SLOVENSKI STANDARD
SIST EN ISO 6974-1:2012

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Nadomešča:
SIST EN ISO 6974-1:2001

Zemeljski plin - Določevanje sestave in pripadajoče negotovosti s plinsko kromatografijo - 1. del: Splošne smernice in računanje sestave (ISO 6974-1:2012)

Natural gas - Determination of composition and associated uncertainty by gas chromatography - Part 1: General guidelines and calculation of composition (ISO 6974-1:2012)

Erdgas - Bestimmung der Zusammensetzung und der zugehörigen Unsicherheit durch Gaschromatographie - Teil 1: Allgemeine Leitlinien und Berechnung der Zusammensetzung (ISO 6974-1:2012)

Gaz naturel - Détermination de la composition avec une incertitude définie par chromatographie en phase gazeuse - Partie 1: Lignes directrices générales et calculs de la composition (ISO 6974-1:2012)

Ta slovenski standard je istoveten z: **EN ISO 6974-1:2012**

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75.060	Zemeljski plin	Natural gas

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN ISO 6974-1

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English Version

Natural gas - Determination of composition and associated uncertainty by gas chromatography - Part 1: General guidelines and calculation of composition (ISO 6974-1:2012)

Gaz naturel - Détermination de la composition et de l'incertitude associée par chromatographie en phase gazeuse - Partie 1: Lignes directrices générales et calcul de la composition (ISO 6974-1:2012)

Erdgas - Bestimmung der Zusammensetzung und der zugehörigen Unsicherheit durch Gaschromatographie - Teil 1: Allgemeine Leitlinien und Berechnung der Zusammensetzung (ISO 6974-1:2012)

This European Standard was approved by CEN on 14 May 2012.

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Foreword

This document (EN ISO 6974-1:2012) 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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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The text of ISO 6974-1:2012 has been approved by CEN as a EN ISO 6974-1:2012 without any modification.

INTERNATIONAL STANDARD

ISO 6974-1

Second edition
2012-05-15

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

Part 1: General guidelines and calculation of composition

Gaz naturel — Détermination de la composition et de l'incertitude associée par chromatographie en phase gazeuse —

Partie 1: Lignes directrices générales et calcul de la composition

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 6974-1 was prepared by Technical Committee ISO/TC 193, *Natural gas*, Subcommittee SC 1, *Analysis of natural gas*.

This second edition of ISO 6974-1, together with ISO 6974-2:2012, cancels and replaces ISO 6974-1:2000 and ISO 6974-2:2001, which have been technically revised.

ISO 6974 consists of the following parts, under the general title *Natural gas — Determination of composition and associated uncertainty by gas chromatography*:

— *Part 1: General guidelines and calculation of composition*

— *Part 2: Uncertainty calculations*

— *Part 3: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and hydrocarbons up to* C_8 *using two packed columns*

— *Part 4: Determination of nitrogen, carbon dioxide and* C_1 *to* C_5 *and* C_{6+} *hydrocarbons for a laboratory and on-line measuring system using two columns*

— *Part 5: Determination of nitrogen, carbon dioxide and* C_1 *to* C_5 *and* C_{6+} *hydrocarbons for a laboratory and on-line process application using three columns*

— *Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and* C_1 *to* C_8 *hydrocarbons using three capillary columns*

Future subsequent parts of ISO 6974 are planned.

Introduction

ISO 6974 describes methods of analysis of natural gas and methods for calculating component mole fractions and uncertainties. ISO 6974 is intended for the measurement of H_2, He, O_2, N_2, CO_2 and hydrocarbons, either as individual components or as a group, for example all hydrocarbons above C_5, defined as C_{6+}. This approach is suitable for a range of end applications, including calibrating gas mixtures and providing natural gas composition and uncertainty data to be used in the calculation of calorific value and other additive physical properties of the gas. Details of these end applications are provided in ISO 6974-3 and subsequent parts of ISO 6974.

This part of ISO 6974 gives guidelines for the gas chromatographic analysis of natural gas and methods of data processing to determine compositions of component mole fractions.

ISO 6974-2 describes the steps required to calculate the uncertainty of each component mole fraction.

ISO 6974-3 and subsequent parts of ISO 6974 describe different gas chromatographic methods. These methods cover both daily practice in the laboratory and on-line field applications. In this part of ISO 6974, Annex A provides a comparison of the characteristics of the analytical methods described in ISO 6974-3 and subsequent parts of ISO 6974.

In cases where only component mole fractions are required, it is intended that this part of ISO 6974 be used in conjunction with a gas chromatographic method of analysis, e.g. ISO 6974-3 or subsequent parts of ISO 6974. In cases where component mole fractions and associated uncertainties are required, it is intended that this part of ISO 6974 be used in conjunction with ISO 6974-2, in addition to a gas chromatographic method of analysis.

This part of ISO 6974 describes all the essential steps for setting up an analysis, including outlining the structure of the analysis, defining the working ranges and establishing the analytical procedure. When the working ranges of the components have been defined, an evaluation is carried out to determine whether components are to be considered as

— main components or groups of components to be analysed using direct measurement (directly measured components),

— components or groups of components to be analysed using indirect measurement, by reference to a different reference component in the calibration gas mixture (indirectly measured components), or

— components that are not measured and whose mole fraction can be assumed to be constant (components not measured).

This part of ISO 6974 provides for the use of three types of method: single operation, multiple operation with bridging and multiple operation without bridging. The last of these methods is a special case of a single operation method.

This part of ISO 6974 describes the conventional normalization approach for calculating processed mole fractions from raw mole fractions (see 5.5). When conventional normalization is used for multiple operations without bridging methods, the uncertainties of the calculated mole fractions will be conservative. If a more accurate assessment of uncertainty is required, an alternative approach for normalization, using the generalized least squares (GLS) method, can be used; this is described in Annex B, which is intended to be used when calculating uncertainties in accordance with ISO 6974-2. Further alternative approaches are available for calculating processed mole fractions, including methane-by-difference (see Annex C) and data harmonization (see Reference [1]).

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

Part 1: General guidelines and calculation of composition

1 Scope

This part of ISO 6974 gives methods for calculating component mole fractions of natural gas and specifies the data processing requirements for determining component mole fractions. This part of ISO 6974 provides for both single and multiple operation methods and either multi-point calibration or a performance evaluation of the analyser followed by single-point calibration. This part of ISO 6974 gives procedures for the calculation of the raw and processed (e.g. normalized) mole fractions, and their associated uncertainties, for all components. The procedures given in this part of ISO 6974 are applicable to the handling of data obtained from replicate or single analyses of a natural gas sample.

2 Normative references

The following referenced documents are indispensable for the application 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/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

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

ISO 10723, *Natural gas — Performance evaluation for on-line analytical systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
response
y
output signal of the measuring system for a component that is measured as peak area or peak height

3.2
reference component
component present in a certified reference gas mixture (CRM) (see 3.10), which is used to calibrate the analyser response to other similar components in the sample which are not themselves present in the CRM

NOTE For example, if the CRM contains hydrocarbons up to and including *n*-butane, but no pentanes or higher, then *n*-butane contained in the CRM can be used as a reference component for the quantification of pentanes and heavier components in the sample. The reference component should have a response function that normally is a first-order polynomial with zero intercept, i.e. a straight line through the origin.

3.3
relative response factor
K
ratio of the molar amount of component j to the molar amount of reference component which gives an equal detector response

NOTE 1 Relative response factors for flame ionization detectors are calculated as the ratio between the carbon number of the reference component and the carbon number of the sample component (see D.1).

NOTE 2 Relative response factors for thermal conductivity detectors are determined experimentally (see D.2).

3.4
other components
components in the gas sample which are not measured by analysis in accordance with ISO 6974 and/or can be regarded as being present at a constant mole fraction

3.5
group of components
components with mole fractions so low that their measurement as individuals would be difficult or require excessive time, and which are therefore measured as a group

NOTE This can be achieved by particular chromatographic techniques, such as backflushing, or by data handling, such as integrating a succession of components as if they were a single component.

3.6
uncertainty (of measurement)
parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

NOTE 1 The parameter may be, for example, a standard deviation (or a given multiple of it), or the half-width of an interval having a stated level of confidence.

NOTE 2 Uncertainty of measurement comprises, in general, many components. Some of these components may be evaluated from the statistical distribution of the results of series of measurements and can be characterized by experimental standard deviations. The other components, which also can be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information.

NOTE 3 It is understood that the result of the measurement is the best estimate of the value of the measurand, and that all components of uncertainty, including those arising from the systematic effects, such as components associated with corrections and reference standards, contribute to the dispersion.

[ISO/IEC Guide 98-3:2008, 2.2.3]

3.7
standard uncertainty
uncertainty of the result of a measurement expressed as a standard deviation

[ISO/IEC Guide 98-3:2008, 2.3.1]

3.8
combined standard uncertainty
standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or covariances of these other quantities weighted according to how the measurement result varies with changes in these quantities

[ISO/IEC Guide 98-3:2008, 2.3.4]

3.9
expanded uncertainty
quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

NOTE 1 The fraction may be viewed as the coverage probability or level of confidence of the interval.

NOTE 2 To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be justified.

NOTE 3 Expanded uncertainty is termed *overall uncertainty* in Recommendation INC-1 (1980)[2], Paragraph 5.

[ISO/IEC Guide 98-3:2008, 2.3.5]

3.10
certified reference gas mixture
CRM
reference gas mixture, characterized by a metrologically valid procedure for one or more specified properties, accompanied by a certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability

NOTE 1 The above definition is based on the definition of "certified reference material" in ISO Guide 35[3]. "Certified reference material" is a generic term; "certified reference gas mixture" is more suited to this application.

NOTE 2 The concept of value includes qualitative attributes such as identity or sequence. Uncertainties for such attributes may be expressed as probabilities.

NOTE 3 Metrologically valid procedures for the production and certification of reference materials (such as certified reference gas mixtures) are given in, among others, ISO Guide 34[4] and ISO Guide 35[3].

NOTE 4 ISO Guide 31[5] gives guidance on the contents of certificates.

3.11
working measurement standard
WMS
measurement standard that is used routinely to calibrate or verify measuring instruments or measuring systems

[ISO/IEC Guide 99:2007[6], 5.7]

NOTE In ISO 6974, a working measurement standard is a CRM that is used to perform a routine calibration or a quality assurance check (see 6.7).

3.12
direct measurement
measurement by which individual components and/or groups of components are determined by comparison with identical components in the CRM(s)

3.13
indirect measurement
measurement by which individual components and/or groups of components which are themselves not present in the CRM(s) are determined using relative response factors to a reference component in the CRM(s)

3.14
repeatability (of results of measurements)
closeness of the agreement between the results of successive measurements of the same measurand carried out under the same conditions of measurement

NOTE 1 These conditions are called repeatability conditions.