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Gas infrastructure — Gas pressure regulating stations for transmission and distribution — Functional requirements

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National foreword

This British Standard is the UK implementation of EN 12186:2014. It supersedes BS EN 12186:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/33, Gas supply.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Contents

Page

Foreword

This document (EN 12186:2014) 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of an identical text or by endorsement, at the latest by April 2015 and conflicting national standards shall be withdrawn at the latest by April 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12186:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

Annex B provides details of significant technical changes between this European Standard and the previous edition.

There is a complete suite of functional standards prepared by CEN/TC 234 "Gas Infrastructure" to cover all parts of the gas infrastructure from the input of gas into the on-shore transmission network up to the inlet connection of gas appliances, including transmission, distribution, storage, compression, pressure regulation and metering, installation, injection of non-conventional gases, gas quality issues and others. In preparing this European Standard, a basic understanding of gas infrastructure by the user has been assumed.

The gas infrastructure is complex and the importance on safety of its 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 recognized standards of gas engineering and the specific requirements imposed by the legal structures of the member countries.

As gas pressure regulating stations for transmission and distribution are specifically designed for pipelines, they are considered as annexed equipment, and as such are excluded from the scope of the Directive 97/23/EC (Pressure Equipment Directive – PED [11]). However, standard pressure equipment installed in these stations, e.g. gas pressure regulators, safety valves, valves, filters, heat exchangers, vessels, is covered by the directive [15].

Directive 2009/73/EC [13] concerning common rules for the internal market in natural gas and the related Regulation (EC) No 715/2009 [14] 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.

In this edition of EN 12186 environmental aspects relevant to the design, construction and testing, operation and maintenance, decommissioning and disposal of gas pressure regulating stations are covered in accordance with CEN Guide 4 and CEN/TR 16388.

This European Standard specifies common basic principles for the gas infrastructure. Users of this European Standard should be aware that more detailed national standards and/or codes of practice can exist 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 basic principles as outlined in Clause 1 of this European Standard.

In the event of conflicts in terms of more restrictive requirements in national legislation/regulation with the requirements of this standard, the national legislation/regulation takes precedence as illustrated in CEN/TR 13737-1 and CEN/TR 13737-2. CEN/TR 13737 gives:

— clarification of all legislations/regulations applicable in a member state;

— if appropriate, more restrictive national requirements;

— a national contact point for the latest information.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard contains the relevant functional requirements for gas pressure regulating stations, which form part of gas transmission or distribution systems. It is applicable to the design, materials, construction, testing, operation and maintenance of gas pressure regulating stations.

This European Standard does not apply to gas pressure regulating stations commissioned prior to the publication of this standard.

The stations covered by this European Standard have a maximum upstream operating pressure which does not exceed 100 bar. For higher maximum upstream operating pressures this standard should be used as a guideline.

If the inlet pipework of the station is a service line and the maximum upstream operating pressure does not exceed 16 bar and the design flow rate is equal to or less than 200 m^3/h under normal conditions, EN 12279 applies.

Basic system requirements for gas pressure regulating stations are contained in this European Standard. Requirements for individual components (valves, regulators, safety devices, pipes, etc.) or installation of the components are contained in the appropriate European Standards.

NOTE For combined regulating and measuring stations, the additional requirements of EN 1776 can apply.

The requirements in this European Standard do not apply to the design and construction of auxiliary facilities such as sampling, calorimetering, odorization systems and density measuring. These facilities are covered by the appropriate European Standards, where existing, or other relevant standards.

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

The requirements in this European Standard are based on the physical and chemical data of gaseous fuels – including non-conventional gases – in accordance with Table 1 of EN 437:2003+A1:2009 for first and second family gases. Additional requirements in the case of gaseous fuels heavier than air and/or sour gases are not covered by this European Standard.

The objective of this European Standard is to ensure the safe operation of such stations. This does not, however, relieve all concerned of the responsibility for taking the necessary care and applying effective quality management during the design, construction and operation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 334, *Gas pressure regulators for inlet pressures up to 100 bar*

EN 437:2003+A1:2009, *Test gases - Test pressures - Appliance categories*

EN 1127-1, *Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology*

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*

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

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

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

EN 12732, *Gas infrastructure - Welding steel pipework - Functional requirements*

EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres - Part 1: Basic method and requirements*

EN 14382, *Safety devices for gas pressure regulating stations and installations - Gas safety shut-off devices for inlet pressures up to 100 bar*

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 16348, *Gas infrastructure - Safety Management System (SMS) for gas transmission infrastructure and Pipeline Integrity Management System (PIMS) for gas transmission pipelines - Functional requirements*

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

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

EN 62305-1, *Protection against lightning - Part 1: General principles*

EN 62305-2, *Protection against lightning - Part 2: Risk management*

EN 62305-3, *Protection against lightning - Part 3: Physical damage to structures and life hazard*

EN 62305-4, *Protection against lightning - Part 4: Electrical and electronic systems within structures*

CEN/TS 15399, *Gas Supply Systems - Guidelines for Management systems for Gas Distribution Network*

3 Terms, definitions, symbols and abbreviations

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

3.1 General

3.1.1
authorized person
competent person who is appointed to fulfil a given task on gas pressure regulating stations

Note 1 to entry: The appointment procedure is defined in each member country.

3.1.2
competent person
person who is trained, experienced and approved to perform activities relating to gas pressure regulating stations

Note 1 to entry: Means of approval, if any, will be determined within each member country.

3.1.3
gas
gaseous fuel, which is in a gaseous state at a temperature of 15 °C and under atmospheric pressure (1,013 25 bar absolute)

3.1.4
volume under normal conditions
quantity of gas which in a dry state occupies a volume of 1 m^3 at a pressure of 1,013 25 bar absolute and at a temperature of 0 °C

3.1.5
hazardous area
area in which an explosive or flammable gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment

[SOURCE: EN 60079-10-1:2009]

3.1.6
hazardous area zones
hazardous areas are classified into zones based upon the frequency of the occurrence and the duration of an explosive gas atmosphere

[SOURCE: EN 60079-10-1:2009]

3.2 Station

3.2.1
cavity wall
wall formed from two layers such as brick or blockwork with a space between

3.2.2
enclosed installation
plant installed in an enclosed space (apart from any necessary ventilation apertures)

3.2.3
open-air installation
plant installed in the open air, which may or may not be protected by a canopy

3.2.4
separate building
building which is detached from any other building and is used exclusively for the enclosed installation of gas pressure regulating and/or measuring equipment and ancillaries and can be accessed by personnel

3.2.5
cabinet station
enclosed space (apart from any necessary ventilation apertures), which is used exclusively to house gas pressure regulating and/or measuring equipment and ancillaries and is too small for access by personnel

3.2.6
underground station
space, partly or totally below ground level in which the gas pressure regulating and/or measuring equipment and ancillaries are installed

3.2.7
component
any item from which a gas pressure regulating station is constructed

Note 1 to entry: A distinction is drawn between the following groups of components:

– equipment – e.g. valves, meters, preheaters, line filters, safety shut-off devices and pressure regulators which are used to control the flow of gas in and out of the station;

– pipework – e.g. pipe, reducers, bends, tees and insulating joints which are used to connect the equipment;

– ancillaries – additional devices and instrumentation which ensure that the equipment functions correctly.

3.2.8
inlet pipework
connecting pipework through which gas enters the station

3.2.9
main
pipework in the gas infrastructure to which service lines are connected

3.2.10
outlet pipework
connecting pipework through which gas leaves the station

3.2.11
pressure regulating station
installation comprising all the equipment including the inlet and outlet pipework as far as the isolating valves and any structure within which the equipment is housed, used for gas pressure regulation and over-pressure protection

3.2.12
service line
pipework from the main to the point of delivery of the gas into the installation pipework

3.2.13
standard pressure equipment
equipment covered by Directive 97/23/EC (Pressure Equipment Directive - PED)

EXAMPLE Gas pressure regulators, safety valves, valves, filters, heat exchangers, vessels.

Note 1 to entry: See Article 1 No. 3.1 of Directive 97/23/EC and Guideline 1/17 of the Commission's Working Group "Pressure" [15].

3.2.14
commissioning
activities required to fill pipework, equipment and assemblies with gas for the first time and to perform test runs to check the system's integrity

3.2.15
decommissioning
activities required to take out of service any pipework, station, equipment or assemblies filled with gas and to disconnect them from the system

3.2.16
inspection
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

3.2.17
maintenance
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

Note 1 to entry: Maintenance includes surveillance, inspection, function check-out, overhaul and repair.

Note 2 to entry: For further terms and definitions related to maintenance, see EN 13306.

3.2.18
disposal
activities to be performed after components of a decommissioned gas pressure regulating station have been dismantled

3.3 Pressure, design and testing

3.3.1
design factor
f_o
factor applied when calculating the wall thickness or design pressure

3.3.2
design flow rate
flow rate on which the design calculations are based

3.3.3
design pressure
DP
pressure on which design calculations are based

Note 1 to entry: A part of a pressure regulating station designed for a design pressure DP can comprise components designed for a different maximum allowable pressure (PS).

3.3.4
pressure
gauge pressure of the fluid inside the system, measured in static conditions

3.3.5
operating pressure
OP
pressure which occurs within a system under normal operating conditions

3.3.6
maximum operating pressure
MOP
maximum pressure at which a system can be operated continuously under normal operating conditions

Note 1 to entry: Normal operating conditions are: no fault in any device or stream.

3.3.7
temporary operating pressure
TOP
pressure at which a system can be operated temporarily under control of regulating devices

3.3.8
maximum incidental pressure
MIP
maximum pressure which a system can experience during a short time, limited by the safety devices

3.3.9
maximum allowable pressure
PS
maximum pressure for which the equipment is designed, as specified by the manufacturer

Note 1 to entry: Definition and requirements according Directive 97/23/EC [11].

3.3.10
strength test
specific procedure to verify that the pipework and/or station meets the requirements for mechanical strength

3.3.11
tightness test
specific procedure to verify that the pipework and/or station meets the requirements for tightness

3.3.12
combined test
specific procedure to verify that the pipework and/or station meets the requirements for mechanical strength and tightness

3.3.13
test pressure
TP
pressure at which pressure tests are conducted

3.3.14
strength test pressure
STP
pressure applied to a system during strength testing

3.3.15
combined test pressure
CTP
pressure applied to a system during combined testing, i.e. tightness and strength testing

3.4 Pressure control

3.4.1
alarm
signal of a situation in which manual intervention may be needed or in which the system itself may perform a safety action

3.4.2
direct-acting
requiring no auxiliary power for operation

3.4.3
indirect-acting
requiring auxiliary power for operation

3.4.4
instrumentation
any system or combination of equipment for measurement and control

3.4.5
instrumentation pipework
pipework required for the proper functioning of the pressure control equipment installed within the pressure regulating station

EXAMPLE Sensing, auxiliary and sampling lines.

3.4.6
monitor
second regulator used as a safety device in series with the active regulator which assumes control of the pressure at a higher set value in the event of the active regulator failing open

3.4.7
safety slam-shut device
device designed to quickly shut off the gas flow in the event of an unacceptable pressure being detected within the system it protects

3.4.8
safety cut-off device
device designed to shut off the gas flow which responds slower dynamically than a slam shut device in the event of an unacceptable pressure being detected within the system it protects

3.4.9
safety relief device
device designed to release gas in the event of an unacceptable pressure being detected within the system it protects

3.4.10
pressure regulating system
system which ensures that a pressure is maintained in the outlet system within required limits

3.4.11
pressure safety system
system which, independent of the pressure regulating system, ensures that the outlet pressure of that system does not exceed the safety limits

3.4.12
pressure alarm system
system which alerts the operator in the case of an undesired pressure

3.4.13
pressure control system
combined system including pressure regulating, pressure safety and possibly pressure recording and alarm systems

3.5 Continuity of supply

3.5.1
station availability
ability to be in a state to perform as and when required under given conditions, assuming that the required external resources are provided

[SOURCE: EN 13306:2010, modified]

3.5.2
component reliability
ability of a component to perform a required function under given conditions for a given time interval

[SOURCE: EN 13306:2010, modified]

4 Quality and management system

The life of a pressure regulating station can be divided into four phases:

— the design;

— the construction and testing;

— the operation and maintenance;

— decommissioning and disposal.

A quality and management system shall be applied in accordance with this European Standard, which includes these four phases. Reference shall be made to EN 16348, CEN/TS 15399 or the EN ISO 9001 or equivalent quality system standards.

Standardized safety design rules on pressure regulation stations shall be incorporated and documented in the quality or management system.

5 Environmental impact

It should be verified if the site is a protected area in terms of noise, ground water, proximity of dwellings and other relevant aspects specific to minimizing the impact on the surroundings.

The compatibility of the materials should be considered to minimize the environmental impact of the building.

Particular measures are to be taken to minimize emissions to air at the commissioning stage and during maintenance/repair operations. Furthermore, the gas used for purging (air, nitrogen or other) should be chosen with regard to the possible impact around the site.

At the stage of planning and designing adequate procedure for assembling/commissioning/decommissioning should be foreseen for a proper waste disposal, taking into account the different materials (e.g. lubrication, electrical elements).

Waste materials (e.g. used oil, filter cartridges, liquids from drains, chemical waste, packing materials, etc.) shall be separated in accordance with relevant legislation and be disposed of by certified waste disposal companies or organizations). Information from the manufacturers dealing with the disposal of replaceable parts shall be taken into account.

6 Layout of the gas pressure regulating station

6.1 General

Gas pressure regulating stations shall be designed, constructed, located, operated and maintained taking into consideration the safety and environmental requirements of the applicable regulations.

During the early planning stage of the station, careful consideration shall also be given to the layout of the site, the need for security of the site and the possible housing of the installation.

Locations susceptible to impact damage should be avoided or suitable precautions against impact damage shall be taken.

6.2 Layout of the site

The area of the site shall be adequate to accommodate the equipment and provide access for maintenance purposes and/or the location of emergency material with consideration of safety distance required by regulations.

An access with a hard surface should be provided up to and within the site to accommodate maintenance and emergency service vehicles.

Consideration shall be given to emergency exits and where appropriate they shall be installed.

The extent of hazardous areas shall be determined according to 8.7 and be taken into account when fixing the site boundary.

6.3 Site security

Gas pressure regulating stations shall be secured against entry by unauthorized persons.

If a site security fence is used, equipment shall be sited at a sufficient distance from the fence to prevent interference from outside.

Consideration should be given to the provision, wherever possible, of locking devices for valves, including auxiliary valves located external to a housing.

In an area which is susceptible to a higher risk of interference, consideration shall be given to an appropriate level of security inspection visits to the station or intruder detection devices.

Prominent signs prohibiting smoking and other ignition sources shall be displayed. Hazardous areas shall be marked at the entries according national regulations.

Signs showing an emergency telephone number should be clearly displayed.

7 Housings

7.1 General

The pressure regulating and/or safety system or parts of it may be installed in the open air, under a canopy or in an enclosed space. Enclosed installations are divided into the following categories:

— separate building;

— cabinet station;

— part of/or inside another building;

— underground station.

The maximum upstream operating pressure (MOP_u) of gas pressure regulating stations installed as part of, or inside another building owned by a third party should not exceed 5 bar. A higher MOP_u is acceptable if the station is installed as part of an industrial or equivalent building and operations are carried out by competent persons. For MOP_u higher than 5 bar an isolated space shall be used.

For the housing requirements for gas pressure regulating stations located on service lines as part of or inside another building with a design flow rate equal to or less than 650m^3/h under normal conditions and a MOP_u equal to or less than 5 bar EN 12279 may be applied.

7.2 Requirements for housings

7.2.1 Partition walls and ducts for pipe, cable and wiring shall be designed in such a way that leakage of gas does not lead to a hazard.

7.2.2 In buildings on land open to the public, no windows shall be located in the outside walls of the gas pressure regulating station. Glass blocks in the walls may be used.

7.2.3 The roof shall not enclose any dead spaces. The roof covering should consist of fire-resistant material. The roof may form part of an explosion relief system.

7.2.4 Cavity walls should not be used.

If cavity walls are used, the cavities in walls of the gas pressure regulating station shall be ventilated to outside through apertures. The cavity shall be vented separately from the installation space. The ventilation apertures shall be positioned in the outer layer close to the ground and the roof and shall be equally spaced around the walls.

7.2.5 The gas pressure regulating space shall not be directly connected to a sewer.

7.2.6 The space in which the gas pressure regulating equipment is installed shall be ventilated directly to atmosphere by means of apertures. These apertures, which may be ventilation ducts, shall be distributed as equally as possible between high and low level over the length of the walls and/or the roof and positioned to provide effective ventilation of the entire space.

Special consideration shall be given to the position of ventilation apertures when cavity walls are used.

The combined free area of the ventilation apertures shall be at least 1 % of the floor area. If vent lines, as described in 8.6.1 are installed, the ventilation may be reduced to 0,5 % of the floor area.

When special conditions can interfere with the proper functioning of the equipment, the free ventilation area may be reduced provided it is verified that the ventilation remains adequate.

The ventilation apertures shall be protected so that materials and objects cannot be inserted and the apertures cannot be blocked. The combined open area of the protected apertures shall not be less than the prescribed minimum ventilation area.

If the space in which the gas pressure regulating equipment is installed is classified as a hazardous area zone an appropriate hazardous area zone outside of ventilation apertures should be considered according to 8.7.

The ventilation of the space which houses the heating installation shall satisfy the combustion appliance requirements.

7.2.7 The access doors of spaces housing gas pressure regulating equipment shall be provided with locks. The doors shall open outwards and it shall be possible to fix them in an open position. In the case of accessible spaces, it shall be possible to open the doors from the inside without a key. Exit routes to the outside of the housing and/or fencing shall be free at all times. There shall be no apertures to other closed spaces.

Doors and ventilation apertures shall be located at a safe distance from windows, doors or apertures of other buildings.

Hazardous areas shall not have any direct connection to rooms with ignition sources, e.g. by doors.

7.2.8 For stations accessible by persons, the floors of the spaces within a hazardous area shall be covered with astatic dissipative and spark inhibiting material.

NOTE A floor can be considered as static dissipative if its electrical resistance – determined according EN 1081 – is less than 10^8 Ohm.

7.2.9 Heating in hazardous areas shall be in accordance with EN 1127-1.

7.2.10 Smoking and other ignition sources shall be prohibited within hazardous areas.

7.3 Underground stations

7.3.1 General

Except as otherwise indicated below, underground stations shall comply with the general requirements for housing of pressure regulating stations (see 7.2).

For gaseous fuels heavier than air appropriate additional requirements in design, construction and ventilation of the station shall be considered.

7.3.2 Stations in a pit

Gas pressure regulating stations may be accommodated in an underground pit.

If necessary the strength of the roof shall be designed to support the weight of heavy traffic or access by vehicles shall be prevented by adequate permanent barriers.

The bottom of the pit shall have drainage, taking into account 7.2.5. If the water table is high, or the area can be flooded, the drainage shall be replaced by a pumping pit for the removal of water. In that case breathing lines shall be installed in a way that their function is not affected by the water.

Ventilation apertures shall be installed at opposite corners. The air outlet may be constructed as a chimney to improve ventilation.

All connections passing through the wall shall be sealed.

EXAMPLE Pipes, cables.

All metallic parts, including stairways and supports shall be earthed and the earthing should be visible to facilitate visual checks.

7.3.3 Buried vessel type stations

Gas pressure regulating installations may be enclosed in a vessel type housing designed to be installed underground as a module between the inlet and outlet pipework.

The housing shall be capable of withstanding external loads.

EXAMPLE Traffic, ground, ground water.

Consideration shall be given to the accessibility of the station in relation to maintenance activities.

8 Design of the station

8.1 General

Gas pressure regulating stations shall be designed and constructed so that:

— the correct functioning of the station is assured considering ambient conditions;

— the relevant components of the station are easily accessible for operation and maintenance;

— the station or separate streams of the installation can be isolated by valves;

— every installed stream, including stand-by streams, fulfils the requirements of this standard.

Consideration shall be given to subsidence, settlement, corrosion, possible vibrations and other hazards.

Components shall be suitable for the pressures and temperatures occurring both under normal operating conditions and in situations where the pressure safety system has initiated action. The requirements of EN 1775 concerning protection in case of fire, where applicable, shall be complied with.

If reverse flow is unacceptable, a check valve or similar device shall be installed on the outlet.

If it is possible to isolate all or part of a system of pipes and equipment, such that no gas is able to flow out of the isolated section, and the pressure can rise in excess of accepted limits due to temperature influence, effective pressure relief devices shall be fitted to protect against this unacceptable rise of pressure.

The connection between the protected system and this pressure relief device, the pressure relief device itself and the vent line shall be dimensioned to provide adequate venting capacity at all times.

8.2 Continuity of supply

The requirements in regard to the station availability in order to minimize the downtime of the network shall be set by the operator.

Depending on the network configuration, measures to increase the station availability can be:

— multiple stream installations;

— stream configuration, e.g. type of safety devices, fail-open / fail-close regulators;

— redundant integration of important components;

— minimizing shared components;

— monitoring of key parameters and key components.

8.3 Gas pre-heating

If reducing the pressure lowers the gas temperature to such an extent that the potential for malfunction exists the gas should be pre-heated.

EXAMPLE 1 Hydrate formation, condensation or icing.

Suitable precautions shall be taken to prevent interchange of the gas with the heating medium giving rise to a hazardous situation.

Alternatively, instead of heating the gas, an inhibitor may be injected into the gas to prevent hydrate formation.

EXAMPLE 2 Methanol.

The impact on the environment shall be considered when using an inhibitor. Appropriate precautions to minimise the impact on the environment shall be taken.

Where the gas temperature is likely to be below the permissible safe temperature of the pipeline system, the gas shall be pre-heated.

8.4 Filters, separators, scrubbers

If there is a possibility of dust or liquid being entrained in the gas stream impairing the proper functioning of the equipment, consideration shall be given to a dust or liquid extraction system. The systems shall have adequate capacity based on the maximum gas flow at minimum inlet pressure.

For filters, a differential pressure gauge should be provided to indicate the level of loading of the filter.

Closures shall be constructed in such a way that they can be opened without risk. For liquids a manual or automatic discharge device, if necessary with collector, should be provided.

8.5 Noise control

8.5.1 General

Pressure regulating processes generate noise which can, if untreated, be radiated by some parts of a station to produce unacceptably high noise levels. These can:

— create nuisance to inhabitants in the locality of the station;

— create a hearing hazard to personnel working on the equipment;

— result in component failure.

8.5.2 Environmental acceptance

Consideration shall be given at the design stage to the incorporation of noise control features to limit noise to an acceptable level at the site boundary or near inhabited buildings. This level may be determined by local regulations.

8.5.3 Work area noise

Consideration shall be given to the installation of low noise level producing equipment. If the noise level is too high, ear defenders shall be used by operatives and prominent signs shall be displayed at the access.

8.6 Apertures and vent lines

8.6.1 Apertures in pressure control equipment

Gas escaping through apertures in pressure control equipment can result in a flammable mixture in an enclosed space.

To avoid this, the following provisions may be used:

— apertures fitted with vent lines to outside the enclosed space;

— restrictors in breather connections, provided the operational performance is not impaired;

— extra ventilation of the enclosed space.

The above apertures also include breather holes serving diaphragms in pressure regulators and safety devices. If vent lines are fitted to these apertures, they shall be of sufficient capacity so that gas can escape freely and the functioning of pressure regulators and safety devices is not adversely affected by pressure build-up in the line.

8.6.2 Vent lines

Vent lines working at the same pressure may be combined provided that leakage through one or more does not affect the operation of any equipment.

Dedicated vent and depressurizing lines shall not be combined with breathing lines in a manifold. If manifolds are used for a type of vent line this shall not impair the proper functioning of the connected units.

The terminals of vent lines shall be located at a safe distance from sources of ignition. All vent terminals shall be designed to suit the local weather conditions.

Suitable precautions shall be taken to prevent blockage of the outlet and to protect it against the ingress of foreign material.

EXAMPLE Water, dirt, insects.

8.7 Hazardous areas

Hazardous areas shall be classified in zones in accordance with EN 60079-10-1 or other recognized standards or national regulations.

Electrical installations in hazardous areas shall comply with EN 60079-14.

Non-electrical equipment with an own potential ignition source installed in hazardous areas shall comply with EN 13463-1.

EXAMPLE Cranes, fans, combustion appliances, etc.

8.8 Lightning and earthing

Consideration shall be given to measures for the protection against lightning strikes, see the relevant national guidelines or EN 62305-1, EN 62305-2, EN 62305-3, and EN 62305-4.

NOTE Lightning protection measures comprising of internal lightning protection measures (lightning equipotential bonding, separation distance) and - if required - the external lightning protection measures (air-termination down-conductor, earth-termination systems).

Overvoltage protection for cables and electrical units should be used.

In the case of electronic devices these provisions may be completed by using overvoltage line protection units for adequate protection of the devices.

To avoid the build-up of electrical potential differences all electrically conductive parts of the installation shall be bonded and connected to earth.

Care shall be taken to minimize interactions between the electrical earthing, instrumentation earthing and cathodic protection systems.

8.9 Cathodic protection and electrical isolation

The gas pressure regulating station shall be isolated electrically from the inlet and outlet pipeline by means of isolating flanges or couplings. Isolating flanges or couplings in hazardous areas shall be protected by explosion-proof spark gaps.

Isolating couplings and flanges shall comply with the requirements in EN 1594 or EN 12007-3.

Cathodic protection should be considered in addition to the external coating if parts of the installation are buried.

Care shall be taken to ensure that no unintended bridging of insulating joints is possible.

EXAMPLE By putting down tools.

If isolating joints are installed outside the gas pressure regulating station building, measures of passive corrosion protection shall be considered on the underground pipeline section between isolating joint and gas pressure regulating station and, if necessary on the measuring line to the gas pressure regulating device.

8.10 Pressure control equipment and ancillaries

All equipment and ancillaries installed at gas pressure regulating stations:

— shall be constructed of suitable materials so that the correct functioning of the equipment is not impaired by corrosion, due to environmental influences;

— shall be provided with suitable valves, valve seats and moving parts to ensure proper functioning;

— shall be designed and installed so that checks can easily be carried out on the action of moving parts, correct pressure setting and leakage in the closed position;

— shall be positioned so that the reaction forces occurring during pressure relief are correctly absorbed;

— shall comply with the applicable European Standards, for the maximum operating pressure;

— shall be installed in accordance with the manufacturer's instructions;

— shall be certified by the manufacturer by a test report or an inspection certificate according to EN 10204.

8.11 Pipework

All pipes, fittings and joints other than instrumentation pipework shall conform to the appropriate standards for material and pipework.

For MOP up to 16 bar the appropriate standard is EN 12007-1.

For MOP over 16 bar the appropriate standard is EN 1594 with regard to wall thickness determination and materials for pipes and fittings.

Steel pipework of appropriate mechanical properties according to EN 15001-1 may also be used.

Materials other than steel should not be used for the pipework between the inlet and outlet isolating valves of the stations.

Threaded joints may be used up to DN 50 provided the thread is appropriate for the maximum operating pressure.

8.12 Welding

Welding of steel pipework shall be performed in accordance with EN 12732.

8.13 Instrumentation pipework

The following requirements relate to the design and installation of instrumentation pipework to ensure the correct functioning and safe operation of these lines.

8.13.1 The instrumentation pipework shall be suitable for the design pressure of the line or equipment to which it is connected.

8.13.2 Instrumentation pipework which is susceptible to blockage by solid materials or deposits shall be fitted with connections which can be dismantled.

8.13.3 Instrumentation pipework which can contain liquid shall be protected against adverse weather conditions.

EXAMPLE By heating.

8.13.4 Instrumentation pipework in which liquid can accumulate may be fitted with an effective liquid trap and drain for safe disposal of the liquid.

8.13.5 The arrangement of instrumentation pipework, supports and anchors shall be carefully designed, not only to accommodate the stresses occurring under normal operating conditions, but also to prevent damage due to sagging, external causes, rough treatment and other abnormal circumstances.

8.13.6 If necessary, appropriate measures shall be taken to prevent corrosion damage, both internally and externally.

EXAMPLE 1 By selection of suitable materials.

EXAMPLE 2 By external corrosion protection.

8.13.7 Joints between pipes and equipment or ancillaries shall be suited to the pressures and temperatures to which they are exposed. Telescopic expansion joints shall not be used. Expansion shall be accommodated by providing flexibility in the configuration of the instrumentation pipework.

8.13.8 Each safety device or pressure regulator shall have individual sensing lines separately connected to the protected system. The connection of the sensing lines for safety devices should be between the regulator and the first outlet isolating valve. The sensing lines shall be visible for reasons of safe operation.

8.13.9 A valve in the sensing lines serving pressure regulators and safety devices should not be installed when the connection of the line is upstream of the first outlet isolating valve. Provisions may be made in sensing lines for switching between sensing points with a three-way valve or two interlocked valves provided that one of the sensing points is connected at all times.

The sensing point selected for regulating and safety systems shall be reasonably free from turbulence and any effect resulting from changes in the gas velocity or from high gas velocities in the installation, such that a representative pressure condition is imposed on the instrumentation at all times.

8.13.10 Individual sensing lines may be connected to a header welded onto the inlet or outlet pipework. To ensure strength and static pressure conditions the diameter of the header and the connection to the pipework shall be at least 40 mm or equal to the diameter of the inlet or outlet pipework.

8.13.11 For the operation of two or more regulator streams in parallel, the control of the regulators by one controller or pilot is permitted.

8.14 Stress analysis

8.14.1 Design pressure

The design pressure of components shall be at least equal to DP_u upstream of a boundary and shall be at least equal to DP_d downstream of that boundary.

The boundary shall be at or downstream of the outlet connection of:

— the isolating outlet valve or the outlet stream valve, if the sensing line of the safety device with the highest setting is connected to pipework downstream of that valve;

— the active regulator;

— a safety device, if this safety device is installed downstream of the active regulator.

8.14.2 Design factor

Principal stresses in pipe material under design conditions shall not exceed the specified minimum yield strength ($R_{t\,0,5}$) multiplied by the design factor (f_o).

The design factor shall be 0,67 maximum. Local conditions may require a smaller value of f_o.

8.14.3 Supports

Supports not intended to anchor the pipework shall be designed to minimize interference with its expansion.

Supports welded on the pipework should be avoided but if used they should be of the full encirclement type. Care should be taken to minimize local stresses due to welding and to exclude any longitudinal welds directly on to the pressure containing pipework. When supports are directly welded on pipework it shall be demonstrated by calculation that the stresses on the pipework remain within the design limits of the pipes.

The design of the supports shall take into account the weight of the hydrostatic test liquid, if the hydrostatic test is carried out after assembly.

Anchor supports shall be located to avoid unacceptable displacements and be designed to withstand the loads indicated by the stress analysis. In this context the possibility of the reversal of forces shall be recognized.

Buried pipework and buried headers shall not be considered as anchors unless specifically designed for that purpose.

The design of supports shall incorporate electrical insulation to meet the requirements of any cathodic protection system. Precautions should be taken to prevent corrosion at the point of contact of the support and the pipework by effectively sealing the interface.

Where it is considered necessary, pipework supports should be designed to be removable for inspection purposes.

8.14.4 Flexibility

Flexibility shall be provided to minimize stresses in the pipework. The general layout should, therefore, have regard to this.

8.14.5 Temperature

The influence of temperature changes due to changes in ambient conditions and solar gain shall be taken into account. The influence of these effects can be severe on sections of pipework in which there is no gas flow.

EXAMPLE 1 Stand-by streams or bypasses.

The increase of the pressure due to possible thermal expansion of gas shall be taken into account.

EXAMPLE 2 When using a gas pre-heating system.

The change in temperature due to the rapid depressurisation of a system shall be considered, where necessary.

8.14.6 Gas velocity

The gas velocity shall be such that vibrations, excessive sound levels, pulsation and interference in the control process will be avoided.

8.15 Standard pressure equipment

Standard pressure equipment installed in gas pressure regulating stations - e.g. valves, pressure regulators, safety valves, filters, heat exchangers, vessels - shall be designed to fit in the pressure scheme of the gas infrastructure as given in Table 1. The maximum allowable pressure of standard pressure equipment (PS) shall be specified in relation to the MIP of the relevant part of the station:

$$PS \geq \frac{MIP}{1{,}1}$$

NOTE National regulations may state a lower factor than 1,1 in the above formula.

8.16 Isolating valves

Isolating valves of the gas pressure regulating station shall be installed in both the inlet and outlet pipework at a safe distance from the housing or above ground parts of the installation.

The outlet isolating valve may be dispensed with if there is no possibility of reverse flow.

The location of the isolating valves shall be clearly indicated and the valves shall be positioned to minimize the risk from damage by vehicles.

The distance between the station isolating valves and the housing should be kept to the minimum practicable in the prevailing circumstances.

As a general rule, the isolating valves in the inlet and outlet pipework also provide the functional demarcation between the station and the pipeline.

9 Pressure control

9.1 General

The pressure control system shall maintain the pressure in the downstream system within the required limits and shall ensure that this pressure does not exceed the permitted level. The downstream system includes all pipework up to the next pressure boundary.

The relationships between MOP, peak level OP, TOP, and MIP is given in Table 1.

Table 1 — Relationships between MOP, TOP and MIP

MOP[a] (bar)	peak level OP ≤	TOP ≤	MIP[c] ≤
MOP > 40	1,025 MOP	1,1 MOP	1,15 MOP
16 < MOP ≤ 40	1,025 MOP	1,1 MOP	1,20 MOP
5 < MOP ≤ 16	1,050 MOP	1,2 MOP	1,30 MOP
2 < MOP ≤ 5	1,075 MOP	1,3 MOP	1,40 MOP
0,1 < MOP ≤ 2	1,125 MOP	1,5 MOP	1,75 MOP
MOP ≤ 0,1	1,125 MOP	1,5 MOP	2,50 MOP[b]

[a] MOP is equal to or less than DP, but the relation factors are valid when DP is equal to MOP.

[b] When gas appliances, tightness tested at 150 mbar, are directly connected to an installation pipework, the MIP downstream of the final regulator shall be limited to 150 mbar.

[c] For standard pressure equipment, see 8.15.

NOTE 1 When no safety device is required, TOP and MIP downstream of the regulator are not relevant for installation pipework supplied by systems with MOP upstream of the regulator up to and including 100 mbar.

NOTE 2 Where MOP is less than DP, the pressure relationships given in Table 1 can be related to DP.

EXAMPLE Where DP is equal to 0,1 bar and MOP equal to 0,075 bar TOP can reach 1,5 x 0,1 bar and MIP can reach 2,5 x 0,1 bar.

9.2 Pressure regulating system

The pressure regulating system shall maintain the pressure within limits which are acceptable for the downstream system. The set value shall not exceed MOP. However, OP may exceed the set value due to the dynamic nature of the system. The pressure regulating system shall not allow the downstream pressure to exceed the values in the second column of Table 1.

Pressure regulators shall comply with EN 334. Devices that do not fall under the scope of EN 334 may be used alternatively for the pressure regulating system, if their fitness for purpose is proven by an appropriate set of tests to comply with the requirements of this standard.

9.3 Pressure safety system

9.3.1 General

The pressure safety system shall operate automatically to prevent the pressure in the downstream system exceeding permitted levels, taking setting tolerances into account, in the event of failure of the pressure regulating system.

For upper pressure limits see Table 1. Lower pressure limits shall be defined by the owner or operator, if applicable.

9.3.2 Operating principles of pressure safety systems

The following principles may be applied for pressure safety systems in pressure regulating stations:

— shut-off: an overpressure slam-shut device or an overpressure cut-off device;

— a monitor regulator;

— venting: this may be a direct-acting or indirect-acting safety relief device.

A full-capacity safety relief device should be avoided for environmental reasons.

The amount of gas vented to the atmosphere should be minimized.

The chosen operating principle shall provide adequate protection against pressure rises in excess of the permitted level in all situations.

The permitted level for monitors shall be related to TOP, with the exception mentioned in 9.5; the permitted level for other safety devices shall be related to MIP.

The reaction time of the system shall be considered when determining the set value of the safety system to ensure MIP is not exceeded.

9.3.3 Applications

A pressure safety system is not needed if:

$$MOP_u \leq MIP_d$$

or

$$MOP_u \leq 100 \text{ mbar}$$

As a minimum a single pressure safety system shall be installed if:

$$MOP_u > MIP_d$$

and

$$MOP_u - MOP_d \leq 16 \text{ bar}$$

A pressure safety system consisting of at least one safety device and a second device shall be installed if:

$$MOP_u - MOP_d > 16 \text{ bar}$$

and

$$MOP_u > STP_d$$

where

MOP_u maximum upstream operating pressure;

MOP_d maximum downstream operating pressure;

MIP_d maximum downstream incidental pressure;

STP_d downstream strength test pressure.

The function of the second device is to increase the safety level.

9.4 Safety shut-off devices

Safety shut-off devices shall comply with EN 14382. Devices that do not fall under the scope of EN 14382 may be used alternatively, if their fitness for purpose is proven by an appropriate set of tests to comply with the requirements of this standard.

Each individual device shall comply with the following requirements:

— The set value for the trip pressure of the pressure safety devices shall not exceed MIP minus the positive tolerance corresponding to the accuracy group of the safety device.

— If an overpressure safety shut-off-device (a safety slam-shut device or safety cut-off device) is activated, it shall remain in the closed position until opened by local manual intervention. However, if it is necessary to maintain supplies in the event of more than one stream failing, consideration may be given to the inclusion of a control system which allows the automatic opening and closing of the safety device between set pressure limits.

For indirect-acting shut-off devices failure of auxiliary power shall result in a safety action. Exceptions to this requirement are permitted if:

— pressurized gas from the controlled system itself is used as auxiliary power and the supply of this gas is continuous;

— auxiliary power (electricity, air or hydraulic fluid) from an external source is supported by gas from the controlled system as auxiliary back-up power (e.g. gas powered electrical generator, compressor of hydraulic pump) and the supply of this gas is continuous.

If instruments e. g. transmitters or control instruments are used without a back-up, loss of signal shall result in a safety action.

9.5 Monitors

Monitors without an external power source shall comply with EN 334. Devices that do not fall under the scope of EN 334 may be used alternatively, if their fitness for purpose is proven by an appropriate set of tests to comply with the requirements of this standard.

A monitor used as a pressure safety device shall comply with the following requirements:

a) The set value for the monitor shall be selected such that TOP cannot be exceeded. If, by means of an alarm system or frequent inspection of the station, the situation where a monitor has taken over control from the active pressure regulator can be detected within a short time period, MIP (instead of TOP) may be taken into account for the determination of the set value.

b) When auxiliary power is used the failure of auxiliary power shall result in a safety action. Exceptions to this requirement are permitted if:

    1) pressurized gas from the system itself is used as auxiliary power and the supply of this gas is continuous;

    2) auxiliary power (electricity, air or hydraulic fluid) from an external source is supported by gas from the system as auxiliary back-up power and the supply of this gas is continuous.

c) If instruments such as transmitters or control instruments are used without a back-up, loss of signal shall result in a safety action.

d) A failure of the active regulator shall not impair the proper functioning of the pressure safety system.

Where a monitor regulator is selected as a second device, the action of the monitor can be either fail-to-close or fail-to-open, depending on the downstream risk priority, i.e. continuity of gas supply versus pressure limitation.

9.6 Venting pressure safety devices

If safety relief devices are used, MIP shall not be exceeded. This shall be considered by selection of the set value of the relief device and the capacity of the vent system.

9.7 Pressure alarm system

If in a pressure control system the settings of the safety devices are in the range between MOP and MIP, measures shall be taken to ensure that entering this range is incidental in both frequency and duration.

9.8 Instrumentation

The instrumentation employed for pressure safety systems shall comply with the following requirements:

— Installation: Instrumentation wiring and pipework shall be dimensioned and installed having due regard for their function. The instrumentation serving the pressure safety system shall be independent from the other instrumentation. The setting of the control system which forms part of the pressure safety system shall be fixed, where necessary.

— Isolation: Isolation of the pressure detection components of the pressure safety system from the system which it protects is not permitted, unless it leads to a safety action. Exception may be made by using locking devices that shall be locked in the in-service position.

9.9 Bypasses

9.9.1 Bypasses for equalization or testing of components

If a permanent bypass is used for the equalization of pressure across a valve or pressure control equipment or for testing purposes, a valve shall be installed in the bypass. Such a valve in a bypass of a pressure safety system shall close automatically, if not manually held open.

9.9.2 Bypasses of the pressure control system

Permanent provisions to bypass a regulating stream designed to maintain the gas flow should be avoided, if the pressure safety system is also bypassed.

Every permanent bypass of a safety system shall be provided with at least a manual regulating valve, a pressure gauge and with appropriate safety provisions (safety devices and/or safety procedures).

10 Testing

10.1 General

All requirements laid down in Clause 6, Clause 7, Clause 8 and Clause 9 of this standard shall be verified by adequate tests or checks.

A procedure for testing activities shall be prepared. The procedure defines the sequence of checks and tests to be carried out and specifies the testing methods and the acceptance criteria.

10.2 Pressure testing

10.2.1 General

All pressure containing components, including pipework, of a gas pressure regulating station shall be strength tested. This may be done prior to assembly of the installation. Instrumentation pipework may be excluded from the strength test.

Test procedures shall be selected from EN 12327.

A strength test does not need to be repeated on an installation if it can be demonstrated, by means of existing certification, that the components have been tested at least to the required test pressure.

When strength testing has been completed satisfactorily, components which have been removed from the installation prior to testing shall be re-installed. The entire installation shall then be subjected to a pneumatic test to prove its tightness.

The boundary (see 8.14.1) between the upstream and downstream system shall be taken into account.

10.2.2 Strength test

10.2.2.1 Test pressure

The strength test pressure (STP) or the combined test pressure (CTP) shall be higher than MIP.

10.2.2.2 Installations with MOP greater than 16 bar

For maximum operating pressures above 16 bar the strength test shall be carried out in line with the test for pipelines as described in EN 1594.

10.2.2.3 Installations with MOP up to and including 16 bar

For maximum operating pressures up to 16 bar the strength test shall be carried out in line with the test for pipelines as described in EN 12007-1.

10.2.3 Tightness test

After the strength test, any component which has been removed from the installation during testing shall be reinstalled.

The entire installation shall then be subjected to a tightness test at a suitable pressure which may be lower than MIP, if it has not been subjected to a combined test. The pressure boundary for the tightness test should be that which applies at the normal operating conditions in each section of the installation.

Air, inert gas or gas shall be used as a test medium.

There shall be no visible leakage when tested with a leak detection fluid.

10.3 Reporting

A report of the test shall be compiled, containing the following information as a minimum:

— the identity of the authorized person responsible for the test;

— the date of the test;

— the applicant or interested party;

— the manufacturer of the station;

— identification of the section to which the test relates;

— the design pressure;

— the pressure reached during pressure testing and the time for which this pressure was maintained;

— the test medium used for pressure testing;

— the inspection method;

— the test results;

— a reference to the testing procedure.

The test documentation shall be retained until the station is taken out of service or has been re-tested and new documentation has been filed.

11 Commissioning

Prior to the commissioning the operator shall have an explosion protection document [12] if appropriate in accordance with national regulations.

The gas pressure regulating station shall only be commissioned after satisfactory completion of the tests specified in Clause 10. Commissioning shall be undertaken in accordance with EN 12327.

The functional testing of the components and the complete system and the commissioning of the station shall be laid down in written procedures. These procedures should ensure the completion of the following:

— the verification of the correct functioning of all components by the operator in accordance with the manufacturer's instruction for the individual components;

— setting and testing of pressure safety systems before commissioning in accordance with an approved test procedure;

— the demonstration of the correct functioning of the station as a whole, when the components have been functionally tested and accepted.

As-built drawings, test reports, procedures and any other documentation required for operation of the station shall be in the possession of the operator of the station at the time of hand-over.

12 Operation and maintenance

12.1 General

The operation of gas pressure regulating stations shall be compatible with those of the associated gas pipeline system.

The network operator is responsible for formulating the policy with regard to pipeline operation and maintenance activities. The objective of the policy is to ensure that the system carries the gas safely, economically and to keep interruption to a technical possible minimum.

The status of the pipeline system can, however, be influenced by the reliability of the individual items of equipment and/or by the operation and the maintenance of the pipelines. In order to meet good performance standards, all necessary precautions and provisions shall be taken to:

a) ensure safe operation of the pipeline system;

b) monitor its condition;

c) carry out maintenance safely and effectively;

d) deal effectively and responsibly with incidents and emergencies.

These precautions and provisions shall be incorporated into the management system according Clause 4.

Some additional primary requirements which relate specifically to gas pressure regulating stations are given in the following clauses.

12.2 Data

Basic data for the operation of each gas pressure regulating station shall be documented and contain the following information, as a minimum:

— a P&ID of the pressure regulating station;

— a diagram of the inlet and outlet pipework and isolating valves;

— essential data relating to the pressure control system.

If hazardous areas have been classified according 8.7 a hazardous area diagram of the installation shall be available.

The operator of the station shall ensure that the basic and relevant data are available throughout the operational life of the station.

EXAMPLE As-built drawings, test reports, certificates, procedures.

12.3 Maintenance

All components of the gas pressure regulating station shall be subjected to maintenance to ensure that they:

— offer sufficient reliability for the purpose for which they are used;

— are in sound mechanical condition, with no leaks;

— are set at the correct pressure;

— are still correctly installed and protected against dirt, liquids, freezing and other effects which may impair their function.

This includes any provisions installed to limit the risk of explosion.

Maintenance shall include the verification of the correct function of the pressure control system by adequate tests on a regular basis as specified by the operator.

It is recognized that a number of different maintenance strategies are available. A structured decision-making process shall be used to identify the optimum maintenance requirements by the operator.

It should also be recognized that optimum maintenance requirements are dependent on a number of factors, including the operating conditions and duty.

Strategies may be simple and straightforward or very complex involving the use of sophisticated mathematical models based on a study of failure modes and effects analysis and reliability data. The strategy may consider the performance of individual key components in the installation.

NOTE 1 The models derived may be used to optimise the frequency of functional checks, determine a parts replacement programme, etc.

The maintenance should follow an approach which utilizes any one or a combination of philosophies, such as:

— preventive maintenance:

  — condition based maintenance;

  — predetermined maintenance;

— corrective maintenance (provided adequate redundancy has been installed or if a failure is acceptable for the gas system).

NOTE 2 Terms of maintenance are defined in EN 13306.

Maintenance activities and irregularities shall be recorded. Irregularity is defined as any malfunction of the system.

EXAMPLE Unintentional tripping or failure of the pressure control system.

If there are any grounds for suspecting that the pressure may be too high or too low the necessary corrective measures shall be taken to rectify the fault.

12.4 Training

The person in charge of the operation and/or maintenance shall be competent and adequately trained.

12.5 Work undertaken

Maintenance, modification and repair work on the equipment may only be carried out by/or under the direct supervision of persons acting on behalf of the operator of the station.

Personal entering the station shall comply with the work permit system of the operator of the station.

In case of dismantling for maintenance or repair purposes, emissions of gas with impact on the environment shall be kept to a minimum.

12.6 Fire fighting

Firefighting equipment shall be available for immediate use and kept within easy reach when maintenance is carried out at the station. The condition of portable fire extinguishers, hose reels and other firefighting equipment or installations shall be checked regularly by an authorized person.

Firefighting shall be carried out by trained personnel.

13 Decommissioning and disposal

13.1 Decommissioning

If the station is to be decommissioned, it shall be isolated from the main pipeline by closing and locking the station valves so that they cannot be opened accidentally. If required, a gastight isolation shall be established, e.g. by using isolating blind flanges.

Specific precautions could be required if liquid hydrocarbons are contained in the pipework.

If major works are to be carried out on the station pipework, involving grinding, welding, drilling and any other potentially hazardous activities, the station pipework shall be purged to remove the gas; to avoid purging for minor works, specific procedures and equipment shall be applied.

If a section of the station is to be decommissioned the following safety measures shall be taken:

a) the section shall be isolated from gas-carrying pipelines or other installations on the station. The ends of the pipelines shall be effectively isolated;

b) the section shall be purged to remove gas by an appropriate method.

13.2 Disposal

Gas pressure regulating stations which are to be disposed shall be decommissioned as stated in 13.1.

All the equipment should be removed and decontaminated from odorant smell.

Attention shall be given to safely isolate any external services into the station.

EXAMPLE These are considered as electrical power, water and drainage.

Waste shall be sorted out in a proper manner (e.g. steel, lubricants/oil, electrical parts). Critical substances (e.g. oil, lubricants) shall not infiltrate into the ground.

All work shall comply with the appropriate national and local environmental legislation.

Annex A
(informative)

Glossary

English	French	German	Term number
— alarm	— alarme	— Alarm	— 3.4.1
— authorized person	— personne autorisée	— autorisierte Person	— 3.1.1
— cabinet station	— coffret	— Schrankanlage	— 3.2.5
— cavity wall	— paroi creuse	— Hohlwand	— 3.2.1
— combined pressure CTP	— pression de l'essai combiné CTP	— Kombinierter Prüfdruck CTP	— 3.3.15
— combined test	— essai combiné	— kombinierte Prüfung	— 3.3.12
— commissioning	— mise en service	— Inbetriebnahme	— 3.2.14
— competent person	— personne compétente	— fachkundige Person	— 3.1.2
— component	— composant	— Komponente	— 3.2.7
— decommissioning	— mise hors service	— Außerbetriebnahme	— 3.2.15
— design factor f_o	— coefficient de conception f_o	— Nutzungsgrad f_o	— 3.3.1
— design flow rate	— débit de conception	— Auslegungsdurchfluss	— 3.3.2
— design pressure DP	— pression de calcul DP	— Auslegungsdruck DP	— 3.3.3
— direct-acting	— à action directe	— direkt wirkend	— 3.4.2
— disposal	— élimination	— Entsorgung	— 3.2.18
— enclosed installation	— installation en local fermé	— geschlossene Anlage	— 3.2.2
— gas	— gaz	— Gas	— 3.1.3
— hazardous area	— zone dangereuse	— explosionsgefährdeter Bereich	— 3.1.5
— hazardous area zones	— classification de zone dangereuse	— Ex-Zonen	— 3.1.6
— indirect-acting	— à action indirecte	— indirekt wirkend	— 3.4.3
— inlet pipework	— tuyauterie d'entrée	— Eingangsleitung	— 3.2.8
— inspection	— inspection	— Inspektion	— 3.2.16
— instrumentation	— instrumentation	— technische Ausrüstung	— 3.4.4
— instrumentation pipework	— tuyauteries d'instrumentation	— Wirkleitungen	— 3.4.5
— main	— conduite principale	— Versorgungsleitung	— 3.2.9
— maintenance	— maintenance	— Instandhaltung	— 3.2.17
— maximum allowable pressure PS	— pression maximale admissible PS	— maximal zulässiger Druck PS	— 3.3.9
— maximum incidental pressure MIP	— pression maximale en cas d'accident MIP	— Grenzdruck im Störungsfall MIP	— 3.3.8
— maximum operating pressure MOP	— pression maximale de service MOP	— maximal zulässiger Betriebsdruck MOP	— 3.3.6
— monitor	— moniteur	— Monitor	— 3.4.6
— open-air installation	— installation à l'air libre	— Freiluftanlage	— 3.2.3
— operating pressue OP	— pression de service OP	— Betriebsdruck OP	— 3.3.5
— outlet pipework	— tuyauterie de sortie	— Ausgangsleitung	— 3.2.10
— pressure	— pression	— Druck	— 3.3.4

English	French	German	Term number
— pressure alarm system	— système d'alarme de pression	— Druckalarmsystem	— 3.4.12
— pressure control system	— système de contrôle de la pression	— Drucküberwachung	— 3.4.13
— pressure regulating station	— poste de détente-régulation	— Gas-Druckregelanlage	— 3.2.11
— pressure regulating system	— système de détente-régulation de pression	— Druckregelung	— 3.4.10
— pressure safety system	— système de sécurité de pression	— Druckabsicherungssystem	— 3.4.11
— safety cut-off device	— dispositif de sécurité à fermeture lente	— Sicherheitsabsperrarmatur	— 3.4.8
— safety relief device	— soupape de sécurité	— Sicherheitsabblaseeinrichtung	— 3.4.9
— safety slam-shut device	— dispositif de sécurité à fermeture rapide	— Sicherheitsabsperrventil	— 3.4.7
— separate building	— bâtiment isolé	— freistehendes Gebäude	— 3.2.4
— service line	— branchement	— Anschlussleitung	— 3.2.12
— standard pressure equipment	— équipement sous pression standard	— Standarddruckgeräte	— 3.2.13
— station availability	— disponibilité du poste	— Verfügbarkeit einer Station	— 3.5.1
— station reliability	— fiabilité du composant	— Zuverlässigkeit einer Station	— 3.5.2
— strength pressure STP	— pression de l'essai de résistance STP	— Festigkeitsprüfdruck STP	— 3.3.14
— strength test	— essai de résistance	— Festigkeitsprüfung	— 3.3.10
— temporary operating pressure TOP	— pression temporaire de service TOP	— temporärer Betriebsdruck TOP	— 3.3.7
— test pressure TP	— pression d'essai TP	— Prüfdruck TP	— 3.3.13
— tightness test	— essai d'étanchéité	— Dichtheitsprüfung	— 3.3.11
— underground station	— poste enterré	— Unterfluranlage	— 3.2.6
— volume under normal conditions	— volume dans des conditions normales	— Volumen im Normzustand	— 3.1.4

Annex B
(informative)

Significant technical changes between this European Standard and the previous edition

Table B.1 — Significant technical changes between this European Standard and the previous edition

Clause/Paragraph/ Table/Figure	Change
General	The requirements related to explosion protection have been reworded taking into account the requirements of Directive 1999/92/EC.
General	Throughout the standard many recommendations have been changed to requirements.
Foreword	The relation of the stations according EN 12186 to the European Pressure Equipment Directive 97/23/EC is explained.
3.2.5	The sub-terms in the definition of the term "component" have been re-defined. As a consequence, several requirements in the document have been adjusted to the new terms.
4	The application of a quality and management system to the whole lifetime of the gas pressure regulating station has been made mandatory. A Reference to EN 16348, CEN/TC 15399 or the ISO 9000 series shall be made. Decommissioning and disposal has been added as 4^{th} phase of the live of a gas pressure regulating station.
5	A new clause setting up requirements and recommendations with regard to the environmental impact of the station was added in accordance with CEN Guide 4 and CEN/TR 16388.
6.3	The marking of hazardous areas has been added as a requirement.
7.2.9	The requirements for heating in hazardous areas have been reworded with reference to EN 1127-1.
8.2	A new clause was added, specifying requirements and measures to ensure the continuity of supply.
8.3	A requirement to consider the impact to the environment has been added in case inhibitors are used.
8.7	The requirements for installations in hazardous areas with regard to potential ignition sources have been reworded. Non-electrical equipment is also taken into account.
8.8	The requirements for measures for the protection against lightning strikes have been modified with a reference to EN 62305-1, EN 62305-2, EN 62305-3, and EN 62305-4.
8.9	The requirement for the protection of isolating flanges or couplings by explosion-proof spark gaps was added.
8.9	A reference to EN 1594 or EN 12007-3 was added regarding the requirements for isolating couplings and flanges.
8.9	A requirement related to corrosion protection has been added in case isolating joints are installed outside the station.

8.11	As a reference standard for steel pipework EN 15001-1 has been added, following a similar approach in EN 1594 for facilities where smaller amounts of pipe materials are needed.
8.15	A requirement for the relation between the maximum allowable pressure PS of standard pressure equipment installed in the station and the MIP of the relevant part of the station has been introduced in order to accommodate the selection of this kind of equipment.
9.3.2	The classification of safety devices in "venting" and "non-venting" are replaced by "shut off", "monitor" and "venting".
9.3.2	The recommendation, to use a full-capacity safety relief device only as a second safety system in conjunction with a shut-off device was replaced by the recommendation to avoid full-capacity safety relief devices.
9.4	A reference to EN 14382 has been added.
9.5	A reference to EN 334 has been added. A description of possible working principles of monitors used as second device was added.
9.7	The use of locking devices in the sensing lines of the pressure safety system was added as a possible exception.
10.1	A new clause was added to ensure that all requirements are subject to an acceptance test prior to commissioning. A requirement for a procedure for testing and acceptance activities has been added.
11	The requirement for an explosion protection document was added.
12.1	A statement on the policy with regard to operation and maintenance activities was added in accordance with EN 1594 with relation to the management system according Clause 4.
12.2	The requirement for a hazardous area diagram has been added.
12.3	A requirement to include the provisions installed to minimize the risk of explosion into the maintenance procedures has been added.
12.3	A requirement to verify the correct function of the pressure control system has been added.
12.3	The terms for maintenance types have been adjusted to the definitions given in EN 13306:2010.
12.5	A requirement that personal entering the station shall comply with the work permit system of the operator of the station was added. A requirement to minimize the emission of gas in case of dismantling was added.
13	A new clause specifying requirements and recommendations for decommissioning and disposal was added.
Annex A	A glossary was added with the terms explained in Clause 3 listed in alphabetical order.
NOTE The technical changes referred include the significant changes from the EN revised but is not an exhaustive list of all modifications from the previous version.	

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