Ambien Monitors Part I PM10 and Meteorology

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PM10

- PM_{10} is atmospheric particulate matter less than or equal to 10 micrometres (µm) in diameter. This is the fraction of atmospheric particulates that are small enough to penetrate deep into the human lung.
- To monitor PM_{10}, the sample air enters a size-selective inlet which has at least 50 per cent efficiency cut-off at a 10 µm aerodynamic diameter. The resulting air stream contains particulate matter generally less than 10 µm (with a small proportion of particulate matter greater than 10 µm).

PM10

- PM_{10} can arise from a wide range of sources, but can generally be separated into three categories:
  - primary combustion particulates – produced directly from combustion, such as domestic heating, road transport, power stations and industrial processes
  - secondary particulates – aggregates in the atmosphere following their release as gases (include nitrates and sulphates)
  - coarse particulates – from non-combustion sources such as re-suspended road dust, construction work, mineral extraction, wind-blown dust and soil, and sea salt.

TSP

- TSP can be considered as anything smaller than 100 µm in diameter. A considerable quantity of inhaled TSP can be removed quite effectively from the human body, although only particles smaller than 10 µm (eg, PM_{10}) achieve any significant degree of lung penetration. For this reason TSP concentrations are not suited to monitoring in relation to health effects, but are more suited to the appraisal of dust nuisance.

Main PM-10 and TSP Differences

PM-10

- Has large intake head with baffles
- Has volumetric flow controller
- No variac

TSP

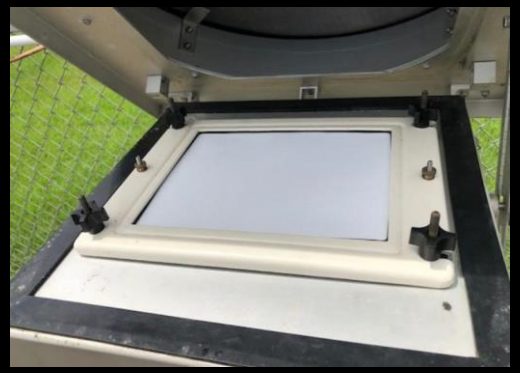
- Small intake head with no baffles
- No volumetric flow controller
- Has variac

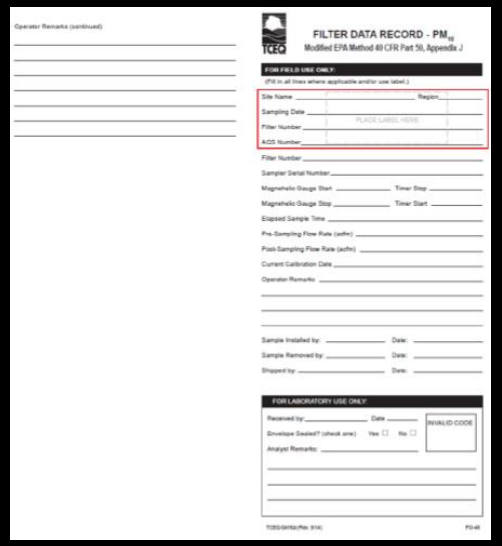
Operations

- Sample setup
  - Inspect that clean quartz filter with no holes or tares
  - Install the filter into the lower filter cassette plate with filter number on the bottom (not visible)
  - Preferable indoors or a clean environment and wearing nitrile gloves to prevent handling contamination
  - Take pre-sample flow reading with the head of the instrument closed
  - Pre-sample flow rate should be between 36-44 ACFM and that is within the last calibration points.

Operations (continued)

- Snap on the filter cassette cover before transporting it the site for installation
- Ensure proper documentation and chain of custody is followed
- Install new filter cassette on the sampler.





Operator Remarks (continued)

FILTER DATA RECORD - PM_{10}

Modified EPA Method 40 CFR Part 50, Appendix J

FOR FIELD USE ONLY

(Fill in all lines where applicable and/or use label.)

Site Name _____ Region_____

Sampling Date _____

Filter Number _____

AQS Number_____

PLACE LABEL HERE

Filter Number _____

Sampler Serial Number _____

Magnehelic Gauge Start _____ Timer Stop _____

Magnehelic Gauge Stop _____ Timer Start _____

Elapsed Sample Time _____

Pre-Sampling Flow Rate (acfm) _____

Post-Sampling Flow Rate (acfm) _____

Current Calibration Date _____

Operator Remarks _____

Sample Installed by: _____ Date: _____

Sample Removed by: _____ Date: _____

Shipped by: _____ Date: _____

FOR LABORATORY USE ONLY

Received by:_____ Date _____

Envelope Sealed? (check one) Yes ☐ No ☐

Analyst Remarks: _____

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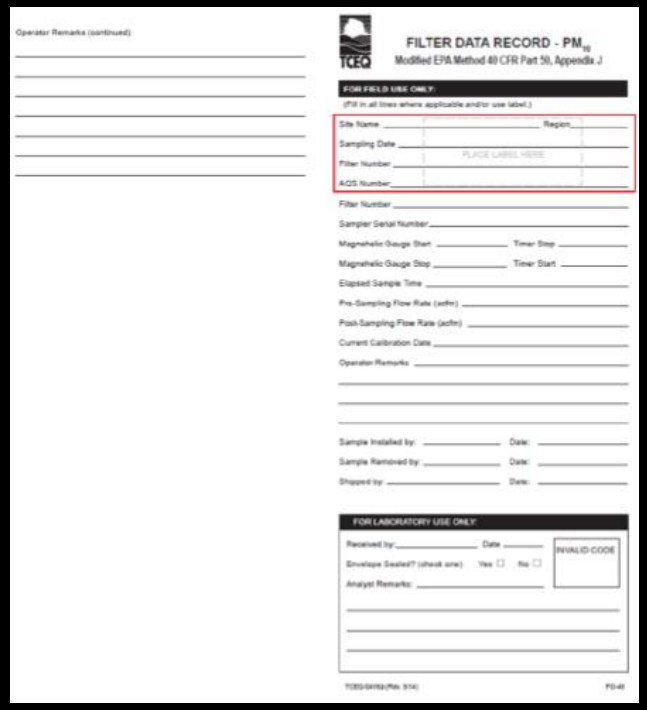
FD-48

Operations (continued)

- Set the Elapsed Time Indicator (ETI) to 0000 if it is resettable. If not, pleaser record the start number on the COC

Non-resettable ETI



Operator Remarks (continued)

FILTER DATA RECORD - PM_{10}

Modified EPA Method 40 CFR Part 50, Appendix J

FOR FIELD USE ONLY:

(Fill in all lines where applicable and/or use label.)

Site Name ____ Region ____

Sampling Date ____

Filter Number ____

AQS Number ____

PLACE LABEL HERE

Filter Number ____

Sampler Serial Number ____

Magnehelic Gauge Start ____ Timer Stop ____

Magnehelic Gauge Stop ____ Timer Start ____

Elapsed Sample Time ____

Pre-Sampling Flow Rate (acfm) ____

Post-Sampling Flow Rate (acfm) ____

Current Calibration Date ____

Operator Remarks ____

Sample Installed by: ____ Date: ____

Sample Removed by: ____ Date: ____

Shipped by: ____ Date: ____

FOR LABORATORY USE ONLY:

Received by: ____ Date ____

Envelope Sealed? (check one) Yes ☐ No ☐

Analyst Remarks: ____

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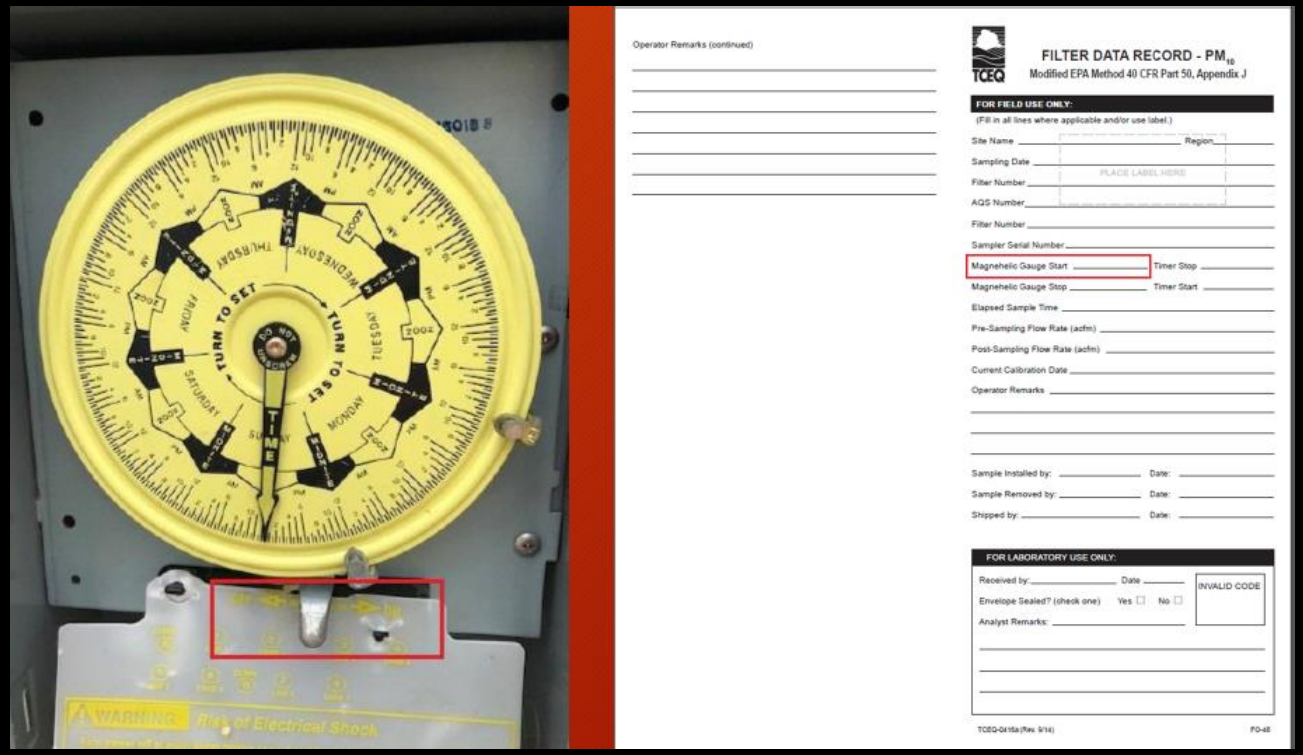
Operations (continued)

- Open the seven-day timer door and turn the motor to record the pre-sampling magnehelic gauge reading on the COC.

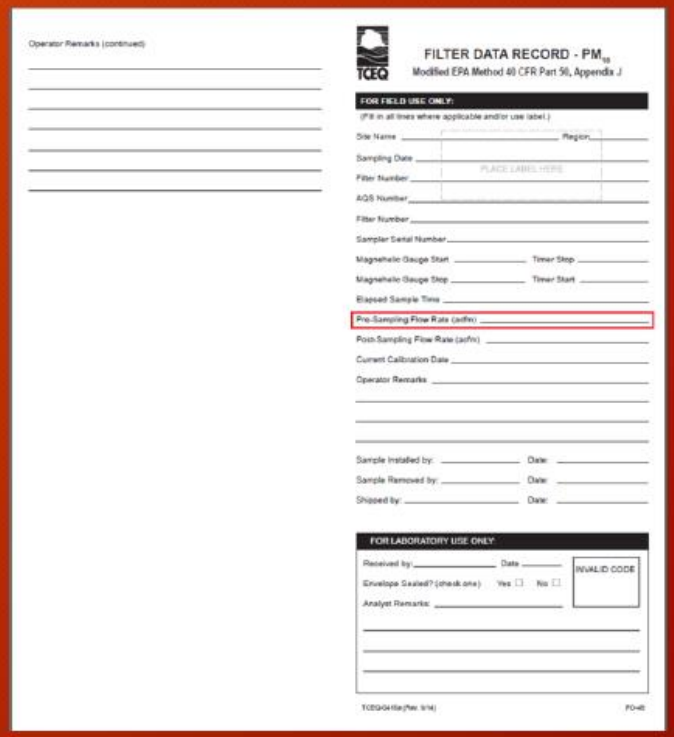


Operations (continued)

- Input the sampler magnehelic reading (in inches water [“H2O]) in the “optional” section of the Worksheet, cell A49.
- The Worksheet calculates the sample flow rate in acfm.
- Record the acfm flow rate on the FDRC in the Pre-Sampling Flow Rate section.
- The flow rate must be between 36 and 44 acfm for PM10 and 39 to 60 for TSP and within the calibration range for the sample to be valid.

Use the following to determine flow from any given sampler magnehelic reading (replaces table from previous workbook):

Pm ("H2O)	SCFM	ACFM	Did flow meet specs?
	42.40	42.79	NO: outside of calibration range



Operator Remarks (continued)

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FILTER DATA RECORD - PM_{10}

Modified EPA Method 40 CFR Part 50, Appendix J

FOR FIELD USE ONLY:

(Fill in all lines where applicable and/or use label.)

Site Name _____ Region _____

Sampling Date _____

Filter Number _____ PLACE LABEL HERE

AQS Number _____

Filter Number _____

Sampler Serial Number _____

Magnehelic Gauge Start _____ Timer Stop _____

Magnehelic Gauge Stop _____ Timer Start _____

Elapsed Sample Time _____

Pre-Sampling Flow Rate (acfm) _____

Post-Sampling Flow Rate (acfm) _____

Current Calibration Date _____

Operator Remarks _____

Sample Installed by: _____ Date: _____

Sample Removed by: _____ Date: _____

Shipped by: _____ Date: _____

FOR LABORATORY USE ONLY:

Received by: _____ Date _____

Envelope Sealed? (check one) Yes ☐ No ☐

Analyst Remarks: _____

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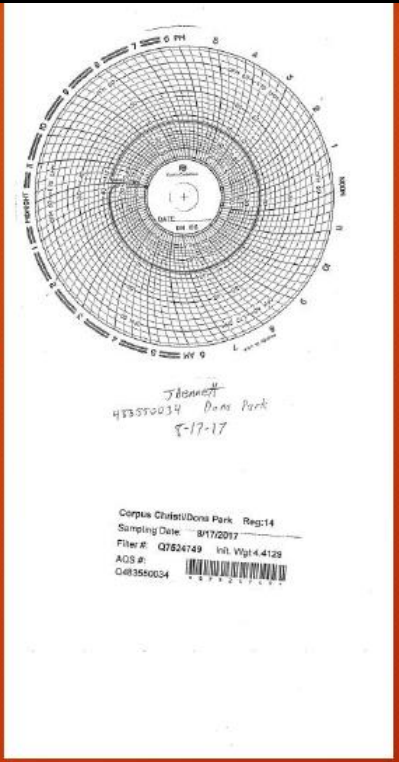
Operations (continued)

- Write the initials of the person loading the sample, the site name or CAMS number, and the sampling date on the back of the circular graph chart.
- Open the chart recorder door and depress the thumb lever on the silver arm.
- Place the chart on the graph recorder to begin at midnight, ensure the red pen is in direct contact with the chart graph, and close and secure the chart recorder door.

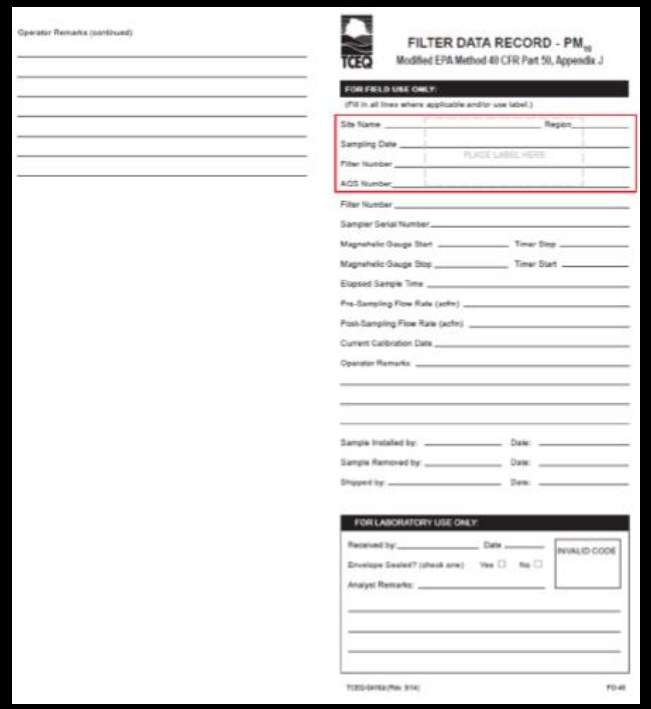


Operations (continued)

- Advance the seven-day clock one day to the current time and day of the filter installation to ensure the next sample collection begins on time.
- Use ONLY local standard time starting at midnight, with no adjustment for daylight savings time.
- For example; during daylight savings time of year, set your start time back 1 hour. When daylight savings time of year ends, use LST.

Operations (continued)

- After sampling, retrieve the filter in the same way it was set up
  - Record stop timer reading
  - Calculate and record the elapsed sample time
  - Take post flow reading prior to opening the sampler head
  - Record post-sampling magnehelic gauge reading



Operator Remarks (continued)

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FILTER DATA RECORD - PM_{10}

Modified EPA Method 40 CFR Part 50, Appendix J

FOR FIELD USE ONLY:

(Fill in all lines where applicable and/or use label.)

Site Name _____ Region _____

Sampling Date _____

Filter Number _____

AQS Number _____

PLACE LABEL HERE

Filter Number _____

Sampler Serial Number _____

Magnehelic Gauge Start _____ Timer Stop _____

Magnehelic Gauge Stop _____ Timer Start _____

Elapsed Sample Time _____

Pre-Sampling Flow Rate (acfm) _____

Post-Sampling Flow Rate (acfm) _____

Current Calibration Date _____

Operator Remarks _____

Sample Installed by: _____ Date: _____

Sample Removed by: _____ Date: _____

Shipped by: _____ Date: _____

FOR LABORATORY USE ONLY:

Received by: _____ Date _____

Envelope Sealed? (check one) Yes ☐ No ☐

Analyst Remarks: _____

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Quality Control Summary

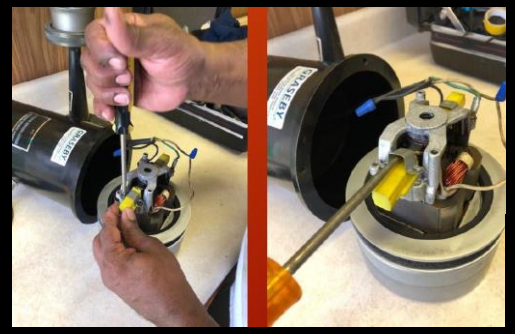
- Perform quarterly calibrations using the **seasonal** quarters;
  - Winter Quarter: December - February
  - Spring Quarter: March - May
  - Summer Quarter: June - August
  - Fall Quarter: September - November
- Perform monthly verifications every month
  - Done within the first 10 business days of the month

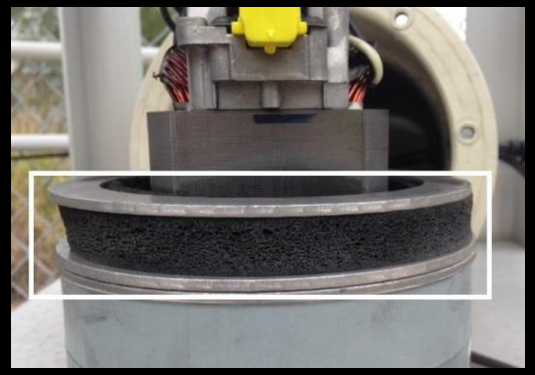
Quarter Calibration

- Use cal-ver ofifice and tha audit orfice from a certified kit within the first six calendar days of the seasonal quarter.

Changing Brushes

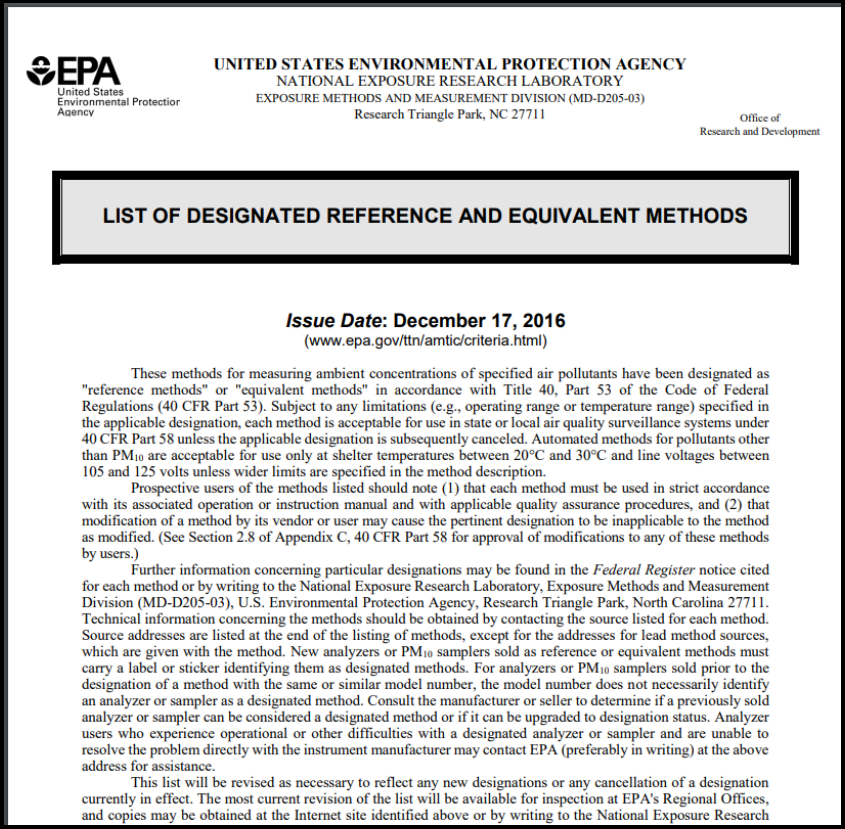
- Unplug the unit main power
- Disconnect the power chord and hose from the motor
- Remove motor housing
- Inspect motor housing flange
- Remove the motor brush bracket
- Carefully remove the brass tab from the brush
- Inspect motor cushion





EPA Approved PM10 Equipment

- There are currently 42 listed PM10 samplers in EPA website that are designated reference and equivalent methods



EPA United States Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EXPOSURE RESEARCH LABORATORY
EXPOSURE METHODS AND MEASUREMENT DIVISION (MD-D205-03)
Research Triangle Park, NC 27711

Office of Research and Development

LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

***Issue Date*: December 17, 2016**
(www.epa.gov/ttn/amtic/criteria.html)

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range or temperature range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently canceled. Automated methods for pollutants other than PM_{10} are acceptable for use only at shelter temperatures between 20°C and 30°C and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Exposure Methods and Measurement Division (MD-D205-03), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM_{10} samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM_{10} samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained at the Internet site identified above or by writing to the National Exposure Research

- Andersen Model RAAS10-100 PM10 Single Channel PM10 Sampler Manual Reference Method: RFPS-0699-130
- Andersen Model RAAS10-200 PM10 Single Channel PM10 Audit Sampler Manual Reference Method: RFPS-0699-131
- Andersen Model RAAS10-300 PM10 Multi Channel PM10 Sampler Manual Reference Method: RFPS-0699-132
- BGI Incorporated Model PQ100 Air Sampler Manual Reference Method: RFPS-1298-124
- BGI Incorporated Model PQ200 Air Sampler Manual Reference Method: RFPS-1298-125
- DKK-TOA Models FPM-222/222C, FPM223/223C, and DUB-222(S)/223(S) PM10 Monitor Automated Equivalent Method: EQPM-0905-156
- Ecotech Model 3000 PM10 High Volume Air Sampler Manual Reference Method: RFPS-0706-162
- Environnement S.A. Model MP101M PM10 Monitor Automated Equivalent Method: EQPM-0404-151
- Graseby Andersen/GMW Model 1200 High-Volume Air Sampler Manual Reference Method: RFPS-1287-063
- Graseby Andersen/GMW Model 321-B High-Volume Air Sampler Manual Reference Method: RFPS-1287-064
- Graseby Andersen/GMW Model 321-C High-Volume Air Sampler Manual Reference Method: RFPS-1287-065

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- Graseby Andersen/GMW Model 321-C High-Volume Air Sampler Manual Reference Method: RFPS-1287-065
- Graseby Andersen/GMW Models SA241 and SA241M Dichotomous Sampler Manual Reference Method: RFPS-0789-073
- Graseby Andersen/GMW Model FH621-N Beta Monitor Automated Equivalent Method: EQPM-0990-076
- Met One or Sibata Models BAM/GBAM 1020, BAM/GBAM 1020-1, Horiba APDA-371, or Ecotech Spirant BAM1000 Automated Equivalent Method: EQPM-0798-122
- Met One Instruments, Inc. E-BAM PLUS Beta Attenuation Mass Monitor- PM10 FEM Configuration Automated Equivalent Method: EQPM-1215-226
- Met One Instruments, Inc. E-FRM– PM10 Manual Reference Method: RFPS-0216-231
- Opsis Model SM200 PM10 Monitor Automated Equivalent Method: EQPM-0810-193
- Oregon DEQ Medium Volume PM10 Sampler Manual Reference Method: RFPS-0389-071
- Teledyne Model 602 BetaPLUS Particle Measurement System or SWAM 5a Dual Channel Monitor Automated Equivalent Method:

  EQPM-0912-205
- Teledyne Advanced Pollution Instrumentation Model T640 PM mass monitor with 640X option Automatic Equivalent Method:

  EQPM–0516–239

- Thermo Andersen Series FH 62 C14 Continuous PM10 Monitor Thermo Scientific Model 5014i Beta (5014i Beta), Continuous Ambient Particulate Monitor Automated Equivalent Method: EQPM-1102-150
- Thermo Scientific or Rupprecht & Patashnick Partisol® Model 2000 Air Sampler Manual Reference Method: RFPS-0694-098
- Thermo Scientific Partisol® 2000-D Dichotomous Air Sampler or Thermo Fisher Scientific Partisol® 2000i-D Dichotomous Air Sampler Manual Equivalent Method: EQPS-0311-197
- Thermo Scientific Partisol® 2000-FRM PM10 Air Sampler or Thermo Fisher Scientific Partisol® 2000i PM10 Air Sampler or Rupprecht and Patashnick Partisol®-FRM 2000 PM10 Air Sampler Manual Reference Method: RFPS-1298-126
- Teledyne Model 602 BetaPLUS Particle Measurement System or SWAM 5a Dual Channel Monitor Automated Equivalent Method: EQPM-0912-205
- Teledyne Advanced Pollution Instrumentation Model T640 PM mass monitor with 640X option Automatic Equivalent Method: EQPM–0516–239

- Thermo Andersen Series FH 62 C14 Continuous PM10 Monitor Thermo Scientific Model 5014i Beta (5014i Beta), Continuous Ambient Particulate Monitor Automated Equivalent Method: EQPM-1102-150
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- Thermo Scientific Partisol® 2000-FRM PM10 Air Sampler or Thermo Fisher Scientific Partisol® 2000i PM10 Air Sampler or Rupprecht and Patashnick Partisol®-FRM 2000 PM10 Air Sampler Manual Reference Method: RFPS-1298-126
- Thermo Scientific Partisol®-Plus 2025 PM10 Sequential Air Sampler or Thermo Fisher Scientific Partisol® 2025i PM10 Sequential Air Sampler or Rupprecht and Patashnick Partisol®-Plus 2025 PM10 Sequential Air Sampler Manual Reference Method: RFPS-1298-127
- Thermo Scientific Dichotomous Partisol®-Plus 2025-D Sequential Air Sampler or Thermo Fisher Scientific Dichotomous Partisol® 2025i-D Sequential Air Sampler Manual Equivalent Method: EQPS-0311-198
- Thermo Scientific TEOM® 1400AB/TEOM® 1405 Ambient Particulate Monitor or Rupprecht & Patashnick TEOM® Series 1400/1400a PM10 Monitors Automated Equivalent Method: EQPM-1090-079
- Thermo Scientific TEOM® 1405-DF Dichotomous Ambient Particulate Monitor with FDMS® Automated Equivalent Method: EQPM-1013-208
- Tisch Environmental Model TE-6070 PM10 High-Volume Air Sampler or New Star Environmental Model NS-6070 PM10 High-Volume Air Sampler Manual Reference Method: RFPS-0202-141
- Tisch Environmental Model TE-Wilbur10 Particulate Sampler – PM10 Manual Reference Method: RFPS-0714-216
- Wedding & Associates' or Thermo Environmental Instruments Inc. Model 600 PM10 High-Volume Sampler Manual Reference Method: RFPS-1087-062
- Wedding & Associates' or Thermo Environmental Instruments Inc. Model 650 PM10 Beta Gauge Automated Equivalent Method: EQPM-0391-081

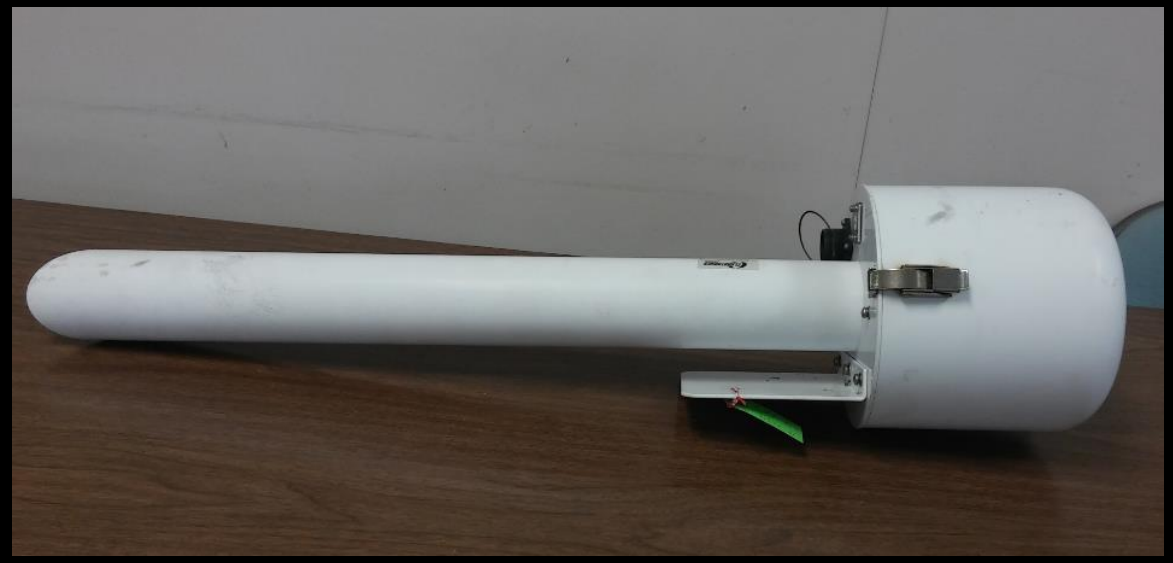
Metereology

- Definition
  - : a science that deals with the atmosphere and its phenomena and especially with weather and weather forecasting
  - : the atmospheric phenomena and weather of a region
    - Source Merriam-Webster

Meteorology Instruments

Thermometer

- Measures air temperature



Barometer

- Measures pressure of the atmosphere (air pressure)

Anemometer

- Measures windspeed

Weather Vane or Windsock

- Finds the wind's direction

Rain Gauge

- Measures the amount of liquid precipitation over a period of time

Meteorology

- In air quality monitoring, these instruments and their data are used for:
- Forecasting weather events
  - Ozone action days
  - Dust storms
- Support exceptional events
  - State Implementation Plan submissions
- Create wind roses
  - Assist with monitoring siting
  - Assist to explain air monitoring events

Questions?

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