BS EN 12007-3:2015

BSI Standards Publication

Gas infrastructure — Pipelines for maximum operating pressure up to and including 16 bar

Part 3: Specific functional requirements for steel

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 12007-3:2015. It supersedes BS EN 12007-3:2000 which is withdrawn.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.

Published by BSI Standards Limited 2015

ISBN 978 0 580 77935 0

ICS 23.040.10; 75.200; 77.140.75

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2015.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12007-3

May 2015

ICS 23.040.10

Supersedes EN 12007-3:2000

English Version

Gas infrastructure - Pipelines for maximum operating pressure up to and including 16 bar - Part 3: Specific functional requirements for steel

Infrastructures gazières - Canalisations pour pression maximale de service inférieure ou égale à 16 bar - Partie 3: Exigences fonctionnelles spécifiques pour l'acier

Gasinfrastruktur - Rohrleitungen mit einem maximal zulässigen Betriebsdruck bis einschließlich 16 bar - Teil 3: Besondere funktionale Anforderungen für Stahl

This European Standard was approved by CEN on 12 March 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 12007-3:2015) 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 November 2015, and conflicting national standards shall be withdrawn at the latest by November 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 12007-3:2000.

Annex D 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 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.

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

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.

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 describes the specific functional requirements for steel pipelines in addition to the general functional requirements of EN 12007-1 for maximum operating pressures up to and including 16 bar. This European Standard specifies common basic principles for gas infrastructure. Users of this European Standard should be aware that more detailed national standards and/or codes of practice may 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 above-mentioned basic principles.

In the event of conflicts in terms of more restrictive requirements in national legislation/regulation with the requirements of this standard, national legislation/regulation takes precedence as illustrated in CEN/TR 13737 (all parts).

CEN/TR 13737 (all parts) gives:

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

— if appropriate, more restrictive national requirements;

— a national contact point for the latest information.

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 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1514-1, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 1: Non-metallic flat gaskets with or without inserts*

EN 1514-2, *Flanges and their joints — Gaskets for PN-designated flanges — Part 2: Spiral wound gaskets for use with steel flanges*

EN 1514-3, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 3: Non-metallic PTFE envelope gaskets*

EN 1514-4, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 4: Corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges*

EN 1515-1, *Flanges and their joints — Bolting — Part 1: Selection of bolting*

EN 1515-2, *Flanges and their joints — Bolting — Part 2: Classification of bolt materials for steel flanges, PN designated*

EN 1591-1, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation*

EN 1591-2, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 2: Gasket parameters*

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

EN 1759-1, *Flanges and their joint — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 1: Steel flanges, NPS 1/2 to 24*

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

EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*

EN 10255, *Non-Alloy steel tubes suitable for welding and threading — Technical delivery conditions*

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

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

EN 12560-3, *Flanges and their joints — Gaskets for Class-designated flanges — Part 3: Non-metallic PTFE envelope gaskets*

EN 12560-4, *Flanges and their joints — Gaskets for Class-designated flantes — Part 4: Corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges*

EN 12560-5, *Flanges and their joints — Gaskets for Class-designated flanes — Part 5: Metallic ring joint gaskets for use with steel flanges*

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

EN 12954, *Cathodic protection of buried or immersed metallic structures — General principles and application for pipelines*

EN 13509, *Cathodic protection measurement techniques*

EN 13774, *Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar — Performance requirements*

EN 15257, *Cathodic protection — Competence levels and certification of cathodic protection personnel*

EN 50162, *Protection against corrosion by stray current from direct current systems*

EN 15280, *Evaluation of a.c. corrosion likelihood of buried pipelines applicable to cathodically protected pipelines*

EN ISO 3183, *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems (ISO 3183)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12007-1 and the following apply.

3.1
compressor joint
type of joint in which gas tightness is achieved by compression within a socket with or without a seal

3.2
threaded joint
type of joint in which gas tightness is achieved by metal to metal contact within threads with the assistance of a sealant

3.3
flanged joint
type of joint in which gas tightness is achieved by compression of a gasket between the faces of two flanges

3.4
insulating joint
fitting installed to insulate electrically one section of pipeline from another

4 Design

4.1 General requirements for selection of steel materials

4.1.1 General

Steel pipes and other pipeline components shall conform to the relevant European or International Standards.

Steel pipe material shall comply with EN ISO 3183 or other suitable European Standards.

Steel types or grades other than those listed in EN ISO 3183 may also be used when their suitability has been demonstrated. The requirements of EN ISO 3183 shall be used for guidance in establishing material properties.

Table 1 gives informative examples of the range of the steel grades available.

Table 1 — Examples of the range of steel grades available

MOP	Standard	Steel grade	Supply condition	Charpy Kv J	Minimum yield strength MPa
≤ 5 bar	prEN 10255:2015	S235GT	-	-	235
≤ 16 bar	EN ISO 3183	L245 L290 L320 L360	PSL2 In all cases, either R/ N/ Q/ M as applicable	27J @ 0 °C	245 290 320 360
≤ 16 bar	EN 10216-1	P235TR2 P265TR2	Either NP/ NW/ NR as applicable	27J @ 0 °C	235 265
≤ 16 bar	EN 10217-1	P235TR2 P265TR2	Either NP/ NW/ NR as applicable	27J @ 0 °C	235 265
≤ 16 bar	EN 10216-2	P235GH P265GH	Either +N/ NP/ NW/ NR as applicable	27J @ 0 °C	235 265
≤ 16 bar	EN 10217-2	P235GH P265GH	Either +N/ NP/ NW/ NR as applicable	27J @ 0 °C	235 265

Key

PSL	product specification level (see EN ISO 3183, 6.1.2)
R	as rolled (see EN ISO 3183, 4.2 and Table 3)
M	thermomechanically rolled or formed (see EN ISO 3183, 4.63, 4.64 and Table 3)
N	full pipe normalized, normalized rolled or normalized formed (see EN 10216-2, Table 1) normalizing forming
+N	full pipe normalized, normalized rolled or normalized formed (see EN 10216-2, Table 1)
NP	pipe full body normalized (see EN 10217-1/ EN 10217-2, Table 1)
NR	pipe normalized rolled or hot (stretch) reduced within the normalizing temperature range (see EN 10217-1/ EN 10217-2, Table 1)
NW	pipe normalized only in weld zone (see EN 10217-1/ EN 10217-2, Table 1)
Q	quenched and tempered (see EN ISO 3183, 4.5 and Table 3)

4.1.2 Quality level

The quality level as defined by the relevant standards for other pipeline components shall be compatible with the quality level of the pipes.

EXAMPLE For welding and jointing purposes.

Steel pipes shall be qualified with respect to their strength, fracture toughness and weldability.

4.1.3 Weldability

Pipes and other pipeline components shall be capable of being welded reliably under site conditions. To meet the weldability criteria, the value of the carbon equivalent value (CEV) of pipes and other pipeline components, based on the steel ladle analysis, shall be less than or equal to 0,45 for grades with specified

minimum yield strength (SMYS) not exceeding 360 Mpa, unless otherwise agreed between the pipeline operator and manufacturer. This value shall be guaranteed by the manufacturer. For all grades of steel, the maximum carbon content shall not exceed 0,22 % and the maximum guaranteed values of sulphur and phosphorus contents shall not exceed 0,035 % for each element or 0,05 % in total on the ladle analysis.

NOTE 1 Carbon equivalent is given by the formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15} \leq 0,45$$

where

CE is the carbon equivalent;

C is the weight percentage of carbon content;

Mn is the weight percentage of manganese content;

Cr is the weight percentage of chromium content;

Mo is the weight percentage of molybdenum content;

V is the weight percentage of vanadium content;

Cu is the weight percentage of copper content;

Ni is the weight percentage of nickel content.

NOTE 2 This CEV formula as shown in Note 1 is appropriate for welding steel pipe of SMYS smaller or equal than 360 MPa for pressures up to and including 16 bar. Other CEV formulae suitable for higher strength steels may be used at the discretion of the asset owner.

If in exceptional cases grades of steel are used which do not fulfil these requirements, the manufacturer shall give detailed data concerning the weldability of the material. The pipeline operator may fix a test of weldability, if the provided data are not sufficient.

4.1.4 Impact energy

When climatic conditions require, materials with proven impact properties at lower temperatures shall be used.

4.1.5 Inspection documents for components

The minimum level of conformity of components shall be certified by an inspection document in accordance with EN 10204, 3.1 or 3.2 as requested from the customer. For dimensions which are not included in EN ISO 3183, the minimum requirements shall be agreed between the manufacturer and the purchaser (Charpy impact test).

4.2 Pipes and fittings

4.2.1 Steel pipes

The requirements for steel pipes of external diameter greater than DN 600 shall be agreed between the pipeline operator and manufacturer.

Where the nominal wall thickness is greater than or equal to the value given in Table 2, it is not necessary to carry out any stress calculation to take account of internal pressure.

Table 2 — Nominal wall thickness

Dimensions in millimetres

Nominal diameter DN	**10**	**15**	**20**	**25**	**40**	**50**	**65**	**80**	**100**
External diameter D	17,2	21,3	26,9	33,7	48,3	60,3	76,1	88,9	114,3
Nominal wall thickness s	2,3	2,3	2,3	2,6	2,6	2,9	2,9	3,2	3,2

Nominal diameter DN	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**500**	**600**	**>600**
External diameter D	139,7	168,3	219,1	273	323,9	355,6	406,4	508	610	>610
Nominal wall thickness s	3,6	4	4,5	5	5,6	5,6	6,3	6,3	6,3	1% D

In certain situations, consideration should be given to using pipes of greater wall thickness than given in Table 2.

EXAMPLE Horizontal drilled sections, crossings with major public works (dykes, waterways, roads, railways), areas with significant soil settlement differences or where pipes are subjected to abnormal ground loading, circumstances, areas where corrosion is a specific issue (for instance where the pipeline is being laid through contaminated or aggressive soils) or where the pipes are being bent or otherwise manipulated.

Where wall thicknesses less than those given in Table 2 are being considered, design calculations shall be undertaken. Guidance on wall thickness calculation is given in Annex C.

The minimum pipe wall thicknesses shall be as given in Table 3.

Table 3 — Minimum wall thickness

Dimensions in millimetres

Nominal diameter DN	**10-20**	**25-50**	**65-125**	**150-300**	**350-400**	**≥450**
Minimum wall thickness s_{min}	2,3	2,3	2,6	3,5	4,5	1% D

4.2.2 Fittings

Fittings shall comply with the appropriate European Standards.

Safety factors of fittings shall be at least equal to the safety factor of the pipes.

4.3 Insulating joints

4.3.1 Type test

Insulating joints shall be type tested.

Insulating joints can be designed as insulating couplings or insulating flanges.

4.3.2 Strength test

Any insulating coupling shall be hydrostatically tested at a test pressure of at least 1,5 times the design pressure of the component. End sealing methods which subject the coupling to axial compression shall not be used.

The hydrostatic cycle test sequence should be agreed upon between pipeline operator and manufacturer.

4.3.3 Tightness test

Following a successful hydrostatic test, any insulating coupling shall be tested with air at 5 bar. There shall be no leakage.

4.3.4 Electrical test

Any insulating joint shall be tested in dry condition for 1 min at a minimum voltage of 5 000 V a.c. (50 Hz) as foreseen in EN 1594. This shall not give rise to any corona effects or an insulation breakdown.

Following a successful hydrostatic test, where applicable, the resistance in the dry condition shall not be less than 0,1 MΩ when tested with a minimum voltage of 500 V d.c.

4.3.5 Inspection documents

Conformity of insulating joints shall be certified by an inspection document 3.1 in accordance with EN 10204.

4.4 Valves

Valves shall comply with the appropriate European Standards. In the absence of a European Standard, the appropriate standard of a member country may be used. Metallic valves shall be in accordance to EN 13774.

4.5 Corrosion protection

4.5.1 General

Corrosion protection systems shall conform to the relevant International, European or National Standards.

Two kinds of corrosion protection can apply:

— passive corrosion protection;

— active corrosion protection.

4.5.2 Passive corrosion protection

For passive protection provided by means of external coating, the corrosion protection has to fulfil the applicable International, European or National Standards.

For buried pipes a coating is required in accordance with relevant European and/or National Standards.

EXAMPLE 1 Examples of standards for coatings on buried pipes are:

— EN ISO 21809-1;

— EN 10288;

— DIN 30670.

For pipe joints and fittings, the coating system may be agreed with the supplier, in accordance with EN 12068, EN 10289 or EN 10290.

Conformity of coating shall be certified by an inspection document in accordance with EN 10204.

EXAMPLE 2 For pipework under 5 bar – Document 2.2 according to EN 10204.

For above ground pipes, an adequate corrosion protection is required, e.g. painted or wrapped coatings:

EXAMPLE 3 EN ISO 12944.

4.5.3 Active corrosion protection

Where an active corrosion protection is required, it shall comply with EN 12954, EN 50162 and EN 15280 and shall be approved with a measuring procedure according to EN 13509. Also the relevant clause in EN 12007-1 shall be considered.

For installation, start up, inspection and maintenance of the cathodic corrosion protection the measurements shall be evaluated by a competent person according to EN 15257 Grade 2, or a suitable alternative.

4.6 Jointing methods

4.6.1 Welding joints

Pipes and other pipeline components should preferably be welded.

Welding, non-destructive testing, other related activities and documentations shall be carried out in accordance with EN 12732.

4.6.2 Flanged joints

Flanges, gaskets and bolting shall conform to EN 1092-1, EN 1514-1, EN 1514-2, EN 1514-3, EN 1514-4, EN 1515-1, EN 1515-2, EN 1591-1, EN 1591-2, EN 1759-1, EN 12560-1, EN 12560-2, EN 12560-3, EN 12560-4 and EN 12560-5, where applicable.

Gaskets shall correspond to the flange type being used and be made of material that is resistant to the transported gas.

Gaskets shall not contain asbestos.

4.6.3 Threaded joints

Threaded joints shall not be used below ground for pipes greater than DN 50 nor for MOP greater than 5 bar.

The use of threaded joints indoors and above ground on pipes greater than DN 50 for pressures up to 5 bar shall be subject to a risk assessment.

Suitable seals shall be used on threaded joints.

Threaded joints shall conform to EN 10226-1 and have an internal parallel thread and an external tapered thread. Threaded tube shall conform to EN 10255.

4.6.4 Compression joints

Compression joints shall not be used for pipes greater than DN 50 nor for MOP greater than 5 bar. Compression joints shall conform to appropriate standards. If no standard is available they shall conform to manufacturer's instructions and shall be type tested.

5 Construction

5.1 Handling, transportation and storage

General requirements are given in EN 12007-1.

Further guidance is given in Annex A.

5.2 Laying

5.2.1 General

The pipework should be lowered into the trench as soon as possible after the string has been welded and should ideally be laid on a dry base. A sufficient number of lifting devices shall be used to lower individual pipes and strings and these lifting devices shall ensure even lowering of the pipework whilst preventing damage due to sagging. Care shall be taken to ensure that damage of the pipework does not occur. Suitable auxiliary devices shall be used to protect the pipework coating.

The pipework shall be evenly bedded on the bottom of the trench. Where flotation can occur after backfilling, consideration should be given to the use of weighted coatings, concrete weights or screw anchors. Under such conditions consideration should be given to the installation of position markers.

Suitable backfill material shall be carefully compacted around the pipework. Care should be taken to prevent any material that could cause damage to the coating or pipe from coming into contact with the pipework.

No foreign matter should remain in the pipework following construction.

NOTE This can be achieved by using a close-fitting pipe brush.

If work is interrupted or upon completion of work, the pipework shall be sealed off using stoppers, covers or similar.

5.2.2 Pipe stringing

Pipes should be strung so as to minimize interference with the land crossed. Care should be taken to avoid damage to pipes and fittings during stringing.

5.2.3 Deflection

Deflections of the pipework in the trench shall not exceed a minimum bending radius of:

$$R_{\min} = 206 \times \frac{S}{R_{t\,0,5}} \times D$$

where

$R_{\min}$ is the minimum bending radius, in m;

S is the safety factor;

$R_{t\,0,5}$ is the specified minimum yield strength, in N/m^2;

D is the outside diameter, in mm.

Numerical examples are given in Annex B.

5.2.4 Connections to other plant

Precautions shall be taken to avoid uneven settlement and minimize induced stresses in pipework at connections to other plant.

EXAMPLE Connections to pressure regulating stations or measuring stations.

5.2.5 Valves

Buried valves for operational purposes shall be fitted with a surface cover. A spindle extension for operation and lubrication purposes may be necessary.

Exposed valves should be positioned to ensure unrestricted access for their operation and maintenance and should be secured against unauthorized interference.

5.2.6 Boring, jacking and impact moling

Attention shall be paid to prevention of damage to the pipework coating when boring, jacking and impact moling techniques are used. Settlement phenomena should also be taken into consideration.

Further guidance is given in EN 1594.

5.3 Construction records

A record shall be maintained for all welding and pipe laying work for pipework with MOP greater than 5 bar.

The content of the records and the period to retain the records shall be specified, in accordance with national legislation, standards and/or national codes of practice.

The records can contain the following information for pipes:

a) diameter;

b) wall thickness;

c) material grade;

d) identification no.; and

e) type of joint.

The record can contain the following information for welding:

f) welders identification;

NOTE Separate records can be required for the root, fill and cover pass welders.

g) welding procedure specification;

h) name of welding supervisor and contractor; and

i) non-destructive test results and certification.

The record can contain the following information for coating:

j) type of coating;

k) inspection of coating; and

l) application of field coating.

6 Coating inspection

Pipe coating and field coated joints shall be inspected in accordance with the specification of the pipeline operator.

Following backfilling and consolidation of the trench, the coating integrity shall be verified.

EXAMPLE By means of a Pearson or similar test system.

7 Pressure testing

Methods and procedures for pneumatic or hydrostatic testing shall be carried out in accordance with EN 12327.

Annex A
(informative)

Handling, transportation and storage

A.1 Safety

Each place of work should be made and kept safe for any person working there so far as is reasonably practicable. A suitable and safe means of access and egress from the construction site should be provided and maintained. Suitable clothing should be worn by all persons involved in handling, transport and storage operations.

EXAMPLE Safety helmets, safety footwear, industrial gloves and high visibility clothing.

All persons employed in handling plant and components should be instructed in the principles of kinetic manual handling and lifting and associated hazards.

Persons employed in handling plant and components should be instructed in:

— inspection of equipment before use;

— safe working loads of single and two legged slings;

— method of joining chains;

— avoidance of use of knotted chains;

— hazard of idle chains on crane hooks.

A.2 Handling

A.2.1 General

The risk should be assessed prior to any manoeuvring of pipeline components, to confirm that the method and the equipment is suitable for the environment and the task.

The type of mobile lifting equipment to be used for a particular handling operation should be chosen to suit the maximum weight of pipe likely to be encountered, the maximum outreach required for loading, offloading, or stacking and the type of ground on which the mobile lifting equipment will happen to operate.

A.2.2 Pipe bundles

Special precautions should be taken when handling pipe bundles. Pipes are likely to roll when a bundle is broken for use. Bundles should be placed in a suitable frame or post pallet before the strapping is cut. The pallet restraining uprights should be suitably padded to prevent any damage to the pipe coating. Suitable personal protection should be worn when removing strapping under tension.

A.2.3 Spreader beam and slings

Where practicable, pipes should be lifted using a spreader beam with suitable slings. The belt slings should be positioned symmetrically on the spreader beam, at approximately the one-quarter and three quarter positions along the pipe.

A.2.4 Two-leg chain slings

When lifting pipes individually and where a spreader beam with belt slings is not practicable, two-leg chain slings should be used.

Two-leg chain slings should not be used at an included angle of more than 120°.

A.2.5 Chains and wire ropes

Chains or wire ropes should not be employed in direct contact with either coated or uncoated pipes.

Bends and tees should not be handled with lifting hooks and chains. Lifting should be done by passing a suitable sling through the bore. The sling should be protected against being cut by the sharp edge of the bevel.

A.2.6 Lifting operations

Pipes should be lifted smoothly and pipe movement controlled by the use of guide ropes. Where it is necessary to travel with a suspended load it should be carried as near to the ground as possible and steadied by the guide rope.

Guide ropes or slings should not be attached to actuator parts, valves, spindles or hand wheels. In the absence of suitable guidance from the manufacturer, slings should be placed around the strongest parts of the component consistent with stability. Guide ropes should be used to prevent swinging and uncontrolled rotation of the load.

The handling of split fittings does not require any different practice from conventional fittings of comparable size, weight and dimensions. It should be remembered that the component parts of split fittings are matched and that proper means of identification should be applied to all parts to ensure that no confusion arises.

If a crane is used, the bundles should be lifted using a spreader beam and belt slings. Chains or wire rope slings should not be used in contact with the pipe. Under no circumstances should lifting equipment be attached to the wooden battens or straps securing the bundle.

A.3 Transportation

When transporting steel pipes, the vehicle bed should be free from nails and other protrusions. The steel pipes should have sufficient support to minimize pipe deformation.

The vehicle should have side supports and the steel pipes should be secured effectively during transportation. All posts should be flat with no sharp edges.

A.4 Storage

A.4.1 General

Any site selected for storage of components should have suitable access for vehicles, equipment and personnel.

The site should be level, firm and well drained.

Vehicle access should be considered in planning the site.

Appropriate precautions should be taken to secure against theft and vandalism.

The disposition of components should afford ready location and ease of identification.

A.4.2 Protection of components against damage or deterioration

Only components which are designed to withstand adverse weather conditions should be stored in the open.

When pipes, bends, tees and all other associated materials are to be stored in open, this should be completed as per agreed guidelines. Where protection is provided for components stored for short periods of time, they should be easily accessible to identify signs of deterioration.

Valves should be stored so as to prevent water accumulating within them. Globe, wedge gate and parallel disc valves should be stored in the closed position with the pipe axis horizontal. Ball and plug and through conduit gate valves should be stored in the open position with the pipe axis either vertical or tilted from the horizontal.

Where components are held in store for extended periods the following measures should be taken.

— Identification markings should be inspected regularly to ensure they are legible.

— Moving parts of components should be checked periodically to ensure they are capable of functioning properly.

— All necessary checks should be carried out prior to an item being issued from site.

— Pipes can be safely stacked up to 1,5 m on a clear and level surface. Battens should be laid to support the first layer of pipes to avoid damage from stones or other objects and to facilitate handling. A sufficient number of battens should be provided to ensure integrity of the coating.

— Bundles of pipes can be placed into pallets for storage, each containing one or two bundles.

— Consideration should be given to the influence of UV-degradation.

A.4.3 First in – first out

The exposure time of polyethylene coated pipes should be minimized by issuing from store on a 'first in – first out' rotation.

Annex B
(informative)

Deflection of pipes

Some of the examples of minimum bending radius, given by the formula in 5.2.3, are shown in Table B.1.

Table B.1 — Numerical values of minimum bending radius

Materials	EN ISO 3183		**L 210**	**L245**	**L 290**	**L320**	**L 360**
Specified minimum yield strength	$R_{t0,5}$	N/mm^2	210	245	290	320	360
Safety factor	*S*		1,5	1,5	1,5	1,5	1,5
Nominal diameter DN	**External diameter D**		**Minimum bending radius R_{min} (m)**				
100	114,3	mm	168	144	122	110	98
150	168,3	mm	248	212	197	162	144
200	219,1	mm	322	276	233	212	188
250	273	mm	402	244	291	263	234
300	323,9	mm	477	408	345	313	278
400	406,4	mm	598	513	433	393	349
500	508	mm	747	641	541	491	436

Annex C
(informative)

Calculation of wall thickness

The minimum wall thickness to withstand the internal pressure is calculated as follows:

$$T_{\min} = \frac{DP \times D}{20 \times \sigma_p}$$

with the requirement that:

$$\sigma_p = f_o \times R_{t\,0,5}$$

where

T_{min} is the calculated minimum wall thickness, in mm;

DP is the design pressure, in bar;

D is the outside diameter in accordance with EN ISO 3183, in mm;

σ_p is the specified maximum hoop stress, in N/mm^2;

f_o is the design factor;

$R_{t\,0,5}$ is the specified minimum yield strength, in N/mm^2.

The maximum design factor (*fo*) for internal pressure to be used for the pipeline section in question is 0,45.

NOTE If a safety factor is designated, it is the reciprocal of the design factor.

EXAMPLE A design factor of 0,45 is equal to a safety factor of 2,22.

The wall thickness to be specified in accordance with EN ISO 3183 is the calculated minimum wall thickness plus the lower wall thickness tolerance.

Annex D
(informative)

Significant technical changes between this European Standard and the previous edition

Clause	Title/Paragraph/Table/Figure	Change
All		Recommendations are checked and transferred into requirements, where appropriate. Accordingly, also the title of the document changed to "[…] Functional requirements".
Clause 3		Definitions are aligned: those given in EN 12007-1 are deleted. Reference is made to EN 12007-1.
4.1.1 4.1.5 Annex B Annex C	Table 1 Table B.1	Reference to EN 10208-1 is replaced by EN ISO 3183 instead of EN 10208-1. EN 10208-1 is withdrawn since 11/2013. The steel grade L235 and L240 are eliminated from the requirements accordingly; Steel grades L245 and L290 are added.
4.1.5		“minimum level of conformity” instead of “conformity”. This is only a grammatical correction.
4.2.1	Table 2, Table 3	Addition of data for very small diameters DN 10-20 which were not included.
4.4		“Metallic valves shall be in accordance to EN 13774”. Reference to the relevant EN was added.
4.5		The missing reference to 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" was added.
4.5.2		A broad reference to the alternative cathodic protection systems was added: “Installation of sacrificial anodes or impressed current systems”. A reference to the applicable standard EN 12954 “Cathodic protection of buried or immersed metallic structures — General principles and application for pipelines” was added.
4.6.1		A broad reference to the tests needed to accept welds was added: “Welding, non-destructive testing, and other related activities and documentations “
4.6.3		Threaded tube shall conform to EN 10255 “Non-alloy steel tubes suitable for welding and threading — Technical delivery conditions”
5.2.5		A strong advice regarding selection of the installation position for exposed valves was added: “exposed valves should be positioned to ensure unrestricted access for their operation and maintenance”

Clause	Title/Paragraph/Table/Figure	Change
A.2.2		The previous reference to eye protection was replaced by a generic reference to “Suitable personal” protection.
General		Clause on "off-take connections" (EN 12007-3:2000, 3.6) is deleted as it is no longer common practice.
General		Text restructured: Construction records in EN 12007-3:2000, 4.3 is now placed at the end of the construction chapter as 5.3 for logical reasons.
General		Text restructured: Chapter on joints is renamed in "Jointing methods" and enlarged for all kind of joints dealt with in the present EN; the clauses on pipe joints (EN 12007-3:2000, 4.2) are now part of it.
NOTE The technical changes referred to include the significant changes from the revised EN but is not an exhaustive list of all modifications from the previous version.		

Bibliography

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

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

[3] EN 10217-1, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*

[4] EN 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*

[5] prEN 10255, *Non-Alloy steel tubes suitable for welding, threading and other joining methods — Requirements and test methods*

[6] EN 10288, *Steel tubes and fittings for onshore and offshore pipelines — External two layer extruded polyethylene based coatings*

[7] EN 10289, *Steel tubes and fittings for onshore and offshore pipelines — External liquid applied epoxy and epoxy-modified coatings*

[8] EN 10290, *Steel tubes and fittings for onshore and offshore pipelines — External liquid applied polyurethane and polyurethane-modified coatings*

[9] EN 12068, *Cathodic protection — External organic coatings for the corrosion protection of burried or immersed steel pipelines used in conjunction with cathodic protection — Tapes and shrinkable materials*

[10] EN ISO 21809-1, *Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems — Part 1: Polyolefin coatings (3-layer PE and 3-layer PP) (ISO 21809-1)*

[11] EN ISO 12944, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems (ISO 12944)*

[12] CEN/TR 13737 (all parts), *Implementation Guide for functional standards elaborated by CEN/TC 234 "Gas infrastructure"*

[13] DIN 30670, *Polyethylen coatings of steel pipes and fittings — Requirements and testings*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™