



Designation: D3162 – 12 (Reapproved 2020)

Standard Test Method for Carbon Monoxide in the Atmosphere (Continuous Measurement by Nondispersive Infrared Spectrometry)¹

This standard is issued under the fixed designation D3162; 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 is applicable to the determination of the carbon monoxide (CO) concentration of the atmosphere between 0.6 mg/m³ (0.5 ppm(v)) and 115 mg/m³ (100 ppm(v)). The measuring principle is based on the absorption of infrared radiation by CO in the 4.7 μ m region (1).²

1.2 The test method has a limit of detection of about 0.6 mg/m³ (0.5 ppm(v)) carbon monoxide in air.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* See Section 9 for additional precautions.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:³

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D1357 Practice for Planning the Sampling of the Ambient Atmosphere

D1914 Practice for Conversion Units and Factors Relating to Sampling and Analysis of Atmospheres

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 the list of references at the end of the 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.

D3249 Practice for General Ambient Air Analyzer Procedures

D3631 Test Methods for Measuring Surface Atmospheric Pressure

E1 Specification for ASTM Liquid-in-Glass Thermometers

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)⁴

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology **D1356** and Practice **D3249**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *fall time, n*—the time interval between initial response and 90 % of final response after a step decrease in input concentrations.

4. Summary of Test Method

4.1 An atmospheric sample is introduced into a sample conditioning system and then into a nondispersive infrared spectrometer (NDIR). The spectrometer measures the absorption by CO at 4.7 μ m using two parallel infrared beams through a sample and a reference cell and a selective detector. The detector signal is conducted to an amplifier control section, and the analyzer output measured on a meter and recording system (2).

4.1.1 Some instruments use gas filter correlation to compare the IR absorption spectrum between the measured gas and other gases present in the gas being sampled, in a single sample cell. These instruments utilize a concentrated sample of CO as a filter for the IR transmitted through the sample cell to produce a beam that cannot be further attenuated by the CO in the sample, and thus produces the reference beam. The broadband radiation that passes through the sample cell and the CO filter is filtered again by a narrow-band-pass filter that allows only the CO-sensitive portion of the band to pass to the detector. The removal of wavelengths sensitive to other gases reduces interferences.

⁴ The last approved version of this historical standard is referenced on www.astm.org.