Rechargeable Battery Test System

Battery Station

Powered by ARRAY Electronic 372XA, 366XA

October 27. 2015

T&C Technical

Sales and Engineering, Section 3

Engineering and Designing

Requirement

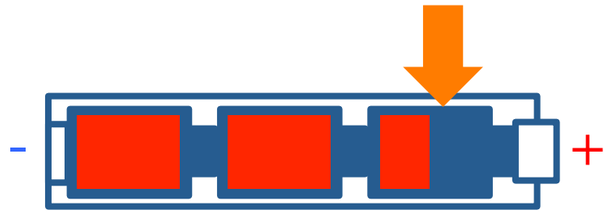
Automate the charge and discharge process with report function.

Measure cell impedance periodically during charging and discharging.

“Impedance” = “Cell Capacity”

If one of the cell in a battery has high impedance,

A charging and discharging capacity is regulated by one cell.



How to select the similar cells to assemble the battery?

Measure the impedance of each cell continuously.

Prepare the similar “impedance trend” of cells to assemble the battery.

Main Hardware / Power supply, Electronic load, Temperature sensor

Battery Station GUI

Windows® 7

500W

DC power supply for charging batteries: 3 models

35V 14.5A 500W

80V 6.5A 500W

120V 4.2A 500W

200W to 400W

DC electronic load for discharging batteries: 4 models

80V 30A 200W

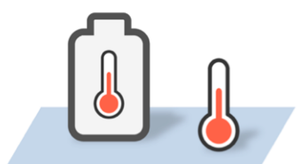
80V 40A 400W

200V 20A 200W

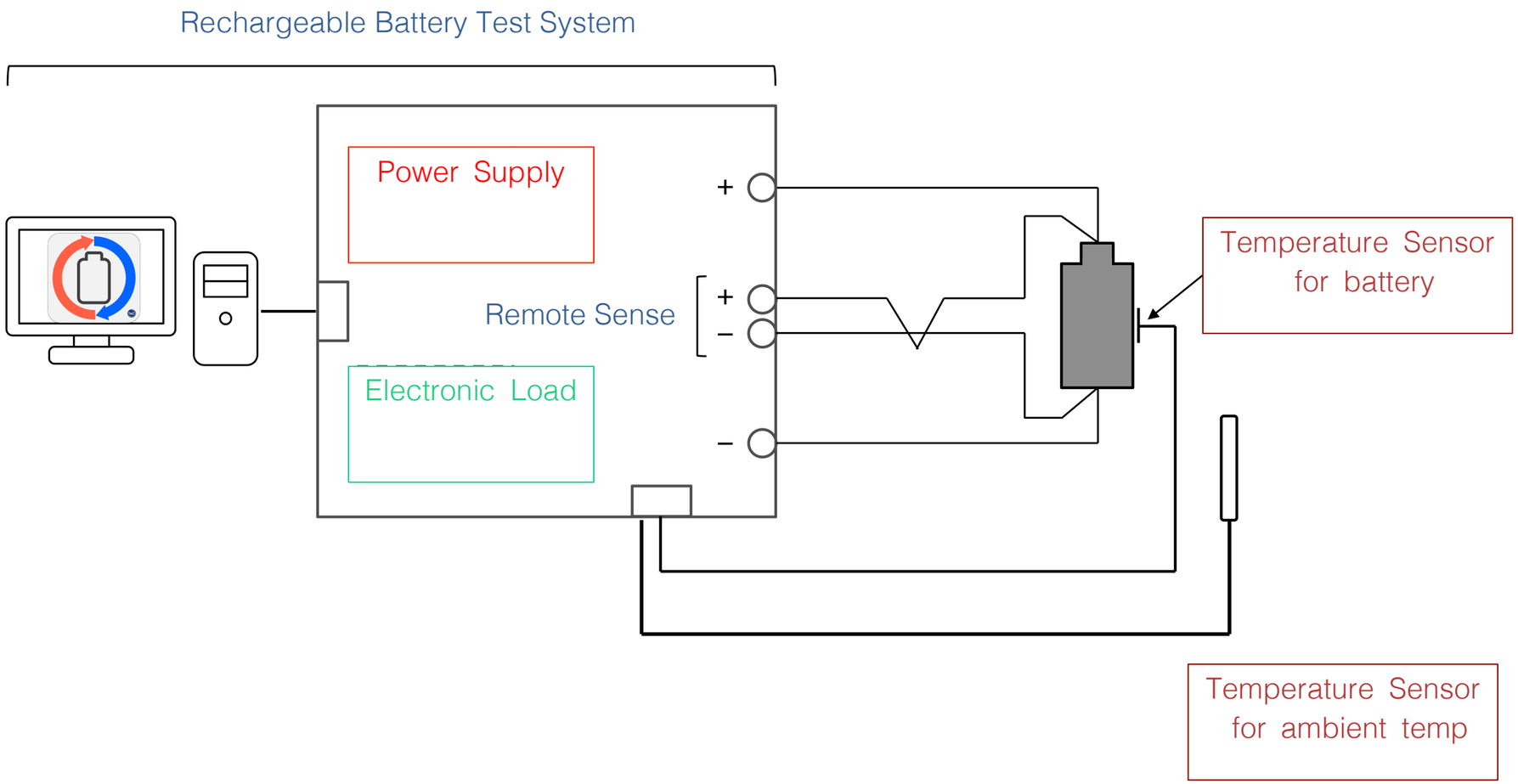
200V 30A 350W

Temperature sensors

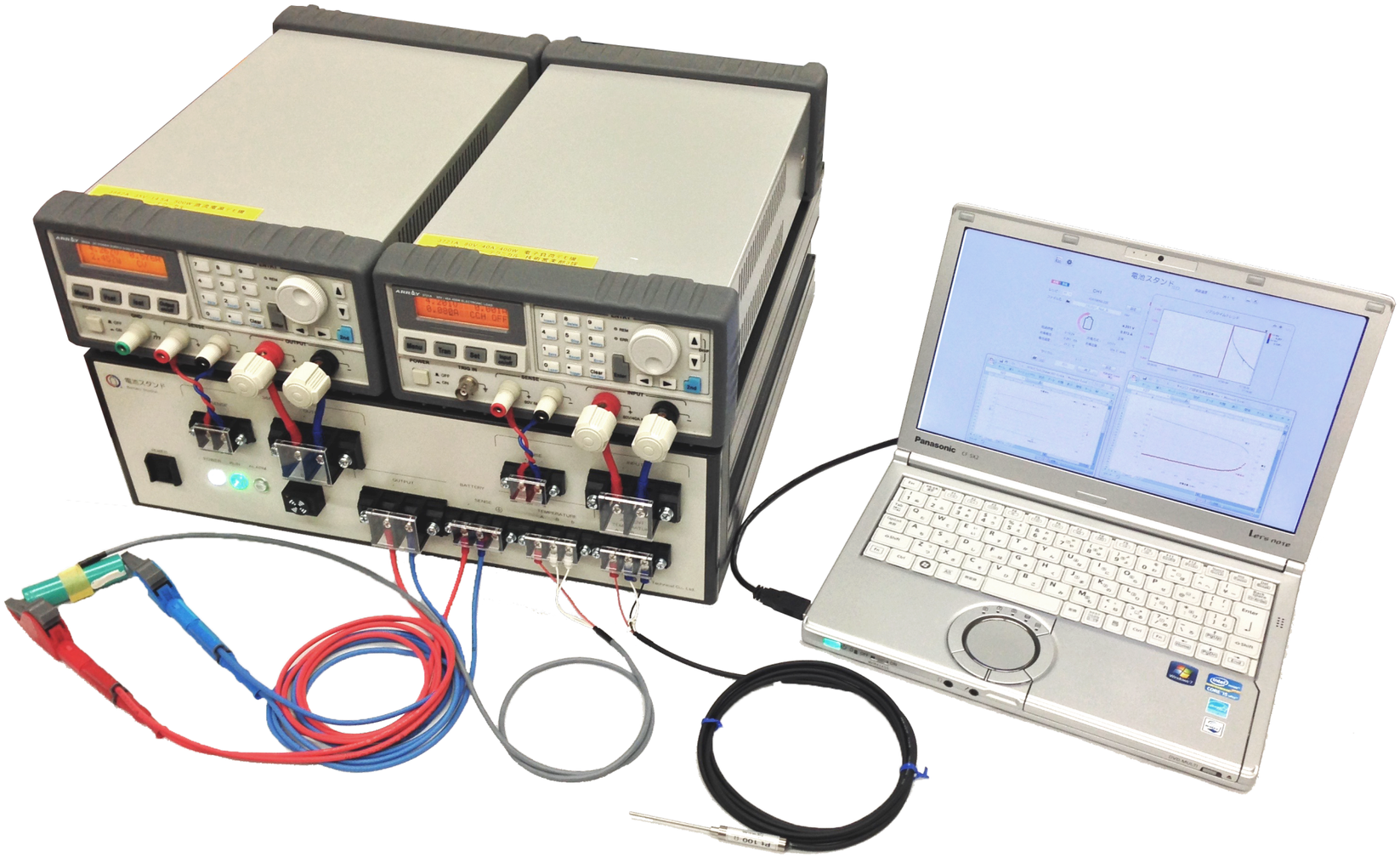
To check the surface of the battery and test environment



System Layout (1ch)



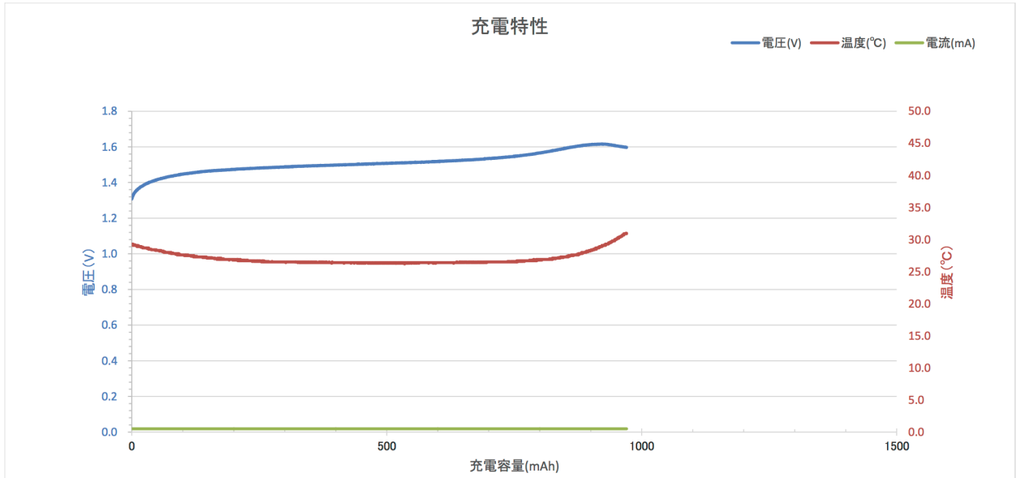
Battery Station Single



Charge and report

Negative Delta V mode　(NiCd, NiMH)

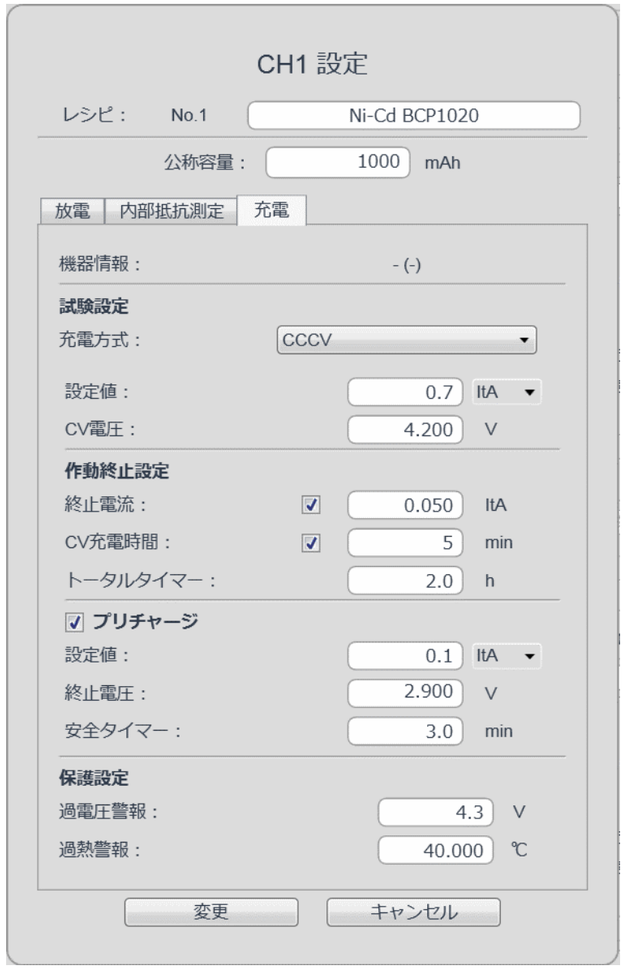
Charging Result:　Voltage / Temperature / Charged mAh



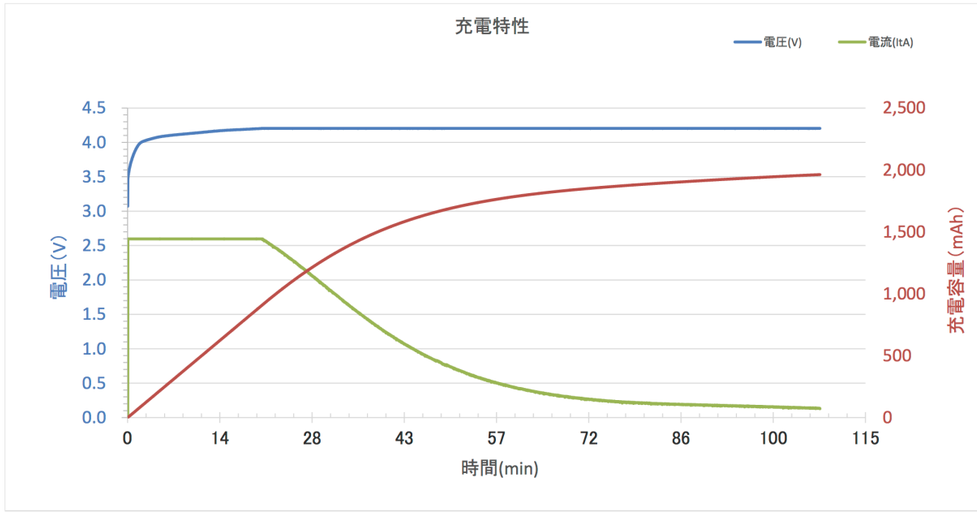
日付：	2015/5/27		ファイル名：	Ni-Cd KR1000AA1_Charge_014.xls					
充電容量：	970	mAh	充電電流：	500	mA	充電時間：	1:56:24	周囲温度：	25.2 ℃

Charge and report

Constant Current and Constant Voltage Mode (Lithium Ion)



Charging Result: Voltage / Current / Charged mAh

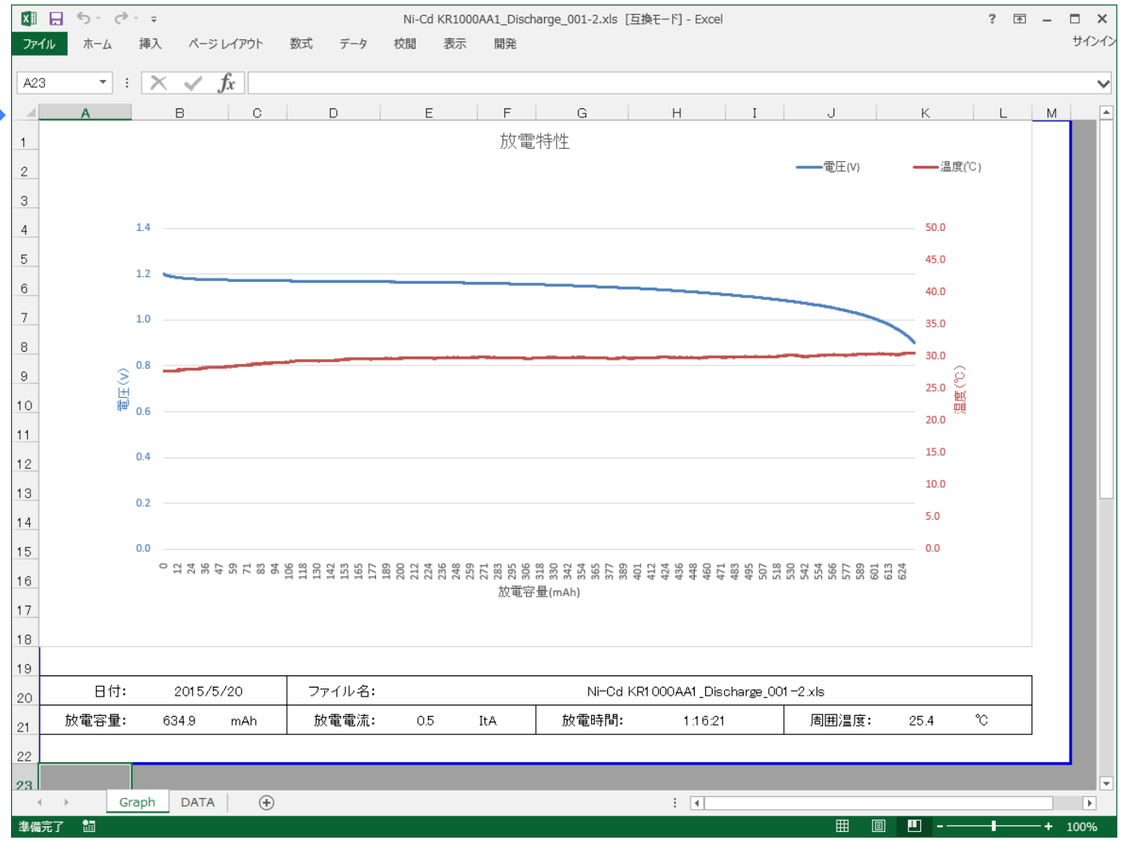


日付：	2015/7/29		ファイル名：	Li-Ion_ICR18650_150729_Charge_001-1.xls			
充電容量：	1962	mAh	充電電流：	128	mA	充電時間：	1:48:05	周囲温度：	0.0	℃

Discharge and report

Constant Current Discharging

Discharging Result: Voltage / Temperature



Impedance test for Longer working time and safer Battery

Before assemble the battery pack (battery built with multiple cells), the cell impedance (internal resistance) must be tolerated between certain levels.

The highest impedance cell limits the battery life and impossible to charge fully.

When the load requires the high current, the high impedance cells get warmer and sometimes destroy the battery itself.

Why choose DC?

AC is also one of the standard methods to measure internal resistance, and normally considered as a standard.

Good point is it is possible to use for discharged batteries and not necessary to charge to test.

But the measurement quality is depended on the tool setting; cable length, test point, electrical effect around the cell. These factors must be controlled carefully to get the precise impedance. To avoid this risk, Battery Station chooses DC method.

The disadvantage of DC method is to consume the energy and need to charge the battery to test and after test.

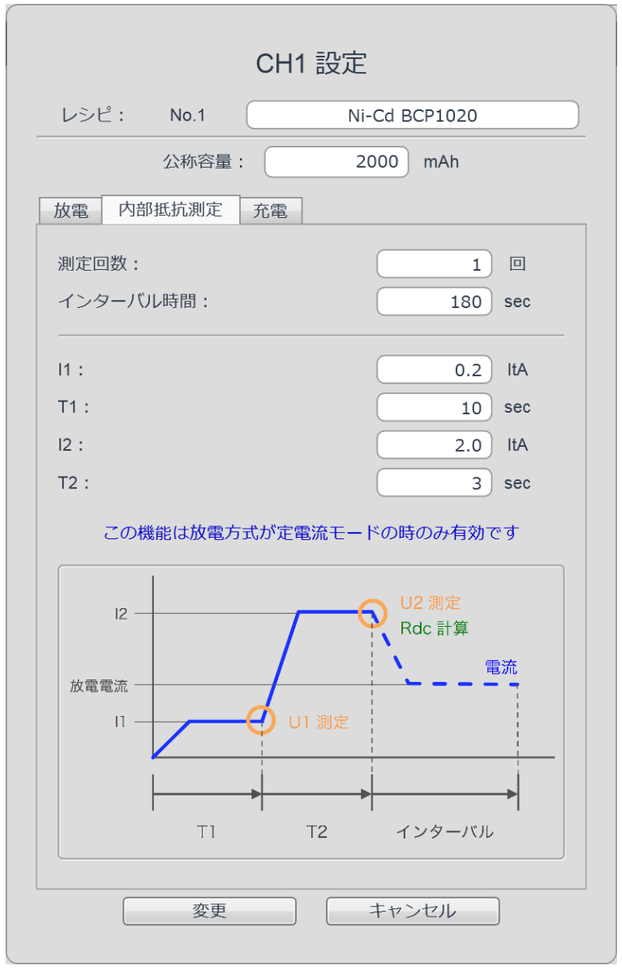
But it is very “stable, accurate and repeatable”.

Also the impedance is measured during discharging. It means you can see the “Real Time Impedance Changing”.

Impedance test and report

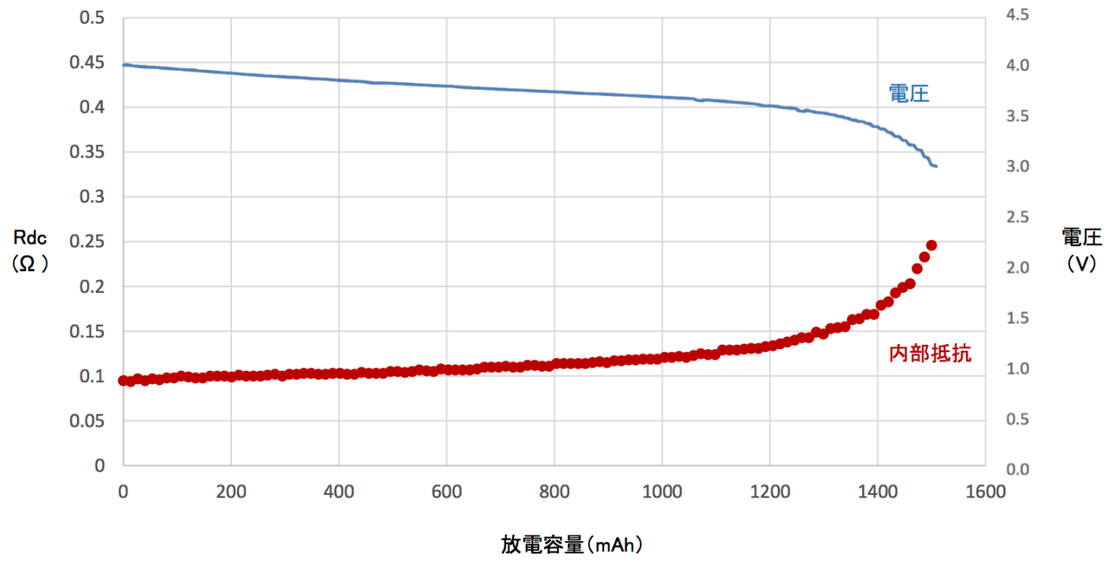
DC Method / charging and discharging process

Any Battery type



Impedance Test Result at discharging state

: Voltage / Internal Resistance / mAh

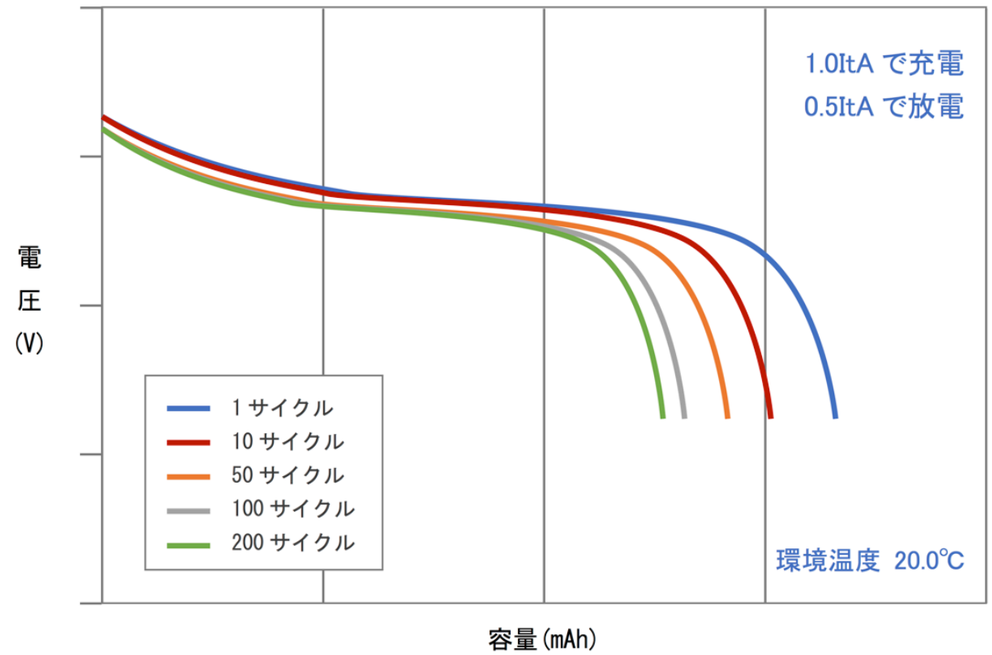


Cycle Test

Charging and discharging the batteries to know the battery durability

Cycle Test Interface

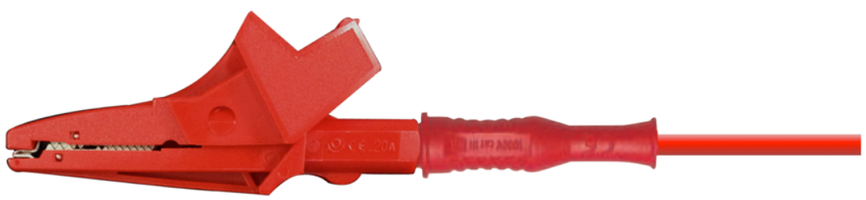
Cycle Test Result:　Voltage / mAh

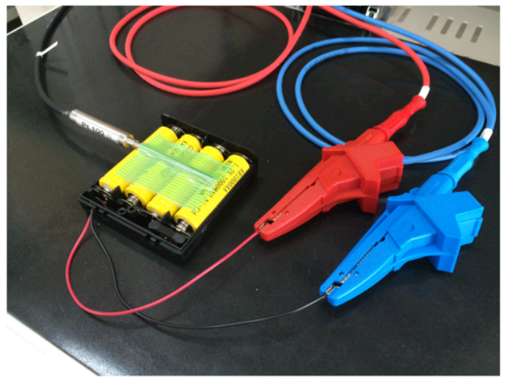


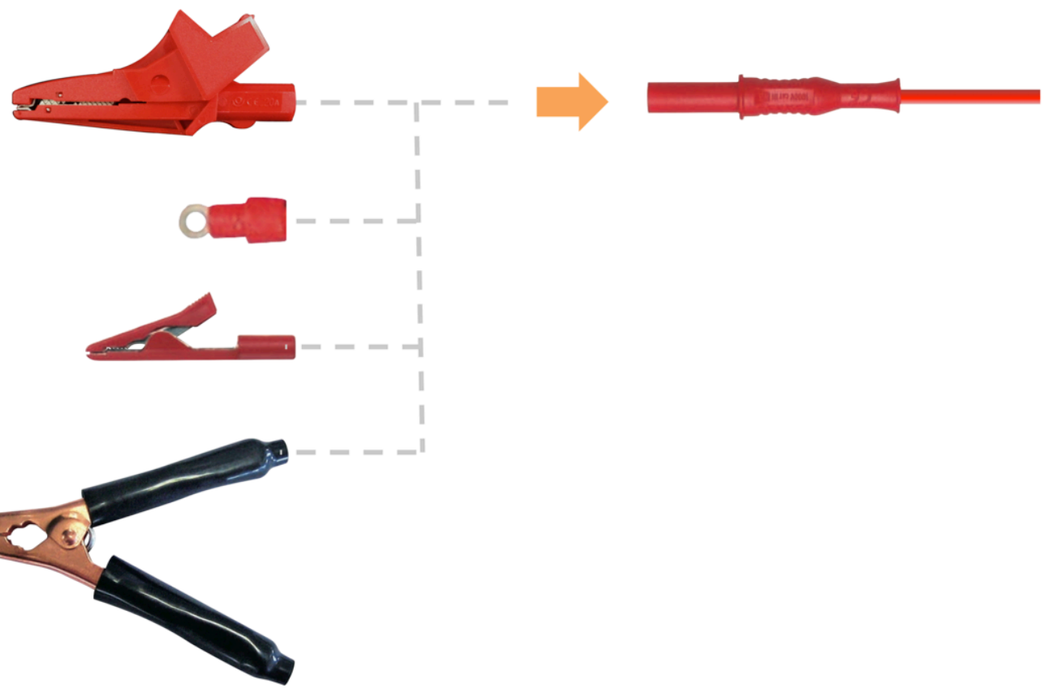
Accessories for Productivity

Battery station can select the various types of clamp to fit the various cells or batteries for accurate test.

電池への接続が容易な大型クリップ







クリップは電池の端子形状に合わせて交換できます

Thank you for your attention

Specification (4ch type)

Basic specification

Standard Test	Charge Test Discharge Test	Discharge Test → Charge Test Charge Test → Discharge Test
Durability Test	Cycle Test	
Quality Test	Impedance Test	
Charge Method	Negative Delta Voltage Charge Test / CC, CV Charge Test	
Charge Range	Depend on selected power supply unit	
Discharge Control Method	Constant Current mode / Constant Resistance mode / Constant Power mode	
Discharge Range	Depend on selected electronic load unit	
Temperature sensor	Sensor Type	Pt100 2 wire
	Range	-200 ～ 850℃
	Accuracy	±1.0℃
Sampling range	1 ～ 3600sec	
Protection	Over Heat Protection / Over Current Protection / Over Voltage Protection / Total Timer shut down	
Graphic	Real Time Trend Graph / Charge, Discharge Recipe management / Automatic Test Report Generation	

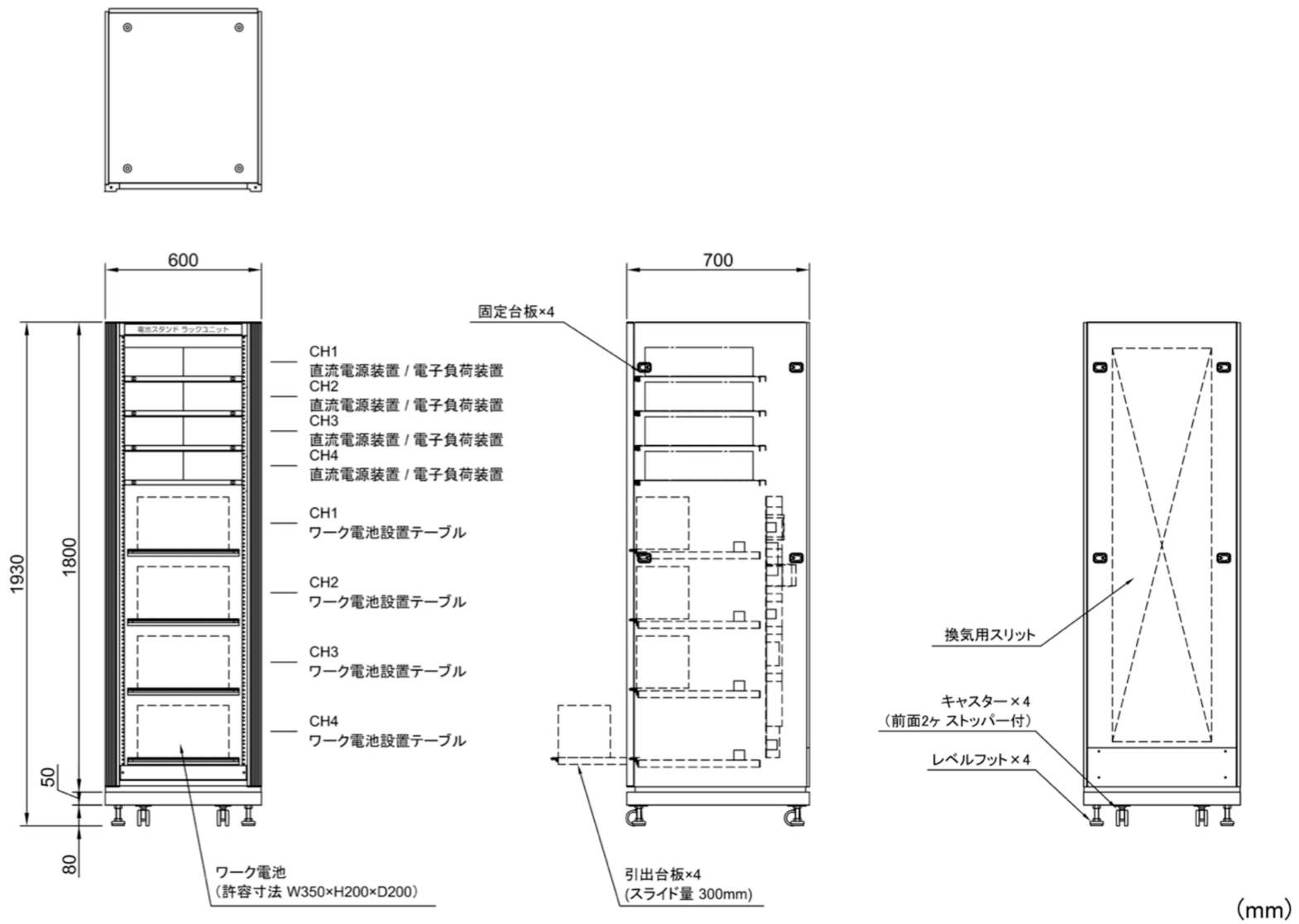
General Specification

Line Voltage	AC200V 50Hz/60Hz（AC100V will be selectable）
Power	3KVA max（when charge power is set at maximum）
Operative Environment	0-40℃ / 0-80%RH
Cooling method	Fan in power supply and electronic load unit
Dimension	W600×H1930×D700（mm）
Weigh	Approximately 160kg

Controller and Accessories

PC for control the system x 1 DC power supply unit x 4　Electronic load unit × 4 台 Rack unit (JIS) x 1 Clip and wire for battery connection x 4set (already assembled)	Battery Slide Tray x 4 Temperature Measurement Unit x 1 set Temperature Sensor x 5 one for measuring the ambient temperature, 4 for battery Other : Devices for Control System

Rack Dimension



(mm)

Reference

JIS C8705 (2012)	Sealed nickel-cadmium rechargeable single cells
IEC61951-1:2006	Secondary cells and batteries containing alkaline of other non-acid electrolytes-Portable sealed rechargeable single cells-Part 1: Nickel-cadmium (MOD)
JIS C8708 (2013)	Sealed nickel-metal hydride rechargeable single cells
IEC 61951-2:2011	Secondary cells and batteries containing alkaline or other non-acid electrolytes-Portable sealed rechargeable single cells-Part 2: Nickel-metal hydride (MOD)
JIS C8711 (2013)	Secondary cells and batteries containing alkaline or other non-acid electrolytes-Secondary lithium cells and batteries for portable applications
IEC 61960:2011	Secondary cells and batteries containing alkaline or other non-acid electrolytes-Secondary lithium cells and batteries for portable applications (MOD)

Key feature of Battery Station

1. Design the system based on industrial grade (24 hour working)

2. Accept the several battery types charging and discharging.

   NiCd, Li Ion, NiMH / single cell test, battery string test

3. Execute the impedance test during discharging to know the changing of the resistance continuously.

4. Real time trend view

5. Easy to use and easy to learn

6. The charging power is 400W. Discharging capacity is 400W.

7. Add the temperature sensor to measure the room temperature and cell surface temperature for safety and charging, discharging condition.

8. Add safety system to run the system for 24 hour. Also PC protection for emergency shut down (sometimes weather causes the sever problem to the system)

9. Design and prepare the customer's own quality report to trace the tested batteries.