

**Natural gas - Determination of composition with defined uncertainty by gas chromatography - Part 3: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and hydrocarbons up to C8 using two packed columns**

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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 6974-3:2002 sisaldab Euroopa standardi EN ISO 6974-3:2001 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 14.02.2002 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 6974-3:2002 consists of the English text of the European standard EN ISO 6974-3:2001.</p> <p>This document is endorsed on 14.02.2002 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b></p> <p>This part of EN ISO 6974 describes a gas chromatographic method for the quantitative determination of the content of helium, hydrogen, oxygen, nitrogen, carbon dioxide and C1 to C8 hydrocarbons in natural gas samples using two packed columns.. This method is applicable to determinations made in on-line processes or in the laboratory.</p>	<p><b>Scope:</b></p> <p>This part of EN ISO 6974 describes a gas chromatographic method for the quantitative determination of the content of helium, hydrogen, oxygen, nitrogen, carbon dioxide and C1 to C8 hydrocarbons in natural gas samples using two packed columns.. This method is applicable to determinations made in on-line processes or in the laboratory.</p>
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**Võtmesõnad:** chemical analysis and testin, chemical c, column chromatography, composition, determination, determination of content, gas analysis, gas chromatography, gas phase chromatography, helium, hydrocarbons, hydrogen content, natural gas, nitrogen, oxygen, uncertainties

English version

Natural gas – Determination of composition with  
defined uncertainty by gas chromatography

Part 3: Determination of hydrogen, helium, oxygen, nitrogen, carbon  
dioxide and hydrocarbons up to C<sub>8</sub> using two packed columns  
(ISO 6974-3 : 2000)

Gaz naturel – Détermination de la  
composition avec une incertitude  
définie par chromatographie en phase  
gazeuse – Partie 3: Détermination de  
l'hydrogène, de l'hélium, de l'oxygène,  
de l'azote, du dioxyde de carbone et  
des hydrocarbures jusqu'à C<sub>8</sub> à l'aide  
de deux colonnes remplies  
(ISO 6974-3 : 2000)

Erdgas – Bestimmung der Zusammen-  
setzung mit definierter Unsicherheit  
durch Gaschromatographie – Teil 3:  
Bestimmung von Wasserstoff, Helium,  
Sauerstoff, Stickstoff, Kohlenstoff-  
dioxid und Kohlenwasserstoffen bis  
zu C<sub>8</sub> mit zwei gepackten Säulen  
(ISO 6974-3 : 2000)

This European Standard was approved by CEN on 2001-06-22.

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which stipulate the conditions for giving this European Standard the status of a  
national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national stand-  
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Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland,  
and the United Kingdom.

**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Management Centre: rue de Stassart 36, B-1050 Brussels

## Foreword

International Standard

ISO 6974-3 : 2000 Natural gas – Determination of composition with defined uncertainty by gas chromatography – Part 3: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and hydrocarbons up to C<sub>8</sub> using two packed columns,

which was prepared by ISO/TC 193 'Natural gas' of the International Organization for Standardization, has been adopted by CEN/CMC as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by February 2002 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

## Endorsement notice

The text of the International Standard ISO 6974-3 : 2000 was approved by CEN as a European Standard without any modification.

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## Introduction

This part of ISO 6974 describes a precise and accurate method for the analysis of natural gas, which permits the determination of the composition of natural gas. The compositional data obtained are used for the calculation of calorific value, relative density and the Wobbe index.

This method requires the use of two columns which are put into one or two gas chromatographs. The constituents of the eluent of the first column are detected by a thermal conductivity detector (TCD). The constituents of the eluent of the second column are detected by a TCD and flame ionization (FID) in series.

If the two columns are put into one chromatograph the gas chromatographic conditions are described in informative annex A.

This part of ISO 6974 provides one of the methods that may be used for determining the composition of natural gas in accordance with parts 1 and 2 of ISO 6974.

## 1 Scope

This part of ISO 6974 describes a gas chromatographic method for the quantitative determination of the content of helium, hydrogen, oxygen, nitrogen, carbon dioxide and C<sub>1</sub> to C<sub>8</sub> hydrocarbons in natural gas samples using two packed columns. This method is applicable to determinations made in on-line processes or in the laboratory. It is applicable to the analysis of gases containing constituents within the mole fraction ranges given in Table 1 and which do not contain any hydrocarbon condensate. These ranges do not represent the limits of detection, but the limits within which the stated precision of the method applies. Although one or more components in a sample may not be detected present, the method can still be applicable.

This part of ISO 6974 is only applicable in conjunction with parts 1 and 2 of ISO 6974.

**Table 1 — Application ranges**

Component	Mole fraction range %
Helium	0,01 to 0,5
Hydrogen	0,01 to 0,5
Oxygen	0,1 to 0,5
Nitrogen	0,1 to 40
Carbon dioxide	0,1 to 30
Methane	50 to 100
Ethane	0,1 to 15
Propane	0,001 to 5
Butanes	0,000 1 to 2
Pentanes	0,000 1 to 1
Hexanes to octanes	0,000 1 to 0,5

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 6974. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 6974 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 6974-1:2000, *Natural gas — Determination of composition with defined uncertainty by gas chromatography — Part 1: Guidelines for tailored analysis.*

ISO 6974-2:—<sup>1)</sup>, *Natural gas — Determination of composition with defined uncertainty by gas chromatography — Part 2: Measuring-system characteristics and statistics for data treatment.*

ISO 7504, *Gas analysis — Vocabulary.*

### 3 Principle

Determination of nitrogen, carbon dioxide and hydrocarbons from C<sub>1</sub> to C<sub>8</sub> by gas chromatography using two chromatographic columns. A molecular sieve 13X column coupled with a thermal conductivity detector (TCD) is used for the separation and detection of hydrogen, helium, oxygen and nitrogen, and a Porapak R column coupled with a TCD and a flame ionization detector (FID) in series is used for the separation and detection of nitrogen, carbon dioxide and hydrocarbons from C<sub>1</sub> to C<sub>8</sub>. The two analyses are carried out independently and the results are combined.

If oxygen is seen to be present at a mole fraction greater than 0,02 % when measured using the molecular sieve column, then the nitrogen value shall be taken from the molecular sieve analysis. If the mole fraction of oxygen is less than 0,02 % and assuming that hydrogen is absent from the gas sample, the nitrogen value can be taken from the Porapak R analysis.

Quantitative results are achieved by determining the response of the TCD detector with reference-gas mixtures and using relative response factors of the FID detector.

The resulting composition of the natural gas is normalized to 100 %.

### 4 Materials

**4.1 For the determination of helium, hydrogen, oxygen and nitrogen**, (separation on molecular sieve 13X column) consisting of the following.

**4.1.1 Argon carrier gas**, > 99,99 % pure, free from oxygen and water.

If the purity of the gas is less than that specified, it is essential to check that the type of impurity present does not interfere with the analysis. Also, even if the carrier gases argon and/or helium fall within the specification, some of the impurities present in the gases can nevertheless interfere with the analysis. Under these circumstances, appropriate purification is essential.

**4.1.2 Working-reference gas mixtures (WRM)**, consisting of:

**4.1.2.1 Gas mixtures containing helium and hydrogen with nitrogen or argon as the matrix gas.**

**4.1.2.2 Gas mixtures containing oxygen and nitrogen with argon as the matrix gas.**

NOTE 1 Take care to prevent explosion of gas mixtures.

NOTE 2 In the case of analysis using only one instrument, the WRM with oxygen and nitrogen as components and argon as the matrix gas can be replaced by oxygen with nitrogen as matrix gas. By addition of helium to the WRM this gas could also be used for the daily calibration.

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1) To be published.