SLOVENSKI STANDARD
SIST EN 12261:2004

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Plinomeri - Turbinski plinomeri

Gas meters - Turbine gas meters

Gaszähler - Turbinenradgaszähler

Compteurs de gaz - Compteurs de gaz a turbine

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ICS:

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Gas meters - Turbine gas meters

Compteurs de gaz - Compteurs de gaz à turbine

Gaszähler - Turbinenradgaszähler

This European Standard was approved by CEN on 2 September 2001.

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 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 Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 12261:2002) 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of an identical text or by endorsement, at the latest by October 2002, and conflicting national standards shall be withdrawn at the latest by October 2002.

In the preparation of this European Standard, the content of ISO 9951, the content of OIML Publication, "International Recommendation 6" and "International Recommendation 32" and the content of member bodies national standards on turbine meters have been taken into account.

The metrological aspects of this European Standard may be subject to amendments to bring it into line with the proposed Measuring Instruments Directive (MID).

Electronic Indexes are not specifically covered by this Standard, however, work to produce a Standard covering these devices is in progress under CEN/TC 237.

Annexes A, B, D and E are normative. Annex C is informative.

This standard includes a Bibliography.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the measuring conditions, requirements and tests for the construction, performance and safety of axial and radial turbine gas meters with mechanical indicating devices, herein after referred to as a meter(s), having in-line pipe connections for gas flow measurement.

This European Standard applies to turbine gas meters used to measure the volume of fuel gases of the 1st and 2nd gas families, the composition of which is specified in EN 437, at maximum working pressures up to 420 bar, actual flow rates up to 25 000 m^3/h over a gas temperature range of at least –10 °C to +40 °C.

Unless otherwise specified in this standard, all pressures used are gauge.

Clauses 1 to 7 and annex B are for design and type testing only, with the exception of 6.2.2.3, 6.2.3.3, 6.6.1.1.2 and 6.6.2.2.2. Annex C may be used to provide guidance on periodic tests during use. Clause 8 and annexes D and E are for each meter prior to dispatch. Annex A shall be used for both type and individual testing.

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 (including amendments).

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

EN 10204, *Metallic products — Types of inspection documents*

EN 50014, *Electrical apparatus for potentially explosive atmospheres — General requirements*

EN 50020, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety "I"*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60947-5-6, *Low-voltage switchgear and controlgear — Part 5-6: Control circuit devices and switching elements — DC interface for proximity sensors and switching amplifier (NAMUR) (IEC 60947-5-6:1999)*

EN ISO 5167-1:1995, *Measurement of fluid flow by means of pressure differential devices — Part 1: Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full (ISO 5167-1:1991)*

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*

ISO 3, *Preferred numbers — Series of preferred numbers*

ISO 2768-1:1989, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO *guide to the expression of uncertainty in measurement*

EN 119000, *Generic specification — Dry and mercury wetted reed contact units*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
turbine gas meter
measuring device in which the dynamic forces of the flowing gas cause a turbine wheel to rotate with a speed as a function of the volume flow rate. The number of revolutions of the turbine wheel is the basis for the indication of the volume passed through the meter

3.1.2
measured quantity
volume in cubic metres, at metering conditions

3.1.3
volume flow rate
volume at metering conditions divided by time

3.1.4
rangeability
the ratio between Q_{min} and Q_{max} i.e. the minimum and maximum flow rate respectively for which the meter performs within the maximum permissible errors

3.1.5
average velocity
volume flow rate divided by the cross-sectional area of the meter connections

3.1.6
casing
pressure containing structure of the meter

3.1.7 pressures and temperatures

3.1.7.1
metering pressure (p_m)
absolute gas pressure to which the indicated volume of gas is related

3.1.7.2
operating pressure
gas pressure within the piping containing the meter

3.1.7.3
working pressure range
allowable pressure range over which the meter is calibrated and performs within the metrological requirements

3.1.7.4
working temperature range
range of metering temperatures over which the meter operates within the metrological requirements

3.1.7.5
maximum design pressure (p_{max})
pressure on which design calculations are based

3.1.8 designation

3.1.8.1
DN-designation
numerical designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections

3.1.8.2
PN-designation
alphanumeric term used for reference purposes related to a combination of mechanical and dimensional characteristics of a component of a pipework system with regard to pressure. It comprises the letters PN followed by a dimensionless whole number

3.1.9
metering conditions
conditions of the gas prevailing at the point of the measurement (e.g.: temperature and pressure of the measured gas in the meter)

3.1.10
Reynolds number (*Re*)
number referring to the flow conditions:

$$Re = 0{,}3537 \times \frac{Q}{D \times v}$$

where the value of D is given by the internal pipe diameter. The parameters (variables) in the above equation and their units are defined in Table 1.

3.1.11
error of indication
indication of a turbine meter minus the reference value of the measurand

Errors (E) are expressed as relative values (as a percentage) by the ratio of the difference between the indicated volume (V_i) and a reference volume (V_c) of the gas which has passed through the gas meter to this latter value:

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

3.1.12
pressure loss
non-recoverable pressure drop caused by the presence of the turbine meter in the conduit

3.1.13
pulse value
number of pulses per cubic metre indicated

3.1.14 gas families

3.1.14.1
1st family
a gas having a Wobbe index between:

23,8 MJ · m^{-3} and 31,4 MJ · m^{-3}

according to EN 437 related on gross calorific value

3.1.14.2
2nd family
a gas having a Wobbe index between:

41,3 MJ · m^{-3} and 57,9 MJ · m^{-3}

according to EN 437 related on gross calorific value

3.2 Symbols

The symbols and subscripts used hereafter in this European Standard are specified in Table 1.

Table 1 — Symbols

Symbols	Represented quantity	Unit
c	Pressure loss coefficient depending on meter type	mm^{-4}
d	Relative density of the gas (air = 1)	-
D	Inside diameter meter outlet/inlet	mm
D_1	Inside diameter pipe	mm
E	Error	%
F	Force (bending moment)	N
F´	Force (torsional moment)	N
I	Current	A
L	Length of the lever arm (bending moment)	mm
L´	Length of the lever arm (torsional moment)	mm
M	Torque	N·m
p	Pressure	Pa, bar
Q	Volume flow rate	m^3/h
Re	Reynolds number	-
t	Temperature	°C
U_B	Battery voltage	V
V	Volume	m^3
ν	Kinematic viscosity	$m^2 \cdot s^{-1}$
ρ	Density of the gas	$kg \cdot m^{-3}$
Subscripts:		
i	Summation index	
m	Metering conditions of the gas	
max	Maximum value	
min	Minimum value	
s	Specified conditions	
t	Transitional	

4 Meter classification

4.1 Flange pressure ratings

Flanges shall be designed according to PN Designation or ANSI class rating (see Table 2).

Table 2 — Flange pressure ratings

PN Designation	ANSI class rating
10	125
16	-
20	150
25	-
40	-
50	300
64	-
100	-
110	600
150	900
250	-
260	1500
420	2500
This table is based on EN 1333 resp. ISO 7005-1.	

The use of the following pressure ratings is recommended:

10 - 16 - 20 - 25 - 40 - 50 - 100 - 150 - 250 - 420.

4.2 Gas meter sizes, rangeability and connection diameter sizes

Gas meters shall be classified according to maximum and minimum flow rates and nominal diameters as shown in Table 3.

The maximum and minimum flow rates shall be specified for the gas density for which the meter will operate within the specifications of meter performance defined in clause 5.

NOTE The maximum flow rate in cubic meters per hour (m^3/h) is a number in R 5 of the sets of preferred numbers listed in ISO 3 (the value of 63 has been rounded to 65).

Table 3 — Authorized values of maximum flow rates, corresponding minimum flow rates and nominal diameters

Q_{max} (m^3/h)	Rangeability				Nominal diameters DN		
	1:10	1:20	1:30	1:50			
	Q_{min} (m^3/h)				A	B	C
40	4	2	1,3	0,8	25		50
65	6	3	2	1,3		50	
100	10	5	3	2		50	80
160	16	8	5	3	50	80	100
250	25	13	8	5		80	100
400	40	20	13	8	80	100	150
650	65	32	20	13	100	150	
1 000	100	50	32	20		150	200
1 600	160	80	50	32	150	200	250
2 500	250	130	80	50	200	250	300
4 000	400	200	130	80	250	300	400
6 500	650	320	200	130	300	400	
10 000	1 000	500	320	200	400	500	
16 000	1 600	800	500	320	500	600	
25 000	2 500	1 300	800	500	600	750	

A high speed version

B normal speed version (preferred)

C low speed version

4.3 Connections and dimensions

The inlet and outlet of the meter shall have the same nominal diameter and connection type.

The preferred overall length in millimetres of the meter between inlet and outlet connections is 3 DN. Tolerances are given in ISO 2768-1:1989, “Designation C“.

The preferred length in millimetres of 3 DN for the meter shall not be exceeded. For shorter meters the manufacturer shall be able to provide a “make up spool piece“ to bring their body lengths up to the preferred length, where requested.

The maximum overall distance in millimetres measured from the extremity of the protruding parts to the meter axis should not exceed 150 plus 1,5 DN.

For flange connections refer to Table 2.

4.4 Temperature ranges

The gas and the ambient temperature ranges for which the meter is designed to perform within the standard performance specification shall be stated.

5 Metrological performance requirements

5.1 General

Each type of meter shall be subjected to the series of tests specified in 5.2 to establish the metrological performance of the type of meter. If one type of meter comprises a range of sizes of the same basic design and a range of metering conditions, the type test may be performed on a limited number of sample meters (1 to 6 samples irrespective of size) being representative for that range of meter sizes and metering conditions.

Each meter conforming to an approved type shall be tested individually according to annex E. The results of the tests obtained in 5.2 and annex E shall be available on request together with a statement of the conditions under which the test took place.

The meter shall be fitted with all components which may affect the metrological performance.

General requirements for the test facility to be used for the type test are given in annex A.

Where the text refers to a gas for flow tests this means air or a gas from the 1st or 2nd gas family or any other gas provided it is yielding similar metrological results at a Reynolds number within ± 5 % of the Reynolds number at the foreseen metering conditions.

The total uncertainty of the equipment used to measure the error of indication shall be calculated according to ISO Guide.

5.2 Type testing

5.2.1 Error of indication

5.2.1.1 Requirements

The error of indication of the meter shall be in absolute values less than the maximum permissible errors specified in Table 4, taking account of Table 5.

Table 4 — Maximum permissible errors

Flow rate Q	Maximum permissible errors
$Q_{min} \leq Q < Q_t$	± 2 %
$Q_t \leq Q \leq Q_{max}$	± 1 %

Table 5 — Transitional flow rate Qt

Rangeability	Q_t
1 : 10	$0{,}20 \cdot Q_{max}$
1 : 20	$0{,}20 \cdot Q_{max}$
1 : 30	$0{,}15 \cdot Q_{max}$
≥ 1 : 50	$0{,}10 \cdot Q_{max}$