



Standard Test Methods for Continuous Measurement of Oxides of Nitrogen in the Ambient or Workplace Atmosphere by the Chemiluminescent Method¹

This standard is issued under the fixed designation D 3824; 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 These test methods cover procedures for the continuous determination of total nitrogen dioxide (NO₂) and nitric oxide (NO) as NO_x, or nitric oxide (NO) alone or nitrogen dioxide (NO₂) alone, in the ranges shown in the following table:

Gas	Range of Concentration	
	Ambient Atmosphere μg/m ³ (ppm) (Note 1)	Workplace Atmosphere mg/m ³ (ppm) (Note 1)
NO	10 to 600 (0.01 to 0.5)	0.6 to 30 (0.5 to 25)
(NO + NO ₂) = NO _x	20 to 1000 (0.01 to 0.05)	1 to 50 (0.5 to 25)
NO ₂	20 to 1000 (0.01 to 0.5)	1 to 50 (0.5 to 25)

NOTE 1—Approximate range: 25°C and 101.3 kPa (1 atm).

1.2 The test methods are based on the chemiluminescent reaction between nitric oxide and ozone.

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 and health practices and determine the applicability of regulatory limitations prior to use. For specific precautionary statements, see Section 9.*

2. Referenced Documents

2.1 ASTM Standards:

- D 1356 Terminology Relating to Sampling and Analysis of Atmospheres²
- D 1357 Practice for Planning the Sampling of the Ambient Atmosphere²
- D 1914 Practice for Conversion Units and Factors Relating to Sampling and Analysis of Atmospheres²
- D 3195 Practice for Rotameter Calibration²
- D 3249 Practice for General Ambient Air Analyzer Procedures²
- D 3609 Practice for Calibration Techniques Using Permeation Tubes²

¹ These test methods are under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmosphere, and are the direct responsibility of Subcommittee D 22.03 on Ambient Atmospheres and Source Emissions.

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² *Annual Book of ASTM Standards*, Vol 11.03.

D 3631 Test Methods for Measuring Surface Atmospheric Pressure²

E 1 Specification for ASTM Thermometers³

2.2 Other Documents:

29 CFR, Part 1910, Occupational Safety and Health Standards⁴

40 CFR, Parts 50 and 53, Environmental Protection Agency Regulations on Ambient Air Monitoring Reference and Equivalent Methods⁴

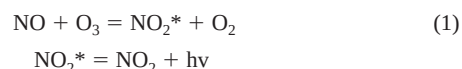
3. Terminology

3.1 Definitions:

3.1.1 Four definitions of terms used in these test methods refer to Terminology D 1356 and Practice D 3249.

4. Summary of Test Method

4.1 The principle is based upon the chemiluminescence, or the emission of light, resulting from the homogeneous gas phase reaction of nitric oxide and ozone (1).⁵ The equation is as follows:



In the presence of excess ozone, the intensity of the light emission is directly proportional to the nitric oxide concentration.

4.2 To measure nitric oxide concentrations, the gas sample being analyzed is blended with ozone in a flow reactor. The resulting light emissions are monitored by a photomultiplier tube.

4.3 To measure total oxides of nitrogen (NO_x = NO + NO₂), the gas sample is diverted through a NO₂ to NO converter before being admitted to the flow reactor.

4.4 To measure nitrogen dioxide (NO₂), the gas sample is intermittently diverted through the converter, and the NO

³ *Annual Book of ASTM Standards*, Vol 14.03.

⁴ Available from Superintendent of Documents, U.S. Printing Office, Washington, DC 20402.

⁵ The boldface numbers in parentheses refer to the list of references at the end of these test methods.