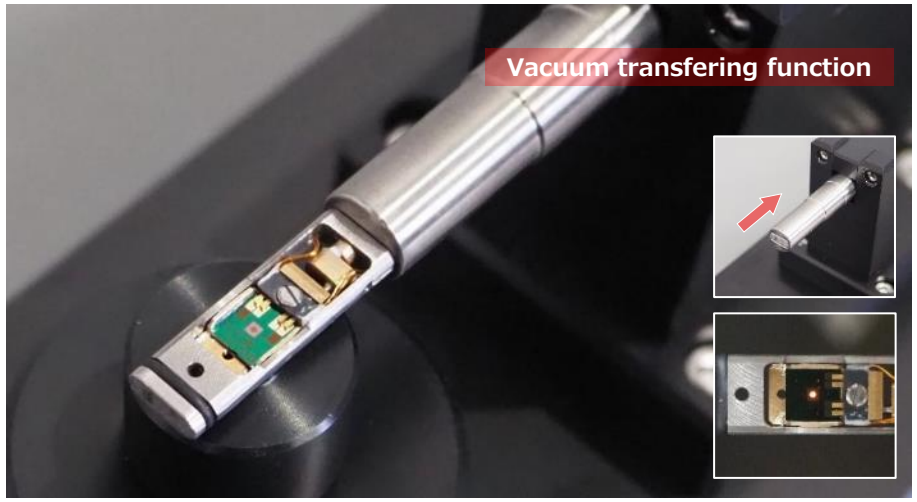
Application Notes

Double Tilt Electronic Transfer Holder

Double Tilt Electronic Transfer Holder

Holder design



Basic Item(Recommended package) *Additional options are available

Tilt /MEMS Chip control unit

・Controller *Biasing or(and) Heating
・Software
・MEMS Chip *See note

Safety Operation Stand

Easy and safety sample mounting in glove box

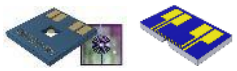
Torque Driver

Manages the torque of screw fixing.
Type:10mN

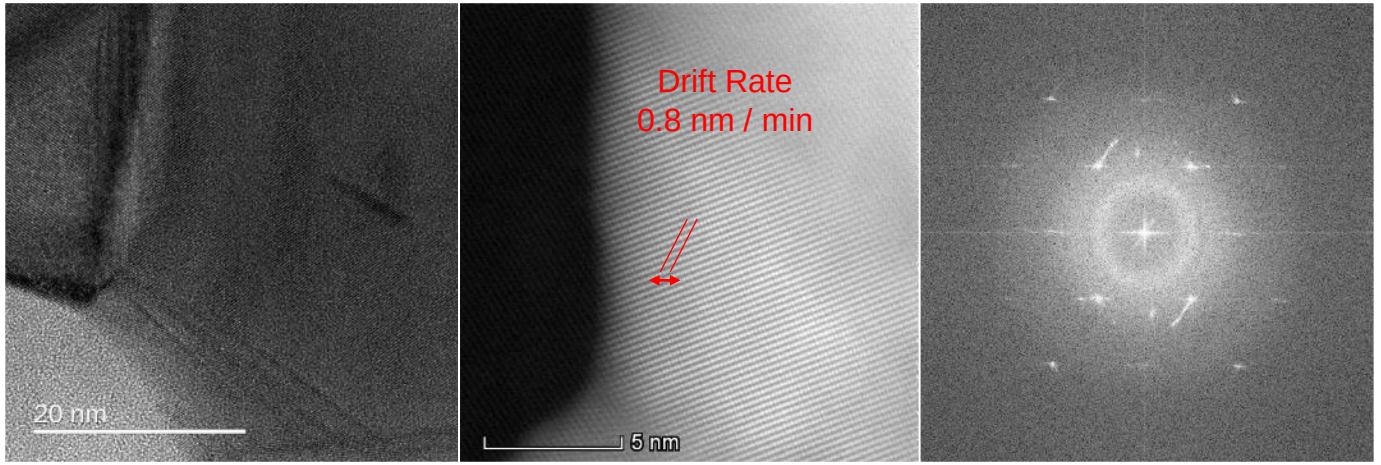
Specification

● **Mechanism**	:	**DT / Biasing / Heating / Vacuum Transfer**
● **Electrode**	:	4 Electrodes
● **Temp.range**	:	+30℃ ~ + 1100℃
● **Resolution**	:	Less than 0.24nm (Guarantee spec.)
● **Tilt**	:	X:± 20 degree Y:± 12 degree @ ST PP
●**Transfer**	:	Ultimate vacuum inside the storage <1X10-3Pa

*NOTE
MEMS Chip price is quoted on a case-by-case basis.
(Not included MEMS Chip cost)



Sample: Ag Temp.+800℃ / Drift rate : 1nm/min / HR image



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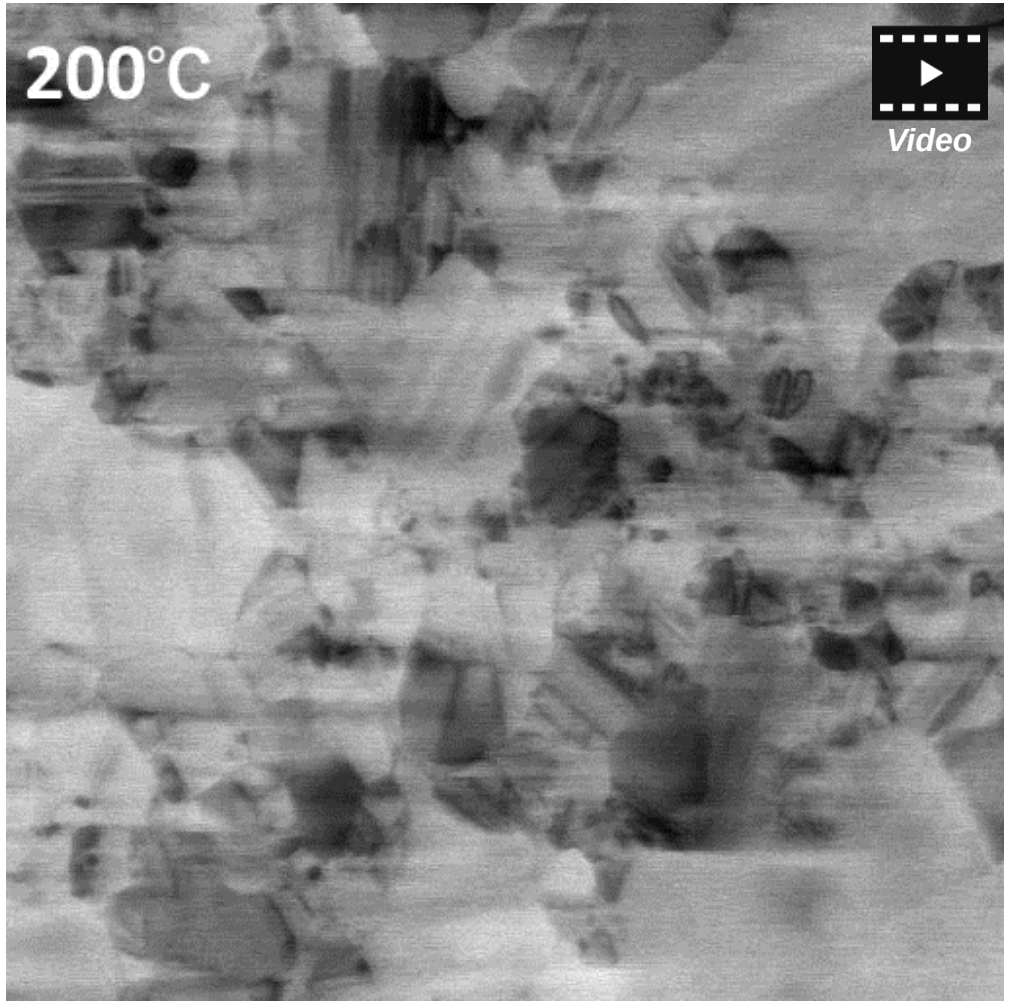
Test Results with Titan at Kyushu Univercity-1



Test summary

●**Sample**	:	$SrTiO_3$
●**Equipment**	:	Titan
●**Temp.range**	:	+ 200℃ ~ +800℃

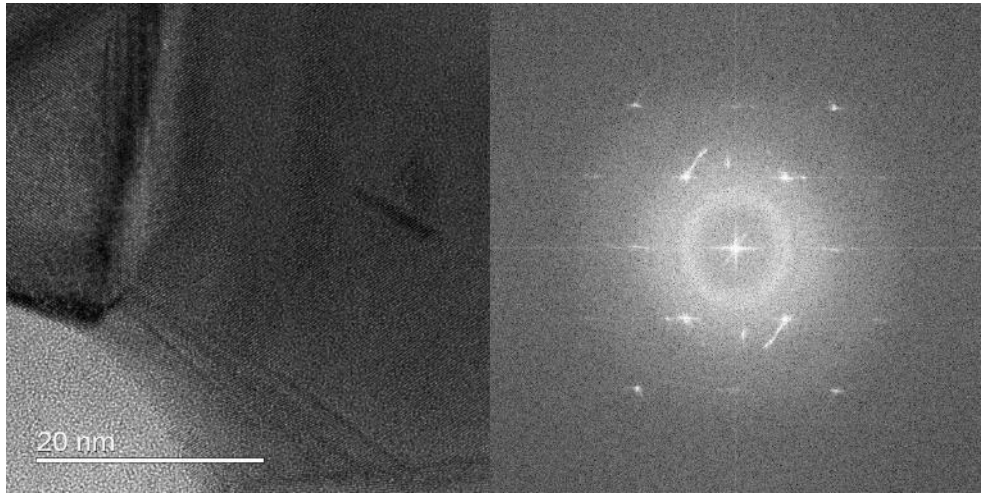
Provision of data

Assistant professor Saito
Kyushu University.

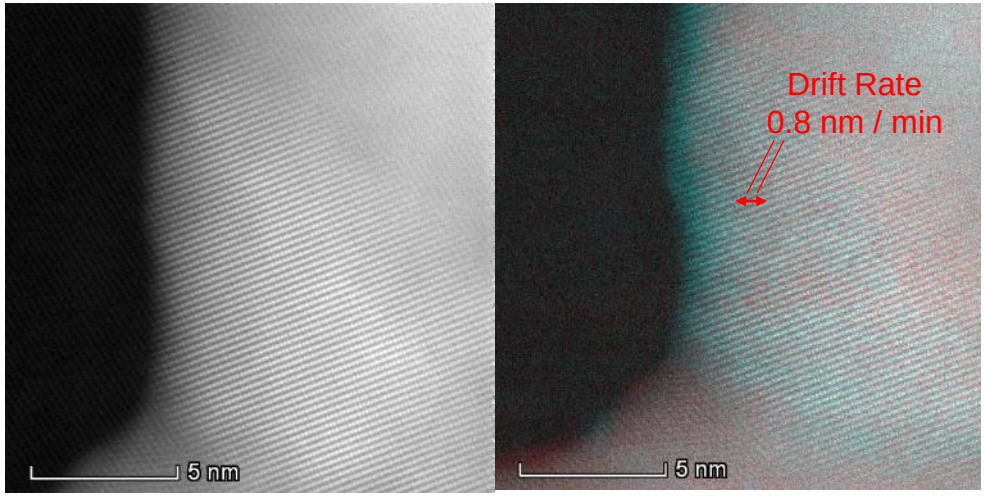
Test Results with Titan at Kyushu Univercity-2

We got to obtain clean data from the observation at +800℃

TEM



STEM



Test summary

●**Sample**	:	$SrTiO_3$
●**Equipment**	:	Titan
●**Start time**	:	After reached +800 ℃

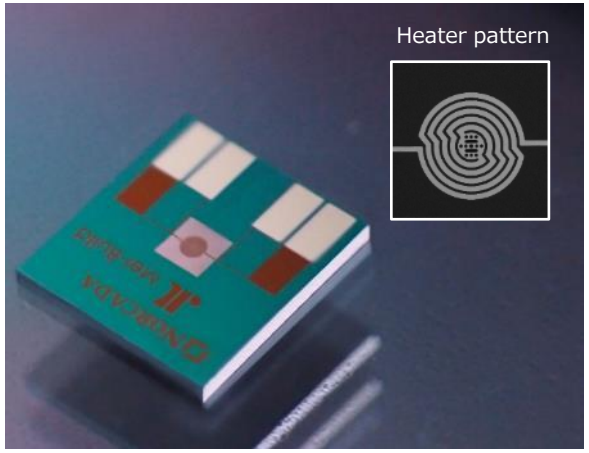
Provision of data

Assistant professor Saito
Kyushu University.

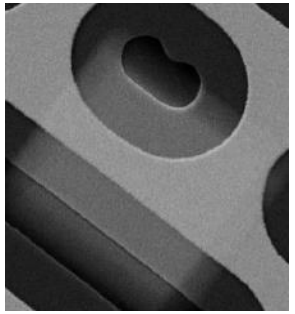
Patterns of Chip design

The cartridge can be selected according to the application.

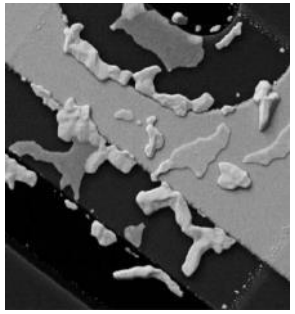
Heating Chip +1100℃



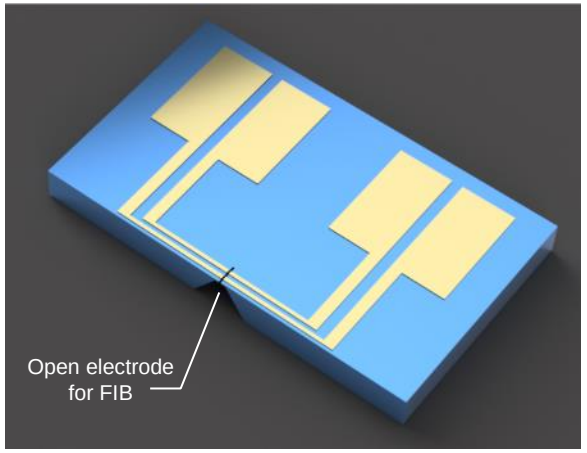
RT



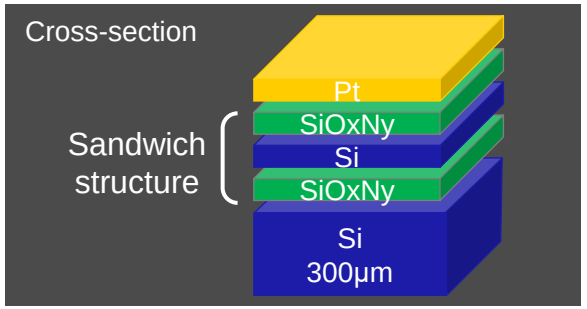
＋900℃



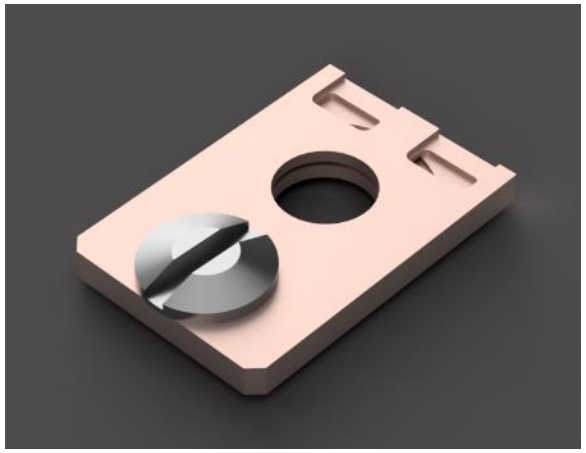
FIB Biasing Chip 4 Leads



Electrode on Gap type



Φ3mm grid adapter



Included items

Note: Original chip development is also possible.

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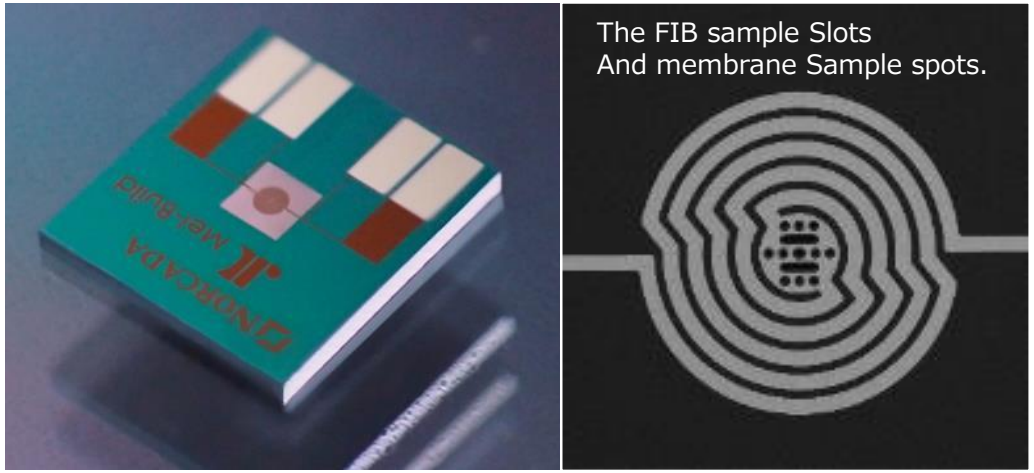
Heating chip configuration image

Basic design



Specification

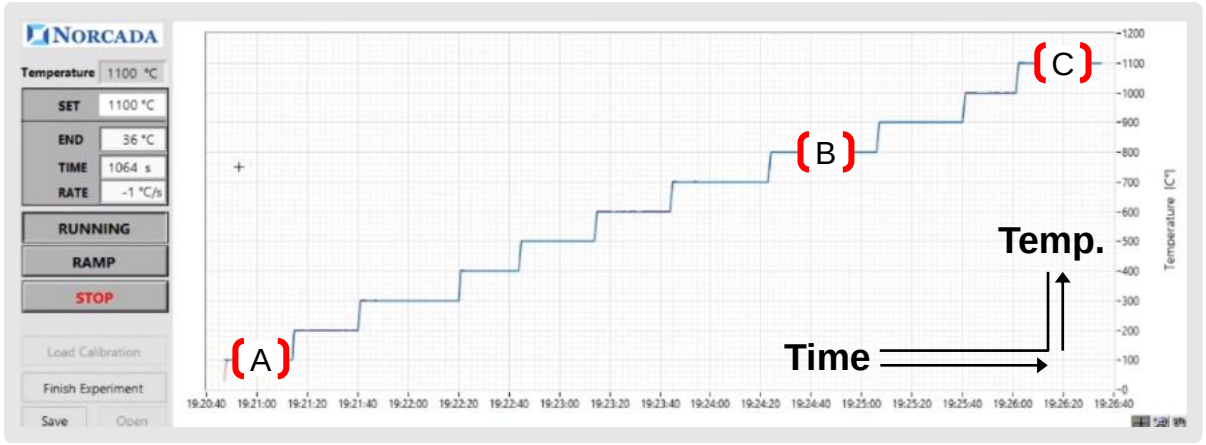
● **Temp.range**	:	+30℃ ~ + 1100℃
● **Resolution**	:	Less than 0.14 nm (at +800℃)
●**Rate**	:	Heating and Cooling rate of 1000℃ in < 1 Sec

Benefits

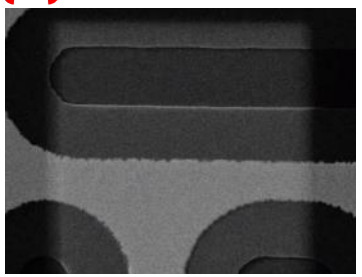
- Tested up to 1100℃ with excellent temperature uniformity.
- **2** Dedicated (1.Ultrathin and location tagged sample membranes.
  2. Location tagged sample slots for FIB samples.)
- Heaters can last for hours inside the TEM.

Screen in the software

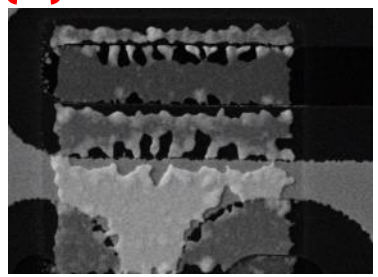
(Temperature readings and control feedback.)



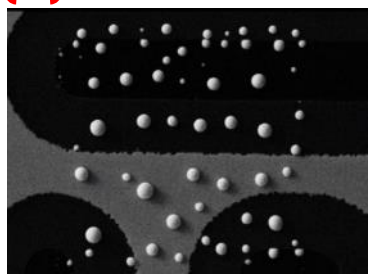
(A) **:RT**



(B) **:+800℃**



(C) **:+1100℃**



Test summary

●**Sample**	:	Gold firm
●**Mg**	:	3.01 KX
●**WD**	:	6.7 mm
●**EHT**	:	20.00kV

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Heating chip Software

Easy to use calibration software

Connect the dedicated kit to the holder and perform the heating compensation on the software.
Accurate heating temperatures can be achieved and measured based on dedicated calibration algorithms provided for chips

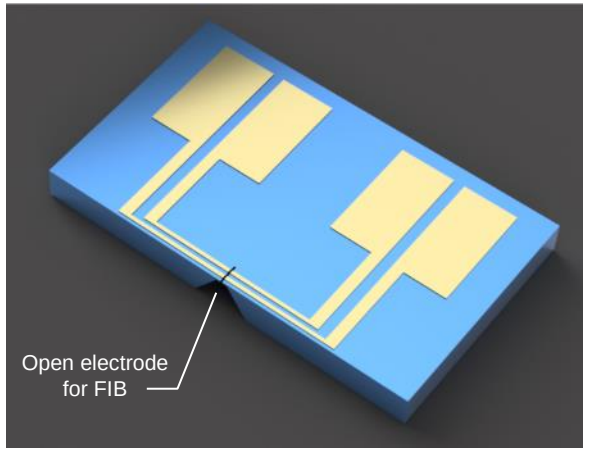
Point 1.
Simple operation input

Point 2.
Controllable between
30℃ and 1100℃

Point 3.
Heating and Cooling rate
of 1000℃ in < 1 Sec.

FIB Biasing chip configuration image

Basic design



Specification

● **Frame**	・**Material:** Silicon, High Resistivity ・Semiconductor-grade Noise Reduction Dielectrics
● **Sample Gap**	・Two chip configurations ・Gap on Membrane allow more precise sample sizes than Gap on Chip ・Size: 10μmx100μm
● **Electrode**	・2 Probe and 4 Probe Layout ・10μm Electrode Gap ・Platinum Standard Electrode Material

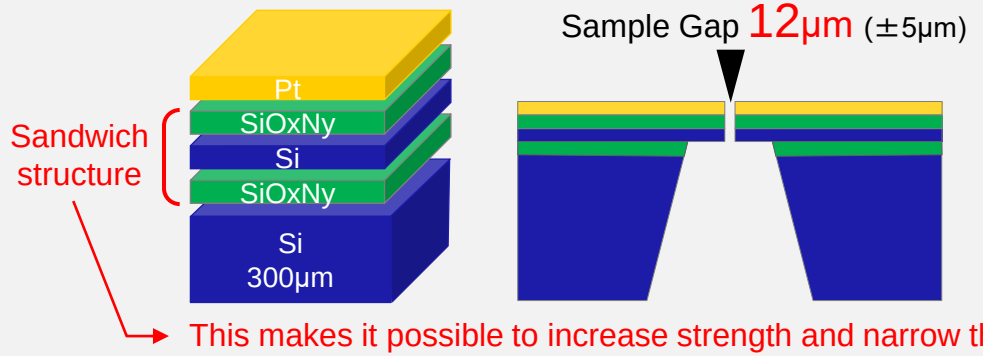
Benefits

- This design can be changed to fit into our holder. The electrode material can be Au, Pd, Pt, Al, Nb, etc.
- MEMS devices are designed and fabricated with noise and capacitance management features
- Superior measurement quality and SNR, in both AC and DC modes. *See the next page.

Electrode on Gap series

Mel-Build's solution

-Gap on Membrane-



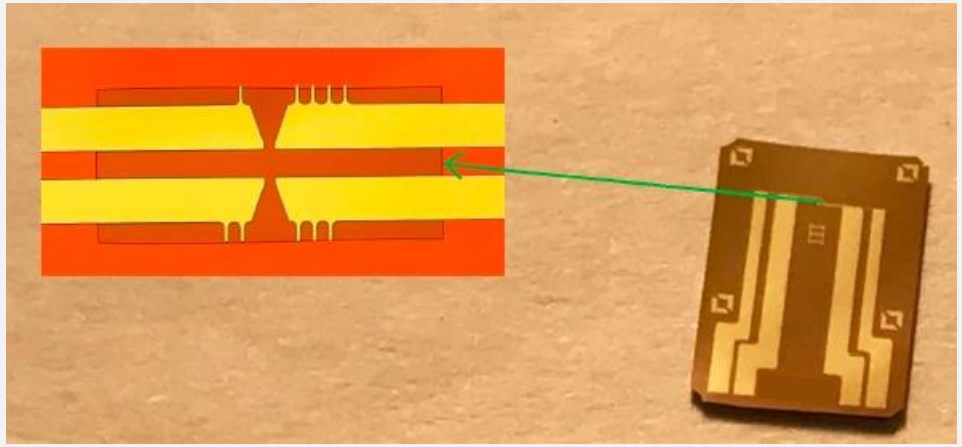
General type

-Gap on Chip-

Suitable for some specific applications.

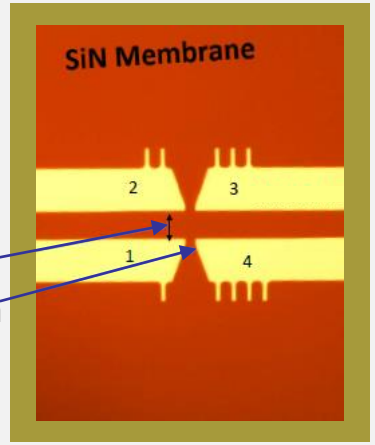
FIB Biasing chip in AC Configuaration

Actual Device without Gold bridge-1



Measured:～18um

Measured:5um～7um



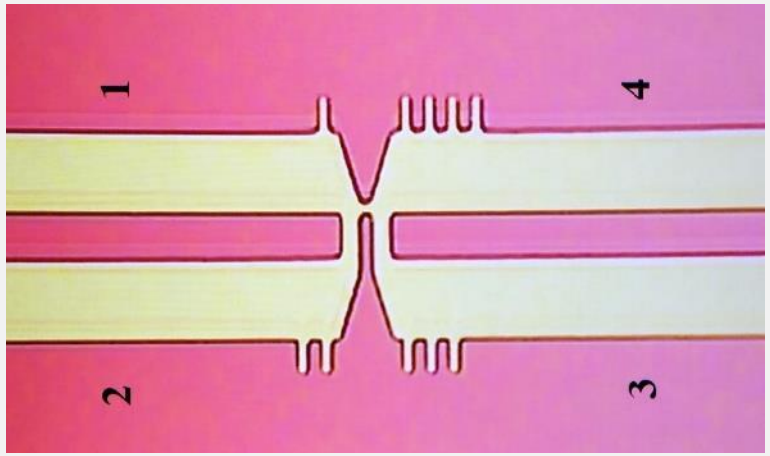
・E-Biasing SiNx Membrane

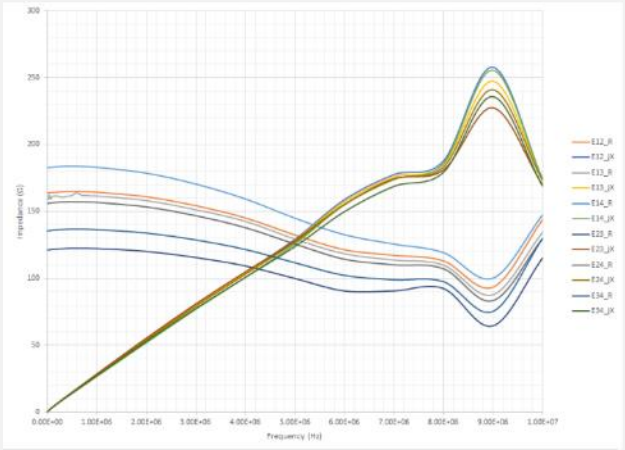
・Membrane:0.20mmx0.25mm, 100nm thick

・Frame:5mm x 5mm,200μm thick Slicon

・Electrode:50nm thick Cr/Au, 4 probes,Type1

Actual Device without Gold bridge-2





*NOTE

・ Impedance is represented as a complex number(R+jX). The real part (R) is called resistance. The imaginary part (X) is called reactance.

・Each device has 4 ports. This means a total of 6 measurements can be performed(1-2,1-3,1-4). However, due to near symmetrical design of the electrode, the measured impedance values are similar.

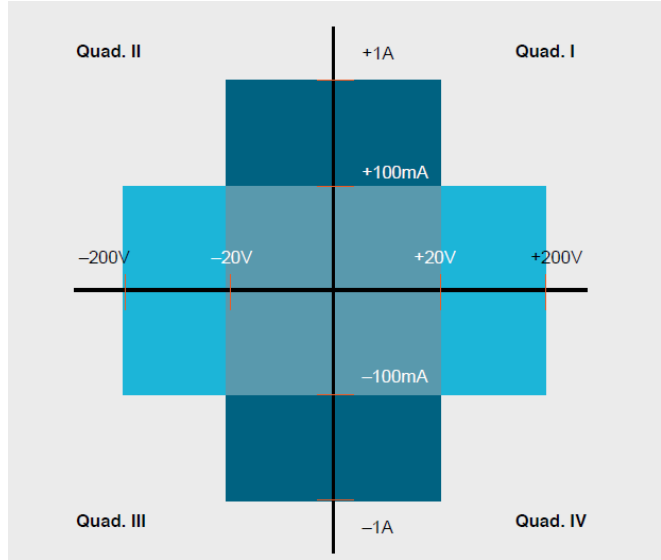
・100mV drive voltage and 1kHz-10MHz frequency range. 100mV drive voltage with the full frequency range were used to perform the measurements.

Precision Biasing Controller-1

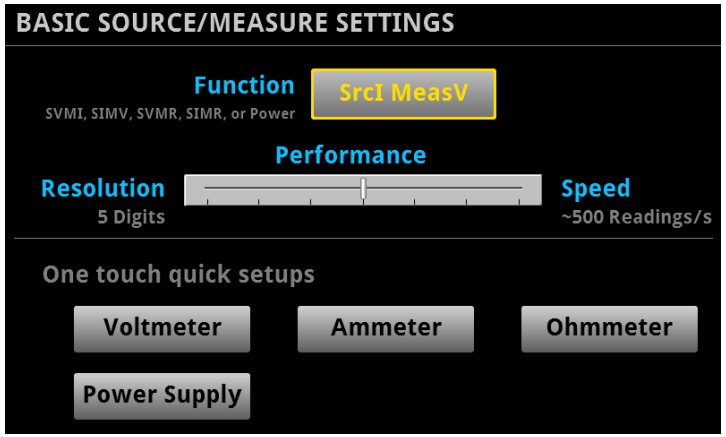
Controller design

Fourth-Generation, All-in-One SMU Instrument

Fourth-Generation, All-in-One SMU Instrument



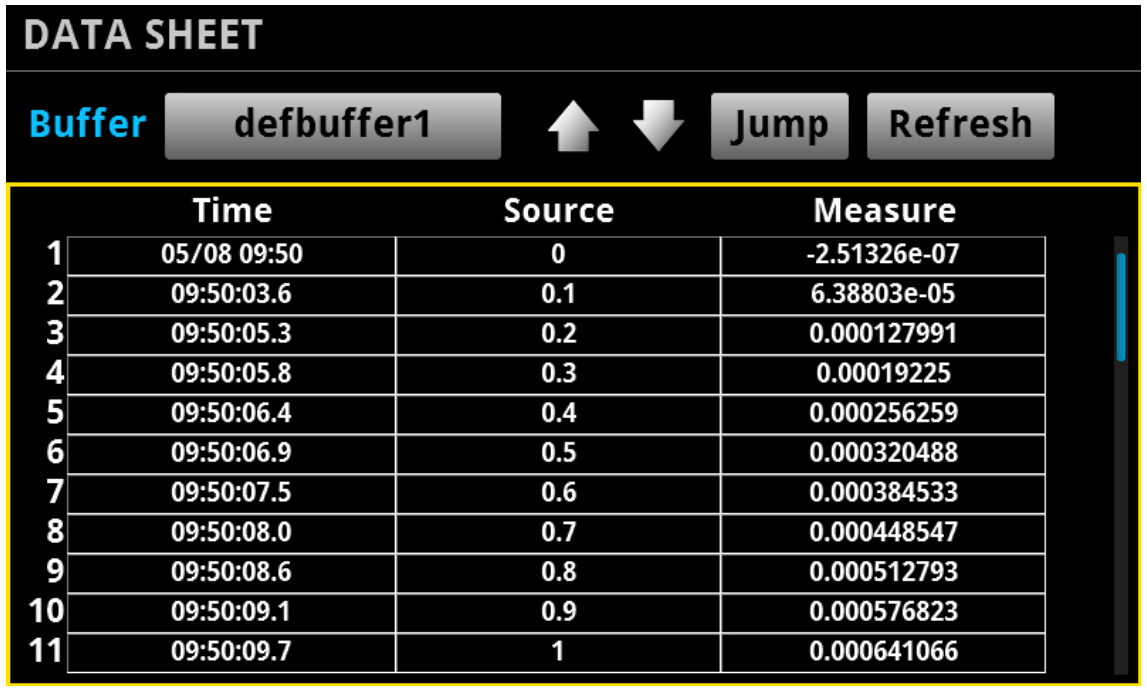
- Capabilities of analyzers, curve tracers, and I-V systems
- Five-inch, high resolution capacitive touchscreen GUI
- 0.012% basic measure accuracy with 6.-digit resolution
- Enhanced sensitivity with new 20mV and 10nA source/measure ranges
- Source and sink (four-quadrant) operation
- Four “Quickset” modes for fast setup and measurements



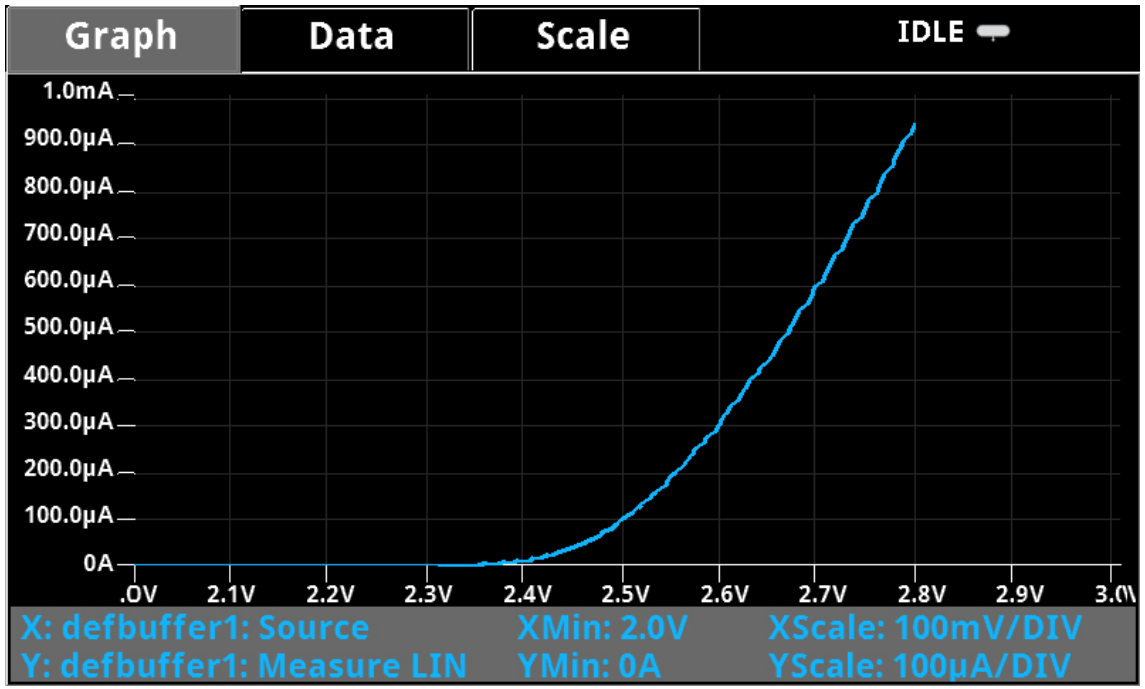
Four “Quickset” modes simplify user setup. With one touch, the instrument can be quickly configured for various operating modes without the need to configure the instrument indirectly for this operation.

Convert Raw Data to Information

The 2450 provides a full plotting and sheet view to display sweeps, measurement data, and charting right on the screen. It also supports exporting to a spreadsheet for further analysis, dramatically improving productivity for research, bench-top testing, device qualification, and debugging.



	Time	Source	Measure
1	05/08 09:50	0	-2.51326e-07
2	09:50:03.6	0.1	6.38803e-05
3	09:50:05.3	0.2	0.000127991
4	09:50:05.8	0.3	0.00019225
5	09:50:06.4	0.4	0.000256259
6	09:50:06.9	0.5	0.000320488
7	09:50:07.5	0.6	0.000384533
8	09:50:08.0	0.7	0.000448547
9	09:50:08.6	0.8	0.000512793
10	09:50:09.1	0.9	0.000576823
11	09:50:09.7	1	0.000641066



Tilt controller

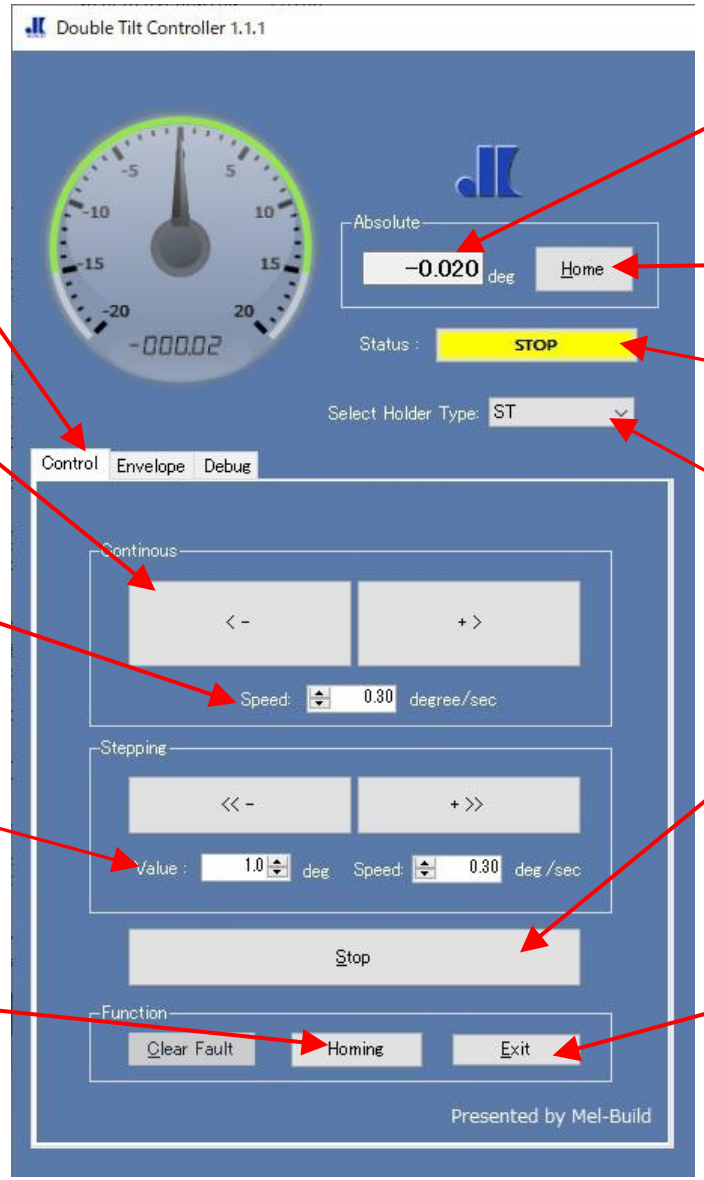
Mode Tab:
Move to various Mode screen.

Continuous:
Tilting while the button is pressed.

Speed adjustable:
0.01 degree / sec minimum
Max3degree/sec

Steeping:
Tilt the Y axis at the set degree,
Operates by stepping to any angle.
Determine the tilt angle and speed
you want to move and operate.

Homing:
The zero point adjustment on
the Y axis is executed.



Absolute:
Absolute position indication
Y-axis tilt angle is displayed.

Home:
Return the angle to zero degree.

Status:
Displays the current operating status.

Holder Type:
Choose the holder type.
FEI user choice to ST.
JEOL User choice to your PP type.

Stop:
The zero point adjustment on the Y axis is executed.

Exit :
Quit the software.

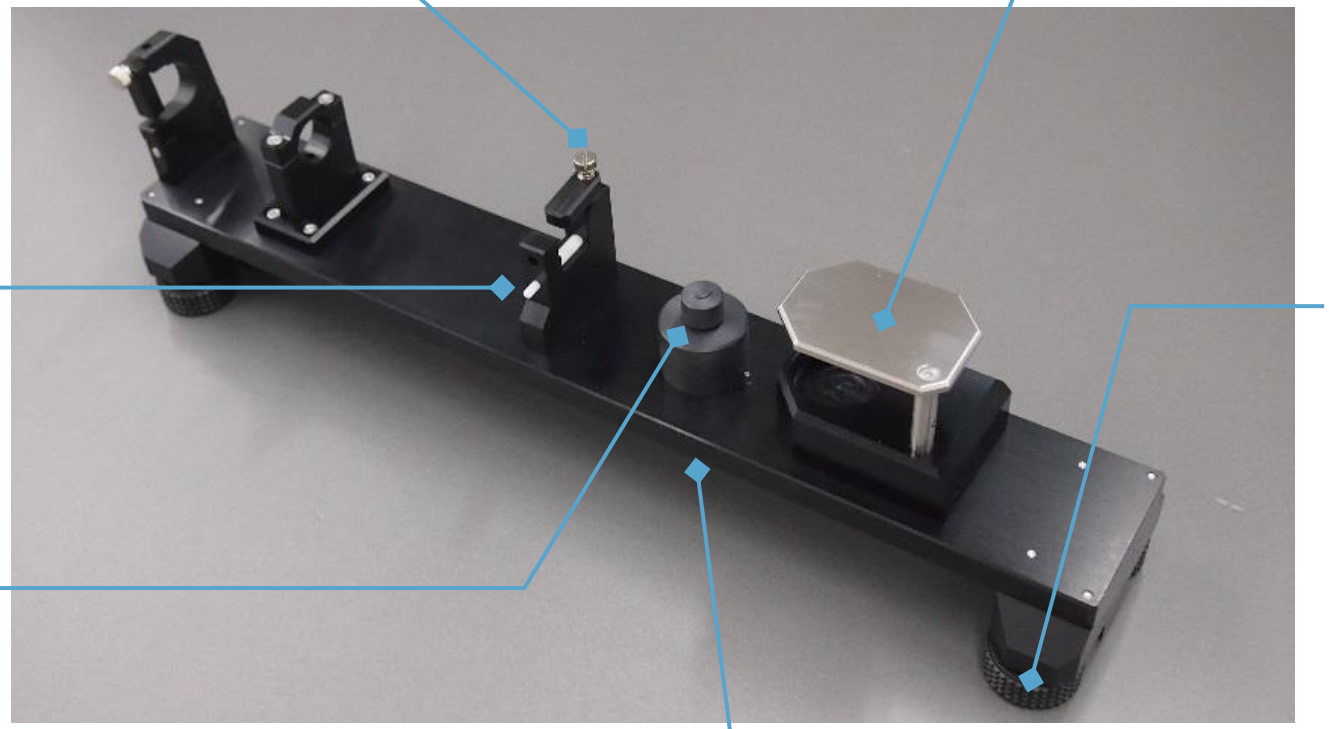
Safety Operation Stand

Working inside the glove box is very difficult,
A stable workbench is required when setting the sample

Holder holding plate：
Since you firmly clamp the holder, you can work safely until the work is completed.

Release button：
You can easily remove the holder from the pedestal with the release button

Mini jack：
We hold the specimen pedestal from below, weak strength, so you can fix the specimen safely. (Fitting sample holder ring from above, necessary for this proposal)



Palm rest：
You can rotate 360 ° , you can rotate it to your favorite position, when handling the sample when installing the sample.
Since the hand is fixed, you can attach the sample in a stable condition.

Height adjustment leg：
Since the height can be independently adjusted in 4 places, it can be adjusted so that stable work can be performed even with a slight distortion and inclination.

Bridge structure：
Since it has a bridge structure, it can work directly under an optical microscope. (Some lights can not be used)