

Gas meters - Conversion devices - Part 2: Energy conversion

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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ICS 91.140.40

English Version

Gas meters - Conversion devices - Part 2: Energy conversion

Compteurs à gaz - Dispositifs de conversion - Partie 2 :
Conversion en énergie

Gaszähler - Umwerter - Teil 2: Energieumwertung

This European Standard was approved by CEN on 9 June 2012.

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Contents

Page

Foreword.....	4
Introduction	5
1 Scope	8
2 Normative references	8
3 Terms, definitions and symbols.....	10
3.1 Terms and definitions	10
3.2 Symbols and subscripts.....	14
3.3 Classification.....	15
4 Principles of energy determination.....	16
5 Rated operating conditions	18
5.1 General.....	18
5.2 Specified field of measurement.....	18
5.3 Environmental conditions.....	18
5.4 Power supply.....	19
6 Construction requirements.....	19
6.1 General.....	19
6.2 General (including software)	19
6.3 Casings (and sealing).....	21
6.4 Indications	21
6.5 Inputs and outputs for energy determination.....	23
6.6 Battery powered ECD	24
6.7 Security devices and alarms	24
6.8 Specific provisions applicable to gas chromatographs.....	25
7 Installation requirements	26
7.1 General.....	26
7.2 CVDD	26
8 Metrological requirements.....	27
8.1 Reference conditions	27
8.2 Rated operating conditions	27
8.3 MPEs	27
8.4 Conditions for matching associated measurement instruments (modular approach)	29
8.5 Influence factor tests.....	29
8.6 Disturbance tests.....	29
8.7 Verification of data transmission interfaces.....	30
8.8 CVDD metrological requirements	30
9 Tests of conformity.....	30
9.1 General.....	30
9.2 Verification of construction requirements	31
9.3 Verification of performance requirements	32
10 Marking	33
10.1 General.....	33
10.2 Marking of energy calculator (or ECD)	33
10.3 Marking of CVDD.....	34
11 Installation and operating instructions	35
Annex A (normative) Type test of the energy calculator (EC).....	36

A.1	General conditions	36
A.2	EC Performance tests	37
Annex B	(normative) Type test of the calorific value determination device (CVDD)	40
B.1	Scope	40
B.2	Performances tests	40
Annex C	(normative) Type approval tests of volume conversion device (VCD)	48
C.1	Scope	48
C.2	General	48
C.3	Verification of data transmission interface	48
Annex D	(normative) Compatibility test for the set of VCD + CVDD + EC	49
D.1	Objective	49
D.2	Procedure	49
D.3	Acceptance criteria	49
Annex E	(normative) Type approval test of the VCD/EC	50
E.1	General	50
E.2	Test procedures	50
E.3	Performance tests	51
Annex F	(normative) Type approval test of the EC/CVDD	53
F.1	General	53
F.2	Performance tests	53
Annex G	(normative) Type approval test of the VCD/EC/CVDD	58
G.1	General	58
G.2	Performance tests	58
Annex H	(normative) Environmental influences (test procedures)	63
H.1	General	63
H.2	Effect of ambient temperature	63
H.3	Effect of damp heat, steady state	63
H.4	Cyclic damp heat	64
H.5	Electrical power variation	65
H.6	Short time AC power reductions	66
H.7	Electrical bursts	67
H.8	Electromagnetic susceptibility	67
H.9	Electrostatic discharges	68
H.10	Short time DC power variations	69
H.11	Surges on supply lines and/or signal lines	69
H.12	Power frequency magnetic field	70
H.13	Random vibrations	70
H.14	Shocks	71
H.15	Durability	72
Annex I	(normative) Testing of the data transmission interface of ECD	73
I.1	General	73
I.2	Data transmission interface tests procedure	73
	Bibliography	74

Foreword

This document (EN 12405-2:2012) has been prepared by Technical Committee CEN/TC 237 “Gas meters”, the secretariat of which is held by BSI.

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 January 2013, and conflicting national standards shall be withdrawn at the latest by January 2013.

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.

EN 12405 consists of the following parts:

- Part 1: Volume conversion (and its amendments EN12405-1/A1 and EN 12405-1+A2 to allow the harmonisation of the standard with the Measuring Instruments Directive 2004/22/EC);
- Part 2: Energy conversion (this European Standard);
- Part 3: Flow computers used as gas meter conversion (in preparation).

In the preparation of this European Standard, the content of OIML Publication, “Recommendation 140 — measuring systems for gaseous fuel”, has been taken into account.

According to the CEN/CENELEC Internal Regulations, the national standards organisations 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.

Introduction

This introduction presents important concepts used in this standard.

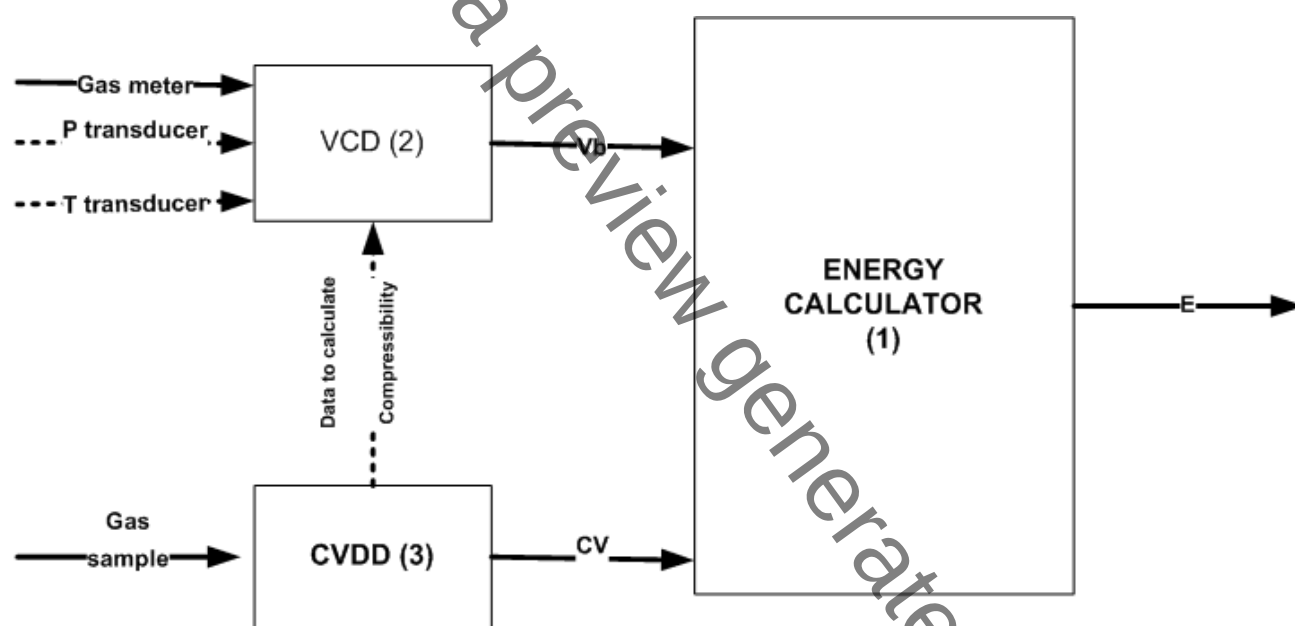
Energy conversion systems

As an energy conversion device (ECD) comprises a number of different components and functions, for the purpose of this Standard, two different systems are considered:

System 1, where

- the calorific value determination device (CVDD) is locally installed and is considered as being fully part of the ECD, and
- the energy calculator (EC) will have the ability to utilise a signal generated by this locally installed CVDD for determining energy.

Figure 1 shows the various components of ECD system 1.



(1) Standardised in EN12405-2

(2) Standardised in EN12405-1 or EN 12405-3 for class 0.5

(3) Standardised in EN 12405-2

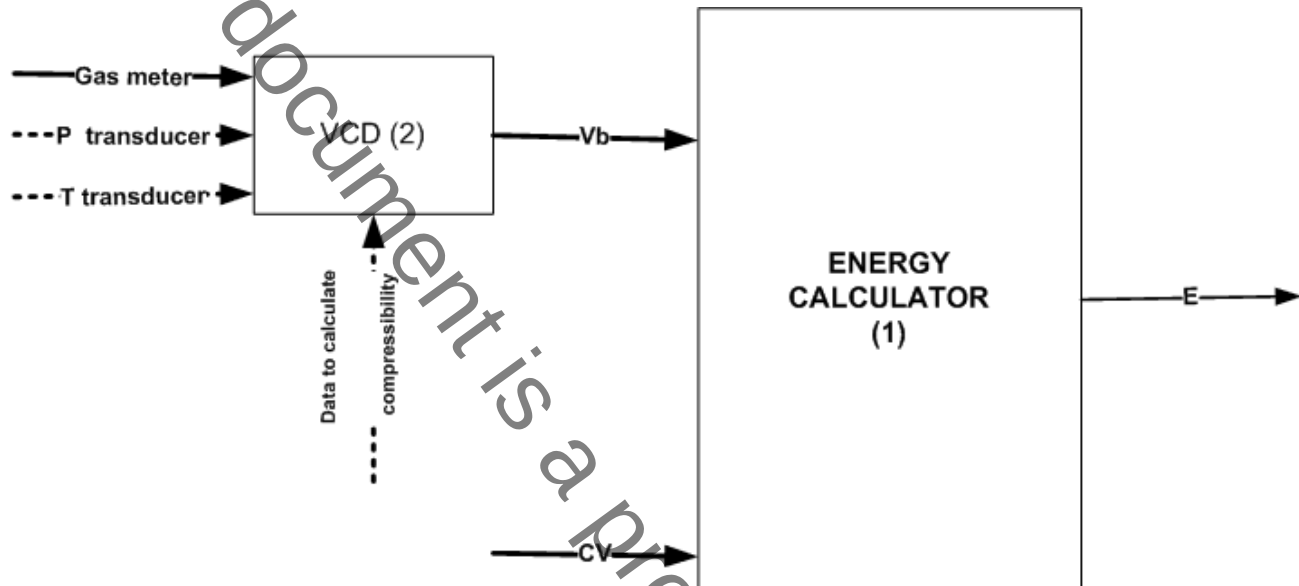
Dotted line = optional

Figure 1 — Description of ECD system 1

System 2, where

- the CVDD may not be locally installed and is considered as an external transducer of the system, and
- the calculator will have the ability to accept fixed or periodically updated signals for the calorific value for determining energy.

Figure 2 shows the various components of ECD system 2.



(1) Standardised in EN12405-2

(2) Standardised in EN12405-1 or EN 12405-3 (for class 0;5%)

Dotted line = optional

Figure 2 — Description of ECD system 2

NOTE The various components of the ECD need to be supplied as a matched, ready-for-use, set of devices; this applies to System 1 and System 2, and mechanically integrated or separated devices (see modular and global approaches below).

Modular and global approaches

In the modular approach, the ECD is an assembly of separate associated measuring instruments (VCD and CVDD) and an energy calculator (EC), which are verified separately. Each instrument is verified according to its testing procedure, using the indication available on the energy calculator or on the associated measuring instrument itself. In this case, the indication shall correspond to the one which is directly processed in energy conversion. The verification of calculation consists in verifying the calculation concerning each characteristic quantity of the gas and/or the calculation for the energy conversion.

The associated measuring instruments are approved for a type or some types of conversion device(s) in order to ensure the compatibility of the association. If the associated measuring instruments deliver a digital signal, they may be considered as interchangeable, provided the type examination certificate provides all the necessary conditions of compatibility with the calculator of the conversion device.

In the global approach, the ECD is tested as a package, performing tests of the following functions: energy calculation, volume conversion and CV determination.

The testing procedures are given in Clause 9.

For the purpose of this standard, the following configurations of devices are accepted:

Table 1 — Description of systems 1 and 2

	Global approach	modular approach
System 1	VCD/CVDD/EC	VCD + CVDD/EC
		VCD/EC + CVDD
		VCD + EC + CVDD
System 2	VCD/EC (signal CV)	VCD + EC (signal CV)

Key: VCD: volume conversion device
 CVDD: calorific value determination device
 EC: energy calculator
 X/Y: devices X and Y mechanically integrated, able to perform their functions separately
 X+Y: devices X and Y exchanging signals between them, verified separately

1 Scope

This European Standard specifies the requirements and tests for the construction, performance, safety and conformity of conversion devices used to determine the energy of fuel gases described in the Table 1, including those of the 1st and 2nd families according to EN 437.

The energy conversion device (ECD) considered in this standard consists of an energy calculator (EC) and is associated with the following devices and/or functions:

- a volume conversion device (VCD) or a flow computer used as gas meter conversion, either conforming to EN 12405-1:2005+A2:2010, or to prEN 12405-3, for high accuracy measurements;
- a calorific value determination device (CVDD).

Requirements for type approval tests of the devices, not included in the above-mentioned standards are described in appropriate annexes specified in Table 6.

For the purpose of this European Standard, the term “volume conversion devices” (VCDs) includes flow computers (FCs).

A single calculator may undertake the volume conversion functions for different metering lines.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 12405-1:2005+A2:2010, *Gas meters — Conversion devices — Part 1: Volume conversion*

prEN 12405-3, *Gas meters — Conversion devices — Part 3: Flow computers*¹⁾

EN 55011, *Industrial, scientific and medical equipment — Radio-frequency disturbance characteristics — Limits and methods of measurement*

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*

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 60068-2-47, *Environmental testing — Part 2-47: Tests — Mounting of specimens for vibration, impact and similar dynamic tests*

EN 60068-2-64, *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance*

1) In preparation.

- 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 60068-3-4, *Environmental testing — Part 3-4: Supporting documentation and guidance — Damp heat tests*
- EN 60068-3-8, *Environmental testing - Part 3-8: Supporting documentation and guidance – Selecting amongst vibration tests*
- EN 60079 (all parts), *Explosive atmospheres*
- EN 60529, *Degrees of protection provided by enclosures (IP Code)*
- EN 60654-2, *Operating conditions for industrial-process measurement and control equipment — Part 2: Power*
- EN 60730-1:2011, *Automatic electrical controls for household and similar use — Part 1: General requirements*
- EN 60950-1, *Information technology equipment - Safety - Part 1: General requirements*
- IEC 61000-2-1, *Electromagnetic compatibility (EMC) Part 2: Environment Section 1: Description of the environment — electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems*
- EN 61000-2-2, *Electromagnetic compatibility (EMC) — Part 2-2: Environment — Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*
- EN 61000-4-1, *Electromagnetic compatibility (EMC) • Part 4-1: Testing and measurement techniques — Overview of IEC 61000-4 series*
- 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 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*

EN ISO 6974-1, *Determination of composition and associated uncertainty by gas chromatography — Part 1: General guidelines and calculation of composition (ISO 6974-1)*

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

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

EN ISO 13443: 2005, *Natural gas — Standard reference conditions (ISO 13443:1996 including Corrigendum 1:1997)*

ISO 6141, *Gas analysis — Requirements for certificates for calibration gases and gas mixtures*

ISO 6142, *Gas analysis — Preparation of calibration gas mixtures — Gravimetric method*

ISO 6143, *Gas analysis — Comparison methods for determining and checking the composition of calibration gas mixtures*

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

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1

adjustment interval

time interval or number of measurements between two necessary adjustments of a calorific value determining device

3.1.2

associated measuring instruments

instruments for measuring certain quantities which are characteristic of the gas (temperature, pressure, calorific value etc.), whose indications are used by the calculator with a view to making a correction and/or a conversion

Note 1 to entry: For the purpose of this standard, when dealing with the ECD in modular approach, the VCD and CVDD are considered as associated measuring instruments.

3.1.3

base conditions

fixed conditions used to express the volume of gas independently of the metering conditions and the superior calorific value

Note 1 to entry: The pressure base for both volumetric metering and combustion is always 101,325 kPa. The temperature needs to be specified

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