Technical Specification for Tender no.2021-22/06

2021-22 / 06 / 01 - AUTOMATIC MICROPROCESSOR CONTROLLED EXTRUSION BLOW MOULDING WITH PARISON PROGRAMMING - 1 LITRE			
Sl. No	**Item**	**Unit**	**Specication**
1	Container Capacity	ml	Upto 1000
2	Screw Diameter	mm	Min. 30 and above
3	L/D ratio	-	20:1 - 22:1
4	Output	Kg/Hrs	Min. 10 and above
5	Screw Speed	RPM	Min. 75 and above
6	Die Diameter	mm	specify & quote
7	Mould Opening Stroke	mm	Min.150
8	Mould Thickness	mm	Min. 170 and above
9	Mould Height	mm	Min. 200
10	Mould Width	mm	Min. 150
11	Plattern Size	mm	Min. 150 X 200
12	Connected load	KW	Max. 15
13	Parison control System	Points	5-10 points
14	No. of Stations and Heads	-	Single head and single station
15	Moulds to be supplied for 500ml &1000 ml along with machine	Each one no.	500 ml and 1000 ml
16	De-flashing system	-	Auto deflashing Type
17	Control System	-	Microprocessor control
18	Oil pump motor power	HP	Min. 3 HP
19	Compressed air pressure requirement	bar	Max. 12 Bar
20	Air Requirenment	CFM	Min. 5 and above
21	Safety	-	Appropriate safety features to be provided
22	Machine Dimension (LxWxH)	mtr.	specify
23	Essential spares for machine	-	Fix spanner set, Allen Key set, Greece gun, Thermocouple, SSR, Hot cutter wire,Nichrome blade

2021-22 / 06 / 02 - Automatic Vacuum forming Machine			
Sl. No	**Item**	**Unit**	**Specication**
1	Forming Area (Min.)	mm	650 x 350
2	Forming Depth / Draw (Max.)	mm	1 to 130
3	Sheet Thickness (Min. – Max.)	mm	0.3 to 2
4	Speed (Min. – Max.)	Cycles /Minutes	30-60
5	Material to be formed	-	HIPS, PP, PET,PVC
6	Compressor air requirement		Pls Specify
7	Motor Type		Servo
8	Control Panel		Microprocessor with Touch screen
9	Safety	-	Appropriate safety features to be provided
10	Heating load	KW	Max. 20 KW
11	Connected load	KW	Specify (lower preferred)

12	Demonstration multicavitymould for products like cup, tray, etc.	-	Please specify and quote suitable Aluminium Alloy Mould - 1 no. for above machine
13	Mould cooling arrangement		Pls specify
14	Machine dimensions	LxWxH	Pls specify

2021-22 / 06 / 03 - CAPILLARY RHEOMETER			
Sl. No	**Item**	**Unit**	**Specication**
1	Purpose	:	Capillary Rheometer measures apparent viscosity (resistance to flow) using a broad range of shear rates at specific temperatures. The viscosity information is also critical in being able to compare materials, to determine processing parameters, quality control, to measure processing degradation, which could reduce physical properties, and to study thermal stability.
2	Applicable Standard	:	ASTM D 3835, ISO 11443, DIN 54811, ASTM D5930
3	Principle/ Definition	:	In a Shear Sweep the plastic melted is extruded through twin capillaries dies, the force at varied shear rates is determined. Thermal Stability, the plastic melted is extruded through a capillary after varied periods of Residence time in the barrel.
TECHNICAL SPECIFICATION FOR CAPILLARY RHEOMETER			
4	Temperature range	Ambient to 400°C.	
5	Temp Control & accuracy	Min. 2 zones barrel heating regulating with microprocessor & PID Temp Controller with 0.1°C resolution	
6	Maximum Force Range	25 KN or better	
7	Piston Speed	0.0024 – up to 1200 mm /min	
8	Type of Barrel	2-Barrel design D =15 mm±0.005 mm dia. Approx. 250mm length	

9	Test Force Transducers	Range 50kN or more including measuring amplifier CAN-Bus Module , Accuracy 0.4% in 1%-100% of the nominal range, 0.8%<1% of the nominal range, Automatic zero calibration, resolution 0.0005%.
10	Test Pressure Transducers	Range: 0 to 2000 Bar,(0-1000bar & 20- 2000Bar Range)
		Accuracy <0.5% Identification of transducer range and calibration data automatically when the transducer is connected, Resolution 0.005%
11	Capillary Dies	Tungsten Carbide orifice die for both PE & PP with L/D 0/1,5/1,20/1 , 30/1 & 40/1
		• 1 mm dia with 10,20 & 40 L/D (one Each)
		• 2mm Dia with 10, 20 L/D (one Each)
12	Temperature Controller	• Electrically heated with Microprocessor based PID Digital Temperature Controller with 0.1°C resolution.
13	General requirement	Corrosion resistance piston and barrel
		Go/ No Go gauges along with die cleaners to be provided.
14	Accessories to be supplied along with Instrument.	Laser micrometer die swell measuring system-01 set
		Personal computer(PC) with software installed-01 set
		Barrel temperature calibration kit-01 set
		Barrel bore verification kit-01 set
		Electronic load cell calibration kit-01 set
		Tip for test barrel D15 mm-01 no
		Reference material PE granulesM 80064-01Kg
		• Advanced electronics and software enable up to 45 shear stress or shear rate data points per test
		• Unique algorithms for polymer melt stability
		• Bi-directional communications to enable test parameters to be downloaded from the PC.

15	Software	• Carreau, Modified Cross, Power Law and Polynomial curve fits.
		• Arrhenius Temperature fit
		• Statistical error estimation
		• Shear rate dependence
		• Time at temperature relationship
		• Critical shear stress
		• Zero shear viscosity and Intrinsic viscosity correlation
		advanced rheology software
16	Rheological corrections& measurements	• Rheological analysis of polymer melts based on capillaries (Apparent Shear rate range : approx..10 to thousands of 1/s (like fiber spinning).
		• Measurement of Elongation/ extensional viscosity according to Cogswell method
		• Measurement non-Newtonian flow index
		• Automatic Bagley and Rabinowitsch correction
		• Rheological analysis of polymer melts based on slit dies (option for future)
		• Measurement of die swell – laser based (Capillary)
		• Measurement of fiber stretchability, melt strength.
		• Measurement of PVT characteristics of polymer melts as per ISO 17744
		• Measurement of flow instabilities (stick-slip, shark skin, gross melt fracture) (option for future)
		• Bagley Correction
		• Thermal Degradation/ Analysis
		• Stress Relaxation module.
		Software with modules for deeper rheological data analysis to be supplied for measurements of Characteristics as mentioned above
		Polymer cooling behaviour and compressibility to be supplied with system.
		Die Swell - material elasticity evaluation after extrusion

17	Other Feature	System to be supplied
		Melt Cutting - extrudate portions cutting at given time
		Unit with pneumatic drive to be supplied
		Stretching & melt tension measurement–Complete set with accessories for the same to be supplied
		Cleaning device complete set with required accessories to be supplied
18	Calibration	Calibration of all required parts like pressure transuduers dies &piston etc. traceable to NIST or equivalent/All digital calibration
19	Mandatory Items	While supplying the Machine, the supplier should also provide the following items apart from above:
		• Hard copies of Operational & Service Manual- 01 set
		• Basic Tool Kit box with all necessary Tools-01 Set,
		• Safety gloves & goggles required for day to day activities during operation of Machine.
		• Machine should also come with all other essential accessories & spares required for installation, commissioning & Operation.
		• Onsite Training to be provided.
20	Personal Computer (PC)	Personal Computer (PC) having latest configuration. All softwares shall be loaded in the hard disk with appropriate partitions. All original CDs/DVDs must be provided. The scope of supply also includes a good (reputed make, please give the details) Colour Laserjet Printer having a resolution of 1200 × 1200 dpi or better.

2021-22 / 06 / 04 - CNC EDM Machine			
Sl. No	**Item**	**Unit**	**Specication**
1	The CNC EDM with C-Axis should capable of wear free ED machining with graphite electrode and copper electrode as per the following detailed specification.		
2	Work Tank Size	mm	(800-1000) X (500- 700) X (250-450)

3	Axis Travel (X x Y x Z)	mm	(400-500) x (300- 400) x (300-400)
4	Measurement resolution	µm	1 or better
5	Maximum Job weight	kg	500 or better
6	Max. electrode weight on automatic chuck	kg	50 or better
7	Dielectric Unit		Filtration system - 10µ or better ; Flushing Injections ;
8	Generator		ISPG Integrated /Transistor-controlled pulse generator or better
9	Max. machining current	A	50 or better
10	Minimum surface roughness (Ra)	µm	0.40 or better
11	Control System	Latest with complete module CNC controller (or OEM system) and Capable storoage to store large part programs for continous running.Program input/output can be performed through USB/LAN.Software should have possibility to create machining programs both in dialogue and visual modes directly from the operator panel	
12	Essential Acessories		
13	Automatic Tool Changer Linear or Rotary	Bidder should quote and supply OEM/well known branded with make, model and major specification	
14	Rigid Linear Motor (X, Y, Z)		
15	Glass Scale Feedback (X, Y, Z)		
16	Rotary Head		
17	C Axis		
18	Super finish Module		
19	Zero Wear Module		
20	Flushing system		
21	Filter set		
22	Servo voltage stabilizer		
23	Ultra Isolation transformer		
24	Silent operation Air Compressor with drier		
25	Chiller Unit		
26	Collet holder with collet set		
27	3D probe measuring system for Erowa or System 3R		
28	Erowa or System 3R electrode holding system kit		
29	Remote controller		
30	Clamping kit		
31	Precision machine vice 4”		
32	Ethernet, USB ports, RS-232C Communication Ports		
33	Machine lamp		
34	Dielectric fluid (400 Litre)		
35	Others	Need to specify and quote if any other accessories available /required for smooth running of the machine	

36	Terms & Conditions	The bidder must have supplied machines at other Institutes in the past (a satisfactory performance certificate from those users may be solicited if needed). Bidder should submit complete contact details.
		Manufacturer of the supplied equipment must be ISO Certified
		Authorization Letter from OEM
		List of clients in last five years to be provided.
		Manufacture/Supplier should have sizable installations of same model worldwide and at least Three Nos. in India.
37	Scope of supply	Bidder should submit complete scope of supply (Machine, standard acessories, Optional Acessories etc with make model) in the technical bid withour price.Bidder should supply complete start up package necessary to prove the machine and provide training.
38	**INSTALLATION, COMMISSIONING AND TRAINING**	
38.1	Installation and requirements	Bidder should state the space required and condition of floor and any other requirements for installation of the machine and equipments. State clearly the specifications of electical requirement.Vendor should carry out installation and commissioning of the machine and its accessories on a turnkey basis.
38.2	Training and documentation	Minimum of 5 days training for five persons which includes basic & advanced level training. Training content and plan to be submitted. Training faculty must have adequate experience in this field.
		The vendor should supply the necessary manuals such as
		· Software instruction
		· Maintenance and trouble manual
		· Training
		· Installation and Commissioning
		· Handling of accessories
		· Software key (if any)
		· Software CDs
38.3	Warranty	The whole system and its accessories should be given three years warranty for replacement and service against any design, manufacturing and workmanship defects from the date of installation and commissioning.

38.4	Technical support and service	Manufacturer should have established after sales & service network in India. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need. Technical support personnel must have adequate experience in this field. Technical support personnel details should be submitted. Name and address of the authorized service centre/ partner in India along with the certificate of authorization should be attached.
38.5	Annual Comprehensive Maintenance Contract (ACMC) as optional	Vendor should quote for Annual Comprehensive Maintenance Contract for the whole system and accessories supplied after the completion of performance warranty period. Supplier has to provide service support within 48 hours. Calibration of the machine shall be a part of warranty and ACMC. It shall also be mandatory to perform calibration after every major repair or breakdown

2021-22 / 06 / 05 - Heavy duty-Scrap Grinder with Deflector Blades			
Sl. No	**Item**	**Unit**	**Specication**
1	Output	Kg / Hr	100 and above
2	Blade Size	inch	24
3	Blade Material	---	HSS or better material
4	Feed Opening (LxW)	mm	500 x 500 or more
5	Motor	HP	20 or less
6	Spare Blades, others		1 Set extra to be supplied
7	Others		Able to cut plastic lumps
8	Body material	--	Epoxy painted steel for robust structure or better

2021-22 / 06 / 06 - High Resolution Field Emission Scanning Electron Microscope (FESEM) with Accessories			
Sl. No	**Item**	**Unit**	**Specication**
The high-resolution field emission scanning electron microscope (FESEM) which is suitable for analyzing samples in the form of metallic / non-metallic, crystals, thin films, polymers, metal oxides, geological, various biological, biomaterials etc. of micro to nano scale dimensions, which will be either coated/uncoated while imaging. The FESEM should be equipped with Energy Dispersive Spectroscopy system as an attachment for investigating chemical composition and the system should be compatible for future upgradation with other accessories as per below specifications. The system also should be equipped with E-beam Lithography and electrical measurement systems. The offered FESEM should be fully computer controlled, fully automatic system with all the required hardware, software, accessories, standards and other consumables required for installation, commissioning, calibration of the unit at your site. The FESEM with Accessories must have the following technical specifications which should be supported by the original technical brochure and official website of the manufacturers			
1	Resolution		• 0.7 nm or better @15 kV in Hi-Vac mode
			• 1.2 nm or better @ 1 kV in Hi-Vac mode
			• 0.6 nm or better @ 30 kV (STEM)
			The achieved resolution should be without any stage bias and independent of any external parameters.
			The resolution should be same in field free mode and immersion lens on mode.
			The definition of resolution and the method used to determine the resolution should be clearly specified and resolution should be shown at the site of installation with standard samples.
2	Electron Gun		High Stability Field Emission Schottky Emitter
3	Operating Modes		High Vacuum (HV) mode
4	Magnification		10x to 20,00,000x or better.
			The user should be able to enter the desired magnification values through software.
5	Acceleration Voltage		The Accelerating Voltage Lower Limit should be 20V or less and Higher Limit 30 kV or more, with 10 V variations in steps.
			Imaging at 20V should be possible without sample biasing.

		All the accelerating voltage settings must be software controlled through PC and should be adjusted to any value as per application requirements with accuracy of ± 10 Volts.
6	Specimen Chamber	Large chamber (at least 100 mm inner diameter and comparable height for accommodating large specimens & multiple accessories comfortably) with at least 7 accessory ports & bigger stage.
		The analytical working distance should be compatible with the chamber.
		The system can accommodate samples with size at least 100 mm diameter and 40 mm
		Height or better.
7	Stage	5-axis, Eucentric Motorized stage and the stage should be controlled by both software & joystick controller in all axes.
		The stage movements should be:
		• X=100 mm or more; Y= 100 mm or more; Z=50 mm or more;
		Tilt = - 3° to + 70° or better; R=360° - continuous.
		• Mínimum step size should be less than 100 nm and repeatability of 2 µm or better.
8	Electron Optics	• Should have Beam Deceleration/Beam Booster Technology/Gentle Beam Technology or equivalent for enhancing resolution at low kV.
		• Should have lens design of combination of Electromagnetic &Electrostatic lenses technology or Super Hybrid Lens design or equivalent lens design technology to cover the high-resolution imaging of all kinds of samples.
		• The system should be able to achieve high resolution imaging of magnetic materials, like ferromagnetic steel, quantum dots etc. even with shorter working distances (≤3 mm).
		• During the stage tilt operation, blurred image corrections should be controllable with proper adjustment.
9	Probe Current	At least 4 pA or lower to 100 nA or higher.
		Probe current setting must be fully automatic and must be ultra-high stable to allow long-term EDX, etc. measurements
		• Chamber mounted Secondary Electron Detector (ET-SED)
		• Chamber mounted Back Scattered Electron Detector (BSED)

10	Detectors	• In-Lens/In-column Secondary Electron Detector
		• Separate In-Lens/ In-column Back Scattered Secondary Electron Detector
		• Pneumatically retractable STEM detector with sample holder.
		• Electron Back Scattered Diffraction (EBSD) detector
		• Mixing of different signals must be possible at any ratio.
11	User Interface	Keyboard, Mouse, Control Panel with multifunction for the control and adjustment of frequently used SEM parameters, Manual Joystick control for stage axis should be supplied.
12	Display& Image processor	• High definition display system to view live images of different detectors simultaneously
		• Software should be capable of automatic generation of report in MS-Office. MS-office to be provided.
		• Image acquisition system should be compatible with Windows 10 or recent operating system version of windows.
		• Operating conditions need to be stored.
		• The system should be capable of collecting & store live image with higher resolution (preferably 32k x 24k pixels or more).
		• Automatic and manual control of large number of functions including Auto emitter system run-up, auto brightness, auto contrast, auto stigmator, auto focus, Auto Alignment etc.
13	Vacuum System	• The vacuum system should be operated with computer controlled, pneumatic operated valves with full safe protection for mains, high voltage and vacuum failures.
		• Suitable vacuum system having ion Getter Pump (IGP), Turbo Molecular Pump (TMP) and Oil free Rotary Pump (RP) for attaining required vacuum levels in Electron Gun/Column and Specimen Chamber and for hassle-free operations. A turbo molecular pump backed by a two-stage dry (oil-free) rotary pump for the specimen chamber.
		• Isolation valves for specimen chamber and high vacuum system during sample loading. Automatic venting with dry nitrogen.

		• Seamless transition between the vacuum modes.
		• Faster vacuum recovery after breaking for specimen exchange.
14	Computer	03-Nos, Compatible windows based latest configuration computer/workstation (i9 or better, 2 TB or more hard disk, 16 GB or more RAM, front panel USB ports, CD/DVD recorder, 24-inch HD Monitor -03) with all its peripheral devices and add-on cards required for FESEM operation.
		Additional input slots for future usage.
		Most recent OS is preferred (i.e. Windows 10 or higher version).
15	Software	Pre-loaded original licensed software having all regular and advanced measurement functions based on latest Windows OS with Customizable GUI.
		Software should be reloaded or upgraded whenever required at free of cost.
		The system should be able to capture live images stored at different resolution.
		Offline software with key for analysis should be provided.
16	Essential Accessories (must provide)	• Water Chiller – air-cooled, to be supplied with the main system.
		• Compressor- to be supplied with the main system
		• Infrared colour CCD Camera for viewing inside the specimen chamber
		• 02 Nos of Control Panel with integrated keyboard for adjustment of various frequently used SEM parameters
		• Interface between SEM and EDS for smooth integration.
		• 02 Nos- Joystick for controlling the complete stage movements manually in all axes
		• 02 Nos of Sputter Coater (FESEM quality) with suitable vacuum pump
		• Sputter targets: 02 Nos each (Gold, Gold/Palladium, Platinum)

16	Essential Accessories (must provide)	• Extra FEG source – at least 3 no.
		• At least 50 nos. of double-sided conductive Carbon Tape.
		• Specimen stub: 250 nos. (at least)
		• Multiple specimen holder: 10 nos.
		• Cross section and tilted samples holder: 10 nos.
		• Specimen Preparation tools kit
		• UPS 20 KVA or more with 3 hour back-up
		• Suitable color printer
17	Standard Samples /Calibration	Standard samples for resolution & magnification calibrations
18	Energy Dispersive Spectroscopy	Advanced Liquid Nitrogen (LN_2) free SDD type Energy Dispersive Spectroscopy system with suitable window for low energy X-ray transmittivity and must be compatible with the FESEM system:
		a. Liquid Nitrogen free with integrated Peltier cooling system
		b. Typical energy resolution of 127 eV, measured at Mn Kα.
		c. The EDS should detect energy of element starting from Be (4) to Am (95).
		d. Detector area 30 mm^2 or higher.
		e. Detector window should have made by robust material and with honeycomb grid structure supporting grid, to increase X ray transmissivity increased light element sensitivity
		f. Vacuum encapsulated module: better low energy sensitivity, lower power draw

		g. A software package for fast and accurate elemental analysis with an easy-to-use user interface for EDS data collection and analysis, software functions like point ID, mapping, Line Scan, Multi point analysis and reporting option must be provided.
		h. EDS detector must be plasma cleaner compatible.
19	Lithography Facilities	• Electron Beam Lithography and electrostatic beam blanker with 100 kV write mode or better and high-resolution lithography below 5 nm or better.
20	In-Situ Electrical Measurements	• Four probe I-V measurement provision should be provided.
21	Colling Stage	• Peltier Colling Stage (-30°C to +50°C or better)
22	Future Upgradation	The complete system should be flexible enough to be upgraded on site with various hardware accessories, various detectors /
23	Warranty	• 5 years from the date of successful installation and
24	Installation, Commissioning & Training	The installation, commissioning, and demonstration of complete system to be carried out by the supplier at free of cost.
		After successful installation and commissioning, on-site operational training for the deputed personnel to be provided for required days at no additional cost.
25	Service Facility	The supplier must have sufficient nos. of service engineers in India as well as in east region to provide prompt service. The vendor should have demo lab with a similar instrument or better and must analyze the samples free of cost during instrument breakdown under warranty period, so that research works should not stop.
		System should be supplied with all necessary tools for emitter change including baking heater, Vacuum recording device etc.
		Service response time must be within 72 hours (working hours).
26	Other Criteria	The manufacturers must have at least 10-15 nos. of FESEM installation in India in last 5 years. Necessary documentary proof should be enclosed
27	Pre-Installation requirement	Pre-installation details, such as, room, floor plan, size, electrical requirements and EM & vibration levels etc. should be sent immediately after the placement of the order and the installation site should be measured physically to check its suitability by the vendor. A copy of that needs to be enclosed along with the tender bid.

		Necessary environmental requirements, i.e. temperature, humidity etc. during the operation (and unused hours) of FESEM & EDS should be specified clearly.

2021-22 / 06 / 07 - Mask Aligner & Exposure Unit			
Sl. No	**Item**	**Unit**	**Specication**
1	**Basic Application**	Offered system must be ideal for the fabrication of high-level systems for research applications. Ability to do photolithography with manual alignment capability on	
		Main applications range from microfluidics, optics and biotechnology to microelectronic devices.	
		It provides the user with fast multilayer device fabrication capabilities.	
2	**General Features**	- Manual & Pneumatic Control system	
		- Sample size : up to 4” diameter	
		- Mask holder: up to 5” × 5”	
		- UV LED Light source With Power Supply	
		- Dual CCD zoom microscope and Dual Monitor	
		- Alignment Tooling Module with X,Y,Z and Theta motion (Micrometer)	
		- Wedge Error Compensation System	
		- Z-axis gab digital display	
		- UV meter(365nm) built-in	
3	**System Specification**	- Light source module	
		- Lamp type : UV LED	
		- Wavelength : 365nm(i-line)	
		- 365nm Beam Intensity : Max. 22 mW/cm2	
		- Max. Beam size : Diameter 125mm	
		Beam Uniformity : ±2%	
4	**B. Microscope**	- Dual CCD zoom microscope	
		- Manual moving stage : Dual X, Y, Z axis	
		- Objective spacing : 50 ~ 110mm	
		- Move range : Y Axis ± 20 mm	
		- Dual Monitor	
		- Magnification(Scope) : 90x~480x	
5	**C. Stage and controller module**	- Exposure Timer : 0.1 sec to 999.9 Hour	
		- Stage movement : X,Y,Z and Theta	
		X, Y : ±5mm,	
		Theta : About ±5°	
		Z Motion travel : 10 mm (Actually Separation Distance Mask & Sample Distance: 5mm)	
		- Contact mode : Vacuum, Hard, Soft Contact	
		Vacuum & Hard contact (Force controllable)	
		- Alignment accuracy : ±0.5um	
		- Vacuum / Pneumatic Controls :	

		Substrate, Mask, Chuck lock & Contact
6	**D. Resolution**	- Vacuum Contact : 1.0um
		- Hard Contact : 2um
		- Soft contact : 3um
		- Proximity : 5um
7	**Vibration Isolation Table**	- Isolation size : 1000 x 1000 x 750mm
		- Type : Vibration Isolation system
		- leveling : 3- Point self-leveling
		- Natural Frequency :
		Vertical : 1.2 ~ 1.5 Hz
		Horizontal : 1.5 ~ 1.8Hz
8	**Computer**	Branded PC i7, 8GB RAM, 1TB, HDD, 21 inch or more LED Monitor, Windows 10 OS, MS office Professional - 2019
9	**TERMS & CONDITIONS**	1. Tenders should specify and quote all mandatory and other accessories required for installation, commissioning and running the machine.
		2. The vendor should supply PCs with requisite specifications and data transfer accessories compatible with the equipment.
		3. All necessary CRM along with the calibration certificates wherever required traceable to international standard should be provided.
10	**AMC**	AMC charges for additional 3 years should be quoted additionally.
12	**PRE-REQUISITES**	1. Pre-installation requirements indicating details of power requirement, utility air, water, ventilation, safety device, if any, along with the foundation requirement needed for installation & commissioning should be provided with tender document.
		2. The vendor should have technical support in the area of application and service available within the country.
		3. The power requirement of UPS for providing a back-up of minimum 01 hour should be specified.
		1. Appropriate tool box/kit for routine maintenance should be provided with the equipment

13	**SERVICE**	2. All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.
		3. In case of any up gradation of software within the period of warranty then the same should be provided free of cost by the supplier/manufacturer.
		4. Power and receptacle/socket as per Indian Standards should be provided.
		5. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
14	**VENDOR TRACK RECORD**	14. The vendor should furnish details of customers in India.
15	**TRAINING**	Onsite training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.

2021-22 / 06 / 08 - Micro Compounding Machine With Micro Injection Moulding Unit			
Sl. No	**Item**	**Unit**	**Specication**
1	Design	vertical/horizontal type with Co-rotating screws and counter-rotating screws	
2	Sample quantity requirement of the Extruder	10 to 15 ml	
3	Extruder Heating	The extruder should include electrically heated controlled heating zone with an adjustable temperature range and the operating temperature should be 400°C or better.	
4	Cooling of the extruder	Water and air cooling	
5	Pressure measurement Sensors	The extruder must include pressure sensors capable of measuring high pressures of 150 bars or better	
6	Main drive	The main drive of the extruder should include digital RPM adjustment with a provision for torque measurement 400 RPM or better by means of a frequency controlled drive.	

7	Instrument control – integrated PC based control and monitoring	PC based Data documentation, Control and acquisition rheological software. Storage of test setup and test results. The software should be operatable under Window platform.
8	Essential accessory	Strand Die compatible with the extruder, Set of rod dies (0.5, 1.0, 1.5 and 2.0 mm diameter)
9	Rheological Measurements	The extruder must have a back-flow channel which should re-circulate the extrudate back to the extruder to enable control of the residence time
10	Bypass operation	Automatic bypass operation for circulation/extrusion
11	Inert environment	Extruder should be equipped with an inert gas flush system
12	Torque on screw:	Double screw torque 20 Nm / screw or better
13	Thermocouple	Standard thermocouple for measurement of temperature
14	Pressure sensor	Standard pressure sensor for measurement of stress
15	Computer	●Latest desktop PC with windows 10 operating system suitable to the requirement to be provided ● 1TB Hard Disk Drive ● 8GB RAM, 4GB Graphics card ● 23" LED Monitor ● Windows 10.0 Pro operating system and MS Office installed
16	Standard tools	1.Cleaning brush 2. Screw set 3.Supporing Table for mounting equipmemtnt and computer to be provided
MICRO INJECTION UNIT		
17	The Micro Injection Moulding Machine and Volume	Piston based injection molding system of volume 10 ml or higher
18	Compatibility	The machine must be capable of being used as standalone unit AND in conjunction with above Micro Twin Screw Extruder with force feeder
19	Pressure requirement	up to & at 10 bar 12 kN (1200 bar), at 16 bar 18 kN (1800 bar)
20	Maximum Injection pressure(Bars)	1100 or More
21	Maximum Mould temperature (°C)	250°C or better
22	Maximum injector temperature (°C)	350 °C or better

23	Mould for Test specimen	Set of Mould for Test specimen for Tensile (Type I to V) , Flexural, Izod, Charpy, Abrasion/Volume & Surface resitivity (Disc-sample) , Compression etc. as per specified ASTM & ISO standards.(ASTMMD 638)
24	Standard tools	Screw type Air Compressor (10 Bar, 40 SCFM) with Air Drier and other accessories (acoustic)
25	Accessories	Bidder to specify and quote any other accessories required for the better utilization of the equipment
26	Scope of supply	Bidder should submit complete scope of supply (Machine, standard accessories, Optional Accessoriesetc with make model) in the technical bid with ourprice. Bidder should supply complete start up package including material necessary to prove the machine and provide training.
27	Warranty	3 years
28	Terms & Conditions	The bidder must have supplied machines at other Institutes in the past (a satisfactory performance certificate from those users may be solicited if needed). Bidder should submit complete contact details.
		Authorization Letter from OEM
		List of clients in last five years to be provided.
		Firms offering the product should have good track record of service support
		Should provide catalogue of the equipment and proof of facility meeting with specification wherever desired. Offers must include sufficient technical documents in support of claims made in the comparative statements
		Manufacture/Supplier should have sizable installations of same model worldwide and at least five in India.

2021-22 / 06 / 09 - Microprocessor Controlled Automatic Injection Moulding Machine 180-225T			
Sl. No	**Item**	**Unit**	**Specication**
	Injection Unit		
1	Shot Capacity (in GPPS)	g	Min. 500 and above
2	SCREW DIAMETER	mm	50-70
3	SCREW L/D RATIO	-	Min. 20
4	INJECTION PRESSURE	bar	Min. 1500
5	INJECTION Speed	mm/sec	Min. 70
6	INJECTION RATE IN AIR	cc/sec	Min. 200
7	PLASTICIZING RATE (GPPS)	gm/sec	30 (higher will be preferred)
8	Max. SCREW SPEED	rpm	275 or Higher
9	Bi-metallic Screw Barrel	-	Specify and Quote

10	Heating Capacity	kw	8 or Higher
	Clamping Unit		
11	CLAMP FORCE	ton	180-225
12	Mould Opening Stroke	mm	Min. 510 and above
13	MAXIMUM DAYLIGHT	mm	Min. 1100 and above
14	MINIMUM MOULD HEIGHT	mm	200
15	Maximum Mould Height	mm	Min. 600 and above
16	PLATEN SIZE	mm	min. 800 x 800 and above
17	DISTANCE BETWEEN TIE ROD	mm	Min. 550 X 550 and above or Tie bar less machine
18	EJECTOR STROKE	mm	Minimum 150 and above
19	EJECTOR FORCE	ton	Min. 4
20	MOULD WEIGHT CAPACITY	kg	Min.1500 & above
21	Hydraulic Multiple core pulling unit	-	Minimum 2 core pulling
22	Multi stage Air Ejection	-	Minimum 5 point
23	Clamping Mechanism	-	Toggle prefered or Ram
	General		
24	T Slot Platen	-	T Slot is Preferred
25	Latest Square Platen	-	Specify
26	Latest Technology Injection unit on LM guides	-	Specify
27	Robot Interface	-	Specify and Quote
28	Hot Runner Inerface	-	Min. 4 Zones
29	Water inlet & outlet manifold for Mould cooling	-	Min. 10/10 Channel
30	Computer connectivity	-	USB/ Wifi ConnectionPreferred
31	Hopper loader cum drier	-	Minimum 75 kg capacity
32	Essential/Standard spares	-	Specify and Quote (Standard Tool Kit, NRV, Thermocouple, Band Heater, Short/Extended Nozzle, Nozzle Spanner, SSR, Proximity Switch, Limit Switch, Mould Clamps, T-Nut and Studs, Etc,.) Should be included in the Quote.
33	Suitable MTC (Oil Type)	-	Quote along with the machine (Optinal)
34	Safety	-	Mention the Special safety provisions
35	Motor / Pump Type	-	Servo
36	Motor load	-	Specify
37	Machine Dimensions (LxWxH)	-	Specify
38	Total connected load	-	Specify (Lower connected load will be preferred)
39	Energy meter	-	to be Incorporated with the machine
40	Max. Power consumption @ full machine capacity	-	Specify (lower power consumption will be preferred)
41	Warranty	-	Two years from the date of installation.

2021-22 / 06 / 10 - Multi-product Calibrator			
Sl. No	**Item**	**Unit**	**Specication**
1	**APPLICATION**	• It is used to Calibrate a wide variety of electrical test such as frequency, Temperature simulation- Thermocouple, RTD, Resistance, DC /AC voltage, AC/DC Current, Capacitance, Power factor, Phase angle, AC/DC Power	
2	**Functional**	• The offered MFC shall be able to source AC/DC voltage, AC/DC current, AC/DC Power, frequency, resistance, capacitance, conductance and inductance.	
3	**Requirement:**	• It should also have capability to simulate thermocouple and RTDs. Additionally; there should be provision for calibration of oscilloscope.	
		• The offered MFC should have capabilities to calibrate digital and analogue multi meters, frequency meters, ohm meters, AC/DC milli voltmeters, thermocouple and RTDs indicators, tachometers, clamp meters, oscilloscopes and timer counters.	
4	**DC Voltage**	• Range: 0 to ± 1000 V or better	
		• Best Resolution: 100 nV or better	
		• Best Accuracy: ± (15ppm + 1uV) or better	
5	**AC Voltage**	• Range: 1 mV to 1000 V or better	
		• Best Resolution: 1 uV or better	
		• Best Accuracy: ± (0.02% + 30uV) or better	
6	**DC Current**	• Range: 0 to ± 20 A or better	
		• Best Resolution: 0.1 nA or better	
		• Best Accuracy: ± (60ppm + 40nA) or better	
7	**AC Current**	• Range: 30 µA to 20 A or better	
		• Best Resolution: 10 nA or better	
		• Best Accuracy: ± (0.05%+ 150 nA)or better	

8	**Capacitance**	• 220 pF to 110 mF or better
		• Best Accuracy: 0.1 pF or better
9	**Inductance**	• 1mH, 1.9mH, 5mH, 10mH, 19mH, 50mH, 100mH, 190mH, 500mH, 1H, 10H
		• Best Accuracy:0.2%
10	**Conductance**	• 1S, 100mS, 10mS, 1mS, 100µS, 10µS, 1µS, 100nS, 10nS
		• Best Accuracy: 200ppm
11	**Phase:**	• 0 to 90° or better
12	**Variable Resistance**	• Range: 0 to 1,100MΩ or better
		• Best Resolution: 0.1mΩ or better
		• Best Accuracy: ± (100ppm + 15mΩ)
13	**Temperature calibration (Thermocouple)**	• Range & type: -210 to 2315°C (type J, K, R, T, S, B, E, N,C,L,U) or better
		• Best Accuracy: ± 0.10°C or better
14	**RTD simulation**	• Range: -200 to 800°C or better
		• Best Resolution: 0.003 or better
15	**Oscilloscope calibration**	• Amplitude
		• Range: 2 mV to 200 V (1 M Ω) and 1 mV to 2 V 50 Ω (Square-wave or DC)
		• Best Accuracy: ± 0.05%
		• Frequency / period
		• Range: 0.1Hz to 100MHz / 10ns to 10s (fixed values 1, 2, 5 sequence)
		• Accuracy:± 0.1ppm (0.1Hz to 10MHz / 100ns to 10s)
		• ± 20ppm (20, 50, 100MHz / 50, 20, & 10ns)
		• Duty Cycle

		• 3 frequency: 100Hz, 1kHz, 10kHz, settable from 0 to 100%
		• Fast-Rise
		• < 400ps. Bandwidth checking up to 400MHz
		• Scope 2.2GHz Sweep
		• 100MHz to 2.2GHz leveled sine-wave (0.5, 1, 1.5V pk-pk)
16	**Power AC/DC**	• Current: up to 22 A, Voltage: up to 1050 V, Power: up to 23 kW or better
		• Frequency: 40 to 500 Hz, Phase: ± 90°, Power Factor: 0.00 to 1.00 PF or better
17	**Clamp Meter Adaptor**	• Range: AC/DC Current up to 1100A (DC, 45 to 90Hz)
		• Best Accuracy: ± 0.5%
18	**Interfaces**	• IEEE-488 (GPIB), RS-232
19	**Environment**	• Operating temperature range: 0°C to 50°C
		• calibration temperature range: 15°C to 35°C
		• Storage : -20 ° to +50 °C; Rh: <95 %
		• Relative Humidity: < 80% non-condensing
20	**Mains power supply**	• Single Phase 230V, 50Hz
21	**Accessories**	• Test lead set, Control Software, PC interface cable, Calibration certificate (NABL/UKAS) & User manual.

2021-22 / 06 / 11 - Physical Vapour Deposition (PVD) Sytems. (Thermal Evaporation, Electron Beam and Magnetron Sources)			
Sl. No	**Item**	**Unit**	**Specication**
Description: The physical vapour deposition unit is comprised of a thermal evaporation, electron beam evaporation and rF/DC magnetron sputtering with load lock system. The vacuum system consisting of turbo molecular pump and dry scroll pump together with system of valves and vacuum measuring hardware's.			
Details about the technical specifications are given below:			
			VACUUM CHAMBER:

		(A)	➢ D- Shaped, SS 304, water cooled vacuum chamber of external dimensions (approx.) 500 mm (W) x 500 mm (D) x 500mm (H).
			➢ A hinged front opening door is provided for loading & unloading of the substrate.
			➢ A set of easy removable thin stainless steel liner inside the chamber is provided to prevent deposition on the chamber wall.
			➢ Water circulation channels are provided on the outside of the chamber for the purpose of chamber cooling.
			➢ The chamber is provided with suitable ports for Turbo molecular pump, vacuum gauges, vent valve, roughing valve etc.
			➢ Chamber base plate is provided with necessary feed through ports for mounting electron beam gun, source shutter, Thermal source and a magnetron source and gas feedthrough etc.
			➢ Chamber top plate is provided with necessary feed through ports for substrate holder.
		(B)	**THERMAL EVAPORATION SOURCE**
			➢ One number of resistance evaporation source holders with clamps capable of holding a single filament or boat source.
			➢ A LT transformers for use with resistance evaporation source. The transformer outputs can be set to 10V at 100A or 5V at 200A.
			➢ A thyristor type evaporation current controller with manual control.
			➢ An electro pneumatically operated shutter is provided
			Electron Beam Source
			One no. of E-beam evaporation source with following is required:
			➢ 4 no's of 4cc volume crucibles (each)
			➢ Capability: 5 KV, Power: 3KW
			➢ Beam deflection: 270^{o}

		(C)	➢ Integrated X-Y beam sweep coils
			➢ Water cooling system
			➢ Quick release electron emitter assembly
			➢ EB3 feedthrough kit with two numbers of Ceramic high voltage feedthrough, dual water feedthrough, flexible stainless steel water pipes and water cooling connection kit
			➢ Electron beam water flow switch kit provides interlock signal when sufficient water is flowing through electron beam source
			➢ Electro pneumatically operated source shutters with rotary shaft seal to cover the evaporation sources
			➢ X-Y beam sweep controller with independent control in both X and Y direction of:
			• Beam position
			• Beam sweep amplitude
			• Beam sweep frequency
			• Sinusoidal, triangular or square oscillation waveforms
			• LED displays provide visual indication of the beam sweep movement in both the X and Y directions.
			➢ Motorized turret indexer for the EB3 electron beam source, it enables any of the four crucibles to be selected from the control panel. Complete with rotary feedthrough, baffle plate, drive indexing mechanism and controller
1	**PVD Chamber**		**<u>ELECTRON BEAM POWER SUPPLY</u>**
			➢ Telemark or equivalent make 3kW Solid State Electron Beam Power Supply for the EB3 source.
			➢ Comprises power module and separate control module.
			➢ Rated at 3kW with 500mA emission current.

		(D)	➢ Has facility for local operation or remote operation from a deposition process controller (where fitted)
			➢ Provided with interlocks for operator safety.
			➢ An electro-pneumatic source shutter with rotary shaft seal, shutter arm and removable shutter pan.
		(E)	**MAGNETRON SOURCES**
			➢ A 3” indirectly water cooled, flexible sputter sources.
			➢ The magnetron is arranged in sputter up configuration.
			➢ Water flow switch for the magnetron source.
			➢ High power Nd-Fe-B magnets which are isolated from the water.
			➢ Easy to change target without breaking any internal seals.
			➢ User-adjustable tilt angle (± 45 with respect to the plane of the substrate.
			➢ Stainless steel cross contamination shield for each magnetron.
			➢ An electro- pneumatically operated source shutter is included.
		(F)	**POWER SUPPLIES:**
			➢ One number of imported make 1.5 KW DC Power supply is provided.
			➢ One number of 600W Imported make 13.56 MHz RF power supply with auto matching network is provided.
			➢ 2 IN 1 OUT RF/ DC Switch box is provided to direct either RF/DC power to the magnetron.
			GLOW DISCHARGE:
			➢ A bar type ion bombardment gadget with necessary HT feedthrough and cables are provided for the glow discharge cleaning of the substrate work holder.

		(G)	➢ A 5000 volts DC Open circuit, 3500 volts at 50 mA high reactance type transformer and solid state bridge rectifier are provided. Thyristor based power controller is provided for HT power control and a digital panel meter for the HT primary current display
		(H)	**ROTABLE SUBSTRATE HOLDER & HEATER** • The substrate holder platform and associated fixtures is designed to accommodate 4 inch substrate. • A rotary drive mechanism for the continuous rotation of 360° with adjustable speed up to 20rpm. • Substrate heater is provided to heat the substrate from R.T to 800 deg. C. • Temperature measurement using 'K' type thermocouple. • Temperature controlled using PID controller. • A motorized z-shift is provided for the work holder to allow transfer from and to the transfer arm and to adjust the source to substrate distance.
		(E)	**MASS FLOW CONTROLLERS:** • Three numbers of mass flow controller for Argon, Oxygen and Nitrogen gas having flow rate 2-100 sccm each with fittings are provided.
2	**Vacuum**		**VACUUM PUMP:**
2.1	**Pumping**	(A)	➢ The vacuum pumping system should consist of **turbo molecular pumping** system which are having the pumping speed of 725 **Ltrs/sec** or better and it's backed by **dry scroll vacuum** pump which capacity of **35 m^3/hr or better**.

2.2	**System**		➢ Ultimate vacuum of **1 x 10^{-6} mbar or better** range should be achieved in clean, degassed chamber after high vacuum valve opens and initially back filled with pure and dry Nitrogen gas.
		(B)	**HIGH VACUUM VALVE:** ➢ A high vacuum isolation gate valve is fitted between the chamber and the turbo-molecular pump.
		(D)	**SS Plumbing line &Collar** ➢ SS Plumbing line with flexible hoses & KF connections wherever required with necessary interlocks should be provided.
		(E)	**VACUUM GAUGES:** ➢ Digital Pirani a Penning Gauge – Imported make
3	**LOAD LOCK CHAMBER :**	➢ The system comprises of a load lock chamber with an access door for a single sample of up to 100mm/4" diameter or irregular size and shape samples, plus connection to the process chamber, sample transport and vacuum pumping.	
		➢ A quick-open door is provided to load and unload the sample. A motor-driven, internal telescopic mechanism transfers the substrate from load lock chamber to the process chamber.	
		➢ Connection to chamber via a pneumatically operated 6" gate valve. Interlocking is provided to prevent inadvertent operation of the gate valve	
		➢ The vacuum pumping system is provided for evacuating the load lock chamber. Comprises of Imported make dry scroll pump is having the pumping capacity of 6m3/hr pump and Imported make turbo molecular pump Model is having pumping capacity of 85 lit/sec.	
		➢ Roughing and backing valves are provided.	
		➢ A vent valve is provided.	
		➢ Imported make pirani gauge and penning gauge for vacuum measurement	

4	**THIN FILM DEPOSITION MONITOR**	➢ Quartz crystal film co deposition process controller is provided.
		➢ Water cooled flexible, quartz crystal for thin film measurement- 4 No's
		➢ Quartz crystal oscillator - 4 No's
5	**Chiller**	➢ 1 TR Chiller should be included with all necessary spares
6	**Air Compressor**	➢ Suitable capacity should be included
7	**Gas Cylinders**	• Three numbers of 47 Liters capacity Gas cylinders with regulators for Argon, Oxygen & Nitrogen are provided.
8	**Consumables**	• DTM Crystal – 40 nos
		• O ring gasket – 1 set
		• Fuses – 1 set
		• Protective sight glasses – 1 set
		• Boat – 10 nos
		• EB Filament – 10 nos
		• EB Gun spare part – 1 set
		• Thermal evaporation source insulator – 1 set
		• 3" Target each -1 No: Titanium (Ti), Aluminum (Al), Vanadium (V), Niobium (Nb), Bismuth (Bi), Barium (Ba), Barium Strontium Titanate (BST), Chromium (Ch), Copper (Cu), Silicon (P-type), Silicon (N-type), Silver (Ag), Zirconium (Zr).
		SYSTEM WITH PLC TOUCH-SCREEN CONTROL
		• An Industrial standard control console is provided which will be integrated to the system. All the controllers and display like Industrial PC, emergency ON/OFF Switch, and, Heater controller, electron beam controllers, electron beam power supply, sweep controller, thickness controller and PLC Modules will be mounted on a control console.
		• 15" industrial PC with window 10 based SCADA control software
		• PLC Include with analog modules and digital modules.
		• SCADA for IPC interface for automatic control of all component with possibility of manual override for operation , essential for safety

		• The system control allow to set all system parameter and program all system function by means of simple and function control panels
		• The system can be operated in the following modes:
		• Auto mode with recipe programming
		• Manual mode [Manual Mode with safety interlocks]
		• Service Mode [Service Mode without safety interlocks, requires supervisory password]
		• The IPC with Software provides control over the following systems with necessary displays:
		• Shutter control.
		• Display of Automatic vacuum cycle to start up the system by switching on the pump and opening the relative valves subject to appropriate interlock.
		• Automatic valve status, pump status, vacuum status, and power supply status etc.
		• Automatic venting cycle
		• Substrate rotation control.
		• Substrate heater control
		• EB gun power supply control
9	**System Control**	• Magnetron source shutter control
		• Chamber heating control
		• The deposition status such as indication of shutter position, deposition source status

• Water flow switch interlock status
• Alarming, failure indication
• Trending of main parameters
• User administration
• Online support for remote maintenance and troubleshooting through internet.
• In summary the software offers the following functionalities:
• Process recipe control provides automatic coating cycle including control of deposition source, shutter, substrate rotation, substrate heating and other process accessories.
• Visualized operation screen showing the settings and status of all major system components like vacuum displays, mass flow controller displays
• Data setting and reading of all the system components (power supplies, gas flow, pump operation, sample movement, etc.)
• Status and settings of recipe
• Menus for pre configuration of system parameters.
• Vacuum system and safety interlock status
• Alarms or error messages
• Automatic process sequence generation
• Date logging.

		• Provision to connect to printer is provided.
		• Redundant workable hard disk of the PLC software will be provided
10	**Safety and Interlocks**	➢ All necessary safety interlocks to be provided.
11	**Warranty**	➢ 12 months from the date of installation
12	**CE Certification**	➢ CE Certification must be provided for the proposed system.
		➢ The CE certificate should be provided with the Unit.
13	**Acceptance Criteria**	➢ The thickness uniformity should be ±5% over 50mm (2 inch) diameter substrate. A measurement certificate of thickness uniformity of any metal (for example Al/Cu/Ag) on Si substrate of appropriate size should be provided with Technical Bid.
	(mandatory)	➢ The thickness should be measured by inhouse ellipsometry/profilometer showing variation of thickness along the radius of the Si substrate.
		➢ The committee reserves the right to verify the certificate and thickness uniformity at the customer site/manufacturer site. If it is done at Manufacturer site, then Manufacturer has to arrange the necessary inhouse facilities for assessing uniformity.
14	**Eligibility**	➢ Manufacturer or their Authorized Agent should have ISO or equivalent international standard certificate.
15	**Criteria**	➢ Manufacturer or their Authorized Agent should haves export experience for similar products
		➢ Manufacturer should have prior export experience for similar system. They have to provide user details for their outside of India customer.
		➢ Must have supplied minimum 5 nos. of similar equipments in India to Government labs / Govt. Institutions / Universities, etc.
		➢ List of Organization names with user details to be submitted along with offer where similar type supplied earlier to above said institutions / Universities / etc.

16	**(mandatory)**	➢ Original Warranty Certificate, Original Test certificate of OEM should be submitted for all imported Items
		➢ System Catalogue and all the spares catalogues should be produced with the Technical Bid
		➢ Supplier will support the user with all the spares for a minimum period of 10 years.
		➢ Bidder has to submit audited accounts of last three financial years.
		➢ Audited statement must be signed and stamped by qualified chartered accounted.
		➢ Income Tax return for last 3 assessment years
		➢ Up to date GST clearance certificate.
17	**Drawings**	➢ Conceptual Drawings (exm: Schematic drawing of whole unit) and Technical brochures must be submitted along with the unit.
18	**Utilities**	➢ Details to be provided in the offer for space, power supply, gases, etc for system operation
19	**Manuals**	➢ Operation Manual to be given after installation and acceptance of equipment
20	**User Training**	➢ Training for 2 users should be provided to make them well familiar with the operation of various components.
21	**AMC**	➢ 3Years

2021-22 / 06 / 12 - PLC MICROPROCESSOR BASED ELECTRO-HYDRAULIC TRAINER			
Sl. No	**Item**	**Unit**	**Specication**
1	Fundamentals of Pressure Limitation & Study of Pressure and Force	Should be able to perform the experiment	
2	Fundamentals of Flow Rate and Velocity, Work and Power	Should be able to perform the experiment	
3	Introduction of control valves	Should be able to perform the experiment	
4	Study of pressure built up in hydraulic system	Should be able to perform the experiment	

5	Control of double acting cylinder with 4/3 way dcv	Should be able to perform the experiment
6	Speed control of double acting cylinder	Should be able to perform the experiment
7	Meter-in speed control circuit	Should be able to perform the experiment
8	Meter-out speed control circuit	Should be able to perform the experiment
9	Study of sequence valve	Should be able to perform the experiment
10	Sequencing of two cylinders	Should be able to perform the experiment
11	Bleed-Off speed control unit	Should be able to perform the experiment
12	Hydraulic motor operation	Should be able to perform the experiment
14	Sequencing of Hydraulic Cylinder & Motor	Should be able to perform the experiment
15	Speed Regulation and Braking of Hydraulic Motors	Should be able to perform the experiment
16	Control of double acting cylinder with 4/2 way dcv	Should be able to perform the experiment
17	Regenerative Circuit	Should be able to perform the experiment
18	Study of pressure switch and its pressure settings	Should be able to perform the experiment
19	Basic Electricity Principles & Study of Electrically Controlled Hydraulic System	Should be able to perform the experiment
20	Introduction to Inductive Proximity sensors, capacitive sensors, photo-electric sensors	Should be able to perform the experiment
21	Operation of Double acting cylinder with 4/3 solenoid operated DCV.	Should be able to perform the experiment
22	Automatic return of Double Acting cylinder	Should be able to perform the experiment

23	Operation of Double acting cylinder using inching operation.	Should be able to perform the experiment
24	Sequencing two cylinder using limit switches	Should be able to perform the experiment
25	Rapid traverse and feed control circuit	Should be able to perform the experiment
26	Study of timer with Timer ON and Timer OFF function	Should be able to perform the experiment
27	Study of counter balance valve with Double Pilot Check Valve	Should be able to perform the experiment
28	Time-Delay Control of Hydraulic Actuators	Should be able to perform the experiment
29	Counting of Hydraulic Actuator Cycles	Should be able to perform the experiment
30	Timer & Counter Instructions in PLC	Should be able to perform the experiment
31	Latching and Comparison Instructions in PLC	Should be able to perform the experiment
32	PLC-Controlled Clamp and Work System	Should be able to perform the experiment
33	Controlling Number of Rotations of Hydraulic Motor with PLC	Should be able to perform the experiment
34	Designing a PLC-Controlled Punching Press	Should be able to perform the experiment
35	Designing a PLC-Controlled Two Cylinder Sequences A+, A- , B+ ,B- , A+, B+ , (A-B-)	Should be able to perform the experiment
36	Introducing Time Delay	Should be able to perform the experiment
37	Any other areas to be covered in kit	Please specify and quote
38	Software modules with computer interface	Please specify and quote
41	Work book, exercise interactive books, section models, charts, etc	Please specify and quote
42	Standard Spares kit, etc	Please specify and quote

2021-22 / 06 / 13 - PLCMICROPROCESSOR BASED ELECTRO-PNEUMATIC TRAINER			
Sl. No	**Item**	**Unit**	**Specication**
1	Latching of solenoid coils using Relay	Should be able to perform the experiment	
2	Function of 4C/O Relay	Should be able to perform the experiment	
3	Understanding of Latching circuits	Should be able to perform the experiment	
4	Creation of basic electro pneumatic circuits using relay	Should be able to perform the experiment	
5	Position sensing using magnetic sensors	Should be able to perform the experiment	
6	Operation of signal elements	Should be able to perform the experiment	
7	Cables with banana plugs for easy connect & disconnect	Should be able to perform the experiment	
8	Creation of basic electro pneumatic circuits	Should be able to perform the experiment	
9	Functions of ON delay & OFF Delay timer	Should be able to perform the experiment	
10	Pulse counting using Counter	Should be able to perform the experiment	
11	Operation of Various types of proximity sensors - inductive, capacitive, Photo electric	Should be able to perform the experiment	
12	Creation of advanced electro pneumatic circuits	Should be able to perform the experiment	
14	It may Includes basic electro pneumatic products like relay etc.,	Please specify and quote	
15	Includes advanced electro pneumatic products like electrical timer, solenoid valves, magnetic sensors Solenoid valves for actuator control	Please specify	
16	Any other areas to be covered in kit	Please specify	
17	Software modules with computer interface	Please specify and quote	

18	Work book, exercise interactive books, section models, charts, etc	Please specify and quote
19	Standard Spares kit, etc	Please specify and quote

2021-22 / 06 / 14 - Polyolefin Pipe Extruder with Post Extrusion Equipments			
Sl. No	**Item**	**Unit**	**Specication**
1	Polymer to be processed	-	LDPE / HDPE
2	Screw Diameter	mm	30 – 55
3	L/D Ratio		28:1 to 32:1
4	Output	Kg / hr.	100 to 120
5	Pipe / Tube Outside Dimensions	mm	25 - 110 mm dia Pipe
6	Vacuum Calibrators	-In SS Structure	
		• -For pipe diameter ranges 20 mm to 125 mm	
		• -Should give a Stable vacuum condition	
		• -Should give aenhanced calibration and cooling precise temperature, flow and level controls	
		• -Should give Separate circuits for vacuum and water spray.	
		• -Should have screen filters, larger filtration area&Auto cleaning.	
7	Water Spray Bath	-Should haveOptimized positioning of spray nozzles	
		-Should have PVC sheets with enclosed type	
8	Pipe Haul Off unit	**-Caterpillar type Haul Offs**	
		-Multi belt type	
		-Pneumatic clamping to be provided	
		-Independent AC geared motor for each caterpillar	
9	Pipe Cut off units	- Upstroke type Cutting Saws for HDPE	
		-Flush mounted type	
		-Should perform Cutting at higher speeds	
		-Chip extraction arrangement to be made	
10	Tripping Chutes	• -Should have a Rigid heavy duty MS Structure	
		• -Rollers for scratch less pipe movement.	
		• -Nominal length -6 Meters	
		- Flat Tray type	
11	Die Size - 75 mm &90 mm	mm	To be incorporated along with machine
12	Total Connected Load	KW	40 to 60 KW

13	Control System	-	Microprocessor/ PLC Controls/ Computer Integrated Control with synchronisation of all parts.
14	Safety	-	Appropriate safety features to be provided
15	Machine dimensions (LxWxH)	mtr	Please specify
16	Essential Machine Spares	-	Please specify and quote