Specification No. CFFP/METLAB/01 REV03 DATE- 05.01.19	
SPECIFICATION: METALLURGICAL MICROSCOPE WITH IMAGE ANALYSIS SOFTWARE, CCD/CMOS CAMERA	
SN	REQUIREMENTS
1.00	Equipment should be a high quality Inverted Optical Metallurgical Microscope for reflected light bright field and dark field studies with a CCD/CMOS Camera, Image Analysis Software
2.00	Specification for Optical Microscope:
2.01	Equipment should be a high quality fully motorized Inverted Optical Metallurgical Microscope, with binocular phototube, suitable for reflected light bright field and darkfield studies with inbuilt touch screen capabilities for complete functioning of microscope through touchscreen itself. It should have high quality optics free from spherical and chromatic aberrations for obtaining high-resolution images of good contrast and image homogeneity. The latest optics available should be quoted. The complete equipment package (ie microscope, camera and image analysis software) must be of the same make for better integration and future up gradation.
2.02	Should be of a reputed make and supplier had supplied the microscope in premier research institutions ie IITs,IISC,TIFR,BARC,NML,IGCAR etc
2.03	Microscope stand with RS232 or compatible interface for PC Connection
2.04	The characteristics of the optics and the incident light illumination aspects to achieve optimum homogeneous illumination and intensity have to be clearly specified with necessary documents.
2.05	Wide field eye pieces of magnification 10x. Field of view should be 22 mm or more.
2.06	Quintuple Nosepieces (minimum).
2.07	Infinitely Plan semi-Apochromatic/Neofluor dry Objectives 5x to 100x i.e. (5x,10x,20x,50x,100x) of high quality Cost of individual objectives must be quoted separately.
2.08	Objective motorized nosepiece with motorized reflector turret should have provision for keeping minimum 5 objectives with bright field/dark field provision.
2.09	Motorized magnification changer of 1x,1.25x/1.5x/1.6x and 2x for higher magnification.
2.10	Illumination Sources: light sources Long life halogen lamp with 100 W halogen bulb equipped with frosted glass & yellow, green and blue filters or an equivalent LED illumination.
2.11	Microscope Stage: Suitable 3 plate motorized XYZ stage having 3 axis movement and rotation capability with various removable inserts having central opening of 10,20,30 mm diameter Stage clip for sample holding Travel range in x/y direction should be 100/40mm or higher With fine movement in X and Y axis Stage should be with micrometer attachments
2.12	Microscope should have suitable C mount facility for attaching video camera for image processing and should provide 1:1 image area as seen through the eyepiece.
2.13	Microscope should have length measurement graticules with calibrated grids and inclusion counter graticules.
2.14	Motorized Z-drive with provision of both coarse and fine adjustment through scaled knobs
2.15	Electrical Power supply input: AC 200-240V, 50/60Hz.
2.16	Should have provision to measure accurately surface pit depth or eroded areas in microns.
2.17	Microscope should work standalone too without pc, if needed.

APPROVED BY

S. N. [illegible]

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2.21	Photography: Colour CCD/CMOS Camera with photo automatic attachment: High resolution colour digital fire-wire/USB 3.0 camera for image capturing from optical microscope with the following features: a) Colour CCD/CMOS camera (latest version) with automatic calibration facility along with automatic intelligent intensity control for capturing the image directly in the digital camera and quality image transfer to a PC. b) Storage should be directly to computer. c) Interline Transfer Frame Readout CCD/CMOS Sensor d) RGB Mosaic Colour Filter e) Electronic Global/rolling Shutter Control f) high Resolution 5.0 Mega Pixel or better g) Pixel size 3.4 micron X 3.4 micron or better h) Fast Live Image with 18 fps or higher at full resolution on Computer Screen i) Shading / Brightness Correction possible on all formats j) Adjustable ROI & Adjustable Binning. k) 36 bit colour depth or higher; 12 Bit Dynamics/Digitization
3.00	Specification for Image Analysis Software:
3.01	Image processing system should possess Measurement modules as per relevant different ASTM, DIN, IS, ISO standards for metallurgical analysis for microstructural features such as: Grain size measurement and morphometric measurement for grains, phase percentage/area distribution, coating thickness, de-carburisation depth, nodular rating, phase analysis, Inclusion-Rating, particle sizing, volume content of multiphase samples, relief measurement, porosity evaluation, Graphite flake size, classification/types & Graphite type percentage etc.
3.02	Softwares available for quantitative evaluation of features, image enhancement & contrast, Image Editing etc. shall be supplied and quoted separately.
3.03	Latest version of image analysis software with software in C.D form and pen drive with backup. Images can be stored in bmp, tiff, gif, jpeg formats. The Image Analysis Software should be well tested, known and proven.
3.04	Software and its future upgrades should be compatible with Microsoft windows 10. Compatible with PC having specifications: 64 bit operating system, Core i7 processor Software bugs, if any, will be solved & near future upgrades of software, within the warranty period, will be supplied free of cost. Software should be compatible with future upgrades in operating system of PC. As applicable compatible version of software should be provided free of cost within the warranty period.
3.05	Capable of generating reports containing images, data tables and graphs. Report templates shall be stored into internal format and exported to PDF or RTF file
4.00	General Requirements:
4.01	Following separate Manuals 03-sets each should be provided in English Language only for all above items: a) Installation Manual. b) Operation Manual. c) Maintenance Manual. d) Calibration Manual.
4.02	Essential Spares and consumables For Continuous Trouble Free Operation also to be quoted for 5 years.
4.03	The supplier should ensure that the spares should be made available for the next 10 years from date of Commissioning at CFFP, Haridwar.
4.04	Free of cost training for two persons shall be provided by the vendor on operation of Microscope and software at CFFP BHEL Haridwar.

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4.05	24 months warranty on microscope including all parts/accessories of the system. The supplier shall provide 24 months warranty from the date of commissioning. Sufficient number of rapidly wearing and consumable parts is included to cover the warranty period.
4.06	Quotation will be considered only if it is submitted with the list of various organizations (including in India) with their contact addresses, where the Inverted Metallurgical Microscope and Imaging Software (same model or similar type) has been supplied in last 3 years.
4.07	Servicing facilities: The supplier or his agent in India should have trained personnel for repairing and servicing the microscope at CFFP, BHEL Haridwar.
4.08	Installation and Commissioning by the vendor shall be carried out at CFFP, BHEL Haridwar.
4.09	The supplier shall provide min. 5 years of Annual Maintenance Contract & Calibration service on expiry of warranty period. The yearly charges for the same may be quoted.
4.10	The commercial quotation to be divided in two parts: a) Hardware-Software. b) Pre-delivery inspection and training.
4.11	All the technical specifications should be supported with printed catalogue giving complete description and operational details along with photographs of the microscope from the respective principals.
4.12	Microscope, digital camera and software should be from same make for better integration and future up gradation.

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