# SLOVENSKI STANDARD
# SIST EN ISO 18453:2006

**01-januar-2006**

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**Zemeljski plin ï Korelacija med deleġem vode in vodnim rosiġļem (ISO 18453:2004)**

Natural gas - Correlation between water content and water dew point (ISO 18453:2004)

Erdgas - Beziehung zwischen Wassergehalt und Taupunkt (ISO 18453:2004)

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Gaz naturel - Corrélation entre la teneur en eau et le point de rosée eau (ISO 18453:2004)

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**Ta slovenski standard je istoveten z:** **EN ISO 18453:2005**

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**ICS:**

| | | |
|---|---|---|
| 75.060 | Zemeljski plin | Natural gas |

**SIST EN ISO 18453:2006** **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN ISO 18453

November 2005

ICS 75.060

English Version

# Natural gas - Correlation between water content and water dew point (ISO 18453:2004)

Gaz naturel - Corrélation entre la teneur en eau et le point de rosée eau (ISO 18453:2004)

Erdgas - Beziehung zwischen Wassergehalt und Taupunkt (ISO 18453:2004)

This European Standard was approved by CEN on 7 October 2005.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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## Foreword

The text of ISO 18453:2004 has been prepared by Technical Committee ISO/TC 193 "Natural gas" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 18453:2005 by CMC.

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of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

**Endorsement notice**

The text of ISO 18453:2004 has been approved by CEN as EN ISO 18453:2005 without any modifications.

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INTERNATIONAL STANDARD

**ISO 18453**

First edition
2004-07-01

# Natural gas — Correlation between water content and water dew point

*Gaz naturel — Corrélation entre la teneur en eau et le point de rosée de l'eau*

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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 18453 was prepared by Technical Committee ISO/TC 193, *Natural gas*, Subcommittee SC 1, *Analysis of natural gas*.

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# Introduction

ISO/TC 193, *Natural gas*, was established in May 1989, with the task of creating new standards, and updating existing standards relevant to natural gas. This includes gas analysis, direct measurement of properties, quality designation and traceability.

This document provides a reliable mathematical relationship between water content and water dew point in natural gas. The calculation method was developed by GERG; it is applicable in both ways, i.e. either to calculate the water content or to calculate the water dew point. Information relating to the thermodynamic principles is given in Annex A; information relating to the traceability, applications and uncertainties associated with this work is given in Annex B.

Some of the operational problems in the natural gas industry can be traced back to water content in natural gases. Even with low water vapour content in the gas, changing operating pressure and temperature conditions can cause water to condense and thus lead to corrosion problems, hydrates or ice formation. To avoid these problems, expensive dehydration units have been installed by natural gas companies. The design and cost of these installations depend on the exact knowledge of the water content at the dew point and the (contractually) required water content.

The instruments resulting from the improvements of moisture measurement equipment during the last decades focus on the determination of water content rather than on water dew point. Therefore, if the water content is measured, a correlation is needed for the expression of water dew point.

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The GERG[1)] Group identified a need to build a comprehensive and accurate database of measured water content and corresponding water dew point values for a number of representative natural gases in the range of interest before validating the existing correlations between water content and water dew point.

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It was subsequently shown that the uncertainty range of the existing correlations could be improved.

Therefore, as a result, a more accurate, composition-dependent correlation was successfully developed on the basis of the new database.

The aim of this International Standard is to standardize the calculation procedure developed by GERG concerning the relationship between water content and water dew point (and vice versa) in the field of natural gas typically for custody transfer.

1) GERG is an abbreviation of *Groupe Européen de Recherche Gazière*.

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# Natural gas — Correlation between water content and water dew point

## 1 Scope

This International Standard specifies a method to provide users with a reliable mathematical relationship between water content and water dew point in natural gas when one of the two is known. The calculation method, developed by GERG; is applicable to both the calculation of the water content and the water dew point.

This International Standard gives the uncertainty for the correlation but makes no attempt to quantify the measurement uncertainties.

## 2 Terms and definitions

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

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**2.1**
**correlation**
relationship between two or several random variables within a distribution of two or more random variables

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[ISO 3534-1]

NOTE The indication of the range of temperature, pressure and composition for which the correlation was validated is given in Clause 3.

**2.2**
**working range**
range of parameters for which the correlation has been validated

**2.3**
**extended working range**
range of parameters for which the correlation has been developed, but outside the range for which the correlation has been validated

**2.4**
**uncertainty of the correlation**
absolute deviation of calculated value from the experimental database

NOTE This does not include any measurement uncertainty in the field.

**2.5**
**acentric factor**
parameter to characterize the acentricity or non-sphericity of a molecule

NOTE This definition was taken from reference [1] in the Bibliography.

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**2.6**
**normal reference conditions**
reference conditions of pressure, temperature and humidity (state of saturation) equal to 101,325 kPa and 273,15 K for the real, dry gas

[ISO 14532:2001]

**2.6**
**traceability**
property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties

[ISO 14532:2001]

## 3 Development of the correlation

In the past, GERG has identified the necessity for an accurate conversion between the water content and the water dew point for natural gases with sales gas characteristics. To achieve this goal, the GERG defined a research program. In the first phase of the project, reliable data on water content together with data on water dew point were collected for several natural gases for the dew-point temperature range of interest: −15 °C to +5 °C and for the (absolute) pressure range of interest: 0,5 MPa to 10 MPa. In addition to the measurements on the seven representative natural gases, measurements were also carried out on the key binary system methane/water. The procedure used for gathering the measured data was the saturation method.

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Taking the determined values for the repeatability and reproducibility of the Karl Fischer instrument as consistency criteria for all measured water contents, only a few inconsistent values were detected, which were mainly situated in the range of low water content (high pressure, low temperature range). Values which failed the consistency check were either rejected or, in a few cases, weighted much lower in the data pool. In most cases, these values were replaced by repeated measurements carried out at the same pressure and temperature conditions.

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Detailed information on the experimental procedure and the composition of the natural gases used during the experiments can be found in the GERG Monograph[2].

The developed relationship is validated for dew-point temperatures ranging from −15 °C to +5 °C and (absolute) pressures ranging from 0,5 MPa to 10 MPa.

The representative natural gases used for validating the correlation were sampled technically free of glycol, methanol, liquid hydrocarbon and with a maximum content of $H_2S$ of 5 mg/m$^3$ (in normal conditions). No attempt was made to investigate the impact of the uncertainties resulting from the inclusion of such contaminants.

The thermodynamic background of the developed relationship makes it possible to extend the range of applicability outside the working range to temperatures of −50 °C to +40 °C and (absolute) pressures from 0,1 MPa to 30 MPa with unknown uncertainties.

It is intended that the correlation be interpreted as reciprocal between the water content and the water dew point. Note that this relationship was derived under laboratory conditions using several compositions of natural gas sampled in the field. Under practical field operational conditions, significant additional uncertainties are generated.

Besides the uncertainty in the conversion of the measurement itself, the uncertainties of the measured values should also be considered.

Unless explicitly otherwise stated, the volume is stated under normal reference conditions (2.6).


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