



Standard Test Method for Average Velocity in a Duct Using a Thermal Anemometer¹

This standard is issued under the fixed designation D3464; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method describes the measurement of the average velocity with a thermal anemometer for the purpose of determining gas flow in a stack, duct, or flue (**1-5**).² It is limited to those applications where the gas is essentially air at ambient conditions and the temperature, moisture, and contaminant loading are insignificant as sources of error compared to the basic accuracy of the typical field situation.

1.2 The range of the test method is from 1 to 30 m/s (3 to 100 ft/s).

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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*:³

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D3796 Practice for Calibration of Type S Pitot Tubes

2.2 *Other Standards*:

ASME PTC 19.5-72 *Application of Fluid Meters*, Sixth Ed. 1971 (Interim Supplement 19.5 on Instruments & Apparatus)⁴

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

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² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

3. Terminology

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

4. Summary of Test Method

4.1 This test method describes the operational and calibration procedures necessary for the measurement of point velocity and calculation of the average velocity of air or gas flows in flues, ducts, or stacks utilizing a thermal anemometer.

5. Significance and Use

5.1 The method presented is a “short method” that may be used where contamination levels are less than 5000 ppm by weight or volume, temperatures are between 0°C (32°F) and 65°C (150°F), and the humidity is not considered. The gas is considered as standard air and the velocity is read directly from the instrument.

5.2 This test method is useful for determining air velocities in HVAC ducts, fume hoods, vent stacks of nuclear power stations, and in performing model studies of pollution control devices.

6. Apparatus

6.1 *Thermal Anemometer*—A commercially available electrically operated hot sensor anemometer with direct readout. A thermal anemometer senses the cooling effect of a moving gas stream passing over an electrically heated sensor. This cooling effect or heat transfer rate is correlated to the velocity of the gas stream. The instrument is calibrated to display a direct readout in terms of velocity.

6.2 *Sensors and Probes*—There are a number of different types of sensors available for thermal anemometry including the hot-wire sensor, the hot-film sensor, and the quartz-coated sensor. Probes are available in many different shapes depending upon application.

6.3 *Temperature Compensation*—If the temperature of the gas stream changes during velocity measurements, the anemometer reading will change accordingly unless a constant-temperature or “temperature-compensated” anemometer is utilized. This type of instrument shall be specified for most applications of this measurement standard.