

1. ENVIRONMENTAL CHAMBER(220Ltr Capacity)		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Purpose	For conditioning of plastic products & allied products & Ageing test.	
TECHNICAL SPECIFICATION		
S.No	Characteristic/ Description	Specification
1	Temperature Range & Accuracy	(-)70°C to (+)180°C or better ,±0.2°C
2	Temperature Least count	±0.1°C
3	Humidity Range & Accuracy	10% to 99%R.H ,± 2 to 3%
4	Humidity Least count	±1%
5	Features	<p>#Microprocessor based PLC HMI Controller with touch screen</p> <p>#Suitable for programming temperature profile.</p> <p>#Minimum 20 test program for temp &amp; humidity test cycles # Ramp rate 1.5 to 2.5°C per minute or better</p> <p>#USB download function, with RS232 interface,</p> <p>#Automatic Cycle complete alarm &amp; door open alarm, sensor failure alarm, condenser failure alarm</p> <p>#Direct observation of the function more effectively</p> <p>#Software upgrade function</p> <p>#Defrost cycle (800 cycle defrost time, defrosting guarantee within 2 hours each time.</p>
6	Working Inner Chamber Size W*H*D(mm)	minimum 600 X600 X 600
7	External Chamber Size W*H*D(mm)	To be specified by Bidder
9	Accessories	i) Mesh Tray -03Nos, ii) Water Container of required capacity .
10	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• Traceable NIST/NPL/NABL Calibration certificate for the applicable parts of equipment like Temp.&amp; humidity for whole ranges</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>• Onsite free operational Training</li> </ul>

2. SCG NOTCH CUTTER		
QUANTITY	01No	
TYPES OF TESTS TO BE PERFORMED	Making Notch on Pipe of various diameters for determination of resistance to crack for slow crack growth on notched pipes.	
APPLICABLE STANDARD	ISO 13479, ISO 1167-2, ISO 6108 & IS-4984-2016	
Technical Specification		
S.No	Characteristic/Description	Specification
1	Diameter of the Pipe	40mm to 315 mm
2	Movement of sample	Auto movement of notch bench
3	Pipe length	Suitable for making notches on pipes with diameter from 40mm upto 315mm and length of up to 3000mm or suitable as per standard.
4	Notch Depth	Up to 15 mm
5	V-Milling Head	60°
6	Slot cutter for high wall thickness	for wall thickness above 50 mm, Notch Cutter also to be quoted.
7	Notch angle and accuracy	60 degree notch with accuracy of 0.01 mm
8	Notch Length	40 to 315mm adjustable
9	Milling Depth	up to 10 mm
10	Other Features	a) Fully Microprocessor control With touch screen operation & Controlled program run b) Machine Should comply the safety norms as per IEC/ISO/EN
11	Accessories	1) Holders for keeping pipes in position (different sizes for different pipe ranges) 2) Exhauster for cuttings with chip collector volume of min. 90 ltr & filter material: category " G " 3) Measuring gauge(digital for checking the notch depths (of good quality of Range: 0 - 25 mm, L.C 0.01 mm)
12	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: • Hard copies of Operational & Service Manual- 01 set . • Calibration Certificate with traceability for required parameters. • Machine should come with all other essential accessories & spares required for installation, commissioning & Operation.

### 3. Automatic Hydrostatic Pressure Tester With Accessories

QUANTITY	01 Set
TYPES OF TESTS TO BE PERFORMED	For determining the strength of thermoplastic pipes when subjected to a constant hydrostatic internal pressure at a constant ambient temperature either for a specified period or until they fail. The test duration is subject to the tension generated by the internal pressure and the temperature.
APPLICABLE STANDARD	<b>ISO 13479, ISO 1167-2, ISO 6108 &amp; IS-4984</b>

#### Technical Specification of Pressure tester

S.No	Characteristic/ Description	Specification
1	Pressure Range	100 bar
2	Resolution	0.01 bar
3	Number of Station	05 Station
4	Pressure transducers	10 bar-01 No,60 bar-02 nos,100bar-02 nos
5	Accuracy class for pressure transducer	0.50% of full scale of pressure transducer or better
6	Features	<p>The machine and the computer should display the time, pressure and all testing conditions</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Quick connected couplings for connecting test samples</b></li> <li><input type="checkbox"/> <b>Integrated high-pressure pump</b></li> <li><input type="checkbox"/> <b>Pressure regulation via microprocessor controller System</b></li> <li><input type="checkbox"/> <b>Controller with two-line LCD display</b></li> <li><input type="checkbox"/> <b>Overtemperature shutdown</b></li> <li><input type="checkbox"/> <b>Interface for chiller/heat exchanger</b></li> <li><input type="checkbox"/> <b>Pressure Transducers of suitable capacity as mentioned above.</b></li> <li><input type="checkbox"/> <b>Automatic Temperature controller interfacing with Water bath</b></li> <li><input type="checkbox"/> <b>Data interface to internal programs via PC</b></li> </ul> <p style="padding-left: 40px;"><input type="checkbox"/> <b>The machine should observe, analysis, inquire, save,print, testing Curve(pressure-time)and starting time,setting time, current time, valid time, invalid time,remaining time, over pressure time, pressure compensating time and etc.</b></p>
7	Accessories	<input type="checkbox"/> <b>Stainless steel pressure reservoir(Material of good construction (to be declared by vendor)</b>

#### Technical Specification of Water Tank -02 Nos

1	Water temperature range of Tank	i) From (+) 0°C or lower to (+)50°C-1No ii) From (+) 30°C to (+)100°C-1No
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2	The Temperature Controlling Accuracy of test tank	±1.0°C
3	Temperature Regulating accuracy	±0.1°C
4	Tank Type	02 Nos of Tank of best quality material with an Inner Size suitable to accommodate Minimum 05 Nos of test samples of 315mm Dia Pipe for pressure testing.
5	The Working Time of the Tim	0-99999h or better
8	Timer Display Accuracy	1Sec
6	Features	<input type="checkbox"/> <b>Auto monitoring of water level &amp; Circultaion System</b> <input type="checkbox"/> <b>Automatic top-up</b> <input type="checkbox"/> <b>Integrated heaters</b> <input type="checkbox"/> <b>Water cooling system/Chiller</b> <input type="checkbox"/> <b>Connection and interface for chiller/heat exchanger</b> <input type="checkbox"/> <b>Automatic Temperature controller with digital temp and time display</b> <input type="checkbox"/> <b>Data interface to internal programs via PC</b>
7	Accessories	<p>Chiller of suitable capacity for Cold Tank of range (+) 0°C or lower to (+)50°C</p> <p>Enclosures/End Caps suitable for fittings of PE Pipes of sizes Upto 315mm as per IS-4984 - 01 set each from each sizes</p> <p>Enclosures/End Caps suitable for fittings of PVC Pipes of sizes Upto 315mm as per IS-4985 - 01 set each from each sizes</p>
8	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>• Calibration Certificate with traceability for required parameters like pressure,temperature &amp; timer.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

4. OPACITY METER		
QUANTITY	01No	
TYPES OF TESTS TO BE PERFORMED	To check the opaqueness of plastic samples as per	
APPLICABLE STANDARD	IS 4985 and IS 12235 (Part 3).	
Technical Specification		
S.No.	Characteristic/Description	Specification
1	Range	0 - 100 % opaque
2	Least count	0.01% or better
3	Display	Digital
4	Features	Test specimen clamps up to 15 mm thickness.
		Indicating Result in percentage reading of light passing through specimen zero & span calibration
		Powder Coated Body
5	Accessories	Standard grey Glass Filter
6	Power Requirement	230V,50Hz
7	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NABL Traceable Calibration certificate for equipment including for Standard grey Glass Filter</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

5. Electrical Heated Press		
<b>QUANTITY</b>	01No	
<b>TYPES OF TESTS TO BE PERFORMED</b>	For preparation of Sheet for PE materials by compression press	
<b>APPLICABLE STANDARD</b>	IS 7328	
Technical Specification		
S.No.	Characteristic/Description	Specification
1	Temperature range:	Max. up to 300°C.
2	Least count	0.5°C or better
3	Pressure Range	Max 200Kg/Cm <sup>2</sup>
4	Least Count	01Kg/Cm <sup>2</sup> or better
5	Features	Digital PID based temperature controller
		Digital Timer & pressure indicator
		Construction of bath is outside MS with powder coating and inside SS
		ISI or CE mark electrical panel and components.
6	Accessories	Highly Polished chrome Plate-04 nos
		Suitable Spacer frame of 100x 120mm-04 sets
7	Power Requirement	230V,50Hz
8	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>• NABL Traceable Calibration certificate for equipment for pressure ,Temperature &amp; timer</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation.</li> </ul>

**6. HDT/VSP Apparatus(Microprocessor based)**

Quantity	01No
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories
Reference Standard	HDT test as per ISO 75 & ASTM D648 and equivalents VSP test as per ISO 306 & ASTM D1525 and equivalents
Purpose	Determining HDT & VSP of Plastics.

**TECHNICAL SPECIFICATION**

<b>S.No.</b>	<b>Characteristic/ Description</b>	<b>Specification</b>
1	Temperature range	From ambient to 300 °C or more.
2	Resolution	0.1°C
3	Accuracy	± 0.1°C
4	No of stations	Min 03 Stations.
5	Special Features	The equipment should be automatic microprocessor-based .
		To be supplied with dedicated Software for test parameters management, data storage and analysis.
		Automatic lift at the beginning and end of tests
		Suitable application and removal of the weights on the test stations
		Automatic cooling cycle at end of test.
		All operations, test cycle and alarms are electronically controlled by a microprocessor via a keyboard with an LED graphic display
6	Material of construction	Inner bath: S.S Outer-M.S with good finish.
7	Cooling System	Suitable cooling system to cool the oil temp for running next operation fastly.
8	Displacement Range	0- 10mm with resolution of 0.01mm measured via LVDT transducers
9	Power	230 Volts, 50Hz, single phase.
10	Weights	For Vicat: 1 kg and 5 kg. For HDT: Set of modular binary test weights ranging from 5grams to 4000g or more as per standard.
11	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NIST/NPL Traceable Calibration certificate for the applicable parts of equipment like Weights , Indentors geometry, Temperature controllers &amp; dial gauge</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation including silicon oil.</li> </ul>

**7. DEEP FREEZER (LOW TEMP.CABINET)**

Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Purpose	For conditioning of Plastic Pipe samples etc.	
<b><u>TECHNICAL SPECIFICATION</u></b>		
<b>S.No.</b>	<b>Characteristic/ Description</b>	<b>Specification</b>
1	Capacity(L)	550
2	Cabinet Type	Upright
3	Climate Class	Any climatic conditions
4	Cooling Type	Natural convection
5	Cooling system	Two Compressor cascade system or equivalent
6	Cooling Performance	-85°C or better
7	Refrigerant	CFC-Free or equivalent
8	Noise level	50 dBa or better
9	Temperature Controller	Microprocessor
10	Display	LED
11	Power	230 v, 50 Hz
12	Material of construction	Interior: high quality stainless steel
		Exterior: Powder coated steel
		Shelf: minimum 03nos.
		Insulation: Panel Foam or better
13	Functions	High/Low Temperature alarm
		Remote alarm
		High Ambient Temperature alarm
		Hot condenser alarm
		Air Circulating Fan
		Power failure alarm
		Sensor failure alarm
		Low Battery alarm
	High/Low Voltage alarm	
14	Accessories	Caster
		Testing Hole
		USB Interface
		CO2 Backup system
		Remote alarm contact
		Temperature Recorder
15	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above:
		<ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual-01 Set .</li> </ul>
		<ul style="list-style-type: none"> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>
		<ul style="list-style-type: none"> <li>• One site training to be provided.</li> </ul>



**8. Modulated Differential Scanning Calorimeter  
(MDSC)**

<b>Quantity</b>	01No
<b>Make, Model, Series &amp; Sr. No.</b>	: To be specified by bidder for all including PC & other accessories
<b>Purpose</b>	: Measurement of the following properties of polymers, rubbers, elastomers etc <ul style="list-style-type: none"> <li>• Measures heat absorbed or released by a sample as a function of time, temperature and environment</li> <li>• Glass transition temperature (<math>T_g</math>)</li> <li>• Melting temperature (<math>T_m</math>),</li> <li>• Crystallization temperature (<math>T_c</math>)</li> <li>• % of crystallinity,</li> <li>• Curing temperature</li> <li>• Degree of cure</li> <li>• Purity</li> <li>• Activation energy</li> <li>• Heat of enthalpy</li> <li>• Heat of fusion</li> <li>• Kinetic studies</li> <li>• Thermal stability</li> <li>• Oxidation/decomposition</li> <li>• Oxidative-Induction Time (OIT)</li> </ul>
<b>Reference Standard</b>	: ASTM D 3417-99, ASTM D 3418-15, ASTM E 1356-08(2014), ISO 11357-1:2016, ASTM-D 3895-14

**TECHNICAL SPECIFICATION**

<b>Characteristic / Description</b>	<b>Specification</b>
Temperature Range	: -180 °C to 700 °C
Temperature Accuracy	: ± 0.1 °C or better
Temperature Precision	: ± 0.05 °C or better
Heating Rate	: 0.01 °C/min to 200°C/ min
Cooling Rate	: 0.01°C/min to 100°C/ min
Calorimeter Sensor	: Ceramic Type
Maximum Calorimetric Sensitivity	: 0.2 µW
Calorimetric Precision (based on metal standard)	: ±0.05%
Dynamic Range	: ± 500 µW or better
Temperature Calibration	: 3 points or more over the specified temperature range
Baseline Curvature (-50° to 300°C)	: 10 µW or better
Baseline Reproducibility	: 10 µW or better
Baseline Noise (max. peak to peak)	: <1 µW or better
	<ul style="list-style-type: none"> <li>• Operating software and analysis software shall be user friendly and shall be running on windows 10 version</li> </ul>

Software	:	<ul style="list-style-type: none"> <li>Analysis software shall have the provision to smoothen to evaluate peak temperature, onset temperature, glass transition temperature, melting temperature, crystallization temperature % of crystallinity, purity, curing temperature, activation energy, heat of enthalpy, heat of fusion, kinetic studies, Oxidative-Induction Time (OIT), X-scaling w.r.t time, temperature, etc.</li> <li>The software shall have the provision to view total heat flow, modulated heat flow, total heat capacity signals in real time during experiment.</li> <li>Software for kinetic studies for single and multiple steps through non-linear regression</li> </ul>
Software	:	<ul style="list-style-type: none"> <li>The data analysis software should be unkeyed or multi-user licensed to allow installation at minimum 3 PCs Calibrations shall include baseline, cell constant and temperature. Scheduling capabilities must be present, such that these calibrations and/or verifications can be programmed to perform during normal quiescent periods, such as overnight or on weekends.</li> <li>The data file format should easily allow sharing/transfer of data files as individual electronic documents, which are readable by the same data analysis package.</li> <li>The operating software should also be capable of periodically and automatically checking for updates via an Internet connection, and downloading/installing those updates if desired.</li> </ul>
Measurement Atmosphere	:	N <sub>2</sub> & O <sub>2</sub>
Provision for cooling	:	Inbuilt cooling system with variable cooling rates
Control system	:	Gas flow correction and controller for accessories mass, flow rate
Accessories	:	<p>DSC shall include</p> <ul style="list-style-type: none"> <li>06nos. of Platinum pans, 30 nos. of Graphite pans and 800 nos. of Aluminium pans.</li> <li>Standard samples such as Indium, Cobalt, Tin, Sapphire, Adamantane for calibration purpose.</li> <li>Sample crimping kit</li> <li>Dewar Flask for liquid Nitrogrn of 500Ltr Capacity</li> <li>Tubing fittings</li> <li>Moisture tap and filters for gas supply system</li> </ul>
Calibration	:	Should produce calibration certificates for reference materials traceable to NIST and internal calibration report
Software	:	<p>Compatible to Windows 10 or higher OS (32 and 64 bit) and should have the capabilities to heating rate, temperature setting, etc.</p> <p>capable of collecting data on heat flow, heat capacity enthalpy change, Cp, Tg, Tm, Tc, peak area, peak onset, etc.</p>
Personal Computer (PC)	:	A Personal Computer (PC) having latest configuration. All softwares shall be loaded in the hard disk with appropriate partitions. All original CDs/DVDs must be provided. The scope of supply also includes a good (reputed make, please give the details) Colour Laserjet Printer having a resolution of 1200 × 1200 dpi or better.
		<ul style="list-style-type: none"> <li>Modulated DSC shall have the ability to apply sinusoidal temperature wave to sample by amplitude and frequency.</li> </ul>

Others

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- Modulated DSC shall include the ability to perform quasi-isothermal experiments i.e. holding isothermal with a small temperature modulation.
- Modulated DSC should be able to show the following signals in real time during the experiment: Total Heat Flow, Total Heat Capacity, Reversing Heat Capacity, Reversing Heat Flow, Non-Reversing (Kinetic) Heat Flow, Modulated Temperature, Modulated Heat Flow, Heat Flow Phase, Reference Sine Angle, Temperature Amplitude, and Heat Flow Amplitude.
- DSC shall allow for the direct measurement of specific heat CP i.e. in one single scan.

9.Burst Tester		
Quantity		01No
Make, Model, Series & Sr. No.		To be specified by Bidder for all including accessories
Reference Standard		<b>ASTM D 1599, &amp; ASTM D 1785</b>
Purpose		For determining the strength of thermoplastic pipes when subjected to a constant hydraulic pressure in a short time period.
Technical Specification		
S.No	Characteristic / Description	Specification
1	Pressure Range	300 bar(Digital Display)
2	Resolution	0.2 bar
3	Number of Station	01 Station
4	Features	<input type="checkbox"/> <b>Quick connected couplings for connecting test samples</b> <input type="checkbox"/> <b>Integrated high-pressure pump capable for achieving required internal hydraulic pressure within 60 secs</b>  above.  bath
5	Accessories	<input type="checkbox"/> <b>Accumulator of suitable capacity</b>  Enclosures/End Caps suitable for fittings of PVC Pipes of sizes 1/2", 3/4", 1", 1 1/2", 2", 2 1/2" , 4" & 5" as per ASTM D 1785 -15, 01 set for each sizes
6	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>• Calibration Certificate with traceability for pressure gauges ,temperature &amp; timer.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

10. Carbon Black Content Apparatus		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Purpose	Capable to measure Carbon Black Content in Plastic Products as per ASTM D 1603, IS 4984 and IS 2530	
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Temperature range	Ambinet to 1150°C
2	Temperature control	Micro-controller based PID controller with resolution of 1.0 degree C and accuracy of +/- 1 degree Centigrade.
3	Size of furnace :	10 inch x 8 inch x 8 inch.
4	Display	LCD
5	Features	Microprocessor based PID temperature controller. Compact with safe assembly for glasswares To be provided with nitrogen gas purification and moisture absorption system.
6	Accessories	Relevant glass wares like Desiccator, Glass U tube, Combustion Tube, Glass Combustion boat-10Nos, Rotometer, Rubber tubes, Glass End plugs- 2 nos & Glass traps - 3 nos and gas flow regulator meter provided for purification and regulation of the nitrogen gas during the test period.
7	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• Tracebale NABL Calibration certificate for the temperature.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>• Onsite free operational Training</li> </ul>

11. Carbon Black Dispersion Tester		
Quantity		01No
Make, Model, Series & Sr. No.		To be specified by Bidder for all including accessories
Purpose		Capable to measure Carbon Black Dispersion in Plastic Products as per IS 2530, & IS 4984
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Hot Plate Size	8 inch.
2	Temperature control	Thermostatic Control with temperature range from ambient to 200 degree centigrade.
3	Microscope Screen	6 inch.
4	Magnification	100X, 200X & 450X.
5	Accessories	Relevant glass wares
6	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• Traceable NABL Calibration certificate for Magnification</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>• Onsite free operational Training</li> </ul>

12.Falling Weight Impact Tester for Pipe		
Quantity		01No
Make, Model, Series & Sr. No.		To be specified by Bidder for all including accessories
Purpose		Used to determine the True Impact Rate of Pipe test samples as per IS-12235(P-9), IS-12818 & IS 4985
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Height	Variable upto 2meter
2	Nose of Striker	d25 & d90 c omplying the dimensions as per IS 12235(P-9)
3	Mass of Strikers	0.5,0.8, 1.0, 1.25, 1.6,2.0,2.5,3.2,4.0, 5.0,6.3,8.3,10.0, 12.5 and 16.0 kg with tolerance issible tolerance of $\pm 0.5$ percent.
4	Rigid specimen support	Consisting of a 120 degree V-Block at least 200 mm long
5	Release mechanism of striker	Suitable for free fall of striker
6	Features	Safety cover at sample test area to safeguard the operator during test
7	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual-01 Set .</li> <li>• Tracebale NABL Calibration certificate for the Height ,Strikers dimension &amp; weights</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>• Onsite free operational Training</li> </ul>

13. CONTOUR CUTTER		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Reference Standard	ASTM 638, ASTM D790-17, ASTM D5930-17, ASTM D257-14, ASTM D3039-17, ISO 294-1, 294-2, IS -14151 Part-1 Type-2 dumbbell, For Tensile specimen - ISO 527-2-2012, Parts-4 and 5, IS 12701 (Tensile and Flexural specimen), IS 4984-2016, IS 13360 (Part-5 sec 6) rectangular	
Purpose	For preparation of test specimens out of thermoplastic (rigid) materials & composite sheets to be used for Testing as per various Standards.	
TECHNICAL SPECIFICATION		
S.No.	Characteristic/ Description	Specification
1	Table size (LXD)	330 x 375 mm or equivalent
2	XYZ axes stroke	310x220x160 mm or equivalent.
3	XYZ axes movement resolution	3 µm or better
4	XYZ axes positioning repeatability	0.02 mm or better
5	Fraise head holder movement	Through a step motor and suitable dia. ball screw without backlash, 5 mm pitch.
6	Max speed (mm/sec)	100
7	Fraise rotation speed (rpm)	8000 to 24000 set manually according to the material type
8	Shield opening safety lock	Timed door lock release.
9	Emergency stop	Red panic button (Mushroom type)
10	Voltage	230V
11	PC connection	Series RS232
12	Dimensions	600 x 800 x 700 mm or equivalent with safety shield closed (L X W X H) 600x850 x 900 mm or equivalent with safety shield open (L X W X H)
13	Other special features	<ul style="list-style-type: none"> <li>· Vacuum system for dust collection to be included</li> <li>· Set of cutter for various type of materials and for different type of finish</li> <li>· Speed control</li> <li>· Dimension control</li> </ul>
14	Personal Computer (PC)	A Personal Computer (PC) of reputed make (bidder need to mention the make & model while quoting) having latest configuration. All software shall be loaded in the hard disk with appropriate partitions. All original CDs/DVDs must be provided.
15	Other Mandatory Items	<ul style="list-style-type: none"> <li>· Hard copies of Operational &amp; Service Manual- 01 set.</li> <li>· All templates as per standards mentioned above with traceable calibration certificates</li> <li>· Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; operation</li> <li>· Onsite free operational Training</li> </ul>



14.REVERSION OIL BATH		
QUANTITY	01No	
MAKE ,MODEL,SERIES & SR No..	To be specified by Bidder for all including accessories	
Application	For reversion test of plastic pipes	
APPLICABLE STANDARD	IS 4985 & IS 12235	
Technical Specification		
S.No.	Characteristic/ Description	Specification
1	Temperature range	Max. up to 200°C.
2	Least count	1°C or better
3	Inner Chamber Size W*H*D(cm)	Suitable for accomodating 350 mm Dia pipe for reversion testing with required oil filling capacity.Size to be specified by bidder accordingly while quoting.
4	Features	Digital PID based temperature controller
		faster heating with low energy cost and maintain the temperature for longer time
		Proper insulation
		Suitable stirring attachment for uniform temperature.
		ISI or CE mark electrical panel and components.
	Construction of bath is outside MS with powder coating and inside SS-304 or better	
5	Power Requirement	230V,50Hz or suitable
6	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NABL Tracebale Calibration certificate for equipment</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation.</li> </ul>

**15. HOT AIR OVEN**

Quantity	01No
MAKE ,MODEL,SERIES & SR No.	To be specified by Bidder for all including accessories
Application	The oven should capable to dry samples, glassware's and synthesis of materials with independent adjustable temperature.

**TECHNICAL SPECIFICATION**

<b>S.No</b>	<b>Characteristic/ Description</b>	<b>Characteristic/ Description</b>
1	Temperature Range	Ambient to 300°C maximum
2	Volume	1000 litres minimum
3	Temperature Accuracy	±1°C or better
4	Controls	PID Controller
5	Temp Display	LED/TFT Colour Display
6	Sensor	PT-100 or equivalent
7	Timer	Digital Pre-Set Timer 999 Hrs
8	Dimension	Internal dimension :1000x1000x1000 mm or Equivalent in line with Volume capacity.
9	Heating Element	Nichrome wire / Kanthal A1/ Titanium wire
10	Interior & External Chamber	Corrosion resistant Steel 304 or 316 stainless steel
11	Doors	Solid doors with silicone rubber gasket & lock
12	Features	Suitable blower arrangement for uniform temperature throughout the chamber.
13	Shelves	Min. of 4 Stainless steel shelves without hole(Removable)spaced equi-distant from each other
14	Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NIST/NPL Traceable Calibration certificate for the applicable parts of equipment like Temp.for whole ranges .</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation.</li> </ul>

16.MUFFLE FURNACE		
Quantity		01No
Make, Model, Series & Sr. No.		To be specified by Bidder for all including accessories
Purpose		For measuring ash/filler content of plastic compound.
TECHNICAL SPECIFICATION		
S.No.	Characteristic/ Description	Specification
1	Controls	PID Based Digital Temperature Controller with Digital Timer (Timer range : 0.001 to 999Secs)
2	Working Range	1200°C
3	Least Count & Accuracy	1°C & ± 5 °C
4	Heating element	Silicon carbide (SiC) / Molybdenum Silicide (MoSi <sub>2</sub> )
5	Heating rate	Fast heating rate and the maximum temperature should be attained as a ramp function within 1 hour Assured uniform heating inside the chamber
6	Furnace	Fire Bricks Insulated Muffle Furnace. Door opening on front side. / Powder coated outer body
7	Inside Chamber size (Minimum)	6 in (W)X 8 In(D) x 6 In(H)
8	Power Requirement	230V, 50Hz
9	Accessories	i)Silica crucible-02Nos, ii)Tongs, & Gloves-1set iii)Any other accessories suitable for smooth running of furnace should also be quoted.
10	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NIST/NPL Traceable Calibration certificate for the applicable parts of equipment like Temp. for whole ranges .</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

17.DIGITAL WEIGHING BALANCE WITH DENSITY KIT		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Reference Standard	ASTM D 792	
Purpose	For measuring density of Solid Plastics/polymeric materials	
TECHNICAL SPECIFICATION		
S No	Characteristic/ Description	Specification
1	Capacity	220 g
2	Accuracy	0.1 mg
3	Display	LCD/VFD
4	Weighing pan diameter	80 - 100 mm
5	Repeatability	0.1 mg
6	Power Supply	230 V AC, 50 Hz
7	Pan Size	8 to 10 cm
8	Weighing units	mg, g & kg
9	Stabilization time	2 sec
10	Stability Filters	Three filters to match weighing environment
11	Output	RS 232 Interfaced
12	Accessories	Density measurement kit with thermometer(Range: Upto 30 Deg,L.C: 0.1 DegC) and sinker of Concave & convex type Calibration Weights Sets consisting 0.1gm,2mg,5mg,100mg,1gm,5gm,10gm,50 gm,100gm,200gm weights
14	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: <ul style="list-style-type: none"> <li>· Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>· Required traceable to NIST calibration certificate for the Weight Sets and for the machine</li> <li>· Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

18.AUTOMATIC MELT FLOW INDEX TESTER		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including PC & other accessories	
Reference Standard	ASTM D 1238	
Purpose	For automatic Measurement of Flow behaviour of Polymeric materials as per ASTM method	
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Temperature Range	Working range 30°C to 400°C
2	Temperature Accuracy	± 0.1 °C
3	Timer	Digital timer with a range of 999.9 Sec or better, accuracy ±0.001 Sec with buzzer indication facility.
4	Temperature Controller	Electrically heated with Microprocessor based PID Digital Temperature Controller
5	General requirement	Corrosion resistance pistons and barrel inert to the test materials confirming to ASTM D1238 with dimensional conformity Traceable calibration certificate.
6	Test Weights	Standard Weights/masses (0.325, 1.0 kg, 1.2 kg, 2.16 kg, 3.8 kg, 5 kg, 10Kg, 15kg & 21.6 kg.) with mass conformity Traceable calibration certificates.
7	Die Material	Tungsten Carbide with dimensional conformity Traceable Calibration
8	Die Dimension	Confirming to ASTM 1238
9	Cutter	Suitable extrudate cutting device.
10	Features	· High-temperature accuracy and stability
		· On-board interface for method setting and visualization of results
		· Built in timer with buzzer alarm.
		· Temperature accuracy and stability according to standards on whole working range
		· Corrosion-resistant material for barrel, piston, and dies
11	Accessories	· Operating console with LCD display
		· Standard Tool Kit containing cleaning tool for barrel and die, compression tool, die removing tool, die plug, cut-off knife, laboratory funnel or spoon for sample loading into barrel, levelling device, die retaining plate, tilt mirror, cleaning patches & cleaning cream.
		· Should be supplied with suitable external thermometers suitable to calibrate the barrel temperature at 190°C & 230 °C with traceable calibration certificate ( 188°C to 192 °C with readability 0.1 °C) & (228°C to 232 °C with readability 0.1 °C).
		· 01 No. of extra Standard die
12	Other Mandatory Items	· Hard copies of Operational & Service Manual- 01 set
		· Safety gloves & goggles required for day to day activities during operation of Machine-01 set
		· The Machines should come with all other essential accessories & spares as per ASTM standards) required for installation, commissioning & operation.
		Onsite free operational Training

19.Moisture Analyzer		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Reference Standard	ASTM D6980-12	
Purpose	Determining Moisture Content in both high level and trace amounts in solids, liquids, or gases.	
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Measuring method	Halogen Lamp
2	Sample capacity(Weight)	Range: 70g to 100g
3	Pan size	Range: 75-85mm
4	Sample Pan	Made from "0" temper, Aluminum 3003 or other nonreactive material.
5	Display	LCD/VFD
6	Temperature range	30°C to 200 °C in 1°C increments
7	Units of measurements	Weight, %Moisture, Ratio.
8	Moisture Content Readability	0.00%
9	Weight resolution	+/-0.0001g
10	Moisture (%)	0 to 100%
11	Moisture Content Accuracy	0.01%
12	Heater	Halogen
13	Measurement mode	Automatic or Timed halting modes, Rapid, Slow and Step drying modes,.
14	Standard accessories	Sample plates(20 Nos), sample pan stop, windbreak case, sample pan, Dust Cover, handler(2 Nos), aluminum sheet, spoon, spatula, Temperature calibration set, Test Sample, Software.
15	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above:
		· Hard copies of Operational & Service Manual- 01 Set .
		· Calibration certificates.
		· Machine should come with all other essential accessories & spares required for installation, commissioning & Operation.

20.Melting Point Apparatus		
Quantity	01No	
Make, Model, Series & Sr. No.	To be specified by Bidder for all including accessories	
Reference Standard	ISO 3146	
Purpose	Determining for melting point of polymers	
TECHNICAL SPECIFICATION		
S.No	Characteristic / Description	Specification
1	Temperature range	From ambient to 400 °C
2	Resolution	0.1°C
3	Accuracy	± 0.1°C
4	Heating Rate	0.1°C to 20°C
5	Cooling System	5 to 6 min (300°C to 50°C)
6	No of capillaries	Min 05 melting point capillaries
7	Power	230 Volts, 50Hz, single phase.
8	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set .</li> <li>• NIST/NPL Traceable Calibration certificate</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation</li> </ul>