

INTERNATIONAL STANDARD

ISO
3183-1

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Petroleum and natural gas industries — Steel pipe for pipelines — Technical delivery conditions —

Part 1:

Pipes of requirement class A

*Industries du pétrole et du gaz naturel — Tubes en acier pour conduites —
Conditions techniques de livraison —*

Partie 1: Tubes de la classe d'exigences A



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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Definitions	3
3.1 General	3
3.2 Welding processes, pipes and welds	3
4 Designation	4
5 Information to be supplied by the purchaser	5
6 Manufacturing	6
6.1 Pipe manufacturing	6
6.2 Cold expansion	7
6.3 Material.....	7
6.4 Heat treatment	7
6.5 Strip end welds - helical seam pipe	7
6.6 Traceability	7
7 Requirements	8
7.1 General	8
7.2 Chemical composition	8
7.3 Mechanical properties	10
7.4 Metallurgical requirements	12
7.5 Appearance, imperfections and defects	12
7.6 Dimensions, masses and tolerances	12
8 Testing and inspection	43
8.1 Type of documents on inspection and testing	43
8.2 Purchaser inspection	43
8.3 Retention of records	43
8.4 Testing of chemical composition	44
8.5 Testing of mechanical and technological characteristics	45
8.6 Hydrostatic test	49
8.7 Dimensional testing and weighing	49

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8.8	Visual examination	49
8.9	Non-destructive testing	50
8.10	Test methods and results	50
8.11	Invalidation of chemical, mechanical and technological tests	68
8.12	Re-tests	68
9	Marking of pipes and pipe couplings	70
9.1	General	70
9.2	Location of marking	70
9.3	Sequence of markings	71
9.4	Bundle identification	72
9.5	Length	73
9.6	Couplings	73
9.7	Die stamping	73
9.8	Thread identification	73
9.9	Thread certification	73
9.10	Pipe processor markings	73
10	Protective coatings	74

Annexes

A	Specification for welded jointers	75
B	Repair welding procedure	76
C	Couplings	81
D	Supplementary requirements	83
E	Guided bend test jig dimensions	92
F	Purchaser inspection	102
G	Workmanship, visual inspection and repair of defects	103
H	Comparison of steel grade designations	108
J	Main differences between ISO 3183-1 and ANSI/API Spec. 5L [1]	109
K	Bibliography	111

Foreword

ISO (International Organization for Standardization) is a worldwide federation of national standard bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3183-1 was prepared by Technical Committee ISO/TC 67 *Materials, equipment and offshore structures for petroleum and natural gas industries*, Subcommittee SC 1, *Line pipe*, on the basis of the American National Standard ANSI/API Spec. 5L [1], structured in accordance with the ISO rules and aligned with ISO 3183, part 2 as far as possible.

It replaces partly ISO 3183:1980 of which it constitutes a technical revision.

ISO 3183 consists of the following parts under the general title

Petroleum and natural gas industries – Steel pipe for pipelines – Technical delivery conditions

- *Part 1: Pipes of requirement class A*
- *Part 2: Pipes of requirement class B*
- *Part 3: Pipes of requirement class C*

Annexes A to G form an integral part of this part of ISO 3183.

Annexes H to K are for information only.

Introduction

In the preparation of this International Standard the competent committee was unanimous in seeking to avoid specifying the quality of line pipe to be used for a particular application. However, the committee recognized that there are several broad quality levels commonly used, and has differentiated between these quality levels as follows:

Firstly, the committee recognized the need to provide a basic quality level which corresponds to that specified in ANSI/API Spec. 5L [1]. This is designated requirement class A and considered in this part of ISO 3183. The main differences between ANSI/API Spec. 5L and ISO 3183-1 are listed in annex J.

Secondly, many purchasers impose requirements different from, or additional to, the basic standard. This approach is common, for example, for transmission pipelines. Such overall enhanced requirements are addressed in requirement class B and considered in Part 2 of ISO 3183.

Thirdly, there are certain particularly demanding applications where very stringent requirements on quality and testing are imposed. Such requirements are reflected in requirement class C and considered in Part 3 of ISO 3183.

The selection of the requirement class depends on many factors. The properties of the fluid to be conveyed, the service conditions, design code and any statutory requirements should all be taken into consideration. Therefore, this International Standard gives no detailed guidelines. It is the ultimate responsibility of the user to select the appropriate requirement class for the intended application.

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Petroleum and natural gas industries – Steel pipe for pipelines – Technical delivery conditions –

Part 1: Pipes of requirement class A

1 Scope

This part of ISO 3183 specifies the technical delivery conditions for seamless and welded pipe of non-alloy and alloy (except stainless) steels with the basic quality and testing requirements (level A), which are intended for the transmission and distribution of combustible and non-combustible fluids (including water) in the petroleum and natural gas industries.

This part of ISO 3183 includes threaded and extra-strong threaded line pipe; and plain-end, regular-mass plain-end, special plain-end, extra-strong plain-end and double-extra-strong plain-end pipe; as well as bell and spigot pipe.

Dimensional requirements on threads and thread gauges, stipulations on gauging practice, gauge specifications and certification, as well as instruments and methods for inspection of threads are given in ISO 10422 and are applicable to products covered by this part of ISO 3183.

Grades covered by this part of ISO 3183 are L175, L210, L245, L290, L320, L360, L390, L415, L450, L485, L555, grades intermediate to the grades L290 and higher, listed in table 2.

For regular-mass and special plain-end pipe (special mass) as shown in tables 8 and 9 and for threaded pipe larger than nominal size 12 (see table 6) the size designations used herein are outside-diameter sizes. For all other pipe, the size designations are nominal pipe sizes. Where pipe size limits (or size ranges) are given, these are outside-diameter sizes except when it is stated that they are nominal. These outside-diameter size limits and ranges apply also to the corresponding nominal sizes (see 7.6).

NOTE 1 Attention is drawn to the definition for seamless pipe in 3.2.2.1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 3183. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 3183 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 404:1992, *Steel and steel products – General technical delivery requirements*.

ISO 1027:1983, *Radiographic image quality indicators for non-destructive testing – Principles and identification.*

ISO 2566-1:1984, *Steel – Conversion of elongation values – Part 1: Carbon and low alloy steels.*

ISO 4200:1991, *Plain end steel tubes, welded and seamless – General tables of dimensions and masses per unit length.*

ISO 4948-1:1982, *Steels – Classification – Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition.*

ISO/TR 4949:1989, *Steel names based on letter symbols.*

ISO 6761:1981, *Steel tubes – Preparation of ends of tubes and fittings for welding.*

ISO 6892:1984, *Metallic materials – Tensile testing.*

ISO 6929:1987, *Steel products – Definitions and classification.*

ISO 7500-1:1986, *Metallic materials – Verification of static uniaxial testing machines – Part 1: Tensile testing machines.*

ISO 8491:1986, *Metallic materials – Tube (in full section) – Bend test.*

ISO 8492:1986, *Metallic materials – Tube – Flattening test.*

ISO 10422:1993, *Petroleum and natural gas industries – Threading, gauging and thread inspection of casing, tubing and line pipe threads – Specification.*

ISO 10474:1991, *Steel and steel products – Inspection documents.*

API Bull 5A2-1992, *Bulletin on thread compounds for casing, tubing, and line pipe.*

API RP 5L3-1996, *Recommended practice for conducting drop-weight tear tests on line pipe.*

API Std 1104-1994, *Welding of pipelines and related facilities.*

ASTM A 29, *Recommended practice for indicating which places of figures are to be considered significant in specified limiting values.*

ASTM A 370:1989, *Test methods and definitions for mechanical testing of steel products.*

ASTM A 751:1990, *Test methods, practices and terminology for chemical analysis of steel products.*

ASTM E 4:1989, *Practices for load verification of testing machines.*

ASTM E 83:1990, *Method of verification and classification of extensometers.*

ASME, *Boiler and pressure vessel code, Section IX.*

3 Definitions

3.1 General

For the purpose of this part of ISO 3183 the definitions in 3.2 shall apply when additional to or differing from those given in ISO 6929 for steel products.

Moreover, within this part of ISO 3183:

- The term *manufacturer* refers to the firm, company or corporation responsible for marking the product to warrant that the product conforms to the standard. The *manufacturer* may be either a pipe mill, a processor, a maker of couplings or a threader as applicable. The *manufacturer* is responsible for compliance with all of the applicable provisions of the standard.
- The term *pipe mill* refers to the firm, company or corporation that operates pipe making facilities.
- The term *processor* refers to the firm, company or corporation that operates facilities capable of heat treating pipe made by a pipe mill.

3.2 Welding processes, pipes and welds

3.2.1 Welding process

3.2.1.1 Without filler metal

- (a) **continuous welding:** Process of forming a seam by heating the strip in a furnace and mechanically pressing the formed edges together, wherein successive coils of strip had been joined together to provide a continuous flow of steel for the welding mill. (This process is a type of butt-welding.)
- (b) **electric-welding:** Process of forming a seam by electric-resistance or electric-induction welding wherein the edges to be welded are mechanically pressed together and the heat for welding is generated by the resistance to flow of electric current.

3.2.1.2 With filler metal

- (a) **submerged arc-welding:** Welding process that produces coalescence of metals by heating them with an arc or arcs between bare metal consumable electrode or electrodes and the work. The arc and molten metal are shielded by a blanket of granular, fusible material on the work. Pressure is not used, and part or all of the filler metal is obtained from the electrode(s).
- (b) **gas metal arc-welding:** Welding process that produces coalescence of metals by heating them with an arc or arcs between a continuous consumable electrode and the work. Shielding is obtained entirely from an externally supplied gas or gas mixture. Pressure is not used, and the filler metal is obtained from the electrode.

3.2.2 Types of pipe

3.2.2.1 seamless pipe: Tubular product without a welded seam, manufactured in a hot forming process which may be followed by cold finishing to obtain the desired shape, dimensions and properties.

NOTE 2 Cast pipes are not covered by ISO 3183.

3.2.2.2 continuous welded pipe: Pipe having one longitudinal seam produced by the continuous welding process defined in 3.2.1.1 (a). (This type of pipe is a type of butt-welded pipe.)

3.2.2.3 electric-welded pipe: Pipe having one longitudinal seam produced by the electric-welding process defined in 3.2.1.1 (b).

3.2.2.4 longitudinal seam submerged arc-welded pipe: Pipe having one longitudinal seam produced by the automatic submerged arc-welding process defined in 3.2.1.2 (a).

3.2.2.5 gas metal arc-welded pipe: Pipe having one longitudinal or helical seam produced by the continuous gas metal arc-welding process defined in 3.2.1.2 (b).

3.2.2.6 combination gas metal arc- and submerged arc-welded pipe: Pipe having one longitudinal or helical seam produced by a combination of the welding processes defined in 3.2.1.2 (a) and 3.2.1.2 (b).

3.2.2.7 double seam submerged-arc welded pipe: Pipe having two longitudinal seams produced by the automatic submerged-arc welding process defined in 3.2.1.2 (a).

3.2.2.8 double seam gas metal arc-welded pipe: Pipe having two longitudinal seams produced by the gas metal arc-welding process defined in 3.2.1.2 (b).

3.2.2.9 double seam combination gas metal arc- and submerged arc-welded pipe: Pipe having two longitudinal seams produced by a combination of the welding processes defined in 3.2.1.2 (a) and 3.2.1.2 (b).

3.2.2.10 helical seam submerged arc-welded pipe: Pipe having one helical seam produced by the automatic submerged arc-welding process defined in 3.2.1.2 (a). (This type of pipe is also known as spiral weld pipe.)

3.2.3 Types of seam welds

3.2.3.1 electric-weld: Longitudinal seam weld produced by the electric-welding process defined in 3.2.1.1 (b).

3.2.3.2 submerged arc-weld: Longitudinal or helical seam weld produced by the submerged arc-welding process defined in 3.2.1.2 (a).

3.2.3.3 gas metal arc-weld: Longitudinal seam weld produced in whole or in part by the continuous gas metal arc-welding process defined in 3.2.1.2 (b).

3.2.3.4 strip/skelp end weld: Seam weld that joins plate or strip ends together.

3.2.3.5 jointer weld: Circumferential seam weld that joins two pieces of pipe together.

3.2.3.6 tack weld: Seam weld used to align the abutting edges until the final seam welds are produced.

3.2.4 Imperfections and defects

3.2.4.1 An "imperfection" is a discontinuity or irregularity in the product detected by methods outlined in this part of ISO 3183.

3.2.4.2 A "defect" is an imperfection of sufficient magnitude to preclude acceptance of the product in accordance with this part of ISO 3183.

4 Designation

The steels specified in this part of ISO 3183 are designated as shown in table 2 differing from ISO/TR 4949.

NOTE 3 In annex H a comparison of these steel designations with those specified in ANSI/API Spec 5L [1] is given.

5 Information to be supplied by the purchaser

In placing orders for line pipe to be manufactured in accordance with this part of ISO 3183 the purchaser should specify the following on the purchase order:

Specification	ISO 3183-1
Quantity	
Grade or class	tables 2 and 3
Type of pipe	3.2.2
Size	
Nominal size	
Threaded pipe	table 6
Extra-strong threaded pipe	table 7
Plain-end pipe	table 8
Extra-strong plain-end pipe	table 8
Double-extra-strong plain-end pipe	table 8
Outside diameter	
Regular-mass plain-end pipe	table 8
Special plain-end pipe	table 8
Mass per metre or wall thickness	7.6.1, 7.6.3
Nominal length	7.6.5
End finish	7.6.9
Delivery date and shipping instructions	

The purchaser should also state on the purchase order his requirements concerning the following stipulations, which are optional:

Document of compliance	8.1.1
Chemical analysis test reports	8.1.2
Acceptance and maximum allowable length requirements on jointers	7.6.7
Jointers for threaded pipe	7.6.7
Threaded ends, extra-strong pipe	7.6.9.1
Alternative bevel, plain-end pipe with outside diameter $\geq 60,3$ mm	7.6.9.3
Special coupling pipe ends	7.6.9.5
Power-tight make-up	7.6.9.2
Special non-destructive inspection for laminations	G.3.9
Defect repair procedures	G.6, G.7, G.8
Bare pipe - special coatings	10
Method of welding jointers	annex A
Purchaser inspection	annex F

Attention is called to the following stipulations which are subject to agreement between the interested parties:

Strip end welds	6.5
Chemical composition	7.2.1
Intermediate grades	1, 7.2.1, 7.3.2, table B.1
Flattening test orientation	8.5.2.2, figure 3
Intermediate diameters	7.6.2
Intermediate wall thickness	7.6.3
Supplementary requirements	annex D

NDT electric welds	8.9, SR7
NDT seamless pipe	8.9, SR2
Supplementary hydrostatic test	8.10.9.4
Hydrostatic test pressure	8.10.9.3
Lengths applied to carloads	7.6.8.6, table 11
Nonstandard length and length tolerances	7.6.5
Welded couplings	C.1
Thread protectors	7.6.9
Repair of welds of electric-welded pipe	8.10.11.3.4, G.5 b)
Marking requirements	9.2, 9.3, 9.7

This information should preferably be given in the way indicated in the following example.

EXAMPLE

Delivery of 1 500 m regular-mass plain-end pipe of grade L290 with an outside diameter of 457,0 mm, a wall thickness of 10,3 mm and a nominal length of 12 m (see table 11), with document of compliance.

Designation in the order:

1 500 m pipe **ISO 3183-1-L290-457,0x10,3x12**-with document of compliance.

6 Manufacturing

6.1 Pipe manufacturing

Pipe complying with this part of ISO 3183 shall be subject to the limitations specified in table 1.

6.1.1 Electric-welded pipe in grades higher than L290, the weld seam and the entire heat affected zone shall be heat treated so as to simulate a normalizing heat treatment (see note 4), except that, by agreement between the interested parties, alternative heat treatments or combinations of heat treatment and chemical composition may be substituted. Where such substitutions are made, the manufacturer shall demonstrate the effectiveness of the method selected using a mutually agreed upon procedure, which may include, but is not necessarily limited to, hardness-testing, microstructural evaluation, or mechanical testing. For grades L290 and lower, the weld seam shall be similarly heat treated, or the pipe shall be processed in such a manner that no untempered martensite remains.

NOTE 4 During the manufacture of electric-welded pipe, the product is in motion through the surrounding air. Normalizing is usually defined as "cooling in still air", hence, the phrase "to stimulate a normalizing heat treatment" is used.

6.1.2 Longitudinal seam submerged arc-welded pipe, at least one pass shall be on the inside and at least one pass shall be on the outside.

6.1.3 Combination gas metal arc- and submerged arc-welded pipe, the gas metal arc-welding process shall be continuous and first, and followed by the automatic submerged arc-welding process with, at least, one pass on the inside and one pass on the outside.

6.1.4 Double seam submerged arc-welded pipe, the seams shall be approximately 180° apart. For each seam, at least one pass shall be on the inside and at least one pass shall be on the outside.

6.1.5 Double seam gas metal arc-welded pipe, the seams shall be approximately 180° apart. For each seam, at least one pass shall be on the inside and at least one pass shall be on the outside.

6.1.6 Double seam combination gas metal arc- and submerged arc-welded pipe, the seams shall be approximately 180° apart. For each seam, the gas metal arc-welding shall be continuous and first, and followed by the automatic submerged arc-welding process with at least one pass on the inside and one pass on the outside.

6.1.7 Tack welds shall be made by manual or semi-automatic submerged arc-welding; electric-welding; gas metal arc-welding; flux cored arc-welding; or shielded metal arc-welding using low hydrogen electrodes. Tack welds shall be removed by machining or remelted during subsequent welding of the seam.

6.1.8 Helical seam submerged arc-welded pipe, at least one pass shall be on the inside and at least one pass shall be on the outside.

6.2 Cold expansion

Pipe complying with this part of ISO 3183, except continuous welded, shall be either non-expanded or cold expanded at the option of the manufacturer unless otherwise specified on the purchase order. Suitable provision shall be incorporated to protect the weld from contact with the internal expander during mechanical expansion.

6.3 Material

The width of plate or strip used to manufacture helical seam pipe shall be not less than 0,8 or more than 3 times the pipe outside diameter.

6.4 Heat treatment

The heat treating process shall be performed in accordance with a documented procedure. Pipe complying with this part of ISO 3183 may be as rolled, normalized, normalized and tempered, subcritically stress-relieved, or subcritically age-hardened; and grades L290 and higher may be quenched and tempered. (See clause 9 for applicable marking requirements.)

6.5 Strip end welds - helical seam pipe

Junctions of strip end welds and helical seam welds in finished pipe shall be permitted only at distances greater than 304,8 mm from the pipe ends. By agreement between the interested parties, strip end welds shall be permitted at the pipe ends, provided there is a circumferential separation of at least 152,4 mm between the strip end weld and the helical seam weld at the applicable pipe ends. Strip end welds in finished pipe shall be properly prepared for welding and shall be made by automatic submerged arc-welding, automatic gas metal arc-welding, or a combination of such welding procedures.

6.6 Traceability

The manufacturer shall establish and follow procedures for maintaining cast and/or lot identity until all required cast and/or lot tests are performed and conformity with standard requirements has been shown.

Table 1 – Process of manufacture

Type of pipe	Grade	
	L175	L210 to L555
Seamless	X	X
Continuous welded	X	
Electric-welded	X	X
Longitudinal seam submerged arc-welded		X
Gas metal arc-welded		X
Combination gas metal arc- and submerged arc-welded		X
Double seam submerged arc-welded ¹⁾		X
Double seam gas metal arc-welded ¹⁾		X
Double seam combination gas metal arc- and submerged arc-welded ¹⁾		X
Helical seam submerged arc-welded ²⁾		X
1) Double seam pipe is limited to outside diameter $\geq 914,0$ mm. 2) Helical seam pipe is limited to outside diameter $\geq 114,3$ mm.		

7 Requirements

7.1 General

The requirements specified in this part of ISO 3183 apply under the conditions that the relevant specifications for sampling, test piece preparation and test methods given in 8.5.2 and 8.10 are complied with.

Pipe manufactured as grade L415 or higher shall not be substituted for pipe ordered for grade L360 or lower without purchaser's approval.

7.2 Chemical composition

7.2.1 The composition of pipe complying with this part of ISO 3183, as determined by cast analysis for pipe other than grade L555, shall conform to the chemical requirements specified in table 2, except that, by agreement between the purchaser and the manufacturer, carbon contents higher than those specified may be used. The composition of intermediate grades (higher than L290) shall conform to chemical requirements agreed upon between the interested parties, and such requirements shall be consistent with the requirements specified in table 2 for the applicable type of pipe. For grades L290 and higher, by agreement between the purchaser and the manufacturer, elements other than niobium, vanadium, and titanium may be used; however, caution should be exercised in the determination of the quantity that may be present for any particular size and thickness of pipe, because the addition of such otherwise desirable elements may alter the weldability of the pipe.

NOTE 5 Class II steel is rephosphorized and probably has better threading properties than Class I but may be somewhat more difficult to bend.

Table 2 – Chemical requirements for cast analysis⁹⁾, % by mass

Type of pipe	Grade and class	Carbon max. ¹⁾	Manganese min. max.		Phosphorus min. max.		Sulfur max.
Seamless							
Non-expanded or cold expanded	L175, CI I	0,21	0,30	0,60	-	0,030	0,030
Non-expanded or cold expanded	L175, CI II ²⁾	0,21	0,30	0,60	0,045	0,080	0,030
Non-expanded or cold expanded	L210	0,22	-	0,90	-	0,030	0,030
Non-expanded or cold expanded	L245 ³⁾	0,27	-	1,15	-	0,030	0,030
Non-expanded	L290 ⁵⁾	0,29	-	1,25	-	0,030	0,030
Non-expanded	L320 ⁵⁾ , L360 ⁵⁾	0,31	-	1,35	-	0,030	0,030
Cold expanded	L290 ⁵⁾ , L320 ⁵⁾ , L360 ⁵⁾	0,29 ⁴⁾	-	1,25	-	0,030	0,030
Non-expanded or cold expanded	L390 ^{5) 6)} , L415 ^{5) 6)}	0,26	-	1,35	-	0,030	0,030
Non-expanded or cold expanded	L450, L485, L555	(By agreement between the interested parties.)					
Welded							
Electric-welded or continous welded only	L175, CI I	0,21	0,30	0,60	-	0,030	0,030
Electric-welded or continous welded only	L175, CI II ²⁾	0,21	0,30	0,60	0,045	0,080	0,030
Non-expanded or cold expanded	L210	0,21	-	0,90	-	0,030	0,030
Non-expanded or cold expanded	L245 ³⁾	0,26	-	1,15	-	0,030	0,030
Non-expanded or cold expanded	L290 ⁵⁾	0,28	-	1,25	-	0,030	0,030
Non-expanded	L320 ⁵⁾ , L360 ⁵⁾	0,30	-	1,25	-	0,030	0,030
Cold expanded	L320 ⁵⁾ , L360 ⁵⁾	0,28	-	1,25	-	0,030	0,030
Non-expanded or cold expanded	L390 ^{5) 6)} , L415 ^{5) 6)}	0,26	-	1,35	-	0,030	0,030
Non-expanded or cold expanded	L450 ^{5) 7)}	0,26	-	1,40	-	0,030	0,030 ²⁾
Non-expanded or cold expanded	L485 ⁶⁾	0,23 ⁸⁾	-	1,60 ⁸⁾	-	0,030	0,030
Non-expanded or cold expanded	L555 ⁹⁾	0,18 ^{8) 9)}	-	1,80 ^{8) 9)}	-	0,030 ⁹⁾	0,030 ⁹⁾
1) For grades L290 to L450 for each reduction of 0,01 % below the specified maximum carbon content, an increase of 0,05 % above the specified maximum manganese content is permissible, up to a maximum of 1,45 % for L360 and lower and up to a maximum of 1,60 % for grades higher than L360.							
2) Class II steel is rephosphorized. (See 7.2.1 for note on bending and threading properties.)							
3) Niobium, vanadium, titanium, or combinations thereof, may be used by agreement between the interested parties.							
4) For cold expanded seamless pipe with ≥ 508 mm outside diameter, the maximum carbon content shall be 0,28 %.							
5) Niobium, vanadium, titanium, or combinations thereof, may be used at the discretion of the manufacturer.							
6) Other chemical compositions may be furnished by agreement between the interested parties.							
7) For grade L450 welded pipe with ≥ 406,4 mm outside diameter with a wall thickness of 12,7 mm or less, the chemical composition shall be as shown or as agreed upon between the interested parties; for all other outside diameters and wall thicknesses of such pipe, the chemical composition shall be as agreed upon between the interested parties.							
8) For each reduction of 0,01 % below the specified maximum carbon content, an increase of 0,05 % above the specified maximum manganese content is permissible, up to a maximum of 2,00 %.							
9) For grade L555, limits are for product analysis only, thereby eliminating the need for product analysis tolerances in 7.2.2.							

7.2.2 The product analysis shall conform to the chemical requirements shown in table 2, within the following permissible variations for product analysis, except for grade L555 pipe where the requirements in table 2 are for product analysis:

Carbon, %:

Seamless pipe	
All non-expanded and cold expanded outside diameter < 508 mm	+ 0,03
Cold expanded 508 mm outside diameter and larger in grades L290 and higher	+ 0,04
Welded pipe	+ 0,04

Manganese, %:

All grades up to L240	+ 0,05
Where minimum is specified	- 0,05
Grade L290 and higher	+ 0,10
Phosphorus, %:	+ 0,01
Where minimum is specified	- 0,01
Sulfur, %:	+ 0,01

7.3 Mechanical properties

7.3.1 Acceptance criteria

These shall be in conformity with the requirements of

- tensile test in 8.10.2;
- flattening test in 8.10.3;
- bend test in 8.10.4;
- guided-bend test in 8.10.5;
- weld ductility test in 8.10.6;
- fracture toughness test in 8.10.7;
- hydrostatic test in 8.10.9.

7.3.2 Requirements for tensile strength

Grades L175, L210, L245, L290, L320, L360, L390, L415, L 450, L485 and L555 shall conform to the tensile requirements specified in table 3. Other grades intermediate to the listed grades between L290 and L555 shall conform to tensile requirements agreed upon between the interested parties, which requirements shall be consistent with those specified in table 3. For cold expanded pipe, the ratio of body yield strength and body ultimate tensile strength shall not exceed 0,93. The yield strength shall be the tensile stress required to produce a total elongation of 0,5 % of the gauge length as determined by an extensometer.

Table 3 – Tensile requirements

Grade	Yield strength for 0,5% total elongation $R_{t0,5}$	Ultimate tensile strength R_m		Elongation ¹⁾ A $L_0 = 5,65\sqrt{S_0}$ min. %
		min.	max.	
	min. N/mm ²	N/mm ²		
L175	175	315		27
L210	210	335		25
L245	245	415		21
L290	290	415		21
L320	320	435		20
L360	360	460		19
L390	390	490		18
L415	415	520		17
L450	450	535		17
L485	485	570		16
L555	555	625	825	15

1) These values apply to transverse specimens taken from the pipe body. When longitudinal specimens are tested (see figure 4) the values of elongation shall be 2 units higher.

7.3.3 Requirements for fracture toughness

For grade L555, the following fracture toughness requirements are mandatory for all diameters.

Table 4 – SR3 mandatory toughness requirements

Minimum impact energy at 0 °C J		Minimum shear area at 0 °C %	
Average of 3 specimens		Average of 3 specimens	
all cast averages	from one cast	all cast averages	from one cast
68	27	70	40

Table 5 – Optional SR3B and SR4 mandatory toughness requirements based on Charpy and drop weight tear tests

Minimum impact energy at 0 °C J		Minimum DWTT shear area at 0 °C %	
Average of 3 specimens		Average of 2 specimens	
all cast averages	from one cast	all cast averages	from one cast
68	27	60	40

For grades lower than L555 optional tests can be specified by the purchaser in accordance with annex D, SR3 or SR4 or any combination of these.

7.4 Metallurgical requirement

For grades higher than L290, full body normalized pipe excluded, compliance with the requirement of 6.1.1 that the entire heat affected zone be heat treated shall be demonstrated by metallographic examinations of a weld cross-section.

7.5 Appearance, imperfections and defects

7.5.1 For workmanship, visual inspection and repair of defects annex G applies.

7.5.2 For the acceptance limits for non-destructive inspection 8.10.11 applies.

7.6 Dimensions, masses and tolerances

7.6.1 General – Dimensions and masses: Line pipe shall be made in the outside diameters, wall thicknesses, and masses provided in tables 6, 7, 8 and 9 and in 7.6.2 and 7.6.3, respectively or in the relevant dimensions and masses given in ISO 4200, as specified on the purchase order.

The plain-end mass M shall be calculated using the following formula:

$$M = (D - T) \times T \times 0,024\ 661\ 5$$

where

- M is the mass per unit length, in kilograms per metre, rounded to the nearest 0,01 kg/m;
- D is the outside diameter, in millimetres, rounded to the nearest 0,1 mm for sizes < 457,0 mm, and 1 mm for sizes $\geq$ 457,0 mm;
- T is the specified wall thickness, in millimetres, rounded to the nearest 0,1 mm.

The coefficient takes into account a density equal to 7,85 kg/dm³.

7.6.2 Diameter

The outside diameter shall be within the tolerances specified in 7.6.8.1 (inside diameters are governed by the outside diameter and mass tolerances). Pipe in grades L290 and higher with outside diameters intermediate to those listed in table 9 is available in outside diameters $\geq$ 508,0 mm by agreement between the interested parties. Such pipe shall be consistent with all requirements of this part of ISO 3183 and shall be marked with the specified outside diameter. For threaded pipe, the outside diameter at the threaded ends shall be such that the thread length L_4 and the number of full-crest threads in that length are within the dimensions and tolerances specified in ISO 10422 (inside diameters are governed by the outside diameter and mass tolerances).

7.6.3 Wall thickness

The wall thickness at any place shall be within the tolerances specified in 7.6.8.4 except that the weld area shall not be limited by the plus tolerance.

Pipe with wall thicknesses intermediate to those listed in tables 8 and 9 is available by agreement between the interested parties. Such pipe shall be consistent with all requirements of this part of ISO 3183 and shall be marked in accordance with clause 9 using the specified wall thickness to calculate M .

7.6.4 Mass

The masses determined as described in 8.10.10.3 shall conform to the specified masses or calculated masses for plain-end pipe, or to the specified calculated masses (or adjusted calculated masses) for threaded-and-coupled pipe, within the tolerances specified in 7.6.8.5.

Calculated masses shall be determined in accordance with the following formula:

$$M_L = (M \times L) + e_M$$

where

- M_L is the calculated mass of a pipe of length L , in kilograms;
- M is the plain-end mass per unit length, in kilograms per metre;
- L is the length of pipe, including end finish, as defined in 7.6.5 and 8.10.10.4, in metres;
- e_M is the mass gain or loss due to end finishing, in kilograms.

For plain-end pipe, e_M equals zero.

7.6.5 Length

Unless otherwise agreed upon between the interested parties, pipe shall be made in the nominal lengths and within the length tolerances shown in table 11, as specified on the purchase order.

7.6.6 Straightness

Pipe in grades L175, L210 and L245 of an outside diameter less than 114,3 mm shall be reasonably straight. For all other pipe the deviation from a straight line shall not exceed 0,2 percent of the length.

7.6.7 Jointers

When specified on the purchase order, jointers (two lengths of pipe coupled together by the manufacturer, or two lengths of pipe welded together by the manufacturer in accordance with the requirements of annex A or other equivalent method as agreed between the interested parties), may be provided; however, no length used in making a jointer shall be shorter than 1 520 mm.

Double joints are not within the purview of this part of ISO 3183. Double joints are defined as two or more lengths of pipe welded together by parties other than the manufacturer, or two or more lengths welded together by the manufacturer in accordance with requirements other than those of annex A.

Table 6 – Threaded line pipe dimensions, masses and test pressures

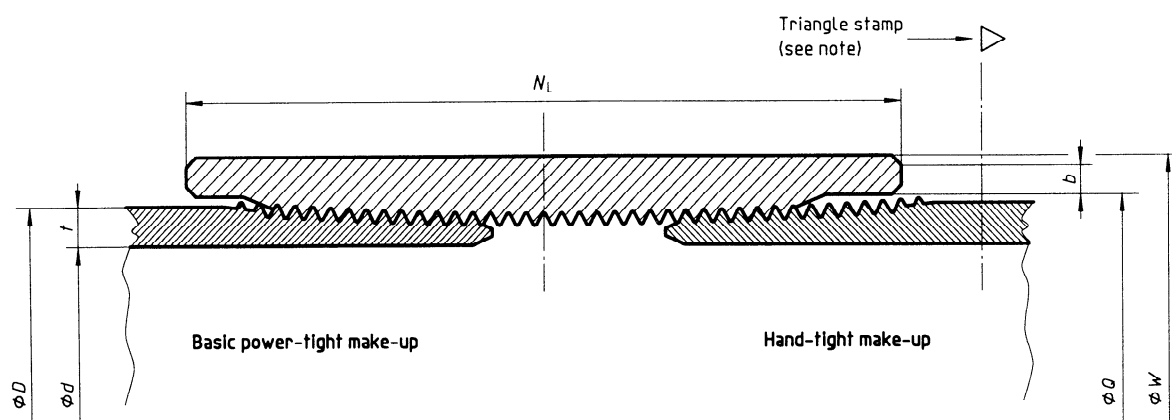
Nominal size designation	Nominal mass designation, threads and coupling ¹⁾	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Calculated mass		Minimum test pressure ³⁾ Grade 100 kPa ⁴⁾		
					Plain-end <i>M</i> kg/m	Threads and coupling ²⁾ <i>e_M</i> kg			
1/8	0,25	10,3	1,7	6,9	0,36	0,09	48	48	48
1/4	0,43	13,7	2,2	9,3	0,62	0,09	48	48	48
3/8	0,57	17,1	2,3	12,5	0,84	0,09	48	48	48
1/2	0,86	21,3	2,8	15,7	1,28	0,09	48	48	48
3/4	1,14	26,7	2,9	20,9	1,70	0,09	48	48	48
1	1,70	33,4	3,4	26,6	2,52	0,09	48	48	48
1 1/4	2,30	42,2	3,6	35,0	3,43	0,18	69	69	76
1 1/2	2,75	48,3	3,7	40,9	4,07	0,27	69	69	76
2	3,75	60,3	3,9	52,5	5,42	0,54	69	69	76
2 1/2	5,90	73,0	5,2	62,6	8,69	0,82	69	69	76
3	7,70	88,9	5,5	77,9	11,31	0,82	69	69	76
3 1/2	9,25	101,6	5,7	90,2	13,48	1,45	83	83	90
4	11,00	114,3	6,0	102,3	16,02	2,00	83	83	90
5	15,00	141,3	6,6	128,1	21,92	2,54	83	83	90
6	19,45	168,3	7,1	154,1	28,22	3,27	-	83	90
8	25,55	219,1	7,0	205,1	36,61	6,72	-	81	94
8	29,35	219,1	8,2	202,7	42,65	6,36	-	94	110
10	32,75	273,0	7,1	258,9	46,57	9,08	-	66	76
10	35,75	273,0	7,8	257,5	51,03	8,72	-	72	84
10	41,85	273,0	9,3	254,5	60,50	7,90	-	86	100
12	45,45	323,8	8,4	307,1	65,35	14,80	-	65	76
12	51,15	323,8	9,5	304,9	73,65	13,98	-	74	86
14D	57,00	355,6	9,5	336,6	81,08	11,17	-	67	79
16D	65,30	406,4	9,5	387,4	92,98	13,62	-	59	69
18D	73,00	457,0	9,5	438,0	104,84	16,16	-	52	61
20D	81,00	508,0	9,5	489,0	116,78	19,07	-	47	55

1) Nominal masses, threads and coupling are shown for the purpose of identification in ordering.

2) Mass gain due to end finishing. See 7.6.4.

3) The test pressures have been calculated on the basis of the formula in 8.10.9.3 for standard test pressure except those for grades L175 (all values) and L210/L245 (up to nominal size 2) which were established arbitrarily.

4) 100 kPa = 1 bar.



(See table 6 for pipe dimensions, table C.1 for coupling dimensions and ISO 10422 for thread details.)

Figure 1 – Line pipe and coupling

Table 7 – Extra-strong threaded line pipe dimensions, masses and test pressures

Nominal size designation	Nominal mass designation, threads and coupling ¹⁾	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Minimum test pressure ²⁾		
				Grade		
				L175	L210	L245
				100 kPa ³⁾		
1/8	0,31	10,3	2,4	59	59	59
1/4	0,54	13,7	3,0	59	59	59
3/8	0,74	17,1	3,2	59	59	59
1/2	1,09	21,3	3,7	59	59	59
3/4	1,48	26,7	3,9	59	59	59
1	2,18	33,4	4,5	59	59	59
1 1/4	3,02	42,2	4,9	90	103	110
1 1/2	3,66	48,3	5,1	90	103	110
2	5,07	60,3	5,5	90	172	172
2 1/2	7,73	73,0	7,0	90	193	172
3	10,33	88,9	7,6	90	193	172
3 1/2	12,63	101,6	8,1	117	193	193
4	15,17	114,3	8,6	117	190	193
5	21,09	141,3	9,5	117	169	193
6	28,89	168,3	11,0	-	165	192
8	43,90	219,1	12,7	-	146	170
10	55,82	273,0	12,7	-	117	137
12	66,71	323,8	12,7	-	97	114

1) Nominal masses, threads and coupling are shown for the purpose of identification in ordering.

2) Test pressures established arbitrarily. For grades L210 and L245 (nominal size $\geq 2\frac{1}{2}$) the values have been calculated on the basis of the formula in 8.10.9.3 for standard test pressure.

3) 100 kPa = 1 bar.

Table 8 – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾

Nominal size designation	Wall designation	Nominal mass, designation <i>M</i>	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ³⁾ Grade L175 L210 L245 100 kPa ⁴⁾		
1/8		0,24	10,3	1,7	6,9	48		
1/8	XS	0,31	10,3	2,4	5,5	59		
1/4		0,42	13,7	2,2	9,3	48		
1/4	XS	0,54	13,7	3,0	7,7	59		
3/8		0,57	17,1	2,3	12,5	48		
3/8	XS	0,74	17,1	3,2	10,7	59		
1/2		0,85	21,3	2,8	15,7	48		
1/2	XS	1,09	21,3	3,7	13,9	59		
1/2	XXS	1,71	21,3	7,5	6,3	69		
3/4		1,13	26,7	2,9	20,9	48		
3/4	XS	1,47	26,7	3,9	18,9	59		
3/4	XXS	2,44	26,7	7,8	11,1	69		
1		1,68	33,4	3,4	26,6	48		
1	XS	2,17	33,4	4,5	24,4	59		
1	XXS	3,66	33,4	9,1	15,2	69		
1 1/4		2,27	42,2	3,6	35,0	69	83	90
1 1/4	XS	3,00	42,2	4,9	32,4	90	124	131
1 1/4	XXS	5,21	42,2	9,7	22,8	96	152	158
1 1/2		2,72	48,3	3,7	40,9	69	83	90
1 1/2	XS	3,63	48,3	5,1	38,1	90	124	131
1 1/2	XXS	6,41	48,3	10,2	27,9	96	152	158

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) Test pressures established arbitrarily.

4) 100 kPa = 1 bar.

Table 9 – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾										
Size	Mass <i>M</i>				L175	L210	L245	L290	L320	L360	L390	L415	L450	L485	L555
2 3/8 ³⁾	2,03	60,3	2,1	56,1	41	88	102	121x	134x	150x	163x	173x	188x	203x	207
2 3/8 ³⁾	2,64	60,3	2,8	54,6	55	117	137	162x	178x	201x	207	207	207	207	207
2 3/8 ³⁾	3,00	60,3	3,2	53,9	69	134	156	185x	204x	207	207	207	207	207	207
2 3/8 ³⁾	3,38	60,3	3,6	53,1	69	150	172	207	207	207	207	207	207	207	207
2 3/8	3,65	60,3	3,9	52,5	69	163	172	207	207	207	207	207	207	207	207
2 3/8	4,05	60,3	4,4	51,5	76	172	172	207	207	207	207	207	207	207	207
2 3/8	4,39	60,3	4,8	50,7	83	172	172	207	207	207	207	207	207	207	207
2 3/8	5,02	60,3	5,5	49,3	90	172	172	207	207	207	207	207	207	207	207
2 3/8	5,67	60,3	6,4	47,5	96	172	172	207	207	207	207	207	207	207	207
2 3/8	6,28	60,3	7,1	46,1	96	172	172	207	207	207	207	207	207	207	207
2 3/8	9,03	60,3	11,1	38,1	96	172	172	207	207	207	207	207	207	207	207
2 7/8 ³⁾	2,47	73,0	2,1	68,8	41	72	85	100x	110x	124x	135x	143x	155x	167x	192x
2 7/8 ³⁾	3,22	73,0	2,8	67,4	55	97	113	133x	147x	166x	180x	191x	207	207	207
2 7/8 ³⁾	3,67	73,0	3,2	66,6	69	110	129	153x	168x	189x	205x	207	207	207	207
2 7/8 ³⁾	4,12	73,0	3,6	65,8	69	124	145	172x	189x	207	207	207	207	207	207
2 7/8	4,53	73,0	4,0	65,0	69	138	161	191x	207	207	207	207	207	207	207
2 7/8	4,97	73,0	4,4	64,2	69	152	172	207	207	207	207	207	207	207	207
2 7/8	5,40	73,0	4,8	63,4	69	166	172	207	207	207	207	207	207	207	207
2 7/8	5,79	73,0	5,2	62,6	69	172	172	207	207	207	207	207	207	207	207
2 7/8	6,13	73,0	5,5	62,0	76	172	172	207	207	207	207	207	207	207	207
2 7/8	7,01	73,0	6,4	60,2	83	172	172	207	207	207	207	207	207	207	207
2 7/8	7,66	73,0	7,0	59,0	90	172	172	207	207	207	207	207	207	207	207
2 7/8	13,69	73,0	14,0	45,0	96	172	172	207	207	207	207	207	207	207	207
3 1/2 ³⁾	3,03	88,9	2,1	84,7	41	60	69	82x	91x	102x	111x	118x	128x	137x	157x
3 1/2 ³⁾	3,95	88,9	2,8	83,3	55	79	93	110x	121x	136x	147x	157x	170x	183x	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15). Sizes for which an alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with maximum values to be considered) may be requested are marked by "x" after the standard test pressure. L175 values were established arbitrarily.

5) 100 kPa = 1 bar

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size		Mass M	Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾										
						L175	L210	L245	L290	L320	L360	L390	L415	L450	L485	L555
3 1/2 ³⁾		4,51	88,9	3,2	82,5	69	91	106	125x	138x	156x	168x	179x	194x	207	207
3 1/2 ³⁾		5,86	88,9	3,6	81,7	69	102	119	141x	158x	175x	190x	202x	207	207	207
3 1/2 ³⁾		5,57	88,9	4,0	80,9	69	113	132	157x	173x	194x	207	207	207	207	207
3 1/2 ³⁾		6,11	88,9	4,4	80,1	69	125	146	172x	190x	207	207	207	207	207	207
3 1/2		6,65	88,9	4,8	79,3	69	136	159	188x	207	207	207	207	207	207	207
3 1/2		7,58	88,9	5,5	77,9	69	156	172	207	207	207	207	207	207	207	207
3 1/2		8,68	88,9	6,4	76,1	-	172	172	207	207	207	207	207	207	207	207
3 1/2		9,66	88,9	7,1	74,7	-	172	172	207	207	207	207	207	207	207	207
3 1/2		10,25	88,9	7,6	73,7	90	172	172	207	207	207	207	207	207	207	207
3 1/2		18,58	88,9	15,2	58,5	-	172	172	207	207	207	207	207	207	207	207
4 ³⁾		3,47	101,6	2,1	97,4	-	52	61	72x	79x	89x	97x	103x	112x	120x	138x
4 ³⁾		4,53	101,6	2,8	96,0	41	69	81	93x	106x	119x	129x	137x	149x	160x	164x
4 ³⁾		5,17	101,6	3,2	95,2	-	79	93	110x	121x	136x	147x	157x	170x	183x	207
4 ³⁾		5,81	101,6	3,6	94,4	55	89	104	123x	136x	153x	168x	176x	191x	206x	207
4 ³⁾		6,40	101,6	4,0	93,6	-	99	116	137x	151x	170x	184x	196x	207	207	207
4		7,03	101,6	4,4	92,8	69	109	127	151x	166x	187x	203x	207	207	207	207
4		7,65	101,6	4,8	92,0	83	119	139	164x	181x	204x	207	207	207	207	207
4		9,11	101,6	5,7	90,2	83	141	165	195x	207	207	207	207	207	207	207
4		10,01	101,6	6,4	88,8	-	159	185	207	207	207	207	207	207	207	207
4		11,16	101,6	7,1	87,4	-	176	193	207	207	207	207	207	207	207	207
4		12,50	101,6	8,1	85,4	117	193	193	207	207	207	207	207	207	207	207
4 1/2 ³⁾		3,92	114,3	2,1	110,1	-	46	54	64x	71x	79x	88x	91x	99x	107x	122x
4 1/2 ³⁾		5,84	114,3	3,2	107,9	55	71	82	97x	108x	121x	131x	139x	151x	163x	188x
4 1/2 ³⁾		6,56	114,3	3,6	107,1	-	79	93	110x	121x	136x	147x	157x	170x	183x	207
4 1/2 ³⁾		7,24	114,3	4,0	106,3	69	86	103	122x	134x	151x	164x	174x	189x	204x	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15). Sizes for which an alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with maximum values to be considered) may be requested are marked by "x" after the standard test pressure. L175 values were established arbitrarily.

5) 100 kPa = 1 bar

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size		Mass <i>M</i>	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾										
						L175	L210	L245	L290	L320	L360	L390	L415	L450	L485	L555
4 1/2		7,95	114,3	4,4	105,5	-	97	113	134x	148x	166x	180x	192x	207	207	207
4 1/2		8,66	114,3	4,8	104,7	83	106	123	146x	161x	181x	197x	207	207	207	207
4 1/2		9,32	114,3	5,2	103,9	-	115	134	158x	175x	197x	207	207	207	207	207
4 1/2		10,01	114,3	5,6	103,1	83	123	144	170x	190x	207	207	207	207	207	207
4 1/2		10,79	114,3	6,0	102,3	83	132	154	183x	202x	207	207	207	207	207	207
4 1/2		11,35	114,3	6,4	101,5	-	141	165	195x	207	207	207	207	207	207	207
4 1/2		12,66	114,3	7,1	100,1	-	157	183	207	207	207	207	207	207	207	207
4 1/2		13,96	114,3	7,9	98,5	-	174	193	207	207	207	207	207	207	207	207
4 1/2		14,98	114,3	8,6	97,1	117	190	193	207	207	207	207	207	207	207	207
4 1/2		19,00	114,3	11,1	92,1	-	193	193	207	207	207	207	207	207	207	207
4 1/2		22,51	114,3	13,5	87,3	-	193	193	207	207	207	207	207	207	207	207
4 1/2		27,54	114,3	17,1	80,1	-	193	193	207	207	207	207	207	207	207	207
5 9/16 ³⁾		4,86	141,3	2,1	137,1	-	37	44	52x	57x	64x	70x	74x	80x	86x	99x
5 9/16 ³⁾		7,26	141,3	3,2	134,9	48	57	67	79x	87x	98x	106x	113x	122x	132x	151x
5 9/16 ³⁾		9,01	141,3	4,0	133,3	59	71	83	99x	109x	122x	132x	141x	153x	185x	189x
5 9/16 ³⁾		10,79	141,3	4,8	131,7	71	96	100	118x	130x	147x	159x	169x	183x	198x	207
5 9/16 ³⁾		12,50	141,3	5,6	130,1	83	100	117	138x	152x	171x	186x	197x	207	207	207
5 9/16 ³⁾		14,62	141,3	6,6	128,1	98	118	137	163x	179x	202x	207	207	207	207	207
5 9/16 ³⁾		15,85	141,3	7,1	127,1	108	127	148	175x	193x	207	207	207	207	207	207
5 9/16 ³⁾		17,50	141,3	7,9	125,5	117	141	164	195x	207	207	207	207	207	207	207
5 9/16 ³⁾		19,17	141,3	8,7	123,9	129	155	181	207	207	207	207	207	207	207	207
5 9/16		20,78	141,3	9,5	122,3	141	169	193	207	207	207	207	207	207	207	207
5 9/16 ³⁾		27,04	141,3	12,7	115,9	189	193	193	207	207	207	207	207	207	207	207
5 9/16 ³⁾		32,96	141,3	15,9	109,5	193	193	193	207	207	207	207	207	207	207	207
5 9/16		38,55	141,3	19,1	103,1	193	193	193	207	207	207	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15). Sizes for which an alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with maximum values to be considered) may be requested are marked by "x" after the standard test pressure. L175 values were established arbitrarily.

5) 100 kPa = 1 bar

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
Size	Mass <i>M</i>				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
6 5/8 ³⁾	5,80	168,3	2,1	164,1	31	37	54	60	67	73	78	84	91	103
6 5/8 ³⁾	7,59	168,3	2,8	162,7	42	49	72	80	90	97	104	112	121	137
6 5/8 ³⁾	8,88	168,3	3,2	161,9	48	56	83	91	103	111	118	128	138	157
6 5/8 ³⁾	9,76	168,3	3,6	161,1	54	63	93	103	116	125	133	144	156	176
6 5/8 ³⁾	10,78	168,3	4,0	160,3	60	70	103	114	128	139	148	160	173	196
6 5/8	11,85	168,3	4,4	159,5	66	77	114	125	141	153	163	176	190	207
6 5/8	12,92	168,3	4,8	158,7	72	84	124	137	154	167	178	193	207	207
6 5/8	13,92	168,3	5,2	157,9	78	91	134	148	167	181	192	207	207	207
6 5/8	14,98	168,3	5,6	157,1	84	98	145	160	180	195	207	207	207	207
6 5/8	17,02	168,3	6,4	155,5	96	112	165	183	205	207	207	207	207	207
6 5/8	18,97	168,3	7,1	154,1	106	124	184	202	207	207	207	207	207	207
6 5/8	21,04	168,3	7,9	152,5	118	138	204	207	207	207	207	207	207	207
6 5/8	23,08	168,3	8,7	150,9	130	152	207	207	207	207	207	207	207	207
6 5/8	25,03	168,3	9,5	149,3	142	166	207	207	207	207	207	207	207	207
6 5/8	28,57	168,3	11,0	146,3	165	192	207	207	207	207	207	207	207	207
6 5/8	32,71	168,3	12,7	142,9	190	193	207	207	207	207	207	207	207	207
6 5/8	38,39	168,3	14,3	139,7	193	193	207	207	207	207	207	207	207	207
6 5/8	40,05	168,3	15,9	136,5	193	193	207	207	207	207	207	207	207	207
6 5/8	45,35	168,3	18,3	131,7	193	193	207	207	207	207	207	207	207	207
6 5/8	47,06	168,3	19,1	130,1	193	193	207	207	207	207	207	207	207	207
6 5/8	53,73	168,3	22,2	123,9	193	193	207	207	207	207	207	207	207	207
8 5/8 ³⁾	11,35	219,1	3,2	212,7	37	43	64	70	79	85	91	99	106	120
8 5/8 ³⁾	14,11	219,1	4,0	211,1	46	54	79	88	99	107	114	123	133	151
8 5/8	16,94	219,1	4,8	209,5	55	64	95	105	118	128	136	148	159	181
8 5/8	18,26	219,1	5,2	208,7	60	70	103	114	128	139	148	160	173	196
8 5/8	19,66	219,1	5,6	207,9	64	75	111	123	138	150	159	173	186	207
8 5/8	22,36	219,1	6,4	206,3	74	86	127	140	158	171	182	197	207	207
8 5/8	24,70	219,1	7,0	205,1	81	94	139	153	173	187	199	207	207	207
8 5/8	27,70	219,1	7,9	203,3	91	106	157	173	195	207	207	207	207	207
8 5/8	28,55	219,1	8,2	202,7	94	110	163	180	202	207	207	207	207	207
8 5/8	30,42	219,1	8,7	201,7	100	117	173	191	207	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
Size	Mass <i>M</i>				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
8 5/8	33,04	219,1	9,5	200,1	109	127	189	207	207	207	207	207	207	207
8 5/8	38,30	219,1	11,1	196,9	128	149	207	207	207	207	207	207	207	207
8 5/8	43,39	219,1	12,7	193,7	146	170	207	207	207	207	207	207	207	207
8 5/8	48,40	219,1	14,3	190,5	164	192	207	207	207	207	207	207	207	207
8 5/8	53,40	219,1	15,9	187,3	183	193	207	207	207	207	207	207	207	207
8 5/8	60,71	219,1	18,3	182,5	193	193	207	207	207	207	207	207	207	207
8 5/8	63,08	219,1	19,1	180,9	193	193	207	207	207	207	207	207	207	207
8 5/8	67,76	219,1	20,6	177,9	193	193	207	207	207	207	207	207	207	207
8 5/8	72,42	219,1	22,2	174,7	193	193	207	207	207	207	207	207	207	207
8 5/8	81,44	219,1	25,4	168,3	193	193	207	207	207	207	207	207	207	207
10 3/4 ³⁾	17,65	273,1	4,0	265,1	37	43	72	80	90	97	103	112	121	137
10 3/4 ³⁾	21,21	273,1	4,8	263,5	44	52	96	96	108	117	124	134	145	164
10 3/4 ³⁾	22,87	273,1	5,2	262,7	48	56	104	104	117	126	134	146	157	178
10 3/4	24,83	273,1	5,6	261,9	52	60	112	112	125	136	145	157	169	192
10 3/4	28,04	273,1	6,4	260,3	59	69	127	127	143	155	165	179	193	207
10 3/4	31,20	273,1	7,1	258,9	66	76	141	141	159	172	183	199	207	207
10 3/4	34,24	273,1	7,8	257,5	72	84	155	155	175	189	201	207	207	207
10 3/4	38,23	273,1	8,7	255,7	80	94	173	173	195	207	207	207	207	207
10 3/4	40,48	273,1	9,3	254,5	86	100	185	185	207	207	207	207	207	207
10 3/4	48,24	273,1	11,1	250,9	102	119	207	207	207	207	207	207	207	207
10 3/4	54,74	273,1	12,7	247,7	117	137	207	207	207	207	207	207	207	207
10 3/4	61,15	273,1	14,3	244,5	132	154	207	207	207	207	207	207	207	207
10 3/4	67,58	273,1	15,9	241,3	147	171	207	207	207	207	207	207	207	207
10 3/4	77,03	273,1	18,3	236,5	169	193	207	207	207	207	207	207	207	207
10 3/4	86,18	273,1	20,6	231,9	190	193	207	207	207	207	207	207	207	207
10 3/4	92,28	273,1	22,2	228,7	193	193	207	207	207	207	207	207	207	207
10 3/4	98,30	273,1	23,8	225,5	193	193	207	207	207	207	207	207	207	207
10 3/4	104,13	273,1	25,4	222,3	193	193	207	207	207	207	207	207	207	207
10 3/4	126,83	273,1	31,8	209,5	193	193	207	207	207	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size	Mass <i>M</i>	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
					L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
12 3/4 ³⁾	23,11	323,9	4,4	315,1	34	40	59	65	73	79	85	92	99	112
12 3/4 ³⁾	25,22	323,9	4,8	314,3	37	44	64	71	80	87	92	100	108	122
12 3/4 ³⁾	27,20	323,9	5,2	313,5	40	47	70	77	87	94	100	108	117	132
12 3/4 ³⁾	29,31	323,9	5,6	312,7	44	51	75	83	93	101	108	117	126	143
12 3/4 ³⁾	33,38	323,9	6,4	311,1	50	58	86	95	107	116	123	133	144	163
12 3/4	37,42	323,9	7,1	309,7	55	64	95	105	118	128	136	148	159	181
12 3/4	41,45	323,9	7,9	308,1	61	72	106	117	132	143	152	165	177	201
12 3/4	43,77	323,9	8,4	307,1	65	76	113	124	140	152	161	175	189	207
12 3/4	45,58	323,9	8,7	306,5	68	79	117	129	145	157	167	181	195	207
12 3/4	49,56	323,9	9,5	304,9	74	86	128	141	158	172	183	198	207	207
12 3/4	53,52	323,9	10,3	303,3	80	93	138	153	172	186	198	207	207	207
12 3/4	57,59	323,9	11,1	301,7	86	101	149	164	185	200	207	207	207	207
12 3/4	65,42	323,9	12,7	298,5	99	115	171	188	207	207	207	207	207	207
12 3/4	73,15	323,9	14,3	295,3	111	130	192	207	207	207	207	207	207	207
12 3/4	80,93	323,9	15,9	292,1	124	144	207	207	207	207	207	207	207	207
12 3/4	88,63	323,9	17,5	288,9	136	159	207	207	207	207	207	207	207	207
12 3/4	96,12	323,9	19,1	285,7	149	173	207	207	207	207	207	207	207	207
12 3/4	103,53	323,9	20,6	282,7	160	187	207	207	207	207	207	207	207	207
12 3/4	110,97	323,9	22,2	279,5	173	193	207	207	207	207	207	207	207	207
12 3/4	118,33	323,9	23,8	276,3	185	193	207	207	207	207	207	207	207	207
12 3/4	125,49	323,9	25,4	273,1	193	193	207	207	207	207	207	207	207	207
12 3/4	132,57	323,9	27,0	269,9	193	193	207	207	207	207	207	207	207	207
12 3/4	139,67	323,9	28,6	266,7	193	193	207	207	207	207	207	207	207	207
12 3/4	153,53	323,9	31,8	260,3	193	193	207	207	207	207	207	207	207	207
14 ³⁾	27,73	355,6	4,8	346,0	34	40	67	73	83	89	95	103	111	126
14 ³⁾	29,91	355,6	5,2	345,2	37	43	72	80	89	97	103	112	121	137
14 ³⁾	30,93	355,6	5,3	345,0	38	44	73	81	91	99	105	114	123	139
14 ³⁾	32,23	355,6	5,6	344,4	40	46	78	86	96	104	111	120	130	147
14 ³⁾	36,71	355,6	6,4	342,8	45	53	89	98	110	119	127	138	148	168

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
Size	Mass M				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
14	41,17	355,6	7,1	341,4	50	59	98	109	122	132	141	153	165	187
14	45,61	355,6	7,9	339,8	56	65	110	121	136	147	157	170	183	207
14	50,17	355,6	8,7	338,2	62	72	121	133	150	162	173	187	202	207
14	54,57	355,6	9,5	226,6	67	79	132	145	163	177	188	204	207	207
14	58,94	355,6	10,3	335,0	73	85	143	158	177	192	204	207	207	207
14	63,44	355,6	11,1	333,4	79	92	154	170	191	207	207	207	207	207
14	67,78	355,6	11,9	331,8	84	98	165	182	205	207	207	207	207	207
14	72,09	355,6	12,7	330,2	90	105	176	194	207	207	207	207	207	207
14	80,66	355,6	14,3	327,0	101	118	198	207	207	207	207	207	207	207
14	89,28	355,6	15,9	323,8	113	131	207	207	207	207	207	207	207	207
14	97,81	355,6	17,5	320,6	124	145	207	207	207	207	207	207	207	207
14	106,13	355,6	19,1	317,4	135	158	207	207	207	207	207	207	207	207
14	114,37	355,6	20,6	314,4	146	170	207	207	207	207	207	207	207	207
14	122,65	355,6	22,2	311,2	157	184	207	207	207	207	207	207	207	207
14	130,85	355,6	23,8	308,0	169	193	207	207	207	207	207	207	207	207
14	138,84	355,6	25,4	304,8	180	193	207	207	207	207	207	207	207	207
14	146,74	355,6	27,0	301,6	191	193	207	207	207	207	207	207	207	207
14	154,69	355,6	28,6	298,4	193	193	207	207	207	207	207	207	207	207
14	170,21	355,6	31,8	292,1	193	193	207	207	207	207	207	207	207	207
16 ³⁾	31,75	406,4	4,8	396,8	30	35	58	64	72	78	83	90	97	110
16 ³⁾	34,25	406,4	5,2	396,0	32	38	63	70	78	85	90	98	105	120
16 ³⁾	36,91	406,4	5,6	395,2	35	41	68	75	84	91	97	105	114	129
16 ³⁾	42,05	406,4	6,4	393,6	40	46	78	86	96	104	111	120	130	147
16 ³⁾	47,17	406,4	7,1	392,2	44	51	86	95	107	116	123	134	144	163
16	52,27	406,4	7,9	390,6	49	57	96	106	119	129	137	149	160	182
16	57,52	406,4	8,7	389,0	54	63	106	116	131	142	151	164	177	200
16	62,58	406,4	9,5	387,4	59	69	115	127	143	155	165	179	193	207
16	67,62	406,4	10,3	385,8	64	75	125	138	155	168	179	194	207	207
16	72,80	406,4	11,1	384,2	69	80	135	149	167	181	193	207	207	207
16	77,79	406,4	11,9	382,6	74	86	144	159	179	194	207	207	207	207
16	82,77	406,4	12,7	381,0	79	92	154	170	191	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾										
Size	Mass <i>M</i>				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555	
16	92,66	406,4	14,3	377,8	89	103	173	191	207	207	207	207	207	207	207
16	102,63	406,4	15,9	374,6	99	115	193	207	207	207	207	207	207	207	207
16	112,51	406,4	17,5	371,4	109	127	207	207	207	207	207	207	207	207	207
16	122,15	406,4	19,1	368,2	118	138	207	207	207	207	207	207	207	207	207
16	131,71	406,4	20,6	365,2	128	149	207	207	207	207	207	207	207	207	207
16	141,34	406,4	22,2	362,0	138	161	207	207	207	207	207	207	207	207	207
16	150,89	406,4	23,8	358,8	148	172	207	207	207	207	207	207	207	207	207
16	160,20	406,4	25,4	355,6	158	184	207	207	207	207	207	207	207	207	207
16	189,43	406,4	27,0	352,4	167	193	207	207	207	207	207	207	207	207	207
16	178,72	406,4	28,6	349,2	177	193	207	207	207	207	207	207	207	207	207
16	187,93	406,4	30,2	346,0	187	193	207	207	207	207	207	207	207	207	207
16	196,91	406,4	31,8	342,8	193	193	207	207	207	207	207	207	207	207	207
18 ³⁾	35,76	457,0	4,8	447,4	26	31	52	57	64	70	74	80	87	207	207
18 ³⁾	41,59	457,0	5,6	445,8	31	36	60	67	75	81	86	94	101	207	207
18 ³⁾	47,39	457,0	6,4	444,2	35	41	69	76	86	93	99	107	115	207	207
18 ³⁾	53,18	457,0	7,1	442,8	39	46	77	85	95	103	110	119	128	207	207
18	58,94	457,0	7,9	441,2	44	51	85	94	106	115	122	132	143	207	207
18	64,87	457,0	8,7	439,6	48	56	94	104	117	126	134	146	157	207	207
18	70,59	457,0	9,5	438,0	52	61	102	113	127	138	147	159	171	207	207
18	78,29	457,0	10,3	436,4	57	66	111	123	138	149	159	172	186	207	207
18	82,15	457,0	11,1	434,8	61	71	120	132	149	161	171	186	200	207	207
18	87,81	457,0	11,9	433,2	66	77	128	142	159	173	184	199	207	207	207
18	93,45	457,0	12,7	431,6	70	82	137	151	170	184	196	207	207	207	207
18	104,67	457,0	14,3	428,4	79	92	154	170	192	207	207	207	207	207	207
18	115,98	457,0	15,9	425,2	88	102	172	189	207	207	207	207	207	207	207
18	127,21	457,0	17,5	422,0	96	113	189	207	207	207	207	207	207	207	207
18	138,17	457,0	19,1	418,8	105	123	206	207	207	207	207	207	207	207	207
18	149,06	457,0	20,6	415,8	114	133	207	207	207	207	207	207	207	207	207
18	160,03	457,0	22,2	412,6	122	143	207	207	207	207	207	207	207	207	207
18	170,92	457,0	23,8	409,4	131	153	207	207	207	207	207	207	207	207	207
18	181,56	457,0	25,4	406,2	140	163	207	207	207	207	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size	Mass <i>M</i>	Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
					L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
18	192,11	457,0	27,0	403,0	149	174	207	207	207	207	207	207	207	207
18	202,75	457,0	28,6	399,6	158	184	207	207	207	207	207	207	207	207
18	213,31	457,0	30,2	396,6	167	193	207	207	207	207	207	207	207	207
18	223,61	457,0	31,8	393,4	175	193	207	207	207	207	207	207	207	207
20 ³⁾	46,27	508,0	5,6	496,8	28	32	58	63	71	77	82	89	96	109
20 ³⁾	52,73	508,0	6,4	495,2	32	37	66	73	82	88	94	102	110	125
20 ³⁾	59,18	508,0	7,1	493,8	35	41	73	81	91	98	104	113	122	138
20	65,60	508,0	7,9	492,2	39	46	81	90	101	109	116	126	136	154
20	72,21	508,0	8,7	490,6	43	50	89	99	111	120	128	139	150	170
20	78,60	508,0	9,5	489,0	47	55	98	108	121	131	140	151	163	185
20	84,96	508,0	10,3	487,4	51	60	106	117	131	142	151	164	177	201
20	91,51	508,0	11,1	485,8	55	64	114	126	142	153	163	177	191	207
20	97,83	508,0	11,9	484,2	59	69	122	135	152	164	175	190	205	207
20	104,13	508,0	12,7	482,6	63	74	131	144	162	176	187	203	207	207
20	116,67	508,0	14,3	479,4	71	83	147	162	182	198	207	207	207	207
20	129,33	508,0	15,9	476,2	79	92	163	180	203	207	207	207	207	207
20	141,90	508,0	17,5	473,0	87	101	180	198	207	207	207	207	207	207
20	154,19	508,0	19,1	469,8	95	111	196	207	207	207	207	207	207	207
20	166,40	508,0	20,6	466,8	102	119	207	207	207	207	207	207	207	207
20	178,72	508,0	22,2	463,6	110	128	207	207	207	207	207	207	207	207
20	190,96	508,0	23,8	460,4	118	138	207	207	207	207	207	207	207	207
20	202,92	508,0	25,4	457,2	126	147	207	207	207	207	207	207	207	207
20	214,80	508,0	27,0	454,0	134	156	207	207	207	207	207	207	207	207
20	226,78	508,0	28,6	450,8	142	166	207	207	207	207	207	207	207	207
20	238,68	508,0	30,2	447,6	150	175	207	207	207	207	207	207	207	207
20	250,31	508,0	31,8	444,4	158	184	207	207	207	207	207	207	207	207
20	261,86	508,0	33,3	441,4	165	193	207	207	207	207	207	207	207	207
20	273,51	508,0	34,9	438,2	173	193	207	207	207	207	207	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size		Mass M	Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
						L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
22 ³⁾		50,94	559,0	5,6	547,8	25	29	52	58	65	70	75	81	87	99
22 ³⁾		58,07	559,0	6,4	546,2	29	34	60	66	74	80	86	93	100	113
22 ³⁾		65,18	559,0	7,1	544,8	32	37	66	73	82	89	95	103	111	126
22		72,27	559,0	7,9	543,2	36	42	74	81	92	99	106	114	123	140
22		79,56	559,0	8,7	541,6	39	46	81	90	101	109	116	126	136	154
22		86,61	559,0	9,5	540,0	43	50	89	98	110	119	127	138	148	168
22		93,63	559,0	10,3	538,4	46	54	96	106	119	129	137	149	161	182
22		100,86	559,0	11,1	536,8	50	58	104	114	129	139	148	161	173	197
22		107,85	559,0	11,9	535,2	54	63	111	123	138	149	159	172	186	207
22		114,81	559,0	12,7	533,6	57	67	119	131	147	159	170	184	198	207
22		126,67	559,0	14,3	530,4	64	75	134	147	166	180	191	207	207	207
22		142,68	559,0	15,9	527,2	72	84	148	164	184	200	207	207	207	207
22		156,60	559,0	17,5	524,0	79	92	163	180	203	207	207	207	207	207
22		170,21	559,0	19,1	520,8	86	100	178	197	207	207	207	207	207	207
22		183,75	559,0	20,6	517,8	93	108	192	207	207	207	207	207	207	207
22		197,41	559,0	22,2	514,6	100	117	207	207	207	207	207	207	207	207
22		211,00	559,0	23,8	511,4	107	125	207	207	207	207	207	207	207	207
22		224,28	559,0	25,4	508,2	115	134	207	207	207	207	207	207	207	207
22		237,48	559,0	27,0	505,0	122	142	207	207	207	207	207	207	207	207
22		250,81	559,0	28,6	501,8	129	150	207	207	207	207	207	207	207	207
22		264,06	559,0	30,2	498,6	136	159	207	207	207	207	207	207	207	207
22		277,01	559,0	31,8	495,4	143	167	207	207	207	207	207	207	207	207
22		289,88	559,0	33,3	492,4	150	175	207	207	207	207	207	207	207	207
22		302,88	559,0	34,9	489,2	157	184	207	207	207	207	207	207	207	207
22		315,79	559,0	36,5	486,0	165	192	207	207	207	207	207	207	207	207
22		328,41	559,0	38,1	482,8	172	193	207	207	207	207	207	207	207	207
24 ³⁾		63,41	610,0	6,4	597,2	26	31	55	60	68	74	78	85	92	104
24 ³⁾		71,18	610,0	7,1	595,8	29	34	61	67	75	82	87	94	102	115
24		78,93	610,0	7,9	594,2	33	38	68	75	84	91	97	105	113	128
24		86,91	610,0	8,7	592,6	36	42	74	82	92	100	107	116	125	141
24		94,62	610,0	9,5	591,0	39	46	81	90	101	109	116	126	136	154

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter <i>D</i> mm	Wall thickness <i>T</i> mm	Inside diameter <i>d</i> mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
Size	Mass <i>M</i>				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
24	102,31	610,0	10,3	589,4	42	49	88	98	110	119	126	137	148	167
24	110,22	610,0	11,1	587,8	46	53	95	105	118	128	136	147	159	180
24	117,86	610,0	11,9	586,2	49	57	102	112	126	137	146	158	170	193
24	125,49	610,0	12,7	584,6	52	61	109	120	135	146	156	169	182	206
24	140,68	610,0	14,3	581,4	59	69	122	135	152	165	175	190	205	207
24	156,03	610,0	15,9	578,2	66	77	136	150	169	183	195	207	207	207
24	171,29	610,0	17,5	575,0	72	84	150	165	186	201	207	207	207	207
24	186,23	610,0	19,1	571,8	79	92	163	180	203	207	207	207	207	207
24	201,09	610,0	20,6	568,8	85	99	176	195	207	207	207	207	207	207
24	216,10	610,0	22,2	565,6	92	107	190	207	207	207	207	207	207	207
24	231,03	610,0	23,8	562,4	98	115	204	207	207	207	207	207	207	207
24	245,64	610,0	25,4	559,2	105	122	207	207	207	207	207	207	207	207
24	260,17	610,0	27,0	556,0	112	130	207	207	207	207	207	207	207	207
24	274,84	610,0	28,6	552,8	118	138	207	207	207	207	207	207	207	207
24	289,44	610,0	30,2	549,6	125	146	207	207	207	207	207	207	207	207
24	303,71	610,0	31,8	546,4	131	153	207	207	207	207	207	207	207	207
24	317,91	610,0	33,3	543,4	138	160	207	207	207	207	207	207	207	207
24	332,25	610,0	34,9	540,2	144	168	207	207	207	207	207	207	207	207
24	346,50	610,0	36,5	537,0	151	176	207	207	207	207	207	207	207	207
24	360,45	610,0	38,1	533,8	157	184	207	207	207	207	207	207	207	207
24	374,31	610,0	39,7	530,6	164	191	207	207	207	207	207	207	207	207
26 ³⁾	68,75	660,0	6,4	647,2	24	29	51	56	63	68	72	79	85	96
26 ³⁾	77,18	660,0	7,1	645,8	27	32	56	62	70	76	80	87	94	107
26	85,60	660,0	7,9	644,2	30	35	62	69	78	84	89	97	104	119
26	94,26	660,0	8,7	642,6	33	39	69	76	85	93	98	107	115	131
26	102,63	660,0	9,5	641,0	36	42	75	83	93	101	108	117	126	143
26	110,98	660,0	10,3	639,4	39	46	81	90	101	110	117	126	136	155
26	119,57	660,0	11,1	637,8	42	49	88	97	109	118	126	136	147	167
26	127,88	660,0	11,9	636,2	45	53	94	104	117	127	135	146	157	179
26	136,17	660,0	12,7	634,6	48	57	100	111	125	135	144	156	168	191
26	152,68	660,0	14,3	631,4	55	64	113	125	140	152	162	176	189	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size		Mass M	Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
						L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
26		169,38	660,0	15,9	628,2	61	71	126	139	156	169	180	195	207	207
26		185,99	660,0	17,5	625,0	67	78	138	153	172	186	198	207	207	207
26		202,25	660,0	19,1	621,8	73	85	151	167	188	203	207	207	207	207
26		218,43	660,0	20,6	618,8	79	92	163	180	202	207	207	207	207	207
26		234,79	660,0	22,2	615,6	85	99	176	194	207	207	207	207	207	207
26		251,07	660,0	23,8	612,4	91	106	188	207	207	207	207	207	207	207
26		267,00	660,0	25,4	609,2	97	113	201	207	207	207	207	207	207	207
28 ³⁾		74,09	711,0	6,4	698,2	23	26	47	52	58	63	67	73	79	89
28 ³⁾		83,19	711,0	7,1	696,8	25	29	52	58	65	70	75	81	87	99
28		92,26	711,0	7,9	695,2	28	33	58	64	72	78	83	90	97	110
28		101,61	711,0	8,7	693,6	31	36	64	70	79	86	91	99	107	121
28		110,64	711,0	9,5	692,0	34	39	70	77	87	94	100	108	117	132
28		119,65	711,0	10,3	690,4	37	43	76	83	94	102	108	117	126	143
28		128,93	711,0	11,1	688,8	39	46	81	90	101	110	117	126	136	155
28		137,90	711,0	11,9	687,2	42	49	87	96	108	117	125	136	146	166
28		146,85	711,0	12,7	685,6	45	53	93	103	116	125	133	145	156	177
28		164,69	711,0	14,3	682,4	51	59	105	116	130	141	150	163	176	199
28		182,73	711,0	15,9	679,2	56	66	117	129	145	157	167	181	195	207
28		200,68	711,0	17,5	676,0	62	72	128	142	159	173	184	199	207	207
28		218,27	711,0	19,1	672,8	68	79	140	155	174	189	201	207	207	207
28		235,78	711,0	20,6	669,8	73	85	151	167	188	203	207	207	207	207
28		253,48	711,0	22,2	666,6	79	92	163	180	202	207	207	207	207	207
28		271,10	711,0	23,8	663,4	84	98	175	193	207	207	207	207	207	207
28		288,36	711,0	25,4	660,2	90	105	186	206	207	207	207	207	207	207
30 ³⁾		79,43	762,0	6,4	749,2	21	25	44	48	54	59	63	68	73	83
30 ³⁾		89,19	762,0	7,1	747,8	23	27	49	54	60	65	70	75	81	92
30		98,93	762,0	7,9	746,2	26	30	54	60	67	73	77	84	91	103
30		108,95	762,0	8,7	744,6	29	34	60	66	74	80	85	92	100	113
30		118,65	762,0	9,5	743,0	31	37	65	72	81	88	93	101	109	123

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation		Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
Size	Mass M				L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
30	128,32	762,0	10,3	741,4	34	40	71	78	88	95	101	109	118	134
30	138,29	762,0	11,1	739,8	37	43	76	84	94	102	109	118	127	144
30	147,92	762,0	11,9	738,2	39	46	82	90	101	110	117	126	136	155
30	157,53	762,0	12,7	736,6	42	49	87	96	108	117	125	135	146	165
30	176,69	762,0	14,3	733,4	47	55	98	108	122	132	140	152	164	186
30	196,08	762,0	15,9	730,2	53	61	109	120	135	146	156	169	182	207
30	215,38	762,0	17,5	727,0	58	68	120	132	149	161	172	186	200	207
30	234,29	762,0	19,1	723,8	63	74	131	144	162	176	187	203	207	207
30	253,12	762,0	20,6	720,8	68	79	141	156	175	190	202	207	207	207
30	272,17	762,0	22,2	717,6	73	86	152	168	189	205	207	207	207	207
30	291,14	762,0	23,8	714,4	79	92	163	180	202	207	207	207	207	207
30	309,72	762,0	25,4	711,2	84	98	174	192	207	207	207	207	207	207
30	328,22	762,0	27,0	708,0	89	104	185	204	207	207	207	207	207	207
30	346,93	762,0	28,6	704,8	95	110	196	207	207	207	207	207	207	207
30	365,56	762,0	30,2	701,6	100	117	207	207	207	207	207	207	207	207
30	383,81	762,0	31,8	698,4	105	123	207	207	207	207	207	207	207	207
32 ³⁾	84,77	813,0	6,4	800,2	20	23	41	45	51	55	59	64	69	78
32 ³⁾	95,19	813,0	7,1	798,8	22	26	46	50	57	61	65	71	76	86
32	105,59	813,0	7,9	797,2	24	29	51	56	63	68	73	79	85	96
32	116,30	813,0	8,7	795,6	27	31	56	62	69	75	80	87	93	106
32	126,66	813,0	9,5	794,0	29	34	61	67	76	82	87	95	102	116
32	136,99	813,0	10,3	792,4	32	37	66	73	82	89	95	103	111	125
32	147,64	813,0	11,1	790,8	34	40	71	79	88	96	102	111	119	135
32	147,94	813,0	11,9	789,2	37	43	76	84	95	103	109	119	128	145
32	168,21	813,0	12,7	787,6	39	46	82	90	101	110	117	127	136	155
32	188,70	813,0	14,3	784,4	44	52	92	101	114	123	131	142	154	174
32	209,43	813,0	15,9	781,2	49	57	102	113	127	137	146	158	171	194
32	230,08	813,0	17,5	787,0	54	63	112	124	139	151	161	174	188	207
32	250,31	813,0	19,1	774,8	59	69	123	135	152	165	175	190	205	207
32	270,47	813,0	20,6	771,8	64	74	132	146	164	178	189	205	207	207
32	290,86	813,0	22,2	768,6	69	80	143	157	177	192	204	207	207	207

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.

Table 9 (continued) – Plain-end line pipe dimensions¹⁾, masses and test pressures²⁾ (to be ordered according to outside diameter)

Designation Size		Mass M	Outside diameter D mm	Wall thickness T mm	Inside diameter d mm	Minimum test pressure ⁴⁾ , 100 kPa ⁵⁾									
						L210 ⁶⁾	L245 ⁶⁾	L290	L320	L360	L390	L415	L450	L485	L555
32		311,17	813,0	23,8	765,4	74	86	153	169	190	206	207	207	207	207
32		331,08	813,0	25,4	762,2	79	92	163	180	202	207	207	207	207	207
32		350,90	813,0	27,0	759,0	84	98	173	191	207	207	207	207	207	207
32		370,96	813,0	28,6	755,8	89	103	184	203	207	207	207	207	207	207
32		390,94	813,0	30,2	752,6	94	109	194	207	207	207	207	207	207	207
32		410,51	813,0	31,8	749,4	99	115	204	207	207	207	207	207	207	207
34 ³⁾		90,11	864,0	6,4	851,2	19	22	39	43	48	52	55	60	65	73
34 ³⁾		101,19	864,0	7,1	849,8	21	24	43	47	53	58	61	67	72	81
34		112,25	864,0	7,9	848,2	23	27	48	53	59	64	68	74	80	91
34		123,65	864,0	8,7	846,6	25	30	53	58	65	71	75	82	88	100
34		134,67	864,0	9,5	845,0	28	32	57	63	71	77	82	89	96	109
34		145,67	864,0	10,3	843,4	30	35	62	69	77	84	89	97	104	118
34		157,00	864,0	11,1	841,8	32	38	67	74	83	90	96	104	112	127
34		167,95	864,0	11,9	840,2	35	40	72	79	89	97	103	112	120	136
34		178,89	864,0	12,7	838,6	37	43	77	85	95	103	110	119	128	146
34		200,70	864,0	14,3	835,4	42	49	86	95	107	116	124	134	144	164
34		222,78	864,0	15,9	832,2	46	54	96	106	119	129	137	149	161	182
34		244,77	864,0	17,5	829,0	51	60	106	117	131	142	151	164	177	201
34		266,33	864,0	19,1	825,8	56	65	115	127	143	155	165	179	193	207
34		287,81	864,0	20,6	822,8	60	70	124	137	155	167	178	193	207	207
34		309,55	864,0	22,2	819,6	65	76	134	148	167	180	192	207	207	207
34		331,21	864,0	23,8	816,4	69	81	144	159	179	193	206	207	207	207
34		352,44	864,0	25,4	813,2	74	86	153	169	191	206	207	207	207	207
34		373,59	864,0	27,0	810,0	79	92	163	180	203	207	207	207	207	207
34		394,99	864,0	28,6	806,8	83	97	173	191	207	207	207	207	207	207
34		416,31	864,0	30,2	803,6	88	103	182	201	207	207	207	207	207	207
34		437,21	864,0	31,8	800,4	93	108	192	207	207	207	207	207	207	207
36 ³⁾		95,45	914,0	6,4	901,2	18	21	37	40	45	49	52	57	61	69
36 ³⁾		107,20	914,0	7,1	899,8	20	23	41	45	50	55	58	63	68	77
36		118,92	914,0	7,9	898,2	22	25	45	50	56	61	65	70	75	86
36		131,00	914,0	8,7	896,6	24	28	50	55	62	67	71	77	83	94

1) Outside diameter and wall thickness dimensions shown are subject to tolerances as described in 7.6.8. Inside diameters are nominal and are given here for information (see 7.6.2).

2) Test pressures apply to the standard grades. For pressures applicable for other grades see 8.10.9.3.

3) These sizes are special plain-end mass sizes. All other sizes are regular-mass, see 7.6.8 for applicable mass tolerances. For grades L 290 and higher masses intermediate to regular-masses shall be considered regular-mass; masses intermediate to special-plain-end masses and masses intermediate between the heaviest tabulated special-plain-end masses and the highest regular-masses shall be considered special-plain-end mass.

4) The test pressures have been calculated on the basis of the formula in 8.10.9.3 as standard test pressure considering specified maximum values (see table 15).

5) 100 kPa = 1 bar

6) An alternative test pressure (1,25x standard test pressure, rounded to the next higher 100 kPa with a maximum value of 19 300 kPa to be considered) may be requested.