ICS 75.060 SLOVENSKÁ TECHNICKÁ NORMA August 2023

| STN | **Analýza zemného plynu<br>Stanovenie obsahu kremíka v biometáne<br>Časť 1: Stanovenie celkového obsahu kremíka atómovou emisnou spektroskopiou (AES)<br>(ISO 2613-1: 2023)** | **STN<br>EN ISO 2613-1**<br><br>38 6130 |
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Analysis of natural gas - Silicon content of biomethane - Part 1: Determination of total silicon by atomic emission spectroscopy (AES) (ISO 2613-1:2023)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/23

Obsahuje: EN ISO 2613-1:2023, ISO 2613-1:2023

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN ISO 2613-1

May 2023

ICS 75.060

English Version

# Analysis of natural gas - Silicon content of biomethane - Part 1: Determination of total silicon by atomic emission spectroscopy (AES) (ISO 2613-1:2023)

Analyse du gaz naturel - Teneur en silicium du biométhane - Partie 1: Détermination de la teneur totale en silicium par spectrométrie d'émission atomique (SEA) (ISO 2613-1:2023)

Analyse von Erdgas - Siliziumgehalt von Biomethan - Teil 1: Bestimmung des Gesamtsiliziumgehalts durch AES (ISO 2613-1:2023)

This European Standard was approved by CEN on 3 May 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



Ref. No. EN ISO 2613-1:2023 E

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## European foreword

This document (EN ISO 2613-1:2023) has been prepared by Technical Committee ISO/TC 193 "Natural gas" in collaboration with Technical Committee CEN/TC 408 “Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid” the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by November 2023, and conflicting national standards shall be withdrawn at the latest by November 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

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## Endorsement notice

The text of ISO 2613-1:2023 has been approved by CEN as EN ISO 2613-1:2023 without any modification.

INTERNATIONAL STANDARD

**ISO 2613-1**

First edition
2023-05

# Analysis of natural gas — Silicon content of biomethane —

## Part 1: Determination of total silicon by atomic emission spectroscopy (AES)

*Analyse du gaz naturel — Teneur en silicium du biométhane —*

*Partie 1: Détermination de la teneur totale en silicium par spectrométrie d'émission atomique (SEA)*

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 193, *Natural gas*, Subcommittee SC 1, *Analysis of natural gas,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 408, *Biomethane for use in transport and injection in natural gas pipelines,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

# Introduction

This document describes a method for the measurement of the total concentration of silicon in biomethane, biogas and similar gaseous matrices when used in the natural gas grids and when using it as a transport fuel. The method is based on using a liquid impinger to accumulate the silicon from a gas sample, followed by instrumental analysis.

Due to the extensive usage of siloxane compounds, their volatility and great affinity to apolar environments, siloxanes are considered as one of the most important impurities in biogas. They are undesired because of their potential for abrasive $SiO_2$ formation as combustion product that can damage engines and appliances. Furthermore, some of these compounds present a health risk.

For the purpose of this document, silicon species measured is quoted as total silicon. Silicon measured is from organosilicon species that are trapped from the gas phase in liquid media and derivatized into analytical form of hexafluorosilicate ($SiF_6^{2-}$) ions which remain present in solution when analysed.

**INTERNATIONAL STANDARD** **ISO 2613-1:2023(E)**

# Analysis of natural gas — Silicon content of biomethane —

# Part 1: Determination of total silicon by atomic emission spectroscopy (AES)

## 1 Scope

This document is applicable to the measurement of the total silicon content in gaseous matrices such as biomethane and biogas. Silicon is present in a gas phase contained predominantly in siloxane compounds, trimethylsilane and trimethylsilanol. The analytical form of the silicon measured in liquid phase after conducted sampling and derivatization procedure is soluble hexafluorosilicate anion stable in slightly acidified media. Total silicon is expressed as a mass of silicon in the volume of the analysed gas.

This document is applicable to stated gaseous matrices with silicon concentrations up to 5 mg/m$^3$, and it is prevalently intended for the biomethane matrices with Si mass concentration of 0,1 mg/m$^3$ to 0,5 mg/m$^3$.

With adaptation to ensure appropriate absorption efficiency, it can be used for higher concentrations. The detection limit of the method is estimated as 0,05 mg/m$^3$ based on a gas sample volume of 0,020 m$^3$. All compounds present in the gas phase are volatile at the absorption and derivatization temperature and gaseous organosilicon species are trapped in absorbance media and derivatized into analytical silicon that is measured by this method. The concentration of the silicon is measured in diluted derivatization media using atomic emission spectrometry upon atomisation/ionisation in microwave or inductively coupled plasma.

Unless specified otherwise, all volumes and concentrations refer to standard reference conditions (temperature, 273 K, and pressure, 101,325 kPa).

NOTE When using appropriate dilution factors, the method can also be applied for silicon concentrations above 5 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 3696, *Water for analytical laboratory use — Specification and test methods*

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

ISO 14532, *Natural gas — Vocabulary*

ISO 10715, *Natural gas — Gas sampling*

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