FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/FDIS
11626**

ISO/TC **193**/SC **1**

Secretariat: **NEN**

Voting begins on:
2023-12-07

Voting terminates on:
2024-02-01

Natural gas — Determination of sulfur compounds — Determination of hydrogen sulfide content by UV absorption method

Gaz naturel — Détermination des composés soufrés — Détermination de la teneur en sulfure d'hydrogène par la méthode d'absorption UV

Reference number
ISO/FDIS 11626:2023(E)

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Published in Switzerland

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Foreword

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Natural gas — Determination of sulfur compounds — Determination of hydrogen sulfide content by UV absorption method

1 Scope

This document describes the test method for the determination of hydrogen sulfide content in natural gas by UV absorption method.

This document applies to the determination of hydrogen sulfide content in natural gas, in the range from 1 mg/m^3 to 50 mg/m^3.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 6141, *Gas analysis — Contents of certificates for calibration gas mixtures*

ISO 6142-1, *Gas analysis — Preparation of calibration gas mixtures — Part 1: Gravimetric method for Class I mixtures*

ISO 6143, *Gas analysis — Comparison methods for determining and checking the composition of calibration gas mixtures*

ISO 6145, *Gas analysis — Preparation of calibration gas mixtures using dynamic methods*

ISO 10715, *Natural gas — Gas sampling*

ISO 12963, *Gas analysis — Comparison methods for the determination of the composition of gas mixtures based on one- and two-point calibration*

ISO 14532, *Natural gas — Vocabulary*

ISO 14912, *Gas analysis — Conversion of gas mixture composition data*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14532 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Test conditions

The test conditions are the same as the calibration conditions.

The reference conditions of the measurement results are the same as those on the calibration gas certificates.

NOTE The reference conditions on the calibration gas certificates usually are 101,325 kPa, 20 °C or 101,325 kPa, 15 °C or 101,325 kPa, 0 °C.

5 Principle

5.1 The ultraviolet (UV) light emitted by the light source is split by a grating or a prism, absorbed by a gas sample and then projected onto a photomultiplier tube. After the photoelectric conversion and amplification of the drawn ultraviolet absorption spectrum, hydrogen sulfide can be quantitatively analysed. The absorbance detected by the receiving unit and the content of hydrogen sulfide in the measured gas conform to Lambert-Beer's law.

5.2 The UV light is delivered from the pulsed light source to the flow cell by a fibre-optic cable. In the flow cell, the continuous natural gas samples interact with the light in an optical path. Hydrogen sulfide absorbs different amounts of light at different wavelengths. The UV light leaves the flow cell after passing through the sample and then goes to the spectrum analyser through the optical fibre. A spectroscopic holographic grating decomposes UV light into continuous wavelengths, focuses each decomposed wavelength on a specific photodiode on the diode array and calculates the hydrogen sulfide content according to Lambert-Beer's law through a built-in algorithm.

5.3 Calculation formula: if the analytical signal is absorbance, the content of hydrogen sulfide is calculated by Formula (1):

$$C_S = \frac{A_S}{A_{ref}} C_{ref} \quad (1)$$

where

C_s is the content of hydrogen sulfide in the natural gas sample, expressed in mg/m^3;

A_s is the absorbance of hydrogen sulfide in the natural gas sample;

C_{ref} is the content of hydrogen sulfide in the calibration gas, expressed in mg/m^3;

A_{ref} is the absorbance of hydrogen sulfide in the calibration gas.

6 Instrument

6.1 General requirements

Choose an instrument with an appropriate measuring range according to the content of hydrogen sulfide in the analysed gas. The instrument shall be regularly maintained to ensure its performance according to the instrument manual. The instrument shall meet the requirements of the work site, including but not limited to, explosion-proof, power supply, air tightness, etc.

6.2 Sample processing system

The sample processing system shall ensure that there is no water, liquid hydrocarbon and particulate matter in the sample. Adjust the sample gas to the injection pressure and temperature required by the instrument, and keep them stable.