

## PM10 High Volumen Air Sampler



*PM10 is the designation for particulate matter in the atmosphere that has an aerodynamic diameter of 10 micrometers ( $\mu\text{m}$ ) or less.*

A high volume PM10 sampler draws a known volume of ambient air at a constant flow rate through a size selective inlet and a filter. Particles in the PM10 size range are then collected on the filter during the specified 24-hour sampling period. Each sample filter is weighed before and after sampling to determine the net weight (mass) gain of the collected PM10 sample.

The total volume of air sampled is determined from the measured volumetric flow rate and the sampling time. The concentration of PM10 in the ambient air is computed as the total mass of collected particles in the PM10 size range divided by the volume of air sampled. This sampled air must be corrected to U.S. EPA standard conditions (25°C, 760mm Hg or 101 kPa), and the PM10 measurement is expressed as micrograms per standard cubic meter ( $\mu\text{g}/\text{std. m}^3$ ).

### Features

Accurately samples particles with aerodynamic diameter less than 10 micrometers (PM10)  
U.S. EPA Federal Reference Method Designation Number for PM10 Sampling: **RFPS-0202-141**  
Mass flow and volumetric flow controllers available  
Brush and brushless motors available  
Optional microprocessor based "**Flow Commander**" management system incorporates flow, temperature and pressure sensors with data logging capability

A high volume PM10 sampler consists of two basic components: a specially designed inlet that transmits only those particles less than 10 $\mu\text{m}$  in diameter and a flow control system capable of maintaining a constant flow rate within the design specifications of the inlet.

The symmetrical design of the PM10 impaction inlet insures wind-direction insensitivity. Ambient air is drawn into the inlet and is evacuated from a buffer chamber through nine acceleration nozzles. By virtue of their larger momentum, particles greater than 10 microns aerodynamic diameter impact onto a greased impaction shim plate. The particles smaller than 10 microns are carried vertically upward by the air flow and down sixteen vent tubes to the standard 8 x 10-inch (20.3 x 25.4cm) filter where they are collected. The acceleration nozzles have critical diameters to provide the necessary changes in velocity to effect correct particle size fractionation within the impaction chamber.

*Two types of flow control systems are available. One is equipped with a mass flow control system; the other is equipped with a volumetric flow control system.*

The flow rate in a **mass flow controlled** system is actively sensed and controlled at some predetermined set point. Air is pulled through the filter into the intake of a blower and subsequently exits the sampler through an exit orifice, which facilitates measurement of the flow with a manometer or pressure recorder. The flow rate is controlled by an electronic mass flow controller which uses a flow sensor probe installed below the filter holder to monitor the mass flow rate and to control the speed of the motor accordingly. The controlled flow rate can be changed by an adjustment knob on the flow controller.

A **volumetric flow control** system maintains a constant volumetric flow rate (given a fixed temperature) through the PM10 inlet. A choked-flow venturi is operated such that the air attains sonic velocity in the throat of the device. In this "choked" mode, the flow rate is unaffected by downstream conditions such as motor speed or exit pressure, and is a predictable function of upstream conditions such as the stagnation pressure ratio and temperature. The volumetric flow is controlled without any moving parts or electronic components.

## PM2.5 High Volume Air Samplers



*Retrofitting a PM10 high volume air sampler allows for characterization of PM2.5 with existing methodologies.*

Ambient air enters the PM2.5 Inlet at a flow rate of 40 cfm (1.13 m<sup>3</sup>/min) through an opening under the weather-proof hood. The air then flows into a stilling chamber and through a screen that is designed to prevent the entry of insects and large-sized airborne debris into the fractionating system. From the stilling chamber the air flows through a set of 40 impactor jets that direct air towards a wetted collection surface. Particles with sizes larger than 2.5 microns aerodynamic diameter impact upon a porous disc wetted with oil. Particles smaller than 2.5 microns are vented from the impaction zone and flow downward to the standard 8 x 10-inch (20.3 x 25.4cm) hi-vol sampling filter.

### Features

Retrofit an existing high volume air sampler at only a fraction of the cost of a new PM2.5 system Existing quality assurance procedures used for PM10 hi-vol sampling are virtually unchanged for PM2.5 sampling Simple flow measurement & control with a critical flow venturi (volumetric flow controller) determines flow rate directly in actual m<sup>3</sup>/min.

### Specifications for PM10 & PM2.5 High Volume Samplers

Motor	1.0 HP
Amperage	7.0
Wattage	840
Flow Set Point	36 - 44 ACFM (1.0 - 1.24 m <sup>3</sup> /min)
Accuracy	<1% deviation over 24 hours sampling
Power Source	110VAC, 1 Phase, 60Hz (other electrical options available)
Net Weight	136 lb (62 kg)

### Shipping Sizes and Weight

Shelter	117cm x 51cm x 58cm, 34 Kg
Inlet	81cm x 81cm x 66cm, 26 Kg
Motor	71cm x 53cm x 48cm, 12Kg