

**1. HDPE PIPE EXTRUSION UNIT**

S. NO.	ITEMS	UNITS	SPECIFICATION
Model :			
1	Polymer to be processed	-	HDPE
2	Screw Diameter	mm	30 – 50
3	L/D Ratio		28 to 30 :1
4	Output	Kg / hr.	Min. 100
5	Pipe / Tube Outside Dimensions	mm	20-110 mm dia Pipe
6	Calibration / Sizing/Cooling tank Vacuum Operated with Suitable Stainless Steel Cooling Tank with arrangement of Re-circulating Water for cooling.	-	Suitable units for above extruder size to be provided
7	Haul off unit (Suitable Haul off Unit with PLC control)		Suitable units for above extruder size to be provided
8	Cutter - Synchronized cutter to be incorporated for both flexible and rigid pipe/tube.	-	Suitable units for above extruder size to be provided
9	Die Size - 50 mm & 90 mm	-	Please quote for the two size die with all accessories
10	Total Connected Load	KW	Please quote for powersaving machine
11	Control System	-	Microprocessor/ PLC Controls/ Computer Integrated Control with synchronisation of whole plant for single point of control
12	Machine Dimensions (LxWxH)		Please Specify
13	Safety	-	Appropriate safety features to be provided

14	Essential/Standard spares	--	Specify and quote for Standard spares like Die and die sets, Spirals, spiders, Filters, Heaters etc for proper functioning of machine.
15	Optional spares/Accessories		
a)	Jockey extruders for colour stripe		Specify and quote for compatible with above machine
b)	Auxiliary extruders for Co-extrusion		Specify and quote for compatible with above machine
c)	Hopper drier		Specify and quote for compatible with above machine
d)	Vacuum hopper loader		Specify and quote for compatible with above machine
e)	Gravimetric system for weight/meter control		Specify and quote for compatible with above machine
f)	Ultrasonic wall thickness measurement system		Specify and quote for compatible with above machine
g)	Laser Marking system		Specify and quote for compatible with above machine

**2. SINGLE LAYER EXTRUSION BLOWN FILM UNIT WITH SUITABLE CARONA TREATER (QTY : 1 NOS.)**

S.NO.	ITEMS	UNITS	SPECIFICATION
<b>Model :</b>			
1	Screw Diameter	mm	30 – 50
2	Screw L/D Ratio	-	Please specify
3	Extruder Output	Kg/hr	20-35
4	Film Thickness	Micron	20-100
5	Material		HM/HDPE
6	LFW	mm	100 to 450 mm
7	Control System	-	Microprocessor/ PLC Controls/ Computer Integrated Control with synchronisation of whole plant for single point of control
8	Plant should have either rotating/Oscillating Die	-	Suitable units for above extruder size to be provided
9	Melt temperature sensor & Melt Pressure transducers	-	Suitable units for above extruder size to be provided
10	Slitting and winder arrangement		Double station surface winder
11	Total connected load	KW	Please quote for powersaving machine
12	Corona Treater	-	Specify and quote for compatible with above machine
13	Safety	-	Appropriate safety features to be provided
14	Machine Dimensions (LxWxH)		Please Specify
15	Safety	-	Appropriate safety features to be provided
16	Essential/Standard spares	--	Specify and quote for Standard spares like Die sets, Filters, Heaters etc for proper functioning of machine.

17	Optional spares/Accessories		
a)	Die for HMHDPE/LLDPE		Specify and quote for compatible with above machine
b)	Hopper drier		Specify and quote for compatible with above machine
c)	Vacuum hopper loader		Specify and quote for compatible with above machine
d)	Gravimetric system for weight/meter control		Specify and quote for compatible with above machine
e)	Ultrasonic thickness measurement system		Specify and quote for compatible with above machine
f)	Water cooling arrangement		Specify and quote for compatible with above machine

**3. VACUUM FORMING MACHINE (SEMI AUTOMATIC) – Category - I**

S.NO.	ITEMS	UNITS	SPECIFICATION
<b>Model :</b>			
1	Material to be formed	-	HIPS, PET,PVC
2	Forming Area	mm	Upto 350 x 500
3	Forming Depth / Draw	mm	Min. 100 & above
4	Sheet Thickness (Min.- Max.)	mm	0.15mm and above
5	Total Heating Load	KW	Please specify
6	Total Connected Load	KW	Please quote for powersaving machine
7	Machine Dimension (LxWxH)		Please specify
8	Sheet roll feeding/ Disposal after forming system attachment	-	Please specify and quote for Manual Type
9	Safety	-	Appropriate safety features to be provided
10	Essential/Standard spares	--	Specify and quote for Standard spares like Heaters etc for proper functioning of machine.
11	Optional spares/Accessories		
a)	Demonstration 2 cavity Aluminium mould for Cake cup of L=10 cm, W=5 cm , H= 5 cm		Specify and quote for compatible with above machine
b)	Plug assisted attachment	-	Specify and quote for compatible with above machine
c)	Sheet roll feeding/ Disposal after forming system attachment		Please specify and quote for Automatic system for above machine

**4. MICROPROCESSOR CONTROLLED AUTOMATIC INJECTION MOULDING MACHINE 450T**

<b>S.No</b>	<b>Items</b>	<b>Units</b>	<b>Specification</b>
<b>MODEL :</b>			
1	Clamping Tonnage	Tons	450
2	Screw Diameter	mm	70 – 100
3	Screw speed	RPM	Min. 140 & above
4	Shot Capacity Minimum	Gms	Min. 1400 and above
5	Injection Pressure	Kgf / Cm2	1600 and above Multi Stage
6	Injection Rate	Cc / sec	400 and above
7	Maximum Daylight	mm	1500 and above
8	Opening Stroke	mm	700 and above
9	Distance Between Tie Bar	mm x mm	750 x 700 and above
10	Platen Size	mm x mm	1000 x 1000 and above
11	Minimum Mould Thickness	mm	300 and above
12	Ejector Stroke	mm	200 and above
13	Motor/Pump type		Servo motor drive type for power saving
14	Motor	KW	Please quote for powersaving machine
15	Total connected load	KW	Please quote for powersaving machine
16	Machine Dimensions (LxWxH)		Please Specify

17	Safety	-	Appropriate safety features to be provided
18	Essential/Standard spares	--	Specify and quote for Standard spares like Heaters, NRV, Thermocouple set etc for proper functioning of machine.
19	Optional spares/Accessories		
a)	Multi stage Air Ejection - Upto 5 Stage	-	Please specify and quote for compatible with above machine
b)	Interface for Gas Assisted Injection	-	Please specify and quote for compatible with above machine
c)	Robot Interface	-	Please specify and quote for compatible with above machine
d)	Hot Runner Interface	-	Please specify and quote for compatible with above machine
e)	Hydraulic Multiple core pulling unit	-	Please specify and quote for compatible with above machine
f)	Water inlet/ out let manifold for Mould cooling	-	Please specify and quote for compatible with above machine
g)	Bimetallic screw barrel	-	Please specify and quote for compatible with above machine
h)	Hopper loader	-	Please specify and quote for compatible with above machine
i)	Drier bin of 150 kg capacity	-	Please specify and quote for compatible with above machine

**5. MICROPROCESSOR CONTROLLED AUTOMATIC INJECTION MOULDING MACHINE 200T**

<b>S.No</b>	<b>Items</b>	<b>Units</b>	<b>Specification</b>
MODEL :			
1	Clamping Tonnage	Tons	200
2	Screw Diameter	mm	45-65
3	Screw speed	-	Min. 250 and above
4	Shot Capacity Minimum	Gms	600 and above
5	Injection Pressure	Kgf / Cm2	1400 and above Multi- Stage
6	Injection Rate	Cc / sec	200 and above
7	Injection Speed	mm / sec	160 and above
8	Maximum Daylight	mm	800 and above
9	opening Stroke	mm	400 and above
10	Distance Between Tie Bar	mm x mm	500 x 500 and above
11	Platen Size	mm x mm	750 x 750 and above
12	Minimum Mould Thickness	mm	150
13	Ejector Stroke	mm	Min. 100 and above (Multi Stage & Multi Point)
14	Motor / Pump Type	-	Servo motor
15	Motor load	KW	Please quote for powersaving machine
16	Total connected load	KW	Please quote for powersaving machine
16	Machine Dimensions (LxWxH)		Please Specify
17	Safety	-	Appropriate safety features to be provided



18	Essential/Standard spares	--	Specify and quote for Standard spares like Heaters, NRV, Thermocouple set etc for proper functioning of machine.
19	Optional spares/Accessories		
a)	Multi stage Air Ejection - Upto 5 Stage	-	Please specify and quote for compatible with above machine
b)	Interface for Gas Assisted Injection	-	Please specify and quote for compatible with above machine
c)	Robot Interface	-	Please specify and quote for compatible with above machine
d)	Hot Runner Interface	-	Please specify and quote for compatible with above machine
e)	Hydraulic Multiple core pulling unit	-	Please specify and quote for compatible with above machine
f)	Water inlet/ out let manifold for Mould cooling	-	Please specify and quote for compatible with above machine
g)	Bimetallic screw barrel	-	Please specify and quote for compatible with above machine
h)	Hopper loader	-	Please specify and quote for compatible with above machine
i)	Drier bin of 60 kg capacity	-	Please specify and quote for compatible with above machine

**6. MICROPROCESSOR CONTROLLED AUTOMATIC INJECTION MOULDING MACHINE 300T**

<b>S.No</b>	<b>Items</b>	<b>Units</b>	<b>Specification</b>
MODEL :			
1	Clamping Tonnage	Tons	275-300
2	Screw Diameter	mm	60-75
3	Screw speed	-	Min. 180 and above
4	Shot Capacity Minimum	Gms	800 and above
5	Injection Pressure	Kgf / Cm <sup>2</sup>	1500 and above Multi- Stage
6	Injection Rate	Cc / sec	280 and above
7	Injection Speed	mm / sec	180 and above
8	Maximum Daylight	mm	1000 and above
9	Opening Stroke	mm	500 and above
10	Distance Between Tie Bar	mm x mm	550 x 550 and above
11	Platen Size	mm x mm	800 x 800 and above
12	Minimum Mould Thickness	mm	230
13	Ejector Stroke	mm	Min. 150 and above (Multi Stage & Multi Point)
14	Motor / Pump Type	-	Servo motor
15	Motor load	KW	Please quote for powersaving machine
16	Total connected load	KW	Please quote for powersaving machine
16	Machine Dimensions (LxWxH)		Please Specify
17	Safety	-	Appropriate safety features to be provided

18	Essential/Standard spares	--	Specify and quote for Standard spares like Heaters, NRV, Thermocouple set etc for proper functioning of machine.
19	Optional spares/Accessories		
a)	Multi stage Air Ejection - Upto 5 Stage	-	Please specify and quote for compatible with above machine
b)	Interface for Gas Assisted Injection	-	Please specify and quote for compatible with above machine
c)	Robot Interface	-	Please specify and quote for compatible with above machine
d)	Hot Runner Interface	-	Please specify and quote for compatible with above machine
e)	Hydraulic Multiple core pulling unit	-	Please specify and quote for compatible with above machine
f)	Water inlet/ out let manifold for Mould cooling	-	Please specify and quote for compatible with above machine
g)	Bimetallic screw barrel	-	Please specify and quote for compatible with above machine
h)	Hopper loader		Please specify and quote for compatible with above machine
i)	Drier bin of 60 kg capacity	-	Please specify and quote for compatible with above machine

**7. SEMI AUTOMATIC VACUUM FORMING MACHINE - Category - II**

S.NO.	ITEMS	UNITS	SPECIFICATION
<b>Model :</b>			
1	Forming Area	mm	Upto 300 x 350
2	Forming Depth / Draw	mm	Please specify
3	Max. Sheet Width	mm	Please specify
4	Sheet Thickness	mm	Please specify
5	Top heating	kW	Please Specify
6	Bottom heating	kW	Please Specify
7	Material to be formed	-	PS/ PP/ PE /PET/PVC etc.
8	Plug assisted attachment	-	Please specify
9	Vacuum Forming / Pressure Forming.	-	Please Specify
10	Sheet roll feeding/ Disposal after forming system attachment	-	Please specify and quote
11	Safety	-	Appropriate safety features to be provided
12	Other Features	-	Please quote
13	Essential Spares	-	Please Specify & Quote
14	Demonstration multicavity mould for products like cup, tray, etc.	-	Please specify and quote
15	Connected load	KW	Please specify
16	Machine dimensions (LxWxH)	mtr	Please specify

**8. ROTATIONAL MOULDING MACHINE- 200 litre**

S.NO.	ITEMS	UNITS	SPECIFICATION
<b>Model :</b>			
1	Type of machine	-	Single station bi-axial with suitable type arm capacity for mounting moulds of 200 Liters.
2	Oven Chamber	-	SS Construction with adequate insulation and an inspection window. Top loading system with ladder for multilayer tanks.
3	No. of station	No.	Single
4	Burner	-	LPG Burner with safety features system
5	Re-circulating Blower	-	Made of stainless steel
6	Arms	-	Heavy duty arm to take up a mould of 100-300 litre. (biaxial rotation)
7	Machine Dimension	mm x mm	Please Specify
8	<b>Additional Features :</b>		
i)	Mould	-	Please Quote for one suitable mould
ii)	Laser gun for surface temperature measurement (range ambient to 250°C)	-	Please Quote
9	Safety	-	Appropriate safety features to be provided
10	Essential Spares	-	Please Specify & Quote
11	Multilayer attachment/ accessories		Please specify and Quote

**9. UTILITY EQUIPMENT (COOLING TOWER- 40 TR)**

S.NO.	ITEMS	UNITS	SPECIFICATION
<b>Model :</b>			<b>FRP Induced draft cross flow type with basin</b>
1	Capacity	TR	40
2	Water flow rate	LPM	Please specify
3	Hot water temperature	°C	Please specify
4	Cold water temperature	°C	Please specify
5	Wet bulb temperature	°C	Please specify
6	Inlet, outlet connection size	mm/inch	please specify
7	No. of Motor/HP/RPM		please specify
8	All fastners, nut, bolts etc. should be made of SS		
9	Machine dimensions (LxWxH)	mtr	Please specify
10	Standard accessories	-	Please specify and quote

## Tooling Machinery

<b>10. CNC EDM Die Sinking Machine (Category – I)</b>			
The CNC EDM with C-Axis should capable of wear free ED machining with graphite electrode and copper electrode as per the following detailed specification.			
<b>S.No</b>	<b>Specification</b>	<b>Units</b>	<b>Range / Value</b>
1	Work Tank Size	mm	<b>Minimum 800 X 550 X 350</b>
2	Axis Travel		
2.1	X-Axis	mm	<b>Minimum 400</b>
2.2	Y-Axis	mm	<b>Minimum 300</b>
2.3	Z-Axis	mm	<b>Minimum 300</b>
2.4	Min./Max. distance between table and chuck	mm	<b>Minimum 125</b>
3	Measurement resolution	μm	<b>0.10 or better</b>
4	Maximum Job weight	kg	<b>&gt;800</b>
5	Max. electrode weight on automatic chuck	kg	<b>&gt;50</b>
6	Dielectric Unit		
6.2	Filtration system	μ	<b>10 or better</b>
6.3	Flushing Injections		<b>2 Laterals, 1 through the piece, 1 through the electrode, 1 suction</b>
7	Generator		
7.1	Generator type		<b>ISPG Integrated or better</b>
7.2	Max. machining current (Option)	A	<b>80</b>
8	Performance		
8.1	Minimum surface roughness (Ra)	μm	<b>0.10 or better</b>
9	Standard Accessories		

9.1	Automatic Tool Changer Linear or Rotary	Set of Standard Accessories suitable to the machine
9.2	Ethernet, USB ports, RS-232C Communication Ports	
9.3	Rigid Linear Motor (X, Y, Z)	
9.4	Glass Scale Feedback (X, Y, Z)	
9.5	Fire Extinguisher	
9.6	<b>Rotary Head, C Axis</b>	
9.7	Super finish Module	
9.8	Zero Wear Module	
9.9	Clamping kit	
9.10	Machine lamp	
9.11	Filter set	
9.12	Precision machine vice 4"	
9.13	Flushing system	
9.14	Servo voltage stabilizer	
9.15	Ultra Isolation transformer	
9.16	<b>Air Compressor</b>	
9.17	Chiller Unit	
9.18	Collet holder with collet set	
9.19	Dielectric fluid (400 Litre)	
9.20	Technology files in CD form apart from loaded in the pc control	
9.21	Air drier	
9.22	Air gun with pipe	
9.23	3D probe measuring system for Erowa or System 3R	



9.24	Erowa or System 3R electrode holding system kit	
9.25	Remote Controller	
10	Others	<b>Need to specify and quote if any other accessories available /required for smooth running of the machine</b>
11	Scope of Supply	<b>Bidder must provide scope of supply list in the technical bid</b>

### 11. CNC EDM Wirecut Machine (Category – I)

Sl. No.	Specification	Unit	Range/Value
1	Type	Submerged	Submerged
2	Dimensions of table	mm	Minimum 800x500
3	Axis Travel		
3.1	X -Axis	mm	Minimum 500
3.2	Y -Axis	mm	Minimum 400
3.3	Z-Axis		Minimum 350
3.4	U & V Travel	mm	Minimum ±50
4	Taper angle and Height	°/ mm	±15 / 100 or better
5	Wire diameter	mm	0.25
6	Permissible weights and types of spool	Kg	Bidder to specify Standard weight
7	Type of wire guides	Closed diamond type without clearance	Closed diamond type without clearance
8	Automatic threading for wire	mm	0.25
9	Automatic rethreading for wire	mm	0.25
10	Protection against electrolytic effects	From roughing through to finishing	From roughing through to finishing
11	Max. cutting speed	mm <sup>2</sup> /min	200 or Better
12	Max. weight of the workpiece	Kg	>1000
13	Max. Machining current	A	25 or better
14	Min. finishing (Ra)	μm	0.1 or better
15	Control Axes	---	X, Y, U, V & Z Simultaneous / Independent

16	Interpolation	---	Linear / Circular
17	Numerical control		
18	Position measurement system/ Measurement resolution	μm	0.1 or better
18.1	Architecture		PC multiprocessors
18.2	Operating system		Windows
18.3	Screen		LCD 15" TFT
18.4	Data input		Touch screen
18.5	Keyboard		Standard alphanumeric , PC style
18.6	Remote control		Standard
18.7	Part program capacity		4 MB
18.8	Ethernet, USB ports, RS-232C Communication Ports		Standard
18.9	NC function		Complete Modules
18.1	Dielectric		
18.11	Paper filters		Standard- PI mention
18.12	Dielectric temperature variation	°C	±1
19	<b>Standard Accessories</b>		
19.1	Chiller	<b>Set of accessories suitable to the machine</b>	
19.2	Wire chopper		
19.3	Rotating axes - Index or servo-control		
19.4	Voltage stabilizer		
19.5	Ultra Isolation transformer		
19.6	Air Compressor with drier		

19.7	Air gun with pipe	
19.8	Holding & Clamping Kit ( Such as vice, angle plate, v block, c clamp etc.)	
20	Others	<b>Need to specify and quote if any other accessories available /required for smooth running of the machine</b>
21	Scope of Supply	<b>Bidder must provide scope of supply list in the technical bid</b>

**12. CNC Milling (3 Axis)**

Sl. No.	Specification	Unit	Range/Value
1	<b>Table</b>		
1.1	X - Axis	mm	Minimum 800
1.2	Y - Axis	mm	Minimum 500
1.3	Max Weight on Table	Kg	>1000
2	<b>Axis Travel</b>		
2.1	X axis	mm	Minimum 600
2.2	Y axis	mm	Minimum 450
2.3	Z axis	mm	Minimum 400
3	<b>Feed</b>		
3.1	Rapid Feed (X, Y,Z Axes)	m/min	25 or better
3.2	Max. Feed (X, Y,Z Axes)	m/min	16 or better
4	<b>Spindle</b>		
4.1	Rating	KW	22 or better
4.2	Max. Speed	rpm	8000 or better
4.3	Taper		BT40
5	<b>Accuracy</b>		
5.1	Positioning	μm	10 or better
5.2	Repeatability	μm	5 or better
6	<b>Automatic Tool Changer</b>	The bidder must provide the details in the standard scope of supply	
6.1	Magazine capacity	Nos	20 or better

6.2	Tool select by shortest & Random select		Bi-Dirctional
6.3	Max. tool diameter	mm	75 or better
6.4	Max. tool length	mm	150 or better
6.5	Max. tool weight	Kg	8 or better
6.6	Tool change time	sec	4.5 or better
7	<b>Control System</b>	The bidder must provide the details in the standard scope of supply	
7.1	Controller	Fanuc / Heidenhain or equivalent (Latest with complete module)	
7.2	Part Program Storage	GB	4 or above
7.3	Programming Functions with editor		Complete module
8	<b>Standard Accessories</b>		
8.1	Touch probe -One No.	Set of accessories suitable to the machine	
8.2	Baby Collet holder - (BT 40 ER 20 x 070 mm & BT 40 ER 20 100 mm each One No. )		
8.3	Tool Holder Shank type -(One set of BT 40 / Dia. 44.45 mm with claming dia 3 mm to 32 mm)		

8.4	Collet Holders - ( BT 40 /ER 16 X 070mm , BT 40 /ER 16 X 100mm , BT 40 /ER 16 X 150mm , BT 40 /ER25 X 070mm , BT40/ER 25 X 100mm , BT40/ER 25 X 100mm , BT 40 /ER 25X 150mm , BT40/ER 32 X 070mm ,BT40/ER 32 X100mm ,BT40/ER 32 X150mm ,BT40/ER 40 X 080mm ,BT40/ER 40 X 100 mm, BT40/ER 40 X 150mm -Each One No.)
8.5	Morse Taper Adapter - ( BT 40 / MTA1 x 045 mm , BT 40 / MTA1 x 120 mm , BT 40 / MTA2 x 060 mm,BT 40 / MTA2 x120 mm, BT 40 / MTA3 x 075 mm, BT 40 / MTA3 x 135 mm, BT 40 / MTA4 x 095 mm,BT 40 / MTA4 x 1655 mm -Each One No.)
8.6	End Mill Holder - (BT 40 / SL 6 x 065 mm, BT 40 / SL 8 x 065 mm, BT 40 / SL 10 x 065 mm,BT 40 / SL 12 x 065 mm, BT 40 / SL 14 x 065 mm, BT 40 / SL 16 x 065 mm, BT 40 / SL 18x 065 mm, BT 40 / SL 20 x 090 mm, BT 40 / SL 25 x 090 mm, BT 40 / SL 32 x 090mm - Each one No.)
8.7	Face Mill Arbor- (BT 40 / FMB 22 x 055 mm ,BT 40 / FMB 27 x 060 mm ,BT 40 / FMB 27 x 090 mm ,BT 40 / FMB 32 x 060 mm ,BT 40 / FMB 32 x 090 mm ,BT 40 / FMB 40 x 060 mm ,BT 40 / FMB 40 x 070 mm -Each one No).
8.8	Shell End Mill Arbor-( BT 40 / SMS 16 x 060 mm,BT 40 / SMS 16 x 120 mm,BT 40 / SMS 22 x 060 mm,BT 40 / SMS 22 x 120 mm,BT 40 / SMS 27 x 045 mm,BT 40 / SMS 27 x 105 mm,BT 40 / SMS 32 x 045 mm,BT 40 / SMS 32x 075 mm -Each One No.)
8.9	Drill chuck arbor -BT 40 /B16 M16 -One No.)

8.1	One Set of Spring type Collet ( Dia. of 3-32 mm std .length )
8.11	One Set of bay collet (Dia. 1mm-10mm Std.Length )
8.12	Zero Point Setter -One No.
8.13	Electronic Edge Finder- One No.
8.14	Edge Finder-One No.
8.15	Center finder / Wiggler - One No.
8.16	ER Wrenchs System - One nset
8.17	Assembling AIDS -One set
8.18	Precision machine vice 4" -One No.
8.19	Tool locking fixture -One set
8.2	Automatic centralized lubrication system - One set
8.21	Machine lamp -Two Nos.
8.22	Operation & maintenance manual / CD -Two Sets
8.23	Clamping kit -Two Sets
8.24	Installation kit - One Set
8.25	Voltage stabilizer -One No.
8.26	Ultra Isolation transformer - One No.
8.27	Ethernet, USB ports, RS-232C Communication Ports - One Set



9	<b>Others</b>	<b>Need to specify and quote if any other accessories available /required for smooth running of the machine</b>
10	Scope of Supply	<b>Bidder must provide scope of supply list in the technical bid</b>

### 13. CNC Wire cut EDM (Category – II)

<b>Make:</b>		<b>Model:</b>	
<b>S.N.</b>	<b>Specification</b>	<b>Unit</b>	<b>Range / Value</b>
1	Type		Both Submerge and Flushing Type
2	Tank Size	mm	(650-850) x (450-650)
3	X -Axis Travel	mm	300 - 400
4	Y -Axis Travel	mm	200 - 300
5	Z-Axis Travel	mm	200 - 300
6	U & V Travel	mm	(100-150) x (100-150) or Better
7	Taper angle/Thickness	<sup>o</sup> / mm	±25° / 120 or better
8	Wire diameter	mm	∅0.15 - ∅0.3
9	Wire Tension	N	03 to 23 N
10	Max. Wire Feed Rate	mm / sec	Max. 420
11	Max. Workpiece Size	mm	(X 500-600) X (Y 300-500) X (Z 200-250)
12	Max. weight of the Workpiece	Kg.	300 – 350
13	Min. finishing (Ra)	µm	0.5
14	Control Axes	---	X, Y, U & V Simultaneous/Independent
15	Interpolation	---	Linear / Circular
16	Maxi. Machining Current	A	25 – 40 or better
<b>17 Numerical control</b>			
17.1	Position measurement system/ Measurement	µm	Linear glass scales - 0.05

	resolution		
17.2	Architecture		PC multiprocessors
17.3	Memory Device	---	External Memory , SSD
17.4	Operating system		Windows
17.5	Screen		LCD 15" TFT
17.6	Data input		Touch screen
17.7	Keyboard		Standard alphanumeric , PC style
17.8	Remote control		Standard
17.9	Part program capacity		Standard
17.10	Ethernet, USB ports, RS-232C Communication Ports		Standard
17.11	NC function		Complete Modules
<b>18 Dielectric</b>			
18.1	Machining fluid Filtration	--	Paper filtration replacement type
18.2	Demineralizer	----	Ion Exchange Resin
18.3	Dielectric temperature variation	°C	±1 or better
<b>19 Standard Accessories</b>			
19.1	Dielectric cooling unit (Chiller)	Set of accessories suitable to the machine	
19.2	Wire chopper		
19.3	Rotating axes - Index or servo- control		
19.4	Voltage stabilizer		
19.5	Ultra Isolation transformer		

19.6	Air Compressor with drier	
19.7	Air gun with pipe	
19.8	Holding & Clamping Kit Such as Set of Complete Beam System, Prism-Vice with Holder Set, V- Block and Pallet with Universal Holder.	
19.9	5 Spool Coated Wire	
20	<b>Others</b>	Need to specify and quote if any other accessories available /required for smooth running of the machine. Enclose scope of supply.
21	<b>Scope of Supply</b>	Bidder must provide scope of supply list in the technical Bid

#### 14. CNC EDM Machine (Category – II)

The CNC EDM with C-Axis should be capable of wear free ED machining with graphite electrode and copper electrode as per the following detailed specification.

Make:		Model:	
S.No	Specification	Units	Range / Value
1	Work Tank Size	mm	(800-1000) x (450-550)x (300 -400)
2	<b>Axis Travel</b>		
2.1	X-Axis	mm	350-450
2.2	Y-Axis	mm	250-350
2.3	Z-Axis	mm	300-400
2.4	C-Axis Rotary 360°	Resolution	1µm
		RPM	50-100
3	Measurement resolution	µm	0.5
4	Axis Positioning Movement		Up to 4 Simultaneous
5	Axis Linear Interpolation Movement		Up to 4 Simultaneous
6	Axis Circular Interpolation Movement		Up to 4 Simultaneous
7	Maximum Job weight	kg	300-500
8	Max. electrode weight on automatic chuck	kg	50 or better
9	<b>Dielectric Unit</b>		
9.1	Dielectric capacity	Liters	400-500 or better
9.2	Filtration system	µ	10 or better
9.3	Flushing Injections		2 Laterals, 1 through the piece, 1 through the electrode, 1 suction

10	<b>Generator</b>			
10.1	Max. machining current	A	40 – 80 or better	
11	<b>Performance</b>			
11.1	Minimum surface roughness (Ra)	μm	0.1 or better	
11.2	Max. MRR (Cu – Steel)	mm <sup>3</sup> /Min	300 – 450 or better	
11.3	Max. MRR (Graphite – Steel)	mm <sup>3</sup> /Min	400 – 600 or better	
12	Set of Standard Accessories suitable to the machine			
12.1				Automatic Tool Changer
12.2				Ethernet, USB ports, RS-232C Communication Ports
12.3				Rigid Linear Motor (X, Y, Z)
12.4				Glass Scale Feedback (X, Y, Z)
12.5				Fire Extinguisher
12.6				Rotary Head, C axis
12.7				Remote controller
12.8				Clamping kit
12.9				Machine lamp
12.1				Filter set
12.11				Precision machine vice 4"
12.12				Flushing system
12.13				Servo voltage stabilizer
12.14				Ultra Isolation transformer
12.15				Chiller Unit
12.16				Collet holder with collet set
12.17	Dielectric fluid			
			Set of Standard Accessories suitable to the machine	

12.18	Technology files in CD form apart from loaded in the pc control	
12.19	Air drier	
12.20	Air gun with pipe	
12.21	3D probe measuring system for Erowa or System 3R	
12.22	Erowa or System 3R electrode holding system kit	
13	<b>Others</b>	Need to specify and quote if any other accessories available /required for smooth running of the machine.
14	<b>Scope of Supply</b>	Bidder must provide scope of supply list in the technical Bid

### 15. Atomic Absorption spectrophotometer

<p>A compact integrated dual atomizer system with inbuilt flame and furnace atomizers. Changeover from Flame to Furnace mode and vice-versa should be automatic and controlled through the software.</p>	
<p>The vertical and horizontal alignment of the flame burner head in the light beam should be Motorized automatic through the software</p>	
<p>Separate 10 cm titanium burner head for Air – Acetylene flame and 5 cm titanium burner head for Nitrous oxide – Acetylene flame should be supplied with the system</p>	
<p>Zeeman Background or other suitable background correction for GF to have higher light through put.</p>	
<p>The heating of the Graphite Atomizer should be in transverse direction, ensuring the uniform temperature distribution across the graphite tube.</p>	
<p>The Graphite Furnace Atomizer must be permanently aligned with no movement, alignment and optimization required.</p>	
<p>The Furnace Auto sampler must be integrated to main Spectrometer with a minimum of 60 sample positions and more.</p>	
<p>The system should be equipped with an integrated graphite furnace camera for easy auto sampler tip alignment and real time viewing of the process happening in graphite furnace.</p>	
<p>The GF system should be supplied with pyrolytically coated graphite tube, integrated platform, rapid furnace heating (up to 2500oC/s).</p>	
<p>An imported air compressor and an imported re-circulating water chiller unit of appropriate capacity for cooling of Graphite Furnace must be quoted by the manufacturer.</p>	
<p>Auto sampler for flame should be quoted in option</p>	
<p>Lamps</p>	
<p>The system should have a minimum 6 lamp holder with a provision of automatic lamp selection and fixed lamp positions. Built-in power supplies for Coded Hollow Cathode Lamps that are used for the analysis of volatile elements like As, Hg, Se, etc. (HCL or other specific lamps qshould be quoted if required.)</p>	



Lamps & Standards for elements Silica, Aluminum, Boron, Phosphorous, Titanium, Iron, Copper Magnesium, Calcium, Zinc, Manganese, Lead, Chromium, Arsenic, Selenium, Molybdenum, Cobalt, Bismuth, Gold, Tungsten, Nickel, Zirconium, Cesium, Silver, Lithium, Sodium, Potassium, Berelium, Strontium, Barium, Uranium, Vanadium, Palladium, Platinum, Cadmium, Gallium, Antimony,	
Sample Introduction System	
A high sensitivity nebulizer system including impact bead and flow spoiler with corrosion resistant against the acids like 5% hydrofluoric acid, hydrochloric acid and Nitric Acid. Corrosion resistant spray chamber.	
Optical System	
A double beam spectrometer system with high light throughput.	
Monochromator system with a diffraction grating ruling density of atleast 1800 lines/mm blazed in both UV and Visible regions.	
A focal length of minimum above 250 mm and the Reciprocal Linear Dispersion of 1.6nm/mm. Variable slit selection.	
Detector - Photomultiplier Tubes (PMT) or Solid State Detector, Wavelength range: 185 – 900 nm	
Back Ground Correction Methodolgy	
Zeeman Background Correction for the Graphite Furnace with the magnetic field applied along optical path.	
Gas Flow System	
Software controlled flame ignition and automatic changeover of oxidant flow from acetylene to nitrous oxide when switching to or from air-acetylene to nitrous oxide – acetylene flame.	Automatic Change over (?)
Safety	
All safety interlocks built-in and additional feature like Burner Head Interlock, Nebulizer/End Cap Interlock, and Drain Interlock to be built-in.	All Interlock is buitlin
Greater than 0.8 absorbance with the precision of <0.5% RSD from 5 second integrations for 5 ppm Cu standard	Available
Hydride Generation Accessory	
Continuous Hydride Generation system should be offered and automated Flow injection based Hydride generation system (FIAS) for both flame and furnace atomizers for the analysis for the	Manual Offered (Deviation)

volatile elements like As, Se, Hg, etc. This FIAS system shall have both continuous and fixed quantity of loops should be in potion.	
Software	
Programmed facility with multitasking software should provide complete control of instrument with instrument status display and its various accessories	Std. Features S/W
Provide Accurate and reproducible time averaged, integration, non- averaged integration, multilevel calibration. Software should handle instrument linear absorbance reading, concentration or emission intensity, integration time, built in statistics, calibration equation control, slope of analytical curve using operator selective calibration standard.	All are Available

## 16. DIFFERENTIAL SCANNING CALORIMETRY (DSC)

**Preamble:** To study the thermal characteristics of polymeric material / product as per test standard ISO, ASTM etc.

### Technical Specifications

Temperature range	:	-70°C to +725°C
Multiple cooling options for a temperature range	:	-70°C to +725°C
Calorimeter Sensitivity	:	1.0 $\mu$ W
Precision	:	$\pm$ 1%
Dynamic range	:	$\pm$ 500 mW
Baseline noise	:	< 1 $\mu$ W
Temperature accuracy	:	$\pm$ 0.1°C
Temperature Precision	:	$\pm$ 0.05°C
Programmable heating rate	:	Lowest: 0.01°C / min.
Cooling rate	:	0.02 to 50°C / min.
Test confirms to	:	ASTM D 3418, ASTM D 3417, ASTM 3895, etc
Accessories	:	Sample press, standards for calibration, Aluminium & copper pans with covers, Quench Cooling, etc.
UPS	:	Suitable UPS system with 30 Minutes Battery Backup facilities should be offered
Other Features:	:	Computer with suitable configuration to support the software and colour bottled inkjet printers should be provided
		Built in digital flow controller & gas switching assessorry
		Copper pans (100 Nos), Aluminium (500 Nos) should be provided

## 17. THERMOGRAVIMETRIC ANALYSIS (TGA)

**Preamble:** To study the thermal stability of polymeric material / product as per test standard ISO, ASTM etc.

### Technical Specifications

Temperature range	:	Ambient to 1000 <sup>0</sup> C
Isothermal temperature accuracy	:	±1.0 <sup>0</sup> C
Isothermal temperature Precision	:	±0.1 <sup>0</sup> C
Weighing precision	:	±0.01%
Heating rate change	:	1 to 100 <sup>0</sup> C / min.
Furnace cooling	:	< 12 min.
Sensitivity	:	0.1µg
UPS	:	Suitable UPS system with 30 Minutes Battery Backup facilities should be offered
Accessories	:	An additional Platinum pan
Other features: TGA system should have		
a) Built in digital flow controller & gas switching assessor		
b) The ability to continuously measure sample weight loss.		
c) Single thermocouple design with continuous use of measured sample temperature to control the furnace so as to minimize thermal lag.		
d) Ability to have upto five points for temperature calibration to provide greater temperature accuracy over wide temperature ranges		
e) Automatic recording of initial sample weight		
f) Push button for for loading pans, raises the furnace, tares the pan & unloads the pan		
g) Computer with suitable configuration to support the software should be provided		

## 18. FLOURESCENT LIGHT APPARATUS FOR UV EXPOSURE (UVB)

Make	Bidder to specify
Model	Bidder to specify (Please attach the supporting documents like product & accessories catalogue )
Applications	To simulate, accelerate and correlate the artificial sunlight / weathering atmosphere for polymers, coatings, etc.
Effective radiation area	4000 cm <sup>2</sup>
Components surface temperature	45°C to 80°C for UV Cycle
	45°C -60°C for Condensation
Temperature accuracy	± 0.1°C or better
Temperature resolution	1°C or better
Temperature controller	Black Panel Temperature
Centre distance of lamp	5 cm
Humidity	100%
Light source	UV-B Fluorescent Lamp
Wavelength	UVB (313 nm)
Minimum sample holder plates	Aluminum Plates 24 sample holders
Space Saver	With doors swing up and out of the way for easy access to the chamber. Should accommodate two testers that can be stacked with Space Saver Frames.
Conditioning cycle	Light cycle and Condensation cycle
Irradiance Calibration	Irradiance calibration (calibration radiometers for periodical calibration) with NIST traceability ( UVA & UVB)

Irradiation Control	Irradiation control (solar eye automatically maintain light intensity through feedback look this controller monitor UV intensity and compensate lamp aging or any other variability by adjusting power to the lamp) with NIST traceability
Conforms to standards	ASTM G151, ASTM G 154, ISO 4892 (1 – 3), SAE J2020
Warranty	Minimum 3 years of warranty to be provided
Scope of supply	Complete list of items quoted are to be provided
Installation requirements	Bidder to specify the preinstallation requirements
Training	Onsite training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.
Service	Appropriate tool box/kit for routine maintenance should be provided with the equipment
	All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.
	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.
	Power and receptacle/socket as per Indian Standards should be provided.
	The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
	The vendor should have technical support in the area of application and service available within the country
The vendor should furnish details of customers in India.	

## 19. GAS CHROMATOGRAPHY (GC)

**Preamble:** To determine Vinyl Chloride monomer (VCM) content in PVC resin as per IS:10151

### Technical Specifications

Oven	:	The Column oven has an operating range of ambient to 450°C.
	:	Heat up time from 50° C to 450° C within 5 minutes (230VAC Version)
	:	Cool down time from 450 deg. C to 50 deg. C in less than 5 minutes.
	:	Heating Rate settable from 0.10 deg. C /min to 110° C /minute with at least 9 Ramps/10 plateaus.
Split / split less Injector – 01 no.	:	The injector is able to operate with capillary wide bore and packed columns.
	:	The injector features an optimized, modular thermal profile for Split and splitless injection with a cold head.
	:	The injector allows timed closure/opening of the purge line.
	:	Maximum Temperature : 400°C
	:	Split Ratio : up to 10,000:1 or better.
	:	Pressure Range : 0-100 PSI or better
	:	Total Flow Setting
	:	Control of Split flow in 1 ml/min from 0 to 125 ml/min
	:	Control of Purge Flow 0 to 50ml/min
Detector	:	The GC must have complete integrated control of all parameters for the following detectors FID & TCD - Detector must be fitted with the instruments (Mandatory) NPD, ECD (Optional)
Flame Ionization Detector	:	Flameout detection and automatic re-ignition
	:	MDL : 1.5pg C/S or better.
	:	Sensitivity : >0.03 Coulombs/gC
	:	Linear Dynamic Range : >10 <sup>6</sup>
	:	Maximum Temperature : 450°C in steps of 10 <sup>0</sup> C.
	:	Data Acquisition Rate : 200 Hz or Better.
	:	Signal filtration: 50, 200, 800 m.sec.
	:	Input range: -1 to 20



Thermal Conductivity Detector	:	Capillary column compatible
		Proven Constant current design, Software protection to prevent filament burnout
		Ideal for series operation
		1/8-in fittings
		PPC pneumatics - software flow control of reference gas
		Operating temperature: 100°C to 450°C in steps of 10°C.
		Sensitivity : 9µV/ppm nonane at 160 mA at the bridge with a detector temperature of 100°C
		Minimum Detectable quantity: Typically < 1 ppm nonane
		Power Supply: Constant current with 4 selectable settings: ±40 mA, ±80 mA, ±120 mA, ±160 mA,
		Linearity: > 105
		Signal filtration: 50, 200, 800 m.sec.
		Filament production: Self limiting & resetting after transient overloads in either channel
		Make up gas: Required for 0.25 mm or smaller. i.e. Columns autosampler independent.
Software	:	Latest 32/64 Bit Software for complete control and data acquisition from GC .
	:	It should be able to collect data from 2 detectors simultaneously.
	:	It should be upgradable to control 2 or more GC in future.
	:	It should have all routine chromatography functionalities like full GC parameter, setting, viewing Chromatograms, calculation based on % area, Area normalization, External standard, internal standard etc. Viewing of calibration curves, addition and subtraction of chromatograms etc., internal standard etc. viewing of calibration etc.
Head Space Sampler	:	Head Space Sampler either by Transfer line technique or heated Syringe base technique.
	:	Sample Tray have Capacity of more than 40 Samples.
	:	Incubation temperature 200° C or better with at least 6 Vials or more Simultaneous heating capacity with overlapping mode.

	:	Syringe Temperature should be up to 150° C or transfer line temperature must be 200° C or better.
	:	Head Space sampler with Auto dilution, Standard preparation facility is preferable .
	:	It should be compatible with 10 or 20 ml vials.
	:	It should have built-in constant temperature mode, multiple Headspace extraction mode and mode for optimization method parameters ( Progressive mode)
	:	Injection Volume Range settable from 0.1 to 5 ml
Note : Require accessories like screw vials, Vial caps, Sampling Vials total of 500 Nos. and suitable capillary column, PC, Printer, Cylinders with Regulators, Gas purification system and UPS must be provided along with the system.		
Optional Accessories.	:	
Auto Sampler	:	Should have Vial capacity of 50 or higher.
	:	Should possible to use ALS and HS on the same inlet, if not possible then please quote one extra set of FID and SSL.
<p>Note –</p> <p>a)Any other Accessories required for installation and successful operation of the machine should be provided</p> <p>b)Quoted Instrument should be latest instrument from the manufacturer from his current Product Line.</p>		