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IEST

Comprehensive Solution for Solid-State Battery Testing

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Initial Energy Science&Technology(Xiamen) Co., Ltd

CATALOGUE

Powder Particles

Powder/Solid-state Electrolyte

Electrode

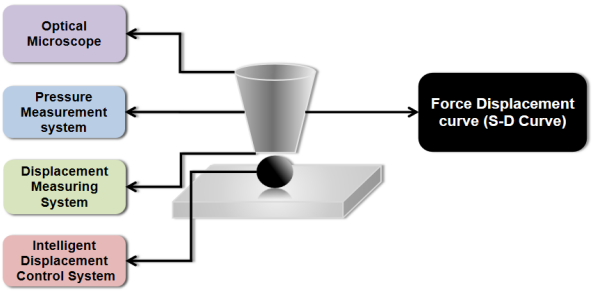
Cell

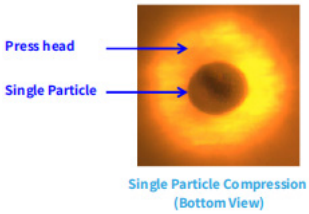
Single Particle Crushing Force Tester

Introduction

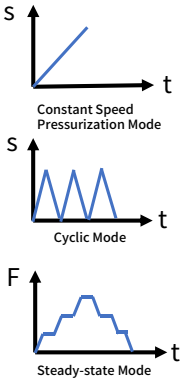
IEST's Single Particle Crushing Force Test System (SPFT) enables material-level mechanical characterization at the microparticle scale. Integrating an optical subsystem, pressure measurement module, displacement monitoring unit, and automated control platform, it supports real-time detection of deformation, slip, collapse, and fatigue life of microparticles during compression.

For solid-state batteries, IEST has developed a glove-box integrated SPFT, enabling inert atmosphere-protected mechanical testing of cathode, anode, and electrolyte materials. This configuration ensures precise characterization of particle mechanical properties under simulated battery operating environments.





Single Particle Compression (Bottom View)



Characteristics

- Atmosphere protection for solid-state sample
- High-Precision displacement with a range of 0-75 μm
- Multiple test modes enable diverse sample analysis
- Sample Particle dimensional range 5~50 μm
- Auto-cleaning function, easy to operate
- Rapid analysis, intelligent calculation of crushing force and data comparison

Model and Parameters

Model	SPFT3000
Equipment Dimensions	450*600*500 (W×D×H)
Glove-box Dimensions	2000*750*1800 (W×D×H)
Microscope Magnification	Max 1200×
Force Range	0~100mN/500mN
Force Resolution	±0.01/0.05mN
Automatic XY Stage Displacement	1μm
Displacement Travel Range	0~75μm
Displacement Resolution	0.001μm (1nm)
Pressure Head Auto-Cleaning	√

Multi-Dimensional Solid-State Electrolyte Testing System

Introduction

The Multi Dimensional Solid-State Electrolyte Testing System facilitates comprehensive powder-level material evaluation. It combines atmospheric protection system, pressurization system, pressure measurement system, thickness measurement system, pressing & lock system, electrochemical testing system, integrated with unified software to enable in-situ monitoring of compaction density and electrochemical performance under adjustable pressure and atmospheric conditions.

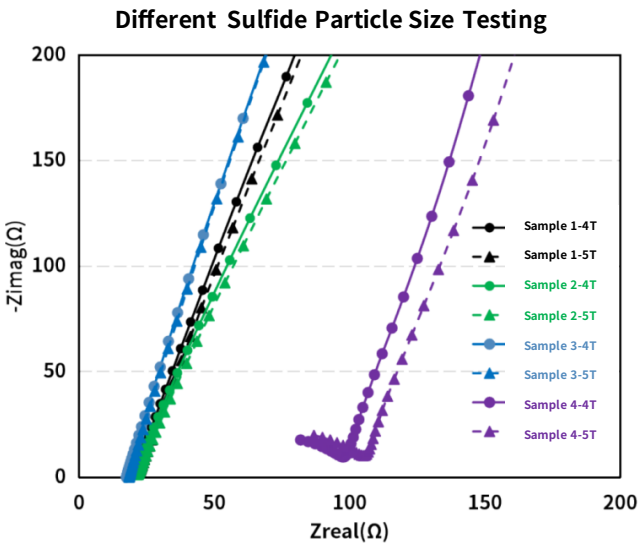
Functions

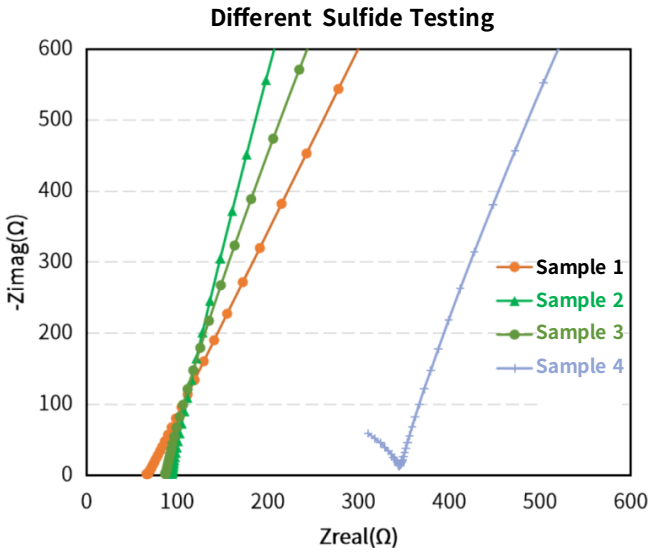
- Atmosphere protection for solid-state electrolyte
- Enhanced pressure control through motor servo
- Thickness test accuracy: ±10 μm
- Integrated pressing and lock for easier operation
- Equipped with internationally certified electrochemical workstations
- Unified Software for Comprehensive Test Control
- Rapid Analysis, Smart Ion Conductivity Calculation, and One-Click Export

Model and Parameters

Model	SEMS3200	SEMS3100
Pressurization Method	Servo Motor	Hydraulic
Electrochemical Test System	Standard Biologic, customizable for other brands	
Glove Box	√	/
Max. Pressure	⩽6T (600MPa)	
Pressure Stability	1%	
Thickness Measurement Accuracy	10μm	
EIS Frequency	⩽5MHz	
Sealing Fixture	SCM	
Screw Tightening	Equipped with automatic screw-tightening function	
Test Software	Interconnected with electrochemical workstation, enabling one-click ion conductivity output	Interconnected with electrochemical workstation, enabling one-click ion conductivity output
Equipment Form	Glove Box + Integrated Pressurized Testing Device	Integrated Pressurized Testing Device
Operation	One-click automatic pressurization testing, highly integrated	Separate software operation

Application Cases





4000kg					
	Thickness cm	Ionic Resistance Ω	Ionic Conductivity S/cm	Fitted Resistance Ω	Fitted Conductivity S/cm
Sample1	0.04234	18.4634	2.90E-03	20.0072	2.68E-03
Sample2	0.02823	19.9897	1.79E-03	20.0827	1.78E-03
Sample3	0.03788	17.5166	2.74E-03	17.4249	2.75E-03
Sample4	0.02888	97.2701	3.76E-04	96.0354	3.81E-04

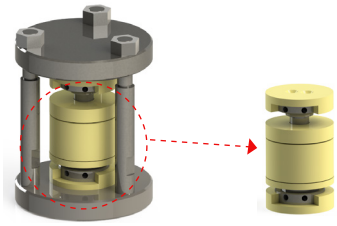
5000kg					
	Thickness cm	Ionic Resistance Ω	Ionic Conductivity S/cm	Fitted Resistance Ω	Fitted Conductivity S/cm
Sample 1	0.03952	20.4210	2.45E-03	21.7771	2.30E-03
Sample 2	0.026	21.5564	1.53E-03	21.5437	1.53E-03
Sample 3	0.03683	18.4914	2.52E-03	18.3934	2.53E-03
Sample 4	0.02171	105.1042	2.61E-04	103.2362	2.66E-04

1400kg					
	Thickness cm	Ionic Resistance Ω	Ionic Conductivity S/cm	Fitted Resistance Ω	Fitted Conductivity S/cm
Sample 1	0.26727	66.3309	5.10E-03	67.4627	5.01E-03
Sample 2	0.25642	90.0848	3.60E-03	93.9603	3.45E-03
Sample 3	0.22398	85.1252	3.33E-03	87.0921	3.26E-03
Sample 4	0.16917	325.4015	6.58E-04	342.6215	6.25E-04

Solid-State Battery Mold & Fixture

01 Mold & Fixture

The Gas-tight mold’ s inner liner is made of ceramic, which can withstand pressure up to 600MPa. Unique insulating cover design ensures structural stability and zero deformation under 60°C high-temperature testing.

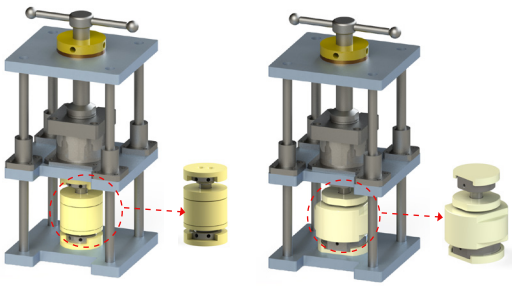


- √ Solid-State Electrolyte Ionic Conductivity Test
- √ Mold Cell Electrochemical Performance Test

Model	MP1000
Fixture Dimensions	Outer Diameter 70mm，Height 95mm
Standard Mold Dimensions	Inner Diameter 10mm（customizable），Outer Diameter 35mm
Applied Force	Max. 6000kg
Operation Temperature	-10~60°C
Weight	＜10kg
Standard configuration	Fixture+Gas-tight Mold

02 Mold Cell Pressure Control Testing System

The three-plate steel structure is designed to maximize stability by mitigating pressure changes caused by bolt deformation during testing, thereby enhancing testing stability.



- √ Solid-State Electrolyte Ionic Conductivity Test
- √ Mold Cell Electrochemical Performance Test
- √ Mold Cell Swelling Force Monitoring(requiring swelling force ＞ accuracy)
- √ Adaptable to Swelling Force Testing Requirements for Certain Pouch Cells

Model	MPC1000
Equipment Dimensions(L*W*H)	100 * 92 * 235mm（Customizable）
Standard Mold	Inner Diameter 10/13mm（Customizable）
Max. Preload Pressure	400kg/(49.94/29.55)MPa（Customizable）
Max. Measurement Pressure	500kg/3000kg（Customizable）
Pressure Resolution	0.1kg
Pressure Accuracy	±0.3%F.S.
Operation Temperature	-10~60°C
Weight	＜10kg
Standard Configuration	Fixture, Gas-tight Molds, Pressure Data Acquisition Capsule, etc.

Mold Cell Automatic Pressing & Lock Equipment

Introduction

With a maximum pressing force of 10,000 kg, the system allows for freely adjustable pressurization force and pressure holding time. Triaxial simultaneous screw tightening post-pressure application, eliminating uneven pressure distribution caused by manual handling.

Automatic Pressing Locking Machine APLM

Characteristics

- Pressure range: 0-10 tons, customizable based on mold dimensions.
- Simultaneously lock/unlock screws during pressure holding to enhance operational efficiency.
- Precisely control screw torque to ensure balanced triaxial pressure and torque.

Models and Parameters

Model	APLM
Pressure Range	500kg~10000kg
Pressurization Method	Servo motor / Electric-hydraulic (optional)
Equipment Dimensions	500*400*1000mm
Pressure Control Accuracy	Servo motor：±0.3% F.S.，Electric-hydraulic：±1% F.S.
Platen Parallelism	OK
Screw Tightening	√
Locking Method	Simultaneous Triaxial Tightening
Screw Removal Function	√

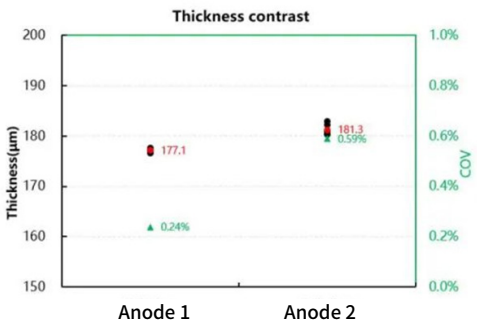
Battery Electrode Resistance Analyzer

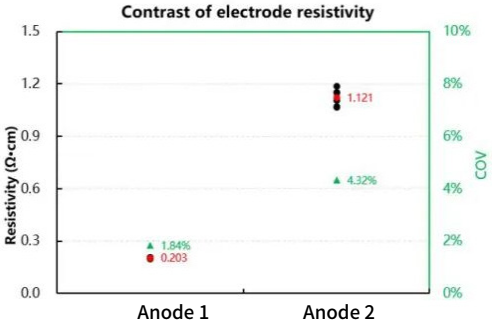
Introduction

The BER Series Multi-Function Electrode Resistivity Analyzer employs a dual-plane controllable-pressure disk electrode resistance method to directly measure the true overall resistivity of electrode sheets, including the sum of coating resistance, coating-to-current collector contact resistance, and current collector resistance. It demonstrates strong discrimination capability for the uniformity of the electrode sheet's electronic conductive network.

Application Cases

Resistivity of Dry Electrodes Under Different Roll Pressing Pressures





Models and Parameters

Model		BER2100	BER2200	BER2300	BER2500
Pressurization Method		Pneumatic cylinder (requires air source, pressure range: 5~35MPa)		Servo motor (pressure range: 5~60MPa)	
Testable parameters		Resistance, pressure, temperature, humidity	Resistance, resistivity, conductivity, force, pressure, temperature, humidity		Resistance, resistivity, conductivity, pressure, temperature, humidity, thickness, compaction density
Specification		1、Dimensions：355mm*321mm*560mm 2、Weight：70kg 3、Power：100W		1、Scale：355mm*321mm*795mm 2、Weight：83kg 3、Power：450W	
Function	Single point test	●	●	●	●
	Continuous test	/	●	●	●
	Variable pressure mode	/	/	●	●
	Automatic software	/	●	●	●
	Thickness Measurement	/	/	/	Test Range：0~5mm Resolution/Accuracy：0.1μm/±1μm
	Compaction Density Relationships	/	/	/	Curves of electrode resistance, resistivity, conductivity, and compaction density
	Optional Modules	In-situ AB-surface testing module, automatic sample loading module, temperature control module, electrode ionic conductivity testing module			

High-throughput Pressure & Electric Coupling Test System

Introduction

A comprehensive solution combining temperature control, electrochemical performance evaluation, and pressure testing modules, designed to perform pressurized tests on pouch cells and mold battery samples under room temperature (RT) to 80°C conditions. The system features 5-layer drawer type sample carrier for effortless operation, enabling seamless integration of pressure application and electrochemical measurements across varying temperatures.

Characteristics

- RT~80°C, Meet multi-scenario testing;
- Unique circulation air duct design, excellent temperature uniformity;
- High-throughput design, supporting simultaneous testing of up to 80 mold batteries or 80 pouch batteries;
- 0.01%F.S. High precision voltage and current control for rapid life evaluation;
- EIS/LSV/CV/PITT/GITT/ and Conventional electrochemical performance;
- Automated Pressuring & Lock System reducing operational workload.

Application Scenarios

☑ High-throughput mold cell test

☑ High-throughput pressurized test of pouch cell

Models and Parameters

Model	MSST6008	MSST7008
Equipment dimensions (mm)	W850*D1100*H1930mm	W1200mm*D900*H1800
Temperature range	RT~80℃	
Temperature accuracy/resolution	±2℃/0.1℃	
Temperature fluctuation	Heating: ±0.5℃ ; Cooling:±1℃	
Temperature uniformity	±2℃	
Space	500 L (customizable)	780 L (customizable)
Sample holder	5-layer drawer design	5-layer drawer design，Double-row shelving
Application scenarios	• Compression and electrical performance testing for mold-type batteries • Swelling force monitoring for mold-type batteries • Swelling force testing for laminated/pouch cells	
Advantages	• 5-layer drawer design, easy to operate • High temperature uniformity enabled • Neat wiring layout with backplane circuit design	• Modular design with independently operable modules • Special air duct design ensuring uniform temperature distribution • Neat wiring layout

In-Situ Cell Swelling Analyzer 20T

Introduction

This 20T high-precision thermal testing platform features a robust metal/insulating material frame for mechanical stability and electrical insulation. It integrates servo-driven pressure control, high-precision thickness monitoring, and a charge/discharge system for in-situ cell force and thickness analysis.

Characteristics

- Auto-controlled lifting.
- Transparent window for real-time battery state observation.
- Integrated protective cover to isolate external interference.
- High-precision thickness sensor (measuring initial thickness and deformation).
- Cell temperature control (-20°C to 85°C), synchronized with charge/discharge equipment via host software.
- Automated data acquisition (time, thickness, pressure, temperature) with real-time display and export(Excel/CSV/TXT).
- Safety Protection: Halt testing and trigger alerts if parameters exceed predefined thresholds.

Models and Parameters

Model	SWE2T00	
Cell Size	400x300mm	
Equipment Dimensions	W	1110mm
	D	1670mm
	H	2250mm
Weight	1400Kg	
Temperature range	-20°C-85°C	
Temperature Control Precision	±2°C (No-Load)	
Test Mode	Constant pressure	
	Constant Gap	
	Steady/Transient State	
Cell Thickness	0.1-100mm	
Thickness Sensor Resolution/Accuracy	0.1μm/1μm	
Pressurization method	Servo Motor	
Pressure range	200kg-20T	

In-Situ Cell Swelling Analyzer 60T

Introduction

The 60T In-Situ Cell Swelling Analyzer features a temperature-controlled thermal platform (35–85°C) with a robust metal/stainless-steel frame. It integrates hydraulic pressure regulation, real-time thickness monitoring, and charge/discharge capabilities for in-situ analysis of cell expansion dynamics.

Characteristics

- Supports temperature control ranging from 35-85°C, for swelling test at high-temperature
- Constant Pressure Mode & Constant Gap Mode
- Automated data acquisition (time, thickness, pressure, temperature) with real-time display and export (Excel/CSV/TXT)
- Safety protection: Halt testing and trigger alerts if parameters exceed predefined thresholds

Models and Parameters

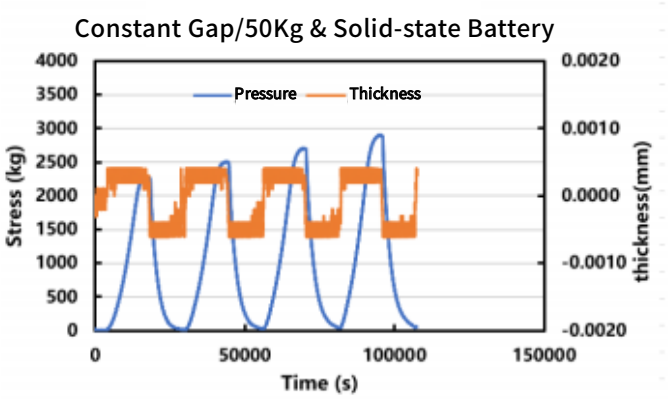
Model	ASST-60TT	
Cell Size	180x300mm	
Equipment Dimensions	W	550mm
	D	610mm
	H	1325mm
Weight	420Kg	
Temperature Range	35°C-85°C	
Temperature Control Precision	±2°C (No-Load)	
Test Mode	Constant Pressure	
	Constant Gap	
Cell Thickness Range	0-15mm	
Thickness Sensor Resolution/Accuracy	0.1μm/3μm	
Pressurization Method	Hydraulic	
Pressure Range	1T-60T	

Application Cases

Polymer-Based Battery Swelling Test

Cell Type	System	Capacity	Voltage Range	Temperature
505573	NCM/Gr	2.5Ah	3~4.2V	RT

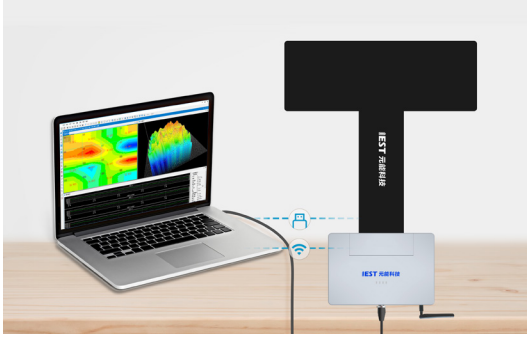
- **Device：SWE2D00**



High-throughput Pressure & Electric Coupling Test System

Introduction

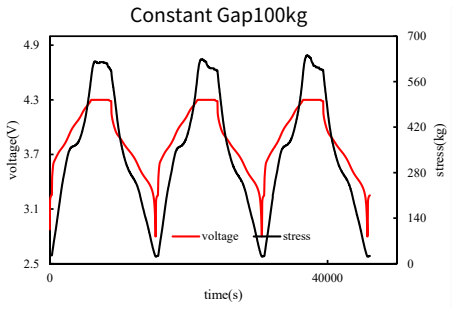
This temperature and pressure film can be adapted to all kinds of swelling equipment or test fixtures, and can monitor and measure the temperature and pressure distribution state of the battery in real time, providing accurate data support for battery performance optimization.



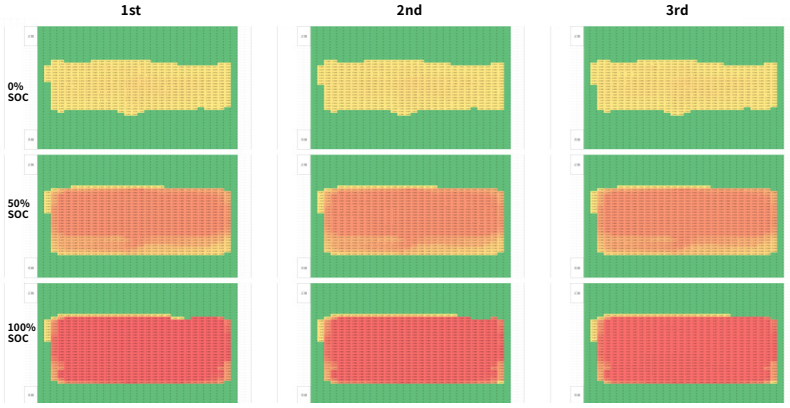
Models and Parameters

Model	Temperature Range	Temperature Accuracy	Temperature Points	Pressure Range	Pressure Accuracy	Density of Stress Points
BPD1100-T	-20~150℃	±1℃	15/64	10MPa	3%~10%F.S	248/cm²

Application Cases

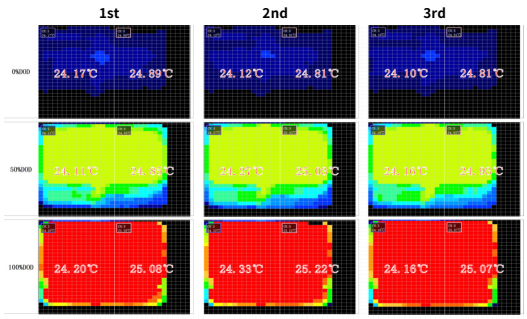


Cycle	Charge Swelling Force Variation(kg)	Discharge Swelling Force Variation(kg)
1	596.0	-571.0
2	605.0	-572.0
3	617.0	-573.0



3 cycles of pressure distribution data

The test results were consistent after three cycles test, and the pressure distribution under different SOC could be seen as well.



3 cycles of temperature distribution data

The test results were consistent after three cycles test, and the temperature distribution under different SOC could be obtained.

INNOVATIVE BATTERY TESTING SOLUTION PROVIDER

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