Model PAM-1 – Alpha Particulate Monitor

Alpha Particulate Monitor Model PAM-1 developed by Para Electronics consists of following subsystems

- Detector, Preamplifier, Filter Paper Holder
- Instrument for data collection
- Panel PC for display, operation control, data storage and communication
- Vacuum pump
- UPS

Complete system is assembled on a trolley. System consists of a detector, preamplifier with filter paper holder. Detector is Ion Implanted Silicon Detector. Preamplifier is directly mounted on the detector. Active area of the detector faces the filter paper. Filter paper is kept inside the filter paper holder.

Preamplifier requires +12V and -12V supply. Detector bias voltage is around 30 volts. Multicore cable with one coaxial is used to carry the necessary voltage and the preamplifier output between the preamplifier and the instrument. 6 pin allied connector is used at the instrument end. Cable is directly soldered to PCB at the preamplifier end.

Power supply for the instrument consists of +5V SMPS for digital circuits. For +12 and -12V, linear supply is used. Inside the instrument, there is a power supply card and the MCA card. Necessary bias for the detector is generated on the power supply card.

Preamplifier output first goes to spectroscopy amplifier. Rise time of the amplifier output is 1.2 uS. Amplifier output is then given to 10 bit Wilkinson type ADC. Necessary signals for control of ADC are generated by the main controller C8051F340. This controller also handles the USB communication with the panel PC. Spectrum collected by 1K channel MCA is first stored in the internal memory of the PC. Then after every second, the spectrum is transferred to software package which runs on the panel PC. The spectrum collected by the MCA is displayed on the PC screen. Many other features like data storage are available in the package.

Mains supply is routed through the spike guard. Vacuum pump is connected on the mains line whereas the instrument and the panel PC are connected to the UPS as shown the block diagram. UPS capacity is 500 VA. This gives backup time of at least 1 hour in case of power failure.

Vacuum pump capacity is 100 LPM. Normal suction rate through filter paper is 40 LPM. This generates back pressure on the pump and results in pump failure. Bypass valve is connected on the suction line of the pump as shown in the diagram to avoid the back pressure on the vacuum pump.

Specifications

Air Monitor Detection Unit - 1K MCA based Unit for detection of Alpha particles

Supply : 230V, 50 Hz Mains

Radiation Detection : 4.2 MeV to 8 MeV

System Resolution : 300 KeV

Display : In CPM and Bq/m3

Detector : Ion Implanted Silicon Detector having 20 KeV Resolution in Vacuum 450 mm^2 Active Area, +30Volts Bias Voltage

Pre Amplifier : Low Noise Charge Sensitive Preamplifier, 100 mV for 5.16MeV output 600 mV/pC Gain and Positive Pulse Polarity

3 meter Interconnecting cable length between preamplifier and amplifier

Amplifier : 0 to +500 mV Input , 0 to +8 Volts Output, 1 uS near Gaussian pulse shape, Gain adjustable through internal trimpot

HV Range : 100 volts

ADC : 10 Bit Wilkinson Type, 5 Volts Range, 1024 No. of Channels ADC

Alarms : Warning Alarm Level & Final Alarm Levels settable in terms of Bq/m3.

Flow Meter : Digital Flow meter for flow rate measurement, Range 0 to 100 LPM

Temp. Range : 0 to 55O C

Display/Storage System : Industrial Panel PC or Laptop with Windows XP (Licensed copy) operating system for display of MCA spectrum, data analysis and spectrum storage. PC will have RS232/RS485 or Ethernet port for data communication. 12" LCD Monitor, Display Resolution At least 1024 x 760 pixels

Air Sampling Unit

SS Air Sampling head capable of holding filter paper of 37 mm dia, Collection efficiency >95%, Flow range 10 to 100 LPM, Filter Paper Millipore type, Wire mesh for supporting filter paper,

Vacuum Pump - Oil less, Capacity 100 LPM with 12.7mm dia inlet and outlet ports

Digital Flow meter - Range 0 to 100 LPM for flow rate measurement.

Bypass valve for bypassing excess flow.

* Suitable Trolley will be provided for entire system with grills for ventilation.

Due to continuous R&D, specifications are likely to change without notice

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