SPUTTERING UNIT

MODEL 6 SPT

CONTENTS

TITLES

1.00 INTRODUCTION

Vacuum technology, thin films, vacuum evaporation and sputtering deal closely with the atomic domain. Ejection of atoms from a surface by heating is called evaporation. If a solid or liquid at any temperature is subjected to bombardment by suitably high energy atomic particles (usually ions). It is possible for individual atoms to acquire enough energy via collision processes to escape from the surface. This means of causing ejection of atoms from a surface called sputtering. Just as atoms ejected from a surface by evaporation can be used in depositing a coating on a substrate atoms ejected from a surface by sputtering can be used in depositing a coating on a substrate. Any suitably energetic atomic particle impinging against a surface can cause sputtering.

HINDHIVAC sputtering Unit Model 6 SPT is basically designed for sputter deposition of thin gold/palladium and platinum conducting films on specimen used in Electron Microscope works.

2.00 GENERAL DESCRIPTION

The basic unit consists of vacuum system with double stage Rotary Vacuum Pump to evacuate the vacuum chamber, where the sputtering operation is conducted. The vacuum chamber is made of glass cylinder with both ends open.

The Chamber is fitted both ends with `L' type Neoprene Rubber Gaskets for vacuum tightness and mounted on the base plate. The top of the chamber is fitted with a plate to hold the adjustable height cathode, which is fed with negative high voltage with reference to ground. This top plate hinged with a support for easier loading and unloading of the specimens. The cathode is a screw type and the material to be sputtered should be thin sheet form to fasten to cathode. The effective dia of the cathode is about 30 mm.

The specimens are kept on a platform mounted on the Base Plate in line with the cathode. A gas inlet valve for introducing pure argon into the chamber for sputtering applications is provided, on the front panel. An air admittance valve to break the vacuum in the Chamber at the end of the process is provided.

A Pirani Gauge with two gauge Heads facilitates Vacuum measurements at the pump and at the chamber through a change over switch. The H.T. supply with a transformer, rectifier indicating meter forms a part of the unit. Process timer with 0-6 minutes time setting facilitates reproducible results.

3.00 SPECIFICATIONS

Vacuum Chamber	:	150mm diameter
Top Plate	:	120 mm height
Direct Drive pump	:	
Model		ED-6
Displacement Capacity		100 lit/min
Number of Stages		Two
Ultimate Vacuum		1 x 10^{-3} m. bar
Valves	:	1: GSV-1 2: NV-1
Utilities		
Power	:	230V AC 50 Hz single phase with peak power of 1 kw.

4.00 SYSTEM DESCRIPTION

1. TOP PLATE:

A 190mm diameter and 16mm thick top plate made out of aluminium plate is being used. cathode assemblies and HT feed throughs are fitted to the top plate.

A gas inlet system consisting of a needle valve and a feed

through is connected to top plate so that the needle valve can be set precisely.

2. ROTARY VACUUM PUMP:

HINDHIVAC Rotary Vacuum Pump double stage with in-built gas ballast with motor directly coupled to the pump free air. Displacement capacity 100 lit/min. Model Ed-6. Ultimate vacuum when measured on Mcleod Gauge with gas ballast closed 1 x 10^{-3} m.bar and with gas ballast opened 1 x 10^{-2} m.bar. Inlet connection QF-25. Motor 1/3 HP single phase and Normal rotation speed is 1400 RPM.

Note: ***For Complete Details please refer Rotary Vacuum Pump Section.***

3. VACUUM CHAMBER

Vacuum chamber is a glass chamber of about 150mm diameter and 120 mm height with `L' gasket at both top and bottom for vacuum tightness.

4. VACUUM VALVE:

a. Air Admittance Valve

A Vacuum Valve (1 number) of 1/8" air admittance valve is connected to the chamber so that the vacuum in the chamber can be released as desired.

b. Gas Admittance Valve

Fine control type Needle valve connected to the chamber facilities fine control bleed of inert gas for sputtering operation.

5. VACUUM GAUGE

Analog pirani gauge with stabilised power supplies in a port of the basic unit to measure vacuum at various stages of operation.

Analog pirani gauge is capable of measuring vacuum in the gauge of 0.5 to 0.001 m.bar.

Two number of metal gauge head with instantaneous selector switch also provided to measure in various stages.

6. H.T. SUPPLY :

D.C. high tension supply is derived from a high reactance transformer with a solid stage full wave bridge rectifier to drive the power for the sputtering operations. The output D.C. voltage is about 3 KV open circuit and 2 KV at 100 ma.

7. PROCESS TIMER :

A timer of 0-6 minutes is provided to terminate the sputtering operations automatically depending on the time of sing. This facilitates the reproducible results.

8. CONTROL PANEL :

R.P H.T and vacuum measuring gauge indicating meter, indicator lamps, switches etc., are all brought to the front panel for convenient operation.

All the above components are conveniently mounted in a cabinet with removable doors on the back on all the four sides, 4 castor wheels facilitates maneouvre of position.

5.00 SAFETY DEVICES :

1. Vacuum Switch

It is impossible to switch on the HT supply when the chamber is exposed to atmosphere. The vacuum switch

breaks the HT circuit when the chamber is in atmosphere and only make the circuit when chamber is evacuated to some degree of vacuum.

2. High Tension System

The HT supply system is fully protected against flash over short circuit by a high reactance transformer which also stabilises glow discharge.

6.00 UTILITIES

(PROVIDED BY THE USES AT THE SIGHT OF INSTALLATION)

a. Power

Power supply : 230 V AC 50 Hz single phase with a peak power of 1 KW.

b. Process Gas

Pure argon gas cylinder to be provided with a two stage regulator.

c. Target

The necessary target materials like gold, gold/palladium and platinum etc., should be provided by the user in thin sheet form to fasten to cathode as per the users requirement.

7.00 OPERATIONAL INSTRUCTIONS

1. Insert the 15 amps plug into the socket and switch it ON.
2. Push the Rotary Vacuum Pump circuit breaker upwards to put on the pump.
3. Open the Isolation valve.
4. Put on the Pirani Gauge select GH1 which reads the vacuum in the chamber.
5. As soon as the GH1 registered a vacuum better than 1 m.bar.
6. Close the isolation valve.
7. Vent Air into the chamber by pulling the vent valve upwards which is provided on the top plate.
8. Open the top lid.
9. Load the samples which has to be coated on the bottom of the material which is to be coated.
10. Refer drawing of the cathode, remove the locknut and load the material which is to be coated.
11. Close the top lid.
12. Open the isolation valve.
13. As soon as GH1 reads better than .05 m.br.
14. Partially close the isolation valve.
15. Connect the Argon gas cylinder to the Nozzel provided on the left hand side of the cabinet and slowly open the needle valve and allow the Argon to flow into the vacuum chamber.
16. When Argon has been admitted into the chamber see that the vacuum is being maintained at .1 m.br. with continuous flow of Argon into the system.
17. Set process timer to the required time as per the desired coating thickness for different materials. This timer is to be adjusted between 0 to 6 minutes.
18. After the timer is set for the desired level.
19. Push the high voltage circuit breaker upwards, thereby the high voltage circuit get on and the t imer starts counting.
20. At the movement,the HT is put ON and there will be a plasma seen in between the Cathode and Anode.
21. HT will be ON till the timer lapses. Once the timer lapses the HT circuit automatically gets OFF.
22. Close the isolation valve.
23. Pull the Vent valve upwards to vent the chamber to atmosphere.

24. Remove the top lid.
25. Take out the samples which has been coated and observe for the thickness and other parameter as desired. If the thickness is not satisfactory, repeat the above cycle once again.

8.00 PRECAUTIONS

1. The L Gasket of the glass beljar should be greased properly and fixed.
2. HT should not be put on unless the chamber is in vacuum.
3. After every operation make sure that the needle valve is kept closed.
4. Make sure that always the back door is kept in closed condition.
5. Make sure that the high voltage cable is not in loose connection.
6. Once in a month open the gas ballast of the vacuum pump for atleast 15 to 20 minutes.

INSTRUCTION MANUAL

ROTARY VACUUM PUMPS
'ED' SERIES

TÜV CERT
DIN EN ISO 9001:2000

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INTRODUCTION

a. *General Description*

'HINDHIVAC' Direct Driven, Vane type vacuum pumps are double stage, oil sealed type and designed for a variety of basic vacuum pumping applications.

The pumps are similar in construction but of varying pumping speeds (nominal free air displacement) like 3(M^3)/hr, 6(M^3)/hr, 15(M^3)/hr, 21(M^3)/hr and 30(M^3)/hr. The direct drive to the pump is provided through a flexible coupling from a flange mounted motor which also drives the cooling fan. The pumps are provided with either single phase or three phase motors.

b. *Construction*

'HINDHIVAC' High Vacuum Pumps, ED-Series, are spring loaded Sliding Vane type, with vanes placed in the slots of the rotor. They are mounted eccentrically both in the first and second stage with inter connecting ports.

Both, the first stage which creates primary vacuum and second stage which creates the low pressure, are isolated with the introduction of an isolator in between and the two rotors are mounted eccentrically within respective stators.

The first stage end plate has a bearing and an oil seal for isolation from atmosphere. The second stage end cover also has a bearing for locating the shaft, which will give the closest possible tolerance and free movement within the stator and rotor for efficient performance of the pump.

This block is fixed to an aluminium assembly, called the Mounting Block. On one side of this is fixed the vacuum pump and the oil cover and on the other side the driving motor. A coupling joins this assembly to the motor for a smooth drive.

The oil pump housing is mounted on the rear end plate of the stator. This oil pump provides the lubrication to the pump and the oil flow to the stator. The pump functions in a similar manner as the vacuum pump. It has a vane, mounted in an excentric position in the bore and drives the oil under pressure. In the event of the pump stopping a spring - loaded flap valve is activated to seal the oil port of the oil pump, thereby preventing any backstreaming of oil in to the chamber because of difference in pressure.

A filter is provided on the oil pump housing through which oil is sucked in. This prevents any dirt or fibrous tissues from entering the pump and causing reduction in flow of oil and thereby seizure of moving parts.

Precautions should also be taken when these pumps are used in places where high water vapour tolerance is required. Chilled condensors are recommended for condensing water vapours. While handling water vapour, please run the pump with its gas ballast open.

Special care is to be taken when pumps are used where acidic vapours are present. Traps to neutralise these dangerous vapours must be used. Otherwise, they will damage the inner parts of the pumps.

For smooth functioning and noiseless operation, epoxy blades are used within the rotors. Chemicals prone to attack such resins should be specially taken care of and should not be allowed inside the pump. Otherwise, decomposition of the vanes will result in unsatisfactory functioning of the pump.

Occasional opening of oil tank and cleaning the filters is recommended to give trouble free service and assured low pressures.

c. *Working Principle*

During operation, the rotor vanes sweep the volume of the gas or air trapped in the crescent shaped gap formed by the rotor which is mounted eccentrically in the stator. As each vane passes the inlet port opening a known quantity of gas is introduced and subsequently trapped and compressed by the next vane following it and ejected via the exhaust flap valve mostly and via the interconnecting port to the II stage partially, when the inlet pressure is near atmospheric pressure. As the inlet pressure drops the I stage exhaust flap valve closes and all the air or gases pass to the II stage, where it is further compressed and discharged to atmosphere.

d. *Gas Ballast*

The Direct drive models are incorporated with a gas ballast facility to enable them to pump the condensable vapours without contaminating the pump oil. This is done by introduction of gas or air at atmospheric pressure through a manually operated valve into the volume between the second stage rotor vane and discharge valve, when the mixture of air and vapour in this volume is at low pressure. When the volume of gas (air)/vapour mixture is compressed prior to ejection, the discharge valve opens before the partial pressure of the vapour component is high enough to cause it to condense.

TECHNICAL SPECIFICATIONS

Sl. No	Pump Model	ED6	ED15	ED21	ED30
1	Nominal Pumping Speed: M^3/Hr	6	15	21	30
	Lit/Min	100	250	350	500
2	Ultimate Partial Pressure : (on Mcleod Gauge)				
	Gas Ballast Closed: (m.bar)	$5x10^{-4}$	$5x10^{-4}$	$5x10^{-4}$	$5x10^{-4}$
	Gas Ballast Opened: (m.bar)	$6x10^{-2}$	$6x10^{-2}$	$6x10^{-2}$	$6x10^{-2}$
3	Weight (kgs)	32	42	45	52
4	Maximum nominal power rating(KW)	0.25	0.37	0.55	1.1
5	Pump Rotational Speed (at no load r.p.m)	1340-1440	1340-1440	1340-1440	1340-1440
6	Oil Capacity (Lits)	2.0	2.75	2.75	3.0
7	Inlet Flange (ISO-KF)	KF-25	KF-25	KF-25	KF-25
8	Recommended Oil	HINDHIVAC Molecular Distilled Oil : Grade MD-504			

INSTALLATION

a. *Unpacking*

Unpack the pump and remove all protective covers and the protective cover on the inlet pipe. Check for any possible damage in transit. If found alright, proceed as given below. The handle of the pump which is packed separately is to be fixed with the two screws provided at the top of the pump.

b. *Pump Inlet Connection*

The vacuum inlet connection is a KF-25 Flange with an 'o' ring holder and 'o'ring. The free flange can be welded to a pipe or inserted into a rubber tubing.

c. *Pump Outlet Connection*

A plain nozzle of suitable size provided for the pump discharge connection.

The pump exhaust nozzle can be connected through a tubing to the outside of the building with a sump in such a way that condensed fluid from pipe should not flow back to the pump.

d. *Oil Charge*

During installation, initially pour 100ml of oil to the inlet of the pump. To facilitate Oil pumping. Remove the oil filling plug and fill oil to a level which is visible through the sight glass using the recommended grade of oil. The level of the oil is to be half the level of the oil sight glass. Replace the oil filling plug with the sealing gasket in position.

NOTE	**During normal running of the pump, the oil level will be visible in the sight glass**

e. *Electrical Connections*

The pumps are fixed with single phase 230V AC 50Hz motors of suitable rating. Three phase motors are provided on request at extra cost.

- To connect the electrical supply leads, remove the terminal box cover and take the lead wires through and connect to the appropriate terminals.

The direction of rotation is clockwise when viewed from drive end. The motor is factory wired to run in the correct direction and requires no change while connecting power in case of single-phase motors.

OPERATION

NOTE	Never obstruct the pump outlet, this may cause dangerous pressure build-up inside the pump.

a. Before starting the pump check that the oil level, which is visible in the oil sight glass, is at the indicated level. The pump will operate satisfactorily at this level for normal use.

b. When pumping condensable vapours present in the system, the gas ballast facility must be utilised by introducing air into the pump by rotating the gas ballast valve in anti-clockwise direction. Before pumping vapours, the pump should be isolated from the system and allowed to run for approximately 20-30 minutes to warm the oil and assist in preventing vapour condensation in the cold pump. The gas ballast valve is to be closed when better ultimate vacuum (lower pressure) is required in the system after the vapours are removed.

c. When the pump is used for pumping large quantities of vapour, it is recommended that the pump is isolated from the system and run for atleast 30 minutes with the gas ballast valve open. This particularly applies after corrosive vapours have been pumped. If the pump is used in systems which produce heavy evacuation of vapours, particularly if vapours are of a corrosive nature, the gas ballast may not completely protect the pump. A suitable trap is recommended to reduce the harmful vapours carried over to the pump.

d. If the system connected to the pump has likelihood of solid particles present entering the pump, a dust filter should be incorporated in the line. (for details refer to accessories)

e. When measuring ultimate pressure (ultimate vacuum) it is to be taken note of, that the pump oil may have a vapour pressure which is higher than that of the permanent gases in the system being evacuated. Hence, while measuring the ultimate vacuum with gauges of Pirani or Thermocouple type, which measure the total pressure of the permanent gases and vapours, they will indicate differently from gauges of Mcleod or Manometer type which will only indicate the pressure of the permanent gases.

To obtain the highest possible vacuum when the pump is filled with a fresh charge of oil, it is recommended to run the pump with full gas ballast open for 10 to 15 minutes before measuring the ultimate vacuum or connecting it to the system. This has the effect of degassing the oil and improving the ultimate vacuum.

f. The retention of vacuum in the system when the pump is shut off for any reason is possibl only if the gas ballast valve is closed. It is recommended to use a Solenoid Operate Isolation-cum-Air Admittance Valve at the inlet of the pump where greater system securit is required, on large volumes which are evacuated where they create a negative drive o the pump by force of a large volume.

g. The pump is designed for long and trouble free operation provided the recommende operating and servicing procedures are adhered to. Before despatching the pump, each an every pump is inspected and tested for performance. Many cases of suspected failur and of poor pump performance are infact due to leakage in vacuum system, faulty due t wrong selection or not properly providing suitable accessories like traps, etc. Any suc possibilities are to be checked with proper guidance by our design department whil choosing pumps for different applications.

MAINTENANCE

The following routine servicing will be required :

a. Oil Level

Oil level to be checked daily.

b. Oil Pouring

To top the oil, remove the oil filler plug located on the top of the oil tank and fill with recommended grade of oil until the oil level is visible in the sight glass above the minimum required level. Replace the filler plug and ensure the gasket seal is in position.

c. Oil Filling

To change the oil proceed as follows :

d. Gravity Drain

Switch off the pump, place a clean suitable tray or container beneath the drain plug and remove the plug. Allow oil to drain completely. Switch on the pump for few seconds and throttle the exhaust nozzle with finger to ensure complete flushing of the oil. Switch off the pump immediately. Pour a small quantity of oil down the vacuum inlet and switch on the pump for rinsing the pump and flushing purpose. Switch off the pump. Drain the oil and replace the

	WARNING	**DO NOT completely restrict the pump outlet while flushing the oil under pressure as this may cause excessive high internal pressure build up resulting in pump oil tank rupture. If long pipes are connected to the pump exhausting out of air conditioned enviornments, please use sufficiently large diameter pipes to ensure no back pressure is built up on exhaust.**

SPARES & ACCESSORIES

A set of spares comprising of these items are recommended for trouble free maintenance.

1.	Springs & Pins for Vanes (1st & 2nd Stage)	:	1 set
2.	Oil seals	:	1 set
3.	Gaskets and 'O' Rings	:	1 set
4.	Filters	:	1 set
5.	'O' ring holder with 'O' Ring	:	1 set
6.	K.F Clamp	:	1 set

A full range of accessories are available for direct drive pumps as listed below.

a. Inlet Filters (Dust Filters)

Inlet dust filters are recommended where fine abrasive dust particles are to be prevented from entering the vacuum pump. This filter incorporates a fine mesh filter which is supported by a frame. The inlet and outlet are of KF couplings.

b. Moisture Trap

The moisture trap is designed for use in systems where the requirement is for removal of limited quantities of moisture at low pressures. The phosphorous pentoxide (P2O5) dessicant is contained within the trap.

c. Foreline Trap

For use in clean pumping systems, it utilises the trapping properties of activated alumina to trap oil vapour and prevent back migration of pump oil vapour into the vacuum system.

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d. *Mist Filter*

The Exhaust Mist Filter is recommended on the outlet (exhaust) to capture oil mist which woul be otherwise admitted into the environment while running on gas ballast or inlet open for lon periods of time.

e. *Anti Vibration Mounting*

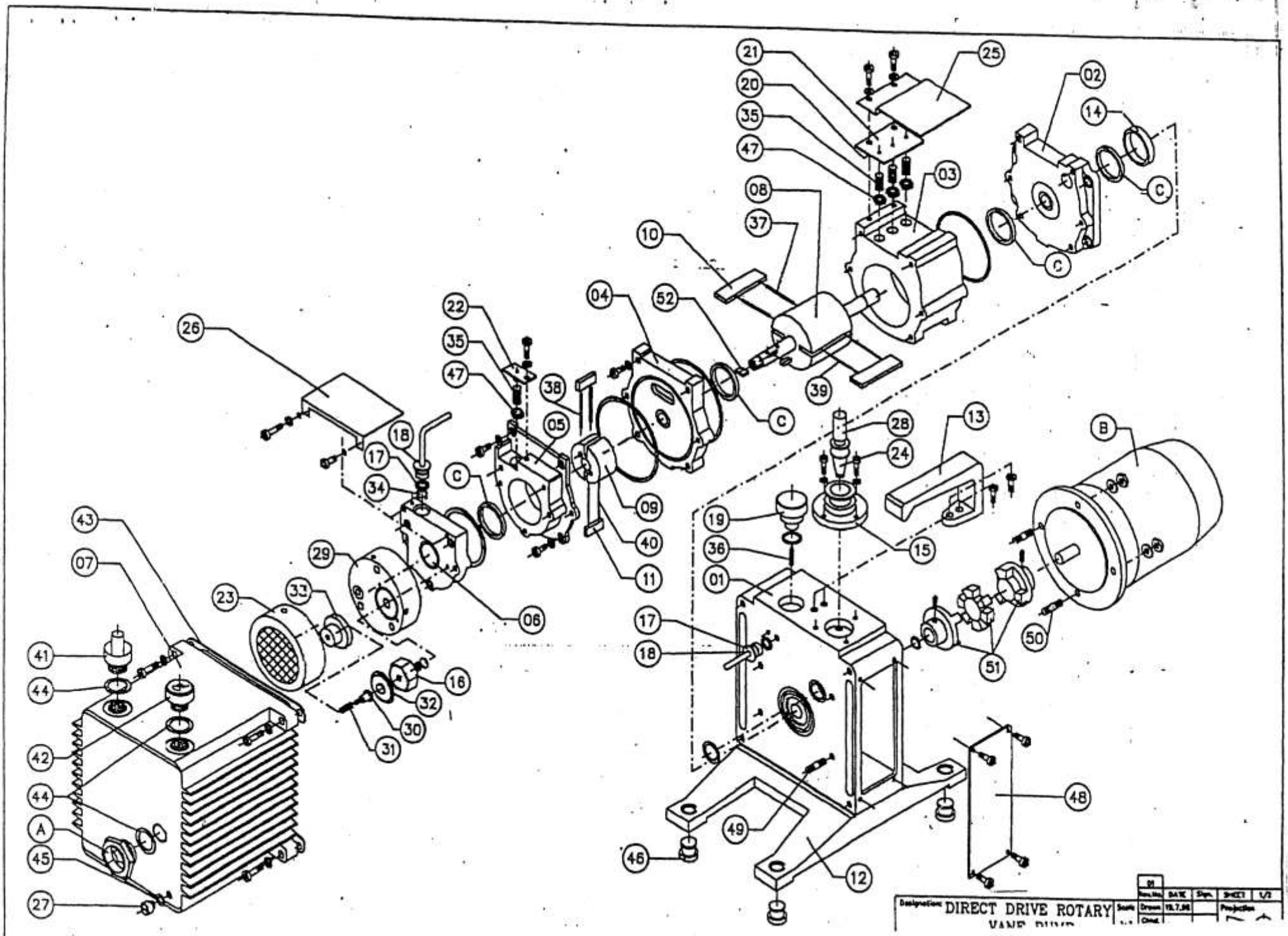
'U' shaped rubber cushion mounting for pumps installed on framed structures to avoid vibrations being transmitted to other parts. Flexible hoses or bellows between the pump and the system, are recommended.

f. *Isolation Valve:*

The Isolation valve is recommended for enhanced protection against backstreaming of vacuum pump oil into the system. This is incorporated directly on the inlet connection of the pump.

g. *Water Cooled Condenser*

The water cooled condenser is recommended where condensable vapours or gases are pumped by the pumping which may otherwise contaminate the pump oil. These are supplied with KF couplings to match the pump inlet.


DIRECT DRIVE ROTARY

ITEM NO.	DESCRIPTION	QTY
01	MOUNTING BLOCK	1
02	END COVER MOUNTING BLOCK SIDE	1
03	I STAGE STATOR	1
04	ISOLATOR	1
05	II STAGE STATOR	1
06	END COVER	1
07	OIL TANK	1
08	I STAGE ROTOR	1
09	II STAGE ROTOR	1
10	I STAGE VANE	2
11	II STAGE VANE	2
12	BASE PLATE	1
13	HANDLE	1
14	LOCATING BUSH	1
15	INLET CONNECTION	1
16	OIL PUMP HOUSING BUSH	1
17	G.B.CONNECTING PLUG	2
18	G.B.CONNECTING PLUG HOLDER	2
19	GAS BALLAST KNOB	1
20	GUIDE PIN	4
21	I STAGE EXHAUST PLATE	1
22	II STAGE EXHAUST PLATE	1
23	OIL FILTER	1
24	AIR INLET FILTER	1
25	I STAGE BAFFLE COVER	1
26	II STAGE BAFFLE COVER	1
27	OIL TANK DRAIN PLUG	1
28	INLET PIPE	1
29	OIL PUMP HOUSING	1
30	OIL PUMP HOUSING SPACER	1

ITEM NO.	DESCRIPTION	QTY
31	OIL PUMP HOUSING SPRING	1
32	OIL PUMP HOUSING FLAP	1
33	OIL PUMP HOUSING TOP COVER	1
34	FLOAT VALVE	1
35	I & II STAGE EXHAUST POPPET SPRING	4
36	GAS BALLAST SPRING	1
37	I STAGE VANE SPRING	2
38	II STAGE VANE SPRING	2
39	I STAGE VANE SPRING PIN	2
40	II STAGE VANE SPRING PIN	2
41	EXHAUST NOZZLE	1
42	OIL POURING PLUG	1
43	OIL TANK GASKET	1
44	WASHER (FOR OIL POURING PLUG & EXHAUST NOZZLE)	2
45	DRAIN PLUG WASHER	1
46	RUBBER GROMMET	4
47	EXHAUST POPPET	4
48	NAME PLATE	2
49	STUD (FOR END COVER MOUNTING BLOCK SIDE)	4
50	STUD (FOR MOTOR)	4
51	FLEXIBLE COUPLING SET	1
52	OIL PUMP VANE	1
A	OIL SIGHT GLASS	1
B	MOTOR	1
C	OIL SEAL	4

		01				
		Rev.No.	DATE	Sign.	SHEET	2
Designation: DIRECT DRIVE ROTARY VANE PUMP	Scale 1:1	Drawn	19.7.98		Projection	
		Chkd.				
		Appvd.				
HINDHIVAC PRIVATE LTD BANGALORE					ED-SERIES-F	

"HINDHIVAC"

MINI PIRANI STABILIZED GAUGE

MODEL - A6STM-D

OPERATION
AND
MAINTENANCE MANUAL

TÜV CERT
DIN EN ISO 9001:2000

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CONTENTS

1.0 INTRODUCTION

The HINDHIVAC mini pirani stabilised gauge model A6STM-D is a pressure control instrument designed with the thermal conductivity type gauge head (Sensor). This provides all necessary bridge circuits and signal conditioned analog outputs. This instrument can accept range from 0.5 m.bar to 0.001 m.bar using a direct reading meter. This instrument works on the principle of change in resistance of material with a change in temperature. This can be used to measure vacuum from 0.5 m.bar to 0.001 m.bar anywhere in the vacuum system with a suitable adopter. This gauge is very much essential in the pirani controller to control vacuum (0.5 m.bar to 0.001 m.bar). Two gauge heads can be directly connected to this gauge to read fore vacuum and roughing vacuum of a vacuum system.

2.0 GENERAL DESCRIPTION

The mini Pirani gauge model A6STM is a modular front panel construction and forms 1/4 size of a standard 19" rack. This can be used as a bench standing type or as a panel mounting type. By using an appropriate rack adaptor,

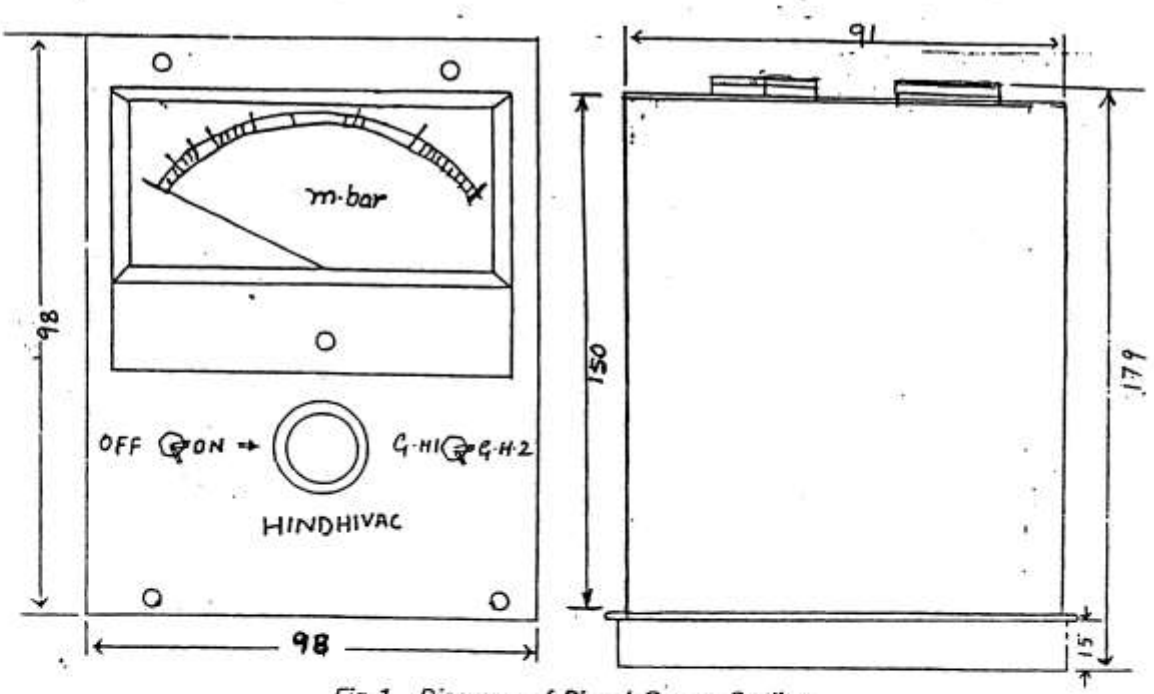


Fig. 1 Diagram of Pirani Gauge Outline

This instrument is constructed with light Mild Steel alloy frames, having detachable cover on top side. This facilitates, easy accessability of all components mounted inside and the gauge makes the service more convenient. This gauge measures the pressure is the range of 0.5 m.bar to 0.001 m.bar using a direct reading meter. It operates with one or two HINDHIVAC Pirani Gauge heads, which facilitate the measurement of the fore vacuum and roughing vacuum in any vacuum system.

The gauge is calibrated for dry air but will be found accurate for most purposes under normal working conditions, where small quantities of other gases or vapours are present.

3.0 SPECIFICATIONS

ELECTRICITY SUPPLY	: 230V AC (+ OR -10%)
BRIDGE OUTPUT VOLTAGE	: 2V D.C. (+ OR -0.5%)
PRESSURE RANGE	: 0.5 m.bar TO 0.001 m.bar
NO. OF GAUGE HEADS	: TWO HINDHIVAC MODEL PR-3
FUSE	: 250 m.a. SIZE: 5 X 20 mm
GH1, GH2	: INPUT TO HINDHIVAC PIRANI CONTROLLER MODEL PRGC-1 FOR PRESSURE CONTROL.
SIZE IN MM	: 98 H x 98W x 180 D.(APPROXIMATELY).

4.0 UNPACKING AND PRE-OPERATIONAL CHECK

The control panel and gauge heads are carefully checked and packed before despatch. Prior to using the instrument carefully inspect the unit for any visual signs of transportational damages. Please remove the top cover by unscrewing the two round head screws on each side and slide the cover towards the back, visually inspect the inside of the unit for damages and displacement of components on the P.C.B that might have occured during transportation. check their sockets if all internal connections are in place and properly seated. Replace the cover in the same way as it was removed.

REMEMBER	When the top cover of the gauge is removed, remove the shorting terminal of the meter.

If any damage is observed, please report to HINDHIVAC and to the insurance to file a proper claim: Please send copy of change claim to HINDHIVAC Bangalore in order to expedite replacements or repair of the instrument.

If the unit fails to function properly contact our local office or please write to HINDHIVAC, Bangalore.

5.0 INSTALLATION

- Check that the supply voltage agrees with operating voltage of instrument.
- Check that the mains ON switch (SW1) is OFF in position.
- Check that the meter indicates zero if not adjust by the mechanical zero adjusting screw on the meter face.
- Plug the gauge heads 1 & 2 respectively into their sockets firmly at the rear panel.
- Connect the gauge head to the vacuum system. See that the O ring is properly placed in the male joint. Tighten the locknut with the hand properly, so that the O ring provides a leak tight joint.
- Switch on the control unit by switching on the toggle switch (S1). Now the neon lamp should glow indicating readiness of the power supply to gauge head.

6.0 CIRCUIT DESCRIPTION

The 230V AC (± 10%) mains supply is given to the primary part of the transformer (T) through a fuse (F) and mains switch (SW1) located on the front panel. The mains indication lamp (PL) is connected across the primary part of the transformer (T) and it glows when the instrument is switched on under normal working condition.

The output from the secondary part of the transformer is rectified by diodes D01 to D04 and smoothened by capacitor C01. The rectified voltage is fed to an integrated circuit voltage stabiliser, the output of which can be adjusted to + 2V by adjustment of a preset (P01). A capacitor C02 is connected across the output of the regulator to reduce ripples. Resistors R02 and R03 form two arms of a bridge net work and the other two arms are formed by the Pirani Gauge Head.

Potentiometer P2 is used for adjusting the initial setting of zero at atmospheric pressure and potentiometer P3 is provided for calibration of the gauge head P2 and P3: They are located inside the gauge heads.

6.1 BRIDGE VOLTAGE

The bridge voltage is set at the factory and should require no further adjustment. However, before a control unit is used for the first time, check the voltage as described below with the gauge heads connected.

a. Remove the top plate of the chassis.

b. Connect the gauge to the mains voltage supply.

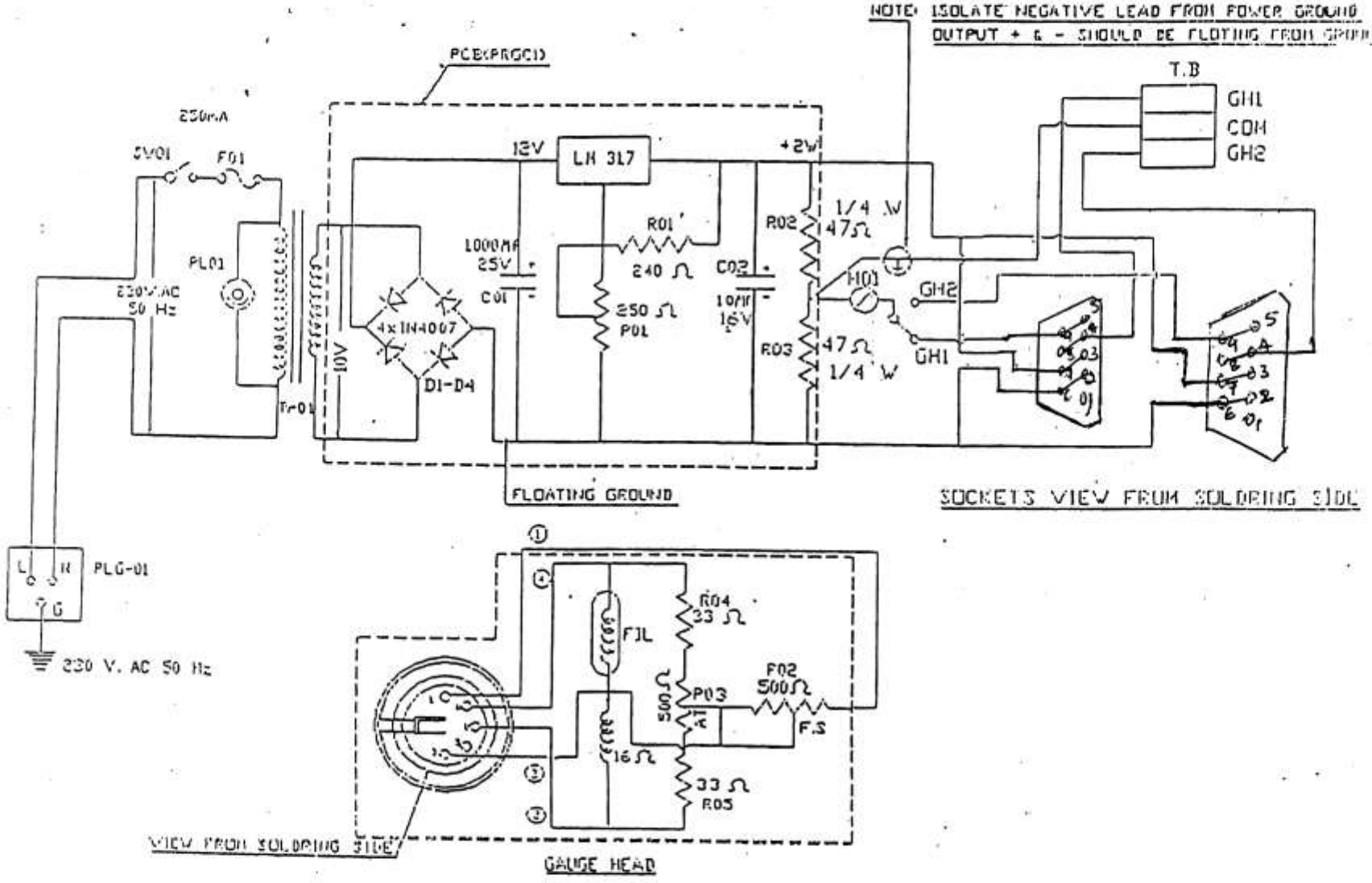


Fig.2. Circuit Diagram of Pirani Gauge

c. Allow 10 minutes to warm up.

d. Measure the output voltage of the regulator on the printed card across R02 and R03.

e. Use a D.C. voltmeter with the range of 0-2.5V DC (Avometer 8 is suitable).

The meter should read 2V DC. If the voltage is not correct adjust (P01) until it reads 2V DC.

7.0 PRINCIPLE OF OPERATION

Change of pressure in the vacuum system brings about a rise or fall in number of gas molecules present and hence a rise or fall in thermal conductivity of the gas. Thus the heat loss of the constant voltage electrically heated filament in the system varies with the pressure.

The pirani gauge head filament has high temperature co-efficient of resistance. So a slight change in the system pressure brings about useful change in the filament resistance resulting in an out of balance current which can be read as pressure on the meter. The Pirani gauge head indicates the total pressure of combined gases and condensable vapours in the system as the heated wire can lose heat. (both gas and vapour molecules.)

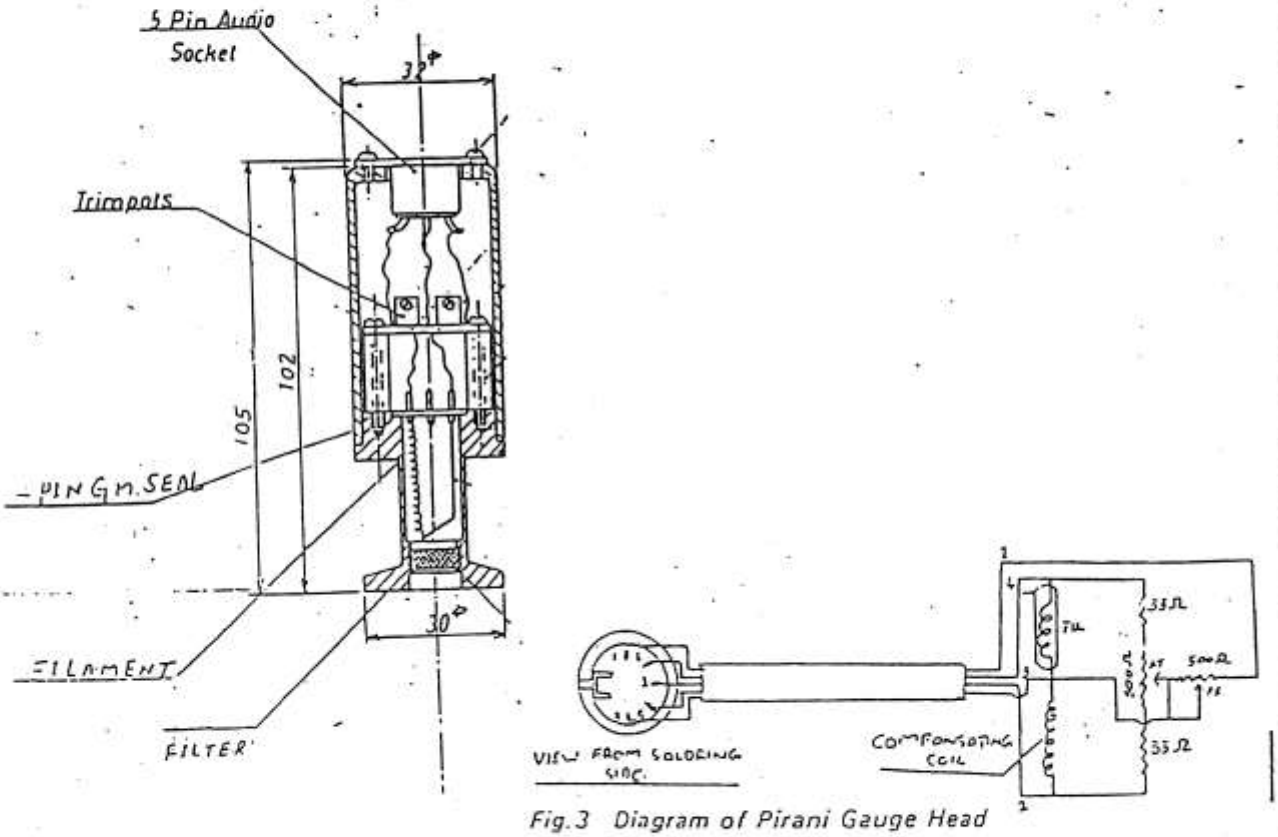


Fig.3 Diagram of Pirani Gauge Head

7.1 OUTPUT FOR VACUUM CONTROLLER

Two electrical signals which are proportional to the meter reading are provided on the back panel corresponding to GH1 and GH2 and marked as GH1 COM GH2. Any one of these signals can be connected to the HINDHIVAC pirani controller Model PRGC-1, which works in the range of 0.5 m.bar to 0.001 m.bar to actuate any external electrical gadgets depend upon the preset vacuum.

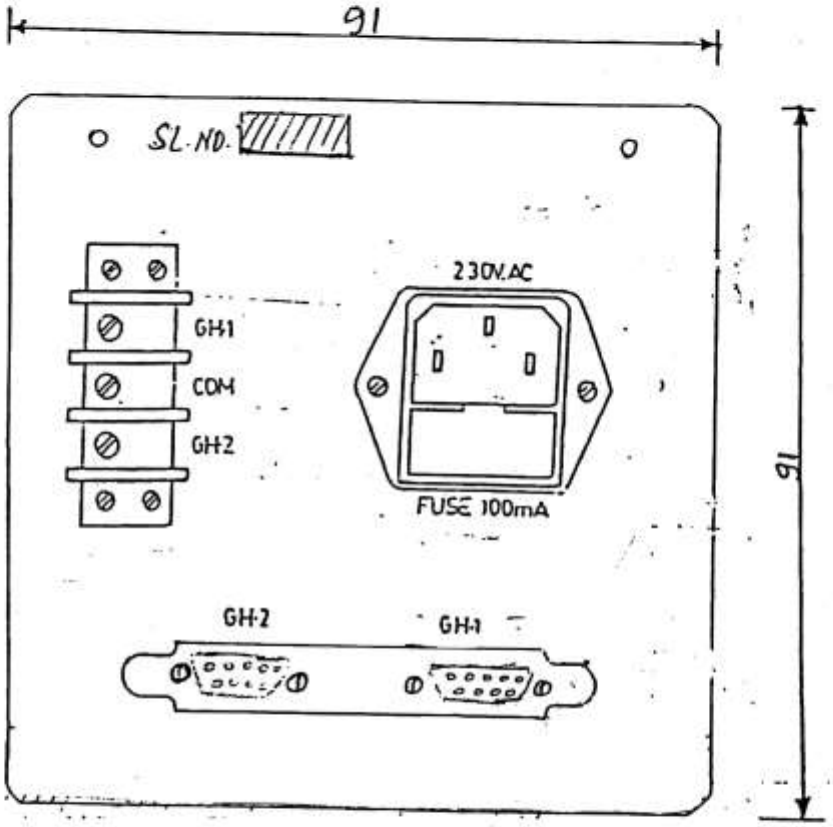


Fig.4 Diagram of Pirani Gauge Back Panel

8.0 OPERATION PROCEDURES

a. Connect the 2 gauge heads at the rear panel.

b. Switch ON the instrument by operating the mains ON switch.

c. Keep SW2 in GH1 position.

d. The meter should indicate 'AT' on the meter scale. If not, adjust (P02) the thick wire potentiometer inside the gauge head until to reads 'AT'.

e. Keep SW2 in G. Head-2 position. Similarly adjust the meter to read 'AT' by using a corresponding potentiometer. (Inside gauge head 2). Now the instrument is ready for vacuum measurement. Evacuate the system and observe the reading on meter scale.

8.1 LEAK DETECTION

The Mini Pirani Gauge can be used to locate coarse leaks such as leaks through 'O' ring seals, door flanges, windows, leak in shaft seals or valve diaphragm. hydrogen is ideally suitable as a probe gas in leak detection; Due to high rate of diffusion through the leak, the pirani gauge senses almost immediately. Moreover the thermal conductivity of hydrogen at low pressure is almost twice that of dry air so that a pirani gauge calibrated for dry air is twice as sensitive to hydrogen at the same absolute pressure.

The leak detection is to be carried on as follows:

Fit a hydrogen cylinder with a pressure reducing valve. An air gun nozzle or a piece of glass tubing of 1/8" diameter at one end and a small hole at the other end is recommended as a probe to direct a fine jet of hydrogen to the suspected leak area. Begin at the highest point in a vacuum system and work slowly and systematically downwards, observing the pirani gauge for fluctuations and sealing each leak as it is found. In equipments with two or more gauge heads, select the gauge head nearest to the path of the gas between the probe area and the pumps for observation. Very small leaks require specialised leak detection apparatus.

PRECAUTION 	Hydrogen is an explosive gas, necessary precautions should be taken while handling it. Alternatively, other safer gases can be used with reduced sensitivity which depends upon their thermal conductivity.

9.0 MAINTENANCE

Servicing of the gauge apart from the adjustments described should be undertaken only by an Electronic engineer familiar with ICs and Transistor circuits.

For voltage and current measurements use an AC/DC multi range meter having a sensitivity of at least 20,000 ohms per volt.

9.1 RECONDITIONING OF THE FILAMENT

The gauge head behaves erratically if it is filled with any contaminants, the gauge head has to be flushed out with suitable organic solvents such as Petroleum, Ether, Benzene, Carbon tetrachloride or Acetone and then thoroughly dried.

Apply 10V AC or DC to pin No.1 and 4 of the gauge head plug for two minutes. This flashes the filament and volatises the deposits over the filament.

9.2 REPLACEMENT OF GAUGE HEAD TUBE

To replace the gauge head tube, remove the screws of the gauge head and take out the top cover. Now the metal body, compensating coil and potentiometers (P02,P03) are accessible. Desolder the leads of the metal gauge head from the cable and potentiometers (P02, P03) shorting point, introduce the new gauge head tube and reverse the procedure.

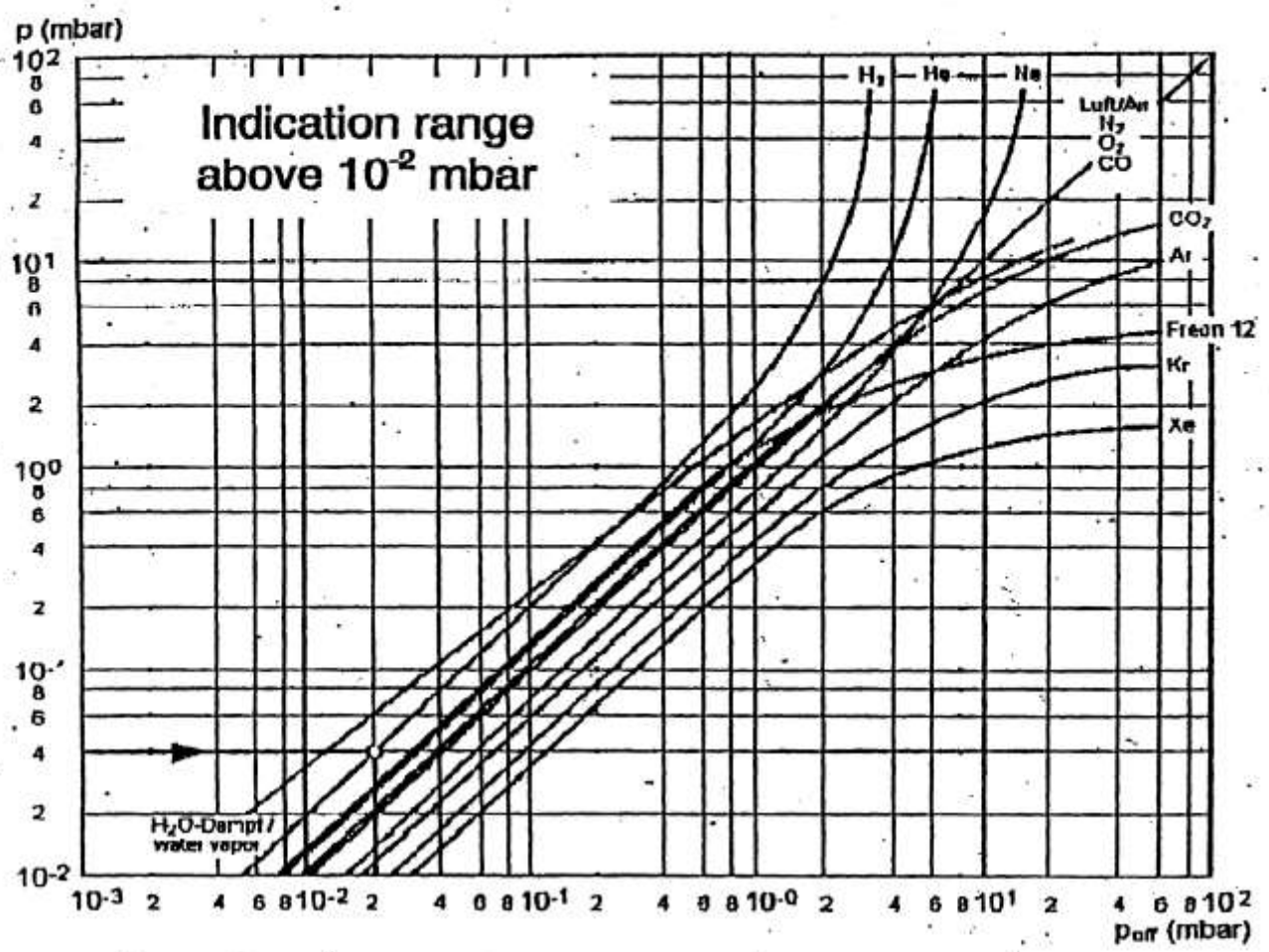
9.3 GAUGE CALIBRATION

When a new gauge head tube is replaced, it is necessary to calibrate the unit. The gauge is to be calibrated for dry air against a Mcleod gauge with all the necessary traps etc., For accurate calibration, the unit has to be sent to the factory. However, for a rough calibration, the following procedure is to be adopted.

1. Follow procedure of operation procedures a,b,c,d and e
2. Evacuate the gauge head to pressure below 0.001 m.bar.
3. Select SW2 switch to G.Head-1 position and adjust potentiometer P02 (FS) (marked on the gauge head). Until the meter reads 0.001 m.bar on the scale.
4. Select SW2 switch to G.Head-2 position and adjust potentiometer P02 (FS) (marked on the gauge head) until the meter reads 0.001 m.bar on the scale.

PRECAUTION	The filament must be flashed only when the pressure in the gauge head is below 1 micron.

Gas type dependence



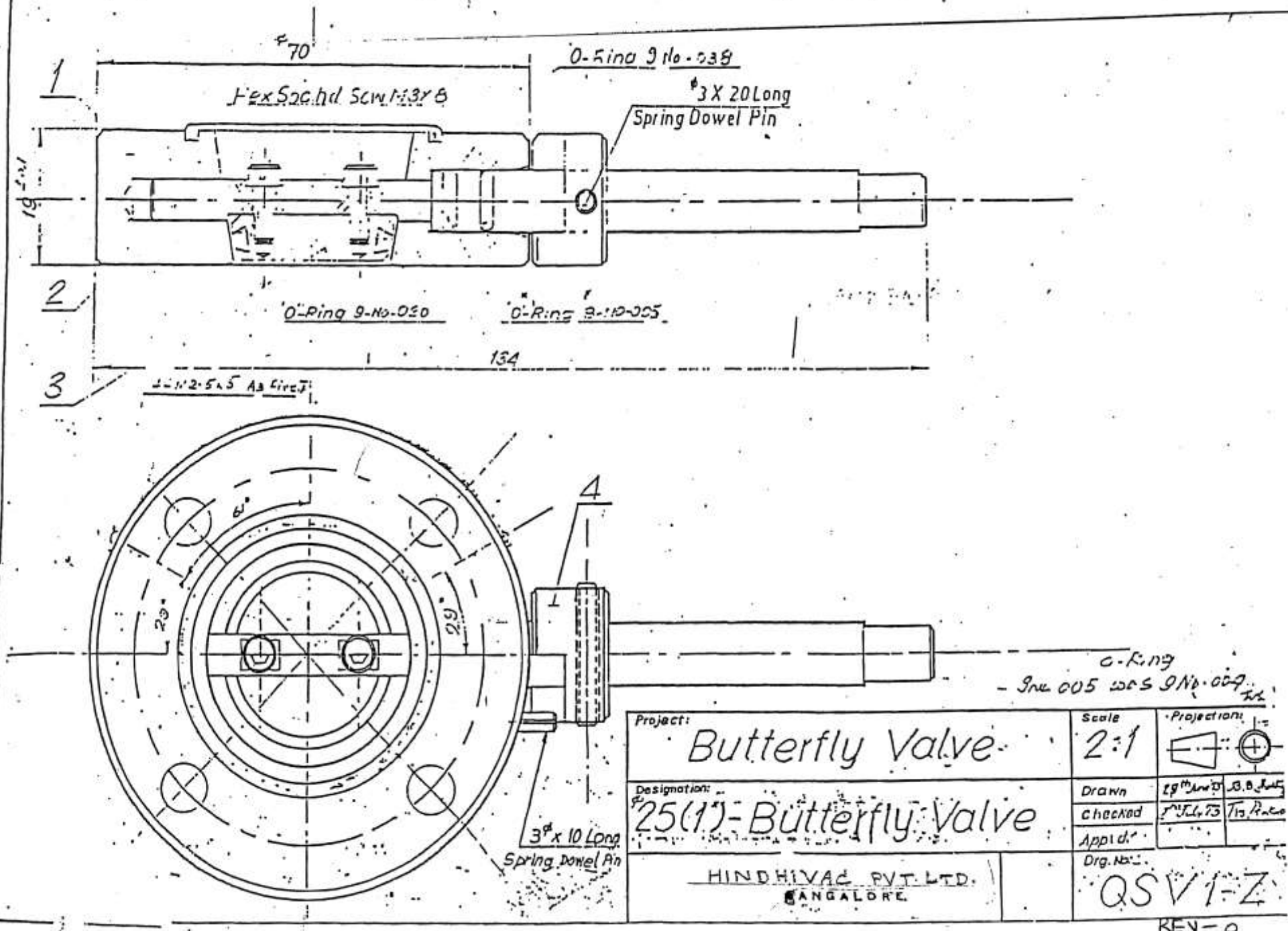
In the range below 10^{-5} mbar, the pressure indication is linear. For gases other than air, the pressure can be determined by means of a simple conversion formula:

$$p_{eff} = K \times \text{pressure indicated}$$

Gas type	Air (N_2, O_2, CO)	Xe	Kr	Ar	H_2	Ne	He
K (mean values)	1.0	0.4	0.5	0.8	2.4	4.1	5.9

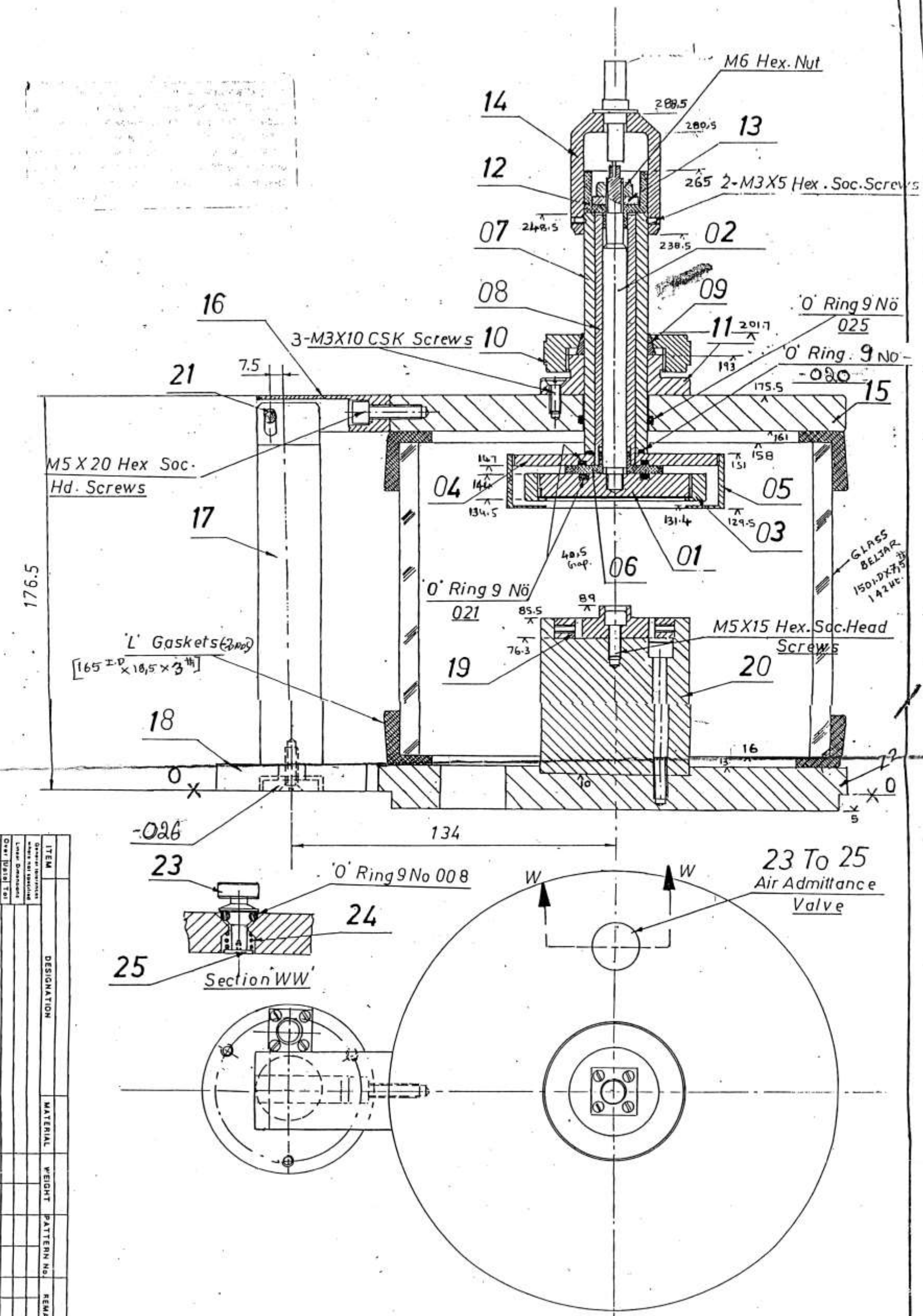
10.0 TROUBLE SHOOTING

SL. NO.	TROUBLE	CAUSE	REMEDY
1.	Mains indicator lamp not glowing	Electricity supply has failed. Lamp PL has failed.	Check supply voltage fuse-F power chord mains plug, switches SW1.
2.	Bridge voltage is too high.	IC is not working properly.	Check & replace.
3.	Bridge voltage is too low.	D01,D02,D03 & D04 are faulty.	Check & replace
4.	Meter reads F.S.D. connection.	Open gauge head or replace filament.	Repair the gauge head
5.	Pressure reading erratic.	Gauge socket contacts are loose or dirty.	Tighten or clean.
6.	Calibration suspect.	Bridge voltage set incorrectly.	Carry out bridge voltage adjustment.
7.	No meter reading.	Pressure at Atm. or gauge head not plug -ged in or 500 ohms (F.S) potentiometer Opened.	Check & Replace.



Project: Butterfly Valve		Scale 2:1	Projection:
Designation: 25(1)-Butterfly Valve		Drawn	
		Checked	
		Appl'd	
HINDHIVAC PVT. LTD. BANGALORE		Drg. No. QSV1-Z	

REV-0



ITEM	DESIGNATION	MATERIAL	WEIGHT	PATTERN No.	REMARKS
	Dimensions unless not specified				
	Angular Dimensions				
	Length of Shorter Arm: Over / Upto / Tol				
	Linear Dimensions: Over / Upto / Tol				
	– / 10 / ± 0.1				
	10 / 30 / ± 0.2				
	30 / 100 / ± 0.3				
	100 / 300 / ± 0.5				
	300 / 1000 / ± 0.8				
	1000 / 2000 / ± 1.2				
	Angular Dimensions: Length of Shorter Arm: Over / Upto / Tol				
	10 / 50 / ± 1°				
	50 / 120 / ± 30'				
	120 / – / ± 10'				

ALTERATION	INDEX	AREA	DATE	NAME	Dist	Asst. No.
	Scale	Drawn	4-6-81	D.V.	Projection:	
		Checked	26/8/81			
		Approved	8-6-81			

Special Cathode Assembly

(For Ind. Inst. Of Science)

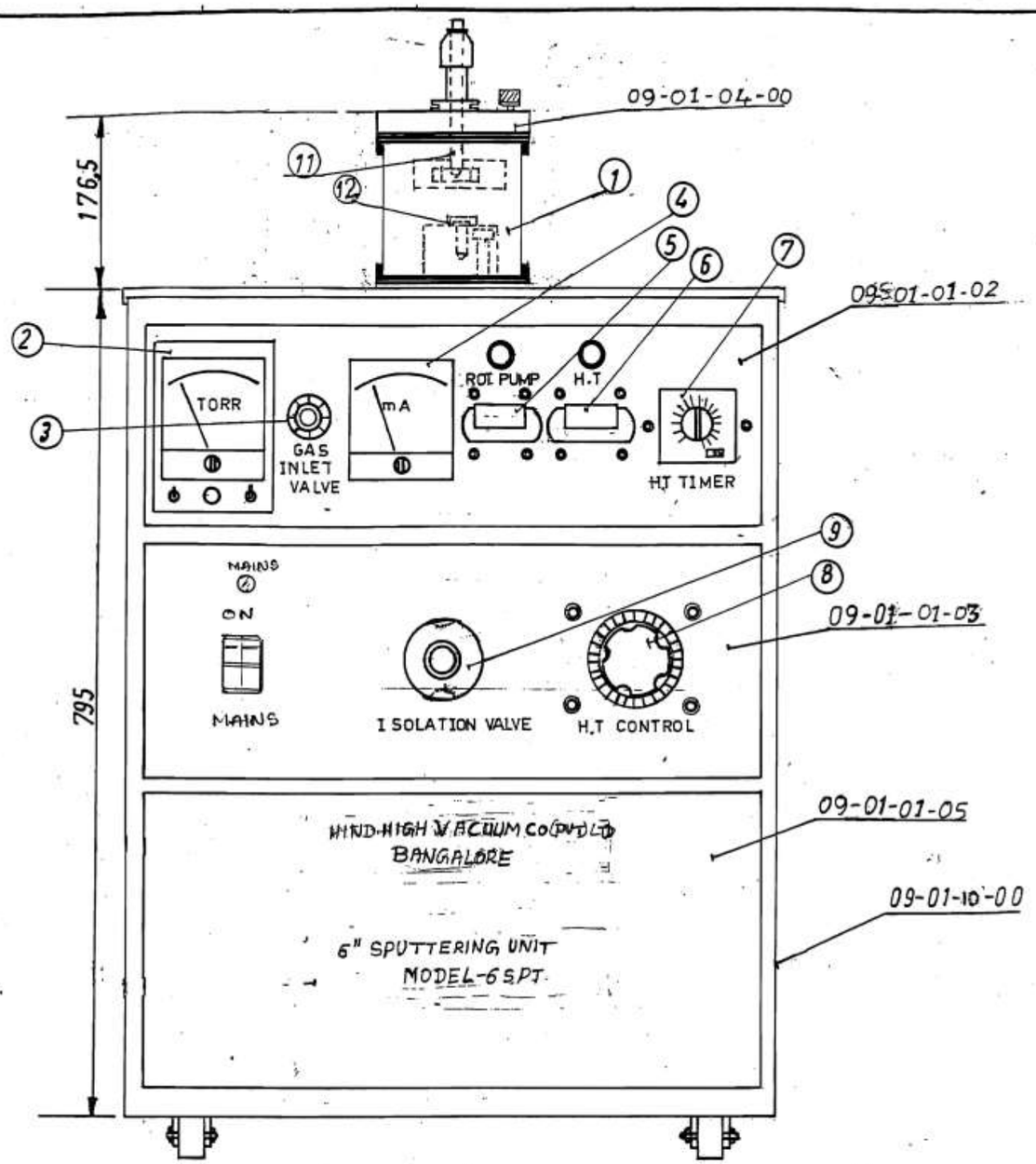
1:1

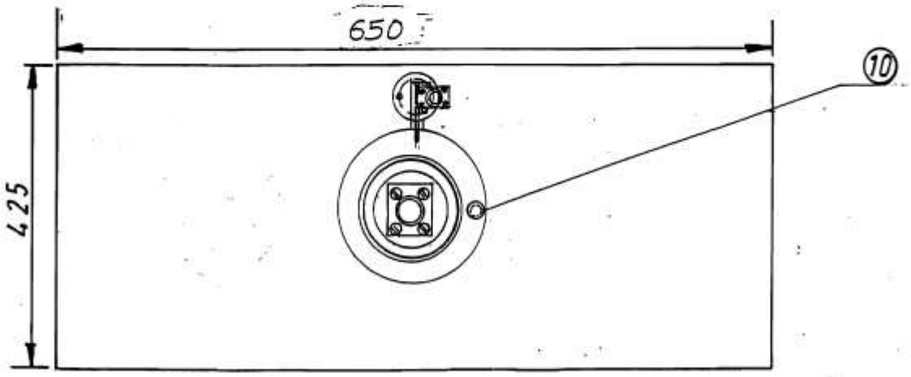
Hind High Vacuum Co. Pvt. Ltd., Bangalore. 560058

0901-004-000

CG-01-00210

designed by HIND HIGH VACUUM CO PVT LTD - BANGALORE





SL. NO.	DESIGNATION	PART NO:
5	Front cover sheet for Rot. pump	09-01-01-05
4	6" Sputtering Unit Cabinet	09-01-01-00
3	Variac fixing plate	09-01-01-03
2	Gauge fixing plate	09-01-01-02
1	Special cathode assembly	09-01-04-00

ITEM	DESCRIPTIONS
(11)+(12)	CATHODE & ANODE RESPECTIVELY
(10)	AIR ADMITTANCE VALVE, AV3
(9)	ISOLATION VALVE, QSV-1
(8)	VARIAC 2A FOR H.T SUPPY CONTROL
(7)	TIMER, DELAY ON TYPE FOR H.T SUPPLY.
(6)	CIRCUIT BREAKER 2A, FOR H.T SUPPLY.
(5)	CIRCUIT BREAKER 4A, FOR ROT.PUMP.
(4)	H.T MILIAMMETER D.C. 0-500ma.
(3)	NEEDLE VALVE. NV1-Z
(2)	PIRANI GAUGE Model no. A6STM-D
(1)	GLASS CHMBER

ITEM	DESIGNATION	MATERIAL	WEIGHT	PATTERN No.	REMARKS

General tolerances where not specified		
Linear Dimensions		
Over	Upto	Tol
–	10	±0.1
10	30	±0.2
30	100	±0.3
100	300	±0.5
300	1000	±0.8
1000	2000	±1.2
Angular Dimensions		
Length of Shorter Arm		Tol
Over	Upto	
–	10	±1°
10	50	±30'
50	100	±20'
100	–	±10'

ALTERATION	INDEX	AREA	DATE	NAME	Qty	Assy.No.
					1	

Designation: 6" DC SPUTTERING UNIT
Model; 6SPT (NEW)

Scale: N.T.S
Drawn: 27/4/87
Checked:
Appvd.: 11-6-87

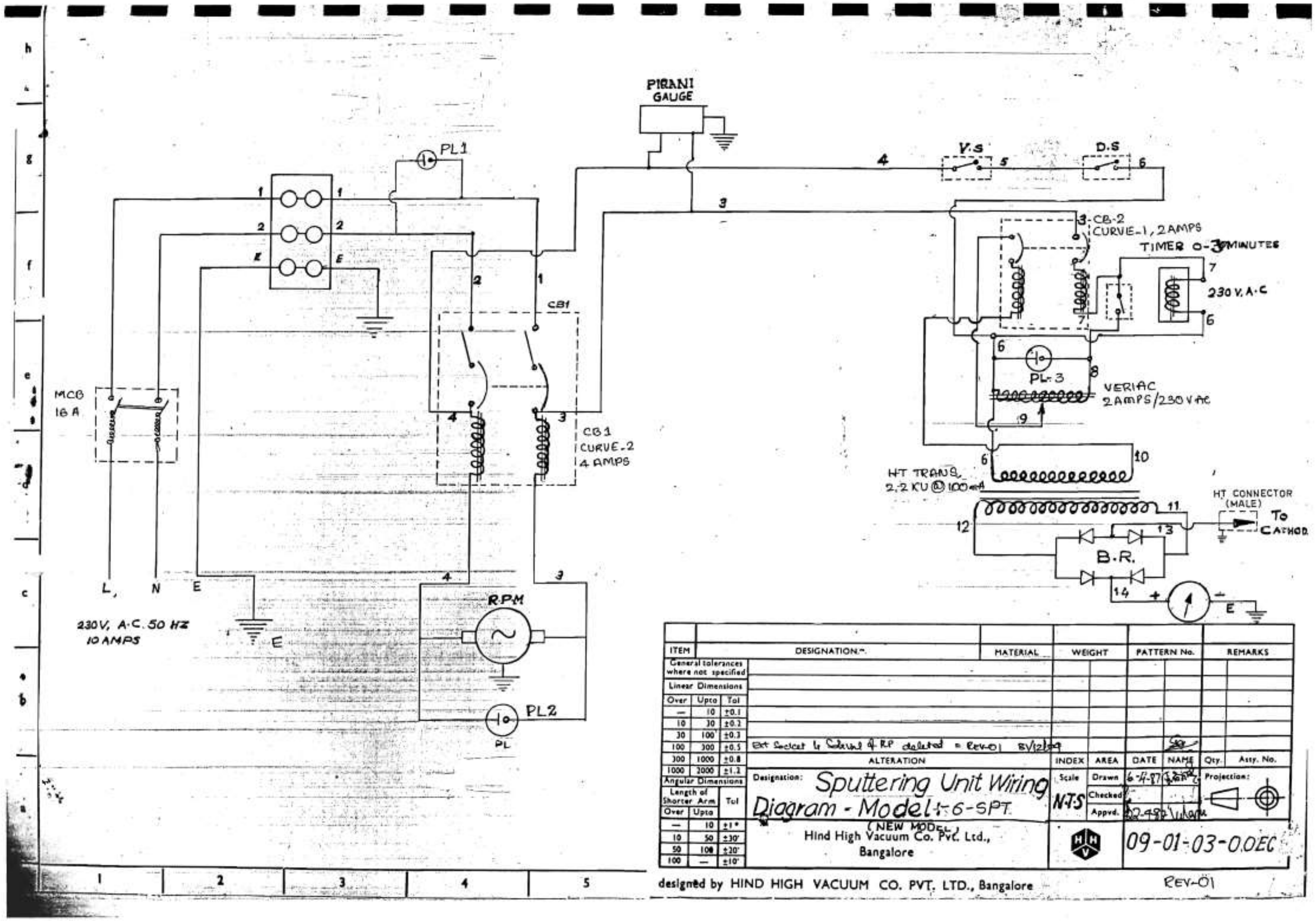
Projection:

Hind High Vacuum Co. Pvt. Ltd.,
Bangalore – 560058

09-01-00-00
REV NO.-0

designed by Hind High V

Bangalore



ITEM	DESIGNATION	MATERIAL	WEIGHT	PATTERN No.	REMARKS

General tolerances where not specified

Linear Dimensions		
Over	Upto	Tol
—	10	±0.1
10	30	±0.2
30	100	±0.3
100	300	±0.5
300	1000	±0.8
1000	2000	±1.2

Angular Dimensions		
Length of Shorter Arm		Tol
Over	Upto	
—	10	±1°
10	50	±30'
50	100	±20'
100	—	±10'

ALTERATION	INDEX	AREA	DATE	NAME	Qty.	Assy. No.
Ext Socket & Solenoid 4 RP deleted = Rev-01 8/12/99						

Designation: Sputtering Unit Wiring Diagram - Model: 6-SPT (NEW MODEL)

Scale: N.T.S

Drawn: 6-4-97

Checked:

Appvd.: [illegible]

Projection:

Hind High Vacuum Co. Pvt. Ltd., Bangalore

09-01-03-0.0EC

designed by HIND HIGH VACUUM CO. PVT. LTD., Bangalore

REV-01