



Standard Practice for Using Flame Photometric Detectors in Gas Chromatography¹

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1. Scope

1.1 This practice is intended as a guide for the use of a flame photometric detector (FPD) as the detection component of a gas chromatographic system.

1.2 This practice is directly applicable to an FPD that employs a hydrogen-air flame burner, an optical filter for selective spectral viewing of light emitted by the flame, and a photomultiplier tube for measuring the intensity of light emitted.

1.3 This practice describes the most frequent use of the FPD which is as an element-specific detector for compounds containing sulfur (S) or phosphorus (P) atoms. However, nomenclature described in this practice are also applicable to uses of the FPD other than sulfur or phosphorus specific detection.

1.4 This practice is intended to describe the operation and performance of the FPD itself independently of the chromatographic column. However, the performance of the detector is described in terms which the analyst can use to predict overall system performance when the detector is coupled to the column and other chromatographic system components.

1.5 For general gas chromatographic procedures, Practice E 260 should be followed except where specific changes are recommended herein for use of an FPD.

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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific safety information, see Section 4, 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

CGA V-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*—For definitions relating to gas chromatography, refer to Practice E 355.

3.2 *Descriptions of Terms*—Descriptions of terms used in this practice are included in Sections 7-17.

3.3 *Symbols: Symbols*—A list of symbols and associated units of measurement is included in Annex A1.

4. Hazards

4.1 *Gas Handling Safety*—The safe handling of compressed gases and cryogenic liquids for use in chromatography is the responsibility of every laboratory. The Compressed Gas Association, (CGA), a member group of specialty and bulk gas suppliers, publishes the following guidelines to assist the laboratory chemist to establish a safe work environment. Applicable CG publications include CGA P-1, CGA G-5.4, CGA P-9, CGA V-7, CGA P-12, and HB-3.

5. Principles of Flame Photometric Detectors

5.1 The FPD detects compounds by burning those compounds in a flame and sensing the increase of light emission from the flame during that combustion process. Therefore, the FPD is a flame optical emission detector comprised of a hydrogen-air flame, an optical window for viewing emissions generated in the flame, an optical filter for spectrally selecting the wavelengths of light detected, a photomultiplier tube for measuring the intensity of light emitted, and an electrometer for measuring the current output of the photomultiplier.

5.2 The intensity and wavelength of light emitted from the FPD flame depends on the geometric configuration of the flame

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.

