

CM300xi

300 mm Semi-/Fully-automated Probe System



DATA SHEET

The Cascade Microtech CM300xi with Contact Intelligence technology meets the measurement challenges brought on by extremely complex environments. The CM300xi senses, learns and reacts to multiple temperatures and small pad layouts, automatically adapting and adjusting to provide the most accurate probe-to-pad alignment for a broad array of wafers, materials and devices. The CM300xi provides the lab automation capabilities needed to make critical precision electrical measurements for device characterization, high-volume engineering and extremely challenging applications. It is also ideally suited in customized solutions, niche production applications, and emerging markets. The CM300xi raises the performance bar with new High Thermal Stability (HTS) capabilities as well as enhancements to VueTrack™, the probe to pad alignment technology. The result is the most accurate, flexible and scalable engineering probe system in the semiconductor lab.

The CM300xi 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 dual-prober 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. The CM300xi provides faster lifetime predictability in the reliability process, and less design iterations in the modeling process.

Using Velox™ probe station control software, the CM300xi 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.

FEATURES / BENEFITS

| | |
|---------------------------------|--|
| Modular design | Scalable from semi-automated operation to fully-automated prober or dual-prober 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 | Enables unattended tests on small pad Thermally induced drift can be automatically re-aligned for 30 µm pads in a temperature range from -40°C to 150°C (the effective temperature range depends on pad size, probe card holder and probe card) |
| Test productivity | Fast delivery of a wide variety of precise model parameters to enhance process and device development |
| Flexibility | DC, AC and RF/microwave device characterization, 1/f, WLR, FA and design debug Full thermal range of -60°C to +300°C Usage of manual and motorized positioners, probe cards within EMI-shielded environment |
| Contact Intelligence | Enables CM300xi to sense, learn and react to multiple temperatures and small pad layouts, providing the most accurate probe to pad alignment |

Note: For physical dimensions and facility requirements, refer to the CM300xi Facility Planning Guide. If not otherwise mentioned, the specified values are given for a temperature range from +18°C to +24°C and relative humidity of 20% to 50%. All specifications are 1 sigma values unless noted otherwise.

SYSTEM COMPONENTS

Prober System

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

| | | |
|-----------|-------------------------|---|
| CM300xi-F | CM300xi, fully-shielded | EMI-shielded system for low-current and low-noise measurements (full thermal range) |
| CM300xi-S | CM300xi, shielded | Shielded system for low-temperature and dark environment (full thermal range) |
| CM300-O | CM300*, open | Open system for ambient or above ambient temperature usage |

* The CM300 open system is not equipped with the Contact Intelligence technology.

MECHANICAL PERFORMANCE

X-Y Stage

| | |
|--------------------|--|
| Travel XY | 301 mm x 501 mm (11.9 in. x 19.7 in.) |
| Resolution | 0.2 µm (0.008 mils) |
| Repeatability | ≤ 1 µm (0.04 mils) |
| Accuracy | Standard mode: ≤ 2 µm (0.08 mils), Precision mode: ≤ 0.3 µm (0.012 mils) |
| Speed | 50 mm/sec (2 in./sec) |
| Bearings | Precision balls bearings |
| Motor-drive system | High-performance micro stepper motor |
| Feedback system | Ceramic ultra-low thermal expansion linear encoder |

Z Stage

| | |
|---|--|
| Travel | 10.0 mm (.39 in.) |
| Resolution | 0.2 µm (0.008 mils) |
| Repeatability | ≤ 1 µm (0.04 mils) |
| Accuracy | ≤ 2 µm (0.08 mils) |
| Speed | 20 mm/sec (0.8 in./sec) |
| Lifting capacity | 20 kg (44 lb.) |
| Probe-force deflection (measured at the chuck edge) | ≤ 0.0005 µm/µm slope per 10 kg load (0.0005 in./in./22 lb) |

Theta Stage

| | |
|----------------------------------|----------------------|
| Travel | ± 3.75° |
| Resolution | 0.2 µm (0.008 mils)* |
| Repeatability | ≤ 1 µm (0.04 mils)* |
| Accuracy of fine correction | ≤ 2 µm (0.08 mils)* |
| Accuracy of large movement (>2°) | ≤ 5 µm (0.20 mils)* |

* Measured at edge of 300 mm chuck

MICROCHAMBER*

| Electrical | CM300xi-F | CM300xi-S |
|----------------------|------------------------------------|------------------------------------|
| EMI shielding | > 30 dB (typical) @ 1 kHz to 1 MHz | > 20 dB (typical) @ 1 kHz to 1 MHz |
| Light attenuation | ≥ 120 dB | ≥ 120 dB |
| Spectral noise floor | ≤ -170 dBVrms/rtHz (≤ 1 MHz) ** | ≤ -150 dBVrms/rtHz (≤ 1 MHz) *** |
| System AC noise | ≤ 5 mVp-p (≤ 1 GHz)**** | ≤ 20 mVp-p (≤ 1 GHz) ** |

* Available for CM300xi-F and CM300xi-S only.

** Test setup uses triaxial thermal chuck, 50 Ω termination, high-quality LNA, and DSA /DSO instrument.

*** Typical results. Actual values depend on probe/test setup.

**** Test setup: Station power ON, Thermal system ON (40°C), MicroChamber® closed. Instrument setup: Time domain digital scope (DC to 1 GHz), 50 Ω input impedance, cable to chuck BNC connector. Measurement: Peak-Peak Noise Voltage (acquire 1000 data points, and calculate mean of Vp-p data).

MICROCHAMBER (CONTINUED)

Air-Purge Management

| | |
|--|---|
| Purge | Clean dry air (CDA) |
| Purge control | Manual or automatic (software controlled) |
| Nominal purge flow rate – Maintenance | 80 liters/min (2.8 SCFM) |
| Nominal purge flow rate – Quick purge conditioning | 240 liters/min (8.5 SCFM) |

PLATEN SYSTEM

Platen

| | |
|------------------------|---|
| Dimensions | 1058 mm (W) x 866 mm (D) x 25 mm (T) |
| Platen-to-chuck height | 43.0 ± 0.5 mm (1.69 ± 0.02 in.) |
| Accessory mounting | Universal Rail System: 53 cm (21 in.) Left / Right Rail, 70 cm (28 in.) Rear Rail |
| Platen mount | Fixed height, High Temperature Stability kinematic mount* |

* Available for CM300xi-F and CM300xi-S only.

Platen Insert

| | |
|----------------|--|
| Dimension | 720 mm x 720 mm x 38 mm (incl. guard for fully-shielded version) |
| Weight | 47 kg (104 lb.) |
| Material | Steel for magnetic positioners |
| Surface finish | Fine ground for vacuum positioner high stability |

Platen Cut-out

| | |
|--------------------|---|
| Diameter | 344 mm (13.5 in.) |
| Standard interface | Probe card holders, custom adapters and TopHat™ |

Probe Card Holder*

| | |
|--|--|
| Probe card shape | Rectangular |
| Probe card width | 114.5 mm (4.5 in.) |
| Max. probe card length (standard) | 284 mm (11.18 in) / 142 mm (5.59 in) from probe center to front/rear |
| Max. probe card length (HTS) | 160 mm (6.30 in) / 80 mm (3.15 in) from probe center to front/rear |
| Tip drop**, standard | 3.0 mm to 5.0 mm (0.12 in. to 0.20 in.) |
| Tip drop**, High Temperature Stability | 4.7 mm (0.185 in.) |

* For more details, please see the Probe Station Accessory Catalog.

** Measured vertical step from mounting level to needle tips. Side view camera tolerates ± 0.5 mm deviation from nominal value.

WAFER CHUCK

| | |
|---------------------------------|--|
| Diameter | 305 mm (12 in.) |
| Material | Nickel- or gold-plated aluminum |
| DUT sizes supported | Shards (10 mm x 10 mm or wafers up to 300 mm/12 in.) |
| Vacuum rings | 7 mm, 66 mm, 130 mm, 180 mm, 280 mm |
| Vacuum-ring actuation | Software controlled (Center, 200 mm, 300 mm) |
| Planarity incl. stage movement* | ≤ 10 µm (0.4 mils) @ 25°C |
| | ≤ 30 µm (1.2 mils) @ -55°C |
| | ≤ 30 µm (1.2 mils) @ 200°C |
| | ≤ 40 µm (1.6 mils) @ 300°C |

* With active z-profiling.

General

| | |
|---|--|
| Attenuation of the vibration damping system | 0 dB @ 6Hz, 5 dB per octave @ 6Hz to 48Hz, 15 dB above 48Hz* |
| Stage damping | 15 dB in less than 1500 m sec |

* Due to the sensitivity of measurements to vibrations, the CM300xi is equipped with a high-performance active vibration damping system. However, unacceptable equipment vibrations can occur when the floor vibrations are high. For this reason, the CM300xi must be used in an environment having background vibrations at or below the Operating Theatre level. This corresponds to a maximum level of 4000 micro-inches/sec (72 dB), measured using the 1/3-octave band velocity spectra method (expressed in RMS velocity as specified by The International Standards Organization [ISO]). For further information and technical solutions with environments using raised floors, please see the Cascade Microtech Stations Facility guide. Damper natural frequency 2.5 Hz.

Contact Intelligence Technology*

The CM300xi provides the lab automation capabilities needed to make critical precision electrical measurements. With Contact Intelligence technology, CM300xi adapts to temperature variance and provides automated drift correction for unattended testing on small pads over time and temperature.

Contact Intelligence technology is enabled by the following features:

- VueTrack™ closed-loop positioning capability minimizes the need of manual re-adjustment when probing small pads across multiple temperatures.
- Velox probe station software provides a single command interface for automated temperature transitions continuously managing the separation between probes and pad during temperature ramp.
- Velox probe station software provide the ability to optimize the soak time after a temperature transition or when stepping across the wafer based on the temperature variance.
- Realign option is much faster due to the fast focus scan, which minimizes the thermally induced drift during off-axis alignment of prober and pads.
- High Temperature Stability (HTS) microscope bridge enables automated over-temperature measurements.
- HTS platen provides stability over a wide thermal probing range.
- HTS probe card holder ensures EMI-shielded and light-tight environment, achieving accurate and reliable small-pad probing (option).
- As an additional option, the Contact Intelligence DC Motorized Positioner Package includes VueTrack Pro, motorized positioners with friction-less EMI shielding and HTS probe arms, enabling unattended testing on small pads across multiple temperatures. This is an ideal option for customers working with high-mix/low-volume device layouts requiring flexible positioner-based setups.

* CM300 open systems are not equipped with Contact Intelligence technology

Software

The CM300xi is equipped with Velox probe station control software and VeloxPro user interface for test automation, making it seamless and easy to convert CM300xi's operation mode from semi-automated to fully-automated. Operating system is Windows 7.

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 Test Automation Software

[Optional, unless system ordered with MHU300]

VeloxPro user interface is available 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 CM300xi 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

Communication Ports

| Type | Qty | Location | Notes |
|-----------------|-----|-------------------------|--|
| USB 2.0 | 1 | IPC front | For quick access to USB devices |
| USB 2.0 | 4 | IntelliControl (option) | For security keys (1x) and USB instrument control (3x) |
| GPIB IEEE 488.2 | 1 | Rear connection panel | For test instrument control |
| LAN | 1 | Rear connection panel | For integration into measurement environment and local network |

Sound level

| | |
|----------------|-------------|
| Constant level | ≤ 60 dB (A) |
| Peak level | < 72 dB (A) |

NON-THERMAL CHUCKS

FemtoGuard® Chuck Performance*

| | | |
|-------------------|------------------|--------------------------|
| Breakdown Voltage | Force -to-Guard | > 500 V |
| | Guard-to-Shield | > 500 V |
| | Force -to-Shield | > 500 V |
| Resistance** | Force -to-Guard | ≥ 5 x 10 ¹² Ω |
| | Guard-to-Shield | ≥ 1 x 10 ¹² Ω |
| | Force -to-Shield | ≥ 5 x 10 ¹² Ω |
| Capacitance*** | Force -to-Guard | ≤ 800 pF |
| | Guard-to-Shield | ≤ 3000 pF |

* Chuck performance measured inside test chamber at dew point < -70°C.

** The chuck resistance is measured in a dry environment. Moisture in the chuck may degrade performance. The chuck layer resistance is measured with a B1500 with HR-SMU B1517, the Cascade Microtech program "F-G_R_@10V@50Hz" at defined test conditions.

*** The chuck layer capacitance is measured with a B1500 with HR-SMU B1517, the Cascade Microtech program "CAP_F-G-300pA" at defined test conditions.

| System Electrical Performance (with non-thermal chuck) | CM300xi-F FemtoGuard | CM300xi-S FemtoGuard | CM300xi-S Coax Chuck | CM300-O Coax Chuck |
|---|-------------------------|-------------------------|-------------------------|-----------------------|
| Probe leakage* | ≤ 1 fA | ≤ 1 fA | ≤ 1 fA | N/A |
| Chuck leakage* | ≤ 3 fA | ≤ 15 fA | ≤ 600 fA | ≤ 1 pA |
| Residual capacitance | 2.5 pF | ≤ 75 pF | N/A | N/A |
| Capacitance variation** | ≤ 2 fF | ≤ 75 pF | ≤ 75 fF | N/A |
| Settling time*** | ≤ 50 fA @ 0.5 sec | ≤ 100 fA @ 2 sec | N/A | N/A |

* 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 B1500 with HR-SMU B1517 and the Cascade Microtech program "DCN@10V" at defined test conditions.

** The residual (triaxial) chuck capacitance is measured with a B1500 with HR-SMU B1517 with the Cascade Microtech program "Cap-Trx-3pA" at defined test conditions. This is chuck capacitance variation based upon chuck position anywhere in the 300 mm area, as measured by a stationary DC probe.

*** Settling time is measured with a B1500 with HR-SMU B1517 and the Cascade Microtech program "ST_10V" at defined test conditions.

Note: Results measured with thermal chuck at standard probing height (20,500 μm) with chuck in a dry environment. Moisture in the chuck may degrade performance.

FemtoGuard Chuck Performance*

| | | Thermal Chuck | | | |
|-------------------|------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| | | @ -55°C | @ 25°C | @ 200°C | @ 300°C |
| Breakdown Voltage | Force -to-Guard | > 500 V | > 500 V | > 500 V | > 500 V |
| | Guard-to-Shield | > 500 V | > 500 V | > 500 V | > 500 V |
| | Force -to-Shield | > 500 V | > 500 V | > 500 V | > 500 V |
| Resistance** | Force -to-Guard | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{11} \Omega$ | $\geq 1 \times 10^{11} \Omega$ |
| | Guard-to-Shield | $\geq 5 \times 10^{11} \Omega$ | $\geq 5 \times 10^{11} \Omega$ | $\geq 5 \times 10^{10} \Omega$ | $\geq 1 \times 10^{10} \Omega$ |
| | Force -to-Shield | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{11} \Omega$ | $\geq 1 \times 10^{11} \Omega$ |
| Capacitance*** | Force -to-Guard | $\leq 1100 \text{ pF}$ | $\leq 1100 \text{ pF}$ | $\leq 1100 \text{ pF}$ | $\leq 1200 \text{ pF}$ |
| | Guard-to-Shield | $\leq 5000 \text{ pF}$ | $\leq 5000 \text{ pF}$ | $\leq 5000 \text{ pF}$ | $\leq 5000 \text{ pF}$ |

* Chuck performance measured inside test chamber at dew point < -70°C.

** The chuck resistance is measured in a dry environment. Moisture in the chuck may degrade performance. The chuck layer resistance is measured with a B1500 with HR SMU B1517, the Cascade Microtech program "F-G_R_@10V@50Hz" at defined test conditions.

*** The chuck layer capacitance is measured with a B1500 with HR-SMU B1517, the Cascade Microtech program "CAP_F-G-300pA" at defined test conditions.

Coaxial Chuck Performance*

| | | Thermal Chuck | | | |
|-------------------|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| | | @ -55°C | @ 25°C | @ 200°C | @ 300°C |
| Breakdown voltage | | > 500 V | > 500 V | > 500 V | > 500 V |
| Resistance | | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{12} \Omega$ | $\geq 5 \times 10^{11} \Omega$ | $\geq 5 \times 10^{10} \Omega$ |
| Capacitance | | $\leq 800 \text{ pF}$ | $\leq 800 \text{ pF}$ | $\leq 800 \text{ pF}$ | $\leq 800 \text{ pF}$ |

* Chuck performance measured inside test chamber at dew point < -70°C.

System Electrical Performance (with thermalchuck)

| | | CM300xi-F FemtoGuard | CM300xi-S FemtoGuard | CM300xi-S Coax | CM300-O Coax |
|-------------------------|------------------------|-------------------------|---|--|-----------------------|
| Probe leakage* | Thermal Controller OFF | $\leq 1 \text{ fA}$ | $\leq 1 \text{ fA}$ | $\leq 1 \text{ fA}$ | N/A |
| | Thermal Controller ON | $\leq 5 \text{ fA}$ | $\leq 10 \text{ fA}$ | $\leq 10 \text{ fA}$ | N/A |
| Chuck leakage* (ATT) | Thermal Controller OFF | $\leq 3 \text{ fA}$ | $\leq 15 \text{ fA}$ | $\leq 25 \text{ pA}$ | $\leq 100 \text{ pA}$ |
| | -55°C | $\leq 6 \text{ fA}$ | $\leq 20 \text{ fA}$ | $\leq 25 \text{ pA}$ | N/A**** |
| | 25°C | $\leq 3 \text{ fA}$ | $\leq 20 \text{ fA}$ | $\leq 25 \text{ pA}$ | $\leq 100 \text{ pA}$ |
| | 200°C | $\leq 3 \text{ fA}$ | $\leq 20 \text{ fA}$ | $\leq 25 \text{ pA}$ | $\leq 100 \text{ pA}$ |
| | 300°C | $\leq 6 \text{ fA}$ | $\leq 25 \text{ fA}$ | $\leq 220 \text{ pA}$ | $\leq 1 \text{ nA}$ |
| Residual capacitance** | | $\leq 2.5 \text{ pF}$ | $\leq 75 \text{ pF}$ | N/A | N/A |
| Capacitance variation** | | $\leq 2 \text{ fF}$ | $\leq 75 \text{ fF}$ | $\leq 75 \text{ fF}$ | N/A |
| Settling time*** | | All temperatures @ 10 V | $\leq 50 \text{ fA @ } 0.5 \text{ sec}$ | $\leq 100 \text{ fA @ } 2 \text{ sec}$ | N/A |

* 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 B1500 with HR-SMU B1517 and the Cascade Microtech program "DCN@10V" at defined test conditions.

** The residual (triaxial) chuck capacitance is measured with a B1500 with HR-SMU B1517 with the Cascade Microtech program "Cap-Trx-3pA" at defined test conditions. This is chuck capacitance variation based upon chuck position anywhere in the 300 mm area, as measured by a stationary DC probe.

*** Settling time is measured with a B1500 with HR-SMU B1517 and the Cascade Microtech program "ST_10V" at defined test conditions.

**** For CM300-O: Thermal chucks can be used for above ambient temperatures only.

Thermal System Overview¹

| | |
|---|--|
| Temperature ranges | -60°C to 300°C, ATT, air cool (200/230 VAC 50/60 Hz) |
| | +20°C to 300°C, ATT, air cool (100/230 VAC 50/60 Hz) |
| | +30°C to 300°C, ATT, air cool (100/230 VAC 50/60 Hz) |
| Wafer temperature accuracy ^{2,3} | ± 2.5°C at 100°C |

1. CM300-O can be used for above ambient temperatures only.
2. As measured with an Anritsu WE-11K-TSI-ANP or WE-12K-GW1-ANP type K thermocouple surface temperature measurement probe with offset calibration procedure. Conditions: closed chamber with minimum recommended purge air, probe centered on a blank silicon wafer, chuck at center of travel and standard probe height. Typical type K thermocouple probe tolerances are ±2.2°C or ±0.75% of the measured temperature in °C (whichever is greater).
3. The test setup can change the wafer temperature accuracy from the calibration by ±5°C (typical). Test setup attributes include open or closed chamber, probe or probe card construction and number of contacts, purge air flow rate, and lab environmental conditions.

ATT Thermal System Specifications (-60°C to 300°C)

| | |
|-----------------------------------|--|
| Temperature range | -60°C to 300°C |
| Resolution | 0.1°C |
| Thermal uniformity ^{1,2} | 1.0°C @ 25°C, 2.0°C @ -60°C, 3.0°C @ 300°C |

1. As measured with type-K thermocouple surface probe. Conditions: 12 mm diameter probe head, closed chamber with minimum recommended purge air, probe centered in probing area, on standard silicon wafer, and chuck at standard probe height. Typical type K thermocouple probe tolerances are ±2.2°C or ±0.75% of the measured temperature in °C (whichever is greater).
2. Peak-to-peak temperature measurement variation across probing sites.

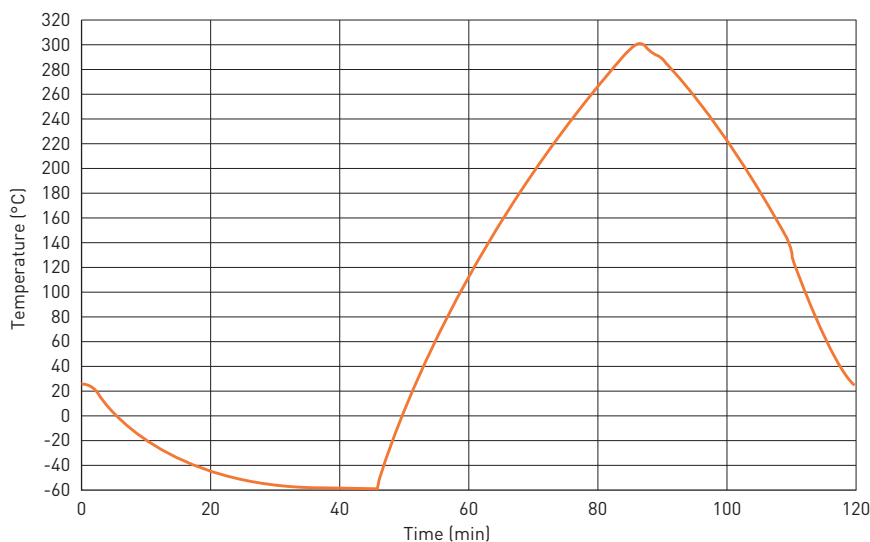
ATT Transition Time (Typical)*

| | | |
|---------|---------------|--------|
| Cooling | 25°C to -40°C | 17 min |
| | 25°C to -60°C | 53 min |
| | 200°C to 25°C | 18 min |
| | 300°C to 25°C | 33 min |
| Heating | -60°C to 25°C | 7 min |
| | -40°C to 25°C | 5 min |
| | 25°C to 200°C | 19 min |
| | 25°C to 300°C | 35 min |

* Performance valid within fulfilled facility media requirements as stated in the Facility Planning Guide.

ATT Thermal Transition Time (-60°C to 300°C)

Typical times using CM300xi with FemtoGuard Chuck



ATT Thermal System Specifications (30°C to 300°C)

| | |
|-----------------------------------|--|
| Temperature range | 30°C to 300°C |
| Resolution | 0.1°C |
| Thermal uniformity ^{1,2} | 1.0°C @ 25°C, 2.0°C @ -60°C, 3.0°C @ 300°C |

1. As measured with type-K thermocouple surface probe. Conditions: 12 mm diameter probe head, closed chamber with minimum recommended purge air, probe centered in probing area, on standard silicon wafer, and chuck at standard probe height. Typical type K thermocouple probe tolerances are $\pm 2.2^{\circ}\text{C}$ or $\pm 0.75\%$ of the measured temperature in $^{\circ}\text{C}$ [whichever is greater].
2. Peak-to-peak temperature measurement variation across probing sites.

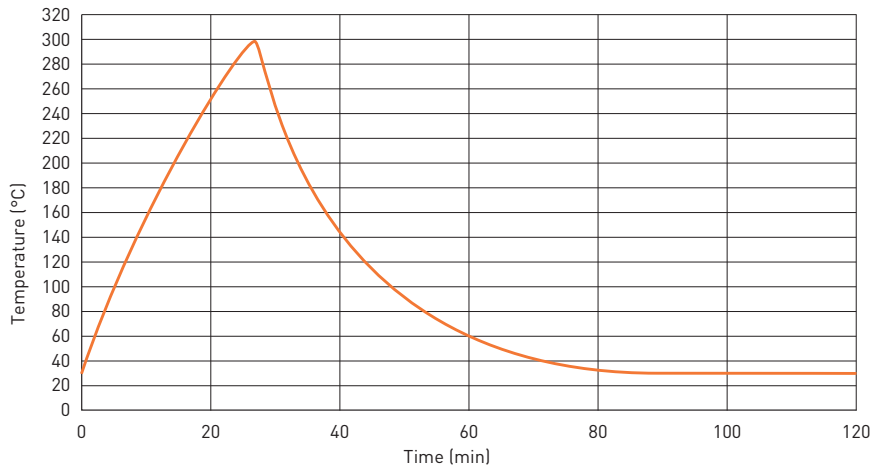
ATT Transition Time (Typical)*

| | | |
|---------|---------------|--------|
| Cooling | 200°C to 30°C | 60 min |
| | 300°C to 30°C | 70 min |
| Heating | 30°C to 200°C | 19 min |
| | 30°C to 300°C | 35 min |

* Performance valid within fulfilled facility media requirements as stated in the Facility Planning Guide.

ATT Thermal Transition Time (30°C to 300°C)

Typical times using CM300xi with FemtoGuard Chuck.



Programmable Bridge/Transport Specifications, High-Temperature Stability (CM300xi-F and CM300xi-S)*

| | |
|-------------------------|--|
| Travel | 75 mm (X) x 75 mm (Y) x 150 mm (Z) (3.0 in. x 3.0 in. x 5.9 in.) |
| Travel in TopHat | 13 mm x 13 mm (0.5 in. x 0.5 in.) |
| Z Lift | 150 mm (5.9 in.) |
| Resolution, X-Y axis | 1 μ m (0.04 mils) |
| Resolution, Z axis | 0.4 μ m (0.016 mils) |
| Repeatability, X-Y axis | $\leq 2 \mu$ m (0.08 mils) |
| Repeatability, Z axis | $\leq 1 \mu$ m (0.04 mils) |
| Accuracy, X-Y axis | $\leq 5 \mu$ m (0.2 mils) |
| Accuracy, Z axis | $\leq 4 \mu$ m (0.016 mils) |
| Speed | 5 mm/sec (0.2 in./sec) |

Programmable Bridge/Transport Specifications (for CM300-O)*

| | |
|-------------------------|--|
| Travel | 50 mm (X) x 50 mm (Y) x 125 mm (Z) (2.0 in. x 2.0 in. x 4.9 in.) |
| Travel in TopHat | 13 mm x 13 mm (0.5 in. x 0.5 in.) |
| Z Lift | 125 mm (4.9 in.) |
| Resolution, X-Y axis | 1 μ m (0.04 mils) |
| Resolution, Z axis | 0.4 μ m (0.016 mils) |
| Repeatability, X-Y axis | $\leq 2 \mu$ m (0.08 mils) |
| Repeatability, Z axis | $\leq 2 \mu$ m (0.08 mils) |
| Accuracy, X-Y axis | $\leq 10 \mu$ m (0.4 mils) |
| Speed | 10 mm/sec (0.3 in./sec) |

Large Area Programmable Bridge/Transport Specifications*

| | |
|-------------------------|--|
| Travel | 300 mm (X) x 300 mm (Y) x 150 mm (Z) (12 in. x 12 in. x 5.9 in.) |
| Travel in TopHat | 13 mm x 13 mm (0.5 in. x 0.5 in.) |
| Z Lift | 150 mm (5.9 in.) |
| Resolution, X-Y axis | 1 μ m (0.04 mils) |
| Resolution, Z axis | 0.4 μ m (0.016 mils) |
| Repeatability, X-Y axis | $\leq 5 \mu$ m (0.2 mils) |
| Repeatability, Z axis | $\leq 2 \mu$ m (0.08 mils) |
| Accuracy, X-Y axis | $\leq 10 \mu$ m (0.4 mils) |
| Speed | 50 mm/sec (2 in./sec) |
| Planarity uncompensated | $\pm 25 \mu$ m (1 mils) |

Manual Bridge/Transport Specifications (for CM300-O)**

| | |
|------------------------------|--|
| Travel | 50 mm (X) x 50 mm (Y) x 125 mm (Z) (2.0 in. x 2.0 in. x 4.9 in.) |
| Z Lift | 125 mm (4.9 in.), |
| Feature resolution, X-Y axis | 5 μ m (0.2 mils) |

* Applicable with eVue only

** Only for use with microscope with focus drive.

AUX CHUCK

| | |
|--------------------------|--|
| Quantity | Two separated chucks for RF calibration (CAL, two sites) and cleaning (CLEAN, three sites), mounted independent of the thermal chuck |
| Max substrate size CAL | 22.15 mm x 22.15 mm ISS substrate 16 mm x 14.5 mm Square substrate |
| Max substrate size CLEAN | 38.1 mm x 38.1 mm gel pad Two 16 mm x 14.5 mm contact pads, solid clean pad, brush |
| Material | CAL: ceramic, CLEAN: steel |
| Flatness | $\leq \pm 10 \mu\text{m}$ (0.39 mils) |
| Thermal isolation | Air gap, > 10 mm |
| Positional repeatability | 2 μm (0.08 mils) after rollout event |
| Vacuum actuation | Independent manual control |

STATION CONTROLLER

High-performance system controller with Velox probe station control software and Windows 7 OS

MODELS

CM300xi Fully-shielded - Probe station platform, semi-automated with MicroChamber, AttoGuard and PureLine technologies

Configuration includes:

Microscope Bridge/Transport – programmable 75 mm x 75 mm, High Temperature Stability
EMI- and light-tight shielding with TopHat, AttoGuard technology for accurate IV/CV measurements
ContactView™ East-West with ProbeHorizon for fast and safe wafer loading
AUX chuck kit for RF calibration and cleaning
Velox Controller with dual TFT monitor 24" on ergo arm
AirGun with front access, IntelliControl

CM300xi Shielded - Probe station platform, semi-automated with MicroChamber

Configuration includes:

Microscope Bridge / Transport – programmable 75 mm x 75 mm, High Temperature Stability
EMI- and light-tight shielding with TopHat
ContactView East-West with ProbeHorizon for fast and safe wafer loading
Velox Controller with single TFT monitor 24" on ergo arm

CM300 Open System - Probe station platform, semi-automated

Configuration includes:

Microscope Bridge / Transport – manual 50 mm x 50 mm
ContactView East-West with ProbeHorizon for fast and safe wafer loading
Velox Controller with single TFT monitor 24" on ergo arm

Options

Note: To complete the CM300xi probe system configuration

- 1. Select a modular chuck from the following list (X=1 for Nickel-plated chuck and 2 for Gold-plated)*
- 2. Select additions/options from the following list (see compatibility chart on following page)*

MODELS (CONTINUED)

| Part Number | General Description | CM300xi-F | CM300xi-S | CM300-O |
|--------------------|--|-----------|-----------|---------|
| 171-294 | CM300xi, microscope bridge/transport HTS – programmable 75 mm x 75 mm | Std | Std | |
| 164-508 | CM300-O, microscope bridge/transport- programmable 50 mm x 50 mm | | | ● |
| 168-930 | CM300xi/CM300-O, large area microscope bridge/transport – programmable 300 mm x 300 mm | ● | ● | ● |
| 169-120 | CM300-O, microscope bridge/transport – manual 50 mm x 50 mm | | | Std |
| 161-677 | CM300xi/CM300-O, AUX chuck kit | Std | ● | ● |
| 167-640 | CM300xi/CM300-O, AirGun with front access, IntelliControl | Std | ● | ● |
| 167-500 | CM300xi/CM300-O, AirGun with front access | | ● | ● |
| 163-262 | CM300xi/CM300-O, 2 nd ContactView North-South | ● | ● | ● |
| 169-121 | CM300xi/CM300-O, Option PTPA for CM300 | ● | ● | ● |
| 161-676 | CM300xi/CM300-O, 2 nd TFT monitor 24" with ergo arm | Std | ● | ● |
| OPT-CM300-TOPCHMBR | CM300xi, TopChambers for simultaneous use with probe card and positioners (EMI-shielded) | ● | ● | |
| VeloxPro300 | Software option, VeloxPro Test Automation Software for 300 mm systems (included if system ordered with MHU300) | ● | ● | ● |

Non-Thermal Chucks

| Part Number | General Description | Chuck Compatibility | | |
|-------------|--|---------------------|-----------|---------|
| | | CM300xi-F | CM300xi-S | CM300-O |
| TC-006-30x | FemtoGuard triaxial chuck, non-thermal, 300 mm (12") | ● | ● | |
| TC-006-10x | Coaxial chuck, non-thermal, 300 mm (12") | | ● | ● |

Thermal Chucks**

| Part Number | General Description | Chuck Compatibility | | |
|-------------|--|---------------------|-----------|----------|
| | | CM300xi-F | CM300xi-S | CM300-O* |
| TC-416-30x | FemtoGuard triaxial chuck, thermal, -60°C to 300°C (ATT), 300 mm (12") | ● | ● | |
| TC-416-10x | Coaxial chuck, thermal, -60°C to +300°C (ATT), 300 mm (12") | | ● | ● |

Note: X = 1 (Nickel), X = 2 (Gold)

* For CM300-O: Thermal chucks can be used for above ambient temperatures only.

** Thermal chucks requires thermal systems to control chuck temperature.

Thermal Systems

| Part Number | General Description | Thermal Compatibility | | |
|-------------|--|-----------------------|-----------|---------|
| | | CM300xi-F | CM300xi-S | CM300-O |
| TS-416-14P | Thermal System, -60°C to 300°C, ATT (200/230 VAC 50/60 Hz) | ● | ● | |
| TS-416-05T | Thermal System, +20 to 300°C, ATT (100-230 VAC 50/60Hz) | ● | ● | ● |
| TS-416-02T | Thermal System, +30 to 300°C, ATT (100-230 VAC 50/60Hz) | ● | ● | ● |

Note: Thermal systems must match the thermal chuck selected, i.e. TS-416-xxx thermal systems are compatible with TC-416-xxx chucks. The upper temperature limit is defined by the chuck.

SYSTEM FEATURES

General Probe System Specifications

Usability feature:

- ContactView (East-West orientation)

Automation features:

- Option off-axis PTPA
- Automated Thermal Management (ATM)

Top shielding:

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

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.



CM300xi fully-automated system with material handling unit (MHU), showing dual load port configuration.

MHU FEATURES

| | |
|------------------------|--|
| 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 FOUP/FOSB cassettes and the probe system. Manual loading of wafer fragments (> 10 mm x 10 mm), as well as full wafers, are supported through manual loading, which bypasses the MHU300. |
| Dual-prober ready | Up to two probe systems can be docked and operated simultaneously to a single central loader. |
| Wafer ID Reading | 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. |
| VeloxPro300 | Fully-automated CM300xi includes the software option VeloxPro Test Automation Software. |

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

CONFIGURATION OPTIONS

Semi-Automated

Stand-alone CM300xi probe system with no integrated wafer loader



Fully-Automated

Wafer loader interfaced to only one CM300xi probe system (at left or right side)



Dual-Prober

Wafer loader interfaced to two independent CM300xi probe systems



Note: For detailed facility requirements, refer to the CM300xi Facility Planning Guide.

SYSTEM UPGRADE OPTIONS

MHU-ready option:

OPT-CM300-MHU-L/R Upgrade capability for conversion of a CM300xi to fully-automated prober system, requires definition of prober location against MHU300; feature is required to prepare a CM300xi for later upgrade in the field.

Non-Thermal Chucks

| Part Number | General Description | Chuck Compatibility | | |
|-------------|--|---------------------|-----------|---------|
| | | CM300xi-F | CM300xi-S | CM300-O |
| TC-006-32x | FemtoGuard triaxial chuck, non-thermal, 300 mm (12"), with lift pins | ● | ● | |
| TC-006-12x | Coaxial chuck, non-thermal, 300 mm (12"), with lift pins | | ● | ● |

Thermal Chucks*

| Part Number | General Description | Chuck Compatibility | | |
|-------------|--|---------------------|-----------|-----------|
| | | CM300xi-F | CM300xi-S | CM300-O** |
| TC-416-33x | FemtoGuard triaxial chuck, thermal, -60°C to +300°C (ATT), 300 mm (12"), with HT lift pins | ● | ● | |
| TC-416-32x | FemtoGuard triaxial chuck, thermal, -60°C to +200°C (ATT), 300 mm (12"), with lift pins | ● | ● | |
| TC-416-13x | Coaxial chuck, thermal, -60°C to +300°C (ATT), 300 mm (12"), with HT lift pins | | ● | ● |
| TC-416-12x | Coaxial chuck, thermal, -60°C to +200°C (ATT), 300 mm (12"), with lift pins | | ● | ● |

Note: X = 1 (Nickel), X = 2 (Gold)

* Thermal chucks require thermal systems to control chuck temperature. The chucks and thermal systems mutually determine the temperature range.

Thermal Systems

| Part Number | General Description | Chuck Compatibility | | |
|--------------|--|---------------------|-----------|-----------|
| | | CM300xi-F | CM300xi-S | CM300-O** |
| TS-416-14P-I | Thermal system, -60°C to 300°C, ATT (208/230 VAC 50/60 Hz)* to be used with MHU300 | ● | ● | |

* Minimum voltage, 200 V, may reduce cooling performance. The upper temperature limit is defined by the chuck.

** For CM300-O: Thermal Chucks can only be used for temperatures above ambient temperature.

AVAILABLE OPTIONS

Automation

| | |
|------------|---|
| MHU300-L/R | Material Handling Unit with one loadport for 300 mm FOUP/FOSB cassettes, for CM300xi at left (-L) or right (-R) side |
| MHU300-2 | Material Handling Unit with one loadport for 300 mm FOUP/FOSB cassettes for two CM300xi probe systems (dual-prober configuration) |
| 159-826 | Second load port for MHU300 |
| 159-827 | Adapter for use of open 200 mm cassettes |
| 159-660 | ID reader station for codes on the surface and back side of wafers |
| 164-678 | Fan filter unit for MHU300 reducing dust pollution level in MHU |



CM300xi fully-automated system with material handling unit (MHU), showing dual-prober configuration.

SYSTEM THROUGHPUT

Semi-automated system

| | |
|---------------------|--|
| Chuck stepping time | ≤ 0.75 sec (200 µm Z down – 1000 µm X-Y – 200 µm Z up) |
|---------------------|--|

Fully-automated system

| | |
|--------------------------------|---|
| FOUP cassette load | ≤ 30 sec (incl. wafer scan) |
| Wafer handling cycle @ ambient | ≤ 1.3 min (Cassette → PreAligner → Prober → Cassette) |
| | ≤ 1.6 min (Cassette → PreAligner → IDReader → PreAligner → Prober → Cassette) |

REGULATORY COMPLIANCE

| | |
|---------------|--|
| Certification | CE certified. TÜV compliance tested for CB, certified for US and Canada (cNRTLus), SEMI S2 and S8. |
|---------------|--|

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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Microtron®

Flexible electronic solutions

Microtron n.v. | Generaal De Wittelaan 7 | B-2800 Mechelen | T +32 (0) 15 29 29 29 | info@microtron.be | www.microtron.be
Microtron b.v. | Hoevestein 11 | NL-4903 SE Oosterhout | T +31 (0) 162 44 72 72 | info@microtron.nl | www.microtron.nl