



SLOVENSKI STANDARD
oSIST prEN 12405-1:2018

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Plinomeri - Korektorji - 1. del: Volumska korekcija

Gas meters - Conversion devices - Part 1: Volume conversion

Gaszähler - Umwerter - Teil 1: Volumenumwertung

Compteurs de gaz - Dispositifs de conversion - Partie 1: Conversion de volume

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Gas meters - Conversion devices - Part 1: Volume conversion

Compteurs de gaz - Dispositifs de conversion - Partie 1:
Conversion de volume

Gaszähler - Umwerter - Teil 1: Volumenumwertung

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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prEN 12405-1:2017 (E)**European foreword**

This document (prEN 12405-1:2017) has been prepared by Technical Committee CEN/TC 237 “Gas meters”, the secretariat of which is held by BSI.

This document is currently submitted to the enquiry.

This document will supersede EN 12405-1:2005+A2:2010.

This document has been prepared under the mandate M/541 given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2014/32/EU Measuring Instruments Directive (MID).

For relationship with EU Directive 2014/32/EU, see informative Annex ZA, which is an integral part of this document.

EN 12405 consists of the following parts:

- Part 1: Volume conversion (this European Standard),
- Part 2: Energy conversion,
- Part 3: Flow computer.

In the preparation of this European Standard, the content of OIML Publication, “International Document 11”, and “International Recommendations 140” and the content of member bodies' national standards on gas-volume electronic conversion devices have been taken into account.

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1 Scope

This European Standard specifies the requirements and tests for the construction, performance, safety and conformity of gas-volume electronic conversion devices associated to gas meters, used to measure volumes of fuel gases of the 1st and 2nd families according to EN 437.

This European Standard is intended for type testing, the detailed relevant provisions of which are given in Annex A.

Only three kinds of conversion are treated in this European Standard:

- conversion as a function of temperature only (called T conversion);
- conversion as a function of the pressure and of the temperature with constant compression factor (called PT conversion);
- conversion as a function of the pressure, the temperature and taking into account the compression factor (called PTZ conversion).

This document is not relevant to temperature conversion integrated into gas meters which only indicate the converted volume.

EN 12405-2 applies for energy conversion.

Gas-volume conversion devices consist of a calculator and a temperature transducer or a calculator, a temperature transducer and a pressure transducer locally installed.

For application of this European Standard, a conversion device may be, as a choice of the manufacturer, considered as a complete instrument (Type 1) or made of separate elements (Type 2), according to the definitions given in 3.1.18.1 and 3.1.18.2.

In this last case, the provisions concerning pressure transducers, temperature sensors and temperature transducers are given in Annexes B, C and D respectively.

Any conversion device can provide an error curve correction for a gas meter.

NOTE When rendering an account to an end user the readings from the conversion device can be used in conjunction with the readings from a gas meter conforming to EN 1359, EN 12480, or EN 12261, as appropriate, or to any other appropriate and relevant international or national standard for gas meters, without prejudice of national regulations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 437, *Test gases — Test pressures — Appliance categories*

EN 1776, *Gas infrastructure - Gas measuring systems - Functional requirements*

EN 55011, *Industrial, scientific and medical (ISM) radio-frequency equipment — Radio disturbance characteristics — Limits and methods of measurement (CISPR 11:2015)*

EN 60068-2-1, *Environmental testing - Part 2-1: Tests - Test A: Cold*

EN 60068-2-2, *Environmental testing - Part 2-2: Tests - Test B: Dry heat*

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- EN 60068-2-30, *Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)*
- EN 60068-2-31, *Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens*
- EN 60068-2-64, *Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance*
- EN 60068-2-78, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*
- EN 60068-3-1, *Environmental testing - Part 3-1: Supporting documentation and guidance - Cold and dry heat tests*
- EN 60079-0, *Explosive atmospheres - Part 0: Equipment - General requirements*
- EN 60079-1, *Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"*
- EN 60079-2, *Electrical apparatus for potentially explosive atmospheres — Part 2: Pressurized apparatus p (IEC 60079-2)*
- EN 60079-5, *Explosive atmospheres — Part 5: Equipment protection by powder filling q (IEC 60079-5)*
- EN 60079-6, *Explosive atmospheres — Part 6: Equipment protection by oil immersion o (IEC 60079-6)*
- EN 60079-7, *Electrical apparatus for potentially explosive atmospheres — Increased safety e (IEC 60079-7)*
- EN 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety i (IEC 60079-11)*
- EN 60079-25, *Explosive atmospheres - Part 25: Intrinsically safe electrical systems*
- EN 60529, *Degrees of protection provided by enclosures (IP Code)*
- EN 60730-1:2013, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:2013)*
- EN 60751, *Industrial platinum resistance thermometers and platinum temperature sensors*
- EN 60950-1, *Information technology equipment - Safety - Part 1: General requirements*
- EN 61000-4-2, *Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test*
- EN 61000-4-3, *Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test*
- EN 61000-4-4, *Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test*
- EN 61000-4-5, *Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test*
- EN 61000-4-6, *Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields*
- EN 61000-4-8, *Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test*

EN 61000-4-11, *Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests*

EN 61000-4-29, *Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

EN ISO 12213-2:2009, *Natural gas - Calculation of compression factor - Part 2: Calculation using molar-composition analysis (ISO 12213-2:2006)*

EN ISO 12213-3:2009, *Natural gas - Calculation of compression factor - Part 3: Calculation using physical properties (ISO 12213-3:2006)*

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3 Terms, definitions, symbols and classification

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

absolute static pressure

value of the static pressure of the gas relative to vacuum

3.1.2

base conditions

specified conditions to which the measured quantity of gas is converted

EXAMPLES Temperature of 273,15 K and absolute pressure of 1,013 25 bar¹ or temperature of 288,15 K and absolute pressure of 1,013 25 bar.

3.1.3

calculator

electronic device that receives the output signals from the associated gas meter and transducers and processes them

3.1.4

conversion factor

factor equal to the volume at base conditions divided by the corrected volume, or if there is no gas meter correction, equal to the volume at base conditions divided by the volume at measurement conditions

3.1.5

conventional true value (of a quantity)

value attributed to a particular quantity and accepted, sometimes by convention, as having an uncertainty appropriate for a given purpose

3.1.6

corrected volume

volume at measurement conditions corrected for the error curve of the gas meter

3.1.7

correction

value added algebraically to the uncorrected result of a measurement to correct the systematic error

3.1.8

correction factor

numerical factor by which the measured volume is multiplied to correct it to compensate the error curve of the gas meter

3.1.9**display**

element or assembly of elements of the indicating device on which the results of measurement and memorized values are displayed

3.1.10**disturbance**

influence quantity having a value within the limits specified but outside the specified rated operating conditions of the measuring instrument

Note 1 to entry: An influence quantity is a disturbance if the rated operating conditions for that influence quantity are not specified.

3.1.11**durability**

ability of an instrument to maintain its performance characteristics over a specified period of use

3.1.12**environmental class**

class referring to the ambient temperature, humidity and power supply

3.1.13**error of conversion**

difference between the conversion factor C displayed by a conversion device and the conventional true value of the conversion factor C_{CV} , expressed as a percentage of the conventional true value of the conversion factor

3.1.14**error of indication**

indication of a measuring instrument minus the (conventional) true value of the corresponding input quantity

3.1.15**error of the calculator unit**

error of the indicated volume at base conditions V_b , when the gas volume, pressure and temperature are simulated by signals, in accordance to the manufacturer specification of interfaces

Note 1 to entry: The calculator error includes all conversion errors with the exception of the pressure and temperature transducer errors (i.e. signal conditioning, Z factor calculation (if applicable), other mathematical calculations etc.).

3.1.16**error of the pressure transducer**

difference between the measured output signals from the pressure transducer and the nominal signal at the applied physical value

3.1.17**error of the temperature transducer**

difference between the measured output signals from the temperature transducer and the nominal signal at the applied physical value

prEN 12405-1:2017 (E)**3.1.18****gas-volume conversion device**

device that computes, integrates and indicates the volume increments measured by a gas meter if it were operating at base conditions, using as inputs the volume at measurement conditions as measured by the gas meter, and other parameters such as gas temperature and gas pressure

Note 1 to entry: The conversion device can also compensate for the error curve of a gas meter and associated measuring transducers.

Note 2 to entry: The deviation from the ideal gas law can be compensated by the compression factor.

3.1.18.1**gas volume conversion device type 1 (complete system)**

conversion device with specific types of transducers for pressure and temperature or for temperature only

3.1.18.2**gas volume conversion device type 2 (separate component)**

conversion device with external separate transducers for pressure and temperature or for temperature only and for separate calculator, which may be approved separately

Note 1 to entry: The matching of the various elements constituting a conversion device type 2 is subjected to verification.

3.1.19**indicating device**

part of a measuring instrument that displays an indication (alphanumeric string)

3.1.20**influence factor**

influence quantity having a value within the specified rated operating conditions of the measuring instrument

3.1.21**influence quantity**

quantity that is not a measurand but that affects the result of the measurement (e.g. ambient temperature)

3.1.22**intrinsic error**

error of a measuring instrument, determined under reference conditions

3.1.23**maximum operating pressure****MOP**

maximum pressure at which a system can be operated continuously under normal conditions

Note 1 to entry: Normal conditions are: no fault in any device or stream.

3.1.24**measurement conditions**

conditions of the gas, the volume of which is measured at the point of measurement (e.g. the temperature and the pressure of the gas)

3.1.25**measuring transducer**

device that provides an output quantity having a determined relationship to the input quantity