

1. Thermo Gravimetric Analyzer (TGA)

Sl. No.	Specification	Range / Value
1	Balance Sensitivity	0.1µg or Better
2	Balance Measurement Range	Upto 400 mg or more
3	Weighing precession	0.05 %or better.
4	Signal Resolution	0.02 µg
5	Temperature Range	ambient or less to1000°C or more
6	Temperature measurement accuracy	±0.5°C or better
7	Temperature Accuracy	±0.5°C or better
8	Dynamic Temperature Precision	±1°C or better
9	Isothermal Precision	±1°C or better
10	Heating rate	0.1°C/minute or lower to100°C/minute
11	Cooling time	20 min or better, any cooling accessory required should be quoted
12	Differential Thermal Analyzer	Simultaneous measurement of TGA/DTA
13	Sample Pans	Alumina Pans-10Nos., Lid for Alumina Pans- 10 Nos, Aluminum Pans-500 Nos.with crimping machine
14	Capacity of Pan	The volume of the sample shall be 100µm or compatible with the equipment
15	Chiller	A suitable in built chiller should be quoted.
16	Gas Flow Control	The system must include a software programmable mass flow controller (2 or more) for convenient & precise gas control and switching between gases (Inert & Air).
		The system should be able to perform under flowing inert and /or active gases, static as well as vacuum atmosphere. All vacuum accessories required should be quoted

17	Atmosphere	The system should also be suitable to perform adsorption studies of gases such as NH ₃ , CO, CO ₂ , H ₂ etc. from a 1 % or more mixture of these gases in an inert gas. The quoted MFC should be able to control the flow rate of such gases. All other accessories required to perform adsorption studies should be quoted.
18	High vacuum pump	Ultimate vacuum less than 10 ⁻⁶ bar or better.
19	Gas cylinder	High purity (99.999%) nitrogen, oxygen zero air gas cylinder (capacity 47 litres) with double stage double meter gas regulator with stainless steel diaphragm and pressure gauge suitable for above cylinder should be quoted
20	Software	The latest Microsoft windows based user-friendly software should be supplied. The software should have the ability to data access, storage and analysis. The software should also have the ability to Plot thermal curves for TGA against time and or temperature. Calculate the derivative of TG data and plot DTG curves. Baseline correction, integration and prepare overlay of curves. Possibility of converting data into ASCII format and export the same for further manipulation.
21	Others	For the entire third party item being quoted the model and make should be specified in the quotation
		System should be supplied with latest branded PC and Printer.
		To supply necessary spares and accessories
22	Accessories to be quoted and supplied along with machine / equipment	The following accessories should be quoted invariably · Auto sampler with 10 sample position · Kinetics software, based on model – free is conversional method based algorithm
23	Calibration	Calibration certificate to be produced wherever required traceable to NIST CRM (Nickel, Calcium Oxalate Monohydrate or equivalent) Standard weight of 1 mg & 100 mg (with certificate)

24	PersonalComputer(PC)	A Personal Computer having latest configuration: i7 processor 10th generation, 16GB RAM, DVD - RW, 500 GBSSD, Windows 11 with lifetime licence, Latest Microsoft Office professional, 27"LCD display, Wi-Fi enabled or with better specifications. The scope of supply also includes a good (reputed make, please give the details) colour Laser jet Printer having a resolution of 1200 × 1200 dpi or better.
		All software shall be loaded into the hard disk with
		Appropriate partitions. All original CDs/DVDs must be provided.
		UPS (5 KVA) for 1 hour or higher power backup (2 years warranty on UPS and 2 years warranty on batteries).
25	Terms & Conditions	Manufacture/Supplier should have sizable installations of same or better model worldwide and at least five in India which is education institutions/Research Testing centrally funded institution
		A Satisfactory Performance certificate from at least one Customer to be provided for eligibility. Bidder should submit complete contact details
		Service Support: reporting time within 48 hours after officially request for service
		Hard copies of operational & Service manual -01 set
26	Scope of supply	Complete list of items quoted are to be provided
27	Warranty	Minimum 2 years warranty must be provided
28	Training	Training on operation & maintenance of the equipment should be provided onsite
29	Installation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation

2. Force Proving Ring		
Sl. No.	Specification	Range / Value
1	Purpose	It is used to calibrate the compression & Tension Force
2	Loading pattern	Compression & Tension
3	Capacity	100 N, 2kN, 20kN, 200kN
4	Display type	High Resolution Colour Touch LCD or better
5	Class	1
6	Reproducibility	0.2% or better

7	Repeatability	0.1% or better
8	Error of interpolation	± 0.1% or better
9	Hysteresis	0.3% or better
10	Creep (in 30 minutes)	0.1% or better
11	Zero Return	± 0.05% or better
12	Nominal Emissivity	0.95 or better
13	Display Resolution	For 2Kn, 20kN : - 0.0001kN or better For 200kN: - 0.01kN or better
14	Measurement Units	N, kN, kgf, lbf etc.,
15	Mode of Operation	Trace, Peak, Auto Peak
16	Plug and Play Sensors (No. of Sensors)	7 or better
17	Data Storage & Logging	Upto 9999 as Calibration Reports or better
18	Calibration Sequence and Report Capture as per ISO 7500-1	Automated Sequence to ensure data credibility
19	Data Transfer Options	USB
20	Operating Temperature	Upto +65°C
21	Construction	Aluminium or better
22	calibration certificate	Traceability certificate should be provided from National/International body

23	Accessories	· Carrying Case
		· Other essential accessories required for the smooth operation of instruments for 3 years. (List of accessories should be quoted/listed in tender)
24	Warranty	· 2 year

3. Black Body (35°C to 500 °C)

Sl. No.	Specification	Range / Value
1	Purpose	It is used to calibrate the IR thermometer, thermocouple, etc. The Black body source is used to calibrate the thermal instruments in on-site. So it is portable, easy to carry for the calibration purpose.
2	Type	Portable; for onsite calibration
3	Temperature Range	ambient to 500 °C or higher
4	Accuracy	± 0.1 °C or better
5	Stability	± 0.5 °C or better
6	Resolution	± 0.1 °C or better
7	Aperture Dia.	25 mm or higher
8	Heating Time	45 min or better
9	Stabilization time	30 minutes or better
10	Nominal emissivity	0.95 or better
11	Thermometer Emissivity Compensation	0.9 to 1.0
12	Target Diameter	65 mm or better
13	Power	120/240 VAC (±10 %), 50/60 Hz or compatible for instrument
14	Computer Interface	RS-232 included with free Interface-it software
15	calibration certificate	Traceability certificate should be provided from national/international accredited body
16	Mandate Accessories	Carrying Case
		Contact Thermocouple for measuring the cavity temperature
		Non Contact IR Infrared Gun Thermometer(upto maximum temperature of the instrument, display resolution - 0.1°C, Repeatability – 1% of reading) – 1 No
		Other essential accessories required for the smooth operation of instruments for 3 years. (List of accessories should be listed in tender)
17	Warranty	Two years

4. Oxygen Transmission Rate

Sl. No.	Specification	Range / Value
1	TYPES OF TESTS TO BE PERFORMED	Gas transmission rate (GTR) is the measurement of the amount of gas that passes through a substance over a given period.
2	APPLICABLE STANDARD	ASTM D3985, ASTM F1307, ASTM F1927, DIN 53380-3 ISO 15105-2, JIS K7126 films
3	Measuring range for film and sheet	Test Range, Single Cell Mode, Unmasked - 0.05 to 200 cc/(m ² -day) or equivalent
		Test Range, Single Cell Mode, Masked - 0.1 to 2,000 cc/(m ² -day) or equivalent
		Test Range, Dual Cell Mode, Unmasked - 0.006 to 100 cc/(m ² -day) or equivalent
		Test Range, Dual Cell Mode, Masked - 0.01 to 1,000 cc/(m ² -day) or equivalent
4	Resolution	Resolution, Single Cell Mode - 0.01 cc/(m ² -day)
		Resolution, Dual Cell Mode - 0.005 cc/(m ² -day)
5	Measuring range package	0.0005 to 1.0 cc/(pkg-day)
6	Resolution	0.00005 cc/(pkg-day)
7	Measuring chambers	2 Chambers (with independent sensors)
8	GTR Repeatability (50 cm ²)	±0.002 cc/(m ² · day) or ± 1% of relative whichever is greater
9	Test Method	Coulometric (sensor in cell)
10	Sample size	10.2cm x 10.2cm (50cm ² Test area), small size samples should also be tested with the help of 5cm ² aluminum masking foil.
11	Film Test Cell per module	2X50cm ² (pneumatic clamping cell)
12	Thickness of sample	Upto 3mm
13	Carrier Gas Requirement	One Gas Cylinder with gas mixture of 98%N ₂ & 2%Hydrogen as per ASTM requirement to be supplied.
14	Test Gas Requirement	One Gas Cylinder of 99.99% dry O ₂ as per ASTM requirement to be supplied.
15	Humidity Range	0%RH & 35%RH to 90% RH, 100% RH for films and packages RH sensor directly at sample site.
16	Humidity control accuracy	±3%RH
17	Temperature Requirement	10-40 ⁰ C
18	Temperature control accuracy	±0.5 ⁰ C or better

19	Gas Pressure Range	30 – 35 psig
20	Cell Clamping	Pneumatic
21	Barometer	Barometric pressure compensator
22	Special Features	Fully Automatic Testing
		Automatic RH control & Built-in software
		Faster Speed to test
		Improved results
		Easy film replacement
		No calibration Required
		Advisory screen prompts operator input
		Customize and store up to 99 test methods
		System protects against over or under pressure
		System protects against thermal runaway
		Status-screens display real-time information
		Pneumatic clamping
		“No-flow” adjustment required
Repeated calibration not required before each testing		
23	Accessories to be supplied	· Necessary two precision, two stage SS diaphragm Regulator for Carrier gas & test Gases of best quality with all necessary tubing fittings&Moisture tap filtersfor accurate pressure adjustment.
		· Standard Reference/Certified Films
		Rings for sample cell of necessary quantities
		· Kit consisting Brass Nut, Brass Ferrule, O ring for cell,Copper tubing, cutting kit,Grease ,syringe,& certified film as mentioned above.
		· Aluminium Foil Mask for 5cm2 film sample

		Operating Software
24	Calibration	Calibration certificate traceable to NIST for the certified Films and instrument to be supplied
25	Other Mandatory Accessories	While supplying the Machine, the supplier should also provide the following items apart from above:
		· Basic tool Kit-01 set
		· Hard copies of Operational & Service Manual- 01 set
		· Necessary Hoses & Nipples required for gas connections-01 set
		· The Machines should come with all other essential accessories & spares (as per ASTM & ISO standards) required for installation, commissioning & operation.

5. UTM (10 kN)

Sl. No.	Specification	Range / Value
1	Application	To be designed for testing of Materials/Products under Tension, flexural and compression bending (Microprocessor Controlled). Supplied UTM must be able to test PE, PP Films, Plastics and wooven sacks along with Poisons ratio.
2	Maximum load Capacity	10 KN, double column type.
3	Load Cell	10 kN and 500 N
4	Load Cell Accuracy	≤ 0.5 % or better
5	Test Speed	0.001 mm/min to 800 mm/min or better
6	Crosshead Speed Accuracy	± 0.1% or better
7	Max Crosshead Travel	1500 mm or better
8	Horizontal Daylight	Min 400 mm or better
9	Strain measurement accuracy	0.5% or better
10	Load measured	Tension, bending and Compression
11	Grips & Fixtures	All the Fixtures such as tensile grips, mechanical wedge grips, pneumatic grips should suitable for testing of PE, PP Films, wooven sacks & plastic material.
12	Grips & Fixtures for 10KN Load Cell	Suitable Pneumatic grip for plastics samples (test specimen-filament, films and fibre)
		Manual Wedge grip up to 10KN
		Grip Face Manual/Pneumatic Grips Filed for Flat specimen T7-20mm or better.
		Pneumatic grip 10kN to be supplied.
		Grip Face Wave for 5kN/10kN Flat Grips 60x50 Wave R1 Pitch 5mm or better.
		Compression test fixture with 100mm plate dia to be supplied.
		Flexural - three point bend complying to ASTM D 790 with adjustable span 20 mm -200 mm or equivalent to be quoted.

13	Grips & Fixtures for 500N Load Cell	Pneumatic grip (for Flim,rubber, fibre/filament)
		Pneumatic grip 500N or 1kN to be supplied.
		Rubber Coated Flat Grips 50x30 Chloroprene to be supplied.
14	Extensometer	Video extensometer
		Capable for use under ambient conditions as well as elevated and sub-zero temperature inside environmental chamber in case if upgrade later on site in future.
		Transverse strain measurement should be standard with 2 camera configuration.
		Field of View - Select from 100 mm to 700 mm. or better.
		Sampling rate - 50 Hz or better.
		Gauge Length - Should be possible to choose within FOV [Field of View] of the camera or 700 mm or better.
		Elongation 700 mm or better.
		Resolution - 0.30 μ m or better.
		Extension accuracy in room temp - ± 0.5 % indicated value or better.
Width accuracy in room temp - ± 0.5 % indicated value or better.		
		Max tension speed - 8000 mm/min or better.
15	Operating system & Software	Suitable for all functions such as maximum load, strain, modulus etc. Necessary software, Computer & Printer should be provided.
16	Installation and Commissioning	The Machines should come with all other essential accessories & spares (as per ASTM & ISO standards) required for installation, commissioning & operation.
17	Scope of supply	Complete list of items quoted are to be provided
18	Training	Training on operation & maintainance of the equipment should be provided onsite
19	Warrantty	two years
20	Supplied system should be upgradable at any point on site for various types of grips for tension, compression, bending including temperature chamber.	

6. Smoke Density Chamber, Smoke Toxicity & Single Flame Source		
Sl. No.	Specification	Range / Value
1	Application	The Smoke Density Chamber should be capable of determining the specific optical density of smoke generated by solid materials, measures the specific optical density of smoke generated by materials when an essentially flat specimen up to 25 mm thick, is exposed vertically to a radiant heat source of 25kW/m ² , in a closed chamber, with or without the use of a pilot flame. In addition to that, it measures the toxicity of the produced smoke.
2	Applicable Standard	ISO 5659-2 – Smoke Density; ISO-17084- Smoke Toxicity
		ISO 11925-2 - Single Flame Source
		Specified as per EN 45545-2 standard
3	SMOKE DENSITY TEST CHAMBER	
3.1	Radiator:-	
	Rated Power	2600 W
	Heat flux	10 kW/m ² to 50 kW/m ²
	Measuring position	25 mm under specimen.
	Measurement area of the radiator	Φ10 mm
	Distance from the furnace	25 mm
3.2	Burner:-	
	Flame Height	30 ± 5 mm
	Distance to the Specimen	10 mm
3.3	Specimen:-	
	Size	59 mm x 59 mm
	Thickness	Less than 25mm
	Orientation	Horizontal
4	SMOKE TOXICITY TEST CHAMBER	
4.1	Smoke Toxicity attachment	Gaseous/volatile test products drawn from the chamber at any time for analysis through three ports on the top of the chamber. One of these ports is used to connect to the vacuum box.
5	SINGLE FLAME SOURCE TESTER	
5.1	Power	AC220V±10%,50Hz

	Burning Chamber :-	
5.2	Burner Dimension	0.17mm with four \varnothing 4mm suction inlet
	Gas pressure	Should have capacity to control gas pressure up to 10 kPa~50 kPa
	Flue air velocity	0.7m/s
	Burner angle	45°
	Control Device:-	
5.3	Timer for flame	0~ 99min 99sec
	Timer accuracy	\leq 1s/h
	Anemometer accuracy	\pm 0.1m/s
	Orientation	Horizontal
	Test procedure:-	
5.4	Specimen process	23 \pm 2 °C, 50% to constant weight
	Modes	25 kW/m2 without fire
		25 kW/m2 with fire
		50 kW/m2 without fire
		50 kW/m2 with fire
	Time	10 min or minimum light transmittance value
		Test chamber should have with full width opening door, allowing easy access for sample loading and chamber cleaning.
		Controls should mounted beside chamber for convenient operation.
		Smoke density and temperature are on digital displays.
		Chamber walls are pre-heated for easier start-up and convenient equipment operation

5.5	Other Features	Safety blow-out panel, easily replaceable, allows for safe operation of test method
		Cabinet should have designed with a standard 19" rack.
		Furnance have to designed for allowingpotential of the Smoke at variable heat fluxes (up to 50 kW/m ²).
		Equipment shoud have the facility for the horizontal rotation of the specimen with mass loss rate of the specimen.
		Equipment should have all facility to complie the test procedure as per the standard ISO 5659-2.
		Test chamber should have made up of stainless steel (SS 316) material.
		Two number of windows on the front and right side to observie the process.
		Equipment should also have all facility to complie the test procedure as per the standard ISO 11925-2.
6	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 for requireded parameters with Traceability.
7	Training	Onsite training (03 days) should be provided to the staff after installation. The Supplier shall provide all facilities for such training programme.
		Complete set of manuals for the operation of equipment should be given.
8	Scope of supply	Complete list of items quoted are to be provided
9	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.