



Central Pollution Control Board  
Parivesh Bhawan, East Arjun Nagar  
Delhi-110032  
011-43102030, 22305792

**Revised PM2.5 Low Volume Sampler's Specifications (earlier released on 30.01.2023):**

**Revision No1.:**

**Section A: Sampler Design Criteria**

<sup>1</sup> "Sampler Body may<sup>1</sup> be of two parts for ease of transport and fabricated by lightweight rust-free metal. The door must open up to 180 degrees and be fitted with a master lock and key. A soft handle with a metallic holder and lock should be provided on the machine for ease of handling."

<sup>2</sup> It is optional to make PM2.5 Low Volume Sampler's body in single part or in two parts, however, manufacturer has to ensure that height of inlet should be between 2 +/- 0.2 m from the base of the sampler, as mentioned on point 4 (of the table) on page 4/8 of annexure II.

<sup>1</sup> "must" replaced with "may"

<sup>2</sup> to be added

**24.04.2023**

Issued with approval of CA, CPCB

DH-AQMN

102946/2023/AQMN-HO



केन्द्रीय प्रदूषण नियंत्रण बोर्ड  
CENTRAL POLLUTION CONTROL BOARD  
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार  
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

EQ-11012/1/2023-AQMN-HO-CPCB-HO

Dated:30.01.2023

To  
The Member Secretaries  
All SPCBs/PCCs

**Subject: Specification of PM<sub>2.5</sub> Low Volume Sampler – regarding**

Sir,

This is to inform that the specifications of manual low volume samplers for ambient PM<sub>2.5</sub> monitoring has been reviewed by an Expert Group comprising experts from National Physical Laboratory (NPL), National Environmental Engineering Research Institute (NEERI), Indian Institute of Technology (IIT) Kanpur & Delhi, State Pollution Control Board (SPCB) of Karnataka & Madhya Pradesh and CPCB.

NPL, the notified agency for certification of environmental monitoring systems in India, after testing of critical parameters related to manual PM<sub>2.5</sub> samplers, will issue initial provisional certificate which can be used as adequate safeguards for going ahead with installations. A detailed field performance and testing report as per ISO17065 will be issued by NPL subsequently.

A copy of revised specifications is attached for reference. You are requested to follow these specifications while installing PM<sub>2.5</sub> manual samplers.

Yours faithfully,

  
(Prashant Gargava)  
Member Secretary

Encl: As above

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**TECHNICAL SPECIFICATIONS  
MANUAL FILTER BASED LOW VOLUME PM<sub>2.5</sub> SAMPLER**

Sampler	Manual Filter Based Sampler (filter diameter 47 mm) as per sampler design & performance criteria as mentioned at Section A,B,C & D in the document.
Flow rate	1 m <sup>3</sup> /hour (16.7 lpm) controlled by a suitable Flow Controller. The Flow Performance criteria should comply with BIS method 5182 (Part 24) 2019 Accuracy $\pm 2\%$ of the reading.
Size Selective Inlets	Should have opposed jet impaction for PM10 cut-off and WINS impactor/VSCC for PM <sub>2.5</sub> collection on filter paper.
Height of the Inlet	The height of the inlet should be between $2 \pm 0.2$ m from the base of the sampler and the sampler should stand alone firmly at erected position
Time Totalizer	Operates only during operation of the pump, display time with a resolution of one second.
Vacuum pump	Suitable pump with brushless motor for providing the designed flow rate. Pulsating pump should have built-in pulse dampeners.
Flowrate Control	<p>Sampler should maintain designed volumetric flow rate (16.7 LPM) at inlet incorporating dynamic volumetric corrections with respect to temperature and barometric pressure. Necessary compensation of volumetric flow rate due to compensating pressure drop across the filter should also be ensured.</p> <p>Ambient temperature, barometric pressure during sampling must be displayed and recorded.</p> <p>Flow rate should be measured at least at 30 seconds interval and averaged over 5 minutes. The flow rate shall not vary more than <math>\pm 5\%</math> from the specified flow of 16.7 lpm.</p>
Data Management	<p>Memory-based recording for flowrate and total volume over five minutes should be downloadable to a computer through a suitable port and USB drive.</p> <p>Current/last logged data should be displayed. Logged data should have cloud connectivity and data of last sampling ten days must be available for crosschecking.</p> <p>Data management requirements (other) &amp; ready reference as mentioned in the document Sections C &amp; D.</p>

*B. S. D. S.*  
30/11/2023

Power Supply	A stabilized power supply through suitable voltage stabilizer having display of input and output voltage should ensure an output voltage within $230 \pm 10$ V, AC 50 Hz.
Supply of Accessories	Manufacturer's standard operation kit must include all required, fittings and accessories for the operation of sampler. Accessories to be supplied with each unit should include Leak check unit-1No., Filter cassettes-2Nos, Filter Cassette Holder-1No., Blunt Tip Forceps-1No., Filter Carrier-3Nos., Silicon Grease 10gm -1 box, Impaction Oil - 100 ml-1 bottle, One Set of O-rings and Cleaning Brush.
Documents	Operation and maintenance manual of sampler, along with data transfer protocols used with their technical description for data management and data transfer.
Certificates	Calibration certificates issued by the manufacturer with references used for Flowrate, Temperature, Barometric Pressure and Time Totalizer should be supplied with each instrument. A satisfactory performance check certificate as mentioned in section B (para 2) is provided along-with all the data-sets recorded in the system for data management etc.
Validation	Preliminary test report/validation issued by NPL to be submitted for respective make and model.  Any changes in model or declared components of the equipment require revalidation by NPL.  Submission of a preliminary test report/validation from NPL as per the set criteria of NPL is mandatory on or before 30 <sup>th</sup> September 2023.

### Section A: Sampler Design Criteria

Impactors of the sampler shall be designed as per specifications mentioned in Appendix L of 40 CFR part 50 Appendix L as defined in BIS 5182 part 24 and tolerances to be followed as specified for PM<sub>10</sub> and PM<sub>2.5</sub> impactor in L14 & L21.

The Material of Construction for the impactor assembly shall be strictly anodised aluminium only

Sampler Body must be of two parts for ease of transport and fabricated by lightweight rust-free metal. The door must open up to 180 degrees and be fitted with a master lock and key. A soft handle with metallic holder and lock should be provided on the machine for ease of handling.

*Subscribed*  
30/10/2023



The connectors shall be leak proof, preferably push fit type with engraved groove for gaskets at male parts.

Filter cassette loading mechanism and filter holder assembly shall be designed in user-friendly way and sufficient space must be provided to ensure proper handling of filter while loading and unloading it in the sampler.

Pressure drop across the filter should be monitored during sampling and whenever it reaches above 200 mm of Hg; the sampler shall stop automatically with an error message recorded.

Provision is required to limit the temperature rise of the sample filter from insulation & internal heat dissipation. The rise should not be more than 5-degree C above the ambient temperature during the sampling duration. The temperature error message should be recorded if temperature rise is more than 5 degrees C.

#### **Section B: Sampler Performance criteria**

The coefficient of variation (CV) in sample flow rate (taken at every 30 seconds) should be calculated and if the %CV (in 24hours of operation) is found more than 4% error message should be displayed and recorded.

Satisfactory performance check (the variation in PM<sub>2.5</sub> concentrations against sampler fitted with certified impactors should be within  $\pm 10\%$ ) for a minimum of five samples should be undertaken for every sampler manufactured and a certificate for satisfactory performance to be provided.

#### **Section C: Data management requirements(other)**

The 5 minutes recording of the average Flow rate, Barometric Pressure, Ambient Temperature, Filter Temperature with the date and time stamp should be available with the sampler

The software should be able to collect the flow sensor status every 30 seconds and display on the screen and compare it with the set flow (i.e, 16.7 LPM). Deviation should not be more than  $\pm 5\%$  of the set value (16.7 LPM).

The software should have the capability to compare the recorded 5 minutes' average flow data with the set value of 16.7 lpm. If the deviation is more than 10% of set value for 6 consecutive readings instrument must be automatically switched off with an error message.

Average flow should be derived by the cumulative volume data recorded (collected by integration of flow data at desired intervals) divided by the ON-Time of machine.

*2nd/2023*  
*30/01/2023*

## Section D: The Data management requirements - ready reference -

Parameter	Availability				Formats & resolutions	
	Anytime on display	End of Period in download	Visual Display on Screen	Data Output in download	Digital Reading	Units
Flow Rate, 30 Seconds Interval	Required	Not required	Required	Not required	XX.X	L/min
Flow rate, average for the sample period	Not required	Required	Required	Required	XX.X	L/min
Flow rate, Coefficient of variation (CV), for the sample period	Not required	Required	Not required	Required	XX.X	%
Flow rate, 5 minutes average	NA	Required	Not required	Required	XX.X	L/min
Sample volume, Total	Required	Required	Any Time	Required	XX.XXX	m <sup>3</sup>
Temperature, ambient, 30 seconds interval	Required	Not required	Yes	Not required	XX.X	°C
Temperature, ambient Average for recording interval (5 minute)	NA	Required	Not required	For sampling period	XX.X	°C
Barometric Pressure, ambient, 30 seconds interval	Required	Not required	Yes	Not required	XXX	mmHg / mbar
Barometric Pressure, ambient Average for Recording Interval (5 Minute)	Not required	Not required	Not required	For sampling period	XXX	mmHg / mbar
Filter Temperature, 30 seconds interval	Required	Not required	Yes	Not required	XX.X	°C
Date and Time	Required	Required	Required	For sampling period	dd/mm/yy * HH.MM.S S	D/M/Y HR:M: S

*Reviewed*  
30/10/2023

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Sampling Start and Stop Time Setting	Not required	Required	Not required	For sampling period	Dd/mmm/yy* HH:MM:S S	Y/M/D HR:M: S
Time Totalizer	Required	Required	Required	For sampling period	HH:MM:S S	HR:M: S
User enter information such as Filter number and site identification	Required			At the start of sampling	As entered	

\*formats may vary

*Amber*  
30/01/2023