

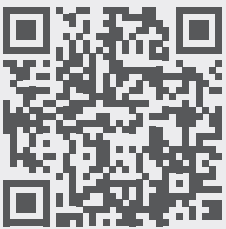


## Basics

standards, sizes, grades  
DIN / EN / ASME



**rff Rohr Flansch Fitting**  
Handels GmbH



All basics.  
Also online available.

The digital basic catalogue of rff:  
[www.rff.de/en/basics](http://www.rff.de/en/basics)

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# A partner to the industry: Strong, reliable, experienced

First-class performance and consistency are essential for creating enduring values. This has been an integral part of our philosophy for the past 45 years. This is also what drives us to find the very best solution for every situation. As a partner to the industry, we represent expertise, experience and competence. More than 400 members of rff staff are on hand to assist you and your project.







Picture left: Beucha/Leipzig site – sales location and central warehouse for pipes

Picture above: Stuhr / Bremen site – head office, sales location and central warehouse for pipe fittings

You set great store by first-rate material quality, planning security and cost-effective procurement. We are committed to creating the ideal conditions to ensure just this and provide you with optimal support – both in specific industries and across disciplines. A visible mark for this are our two central warehouses in Stuhr/Bremen and Beucha/Leipzig, which store more than 14.000 tonnes of pipes, flanges, elbows, buttweld fittings and pipe accessories. One notice-

able sign of this is our expertise in the areas of material and product science, standards and application technology. This allows us to support you during planning, construction and maintenance of your project. What's more: With our ex warehouse delivery service and highly efficient logistics, we can guarantee reliable commissioning and distribution of your materials "just in time". We are there wherever and whenever you need us. **rff – Strongly connected.**

# Delivery programme DIN EN and DIN

## Pipes / Tubes acc. to DIN EN



Cutting and bevelling, blasting, coating and marking for all requirements according to customer specifications

### Standards

Carbon steels	DIN EN
Seamless pipes	10216-1 to 4
Welded pipes	10217-1 to 6
Precision steel pipes	10305-1 to 5
Stainless steels	
Seamless pipes	10216-5
Welded pipes	10217-7
Precision steel pipes	10305-1 to 2
Line pipes	
Seamless and welded pipes	ISO 3183

### Types

Seamless and welded

### Dimensions and weights

DIN EN 10220 / Carbon steels  
DIN EN ISO 1127 / Stainless steels

### Material grades

- P235TR1/TR2
- P235GH TC1/TC2, P265GH TC1/TC2
- 16Mo3, 13CrMo4-5, 12 CrMo19 5
- P265NL
- L290NE, L360NE
- 1.4301, 1.4306, 1.4307, 1.4541
- 1.4401, 1.4404, 1.4571
- 1.4410 (Superduplex), 1.4462 (Duplex)
- 1.4529, 1.4539, 1.4547

## Flanges acc. to DIN EN and DIN



Turning and drilling (flat or threaded), blasting, coating and marking for all requirements according to customer specifications

### Standards DIN EN 1092-1 and DIN

Neck Flanges	Typ	DIN
Weld Neck Flanges	11	2627-2638
Weld Neck Collars	34	2673-2676
Slip-on Flanges	12	86029/30
Threaded Flanges	13	2565-2569
Flat Flanges		
Flanges for welding	01	2573, 2576
Loose Flanges	02	2641/2, 2655/6
Loose Flanges	04	2673-2676
Blind Flanges	05	2527
Collars		
Flat Collars	32	2641/2, 2655/6
Weld-on Collars	37	2641/2

Flanges for vessels und process apparatus,  
Flanges for automated welding process,  
Special Flanges acc. to drawing

### Pressure Classes

PN 6 to 400

### Dimensions

All standard dimensions

### Facing

Acc. to DIN 2526, DIN EN 1092-1 and to customer specification

### Material grades

- S235JR, S355J2
- P250GH, P245GH, P265GH
- 16Mo3, 13CrMo4-5
- P355QH1
- 1.4301, 1.4307, 1.4541
- 1.4401, 1.4404, 1.4571
- 1.4410 (Superduplex), 1.4462 (Duplex)
- 1.4529, 1.4539, 1.4547

## Buttweld Fittings acc. to DIN EN and DIN



Cutting and bevelling, tapering, blasting, coating and marking for all requirements according to customer specifications

### Standards DIN EN 10253 part 1 to 4

Buttweld Fittings	Typ	DIN
Elbows	A/B	2605 Teil 1/2
Tees	A/B	2615 Teil 1/2
Reducers, concentric	B	2616 Teil 2
Reducers, eccentric	A/B	2616 Teil 1/2
Caps	B	2617

Special Fittings made of plates, round-bar steels acc. to drawing

### Types

Seamless and welded

### Material grades

- S235
- P235GH
- P250GH, P265GH
- 16Mo3, 13CrMo4-5
- L290NE, L360NE
- P355QH1
- 1.4301, 1.4306, 1.4307, 1.4541
- 1.4401, 1.4404, 1.4571
- 1.4410 (Superduplex), 1.4462 (Duplex)
- 1.4529, 1.4539, 1.4547

### Types of elbows

2D, 3D and 5D as well as customer specification

### Dimensions

All standard dimensions

# Delivery programme ASME / API

## Pipes / Tubes acc. to ASTM / ASME / API



Cutting and bevelling, blasting, coating and marking for all requirements according to customer specifications

### Standards

B 36.10, B 36.19 and API 5L

### Types

Seamless and welded

### Wall thicknesses

All schedules

### Material grades

- A/SA 53 Gr. B, A/SA 106 Gr. B, API 5L Gr. B
- A/SA 335 Gr. P5, P9, P11, P12, P22, P91
- A/SA 333 Gr. 6
- API 5L Gr. X52, X60, X65
- A/SA 321 Gr, TP 304/L, 316L, 321/H
- Duplex, Special Alloys

### Dimensions

1/2" to 48"

## Flanges acc. to ASTM / ASME / API



Turning and drilling (flat or threaded), blasting, coating and marking for all requirements according to customer specifications

### Standards

B 16.5, B 16.47 Series A+B and B.S. 3293  
API 6A

### Types

- Weld Neck Flanges
- Blind Flanges
- Slip-on Flanges
- Lap Joint Flanges
- Threaded Flanges
- Long Welding Neck Flanges
- Socket Welding Flanges
- Orifice Flanges B 16.36
- Spectacle Blind B 16.48
- Flanges according to drawings

### Pressure classes

Class 150–2500  
2,000–20,000 psi

### Material grades

- A/SA 105/C21, P250GH, P280GH
- A/SA 182 Gr. F5, F9, F11, F12, F22, F91
- A/SA 350 Gr. LF2, P355QH1
- A 694 Gr. F52, F60, F65
- A/SA 182 Gr. F304/L, F316/L, F321/H
- 1.4541, 1.4571
- F53 (Superduplex), F51 (Duplex)
- Special Alloys

### Dimensions

1/2" to 48"

### Facings

- RF and RTJ
- For all requirements according to customer specifications

## Buttwelding fittings acc. to ASTM / ASME



Cutting and bevelling, tapering, blasting, coating and marking for all requirements according to customer specifications

### Standards

B 16.9

### Types

- Elbows, seamless and welded
- Tees, seamless and welded
- Reducers, concentric and eccentric, seamless and welded
- Caps
- Stub Ends
- Special Fittings made of plates, round-bar steels acc. to drawing

### Elbow types

Short Radius (SR) und Long Radius (LR) as well as radii to customer specifications

### Wall thicknesses

All schedules

### Material grades

- A/SA 234 Gr. WPB
- A/SA 234 Gr. WP5, 9, 11, 12, 22, 91
- A/SA 420 Gr. WPL6
- A 860 Gr. WPHY42, 52
- L290NB / L290NE
- A/SA 430 Gr. WP 304/L, 316/L, 321/H
- Duplex, Special Alloys

### Dimensions

1/2" to 48"



# Equipment DIN / EN / ASME

## High-pressure fittings acc. to ASME / ASTM



### Types

All types of high pressure forged steel fittings and branch outlet fittings

### Pressure classes

Class 2000, 3000, 6000, 9000

### Designs

Socket weld (SW) and threaded (NPT)

### Wall thicknesses

All schedules

### Surfaces

Black, galvanised and hot-dip galvanised

### Dimensions

1/4" to 4"

### Material grades

- A/SA 105/C21, P250GH
- A/SA 182 Gr. F5, F11, F12, F22, F91
- A/SA 350 Gr. LF2, P355QH1
- A/SA 182 Gr. F304/L, F316/L, F321/H
- 1.4541, 1.4571
- F53 (Superduplex), F51 (Duplex)

## Screws, bolts and nuts acc. to ISO / ASME / ASTM



### Standards

- Screws acc. to DIN ISO 4014, 4016 and 4017
- Nuts acc. to DIN ISO 4032 and DIN ISO 4034
- Stud bolts acc. to DIN 2510
- B 16.5 and B 18.2.2

### Dimensions

For all standard flange sizes

### Material grades

- 4.6, Grade 5
- 24 CrMo 5 and Ck 35 acc. to DIN 17240 / DIN EN 10269
- V4A, V2A, A2-70, A4-70
- 1.4301, 1.4401, 1.4541, 1.4571 acc. to DIN 17440 / DIN EN 10269
- ASTM A 193 Gr. B7 for stud bolts
- ASTM A 194 Gr. 2H for nuts
- Other materials to customer specifications

## Gaskets acc. to DIN EN / ASME / ASTM



### Standards

- Flat gaskets acc. to DIN EN 1514-1:
- Type IBC flat gaskets for flanges with / without raised faces
  - Type TG flat gaskets for flanges with tongue / groove
  - Type SR flat gaskets for flanges with male / female facing
  - ASME B 16.20 – for metallic gaskets
  - ASME B 16.21 – for non-metallic gaskets

### Material grades

- Hecker Centellen
- KLINGERSIL
- Rubber
- Carbon steel
- Stainless steel
- Soft iron / Pure iron
- StW 24

### Dimensions

For all standard flanges

## Standard and special parts



- Pipe clamps acc. to DIN 3567
- U-bolts acc. to DIN 3570
- Pressed collars similar to DIN 2642
- Torispherical heads DIN 28011
- Ellipsoidal heads DIN 28013
- Weld-in elbows similar to DIN 2619
- Branch saddles similar to DIN 2618
- Pipe coupling
- Malleable iron fittings acc. to DIN EN 10242
- Threaded steel fittings acc. to DIN EN 10241
- Welded constructions



# The rff range of services

<b>1 Access to over 14,000 tons of pipe and pipe fittings</b>
<b>DIN / EN / ASME</b>
<ol style="list-style-type: none"> <li>1. Pipes, seamless and welded, uncoated and coated</li> <li>2. Flanges, collars and rings, forged, rolled, bent and welded</li> <li>3. Fittings, seamless and welded, tees, reducers, caps, special fittings, Type A and B</li> <li>4. Elbows, all types, seamless and welded, Part 1 / Type A, Part 2 / Type B</li> <li>5. Special elbows, pipe bends inductive and cold-formed, all radii also with extended legs</li> <li>6. Heads, collars, pipe clamps, U-bolts</li> <li>7. Gaskets, bolts and nuts, stud bolts</li> <li>8. High pressure, steel and malleable iron fittings</li> <li>9. Couplings and valves</li> <li>10. Bar steel, hollow steel bars, plates</li> <li>11. Special parts acc. to specification / drawing</li> <li>12. Material qualities: non-alloy, non-alloy heat-resistant, alloy heat-resistant, low temperature, fine grain steels, high yield steels, stainless steels, high temperature steels, special steels, sour gas materials, non-ferrous metals</li> </ol>
<b>2 Mechanical processing</b>
<b>Semi-finished stock items as installation-ready components</b>
<ol style="list-style-type: none"> <li>1. <b>Pipes</b> cutting and bevelling, drilling, bending, thread cutting</li> <li>2. <b>Flanges</b> face machining, e.g. tongue/groove, male/female, tapering of ring type joints, drilling (smooth and tapped), machining of edges (inside and outside), tapped holes</li> <li>3. <b>Fittings</b> bevelling, tapering, pig guide bars welded into tees</li> <li>4. <b>Elbows</b> bevelling, tapering, cutting into graduated sections</li> <li>5. Prefabricated pipe line parts acc. to isometric drawings and pipe classes</li> </ol>
<b>3 Surface treatment</b>
<ol style="list-style-type: none"> <li>1. Blasting according to required class, e.g. SA 2,5</li> <li>2. Interior and exterior primer acc. to specification, e.g. with epoxy resin or other</li> <li>3. Galvanising, hot-dip galvanising, zinc plating</li> <li>4. PE coating, all types</li> <li>5. Interior cement coating, all types</li> <li>6. Rilsan coating</li> <li>7. Pickling and passivating</li> <li>8. Grinding and brushing</li> <li>9. Polishing, mechanical or electropolishing</li> </ol>
<b>4 Material tests</b>
<ol style="list-style-type: none"> <li>1. Ultrasonic (U.S.), surface crack detection, magnetic particle testing</li> <li>2. Mill test reports (MTR) acc. to EN 10204, 3.2 by TÜV or GL, LR, DNV, BV, ABS, RINA or other in compliance with customer specifications</li> <li>3. Impact test</li> <li>4. Tensile test at room temperature</li> <li>5. Hot tensile test</li> <li>6. Folding test, widening test, ring expanding test</li> <li>7. HIC test / HUEY test for sour gas affected pipe components</li> <li>8. Tests to customer specification</li> </ol>
<b>5 Labeling / marking</b>
<ol style="list-style-type: none"> <li>1. Marking with manual marking punches and embossing stamps</li> <li>2. Hard stamping with electromagnetic dot marking</li> <li>3. Colour marking</li> <li>4. Component marking, individual part or trading unit labeling</li> <li>5. Barcode labeling</li> <li>6. Account number, drawing number, and other</li> </ol>
<b>6 Logistics</b>
<ol style="list-style-type: none"> <li>1. Logistics centre in Stuhr/Bremen, Beucha/Leipzig, Erkrath/Düsseldorf</li> <li>2. Order picking from full automated pipe storage systems and small parts storage systems, high rack storage system</li> <li>3. Disposable and reusable packaging</li> <li>4. Export packaging according to specifications, e.g. IPPC standard</li> <li>5. Shrink wrap packing</li> </ol>

<ol style="list-style-type: none"> <li>6. Individual or bundle packaging</li> <li>7. Materials supply / storage in rff owned containers</li> <li>8. Parcel station for lately pickup in Stuhr/Bremen</li> <li>9. Own fleet with 10 trucks</li> <li>10. Shipping with long-standing contract carriers, regular transit time 24 to 48 hours</li> <li>11. Express and courier services, TNT innight or overnight service</li> <li>12. Parcel service</li> </ol>
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<b>7 Project management</b>
<ol style="list-style-type: none"> <li>1. Projects management by designated project teams</li> <li>2. Shutdown support, preplanning and storage</li> <li>3. Deadline monitoring / expediting</li> <li>4. Regular status reports</li> <li>5. Bill of materials (BOM) preparation acc. to isometric drawing</li> <li>6. Order picking and labeling per assembly / isometric drawing</li> <li>7. Designated project-specific warehouse space</li> <li>8. Internal/external inspection</li> <li>9. Colli lists and outgoing goods reports</li> </ol>

<b>8 Certifications, documentation and calculation</b>
<ol style="list-style-type: none"> <li>1. Unmistakeable Mill test report (MTR) number system</li> <li>2. 6-fold MTR backup</li> <li>3. Immediate access to MTRs for telephone inquiries</li> <li>4. Additional information / Barcode directly on MTR acc. to customers specification</li> <li>5. MTRs enclosed with goods delivery and / or invoice</li> <li>6. Online MTR access</li> <li>7. MTRs deliverable via email or on CD</li> <li>8. MTRs deliverable in multiple languages</li> <li>9. Shipping documents and MTR cover letter with heat numbers</li> <li>10. Interim certificate for acceptance according to DIN EN 10240 3.2 possible</li> <li>11. Wall thickness calculations according to DIN 2413, AD-B2, AD-B3, AD-B9 or TRD 301 on request, TÜV-approved</li> </ol>

<b>9 IT Service – Information Technology</b>
<ol style="list-style-type: none"> <li>1. Comprehensive process control</li> <li>2. Online access from all sites to article information of all logistic centres</li> <li>3. Customised B2B solutions</li> <li>4. Marketplace solutions</li> <li>5. Item definition based on e-class characteristics</li> <li>6. Order tracking and online catalogue service via website rff.de/en and "my rff"</li> <li>7. Electronic invoices</li> <li>8. Invoice settlement in the credit memo procedure</li> </ol>

<b>10 Management system</b>
<ol style="list-style-type: none"> <li>1. Quality management acc. to DIN EN ISO 9001</li> <li>2. Environmental management acc. to DIN EN ISO 14001</li> <li>3. Occupational health and safety management acc. to DIN ISO 45001</li> <li>4. Processors of materials acc. to AD 2000 Data Sheet W0</li> <li>5. TÜV restamping authorisation acc. to DIN EN 764-5 for acceptance certificates DIN EN 10240/3.1</li> <li>6. Certified acc. to Pressure Equipment Directive 97/23/EC</li> <li>7. Approved supplier acc. to Regulation KTA 1401</li> <li>8. In-house test equipment for spectral analyses, hardness testing and surface roughness measurement</li> <li>9. Inspection of all incoming goods for radioactivity</li> <li>10. Specific warehouse bin assignment system</li> <li>11. Single batch / heat storage</li> <li>12. Ongoing education and further training programmes to increase employee expertise</li> </ol>









**Fast availability of best pipes**

The Kasto 2 pipe storage system is the core feature of our central warehouse for pipes in Beucha/Leipzig. 6,000 tonnes of carbon steel and stainless-steel pipes are stored in a hall space of 16,000 m<sup>2</sup>.







# Steel pipes – convincing

Storage, order picking and packaging – when it comes to seamless and welded carbon steel and stainless-steel pipes we refuse to compromise. Enjoy the benefits of our extensive product range according to EN and ASME standards.



# Standards comparison

## Seamless steel pipes for pressure purposes DIN EN 10216

EN standard	Description / Area of application	Replacement for DIN
10216-1	Non-alloy steel tubes with specified room temperature properties	1629 / 1630
10216-2	Non-alloy and alloy steel tubes with specified elevated temperature properties	17175
10216-3	Alloy fine grain steel tubes	17179
10216-4	Non-alloy and alloy steel tubes with specified low temperature properties	17173
10216-5	Stainless steel tubes	17458 / 17459

## Welded steel pipes for pressure purposes DIN EN 10217

EN standard	Description / Area of application	Replacement for DIN
10217-1	Non-alloy steel tubes with specified room temperature properties	1626 / 1628
10217-2	Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties	17177
10217-5	Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties	
10217-3	Alloy fine grain steel tubes	17178
10217-4	Electric welded non-alloy steel tubes with specified low temperature properties	17174
10217-6	Submerged arc welded non-alloy steel tubes with specified low temperature properties	17174
10217-7	Stainless steel tubes	17457

## Petroleum and natural gas industries / steel pipes for pipeline transportation systems DIN EN ISO 3183

EN standard	Description / Area of application	Replacement for DIN EN
ISO 3183	Petroleum and natural gas industries / steel pipes for pipeline transportation systems	10208-1 / -2

## Steel pipes for pipelines for combustible fluids DIN EN 10208

EN standard	Description / Area of application	Replacement for DIN
10208-1	Requirement class A (to 16 bar operating pressure)	2470-1
10208-2	Requirement class B (over 16 bar operating pressure)	2470-2 / 17172

## Gas infrastructure / Pipelines for maximum operating pressure ≤ 16 bar

EN standard	Description / Area of application	Replacement for DIN
12007-1	General functional requirements	2470-1
12007-2	Specific functional requirements for polyethylene (MOP) up to and including 10 bar	
12007-3	Specific functional requirements for steel	
12007-4	Specific functional requirements for renovation	
12007-5	Service lines – specific functional requirements	

### Steel pipes for precision applications DIN EN 10305

EN standard	Description / Area of application	Replacement for DIN
10305-1	Seamless cold drawn tubes	2391-1 / -2
10305-2	Welded cold drawn tubes	2393-1 / -2
10305-3	Welded cold sized tubes	2394-1 / -2
10305-4	Seamless cold drawn tubes for hydraulic and pneumatic power systems	2391-1 / -2 in connection with DIN 1630
10305-5	Welded and cold sized square and rectangular tubes	2395-1 / -2
10305-6	Welded cold drawn tubes for hydraulic and pneumatic power systems	

### Non-alloy steel pipes suitable for welding and threading

EN standard	Description / Area of application	Replacement for DIN
10255	Non-alloy steel pipes suitable for welding and threading	2440 / 2441

### Hot finished structural hollow sections DIN EN 10210

EN standard	Description / Area of application	Replacement for DIN
10210-1	Hot finished structural hollow sections of non-alloy and fine grain steels / <b>Technical delivery conditions</b>	17120–17125
10210-2	Hot finished structural hollow sections of non-alloy and fine grain steels / <b>Dimensions</b>	59410

### Colded formed structural hollow sections DIN EN 10219

EN standard	Description / Area of application	Replacement for DIN
10219-1	Cold formed structural hollow sections of non-alloy and fine grain steels / <b>Technical delivery conditions</b>	17119 / -20 / -23
10219-2	Cold formed structural hollow sections of non-alloy and fine grain steels / <b>Dimensions</b>	59411

### Welded steel tubes for mechanical and general engineering purposes DIN EN 10296

EN standard	Description / Area of application	Replacement for DIN
10296-1	Welded circular steel tubes for mechanical and general engineering purposes / <b>Non-alloy and alloy steels</b>	1626 / 17123
10296-2	Welded circular steel tubes for mechanical and general engineering purposes / <b>Stainless steels</b>	17455

### Seamless steel tubes for mechanical and general engineering purposes DIN EN 10297

EN standard	Description / Area of application	Replacement for DIN
10297-1	Seamless circular steel tubes for mechanical and general engineering purposes / <b>Non-alloy and alloy steels</b>	1629 / 17124
10297-2	Seamless circular steel tubes for mechanical and general engineering purposes / <b>Stainless steels</b>	17456

# Seamless steel pipes for pressure purposes

Overview of pipes acc. to DIN EN 10216 in comparison to earlier DIN standards

Area of application	acc. to EN	acc. to DIN
Non-alloy steel tubes with specified room temperature properties	10216-1	1629 / 1630
Non-alloy and alloy steel tubes	10216-2	17175
Alloy fine grain steel tubes with specified room temperature properties	10216-3	17179
Non-alloy and alloy steel tubes with specified low temperature properties	10216-4	17173
Stainless steel tubes	10216-5	17458 / 17459

**Part 1:** Non-alloy steel tubes with specified room temperature properties

**Area of application:** acc. to rules and standards of DVGW, TRB, TRD and AD 2000 Data Sheet W4 (only TR2 approved under PED)

Standards (formerly DIN)	Operating temperature / working pressure	Size range	EN materials (formerly DIN)	Notes
EN 10216-1 (DIN 1629)	to 300° C / to 160 bar	10,2–711,0 mm	P235TR1 (St 37.0) P265TR1 (St 44.0)	<b>TR1</b> without impact test
EN 10216-1 (DIN 1630)	to 300° C / unlimited		P235TR2 (St 37.4) P265TR2 (St 44.4)	<b>TR2</b> impact test at 0° C (optional –10° C)

**Part 2:** Non-alloy and alloy steel tubes with specified elevated temperature properties

**Area of application:** Boiler construction, pipeline and plant engineering, pressure vessels and apparatus engineering

Standards (formerly DIN)	Test classes / operating temperature / working pressure	Size range	EN materials (formerly DIN)	Notes
EN 10216-2 (DIN 17175)	Non-alloy tubes: <b>TC1</b> / to 450° C / 160 bar <b>TC2</b> / to 450° C / unlimited Alloy tubes: <b>TC2</b> / to 600° C / unlimited	10,2–711,0 mm	P235GH (St 35.8) P265GH (St 45.8) 16Mo3 (15Mo3) 13CrMo4-5 (13CrMo44)	<b>TC1</b> without US testing <b>TC2</b> with US testing (generally with alloy steels)

**Part 3:** Alloy fine grain steel tubes

**Area of application:** Pressure vessel, apparatus, pipelines, general mechanical engineering and tool-building

Standards (formerly DIN)	Test classes	Size range	EN materials (formerly DIN)
EN 10216-3 (DIN 17179)	<b>TC1</b> without US testing <b>TC2</b> with US testing	10,2–711,0 mm	basic quality P355N (StE 355) P460N (StE 460) elevated temperature quality P355NH (WStE 355) P460NH (WStE 460) low temperature quality P275NL1 (TStE 285) P355NL1 (TStE 355) P460NL1 (TStE 460) special low temperature quality P275NL2 (EStE 285) P355NL2 (EStE 355) P460NL2 (EStE 460)



**Part 4:** Non-alloy and alloy steel tubes with specified low temperature properties

**Area of application:** Apparatus, pressure vessel, refrigeration system and general pipeline engineering

Standards (formerly DIN)	Test classes	Size range	EN materials (formerly DIN)	Official regulations
EN 10216-4 (DIN 17173)	Non-alloy tubes: <b>TC1</b> without US testing <b>TC2</b> with US testing Alloy tubes: general <b>TC2</b>	10,2–711,0 mm	P215NL (TTSt 35N) P255QL (TTSt 35V) 12Ni14 (10Ni14) X12Ni5 (12Ni19)	AD 2000 Data Sheet W4 / W10

**Part 5:** Stainless steel tubes

**Area of application:** Apparatus, pressure vessel, pipeline and plant engineering (transport of corrosive materials)

Standards (formerly DIN)	Test classes / operating temperature	Size range	EN materials (comparable to ASTM A312)	AD 2000-W2 regulations
EN 10216-5 (DIN 17458) EN 10216-5 (DIN 17459)	<b>TC1</b> without US testing <b>TC2</b> with US testing Generally <b>TC2</b> / from 550° C operating temperature	6,0–610,0 mm	V2A-Series 1.4301 (TP 304) 1.4306 (TP 304L) 1.4307 (TP 304L) 1.4541 (TP 321) V4A-Series 1.4401 (TP 316) 1.4404 (TP 316L) 1.4571 (TP 316Ti) V5A-Series 1.4529 1.4539 1.4547 Duplex 1.4462 Super-Duplex 1.4410	Internal tubes: AD 2000-W2 / <b>TC1</b> Line pipes: OD ≤ 42.4 mm and wall ≤ 3,6 mm: AD 2000-W2 / <b>TC1</b> OD > 42.4 mm or wall > 3,6 mm: AD 2000-W2 / <b>TC2</b> Casing tubes for pressure vessels: AD 2000-W2 / <b>TC2</b>

# Welded steel pipes for pressure purposes

Overview of pipes acc. to DIN EN 10217 in comparison to earlier DIN standards

Conditions of use	acc. to EN	acc. to DIN
Non-alloy steel tubes with specified room temperature properties	10217-1	1626 / 1628
Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties	10217-2	17177
Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties	10217-5	
Alloy fine grain steel tubes	10217-3	17178
Electric welded non-alloy steel tubes with specified low temperature properties	10217-4	17174
Submerged arc welded non-alloy steel tubes with specified low temperature properties	10217-6	17174
Stainless steel tubes	10217-7	17457

**Part 1:** Non-alloy steel tubes with specified room temperature properties

**Area of application:** acc. to rules and standards of DVGW, TRB, TRD and AD 2000 Data Sheet W4 (only TR2 approved under PED)

Standards (formerly DIN)	Operating temperature / working pressure	Size range	EN materials (formerly DIN)	Test scope
EN 10217-1 (DIN 1626)	to 300° C / to 160 bar	10,2–2.540 mm	P235TR1 (St 37.0) P265TR1 (St 44.0)	<b>TR1</b> without impact test
EN 10217-1 (DIN 1628)	to 300° C / unlimited		P235TR2 (St 37.4) P265TR2 (St 44.4)	<b>TR2</b> impact test at 0° C (optional –10° C)

**Part 2:** Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties

**Part 5:** Submerged arc welded non-alloy and alloy steel pipes with specified high temperature properties

**Area of application:** Pressure vessel and plant engineering, pipeline construction, shipbuilding

Standards (formerly DIN)	Welding process	Size range	EN materials (formerly DIN)	Test scope
EN 10217-2 (DIN 17177)	Electric welded (HFW = high frequency welding)	10,2–508,0 mm	P235GH (St 37.8) P265GH (St 42.8)	<b>TC1</b> without US testing <b>TC2</b> with US testing
EN 10217-5	Submerged arc welded (SAW = submerged arc welded) SAWL longitudinal welded / SAWH spiral welded	406,4–2.540 mm	16Mo3 (15 Mo 3) 13CrMo4-5 (13 CrMo 4 4)	(generally with alloy steels)

**Part 3:** Alloy fine grain steel tubes**Area of application:** Pressure vessels, apparatus and general mechanical engineering

Standards (formerly DIN)	Welding process	Size range	EN materials (formerly DIN)	Test scope	
EN 10217-3 (DIN 17178)	Electric welded (HFW = high frequency welding)	10,2–508,0 mm	basic quality	P355N (StE 355) P460N (StE 460)	<b>TC1</b> without US testing <b>TC2</b> with US testing (generally with alloy steels)
	Submerged arc welded (SAW = submerged arc welded) SAWL with longitudinal seam / SAWH with spiral seam	406,4–2.540 mm	elevated temperature quality low temperature quality special low tempera- ture quality	P355NH (WStE 355) P460NH (WStE 460) P275NL1 (TStE 285) P355NL1 (TStE 355) P460NL1 (TStE 460) P275NL2 (EStE 285) P355NL2 (EStE 355) P460NL2 (EStE 460)	

**Part 4:** Electric welded non-alloy steel tubes with specified low temperature properties**Part 6:** Submerged arc welded non-alloy steel tubes with specified low temperature properties**Area of application:** Apparatus, pressure vessel, refrigeration system and general pipeline engineering

Standards (formerly DIN)	Welding process	Size range	EN materials (formerly DIN)	Test scope
EN 10217-4 (DIN 17174)	Electric welded (HFW = high frequency welding)	10,2–508,0 mm	P215NL1 (TTSt 35 N) P265NL1	AD 2000 Data Sheet W4 / W10
EN 10217-6 (DIN 17174)	Submerged arc welded (SAW = submerged arc welded) SAWL with longitudinal seam / SAWH with spiral seam	406,4–2.540 mm		

**Part 7:** Stainless steel tubes**Area of application:** Chemical system, pressure vessel and apparatus engineering, pipelines (transport of corrosive media), water and wastewater technology

Standards (formerly DIN)	Test classes / test scope per 100 pipes	Size range	EN materials (comparable to ASTM A312)	Delivery conditions
EN 10217-7 (DIN 17457)	<b>TC1</b> 1 Tensile test / 1 Ring tension test <b>TC2</b> 2 Tensile tests / 1 Ring tension test	6,0–1.016 mm	V2A-Series 1.4301 (TP 304) 1.4306 (TP 304L) 1.4307 (TP 304L) 1.4541 (TP 321) V4A-Series 1.4401 (TP 316) 1.4404 (TP 316L) 1.4571 (TP 316Ti) V5A-Series 1.4529 1.4539 1.4547 Duplex 1.4462 Super-Duplex 1.4410	W1 = hot rolled strip, unannealed W2 = cold rolled, unannealed W1A / W2A = heat-treated, descaled W1R / W2R = bright annealed WG = Ground WP = Polished b = Smoothed welding seam

# Line pipes DIN EN ISO 3183 / DIN EN 10208

Brief overview and comparison

**When DIN EN ISO 3183 came into force in March 2013, it replaced the previously valid standards DIN EN 10208-1 and -2 – line pipes for gas for combustible media.**

This new standard is based on ISO 3183:2007 and API 5L. With this, the American USC system has been put on an equal footing alongside the international units (SI). With PSL 1 and PSL 2 the standard distinguishes between two specification levels. PSL 1 is considered as the standard specification level. PSL 2 stipulates additional binding

requirements on chemical compositions and mechanical properties. The standard has been amended by the special annex M which aligns the new standard to the key definitions of DIN EN 10208-2.

The steel grade L235 has been removed from both specification levels. Through the inclusion of special API steel grades and expansion of the strength ranges, today 11 (PSL 1) / 31 (PSL 2) steel grades are available. The spectrum ranges from 175 MPa to 485 MPa. By way of comparison: With DIN EN 10208, the range was 210 MPa to 360 MPa.

## Operating area and requirements

DIN EN ISO 3183	DIN EN 10208
Replacement for basics acc. to EN 10208, ISO 3183 an API 5L Subdivided in PSL1 and 2 • <b>PSL 1 (Product Specification Level)</b> Standard class requirements. Admittance of further seven steel types. • <b>PSL 2 (Product Specification Level)</b> Additional requirements does apply to chemical configuration and mechanical performance. Admittance of eleven new steel types.	The standard subdivided in two requirement classes: • <b>Requirement class A</b> Application in low-pressure area ( $\leq 16$ bar operating pressure) • <b>Requirement class B</b> Application in pipeline construction ( $\geq 16$ bar operating pressure)

## Order information

DIN EN ISO 3183	DIN EN 10208
Regular information to be given in orders Ordered quantity, PSL1 or PSL 2, type of pipe, advice to standard, steels-short names, outside diameter and wall thickness, Certification of Application of attachment, type of test certificate	Obligatory information to be given in orders Ordered quantity, type of pipe (seamless or welded), product form (pipe), outside diameter and wall thickness, manufactured length, Standard (EN 10208-1 /-2), steels-short names / material number, without or within impact test, type of test certificate

## Further obligatory information

DIN EN ISO 3183	DIN EN 10208
Regular order information · Chemical configuration for pipes with a wall thickness $\geq 25$ mm · Limits of carbon equivalent to PSL 2-pipes consisting of L415N · Limits of carbon equivalent to PSL 2-seamless pipes with a wall thickness $> 20$ mm <b>Optionally agreements:</b> In total 59 options, e.g. PSL 2- pipes for natural gas transport in application for european Onshore area acc. to attachment M.	Obligatory order information · Chemical configuration of pipes with a wall thickness $> 25$ mm · Mechanical performance of pipes with a wall thickness $> 25$ mm · Requirements to notch impact test for pipes with a wall thickness $> 25$ mm <b>Optional agreements:</b> In total 32 options, e.g. from 0° different test temperature to impact test

## Comparable materials

In EN ISO 3183, the materials are specified without material numbers. Annex L of the standard includes the table L.1, which assigns the materials to the European material numbers according to DIN EN 10027-2. The material designations of DIN EN 10208 are listed in the normative annex M with only minor changes. The previous material numbers thus continue to apply unchanged.



# Line pipes DIN EN ISO 3183

Seamless and welded

<b>Operation area</b>	<b>PSL 1</b> Pipes with special requirements <b>PSL 2</b> Pipes to the European Onshore- gas pipeline / attachment M
<b>Example for an order text</b>	<b>Seamless pipes</b> Pipe, seamless, DIN EN ISO 3183, L290NE/1.0484, APZ DIN EN 10204/3.2, TÜV 114,3 × 3,6 mm <b>Welded pipes</b> Pipe, high frequency welded (HFW), DIN EN ISO 3183, L290NE/1.0484, APZ DIN EN 10204/3.2, TÜV 114,3 × 3,6 mm

Standards		EN ISO 3183 / PSL 1			EN ISO 3183 / PSL 2	EN 10208-2
Type of pipe / type of steel		L210	L245	L290-L485	L245-L555	
Seamless	S	•	•	•	•	•
Low frequency welded	LFW	•	•	•		
High frequency welded	HFW	•	•	•	•	•
Submerged arc welded	SAW	•	•	•	•	•
Combiniert welded	COW	•	•	•	•	•

Standard	Material Number	EN ISO 3183	EN 10208-2	API 5L	Notes	EN ISO 3183	EN 10208-2
DIN EN ISO 3183	1.0457	L245	L245	Gr. B	Normalized	NE	NB
DIN EN 10208-2	1.0484	L290	L290	X42	Quenched tempered (Seamless only)	QE	QB
API 5L	1.0582	L360	L360	X52	Thermo-mechanically rolled (welded only)	ME	MB
	1.8972	L415	L415	X60			

<b>Size range</b>	<b>Seamless</b> 10,3 to 711,0 mm <b>Welded</b> 10,3 to 2.134 mm
<b>Tolerance</b>	<b>Diameter / circularity</b> acc. to attachment M/table M3 <b>Wall thickness</b> acc. to attachment M/table M4 The regulations of EN ISO 3183 / annex M are largely in accordance with those of EN 10208-2. However, five tolerance ranges are now intended for the wall thickness of welded pipes (instead of 3).
<b>Samples, scopes of testing and test certificates</b>	<b>Inspection certificate</b> DIN EN 10204/3.1 or 3.2 The regulations of EN ISO 3183 / annex M are largely in accordance with those of EN 10208-2. Two tests are mandatory for the check analysis.
<b>Marking/labeling</b>	Factory stamps, standard, outside diameter an wall thickness, type of steel, type of pipe S (seamless) or W (welded), inspector mark and identity number. The material can optionally marked with a coat of paint.

DIN	DIN EN	
30670 PE coating	10285	3-layer-process
	10287	2-layer-process
	10288	Sinter process

Nominal diameter	Minimum coat thickness / mm	
	Standards (n)	Strengthened (v)
< DN 100	1,8	2,5
> DN 100 ≤ DN 250	2,0	2,7
> DN 250 ≤ DN 500	2,2	2,9
> DN 500 ≤ DN 800	2,5	3,2
> DN 800	3,0	3,7

# Precision steel pipes DIN EN 10305

## Precision steel pipes DIN EN 10305

### Part 1: Seamless cold drawn tubes

**Area of application:** Automotive, mechanical engineering

Standards (formerly DIN)	State as delivered (previous designation)	Size range	EN materials (formerly DIN)	Notes
EN 10305-1 (DIN 2391-1 /-2)	+C Cold finished, hard (BK) +LC Cold finished, soft (BKW) +SR Cold finished and stress-relieved (BKS) +A Annealed (GBK) +N Normalised (NBK)	4,0–260 mm	E215 (St 30 Al) E235 (St 35) E355 (St 52)	· Precisely defined tolerances · Specified surface roughness

### Part 2: Welded cold drawn tubes

**Area of application:** Automotive, mechanical engineering

Standards (formerly DIN)	State as delivered (previous designation)	Size range	EN materials (formerly DIN)	Notes
EN 10305-2 (DIN 2393-1 /-2)	+C Cold finished, hard (BK) +LC Cold finished, soft (BKW) +SR Cold finished and stress-relieved (BKS) +A Annealed (GBK) +N Normalised (NBK)	4,0–150 mm	E195 (St 34-2) E235 (St 37-2) E275 (St 44-2) E355 (St 52-3)	· Precisely defined tolerances · Specified surface roughness

### Part 3: Welded cold sized tubes

**Area of application:** Automotive, mechanical and plant engineering

Standards (formerly DIN)	State as delivered (previous designation)	Size range	EN materials (formerly DIN)	Insert strip
EN 10305-3 (DIN 2394-1 /-2)	+CR1 Usually not heat-treated, but suitable for final annealing (BKM) +CR2 Heat treatment after welding, and sizing is not provided (BKM) +A After welding and sizing the pipes are annealed (GBK) +N After welding and sizing the pipes are normalised (NBK)	6,0–193.7	E155 E195 (St 34-2) E235 (St 37-2) E275 (St 44-2) E355 (St 52-3) Additional for +CR2: E190, E220, E260, E320, E370, E420	S1 (black) S2 (pickled) S3 (cold rolled) S4 (coated)

### Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems

**Area of application:** Hydraulic and pneumatic power systems

Standards (formerly DIN)	Surface finish	Size range	EN materials (formerly DIN)	Notes
EN 10305-4 (DIN 2391-1 /-2 in connection with DIN 1630)	· Phosphate-treated (bonderised) · Galvanised – chromated: with Cr6: yellow/olive-green Cr6-free: white/blue	4,0–80.0	E215 E235 (St 37.4) E355 (St 52.4)	· Precisely defined tolerances · Specified surface roughness · Suitable for conveying pressurised fluids

# Precisions steel pipes / Pipes with threaded ends

## Part 5: Welded and cold sized square and rectangular tubes

**Area of application:** Automotive, mechanical and plant engineering

Standards (formerly DIN)	State as delivered (previous designation)	Size range (H / B)	EN materials (formerly DIN)	Insert strip
EN 10305-5 (DIN 2395-1 /-2)	<p><b>+CR1</b> Usually not heat-treated, but suitable for final annealing (BKM)</p> <p><b>+CR2</b> Heat treatment after welding and sizing not provided (BKM)</p> <p><b>+A</b> After welding and sizing the pipes are annealed (GBK)</p> <p><b>+N</b> After welding and sizing the pipes are normalised (NBK)</p>	15 / 15 mm – 120 / 60 mm	E155 E195 (St 33 / S185) E235 (RSt 37-2 / S235JRG2) E275 E355 (St 52-3 / S355J2G3) Additional for +CR2: E190, E220, E260, E320, E370, E420	<p><b>S1</b> (black)</p> <p><b>S2</b> (pickled)</p> <p><b>S3</b> (cold rolled)</p> <p><b>S4</b> (coated)</p>

## Non-alloy steel pipes suitable for welding and threading DIN EN 10255

**Description:** Non-alloy steel pipes suitable for welding and threading

**Area of application:** Transport of fluids (to 25 bar) and gaseous media (to 10 bar)

Standards (formerly DIN)	Types	Size range	EN materials (formerly DIN)	Notes
EN 10255 (DIN 2440) EN 10255 (DIN 2441)	Series M: Medium Series H: Heavy Series L, L1, L2 (ISO-Light series)	1/8"–6"	S195T (St 33)	<ul style="list-style-type: none"> <li>· Galvanised acc. to DIN EN 10240 (DIN 2444)</li> <li>· Pipe ends threaded/non-threaded</li> <li>· Pipe ends with/without couplings</li> </ul>

# Pipes for the food industry DIN EN 10357

**Description:** Longitudinally welded pipes from stainless steel for the food and chemicals sectors

**Area of use:** Food industry, chemicals industry

## Preferred dimensions and limit deviations

Serie A													
Outer diameter	13,0	19,0	23,0	29,0	35,0	41,0	53,0	70,0	85,0	104,0	129,0	154,0	204,0
Limit deviation	± 0,10	± 0,10	± 0,12	± 0,15	± 0,18	± 0,21	± 0,27	± 0,35	± 0,43	± 0,78	± 0,97	± 1,16	± 1,53
Inner diameter	10,0	16,0	20,0	26,0	32,0	38,0	50,0	66,0	81,0	100,0	125,0	150,0	200,0
Wall thickness	1,50	1,50	1,50	1,50	1,50	1,50	1,50	2,00	2,00	2,00	2,00	2,00	2,00
Limit deviation	± 0,15	± 0,15	± 0,15	± 0,15	± 0,15	± 0,15	± 0,15	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20

Serie B							
Outer diameter	12,0	18,0	22,0	28,0	34,0	40,0	52,0
Limit deviation	± 0,10	± 0,10	± 0,12	± 0,15	± 0,18	± 0,21	± 0,27
Inner diameter	10,0	16,0	20,0	26,0	32,0	38,0	50,0
Wall thickness	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Limit deviation	± 0,15	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20

Serie C <sup>a)</sup>										
Outer diameter	17,2	21,3	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
Limit deviation	± 0,10	± 0,11	± 0,14	± 0,17	± 0,21	± 0,24	± 0,30	± 0,38	± 0,44	± 0,86
Inner diameter	14,0	18,1	23,7	29,7	38,4	44,3	56,3	72,1	84,9	110,3
Wall thickness	1,60	1,60	1,60	2,00	2,00	2,00	2,00	2,00	2,00	2,00
Limit deviation	± 0,15	± 0,15	± 0,15	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20	± 0,20

Serie D <sup>a)</sup>															
Outer diameter	25,0	25,4	32,0	38,0	38,1	38,1	50,8	50,8	51,0	63,5	63,5	76,1	76,1	76,1	101,6
Limit deviation	± 0,13	± 0,13	± 0,16	± 0,19	± 0,19	± 0,19	± 0,25	± 0,25	± 0,25	± 0,32	± 0,32	± 0,38	± 0,38	± 0,38	± 0,76
Inner diameter	22,6	22,2	29,6	35,6	35,1	34,9	47,8	47,6	48,6	60,5	60,3	73,1	72,9	72,1	97,6
Wall thickness	1,20	1,60	1,20	1,20	1,50	1,60	1,50	1,60	1,20	1,50	1,60	1,50	1,60	2,00	2,00
Limit deviation	± 0,12	± 0,16	± 0,12	± 0,12	± 0,15	± 0,16	± 0,15	± 0,16	± 0,12	± 0,15	± 0,16	± 0,15	± 0,16	± 0,20	± 0,20

<sup>a)</sup> The following limit deviations apply for dimensions other than those stated above.

EN ISO 1127-D4 for outer diameter < 90 mm

EN ISO 1127-D3 for outer diameter > 90 mm

The out-of-roundness is included in the limit deviations of the outer diameter.

For wall thicknesses ± 10 %

## Responsibility for the selection of materials

Short name	Material number
X5CrNi18-10	1.4301
X2CrNi18-9	1.4307
X2CrNiMo17-12-2	1.4404
X2CrNiMo17-12-3	1.4432
X2CrNiMo18-14-3	1.4435



## Design, requirements and surface finish

Design	Heat treatment	Surface finish and roughness			Symbol
		Inner surface	Inner welding seams	Outer surface and welding seam area	
From cold rolled steel <sup>a)</sup> Welded, Smoothed seam	Not heat treated	Ra < 0,80 µm pickled and passivated	Ra < 1,60 µm pickled and passivated	Pickled and passivated	CC
				Ground Ra < 1,00 µm	CD
From cold rolled steel <sup>a)</sup> Welded, Smoothed seam	Heat treated	Ra < 0,80 µm pickled and passivated or bright annealed	Ra < 1,60 µm pickled and passivated or bright annealed	Pickled and passivated or bright annealed	BC
				Ground Ra < 1,00 µm	BD

<sup>a)</sup> From cold rolled material according to DIN EN 10028-7 / Table 6, Surface finish 2B or 2R

### Testing and test certificates

Pipes according to this standard are to be tested according to the following standard

- DIN EN 10217-7 for test category TC1 or TC2 for austenitic and austenitic-ferritic steels
- DIN EN 10028-7 for ferritic steels (for D > 219.1 mm a tensile test transverse to the welding seam is required. Rm must meet the requirements of the base material).

A test certificate according to DIN EN 10204 / 3.1 is to be issued.

### Labelling

Each pipe supplied according to DIN EN 10357 is to be labelled suitably and permanently with the following information

- Name or designation of manufacturer
- EN 10357 TC1 or TC2 for test category 1 or 2 according to DIN EN 10217-7
- Indication of design (e.g. CC)
- Steel type
- Dimensions
- Heat number
- For pipes of test category TC2: In addition, the identification number (e.g. order or position number) according to DIN EN 10217-7, which enables the allocation of the product or delivery to the corresponding certification

# Steel pipes seamless

DIN EN 10220 – Dimensions and masses for seamless pipes

Outside diameter D in mm Series <sup>1)</sup>			Mass (weight) per unit lengths in kg/m for wall thicknesses in mm																	
Series 1	Series 2	Series 3	1,6	1,8	2,0	2,3	2,6	2,9	3,2	3,6	4,0	4,5	5,0	5,6	6,3	7,1	8,0	8,8	10	
10,2			0,339	0,373	0,404	0,448	0,487													
	12,0			0,453	0,493	0,550	0,603	0,651	0,694											
	12,7			0,484	0,528	0,590	0,648	0,701	0,750											
13,5				0,519	0,567	0,636	0,699	0,758	0,813	0,879										
		14,0		0,542	0,592	0,664	0,731	0,794	0,852	0,923										
		16,0		0,630	0,691	0,777	0,859	0,937	1,01	1,10	1,18									
17,2				0,684	0,750	0,845	0,936	1,02	1,10	1,21	1,30	1,41								
		18,0		0,789	0,891	0,987	1,08	1,17	1,28	1,38	1,50									
		19,0			0,838	0,947	1,05	1,15	1,25	1,37	1,48	1,61	1,73							
		20,0			0,888	1,00	1,12	1,22	1,33	1,46	1,58	1,72	1,85							
21,3					0,952	1,08	1,20	1,32	1,43	1,57	1,71	1,86	2,01							
		22,0			0,996	1,12	1,24	1,37	1,48	1,63	1,78	1,94	2,10							
		25,0			1,13	1,29	1,44	1,58	1,72	1,90	2,07	2,28	2,47	2,68	2,91					
		25,4			1,15	1,31	1,46	1,61	1,75	1,94	2,11	2,32	2,52	2,73	2,97					
26,9					1,23	1,40	1,56	1,72	1,87	2,07	2,26	2,49	2,70	2,94	3,20	3,47	3,73			
		30,0				1,57	1,76	1,94	2,11	2,34	2,56	2,83	3,08	3,27	3,68	4,01	4,34			
		31,8				1,67	1,87	2,07	2,26	2,50	2,74	3,03	3,30	3,62	3,96	4,32	4,70			
		32,0				1,68	1,89	2,08	2,27	2,52	2,76	3,05	3,33	3,65	3,99	4,36	4,74			
33,7						1,78	1,99	2,20	2,41	2,67	2,93	3,24	3,54	3,88	4,26	4,66	5,07	5,40		
		35,0					2,08	2,30	2,51	2,79	3,06	3,38	3,70	4,06	4,46	4,89	5,33	5,69		
		38,0					2,27	2,51	2,75	3,05	3,35	3,72	4,07	4,47	4,93	5,41	5,92	6,34	6,91	
		40,0					2,40	2,65	2,90	3,23	3,55	3,94	4,32	4,75	5,24	5,76	6,31	6,77	7,40	
42,4							2,55	2,82	3,09	3,44	3,79	4,21	4,61	5,08	5,61	6,18	6,79	7,29	7,99	
		44,5					2,69	2,98	3,26	3,63	4,00	4,44	4,87	5,37	5,94	6,55	7,20	7,75	8,51	
48,3							2,93	3,25	3,56	3,97	4,37	4,86	5,34	5,90	6,53	7,21	7,95	8,57	9,45	
		51,0					3,10	3,44	3,77	4,21	4,64	5,16	5,67	6,27	6,94	7,69	8,48	9,16	10,1	
		54,0					3,30	3,65	4,01	4,47	4,93	5,49	6,04	6,68	7,41	8,21	9,08	9,81	10,9	
		57,0						3,87	4,25	4,74	5,23	5,83	6,41	7,10	7,88	8,74	9,67	10,5	11,6	
60,3								4,11	4,51	5,03	5,55	6,19	6,82	7,55	8,39	9,32	10,3	11,2	12,4	
		63,5						4,33	4,76	5,32	5,87	6,55	7,21	8,00	8,89	9,88	10,9	11,9	13,2	
		70,0						4,80	5,27	5,90	6,51	7,27	8,01	8,89	9,90	11,0	12,2	13,3	14,8	
		73,0						5,01	5,51	6,16	6,81	7,60	8,38	9,31	10,4	11,5	12,8	13,9	15,5	
76,1								5,24	5,75	6,44	7,11	7,95	8,77	9,74	10,8	12,1	13,4	14,6	16,3	
		82,5							6,26	7,00	7,74	8,66	9,56	10,6	11,8	13,2	14,7	16,0	17,9	
88,9									6,76	7,57	8,38	9,37	10,3	11,5	12,8	14,3	16,0	17,4	19,5	
		101,6								8,70	9,63	10,8	11,9	13,3	14,8	16,5	18,5	20,1	22,6	
		108,0								9,27	10,3	11,5	12,7	14,1	15,8	17,7	19,7	21,5	24,2	
114,3										9,83	10,9	12,2	13,5	15,0	16,8	18,8	21,0	22,9	25,7	
		127,0									12,1	13,6	15,0	16,8	18,8	21,0	23,5	25,7	28,9	
		133,0									12,7	14,3	15,8	17,6	19,7	22,0	24,7	27,0	30,3	
139,7											13,4	15,0	16,6	18,5	20,7	23,2	26,0	28,4	32,0	
		141,3										15,2	16,8	18,7	21,0	23,5	26,3	28,8	32,4	
		152,4										16,4	18,2	20,3	22,7	25,4	28,5	31,2	35,1	
		159,0										17,1	19,0	21,2	23,7	26,6	29,8	32,6	36,7	
168,3												18,2	20,1	22,5	25,2	28,2	31,6	34,6	39,0	
		177,8											21,3	23,8	26,6	29,9	33,5	36,7	41,4	
		193,7												26,0	29,1	32,7	36,6	40,1	45,3	
219,1																33,1	37,1	41,6	45,6	51,6
		244,5														37,0	41,6	46,7	51,2	57,8
273,0																41,4	46,6	52,3	57,3	64,9
323,9																	55,5	62,3	68,4	77,4
355,6																		68,6	75,3	85,2
406,4																			86,3	97,8
457,0																				110
508,0																				
		559,0																		
610,0																				
		660,0																		
711,0																				

<sup>1)</sup> Series 1 Outside diameter for which all equipment required in pipe system construction are standardised

Series 2 Outside diameter for which not all equipment are standardised

Series 3 Outside diameter for which there are few standardised equipment

11	12,5	14,2	16	17,5	20	22,2	25	28	30	32	36	40	45	50	55	60	65	70	80	90	100
<b>Tolerances of the outside diameter and wall thickness</b>																					
Outside diameter D mm	Tolerances for T in a T/D ratio of				Tolerances for D																
	≤ 0,025	> 0,025 to 0,050	> 0,050 to 0,10	> 0,10																	
D ≤ 219,1	± 12,5% or ± 0,4 mm, the larger value applies in each case				± 1% or ± 0,5 mm, the larger value applies in each case																
D > 219,1	± 20 %	± 15 %	± 12,5 %	± 10 % <sup>1)</sup>																	
<sup>1)</sup> For outside diameter D ≥ 355,6 mm the upper limit of the local wall thickness may be exceeded by a further 5% of the wall thickness T.																					
9,09	9,86																				
10,1	11,0																				
10,9	11,9																				
11,7	12,8	13,9																			
12,5	13,7	15,0																			
13,4	14,7	16,1	17,5																		
14,2	15,7	17,3	18,7																		
16,0	17,7	19,5	21,3	22,7																	
16,8	18,7	20,6	22,5	24,0																	
17,7	19,6	21,7	23,7	25,3	27,7																
19,4	21,6	23,9	26,2	28,1	30,8	33,0															
21,1	23,6	26,2	28,8	30,8	34,0	36,5	39,4														
24,6	27,5	30,6	33,8	36,3	40,2	43,5	47,2	50,8													
26,3	29,4	32,8	36,3	39,1	43,4	47,0	51,2	55,2	57,7												
28,0	31,4	35,1	38,8	41,8	46,5	50,4	55,1	59,6	62,4	64,9											
31,5	35,3	39,5	43,8	47,3	52,8	57,4	62,9	68,4	71,8	75,0	80,8										
33,1	37,1	41,6	46,2	49,8	55,7	60,7	66,6	72,5	76,2	79,7	86,1	91,7									
34,9	39,2	43,9	48,8	52,7	59,0	64,3	70,7	77,1	81,2	85,0	92,1	98,4									
35,3	39,7	44,5	49,4	53,4	59,8	65,2	71,7	78,2	82,3	86,3	93,5	99,9									
38,4	43,1	48,4	53,8	58,2	65,3	71,3	78,5	85,9	90,6	95,0	103	111	119								
40,1	45,2	50,7	56,4	61,1	68,6	74,9	82,6	90,5	95,4	100	109	117	127								
42,7	48,0	54,0	60,1	65,1	73,1	80,0	88,3	96,9	102	108	117	127	137	146							
45,2	51,0	57,3	63,8	69,2	77,8	85,2	94,2	103	109	115	126	136	147	158	167						
49,6	55,9	62,9	70,1	76,0	85,7	93,9	104	114	121	128	140	152	165	177	188	198					
56,5	63,7	71,8	80,1	87,0	98,2	108	120	132	140	148	163	177	193	209	223	235	247	257			
63,3	71,5	80,6	90,2	98,0	111	122	135	149	159	168	185	202	221	240	257	273	288	301	325		
71,1	80,3	90,6	101	110	125	137	153	169	180	190	210	230	253	275	296	315	333	350	381		
84,9	96,0	108	121	132	150	165	184	204	217	230	256	280	310	338	365	390	415	438	481	519	552
93,5	106	120	134	146	166	183	204	226	241	255	284	311	345	377	408	437	466	493	544	590	630
107	121	137	154	168	191	210	235	261	278	295	329	361	401	439	477	513	547	581	644	702	765
121	137	155	174	190	216	238	266	296	316	335	374	411	457	502	545	587	628	668	744	815	880
135	153	173	194	212	241	266	298	331	354	376	419	462	514	565	614	663	710	756	844	928	1006
	168	191	214	234	266	294	329	367	391	416	464	512	570	628	684	738	792	844	945	1041	1132
	184	209	234	256	291	322	361	402	429	456	510	562	627	691	753	814	874	932	1046	1154	1258
					316	349	392	436	466	496	554	612	683	752	821	888	954	1019	1144	1265	1381
							423	472	504	536	599	662	739	815	890	963	1036	1107	1245	1378	1507

# Steel pipes welded

DIN EN 10220 – Dimensions and masses for welded pipes

Outside diameter D in mm Series <sup>1)</sup>			Mass (weight) per unit lengths in kg/m for wall thicknesses in mm																	
Series 1	Series 2	Series 3	1,4	1,6	1,8	2,0	2,3	2,6	2,9	3,2	3,6	4,0	4,5	5,0	5,6	6,3	7,1	8,0	8,8	
10,2			0,304	0,339	0,373	0,404	0,448	0,487												
13,2			0,418	0,470	0,519	0,567	0,635	0,699	0,758	0,813	0,879									
	16,0		0,504	0,568	0,630	0,691	0,777	0,859	0,937	1,01	1,10									
17,2			0,546	0,616	0,684	0,750	0,845	0,936	1,02	1,10	1,21	1,30								
	19,0		0,608	0,687	0,764	0,838	0,947	1,05	1,15	1,25	1,37	1,48								
	20,0		0,642	0,726	0,808	0,888	1,00	1,12	1,22	1,33	1,46	1,58								
21,3			0,687	0,777	0,866	0,952	1,08	1,20	1,32	1,43	1,57	1,71	1,86							
	25,0		0,815	0,923	1,03	1,13	1,29	1,44	1,58	1,72	1,90	2,07	2,28	2,47						
		25,4	0,829	0,939	1,05	1,15	1,31	1,46	1,61	1,75	1,94	2,11	2,32	2,52						
26,9			0,880	0,998	1,11	1,23	1,40	1,56	1,72	1,87	2,07	2,26	2,49	2,70						
		30,0	0,987	1,12	1,25	1,38	1,57	1,76	1,94	2,11	2,34	2,56	2,83	3,08	3,37	3,68				
	31,8		1,05	1,19	1,33	1,47	1,67	1,87	2,07	2,26	2,50	2,74	3,03	3,30	3,62	3,96	4,32			
33,7			1,12	1,27	1,42	1,56	1,78	1,99	2,20	2,41	2,67	2,93	3,24	3,54	3,88	4,26	4,66	5,07		
	38,0		1,26	1,44	1,61	1,78	2,02	2,27	2,51	2,75	3,05	3,35	3,72	4,07	4,47	4,93	5,41	5,92	6,34	
42,4			1,42	1,61	1,80	1,99	2,27	2,55	2,82	3,09	3,44	3,79	4,21	4,61	5,08	5,61	6,18	6,79	7,29	
		44,5	1,49	1,69	1,90	2,10	2,39	2,69	2,98	3,26	3,63	4,00	4,44	4,87	5,37	5,94	6,55	7,20	7,75	
48,3			1,62	1,84	2,06	2,28	2,61	2,93	3,25	3,56	3,97	4,37	4,86	5,34	5,90	6,53	7,21	7,95	8,57	
	51,0		1,71	1,95	2,18	2,42	2,76	3,10	3,44	3,77	4,21	4,64	5,16	5,67	6,27	6,94	7,69	8,48	9,16	
		54,0	1,82	2,07	2,32	2,56	2,93	3,30	3,65	4,01	4,47	4,93	5,49	6,04	6,68	7,41	8,21	9,08	9,81	
		57,0	1,92	2,19	2,45	2,71	3,10	3,49	3,87	4,25	4,74	5,23	5,83	6,41	7,10	7,88	8,74	9,67	10,5	
60,3			2,03	2,32	2,60	2,88	3,29	3,70	4,11	4,51	5,03	5,55	6,19	6,82	7,55	8,39	9,32	10,3	11,2	
	63,5			2,44	2,74	3,03	3,47	3,90	4,33	4,76	5,32	5,87	6,55	7,21	8,00	8,89	9,88	10,9	11,9	
	70,0			2,70	3,03	3,35	3,84	4,32	4,80	5,27	5,90	6,51	7,27	8,01	8,89	9,90	11,0	12,2	13,3	
		73,0		2,82	3,16	3,50	4,01	4,51	5,01	5,51	6,16	6,81	7,60	8,38	9,31	10,4	11,5	12,8	13,9	
76,1				2,94	3,30	3,65	4,19	4,71	5,24	5,75	6,44	7,11	7,95	8,77	9,74	10,8	12,1	13,4	14,6	
		82,5		3,19	3,58	3,97	4,55	5,12	5,69	6,26	7,00	7,74	8,66	9,56	10,6	11,8	13,2	14,7	16,0	
88,9				3,44	3,87	4,29	4,91	5,53	6,15	6,76	7,57	8,38	9,37	10,3	11,5	12,8	14,3	16,0	17,4	
	101,6					4,91	5,63	6,35	7,06	7,77	8,70	9,63	10,8	11,9	13,3	14,8	16,5	18,5	20,1	
		108,0				5,23	6,00	6,76	7,52	8,27	9,27	10,3	11,5	12,7	14,1	15,8	17,7	19,7	21,5	
114,3						5,54	6,35	7,16	7,97	8,77	9,83	10,9	12,2	13,5	15,0	16,8	18,8	21,0	22,9	
	127,0					6,17	7,07	7,98	8,88	9,77	11,0	12,1	13,6	15,0	16,8	18,8	21,0	23,5	25,7	
	133,0					6,46	7,41	8,36	9,30	10,2	11,5	12,7	14,3	15,8	17,6	19,7	22,0	24,7	27,0	
139,7						6,79	7,79	8,79	9,78	10,8	12,1	13,4	15,0	16,6	18,5	20,7	23,2	26,0	28,4	
		152,4				7,42	8,51	9,61	10,7	11,8	13,2	14,6	16,4	18,2	20,3	22,7	25,4	28,5	31,2	
		159,0				7,74	8,89	10,0	11,2	12,3	13,8	15,3	17,1	19,0	21,2	23,7	26,6	29,8	32,6	
168,3									11,8	13,0	14,6	16,2	18,2	20,1	22,5	25,2	28,2	31,6	34,6	
		177,8							12,5	13,8	15,5	17,1	19,2	21,3	23,8	26,6	29,9	33,5	36,7	
		193,7							13,6	15,0	16,9	18,7	21,0	23,3	26,0	29,1	32,7	36,6	40,1	
219,1										17,0	19,1	21,2	23,8	26,4	29,5	33,1	37,1	41,6	45,6	
		244,5								19,0	21,4	23,7	26,6	29,5	33,0	37,0	41,6	46,7	51,2	
273,0										21,3	23,9	26,5	29,8	33,0	36,9	41,4	46,6	52,3	57,3	
323,9										25,3	28,4	31,6	35,4	39,3	44,0	49,3	55,5	62,3	68,4	
355,6										27,8	31,3	34,7	39,0	43,2	48,3	54,3	61,0	68,6	75,3	
406,4											35,8	39,7	44,6	49,5	55,4	62,2	69,9	78,6	86,3	
457,0											40,3	44,7	50,2	55,7	62,3	70,0	78,8	88,6	97,3	
508,0											44,8	49,5	55,9	62,0	69,4	77,9	87,7	98,6	108	
		559,0												61,5	68,3	76,4	85,9	96,6	109	119
610,0														67,2	74,6	83,5	93,8	106	119	130
		660,0												72,7	80,8	90,4	102	114	129	141
711,0														78,4	87,1	97,4	109	123	139	152
		762,0												84,1	93,3	104	117	132	149	163
813,0														89,7	99,6	112	125	141	159	175
		864,0												95,4	106	119	133	150	169	186
914,0														101	112	125	141	159	179	196
1016														112	125	140	157	177	199	219
1220															168	182	212	239	263	
1420																220	247	279	306	
1620																	282	318	350	
1820																			393	
2020																				
2220																				

<sup>1)</sup> **Series 1** Outside diameter for which all equipment required for pipe system construction are standardised

**Series 2** Outside diameter for which not all equipment are standardised

**Series 3** Outside diameter for which there are few standardised equipment

10	11	12,5	14,2	16	17,5	20	22,2	25	28	30	32	36	40							
10,9																				
11,6																				
12,4																				
13,2																				
14,8																				
15,5																				
16,3																				
17,9																				
19,5																				
22,6																				
24,2	26,3																			
25,7	28,0																			
28,9	31,5																			
30,3	33,1																			
32,0	34,9																			
35,1	38,4																			
36,7	40,1																			
39,0	42,7																			
41,4	45,2																			
45,3	49,6																			
51,6	56,5	63,7																		
57,8	63,3	71,5																		
64,9	71,1	80,3																		
77,4	84,9	96,0																		
85,2	93,5	106																		
97,8	107	121																		
110	121	137																		
123	135	153	173	194																
135	149	168	191	214	234	266														
148	162	184	209	234	256	291	322	361	402											
160	176	200	226	254	277	316	349	392	436	466										
173	190	215	244	274	299	341	377	423	472	504	536									
185	204	231	262	294	321	366	405	454	507	542	576	645								
198	218	247	280	314	343	391	433	486	542	579	616	690	763							
211	231	262	298	335	365	416	461	517	577	617	657	735	813							
223	245	278	315	354	387	441	488	548	612	654	696	780	862							
248	273	309	351	395	431	491	544	611	682	729	777	870	963							
298	328	372	422	475	519	592	656	737	823	880	938	1051	1164							
348	382	434	492	554	605	691	765	860	961	1028	1095	1229	1361							
397	436	496	562	633	692	789	875	983	1099	1176	1253	1406	1559							
446	491	557	632	712	778	888	984	1107	1237	1324	1411	1584	1756							
496	545	619	702	791	864	986	1094	1230	1376	1472	1569	1761	1953							
545	599	681	772	870	951	1085	1203	1353	1514	1620	1727	1939	2150							

**Tolerances of the outside diameter and wall thickness for electric welded pipes acc. to DIN EN 10217-2**

Outside diameter D	Tolerances dimensions in mm		
	Tolerances of outside diameter D	Tolerances of wall thickness T <sup>1)</sup> for	
		T ≤ 5	5 < T ≤ 16
D ≤ 219,1	± 1% or ± 0,5 mm, the larger value applies in each case	± 10% or ± 0,3 mm, the larger value applies in each case	± 8%
D > 219,1	± 0,75%		

<sup>1)</sup> The upper limit tolerance does not apply to the weld seam area (see DIN EN 10217-2/section 8.7.4.2)

**Tolerances of the outside diameter and wall thickness for submerged arc welded pipes acc. to DIN EN 10217-5**

Outside diameter D	Tolerances dimensions in mm		
	Tolerances of outside diameter D	Tolerances of wall thickness T <sup>1)</sup> for	
		T ≤ 5	5 < T ≤ 40
D > 219,1	± 0,75% or ± 6 mm, the smaller value applies in each case	± 10% or ± 0,3 mm, the larger value applies in each case	± 8% or ± 2 mm, the smaller value applies in each case

<sup>1)</sup> The upper limit tolerance does not apply to the weld seam area (see DIN EN 10217-5/section 8.7.4.2)



# Stainless steel pipes / austenitic steels

Dimensions and masses per unit lengths of pipes according to DIN EN ISO 1127 – Table 3

Outside diameter D in mm			Mass (weight) per unit lengths in kg/m for wall thicknesses in mm																	
Series 1	Series 2	Series 3	1,0	1,2	1,6	2,0	2,3	2,6	2,9	3,2	3,6	4,0	4,5	5,0	5,6	6,3	7,1	8,0	8,8	
	6,0		0,125	0,144																
	8,0		0,176	0,204																
	10,0		0,225	0,264																
10,2			0,230	0,270	0,344	0,410														
	12,0		0,275		0,416	0,500														
	12,7		0,293	0,345	0,445	0,536	0,599	0,658	0,711	0,761										
13,5			0,313	0,369	0,477	0,576	0,645		0,789											
		14,0	0,326		0,496	0,601														
	16,0		0,376	0,445	0,577	0,701														
17,2			0,406		0,625	0,761	0,858			1,12										
		18,0	0,425		0,657	0,801														
	19,0		0,451	0,535	0,697	0,851														
	20,0		0,476	0,564	0,737	0,901														
21,3			0,509		0,789	0,966		1,22		1,45		1,74								
		22,0	0,526			1,00														
	25,0		0,601	0,715	0,937	1,15		1,46												
		25,4		0,727	0,953	1,17		1,48												
26,9			0,649		1,01	1,25		1,58	1,75	1,90		2,29								
		30,0			1,14	1,40														
	31,8			0,920	1,21	1,49		1,90		2,29		2,78								
	32,0			0,925		1,50														
33,7			0,818	0,976	1,29	1,58	1,81	2,02		2,45		3,29								
		35,0		1,02		1,65														
	38,0			1,11	1,46	1,81		2,30		2,79										
	40,0			1,17	1,54			2,44												
42,4					1,63	2,02		2,59		3,14	3,49		4,68							
		44,5				2,13		2,73	3,02											
48,3					1,87	2,31		2,97		3,61	4,03		5,42							
	51,0		1,25	1,49	1,98	2,46		3,15		3,83										
		54,0			2,10	2,60		3,35												
	57,0				2,22	2,75			3,93											
60,3					2,35	2,92	3,34	3,76	4,17	4,58	5,11	5,83		7,66						
	63,5				2,48	3,08		3,96		4,83										
	70,0				2,74	3,40			4,87											
76,1					2,98	3,70	4,25	4,78	5,32		6,54	7,22		8,90				12,3		
		82,5				4,03				6,35										
88,9					3,49	4,35	4,98	5,61	6,24	6,86	7,68	8,51		11,7				16,2		
		101,6				4,98			7,17		9,77		13,5					18,8		
114,3					4,52	5,62		7,27	8,09		9,98		12,4				17,1			23,2
139,7					5,53	6,89		8,92		11,0		13,6		16,8			21,0	23,5		
168,3					6,68	8,32		10,8		13,2		16,4	18,5	20,4			28,6			
219,1						10,9		14,1		17,3	19,4	21,5					33,6		42,2	
273,0						13,6		17,6		21,6	24,3	26,9					42,0			
323,9								20,9		25,7		32,1	35,9	39,9				56,3		
355,6								22,9		28,2		35,2		43,8						
406,4								26,3		32,3		40,3		50,2						
457,0										36,3		45,4		56,5						
508,0										40,4	45,5		62,9	70,4						
610,0										48,6		60,7			84,8	95,2				
711,0																		125		
813,0																			161	
914,0																				199
1016																				

The values of the mass per unit length in the table are obtained from multiplying the corresponding values from ISO 4200 by a factor of 1.015. This factor is based on an average density of these pipes of 7.97 kg/dm³.

10	11	12,5	14,2																	
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Outside diameter tolerances	
Tolerance class	Outside diameter tolerances
D1	± 1,50 % / min. ± 0,75 mm
D2	± 1,00 % / min. ± 0,50 mm
D3	± 0,75 % / min. ± 0,30 mm
D4	± 0,50 % / min. ± 0,10 mm

Wall thickness tolerances	
Tolerance class	Wall thickness tolerances
T1	± 15,0 % / min. ± 0,60 mm
T2	± 12,5 % / min. ± 0,40 mm
T3	± 10,0 % / min. ± 0,20 mm
T4	± 7,50 % / min. ± 0,15 mm
T5	± 5,00 % / min. ± 0,10 mm

32,5			
	43,3		
		64,7	
65,9		81,5	92,0
78,6		97,4	
86,5	94,9	108	
99,3		123	
112		139	157
	137	155	176
		187	212
252			

# Precisions steel pipes DIN EN 10305-1 to -4

Dimensions and masses for circular pipes

Outside diameter in mm	Part				Weight in kg/m for wall thickness T in mm <sup>1)</sup>																	
					1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4			
					0,5	0,6	0,75	0,8	1,0	1,2	1,5	1,8	2,0	2,2	2,5	2,8	3,0	3,5	4,0	4,5		
4,0	•	•		•	0,04			0,06	0,07	0,08												
5,0	•	•		•	0,06		0,08	0,08	0,10	0,11												
6,0	•	•	•	•	0,07	0,08		0,10	0,12	0,14	0,17	0,19	0,20									
7,0	•	•		•	0,08			0,12	0,15	0,17	0,20	0,23	0,25									
8,0	•	•	•	•	0,09	0,11		0,14	0,17	0,20	0,24	0,28	0,30	0,31	0,34							
9,0	•	•		•	0,10			0,16	0,20	0,23	0,28	0,32	0,35	0,37	0,40	0,43						
10,0	•	•	•	•	0,12	0,14		0,18	0,22	0,26	0,31	0,36	0,39	0,42	0,46	0,50	0,52					
12,0	•	•	•	•	0,14	0,17		0,22	0,27	0,32	0,39	0,45	0,49	0,53	0,59	0,64	0,67	0,73	0,79			
14,0	•	•		•	0,17			0,26	0,32	0,38	0,46	0,54	0,59	0,64	0,71	0,77	0,81	0,91	0,99	1,05		
15,0	•	•	•	•	0,18	0,21		0,28	0,35	0,41	0,50	0,59	0,64	0,69	0,77	0,84	0,89	0,99	1,09	1,17		
16,0	•	•	•	•	0,19	0,23		0,30	0,37	0,44	0,54	0,63	0,69	0,75	0,83	0,91	0,96	1,08	1,18	1,28		
18,0	•	•	•	•	0,22	0,26		0,34	0,42	0,50	0,61	0,72	0,79	0,86	0,96	1,05	1,11	1,25	1,38	1,50		
19,0			•			0,27		0,36	0,44	0,53	0,65	0,76	0,84	0,91	1,02		1,18					
20,0	•	•	•	•	0,24			0,38	0,47	0,56	0,68	0,81	0,89	0,97	1,08	1,19	1,26	1,42	1,58	1,72		
22,0	•	•	•	•	0,27			0,42	0,52	0,62	0,76	0,90	0,99	1,07	1,20	1,33	1,41	1,60	1,78	1,94		
25,0	•	•	•	•	0,30			0,48	0,59	0,70	0,87	1,03	1,13	1,24	1,39	1,53	1,63	1,86	2,07	2,27		
26,0	•	•			0,31			0,50	0,62	0,73	0,91	1,07	1,18	1,29	1,45	1,60	1,70	1,94	2,17	2,39		
28,0	•	•	•	•	0,34			0,54	0,67	0,79	0,98	1,16	1,28	1,40	1,57	1,74	1,85	2,11	2,37	2,61		
30,0	•	•	•	•	0,36			0,58	0,72	0,85	1,05	1,25	1,38	1,51	1,70	1,88	2,00	2,29	2,56	2,83		
32,0	•	•	•	•	0,39			0,62	0,76	0,91	1,13	1,34	1,48	1,62	1,82	2,02	2,15	2,46	2,70	3,05		
35,0	•	•	•	•	0,43			0,67	0,84	1,00	1,24	1,47	1,63	1,78	2,00	2,22	2,37	2,72	3,06	3,38		
38,0	•	•	•	•	0,46			0,73	0,91	1,09	1,35	1,61	1,78	1,94	2,19	2,43	2,59	2,98	3,35	3,72		
40,0	•	•	•		0,49			0,77	0,96	1,15	1,42	1,70	1,87	2,05	2,31	2,57	2,74	3,15	3,55	3,94		
42,0	•	•	•	•				1,01	1,21	1,50	1,78	1,97	2,16	2,44	2,71	2,89	3,32	3,75	4,16			
42,4			•					1,02	1,22	1,51	1,80	1,99	2,18	2,46			2,91	3,36	3,79			
44,0			•					1,06	1,27	1,57	1,87	2,07	2,27	2,56			3,03	3,50	3,95			
45,0	•	•	•					1,09	1,30	1,61	1,92	2,12	2,32	2,62	2,91	3,11	3,58	4,04	4,49			
48,0	•	•	•					1,16	1,38	1,72	2,05	2,27	2,48	2,81	3,12	3,33	3,84	4,34	4,83			
48,3			•					1,17	1,39	1,73	2,06	2,28	2,50	2,82			3,35	3,87	4,37	4,86		
50,0	•	•	•	•				1,21	1,44	1,79	2,14	2,37	2,59	2,93	3,26	3,48	4,01	4,54	5,05			
51,0			•						1,47	1,83	2,18	2,42	2,65	2,99			3,55	4,10	4,64	5,16		
55,0	•	•	•	•				1,33	1,59	1,98	2,36	2,61	2,86	3,24	3,60	3,85	4,44	5,03	5,60			
57,0			•						1,65	2,05	2,45	2,71	2,97	3,36			3,99	4,62	5,23	5,83		
60,0	•	•	•	•				1,45	1,74	2,16	2,58	2,86	3,14	3,54	3,95	4,22	4,88	5,52	6,16			
63,5			•						1,84	2,29	2,74	3,03	3,33	3,76			4,48	5,18	5,87	6,55		
65,0	•	•						1,58	1,89	2,35	2,81	3,11	3,41	3,85	4,29	4,59	5,31	6,02	6,71			
70,0	•	•	•	•				1,70	2,04	2,53	3,03	3,35	3,68	4,16	4,64	4,96	5,74	6,51	7,27			
75,0	•	•						1,82	2,18	2,72	3,25	3,60	3,95	4,47	4,99	5,33	6,17	7,00	7,82			
76,0			•						2,21	2,76	3,29	3,65	4,00	4,53			5,40	6,26	7,10	7,93		
80,0	•	•	•	•				1,95	2,33	2,90	3,47	3,85	4,22	4,78	5,33	5,70	6,60	7,50	8,38			
85,0	•	•								3,09	3,69	4,09	4,49	5,09	5,68	6,07	7,03	7,99	8,93			
89,0			•						2,60	3,24	3,87	4,29	4,71	5,33			6,36	7,38	8,38	9,38		
90,0	•	•	•							3,27	3,92	4,34	4,76	5,39	6,02	6,44	7,47	8,48	9,49			
95,0	•	•										4,59	5,03	5,70	6,37	6,81	7,90	8,98	10,0			
100,0	•	•	•									4,83	5,31	6,01	6,71	7,18	8,33	9,47	10,6			
101,6			•						2,97	3,70	4,43	4,91	5,39	6,11			7,29	8,47	9,63	10,8		
108,0			•						3,16	3,94	4,71	5,23	5,74	6,50			7,77	9,02	10,3	11,5		
110,0	•	•										5,33	5,85	6,63	7,40	7,92	9,19	10,5	11,7			
114,0			•						3,34	4,16	4,98	5,52	6,07	6,87			8,21	9,54	10,9	12,2		
120,0	•	•	•									5,82	6,39	7,24	8,09	8,66	10,1	11,4	12,8			
127,0			•						3,72	4,64	5,56	6,17	6,77	7,68			9,17	10,7	12,1	13,6		
130,0	•	•												7,86	8,78	9,40	10,9	12,4	13,9			
133,0			•						3,90	4,86	5,82	6,46	7,10	8,05			9,62	11,2	12,7	14,3		
139,7			•						4,10	5,11	6,12	6,79	7,46	8,46			10,1	11,8	13,4	15,0		
140,0	•	•													8,48	9,47	10,1	11,8	13,4	15,0		
150,0	•	•															10,9	12,6	14,4	16,1		
159,0			•						4,67	5,83	6,98	7,74	8,51	9,65			11,5	13,4	15,3	17,1		
160,0	•																11,6	13,5	15,4	17,3		
168,0			•						4,94	6,16	7,38	8,19	8,99	10,2			12,2	14,2	16,2	18,1		
170,0	•																12,4	14,4	16,4	18,4		
180,0	•																	15,2	17,4	19,5		
190,0	•																	16,1	18,3	20,6		
193,7			•						5,70	7,11	8,52	9,45	10,4	11,8			14,1	16,4	18,7	21,0		
200,0	•																	17,0	19,3	21,7		
220,0	•																			23,9		
240,0	•																				26,1	
260,0	•																					

<sup>1)</sup> The wall thickness is standardised acc. to this part of DIN EN 10305.

Weight in kg/m for wall thickness T in mm <sup>1)</sup>														
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
5,0	5,5	6,0	7,0	8,0	9,0	10,0	12,0	12,5	14,0	16,0	18,0	20,0	22,0	25,0
1,23														
1,36	1,42	1,48												
1,60	1,70	1,78												
1,85	1,97	2,07	2,24											
2,10	2,24	2,37	2,59											
2,47	2,64	2,81	3,11	3,35										
2,59	2,78	2,96	3,28	3,55										
2,84	3,05	3,26	3,63	3,95										
3,08	3,22	3,55	3,97	4,34	4,66	4,93								
3,33	3,59	3,85	4,32	4,73	5,10	5,43								
3,70	4,00	4,29	4,83	5,33	5,77	6,17								
4,07	4,41	4,73	5,35	5,92	6,44	6,90								
4,32	4,68	5,03	5,70	6,31	6,88	7,40								
4,56	4,95	5,33	6,04	6,71	7,32	7,89								
4,93	5,36	5,77	6,56	7,30	7,99	8,63								
5,30	5,76	6,21	7,08	7,89	8,66	9,37								
5,55	6,04	6,51	7,42	8,29	9,20	9,86								
6,17	6,71	7,25	8,29	9,27	10,2	11,1	12,7							
6,78	7,39	7,99	9,15	10,3	11,3	12,3	14,2	14,7						
7,21	7,87													
7,40	8,07	8,73	10,0	11,2	12,4	13,6	15,7	17,6						
8,01	8,75	9,47	10,9	12,2	13,5	14,8	17,2	17,7	19,3					
8,63	9,43	10,2	11,7	13,2	14,7	16,0	18,6	21,1	23,3					
8,75	9,56													
9,25	10,1	11,0	12,6	14,2	15,8	17,3	20,1	20,8	22,8	25,3				
9,86	10,8	11,7	13,5	15,2	16,9	18,5	21,6		24,5	27,2				
10,4	11,3	12,3												
10,5	11,5	12,4	14,3	16,2	18,0	19,7	23,1		26,2	29,2				
11,1	12,1	13,2	15,2	17,2										
11,7	12,8	13,9	16,1	18,2	20,2	22,2	26,0		29,7	33,1	36,4			
11,9	13,0	14,1												
12,7	13,9	15,1												
13,0	14,2	15,4	17,8	20,1	22,4	24,7	29,0		33,1	37,1	40,8			
13,4	14,7	16,0												
14,2	15,5	16,9	19,5	22,1	24,6	27,1	32,0		36,6	41,0	45,3			
15,0	16,5	17,9												
15,4	16,9	18,4	21,2	24,1	26,9	29,6	34,9		40,1	45,0	49,7			
15,8	17,3	18,8												
16,6	18,2	19,8												
16,7	18,2	19,8	23,0	26,0	29,1	32,1	37,9		43,5	48,9	54,2			
17,9	19,6	21,3	24,7	28,0	31,3	34,5	40,8		47,0	52,9	58,6	64,1		
19,0	20,8	22,6												
19,1	21,0	22,8	26,4	30,0	33,5	37,0	43,8		50,4	56,8	63,0	69,0		
20,1	22,0	24,0												
20,3	22,3	24,3	28,1	32,0	35,7	39,5	46,8		53,9	60,8	67,5	74,0		
21,6	23,7	25,7	29,9	33,9	38,0	41,9	49,7		57,3	64,7	71,9	78,9		
22,8	25,0	27,2	31,6	35,9	40,2	44,4	52,7		60,8	68,7	76,3	83,8		
23,3	25,5	27,8												
24,0	26,4	28,7	33,3	37,9	42,4	46,9	55,6		64,2	72,6	80,8	88,8	96,6	
26,5	29,1	31,7	36,8	41,8	46,8	51,8	61,6		71,1	80,5	89,7	98,6	107	120
29,0	31,8	34,6	40,2	45,8	51,3	56,7	67,5		78,0	88,4	98,5	109	118	133
31,4	34,5	37,6	43,7	49,7	55,7	61,7	73,4		84,9	96,3	107	118	129	145

# Precisions steel tubes DIN EN 10305-5

Dimensions and masses for square and rectangular steel tubes

## Welded and cold sized square and rectangular tubes

Side length / mm			Weight in kg/m <sup>1</sup> for wall thickness T/mm						
H	B (or H)	Tolerance	1,00	1,25	1,50	2,00	2,50	3,00	4,00
15	15	± 0,20	0,438	0,537	0,632	0,810			
20	10	± 0,20	0,438	0,537	0,632	0,810			
	15		0,516	0,635	0,750	0,967			
25	20	± 0,25	0,595	0,733	0,868	1,12			
	25		0,752	0,930	1,10	1,44			
30	10	± 0,25	0,595	0,733	0,868	1,12			
	15		0,673	0,831	0,985	1,28			
	20		0,752	0,930	1,10	1,44			
34	30	± 0,25	0,909	1,13	1,34	1,75	2,15	2,39	
	20		0,815	1,01	1,20	1,56			
35	20	± 0,25	0,830	1,03	1,22	1,59	1,95		
	25		0,909	1,13	1,34	1,75	2,15	2,39	
	35		1,07	1,32	1,57	2,07	2,54	2,86	
40	20	± 0,30			1,34	1,75	2,15	2,39	
	25				1,46	1,91	2,34	2,63	
	30				1,57	2,07	2,54	2,86	
45	40	± 0,30			1,81	2,38	2,93	3,33	4,25
	45				2,05	2,69	3,33	3,80	4,88
50	20	± 0,30			1,57	2,07	2,54	2,86	
	25				1,69	2,22	2,74	3,10	
	30				1,81	2,38	2,93	3,33	4,25
	40				2,05	2,69	3,33	3,80	4,88
	50				2,28	3,01	3,72	4,28	5,51
60	20	± 0,35				2,38	2,93	3,33	
	30					2,69	3,33	3,80	4,88
	40					3,01	3,72	4,28	5,51
	50					3,32	4,44	4,75	6,14
70	60	± 0,40				3,64	4,50	5,22	6,76
	40					3,32	4,11	4,75	6,14
80	70	± 0,50				4,26	5,29	6,16	8,02
	20					3,01	3,72	4,28	
	30					3,32	4,11	4,75	
	40					3,64	4,50	5,22	6,76
	50					3,95	4,90	5,69	7,39
90	60	± 0,60				4,26	5,29	6,16	8,02
	80					4,89	6,07	7,10	9,28
	90					5,52	6,86	8,04	10,50
	20					3,01	3,72	4,28	
100	30	± 0,65				3,32	4,11	4,75	
	40					3,64	4,50	5,22	6,76
	50					3,95	4,90	5,69	7,39
	60					4,26	5,29	6,16	8,02
120	80	± 0,70				4,89	6,07	7,10	9,28
	100					5,52	6,86	8,04	10,50
	40					6,15	7,64	8,99	11,80
	60					4,89	6,07	7,10	9,28
					5,52	6,86	8,04	10,50	

<sup>1)</sup> The factor of the masses based on an average density of 7,85 kg /dm<sup>3</sup> acc. to DIN EN 10305-5 table 6.



# Pipes with threaded ends DIN EN 10255

Dimensions and masses

## Seamless and welded non-alloy steel pipes suitable for welding and threading

Outside Diameter in mm	Thread size	Heavy series (H)		Medium series (M)	
		Wall thickness in mm	Square ends in kg/m	Wall thickness in mm	Square ends in kg/m
10,2	1/8"	2,6	0,487	2,0	0,404
13,5	1/4"	2,9	0,765	2,3	0,641
17,2	3/8"	2,9	1,02	2,3	0,839
21,3	1/2"	3,2	1,44	2,6	1,21
26,9	3/4"	3,2	1,87	2,6	1,56
33,7	1"	4,0	2,93	3,2	2,41
42,4	1 1/4"	4,0	3,79	3,2	3,10
48,3	1 1/2"	4,0	4,37	3,2	3,56
60,3	2"	4,5	6,19	3,6	5,03
76,1	2 1/2"	4,5	7,93	3,6	6,42
88,9	3"	5,0	10,30	4,0	8,36
114,3	4"	5,4	14,50	4,5	12,20
139,7	5"	5,4	17,90	5,0	16,60
165,1	6"	5,4	21,30	5,0	19,80

Outside Diameter in mm	Thread size	Series L		Series L1		Series L2	
		Wall thickness in mm	Square ends in kg/m	Wall thickness in mm	Square ends in kg/m	Wall thickness in mm	Square ends in kg/m
13,5	1/4"	2,0	0,567	2,0	0,570	1,8	0,515
17,2	3/8"	2,0	0,750	2,0	0,742	1,8	0,670
21,3	1/2"	2,3	1,08	2,3	1,08	2,0	0,947
26,9	3/4"	2,3	1,40	2,3	1,39	2,3	1,38
33,7	1"	2,9	2,20	2,9	2,20	2,6	1,98
42,4	1 1/4"	2,9	2,82	2,9	2,82	2,6	2,54
48,3	1 1/2"	2,9	3,25	2,9	3,24	2,9	3,23
60,3	2"	3,2	4,51	3,2	4,49	2,9	4,08
76,1	2 1/2"	3,2	5,75	3,2	5,73	3,2	5,71
88,9	3"	3,2	6,76	3,6	7,55	3,2	6,72
101,3	3 1/2"	3,6	8,70				
114,3	4"	3,6	9,83	4,0	10,80	3,6	9,75
139,7	5"	4,5	15,00				
165,1	6"	4,5	17,80				

Basic: Uncoated pipe with square ends.

# Steel pipes ASME B 36.10/36.19

## Dimensions and weights

Nominal Pipe Size			Wall thickness / Schedule in mm Weights in kg/m																		
			ASME B 36.10 <sup>1)</sup>													ASME B 36.19					
NPS	Ø	DN	S5	S10	S20	S30	STD	S40	S60	XS	S80	S100	S120	S140	S160	XXS	5S	10S	40S	80S	
1/8"	10,3			1,24		1,45	1,73			2,41								1,24	1,73	2,41	
				0,28		0,32	0,37		0,47										0,29	0,38	0,48
1/4"	13,7			1,65		1,85	2,24			3,02								1,65	2,24	3,02	
				0,49		0,54	0,63		0,80										0,50	0,64	0,82
3/8"	17,2	10		1,65		1,85	2,31			3,20								1,65	2,31	3,20	
				0,63		0,70	0,84		1,10										0,64	0,86	1,12
1/2"	21,3	15	1,65	2,11		2,41	2,77			3,73					4,78	7,47	1,65	2,11	2,77	3,73	
			0,80	1,00		1,12	1,27		1,62							1,95	2,55	0,82	1,02	1,30	1,65
3/4"	26,7	20	1,65	2,11		2,41	2,87			3,91					5,56	7,82	1,65	2,11	2,87	3,91	
			1,03	1,28		1,44	1,69		2,20							2,90	3,64	1,05	1,31	1,72	2,24
1"	33,4	25	1,65	2,77		2,90	3,38			4,55					6,35	9,09	1,65	2,77	3,38	4,55	
			1,30	2,09		2,18	2,50		3,24							4,24	5,45	1,33	2,13	2,55	3,30
1 1/4"	42,2	32	1,65	2,77		2,97	3,56			4,85					6,35	9,70	1,65	2,77	3,56	4,85	
			1,65	2,70		2,87	3,39		4,47							5,61	7,77	1,68	2,75	3,46	4,56
1 1/2"	48,3	40	1,65	2,77		3,18	3,68			5,08					7,14	10,15	1,65	2,77	3,68	5,08	
			1,91	3,11		3,53	4,05		5,41							7,25	9,56	1,95	3,17	4,13	5,52
2"	60,3	50	1,65	2,77		3,18	3,91			5,54					8,74	11,07	1,65	2,77	3,91	5,54	
			2,40	3,93		4,48	5,44		7,48							11,1	13,4	2,45	4,01	5,55	7,63
2 1/2"	73,0		2,11	3,05		4,78	5,16			7,01					9,53	14,02	2,11	3,05	5,16	7,01	
			3,69	5,26		8,04	8,63		11,4							14,9	20,4	3,76	5,37	8,80	11,6
3"	88,9	80	2,11	3,05		4,78	5,49			7,62					11,13	15,24	2,11	3,05	5,49	7,62	
			4,51	6,45		9,92	11,3		15,3							21,4	27,7	4,60	6,58	11,5	15,6
3 1/2"	101,6		2,11	3,05		4,78	5,74			8,08								2,11	3,05	5,74	8,08
			5,18	7,40		11,4	13,6		18,6										5,28	7,55	13,9
4"	114,3	100	2,11	3,05		4,78	6,02			8,56			11,13		13,49	17,12	2,11	3,05	6,02	8,56	
			5,84	8,36		12,9	16,1		22,3							33,5	41,0	5,96	8,53	16,4	22,7
5"	141,3		2,77	3,40			6,55			9,53			12,70		15,88	19,05	2,77	3,40	6,55	9,53	
			9,47	11,6			21,8		31,0							40,3	49,1	57,4	9,66	11,8	22,2
6"	168,3	150	2,77	3,40			7,11			10,97			14,27		18,26	21,95	2,77	3,40	7,11	10,97	
			11,3	13,8			28,3		42,6							67,6	79,2	11,5	14,1	28,9	43,5
8"	219,1	200	2,77	3,76	6,35	7,04	8,18		10,31	12,70		15,09	18,26	20,62	22,23	23,01	2,77	3,76	8,18	12,70	
			14,8	20,0	33,3	36,8	42,6		53,0	64,6		75,9	90,4	101	108	111	15,1	20,4	43,5	65,9	
10"	273,0	250	3,40	4,19	6,35	7,80	9,27		12,70	15,09	18,26	21,44	25,40	28,58	25,40	3,40	4,19	9,27	12,70		
			22,6	27,8	41,8	51,0	60,3		81,6	96,0	115	133	155	172	155	23,1	28,4	61,5	83,2		
12"	323,8	300	3,96	4,57	6,35	8,38	9,53	10,31	14,27	12,70	17,48	21,44	25,40	28,58	33,32	25,40	3,96	4,57	9,53	12,70	
			31,3	36,0	49,7	65,2	73,9	79,7	109	97,5	132	160	187	208	239	187	31,9	44,6	75,4	99,5	

NPS Nominal Pipe Size  
 Ø Outside diameter in mm  
 DN Diameter Nominal

<sup>1)</sup> All details does apply to carbon steel pipes.  
 All weights from the stainless steel pipes arising from  
 multiplications from values with the factor 1,015.

Nominal Pipe Size			Wall thickness / Schedule in mm Weights in kg/m																	
			ASME B 36.10 <sup>1)</sup>														ASME B 36.19			
			S5	S10	S20	S30	STD	S40	S60	XS	S80	S100	S120	S140	S160	XXS	5S	10S	40S	80S
14"	355,6	350	3,96	6,35	7,92	9,53	11,13	15,09	12,70	19,05	23,83	27,79	31,75	35,71		3,96	4,78	9,53	12,70	
			34,4	54,7	67,9	81,3	94,6	127	107	158	195	225	254	282		35,1	42,2	82,9	109	
16"	406,4	400	4,19	6,35	7,92	9,53	12,70	16,66	12,70	21,44	26,19	30,96	36,53	40,49		4,19	4,78	9,53	12,70	
			41,6	62,6	77,8	93,3		123	160	123	203	246	287	333	365		42,4	48,2	95,2	126
18"	457,2	450	4,19	6,35	7,92	11,13	9,53	14,27	19,05	12,70	23,83	29,36	34,93	39,67	45,24		4,19	4,78	9,53	12,70
			46,8	70,6	87,7	122	105	156	206	139	255	310	364	408	459		47,3	54,4	107	142
20"	508,0	500	4,78	6,35	9,53	12,70	9,53	15,09	20,62	12,70	26,19	32,54	38,10	44,45	50,01		4,78	5,54	9,53	12,70
			59,3	78,6	117	155	117	183	248	155	311	381	441	508	565		60,5	70,3	119	158
22"	558,8	550	4,78	6,35	9,53	12,70	9,53	15,88	22,23	12,70	28,58	34,93	41,28	47,63	53,98		4,78	5,54	9,53	12,70
			65,2	86,5	129	171	129	213	294	171	374	451	527	601	672		66,5	77,4	132	174
24"	609,6	600	5,54	6,35	9,53	14,27	9,53	17,48	24,61	12,70	30,96	38,89	46,02	52,37	59,54		5,54	6,35	9,53	12,70
			82,5	94,5	141	210	141	255	355	187	442	548	640	720	808		84,2	96,4	144	191
26"	660,4	650		7,92	12,70		9,53			12,70										
				127	203		153			203										
28"	711,2	700		7,92	12,70	15,88	9,53			12,70										
				137	219	271	165			219										
30"	762,0	750	6,35	7,92	12,70	15,88	9,53			12,70							6,35	7,92		
			118	147	235	292	177			235							121	150		
32"	812,8	800		7,92	12,70	15,88	9,53	17,48		12,70										
				157	251	312	189	343		251										
34"	863,6	850		7,92	12,70	15,88	9,53	17,48		12,70										
				167	267	332	200	365		267										
36"	914,4	900		7,92	12,70	15,88	9,53	19,05		12,70										
				177	282	352	213	420		282										
38"	965,2	950					9,53			12,70										
							224			298										
40"	1016,0	1000					9,53			12,70										
							236			314										
42"	1066,8	1050					9,53			12,70										
							248			330										
44"	1117,6	1100					9,53			12,70										
							260			346										
46"	1168,4	1150					9,53			12,70										
							272			352										
48"	1219,2	1200					9,53			12,70										
							284			378										

NPS Nominal Pipe Size  
 Ø Outside diameter in mm  
 DN Diameter Nominal

<sup>1)</sup> All details does apply to carbon steel pipes.  
 All weights from the stainless steel pipes arising from  
 multiplications from values with the factor 1,015.

# Pipes in acc. with ASTM / ASME A/SA106

<b>Scope of application</b>	<b>Seamless pipes</b> in non-alloy steel for general applications for service at elevated temperatures
<b>Example order text</b>	Pipe, seamless, ASME B 36.10, ASTM/ASME A/SA106 Grade B, APZ DIN EN 10204/3.1, requirements as per ASME Sec. II Part A, NACE-MR0175/MR0103 8" (219.1) xs (12.70)
<b>Range of dimensions</b>	≤ NPS 30" / 762.0 mm
<b>Materials</b>	Grade A Grade B – comparable to P265GH Grade C
<b>Non destructive electric testing (NDE)</b>	Hydro testing or eddy-current testing

## Tolerances in acc. with ASTM A530

Outside diameter	Permissible variations	Weights	Wall thickness
≤ 48.3 mm	+0.4 / -0.4 mm		
> 48.3 / ≤ 114.3 mm	+0.8 / -0.8 mm		
> 114.3 / ≤ 219.1 mm	+1.6 / -0.8 mm	+10 / -3,5% ≤ 323,8 +10 / -5,0% > 323,8	-12.5%
> 219.1 / ≤ 457.2 mm	+2.4 / -0.8 mm		
> 457.2 / ≤ 660.4 mm	+3.2 / -0.8 mm		
> 660.4 / ≤ 863.6 mm	+4.0 / -0.8 mm		
> 863.6 / ≤ 1219 mm	+4.8 / -0.8 mm		

<b>Lengths</b>	Single Random Length 5 to 7 metres Double Random Length 8 to 12 metres
<b>Welding Ends</b>	NPS ≤ 1 1/2" to be specified by purchaser NPS ≥ 2" / t ≤ XS Bevel 30° / + 5°-0° NPS > 2" / t > XS Plain ends square cut
<b>Surface</b>	Black, hot-dip galvanized, coated, PE-coated
<b>Marking</b>	Manufacturers name as mark, material, A/SA106, test pressure or NDE, dimension and wall thickness, heat number
<b>Dimensions and weights</b>	ASME B 36.10
<b>Mill test report</b>	DIN EN 10204 / 3.1 or 3.2
<b>Additional requirements</b>	ASME Code Section II – Part A NACE standard – MR0175 / MR0103

# Pipes in acc. with ASTM / ASME A/SA333

<b>Scope of application</b>	<b>Seamless and welded pipes</b> in non-alloy steel for pressure purposes for low temperature service
<b>Example order text</b>	Pipe, seamless, ASME B 36.10, ASTM/ASME A/SA333 Grade 6, APZ DIN EN 10204/3.1 1" (33.4) Sched. 160 (6.35)
<b>Range of dimensions</b>	<b>Seamless</b> ≤ NPS 30" / 762.0 mm <b>Welded</b> ≤ NPS 60" / 1,524 mm
<b>Materials (extract)</b>	Grade 3 – comparable to 12Ni14 / 1.5637 Grade 6 – comparable to P265NL / 1.0453
<b>Scope of testing</b>	A333 Grade 3 Impact test at -100 °C / -150 °F A333 Grade 6 Impact test at -45 °C / -50 °F
<b>Non destructive electric testing (NDE)</b>	<b>Seamless pipes</b> Hydro testing or eddy-current testing <b>Welded pipes</b> US-testing of welding seams

## Tolerances in acc. with ASTM A530

Outside diameter	Permissible variations	Weights (only seamless)	Wall thickness
≤ 48.3 mm	+0.4 / -0.8 mm		
> 48.3 / ≤ 114.3 mm	+0.8 / -0.8 mm		
> 114.3 / ≤ 219.1 mm	+1.6 / -0.8 mm		
> 219.1 / ≤ 457.2 mm	+2.4 / -0.8 mm	≤ 323.8 +10 / -3.5%	-12.5%
> 457.2 / ≤ 660.4 mm	+3.2 / -0.8 mm	> 323.8 +10 / -5.0%	
> 660.4 / ≤ 863.6 mm	+4.0 / -0.8 mm		
> 863.6 / ≤ 1219 mm	+4.8 / -0.8 mm		

<b>Lengths</b>	Single Random Length 5 to 7 metres Double Random Length 8 to 12 metres
<b>Welding Ends</b>	to be specified by purchaser. Otherwise the pipes shall be delivered with plain ends (see ASTM A999).
<b>Surface</b>	Black, hot-dip galvanized, coated, PE-coated
<b>Marking</b>	Manufacturers name as mark, material, A/SA333, dimension and wall thickness, heat number
<b>Dimensions and weights</b>	ASME B 36.10
<b>Mill test reports</b>	DIN EN 10204 / 3.1 or 3.2
<b>Additional requirements</b>	ASME Code Section II – Part A NACE standard – MR0175 / MR0103



# Pipes in acc. with ASTM / ASME A/SA335

<b>Scope of application</b>	<b>Seamless pipes</b> in alloy steel for pressure purposes for high temperature service																									
<b>Example order text</b>	Pipe, seamless, ASME B 36.10, ASTM/ASME A/SA335 Grade P11, APZ DIN EN 10204/3.1, requirements as per ASME Sec. II Part A, NACE-MR0175/MR0103 6" (168.3) Std (7.1)																									
<b>Range of dimensions</b>	≤ NPS 30" / 762.0 mm																									
<b>Materials (extract)</b>	Grade P5 – comparable to 12CrMo195 / 1.7362 Grade P11 – comparable to 13CrMo4-5 / 1.7335 Grade P22 – comparable to 10CrMo9-10 / 1.7380 Grade P91 – comparable to X10CrMoVNb9-1 / 1.4903																									
<b>Non destructive electric testing (NDE)</b>	Hydro testing or eddy-current testing																									
<b>Tolerances in acc. with ASTM A530</b>	<table border="1"> <thead> <tr> <th>Outside diameter</th> <th>Permissible variations</th> <th>Weights (only seamless)</th> <th>Wall thickness</th> </tr> </thead> <tbody> <tr> <td>≤ 48.3 mm</td> <td>+0.4 / -0.4 mm</td> <td></td> <td></td> </tr> <tr> <td>&gt; 48.3 / ≤ 114.3 mm</td> <td>+0.8 / -0.8 mm</td> <td rowspan="2">≤ 323.8 +10 / -3.5 % &gt; 323.8 +10 / -5.0 %</td> <td>≤ 73,0 mm +20,0 / -12,5 %</td> </tr> <tr> <td>&gt; 114.3 / ≤ 219.1 mm</td> <td>+1.6 / -0.8 mm</td> <td>&gt; 73,0-t/D ≤ 5 % +22,5 / -12,5 %</td> </tr> <tr> <td>&gt; 219.1 / ≤ 323.8 mm</td> <td>+2.4 / -0.8 mm</td> <td></td> <td>&gt; 73,0-t/D &gt; 5 % +15,0 / -12,5 %</td> </tr> <tr> <td>&gt; 323.8 mm</td> <td>+1.0 / -1.0 %</td> <td></td> <td></td> </tr> </tbody> </table>			Outside diameter	Permissible variations	Weights (only seamless)	Wall thickness	≤ 48.3 mm	+0.4 / -0.4 mm			> 48.3 / ≤ 114.3 mm	+0.8 / -0.8 mm	≤ 323.8 +10 / -3.5 % > 323.8 +10 / -5.0 %	≤ 73,0 mm +20,0 / -12,5 %	> 114.3 / ≤ 219.1 mm	+1.6 / -0.8 mm	> 73,0-t/D ≤ 5 % +22,5 / -12,5 %	> 219.1 / ≤ 323.8 mm	+2.4 / -0.8 mm		> 73,0-t/D > 5 % +15,0 / -12,5 %	> 323.8 mm	+1.0 / -1.0 %		
Outside diameter	Permissible variations	Weights (only seamless)	Wall thickness																							
≤ 48.3 mm	+0.4 / -0.4 mm																									
> 48.3 / ≤ 114.3 mm	+0.8 / -0.8 mm	≤ 323.8 +10 / -3.5 % > 323.8 +10 / -5.0 %	≤ 73,0 mm +20,0 / -12,5 %																							
> 114.3 / ≤ 219.1 mm	+1.6 / -0.8 mm		> 73,0-t/D ≤ 5 % +22,5 / -12,5 %																							
> 219.1 / ≤ 323.8 mm	+2.4 / -0.8 mm		> 73,0-t/D > 5 % +15,0 / -12,5 %																							
> 323.8 mm	+1.0 / -1.0 %																									
<b>Lengths</b>	Single Random Length	5 to 7 metres																								
	Double Random Length	8 to 12 metres																								
<b>Welding Ends</b>	To be specified by purchaser. Otherwise the pipes shall be furnished with plain ends (see ASTM A999).																									
<b>Surface</b>	Black, hot-dip galvanised, coated, PE-coated																									
<b>Marking</b>	Manufacturers name as mark, material, A/SA335, test pressure or NDE, dimensions and wall thickness, heat number																									
<b>Dimensions and weights</b>	ASME B 36.10																									
<b>Mill test reports</b>	DIN EN 10204 / 3.1 or 3.2																									
<b>Additional requirements</b>	ASME Code Section II – Part A NACE standard – MR0175 / MR0103																									

# Pipes in acc. with ASTM / ASME A/SA312

<b>Scope of application</b>	For use in the construction of steam boilers and pressure vessels with application of the ASME Codes Section II – Part A
<b>Example order text</b>	<p>Pipe, <b>seamless</b>, ASME B 36.10 / 36.19, ASTM / ASME A/SA312, Grade TP316L, APZ DIN EN 10204 / 3.1, requirements as per ASME Sec. II – Part A, NACE-MR0175/MR0103 4" (114.3) S40S (6.02)</p> <p>Pipe, <b>welded</b>, ASME B 36.10 / 36.19, ASTM/ASME A/SA312, Grade TP316L, APZ DIN EN 10204 / 3.1, requirements as per ASME Sec. II – Part A, NACE-MR0175 / MR0103 4" (114.3) S40S (6.02)</p>
<b>Manufacturing process</b>	<p><b>SML</b> Seamless</p> <p><b>WLD</b> Welded from coil, without filler material</p> <p><b>HCW</b> Heavily Cold-worked</p>

Designation ASTM A/SA312	UNS	Comparable to DIN EN
TP 304 / 304L	S30400 / 30403	1.4301 / 1.4307
TP 304H	S30409	
TP 304N	S30451	
TP 304LN	S30453	
TP 321	S32100	1.4541
TP 316 / 316L	S31600 / 31603	1.4401 / 1.4404
TP 316H	S31609	
TP 316N	S31651	
TP 316LN	S31653	
	S31635	1.4571

<b>Specifications</b>	ASME Code Section II – Part A
<b>Scope of testing as per NACE</b>	<p><b>MR 0175</b> Chlorine-induced stress corrosion cracking</p> <p><b>MR 0103</b> Hydrogen-induced stress corrosion cracking</p>
<b>Non destructive electric testing (NDE)</b>	<p><b>NH</b> Hydro Testing</p> <p><b>ET</b> Eddy-Current Testing</p> <p><b>UT</b> Ultrasonic Testing</p>
<b>Dimensions and weights</b>	<p><b>ASME B 36.10</b> S10 to XXS</p> <p><b>ASME B 36.19</b> S5S / S10S / S40S / S80S</p>

Outside diameter	Permissible deviations	Wall thickness
½" ≤ 1½"	+0.4 / -0.8 mm	-12.5 %
> 1½" ≤ 4"	+0.8 / -0.8 mm	
> 4" ≤ 8"	+1.6 / -0.8 mm	
> 8" ≤ 18"	+2.4 / -0.8 mm	
> 18" ≤ 26"	+3.2 / -0.8 mm	
> 26" ≤ 30"	+4.0 / -0.8 mm	

<b>Mill test reports</b>	DIN EN 10204/3.1 or 3.2
<b>Marking</b>	Manufacturers name as mark, material, A/SA312, dimensions, wall thickness, NDE, manufacturing method, heat number





Kein Zutritt  
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B<sub>2</sub>

C<sub>1</sub>

C<sub>2</sub>

D<sub>1</sub>





### **Well-equipped**

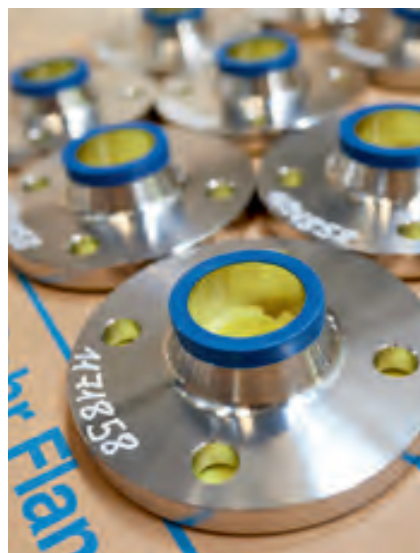
The central warehouse for fittings in Stuhr/Bremen offers space for 8,000 tonnes of flanges, pipe fittings and equipment. This allows us to offer best-possible availability and a high standard of supply service.





# Flanges – qualified

The extensive warehouse and delivery programme for flanges according to DIN, EN and ASME ensures optimal availability. Benefit of our diverse possibilities.





# Steel flanges acc. to DIN EN 1092-1

The European standard for flanges DIN EN 1092-1 was developed under the auspices of the European standardisation body CEN and its 30 national member organisations.

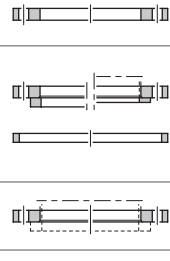
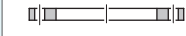

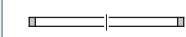
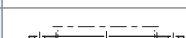



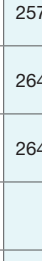




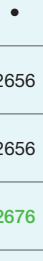

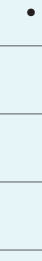
The standardisation committee of 30 member organisations – for Germany the German Institute for Standardisation (DIN); for Austria, Austrian Standards Institute (ÖNORM); for France, the AFNOR Group; for England, the British Standards Institution (BSI) and others – influenced the European standard EN 1092-1 as defined by their national standards. Therefore it is a compromise amongst all the participating member organisations.

Listed below are the major changes to the standard DIN EN 1092-1 with respect to the standard for flanges according to DIN.

1. The flange connection sizes such as the outside diameter, the bolt circle, number of screws and diameter of the screw holes correspond to DIN 2500 etc.
2. For all PN 16 flanges, the DN 10 to DN 40 dimensions do not apply. PN 40 flanges apply for these dimensions.
3. The facing type designations have been changed (see page 35).
4. The type A facing (without requirements) according to DIN 2526 has been dispensed with. According to DIN EN 1092-1, all facing surfaces must be machined.
5. For flanges PN 16 DN 65, the number of bolt holes is 8. At the customer's request, 4-hole flanges can also be supplied.
6. Welding neck flanges type 11 PN 100 have been expanded to the sizes of DN 20 and DN 32.
7. The pipe connection dimensions from DN 1200 have been changed, e.g. ISO = 1220, = EN 1219, ISO = 1420, EN = 1422
8. DIN EN 1092-1 henceforth contains additional materials. These are divided into separate material groups.
9. For each category of material, there is a pressure-temperature correlation.
10. The structural dimensions of the grooves or tongues acc. to DIN EN 1092-1 are designed lower or higher than acc. to DIN 2512, 1975 edition.
11. For flanges with groove-groove connections, sealing rings of steel washers were incorporated.
12. Further manufacturing methods have been accredited (e.g. cast).
13. Welding conditions and tests are described.
14. Manufacturers of flanges acc. to DIN EN 1092-1 must be accredited acc. to the PED (Pressure Equipment Directive) to issue an acceptance test certificate acc. to EN 10204:2005 3.1 or 3.2.
15. Tolerances are specified in more detail in DIN EN 1092-1.
16. Marking changes so that only the nominal size, e.g. DN 50, needs to be stamped, since there is only one ISO pipe connection acc. to DIN EN 1092-1.
17. Further supplementary notes on DIN EN 1092-1 can be found on page 47 of this catalogue, under the block of respective flange types.
18. The material according to DIN EN 1092-1, issue 12-2018 is now, in addition to P245GH, also P250GH. Annex D (informative) of DIN EN 1092-1 now lists, in table D.1 (additional materials) the material C22.8/1.0460 according to VdTÜV 350/3.

In collaboration with Beuth-Verlag, the trade union *Stahlflansche e.V.* in Dusseldorf has published a catalogue of flanges acc. to DIN EN 1092-1 under the title *Deutscher Flanschenkatalog, Europäische Norm*, ("German flange catalogue, European Standard). This can be purchased via rff Rohr Flansch Fitting Handels GmbH, Postfach 1365, 28803 Stuhr, Communication/Media, marketing@rff.de.

**Flange types acc. to DIN EN 1092-1** with stating of the comparable DIN norms for the respective nominal pressure levels acc. to DIN EN 1092-1 (marked with a black dot)

Designation			PN EN Type	2.5	6	10	16	25	40	63	100	160	250	320	400
Flat Flanges	Flat Flanges for welding		01	•	2573	2576	•	•	•	•	•				
	Loose Flanges Flat Collars <sup>1)</sup> see also type 37		02	•	2641	2642	•	2655	2656						
			32	•	2641	2642	•	2655	2656						
	Loose Flanges fit type 34		04			2673	2674	2675	2676						
Blind Flanges		05	•	2527	2527	2527	2527	2527	2527	2527	•	•	•	•	
Neck Flanges	Weld-Neck Flanges		11	2630	2631	2632	2633	2634	2635	2636	2637	2638	2628	2629	2627
	Weld-Neck Collars <sup>2)</sup> fit type 04		34			2673	2674	2675	2676						
	Slip-on Flanges		12		•	86029	86030	•	•	•	•				
	Threaded Flanges		13		2565	•	2566	•	2567	2568	2569				
Collars and flanging	Flat Collars fit type 02		32	•	2641	2642	•	2655	2656						
	Pipe Ends, flanged fit type 02		33	•	•	•	•								
	Weld-Neck Collars fit type 04		34			2673	2674	2675	2676						
	Weld-Neck Rings fit type 02		35	•	•	•	•	•	•						
	Pressed Collars, long fit type 02		36	•	•	•	•								
	Pressed Collars fit type 02		37	•	2641	2642	•								

<sup>1)</sup> and <sup>2)</sup> also see under Collars and Flanging

**Supplementary notes on DIN EN 1092-1**

The following DIN standards are not included in DIN EN 1092-1 and, if needed, can be ordered acc. to the relevant DIN standards:

- Oval threaded flanges DIN 2558.
- Flange joints for vessels and process apparatus DIN 28030, 28031, 28032, 28034, 28036 and DIN 28038 as well as DIN 86041, DIN 86044 and DIN 28117.
- Flanges with chamfering for membrane seal welds acc. to DIN 2695 and flanges with groove for lens gasket acc. to DIN 2696.
- Slip-on flanges are available as type 12, PN 10 and PN 16 acc. to DIN EN 1092-1, or also acc. to DIN 86029/86030.
- In DIN EN 1092-1, EN standard sheets are shown in the respective flange types and respective nominal pressures. They conform to DIN standards, but have been withdrawn again from the DIN-standards. These withdrawn DIN standards are marked **green** in the table.
- Flanges with DIN pipe connection dimensions, such as DN 15/20, DN 25/30, DN 50/57, DN 100/108, can be delivered only acc. to DIN standards, because in all types and pressure ratings acc. to DIN EN 1092-1 only ISO pipe connection dimensions were recorded.
- Flanges for automated welding processes (machine welding flanges) are dimensioned acc. to PAS 1057-6 due to the tight tolerances.

# Materials for DIN flanges

DIN 2528 – Extract

Steel grades – Short name	Material number	Application temperature °C	Base material <sup>1)</sup>				Condi- tion of delivery <sup>2)</sup>	Chemical composition	Mechanical- technological properties	Test temperature
			1	2	3	4				
<b>Non-alloy steels</b>										
USt 37-2	1.0036	-10 to 300	•	•	•	•	U	DIN EN 10 025	DIN EN 10 025	Room temperature
RSt 37-2	1.0038	-10 to 300	•	•	•	•	U	DIN EN 10 025	DIN EN 10 025	Room temperature
St 52-3	1.0570	-20 to 300	•	•	•	•	N	DIN EN 10 025	DIN EN 10 025	-20° C
C 22.3	1.0427	-10 to 50	•	•	•	•	N	Table 3	Table 4	Room temperature
C 21	1.0432	-10 to 350	•	•	•	•	N	Table 3	Table 4	Room temperature
StE 355	1.0562	-20 to 300			•	•	N.V	DIN 17 103	DIN 17 103	-20° C
StE 355	1.0562	-20 to 300	•	•			N	DIN 17 102	DIN 17 102	-20° C
<b>Non-alloy heat-resistant steels</b>										
C 22.8	1.0460	-10 to 420	•	•	•	•	N	DIN 17 243	Table 4	Room temperature
H I	1.0345	-10 to 480	•				N	DIN 17 155	DIN 17 155	0° C
H II	1.0425	-10 to 480	•				N	DIN 17 155	DIN 17 155	0° C
WStE 355	1.0565	-20 to 400			•	•	N	DIN 17 103	DIN 17 103	-20° C
WStE 355	1.0565	-20 to 400	•	•			N	DIN 17 102	DIN 17 102	-20° C
<b>Alloyed heat-resistant steels</b>										
15 Mo 3	1.5415	-10 to 530	•				N	DIN 17 155	Table 4	Room temperature
15 Mo 3	1.5415	-10 to 530		•	•	•	N.V	DIN 17 243	Table 4	Room temperature
13 CrMo 4 4	1.7335	-10 to 570	•				V	DIN 17 155	Table 4	Room temperature
13 CrMo 4 4	1.7335	-10 to 570		•	•	•	V	DIN 17 243	Table 4	Room temperature
10 CrMo 9 10	1.7380	-10 to 600	•				V	DIN 17 155	Table 4	Room temperature
10 CrMo 9 10	1.7380	-10 to 600		•	•	•	V	DIN 17 243	Table 4	Room temperature
12 CrMo 19 5	1.7362	-10 to 650	•	•	•	•	V	Table 3	Table 4 and 6	Room temperature
<b>Low temperature steels</b>										
TStE 285	1.0488	-60 to 300			•	•	N.V	DIN 17 103	DIN 17 103	-50° C
TStE 285	1.0488	-60 to 300	•	•			N	DIN 17 102	DIN 17 102	-50° C
10 Ni 14	1.5637	-120 to 50	•	•	•	•	V	DIN 17 280	DIN 17 280	-120° C
TStE 355	1.0566	-60 to 300			•	•	N.V	DIN 17 103	DIN 17 103	-50° C
TStE 355	1.0566	-60 to 300	•	•			N	DIN 17 102	DIN 17 102	-50° C
<b>Stainless steels</b>										
X 2 CrNi 19 11	1.4306	-270 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature
X 5 CrNi 18 10	1.4301	-200 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature
X 6 CrNiTi 18 10	1.4541	-270 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature
X 2 CrNiMo 17 13 2	1.4404	-200 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature
X 5 CrNiMo 17 12 2	1.4401	-200 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature
X 6 CrNiMoTi 17 12 2	1.4571	-270 to 550	•	•	•	•	A	DIN 17 440	DIN 17 440	Room temperature

<sup>1)</sup> 1 Plate metal 2 Bar steel 3 Forging 4 Seamless rolled flange

<sup>2)</sup> U Untreated N Normalised V Tempered A Solution-annealed and quenched

# Materials for flanges DIN EN 1092-1

Table 9 – Extract

Group	Forgings			Flat products		
	Material	Material number	Standard DIN EN	Material	Material number	Standard DIN EN
2E0						
3E0	P250GH	1.0460	10222-2	P235GH	1.0345	10028-2
	P245GH	1.0352	10222-2	P265GH	1.0425	10028-2
3E1	P280GH	1.0426	10222-2	P295GH	1.0481	10028-2
4E0	16Mo3	1.5415	10222-2	16Mo3	1.5415	10028-2
5E0	13CrMo4-5	1.7335	10222-2	13CrMo4-5	1.7335	10028-2
6E0	11CrMo9-10	1.7383	10222-2	12CrMo9-10	1.7375	10028-2
				10CrMo9-10	1.7380	10028-2
6E1	X16CrMo5-1+NT	1.7366	10222-2			
7E0				P275NL1	1.0488	10028-3
				P275NL2	1.1104	10028-3
7E1				P355NL1	1.0566	10028-3
				P355NL2	1.1106	10028-3
7E2	15NiMn6	1.6228	10222-3	15NiMn6	1.6228	10028-4
				11MnNi5-3	1.6212	10028-4
7E3	13MnNi6-3	1.6217	10222-3	13MnNi6-3	1.6217	10028-4
	12Ni14	1.5637	10222-3	12Ni14	1.5637	10028-4
	X12Ni5	1.5680	10222-3	X12Ni5	1.5680	10028-4
8E0	X8Ni9	1.5662	10222-3	X8Ni9	1.5662	10028-4
8E2	P285NH	1.0477	10222-4	P275NH	1.0487	10028-3
	P285QH	1.0478	10222-4			
8E3	P355NH	1.0565	10222-4	P355N	1.0562	10028-3
	P355QH1	1.0571	10222-4			
9E0	X20CrMoV11-1	1.4922	10222-2			
9E1	X10CrMoVNb9-1	1.4903	10222-2	X10CrMoVNb9-1	1.4903	10028-2
10E0	X2CrNi18-9	1.4307	10222-5	X2CrNi18-9	1.4307	10028-7
				X2CrNi19-11	1.4306	10028-7
				X1CrNi25-21	1.4335	10028-7
10E1	X2CrNi18-10	1.4311	10222-5	X2CrNi18-10	1.4311	10028-7
11E0	X5CrNi18-10	1.4301	10222-5	X5CrNi18-10	1.4301	10028-7
	X6CrNi18-10	1.4948	10222-5	X6CrNi18-10	1.4948	10028-7
12E0	X6CrNiTi18-10	1.4541	10222-5	X6CrNiTi18-10	1.4541	10028-7
	X6CrNiNb18-10	1.4550	10222-5	X6CrNiNb18-10	1.4550	10028-7
	X6CrNiTiB18-10	1.4941	10222-5	X6CrNiTiB18-10	1.4941	10028-7
13E0	X2CrNiMo17-12-2	1.4404	10222-5	X2CrNiMo17-12-2	1.4404	10028-7
	X2CrNiMo17-12-3	1.4432	10222-5	X2CrNiMo17-12-3	1.4432	10028-7
	X2CrNiMo18-14-3	1.4435	10222-5	X2CrNiMo18-14-3	1.4435	10028-7
	X1NiCrMoCu25-20-5	1.4539	10222-5	X1NiCrMoCu25-20-5	1.4539	10028-7
13E1				X1NiCrMoCu31-27-4	1.4563	10028-7
	X2CrNiMoN17-11-2	1.4406	10222-5	X2CrNiMoN17-11-2	1.4406	10028-7
	X2CrNiMoN17-13-3	1.4429	10222-5	X2CrNiMoN17-13-3	1.4429	10028-7
				X2CrNiMoN17-13-5	1.4439	10028-7
				X1NiCrMoCuN25-20-7	1.4529	10028-7
14E0	X1CrNiMoCuN20-18-7			X1CrNiMoCuN20-18-7	1.4547	10028-7
	X5CrNiMo17-12-2	1.4401	10222-5	X5CrNiMo17-12-2	1.4401	10028-7
15E0	X3CrNiMo17-13-3	1.4436	10222-5	X3CrNiMo17-13-3	1.4436	10028-7
	X6CrNiMoTi17-12-2	1.4571	10222-5	X6CrNiMoTi17-12-2	1.4571	10028-7
16E0				X6CrNiMoNb17-12-2	1.4580	10028-7
				X2CrNiN23-4	1.4362	10028-7
	X2CrNiMoN22-5-3	1.4462	10222-5	X2CrNiMoN22-5-3	1.4462	10028-7
	X2CrNiMoN25-7-4	1.4410	10222-5	X2CrNiMoN25-7-4	1.4410	10028-7

# Additional materials DIN EN 1092-1

Table D.1 – Extract

Table D.1 lists, in addition to Table 9, materials which are widely in use, but which are not listed in EN standards. These materials do not have any presumption of conformity if used in pressure equipment under jurisdiction of Directive 97/23/EC (Pressure Equipment Directive).

These materials may be used in pressure equipment according to article 3.3 of the PED (sound engineering practice) or in applications that are not covered by the PED. If they are used in pressure equipment according to categories I to IV

according to the PED, they shall have either a

- European Approval of Material (EAM), or
- be covered by a Particular Material Appraisal (PMA).

PMA shall be made by the pressure equipment manufacturer and in categories III and IV it shall have appraisal of the notified body that is responsible for the conformity assessment of the equipment. In the PMA it shall be proved, that the material fulfils the essential safety requirements of the PED.

Specification, grade, symbol and material number <sup>1)</sup>						
Material group <sup>2)</sup>	Castings <sup>3)</sup> Seamless pipes <sup>3)</sup> Welded pipes <sup>3) 4)</sup>		Forgings <sup>3) 5)</sup>		Flat steel products <sup>3) 5)</sup>	
	Standard	Material number	Standard	Material number	Standard	Material number
1E0	DIN 1681	GS-38	VdTÜV 399/3 <sup>6)</sup>	C 21/1.0432	VdTÜV 399/1 <sup>6)</sup>	C 21/1.0432
1E1			EN 10025-2 <sup>8)</sup>	S235JR/1.0038	EN 10025-2	S235JR/1.0038
3E0			VdTÜV 350/3 <sup>6)</sup>	C 22.8/1.0460	VdTÜV 350/1 <sup>6)</sup>	C 22.8/1.0460
7E0			DIN 17103 <sup>7)</sup>	TSTE 285/1.0488	DIN 17102 <sup>7)</sup>	TSTE 285/1.0488
7E1	DIN 17245	GS-10 Ni 19	DIN 17103 <sup>7)</sup>	TSTE 355/1.0566	DIN 17102 <sup>7)</sup>	TSTE 355/1.0566
			DIN 17103 <sup>7)</sup>	TSTE 420/1.8912	DIN 17102 <sup>7)</sup>	TSTE 420/1.8912
1E0	ASME SA 106	B				
3E0			ASME SA 105			
3E1	ASME SA 216	WCB			ASME SA 515	70
	ASME SA 216	WCC			ASME SA 516	70
	ASME SA 333	6			ASME SA 537	CL 1
4E0	ASME SA 217	WC 1	ASME SA 182	F 1	ASME SA 204	A
	ASME SA 217	WC 1	ASME SA 182	F 1	ASME SA 204	B
5E0	ASME SA 217	WC 6	ASME SA 182	F 11, CI 1, 2 and CI 3	ASME SA 387	11
	ASME SA 217	C 5	ASME SA 182	F 11, CI 1, 2 and CI 3	ASME SA 387	11
	ASME SA 335	P 12	ASME SA 182	F 12, CI 1 and 2	ASME SA 387	12
6E0	ASME SA 217	C 12	ASME SA 182	F 5	ASME SA 387	5
	ASME SA 335	P 5, P 9	ASME SA 182	F 9	ASME SA 387	9
	ASME SA 335	P 22	ASME SA 182	F 22, CI 1 and 3	ASME SA 387	22
7E3	ASME SA 352	LC 2, LC 3, LC 8	ASME SA 350	LF 3	ASME SA 203	A
	ASME SA 352	LC 2, LC 3, LC 8	ASME SA 350	LF 3	ASME SA 203	E
8E2			ASME SA 350	LF 2 CI 1 / CI 2		
10E0	ASME SA 351	CF 8	ASME SA 182	F304	ASME SA 240	304
	ASME SA 312	TP304L	ASME SA 182	F304	ASME SA 240	304
	ASME SA 312	TP304	ASME SA 182	F304L	ASME SA 240	304L
	ASME SA 312	TP304H	ASME SA 182	F304H	ASME SA 240	304H
12E0	ASME SA 312	TP321	ASME SA 182	F321, F321H	ASME SA 240	
	ASME SA 312	TP321H	ASME SA 182	F321, F321H	ASME SA 240	
14E0	ASME SA 351	CF 8 M	ASME SA 182	F316	ASME SA 240	316
	ASME SA 312	TP316	ASME SA 182	F316	ASME SA 240	316
	ASME SA 312	TP316L	ASME SA 182	F316L	ASME SA 240	316L
	ASME SA 312	TP316H	ASME SA 182	F316H	ASME SA 240	316H
15E0					ASME SA 240	316Ti
16E0			ASME SA 182	F51		

<sup>1)</sup> Material for bars in all Groups are identical with the material for forgings, ASME Materials see additionally. <sup>b)</sup>

<sup>2)</sup> The specification of ASME Materials may not be equivalent in all details to the material groups and therefore may not be equally for all applications.

<sup>3)</sup> Starting material for the manufacture of flanges. The properties of the resulting flanges may differ from starting material and require to be taken into consideration, so that the resulting flange has adequate properties.

<sup>4)</sup> Base material see flat steel products.

<sup>5)</sup> Impact properties for RT or low temperature service and guaranteed elevated temperature properties for high temperature service have to be considered.

<sup>6)</sup> Material Data Sheet by VdTÜV.

<sup>7)</sup> This DIN-materials are listed in particular upon the EN 10222-4 has been revised and provide the corresponding NL-Grades.

<sup>8)</sup> Use as forging with the requirements for chemical and mechanical properties of EN 10025-2, hot-rolled structural steel.

# Facings acc. to DIN EN 1092-1 in comparison to DIN 2526

**Facings acc. to DIN EN 1092-1** The mechanical process “turning” includes all machining processes that create either spiral or concentric grooves. The radius of the round steel chisel drill for types A, B1, E, and F should be at least 1 mm.

Flange	Designation acc. to DIN 2526			acc. to DIN EN 1092-1			Drawing
	Standard	Note	Facing	Facing	Ra in $\mu\text{m}^{4)}$	Rz in $\mu\text{m}^{5)}$	
Flat face	DIN 2641 / 2642 DIN 2655 / 2656 DIN 2673	No requirements	type A	type A	3,2–12,5	12,5–50	
	DIN 2527 ≤ PN 40 DIN 2573 / 2576	Rz = 160, turned <sup>1)</sup>	type B				
Raised face	DIN 2630 to DIN 2635	Rz = 160, turned <sup>1)</sup> Rz = 40, turned	type C type D	type B1 <sup>2)</sup>	3,2–12,5	12,5–50	
	from DIN 2636 DIN 2527 ≥ PN 63	Rz = 16, turned	type E	type B2 <sup>3)</sup>	0,8–3,2	3,2–12,5	
Tongue	DIN 2512	PN 10 to PN 160	type F	type C	0,8–3,2	3,2–12,5	
Groove	DIN 2512	PN 10 to PN 160	type N	type D	0,8–3,2	3,2–12,5	
Male	DIN 2513	PN 10 to PN 100	type V13	type E	3,2–12,5	12,5–50	
Female	DIN 2513	PN 10 to PN 100	type R13	type F	3,2–12,5	12,5–50	
O-Ring	DIN 2514	PN 10 to PN 40	type R14	type G	0,8–3,2	3,2–12,5	
O-Ring groove	DIN 2514	PN 10 to PN 40	type V14	type H	0,8–3,2	3,2–12,5	
Counter bore for ovale seal	DIN 2696	PN 63 to PN 400	type L				
Bevel for diaphragm welding seal	DIN 2695	PN 63 to PN 400	type M				

<sup>1)</sup> No finer than 40  $\mu\text{m}$ .

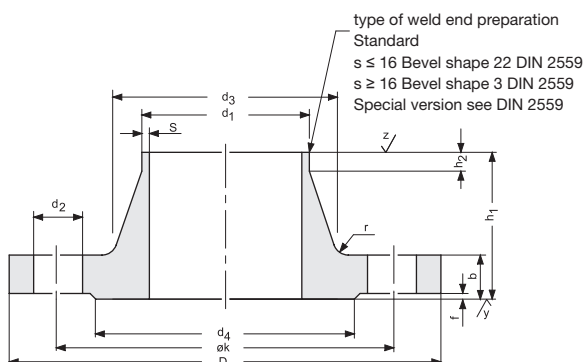
<sup>2)</sup> B1 general applications PN 2,5–PN 40.

<sup>3)</sup> B2 general applications PN 63–PN 400.

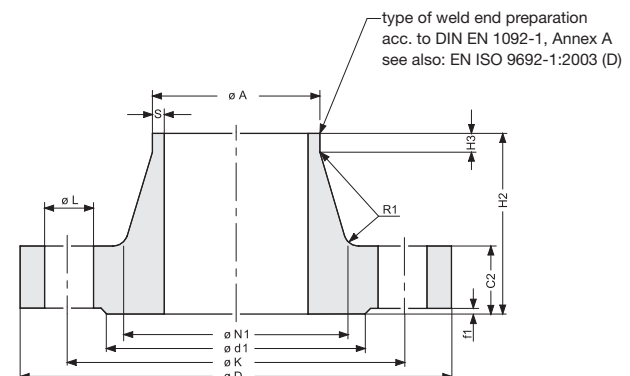
<sup>4)</sup> Ra = arithmetical mean deviation.

<sup>5)</sup> Rz = average surface roughness.

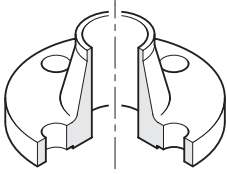
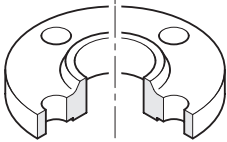
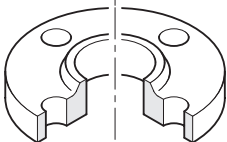
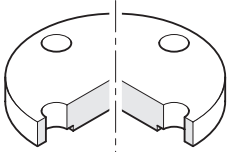
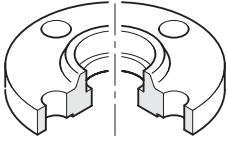
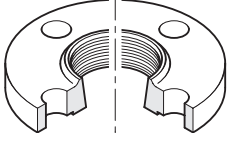
## Measurement acc. to DIN



## Measurement acc. to EN



# Flanges acc. to ASME B 16.5

Flange types	Dimensions																								
	Class	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"				
<b>Weld Neck Flanges</b> 	150 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
	300 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	400 <sup>1)</sup>	Dimension as Class 600										•	•	•	•	•	•	•	•	•	•	•	•		
	600 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	900 <sup>1)</sup>	Dimension as Class 1500								•		•	•	•	•	•	•	•	•	•	•	•	•	•	
	1500	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	2500	•	•	•	•	•	•	•	•		•	•	•	•	•	•									
<b>Slip-on Flanges</b> 	150	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	400	Dimension as Class 600										•	•	•	•	•	•	•	•	•	•	•	•	•	
	600	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	900	Dimension as Class 1500								•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
	1500	•	•	•	•	•	•	•	•																
<b>Lap Joint Flanges</b> 	150	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	400	Dimension as Class 600										•	•	•	•	•	•	•	•	•	•	•	•	•	•
	600	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	900	Dimension as Class 1500								•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
	1500	•	•	•	•	•	•	•	•																
<b>Blind Flanges</b> 	150 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	300 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	400 <sup>1)</sup>	Dimension as Class 600										•	•	•	•	•	•	•	•	•	•	•	•	•	•
	600 <sup>1)</sup>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	900 <sup>1)</sup>	Dimension as Class 1500								•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
	1500	•	•	•	•	•	•	•	•																
<b>Socket Welding Flanges</b> 	150	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	600	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	1500	•	•	•	•	•	•	•	•																
<b>Threaded Flanges</b> 	150	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	400	Dimension as Class 600										•	•	•	•	•	•	•	•	•	•	•	•	•	•
	600	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	900	Dimension as Class 1500								•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
	1500	•	•	•	•	•	•	•	•																
2500	•	•	•	•	•	•	•	•																	

<sup>1)</sup> Dimensions ≥ 26" see ASME B 16.47 Series A and B.



# Pressure ratings, dimensions and facings

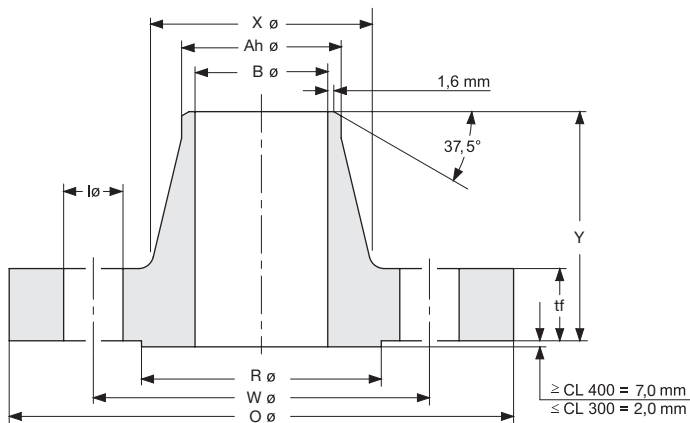
## Nominal pressure comparison Class / bar / psi / API psi

ASME Class	150	300	400	600	900	1500	2500					
bar ~	20	51	68	102	140	210	233	350	422	700	1050	1400
psi ~	285	740	990	1480	2220	3380	5000	6120	10000	15000	20000	
API psi					2000	3000	5000					

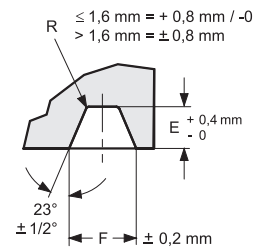
bar Greek barys, hard  
psi Pounds per square inch

Conversion: 1 bar ~ 14,29 psi / 1 psi ~ 0,07 bar

## Dimensions acc. to ASME B 16.5



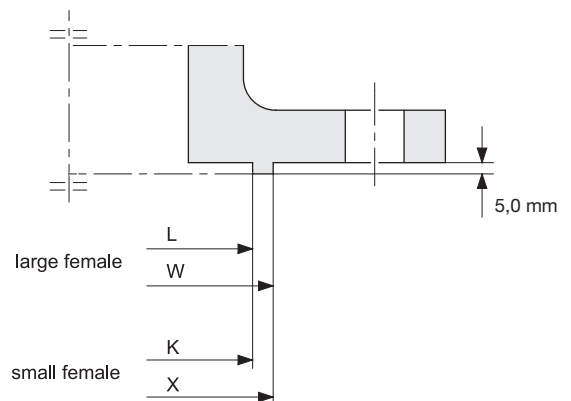
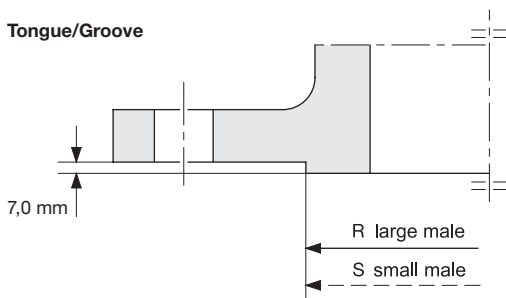
## Ring Type Joint (RTJ)



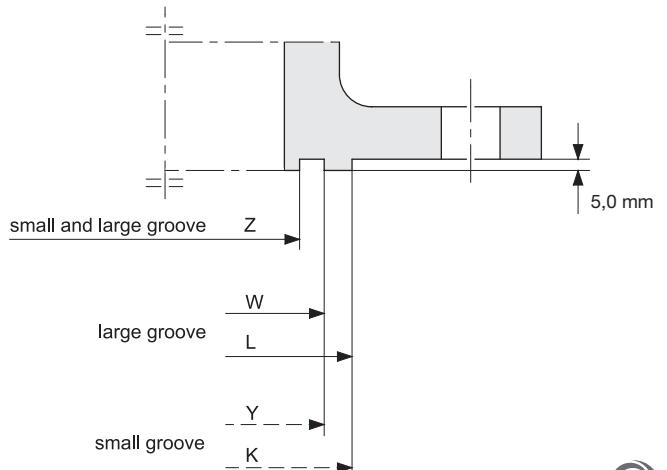
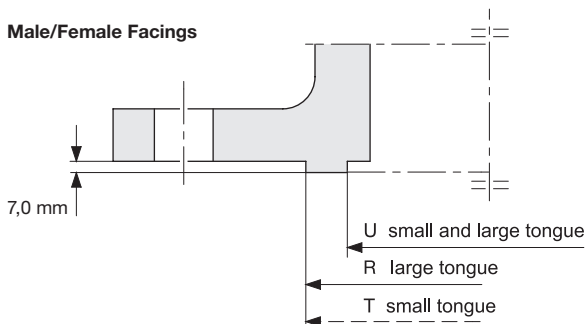
## Facing

The facing is made by mechanical turning, resulting in the following surface conditions:

### Tongue/Groove



### Male/Female Facings







# Pipe Fittings – diverse

We are specialists for elbows, tees and reducers in carbon steel and stainless steel. The rff delivery programme offers a wide range of pipe fittings according to DIN, EN and ASME



# Buttweld Fittings DIN EN 10253

## 1. Brief description and comparison

Buttweld Fittings	
DIN EN 10253-1	Non-alloy steel for general applications and without special test requirements
DIN EN 10253-2	Non-alloy and alloy ferritic steels with special test requirements
DIN EN 10253-3	Wrought austenitic and austenitic-ferritic (duplex) stainless steels without special test requirements
DIN EN 10253-4	Wrought austenitic and austenitic-ferritic (duplex) stainless steels with special test requirements

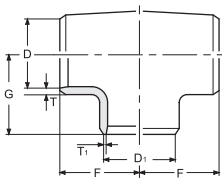
  

Earlier issues	
DIN 2609	Buttwelding fittings – Technical delivery conditions
DIN 2605-1 / -2	Elbows, reduced and full pressure factor
DIN 2615-1 / -2	Tees, reduced and full pressure factor
DIN 2616-1 / -2	Reducers, reduced and full pressure factor
DIN 2617	Caps

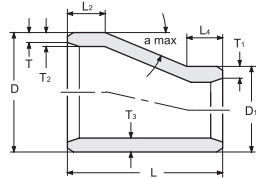
DIN EN 10253 establishes – in addition to the steel grades, mechanical properties, dimensions and tolerances, test requirements, test reports and identification – two types of fittings:

- **Fittings Type A:** Same wall thickness as the subsequent pipe (DIN 2605-1, DIN 2615-1, DIN 2616-1 und DIN 2617).
- **Fittings Type B:** With higher wall thickness of the fitting body are designed for the same internal pressure as for a straight pipe with the same dimensions (DIN 2605-2, DIN 2615-2 und DIN 2616-2).

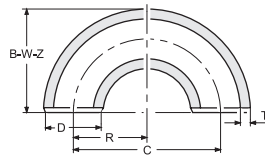
According to the calculation rules of DIN EN 13480-3, there are also, as opposed to DIN, caps of type A and B, in which, at a reduced utilization factor (Type A), the values lie in the range of 94 to 100%, as far as they can be calculated acc. to the standard.



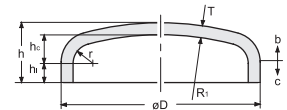
Tees acc. to  
DIN EN 10253 Type A



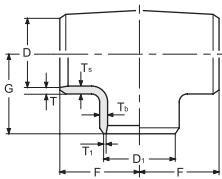
Eccentric reducers acc. to  
DIN EN 10253 Type A/B



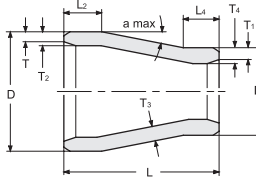
Elbows acc. to  
DIN EN 10253 Type A



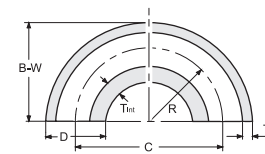
Caps acc. to  
DIN EN 10253



Tees acc. to  
DIN EN 10253 Type B



Concentric reducers acc. to  
DIN EN 10253 Type B



Elbows acc. to  
DIN EN 10253 Type B

## 2. Types of welding ends

Implementation of the ends acc. to DIN EN 10253			Implementation of the ends acc. to DIN 2559		
≤ 3 mm wall thickness	Plain or slightly bevelled ends		DIN 2559-1	≤ 3 mm wall thickness	
> 3 mm to ≤ 22 mm	30° bevel +5 /-0° with a root face of 1,6 mm ± 0,8 mm	∇	DIN 2559-22	> 3 mm to ≤ 16 mm	∇
> 22 mm wall thickness	to be agreed		DIN 2559-3	>16 mm wall thickness	∪

### 3. Comparison of dimension standards and tolerances

Weld end tolerances			
DIN EN 10253-2	DIN EN 10253-4		According to DIN 2609
	Tolerances	Admitted difference <sup>1)</sup>	
± 1% of the theoretical inside diameter or ± 0,5 mm, whichever is greater, but not more than ± 5 mm.  If the tolerance for the <b>outside diameter</b> applies, <b>Option 9</b> must be ordered.	D2	± 1% or 5 mm	± 1% of the theoretical outside diameter (≤ 100 mm d <sub>a</sub> as max. ± 5 mm is allowed.)
	D3	± 0,75% or 0,3 mm <sup>2)</sup>	
	D4	± 0,50% or 0,1 mm <sup>2)</sup>	

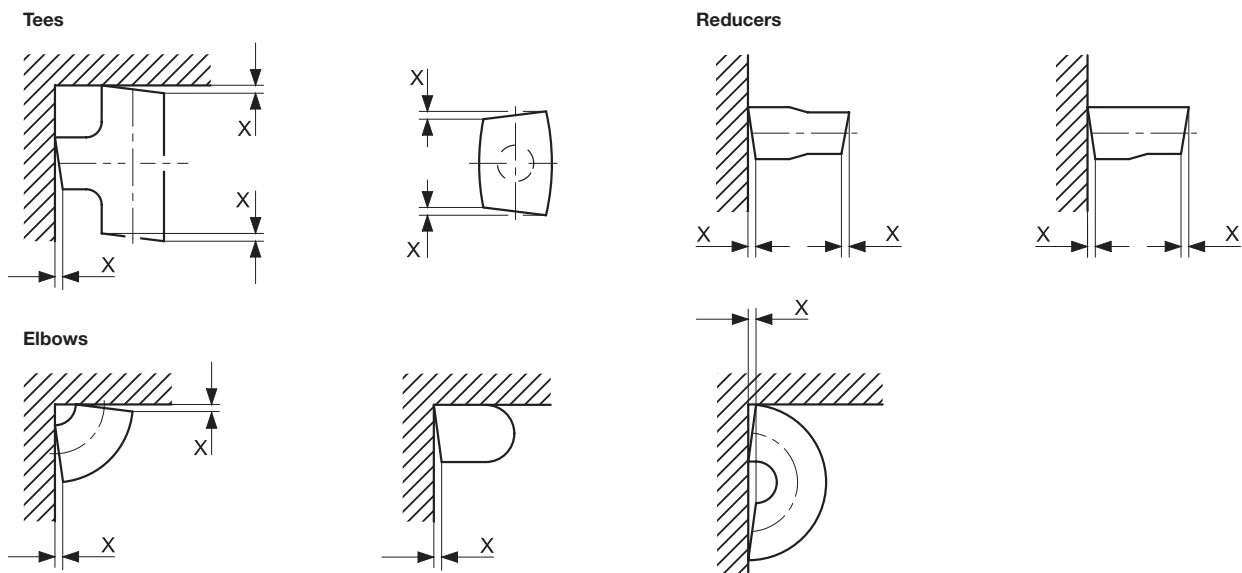
<sup>1)</sup> Acc. to outside diameter: the major value is applicable.

<sup>2)</sup> Option 13: Fittings can be ordered in tolerances D3 or D4.

Wall thickness tolerances of welding ends							
Diameter	Wall thickness	DIN EN 10253-2		DIN EN 10253-4		Nach DIN	
		Minus	Plus	Minus	Plus	Minus	Plus
All	All					2605-1 12,5%	2609 15%
D ≤ 610	All	12,5%	20%	12,5%	15%	2605-2 / 2615 / 2616 / 2617 12,5%	
D > 610		<b>Seamless</b> 12,5%	20%				
D > 610	≤ 10 > 10	<b>Welded</b> 0,35 mm 0,50 mm	20%	0,35 mm 0,50 mm	15%	2605-2 / 2615 / 2616 / 2617 0,35 mm 0,50 mm	

Tolerances of the fitting geometry		
DIN EN 10253-2	DIN EN 10253-4	DIN 2609
	± 1% diameter at measuring point, min. 1 mm	
For 180° elbows, a tolerance P was created.		

#### Definition of tolerances of the fitting geometry



# Buttweld Fittings DIN EN 10253

## 4. Different radii for elbows

Size in mm	Type 2D / 2			Type 3D / 3			Type 5D / 5		
	DIN EN 10253		DIN 2605	DIN EN 10253		DIN 2605	DIN EN 10253		DIN 2605
	Part 2	Part 4		Part 2	Part 4		Part 2	Part 4	
21,3	25,0	17,5	17,5	38,0	28,0	28,0			
26,9				38,0	29,0	29,0			
48,3							109,5	108,0	107,5
51,0				63,0	63,0	63,5	122,5	115,0	115,0
57,0							130,0	127,5	127,5
60,3							137,5	135,0	135,0
88,9							207,5	205,0	205,0
101,6				133,0	133,5	133,5	235,0	237,5	237,5
108,0							253,0	252,5	252,5
133,0							311,5	312,5	312,5
219,1							515,0	510,0	510,0
323,9							770,0	775,0	775,0

## 5. Material comparison

Designation	Material grade	Comparable DIN material	Material grade	ASME
P235TR2	1.0255	St 37.4	1.0255	
P265TR2	1.0259	St 44.4	1.0257	
P235GH	1.0345	St 35.8 / St 37.8	1.0305 / 1.0315	
P265GH	1.0425	St 45.8 / St 42.8	1.0405 / 1.0498	WPB
16Mo3	1.5415	15 Mo 3	1.5415	
10CrMo5-5	1.7338			WP11
13CrMo4-5	1.7335	13 CrMo 4 4	1.7335	WP12
10CrMo9-10	1.7380	10 CrMo 9 10	1.7380	WP22
X11CrMo5	1.7362	12 CrMo 19 5	1.7362	WP5
X11CrMo9-1	1.7386	X 12 CrMo 9 1	1.7386	WP9
X10CrMoVNb9-1	1.4903			WP91
P355N	1.0562	StE 355	1.0562	
P355NH	1.0565	WStE 355	1.0565	
P355NL1	1.0566	TStE 355	1.0566	
P215NL	1.0451	TT St 35 N	1.0356	
P265NL	1.0453			
12Ni14	1.5637	10 Ni 14	1.5637	WPL3
X10Ni9	1.5682	X 8 Ni 9	1.5662	
L290NB	1.0484	StE 290.7	1.0484	WPHY42
L360NB	1.0582	StE 360.7	1.0582	WPHY52
L360QB	1.8948			
L415NB	1.8972	StE 415.7	1.8972	WPHY60
L415QB	1.8947			
L450QB	1.8952			

### Material comparison:

Some of the materials are not strictly comparable. Small differences in the chemical analysis and mechanical properties will be identified in the respective requirement tables. The brief comparison presented here is to show that, for example, a complete DIN/EN double-certification or a 100% rewriting of certification under DIN rules to EN rules and standards can be done only with great difficulty. The choice of the starting material for seamless fittings is left to the manufacturer, provided that the chemical requirements (Table 4) and mechanical properties (Table 6) of DIN EN 10253-2 are met.

## 6. Identifications

Identification	DIN EN 10253-2	DIN EN 10253-4	DIN 2609
Manufacturers identification	•	•	•
Country of manufacture	•	•	
Standard	EN2	EN 10253-4	≤ DN 50 the "DIN" symbol is not necessary
Type A or B	Only type B	•	Only type 2
"W" to buttwelding	•	•	•
"S" to seamless fittings		•	•
Outside diameter	Rounded (e.g. 139,7 = 140) <sup>1)</sup>	•	
Wall thickness	• <sup>1)</sup>	•	
Material	•	•	Symbo acc. to DIN 2609
Heat-number	•	•	•
Inspectors'sign	•	•	•

<sup>1)</sup> For fittings with D < 88,9 mm, markings may be omitted in the following order when the shape or size of the product does not permit the inclusion of all required markings.

## 7. Testing comparison

Inspection lots	
DIN EN 10253-2	According to DIN 2609
An inspection lot shall consist of the same size, be from the same manufacturing process, the same melting and heat treatment, in which, under certain conditions, multiple heat treatment lots can be combined into one.  Maximum lot sizes must be ordered separately.	According to DIN 2609 Section 5.3.2 and the max lot sizes given there.

Inspections are somewhat comparable, in that tensile and impact tests under DIN EN 10253-2, only one sample per test lot is required. For non-alloy type A fittings the wall thickness of the parts supplied can be reduced under certain conditions, if the product of the minimum yield strength (measured) x reduced wall corresponds at least to the product of a fixed wall thickness x specified minimum yield strength (standard) (equivalent to DIN EN 10253-2 Sect 7.1.). Under certain conditions, with non-alloy steels the tensile test on the fitting can be substituted by a tensile test and hardness test on the primary material. From D of 114.3 mm, however, an impact test must be conducted. With Option 14, this procedure can be excluded.

### Non-destructive testing of cold-formed tees

If, based on the inspection history (based on the fitting lot size), the manufacturer can demonstrate that the results agree with the definition of an inspection lot, then the manufacturer and purchaser may agree on the inspection of a percentage of the fittings, provided that at least 10% of each inspection lot is tested. If a crack is found in this sample, then 100% of the lot is to be inspected.



# Materials for Buttweld Fittings DIN 2609

Table 2 – Extract

Index	Materials group		Material number	Product form of base materials <sup>1)</sup>					Application temperature in °C	
	Short name	Base material		1	2	3	4	5		DIN
<b>A</b>	St 37.0	St 37.0	1.0254	•					1629	-10 to 300
	St 37.0	St 37.0	1.0254		•				1626	-10 to 300
	St 37.0	RSt 37-2	1.0038			•	•	•	17 100	-10 to 300
<b>B</b>	St 44.0	St 44.0	1.0256	•					1629	-10 to 300
	St 44.0	St 44.0	1.0256		•				1626	-10 to 300
	St 44.0	St 44-2	1.0044			•	•	•	17 100	-10 to 300
<b>C</b>	St 52.0	St 52.0	1.0421	•					1629	-10 to 300
	St 52.0	St 52.0	1.0421		•				1626	-10 to 300
	St 52.0	St 52-3	1.0570			•	•	•	17 100	-10 to 300
<b>D</b>	St 290.7	St 290.7	1.0484	•	•				17 172	-10 to 50
<b>E</b>	StE 360.7	StE 360.7	1.0582	•	•				17 172	-10 to 50
<b>F</b>	St 35.8 I	St 35.8 I	1.0305	•					17 175	-10 to 420
	St 35.8 I	St 37.8 I	1.0315		•				17 177	-10 to 420
	St 35.8 I	HI	1.0345			•			17 155	-10 to 420
	St 35.8 I	HII	1.0425			•			17 155	-10 to 420
	St 35.8 I	C 22.8	1.0460				•	•	17 243	-10 to 420
<b>G</b>	St 35.8 III	St 35.8 III	1.0305	•					17 175	-10 to 420
	St 35.8 III	St 37.8 III	1.0315		•				17 177	-10 to 420
	St 35.8 III	HII	1.0425			•			17 155	-10 to 420
	St 35.8 III	C 22.8	1.0460				•	•	17 243	-10 to 420
<b>H</b>	15 Mo 3	15 Mo 3	1.5415	•					17 175	-10 to 530
	15 Mo 3	15 Mo 3	1.5415		•				17 177	-10 to 530
	15 Mo 3	15 Mo 3	1.5415			•			17 155	-10 to 530
	15 Mo 3	15 Mo 3	1.5415				•	•	17 243	-10 to 530
<b>J</b>	13 CrMo 4 4	13 CrMo 4 4	1.7335	•					17 175	-10 to 570
	13 CrMo 4 4	13 CrMo 4 4	1.7335			•			17 155	-10 to 570
	13 CrMo 4 4	13 CrMo 4 4	1.7335				•	•	17 243	-10 to 570
<b>K</b>	10 CrMo 9 10	10 CrMo 9 10	1.7380	•					17 175	-10 to 600
	10 CrMo 9 10	10 CrMo 9 10	1.7380			•			17 155	-10 to 600
	10 CrMo 9 10	10 CrMo 9 10	1.7380				•	•	17 243	-10 to 600
<b>L</b>	X 5 CrNi 18 10	X 5 CrNi 18 10	1.4301	•					17 458	-200 to 550
	X 5 CrNi 18 10	X 5 CrNi 18 10	1.4301		•				17 457	-200 to 550
	X 5 CrNi 18 10	X 5 CrNi 18 10	1.4301			•	•	•	17 440	-200 to 550
<b>M</b>	X 2 CrNi 19 11	X 2 CrNi 19 11	1.4306	•					17 458	-200 to 550
	X 2 CrNi 19 11	X 2 CrNi 19 11	1.4306		•				17 457	-200 to 550
	X 2 CrNi 19 11	X 2 CrNi 19 11	1.4306			•	•	•	17 440	-200 to 550
<b>N</b>	X 6 CrNiTi 18 10	X 6 CrNiTi 18 10	1.4541	•					17 458	-200 to 550
	X 6 CrNiTi 18 10	X 6 CrNiTi 18 10	1.4541		•				17 457	-200 to 550
	X 6 CrNiTi 18 10	X 6 CrNiTi 18 10	1.4541			•	•	•	17 440	-200 to 550
<b>O</b>	X 5 CrNiMo 17 12 2	X 5 CrNiMo 17 12 2	1.4401	•					17 458	-200 to 550
	X 5 CrNiMo 17 12 2	X 5 CrNiMo 17 12 2	1.4401		•				17 457	-200 to 550
	X 5 CrNiMo 17 12 2	X 5 CrNiMo 17 12 2	1.4401			•	•	•	17 440	-200 to 550
<b>P</b>	X 2 CrNiMo 17 13 2	X 2 CrNiMo 17 13 2	1.4404	•					17 458	-200 to 550
	X 2 CrNiMo 17 13 2	X 2 CrNiMo 17 13 2	1.4404		•				17 457	-200 to 550
	X 2 CrNiMo 17 13 2	X 2 CrNiMo 17 13 2	1.4404			•	•	•	17 440	-200 to 550
<b>Q</b>	X 6 CrNiMoTi 17 12 2	X 6 CrNiMoTi 17 12 2	1.4571	•					17 458	-200 to 550
	X 6 CrNiMoTi 17 12 2	X 6 CrNiMoTi 17 12 2	1.4571		•				17 457	-200 to 550
	X 6 CrNiMoTi 17 12 2	X 6 CrNiMoTi 17 12 2	1.4571			•	•	•	17 440	-200 to 550
<b>R</b>	WStE 355	WStE 355	1.0565	•					17 179	-20 to 400
	WStE 355	WStE 355	1.0565		•				17 178	-20 to 400
	WStE 355	WStE 355	1.0565			•		•	17 102	-20 to 400
	WStE 355	WStE 355	1.0565				•		17 103	-20 to 400
<b>S</b>	TStE 355	TStE 355	1.0566	•					17 179	-60 to 50
	TStE 355	TStE 355	1.0566		•				17 178	-60 to 50
	TStE 355	TStE 355	1.0566			•		•	17 102	-60 to 50
	TStE 355	TStE 355	1.0566				•		17 103	-60 to 50
<b>T</b>	TStE 285	TStE 285	1.0488	•					17 179	-50 to 50
	TStE 285	TStE 285	1.0488		•				17 178	-50 to 50
	TStE 285	TStE 285	1.0488			•		•	17 102	-50 to 50
	TStE 285	TStE 285	1.0488				•		17 103	-50 to 50
<b>U</b>	10 Ni 14	10 Ni 14	1.5637	•					17 173	-105 to 50
	10 Ni 14	10 Ni 14	1.5637		•				17 174	-105 to 50
	10 Ni 14	10 Ni 14	1.5637			•	•	•	17 280	-105 to 50

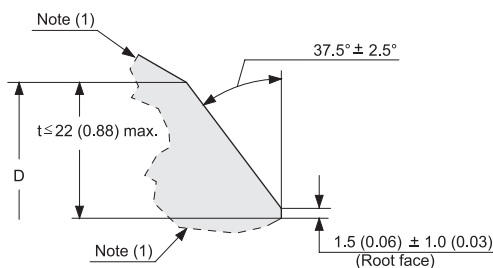
<sup>1)</sup> 1 Seamless pipe 2 Welded pipe 3 Plate metal 4 Forging 5 bar steel

# General standard of Buttweld Fittings acc. to ASME B 16.9

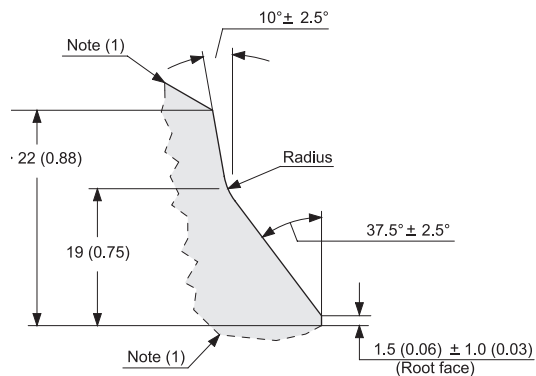
Types																											
OD 1	Elbows			Tees														OD 1	Reducers concentric / eccentric					Caps	Stub ends		
	LR	SR	3D	Outside diameter 2															Outside diameter 2								
1/2"	•			1/2"	3/8"	1/4"																				•	•
3/4"	•		•	3/4"	1/2"	3/8"																				•	•
1"	•	•	•	1"	3/4"	1/2"																				•	•
1 1/4"	•	•	•	1 1/4"	1"	3/4"	1/2"																			•	•
1 1/2"	•	•	•	1 1/2"	1 1/4"	1"	3/4"	1/2"																		•	•
2"	•	•	•	2"	1 1/2"	1 1/4"	1"	3/4"																		•	•
2 1/2"	•	•	•	2 1/2"	2"	1 1/2"	1 1/4"	1"																		•	•
3"	•	•	•	3"	2 1/2"	2"	1 1/2"	1 1/4"																		•	•
3 1/2"	•	•	•	3 1/2"	3"	2 1/2"	2"	1 1/2"																		•	•
4"	•	•	•	4"	3 1/2"	3"	2 1/2"	2"	1 1/2"																	•	•
5"	•	•	•	5"	4"	3 1/2"	3"	2 1/2"	2"	1 1/2"																•	•
6"	•	•	•	6"	5"	4"	3 1/2"	3"	2 1/2"	2"																•	•
8"	•	•	•	8"	6"	5"	4"	3 1/2"	3"	2 1/2"																•	•
10"	•	•	•	10"	8"	6"	5"	4"																		•	•
12"	•	•	•	12"	10"	8"	6"	5"																		•	•
14"	•	•	•	14"	12"	10"	8"	6"																		•	•
16"	•	•	•	16"	14"	12"	10"	8"	6"																	•	•
18"	•	•	•	18"	16"	14"	12"	10"	8"																	•	•
20"	•	•	•	20"	18"	16"	14"	12"	10"	8"																•	•
22"	•	•	•	22"	20"	18"	16"	14"	12"	10"																•	•
24"	•	•	•	24"	22"	20"	18"	16"	14"	12"	10"															•	•
26"	•	•	•	26"	24"	22"	20"	18"	16"	14"	12"															•	•
28"	•	•	•	28"	26"	24"	22"	20"	18"	16"	14"	12"														•	•
30"	•	•	•	30"	28"	26"	24"	22"	20"	18"	16"	14"	12"	10"												•	•
32"	•	•	•	32"	30"	28"	26"	24"	22"	20"	18"	16"	14"													•	•
34"	•	•	•	34"	32"	30"	28"	26"	24"	22"	20"	18"	16"													•	•
36"	•	•	•	36"	34"	32"	30"	28"	26"	24"	22"	20"	18"	16"												•	•
38"	•	•	•	38"	36"	34"	32"	30"	28"	26"	24"	22"	20"	18"												•	•
40"	•	•	•	40"	38"	36"	34"	32"	30"	28"	26"	24"	22"	20"	18"											•	•
42"	•	•	•	42"	40"	38"	36"	34"	32"	30"	28"	26"	24"	22"	20"	18"	16"									•	•
44"	•	•	•	44"	42"	40"	38"	36"	34"	32"	30"	28"	26"	24"	22"	20"										•	•
46"	•	•	•	46"	44"	42"	40"	38"	36"	34"	32"	30"	28"	26"	24"	22"										•	•
48"	•	•	•	48"	46"	44"	42"	40"	38"	36"	34"	32"	30"	28"	26"	24"	22"									•	•

Weld seam preparations	
Nominal wall thickness T	Type of preparation
T < 5 mm (for austenitic steels ≤ 3 mm)	Cut square or slightly chamfered, at manufacturer's discretion
5 < T < 22 mm (for austenitic steels > 3 mm)	Plain bevel as in sketch 1 (s.b.)
T > 22 mm	Compound bevel as in sketch 2 (s.b.)

Sketch 1: Plain bevel

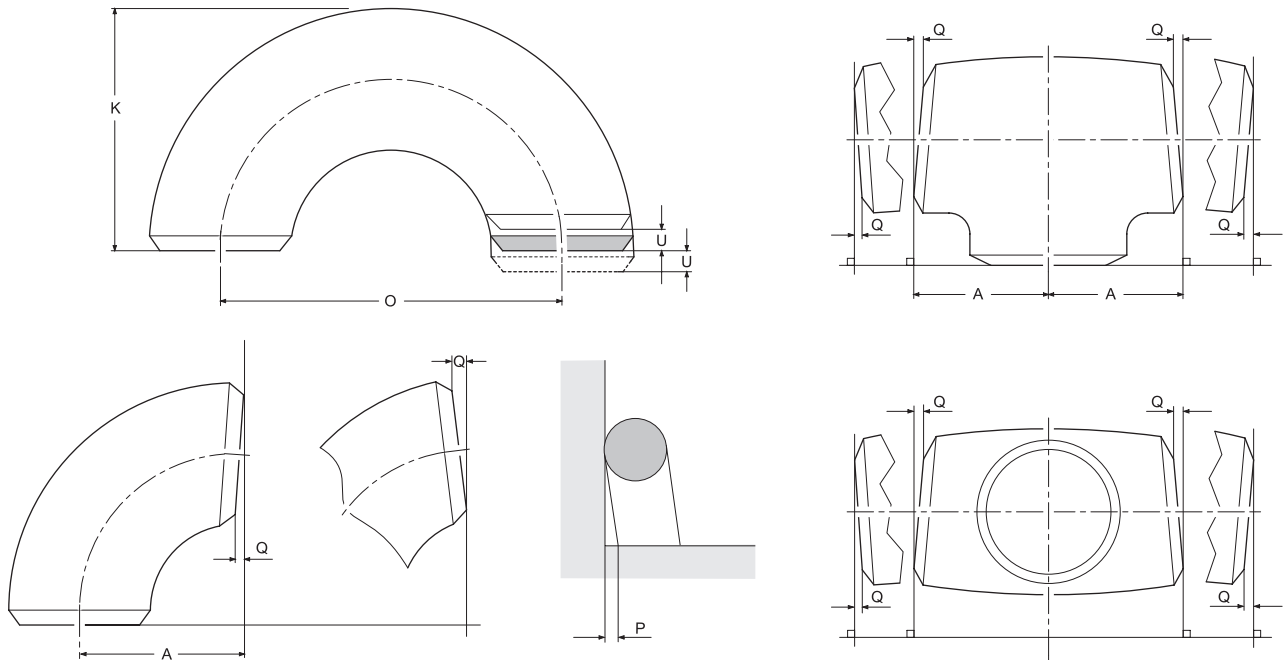


Sketch 2: Compound bevel



Note (1) See also ASME 16.9, Section 8

# Tolerances acc. to ASME B 16.9



All fittings				Elbows 90°/45° and tees	Reducers / Lap Joint Stub Ends	Elbows 180°			Elbows 3D	Caps
NPS	Outside diameter at bevel	Inside diameter at end	Wall thickness	Center to End	Overall length	Center to Center	Back to face	Alignment of Ends	Center to End	Overall length
	D		T	A, B, C, M	F, H	O	K	U	A, B	E
½–2½"	+1,6 / -0,8	± 0,8	No smaller than 87,5% of the nominal wall thickness	± 2	± 2	± 6	± 6	± 1	± 3	± 3
3"–3½"	± 1,6	± 1,6		± 2	± 2	± 6	± 6	± 1	± 3	± 3
4"	± 1,6	± 1,6		± 2	± 2	± 6	± 6	± 1	± 3	± 3
5"–8"	+2,4 / -1,6	± 1,6		± 2	± 2	± 6	± 6	± 1	± 3	± 6
10"–18"	+4,0 / -3,2	± 3,2		± 2	± 2	± 10	± 6	± 2	± 3	± 6
20"–24"	+6,4 / -4,8	± 4,8		± 2	± 2	± 10	± 6	± 2	± 3	± 6
26"–30"	+6,4 / -4,8	± 4,8		± 3	± 5				± 6	± 10
32"–48"	+6,4 / -4,8	± 4,8		± 5	± 5				± 6	± 10

All data in mm

Angularities tolerances		
NPS	Off Angle	Off plane
	Q	P
½–4"	± 1	± 2
5"–8"	± 2	± 4
10"–12"	± 3	± 5
14"–16"	± 3	± 6
18"–24"	± 4	± 10
26"–30"	± 5	± 10
32"–42"	± 5	± 13
44"–48"	± 5	± 19

All data in mm

Lap Joint Stub Ends			
NPS	OD of Lap	Fillet	Thickness
	G	R	T
½–2½"	+0 / -1	+0 / -1	+1,6 / -0
3"–3½"	+0 / -1	+0 / -1	+1,6 / -0
4"	+0 / -1	+0 / -2	+1,6 / -0
5"–8"	+0 / -1	+0 / -2	+1,6 / -0
10"–18"	+0 / -2	+0 / -2	+3,2 / -0
20"–24"	+0 / -2	+0 / -2	+3,2 / -0
26"–30"			
32"–48"			

# Going the extra service mile

For you, the right material in the very best quality is absolutely essential. This is what you get with our pipes, flanges, fittings and pipe accessories. We go the extra service mile to ensure that you are thoroughly satisfied at every stage of the order.











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At the head office in Stuhr/Bremen and four additional locations 400 employees give their best every day to ensure that you are satisfied with the supply service and services of rff.

# Quality management

When it comes to your satisfaction, we refuse to compromise. For this reason, the high quality of the products and services are essential for us. This is verified by the large number of approvals and certificates. So you can always be sure of receiving the best solution.



Approval / certificate	Area of application	Certification authority
<b>QM system in accordance with DIN EN ISO 9001</b> No. 07 100 010599	Quality management in the procurement, storage and distribution of pipes and pipe connection parts	TÜV Nord Cert GmbH
<b>EM system in accordance with DIN EN ISO 14001</b> No. 07 104 010599	Environmental management in the procurement, storage and distribution of pipes and pipe connection parts	TÜV Nord Cert GmbH
<b>OH&amp;S Management system in acc. with DIN ISO 45001</b> No. 126 104 010599	Occupational health and safety management system in the area of procurement, storage and distribution of pipes and pipe connections	TÜV Nord Cert GmbH
<b>Approval in accordance with AD 2000 Instructions W0</b> No. 07-202-1326-WP-0538/07	Approved processor of materials according to AD 2000 Merkblatt W0 and VdTÜV Merkblatt 1253/2	TÜV Nord Systems GmbH & Co. KG
<b>QA system in accordance with the Pressure Equipment Directive 97/23/EC</b> No. 07-202-1326-WZ-0538/10	Confirmation of conformity of the QA system in accordance with the Pressure Equipment Directive 97/23/EC	TÜV Nord Systems GmbH & Co. KG
<b>Re-stamping agreement in accordance with DIN EN 764-5, Section 6</b> 07-701-1326-UH-0538/10	Certificate for the transfer of marking (re-stamping) of metallic materials with inspection certificate 2.1, 2.2 and 3.1 in accordance with DIN EN 10204	TÜV Nord Systems GmbH & Co. KG
<b>Confirmation of suitability as per KTA rule 1401</b>	Approval for the supply of pipes, flanges and fittings for use in nuclear installations (KTA)	VGB PowerTech e.V.



# IT services

To ensure the smooth processing of your order we utilise a comprehensive IT service that provides you with efficient support at all levels – from ordering to delivery and on to invoicing and documentation.



# Surfaces for flanges

## General

When using the surface marks acc. to the following table, each underlying Series – 1, 2, 3 or 4 – and a reference to DIN 3141 must be specified on the drawing, for example “**Surfaces acc. to DIN 3141 Series 2**”.

If not specified, the characteristics given are to be viewed as processing symbols acc. to DIN 140 Sheet 2 and then finished.

Symbols	R <sub>t</sub> max. µm Series 1	R <sub>t</sub> max. µm Series 2	R <sub>t</sub> max. µm Series 3	R <sub>t</sub> max. µm Series 4	Requirements
	Optional	Optional	Optional	Optional	None
	Optional	Optional	Optional	Optional	Clean and evenly
	160	100	63	25	Values may not be exceeded
	40	25	16	10	Values may not be exceeded
	16	6	4	2,5	Values may not be exceeded
		1	1	0,4	Values may not be exceeded

## Comparison of rugosity

Since an exact comparison is not possible, the following table has been drawn up to allow the permissible roughness to be observed.

Roughness	Comparison												
R <sub>t</sub> in µm	160	100	63	50	40	32	25	16	10	8	6,3	4	2,5
R <sub>a</sub> in µm	40	25	16	12,5	10	6,3	4,8	3,2	2,5	1,6	1,2	0,8	0,4
R <sub>a</sub> in µinch	1500	1000	630	500	350	250	190	125	80	63	48	32	16
R <sub>p</sub> in µm	80	50	32	25	20	12,5	10	6,3	4,8	3,2	2,5	1,6	0,8

## Reference values for the rotation

Steel radius	Roughness R <sub>t</sub> in mm												
	160	100	63	50	40	32	25	16	10	8	6.3	4	2.5
1 mm	1,13	0,89	0,69	0,63	0,57	0,50	0,48	0,36	0,28	0,25	0,22	0,18	0,13
1,6 mm	1,40	1,12	0,90	0,80	0,72	0,65	0,57	0,46	0,36	0,32	0,28	0,23	0,18

# Roughness – conversion table

For N-, Ra-, Rt-, Rz-, CLA-(AA)-Values (approximated)

N values	R <sub>a</sub> µm	R <sub>t</sub> µm approx.	R <sub>z</sub> µm approx.	AARH / CLA	RMS	Ration R <sub>z</sub> to R <sub>a</sub>
N1	0,025	0,24 to 0,40	0,22 to 0,30	1	1,1	9:1 to 12:1
N2	0,050	0,49 to 0,80	0,45 to 0,60	2	2,2	8:1 to 12:1
N3	0,100	0,85 to 1,15	0,80 to 1,10	4	4,4	8:1 to 11:1
N4	0,200	1,10 to 2,40	1,00 to 1,80	8	8,8	5:1 to 9:1
N5	0,400	1,75 to 3,60	1,60 to 2,80	16	17,6	4:1 to 7:1
N6	0,800	3,20 to 6,00	3,00 to 4,80	32	35,2	3,8:1 to 6:1
N7	1,600	6,30 to 10,00	5,90 to 8,00	63	64,3	3,7:1 to 5:1
N8	3,200	13,00 to 19,50	12,00 to 16,00	125	137,5	3,7:1 to 5:1
N9	6,300	25,00 to 38,00	23,00 to 32,00	250	275,0	3,7:1 to 5:1
N10	12,500	48,00 to 68,00	46,00 to 57,00	500	550,0	3,7:1 to 4,6:1
N11	25,000	95,00 to 130,00	90,00 to 110,00	1000	1100	3,6:1 to 4,4:1
N12	50,000	190,00 to 250,00	180,00 to 220,00	2000	2200	3,6:1 to 4,4:1
N13	100,000	380,00 to 500,00	360,00 to 430,00	4000	4400	3,6:1 to 4,3:1



**N5**  
R<sub>a</sub> 0,4 µm – AARH / CLA 16  
R<sub>z</sub> 1,92 µm



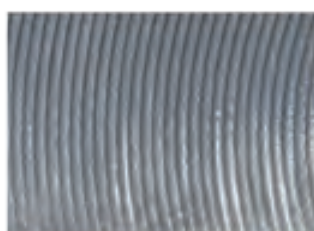
**N6**  
R<sub>a</sub> 0,8 µm – AARH / CLA 32  
R<sub>z</sub> 3,20 µm



**N7**  
R<sub>a</sub> 1,6 µm – AARH / CLA 63  
R<sub>z</sub> 6,15 µm



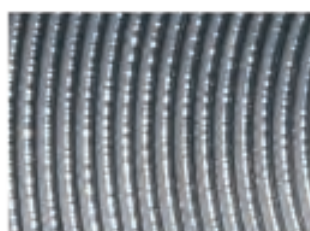
**N8**  
R<sub>a</sub> 3,2 µm – AARH / CLA 125  
R<sub>z</sub> 12,5 µm



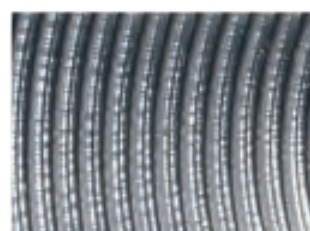
**N9**  
R<sub>a</sub> 6,3 µm – AARH / CLA 250  
R<sub>z</sub> 25,7 µm



**N10**  
R<sub>a</sub> 12,5 µm – AARH / CLA 500  
R<sub>z</sub> 48,7 µm



**N11**  
R<sub>a</sub> 25 µm – AARH / CLA 1000  
R<sub>z</sub> 102 µm



**N12**  
R<sub>a</sub> 50 µm – AARH / CLA 2000  
R<sub>z</sub> 185 µm



# Designation systems for DIN and EN steels

Letters and ref. numbers are to be written together without spaces. Numbers must be separated by hyphens. The following list shows the most common materials indicating the mechanical properties at room temperature.

Steel grade				Tensile test at room temperature							Impact test	
DIN	Material number	EN	Material number	Tensile strength $R_m$ MPa / N / mm <sup>2</sup>	Yield point $R_{0.2}$ or $R_{p0.2}$ For wall thickness T in mm:			Elongation at rupture A in min. %		Minimum-average impact value KV t/transverse in J		
					$T \leq 16$	$16 < T \leq 40$	$40 < T \leq 60$	$60 < T \leq 100$	l / length	t / transverse	at 20° C	at 0° C
St 35.8	1.0305	P235GH	1.0345	360 to 500	235	225	215		25	23		27
St 45.8	1.0405	P265GH	1.0425	410 to 570	265	255	245		23	11		27
St 37.8	1.0315	P235GH	1.0345	360 to 500	235	225	215		25	23		27
St 42.8	1.0498	P265GH	1.0425	410 to 570	265	255	245		23	21		27
15 Mo 3	1.5415	16Mo3	1.5415	450 to 600	280	270	260		22	10	27	
13 CrMo 4-4	1.7335	13CrMo4-5	1.7335	440 to 590	290	290	280		22	20	27	
10 CrMo 9-10	1.7380	10CrMo9-10	1.7380	480 to 630	280	280	270		22	20	27	
14 MoV 6-3	1.7715	14MoV6-3	1.7715	460 to 610	320	320	310		20	18	27	
X 20 CrMoV 12-1	1.4922	X20CrMoV11-1	1.4922	690 to 840	490	490	490	490	17	14	27	
X 10 CrMoVNb 9-1	1.4903	X10CrMoVNb9-1	1.4903	630 to 830	450	450	450	450	19	17	27	
15 NiCuMoNb 5 (WB 36)	1.6368	15NiCuMoNb5-6-4	1.6368	610 to 780	440	440	440	440 <sup>1)</sup>	19	17	27	

<sup>1)</sup> For wall thicknesses  $60 \text{ mm} < T \leq 80 \text{ mm}$

## The new short designations, principal symbols; DIN EN 10027-Part 1

This abbreviation is always followed by a number that corresponds to the minimum stretch value in MPa for the smallest product thickness.

- S** Structural steels
- P** Pressure vessel steels
- L** Line pipes
- E** Machinery steels
- B** Concrete reinforcement steel

## Additional symbols (group 1) for short names; DIN EN 10027-Part 1

Impact value in Joules		at temperatures of °C		Impact value in Joules			Test temperature °C
J	K	L		27 J	40 J	60 J	
J 27 J			<b>R</b> +20	JR	KR	LR	+20
K 40 J			<b>0</b> 0	J0	K0	L0	0
L 60 J			<b>2</b> -20	J2	K2	L2	-20
			<b>3</b> -30	J3	K3	L3	-30
			<b>4</b> -40	J4	K4	L4	-40
			<b>5</b> -50	J5	K5	L5	-50
			<b>6</b> -60	J6	K6	L6	-60

## Additional symbols (group 1 + 2) for short names; DIN EN 10027-1

<b>B</b> Gas bottles	<b>O</b> Offshore
<b>C</b> Special cold workability	<b>P</b> Sheet pile steel
<b>D</b> For hot-dip coatings	<b>Q</b> Quenched heat
<b>E</b> For enamelling	<b>R</b> Room temperature
<b>F</b> For forging	<b>S</b> Simple pressure vessels
<b>G</b> Other characteristics (may be 1 to 2 digits)	<b>S</b> Structural steel
<b>H</b> Material for high temperatures	<b>T</b> Piping (tube)
<b>H</b> Hollow (structural steel)	<b>W</b> Weather-resistant
<b>L</b> Low temperature	<b>X</b> High and low temperatures
<b>M</b> Thermo-mechanically rolled	<b>an</b> Chemical symbols for additionally required elements
<b>N</b> Normalised	

Example			
old		new	
<b>St 52-3</b>	Steel Tensile strength 52 kp/mm <sup>2</sup> Quality grade 3 (27 J at -20° C)	<b>S355J2H</b>	Structural steels Yield point 355 N/mm <sup>2</sup> 27 J impact value -20° C Hollow
<b>TStE 355</b>	Fine grain steel for low temperatures Yield point 355 N/mm <sup>2</sup>	<b>P355NL1</b>	Steel for pressure vessels Yield strength 355 N/mm <sup>2</sup> Normalised Low temperature series 1
<b>St 37.0</b>	Steel Tensile strength 37 kp/mm <sup>2</sup> Standard grade	<b>P235TR1</b>	Steel for pressure vessels Yield strength 235 N/mm <sup>2</sup> Piping Inspection class 1
<b>St 35.8</b>	Steel Tensile strength 35 kp/mm <sup>2</sup> Heat-resistant	<b>P235GH TC1</b>	Steel for pressurised vessels Yield point 235 N/mm <sup>2</sup> Test class 1 Piping High temperature

## Low-alloy steels (individual alloying element fractions less than 5%)

The first number corresponds to the 100-fold of the C-content, followed by the chem. symbols for the alloys characterising the steel, followed by the numbers indicating the alloy content of the alloying elements in the series.

Element	Factor
Cr, Co, Mn, Ni, Si, W	4
Al, Be, Cu, Mo, Nb, Pb, Ta, Ti, V, Zr	10
C, N, P, S	100
B	1000

**X = High-alloy steels** (at least one alloy element with more than 5% fraction)

The short name begins with "X" in front of the C-carbon content in hundredths of a percent. Then follow the abbreviations Cr, Ni, Mo (in full %) and the alloying elements Ti, Nb, V, Cu, N (less than 1%) as alloy symbols only, with no numerical value attached.

Example							
old		new		old		new	
X20CrMoV12 1	X20CrMoV12-1	12CrMo19 5	X11CrMo5	X5CrNi18 10	X5CrNi18-10	X6CrNiMoTi17 12 2	X6CrNiMoTi17-12-2
X12CrMo9 1	X12CrMo9-1	12Ni19	X12Ni5	X6CrNiTi18 10	X6CrNiTi18-10	X8Ni9	X8Ni9

# Material testing

## General information / destructive testing methods

The term material testings comprises a range of various testing methods to analyse the characteristics and parameters of standardised material samples or finished components under certain mechanical, thermal or chemical conditions.

Materials are tested in regard to their purity, resilience or absence of defectiveness. Common testing methods are divided into two main groups:

### Destructive and non-destructive testing

#### Destructive testing

Destructive testing methods include

- Tensile test
- Impact test
- Hardness test
- Pressure test
- Bending test for sheets
- Cupping test
- Fatigue test
- Creep rupture test

Within this group, those mechanical methods that are meant to check compliance with strength and ductility values play a central role.

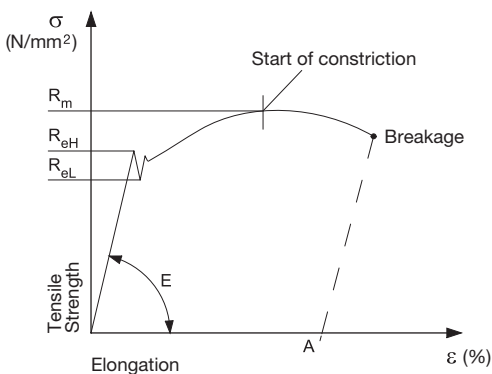
#### Tensile test in accordance with DIN EN ISO 6892

The **tensile test** is an important destructive testing method. Here, samples with a small cross sectional area are being stretched until they break. The stretching is applied steady-going, shock-free and slowly. During testing, both power and expansion are being measured continuously. Finally, applied power as well as the values of expansion and cross sectional change are used to calculate a stress-strain diagram including parameters such as tensile strength ( $R_m$ ), yield point ( $R_p$ ), and elongation ( $A$ ).

The result of the tensile test is the stress-strain diagram. The following parameters, can be derived from this:

<b>E</b>	Modulus of elasticity
<b><math>R_p</math></b>	Tensile yield strength (yield point)
<b><math>R_{eL}</math></b>	Lower yield point
<b><math>R_{eH}</math></b>	Upper yield point
<b><math>R_m</math></b>	Tensile strength
<b>A</b>	Elongation after fracture
	All values in $N/mm^2$

Stress-strain diagramm



#### Impact test in accordance with DIN EN ISO 148

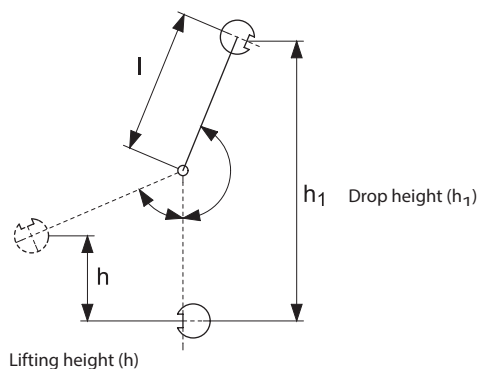
Another common method is the **impact test** which is used to analyse ductility of a material sample. The sample is notched on one side and can be tested at both room and low temperature. By this testing method, a charpy (pendulum) hammer is impacted against the non-notched side and the sample will consequently be destroyed. According to the energy absorbed while destroying the sample, the charpy hammer will be swinging less heavily on the other side. Notch impact energy  $W$  (indicated in joules) is calculated by using formula as follows:

$$W = m \times g \times (h_1 - h)$$

<b>W</b>	Notch bar impact energy (joules)
<b>m</b>	Charpy hammer mass (kg)
<b>g</b>	Acceleration due to gravity (9,81 m/s)
<b><math>h_1 - h</math></b>	Drop height minus rise of charpy hammer (mm)
<b>l</b>	Length of charpy hammer

Elongation and ductility of a material provide important information about it's deformation behaviour and thus are an essential criteria for both evaluation and selection of materials.

Impact test



# Material testing

## Non-destructive testing

### Non-destructive testing

The main group of non-destructive testing methods is divided into four subcategories:

#### Radiative and sonic testing methods

- Radiographic test
- Ultrasonic test

**Radiographic testing** is an imaging procedure which serves to visualise material imperfections. By using x-rays, the density of a component is depicted on a film. Different shades of blackening are evidence of both deviations in density and imperfections in base material.

**Ultrasonic testing** is an acoustic test method in order to identify material imperfections. With this method, even already installed components can be tested. The entire surface is scanned by using a sensor. Changes in the properties inside the tested components reflect acoustic pulses. Position and size of imperfections such as cavities or inclusions, can be analysed based on the time which elapses between transmission and reception of the signal.

### Magnetic and capillary testing methods

- Eddy current test
- Magnetic particle test
- Dye penetrant test

**Eddy current testing** is a method used to test electroconductive materials. A magnetic field is created using a coil which induces eddy currents in the material. This exploits the effect that the majority of impurities in the material has a different conductivity. This test procedure is primarily used for crack testing.

**Magnetic particle testing** is a method to demonstrate cracks on or close to the surface of ferromagnetic materials. The area to be tested is treated with dyed iron powder or black powder on a white background. The powder adheres to the cracks as changes in the magnetic field occur here. These imperfections can be located by using UV radiation or white light.

For stainless steels, surface imperfections can be identified by **dye penetrant testing**. To this end, a penetrant (red) is applied to the previously cleaned surface. At the end of the residence time, the surface is cleaned and the developer (white) is applied. The resulting colour contrast makes it possible to locate the imperfection.

# Weld seam preparation for butt welds, single-sided welding

DIN EN ISO 9692-1 – Extract Table 1

Index	Work piece thickness t in mm	Bevel shape preparation type	Symbol (acc. to ISO 2553)	Cross section	Joint preparation				Recommended welding process <sup>3)</sup> (acc. to ISO 4063)	Illustration	Remarks
					Angle <sup>1)</sup> α, β	Gap <sup>2)</sup> b in mm	Thickness of root face c in mm	Depth of preparation h in mm			
1.2.1	≤ 4	Square butt weld				≈ t			3 111 141		With backing
1.2.2	3 < t ≤ 8					6 ≤ b ≤ 8			13		
	≤ 15					≈ t			141 <sup>3)</sup>		
						≤ 1 <sup>4)</sup>			52		
1.3	3 < t ≤ 10	Single-V butt weld	∇		40° ≤ α ≤ 60°	≤ 4	≤ 2	3 111 13 141		If needed with weld pool backing	
	8 < t ≤ 12							6° ≤ α ≤ 8°			52 <sup>4)</sup>
1.5	5 ≤ t ≤ 40	Single-Y butt weld	Y		α ≈ 60°	1 ≤ b ≤ 4	2 ≤ c ≤ 4	111 13 141			
1.6	> 12	Single-U butt weld with V root			60° ≤ α ≤ 90° 8° ≤ β ≤ 12°	1 ≤ b ≤ 3		≈ 4	111 13 141		6 ≤ R ≤ 9
1.7	> 12	Single-V butt weld with V root			60° ≤ α ≤ 90° 10° ≤ β ≤ 15°	2 ≤ b ≤ 4	> 2		111 13 141		
1.8	> 12	Single-U butt weld			8° ≤ β ≤ 12°	≤ 4	≤ 3		111 13 141		

<sup>1)</sup> For welding in position PC acc. to ISO 6947 (transverse position) also larger and / or non-symmetrical.

<sup>2)</sup> The dimensions quoted are for the tack-welded state.

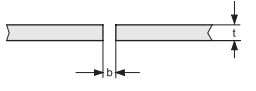
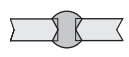

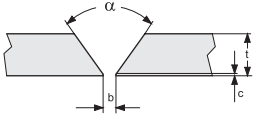
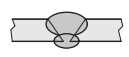

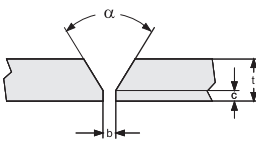
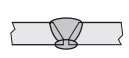

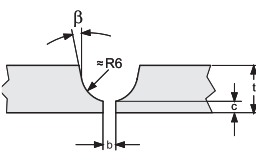
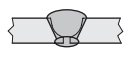
<sup>3)</sup> The reference to the welding process does not mean it can be used for the entire range of workpiece thicknesses.

<sup>4)</sup> With filler metal.



# Weld seam preparation for butt welds, double-sided welding

DIN EN ISO 9692-1 – Extract Table 2

Index	Work piece thickness t in mm	Bevel shape preparation type	Symbol (acc. to ISO 2553)	Cross section	Joint preparation				Recommended welding process <sup>3)</sup> (acc. to ISO 4063)	Illustration	Remarks
					Angle <sup>1)</sup> α, β	Gap <sup>2)</sup> b in mm	Thickness of root face c in mm	Depth of preparation h in mm			
2.1	≤ 8	Square butt weld				≈ t/2			111 141		
					≤ t/2			13			
	≤ 15				0			52			
2.2	3 ≤ t ≤ 40	Single-V butt weld			α ≈ 60°	≤ 3	≤ 2		111 141		Counter position is specified
					40° ≤ α ≤ 60°				13		
2.3	> 10	Single-Y butt weld			α ≈ 60°	1 ≤ b ≤ 3	2 ≤ c ≤ 4		111 141		In special cases also for smaller work piece thickness and Process 3 possible; Counter position is specified
					40° ≤ α ≤ 60°				13		
2.6	> 12	Single-U butt weld			8° ≤ β ≤ 12°	1 ≤ b ≤ 3	≈ 5		111 13		Counter position is specified
									≤ 3		

<sup>1)</sup> For welding in position PC acc. to ISO 6947 (transverse position) also larger and / or non-symmetrical.

<sup>2)</sup> The dimensions quoted are for the tack-welded state.

<sup>3)</sup> The reference to the welding process does not mean it can be used for the entire range of workpiece thicknesses.

# Materials comparison DIN / EN / ASTM

Finished parts

Pipes / Tubes				Flansche	
Material number	DIN	EN	ASTM	Material number	DIN
<b>Non-alloy</b>				<b>Non-alloy</b>	
1.0254	St 37.0	P235TR1	A 53 Grade A	1.0038	RSt 37-2
1.0570	St 52-3	S355J2H (1.0576)		1.0570	St 52-3
1.0305	St 35.8/I	P235GH TC1 (1.0345)	A 106 Grade A	1.0460	C 22.8
1.0305	St 35.8/III	P235GH TC2 (1.0345)		1.0432	C 21
1.0405	St 45.8/I	P265GH TC1 (1.0425)	A 106 Grade B	1.0352	
1.0405	St 45.8/III	P265GH TC2 (1.0425)			
<b>Alloyed heat-resistant</b>				<b>Alloyed heat-resistant</b>	
1.5415	15 Mo 3	16Mo3	A 335 Grade P1	1.5415	15 Mo 3
1.7335	13 CrMo 4 4	13CrMo4-5	A 335 Grade P11, P12	1.7335	13 CrMo 4 4
1.7380	10 CrMo 9 10	10CrMo9-10	A 335 Grade P22	1.7380	10 CrMo 9 10
1.7362	12 CrMo 19 5	X11CrMo5	A 335 Grade P5 A 335 Grade P9	1.7362	12 CrMo 19 5
1.4903		X10CrMoVNb9-1	A 335 Grade P91	1.4903	
<b>Low temperature</b>				<b>Low temperature</b>	
1.5637	10 Ni 14	X12Ni14	A 333 Grade 3	1.5637	10 Ni 14
1.0356	TTSt 35 N	P215NL (1.0451)	A 333 Grade 1	1.0566	TStE 355
1.0356	TTSt 35 V	P255QL (1.0452) P265NL (1.0453)	A 333 Grade 6		
<b>Fine grain steels</b>				<b>Fine grain steels</b>	
1.0486	StE 285		API 5L Grade X42	1.0486	StE 285
1.0562	StE 355	P355N	API 5L Grade X52	1.0562	StE 355
1.8902	StE 420	P420N	API 5L Grade X60	1.8902	StE 420
1.8905	StE 460	P460N	API 5L Grade X70	1.8905	StE 460
<b>High yield steels</b>				<b>High yield steels</b>	
1.0457	StE 240.7	L245NB/L245NE	API 5L Grade B		
1.0484	StE 290.7	L290NB/L290NE	API 5L Grade X42		
1.0582	StE 360.7	L360NB/L360NE	API 5L Grade X52		
1.8972	StE 415.7	L415NB/L415NE	API 5L Grade X60		
<b>Stainless steel</b>				<b>Stainless steel</b>	
1.4307		X2CrNi18-9	A 312 Grade TP304L	1.4307	
1.4306	X 2 CrNi 19 11	X2CrNi19-11	A 312 Grade TP304L	1.4306	
1.4301	X 5 CrNi 18 10	X5CrNi18-10	A 312 Grade TP304	1.4301	X 5 CrNi 18 10
1.4541	X 6 CrNiTi 18 10	X6CrNiTi18-10	A 312 Grade TP321	1.4541	X 6 CrNiTi 18 10
1.4550	X 6 CrNiNb 18 10	X6CrNiNb18-10	A 312 Grade TP347	1.4550	X 6 CrNiNb 18 10
1.4404	X 2 CrNiMo 17 13 2	X2CrNiMo17-12-2	A 312 Grade TP316L	1.4404	X 2 CrNiMo 17 13 2
1.4401	X 5 CrNiMo 17 12 2	X5CrNiMo17-12-2	A 312 Grade TP316	1.4401	X 5 CrNiMo 17 12 2
1.4571	X 6 CrNiMoTi 17 12 2	X6CrNiMoTi17-12-2	A 312 Grade S 31635	1.4571	X 6 CrNiMoTi 17 12 2
1.4429	X 2 CrNiMoN 17 13 3	X2CrNiMoN17-13-3	UNS S31635	1.4429	X 2 CrNiMoN 17 13 3
1.4436	X 5 CrNiMo 17 13 3	X3CrNiMo17-13-3	A 312 Grade TP316	1.4436	X 5 CrNiMo 17 13 3
1.4435	X 2 CrNiMo 18 14 3	X2CrNiMo18-14-3	A 312 Grade TP316L	1.4435	X 2 CrNiMo 18 14 3
1.4439	X 2 CrNiMoN 17 13 5	X2CrNiMoN17-13-5	UNS N 31726	1.4439	X 2 CrNiMoN 17 13 5
1.4539	X 1 NiCrMoCuN 25 20 5	X1NiCrMoCu25-20-5	UNS N 08904 (904L)	1.4539	X 1 NiCrMoCuN 25 20 5
1.4547		X1CrNiMoCuN20-18-7	UNS S 31254	1.4547	
1.4529	X 1 NiCrMoCuN 25 20 6	X1NiCrMoCuN25-20-7	UNS N 08926	1.4529	X 1 NiCrMoCuN 25 20 6
1.4462	X 2 CrNiMoN 22 5 3	X2CrNiMoN22-5-3	UNS S 31803 (Duplex)	1.4462	X 2 CrNiMoN 22 5 3
1.4410		X2CrNiMoN25-7-4	UNS S 32750 (Superduplex)	1.4410	

		Buttwelding Fittings			
EN	ASTM	Material number	DIN	EN	ASTM
<b>Non-alloy</b>					
S235JR		1.0254	St 37.0	S235	
S355J2 (1.0577)					
P250GH		1.0305	St 35.8/I	P235GH (1.0345)	A 234 Grade WPA
	A 105	1.0305	St 35.8/III	P235GH (1.0345)	
P245GH		1.0405	St 45.8/I	P265GH (1.0425)	A 234 Grade WPB
		1.0405	St 45.8/III	P265GH (1.0425)	
<b>Alloyed heat-resistant</b>					
16Mo3	A 182 Grade F1	1.5415	15 Mo 3	16Mo3	A 234 Grade WP1
13CrMo4-5	A 182 Grade F11, F12	1.7335	13 CrMo 4 4	13CrMo4-5	A 234 Grade WP11, WP12
11CrMo9-10 (1.7383)	A 182 Grade F22	1.7380	10 CrMo 9 10	10CrMo9-10	A 234 Grade WP22
	A 182 Grade F5	1.7362	12 CrMo 19 5	X11CrMo5	A 234 Grade WP5
	A 182 Grade F9				A 234 Grade WP9
X10CrMoVNb9-1	A 182 Grade F91	1.4903		X10CrMoVNb9-1	A 234 Grade WP91
<b>Low temperature</b>					
12Ni14	A 350 Grade LF3	1.5637	10 Ni 14	12Ni14	A 420 Grade WPL3
P355QH1 (1.0571)	A 350 Grade LF2	1.0356	TTSt 35 N	P215NL (1.0451)	
		1.0356	TTSt 35 V		
				P265NL (1.0453)	A 420 Grade WPL6
<b>Fine grain steels</b>					
	A 694 Grade F42	1.0486	StE 285		A 860 Grade WPHY42
P355N	A 694 Grade F52	1.0562	StE 355	P355N	A 860 Grade WPHY52
P420N	A 694 Grade F60	1.8902	StE 420		A 860 Grade WPHY60
P460N	A 694 Grade F70	1.8905	StE 460		A 860 Grade WPHY70
<b>High yield steels</b>					
		1.0457	StE 240.7		
		1.0484	StE 290.7	L290NB/L290NE	A 860 Grade WPHY42
		1.0582	StE 360.7	L360NB/L360NE	A 860 Grade WPHY52
		1.8972	StE 415.7	L415NB/L415NE	A 860 Grade WPHY60
<b>Stainless steel</b>					
X2CrNi18-9	A 182 Grade F304L	1.4307		X2CrNi18-9	A 403 Grade WP304L
	A 182 Grade F304L	1.4306	X 2 CrNi 19 11	X2CrNi19-11	A 403 Grade WP304L
X5CrNi18-10	A 182 Grade F304	1.4301	X 5 CrNi 18 10	X5CrNi18-10	A 403 Grade WP304
X6CrNiTi18-10	A 182 Grade F321	1.4541	X 6 CrNiTi 18 10	X6CrNiTi18-10	A 403 Grade WP321
X6CrNiNb18-10	A 182 Grade F347	1.4550	X 6 CrNiNb 18-10	X6CrNiNb18-10	A 403 Grade WP347
X2CrNiMo17-12-2	A 182 Grade F316L	1.4404	X 2 CrNiMo 17 13 2	X2CrNiMo17-12-2	A 403 Grade WP316L
X5CrNiMo17-12-2	A 182 Grade F316	1.4401	X 5 CrNiMo 17 12 2	X5CrNiMo17-12-2	A 403 Grade WP316
X6CrNiMoTi17-12-2	A 182 Grade F316Ti	1.4571	X 6 CrNiMoTi 17 12 2	X6CrNiTi18-10	
X2CrNiMoN17-13-3	A 182 Grade F316LN	1.4429	X 2 CrNiMoN 17 13 3	X2CrNiMoN17-13-3	A 403 Grade WP316LN
X3CrNiMo17-13-3	A 182 Grade F316	1.4436	X 5 CrNiMo 17 13 3	X3CrNiMo17-13-3	A 403 Grade WP316
X2CrNiMo18-14-3	A 182 Grade F316L	1.4435	X 2 CrNiMo 18 14 3	X2CrNiMo18-14-3	A 403 Grade WP316LN
X2CrNiMoN17-13-5	A 182 Grade F48	1.4439	X 2 CrNiMoN 17 13 5	X2CrNiMoN17-13-5	UNS S 31726
X1NiCrMoCu25-20-5	A 182 Grade F904L	1.4539	X 1 NiCrMoCuN 25 20 5	X1NiCrMoCu25-20-5	UNS N 08904 (904L)
X1CrNiMoCuN20-18-7	A 182 Grade F44	1.4547		X1CrNiMoCuN20-18-7	UNS S 31254
X1NiCrMoCuN25-20-7	UNS N 08926	1.4529	X 1 NiCrMoCuN 25 20 6	X1NiCrMoCuN25-20-7	UNS N 08926
X2CrNiMoN22-5-3	A 182 Grade F51 (Duplex)	1.4462	X 2 CrNiMoN 22 5 3	X2CrNiMoN22-5-3	UNS S 31803 (Duplex)
X2CrNiMoN25-7-4	A 182 Grade F53 (Superduplex)	1.4410		X2CrNiMoN25-7-4	UNS S 32750 (Superduplex)

# Materials comparison DIN / EN / ASTM

Base material

## Forged materials

	DIN			EN			ASTM	
	Material Number	Material	Technical delivery conditions	Number	Material	Technical delivery conditions	A	Grade
Non-alloy	1.0038	RSt 37-2	17100	1.0038	S235JR	10025-2		
	1.0570	St 52.0	17100	1.0577	S355J2	10025-2		
Non-alloy heat-resistant	1.0460	C 22.8	17243	1.0352	P245GH	10222-2		
	1.0432	C 21	VdTÜV WB399/3	1.0460	P250GH	10222-2 NB <sup>1)</sup>		
Alloyed heat-resistant	1.5415	15 Mo 3	17243	1.5415	16Mo3	10222-2	182	F1
	1.7335	13 CrMo 44	17243	1.7335	13CrMo4-5	10222-2	182	F12
	1.7380	10 CrMo 9 10	17243				182	F22
Low temperature	1.5637	10 Ni 14	17280	1.5637	12Ni14	10222-3	350	LF3
	1.0566	TStE 355	17103				350	LF2
Fine grained steel	1.0477	WStE 285	17103	1.0477	P285NH	10222-4	694	F42
	1.0565	WStE 355	17103	1.0565	P355NH	10222-4	694	F52
	1.8932	WStE 420	17103	1.8932	P420NH	10222-4	694	F60
Stainless steel	1.4301	X 5 CrNi 18 10	17440	1.4301	X5CrNi18-10	10222-5	182	F304
	1.4306	X 2 CrNi 19 11	17440	1.4307	X2CrNi18-9	10222-5	182	F304L
	1.4541	X 6 CrNiTi 18 10	17440	1.4541	X6CrNiTi18-10	10222-5	182	F321
	1.4401	X 5 CrNi 17 12 2	17440	1.4401	X5CrNiMo17-12-2	10222-5	182	F316
	1.4404	X 2 CrNiMo 17 13 2	17440	1.4404	X2CrNiMo17-12-2	10222-5	182	F316L
	1.4571	X 6 CrNiMoTi 17 12 2	17440	1.4571	X6CrNiMoTi17-12-2	10222-5	182	F316Ti
	1.4529	X 1 NiCrMoCuN 25 20 6	VdTÜV WB 502	1.4529	X1NiCrMoCuN25-20-7	10222-5		
	1.4539	X 1 NiCrMoCu 25 20 5	VdTÜV WB 421	1.4539	X1NiCrMoCu25-20-5	10222-5	182	F904L
1.4462	X 2 CrNiMoN 22 5 3	VdTÜV WB 418	1.4462	X2CrNiMoN22-5-3	10222-5	182	F51	

<sup>1)</sup> The steel grade P250GH is available in Germany and widely used there. For systems requiring monitoring (such as TRD, PED, AD 2000 data sheets, TRG, TRbF, TRFL and KTA) the VdTÜV WB 350/3 is used.

## Seamless pipes

	DIN			EN			ASME	
	Material Number	Material	Technical delivery conditions	Material Number	Material	Technical delivery conditions	ASTM	Grade
Non-alloy	1.0254	St 37.0	1629	1.0254	P235TR1	10216-1		
	1.0256	St 44.0	1629	1.0258	P265TR1	10216-1		
	1.0421	St 52.0	1629					
Non-alloy heat-resistant	1.0305	St 35.8	17175	1.0345	P235GH	10216-2	A 106	A
	1.0405	St 45.8	17175	1.0425	P265GH	10216-2	A 106	B
Alloyed heat-resistant	1.5415	15 Mo 3	17175	1.5415	16Mo3	10216-2	A 335	P 1
	1.7335	13 CrMo 4 4	17175	1.7335	13CrMo4-5	10216-2	A 355	P 11
	1.7380	10 CrMo 9 10	17175	1.7380	10CrMo9-10	10216-2	A 355	P 22
Low temperature	1.0356	TTSt 35 N	17173	1.0451	P215NL	10216-4	A 333	1
	1.0356	TTSt 35 V	17173	1.0452	P255QL	10216-4		
	1.5637	10 Ni 14	17173	1.5637	12Ni14	10216-4	A 333	3
	1.5680	12 Ni 19	17173	1.5680	X12Ni5	10216-4		
Fine grained steel	1.0562	StE 355	17179	1.0562	P355N	10216-3		
	1.0565	WStE 355	17179	1.0565	P355NH	10216-3		
	1.0566	TStE 355	17179	1.0566	P355NL1	10216-3		
	1.1106	ESStE 355	17179	1.1106	P355NL2	10216-3		
High yield steels	1.0457	St 240.7	17172	1.0457	L245NB	10208-2	API 5L	B
	1.0484	St 290.7	17172	1.0484	L290NB	10208-2	API 5L	X42
	1.0582	StE 360.7	17172	1.0582	L360NB	10208-2	API 5L	X52
	1.8972	StE 415.7	17172	1.8972	L415NB	10208-2	API 5L	X60
Stainless steel	1.4301	X 5 CrNi 18 10	17458	1.4301	X5CrNi18-10	10216-5	A 312	TP304
	1.4306	X 2 CrNi 19 11	17458	1.4307	X2CrNi18-9	10216-5	A 312	TP304L
	1.4541	X 6 CrNiTi 18 10	17440	1.4541	X6CrNiTi18-10	10222-5	182	TP321
	1.4401	X 5 CrNi 17 12 2	17440	1.4401	X5CrNiMo17-12-2	10222-5	182	TP316
	1.4404	X 2 CrNiMo 17 13 2	17440	1.4404	X2CrNiMo17-12-2	10222-5	182	TP316L
	1.4571	X 6 CrNiMoTi 17 12 2	17458	1.4571	X6CrNiMoTi17-12-2	10216-5		
	1.4529	X 1 NiCrMoCuN 25 20 6	VdTÜV WB 502	1.4529	X1NiCrMoCuN25-20-7	10216-5	A 312	N 08926
	1.4539	X 1 NiCrMoCu 25 20 5	VdTÜV WB 421	1.4539	X1NiCrMoCu25-20-5	10216-5	A 312	N 08904
	1.4462	X 2 CrNiMoN 22 5 3	VdTÜV WB 418	1.4462	X2CrNiMoN22-5-3	10216-5		

## Notes for elbows and butt welding fittings made from seamless pipe

**DIN** The technical delivery conditions for elbows and butt welding fittings are standardised in DIN 2609. The material description and technical delivery conditions will not change.

**EN** The technical delivery conditions for elbows and butt welding fittings are standardised in EN 10253. The material description and technical delivery conditions will not change.

**ASTM** Processing the seamless pipe acc. to ASME changes the quality standard as follows:

- Non-alloy heat-resistant – ASTM A 234 Grade WP ... (s.a.)
- Alloy heat-resistant – ASTM A 234 Grade W ... (s.a.)
- Low temperature – ASTM A 420 Grade WPL ... (s.a.)
- High yield steels – ASTM A 860 Grade WPHY ... (s.a.)
- Stainless steel – ASTM A 403 Grade W ... (s.a.)



# Materials comparison DIN / EN / ASTM

Base material

## Sheet metals

	DIN			EN			ASTM	
	Material Number	Material	Technical delivery conditions	Material Number	Material	Technical delivery conditions	A	Grade
Non-alloy	1.0038	RSt 37-2	17100	1.0038	S235JR	10025-2		
	1.0570	St 52-3	17100	1.0577	S355J2	10025-2		
Non-alloy heat-resistant	1.0460	C 22.8	VdTÜV WB 350/1					
	1.0425	H II	17155	1.0425	P265GH	10028-2	515	55
Alloyed heat-resistant	1.5415	15 Mo 3	17155	1.5415	16Mo3	10028-2	204	A
	1.7335	13 CrMo 44	17155	1.7335	13CrMo4-5	10028-2	387	11
	1.7380	10 CrMo 9 10	17155	1.7380	10CrMo9-10	10028-2	387	22
Low temperature	1.5637	10 Ni 14	17280	1.5637	12Ni14	10028-4	203	D
	1.5680	12 Ni 19	17280	1.5680	X12Ni5	10028-4		
Fine grained steel	1.0487	WStE 285	17102	1.0487	P275NH	10028-3	515	60
	1.0488	TStE 285	17102	1.0488	P275NL1	10028-3	516	60
	1.1104	EStE 285	17102	1.1104	P275NL2	10028-3		
	1.0562	StE 355	17102	1.0562	P355N	10028-3		
	1.0565	WStE 355	17102	1.0565	P355NH	10028-3	515	70
	1.0566	TStE 355	17102	1.0566	P355NL1	10028-3	516	70
	1.1106	EStE 355	17102	1.1106	P355NL2	10028-3		
	1.8935	WStE 460	17102	1.8935	P460NH	10028-3		
	1.8915	TStE 460	17102	1.8915	P460NH1	10028-3		
	1.8918	EStE 460	17102	1.8918	P460NH2	10028-3		
Stainless steel	1.4301	X 5 CrNi 18 10	17440	1.4301	X5CrNi18-10	10028-7	240	304
	1.4306	X 2 CrNi 19 11	17440	1.4307	X2CrNi 18-9	10028-7	240	304L
	1.4541	X 6 CrNiTi 18 10	17440	1.4541	X6CrNiTi18-10	10222-5	240	321
	1.4401	X 5 CrNi 17 12 2	17440	1.4401	X5CrNiMo17-12-2	10222-5	240	316
	1.4404	X 2 CrNiMo 17 13 2	17440	1.4404	X2CrNiMo17-12-2	10222-5	240	316L
	1.4571	X 6 CrNiMoTi 17 12 2	17440	1.4571	X6CrNiMoTi17-12-2	10028-7	240	316Ti
	1.4529	X 1 NiCrMoCuN 25 20 6	VdTÜV WB 502	1.4529	X1NiCrMoCuN25-20-7	10028-7		
	1.4539	X 1 NiCrMoCu 25 20 5	VdTÜV WB 421	1.4539	X1NiCrMoCu25-20-5	10028-7	240	904L
1.4462	X 2 CrNiMoN 22 5 3	VdTÜV WB 418	1.4462	X2CrNiMoN 22-5-3	10028-7	240	S 31803	

## Welded pipes

	DIN			EN			ASME	
	Material Number	Material	Technical delivery conditions	Material Number	Material	Technical delivery conditions	A	Grade
Non-alloy	1.0254	St 37.0	1626	1.0254	P235TR1	10217-1		
	1.0256	St 44.0	1626	1.0258	P265TR1	10217-1		
	1.0421	St 52.0	1626					
Non-alloy heat-resistant	1.0315	St 37.8	17177	1.0345	P235GH	10217-2/5		
	1.0498	St 42.8	17177	1.0425	P265GH	10217-2/5		
Alloyed heat-resistant	1.5415	15 Mo 3	17177	1.5415	16Mo3	10217-2/5		
Low temperature	1.0356	TTSt 35 N	17174	1.0451	P215NL	10217-4/6	333	1
	1.0356	TTSt 35 V	17174	1.0452	P255QL	10217-4/6		
	1.5637	10 Ni 14	17174	1.5637	12Ni14	10217-4/6	333	3
	1.5680	12 Ni 19	17174	1.5680	X12Ni5	10217-4/6		
Fine grained steel	1.0562	StE 355	17178	1.0562	P355N	10217-3		
	1.0565	WStE 355	17178	1.0565	P355NH	10217-3		
	1.0566	TStE 355	17178	1.0566	P355NL1	10217-3		
	1.1106	ESTe 355	17178	1.1106	P355NL2	10217-3		
High yield steels	1.0457	St 240.7	17172	1.0457	L245NB	10208-2	API 5L	B
	1.0484	St 290.7	17172	1.0484	L290NB	10208-2	API 5L	X42
	1.0582	StE 360.7	17172	1.0582	L360NB	10208-2	API 5L	X52
	1.8972	StE 415.7	17172	1.8972	L415NB	10208-2	API 5L	X60
Stainless steel	1.4301	X 5 CrNi 18 10	17457	1.4301	X5CrNi18-10	10217-7	312	TP304
	1.4306	X 2 CrNi 19 11	17457	1.4307	X2CrNi18-9	10217-7	312	TP304L
	1.4541	X 6 CrNiTi 18 10	17457	1.4541	X6CrNiTi18-10	10217-7	312	TP321
	1.4401	X 5 CrNi 17 12 2	17457	1.4401	X5CrNiMo17-12-2	10217-7	312	TP316
	1.4404	X 2 CrNiMo 17 13 2	17457	1.4404	X2CrNiMo17-12-2	10217-7	312	TP316L
	1.4571	X 6 CrNiMoTi 17 12 2	17457	1.4571	X6CrNiMoTi17-12-2	10217-7		
	1.4529	X 1 NiCrMoCuN 25 20 6	VdTÜV WB 502	1.4529	X1NiCrMoCuN25-20-7	10217-7	312	N 08926
	1.4539	X 1 NiCrMoCu 25 20 5	VdTÜV WB 421	1.4539	X1NiCrMoCu25-20-5	10217-7	312	N 08904
1.4462	X 2 CrNiMoN 22 5 3	VdTÜV WB 418	1.4462	X2CrNiMoN22-5-3	10217-7			

**Notes for elbows and butt welding fittings made from welded pipe**

**DIN** The technical delivery conditions for elbows and butt welding fittings are standardised in DIN 2609.

The material description and technical delivery conditions will not change.

**EN** The technical delivery conditions for elbows and butt welding fittings are standardised in EN 10253.

The material description and technical delivery conditions will not change.

**ASTM** Processing the welded pipe acc. to ASME changes the quality standard as follows:

Low temperature – ASTM A 420 Grade WPL ... (s.a.)

High yield steels – ASTM A 860 Grade WPHY ... (s.a.)

Stainless steel – ASTM A 403 Grade W ... (s.a.)

# Wall thickness table DIN EN / ISO / ASME

NPS		Outside diameter in mm			DIN / ISO Wall thicknesses in mm					Wall thicknesses acc. to DIN EN 10253-2 in mm								Ø in mm NPS		
DN	ZOLL	DIN	ISO	EN	1	2	3	4	5	1	2	3	4	5	6	7	8	ASME	DN	ZOLL
15	½"	20,0	21,3	21,3	1,6		2,0	3,2	4,0		2,0	2,6	3,2	4,0		5,0	7,1	21,3	15	½"
20	¾"	25,0	26,9	26,9	1,6		2,3	3,2	4,0		2,3	2,6	3,2	4,0	4,5	5,6	8,0	26,7	20	¾"
25	1"	30,0	33,7	33,7	2,0		2,6	3,2	4,0		2,6	3,2	<b>4,0</b>	<b>4,5</b>	5,6	6,3	8,8	33,4	25	1"
32	1¼"	38,0	42,4	42,4	2,0		2,6	3,6	4,0		2,6	3,6	<b>4,0</b>	<b>5,0</b>	6,3	8,0	10,0	42,2	32	1¼"
40	1½"	44,5	48,3	48,3	2,0		2,6	4,0	5,0		2,6	3,6	4,0	5,0	6,3	8,0	10,0	48,3	40	1½"
50	2"	57,0	60,3	60,3	2,0		2,9	4,5	5,6		2,9	3,6	<b>4,0</b>	5,6	7,1	8,8	11,0	60,3	50	2"
	2½"			73,0							2,9	3,6	4,5	7,1			14,2	73,0		2½"
65		76,1	76,1	76,1	2,3		2,9	5,0	7,1		2,9	3,6	<b>5,6</b>	7,1	8,0	10,0	14,2		65	
80	3"	88,9	88,9	88,9	2,3		3,2	5,6	8,0		3,2	4,0	5,6	8,0	8,8	11,0	16,0	88,9	80	3"
	3½"			101,6							3,6	4,0	5,6	8,0				101,6		3½"
100	4"	108,0	114,3	114,3	2,6		3,6	6,3	8,8		3,6	4,5	6,3	8,8	11,0	14,2	17,5	114,3	100	4"
125		133,0	139,7	139,7	2,6		4,0	6,3	10,0		4,0	5,0	6,3	10,0	12,5	16,0	20,0		125	
	5"			141,3							4,0	5,4	6,3	10,0		16,0	20,0	141,3		5"
150	6"	159,0	168,3	168,3	2,6	4,0	4,5	7,1	11,0		4,0	4,5	5,6	7,1	11,0	14,2	17,5	168,3	150	6"
200	8"	216,0	219,1	219,1	2,9	4,5	6,3	8,0	12,5		4,5	6,3	7,1	8,0	12,5	16,0	17,5	219,1	200	8"
250	10"	267,0	273,0	273,0	2,9	5,0	6,3	8,8	14,2		5,0	6,3	8,8	<b>10,0</b>	<b>12,5</b>	16,0	22,2	273,0	250	10"
300	12"	318,0	323,9	323,9	2,9	5,6	7,1	10,0	16,0		5,6	7,1	8,8	10,0	<b>12,5</b>	17,5	25,0	323,8	300	12"
350	14"	368,0	355,6	355,6	3,2	5,6	8,0	11,0	17,5		5,6	8,0	10,0	<b>12,5</b>	<b>16,0</b>	20,0	28,0	355,6	350	14"
400	16"	419,0	406,4	406,4	3,2	6,3	8,8	12,5	20,0		6,3	8,8	10,0	12,5	<b>17,5</b>	22,2	30,0	406,4	400	16"
450	18"	470,0	457,0	457,0	4,0	6,3	10,0	14,2	22,2		6,3	10,0	11,0	<b>12,5</b>	<b>17,5</b>	22,2	32,0	457,0	450	18"
500	20"	521,0	508,0	508,0	4,0	6,3	11,0	16,0	25,0		6,3	<b>10,0</b>	11,0	<b>12,5</b>	<b>17,5</b>	25,0	36,0	508,0	500	20"
600	24"	622,0	610,0	610,0	5,0	6,3	12,5	17,5	30,0		6,3	<b>10,0</b>	12,5	17,5	<b>25,0</b>	30,0	45,0	610,0	600	24"
700	28"	720,0	711,0	711,0	5,0	7,1	12,5				7,1	<b>10,0</b>	12,5	25,0				711,0	700	28"
800	32"	820,0	813,0	813,0	5,6	8,0	12,5				8,0	<b>10,0</b>	12,5	<b>25,0</b>				813,0	800	32"
900	36"	920,0	914,0	914,0	6,3	10,0	12,5				10,0	12,5	20,0	<b>25,0</b>				914,0	900	36"
1000	40"	1020,0	1016,0	1016,0	6,3	10,0	12,5				10,0	12,5	20,0	<b>25,0</b>				1016,0	1000	40"
1200	48"	1220,0	1219,0	1219,0	6,3	12,5					<b>10,0</b>	12,5	20,0	25,0				1219,0	1200	48"

NPS Nominal Pipe Size  
 DN Diameter Nominal  
 PN Pressure Nominal  
 Ø Outside diameter

- EN series 1 = standard wall welded carbon steel equivalent to DN 1000 DIN/ISO series 2
- EN series 2 = standard wall seamless carbon steel equivalent to DN 450 DIN/ISO series 3
- EN series 3 = new wall thickness schedule from DIN 2448, below the DIN/ISO series 4, from DN 500–DN 800 DIN/ISO series 3
- EN series 4 = similar to DIN/ISO series 4
- EN series 5 = similar to DIN/ISO series 5
- EN series 6–8 = new wall thickness series, very thick-walled, in some areas in consistent with ASME schedules
- For buttwelding fittings acc. to DIN EN 10253-4 (stainless steel), wall thickness acc. to DIN EN ISO 1127 (stainless steel pipes) = old DIN/ISO series 1

Wall thicknesses in mm / Schedule acc. to ASME B 36.10																	
Wall thicknesses series ASME B 36.19 / Stainless steel Series 5 S, 10 S, 40 S, 80 S																	
5 S	5	10 S	10	20	30	40 S	STD	40	60	80 S	XS	80	100	120	140	160	XXS
1,65	1,65	2,11	2,11		2,41	2,77	2,77	2,77		3,73	3,73	3,73				4,78	7,47
1,65	1,65	2,11	2,11		2,41	2,87	2,87	2,87		3,91	3,91	3,91				5,56	7,82
1,65	1,65	2,77	2,77		2,90	3,38	3,38	3,38		4,55	4,55	4,55				6,35	9,09
1,65	1,65	2,77	2,77		2,97	3,56	3,56	3,56		4,85	4,85	4,85				6,35	9,70
1,65	1,65	2,77	2,77		3,18	3,68	3,68	3,68		5,08	5,08	5,08				7,14	10,15
1,65	1,65	2,77	2,77		3,18	3,91	3,91	3,91		5,54	5,54	5,54				8,74	11,07
2,11	2,11	3,05	3,05		4,78	5,16	5,16	5,16		7,01	7,01	7,01				9,53	14,02
2,11	2,11	3,05	3,05		4,78	5,49	5,49	5,49		7,62	7,62	7,62				11,13	15,24
2,11	2,11	3,05	3,05		4,78	5,74	5,74	5,74		8,08	8,08	8,08					
2,11	2,11	3,05	3,05		4,78	6,02	6,02	6,02		8,56	8,56	8,56		11,13		13,49	17,12
2,77	2,77	3,40	3,40			6,55	6,55	6,55		9,53	9,53	9,53		12,70		15,88	19,05
2,77	2,77	3,40	3,40			7,11	7,11	7,11		10,97	10,97	10,97		14,27		18,26	21,95
2,77	2,77	3,76	3,76	6,35	7,04	8,18	8,18	8,18	10,31	12,70	12,70	12,70	15,09	18,26	20,62	23,01	22,23
3,40	3,40	4,19	4,19	6,35	7,80	9,27	9,27	9,27	12,70	12,70	12,70	15,09	18,26	21,44	25,40	28,58	25,40
3,96	3,96	4,57	4,57	6,35	8,38	9,53	9,53	10,31	14,27	12,70	12,70	17,48	21,44	25,40	28,58	33,32	25,40
3,96	3,96	4,78	6,35	7,92	9,53	9,53	9,53	11,13	15,09	12,70	12,70	19,05	23,83	27,79	31,75	35,71	
4,19	4,19	4,78	6,35	7,92	9,53	9,53	9,53	12,70	16,66	12,70	12,70	21,44	26,19	30,96	36,53	40,49	
4,19	4,19	4,78	6,35	7,92	11,13	9,53	9,53	14,27	19,05	12,70	12,70	23,83	29,36	34,93	39,67	45,24	
4,78	4,78	5,54	6,35	9,53	12,70	9,53	9,53	15,09	20,62	12,70	12,70	26,19	32,54	38,10	44,45	50,01	
5,54	5,54	6,35	6,35	9,53	14,27	9,53	9,53	17,48	24,61	12,70	12,70	30,96	38,89	46,02	52,37	59,54	
			7,92	12,70	15,88		9,53				12,70						
			7,92	12,70	15,88		9,53	17,48			12,70						
			7,92	12,70	15,88		9,53	19,05			12,70						
							9,53				12,70						
							9,53				12,70						

The EN series 3 + 4 include thick-walled designs for seamless and welded fittings.

The EN series 5–8 are purely for seamless equipment and end at DN 600.

**Wall thicknesses:** The **bolded** wall thicknesses have been changed compared to the old DIN / ISO wall thicknesses.



# Wall thickness calculation for pipes

Wall thickness calculations of pipes under internal pressure are carried out according to the following formulas:

Calculation acc. to AD 2000 Data Sheet B 1	
<b>Formula</b>	$s = \frac{D_a \times p}{20^{1)} \times \frac{K}{S} \times v + p} + c_1$
<sup>1)</sup> Constant acc. to calculation as per AD 2000 Data Sheet B 1	
<b>Area of application</b>	$\frac{D_a}{D_i} \leq 1,2$
Pipes with an outside diameter ratio of	
For pipes with $D_a \geq 200$ mm, is valid up to an outside diameter ratio of	$\frac{D_a}{D_i} \leq 1,7$

Calculation acc. to AD 2000 Data Sheet B 10	
<b>Formula</b>	$s = \frac{D_a \times p}{23^{1)} \times \frac{K}{S} \times v - p} + c_1 + c_2$
<sup>1)</sup> Constant acc. to calculation as per AD 2000 Data Sheet B 10	
<b>Area of application</b>	$1,2 \leq \frac{D_a}{D_i} \leq 1,7$
For pipes with $D_a \geq 200$ mm and an outside diameter ratio of	

## Strength value acc. to DIN EN 10028-2 or DIN EN 10088-2 (excerpt)

Material P235GH	Material 16Mo3	Material 1.4541	Material 1.4571
50° C = 227 N/mm <sup>2</sup>	50° C = 273 N/mm <sup>2</sup>	20° C = 240 N/mm <sup>2</sup>	20° C = 260 N/mm <sup>2</sup>
100° C = 214 N/mm <sup>2</sup>	100° C = 264 N/mm <sup>2</sup>	100° C = 208 N/mm <sup>2</sup>	100° C = <b>218</b> N/mm <sup>2</sup>
150° C = 198 N/mm <sup>2</sup>	150° C = 250 N/mm <sup>2</sup>	150° C = 196 N/mm <sup>2</sup>	150° C = 206 N/mm <sup>2</sup>
200° C = 182 N/mm <sup>2</sup>	200° C = 233 N/mm <sup>2</sup>	200° C = 186 N/mm <sup>2</sup>	200° C = 196 N/mm <sup>2</sup>
250° C = 167 N/mm <sup>2</sup>	250° C = 213 N/mm <sup>2</sup>	250° C = 177 N/mm <sup>2</sup>	250° C = 186 N/mm <sup>2</sup>
300° C = 153 N/mm <sup>2</sup>	300° C = 194 N/mm <sup>2</sup>	300° C = 167 N/mm <sup>2</sup>	300° C = 175 N/mm <sup>2</sup>
350° C = 142 N/mm <sup>2</sup>	350° C = 175 N/mm <sup>2</sup>	350° C = 161 N/mm <sup>2</sup>	350° C = 169 N/mm <sup>2</sup>
400° C = 133 N/mm <sup>2</sup>	400° C = 159 N/mm <sup>2</sup>	-	-
Basis: Product thickness $t \leq 16$ mm		Basis: Heat-treatment condition: solution-annealed	

The **sample calculation** is based on a stainless steel pipe made of material 1.4571 with an outside diameter ( $D_a$ ) of 114.3 mm. The connected pump station generates an operating pressure ( $p$ ) of 45 bar at an operating temperature of 100°C. The pipes were manufactured with an efficiency of weld ( $v$ ) of 1.0. For the wall thickness calculation, a safety factor ( $S$ ) of **1.5**, as per AD-2000 data sheet B0, must be considered.

Calculation example as per AD 2000 Data Sheet B 1	
Pipe outside diameter $\varnothing$	$D_a = 114.3$ mm
Material	1.4571
Operating temperature	100° C K = <b>218</b> N/mm <sup>2</sup>
Efficiency of weld	$v = 1.0$
Operating pressure	45 bar ( $p = 45$ )
	$s = \frac{114,3 \times 45}{20 \times \frac{218}{1,5} \times 1 + 45}$
Theoretical minimum wall thickness: $s = 1.74$ mm	

- $D_a$**  Outside diameter (mm)
- $D_i$**  Inner diameter (mm)
- $s$**  Required wall thickness (mm)
- $S$**  Safety factor as per AD data sheet B0
- $p$**  Design pressure (bar)
- $c_1$**  Excess to compensate for the wall thickness tolerance
- $c_2$**  Abrasion excess (mm)
- $v$**  Factor for ensuring the weld seam quality (for welded pipe only)
- $K$**  Strength value (in N/mm<sup>2</sup>)

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# Pipe construction standards

Directives, Rules, Regulations		Standard
Directives for pressure equipment		PED 97/23/EC
Pressure Equipment Regulation (14.Change of the GPSG)		Pressure equipment
Technical basics		Standard
<b>Symbolic representation for use on engineering drawings</b>		
Basic requirements		DIN 2429-1
Functional representation		DIN 2429-2
<b>Guide for procurement of power station plant, equipment and systems</b>		
High pressure piping systems		DIN EN 45510-7-1
Boiler and high pressure piping valves		DIN EN 45510-7-2
Pipeline components-Definition and selection of DN (diameter nominal)		DIN EN ISO 6708
Fluid power systems and components-Nominal pressures		ISO 2944
Identification of pipelines according to the fluid conveyed		DIN 2403
Technical rules		Standard
Pressure equipment		DIN EN 764-1 to 7
Water tube boilers and auxiliary installations		DIN EN 12952-1 to 16
Shell boilers		DIN EN 12953-1 to 12
Unfired pressure vessels		DIN EN 13445-1 to 8
Metallic industrial piping		DIN EN 13480-1 to 8
Pressure equipment for refrigerating systems and heat pumps		DIN EN 14276-1 to 2
Technical Basic Standards		Standard
Definition and classification of grades of steel		DIN EN 10020
<b>Designation systems for steels</b>	Steel names	DIN EN 10027-1
	Numerical systems	DIN EN 10027-2
Designation systems for steel. Additional symbols		CR 10260
Seamless and welded steel tubes – Dimensions and masses per unit length		DIN EN 10220
Metallic products – Types of inspection documents		DIN EN 10204
Stainless steel tubes – dimensions, tolerances and conventional masses per unit length		DIN EN ISO 1127
Publicly Available Specifications		Standard
<b>Pipe classes for process plants</b>		
Basic requirements for the development of pipe classes on the basis of EN 13480		DIN 21057-1
Pipe fittings – Special designs		DIN 21057-5
Flanges for automated welding processes		DIN 21057-6
Technical delivery conditions for pipe components made from non-alloy and alloy steels with specified elevated temperature properties. Group 1.1 and 1.2 (CR ISO 15608)		DIN 21057-10
Technical delivery conditions for pipe components made from austenitic stainless steels, Group 8.1 (CR ISO 15608)		DIN 21057-11
Standard pipe classes PN 10 to PN 100 – Pipe components made from non-alloy and alloy steels with specified elevated temperature properties. Group 1.1 and 1.2 and austenitic stainless steels, Group 8.1 (CR ISO 15608)		DIN 21057-101
Seamless steel tubes for pressure purposes		Standard
Non-alloy steel tubes with specified room temperature properties		DIN EN 10216-1
Non-alloy and alloy steel tubes with specified elevated temperature properties		DIN EN 10216-2
Alloy fine grain steel tubes		DIN EN 10216-3
Non-alloy and alloy steel tubes with specified low temperature properties		DIN EN 10216-4
Stainless steel tubes		DIN EN 10216-5
Welded steel tubes for pressure purposes		Standard
Non-alloy steel tubes with specified room temperature properties		DIN EN 10217-1
Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties		DIN EN 10217-2
Alloy fine grain steel tubes		DIN EN 10217-3
Electric welded non-alloy steel tubes with specified low temperature properties		DIN EN 10217-4
Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties		DIN EN 10217-5
Submerged arc welded non-alloy steel tubes with specified low temperature properties		DIN EN 10217-6
Stainless steel tubes		DIN EN 10217-7
Steel pipes for pipelines for combustible fluids		Standard
Pipes for pipelines for combustible fluids	Requirement class A	DIN EN 10208-1
	Requirement class B	DIN EN 10208-2
Petroleum and natural gas industries – Steel pipe for pipeline transportation systems		DIN EN ISO 3183
Flat products and forgings		Standard
Steel forgings for pressure purposes		DIN EN 10222-1 to 5
Flat products made of steels for pressure purposes		DIN EN 10028-1 to 6

Piping equipment		Standard
Threaded steel pipe fittings		DIN EN 10241
Malleable iron fittings		DIN EN 10242
Buttwelding pipe fittings – Non-alloy and ferritic alloy steels with specific inspection requirements		DIN EN 10253-2
Buttwelding pipe fittings – Austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements		DIN EN 10253-4
Guideline for the ordering and manufacturing of pressure equipment according to PED 97/23/EC		Standard
General requirement		PAS 1010-1
Unfired pressure vessels		PAS 1010-2
Industrial piping		PAS 1010-3
Pressure equipment		PAS 1010-4
Equipment with safety function		PAS 1010-5
Package units		PAS 1010-6
Flanges and their joints		Standard
<b>Circular flanges PN designated</b>	Steel flanges	DIN EN 1092-1
	Cast iron flanges	DIN EN 1092-2
	Copper alloy flanges	DIN EN 1092-3
	Aluminium alloy flanges	DIN EN 1092-4
<b>Gaskets for PN-designated flanges</b>		
Non-metallic flat gaskets with or without inserts		DIN EN 1514-1
Spiral wound gaskets for use with steel flanges		DIN EN 1514-2
Non-metallic PTFE envelope gaskets		DIN EN 1514-3
Corrugated flat or grooved metallic and filled metallic gaskets for use with steel flanges		DIN EN 1514-4
Covered serrated metal gaskets for use with steel flanges		DIN EN 1514-6
Covered metal jacketed gaskets for use with steel flanges		DIN EN 1514-7
Polymeric O-Ring gaskets for grooved flanges		DIN EN 1514-8
<b>Circular flanges for pipes, valves, fittings and equipment, class designated</b>		
Steel flanges, NPS 1/2 to 24		DIN EN 1759-1
Copper alloy flanges		DIN EN 1759-3
Aluminium alloy flanges		DIN EN 1759-4
<b>Gaskets for class-designated flanges</b>		
Non-metallic flat gaskets with or without inserts		DIN EN 12560-1
Spiral wound gaskets		DIN EN 12560-2
Non-metallic PTFE envelope gaskets		DIN EN 12560-3
Corrugated flat or grooved metallic and filled metallic gaskets		DIN EN 12560-4
Metallic ring-joint gaskets (RTJ)		DIN EN 12560-5
Covered serrated metal gaskets		DIN EN 12560-6
Covered metal jacketed gaskets		DIN EN 12560-7
Quality assurance inspection and testing of gaskets in accordance with the series of standards EN 1514 and EN 12560		DIN EN 14772
<b>Bolts and nuts</b>		
Selection of bolting and nuts		DIN EN 1515-1
Classification of bolt materials for steel flanges, PN designated		DIN EN 1515-2
Classification of bolt materials for steel flanges, Class designated		DIN EN 1515-3
Selection of bolting for equipment subject to the Pressure Equipment Directive 97/23/EC		DIN EN 1515-4
Design rules for gasketed circular flanges connections		Standard
Calculation method		DIN EN 1591-1
Background information		DIN EN 1591-1 Bbl 1
Gasket parameters		DIN EN 1591-2
Calculation method for metal to metal contact type flanged joint		DIN CEN/TS 1591-3
Qualification of personnel competency in the assembly of bolted joints fitted to equipment subject to the PED		DIN CEN/TS 1591-4
Calculation method for full face gasketed joints		DIN CEN/TS 1591-5
AD 2000		Standard
<b>Group W – Pressure vessel made from steel material</b>		
General principles for materials		W0
Non-alloy and alloy steel plates		W1
Austenitic stainless steels		W2
Non-alloy and alloy steel tubes		W4
Bolts and nuts-Ferritic Steel		W7
Steel flanges		W9
Materials for low temperature		W10
Non-alloy and alloy steel forgings		W13

# Comparing standards DIN / EN

<b>A Technical standards</b>		
<b>A 1 Dimension standards</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Outside diameter, wall thicknesses and weights for seamless and welded tubes and precision pipes		ISO 4200
Dimensions and conventional masses per unit length of seamless steel tubes	2448	10 220
Dimensions and conventional masses per unit length of welded steel tubes	2458	10 220
Dimensions and masses per unit length of welded austenitic stainless steel tubes	2463-1	ISO 1127 (ISO 5252)
Dimensions and masses per unit length of seamless stainless steel tubes	2462-1	ISO 1127 (ISO 5252)
Tongue PN 10-160	2512 Form F	1092-1 Form C
Groove PN 10-160	2512 Form N	1092-1 Form D
Male facing PN 10-100	2513 Form V	1092-1 Form E
Female PN 10-100	2513 Form R	1092-1 Form F
Male facing PN 10-40 / O-Ring	2514 Form V	1092-1 Form H
Female facing PN 10-40 / O-Ring	2514 Form R	1092-1 Form G
Technical terms of delivery for steel flanges	2519	1092-1
Flanges flat face without specification	2526 Form A	
Flanges flat face / Rz = 160 (not finer than 40 µm)	2526 Form B	1092-1 Form A
Flanges with raised face	2526 Form C, D, E	1092-1 Form B1, B2
Steel flanges ready for use, materials	2528	1092-1
Edge preparation, directives for grooves of the weld	2559	ISO 9692-1
Diaphragm seals	2695	
Groove for lens gasket	2696	
<b>A 2 Test standards</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Non-destructive testing, penetrant testing	54 152 T1	571-1
Non-destructive testing	54 111 T1	1435
Testing of steel, tensile test on welded joints, fusion welded butt joints	50 120 T1	895
Testing of steel, tensile test on welded joints, pressure welded butt joints	50 120 T2	895
Tensile testing-Method of test at ambient	50 125	10 002-1
Tensile testing-Method of testing at elevated temperature		10 002-5
Vickers hardness test, testing of metallic materials (test load range 49–980 N)	50 133 T1	ISO 6507-1
Vickers hardness test, testing of metallic materials (test load range 1.96–49 N)	50 133 T2	ISO 6508-1
Brinell hardness test, testing of metallic materials	50 351	10 003-1
Non-destructive bar impact test	50 115	10 045
Impact testing of metallic materials		10 246
Flattening test		10 233
Testing of metallic materials, ring tensile test on tubes	50 138	10 237
Testing of metallic materials, ring tensile test on tubes and tube strips	50 140	10 002-10
Testing of metallic materials, tensile test, hardness conversion table for Vickers, Brinell, and Rockwell hardness and tensile strength	50 145	10 002-10
Brinell hardness test, testing of metallic materials	50 351	10 003-1
Testing the resistance of stainless steels to intergranular corrosion	50 914	ISO 3651-2
Drift expanding test	50 135	10 234
Ring expanding test		10 236
Ring tensile test		10 237
<b>A 3 Standards for inner and outer coating</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Hot-dip galvanized coatings on fabricated iron and steel articles	1461	ISO 1461
Galvanising of steel tubes for installation purposes	2444	10 240
Internal lining with cement mortar for cast iron tubes, steel tubes and fittings	2614	10 298
Polyethylene coatings of steel pipes and fittings	30 670	10 285 / 10 287 / -88
Thermoset plastic coatings for buried steel pipes	30 671	
Polypropylene coatings	30 678	10 286
Corrosion protection	55 928	ISO 12 944
Deformation tolerance values	59 200	10 029



<b>B Quality standards</b>		
<b>B 1 Designation of steels</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Definition and classification of grades of steel	20	10 020
Designation systems for steels-short names	17 006	10 027-1
Designation systems for steels-numerical systems	17 007	10 027-2
<b>B 2 Definition of steel products</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Definition of steel products		10 079
Steel tubes, fittings and structural sections for structural steelwork		10 266
<b>B 3 Classification of steels</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Steels for general structural purposes	17 100	10 025
Steels for quenching and tempering and stainless steels	17 200	10 083
Stainless steels Part 1: list (such as SEW 400)		10 088
Fine grain steels	17 102	10 113

<b>C Product and quality standards</b>		
<b>C 1 Elbows</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Elbows without special test requirements of non-alloy and alloy steels	2605 T1	10 253-1
Elbows for internal pressure loading of non-alloy and alloy carbon steels	2605 T1/T2	10 253-2 Type A/B
Elbows without special test requirements of austenitic steels	2605 T1	10 253-3
Elbows for internal pressure loading of austenitic steels	2605 T1/T2	10 253-4 Type A/B
<b>C 2 Buttwelding fittings</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Buttwelding pipe fittings made from St35 (37.0), simple requirement		10 253-1
Tees without special test requirements of non-alloy and alloy steels	2615 T1	10 253-1
Reducers without special test requirements of non-alloy and alloy steels	2616 T1	10 253-1
Caps without special test requirements of non-alloy and alloy steels	2617	10 253-1
Tees for internal pressure loading of non-alloy and alloy carbon steels	2615 T1/T2	10 253-2 Type A/B
Reducers for internal pressure loading of non-alloy and alloy carbon steels	2616 T1/T2	10 253-2 Type A/B
Caps for internal pressure loading of non-alloy and alloy carbon steels	2617	10 253-2 Type A/B
Tees without special test requirements of austenitic steels	2615 T1	10 253-3
Reducers without special test requirements of austenitic steels	2616 T1	10 253-3
Caps without special test requirements of austenitic steels	2617	10 253-3
Tees for internal pressure loading of austenitic steels	2615 T1/T2	10 253-4 Type A/B
Reducers for internal pressure loading of austenitic steels	2616 T1/T2	10 253-4 Type A/B
Caps for internal pressure loading of austenitic steels	2617	10 253-4 Type A/B
<b>C 3 Steel fittings with thread</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Long screws	2981	10 241
Nipples, barrel nipples	2982	10 241
Elbows	2983	10 241
Sockets	2986	10 241
Crosses, tees, elbows	2987	10 241
Reduced sockets	2988	10 241
Hexagon bushings, hexagon nipples	2990	10 241
Plugs, caps	2991	10 241
Pipe unions	2993	10 241
Malleable cast iron pipe fittings	2950	10 242

# Comparing standards DIN / EN

C Product and quality standards			
C 4 Flanges		DIN standard	DIN EN 1092-1
Blind flanges	PN 6–400	2527 / PN 6–100	Type 05, PN 2.5–400
Oval screwed flanges	PN 6	2558	
Screwed flanges	PN 10 / 16	2566	Type 13, PN 10 / 16
Screwed flanges	PN 25 / 40	2567	Type 13, PN 25 / 40
Screwed flanges	PN 64	2568	Type 13, PN 63
Screwed flanges	PN 100	2569	Type 13, PN 100
Flanges for welding	PN 6	2573	Type 01, PN 6
Flanges for welding	PN 10	2576	Type 01, PN 10
Welding neck flanges	PN 1–2.5	2630	Type 11, PN 2.5
Welding neck flanges	PN 6	2631	Type 11, PN 6
Welding neck flanges	PN 10	2632	Type 11, PN 10
Welding neck flanges	PN 16	2633	Type 11, PN 16
Welding neck flanges	PN 25	2634	Type 11, PN 25
Welding neck flanges	PN 40	2635	Type 11, PN 40
Welding neck flanges	PN 64	2636	Type 11, PN 63
Welding neck flanges	PN 100	2637	Type 11, PN 100
Welding neck flanges	PN 160	2638	Type 11, PN 160
Welding neck flanges	PN 250	2628	Type 11, PN 250
Welding neck flanges	PN 320	2629	Type 11, PN 320
Welding neck flanges	PN 400	2627	Type 11, PN 400
Loose flanges for type 32	PN 6	2641	Type 02, PN 6
Weld-on collar	PN 6	2641	Type 32, PN 6
Pressed collar	PN 6	2641	Type 37, PN 6
Loose flanges for type 32	PN 10	2642	Type 02, PN 10
Weld-on collar	PN 10	2642	Type 32, PN 10
Pressed collar	PN 10	2642	Type 37, PN 10
Loose flanges for type 32	PN 25	2655	Type 02, PN 25
Weld-on collar	PN 25	2655	Type 32, PN 25
Loose flanges for type 32	PN 40	2656	Type 02, PN 40
Weld-on collar	PN 40	2656	Type 32, PN 40
Loose flanges for type 34	PN 10	2673	Type 04, PN 10
Welding neck collar	PN 10	2673	Type 34, PN 10
Loose flanges for type 34	PN 16	2674	Type 04, PN 16
Welding neck collar	PN 16	2674	Type 34, PN 16
Loose flanges for type 34	PN 25	2675	Type 04, PN 25
Welding neck collar	PN 25	2675	Type 34, PN 25
Slip-on flanges for welding	PN 10	86 029 <sup>1)</sup>	Type 12, PN 10
Slip-on flanges for welding	PN 16	86 030 <sup>1)</sup>	Type 12, PN 16
Welding flanges for tanks and sea boxes		86 041	
Exhaust flanges		86 044	
Welding on flanges		86 057	
Flanged joints for vessels and process apparatus (apparatus flanged joints)		28 030	
Weld flanges for non-pressure vessels and process apparatus of non-alloy and stainless steel		28 031	
Weld flanges for pressure vessels and process apparatus of non-alloy steel		28 032	
Welding neck flanges for pressure vessels and process apparatus		28 034	
Weld flanges for pressure vessels and process apparatus of stainless steel.		28 036	
Weld flanges with cylindrical hub for pressure vessels and process apparatus of stainless steels		28 038	

<sup>1)</sup> EN 1092-1 includes the slip-on flanges (type 12), but the DIN standards continue to be valid.

<b>C Product and quality standards</b>		
<b>C 5 Pipes / product-conducting pipes, seamless</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Seamless circular tubes of non-alloy steels for pressure purposes	1629	10 216-1
Seamless circular tubes of non-alloy steels for the conveyance of water and other aqueous liquids	1629	10 224
Seamless circular tubes of non-alloy steels with very high quality requirements	1630	10 216-1
Seamless circular tubes for low temperatures	17 173	10 216-4
Seamless steel tubes for elevated temperatures	17 175	10 216-2
Seamless circular tubes of fine grain steels for special requirements	17 179	10 216-3
Seamless circular tubes of stainless steels for general requirements	17 456	10 297-2
Seamless circular tubes of austenitic stainless steels for special requirements	17 458	10 216-5
High temperature seamless circular austenitic steel tubes	17 459	10 216-5
<b>C 5 Pipes / product-conducting pipes, welded</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Welded circular tubes of non-alloy steels for pressure purposes	1626	10 217-1
Welded circular tubes of non-alloy steels for the conveyance of water and other aqueous liquids	1626	10 224
Welded circular tubes of non-alloy steels with very high quality requirements	1628	10 217-1
Welded circular tubes for low temperatures	17 174	10 217-4
Submerged arc welded tubes for low temperatures	17 174	10 217-6
Welded steel tubes for elevated temperatures	17 177	10 217-2
Submerged arc welded tubes for elevated temperatures	17 177	10 217-5
Welded circular tubes of fine grain steels for special requirements	17 178	10 217-3
Welded circular tubes of stainless steels for general requirements	17 455	10 296-2
Welded circular tubes of stainless steels for special requirements	17 457	10 217-7
<b>C 5 Pipes / precision pipes, seamless</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Seamless precision steel tubes	2391	10 305-1
Seamless precision steel tubes & seamless circular tubes of non-alloy steels with very high quality requirements	2391 & 1630	10 305-4
<b>C 5 Pipes / precision pipes, welded</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Welded precision steel tubes	2393	10 305-2
As-welded and sized precision steel tubes	2394	10 305-3
Welded and cold-sized square and rectangular tubes for precision applications	2395 T1	10 305-5
Welded and cold-sized square and rectangular tubes for precision applications	2395 T2	
Welded cold drawn tubes for hydraulic and pneumatic power systems		10 305-6
<b>C 5 Pipes / Hot-finished structural hollow sections for steel structures</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Welded circular tubes of general structural steels for structural steelwork	17 120	10210-1
Seamless steel tubes for structural steelwork of St 37 to St 52	17 121	10210-1
Welded circular fine grain steel tubes for structural steelwork	17 123	10210-1
Seamless fine grain steel tubes for structural steelwork	17 124	10210-1
Hot-finished structural hollow sections of fine grain steels	17 125	10210-1
Dimensions and weights, tolerances, sectional properties	59 410	10210-2
<b>C 5 Pipes / Cold finished structural hollow sections for steel structures</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Welded cold formed square and rectangular steel tubes (hollow sections) for structural steelwork	17 119	10219-1
Welded circular steel tubes for structural steelwork	17 120	10219-1
Welded circular fine grain steel tubes for structural steelwork	17 123	10219-1
Dimensions and weights, tolerances, sectional properties	59 411	10219-2
<b>C 5 Pipes / machine pipes, seamless</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Seamless circular steel tubes for pressure purposes	1629	10 297-1
Dimensions and conventional masses per unit length of seamless steel tubes	2448	10 297-1
Seamless circular fine grain steel tubes for structural steelwork	17 124	10 297-1
Seamless circular tubes of austenitic stainless steels for general requirements	17 456	10 297-2
<b>C 5 Pipes / machine pipes, welded</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Welded circular tubes of non-alloy steels	1626	10 296-1
Dimensions and conventional masses per unit length of welded steel tubes	2458	10 296-1
Welded circular fine grain steel tubes for structural steelwork	17 123	10 296-1
Welded circular tubes of stainless steel for general requirements	17 455	10 296-2
<b>C 5 Pipes / Food industry</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Longitudinally welded stainless steel tubes for the food and chemical industry	11 850	10 357

# Comparing standards DIN / EN

<b>C Product and quality standards</b>		
<b>C 6 Screws</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Hexagonal head bolts	601	ISO 4016
Hexagonal nuts	555	ISO 4034
Hexagon head bolts	931	ISO 4014
Hexagon head screws	933	ISO 4017
Hexagon nuts	934	ISO 4032
<b>C 7 Gaskets</b>	<b>DIN standard</b>	<b>DIN EN standard</b>
Flat gaskets for flanges with / without raised face	2690	1514-1
Flat gaskets for flanges with tongue / groove	2691	1514-1
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# Standard overview ASME / ASTM / API

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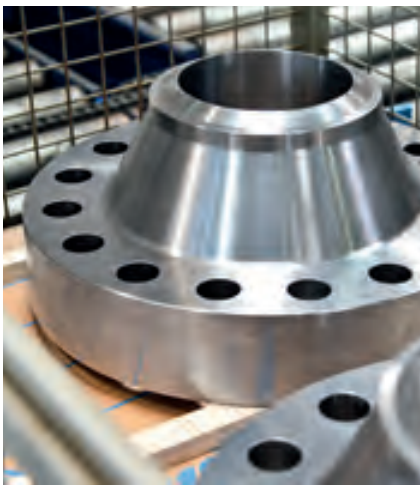
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