SLOVENSKI STANDARD
SIST EN ISO 15970:2014

01-maj-2014

Zemeljski plin - Merjenje njegovih lastnosti - Volumetrične lastnosti: gostota, tlak, temperatura in kompresijski faktor (ISO 15970:2008)

Natural gas - Measurement of properties - Volumetric properties: density, pressure, temperature and compression factor (ISO 15970:2008)

Erdgas - Messung der Eigenschaften - Volumetrische Eigenschaften: Dichte, Druck, Temperatur und Kompressibilitätsfaktor (ISO 15970:2008)

Gaz naturel - Mesurage des caractéristiques - Caractéristiques volumétriques: masse volumique, pression, température et facteur de compression (ISO 15970:2008)

Ta slovenski standard je istoveten z: **EN ISO 15970:2014**

ICS:

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

SIST EN ISO 15970:2014 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 15970

March 2014

ICS 75.060; 75.180.30

English Version

Natural gas - Measurement of properties - Volumetric properties: density, pressure, temperature and compression factor (ISO 15970:2008)

Gaz naturel - Mesurage des caractéristiques - Caractéristiques volumétriques: masse volumique, pression, température et facteur de compression (ISO 15970:2008)

Erdgas - Messung der Eigenschaften - Volumetrische Eigenschaften: Dichte, Druck, Temperatur und Kompressibilitätsfaktor (ISO 15970:2008)

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

The text of ISO 15970:2008 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 15970:2014.

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Endorsement notice

The text of ISO 15970:2008 has been approved by CEN as EN ISO 15970:2014 without any modification.

INTERNATIONAL STANDARD

ISO 15970

First edition
2008-06-15

Natural gas — Measurement of properties — Volumetric properties: density, pressure, temperature and compression factor

Gaz naturel — Mesurage des caractéristiques — Caractéristiques volumétriques: masse volumique, pression, température et facteur de compression

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Fax + 41 22 749 09 47
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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.

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ISO 15970 was prepared by Technical Committee ISO/TC 193, *Natural gas*.

Introduction

The transmission of natural gas can involve passage across national boundaries; at border stations and elsewhere, knowledge of the physicochemical properties of the fluid is of great operational and economic importance. The energy flow and properties of the gas are required at several stages of the overall production and custody transfer process: production, blending, transmission, metering, distribution and supply.

International standardization of the performance specifications for various types of measuring instruments can facilitate comparison of, and increase confidence in, measurement results for contracting partners. In many cases, it is possible to calculate the properties of natural gas with sufficient accuracy, given the composition. However, it is often also possible to measure the property using techniques that do not require a compositional analysis for their implementation.

This International Standard considers only those methods for determining physical properties of natural gas that do not rely upon a detailed component analysis of the gas. Such measurements consider the “whole” sample of the gas.

This International Standard defines performance characteristics necessary to specify instrumentation for measurement of some natural gas properties. It provides guidelines for the installation, traceable calibration, performance, operation, maintenance and acceptance testing of these measurement instruments.

The principle of measurement of various properties included in this International Standard is typical for a number of applications.

It is required that the calibration of the instruments dealt with in this International Standard be traceable to national standards or International Standards.

It is required that the measuring instruments, including their installation and the devices used for field calibration, verification and maintenance comply with local legal regulations on application in hazardous areas.

Annex A presents general guidelines for instrument selection, instrument test and operational procedures of the instruments considered in this International Standard.

Annex B lists the data of particular importance for the instrument documentation.

Natural gas — Measurement of properties — Volumetric properties: density, pressure, temperature and compression factor

1 Scope

This international Standard gives requirements and procedures for the measurement of the properties of natural gas that are used mainly for volume calculation and volume conversion: density at reference and at operating conditions, pressure, temperature and compression factor.

Only those methods and instruments are considered that are suitable for field operation under the conditions of natural gas transmission and distribution, installed either in-line or on-line, and that do not involve the determination of the gas composition.

This International Standard gives examples for currently used instruments that are available commercially and of interest to the natural gas industry.

NOTE Attention is drawn to requirements for approval of national authorization agencies and to national legal regulations for the use of these devices for commercial or official trade purposes.

The density at reference conditions (sometimes referred to as normal, standard or even base density) is required for conversion of volume data and can be used for other physical properties.

Density at operating conditions is measured for mass-flow measurement and volume conversion using the observed line density and can be used for other physical properties. This International Standard covers density transducers based on vibrating elements, normally suitable for measuring ranges of 5 kg/m^3 to 250 kg/m^3.

Pressure measurement deals with differential, gauge and absolute pressure transmitters. It considers both analogue and smart transmitters (i.e. microprocessor based instruments) and, if not specified otherwise, the corresponding paragraphs refer to differential, absolute and gauge pressure transmitters without distinction.

Temperature measurements in natural gas are performed within the range of conditions under which transmission and distribution are normally carried out (253 K $< T <$ 338 K). In this field of application, resistance thermometer detectors (RTD) are generally used.

The compression factor (also known as the compressibility factor or the real gas factor and given the symbol Z) appears, in particular, in equations governing volumetric metering. Moreover, the conversion of volume at metering conditions to volume at defined reference conditions can properly proceed with an accurate knowledge of Z at both relevant pressure and relevant temperature conditions.

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 2186, *Fluid flow in closed conduits — Connections for pressure signal transmissions between primary and secondary elements*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principals and requirements*

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

ISO 10715, *Natural gas — Sampling guidelines*

ISO 12213-1, *Natural gas — Calculation of compression factor — Part 1: Introduction and guidelines*

IEC 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements*

IEC 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*

IEC/TR 60079-15, *Electrical apparatus for explosive gas atmospheres — Part 15: Construction, test and marking of type of protection 'n' electrical apparatus*

IEC 60381-1, *Analogue signals for process control systems — Part 1: Direct current signals*

IEC 60381-2, *Analogue signals for process control systems — Part 2: Direct voltage signals*

IEC 60751, *Industrial platinum resistance thermometer sensors*

IEC 60770-1, *Transmitters for use in industrial-process control systems — Part 1: Methods for performance evaluation*

3 Terms and definitions

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

3.1 Terms and definitions for density at reference conditions

3.1.1
density at reference conditions
mass of a gas divided by its volume at specified reference conditions of pressure and temperature

3.1.2
relative density at reference conditions
ratio of the mass of a gas, contained within an arbitrary volume, to the mass of dry air of standard composition in accordance with ISO 6976, which would be contained in the same volume at the same references conditions

3.2 Terms and definitions for density at operating conditions

3.2.1
density
mass of a gas divided by its volume at operating conditions of pressure and temperature (operating and reference conditions)

3.2.2
vibrating element density transducer
device that contains a vibrating element that is maintained at its natural frequency, made such that the element contains or is surrounded by gas, the gas and the element forming a system where the density of the gas is the main property of the gas determining the natural frequency of the element

NOTE The natural frequency to the first approximation is determined by the gas density.

3.2.3
main density transducer constants
constants that, to a first approximation, define the relationship between the natural frequency of the vibrating element and the density of the gas

3.2.4
raw density
density as determined by a vibrating-element density transducer from its vibrating frequency by use of the main density transducer constants before any corrections for temperature, pressure and composition are applied

3.2.5
correction density transducer constants
constants applicable to a density transducer to correct for the deviation between the calibration condition under which the main constants were determined and the operating conditions

3.2.6
temperature-corrected density
raw density corrected for difference in temperature to which the vibrating element is exposed in operation and the temperature at which the density transducer was calibrated

3.2.7
compositional-corrected density
temperature-corrected density, corrected for difference in gas properties between gas to which the vibrating element is exposed in operation and the gas properties of the gas used for calibration

NOTE Normally, the gas property relevant for this purpose is velocity of sound, hence this term is often referred to as velocity-of-sound-corrected density.

3.2.8
line density
compositional-corrected density, corrected for difference in operating conditions, e.g. pressure and temperature, to which the vibrating element is exposed and the operating conditions in the line where the density is measured

3.3 Terms and definitions for pressure

3.3.1
pressure transmitter
device that responds to a measured pressure to produce a standard output signal for transmission, which has a prescribed continuous relationship to the value of the measured pressure

3.3.2
lower range value
LRV
lowest value of the pressure that a transmitter is adjusted to measure

3.3.3
upper range value
URV
highest value of the pressure that a transmitter is adjusted to measure