

User manual – Training, beamline 7.3.1 (PEEM-2)

The PEEM-2 endstation is a scientific instrument. This manual is meant to identify possible risks in operating the endstation and procedures to avoid them. Engineered controls are implemented to minimize the risk if used properly. Please use good judgment in using the equipment and contact the beamline scientist if in doubt about how to operate it.

Do not disassemble any components without contacting the beamline scientist. A shielding change form may be required.

Before starting work

Discuss your experiment with the beamline scientist and receive training in using the equipment. No formal training is needed at this beamline in addition to the general user training required by the ALS.

Do not start work before proper documentation of the experiment signed and in place: ESS (experiment safety sheet, valid 1 year) and UEF (user experiment form, valid for the duration of an experiment).

The ESS needs to list all experimenters, and all risks associated with the planned experiment. Based on the ESS, ALS safety personal and the beamline scientist will inspect all equipment and materials brought to the ALS. The ESS and UEF signature pages need to be signed.

Shielding

The PEEM-2 microscope chamber and the beamline upstream, including I0 section, exit slit are classified as shielding. Beamline 7.3.1 does not have a shielding end point. All vacuum work on microscope and beamline requires a shielding change form. Do not vent/work on the chamber without a valid permit. Work on preparation chamber and load lock does not require a shielding change form.

High voltage

PEEM uses high voltage (>50V) for electron lenses, deflector plates and ion pumps. The charged electrodes are inside the vacuum vessel and cannot be touched accidentally when the vessel is closed. High voltage cables connect the electrodes through shielded vacuum feedthroughs with HV powersupplies. These cables and feedthroughs must not be disconnected, modified or dismantled without contacting the BL scientist and, if necessary, help by certified electrical technicians. The sample HV can be shorted by transferring a sample when the manipulator/sample voltage is on. This should be avoided to protect powersupplies and equipment but does not constitute a safety risk since transfer rod and chamber are grounded. A vacuum sensor turns off deflector and lens supplies when the chamber is vented to prevent an accidental turning on of the HV when the chamber is open and accessible.

Hot deck

High voltage to the sample is distributed via a “Hot Deck”, which in operation is on the same potential as the sample (up to 30 kV but usually between 15 and 20 kV). The hot deck houses powersupplies and measurement equipment for various functions of the sample holder (heating, magnetic fields, pulses, etc.).

Do not access the hot deck behind the stairs without training by the beamline scientist.

The hot deck door is locked by a key and an additional magnetic lock, which engages when the PEEM lens (and sample) powersupplies are turned on. Opening the door will activate a door interlock that disables the HV powersupplies.

Checklist for opening the hot deck:

- Lower voltages (all lenses) on computer control panel.
- Wait until all voltages have reached zero potential.
- Stop control panel.
- Turn off lens powersupplies.
- Turn off main power to lens supplies.
- Remove stairs.
- Open key lock and open door.
- Make sure that the hot deck is not charged.
- Do work

Checklist for closing the hot deck:

- Make sure that all cables are bundled in the center of the hot deck, away from the support structure, which is on ground potential.
- Close door.
- Ascertain that no conductive cables are entering the hot deck through the door.
- Lock the door
- Rotate stairs back.
- Turn on main power to lens powersupplies.
- Turn on lens powersupplies.
- Start computer control panel and start working

Removing the sample manipulator:

Removal the sample manipulator is a relatively frequent task to collect samples lost during the sample transfer. Since PEEM-2 is part of the beamline, a shielding change form needs to be in place before starting the work. In order to remove the manipulator, the HV cable needs to be disconnected at the manipulator and the HV contacts become accessible. "Lockout-tagout" of the HV supplies by qualified personal is required to ascertain that the cable cannot be energized. The vacuum sensor that shuts down the supplies when the chamber is vented does not fully protect against HV shocks, since the chamber can be pumped down without the cable being reconnected.

Liquid nitrogen

Boil off from a liquid nitrogen tank is used to vent the load lock. No precautions are needed when N₂ gas is used through the installed gas hoses. Use proper PPE (personal protective equipment), when using liquid N₂ from the tank (not currently used): safety glasses, face shield, proper gloves. A overpressure valve protects the tank from accidental pressurization.

Falling hazards

The PEEM-2 endstation has 2 elevated platform. Use caution navigating those stairs and use handrails and handholds. Do not climb on top of the equipment.

Chemical hazards

Chemicals (ethanol in particular) are used for sample cleaning. Use PPE (gloves, safety glasses). Do not eat or drink at the endstation. All chemicals and samples need to be listed in the user ESS (experiment safety sheet) and proper PPE needs to be used..