

## High Temperature Muffle Furnace Specifications

Inside Chamber Size	6" x 6" x 6", 3.6L approx with swing aside door at the front
Furnace construction	(i) Double shell steel case with cooling fan to keep outside case cool (ii) High purity alumina fiber insulation for max. energy saving
Heating element	The chamber section should be heated by six to eight Super Kanthal Molybdenum disilicide heating elements (Super 1800 grade MoSi <sub>2</sub> ) suspended in a chamber made of high temperature refractory fiber lined with a combination of ceramic fibre blankets.
Standard Working Temperature	1600° C (continuous)
Maximum Working Temperature	1700° C (< 3 hours)
Temperature Control	The temperature controller should be a PID automatic control power control and programmable with necessary safety features.
Heating Rate	The furnace should be of fast heating type with the maximum attainable temperature should reach as a ramp function in less than one hour.
Temperature Accuracy	+/- 1.0 °C
Thermocouple	Pt. Pt. Rh. Thyristor controller will be provided along with the furnace to measure the temperature with Recrystallized alumina sheath & connecting holder complete set.
Cooling Fan/ Air Circulation	Attached with Furnace, Provided inside the control unit to protect Costly component
Max. Power	Upto 8 KW
Certificate	CE certified

Along with the furnace one set of the following accessories should be provided

Description	Quantity
Al <sub>2</sub> O <sub>3</sub> Sample Plate	1 pcs
Al <sub>2</sub> O <sub>3</sub> Furnace Door Block	1 pcs
Protection Glove	2 pairs
Crucible Clip	1 pair
Crucibles	6 pcs

## Boiler

Lab scale baby boiler along with water softener & steam distribution network including required insulation & installation work as per specifications below:

Make	Thermax
Steam Output	50 Kg/h
Steam pressure	10 Kg/cm <sup>2</sup> max
Fuel type suitable	HSD (Light Oil)
Fuel consumption	Upto 3 Kg/h approx.
Burner control	<b>ON/OFF</b>
Pressure parts	Design as per Small Industrial Boiler Act of IBR
Electrical supply	3 phase
Total Connected load	Upto 2 KW
Insulation	Glasswool
Chimney	MS 150 mm dia, 8-10 m height approx.
Diesel Tank	200ltr-MS
Water Tanks for raw & soft water	500Ltr each -PVC
Service tanks	As per requirement compatible MOC
Softener	Compatible capacity standard make
Steam distribution network for supply of steam to various labs approximate length 250 to 300ft through a header with pressure reducing valve upto 4 kg/cm <sup>2</sup> with 8-10 outlets from the header	
Steam Pipe Line	MS ¾"
Valves & Steam traps	Thermax and IBR Approved
Safety features	(i) Low/no water flow safety  (ii) Alarm & protection for high pressure & temperature  (iii) Electrical overload protection
Control panel& instrumentation	As required

The job should include all civil and structural work for installation of the boiler and other items and training

## CVD Apparatus:

A CVD apparatus will consist of several basic components:

- Gas delivery system – For the supply of four gases (precursors) to the reactor chamber through appropriate digital mass flow controllers and gas pipes which must be of Austenitic stainless steel (AISI 304/306 type).
- Reactor chamber – Alumina/quartz tube Chamber within which deposition takes place
- Substrate loading mechanism – A system for introducing and removing substrates, mandrels etc.
- Energy source – Provide the energy/heat that is required to get the precursors to react/decompose, must be digital microprocessor based PID controller, longitudinal zone accuracy of 0.1 %. Fast response temperature indicator and temp vs time profile PID controller of a size 96 mmX 06 mm with digital communication such as RS 232 /RS 485 and to USB converter and software, 2 programs of 8 steps each. Independent profiles should have parameters for linking, auto start and program repeat cycles.
- Vacuum system – A system for removal of all other gaseous species other than those required for the reaction/deposition. Pirani gauge to measure gas base and dial gauge to measure process vacuum. Manual throttle valve.

Both ends water cooled with flanges and vacuum compatible upto  $10^{-3}$  torr.

- Process control equipment – Gauges, controls etc to monitor process parameters such as pressure, temperature and time. Alarms and safety devices would also be included in this category.
  - Installation and integration at user site on a tall support fabricated from strong ms channels.
  - Furnace interfaced PC specifications: Intel core 2 duo processor E7500 or better. 3 GB DDR2 SD RAM, 320 hard disk drive, keyboard and mouse, CD RW drive, 24 inches or larger wide screen flat panel monitor.

furnace:, 1200 degree celsius.

Standard gas inputs (mks MFCs) Acetylene-200 sccm, Ammonia-200 sccm, Argon-1000 sccm and nitrogen 1000 sccm.

Rotary pump: 200 litres/min.

Warrenty: 1 year

## CVD Accessories:

- (i) **Mass flow controllers:** mass flow controllers for Acetylene-200 sccm, Ammonia-200 sccm, Argon-1000 sccm and nitrogen 1000 sccm.

(ii) **Gas cylinders** (filled with 99.999 % pure gas/empty)

(a) Acetylene (10 litre/40 litres)

(b) Ammonia(do)

(c) Nitrogen (do)

(d) Argon (do) in all of the above outlet assembly and suitable length of flexible pipes for making connections

(iii) **Standard make gas regulators** for these gases, viz Acetylene, Ammonia, Argon and nitrogen double stage and ISI marked.

## WEAR AND FRICTION MONITOR (TRYBOMETER)

### SPECIFICATIONS

PARAMETERS	UNITS	MIN	MAX	REMARKS
Wear disc				
Diameter	mm	100		
Thickness	mm	6	8	
Pin diameter	mm	4	8	In steps of 2
Length	mm	20	30	
Ball diameter	mm	10		
Wear track diameter	mm	50	80	Adjustable
Disc speed	RPM	100	1000	
Normal load	N	10	100	In steps of 5N
Frictional force	N	0	100	1N least count
Preset timer	Hr/Min/Sec	99/59/59		
Wear range	Micrometer	0	2000	
Power	V/PH/Hz/VA	230/1/50/1000		

### FEATURES

- Continuously variable wear track.
- Display of wear and frictional force.
- Data acquisition software on Lab View platform for your Windows XP PC.

## **Computer controlled Electronic Universal Testing Machine with data software**

### **as per following specifications:**

UTM

100 T with electronic control panel and all standard accessories  
Specimens can be tested as per IS & BS standards.

### **Technical Specification:**

1. Capacity: 1000 KN
2. Measuring range: 0-1000KN
3. Least count: 0.05 KN
4. Load range: 10 to 1000KN with accuracy of measurement:  $\pm 1\%$
5. Maximum clearance for tensile test : 50 to 850 mm
6. Maximum clearance for compression test (mm): 0 to 850 mm
7. Distance between columns (mm): 700
8. Speed Range (mm/min): 0.1 to 80
9. Power supply: 3 phase 415 V, 50 Hz AC
10. Electronic control panel: Front panel membrane type key board test setup, digital display load  
displacement/extension, printer port interface, serial port for communication with PC, facility for electronic  
extensometer and electronic load spacer, storage for peak load, displacement at peak and maximum  
displacement after test, pre load selection to take care of initial slippage.

### **Accessories:**

1. Tension test jaws for round specimen
2. Tension test jaws for flat specimen
3. A pair of compression plate
4. Transverse test attachment with adjustable roller supports with punch top
5. Load stabilizer to maintain desired load
6. Electronic extensometer suitable for calculating proof stress
7. Shear attachment
8. Bending test attachment
9. Flexure test attachment