

## MANUAL STACK MONITORING KIT

### Available Model

#### PEM-SMK-20

Stack Monitoring is an instrumental method or procedure for evaluating the concentrations and total amount of emissions from industrial waste gas streams discharged into the atmosphere. Effluent measurements and sampling procedures follow specific test methods and protocols to ensure representative and accurate emission data. Test methods are generally pollutant specific, sometimes industry specific. These test methods are formulated and recommended by a variety of regulatory and statutory authorities and jurisdictions such as USEPA, CPCB etc.

### Salient Features

- Design complies with specifications recommended by US EPA & CPCB, New Delhi
- All disassembled components of the kit packed in a padded suitcase for safe and easy transportation
- Assembled kit is portable, compact and weighs less than 20 Kg, the lightest available in India
- User Friendly Multi-Function Electronic Unit with Digital Display (20x4 OLED) of all measured parameters viz.
  - \* Ambient Pressure & Temperature
  - \* Stack Gas Temperature, Pressure & Pitot DP,
  - \* Particulate and Gaseous Metering Flow, Volume, Time, Meter Pressure & Meter Temperature
- Leak Check & Leak Rate
- Programmable Start and Stop of Sampling Pump



OPEN VIEW OF SUITCASE

Polltech's Stack Monitoring Kit-SMK 20 is an advanced, user friendly kit which is very compact. It has been designed for easy transportability, therefore the complete kit is housed in a light weight ABS suitcase.. It can be used to take accurate representative samples of particulate matter and various gaseous pollutants from the stack in accordance with the methodologies developed by US EPA. All parameters required for measurement of gas velocity, iso-kinetic flow rate, particulate and gaseous flow rate and their volume are displayed digitally on an alpha-numeric OLED module.

### Monitoring Kit Description

PEM-SMK20 is housed in a easily transportable ABS moulded VIP suit case. It consists of a Control Module, a sampling pump, a gaseous sampling arrangement and a set of standard sampling accessories.

### Control Module

This module is actually an integrated assembly made by tightly coupling two separate sub-modules (units). One sub-module (unit) is a micro-controller based unit which carries out signal processing, timing, computation and operator interface functions, an 20 x 4 character OLED module and nine keys. The other sub-module (unit) houses all devices and sensors which measure the various input parameters required for computation of various derived parameters which characterize the stack emission.



## Detailed Technical Specifications

### Control Module

<b>Technology</b>	Micro-controller based	<b>Power</b>	Li-ion battery with built in charger
<b>Display module</b>	20 characters x 4 lines Alphanumeric OLED	<b>Connections</b>	Push fit unions
<b>Keypad</b>	7 multifunction keys with tactile feedback	<b>Size &amp; Weight</b>	28 x 23 x 9 Cms. , About 1.5 Kg.

Measurement Category	Measured Parameter	Sensor employed	Range	Measurement Accuracy
<b>Ambient</b>	Pressure	Abs. Pressure Sensor	400-800 mmHg A	±0.5 % of FS
	Temperature	RTD Sensor	0.0-60.0 °C	±0.5 °C
<b>Velocity</b>	Pitot Differential Pressure	Pressure Sensor	0 to 200.0 mmWC	±0.5 % of FS
	Stack Gas Temperature	K Type Thermocouple	0 to 1200 °C	±2 °C
	Stack Gas Pressure	Abs. Pressure Sensor	400 to 800 mmHg	±0.5 % of FS
<b>Particulate Sampling</b>	Gas Temperature	RTD Sensor	0 to 100.0 °C	±0.5 °C
	Gas Pressure (Absolute)	Abs. Pressure Sensor	400 to 800 mmHg	±0.5 % of FS
	Particulate Flow Rate	Orifice flow DP Sensor	2.0 to 60.0 LPM	±2% of FS
	Metered Volume (Traverse Point wise)	Computed from Flow and Time	999 L	±2% of reading
	Total Metered Volume		9999 L	
	Time of Sampling	Stop watch / Timer	9 h 59 min 59 s	±2 seconds
<b>Gaseous Sampling</b>	Gas Temperature	RTD Sensor	0 to 100.0 °C	±0.5 °C
	Gas Pressure Absolute	Abs. Pressure Sensor	400 to 800 mmHg	±0.5 % of FS
	Gaseous Flow Rate	Orifice flow DP Sensor	0.2 to 6.0 LPM	±2% of FS
	Gaseous Volume	Computed from Flow and Time	999.9 L	±2% of rdg.
	Time of Sampling	Stop watch / Timer	9 h 59 min 59 s	±2 sec
<b>Auxiliary Temperature</b>	Exit Gas Temperature or Heated Probe	PT100°C or T/C K Type	0 to 100.0 °C or 0 to 200.0 °C	±0.5 °C ±1°C
<b>Leak Check</b>	Leak Rate	Computed from Vacuum drop and Time	0.1 to 9.9 LPM	±10 %
<b>Additional Feature</b>	Auto Start & Stop of Sampling Pump	Through Start & Stop key of Stopwatch / Timer		

### Impinger Module

This module is required for gaseous sampling and moisture removal, It consists of a foldable stand and a lightweight cooling box. The cooling box, which is made of plastic, has the provision to contain ice for cooling the impingers. The Impinger box has the capacity to accommodate 4 nos. of 125 ml capacity and 2 nos. of 250 ml capacity glass impingers.

### Sampling Pump Module

<b>Sampling Pump</b>	Monoblock, Dry Rotary type with Graphite Vanes coupled to a 0.25 HP. Pump Motor
<b>Motor operating supply</b>	230 V AC, 1 Phase, suitable for 0.25 HP Motor
<b>Free Flow</b>	> 95 LPM   Maximum Vacuum - > 600 mmHg
<b>Controls</b>	Power On / Off switch, Auto / Manual switch, Fuse, Auto start / stop electronic
<b>Size &amp; Weight</b>	24 x 14 x 16 Cms., About 7 Kg.

### Standard Sampling Train and Connecting Accessories

<b>Pitot Tube</b>	Modified S-type made of SS 304 duly calibrated 1.2 Meter length with ext. pipes
<b>Sampling Probe</b>	SS 304 tube (ID >15 mm) 1.2 Meter length with extension pipe
<b>Nozzles Set</b>	3 SS Nozzles (¼", 3/8 & ½" bore) with sharp & tapered outer leading edge.
<b>Stack Thermocouple</b>	0.6 Meter long* K type in SS housing with 3 mtr. Cable.
<b>Thimble Holder</b>	Tapered design made from SS 304 for Cellulose ( 28/100 ) & G/F Thimbles.(19/90 )
<b>Tool kit</b>	Containing essential tools required for assembly of Sampling Train
<b>Poly-urethane Interconnection tubes</b>	12 mm OD – 3 Nos. All tubes 3 meters long (Other length Optional) 6 mm OD – 2 Nos. All tubes 3 meters long (Other length Optional)

### Accessories

Whatman Glass Fiber Thimbles, Whatman Cellulose Filter Thimbles, Glass Impingers of various types & capacity, Silica gel traps, Condenser of various types, Pitot Tubes of various length, Sampling Probes of various length, PU Tubes of various length, Thermocouple, of various length. Nozzles of various sizes, High temperature Pitob assemblies.

### Related Products

<b>Automatic Stack Monitoring System Model PEM– SMS4</b>	<b>Manual Stack Monitoring Kit Model PEM–SMK-10B, PEM–SMK-10M</b>
<b>Digital Stack Velocity Meter Model PEM–SVM1</b>	<b>Heated Sampling Probes Model PEM-HGLP3,PEM-HTLP3, PEM–HSLP3</b>
<b>PM<sub>10</sub> Sampling Equipment Model PEM - STPM10- X</b>	<b>Sampling Equipment PEM - STPM2.5-X</b>
<b>Heated Filter Box Model PEM–HFB2; Sampling Equipment for NO<sub>x</sub>, Sulfuric Acid Mist, Metal Emission, Halogen &amp; Halides, Volatile Organic Compounds, Dioxins &amp; Furans etc.</b>	

# MANUAL STACK MONITORING KIT

## Available Model

**PEM-SMK-10B**

**PEM-SMK-10M**

Industrial stacks are the means by which an industrial plant discharges its gaseous wastes into the atmosphere. These gaseous effluents may contain pollutants which may be organic or inorganic in chemical nature and be in may be solid, liquid, or gas in physical form.

Stack Monitoring is an instrumental method or procedure for evaluating the characteristics of the emissions into the atmosphere from industrial waste gas streams. Effluent measurements and sampling procedures follow specific test methods and protocols to ensure representative and accurate emission data. Test methods are pollutant specific, sometimes industry specific and originate from a variety of sources and jurisdictions such as USEPA, CPCB etc.

### Salient Features

- Portable, Compact and Light Weight
- User Friendly Control Module
- Multi-Function Electronic Unit with Digital Electronic Manometer
- Programmable For Start and Stop of Sampling Pump
- Digital Display of Stack Gas & Gas Meter Temperatures
- Electronic High Precision Gas Flow & Volume Meter for Particulate Flow
- Light-Weight Sampling Pump
- Fiber Glass Impinger Module
- Design Complies with Specifications recommended by US EPA & CPCB, New Delhi



Manual Stack Monitoring Kit can be used to take accurate representative samples of particulate matter and various gaseous pollutants such as SO<sub>2</sub>, NO<sub>x</sub> etc. from the stack in accordance with the methodologies developed by US EPA.

### Monitoring Kit Description

Polltech manufactures two models of Stack Monitoring Kit. These models are called Model PEM-SMK-10B and Model PEM-SMK-10M. The two models are similar in most respects. PEM-SMK-10B is a battery operated instrument where as Model PEM-SMK-10M is a mains cum battery operated instruments. Model PEM-SMK-10M also includes a provision for automatic starting and stopping of the sampling pump. For accomplishing this, two modes are provided viz. timer mode and stop watch mode. In all other respects the two models are similar and are referred in the rest of this document as simply Model PEM-SMK-10.

**PEM-SMK10** consists of a control module, a sampling pump and a set of standard sampling accessories. A stack gaseous sampling add-on (**Model PEM-SSCIB-1X**) with 6 glass impingers is provided as standard accessory for sampling of gaseous pollutants and determination and removal of moisture.

### Control Module

The module houses a electronic gas flow and volume meter for particulate flow, one gaseous rotameter, two control valves, a vacuum gauge for meter vacuum and a multifunction electronic unit, which gives digital display of the various parameters such as stack gas temperature, meter temperature, Pitot differential pressure along with an electronic stopwatch / timer. The stopwatch /timer function can be used for auto start and stop of sampling pump when model PEM-SMK 10M is operated on mains power.

### Impinger Module (Stack gaseous sampling add-on Model PEM-SSCIB-1X)

Required for gaseous sampling, consists of a thermocole-insulated lightweight, fiberglass cabinet, which is capable of accommodating 4 nos. of 125 ml capacity and 2 nos. of 250 ml capacity glass impingers. The required low temperature is maintained by keeping ice in the module

### Sampling Pump

Sampling Pump is a very lightweight mono-block dry type pump with a free flow of about 100 LPM.

### Standard Sampling accessories

Standard sampling accessories includes Pitot tube, thimble filter holder, thimble pipe, nozzles, stack thermo-couple and interconnecting tubes etc.

## Detailed Technical Specifications

### Sampling accessories

<b>Pitot Tube</b>	Modified S-type Pitot tube of SS 304 duly calibrated 1 Meter length *
<b>Sampling Probe</b>	Fabricated from SS 304 tube (ID >15 mm) 1 Meter length *
<b>Nozzles</b>	A set of 3 SS Nozzles (¼", 3/8 & ½" bore) with sharp & tapered outer leading edge.
<b>Stack Thermocouple</b>	1 Meter long* K type in SS housing with 3 mtr. Cable.
<b>Thimble Holder</b>	Tapered design made from SS 304 / 316 for Cellulose & G/F Thimbles.
<b>Poly-urethane Interconnection tubes</b>	12 mm OD – 3 Nos. All tubes 3 meters long * 6 mm OD – 2 Nos. All tubes 3 meters long *
<b>Tool kit</b>	Containing essential tools required for assembly of Sampling Train

### Control Module

Measured Parameter	Required for	Methodology	Range	Accuracy	Display	
					Mode	Device
<b>Pitot Δp</b>	Velocity	Pressure Sensor	200.00 mmWC (1300 mmwc onrequest)	±0.5% FS	Digital	LCD Display Module
<b>Stack Gas Gauge Pressure</b>	Velocity, Iso-kinetic particulate sampling and Gaseous sampling					
<b>Stack Gas Temperature</b>	Iso-kinetic particulate Sampling	K Type Thermocouple	60 <sup>o</sup> C	±2 <sup>o</sup> C		
<b>Particulate Flow</b>		Orifice dp measured by Pressure sensor	2-60.0 LPM	±2% FS		
<b>Sample Volume</b>		Computed from Flow and Time	9999.9 - 9999 Liters	±2% of reading		
<b>Meter Temperature</b>	Iso-kinetic particulate Sampling & Gaseous sampling	K Type Thermocouple	60 <sup>o</sup> C	±1 <sup>o</sup> C	Digital	LCD Display Module
<b>Meter Vacuum</b>		Vacuum gauge	0-760 mmHg	±5%	Analog	
<b>Time / Timer</b>		Quartz crystal controlled Stop Watch/Timer	9 Hours, 59 minutes, 59 seconds	±0.1%	Digital	LCD Display Module
<b>Gaseous Flow</b>	Gaseous Sampling	Rotameter	0-6 LPM	±2%	Analog	Rotameter
<b>Pneumatic Connections</b>	Push fit unions: 2 Nos. for 6mm OD for Ptot tube and 2 Nos. for 12mm OD PU tube for sample inlet and sample outlet					
<b>Housing</b>	High quality, light-weight powder coated aluminum box					
<b>Power</b>	6 VDC from 1.5x4 dry cells or from external adaptor (110-230 V AC). 230 AC for Pump operation for SMK10M					
<b>Dimensions</b>	31 x 32 x 17 Cms. and <b>Weight</b> about 4 Kg.					

### Sampling Pump

<b>Type</b>	Monoblock, Dry Rotary type with Graphite Vanes coupled to a 1/4 H.P. Pump Motor
<b>Motor operating supply</b>	230 V AC, 1 Ph, suitable for 0.5 HP Motor
<b>Free Flow &amp; Max. Vacuum</b>	> 95 LPM & > 600 mm Hg
<b>Weight</b>	About 7 Kg.

### Add-Ons

PEM-SMK10 facilitates sampling for gaseous pollutants as per EPA specified methods through an add-on Standard Stack Gaseous Sampling Equipment Model PEM-SSCIB-1X. It comprises of a thermocole-insulated lightweight, cabinet, which is capable of accommodating 4 nos. of 125 ml capacity and 2 nos. of 250 ml capacity glass impingers. The required low temperature is maintained by keeping ice in the module.

### Accessories

Whatman Glass Fiber Thimbles, Whatman Cellulose Filter Thimbles, Glass Impingers of various types & capacity, Pitot Tubes of various length, Sampling Probe s of various length, PU Tubes of various length, Thermocouple, of various length. Nozzles of various sizes.

### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4

**Manual Stack Monitoring Kit** Model PEM-SMK-10B, PEM-SMK-10M

**Digital Stack Velocity Meter** Model PEM-SVM1

**Heated Sampling Probes** Model PEM-HGLP3, PEM-HTLP3, PEM-HSLP3

**Heated Filter Box** Model PEM-HFB2

**Sampling Equipment for NO<sub>x</sub>, Sulfuric Acid Mist, Metal Emission, Halogen & Halides, Volatile Organic Compounds, Dioxins & Furans etc.**

**PM<sub>10</sub> Sampling Equipment** Model PEM - STPM10-X

**PM<sub>2.5</sub> Sampling Equipment** PEM - STPM2.5-X



# AUTOMATIC STACK MONITORING SYSTEM

## Available Model PEM-SMS4

Industrial stacks and ducts are the means by which an industrial plant transports its gases for discharge into the atmosphere. Stack Monitoring is an instrumental method or procedure for evaluating the characteristics of the emissions into the atmosphere from industrial waste gas streams. Effluent measurements and sampling procedures follow specific test methods and protocols to ensure representative and accurate emission data. Test methods are pollutant specific, sometimes industry specific and originate from a variety of sources and jurisdictions such as USEPA, CPCB etc.

### Salient Features

- ☞ True Iso-kinetic Sampling
- ☞ Automatic Computation Of Online Linear Velocity & Iso- Kinetic Flow Rate
- ☞ Automatic Control of Flow to Iso-Kinetic conditions
- ☞ Ideal Nozzle size Computation
- ☞ Computation of Number of Traverse Points and their Distances
- ☞ On-Line Condenser Temperature Measurement & Moisture Correction
- ☞ Automatic Recording of Data
- ☞ Compact, Lightweight, Portable & Battery Operated



Model PEM-SMS4 is a highly advanced automatic iso-kinetic sampler, which facilitates the measurement of Particulate Matter (PM) moisture and gaseous pollutants in stacks and ducts. It not only computes Traverse Points (EPA method 1) and stack gas velocity (EPA method 2) but also continuously computes iso-kinetic flow and regulates the sampling flow rate automatically to comply with iso-kinetic sampling conditions throughout the sampling process (EPA method 5 and method 17, 26, 29).

### Monitoring System Description

PEM-SMS 4 comprises a **control module**, a **pump interface module** with sampling pump, a **condenser unit** and **sampling accessories** such as Nozzles, Thimble Holder, interconnection hardware and a Pitob assembly consisting of a Pitot tube, a stack gas temperature sensor and a Sampling Probe mounted on special clamps. A stack **gaseous sampling add-on (Model PEM - SSCIB 1-X)** with 6 glass impingers is provided as **standard accessory**.

The control module is microprocessor-based which carries out multiple functions. It serves as a data acquisition and computation system and operator interface. It houses an orifice system and the corresponding flow connection ports. It houses three solid state pressure sensors; one each for the measurement of Pitot tube differential pressure, orifice differential pressure and orifice inlet pressure. It houses a solid state temperature sensor which measures the orifice temperature.

The embedded software of control module enables manual inputting of gas composition and moisture contents. It processes the acquired measurements and manually inputted data to carry out various computations in accordance with US EPA requirements for measurement of Stack Gas Velocity, Moisture content and for iso-kinetic sampling of PM. It recommends the ideal nozzle size, number of traverse points & their distances. It then computes the iso-kinetic set point, which is displayed and utilized for continuous control of the sampling flow rate through a proportional control valve. It enables selection of the required mode of sampling for particulate, moisture or gaseous sampling. It enables storage of all data; automatically-acquired and manually-entered; in the system's internal non-volatile memory. It carries out the computation of particulate matter concentration, volumetric discharge and emission rate of PM from the stack and enables printing of the data.

The pump module houses a dry sampling pump, a proportional flow control valve and necessary electronics for communicating with control module. All components are housed in a sturdy cabinet.

### Detailed Technical Specifications Standard Accessories

<b>Pitot Tube</b>	: Modified S-type Pitot tube of SS 304 with engraved markings and duly calibrated Standard L=1 Meter.
<b>Sampling Probe</b>	: Fabricated from SS 304 tube (ID >15 mm). Standard Length =1 Meter.
<b>Nozzles</b>	: A set of 3 SS Nozzles (¼", 3/8 & ½" bore) with sharp & tapered outer leading edge.
<b>Stack Thermocouple</b>	: K type in SS housing with 3 mtr. Cable, suitable up to 1000°C Standard Probe Length = 1 Meter.
<b>Thimble Holder</b>	: Tapered design made from SS 304 / 316 for Cellulose & G/F Thimbles.
<b>Inter Connection</b>	: 3 Nos. of PU Tubes of 12 mm OD & 2 Nos. PU Tubes of 6 mm OD of each of 3 mtr. length.
<b>Pitob Box &amp; Tool Kit</b>	: For carrying Pitot Tube, Sampling Probe & Stack Thermocouple along with essential tools required

## CONDENSER UNIT

All metal, thermally insulated condenser unit with copper coil for cooling of the sample gas and removal of moisture and collection of water condensate. A solid state temperature sensor measures gas outlet temperature for on line moisture correction.



## PUMP INTERFACE MODULE

Sampling Pump	Monoblock type Dry Rotary Vane Pump with Graphite Vanes and 0.25 HP Motor
Flow Control Element	Proportional control valve
Control Signals	From Control module through 10 core cable
Status Indicators	4 LED's for Control Valve, Pump, Maximum Flow & Minimum Flow
Free Flow and Maximum Vacuum	Free Flow > 95 LPM. Vacuum more than 600 mm Hg
Operating Power Supply	230 V AC, 1 Ph, suitable for 0.5 HP Motor
Size and Weight	21 X 30 X 28 CMs. Weight - 13 Kg



## ELECTRONIC CONTROL MODULE

Display	32 character large LCD display module
Keys	10 Nos. (PARAMETER., PROG. / RUN, RESULT-START / ↑, STOP / ↓, → ← & ENTER)
Sampling Modes	Particulate / Moisture / Gaseous Sampling
User Supplied Parameters	Barometric Pressure or Altitude. Pitot tube co-efficient. Stack or Duct dimensions. Molecular weight or composition of stack gas. Condensate Water volume. Initial & Final weight of filter thimble
Measured and Displayed Parameters	
Stack gas Temperature	Ambient to 1200°C
Pitot Tube Δp	0 to 200.0 mm WC
Stack gas / orifice inlet pressure	0 to 760 mmHg
Orifice meter Δp	0 to 200.0 mm WC
Orifice meter Gas Temp.	0 to 60.0°C
Cooled Gas outlet Temp.	0 to 55°C
Computed Parameters	
Moisture Concentration	0.1 to 60 %
Stack gas Velocity	0 to 99.9 M / sec
Computed Iso-kinetic Flow Rate	10-100 LPM
Actual Sampling Flow Rate	10-100 LPM
Total Volume Collected (STP)	0-999.9 Liters
Gaseous Flow Rate (STP)	~1 to ~2 LPM
Gaseous Volume	0 to 99.9 liters
Total sampling Time	0 to 999 Minutes 59 seconds
Leak rate	0 to 9.9 LPM
Other Parameters	PM concentration, Volumetric Discharge, Emission Rate, Average Stack Gas Velocity
Parameters Stored	For more than 10 samples
Communication port	USB FOR DATA TRANSFER TO PC. WINDOW BASED PC SOFTWARE PROVIDED ON CD
Data Transferred Type	All measured parameters, all computed parameters and all user supplied data
Pneumatic Connections	Pushfit unions: 2 Nos. for 6mm OD and 2 Nos. for 12mm OD PU tube
Housing	High quality, light-weight aluminum box with hinges & lock
Power	From Rechargeable Li-ion battery. External charging adaptor for 110-230 VAC.
Dimensions & Weight	35 x 28 x 15 CMs. Weight – 6 KG.

## Add-Ons

PEM-SMS 4 facilitates sampling for gaseous pollutants as per EPA specified methods through an add-on comprising an Impinger Box with six glass impinger bottles for sampling of gaseous pollutants

Add-on Name	Model	
Standard Stack Gaseous Sampling Equipment	Model PEM - SSCIB 1-X	Add-on comprising a thermally insulated light weight Impinger Box with six glass impinger ( 2 nos. of 250 ml and 4 nos. of 125 ml capacity for sampling of gaseous pollutants. Size-30x34x18 CMs. Wt.- 5Kg.

## Accessories

Whatman Cellulose Thimbles, Whatman Glass Fiber Thimbles, Silica Thimbles, Spare Glass Impingers, Glass Moisture Condenser, Silica Gel Traps. Pitot Tube, Sampling Probe, Thermocouple, etc. of various length and for high temperature ( up to 1200 °C). PU Tubes of various lengths up to 25 meters.,

## Related Products

Manual Stack Monitoring Kit Model PEM-SMK10B, PEM-SMK10M

Heated Sampling Probes Model PEM-HGLP3, PEM-HTLP3, PEM-HSLP3

Sampling Equipment for NOx, Sulfuric Acid Mist, Metal Emission, Halogen & Halides, Volatile Organic Compounds, Dioxins & Furans etc.

PM<sub>10</sub> Sampling Equipment Model PEM - STPM10-X

Digital Stack Velocity Meter Model PEM-SVM1

Heated Filter Box Model PEM-HFB2

PM<sub>2.5</sub> Sampling Equipment PEM - STPM2.5-X

## Method 23 - Determination of Polychlorinated Dibenzop-dioxins, Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Polycyclic Aromatic Hydrocarbons from Stationary Sources

**Applicability.** This method applies to the measurement of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), polychlorinated biphenyls (PCB), and/or polycyclic aromatic hydrocarbons (PAH) in emissions from stationary sources. Using this method, you can measure these analyte groups individually or in any combination using a single sample acquisition unless otherwise specified in a rule, regulation, or permit. Tables 23-1 through 23-3 of this method list the applicable target analytes for Method 23. If all 209 PCB are analyzed, the 17 toxic PCB congeners should be resolved and reported while the other PCB can be reported as totals by homolog, for example, total trichlorobiphenyl (TrCB).

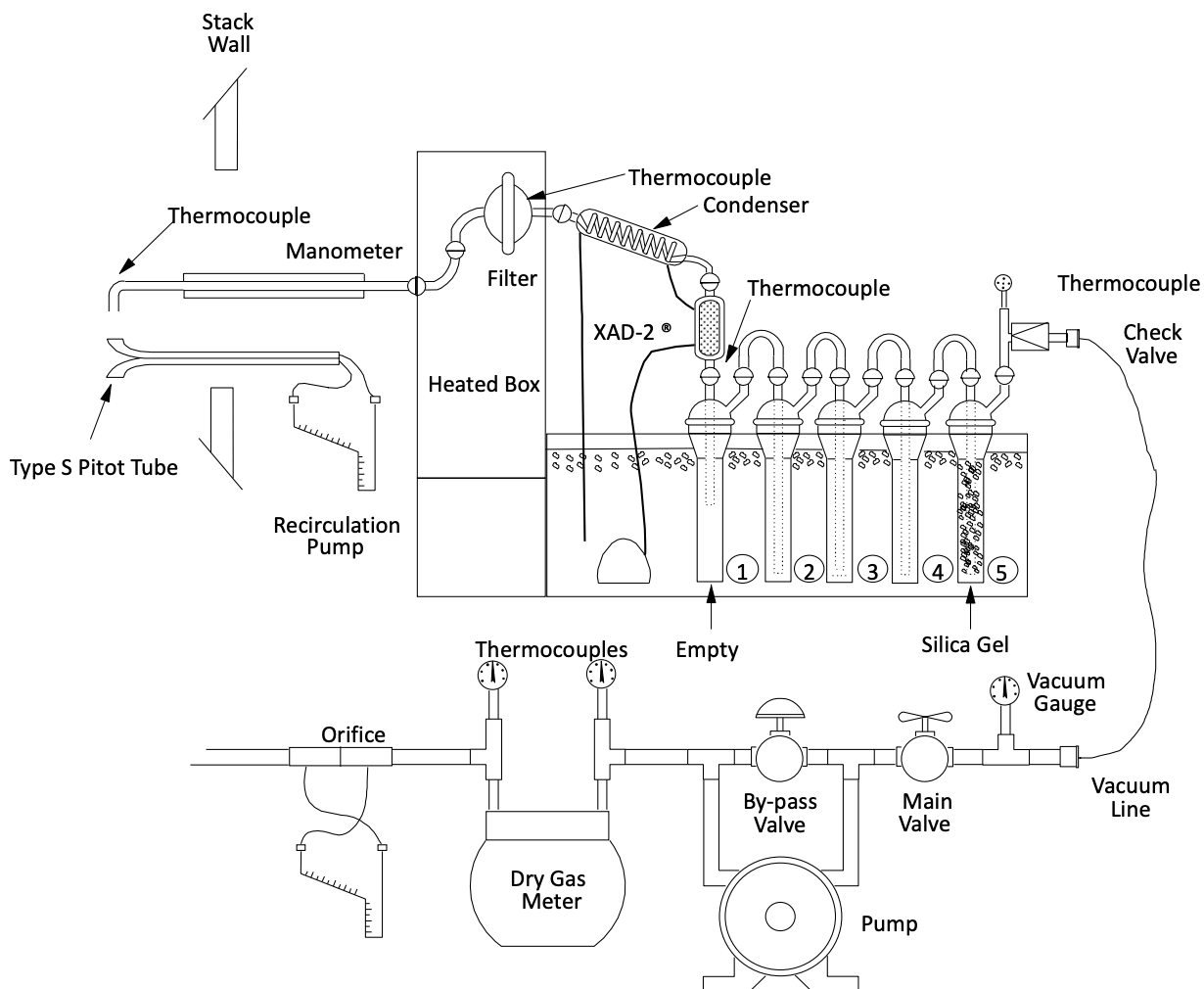


Figure 23-1. Method 23 Sampling Train



# DIOXIN FURAN SAMPLING EQUIPMENT

## Available Models

### PEM-DFS1-X, PEM-DFS2-X

Dioxins and furans are unwanted by-products generated during manufacturing of certain chemicals and combustion processes such as the incineration of municipal and industrial waste, wood and petrol burning. Dioxin has often been found to be one of the most toxic substances known to human beings.

US EPA Method 0023A is the accepted method of sampling for dioxins and furan emissions from stationary sources. This method involves iso-kinetic withdrawal of gaseous and particulate PCDDs/PCDFs from the stack in a heated glass lined probe, removal of particulate phase in a heated filter holder and collection of the gaseous phase on a cooled solid sorbent (XAD-2®) module and a set of glass impingers for removal of moisture. The filter and XAD extracts are analyzed using High Performance GCMS. A standard metering system can be used for measurement and control of various parameters.



PEM - DFS1-X



PEM - DFS2-X

### Salient Features

- Fully compliant with US EPA Method 0023A
- Thermally Insulated Ice-Cold Water Bath
- Glass Impingers with Leak Free Spherical Joints
- Outlet Gas & Condenser Temperature Display Unit
- Submersible Water Circulation Pump
- Compact and Light weight
- Glass and PTFE in Gas Contact

Polltech provides complete sampling system for Dioxin Furan Sampling. It consists of a set of glass nozzles, a heated glass lined probe ( model PEM-HGLP3S ), a heated filter box (model PEM-HFB2), an insulated PTFE sample transport tube and a sample collection equipment in two models viz. PEM-DFS1-X & PEM-DFS2-X. The metering system for iso-kinetic sampling can be either be a manual kit ( PEM-SMK10) or automatic kit (PEM SMS-4). The sample collection module can also be provided as add-on for an existing EPA method 5 sampling train.

The sample transport tube is used for connecting the outlet of heated filter box to the sample collection module. It basically consists of a PTFE tube which is thermally insulated with glass wool insulation. The entire tube, except its two ends, is encapsulated with a heat shrinkable PTFE sleeve.

Model PEM-DFS1-X sample collection module comprises of a double walled multi coiled glass condenser before the double walled water jacketed XAD Module. An arrangement for circulating the cold water helps in maintaining temperature below 20<sup>0</sup> Celsius. This is achieved by including a cooling box and a water circulating pump for cooling the condenser and the XAD solid adsorbent module. A temperature sensor (K type thermocouple) mounted on the glass condenser is provided for measurement of cooling available. All these assemblies are housed in a sturdy portable ABS plastic case. A separate impinge box can be used for removal of moisture. All pneumatic connections are made with PTFE unions and are completely leak free.

Model PEM-DFS2-X is an enhanced version of PEM-DFS1-X. This model has all assemblies provided with PEM-DFS1-X. In addition a set of user specified number of impingers are also provided. The outlet of XAD solid adsorbent module is directly connected to a 1<sup>st</sup> impinger which is a knock out type with half stem. The second and third impingers are Greeburg-Smith type with standard tip. while the last one is modified G-S type and also has provision for a temperature sensor. All impingers are provided with leak free spherical ball-cup joints. An independent temperature display units provides temperature reading of both- the condenser temperature and the outlet gas temperature. All the assemblies are housed in a laminated wooden or aluminum box.

**Both the models can be used in conjunction with our Stack Monitoring Kit or Stack Monitoring System SMS 4.**



## Detailed Technical Specifications

### Sample Transfer Line

Inner Tube Material	PTFE tube of 12 mm OD and one meter length.
Thermal Insulation	Glass or Ceramic Wool
Outer Encapsulation	Heat shrinkable black PTFE sleeve
Dimensions & Weight	Length: 1 meter Diameter: 25 mm Weight: 1 Kg.

### Sample Collection Module

	Model PEM-DFS1-X	Model PEM-DFS2-X
Condenser	Multi-coiled double walled water cooled glass condenser with thermal insulation.	
Sorbent module	Water cooled threaded glass assembly with a glass frit to hold XAD-2 resin as per USEPA design.	
Condenser Temperature	K type thermocouple for measuring circulating cooled water temperature.	
Water Circulation Bath	Thermally insulated cold box with submersible type water circulating pump for circulation of ice cold water through condenser and sorbent module	
Pneumatic Connections	PTFE unions with ferrules for leak free joints	
Impinger train	Not provided	4 glass impingers of 240 ml with ball & cup joints
1 <sup>st</sup> Impinger	Not provided	Knock-out type with half stem
2 <sup>nd</sup> and 3 <sup>rd</sup> Impinger	Not provided	Greenburg-Smith with standard tip
4 <sup>th</sup> Impinger	Not provided	Modified Greenburg-Smith with temperature sensor
Temperature Display Unit	Not provided	2 channels for condenser & outlet gas temperature
Power	230 V AC Mains power	
Enclosure	ABS Suitcase	Wooden / Metal Box with cover
Dimensions & Weight	20 X 47 X 58 Cm Wt- 6 Kg	49 x 22 x 44 Cm Wt-12 Kg

### Accessories

Glass Condenser, Sorbent Module, Threaded PTFE Cap for sorbent module, Closing Cap (PTFE) for sorbent module

### Related Products

**Automatic Stack Monitoring System** Model PEM –SMS4

**Manual Stack Monitoring Kit** Model PEM–SMK10B, PEM–SMK10B

**Heated Filter Box** Model PEM–HFB 2

**Heated Sampling Probes** Model PEM-HGLP3,PEM-HTLP3, PEM-HSLP3

**Volatile Organic Sampling System** Model PEM–VOSS1

**Nitrogen Oxides (NOx) Sampling Equipment** Model PEM-NOS1-X

**Sulfuric Acid Mist Sampling Equipment** Model PEM-SAMS1-X

**Halogen and Halides Sampling Equipment** Model PEM-HHS1-X

**Metal Emissions Sampling Equipment** Model PEM-MES1-X

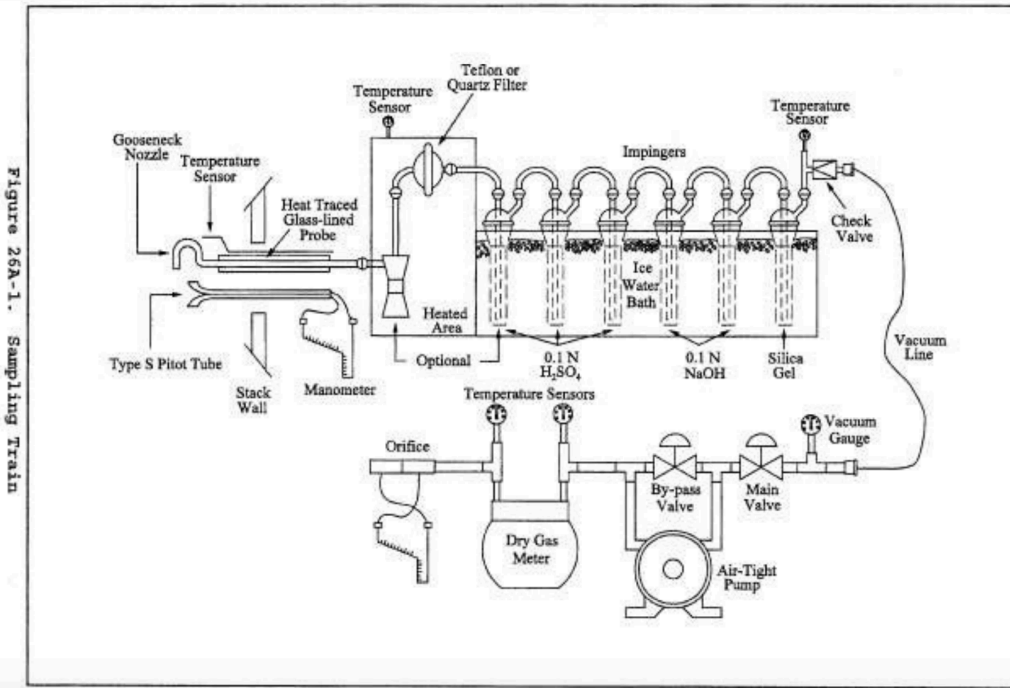
**PM<sub>10</sub> Sampling Equipment** Model PEM-STPM10-X

**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM2.5-X

**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB 1-X

## METHOD 26A—DETERMINATION OF HYDROGEN HALIDE AND HALOGEN EMISSIONS FROM STATIONARY SOURCES ISOKINETIC METHOD

**Applicability.** This method is applicable for determining emissions of hydrogen halides (HX) [HCl, HBr, and HF] and halogens (X<sub>2</sub>) [Cl<sub>2</sub> and Br<sub>2</sub>] from stationary sources when specified by the applicable subpart. This method collects the emission sample isokinetically and is therefore particularly suited for sampling at sources, such as those controlled by wet scrubbers, emitting acid particulate matter (e.g., hydrogen halides dissolved in water droplets).



# HALOGENS AND HYDROGEN HALIDES SAMPLING

## Available Model

### PEM-HHS1-X

Measurement of Halogens Chlorine (Cl<sub>2</sub>), Bromine (Br<sub>2</sub>) and halides Hydrogen Chloride (HCl), Hydrogen Bromide (HBr), Hydrogen Fluoride (HF), emitted from stationary sources viz. Industrial stacks is carried out as per US EPA Method 26 (Non-isokinetic method) or Method 26A (Isokinetic method).

Polltech provides complete sampling system for Halogen-Halides sampling. It consists of a set of glass nozzles, a heated glass lined probe (model PEM-HGLP-3S), a heated filter box (model PEM-HFB-2), an insulated PTFE sample transport tube and a sample collection equipment consisting of 5 or 6 glass impingers in an impinger box. The metering system for iso-kinetic sampling can be either be a manual kit (PEM-SMK-10) or automatic kit (PEM SMS-4). The sample collection module can also be provided as add-on for an existing EPA method 5 sampling train.

PEM-HHS1-X is ideally suited for EPA method 26A and comprises of a specially designed impinger box that consists of five or six number of glass impinger tubes with leak tight ball and cup joints. The impingers are housed in a thermally insulated box which can be filled with ice to remove the moisture by condensation and to cool the reagents. The hydrogen halides and halogens present in the sample are adsorbed in appropriate solutions placed in the impingers. Polltech provides a set of six glass impingers of Greenburg Smith type of 240 ml capacity. The 1<sup>st</sup> impinger can be a knock-out impinger with short stem. The 2<sup>nd</sup> and 3<sup>rd</sup> are with standard tip while 4<sup>th</sup> and 5<sup>th</sup> are with modified tip. The last impinger is with Silica gel and has provision for measurement of outgoing gas with a thermometer or digital temperature indicator. All impingers have leak free spherical ball and cup joints are housed in a light weight thermally insulated box.

#### Salient Features

- ☛ Compliant with US EPA Method 26A
- ☛ Can be combined with a Method 5 train
- ☛ Set of six Glass Greenburg-Smith Impingers
- ☛ Leak Free Spherical Joints
- ☛ Thermally Insulated Cold Box



## Technical Specifications

Equipment Item	Specifications
Impinger Train	Six Greenburg-Smith impingers of 240 ml capacity. 1 <sup>st</sup> Knock-out with short stem, 2 <sup>nd</sup> and 3 <sup>rd</sup> with standard tip, 4 <sup>th</sup> and 5 <sup>th</sup> with modified tip and 6 <sup>th</sup> with silica gel.
Connections Internal	Leak-free spherical ground glass joints
Gas Temperature Measurement	Mercury in Bulb Thermometer / Digital Thermometer
Impinger Box	Light weight thermally insulated Box
Connections - External	PTFE / Pushfit Unions suitable for 12 mm OD tube
Dimension & Weight	20(W) x 43(L) x 35(H) CM. Wt. - 6 Kg

## Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4

**Manual Stack Monitoring Kit** Model PEM-SMK-10B, PE-SMK-10B

**Heated Sampling Probes** Model PEM-HGLP3, PEM-HTLP3, PEM-HSLP3

**Volatile Organic Sampling System** Model PEM-VOSS 1

**NOx Sampling Equipment**

**Metal Emissions Sampling Equipment** Model PEM-MES 1-X

**PM<sub>10</sub> Sampling Equipment** Model PEM-STPM10-X

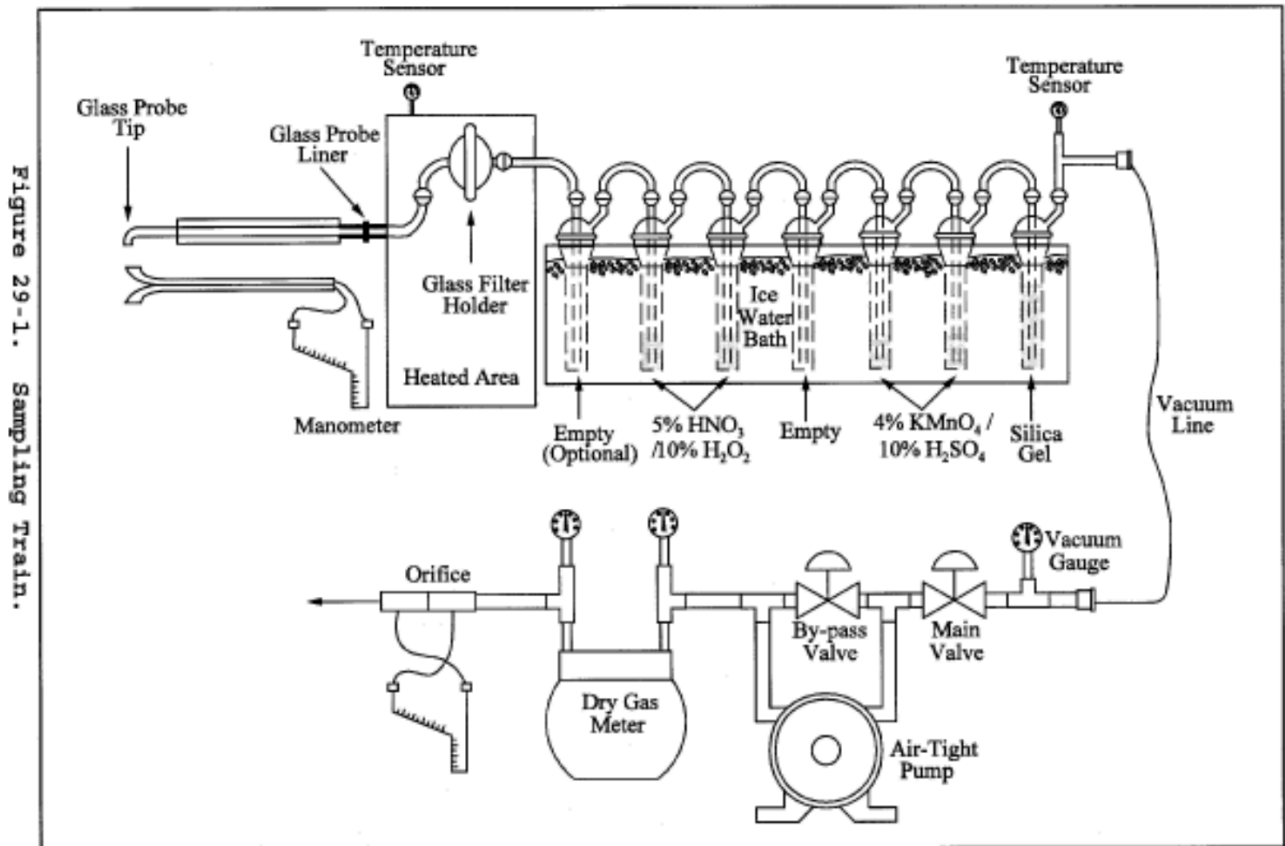
**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM2.5-X

**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB 1-X

## METHOD 29—DETERMINATION OF METALS EMISSIONS FROM STATIONARY SOURCES

**Applicability.** This method is applicable to the determination of metals emissions from stationary sources. This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed.

Hg emissions can be measured, alternatively, using EPA Method 101A of Appendix B, 40 CFR Part 61. Method 101-A measures only Hg but it can be of special interest to sources which need to measure both Hg and Mn emissions.





# METAL EMISSIONS SAMPLING EQUIPMENT

## Available Model

### PEM-MES1-X

Measurement of metals emitted from stationary sources viz. Industrial stacks is carried out as per US EPA Method 29. In this method, A stack sample is withdrawn isokinetically from the source, particulate emissions are collected in the probe and on a heated filter, and gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including Hg) and an aqueous acidic solution of potassium permanganate (analyzed only for Hg).

Polltech provides complete sampling system for metal emission sampling. It consists of a set of glass nozzles, a heated glass lined probe ( model PEM-HGLP-3 ), a heated filter box (model PEM-HFB-2), an insulated PTFE sample transport tube and a sample collection equipment consisting of 6 or 7 glass impingers in an impinger box. The metering system for iso-kinetic sampling can be either be a manual kit ( PEM-SMK-10) or automatic kit (PEM-SMS-4). The sample collection module can also be provided as add-on for an existing EPA method 5 sampling train.

PEM-MES1-X is ideally suited for EPA method 29 and comprises of a specially designed impinger box that consists of six or seven number of glass impinger tubes with leak tight ball and cup joints. The impingers are housed in a thermally insulated box which can be filled with ice to remove the moisture by condensation and to cool the reagents. The hydrogen halides and halogens present in the sample are adsorbed in appropriate solutions placed in the impingers. Polltech provides a set of seven glass impingers of Greenburg Smith type of 240 ml capacity. The 1<sup>st</sup> impinger can be a knock-out impinger with short stem. The 2<sup>nd</sup> and 3<sup>rd</sup> are with standard tip while 4<sup>th</sup> is empty. 5<sup>th</sup> and 6<sup>th</sup> are used when Hg measurements are also required. The last impinger is with Silica gel and has provision for measurement of outgoing gas with a thermometer or digital temperature indicator. All impingers have leak free spherical ball and cup joints are housed in a light weight thermally insulated box.

#### Salient Features

- ☛ Compliant with US EPA Method 29
- ☛ Can be combined with a Method 5 train
- ☛ Set of Seven Glass Greenburg-Smith Impingers
- ☛ Leak Free Spherical Joints
- ☛ Thermally Insulated Cold Box



#### Technical Specifications

Equipment Item	Specifications
Impinger Train	Seven Greenburg-Smith impingers of 240 ml capacity. 1 <sup>st</sup> Knock-out with short stem, 2 <sup>nd</sup> and 3 <sup>rd</sup> with standard tip, 4 <sup>th</sup> empty, 5 <sup>th</sup> and 6 <sup>th</sup> for Mercury and 7 <sup>th</sup> with silica gel. Fittings: Leak-free spherical ground glass joints
Gas Temperature Measurement	Mercury in Bulb Thermometer / Digital Thermometer
Impinger Box	Light weight thermally insulated wooden / aluminum Box
Connections - External	Push fit Unions suitable for 12 mm OD tube
Dimension & Weight	20(W) x 43(L) x 35(H) CM. Wt. - 6.5Kg

#### Related Products

Automatic Stack Monitoring System Model PEM-SMS 4  
 Manual Stack Monitoring Kit Model PEM-SMK10B, PEM-SMK 10B  
 Heated Sampling Probes Model PEM-HGLP 3, PEM-HTLP3, PEM-HSLP3  
 Volatile Organic Sampling System Model PEM-VOSS 1  
 NOx Sampling Equipment Model PEM-NOS 1  
 Halogen and Halides Sampling Equipment Model PEM-HHS 1-X  
 PM<sub>10</sub> Sampling Equipment Model PEM-STPM10-X  
 PM<sub>2.5</sub> Sampling Equipment PEM-STPM2.5-X  
 Standard Stack Gaseous Sampling Equipment Model PEM-SSCIB1-X

## METHOD 8—DETERMINATION OF SULFURIC ACID AND SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

**Applicability.** This method is applicable for the determination of H<sub>2</sub>SO<sub>4</sub> (including H<sub>2</sub>SO<sub>4</sub> mist and SO<sub>3</sub>) and gaseous SO<sub>2</sub> emissions from stationary sources.

**NOTE:** Filterable particulate matter may be determined along with H<sub>2</sub>SO<sub>4</sub> and SO<sub>2</sub> (subject to the approval of the Administrator) by inserting a heated glass fiber filter between the probe and isopropanol impinger (see section 6.1.1 of Method 6). If this option is chosen, particulate analysis is gravimetric only; sulfuric acid is not determined separately.

**Data Quality Objectives.** Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

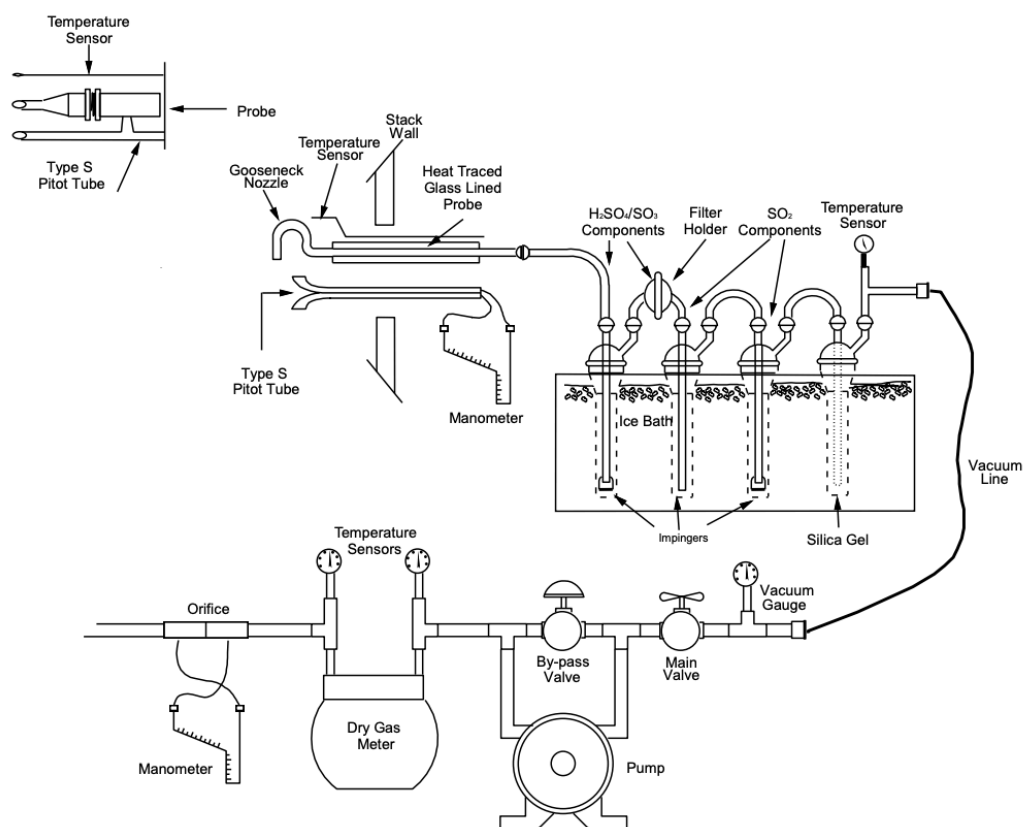


Figure 8-1. Sulfuric Acid Sampling Train

# SULFURIC ACID MIST SAMPLING EQUIPMENT

## Available Model:

### PEM-SAMS-1-X

Measurement of Sulfuric Acid Mist emitted from stationary sources viz. Industrial stacks is carried out as per US EPA Method 8. In this method, a stack sample is withdrawn isokinetically from the stack. The sulfuric acid mist (including sulfur trioxide) and sulfur dioxide are separated and both fractions are measured separately by barium-thorin titration

Polltech's model PEM-SAMS1-X has been designed to facilitate collection of the grab sample in accordance with the stipulations of US EPA Method 8.

The sampling method is similar to EPA method 5 except with few modifications. It basically comprises of a Heated glass lined probe, an impinge train with a unheated filter holder and four glass impingers followed by a iso-kinetic metering module ( Stack monitoring kit Model PEM-SMK 10 or Model PEM-SMS 4 ) and a sampling pump. The filter holder is placed between the first and third glass impinger.

#### Salient Features

- ☛ Compliant with US EPA Method 8
- ☛ Set of 4 nos. of glass impingers in thermally insulated cold box
- ☛ Option of Glass or PTFE Filter Holder
- ☛ Greenburg-Smith type Glass Impingers with standard tips.
- ☛ Digital Temperature Indicator of outgoing gas



#### Technical Specifications

Equipment Item	Specifications
Filter holder	Unheated borosilicate glass, with a glass frit or unbreakable PTFE Filter Holder
Impinger Train	Four Impingers connected in series with the filter holder between 1 <sup>st</sup> and 2 <sup>nd</sup> Impinger. Leak-free spherical ground glass fittings are provided.
Impinger Type	1 <sup>st</sup> and 3 <sup>rd</sup> Impinger : Greenburg-Smith impingers with standard tips 2 <sup>nd</sup> and 4 <sup>th</sup> Impinger : Modified Greenburg-Smith impingers
Impinger Box	Thermally insulated Cold Box with ice cooling arrangement
Outlet gas Temperature	Thermometer or Electronic Temperature Indicator

#### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4

**Manual Stack Monitoring Kit** Model PEM-SMK10B, PEM-SMK10B

**Heated Sampling Probes** Model PEM-HGLP3, PEM-HTLP3, PEM-HSLP3

**Volatile Organic Sampling System** Model PEM-VOSS 1

**NOx Sampling Equipment** Model PEM-NOS 1

**Halogen and Halides Sampling Equipment** Model PEM-HHS1-X

**Metal Emissions Sampling Equipment** Model PEM-ME1-X

**PM<sub>10</sub> Sampling Equipment** Model PEM-STPM-10-X

**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM-2.5-X

**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB1-X

## METHOD 201A—DETERMINATION OF PM<sub>10</sub> AND PM<sub>2.5</sub> EMISSIONS FROM STATIONARY SOURCES (CONSTANT SAMPLING RATE PROCEDURE)

Scope. The U.S. Environmental Protection Agency (U.S. EPA or “we”) developed this method to describe the procedures that the stack tester (“you”) must follow to measure filterable particulate matter (PM) emissions equal to or less than a nominal aerodynamic diameter of 10 micrometers (PM<sub>10</sub>) and 2.5 micrometers (PM<sub>2.5</sub>). This method can be used to measure coarse particles (i.e., the difference between the measured PM<sub>10</sub> concentration and the measured PM<sub>2.5</sub> concentration).

Applicability. This method addresses the equipment, preparation, and analysis necessary to measure filterable PM. You can use this method to measure filterable PM from stationary sources only. Filterable PM is collected in stack with this method (i.e., the method measures materials that are solid or liquid at stack conditions). If the gas filtration temperature exceeds 29.4 °C (85 °F), then you may use the procedures in this method to measure only filterable PM (material that does not pass through a filter or a cyclone/filter combination). If the gas filtration temperature exceeds 29.4 °C (85 °F), and you must measure both the filterable and condensable (material that condenses after passing through a filter) components of total primary (direct) PM emissions to the atmosphere, then you must combine the procedures in this method with the procedures in Method 202 of appendix M to this part for measuring condensable PM. However, if the gas filtration temperature never exceeds 29.4 °C (85 °F), then use of Method 202 of appendix M to this part is not required to measure total primary PM.

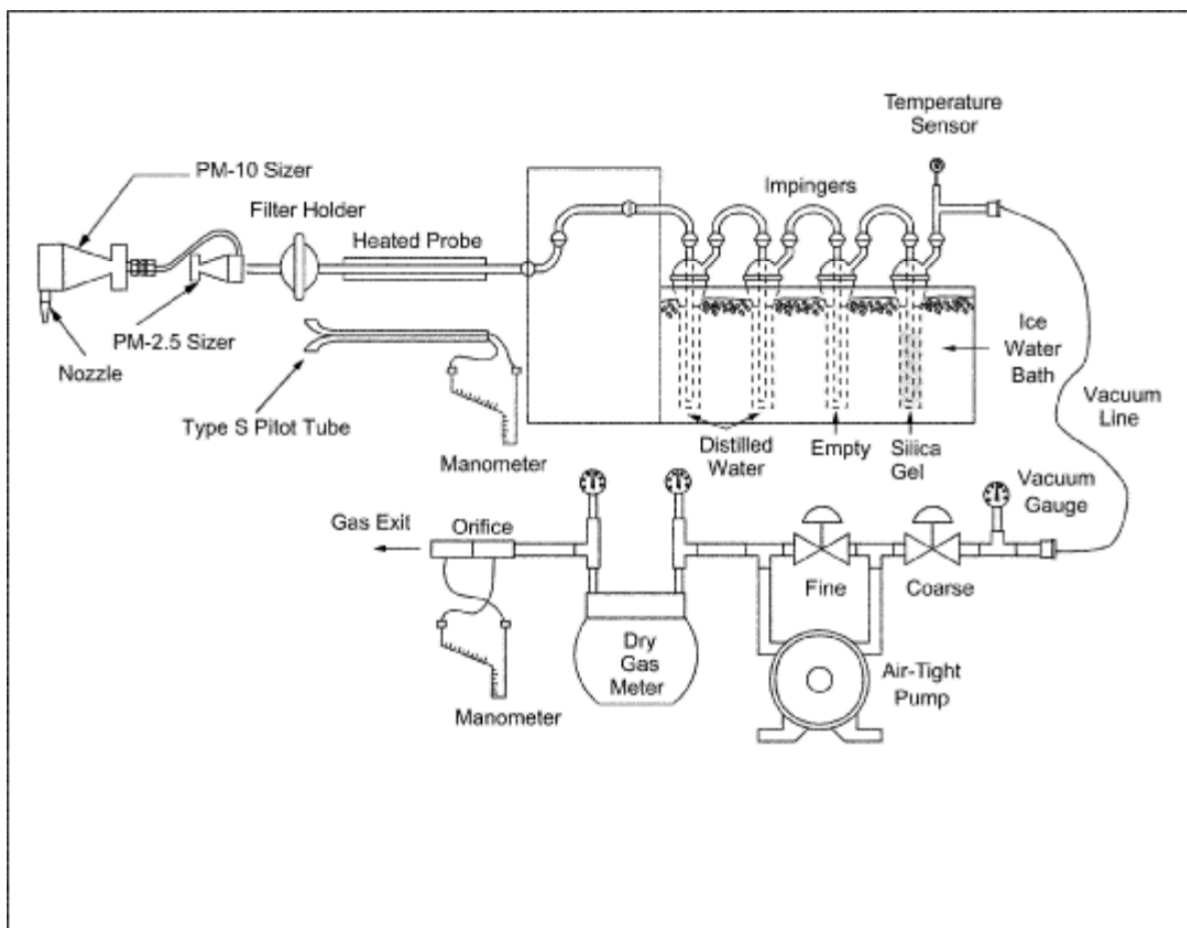


Figure 1. In-stack PM<sub>10</sub> and PM<sub>2.5</sub> Sampling Train



# PM<sub>10</sub> SAMPLING EQUIPMENT

## Available Model PEM-STPM-10X

In-stack measurement of particulate matter (PM) emissions equal to or less than an aerodynamic diameter of nominally 10 µm (PM10) from stationary Sources is carried out as per US EPA Method 201A. In this method, a gas sample is extracted at constant flow rate from the source through an in-stack cyclone which is used to separate PM greater than PM10. An in-stack glass fiber filter is used to collect the PM10. To maintain Iso-kinetic flow rate conditions at the tip of the sampling inlet and a constant flow rate through the cyclone, a set of 11 nozzles of varying diameters are provided. Variations from iso-kinetic sampling conditions are thus maintained within well defined limits.



### Salient Features

- Meets all requirements of USEPA Method 201A with respect to materials, construction, tolerances and finishes.
- Cyclone with a Set of 11 Nozzles.



Polltech's model PEM-STPM-10X comprises the in-stack cyclone and a set of 11 nozzles of various bore size manufactured to the interior dimensional specifications as defined in US EPA Method 201A. The shank has a ½" BSP connection for easy adaption to method 17 thimble holder-probe assembly. It can be used in conjunction with our Automatic Stack Monitoring System or Manual Stack Monitoring Kit. The cyclone kit is enclosed in a sturdy foam lined stainless steel case. A compact in-line filter holder for 47 mm filter paper is available optionally for collection of PM<sub>10</sub>.

### Technical Specifications

	Equipment Item	Specifications
1.	Cyclone	Made of SS316 as per interior dimensional specifications mentioned in US EPA Method 210A
2.	Nozzles Set	A set of 11 nozzles made from SS316 with sharp tapered leading edge. Nozzle diameters vary from 3.45mm to 9.90 mm ( 0.136" to 0.390" ) All sizes Laser engraved
3.	Connection	½" BSP (M) standard. Others-optional
4.	Carrying Case	Foam padded stainless steel. Size- 28 x 21 x 8 Cm.
5.	Filter Holder	In-line type for 47 mm circular filter ( Optional )

### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4  
**Manual Stack Monitoring Kit** Model PEM-SMK-10B, PEM-SMK-10B  
**Heated Sampling Probes** Model PEM-HGLP3, PEM-HTLP3, PEM-HSLP3  
**Volatile Organic Sampling System** Model PEM-VOSS1  
**NO<sub>x</sub> Sampling Equipment** Model PEM-NOS1  
**Halogen and Halides Sampling Equipment** Model PEM-HHS-1X  
**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM-2.5X  
**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB-1X

# PM<sub>2.5</sub> SAMPLING EQUIPMENT

## Available Model PEM-STPM-2.5X

In-stack measurement of particulate matter (PM) emissions equal to or less than an aerodynamic diameter of nominally 10µm (PM<sub>10</sub>) and 2.5 µm (PM<sub>2.5</sub>) from stationary Sources is carried out as per US EPA Method OTM 27. In this method, a gas sample is extracted at constant flow rate from the source through one or more an in-stack sizing device. The sizing device can be a cyclone designed to separate PM<sub>10</sub>, or a cyclone designed to separate PM<sub>2.5</sub> or a combination of two cyclones to provide both size cuts. An in-stack glass fiber filter is used to collect the particulate matter to maintain Iso-kinetic flow rate conditions at the tip of the sampling inlet and a constant flow rate through the cyclone, a set of 12 nozzles of varying diameters are provided. Variations from iso-kinetic sampling conditions are thus maintained within well defined limits.

Polltech's model PEM-STPM-2.5X comprises a in-stack cyclone and a set of 12 nozzles of various bore size manufactured to the interior dimensional specifications as defined in US EPA OTM 27. The shank has a ½" BSP connection for easy adaption to method 17 thimble holder-probe assembly. It can be used in conjunction with our Automatic Stack Monitoring Systems, Manual Stack Monitoring System. The cyclone kit is enclosed in a sturdy foam lined stainless steel case. **A compact in-line filter holder for 47 mm filter paper is available optionally for collection of PM<sub>2.5</sub>.**



**PM<sub>2.5</sub> Cyclone-Filter Holder**



**SS Filter Holder**

### Salient Features

- ☛ Meets all requirements of USEPA Method OTM 27 with respect to materials, construction, tolerances and finishes.
- ☛ Cyclone and Set of 12 Nozzles

### Technical Specifications

Equipment Item	Specifications
<b>Cyclone</b>	Made of SS316 as per interior dimensional specifications mentioned in US EPA OTM 27
<b>Nozzles Set</b>	A set of 12 nozzles made from SS316 with sharp tapered leading edge. Nozzle diameters vary from 3.18 mm( 0.125") to 8.13 mm( 0.320")
<b>Connection</b>	½" BSP (M) standard. Others-optional
<b>Carrying Case</b>	Foam padded stainless steel. Size- 26 x 18 x 8 Cm.
<b>Filter Holder</b>	In-line type for 47 mm circular filter ( Optional )

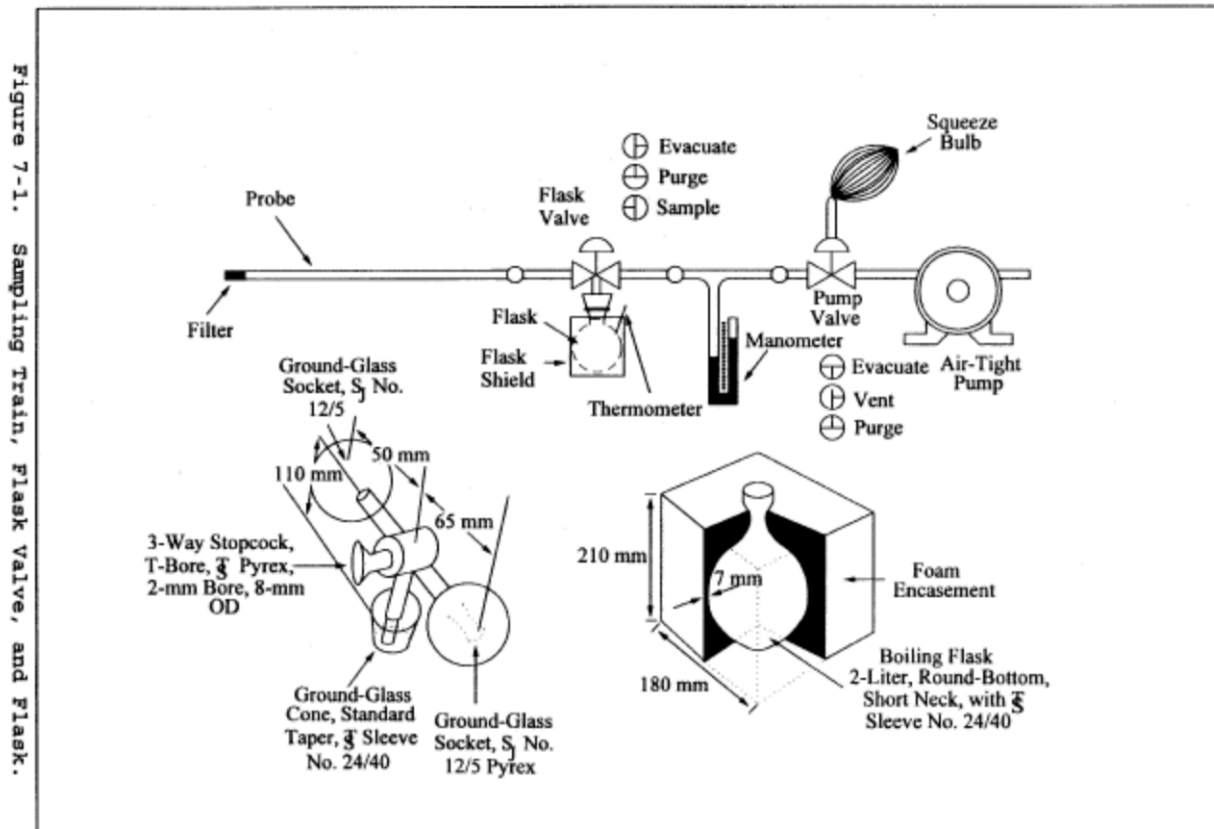
### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4  
**Manual Stack Monitoring Kit** Model PEM-SMK-10B, PEM-SMK-10B  
**Heated Sampling Probes** Model PEM-HGLP-3S, PEM-HTLP-3S, PEM-HSLP-3S  
**Volatile Organic Sampling System** Model PEM-VOSS-1  
**NO<sub>x</sub> Sampling Equipment** Model PEM-NOS-1  
**Halogen and Halides Sampling Equipment** Model PEM-HHS-1X  
**PM<sub>10</sub> Sampling Equipment** PEM-STPM-10X  
**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB-1X

## METHOD 7—DETERMINATION OF NITROGEN OXIDE EMISSIONS FROM STATIONARY SOURCES

Applicability. This method is applicable for the measurement of nitrogen oxides (NO<sub>x</sub>) emitted from stationary sources.

Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sample methods.



# NITROGEN OXIDES (NO<sub>x</sub>) SAMPLING EQUIPMENT

## Available Model PEM - NOS1-X

Measurement of oxides of nitrogen (NO<sub>x</sub>) emitted from stationary sources viz. Industrial stacks is carried out as per US EPA Method 7. In this method, a grab sample is collected in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution, and the nitrogen oxides, except nitrous oxide, are measured colorimetrically using the phenol-disulfonic acid (PDS) procedure. Polltech's model PEM-NOS1-X has been designed to facilitate collection of the grab sample in accordance with the stipulations of US EPA Method 7.

The sampling equipment consists of a round bottom glass flask fitted with a 3-way stopcock. The flask is encapsulated with PE foam and housed in an elegant box. The 3-way stop cock helps in evacuating the flask, flushing the sample line and collecting the NO<sub>x</sub> sample in the evacuated flask. The glass flask has provision to connect a vacuum gauge and a thermometer for measuring the pressure and temperature inside the flask.

### Salient Features

- Meets EPA Method 7 requirements
- Enclosed in a box (with cover) with foam packing
- S-13 Ball & cup joint sides for connection to sampling probe & pump
- Glass Thermometer for measuring temperature of gas in flask
- Vacuum Gauge for measuring vacuum in flask.



### Technical Specifications

	Equipment Item	Specifications
1.	Collection Flask	Round Bottom Borosil Glass of 2 liters capacity
2.	Stop-Cock	3 way with B 34 cone and S-13 Ball Joints for connections to sampling probe and pump with matching cup joints
3.	Thermometer	Type: Mercury in Glass. Range 0-50 <sup>0</sup> C or 0-100 <sup>0</sup> C
4.	Vacuum Gauge	0-760 mm Hg Wika make

### Accessories

Monoblock Dry type light weight vacuum pump for evacuating the flask.  
Various sampling probes of Glass (unheated & heated) & Teflon.

### Related Products

**Automatic Stack Monitoring System** Model PEM – SMS 4,  
**Heated Sampling Probes** with liners of SS / Teflon or Glass  
**Sulfuric Acid Mist Sampling Equipment** Model PEM - SAMS 1-X,  
**Metal Emissions Sampling Equipment** Model PEM - MES 1-X  
**PM<sub>10</sub> Sampling Equipment** Model PEM - STPM10-X

**Manual Stack Monitoring Kit** Model PEM – SMK 10B, PEM – SMK10B  
**Volatile Organic Sampling System** Model PEM – VOSS 1  
**Halogen and Halides Sampling Equipment** Model PEM - HHS 1-X  
**Standard Stack Gaseous Sampling Equipment** Model PEM - SSCIB 1X  
**PM<sub>2.5</sub> Sampling Equipment** PEM - STPM2.5-X



# STANDARD STACK GASEOUS SAMPLING EQUIPMENT

## Available Model PEM-SSCIB1-X

PEM-SSCIB1-X is an add-on which enables sampling of gaseous pollutants by Polltech's Stack Monitoring products viz. Automatic Stack Monitoring System PEM-SMS-4 and Manual Stack Monitoring Kit PEM-SMK-10. In its standard configuration the equipment houses six glass impingers tubes (4 of 125 ml & 2 of 250 ml capacity) in an impinger box. It has provision for filling with ice and drainage of water. The inlet and outlet connections for drawing the stack effluents through the impingers are also provided. Optionally the equipment can be provided custom designed on specific request with other combinations of impingers. The standard equipment is suitable for sampling of moisture, SO<sub>2</sub> and many other gases.

Polltech also provides **gaseous sampling equipment for US EPA Method-8, Method-23, Method-26 & 26A and Method-29**. The equipment can be supplied with various types of impingers fitted with spherical ball and cup joints, knock out impingers, impingers filled with silica gel and those with arrangement for measurement of temperature of outgoing gas. Equipment with glass impingers of 500 ml capacity is also available.

### Salient Features

- Graduated Glass Impingers of Borosil make
- Light Weight Fiber Box
- Thermally Insulated Ice Cold Box
- Six Glass Impingers
- Spherical Ball & Cup Joints (Optional)



### Technical Specifications

Equipment Item	Specifications
Glass Impingers 120 ml	Midget type- 4 Nos.
Glass Impingers 250 ml	Greenburg-Smith modified impingers-2 Nos.
Connections - Internal	Soft PVC or Silicon Tubing
Connections - External	Push fit Unions suitable for 12 mm OD tube
Cabinet	Light weight thermally insulated Box with water drain
Dimension & Weight	20(W) x 43(L) x 35(H) Cm. Wt. 5 Kg

### Accessories

Glass Impingers of various types & capacity ( 75 ml, 120 ml, 250ml, 500,ml )

### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS-4  
**Manual Stack Monitoring Kit** Model PEM-SMK-0B, PEM-SMK-10M  
**Heated Sampling Probes** Model PEM-HGLP-3, PEM-HTLP-3, PEM-HSLP-3  
**Volatile Organic Sampling System** Model PEM-VOSS-1  
**NOx Sampling Equipment** Model PEM-NOS-1  
**Halogen and Halides Sampling Equipment** Model PEM-HHS-1-X  
**PM<sub>10</sub> Sampling Equipment** Model PEM-STPM-10-X  
**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM-2.5-X



# METHOD 5—DETERMINATION OF PARTICULATE MATTER EMISSIONS FROM STATIONARY SOURCES

Applicability. This method is applicable for the determination of PM emissions from stationary sources.

Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

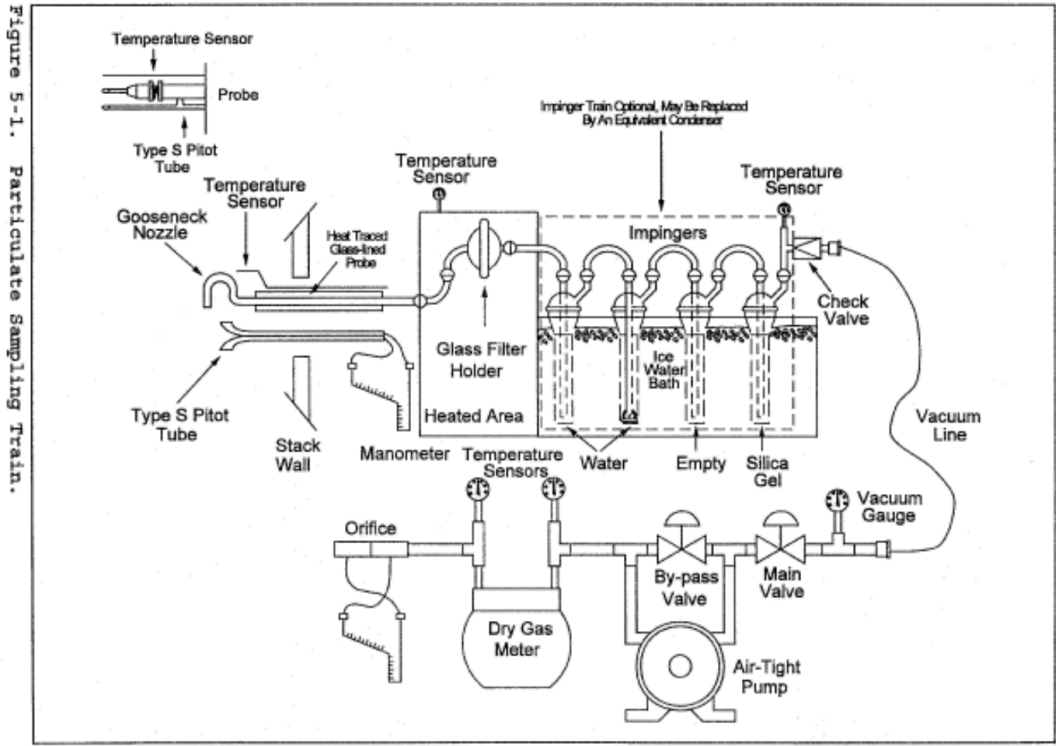
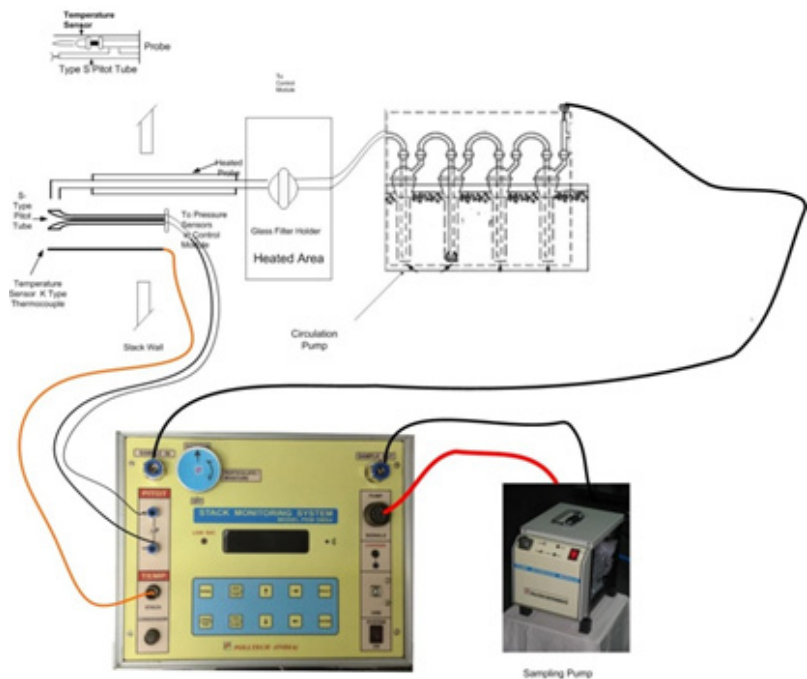


Figure 5-1. Particulate Sampling Train.

Particulate Matter Sampling System – Method 5



## Method 5: Out of Stack Particulate Matter

In this method, particulate matter (PM) is withdrawn isokinetically from the source and is collected on a glass fiber filter maintained at a temperature of  $120 \pm 14$  °C or such other temperature as specified by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water.

The figure below shows the schematics of a typical PM sampling system complying with Method 5 of US EPA.

A typical Method 5 compliant isokinetic sampling system for particulate sampling comprises the following components, devices, and subassemblies etc.

- Control Module for controlling the operation of the sampling system.
- Sampling pump for drawing sample of stack gas.
- Sampling probe consisting of Sampling Nozzle, a heated sampling pipe, S type Pitot Tube and Thermocouple.
- Particulate filtering system comprising a circular glass fiber filter housed in a filter holder which is enclosed in a heated filter box.
- A moisture removal system comprising a set of impingers placed in a cooled bath.

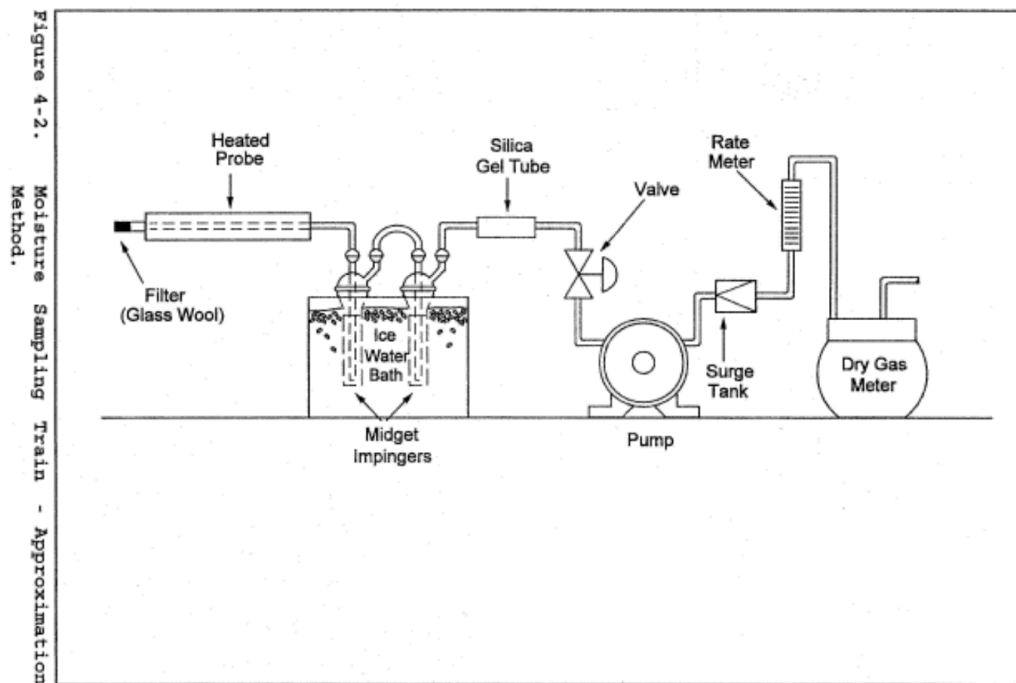
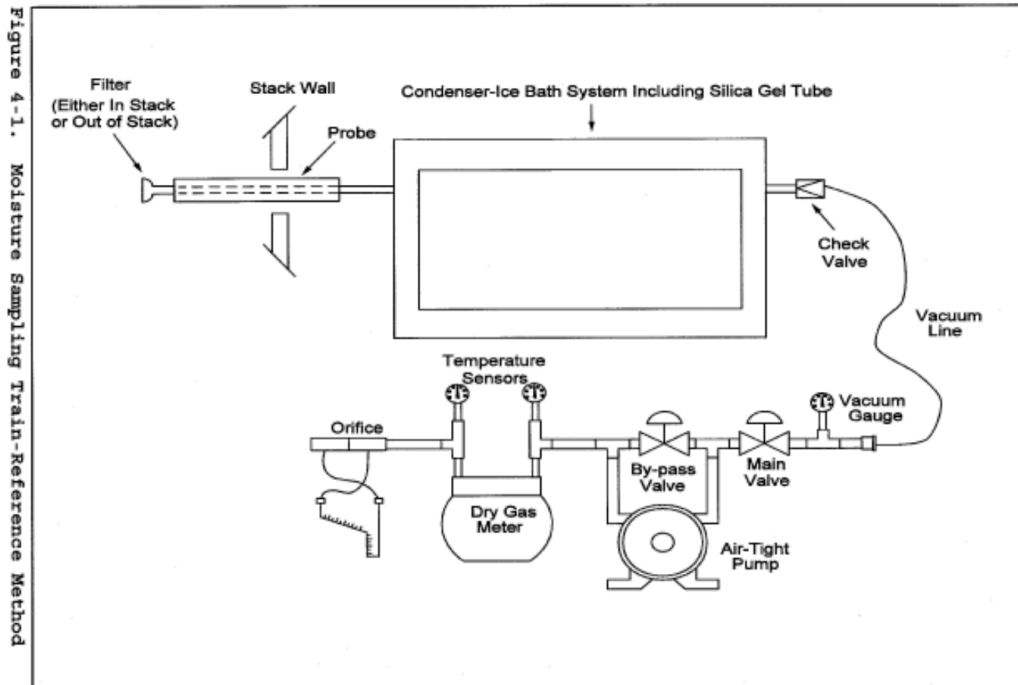
Specifications:

	<b>Component</b>	<b>Method 5</b>
1.	Control Module	No difference
2.	Sampling pump	No difference
3.	Pitot Tube	No difference
4.	Thermocouple	No difference
5.	Thermocouple	Circular filter placed in a heated filter box outside the stack
6.	Sample transport pipe	Heated
7.	Moisture removal device	No difference

## METHOD 4—DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Applicability. This method is applicable for the determination of the moisture content of stack gas.

Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.



In this method, a gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

The method contains two possible procedures: a reference method and an approximation method.

The required equipment is shown in the table below.

<b>Type of sampling → Equipment ↓</b>	<b>Reference Method</b>	<b>Approximation Method</b>
<b>Probe</b>	Stainless steel or glass tubing, sufficiently heated to prevent water condensation, and equipped with a filter, either in-stack or heated out-of-stack to remove particulate matter.	
<b>Condenser</b>	As required in Method 5	Two midget impingers, each with 30-ml capacity, or equivalent.
<b>Cooling Systems</b>	An ice bath container, crushed ice, and water (or equivalent), to aid in condensing moisture.	
<b>Drying Tube</b>	-	Tube packed with new or regenerated 6- to 16-mesh indicating-type silica gel (or equivalent desiccant), to dry the sample gas and to protect the meter and pump.
<b>Pump</b>	-	Leak-free, diaphragm type, or equivalent, to pull the gas sample through the train.
<b>Volume Meter</b>	-	Dry gas meter, sufficiently accurate to measure the sample volume to within 2 percent and calibrated over the range of flow rates and conditions actually encountered during sampling.
<b>Flow rate Meter</b>	-	To measure the flow range from 0 to 3 liters/min
<b>Vacuum Gauge</b>	-	to be used for the sampling leak check.
<b>Flow rate Meter</b>	-	To measure the flow range from 0 to 3 liters/min
<b>Barometer</b>	-	-
<b>Graduated Cylinder</b>	-	-

## METHOD 3 - GAS ANALYSIS FOR THE DETERMINATION OF DRY MOLECULAR WEIGHT

**Applicability.** This method is applicable for the determination of CO<sub>2</sub> and O<sub>2</sub> concentrations and dry molecular weight of a sample from an effluent gas stream of a fossil-fuel combustion process or other process.

Other methods, as well as modifications to the procedure described herein, are also applicable for all of the above determinations. Examples of specific methods and modifications include: (1) A multi-point grab sampling method using an Orsat analyzer to analyze the individual grab sample obtained at each point; (2) a method for measuring either CO<sub>2</sub> or O<sub>2</sub> and using stoichiometric calculations to determine dry molecular weight; and (3) assigning a value of 30.0 for dry molecular weight, in lieu of actual measurements, for processes burning natural gas, coal, or oil. These methods and modifications may be used but are subject to the approval of the Administrator. The method may also be applicable to other processes where it has been determined that compounds other than CO<sub>2</sub>, O<sub>2</sub>, carbon monoxide (CO), and nitrogen (N<sub>2</sub>) are not present in concentrations sufficient to affect the results.

**Data Quality Objectives.** Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

### Method 3

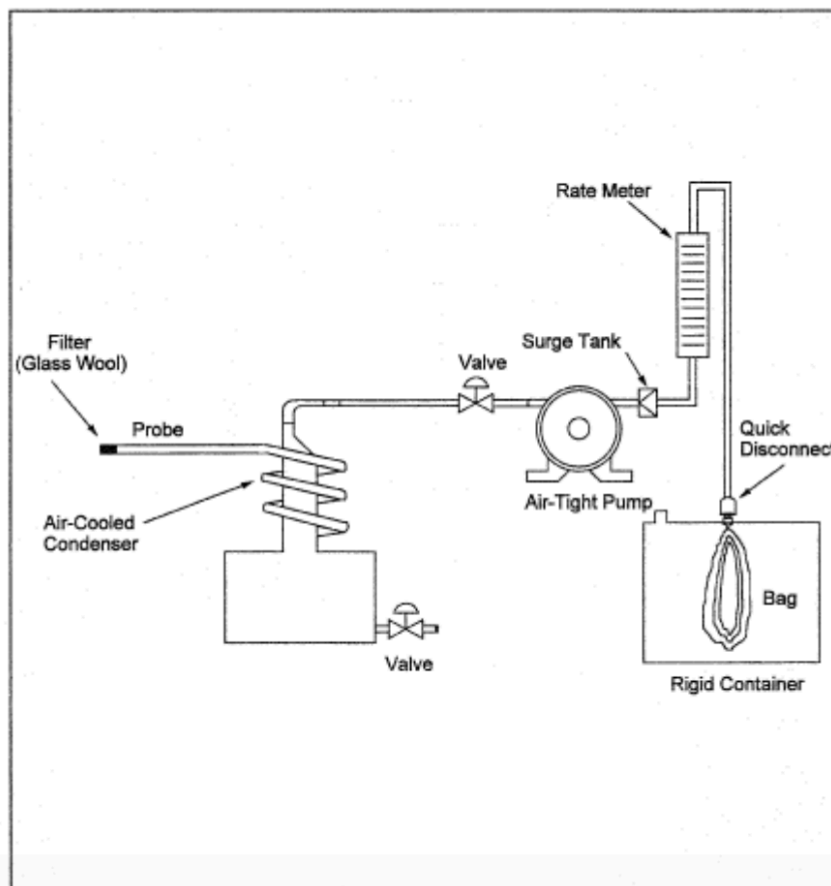


Figure 3-2. Integrated Gas-Sampling Train.



This method pertains to the determination of CO<sub>2</sub> and O<sub>2</sub> concentrations and dry molecular weight of a sample from an effluent gas stream of a fossil-fuel combustion process or other process.

In this method, a gas sample is extracted from a stack by one of the following methods:

- Single-point, grab sampling
- Single-point, integrated sampling
- Multi-point, integrated sampling
- 

The gas sample is analyzed for percent CO<sub>2</sub> and percent O<sub>2</sub>. For dry molecular weight determination, either an Orsat or a Fyrite analyzer may be used for the analysis.

The sampling apparatus required for this purpose must be capable of obtaining a representative sample and maintaining a constant sampling rate, and should be otherwise, capable of yielding acceptable results.

The required equipment is shown in the table below.

<b>Type of sampling → Equipment ↓</b>	<b>Grab sampling</b>	<b>Integrated Sampling</b>
<b>Probe</b>	Stainless steel or borosilicate glass tubing equipped with an in-stack or out-of-stack filter to remove particulate matter (a plug of glass wool is satisfactory for this purpose).	
<b>Sampling Pump</b>	For transport the gas sample to the analyzer.	A leak-free, diaphragm-type pump, or equivalent, to transport sample gas to the flexible bag. A small surge tank between the pump and rate meter needs to be installed to eliminate the pulsation effect of the diaphragm pump on the rate meter.
<b>Flow Rate Meter</b>	Not required	<b>Range:</b> A flow rate range of 500 to 1000 ml/min is suggested. <b>Accuracy :</b> ±2 percent of the selected flow rate.
<b>Flexible Bag</b>	-	<b>Any leak-free plastic:</b> Tedlar, Mylar, Teflon or plastic-coated aluminum <b>Suggested capacity :</b> 55 to 90 liters (1.9 to 3.2 ft <sup>3</sup> ) <b>Leak rate :</b> within specified limits
<b>Pressure Meter</b>	-	For flexible bag leak-check.
<b>Vacuum Meter</b>	-	For sampling train leak-check.
<b>Combustion gas analyzer</b>	-	Orsat or Fyrite type analyzer

We manufacture and / or supply all equipment required for implementation of Method 3 and much more.

## **Method 2—Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)**

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

This method is not applicable at measurement sites that fail to meet the criteria of Method 1, section 11.1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams; section 11.4 of Method 1 shows how to determine cyclonic or swirling flow conditions. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, must be employed to produce accurate flow rate determinations. Examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

This method pertains to the determination of average gas velocity in a stack. The average velocity is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

Implementation of this method requires the following equipment.

Type S Pitot Tube made of made of metal tubing (e.g., stainless steel) of recommended external tubing diameter between 0.48 and 0.95 cm (3/16 and 3/8 inch) and with a known coefficient.

- Pitot differential pressure measurement system
- Absolute Stack temperature measurement System
- Stack absolute pressure measurement system
- Gas Density Determination Equipment to determine the stack gas dry molecular weight (Method 3 equipment)
- Moisture determination equipment (Method 4 or Method 5 Equipment)

Our Stack Monitoring Kits / Systems include all the equipment required for implementation of Method 2 and much more.

## Method 1— Sample and Velocity Traverses for Stationary Sources

**Measured Parameters.** The purpose of the method is to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed pursuant to regulations set forth in this part. Two procedures are presented: a simplified procedure, and an alternative procedure (see section 11.5). The magnitude of cyclonic flow of effluent gas in a stack or duct is the only parameter quantitatively measured in the simplified procedure.

**Applicability.** This method is applicable to gas streams flowing in ducts, stacks, and flues. This method cannot be used when: (1) the flow is cyclonic or swirling; or (2) a stack is smaller than 0.30 meter (12 in.) in diameter, or 0.071 m<sup>2</sup> (113 in.<sup>2</sup>) in cross-sectional area. The simplified procedure cannot be used when the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

**Data Quality Objectives.** Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

**NOTE:** The requirements of this method must be considered before construction of a new facility from which emissions are to be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator.

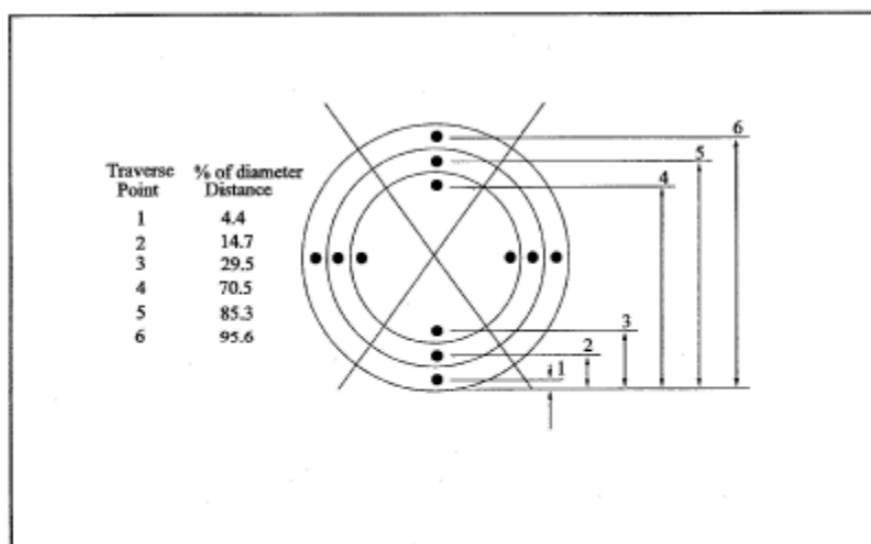


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

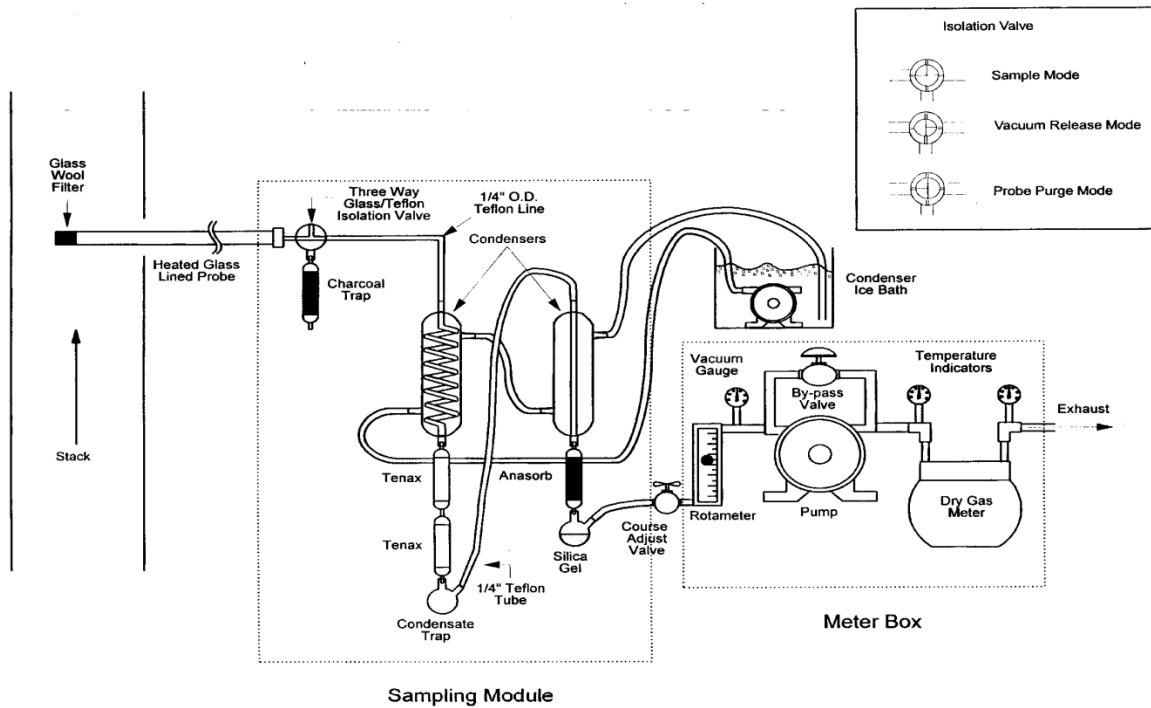
The purpose of the method is to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed. The method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source.

Our SMS 4 Stack Monitoring System is a versatile instrument which provides this guidance based on the data provided by the user. It prompts the user to provide the stack / duct dimensions and shape and outputs the number of traverse points and the location thereof.

# METHOD 0031 SAMPLING METHOD FOR VOLATILE ORGANIC COMPOUNDS (SMVOC)

Method 0031 is used to determine volatile organic compounds in gaseous emissions from a wide variety of stationary sources including hazardous waste incinerators.

FIGURE 1  
SCHEMATIC OF SAMPLING METHOD FOR VOLATILE ORGANIC COMPOUNDS (SMVOC) TRAIN



# VOLATILE ORGANICS SAMPLING SYSTEM

## Available Model

### PEM-VOSS1

Volcanic Organic Compounds (VOC) are air pollutants and can have detrimental effects on human health. They may also harm the environment by causing damage to crop, vegetation and materials and by reducing visibility.



### Salient Features

- ☛ Complies with the requirements of method 0031 of US EPA.
- ☛ All parts in contact with the sample gas made only of Glass / PTFE
- ☛ Electronic temperature control.
- ☛ Easy to set up and simple to operate.

Model PEM-VOSS1 is a sampling system which enables sampling of stack emissions for determining concentrations of Volatile Organic Compounds present therein. It facilitates sampling of stack emissions in compliance with procedure described in Method 0031 of US EPA.

### Description

The sampling system consists of a VOC Sampling train a sample collection module and a Sampling Control module.

The Sampling train consists of a heated glass-lined probe and a heated PTFE sample transportation tube. A sample collection module contains three sorbent tubes filled with Tenax / Anasorb sorbent, 2 glass stop cock, a charcoal trap, two water-cooled coiled glass condensers with temperature sensors, a condenser bottle and a silica gel bottle. All these components are housed in a ABS suitcase for safe and easy transportation.

Sampling Control module houses temperature controllers for controlling the temperature of Heated Sample Tubes, a VOC electronic unit, Electronic gas meter together with the vacuum gauge, switches for controlling Water pump and Sampling pump operations and a flow control valve. It also houses various connectors for pneumatic connections and temperature sensors.

The VOC electronic unit serves as an operator interface. It includes a key pad and a digital display and an electronic timer. The operator selects the parameter to display through the key pad. The operator also controls the operation of the timer and sampling pump through the keypad and display.



## Detailed Technical Specifications

### Heated Glass-lined probe and Heated Sampling Tube

Heated Device→	Heated Glass Lined Probe	Heated Sampling Tube
Specification↓		
Length	100 cm	125 cm
Internal Tube	Borosil Glass with ¼" OD end tube	¼" OD Teflon
Outer Casing	38 mm OD Aluminum	Insulated Heat-shrinkable Teflon Sleeve
Heating Element	Electrical Resistive Heating	
Temperature Sensor	K type Thermocouple	
Heating Temperature Range	50 °C to 180 °C	
Temperature Control Type	2 Nos. Electronic – proportional type fitted in the control module	
Dimensions & Weight	4 Cm dia x 107 Cm Wt.- 1 Kg	2 Cm dia x 125 Cm Wt.- 1 Kg

### Sample Collection Module

Stop Cocks	2 Nos of Glass body with PTFE Plug
1 <sup>st</sup> Condenser for Cooling	Double walled water cooled Coiled Glass body with Temperature Sensor & Thermal insulation
2 <sup>nd</sup> condenser for cooling	
1 <sup>st</sup> Tenax TA Tube	Threaded Glass tubes with PTFE Cap
2 <sup>nd</sup> Tenax TA Tube	
Anasorb Tube	
Condenser bottle	50 ml capacity Glass bottle
Silica Gel Bottle	20 cm long Threaded Glass body with PTFE Cap
Connections / Unions / Tubing	PTFE
Charcoal Trap	Glass Tube for filling with charcoal
Water Circulating Pump	Submersible type fitted inside for 230 V AC Operation.
Power	230 V AC from Control Module
Cabinet	ABS Suitcase with PE Foam insulated Reservoir for ice/cold water
Dimensions & Weight	58 x 47 x 20 Cms. Wt. - 7 Kg.

### Sample Control Module

Temperature Controller	2 numbers for Heated glass lined Probe and Heated sampling tube. Display- digital LED. Range-50 to 180 °C. Type-Proportional
Gas Flow Meter Range	0.10 to 2.00 LPM with fine control valve
Gas Meter Volume Range	0.10 to 999,9 Liters resettable with a key
Meter Vacuum Gauge Range	0-760 mm Hg
Electronic Unit Parameters	Temperature readings of three sensors selected through a switch and Timer functions.
1 <sup>st</sup> Condenser Temperature Range	0 to 60°C
2 <sup>nd</sup> Condenser Temperature Range	0 to 60°C
Gas Meter Temperature Range	0 to 60°C
Timer Function	Stop Watch / Down Counting Programmable Timer
Time Range	0 to 9 Hours 59 Minutes 59 Seconds
Control Keys	Start , Stop, Reset
Control Switches	On / Off type. 2 nos. for sampling pump and sample collection module power
Sampling Pump	Diaphragm Type with PTFE coating and film Capacity : 10 LPM
Power Supply	230 V AC
Dimensions & Weight	32 x 32 x 20 Cms. 8 Kg.

### Accessories

Coiled Glass Condenser

Threaded Glass tube with threaded PTFE union for Tenax / Anasorb /Silica Gel

Closing Caps of 2 types for both ends of threaded glass tube

### Related Products

Automatic Stack Monitoring System Model PEM –SMS4

Manual Stack Monitoring Kit Model PEM–SMK10B, PEM–SMK10B

Heated Filter Box Model PEM–HFB 2 & Heated Sampling Probes Model PEM-HGLP3,PEM-HTLP3, PEM-HSLP3

Nitrogen Oxides (NOx) Sampling Equipment Model PEM-NOS1-X

Sulfuric Acid Mist Sampling Equipment Model PEM-SAMS1-X

Halogen and Halides Sampling Equipment Model PEM-HHS1-X

Metal Emissions Sampling Equipment Model PEM-MES1-X

PM<sub>10</sub> Sampling Equipment Model PEM-STPM10-X & PM<sub>2.5</sub> Sampling Equipment PEM-STPM2.5-X

Standard Stack Gaseous Sampling Equipment Model PEM-SSCIB 1-X

# DIGITAL PRESSURE CALIBRATOR

## Available Models:

### PSI-DPC-1-HH, PSI-DPC-1-TT & PSI-DPC-1-IB

Pressure measurement is one of the most important parameters in the operation and control of most industrial processes, allied services and utilities. Not only the pressure measuring instruments must be designed to be inherently accurate and reliable but they must also be periodically calibrated so as to ensure continued reliable and accurate measurements.



**PSI-DPC-1-TT**



**PSI-DPC-1-IB**



**PSI-DPC-1-HH**

### Salient Features

- ☛ Microprocessor based
- ☛ Excellent accuracy of  $\pm 0.1\%$  FS.
- ☛ Customizable give accuracy of  $\pm 0.05\%$  FS
- ☛ High reliability and reproducibility
- ☛ Selectable pressure unit from 11 pressure units
- ☛ Wide range of user-specifiable measurement ranges
- ☛ Peak Hold
- ☛ Auto Zero
- ☛ User specified fluid service- Air, liquid, corrosive gases

Model PSI-DPC-1 is a compact instrument, which comes in three models namely PSI-DPC-1-HH, PSI-DPC-1-TT and PSI-DPC-1-IB which are distinguished in respect of the cabinet, operating power supply and maximum measurement range and are similar in all other respects. PSI-DPC-1-HH is a battery operated, hand held instrument and is normally used for pressures up to 100 psi full scale with internal sensor. PSI-DPC-1-TT is a table top instrument and can be used for any pressure range from 100 mm WC full scale to 10000 psi full scale. PSI-DPC-1-IB is supplied generally as mains operated but can be made battery operated

for ranges up to 1000 psi. Model DPC 1-IB is a field model which is housed in an elegant industrial box with cover and lock and operates on built-in rechargeable Li-ion battery. All the models are similar in functionality; they will be simply referred to as DPC 1 henceforth in this text.

DPC-1 comprises a pressure sensor and electronics. All the parts including the pressure sensor and electronics and pressure connections are housed inside or on the single instrument cabinet for most general applications involving non-corrosive fluids like air and moderate pressure range viz. 0-0.3 PSI, 0-0.8 PSI, 0-1 PSI, 0-3 PSI, 0-5 PSI, 0-15 PSI, 0-30 PSI, 0-100 PSI and 0-150 PSI F.S. For applications involving pressures higher than 150 PSI and up to 10000 PSI, sensors with stainless steel isolated diaphragm and SS body are available. These sensors are located outside the instrument cabinet as such or packaged as a probe. These sensors are also available for lower pressures and are suitable for applications involving liquids and corrosive gases

The pressure sensor is selected from among a variety of highly stable, temperature compensated pressure sensors according to the range, type of measurement viz. differential, gauge and absolute.

The electronic includes circuits for sensor supply, signal conditioning and interfacing and microprocessor based assembly for carrying out data acquisition, advanced multipoint linearization\* and operator interface including unit selection, display, calibration, peak hold and auto zero etc.

Model PSI-DPC-1 comes with standard accuracy of  $\pm 0.1\%$  which is achieved through advanced multipoint linearization. DPC 1 can also be supplied with more precise and accurate sensor to achieve specified higher accuracy  $\pm 0.05\%$  of FS.

All hand held (HH) standard models are available with four dry cells of 1.5 Volts. A DC adaptor of 6V DC output can be used for operation of calibrator on 230 V mains. These calibrators can also be provided with rechargeable Li-ion battery pack. An external Li-ion battery charger is also provided.

Serial communication facility for Data Transfer to a PC is provided on specific request.

## Detailed Technical Specifications

### Pressure Sensor

Type →	Internal	External
<b>Specification↓</b>		
<b>Application: Media used for</b>	Air and Non-corrosive gases	Liquids and gases
<b>Differential Pressure range</b>	0.3 to 150PSID	Not Available
<b>Gauge Pressure range</b>	0.3 to 150 PSIG	15 to 10000 PSIG
<b>Absolute Pressure range</b>	1150 mbar	500 PSIA
<b>Casing</b>	Plastic	SS
<b>Sensor Media Isolation</b>	Silicon diaphragm	SS diaphragm

### Electronics

Model → Specification↓	PSI-DPC-1-HH	PSI-DPC-1-TT		PSI-DPC-1-IB
		Battery operated	Mains operated	
<b>Functions</b>	Interfacing with pressure sensor Data acquisition and processing Operator interface			
<b>Pressure measurement type</b>	Differential, Gauge, Absolute			
<b>Differential Pressure range</b>	0.3 to 100 PSID	0.3 to 150 PSID		0.3 to 100 PSID
<b>Gauge Pressure range</b>	15-1000 PSIG	15 to 1000 PSIG	15 to 10000 PSIG	
<b>Absolute Pressure range</b>	15 PSIA	15 to 500 PSIA	15 to 500 PSIA	
<b>Display</b>	32 character Alphanumeric LCD			
<b>Operating keys</b>	3 Auto Zero, Units, Peak Hold			
<b>Power supply Standard ( Optional - Li-ion Rechargeable battery with external charger )</b>	6 Volts (4x1.5Volts Dry cells) (7.2 Volts ( 2x3.6 Volts)	6Volts (4x1.5Volts Dry cells) (7.2 Volts (2x3.6 Volts)	230V 50 Hz., Single Phase mains supply	Built-in 7.2 Volts Li-ion Rechargeable battery pack and charger with 2 core mains cable
<b>AC Adaptor ( Optional )</b>	Input: 230 V, 50Hz., Single Phase Output: 6 Volts @ 100mA			
<b>Cabinet Material</b>	High quality ABS			Industrial Box with cover
<b>Cabinet Dimensions</b>	210 x 100 x 40 mm	210 x 150 x 75 mm		220 x 130 x 130 mm
<b>Weight</b>	500 grams	800 grams	1200 grams	2200 grams

### Accessories

**Carrying Bags** for Pressure Calibrators

**Carrying Cases** for Pressure Calibration Hand Pumps

**Carrying Cases** for Pressure Calibrator and Pressure Calibration Hand Pumps

**Linear Adaptors** for operating on AC Mains

### Related Services

**Pressure calibration of own and third party instruments**

### Related Products

**Digital Pressure Calibrator** Model PSI-DPC 2

**Digital Alarming Pressure Gauge** Model PSI – DPG1

**Digital Barometric Pressure Indicator** Model PSI – BPI 1

**Pressure Calibration Hand Pump** Model PSI – PP-1, PSI – PP-2, PSI – PP-3, PSI – HPP-1

# ADVANCED DIGITAL PRESSURE CALIBRATOR

## Available Model:

### PSI-DPC- 2

Pressure measurement is one of the most important parameters in the operation and control of most industrial processes, allied services and utilities. Not only the pressure measuring instruments must be designed to be inherently accurate and reliable but they must also be periodically calibrated so as to ensure continued reliable and accurate measurements.

#### Salient Features

- High Resolution sigma-delta ADC
- Microprocessor based electronics
- Multipoint Linearization to enable high accuracy pressure measurements
- Excellent accuracy of  $\pm 0.1\%$  FS –customizable to accuracy of  $\pm 0.05\%$  FS on request
- High reliability and reproducibility
- Selectable pressure unit from 11 pressure units
- USB port for transfer of data to PC at user selectable transmit rates
- Li-ion rechargeable battery with USB Charger
- Peak Hold facility
- Very elegant and sturdy hand held cabinet



PSI-DPC-2 is an advanced, high resolution, microprocessor based hand held instrument. The user interface comprises a 32 character OLED Module and a 9-key key pad.

DPC-2 comprises a pressure sensor and electronics. All the parts including the pressure sensor and electronics and pressure connections are housed inside or on the single instrument cabinet for most general applications involving non-corrosive fluids like air and moderate pressure range 0-25.000 mmWC to 100.00 psid and 1150 mbar

For applications involving pressures higher than 5 psig and up to 10000 psig, sensors with stainless steel isolated diaphragm and SS body are available. These sensors are located outside the instrument cabinet as such or packaged as a probe. These sensors are also available for lower pressures and are suitable for applications involving liquids and corrosive gases

Pressure sensors are selected from among a variety of highly stable, temperature compensated pressure sensors according to the range, type of measurement viz. differential, gauge and absolute.

The electronic includes circuits for sensor supply, signal conditioning and interfacing and microprocessor based assembly for carrying out data acquisition, advanced multipoint linearization\* and operator interface including unit selection, display, calibration, peak hold and auto zero etc.

\*Model PSI-DPC-2 comes with standard accuracy of  $\pm 0.1\%$  which is achieved through advanced multipoint linearization. DPC 1 can also be supplied with more precise and accurate sensor to achieve specified higher accuracy  $\pm 0.05\%$  of FS.

- PSI-DPC-2 is equipped with a USB port for transfer of data to PC at user selectable transmit rates
- PSI-DPC-2 operates on 3.6 Volts 1400 mAh Li-ion Battery. USB Charger for charging the battery is provided.

## Detailed Technical Specifications

### Sensor

Type →	Internal	External
Specification ↓		
Application: Media used for	Air and Non-corrosive gases	Liquids and Non-corrosive gases
Differential Pressure range	0-25 mmWC to 100 psid	-
Gauge Pressure range		5 to 10000 psig
Absolute Pressure range	1150 mbar	
Sensor Casing	Plastic	SS
Sensor Media Isolation	Silicon diaphragm	SS diaphragm

### Electronics

Functions	Interfacing with pressure sensor, Data acquisition and processing, Operator interface
Pressure measurement type	Differential, I Gauge, Absolute
Differential Pressure range	0-25.000 mmWC to 100.00 psid
Gauge Pressure range	15 to 10000 psig
Absolute Pressure range	1150 mbar
Display	32 character Alphanumeric OLED
Operating keys	9
Maximum Resolution	1 in 60000
Operating Power supply	3.6 Volts 1400 mAh Li-ion Battery
Charger	USB Charger
Cabinet Material	High quality ABS
Cabinet Dimensions	22 x 10 x 4 cms
Weight	400 grams

### Accessories

Carrying Cases for Pressure Calibrator

Carrying Cases for Pressure Calibrator and Pressure Calibration Hand Pumps

### Related Products

Digital Pressure Calibrator Model PSI-PC1

Digital Alarming Pressure Gauge Model PSI-DPG1

Digital Barometric Pressure Indicator Model PSI-BPI 1

Pressure Calibration Hand Pump Model PSI-PP1, PSI-PP2, PSI-PP3, PSI-HPP 1

Precision Low Pressure Generator Model PSI-PLPG 1



# Digital Barometric Pressure Indicator

Measure barometric pressure at any place any time.

## Available Models:

**PSI-BPI-1 M**

**PSI-BPI-1 B**

Barometric pressure measurements are required extensively in Air Pollution Monitoring. The calibration procedures of NABL laboratories specifically mandate that measurement of flow to be carried out at operating conditions of pressure and temperature which necessitates the measurement of barometric pressure in the laboratory. Model PSI-BPI-1 proves to be a handy tool for meeting this requirement.



## Salient Features

- Compact and light-weight
- Large Backlit Display
- Wall mountable / Table Top
- Measures Absolute Pressure at the inlet of a device under calibration
- Measures Barometric Pressure

## Physical Design Highlights

While PSI-BPI-1 M is a mains operated instrument, PSI- PSI-BPI-1 B is battery operated. The two models are similar in all respects except the source of power. Accordingly the two models are referred to PSI-BPI-1 in the rest of this document.

Model PSI-BPI-1 is a compact, wall mountable / table top instrument. It utilizes a precision solid-state absolute pressure sensor and a large alpha-numeric display for viewing the ambient pressure. It permits the user to select the units of measurement with press of a key.

The pressure indicator has an input Port (Nozzle) When the Port (Nozzle) is left open; the sensor measures the barometric pressure. When the input Port (Nozzle) is connected to the inlet of a device under calibration such as a rotameter or a digital flow indicator, the instrument can be used for measuring the inlet pressure for complying with requirements of calibration procedures specified by NABL accredited laboratories. The availability of this Port (Nozzle) also facilitates the PSI-BPI-1 itself to be calibrated.

## Detailed Technical Specifications:

Model → Specification ↓	PSI-BPI-1 M	PSI-BPI-1 B
Range	200.0 to 1050.0 mbar Absolute	
Accuracy	± 0.25% F.S.	
Resolution	0.1 mbar	
Media	Air or non corrosive gases	
Display	32 character large alphanumeric LCD	
Keys	1 No. (Unit selection)	
Pressure Units	Torr , mm Hg, mBar, PSI, Kg/cm <sup>2</sup> , In Hg, K.Pascal	
Power	230 V AC Mains ± 20% through 9 VDC Linear Adaptor	
Connections	Nozzle or Ferruleless union	
Size & Weight	140 x 120 x 70 mm Wt - 500 Gm.	

## Related Products

Digital Pressure Calibrator Model PSI-PC1

Digital Alarming Pressure Gauge Model PSI-DPG1

Pressure Calibration Hand Pump Model PSI-PP1, PSI-PP2, PSI-PP3, PSI- HPP1

# DIGITAL ALARMING PRESSURE GAUGE

## Available Model PSI-DPG-1

Pressure measurement is one of the most important parameters in the operation and control of most industrial processes, allied services and utilities. Pressure measuring instruments must be accurate and reliable and easy to use and calibrate.

### Salient Features

- ☛ Microprocessor based
- ☛ Accuracy  $\pm 0.5\%$  of FS.
- ☛ High reliability and reproducibility
- ☛ Programmable alarm setting up to 2 alarms
- ☛ Programmable delays
- ☛ Programmable hysteresis
- ☛ Potential free alarm contacts for alarming and ON/OFF control
- ☛ User defined averaging
- ☛ DIN compliant panel mounting



Model PSI-DPG is a compact, accurate and reliable instrument which is very useful in industrial processes requiring accurate indication of pressure of expensive gases, liquid and air.

Model PSI-DPG comprises a pressure sensor and electronics. All the parts including the pressure sensor and electronics and pressure connections are housed inside  $\frac{1}{4}$  DIN housing for low pressure applications. For high pressure measurement an external SS body sensor is provided in a suitable housing.

The pressure sensor is selected from a variety of highly stable, temperature compensated pressure sensors according to the media, range and type of measurement viz. differential, gauge and absolute.

The electronic includes circuits for sensor supply, signal conditioning and interfacing and microprocessor based assembly for carrying out data acquisition and operator interface including unit audio-visual indication, display, mode selection, alarm setting, auto zeroing etc. It can also be used for automatic ON/OFF control for which potential free alarm relay contacts are provided.

### Detailed Technical Specifications

MEASUREMENT		ELECTRONICS	
<b>Sensor</b>	Solid State Pressure sensor Selected according to specified type and range of measurement	<b>Functions</b>	Interfacing with pressure sensor Data acquisition and processing Operator interface
<b>Measurement type</b>	User specified from Differential Gauge Absolute	<b>Implementation technology</b>	Microprocessor based
<b>Gauge Pressure range</b>	User specified up to 10000 PSIG	<b>Digital Averaging</b>	2 to 50 readings
<b>Absolute Pressure range</b>	15 to 500 PSIA	<b>Alarms</b>	User specified 1 or 2 Alarms
<b>Measurement accuracy</b>	$\pm 0.5\%$ FS	<b>Delay</b>	User settable from 0 to 50 seconds
<b>Differential Pressure range</b>	User specified up to 150 PSID	<b>Hysteresis</b>	Factory settable from 5 to 20%
<b>Related Services</b> Pressure calibration of own and third party instruments		<b>Display</b>	4 digit 7 segment LED ( 9999 Counts )
<b>Related Products</b> Digital Pressure Calibrator Model PSI –DPC-1 & DPC 2 Digital Barometric Pressure Indicator Model PSI – BPI-1 Pressure Calibration Hand Pump Model PSI – PP1, PSI – PP-2, PSI – PP-3 , PSI – HPP-1		<b>Visual Indication</b>	3 LED indicators one each for Set Alarm 1 Alarm 2
		<b>Operating keys</b>	3 Nos. for Mode Auto Zero / Increment Auto Zero / Decrement
		<b>Alarm output</b>	1 or 2 Nos. Independent potential free relay-contacts
		<b>Housing Cabinet</b>	1/4 DIN panel mountable box L=20 cm
		<b>Power</b>	110 - 230 Volts, 50 Hz. Single phase

# PRESSURE CALIBRATION HAND PUMPS

## Available Models

**PSI-PP1**

**PSI-PP2**

**PSI-PP3**

**PSI-PP3-L**

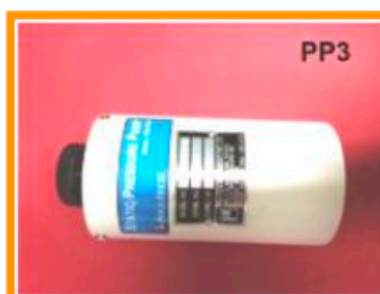
**PSI-HPP1**

When calibrating pressure metering instruments including pressure gauges and pressure calibrators, it is essential that a stable pressure source of generating requisite pressure is available at hand. Polltech provides four hand operated pumps to fulfill this need. Model PSI-PP1, PSI-PP2, Model PSI-PP3 are pneumatic pumps and generate pneumatic pressure up to  $25 \text{ kg/cm}^2$ . They are also useful for generating vacuum up to 70/80 % of the atmospheric pressure. Model PSI-HPP1 is a hydraulic pump and is used for generating high pressures up to  $550 \text{ kg/cm}^2$  which are not possible by hand operated pneumatic pumps.

All four pumps are manually operated and require no electrical power making them useful for testing of mechanical and electronic pressure gauges even when power is unavailable.

### Salient Features

- ☛ Dual source of pressure and vacuum
- ☛ Manually operated. Require no electrical power
- ☛ Simple one hand operation
- ☛ Coarse and fine control for adjusting pressure to desired accuracy
- ☛ Pneumatic pumps for low pressures up to  $25 \text{ kg/cm}^2$
- ☛ Hydraulic pumps for high pressure up to  $550 \text{ kg/cm}^2$





## Description

**Polltech Model PSI-PP1 Pneumatic Hand Pump** is the most dependable and rugged pump for applications up to 100 psi or 24" Hg Vacuum. The anodized aluminum honed tube construction is mounted on a sturdy stand to prevent body heat transfer, resulting in drift-free, accurate readings. The PP1 is equipped with dual pistons ( coarse and fine ) in order to provide smooth and controlled operation. Dual O-Rings on all pistons ensure the pump to be leak free. The unit is fitted with a tee to provide direct connection to a pressure meter / gauge and a calibrator. The PP1 is ideal for checking calibration of pressure or vacuum gauges, switches, or transmitters.



**The Model PSI- PP3 and PSI-PP3L are Low Pressure Calibration Pumps**, similar in construction to model PSI PP-1, with only one piston with fine control. These hand pumps have a pressure range of 30 psi; uses air as the media, and can adjust the pressure easily with great stability. The pumps have a heat-insulator between the cover and pressure chamber to lessen the heat effect during the micro-pressure calibration. The adjusting resolution is about 0.1 Pa. These features make the PP3 ideal for calibrating low pressure transducers, precision pressure gauges, Magnehelic gauges and other pressure instruments. The PP 3L



has been specially designed for low pressure differential gauges since it has two compartment. This helps in reducing the effect of temperature and barometric pressure changes .The PP3 is provided with two ferrule-less connectors while PP3L has four connectors for fast instrument connect and disconnect.

**The Model PSI- PP2 and HPP1 are High Pressure Calibration Pumps.** The PP2 model is designed for pneumatic applications for a pressure range of 350 PSIG while HPP1 is a hydraulic type suitable for pressure applications upto 550 kg/cm<sup>2</sup>. Both the pumps use multiple strokes to generate high pressure and are also provided with a variable stroke adjustment in addition to a fine adjustment valve. A set of BSP adaptors and a flexible hose connection (PSI-PP2) are standard accessories.



### Detailed Technical Specifications:

Model →	Model PSI – PP1	Model PSI – PP2	Model PSI – PP3	Model PSI – HPP1
Specifications ↓				
Maximum Pressure	100 PSIG	350 PSIG	30 PSIG	700 kg/cm <sup>2</sup>
Operation Action	Two Knob-Screws	Scissor-Spring	Knob- Screw	Scissor-Spring
Pressure Media	Air			Distilled water
Maximum Vacuum Generated	80% of atmospheric pressure		70% of atmospheric pressure	80% of atmospheric pressure
Controls	Coarse & Fine Control		Fine Control	Coarse & Fine Control
Wetted parts	Anodized Aluminum		Anodized Aluminum	SS 304 & Acrylic
'O' Rings	Neoprene			
Outlet Connection	2 ferrule-less Union	2 standard ¼" BSP (M)	2 standard ferrule-less Union	¼" BSP Male
Size	250 x 140 x110 mm	230x 130x70 mm	200(L) x 85 dia mm	300 x 150 x 80 mm
Weight	1.6 Kg	1 Kg	1.15 Kg	1.7 Kg
Reservoir Capacity	Not applicable			100 ml

### Related Products

**Digital Pressure Calibrator** Model PSI – PC1

**Digital Alarming Pressure Gauge** Model PSI – DPG1

**Digital Barometric Pressure Indicator** Model PSI – BPI 1

# PRECISION LOW PRESSURE GENERATOR

## Available Model

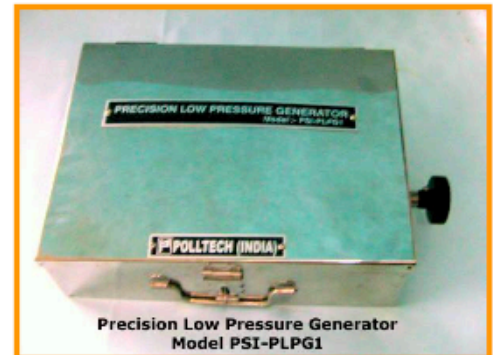
### PSI-PLPG1

When calibrating low pressure metering instruments including Magnehelic pressure gauges and pressure calibrators, it is essential that a stable pressure source of generating requisite pressure is available at hand. Calibration of pressure measuring instruments for low and very low pressures hitherto presented a challenge because of non-availability of low pressure generators. Polltech proudly presents its model PSI-PLPG1, a precision Low Pressure Generator.

PLPG1 is manually operated and require no electrical power making them useful for testing of Magnehelic Gauges, Pressure Transmitters etc. even when power is unavailable.

#### Salient Features

- ☛ Ideally suitable for Magnehelic Gauges
- ☛ Dual source of pressure and vacuum
- ☛ (+) Pressure Range: 2 mm WC to 5000 mm WC
- ☛ (-) Pressure Range: 2 mm WC to 3500 mm WC
- ☛ Manually operated. Require no electrical power
- ☛ Simple one hand operation
- ☛ Fine control for adjusting pressure to desired accuracy



## Description

Model PSI-PLPG1 Pneumatic Hand Pump utilizes Polltech's well proven, dual chamber, single piston pump. It is also provided with an auxiliary chamber for precision control of pressure. All assemblies are enclosed in a thermally insulated, SS carrying box, thus providing better stability in pressure generation.

## Detailed Technical Specifications:

<b>Pressure Range</b>	2mmWC to 5000 mm WC
<b>Setting Resolution</b>	Better than 0.2 mm WC
<b>Operation Action</b>	Single Knob- Screw
<b>Pressure Media</b>	Air
<b>Maximum Vacuum Generated</b>	3500 mm WC
<b>Control</b>	Very Fine Control Thread Screw
<b>Wetted parts</b>	Anodized Aluminum
<b>'O' Rings</b>	Neoprene
<b>Outlet Connection</b>	2 standard ferule-less Unions each for positive & negative pressure
<b>Size</b>	36 (L) x 23 (W) x 9 (H) cm (Approx)
<b>Weight</b>	About 3.5 Kg.

## Related Products

**PRESSURE CALIBRATION HAND PUMPS**  
Model PSI-PP1, PSI-PP2, PSI-PP3, PSI-PP3-L, PSI-HPP1  
Digital Pressure Calibrator Model PSI – PC1, Model PSI-PC 2  
Digital Alarming Pressure Gauge Model PSI – DPG1  
Digital Barometric Pressure Indicator Model PSI – BPI 1

# Mono Block Type Pump

This sampling pump is very lightweight mono-block dry type pump with graphite vanes and therefore needs very little maintenance. It has a free flow of about 95 LPM.



## Specifications:

<b>Used in</b>	Manual stack monitoring kits PEM-SMK-10 & PEM-SMK-20
<b>Type</b>	Dry Rotary type pump with graphite Vanes
<b>Driving Motor</b>	½ H.P. Motor
<b>Free Flow</b>	> 95 LPM
<b>Vacuum Created</b>	> 600 mm Hg
<b>Approximate Weight</b>	7 kg
<b>Pump Housing</b>	Available (Side open enclosure with Power switch, fuse holder ) and 3 meter power cable



# Sampling Pump with Flame-Proof Motor

Applications:

Sampling in hazardous areas such as Petro-chemical industry and refineries

Available Model: RVD-150



Specifications:

<b>Model</b>	<b>RVD-150</b>
<b>Type</b>	Rotary Vane Dry type Vacuum Pump
<b>Driving Motor</b>	Flame Proof Motor
<b>Pump – Motor Coupling</b>	Belt
<b>Free Flow Capacity</b>	150 LPM
<b>Max. Vacuum</b>	650 mm Hg
<b>Electric Motor Flame Proof</b>	0.75 HP, 1440 RPM
<b>Size(LWH)</b>	435 mm x 350 mm x 300mm
<b>Connections</b>	½” BSP (M) Union
<b>Mounting</b>	Stand with heavy duty lockable castor wheels
<b>Approximate Weight</b>	45 kg
<b>Power</b>	230 V AC Single Phase

## Pump Interface Module (for use with SMS 4)

### Specifications:

<b>Pump Type</b>	Monoblock Dry Rotary type pump with graphite Vanes
<b>Driving Motor</b>	½ H.P. Motor
<b>Isokinetic Flow Control Element</b>	Proportional control valve
<b>Free Flow</b>	> 95 LPM
<b>Vacuum created</b>	> 600 mm Hg
<b>Approximate Weight</b>	12 kg



# Sampling Probes

In stack emission monitoring, sampling of stack gas is a very important and a commonly employed technique. In order to ensure a reliable analysis, it is essential that the sample gas is extracted free of ambient gas leaking into the system and at the same time the dew point of the sample must remain stable. A sampling probe fulfills this dual objective by acting as an interface between the stack and the analysis system.

A sampling probe comprises of a sampling nozzle, a sample transport pipe and in some cases a filter holder in addition to a Pitot tube and a stack temperature sensor.

Probe design is dictated by specific application. Probes are designed with different materials and may be heated or unheated.

We design and manufacture a variety of probe accessories to suit various applications and sampling conditions.

# Sampling Nozzles

We have a large selection of Nozzles of different shapes ( right angle, straight and button-hook Nozzles) in multiple materials. Determining the size needed for isokinetic sampling depends on the stack gas velocity. Determining the material depends on the stack temperature and the sampling method. We provide technical support and can help with configuration.



## Specifications:

Material	Shape	Available Sizes (ID)	Thread /Shank	Suitable for Temperature Range
SS304	Straight (for fixing to button-hook bend)	1/8"	1/2" BSP Female	1000°C
		1/4"		
		5/16"		
		3/8"		
		7/16"		
		1/2"		
SS304	Right Angle	1/8"	1/2" BSP male	1000°C
		1/4"		
		5/16"		
		3/8"		
		1/2"		
		5/8"		
Glass	Right Angle	1/4", 3/8", 1/2"	5/8" OD	450°C
SS 310	Right Angle	1/8", 1/4", 5/16", 3/8", 1/2", 9/16"	1/2" BSP male	1200°C

# Filter Holder



## Specifications:

Material	Design	Suitable for Filter type	
		Type	ID / Diameter
SS304	Tapered	Glass Fiber Thimble	19 mm
	Tapered	Silica Thimble	25 mm
	Tapered	Cellulose Thimble	28 mm
	Straight	Glass Fiber Circular	47 mm

# Sample Transport Pipe

We provide various types of sample transport pipes of different materials and lengths. These may be heated or unheated.

## Unheated SS 304 Sample Transport Pipe

<b>Material of Construction</b>	SS 304
<b>Type</b>	Thimble pipe
<b>ID</b>	>15 mm
<b>End connection</b>	½ " BSP (M / F)
<b>Available lengths</b>	0.6, 1.0, 1.2, 1.5 and 2 meters

## Heated Sampling Probes

Condensation of any moisture present in the stack gas during the sampling process would lead to error in the results. This effect is more serious when sampling for particulates in stack emissions. This error can be eliminated or minimized by heating the probe to prevent condensation of the moisture till the point where the stack gas enters the moisture removal apparatus.

We manufacture a variety of heated probes for the above stated purposes.

## Heated SS 304 Probe

This type of probe is sheathed with aluminum and provided with a heater which is electronically controlled to maintain the probe at specified temperature.

<b>Model No.</b>	<b>PEM-HTP-1</b>
<b>Material of Construction</b>	SS 304
<b>Type</b>	Thimble pipe
<b>ID</b>	>15 mm
<b>End connection</b>	½ "BSP (M / F)
<b>Heater</b>	Electric Resistive Heating
<b>Temperature Controller</b>	Electronic
<b>Available lengths</b>	1 meter, 1.5-meter, 2 meters



# HEATED FILTER BOX & HEATED SAMPLING PROBES

## Heated Filter Box

Available Model

**PEM-HFB2**

## Heated Sampling Probes

Available Models

**PEM-HGLP-3S, Model PEM-HTLP-3S, Model PEM-HSLP-3S, Model PEM-HSSP-1**

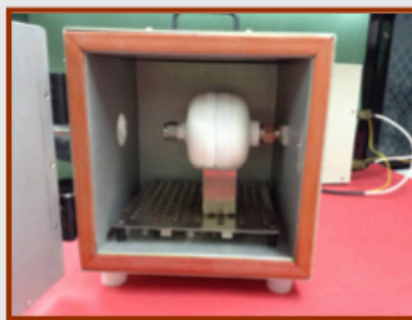
In USEPA Method 5 and other methods for out-of-stack measurement of stack emissions, particulate matter to be sampled is drawn iso-kinetically from the stack through a probe and is collected on a glass fiber filter. In order to prevent loss of particulates to water that may form due to condensation of water vapours present in the emission stream, the probe and the filter are required to be maintained typically at a temperature of  $120 \pm 14^{\circ}\text{C}$  ( $248 \pm 25^{\circ}\text{F}$ ).

Polltech provides a complete set of nozzles, heated sampling probes with removable liners of various types and heated filter box with glass or PTFE filter holders to fulfill this requirement. A single compact cabinet housing two electronic temperature controllers maintains independently the desired temperature of both these equipments with excellent response time and temperature control accuracy.

### Salient Features

- Double walled with thermal insulation
- Compact and Lightweight
- Strong Probe Holder
- Electronic Temperature Controller
- Choice of glass or PTFE filter holder
- Choice of Glass, SS or PTFE Liner

Model PEM-HFB2 consists of a double walled thermally insulated, electrically heated compartment which has a provision to accept a glass or a Teflon filter holder of various sizes. A large area sealed tubular heated element provides uniform heating. A strong SS probe clamp is provided to mount heated probes. The heat / temperature control is affected by an independent electronic module comprising two electronic temperature controllers with digital display which continuously display the actual temperatures (set with press of key ) of the heated filter box and probe at all times.



Polltech manufactures heated probes with different liners viz. Glass, PTFE and Stainless Steel. All the probes are sheathed with aluminum and provided with a heater which is electronically controlled to maintain the probe at specified temperature. The heated probes are so designed that the liners can be easily removed in the field for cleaning, rinsing or any other purpose. On special request they can be provided in modular form which can be joined to increase their length. These are available with a choice of various internal liners i.e. SS, Glass and Teflon. They come with electronic temperature controller for a temperature range of 50 to 200°C. Heated Sampling probes are available in standard lengths of 1, 1.5 and 2 meters.

### Technical Specifications

Specification	Heated Filter Box	Heated Sampling Probe			
		HGLP-3S	HTLP-3S	HSLP-3S	HSSP-1
Construction Design	Double walled with ceramic wool insulation				
Construction Material	Powder Coated Aluminum, Anodized Aluminum, SS				
Filter paper size	70, 90 mm dia. or custom specified	Not applicable			
Filter Holder	Glass or PTFE	Not applicable			
Probe Clamp Holder	SS for 38 mm dia. Probe	All Probes 38 mm diameter Aluminum Tubes			
Removable Probe Liner	Not applicable	Glass	PTFE	SS	No Liner
Standard Length (Meters)		1, 1.5, 2			
Heating Method	Electrical Resistance Heater				
Temperature Range	50 to 200°C				
Temperature Sensor	Thermocouple : Type K				
Temperature Controller	2 Numbers - Electronic Closed Loop Feedback Type with digital display for set and actual temperature mounted in Electronic Unit				
Measurement / Control Accuracy	Better than 5°C				
Power & Temperature Sensor Connectors	Total 4 Nos. Mil grade threaded type				
Connections-Inlet	5/8" Swagelok	5/8" Swagelok	5/8" Swagelok	5/8" Swagelok	½" BSP
Connections-Outlet	Pushfit Union for 12mm PU tube	5/8" Swagelok	5/8" Swagelok	5/8" Swagelok	5/8" Swagelok
Dimensions & Weight	26 x 26 x 37 CM. Wt. 7 Kg.	3.8 cm dia x 107 cm length Wt. 1.5 Kg			
Dimensions & Weight	Electronic Unit - 11 X 13 X 27 CM Wt. – 2 Kg				

### Accessories

Glass Liners, Glass, PTFE or SS nozzles of various sizes, Filter Holders for various sizes, Filter Papers of Cellulose, Glass Fiber, Quarts Microfiber

### Related Products

**Automatic Stack Monitoring System** Model PEM-SMS4

**Manual Stack Monitoring Kit** Model PEM-SMK-10B, PEM-SMK10B

**Digital Stack Velocity Meter** Model PEM-SVM1

**Volatile Organic Sampling System** Model PEM-VOSS1

**Dioxins Furans Sampling System** Model PEM-DFSS1

**Nitrogen Oxides (NO<sub>x</sub>) Sampling Equipment** Model PEM-NOS-1X

**Sulfuric Acid Mist Sampling Equipment** Model PEM-SAMS-1X

**Halogen and Halides Sampling Equipment** Model PEM-HHS-1X

**Metal Emissions Sampling Equipment** Model PEM-MES-1X

**PM<sub>10</sub> Sampling Equipment** Model PEM-STPM-10X

**PM<sub>2.5</sub> Sampling Equipment** PEM-STPM-2.5X

**Standard Stack Gaseous Sampling Equipment** Model PEM-SSCIB-1X

# Pitot Tube

We manufacture a variety of Pitot Tubes and extension pipes for the same

Type	Material	Length
'S' Type	S. S	0.6 meter
Engraved 'S' Type	S. S	0.6 meter
'S' Type	S. S	1.0 meter
Engraved 'S' Type	S. S	1.0 meter
'S' Type	S. S	1.5 meter
Engraved 'S' Type	S. S	1.5 meter
'S' Type	S. S	2.0 meter
Engraved 'S' Type	S. S	2.0 meter

## Pitot Tube Extension Pipes

Extension pipe Type	Material	Length
Set of 2 with fixtures	S. S	0.6 meter
Set of 2 with fixtures	S. S	1.0 meter
Set of 2 with fixtures	S. S	1.5 meter
Set of 2 with fixtures	S. S	2.0 meter
Engraved- Set of 2 with fixtures	S. S	0.6, 1.0, 1.5 & 2.0 meter

We also manufacture and supply L type Pitot tubes of various lengths and materials of constructions.

# Stack Gas Temperature Sensor

Thermocouple Type	Sheath / Enclosure	Length	Cable length
'K' For temperature up to 1000°C	S.S. 304 Tubes	0.5 m	3 m
		1.0 m	3 m
		1.5 m	3 m
		2.0 m	3 m
		3.0 m	3 m
'K' For temperature up to 1200°C	Inconel 600	0.5 m	3 m
		1.0 m	3 m
		1.5 m	3 m
		2.0 m	3 m
		3.0 m	3 m

## Flexible Thermocouples

### Applications:

Sampling of stack flue gases with temperature up to 1200°C

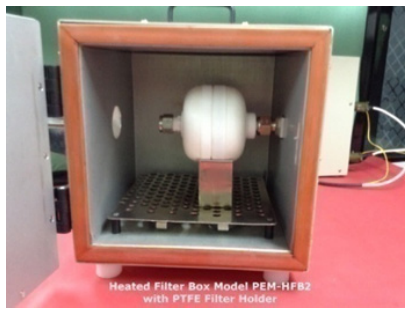
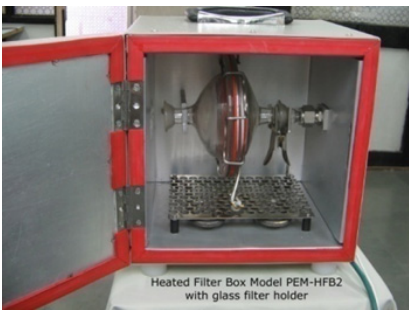
Thermocouple Type	Sheath / Enclosure	Length	Cable length
'K'	MI / Inconel 600	1 m	3 m
'K'	MI / Inconel 600	2 m	3 m
'K'	MI / Inconel 600	3 m	3 m

# Heated Filter Box

In Method 5 and other methods for out-of-stack measurement of stack emissions, when sampling for particulate matter, it is mandatory for the sample to be drawn iso-kinetically. The sample is drawn through a probe and is collected on a glass fiber filter. In order to prevent loss of particulates to water that may form due to condensation of water vapor present in the sampled stack gas, the probe and the filter are required to be maintained typically at a temperature of  $120 \pm 14$  °C ( $248 \pm 25$  °F).

This necessitates the filter holders also to be maintained at the above-mentioned temperatures in addition to heating the sampling probes.

The heated filter box Model PEM-HFB2 meets these requirements adequately. It comprises a double walled thermally insulated, electrically heated compartment. It can accept a glass or PTFE filter holders of various sizes. Uniform heating is provided by a large area sealed tubular heater element. Heated probes are held in place by a strong SS probe clamp. An independent electronic module comprising two digital electronic temperature controllers' control and display the temperatures in real time.



## Detailed Technical Specifications:

<b>Construction Design</b>	Double walled with ceramic wool insulation
<b>Construction Material</b>	Powder Coated Aluminum, Anodized Aluminum, SS
<b>Filter paper size</b>	70, 90 mm dia. or custom specified
<b>Filter Holder</b>	Glass or PTFE
<b>Probe Clamp Holder</b>	SS for 38 mm dia. Probe
<b>Removable Probe Liner</b>	Not applicable
<b>Standard Length (Meters)</b>	Not applicable
<b>Heating Method</b>	Electrical Resistance Heater
<b>Temperature Range</b>	50 to 2000 °C
<b>Temperature Sensor</b>	Thermocouple: Type K

<b>Temperature Controller</b>	2 Numbers - Electronic Closed Loop Feedback Type with digital display for set and actual temperature mounted in Electronic Unit
<b>Measurement / Control Accuracy</b>	Better than 50 °C
<b>Power &amp; Temperature Sensor Connectors</b>	Total 4 Nos. Mil grade threaded type
<b>Connections-Inlet</b>	5/8" Swagelok
<b>Connections-Outlet</b>	Push-fit Union for 12mm PU tube
<b>Dimensions</b>	26 x 26 x 37 cm
<b>Weight</b>	7 kg
<b>Electronic Unit Dimensions</b>	11 X 13 X 27 cm
<b>Electronic Unit Weight</b>	2 kg



# Moisture Removal Device

## Metal Condenser



Condenser



Condenser inside view

<b>Make</b>	Indusmation
<b>Model No.</b>	PEM-EACM1
<b>Material of construction</b>	Aluminum metal
<b>Design</b>	Dual Compartment

## Coiled Glass Condenser



<b>Make</b>	Indusmation
<b>Model No.</b>	PEM-EACGC1
<b>Material of construction</b>	Glass
<b>Design</b>	Coiled glass assembly
<b>Application</b>	Suitable for housing in an impinger box in lieu of 250 mL glass impinger

## Silica Gel Trap (Glass)



<b>Make</b>	Indusmation
<b>Model No.</b>	PEM-EASGC1
<b>Material of construction</b>	Glass
<b>Design</b>	Glass bottle filled with anhydrous silica gel (blue)
<b>Application</b>	Suitable for housing in an impinger box in lieu of glass impinger

## Silica Gel Trap (acrylic)



<b>Make</b>	Indusmation
<b>Model No.</b>	PEM-EASGA1
<b>Material of construction</b>	Acrylic
<b>Design</b>	Container with threaded caps- filled with anhydrous silica gel (blue)
<b>Capacity</b>	400 g
<b>Application</b>	Suitable for standalone application in lieu of silica gel glass impinger

## Glass Impingers

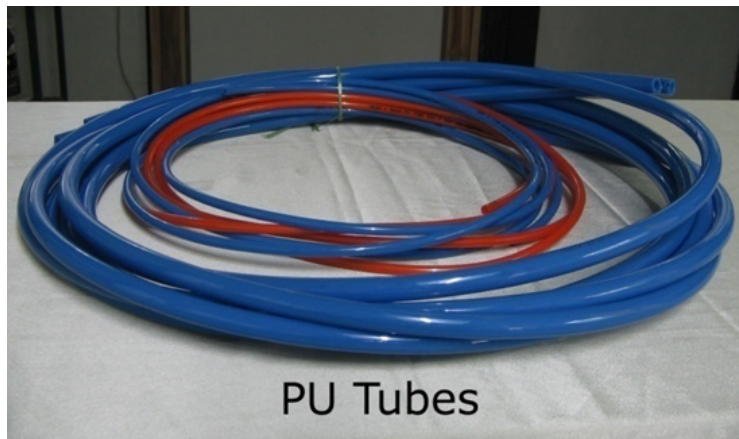


Capacity	Interconnecting Joints
75 mL	Straight ends for flexible tubes
120 mL	
250 mL	
500 mL	
120 mL	Ball & Cup
250 mL	
500 mL	

## Heated Umbilical Cord

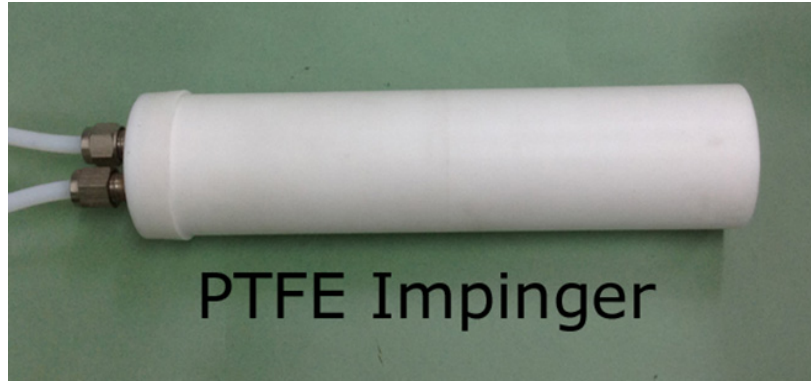
Heated umbilical cords contain the same constituents as are contained in unheated cords, but all these constituents are enveloped by an electrical heater coil which is in turn enclosed in a thermally conducting and electrically insulated sheath.

## Interconnecting Tubes



Constituent	Material	Devices connected
6 mm (OD) Tube	PU	Pitot Tube
12 mm (OD) Tube	PU	Sampling Probe and sampling pump
6 mm (OD) Tube	Metal braided PU	Pitot Tube
12 mm (OD) Tube	Metal braided PU	Sampling Probe

# PTFE Impinger



Capacity	Joint Type
200 mL	Straight ends for flexible tubes / Swagelok

# ELECTRONIC GAS VOLUME METER

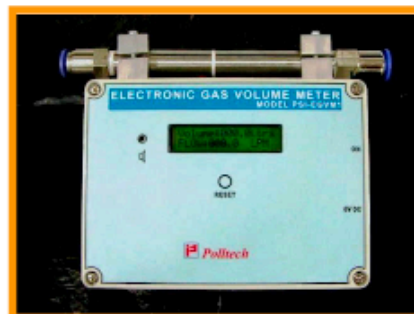
## Available Models

### PSI-EGVM-1L, PSI-EGVM-1M, PSI-EGVM-1H

Flow and sampled volume measurements are of fundamental importance in air pollution monitoring particularly in stack emission monitoring. US EPA has stipulated a number of requirements with respect to range, accuracy and stability for dry gas meters. Dry gas meters are mechanical volume totalizers which are now being replaced by their electronic counterparts.

#### Salient Features

- ☛ Digital Display of Flow and Volume
- ☛ Online Integration of Flow
- ☛ Fully Portable
- ☛ Flow Accuracy  $\pm 2\%$  of Full scale
- ☛ Wide Measuring Range
- ☛ Precision Orifice Flow Sensor
- ☛ Measures Flow from Pressure or Vacuum Source



### PSI-EGVM-1H

Model PSI-EGVM1 is a micro-processor based electronic instrument which basically measures flow and carries out the volume totalization programmatically. Totalized volume is updated every second, the timing function being carried out internally by the microprocessor.

Model PSI-EGVM1 employs a precision orifice for flow measurement. The pressure drop that develops across the orifice is measured by a low pressure solid state pressure sensor. It takes advantage of multi-point linearization technique to enhance accuracy and the dynamic range of measurements. The flow and volume measurements are continuously displayed on a digital LCD module. The instrument also has a provision for manually resetting the totalized volume to zero.

#### Detailed Technical Specifications

Model →	PSI-EGVM-1L	PSI-EGVM-1M	PSI-EGVM-1H
<b>Specification ↓</b>			
<b>Flow Range</b>	0.10 to 2.00 LPM	0.50 to 10.0 LPM	2.0 to 80.0 LPM
<b>Flow Sensor</b>	Precision Orifice		
<b>Volume Ranges</b>	Two		
<b>Volume Range 1</b>	0 to 99.99 Liters	0 to 99.99 Liters	0 to 999.9 Liters
<b>Volume Range 2</b>	999.9 Liters	999.9 Liters	9999 Liters
<b>Range Selection</b>	Auto-ranging		
<b>Accuracy</b>	$\pm 2\%$ of Full Scale		
<b>Display</b>	32 character Alphanumeric backlit LCD Module		
<b>Volume Reset</b>	Reset key provided		
<b>Power supply</b>	4x1.5V Type AA Dry Cells		
<b>Mains operation</b>	AC Adaptor available as option		
<b>Dimensions &amp; Weight</b>	21 (L) X 14 (W) X 7 (H) cm 800 Gm.	18 (L) X 14(W) X 7(H)cm 800 Gm.	21 (L) X 16 (W) X 7 (H) cm 1 Kg.

#### Accessories

Carrying case, Filter cartridge

#### Related Products

**Low Flow Digital Calibrator** Model PSI-DFC-1L

**Air Flow Calibrator** PSI – AFC-1L, PSI- AFC-1M, PSI- AFC-1H

**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI – TLOC2.

**Digital Flow Meter** Model PSI-DFM-1L, Model PSI-DFM-1M, Model PSI-DFM-1H

**Digital Orifice Flow Calibrator** Model PSI – OFC1, Model PSI-OF2, Model PSI-OF3

**Digital Air Flow Calibration System** Model PSI- DFCS-1L, PSI- DFCS-1M, PSI- DFCS-1H



## Air Flow Calibrator

*An easy to use standard flow meter for calibration of flow measuring instruments in air sampling equipment and industrial processes*

### Available Model:

<b>PSI- AFC1 (L)</b>	Range: 2.00 cc/min to 200.00 cc/min
<b>PSI- AFC1 (M)</b>	Range: 0.03 L/min to 3.000 L/min
<b>PSI- AFC1 (H)</b>	Range: 0.200 L/min to 20.000 L/min



### Applications:

Calibration of rotameters, orifice meters, digital flow meters, air sampling pumps (vacuum or pressure) etc.

### Physical Design Highlights:

Model PSI-AFC-1 employs a mass air flow sensor which comprises a micro bridge chip housed in venturi type flow housing. This arrangement permits in-line flow measurement without introducing any significant pressure drop.

Also the micro bridge chip being in direct contact with the flow stream greatly reduces possibilities of errors in measurement due to orifice or bypass channel clogging. The microprocessor based electronics performs the tasks of data acquisition, linearization, and gas calibration and operator interface including data display etc.

The three models are designed to cover wide flow ranges starting from 200.00 cc/minute full scale to 20.000 LPM full scale.

### Salient Features

- Flow Accuracy  $\pm 2\%$  of reading
- Fully Portable
- Multiple Units Option
- Wide Measuring Range
- Mass Air Flow Sensor
- Measures Flow from Pressure or Vacuum Source
- Gas Selection Mode

## Specifications

→ Specification↓	Model	PSI-AFC-1L	PSI-AFC-1M	PSI-AFC-1H
<b>Flow Measuring Range</b>		2.00 cc/min to 200.00 cc/min	0.03 to 3.000 L/min	0.200 to 20.000 L/min
<b>Flow Sensor</b>	Precision, Mass Air Flow Sensor			
<b>Accuracy</b>	± 2% of Reading			
<b>Display</b>	32 character alphanumeric backlit LCD Module			
<b>Operating Keys</b>	3 Nos.			
<b>Key Functions</b>	Select Gas, Select Units, Auto zero			
<b>Power Supply</b>	12 V DC supplied through AC Adaptor			
<b>Pneumatic Connection</b>		Ferruleless Union	Push fit for 6 mm PU tube	Push fit for 8 mm PU tube
<b>Dimensions</b>	6 cm (H) x 16cm (W) x 21cm (D)			
<b>Weight</b>	750 gm			

## Accessories

Filter cartridges for Flow calibrators, Carrying bag

## Related Products

**Digital Air Flow Calibration System** Model PSI-DFCS-1L, PSI-DFCS-1M, PSI-DFCS-1H

**Low Flow Digital Calibrator** Model PSI-DFC-1L

**Digital Orifice Flow Calibrator** Model PSI-OFC1, Model PSI-OFC2, Model PSI-OFC3

**Digital Flow Meter** Model PSI-DFM-1L, Model PSI-DFM-1M, Model PSI-DFM-1H

**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI-TLOC2.

# DIGITAL LOW FLOW CALIBRATOR

## Available Model

### PSI-DFC-1L

Calibration is the process of comparing a measurement device against an equal or a better standard to verify the closeness of the measurement device to the standard. The standard instrument, commonly called a calibrator, is generally required to be more accurate than the instrument under calibration. Calibrators are characterized by high accuracy, reproducibility, high reliability and stability.

In order to ensure that the accuracy of the measurement stays within the claimed specifications, calibration of flow (also pressure and temperature) measuring instruments needs to be carried out on a periodic basis, normally once a year.

#### Salient Features

- ☛ Primary Standard
- ☛ Flow Accuracy  $\pm 2\%$
- ☛ Auto Ranging
- ☛ Fully Portable
- ☛ Tracks Multiple Bubbles
- ☛ Average Mode
- ☛ Wide Measuring Range
- ☛ Measures Flow from Pressure or Vacuum Source



Model PSI-DFC-1L is an easy to use air flow calibrator which can be used for accurately calibrating low flow air sampling pumps rotameters, digital flow meters etc quickly and reliably with accurate and reproducible results. It also finds application in flow measurement in Gas-Chromatography systems.

Model PSI-DFC-1L employs two sets of IR transmitter-receiver pairs for detection of the presence of a liquid soap bubble in a glass flow cell. The flow is computed from time of flight of the soap bubble between these two fixed set of sensors.

Model PSI-DFC 1L comprises of a highly precise glass flow-cell, two sets of IR sensors, an electronics unit, and an arrangement for bubble formation. The bubble formation process is very simple and comprises just pressing of the bulb to raise the level of liquid soap above the gas opening. The electronic unit is a microprocessor based unit which performs the tasks of interfacing with IR sensors, timing, computations and operator interface.

#### Detailed Technical Specifications:

<b>Flow Measuring Range</b>	From 1.00 cc/min to 500 cc/min - auto ranging
<b>Flow Sensor</b>	Optically tracked Soap bubble
<b>Flow computation methodology</b>	Volume $\div$ Time of flight of soap bubble
<b>Accuracy</b>	2 % of Full Scale
<b>Display</b>	16 character alphanumeric backlit LCD Module
<b>Operating Keys</b>	2 Nos.
<b>Key Functions</b>	Average, Reset
<b>Power Supply</b>	6 VDC through a adaptor for 110-230 V AC, or Optional- Built-in rechargeable Li-ion Battery with external Charger
<b>Dimensions &amp; Weight</b>	23 cm (H) x 15cm (W) x 14cm (D) Wt. - 1.25 Kg.

#### Accessories

Soap solution for Digital Flow Calibrator, Filter cartridges, Carrying case / bag

#### Related Services

Flow calibration of own and third party instruments

#### Related Products

**Digital Air Flow Calibration System** Model PSI- DFCS-1L, PSI- DFC-1M, PSI- DFCS-1H

**Digital Orifice Flow Calibrator** Model PSI – OFC1, Model PSI-OF2, Model PSI-OF3

**Digital Flow Meter** Model PSI-DFM 1L, Model PSI-DFM 1M, Model PSI-DFM 1H

**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI –TLOC2.

**Air Flow Calibrator** PSI – AFC-1L, PSI- AFC-1M, PSI- AFC-1H

# DIGITAL ORIFICE FLOW CALIBRATOR

## Available Models

### PSI-OFC1

### PSI-OFC2

### PSI-OFC3

Calibration is the process of comparing a measurement device against an equal or a better standard to verify the closeness of the measurement device to the standard. The standard instrument, commonly called a calibrator, is generally required to be more accurate than the instrument under calibration. Calibrators are characterized by high accuracy, reproducibility, high reliability and stability. A calibrator's accuracy itself needs to be verified against a known primary or secondary standard and is called traceability of calibration.

In order to ensure that the accuracy of the measurement stays within the claimed specifications, calibration of flow (also pressure and temperature) measuring instruments needs to be carried out on a periodic basis which may be once in six months to once a year as stipulated by the regulatory authorities.

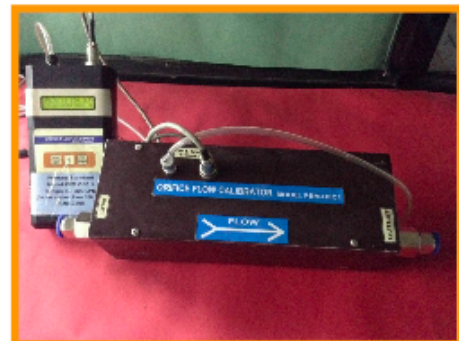
Polltech's Digital Orifice Flow Calibrator is an easy to use air flow calibrator which can be used for accurately and quickly calibrating high flow rotameters and other instruments. It can also be used to calibrate volumetric device such as Dry Gas Meter or other volume totalizers.

## Salient Features

- Based on internationally accepted orifice flow metering
- Uses Pressure sensors and Temperature sensor for measurement of Orifice Parameters
- Microprocessor based electronics
- Measurement accuracy  $\pm 2\%$  of reading
- Three different models covering all ranges of flow up to 300 LPM



**PSI-OFC2 & PSI-OFC3**



**PSI-OFC1**

Digital Orifice Flow Calibrator employs a high-precision orifice assembly for measurement of flow. The orifice assembly consists of an orifice plate mounted in a specially designed cylindrical tube and is fitted with push fit unions for air inlet and outlet. In the case of PSI-OFC1 this assembly is a stand alone unit which is kept separate from the electronic unit, while for PSI-OFC2 and PSI-OFC3 it is fitted at the back of the electronic unit. The differential pressure that develops across the orifice because of the flow is measured with a precision solid state pressure sensor. Another solid state pressure sensor and a temperature sensor measures absolute pressure and temperature at the inlet of the orifice. The flow rate is computed programmatically from these measurements using stored calibration constants.

The electronic unit is a microprocessor based unit which houses the pressure and temperature sensors and performs the tasks of interfacing with sensors, timing, computations and operator interface. The 32 character alphanumeric display provides information about flow at operating condition as well as flow value corrected to ASTP ( 760 mmHg & 25<sup>o</sup> C ). In addition absolute gas pressure and gas temperature at operating conditions is also displayed. The volume totalisation mode can be used for calibrating gas volume meters since it provides total integrated volume of gas flow over a particular time.

The performance of Digital Orifice Flow Calibrator is carefully characterized during its design and development to ensure good linearity over entire measurement range. The multi-point linearization further helps in the calibrator achieving accuracy of better than  $\pm 1\%$  of F.S. Calibration certificates traceable to NPL New Delhi are provided.

The three models are designed to cover wide flow ranges viz. 30.0 to 300.0 LPM, 10.0 to 120.0 LPM, 2.00 to 30.00 LPM. Every model can carry out volume totalization up to 9999.9 Liters.

#### Detailed Technical Specifications :

Model →	PSI-OFC 1	PSI-OFC 2	PSI-OFC 3
<b>Specification ↓</b>			
<b>Flow Range</b>	30.0 to 300.0 LPM	10.0 to 120.0 LPM	2.00 to 30.00 LPM
<b>Display</b>	32 Characters LCD Module		
<b>Parameters displayed</b>	Flow at Operating conditions, Flow at SATP (760 mmHg & 25 <sup>o</sup> C) conditions, Operating conditions Pressure and Temperature, Total Time, Total Volume		
<b>Operating Key Functions</b>	Mode, Start and Stop ( for Time & Volume )		
<b>Totalizing Timer Range</b>	1 Second to 60 Minutes		
<b>Totalized Volume range</b>	9999.9 Liters	0.1 to 9999.9 Liters	0.1 to 9999 Liters
<b>Flow sensing technique</b>	Orifice differential pressure, Gas Inlet absolute pressure & Temperature		
<b>Sensors</b>	Solid State Sensors for Orifice $\Delta P$ & inlet Pressure and gas Temperature		
<b>Absolute pressure Range</b>	600 to 800 mm Hg		
<b>Temperature Sensor Range</b>	5 to 60 <sup>o</sup> C		
<b>Flow computation</b>	Computed programmatically using a 10 point Calibration table.		
<b>Volume Totalization</b>	Computed programmatically using the flow rate and the totalizing time		
<b>Orifice assembly location</b>	Stand alone housing	Fitted at the back of Electronic unit housing	
<b>Orifice material</b>	Precision machined SS		
<b>Inlet / Outlet Connection</b>	Pushfit Union for 16 mm OD tube	Push fit Union for 12mmOD tube	
<b>Power Supply</b>	6 VDC through 230 V AC adaptor (Optional- Li-ion battery )		
<b>Dimensions &amp; Weight</b>	35x10x8 Cm for Orifice housing .21x20x5 Cm for Display unit Total Weight- 2.5 Kg	Size - 25 x 25 x 8 Cm Wt.- 1.2 Kg.	

#### Accessories

Filter cartridges, Carrying case / bag

#### Related Services

Flow calibration of own and third party instruments

#### Related Products

**Air Flow Calibrator** PSI-AFC-1L, PSI-AFC-1M, PSI-AFC-1H

**LFE Gas Flow Calibrator Model-PSI-LGFC-1**

**Low Flow Digital Calibrator** Model PSI-DFC-1L

**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI-TLOC2

**Digital Flow Meter** Model PSI-DFM-1L, Model PSI-DFM-1M, Model PSI-DFM-1H



# DIGITAL FLOW METER

## Available Models

**PSI-DFM-1-PM-L, PSI-DFM-1-PM-M, PSI-DFM-1-PM-H**  
**PSI-DFM-1-HH-L, PSI-DFM-1-HH-M, PSI-DFM-1-HH-H**

Accurate flow measurement is of fundamental importance in Gas Chromatography, air pollution sampling, gas metering and other industrial applications. Wrong flow measurements can lead to misleading results in respect of concentration of air pollutants, which in turn could result in health risks and / or wasted man hours. Accurate and quick periodic calibration of flow measuring devices like rotameters and flow generating devices like sampling pumps is an important requirement.

### Salient Features

- ☛ Easy to Operate
- ☛ Flow Accuracy  $\pm 2\%$
- ☛ Various Flow Ranges
- ☛ Suitable for Various Gases
- ☛ Fully Portable
- ☛ Wide Measuring Single Range
- ☛ Measures Flow from Pressure or Vacuum Source



Digital Flow Meter Model PSI-DFM1-PM and PSI-DFM1-HH afford accurate and fast flow measurements in air sampling applications. The two models are distinguished only in enclosure specifications i.e. PSI-DFM1-PM is panel mountable while PSI-DFM1-HH is hand held type and are otherwise similar in functionality. Each of these models is available in three user specified ranges, namely Low, Medium and High. In this text, all these models will be simply referred to as DFM1.

DFM1 measures flow by measuring the differential pressure across an orifice. The pressure in turn is measured by a solid state pressure sensor. The orifice, the pressure sensor, the flow connections and the electronics are all housed in a single cabinet. The electronics is a microprocessor based unit which performs the tasks of interfacing with sensors, timing, computations and operator interface. The unit has a provision for G.C. users to select any of the gases i.e. Air, O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>, He, Ar / CH<sub>4</sub> and CO<sub>2</sub>. The flow is automatically corrected for the properties of the gas. All instruments are provided calibrated reports with traceability to National standard

### Detailed Technical Specifications :

Model	PSI-DFM1-PM-L PSI-DFM1-HH-L	PSI-DFM1-PM-M PSI-DFM1-HH-M	PSI-DFM1-PM-H PSI-DFM1-HH-H
<b>Specifications</b>			
<b>Measuring Range</b>	5.0 - 400.0 cc / Minute	0.10 LPM - 5.00 LPM	0.50 - 20.00 or 5.0 to 80.0 LPM
<b>Accuracy</b>	$\pm 2\%$ of Full Scale		
<b>Display</b>	32 character Alphanumeric backlit LCD Module		
<b>Keys</b>	Auto Zero, Gas Selection		
<b>Flow Connections</b>	Ferruleless unions suitable for 4/6 mm tubing		
<b>Power supply</b>	230V AC, 50Hz.( for PM ) and 4x1.5V Type AA Dry Cells (for HH )		
<b>Cabinet</b>	96 x 96 x150 mm ( for PM ) and ABS Plastic 200 x 100 x 40 mm ( for HH )		

### Accessories

AC Adaptor, Filter cartridges, Carrying case / bag

### Related Products

**Air Flow Calibrator** PSI-AFC-1L, PSI-AFC-1M, PSI- AFC-1H  
**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI-TLOC2  
**Digital Orifice Flow Calibrator** Model PSI-OFC1, Model PSI-OFC2,  
 Model PSI-OFC3

**Low Flow Digital Calibrator** Model PSI-DFC-1L  
**LFE Gas Flow Calibrator** Model-PSI-LGFC-1



# LFE GAS FLOW CALIBRATOR

## Available Model PSI-LGFC-1

Calibration is the process of comparing a measurement device against an equal or a better standard to verify the closeness of the measurement device to the standard. The standard instrument, commonly called a calibrator, is generally required to be more accurate than the instrument under calibration. Calibrators are characterized by high accuracy, reproducibility, high reliability and stability. A calibrator's accuracy itself needs to be verified against a known primary or secondary standard and is called traceability of calibration

In most commonly used flow meters, the accuracy of measurement of flow at low flow rates becomes poor. Polltech's LFE gas flow calibrator is a special instrument which utilizes a Laminar Flow Element (LFE) which affords measurement accuracy of better than +/- 1% even at low flow rates. The calibrator can be fine tuned on specific request to further enhance the accuracy to +/-0.5 % of reading.

### Salient Features

- ☛ Laminar Flow Element (LFE) sensor
- ☛ Built-in sensors for measuring temperature differential and absolute pressure
- ☛ Flow Accuracy  $\pm 1\%$  of reading
- ☛ Customizable to 0.5% of reading
- ☛ OLED display of 4 line x 20 character
- ☛ Touch sensitive key pad
- ☛ Multiple Units Option
- ☛ Various Flow mode options
- ☛ Wide Measuring Range
- ☛ Measures Flow from Pressure or Vacuum Source
- ☛ Gas Selection Mode: User can select flow meter gas from a large number of gases.
- ☛ USB port for Data Transfer to PC. Windows based application software utility
- ☛ Fully Portable
- ☛ Elegant Cabinet



### Principle of Operation

Differential pressure ( $\Delta p$ ) flow meters are one of the most common types of flow meters. The principle of operation of  $\Delta p$  flow meters is based on Bernoulli's equation which relates flow to differential pressure across a restriction. Accordingly, in these  $\Delta p$  flow meters, a constriction (normally a orifice or venturi) is introduced in the flow path. When the fluid flows through this constriction, a pressure drop develops across it; the greater the flow, the more is the pressure drop. Mathematically, the pressure drop across the constriction is proportional to the square of the flow rate. Because of this, the accuracy of measurement at lower flow rates becomes poor. This problem is mitigated by the using a Laminar Flow Element (LFE).

LFE is a special kind of constriction, through which the fluid flow is in laminar regime (low Reynolds number). The pressure drop across this element is linear in relation to the flow rate. This enhances accuracy of reading at lower flow rates and increases the "turn down ratio" from the usual 10:1 to 100:1.

The flow is computed by measuring differential pressure and making corrections with data from temperature and absolute pressure sensors

### Design & Construction

PSI -LGFC is a microprocessor based hand held instrument. It utilizes a Linear Flow Element suitable coupled with a differential pressure sensor. It also includes sensors for measuring temperature and absolute pressure. The user interface comprises a 4 lines by 20 characters OLED Display and a 9-key touch sensitive key pad. It is also provided with a USB port for data transfer to a PC. All the electronics and the sensors housed in a hand held elegant and sturdy imported cabinet.

### Data Transfer and Management

Windows based software app for data capture on PC and subsequent management of capture data is provided.

### Detailed Technical Specifications:

The various models are designed to cover wide flow ranges starting from 1.00 lpm full scale to 100.00 full scale.

<b>Flow Measuring Range</b>	From 1.00 cc/minute to 300.00 LPM in 4 models 1.00cc/minute to 100.00 cc/minute 50.0 cc/minute to 5000.0 cc/minute 1.00 LPM to 100.00 LPM 30.00 to 300.00 LPM Other ranges on request
<b>Flow Sensor</b>	Laminar Flow Element (LFE)
<b>Flow Inference Methodology</b>	Flow is inferred from the differential pressure ( $\Delta p$ ) developed across LFE
<b>Flow Vs <math>\Delta p</math> Relation</b>	Linear
<b>Accuracy</b>	Better than $\pm 1\%$ of Reading Customizable to $\pm 0.5\%$ of Reading
<b>Gas measured</b>	<b>User selectable from dry air, wet air, Nitrogen, Argon, Oxygen Helium, Hydrogen Carbon dioxide etc.</b>
<b>Unit of measurement</b>	<b>User selectable from</b> cm <sup>3</sup> /sec (ccs), cm <sup>3</sup> /min (ccm), Liters/sec (LPS), Liters/min (LPM), Liters/hr (LPH), Std cm <sup>3</sup> /sec (sccs), Std cm <sup>3</sup> /min (sccm), cu ft/sec(CFS), cu ft/min(CFM), Std cu ft/hr(SCFH), Std cu ft/sec(SCFS), Std cu ft/min(SCFM), Std cu ft/hr(SCFH), milligram/sec (mgs), milligram/min (mgm), milligram/hr(mgh)
<b>Flow Mode</b>	<b>Use selectable from</b> Flow at Operating Conditions, Flow at STP, Mass Flow at operating condition and at STP
<b>Other User Settings</b>	Averaging Period, Data Transfer Rate, Data Storage Frequency
<b>Parameters Displayed</b>	Gas, Temperature, Pressure, Flow Rate, Battery Status
<b>Display</b>	4 lines x 20character alphanumeric OLED Module
<b>Operating Keys</b>	9 Nos.
<b>Key Functions</b>	Select gas, Select Flow mode, Auto zero Inc/ Scroll up, Dec/ Scroll Down, Escape, Fn, Return
<b>Operating Supply</b>	Built-in Li-ion battery with USB charger
<b>Dimensions</b>	260 x 130 x 45 mm

### Related Products

**Air Flow Calibrator Models** PSI-AFC-1L, PSI-AFC-1M, PSI-AFC-1H

**Digital Air Flow Calibration System** Model PSI-DFCS-1L, PSI-DFCS-1M, PSI-DFCS-1H

**Low Flow Digital Calibrator** Model PSI-DFC-1L

**Digital Orifice Flow Calibrator** Model PSI-OFC1, Model PSI-OFC2, Model PSI-OFC3

**Digital Flow Meter** Model PSI-DFM-1L, Model PSI-DFM-1M, Model PSI-DFM-1H

**Top Loading Orifice Calibrator** Model PSI-TLOC1 & PSI-TLOC2.

# TOP LOADING ORIFICE CALIBRATOR

## Available Models

### PSI-TLOC1, PSI-TLOC2

Accurate flow measurement is fundamental to this method for accurate determination of the extent of pollution in the air. US EPA and other pollution control authorities recommend that an air sampler (particularly high volume sampler) should be calibrated at regular intervals in the field using a calibrated orifice flow rate transfer standard. The orifice transfer standard should be recertified once every year. The set of five multi-hole resistance plates are used to change the flow through the orifice so that several points can be obtained for the air sampler calibration curve.

#### Salient Features

- ☞ Designed as per EPA specification
- ☞ Precision SS Orifice
- ☞ Portable compact light weight Multi-function electronic unit
- ☞ Digital display of
  - ◆ Flow for STP & operating conditions
  - ◆ Differential Pressure across orifice
  - ◆ Operating temperature



#### Change photo

Polltech's Top Loading Orifice Calibrator is an equipment, designed as per EPA specifications, which makes easy the task of in-field calibration of blower flow meter in High Volume samplers and High Volume PM10 Samplers of Polltech make as well as all other standard makes. Top Loading Orifice Calibrator is a flow transfer standard which can be taken to the field for in-situ calibration of the samplers without disassembling any flow measuring device of the sampler.

The TLOC assembly is fabricated as per US EPA design. It consists of a base plate, cylindrical pipe, an orifice plate, gaskets and mounting accessories. The base plate matches the filter holder and can be fixed directly to it in place of the pressure plate. It has provision for introducing and holding in place one of the 5 resistance plates at a time. The cylindrical pipe is mounted directly on top of the resistance plate. The transfer standard orifice is fixed on the top of the cylindrical pipe. A pressure tap below the orifice is provided on the cylindrical pipe. This tap is used to measure pressure across the orifice, which is a measure of flow. The cylindrical pipe also has a provision for accommodating a temperature sensor (for TLOC2).

Top Loading Orifice Calibrator model PSI-TLOC1 comprises a base plate, an orifice assembly, a set of five multiple resistance plates a manometer assembly. The manometer assembly employed in model PSI-TLOC1 is a U-Tube Manometer for measurement of differential pressure across orifice. The flow is determined from the calibration graph of flow v/s dp provided with the calibrator.

Top Loading Orifice Calibrator model PSI-TLOC 2 is a very advanced model with digital display of flow at operating conditions as well as corrected for STP conditions. It comprises a base plate, an orifice assembly, a set of five multiple resistance plates and an Electronic unit with a solid state pressure sensor for measurement of  $\Delta p$ .

Electronic unit used in PSI-TLOC2 is a microprocessor based unit which houses the pressure sensor and performs the tasks of interfacing with sensors, timing, computations, flow computations and operator interface. The unit has a provision for showing the flow under operating conditions as well as flow corrected for ASTP conditions i.e. 25<sup>o</sup>C & 760 mm Hg absolute pressure.

The Orifice assembly is calibrated with a certified digital flow calibrator and a calibration graph is provided for model PSI-TLOC1. However for advanced model PSI-TLOC2, a ten point calibration table is stored in its non-volatile memory to achieve higher accuracy.

## Detailed Technical Specifications

### Orifice Assembly

Model →	PSI-TLOC1	PSI-TLOC2
Specification ↓		
Base Plate size	Suitable for 8" x 10" standard filter holder	
Cylindrical housing	With pressure tap nozzle	With pressure tap nozzle & temperature sensor union
Orifice Plate	Precision machined SS as per USEPA mounted on cylindrical housing	
Resistance plates	5 plates – 1 each with 17, 13, 10, 7 & 5 holes for varying flows	
Material of construction	Aluminum with high quality finish	
Dimensions & Weight	Size - 33 x 24 x 19 Cms.	Weight- 2.7 Kg.

### Manometer Assembly (PSI-TLOC1)

Functions	Pressure measurement
Flow Range	500 to 2000 LPM
Flow Measurement Accuracy	±2% of Full Scale
Pressure Measurement Range	20 – 0 – 20 cm WC
Manometer Type	U-tube glass
Scale Graduation Resolution	1 mm
Enclosure	Aluminum with acrylic front
Calibration Report	Provided with traceability to National standard
Dimensions & Weight	Size-500 x 80 x 40 mm Weight.-0.9 Kg.

### Electronic unit (PSI-TLOC2)

Functions	Δp Pressure measurement, Absolute Pressure measurement Temperature measurement Flow computation at operating conditions Flow computation at STP Operator interface
Flow Range	250 to 2500 LPM with a resolution of 1 LPM
Flow measurement accuracy	±2% of reading with multi point Linearization
DP Pressure Sensor Range	550 mmWC
Absolute Pressure Sensor Range	1050.0 mbar
Temperature range	5°C to 50°C
Display	32 character Alphanumeric LCD
Operating keys	3
Operating Power supply	6 V - 4 x 1.5 V Dry Cells or AC adaptor or rechargeable Li-ion Battery
Cabinet	High quality ABS
Calibration Report	Provided with traceability to National standard
Dimensions & Weight	210 x 200 x 50 mm 1 kg

### Calibration Report

Provided with traceability to National standard

### Accessories

TLOC Base plate suitable for fixing to Envirotech Respirable Dust Sampler, Carrying Case made of ABS

### Related Products

Low Flow Digital Calibrator Model PSI-DFC1L  
Air Flow Calibrator PSI - AFC1L, PSI- AFC1M, PSI- AFC1H  
Digital Flow Meter Model PSI-DFM1L, Model PSI-DFM1M, Model PSI-DFM1H  
Digital Orifice Flow Calibrator Model PSI – OFC1, Model PSI-OFC2, Model PSI-OFC3  
LFE Gas Flow Calibrator Model-PSI-LGFC-1

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