

Cascade

# Summit 11000

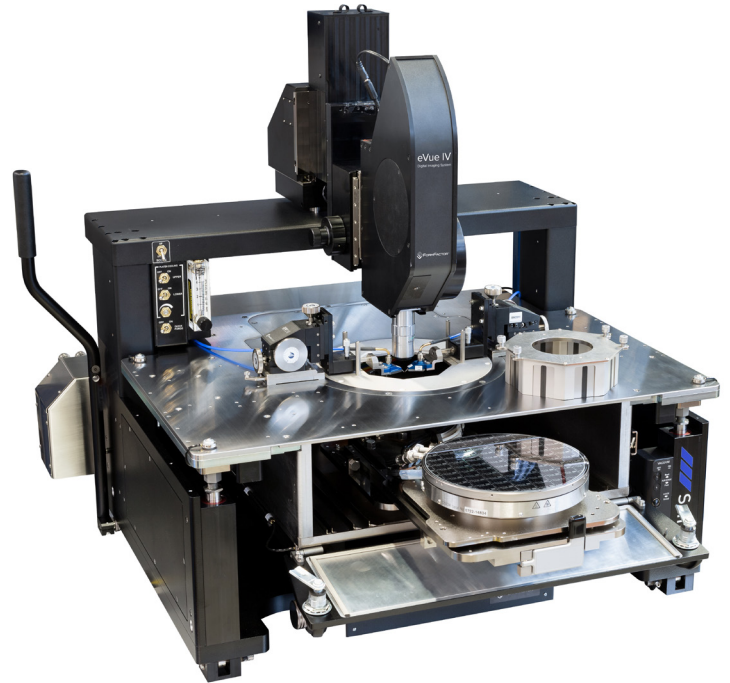
200 mm Manual Probe System

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## > Overview

Summit™ series manual probe system, with PureLine™ and AttoGuard® technology, allow you to access the full range of your test instruments for 200 mm and 150 mm wafers. Whatever your application: RF/Microwave, device characterization, wafer level reliability, e-test, modeling, or yield enhancement, Summit series platforms lead the industry in on-wafer measurements. Summit series probe stations are easy to configure with your choice of measurement performance, manual or semi-automated operation, chuck size, thermal range and microscope options. All platforms are -60°C to 300°C compatible to ensure an upgrade path to meet your future needs.

The powerful Velox™ for manual probe stations control software features easy on-screen navigation and seamless integration with analyzers and measurement software. It enables simple operation of motorized positioners and thermal systems. For a wide range of applications, the Summit probe station powered by Velox software achieves high test efficiency.



## > Features / Benefits

<b>Measurement accuracy</b>	<ul style="list-style-type: none"><li>• Best solution for low-noise and 1/f measurements with advanced PureLine, AttoGuard and MicroChamber® technologies</li><li>• Minimize AC and spectral noise with effective shielding capability</li></ul>
<b>Positioning accuracy</b>	<ul style="list-style-type: none"><li>• Manual 3-axis stage enables fast, accurate “hands on” wafer positioning with ergonomic controls</li></ul>
<b>Productivity</b>	<ul style="list-style-type: none"><li>• eVue™ digital imaging system: enhanced optical visualization, fast set-up</li></ul>
<b>Flexibility and application-tailored solutions</b>	<ul style="list-style-type: none"><li>• RF/microwave device characterization, 1/f, WLR, FA and design debug</li><li>• Complete solution for small- and large-area multi-site probe cards</li><li>• Seamless integration between Velox and analyzers/measurement software</li></ul>
<b>Ease of use</b>	<ul style="list-style-type: none"><li>• Quick, safe, and comfortable wafer access via locking roll-out stage</li><li>• “Hands-free” microscope remote control</li><li>• Intuitive ergonomic controls, enable fast setup and test data gathering</li><li>• Easy navigation and operation of motorized positioners and thermal systems with Velox</li></ul>

## > Mechanical Performance

### X-Y Travel

Travel	203 mm x 203 mm (8 in. x 8 in.)
Motion control	Manual controls (X-Y direct rotary knobs)
Resolution	5 mm / turn

### Z Stage

Travel	Fixed Z mount
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### Theta Stage

Travel	$\pm 5.7^\circ$
Resolution	0.8° / turn

\* Measured at edge of 200 mm chuck

### System

Probe-force capability	20 kg (44 lb.) maximum
Probe-force deflection	$\leq 0.0015 \mu\text{m}/\mu\text{m}$ slope per 10 kg load
System planarity	$\leq 35 \mu\text{m}$ (1.3 mils) @ 25°C
	$\leq 35 \mu\text{m}$ (1.3 mils) @ -60°C (typical)
	$\leq 35 \mu\text{m}$ (1.3 mils) @ 200°C (typical)
	$\leq 50 \mu\text{m}$ (2.0 mils) @ 300°C (typical)

## MicroChamber

Electrical	Summit 11000B-AP
EMI shielding	≥ 20 dB 0.5-3 GHz, ≥ 30 dB 3-20 GHz (typical)
Spectral noise floor*	≤ -170 dBVrms/rtHz (≤ 1 MHz) Non thermal ≤ -170 dBVrms/rtHz (≤ 1 MHz) Thermal ATT
System AC noise **	≤ 5 mVp-p (≤ 1 GHz) Non thermal ≤ 5 mVp-p (≤ 1 GHz) Thermal ATT

\* Typical results. Actual values depends on probe / test setup. Test setup uses triaxial thermal chuck, 50 Ω termination, high quality LNA, and DSA/DSO instrument.

\*\* Test setup: Station power ON, Thermal system ON (40°C), MicroChamber closed, guard to shield shorted with triax adapter on chuck. 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).

### Light Shielding

Type	Complete dark enclosure around chuck
Wafer access	Front access door with rollout stage for easy wafer loading
Probe compatibility	Standard MicroChamber TopHat™ allows access for up to eight probes
Light attenuation	≥ 120 dB

### Purge and Condensation Control

Test environment	Low volume for fast purge, external positioning and cable access to maintain sealed environment
Dew point capability	> -70°C for frost-free measurements and high-voltage measurements*
Purge gas	Dry air or nitrogen
Purge flow rate	Standard purge - manual controls, variable 0 to 110 l/min (4 CFM) at SATP** Quick purge - manual controls, standard purge rate or maximum > 110 l/min (4 CFM) at SATP**
Purge time	< 15 min for measurements @ -55°C (typical)
External condensation control	Integrated laminar-flow air distribution on external MicroChamber surfaces to eliminate condensation Controls for ON/OFF and flow rate for both top and bottom surfaces

\* Please see the facilities guide for air requirements to enable optimum dew point for low-temperature measurements using a thermal chuck inside the MicroChamber.

## Platen System

### Platen

Material	Steel for magnetic positioners
Dimensions	74.5 cm (W) x 59.5 cm (D) x 20 mm (T) (29.3 in. x 23.4 in. x 0.78 in.)
Mounting system	Kinematic 4 point
Platen to chuck height	14 ± 0.5 mm (0.55 ± 0.02 in. )
Accessory compatibility	Minimum of 8 DC or 4 RF positioners allowed, compatible simultaneous probe card holder use
Thermal management	Integrated laminar-flow air-cooling for thermal expansion control

### Platen Ring Insert

Material	Steel for magnetic positioners
Weight	4.5 kg (9.9 lb.)
Standard interface	For MicroChamber, TopHat, probe card holders and custom adapters

### Platen Lift

Type	Precision 4-point linear lift
Range	5.0 mm (0.20 in.)
Repeatability	≤ 3 μm (0.12 mils)
Lift control	Ergonomic handle with 90° stroke. Optional micrometer control for fine adjustment of probe card contact.

## ➤ Wafer and Aux Chuck Design

<b>Wafer Chuck</b>				
	<b>FemtoGuard</b>	<b>MicroVac™</b>	<b>Hi-ISO</b>	<b>Basic</b>
Type	Triax			
Material *	Ni or Au			
Vacuum interface	Standard (35 holes)	MicroVac ** (495 Micro-holes, best for thin wafers)	Standard (35 holes)	Rings
Diameter				
Thermal 200 mm (8 in.)	●	●	●	●
Non-Thermal 200 mm (8 in.)	●	●	●	
Non-Thermal 150mm (6 in.)			●	
AUX chucks (integrated)	2	2	2	Optional
DUT sizes supported	Shards or wafers 50 mm (2 in.) through 200 mm (8 in.) Optional single-die accessory available.			
Vacuum zones	4	5	4	3
Vacuum diameters ***	10, 70, 141, 180 mm (0.4, 2.8, 5.5, 7 in.)	10, 70, 93, 144, 178 mm (0.4, 2.8, 3.6, 5.6, 7 in.)	10, 70, 141, 180 mm (0.4, 2.8, 5.5, 7 in.)	16, 130, 190 mm (0.6, 5, 7 in.)
Vacuum actuation	Easy access multi-zone manual vacuum controls, and software control (semi-automated)			

\* Nickel (Ni) plated aluminum or Gold (Au) plated aluminum

\*\* Patented MicroVac technology using 495 micro-hole pattern for uniform vacuum hold down of thin, warped and partial wafers, and uniform temperature conductivity.

\*\*\* Diameter of arranged vacuum hole patterns (or vacuum rings) into individual zones

### **Auxiliary Chuck**

Quantity	Two, integrated with wafer chuck assembly
Substrate size (maximum)	15.2 mm x 22.1 mm (0.59 in. x 0.87 in.) ISS substrate 19 mm x 19 mm (0.75 in. x 0.75 in.) substrate
Material	Steel (Magnetically loaded, RF absorbing Eccosorb available)
Thermal isolation	Ensures negligible load drift on ISS
Flatness	≤ 8 μm (0.3 mils)
Vacuum actuation	Independently controlled apart from wafer vacuum zones

## ➤ Velox™ Probe Station Control Software

The Summit is optionally equipped with Velox probe station control software. Operating system is Windows 10.

## ➤ Non-Thermal Modular Chucks

### FemtoGuard® Chuck Performance (150/200 mm)

Breakdown voltage	Force-to-guard	≥ 500 V
	Guard-to-shield	≥ 500 V
	Force-to-shield	≥ 500 V
Resistance	Force-to-guard	≥ 1 x 10 <sup>12</sup> Ω
	Guard-to-shield	≥ 1 x 10 <sup>12</sup> Ω
	Force-to-shield	≥ 5 x 10 <sup>12</sup> Ω

### MicroVac / Hi-ISO Coaxial Chuck Performance (150/200 mm)

Breakdown voltage	≥ 500 V
Resistance	≥ 1 x 10 <sup>12</sup> Ω

### System Electrical Performance

Station with chuck (non-thermal)	FemtoGuard	MicroVac / Hi-ISO
Probe leakage *	≤ 1 fA	≤ 1 fA
Chuck leakage *	≤ 1 fA	≤ 600 fA
Residual capacitance	≤ 1.0 pF	N/A
Capacitance variation **	≤ 3 fF	≤ 75 fF
Settling time	≤ 50 fA @ 50 ms (typical)	N/A

NOTE: Results measured with non-thermal chuck at standard probing height (5,000 μm) with chuck in a dry environment. Moisture in the chuck may degrade performance.

\* 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 CMI program or equivalent; 4 ms sample rate, auto scale, 1 nA compliance, 1 NPLC integration  
Settling time is measured with a 4156C SETLB.dat CMI program or equivalent; 2 ms sampling rate, limited auto 1 nA, 1 μA compliance, 3 NPLC integration.

\*\* This is chuck capacitance variation based upon chuck position anywhere in the 200 mm area, as measured by a stationary dc probe. Test conditions: Agilent 4284A LCR meter (Cp-d,1 Mhz,4 Average,0 Power), DCP-150, 75 μm above chuck surface, 4-wire connection (HiZ/Hipot to chuck, Loz/Lopot to Probe).

## Thermal Modular Chucks

### FemtoGuard Chuck Performance (200 mm)

		Thermal Chuck @ -60/-55°C	Thermal Chuck @ 25°C	Thermal Chuck @ 200°C	Thermal Chuck @ 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	≥ 1 x 10 <sup>12</sup> Ω	≥ 1 x 10 <sup>12</sup> Ω	≥ 5 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>11</sup> Ω
	Guard-to-shield	≥ 1 x 10 <sup>12</sup> Ω	≥ 1 x 10 <sup>12</sup> Ω	≥ 5 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>11</sup> Ω
	Force-to-shield	≥ 5 x 10 <sup>12</sup> Ω	≥ 5 x 10 <sup>12</sup> Ω	≥ 5 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>11</sup> Ω

### Coaxial Chuck Performance (200 mm)

		Thermal Chuck @ -60/-55°C	Thermal Chuck @ 25°C	Thermal Chuck @ 200°C	Thermal Chuck @ 300°C
Breakdown voltage		≥ 500 V	≥ 500 V	≥ 500 V	≥ 500 V
Resistance (MicroVac / Hi-ISO)		≥ 1 x 10 <sup>12</sup> Ω	≥ 1 x 10 <sup>12</sup> Ω	≥ 5 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>11</sup> Ω
Resistance (Basic)		≥ 1 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>11</sup> Ω	≥ 1 x 10 <sup>10</sup> Ω	≥ 1 x 10 <sup>9</sup> Ω

### System Electrical Performance

Station with chuck (thermal)		FemtoGuard	MicroVac / Hi-ISO	Basic
Probe leakage *	Thermal controller OFF	≤ 1 fA	≤ 1 fA	N/A
	Thermal controller ON	≤ 5 fA	≤ 10 fA	N/A
Chuck leakage * (ATT)	Thermal controller OFF	≤ 2 fA	25 pA	N/A
	-60/-55°C	≤ 6 fA	25 pA	N/A
	25°C	≤ 3 fA	25 pA	N/A
	200°C	≤ 6 fA	25 pA	N/A
	300°C	≤ 6 fA	220 pA	N/A
Residual capacitance		≤ 2.0 pF	N/A	N/A
Capacitance variation **		≤ 3 fF	≤ 75 fF	N/A
Settling time ***	All temperatures @ 10 V	≤ 50 fA @ 50 ms (typical)	N/A	N/A

NOTE: Results measured with thermal chuck at standard probing height (5000 μm) with chuck in a dry environment. Moisture in the chuck may degrade performance.

\* 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 a 4156C NOISE.dat CMI program or equivalent; 4ms sample rate, auto scale, 1nA compliance, 1 NPLC integration.

\*\* This is chuck capacitance variation based upon chuck position anywhere in the 200 mm area, as measured by a stationary dc probe. Test conditions: Agilent 4284A LCR meter (Cp-d, 1 Mhz, 4 Ave, 0 Power), DCP-150, 75 μm above chuck surface, 4-wire connection (HiZ/HiPot to chuck, LoZ/Lopot to Probe), 25°C.

\*\*\* Settling time is measured with a 4156C SETLB.dat CMI program or equivalent; 2 ms sampling rate, limited auto 1 nA, 1 μA compliance, 3 NPLC integration.

## Thermal System Performance

### Thermal System Overview

Temperature ranges	-55°C to 200°C, ATT, liquid cool (200 mm)	
	-60°C to 300°C, ATT, air cool (200 mm)	
	+20°C to 300°C, ATT, air cool (200 mm)	
	+30°C to 300°C, ATT, air cool (200 mm)	
Wafer temperature accuracy	Standard <sup>1,2</sup>	± 2.5°C at 100°C
	High Accuracy <sup>3</sup>	± 0.05°C (0 to 250°C)
Thermal uniformity	FemtoGuard, MicroVac, Hi-Iso <sup>4</sup>	≤ ± 0.5°C @ 25°C, ≤ ± 1.5°C @ -60°C, ≤ ± 0.85°C @ 200°C, ≤ ± 1.5°C @ 300°C
	Basic Chuck <sup>4</sup>	≤ ± 0.5°C or ± 0.5% of measurement temp up to 200°C, (whichever is greater)

1. 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).

2. 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.

3. Special high accuracy calibration using KLA Sense array wafer (Consult factory for pricing and availability)

4. As measured at DUT (device under test) probing location.

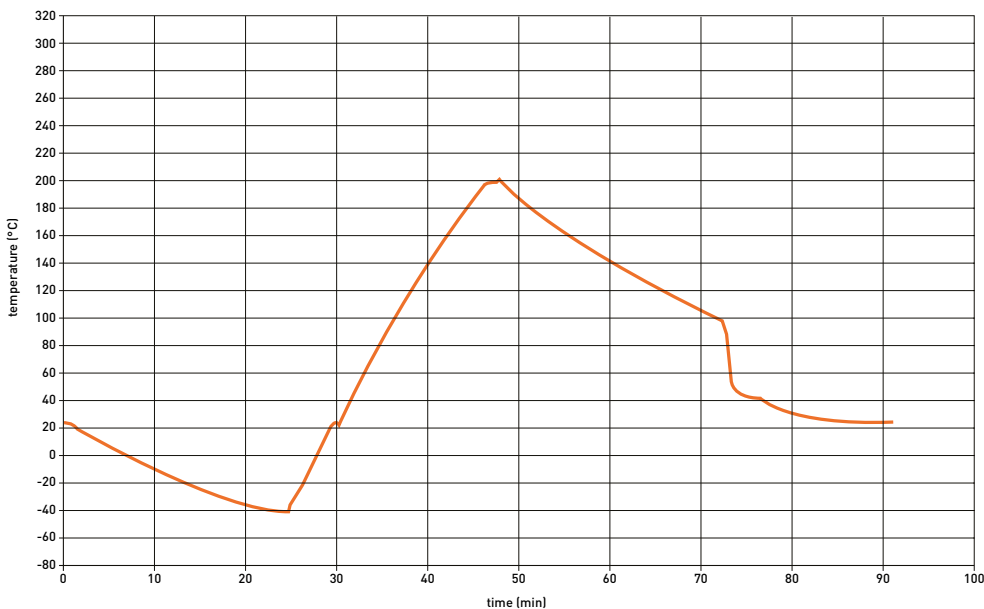
Note: For physical dimensions and facility requirements, refer to the Summit Facility Planning Guide.

### ATT Thermal System Specifications, 200 mm (liquid cool, -55°C to 200°C)

Temperature range	-55°C to 200°C
Transition time – Heating (-55°C to 25°C)	5 min (typical)
Transition time – Heating (25°C to 200°C)	14 min (typical)
Transition time – Cooling (200°C to 25°C)	34 min (typical)
Transition time – Cooling (25°C to -55°C)	20 min (typical)
Temperature resolution	0.1° C
Audible noise	< 60 dB (A)

### ATT Thermal Transition Time (-55°C to 200°C)

Typical times using Summit-AP with FemtoGuard Chuck.



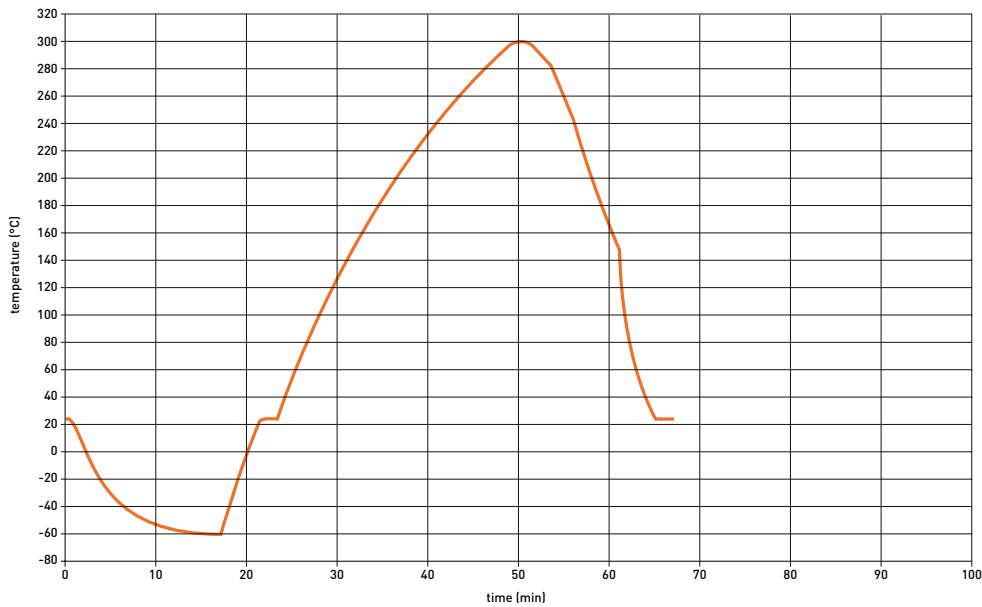
## ➤ Thermal System Performance (Continued)

### ATT Thermal System Specifications, 200 mm (air cool, -60°C to 300°C)

Temperature range	-60°C to 300°C
Transition time – Heating (-60°C to 25°C)	5 min (typical)
Transition time – Heating (25°C to 300°C)	27 min (typical)
Transition time – Cooling (300°C to 25°C)	15 min (typical)
Transition time – Cooling (25°C to -60°C)	15 min (typical)
Temperature resolution	0.1°C
Audible noise	< 60 dB (A)

### ATT Thermal Transition Time (-55°C to 200°C)

Typical times using Summit-AP with FemtoGuard Chuck.





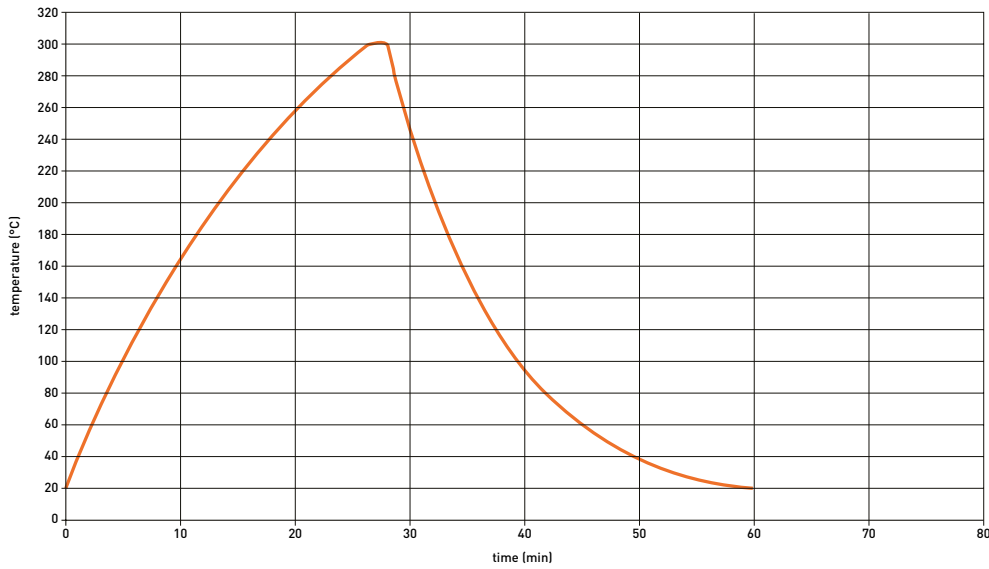
## ➤ Thermal Options and Performance

### ATT Ambient Option Specifications, 200 mm (air cool, + 20°C to 300°C)

Temperature range	+ 20°C to 300°C
Transition time - Heating	27 min 200 mm (typical)
Transition time - Cooling	31 min 200 mm (typical)
Temperature resolution	0.1°C
Audible noise	< 60 dB (A)

### ATT Thermal Transition Time (+20°C to 300°C)

Typical times using Summit-AP with FemtoGuard Chuck.



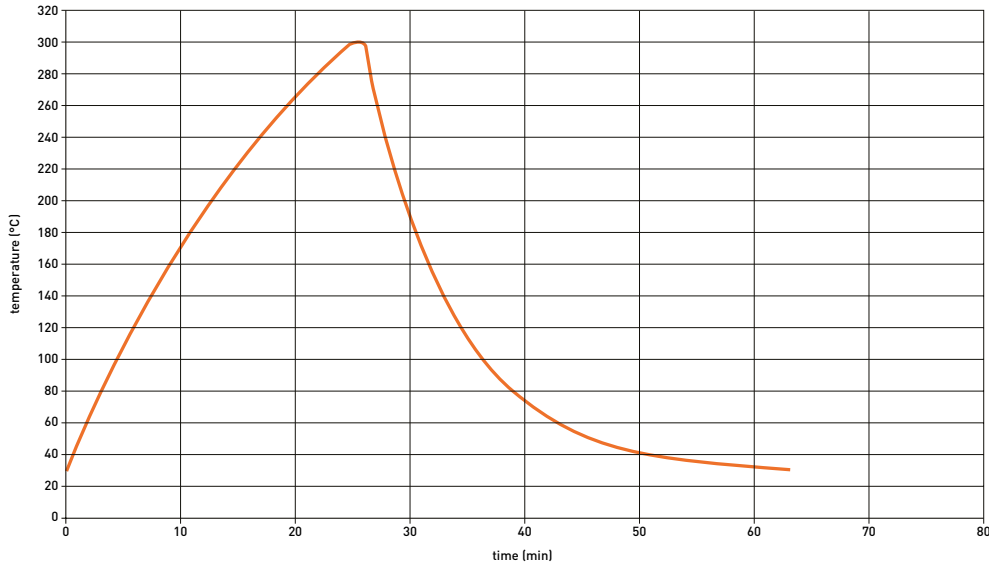
## ➤ Thermal Options and Performance

### ATT Ambient Option Specifications, 200 mm (air cool, +30°C to 300°C)

Temperature range	+ 30 to 300°C
Transition time - Heating	25 min (typical)
Transition time - Cooling	36 min (typical)
Temperature resolution	0.1°C
Audible noise	< 60 dB (A)

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

Typical times using Summit-AP with FemtoGuard Chuck.



## ➤ Station Controller

Optional high-performance system controller with Velox probe station control software and Windows 10

## ➤ Available Models

**Summit 11000B-AP** – Probe station platform, manual with MicroChamber, AttoGuard and PureLine technology

Configuration includes:

MicroChamber for dark, dry and enhanced EMI-shielding enclosure

PureLine technology for premium signal path fidelity

AttoGuard for enhanced IV and CV testing

Roll-out wafer stage for safe and easy wafer loading

High-stability platen with linear lift

Precision manual X-Y stage

User guides, tools and accessories

*Note: To complete the Summit station platform configuration:*

1. Select a modular chuck from the following non-thermal or thermal list
2. Select a matching thermal system if a thermal chuck is desired

### Summit Non-Thermal Chucks

Part Number	General Description
TC-002-30x	FemtoGuard triaxial chuck, non-thermal, 200 mm (8")
TC-002-104	MicroVac coaxial Chuck, high isolation, non-thermal, 200 mm (8")
TC-002-101	Hi-ISO coaxial chuck, non-thermal, 200 mm (8")
TC-002-10x-6	Hi-ISO coaxial chuck, non-thermal, 150 mm (6")

### Summit Thermal Chuck

Part Number	General Description	Cooling
TC-412-30x	FemtoGuard triaxial chuck, thermal, -60°C to 300°C, 200 mm (8"), Ni/Au	Air
TC-412-104	MicroVac coaxial chuck, high isolation, thermal, -60°C to 300°C, 200 mm (8"), Au	Air
TC-412-101	Hi-ISO coaxial chuck, thermal, -60°C to 300°C, 200 mm (8"), Ni	Air
TC-412-001	Basic chuck, coaxial, thermal, -60°C to 300°C, 200 mm (8"), Ni	Air
TC-402-30x	FemtoGuard triaxial chuck, thermal, -55°C to 200°C, 200 mm (8"), Ni/Au	Liquid
TC-402-104	MicroVac coaxial chuck, high isolation, thermal, -55°C to 200°C, 200 mm (8"), Au	Liquid
TC-402-101	Hi-ISO coaxial chuck, thermal, -55°C to 200°C, 200 mm (8"), Ni	Liquid
TC-402-001	Basic chuck, coaxial, thermal, -55°C to 200°C, 200 mm (8"), Ni	Liquid

### Summit Thermal System (200 mm)

Part Number	General Description
TS-412-02T	Thermal system for Summit, +30°C to 300°C, ATT, air cool (100-230 VAC 50/60 Hz)
TS-412-05T	Thermal system for Summit, +20°C to 300°C, ATT, air cool (100-230 VAC 50/60 Hz)
TS-412-14R	Thermal System, -60°C to 300°C, ATT (200-220 VAC 60 Hz, 200 VAC 50 Hz)
TS-412-14E	Thermal System, -60°C to 300°C, ATT (220-240 VAC 50 Hz)
TS-402-07R	Thermal system for Summit, -55°C to 200°C, ATT, liquid cool (208 VAC 60Hz)
TS-402-07E	Thermal system for Summit, -55°C to 200°C, ATT, liquid cool (230 VAC 50Hz)

*Note: Thermal systems must match the thermal chuck selected, i.e. TS-412-xxx thermal systems are compatible only with TC-412-xxx chucks.*

## ➤ Standard Options for Microscope Mounts

<b>High Stability Bridge/Transport (manual)</b>	<b>Part Number 162-160</b>
Travel X-Y	50 mm x 50 mm (2 in. x 2 in.)
Travel X-Y in TopHat	13 mm x 13 mm (0.5 in. x 0.5 in.)
Resolution X-Y	5 mm (0.2 in.) / turn, coaxial XY control
Planarity	10 $\mu$ m (0.4 mils) over full travel with 5 kg (11 lb.) load
Z gross lift	4" vertical lift, pneumatic with up/down, for easy probe access
Z gross repeatability	1 $\mu$ m (0.04 mils)
Z focus	Coarse/fine focus uses microscope system

<b>Large Area Bridge / Transport</b>	<b>Part Number 158-073</b>
XY travel	200 mm x 125 mm (7.8 in. x 4.9 in.)
XY travel in TopHat	13 mm x 13 mm (0.5 in. x 0.5 in.)
Resolution X-Y	5 mm (0.2 in.) / turn
Planarity	75 $\mu$ m (3 mils) over full travel with 5 kg (11 lb.) load
Z gross lift	150 mm (6 in.) manual linear lift with counterbalance
Z gross repeatability	5 $\mu$ m (0.2 mils)
Z focus	Coarse/fine focus uses microscope system

<b>High Stability Bridge/Transport (programmable)</b>	<b>On request</b>
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## > Summit Station Accessories

Microscope / video system

Vibration isolation table

Probe card holders

RF and DC probes, needles and probe cards

RF and DC cables and adapters

RF and DC probe positioners

Calibration software and standards

Vacuum pump, air compressor

## > Summit Upgrade Options

### HTS Enhancements

High Thermal Stability (HTS) enhancements minimize the thermal drift of the probe supporting components. They are made of high temperature stable materials such as Invar. Using HTS enhancements, transition and die soak time can be minimized to optimize the probe station's productivity.

#### Available Items\*

Part Number	Description
151-293	HTS Probe Card Holder, 40 mm, universal
151-337	HTS platen upgrade
	Various HTS single probe arms*

\* See FormFactor's Station Accessory Guide for other available items, such as HTS probe arms and probes tips.

## > Regulatory Compliance

Certification TÜV compliance tested for CE and CB, certified for US and Canada, 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 FormFactor's Terms and Conditions for Sale for more details.

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