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Second edition  
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## Natural gas — Determination of composition and associated uncertainty by gas chromatography —

### Part 2: Uncertainty calculations

*Gaz naturel — Détermination de la composition et de l'incertitude associée par chromatographie en phase gazeuse — Partie 2: Calculs d'incertitude*



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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
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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 6974-2 was prepared by Technical Committee ISO/TC 193, *Natural Gas*, Subcommittee SC 1, *Analysis of natural gas*.

This second edition of ISO 6974-2, together with ISO 6974-1:2012, 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<sub>8</sub> using two packed columns*
- *Part 4: Determination of nitrogen, carbon dioxide and C<sub>1</sub> to C<sub>5</sub> and C<sub>6+</sub> hydrocarbons for a laboratory and on-line measuring system using two columns*
- *Part 5: Determination of nitrogen, carbon dioxide and C<sub>1</sub> to C<sub>5</sub> and C<sub>6+</sub> hydrocarbons for a laboratory and on-line process application using three columns*
- *Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and C<sub>1</sub> to C<sub>8</sub> hydrocarbons using three capillary columns*

Future subsequent parts of ISO 6974 are planned.

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## Introduction

ISO 6974 describes methods of analysis of natural gas and methods for calculating component mole fractions and uncertainties. ISO 6974 (all parts) is intended for the measurement of H<sub>2</sub>, He, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub> and hydrocarbons, either as individual components or as a group, for example all hydrocarbons above C<sub>5</sub>, defined as C<sub>6+</sub>. 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.

ISO 6974-1 gives guidelines for calculating the mole composition of natural gas, determined using one of the gas chromatographic methods described in ISO 6974-3 and subsequent parts of ISO 6974. ISO 6974-1 also 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.

This part of ISO 6974 describes the steps required to calculate the uncertainty of the component mole fractions of natural gas determined using gas chromatography.

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. ISO 6974-1:2012, Annex A, provides a comparison of the characteristics of the analytical methods described in ISO 6974-3 and subsequent parts of ISO 6974.

It is intended that this part of ISO 6974 be used in conjunction with ISO 6974-1 and a method of analysis, e.g. ISO 6974-3 or subsequent parts of ISO 6974.

ISO 6974-1:2012, 5.5, describes the conventional normalization approach for calculating processed mole fractions from raw mole fractions. When conventional normalization is used for multiple operation methods without bridging, the uncertainties of the calculated mole fractions will be conservative. If a more accurate assessment of uncertainty is required, an alternative approach to normalization, using the generalized least squares (GLS) method, can be used; this is described in ISO 6974-1:2012, Annex B. Further alternative approaches are available for calculating processed mole fractions, including methane-by-difference (see ISO 6974-1:2012, Annex C) and data harmonization (see Reference [1]).