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Plinomeri - Turbinski plinomeri

Gas meters - Turbine gas meters

Gaszähler - Turbinenradgaszähler

Compteurs de gaz - Compteurs de gaz à turbine

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ICS:

91.140.40 Sistemi za oskrbo s plinom Gas supply systems

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English Version

Gas meters - Turbine gas meters

Compteurs de gaz - Compteurs de gaz à turbine

Gaszähler - Turbinenradgaszähler

This European Standard was approved by CEN on 9 November 2017.

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

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European foreword

This document (EN 12261:2018) 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of an identical text or by endorsement, at the latest by September 2018, and conflicting national standards shall be withdrawn at the latest by September 2018.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 12261:2002.

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(s).

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

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.

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 document specifies the measuring conditions, requirements and tests for the construction, performance and safety of class 1,0 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 document 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 40 K and for a climatic environmental temperature range of at least 50 K.

This document applies to meters that are installed in locations with vibration and shocks of low significance and in

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

or, if specified by the manufacturer,

— open locations (outdoor without any covering) with condensing humidity or with non-condensing humidity

and in locations with electromagnetic disturbances.

Unless otherwise specified in this document:

— all pressures used are gauge;

— all influence quantities, except the one under test, are kept relatively constant at their reference value.

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 10204, *Metallic products — Types of inspection documents*

EN 22768-1:1993, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1:1989)*

EN 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0)*

EN 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i" (IEC 60079-11)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

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 amplifiers (NAMUR) (IEC 60947-5-6)*

EN 62246-1, *Reed switches — Part 1: Generic specification (IEC 62246-1)*

EN ISO 5167-1:2003, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2003)*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms, definitions and symbols

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
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

It is designed to measure, memorize and display the volume of a fuel gas that has passed through it

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
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
operating 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

Note 1 to entry: 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

Note 1 to entry: 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:

$$Re = 0,353\ 7 \cdot \frac{Q}{D \cdot \nu}$$

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

Note 1 to entry: 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:

$$E = \frac{V_i \cdot V_c}{V_c} \cdot 100[\%]$$

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
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
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

3.1.15
class 1,0 meter
meter which has an error of indication between –2% an + 2% for flow rates Q where $Q_{min} < Q < Q_t$, -1 % and +1 % for flow rates Q where $Q_t < Q < Q_{max}$ and when the errors between Q_t and Q_{max} all have the same sign, they do all not exceed 0,5 %

3.1.16
Q_{min}
lowest flowrate at which the gas meter provides indications that satisfy the requirements regarding maximum permissible error (MPE)

3.1.17
Q_{max}
highest flowrate at which the gas meter provides indications that satisfy the requirements regarding MPE

3.1.18
Q_t
transitional flowrate, the 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'

Note to entry 1: Each zone has a characteristic MPE.

3.1.19
Q_r
overload flowrate, the highest flowrate at which the meter operates for a short period of time without deteriorating

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	-

Symbols	Represented quantity	Unit
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	1 500
420	2 500
NOTE 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 as class 1,0 with the 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		
	1:20	1:30	1:50			
	Q_{min} (m^3/h)			A	B	C
40	2	1,3	0,8	25		50
65	3	2	1,3		50	
100	5	3	2		50	80
160	8	5	3	50	80	100
250	13	8	5		80	100
400	20	13	8	80	100	150
650	32	20	13	100	150	
1 000	50	32	20		150	200
1 600	80	50	32	150	200	250
2 500	130	80	50	200	250	300
4 000	200	130	80	250	300	400
6 500	320	200	130	300	400	
10 000	500	320	200	400	500	
16 000	800	500	320	500	600	
25 000	1 300	800	500	600	750	

Q_{max} (m^3/h)	Rangeability				Nominal diameters DN		
		1:20	1:30	1:50			
		Q_{min} (m^3/h)					
					A	B	C
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 EN 22768-1:1993, “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.

4.5 Climatic environment

The climatic environment 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.