SLOVENSKI STANDARD
SIST EN ISO 15971:2014

01-maj-2014

Zemeljski plin - Merjenje njegovih lastnosti - Kalorična vrednost in Wobbejev indeks (ISO 15971:2008)

Natural gas - Measurement of properties - Calorific value and Wobbe index (ISO 15971:2008)

Erdgas - Messung der Eigenschaften - Wärmewerte und Wobbe-Index (ISO 15971:2008)

Gaz naturel - Mesurage des propriétés - Pouvoir calorifique et indice de Wobbe (ISO 15971:2008)

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ICS:

75.060	Zemeljski plin	Natural gas
75.180.30	Oprema za merjenje prostornine in merjenje	Volumetric equipment and measurements

SIST EN ISO 15971:2014 **en**

EUROPEAN STANDARD

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EN ISO 15971

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English Version

Natural gas - Measurement of properties - Calorific value and Wobbe index (ISO 15971:2008)

Gaz naturel - Mesurage des propriétés - Pouvoir calorifique et indice de Wobbe (ISO 15971:2008)

Erdgas - Messung der Eigenschaften - Wärmewerte und Wobbe-Index (ISO 15971:2008)

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

The text of ISO 15971:2008 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 15971:2014.

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Endorsement notice

The text of ISO 15971:2008 has been approved by CEN as EN ISO 15971:2014 without any modification.

INTERNATIONAL STANDARD

ISO 15971

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Natural gas — Measurement of properties — Calorific value and Wobbe index

Gaz naturel — Mesurage des propriétés — Pouvoir calorifique et indice de Wobbe

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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.

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ISO 15971 was prepared by Technical Committee ISO/TC 193, *Natural gas*.

Introduction

The amount of energy delivered by a flowing natural gas is often determined as the product of the volume delivered and the calorific value per unit volume of the gas. It is, therefore, important to have available standardized methods of determining the calorific value. In many cases, it is possible to calculate the calorific value of natural gas, with sufficient accuracy, given the composition (see ISO 6976). However, it is also possible, and sometimes a preferred alternative, to measure calorific value using any one of several techniques that do not require a compositional analysis. The methods currently in use, and the many factors that it is necessary to address in the selection, evaluation, performance assessment, installation and operation of a suitable instrument, are detailed herein. The measurement of the Wobbe index, a property closely related to calorific value, is discussed briefly in an informative annex, but is not considered in detail in the normative parts of this International Standard.

Natural gas — Measurement of properties — Calorific value and Wobbe index

1 Scope

This International Standard concerns the measurement of calorific value of natural gas and natural gas substitutes by non-separative methods, i.e. methods that do not involve the determination of the gas composition nor calculation from it. It describes the principles of operation of a variety of instruments in use for this purpose, and provides guidelines for the selection, evaluation, performance assessment, installation and operation of these.

Calorific values can be expressed on a mass basis, a molar basis or, more commonly, a volume basis. The working range for superior calorific value of natural gas, on the volume basis, is usually between 30 MJ/m^3 and 45 MJ/m^3 at standard reference conditions (see ISO 13443). The corresponding range for the Wobbe index is usually between 40 MJ/m^3 and 60 MJ/m^3.

This International Standard neither endorses nor disputes the claims of any commercial manufacturer for the performance of an instrument. Its central thesis is that fitness-for-purpose in any particular application (defined in terms of a set of specific operational requirements) can be assessed only by means of a well-designed programme of experimental tests. Guidelines are provided for the proper content of these tests.

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 6976:1995, *Natural gas — Calculation of calorific values, density, relative density and Wobbe index from composition*

ISO 14532: 2001, *Natural gas — Vocabulary*

3 Terms and definitions

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

3.1 Calorific value and Wobbe index

3.1.1
superior calorific value
amount of heat that would be released by the complete combustion in air of a specified quantity of gas (on a molar, mass or volume basis), in such a way that the pressure, p, at which the reaction takes place remains constant and all the products of combustion are returned to the same specified temperature, T, as that of the reactants, all of these products being in the gaseous state, except for water formed by combustion, which is condensed to the liquid state at T

See ISO 6976.

3.1.2
inferior calorific value
amount of heat that would be released by the complete combustion in air of a specified quantity of gas (on a molar, mass or volume basis), in such a way that the pressure, p, at which the reaction takes place remains constant, and all the products of combustion are returned to the same specified temperature, T, as that of the reactants, all of these products being in the gaseous state

See ISO 6976.

3.1.3
Wobbe index
superior calorific value on a volumetric basis at specified reference conditions, divided by the square root of the relative density at the same specified metering reference conditions

See ISO 6976.

3.1.4
standard reference conditions
temperature, $T = 288{,}15$ K, and (absolute) pressure, $p = 101{,}325$ kPa, for the real dry gas

See ISO 13443.

NOTE Standard reference (or base) conditions of temperature, pressure and humidity (state of saturation) are defined for use only in natural gas and similar applications. For the calorific value on a volumetric basis, these conditions apply to both the metering and combustion of the gas. In the expression of physical quantities throughout this International Standard, these standard reference conditions as defined in ISO 13443 are taken to apply.

3.2 Water content of gas

3.2.1
saturated gas
natural gas which, at the specified conditions of temperature and pressure, is at its water dew-point

3.2.2
dry gas
natural gas which does not contain water vapour at a mole fraction greater than 0,000 05

See ISO 6976.

3.2.3
partially saturated or wet gas
natural gas which contains an amount of water vapour between that of the saturated gas and that of the dry gas, at the specified conditions of temperature and pressure

3.3 Performance classification

NOTE The following classification scheme is adopted in order to categorize the uncertainties associated with measurement of calorific value. The attached notes are explanatory, not parts of the definitions. The values given refer to an expanded uncertainty with a coverage factor of 2.

3.3.1
class 0
performance with which uncertainty limits of no greater than ± 0,1 % in calorific value may be associated

NOTE Performance of this quality can currently be achieved only by instruments in which all operations are carried out in strict accordance with the best metrological practices and in which all relevant physical measurements are directly traceable to primary metrological standards. Typically, such an instrument is custom-built and installed in a purpose-built, environmentally controlled specialist laboratory; a specially trained and identified operator is likely required. Instruments of this type are sometimes known as “reference calorimeters” and all, to date, make measurements discontinuously on discrete samples of gas.

3.3.2
class 1
performance with which uncertainty limits of no greater than ± 0,1 MJ/m^3 on a volume-basis calorific value (approximately 0,25 %) may be associated

NOTE This is the lowest level of measurement uncertainty currently available for any form of commercial instrument used in routine field (i.e. non-laboratory) operation. Even for the few types of instrument that are intrinsically capable of this performance, it is unlikely to be achieved unless installation is in accordance with both the manufacturer's instructions and the principles described in this International Standard, and operation is in accordance with the calibration, verification, maintenance and quality control procedures described in this International Standard.

3.3.3
class 2
performance with which uncertainty limits of no greater than ± 0,2 MJ/m^3 on a volume-basis calorific value (approximately 0,5 %) may be associated

3.3.4
class 3
performance with which uncertainty limits of no greater than ± 0,5 MJ/m^3 on a volume-basis calorific value (approximately 1,0 %) may be associated

3.4 Terms from metrology

NOTE The following definitions, including the Notes attached to them (except the Note to 3.4.6), are all taken from ISO 14111, where additional explanatory details are given.

3.4.1
accuracy
closeness of agreement between a measurement result and the true value of the measurand

NOTE The term “accuracy”, when applied to a set of measurement results, describes a combination of random components and a common systematic error or bias component.

3.4.2
trueness
closeness of agreement between the average value obtained from a large series of measurement results and the true value of the measurand

NOTE The measure of trueness is usually expressed in terms of bias.

3.4.3
bias
difference between the expectation of the measurement results and an accepted reference value

3.4.4
precision
closeness of agreement between independent measurement results obtained under prescribed conditions

NOTE Precision depends only on the distribution of random errors and does not relate to the true value.

3.4.5
repeatability
precision under conditions where independent measurement results are obtained with the same method on identical measuring objects in the same laboratory by the same operator within short intervals of time

NOTE Repeatability is expressed quantitatively based on the standard deviation of the results.