Eoulu M1 Probe Station

Novel Features

- The only mass production probe station in the world that can observe wafers in real time, and ensure the stability of probing, with Eoulu’s invention patented
- The only mass production probe station with a Faraday Cage in the world, which enables more stable measurement results, with Eoulu’s invention patented
- The only mass production probe station in the world that can calculate the probe scrub mark in real time and determine the spatial information of probes and probe cards, with Eoulu’s invention patented
- The world's lightest 12-inch probe station, and the main body only weighs 750 kg, so that the site can easily meet the requirement of bearing capacity
- A dynamic map and static map system with Eoulu's copyright and patent makes the probe station faster and more accurate
- Eoulu's patented "Zero Error (C0)" and "Virtual Ruler (VR)" technologies, specially used for uneven wafers

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Product Description

- The world's first digital probe station launched by Eoulu
- The letter M of the M1 probe station's name stands for Mass
- From the wafer to the data, there is little manual work involved. You don’t have to worry about inaccurate probing
- Eoulu's futureC software can be used to enable M1 to be easily and seamlessly integrated with the world's mainstream or custom instruments
- futureC provides mass instrument interfaces and applications, making it easy for M1 to test wafers integrated with instruments
- Eoulu's futureD data system and background monitoring technology can be used to easily trace the data of each chip

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M1 Mechanical Performance

No.	Item	Chuck			
		X-axis	Y-axis	Z-axis	Theta axis
1	Travel	301 mm	501 mm	20 mm	10°
2	Maximum positioning accuracy *	≤ 1 μm	≤ 0.05 μm	≤ 1 μm	± 0.003°
3	Speed **	≥ 50 mm/s	≥ 50 mm/s	≥ 20 mm/s	/
4	Maximum speed	150 mm/s	150 mm/s	35 mm/s	/
5	Wafer roughness adaptability *	100 μm			
6	Average time of mapping ***	Minimum value	Typical value	Maximum value	
		< 500 ms	< 1 s	< 3 s ****	

* When C0 and VR are enabled

** The speed at which M1 chuck moves varies depending on the chuck size chosen by the customer, the chuck construction (Coax or Triax), and whether the chuck supports high and low temperatures

*** This time only refers to the mechanical movement time and does not include alignment time. There will be some variation depending on the size of the DUT, movement precision, and stability requirements

*** High speed and high stability cannot be achieved simultaneously. Eoulu can provide services to optimize test accuracy or test speed according to the customer's wafer and measurement application. For more information, please contact sales for hardware and software upgrade solutions

**** In the case of 12-inch, room temperature, and triax chuck, F1 adopts the highest accuracy and most stable speed mode, 1000 μm * 1000 μm chip movement time

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M1 Shielding Capability

No.	Shielding and Noise Capability *	
1	Light attenuation	≥ 150 dB **
2	EMI shielding	≥ 20 dB 0.5-20 GHz (typical)
3	Spectral noise floor	≤ -150 dBVrms/rtHz (≤ 1 MHz)
4	System AC noise	≤ 15 mVp-p (≤ 1 GHz)

* In addition to the system capability, environmental conditions should also be considered. This project is not verified on the client side, and can be arranged to be verified in Suzhou laboratory of Eoulu; During the verification process, install the shield enclosure when there is no testing machine.

** The test light path refers to the perpendicular incident light from 90° directly above the microscope

** The light shielding wavelength is 200 ~ 2000 nm

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M1 Vibration Isolation Capability (Option)

No.	Vibration Isolation Capability *	
1	Natural frequency (vertical)	2.5 ~ 2.7 Hz
2	Natural frequency (horizontale)	2.0 ~ 4.5 Hz
3	Vertical damping (adjustable)	6% ~ 20%
4	Horizontal damping	5% ~ 6%
5	Air pressure	0.3 ~ 0.5 Mpa
6	Maximum load	1600 kg
7	Isolation efficiency	5% ~ 6%
8	Response time to external excitation	< 1 s
9	Vibration isolation level	VC-C

* Only when the specified damping valve option is selected in the M1 configuration can there be the vibration isolation capability. There are no such parameters for the configurations without the damping valve or the ordinary damping valve. For the vibration isolation table related parameters, please refer to the manufacturer traceability index. This project is not verified on the client side

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M1 Microscope

No.	Front	Real-time observation microscope
1	Number of CCD or CMOS	3
2	Travel	12.5 mm
3	Feature resolution	< 2 μm
4	Maximum speed	5 mm/s
5	Typical magnification *	500 ~ 2000X or higher
6	Typical optical lens resolution **	The physical resolution is 11 μm，imaging calculation is enhanced to 5.5 μm or smaller
7	Imaging calculation	10 Eoulu’ s Copyright Algorithm

No.	Back	Microscope
1	Number of CCD or CMOS	1
2	Travel	The same as chuck
3	Feature resolution	< 2 μm
4	Maximum speed	5 mm/s
5	Typical magnification *	200X or higher
6	Typical optical lens resolution **	4.5 μm
7	Imaging calculation	3 Eoulu’ s Copyright Algorithm

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M1 Microscope

* When the CCD configuration is different, the color and magnification will be different

** When the lens configuration is different, the resolution will be different

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M1 Chuck

No.	Item	12-inch	
1	Temperature range	Room temperature	High and low temperature
2	Maximum operating temperature range *	-	-60 ~ 300°C
3	Typical temperature range **	-	-60 ~ 150°C -60 ~ 200°C -60 ~ 300°C -40 ~ 150°C -40 ~ 200°C -40 ~ 300°C 0 ~ 100°C 0 ~ 200°C Room temperature ~ 150°C Room temperature ~ 200°C Room temperature ~ 300°C

* Users can choose in these temperature ranges according to test requirements

** For other temperature ranges, please contact Eoulu's sales

** The larger the temperature range, the higher the purchase cost. Testing below room temperature requires cooling, and the lower the temperature, the higher the purchase cost

Please select the appropriate temperature range according to the actual test requirements

M1 Chuck

No.	Item	12-inch
4	Temperature accuracy	± 1°C
5	Temperature resolution	0.1°C
6	Triax chuck leakage (non-thermal)	≤ 231 fA
7	Triax chuck noise (non-thermal)	≤ 42 fA
8	Cooling mode	Liquid cool and air cool are optional
9	Typical transition time *** (Liquid cool)	- 60°C → 25°C：23 min 25°C → 300°C：28 min 300°C → 25°C：25 min 25°C → -60°C：37 min
10	Typical transition time *** (Air cool)	- 60°C → 25°C：9 min 25°C → 300°C：25 min 300°C → 25°C：12 min 25°C → -60°C：29 min

*** Measured in 20°C~24°C,40%~50% humidity

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M1 Chuck

No.	Item	12-inch
11	Maximum heating power	5.5 kW
12	Maximum cooling power	12.5 kW
13	Maximum refrigerant flow	5 m/s
14	Maximum transport pressure	4 bar
15	Maximum voltage (high power option) ****	10000 V
16	Maximum current (high power option) ****	800 A

**** High voltage and high current cannot be reached at the same time

**** Higher voltage or higher current need to be customized

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M1 Chuck

No.	Item	12-inch
17	Statement	● It shall be operated and stored strictly in accordance with the temperature and humidity specified in "Environmental conditions" in this Manual. ● Before the probe station leaves the factory, wafers shall be placed on chuck for performance verification and reliability test. Therefore, the scratches on the surface of chuck or the movable plate cannot be completely avoided. The scratches do not affect the use of the probe station and are not considered as a quality problem. ● Before the thermal probe station leaves the factory, heating and cooling test shall be conducted on the thermal system and thermal chuck. Therefore, the baking marks on the surface of the chuck (e.g. chuck color change and water vapor mark) cannot be completely avoided. The baking marks do not affect the use of the equipment and are not considered as a quality problem.
18	Cleaning	● Clean the probe station once a month. Use a soft dust-free cloth to remove the dirt from chuck. If lots of dust and debris are generated during use, the cleaning frequency shall be increased. ● Do not use isopropyl alcohol(IPA) or any other chemicals on the chuck, as improper use of solvents or grinding agents may damage the probe station.
19	Maintenance	● No items can be placed on the chuck except the device under test. ● If the screws are loose, promptly tighten them carefully and evenly according to the torque requirements. If necessary, contact the Eoulu's service team for treatment. ● For the fully-automated probe station, ensure that the power supply has been properly shut down during maintenance or when not in use, and ensure they do not accidentally restart before maintenance is completed or before use.
20	Service	● For probe station with a high utilization rate, it is recommended to conduct operational inspection and service of the chuck once a year. ● The following services can only be executed by Eoulu's team: 1. Leveling and calibration of the chuck X/Y/Z/Theta stage 2. Disassembly and installation of the chuck

M1 Chuck

No.	Item	12-inch
21	Eoulu high performance thermal Chuck	

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M1 Loader

Loader Specifications			
1	Travel	R-axis	630 mm
		θ -axis	340°
		Z-axis	300 mm
2	Average handling speed	R-axis	430 mm/sec
		θ -axis	240°/sec
		Z-axis	180 mm/sec
3	Maximum handling speed	R-axis	640 mm/sec
		θ -axis	340°/sec
		Z-axis	250 mm/sec
4	Resolution	R-axis	within 10 μm
		θ -axis	0.0015°
		Z-axis	2 μm
5	Repetition accuracy		± 0.1 mm
6	End-effector		Bottom supported vacuum adsorption type

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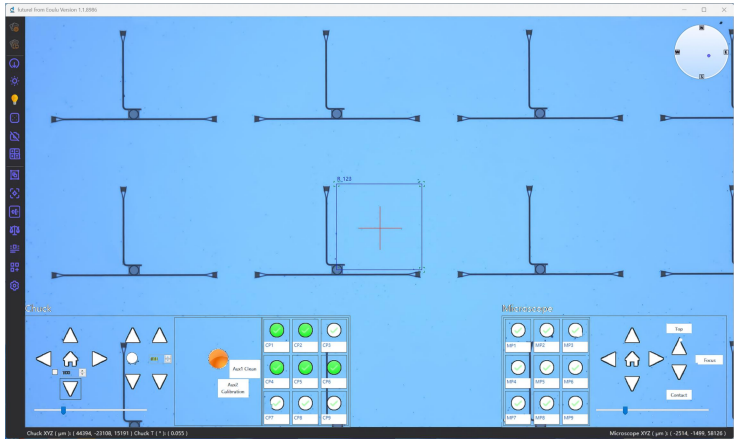
M1 Loader

Calibrator Specifications		
7	Calibration accuracy	Within ± 0.1 mm in the center of the wafer，and within ± 0.1° for the notched of the wafer
8	Calibration time	≤ 3 s
Operating Efficiency Of Wafer Loading And Unloading（Operating Speed 35%）		
9	First Load	79 s
10	UnLoad	58 s
11	Next Load	46 s

M1 Control Software future interface (futurel)

No.	Item	futurel function
1	Single-page operation	Included
2	Autofocus	Included
3	2 Points Align	Included
4	Auto Align	Included
5	AutoZ	Included
6	High speed AutoZ	Optional
7	Twin-rudder operation *	Microscope and chuck movement
8	futurel interface *	

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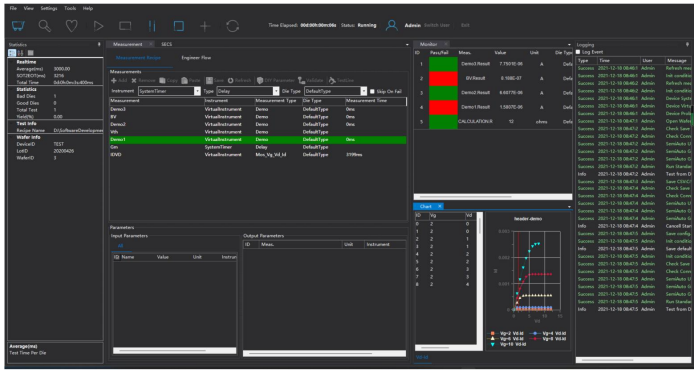
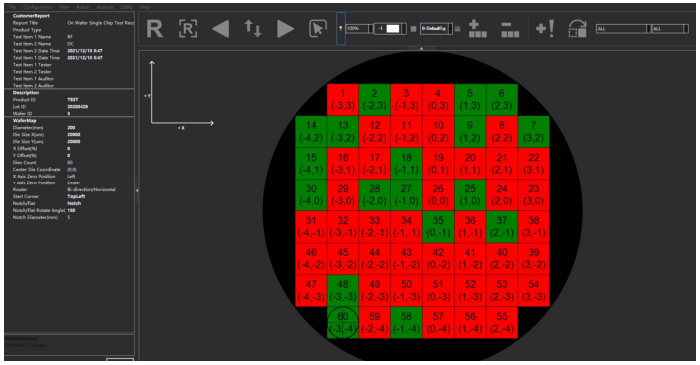
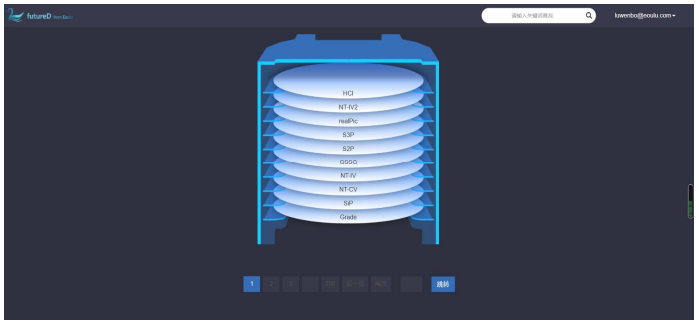
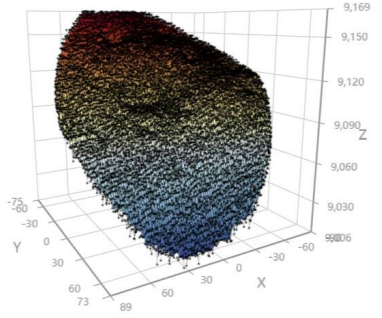
M1 Control Software future interface (futureI)

9	futureI and Eoulu integration software futureC seamless connection makes test easier *		
10	futureI and Eoulu data software futureD seamless connection makes data processing easier *		

* Eoulu copyright

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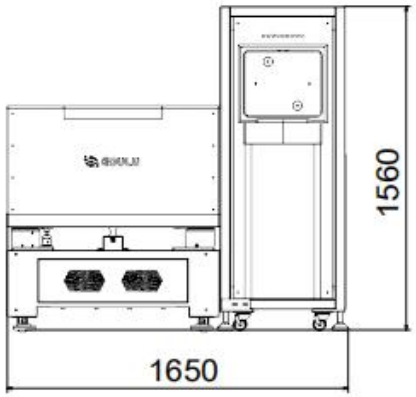
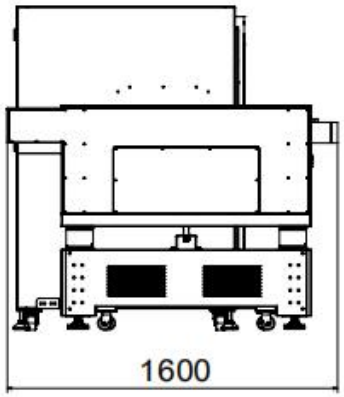
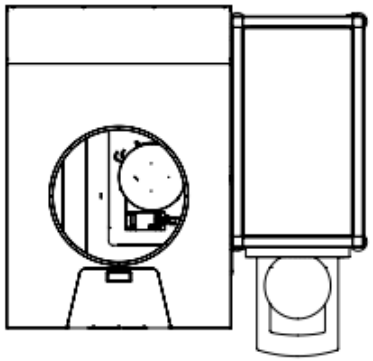
M1 Dimensions and Weight

No.	Item	M1
1	Typical dimensions (W x D x H)	~ 1650 x 1600 x 1560 mm *
2	Main dimensions	  

* These dimensions don’t include the adjustable stands for LCD, mouse and keyboard.

M1 Dimensions and Weight

<table>
<tr><td>3</td><td>External view</td><td colspan="3"> 
</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Weight</td><td>Probe station</td><td>Thermal system（Liquid Cooling）</td><td>Thermal system（Air Cooling）</td></tr>
<tr><td>~ 750 kg</td><td>~ 245 kg</td><td>~ 295 kg</td></tr>
</table>

M1 Facility Planning

1	Environmental conditions	Operating	• Ambient temperature: 17°C ~ 25°C, ± 0.5°C • Relative humidity: 20% ~ 60%
		Storage	• Ambient temperature: 10°C ~ 30°C • Relative humidity: ≤ 50% • Storage time: ≤ 6 months (When the storage time exceeds 6 months, it needs to be powered on for 24 hours)
		Ambient vibration (including floor)	• On the horizontal floor, equivalent uniform live load ≥ 200 kg/㎡ • Maximum level 100 micrometers/sec,rms (ISO Operating Theatre level) * • Laboratory cleanliness: General laboratory (The requirements for the F1 operating and storage environment described in this Manual must be met) • Recommended to be placed in Class-10,000 clean room and above **
2	Power	probe station	• Probe station: single-phase 220 VAC (+7%, -10%) ***, 50/60 Hz, 1800 VA, GB 10A socket • LCD, computer host, and vacuum pump: single-phase 220 VAC (+7%, -10%) ***, 50/60 Hz, 1000 VA, GB 10A socket (3-way, power strip) • Loader: single-phase 220 VAC (+7%, -10%) ***, 50/60 Hz, 1000 VA, GB 10A socket
		Thermal system	• Controller: single-phase 220 VAC (+7%, -10%) ***, 50/60 Hz, GB 10A socket • Chiller (Liquid cool): three-phase 380 VAC (+7%, -7%) ***, 50/60 Hz, GB 32A 5-core aviation socket • Chiller (Air cool): three-phase 380 VAC (+7%, -7%) ***, 50/60 Hz, GB 32A 5-core aviation socket

* Refer to Gen*eric vibration criteria for vibration-sensitive equipment*

** Refer to the international standard ISO 14644-1

**** According to the requirements of the national standard GB/T 156-2007

M1 Facility Planning

3	Clean Dry Air ****** (CDA)	Room-temperature probe station	• Air pressure: 4.5 ~ 8 bar (65 ~ 116 psi) • Dew point: ≤ -20°C • Connector *****: Semi-automated: 8 mm OD (CDA 1) Fully-automated: 8 mm OD (CDA 1) and 8 mm OD (CDA 2)
		High and low-temperature probe station	Testing at low and high temperatures, the following conditions must be met to keep Chuck frost-free: • Air pressure: 4.5 ~ 8 bar (65 ~ 116 psi) • Continuous flow: Liquid cool: ≥ 100 l/min @ 4.5 bar Air cool: ≥ 400 l/min @ 4.5 bar • Dew point: ≤ -70°C (when the lowest test temperature is -60°C) • Oil less than 0.01 mg/m³ **** • Connector *****: Semi-automated: 8 mm OD (CDA 1) Fully-automated: 8 mm OD (CDA 1) and 8 mm OD (CDA 2)
4	Vacuum ******	Air pressure (absolute vacuum)	≤ 0.4 bar @ 10 l/min
		Air pressure (relative vacuum)	≤ - 0.6 bar @ 10 l/min
		Continuous flow	≥ 10 l/min
		Connector *****	• Semi-automated: 8 mm OD (VAC 1) • Fully-automated: 8 mm OD (VAC 1) and 8 mm OD (VAC 2)

M1 Facility Planning

5	Accessories	Air compressor	**Temperature range (liquid cool)**	**Part Number**
			Room temperature	I-001
			-60 ~ 150°C	I-002
			-60 ~ 200°C	
			-60 ~ 300°C	
			-40 ~ 150°C	
			-40 ~ 200°C	
			-40 ~ 300°C	
			0 ~ 100°C	
			0 ~ 200°C	
			Room temperature ~ 150°C	
			Room temperature ~ 200°C	
			Room temperature ~ 300°C	
		Vacuum pump	-	K-001

***** According to the requirements of the international standard ISO 8573-1

**** Refer to the international standard ISO 14743:2020

***** For the positions of interfaces CDA 1, CDA 2, VAC 1 and VAC 2, see the following CDA and VAC Connectors diagram

***** Measured in laboratory at Standard Ambient Temperature And Pressure (SATP). For more information on CDA pressure and flow, please consult Eoulu

M1 Service Center *

Service category	Service content	Part Number
Hardware service (Installation)	• System installation (mass production mode)	SRV-301
	• System installation (analysis mode)	SRV-501
	• Accessory installation	SRV-305
	• System reinstallation	SRV-306
	• Instrument connection	SRV-307
	• Ground connection	SRV-308
Hardware service (Calibration)	• Accuracy calibration	SRV-503
	• Temperature calibration	SRV-505
	• Loader calibration	SRV-506
Hardware service (Training)	• Probe station operation (mass production mode)	SRV-303
	• Probe station operation (analysis mode)	SRV-502
	• RF calibration	SRV-202
	• Instrument operation	SRV-203
Hardware service (Others)	• Probe station PM	PM-F1
	• Probe station relocation	RELO-F1
	• Accompanying service	SRV-201

M1 Service Center *

Service category	Service content	Part Number
Software service (Installation)	• On-site installation	SRV-101
	• Remote installation	SRV-103
Software service (Update)	• Platform function	SRV-607
	• Platform version	SRV-606
	• Test script	SRV-608
	• Instrument driver	SRV-609
	• Plug-in update	SRV-701
Software service (Training)	• Software operation	SRV-605
	• Driver development	SRV-603
	• Script development	SRV-702
Software service (Others)	• Operation consultation	SRV-706
	• Troubleshooting	SRV-703
	• Accompanying service	SRV-705

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M1 Service Center *

Service category	Service content	Part Number
Application service	• IV test	SRV-707
	• CV test	SRV-708
	• RF test	SRV-709
	• SiPh test	SRV-801
	• Blue tape test	SRV-802
	• Fixture test	SRV-803
	• MMIC test	SRV-805
	• Automatic test	SRV-806

Service category	Service content	Part Number
Delivery service	• Urgent service	SRV-807
	• Insurance	SRV-808
	• Unloading	SRV-809
	• Exclusive vehicle	SRV-901
	• Storing	SRV-902
	• Upstairs delivery	SRV-903
	• Cleanup	SRV-905

* For details of service quotation, please contact Eoulu's sales.

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