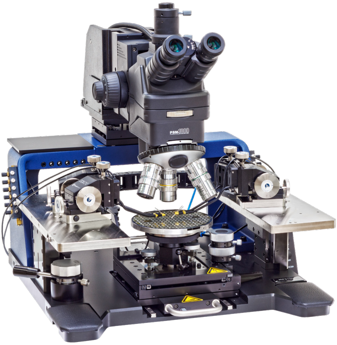
Cascade

MPS150

150 mm Manual Probe System



Overview

The MPS150 is an easy to use, yet highly-precise manual probe platform for wafers and substrates up to 150 mm. It supports a wide variety of applications and accessories. The modular and flexible design allows to configure and individualize the system to match application requirements. With the System Integration for Measurement Accuracy (SIGMA™) kit, MPS150 can be seamlessly integrated with third-party instrumentation, ensuring the shortest signal path.

Combining the MPS150 probe system with our measurement expertise, FormFactor provides pre-configured application-focused probing solutions for a variety of applications, and an integrated measurement solution for accurate S-parameter measurements, which include everything you need to achieve accurate measurement results in the shortest time, with maximum confidence.

Features / Benefits

Flexibility	• Ideal for a wide range of applications such as RF, mm-Wave and sub-THz characterization, FA, DWC, MEMS, optoelectronic tests and WLR • Re-configurable and upgradable as requirements grow • Minimizes setup times with no loss in performance or accuracy • Seamless integration of various measurement instruments
Stability	• Compact and rigid mechanical design • Built-in vibration-isolation solution for superior vibration attenuation • Highly accurate measurement results • Incorporates best-known methods
Ease of use	• Ergonomic and straightforward design for comfortable and easy operation • Quick and ergonomic change of DUT through pull-out stage • Fast time to data

Note: For physical dimensions and facility requirements, refer to the MPS150 Facility Planning Guide.

Mechanical Performance

Chuck Stage

Travel	155 mm x 155 mm (6 in. x 6 in.)
Resolution	5 µm
Planarity over 150 mm (6 inch)	< 10 µm
Load stroke, Y axis	90 mm
Z height adjustment range	10 mm
Z contact / separation / load stroke	0-3 mm adjustable
Theta travel (standard)	360°
Theta travel (fine)	± 8°
Theta resolution	7.5 x 10^{-3} gradient

Manual Microscope Stage (On Bridge)

Travel range	50 mm x 50 mm (2 in. x 2 in.) / 150 mm x 100 mm (6 in. x 4 in)
Resolution	≤ 5 µm (0.2 mils)
Scope lift	Manual, tilt-back or linear pneumatic

Programmable Microscope Stage*

Travel range	50 mm x 50 mm (2 in. x 2 in.)
Resolution	0.25 µm (0.01 mils)
Scope lift	Programmable 130 mm

* *Electronics box for manual systems (P/N 157-137) required*

Platen System

Platen

Platen space (typical)	Universal platen: space for up to four DPP2xx/DPP3xx/DPP4xx/RPP210 or up to twelve DPP105 positioners Universal platen with optional probe card adapter: space for up to eight DPP2xx/DPP3xx/DPP4xx/RPP210 or up to sixteen DPP105 positioners MMW platen: space for up to four RPP305 or two LAP positioners
Z-Height adjustment range	Maximum 40 mm (depending on configuration)
Minimum platen-to-chuck height	16 mm (universal platen)
Separation lift	200 µm
Separation repeatability	< 1 µm
Vertical rigidity / force	5 µm / 10 N (0.2 mils / 2.2 lb.)
Accessory mounting options	Universal platen: magnetic, vacuum RF-platen: bolt-down, magnetic

Wafer Chuck

Standard Wafer Chuck

Diameter	150 mm
Material	Stainless steel
DUT sizes supported	Shards or wafers 25 mm (1 in.) through 150 mm (6 in.)
Vacuum ring diameter	Universal: 4 mm, 7 mm, 22 mm, 42 mm, 66 mm, 88 mm, 110 mm, 132 mm

	Standard: 22 mm, 42 mm, 66 mm, 88 mm, 110 mm, 132 mm
Vacuum ring actuation	Universal: all connected in meander, center hole 1.5 mm diameter Standard: mechanically selected, center hole 1.0 mm diameter
Chuck surface	Planar with centric-engraved vacuum grooves
Surface planarity	≤ ± 3 µm
Rigidity	< 15 µm / 10 N @ edge

RF Wafer Chuck

Diameter	150 mm with two additional AUX chucks
Material	Stainless steel with HF/OPTO surface (flat with 0.7 mm holes)
DUT sizes supported	Main: single DUTs down to 3 mm x 5 mm size or wafers 25 mm (1 inch) through 150 mm (6 inch) AUX: up to 18 mm x 26 mm (1 in. x 0.7 inch) each
Vacuum hole sections (diameter)	22 mm, 42 mm, 66 mm, 88 mm, 110 mm, 132 mm (four holes in center with 2.5 mm x 4.3 mm distance)
Vacuum hole actuation	Mechanically selected
Chuck surface	Planar with 0.7 mm diameter holes in centric sections
Surface planarity	≤ ± 3 µm
Rigidity	< 15 µm / 10 N @ edge

Triax Wafer Chuck

Diameter	150 mm with three additional AUX chucks (two with vacuum fixation)
Material	Stainless steel
DUT sizes supported	Main: wafers 50 mm through 150 mm AUX: up to 18 mm x 26 mm (1 inch x 0.7 inch) each
Vacuum hole sections (diameter)	50 mm, 100 mm, 150 mm (2 inch, 4 inch, 6 inch)
Vacuum hole actuation	3x vacuum switch unit
Chuck surface	Planar with 0.4 mm diameter holes in centric sections
Surface planarity	≤ ±5 µm

Non-Thermal Chucks

Note: Results measured with non-thermal chuck at standard probing height (10,000 µm) with chuck in a dry environment. Moisture in the chuck may degrade performance.

MPS-CHUCK150-COAX

Operation voltage	Standard: in accordance with EC 61010, certificates for higher voltages available upon request
Isolation*	> 2 GΩ
Capacitance	100 pF

* *Factory test with multimeter with maximum 2 GΩ range.*

Non-Thermal Chucks (continued)

MPS-CHUCK150-RF

Operation voltage	Standard: in accordance with EC 61010, certificates for higher voltages available upon request
Isolation (Signal-Shield)	> 200 GΩ
Capacitance (Signal-Shield)	80 pF

MPS-CHUCK150-TRIAX[1]

	In Purged Shield Enclosure	**Open[2]**
Humidity[2]	< 30%	50%

Leakage (1 sigma)	< 50 fA	< 200 fA
Leakage (average)	NA	NA
Leakage (P-P)	< 100 fA	< 1000 fA
Resistance (F-G)	> 1 TΩ	> 1 TΩ
Resistance (G-S)	> 1 TΩ	> 1 TΩ
Resistance (F-S)	> 1 TΩ	> 1 TΩ
Residual capacitance @ 3 pA Tx	< 20 pF	< 20 pF
Capacitance @ 300 pA (F-G)	< 400 pF	< 400 pF
Capacitance @ 300 pA (G-S)	< 400 pF	< 400 pF

TRIAXIAL PROBE ARMS[1]

	Standard Triaxal Arm (PN 100525)	**Advanced Triax Option (PN 157-450 and DCP)**
	In Purged Shield Enclosure	**In Purged Shield Enclosure**
Humidity[3]	< 30%	< 30%
Leakage (1 sigma)	< 5 fA	< 2 fA
Resistance (F-G)	> 20 TΩ	> 50 TΩ
Resistance (G-S)	> 4 TΩ	NA
Residual capacitance @ 3 pA Tx	< 1 pF	< 0.3 fF
Capacitance @ 300 pA (F-G)	< 300 pF	< 150 pF
Capacitance @ 300 pA (G-S)	< 400 pF	< 200 pF

COAXIAL PROBE ARMS[1]

	Coaxial Probe Arm (PN 100561)
	Open / Ambient[2, 4]
Resistance (Signal-Shield)	> 20 TΩ
Capacitance (Signal-Shield)	< 200 pF

1. *Test conditions: B1500 with SMU B1517, triax test cables and adapter ground unit (104-337). Resistor test setup: 10 V HR Mode PCL Factor 15. Capacitor test setup: 3 pA / 300 pA HR Mode PCL Factor 4. Leakage test setup: 10 V HR Mode PCL Factor 40.*
2. *Depending on DC-/AC-noise environment.*
3. *Environment data (not specification data).*
4. *Depending on humidity.*

Thermal Chuck Performance

Note: For details on facility requirements, refer to the Facility Planning Guide for your thermal system.

MPS-TC150-CTX-300C[1]

		Triax @ 30°C	**Triax @ 200°C**	**Triax @ 300°C**
Breakdown voltage[2a]	Force-to-guard	≥ 500 V	≥ 500 V	≥ 500 V
	Guard-to-shield	≥ 500 V	≥ 500 V	≥ 500 V
	Force-to-shield	≥ 500 V	≥ 500 V	≥ 500 V
Resistance[3a]	Force-to-guard	$\geq 1 \times 10^{12}$	$\geq 1 \times 10^{11}$	$\geq 5 \times 10^{9}$
	Guard-to-shield	$\geq 1 \times 10^{11}$	$\geq 1 \times 10^{10}$	$\geq 1 \times 10^{9}$
	Force-to-shield	$\geq 5 \times 10^{12}$	$\geq 2 \times 10^{11}$	$\geq 5 \times 10^{9}$
Chuck leakage[4]		≤ 100 fA	≤ 10 pA	≤ 300 pA
Residual capacitance		≤ 50 pF		
Settling time[6] @ 10 V 50 fA		500 ms (typical)		

MPS-TC150-CTX-300C (using coax-triax adapter)[1, 5]

		Coax @ 30°C	Coax @ 200°C	Coax @ 300°C
Breakdown voltage[2a]		≥ 500 V	≥ 500 V	≥ 500 V
Resistance[3a]	Signal-to-shield	≥ 1 x 10^{12}	≥ 1 x 10^{11}	≥ 5 x 10^{9}
Chuck leakage[4]		≤ 600 fA	≤ 15 pA	≤ 1 nA
Residual capacitance		≤ 600 pF		

MPS-TC150-RF-300C[1, 5]

		Coax @ 30°C	Coax @ 200°C	Coax @ 300°C
Breakdown voltage[2a]		≥ 500 V	≥ 500 V	≥ 500 V
Resistance[3a]	Signal-to-shield	≥ 1 x 10^{12}	≥ 1 x 10^{11}	≥ 5 x 10^{9}
Chuck leakage[4]		≤ 600 fA	≤ 15 pA	≤ 1 nA
Residual capacitance		≤ 600 pF		

MPS-TC150-200C[1]

		Triax @ 30°C	Triax @ 200°C
Breakdown voltage[2b]	Force-to-guard	≥ 500 V	≥ 500 V
	Guard-to-shield	≥ 500 V	≥ 500 V
	Force-to-shield	≥ 500 V	≥ 500 V
Resistance[3b]	Force-to-guard	≥ 5 x 10^{12}	≥ 5 x 10^{11}
	Guard-to-shield	≥ 2 x 10^{12}	≥ 8 x 10^{10}
	Force-to-shield	≥ 7 x 10^{12}	≥ 5 x 10^{11}
Chuck leakage[4]		≤ 35 fA	≤ 40 fA
Residual capacitance[6]		≤ 20 pF	
Settling time[7] @ 10 V 50 fA		500 ms (typical)	

Thermal Chuck Performance (continued)

MPS-TC150-200C (using coax-triax adapter)[1, 5]

		Coax @ 30°C	Coax @ 200°C
Breakdown voltage[2b]		≥ 500 V	≥ 500 V
Resistance[3b]	Signal-to-shield	≥ 5 x 10^{12}	≥ 5 x 10^{11}
Chuck leakage[4]		≤ 600 fA	≤ 7.5 pA
Residual capacitance[6]		≤ 600 pF	

1. *Performance values determined using EMV shielded chamber. Actual value depend on electromagnetic surrounding and shielding situation of the probe station.*

2a. *For fully-baked chuck: 90°C for 60 minutes + 200°C for 240 minutes + 300°C for 480 minutes.*

2b. *For fully-baked chuck: 90°C for 60 minutes + 200°C for 800 minutes*

3a. *For fully-baked chuck: 90°C for 60 minutes + 200°C for 240 minutes + 300°C for 480 minutes; controller on; 21-23C° environment with ≤ 50% humidity.*

3b. *For fully-baked chuck: 90°C for 60 minutes + 200°C for 800 minutes; 21-23C° environment with ≤ 50% humidity.*

4. *Overall leakage current is comprised of two separate components: 1) offset, and 2) noise. Offset is the DC value of current due to instrument voltage offset driving through isolation resistance. Noise is low frequency ripple superimposed on top of offset and is due to disturbances in the probe station environment.*
   Noise and leakage are measured with B1500 with SMUB1517 - DCN@10V CMI program or equivalent. This value specifies standard deviation (1σ).

5. *Chuck: Guard-Shield shorted, B1500: triax, guard open.*

6. *Depends on test environment*

7. *Settling time is measured with B1500 with SMUB1517 - ST@10V CMI program or equivalent*

Transition Time

	Heating			Cooling		
	30°C to 100°C°	**100°C to 200°C**	**200°C to 300°C**	**300°C to 200°C**	**200°C to 100°C**	**100°C to 30°C**
MPS-TC150-CTX-300C	145 sec	155 sec	300 sec	145 sec	245 sec	1525 sec
MPS-TC150-RF-300C	180 sec	300 sec	540 sec	165 sec	310 sec	1650 sec
MPS-TC150-200C	155 sec	260 sec	na	na	120 sec	425 sec

MPS-TC150-CTX-300C and MPS-TC150-RF-300C Specifications

Temperature range	+ 30°C to 300°C
Temperature accuracy	± 0.1°C (with calibrated controller)
Temperature resolution	0.1°C
Temperature uniformity	≤ 0.5°C @ 30°C, ≤ 3.0°C @ 300°C
Chuck flatness	≤ 30 µm (0.12 mils) @ +30°C to 300°C
Audible noise	< 58 dB(A) (normal operation); < 79 dB(A) (max. cooling mode)

MPS-TC150-200C

Temperature range	+ 30°C to 200°C
Temperature accuracy	± 0.5°C
Temperature resolution	0.1°C
Temperature uniformity	≤ ±1°C (30°C - 200°C)
Chuck flatness	≤ 30 µm (0.12 mils) @ +30°C to 200°C
Audible noise	< 54 dB(A) (normal operation); < 68 dB(A) (max. cooling mode)

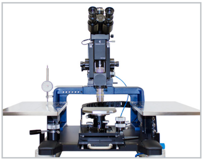
Ordering Information

Pre-Configured Application-Focused Packages

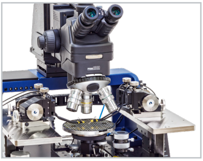
EPS150 COAX / COAX^{PLUS}

EPS150TRIAX

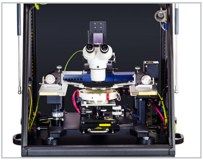
EPS150RF



EPS150MMW



EPS150FA



EPS150TESLA

Integrated Measurement Solution

RFgenius

Part Number	**Description**
EPS150COAX	150 mm manual probing solution for DC parametric test
EPS150COAXPLUS	150 mm manual probing solution for DC parametric test (including platen lift)
EPS150TRIAX	150 mm manual probing solution for low-noise measurements
EPS150RF	150 mm manual probing solution for RF applications
EPS150MMW	150 mm manual probing solution for mmW, THz and load pull applications
EPS150FA	150 mm manual probing solution for failure analysis
RFgenius-xx*	RFgenius education kit, turn-key solution for measurements up to 4.5/6.5/9/14/20/26.5 GHz
181-669	FormFactor certified laptop for RFgenius-xx (optional)**

* *Enter the frequency range for a VNA of your choice. Example: RFgenius-4 for 4.5 GHz. RFgenius-26 for 26.5 GHz.*

** *Minimum requirement for a laptop to be supplied by a user: Windows 7 or 10 (64 bit), Intel i5 6th Gen or newer, 4 GB memory or more (16 GB recommended),2 GB disk space or more, 1024 x 768 resolution, USB 3.o port.*

Regulatory Compliance

Certification	CE, cNRTLus, CB

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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