SLOVENSKI STANDARD
SIST EN 1594:2000

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Sistemi oskrbe s plinom - Cevovodni sistemi za najvišji delovni tlak nad 16 bar - Funkcionalne zahteve

Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements

Gasversorgungssysteme - Rohrleitungen für einen maximal zulässigen Betriebsdruck über 16 bar - Funktionale Anforderungen

Systemes d'alimentation en gaz - Canalisations pour pression maximale de service supérieure a 16 bar - Prescriptions fonctionnelles

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Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements

Systèmes d'alimentation en gaz - Canalisations pour pression maximale de service supérieure à 16 bar - Prescriptions fonctionnelles

Gasversorgungssysteme - Rohrleitungen für einen maximal zulässigen Betriebsdruck über 16 bar - Funktionale Anforderungen

This European Standard was approved by CEN on 21 October 1999.

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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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 234 "Gas supply", 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of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

There is a complete suite of functional standards prepared by CEN/TC 234 "Gas Supply" to cover all parts of the gas supply system from the input of gas to the transmission system up to the inlet connection of the gas appliances, whether for domestic, commercial or industrial purposes.

A list of the relevant functional standards prepared by CEN/TC 234 is included in clause 2 and Annex A to this document.

CEN/TC 234 will continue its work updating this standard to the latest developments at regular intervals.

In preparing this standard a basic understanding of gas supply by the user has been assumed.

Gas supply systems are complex and the importance on safety of their construction and use has led to the development of very detailed codes of practice and operating manuals in the member countries. These detailed statements embrace recognised standards of gas engineering and the specific requirements imposed by the legal structures of the member countries.

This European Standard has been prepared under mandate M/017 given to CEN by the Commission of the European Communities and the European Free Trade Association.

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.

Introduction

This European Standard describes the general functional requirements for gas supply through pipe systems and covers the pressure range greater than 16 bar maximum operating pressure (MOP) for steel systems. It gives normative and informative references for safe and secure gas supply systems. It applies to their design, construction, operation and the related aspects of safety, environment and public health, all in order to provide a safe and secure supply of gas.

The requirements of this standard are based on safe gas engineering practice under conditions normally encountered in the gas industry. Requirements for all unusual conditions cannot be specifically provided for, nor are all engineering and construction details prescribed.

Existing industrial safety regulations applying to work areas, safety devices, and safe work practices are not intended to be supplanted by this standard.

Managers with responsibilities for the design, construction and operation of gas supply systems should have regard to the guidance given in this document and to other relevant standards. It is the responsibility of these managers and engineers to apply these functional requirements, supplemented with other proven good practice to the particular circumstances of each gas supply system.

The designer, constructor or operator of pipeline systems is cautioned that this standard is not a design handbook or code of practice. Additional national or company standards describing the details are needed. These detailed standards should be in line with the basic principles of this standard.

In preparing the standard it was recognized that the suite of relevant European standards is incomplete. Reference may be made where appropriate to international, national or other standards until relevant European standards are available.

1 Scope

This European Standard is applicable to pipelines with a maximum operating pressure (MOP) over 16 bar for the carriage of processed, non-toxic and non-corrosive natural gas according to ISO 13686 in onland gas supply systems, where:

- the pipeline elements are made of unalloyed or low-alloyed carbon steel;
- the pipeline elements are joined by welds, flanges or mechanical couplings;
- the pipeline is not located within commercial or industrial premises as an integral part of the industrial process on these premises except for any pipelines and facilities supplying such premises;
- the design temperature of the system is between -40 °C and 120 °C inclusive.

This European Standard does not apply to existing pipelines, in use prior to the publication of this standard, nor to modifications to existing pipelines.

Gas supply systems covered by this standard begin after the gas producer's metering station. The functional demarcation of the pipeline system within a plant area will be determined from case to case. Generally speaking, this will be directly after the first isolating valve of the installation.

This standard also describes the mechanical requirements for pipework in stations with a maximum operating pressure greater than 16 bar. Welding requirements are described in a special application standard on welding for gas supply systems EN 12732. Functional requirements for stations are given in:

EN 1776, *Gas supply systems - Natural gas measuring stations - Functional requirements*

EN 1918-5, *Gas supply systems - Underground gas storage - Part 5: Functional recommendations for surface facilities*

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

EN 12583, *Gas supply systems - Compressor stations - Functional requirements*

This European Standard specifies common basic principles for gas supply systems. Users of this European Standard should be aware that there may exist more detailed national standards and codes of practice in the CEN member countries.

This European Standard is intended to be applied in association with these national standards and/or codes of practice setting out the above mentioned principles.

In the event of conflicts in terms of more restrictive requirements in the national legislation/regulation with the requirements of this standard, the national legislation/regulation shall take precedence.

Reference is made in this standard to relevant European and other recognized standards for products used to construct and operate gas supply systems.

A schematic representation of pipelines for gas transmission is given in Figure 1.

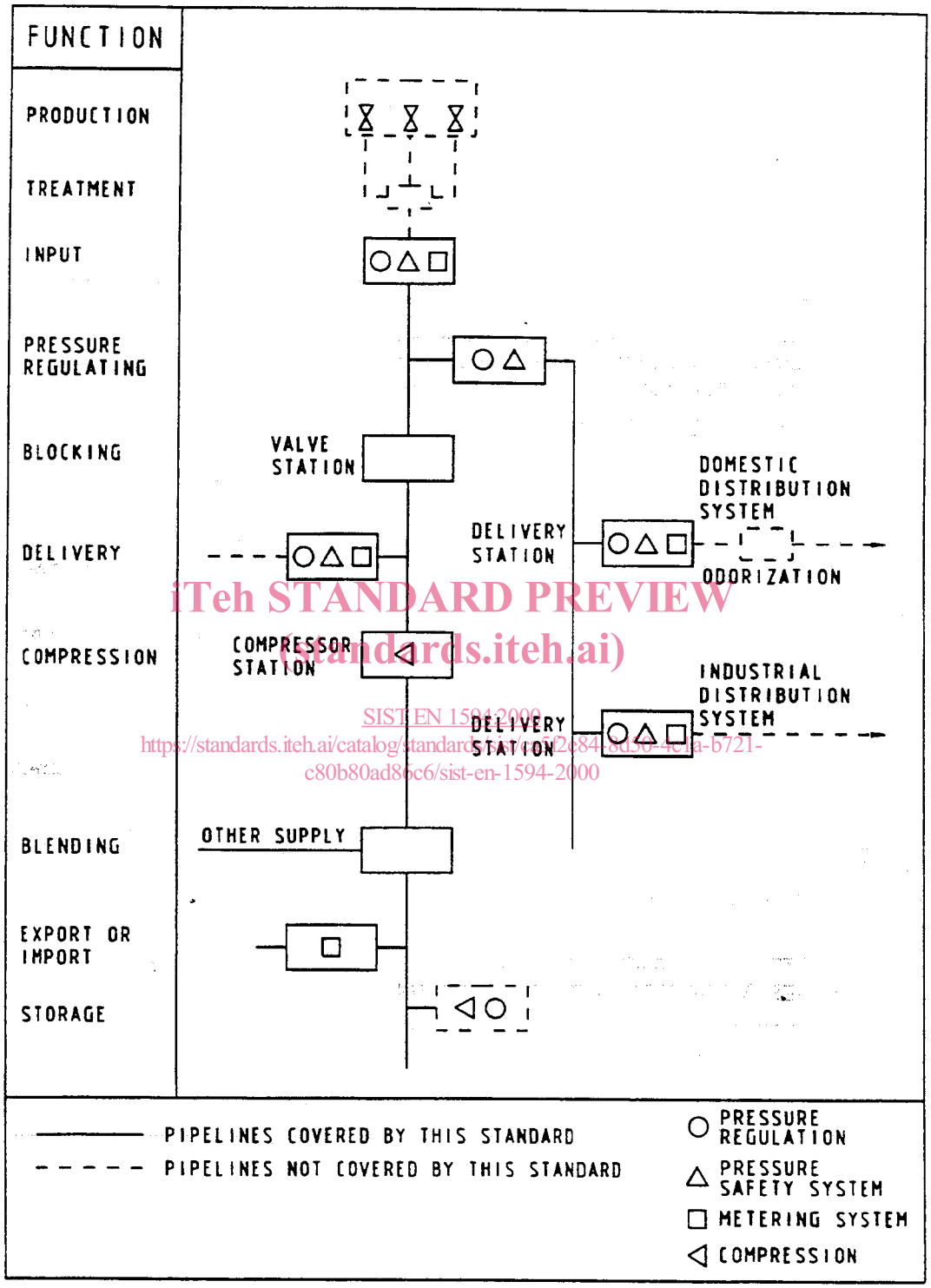

Figure 1 - Schematic representation of pipelines for gas supply over 16 bar

2 Normative references

This European Standard incorporates by dated or undated reference, 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 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test*

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

EN 10208-2, *Steel pipes for pipelines for combustible fluids - Technical delivery conditions - Part 2: Pipes of requirement class B*

prEN 10216-1, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 1: Non-alloy steel tubes with specified room temperature properties*

prEN 10216-2, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties*

prEN 10216-3, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 3: Non-alloy and alloy fine grain steel tubes*

prEN 10216-4, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 4: Non-alloy and alloy steel tubes with specified low temperature properties*

prEN 10217-1, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 1: Non-alloy steel tubes with specified room temperature properties*

prEN 10217-2, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties*

prEN 10217-3, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 3: Non-alloy and alloy fine grain steel tubes*

prEN 10217-4, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 4: Electric welded non-alloy and alloy steel tubes with specified low temperature properties*

prEN 10217-5, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties*

prEN 10217-6, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 6: Submerged arc non-alloy and alloy steel tubes with specified low temperature properties*

prEN 10285, *Steel tubes and fittings for on and offshore pipelines - External three layer extruded polyethylene based coatings*

prEN 10286, *Steel tubes and fittings for on and offshore pipelines - External three layer extruded polypropylene based coatings*

prEN 10287, *Steel tubes and fittings for on and offshore pipelines - External fused polyethylene based coatings*

prEN 10288, *Steel tubes and fittings for on and offshore pipelines - External two layer extruded polyethylene based coatings*

prEN 10289, *Steel tubes and fittings for on and offshore pipelines - External liquid applied epoxy and epoxy-modified coatings*

prEN 10290, *Steel tubes and fittings for on and offshore pipelines - External liquid applied polyurethane and polyurethane-modified coatings*

EN 12007-1, *Gas supply systems - Pipelines for maximum operating pressure up to and including 16 bar - Part 1: General functional recommendations*

EN 12007-3, *Gas supply systems - Pipelines for maximum operating pressure up to and including 16 bar - Part 3: Specific functional recommendations for steel*

EN 12068, *Cathodic protection - External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection - Tapes and shrinkable materials*

EN 12186, *Gas pressure regulating stations for transmission and distribution*

EN 12327, *Pressure testing, commissioning and decommissioning procedures for gas supply systems*

EN 12583, *Gas supply systems - Compressor stations - Functional requirements*

prEN 12560-1, *Flanges and their joints - Dimensions of gaskets for Class-designated flanges - Part 1: Non-metallic flat gaskets with or without inserts*

prEN 12560-2, *Flanges and their joints - Dimensions of gaskets for Class-designated flanges - Part 2: Spiral wound gaskets for use with steel flanges*

prEN 12560-3, *Flanges and their joints - Dimensions of gaskets for Class-designated flanges - Part 3: Non-metallic PTFE envelope gaskets*

prEN 12560-4, *Flanges and their joints - Dimensions of gaskets for Class-designated flanges - Part 4: Corrugated flat or grooved metallic and filled metallic gaskets for use with steel flanges*

EN 12732, *Gas supply systems - Welding steel pipework - Functional requirements*

EN 45004, *General criteria for the operation of various types of bodies performing inspection*

EN 45011, *General requirements for bodies operating product certification systems (ISO/IEC Guide 65:1996)*

3 Definitions, symbols and abbreviations

For the purposes of this standard, the following definitions apply. Symbols used in formulae are defined where they occur.

3.1
commissioning
the activities required to pressurize pipework, stations, equipment and assemblies with gas and to put them into operation.

3.2
control zone
the strip of land over which the pipeline operator has a right to control activities.

3.3
decommissioning
the activities required to take out of service any pipework, station, equipment or assemblies filled with gas and to disconnect them from the system.

3.4
design factor
f_o
a factor applied when calculating the wall thickness or pressure.

3.5
design pressure
DP
the pressure on which design calculations are based.

3.6
design temperature
the temperature on which design calculations are based.

3.7
emergency
a situation which could affect the safe operation of the gas supply system and/or the safety of the surrounding area, requiring urgent action.

3.8
gas
the gaseous fuel which is in gaseous state at a temperature of 15°C under atmospheric pressure (1,013 25 bar absolute).

3.9
gas distribution system
the pipeline system including piping above and below ground and all other equipment necessary to supply the gas to the consumers.

3.10
gas distributor
the private or public organization authorized to distribute gas to consumers through a gas distribution system.

3.11
gas transmission
the activity intended to convey gas from one place to another through pipelines in order to supply gas to distribution systems or to industrial consumers.

3.12
incident
an unexpected occurrence, which could lead to an emergency situation.

This includes a leakage of gas or plant failure.

3.13
incidental pressure
IP
the pressure which occurs incidentally within a system at which a safety device becomes operative.

3.14
inspection

the process of measuring, examining, testing, gauging or otherwise determining the status of items of the pipeline system or installation and comparing it with the applicable requirements.

3.15
installation

equipment and facilities for the extraction, production, chemical treatment, measurement, control, storage or offtake of the transported gas.

3.16
installation temperature
the temperature arising from ambient or installation conditions during laying or during construction.

3.17
maintenance
the combination of all technical and associated administrative actions intended to keep an item in, or restore it to, a state in which it can perform its required function.

3.18
maximum incidental pressure
MIP
the maximum pressure which a gas system can experience during a short time, limited by the safety devices.

3.19
maximum operating pressure
MOP
the maximum pressure at which a system can be operated continuously under normal conditions.

NOTE Normal conditions are: no fault in any device or stream.

3.20
national requirements
requirements following from national legislation or more detailed or stringent national standards.

3.21
onshore pipeline
a buried and/or above ground pipeline including those sections laid in or across inland lakes or water courses.

3.22
operating pressure
OP
the pressure which occurs within a system under normal operating conditions.

3.23
operating temperature
OT
the temperature which occurs within a system under normal operating conditions.

3.24
pig
a device which is driven through a pipeline by the flow of fluid, for performing various internal activities (depending on pig type), such as separating fluids, cleaning or inspecting the pipeline.

3.25
pipeline
a system of pipework with all associated equipment and stations up to the point of delivery. This pipework is mainly below ground but also includes above ground parts.

3.26
pipeline components
the elements from which the pipeline is constructed. The following are distinct pipeline elements:

– pipe including cold-formed bends;

– fittings;

EXAMPLE 1 Reducers, tees, factory-made elbows and bends, flanges, caps, welding stubs, mechanical joints.

- fabrications, manufactured from the elements referred to above;

EXAMPLE 2 Manifolds, slug catchers, pig launching/receiving stations, metering and control runs.

- equipment;

EXAMPLE 3 Valves, expansion joints, insulation joints, pressure regulators, pumps, compressors.

- pressure vessels.

3.27
pipeline operator
the private or public organization authorized to design, construct and/or operate and maintain the gas supply system.

3.28
pipework
an assembly of pipes and fittings.

3.29
point of delivery
the point of transfer of ownership of gas from supplier to the customer.

NOTEThis can be at a valve or at the meter outlet connection.

3.30
precommissioning
a series of activities, including cleaning and possible drying, executed prior to pipeline commissioning.

3.31
pressure
the gauge pressure of the fluid inside the system, measured in static conditions.

3.32
pressure control system
a combined system including pressure regulating, pressure safety and eventually pressure recording and alarm systems.

3.33
pressure regulating system
the system which ensures that a pressure is maintained at the outlet system within required limits.

3.34
pressure safety system
a system which, independent of the pressure regulating system, ensures that the outlet pressure of the regulator does not exceed the preset value.

3.35
recommissioning
the activities required to put a decommissioned pipeline, associated stations and equipment into service again.

3.36
special crossing
a point at which the pipeline has to pass a special feature.

EXAMPLE Major road, railway, river, canal, dyke.

3.37
station
a plant or facility for the operation and/or processing of gas supply systems.

3.38
strength test
a specific procedure to verify that the pipework and/or station meets the requirements for mechanical strength.

3.39
strength test pressure
STP
the pressure applied to a system during strength testing.

3.40
test pressure
TP
the pressure to which the gas supply system is subjected to ensure that it can operate safely.

3.41
tightness test
a specific procedure to verify that the pipework and/or station meets the requirements for leak tightness.

3.42
tightness test pressure
The pressure applied to a system during tightness testing.

3.43
volume under normal conditions
a quantity of gas which in the dry state occupies a volume of 1 m^3 at atmospheric pressure (1,013 25 bar absolute) at a temperature of 0°C.

3.44
volume under standard conditions
a quantity of gas which in the dry state occupies a volume of 1 m^3 at atmospheric pressure (1,013 25 bar absolute) at a temperature of 15°C.

4 Quality system

The life of a pipeline for transmission of gas can be divided into three phases:

- the design;
- the construction and testing;
- the operation and maintenance.

A quality system should be applied to the design, construction, testing, operation and maintenance activities in accordance with this Standard.

Reference may be made to the EN ISO 9000 series of standards or to equivalent quality assurance systems.

After the pipeline has been commissioned, the integrity should be maintained by a precisely defined programme of operation, maintenance and condition monitoring (a pipeline integrity management system).

Competent personnel capable of assessing the quality of the work within the scope of this standard, shall be employed for in all activities in the design, construction, testing and operating phases.

5 Safety and the environment

5.1 Introduction

Various safety measures are required to ensure a safe pipeline. Measures that are appropriate to the specific circumstances shall be adopted.

5.2 Appropriate safety measures

Possible measures to ensure safety in design, construction and operation are listed below. The list is not intended to be exhaustive nor will it be necessary to incorporate all the measures on each occasion.

When selecting measures, consideration shall be given to the safety and environmental conditions existing at the time of construction for which firm details are known:

- A control zone should be established to control all third-party activities in order to safeguard the pipeline against interference.
- If a system of area classification is used, design factors should be chosen relevant to the classification levels.

  This design factor may be increased if additional measures are taken against third-party interference (for limitation on the design factor reference is made to 7.2).
- The route of the pipeline should be at an appropriate distance from buildings. The distance should be fixed by the particular parameters and/or national requirements.
- For high-strength pipe steels, appropriate toughness properties for fracture-arrest capability should be selected.
- The minimum depth for the pipeline shall be greater than that of normal agricultural/horticultural activities expected in the area. The probability of third-party interference to the pipeline will decrease if a depth greater than the minimum specified in 7.7 is adopted.
- Additional forms of mechanical protection can reduce interference by third-party activity. Designers shall carefully select the forms of the additional protection to minimize any adverse effects on the efficiency of the cathodic protection.
- The route of the pipeline should be identified by a locating system such as markers.
- Pipeline safety can further be increased by ensuring an adequate frequency of surveillance.