

1-15 with UV-PEEM, 16 and insertion of CA and energy slit with LEEM (and repeat 16,1 to 15). Step 7 and afterwards might need realignments when FoV changed.

LEEM2000 - LEEM Control Program Version 43.8.7 < --- > Remote Process

View Tools Scripts

Objective

Objective 1965.3 mA (2)

Obj.Stigm. -58.92 mA

Obj.Stigm. -1.26 mA

Obj.Align. 24.00 mA

Obj.Align. -23.00 mA

Illumination Optics

Illum.Stigm. 108.90 mA

Illum.Stigm. 18.70 mA

Illum.Defl. -12.83 mA

Illum.Defl. -1.66 mA

Cond. Len. 782.10 mA

CI3 Align. -91.70 mA

CI3 Align. -172.80 mA

Cond. Len. 2500.0 mA

CI2 Align. -115.32 mA

CI2 Align. -15.04 mA

Cond. Len. 896.90 mA

Electron Source

Wehnelt -290.00 V

Emission Curr. 0.00 μ A

Sample

Start Volta -0.09 V

Sample Temp. 20.4 $^{\circ}$ C

Bomb. Vol. 10.02 V

Temp. Cor. OFF

Filament 20.00 mA

Emission 0.0 mA

Ccs +/-1 0.0 mA

Mag. Com. -226.00 mA

Imaging Optics

Transfer L 530.00 mA (6)

Difr.Stigm. -51.00 mA

Difr.Stigm. 66.40 mA

FI Align.X 66.64 mA

FI Align.Y 10.91 mA

Field Lens 1682.9 mA

II Align.X -5.89 mA

II Align.Y 17.43 mA

Intern. Len. 1928.2 mA (9)

P1 Align.X 9.55 mA

P1 Align.Y 36.92 mA

Projective 1077.2 mA (10)

RI Align.X 7.69 mA

RI Align.Y 9.72 mA

Ana.Stigm. 0.0 mA

Ana.Stigm. 0.0 mA

Vacuum Gauges

MCH 286 $\times 10^{-10}$ Torr

COL 393 $\times 10^{-10}$ Torr

PCH 900 $\times 10^{-10}$ Torr

Sample Temp.

20.4 $^{\circ}$ C

Emission Curr.

0.00 μ A

Object(MOB)

Adjust fine medium coarse

Toggle 0.11 + 0.11 %Fs 1.4 Hz

Wehnelt[WEH]

Adjust fine medium coarse

Turn off electron gun

Projection System

P2 Align.X 23.45 mA

P2 Align.Y 22.69 mA

Projective 1152.9 mA (14)

P3 Align.X 204.70 mA

P3 Align.Y 59.70 mA

Projective 2200.0 mA (15)

Motors

Right -1035.1 μ m

Left 1035.4 μ m

Top -199.1 μ m

Bottom 199.1 μ m

Manip.X 11.4 μ m

Manip.Y 24.6 μ m

Slit -1600.0 μ m

Ca Motion -1000.0 μ m

Ca Correc 0.0 μ m

Mirror

Mt1 Align.X 9.80 mA

Mt1 Align.Y -26.10 mA

Mtrans. Le 6934.5 V

Mirror Stig. 0.0 V

Mirror Stig. 0.0 V

Mirror Align. 42.30 V

Mfocus 6798.9 V

Mextractor 2348.9 V

Mirror 2000.2 V

Workfunct. 0.0 V

Energy Analyzer

Ret. Lens 7709.0 V

Inner Lens 3712.9 V

Bias 1024.5 V

Sel +/- 80.19 V

Al Align.A 33.10 mA

Al Align.B -143.90 mA

Acc. Lens 651.90 V

Sample tilt

Right -1035.1 μ m

Left 1035.4 μ m

Top -199.1 μ m

Bottom 199.1 μ m

Sample position

Energy slit

Contrast aperture

Based on Marker for sample tilt

MEM-LEEM transition; e-gun normal incidence

Alignment is normally not needed. If necessary, align the other columns well with PEEM first.

Current sample location

DP mode

Pass energy

Adjust FL value if needed

Align towards the opposite direction of breath center.

Wobble (amplitude and frequency)

Turn off electron gun

(2) Needs to be aligned with marker instead of ref point.

(14) Can be used for zooming out after alignment. Remember the value for typing back.

Current of deflectors will not exceed 70mA, except P3'Y.

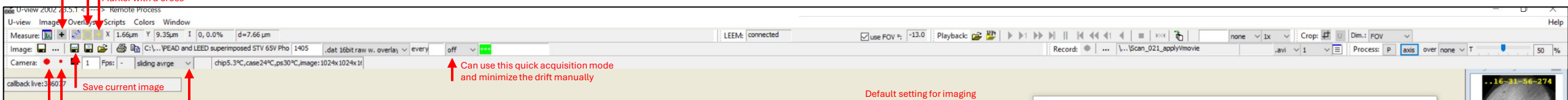
(3) X-alignment (Outer sel) might change incidence angle. (check step 16)

(S2) Adjust when circles in LEED (patterns) are not round.

(S1) After adjustment on S1, check Illum deflectors (MEM-LEEM transition).

Magnification ■ Click three positions to

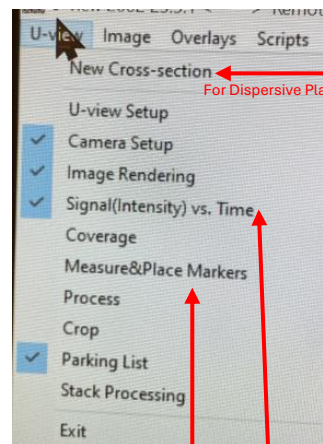
- Marker with a cross



Acquisition mode:
continue mode / single shot

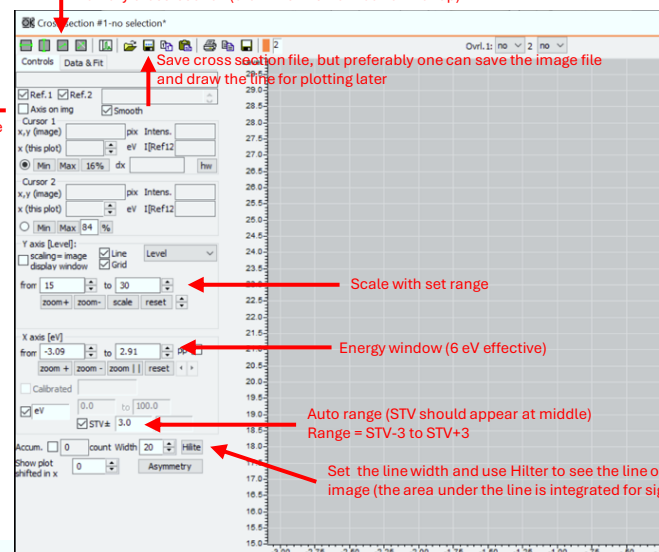
Average number per image
Sliding avrg = 25% * first image + 75% * second image

Arbitrary cross-section (draw the line from bottom to top)



Control panel of markers

For Dispersive Plane (DP) mode

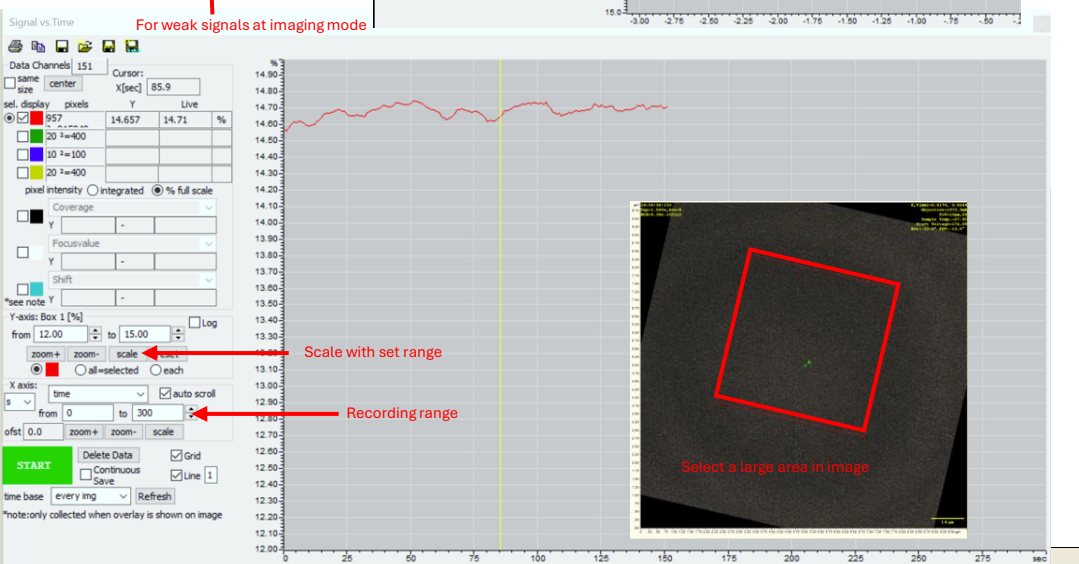


- Scale with set range

Energy window (6 eV effective)

Auto range (STV should appear at middle)
Range = STV-3 to STV+3

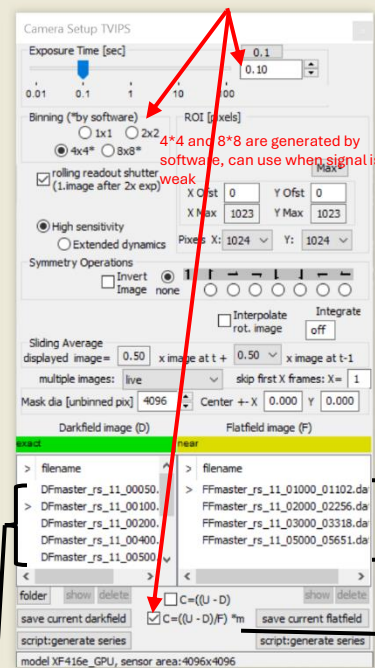
Set the line width and use **Filter** to see the line on image (the area under the line is integrated for signal)



Scale with set range

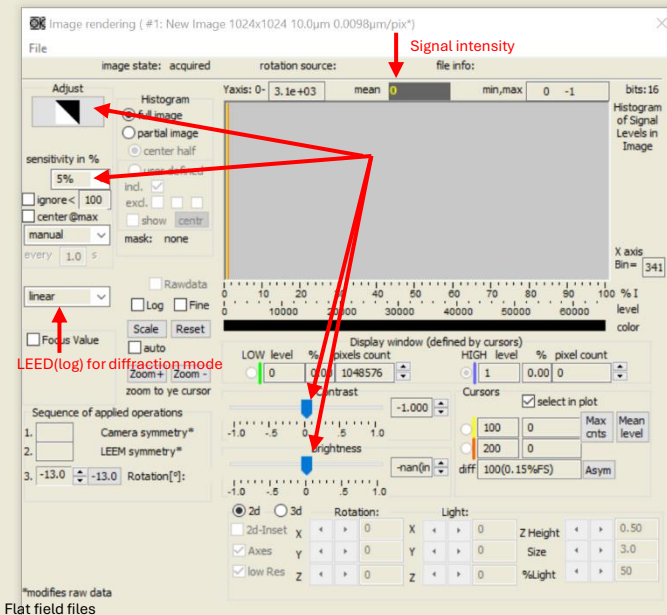
- Recording range

Default setting for imaging



4*4 and 8*8 are generated by software, can use when signal is weak

Dark field files
(Background files for image data)



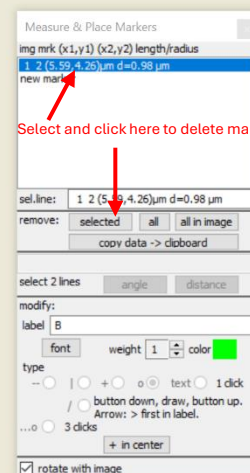
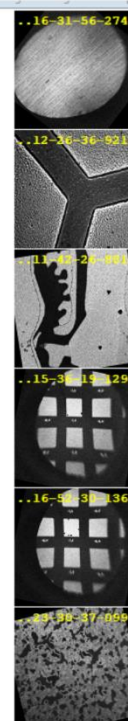
Signal intensity

LEED(log) for diffraction mode

(Correction for the non-uniform gain efficiency of microscope pixels)

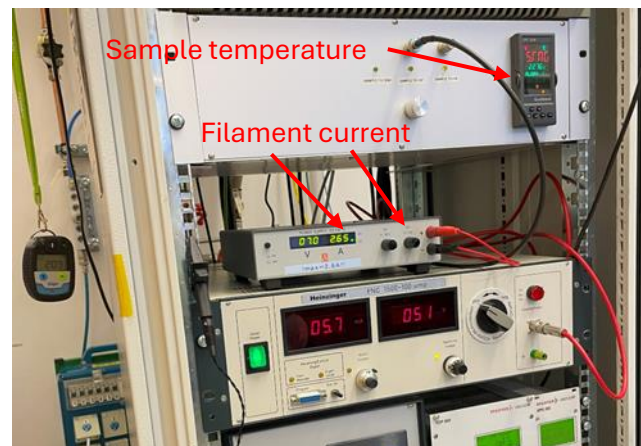
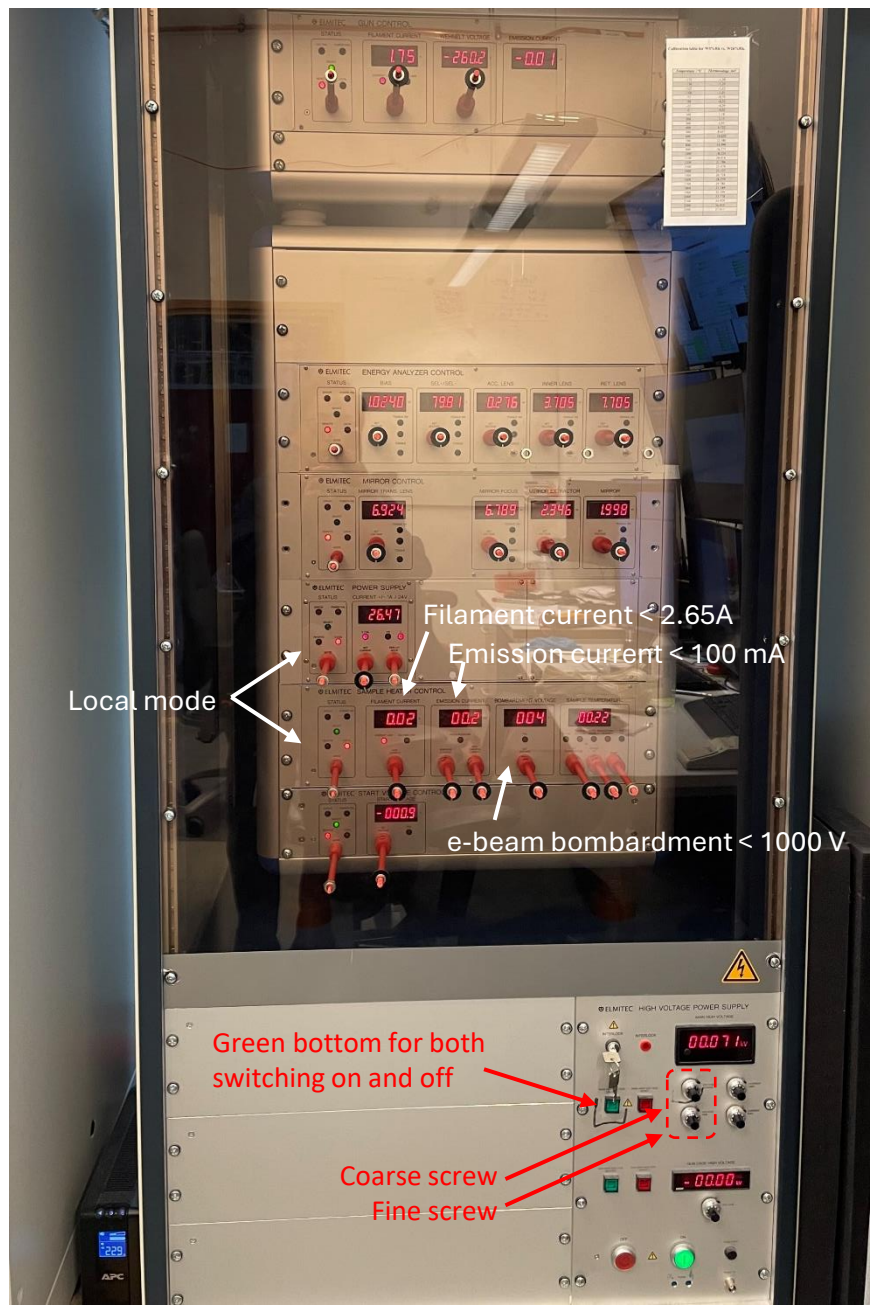
C=(U-D)
Corrected = Uncorrected – Dark field

C=((U-D)/F)*m (default for data acquisition)
Corrected = [(Uncorrected – Dark field)/Flat field]* Normalization



Select and click here to delete marker

Annealing/Degasing



Annealing in Prep chamber

CAREFUL! * Current is set to minimum when switching on.

1.2A ~ 150 °C

1.5A ~ 200 °C

2.0A ~ 300 °C



Annealing in Main chamber

- * Remember to move sample at least 3mm away from objective lens.
- * Disable interlock beforehand.
- Check valves to prep chamber and column chamber are closed.
- * Eyes on pressure when annealing.

Filament in Main chamber (2.65A ~ up to 400 °C)

* During annealing, pressure is kept at least on the order of 10^{-8} torr, even with interlock disabled.

e-beam bombardment in Main chamber (< 1000V, ~ 1300 - 1500 °C)

800 °C = Filament 2.65A + e-beam bombardment 360 V

600 °C = Filament 2.65A + e-beam bombardment 200 V

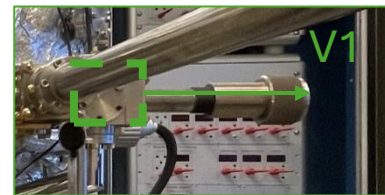
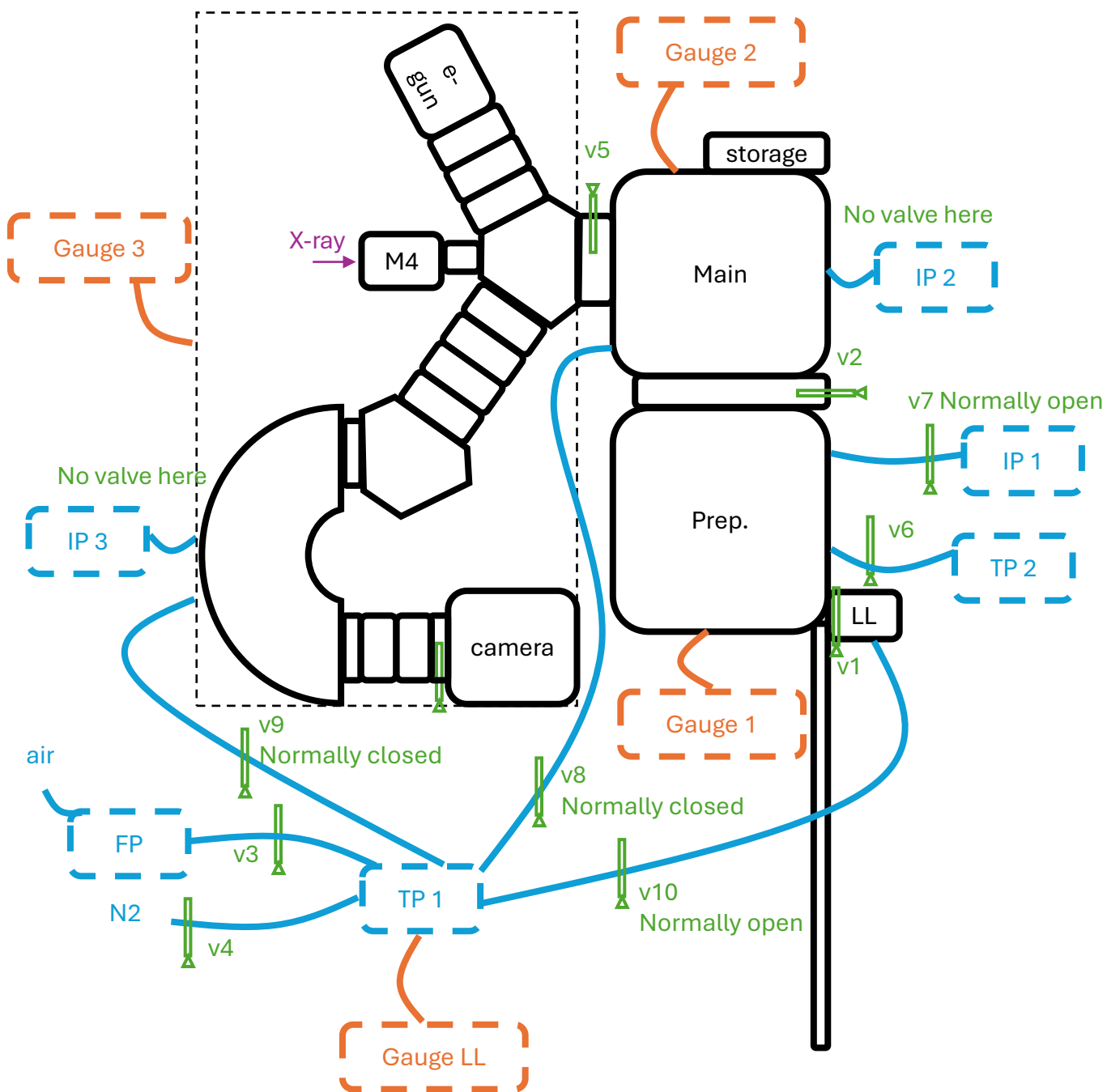
Pyrometers

Pyrometer is needed to check the sample temperature.

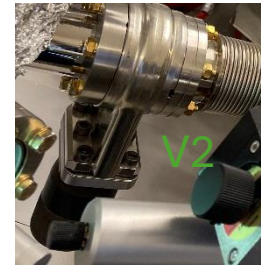
There are two pyrometers in lab (top shelf).

One starts working at 250 °C: Set mode as CONT and set emissivity according to sample.

Another one starts working at 600 °C: Mode matters when heating towards high temperature, so use 'None' when only heating to 800 °C. Set emissivity according to sample.



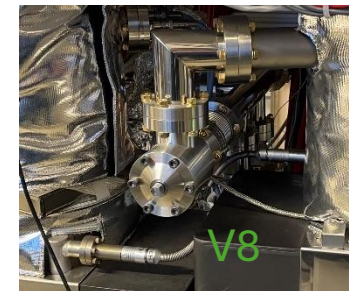
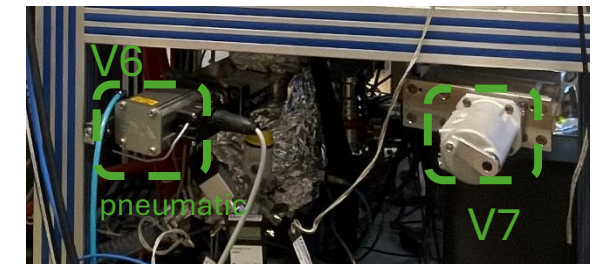
This direction to close the valve.
Separating Load lock from Prep. Chamber.



Separating forepump FP and small turbo pump TP1



Left side view of v7
close ☐ open ☐



Safe working regions about pressure: (1 torr = 1.33 mbar)

Ion pumps (start pressure: 10^{-6} to 10^{-7} torr) to (achievable pressure: 10^{-10} to 10^{-11} torr)

Turbo pumps (start pressure: 10^{-2} to 10^{-3} torr) to (achievable pressure: 10^{-9} torr)

Forepump (start pressure: air) to (achievable pressure: 10^{-2} torr)

Gauge 1-3: start pressure: 10^{-6} to be safe; 10^{-4} torr at least with interlock disabled

Interlock activates at $> 5 \times 10^{-8}$ torr, except prep chamber and LL.

Even disable Interlock, Main chamber pressure should be kept at order of 10^{-8} torr during annealing.