

Cascade

# PLC50

## Manual Cryogenic Probe System

000111100010

### > Overview

The PLC50 is the most cost-effective and simple, yet highly-precise probing solution for wafers and substrates up to 100 mm at cryogenic temperatures. Specially designed for laboratory requirements, it supports a wide range of applications, including I-V, C-V and RF, and can be used for probing down to 77 K with liquid nitrogen or below 7 K with liquid helium. A dry-cooling option is also available (PLC50-CLR). Application flexibility is ensured for DC and RF measurements of the latest silicon, compound semiconductor and superconductor devices. RF tests are supported by a wide range of probes, calibration substrates and other accessories, as well as WinCal XE™ calibration software. The unique LRRM, LRM+, NIST-style TRL<sup>1</sup> and hybrid calibration methods are available with the WinCal XE wafer-level calibration and measurement software.



The PLC50 is equipped with a stable vibration isolating frame. The high-vacuum chamber with a hinged topside lid and an optical window made of quartz glass contains flanges for vacuum-tight mechanical feedthrough drives. Thus, the chuck and up to six vacuum-type positioners can be easily operated from outside via cardan shaft. The high-vacuum pumping system consists of a wide-range Turbo-Molecular Pump, a diaphragm forepump, and a full-range vacuum gauge. The independently-cooled cryogenic shield ensures ice- and condensation-free probing.

The chuck stage and chuck are located inside the vacuum chamber. The probe platen is designed to mount up to six vacuum-type positioners on magnetic feet. For step-and-repeat contacting, the probe platen can be lifted up and down from outside the chamber by a unique mechanical drive. A high-resolution video microscope is mounted above the view-port.

The PLC50 can be customized with a number of instruments, including various video microscopes, optical motion analysis tools, or black bodies for exposure of the DUT with controlled IR radiation.

<sup>1</sup> LRRM = Line-Reflect-Reflect-Match, LRM+ = Line-Reflect-Match, TRL = Through-Reflect-Line

<b>Flexibility</b>	<ul style="list-style-type: none"><li>• Ideal for a wide range of applications such as RF, FA, DWC, MEMS and optoelectronic tests</li><li>• A stable platen mounted with up to six positioners</li><li>• Use with liquid nitrogen or helium, depending on the target temperature (dry-cooling option available)</li><li>• Probing with an open chamber lid possible under atmospheric condition</li></ul>
<b>Stability</b>	<ul style="list-style-type: none"><li>• Built-in vibration-isolation solution for superior vibration attenuation</li><li>• Precise probe positioning with short and stable probe arms of positioners located inside the vacuum chamber</li><li>• Independently cooled cold shield to guarantee condensation-free test environment</li></ul>
<b>Ease of use</b>	<ul style="list-style-type: none"><li>• Interfaces to all major analysis instrumentation, optics software and testers</li><li>• Small footprint</li><li>• Upgradeable in the field, i.e., wide range of accessories</li><li>• Low cost of ownership</li></ul>
<b>High measurement throughput</b>	<ul style="list-style-type: none"><li>• Independent control of chuck and positioners for fast step-and-repeat testing of the whole wafer</li><li>• Platen lift (up and down) for simultaneous separation of all probes</li></ul>

## Specifications

### Chuck Stage

X-Y travel	50 mm x 50 mm, optional 80 mm x 80 mm
Resolution	5 $\mu$ m
Manipulation	Linear, from outside the chamber via rotary feed thru drives

### Probe Platen

Platen space	Universal platen for up to six VCP110 positioners
Z contact / separation	250 $\mu$ m
Manipulation	From outside the chamber

### Microscope

Travel	Swivel mechanism for moving the microscope in a safe rest position for chamber opening
Focus	Manual drive
Type	Video zoom microscope
Zoom	7x
Magnification	0.38x to 2.6x
Resolution	240 lp/mm to 721 lp/mm
Field of view	12.8 mm x 17.1 mm to 1.8 mm x 2.4 mm

### Cryogenic Chuck

Minimum temperature	<7K, final device temperature depend on number and type of probe needles
Maximum temperature	400K, optionally up to 675K

### Vacuum Chamber

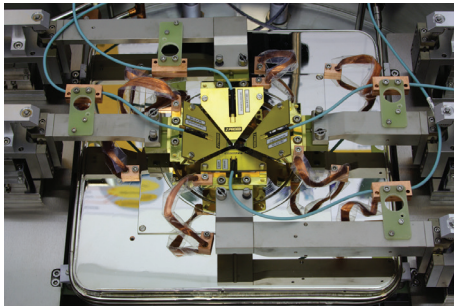
Size	Approximately $\varnothing$ 600 mm x 300 mm (H)
Material	Stainless steel
Loading	Hinged top side lid, made of aluminum, fast lock mechanism
View port	Central, top side, made of $\varnothing$ 90 mm quartz glass, 6 mm thickness, $\varnothing$ 75 mm clear opening, minimum objective working distance 75 mm

### Feedthrough

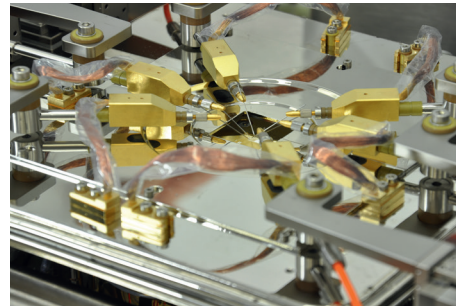
Chamber wall	<ul style="list-style-type: none"> <li>• 6x DN50 ISO-KF flange for rotary feedthrough drives to operate VCP110 probe positioners from outside</li> <li>• 2x DN25 ISO-KF flange for rotary feedthrough drives for operating chuck XY stage from outside</li> <li>• 1x DN25 ISO-KF flange for rotary feedthrough drive for operating platen contact/separation drive from outside</li> <li>• 1x DN25 ISO-KF vacuum gauge</li> <li>• 2x DN50 ISO-KF flange for measurement feedthroughs</li> <li>• 1x DN25 ISO-KF flange with safety valve</li> <li>• 1x DN16 ISO-KF flange for venting valve, manually operated</li> </ul>
Chamber bottom plate	<ul style="list-style-type: none"> <li>• 1x DN100 ISO-K flange for measurement feedthroughs</li> <li>• 1x DN63 ISO-K flange for turbo-molecular drag pump</li> <li>• 2x DN40 ISO-KF flange (1x for cooling of chuck base with optional high temperature extension / 1x spare)</li> <li>• 2x DN16 ISO-KF flange (for chuck/shield exhaust)</li> <li>• 3x WDE105 feedthrough (2x for chuck/shield thermal control, 1x spare)</li> <li>• 1x Liquid gas inlet</li> <li>• 2x cold valve</li> <li>• 1x DN25 ISO-KF flange for vacuum gauge</li> </ul>
Purging	Manual operated valve to vent the vacuum chamber with inert gas (N <sub>2</sub> )

## › Specifications (Continued)

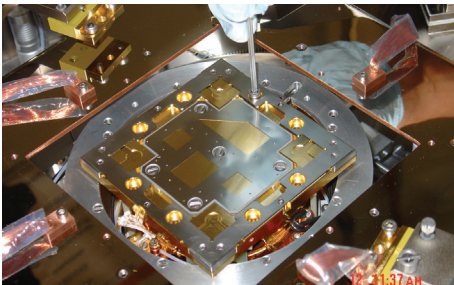
<b>Carrier</b>	
Wafer carrier	2", 3" and 100 mm
Universal carrier	Small dies, wafer fragments
<b>Positioner</b>	
Type	VCP110 high-vacuum type probe positioner, maximum quantity is 6
Travel range	X, Y and Z = 12 mm linear
Fixation	Magnetic
Manipulation	From outside the chamber via rotary feed thru drives
<b>Measurement Setup</b>	
Probe arms	Triax, advanced coax and high frequency
Cabling	Triax, advanced coax and high frequency (40 GHz, 50 GHz and 67 GHz)
Feedthrough	Triax, advanced coax and high frequency (40 GHz, 50 GHz and 67 GHz)
Triax chuck	For low-noise I-V and C-V measurements
<b>High Vacuum System</b>	
Minimum pressure	$< 10^{-5}$ mbar
Maximum pressure	no cryogenic operation possible in this mode
Pump type	Turbo-molecular pump + membrane pre-pump
Vacuum gauge	Full range, i.e., $5 \times 10^{-9}$ to $1 \times 10^3$ hPa
<b>TV System</b>	
USB	Digital camera connection to computer
HDMI	Digital camera connection to monitor
<b>Microscope Upgrade</b>	
Movement	Upgrade from default boom stand to high resolution XY microscope movement
Microscope	Upgrade from default video zoom microscope to high-magnification compound microscope
<b>View-port</b>	
Customized window	For applications where the standard window does not meet the requirements, other windows available with different window material, AR coating, working distance and diameter.



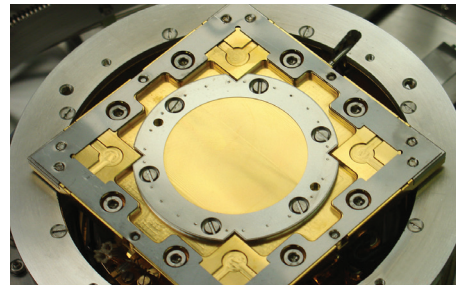
Test of wafer with four Multi IZI Probes®.



DC setup.



Fixing universal carrier.



2 inch wafer carrier.

## › Ordering Information

Components	Probe Station (Standard)	Probing solution for DC Test (Package)	Probing solution for RF Test (Package)
Microscope	X	X	X
Ball bearing boom stand	X	X	X
Vibration isolation table	X	X	X
Pump and Control Rack	X	X	X
Tool Kit (Thermal contact grease)	X	X	X
Tool Kit (Metric allen key set)	X	X	X
Extended Chuck Stage movement (80 mm x 80 mm)		X	X
Liquid gas Dewar		X	X
High Vacuum pumping Station		X	X
Substrate Carrier*		X	X
EPS-ACC-HDTV+** EPS-PKG Digital HDTV plus option package		X	X
Positioner VCP110 PLC-G2 Triax		X	
Vacuum rotary feedthrough drive for VCP110		X	X
4+1 Triax High-Vacuum feedthrough DN100 Iso-K		X	
Probe tip 7 mic tungsten: 25 tips		X	
Positioner VCP110 PLC-G2 RF east-west			X
High-Vacuum 2x-HF-Feedthrough DN50KF***			X
RF cable VAC 0.9m right-angle			X
RF precision cable 1.2 m flexible			X
Calibration substrate CSR-8			X
WinCal XE, full version, software key			X

\* Selection of universal carrier or wafer carrier for 2" or 3" or 100 mm (other sizes on request) wafers

\*\* Digital high-definition TV containing C-mount HDTV camera, cables, power supply and monitor, with crosshair overlay

\*\*\* Selection of 40 GHz / 2.92 mm feedthrough or 50 GHz / 67 GHz / 1.85 mm feedthrough, compatible also with 2.4 mm system

The offered PLC50 packages include all required components for successful probing:

- PLC50 base system with a chuck movement of 80 mm x 80 mm
- High-vacuum pump station
- Substrate carrier for the required sample size
- Microscope with camera and monitor
- Cryogenic chuck and controller
- Liquid gas dewar (liquid Helium or liquid Nitrogen)
- Exhaust gas heater and exhaust gas pump in a separate pump/control rack

» *Note: dry-cooling available with PLC50-CLR*

## › Warranty

Warranty\* Fifteen months from date of delivery or twelve months from date of installation

Service contracts Single- and multi-year programs available to suit your needs

\* See FormFactor's Terms and Conditions of Sale for more details.

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