

Cascade PMC200

200 mm Manual Cryogenic Probe System

➤ Overview

Cascade PMC200 probe system from FormFactor is the ideal solution for testing wafers and substrates up to 200 mm in a cryogenic environment. Specially designed for laboratory requirements, it supports a wide range of measurements, including I-V, C-V and RF, and can be used for probing down to 77 K with liquid nitrogen or 7 K with liquid helium. Application flexibility is ensured for DC and RF measurements of the latest silicon, compound semiconductor and superconductor devices.

The base of the PMC200 is a vibration isolated mainframe. The chuck and the chuck stage with 200 mm x 200 mm X-Y travel, theta and separation stroke are located inside the high-vacuum chamber that contains flanges for vacuum-tight mechanical feedthrough drives. Thus the chuck and up to eight vacuum-type positioners can be easily operated from outside of the chamber via cardan shaft. The high-vacuum pump stand with turbo-molecular-pump (TMP) ensures ice- and condensation-free probing.

To reduce heat entrance, probes are cooled by flexible copper braids connected with the cryo shield. A high-resolution video microscope with 50 mm x 50 mm travel range is mounted either on a microscope bridge for vibration-sensitive test instruments or on a remote controlled lift.

The PMC200 can be customized with various instruments, such as various video microscopes, laser cutters and optical topology measurement tools, or black bodies for exposure of the DUT with controlled IR radiation.



➤ Features / Benefits

Flexibility	• Customized to meet users' requirements • Different substrate carriers for wafers up to 200 mm or single dies • Cooling sequence of chuck and shield controlled by cold valves • Use of both, LN₂ and LHe • Wide range of measurements (I-V, C-V, RF) • Accessories available, such as laser cutters and optical motion analysis tools
Stability	• High accuracy, ideal for small structures • Highly stable mechanics, stable vibration isolation table
Ease of use	• Simple, straightforward design for easy and ergonomic operation • Quick and ergonomic change of the DUT through front door
High measurement throughput	• Independent control of chuck and positioners for fast step-and-repeat testing of the whole wafer • Platen lift (up and down) for simultaneous separation of all probes

> Specifications*

Chuck Stage

Travel range	Up to 200 mm (round or square)
Resolution	5 µm
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	About 250 µm
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	721 lp/mm to 240 lp/mm
Field of view	12.8 mm x 17.1 mm to 1.8 mm x 2.4 mm

Chuck

Standard Chuck	No temperature control, holds carrier for fixing single chips, wafer fragments and full wafer up to 150 mm
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Cryogenic Chuck

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

Vacuum Chamber

Size	Approximately ø 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 ø 90 mm quartz glass, 6 mm thickness, ø 75 mm clear opening, minimum objective working distance 75 mm

> Specifications (continued)

Feedthrough

Chamber wall:	• 6x DN50 ISO-KF flange for rotary feedthrough drives to operate VCP110 probe positioners from outside • 2x DN50 ISO-KF flange for rotary feedthrough drives for operating chuck XY stage from outside • 1x DN50 ISO-KF flange for rotary feedthrough drive for operating platen contact/separation drive from outside • 2x DN50 ISO-KF flange for measurement feedthroughs • 1x DN25 ISO-KF flange with safety valve • 1x DN10 ISO-KF flange for venting valve, manually operated
Chamber bottom plate:	• 1x DN100 ISO-K flange for measurement feedthroughs • 1x DN63 ISO-K flange for turbo-molecular drag pump • 2x DN40 ISO-KF flange (1x for optional thermal chuck, 1x spare) • 1x DN25 ISO-KF flange for vacuum gauge • 1x DN16 ISO-KF flange (spare) • 6x WDE105 feedthrough (1x for optional thermal chuck, 5x spare) • 1x D28 opening (spare)

Purging

Manual operated inlet valve to fill the vacuum chamber with inert gas (N₂)

Carrier

Wafer carrier	50 mm, 75 mm, 100 mm, 150 mm, 200 mm
Universal carrier	Small dies, wafer fragments

Positioner

Type	VCP110 high vacuum type probe positioner
Travel range	X, Y and Z = 12 mm linear
Fixation	Magnetic
Manipulation	From outside the chamber via rotary feed thru drives

Measurement Setup

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

High Vacuum System

Minimum pressure	< 1 x 10 ⁻⁵ mbar
Maximum pressure	Atmosphere
Pump type	Turbo and diaphragm
Vacuum gauge	Full range
Pressure control system	Optional, up-stream controlled

TV System

USB	Digital camera connection to computer
HDMI	Digital camera connection to monitor

> Specifications (continued)

Microscope Upgrade

Movement	Upgrade from default boom stand to high resolution XY microscope movement
Microscope	Upgrade from default video zoom microscope to high-magnification compound microscope

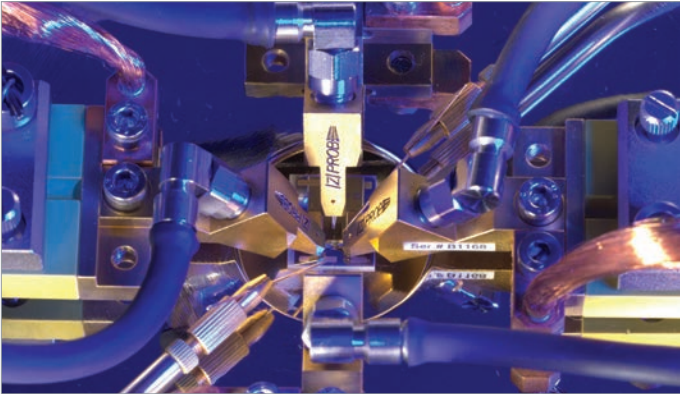
View-port

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.
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* Data, design and specification depend on individual process conditions and can vary according to equipment configurations. Not all specifications may be valid simultaneously

> Applications

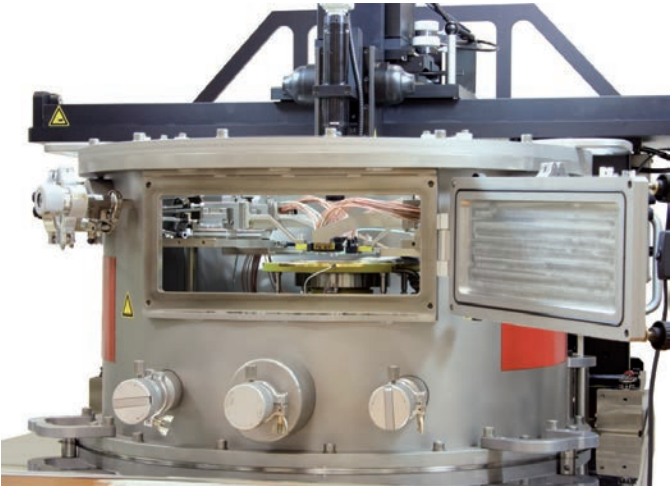
Advanced silicon technology
Compound semiconductor devices
Superconductors



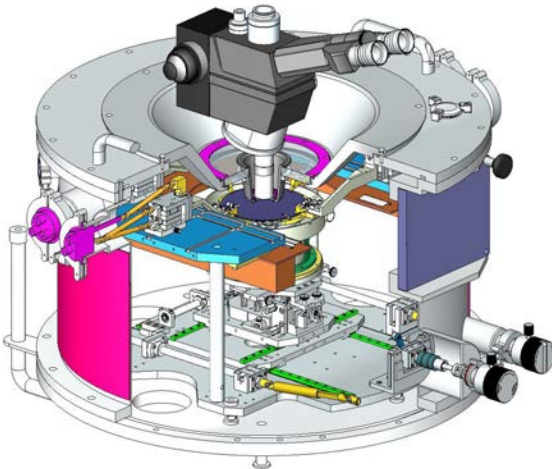
Test of a wafer with six positioners (four RF, two DC).

> Handling

All knobs located outside of the chamber ensure easy and precision control of the chuck stage and positioners. The hinged front door allows quick and ergonomic loading and unloading of your DUT. The camber lid enables easy probe configuration and probe tip exchange.



The large front door allows quick and ergonomic loading and unloading of your DUT. The chuck and up to eight vacuum-type positioners can be easily operated from outside via universal joint drivers.



Principle of manual chamber.

> Ordering Information

Part Number	Description
PMC200DC-QT	Manual cryogenic probing solution for DC test includes the PMC200 package, four DC triax positioners, probe tips, feedthrough and cabling
PMC200RF-QT	Manual cryogenic probing solution for RF test includes the PMC200 package, two RF positioners, IZI Probes, feedthrough and cabling

The offered PMC200 packages include all required components for successful probing:

- PMC200 base system with a chuck movement of 200 mm
- High-vacuum pump station
- Substrate carrier for the required sample size
- Microscope with camera and monitor

> 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 Cascade Microtech's Terms and Conditions of Sales for more details.

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