INTERNATIONAL STANDARD

ISO 6326-5

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Natural gas — Determination of sulfur compounds —

Part 5 : Lingener combustion method

Gaz naturel — Détermination des composés soufrés —

Partie 5 : Méthode de combustion Lingener

Reference number
ISO 6326-5 : 1989 (E)

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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6326-5 was prepared by Technical Committee ISO/TC 158, *Analysis of gases.*

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 sulfur compounds*

— *Part 3: Determination of hydrogen sulfide, mercaptan sulfur and carbonyl sulfide sulfur by potentiometry*

— *Part 4: Determination of individual sulfur compounds by gas chromatography with a flame photometric detector*

— *Part 5: Lingener combustion method*

Annex A of this part of ISO 6326 is for information only.

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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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Natural gas — Determination of sulfur compounds —

Part 5 :
Lingener combustion method

1 Scope

This part of ISO 6326 specifies a method for the determination of total sulfur in natural gas. The method is applicable to gases with sulfur contents between 0,5 mg/m^3 and 1 000 mg/m^3. With a total sulfur content of more than 0,1 mg sulfur in the absorption solution, visual titration with an indicator can be chosen, whereas for lower contents turbidimetric titration is preferable.

NOTE — In all parts of ISO 6326, 1 m^3 of gas is expressed at normal conditions (0 °C; 101,325 kPa).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6326. At the time of publication, the editions indicated were 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 editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 385-1 : 1984, *Laboratory glassware — Burettes — Part 1 : General requirements.*

ISO 648 : 1977, *Laboratory glassware — One-mark pipettes.*

ISO 1042 : 1983, *Laboratory glassware — One-mark volumetric flasks.*

ISO 3585 : 1976, *Glass plant, pipeline and fittings — Properties of borosilicate glass 3.3.*

3 Principle

A measured volume of gas is burnt with air at atmospheric pressure in a glass combustion apparatus. The resulting sulfur oxides are converted into sulfuric acid by absorption in hydrogen peroxide solution. Depending on the sulfur content of the test gas, the sulfate ions in the absorption solution are determined using either visual titration with an indicator or turbidimetric titration.

4 Reagents and materials

During the analysis, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

4.1 Hydrogen peroxide, 10 % (m/m) aqueous solution, sulfur-free, as absorbing liquid for the sulfur oxides.

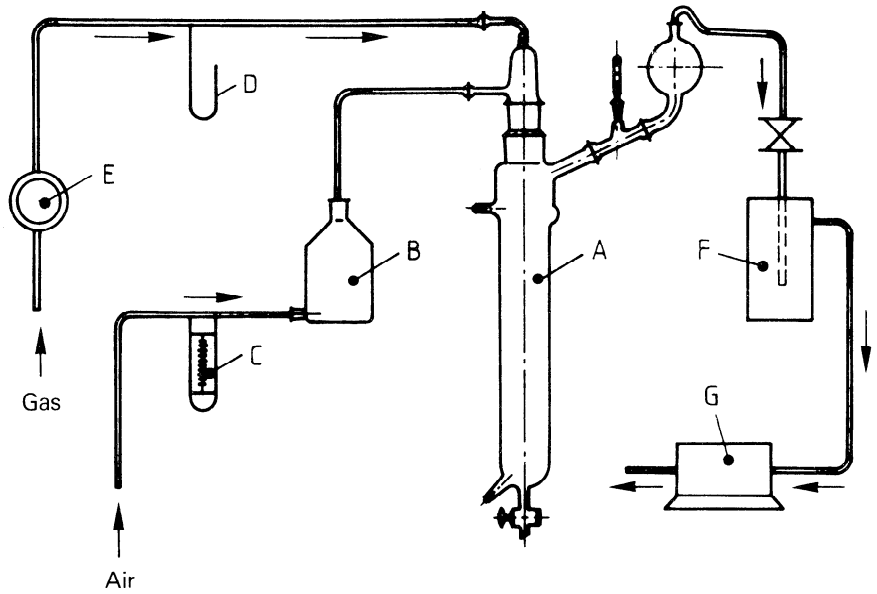
4.2 Activated carbon, for adsorption of sulfur impurities from the combustion air.

4.3 Absorbing liquid : 30 % (m/m) aqueous solution of potassium hydroxide, for the purification of the combustion air.

5 Apparatus

The schematic layout of the apparatus is shown in figure 1.

Ordinary laboratory apparatus and



A Combustion device
B Pressure-equalizing vessel
C Capillary flow meter
D U-tube manometer
E Dry gas meter with thermometer
F Condensate separator
G Vacuum pump

Figure 1 — Schematic layout of the apparatus

5.1 Combustion device (A)

The combustion device is manufactured of borosilicate glass complying with ISO 3585. It consists of the parts shown in figure 2.

5.1.1 Receiver with cooling jacket (see figure 3).

5.1.2 Flame tube (see figure 4)

The outer diameter of the flame tube is determined by the inside diameter of the receiver with cooling jacket and the annular gap shown in figure 2.

5.1.3 Burner (see figure 5)

For the combustion of natural gases a universal burner with a needle valve is often preferable.

5.1.4 Intermediate piece (see figure 6)

The thermometer shall have a measuring range of 0 °C to at least 100 °C. The scale interval shall be not less than 1 °C.

5.1.5 Reitmeyer attachment (see figure 7).

5.2 Pressure-equalizing vessel (B).

5.3 Capillary flow meter (C), measuring range 10 l/min to 30 l/min.

5.4 U-tube manometer (D), arm length 500 mm.

5.5 Dry gas meter (E)

The range of the meter shall be appropriate for the quantity of sample to be burned and the meter shall have been recently calibrated. The gas meter shall be equipped with a thermometer for the measurement of the gas temperature. The thermometer shall have a measuring range of 0 °C to at least 30 °C. The scale intervals shall be not less than 0,5 °C.

NOTE — The gas meter should be flushed with the gas to be analysed before the combustion, in particular when analysing gases with different sulfur contents, to avoid disturbance by adsorption and desorption phenomena.

5.6 Condensate separator (F).

5.7 Vacuum pump (G)

The suction capacity of the vacuum pump shall be at least 25 l/min. It is recommended that a drying tower with a drying agent be included between the condensate separator (F) and the vacuum pump (G) to protect the oil in the vacuum pump.

Dimensions in millimetres

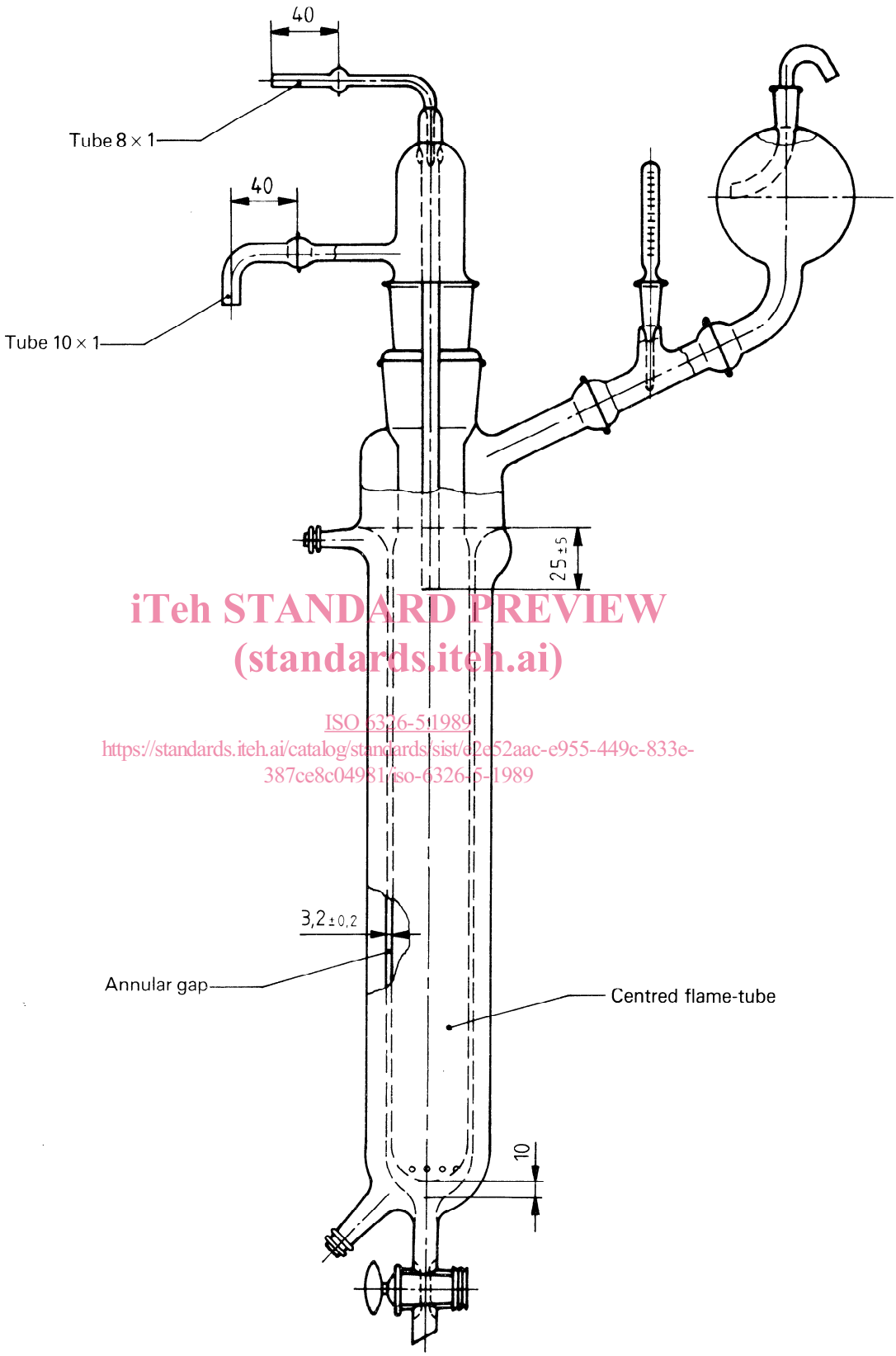


Figure 2 — Combustion vessel

Dimensions in millimetres

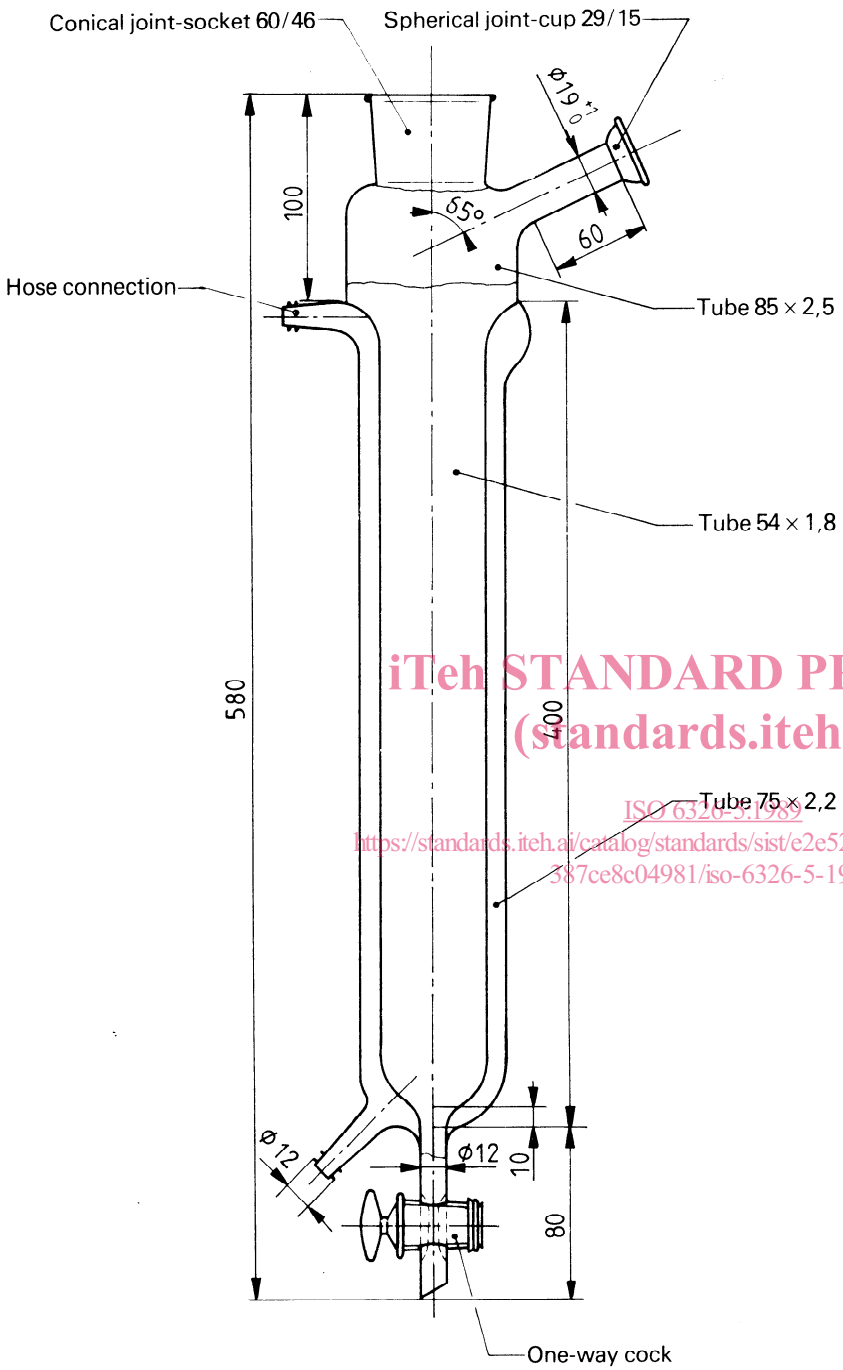


Figure 3 — Receiver with cooling jacket

Dimensions in millimetres

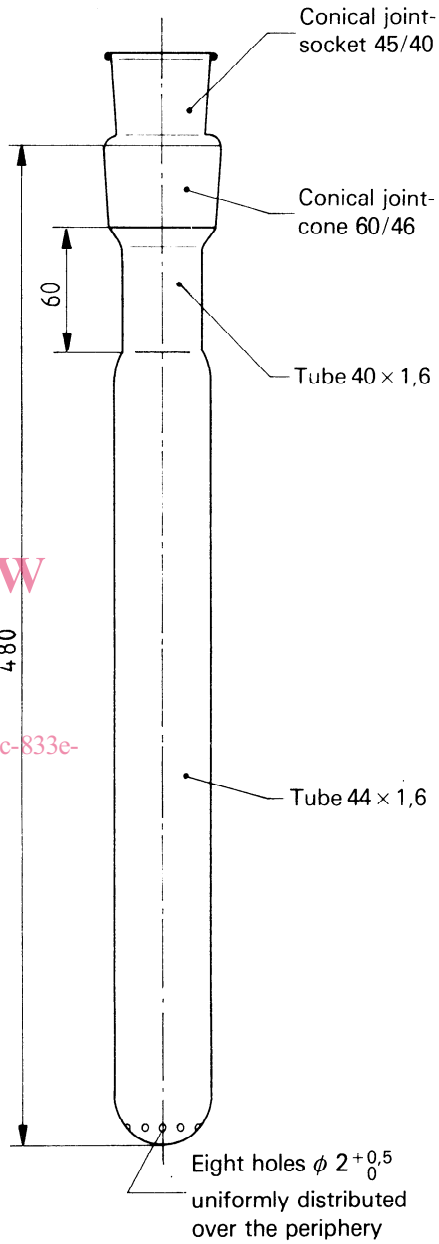


Figure 4 — Flame tube

Dimensions in millimetres

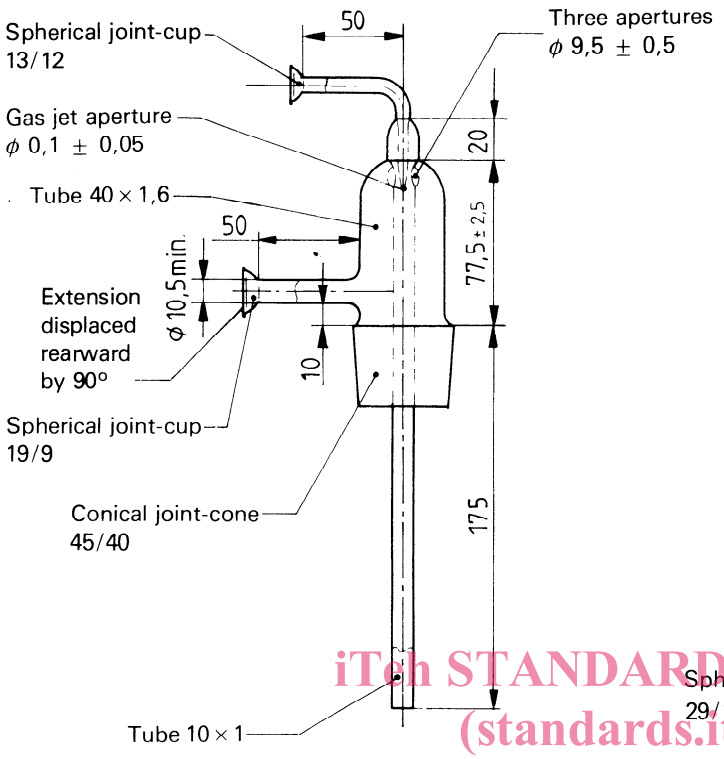


Figure 5 — Burner

Dimensions in millimetres

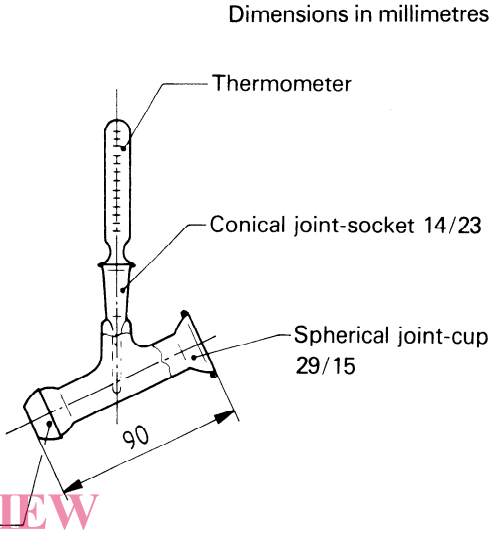


Figure 6 — Intermediate piece

Dimensions in millimetres

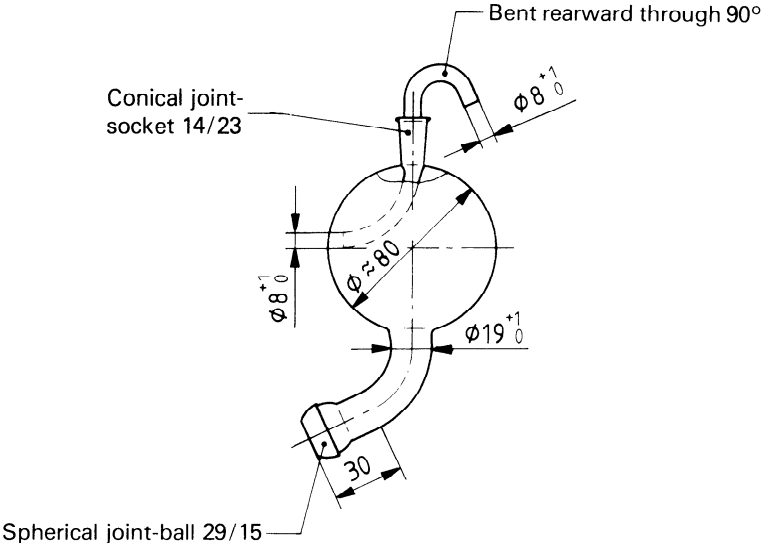


Figure 7 — Reitmeyer attachment