



Standard Test Method for Sampling and Determining Particulate Matter in Stack Gases Using an In-Stack, Inertial Microbalance¹

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1. Scope

1.1 This test method describes the procedures for determining the mass concentration of particulate matter in gaseous streams using an automated, in-stack test method. This method, an in-situ, inertial microbalance, is based on inertial mass measurement using a hollow tube oscillator. This method describes the design of the apparatus, operating procedure, and the quality control procedures required to obtain the levels of precision and accuracy stated.

1.2 This method is suitable for collecting and measuring filterable particulate matter concentrations in the ranges 0.2 mg/m³ and above taken in effluent ducts and stacks.

1.3 This test method may be used for calibration of automated monitoring systems (AMS). If the emission gas contains unstable, reactive, or semi-volatile substances, the measurement will depend on the filtration temperature, and this method (and other in-stack methods) may be more applicable than out-stack methods for the calibration of automated monitoring systems.

1.4 This test method can be employed in sources having gas temperature up to 200°C and having gas velocities from 3 to 27 m/s.

1.5 This test method includes a description of equipment and methods to be used for obtaining and analyzing samples and a description of the procedure used for calculating the results.

1.6 Stack temperatures limitation for this test method is approximately 200°C (392°F).

1.7 This test method may be also be limited from use in sampling gas streams that contain fluoride, or other reactive species having the potential to react with or within the sample train.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

¹ This test method is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

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2. Referenced Documents

2.1 ASTM Standards:

D 1356 Terminology Relating to Atmospheric Sampling and Analysis²

D 3154 Test Method Average Velocity in a Duct (Pitot Tube Method)²

D 3685/D 3685M Test Methods for Sampling and Determination of Particulate Matter in Stack Gases²

D 3796 Practice for Calibration of Type S Pitot Tubes²

D 6331 Test Method for Determination of Mass Concentration of Particulate Matter from Stationary Sources at Low Concentrations (Manual Gravimetric Method)²

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology D1356.

3.2 Definition of terms specific to this standard:

3.2.1 *particulate matter*—for solid particles of any shape, structure, or density dispersed in the gas phase at flue gas temperature and pressure conditions.

3.2.1.1 *Discussion*—In accordance with the described test method, all material that may be collected by filtration under specified conditions and that remains upstream of the filter and on the filter after drying under specified conditions are considered to be particulate matter. For the purposes of this test method, particulate matter is defined by gas borne matter (solid or liquid) captured on or in the filter after drying and weighing in accordance with this test method.

3.2.2 *in-stack, inertial microbalance*—a mechanical oscillator constructed of a hollow tube of a specific metal alloy and fitted with a filter cartridge that is designed to oscillate at a frequency that is proportional to the mass of the hollow tube oscillator plus the mass of its filter cartridge.

3.2.3 *mass transducer*—the mass transducer is a principle component of an in-stack inertial, microbalance. The mass transducer provides the mechanical structure to support and contain the hollow tube oscillator and to support the sample inlet nozzle fixture, source gas temperature thermocouple, and s-type Pitot tube assembly. Refer to 6.1.1 for a detailed description of this component.

² Annual Book of ASTM Standards, Vol 11.03.

