

This document

**Natural gas — Determination of sulfur
compounds —**

Part 4:

Gas chromatographic method using a flame
photometric detector for the determination of
hydrogen sulfide, carbonyl sulfide and
sulfur-containing odorants

Gaz naturel — Détermination des composés soufrés —

*Partie 4: Détermination du sulfure d'hydrogène, du sulfure de carbonyle
et des composés soufrés malodorants par chromatographie en phase
gazeuse avec détecteur à photométrie de flamme*



Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 6326-4 was prepared by Technical Committee ISO/TC 193, *Natural gas*, Sub-Committee SC 1, *Analysis of natural gas*.

ISO 6326 consists of the following parts, under the general title *Natural gas — Determination of sulfur compounds*:

- *Part 1: General introduction*
- *Part 2: Gas chromatographic method using an electrochemical detector for the determination of odoriferous sulphur compounds*
- *Part 3: Determination of hydrogen sulfide, mercaptan sulfur and carbonyl sulfide sulfur by potentiometry*
- *Part 4: Gas chromatographic method using a flame photometric detector for the determination of hydrogen sulfide, carbonyl sulfide and sulfur-containing odorants*
- *Part 5: Lingener combustion method*

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Introduction

The standardization of several methods for the determination of sulfur compounds in natural gas is necessary in view of the diversity of these compounds [hydrogen sulfide, carbonyl sulfide, thiols (mercaptans), tetrahydrothiophene (THT), etc.] and the purposes of the determinations (required accuracy, measurement at the drilling head or in the transmission pipes, etc.).

In order to enable the user to choose the method most appropriate to his needs and to perform the measurements under the best conditions, ISO 6326 has been prepared in several parts.

ISO 6326-1 gives a rapid comparison of standardized methods and therefore provides information for the choice of the method.

The other parts of ISO 6326, including this part, describe in detail the various standardized methods.

The determination of total sulfur is specified in ISO 4260:1987, *Petroleum products and hydrocarbons — Determination of sulfur content — Wickbold combustion method*.

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Part 4:

Gas chromatographic method using a flame photometric detector for the determination of hydrogen sulfide, carbonyl sulfide and sulfur-containing odorants

1 Scope

This part of ISO 6326 specifies a precise and accurate method for the analysis of sulfur compounds in natural gas.

This method is applicable to the determination of hydrogen sulfide, carbonyl sulfide, C1-C4 thiols and sulfides and tetrahydrothiophene (THT), generally in the range 0,5 $\mu\text{mol/mol}$ to 50 $\mu\text{mol/mol}$. It is also applicable to the quantitative determination of sulfur compounds other than hydrogen sulfide, when hydrogen sulfide is present at concentrations up to 5 000 $\mu\text{mol/mol}$.

The method uses a single temperature-programmed column, and a sulfur-selective flame photometric detector (FPD).

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 6326. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6326 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6143:1981, *Gas analysis — Determination of composition of calibration gas mixtures — Comparison methods*.

3 Principle

The components are separated using a temperature-programmed oven and a column of styrene/divinylbenzene porous polymer beads and measured with a sulfur-selective flame photometric detector. Potentially interfering hydrocarbons are also separated from the sulfur compounds. Some sulfur compounds are not completely resolved from others. Identification can be aided by selective scrubbing of the sample to remove different types of sulfur compound (see 7.4.2).

4 Materials

4.1 Gases

4.1.1 Carrier gas, nitrogen, helium or argon, [purity > 99,9 % (*m/m*)], free from oxygen and moisture.

4.1.2 Auxiliary gases, hydrogen and oxygen or air, [purity > 99,9 % (*m/m*)].

4.2 Reference materials, individual thiols and sulfides in the range C1 to C4, tetrahydrothiophene, hydrogen sulfide and carbonyl sulfide.