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Infrastruktura za plin - Merilni sistemi - Funkcionalne zahteve

Gas infrastructure - Gas measuring systems - Functional requirements

Gasinfrastruktur - Gasmesssysteme - Funktionale Anforderungen

Infrastructures gazières - Systèmes de mesure de gaz - Prescriptions fonctionnelles

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91.140.40	Sistemi za oskrbo s plinom	Gas supply systems

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Anforderungen

This European Standard was approved by CEN on 1 December 2025.

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European foreword

This document (EN 1776:2025) has been prepared by Technical Committee CEN/TC 234 “Gas infrastructure”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by June 2025, and conflicting national standards shall be withdrawn at the latest by June 2025.

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 1776:2015.

EN 1776:2025 includes significant technical changes with respect to EN 1776:2015, which are described in Table H.1 in Annex H.

This version of the document comprises a major revision of EN 1776:2015. The scope of the standard is expanded and now includes natural gas / hydrogen blends and hydrogen, as mentioned in CEN/TR 17797. For this purpose, the document has been amended.

This document has been prepared under a standardization request addressed to CEN by the European Commission.

This document has in part been developed in response to the work of the European Standards Organisations (CEN/CENELEC/ETSI) under the Commission Mandate M/441. The standard is applying in conjunction with CEN/CLC/ETSI TR 50572, *Functional Reference Architecture for Communications in Smart Metering Systems* and EN 16314, *Gas meters – Additional functionalities* (often referred to as a smart gas meter).

Directive 2009/73/EC concerning common rules for the internal market in natural gas and the related Regulation (EC) No 715/2009 on conditions for access to the natural gas transmission networks also aim at technical safety (security) including technical reliability of the European gas system. These aspects are also in the scope of CEN/TC 234 standardization. In this respect CEN/TC 234 evaluated the indicated EU legislation and amended this technical standard accordingly, where required and appropriate.

This document covers the environmental aspects relevant to the design, construction, operation, and maintenance and commissioning/decommissioning of gas measuring systems, where appropriate, in accordance with CEN Guide 4 and CEN/TR 16388.

In preparing this document, a basic understanding of gas infrastructure by the user has been assumed.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

EN 1776:2025**Introduction**

This document specifies different classes of measuring systems, each having their own specific requirements.

By nature, a measuring system is an aggregate of several components. In this document, it is assumed that each component is in full compliance with applicable CEN or ISO standards, if any.

This document allows the user to choose between different accuracy classes of measuring systems, the choice of which can be justified on economic grounds.

This document specifies common basic principles for gas infrastructure. Users of this document are expected to be aware that there can exist more detailed national standards and/or codes of practice in the CEN member countries.

This document is intended to be applied in association with these national standards and/or codes of practice setting out the basic principles as outlined in Clause 1 of this document.

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1 Scope

This document specifies functional requirements for the design, construction, testing, commissioning/decommissioning, operation, maintenance and, where appropriate, calibration, together with suitable documented provisions for all new gas measuring systems and any major changes of existing systems.

This document also specifies accuracy classes of measuring systems and thresholds applicable to these classes. Demonstration of compliance is achieved through the selection, installation and operation of appropriate measurement instruments, together with suitable documented provisions for calculations. Examples of demonstration of compliance are provided for each accuracy class; however, they are not prescriptive solutions.

This document is applicable for gases of the 2nd family as classified in EN 437. It is also applicable for treated non-conventional combustible gases complying with EN 437 and for which a detailed technical evaluation of the functional requirements (such as injected biomethane) is performed ensuring there are no other constituents or properties of the gases that can affect the metrological and physical integrity of the measuring systems. This version mentions technical topics to consider when hydrogen and natural gas / hydrogen blends flow through the measuring systems. Blends with a hydrogen content between 20mol% and 98 mol% are not considered by this standard. This document applies to hydrogen with a purity as specified in CEN/TS 17977 for rededicated natural gas systems.

This document can also be used as a guideline for measuring systems for other gases e.g. gaseous CO₂ for CCUS.

This document does not apply to for raw or sour gases.

This document does not apply to for gas measurement in CNG filling stations.

This document gives guidelines when designing, installing and operating gas meters with additional functionalities (smart gas meters).

Communication protocols and interfaces for gas meters and remote reading of gas meters are outside the scope of this document and are covered by the appropriate parts of the EN 13757 series, which provide a number of protocols for meter communications. Supervisory control and data acquisition protocols (SCADA) are also not covered by this document.

Unless otherwise specified all pressures used in this document are gauge pressures.

For associated pressure regulating systems the requirements of EN 12186 and/or EN 12279 apply.

For requirements on design, housing, lay-out, materials for components, construction, ventilation, venting and overall safety of gas measuring systems within the scope of this document, the EN 15001 series, EN 12186, EN 12279 and/or EN 1775 apply additionally, where relevant.

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.

NOTE There is assumption that any guidance within these standards will be updated to include hydrogen.

EN 1594, *Gas infrastructure - Pipelines for maximum operating pressure over 16 bar - Functional requirements*

EN 1775, *Gas supply - Gas pipework for buildings - Maximum operating pressure less than or equal to 5 bar - Functional recommendations*

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EN 12186, *Gas infrastructure - Gas pressure regulating stations for transmission and distribution - Functional requirements*

EN 12279, *Gas supply systems - Gas pressure regulating installations on service lines - Functional requirements*

EN 12327, *Gas infrastructure - Pressure testing, commissioning and decommissioning procedures - Functional requirements*

EN 12405 (all parts), *Gas meters — Conversion devices*

EN 15001-1, *Gas Infrastructure - Gas installation pipework with an operating pressure greater than 0,5 bar for industrial installations and greater than 5 bar for industrial and non-industrial installations - Part 1: Detailed functional requirements for design, materials, construction, inspection and testing*

EN 15001-2, *Gas supply systems - Gas installation pipework with an operating pressure greater than 0,5 bar for industrial installations and greater than 5 bar for industrial and non-industrial installations - Part 2: Detailed functional requirements for commissioning, operation and maintenance*

EN 16314, *Gas meters - Additional functionalities*

EN IEC 60079-10-1, *Explosive atmospheres - Part 10-1: Classification of areas - Explosive gas atmospheres (IEC 60079-10-1)*

EN 60079-14, *Explosive atmospheres - Part 14: Electrical installations design, selection and erection (IEC 60079-14)*

EN 60079-17, *Explosive atmospheres - Part 17: Electrical installations inspection and maintenance (IEC 60079-17)*

EN 61000 (all parts), *Electromagnetic compatibility (EMC) (IEC 61000 (all parts))*

EN ISO 5167-1, *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)*

EN ISO 5167-2, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates (ISO 5167-2)*

EN ISO 6141, *Gas analysis - Contents of certificates for calibration gas mixtures (ISO 6141:2015)*

EN ISO 6142-1, *Gas analysis - Preparation of calibration gas mixtures - Part 1: Gravimetric method for Class I mixtures (ISO 6142-1)*

EN ISO 6143, *Gas analysis - Comparison methods for determining and checking the composition of calibration gas mixtures (ISO 6143)*

EN ISO 6975, *Natural gas - Extended analysis - Gas-chromatographic method (ISO 6975)*

EN ISO 10715, *Natural gas - Gas sampling (ISO 10715)*

EN ISO 10723, *Natural gas - Performance evaluation for analytical systems (ISO 10723)*

EN ISO 12213-1, *Natural gas - Calculation of compression factor - Part 1: Introduction and guidelines (ISO 12213-1)*

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

EN ISO 15970, *Natural gas - Measurement of properties - Volumetric properties: density, pressure, temperature and compression factor (ISO 15970)*

EN ISO 20765-1, *Natural gas - Calculation of thermodynamic properties - Part 1: Gas phase properties for transmission and distribution applications (ISO 20765-1)*

EN ISO 20765-2, *Natural gas - Calculation of thermodynamic properties - Part 2: Single-phase properties (gas, liquid, and dense fluid) for extended ranges of application (ISO 20765-2)*

EN ISO 20765-5, *Natural gas - Calculation of thermodynamic properties - Part 5: Calculation of viscosity, Joule-Thomson coefficient, and isentropic exponent (ISO 20765-5)*

EN ISO 80079-36, *Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements (ISO 80079-36)*

ISO 2186, *Fluid flow in closed conduits — Connections for pressure signal transmissions between primary and secondary elements*

ISO 10790, *Measurement of fluid flow in closed conduits — Guidance to the selection, installation and use of Coriolis flowmeters (mass flow, density and volume flow measurements)*

ISO/IEC Guide 98-1, *Guide to the expression of uncertainty in measurement — Part 1: Introduction*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 98-3 Supplement 1, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995) — Supplement 1: Propagation of distributions using a Monte Carlo method)*

ISO/IEC Guide 98-3 Supplement 2, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995) — Supplement 2: Extension to any number of output quantities)*

ISO/IEC Guide 98-4, *Uncertainty of measurement — Part 4: Role of measurement uncertainty in conformity assessment*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

accuracy of measurement

closeness of the agreement between the result of a measurement and a true value of the measurand

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3.2

additional components

elements or devices, required to ensure correct measurement or intended to facilitate the measuring operations, or which could in anyway affect the measurement

EXAMPLE Additional components can be

- a) filter;
- b) flow conditioning device;
- c) branch or by-pass line;
- d) valves;
- e) pressure reduction devices located upstream or downstream of the meter;
- f) sampling systems;
- g) piping.

3.3

analyser

equipment which by means of any technology (chromatography, spectrometry, etc.) is able of measuring or calculating some chemical or physical properties of the gas (composition, wobbe index, purity, etc.)

3.4

authorized person

person who is appointed to fulfil a given task on gas measuring systems

3.5

availability

probability, at any time, that the measuring system, or a measuring instrument forming a part of the measuring system, is functioning according to specifications

3.6

bidirectional flow measurement

situation where a network can receive gas flow in one direction or the other

EXAMPLE For example, distribution networks that are interconnected and gas flow is transferred from one to the other as required.

3.7

base condition

specified condition to which the measured quantities of gas are converted

Note 1 to entry: Operating and base conditions relate to the volume of gas to be measured or indicated only and should not be confused with "rated operating conditions" and "reference conditions" which refer to influence quantities.

3.8

bias

systematic difference between the true value of measurand and its determined value

3.9 calorific value determination device CVDD

measuring instrument for obtaining the calorific value of gas. The CVDD can comprise multiple devices

3.10 class

accuracy class of measurement systems based on the maximum level of uncertainty of the system and its constituent elements

Note 1 to entry: Accuracy classes can be A, B, C or D.

Note 2 to entry: Each class has an uncertainty and elements, see point 5.2 where the classes and the elements of the measurement system are defined.

3.11 competent person

person who is qualified, trained and experienced to perform activities to gas measuring systems

3.12 compression factor Z

ratio of the volume of an arbitrary mass of gas, at a specified pressure and temperature to the volume of the same mass of gas under the same conditions as calculated from the ideal-gas law

Note 1 to entry: The compression factor (Z) indicates the extent to which gas deviates from ideal gas behaviour.

3.13 conversion device

device that converts a quantity at metering conditions to a quantity to base conditions or energy

3.13.1 energy conversion device

device which calculates, integrates and displays energy using quantity at base conditions and the calorific value and/or the gas composition

3.13.2 volume conversion device

device that converts the quantity measured at measuring conditions into a quantity at base conditions

3.14 custody transfer

change in responsibility for the conveyance of gas, this can or cannot involve a change of ownership of the gas

3.15 documented provision

provision established by the operator of a gas measuring system in order to give confidence that operations are performed according to metrological expectations

3.16 drift

slow change of a metrological characteristic of a measuring instrument