



Standard Practice for Testing Nitrogen/Phosphorus Thermionic Ionization Detectors for Use In Gas Chromatography¹

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1. Scope

1.1 This practice is intended to serve as a guide for testing the performance of a nitrogen/phosphorus thermionic ionization detector (NPD) used as the detection component of a gas chromatographic system.

1.2 This practice applies to an NPD that employs a heated alkali metal compound and emits an electrical charge from that solid surface.

1.3 This practice addresses the operation and performance of the NPD independently of the chromatographic column. However, the performance is specified in terms that the analyst can use to predict overall system performance when the detector is coupled to the column and other chromatographic components.

1.4 For general chromatographic procedures, Practice E 260 should be followed except where specific changes are recommended herein for the use of a nitrogen/phosphorus (N/P) thermionic detector.

1.5 *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 safety information, see Section 5, Hazards.

2. Referenced Documents

2.1 ASTM Standards:

E 260 Practice for Packed Column Gas Chromatography²

E 355 Practice for Gas Chromatography Terms and Relationships²

2.2 CGA Standards:

CGA P-1 Safe Handling of Compressed Gases in Containers³

CGA G-5.4 Standard for Hydrogen Piping Systems at Consumer Locations³

CGA P-9 The Inert Gases: Argon, Nitrogen and Helium³

¹ This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and is the direct responsibility of Subcommittee E13.19 on Chromatography.

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² *Annual Book of ASTM Standards*, Vol 14.02.

³ Available from Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

CGAV-7 Standard Method of Determining Cylinder Valve
Outlet Connections for Industrial Gas Mixtures³
CGA P-12 Safe Handling of Cryogenic Liquids³
HB-3 Handbook of Compressed Gases³

3. Terminology

3.1 Definitions:

3.1.1 For definitions of gas chromatography and its various terms, see Practice E 355.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *drift*—the average slope of the noise envelope expressed in amps/h as measured over ½h.

3.2.2 *linear range*—range of mass flow rates of nitrogen or phosphorus in the carrier gas, over which the sensitivity of the detector is constant to within 5 % as determined from the linearity plot.

3.2.3 *minimum detectability*—the mass flow rate of nitrogen or phosphorus in the carrier gas that gives a detector signal equal to twice the noise level.

3.2.4 *noise (short term)*—the amplitude, expressed in amperes, of the baseline envelope that includes all random variations of the detector signal of a frequency greater than one cycle per minute.

3.2.5 *selectivity*—the ratio of the response per gram of nitrogen or phosphorus in the test substance to the response per gram of carbon in octadecane.

4. Significance and Use

4.1 Although it is possible to observe and measure each of the several characteristics of a detector under different and unique conditions, it is the intent of this practice that a complete set of detector specifications be obtained at the same operating conditions, including geometry, flow rates, and temperatures. To specify a detector's capability completely, its performance should be measured at several sets of conditions within the useful range of the detector. The terms and tests described in this practice are sufficiently general so that they may be used under any chosen conditions.

4.2 Linearity and speed of response of the recorder should be such that it does not distort or otherwise interfere with the performance of the detector. Effective recorder response should be sufficiently fast so that its effect on the sensitivity of measurement is negligible. If additional amplifiers are used between the detector and the final readout device, their