Natural gas - Determination of composition and associated uncertainty by gas chromatography - Part 5: Isothermal method for nitrogen, carbon dioxide, C1 to C5 hydrocarbons and C6+ hydrocarbons (ISO 6974-5:2014)

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NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 6974-5:2014 sisaldab Euroopa standardi EN ISO 6974-5:2014 inglisekeelset teksti.	This Estonian standard EVS-EN ISO 6974-5:2014 consists of the English text of the European standard EN ISO 6974-5:2014.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 16.07.2014.	Date of Availability of the European standard is 16.07.2014.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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Natural gas - Determination of composition and associated uncertainty by gas chromatography - Part 5: Isothermal method for nitrogen, carbon dioxide, C1 to C5 hydrocarbons and C6+ hydrocarbons (ISO 6974-5:2014)

Gaz naturel - Détermination de la composition et de l'incertitude associée par chromatographie en phase gazeuse - Partie 5: Méthode isotherme pour l'azote, le dioxyde de carbone, les hydrocarbures C1 à C5 et C6+ (ISO 6974-5:2014)

Erdgas - Bestimmung der Zusammensetzung und der zugehörigen Unsicherheit durch Gaschromatographie - Teil 5: Isothermes Verfahren für Stickstoff, Kohlenstoffdioxid, C1- bis C5-Kohlenwasserstoffe und C6+-Kohlenwasserstoffe (ISO 6974-5:2014)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 6974-5:2014) has been prepared by Technical Committee ISO/TC 193 "Natural gas".

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of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by January 2015.

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Endorsement notice

The text of ISO 6974-5:2014 has been approved by CEN as EN ISO 6974-5:2014 without any modification.

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Introduction

This part of ISO 6974 describes a method for the analysis of natural gas that is commonly used for online process applications, but can be applied to laboratory instruments. The compositional data obtained are used for the calculation of calorific value, density and Wobbe index.

It is assumed that the natural gas does not contain any oxygen at source and that any oxygen which may be present is due to contamination during sampling.

The primary use of this chromatographic method is the calculation of calorific value (CV) according to ISO 6976. It is based on a column switching technique in which multiple columns, chosen for their separating ability for particular groups of components, are switched under automatic control.

Only one injection is necessary and the first phase of the method involves accelerated backflush of C_6+ (which is measured as a recombined "pseudo component" rather than by the summation of individual component measurements). Lighter components (nitrogen, methane, carbon dioxide and ethane) are stored on the appropriate separating column while the heavier, C_3 to C_5 hydrocarbons are eluted. The lighter components are then separated by redirecting carrier gas on to the appropriate column.

A Thermal Conductivity Detector (TCD) is used for measurement of the above components.

When the method is first set up, the repeatability of measurement is established by repetitive analysis of a cylinder of test gas, commonly a typical natural gas. For each component, a control chart showing the mean value, and the bounds representing 2 and 3 standard deviations, is drawn up. Subsequently, this test gas is analysed after each calibration of the analyser, and the results are compared with the data in the control charts. The performance of the analyser is assessed by this procedure.

Any change in the method setup can give rise to differences in component responses and hence (where applied) to calculated uncertainties. In these circumstances fitting data to an existing control chart is not a suitable procedure, and the operations that were undertaken when the method was first set up shall be repeated.

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

Natural gas — Determination of composition and associated uncertainty by gas chromatography —

Part 5: Isothermal method for nitrogen, carbon dioxide, C_1 to C_5 hydrocarbons and C_{6+} hydrocarbons

1 Scope

This part of this International Standard describes a gas chromatographic method for the quantitative determination of the content of nitrogen, carbon dioxide and C_1 to C_5 hydrocarbons individually and a composite C_6+ measurement, which represents all hydrocarbons of carbon number 6 and above in natural gas samples. It is applicable to the analysis of gases containing constituents within the working ranges given in Table 1.

Table 1 — Component working ranges

Component		Mole fraction %	
		Min.	Max.
Nitrogen	N_2	0,1	22
Carbon dioxide	CO_2	0,05	15
Methane	CH_4	34	100
Ethane	C_2H_6	0,1	23
Propane	C_3H_8	0,05	10
iso-Butane	i-C_4H_{10}	0,01	2,0
n-Butane	n-C_4H_{10}	0,01	2,0
neo-Pentane	neo-C_5H_{12}	0,005	0,35
iso-Pentane	i-C_5H_{12}	0,005	0,35
n-Pentane	n-C_5H_{12}	0,005	0,35
Hexanes +	C_6+	0,005	0,35

NOTE 1 The working ranges in Table 1 are those for which the method has been shown to be satisfactory, and are offered for guidance. However, there is no reason why wider ranges should not be used, provided that the successful measurement of such wider ranges has been demonstrated.

NOTE 2 Hydrocarbons above n-pentane are expressed as the "pseudo-component" C_6+ which is measured as one composite peak and calibrated as such. The properties of C_6+ are calculated from an extended analysis of the individual C_6 and higher hydrocarbons.

NOTE 3 Oxygen is not a normal constituent of natural gas and would not be expected to be present in gas sampled to an online instrument. If any oxygen is present as a result of air contamination, it will be measured with the nitrogen. The resulting measured (nitrogen + oxygen) value will be in error to a small extent because of the slight difference between the detector responses of oxygen and nitrogen.

NOTE 4 The helium and argon contents are assumed to be sufficiently small and unvarying that they need not be analysed for.

NOTE 5 The gas sample shall not contain any hydrocarbon condensate and/or water.

2 Normative references

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

ISO 6974-1, *Natural gas — Determination of composition and associated uncertainty by gas chromatography — Part 1: General guidelines and calculation of composition*

ISO 6974-2, *Natural gas — Determination of composition and associated uncertainty by gas chromatography — Part 2: Uncertainty calculations*

3 Principle

Figure 1 is a flowchart showing the steps involved in the analytical process. It is based on more detailed flowcharts in ISO 6974-1 and ISO 6974-2, simplified to represent the procedure described in this part. References are given at each step to the relevant clause in this part and, where appropriate, to the relevant clauses in ISO 6974-1 and ISO 6974-2.