



PR No. 1000037247 (Rfx No. 6100001646)

Detailed Technical Specifications for Add on Components for PIPS

1. ION BEAM MILLING SYSTEM

The ion-beam thinning equipment should be capable of preparing transmission electron microscopy specimens (3 mm diameter) of both conducting and non-conducting samples, such as Silicon Carbide, Silicon, ceramics, multi-phase metals and composites etc. It should not induce artifacts in the specimen preparation. Also, it should result in large electron transparent regions for viewing in a TEM; both conventional and high resolution TEM modes. The construction and operation of the equipment should be user-friendly.

The technical specifications of the equipment are given below:

S. No.	Item	Description
1.	Ion-guns	<ul style="list-style-type: none">• Two ion guns each with independently adjustable gas control utilizing mass flow controllers to permit either rapid milling or slow precise ion polishing.• Ion beam energy shall be continuously adjustable from 100eV to 8keV.• The alignment of the ion beams should be user friendly with either a fluorescent screen or a suitable mechanism. Also a mechanism is to be provided to measure the ion beam currents/operating voltage.• Ion gun should produce narrow ion beam width at the sample (full width at half maximum of the beam diameter shall be around 600-800 um for standard guns at 5 kV with ion current density of ~ 10mA/cm²)• The milling angle shall be continuously variable from +10 Deg to -10 Deg and fully adjustable during operation.• The ion guns shall have no consumable parts or very long life (> 30,000 hours of continuous operation.• The current range should be variable from 0 to 100 micro Amps.• The current should be measurable for each gun independently and measured at the gun.• Special Operational Mode for preparing cross sectional samples for TEM Analysis should be offered as standard.

		<ul style="list-style-type: none"> • Ion Gun Energies for both the ion guns on the ion milling system should be same & continuously variable from 100 eV to 8 keV in steps of 0.1 keV.
2.	Stage and Specimen Holders	<ul style="list-style-type: none"> • A specimen exchange mechanism shall be incorporated in the system to permit loading or unloading of samples without venting the work chamber to atmosphere. Specimen stage should allow rapid transfer of specimens (~1-2 minutes). • The Specimen stage should have provision for the rotation of the specimens during milling. Rotational speed shall be continuously variable from 0 – 5 rpm or more. • Provision of a mechanism for Sector milling (i.e, milling the specimens from only one side or any side) over a range of 45 to 90 degrees should be available. The mechanism should permit the preparation of cross-sectional TEM specimens of multilayer's without significant milling of the glue-line (or bonding layer used to prepare cross-sections). • The Stage shall incorporate X, Y motion to assist the user in positioning the specified mill location at the center of the beam polishing area. The minimum stage travel shall be~ +/-0.5 mm (i.e. ~ 1 mm in total) in X and Y directions. Please note that it should be possible to align the ion milling sample using the X & Y Alignment mechanism while the sample is mounted on the specimen post & loaded inside the ion milling system. • The specimen holder should be able to hold 3 mm diameter TEM specimens by either clamping mechanism or sticking mechanism. For loading unloading of the sample in specimen holders, suitable user-friendly mechanism should be provided. Also they can be rapidly and easily transferred in to the ion beam thinning equipment. • Specimen heating: A glue-type specimen holder shall be supplied to optimize heat dissipation. • The holder should have long life time and durability. They should be compatible for cooling the TEM specimens with liquid nitrogen during the ion milling • Cold stage shall offered as standard as per the following specifications: <ul style="list-style-type: none"> ○ Dewar and conductor rod should share the main vacuum system ○ 6-8 hour Dewar capacity ○ Sample temperature: -The specimen can be kept in user defined temperature in the range of -150 °C to 30 °C or better, during milling. A mechanism to measure the relevant temperature should be provided. The cooling/warm-up of

		<p>the specimen's should be done rapidly (~30-45 minutes) and in-built mechanism for this operation should be provided.</p> <ul style="list-style-type: none"> ○ Electronic temperature regulation: minimum range (-180°C to + 100°C) ○ Through transmission illumination of sample ○ Built in Dewar heater is essential.
3.	Specimen Viewing	<ul style="list-style-type: none"> ● In-situ viewing: Any time without shutting down the ion guns or raising the sample into the airlock. ● Shutter: An automatic shutter shall be incorporated to reduce window contamination when not viewing the specimen. ● Sample illumination: Reflection and through transmission with the intensity set via the Touch Screen. ● A digital CCD imaging system with a magnification of 100x-2500x and also to record and display the sample images during ion milling on a desktop computer. ● The operator should be able to start, stop, or pause the milling process from the system PC. ● Remote Access to PIPS-II should be possible using network connectivity.
4.	Milling Termination	<ul style="list-style-type: none"> ● Milling termination by elapsed timer or optional light operated Auto-Terminator.
5.	User Interface	<ul style="list-style-type: none"> ● At least 10" color touch-screen graphical user interface (GUI) should be supplied as standard. The GUI must be located on the front panel of the system for easy access and viewing. All system functions (gun settings, gas flow controls, stage movements, etc.) shall be controlled through this screen. ● Remote access to the system must be available through a network connection. The communication protocols will be used for monitoring the system's status, starting, pausing, and/or stopping the milling process.
6.	Vacuum System and vacuum reading	<ul style="list-style-type: none"> ● The vacuum system shall be totally self-contained within the enclosure. ● A totally oil-free vacuum system, pumping with turbo pump and oil free backing pump ● Work chamber base pressure: 1E -6 Torr or better. ● Operating pressure: 1E -5 Torr or better. ● Suitable gauges to monitor the vacuum levels in main chamber and baking pump. ● Vacuum gauge should be present in the chamber area to read the vacuum in the specimen preparation area ● Sample exchange through air lock
7.	Power	<ul style="list-style-type: none"> ● 230 V, 50 Hz, single phase
8.	Cooling	<ul style="list-style-type: none"> ● The system shall be air cooled only, no water cooling should be required.

9.	Documentation	<ul style="list-style-type: none"> The detailed user instruction manual, operation/instruction manual, trouble shooting and maintenance manual and wiring diagrams in English should be supplied free of cost along the system
10.	a) Installation/ Commissioning b) Warranty	<p>a) The equipment should be installed in the laboratory without additional cost. Also, three scientists should be trained in the laboratory.</p> <p>b) 1 year comprehensive warranty including service and parts from the date of installation of the equipment. In addition support for 1 year along with all equipment in TEM sample preparation lab.</p>
11.	Spare/ consumable	<p>Following consumables should be supplied with the equipment as a part of standard package –</p> <ul style="list-style-type: none"> Comprehensive Service Kit Duo post clamp type at least 2 number Duo post glue type at least 2 number

2. ULTRASONIC DISC CUTTER with Cross Section Kit

The technical specifications of the equipment are given below:

Sr.No.	Item	Description
1.	Sample Size	<ul style="list-style-type: none"> Circular cutting tool 3 mm at least 1 number 2.3 mm diameter at least 3 number Rectangular cutting tools min. 4mm X 5mm at least 2 number
2.	Sample monitoring during cutting	<ul style="list-style-type: none"> Optical Microscope for alignment of the sample before cutting is a must
3.	Cutting process specs	<ul style="list-style-type: none"> Variable user tunable frequency Depth of cut display indicator Spring loaded sample stage with capability of positioning the cut in the desired position accurately
4.	Consumables	<ul style="list-style-type: none"> Consumables for 5 years should be supplied.
5.	Power supply requirements	<ul style="list-style-type: none"> 230V, 50 Hz Operation, Single phase
6.	a) Installation & commissioning b) Warranty	<p>a) The equipment should be installed in the laboratory without additional cost. Start-up assistance and training should be included for three scientists in the laboratory.</p> <p>b) 12 months comprehensive warranty from the date of installation of the equipment.</p>
7.	Manuals	<ul style="list-style-type: none"> Operating and maintenance manual, wiring diagrams, spare part list as applicable

Cross Sectional Kit for Cross Sectional TEM Sample Preparation -

S. No.	Item	Description
1.	Cross -sectional TEM Kit	<ul style="list-style-type: none"> • Standard for cross-sectional specimen preparation.
2.	Consumables/ Spares	<ul style="list-style-type: none"> • Additional spares for at least 3 years operation.
3.	a) Installation and start-up assistance b) Warranty	a) Installation, start-up assistance and training should be included. b) 12 months warranty from the date of Installation of the equipment. In addition support for 1 year along with all equipment in TEM sample preparation lab.

Essential Criteria –

- **One Vendor should be responsible for all these equipment, so that the vendor is able to guarantee the quality of the final prepared Specimen.**
- **Vendor should be capable of preparing samples on site using these equipment & training the users on preparing these samples.**
- **The company should have the experience of setting up at least 10 such TEM Sample Prep labs in India. Out of these at least 5 PIPS should have been installed in the last 5 years. User names & references should be provided along with the bid.**