



NSAI
Standards

Irish Standard
I.S. EN ISO 15970:2014

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

I.S. EN ISO 15970:2014

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN ISO 15970:2014

Published:

2014-03-19

This document was published under the authority of the NSAI and comes into effect on:

2014-03-29

ICS number:

75.060

75.180.30

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

EN ISO 15970

NORME EUROPÉENNE

EUROPÄISCHE NORM

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)

This European Standard was approved by CEN on 16 February 2014.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

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

EN ISO 15970:2014 (E)

Contents

Page

Foreword.....3

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.

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 September 2014, and conflicting national standards shall be withdrawn at the latest by September 2014.

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

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

Endorsement notice

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

This page is intentionally left blank

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*



Reference number
ISO 15970:2008(E)

© ISO 2008

ISO 15970:2008(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2008

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	2
3.1 Terms and definitions for density at reference conditions	2
3.2 Terms and definitions for density at operating conditions	2
3.3 Terms and definitions for pressure	3
3.4 Terms and definitions for temperature.....	4
3.5 Terms and definitions for compression factor	4
4 Symbols and units	4
4.1 Symbols and subscripts for density at reference conditions	4
4.2 Symbols and subscripts for density at operating conditions.....	5
4.3 Symbols and subscripts for compression factor	5
5 Density at reference conditions	6
5.1 Principle of measurement.....	6
5.2 Performance assessment and acceptance tests.....	10
5.3 Sampling and installation guidelines	11
5.4 Calibration	11
5.5 Verification	11
5.6 Maintenance	12
5.7 Quality control.....	12
6 Density at operating conditions	12
6.1 Principle of measurement.....	12
6.2 Performance assessment and acceptance tests.....	13
6.3 Sampling and installation guidelines	16
6.4 Calibration	20
6.5 Verification	20
6.6 Maintenance	21
6.7 Quality control.....	21
7 Pressure.....	21
7.1 Principle of measurement.....	22
7.2 Performance assessment and acceptance tests.....	24
7.3 Sampling and installation guidelines	24
7.4 Calibration	27
7.5 Verification	28
7.6 Maintenance	28
7.7 Quality control.....	29
8 Temperature	29
8.1 Principle of measurement.....	29
8.2 Performance assessment and acceptance tests.....	30
8.3 Installation guidelines	31
8.4 Calibration	33
8.5 Verification	34
8.6 Maintenance	34
8.7 Quality control.....	34
9 Compression factor	34

ISO 15970:2008(E)

9.1	Principle of measurement	34
9.2	Working principle	35
9.3	Performance assessment and acceptance tests	38
9.4	Sampling and installation guidelines	38
9.5	Calibration	39
9.6	Verification	40
9.7	Maintenance	40
9.8	Quality control	40
Annex A	(informative) Guidance for instrument selection, instrument test and operational procedures	41
Annex B	(informative) Instrument documentation	45
Bibliography	47

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

ISO 15970:2008(E)

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/m³ to 250 kg/m³.

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*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-