



Designation: D8406 – 22

Standard Practice for Performance Evaluation of Ambient Outdoor Air Quality Sensors and Sensor-based Instruments for Portable and Fixed-point Measurement¹

This standard is issued under the fixed designation D8406; 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.

1. Scope

1.1 This practice establishes standardized tests for the performance evaluation of sensor-based continuous instruments for ambient outdoor air quality measurements. It describes both laboratory and field tests that provide information on candidate sensor repeatability, sensitivity, linearity, cross-interferences, drift, and comparability against reference instruments.

1.2 This practice does not apply to sensors or instruments that remotely measure atmospheric pollutants using open path, lidar, or imaging technology.

1.3 The evaluation procedures contained in this practice are for sensors that alone or in combination measure outdoor criteria pollutants in ambient air: particulate matter ($PM_{2.5}$ and PM_{10}), sulfur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), or nitrogen dioxide (NO_2) at concentrations that are relevant to public health.

1.4 Testing is to be performed by a competent entity able to demonstrate that it operates in conformity with internationally accepted test laboratory quality standards such as ISO/IEC 17025.

1.5 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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:²

- D1356 Terminology Relating to Sampling and Analysis of Atmospheres
- D1914 Practice for Conversion Units and Factors Relating to Sampling and Analysis of Atmospheres
- D3162 Test Method for Carbon Monoxide in the Atmosphere (Continuous Measurement by Nondispersive Infrared Spectrometry)
- D3249 Practice for General Ambient Air Analyzer Procedures
- D3824 Test Methods for Continuous Measurement of Oxides of Nitrogen in the Ambient or Workplace Atmosphere by Chemiluminescence
- D5011 Practices for Calibration of Ozone Monitors Using Transfer Standards
- D5110 Practice for Calibration of Ozone Monitors and Certification of Ozone Transfer Standards Using Ultraviolet Photometry
- D6332 Guide for Testing Systems for Measuring Dynamic Responses of Carbon Monoxide Detectors to Gases and Vapors
- D8405 Test Method for Evaluating $PM_{2.5}$ Sensors or Sensor Systems Used in Indoor Air Applications
- E178 Practice for Dealing With Outlying Observations
- E456 Terminology Relating to Quality and Statistics
- E3080 Practice for Regression Analysis with a Single Predictor Variable

2.2 Other References:

- 29 CFR 1910.101 Compressed gases (general requirements)³
- 40 CFR Part 58 Ambient Air Quality Surveillance³
- EN 14626:2012 Ambient air – Standard method for the measurement of the concentration of carbon monoxide by

¹ This practice 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.

Current edition approved Sept. 1, 2022. Published October 2022. DOI: 10.1520/D8406-22.

² 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.

³ Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.