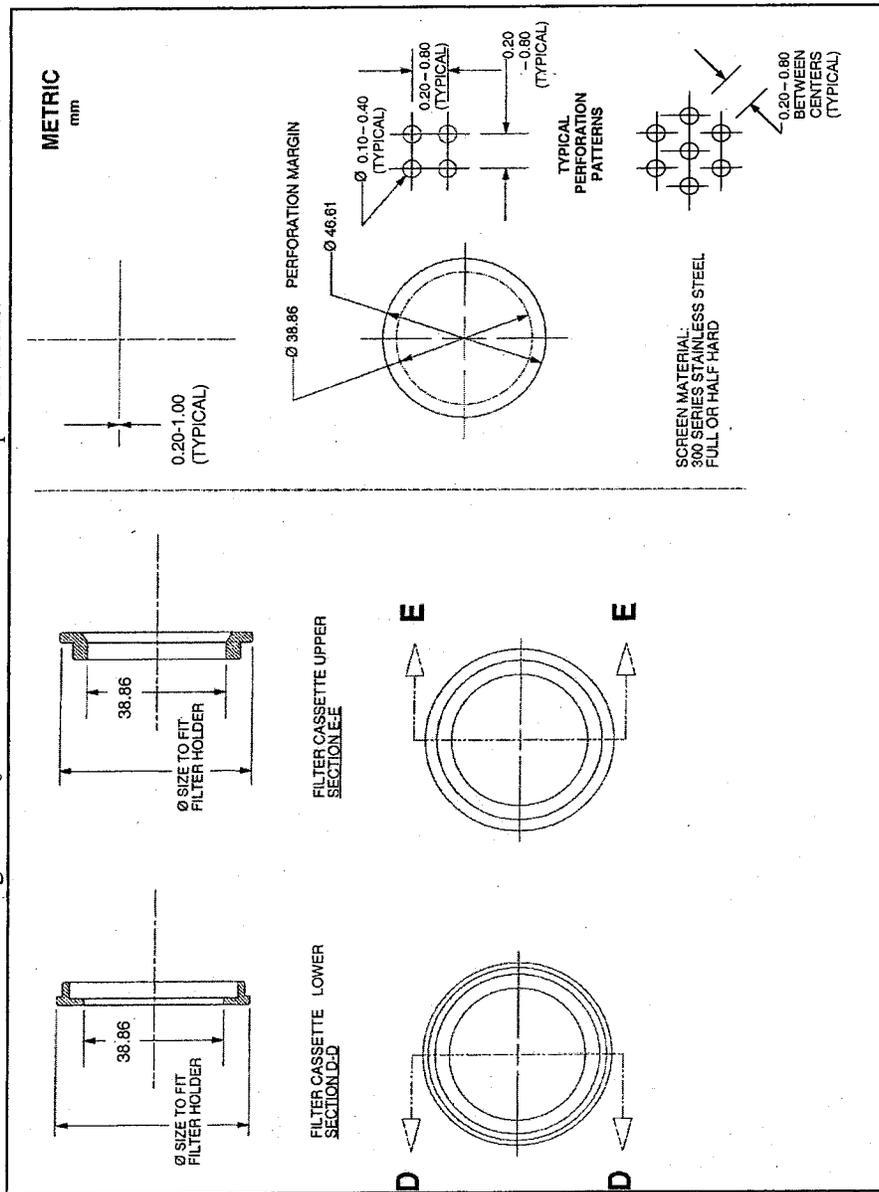


Figure 1 of §1065.170—PM filter cassette specifications.



§1065.190 PM-stabilization and weighing environments for gravimetric analysis.

(a) This section describes the two environments required to stabilize and

weigh PM for gravimetric analysis: the PM stabilization environment, where filters are stored before weighing; and the weighing environment, where the balance is located. The two environments may share a common space.

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These volumes may be one or more rooms, or they may be much smaller, such as a glove box or an automated weighing system consisting of one or more countertop-sized environments.

(b) We recommend that you keep both the stabilization and the weighing environments free of ambient contaminants, such as dust, aerosols, or semi-volatile material that could contaminate PM samples. We recommend that these environments conform with an "as-built" Class Six clean room specification according to ISO 14644-1 (incorporated by reference in §1065.1010); however, we also recommend that you deviate from ISO 14644-1 as necessary to minimize air motion that might affect weighing. We recommend maximum air-supply and air-return velocities of 0.05 m/s in the weighing environment.

(c) Verify the cleanliness of the PM-stabilization environment using reference filters, as described in §1065.390(b).

(d) Maintain the following ambient conditions within the two environments during all stabilization and weighing:

(1) *Ambient temperature and tolerances.* Maintain the weighing environment at a tolerance of (22 ± 1) °C. If the two environments share a common space, maintain both environments at a tolerance of (22 ± 1) °C. If they are separate, maintain the stabilization environment at a tolerance of (22 ± 3) °C.

(2) *Dewpoint.* Maintain a dewpoint of 9.5 °C in both environments. This dewpoint will control the amount of water associated with sulfuric acid (H₂SO₄) PM, such that 1.1368 grams of water will be associated with each gram of H₂SO₄.

(3) *Dewpoint tolerances.* If the expected fraction of sulfuric acid in PM is unknown, we recommend controlling dewpoint at within ± 1 °C tolerance. 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 the following table as a guide:

TABLE 1 OF § 1065.190—DEWPOINT TOLERANCE AS A FUNCTION OF % PM CHANGE AND % SULFURIC ACID PM

Expected sulfuric acid fraction of PM (percent)	$\pm 0.5\%$ PM mass change	$\pm 1.0\%$ PM mass change	$\pm 2.0\%$ PM mass change
5	± 3.0 °C	± 6.0 °C	± 12 °C
50	± 0.30 °C	± 0.60 °C	± 1.2 °C
100	± 0.15 °C	± 0.30 °C	± 0.60 °C

(e) Verify the following ambient conditions using measurement instruments that meet the specifications in subpart C of this part:

(1) Continuously measure dewpoint and ambient temperature. Use these values to determine if the stabilization and weighing environments have remained within the tolerances specified in paragraph (d) of this section for at least the past 60 min. We recommend that you provide an interlock that automatically prevents the balance from reporting values if either of the environments have not been within the applicable tolerances for the past 60 min.

(2) Continuously measure atmospheric pressure within the weighing environment. You may use a shared atmospheric pressure meter as long as you can show that your equipment for handling the weighing environment air maintains ambient pressure at the balance within ± 100 Pa of the shared atmospheric pressure. Provide a means to record the most recent atmospheric pressure when you weigh each PM sample. Use this value to calculate the PM buoyancy correction in §1065.690.

(f) We recommend that you install a balance as follows:

(1) Install the balance on a vibration-isolation platform to isolate it from external noise and vibration.

(2) Shield the balance from convective airflow with a static-dissipating draft shield that is electrically grounded.

(3) Follow the balance manufacturer's specifications for all preventive maintenance.

(4) Operate the balance manually or as part of an automated weighing system.

(g) Minimize static electric charge in the balance environment, as follows:

- (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)