

CM300

300 mm semi-/fully-automated probe system



DATA SHEET

In device and process development, the right solution helps you handle test requirements that change from day to day. That's why Cascade Microtech developed the CM300, a flexible on-wafer probe system that scales to meet your evolving needs. By capturing the true electrical performance of devices, it helps you produce high-integrity data and achieve hands-off productivity.

The CM300 offers measurement accuracy and reliability in a solution that is completely modular – whether it's I-V/C-V, RTN and RF measurements in one semi-automated system, or a fully-automated cluster probe system that handles any combination of 200 mm and 300 mm wafers. With renowned Cascade Microtech precision measurement expertise, you can confidently deliver accurate and reliable data for current and evolving device technologies. By that the CM300 provides faster lifetime predictability in the reliability process, and less design iterations in the modeling process. Productivity and efficiency are increased with the ability to test over a wide temperature range, and to maintain probe-to-pad accuracy for testing on small pads down to 30 μm .

Using Velox™ probe station control software, the CM300 enables safe and fast wafer loading and easy test automation and measurement system integration, while preventing damage of probe tips and probe cards throughout the entire measurement cycle. The VeloxPro™ test automation open-architecture interface integrates wafer handling, temperature control, Z-profile and stepping to fully automate wafer probing.

Equip your lab with CM300—and deliver data you trust.

FEATURES / BENEFITS

Modular design	Scalable from semi-automated operation to fully-automated prober or cluster probe system
High accuracy and repeatability	Superior low-leakage and low-noise measurements Safe and accurate hands-off testing with reliable and repeatable contact
Automated test management capability	Enables unattended testing on pads as small as 30 μm Thermally induced drift can be automatically re-aligned with temperature steps up to 200 K
Test productivity	Fast delivery of a wide variety of precise model parameters to enhance process and device development
Velox software	Easy and simple wafer loading operation, test automation and measurement system integration Minimum damage to valuable devices, probe tips and probe cards

CONFIGURATION OPTIONS

Semi-Automated

Stand-alone CM300 probe system with no integrated wafer loader



Fully-Automated

Wafer loader interfaced to only one CM300 probe system



Cluster

Wafer loader interfaced to two independent CM300 probe systems



SYSTEM COMPONENTS

Prober System

The CM300 probe system (base platform) is available in three different configurations:

CM300, open system	Open system (ambient to high temperature)
CM300, shielded	Shielded system for low-temperature and dark environment (full thermal range)
CM300, fully shielded	EMI-shielded system for low-current and low-noise measurements (full thermal range)

Material Handling Unit

The MHU300 wafer handling unit can be configured with up to two load-ports and controls the movement of 200 mm and 300 mm SEMI spec wafers between FOUF/FOSB cassettes and the probe system. Manual loading of wafer fragments > 10 mm x 10 mm, as well as full wafer, are supported through manual loading, which bypasses the MHU300.

Note: 200 mm wafers require a dedicated adapter to fit a 300 mm cassette.

SYSTEM PERFORMANCE

General Probe System Specifications

Automation features:

- MicroAlign™
- Automated Thermal Management (ATM™)
- Wafer lift pins

Top shielding:

- TopHat™ (for shielded configurations only, top chambers are optional)
- Probe card holder with cover for use with 4.5" probe cards

Note: All performance metrics identified in this document are valid only when the system is installed and operated within the terms specified in the Facilities Preparation Guide.

CM300 Chuck Stage – Mechanical*

	X axis	Y axis	Z axis	Theta
Travel range	305 mm	505 mm	12 mm	7.5°
Encoder resolution	0.2 μm	0.2 μm	0.2 μm	0.0001°
Repeatability¹	1.5 μm	1.5 μm	1.5 μm	NS
Accuracy²	3.0 μm	3.0 μm	NA	NA
Planarity in Z across XY³	NA	NA	± 15 μm	NA

* All measurements performed at ambient temperature

1. Repeatability reports $\pm 3\sigma$ variation in the system
2. Accuracy = $(\text{mean}) + 3\sigma$
3. Measured with Z compensation drive

Probe-to-Pad Alignment

MicroAlign enables precise probe-to-pad alignment across the thermal range of -40°C to 125°C.

MicroAlign performance	X axis	Y axis	Z axis
Accuracy ¹	5 µm	5 µm	7 µm

1. Accuracy = $(|mean| + 3\sigma)$

Thermal Control System

The thermal control system enables independent prober control across temperature with one integrated dual control chiller.

Thermal performance	Minimum	Maximum
CM300, open system	Ambient	200°C
CM300, shielded configurations	-60°C	200°C
CM300, cluster, shielded configurations (one prober cooling)	-60°C	200°C
CM300, cluster, shielded configurations (both probers cooling)	-40°C	200°C
High-temperature option ¹	NA	300°C
Thermal resolution ^{2,3}	0.1°C	0.1°C
Uniformity ^{2,3}	± 1°C	± 1°C

1. High-temperature upgrade option available for semi-automated configuration only

2. Specification per supplier test protocol utilizing the same chuck stack type

3. Verification is by inspection to vendor supplied protocol

FemtoGuard® Chuck Performance

Breakdown voltage ¹	-40°C	+25°C	+200°C
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 ²	-40°C	+25°C	+200°C
Force-to-Guard	≥ 5 x 10 ¹² Ω	≥ 5 x 10 ¹² Ω	≥ 5 x 10 ¹¹ Ω
Guard-to-Shield	≥ 5 x 10 ¹¹ Ω	≥ 5 x 10 ¹¹ Ω	≥ 1 x 10 ¹⁰ Ω
Force-to-Shield	≥ 5 x 10 ¹² Ω	≥ 5 x 10 ¹² Ω	≥ 5 x 10 ¹¹ Ω
Capacitance	-40°C	+25°C	+200°C
Force-to-Guard	≤ 1000 pF	≤ 1000 pF	≤ 1000 pF
Guard-to-Shield	≤ 5000 pF	≤ 5000 pF	≤ 5000 pF

1. Breakdown voltage measured with chuck at center position at ambient, contact position 4 mm below platen, under CDA purge. Voltage supply for one minute each.

2. Resistance measured under CDA purge with picoammeter and known voltage source.

Coaxial Chuck Performance

Parameter	-40°C	+25°C	+200°C
Breakdown voltage	≥ 500 V	≥ 500 V	≥ 500 V
Resistance	≥ 5 x 10 ¹¹ Ω	≥ 5 x 10 ¹¹ Ω	≥ 1 x 10 ¹¹ Ω
Capacitance	≤ 5000 pF	≤ 5000 pF	≤ 5000 pF

SYSTEM PERFORMANCE (CONTINUED)

Noise Performance

DC leakage current ¹	-40°C	+25°C	+200°C
CM300, fully shielded	25 fA	15 fA	25 fA

1. Using fixed-voltage measurement, no probe card, chuck only. All values represent 3 sigma performance after 10 sec delay. Overall leakage current is comprised of two distinctly 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 a 4156C NOISE.dat Cascade Microtech program or equivalent; 4 ms sample rate, auto scale, 1 nA compliance, 1 NPLC integration.

System AC noise	+40°C
CM300, fully shielded ¹	≤ 5 mV p-p (≤ 1 GHz)

1. Test setup: station power ON, thermal system ON. Instrument setup: time domain digital scope Agilent DSO 8104, 50 Ω input impedance, cable to chuck with Guard-Shield shorted Triax to BNC adapter. Measurement: Peak-Peak noise voltage (acquire 1000 data points, and calculate mean of Vp-p data). Requires low noise system option.

PHYSICAL DIMENSIONS

	Dimensions (W x D x H)	Weight
Semi-automated system	2254 mm x 1435 mm x 1635 mm	1150 kg
Fully-automated system	2289 mm x 1991 mm x 2095 mm	1650 kg
Cluster probe system	3424 mm x 1991 mm x 2095 mm	2800 kg

CONFIGURABLE OPTIONS

Probe card	The probe system can accommodate both vertical and cantilever probe cards with 4.5" width.
HF measurement	The probe system is configurable for all standard HF measurements up to 110 GHz.
Positioners	The probe system is capable of accommodating up to four motorized or up to eight manual positioners.

MHU FEATURES

Cassette auto-inventory	The probe system has the optional ability to automatically identify wafers. Wafers are identified by a barcode [BC 412 (SEMI T1-95 Standard)] and IBM 412, OCR text [SEMI (M12, M13 and M1.15 Standard)], IBM, Triple and OCR-A fonts or 2D code [Data Matrix (T7 and M1.15 Standard)] at the top or bottom side of the wafer.
Cluster ready	Up to two probe systems can be docked and operated simultaneously to a single central loader.



CM300 fully-automated system with material handling unit (MHU), showing dual load port configuration.

CONTROL SOFTWARE FUNCTIONS

The CM300 is equipped with Velox probe station control software and VeloxPro™ user interface for test automation, making it seamless and easy to convert CM300's operation mode from semi-automated to fully-automated.

Velox Probe Station Control Software

Velox software provides all features and benefits required for semi-automated operation of the probe system, such as:

- WaferMap with Z-profiling, sub-die stepping, binning and other useful features
- Integrated thermal control, facilitating automated conditioning of the test environment in shielded system
- CellView using stitched image of the full device to enable on-screen navigation within the die layout
- Configurable user interface and programmable buttons
- ProbeHorizon™ for easy wafer loading
- Cleaning routines for probe cards and probe tips

VeloxPro User Interface for Test Automation

The CM300 also includes VeloxPro user interface for test automation and automated wafer handling, featuring:

- Compliance to SEMI E95
- Cassette mapping and map visualization capabilities, with statistics and status view
- Test sequence customization
- Ability to load new wafers into the cassette while test is running on the chuck
- AutoInventory feature to address wafers by wafer ID
- Screens for the setup of new recipes, parameters and pattern recognition
- Capability to accommodate multiple types of wafers in one cassette
- Ability to load any wafer out of any cassette to any system chuck

Tester Interface

The CM300 uses commands through GPIB as a permanent listener. The GPIB interface provides the ability to:

- Request an inventory of all wafers available in the cassettes
- Define a wafer map
- Define a job (out of wafers and recipe)
- Change chuck temperature and initiate re-alignment
- Receive notifications when the wafer is aligned and ready to test

FACILITY REQUIREMENTS

Power	120/208 V AC nominal and 60 Hz (US), 230/400 V AC nominal and 50 Hz (EU)
Vacuum	< 200 mbar absolute, 10 mm hose
Compressed air	6 to 10 bar, 8 mm hose
CDA	6 to 10 bar, 12 mm hose

SYSTEM UPGRADE OPTIONS

MHU option:

MHU-ready option, upgrade capability for conversion to fully-automated prober system

AVAILABLE OPTIONS

Accessories:

MicroAlign technology for handling of vertical/advanced probe cards

Probe card holder 4.5" for shielded CM300 for use with Celadon cards

Probe card holder 4.5" for shielded CM300

Velox software upgrade to VeloxPro

Thermal chucks:

FemtoGuard triaxial chuck, thermal, -60°C to 300°C (ERS AC3), 300 mm

FemtoGuard triaxial chuck, thermal, -60°C to 200°C (ERS AC3), 300 mm, for automated wafer loading

Thermal systems:

Thermal system for shielded CM300, -60°C to 300°C, ERS AC3 (200/230 VAC 50/60 Hz)

Thermal system for shielded CM300, +20°C to 300°C, ERS AC3 (100/230 VAC 50/60 Hz)

Thermal system for CM300, +30°C to 300°C, ERS AC3 (100/230 VAC 50/60 Hz)

Automation:

Material Handling Unit with one loadport for 300 mm FOUP/FOSB cassettes, available for combination with one or two CM300 probe systems

Second load port for MHU300

Adapter for use of open 200 mm cassettes

ID reader station for codes on the surface and back side of wafers

REGULATORY COMPLIANCE

Certification CE, SEMI S2

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 Sale for more details.

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