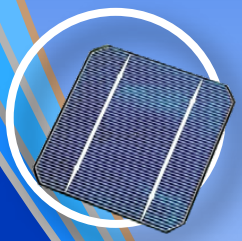
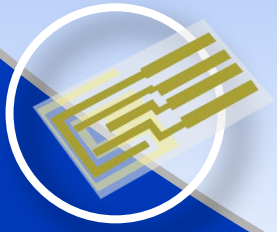
5th Edition

Product Catalog

WPG Series
Potentiostat/Galvanostat





For

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

WonATech

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 WPG100ex, 6 ranges for WPG100S & WPG100H8, 4 ranges for WPG100H12, & 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)
  - WPG100ex: 8 ranges
  - WPG100S, WPG100H8: 6 ranges
  - WPG100H12 : 4 ranges
  - WPG100HP: 3 or 1 range depending on system
- User specification is available from low current to high current
- Temperature measurement input: (standard) K-type thermocouple (option)
- Auxiliary voltage measurement(standard)-Aux V cable (option)
- Shield cell cable to protect EMI noise
- Automatic firmware upgrade
- LAN communication network
- This system can be used for battery cycler.

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 potentiostatl 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

Cell kits

Corrosion Cell Kit

Flat Cell Kit

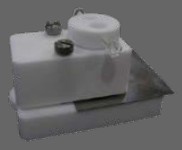


Plate Test Cell

Plate Test Cell

- Pt Plate Counter Electrode
  - active area(Pt plate) : 1, 4, 5cm^2

- Faraday Cage

- Universal Electrode Holder
  - electrode and glass vial are not included.

- Battery Jigs
  - Single universal jig
  - Single pouch cell jig

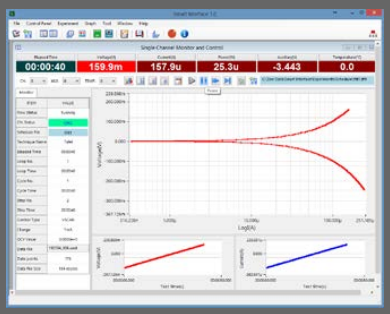
Single Universal Jig

Single Pouch Cell Jig

Software (Smart Interface)

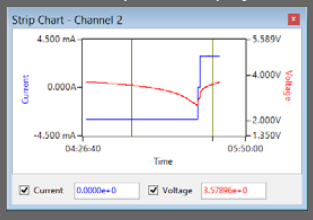
- 32bit/64bit OS environment
- TCP/IP communication
- Max. 200 steps
- Max. 10 cutoff(vertex) condition
- Max. 300,000 data point memory on control board
- Virtual control panel
- Various real time plots & universal axis graphs
- Data backup function
- WYSIWYG graphics
- User friendly software

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

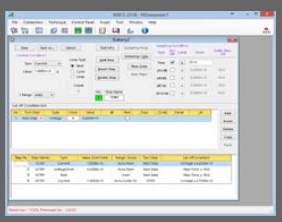


- User can nominate folder for saving data.
- Value of Interest(VOI) display function

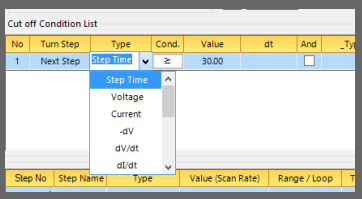
Elapsed Time	Voltage(V)	Current(A)	Power(W)	Auxiliary(V)	Temperature(°C)
00:00:29	34.8m	33.2u	1.2u	180.1m	0.0

- Various safety function (Safety limit setting etc)

Schedule Editor



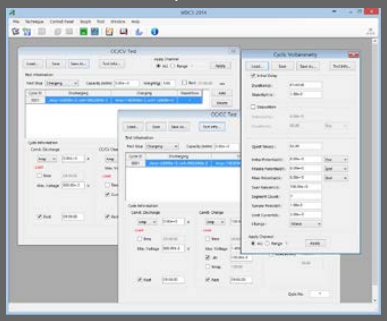
- One stop test condition creation/modification
- Parameter mixed input system
- Max. 200 of test steps
- Control parameters are
  - Constant voltage
  - Constant current
  - Constant power
  - Constant load
  - C-rate
  - Voltage scanning
  - Conditioning potential
  - Conditioning current
  - Rest
  - 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,



- 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

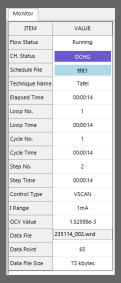
Corrosion Measurement

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

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

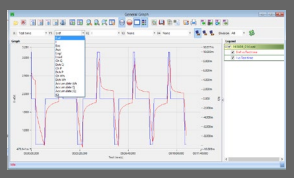
Real Time Data Monitor



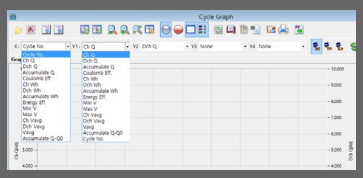
- Displayed test data: status, running time, step number, cycle number, step time, current range, current, voltage, capacity, power, energy, Aux V, Calc V, temp, cycle file name, data file name, and file size.

Graphics

- Multiple plot format
  - General graph
  - Cycle graph



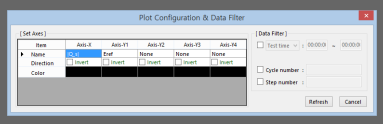
General graph format



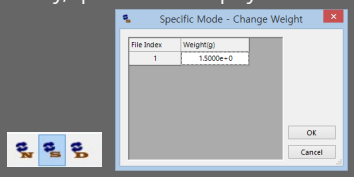
Cycle graph format

General Function of Graph

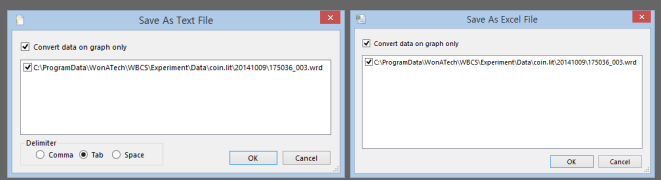
- Multi-parameters
- Plot overlay: max. 20 plot
- Universal graphics: any combination of X,Y1,Y2,Y3,Y4 axis parameters
- Automatic updating plot with reloading button for running experiment data
- Automatic/Manual scale and polarity selection for each axis



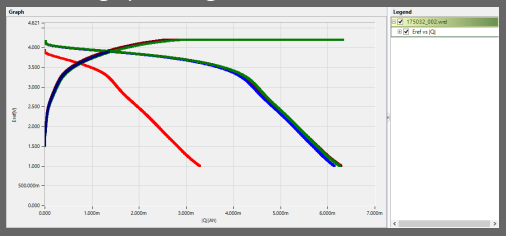
- Cross-hair pointer by mouse click/arrow key displays coordinate values on graph
- Mouse zooming
- Density, specific value display



- 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



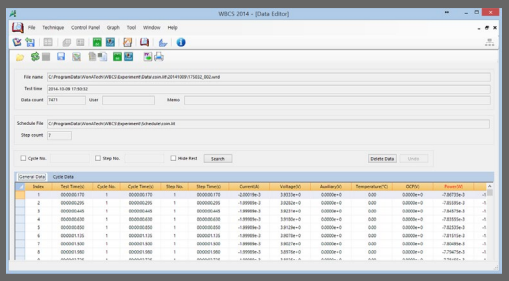
- Parameter change without reloading the data file
- Data set On/Off: Data can be visible or invisible by selecting/deselecting the data set.
- Rest step data hidden function
- Advanced graph setting



Voltage vs. |charging-discharging capacity| graph

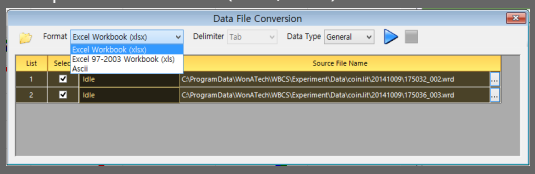
Tools

- Data Editor
  - General data report
  - Cycle data report

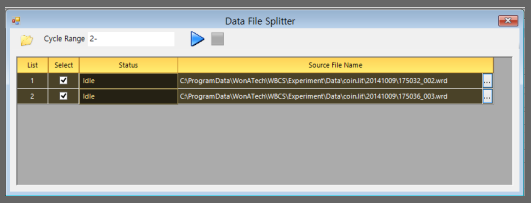


  * Data editing
  * Data filtering

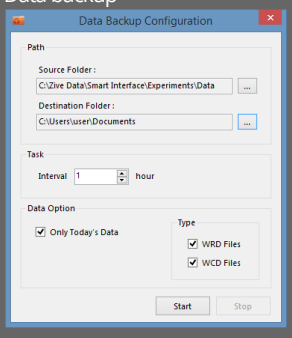
- Data Conversion
  - Multiple data conversion(ASCII, Excel)



- Data file splitter by cycle number



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



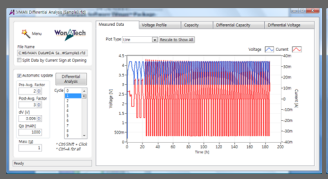
- Split data file

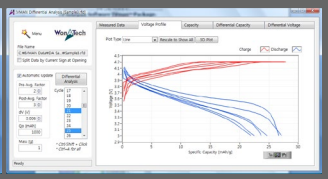
Independent Data Analysis Software

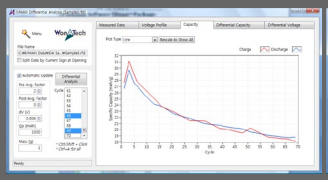
The WPG data format can be used for independent data analysis software IVMAN™ at free of charge.
IVMAN™ software package consists of
- IVMAN software
- IVMAN differential analysis software
- IVMAN photo voltaic cell analysis.
- IVMAN Tafel analysis
- IVMAN extractor
- IVMAN peak find module

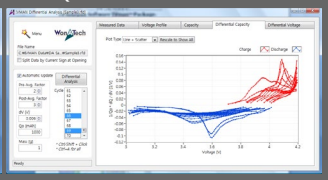
IVMAN DA™ Battery Test Data Analysis Software

- 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)

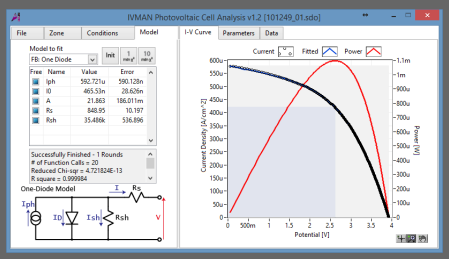

Measured data


V vs. Q


Cycle graph


dQ/dV vs. V

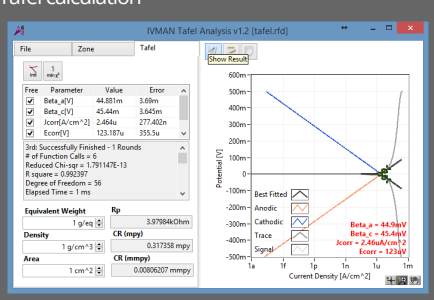
IVMAN™ Photovoltaic Cell Analysis



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

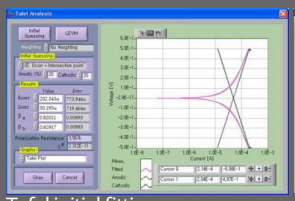
IVMAN™ Tafel Analysis

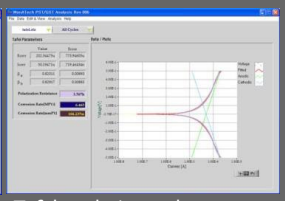
- Simple Tafel calculation

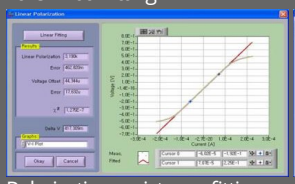


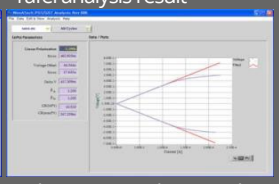
IVMAN™ Main Software

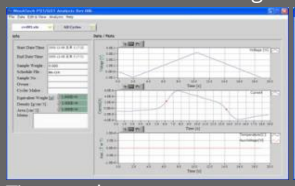
- Electrochemical analysis software
- Ideal for DC corrosion data analysis and electro-analytical data analysis
- Initial guessing function on Tafel analysis
- Automatic Tafel fitting
- Polarization resistance fitting
- 3D graph
- Find peak function
- Interpolation, differentiation, integration, etc.
- Reporting function

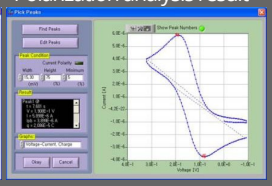

Tafel initial fitting

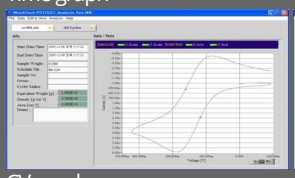

Tafel analysis result

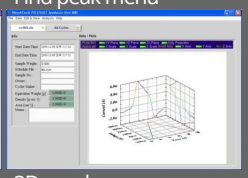

Polarization resistance fitting


Polarization analysis result


Time graph

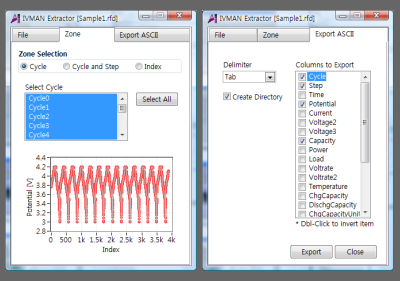

Find peak menu


CV graph


3D graph

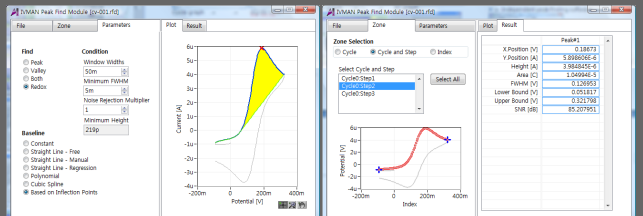
Extractor

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



Peak Find Module

- Independent peak finding software



WPG100ex Standard Type

Application

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

The WPG100ex is an economical research grade potentiostat system which is designed for general electrochemistry, corrosion, battery, etc. It has a power of ±1A and low current ranges, down to 100nA full scale as standard. And customized specification is available upon request. The WPG100ex is designed with a local area network(LAN) for communication with a computer.
Temperature input and auxiliary voltage input are included.

Specifications

Control voltage range	±10V (standard)
Compliance voltage	±12V (standard)
Control current range	1A, 8 ranges (standard)
LED	Run: 1ea, Mode: 2ea, Irange: 8ea
Input impedance	10^{12} Ohm
Cell connection	6 probe type, alligator clip cables
Voltage accuracy	±0.02% f.s.
Current accuracy	±0.02% at 10uA to 1A range ±0.1% at 1uA, 100nA range
Voltage Control/Measurement	
Full scale ranges (within 40 Watt)	±10V (standard) ±20V or ±40V (optional)
Resolution (16 Bits)	0.3mV(standard)
Current Control/Measurement	
Full scale ranges	±10V@1A (standard) ±20V@1A, ±40V@500mA (optional)
Resolution	16 bit(0.0015% f.s)
Power	40Watt
Sampling time	1msec
Communication	TCP/IP
Size	350x328x84mm (WxDxH)

All specifications are subject to change without notice.

WPG100S Potentiostat/Galvanostat

Application

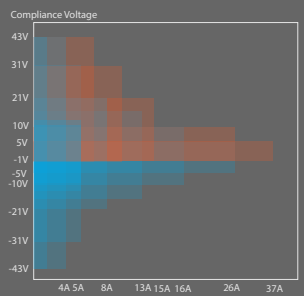
- General electrochemical application
- Corrosion/electroplating
- Electrosynthesis/Electrolysis
- Battery test/Supercapacitor test
- Fuel cell test
- Solar cell test

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 . Temperature input and auxiliary voltage input are included.
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. Bipolar model's max voltage is +/-40Volts.

Specifications

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	±0.05% f.s. (<10V)
Current accuracy	±0.05% f.s.
Voltage Control/Measurement	
Full scale ranges	Refer to power configuration map
Resolution (16 bits)	0.0015% f.s
Current Control/Measurement	

Full scale ranges



Power Configuration Map

Max. f.s under 400Watt
Bipolar voltage range
1) Max 26A @ ±5V (C5V*)
2) Max 5A @ ±5V (C10V*)
3) Max 5A @ ±10V (C12V*)
4) Max 16A @ ±10V (C10V*)
5) Max 13A @ ±10V (C15V*)
6) Max 8A @ ±20V (C21V*)
7) Max 5A @ ±30V (C31V*)
8) Max 1A @ ±40V (C43V*)
9) Max 4A @ ±40V (C43V*)
* Compliance voltage

Unipolar voltage range
1) Max 37A @ -1V to 5V
2) Max 26A @ -1V to 10V
3) Max 14A @ -1V to 21V
4) Max 10A @ -1V to 31V
5) Max 7A @ -1V to 43V

Resolution	16 bit (0.0015% f.s)
Communication	TCP/IP
Sampling time	1msec
Size	447x188x491.2mm (WxDxH)

All specifications are subject to change without notice.

WPG100H8/H12 Power Potentiostat/Galvanostat

Application

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

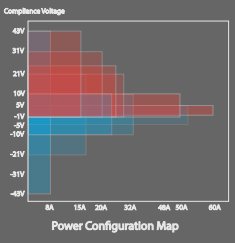
The system hardware is based on WPG series potentiostat/galvanostat and designed for high power application with 6 or 4 current ranges. Maximum power is 800Watt(WPG100H8) or 1200Watt(WPG100H12). The customize specification is available within this power. Temperature input and auxiliary voltage input are included

Specifications

Control current range	WPG100H8: 6 ranges WPG100H12: 4 ranges
LED	Run: 1ea, Mode: 2ea Irange: 3ea
Input impedance	10^{12} Ohm
Cell connection	4 probe type, alligator clip cables
Voltage accuracy	±0.05% f.s. (<10V)
Current accuracy	±0.1% f.s.
Voltage/Current Control/Measurement	
Refer to Power configuration Map	
Resolution (16 bits)	0.0015% f.s

Power Configuration

Full scale ranges



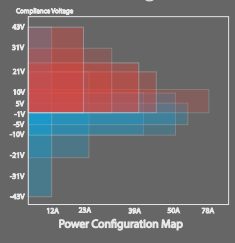
Power Configuration Map

Max. f.s under 800Watt (H8)

Bipolar voltage range
1) Max 52A @ ± 5V (C5V*)
2) Max 32A @ ±10V (C10V*)
3) Max 25A @ ±10V (C10V*)
4) Max 16A @ ± 20V(C21V*)
5) Max 8A @ ± 40V(C43V*)
* Compliance Voltage

Unipolar voltage range
1) Max 60A @ -1V to 5V
2) Max 50A @ -1V to 10V
3) Max 29A @ -1V to 21V
4) Max 26A @ -1V to 24V
5) Max 20A @ -1V to 31V
6) Max 15A @ -1V to 43V

Full scale ranges



Power Configuration Map

Max. f.s under 1200Watt (H12)

Bipolar voltage range
1) Max 61A @ ± 5V(C5V*)
2) Max 50A @ ±10V(C10V*)
3) Max 40A @ ±10V(C10V*)
4) Max 25A @ ± 20V(C21V*)
5) Max 12A @ ± 40V(C43V*)
* Compliance voltage

Unipolar voltage range
1) Max 78A @ -1V to 10V
2) Max 43A @ -1V to 21V
3) Max 39A @ -1V to 24V
4) Max 30A @ -1V to 31V
5) Max 23A @ -1V to 43V

Communication	TCP/IP
Sampling time	1msec
Emergency switch	Located on the front panel
Size	H8: 447.1x241x505.2mm (WxDxH) H12: 464.1x285.4x626mm (WxDxH)

All specifications are subject to change without notice.

WPG100HP High Power Potentiostat/Galvanostat

Application

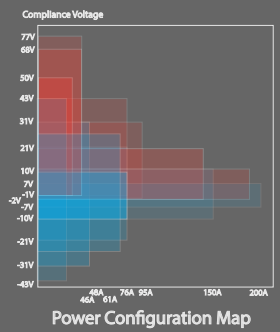
- High power application
- Electrosynthesis/Electrolysis
- Battery test/Supercapacitor test
- Fuel cell test
- Solar cell test
- Pilot line application

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. Bipolar model's max voltage is +/-45Volts. Temperature input and auxiliary voltage input are included.
U model (WPG100HPU) is unipolar model (positive voltage only) for Energy research. Max voltage is 0 to 90V available.

Specifications

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	±0.1% f.s.
Current accuracy	±0.1% f.s.
Voltage Control/Measurement	
Full scale ranges	Refer to power configuration map
Resolution (16 bits)	0.0015% f.s
Current Control/Measurement	

Full scale ranges



Power Configuration Map

Maximum current depending on voltage range

1. voltage bipolar
1) Max 200A @ ±5V (C7V*)
2) Max 150A @ ±10V (C10V*)
3) Max 76A @ ±10V (C10V*)
4) Max 76A @ ±20V (C21V*)
5) Max 72A @ ±24V (C24V*)
6) Max 46A @ ±30V (C31V*)
7) Max 38A @ ±40V (C43V*)
* Compliance voltage

2. voltage unipolar
1) Max 180A @ -2V~+10V
2) Max 140A @ -2V~+21V
3) Max 95A @ -2V~+31V
4) Max 76A @ -1V~+43V
5) Max 42A @ -1V~+50V
6) Max 46A @ -1V~+68V
7) Max 46A @ -1V~+77V

Resolution	16 bit (0.0015% f.s)
Communication	TCP/IP
Sampling time	1msec
Emergency switch	Located on the front panel

All specifications are subject to change without notice.

Designing the Solution for Electrochemistry

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