



Indian Institute of Technology Kanpur

Department of Materials Science & Engineering

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Enquiry for Vacuum Tube Sealing Unit

We would like to purchase for a Vacuum Tube Sealing Unit for our laboratory scale experimentation. The facility will be used to vacuum seal quartz tubes containing samples.

The Tube sealing unit consists of:-

- 1) Main Cylindrical vacuum chamber mounted vertically having No. of ports
- 2) High Vacuum pumping system
- 3) Support structure
- 4) Safety interlocks

Main Cylindrical vacuum chamber mounted vertically for Arc melting cum-suction casting facility.

It is a cylindrical high vacuum chamber made out of SS304 material of size ID 3" dia x 500mm long. The chamber is mounted on the collar of the 3" high vacuum system. The bottom port of the sealing unit is fixed to the top flange with O ring seal & is removable. Top & bottom plates are fitted with viton O rings for vacuum sealing.

The chamber has no. of ports:

- 1) Vacuum pumping port both for roughing & high vacuum
- 2) Vent valve port
- 3) Port for vacuum gauges for measuring vacuum
- 4) Port to connect quartz tubes of for evacuation & subsequent sealing.

The chamber is made by TIG Argon Arc welding following ASME code Sec. IX. Design and fabrication of the chamber follows ASME code Sec. VIII. All the welded joints & all individual components as well as total system are leak tested to an individual leak rate of 1×10^{-8} std cc/sec.

High vacuum pumping system consists of:

- 1) Diffusion Pump
- 2) Rotary Vacuum Pump
- 3) Liquid Nitrogen trap
- 4) Vacuum Valves
- 5) Vacuum Measuring Gauges
- 6) SS Collar
- 7) Plumbing Line

High Vacuum Pumping station consists of the pumping stack which include Air cooled diffusion pump, high vacuum valve, rotary pump, collar, Backing and roughing valves, frame and Analog combined gauge. The basic system is capable of giving the vacuum of the order 5×10^{-6} mbar.

Rotary vane pump used on the pumping station is direct driven with built in anti-suck back device, the oil fill and drain ports as well as the oil level indicator are readily accessible on the material face of the station for easy maintenance. The pumping station includes the vent valve, gas admittance valve and the collar to facilitate for easy connection.

One Analog Pirani-Penning Combined gauge is provided for monitoring vacuum of backing, roughing and high vacuum. Complete system is assembled in a compact frame, which is mobile with castor wheels with brakes.

Diffusion Pump

Specifications:

| | |
|------------------------------|-------------------------------------|
| Size | : 3" |
| Pumping speed | : 150 lits/sec. (unbaffled pumping) |
| Critical Backing Pressure | : 0.1 mbar |
| Backing pump | : 100 lit/min |
| Recommended fluid charge | : 75 ml (DC – 704 Oil) |
| Inlet connection (Fore line) | : KF – 25 |
| Outlet connection | : ISO 75 |
| Warm up time (in minutes) | : 30 |
| Heater power | : 350 W |
| Material | : SS 304. |
| Ultimate vacuum | : 1×10^{-6} mbar |

Direct Driven Double Stage Rotary Vane Pump:

Salient Features:

- Direct drive
- Air cooled.
- Less oil charge.
- Compact and rugged.
- Light weight.
- Gas ballast.
- Less noise and vibration.
- Built in anti suck back facility.

Specifications:

| | |
|--|---|
| Free air displacement capacity | : 100 lit/min (6M ³ /hr) |
| Ultimate vacuum at the intake with Mecleod | : 1×10 ⁻³ mbar. |
| Gauge (With Gas ballast Closed) | |
| Vacuum with gas ballast open | : 5 x 10 ⁻² mbar. |
| Vacuum connection | : KF-25 |
| Exhaust port | : KF-25 |
| Motor power | : ½ H.P. Single Phase. (230 V/ AC, 50Hz.) |
| Cooling | : Forced air cooling. |
| Pump rotation speed | : 1440 rpm. |
| No. of stages | : 2 |
| Oil capacity | : 0.5 Lit. |
| Seal material | : Viton |
| Noise level | : 60 Db |
| Overall dimension LBH | : 500 x 132 x 240mm |
| Weight | : 20 kg. |

Liquid Nitrogen Trap:

This is fitted above the diffusion pump. It is essentially a double walled container containing LN2 in the central chamber. The inner surface get cooled when LN2 filled and condenses water vapour and other condensable, thereby reduces the pressure by large extent. With the use of LN2 trap ultimate vacuum is 1 x 10⁻⁶ mbar.

Vacuum Valves:

A manually operated 3" Butterfly type valve will be used as high vacuum valve. Manually operated 1" quarter swing butterfly type valves will be used for Roughing and backing. For venting ¼" Air admittance valve is provided. A needle valve is used as standard valve for admitting gas.

Analog Combined Gauge:

ANALOG PIRANI GAUGE

Specifications:

| | |
|--------------------------|--|
| Range of Vacuum | : 0.5 to 10(-3) mbar. |
| Principle of operation | : Thermal conductivity / constant voltage. |
| No. of Ranges | : Single. |
| No. of gauge head | : Two. |
| Material of construction | : Aluminum, glass to metal seal. |
| Analog output | : 100 mv. (Optional) |
| Type of coupling | : KF-10 quick clamps type. |
| Cable length | : 2 mtr. |

ANALOG PENNING GAUGE:

Specifications

| | |
|--------------------------|---|
| Range | : 10(-3) to 10(-6) mbar. |
| Principle | : Cold cathode discharge. |
| No. of range | : Two. |
| No. of gauge head | : Single. |
| Material of construction | : Aluminum, Stainless Steel, G.M. Seal. |
| Type of coupling | : KF 25 (Quick clamp type). |
| Cable length | : 2 mtr |
| Control unit size | : 230 W × 130 H × 215 D |

SS COLLAR:

A 3" dia & 3" long S.S collar is mounted on the top of the high vacuum valve. It houses Penning gauge head for measurement of High vacuum & pirani Gauge sensor for roughing vacuum measurement. It has roughing line and needle valve for gas admittance. The collar is made out of SS 304 and bottom flange matches directly with the high vacuum valve.

Plumbing Line:

Plumbing line consists of roughing and backing line are made out of metal and flexible Vacuum hose with KF 25 coupling. Backing and roughing butterfly valves and pirani gauge head adaptor are fixed in the plumbing line.

Support structure:

The whole assembly is mounted on a compact frame with casted wheel for easy mobility.

Safety interlocks:

Complete electricals circuit is designed with well protections such as tripping circuit breaker.

Diffusion pump heater is interlocked with thermostat.

Diffusion pump is interlocked with Rotary pump.

Rotary pump is provided with isolation valve

Electrical Wiring:

All components are wired internally with interlock and only a mains power cable with plug is taken out.

Mains Supply : 230 AC 50 Hz 15 Amps.

Leak Testing:

System will be leak tested by Helium Mass Spectrometer Leak Detector to an individual leak rate better than 5×10^{-9} std. cc/sec.

Fabrication Drawing:

Detailed Fabrication drawing will be prepared & submitted for your approval & only after your approval fabrication process start.

Pre-Despatch Inspection:

The High Vacuum pumping system will be offered for your inspection at our works before despatched and only after your acceptance the system will be despatched to your site.

Installation:

The Tube Sealing unit will be installed at our site by your engineer at free of cost. All the specification should be met at the time of installation.

Term & Conditions

1. Delivery: 12 Weeks
2. Payment: 100% Against Delivery
3. Guarantee: 12 months from the date of installation
4. Road permit excise exception certificate.

Address the quotations to:

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