system, independent server program keeps the experiment (control & data acquisition) without dead time.
- Easy calibration with verification function

Options

- Auxiliary Voltage & Temperature Measurement
 - Customized auxiliary voltage range and temperature range is available upon request.

- Cell Kit



Corrosion Cell Kit



Flat Cell Kit



Plate Test Cell



Plate Test Cell

- Pt Plate Counter Electrode

- active area(Pt plate) : 1, 4, 5, 9, 16, 25cm²
- mesh type electrode is available. (25cm², 80 mesh)



- Faraday Cage



- Universal Electrode Holder

- electrode and glass vial are not included.



- Battery Jigs

- Single universal jig
- Pouch cell jig
- Coin cell holder



Single Universal Jig



Single Pouch Cell Jig



Coin Cell Holder

Potentiostat/Galvanostat WPG Series

Software (Smart Interface)

- 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

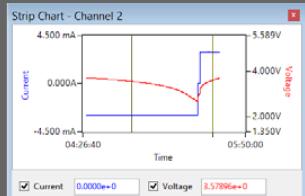
Virtual Control Panel



- BCO(button click operation): User can do any task just by clicking the button. No Menu Selection.
- Easy assignment of cycle test condition file
- It displays real time graphics(V vs. I, V & I vs. time, V vs. logI etc.) to fit its own techniques. This can be selected by graphic short cut icon.



- Status bar displays the potentiostat status.
- Various task functions: run, stop, suspend, moving step, etc.
- Spying the contents of test program which were assigned to potentiostat
- Experiment parameters can be saved or loaded on the virtual control panel.
- On experiment running, users can analysis data or other tasking simultaneously.
- Real time strip chart display

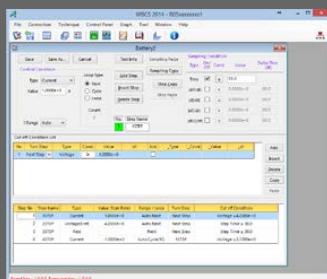


- User can nominate folder for saving data.
- Value of Interest(VOI) display function

Elapsed Time	Voltage(V)	Current(A)	Power(W)	Auxiliary(V)	Temperature(°C)
00:00:29	34.8m	33.2u	1.2u	180.1m	0.0

- Various safety function (Safety limit setting etc)

Schedule Editor



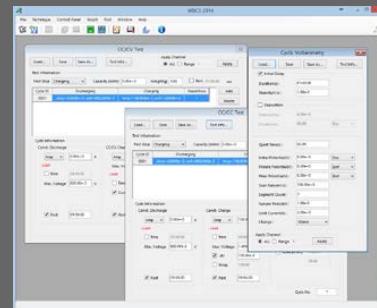
- One stop test condition creation/modification
- Parameter mixed input system
- Max. 200 of test steps
- Control parameters are
 - Constant voltage
 - Constant current
 - Constant power
 - Constant load
 - C-rate
 - Voltage scanning
 - Conditioning potential
 - Conditioning current
 - Rest
 - LastVscan
 - CstepV (Staircase Voltage Sweep)
 - CstepI (Staircase Current Sweep)
 - CC/CV
- Step flow are defined by next step, loop and cycle
- Cut-off conditions can be set by:
step time, voltage, current, dV/dt, dI/dt, cycle time, loop time, capacity, -dV, Whr, temperature, Aux voltage,, dT/dt,

Cut off Condition List						
No	Turn Step	Type	Cond.	Value	dt	And
1	Next Step		<input checked="" type="checkbox"/>	30.00		<input type="checkbox"/>
		Step Time				
		Voltage				
		Current				
		-dV				
		dV/dt				
		dI/dt				

- Data sampling condition by each step:
time, dV/dt, dI/dt, dT/dt, dV2/dt
- And/Or logic for cut-off condition setting

Pre-defined Techniques

- This system provides pre-defined technique menu and universal test procedure menu for user to make their own experiment procedure with cycle, loop and/or logic.
- Predefined technique menu



Electroanalytical Techniques

- 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

Potentiostat/Galvanostat WPG Series

■ Energy Test

- CC/CV (Lithium battery) test menu
- CC/CC (NiCd(NiMH) battery) test menu
- Steady state CV
- Pstat IV curve
- Gstat IV curve
- EVS (Electrochemical voltage spectroscopy) test
- GITT (Galvanostatic intermittent titration technique) test
- PITT (Potentiostatic intermittent titration technique) test

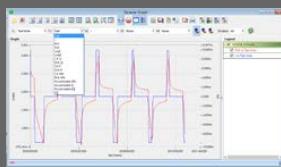
● Real Time Data Monitor



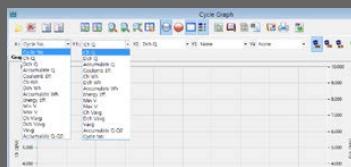
- Displayed test data: status, running time, step number, cycle number, step time, current range, current, voltage, capacity, power, energy, Aux V, Calc V, temp, cycle file name, data file name, and file size.

● Graphics

- Multiple plot format
 - General graph
 - Cycle graph



General graph format



Cycle graph format

● General Function of Graph

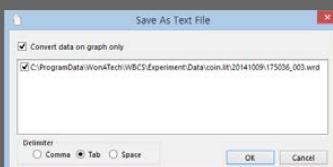
- Multi-parameters
- Plot overlay: max. 20 plot
- Universal graphics: any combination of X,Y1,Y2,Y3,Y4 axis parameters
- Automatic updating plot with reloading button for running experiment data
- Automatic/Manual scale and polarity selection for each axis



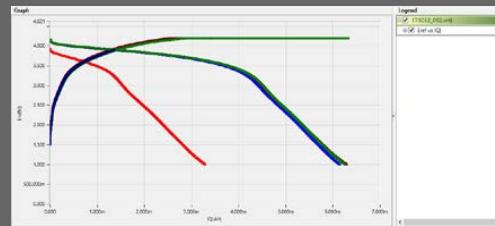
- Cross-hair pointer by mouse click/arrow key displays coordinate values on graph
- Mouse zooming
- Density, specific value display



- Copy to clipboard function to use in other application software
- Grid on/off and dot/line selection
- ASCII file conversion or Excel file conversion of graph data only



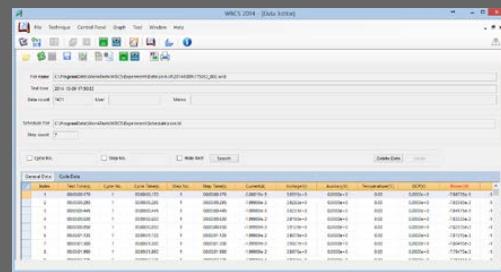
- Parameter change without reloading the data file
- Data set On/Off: Data can be visible or invisible by selecting/deselecting the data set.
- Rest step data hidden function
- Advanced graph setting



Voltage vs. [charging-discharging capacity] graph

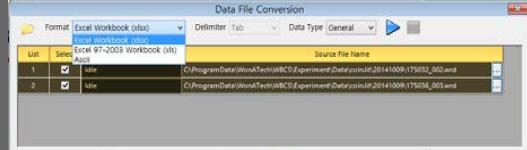
● Tools

- Data Editor
 - General data report
 - Cycle data report

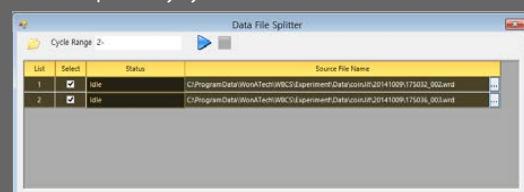


- * Data editing
- * Data filtering

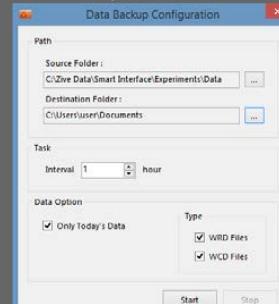
- Data Conversion
 - Multiple data conversion(ASCII, Excel)



- Data file splitter by cycle number



- Calibration
 - User can calibrate the potentiostat.
- Data backup



- Split data file

Potentiostat/Galvanostat WPG Series

Independent Data Analysis Software



The WPG data format can be used for independent data analysis software IVMAN™ at free of charge.

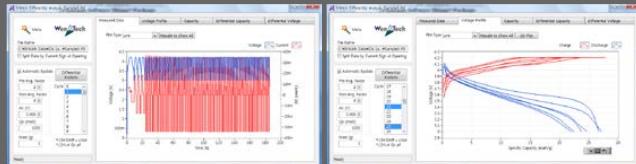
IVMAN™ software package consists of

- IVMAN software
- IVMAN differential analysis software
- IVMAN photo voltaic cell analysis.
- IVMAN Tafel analysis
- IVMAN extractor
- IVMAN peak find module



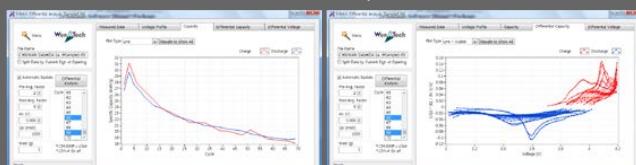
IVMAN DA™ Battery Test Data Analysis Software

- 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)



Measured data

V vs. Q

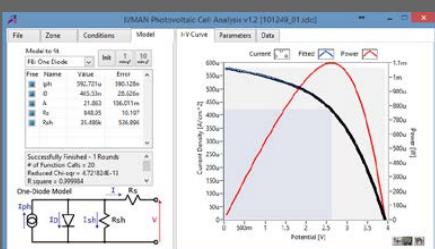


Cycle graph

dQ/dV vs. V



IVMAN™ Photovoltaic Cell Analysis

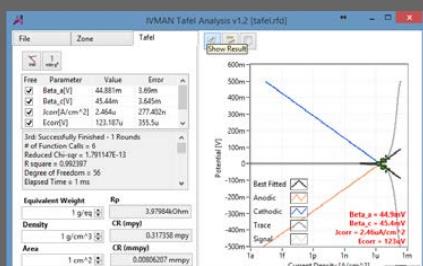


- Automatic analysis of parameters
- open circuit voltage, open circuit current, max. power, efficiency, photo induced current, diode quality factor, series resistance, etc.



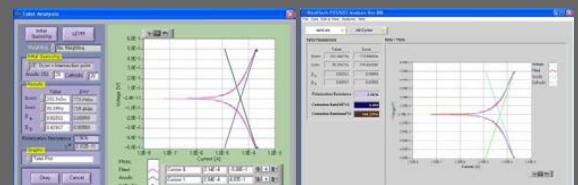
IVMAN™ Tafel Analysis

- Simple Tafel calculation



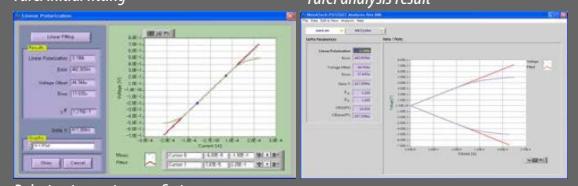
IVMAN™ Main Software

- Electrochemical analysis software
- Ideal for DC corrosion data analysis and 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



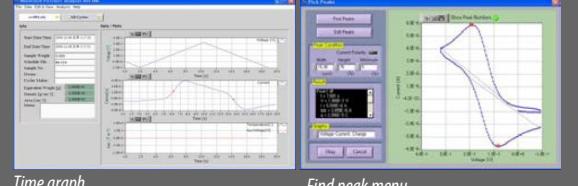
Tafel initial fitting

Tafel analysis result



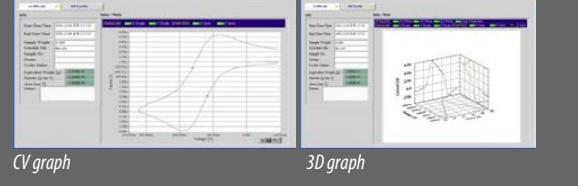
Polarization resistance fitting

Polarization analysis result



Time graph

Find peak menu

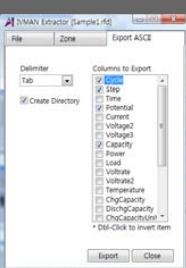
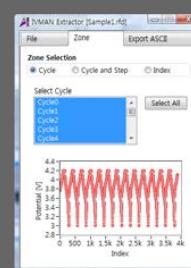


CV graph

3D graph

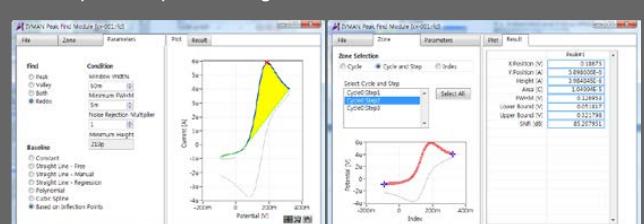
Extractor

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



Peak Find Module

- Independent peak finding software



Potentiostat/Galvanostat WPG Series

WPG100e Standard Type



Application

- Corrosion test
- Sensor application
- General electrochemistry
- Battery/Super capacitor/Fuel cell test
- Material test

The **WPG100e** is an economical research grade potentiostat system which is designed for general electrochemistry, corrosion, battery, etc. It has a power of $\pm 1A$ and low current ranges, down to $100nA$ full scale as standard. And customized specification is available upon request. The **WPG100e** is designed with a local area network(LAN) for communication with a computer.

Option

- Temperature/Auxiliary voltage measurement

Specifications

Control voltage range	$\pm 10V$ (standard) or customer specified range
Compliance voltage	$\pm 12V$ (standard) or customer specified voltage
Control current range	8 ranges ($1A$, $100mA$, $10mA$, $1mA$, $100uA$, $10uA$, $1uA$, $100nA$) or customer specified range
LED	Run: 1ea, POT/GAL: 2ea, Irange: 8ea
Input impedance	10^{12} Ohm
Cell connection	4 probe type, alligator clip cables
Voltage accuracy	$\pm 0.01%$ f.s.
Current accuracy	$\pm 0.01%$ at $10uA$ to $1A$ range
Voltage Control/Measurement	
Full scale ranges	$\pm 10V$ (standard)
Resolution (16 Bits)	0.3mV(standard)
Current Control/Measurement	
Full scale ranges	$\pm 1A$, $\pm 100mA$, $\pm 10mA$, $\pm 1mA$, $\pm 100uA$, $\pm 10uA$, $\pm 1uA$, $\pm 100nA$ (standard)
Resolution	16 bit(0.0015% f.s.)
Power	30Watt
Sampling time	>500usec
Temperature measurement	Option
Auxiliary voltage measurement	Option
Communication	TCP/IP
Dimensions	350 x 328 x 84mm(WxDxH)

All specifications are subject to change without notice.

WPG100S Potentiostat/Galvanostat



Application

- General electrochemical application
- Corrosion/electroplating
- Electrosynthesis/Electrolysis
- Battery test/Supercapacitor test
- Fuel cell test
- Solar cell test

The system hardware is based on WPG series potentiostat/galvanostat and designed for general electrochemical application such as corrosion, battery test, photoelectrochemistry, and fuel cell, electroplating etc with 6 current ranges. Maximum power is 400Watt and the customize specification is available within this power. The **WPG100S** is designed with a local area network(LAN) for communication with a computer.

Options

- Temperature/Auxiliary voltage measurement

Specifications

Control voltage range	User specification*1
Compliance voltage	User specification*1
Control current range	6 ranges
LED	Run: 1ea, Mode: 2ea I range: 6ea
Input impedance	10^{12} Ohm
Cell connection	4 probe type, alligator clip cables
Voltage accuracy	$\pm 0.05%$ f.s.
Current accuracy	$\pm 0.05%$ f.s.
Voltage Control/Measurement	
Full scale ranges	User specification*1
Resolution (16 bits)	0.0015% f.s
Current Control/Measurement	
Full scale ranges	User specification within power limit (max. 400Watt)
Resolution	16 bit(0.0015% f.s)
communication	TCP/IP
Sampling time	>500usec
Temperature measurement	Option
Auxiliary voltage measurement	Option
Safety switch	Depending on model

* 1: User specified current specification is available.
All specifications are subject to change without notice.

Potentiostat/Galvanostat WPG Series

WPG100H8/H12 Power Potentiostat/Galvanostat



Application

- High power application
- Electrosynthesis/Electrolysis
- Battery test/Supercapacitor test
- Fuel cell test
- Solar cell test

The system hardware is based on WPG series potentiostat/galvanostat and designed for high power application such as battery pack, solar module, and fuel cell stack, electroplating etc with 3 current ranges. Maximum power is 800Watt(WPG100H8) or 1200Watt(WPG100H12). The customize specification is available within this power. The **WPG100H** is designed with a local area network(LAN) for communication with a computer.

Options

- Temperature/Auxiliary voltage measurement

Specifications

Control voltage range	User specification*1
Compliance voltage	User specification*1
Control current range	3 ranges
LED	Run: 1ea, Mode: 2ea Irange: 3ea
Input impedance	10^{12} Ohm
Cell connection	4 probe type, alligator clip cables
Voltage accuracy	$\pm 0.05\%$ f.s.
Current accuracy	$\pm 0.1\%$ f.s.
Voltage Control/Measurement	
Full scale ranges	User specification*1
Resolution (16 bits)	0.0015% f.s
Current Control/Measurement	
Full scale ranges	User specification within power limit max. 800Watt or 1200Watt
Resolution	16 bit(0.0015% f.s)
communication	TCP/IP
Sampling time	>500usec
Temperature measurement	Option
Auxiliary voltage measurement	Option
Safety switch	Depending on model

* 1: User specified current specification is available.
All specifications are subject to change without notice.

WPG100HP High Power Potentiostat/Galvanostat



Application

- High power application
- Electrosynthesis/Electrolysis
- Battery test/Supercapacitor test
- Fuel cell test
- Solar cell test
- Pilot line application

The system hardware is based on WPG series potentiostat/galvanostat and designed for high power application such as battery pack, solar module, and fuel cell stack, electroplating etc with 1 or 3 current ranges depending on system. Maximum power is 4kWatt and the customize specification is available within this power. The **WPG100HP** is designed with a local area network(LAN) for communication with a computer.

Options

- Temperature/Auxiliary voltage measurement

Specifications

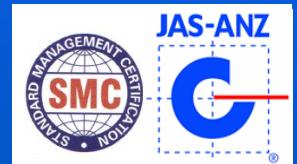
Control voltage range	User specification*1
Compliance voltage	User specification*1
Control current range	1 or 3 ranges depending on power
LED	Run: 1ea, Mode: 2ea
Input impedance	10^{12} Ohm
Cell connection	4 probe type, alligator clip cables
Voltage accuracy	$\pm 0.05\%$ f.s.
Current accuracy	$\pm 0.1\%$ f.s.
Voltage Control/Measurement	
Full scale ranges	User specification*1
Resolution (16 bits)	0.0015% f.s
Current Control/Measurement	
Full scale ranges	User specification within power limit (max. 4kWatt), Max. 400A
Resolution	16 bit(0.0015% f.s)
communication	TCP/IP
Sampling time	>500usec
Temperature measurement	Option
Auxiliary voltage measurement	Option
Safety switch	Depending on model

* 1: User specified current specification is available.
All specifications are subject to change without notice.



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