

# GATAN PIPS MODEL 691

## Instructions for Use

### Please Note:

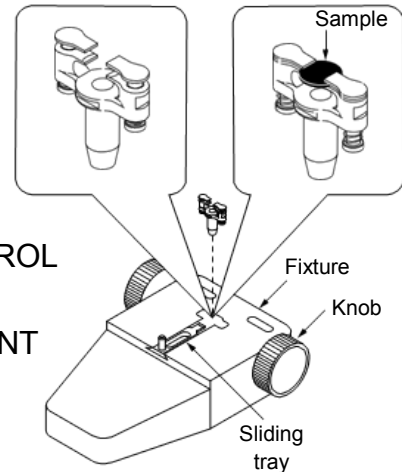
*The purpose of this document is to remind you of the essential points for the safe operation of this instrument. Complete instructions are described in the PIPS manual.*

### **STARTING UP the PIPS**

- Open main valve on Argon gas cylinder (DO NOT adjust other valves).
- Check Argon supply pressure = 25 psi.
- Switch on the ion mill using the POWER switch on the front panel.
- Diaphragm and molecular drag pump will start and digital display will light up.
- Red HIGH DP indicator will illuminate until backing pressure <12 Torr.
- After ~15 min, Green MDP indicator will light up – MDP at 60% running speed.
- Chamber pressure will now register on vacuum gauge.
- Check that upper part of AIRLOCK CONTROL switch is depressed (*airlock is up*).
- Check that airlock cover is in place.
- **Wait until PENNING GAUGE is <  $4 \times 10^{-5}$  Torr before proceeding.**
- Perform Ion-Gun Purge and Gas-Flow Adjustment as described in sections 2.5 and 2.6 of the GATAN Instruction Manual for the PIPS.

## SAMPLE LOADING

- Mount sample into sample holder (**These holders are very expensive- be careful!**)
  - Use mounting block for clamp-type holder.
  - Use mounting wax and hot plate for post-type and glue-type holders.
  - Mount cross-section sample with interface parallel to long axis of holder.
- Confirm that upper part of AIRLOCK CONTROL switch is depressed (airlock is up).
- Vent airlock chamber by holding down the VENT button.



*Clamp-type DuoPost and loading dock*

- Remove airlock cover (keep it cleans!)
- Use special tweezers to load clamp-type sample holder into airlock.
- Ensure long axis of holder is parallel with front panel of ion mill.
- Ensure sample is properly seated, but do NOT push down hard!!
- Clean glass window if required.
- Replace airlock cover.
- Depress VAC button while gently rotating airlock cover to properly seat o-ring.
- Once airlock chamber reaches a safe vacuum level, green VAC light will illuminate.
- Depress lower part of AIRLOCK CONTROL switch to lower sample into chamber.

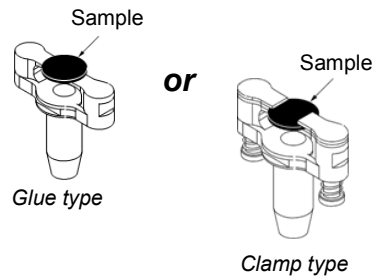
## ION MILLING

- Rotate ion guns to desired angle (note TOP marking on each gun).
- Switch on ION GUN GAS FLOW CONTROL switches – green LED will light.
- Set sample ROTATION SPEED to desired speed (0-6 rpm).
- Set required milling time using up/down arrows on HIGH VOLTAGE TIMER (clock Scale is Minutes: Seconds or Hours: Minutes).
- Set the ION GUN control to desired energy.
- Set **ION BEAM MODULATOR**:

- OFF: Ion beam always on. For single-side milling **ONLY**. Both guns **TOP ONLY**. Use **post-type** holders **ONLY**.
- DOUBLE: Ion beam on in 2 sectors of 60° each (both guns).
- SINGLE: Ion beam on in 1 sector of 60° (both guns).

**NOTE:**

When using **clamp-type** holder:  
Set **MODULATOR** to **DOUBLE** or **SINGLE**.



Operate PIPS with **MODULATOR set to OFF ONLY** with **post-type** holder:



- Press START. Shutter will close below window- check that this occurs!
  - After milling is complete, unload the sample holder from the airlock chamber.

*Bulk/rim thickness vs. minimum milling angle*

BULK/RIM THICKNESS (μm)	MINIMUM MILLING ANGLE
40	3°
50-70	4°
70-100	5°
100-150	6°
150-200	7°

*PIPS milling parameters*

GUN KEV	GUN ANGLE	BEAM MODULATION	ROTATION	TIME
4.0	5° Top 3° Bottom	Dual Beam	3 rpm	Until perforation reaches area of interest
2.5	4° Top 2° Bottom	Dual Beam	3 rpm	About 5 min
0.5	4° Top 2° Bottom	Dual Beam	3 rpm	About 2 min for clean-up

## SAMPLE EXAMINATION

- Swing optical microscope into position over airlock
- Switch on light source (6 maximum).
- Switch on monitor.
- Open shutter using switch on top right-hand side of airlock.
- Find image.
- Optical microscope should be aligned- you only need to adjust the focusing.
- Close shutter and turn off both light source and monitor when finished.

## SAMPLE REMOVAL

- Check that milling has finished - press STOP if not.
- Switch off gas flow to ion guns (GAS FLOW CONTROL switches).
- Depress upper parts of AIRLOCK CONTROL switch to raise sample into airlock.
- Press and hold the VENT button until cover is loose.
- Remove sample holder with special tweezers, remove your sample and store sample holder in box.
- RETURN SAMPLE HOLDERS TO TEM SPECIALIST.
- Replace cover and evacuate airlock by pressing VAC and gently rotating cover.

## COOLING A SAMPLE

- Fill the dewar with liquid nitrogen prior to loading a sample into the PIPS.
  - The LN<sub>2</sub> in the dewar should last 3 - 4 hours if the heater is not being used.
  - Insert sample (specimen post). Be sure the sample post is properly seated in its lowest position.
  - Replace the airlock cover. Hold down the VAC button.
  - After the stage is lowered and begins to rotate, wait 10 minutes for the sample to cool down.
  - Being milling.
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- Sample temperature specification [e.g., minimum -120°C (+/- 25°C)]
  - Electronic temperature regulation (-180°C to +100°C)



- Controller display monitors conductor temperature
- Fast cool down time (approximately 10 minutes)
- Fast warm up time before venting (approximately 10 minutes)
- Uses same standard PIPS DuoPost sample holders