Carl Zeiss SMT – Nano Technology Systems Division

NVision 40

BA_NVision_40_en01
Original Instructions

Instruction Manual

ZEISS

Operating Manual for NVision 40

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1 Introduction

This manual is intended for authorised technicians. Users of this instrument may not deviate from the instructions provided in this documentation.

If the user modifies the instrument without the manufacturer's consent, the manufacturer will not be liable for any damage that may result. Such modifications will also void the warranty. Carl Zeiss SMT AG reserves the right to terminate the user's license and sue for damages if the terms of this agreement are violated.

We reserve the right to make modifications as part of the technical development process.

1.1 Explanation of symbols

1.1.1 Safety information to prevent injuries

DANGER

Indicates a imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

1.1.2 Safety information to prevent damage to equipment

NOTICE

This symbol calls your attention to possible danger. Disregarding this warning can lead to damage to the machine and surrounding areas!

1.1.3 Other important information

IMPORTANT

This symbol calls your attention to important additional notices.

1.2 Definition of terms

The following terms are used in this instruction manual:

— **SEM**

SEM is the abbreviation for **S**canning **E**lectron **M**icroscope.

— **FIB**

FIB is the abbreviation for **F**ocused **I**on **B**eam. The FIB image of the specimen is created using an ion beam.

— **NVision 40**

The NVision 40 is a combination of an SEM and FIB.

— **SmartSEM®**

The control software for the NVision 40, that runs under the Windows™ operating system on the computer, is referred to herein as the SmartSem®. The corresponding dialog windows are displayed on the screen.

— **MGS**

MGS refers to the **M**ultichannel **G**as injection **S**ystem as a whole.

— **GIS**

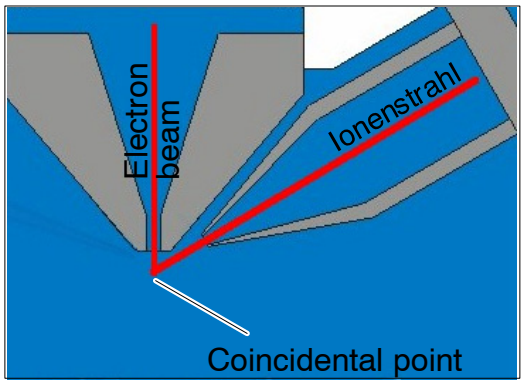
GIS is the abbreviation for **G**as Injection **S**ystem. The GIS is part of the multichannel gas injection system. It channels the process gases into the chamber.

— **GIS cabinet**

Cabinet that houses the gas cartridges and dosing system.

— **Coincidental point**

Point at which the electron beam meets the ion beam.



2 Safety

2.1 Proper use

The SEM is designed for microscopic examinations of specimens.

The NVision 40 operates with two beams, one electron beam and one ion beam. Both beams can be used independently of each other to generate images using the secondary electrons emitted from the surface of the specimen. The ion beam can be used for imaging in addition material removal or coating purposes.

The two beams can be operated synchronously. Here, the ion beam scans a specified area while the SEM can be used independently to change the magnification, scan speed and so on.
The electron beam can also be disabled. The image is then generated using the ion beam.

By removing layers from the specimen, you can investigate the material properties at cross-sections. You can extract specimens from the material or manipulate its structures. For example, you can cut conductor paths in microelectronic components or drill down to deeper contact points and so on.

It is also possible to add special coatings to the specimen.

WARNING

Using the microscope for any other purpose is prohibited and could be hazardous.

2.2 Accident prevention and safety

WARNING

Risk of injury

Improper operation of the NVision 40 may result in serious injury.

Any person operating the NVision 40 must read and fully understand the operating manual, documents and manuals from the suppliers before using it.
The documentation for the individual components are located in the NVision 40 document folder.

The operating manual has been written for users of the NVision 40. In conjunction with the documents and manuals from the suppliers, it should help users to:

— avoid unnecessary risks

— properly use the NVision 40

— avoid downtime and repair costs

— to maintain the NVision 40 specifications and obtain the maximum service of the device.

The effectiveness of any measures ultimately depends on how well all parties - that is the manufacturer, the owner, and the operating personnel - can work together to uphold safety standards.

2.3 Safety instructions

The NVision 40 employs cutting-edge technology and conforms to recognised safety requirements. This ensures the highest level of industrial safety. However, the NVision 40 may still present a hazard to human health and safety and/or damage property if it is used improperly.

It is absolutely critical that users follow the safety information provided in this manual.

DANGER

Death may result if safety features are removed or non-functional!
The instrument may cause injury or death if operated with the safety features removed!
Replace the safety features immediately after any work on the instrument is completed!
Check the safety features regularly!

High voltage, danger to life!
Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform work on the electrical system of the NVision 40.

WARNING

Hazard of poisoning or chemical burns from gases!

Always avoid inhalation as well as skin and eye contact!

Do not allow dust to settle and always ventilate closed rooms!
Do not inhale dust and avoid skin and eye contact!

It is forbidden to eat or drink at the workplace!
Always eat in employee break rooms or cafeteria areas!

Observe the instructions in the safety data sheets from the manufacturer on the use of each gas.

Risk of injury from hot surfaces during bakeout!
Parts of the enclosure in the upper range of the column may become hot during bakeout, particularly after long bakeout.
Do not remove any parts of the cover panels or place any objects on the electron optical column grid.

Risk of injury from hot surfaces on the GIS!
The surface under the cover panels may reach a temperature of 80˚C.
Do not remove any of the cover panels.

CAUTION

X-ray hazard !
X-radiation is generated inside the device during normal operation.
Do not make any modifications to the NVision 40 that may reduce the level of X-ray protection. Never remove the cover panels, particularly those covering the columns and specimen chamber. Flange and vacuum part may only be replaced with original spare parts or approved spare or accessory parts.

IMPORTANT

The competent authorities must be notified before initial start-up of the NVision 40.

The NVision 40 is equipped with several radiation protection devices. The specimen that will be hit by the accelerated particles is located in the closed and shielded specimen chamber. Likewise, the electron beam leading space is totally surrounded by a closed and shielding protection cover.
Furthermore, it is ensured that specimen chamber and space with radiation can be opened only if the electron and ion gun is switched off and thus no more X-radiation is present.

- **The acceleration voltage (U) is limited to 30 kV.**
- **The maximum potential difference of the accelerated ions is 70 kV.**
- **The local dosage rate at a distance of 10 cm from the exposed surface of the device is less than 1;µSv/h.**

WARNING

Suffocation hazard when chamber door is opened due to lack of oxygen!
The chamber is filled with nitrogen!
Inhaling air with high nitrogen concentrations may lead to unconsciousness due to a lack of oxygen.

Monitor area with nitrogen sensor or ventilate well.

Hazard of poisoning or irritation from gases!
Gas injection systems may utilise gases that may be poisonous or cause irritation to eyes and respiratory passages.
Always follow the instruction requirements when using the ventilation system.
Protect eyes and respiratory system.
Always avoid inhaling poisonous gases!

Observe the instructions in the safety data sheets from the manufacturer on the use of each gas.

IMPORTANT

Only personnel who are specifically authorised and qualified to do so may work with the NVision 40.
Each person who works on the NVision 40 must have read and understood these operating instructions as well as the documents and operating instructions from the supplier!

Provide this operating manual and any documents from the supplier to any future owner, operator, or party borrowing the instrument, and stress the importance of reading and understanding all instructions!

Comply with all laws, guidelines, accident prevention measures, and generally recognised rules!

IMPORTANT

Use the NVision 40 only when it is in good working order, and use the instrument only for its intended applications!
Add-ons and modifications to the NVision 40 that are not approved by the manufacturer are prohibited!

If damage or defects that could endanger people or property are discovered on the NVision 40, shut down the machine immediately and do not use it again until all repairs are completed!

Comply with all safety requirements pertaining to fire and explosion prevention!

Only a qualified technician sent by NTS/SMT may start the NVision 40 for the first time.

IMPORTANT

Only trained and qualified personnel may perform maintenance, repairs, and any hazardous work on the instrument!

Personnel may not be under the influence of alcohol or other intoxicants!

Dispose of used supplies and parts in accordance with all applicable laws, regulations and rules!

2.4 Safety devices

To prevent any risk of property damage or hazard to human health and safety, the NVision 40 is equipped with the following safety and protective devices.

NOTICE

Possible loss of data if any of the safety features are activated.

The programs running on the computer are not properly closed if the NVision 40 is switched off using one of the safety devices. Any unsaved changes to files may be lost.

The devices explained below are intended to ensure that all power to the NVision 40 is safely cut off in the special cases described. These devices are not appropriate for shutting down the NVision 40 in normal operation!

2.4.1 X-ray protection

IMPORTANT

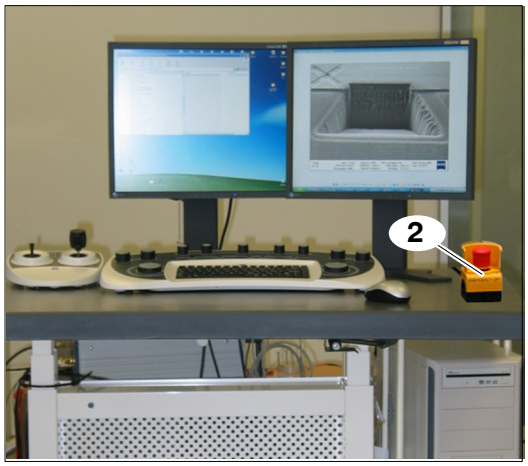
The competent authorities must be notified before initial start-up of the NVision 40.

2.4.2 Master switch

Use the master switch [1] to cut all power to the NVision 40 and the devices connected directly to the EMO-Box. This is only required when work needs to be performed with the power fully off. The master switch [1] can be locked in the ”off” position to keep it from being switched on, e.g. during repair and maintenance work (→ arrow).

2.4.3 Emergency OFF button

The emergency OFF button is located on the table adjacent to the column and must always be accessible and operable. **Only press the emergency OFF button in an actual emergency.**



1. Only press the emergency OFF button [2] in the event of an emergency to quickly turn the device off.

✓ This safely cuts off all mains power to the NVision 40 and/ or all devices connected to the EMO-Box.

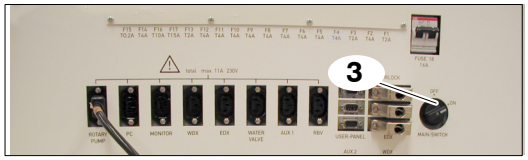
✓ The button will remain in its depressed position.

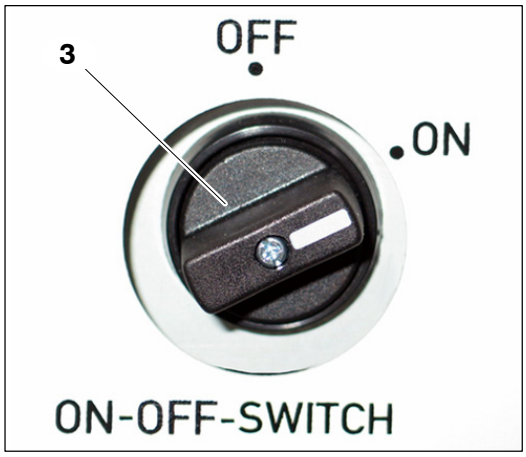
2. Once the emergency has been resolved, the emergency OFF button is released by pulling it out.
3. The NVision 40 can then be restarted. (→ Chapter 5.2 Page 32).

2.4.4 On-off switch

The on-off switch [3] is located on the rear side of the lower frame. It disconnects the NVision 40 totally from the mains power distributed by the EMO-Box.

Components directly connected to the EMO-Box will not be switched off in conjunction.





2.4.5 Protective cover panels

The electronics cabinet, the electro-optic column, the MGS and the base device are secured with protective panel enclosures.

2.4.6 Interlock system

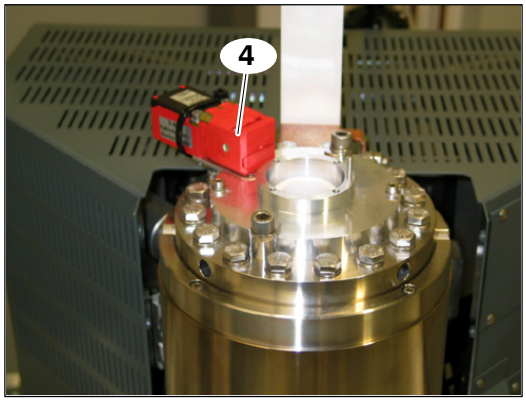
The interlock system is integrated in the NVision 40 to prevent abnormal operation.

WARNING

Electrocution and radiation hazards!
Disabling interlock system elements is prohibited!

The interlock system includes the following:

— Cathode head plug switch [4]



The cathode head plug switch shows whether the high-voltage plug is plugged in.

— Door contact switch

The door contact switch indicates whether the chamber door is closed properly.

— Vacuum lock (on VAC board)

The vacuum lock will also de-energise the electrical high tension for SEM and FIB when the specimen chamber or the column is ventilated.

— Contact switch for chamber door rod

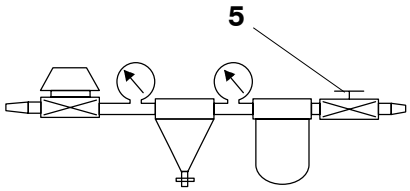
The chamber door is only closed when the chamber door rod is removed from the specimen chamber and the contact switch is locked.

2.4.7 Shut-off valves

The customer is responsible for installing main shut-off valves ([5]) for water, nitrogen and compressed air.

The shut-off valves must be easily accessible, and they must close off the connections to the corresponding media when needed.

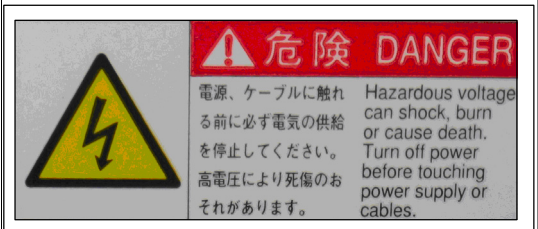
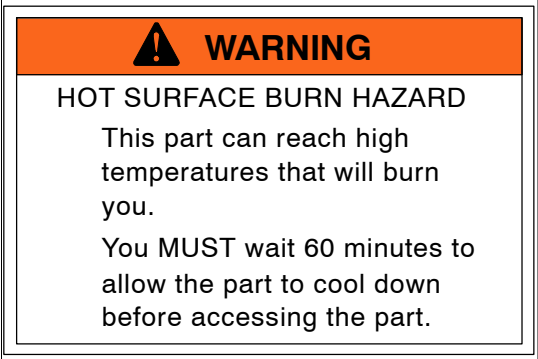
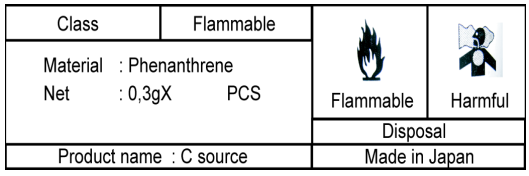
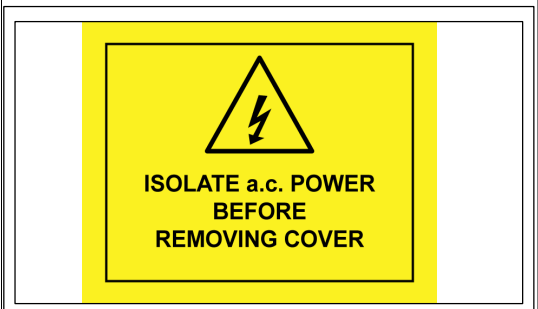
The shut-off valves have to be lockable in their off position against accidental re-activation.

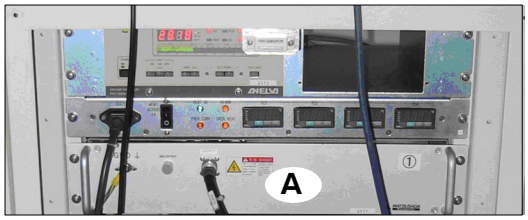


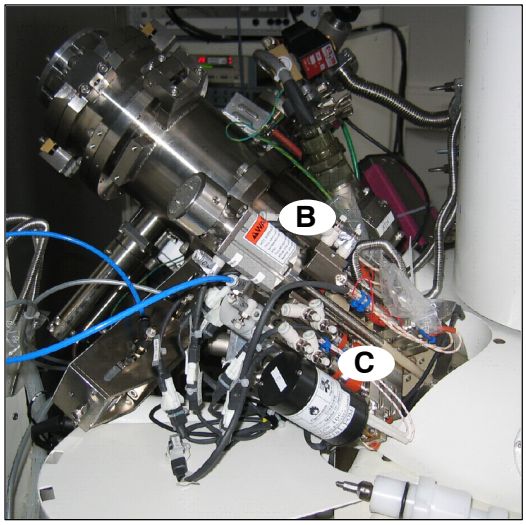
Valve sequence for cooling
with building water connection

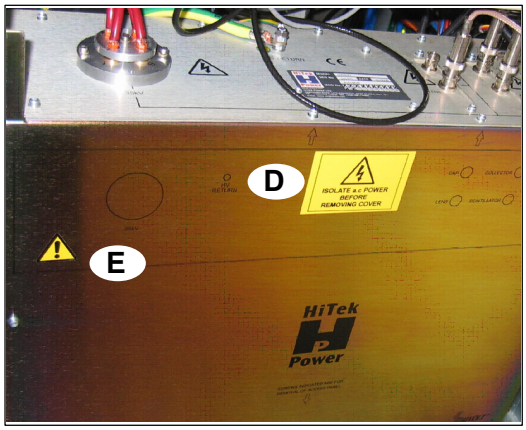
2.5 Safety labels on the instrument

Appropriate safety labels on the NVision 40 warn users about possible hazards. Each safety label is affixed at the point where a particular hazard exists.

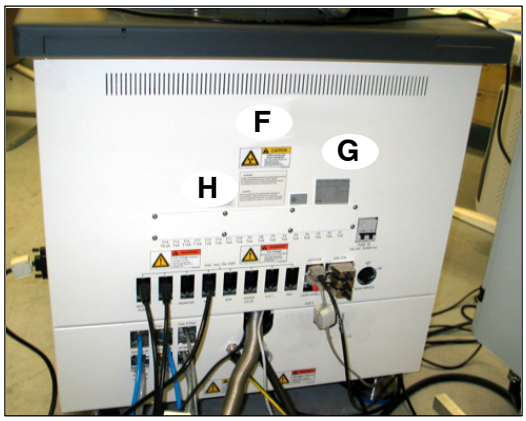
Label	Position
	A
	B
	C
	D
	E

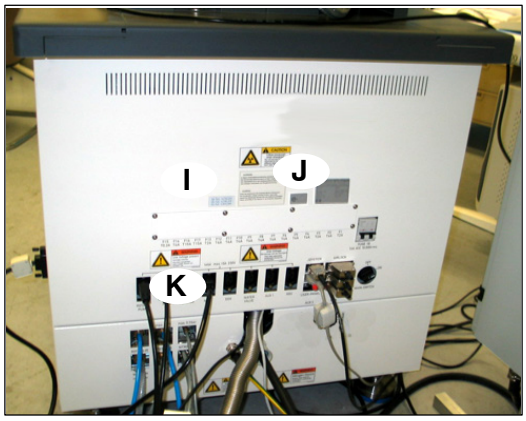


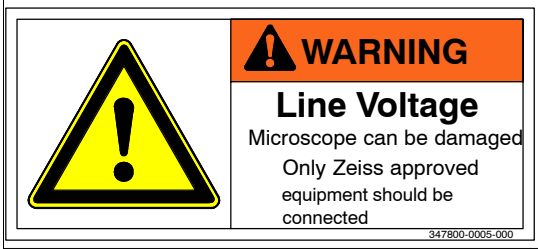
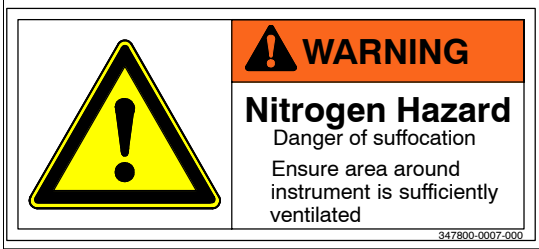


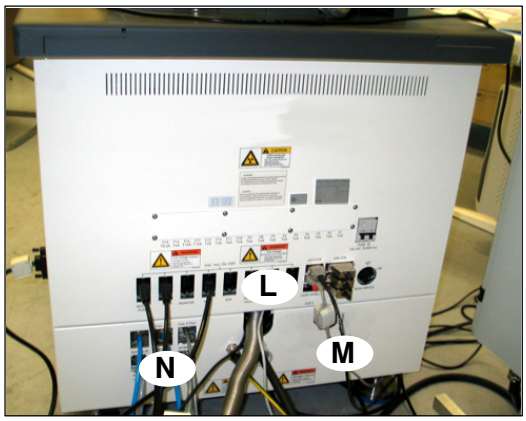


Label	Position
 **CAUTION** **x - rays produced when energised** The microscope should be approved by the national regulations. Don't take off any parts 347800-0016-000	F
Carl Zeiss NTS GmbH 73447 Oberkochen, Germany Ser.Nr. 3801 NVision 40 349300-9002-000 1/N/PE 208-230 V 50-60 Hz max.16A CE Made in Germany	G
CAUTION: X–ray radiation is produced in this Scanning Electron Microscope with Focus Ion Beam. The acceleration voltage is limited to 30 kV. Dose rates around the microscope are less than the maximum permissible values under The Radiation Protection Regulation **CAUTION:** X–rays are produced in this Scanning Electron Microscope with Focused Ion Beam! the acceleration voltage is limited to 30 kV. Dose rates around the microscope are less than the maximum permissible values German Radiation Protection Regulation	H
US Pat. 4,713,543 US Pat. 4,785,176 US Pat. 4,831,266	I
 LR66238 NRTL/C	J
 **WARNING** **Line Voltage present** Damage warning The total connected load current should not exceed 10A 347800-0006-000	K





Label	Position
	L
	M
	N



3 Transport and Assembly

NOTICE

The NVision 40 may be transported only in air-cushioned vehicles! Moving parts must be secured during transport to prevent them from sliding or tipping!
Potential damage if instrument is tipped or dropped! Devices for transporting the instrument must be rated to handle its full weight and dimensions!
Note the weight information on the package and on the shipping documents!
(→ Chapter 10 -page 56)
Do not raise the crates any higher than necessary!
Avoid rocking the crates back and forth!

WARNING

Risk of physical injury!
The load can cause serious injury as it is lowered!
Maintain a safe distance.
Do not walk under or place your hands/feet under the load while it is being lowered.
Wear safety shoes.
Wear safety gloves.

The complete NVision 40 is delivered in 5 wooden crates and cartons.

Crate 1: Base unit with electro-optic column, FIB column Specimen chamber, specimen stage, GIS, lower frame with vacuum system and control electronics

Crate 2: FIB electronics rack

Crate 3: Holding table, booster pump, vibration damper Monitors, computers

Crate 4: GIS cabinet

Crate 5: Chamber door, FIB raster generator, other components

— Check whether any items have been damaged in transit. Report any problems to the manufacturer immediately!

IMPORTANT

Complaints cannot be acknowledged at any later date!

3.1 Location requirements

IMPORTANT

The location for the NVision 40 should be determined and prepared before the instrument is delivered.

Appropriate checks must be made.
The NTS/SMT service technician can be of assistance with checking the ambient conditions and determining appropriate measures to be taken. (→ Chapter 10 - Page 56 and in the Installation Requirements)

See the assembly plan for the dimensions of the NVision 40 and the locations of the electrical, cooling water, nitrogen and compressed air connections.
The customer is provided with the assembly plan before the NVision 40 is delivered. Another copy is included in these operating instructions.
(→ Chapter 3.2 - Page 24).

The minimum room size needed (without any accessories attached) is 3.5m x 5.0m. The ceiling must be at least 2.3m high.
The transport ways should always be stepless.
The doors have to be at least 1.10 m wide.
The hallways have to be at least 1.25 m wide (cornered hallways: 1.70 m).
The distance between the lower frame and the FIB electronics must be between 0.60 and 1.00 m.

3.1.1 Power supply

WARNING

High voltage, danger to life!
Only sufficiently knowledgeable and qualified professional electricians may perform work on the electrical installation.

Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform work on the electrical system of the NVision 40.

▶ **The electrical connection (1/N(L2)/PE) must be provided in accordance with the applicable electrical codes for your country.**

Manufacturer's recommendation:

— For Europe

  Connection: 1/N/PE, 230 V

  Fixed connection of terminal type: CEE 32A-6h, 230 V

  The main power line must be protected with a circuit breaker C32 A and a ground fault circuit interrupter (30 mA).

— For the USA and Canada

  Connection: 2/PE, 208 V

  Fixed connection

  The main power line must be protected with two circuit breaker (each 32 A) and a ground fault circuit interrupter (30 mA).

The main disconnect device in the EMO-Box is approved according to UL 489 with an AIC rating (current-interrupting capacity) of 85 kA.

3.1.2 Grounding

WARNING

High leakage current!
Before mains connection establish protective grounding connection.

A separate grounding connection (cross-section ⩾4 mm²) for the NVision 40 must be established directly to the equipotential bonding bar. (→ Chapter 3.2 - Page 24)

3.1.3 Cooling

The electron optical lenses, the turbo molecular pump and some parts of the electronic system are water-cooled.

Closed-circuit cooling or water from the building water supply can be used for cooling. The inside diameter of the connecting tube is 6 mm. Heat dissipation is approximately 1 kW.

Closed-circuit cooling

The closed-circuit cooling systems use either water or air.

Both systems should be located outside the workspace. In the case of an air-cooled system, this allows warm air to be exhausted freely; a water-cooled system needs to be further away to reduce the noise level.

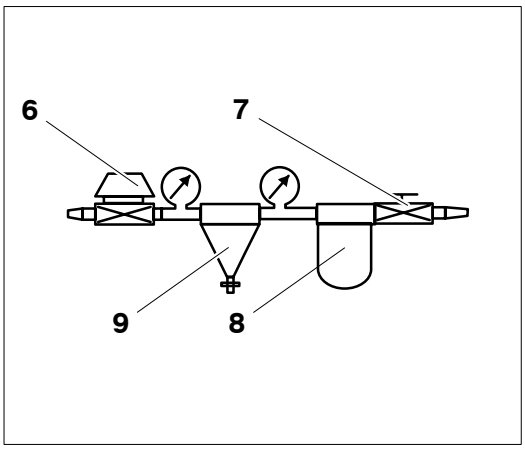
Two outlets (230 V, 16 A) must be installed where the closed-circuit cooling system will be placed. One outlet is for the unit; the other is for servicing purposes.

For water-cooled systems, an unfiltered building water connection and a wastewater connection must be available.

Water consumption is controlled by the system; the system uses min. 1.5 l/h.

Cooling from building water supply

If you are cooling using a water supply, you must install a water filter [8] between the main cut-off valve [7] and the pressure regulator with 2 pressure reducers [9], and a water solenoid valve [6 that interrupts cooling when the NVision 40 is switched off.→ Chapter 3.2 - page 24)



IMPORTANT

The items can be ordered as a kit from the manufacturer. The water solenoid valve is controlled by the NVision 40.

The water must be maintained at a temperature between 18 °C and 22 °C. The supply pressure is 2 bar and may not exceed 3 bar. The flow rate should be 2 l/min.

For ecological reasons do not use water from the building water supply with an open drain.

It must be possible to cut the water supply and lock the valve so that the water cannot be turned back on accidentally.

3.1.4 Exhaust gases

All exhaust (air, nitrogen and other gases) must be vented through an exhaust line (made of corrosion-free material) to the outside.

3.1.5 Compressed air

Compressed air is used to operate several valves and the auto-levelling damping system of the FESEM. The required pressure is 5-6 bar. The inside diameter of the connecting tube is 6 mm. (→ Chapter 3.2 - page 24)

CAUTION

Risk of injury from high pressure when using gas cylinders. Observe the applicable operating guidelines and warning signs from the gas cylinder manufacturer.

The compressed air needed can either be taken from an in-house supply system or from a gas cylinder or generated by a compressor.
The connection must be equipped with an appropriate pressure reducer and a shut-off valve, which is lockable against accidental re-activation (→ Chapter 2.4.7 - Page 15).

3.1.6 Nitrogen

Dry gaseous nitrogen is used to ventilate the chamber when changing specimens.

WARNING

Suffocation hazard when chamber door is opened due to lack of oxygen!
The chamber is filled with nitrogen!
Inhaling air with high nitrogen concentrations may lead to unconsciousness due to a lack of oxygen.

Monitor area with nitrogen sensor or ventilate well.

NOTICE

Use only pressure reducers that are approved for use with nitrogen.

Keep the valves and fittings completely free of lubricants or oils to prevent contamination.

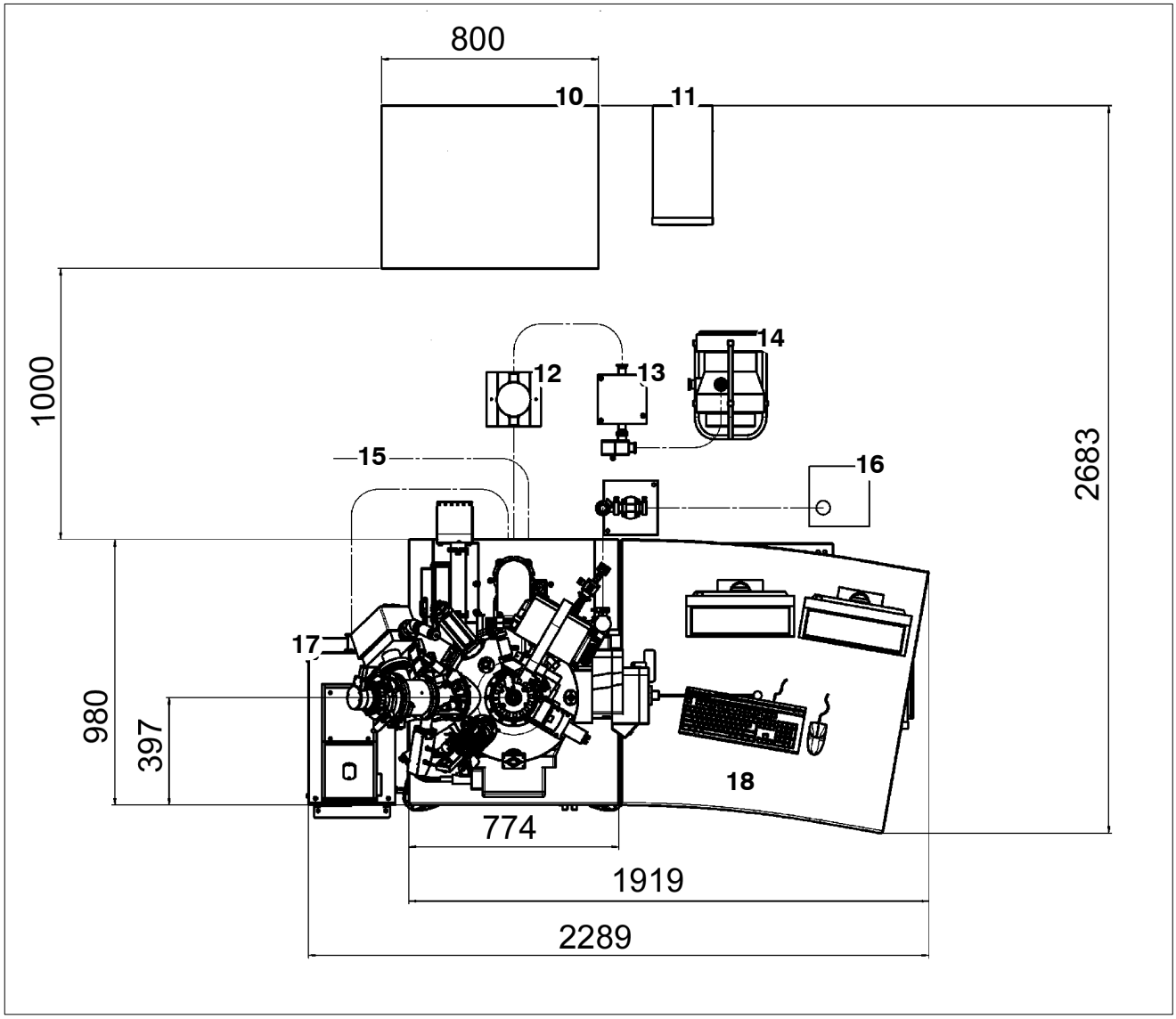
CAUTION

Risk of injury from high pressure when using gas cylinders.
Observe the applicable operating guidelines and warning signs from the gas cylinder manufacturer.

The required nitrogen may be supplied from an in-house feed system or from gas cylinders.
The connection must be equipped with an appropriate pressure reducer and a shut-off valve, which is lockable against accidental re-activation. (→ Chapter 2.4.7 - Page15)

Parameters for nitrogen		Value	Unit
Pressure	min. max.	0,2 0,3	bar bar
Consumption with open chamber door		approx. 3	l/min
Min. percentage	purity	99,996	%
Connection hose Inside diameter		4	mm

3.2 Assembly plan



[10] FIB electronics rack

[11] Chamber door controller

[12] Static vibration damper

[13] Dynamic vibration damper

[14] Pre-vacuum pump

[15] Power supply

[16] Chamber pre-pump

[17] GIS cabinet

[18] Computer workstation

3.3 Assembly and adjustment

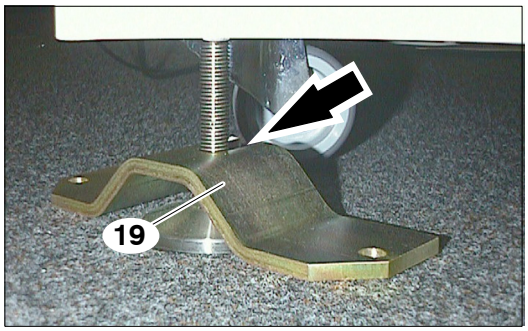
IMPORTANT

Observe the safety instructions in Chapters 2 and 3. Only a qualified technician sent by NTS/SMT may start the NVision 40 for the first time.

1. Assemble the NVision 40 correctly.
   (→ Set-up plan in Chapter 3.2 -page 24)
2. Remove all items used to secure instrument components during transport.
3. Re-assemble and attach all safety devices that were disabled and removed from the instrument for transport.

3.4 Anti-tip system for earthquake-prone areas (optional)

In earthquake hazard areas, the NVision 40 must be mounted on a special heavy-duty anchor installed in the floor and secured against tipping by means of a seismic kit.



1. Place the NVision 40 on the heavy-duty anchor.
2. Place the clamp from the seismic kit [19] with the slit (arrow) onto the adjustable foot.
3. Use two bolts to connect the clamp to the heavy-duty anchor.
4. Repeat steps 2. – 3. with the other three clamps and adjustable feet.

3.5 Storage

IMPORTANT

Observe the safety instructions in Chapters 2 and 3.
When packed accordingly, the NVision 40 may be stored in rooms with an ambient temperature of between -10 °C and +70 °C (Ga Emitter: max. +27 C°).
If the NVision 40 is out of operation for an extended period of time, perform maintenance on it and check the safety devices before using it again!

To turn the NVision 40 fully off, follow the individual steps described in chapter 5.11... 5.13.

— Chapter 5.11:
  Switch the NVision 40 to Standby mode
— Chapter 5.12:
  Shut down the NVision 40
— Chapter 5.13:
  Shut down the NVision 40 completely

4 Installation

IMPORTANT

Observe the safety instructions in Chapter 2.

Only service technicians from NTS/SMT may connect the NVision 40 components, inspect the main connection or install the MSG.

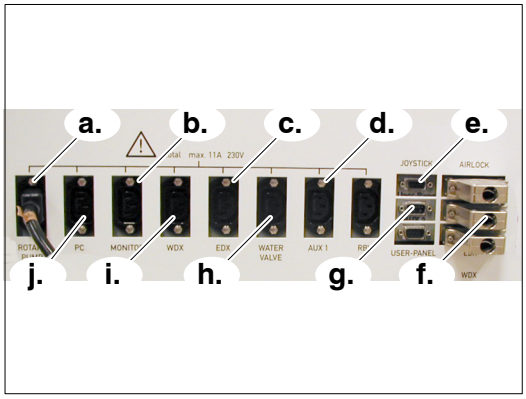
4.1 Establishing Connections

IMPORTANT

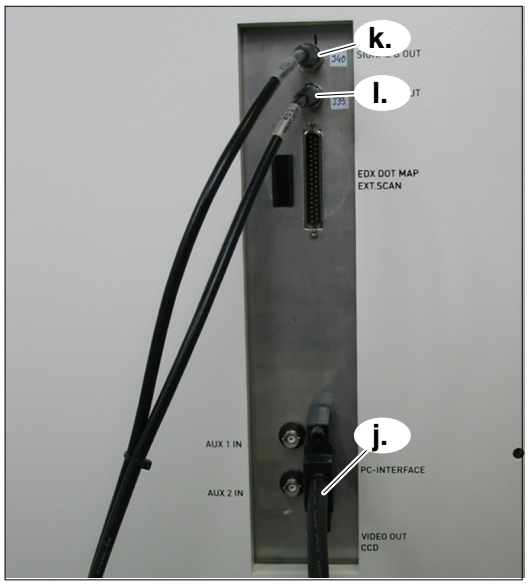
Read and note the information in the supplier's documents and instructions!

Note and follow the inspection and maintenance schedules!
(→ Chapter 7.1 - page 49)

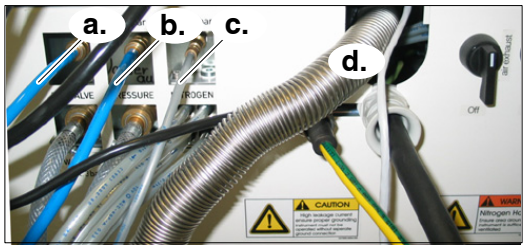
Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform work on the electrical system.



1. Connect lines to the
   - **a.** Pre-vacuum pump
   - **b.** Monitor
   - **c.** Optional accessories
   - **d.** Airlock
   - **e.** Joystick
   - **f.** FIB-electronics
   - **g.** Hard panel
   - **h.** Water solenoid valve
   - **i.** FIB electronics
   - **j.** Computer
   - **k.** SEM scan (I40)
   - **l.** SEM scan (I39)



2. Connect lines to the cooling water, nitrogen and compressed air.

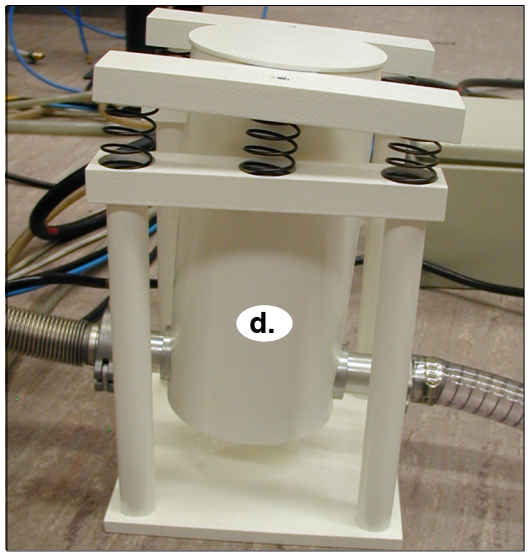


a. Attach compressed air line either to the angle valve on the vacuum pump

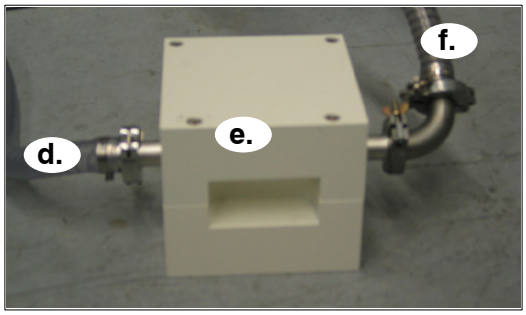
b. Connect compressed air

c. Connect nitrogen

d. Connect dynamic vibration damper



e. Connect static damper

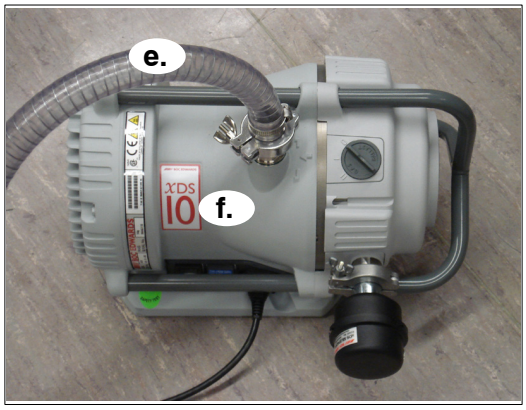


f. Connect pre-vacuum pump
(→ Manufacturer documentation)
Connect the exhaust hose
(type of connector varies according to vacuum pump)

— either vent plastic hose to outside

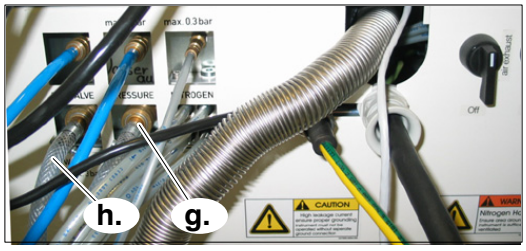
— oil mist filter (optional)

— or a sound absorber



g. Connect water runback line

h. Connect water supply line



4.2 Check main electric connection and attach connectors

IMPORTANT

The technical data for the main connection must conform to the specifications in Chapter 10 - Page 56.

1. Check voltage on main connection (nominal AC voltage).
2. Connect the supplementary protective ground [a.] to the equipotential bonding bar.

Attach lines to EMO-Box (bottom).

3. Connect mains out for EMO-Box [b.] on the connector terminal to the back of the NVision 40 [c.].
4. Connect the emergency OFF button to one of the connectors X13...X16 [d.].

Several emergency OFF buttons may be connected.

5. Close the unused sockets of connectors X13 - X16 [d.] using a suitable short-circuit plug.
6. Attach ”mains in” [e.] line to the mains connection.

4.3 Install MGS and GIS

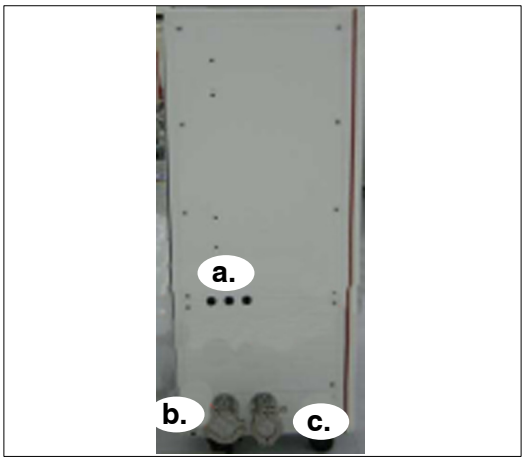
4.3.1 Install gas tanks and connect GIS

WARNING

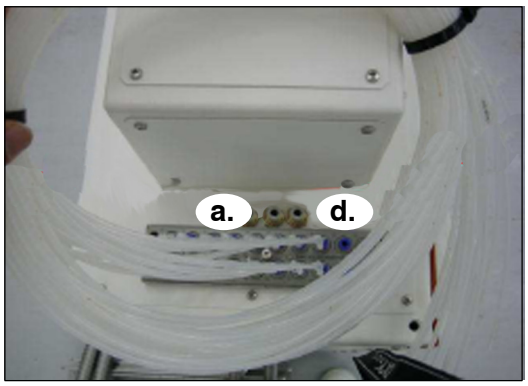
Hazard of poisoning or chemical burns from gases!
Only NTS/SMT service technicians may connect the individual gas tanks and/or GIS.

4.3.2 Connect MGS

1. Connect electronic lines, exhaust lines
   - **a.** Electronic connections
   - **b.** Flue gas connection for line system
   - **c.** Flue gas connection



2. Connect compressed air/nitrogen supply lines
   - **d.** Compressed air supply
   - **a.** Nitrogen connection



5 Operation

WARNING

Risk of injury from hot surfaces during bakeout!
Parts of the enclosure in the upper range of the column may become hot during bakeout, particularly after long bakeout cycles.
Do not touch any parts of the cover panels or place any combustible objects on the electron optical column grid.

CAUTION

X-ray hazard !
X-radiation is generated inside the device during normal operation.
Do not make any modifications to the NVision 40 that may reduce the level of X-ray protection. Never remove the cover panels, particularly those covering the electron optical column and specimen chamber.
Flange and vacuum part may only be replaced with original spare parts or approved spare or accessory parts.

IMPORTANT

The competent authorities must be notified before initial start-up of the NVision 40.
The NVision 40 is equipped with several radiation protection devices. The specimen that will be hit by the accelerated particles is located in the closed and shielded specimen chamber. Likewise, the electron beam leading space is totally surrounded by a closed and shielding protection cover.
Furthermore, it is ensured that specimen chamber and space with radiation can be opened only if the electron and ion gun is switched off and thus no more X-radiation is present.

- **The acceleration voltage (U) is limited to 30 kV.**
- **The maximum potential difference of the accelerated ions is 70 kV.**
- **The local dosage rate at a distance of 10 cm from the exposed surface of the device is less than 1 µSv/h.**

WARNING

Suffocation hazard when chamber door is opened due to lack of oxygen!
Inhaling air with high nitrogen concentrations may lead to unconsciousness due to a lack of oxygen.

Monitor area with nitrogen sensor or ventilate well.

CAUTION

Squeezing hazard by improper handling.

Injuries as a result of squeezing may occur when closing the chamber door in a careless manner.

Apply light pressure on the front of the chamber door to close it!

5.1 Initial start-up

IMPORTANT

Observe the safety instructions in Chapters 2 and 5.

Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform initial start-up of the NVision 40.

5.2 Switching on the equipment

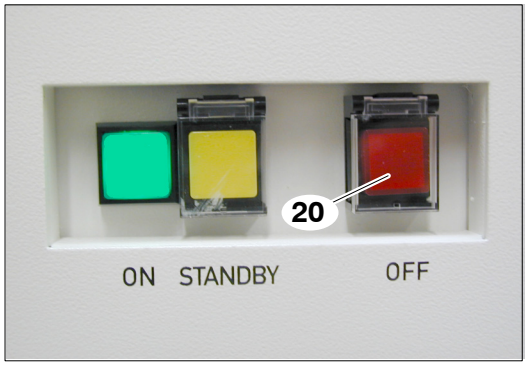
IMPORTANT

Follow the safety instructions in Chapters 2 and 5!

Before restarting the NVision 40 when the emergency off button is depressed or when the master switch is set to off, find the cause and eliminate it.

The pre-vacuum pump may start automatically if the START button is pressed.
This will be the case if the NVision 40 had previously been shutdown using the emergency off button as the NVision 40 status (Standby or ON) is the same as at the time shutdown was initiated.

The automatic start of the pre-vacuum pump can be avoided if the FESEM is set to the state “Normal Off” prior to pressing the START button.
(→ Chapter 5.2.1 Page 32).



5.2.1 Set to ”Normal OFF”

Set to ”Normal OFF” before restart as described below.

1. Lift the protective lid of the OFF button [20] on the lower frame.
2. Press the ”OFF” button [20].

5.2.2 Turn on the NVision 40

The emergency OFF button (→ Chapter 2.4.3 Page 14) has to be unlocked.
If more than one emergency OFF button is connected to the EMO-Box, they **all** need to be unlocked.

The master switch on the EMO-Box (→ Chapter 2.4.2 Page 13) needs to be switched on **first**.

To turn on the switch, follow these steps:

1. Turn the master switch [1] counter-clockwise to the Reset position.
2. Turn main switch from OFF to ON.
3. Press the START [21] on the EMO-Box.

✓ The NVision 40 now receives power.

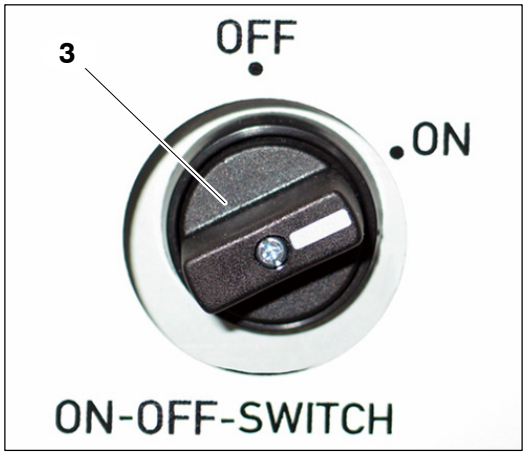
✓ The contactors in the EMO-Box close audibly.

✓ The START button is lit.

4. Turn the on-off switch [3] on the back of the lower frame to on.
5. Open main shut-off valve for cooling water.

IMPORTANT

If the NVision 40 is equipped with an optional water solenoid valve, it will be opened automatically.

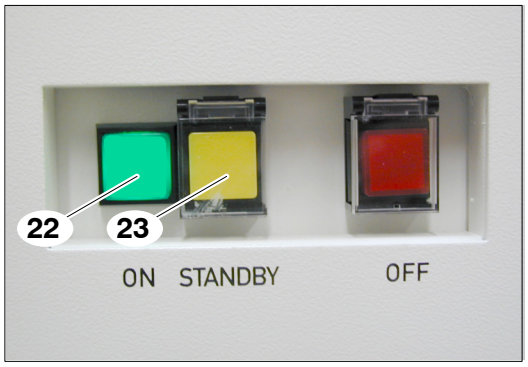


6. Open main shut-off valve for compressed air.
7. Open main shut-off valve for nitrogen.
8. Turn on FIB electronics.
9. Open the cover on the yellow STANDBY-button [23].
10. Press the STANDBY button [23].

- The pre-vacuum pump switches on immediately.
- The vacuum control starts and turns on the vacuum modules one after the other.
- The standby button will be lit.

11. Press the green *ON* [22] button.

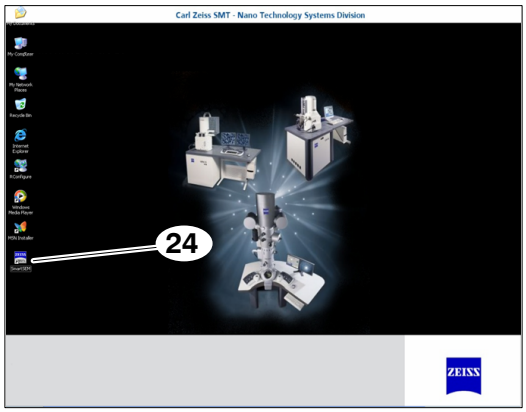
- The ON button is lit.
- All of the electronics are now activated.
- Thecomputer will boot up, and the program icons will appear on the screen.



5.3 Starting the SmartSem® program

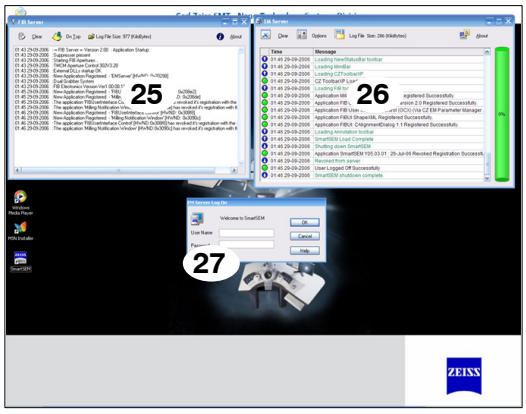
1. Double-click the SmartSem® icon [24] on screen 1 with the left mouse button.

- The SmartSEM® now loads.
- The window of the FIB Server [25] and the EM Server [26] appears on the screen,



IMPORTANT

While the program loads, the screen will also show you which systems, if any, are not ready [25, 26]. This will allow conclusions on possible errors.



- The 'EM Log on' [27] window appears.

2. In the User Name field, enter your user name.
3. In the "Password" field, enter your password.
4. Click OK or press "Enter" on the keyboard.

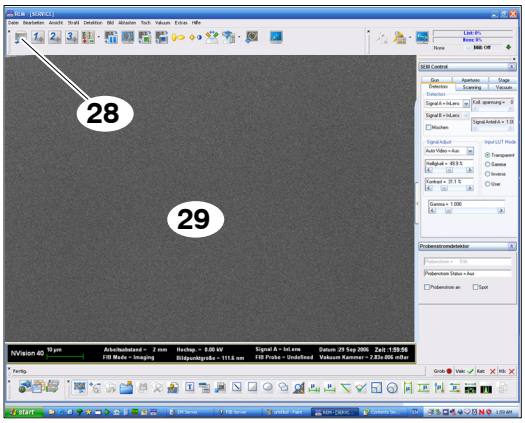
- The main window [29] appears.

5.4 Transfer the specimens

- SmartSem® is active.
- The main window [29] is active.

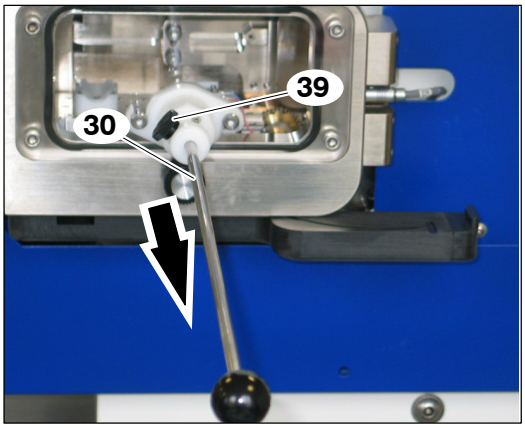
1. Right-click on ”SpecimenChange” [28] and ”Vac Control” .

- The stage in the specimen chamber drives to the exchange position.
- The column gate valve of the FIB is closed.
- The column gate valve of the electro-optic column is closed.
- The high voltage for the SEM and FIB is shut down.
- The FIB lens voltage is switched off.



IMPORTANT

Before purging (evacuating) the chamber, the operator needs to make sure that the chamber door rod [30] is drawn all the way back and locked with the knob [39].

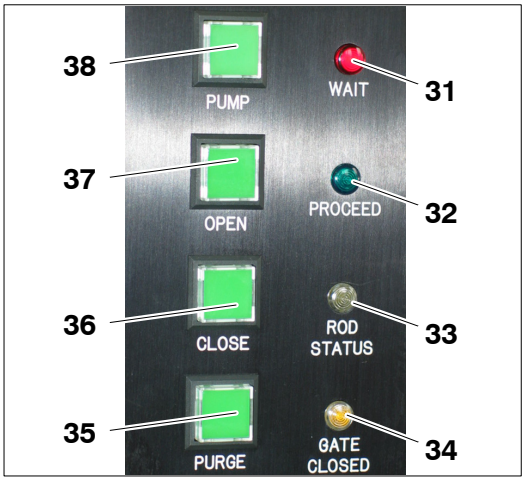


2. Where required, pull back the chamber door rod [30] all the way and lock in place with knob [39].
3. Press the PUMP button on the control block [38].

- The PUMP button is lit.
- After a few seconds, the red indicator lamp (WAIT) [31] turns off and the green indicator light (PROCEED) [32] turns on.

4. Press the OPEN button on the control block [37].

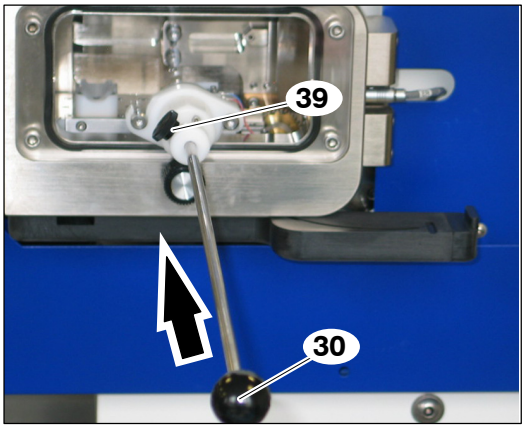
- The yellow indicator lamp [34] ”GATE CLOSED” turns off.
- The inner chamber door opens. The pressure in the chamber may drop by several orders of magnitude.



IMPORTANT

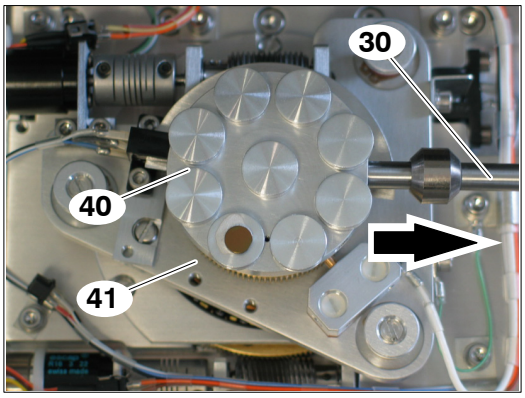
The inner chamber door separates the specimen chamber from the chamber.

5. Release the chamber door rod [30] by turning the knob [39].
6. Insert chamber door rod [30] into specimen chamber.
7. Turn the chamber door rod on black ball in an anti-clockwise direction, thus fastening the specimen holder.



8. Remove the specimen holder [40] from the chamber's specimen stage [41] and place it on the receptacle table in the chamber.
9. Turn the chamber door rod on the black ball in an anti-clockwise direction to release the rod from the specimen holder.
10. Pull the chamber door rod [30] all the way back.
11. Lock the chamber door rod [30].

✓ The "ROD STATUS" [33] indicator lamp lights up.



12. Press "CLOSE" [36].

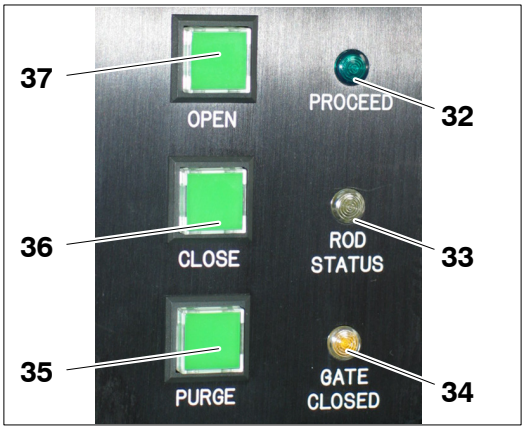
✓ The inner chamber door closes.

✓ The yellow indicator lamp [34] "GATE CLOSED" turns on.

13. Press "PURGE" [35].

✓ The chamber door is filled with nitrogen.

✓ The internal and external pressures will equalise after about 10 seconds.



WARNING

Suffocation hazard when chamber door is opened due to lack of oxygen!
Inhaling air with high nitrogen concentrations may lead to unconsciousness due to a lack of oxygen.

Monitor area with nitrogen sensor or ventilate well.

5.5 Insert specimens

IMPORTANT

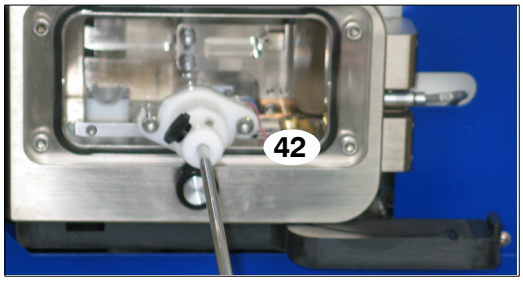
Two specimen holders many be placed on the specimen stage at any one time to increase the throughput rate for the specimens.

By rotating the dial [46]**, you can change the specimen holder while the chamber door is closed.**

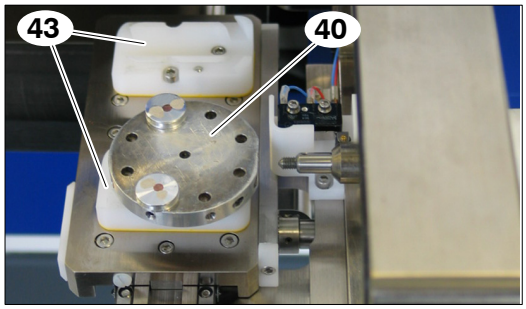
The chamber needs to be vented before the specimens can be inserted.

1. Open chamber door [42].

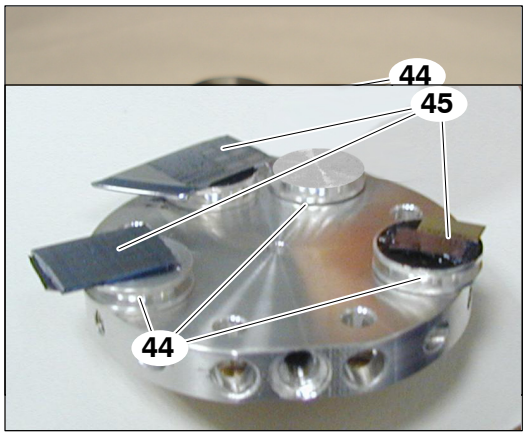
✓ The specimen holder [40] can be exchanged.



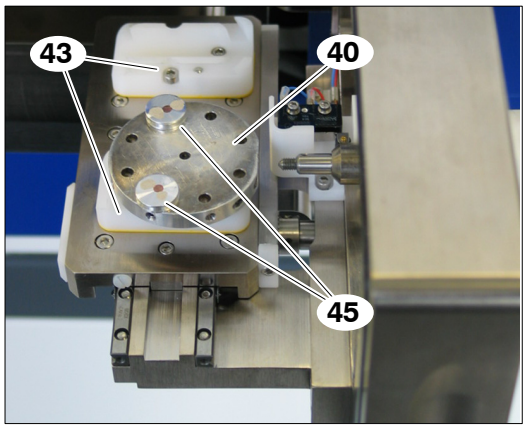
2. Remove specimen holders [40] from the receptacle [43].



3. Load specimen containers [40] into specimen holder [44] and tighten laterally with an Allen wrench (size 1.5).
4. Place samples [44] into specimen containers [45].



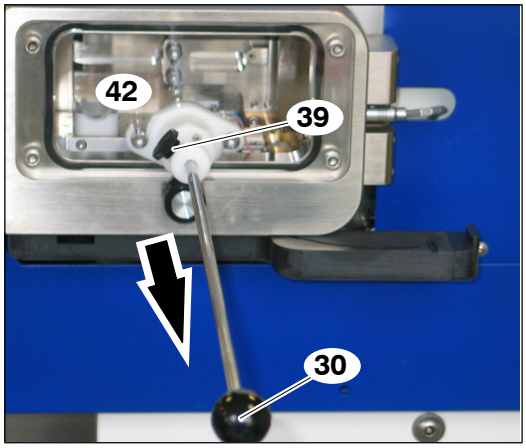
5. Insert the specimen holder [40]with the specimens [45] all the way into the receptacles [43].



6. Close the chamber door [42].

IMPORTANT

Before purging (evacuating) the chamber, the operator needs to make sure that the chamber door rod [30] **is drawn all the way back and locked with the knob** [39]**.**



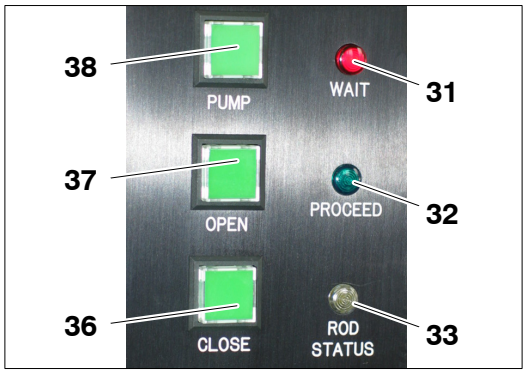
- The green indicator lamp (PROCEED) [32] is lit.

7. Press ”PUMP” [38].

8. Press ”OPEN” [37].

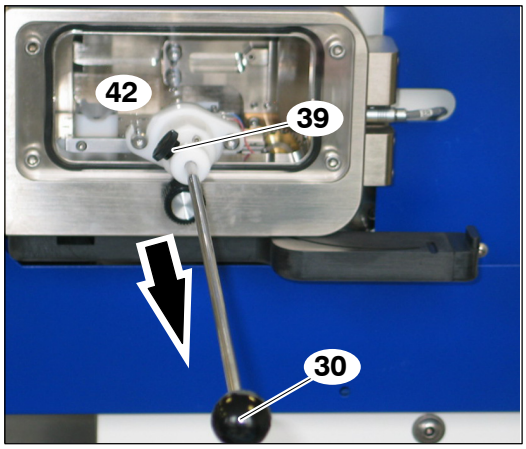
- The inner chamber door opens. The pressure in the chamber may drop by several orders of magnitude.
- The yellow indicator lamp [34] ”GATE CLOSED” turns off.

9. Move the required receptacle on the specimen stage into the working position. To do so, turn the dial [46] until the specimen stage snaps into place.



IMPORTANT

Turn the dial until it clicks into place. When this happens,the stage is not fixed and can be pulled out and removed.



10. Insert chamber door rod [30] into the chamber.
11. Turn the chamber door rod [30] on black ball in an anti-clockwise direction, thus fastening the specimen holder.
12. Insert the specimen holder on the specimen stage into the chamber.
13. Turn the chamber door rod [30] on the black ball in an anti-clockwise direction to release the rod from the specimen holder.
14. Pull the chamber door rod [30] all the way back.
15. Lock the chamber door rod [30] using the dial [39].
16. Press the ”OPEN” [37] button to deactivate it.

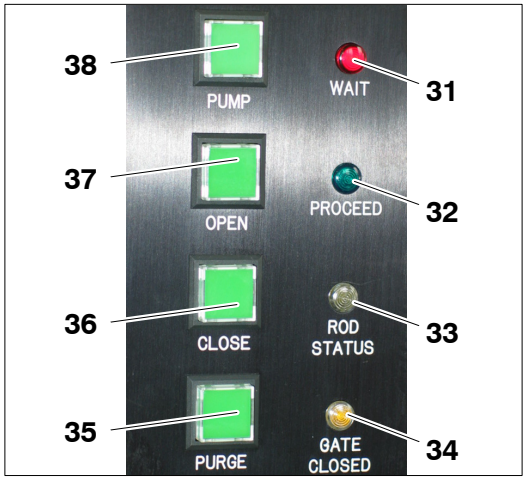
- The ”ROD STATUS” [33] indicator lamp lights up.

17. Press ”CLOSE” [36].

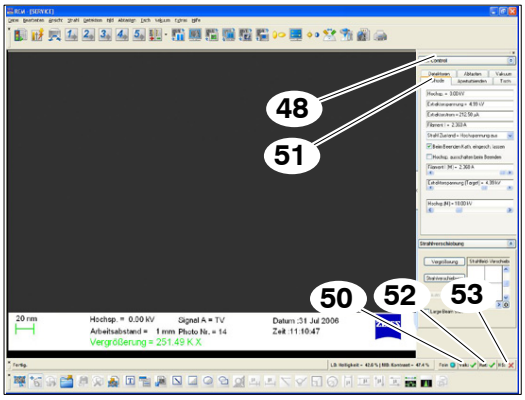
- The CLOSE button is lit and the inner chamber door closes.
- The yellow indicator lamp [34] ”GATE CLOSED” turns on.

18. Press ”PURGE” [35].

- The chamber door is filled with nitrogen.
- The internal and external pressures will equalise after about 10 seconds.



5.6 Activating the electron beam



1. Left-click on ”GUN” [52] (in the status bar).

✓ A drop-down menu will be displayed.

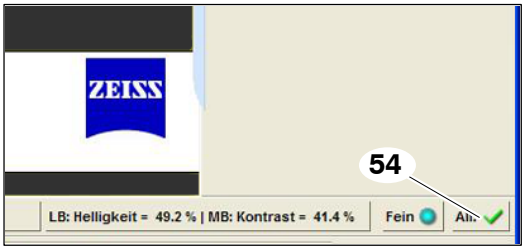
2. Left-click ”Gun on”.

✓ The cathode will heat up.

3. Left-click on the ”Gun” [51] module.

✓ You will see the cathode voltage values.

When the cathode start-up procedure is complete, the red X next to the Gun [52] icon in the status bar will become a green check mark.



4. Left-click on ”EHT” [53] (on the bottom toolbar).

✓ A drop-down menu will be displayed.

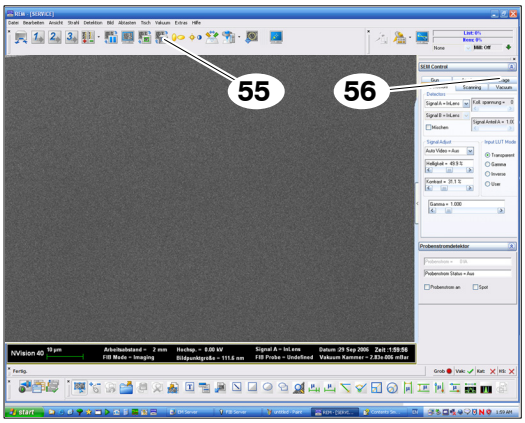
5. Left-click ”EHT ON”.

✓ The acceleration voltage is now on.

✓ The image on the screen will turn lighter.

✓ If the focus is already correct, the contours of the specimen will appear. If not → Chapter 5.9 Page 42.

✓ The indications ”VAC” [50], ”Gun” [52] and ”EHT” [53] will be replaced by one indication ”All” [54].



5.7 Position specimens

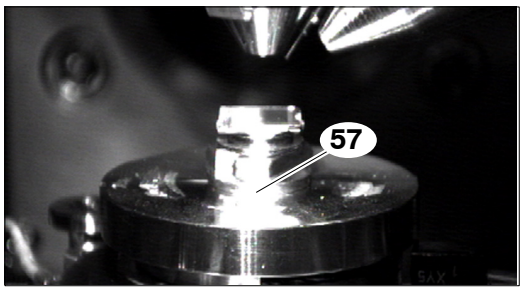
1. Left-click on the ”Camera” icon [55]

2. Left-click to select the tab ”Tools” ⇒ ”SEM-Control” ⇒ ”Stage” [56] .

3. Enter 50 mm for the X-coordinate and 50 mm for die Y-coordinate.

4. Confirm with OK.

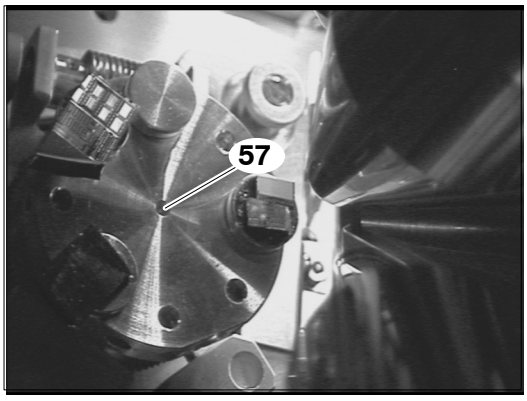
✓ The specimen table drives to the central position below the final lens.



✓ The specimen table [57] is visible in the rear camera.

5. Left-click on the ”Camera” icon [55].

✓ The specimen table [57] is visible in the rear camera.



6. Use the joystick [58] to move the specimen into the range of the SEM.

As soon as the specimen is coarsely focussed under the lens, you can begin to adjust the brightness, contrast, working distance etc. The settings are described in the upcoming chapters.

It may often be necessary to tilt the specimen between 0° and 54° without losing the position of the specimen details. This necessitates using eucentric tipping. If the specimen surface lies on the eucentric axis, the specimen can be tipped without moving a detail in the X or Y direction.

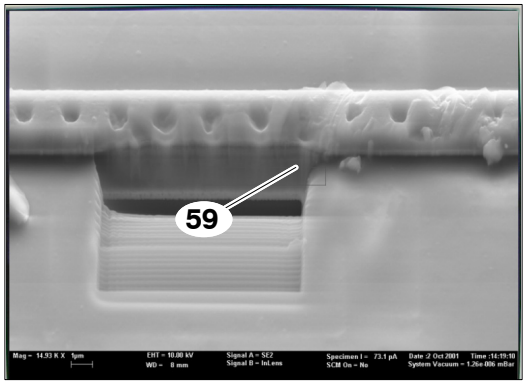
5.7.1 Set eucentric axis with electron beam

1. Tilt the specimen to 0° with a large WD (10 – 20 mm)
2. Set magnification to approx. 500 X
3. Tip T-axis by a few degrees in positive direction
4. When the image moves upwards, the value for the M-axis has to be increased. If the image moves downwards, the value for the M-axis has to be reduced.
5. Repeat successively with various magnifications until specimen details remain static at MAG 2k X (magnification: 2000x) and tilt to 54° .

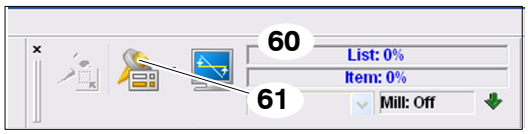
✓ This indicates that you have found the eucentric axis.

5.7.2 Tilt the specimen into the FIB work position.

1. Search for distinguishing features [59] on the specimen and move it to the centre of the screen.
2. Set magnification to approx. 50–100 X
3. Tilt the specimen by 54° (perpendicular to ion beam)
4. Using X and Y, continue to move the specimen until the distinguishing features are in the centre of the screen.



5.7.3 Switch on FIB high voltage



1. In the FIB toolbar [60], click on ”FIB Control” [61].

✓ The window ”FIB Control” appears.

2. Click the ”FIB” tab [62].

✓ The ”FIB” menu is activated.

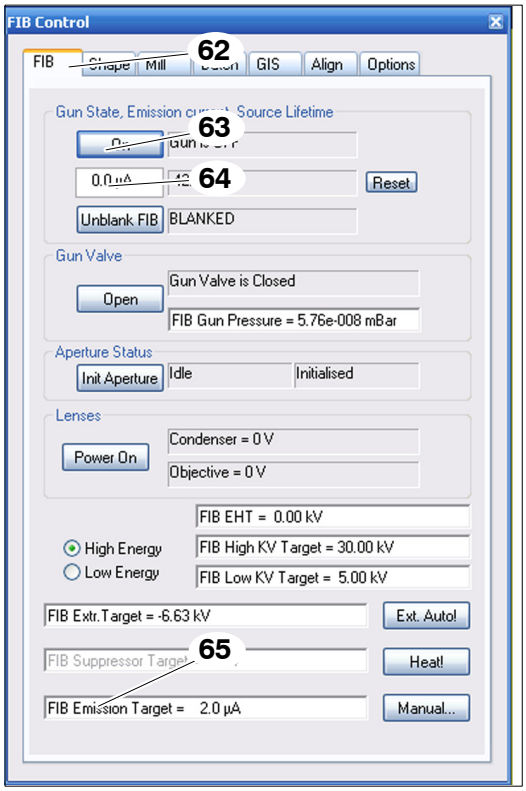
3. Click the field labelled ”On” [63] to start the FIB high voltage.

✓ The FIB high voltage switches on.

✓ The FIB gate valve opens.

✓ The lens voltage is turned on.

✓ This may take several minutes. When complete, the setpoint value [65] is displayed in the field [64] and the background colour shifts from white to green.



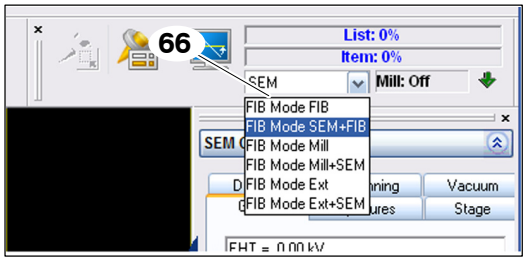
5.7.4 Moving the specimen to the coincidental point:

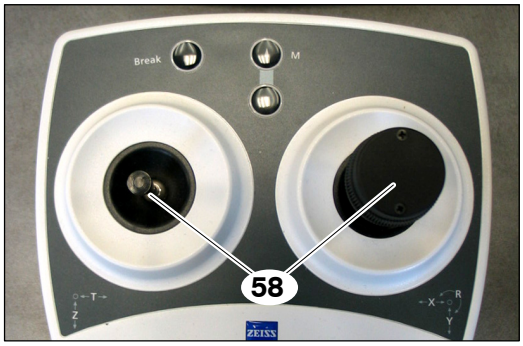
1. Select ”FIB imaging FIB” from the drop-down menu (Mode) [66] (only possible when electron beam activated → Chapter 5.6 Page 38).
Or else press F8.

2. Adjust the brightness, contrast and focus on the hard panel [67] (→ Chapter 5.9 Page 42).

✓ The image that appears is created using the ion beam.

3. Use the joystick [58] to adjust the z-axis so that the same section of the screen is shown when switching between images.



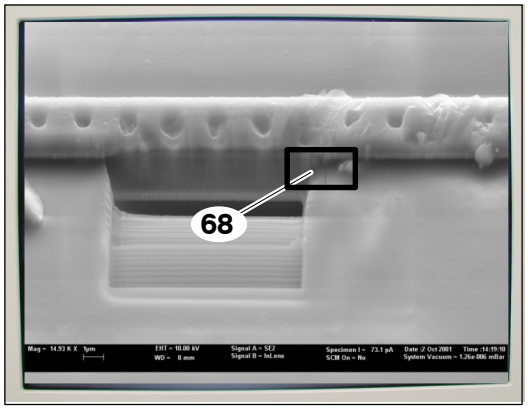


5.8 Adjusting the ion beam

1. Adjust the brightness, contrast and focus on the hard panel [67] (→ Chapter 5.9 Page 42).

2. Use the mouse to select a small window in the screen [68].

✓ The FIB scans through a reduced region. A rapidly vacillating image appears.



3. Click on the Align [69] tab in the ’FIB Control’ window.

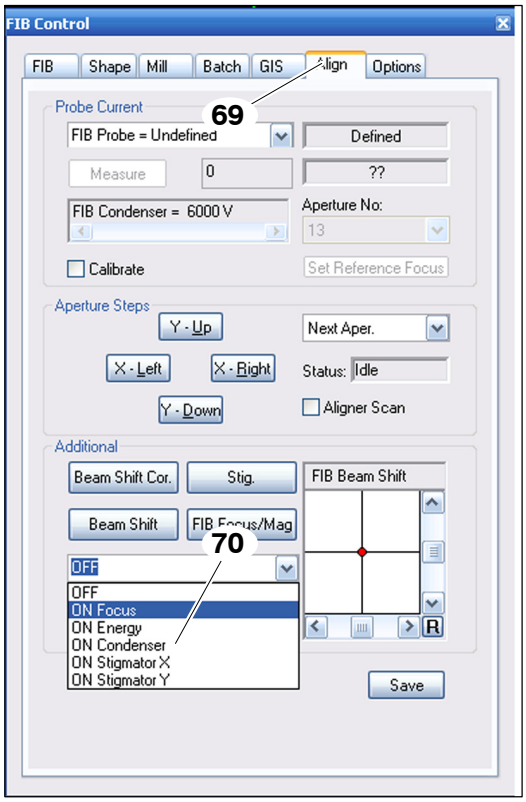
✓ The”FIB Align” menu appears.

   b. Select the ’ON Focus’ mode from the ’Wobble’ [70] drop-down menu.

✓ The voltage of the objective lens is wobbled.

   c. Slow down the image vacillation by clicking the ”Aperture Steps” buttons.

   d. Select the ’OFF’ mode from the ’Wobble’ drop-down menu.



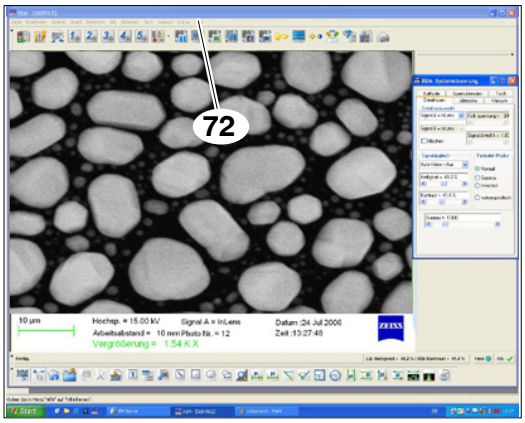
5.9 Focusing the ion beam

The ion beam can be focussed using the focus dial [71] on the hard panel.

Or simply press the Magnification button and focus and move the cursor to the left or right on the ion image while pressing the left mouse button.

5.10 Help functions

5.10.1 Windows help



1. Left-click on ”Help” [72] on the menu bar.

✓ You will see a sub-menu with the following choices:

- Help on help
- Search...
- Release notes
- ”SmartSEM®” help
- Getting started ...
- Shortcuts
- Software version

2. Click on the desired topic in the sub-menu.

5.10.2 ”SmartSEM® Help”

1. Click ”SmartSem® Help” in the sub-menu.

✓ You will see the following directories for ”SmartSEM®” help appears:

- Important information
- Operation of instrument
- Description of the instrument
- Interfaces
- Operating principles
- Accessories
- Care, maintenance, and troubleshooting
- Glossary
- Getting started ...
- How to ...
- Release notes

2. Click on the desired topic in the sub-menu.

5.10.3 Context-based help

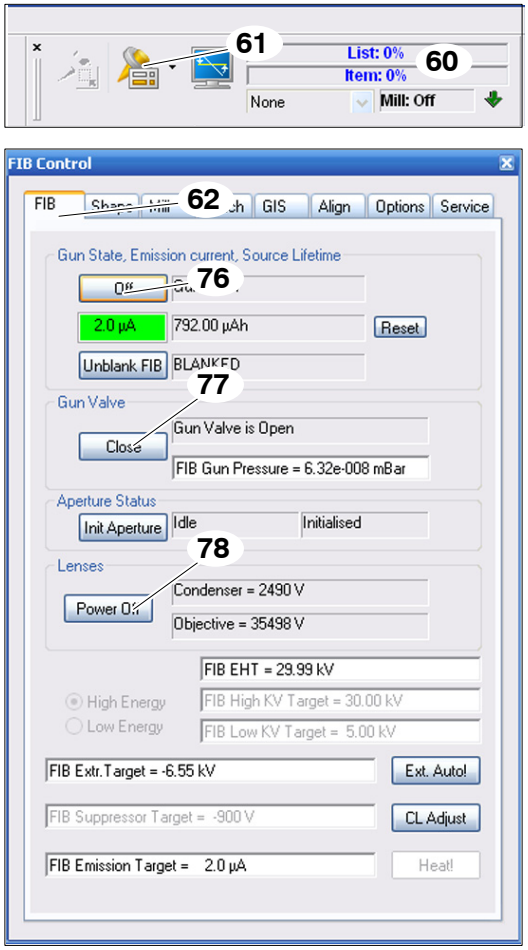
— Press ”F1”.

✓ This opens the ”Using Windows Help” help window.

— Select an action and click on the appropriate area of the screen, or press a key whose function is unknown to you.

5.11 Switch the NVision 40 to standby mode

Standby mode is the normal status for the NVision 40 once you have finished examining a specimen. The SEM cathode continues to heat and the FIB cathode is turned off. The vacuum is maintained throughout the entire system.



1. In the FIB toolbar [60], click on ”FIB Control” [61].

✓ The window ”FIB Control” appears.

2. Click the ”FIB” tab [62].

✓ The ”FIB” menu is activated.

3. Click the field labelled ”On” [76] to switch off the FIB high voltage.

✓ The emitter gun is shut down.

4. Click ”Close” under Gun Valve [77].

✓ The FIB gate valve of the FIB chamber is closed.

5. Click ”Power off” under Lenses [78].

✓ The high-voltage power is cut to the objective and condenser lenses.

5.11.1 Turn off filament heating

IMPORTANT

The cathode will not need to be replaced as often if it is operated for extended periods at a constant temperature (i.e., not turned off).

When switching to Standby mode, the ”SEM Control” [48] windo- wappears where you can select whether the cathode will continue to heat or should be turned off.

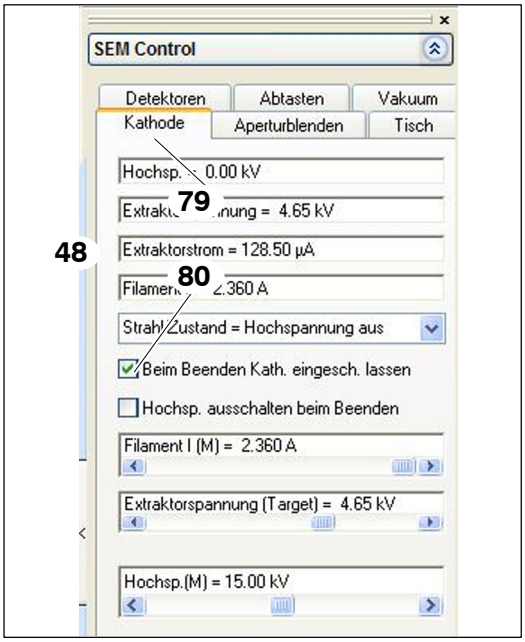
— Select the ”Gun” [79] tab in the ”SEM Control” window.

— If the NVision 40 will not be operated for a short period of time (e.g., overnight), **activate** the ”Leave Gun On at Shutdown” box [80].

✓ The cathode will continue to heat continuously.

— If the NVision 40 will not be operated for a longer period (e.g. weekend, holidays) or if the NVision 40 will be shut down completely, **deactivate** the ”Leave Gun On at Shutdown box” [80].

✓ The filament heating will now be turned off at shutdown.



5.11.2 Venting specimen chamber

When switching to Standby mode, you can select whether the specimen chamber is or is not partially vented.

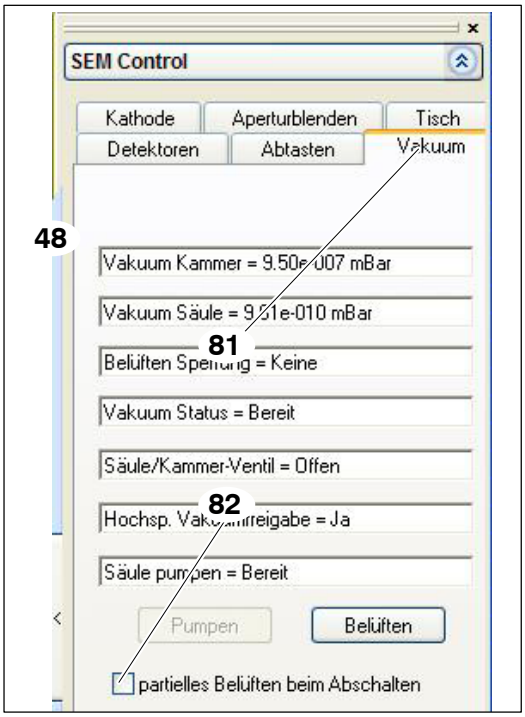
— Select the ”Vacuum” [81] tab in the ”SEM Control” [48] window.

— If the vacuum is in proper working order and the NVision 40 will not be used for an extended time (several days), **activate** the ”Partial Vent on Standby” [82] box.

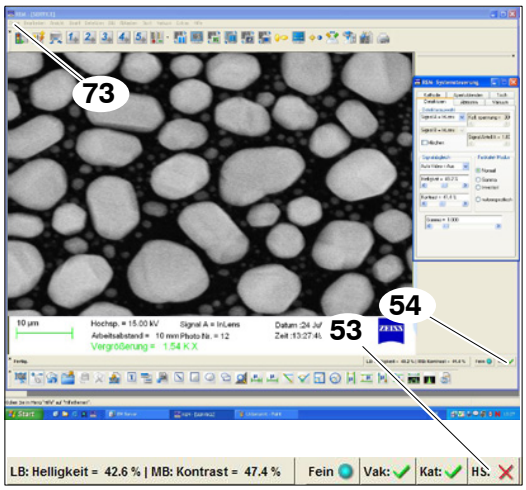
✓ When this option is selected, the venting valve is opened for about 10 seconds and the turbo pump and pre-pump are turned off.

✓ This helps extend the life of the turbo pump and pre-pump.

— If the specimens are replaced at frequent intervals and the vacuum system needs to remain clean, do **deactivate** the ”Partial Vent on Standby [82]” box.



5.11.3 Enable Standby mode.



1. Left-click on ”EHT” [53] or ALL [54] (in the bottom toolbar).

✓ A drop-down menu will be displayed.

2. Left-click on ”EHT OFF”.

✓ The acceleration voltage will shut down.

✓ The electron beam will shut off.

3. Left-click on ”File” [73] on the menu bar.
4. Click on ”Exit” in the drop-down menu.
5. Click on ”Yes” in the next drop-down menu.

✓ The SmartSEM® now closes.

6. Left-click on ”Start” [83].
7. Click ”Shut down” in the drop-down menu.

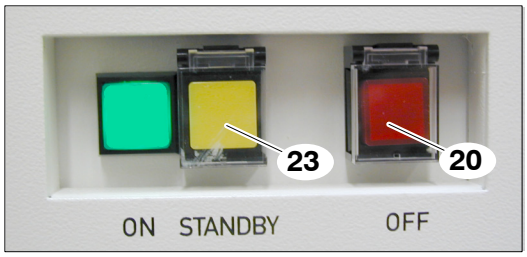
✓ A dialog box opens.

8. Select ”Shut down”.
9. Confirm with OK.

✓ WINDOWS™ is closed and the computer shuts down.

10. Open the cover on the yellow STANDBY button [23] and press the button.

✓ The standby button will be lit.



5.12 Shutting down the NVision 40

The NVision 40 must be shut down for maintenance, repairs, or if the instrument will not be used for an extended period of time.

1. To protect the cathode, the filament heating should be slowly shut down before and while switching to Standby mode.
2. The specimen chambers should also be partially vented.

— The NVision 40 is in standby mode.

3. Open the cover on the red OFF button[20] and press the button.

✓ The ON button is lit.

✓ The computer and the instrument’s electronic components are now off.

✓ When off, the NVision 40 is powered by a 24 V auxiliary power supply required for restart.

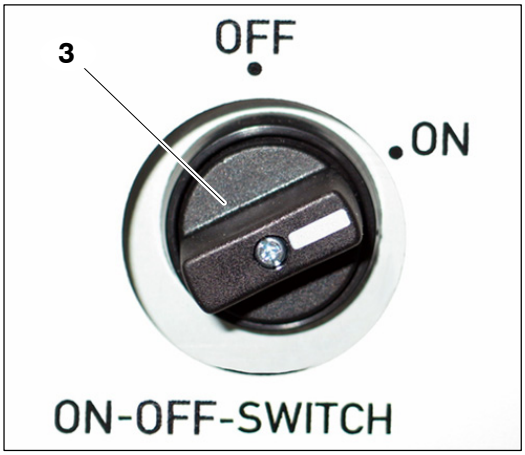
✓ The vacuum system is now off.
The specimen chamber will be partially ventilated (filled with nitrogen) to keep air or dust from being drawn into the column.

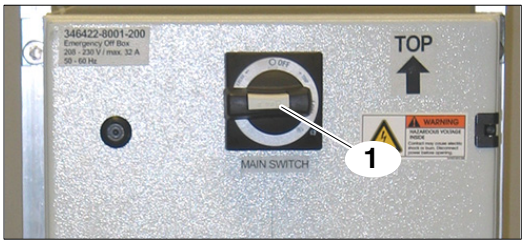
✓ The system is now in ”Normal OFF” mode.

5.13 Shutting down the NVision 40 completely

NOTICE

The NVision 40 should be completely shut down for servicing and in the event of an emergency.





- The NVision 40 is in ”Normal OFF” mode.

1. Set the on-off switch [3] to OFF.

- The power supply to the NVision 40 is now cut off.

2. Turn the master switch [1] to the “O” (OFF) position.

- The NVision 40 is now fully cut off from the mains power.

3. Use a lock to secure the main switch when servicing the unit and unplug the power cable.

6 Removing faults

IMPORTANT

Observe the safety instructions in Chapter 2.

WARNING

High voltage, danger to life!
Only sufficiently knowledgeable and qualified professional electricians may perform work on the electrical installation.

Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform work on the electrical system of the NVision 40.

Problem	Remedy
The NVision 40 won't vent.	Check compressed air supply, check nitrogen supply.
The NVision 40 won't turn on.	Remove any faults. Check the circuit breaker. Check the on-off switch
Message: Water Flow OK= No	Check the flow of cooling water.
The vacuum release is not available after $^{1}/_{2}$ hours.	Check if the specimen releases gas. Contact customer service.
The effectiveness of the corrosion function is worsening.	Contact service hotline.

7 Maintenance

DANGER

Death may result if safety features are removed or non-functional!
The instrument may cause injury or death if operated with the safety features removed!
Replace the safety features immediately after any work on the instrument is completed!
Check the safety features regularly!

WARNING

High voltage, danger to life!
Only sufficiently knowledgeable and qualified professional electricians may perform work on the electrical installation.

Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform work on the electrical system of the NVision 40.

Risk of injury from hot surfaces during bakeout!
Parts of the cover panelling in the upper section of the column may become hot during bakeout, particularly after long bakeout.
Do not touch any parts of the cover panels or place any combustible objects on the electron optical column grid!

Hazard of poisoning or chemical burns from gases.

It is forbidden to eat or drink at the workplace!
Always eat in employee break rooms or cafeteria areas!

Observe the instructions in the safety data sheets from the manufacturer on the use of each gas.

IMPORTANT

Comply with all safety requirements pertaining to fire and explosion prevention!

Flange and vacuum part may only be replaced with original spare parts or approved spare or accessory parts.

7.1 Inspection and service schedule

No.	Tasks to be performed	Frequency	Comments
1.	Check for cleanliness	daily	Clean the NVision 40 with clean, dry, lint-free cloth if dirty.
2.	Check function of safety devices and covers	weekly	Contact customer service if necessary.
3.	Clean/replace HV-Penning electrode	annually	Contact service hotline.
4.	Adjust aperture/magnification	annually	Contact service hotline.

7.2 Baking out the cathode head

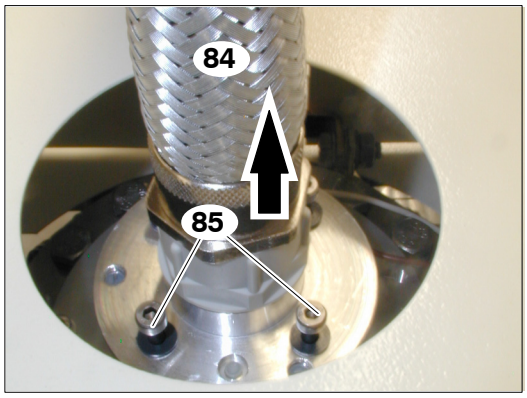
IMPORTANT

Observe the safety instructions in Chapter 2.

The vacuum in the cathode head will deteriorate over time. If the pressure increases to a value of 8×10^{-9} ... 9×10^{-9} mbar, you need to bake out the cathode using the following procedure.

IMPORTANT

Only qualified and trained service technicians authorised by NTS/SMT are permitted to perform the bakeout procedure.



1. Shut down the high-voltage connections (EHT and GUN).
2. Loosen and remove the fastening screws [85].
3. Take hold of the high-voltage line [84].
4. Pull the plug out of the cathode head. (→ arrow)

NOTICE

Be careful not to knock the cathode out of alignment!
Do not apply any side-to-side force while pulling out the high-voltage line. Pull it straight back.

5. Cover the cable bushing with aluminium foil and wrap the high-voltage plug in aluminum foil.
6. Select menu: *Extras →Goto menu ... →Bakeout*

WARNING

Risk of injury from hot surfaces during bakeout!
Parts of the enclosure in the upper range of the column may become hot during bakeout, particularly after long bakeout cycles.
Do not touch any parts of the cover panels or place any combustible objects on the electron optical column grid!

You can choose from one of four bakeout cycles:

- Quick: Heat 2 hours/ cool 1 hour
- Overnight: Heat 8 hours/ cool 2 hours
- Weekend: Heat 40 hours/ cool 3 hours
- Operator: customised settings

7. After bakeout is complete, plug the plug back into the cathode and switch the high-voltage line on.

7.3 Cathode replacement

After approx. 1000 hours of operation, cathode emission will decrease, and the cathode must be replaced.

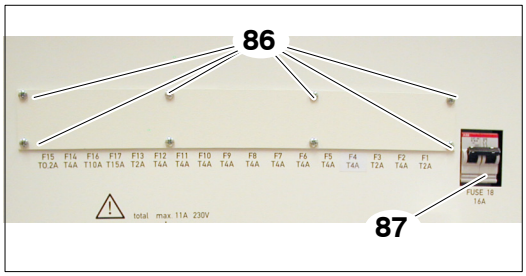
IMPORTANT

Only qualified and trained service technicians authorised by NTS/SMT are permitted to replace the cathode.

7.4 Replacing fuses

IMPORTANT

Observe the safety instructions in Chapters 2 and 7.
Only use original replacement parts.



1. Shut down the NVision 40 completely.
(→ Chapter 5.13 - Page 46)
2. Check the miniature circuit breaker [87] (must be in upper position).
3. Loosen and remove the screws [86].
4. Remove the panel.
5. Check the fuses. Remove and replace as necessary.
6. Reinstall the panel.
7. Tighten the screws [86].

No	Va-lue	Compo-nents	No	Va-lue	Compo-nents	No	Value	Components	No	Value	Compo-nents
F1	T2A	Water Valve	F6	T4A	EHT	F11	T4A	Spare	F16	T10A	Rotary Pump
F2	T4A	IP-PSU	F7	T4A	PC	F12	T4A	Spare	F17	T15A	EO-PWSPL
F3	T2A	Heater 1	F8	T4A	Spare	F13	T2A	Spare			
F4	T2A	Heater 2	F9	T4A	EDX	F14	T4A	Turbo PWSPL			
F5	T4A	Spare	F10	T4A	WDX	F15	T0,2A	24V Contr. Volt.			

7.5 Servicing the MSG

IMPORTANT

Only service technician authorised by NTS/SMT are permitted to open and close the MGS cabinet or inspect and service the GIS and MGS.

8 Customer service

IMPORTANT

If damage or defects that could endanger people or property are discovered on the NVision 40, shut down the machine immediately and do not use it again until all repairs are completed!

Only trained and qualified personnel may perform maintenance and repairs on the instrument!

To ensure trouble-free operation of the NVision 40 and obtain reliable results, we recommend concluding a service agreement with Carl Zeiss SMT AG.

Carl Zeiss SMT AG, Oberkochen
→ last page

Radiation protection officer
Dr. Sold +49 (0) 73 64 20 29 51

Service Hotline +49 (0) 73 64 20 61 38

Responsible Service Technician Name:

Phone:

Instrument log A

- Instrument-No. _____
- Sheet No. _____
- Responsible person Name: Phone:

IMPORTANT

Instructions, tests, and changes in location must be document in instrument log A.

You may copy pages from this instruction manual for the instrument log, but you must number them consecutively!

Instructions

The knowledge of the operating- and maintenance technician has been tested by a competent party (e.g., safety officer, supervisor) **before any work is performed**. The operating personnel are to be instructed on the safety regulations.

I hereby confirm that the safety instructions were given and my technical knowledge was checked. I have read the operating manual in full. I spoke to my supervisor and resolved everything I was unsure of.

Person instructed	Signature	Date	Instructed by

Instrument log B

- Instrument-No. _____
- Sheet No. _____
- Responsible person Name: Phone:

IMPORTANT

Maintenance, repairs and changes in location must be documented in instrument log B.

You may copy pages from this instruction manual for the instrument log, but you must number them consecutively!

Work and modifications carried out

Work and modifications carried out	Date	Signature

Work and modifications carried out	Date	Signature

9 Disposal

IMPORTANT

The operator must ensure that waste products are disposed of and recycled in a responsible fashion.

(EC-guidelines 2002/96/EC concerning waste electrical and electronic equipment WEEE)
Observe the law on marketing, retraction and environmentally-friendly disposal of electrical and electronic equipment of 16.03.2005.

The NVision 40 has a modular structure. Be careful to separate the materials properly when you dispose of the instrument:

Dispose of empty gas tanks according to the instructions of the manufacturer.

Materials: e.g., metals, non-metals, composite materials, process materials

Electronic scrap material: e.g., transformers, circuit boards, cables

Comply with national and regional waste disposal ordinances.

10 Technical data

General data			
Dimensions:	Basic instrument Electronic rack for FIB GIS cabinet	W x D x H W x D x H W X D x H	max. 1300 x 1422 x 2008 mm max. 1120 x 920 x 1870 mm max. 1050 x 650 x 1970 mm
Transport weight:	Crate 1 Crate 2 Crate 3 Crate 4 Crate 5		900 kg 100 kg 300 kg 100 kg 200 kg
Room size			min. 3.5 x 5.0 x 2.3 m
Installation category			II
Application			exclusively inside buildings

Electrical system	
Nominal AC voltage	208 ... 230 V AC +10% ... -10%
Nominal frequency	50 ... 60 Hz
Nominal power	3600 VA
Nominal current of line-side fuse	max. 32 A K
PE conductor cross-section (protective earth)	> 4 mm^2
Ground resistance	<0.1 Ω
Protection class	I

Cooling	
Water flow rate	min. 1.5 l/min
Input pressure	2 ... 3 bar
Water temperature	18 °C ... 22 °C

Ambient conditions	
Ambient temperature	approx. 21 °C ±4 °C (stability 0.5 °C/h)
Relative humidity	< 60%
Floor vibrations	< 2 µm/sec rms. <15 Hz <4 µm/sec rms. 15 Hz ... 25 Hz < 7 µm/sec rms. >25 Hz
Magnetic fields	AC components < 2 mG 50/60 Hz DC components 0.5 mG / 5 min
Acoustic noise	<53 dBA at frequency of < 200 Hz <42 dBA at frequency of 200-300 Hz <50 dBA at frequency of > 300 Hz
Degree of pollution	2
Maximum operating altitude	2000 m above sea level

Nitrogen	
Pressure	0,2 ... 0.3 bar
Nitrogen use when chamber is open	3 l/min
Percentage purity	99,996 %

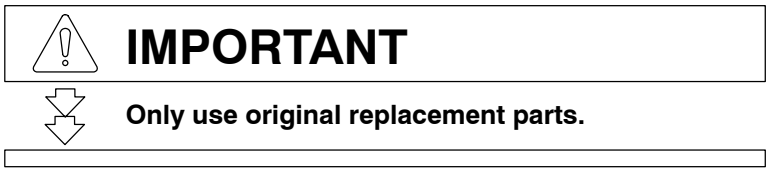
Compressed air	
Flow	<1 l/min
Input pressure	min. 5 bar max. 6 bar

11 Appendix

11.1 Consumption parts

Name		No.
FE cathode	Demka / FEI	302.102
Ga emitter	SII	349360-8010-000

11.2 Spare parts



Name		No.
Fuses	T 0.2 A T 2.0 A T 4.0 A T10.0 A T15.0 A	127.013 127.024 122.131 302.848 148.331

11.3 Accessories

Name		No.
Tweezers for specimen		119-269
Specimen holder	See Accessories list	
Specimen container		345812-0000-000
1.5 mm Allen wrench		151-883

12 Declaration of conformity

Declaration of Conformity
Konformitätserklärung
Déclaration de Conformité

We / Wir / Nous

Carl Zeiss NTS GmbH
Carl-Zeiss-Str. 56
73447 Oberkochen
Germany

declare under our sole responsibility that the product
erklären in alleiniger Verantwortung, daß das Produkt
déclarons sous notre seule responsibilité que le produit

NVISION 40

to which this declaration relates are in conformity with the following standards
auf die sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt
auxquels se référe cette déclaration sont conformes aux normes

EN 61000-6-4	**Conductive and Radiated Emissions (Class A on Radiated Emissions)**
EN 61000-6-2	**Immunity**
EN 61010-1	**Safety requirements for electrical equipment for measurement control and laboratory use**

following the provisions of directives
gemäß den Bestimmungen der Richtlinien
conformément aux dispositions des directives

89/336/EEC	**Electromagnetic Compatibility, changed by 93/68/EEC**
73/23/EEC	**Low Voltage, changed by 2006/95/EG**

for and on behalf of

Signed:	Dr. Michael Steigerwald	Dr. Markus Dilger
Position:	R&D Manager	Member of the Board
Date:	23.01.2007	23.01.2007

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