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Gas meters – Diaphragm gas meters

The European Standard EN 1359:1998 has the status of a Swedish Standard. This document contains the official English version of EN 1359:1998.

Swedish Standards corresponding to documents referred to in this Standard are listed in ”Catalogue of Swedish Standards”, issued by SIS. The Catalogue lists, with reference number and year of Swedish approval, International and European Standards approved as Swedish Standards as well as other Swedish Standards.

Gasmätare – Membrangasmätare

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Motsvarigheten och aktualiteten i svensk standard till de publikationer som omnämns i denna standard framgår av ”Katalog över svensk standard”, som ges ut av SIS. I katalogen redovisas internationella och europeiska standarder som fastställts som svenska standarder och övriga gällande svenska standarder.

ICS 91.140.40

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Descriptors: metrology, measuring instruments, volume measurements, gas supply meters, definitions, classifications, metrological inspection, design, safety, equipment specifications, performance evaluation, mechanichal properties, tests, specifications, marking

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 28 November 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Ref. No. EN 1359:1998 E

Contents

Foreword

This European Standard 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 June 1999, and conflicting national standards shall be withdrawn at the latest by June 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

In the preparation of this European Standard, the content of the Marcogaz/Facogaz/AEGPL liaison committee CL5 document, the content of OIML Publications 'International Recommendation R 6 and 'International Recommendation R 31 and the content of member countries' National Standards for diaphragm gas meters, have been taken into account.

The metrological aspects of this European Standard can be subject to final modification to bring them into line with the proposed Measuring Instruments Directive.

1 Scope

This European Standard specifies the requirements and tests for the construction, performance and safety of diaphragm gas meters (hereinafter referred to as meters) having co-axial single pipe, or two pipe connections, used to measure volumes of fuel gases of the 1st, 2nd and 3rd families according to EN 437:1993, at maximum working pressures of up to 1 bar and maximum actual flow rates of up to 160 m^3/h over a minimum ambient and gas temperature range of -5 °C to + 35 °C.

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

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

NOTE: See annex A for production requirements.

2 Normative references

This European Standard incorporates by dated or undated references provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 437 : 1993	Test gases - Test pressures - Appliance categories
EN 50020 : 1994	Electrical apparatus for potentially explosive atmospheres - Intrinsic safety "i"
EN 55022 : 1994	Limits and methods of measurement of radio disturbance characteristics of information technology equipment (CISPR 60022:1993)
EN 60529 : 1991	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)
EN 60730-1 : 1995	Automatic electrical controls for household and similar use - Part 1: General requirements (IEC 60730-1:1993, modified)
EN 60801-2: 1993	Electromagnetic compatibility for industrial -process measurement and control equipment - Part 2: Electrostatic discharge requirements (IEC 60801-2:1991)
EN ISO 9001 : 1994	Quality systems - Model for quality assurance in design/development, production, installation and servicing (ISO 9001:1994)

EN ISO 9002 : 1994	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002:1994)
ISO 228-1 : 1994	Pipe threads where pressure-tight joints are not made on the threads - Part 1 : Dimensions, tolerances and designation.
ISO 834 : 1975	Fire resistance tests - Elements of building construction.
ISO 1518 : 1992	Paints and varnishes - Scratch test
ISO 2409 : 1992	Paints and varnishes - Cross-cut test
ISO 2812-1 : 1993	Paints and varnishes - Determination of resistance to liquids : Part 1 : General methods
ISO 4628-2 : 1982	Paints and varnishes - Evaluation of degradation of paint coatings- Designation of intensity, quantity and size of common types of defect; Part 2: Designation of degree of blistering.
ISO 4628-3 : 1982	Paints and varnishes; Evaluation of degradation of paint coatings- Designation of intensity, quantity and size of common types of defect - Part 3 : Designation of degree of rusting.
ISO 6270 : 1980	Paints and varnishes - Determination of resistance to humidity (continuous condensation)
ISO 6272 : 1993	Paints and varnishes - Falling weight test
ISO 7005-1 : 1992	Metallic flanges - Part 1: Steel flanges.
ISO 7253 : 1984	Paints and varnishes -Determination of resistance to neutral salt spray.
IEC 61000-4-3:1996	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test

3 Terminology

3.1 Definitions

For the purposes of this standard, the following definitions apply:

3.1.1 diaphragm gas meter: Gas volume meter in which the gas volume is measured by means of measuring chambers with deformable walls.

3.1.2 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.

3.1.3 working pressure: Difference between the pressure of the gas at the inlet of the meter and the atmospheric pressure.

3.1.4 maximum working pressure: Upper limit of working pressure for which the meter has been designed, as declared by the manufacturer and marked on the meter index or data plate.

3.1.5 pressure absorption: Difference between the pressure measured at the inlet and outlet connections of the meter whilst the meter is operating.

3.1.6 external leak tightness: Leak tightness of the gas carrying components of the gas meter with respect to the atmosphere.

3.1.7 error of indication: Value which shows the relationship in percentage terms of the difference between the volume indicated by the meter and the volume which has actually flowed through the meter, to the latter volume:

$$E = 100\frac{V_i - V_c}{V_c}$$

where

E is the error of indication, expressed as a percentage.

V_i is the indicated volume and V_c is the volume which has actually flowed through the meter.

3.1.8 normal conditions of use: Conditions 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.

3.1.9 initial permissible errors: Those errors of indication which are permitted when first determining the accuracy of a meter, prior to any other tests being carried out.

3.1.10 endurance permissible errors: Those errors of indication which are permitted during and on completion of the endurance test.

3.1.11 base conditions: Fixed conditions to which a volume of gas is converted. (i.e. base gas temperature 15 °C, base gas pressure 1 013,25 mbar).

3.1.12 cyclic volume: Volume of gas corresponding to the working cycle of the gas meter, i.e. to all the movements of the moving components which, except for the indicating device and the intermediate transmissions, resume for the first time the position they occupied at the beginning of the cycle.

This volume is calculated by multiplying the value of the volume represented by one complete revolution of the test element, or the value of the smallest scale interval, by the transmission ratio of the measuring device to the indicating device.

3.1.13 distributed gas: Gas locally available.

3.1.14 metering conditions: Conditions of the gas, the volume of which is to be measured, at the point of measurement (e.g. temperature and pressure of the measured gas).

3.1.15 mechanical temperature conversion device: A device which converts the volume measured to a corresponding volume at the base gas temperature.

The conversion formula is

$$V_b = \frac{T_b}{T} \bullet V$$

where

V is the volume at metering conditions, in cubic metres (m^3)
V_b is the volume at base gas temperature, in cubic metres (m^3)
T is the gas temperature at metering conditions, in Kelvin (K)
T_b is the base gas temperature 15 °C (288,15 K)

3.1.16 meter error curve: Plot of average error of indication against actual flow rate.

3.2 Symbols

3.2.1 Q_{min}

The minimum flowrate, specified in cubic metres per hour, m^3/h, for which the meter has been designed.

3.2.2 Q_{max}
The maximum flowrate, specified in cubic metres per hour, m^3/h, for which the meter has been designed.

4 Working conditions

4.1 Flow range

The values of maximum flow rates and the corresponding values of the upper limits of the minimum flow rates shall be one of those given in table 1.

Table 1: Flow range

Q_{max} (m^3/h)	Upper limits of Q_{min} (m^3/h)
1	0,016
1,6	0,016
2,5	0,016
4	0,025
6	0,04
10	0,06
16	0,1
25	0,16
40	0,25
65	0,4
100	0,65
160	1

A gas meter may have a lower value for the minimum flow rate 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.

4.2 Maximum working pressure

The manufacturer shall declare the maximum working pressure of the meter and this figure shall be marked on the index of the meter.

4.3 Temperature range

All meters shall be capable of meeting the requirements for a minimum ambient temperature range and a minimum gas temperature range of -5 °C to +35 °C (see 7.1.3) and minimum storage temperature range of -20 °C to +60 °C (see 6.4.1).

If the manufacturer declares a wider ambient and gas temperature range and/or a wider storage temperature range, the meter shall be capable of meeting the requirements over this declared wider range.

If the manufacturer declares that the meter is resistant to high ambient temperatures, the meter shall also be capable of meeting the requirements of the heat resistance test and shall be marked accordingly (see 6.5.5 and 8.1).

5 Metrological performance

5.1 Errors of indication

5.1.1 *Requirements*

a) The individual errors of indication of the meter shall be within the initial permissible error limits specified in table 2, when tested by the method given in 5.1.2 a).

b) After the meter has been subjected to other influences, given in the individual clauses of this European 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, shall be within the error limits specified within those clauses, whichever is applicable, when tested by the methods given in 5.1.2 b) or 5.1.2 c).

5.1.2 *Test*

a) Thermally stabilize the meter to be tested to 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 test 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}.

Pass a volume of air, the actual volume of which is measured by a reference 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 notified body.

Calculate the error of indication (see 3.1.7).

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}; ensure 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).

Calculate the six errors of indication at each of the flow rates. Calculate the average of the six errors of indication and note as the error curve of the meter.