SLOVENSKI STANDARD
SIST EN 1359:2017

01-december-2017

Nadomešča:
SIST EN 1359:2004
SIST EN 1359:2004/A1:2006

Plinomeri - Mehovni plinomeri

Gas meters - Diaphragm gas meters

Gaszähler - Balgengaszähler

Compteurs de gaz - Compteurs de volume de gaz à parois déformables

Ta slovenski standard je istoveten z: **EN 1359:2017**

ICS:

91.140.40 Sistemi za oskrbo s plinom Gas supply systems

SIST EN 1359:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1359

July 2017

ICS 91.140.40

Supersedes EN 1359:1998

English Version

Gas meters - Diaphragm gas meters

Compteurs de gaz - Compteurs de volume de gaz à parois déformables

Gaszähler - Balgengaszähler

This European Standard was approved by CEN on 14 May 2017.

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, Serbia, 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

Ref. No. EN 1359:2017 E

Contents

Page

European foreword

This document (EN 1359:2017) 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of an identical text or by endorsement, at the latest by January 2018, and conflicting national standards shall be withdrawn at the latest by January 2018.

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

This document supersedes EN 1359:1998.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

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

Significant changes from the previous editions include:

— conformity with the MID 2014/32/EU regarding declared errors of the same sign and testing Q_{min} at the minimum and maximum declared gas temperatures;

— corrosion protection restructured;

— endurance testing for residential meters revised to reflect better the in-service life;

— provision for meters with electronic indexes and integrated valves, and requirements for additional functionalities as given in EN 16314;

— adhesion testing of labels.

Annex B has been restructured to give additional requirements for meters provided with a built-in gas temperature conversion device.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the requirements and tests for the construction, performance, safety and production of class 1,5 diaphragm gas meters (referred to as meters). This applies to meters with co-axial single pipe, or two pipe connections, that are used to measure volumes of fuel gases, which are within the limits of test gases of the 1st, 2nd and 3rd families described in EN 437. The meters have maximum working pressures not exceeding 0,5 bar and maximum actual flow rates not exceeding 160 m^3h^{-1} over a minimum ambient temperature range of −10 °C to 40 °C and a gas temperature range as specified by the manufacturer with a minimum range of 40 K.

This standard applies to meters with and without built-in temperature conversion that are installed in locations with vibration and shocks of low significance (see MID Annex 1 Chapter 1.3.2 (a), class M1). It also applies to meters in:

— closed locations (indoor or outdoor with protection as specified by the manufacturer) both with condensing humidity, or with non-condensing humidity;

or, if specified by the manufacturer:

— open locations (outdoor without any covering) both with condensing humidity and with non-condensing humidity;

— in locations with electromagnetic disturbances corresponding to those likely to be found in residential, commercial and light industrial buildings (see MID Annex 1 Chapter 1.3.3 (a), class E1).

Unless otherwise stated, all pressures given in this document are gauge pressure.

Requirements for electronic indexes, batteries, valves incorporated in the meter and other additional functionalities are given in EN 16314.

Unless otherwise stated in a particular test, the tests are carried out on meters that include additional functionality devices intended by the manufacturer.

Clauses 1 to 9 and Annexes B and C are for design and type testing only.

NOTE The content of OIML Publication 'International Recommendation R 137' has been taken into account in the drafting of this standard.

If no specific requirements are given for test equipment, the instruments used should be traceable to a national or international reference standard and the uncertainty (2σ) should be better than 1/5 of the maximum value of the parameter to be tested. For differential results the repeatability (2σ)/resolution should be better than 1/5 of the maximum value of the parameter to be tested.

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 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 16314:2013, *Gas meters - Additional functionalities*

EN 60730-1:2011, *Automatic electrical controls for household and similar use - Part 1: General requirements (IEC 60730-1:2011)*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1)*

EN ISO 1518-1, *Paints and varnishes - Determination of scratch resistance - Part 1: Constant-loading method (ISO 1518-1)*

EN ISO 2409, *Paints and varnishes - Cross-cut test (ISO 2409)*

EN ISO 2812-1:2007, *Paints and varnishes - Determination of resistance to liquids - Part 1: Immersion in liquids other than water (ISO 2812-1:2007)*

EN ISO 4628-2, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 2: Assessment of degree of blistering (ISO 4628-2)*

EN ISO 4628-3:2016, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting (ISO 4628-3:2016)*

EN ISO 4892-2:2013, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2:2013)*

EN ISO 6270-1, *Paints and varnishes - Determination of resistance to humidity - Part 1: Continuous condensation (ISO 6270-1)*

EN ISO 6272-2, *Paints and varnishes - Rapid-deformation (impact resistance) tests - Part 2: Falling-weight test, small-area indenter (ISO 6272-2)*

EN ISO 9227:2012, *Corrosion tests in artificial atmospheres – Salt spray tests (ISO 9227)*

EN ISO 11664-4, *Colorimetry - Part 4: CIE 1976 L*a*b* Colour space (ISO 11664-4)*

ISO 834-1, *Fire-resistance tests — Elements of building construction — Part 1: General requirements*

ISO 5168, *Measurement of fluid flow — Procedures for the evaluation of uncertainties*

ISO 7005-1:2011, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*

ASTM D1003, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics*

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
air
air of density approximately 1,2 kgm^{-3}

3.1.2
gas volume meter
instrument designed to measure, memorize and display the volume of a fuel gas that has passed through it

3.1.3
diaphragm gas meter
gas volume meter in which the gas volume is measured by means of measuring chambers with deformable walls

3.1.4
actual flow rate
flow rate at the gas pressure and gas temperature conditions prevailing in the gas distribution line in which the meter is fitted, at the meter inlet

3.1.5
working pressure
difference between the pressure of the gas at the inlet of the meter and the atmospheric pressure

3.1.6
maximum working pressure
upper limit of the working pressure for which the meter has been designed, as declared by the manufacturer and marked on the meter data plate

3.1.7
pressure absorption
difference between the pressure measured at the inlet and outlet connections of the meter whilst the meter is operating

3.1.8
external leak tightness
leak tightness of the gas carrying components of the gas meter with respect to the atmosphere

3.1.9
error of indication
E
value that shows the relationship in percentage terms of the difference between the volume indicated by the meter and the volume that has actually passed through the meter, to the latter volume

Note 1 to entry: Error of indication, as a percentage, is calculated using the Formula (1):

$$E = 100\frac{V_i - V_c}{V_c} \quad (1)$$

where

V_i is the indicated volume

V_c is the volume which has actually passed through the meter.

3.1.10
normal condition of use
condition referring to the meter operating:

— at a pressure up to the maximum working pressure (with or without a flow of gas);

— within the range of flow rates;

— within the ambient and gas temperature range;

— with the distributed gas

3.1.11
base condition
fixed condition (temperature and pressure) to which a volume of gas is converted

3.1.12
cyclic volume
volume of gas corresponding to the working cycle of the gas meter

Note 1 to entry: This means that all the moving components, except for the indicating device and the intermediate transmissions, resume for the first time the position they occupied at the beginning of the cycle.

3.1.13
distributed gas
gas locally available

3.1.14
metering conditions
condition of the gas at the point of measurement

Note 1 to entry: E.g. temperature and pressure of the measured gas.

3.1.15
temperature conversion device
device which converts the volume measured to a corresponding volume at the base gas temperature

Note 1 to entry: The volume at base gas temperature, V_b in cubic metres (m^3) is given by the equation

$$V_b = \frac{T_b}{T} \times V \qquad (2)$$

where

V is the volume at metering conditions, in cubic metres (m^3);

T is the gas temperature at metering conditions, in Kelvin (K);

T_b is the base gas temperature, in Kelvin (K).

3.1.16
meter error curve
plot of average error of indication against actual flow rate

3.1.17
class 1,5 meter
meter which has an-MPE at production-of:

±3 % where $Q_{min} \leq Q < Q_t$

and

±1,5 % where $Q_t \leq Q \leq Q_{max}$

3.1.18
MPE
maximum permissible error for a class 1,5 diaphragm gas meter

3.1.19
MPE-Initial
maximum permissible error for a Class 1,5 diaphragm gas meter before testing in accordance with this standard

3.1.20
MPE-Subsequent
maximum permissible error for a Class 1,5 diaphragm gas meter following the completion of specific individual tests within this standard

3.2 Symbols

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

3.2.1
Q
volume flowrate
actual flow of gas passing through the diaphragm gas meter

3.2.2
Q_{min}
minimum flowrate
lowest flowrate at which the gas meter provides indications that satisfy the requirements regarding MPE

3.2.3
Q_t
transitional flowrate
flowrate occurring between the maximum and minimum flowrates at which the flowrate range is divided into two zones, the 'upper zone' and the 'lower zone', each zone having a characteristic MPE

3.2.4
Q_{max}
maximum flowrate
highest flowrate at which the gas meter provides indications that satisfy the requirements regarding MPE

3.2.5
Q_r
overload flowrate
highest flowrate at which the meter operates for a short period of time without deteriorating

3.2.6
V
cyclic volume

3.2.7
p_{max}
maximum working pressure

3.2.8
t_b
base gas temperature

3.2.9
t_m
ambient temperature

3.2.10
t_g
gas temperature

3.2.11
t_{sp}
specified centre temperature for meters with temperature conversion

3.2.12
g_n
nominal gravitational acceleration

4 Working conditions

4.1 Flow range

The flow rate range shall be one of those given in Table 1.

Table 1 — Flow rate range

Q_{max} m^3h^{-1}	Q_{min} m^3h^{-1}	Q_t m^3h^{-1}	Q_r m^3h^{-1}
2,5	0,016	0,25	3,0
4	0,025	0,4	4,8
6	0,04	0,6	7,2
10	0,06	1,0	12,0
16	0,1	1,6	19,2
25	0,16	2,5	30,0
40	0,25	4,0	48,0
65	0,4	6,5	78,0
100	0,65	10,0	120,0
160	1	16,0	192,0

A gas meter may have a lower value for the minimum flow rate, Q_{min}, than that shown in Table 1, but this lower value shall be equal to one of the values shown in the table or to a decimal submultiple of these values.

NOTE The values given in Table 1 ensure conformity with the requirements of the MID for a minimum ratio Q_{max} to Q_{min} of 150:1.

4.2 Maximum working pressure

Unless required otherwise for a particular test, all meters shall be capable of meeting the requirements up to the maximum working pressure of the meter, P_{max}, which shall be declared and shall be marked on the index plate of the meter.

4.3 Temperature range

All meters shall be capable of meeting the requirements for a minimum ambient temperature range of −10 °C to 40 °C and a minimum gas temperature range of 40 K (see 7.1.3) and a minimum storage temperature range of −20 °C to 60 °C (see 6.5). The gas temperature range shall be within the ambient temperature range.

The gas temperature range and the ambient temperature range shall be declared and shall be marked on the index plate of the meter.

The manufacturer may declare a wider ambient temperature range using a minimum temperature of −10 °C, −25 °C or −40 °C and a maximum temperature of 40 °C, 55 °C or 70 °C and/or a wider storage temperature range. The meter shall be capable of meeting the requirements over this declared wider range.

4.4 Climatic environment

Meters that conform to the requirements of this standard are deemed suitable for installation in closed locations (indoor or outdoor with protection as specified by the manufacturer) with condensing or non-condensing humidity.

If the manufacturer declares that the meter is also suitable for installation in open locations (outdoor without any protection) with condensing or non-condensing humidity, it shall meet the requirements of Annex C.

4.5 Installation orientation

The meter shall be designed for installation upright as specified by the manufacturer.

5 Metrological performance

5.1 Errors of indication

5.1.1 Requirements

When tested by the method given in 5.1.2 a) the individual errors of indication of the meter shall be within the initial permissible error (MPE-Initial) limits specified in Table 2.

Table 2 — Maximum permissible errors

Flow rate m^3h^{-1}	Maximum permissible errors	
	Initial	Subsequent
$Q_{min} \leq Q < Q_t$	±3 %	±6 %
$Q_t \leq Q \leq Q_{max}$	±1,5 %	±3 %

The meter, including any additional functionality devices intended by the manufacturer, shall have the error adjusted as close to zero as the adjustments allow, without systematically favouring any party.

After the meter has been subjected to other influences, given in the individual clauses of this standard, the average of the errors of indication of the meter shall either:

— not vary from the average of the initial errors of indication by more than that allowed by those clauses or;

— be within the error limits specified within those clauses;

whichever is applicable, when tested by the methods given in 5.1.2 b), 5.1.2 c or 5.1.2 d).

5.1.2 Test procedure — Errors of indication

a) Thermally stabilize the meter to be tested for a minimum of 4 h at the temperature of the test laboratory and carry out the error of indication test using air at laboratory temperature.

Immediately before commencing the test, pass a quantity of air equal to at least 50 cyclic volumes of the meter under test, through the meter under test at a flow rate of Q_{max}.

Carry out this test six times at each of the flow rates Q_{min}, 3 Q_{min}, 0,1 Q_{max}, 0,2 Q_{max}, 0,4 Q_{max}, 0,7 Q_{max} and Q_{max}, ensuring that the flow rates between each individual test are different (i.e. it is not permissible to carry out consecutive tests at the same flow rate).

Pass a volume of air, the actual volume of which is measured by a traceable standard, through the meter under test and note the volume indicated by the meter index. The minimum volume of air to be passed through the meter under test is specified by the manufacturer and agreed with the Accredited test house.

Calculate the six errors of indication at each of the flow rates using the equation given in 3.1.9. Calculate the mean of each of the six errors of indication and record the results as the meter error curve.