

ADSP-HV80 +

Electron Gun High Voltage Power (HV UNIT)
For HITACHI CD-SEM S-88XX/S-92XX/S-93XX series tools

Specifications and Manual



OVERVIEW

High-precision, high-stability high-voltage power supply for driving electron gun, used to directly replace the dedicated high-voltage power supply used in HITACHI CD-SEM tools, such as part No. 567-5101, 560-6590, 569-6592.

APPLICATIONS

HITACHI CD-SEM S-8000/S-9000 series tools, including S-8820, S-8840, S-9220, S-9260, S-9300, S-9380.

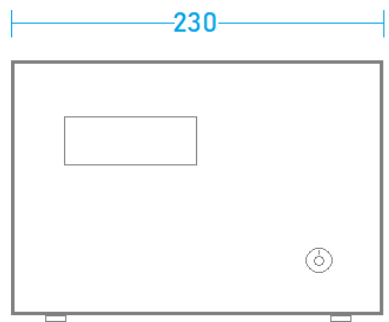
KEY FEATURES & HIGHLIGHTS

- ADSP-HV80+ power supply is a high-precision, high-stability, low-temperature drift, multi-channel high-voltage output, and a high-voltage power supply with filament heating driver specially designed for the drive of HITACHI CD-SEM scanning electron microscope electron gun.
- The ADSP-HV80+ power supply has the same power input interface, LINK interface, serial communication interface and communication protocol, high-voltage output interface, high-voltage cable and high-voltage plug as the original HVPS. It can be directly used to replace all models of HITACHI's original CD-SEM dedicated HVPS without any modification.
- We use a new design concept and adopt a new generation of high-precision, compact modular high-voltage unit, which makes the ADSP-HV80 high-voltage power supply reduced by a quarter of the volume and half of the weight compared to Hitachi's original HVPS. The power consumption and heat generation of this unit have been drastically reduced by about 40%.
- More importantly, we designed the new HVPS with a wider high-voltage output range, and built-in a variety of HITACHI original HVPS models of V1/V2 characteristic curve library, the user only needs to set one parameter to change The high-voltage output value range and characteristics of the HVPS, then it can be applied to all different types of HITACHI CD-SEM machines, such as S-8820, S-8840, S-9220, S-9260, S-9300, S-9380 .

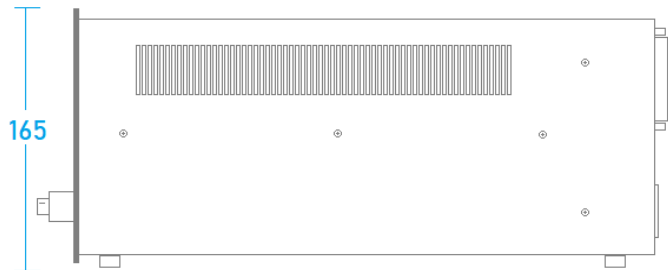
SPECIFICATIONS

Model	ADSP-HV80+
Input Voltage (Current)	AC85-265V, 1Φ, 50/60Hz (100V@0.44A/ 220V@0.22A)
Power Input Interface	Three-pin receptacle, same as the original supply. For S92XX and S93XX: 10SL-3P/ For S88XX: 20M-3E
High Voltage Outputs	V0: 0- -3KV, 1000μA Max V1: 0- +3KV, 1000μA Max V2: 0- +6KV, 670μA Max Vs: 0- -4KV, 1000μA Max
HV Outputs Accuracy	After warm-up, $\pm 0.02\%$ of settings
HV Outputs Ripple	<math>< 30\text{MV}</math> (p-p)
HV Outputs Temperature Coefficient	<math>< 0.01\%/^{\circ}\text{C}</math>
HV Outputs Protection	Overload and short circuit protected
Filament drive output	DC 0-3A, Constant current Mode
Accuracy of Filament Current	After warm-up, $\pm 0.2\%$ of settings
Communication Interface	Optical isolation serial RS232, DB25F
Communication Protocol	HITACHI CD-SEM customized, compatible with Hitachi S-88XX/S-92XX/S-93XX series models of CD-SEM tools
Display	V0,V1,V2,VS,IF,Ie values IP RANGE,IP CONTROL Instruction execution status Key locked Outputs start and stop Ie and If over current, vacuum error The setting corresponds to the model information of HITACHI CD-SEM tools Filament heating time accumulation (hours)
Protections	If over current more than 3A Ie over current more than 511μA Vacuum error
Supported HITACHI CD-SEM tools	S-8820/8840/9220/9260/9300/9380, The power supply has built-in V1/V2 voltage characteristic curve data corresponding to the CD-SEM model.
High Voltage Output Cable	2.2m shielded high-voltage cable, 5-core high-voltage and separate ground wire, with PVC sheath
High Voltage Output Plug	Customized, consistent with the original HITACHI, 6-hole eccentric shielded plug, directly plugged into the CD-SEM tools' electron-gun receptacle
Weight (Excluding HV cable)	7.4 kg
High Voltage Cable Weight	1.8 kg
Dimensions	D X W X H (mm) : 435X230X165

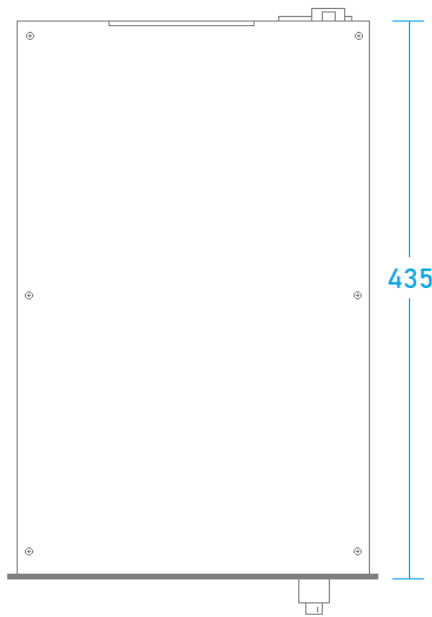
DIMENSIONS



FRONT VIEW



SIDE VIEW



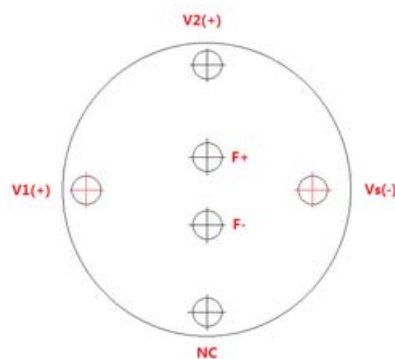
TOP VIEW

HIGH VOLTAGE OUTPUT CABLE & PLUG

HV cable and plug assembly for high voltage power supply used in HITACHI CDSEM tools, can be used for all HITACHI CD-SEM S-8820, S-8840, S-9220, S-9260, S9300, S-9380 series tools.

- This is our newly developed special high-voltage cable, which uses a new generation of silicone dielectric shielded high-voltage cable.
- Very flexible 10kVDC shielded high voltage cable for high voltage applications at high temperatures up to 180°C, made in Germany.
- The construction is based on a silver plated fine stranded conductor, Silicone dielectric, silver plated fine stranded shield braid and a Silicone jacket.
- Conductor Resistance @ 20°C : $\leq 40\Omega/\text{km}$
- A high-voltage plug with the same size as the original HITACHI's, as well as same vacuum interlock (link) connector.
- The outer layer has a second shielding layer.

High-voltage output plug, and the definition of the functions of each electrode as followings:



HIGH VOLTAGE OUTPUT CABLE



INTERNAL HV MODULS

The power supply is internally equipped with a high-precision and high-stability high-voltage module, made in Germany.

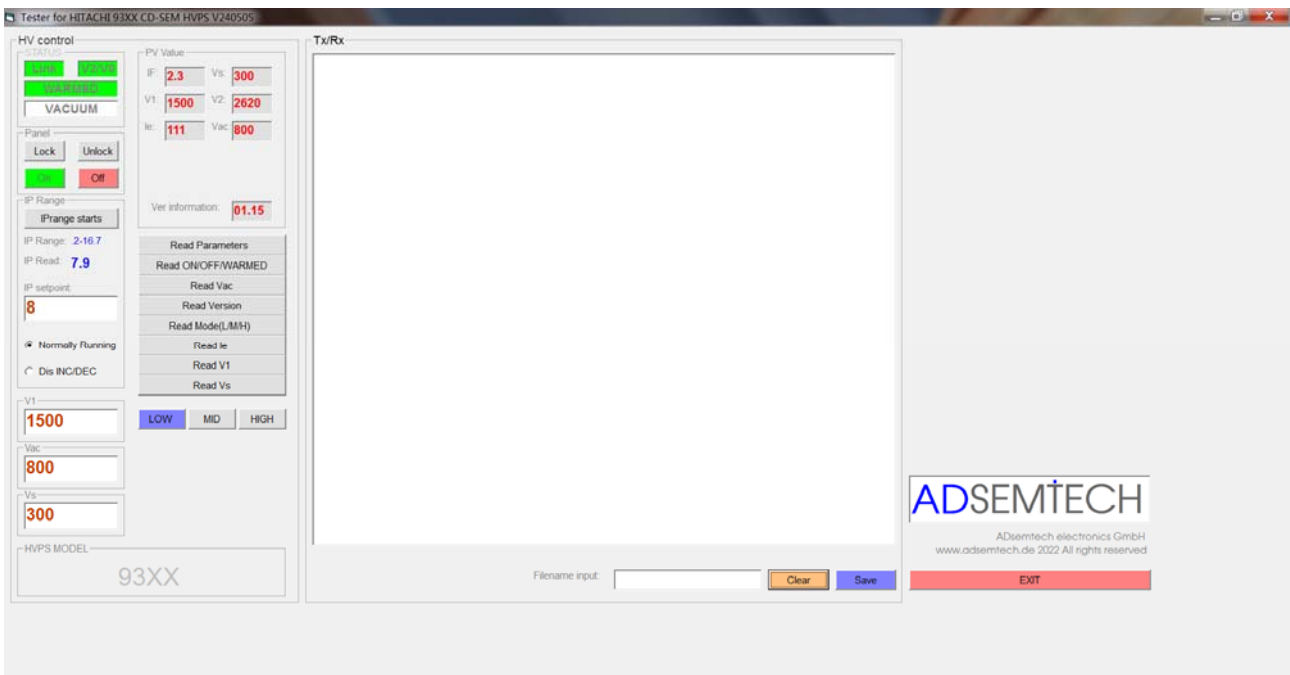


FULL-FEATURED TEST PLATFORM

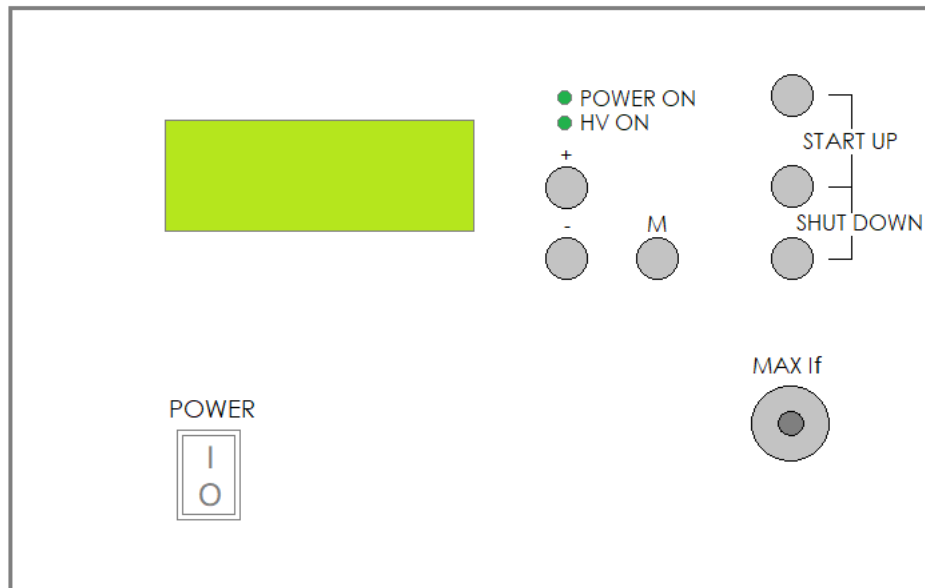
We have developed a dedicated test platform for fully functional and accurate testing of HITACHI CD-SEM electron gun high voltage power (HV UNIT).

The test platform can be used for Off-line testing of HV Unit used on the following tools models: S-8820, S-8840, S-9220, S-9260, S-9300, S-9380, CG4000.

It can output a full set of instructions, even commands such as very complex IP current range search, automatic IP current control, etc.



Display, Switch, Leds, Buttons, Knob on the front panel



The switch, buttons, leds, and knob on the front control panel of the ADSP-HV80+ high-voltage power supply are configured and functioned as follows:

POWER Switch: To turn on and turn off the power of supply.

POWER ON Led: Lights up to indicate that the power of the high-voltage power supply has been turned on.

HV ON Led: Lighting indicates that the high-voltage power supply has started the high-voltage and filament drive output of each circuit.

+ Button: The selected value is increased when press down.

- Button: To reduce selected values.

M button: To select function menu.

START UP button: Two buttons are active, and the high-voltage and filament drive output of each circuit of the high-voltage power supply can be activated through the panel.

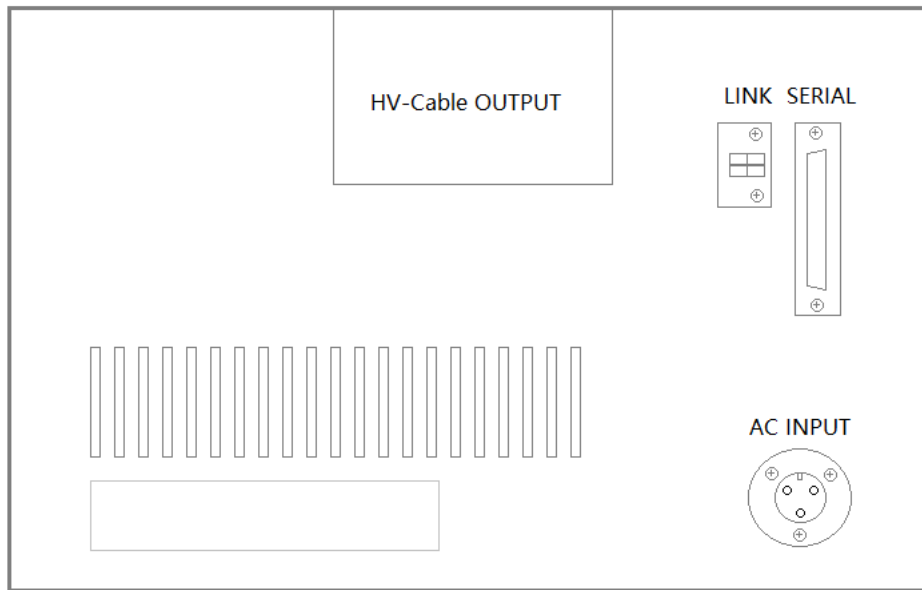
SHUT DOWN button: The two buttons are active, and the high-voltage and filament drive output of each circuit of the high-voltage power supply are stopped through the panel.

MAX If Potentiometer: The maximum value used to adjust the heating current of the If filament, which is also limited by the value of the current set by If. Note that when the power is turned on, the default maximum If current is 2.50A, which means that the MAX If potentiometer can be set to a maximum current of 2.5A and a minimum value of 0.00A, unless the user resets the If current value with "+" or "-" buttons.

The knob has a locking device to prevent it from being turned at will.

Clockwise, you can increase the maximum value of the If current; In the counterclockwise direction, the maximum value of the If current is reduced.

Connectors on the rear panel



The connectors and functions on the rear panel of the ADSP-HV80+ high voltage power supply are as follows:

HV-Cable OUTPUT: High-voltage cable exit with pre-strain relief clamp that allows cables with a total diameter of up to 20 mm to pass through and be reliably secured.

LINK: Vacuum switch input interface.

Closed: The power supply is normal;

Open: Vacuum alarm is displayed, and the output is stopped by the power supply.

SERIAL interface: RS-232 serial communication interface, DB25F, HVPS communication control cable for connecting CD-SEM tools.

AC INPUT: Three-pin aviation receptacle, for AC power input, power input range: AC85-265V self-adaptive.

Information displayed on the front panel LCD display



The ADSP-HV80+ high voltage power supply features a four-line LCD panel with a complete and rich display that allows users to read and set key parameters, alarm messages, and more.

The meaning of the content displayed in each row is as follows:

>: Displays the function currently selected by the "M" button, and the value of this function will allow the setting and change by pressing the "+" or "-" button.

I f: Real-time display of the current electron gun filament heating current, unit: A (Amps)

I e: Real-time display of the current electron gun emission current, unit: μA (Microamperes); When the emission current is higher than $1000\mu\text{A}$, "----" is displayed

V s: Displays the current set and output V_s voltage value, unit: KV

V 0: Displays the current set and output V₀ voltage value, unit: KV

V 1: Displays the current set and output V₁ voltage value, unit: KV

V 2: Display the current set and output V₂ voltage value, unit: KV

In the setting mode, "Ve" is displayed, and the setting range is: 1-9, which is used to set the model of Hitachi CD-SEM corresponding to the high-voltage power supply.

0000: This content is four digits, showing the current actual filament heating cumulative hour value, the maximum value is 9999 hours, and the excess will automatically return to zero.

92: This content is two-digit, showing the corresponding HITACHI CD-SEM tool model set in the current high-voltage power supply. "80": corresponding to 88XX series machines, "92": corresponding to 92XX series machines, "93": corresponding to 93XX series tools.

S: Indicates that the high-voltage power supply is in the shutdown state, and the character disappears after the high-voltage output is started.

H: Indicates that the high-voltage power supply is not connected to the tool, and the character disappears after the communication with the CD-SEM tool is successful.

W: Indicates that the high-voltage power supply is in an un-warmed state, and the character disappears after the output is started and the predetermined warm-up time has passed.

I: Indicates that the high-voltage power supply is in the state of receiving the CD-SEM tool command to automatically control the IP current, and the character disappears after the process is completed.

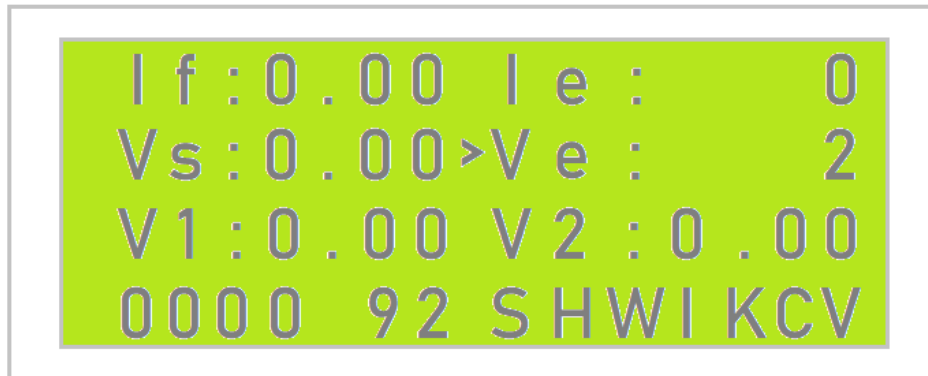
R: Indicates that the high-voltage power supply is in the operation state of automatically searching for the IP current range after receiving the CD-SEM tool command, and the character disappears after the process is completed.

K: Indicates that the high-voltage power supply is active on the keyboard, and if the lock keyboard command is received from the CD-SEM tool, the character disappears.

C: It means that the high-voltage power supply has had a current fault, and the corresponding I_f exceeds 3.00A, or I_e exceeds 500.00 μ A, the character will not disappear by itself, and will be in the maintenance state. This character disappears when SHUT DOWN or START UP is pressed, or when the CD-SEM machine receives the boot output command, or when the power is turned off and restarted.

V: It means that the LINK terminal at the rear of the high-voltage power supply is not reliably shorted, and the corresponding is that the vacuum drop switch at the end of the high-voltage cable is not closed, and the vacuum is poor.

Set the parameters of the high-voltage power supply to correspond to the HITACHI CD-SEM tools model



The ADSP-HV80+ high-voltage power supply has built-in high-precision, wide-range, and high-stability precision high-voltage circuits, so users can apply high-voltage power supplies to various types of HITACHI CD-SEM tools through parameter settings, including 88XX, 92XX, 93XX and other series of models.

Once the CD-SEM tool model corresponding to the high-voltage power supply is changed, the maximum high-voltage value, V1/V2 correspondence curve, and corresponding CD-SME tool communication instructions of the high-voltage power supply will be changed accordingly.

Here's how to set it up:

1. Turn off the power switch on the front panel of the high-voltage power supply.
2. Disconnect the vacuum LINK connection from the rear panel of the high-voltage power supply.
3. Turn on the power switch on the front panel of the high-voltage power supply, and the "V" vacuum error alarm character of the high-voltage power supply will be displayed at this time.
4. Press the "M" key to move ">" to the V0 position, at this time, the "V0" character will automatically change to "Ve", as shown in the above figure.
5. Change the "Ve" value through the "+" or "-" button, so as to change the model of the HITACHI CD-SEM tools corresponding to the high-voltage power supply, the correspondence is as follows, and the range 1-9 can be changed:

"1": 88XX series machines

"2": 92XX series machines

"3": 93XX series machines

Please note that this value is set to "2" when the high voltage power supply is shipped, which is applicable to the 92XX series.

6. Turn off the power switch on the front panel of the high-voltage power supply.
7. Restore the vacuum LINK connection on the rear panel of the high-voltage power supply.
8. Turn on the power switch of the high-voltage power supply again, and you can see the number of CD-SEM tool model displayed on the front panel.

How to reset the filament heating cumulative hour value to zero

Use the M button to move the ">" to the four-digit filament heating accumulation hour value, and press the "+" and "-" buttons at the same time to reset the value to zero.

In addition, please note that the power supply has an auto-zero function, when the cumulative heating hours of the filament displayed by the power supply exceed 9999 hours, the value will automatically reset to zero and start the timer again.

How to use the ADSP-HV80+ high voltage power supply on a HITACHI CD-SEM tool

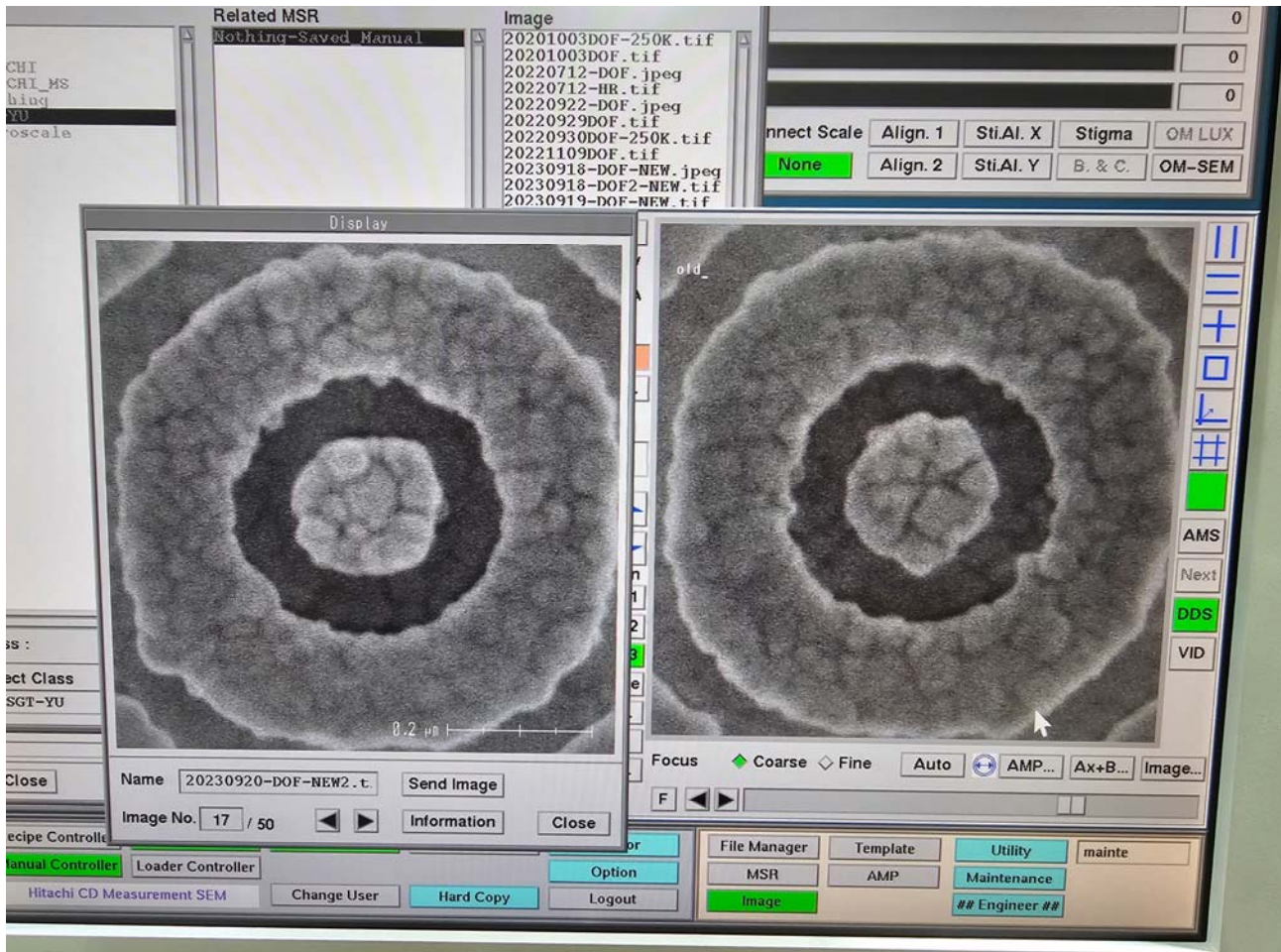
The use of this power supply is the same as that of HITACHI's original high-voltage power supply, which is described as follows:

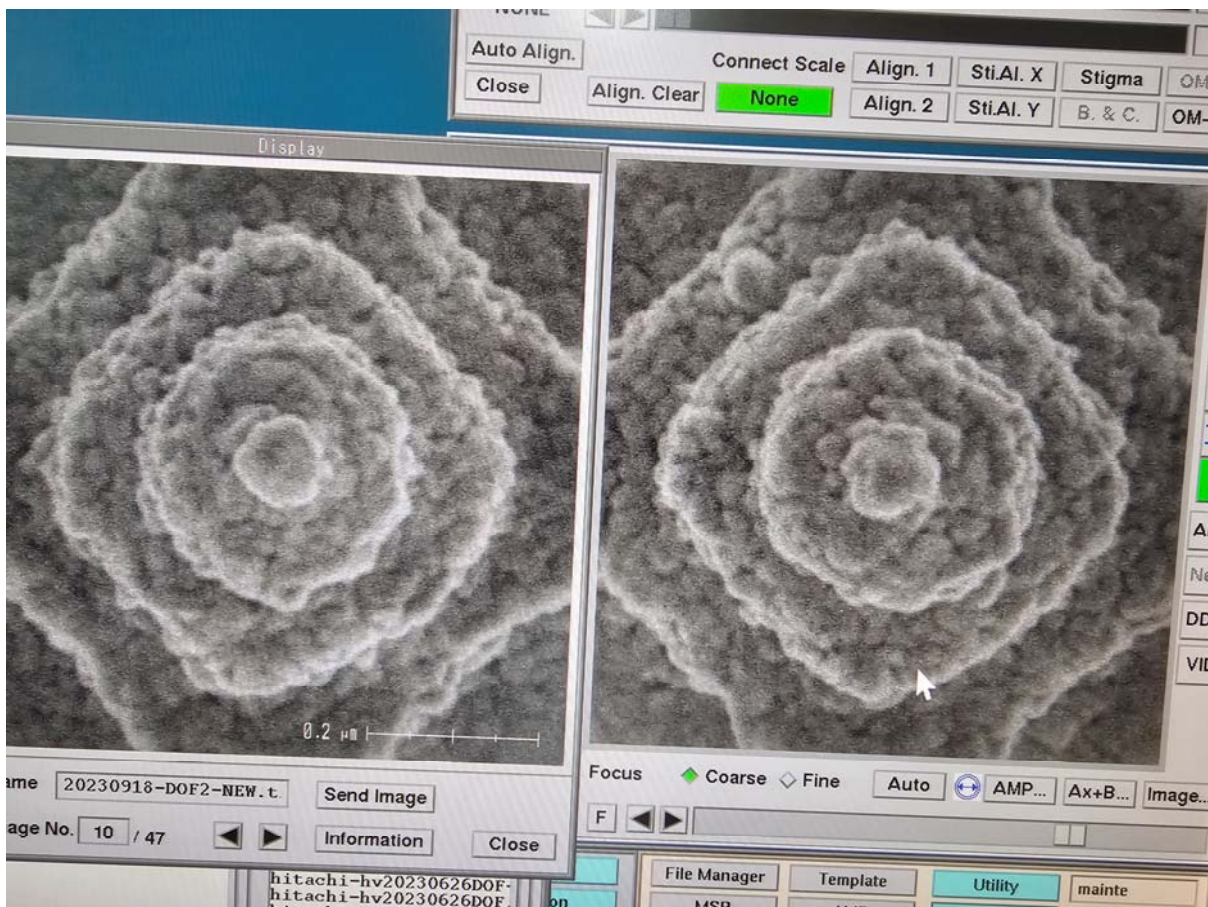
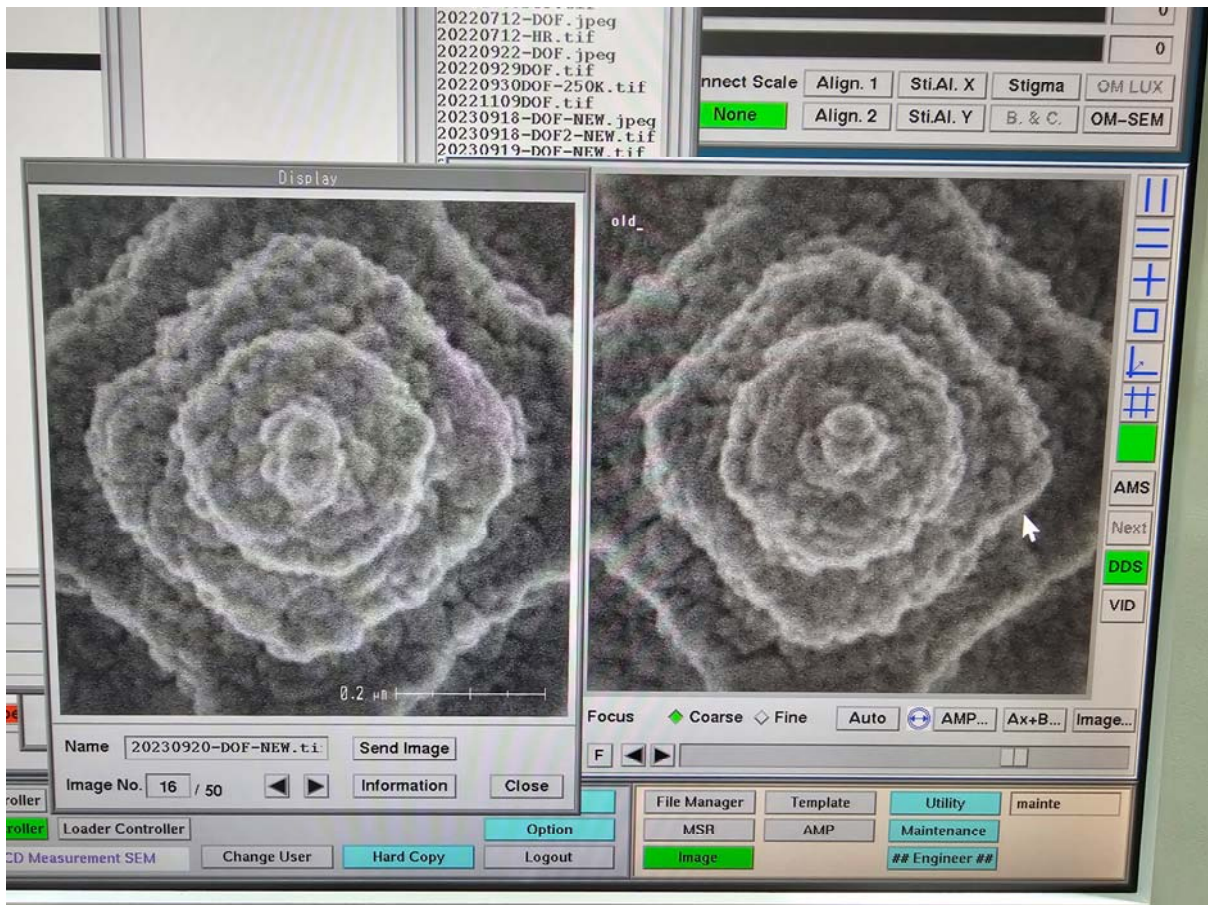
1. First of all, make sure that the IF MAX potentiometer is in the right position. Typically, the number "9" of this potentiometer corresponds to approximately 2.3 Amps of filament heating current. When the high-voltage power supply is shipped, the potentiometer is set to the "9" position and locked. If needed, first rotate the potentiometer counterclockwise to a smaller value, such as "8".
2. Keep the CD-SEM tool's computer running.
3. Insert the high-voltage cable plug supplied with the high-voltage power supply into the special receptacle at the top of electron gun.
4. Insert the communication cable from the tool into the DB25F communication interface on the rear panel of the high-voltage power supply.
5. Connect the vacuum interlock connector on the high-voltage cable to the LINK connector on the rear panel of the high-voltage power supply.
6. Connect the power plug to the power input receptacle of the high-voltage power supply.
7. Turn the IF MAX knob counterclockwise to the minimum.
8. Turn on the switch of the high-voltage power supply.
9. After that, there is no longer any need for any operation on the high-voltage power supply, the tool's computer will automatically complete the handshake identification communication with the high-voltage power supply, and start to perform the necessary operations, such as starting and stopping, reading the status information, setting the output voltage value of each output channels, etc.
10. In the HV-CONTROL software of the CD-SEM tool, turn on the output of the high-voltage power supply.
11. After about 5 minutes, the HV-CONTROL software shows that the warm-up is complete. Please note that our high-voltage power supplies are set to have a shorter warm-up time than the original high-voltage power supplies.
12. Slowly adjust the IF MAX knob clockwise to increase the filament heating current until the desired current value is reached. In general, the value of "9" for the IF MAX potentiometer corresponds approximately to the IF current value of 2.3 Amps.

COMPARISON OF IMAGE RESULTS

The images captured after our high voltage was applied to Hitachi CD-SEM tools were combined with those captured with the original high voltage power supply in the same image for detailed comparison.

The images are from our customers, and in each of the following images, the left is the picture under the new power supply ADSP-HV80+ and the right is the picture under the original power supply condition.





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