

- (1) Electrically ground the balance.
- (2) Use 300 series stainless steel tweezers if PM samples must be handled manually.
- (3) Ground tweezers with a grounding strap, or provide a grounding strap for the operator such that the grounding strap shares a common ground with the balance. Make sure grounding straps have an appropriate resistor to protect operators from accidental shock.
- (4) Provide a static-electricity neutralizer that is electrically grounded in common with the balance to remove static charge from PM samples, as follows:
 - (i) You may use radioactive neutralizers such as a Polonium (^{210}Po) source. Replace radioactive sources at the intervals recommended by the neutralizer manufacturer.
 - (ii) You may use other neutralizers, such as corona-discharge ionizers. If you use a corona-discharge ionizer, we recommend that you monitor it for neutral net charge according to the ionizer manufacturer's recommendations.
- (5) We recommend that you use a device to monitor the static charge of PM sample media surfaces.
- (6) We recommend that you neutralize PM sample media to within ± 2.0 V of neutral.

§ 1065.195 PM-stabilization environment for in-situ analyzers.

- (a) This section describes the environment required to determine PM in-situ. For in-situ analyzers, such as an inertial balance, this is the environment within a PM sampling system that surrounds the PM sample media. This is typically a very small volume.
- (b) Maintain the environment free of ambient contaminants, such as dust, aerosols, or semi-volatile material that could contaminate PM samples. Filter all air used for stabilization with HEPA filters. Ensure that HEPA filters are installed properly so that background PM does not leak past the HEPA filters.
- (c) Maintain the following thermodynamic conditions within the environment before measuring PM:
 - (1) *Ambient temperature.* Select a nominal ambient temperature, T_{amb} , between (42 and 52) °C. Maintain the am-

bient temperature within ± 1.0 °C of the selected nominal value.

(2) *Dewpoint.* Select a dewpoint, T_{dew} , that corresponds to T_{amb} such that $T_{dew} = (0.95T_{amb} - 11.40)$ °C. The resulting dewpoint will control the amount of water associated with sulfuric acid (H_2SO_4) PM, such that 1.1368 grams of water will be associated with each gram of H_2SO_4 . For example, if you select a nominal ambient temperature of 47 °C, set a dewpoint of 33.3 °C.

(3) *Dewpoint tolerance.* If the expected fraction of sulfuric acid in PM is unknown, we recommend controlling dewpoint within ± 1.0 °C. This would limit any dewpoint-related change in PM to less than $\pm 2\%$, even for PM that is 50% sulfuric acid. If you know your expected fraction of sulfuric acid in PM, we recommend that you select an appropriate dewpoint tolerance for showing compliance with emission standards using Table 1 of § 1065.190 as a guide:

(4) *Absolute pressure.* Maintain an absolute pressure of (80.000 to 103.325) kPa. Use good engineering judgment to maintain a more stringent tolerance of absolute pressure if your PM measurement instrument requires it.

(d) Continuously measure dewpoint, temperature, and pressure using measurement instruments that meet the PM-stabilization environment specifications in subpart C of this part. Use these values to determine if the in-situ stabilization environment is within the tolerances specified in paragraph (c) of this section. Do not use any PM quantities that are recorded when any of these parameters exceed the applicable tolerances.

(e) If you use an inertial PM balance, we recommend that you install it as follows:

(1) Isolate the balance from any external noise and vibration that is within a frequency range that could affect the balance.

(2) Follow the balance manufacturer's specifications.

(f) If static electricity affects an inertial balance, you may use a static neutralizer, as follows:

(1) You may use a radioactive neutralizer such as a Polonium (^{210}Po)

source or a Krypton (^{85}Kr) source. Replace radioactive sources at the intervals recommended by the neutralizer manufacturer.

(2) You may use other neutralizers, such as a corona-discharge ionizer. If you use a corona-discharge ionizer, we recommend that you monitor it for neutral net charge according to the ionizer manufacturer's recommendations.

Subpart C—Measurement Instruments

§ 1065.201 Overview and general provisions.

(a) *Scope.* This subpart specifies measurement instruments and associated system requirements related to emission testing in a laboratory and in the field. This includes laboratory instruments and portable emission measurement systems (PEMS) for measuring engine parameters, ambient conditions, flow-related parameters, and emission concentrations.

(b) *Instrument types.* You may use any of the specified instruments as described in this subpart to perform emission tests. If you want to use one of these instruments in a way that is not specified in this subpart, or if you want to use a different instrument, you must first get us to approve your alternate procedure under § 1065.10. Where we specify more than one instrument for a particular measurement, we may identify which instrument serves as the reference for showing that an alternative procedure is equivalent to the specified procedure.

(c) *Measurement systems.* Assemble a system of measurement instruments that allows you to show that your engines comply with the applicable emission standards, using good engineering judgment. When selecting instruments, consider how conditions such as vibration, temperature, pressure, humidity, viscosity, specific heat, and exhaust composition (including trace concentrations) may affect instrument compatibility and performance.

(d) *Redundant systems.* For all measurement instruments described in this subpart, you may use data from multiple instruments to calculate test results for a single test. If you use redun-

dant systems, use good engineering judgment to use multiple measured values in calculations or to disregard individual measurements. Note that you must keep your results from all measurements, as described in § 1065.25. This requirements applies whether or not you actually use the measurements in your calculations.

(e) *Range.* You may use an instrument's response above 100% of its operating range if this does not affect your ability to show that your engines comply with the applicable emission standards. Note that we require additional testing and reporting if an analyzer responds above 100% of its range. See § 1065.550. Auto-ranging analyzers do not require additional testing or reporting.

(f) *Related subparts for laboratory testing.* Subpart D of this part describes how to evaluate the performance of the measurement instruments in this subpart. In general, if an instrument is specified in a specific section of this subpart, its calibration and verifications are typically specified in a similarly numbered section in subpart D of this part. For example, § 1065.290 gives instrument specifications for PM balances and § 1065.390 describes the corresponding calibrations and verifications. Note that some instruments also have other requirements in other sections of subpart D of this part. Subpart B of this part identifies specifications for other types of equipment, and subpart H of this part specifies engine fluids and analytical gases.

(g) *Field testing and testing with PEMS.* Subpart J of this part describes how to use these and other measurement instruments for field testing and other PEMS testing.

§ 1065.202 Data updating, recording, and control.

Your test system must be able to update data, record data and control systems related to operator demand, the dynamometer, sampling equipment, and measurement instruments. Use data acquisition and control systems that can record at the specified minimum frequencies, as follows: