

IV & SHEET RESISTANCE MODULE

Use Case: Thin film material resistance, resistivity, and sheet resistance measurements of semiconductors and conductors.


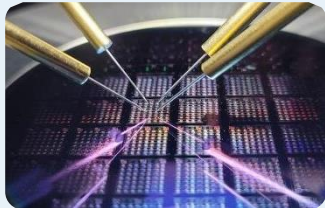
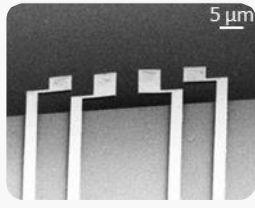
Xallent four-point probes directly measure the resistance, sheet resistance, and resistivity of thin film materials. Xallent's nanoscale resolution even makes it possible to investigate how grain sizes, boundaries, defects, and material composition impact those measurements. Using that detailed information, researchers can quickly optimize material production, reliability, and yield.

Combined with the Xallent probe head or prober, the 4-point probes allow quick, automatic sample mapping at the micro and nanoscale level.

Xallent's 4-point probes solve key issues for material researchers:

- **No sample preparation:** The probes eliminate the need for using expensive and destructive lithographic, etching, and deposition techniques to pattern and deposit metal electrodes on thin films before performing electrical tests.
- **Accessibility:** The small form factor of the probes opens new frontiers in testing materials at the micro and nanoscale, quickly and effectively.
- **Resolution:** Xallent's fine-pitch 4-point probes offer the necessary spatial resolution to reveal a material's surface conductivity distribution, allowing targeted optimizations for reliability and yield.

COMPARISON OF 4-POINT PROBING TECHNOLOGIES

	Litho & Metal Deposition	Individual Probes	Xallent's Integrated Probes
Technology			
Electrical Testing Process Comparison			
Sample Prep	Expensive & time-consuming lithography and	To avoid puncturing the thin-film material, metal contact pads are often	None—just connect probe to sample

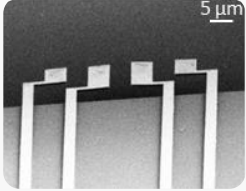
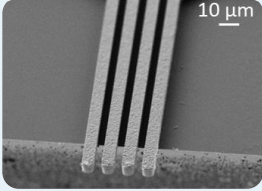
	sputter coating process required to deposit metal electrodes on sample	first deposited on the sample	
Precision	Complicated, painstaking process to identify nanoscale area and deposit metal electrodes	Individual probe tips can crash into each other during the navigation of probes to target	Easily measure samples in the nanometer range in ambient air or in an SEM or TEM
Sample damage	Etchant used in the sample preparation process can destroy the sample	Probe tips can puncture sample on contact. Etchant used in the sample preparation process can destroy the sample	No destructive lithographic or other prep steps. Spring-loaded probes mitigate sample damage during testing
Prep steps introduce potential for testing error	Lithographic chemicals may dope or change the properties of the sample, distorting measurements	Lithographic chemicals used to pattern metal contact pads may change sample properties	None
Time-to-test	About 24 hours	About 24 hours with metal contact pads, about 15 min without	About 5 minutes

PROBES

Xallent's 4-point probe technology monolithically integrates 4 spring-loaded probes on a single chip substrate. The chip is navigated by an XYZ positioner to the area of interest and the 4 probe tips simultaneously make contact with the sample surface. Moving the 4 probes with a single positioner increases measurement throughput and eliminates probe-to-probe crashing during navigation and landing.

Need a special probe tip? We design and manufacture a portfolio of probes with a full range of probe spacings, tip materials, and radii. In addition to our current portfolio of probes, we work closely with our customers to develop application-specific probes to meet the most challenging testing needs.

Xallent 4-Point Probe Specifications

Parameter	SKU: X4-A1-5-5	SKU: X4-A2-5-5-HF
Probe Type		
Number of Tips	4	4
Minimum Pitch	10 µm	10 µm
Tip Area	5 µm x 0.2 µm	5 µm x 5 µm
Probe Material	Platinum Alloy	Nickel Alloy
Probe-to-Probe Leakage	0.6 pA @ 5V	35 pA @ 5 V
Current Carrying Capacity	10 mA	100 mA

Xallent 4-Point Probes Under Development

Parameter	SKU: X4-A1-0.4-0.4	SKU: X4-A2-5-5-SS
Probe Type		
Number of Tips	4	4
Minimum Pitch	0.8 µm	10 µm
Tip Area	0.4 µm x 0.2 µm	5 µm x 5 µm
Probe Material	Platinum Alloy	Nickel Alloy

Note: Probe designs and specifications are evolving so depending on customer's specifications, final design might be different.

NANOPROBER

Unlock the Power of the Xallent System: The next frontier in semiconductor, thin film, MEMS, NEMS, and photonics testing is here—more tests, faster, with higher resolution and at a fraction of the cost, with a much smaller footprint than with conventional equipment.



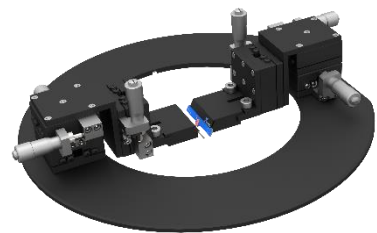
The Xallent SAKYIWA Nanoprober enables high-speed extraction of the electrical, mechanical, and optical properties of thin film materials, MEMS, NEMS, and solid-state devices at the micro and nanoscale in ambient air. With the Xallent SAKYIWA Nanoprober, you can run the following tests, all on one compact machine:

- DC, high frequency, and CV electrical tests
- Mechanical and scanning probe tests
- Imaging and metrology tests

Taken together, the Xallent SAKYIWA Nanoprober replaces machines up to 5X the price and occupying 10X the lab space. Powered by user-friendly software, the SAKYIWA combines accurate measurement results with unprecedented speed.

Since the SAKYIWA is a semi-automatic prober and is capable

of running a wide range of tests, there is no need to reposition the sample on multiple machines and search for the area of interest again. Simply place your sample in the SAKYIWA and run all of your tests. The prober can be adapted with multiple probe heads to allow for parallel testing—one head can be dedicated to performing electrical characterization, while the other is used for photonics or mechanical measurements.



The SAKYIWA is currently available in two versions: the XS10 and the XS20. The XS10 has an open-loop stage platform and highly reliable, low-voltage piezoelectric (PZT) positioning stacks for high-duty cycle operations. The XS20 features high-precision, closed-loop piezoelectric positioners. Closed-loop operation is achieved through the use of integrated strain gauge sensors, making the XS20 ideal for mapping and scanning probe applications.

Nanoprober Specifications

Parameter	XS10	XS20
Motion and Positioning for Fine Positioner		
Open Loop Travel	100 μm/axis	120 μm/axis
Closed Loop Travel	N/A	100 μm/axis
Resolution Open Loop	0.4 nm	0.2 nm
Resolution Closed Loop	N/A	1 nm
Vertical Load	30 N	15 N
Motion and Positioning for Coarse Positioner		
X/Y Travel Range	+/- 12.5 mm	
Z Travel Range	45 mm	
Microscope		
Objective	20X	
Eyepieces	High-Eyepoint WF10X	
Camera	CMOS	
Image Magnification	40X	
Light Source	Variable Intensity	
Sample Stage		
Max Sample Size	100 X 100 mm²	
Active Probing Area	25 X 25 mm²	

Focus System	Coaxial Coarse & Fine Focus
Manipulator	
XYZ Manual Travel	6 mm
Electrical	
Power Input to Lamp	100-240V, ~65W, 50/60Hz
Operating Voltage for Stage Controller	24 V DC
Dimensions	
L x W x H	18 cm x 45 cm x 65 cm

Note: Discuss with us on manual, semi-automatic, or automatic probing capabilities for 100 mm, 150 mm, 200 mm, and 300 mm wafers. Prober design is evolving so depending on customer's specifications, final design might be different.

SOFTWARE

Automated, Unified Software Puts You in Control...Fast: The Xallent Nanoprober system is powered by an expanding portfolio of user-friendly software modules for application-specific measurements. With an intuitive graphical user interface and analysis driven by AI, the Xallent software suite maximizes the utility of your Xallent prober system. When you connect your Keithley SMU the Xallent software enables a one-stop, complete IV and sheet resistance probing solution.

With the Xallent Nanoprober, there's no need to move the sample between tests. Locate your area of interest once and do all of your measurements using a unified interface. When you're done, simply export the measurement results and images.

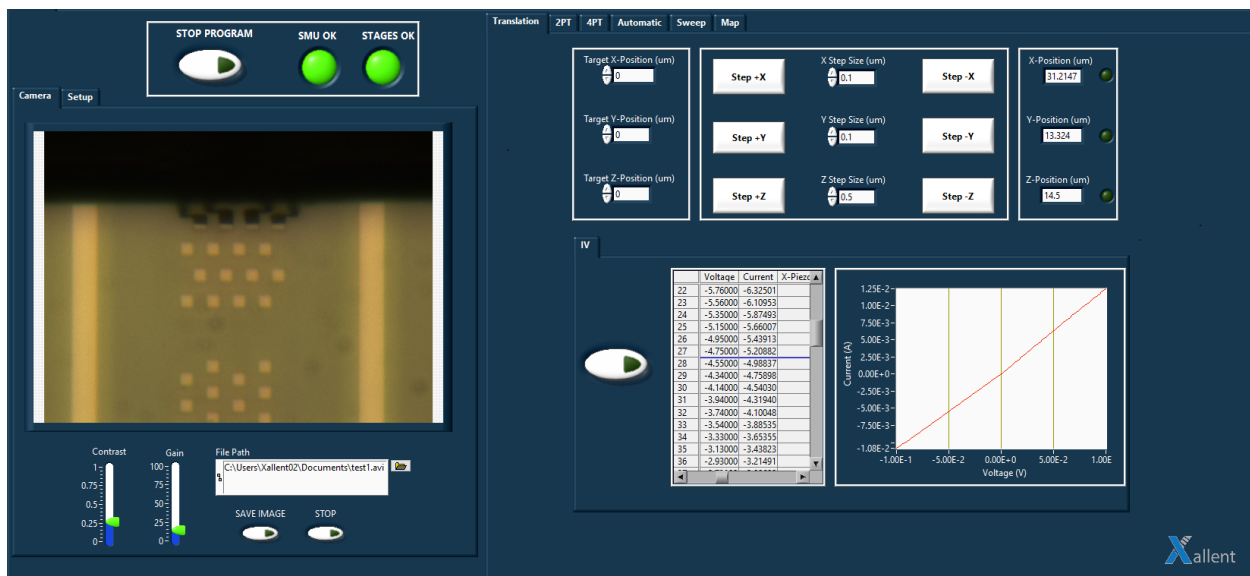
Key Benefits

- Run multiple tests without moving the sample
- Auto-locate areas of interest
- Automate repeated measurements for multiple samples
- Control all modules using one graphical user interface

- Connect and control a Keithley 2400 and 2450 Source Measure Units directly from the software, both voltage and current.
- Easily export all data from multiple tests into a unified database.

If you already have testing hardware, you can connect it directly to the Xallent Nanoprober to upgrade your testing immediately.

SOFTWARE MODULE	FEATURES
IV and Sheet Resistance	<ul style="list-style-type: none"> • Current and voltage sweeps. • Sheet resistance and resistivity measurements. • Auto-mapping of resistance or sheet resistance of sample surface. • Image capture of probing area. • Save and export data.
Metrology (Option)	<ul style="list-style-type: none"> • Machine learning and pattern recognition algorithms enable automated identification of key features, quantitative analysis, and statistical data generation. • Capture an image of the feature of interest. • Save and export data for post processing.



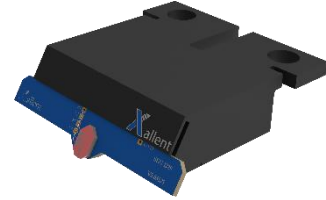
When you connect your Keithley SMU the Xallent software enables a one-stop, complete IV & sheet resistance probing solution.

Note¹: Software interface and capabilities are evolving so depending on customer's specifications, final software package could be different.

Note²: AFM-Profilometer, Nano-Indentation, and High Frequency modules are under development and available in 2022.

PROBE HEADS

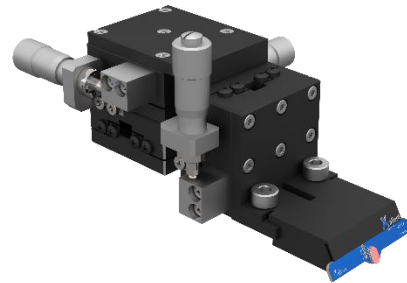
Enabling the future—with Xallent or your current equipment: Xallent Probe Heads can be used on the Xallent Nanoprober or as a drop-in replacement for your current manipulator. When used with existing wafer probers and microscope systems, the Xallent Probes and Probe Heads dramatically extend the capabilities to include multi-point probing and imaging capabilities at the micro and nanoscale. When you use the end-to-end Xallent Nanoprober, you open an even bigger world of high-speed, high-accuracy tests on a system that takes a fraction of the space of conventional equipment.



Whether you're using Xallent Probe Heads on existing equipment or on the Xallent Nanoprober, the Xallent Probe Heads upgrade your workflow on every dimension—expanding your range of testing and making it faster, easier, and at lower cost.

The Xallent Probe Head can be attached to the manipulators of many conventional wafer probers, including those manufactured by:

- Cascade Microtech (FormFactor)
- Signatone
- SemiProbe
- Wentworth Labs
- MPI
- Micromanipulator
- Everbeing



Need a custom probe head? We design and manufacture a portfolio of custom probe heads for ambient air and vacuum operations. Our custom probe heads mount onto a host of probers, optical microscopes, SEMs, and TEMs. Please discuss with us about your need for a custom probe head and we will be happy to work with you to deliver a custom solution for your application.

Xallent LLC

95 Brown Road
MS 1035, Suite 271
Ithaca, NY 14850
Tel: +1(424)262-0515
Web: www.xallent.com
Email: info@xallent.com



双程科技公司
SE TECHNOLOGIES CORP.

03-579-9029
info@se-group.com