



Standard Test Method for Average Velocity in a Duct (Pitot Tube Method)¹

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1. Scope

1.1 This test method describes measurement of the average velocity of a gas stream for the purpose of determining gas flow in a stack, duct, or flue. Although technically complex, it is generally considered the most accurate and often the only practical test method for taking velocity measurements.

1.2 This test method is suitable for measuring gas velocities above 3 m/s (10 ft/s).

1.3 This test method provides procedures for determining stack gas composition and moisture content.

1.4 The values stated in SI units are to be regarded as standard. The inch-pound units given in parentheses are for information only.

1.5 This test method is applicable to conditions where steady-state flow occurs, and for constant fluid conditions. If these conditions are not meant, other methods must be used.

1.6 *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.*

2. Referenced Documents

2.1 ASTM Standards:

D 1071 Test Methods for Volumetric Measurement of Gaseous Fuel Samples²

D 1193 Specification for Reagent Water³

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres⁴

D 3195 Practice for Rotameter Calibration⁴

D 3631 Test Methods for Measuring Surface Atmospheric Pressure⁴

D 3685/D 3685M Test Methods for Sampling and Determination of Particulate Matter in Stack Gases⁴

D 3796 Practice for Calibration of Type S Pitot Tubes⁴

E 1 Specification for ASTM Thermometers⁵

E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)⁴

2.2 EPA Standards:

EPA-600/9-76-005 Quality Assurance Handbook for Air Pollution Measurement Systems. Vol I. Principles⁶

EPA-600/4-77-027b Quality Assurance Handbook for Air Pollution Measurement Systems. Vol. III. Stationary Source Specific Methods⁶

2.3 ASME Standards:

ASME Performance Test Code: PTC 19.10-1968, Flue and Exhaust Gas Analysis⁷

ASME Performance Test Code: PTC 19.10-1981 Part 10, Flue and Exhaust Measurements: Instruments and Apparatus⁷

ASME Performance Test Code: PTC 38-1980, Determining the Concentration of Particulate Matter in a Gas Stream⁷

2.4 Code of Federal Regulation:

CFR Part 50 Standards of Performance for Stationary Sources, Appendix A; Test Methods 1 through 4⁶

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology D 1356.

3.2 Descriptions of Symbols Specific to This Standard:

A	= cross-sectional area of stack, m ² (ft ²).
B_{ws}	= water vapor in the gas stream, proportion by volume.
C_p	= pitot tube coefficient, dimensionless.
D_s	= internal diameter of stack, cm, (in.).
K_p	= pitot tube constant:

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 Annual Book of ASTM Standards, Vol 05.05.

³ Annual Book of ASTM Standards, Vol 11.01.

⁴ Annual Book of ASTM Standards, Vol 11.03.

⁵ Annual Book of ASTM Standards, Vol 14.03.

⁶ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

⁷ Available from American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.