2021-22/02/27 Abraser Tester

S. no.	Item	Specification
1	APPLICATION	• The abrading wheels produce characteristic rub wear action. Mounted to a rotating turntable, specimens are subjected to the rub- wear action of two abrasive wheels. Driven by the test sample, the wheels produce abrasion marks that form a pattern of crossed arcs over a circular ring approximately 30 square centimeters. This reveals abrasion resistance at all angles relative to the weave or grain of the material
1		 The Abraser can be used to test virtually any flat specimen. Its field of application has included tests of: painted, lacquered, powder coated, and electroplated surfaces; textile fabrics ranging from sheer silks to heavy upholstery and carpeting; and solid materials such as metals, stone and ceramics. Other materials include paper, glass, plastics, leather, rubber, linoleum, laminates, plus many others.
Techn	ical Specification for Rotary Abra	ser
2	Configuration :	Abrader type: circular / Cyclic / Rotary model
3	Specification	 Should complies to ASTM D 1044
		 Balanced, calibrated arms and wheel mounts Auxiliary Weights: 500g & 1000g
		 Specimen Table: 108 mm diameter with clamp plate and nut to test rigid material.
		 Rubber pad: To ensure non slip surface during testing Hold Down Ring: To clamp
		flexible samples Refacing Discs – 100 Nos.
		 Diamond tool refacer – 01 No
4	Material	Specimen Mounting Card Sample Package

		Abrading Wheels:
		• CS-10F – 05 sets
		• H-18: 05 sets
		• CS-17: 05 sets
		Cycle Counter Display: LED /
		LCD display
		• Vacuum Unit with Suction Hose &
		Round Brush
		Platform speeds 60 and 72 rpm
		 Power supply: 115/230V,
		60/50Hz
5	Material	• Strong structure overall steel
		construction
		Calibration / Verification Kit
		Sample
		Cutter
	Accessories	Wheel Refacer
		Quiet Cabinet
		Grit Feeder
		Scuffing Head Attachment
		Multi-Media Attachment
6		• Interchangeable Specimen
		I ables
		thicknoon 1/" to 1/")
		Arm Height Extension Kit
		AIIII ⊓eigill Extension Kil (specimen thickness up to 40mm)
		Selection of Abrading Wheel Sets
		Test Accessories
		Haze Kit
7	Safety	Overload protection circuit

2021-22/02/28 Arc Resistance Tester

S. no.	Item	Specification
1	TYPES OF TESTS TO BE PERFORMED	To examines the specimen's ability to resist an arc with high voltage and low current exposed to the material's
2	APPLICABLE STANDARD	Should be complied to ASTM-D495 and UL 746 A
3	Test Voltage	0 – 15 kV adjustable
4		Voltage and current calibration facility should be available.
5	Input Supply Voltage	230 V ±10%.
6	Voltameter	90-130V ±1.0 V
7	MilliAmmeter	10-40 mA ± 5%.
8	Timer	0 – 999 seconds with an accuracy of 1 second

	Wiring	All wiring in the arc circuit must be of
9		ignition wire rated at 15kV and higher
10	Electrodes	Stainless steel strip: 25.4 mm x 12.7
10		mm x 0.15 mm
11		Tungsten rod: 2.4 mm dia and 45 mm
		long
12	Specimen platform	Graphite
13	Specimen size	0-30 mm
	Enclosure	Test chamber with door interlock
14		system to protect user from direct
14		contact of high voltage with control for
		user safety
15	 Dedicated PLC system for c 	control of sequence and user friendly.
12		
16	Automated test controller	
17	 LCD Display to set test para 	ameters and read test results.
18	Exhaust fans in – built in the test chamber to remove fumes	
	 Adjustable test jig to hold directly 	fferent test samples of various
19	dimensions	
		Hard copies of Operational &
20		Service Manual
		Grinding and polishing block for
21		electrode
		Calibration Certificate with NIST
22		traccability should be provided
~~~		traceability should be provided.
	Mandatory Items	Machine should come with all
	Mandatory Romo	• Machine Should come with an
23		lineluding additional one pair of
		including additional one pair of
		electrodes required for installation,
		commissioning& Operation.
	•	• Oncito training to be provided at
24		• Onsite training to be provided at
		commissioning site.

## 2021-22/02/29 Coefficient of Friction (Horizontal Type)

S. no.	Item	Specification
1	Applicable standard	Should be complied to ASTM D
T		1894
2	Test requirement	Horizontal type
3	Weight	200 g & 500g
4	Allowable thickness	Max 1.5mm
5	Allowable Stroke	Max 150mm
6	Sliding speed	150±30 mm/min
7	Weight of table part	2.0 kg approx.
8	Measurement	Graphing software
9	Accessories	Other necessary accessories

10		<ul> <li>Hard copies of Operational &amp; Service Manual</li> </ul>
11		<ul> <li>Calibration Certificate traceable to NIST for required parameters.</li> </ul>
12	12 Mandatory Items 13	<ul> <li>Machine should come with all other essential accessories, computer &amp; spares required for installation, commissioning&amp; Operation.</li> </ul>
13		<ul> <li>Onsite training to be provided at commissioning sitebe provided at commissioning site.</li> </ul>

## 2021-22/02/30 Coefficient of Friction (Vertical Type)

S. no.	ltem	Specification
1	Applicable standard	Should be complied to ASTM D
L		1894
2	Test requirement	Vertical type
2	Weight	200g (2N approx.) and 1000 g (10N
5	Weight	approx)
4	Allowable thickness	Max 1.5 mm
5	Allowable Stroke	Max 150 mm
6	Weight of table part	2.0 kg approx.
7	Measurement	Graphing software
8	Accessories	Other necessary accessories
9		<ul> <li>Moving platform</li> </ul>
10		<ul> <li>Hard copies of Operational &amp;</li> </ul>
10		Service Manual
		<ul> <li>Calibration Certificate NIST with</li> </ul>
11		traceability for required parameters.
	Mandatory Items	
		<ul> <li>Machine should come with all</li> </ul>
		other essential accessories, computer
12		& spares required for installation,
		commissioning& Operation.
12		<ul> <li>Onsite training to be provided at</li> </ul>
13		commissioning site.

### 2021-22/02/31 Automatic Compression Moulding Machine

S. no.	Item	Specification
1	TYPES OF TESTS TO BE PERFORMED	Molding of polymeric material under compression press as per the desired size to undertake specimen preparation for various mechanical properties study.
2	APPLICABLE STANDARD	ASTM D4703(Method A, B, C & D) ISO 293

3		30 ton (adjustable).
		<ul> <li>Min300mm x min300mm polished</li> </ul>
	Clamping force	platens for heating/cooling Capable of
4		making compression molded plaques
5	Operating mode	Manual & Automatic both
6	Max. Daylight	350 mm or equivalent
7	No. of daylight	1
8	Max. mould height	350 mm or equivalent
9	Hydraulic cylinder stroke	150 mm or better
10	Ejector force	Manual
11	Ejector stroke	Manual
12	Electrical motor	To be clearly specified by the vendor
13	Mode of operation	Operating buttons, including two-
A A	Construction trac	
14		4 post/column
15		
16	Electrical beating of platene	Uniform temperature
	Electrical heating of platens	distribution on platen surface.
17		Programmable digital
		Solf contained energy officient
		bydraulic system with access panel
18	Hydraulic System	and gauge for Oil level and
10		tomporature indication should be
		provided
		It should have dual nump system and
19		water cooled heat exchanger.
		Operating buttons, including
20		two hand "anti-tie-down" circuit
		for cycle initiation.
		<ul> <li>Proximately switches to</li> </ul>
21		control "slow close" position and
		"cycle reset".
22		Clamp pressure relief valve
22	Control System	and gauge.
23		Touch screen control panel
24		PID temperature controllers.
25		Timor up to 000 minutes
20		Inner up to 999 minutes.
26		Alarm display manual / auto
27		<ul> <li>Emergency down and stop switches</li> </ul>
		SWITCHES

28	Cooling System	The cooling system(Water chiller of reputed make to be supplied) should be controlled by microprocessor based temperature controllers which are programmed for the specified cooling rate to maintain set temperature as per ASTM D4703(Method A, B, C & D)and ISO 293standards.
29	Safety features	<ul> <li>Safety guards to be provided with the molding area with manual sliding, interlocked operator gate</li> </ul>
30	<ul> <li>Automatically switching from he</li> </ul>	eating to cooling mode.
31	<ul> <li>The system should have autom</li> </ul>	atic low pressure system
32	<ul> <li>Thermocouples for insertion interview.</li> </ul>	o drilled backing plates.
33	<ul> <li>Facility for controlling the syster</li> </ul>	m with Auto & manual both.
34	Calibration certificates	<ul> <li>Calibration of platen</li> <li>temperature control &amp; pressure</li> <li>calibration to be provided.</li> </ul>
35	The machine should be supplied with suitable compression Moulds as per below specification, material feeding-manually, compression release, ejection, curing time one cycle auto.	
36		Hydraulic Oil -As per requirements for Installation & operation of Machine .
37	Spares Parts	Electrical spares of reputed brand -Catridge Heaters-01 set, temperature sensor-01
38		set,solenoid valve-01 ,MCB -01no
39		While supplying the Machines, the supplier should also provide the following items apart from above:
40		Hard copies of Operational & Service Manual- 01 Set .
41	Other Mandatory Items	<ul> <li>Calibration Certificate for Temperature and parallelisim for the platterns with Traceability.</li> </ul>
42		<ul> <li>Hydraulic as per the requirements.</li> </ul>
43		<ul> <li>Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation.</li> </ul>
	PRESSION MOULDS	
44	Mould material	Stainless Steelor as mentioned in ASTM4703
45		200x200mm thickness 3.2 mm

46	Tile Mould	150mm x 150 mm each for 0.5 mm, 1.0mm, 1.5 mm, 2.0mm, and 4.0mm thickness sizes.
47	Circular mould	Male female type mould with opening tool. For preparing sheet of 120 mm diameter and 10 mm thickness as per ISO 16770
48	Specimen moulds	Cavities with specimen dimensions complying ASTM above standards to be provided
49		While supplying the Machine, the supplier should also provide the following items apart from above:
50	Mandatory Items	<ul> <li>Hard copies of Operational &amp; Service Manual- 01 set</li> </ul>
51		<ul> <li>Basic Tool Kit box with all necessary Tools like spanner,allenkeys,scew driver set,etc,</li> </ul>
52		<ul> <li>Safety gloves &amp; goggles required for day to day activities during operation of Machine.</li> </ul>
53		Machine should come with all other essential accessories & spares required for installation,commissioning& Operation including Hydraulic Oil .

# 2021-22/02/32 Dielectric strength tester

S. no.	ltem	Specification
1		To determine the dielectric
2	PERFORMED	between a solid specimen in air and oil medium.
3	APPLICABLE STANDARD	Should be complied to ASTM D 149,
4		
5	Capacity	0-100 kV(Suitable for BDV up to 100 KV without external flashover). Mode of operation Fully automatic. Breakdown detection should perform in terms of both Voltage and Current.
6		Suitable step-up Transformer supplied from a variable sinusoidal low-voltage source with Voltage capacities range 0 to 100 kV rms

7	Voltage Source	With ratio of crest to root-mean-
,	Voltage Oburee	square (rms) test voltage, equal to
		$\sqrt{2} \pm 5$ % (1.34 to 1.48), with the test
Q		specimen in the circuit, at all voltages
8		greater than 50 % of the breakdown
		voltage.
		Colour display with backlight. The test
		set should give all the test results with
		standard deviation, average of
		reading and a pass / fail message
9	Display	wherever necessary on LCD/LED
		screen, Instrument should have
		alphanumeric keypad to facilitate
		entry of test ID notes etc
		-
10	Frequency	from 25 to 800 Hz
		Suitable as per Method A,B, & C of
11	Voltage rise time& accuracy	ASTM D 149 & other standard as
		mentioned.
12	Voltage rise time Resolution	0.1 kV ±1%
		Air & Oil medium. Suitable Oil media
13	Test Vessels/Medium	Tank in line with the requirement of
		Standard
		Ambient to 100°C. Suitable heaters
		should be provided for heating oil
		bath. Test kit should have automatic
14	Test Temperature range	oil temperature measurement facility
		with a temperature sensor resolution
		of 1°C or better.
15	l emperature resolution	1 °C or better
16	Power supply	Voltage - 85 to 265 VAC
17		Irequency - 50/60 Hz
10		RS-232 Interface, I/O port with safety
18	Interface	Interlock, USB Host Port for
		Data/Program storage
19	Protection provided to equipment	
	· · ·	
20		
21	Mandatony Itoms With the Machine	DC miero ammeter
		Electrode set of Type 1 to Type 7 co
22		Lectione set of Type 1 to Type 7 as
		Vendors must have sufficient
		experience in supplying equipment to
23		reputed organizations of
		Plastic/polymerindustries
24	Additional Requirements - Special	Magnetic head stirrers
24	Fosturos Noodod	Somple outtor of por standard
25	reatures needed	• Sample culler as per standard.

26		<ul> <li>A suitable Voltage calibrator meter should be provided along with equipment which should be oil free</li> </ul>
27		While supplying the Machines, the supplier should also provide the following items apart from above:
28	Other Mandatory Items	<ul> <li>Hard copies of Operational &amp; Service Manual-01Set.</li> </ul>
29		<ul> <li>Traceable Calibration certificate ofequipment.</li> </ul>
30		<ul> <li>Machine should come with all other essential accessories,</li> </ul>
31		Commissioning&Operation.

# 2021-22/02/33 Electrodynamic Shaker

S. no.	Item	Specification
1		Electrodynamic vibration shaker with base table
2	Scope of supply	Power amplifier
3		Shaker cooling systems and other auxiliaries
4		Acceleration:
5		✓ Bare table - 110 g pk
6		✓ 1 lb load - 55 g pk
7		✓ 5 lb load - 18 g pk
8		Stroke size: 1 Inch
9		<ul> <li>Velocity (Max.): 70 ipspk</li> </ul>
10		Sine Force: 110 lbs force pk
11		Random Force: 75 lbfrms random
12	Conoral Specifications for	Shock Force: 225 lbfpk
13	shakar	<ul> <li>shock Frequency Range: DC to 6,500 Hz</li> </ul>
14	Sliakei	Max. Acceleration: 110 g pk,
15		Maximum acceleration
16		✓ Resonant 150 g pk
17		✓ Peak shock 200 g pk
18		Max. Displacement:
19		✓ Continuous pk-pk - 1.0 inch
20		✓ Between stops - 1.03 in
21		Cooling: Amplifier: forced air
22		Shaker: cooling blower
23		Output voltage: 50 V rms
24		Output current: 20 A rms
25		Max. cont. dissipation 900 W
26		Frequency response
27		✓ DC input: DC to 10 KHz6 dB
28		✓ AC input: 1.0 to 10 KHz6 dB
29		Max. voltage gain: 36 dB
30		Cooling 2-speed fan, automatic
31		<ul> <li>Input impedance: 10 kΩ</li> </ul>

32	Concret Creations for	✓ Volts. pk 19 segment ± 5 %	
33	General Specifications for	✓ Amps, rms 19 segment ± 5 %	
34	Linear Power Ampliner:	<ul> <li>Interlock circuit External: F.O. swi</li> </ul>	tch or TTL Shaker
35		<ul> <li>Optional field power: 1000 W max</li> </ul>	(
36		Interlock protection:	
37		Over current	
38		✓ Supply over voltage	
39		✓ Power module failure	
40		✓ Amplifier cooling	
41		✓ Vibrator cooling	
42		✓ Power module over current	
43		✓ Phase failure	
44		Blower type:	Regenerative
45		Flow @ pressure:	30 cfm @ 30" H2O min
46		Motor:	0.75 Hp
47	Specification for Vacuum Cooling system	<ul> <li>Intake:</li> </ul>	0.63" &0.75" dia. (shaker fittings included)
48		Hose length:	7.5', flexible vacuum
49		Minimum vacuum life	>25,000 Hrs
50		Noise Level:	< 71 dB @ 1M
51	Power	• 230V AC ± 10%, Single phas	e and 50 Hz.

### 2021-22/02/34 Electrometer

S. no.	Item	Specification
		Current, Voltage,
1	Purpose	Resistance, Impedance and Charge
		measurement
2	Function	Current, Voltage, Resistance and
2		Charge measurement
3	Voltage range	2µ V-200 V or better
4	Current range	2fA-20 mA or better
5	Resistance range	100 Ω- 200 GΩ
6	Noise level	< 1 fA or better
7	Impedance for Voltage	200 TΩ or more
/	measurement	
8	Charge measurement range	10 fC to 2 µC or better
0	Data reading speed	High speed - up to 1200
9		readings/second or better
10	DMM Connectivity	GPIB, RS232, USB
11	Digit resolution	5.5 or better
12		<ul> <li>Low Noise Cable with Alligator</li> </ul>
12	Cables & USB connector	Clips (3-Slot)
13		<ul> <li>NI - USB-to-GPIB Interface</li> </ul>
		Adapter
14	Safety	Overflow indication

15	Operational Condition	Operating: 0°–50°C; relative humidity: 50 - 70% non-condensing, up to 35°C. Storage: –25° to +65°C
16	Voltage	AC 220V Single Phase, 50/60 Hz
17	Software	Necessary software for measuring I- V, I-t, V-t, etc., through computer
18	-Features	<ul> <li>Interfaces readily with switches, computers, and component handlers Cancels voltage and current offsets easily.</li> </ul>
19		<ul> <li>Current sensitivity, coupled with low-voltage burden.</li> </ul>
20		Photodiode dark-current measurements.

# 2021-22/02/35 Fusion Deposition Modelling System

S. no.	ltem	Specification
1	MACHINE	
1.1	Technology	Solid based additive manufacturing system (Latest Fused Deposition Modelling system)
1.4	Build Volume	Minimum build volume 190 * 190 * 190 mm
1.5	Nozzles	2 (Dual Wear Resistance Nozzles). Must be capable of having e.g., water soluble for one nozzle for support creation and having another material e.g., ABS on another nozzle for part creation.
		Nozzles: 0.05, 0.1, 0.25, 0.4, 0.6, 0.8 mm
1.6	Layer resolution	Minimum 20 micron or better
1.7	Part accuracy	Parts produced should be within an accuracy of +/- 0.2 mm
1.8	Support structure	Soluble and breakaway
		Machine should build parts in circulated air heated chamber two or more heat exchangers and blowers to provide uniform temperature control and heated build environment throughout the volume of the build and each layer of the print.
		Chamber Temperature: 100°C or higher.
		Non Heated removable and flexible build
		plate made from heat absorbing material such
1.9	Machine Control	as Polycarbonate or equivalent
		Motion controlled components should place outside and should be insulated from the heated build chamber.

		The support material distinct material which
		should extrude from a different
		The machine shall sutematically calibrate
		nozzle and build platform in X Y and Z axis
		before the start of each job.
1.1	Material Flow Rate	500 mm ³ /sec or better
1.11	Extruder/ Nozzle Temperature	300 °C or Better
1.12	Monitoring	Live camerafor tracking and monitoring, Mobile app for android and iOS should be available.
1.13	Material Handling	Material handling systems should be part of the Printer with automatic material loading, feeding and storage management system. Material cabinet should be dry sealed with humidity control. All material spool/cartridges (model and support) should have an EEPROM/chip to indicate the quantity of material available in the spool / cartridge at any instance of the machine operation during idle or run time.
		For large jobs. The machine shall automatically pause and prompt the operator to replenish material and resume printing in case of the material (for both model and support) gets consumed during the build process. The machine should keep the chamber temperature and heated airflow constant while the machine is paused.
1.14	Connectivity	Wi-Fi, USB, LAN/SD card compatible
1.15		Touch Screen
1.16	User Interface	Using computer with appropriate software. Software should display and control. Complete program of solution must be provided.
1.17	Slicing software	Software should be able to import any native CAD formats like stl, obj igs, vrml. stp, Parasolid, native files of CAD packages etc and be able to repair errors like open surfaces, inverted normal etc without use of any 3rd party software. Software should be from same OEM: 3 rd
		party software is not allowed. License must be perpetual and cloud support must be available.
2	Materials	

		Standard Materials (Print Settings should be pre-configured in machine and software): ABS, ASA, Chemical Resistant Material, Nylon12, Carbon Fiber re-enforced material, PC-ABS, Fire-Resistant PC-ABS Research Material: User should be able to run self-developed/open-source materials metal and polymer filaments. Vendor should quote all possible materials and supply 5 Nos. of Canister on each material excluding the quantity of material
2.1	Materials	required for installation, training, and calibration. Machine should be calibrated to fabricate parts with all the materials mentioned above at the time of installation.
		Machine should have the provision of testing materials developed by the customer and professional guidance should be given to adhere to the system compatibility and configuration
		Vendor should attach the quality certificate of each material with test report evaluating the parameters according to ASTM/DIN standards tested on same/similar machine from same OEM.
2.2	Customised material guidance	Machine should have the provision of testing materials developed by the customer and professional guidance should be given to adhere to the system compatibility and configuration
2.3	Material Quality	Vendor should also supply proven parameters for all the suitable materials with clear documentation and statistics of the mechanical properties with respect to build orientation and layer thickness.
2.4	Material Property	Vendor should also supply proven parameters for all the suitable materials with clear documentation and statistics of the mechanical properties with respect to build orientation and layer thickness.
3	ESSENTIAL ACCESSORIES	
3.1	Support removing system	As per the requirement to be quoted by the bidder
3.2	Consumables	Vendor should supply minimum quantities of consumables like build platforms, nozzle for all layer thickness, wiper blade, brush etc., required for 6 months

3.3	Tool kit	Vendor should supply standard tool kit for start-up, removal of parts and cleaning (list to be attached).
3.4	Any other accessories required	Vendor should supply all the other accessories, material transport trolleys / carts and spares required for effective and better utilization of machine. All the required accessories should be listed
3.5	Compressor	Vendor should supply Suitable compressor with dryer and all necessary accessories
3.6	De-humidifier	Vendor should supply suitable de- humidifier to maintain room humidity level within suitable range for machine operation.
3.7	Online UPS	Vendor should supply suitable UPS with minimum 60 minutes power backup for the machine and essential accessories. Should have built in safety to protect machine from voltage spikes and sudden surges.
3.8	Workstation with accessories	Vendor should supply suitable OEM workstation computer system with complete accessories and UPS. It should have minimum of i7 (3.4 GHz, quad core) processor of latest configuration, 64GB RAM (2400MHz, DDR4), 1TB hard disk (7200 RPM), and 4GB graphics card or better configuration, with windows operating system and MS office recent version.
4	OTHER ESSENTI	AL REQUIREMENTS
4.1	Benchmark part	Vendor should submit two numbers of benchmark parts in two material which should be built in the quoted machine same is to be built during prove out of the machine at the site
4.2	Manufacturer's/Suppliers Credential Credentials	Supplier should have sizable installations of same model worldwide and at least three same or similar models in India. Supplier should submit complete contact details and acceptance letter from the recent customers. Manufacturer of the quoted equipment should be ISO certified and should have supplied same/similar machine in India/globally for a period of minimum of 10 years.

4.3	Safety Requirements	The machine and all the accessories supplied to meet objective should be able to operate without any risk or hazard, without any additional protection, provision, training or guarding devices and meet current international standards such as CE, FCC, EMC, Low Voltage Directive 60950-1, 62368 - Certificate of Conformance to be attached
4.4	Scope of supply	Vendor should supply complete start up package necessary to prove the machine and provide training. List for scope of supply to be submitted.
4.5	Environment Protection	The machine and all the accessories supplied should be safe to use without emission of any hazardous gases, noise level and radiation without any need for additional equipment, provision or training and meet current international standards
4.5	Consumables & accessories and their availability	List all such material that will be used in building part. Tender shall include list of all essential spares and consumables to be provided with replacement time prescribed for each such item and its availability within reasonable time period. In case if any such item is likely to be out of availability within service period of machine, such item shall be included in initial supply
4.6	Price list of material, spares, and consumables	Price list of each material with minimum order quantity, machine spares and consumables are to be quoted.
5	INSTALLATION, COMM	ISSIONING AND TRAINING
5.1	Installation and requirements	Vendor should state the space required and condition of floor and any other requirements for installation of the machine and equipment's. State clearly the specifications of the following items required for installation such as Transformer, chiller, UPS, Air conditioner, Dehumidifier, separate special earthing, vibration isolation
		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.
5 7	Training and documentation	The vendor should supply the necessary manuals such asSoftware instructionMaintenance and trouble manual

5.4		
		□ Installation and Commissioning
		□ Handling of accessories
		□ Software key (if any)
		□ Software CDs
	Installation and requirements commissioning	The vendor should support necessary site preparation for installation. Vendor should carry out installation and commissioning of the machine and its accessories on a turnkey basis

### 2021-22/02/36 Gloss meter

S. no.	Item	Specification
1	Purpose	Measurement of Specular Gloss of
-		plastic films & sheets
		Should be complied to ASTM D2457,
2	Reference Standard	ASTM D523, ISO 2813, ISO 7668,
		DIN 67530, JIS 8741
3	Projecting angle	20, 45, 60 & 85 degree Angles
4		Triple geometry display
5	Light Source	Incandescent Lamp
6		20 degree: 10 mm X 10 mm
7	Magguring Area	45 degree: 9mm X 13 mm
8	Measuring Area	60 degree: 9mm X 13 mm
9		85 degree: 5 mm X 38 mm
10	Range	0 – 1500 GU (Gloss Unit) or higher
11	Repeatability	±0.2 GU or better
12	Reproducibility	± 0.5GU or better
13	Measuring time	0.5 Seconds/geometry or better
11	Power Supply	230 V & 50 HZ (With the battery
14		model)
15	Colibration	Automatic by means of built – in
15	Calibration	Microprocessors
	Standard Reference	One standard tile for 20 deg., 45
16		deg., 60 deg., and 85 deg., with
		certificate should be provided
17	Operating Temperature range	Up to 40°C
10	Momony	999 Measurement values with the
10	Memory	date and time.
19	Digital Display	Alphanumeric LCD
20	Data transfor	Bluetooth, PC compatible, USB
20		connection
		While supplying the Machines, the
21		supplier should also provide the
		following items apart from above:
22		Hard copies of Operational &
22		Service Manual- 01 Set

23	Other Mandatory Items	<ul> <li>Machine should come with all other essential accessories, computer &amp; spares required for installation, commissioning&amp; Operation</li> </ul>
24		<ul> <li>Onsite Training to be provided for CIPET staff at commissioning site.</li> </ul>
25		<ul> <li>Calibration certificate with NIST traceability</li> </ul>

# 2021-22/02/37 Glove box

S. no.	Item	Specification
1	Durpage	<ul> <li>✓ Storage of air sensitive chemicals and fabricated devices.</li> </ul>
2	Pulpose	<ul> <li>✓ Fabrication of high end electronics, energy storage and energy conversion devices</li> </ul>
3	Glove box	Glove box
4	Moisture level Requirements	< 1.0ppm
5	Oxygen Level Requirement	<1.0 ppm
6	Environment	Nitrogen and Argon
7	Material of construction	Stainless Steel of high quality (grade to be mentioned by bidder)
8	Box Windows	Transparent Polycarbonate which can retain pressure range of -15 mbar to +15 mbar
9	Dressure	<ul> <li>✓ Automatic Pressure control from - 15 mbar to + 15mbar</li> </ul>
10	Pressure	<ul> <li>✓ Continuous Digital Pressure monitoring of the glove box</li> </ul>
11	Display of Reading	High accuracy sensor based reading of moisture and oxygen level in ppm levels to be displayed at all-time along with Glove box pressure, purging condition, regeneration etc. which should be monitored/controlled through a microprocessor based control system.
12		<ul> <li>Scratch proof coating to protect the inner and outer housing</li> </ul>
13	]	Dust filter of 0.3 micron
14		Gas inlet and outlet filter.
15	1	3 height adjustable shelves
16	Box	3 Electrical feed through
17		<ul> <li>Stand for the box along with levelling</li> </ul>

18		Foot pedal control of the internal
10		pressure
19		• waterproof
		One antechambers made up of
		stainless steel with metal doors which
20		can be interlocked to maintain
		pressure range of -10 mbar to 10
		mbar.
21		Pressure gauges to monitor the
		pressure.
22	Antechamber Large	<ul> <li>Metal Sliding tray to transport</li> <li>sample</li> </ul>
		Manual Control of Vacuum and
23		Refill process
24		Door lock easy to operate with a
24		spindle lock system
		One large antechamber for
		transporting larger volume inside the
25		glove box. At least 390 mm diameter.
		600 mm length
		Small Antechamber to allow
26		transfer of Min 100 mm Petridis
20	Antechamber Small	diameter
		a 3 way yalvo control with analog
27		
		Closed loop gas purification with
20		attainable moisture and oxygen level
20		of < 0.1 ppm over complete pressure
	Gas purification	range for the complete volume of gas.
20		<ul> <li>Accessories and columns</li> </ul>
29		required for the gas pullication
		Silvitable blower with adapted
		sonabily should be provided with the
30	Circulation Unit	unit for adaption size desired
		unit for adequate circulation along
		WILLI OLLIEL ACCESSOFIES.
24	Degeneration	Automatic regeneration control and
31	Regeneration	electronic control of inlet and outlet of
		regeneration gas.
		Rotary Oil Pump of industrial required
		which will be capable of running 24
32	vacuum Pump	hours. The pump should have an oil
		mist filter and control for gas ballast.
		Rotary vane mechanical vacuum
33	Control System	pump with necessary moisture and
		vapour traps details should be
		provided

34	Running Time	The instrument and the ancillary vacuum pumps should be capable for
35	Box Dimensions and number of ports	<ul> <li>✓ Suitable dimension to allow minimum 02 pair of gloves (neoprene rubber) in front to be used for accessing the box.</li> <li>✓ Typical dimension of each glove</li> </ul>
36		port would be 200mm-220 mm diameter
37		The glove box and its parts should be compatible for storage and usage of
38	Chemical Storage Requirements	• Organic solvents both chlorinated and unchlorinated.
39		Use of electrolytes and ionic liquids
40		Intermittent usage of acids and bases
41	Box Light	1 or 2 tube light front mounted with adequate illumination.
42	Valves and Piping	• Pneumatic Valve to control pressure in case of gas shut down for at least 12 hours.
43		Stainless Steel Piping
44		Microprocessor controlled analyzer to monitor from 1 – 1000 ppm
45		<ul> <li>Operating Temperature: ambient to 35°C</li> </ul>
46		• Pressure - 800 - 1200 hPa
47		<ul> <li>Sensitivity - 10 mV/ppm(v)</li> </ul>
48		Response time- < 10 sec
49	Oxygen Analyzer	<ul> <li>Accuracy: +/- (2 % of displayed value + 1 ppm)</li> </ul>
50		<ul> <li>Zero Stability: &lt;1ppm/24 h</li> </ul>
51		Repeatability: +/- 1% in full range
52		Resolution: +/- 0.1% in full range
53	-	<ul> <li>Probe/ analyzer type to be provided</li> </ul>
54		<ul> <li>In-house calibration procedures to be provided</li> </ul>
55		Microprocessor controlled analyzer to monitor from 1 – 500 ppm
56	Moisture Analyzer	Accuracy: +/- 2 °C DP
57		Probe/ analyzer type to be provided
58	Filters	Charcoal Filter or better system for moisture removal to achieve the required level of moisture as specified.

59	Catalyst for Oxygen	Suitable technology for oxygen removal to achieve the required level as specified
60	Energy Conservation	Any energy conservation technology would be preferred
61		<ul> <li>Piping and fittings Should be made of stainless steel</li> </ul>
62	Others	• Electrical · Lighting: Internal LED/fluorescent lamp and provision of electrical points inside the chamber with leak proof sealing
63		<ul> <li>Operating voltage: 230 V (±10 %),</li> <li>50 Hz</li> </ul>
64		<ul> <li>Additional 03 pair of gloves and O rings</li> </ul>
65		Rotary oil
66	Accessories	<ul> <li>Nitrogen and argon cylinder with regulator</li> </ul>
67		Required additional accessories     should be provided.

## 2021-22/02/38 Impedance Analyzer

S. no.	Item	Specification
1	Purpose	Measurement of the dielectric, ferroelectric, piezoelectric properties of the materials. Measurement of impedance in the range between $100m\Omega$ to $2G\Omega$ or better with a broad frequency range.
2	Measurement frequency	20 Hz to 50MHz upgradable
3	Frequency resolution	1mHz or better
4	Basic Accuracy	$\pm 0.05\%$ or better
5	Measurement parameters	Capacitance (C), Inductance (L), Resistance (R), Reactance (X), Conductance (G), Susceptance (B), Dissipation Factor (D), Quality Factor (Q), Impedance (Z), Admittance (Y), Phase Angle (Ø), Permittivity, Permeability, Polar & complex plots and additional measurements parameters are preferable.
6	Measurement modes	LCR mode, Analyzer mode, Continuous measurement mode, Equivalent circuit analysis functions
7	Measurement circuit	Series/Parallel
8	Correction	Open Circuit/ Short Circuit/Load Correction

		Rms Voltage: 10 mV to 1Vor better
9		Voltage resolution: 1 mV or better
	lest signal	Current: 200µA - 20mA
		Current Resolution: 20 µA or better
10	No. of Maggurament Doints	Upto 1600 or better in one sweep
10	No. of Measurement Points	analysis.
11	Ranging	Auto /Manual (both)
12	Sween Parameters	Frequency, signal voltage, signal current,
12		DC bias voltage, DC bias current
13	Sweep type	Linear frequency, log frequency, OSC
	1 71	level, DC bias
14	Display	Touch screen, Instrument should be able
		connect Monitor for display.
15	Interfaces	GPIB, LAN, USB, RS232 should be
		available
		Maximum value, minimum value, multi-
16	Montron cooreb	right target target left target right and
10	Marker search	right, target, target left, target right, and
		hendwidth velves
		Dandwidth values
		1. Materials test fixture
		2. Eliquids fixture with BINC converter
		5. SIMD test fixture compatible upto $120$
	Test fixtures	
17		4. Bottom Electrode SMD Test Fixture
		5. Axial & radial test fixture
		6. SMD Tweezers test fixtureupto
		120Mhz
		7. Kelvin Clip-type test fixture
		• High temperature accessories (RT-500
		°C)
		• High temperature holder for bulk
		samples
10	High temperature option with variable	• PID temperature controller
10	temperature	O Data logging software: Parameter Vs
		Frequency, Parameter VS Temperature
		o Interfaced. KS232
		• Interfacing Cables: BNC coaxial cables
		should be provided along with the setup
		• Supplier should add the required
19	Accessories	accessories
		• Require 4 (four) BNC cable to BNC
20	Connectors	cable connection
		• Converter 4 to1 and 2
21	Power supply	220 to 240 V AC, 50/60 Hz

		Temperature: $10 \sim 40$ or higher
22	Operation Environment	Humidity: 90%
23	Manual Accessories	Power cord , Instruction manual , PC communication instruction manual (CD- R)
24	Personal Computer (PC)	A Personal Computer (PC) having latest configuration with complete accessories and UPS. It should have minimum of i7 (3.4 GHz, quad core) processor of latest configuration, 1TB hard disk or better configurations. 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.
25	Software	Suitable software for PC Equivalent circuit analysis with licence
26	Calibration	<ul> <li>Provide trimming standards for calibration</li> <li>The Impedance Analyzer should be pre-calibrated</li> <li>The OEM provide calibration certificate.</li> </ul>
27	Compatibility	Instrument should be compatible with high Temperature and Low temperature systems

### 2021-22/02/39 Hot Air Oven

S. no.	Item	Specification
1	Application	To dry samples, glassware's and synthesis of nanomaterials
2	Temperature Range	5°C above ambient to 300°C maximum or better
3	Temperature Accuracy	+ / -0. 5°C or better
4	Temperature Uniformity	+ / - 1°C
5	Controls	Digital PID Control by AdvancedMicroprocessor
6	Temperature Display	Digital LED / LCD
7	Sensor	PT-100
8	Timer	Digital Pre-Set Timer 999 Hrs

9	Volume	90L or Better
10	Heating Element	Nichrome wire / Kanthal A1 or better
11		Over temperature protection
12	Safety device	Electric leakage breaker
13	Salety device	Temperature safety as per DIN 12880 Class 3.1
14	Exterior Chamber	MS powder coated
15	Interior Chamber	304 or 316 stainless steel
16	Insulation	Glass wool insulation between the walls
17	Doors	Solid doors with silicone rubber gasket & lock
18	Shelves	2or 3 Stainless steel shelves (Removable)
19	Air Circulation	Forced air circulation
20		• Glass window in-built into the door for easy viewing of samples.
21		• Automatic cut off of heater & blower when door opened.
22		• Digital PID temperature controller with timer, alarms and auto tuning.
23	Features	<ul> <li>Forced Air Circulation system to maintain uniformtemperature in the chamber.</li> </ul>
24		• Polished stainless-steel chamber, Semi-circular arcs at corners for easy cleaning, and the space between the shelves in the chamber is adjustable.
25		Independent audible and visible temperature temperature-limiting alarm system ensures experiments run safely.
26	Installation & Training:	Installation and Training to be provided at installation site. Installation requirement to be submitted in advance to provide suitable power connection and suitable working space for the instrument. All parts/accessories required for meeting the pre- installation as well as operation of the instrument should be quoted by the supplier.
27	Calibration	Calibration certificate traceable to NIST for Temperature controller is essential.
28	Manuals:	One set of manuals with all details of parts should be supplied

29	Warranty:	Comprehensive 2-year warranty covering all spare parts and labour.
30	Available Input power:	220 V one phase/three Phase, 50 Hz

### 2021-22/02/40 Lab-Scale Twin Screw Extruder for 3D printing filament

S. no.	Item	Specification
1	Extruder type	Parallel, Co-Rotating, Lab scale Twin Screw Extruder. Filament measuring and controlled unit with closed loop for precise adjustment of the 3D filament diameter.
2	Application	Extrusion of polymer monofilament for 3D printing.
3	Barrel	<ul> <li>L/D ratio: 40:1 or as suitable for manufacture and recipe development of thermoplastic and engineering polymers.</li> <li>The system must have an atmospheric vent facility with proper adaptor.</li> </ul>
4	Screw Diameter	Minimum 11 mm
5	Screw speed	10 to 1000 rpm
6	Torque per shaft	Minimum 6 Nm, constant torque with safety monitor
7	Ratio screw outer dia./ inner dia.	1.72 or more to allow feeding of fluffy materials
8	Pressure	100 bar or Higher with safety monitor
9	Temperature	Room temperature to 450°C
10	Feed zone	Permanently water cooled with refrigerated chiller to be included
11	Heating zones	With minimum of5 zones with electrical heated (optional water cooling should be quoted)
12	Extruder control	<ul> <li>Extruder control is via an integral colour touch screen for monitoring of following parameters:</li> <li>Extruder speed (rpm)</li> <li>Extruder torque (%)</li> <li>Barrel temperatures (Deg. C)</li> <li>Pressure (bar)</li> <li>Volumetric/Gravimetric feeder speed (%)</li> <li>Able to monitor the filament dia.</li> </ul>

13	Feeding systems	Minimum 2 nos. feeding zone - One for polymer and other for powders/fillers/Additives with the following requirement: Volumetric/Gravimetric Single Screw Feeders for polymer with feed funnel and hopper (minimum volume of 1.3 litres or more). Safety grid feeder which controls by main control panel with safety interlocked feeder support.
		<ul> <li>Feeder for base polymer: Single screw feeder to feed powder or pellets into the main feeding or a secondary feeding port.</li> </ul>
		<ul> <li>Feeder for feeding powders: Twin Lead Feeder screw with core for minimal output. Suitable for powder materials.</li> </ul>
14	The extruder should be supplied with 3D strand die	Strand diameter can be easily altered using various set of die inserts (0.5, 1, 1.5, 1.75, 2, 2.5, 3 mm).
		Allows quick change of the die diameter. Should contains a set of threaded die nozzle (0.5, 1, 1.5, 1.75, 2, 2.5, 3 mm).
	Melt pump	The extruder must be supplied with a melt pump to eliminate the pulsation in the polymer melt flow. The melt pump should be fully compatible with the extruder with the flowing specifications:
15		Pump head volume:0.6 cm ³ /rev or better
		<ul> <li>Pump speed: 0.1 to 50 rpm or more</li> <li>Heating zones: 1 (1 internal / 1 external)</li> <li>Temperature: Room temperature</li> </ul>
		to 450 °C • Pressure: 500 bar or better
		The extruder should be supplied with post extrusion accessories like water
		bath, spooler and laser diameter
		measure and wind up the strand for 3
		The spooler must be compatible with
		following specifications:

		<ul> <li>Adjustable line speed with self- adjusting compensation for spool diameter.</li> </ul>
		Filament distribution traverse with settable travel to compensate spool
16		<ul> <li>Line speed: 0.5 -15 m/min or more</li> </ul>
		<ul> <li>Filament diameter: 0.5 - 3 mm</li> </ul>
		<ul> <li>Mas spool width: 100mm or better</li> </ul>
		Laser diameter measuring system:
		• Measurement range: 0.1-5mm or
		better
		Measurement accuracy:
		$\pm 0.002$ mm of beller
		<ul> <li>Should be capable of identifying</li> </ul>
		the variation of diameter while
		extruding for maintaining the desired
		diameter
		<ul> <li>Fully automatic closed loop</li> </ul>
		control technology for precise control of filament diameter.
17	Vacuum system	Compatible vacuum system to be attached with extruder
	Chiller	Refrigerated circulator chiller to cool
18		and maintain the extruder zones
		Extra Scrow clomont set: To
	Other accessories as a part of supply	<ul> <li>Exita Sciew element set. To change the screw profile and should</li> </ul>
		contain the following:
		4 x Feed Screw, 1 L/D
		2 x Feed Screw, 0.5 L/D
		2 x Reverse Feed Screw, 0.5 L/D
		8 x Mixing Element 0°, 0.25 L/D
19		8 x Mixing Element 90°, 0.25 L/D
		Anti-Seize paste
		<ul> <li>High Volume Feed Screws: A set of asymmetrical shaped geometry feed screws to increase free volume and to allow feeding commercial</li> </ul>
		pellet sizes (=4 mm) into the extruder.
20	Essential spares/ Accessories	Tool box
		Purging kit
		Compressor as per the requirement
		Spare should be available for smooth running of instrument for minimum of 02years.

21	Software	Compatible to Windows 10 or higher
		Required system controlled through using appropriate software and interphases for quick and reliable data acquisition and analysis.
		Upgradable software for complete data analysis/programming.
22	Personal Computer (PC)	A Personal Computer (PC) i7 10 th Generation latest Processor 2tb HDD, 21" LCD monitor 8Gb RAM. OEM Windows 10 Professional. All software shall be loaded in the hard disk with appropriate partitions. All original Software 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.
23	Other Mandatory Items	<ul> <li>While supplying the Machines, the supplier should also provide the following items apart from above:</li> <li>Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation.</li> <li>Onsite Training to be provided for CIPET official at the commissioning site.</li> </ul>
24	Warranty	3 years comprehensive warranty should be provided
25	Maintenance	The system should come with an initial annual maintenance cover (AMC) of minimum 03 years after completion of warranty period.

## 2021-22/02/41 Multi-channel Electrochemical Workstation

S. no.	Item	Specification
1	APPLICATION	<ul> <li>Battery, Super capacitor, Corrosion, Electrodeposition, Electro</li> </ul>
		catalysis
2		Electrochemical Impedance Spectroscopy Studies (EIS)
3	Specifications for Multichannel Electrochemical Test Station	

4	Application	• Battery, Super capacitor, Corrosion, Electrodeposition, Electro catalysis
5		Electrochemical Impedance Spectroscopy Studies (EIS)
6	Configuration Design	Multichannel Electrochemical Workstation with minimum 24 channels or more.
7		• Multi-channel Electrochemical work station for testing and evaluating Battery components in single / multiple unit cells simultaneously with high accuracy and precision
8		<ul> <li>Chassis: Multichannel Single</li> <li>Chassis (Modular) expandable up to</li> <li>80 Channels</li> </ul>
9		High Precision Columbic Efficiency Determination
10	General Description	• Grouping, Synchronising of At least 4 Channels should be possible
11		<ul> <li>Electrochemical Impedance</li> <li>Spectroscopy (EIS) measurements at least on 8 channels with Equivalent</li> <li>Circuit Modelling</li> </ul>
12		<ul> <li>Internal Resistance</li> <li>Determination</li> </ul>
13		<ul> <li>Software Controlled Data Acquisition with Minimum Sampling rate</li> </ul>
14		<ul> <li>Temperature measurement on each cell should be possible</li> </ul>
15		• Cell Connection: 2, 3, 4, 5 electrodes (+ ground) or more and atleast1.5m Cell cable
16		<ul> <li>Compliance voltage: 12 V or better per channel</li> </ul>
17		<ul> <li>Applied Voltage: ±10 V or better per channel</li> </ul>
18		• Maximum Output Current: ± 400 mA or better at ± 10 V per channel
19		<ul> <li>Current Ranges: ± 10 nA to 400 mA or better</li> </ul>
20		<ul> <li>Accuracy of applied and measured current: ± 0.1 % Full scale range or better</li> </ul>
21		<ul> <li>Resolution of applied potential: 0.0015% or 1µV or better</li> </ul>

22		<ul> <li>Voltage accuracy: 0.1 % of Full scale range or better</li> </ul>
23		<ul> <li>Measured current resolution: 800</li> </ul>
25		fA on lowest current range
24		<ul> <li>Potentiostat Rise/fall Lime: &lt;1 µs or better</li> </ul>
	Specifications for Channels 1	<ul> <li>Frequency range: 10µHz to 6</li> </ul>
25		MHz or better
26		• Impedance accuracy of 1%
27		& 1° at 1Hz
		<ul> <li>Gain bandwidth range of</li> </ul>
28		amplifier: 1 MHz or better
29		Bandwidth of electrometer: 1
		MHZ or better
30		<ul> <li>Input bias current: 20pA or better</li> </ul>
31		Acquisition speed: 1,00,000
		samples/second
32		rates 10 mV/Sec to 100V/Sec or
01		better
		<ul> <li>Floating mode Floating mode</li> </ul>
33		should be available Interface for
		connection with PC: Ethernet LAN
34		Multiple Computers
		<ul> <li>Possibility to upgrade to high</li> </ul>
35		current up to 30 A using external
		booster Provision for Safety limits on
		each channel to shut down the
		channel in the event Something goes
36		wrong during the experiment Manual
		Emergency Stop Switch should be
		available in case of emergency
		stoppage of whole equipment for
37		<ul> <li>Voltage range: 0-10 v or better for</li> </ul>
		all channels
38		<ul> <li>Voltage Accuracy: 0.01% or</li> </ul>
		Voltage Control Resolution:
39		150µV or better
40		• Max Current: ±150 mA or more
	Specifications for Channels 2 to	Min Current: at least 10 uA or
41	9	better for all channels
		Current Ranges: Must be
42		provided with 4-5 ranges (100 mA to
		10 µA)

43		<ul> <li>Automatic Current ranging should be available</li> </ul>
44		Current accuracy: 0.05% of FSR or better
45		<ul> <li>Current Control resolution: 800</li> <li>nA or better for all channels</li> </ul>
46		<ul> <li>Data Acquisition/ Sampling Rate: At least 2ms or better</li> </ul>
47		High Precision Coulometry measurements up to 10 ppm or better
48		<ul> <li>Cell Connections: 2,4 terminal leads</li> </ul>
49		<ul> <li>Voltage range: 0-10 v or better for all channels</li> </ul>
50		<ul> <li>Voltage Accuracy: 0.01% or better</li> </ul>
51		<ul> <li>Voltage Control Resolution: 150µV or better</li> </ul>
52		<ul> <li>Max Current: ±1.5 A or more per channel</li> </ul>
53		<ul> <li>Min Current: At least 0.1 mA or better for all channels</li> </ul>
54	- Specifications for Channels 10 to 17	<ul> <li>Current Ranges: Must be provided with 4-5 ranges (1 A to 0.1 mA)</li> </ul>
55		Automatic Current ranging     should be available
56		Current accuracy: 0.05% of FSR     or better or better
57		<ul> <li>Current Control resolution: 8µA or better for all channels</li> </ul>
58		<ul> <li>Data Acquisition/ Sampling Rate: At least 2ms or better</li> </ul>
59		Cell Connections: 2, 4 terminal leads
60		<ul> <li>High Precision Coulometry measurements up to 10 ppm or better</li> </ul>
61		EIS (Electrochemical Impedance Spectroscopy) All the 8 channels should have EIS
62		<ul> <li>EIS Frequency Range 10mHz – 10Khz or better</li> </ul>
63		Voltage range: 0-9 V or better for all channels
64	1	<ul> <li>Voltage Accuracy: at least 0.4mV or better for all channels</li> </ul>
65		<ul> <li>Voltage Control Resolution: 200µV or better for all channels</li> </ul>

66		Max Current: ±15 A or more per chapped
		<ul> <li>Min Current: at least 1mA or</li> </ul>
67		better for all channels
		Current Ranges: Must be
68		provided with 4-5 ranges (ranging few
		mA to 10A)
60		Automatic Current ranging should
69		be available
70	Specifications for Channels 18	• Current accuracy: 0.05% of FSR
/0	to 25	or better
71		• Current Control resolution: $\leq 100$
		nA or better for all channels
72		Data Acquisition/ Sampling Rate:
		Minimum 2ms
		Channel Parallel Ability up to
73		100A (suitable current collector
		module/device/attachment is to
		provide with Cables
74		• Cell Connections :2, 4 terminal
		leaus
75		High Precision Coulometry
, 0		measurements up to 10 ppm or better
		Provision to measure
76		Temperature from -25 °C to 200 °C
		with accuracy of ±2 °C
		Galvanostatic Charge / Discharge
77		(Including C rate control) with voltage
		vs. time Graph plots
		<ul> <li>Multigraph window capable of</li> </ul>
78		displaying up to 10 graphs within a
		single window
79		Customize variables graph plot for
80		<ul> <li>voltage vs. Capacity plot during</li> <li>Charge/Discharge Cycles</li> </ul>
		Charge/Discharge Cycles
		<ul> <li>At least 3 limits and 3 recording</li> </ul>
		conditions per sequence/cvcle (ability
		to limit a cycle or changeover to next
		sequence with Time, Voltage/Current,
81		Charge/Power all simultaneously)
		Multiple recording conditions
		Industrial CC-CV Method (Constant
		Current – Constant Voltage)

82	Complete battery cycling software facility with following specifications	<ul> <li>Cyclic Voltammetry, Current Scan (Current/Galvano Dynamic), Voltage Scan (Potentio Dynamic) Constant Power / Constant Resistance</li> <li>GITT and PITT Techniques</li> </ul>
84		Columbic Efficiency Determination     with fitting tool
85		Current Interrupt
86		Rest Time
88		<ul> <li>Provision to connect and control</li> <li>External devices like Furnace,</li> <li>Thermal chambers</li> </ul>
89		<ul> <li>Monitoring status of each Channel using Global Table/Summary Table</li> </ul>
90		<ul> <li>Option to update the experimental setting parameters on current running experiment without pausing/stopping the channel/experiment</li> </ul>
91		<ul> <li>Profile Importation to study Urban Life Cycle Tests</li> </ul>
92		<ul> <li>Analysis tools like Integral, Circular or linear fit and Electrochemical EIS - Z fit should be available</li> </ul>
93	Electrochemical Impedance Spectroscopy (EIS)	Real-time fit and simulation analysis as well as live data plotting option for simulation plot must be available as default software protocol. Real time needed for Lissajous curve, Nyquist, Bode, Admittance and Dielectric & Mott-Schottky. The fit and simulation software should include basic options such as find circle, element subtraction and an equivalent circuit library with all the modern EIS equivalent circuit models. Minimum visible plots in real time should be 8 or more. EIS Modelling with Equivalent Circuit Fits.
94		Simultaneous impedance measurement at counter electrode and working electrode
95		Pouch cell r Holder - 4 nos.
96		Cylindrical cell Holder - 1 nos.
97	]	2032 Coin cell holder - 8 nos.

98		Temperature probes - 4 Nos
	Accessories:	Alligator clip for 8 channels
99		(red2mm, blue 2mm, red 4mm, blue
		4mm)-1 no
100		Cell Cables – 24 Nos (at least 1.5
100		metre. long)
101		Customized test chamber with
101	Indigenous items	Temperature control10°C to
102		60°C: 1no
102		• Branded PC i7, 16GB RAM, 1TB,
103	Computer	HDD, 19 inch or higher
104		LED Monitor, Windows 10 OS: 2 nos.
105	Warranty	One Years Standard Warranty after
200		installation and commissioning
		The channels Should be plug & play
106	Maintenance he system has its	type and easy to install or to be
		removed.
107	Dummy Cell	Dummy cell to be provided for
		internal validation.
		Necessary clips for Pouch cell,
108		Cylindrical cell, Coin cell, Alligator
100		Clips - 50 Nos
109	•	
111	•	Ay/AyCi-2     Saturated Calomal Electrode 2
112	Optional	
112	4	
11/	1	Corrosion Cell Kit
115	1	Three electrode cell set-up
116	1	Polishing kit
117	1	BBDE
**'		

# 2021-22/02/42 Optical Blue Light 3D Scanner

S. no.	Item	Specification
1	Resolution	Dual camera 8 MegaPixel system with blue light projector
2	Light Source	Optical Blue LED light based 3D Scanning system.
3	Measuring Volume	Minimum 2 measuring volume to cover small part to large size part upto 2 mtrs.
4	Acquisition Time	Should be 2 seconds or better
5		To be reported as per VDI 2634 – Part 3 with following accuracy for different Scanning volumes as below:
6		MV 170
7		a. Probing Error Form 0.005 mm

8	System Accuracy	h Prohing Error Size 0.012
9	System Accuracy	c. Spacing Error 0.014
10		MV 600
11		a. Probing Error Form 0.010
12		b. Probing Error Size 0.029
13		c. Spacing Error 0.035
14	Data Transmission	Between sensor and data acquisition system should be through Ethernet or Thunderbolt
15	LED Bulb Life	Minimum 10,000 hours or better
16	Calibration	Certified calibration plates covering all measurement volumes to be supplied
17		Transport box and casing to be supplied
18		Supplied Mounting and Handling system of the Sensor could be handled by a single person.
19	Transport Box & Casing	High quality height adjustable Studio stand with manual tilt axis for quick and easy manual sensor positioning. The tripod should be equipped with high- quality and smooth-running wheels for maximum maneuverability.
20	Mounting and Handling System	Scanner should have 10 meter sensor cable
21		Rotation of rotary table should be auto- synchronised with scanning software.
22	Rotary Table	One axis rotary table of diameter 300 mm (minimum) and load capacity 20 kg (Minimum) to be supplied. Resolution: 1° (or better), RPM- 7
23	Guided Pointers	The system should be equipped with guided pointers for setting of optimum standoff distance
24	Stand-off Distance	500 -700 mm
25	Fields of View and Component Size to	System should be upgradable with the ability to change only the lenses – if necessary, for adapting for different fields of views (FOV).
26		No manual setting of focus is needed, either at projector or at camera.
27	Operating Conditions	The instrument should be capable of operating at 10 to 40 deg C temperature and Relative humidity 55% or less with no condensation.
28	Marging Scanned Data	Should have the ability to merge scanned data using different methods

29		Merging of back or front side should be with or without use of reference marker
30	GD & T Analysis	All GD & T measurements as per ISO and ASME (User selectable)
31	Datum Creation	Should facilitate datum creation and local coordinate system
32	Sectional analysis	Color base sectional analysis with uniform and non-uniform tolerance band
33	2D Analysis	Tolerance and deviation Computations for sections and surfaces
34	Report Format	Should be capable of graphical report presentation in pdf
35	Import CAD Data Formats	IGES and STEP
36	Import of point clouds and polygons	OBC, ASC, TXT, STL, PLY
37	Export of point clouds and polygons	ACS, POL, STL, TXT
38	Data export to statistics Programs	CSV format
39	3D Comparison	3D comparison with CAD/Mesh to generate color report.
40	After Sales Support	All kind of After Sales support including Repairs, Calibration, Spares, etc. should be locally available in India & OEM Authorization letter for the same should be provided.
41	Auto Exposure	Automatic monitoring of calibration, transformation, movement and positioning for each single measurement
42	CAD Alignment	The software shall have all the latest CAD based alignment features like automatic pre-alignment against CAD, alignment using 3-2-1, Best Fit with Tolerance, RPS, Plane-Line-Point, local best fit, etc. Tolerance definition on the CAD data should be possible
43	Draft Angle Analysis	Should be able to do draft angle analysis in color
44	Gap & Flush Analysis	The software should be capable of evaluating flush & gap between mating parts & curve based analysis should be possible. Character line, bending distance, radius analysis, hemmed edge analysis, trim line &spring back analysis should be possible
45	Hardware & Software Make	Should be from same make software and hardware for hassle free and smooth operations in future.
46	Material Thickness Analysis	Full-surface computation of material thickness based on polygon meshes

47	Onsite Calibration	VDI 2634 – Part 3 Calibration & accuracy certification should be done at on site.
48	Surface Defect Analysis	Surface defect analysis and classification to determine surface quality of sheet metal and plastic shall be possiblein the inspection software.
49	Curve Bases Analysis	Should be able to do character curve and curvature analysis
50	GD&T Form Deviation	Color plot presentation of form error feature of GD&T (flatness,roundness etc) on points and mesh data
51	Strain Analysis	System should be capable to do strain analysis for material testing with add on software (Hardware same)
52	User Reference	The supplier should have supplied similar systems to at least 5 premier government organizations like ISRO, HAL,DRDO, CIPET,CTTCs, NITs & Central Universities.
53		Software should be parametric. Software should be capable of 3D data acquisition, processing and 3D color comparison as well as 2D comparison
54		System should be capable to do large size part with add on photogrammetry system upto 10metre.
55		The software shall provide online display of sensor position and live image mapping
56		Data acquisition and inspection software should be from in-house development of the manufacturer in an integrated suite of software. No add on third party software should be required to do the mentioned inspection functions.
57		Automatic transformation by measurement data by reference points or best fit of surface
58	1	Import /Export of scan data in STL,ASCII,POL etc
59	]	Mesh editing by filling holes, smooth, thining, repairing, etc.
60	1	Facility of Augmented view for inspection report
61	]	Import of CT volume data (VGI, VGL, PCR, EXV, REK) as a polygon mesh

62		Complete geometric measurement such as point, line, circle, slot, rectangle, vector, plane, cylinder, sphere, cone etc.
63		Fitting elements feature (maximum inscribed and minimum circumscribed elements, Gaussian and Chebyshev methods) should be possible
64		Tracing and evaluation of curvatures and character lines
65		Silhouette section facility for 2D inspection
66		Multisections (axis parallel, radial, along curves and in viewing direction)
67		Cylindrical /conical base section and unroll section
68		Distance measurement using virtual caliper shall be possible. Software shall be capable to calculate curve length.
69	Other Features of the Software	The measuring software shall provide complete set of indirect measurement for intersection, distance, angle, symmetry etc.Volume& Surface area evaluations should be possible in inspection software
70		Curve base analysis like flush and gap,curvature etc
71		Evaluation of GD&T according to DIN ISO 1101 and ASME Y14.5 should be possible in software. All parameters like- flatness, Theoretically Exact Dimension (TED) Pattern, cylindricity, concentricity, roundness, run-out, total run-out should be evaluated by the software.
72		The software shall provide polygonization of random point clouds into polygon meshes.
73		Multiple alignment with hierarchical order in same project should be possible.
74		Tracing and evaluation of curvatures and character lines
75		Complete traceability of constructions and evaluations`

76		This software shall be able to construct equidistant multiple points on areas or along edges. It should be capable to evaluate collective sections like axis parallel, radial and along curves. Intersection, projection, perpendicular dropping and averaging of features shall be possible.
77		Multiple copy of analysis software for report creation .No need to keep scanner ideal for analysis and report.
78		Analysis of material allowance control
79		Software should be certified by PTB & NIST.
80		Able to find surface and Section enclosed area
81		Analysis of bending distance, radius analysis, hemmed edge analysis, trim line & spring back should be possible
82		Arc length and continuous curve distance for analysis of deviation.
83		Should have disk and edge caliper for distance measurement.
84	Laptop	Latest configuration Workstation laptop with minimum 64GB RAM
85	Technical updates	Availability of information on technical update such as updated software, case studies, feedback from other customers etc. for effective utilization of the system on a regular basis.
86		Operational Manual (User Manual)
87		Software Instruction Manual
88		Maintenance and troubleshooting Manual
89	Documentation	• Training Manual
90		Installation and Commissioning
91		Handling of accessories
92		Software key (for operation, if any)
93		· Software CDs
94		Calibration Plate with International     STD VDI Certification for all FoV
95	Calibration Plates	• Periodic calibration of the artefact during and subsequent to expiry of warranty at a periodicity of one year for a period of five years to be indicated.

96	Any other Accessories	Any other Accessories, if available for better utilization - Bidder to specify and quote
97	System	The System shall be catalogued items from a company. All the relevant catalogues shall be enclosed in the technical bid.
98	Scope of supply	Attach list for scope of supply
99	Installation requirements	Bidder to specify , pre-installation requirement
100	Installation &Training	Basic and Advanced training should be provided a minimum 6 days
101	Technical support and service	Availability of technical support in the area of application and service both within the country. The tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
102	Manufacturer's credential	Should have installations of same model worldwide and at least Three similar model sold in Private and Government sectors, Attached OLD PO's for REF

### 2021-22/02/43 Plasma Cleaner

S. no.	Item	Specification
1	APPLICATION	Surface cleaning and modification of variety of materials, including glass, semiconductors, polymers, and metals.
2	<ul> <li>Compact and benchtop unit</li> </ul>	
3	<ul> <li>Adjustable radio frequency (RF) power settings: Low, Medium, High</li> </ul>	
4	<ul> <li>Maximum RF power of 30W or better</li> </ul>	
5	• Pyrex chamber: Dimension not less than 6" diameter x 6.5" length	
6	<ul> <li>System should include hinged door with viewing window and integral switch for a vacuum pump.</li> </ul>	
7	<ul> <li>System should have active fan cooling</li> </ul>	
8	<ul> <li>Integral switch for a vacuum pump</li> </ul>	

9	• The metering valve should be able to qualitatively control the gas flow and chamber pressure; it should have 1/8" national pipe thread (NPT).	
10	<ul> <li>A 1/8"NPT 3-way valve should be there for quick in bleeding of gas, isolating the chamber and ventilating.</li> </ul>	
11	<ul> <li>Gas mixer allows quantitative control of up totwo process gases and monitoring of vacuum pressure.</li> </ul>	
12	<ul> <li>2 No of Quartz chamber and sample tray.</li> </ul>	
13	• Suitable Vacuum Pump for Plasma Cleaner with following specifications: Oxygen compatible vacuum pump with a minimum pump with ultimate total pressure (closed) of 100m Torr or less. The dry (oil free) vacuum pump should able to pump oxygen, air, nitrogen and argon. Pump should include inlet hose, hose clamps, hose adaptor, centering ring and swing clamp to connect plasma cleaner to pump inlet.	
14	• <b>Power:</b> 230V AC ± 10%, Single phase and 50 Hz.	
15	• Minimum 2 yearcompliancy warranty with additional 1 year's maintenance warranty must be provided in order to keep the equipment in continuous working condition.	

## 2021-22/02/44 Probe Sonicator

S. no.	ltem	Specification
1		<ul> <li>It is used to synthesis various nanomaterials</li> </ul>
2	APPLICATION	• Disperse solids, de- agglomeration of powders, degassing of liquids, emulsion preparation, acceleration of chemical reaction, dissolving powders/solids, protein extraction etc.

		I
3	Configuration :	Micro Processor controlled Ultrasonic Probe Sonicator (Digital)
4		Power: 750 watt or more
5		Frequency:Up to 20 kHz or more
6		Energy monitor
7		• Full function Pulser – ON and OFF cycle independently controllable from .1 to 10 seconds
8		<ul> <li>Full function Pulser – ON and OFF cycle independently controllable from .1 to 10 seconds</li> </ul>
9	Specification	• Pulse mode with full function ON and OFF cycle. Continuous mode up to 30 minutes or preferably more
10		Variable amplitude control
11		<ul> <li>Replaceable probe tip – Size : ½"</li> <li>(13 mm)</li> </ul>
12		• Digital amplitude / Intensity control : Output amplitude can be set from 10 to 100%
13		Temperature controller integratable
14		Elapsed time indicator should indicate both elapsed time and actual duration of processing
15	Probe material	Titanium alloy
16	Display parameters	• Energy monitor, Watt meter, Amplitude, Time indicator, Pulser and Temperature
17	Processing Volume	• 10 ml – 1000 ml
18		Suitable sound abating enclosure
19		Temperature probe – 1
20	Accessories	19 mm probe
21		stepped microtip probe of 2 mm
22		Toolkit for replacing different probes
23	Safety	Overload protection circuit
24	Power	• 230V AC ± 10%, Single phase and 50 Hz.

2021-22/02/45 Rockwell Hardness Tester		
S. no.	Item	Specification
1	Purpose	To determine the comparative depth of indentations of the different types of polymeric material.

2	Principle/ Definition	Resistance of solid matter to various kinds of permanent shape change when a compressive force is applied.
3	Reference Standard	Should be complied to ASTM D 785, IS:1586- 2000
4	Display and Operation panel	LCD / LED Colour display panel. Automatic weight selection with automatic zero setting dial gauge
5		Minor load: 3 &10 kgf
6	Test Force Rockwell or Load	Major load: 5, 15, 30, 45, 60, 100, 150 kgf
7	Preliminary Test Force	Minor load auto-brake system
8	Total Test Force Control	Automatic (loading, duration, unloading)
9	Dwell time	Minor Dwell Time: adjustable 0.1 to 60s or better
10		Major Dwell Time: adjustable 1.0 to 60s or better
11		Test Cycle Time: Test cycle time shall meet table 3 of ASTM E18-15
12	Hardness Test Cycle Tolerances	Test load holding time: Optionally settable over a range from 0 to 99 seconds. This time to be set to 3 seconds at the time of delivery.
13		Indenter Contact Velocity: Indenter Contact Velocity shall be <2.5 mm/seconds
14		Total Measuring Time: Approx. 15 seconds / cycle
15	Max. Test Height (mm)	250 and above
16	Depth of Throat (mm)	150 and above
17	Hardness Minimum Value	0.1 HR (adjustable)
18	Rockwell Hardness Scales to be tested	HRA, HRB, HRC, HRE, HRF, HR15N, HR30N, HR45N, HR15T, HR30T, HR45T
19	Scale Conversions	Advanced with corrections
20	Data Output	USB or RS-232C or Centronics for easy data transfer to MS Excel or other applications
21	Power Supply	120V AC (±10%), 60Hz
22		Additional indenters and standard test blocks.
23	Accessories	<ul> <li>Indenter and test block should be certified by any one of these (DKD, UKAS, NABL)</li> </ul>
24		While supplying the Machines, the supplier should also provide the following items apart from above:
25		Hard copies of Operational & Service Manual- 01 Set.

		• Machine should come with all
	Other Mandatory Items	other essential accessories,
26		computer& spares required for
		installation, commissioning&
		Operation
27		Compliance to ASTM D-785
28		• Onsite Training to be provided for CIPET staff at commissioning site.

### 2021-22/02/46 Salt Spray Chamber

S. no.	Item	Specification
1		<ul> <li>Worldwide, materials used by manufacturing industry are exposed to natural or industrial corrosion in shape of salt fog.</li> </ul>
2	APPLICATION	<ul> <li>Laboratory corrosion tests are used extensively for selection of materials and their surface protection.</li> <li>Salt spray chambers are what you need to predict corrosion resistance of materials such as paints and coatings.</li> </ul>
3	Configuration :	<ul> <li>Salt spray chamber in vertical model</li> </ul>
4		<ul> <li>Overall dimensions (mm) 1320 x 780 x 1450 (W x D x H)</li> </ul>
5		<ul> <li>Test chamber internal dimensions (without dome area) (mm) 800 x 700 x 800 (W x D x H)</li> </ul>
6		Test chamber internal volume (without dome area) (litres) 448
7		<ul> <li>Salt solution reservoir capacity (litres) 110</li> </ul>
8		<ul> <li>Salt solution reservoir capacity - Min. 100 Litres</li> </ul>
9		<ul> <li>Capable of holding specimen weighing atleast</li> <li>4 kg.</li> </ul>
10		<ul> <li>Type of connection Electrical: 1/N/PE</li> </ul>
11	All Specification	Type of water: demineralised
12		Water pressure: 2-4 bar
13		<ul> <li>Water consumption (approximate) (litres/day) 3</li> </ul>
14		Type of air : Filtered, oil free
15		Air pressure: 4-6 bar
16		<ul> <li>Air consumption (approximate) (Nm3 /h) 5-8</li> </ul>
17		<ul> <li>Test chamber temperature range (°C) :Ambient to 50</li> </ul>

18		Temperature accuracy: 0.1°C
19		Temperature Repeatability: ± 2 °C
20		<ul> <li>Humidifier temperature range (°C): Ambient to 70Power: 230V AC ± 10%, Single phase and 50 Hz.</li> </ul>
21	Material	<ul> <li>Strongstructure overall 10mm thick polypropylene construction with built-in salt solution reservoir. Material should capable of withstanding salt corrosion</li> </ul>
22	Display parameters	• Free programming, up to 15 different test programs, inputs via keyboard with soft keys and easy to use structure of the Menu. Test status should be continuously displayed on the large LCD display with 4 lines of 20 characters each. Control and monitoring of test chamber and humidifier temperature, monitoring of nozzle air pressure and dosing pump RPH. Self-diagnostic including warning messages, alarm messages and safety shut down.
23		• Complete test report: chamber and humidifier temperature, nozzle air pressure and dosing pump RPH are periodically measured and stored in the controller memory together with test interruptions or alarms. By simply pressing a key a complete report of the test is printed.
24		Rods
25		Test panel racks
26	Accessories	Air filter and pipe
27		Thermo couple
28		Compressor
29		Dosing pump
30	Safety	Overload protection circuit
31	Standard	<ul> <li>Equipment shall complies to ASTM B 117</li> </ul>
32	Calibration	Calibration certificate with NIST traceability for Temperature controller, Solution spray rate, air pressure, etc. is essential.

#### 2021-22/02/47 Selective Laser Sintering - PolymerPlastic

S. no.	Item	Specification
Technical Specifications for Selective Laser Sintering - Polymer/Plastic The latest model and version of Selective Laser Sintering 3D printer that shall be capable of producing Plastic components with several material option from vide range of Plastic powders such as nylon (polymide), glass filled polyimide etc., for functional testing. The 3D printing syste consists of process unit with High Performance Control Computer and System Monitor, Therma Control System and Real Time Monitor System, Large Range of Laser Sintering Materials for multiple solutions and accessories. This machine should allow highly individualised products to manufactured in exceptional quality with latest technology. The detailed technical specifications are as below:		
1	Technology	Powder based additive manufacturing system (Latest Selective Laser Sintering system)
2	Build Volume	Minimum build volume 200 x 200 x 200 mm or more Complete build volume to be achieved
2	Lover thickness	0.06 0.12 mm or better
3	Duild volume rete	1 21 /hr or better
4	Scon spood	Scon speed with may of 5m/s
5	Min wall thickness	1 mm or Better
7	L ager type	CO = 30 W or better
/	Laser type	
8	Build environment temperature	Temperature of the build chamber to be maintained close to the melting point of the processed material& each layer to be heated to achieve better mechanical strength.
9	Machine Architecture	To avoid down time after every build the machine should be capable to replace the part build chamber for next build.
10	Recoating	Double side recoating with hopper like arrangement to spread the powder uniformly & different blades depending on the build requirement like surface & good strength etc. to be quoted.
11	Powder feed	Required powder quantity should be calculated automatically & feed to the re- coater in order to spread the powder in the build area. Manual Top loading of powder to ensure that the powder can be loaded when the process is running to build the complete build volume. For quick change of material vendor should provide an extra powder dispensing unit. Automatic change over of the powder dispensing bin when one is empty.

12	Laser cooling system	Suitable cooling system to be included in the scope of supply.
13	Machine Control	Real time computer to control the system components for easy accessibility
14	Material	Wide variety of material option and capable to use all type of materials such as polymide (Bio-compatible), glass filled polymide PP (Bio-compatible),, composite material, Polystyrene with 0.002% ash content, and new materials. RoHS certificate to be enclosed for Non Toxic Materials & Processes. Vendor to submit Bio-compatibility certificates for PA & PP.
15	Parameter set module for the laser power(s)	Documented laser sintered properties according to standards of the quoted material should be available .Material data sheet to be provided.
		Complete package of process Parameter Editor to optimize parts results.
16	Parameter Editor Module	Vendor to confirm that all parameters that are required to build a part is user controllable, and if not, to list what is not accessible.
		Also vendor should provide training on build Parameter Editing. The syllabus of this training should be clearly defined so that the user knows what is being offered.
17	Powder material	To supply 100 Kgs of each material. Powders should be reusable for better economics
18	Process Software	To control the building process and ergonomic operating interface of the touch screen.
19	Slicing and data editing software	Complete module for conversion of part data in the STL format and optimization of layer data.
20	Working zone	Closed (with a view glass)
21	Language	Multilingual
22	Connectivity	USB, LAN
23	Software feature	3D nesting should be possible.
24	License	License must be perpetual

25	Process control desktop software	Independent process software to be supplied for the build data to be prepared & to evaluate the total build time that would be required to finish the job.
26	Workstation with accessories	Vendor should supply suitable OEM workstation computer system with complete accessories and UPS. It should have minimum of i7 (3.4 GHz, quad core) processor of latest configuration, 64GB RAM (2400MHz, DDR4), 1TB hard disk (7200 RPM), and 4GB graphics card or better configuration, with windows operating system
27	Nitrogen Generator	System should have inbuilt Nitrogen generator for economic purposes
28	Vacuum Cleaner	Suitable Vacuum Cleaner - Bidder to specify and quote.
29	Process Station	Semi Automating uppacking/Sieving and complete accessories for maximum safety and minimum material contamination Bidder to specify and quote.
30	Sand blasting	Suitable sand blasting machine to specify and quote.
31	Online UPS	Suitable UPS with minimum 60 minutes backup power for the machine Bidder to specify and quote.
32	De-humidifier	As per the requirement, Bidder to specify and quote.
33	Compressor (Silent operation)	As per the requirement, Bidder to specify with details and quote.
34	Lifting and handling truck	Suitable system if necessary for the machine - Bidder to specify and quote.
35	Additional Accessories	Bidder should specify and quote if any other items required for better utilisation of machine.
36	Tool Kit	Standard tools/kits for start-up, removal of parts and cleaning (list to be attached).
37	Powder Material	Inspection certificate of the material with test certificate evaluating the grain size distribution, bulk density etc according to standards should be supplied.
38	Benchmark part	Part geometry to be provided.

		State space required and condition of
39	Installation requirements	floor and any other requirement for
39	Instantation requirements	installation of the machine and
		equipment.
		Onsite training (Basic & Advanced level)
		including providing two sets of operating
		and maintenance manuals and other
40	Installation & Training	reference
40	instantation & Franning	manuals for getting quality output and
		longer trouble free life of machine.
		Basic & Advanced level training schedule
		and plan to be submitted
		Should have minimum 3 installations of
41	Manufasturar's anodantial	the same model in India & The
41	Manufacturer's credential	manufacturer should have independent
		office in India for a min of 10 years.
		Tenderer shall give complete contact
42	References	details of existing customers having such
		supply in India.
12	Safaty requirements	Suitable safety gear to be recommended
43	Safety requirements	by the supplier.
	Environment protection	Safe to use without emission of any
		hazardous gases, noise level, radiation
44		etc. without any need for additional
		equipment, provision or training and meet
		current international standard.
45	Consumption of other consumables	List all such material that will be used in
43	Consumption of other consumations	building prototype
		Tender shall include list of all essential
		spares and consumables to be provided
		with replacement time prescribed for each
46	Availability of sparse and	such item and its availability within
	consumables	reasonable time period. In case if any
		such item is likely to be out of availability
		within service period of machine such
		item shall be included in initial supply.
47	Price list of material, spares and	Price list of each material should be fixed
47	consumables	for next 3 years from the date of PO.

48	Technical support and service	Availability of technical support in the area of application and service both within the country from OEM. The tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need. OEM should have min. 5 years' experienced service/application engineer. Vendor to submit the credentials of service/application personals.
49	Software license	The entire software license must be perpetual.
50	Retrofits	Free hardware Retrofits and software updates till the life of machine.
51	Scope of supply	Tenderer will supply complete start up package necessary to prove the machine and provide training. List for scope of supply (with make model, quantity of each items) to be submitted.

# 2021-22/02/48 Semiconductor measurement with Probe Station

S. no.	Item	Specification
1	Purpose	An Electrical Characterization System to perform device characterization, real-time plotting, and analysis withhigh precision and resolution, while remaining a highly integrated, flexible, upgradable and user- friendlypackage.
2		The system should be capable to perform the I-V and C-V characterization of ThinFilms,Electronic materials, Semiconductor devices, Solar Cells,High resistive materials and nano materials etc.
3		<ul> <li>Single box solution for current- voltage (IV), CV, pulse generation upgradable (Fast IV) capability with built in PC.</li> </ul>
4		<ul> <li>Slot system for Source measure unit (SMU), Capacitance-voltage unit (CVU) and pulse IV modules.</li> </ul>
5	Features	<ul> <li>Should be compatible with automatic/semiautomatic prober.</li> </ul>

		All SMU should provide
6		voltage/current in Bias; Common;
		Sweep; List sweep (custom point-by-
		point user-defined sweep); Step
		mode.
7		<ul> <li>SMU should able to apply pulse in mS range</li> </ul>
8	No of SMU	3 expandable up to 9
9	Type of SMU	High Power -1: Medium-2
10	Display	Built in 12.5 TFT display or better
11	Voltage Source and measure	200  mV to $200V$ or better
11	range	
12	Voltage Resolution	Source: 5 $\mu$ V and measure: ± 200nV
		or better
13	Current Source and measure ranges	1 pA to 100mA or better
1/	Current Resolutions	Source: 1.5pA Measure: ± 100 aA
14		or better
15		Frequency Range:1KHz to 10 MHz
		variable.
16	Built in C-V Measurement	DC Voltage Bias: + / - 30V / 1mV
	capability	resolution.
17		Measurement Parameters:CS-GS,
		CP-GP, Z theta, Cs-D, Cp-D, R+JX
18		Frequency range: 10 mHz to 10 Hz.
19	System should have Very Low	Voltage: up to 200 V.
	Frequency CV capability.	VI E measurement models: CS-GS
20		CP-GP Z theta Cs-D Cp-D R+iX
		In-Built PC platform with windows-
		OS,having LAN; GPIB; USB; RS232;
21	Hardware/ Architecture	parallelport; HDD,CD-RW;Should
		provide libraries / projects
		formeasurement of device
		parameters forsemiconductors.
22	Power requirement	230V AC, +/- 10%; 50Hz.
23	Accessories	Low Noise Triax Cable-03
24		Piv Demo Fixture

# 2021-22/02/49 Shore harness tester A & D

S. no.	Item	Specification	
1	Purpose	It is an instrument which is used to measure the hardness of a material. Hardness may be defined as a material's resistance to permanent indentation.	
2	Principle/ Definition	Resistance of solid matter to various kinds of perma shape change when a compressive force is applied.	

3	Reference Standard	Should be complied to ASTM D2240, ISO 7619, ISO 868	
4		Shore A	Shore D
5	Test Scale	(hardness testing of soft rubber, plastic and such substances)	(hardness testing of hard rubber, plastic and such substances)
6	Display	Bright & clear LCD display	Bright & clear LCD display
7	Result display	Hardness result, average value, max value (peak value lock), battery indication	Hardness result, average value, max value (peak value lock), battery indication
8	Data output	RS232	RS232
9	Measuring range	0~100HA	0~100HD
10	Tolerance	≤ ± 1HA (between 20~90HA)	≤ ± 1HD (between 20~90HD)
11	Display resolution	0.2 HA	0.2 HD
12	Statistics	Highest hardness, average	Highest hardness, average
13	Operating temperature	$0 - 40 {}^{0}\text{C}$	$0 - 40^{0}$ C
14	Features	Automatic switch off, battery low alarming	Automatic switch off, battery low alarming
15	Power Supply	3 x 1.5V-Buttonbatteries or 4.5V AC/DC adapter	3 x 1.5VButton batteries or 4.5V AC/DC adapter
16	Other features	Pocket size model with integrated prob	be
17		While supplying the Machines, the sup provide the following items apart from	oplier should also above:
18		<ul> <li>Hard copies of Operational &amp; Ser Set</li> </ul>	vice Manual- 01
19	Other Mandatory Items	<ul> <li>Machine should come with all other essential accessories, computer &amp; spares required for installation commissioning&amp; Operation</li> </ul>	
20		• Onsite Training to be provided for commissioning site.	CIPET staff at

### 2021-22/02/50 Spin coater

S. no.	Item	Specification
		• It is used to coat the polymer &
1	APPLICATION	nanomaterials on various substrates
		for different applications
2		• The top plate assembly of spin
	Configuration :	coater with spin bowl/head
3		• The spin coater should be clean
		room compatible
4		• Spin Speed: 10 – 12000 RPM or
		better
5		• Speed Accuracy: < 1% or better
		error across the full scale
6		• Acceleration/ Deceleration. To –
	Snin Parameters	Time: 1-999 sec or more with
7		increment of 1 sec or less
		Spin speed stability : +1 RPM or
8		better
		Spin cycle: One cycle should have
9		up to16 steps with control of
		acceleration/deceleration.
		Spin parameters like spin speed /
10	Control parameters :	• Spin parameters like spin speed /
		deceleration / step time
	Hot Plate	• In built with the coating system
11		and capable of varying substrate
		temperature from 40°C to 150°C or
		better
		• Suitable vacuum chuck/holder to
10	Substrate holder	handle substrates of various size upto
12		4 water with integrated vacuum
		substrates
		<ul> <li>Suitable Fragment Adapter for</li> </ul>
13		(substrate size > $3$ mm to 15 mm and
_		> 5  mm to  25  mm
14		<ul> <li>2 Nos each of substrate holder</li> </ul>
		LCD touch screen with colour real
15	Display	time display of speed (RPM) versus
		time
16	Motor	Integrated brushless DC
		servomotor with closed loop digital
		speed control.
17	Gas purging connection	Nitrogen gas purging facility
		should be provided.
18	Vacuum pump	Oil free, Diaphragm pump with
		pumping speed ~ 75 lit/min

19	Safety interlocks	<ul> <li>All the standard safety interlocks should be incorporated, including vacuum switch interlock.</li> </ul>
20	Vacuum connections	<ul> <li>Polyurethane tubing or equivalent for vacuum plumbing.</li> </ul>
21	Power	• 230V AC $\pm$ 10%, Single phase and 50 Hz.

### 2021-22/02/51 Tear Tester

S. no.	Item	Specification
		• ASTM D1922 , ASTM D1424,
1	Applicable standard	ASTM D295, D752, D4247, BIS IS
		13360-5-23, BIS IS 6489-1
2	Pendulum Capacity	200,400,800,1600,3200,6400 gm
3	Pendulum Accuracy	0.5% of Pendulum Capacity
4		50%, 50%, 90%
5	Learing Initial Angle	27.5°±0.5°
6	Measurement	Hi-resolution digital encoder
7		Optional pendulum weight kit for
	Accessories	heavier materials (128N),
8		Other necessary accessories
9		<ul> <li>Clamp type should be both manual &amp; pneumatic</li> </ul>
10		Clamp pressure in psi and kg/cm
11		Calculates force of multiple plies
12	Features	<ul> <li>Multiple data export options: USB flash drive, USB ESC/POS printer</li> </ul>
13		<ul> <li>Selectable units: grams-force, milli- newtons, lbs-force, percentage of pendulum capacity</li> </ul>
14		<ul> <li>PLC control and touch screen operation</li> </ul>
15		<ul> <li>Contact area and pressure are standards conformed.</li> </ul>
16		Pendulum automatic release
17		Automatic calibration of pendulum
18		Automatic specimen notching
19		Automatic pendulum reset with lifting device
20		Tearing force displayed digitally
21		<ul> <li>Safety hood protects operator from injury while pendulum is in motion</li> </ul>
22		Hard copies of Operational & Service Manual

		•	Calibrat	ion	Certificate	with
23		trace	eable	to	NISTreq	uired
		para	meters.			
24	Mandatory Items	• Te	est Speci	men p	ounching tool	
		• •	Machine	shoul	d come with	n all
25		othe	r esse	ntial	accessories	for
		comr	missionir	ig& Op	peration.	
26		• 0	)nsite tra	ining	to be provide	ed at
20		comr	missionir	ig site.		

# 2021-22/02/52 Thermal Evaporator System

S. no.	Item	Specification
1	Application	Thermal Evaporation system should be capable of depositing metals / metal oxides / ceramics with uniform film thickness
2		• SS 304 Metal Chamber fabricated from polished stainless steel.
3		<ul> <li>Approximately 16" x 16" x 18" Height with front door opening.</li> </ul>
4	Vacuum Chamber	• Cooling water pipeline is coiled on the outer wall of the chamber to prevent overheating, especially at the chamber windows and to reduce the out gassing by circulating the water and viewing window. There should be provision for necessary feed through.
5		<ul> <li>The chamber is evacuated by a double stage direct drive, rotary vacuum pump, with Edward Turbo pump for high vacuum.</li> </ul>
6	High Vacuum Pumping System:	<ul> <li>Rotary pump (with appropriate oil/mist filter) for creating initial vacuum till 10⁻³ mbar and backing for the turbo pump after that.</li> </ul>
7	Rotary Vacuum Pumping System	(1 No) Capacity 250 LPM, Direct drive, Single phase, Double stage, Oil charge 0.75liters, Ultimate vacuum > [5-6] x10 ⁻³ m. bar.
8		The pump should be capable for running 24 hrs.
9		nEXT400D ISO100 160W with inlet screen and manual vent valve Having Field replaceable bearing.01No.
10		01.Effective Pumping speed - >300(LPS)

11	Turbo Pumping System	02. Ultimate vacuum - $10^{-7}$
12		03. Critical backing pressure - 3.5 X 10 ⁻¹ m. bar.
13		04. No. of stages - 5.
14	4" Butterfly valve	(1No) a hand operated high vacuum valve is fixed to a base plate of 13" diameter. This valve isolates the chamber from the pumping system so that the chamber can be brought to atmospheric pressure without switching off the pumping system.
15	1" Quarter swing Butterfly Valves	(2 No's) one is for roughing and another for backing.
16	A¼" air admittance valve	(1 No) is fixed to the chamber pipeline to release the chamber vacuum after each coating process cycle.
17	Needle valve	[1No] along with the unit for gas purging. A fine control needle valves providing in the pipeline for use during H.T. discharge cleaning.
18	L.T/H.T Control	Variac (Dimmer) Controller in the input circuit of LT/HT selector provides the output power variation.
19	Meters	Separate digital panel meters provided for HT primary current LT secondary current through current transformers
20	Indicator Lamps	Glow lamps are to indicate ON/OFF status of rotary pump, Turbo pump, LT, HT and other accessories.
21	Power connection	For connection the power to the system 2 meters long 15amps wire chord with plug.
22	Vacuum Measuring Gauges	<b>Digital Pirani Gauge</b> -(1 No): Measure vacuum from 0.001 to 1000 m.bar anywhere in the vacuum system with suitable adaptor. Two gauge heads should be to this gauge to read fore vacuum and roughing vacuum of the system.

		Digital Penning Gauge- (1No):
22		Measure vacuum from 9.9x10 ⁻³ to
23		1.0x10 ⁻⁶ m.bar anywhere in vacuum
		system with suitable adaptor.
		Atleast 3 No. of LT electrical feed-
24	IT Eveneration Feedthrough	through for evaporation, made of
24	LI Evaporation Feedthroughs	electrolytic pure copper with
		should be provided
25		Maximum Temp: 500DegC
26		PID ON/Off Controller
27		K-Type Thermocouple.
28	Substrate Heater With Controller	Heater Size: 3" Diameter,
29		Heating Element: Super kanthal,
30		Solid State relay and a Transformer.
31	Substrate cooling facility	To be provided through water piping (as main quotation).
32		Liquid nitrogen cooling facility can be provided as additional cost.
		Appropriate feed through and
33	Divited Thickness menitor	sensor to be provided close to the LT
	Digital Thickness monitor	Source.
34		• Ability to monitor evaporation rates of 0.1 Å/s
		<ul> <li>6 MHz crystal holder with</li> </ul>
35		oscillation box and connecting cables.
20		Diamlay w2 digit LED
30		
37	Quartz Crystal Thickness	<ul> <li>Thickness Display 4Digit LED auto</li> </ul>
57	Monitor (DTM):	ranging from 0.000 to 999.9 Å,
38	, , , , , , , , , , , , , , , , , , ,	Crystal Frequency: 6MHz
20		Thickness Set point 0.000 to
39		999.9KÅ,
40		<ul> <li>Film Dencity:0.800 to</li> </ul>
		99.99grams/cc.
		Control console is fabricated with mild
		steel and neatly powder coated. It is
41		provided to house all the electrical
41		control instrumentation, control
		switches and standalone control
		panel of the following switches;
40	Control Concolo	✓ ON/OFF switches for vacuum
42		pumps and all valves
43		✓ vacuum measuring gauges
		controller
44		<ul> <li>Substrate rotation and substrate</li> </ul>
		neater controls

		The above control console is wired to
45		operate on 230 V AC, 50Hz, Single
		phase power supply.
46		<ul> <li>Should be made out of MS</li> </ul>
40	Support structure	channel and angles, neatly painted
47		<ul> <li>Must have castor wheels for</li> </ul>
47		mobility purpose.
48	Source shutter	To cover the evaporation source
49	Electrical Controls	Unit operates on 220V A.C 50Hz
		single phase power supply.
50		A 200Amps power supply capable of
<b>F</b> 4		delivering (1 No)
51	L.I Power Supply	a) 200Amps at 10volts. And
52		b) 100amps at 20 volts intermittent.
53		5000volts DC open circuit.
54	H.T Power Supply	3500volts at 50mA high reactance
		type-1NO
		An electrical circuit breaker in
		different power supply line protects
55	Safety Devices	these against over-load shorting. An
	-	over load protection device for
		vacuum pump motor snould be
		The unit is specified to achieve an
		The drift is specified to achieve an $10^{-6}$ m bar in
56	Ultimate Vacuum	close cool ampty decased condition
50		within 1 hour of switching on of the
		pumping system
		Nitrogen and Air purging facility
57	Purging	should be available
-0	Manual	Operation Manual to be given after
58	Manual	delivery and installation
		CIPET will inspect the instrument for
59	Inspection	two complete runs before despatch
		from factory outlet.
60		Basket: Spiral (10 each)
61		Boat: 10 each (Mo and W)
62		Evaporation materials:
63		• Al metals (99.99%) 100 gm,
64		• Ag metal (99.99%), 100 -gm
65		• Au-wire (99.99%): 10 cm -
66		Ceramic boat (organic
		evaporation): 5 nos
67	Accessories	Each 2 set of rubber O-rings for
60		Pump oil (2.5. Ho)
00		
69		Vacuum clamps with metal O-rings
70		Vacuum grease
71		Spare butterfly valves (1 No.)

72	•	Pirani gauge (1 No.)
73	•	Thickness monitor crystals (1-box)
74	•	All required tools

### 2021-22/02/53 Two Roll Mill

S. no.	Item	Specification
1	Roll Diameter	Minimum 150 mm
2	Roll Width	Minimum 350 mm
3	Heating Power/Roll	2.5 kW- Electrical Heating
4	Roll Speed	Variable speed Drive 2-25 RPM
5	Nip-Gap	0.1-10 mm
C	Dell Temperature	Upto 300° C with an accuracy of ±
6		2°C
7		Brass Spatula (2 Nos), Brass roll
/	Accessories	cleaning accessories,
8		Other necessary accessories
0		• Uniform temperature distribution
9		across rollers
10		<ul> <li>Rapid cooling of rollers by water</li> </ul>
10		circulation
		• Any polymer like LDPE, HDPE,
11		PP, PVC, PS, ABS, HIPS, Natural
		Rubber, EVA etc. can be tested
12		<ul> <li>Individual adjustable roller speed</li> </ul>
12		with digital RPM display
	Features	<ul> <li>Incorporated with additional</li> </ul>
		safety features like Knee operated
12		reversible emergency switch at both
15		the sides, hand operated roller safety
		switch and emergency push button
		on panel
14		<ul> <li>Digital nip gap displays for both</li> </ul>
14		rollers
		<ul> <li>Control options available like</li> </ul>
15		HMItouch screen with PLC control
		and digital display by PID controls
16		<ul> <li>Hard copies of Operational &amp;</li> </ul>
10		Service Manual
		<ul> <li>Machine should come with all</li> </ul>
17	Mandatory Items	other essential accessories & spares
		required for installation,
		commissioning& Operation.
10		<ul> <li>Onsite training to be provided at</li> </ul>
18		commissioning site.

### 2021-22/02/54 UV-Vis-NIR Spectrophotometer

S. no.	Item	Specification		
1	Photometric system	Double beam optics		
2	Monochromator	Double beam monochromator		
2	Light Course	Deuterium lamp, WI lamp with		
3		automatic optical axis adjustment		
1	Detectore	PMT, InGaAs and Cooled PbS: All		
4		three detectors		
5	Wavelength Range	200 or lower to 3300 nm		
6	Wavelength Accuracy	± 0.2 nm or lower for UV/Vis		
7		NIR: ± 0.8 nm or lower		
8	Resolution	0.1 nm or better.		
9	Wavelength Repeatability	± 0.05 nm or better		
		Instrument should have variable		
10	Weisland the according anod	wavelength scan rate from 4000 to		
10	Wavelength scanning speed	0.5 nm/min (UV-VIS) and 9000		
		nm/min (INIR) with automatic		
11		Selection. $1 - 8 \text{ pm}$ or higher		
12	Spectral band width	NIR: $0.2 - 32$ nm or higher		
13		0 00008 %T or less (220 nm, Nal)		
14		0.00005 %T or less (340 nm, NaNO ₂ )		
45	Stray light:	$0.0005.0(T_{at}) = 1000.0(1.000 \text{ nm} + 0)$		
15		$0.0005 \%1$ of less (1420 mm, $\Pi_2 0$ )		
16		0.005 %T or less (2365 nm, CHCl₃)		
		,		
17	Photometric range	Absorbance = $-6$ to 6 Abs or better.		
18	_			
		80000% of better.		
19				
	Photometric Accuracy	$\frac{\text{ACCULACY}}{\text{of } \pm 0.003 \text{ Abs (at 1.Abs)} \pm 0.002}$		
20		$\Delta he (at 0.5 \Delta he) \text{ or hatter/+ } 0.007$		
20		$\Delta be (at 2 \Delta be) or better$		
21		0 0008 Abs (0 - 0.5A)		
22	Photometric repeatability	0.0016 Abs (0.5 - 1A)		
23		or better.		
24		±0.001 Abs (200 - 3000 nm)		
25	Baseline Flatness	±0.005 Abs (3000 - 3300 nm)		
26	Descling stability	Within 0.0002 Abs/h (500 nm, 1-		
20		second integration)		
27		UV-Vis: 0.00005 Abs or less (500 nm)		
2,	Noise Level			
28		NIR: 0.00008 Abs or less (900 nm)		
29		0.00003 Abs or less (1500 nm)		
		The equipment should interface with		
30	Data Acquisition	computer and controlled by software.		
		Data points in .csv format to be		
		lobtained.		

31	Accessories
32	1. 10 mm rectangular quartz cell - 02 pair
33	2. 100 mm cylindrical quartz cell - 02 pair
34	3. Film Holder - 01 no.
35	4. Computer Interface: Latest configuration Branded PC
36	5. Printer Interface: laser jet Printer
37	6. The total instrument must have warranty of 36 months from the date of installation
38	Optional accessories
39	7. Integrating sphere accessory with facility to measure powder, film as well as liquid samples for diffuse as well as specular reflectance measurement, with wavelength range of 250 to 1400 nm or higher.

### General terms and conditions :

 Tenders should specify and quote the necessary accessories required for installation and running the machine.

• Minimum 2 years compliancy warranty with additional 1 year's maintenance warranty must be provided in order to keep the equipment in continuous working condition.

• Onsite training as well as application support should be provided by the vendor at its own cost.

Necessary spares and Consumable for 2 years

Appropriate tool box/kit for routine maintenance should be provided with the equipment

• Technical support and service: Availability of technical support in the area of application and service both within the country, The Tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need.

• 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.

 All documents (i.e. manuals, drawings etc.) and original software's relevant to the instrument and its accessories must be supplied