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SIP CONTROLLER

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Abstract: **Power supply, which is used to energize the ion pump, has to be able to meet a fairly wide range of load variation. While operating at a high pressure, since the characteristics of the pump is such, that a glow discharge appears between anode and cathode, the pump draws rather heavy current from the supply. In this condition, the voltage across the pump is very low or near to zero. At that time the current is high which is called short circuit current. The actual value of this current is dependent on the intensity of the electric discharge and is also governed by the geometry and the capacity of the pump. As the pumping action get under way, the discharge intensity comes down, thereby reducing the current that has to be handled by the power supply. With the change in pressure there is the proportional change in the current. And from this current the pressure generated can be inferred. As the current decreases the voltage across the pump increases and when the pressure gets to order of 10^{-8} torr, the voltage ranges to its maximum value (negative).**

Keywords: **SIP (Sputter Ion Pump).**

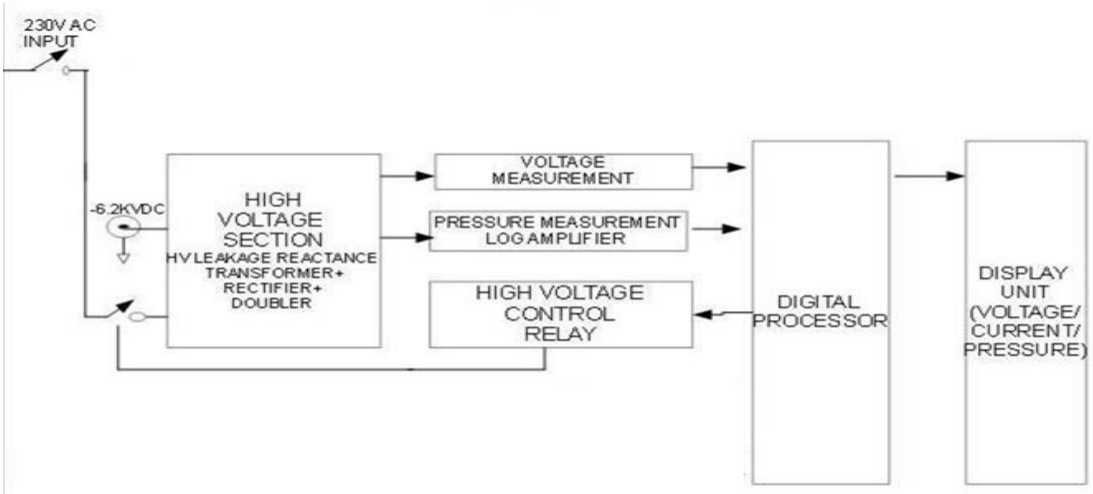
1. INTRODUCTION

In order to meet the demand of the power supply, the design should be developed to handle maximum open circuit voltage and minimum short circuit current depending on the pump size selected. The voltage across the secondary side of the high voltage transformer is rectified by a high voltage bridge and then filtered by the capacitor filter. The current drawn by the pump develops voltage across various shunt for different current range. This voltage is buffered, amplified with the help of ADC and micro controller and can be displayed on LCD. The dc high voltage is sensed by the log amplifier and then further by voltage divider and can be displayed on the LCD

2. EXISTING SYSTEM

The SIP controllers presently used for Accelerators and in UHV application are single channel linear type. They are rated for -6.2 kVDC open circuit voltage and 1000 mA short circuit current. The high voltage transformer is the most important part of this instrument. It has a secondary winding rated for 2200 VAC, a 500 V capacitor winding and a half inch shunt path, inserted between primary and secondary, to limit the short circuit current to 1000 mA. The Ferro resonance feature helps to regulate the transformer secondary voltage for line voltage variations. The transformer weighs nearly 30 kgs.

3. DESIGNED SYSTEM



On the basis of the block diagram main controller may consist of the following parts:

1. High voltage power supply (that includes HV leakage reactance transformer and high voltage full wave doubler).
2. Voltage & Current Signal conditioning circuit
3. Microcontroller based digital display

High voltage power supply can generate the high voltage of -6200 V (DC). That is required to evacuate the pump. The input is given to the high voltage reactance transformer which can be doubled and rectified by the doubler circuit.

Current measurement can be done with the help of log amplifier as we can split the wide range of current variation in the decades. Thus by using the log amplifier we can precisely calculate the current and pressure that is proportional to that current as the pressure can be calculated by the given equation:

P = (Kx1)/ (SxV)

Where P= pressure in mbar

K= constant of the pump

I= the current in ampere

S= is the pumping speed of SIP

V= voltage in kilovolts.

The working of the microcontroller based CPU board is to display voltage, current and relevant pressure on the display. Previously the led display is used that only shows the value but by using LCD display we can display the value with their units.

The CPU performs the work of controlling the SIP controller as relays can be used to operate the high voltage control relay.

4. COMPARISION

Parameters	Existing system	Designed system
Weight	70kgs	May reduced to half
Depth	450mm	450mm
Height	5U	4U
Wide	19”	Half 19”

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