Specifications of Electron Probe Micro Analyzer (EPMA) with Accessories

Sl No.	Specifications	
1.	Introduction and scope	The proposed equipment is a state-of-the art fully automated, computer-controlled, Brand-New Electron Probe Micro Analyzer (EPMA) for high speed, high precision, multi elemental quantitative analysis of all the elements ranging from Be to U. The system should be capable of analysing various metals/alloys and composite materials for precise major and trace element analysis. It should also be capable for high resolution imaging and accommodating large/multiple specimens for carrying out failure analysis investigations. The equipment should be flexible enough to accommodate the futuristic developments in relevant field as well as other additional features, not included in the present specification, as future upgrades.
2.	Electron source:	The electron source should be field emission gun (FEG) assembly with Schottky thermal field emitter source.
3.	WDS Detectors for Elemental Microanalysis	A) Minimum Five Wavelength Dispersive Spectrometers (WDS) with appropriate crystals to cover entire range of elements from Beryllium (Be) to Uranium (U) should be provided with the instrument. B) Each WDS should consist of minimum two crystals. Minimum 10 crystals should be provided with the configuration designed for high sensitivity, high precision and high wavelength resolution for light elements mainly Be, B, C, N, O and S, P (Detailed catalogue or application notes should be submitted mentioning the crystal details) C) The crystals should be best effective for analysing the trace concentrations with detection limits for elements down to 100 ppm for light elements mainly Be, B, C, N, O and S, P. D) All 10 crystals supplied with the instrument should be latest crystals available with supplier for high sensitivity, high precision and high wavelength resolution. E) The WDS spectrometers should be capable of qualitative analysis, quantitative analysis, mapping/line analysis and Chemical state analysis. F) Should be capable of Quantitative elemental mapping to obtain quantitative values from map G) Quantitative analysis matrix correction: ZAF correction method (metals/oxides), Calibration curve method. H) Should have feature of automatic image drift correction/ Image tracking feature I) Software should be capable of performing data acquisition, storing and transfer in common windows-based application format.

		J) The software supplied should be of latest version with permission for using all the features of software. K) All the database required for analysis and possible to be used with the supplied software should be provided. L) Backup software must be provided in optical media. M) Any further version of the software and updates must be provided free of cost for 5 years from the date of installation. N) Software support to be provided even after free 5-year updates.
4.	EDS Detector for Elemental Microanalysis	A) Minimum one Energy Dispersive Spectrometer (EDS) should be provided with the instrument. B) EDS should be LN2 free SDD detector with minimum 60 mm2 detector sensor area. C) The detector should be capable of detecting elements from beryllium (Be) to Uranium (U). D) EDS should be capable of qualitative & quantitative elemental analysis, line scanning, 2D elemental or dot-mapping (area) and multi-point analysis. E) Supplied EDS server & analysis software should be capable of performing data acquisition, storing and transfer in common windows-based application format. F) The software supplied should be of latest version with permission for using all the features of software. G) Backup software must be provided in optical media. H) Any further version of the software and updates must be provided free of cost for 5 years from the date of installation. I) Software support to be provided even after free 5-year updates.
5.	Secondary electron image resolution:	3nm or better
6.	Accelerating Voltage range:	1kV - 30 kV
7.	Probe current range:	0.2nA to 3µA
8.	Probe current stability:	± 0.3% / h
9.	Magnification:	40x - 3,00,000 X or better
10.	Image resolution with pixel size:	5120 x 3840 (minimum)

11.	Sample stage:	System should have minimum three axes stage, movable in X, Y, Z direction and Rotation feature.
12.	Sample stage movement:	a) X= 90 mm or larger, b) Y= 90 mm or larger, c) Z= 7 mm or larger
13.	Sample dimension:	Machine should be capable of analysing sample with dimension 100 mm x 100 mm x 50 mm (L x B x H) or wider
14.	Specimen holders:	Minimum 8 different types of specimen holders to be provided for loading of variety of samples.
15.	Imaging Detectors:	a) Secondary electron (SE) detector b) Back-scattered electron (BSE) detector c) Provision to install any new detector in future to be provided in the equipment.
16.	Additional active Vibration protection system:	Additional active, automatic, highly reliable and maintenance free, piezo-electric vibration cancellation system/platform should be provided.
17.	Calibration standards:	a) Certified standards for calibration of magnifications and resolution must be provided. b) Multielement metal/alloy calibration standards (minimum 18 standards) for WDS and EDS calibration must be provided.
18.	Load-lock mechanism/automatic specimen exchange system:	For quick exchange of specimens, the load-lock mechanism/automatic specimen exchange system should be provided.
19.	System control:	The system controller should be supplied with fully licensed system control software with latest hardware. Suitable factory integrated latest high-end computer work stations with latest new generation processor, Microsoft Windows 11 Pro, 64-bit operating system (Latest configuration) and latest MS office Pro, minimum 16 TB HDD for data storage, minimum 64 GB RAM, CD/DVD Writer and 32-Inch 4K-HDR monitors with height adjustment facility. High resolution colour printer: HP Color LaserJet Pro MFP M479fdw or better model with automatic duplex printing facility. All supplied software should have Perpetual licence.

20.	Software:	a) The instrument should consist of latest, standard and user friendly, software for the control, acquisition, image and analysis processing and data analysis. b) The software supplied should be of latest version with permission for using all the features of software. c) Backup software must be provided on optical media. d) Capable of Controlling detectors and other accessories through software e) One no. of additional High end computer workstation should be provided for offline analysis with following specifications: Intel Core i9 Processor, 64GB DDR5, 4 TB HDD, Second storage drive: 4TB HDD, C4 SSD Boot + SSD, Raid 1 for M.2NVMeSSD, Windows 11 Pro Operating system, recovery USB, Intel integrated graphics: Nvidia T1000 8GB, 4 mDP to DP adapter, 8x DVD+/-RW with optical driver, CyberLink Media Essentials for Windows 11, Latest Microsoft Office Professional, 32-Inch 4K-HDR monitor with height adjustment facility. Latest Adobe Acrobat Professional, Latest Adobe Photoshop Elements & Premier Elements Bundle. All supplied software should have perpetual license. f) Additional 1 no. of analysis software for offline analysis. g) Any further version of the softwares and updates must be provided free of cost for 5 years from the date of installation. Upgrade should be provided for all the systems (main on-line system and offline analysis system). h) Software support to be provided even after free 5-year updates. i) All supplied software should have perpetual licence.
21.	Mandatory Accessories:	For smooth functioning of the facility, mandatory accessories such as (but not limited to) should be supplied along with the equipment: a) Necessary vacuum pumping system with detection gauges b) Water chiller c) Oil free Air Compressor with combination filter d) Spare Field Emission Gun: 1 no. e) Tweezers, stubs, Carbon tape, carbon and silver paste, copper tapes. f) Essential Spares Kit (for the trouble-free operation of equipment for a period of 5 yrs). g) Maintenance tool kits should to be provided. h) All essential gas cylinders with regulators for proper functioning of the machine to be provided by the supplier.

22.	Optional accessories for Specimen preparation for EPMA:	The following three optional accessories for specimen preparation for EPMA system (a) Ion beam polishing/etching system (b) Vibratory polishing machine (c) Optical microscope for verifying microstructural features before loading the sample inside EPMA system should be quoted separately. The specification of these equipment is given below.
23.	Ion beam polishing/etching system:	Ion beam polishing/ etching system is used to polish the metallographic specimens for high quality specimens for EPMA analysis. The system will consist of Argon Ion milling guns that will eliminate the mechanical stress / deformation which is obtained by conventional polishing. The outcome of this system will be high quality damage less specimen suitable for EPMA analysis. The following are the detailed specifications: a) Ion guns: Argon ion guns. b) Ion beam energy/Ion accelerating voltage: 2kV to 10kV c) Milling rate: 300 microns/hr or better. d) Milling capabilities: planer and cross-section. Necessary accessories to be provided for carrying out planer and cross-section milling. e) Specimen size: minimum 35mm diameter. f) Specimen cooling: Should have the feature of specimen cooling to avoid damage caused by heating. Necessary cooling mechanism/accessories to be provided. g) Monitoring of milling position: optical microscope to be provided for Monitoring of milling position. h) Camera and external monitor for specimen viewing. i) Specimen holders: Multiple specimen holders should be provided for polishing standard, cross-section and irregular samples. j) Necessary gas cylinders with regulators to be provided. k) Power requirements: 230V, 50/60 Hz, Single phase.
24.	Vibratory polishing machine	a) Vibratory polishing machine should be suitable for obtaining the deformation/stress free surface for EPMA analysis. b) The machine should oscillate horizontally to maximize the polishing. c) Specimen should rotate around the polishing cloth. d) 12 inch diameter polishing bowl : Minimum 3 bowl should be provided. e) Specimen holders with 1 inch, 1.25 inch, 1.5 inch and 2 inch size (3 nos. each) should be provided. f) Specimen weights and loading fixtures should be provided. g) 12 inch size cloth (100 nos.). h) Alumina suspension of different sizes should be provided. i) Colloidal silica should be provided. j) Power requirements: 230V, 50/60 Hz, Single phase.

25.	Optical microscope system	Optical microscope for verifying microstructural features before loading the sample inside EPMA a) Type of Microscope: Inverted Metallurgical Optical Microscope b) upto 3000X (minimum) with magnification changer facility. c) Minimum three magnification changer zoom optics: 1st Magnification changer: Between 1.25X to 1.30X, 2nd Magnification changer: Between 1.5 X to 1.7X, 3rd Magnification changer: Between 2X to 2.5X d) Minimum four observation modes: Bright field, Dark field, Differential interference contrast (DIC), Polarized light. e) Observation tube: Binocular or Trinocular tube. f) Illumination system: Reflected light illumination system with ultra-bright LED light source with standard filters. g) Revolving Nosepiece: 6 Position coded Nosepiece (For automatic recognition of objective magnification by software). h) High resolution objective lenses attached to the microscope: 5X, 10X, 20X, 50X, 100X. i) Additional objective lenses as spares:1.25X, 2.5X, 150X. j) Eyepieces: Widefield 10X Eyepiece with eyecup - 2 nos. Field of View: 22mm or higher. k) Specimen Stage: Stage with X/Y movement: 50 mm× 50 mm (minimum) l) Metal Stage plates/ inserts: Four different sizes. m) Camera: High resolution colour single-chip CMOS camera with minimum 12 Megapixels colour CMOS image sensor. Minimum Pixel size of 3.45 µm x 3.45 µm. Imaging sensor size: Minimum 1.1 inch. Minimum effective image resolution: 8000 x 6000 (pixel shifting). It should have global shutter and High Dynamic Range (HDR). n) Computer workstation for operation with minimum specification of: Intel Core i9 Processor, 32GB DDR4, 8 TB HDD, second storage drive: 4TB HDD, Windows 11 Pro, 32-Inch 4K-HDR monitor with height adjustment facility, Adobe Acrobat Professional, Microsoft Office Professional. All supplied software should have perpetual licence. o) Software for microscope control and image analysis: instrument should consist of latest, standard and user friendly, software for the control, acquisition and image analysis. p) Image analysis should have facility for measurements, multiphase analysis, Grain size, Inclusion rating, Layer thickness, Extended focus (focussing sample with uneven surfaces), Multiple image stitching (stitching many fields of images to form a single large image). q) Mandatory condition: Microscope, objective lenses, eyepieces, camera & software should be from same manufacturer. r) Mains Power Supply requirement: Equipment should work on 230V, 50 Hz Single phase AC.

26.	**General conditions:**	1) Break-up prices of all items should be provided individually in the price bid. 2) Parties should submit their offers in two parts: Part I - Technical bid only Part II - Price bid All the items quoted in technical bid must be quoted in price bid also. Any item missing in price bid (intentional or unintentional) will disqualify the bidder and no further correspondence will be made with the party. 3) Technical bid with price details will be rejected. 4) Indian agents submitting the quotation on behalf of foreign suppliers must submit the authorization letter to submit the quotation, techno-commercial negotiation, after sales service, maintenance and repair. 5) Any item not explicitly mentioned in the specification but which may be required for demonstration of specification and smooth functioning of the equipment shall be within the scope of supply. 6) All the accessories required for the installation and operation of the equipment should be arranged by the supplier of the equipment. 7) Responsibility of installation and maintenance of system, all the detectors and accessories lie with the supplier. 8) The vender must supply accessories, spares and consumables for a minimum operating period of 5 years. 9) The supplier shall install and commission the equipment in our laboratory and demonstrate the performance of the equipment. 10) Pre-installation requirements such as tolerable limits of EM field and mechanical vibration etc, should be clearly indicated in technical Bid and to be surveyed by the supplier at the installation site before 90 days of delivery of the equipment. 11) Necessary environmental requirements like temperature, humidity etc essential for trouble free operation of the system should be specified clearly. 12) The supplier should submit technical brochures and proper application notes for adequately explaining and confirming the availability of features in the quoted model of equipment. 13) The Indian agents should also have service facilities in India and should have factory trained and qualified engineers to attend on call within 48 hours. 14) Training: In-depth training shall be provided for the operation of complete system including at VSSC. The training

		period should be for a minimum of 10 working days after the date of installation, commissioning and acceptance by VSSC. Training to be provided in batches as per mutual agreement. 15) Application training: To be provided by well-trained application specialist for metallurgical applications, in addition to the training mentioned above. The training should be minimum of 15 working days. Training to be provided in batches as per mutual agreement. 16) The vendor should provide a user list of similar model supplied. 17) Party should not quote an obsolete model. An Undertaking should be provided by the party that the quoted model is the latest in technology. The quoted equipment and all the accessories should be latest and brand-new equipments. 18) Delivery period: Delivery of the equipment at VSSC should be clearly mentioned in the offer. Time required for Installation after the receipt of the item at user division and intimation from user for installation should be clearly mentioned. The time required for installation will be included in the delivery period and non-compliance of meeting the delivery schedule will invite the LD penalty. 19) Pre-Delivery Inspection: Pre delivery inspection shall be carried out by two VSSC personnel at your site. Inspection will be carried out for minimum three days duration to verify all the major specifications of the equipment and analysis of minimum 3 specimens before the clearance of dispatch to VSSC. 20) The performance of the machine with specimens also to be demonstrated at VSSC after the installation. Analysis of minimum 5 different types of specimen to be demonstrated before the acceptance. 21) Warranty: Complete system (including all the systems, subsystems, and accessories) should be covered for 5 years comprehensive warranty from the date of installation, commissioning and acceptance by VSSC. Party should replace the spares free of cost to maintain the system operational. Party should make 10 preventive maintenance visits (with interval of six months) and any nos. of breakdown visits during the warranty period of 5 years. Service response time must be within 48 hours. 22) During warranty period, spares taken from our stock, if any, should be replaced by the party free of cost. 23) The party should undertake non comprehensive AMC after the completion of warranty period. AMC charges to be quoted year-wise separately for 5 yrs after the warranty period. Party should make 2 preventive maintenance visits (with interval of six months) and 1 no. of breakdown visit per year during the AMC period. Service response time must be within 48 hours.

		Price list of essential spares which may require during AMC period to be provided in AMC price bid. The price list should be valid for 5 years AMC period. 24) Operation/ maintenance manual should be provided. 25) An undertaking that the vendor will supply all the spares and services for the equipment for at least 12 years from the date of final acceptance or for at least 8 years after the model has been discontinued whichever is later should be provided. 26) Party has to inform about the requirement of space required for installation of equipment. 27) Optional accessories / attachments: Any additional accessories / attachments which are not mentioned in the specification can be quoted separately. 28) Detailed compliance matrix of our specifications and supplier specifications item by item should be given in this format. It has to be filled and provided along with the quotation. All the columns in the compliance matrix should be filled with supplier specifications. Incomplete compliance statements will disqualify the offer and no further consideration will be given at a later time. Wherever, numerical values of specification are required, they should be explicitly mentioned. To substantiate the information provided in the compliance matrix, the party should submit technical brochures, catalogues for all the subsystems proposed (including bought out items, if any) with full features and capabilities.

FORMAT FOR COMPLIANCE STATEMENT

(1) VSSC's Enquiry Specifications	(2) Specification of Equipment (offered by Manufacturer)	(3) Compliance to VSSC's Technical Specifications YES or NO	(4) Details of Deviation, if any