



THE EXPERT IN CERAMIC TESTING SERVICES AROUND YOU

BALAB Technology Co., Ltd (China)

- Tel: +86 18207135787 (Balab)
- E-mail: xpyang@balab.com.cn (Balab)
- Website: www.balab.com.cn (Balab)
- Add: Guanggu New Power 9-602, No. 219 Guanggu 2nd Road, Donghu High-tech Development Zone, Wuhan City, Hubei Province (Balab)

MatMeas Technology Co., Ltd

- Tel: +1 (909) 893-4045/+86 13927477372 (MatMeas/Coco Zhang)
- E-mail: sales@goodlab.com (MatMeas)
- Website: www.matmeas.com (MatMeas)
- Add: 25803 Rippey Glen dr Katy Houston TX US 77494 (MatMeas)



Contact balab



Contact MatMeas

PIEZO PREPARATION AND CHARACTERIZATION SOLUTIONS

www.balab.com.cn / www.matmeas.com

COMPANY PROFILE

BaLab Technologies, founded in 2013 and headquartered in China's Optic Valley—the East Lake National Innovation Demonstration Zone, is a National High-Tech Enterprise, Gazelle Enterprise, and Specialized, Refined, Distinctive, and Innovative SME. Driving progress through integrated innovation in materials science and electronic science, the company establishes three technological cornerstones: intelligent instrumentation, automated experimental equipment, and digital-intelligent systems. This foundation enables a comprehensive service ecosystem spanning functional materials R&D design, process optimization, performance characterization, and reliability verification. By forging the closed-loop technological framework of "Equipment Automation - Experimental Digital Intelligence - Data Modeling", BaLab delivers intelligent solutions to the global materials industry, powering the digital and intelligent transformation of materials R&D and production.

BALAB  **佰力博**

Contents

1. Introduction To Piezoelectric Ceramics	P/05
2. Piezoelectric Ceramics Preparation	
SPD corona high voltage polarimeter	P/15
OBP oil bath high pressure polarimeter	P/17
FCP thin film corona polarimeter	P/19
VBT Voltage Breakdown Tester	P/21
3. Piezoelectric Ceramic Detection	
High temperature platform series	P/25
Low temperature platform series	P/31
Instrument Product Series	P/35
4. Successful Case	P/39

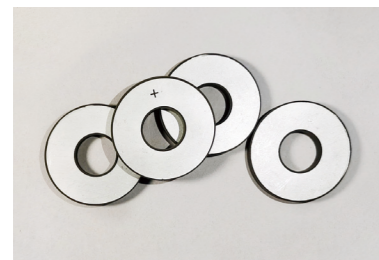
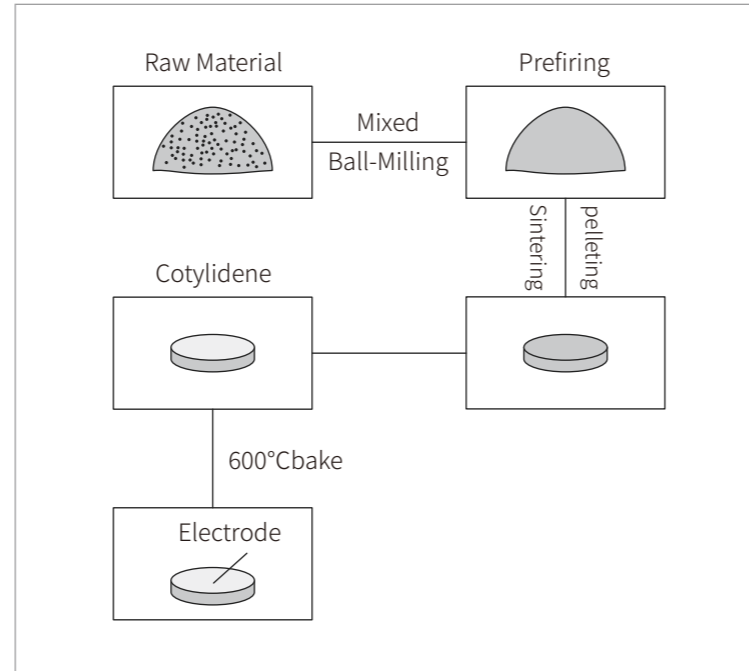


01

INTRODUCTION TO PIEZOELECTRIC ERAMICS

INTRODUCTION TO PIEZOELECTRIC CERAMICS

Piezoelectric ceramic is a type of information function ceramic material which can convert mechanical energy and electric energy into each other. Piezoelectric ceramics have been widely used in medical imaging, acoustic sensors, acoustic transducers, ultrasonic motors and so on. Piezoelectric ceramics use its material under the action of mechanical stress, cause the internal positive and negative charge center relative displacement and polarization, resulting in the surface of the material at both ends of the opposite side bound charge, that is, piezoelectric effect and made of sensitive characteristics. Piezoelectric ceramics are mainly used in the manufacture of ultrasonic transducers, hydroacoustic transducers, electro-acoustic transducers, ceramic filters, ceramic transformers, ceramic discriminators, high voltage generators, infrared detectors, surface acoustic wave devices, electro-optical devices, ignition detonators and piezoelectric gyroscopes.



Ring Piezoelectric Ceramic Plate



Tubular Piezoelectric Ceramic Elements



Piezoelectric Ceramic Strip

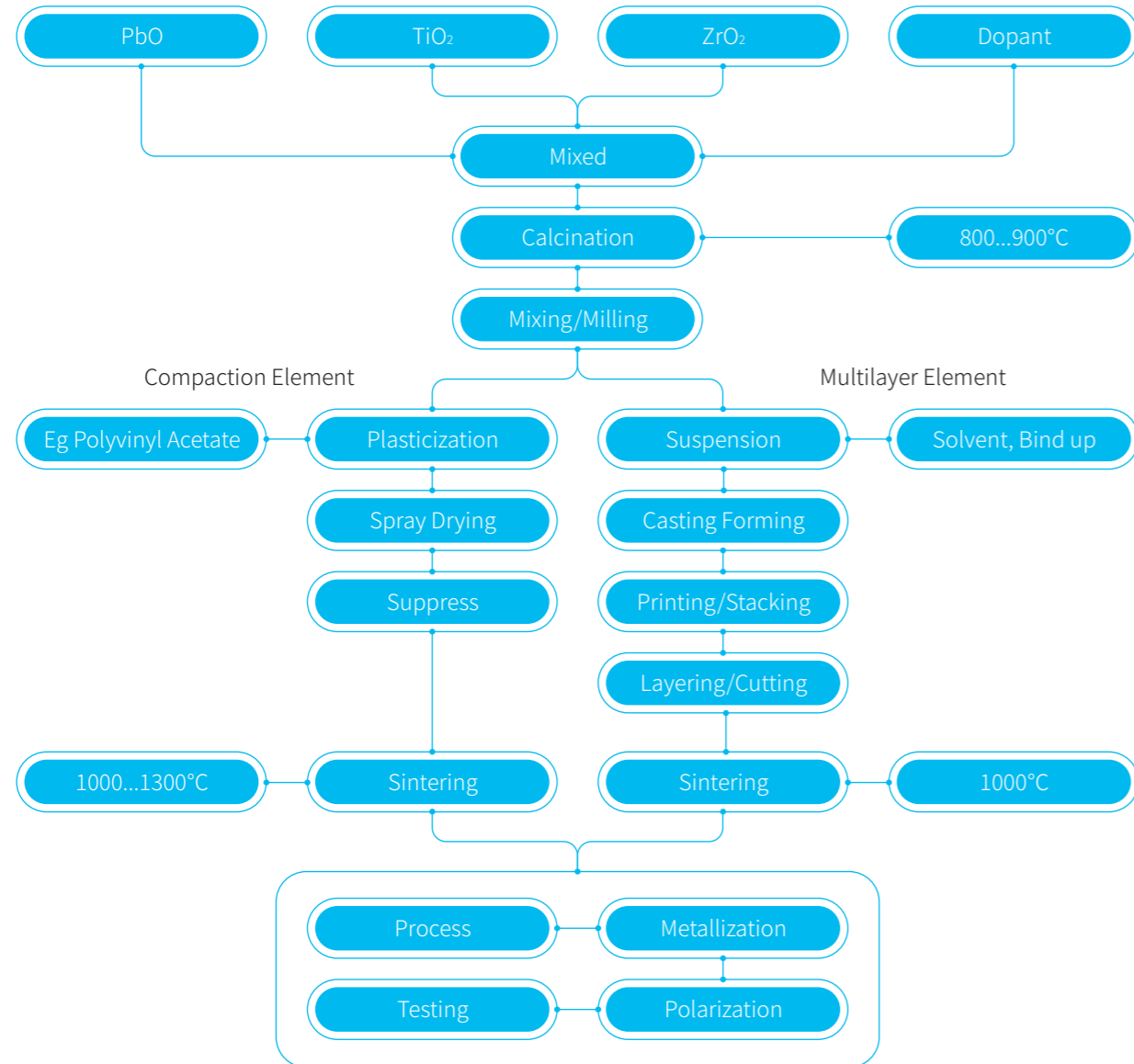


PVDF Piezoelectric Film

PIEZOCERAMICS TEST STANDARD

GB/T 3388-2002	Designations for types of piezoelectric ceramics
GB/T 15156-2015	Generic specification for piezoelectric ceramic transducing elements
GB/T 3389-2008	Test methods for the properties of piezoelectric ceramics - Test for the performance parameter
GB/T 16304-2008	Test methods of the properties for piezoelectric ceramics - Test for relation between electric field and strain
GB/T 3389.3-2001	Test methods of the properties for piezoelectric ceramics - Test method for Curie temperature
GB/T 3389.7-1986	Test methods for the properties of piezoelectric ceramics - Test for dielectric properties in high electric field
GB/T 3389.8-1986	Test methods for the properties of piezoelectric ceramics - Test for the pyroelectric coefficient
GB/T 6427-1999	Test method for frequency temperature stability of piezoelectric ceramic vibrator
GB 11310-1989	Test methods for the properties of piezoelectric ceramics - Test methods for temperature characteristics of relative free dielectric constants
GB/T 3389.2-1999	Test methods for the properties of piezoelectric ceramics - Static test for piezoelectric strain constant d33
GB/T 2414.2-1998	Test methods for the properties of piezoelectric ceramics - Transverse length extension vibration mode for bar
GB/T 3389.6-1997	Test methods for the properties of piezoelectric ceramics - Thickness-shear vibration mode for rectangular plate
GB/T 2414.1-1998	Test methods for the properties of piezoelectric ceramics - Radial extension vibration mode for disk
GB/T 3389.5-1995	Test methods for the properties of piezoelectric ceramics - Thickness extension vibration mode for disk
GB/T 3389.4-1982	Test methods for the properties of piezoelectric ceramics - Longitudinal length extension vibration mode for rod
GB 11320-1989	Test methods for the properties of piezoelectric ceramics - Material with the low mechanical quality factor
GB/T 11311-1989	Test methods for the properties of piezoelectric ceramics - Test for Poisson's ratio σ_E
GB/T 11312-1989	Test methods for SAW properties of piezoelectric ceramics and crystals
GB/T 11387-2008	Test methods for the properties of piezoelectric ceramics - Test for the static flexural strength
GB/T 2413-1980	Piezoelectric ceramic materials - Measuring methods for determination of volume density
GB/T 15750-2008	Test methods for the properties of piezoelectric ceramics - Test for the ageing properties
CB/T 3794-2014	Test methods for the properties of piezoelectric ceramics - Test for electrode joint strength
SJ/T 11469-2014	Test methods for the properties of piezoelectric ceramics - shear piezoelectric strain constant d15 testing on quasi-static principle

PIEZOELECTRIC CERAMIC MANUFACTURING PROCESS



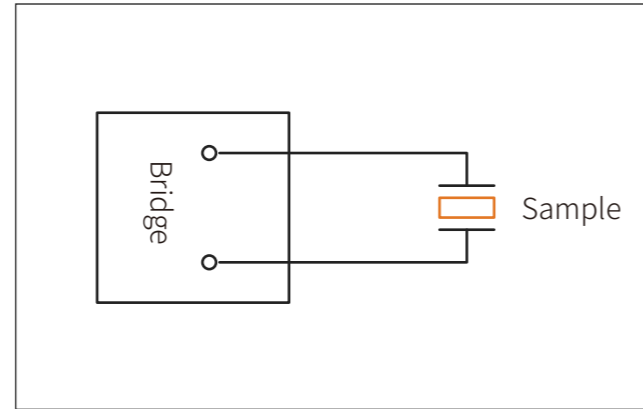
KEY PERFORMANCE PARAMETERS OF PIEZOELECTRIC CERAMICS

ϵ_{33}^T	Free Dielectric Constant	ϵ_{r3}^T	Relative Permittivity	D	Dielectric Loss	tgδ	Loss Tangent
Q _e	Electrical Quality Factor	Q _m	Mechanical Quality Factor	F _s	Series Resonance Frequency	F _p	Parallel Resonance Frequency
F _r	Resonance Frequency	F _a	Antiresonance Frequency	F _m	Maximum Admittance Frequency	F _n	Minimum Admittance Frequency
S _{11}^E}	Short circuit Elastic Compliance Constant	V _{1}^E}	Speed Of Sound	T _c	Curie Temperature	TK _f	Frequency Temperature Coefficient
d _{33}}	Piezoelectric Constant	g _{33}}	Piezoelectric Voltage Constant	e _{33}}	Piezoelectric Constant	N _t	Frequency Constant
k _p	Electro-mechanical Coupling Factor	k _{31}}	Electro-mechanical Coupling Factor	k _{33}}	Electro-mechanical Coupling Factor	k _t	Electro-mechanical Coupling Factor
k _{15}}	Electro-mechanical Coupling Factor	R	Resistance	ρ	Resistivity		

METHOD OF MEASUREMENT

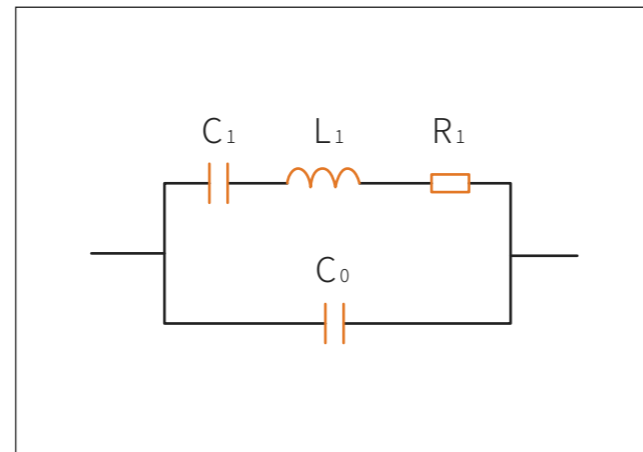
1. Principle of AC impedance measurement

The sample is connected to the input ends of the fixture, as shown in the figure, the output voltage of the instrument is adjusted, the frequency of the electrical output is adjusted, the impedance spectrum is scanned, and the piezoelectric ceramic parameters and equivalent circuit parameters are obtained directly through the software.



2. Piezoelectric ceramic equivalent circuit

The electromechanical characteristics of a single mode free vibrating piezoelectric ceramic oscillator near its resonant frequency can be expressed by the equivalent circuit in the figure, which consists of a series branch composed of a dynamic capacitor C_1 , a dynamic inductor L_1 , and a dynamic resistor R_1 in parallel with a parallel capacitor C_0 .



3. Characteristic Frequency

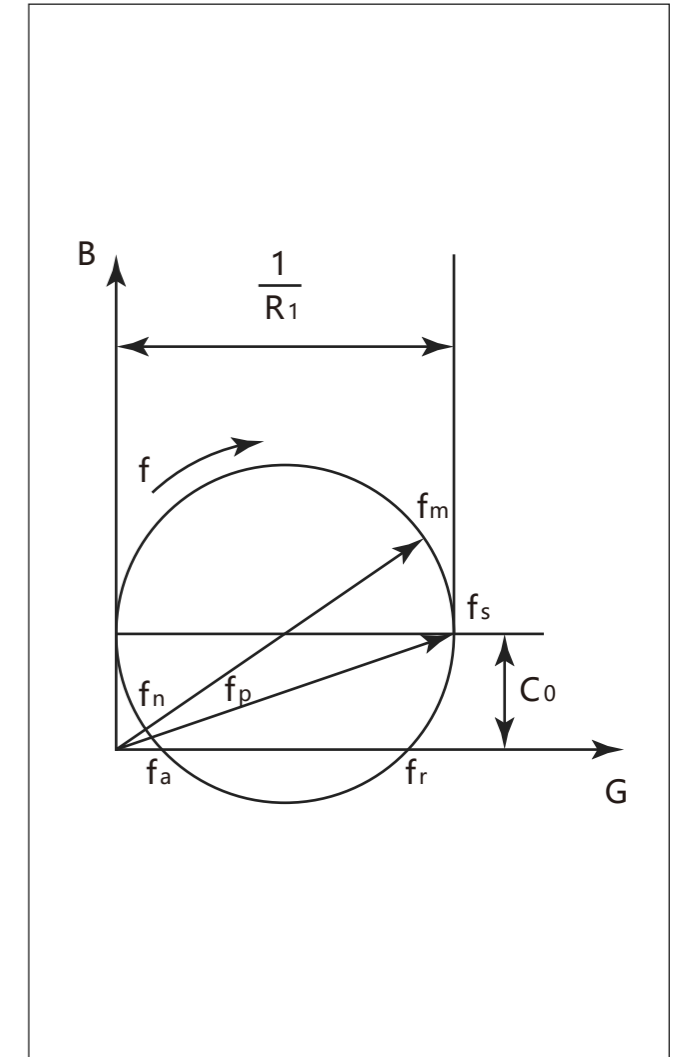
In the coordinate plane of conductance susceptance, as the frequency changes, the series branch admittance. The vector terminal trajectory is a circle. When the mechanical quality factor Q_m is large, ωC_0 changes little in the resonance region, so it can be seen as a constant. Without considering the dielectric loss, the circle diagram of piezoelectric ceramic oscillator admittance (as shown in the figure) can obtain the following six characteristic frequencies:

- f_s ----Series Resonant Frequency
- f_a ----Antiresonance Frequency
- f_p ----Parallel Resonance Frequency
- f_m ----Maximum Admittance Frequency
- f_r ----Resonance Frequency
- f_n ----Minimum Admittance Frequency

In general, $f_m < f_s < f_r$; $f_n > f_p > f_a$; $(f_m - n) > (f_p - f_s) > (f_a - f_r)$;

When the figure of merit M of the oscillator is high, Under the first approximation $f_m = f_s = f_r$; $f_n = f_p = f_a$;

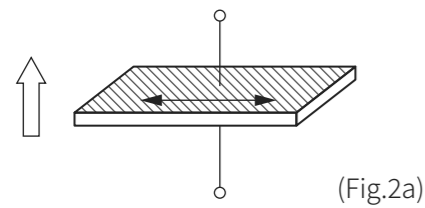
When the figure of merit M of the oscillator is low, with $(f_m - n)$ replace $(f_p - f_s)$ Performance calculation parameters need to be corrected.



BASIC VIBRATION MODES OF PIEZOELECTRIC CERAMIC RESONATORS



1. Transverse length extension vibration mode for bar



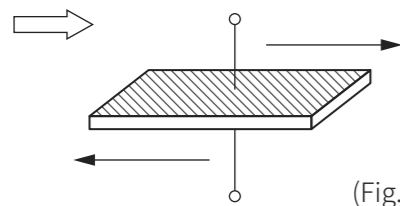
(Fig.2a)

Dimensional ratio

$$\frac{l}{t, w} > 5$$

The direction of polarization is the same as the direction of electrode energization, and the direction of sample displacement is perpendicular to the direction of energizing.

2. Thickness-shear vibration mode for rectangular plate

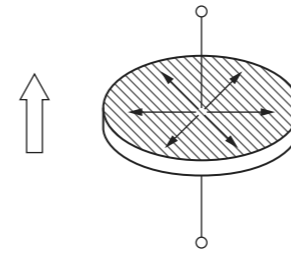


(Fig.2e)

$$\frac{l}{t, w} > 3.5$$

The polarization direction is perpendicular to the energized electrode direction, and the sample displacement direction is tangential to the thickness.

3. Radial extension vibration mode for disk

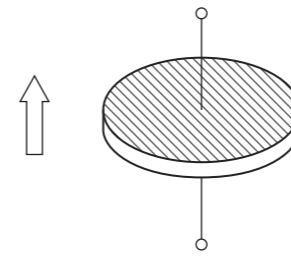


(Fig.2b)

$$\frac{d}{t} > 10$$

The polarization direction is the same as the direction of the energized electrode, and the sample displacement direction is divergent.

4. Thickness extension vibration mode for disk

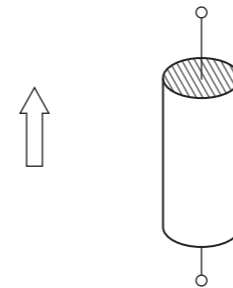


(Fig.2c)

$$\frac{d}{t} > 10$$

The polarization direction is consistent with the energized electrode direction, and the sample displacement direction is consistent with the energized direction.

5. Longitudinal length extension vibration mode for rod



(Fig.2d)

$$\frac{l}{d} > 2.5$$

The polarization direction is consistent with the energized electrode direction, and the sample displacement direction is consistent with the energized direction.

THREE ELEMENTS OF POLARIZATION

Polarization Electric Field

Only when the polarized electric field is the electric field can the electric domains be aligned in the direction of the electric field, so it is the main factor in the polarization condition. The higher the polarized electric field, the greater the role of promoting the arrangement of electric domains, and the more complete the polarization. Therefore, the polarized electric field is reduced accordingly, and the polarization effect is achieved by increasing the polarization temperature and prolonging the polarization time.

Polarization Temperature

Under certain conditions of polarized electric field and polarization time, the higher the polarization temperature, the easier the domain orientation arrangement and the better the polarization effect. Because increasing the polarization temperature can shorten the polarization time and improve the polarization efficiency.

Polarization Time

Polarization time refers to the holding time required for ceramic products to transition from one equilibrium state to another. For a long time, the domain steering arrangement is sufficient, and it is conducive to the relaxation of stress during polarization.



02

PREPARATION OF
PIEZOELECTRIC
CERAMICS

SPD CORONA POLARIZATION

Suitable for single sample, air corona polarization



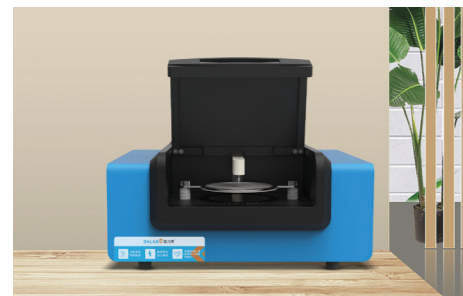
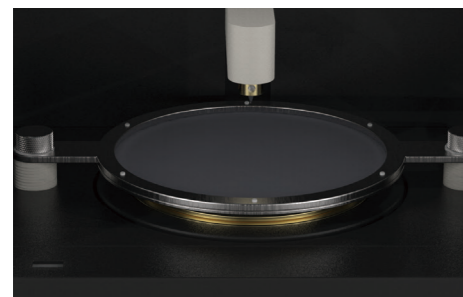
Scan code to watch, teaching video







SPD corona polarization is developed for the practice of piezoelectric ceramic polarization in colleges and universities, the equipment is precise and compact, the operation is simple and fast, suitable for the polarization of thin film and powder materials, so that students can be familiar with and master the polarization method of piezoelectric ceramic materials, cultivate their theoretical practice, analysis and problem solving ability. It is a teaching experimental instrument necessary for piezoelectric ceramic polarization research.



TECHNICAL SPECIFICATION

Polarization Mode: Air Corona	Temperature Slope: 3°C/min、6°C/min、9°C/min
Sample Quantity: 1	Temperature Range: RT~180°C
Polarization Voltage: 0~20KV optional	Sample Material: Film/powder
Polarization Current: 1mA/Max	Sample Size: $\phi \leq 50\text{mm}$, $d \leq 10\text{mm}$
Temperature Accuracy: $\pm 3^\circ\text{C}$	Equipment Size: 325×300×160mm (L/W/H)
Temperature Control Mode: PID	Power Supply: 220V/50Hz~60Hz, 300W
Voltage Output Accuracy: 5%	Weight: 12kg
Minimum Sense Current: 100nA or more	Warranty Period: 1 year



- 01 Integrated design, compact and easy to operate; 
- 02 Safe and reliable, with breakdown protection and breakdown alarm function; 
- 03 Visualization, real-time monitoring of voltage, current, time; 
- 04 Alarm, breakdown protection, current protection, cut off function; 
- 05 Diversified, adapted to the needs of different material samples; 
- 06 One-key polarization to get the best polarization effect; 

PN	MODEL	PRODUCT DESCRIPTION
050102015	SPD30KVPOS	0~20KV; 1mA; RT-180°C; CH1; $\phi \leq 50\text{mm}$, $d \leq 10\text{mm}$; film/powder; Single circuit; 110~130V/60Hz;
050102001	SPD30KVPOS	0~20KV; 1mA; RT-180°C; CH1; $\phi \leq 50\text{mm}$, $d \leq 10\text{mm}$; film/powder; Single circuit; 220~240V/50Hz;

OBP OIL BATH HIGH PRESSURE POLARIMETER

Suitable for single-sample, oil-bath polarization



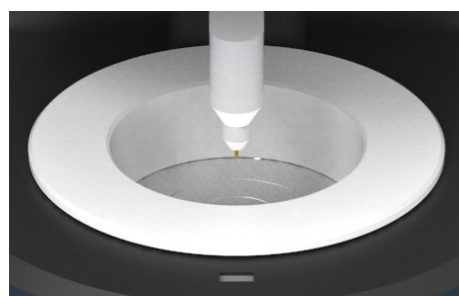
Scan code to watch, teaching video

OBP oil bath high pressure polarimeter is developed for the practice of piezoelectric ceramic polarization in colleges and universities. The equipment is precise and compact, the operation is simple and fast, and it is suitable for the polarization of block and sheet materials. By mastering and constantly optimizing the experimental preparation process, piezoelectric ceramics can achieve the best polarization effect, and are widely used in aerospace, laser gyro, adaptive optics, precision machinery, automatic control, semiconductor integration, biomedical engineering and other technical fields.



TECHNICAL SPECIFICATION

Polarization Mode: Oil bath polarization	Temperature Slope: 3°C/min, 6°C/min, 9°C/min
Sample Quantity: 1	Temperature Range: RT~180°C
Polarization Voltage: 0~10/30KV optional	Sample Material: thin film / bulk samples
Polarization Current: 1mA/Max	Sample Size: $\phi \leq 50\text{mm}$, $d \leq 10\text{mm}$
Temperature Accuracy: $\pm 3^\circ\text{C}$	Equipment Size: 345 × 335 × 243mm (L/W/H)
Temperature Control Mode: PID	Power Supply: 220V/50Hz~60Hz, 600W
Voltage Output Accuracy: 5%	Weight: 16kg
Minimum Sense Current: 100nA or more	Warranty Period: 1 year



01 Each channel has detection, current protection, cut-off function and alarm prompt.



02 The intelligent monitoring function can observe the polarization current and help you find the best polarization conditions.



03 Isolation shielding technology and safe interlock function are used to avoid misoperation.



04 Polarization of various forms of samples, a variety of choices, trustworthy.



05 High-definition liquid crystal display, visual automatic operation, indicator light real-time monitoring.



06 Integrated design, with excellent ease of use.



PN	MODEL	PRODUCT DESCRIPTION
050102016	OBP10KVPOS	Maximum 10KV/1mA; Maximum temperature 180°C; Temperature Accuracy $\pm 3^\circ\text{C}$; 110~130V/60Hz;
050102002	OBP10KVPOS	Maximum 10KV/1mA; Maximum temperature 180°C; Temperature Accuracy $\pm 3^\circ\text{C}$; 220~240V/50Hz;
050102022	OBP30KVPOS	Maximum 30KV/1mA; Maximum temperature 180°C; Temperature Accuracy $\pm 3^\circ\text{C}$; 110~130V/60Hz;
050102021	OBP30KVPOS	Maximum 30KV/1mA; Maximum temperature 180°C; Temperature Accuracy $\pm 3^\circ\text{C}$; 220~240V/50Hz;

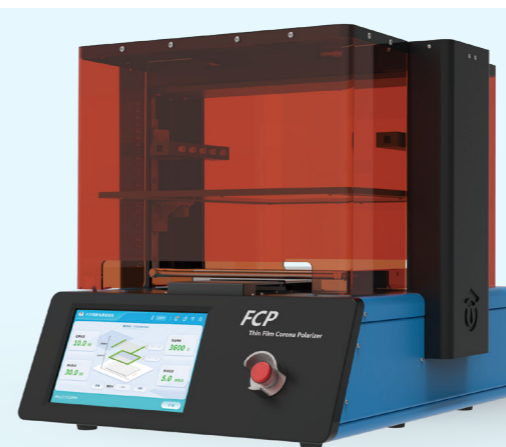
FCP THIN FILM CORONA POLARIMETER

Suitable for large samples, Oil bath polarization



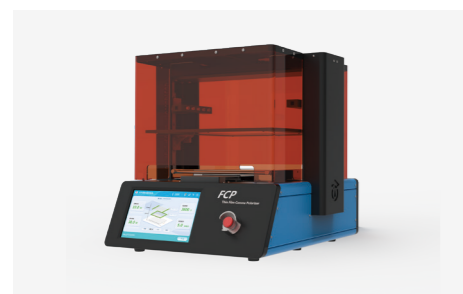
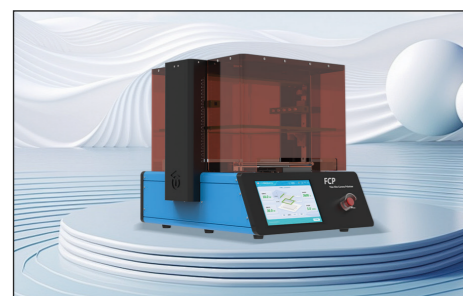
Scan code to watch, teaching video







FCP thin film corona polarizer is developed for the laboratory-scale production of piezoelectric polymer films. Through proficient mastery and continuous optimization of the experimental preparation process, the piezoelectric films can achieve the best polarization effect. And it is widely applied in technical fields such as high-voltage power equipment, electron microscopes, ion implantation, sensors, capability collection and storage, acoustic technology, medical devices, aerospace and defense, vibration control and noise elimination, etc.



TECHNICAL SPECIFICATION

Polarization Mode: Air corona	Temperature Slope: 0~10°C/min (Typical value 3°C/min)
Sample Quantity: 1	Temperature Range: RT~150°C
Polarization Voltage: 30KV	Sample Material: film sample
Polarization Current: 1mA/Max	Sample Size: 148mm*210mm
Temperature Accuracy: ±5°C	Equipment Size: 458×505×450mm (L/W/H)
Temperature Control Mode: PID	Power Supply: 220V/50Hz~60Hz, 600W
Voltage Output Accuracy: 5%	Weight: 32kg
Minimum Sense Current: 100nA or more	Warranty Period: 1 year



- 01 Corona voltage -30KV ~ 0KV, corona film polarization. 
- 02 Built-in 2 independent power supply module, mutual. 
- 03 The A5 size film can be polarized once, and the polarization efficiency is high. 
- 04 Single wire electrode clamp, neither damage the sample, from. 
- 05 The contact between the film electrode and the sample plate is good. 
- 06 Intelligent control electrode fixture system, operation. 

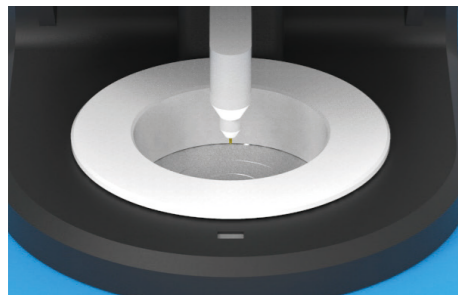
PN	MODEL	PRODUCT DESCRIPTION
050102024	FCP30KVNEG	A5 size; 30KV / 1mA; accuracy 5%; ≤150°C; ±5°C; 110~130V/60Hz;
050102023	FCP30KVNEG	A5 size; 30KV / 1mA; accuracy 5%; ≤150°C; ±5°C; 220~240V/50Hz;

VBT VOLTAGE BREAKDOWN TESTER

Measured parameters: withstand voltage breakdown test



Scan code to watch, teaching video









VBT voltage breakdown tester is a specialized equipment for evaluating the dielectric strength of piezoelectric ceramics, the equipment can not only directly test the maximum voltage value of piezoelectric ceramics in the breakdown damage and the maximum voltage value in normal operation, it can also design high voltage breakdown isolation technology to ensure that the equipment is safe and reliable. It is widely used in universities, research institutes and enterprises to study and test the dielectric strength of piezoelectric ceramics necessary for reliability and verification to process equipments.



TECHNICAL SPECIFICATION

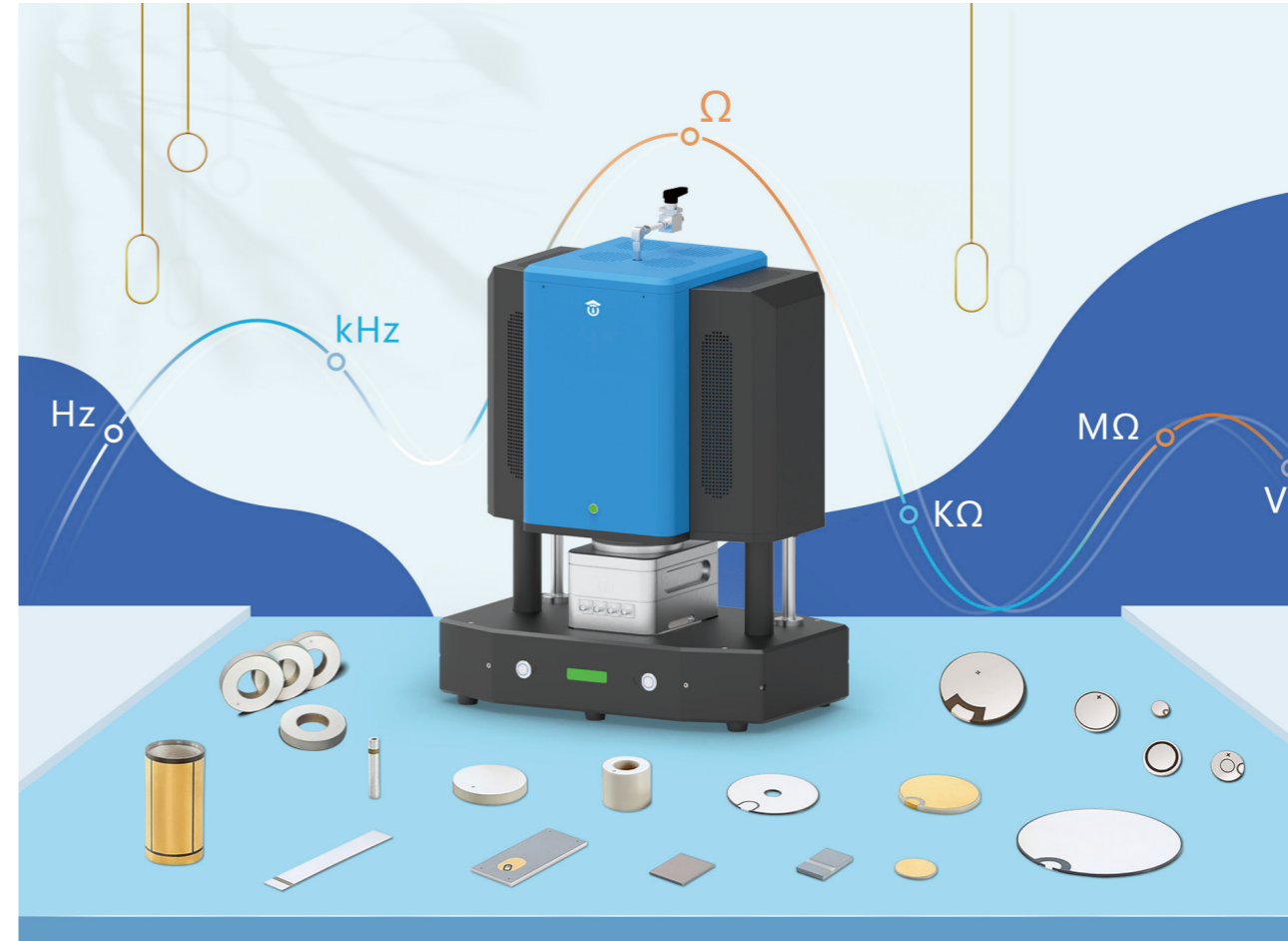
Temperature Range: RT~180°C	Current Range: 100nA~1mA
Temperature Accuracy: ±3°C	Environment: silicone oil
Temperature Slope: 3°C/min, 6°C/min, 9°C/min	Sample Size: $\phi < 10\text{mm}, d < 5\text{mm}$
Test Voltage: 0~50KV DC	Equipment Size: 350X325X195mm(L/W/H)
Voltage Accuracy: 5%	Power Supply: 220V/50Hz~60Hz, 480W
Boost Rate: <5KV/s	Weight: 15.5kg
Step Up Pressure: >10KV	Warranty Period: 1 year

- 01 Evaluate the maximum voltage value when the piezoelectric ceramic is broken down and evaluate the maximum voltage value during normal operation. 
- 02 Using 50 KV digital high voltage generator, small size, high precision. 
- 03 High voltage interlock breakdown isolation technology, safe and reliable. 
- 04 With breakdown protection and breakdown alarm function. 
- 05 With uniform breakdown and withstand voltage mode, etc. 
- 06 Scanning code with online teaching. 

PN	MODEL	PRODUCT DESCRIPTION
050102026	VBT50KVPOS	Maximum 50KV / 1mA; accuracy 5 %; maximum temperature 180 °C; ± 3 °C; 110~130V/60Hz;
050102025	VBT50KVPOS	Maximum 50KV / 1mA; accuracy 5 %; maximum temperature 180 °C; ± 3 °C; 220~240V/50Hz;

OPTIONAL PIEZOELECTRIC CERAMIC POLARIZATION FIXTURE

Product	Polarization Mode	Sample Quantity
	SPD corona polarization	1
	OBP oil bath polarization	1
	FCP corona polarization	1



03

PIEZOELECTRIC
CERAMICS
TESTING

HTS1000 HIGH TEMPERATURE DIELECTRIC TEST PLATFORM

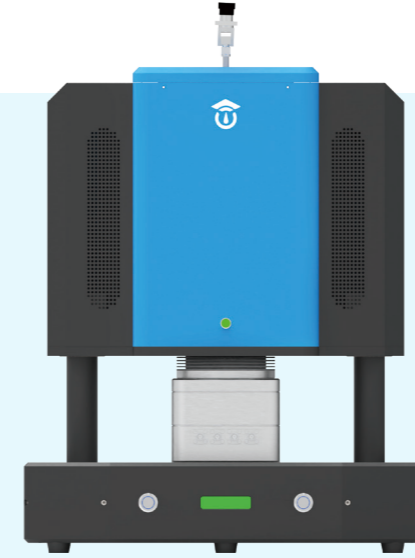
Measured parameters:

curie temperature, cole-cole diagram



Scan code to watch, teaching video

Dozens of engineers and users from BALAB meticulously analyzed, adjusted, overturned and resolved, giving a brand-new definition to the high-temperature dielectric impedance temperature spectrometer. The brand-new high-temperature dielectric testing system not only upgrades the electrode fixture measurement platform but also enables the measurement of both single and four-sample bulk materials. It also upgrades the sealable metal shielded heating system, which can create more measurement environments to meet the diverse needs of scientific research.



TECHNICAL SPECIFICATION

Temperature Range: RT-800°C

Electrode Material: platinum

Temperature Accuracy: $\pm 1^\circ\text{C}$

Sample Size: $\phi \leq 20\text{mm}, d \leq 5\text{mm}$

Temperature Slope: 0-10°C/min

Equipment Size: 480×320×830mm(L/W/H)

Heating Method: resistance wire heating

Power Supply: 220V/50Hz~60Hz, 1600W

Frequency Range: 10Hz~10MHz

Weight: 46kg

Environment: air/flow/vacuum

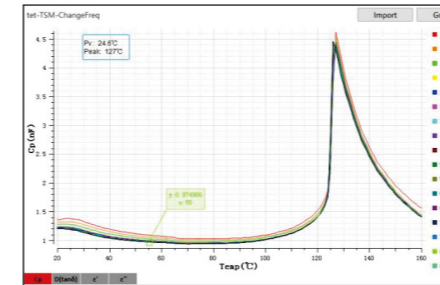
Warranty Period: 1 year



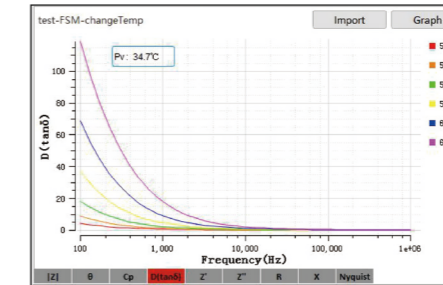
- 01 Provides broadband dielectric impedance measurement solutions.
- 02 Patent fixture, temperature data does not jump, temperature does not lag.
- 03 Temperature control is accurate and the measurement data does not fluctuate.
- 04 Factory calibration, accurate and reliable measurement results.
- 05 A variety of atmosphere environment measurement to meet the needs of personalized scene measurement.
- 06 Accord ASTM D150, D2149-97 and T1409-2006 test standards.



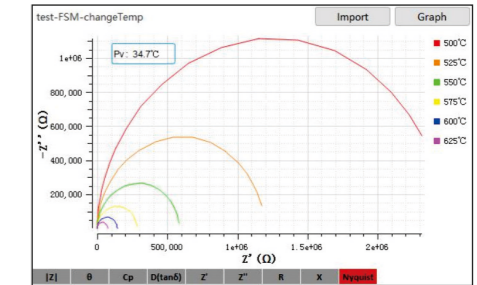
MEASUREMENT DATA GRAPH



Dielectric/impedance temperature spectrum measurement



Dielectric/impedance spectrum measurement



Impedance Quine curve

PN

MODEL

PRODUCT DESCRIPTION

050202005

HTS1000DE

RT-800°C; CH1/CH4; $\phi \leq 20\text{mm}, d \leq 5\text{mm}$; block/thin sample; air/flow/vacuum; 110~130V/60Hz;

050202001

HTS1000DE

RT-800°C; CH1/CH4; $\phi \leq 20\text{mm}, d \leq 5\text{mm}$; block/thin sample; air/flow/vacuum; 220~240V/50Hz;

HTS1000 HIGH TEMPERATURE RESISTANCE TEST PLATFORM

Measurement parameter:

High temperature resistivity, Leakage current



Scan code to watch, Teaching video

HTS1000 Resistance Temperature Spectrometer is a device specifically designed for evaluating insulation materials. This system accurately evaluates the conductivity of piezoelectric ceramics, and also evaluates the relationship between the resistivity of piezoelectric ceramics and temperature and time under conditions such as high temperature, air, flowing atmosphere, and vacuum atmosphere. It has been highly recognized by industry customers such as Shanghai Silicon Institute and Huawei, and is a necessary characterization tool for universities, research institutes, and enterprises to research and conduct test of the insulation performance of piezoelectric ceramics.



TECHNICAL SPECIFICATION

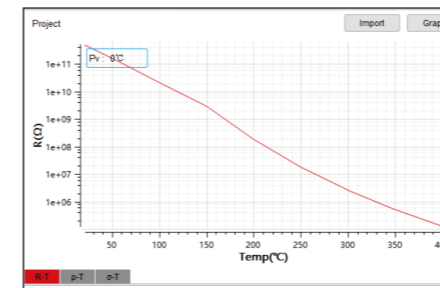
Temperature Range : RT~800°C	Passage: 1
Temperature Accuracy : $\pm 1^\circ\text{C}$	Sample Size: $\text{OD} \leq 30\text{mm}$, $t \leq 5\text{mm}$
Temperature Slope : $0 \sim 10^\circ\text{C}/\text{min}$	Electrode Material: Platinum
Heating Method: Resistance wire heating	Equipment Size: $480 \times 320 \times 830\text{mm}(\text{L}/\text{W}/\text{H})$
Resistance Range : $10^3\Omega \sim 10^{15}\Omega$	Power Supply: 220V/50Hz~60Hz, 1600W
Measuring Range : 500fA ~ 20mA	Weight: 46kg
Environment : Air/Flow/Vacuum	Warranty Period: 1 year



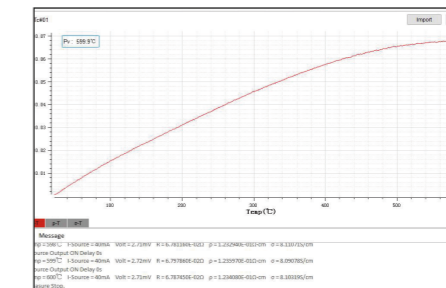
- 01 Implement a solution for measuring resistivity between $10^3\Omega \sim 10^{15}\Omega$.
- 02 Imported corundum liner, resistant to high temperature and oxidation, capable of achieving various environmental measurements.
- 03 Patent fixture, temperature measurement data does not skip points, and temperature does not lag.
- 04 Easily implementing various experimental environments such as diverse atmospheres, making it easy for you to cope with more complex challenges.
- 05 The system comes with a temperature calibration function to keep the measured temperature as consistent as possible with the actual temperature of the sample.
- 06 Built in common key measurement parameters, five step operation, easy to obtain the best measurement results.



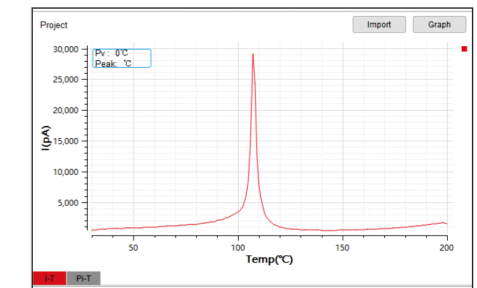
MEASUREMENT DATA GRAPH



R-Ts



R-Tc



TSDC

PN	MODEL	PRODUCT DESCRIPTION
050202005	HTS1000HR	RT~800°C; $10^3\Omega \sim 10^{15}\Omega$; CH1; Bulk sample; $\text{OD} \leq 30\text{mm}$, $t \leq 5\text{mm}$; Air/flow/vacuum; 110~130V/60Hz;
050202001	HTS1000HR	RT~800°C; $10^3\Omega \sim 10^{15}\Omega$; CH1; Bulk sample; $\text{OD} \leq 30\text{mm}$, $t \leq 5\text{mm}$; Air/flow/vacuum; 220~240V/50Hz;

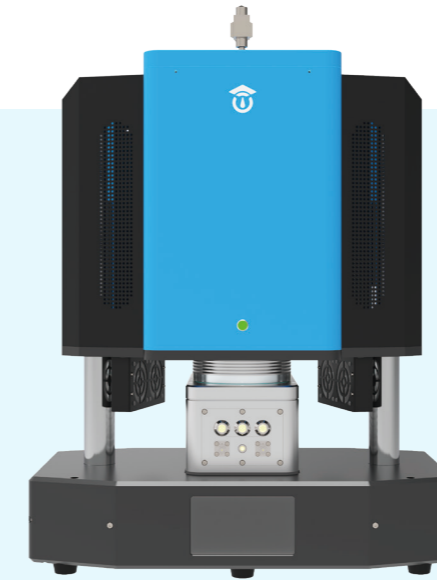
HTS1000 HIGH TEMPERATURE PIEZOELECTRIC TEST PLATFORM

Measured parameters:
piezoelectric constant, d33;



Scan code to watch,
teaching video

HTS1000 piezoelectric temperature spectrometer is designed and developed on the basis of the static d33 approved by the Chinese Academy of Acoustics, which is specially used to evaluate the high temperature characteristics of piezoelectric ceramics. It can directly analyze the piezoelectric temperature spectrum of the sample piezoelectric constant d33 with the change of temperature. Compared to the traditional d33 measuring instrument, the PMS series of piezoelectric temperature spectrometer is used to measure the force and charge before delivery to ensure the measurement accuracy and reliability, which is highly recognized by Tsinghua, Shanghai Silicon Institute, China Southern Airlines and other industry customers. It can be widely used in the evaluation and measurement of piezoelectric materials (piezoelectric ceramics, polymers), ferroelectric materials and related devices.



TECHNICAL SPECIFICATION

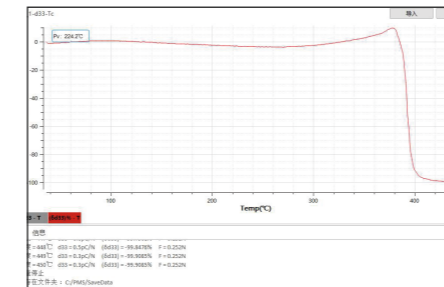
Temperature Range: RT~800°C	Frequency: 110Hz
Temperature Accuracy: ±1°C	Measurement Mode: d33-T/d33-t
Temperature Slope: 0~10°C/min	Sample Size: $\phi \leq 34\text{mm}$, $d \leq 20\text{mm}$
Heating Method: resistance wire heating	Equipment Size: 480×320×830mm(L/W/H)
d33: 0~2000pC/N	Power Supply: 220V/50Hz-60Hz, 1600W
Dynamic Forces: 0.25N	Weight: 46kg
Static Force: 10N	Warranty Period: 1 year



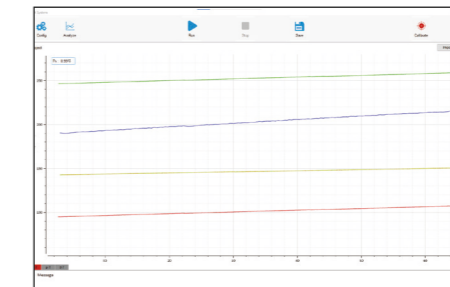
- 01 Specially used for piezoelectric material d33 constant measurement, accurate and reliable data.
- 02 The electrode adopts modular design, which can determine the measurement of variable frequencies and variable forces.
- 03 High purity platinum electrode, high temperature and oxidation resistance, small contact resistance.
- 04 Automatic calibration of dynamic force 0.25N, measurement data does not drop, and temperature does not lag.
- 05 Integrated design, built-in commonly used key measurement parameters, five-step operation, easy to obtain the best measurement results.
- 06 Accord GB3389.4-82 "Piezoelectric ceramic material performance test method longitudinal piezoelectric strain constant d33 static test".



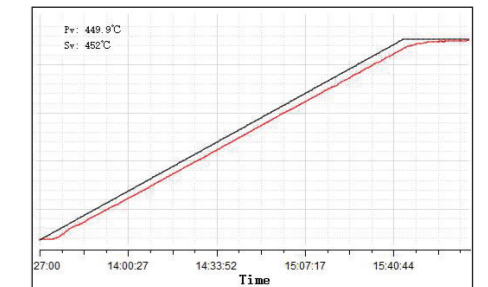
MEASUREMENT DATA GRAPH



d33-T



d33-t



temperature control curve

PN	MODEL	PRODUCT DESCRIPTION
050202005	HTS1000PE	RT-800°C; 0-2000pC/N; 0.25N; 110Hz; CH1; 110~130V/60Hz;
050202001	HTS1000PE	RT-800°C; 0-2000pC/N; 0.25N; 110Hz; CH1; 220~240V/50Hz;

PEMS IN-SITU PIEZOELECTRIC TESTING SYSTEM

Measured parameters:
piezoelectric constant, d33;



Scan code to watch,
teaching video

PEMS In-situ piezoelectric testing system is a dedicated in-situ analysis and measurement instrument for piezoelectric constants of high-temperature piezoelectric materials developed by Bailibo Technology following the Chinese Institute of Acoustics. It can analyze the curves of the constants d33, d31 and d15 of the tested samples changing with temperature, frequency and time. By adopting the technology of simultaneously applying and measuring static and dynamic forces, it ensures that the static holding force of each sample remains consistent, resulting in higher measurement accuracy, wider measurement range, higher reliability and repeatability. It is an essential instrument for the production, application and research departments of high-temperature piezoelectric materials and piezoelectric components.



TECHNICAL SPECIFICATION

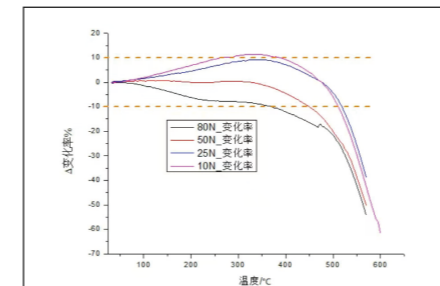
Temperature Range: -60°C~450°C	The frequency of force: 30Hz~200Hz (default: 110Hz)
Temperature Accuracy: ±1°C	Resonant frequency: 10Hz~8MHz
Temperature Slope: 0~10°C/min	Impedance range: 25mΩ~10MΩ
Heating power: 1000W	Resonance method d33/d31/d15
d33: 0~2000pC/N, Minimum resolution 0.1pc/N	Sample size: φ<34mm, T<20mm
F dynamic force: 0.1N ~ 0.5N, minimum step 0.05N	Equipment Size: 600×540×1530mm(L/W/H)
Static force: 1 ~ 50N, minimum step 1N, precision0.1N	Warranty Period: 1 year



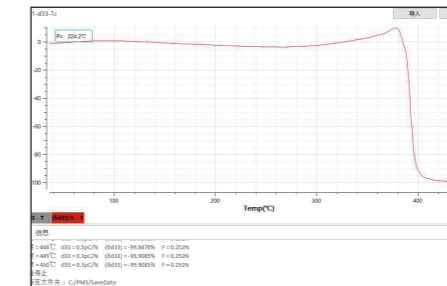
- 01 The first of its kind in China, with a maximum temperature range of -60°C to 450°C.
- 02 The new generation of quasi-static d33 measuring instrument developed by adopting phase-locked amplification technology.
- 03 The piezoelectric constants d33, d31 and d15 of piezoelectric materials can be measured.
- 04 Both static and dynamic forces can be applied simultaneously, resulting in higher measurement accuracy and a wider measurement range.
- 05 Variable force precise measurement, fully meeting the demands of various application scenarios.
- 06 It is equipped with an RS232 USB interface, allowing for one-click export of read data.



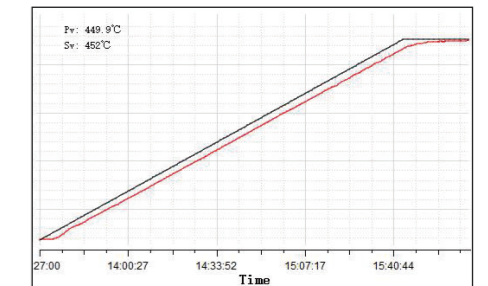
MEASUREMENT DATA GRAPH



d33-N



d33-T



temperature control curve

PN MODEL PRODUCT DESCRIPTION

050202003	PEMS3000	RT~450°C; 0-2000pC/N; 0.1N~0.5N; 30Hz~200Hz(default: 110Hz);
050202004	PEMS3000LN	-60°C~450°C; 0-2000pC/N; 0.1N~0.5N; 30Hz~200Hz(default: 110Hz);

DMS2000 DIELECTRIC TEMPERATURE SPECTROMETER

Measured parameters:
curie temperature, cole-cole diagram



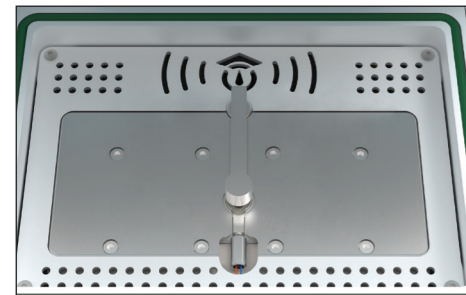
Scan code to watch,
teaching video

DMS2000 dielectric temperature spectrometer is a device specially used to evaluate the dielectric properties of dielectric materials in high and low temperature environment. The system adopts the principle of parallel plate capacitor combined with ASTM D150 standard design and development, a new generation of dielectric impedance temperature spectrometer, which can not only realize single sample and five sample block test models; but can also, with the self-developed LNP-95 liquid nitrogen injection system, it can achieve continuous temperature change test of -160°C~450°C to meet the diversified needs of scientific research.



TECHNICAL SPECIFICATION

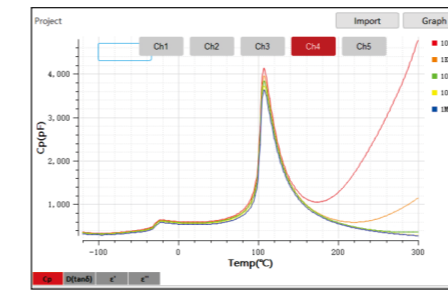
Temperature Range: -160°C~450°C	Sample Size: $\phi < 20\text{mm}, d < 5\text{mm}$
Temperature Accuracy: $\pm 1^\circ\text{C}$	Electrode Material: silver
Temperature Slope: 0-10°C/min	Equipment Size: 547×380×326mm(L/W/H)
Heating And Cooling Method: resistance wire heating/liquid nitrogen cooling	Power Supply: 220~240V, 50Hz/60Hz
Frequency Range: 20Hz~10MHz	Weight: 25kg
Accuracy: 0.05%	Warranty Period: 1 year
Environment: vacuum	



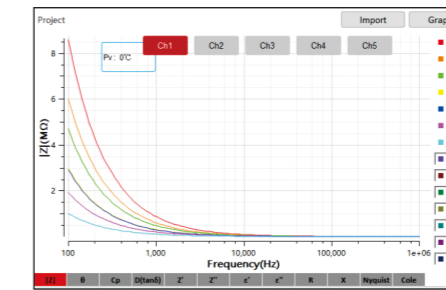
- 01** Provide broadband dielectric impedance measurement solutions.
- 02** Environmental measurement of continuous rise and fall from -160°C to 450°C.
- 03** The temperature control is accurate and high, and the measurement data does not jump.
- 04** Vacuum insulation, sample near 0°C no water peak appearance.
- 05** Liquid nitrogen transfer pump, easy to achieve accurate measurement of rise and fall.
- 06** Compliance standards: ASTM D150, D2149-97 and T1409-2006.



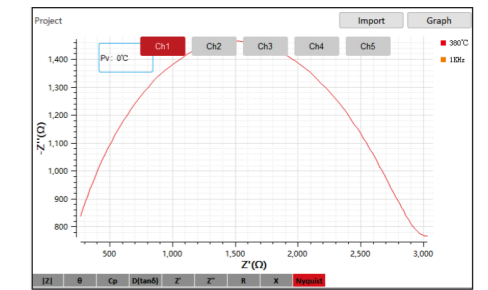
MEASUREMENT DATA GRAPH



Dielectric/impedance temperature spectrum measurement



Dielectric/impedance spectrum measurement



Impedance Quine curve

PN	MODEL	PRODUCT DESCRIPTION
050203010	DMS2000	-160°C~450°C; CH1; 20Hz~10MHz; vacuum; 110V~130V/60Hz;
050203001	DMS2000	-160°C~450°C; CH1; 20Hz~10MHz; vacuum; 220V~240V/50Hz;

CPS7000 LOW TEMPERATURE VACUUM PROBE STATION

Measurement parameter:

Dielectric, Piezoelectric, TSDC



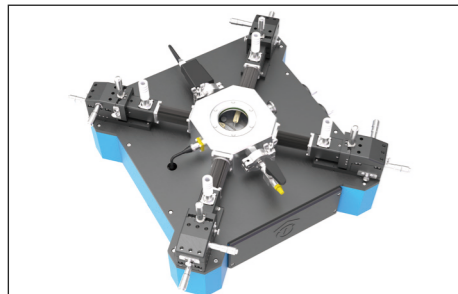
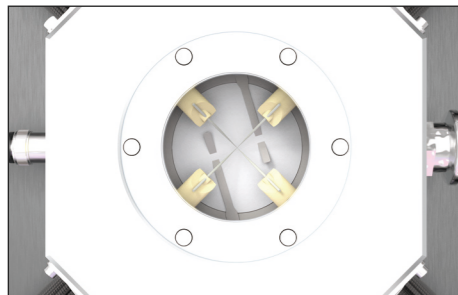
Scan code to watch, Teaching video







CPS7000 vacuum probe station is a miniature desktop measurement platform specifically designed for characterizing and measuring the electrical properties of materials. It is suitable for characterizing and measuring the electrical properties of dielectric, piezoelectric, ferroelectric, pyroelectric, photoelectric and other materials. It can also conduct electrical measurement and evaluation of materials in a vacuum atmosphere environment. It is an essential tool for laboratory measurement of bulk, thin sheet and thin film electrical materials. It is widely used in universities, scientific research, aerospace, military industrial institutes and other fields.



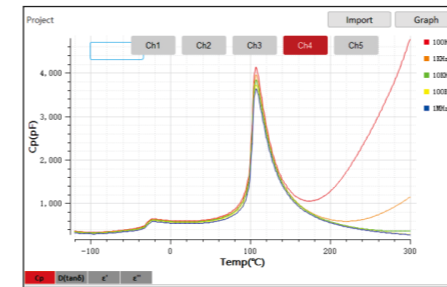
TECHNICAL SPECIFICATION

Channel: 1	Temperature control mode: heating up, constant temperature, heating up and cooling down
Temperature Range : -160°C~450°C	Functional modules: Dielectric, ferroelectric, TSDC, High resistance
Temperature Slope : 0~10°C/min	Sample Size : $\phi < 40\text{mm}$, $d < 5\text{mm}$
Temperature Accuracy : $\pm 1^\circ\text{C}$	Probearm : 4
Heating Method: Liquid nitrogen refrigeration	Operation mode: Semi-automatic
Cooling Time : 1~10°C/min(Program adjustable)	Equipment Size : 435×435×205mm(L/W/H)
Optical observation window: $\phi 55\text{mm}$ quartz glass	Weight : 20kg

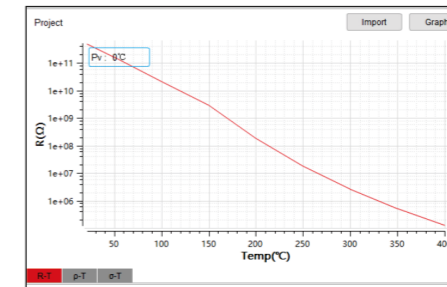


- 01 Focus on electronic thin film electrical performance characterization measurement solutions. 
- 02 Comparable to the American brands Lake shore and Janis, it has a wide temperature range and a compact size. 
- 03 Solve the problem of no jumping points in the continuous temperature rise test of the substrate film. 
- 04 Meet the requirements of high voltage and low current testing. 
- 05 Equipped with a low-temperature liquid nitrogen transmission system to automatically supply the cooling capacity required by the temperature control platform. 
- 06 It has the function of cyclic testing. 

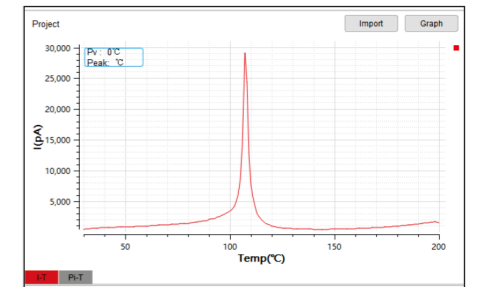
MEASUREMENT DATA GRAPH



DE-T



R-T



TSDC

PN	MODEL	PRODUCT DESCRIPTION
050203012	CPS7001	-160°C~450°C; CH1; $\pm 1^\circ\text{C}$; Vacuum; Measurement instrument selection; 110V~130V/60Hz;
050203003	CPS7001	-160°C~450°C; CH1; $\pm 1^\circ\text{C}$; Vacuum; Measurement instrument selection; 220V~240V/50Hz;

TSDC PYROELECTRIC TESTING SYSTEM

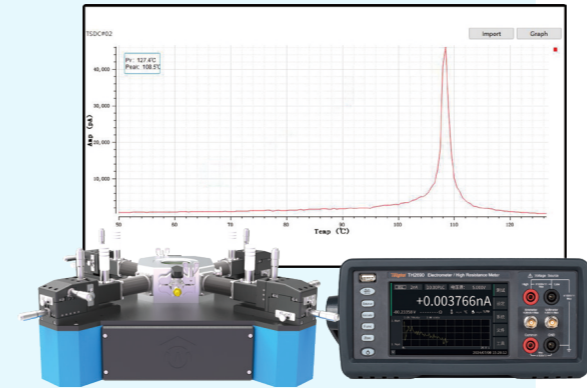
Measurement parameter:

TSDC, Polarization voltage 300V



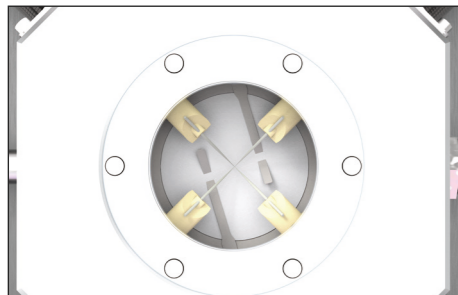
Scan code to watch, Teaching video

TSDC pyroelectric testing system is a specialized equipment for measuring the thermal excitation current of piezoelectric ceramics. It is an upgraded version from the TSC6510 model. It can measure the TSDC of piezoelectric ceramics, and also TSPC, with a maximum polarization voltage of 300V and a minimum no-load current of 0.5pA. It has been highly recognized by industry customers such as Tsinghua University, Shanghai Silicon Research Institute, and Huazhong University of Science and Technology. It is a university, enterprise, and research institutes characterization tool that is necessary to study the pyroelectric properties of piezoelectric ceramics.



TECHNICAL SPECIFICATION

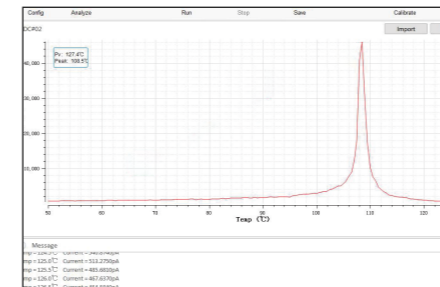
Channel: 1	Measuring Range : 500fA~20mA
Temperature Range : -100°C~450°C	Vacuum Degree : <math>< 10^{-2}</math>Pa (Molecular pumps)
Temperature Slope : 0~10°C/min	Sample Size : $\phi \leq 20$ mm
Temperature Accuracy : $\pm 1^\circ\text{C}$	Probeam : 4
Heating Method: Liquid nitrogen refrigeration/resistance wire heating	X-axis : trip ± 5 mm, accuracy ± 0.01 mm
Cooling Time : 30min/-100°C	Y-axis : trip ± 5 mm, accuracy ± 0.1 mm
Polarization Voltage : 0~300V	Z-axis : trip ± 5 mm, accuracy ± 0.01 mm



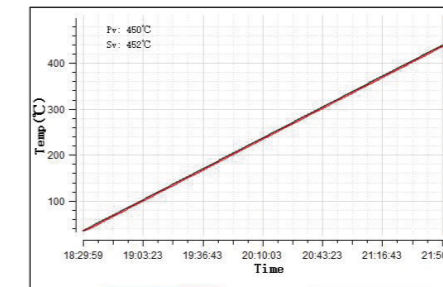
- 01** Implement a 500fA~20mA current measurement solution.
- 02** The polarization voltage can reach up to 300V, and the minimum no-load current can reach 0.5pA.
- 03** Study the thermal excitation current of piezoelectric ceramics under high and low temperature, vacuum, and atmosphere conditions.
- 04** Can analyze and monitor the curves of TSDC and polarization current with temperature changes.
- 05** Equipped with a low-temperature liquid nitrogen transmission system to automatically supply the cooling capacity required by the temperature control platform.
- 06** Scanning online teaching.



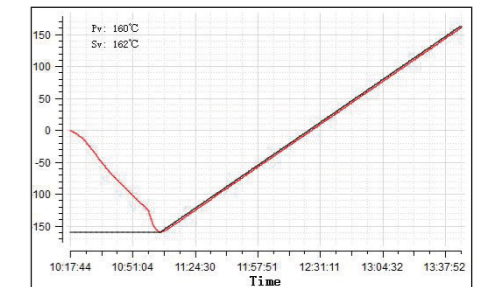
MEASUREMENT DATA GRAPH



Curie temperature



Normal temperature control curve



Variable temperature control curve

PN	MODEL	PRODUCT DESCRIPTION
050203013	TSDC6520	-100°C~450°C; Polarization voltage 0~300V; CH1; Vacuum; Measurement instrument selection;

PEAI1000 PIEZOELECTRIC ANALYZER

Measured parameters:
piezoelectric constant, d33



Scan code to watch,
teaching video







PEAI1000 piezoelectric analyzer is a special measuring device for evaluating the piezoelectric coefficient d33 of piezoelectric materials by dynamic method. It is another high-precision piezoelectric coefficient measuring device for piezoelectric materials after China Institute of Acoustics. The latest piezoelectric material parameter analyzer adopts lock-in amplification technology, which greatly suppresses useless noise and improves the detection signal-to-noise ratio. Compared with the traditional d33 measuring instrument, it has higher precision, wider range, better reliability and simpler operation. It is an essential tool for the research, application and production of piezoelectric materials and piezoelectric elements.



TECHNICAL SPECIFICATION

Measuring Range: 0~2000pC/N	Calibration Frequency: 110Hz
Frequency Range: 110Hz	Calibration Force: 0.25N (typical value)
Dynamic Forces: 0.1~0.5N	Sample Size: $\phi \leq 40\text{mm}$, $d \leq 20\text{mm}$
Static Force: 1~10N	Equipment Size: 328×210×357mm(L/W/H)
Measured Velocity: Fast, medium, slow	Power Supply: 220~240V, 50Hz/60Hz
Measuring Accuracy: $\pm 2\%$	Weight: 19kg
Measuring Sample: block/sheet/film	Warranty Period: 1 year



- 01 The piezoelectric constant d33 measured by the dynamic method is more accurate and reliable. 
- 02 Precision and compact appearance, simple and convenient operation. 
- 03 Using phase-locked amplification technology, strong anti-interference ability. 
- 04 Variable static force and dynamic force can be applied, and the measurement accuracy is higher and the measurement range is wider. 
- 05 It can realize accurate measurements of variable frequencies and variable forces to meet the needs of different application scenarios. 
- 06 Comes with RS232 USB interface, read data one-click export. 

PN	MODEL	PRODUCT DESCRIPTION
050407004	PEAI1000	Piezoelectric analyzer; 0~2000pC/N; SF 1~10N; DF 0.1~0.5N; 110Hz; 110V~130V/60Hz;
050407001	PEAI1000	Piezoelectric analyzer; 0~2000pC/N; SF 1~10N; DF 0.1~0.5N; 110Hz; 220V~240V/50Hz;

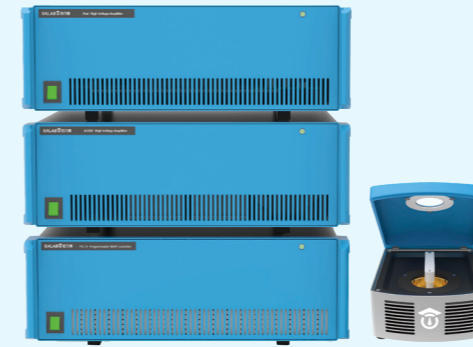
FEAI1000 FERROELECTRIC ANALYZER

Measured parameters: saturation polarization, residual polarization, coercive field



Scan code to watch, teaching video

FEAI1000 is an analytical and measurement system specifically designed for evaluating the important characteristic parameters of ferroelectric thin film materials. The FEAI1000 ferroelectric analyzer is equipped with a $\pm 100V$ high-voltage source and can measure the hysteresis loop of thin film materials. It can obtain important parameters such as the spontaneous polarization intensity P_s , residual field polarization intensity P_r , coercive field E_C and leakage current of ferroelectric materials. It can be widely applied in scientific research on dielectric functional ceramics in universities, research institutes and enterprises.



TECHNICAL SPECIFICATION

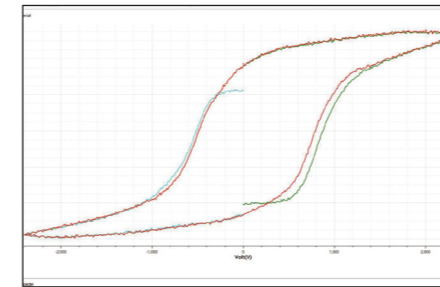
Test Specification: $\pm 100V$	Peak Output Current: 100mA
Hysteresis Frequency: 1mHz~1KHz	Material Type: block or film
Minimum Pulse Width: 0.1ms	Power Supply: 220V, 50Hz/60Hz
Minimum Rise Time: 1 μ s	Weight: 15kg
Capacitor module: below 100nF	Warranty Period: 1 year
Current range: 100pA~1A	



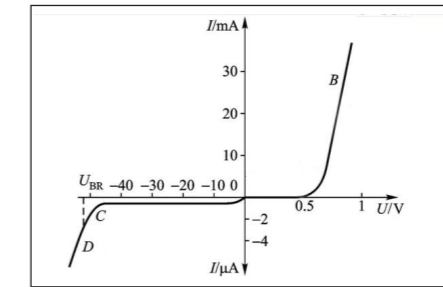
- 01 The measurement results are comparable to the German aixACCT TF2000.
- 02 Built-in or external high voltage amplifier ($\pm 100V$).
- 03 Suitable for ferroelectric property parameter analysis of block or film samples.
- 04 It can achieve parameters such as dynamic hysteresis loop, leakage current (2 types), fatigue, PUND test, and electrostatic hysteresis loop.
- 05 With high voltage breakdown protection function, to avoid similar imported instruments due to breakdown damage to the instrument phenomenon.
- 06 Scanning code online teaching.



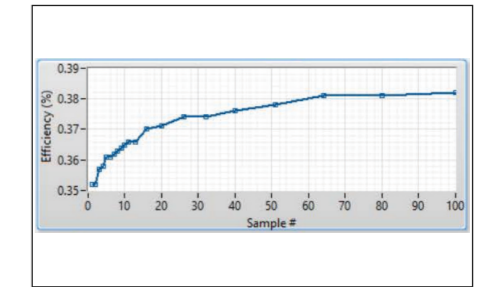
MEASUREMENT DATA GRAPH



Electric hysteresis loop



I-V characteristic curve



Fatigue curve

PN	MODEL	PRODUCT DESCRIPTION
050406002	FEAI1000	test specification: $\pm 100V$; hysteresis frequency: 1mHz-1KHz(Determined by the load); 100pA~1A; 110V~130V/60Hz;
050406001	FEAI1000	test specification: $\pm 100V$; hysteresis frequency: 1mHz-1KHz(Determined by the load); 100pA~1A; 220V~240V/50Hz;



7

7

12

7



01

33
Product Patent

02

Performance has
increased by over 50% for
three consecutive years

03

More than 60%
market share

04

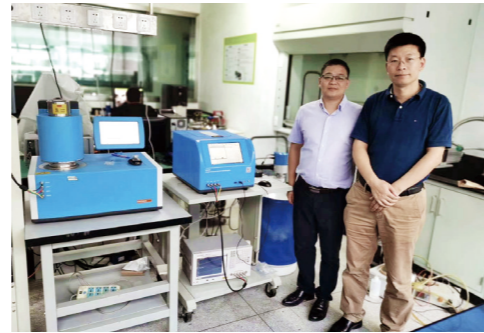
Industry benchmark,
comparable to imported
quality

04

SUCCESSFUL CASES

SCIENTIFIC RESEARCH INSTITUTION

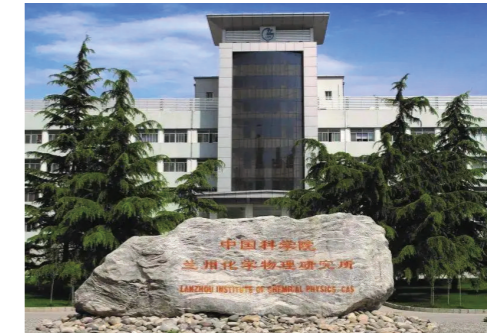
Only some users — are ranked in no particular order,
Thank you for your trust and support



Shanghai Institute of Ceramics
Academy of Sciences



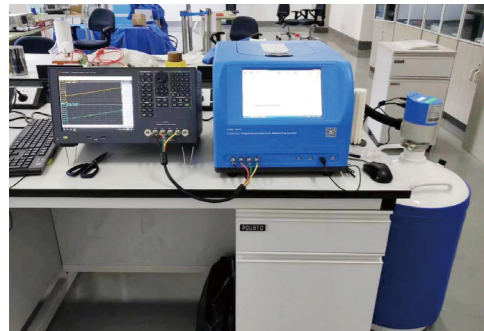
Fujian Institute of Research on
The Structure



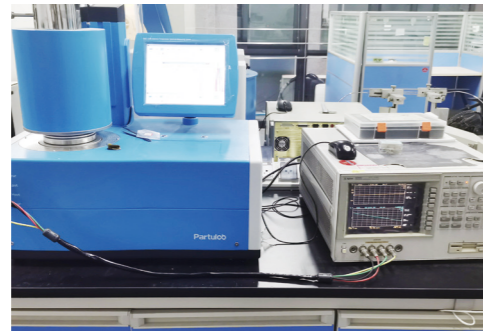
Lanzhou institute of chemical physics



SINOPEC(Dalian)Research Institute of
Petroleum and Petrochemicals Co.,Ltd.



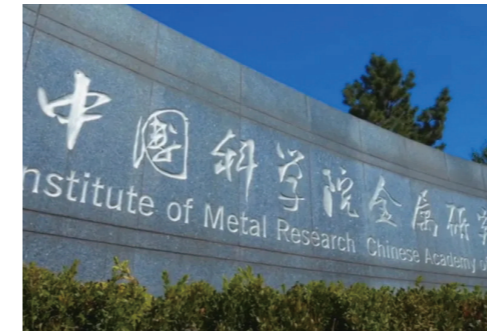
China State Shipbuilding
Corporation Limited



Institute of Nanoenergy and Nanosystems,
Chinese Academy of Sciences



Shenzhen Institute of Advanced
Technology Chinese Academy of Sciences



Institute of Metal Research,
Chinese Academy of Sciences



Ningbo Institute of Materials
Technology & Engineering, CAS



Institute of Process Engineering,
Chinese Academy of Sciences



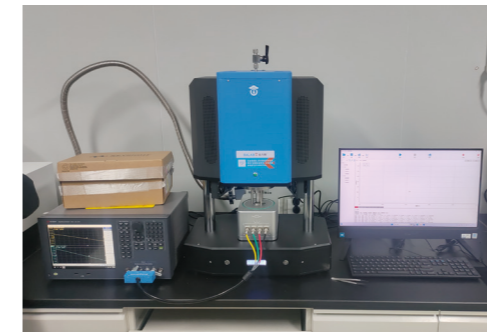
Institute of Optics and Electronics,
Chinese Academy of Sciences



China Academy of Engineering Physics



The Xinjiang Technical Institute of
Physics & Chemistry.CAS



Yichun Jiangli Lithium Battery New
Energy Industry Research Institute



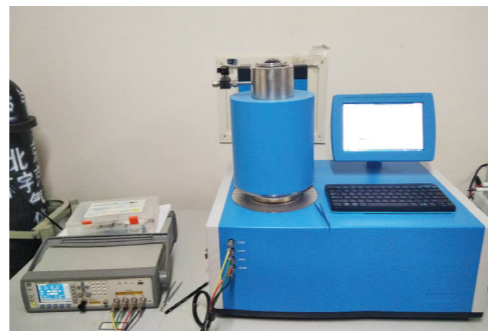
Institute of Flexible Electronics
Technology of Tsinghua, Zhejiang



Ganjiang Innovation Academy,
Chinese Academy of Sciences

INSTITUTIONS OF HIGHER LEARNING

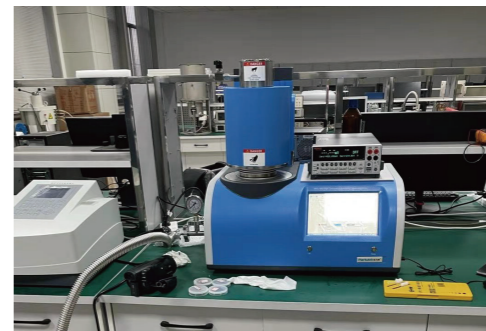
Only some users — are ranked in no particular order,
Thank you for your trust and support



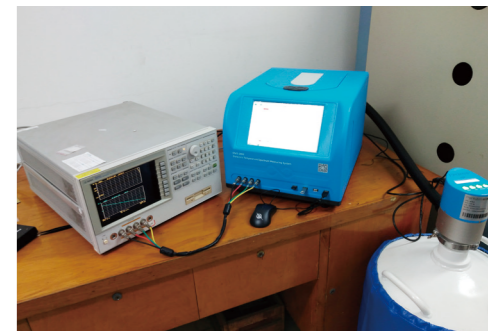
Tsinghua University



China University of Geosciences, Wuhan



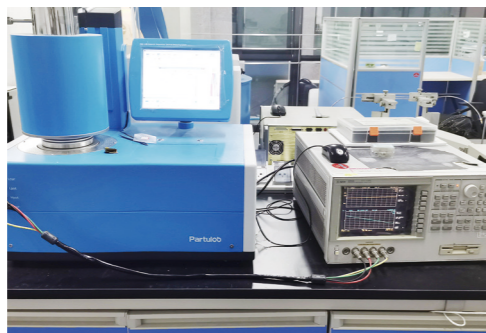
Air Force Engineering University



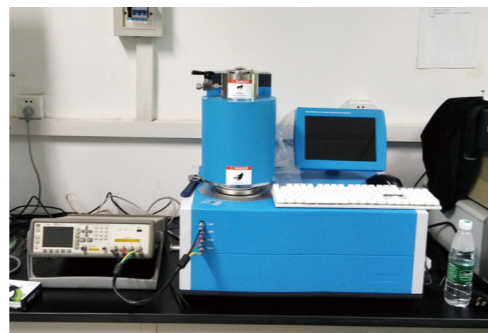
Zhejiang University



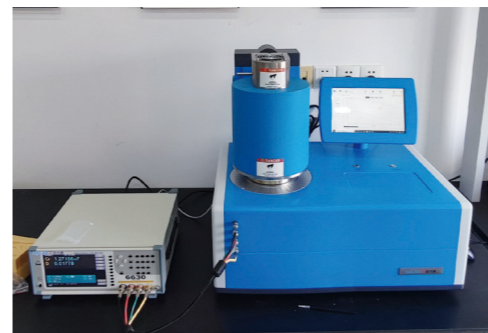
Beihang University



Huazhong University of Science and Technology



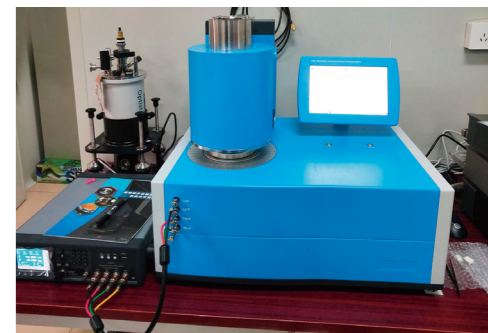
Wuhan University of Technology



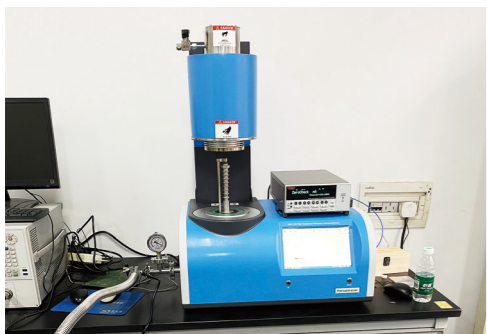
Xiamen University



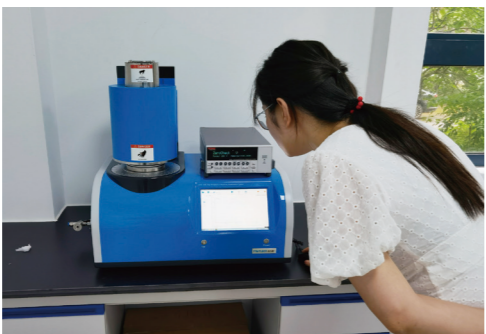
Southeast University



Nanchang University



National University of Defense Technology



Donghua University



Southern University of Science and Technology



North Minzu University



Guilin university of technology



Qilu University of Technology

WELL KNOWN ENTERPRISE

Only some users — are ranked in no particular order,
Thank you for your trust and support



Huawei Technologies Co., Ltd



Suzhou Kematek, Inc.



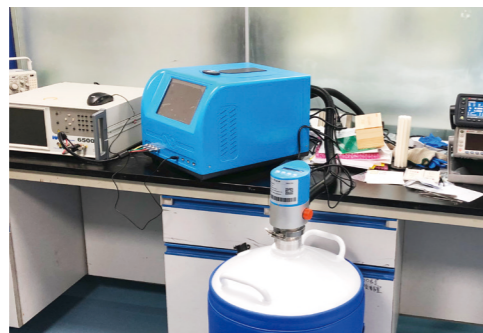
Suzhou Changfeng Co., Ltd.



TDG Holding Co., Ltd



BYD Company Limited



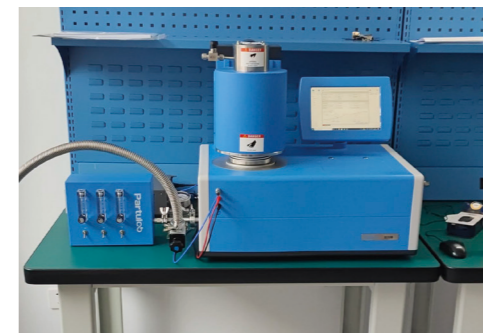
Guangdong Fenghua Advanced
Technology(Holding)Co.,Ltd.



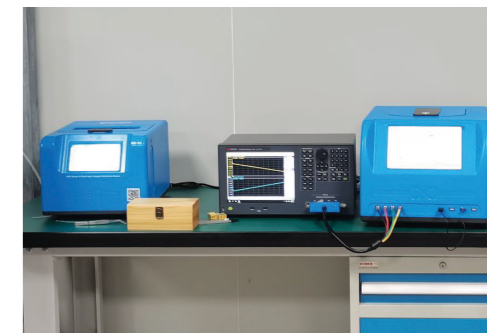
China Zhehua(GROUP) Science&
Technology CO.,Ltd



Zibo Boshan Lisheng Function
Chinaware Co., Ltd.



Suzhou Sicui Electronic Functional Materials
Technology Research Institute Co., Ltd.



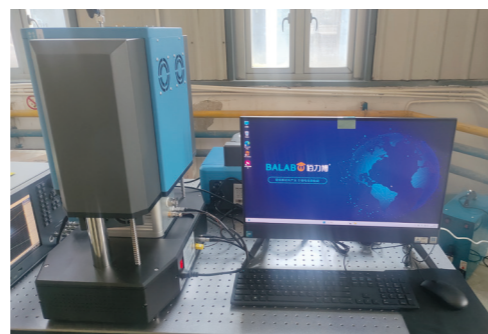
Zhejiang Silicon Porcelain
Technology Co., Ltd.



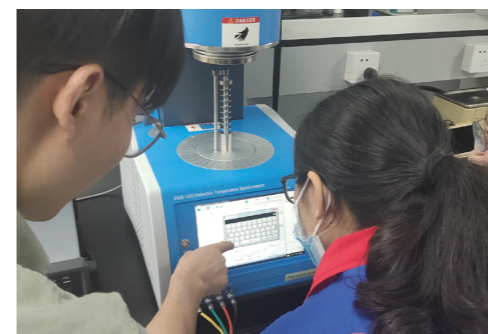
Beijing Yuanliu Hongyuan Electronic
Technology Co., Ltd.



Jiangmen Smoore Technology Co., Ltd.



Wuhan Hitrusty Electrnics Co., Ltd.



Wuxi Jialine Electronic
Materials Co., Ltd.



Suzhou YINGUAN Semiconductor
Technology Co., Ltd.



Hunan Meicheng Ceramic
Technology Co., Ltd