Micro Probe System

NEXTRON
MICRO PROBE SYSTEM

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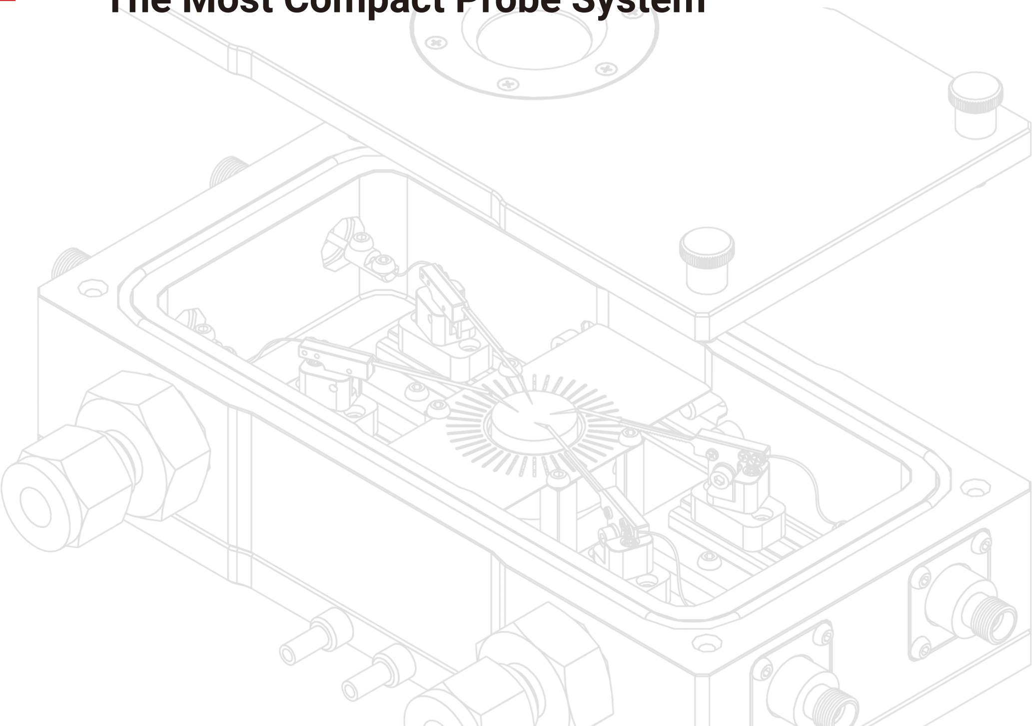
The Most Compact Probe System



Micro Probe System is suitable to analyze the Electrical & Optical properties of the materials. Its advantage is the in-situ measurement of the electrical and optical properties under the various environmental conditions; Vacuum, Temperature, Gas Flow, Humidity, Light Irradiation and X-ray.

NEXTRON R&D Team is Ready to Discuss Complex Requirements

Overview

Specific requirements should be provided for further assessment.

Modeling

A dedicated team collaborates directly with clients to design customized chambers that align with specific requirements. A 3D image copy is provided along with a budgetary quote. If necessary, this process is repeated until all requirements are met.

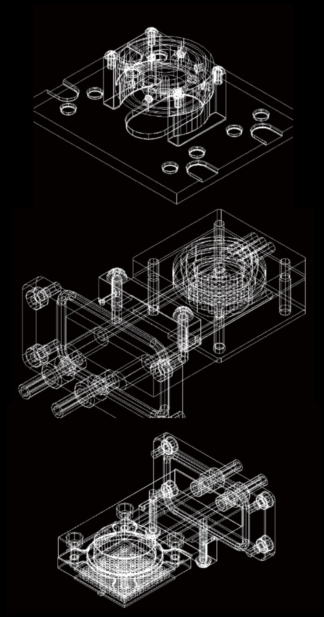
Production

Custom orders are manufactured using advanced high-tech machining equipment to ensure precision and quality.

Custom list

- Dimension
- Number of Probes
- Optical Components
- Temperature Range
- Gas (Mass Flow Controller)
- RF Measurement
- Humidity Control
- High Voltage
- Probe Tip
- Additional specifications as required

Temperature Ranges



RT ~ +1000 °C
(Model: MPS – CHU)
Sample stage size: Ø 1/2”

RT ~ +750 °C
(Model: MPS – CHH)
Sample stage size: Ø 1/2”

RT ~ +450 °C
(Model: MPS – CHL)
Sample stage size: Ø 1/2”

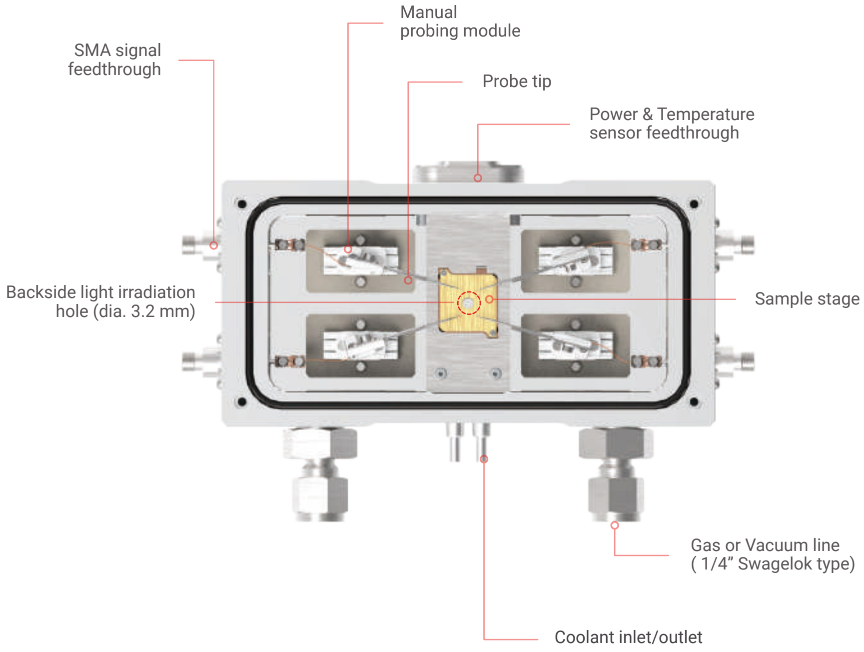
-40 ~ +200 °C
(Model: MPS – PT)
Sample stage size: 19 x 19 mm

-40 ~ +170 °C
(Model: MPS – PTH)
Sample stage size: 16 x 16 mm

80 K ~ RT
(Model: MPS – LN)
Sample stage size: Ø 15mm

Main Probe System Structure

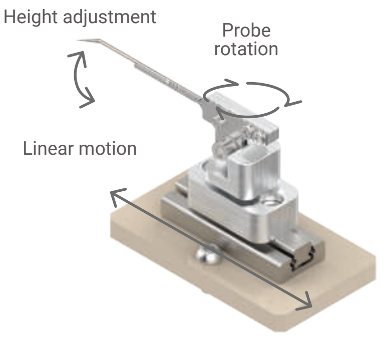
MPS - PTH

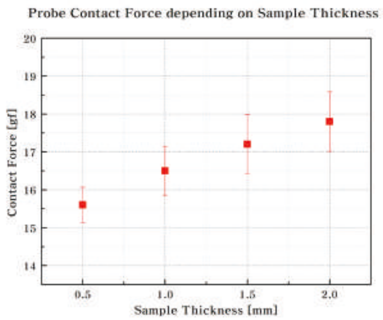


General

Manual Probe Module

Quick & Easy



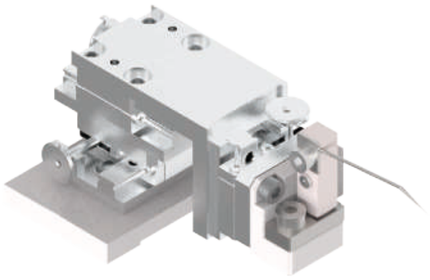


The manual probe module is compact, measuring 30 × 20 × 20 mm. It enables rapid and stable contact with contact pads exceeding 500 μm using a manual contact method. Due to its flexible motion, the module smoothly adapts to the displacement of the contact point resulting from thermal expansion, maintaining stable contact.

video at: https://www.youtube.com/watch?v=STMfOxmsdQo&t=2s
video at: https://www.youtube.com/watch?v=dx8p2IL6QP4

Motorized Probe Module

Precise & Positioning under vacuum



Specification

Module Speed: 5 mm /s
Stroke (X , Y axis): 8 mm
Stroke (Z - axis): 3 mm
Holding Force: 150 gf – 200 gf
Manipulate Dimension: 20 × 20 × 30 mm
Resolution: < 1 μm

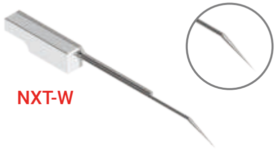
Ensuring stability and high resolution is crucial in precision applications. The Piezo-Driven Positioner offers an optimal solution by enabling remote micro-positioning. Nextron piezo-driven micro probe system allows for precise placement at the desired location. Even when contact pads are extremely small, the system enables precise measurements using a 10 μm probe tip. Additionally, the piezo-driven micro probe system is competitively priced compared to other market alternatives.

video at: https://bit.ly/3Ne5tkQ

General

Probe Tips

Tungsten Probe

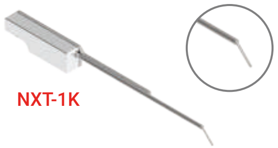


Tungsten Probe Information

Tip Dia.	Plate	Operating temp./time @1atm
50 μm	None	450 °C / 72 h
100 μm	None	450 °C / 72 h
	Special alloy	450 °C / 72 h 750 °C / 3.5 h

* Small tip size

Nextron 1K Probe



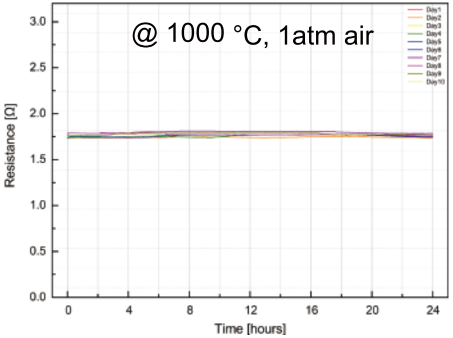
Nextron 1K Probe Information

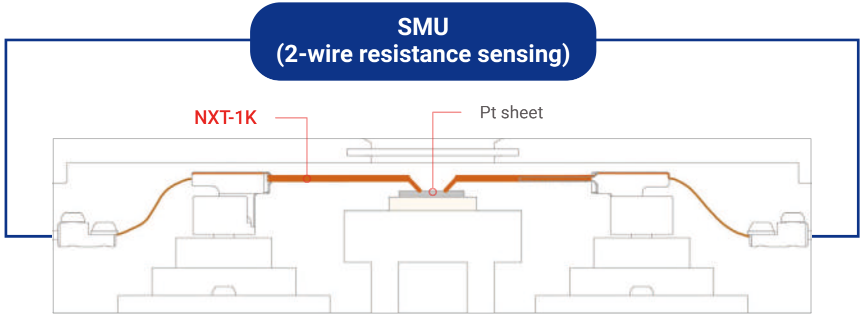
Tip Dia.	Remark
250 μm	Max. operating Temp. : 1000 °C / 150 h

* The unique probe capable of withstanding extreme heat up to 1000°C in air.

- Tungsten probes with tip diameters of 50 μm and 100 μm are recommended for applications requiring small contact pads. For enhanced precision, the use of an optional precise probing arm is advised.
- Larger tip sizes provide increased sample clamping force and durability.
- The table above presents recommended models for appropriate probe selection.
- All probes feature a spring structure within or outside the probe module, ensuring consistent contact stability in gas flow and scanning experiments. A key advantage is that the contact remains stable even in the presence of movement caused by thermal expansion and vibration.

Nextron 1K Probe
High-temperature resistance test





The graph illustrates the resistance stability of the Nextron 1k Probe under conditions of 1000 °C at 1 atm air over a 24-hour period.

Equipment Used:

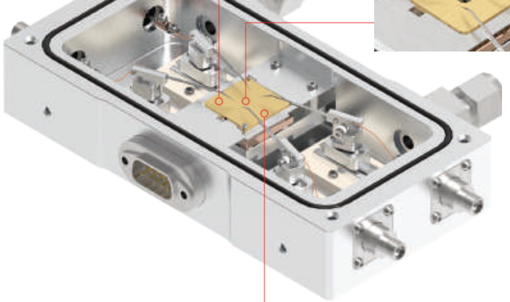
- MPS-CHU probe system with Nextron 1K Probe
- SMU: Keithley 2450

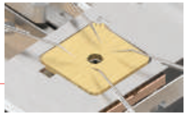
6 Versions Depending on Temperature

Peltier Stage

MPS - PT

Temp.: -40 ~ +200 °C
Sample stage size: 19 × 19 mm
Stage material: Special alloy coated Cu





MPS - PTH

Temp.: -40 ~ +170 °C
Sample stage size: 16 × 16 mm
Stage material:
Special alloy coated Cu
Ø 3.2 mm bottom hole

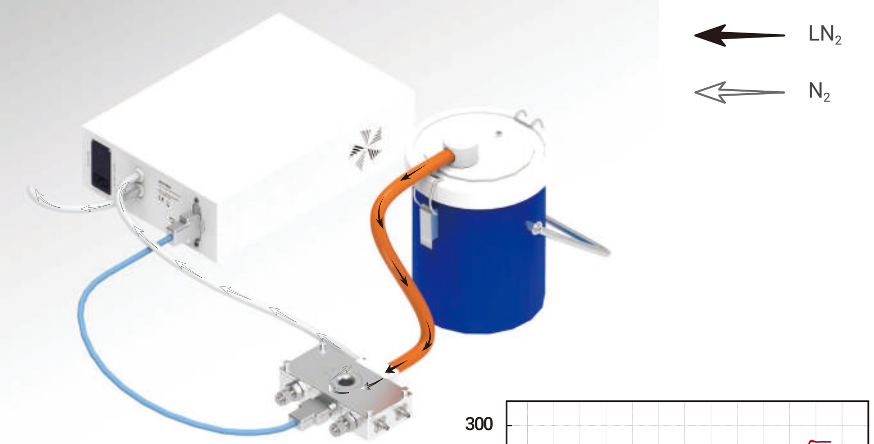
Ceramic Stage

MPS - CH

Temp.: MPS - CHL: RT ~ +450 °C
MPS - CHH: RT ~ +750 °C
MPS - CHU: RT ~ +1000 °C
Sample stage size: Ø 1/2”
Stage material: Alumina

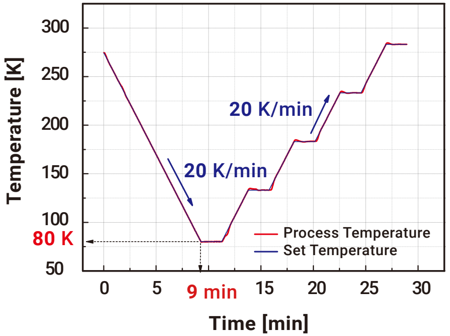
6 Versions Depending on Temperature

Liquid Nitrogen Cooling Sample Stage



MPS - LN

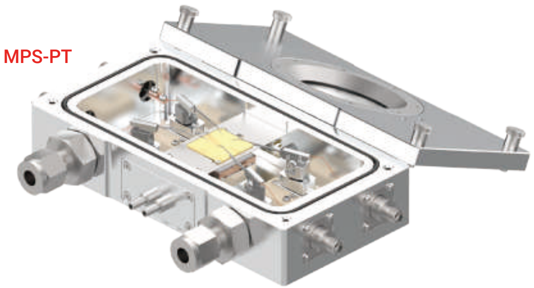
Temp.: 80 K ~ RT
Sample stage size: Ø 14 mm
Cu sample stage
1L LN_2 Dewar
Dimension: Ø 132 × 215 mm
2L LN_2 Dewar (Optional)
Dimension: Ø 170 × 245 mm
10L LN_2 Dewar (Optional)
Dimension: Ø 290 × 597 mm



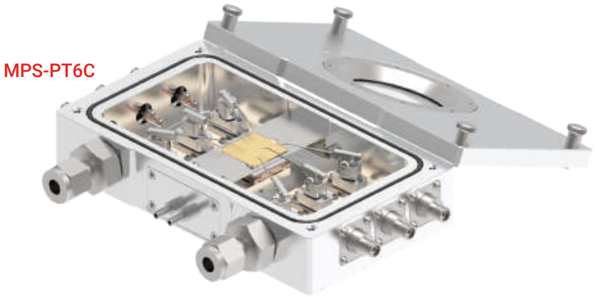
video at: https://bit.ly/3FjcGv8

Micro Probe System

4-Channel Micro Probe System



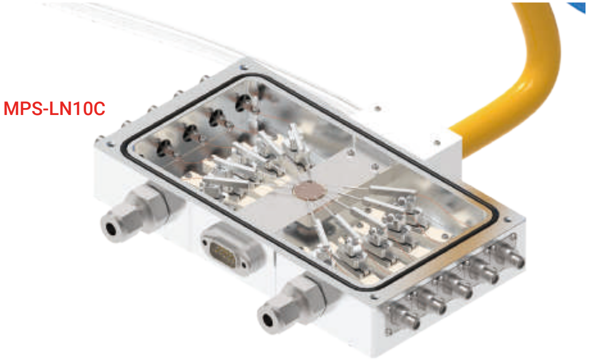
6-Channel Micro Probe System



Micro Probe System

8-Channel Micro Probe System

10-Channel Micro Probe System



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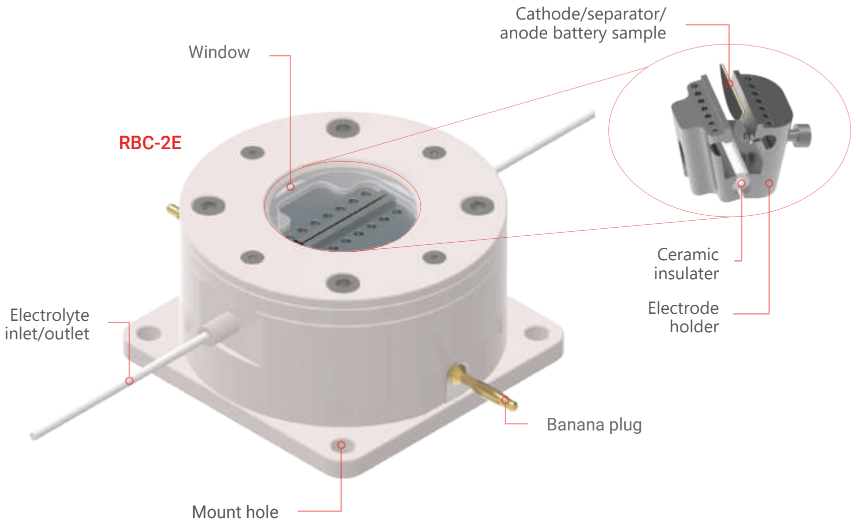
In-situ Raman Battery Test Cell

The In-situ Raman Battery Test Cell is considered a breakthrough product in the rechargeable battery industry.



In-situ Raman battery cell is capable of measuring the Raman spectrum of the cross-section of a battery sample. The In-situ Raman battery cell is developed for the in-situ study of the interface between layers such as anode, cathode, and separator. It is available to measure in-situ Raman not only liquid electrolyte batteries but also solid-state batteries. The product has a feature that can easily inject a liquid electrolyte and simple preparation of test samples.

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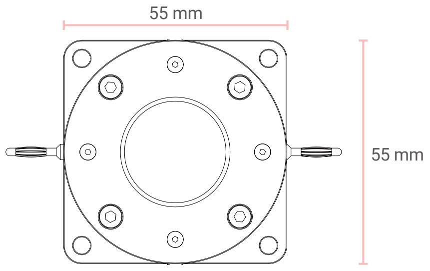
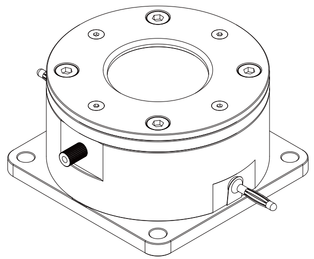
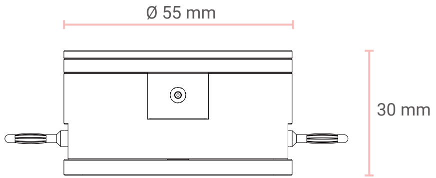
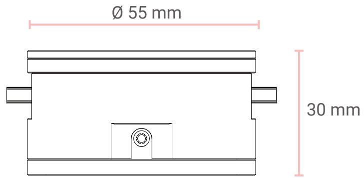
Specification

- Cell dimension: 55(l) × 55(w) × 30(h) mm
- Inner electrolyte dish volume: 150 μL
- Cell material: PEEK
- Corrosion resistance:
  All metal parts are coated with platinum
- Battery charge/discharge holder type:
  M3 bolt clamping type
- Battery holder material:
  Stainless 316L
- Weight of cell: 150 g
- Number of electrode: 2 ea
- Cathode/anode electrode type: Banana plug
- Sample total thickness: 300 μm
- Sample loading size: 15 × 6 mm
- Window material: Sapphire
- Window dimension: Ø 25 × t 1.0
- Minimum optional working distance: 1 mm
- Electrolyte inlet/outlet fitting:
  1/16 inch Fingertight Fitting









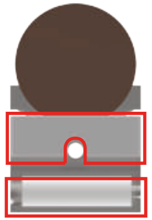
Sample loading to the electrode holder

Align the sample

1. Align the sample on Holder A as required.
Soak the separator in the electrolyte prior to use where applicable.

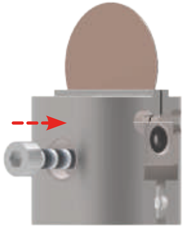
holder A

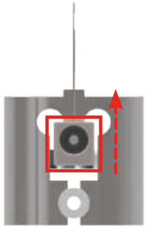
2. When using a dish place the dish and the rod into the designated grooves.
Ensure the end of the separator is fully contained within the dish.



* The total thickness of the sample is approximately 300 μm.
* For samples with significant thickness differences, a holder suitable for the sample size is to be used.

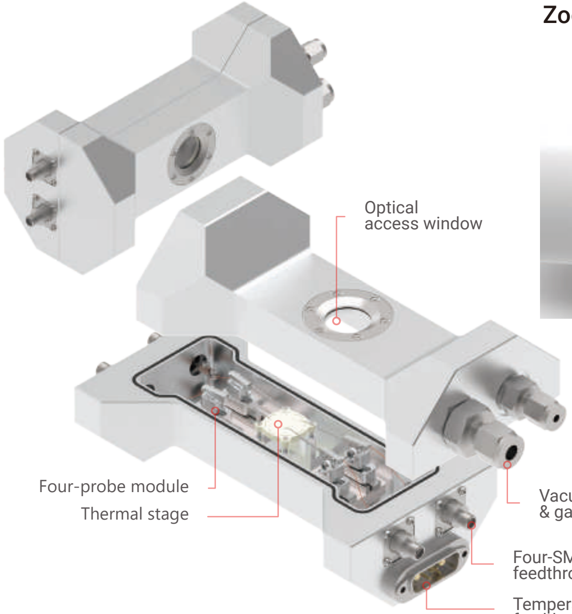
3. Cover electrode B and tighten the bolt.
Raising the dish allows for easier tightening of the bolt.



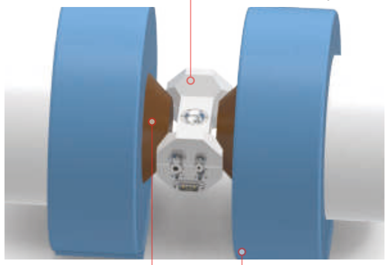


4. Cut the protruding sample to fit the cross-sectional side of the electrode holder.

Hall Measurement Micro Probe System



Zoom Out

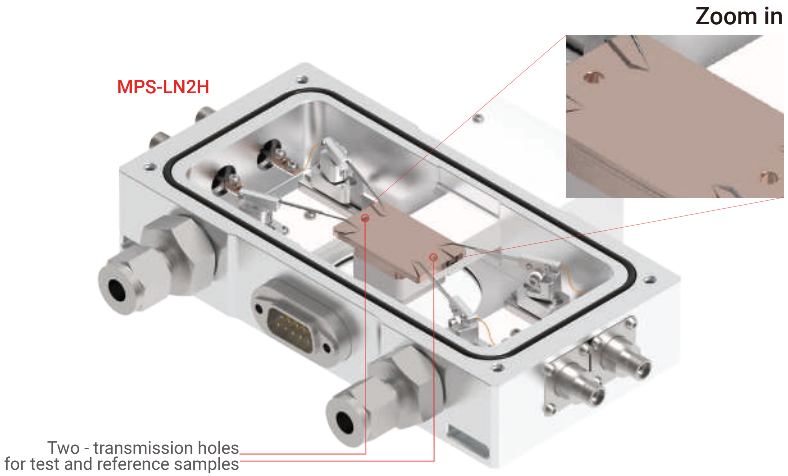


The Hall Measurement Micro Probe System is designed for applications requiring integration with conventional electromagnets, facilitating electric transport experiments, especially Hall effect studies.
This system is compatible with Nextron’s environmental controllers, enabling comprehensive environmental control including temperature, vacuum, humidity, and gas management.
Equipped with Nextron's unique four-probe configuration, this system allows for advanced magnetic in-situ experiments, providing precise measurements and analyses in controlled conditions.

Specification

Min. air gap	40 mm (both in-plane & out-of-plane)
Max. pole face	3 inch
Temperature ranges	**HMMPS-PT** -40 ~ 200°C
	HMMPS-CH RT ~ 1000°C
	HMMPS-LN 80K ~ RT (coming soon)
Chamber cooling option	Active TEC air cooling block (Required for high temperature model; HMMPS-CH)
Motorized chamber rotation option	Angular magnetoresistance measurements between in-plane & out-of-plane (coming soon)
Chamber mounting stand option	Easily position the chamber between the magnetic poles (Custom made to fit your magnet)
SMU switching box option	Useful for measuring Hall voltage in a van der pauw sample (coming soon)
Number of probes	4 probes
Environmental control	**Vacuum tight** < 1×10^{-4} mbar
	Humidity control option 4 ~ 95 %RH
	Vacuum partial pressure control option 0.001~1300 mbar
	MFC Gas control option
Dimension	150 × 80 × 80 mm
Signal port	SMA (SMA to BNC cable included)
Vacuum & gas port	1/4 inch & 1/8 inch Swagelok Tube fitting
Optical window option	Customizable for optical access
Electrical characteristics	**Leakage Current** 100 fA
	Maximum DC Voltage/Current 300 VDC/1000 mA
	Frequency DC ~ 300 MHz
Thermal stage size	**HMMPS-CH** Ø 15 mm
	HMMPS-PT 19 × 19 mm
	HMMPS-LN Ø 14 mm

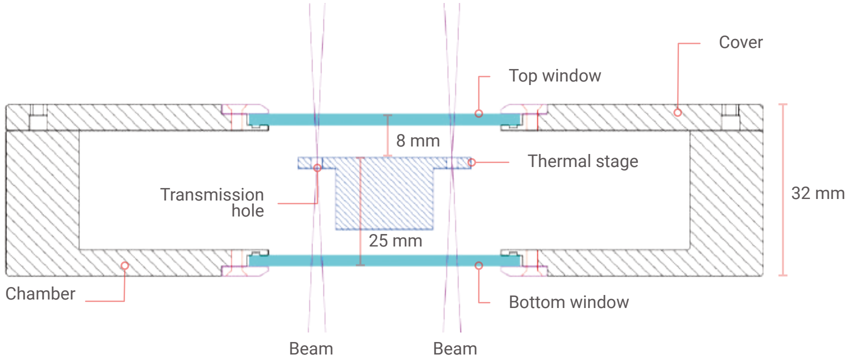
Micro Probe System for THz Signal Transmittance Measurement

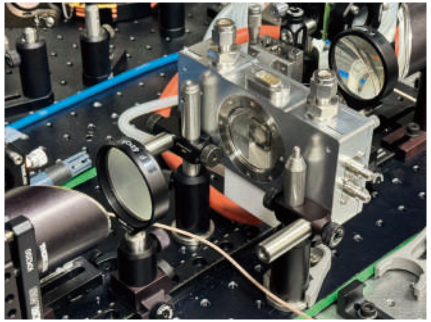


This probe system is perfectly suited for terahertz transmission experiments.

It features a temperature-controlled sample holder with dual transmission apertures.
It allows for simultaneous comparative analysis of test and reference samples.

The unique Nextron probe ensures stable electrical probing and sample fixation, even in vertical orientations.

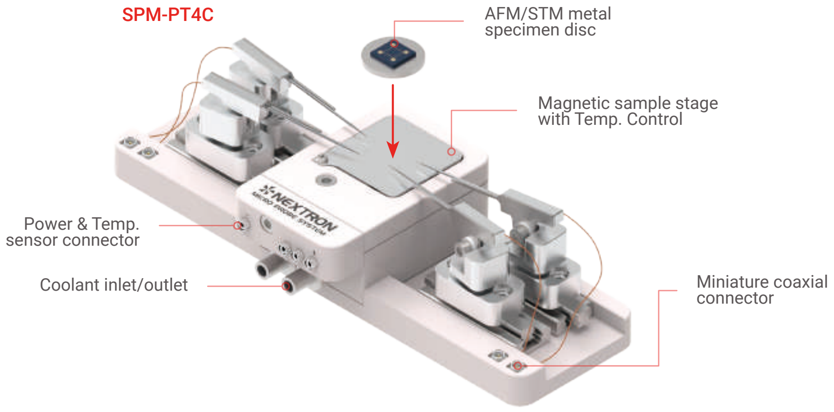




Specification

- Dimension: 140(l) × 70(w) × 31.6(h) mm
- Stage size: 32 × 18.2 mm
- Stage transmission hole: Ø 2 mm
- Temperature Range:
  80 K~RT(LN model)/ -30 ~ 150 °C(PT model)
- Temperature Accuracy: ±0.1 °C
- Temp Resolution: ±0.1 °C
- Max. Ramping Rate: 30 °C/min
- Top and bottom window:
  Ø 43 mm, Fused silica 2T

SPM(scanning probe microscopy) Probe System



Combine precise temperature control with electrical probing for **in-situ electrical and topographical measurements.**

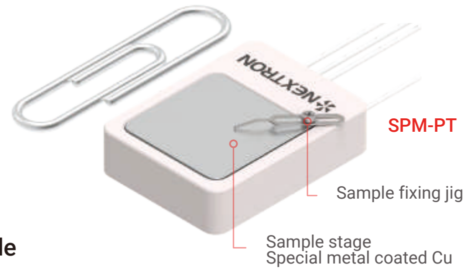
Specification

- Dimension: 90(l) × 35(w) × 20(h) mm
- Stage size: 16 × 16 mm
- Temperature range: -30 ~ 150 °C[1)]
- Max. Ramping Rate: 30 °C/min
- Temperature Accuracy: ±0.1 °C

[1)] The lower limit of the temperature range is typically attained when a coolant is approximately 0 °C.

SPM(scanning probe microscopy) Thermal Stage

Upper Side



Under Side

Specification

- Dimension: 20(l) × 26.5(w) × 6.5(h) mm
- Stage size: 16 × 16 mm
- Temperature range: RT ~ 150 °C
- Max. Ramping Rate: 30 °C/min
- Temperature Accuracy: ±0.1 °C

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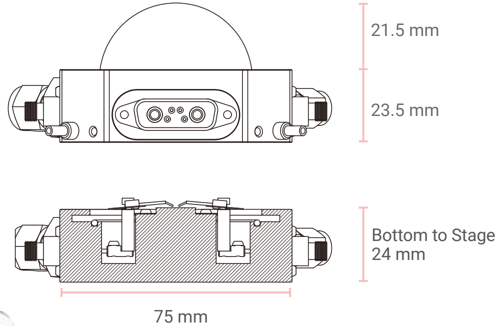
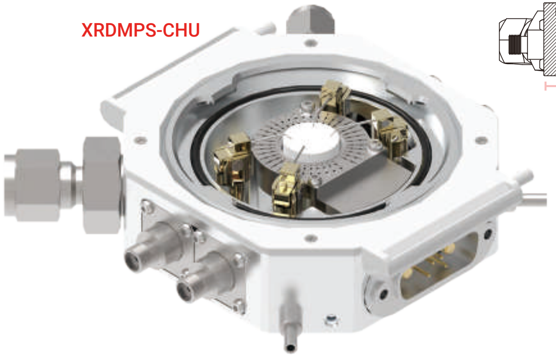
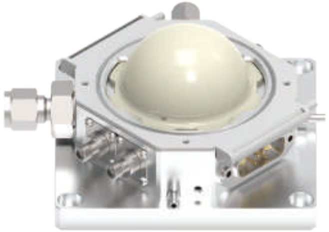
XRD Micro Probe System
(Environment System with Probes for Mounting XRD Machine)



XRDMPS-CHU





Properties		Specification	Properties		Specification
Temperature Range		RT ~1000 °C	Angle	2θ	0 ~ 180°
Vacuum	Rotary Pump	~ 10^{-3} mbar at RT		Ψ	0 ~ 85°
	Turbo Pump	~ 10^{-5} mbar at RT		Φ	0 ~ 360°
Heating Stage Size		Φ 1/2”	Dome Material		PEEK
Number of Probes		4 ea	Weight		450 g

D8 Bruker XRD set up image

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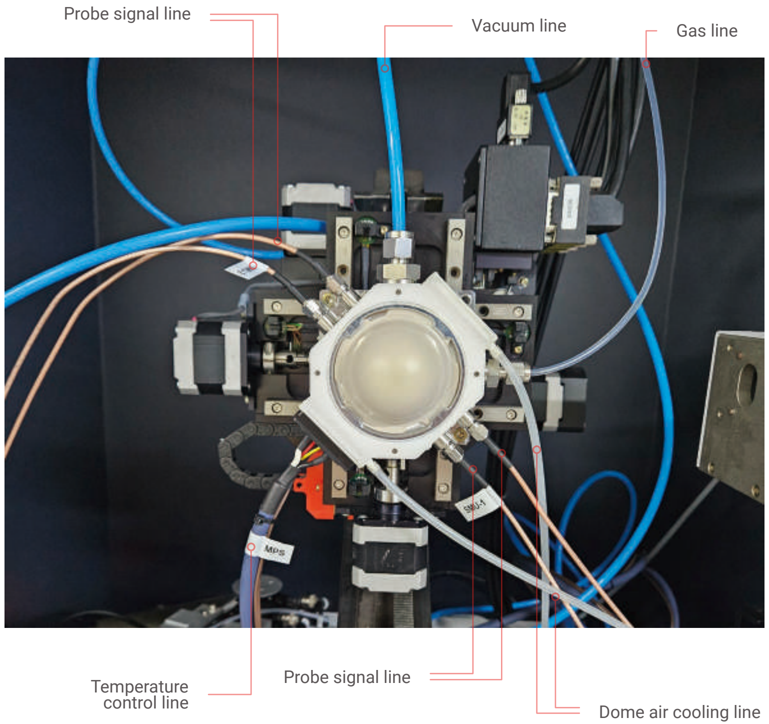
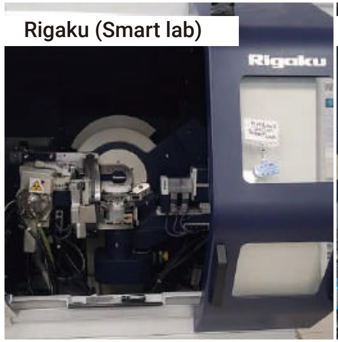
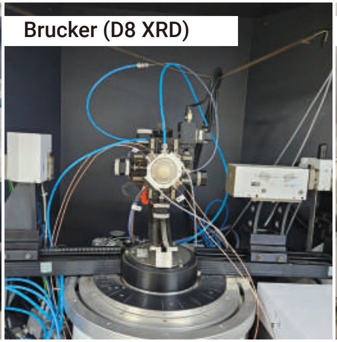
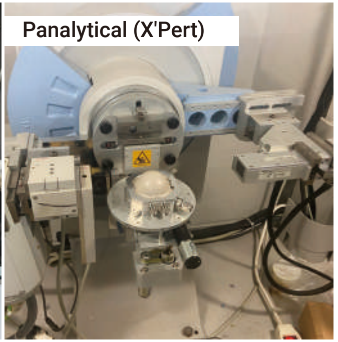
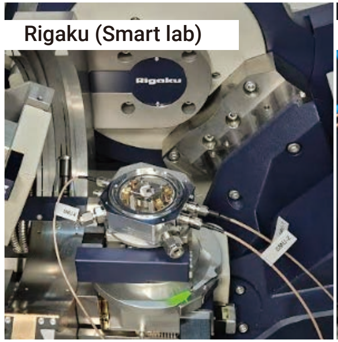
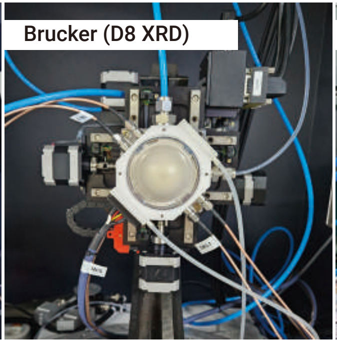


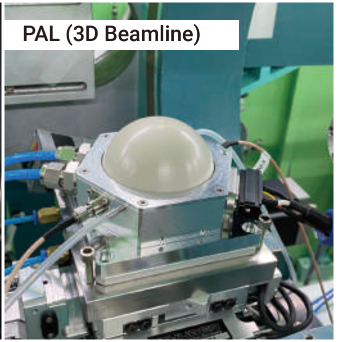












Technical Description

The XRD Micro Probe System is a probe station designed for in-situ XRD measurements under high temperature and high vacuum conditions. The system incorporates Nextron's unique manual probe, enabling the application of voltage and the measurement of current. This system is particularly effective for electric-field-induced phase transitions in ferroelectric materials, resistance analysis during PRAM phase changes, and ion-based battery studies.

More Information: Applications-XRD: In-situ Observation of Structural- and Resistance-Changes by Redox Reactions

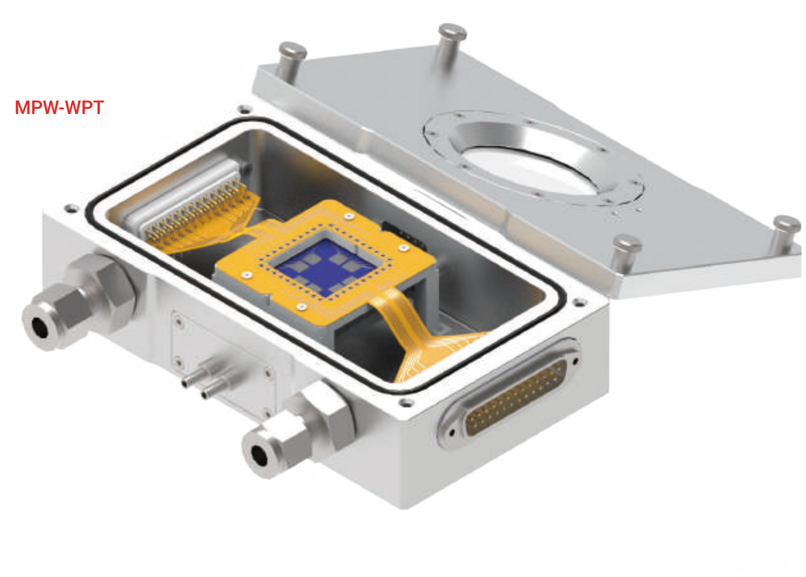
Applications

The XRD Micro Probe System is applicable to a wide range of research fields, particularly for in-situ analysis within XRD chambers. The system supports the following applications:

- Phase transition analysis under oxidizing or reducing gas atmospheres, utilizing XRD for structural observations and probes for electrical property measurements.
- Crystal structure analysis of materials subjected to periodic temperature variations, such as battery cells.
- In-situ characterization of anode and cathode crystal structures in battery cells during charging and discharging cycles.
- Phase transition analysis during Chemical Vapor Deposition (CVD) processes, particularly for monitoring thin-film thickness variations.
- Electric-field-assisted phase transition studies under varying temperature conditions.
- Temperature-dependent phase transition analysis, incorporating both XRD measurements and electrical property evaluations.

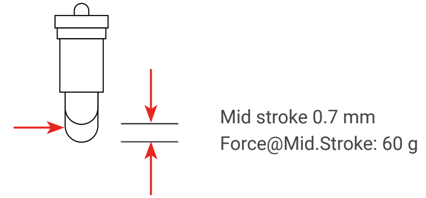
Probe Head Chamber - Pogo pin

MPW-WPT

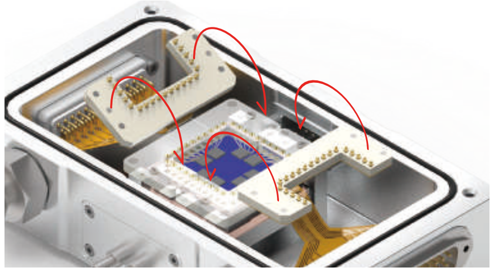


The probe head can be customized according to sample.

About Pogo Pin



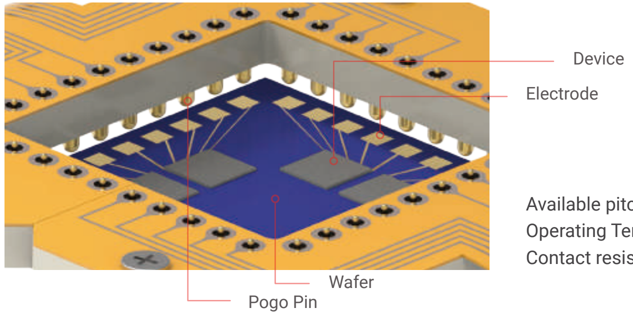
Device Loading



Custom-made Probe Head

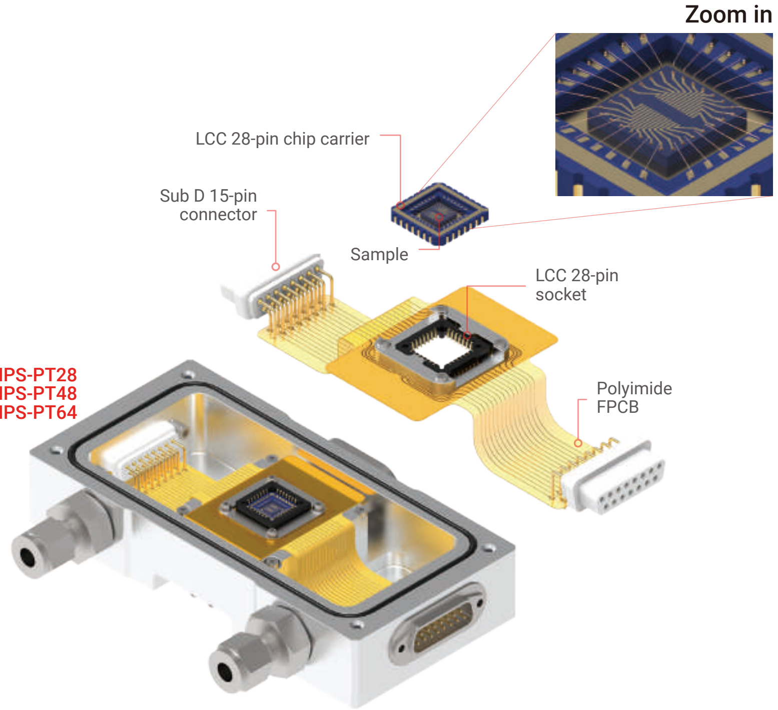
- No. of Pins
- Position of Pins
- Shape of Probe head
- Size of Sample Stage
  (*Maximum 30 x 30 mm with Temperature Control)

Zoom In



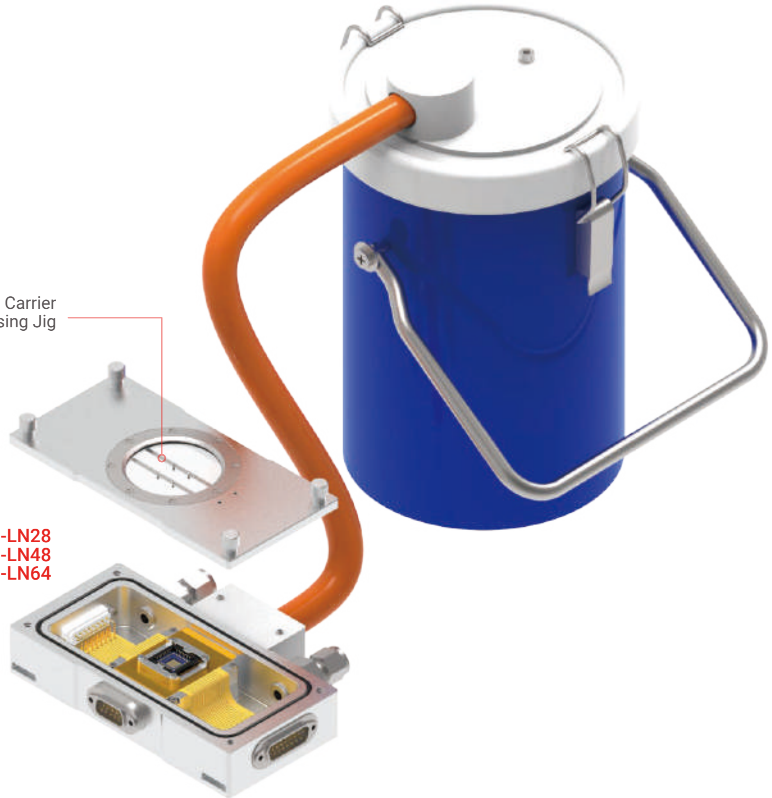
Available pitch: > 2.5 mm
Operating Temperature: -30 ~ 150 °C
Contact resistance: 20 mΩ Max

Micro Probe System for LCC Chip



Temperature Range	28-pin	48-pin	64-pin
-30 ~ 150 °C	LCC MPS - PT28	LCC MPS - PT48	LCC MPS - PT64
80K ~ RT	LCC MPS - LN28	LCC MPS - LN48	LCC MPS - LN64

* Customization is avaible on request.



3

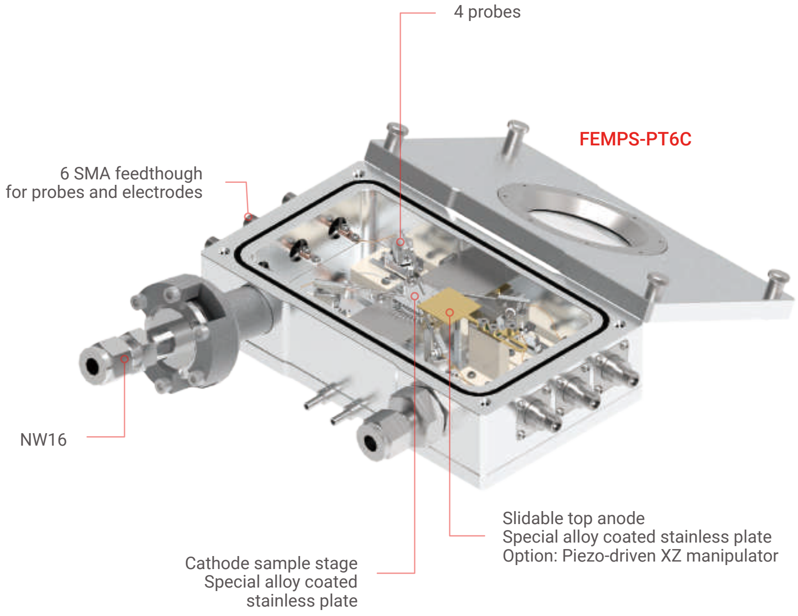
Feature Comparison of Probe Head System and LCC System

Feature Comparison of Probe Head System and LCC System		
Product	Probe Head System	LCC System
Model Name	MPW-WXXXX	LCCMPS-XX
Discription	Using Pogo pin	Using LCC socket and Chip Carrier
Contact Pad size	0.5mm or more (Direct Contact)	Less than 0.5 mm (Wire Bonding)
Pitch	> 2.5 mm	-
Remark	Customize based on customer sample's electrode information	28, 48, 64 Pins available
Temperature	-30 to 150 °C	80K to RT -30 to 150 °C

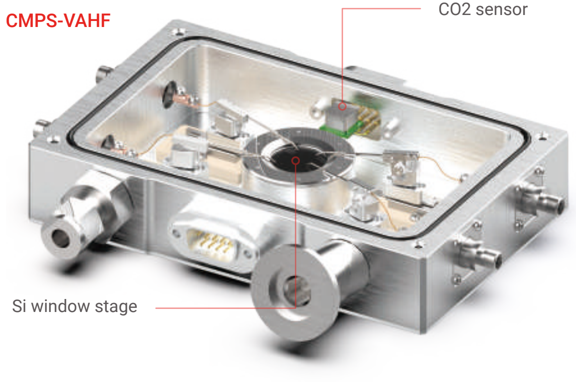
MEMO

3

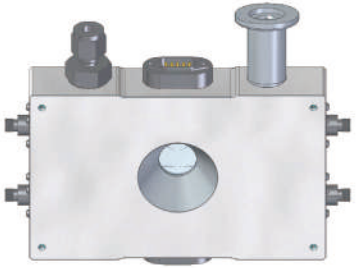
Micro Probe System for Field Emission Measurements

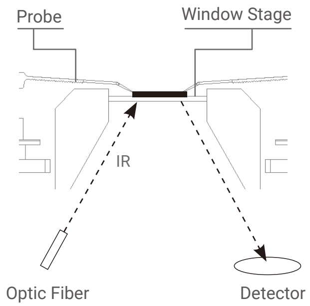


Optical Window Stage Chamber for Integrated Electro-Optical Experiments



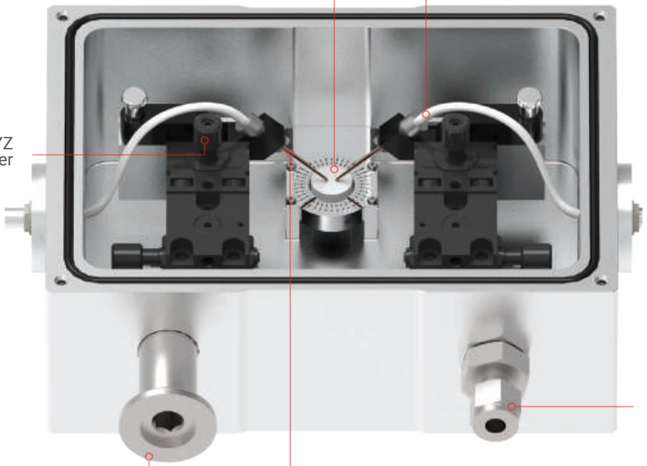
Bottom side





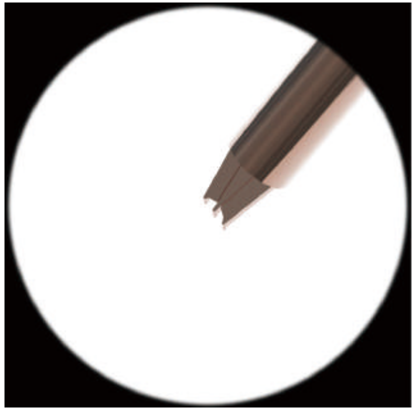
RF Micro Probe System with GSG Probe

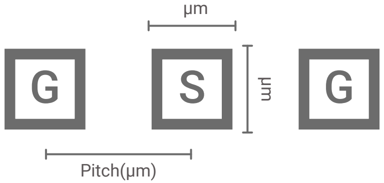
RFMPS-CHL2C



Backside

GSG Probe Tip





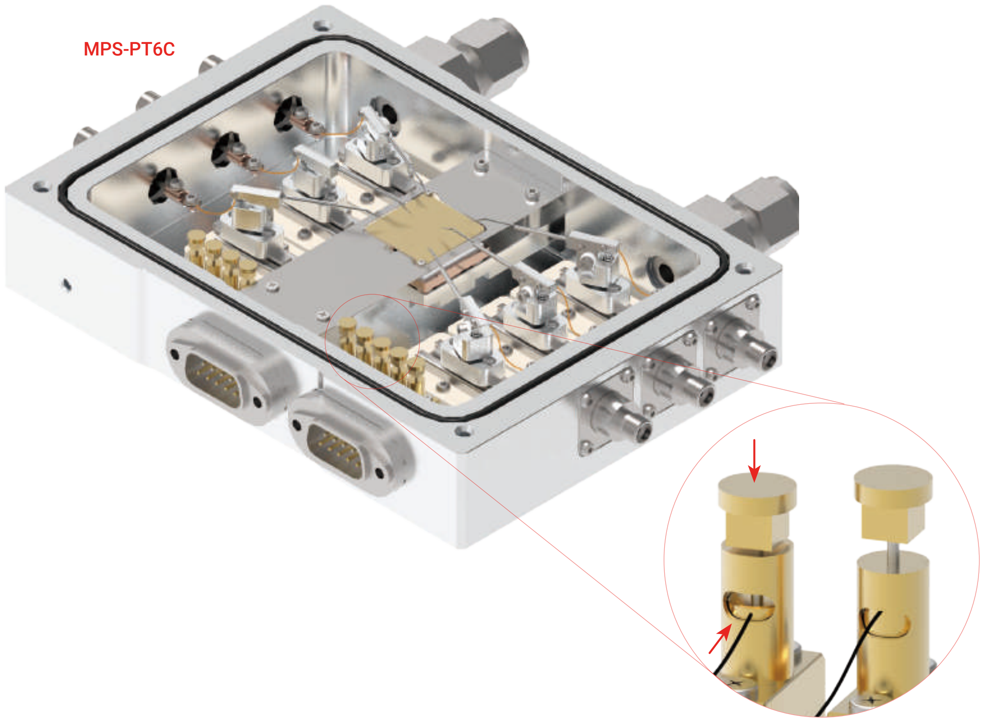
Technical Specification

Standard Pitch Range (μm)	Minimum Pad Size (μm)	Maximum Frequency (GHz)
50 ~ 1250	80 × 80	40

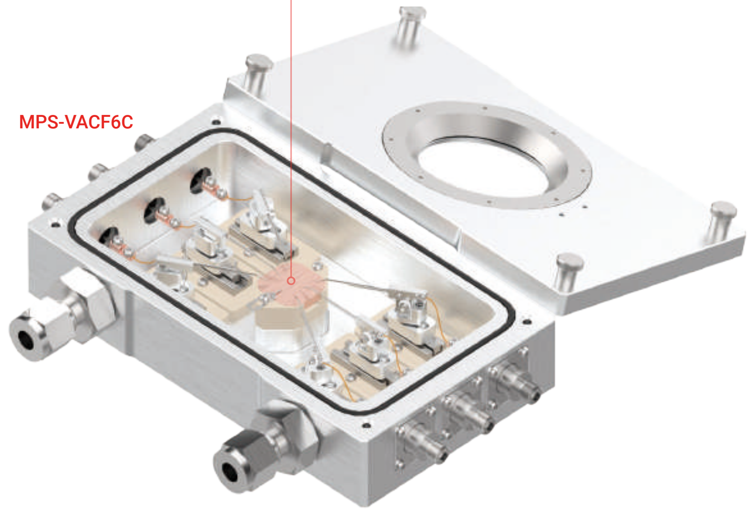
Temperature Range

RFMPS-VAC2C	RFMPS-LN2C	RFMPS-PTH2C	RFMPS-PT2C	RFMPS-CHL2C
Non-temp. control	80K ~ RT	-40 ~ 170°C	-40 ~ 200°C	RT ~ 450°C

Micro Probe System with Wire Push Contact

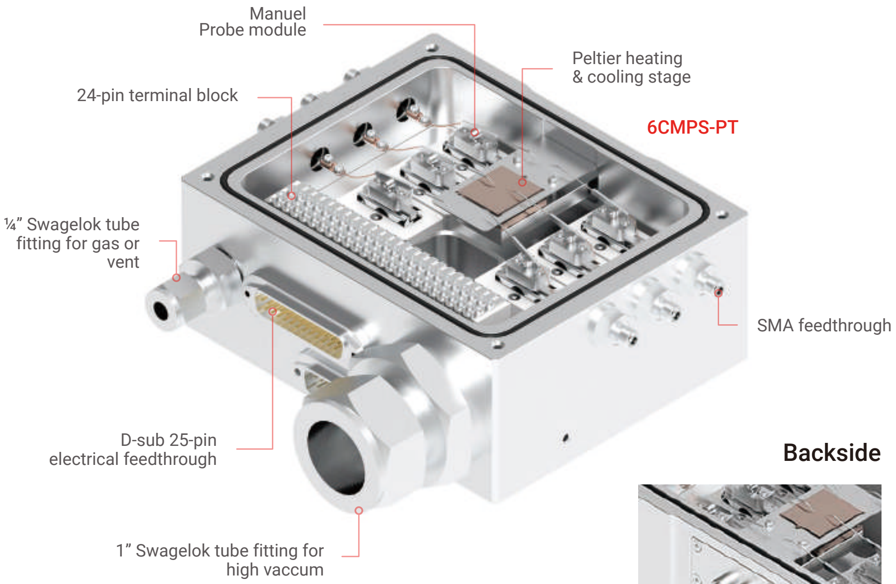


Micro Probe System without Thermal Stage



Micro Probe System with Terminal Block

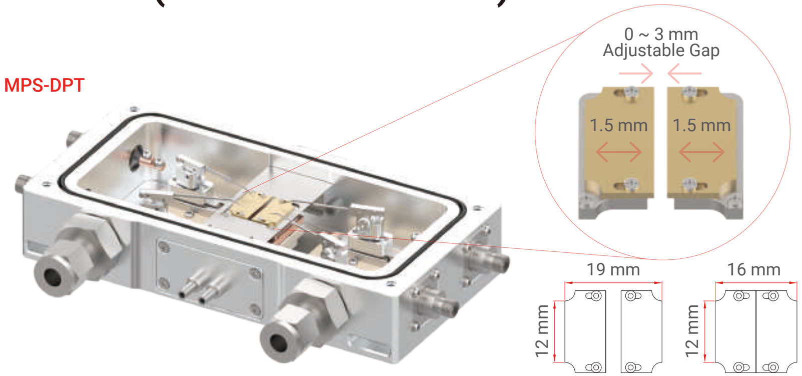
6 Probes and 24-Pin Terminal Block

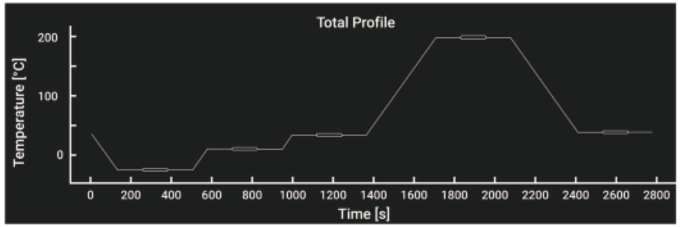


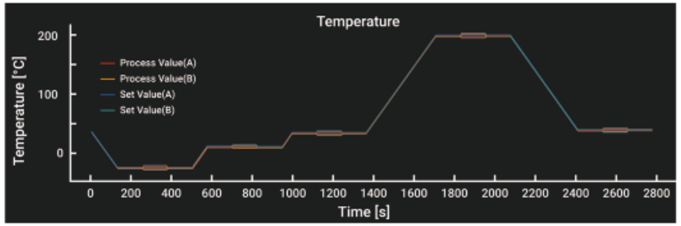
Backside

video at: https://youtu.be/eh2G-aS8C0s

Micro Probe System for Thermoelectric Devices (Dual Peltier Model)







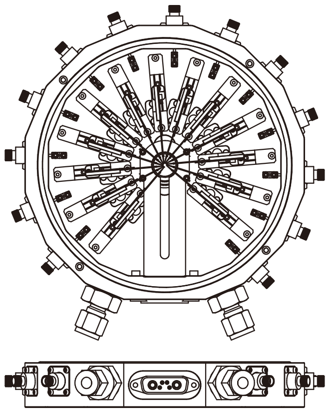
Micro Probe System

3

13-channel Micro Probe System


MPS-CHL13C

Ø 162 mm



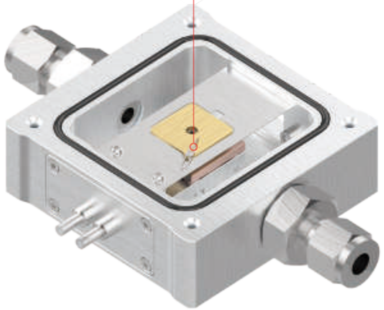
25.5 mm
(CHH/CHU : +6.5 mm)

Micro Optical Chamber (MOC)

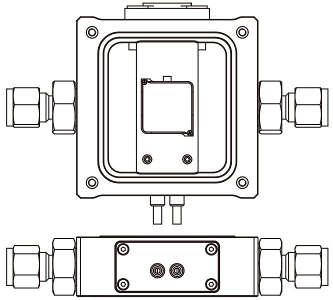
3

MOC is miniature optical chamber (MOC) for optical measurements.

Sample fixing jig



70 mm



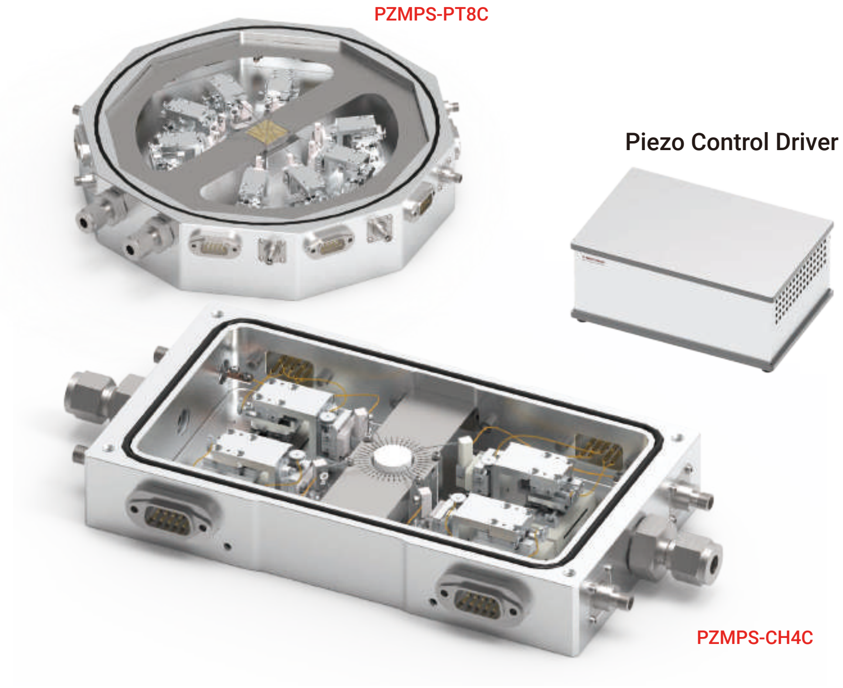
70 mm

23 mm

- Low weight (300 g), small volume (< 30 cc), low profile (24.5 mm)
- Focal distance from sample stage to top of window: ~3 mm
- 6 versions depending on various temperature ranges

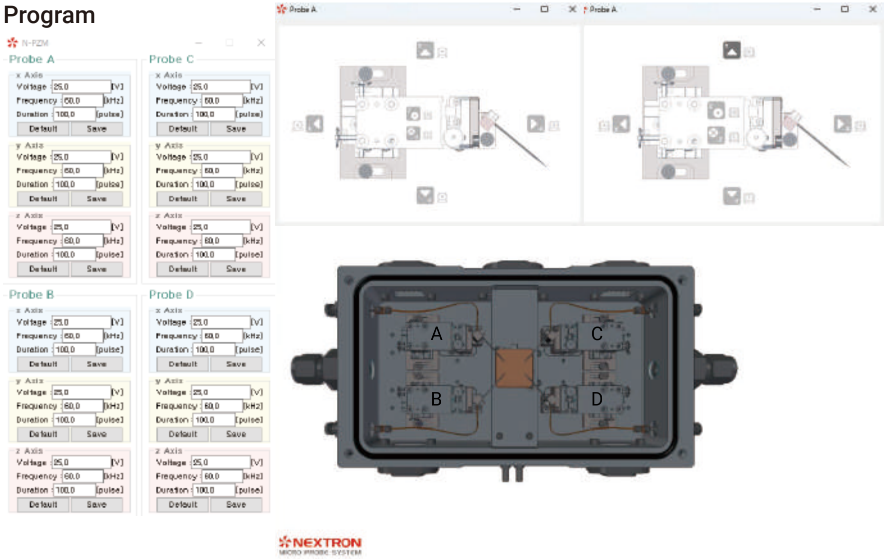
1) -40 ~ +200 °C (Peltier type, MOC-PT)
2) -40 ~ +170 °C (Peltier type, MOC-PTH)
3) RT ~ +450 °C (Ceramic Heater type, MOC-CHL)
4) RT ~ +750 °C (Ceramic Heater type, MOC-CHH)
5) RT ~ +1000 °C (Ceramic Heater type, MOC-CHU)
6) 80 K ~ RT (Liquid Nitrogen type, MOC-LN)

Piezo Module Micro Probe System



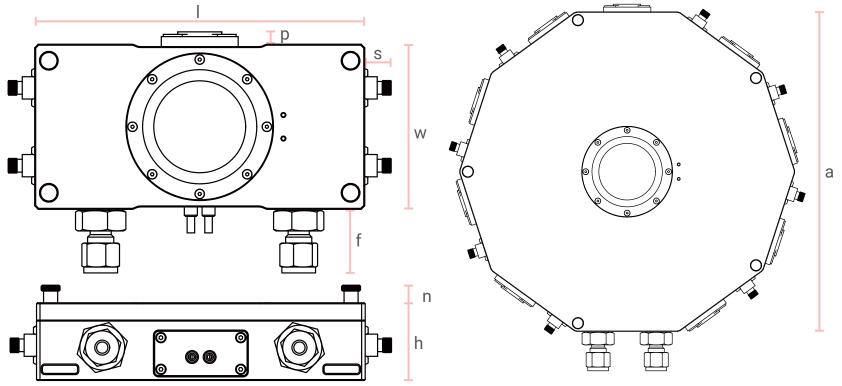
For the contact pad smaller than 400μm x 400μm, Piezo type probe is recommended.

Program



System Dimension

Dimension



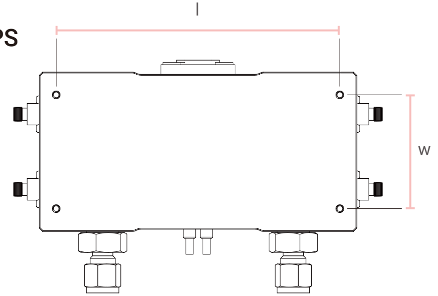
(Unit: mm)

		l	w	h[1]	a[2]	s	f[3]	p	n
Micro Probe System	4-ch	140	70	30.3	-	11.3	27	5.3	6
	6-ch	140	80	30.3	-	11.3	27	5.3	6
	8-ch	140	99	30.3	-	11.3	27	5.3	6
	10-ch	180	99	30.3	-	11.3	27	5.3	6
	13-ch	-	-	30.3	160	11.3	27	5.3	6
Piezo Micro Probe System	4-ch	180	99	33.3	-	11.3	27	5.3	6
	8-ch	-	-	33.3	220	11.3	27	5.3	6

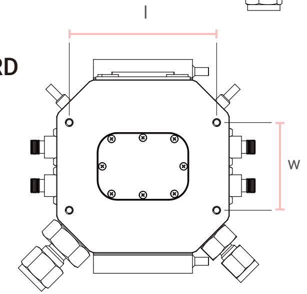
[1] With the addition of a cooling plate, the CHH/CHU model's height increases by 6.5mm.
[2] Apothem in a polygon shaped chamber (Distance between Opposite Sides)
[3] Standard 1/4" swagelok tube fitting, 23.2 mm with 1/8" tube fitting, 33 mm with NW16 option.

Thread Information for Mounting and Bracket Design

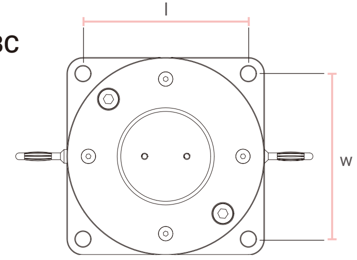
MPS



XRD



RBC

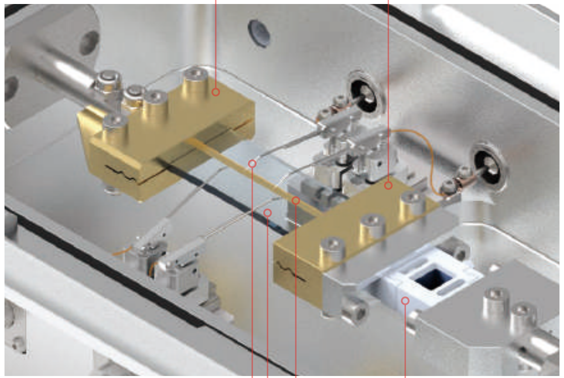


Dimension

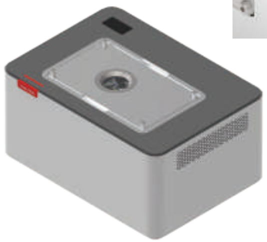
(Unit: mm)

		l	w
Micro Probe System	4-ch,6-ch	125	50
	8-ch	125	75
Piezo Micro Probe System	4-ch	168	85
XRD		64	38
RBC		46	46

In-situ Stretchable Probe System



SPS-5K



Our system Provides in-situ electrical characterization of planar and flexible devices during stretching, eliminating the limitations of conventional clamp-based methods.

video at: https://youtu.be/Loh6-39Y5q0?si=H4CYmf6ODmcl477W

Specification

- Effective stroke: 10 ~ 30 mm
- Max sample width: 30 mm
- Max stretching speed: 10 mm/s
- Cycle repeatability: 10 μm
- Max tensile force: 3 kg
- Force meter resolution: 5 gf
- Electrical measurements:
  2 or 4 wire measurements (500 VDC/1 A)
- Probing contact force: 5 ~ 20 gf

The Stretchable Probe System fits a periodic expansion/return experiment with an electrode coated on a stretchable substrate.

The probe, placed directly on the electrode located on the stretchable substrate between the clamps, allows for studying changes in electrical characteristics in various environments such as vacuum, gas, humidity, and UV.

In a typical experiment, electrical resistance is measured by securing the ends of a flexible substrate with clamps and connecting wires to these clamps. However, the clamping force exerted on the sample during stretching can introduce variability, making it difficult to obtain reliable data.

With the Stretchable Probe System, by positioning the probe directly onto the center of the sample, the variable introduced by clamp pressure, a common issue in traditional methods, is completely eliminated. Consequently, this approach facilitates the analysis of intrinsic properties related to adhesion between the elastic substrate and the electrode.

Furthermore, it is expected that the characteristics of FET devices implemented on the stretchable substrate can be measured in real-time, in accordance with the expansion/return of the stretchable substrate.

Gas Sensor Measurement System (GSS)

Optimized system for analysis according to temperature and gas atmosphere.
Especially gas sensors.

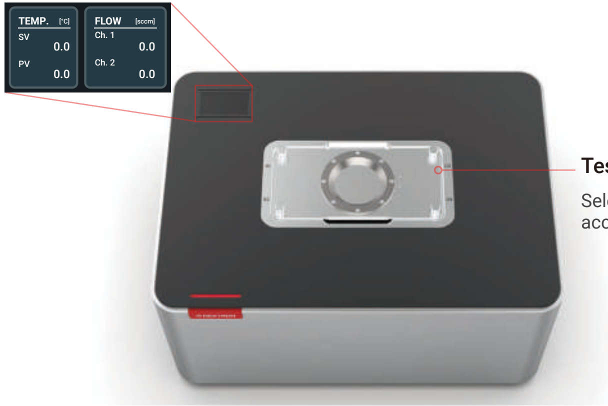
Specification

- Small size for compact set-up: 324(l) × 233(w) × 170(h) mm
- Two options of control range: GSS-PT(10 ~ 200 °C) / GSS-CHL(RT ~ 450 °C)
- High accuracy of mass flow control (±0.4 % of reading and ±0.2 % of full scale)
- Various gas selection: 150+ gases including corrosive ones & 20 settings of mixed gas

Gas Selection

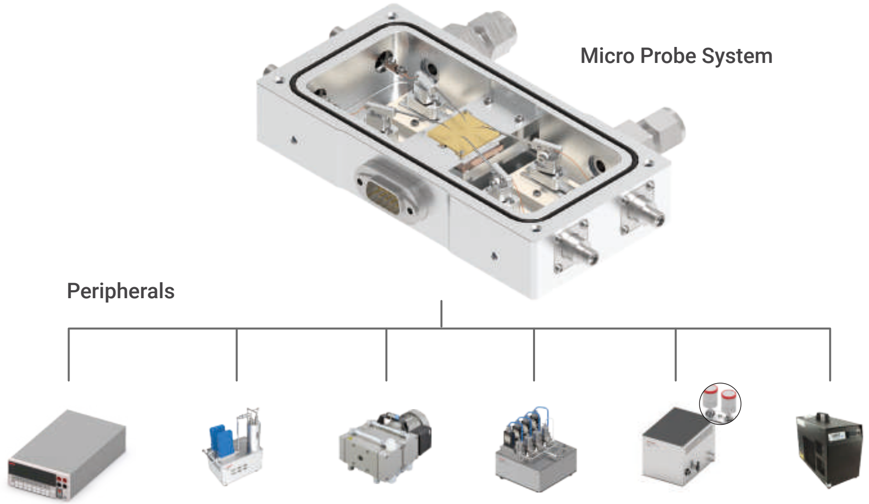
Mass flow	Single gas [1]		Mixed gas
	Standard	Corrosive	20 definable gas mixes
500 SCCM	128 selectable gas	32 selectable gas	

[1] Get more information about gas selection on the contact page of "microprobesystem.com"



System Configuration

Highly Configurable and Adaptable System



Instruments

- Sourcemeter
- LCR meter
- Spectroscopy
- Microscopy
- XRD
- Vibrometry
- Etc...

Precision Humidity Control

Vacuum Pump

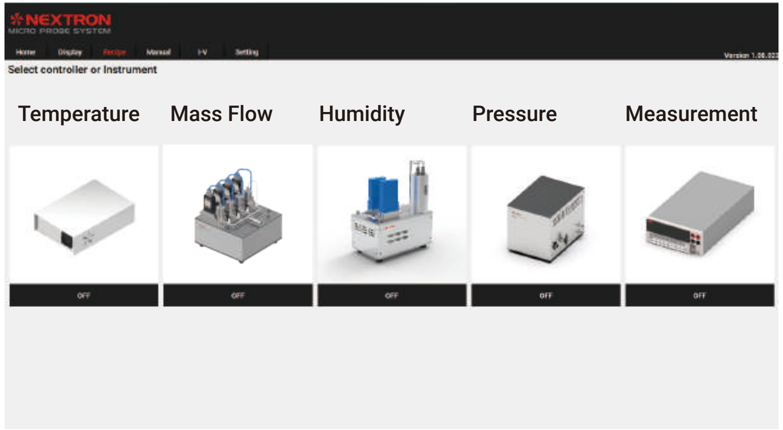
MFC Control Stage

Precision Pressure Control System

Chiller

Integrated Software

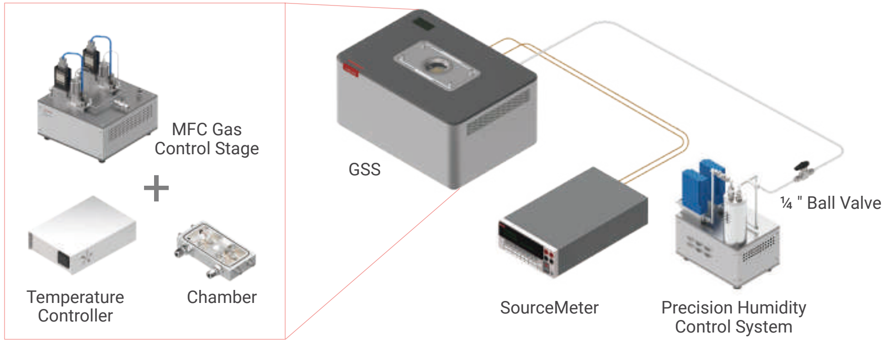
Software Main Display



Simply set your recipe and execute the process!

Nextron's integrated software enables seamless control of Keithley 2400/2450 as well as various environmental control systems. The software facilitates convenient and efficient management of temperature, humidity, gas flow, pressure, and electrical measurements within a single platform.

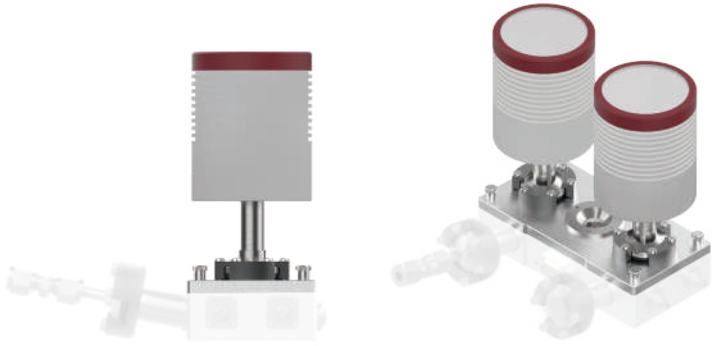
System Configuration for Gas Sensor Analysis



MEMO

Vacuum Partial Pressure Control System

Micro Probe System with Baratron Gauge



Vacuum Partial Pressure Controller

PCS-WP

Pressure Control Range

0.001 ~ 1000 Torr

The Precision Vacuum Pressure control system can control partial pressure with the desire gas. The software can automatically acquest and maintain it as a recipe.

video at: https://bit.ly/3yiOW91

Precision Humidity Control System

Humidity sensor[1] can be optionally installed inside the all chambers of Micro Probe System.

HCS-2M

The Precision Humidity Control System consists of a two-channel MFC, DI water bubbling bath and humidity control software.

Precise control of relative humidity can be quickly achieved PID control method.

Technical Specification

Typical RH Accuracy (%RH)	RH Resolution (%RH)	Normal Ramp Speed (%RH / min.)	Nomal Range
2 (@1 ~ 97 %RH)	0.01	10	4 ~ 95 %RH[2]

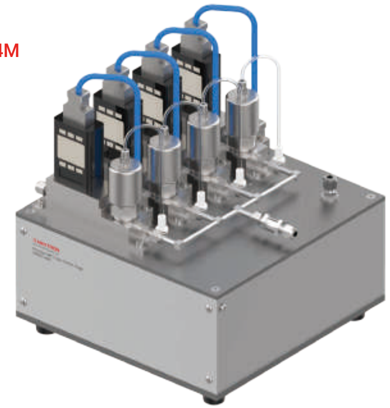
[1] Fully calibrated, linearized, and temperature compensated output.

[2] Ranges may differ depending on experimentation and laboratory temperature.

Precision MFC Gas Control Stage

Gas Flow Control

PMGC-4M



- **The Ultimate Solution for Precise and Stable Flow Control**

  The PMGC –XX Gas Flow Station, built with the mass flow control unit, gas flow pipeline, and electrical components, is the ideal solution for various applications demanding precise and stable flow control.

- **Versatile Gas Control**

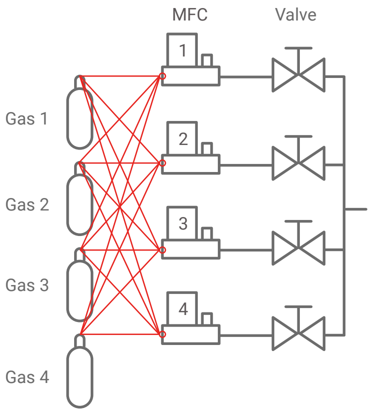
  The Precision MFC gas control stage offers exceptional flexibility, supporting over 130 user-selectable gases. Whereas conventional MFCs are restricted to a single gas type, this system enables seamless gas switching and precise concentration adjustments. Its compact design ensures efficient integration into various applications requiring dynamic gas control.

- **Ease of Use**

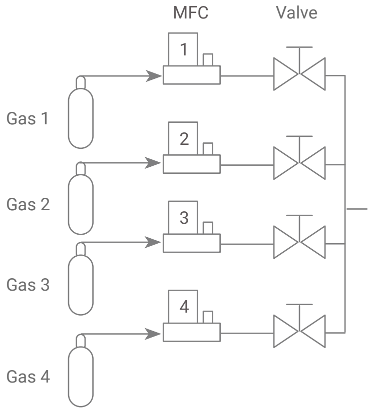
  Ready for operation with just a few gas lines and a USB connection.

Comparison of MFC Gas Control Stage

Nextron MFC Stage



Typical Competitors

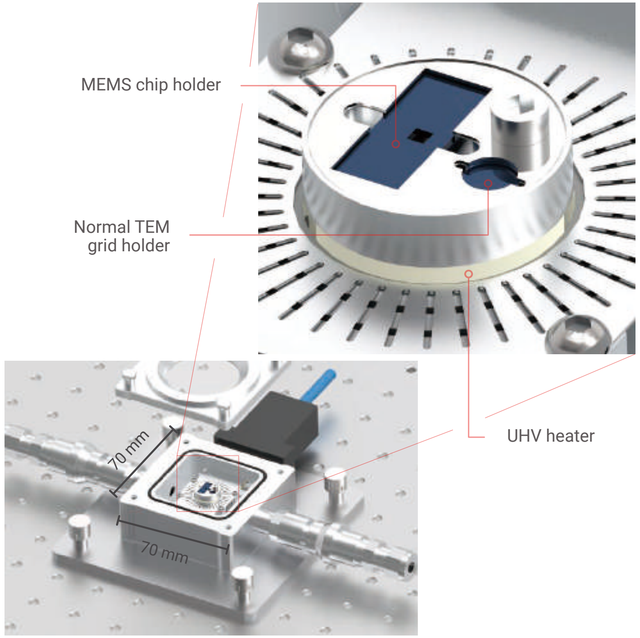


	NEXTRON	Typical Competitors	Remarks
Steady State Control Range	0.01% ~100% (10000:1 turndown ratio)*	5% ~100% (20:1 turndown ratio)	Low full-scale
		2% ~ 100% (50:1 turndown ratio)	Large full-scale (>500sccm)
Flexibility of Gas Connections	130+ user-selectable gases	Only a single gas type with a fixed concentration	Refer to diagram

*It has a turndown ratio of 100:1, even for corrosive gases, which is higher than that of typical competitors.

Options

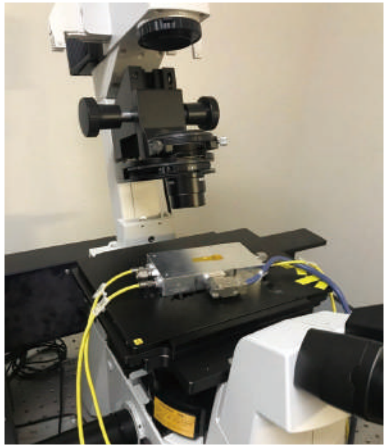
TEM Sample Cleaning / Gas Reaction Chamber



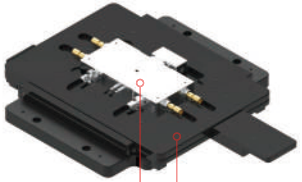
Technical Specification

Maximum Temperature	Max. Heating / Cooling Rate
1000 °C	1 °C/sec

Stage for Eclipse Ti-U Inverted Microscopes



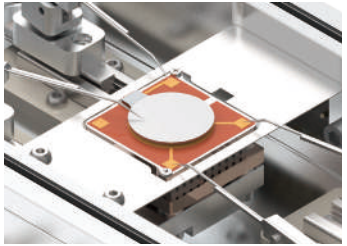
Upper Side

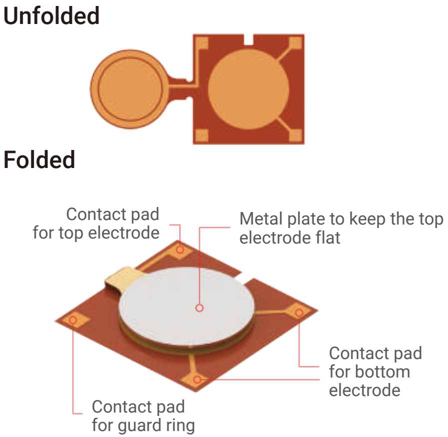


Under Side

Polymer Capacitance Measurement Fixture

Polymer Fixture Equipped on the Peltier Stage





The polymer fixture is designed for measuring the dielectric properties of polymer films. Using this fixture, characteristics such as temperature-capacitance and frequency-capacitance can be analyzed in various environments, including vacuum, humidity, and gas conditions.
The reliability of measurements is enhanced as the fixture ensures consistent contact pressure using a single probe module. Additionally, a guard ring generates a uniform electric field, improving measurement precision. The fixture also provides well-defined top electrodes, facilitating accurate and reproducible measurements.

- This fixture is not an off-the-shelf product and is supplied through customized manufacturing after consultation with customers.

video at: https://youtu.be/N31PeDQ7AEM

MEMO

Optical Covers

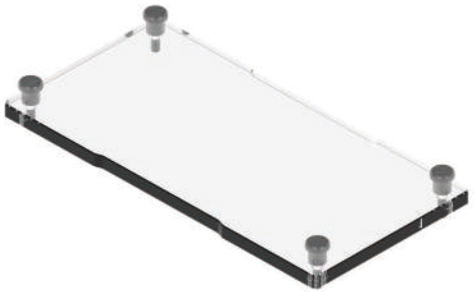
Light / EMF Blocking Cap

WC-39

ZnSe Window for IR Transmittance

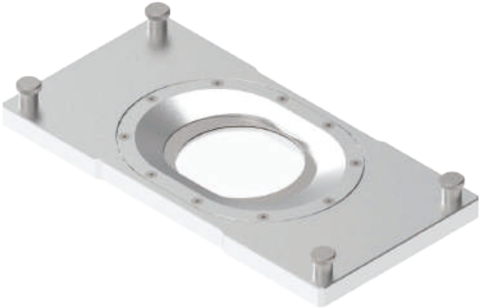
SC-4CH_ZnSe

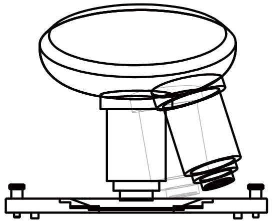
Full Quartz Cover



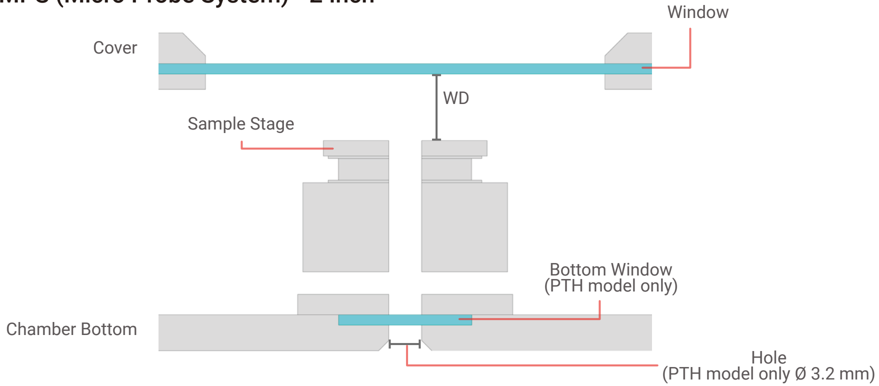
Optical Covers

Cover for Microscope Objective Turret





Working Distance
MPS (Micro Probe System) - 2 Inch



Optical Covers

Optical Cover Information

Window Selection Guide						
Clear Aperture (mm)	18			43		
Thickness[1](mm)	1.0±0.1	0.50±0.05	1.0±0.1	2.0±0.1	1.00±0.05	2.0±0.1
Material[2]	Fused Silica	Sapphire	Zinc Selenide	Fused Silica	Sapphire	Zinc Selenide
Wavelength[3] (nm)	200 - 2200	330 - 5500	600 - 18000	200 - 2200	330 - 5500	600 - 18000
TWD[4]	λ/10	2λ(typical)	λ/10 @10.6μm	λ/10	2λ(typical)	λ/10 @10.6μm
Surface Quality[5]	20-10	80-50	60-20	20-10	80-50	60-20
Structure	amorphous	Random Axis Orientation[6]	Isotropic (Cubic Zincblende)	amorphous	Random Axis Orientation[6]	Isotropic (Cubic Zincblende)
WD (mm)	7±0.2	6.5±0.15	7±0.2	8±0.2	7±0.15	8±0.2

* In addition to the standard options listed in the table, windows can be customized to meet customer specifications, including size, coating, material, etc,.

[1] Sapphire windows, owing to their higher modulus of rupture, allow thinner vacuum window applications compared to fused silica or ZnSe. The listed thicknesses are the minimum recommended for vacuum use.

[2] Micro probe system(MPS) includes a fused silica window as a standard feature at no additional cost.

[3] Anti-reflection coating is available for UV, VIS, and NIR wavelengths.

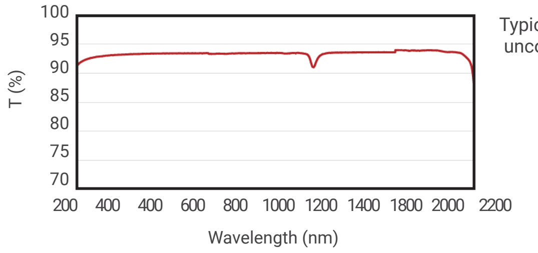
[4] For sapphire windows, this value(Transmitted Wavefront) represents the Surface Flatness(P-V).

[5] Scratch-Dig numbers for surface quality conform to the US government standards MIL-PRF-13830B.

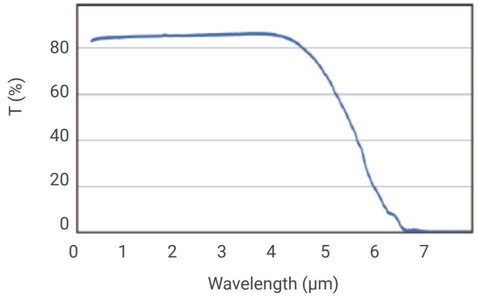
[6] A wafer-grade sapphire window with a C-plane(0001) surface orientation can be selected as an option.

Optical Covers

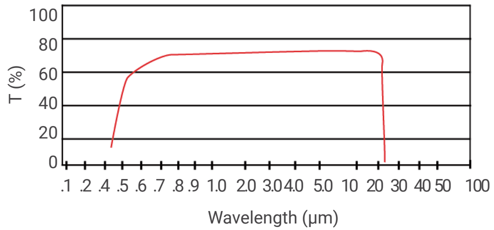
Windows Transmission Data for Optical Measurements



Typical transmission of a 3mm thick, uncoated fused silica window.



Typical transmission of a 2mm thick, uncoated Sapphire window.



Typical transmission of a 3mm thick, uncoated ZnSe window.

Signal Cable

Standard: Coaxial Cable(SMA-BNC)



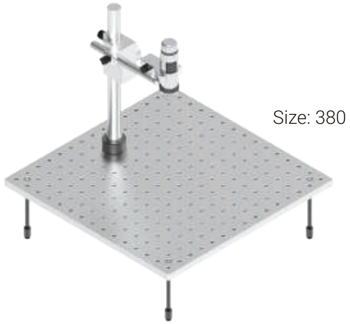
- Length: 1.5 m
- Impedance: 50 Ω
- Leakage current: 100 pA

Option: Triaxial Cable(SMA-TNC)



- Length: 1.5 m
- Impedance: 50 Ω
- Leakage current: 100 fA

Breadboard & Digital Microscope (Optional)



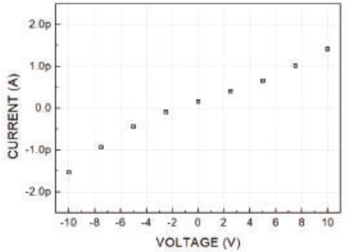
Model	DM-5MP
Resolution	5M pixels (MJPEG codec 2592 × 1944 resolution)
Magnification	10 ~ 140X
Sensor	Color CMOS
Frame rate	10fps @5MP/3MP/2MP 25fps @130M pixels 30fps @VGA
Lighting	8 LED (on/off)
Measuring function	Available
Calibration function	Available
Weight	125 G
Dimensions	10.5(l) × 3.2(w) cm

Technical Data

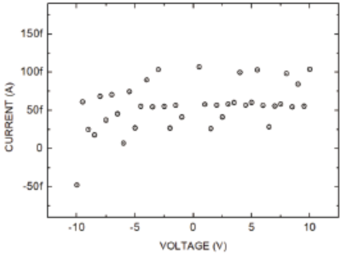
Electric Characteristics

- Leakage Current: 100 pA
  standard SMA-BNC coaxial cable
- Leakage Current: 100 fA
  option SMA-TNC triaxial cable
  tested by using Keithley 4200-SCS Semiconductor Characterization System.
- Maximum DC Voltage / Current:
  500 VDC / 1000 mA

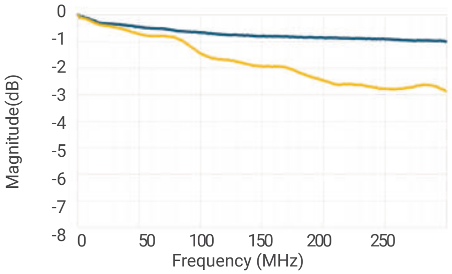
- Frequency: DC ~ 300 MHz
- Measured by using Agilent E5071C network analyzer



Low current measurement of ~ 10^{13}ohm resistor



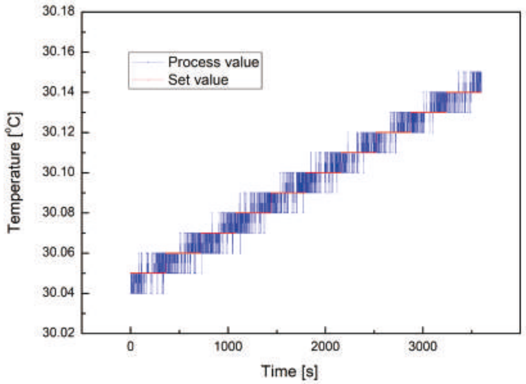
Off-current noise test



S21 measurement

Temperature Resolution and Accuracy

Model: MPS-PT



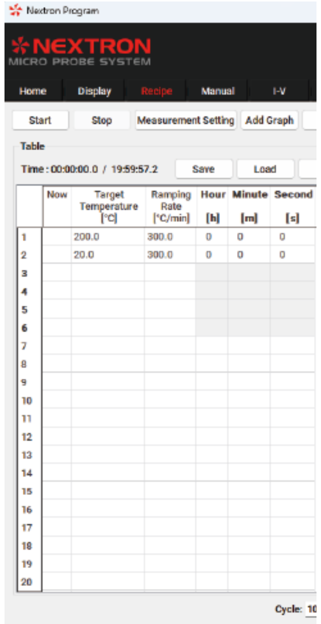
- Temperature Setting Conditions: 0.1 °C heating condition from 30.04 °C to 30.14 °C for 1 hour
- Featuring Peltier thermoelectric elements, the MPS-PT model offers unparalleled temperature stability and control.
- The accompanying graph demonstrates the system's capability to control the sample stage temperature with a precision of ±0.01°C.

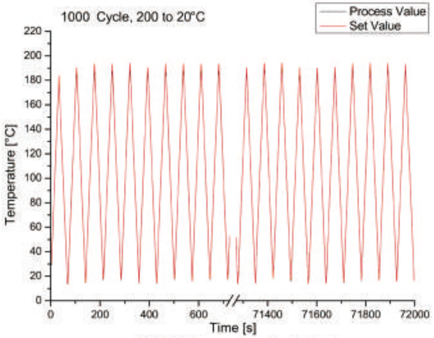
Temperature Cycle Test

Temperature cycle test can be performed accurately with a Peltier type Micro Probe System (model: MPS-PT or MPS-PTH).

video at: https://youtu.be/cUdyocmzVM8

Software

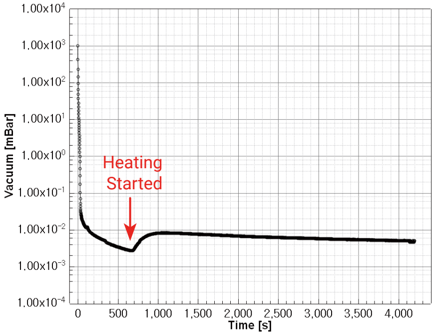


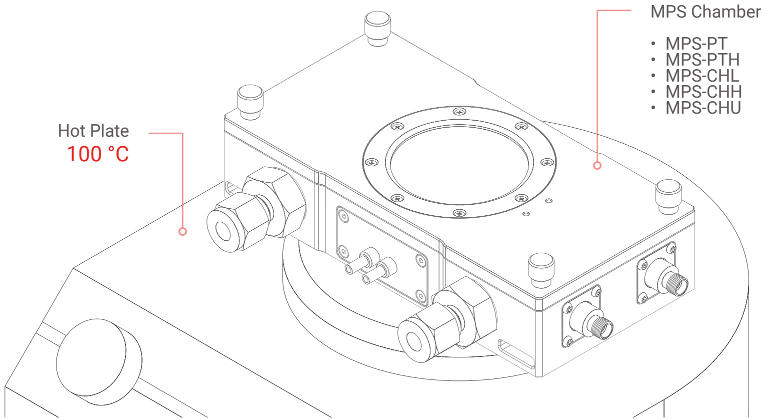


MPS-PT Temperature Cycle Test

Heating Capability for the Entire Chamber

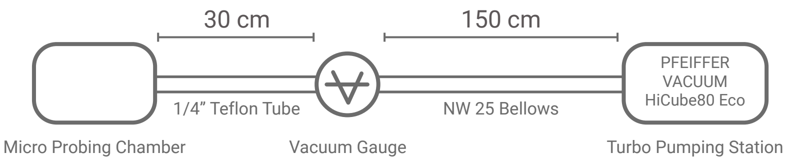
Model: MPS-PT

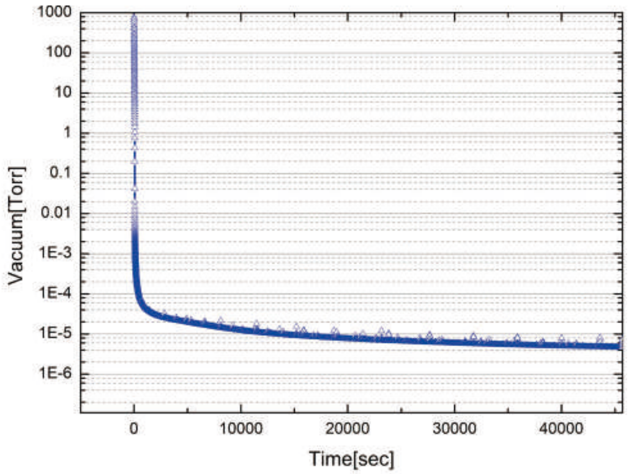




Vacuum Test

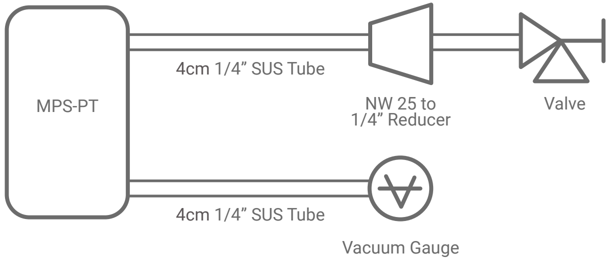
Model: MPS-CH

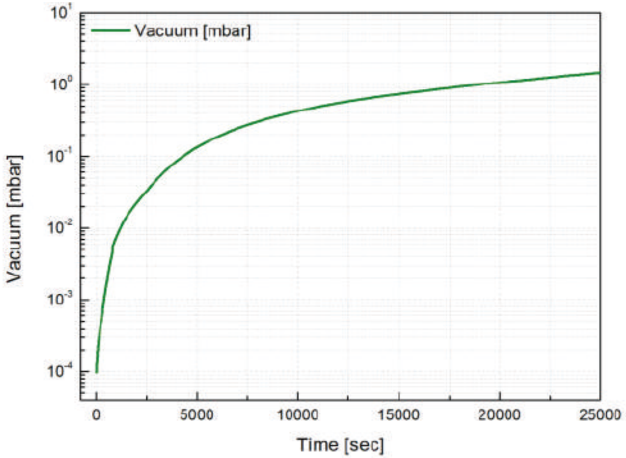




Vacuum Leak Test

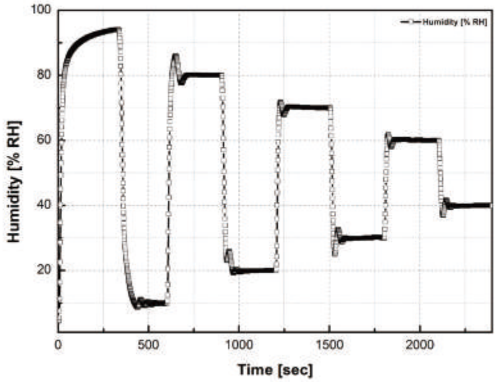
Model: MPS-PT





Humidity Test

Model: MPS-CH

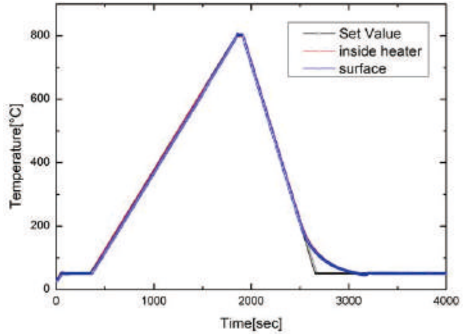


This Figure demonstrates the precise control of humidity levels between 10 % RH and 90 % RH.

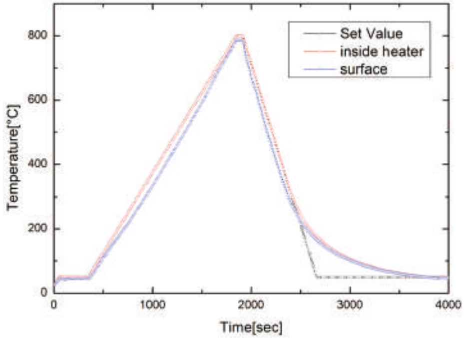
- Rapid response time minimizes settling time and ensures quick adjustments to maintain desired humidity levels.
- Adjustable total flow rate from 100sccm to 1000sccm allows for fine-tuning to match specific application requirements.
- Integration with Nextron Gas Control System enables simultaneous control of humidity and gas concentration.

Heating Stage Temperature (Internal & Surface)

Model: MPS-CHH



Test Condition: under 1 atm air atmosphere

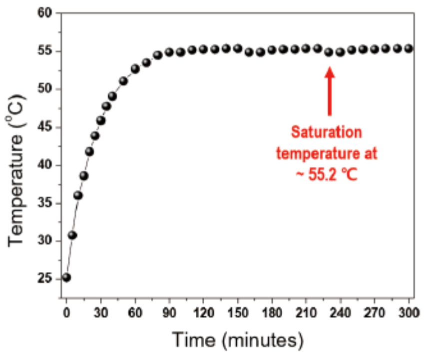


Test Condition: under 10^{-5} torr

Thermal Isolation

Model: MPS-CH

The MPS chamber is designed with optimized insulation, ensuring that the chamber temperature remains at a low level even during high-temperature operation.

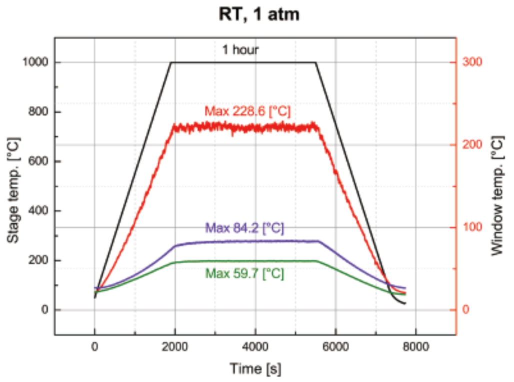


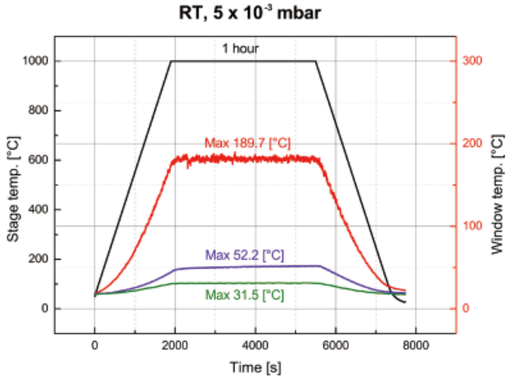
✓ **Experiment conditions**

Laboratory temperature	19 ~ 21 ℃
Temperature of sample stage	450 ℃
Ramping rate of sample stage	1 ℃ per second
Chamber condition	Thermally floated, with cover
Chamber pressure	1 atm, air

- The measured temperature at the bottom-center of the chamber, the closest spot to the heater, confirms the effectiveness of thermal insulation.

Window Temperature during High-temperature Experiment

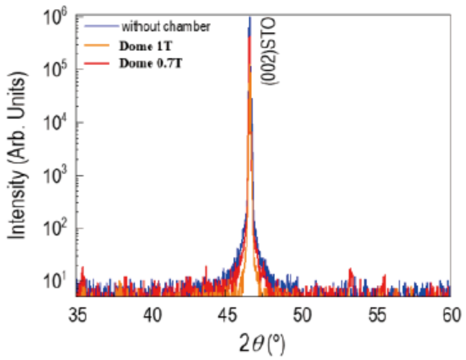




Careful attention is required to protect the objective lens of a microscope during high-temperature experiments.
The graph provides data to assist in selecting the material for the optical window of the cover.
You can check the temperature of the window according to the absorption of radiant heat by material and the vacuum level in the chamber.

X-ray transmittance of PEEK dome

Model: XRDMPS-CHU



Results

- Transmittance (PEEK dome 1.0 t) : ~15 %
- Transmittance (PEEK dome 0.7 t) : ~45 %

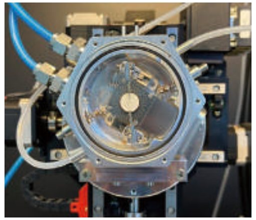
Test conditions

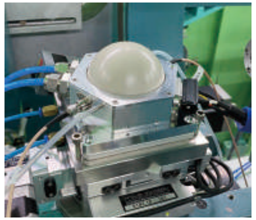
- XRD : Bruker D8 Discover
- Power : 40 kV, 40 mA
- Source : Cu Kα1, 1.5046 Å

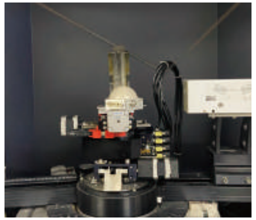
MEMO

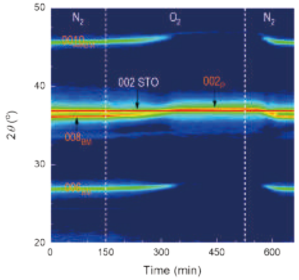
Applications

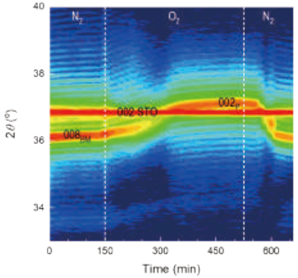
XRD: In-situ Observation of Structural- and Resistance-Changes by Redox Reactions

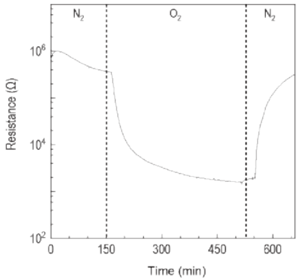












- XRD chamber: Nextron XRD Micro Probe System
- Sample: $SrFe_{0.8}Co_{0.2}O_{2.5}$ on 001 $SrTiO_3$
- Beam line: Pohang Accelerator Laboratory 3D beam line
- Measurement: Real-time XRD and resistance measurements in supply of N_2(2.5 hrs), O_2(6 hrs), and N_2 (2.5 hrs) in sequence. Flow rate was 20 sccm.
- Results: The lattice constant of $SrFe_{0.8}Co_{0.2}O_{2.5}$ thin film shifted sequentially to 3.99 Å(N_2), 3.90 Å(O_2), and 4.00 Å(N_2). Associated resistance changes is observed due to topotactic transformations.

This research work is supported by 'Busan Open Laboratory Business Meeting Market Demands' project.

Applications

Optical transmittance of VO_2 thermochromic films

Materials and Design 182 (2019) 107970

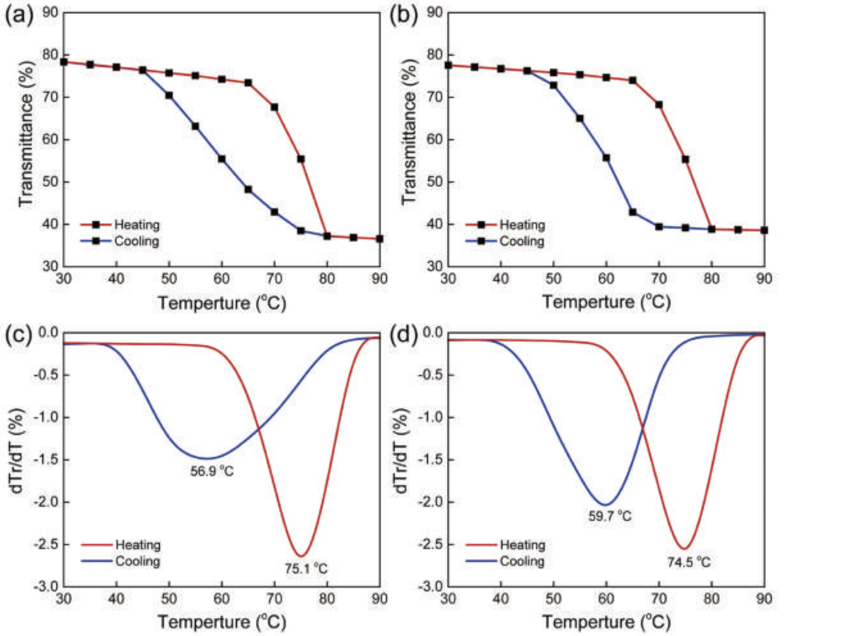
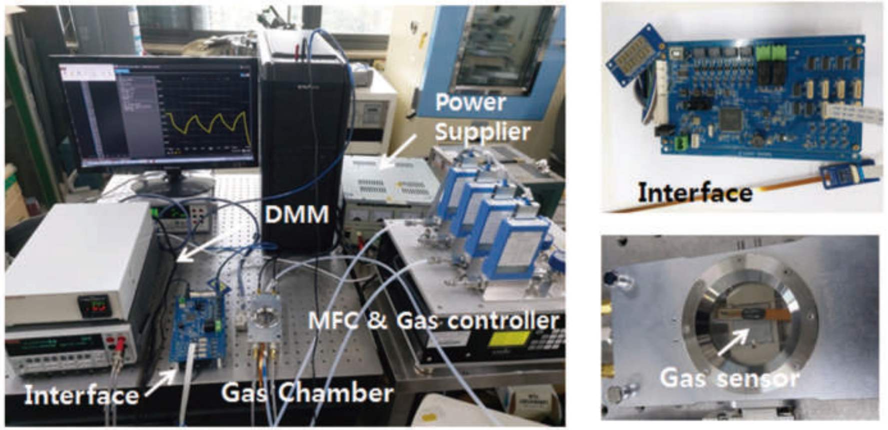


Figure. Transmittance hysteresis curves at wavelength of 2000 nm for (a) thermal and (b) IPL sintered VO_2 films. The temperature corresponding to themaximumof first-order derivative curves for (c) thermal and (d) IPL sintered VO_2 films.

Applications

Hydrogen Gas Sensor

ACS Sens. 2021, 6, 4145–4155



Applications

Hydrogen Gas Sensor

ACS Sens. 2021, 6, 4145–4155

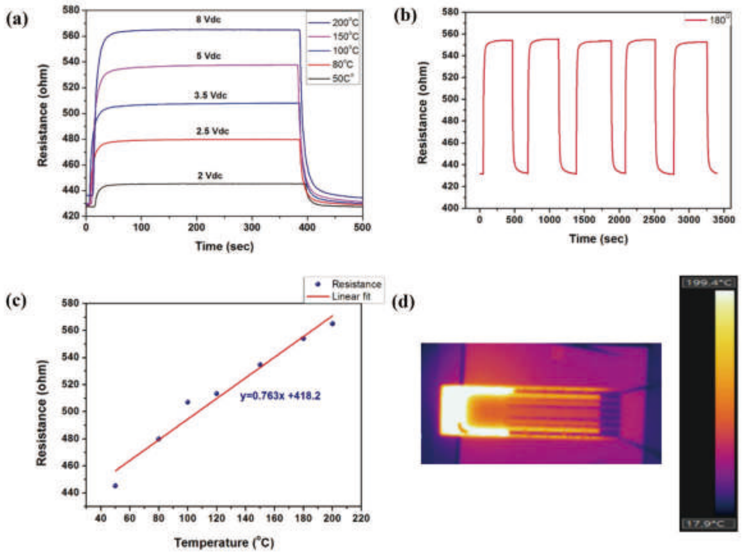
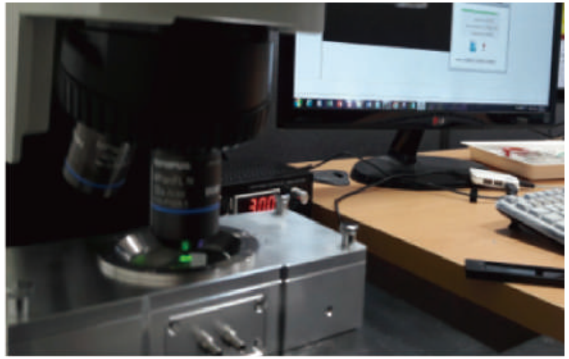
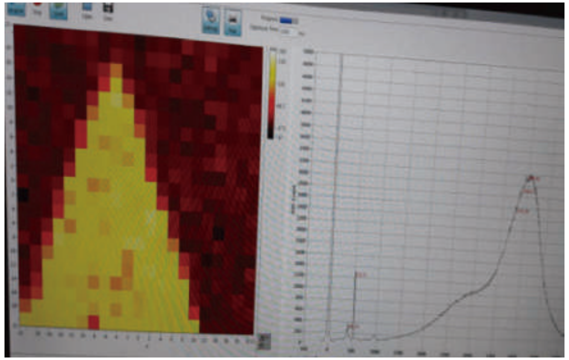


Figure. Integrated in-plane microheater’s (a) temperature variations in terms of the applied DC bias voltages, (b) repeatability at 180 °C, (c) sensitivity and linearity, and (d) surface temperature analysis by a thermal imaging camera at 8 V DC bias.

Applications

Raman Mapping



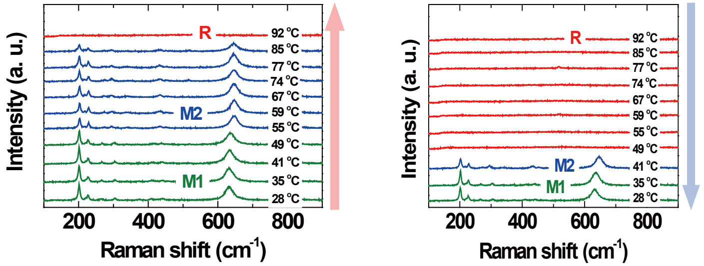


2D Molybdenum disulfide(MoS_2)

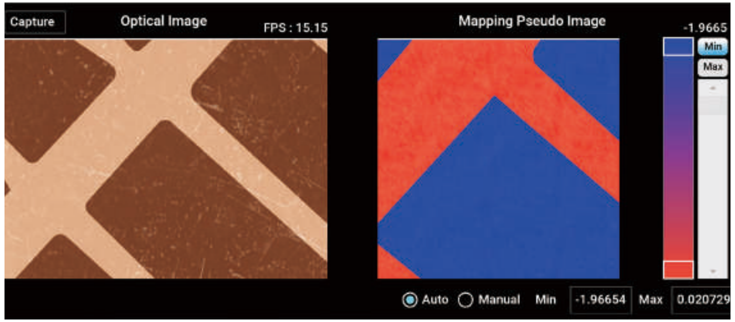
Applications

Raman Spectrometry

Vanadium dioxide(VO_2) nanowire
Study of phase transition by temperature



Photocurrent Mapping



Applications

Humidity Sensor

Adv. Mater. Technol. 2022, 7, 2100751

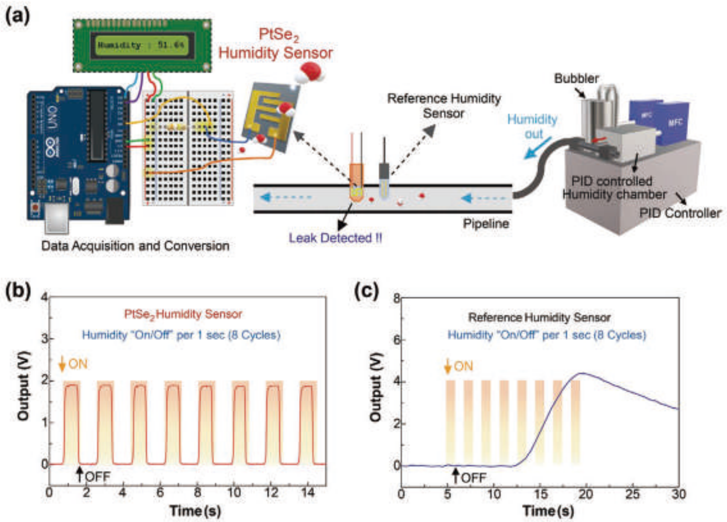


Figure. (a) Schematic diagram of the custom-made early detection of pipeline leak etection system consisting of $PtSe_2$ nanograin-based humidity sensor, (b) precise detection of input humidity pulses by the $PtSe_2$-based humidity sensor, (c) response of best-in-class reference humidity sensor for comparison.

Applications

Humidity Sensor

Adv. Mater. Technol. 2022, 7, 2100751

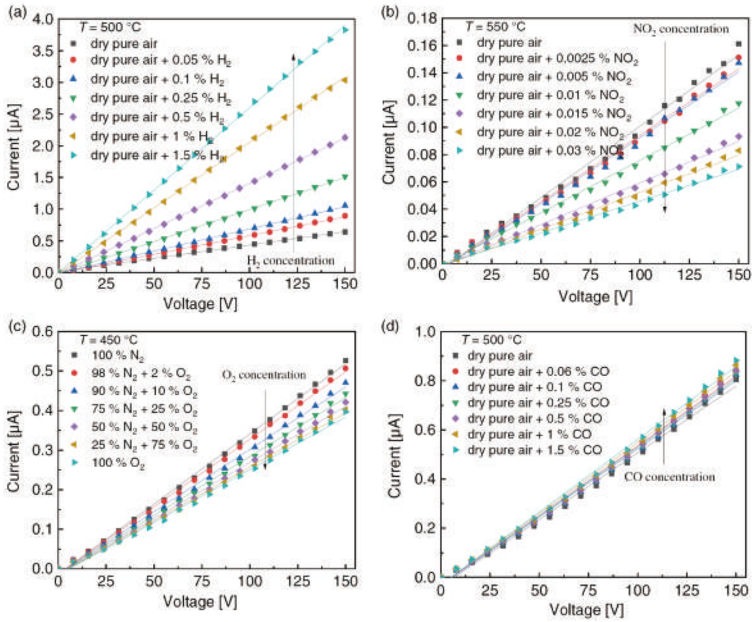


Figure. IV characteristics of ε-Ga_2O_3 layers when exposed to different concentrations of (a) H_2, (b) NO_2, (c) O_2, and (d) CO.

Applications

Light-emitting diodes

Nanoscale, 2019, 11, 18444–18448

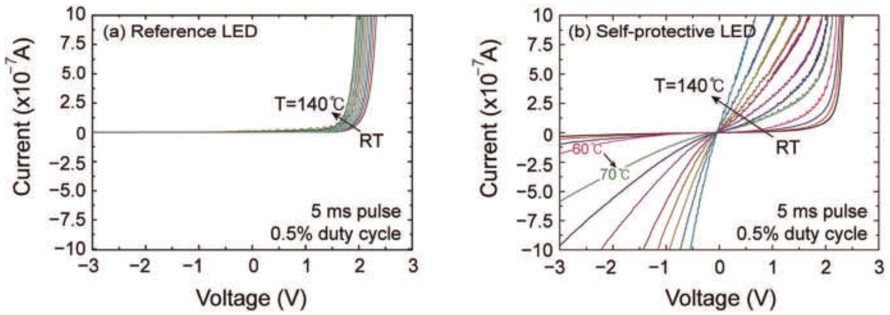
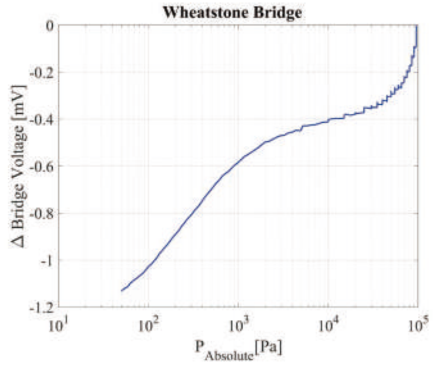


Figure. Temperature-dependent I–V characteristics for (a) the reference LED and (b) the self-protective LED under pulse operation.

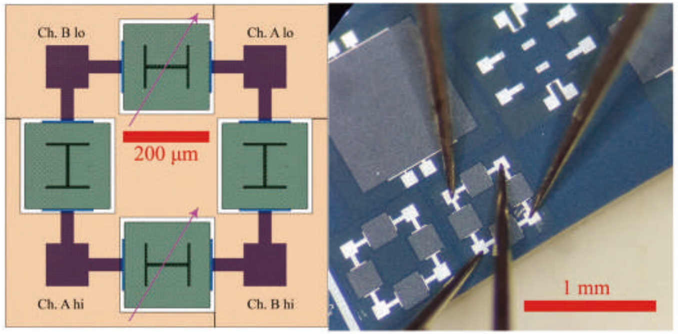
Applications

Piezoresistive Pressure Sensor

Sensors and Actuators A 314 (2020) 112217



The bridge voltage as function of pressure after an offset voltage correction at 100 kPa.



The Wheatstone bridges connections to the SMU; schematically (left) and through microscope (right).

Applications

Electromigration test

J. Phys.: Condens. Matter 34 (2022) 175401

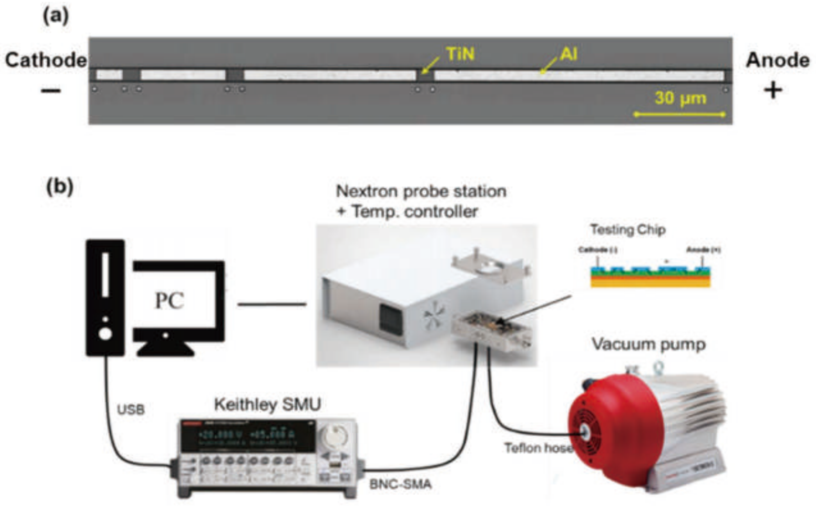


Figure (a) Top view of the sample used in electromigration test. (b) A schematic overview of the electromigration measurement setup.

Applications

Electromigration test

J. Phys.: Condens. Matter 34 (2022) 175401

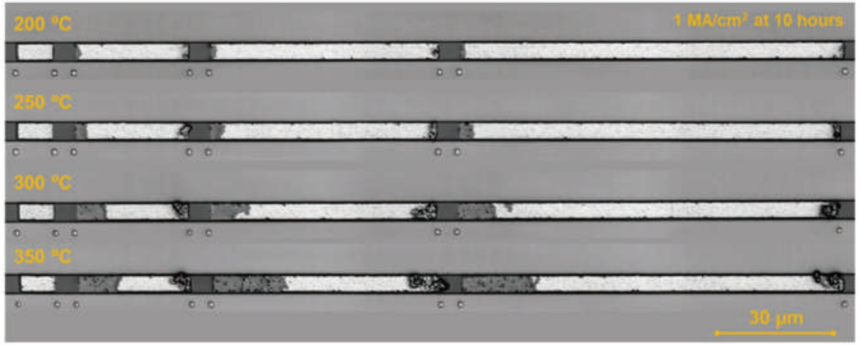
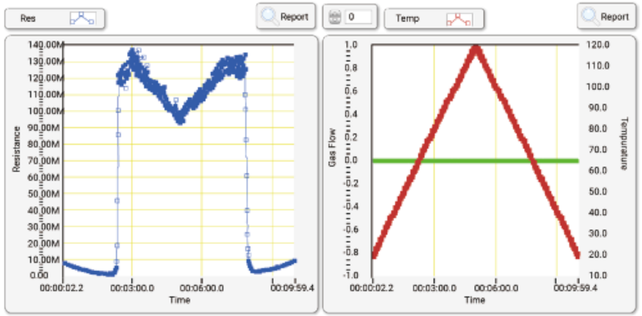


Figure. Electromigration results for 300 °C-deposited Al stripes under 1 MA cm−2 at 200 °C, 250 °C, 300 °C, and 350 °C at 10 h.

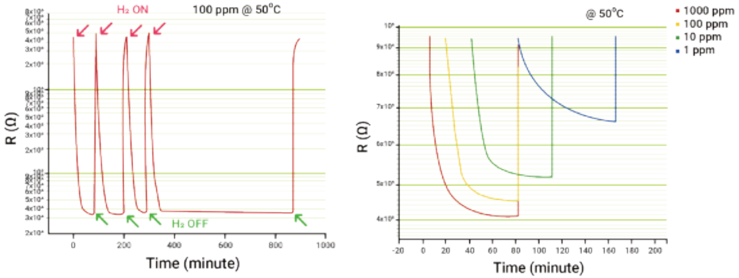
Applications

MIT(Metal-Insulator Transition)

Single crystalline VO_2 nanobeams
Study of MIT(Metal-Insulator Transition)



Resistive Gas Sensor Characterization

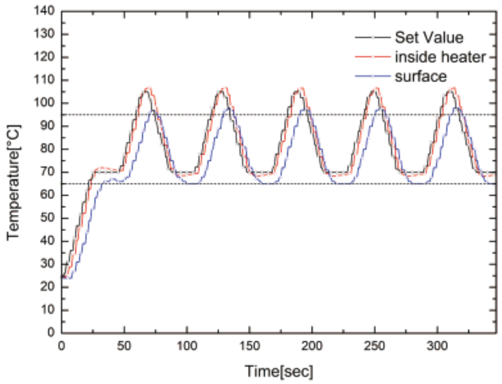


Measured while purging hydrogen and nitrogen mixed gas without using vacuum pump
Sample: Palladium coated Zinc oxide($ZnO/A_{l2}O_3$) nanowire for hydrogen gas sensing

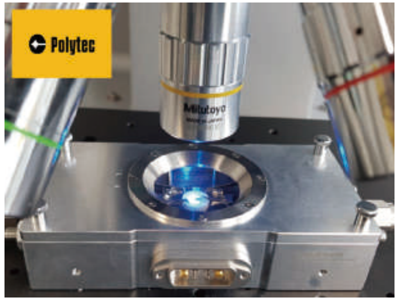
Applications

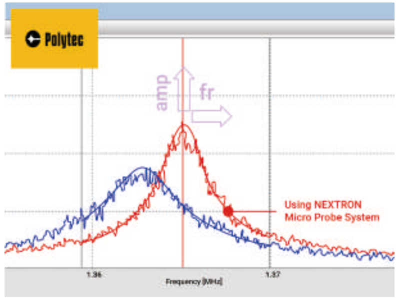
Rapid Microfluidic PCR(Polymerase Chain Reaction)

Slide glass substrate
Denaturation at 94 °C and annealing/extension at 59 °C



Thermal Resonant Frequency Measurement





Applications

- Gas sensor characterization
- Rapid Microfluidic PCR(Polymerase Chain Reaction)
- Photovoltaic cells' and thermoelectric materials' characterization
- Transistors, diodes, LED, ... testing
- Bulk and thin film materials' thermal conductivity measurements(3ω-Method)
- Phase transition materials' electrical/optical characterization (metal oxides, Memristor,...)
- Characterization of MEMS/NEMS mechanical and electro- mechanical resonators(reference clocks, mass sensors)
- Characterization of micro-coils and micro-antenna for inductive sensors(Impedance spectroscopy of biological tissues, In vivo RMN)
- Capacitive, resistive & resonant micro/nano sensors testing

MEMO

Publications

Zhen Cui, Yaqian Zhang, Dong Hu, Sten Vollebregt, Jiajie Fan, Xuejun Fan and Guoqi Zhang “Effects of temperature and grain size on diffusivity of aluminium: electromigration experiment and molecular dynamic simulation.” *J. Phys. Condens. Matter* 34,175401(2022).

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Paul Grey, Manuel Chapa, Miguel Alexandre, Tiago Mateus, Elvira Fortunato, Rodrigo Martins, Manuel J. Mendes, Luís Pereira “Combining Soft with Hard Condensed Matter for Circular Polarized Light Sensing and Logic Operations.” *Adv. Opt. Mater.* 9,2001731(2021).

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