



Standard Test Method for Mercaptans in Natural Gas Using Length-of-Stain Detector Tubes¹

This standard is issued under the fixed designation D 1988; 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 test method covers a rapid and simple field determination of mercaptans in natural gas pipelines. Available detector tubes provide a total measuring range of 0.5 to 160 ppm by volume of mercaptans, although the majority of applications will be on the lower end of this range (that is, under 20 ppm). Besides total mercaptans, detector tubes are also available for methyl mercaptan (0.5 to 100 ppm), ethyl mercaptan (0.5 to 120 ppm), and butyl mercaptan (0.5 to 30 mg/M³ or 0.1 to 8 ppm).

NOTE 1—Certain detector tubes are calibrated in terms of milligrams per cubic metre (mg/M³) instead of parts per million by volume. The conversion is as follows for 25°C (77°F) and 760 mm Hg.

$$\text{mg/M}^3 = \frac{\text{ppm} \times \text{molecular weight}}{24.45} \quad (1)$$

1.2 Detector tubes are usually subject to interferences from gases and vapors other than the target substance. Such interferences may vary among brands because of the use of different detection principles. Many detector tubes will have a pre-cleanse layer designed to remove interferences up to some maximum level. Consult manufacturer's instructions for specific interference information. Hydrogen sulfide and other mercaptans are usually interferences on mercaptan detector tubes. See Section 5 for interferences of various methods of detection.

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 hazard statements, see 7.3.

2. Referenced Documents

2.1 Gas Processors Association Standard:

GPA Standard 2188 Tentative Method for the Determination of Ethyl Mercaptan in LP Gas Using Length-of-Stain Detector Tubes, Appendix B, Test for Ethyl Mercaptan Odourant in Propane, Field Method, 1988²

¹ This test method is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.05 on Determination of Special Constituents of Gaseous Fuels.

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² Available from Gas Processors Association, 6526 E. 60th St., Tulsa, OK 74145.

3. Summary of Test Method

3.1 The sample is passed through a detector tube filled with a specially prepared chemical. Any mercaptan present in the sample reacts with the chemical to produce a color change, or stain. The length of the stain produced in the detector tube, when exposed to a measured volume of sample, is directly proportional to the amount of mercaptan present in the sample. A hand-operated piston or bellows-type pump is used to draw a measured volume of sample through the tube at a controlled rate of flow. The length of stain produced is converted to parts per million (ppm) by volume mercaptan by comparison to a calibration scale supplied by the manufacturer for each box of detection tubes. The system is direct reading, easily portable, and completely suited to making rapid spot checks for mercaptans under field conditions (see Note 1).

4. Significance and Use

4.1 The measurement of mercaptans in natural gas is important, because mercaptans are often added as odorants to natural gas to provide a warning property. The odor provided by the mercaptan serves to warn consumers (for example, residential use) of natural gas leaks at levels that are well below the flammable or suffocating concentration levels of natural gas in air. Field determinations of mercaptans in natural gas are important because of the tendency of the mercaptan concentration to fade over time.

4.2 This test method provides inexpensive field screening of mercaptans. The system design is such that it may be used by nontechnical personnel, with a minimum of proper training.

5. Interferences

5.1 Interference from hydrogen sulfide gas (H₂S) is a common problem with mercaptan detector tubes and its extent should be understood to make use of tube readings. There are at least three detection principles used in mercaptan detector tubes and each is summarized below.

5.1.1 Palladium sulfate is used by at least one manufacturer. It has a positive interference from H₂S, but H₂S may be removed in a preconditioning layer at the front of the tube. If this is the case, the manufacturer will state some finite level of H₂S at which interference initiates (for example, greater than 500-ppm H₂S causes a positive error). Consult manufacturers' instruction sheets for this information. Propylene and hydrocarbons of five or more carbon atoms will cause interfering