CANRD

Introduction to Canrd Testing Center's Testing Capabilities

Publication Date : June 24 , 2025

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Canrd Brief Introduce

✓**one-stop service provider** in the field of new energy research (experimental equipment / pilot-scale verification / experimental materials) ;

✓Our main business is the research and development and sales of **experimental equipment , with pilot-scale verification** services as our technological engine and the selection of **experimental materials** as our market foundation;

✓ Founded in Songshan Lake High-tech Zone in 2015 , approved as a national high-tech enterprise in 2017 **,** with a registered capital of 10 million yuan;

✓140+ patent applications ; **110+ authorized invention patents** ; the company **has passed ISO9001** and **CNAS** system certifications;

✓ Factory area of 9000m2 , 140+ employees (core team from **CATL /ATL/ Jiyang Automation / Alibaba**) .

Introduction to Testing Capabilities

We can provide one-stop testing services for materials, cells, modules, and systems .

Raw Materials

Battery Cells

Modul

Battey pack

Battery System

Materials Testing

Microanalysis
Surface and cross-sectional morphology
Spectral analysis
Major elements, trace elements
Chromatographic analysis
Polymer molecular weight distribution
Thermal analysis
Melting point, specific heat capacity of materials
Electrochemical analysis
Electrochemical impedance
Physical & Chemical Analysis
True density, compacted density
...

Electrical performance

Electrical performance testing
Rate performance, high and low temperature performance
Limiting current, limiting power
Charge retention and capacity recovery capabilities
Operating conditions, energy efficiency, DC internal resistance
...
Life test
Low temperature, normal temperature, and high temperature cycle life
Liquid cooling cycle, float charge cycle, inverted cycle, low temperature, normal temperature, high temperature calendar life
Gas generation through circulation and gas storage
...

Safety & Reliability

Electrical abuse
Overcharge, over-discharge, short circuit
Mechanical property abuse
Extrusion, needle puncture, thermal diffusion
Thermal performance abuse
Thermal runaway, thermal stability, heat propagation
...
Reliability testing
Mechanical vibration, three-dimensional vibration
Mechanical, heavy objects, functional impact
Temperature cycling, temperature shock, damp heat cycling
...

CNAS accreditation scope

GB/T 18287-2013
GB/T 23365-2023
GB/T 43092-2023
GB/T 37207-2018
GB/T 23366-2009
GB/T 42161-2022
GB/T 42260-2022
GB/T 39864-2021
GB/T 39861-2021
GB/T 37201-2018

...

Materials Testing Capabilities

CANRD

XRD

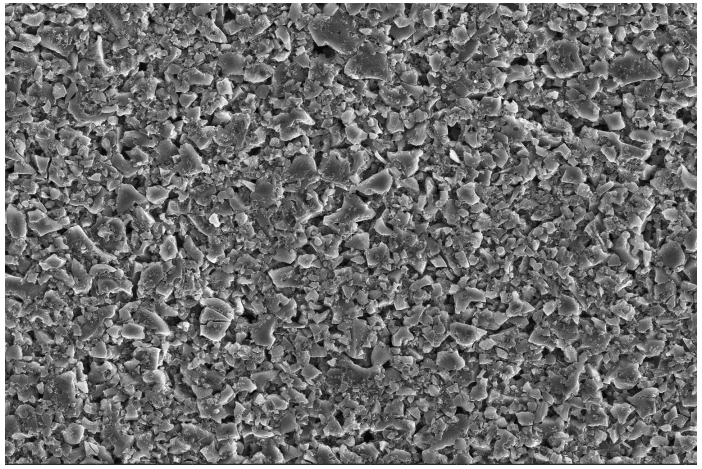
SEM-EDS

GC-MS

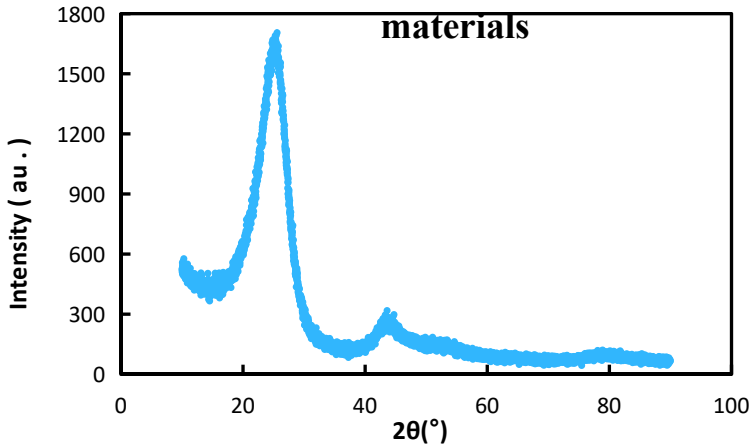
ICP-OES

Test Case Demonstration

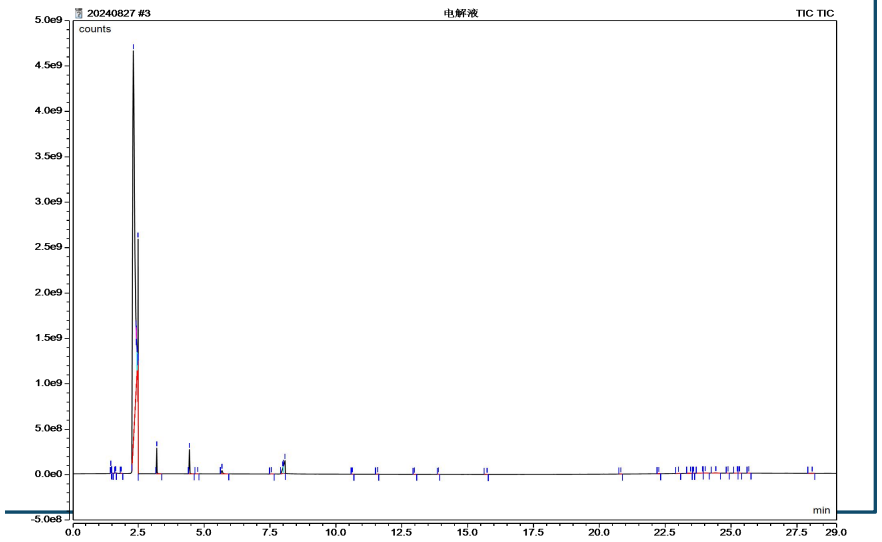
SEM scan image of a negative electrode surface



XRD test curves of soft carbon materials



GC-MS test results of a certain electrolyte



Materials Testing Capabilities

TG-DSC

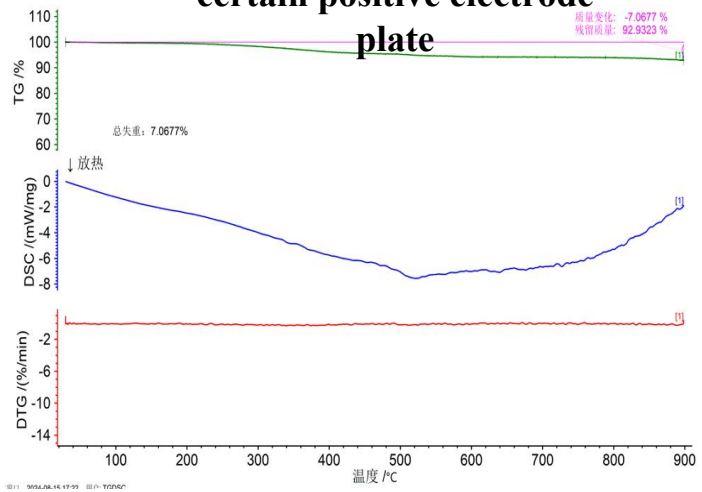
Diaphragm

FTIR

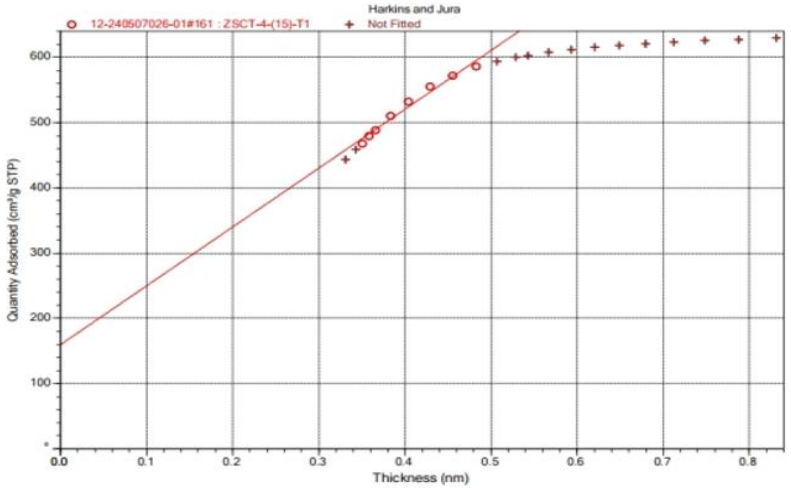
compaction

Test Case Demonstration

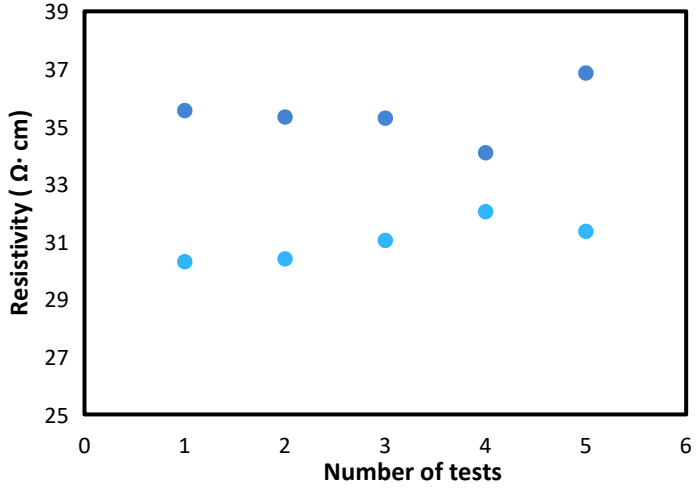
DSC test results of a certain positive electrode plate



Material pore size



Resistivity Comparison Analysis



We have established long-term and stable cooperative relationships with multiple materials testing laboratories, including ATL , Tsinghua University, and BTR .

Materials Testing Capabilities

Analysis Category	Main Instruments	Major Brands	Main Analytical and Characterization Applications
Spectral analysis	Inductively Coupled Plasma Emission Spectrometer (ICP-OES)	Agilent	Major and trace element content of materials, and impurity analysis.
	X- ray diffraction (XRD)	Panaco	Sample phase analysis, graphitization degree analysis, in-situ analysis
	Fourier transform infrared spectrometer (FTIR)	Thermo Fisher	Analysis of organic functional groups in samples
Chromatographic analysis	Gas chromatography (GC)	Agilent	Cell gas composition analysis
	GC /MS	Agilent	Electrolyte composition analysis, NMP purity, and NMP content analysis in electrodes
	Ion Chromatograph IC	Thermo Fisher Scientific & Vantone	Anion and cation analysis: Ca2+, Na+, Li+, Cl-, F-, PO43-, PF6-; electrolyte lithium salt content analysis.
	Ultra-high performance polymer chromatograph (APC)	Waters (TA)	Analysis of molecular weight and distribution of polymers such as adhesives
Electrochemical analysis	Electrochemical workstation	Stronger & BioRoger	Electrochemical impedance, electrochemical reaction window, Binder ion conductivity & electrochemical stability, lithium ion transference number, electroactive specific surface area, entropy change coefficient
	Button battery tester	Newway & Blue Lightning	Material capacity testing, rate and cycle testing
	Vacuum glove box	Milano & Delis	Symmetrical battery, button cell assembly
Thermal analysis	STA-MS (Simultaneous Thermal Analyzer)	Netzsch	Thermal performance analysis of separators, electrodes, binders, etc.
	Differential Scanning Calorimeter (DSC)	Netzsch	Thermal property analysis of materials, including melting point, glass transition temperature, and thermal stability of SEI film.
	Thermogravimetric - mass spectrometry (TG-MS)	Netzsch	Material escaping gas analysis, thermogravimetric analysis, etc.
	Dynamic Thermomechanical Analyzer (DMA)	TA	Thermomechanical analysis of diaphragms and films, including thermal strain and compressive strain.

Materials Testing Capabilities

Analysis Category	Main Instruments	Major Brands	Analysis & Characterization Applications
Microscopic analysis	Scanning Electron Microscopy - Energy Spectroscopy (SEM-EDS)	Zeiss & Thermo Fisher	Surface micro-region morphology and elemental analysis
	Argon ion polishing instrument CP	Japan Electronics	Argon ion cross-section polishing of electrodes, separators, positive and negative electrode powders, etc.
	Cleanliness analyzer	Shanghai Yuemei	Quantity and size of metallic, fibrous, and non-metallic particles
	Super depth-of-field microscope	Keyence	Detection of burrs and flashes on positive and negative electrode sheets, welding cracks and fissures, size of solder marks on positive and negative electrode tabs, and residual foil.
Physical and chemical analysis	Universal stretching machine	Shimadzu	Tests on the tensile strength, elongation, and puncture resistance of the separator; analysis of the electrode peel force.
	Laser Particle Size Analyzer (LPS)	Marvin	Characterization of powder particle distribution
	BET Surface Area Analyzer	Mike	Analysis of specific surface area and pore size distribution of materials
	Powder Resistivity Tester	Mitsubishi Japan	Volume resistivity of powder materials
	True density meter	Mike	True density analysis of powder materials and porosity analysis of electrode sheets
	compaction density meter	Three Thoughts	Powder material compaction density analysis
	Tap density meter	Chengdu Jingxin	Powder material tap density analysis
	potentiometric titrator	Mettler	free lithium in powder materials, free amine content in NMP , and degree of substitution of CMC
	pH meter	Mettler	pH testing of electrolyte, binder, and positive and negative electrode powders
	tubular combustion furnace	Shanghai Jujing	Carbon nanotube content test
	muffle furnace	Shenzhen Kejing	Graphite ash content test
	Carbon and sulfur analyzer	Steel Research Institute Nake	Analysis of carbon and sulfur content in positive and negative electrode materials 9

Materials Testing Capabilities

Analysis Category	Main Instruments	Major Brands	Analysis & Characterization Applications
Physical and chemical analysis	Solid Moisture Meter	MassMutual	Trace moisture analysis of powders and electrodes
	Liquid Moisture Analyzer	Mettler	Electrolyte and slurry trace moisture analysis
	Contact Angle Tester	Biolin Sweden	/ contact angle of the electrolyte on the separator and electrode , and the surface tension of the electrolyte.
	Viscometer	Bollefly	Viscosity analysis of electrolyte and binder
	conductivity meter	Mettler	Electrolyte conductivity analysis
	Densitometer	Antonpa	Electrolyte and NMP density analysis
	black box	Three Graces	Analysis of sulfate and chloride ion content in electrolyte
	Slurry stability analyzer	Formulation	Slurry stability analysis
	Microwave digester	Antonpa	Microwave digestion of materials such as graphite
	diaphragm resistor	Chuanyuan Technology	Resistance analysis of positive and negative electrodes
	Oil absorption value tester	Japan ASAHI	Oil absorption value test of positive and negative electrodes and conductive agent
	Electrode wettability tester	Yuaneng Technology	Electrolyte wettability analysis of positive and negative electrode plates
	Air permeability tester	Gurley	Diaphragm air permeability test
	Thin film thickness gauge	Shenzhen Borui	Diaphragm thickness test
	Hardness tester	Shaw Brothers A/C/D	Hardness testing of battery component materials
	density balance	Lugong Precision	Glue & Solid Density Test
	High rent	Hioki	Battery component material insulation internal resistance & volume resistivity testing

Materials testing capabilities

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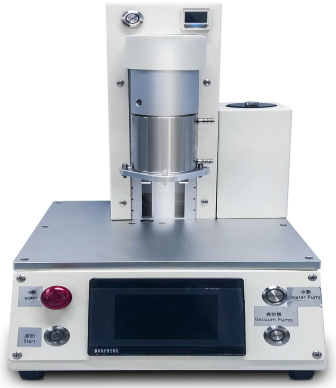
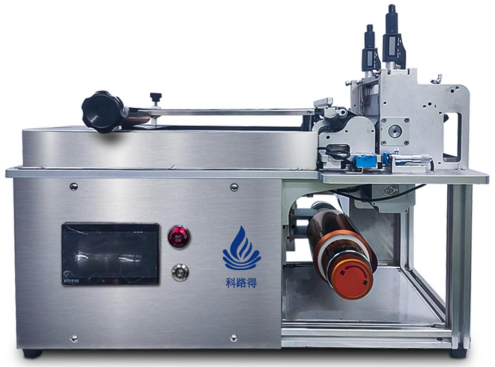
Mixer



Coating Machine

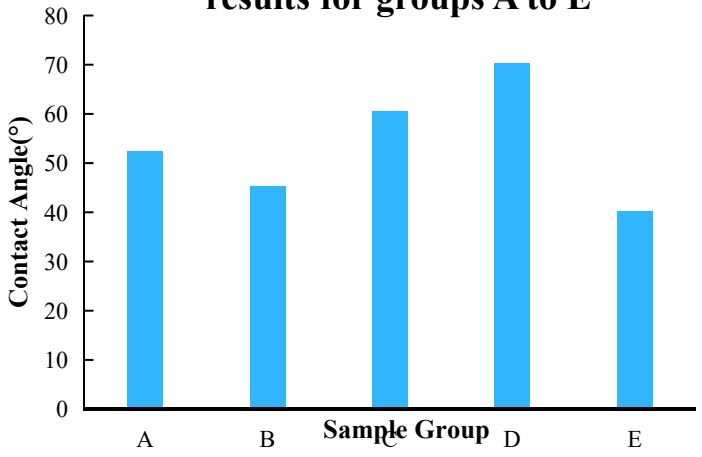


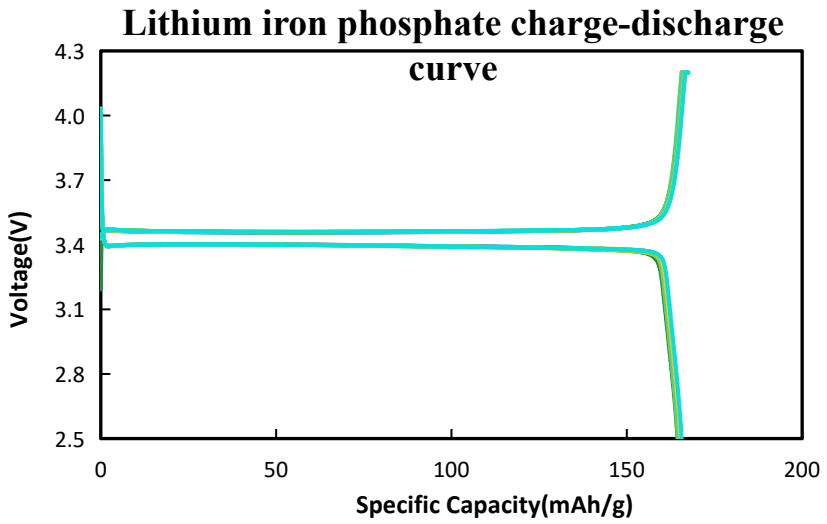
Roller Press

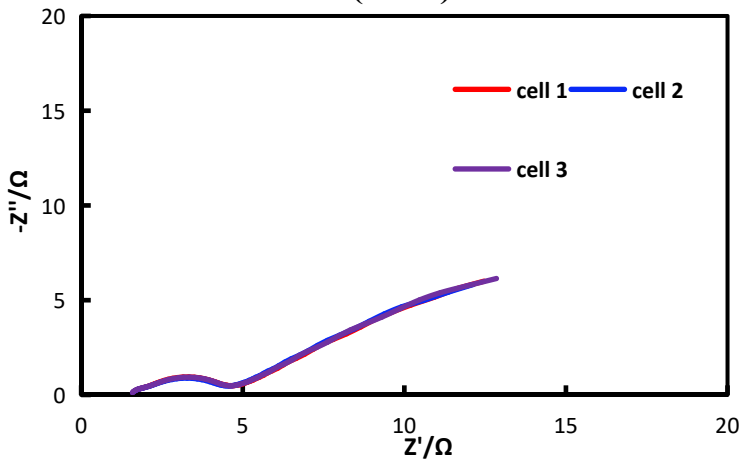
Sealing Machine

Testing System

Test Case Demonstration







Materials Testing Capabilities






- **Independent research and development and pilot production lines for pouch and cylindrical batteries, as well as battery cells, help customers evaluate material process performance and electrochemical performance.**

Cell & Module Testing Capabilities

High-precision battery testing system

- Measurement range: Voltage: 0~5V; Current: 0~5A;
- Current accuracy: 0.05%FS & 0.01%FS;
- Voltage accuracy: 0.05%FS & 0.01%FS;
- Minimum sampling frequency: 10ms.

Battery testing system

- Measurement range: Voltage: 0~5V; Current: 0~5A;
- Current accuracy: 0.05%FS;
- Voltage accuracy: 0.05%FS;
- Minimum sampling frequency: 100ms.

Thermostatic chamber

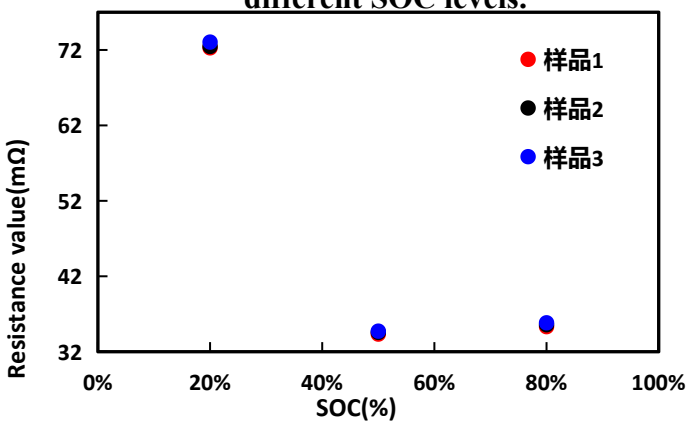
- Testing temperature range: 10℃~85℃;
- Dimensions: L690*W510*H1755mm.

Constant temperature and humidity test chamber

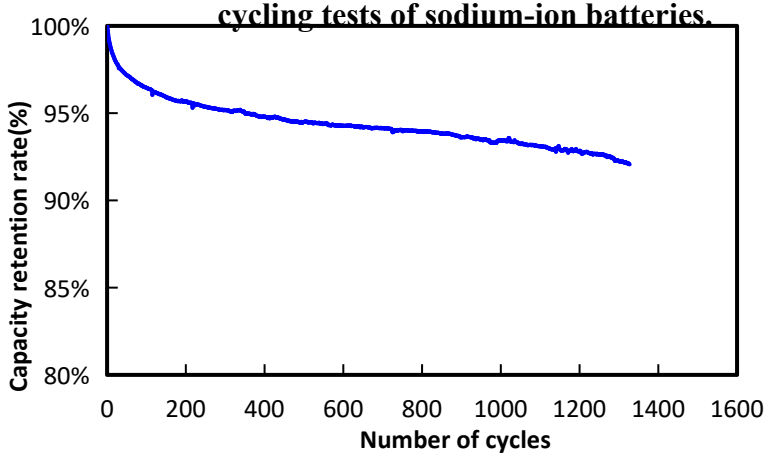
- Testing temperature range: -75℃ to 85℃;
- Dimensions: L1000*W1040*H1820mm.

Test case demonstration

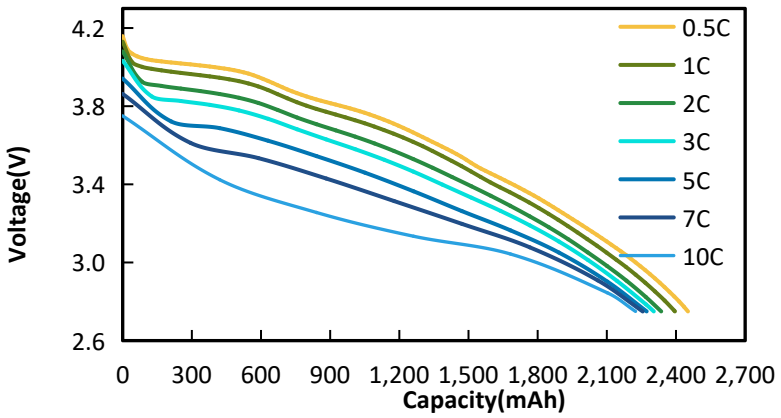
DCR testing at room temperature under different SOC levels.



Capacity retention rate in high-temperature cycling tests of sodium-ion batteries.



Room temperature discharge rat



Cell & Module Testing Capabilities

Liquid cooling test & integrated feeder temperature chamber test

- Current and voltage accuracy: 0.05%FS ;
- Resolution: Voltage: 0.1mV ; Current : 0.1mA ;
- Cooling capacity: 0.01℃ ;
- Flow resolution: 0.001 L/min.

Four-way integration test system

- Measurement range: voltage: 0~5V ; Current: 0~2000A ;
- Resolution: Current: 0.1mA ; Voltage: 0.1mV;
- Current response time: 20μs;
- Maximum pulse width: 500μs;
- Minimum sampling frequency: 10ms.

High-precision & rapid current response testing system

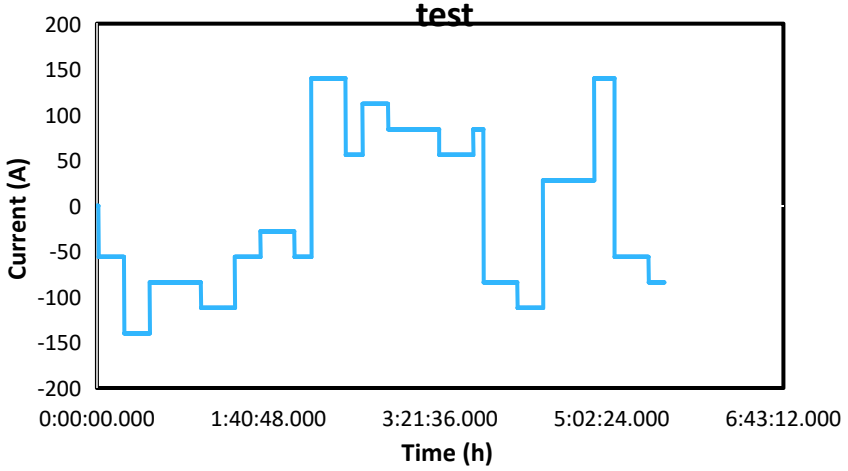
- Measurement range: Voltage: 0~5V ; Current: 0~500A ;
- Current accuracy: 0.025%FS ;
- Voltage accuracy: 0.02%FS ;
- Maximum pulse width: 500μs;
- Minimum sampling frequency: 10ms

Constant temperature and humidity test chamber

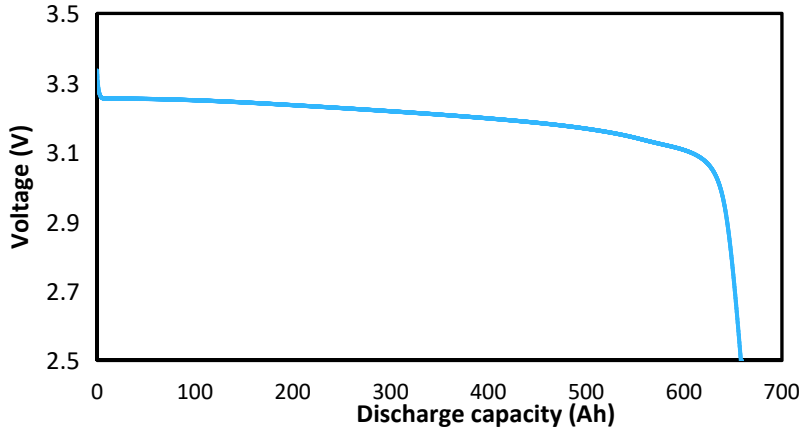
- Measurement range: Voltage: 0~5V ; Current: 0~2000A ;
- Resolution: Current: 0.1mA ; Voltage: 0.1mV
- Current response time: 20μs
- Maximum pulse width: 500μs
- Minimum sampling frequency: 10ms

Test Case Demonstration

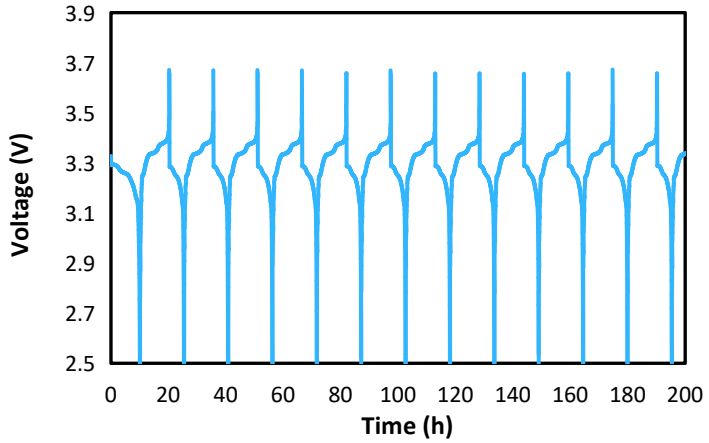
Module operating condition simulation test



Discharge capacity test



Loop test results



Cell & Module Testing Capabilities

Serial Number	Equipment type	Major Brands	Measuring range	Equipment accuracy	Number of channels	Main inspection items
1	charging and discharging equipment	Blue Lightning	5V 5mA~20mA	0.5‰FS	160	Room temperature capacity and energy (initial capacity and energy) , room temperature power (initial power) , standard cycle life, operating cycle life, standard cycle life, room temperature rate discharge capacity, room temperature rate charge performance, low temperature discharge capacity, high temperature discharge capacity, charge retention and capacity recovery capability.
2		Canrd	5V 5mA~100mA	0.2‰FS	160	
3		Newway	5 V3A~50A	0.5‰FS	576	
4		AVL	800V/600A	0.1‰FS	2	
5		Wright	5 V/5A	0.1‰FS	16	
8		Arbin	1000V/800A	0.2‰FS	4	
9		Arbin	120V/300A	0.5‰FS	twenty two	
10		Chroma	150V/500A	0.5‰FS	8	
11		Chroma	100V/500A	0.5‰FS	4	

Cell & Module Testing Capabilities

Serial Number	Equipment type	Major Brands	Measuring range	Equipment accuracy	Number of channels	Main inspection items
12	High-precision test cabinet	Maccor, Arbin , Wright	5V 30A~500A	±0.025%FS	596	Cycle , storage, gas generation, capacity, rate capability, high and low temperatures, lithium plating, SOC-OCV , DCR , HPPC , power , IMAX , operating conditions, etc.
13	rapid sampling machine	Newwell, Shenghong	5V 30A~1000A	±(0.05%FS + 0.05%RD)	2414	
14	Standard Precision Test Cabinet	Newwell, Extreme Test, Shenghong	5V6A~1500A	±(0.05%FS + 0.05%RD)	15630	
15	Integrated incubator	Newwell, Extreme Test, Shenghong	5V20A~700A	±(0.05%FS + 0.05%RD)	4548	
16	Oven-drying machine	Newwell, Extreme Test	5V 20A~600A	±(0.05%FS + 0.05%RD)	4077	
17	High and low temperature chamber integrated unit	Newwell, Extreme Test	5V 20A~600A	±(0.05%FS + 0.05%RD)	1724	
18	Liquid-cooled integrated machine	Newwell, Extreme Test, Shenghong	5V 20A~1000A	±(0.05%FS + 0.05%RD)	2174	
19	High and low temperature box	Miki, Tokyo University, Bell, Canrd	-75 ℃ ~150 ℃	Temperature deviation: ±1℃ ; Uniformity ≤ 1℃	60 (Taiwan)	
20	hothouse	Newwell, Extreme Test, Shenghong	5V 6A~1000A	Temperature deviation: ±1℃ ; Uniformity ≤ 1℃	20720	

Safety & Reliability Testing Capabilities

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Heavy impact testing system

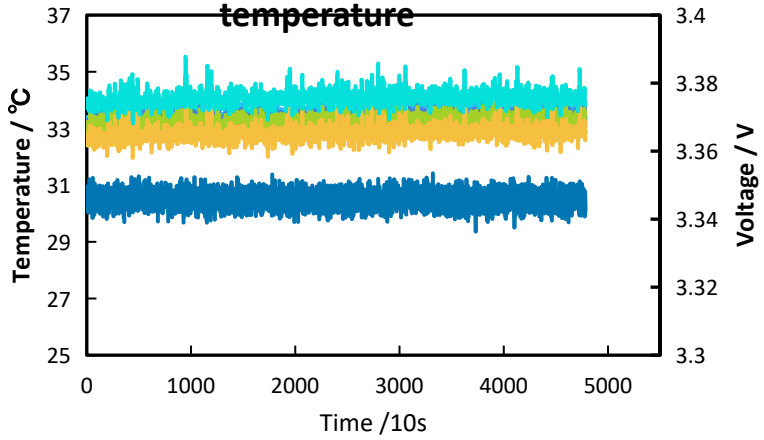
Thermal runaway testing system

Compression & Needle Puncture

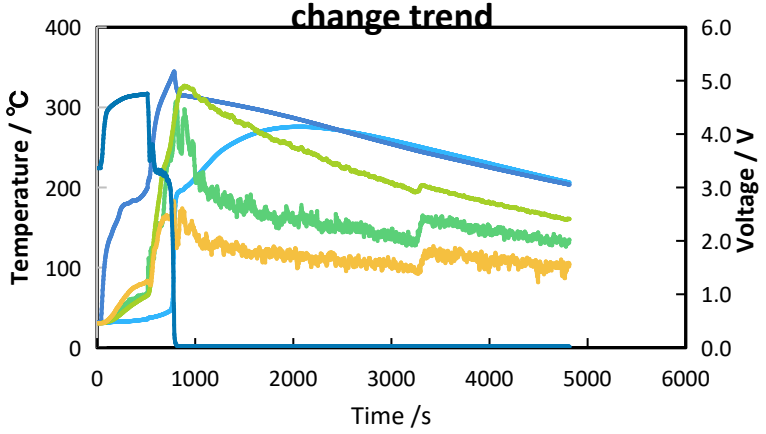
Short circuit test

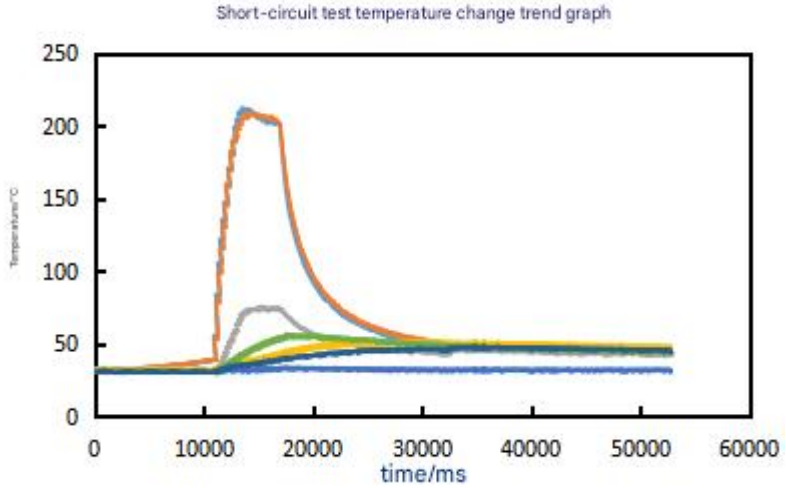
Test Case Demonstration

Trends in extrusion test voltage and temperature

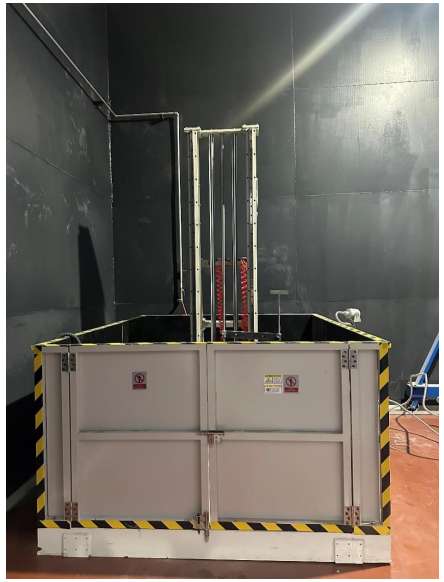


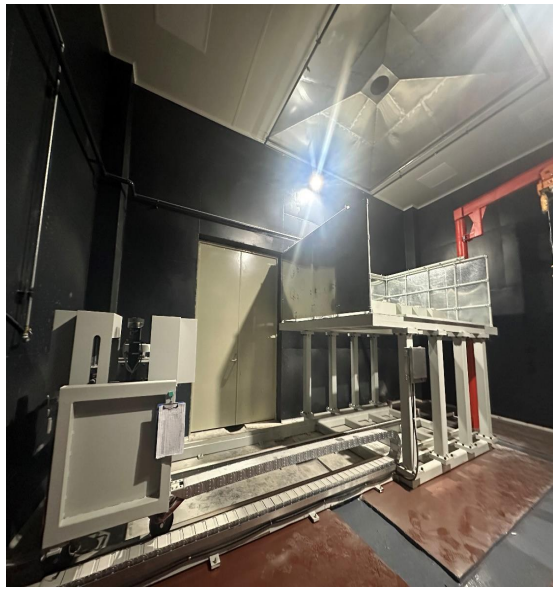
Thermal runaway test temperature change trend

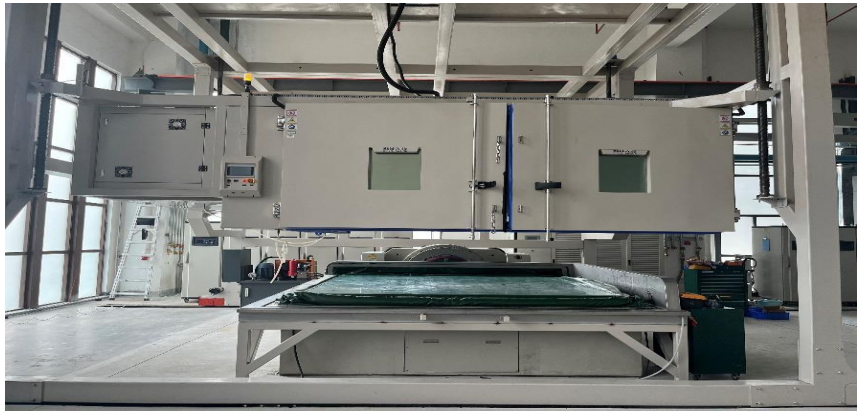




Safety & Reliability Testing Capabilities (Partial Real-Scene Photos)







We have established long-term and positive cooperative relationships with several safety and reliability testing laboratories , including New Energy Pioneer, Presys, Sunwoda, and Kezheng.

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Safety & Reliability Testing Capabilities

Serial Number	Test Project	Equipment Name	Major Brands	Measuring range	Equipment accuracy
1	Overcharge test	Battery testing system	Decathlon	Voltage : 0V-100V ; Charging current : 0-150A; Discharging current : 150A -1.5A	Voltage : ±0.1%FS Current : ±0.1%FS
2	Over-discharge test	Battery testing system	Chroma	Voltage : -10V to 20V ; Charging current : 0 to 200A; Discharging current : 200A to 2A	Voltage : ±0.5%FS Current : ±0.5%FS
3	Short circuit	Power Battery Short Circuit Tester	Huayin	Short-circuit resistance : 0-100 mΩ ; Current : 0-10000 A	Short-circuit resistance : < 1mΩ Current : ±1%FS
4	Adiabatic temperature rise	ARC devices	THT	Temperature range: -40~315℃ ; Temperature stability: ±0.01℃/min; Temperature resolution: 0.001℃	Self-generated heat detection sensitivity: 0.01℃/min; Pressure detection range: 0~200 bar; Pressure detection accuracy: ≤ 0.05%.
5	extrusion	Battery extrusion testing machine	Ruijiada	Extrusion drive method: Servo hydraulic extrusion speed: 0.1mm/s~5mm/s Extrusion force range: 1.5~500KN	Displacement range and accuracy: 0~1500mm ±0.6mm; Voltage range and accuracy: 0~900V, < ±0.3%FS
6	acupuncture	Temperature-controlled battery extrusion and needle penetration testing machine	Gao Xin	Test environment temperature: RT~60℃; Needle penetration speed: 0.1mm/s~80mm/s	Displacement range and accuracy: 0~1000 mm, ±0.1%FS; Voltage range and accuracy: 0~1200 V, 0.05%FS
7	heating	High temperature test chamber with pressure relief safety door	Guangwu Institute	Programmable oven temperature: RT+10℃~300℃	Heating rate: (5±2)℃ /min ; Temperature deviation: ≤ 2℃ ; Temperature resolution: 0.1℃
8	Mechanical shock	Battery impact testing machine	Gao Xin	Weight: 9.1kg , 10kg ; Height: 0~700 mm ; Crossbar diameter: 15.8mm	Weight: ±0.1kg ; Height: ±0.1mm; Crossbar diameter: ±0.1mm
9	Mechanical vibration	40T Vibration Test Bench	Dongling	Thrust: 400 kN (Impact thrust: 800 kN); Maximum acceleration: 980 m/s² ; Maximum velocity : 2.0 m/s ; Maximum displacement: 51 mm (pp) ; Maximum load: 4000 kg	Amplitude accuracy : ±0.2dB Voltage range: 10V

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Safety & Reliability Testing Capabilities

Serial Number	Test Project	Equipment Name	Major Brands	Measuring range	Equipment accuracy
1	Salt spray	15m³ composite salt Fog test chamber	Zhongzhi	Studio dimensions: W2500×D2000×H3000mm ; Maximum load: 4000kg (bearing capacity ≥ 800kg /m2) ; Temperature range: 15℃~100℃ (continuously adjustable) ; Temperature rise/fall: ≥ 1℃/min (under load, average over the entire range) ; Humidity range: 20%RH~98%RH (20℃-85℃)	Settlement rate: 1.0~2.0 mL/80 cm²/h ; Spray pressure: 1.00±0.01 MPa ; Spraying modes: Continuous spraying, intermittent spraying, and programmed spraying are all adjustable. pH value of the solution : 5% concentration neutral saline: 6.0~7.07 ; acidic : 3.0~3.1
2	low pressure	15m³ low pressure Test chamber	Zhongzhi	Studio dimensions: 2500(W)×2000mm(D)×3000mm(H) ; Maximum load: 4T ; Pressure range: 11.6 kPa—101 kPa (adjustable) Accuracy: ±2 kPa ; Temperature range: 0℃~100℃ ;	Pressure drop time: less than 30 minutes from 101 kPa to 11.6 kPa (drop rate and time adjustable). Pressure rise time: less than 5 minutes (from 11.6 kPa to 101 kPa, rise rate and time are adjustable). Four sets (eight terminals) of terminals, compatible with a 750V charge/discharge machine . Two DN20 water-cooled pipe interfaces, enabling simultaneous charging/discharging and liquid cooling under low pressure. Also includes a 16CH communication terminal. Closed
3	Insulation withstand voltage	Insulation withstand voltage tester	Chroma	AC voltage range: 50 ~ 5000V ; Leakage current: 0~100mA ; DC voltage range: 50~6000V ; Leakage current: 0~25mA ; Insulation resistance: DC voltage range: 50 ~ 1000V ; Resistance range: 0.1MΩ~50GQ	Insulation withstand voltage: ±(2%d.±5%fs) Insulation resistance: ≥ 500V ; ±(5%rdg.+0.5%fs)(1~1000MQ)±(10%rdg.+0.5%fs) (1001~9999MQ)±(15%rdg.+1%fs.)_(10GQ~50GQ) Insulation resistance: ≤500V ; (10%rdg. + 0.5%fS) __ (0.1~1000MΩ) Insulation resistance: <100V ; ±(15%rdg.+0.5%fs)_((0.1~1000M Ω)_

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Scope of CNAS Accreditation

Serial Number	Detection object	Project / Parameters		Testing standards (methods)
		Serial Number	name	
1	Lithium cobalt oxide	1	First discharge specific capacity and first charge-discharge efficiency	Electrochemical Performance Testing Methods for First Discharge Specific Capacity and First Charge-Discharge Efficiency of Lithium Cobalt Oxide (GB/T23365-2023)
		2	Discharge plateau capacity ratio and cycle life	Electrochemical Performance Testing Methods for Lithium Cobalt Oxide: Discharge Plateau Capacity Ratio and Cycle Life (GB/T23366-2009)
2	Lithium iron phosphate	1	First discharge specific capacity and first charge-discharge efficiency	Electrochemical Performance Testing Methods for First Discharge Specific Capacity and First Charge-Discharge Efficiency of Lithium Iron Phosphate (GB/T42161-2022)
		2	Cycle life	Electrochemical Performance Testing and Cycle Life Test Method for Lithium Iron Phosphate (GB/T42260-2022)
3	Lithium manganese oxide	1	First discharge specific capacity and first charge-discharge efficiency	Electrochemical Performance Testing Methods for First Discharge Specific Capacity and First Charge-Discharge Efficiency of Lithium Iron Phosphate (GB/T39864-2021)
		2	Discharge plateau capacity ratio and cycle life	Electrochemical Performance Testing Method for Lithium Iron Phosphate - Cycle Life Test GB/T39861-2021
4	Lithium nickel cobalt manganese oxide	1	First discharge specific capacity and first charge-discharge efficiency	Electrochemical Performance Testing Methods for First Discharge Specific Capacity and First Charge-Discharge Efficiency of Lithium Nickel Cobalt Manganese Oxide (GB/T37201-2018)
		2	Discharge plateau capacity ratio and cycle life	Electrochemical Performance Testing Methods for Lithium Nickel Cobalt Manganese Oxide: Discharge Platform Capacity Ratio and Cycle Life (GB/T37207-2018)
5	Lithium nickel manganese oxide	1	First discharge specific capacity and first charge-discharge efficiency	Electrochemical Performance Testing Methods for First Discharge Specific Capacity and First Charge-Discharge Efficiency of Lithium Nickel Manganese Oxide (GB/T43093-2023)
		2	High-temperature performance of pouch cells	Electrochemical Performance Test Method for Cathode Materials of Lithium-ion Batteries GB/T43092-2023

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Serial Number	Detection object	Project / Parameters		Testing standards (methods)
		Serial Number	name	
6	Lithium-ion batteries and battery packs for mobile phones	1	0.2 ItA discharge	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.1
		2	Rate Discharge	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.2
		3	High-temperature discharge	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.3
		4	Low temperature discharge	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.4
		5	Charge retention capacity and recovery capacity	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.5
		6	Storage performance	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.6
		7	Cycle life	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T 18287-2013 4.2.7
		8	Internal resistance	General Specification for Lithium-ion Batteries and Battery Packs for Mobile Phones GB/T18287-2013 4.2.8
7	Lithium-ion battery cathode materials	1	High-temperature performance of button cells	Electrochemical Performance Testing Method for High-Temperature Performance of Lithium-ion Battery Cathode Materials GB/T43092-2023
		2	High-temperature performance of pouch cells	Electrochemical Performance Test Method for Cathode Materials of Lithium-ion Batteries GB/T43092-2023

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THANK YOU !