TEM JEOL 2100F

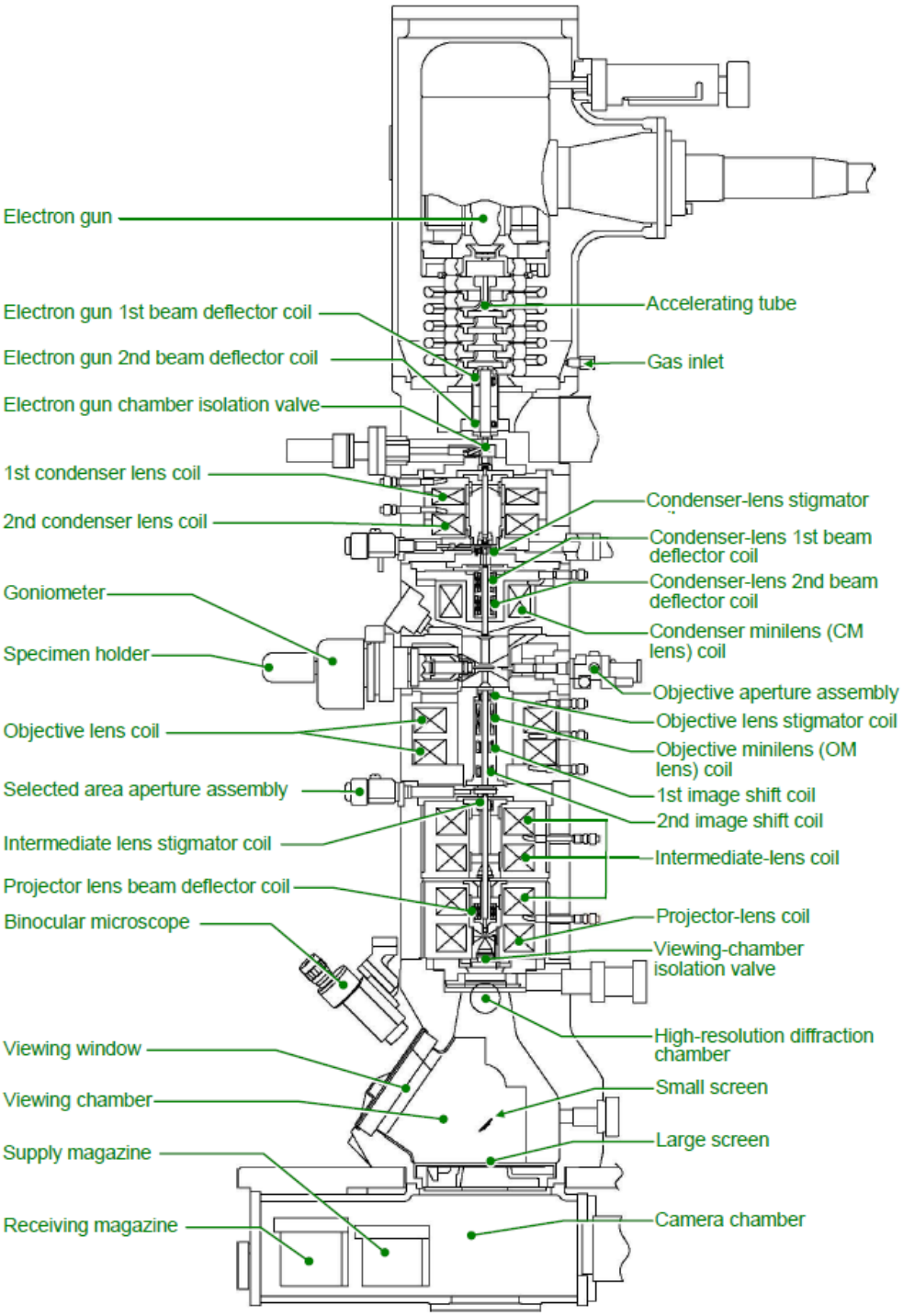


Fig. 3.4 Cross section of column

Inhalt

TEM operation mode

Starting procedure:

1. Check if water levels are ok for lenses:

2. Check cooling water 10 °C (inflow) and ±14 °C (outflow) on the wall, (the values are somewhat different, i.e. higher in summer)

3. 19C on the cooler

4. Check that ion getter pumps: all lamp green, GUN pumps are about 0, Column pump in the left half

5. Switch on voltmeter for pressure measurements to mV and press SEND (mixmax) until pips, then start the pressure measurements program on Gatan PC.
6. Write P value to the notebook on the PC
7. P vacuum: check should be less than **$2{,}5*10^{-5}$ Pa** to start, if $<1*10^{-5}$ Pa, it is good (the vacuum is better in winter and becomes somewhat worse in summer)
8. Check TEMCON software (should always on): Press circle arrow if red (to reset the connection)
9. Start Gatan Digital software on the right computer => 2 pips (control ok), error comes it is ok.
10. Temperature on the camera should go down and reach about 10 °C.
11. **<u>Close the viewing screen</u>**
12. **Fill nitrogen, first small amount, and wait a bit (5-10 minutes), it will splash, then fill more. If filled full, it should be good for 6 h.**
13. Check in software HT=> Emission current 116-126µA.
14. If the emission current if not in the right range, go to Emission and change emission (Filament value)
15. Stage position neutral, z in range [-200,200] µm

16. Set 20x MAG (MAG1 mode). **If you have magnetic sample: use LOW MAG**
17. Alignment file alignment_200kVTEMSTEM15.11.21 or the last one.
18. Vacuum at PEG1 20-23*10-3, PIG1<20, PIG4<40, when all is on, PIG3<35 PIG5<70.
19. Insert TEM holder: **wait until PIG4<40, Green on (Pump air) and PIG5 is 10 up from the preload value,** then load the holder.
20. Check the vacuum. It should be below 2.5*10-5Pa to open the beam
21. Beam on (it opens the valve)

Beam alignment

1. <u>You should work at the clockwise side of the crossover.</u>
2. <u>Beam center:</u> GUNA (Gun alignment) Spot 1, brightness to a spot, press F4 and center using SHIFT X&Y (Spot 1-5, 1 more bright, bigger current). Alpha 3. For high resolution you can try alpha 1 and MAG 300K.
3. Then BRIGHT TILT, spot 5, center with SHIFT X&Y, repeat step 1 and continue until GUNA and BRIGHT TILT both centered. If you plan using higher MAG, go to 200K and center the beam again
4. Condenser aperture in and center the aperture
5. <u>Gun Tilt</u>: ANODE WOBBLER (F3), if beam contract/expand not concentrically-GUNA-F4, and with DEF/STIG X&Y adjust
6. Do steps 1-2 again-beam centering
7. <u>Z height</u>: press STD FOCUS, activate IMAGE WOB X or Y, press Z up and down to see when the image stops wobbling
8. <u>HT center</u>: expand the beam more than the screen, find a good feature, turn HT WOBBLER, adjust with Bright Tilt and DEF X&Y, then adjust beam with Shift X&Y
9. <u>Do the condenser stigmator check</u>
10. Objective aperture in: align with condenser aperture. Do it at MAG 6000X

Condenser stigmator check

1. At 20k MAG use the BRIGHTNESS control to make the electron beam small.
2. Adjust the size of the beam by turning the BRIGHTNESS control clockwise or anticlockwise from the smallest point.
3. The shape of the beam should remain circular for both directions of rotations.
4. If not STIGMATION is wrong.

5. To correct the CONDENSER STIGMATION, select COND STIG button from the left-hand control panel.
6. Use the DEF/STIG X and DEF/STIG Y knobs to adjust the shape of the beam.
7. BRIGHTNESS is adjusted either clockwise (less brightness) or anticlockwise (more brightness) from the smallest beam. If you have a beam spot and turn BRIGHTNESS further anticlockwise, the brightness decreases, too. Then you are on the WRONG SIDE of the cross over which is really not good!!)
8. Turn off COND STIG by pressing the button again (the light in the button will go off).

Imaging

1. Check that the camera temperature reached 10 °C.
2. Insert the camera (bottom one for higher resolution), start life, choose exposure time you need.
3. For the bottom camera: lift the screen F2.
4. Do the objective stigmator check/live FFT at 100K or more. Use OBJ STIG and DEF/STIG X and Y for alignement
5. Take images and save in your folder.

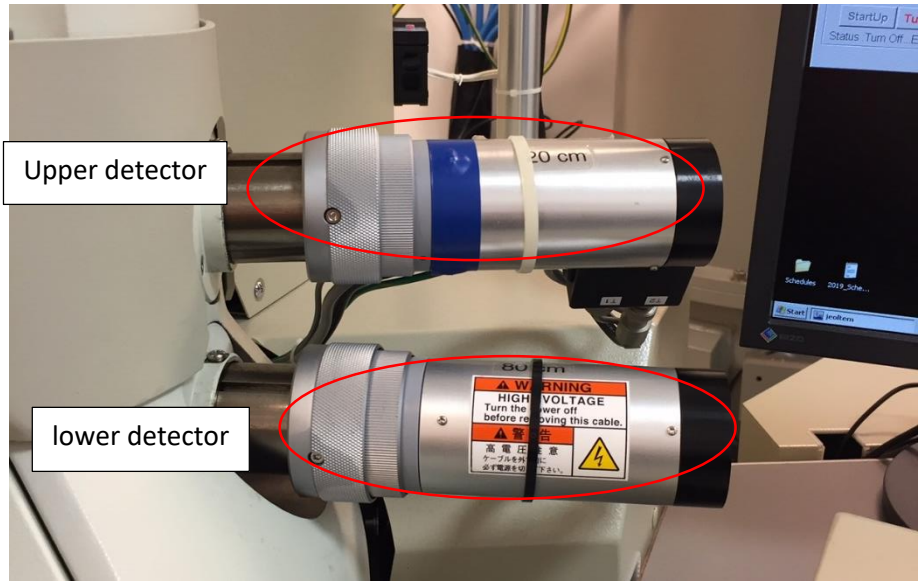
When finished TEM imaging

1. Apertures out
2. MAG 20k, Spread the beam on the fluorescent screen
3. **Stage neutral**
4. Beam off
5. Remove your sample
6. (if you are the last user of the day) Put the heater plug in
7. (if you are the last user of the day) Choose Maintenance, ACD on
8. Switch off the voltmeter.
9. Save your data and copy your data via network drive.
10. Fill the pressure log and TEM log on the TEM PC, fill the hours log for the facility usage.
11. In any issues, report to vita.solovyeva@uol.de

STEM operation mode

After you set up the TEM mode (see § TEM operation mode)

1. For STEM mode condenser and objective apertures should be out
2. MAG 200K
3. Start software: JEOL simple viewer
4. To go to STEM mode: Dialog=> ASID control,
5. On ASID choose SPOT mode, SND FOCUS 1 sec
6. Focus through your sample to obtain a ronchigram, make it round by using Condensor Stigmator in combination with DEF/STIG and center it using PLA and DEF/STIG knobs
7. Insert first condenser aperture and then second and go to the third one.
8. Aperture 3(Condenser), step by step align and adjust
9. Focus to find a sample, ronchigram
10. Center the beam with PLA and adjust condenser stigmation
11. Insert the down detector (Bright field) first



12. Insert the upper detector (Dark field)
13. Choose camera.
14. Camera length should be set to 80 cm for the lower detector and 20 cm for the upper detector.
15. Open Jeol Simple Viewer program, go to the LINE scan mode, adjust brightness and contrast.
16. Take images

When finished with STEM mode:

1. Choose “Detector none”
2. Draw back and out the STEM detectors, first the lower one, then the upper one
3. go to TEM mode
4. Finish as you normally do in the TEM mode (see page 6).

EDX

After you set the TEM and STEM mode

1. Start EDX PC (in the tech room)
2. Login as INKA operator on the left PC
3. Start the INKA software
4. **Close the beam**
5. Insert the Oxford Detector: to do this, go to INCA software, Optionen, Detektorsteuerung=>in

6. **Beam on**
7. Choose either STEI-BF or STEI-DF for detection.
8. Set sitelock in Bildvorgabe to compensate for the drift.
9. Choose area to take a mapping.
10. Smart map, start (Cu and Si signals can come from the device)
11. You need to get at least 200.000 counts, 10^6 counts or more are better!!
12. Safe your project and data for further analysis

When finished

1. When EDX is done. Beam off.
2. Detector out.
3. Beam on.
4. choose “Detector none” in ASID CONTROL .
5. STEM detectors out, go to TEM mode.
6. Finish as you normally do in the TEM mode (see page 6).