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Natural gas - Determination of sulfur compounds - Part 1: General introduction (ISO 6326-1:2007)

I.S. EN ISO 6326-1:2009

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**Natural gas - Determination of sulfur compounds - Part 1:
General introduction (ISO 6326-1:2007)**

Gaz naturel - Détermination des composés soufrés - Partie
1: Introduction générale (ISO 6326-1:2007)

Erdgas - Bestimmung von Schwefelverbindungen - Teil 1:
Allgemeine Einleitung (ISO 6326-1:2007)

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Foreword

The text of ISO 6326-1:2007 has been prepared by Technical Committee ISO/TC 193 "Natural gas" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 6326-1:2009.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

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I.S. EN ISO 6326-1:2009
**INTERNATIONAL
STANDARD**

**ISO
6326-1**

Second edition
2007-06-15

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

Part 1:
General introduction

*Gaz naturel — Détermination des composés soufrés —
Partie 1: Introduction générale*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

This second edition cancels and replaces the first edition (ISO 6326-1:1989), which has been technically revised due to the replacement of ISO 6326-2:1981 and ISO 6326-4:1994 by ISO 19739:2004, *Natural gas – Determination of sulfur compounds using gas chromatography*, which gives the requirements needed to perform a sulfur analysis by gas chromatography. This second edition also provides a general introduction to ISO 19739.

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

- *Part 1: General introduction*
- *Part 3: Determination of hydrogen sulfide, mercaptan sulfur and carbonyl sulfide sulfur by potentiometry*
- *Part 5: Lingener combustion method*

Introduction

Sulfur compounds can occur naturally in natural gas and remain as traces after treatment, or they may have been injected deliberately to allow subsequent olfactory detection for safety reasons.

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, tetrahydrothiophene (THT), etc.] and the requirements of the determinations (required uncertainty, measurement at the well head, at clean-up plant 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.

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

The other parts of ISO 6326 and ISO 19739 describe in detail the various standardized methods.

Natural gas — Determination of sulfur compounds —

Part 1: General introduction

WARNING — The majority of sulfur compounds are extremely toxic and thus present a serious health hazard if handled without precautions.

1 Scope

This part of ISO 6326 gives a brief description of standardized methods that can be used for the determination of sulfur compounds in natural gas.

The principle of each method is described generally, the range of concentrations for which the method is suitable is indicated, and the analytical range and precision of each method is given. It should enable the user to select judiciously the proper method for the application being considered. Sulfur analysis is performed in order to determine

- a) total sulfur,
- b) sulfur contained in specific groups (e.g. thiol sulfur),
- c) individual sulfur compounds, and
- d) specific groups of sulfur compounds.

The standardized methods available in the field of sulfur analysis are

- the Wickbold combustion method: for total sulfur determination (ISO 4260),
- the Lingener combustion method: for total sulfur determination (ISO 6326-5),
- gas chromatography: for determination of individual sulfur compounds (ISO 19739), and
- potentiometry: for determination of hydrogen sulfide, carbonyl sulfide and thiol compounds (ISO 6326-3).

Other methods for the determination of sulfur compounds are available but are not considered here. Table 1 gives an overview of the standardized methods which can be used for the determination of total sulfur, hydrogen sulfide, carbonyl sulfide, tetrahydrothiophene, thiol sulfur, individual thiols, individual thiophenes, individual organic sulfides and disulfides.

Table 1 — Methods for the determination of sulfur compounds in natural gas

Determination	Method	Concentration range ^a mg/m ³	Reference
Total sulfur	Wickbold combustion method	1 to 20 000	ISO 4260
	Lingener combustion method	0,5 to 1 000	ISO 6326-5
Hydrogen sulfide (H ₂ S)	Potentiometry	≥ 1	ISO 6326-3
	Gas chromatography	0,1 to 100 (or 0,5 to 600 depending on the detector used)	ISO 19739
Carbonyl sulfide (COS)	Gas chromatography	0,1 to 30	ISO 19739
	Potentiometry	≥ 1	ISO 6326-3
Tetrahydrothiophene (THT)	Gas chromatography	0,1 to 100	ISO 19739
Thiol sulfur	Potentiometry	≥ 1	ISO 6326-3
Individual thiols	Gas chromatography	0,1 to 100	ISO 19739
Individual thiophenes	Gas chromatography	0,1 to 100	ISO 19739
Individual organic sulfides and disulfides	Gas chromatography	0,1 to 100	ISO 19739

^a For the determination of total sulfur, the sulfur content is expressed as milligrams of sulfur per cubic metre of gas. For the determination of sulfur compounds, the mass concentration of sulfur compounds is expressed as milligrams of sulfur compound per cubic metre of gas.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4260, *Petroleum products and hydrocarbons — Determination of sulfur content — Wickbold combustion method*

ISO 6326-3, *Natural gas — Determination of sulfur compounds — Part 3: Determination of hydrogen sulfide, mercaptan sulfur and carbonyl sulfide sulfur by potentiometry*

ISO 6326-5, *Natural gas — Determination of sulfur compounds — Part 5: Lingener combustion method*

ISO 10715, *Natural gas — Sampling guidelines*

ISO 16664, *Gas analysis — Handling of calibration gases and gas mixtures — Guidelines*

ISO 19739:2004, *Natural gas — Determination of sulfur compounds using gas chromatography*

3 Sampling

3.1 General

The sampling procedures are very important in the analysis of sulfur compounds. Sulfur compounds have a strong tendency to adsorb on to, or to chemically react with, different materials of construction. Low contents of sulfur compounds in samples and calibration gas mixtures put demands on the sampling procedure in order to ensure that the sulfur compounds in correct quantity reach the analytical device.

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