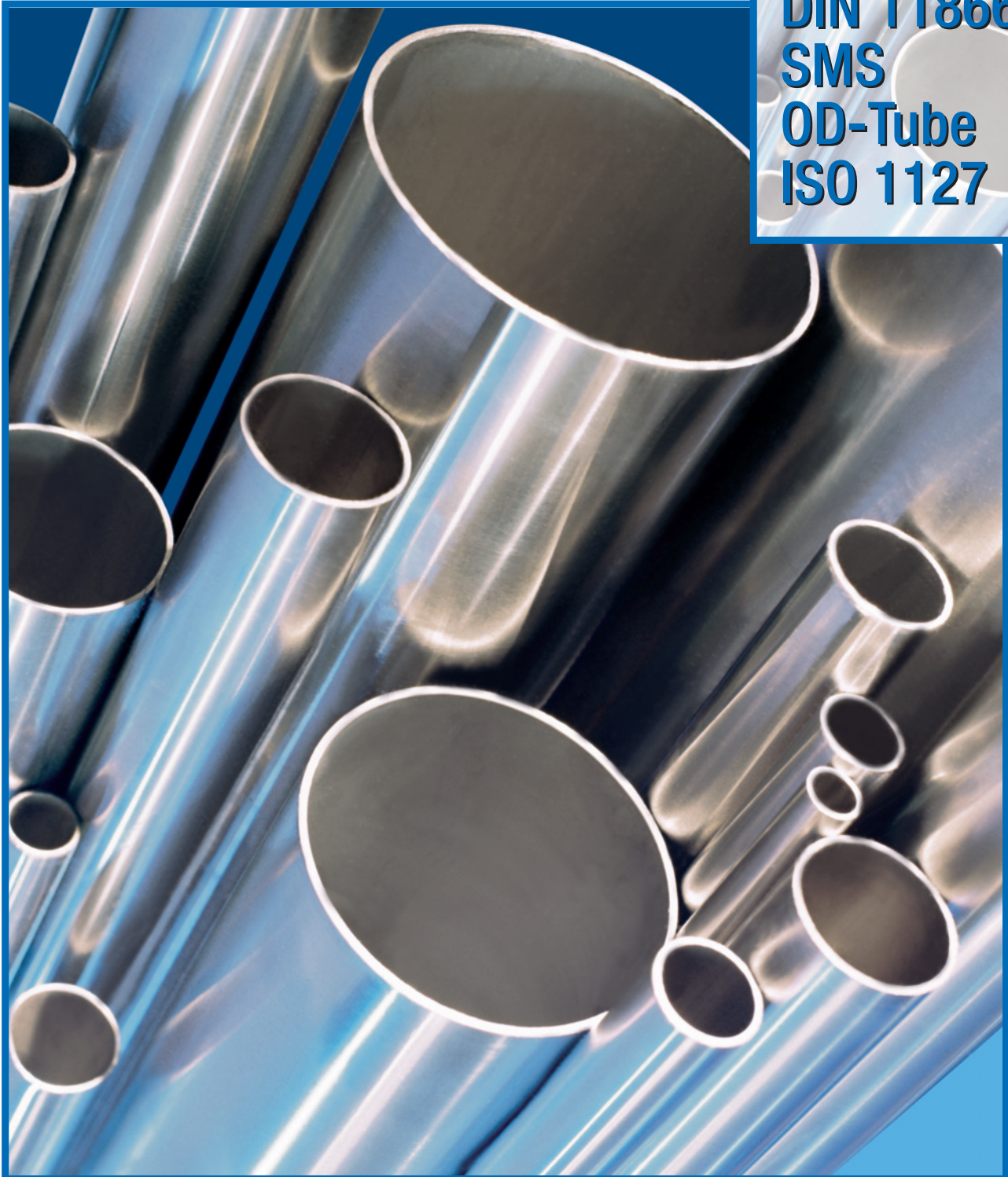


# Stainless Steel Pipes

**DIN 11850  
DIN 11866  
SMS  
OD-Tube  
ISO 1127**



Founded in around 1900, AWH has been developing a wide range of special steel products during the last decades.

After the privatization and takeover of AWH by the NEUMO-EHRENBERG-GROUP in 1991, the main emphasis was shifted from the former "TGL-Norm-Fertigung" (former GDR standard production) to products complying with DIN 11850 and following, meanwhile also DIN 11864, 11865, 11866 and similar products.

Today, many special steel tasks for industrial fields including pharmacy, food industry, breweries etc. are being solved. The permanent workforce has been reduced by a factor of 7, as was the case at nearly all companies located in former East Germany, after the privatization in 1991.

Fundamental restructuring within the production area and with regard to the product itself have facilitated a reversal of trend since 1995, i.e. at the end of 1995 we counted approx. 90 employees, yet in 2002 the permanent workforce was increased to a total of 200 members of staff again!

Another decisive factor is that prior importance is attached to apprenticeships in Hötensleben. The high degree of trainees, amounting to 15 % of employed staff, is a supporting pillar for future efficiency. The turnover has been increased by approx. 30% from 2000 to 2001. Owing to this considerable growth rate, annual investment activity accounts for over 10% of the turnover.

In the workshops the most various materials are processed.

For example:

1.4301, 1.4307, 1.4404, 1.4571, 1.4435 as well as 1.4435 according to Basler Norm (BN2 Standards).

Here, approx. 50 tonnes of VA steel chips are produced per month. These are collected and sorted according to their grades for recycling.

The produced stainless steel is of course surface finished. For this, various methods are applied; e.g. electrolytic polishing, manual and automatic polishing, wet grinding and glass bead blasting and for pipes K400-grinding.

Finally, most products are cleaned in an ultrasonic washing machine.

Besides some 38,000 different standard items, we manufacture tailor-made articles according to customer drawings, such as coupling panels, air-filter housings or pipeline preassembly (in-house).

The quality control department conducts and records all required inspections.

Marking of the single items and appropriate packaging are performed according to the product's and customers' requirements.

AWH processes stainless steel for the most various demands. State-of-the-art processing technologies guarantee premium quality and excellent services. Thanks to the affiliation with the NEUMO-EHRENBERG group, AWH has the right solution for any of your requirements.

This catalogue is provided by AWH, to support you with a means for pipe procurement.

You will find comprehensive information around the subject of special steel pipes in this edition.

Additionally, this version is supplemented by item numbers for the different pipe products of various qualities. However, it was not possible to include the entire range of pipe qualities and dimensions provided on stock at AWH. At the central warehouse for pharmaceutical products in Knittlingen, we have pipes according to ASTM ASME-BPE on stock.

Please let us know your requirements and we shall meet any of your demands.

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**For special demands, AWH will gladly manufacture tailor-made solutions to meet your requirements!**

## General Overview

Nominal width/ Type of pipe	acc. to DIN 11850 series 1 pickled CC	acc. to DIN 11850 series 1 pickled CD	acc. to DIN 11850 series 1 pickled BC	acc. to DIN 11850 series 1 pickled BD	acc. to DIN 11850 series 2 CC	acc. to DIN 11850 series 2 CD	acc. to DIN 11850 series 2 BC	acc. to DIN 11850 series 2 BD	acc. to DIN 11850 series 3 CC	DIN 11850 "old series" +series "W" CC/CD	Pipe DIN 11850 "old series" BC/BD	Pipe with 3, 1B AD2000W2 CC/CD	Pipe with 3, 1B AD2000W2 BC/BD	Pipe acc. to DIN 1127 CC	Pipe acc. to DIN 1127 CD	Pipe acc. to DIN 11866 series A H1	Pipe acc. to DIN 11866 series A H2	Pipe acc. to DIN 11866 series A H3	
6,35 x 0,89																			
8 x 1,0																	P. 25	P. 25	P. 25
9,53 x 0,89																			
10 x 1,0																	P. 25	P. 25	P. 25
10,2 x 1,6																			
12 x 1,0	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
12 x 1,0														P. 21 ●	P. 21 ●				
12 x 1,5														P. 21 ●	P. 21 ●				
12,7 x 1,65																			
13 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
13 x 1,5														P. 21 ●	P. 21 ●				
13,5 x 1,6																			
14 x 2									P. 21 □										
17,2 x 1,6																			
18 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
18 x 1,5										P. 22 ●	P. 22 ●								
19 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
19,05 x 1,65									P. 21										
20 x 2																			
21,3 x 1,6																			
22 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
22 x 1,5										P. 22 ●	P. 22 ●								
23 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
25 x 1,2																			
25,4 x 1,65																			
26,9 x 1,6																			
28 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
28 x 1,25										P. 21 ●									
28 x 1,5										P. 22 ●	P. 22 ●								
29 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
30 x 2									P. 21 □										
33,7 x 2,0																			
34 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
34 x 1,5										P. 22 ●	P. 22 ●								
35 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
36 x 2									P. 21 □										
38 x 1,2																			
38,1 x 1,65																			
40 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
40 x 1,5										P. 22 ●	P. 22 ●								
40 x 1,25										P. 21 ●									
41 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
42 x 2									P. 21 □										
42,4 x 2,0																			
48,3 x 2,0																			
50,8 x 1,65																			
51 x 1,2																			
52 x 1	P. 19 ●	P. 19 ●	P. 19 ●	P. 19 ●															
52 x 1,25																			
52 x 1,5										P. 22 ●	P. 22 ●								
53 x 1,5					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
54 x 2									P. 21 □			P. 23 ●	P. 23 ●						
60,3 x 2,0																			
63,5 x 1,5																			
63,5 x 1,65																			
70 x 1,5																			
70 x 2					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
76,1 x 1,6																			
76,1 x 2,0																			
76,2 x 1,65																			
85 x 2					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
88,9 x 2,3																			
101,6 x 2																			
101,6 x 2,11																			
104 x 2					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
114,3x2,0																			
114,3 x 2,3																			
129 x 2					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
139,7 x 2,6																			
152,4 x 2,77																			
154 x 2					P. 20 ●	P. 20 ●	P. 20 ●	P. 20 ●				P. 23 ●	P. 23 ●			P. 25	P. 25 ●	P. 25	
168,3 x 2,6																			
204 x 2					P. 20 ●	P. 20 ●	P. 20	P. 20				P. 23	P. 23			P. 25	P. 25 ●	P. 25	
219,1 x 2,6																			
254 x 2,0														P. 21 ●					
304 x 2,0														P. 21 ●					

● = stocked products □ = on request

● = stocked products □ = on request

## General Overview

Pipe acc. to DIN 11866 series A H4	Pipe acc. to DIN 11866 series B H1	Pipe acc. to DIN 11866 series B H2	Pipe acc. to DIN 11866 series B H3	Pipe acc. to DIN 11866 series B H4	Pipe acc. to DIN 11866 series C H1	Pipe acc. to DIN 11866 series C H2	Pipe acc. to DIN 11866 series C H3	Pipe acc. to DIN 11866 series C H4	Pipe acc. to DIN EN ISO 1127 CC	Pipe acc. to DIN EN ISO 1127 CD	Pipe acc. to DIN EN ISO 1127 BC	Pipe acc. to DIN EN ISO 1127 BD	SMS pipe similar to DIN 11850 CC	SMS pipe similar to DIN 11850 CD	SMS pipe similar to DIN 11850 BC	SMS pipe similar to DIN 11850 BD	OD-Tube similar to ASTM A 269 / 270	Nominal width/ Type of pipe	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										6,35 x 0,89	
P. 25					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										8 x 1,0	
P. 25					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										9,53 x 0,89	
	P. 26 ●	P. 26 ●	P. 26 ●	P. 26 ●														10 x 1,0	
																		10,2 x 1,6	
																		12 x 1,0	
																		12 x 1,0	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										12 x 1,5	
P. 25																	P. 29 ●	12,7 x 1,65	
																		13 x 1,5	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														13 x 1,5	
																		13,5 x 1,6	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														14 x 2	
																		17,2 x 1,6	
																		18 x 1	
																		18 x 1,5	
P. 25																		19 x 1,5	
																		19,05 x 1,65	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						20 x 2	
																		21,3 x 1,6	
																		22 x 1	
																		22 x 1,5	
P. 25													P. 29 ●	P. 29 ●	P. 29 ●	P. 29 ●		23 x 1,5	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										25 x 1,2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						25,4 x 1,65	
																		26,9 x 1,6	
																		28 x 1	
																		28 x 1,25	
P. 25																		28 x 1,5	
																		29 x 1,5	
																		30 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						33,7 x 2,0	
																		34 x 1	
																		34 x 1,5	
P. 25																		35 x 1,5	
																		36 x 2	
													P. 29 ●	P. 29 ●	P. 29	P. 29		38 x 1,2	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										38,1 x 1,65	
																		40 x 1	
																		40 x 1,5	
																		40 x 1,25	
P. 25																		41 x 1,5	
																		42 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						42,4 x 2,0	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						48,3 x 2,0	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										50,8 x 1,65	
													P. 29 ●	P. 29 ●	P. 29	P. 29		51 x 1,2	
																		52 x 1	
																		52 x 1,25	
																		52 x 1,5	
P. 25																		53 x 1,5	
																		54 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						60,3 x 2,0	
													P. 29 ●	P. 29 ●	P. 29	P. 29		63,5 x 1,5	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										63,5 x 1,65	
																		70 x 1,5	
P. 25																		70 x 2	
													P. 29 ●	P. 29 ●	P. 29	P. 29		76,1 x 1,6	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						76,1 x 2,0	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										P. 29 ●	76,2 x 1,65
P. 25																		85 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●					P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						88,9 x 2,3	
													P. 29 ●	P. 29 ●	P. 29	P. 29		101,6 x 2	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										P. 29 ●	101,6 x 2,11
P. 25																		104 x 2	
									P. 28 ●	P. 28 ●	P. 28 ●	P. 28 ●						114,3x2,0	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														114,3 x 2,3	
P. 25																		129 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														139,7 x 2,6	
					P. 27	P. 27 ●	P. 27 ●	P. 27 ●										152,4 x 2,77	
P. 25																		154 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														168,3 x 2,6	
P. 25																		204 x 2	
	P. 26	P. 26 ●	P. 26 ●	P. 26 ●														219,1 x 2,6	
																		254 x 2,0	
																		304 x 2,0	

● = stocked products □ = on request

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## Special steel (characteristics and types of corrosion)

The term "special steel" is generally used as a collective name for stainless steel.

These types of steel have a min. chrome content of 12%. The resistance against oxidizing agents is mainly owing to this quantity of the chromium component. An increase of the quantity of chromium alloys or other alloying components such as Ni, Mo, Ti or niobium results in an increased corrosion resistance.

Sulphur, applied as alloying constituent, improves the machining properties, while the weld cracking sensitivity is increased. By adding nitrogen, the chemical properties are improved.

An important alloying constituent for avoiding interchrySTALLINE corrosion is titanium and niobium. These materials are carbide forming agents, which link the nascent carbon during heat supply.

Due to the various structure, the special steel types are subdivided into **austenitic** steel types on the one hand and **ferritic** and **martensitic** steel types on the other.

### Properties of the austenitic steel types

- Are not magnetic in annealed condition (can be tested with a magnet)
- Work-hardening causes the formation of martensites, implicating a low magnetizability
- Solution annealing can reconvert the austenite structure
- The major alloying constituents are at least 18% chrome and 8% nickel
- Provide very good cold forming properties
- Have very good tenacity properties at very low temperatures (up to  $-271^{\circ}\text{C}$ )
- Show good welding characteristics and high corrosion resistance
- Are the most frequently applied materials in this area of the stainless steel types

### Properties of the ferritic and martensitic steel types

- Are magnetic and not as corrosion-proof as the austenitic steel types.
- The most important alloying constituent is chrome with a content of 10.5 to 18 %
- The typical ferritic structure cannot be reconverted by thermal treatment
- High resistance to chloride induced transchrySTALLINE stress corrosion cracking compared to austenitic steel types
- Martensitic steel types can be hardened and tempered
- Poor welding properties

### Types of corrosion

#### Abrasive surface corrosion

Abrasive surface corrosion is characterized by an even or nearly even abrasion. Up to a corrosion rate of 0.1mm/a a sufficient resistance can be assumed. This is initiated by acids and strong alkaline solutions.

#### Pitting

Pitting corrosion is a localized form of corrosion by which cavities or "holes" are produced in the material, due to the damage to the protective passive film. The spherical, hole-like corrosion is initiated by halogenated chlorine, bromine, fluorine or iodine ions. Precipitations, extraneous rust, slag residues and tarnish on the surface tend to render a protective oxide film less stable.

#### Crevice corrosion

Occurs in crevices and is characterized by the same mechanisms as the pitting. A concentration cell forms with the crevice being depleted of oxygen. This differential aeration between the crevice (microenvironment) and the external surface (bulk environment) gives the crevice an anodic character., which contributes to a highly corrosive condition in the crevice. The lack of aeration or diffusion inhibition, respectively, can be avoided by an appropriate construction.

#### Contact corrosion

When two dissimilar metals are in contact without a protective barrier between them and they are in the presence of liquid, an electrolytic cell is created. The less noble metal is liable to be attacked. In practice, the stainless steel types are the more noble materials compared to many other materials (such as unalloyed and low-alloyed steel types or aluminium). Direct contact can be avoided, by placing an insulation between the two metals.

#### Stress corrosion

Cold deformation and forming, welding, heat treatment, machining and grinding can introduce residual stresses, thus producing fine cracks penetrating into the material. The magnitude and importance of such stresses is often underestimated for austenitic steel. In this multi-branched "lightning bolt" transchrySTALLINE crack pattern, chloride solutions attack the austenitic stainless steel. A corrosive attack leads to a wide range of scatter, thus resulting in fractures or breaking of the components. Stress corrosion cracking depends upon the temperature. At an operating temperature of below  $50^{\circ}\text{C}$  damages are fairly exceptional. The most effective means of preventing stress corrosion cracking is to apply an appropriate annealing procedure to the components or to increase the nickel contents of the material.

#### InterchrySTALLINE corrosion (grain decay)

This type of corrosion may occur if the area around the grain boundaries is less corrosion-resistant than the matrix in the medium in question. The classical case is when chromium carbide is precipitated at the grain boundaries. In order to prevent interchrySTALLINE corrosion the formation of chrome carbides should be inhibited. Inappropriate temperature conditions between  $450$  to  $850^{\circ}\text{C}$  initiate undesirable chrome carbide formation. The increased carbon content is particularly affective, as it promotes the chrome carbide formation, which results in a local depletion of chrome, leaving these areas vulnerable to corrosive attack in certain electrolytes. In austenitic stainless steels, titanium or niobium can react with carbon to form carbides in the heat affected zone (HAZ) causing a specific type of interchrySTALLINE corrosion known as knife-line attack. These carbides build up next to the weld bead where they cannot diffuse due to rapid cooling of the weld metal.

The problem of knife-line attack can be corrected by reheating the welded metal to allow diffusion to occur or by using steel types with a low carbon content.

# Roughness (definition and charts)

## General information

The stainless special steels are physiologically and in terms of taste reliably applicable as standard material in the food and beverage industry. In addition to the correct material selection, the finish of the surface in contact with the product is of decisive importance for the production and transportation of foods. Further criteria for the quality of the material, besides the resistance to any kind of selective corrosion are the adhesive properties of micro organisms, product residues and coatings, the incrustation as well as the cleaning characteristics.

Generally, the surface roughness profile is evaluated on the basis of the average peak-to-valley height  $R_a$ . It is determined depending on the product quality, its microbiological risk potential and the correct hygienic conditions for cleaning based on practical experiences. The evenness of the surface is not only defined by above mentioned parameters, such as  $R_a$ . An even surface is also characterized by larger distances of the peaks and valleys as well as the rounded profile form.

According to latest studies, such surfaces provide very low interactive properties to certain products, thus hampering the formation of coatings and facilitating the cleaning, respectively.

For highly demanding hygienic conditions, smooth surfaces are produced by electro polishing, which is regarded a standard method nowadays. This method gives superior results to surfaces smoothed within the range of micrometers, compared to mechanical processes or chemical pickling procedures. Furthermore, the removal of the upper layers reveals a crevice-free and non-porous surface that is characterized by the original austenitic crystalline structure, thus maintaining optimal conditions for cleaning purposes.

The standardization of surface roughness provides a transparent measurable value for both, the manufacturer and the supplier. By means of additional data on the processing of the surface quality, such as electro polishing, grinding, etc. another basis is provided to exclude misunderstandings.

## Definition of the surface roughness

The following roughness parameters are described in DIN 4768. The standard describes the determination of the roughness with electronic brush analyzers.

### The average roughness $R_a$ ( $\mu\text{m}$ )

is the arithmetic mean value of all profile deviations within the roughness reference path  $l$ .

This means: the sum of the single areas that lie between the x-axis and the actual profile is equal to the a certain rectangular surface area. (All single areas are added up, no matter whether they are located above or below the median line). The height of the rectangular area corresponds to the  $R_a$  value and the width to the length of the reference path.

The characteristic value  $R_a$  is regarded a preferred value.

### The mean roughness depth $R_z$ ( $\mu\text{m}$ )

is calculated by measuring the distance from the highest peak to the lowest valley within five adjacent sampling lengths, then averaging these distances (acc. to DIN ISO EN – 4287).

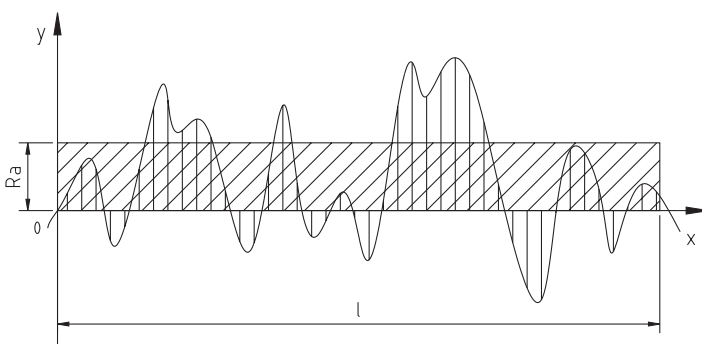
### The maximum roughness $R_{\text{max}}$ ( $\mu\text{m}$ )

indicates the largest roughness depth on the entire measuring length.

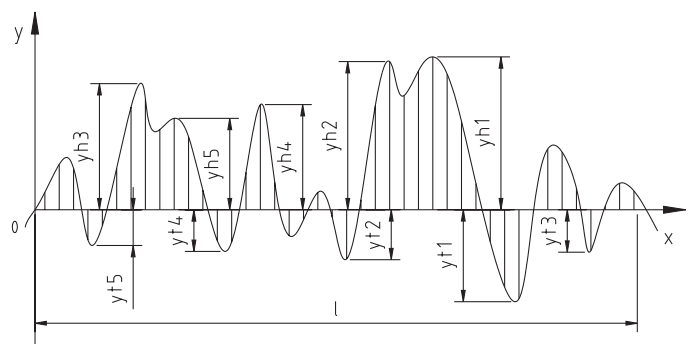
Other roughness parameters, such as the mean groove width  $R_{\text{Sm}}$ , the mean smoothness depth  $R_{\text{p}}$  or the mean roughness depth  $R_{\text{m}}$  do not play a role for the food industry, due to the transparency.

## Dependence of the surface roughness to the manufacturing processes

Arithmetic average roughness  $R_a$



Mean roughness depth  $R_z$



## AWH is the specialist for processing inner and outer surfaces of stainless steel pipes

Procedure	Work data	Application	Achievable roughness Ra [µm], typical	Description
Pickling	diluted acids	pipes pipe fittings sheet metal pieces etc. inside and outside	0.8 - 1.8 the roughness is not affected	light grey, mat surface, levelled, passivating (removes oxides)
Electro polishing	diff. treatment duration, volt value; defined temp. particular work piece prep.	pipes pipe fittings turned parts sheet metal pieces inside and outside	according to the ingoing material up to 0.2 - 0.7 (Indication: the roughness depth is reduced by approx. 30-40% for the ingoing material)	shining, reduction of spec. surface, increase of corrosion resistance evenness depends on electrode etc.
Grinding manually outside	K 80 K 120 K 180 K 240 K 320 K 400 grinding belts, different grinding pressure	pipes pipe fittings valves sheet metal components etc.  outside	2 - 3 1.3 - 2.2 0.9 - 2.2 0.8 - 1.2 0.5 - 0.9 0.4 - 0.5	belt grinding produces a directional surface structure with finest surfaces, for coarse graining enlargement, otherwise decrease of spec. surface, high abrasion possible, e.g. for weld seam smoothening
Grinding manually inside	K 80 K 120 K 180 K 320 K 400 grinding mop scotchbrite wheel	pipes pipe fittings sheet metal components etc.  inside	1.2 - 2 0.8 - 1.3 0.6 - 0.8 0.4 - 0.6 0.3 - 0.4	different grinding results for various materials, also for high demands, e.g. 3A standard otherwise like grinding manually inside
Grinding mechanically outside	K 80 K 120 K 180 K 320 K 400	pipes   outside	1.2 - 2 0.8 - 1.3 0.6 - 0.8 0.4 - 0.6 0.3 - 0.4	belt grinding produces a directional surface structure with finest roughness, for coars graining enlargement otherwise decrease of spec. surface
Brushing/Scotshing	sisal wheels, nylon brushes, scotch wheels or belts	pipes pipe fittings valves pneum. drives  outside	0.5 - 0.6	silk luster, carefree, insensitive surface
Polishing manually	sisal or felt disc polishing agent	pipe fittings valves casing decorative objects	0.15 - 0.3	mirror-finish, min. spec. surface, for clean room conditions
Slide gliding	variable filling ratio various abrasive wheels	turned parts valve discs pipe fittings  outside/ partly inside	depending on utilization conditions	mat, weakly structured surface has rounding effect to edges, removes burrs, increases the surface density
Blasting	various blasting com- ponents, variable blasting pressure and distance	Pipe fittings, Turned parts, Fittings of any kind, Sheet metal components etc.	depends on blasting material and conditions 0.8 - 3.5	dark grey, mat, levelling, increase of spec. surface, in case of fine blasting a satin-finish
Precision turning		Turned parts  outside and inside	0.8 - 2	fine, homogeneous structure, luster depends on angle of view, rather unsensitive surface

# DIN 17457

## General information

DIN standard 17457 (DIN published by Beuth Verlag GmbH, D-10722 Berlin) describes the **technical terms of delivery for "welded circular pipes made of austenitic stainless steels for particular demands"**.

The calculated characteristic value (weld factor) for the weld seam is determined with 1.0 in this standard.

Pipes that comply with this standard are most frequently applied for tank construction, apparatus engineering and line construction.

## Besides the evaluation criteria of the delivered goods, the DIN standards describe

- manufacturing process,
- delivery condition,
- chemical composition,
- mechanical and technological properties,
- suitability and ability for welding,
- further processing and heat treatment
- chemical corrosion behaviour
- types of execution and appearance of the surface and the weld joints

## The order data typically contain acc. to DIN 17457:

	Examples
DIN of the dimension standard	DIN EN 1127
Outside diameter of pipe and wall thickness	114.3 x 3.6
Test category	1
Manufactured length	approx. 6,000 mm
Material no.	1.4541
Tolerance categories	D2, T3
Type of execution acc. DIN 17457-Tab.6	d1

## DIN 17455

Technical terms of delivery of pipes for general requirements are defined in DIN 17455. The weld factor is determined at 0.8 in this standard.

## A summary of the style of execution and test category for your information:

Types of execution:		
Abbreviation	Types of execution	Surface quality
d0	from hot rolled sheet and not pickled	metallically clean
d1	from hot rolled sheet and pickled	metallically bright
d2	from hot rolled sheet and heat treated, pickled	metallically bright
d3	from hot rolled sheet and bright annealed, heat treated	metallically bright
k0	and d0, only from cold rolled sheet	with exception of the weld seam, the surface is smoother than with "d0"
k1 bis k3	like d1 to d3, only from cold rolled sheet	with exception of the weld seam the surface is smoother than with "d1 to d3"
l0	from cold rolled sheet, if necessary heat treated, surface is pickled or heat treated by bright annealing, cold formed,	with exception of the weld seam the surface smoother than with "d1 to d3"
l1	from cold or hot rolled sheet, if necessary min. 20% cold formed, heat treated, with obviously recrystallized welding deposit, pickled	metallically bright, weld seam hardly heat treated
l2	from cold or hot rolled sheet, if necessary min. 20% cold formed, bright annealed, obviously heat treated, with recrystallized welding deposit	metallically bright, weld seam hardly heat treated
o	ground	metallically bright grinding
p	polishing	metallically bright polishing

## The test categories:

Test **category 1** meets the typical requirements for inspection of pipe manufacturing. Here, extensive inspections are performed and recorded for each batch / cast.

Test **category 2** complements the complex test program by the inspection of each pipe. The resulting costs can only rarely be justified by the application.

The execution of the checks/inspections is described in DIN EN 10204.

# DIN EN 10204

The DIN EN 10204 describes the "types of test certificates" (published by Beuth Verlag GmbH, D-10722 Berlin). It replaced the DIN 50049 in 1991.

## The types of certificates are distinguished as follows:

DIN Standard	Certificate	Inspection	Content	issued by
2.1	Certificate of conformity "2.1"	Without specific inspection	confirmation that the delivered products come up to the agreements of the order. Without details on the test results.	the manufacturer
2.2	Test certificate "2.2"	Without specific inspection	Confirmation that the delivered products come up to the agreements of the order. Details on the non-specific test results are provided.	the manufacturer
2.3	Work's test certificate "2.3"	Specific inspection	Confirmation that the delivered products come up to the agreements of the order. Details on the specific test results are provided.	the manufacturer
3.1 A	Inspection certificate 3.1.A	Specific inspection acc. to the guidelines and related techn. rules	Confirmation that the delivered products come up to the official regulations and the related technical rules.	a publicly appointed expert
3.1 B	Inspection certificate 3.1.B	Specific inspection acc. to agreement and official guidelines and related techn. rules	Confirmation that the delivered products come up to the agreements of the order. Details on the specific test results are provided.	an expert commissioned by the manufacturer, independent of the fabrication
3.1 C	Inspection certificate 3.1.C	Specific inspections as agreed	Confirmation that the delivered products come up to the agreements of the order. Details on the specific test results are provided.	an expert commissioned by the customer
3.2 A	Inspection report 3.2.A	Specific inspection acc. to the guidelines and related techn. rules	Confirmation that the delivered products come up to the official regulations and the related technical rules.	a publicly appointed expert and a works expert
3.2 C	Inspection report 3.2.C	Specific inspections as agreed	Confirmation that the delivered products come up to the agreements of the order. Details on the specific test results are provided.	an expert commissioned by the customer and a works' expert
3.1 B AD2000 W2	Inspection certificate 3.1.B AD2000 W2 mainly for procedures of conformity acc. to the modules "G" and "B+F"	Specific inspections and tests as stated by "Arbeitsgemeinschaft Druckbehälter" (working-group for pressure vessels)	Confirmation that the delivered products come up to the agreements of the order. Details on the specific test results are provided.	an expert commissioned by the manufacturer, independent of the fabrication

### Explanation for the table:

Specific types of inspection:	Are determined in the order.
non-specific types of inspection:	Are determined accordingly by the manufacturer.

## Test certificates of Armaturenwerke Hötensleben GmbH

AWH holds the licence for issuing test certificates of 2.1 and 2.2.

Furthermore, we provide a 3.1 B certificate or a 3.1B AD 2000 W2 certificate of the primary material in connection with a restamping certificate for the product.

AWH holds an appropriate TÜV-Nord certificate for issuing restamping certificates. These certificates for the finished product are sufficient for the area of concern (acc. to guidelines for pressure devices), as the chemical and physical properties are maintained during processing.

The certificates will be issued at the customer's expense and are to be requested upon placement of the order.

# Guideline for pressure devices

## General information

AWH is authorized to manufacture pressure devices according to the guidelines for pressure devices. AWH holds a valid welding certificate, a QA department, a restamping certificate from the TÜV as well as a certificate from TÜV-Nord for manufacturing pressure devices.

## Scope of validity

The guidelines for pressure devices define that only complete pipelines or vessels are to be inspected. Therefore no CE marking is allowed on single components (e.g. single pipes, screwed connection parts, T-pieces, bends or similar parts).

In this context, please refer to guideline 1/9 for pressure devices, where the term "pipeline" (components that have to be inspected acc. to the DGRL) is defined in detail.

Single line components, such as a pipe or pipe system, pipe fittings, equipment, compensators, hose lines or other pressurized components are no "pipelines". The customer can require particular material certificates for these components, such as 2.1, 2.2, 3.1B or 3.1B AD 2000 W2 or similar certificates. The scope of inspection is determined in the various standards for semi-finished standards or the technical guidelines. The selection of the appropriate certificate is defined by the appointed authority or selected according to the customer's requirements.

For selecting the test certificates, the expense factor should be taken into consideration, due to the increased scope of inspection and the special production technologies.

## AWH implementation

The demands for implementing the guidelines for pressure devices are based upon a classification of the hazardous potential. For the classification of the hazardous potential the following preconditions have been assumed:

- the product is gaseous
- the product is subject to the danger class "group 2 (non-hazardous media)"

The risk potential is higher than for fluid and hazardous products.

## The production parts of AWH, subject to the guideline for pressure devices, are divided into two groups as follows:

### 1. Parts without CE marking

- disk valves DN 25 - 100
- corner pipe strainers up to DN 65
- level indicator, combination set
- check valves DN 25-100

Article 3, third paragraph states:

- pressure devices and/or subassemblies, which would maximally reach the limit values of items 1.1 to 1.3 of the DGRL (guideline for pressure devices), have to be designed and manufactured in compliance with the general engineering practice within a member state, in order to guarantee safe operability. The pressure devices and/or subassemblies should be sufficiently equipped with operating instructions and they should be provided with a marking, quoting the identity of the manufacturer or its authorized representative, resident within the community.

These pressure devices and/or subassemblies must not bear the CE marking quoted in article 15.

If a customer orders a plant or subassembly, subject to acceptance, we can provide an appropriate certificate of conformity (WAZ). This has to be observed when processing the order.

### 2. Parts with CE marking

- corner pipe strainers DN 80 and DN 100 belong to category 1
- corner pipe strainers as of DN 125 belong to category 2
- disk valves DN 125 – 200 belong to category 1

On the basis of this classification we have to perform tests according to the modules "A" and "A1" of the guidelines for pressure devices.

# Guideline for pressure devices

## Compilation of the modules

Category	without QA system		with QA system	
	Series production	Single-part production	Series production	Single-part production
Category I	A - Internal manufacturing control			
Category II	A1- Internal manufacturing control with surveillance of approval		D1- Quality assurance production E1- Quality assurance products	
Category III	B- EC - constructional design control + C1- Conformity with the design	B1- EC - draft's check + F- inspection of products	B- EC - constructional design control + E- Quality assurance product  B1- EC - draft's check + D- Quality assurance production	H- Extensive quality assurance
Category IV	B- EC - constructional design control + F- inspection of products	G- EC - single inspection	B- EC - constructional design control + D- Quality assurance production	H1- Extensive quality assurance with draft's control and special surveillance of production

## Description of the modules

### Module A:

Internal manufacturing control, for products of category I, without QA system

### Modul A1:

Internal manufacturing control with acceptance monitoring for products of category II, without QA system

### Modul B:

EC – design control, only in conjunction with another module, for products of category III + IV

### Modul B1:

EC – draft control, only in conjunction with another module, for products of category III + IV

### Modul C1:

Conformity with the design, only in conjunction with module B, for products of category III, without QA system

### Modul D:

Quality assurance of production, only in conjunction with another module, for products of category III + IV, with QA system

### Modul D1:

Quality assurance of production, for products of category II, with QA system

### Modul E:

Quality assurance for product, for products of category III, with QA system

### Modul E1:

Quality assurance for product, for products of category II, with QA system

### Modul F:

Control of products, only in conjunction with module B or B1, for products of category III+IV, without QA system

### Modul G:

EC – single inspection, for products of category IV, without QA system

### Modul H:

Extensive quality assurance, for products of category III, with QA system

### Modul H1:

Extensive quality assurance with draft control and special acceptance monitoring, for products of category IV, with QA system

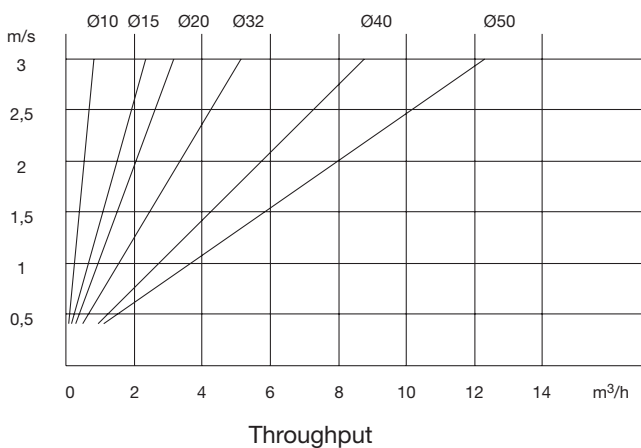
# Flow rates

## Standard values for flow rates

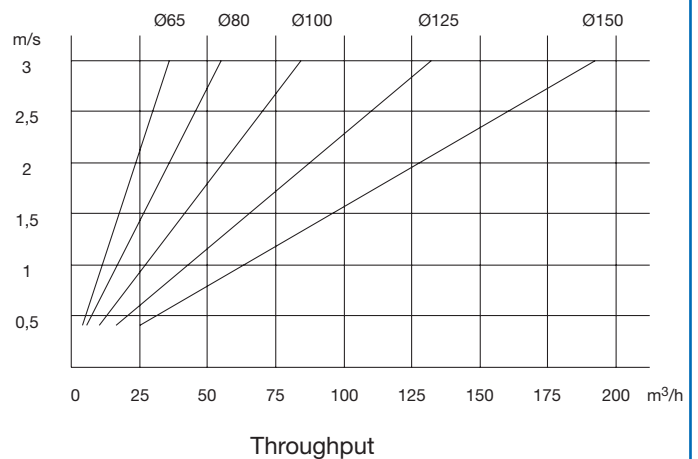
Values listed in the table below are experimental values. For long pipelines and low pressure we recommend to assume low flow rates.

Operating material		Type of line	Flow rate [m/s]
Water	Clear water and service water	Suction line Pressure line	up to 1.5 up to 2.0
	Lukewarm water	Suction line Pressure line	up to 1.5 up to 2.0
	Warm water	Suction line Pressure line	up to 3.0 up to 1.5
	Ice cold water and brine	Suction line Pressure line	up to 1.3 up to 2.5
	Returning water	Suction line Pressure line	up to 1.5 up to 3.0
Refrigerant	Ammonia	Liquid gas line Gas line	up to 1.5 1.5 to 20
	Freon	Liquid gas line Gas line	0.4 up to 0.8 8.0 - 12.0
Air	Compressed air and sterile air	Suction line Pressure line Control line	up to 6.0 up to 15.0 2.0 to 5.0
cleansing agent		Suction line Pressure line	up to 1.5 up to 2.0
Product	Milk	Suction line Pressure line	1.0 to 2.0 2.0 to 3.0
	Cream	Suction line Pressure line	0.7 to 1.0 1.0 to 2.0
	Yoghurt	Suction line Pressure line	0.5 to 0.8 1.0 to 1.5
	Carbonated drinks	Pressure line	0.5 to 1.0
	Mash	Pressure line	1.2 to 1.5
	Seasoning	Pressure line	1.5 to 2.0

Flow rates in pipelines



Flow rates in pipelines



# Calculation of the wall thickness

## Formula of calculation for wall thickness

The calculation of longitudinally welded, pressurized pipes is performed according to the AD-2000 code of practice B1.

The formula of calculation for the wall thickness

$$s = Da \times p / (20 \times K / S \times v + p) + c1 + c2$$

- s** = wall thickness [mm]
- Da** = outside diameter of the pipe [mm]
- p** = max. admissible working pressure [bar]
- K** = mechanical strength value (see table) [N/mm<sup>2</sup>]
- S** = safety correction value (acc. to AD-2000 code of practice) = 1.5
- v** = calculated value of the weld seam  
1.0 for pipes acc. to DIN 1850 and 17457  
0.8 for pipes acc. to DIN 17455
- c1** = 0 (wall thickness overmeasure for compensation of thickness tolerance, which is omitted acc. to AD code of practice for austenitic steels)
- c2** = 0 (overmeasure for corrosion and wear, is omitted under normal conditions for austenitic steels)

## Table of mechanical strength properties

Type of steel	1.0 % offset yield stress at a temperature [°C] of					
	20	50	100	150	200	250
1.4301	230	211	191	172	157	145
1.4541	235	222	208	195	185	175
1.4404	225	217	199	181	167	157
1.4571	245	234	218	206	196	186
1.4435	225	217	199	181	167	157
1.4306	215	201	181	162	147	137

According to the limit value for the wall thickness (EN ISO 1127) the dimension still has to be included into the calculation.

## Example of calculation

**Given:**

- Outside pipe diameter      Da = 42.4mm
- Material                         1.4301
- Operating pressure            45 bar
- Operating temperature        150 °C
- Limit dimension                D3 (0.5% mit min.± 0.3mm)

**Required :** Minimum wall thickness s [mm]

**Solution:**

$$s = Da \times p / (20 \times K / S \times v + p) + c1 + c2$$

$$s = 42.4\text{mm} \times 45\text{bar} / (20 \times 172 / 1.5 \times 0.8 + 45\text{bar}) + 0 + 0$$

$$s = 1.015\text{mm}$$

**Required pipe wall thickness =**

$$s + \text{limit value}$$

$$= 1.015 \text{ mm} + 0.3 \text{ mm}$$

$$= 1.315\text{mm}$$

# Material characteristics

## Chemical composition of steels according to EN 10088 part 1

Type of steel		Composition						
Material grade	Abbreviation	C ≥	Si ≥	Mn ≥	Cr	Mo	Ni	others
1.4301	X 5 CrNi 18 10	0.07	1.0	2.0	17.0 - 19.0	-	8.5 - 10.5	
1.4306	X 2 CrNi 19 11	0.03	1.0	2.0	18.0 - 20.0	-	10.0 - 12.5	
1.4541	X 6 CrNiTi 18 10	0.08	1.0	2.0	17.0 - 19.0	-	9.0 - 12.0	Ti ≥ 5%C to 0.8
1.4401	X 6 CrNiMo 17 12 2	0.07	1.0	2.0	16.5 - 18.5	2.0 - 2.5	10.5 - 13.5	
1.4404	X 2 CrNiMo 17 13 2	0.03	1.0	2.0	16.5 - 18.5	2.0 - 2.5	11.0 - 14.0	
1.4571	X 6 CrNiMoTi 17 12 2	0.08	1.0	2.0	16.5 - 18.5	2.0 - 2.5	10.5 - 13.5	Ti ≥ 5%C to 0.8
1.4435	X 2 CrNiMo 18 14 3	0.03	1.0	2.0	17.0 - 18.5	2.5 - 3.0	12.5 - 15.0	S ≤ 0.025

## Minimum values of 0.2% and 1.0% offset yield stress at increased temperatures as well as indications for the limiting temperature for stress on intergranular corrosion

Type of steel		0.2% offset yield stress [ N/mm <sup>2</sup> ] at a temperture [°C] of										0.1% offset yield stress [ N/mm <sup>2</sup> ] at a temperture [°C] of										Lim. temp. <sup>1)</sup> in °C			
Material grade	Abbreviation	50	100	150	200	250	300	350	400	450	500	550	50	100	150	200	250	300	350	400	450	500	550		
1.4301	X 5 CrNi 18 10	177	157	142	127	118	110	104	98	95	92	90	211	191	172	157	145	135	129	125	122	120	120	300	
1.4306	X 2 CrNi 19 11	162	147	132	118	108	100	94	89	85	81	80	201	181	162	147	137	127	121	116	112	109	108	350	
1.4307	X 2 CrNi 18 9	162	147	132	118	108	100	94	89	85	81	80	201	181	162	147	137	127	121	116	112	109	108	350	
1.4541	X 6 CrNiTi 18 10	190	176	167	157	147	136	130	125	121	119	118	208	208	195	185	175	167	161	156	152	149	147	400	
1.4401	X 6 CrNiMo 17 12 2	196	177	162	147	137	127	120	115	112	110	108	230	211	191	177	167	156	150	144	141	139	137	300	
1.4404	X 2 CrNiMo 17 13 2	182	166	152	137	127	118	113	108	103	100	98	217	199	181	167	157	145	139	135	130	128	127	400	
1.4571	X 6 CrNiMoTi 17 12 2	202	185	177	167	157	145	140	135	131	129	127	234	218	206	196	186	175	169	164	160	158	157	400	
1.4435	X 2 CrNiMo 18 14 3	182	166	152	137	127	118	113	108	103	100	98	217	199	181	167	157	145	139	135	130	128	127	400	

- 1)... Up to this temperature (max. 100,000 h) the material has not shown any vulnerability regarding intergranular corrosion with regard to the inspection.  
2)... Only for wall thickness below 6 mm.

Note: The values correspond to the parts that are in a dissolved calcined and quenched condition.

## Chemical composition of the steels according to AISI qualities

Type of steel		Composition						
Material grade	alternative material grade	C ≥	Si ≥	Mn ≥	Cr	Mo	Ni	others
304	1.4301	0.08	1.0	2.0	18.0 - 20.0	-	8.0 - 10.5	
304 L	1.4307	0.03	1.0	2.0	18.0 - 20.0	-	8.0 - 12.0	
316	1.4401 / 1.4436	0.08	1.0	2.0	16.0 - 18.0	2.0 - 3.00	10.0 - 14.0	
316L	1.4404 / 1.4435	0.03	1.0	2.0	16.5 - 18.5	2.0 - 3.00	10.0 - 14.0	

## Physical properties of steels according to EN 10088 part 1

Type of steel		Density	modulus of elasticity	Tensile strength	Thermal expansion	Thermal conductivity	Specific heat	Resistance
Material grade	Abbreviation	[ kg/dm <sup>3</sup> ]	at 20°C [ kN/mm <sup>2</sup> ]	[ N/mm <sup>2</sup> ]	20-100°C [10 <sup>-6</sup> K <sup>-1</sup> ]	at 20°C [ W/mK ]	at 20°C [ kJ/kgK ]	at 20°C [ Ωmm <sup>2</sup> /m ]
1.4301	X 5 CrNi 18 10	7.90	200	500 - 750	16.5	15	500	0.73
1.4306	X 2 CrNi 19 11	7.90	200	450 - 700	16.5	15	500	0.73
1.4307	X 2 CrNi 18 9	7.90	200	450 - 700	16.5	15	500	0.73
1.4541	X 6 CrNiTi 18 10	7.90	200	540 - 740	16.5	15	500	0.73
1.4401	X 6 CrNiMo 17 12 2	7.98	200	550 - 700	16.5	15	500	0.75
1.4404	X 2 CrNiMo 17 13 2	7.90	200	450 - 700	16.5	15	500	0.75
1.4571	X 6 CrNiMoTi 17 12 2	7.98	200	540 - 690	16.5	15	500	0.75
1.4435	X 2 CrNiMo 18 14 3	7.90	200	500 - 700	16.5	15	500	0.75

## Welding notes

Below please find notes on the weldability and welding properties of materials processed at AWH. An overview of the materials and fillers to be applied is listed in the table below.

### The types of certificates are distinguished as follows:

Material grade acc. to DIN 17007	Abbreviation acc. to DIN 17006	Properties and Applications	Recommendation filler
1.4301 1.4541	X 5 CrNi 18 10 X 6 CrNiTi 18 10	Water and slightly contaminated waste water, foods and organic acids, up to a pH value of 4.5 resistant in corroding agents with a low concentration of chloride: Food industry, apparatus engineering, household	1.4302(1.4301); 1.4316; 1.4551; 1.4576(1.4541)
1.4404 1.4571	X 2 CrNiMo 17 13 2 X 6 CrNiMoTi 17 12 2	Higher general resistance than the above mentioned group, preferential for chem. apparatus engineering, sewage works, paper industry, especially for higher concentrations of chloride: chemical industry, textile industry, breweries, dairies	1.4430; 1.4455(1.4404); 1.4576;
1.4435	X 2 CrNiMo 18 14 3	Higher resistance than the groups mentioned above regarding non-oxidating acids and chloride-containing corrosion agents; chemical industry, transport vessels for chemicals, pulp industry	1.4430, 1.4576

### General information

The listed parent materials are austenitic steels. Owing to their chemical composition and the resulting position on the Schaeffler diagram they are particularly suitable for welding purposes and can principally be welded without heat treatment.

As fillers, higher-grade alloys are to be applied, in order to compensate the melting loss at alloying elements. For a combination of different parent materials the selection of the filler should be based on the parent material with the highest-grade alloy.

Another important factor regarding the weld seam quality, is the right selection of the inert gas. The different physical properties and thermal conductivities of the active and inert gases have a decisive influence on the penetration profiles.

For the most frequently applied welding procedure at AWH, the TIG welding, the standard inert gas Argon is used. "Pure" Argon can be combined with Helium (inert gas) to 30% - 70%, hydrogen (reducing gas) to 2% - 7.2% and with lowest concentrations of nitrogen (low activity gas) to 0.015% for increasing the performance.

Argon approx. 99,996 Vol. %      standard protective gas  
no chemical reaction with the welding material  
good arc ionization and ignition,  
also applied as root protection gas

Argon + hydrogen (5%)      increases both the welding speed and the penetration  
for welding CrNi steel, mainly completely mechanical welding (orbital welding)  
(not for ferrites and duplex steels)

Forming gas N<sub>2</sub> + 10 % H<sub>2</sub>      4 l/min 1.5 minutes flow time at a pipe Ø of 15 – 20 mm  
6 l/min 1.5 minutes flow time at a pipe Ø of 33-38 mm

For MAG welding Ag + 2,5% H<sub>2</sub> is applied and for MIG welding Ag is used as inert gas.

The welding current source should preferably provide impulse technique. The advantages of the impulse technique are:

- possibilities for lower energy input
- steady arc
- more constant root formation
- better inclination of constrained welding position
- lower distortion of the work pieces
- improved plasticity of the melting bath
- improved bridging of the welding gap

## DIN 11850

DIN 11850 has been drawn up for welded pipes made of stainless steels for pipe line systems within the food industry, pharmaceutical and chemical industries.

DIN 11850 (10-1999, issued by Beuth Verlag GmbH, D-10722 Berlin) contains some modifications on the version issued in July 1985. Seamless pipes have been excluded from this standard. The weld factor is 1.0. Furthermore, the nominal width DN 200 has been integrated and the tolerances and the modified surface qualities should be observed.

In connection with DIN 11850 the following normative references are made: DIN 4768, DIN 11851, DIN 11864-1, DIN 11864-2, DIN 17457, DIN 32676, DIN EN 10088-1, DIN EN 10088-2, DIN EN 10204 und DIN EN ISO 1127

**The steel types are made of the standard materials 1.4301, 1.4307 and 1.4404.**

The material grade 1.4404 is increasingly replacing the titanium stabilized material grade 1.4571. Thanks to state-of-the-art melting procedures, the carbon content in 1.4404 could be reduced to a point, where the same corrosion properties are achieved as with the titanium stabilized material grade 1.4571. Many years of experience in the chemical industry have retained the material grade 1.4571 up to today.

### The ordering information typically contain according to DIN 11850:

Surface qualities according to DIN 17457	BC – bright annealed or matte pickled and annealed
Outside pipe diameter and wall thickness	41 x 1.5
Manufactured length	approx. 6,000 mm
Material	1.4404
Certificates	3.1 B
Test class according to DIN 17457	Pk1 or Pk2 (exception)

Marking of the pipes is carried out on at least one end of the delivered pipes.

### Surface condition

The surface condition is divided into inside and outside surface and mainly evaluated according to DIN 17457. The types of execution are:

	Inside surface	Outside surface
CC	pickled, k1g Ra < 0.8 µm, weld seam area Ra < 1.6 µm	pickled, k1
CD	pickled, k1g Ra < 0.8 µm, weld seam area Ra < 1.6 µm	grinded, Ra < 1.0 µm
BC	annealed and pickled or bright-annealed, k2g, k3g, l1g* oder l2g* Ra < 0.8 µm weld seam area Ra < 1.6 µm	annealed and pickled or bright-annealed, k2g, k3g, l1g* oder l2g*
BD	annealed and pickled or bright-annealed, k2g, k3g, l1 * oder l2g* Ra < 0.8 µm weld seam area Ra < 1.6 µm	grinded, Ra < 1.0 µm

## Pipe according to DIN 11850 - Series 1

Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]	Quality CC	
	1.4301 / 1.4307	1.4404	1.4571			
12 x 1.0	Economically priced alternative see page 21					<ul style="list-style-type: none"> <li>• not heat treated</li> <li>• pickled inside</li> <li>• pickled outside</li> </ul>
12 x 1.0	222 461	222 376		0.275		
18 x 1.0	222 009	222 014	222 766	0.426		
22 x 1.0	222 045	222 050	222 343	0.526		
28 x 1.0	222 087	222 092	222 767	0.676		
34 x 1.0	222 132	222 137	222 768	0.826		
40 x 1.0	222 168	222 173	222 769	0.977		
52 x 1.0	222 215	222 220	222 770	1.277		

Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]	Quality CD	
	1.4301 / 1.4307	1.4404	1.4571			
12 x 1.0	Economically priced alternative see page 21					<ul style="list-style-type: none"> <li>• not heat treated</li> <li>• pickled inside</li> <li>• grinded outside</li> </ul>
12 x 1.0	222 469	222 470		0.275		
18 x 1.0	222 011	222 016	222 771	0.426		
22 x 1.0	222 047	222 052	222 772	0.526		
28 x 1.0	222 089	222 094	222 773	0.676		
34 x 1.0	222 134	222 139	222 774	0.826		
40 x 1.0	222 167	222 175	222 775	0.977		
52 x 1.0	222 217	222 222	222 776	1.277		

Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]	Quality BC
	1.4301 / 1.4307	1.4404	1.4571		
12 x 1.0	222 567	222 434		0.275	<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickled inside</li> <li>• pickles outside</li> </ul>
18 x 1.0	222 010	222 015	222 777	0.426	
22 x 1.0	222 046	222 051	222 778	0.526	
28 x 1.0	222 088	222 093	222 779	0.676	
34 x 1.0	222 133	222 138	222 780	0.826	
40 x 1.0	222 169	222 174	222 781	0.677	
52 x 1.0	222 216	222 221	222 782	1.277	

Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]	Quality BD
	1.4301 / 1.4307	1.4404	1.4571		
12 x 1.0	222 580	222 001		0.275	<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickled inside</li> <li>• grinded outside</li> </ul>
18 x 1.0	222 012	222 017	222 783	0.426	
22 x 1.0	222 048	222 053	222 784	0.526	
28 x 1.0	222 090	222 095	222 785	0.676	
34 x 1.0	222 135	222 140	222 786	0.826	
40 x 1.0	222 171	222 176	222 788	0.677	
52 x 1.0	222 218	222 223	222 789	1.277	

## Pipe according to DIN 11850 - Series 2

Quality CC	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>pickled outside</li> </ul>	13 x 1.5	Economically priced alternative see page 21			
	13 x 1.5	222 797	222 796	222 790	0.428
	19 x 1.5	222 029	222 034	222 791	0.658
	23 x 1.5	222 066	222 071	222 792	0.808
	29 x 1.5	222 109	222 114	222 793	1.030
	35 x 1.5	222 154	222 159	222 794	1.258
	41 x 1.5	222 190	222 195	222 795	1.490
	53 x 1.5	222 237	222 242	222 798	1.944
	70 x 2.0	222 265	222 270	222 799	3.405
	85 x 2.0	222 282	222 287	222 815	4.157
	104 x 2.0	222 299	222 304	222 830	5.108
	129 x 2.0	222 316	222 321	222 831	6.360
	154 x 2.0	222 327	222 332	222 832	7.612
	204 x 2.0	801 794	801 793	801 818	10.116
	204 x 2.0	Economically priced alternative see page 21			
	254 x 2.0	Economically priced alternative see page 21			
	304 x 2.0	Economically priced alternative see page 21			

Quality CD	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>grinded outside</li> </ul>	13 x 1.5	Economically priced alternative see page 21			
	13 x 1.5	222 800	222 378	222 833	0.428
	19 x 1.5	222 031	222 036	222 834	0.658
	23 x 1.5	222 068	222 073	222 835	0.808
	29 x 1.5	222 111	222 116	222 836	1.030
	35 x 1.5	222 156	222 161	222 837	1.258
	41 x 1.5	222 192	222 197	222 838	1.490
	53 x 1.5	222 239	222 244	222 839	1.944
	70 x 2.0	222 267	222 272	222 840	3.405
	85 x 2.0	222 284	222 289	222 841	4.157
	104 x 2.0	222 301	222 306	222 842	5.108
	129 x 2.0	222 318	222 323	222 843	6.360
	154 x 2.0	222 329	222 334	222 844	7.612
	204 x 2.0	801 796	801 819	801 822	10.116
	204 x 2.0	Economically priced alternative see page 21			
	254 x 2.0	Economically priced alternative see page 21			
	304 x 2.0	Economically priced alternative see page 21			

Quality BC	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>annealed</li> <li>pickled inside</li> <li>pickles outside</li> </ul>	13 x 1.5	Economically priced alternative see page 21			
	13 x 1.5	222 856	222 857	222 858	0.428
	19 x 1.5	222 030	222 035	222 845	0.658
	23 x 1.5	222 067	222 072	222 846	0.808
	29 x 1.5	222 110	222 115	222 847	1.030
	35 x 1.5	222 155	222 160	222 848	1.258
	41 x 1.5	222 191	222 196	222 849	1.490
	53 x 1.5	222 238	222 243	222 850	1.944
	70 x 2.0	222 266	222 271	222 851	3.405
	85 x 2.0	222 283	222 288	222 852	4.157
	104 x 2.0	222 300	222 305	222 853	5.108
	129 x 2.0	222 317	222 322	222 854	6.360
	154 x 2.0	222 328	222 333	222 855	7.612
	204 x 2.0				10.116
	204 x 2.0	Economically priced alternative see page 21			
	254 x 2.0	Economically priced alternative see page 21			
	304 x 2.0	Economically priced alternative see page 21			

Quality BD	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>annealed</li> <li>pickled inside</li> <li>grinded outside</li> </ul>	13 x 1.5	Economically priced alternative see page 21			
	13 x 1.5	222 859	222 860	222 861	0.428
	19 x 1.5	222 032	222 037	222 862	0.658
	23 x 1.5	222 069	222 074	222 863	0.808
	29 x 1.5	222 112	222 118	222 864	1.030
	35 x 1.5	222 157	222 162	222 865	1.258
	41 x 1.5	222 193	222 198	222 866	1.490
	53 x 1.5	222 240	222 245	222 867	1.944
	70 x 2.0	222 268	222 273	222 868	3.405
	85 x 2.0	222 285	222 290	222 869	4.157
	104 x 2.0	222 302	222 307	222 870	5.108
	129 x 2.0	222 319	222 324	222 871	6.360
	154 x 2.0	222 330	222 335	222 872	7.612
	204 x 2.0				10.116
	204 x 2.0	Economically priced alternative see page 21			
	254 x 2.0	Economically priced alternative see page 21			
	304 x 2.0	Economically priced alternative see page 21			

## Pipe according to DIN 11850 - Series 3 and special dimensions

Dimensions	Item no.	Item no.		Weight[kg/m]	
	1.4301/1.4307	1.4404			<b>Quality CC</b>
14 x 2	222 183	222 189		0.60	<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>pickled outside</li> </ul>
20 x 2	222 206	222 219		0.90	
30 x 2	222 286	222 298		1.40	
36 x 2	222 309	222 315		1.70	
42 x 2	222 326	222 331		2.00	
54 x 2	222 251	222 256		2.60	
other qualities on request					

Pipe according to DIN EN ISO 1127 / former 2463					
Dimensions	As alternative for	Item no.	Item no.	Weight[kg/m]	
		1.4301/1.4307	1.4404		<b>Quality CC</b>
12 x 1.0	DIN 11850 Series 1	800 032	800 056	0.275	<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>pickled outside</li> <li>surface as DIN 11850</li> <li>weld seam not masked</li> </ul>
12 x 1.5	old Series	800 062	800 086	0.394	
13 x 1.5	DIN 11850 Series 2	801 998	801 989	0.428	
204 x 2.0	DIN 11850 Series 2	801 794	801 793	10.116	
254 x 2.0		801 808	801 832	12.600	
304 x 2.0		801 844	801 846	15.120	
other qualities on request					

Dimensions	As alternative for	Item no.	Item no.	Weight[kg/m]	
		1.4301/1.4307	1.4404		<b>Quality CD</b>
12 x 1.0	DIN 11850 Series 1	800 033	801 010	0.275	<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>grinded outside</li> <li>surface as DIN 11850</li> <li>weld seam not masked</li> </ul>
12 x 1.5	old Series	800 063	800 064	0.394	
13 x 1.5	DIN 11850 Series 2	801 070	801 058	0.428	
other qualities on request					

Pipe "old series"-W					
Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]	
	1.4301/1.4307	1.4404	1.4571		<b>Quality CC</b>
28 x 1.25	222 570	222 586	222 873	0.830	<ul style="list-style-type: none"> <li>not heat treated</li> <li>pickled inside</li> <li>pickled outside</li> <li>surface as DIN 11850</li> </ul>
40 x 1.25	222 571	222 504	222 874	1.202	
52 x 1.25	222 572	222 587	222 875	1.574	
70 x 1.5	222 573	222 588	222 876	2.550	
other qualities on request					

## Pipe "old series" similar to DIN 11850

Quality CC	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• not heat treated</li> <li>• pickled inside</li> <li>• pickled outside</li> </ul>	12 x 1.5	Economically priced alternative see page 21			
	12 x 1.5	222 468	222 467		0.394
	18 x 1.5	222 019	222 024	222 552	0.620
	22 x 1.5	222 055	222 060	222 076	0.770
	28 x 1.5	222 098	222 103	222 577	0.995
	34 x 1.5	222 143	222 148	222 409	1.146
	40 x 1.5	222 179	222 184	222 877	1.446
	52 x 1.5	222 226	222 231	222 527	1.897

Quality CD	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• not heat treated</li> <li>• pickled inside</li> <li>• grinded outside</li> </ul>	12 x 1.5	Economically priced alternative see page 21			
	12 x 1.5	222 471	222 472		0.394
	18 x 1.5	222 021	222 026	222 878	0.620
	22 x 1.5	222 057	222 062	222 803	0.770
	28 x 1.5	222 100	222 105	222 879	0.995
	34 x 1.5	222 145	222 150	222 812	1.146
	40 x 1.5	222 181	222 186	222 880	1.446
	52 x 1.5	222 228	222 233	222 881	1.897

Quality BC	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickled inside</li> <li>• pickles outside</li> </ul>	12 x 1.5	Economically priced alternative see page 21			
	12 x 1.5	222 520	222 474		0.394
	18 x 1.5	222 020	222 025	222 882	0.620
	22 x 1.5	222 056	222 061	222 507	0.770
	28 x 1.5	222 099	222 104	222 498	0.995
	34 x 1.5	222 144	222 149	222 499	1.146
	40 x 1.5	222 180	222 185	222 479	1.446
	52 x 1.5	222 227	222 232	222 888	1.897

Quality BD	Dimensions	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301/1.4307	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickled inside</li> <li>• grinded outside</li> </ul>	12 x 1.5	Economically priced alternative see page 21			
	12 x 1.5	222 939	222 938		0.394
	18 x 1.5	222 022	222 027	222 883	0.620
	22 x 1.5	222 058	222 063	222 884	0.770
	28 x 1.5	222 101	222 106	222 885	0.995
	34 x 1.5	222 146	222 151	222 543	1.146
	40 x 1.5	222 182	222 187	222 886	1.446
	52 x 1.5	222 229	222 234	222 890	1.897

## Pipe according to DIN 11850 with 3.1 AD 2000 W2

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404		Weight[kg/m]	Quality CC
13 x 1.5	222 647	222 620		0.428	
19 x 1.5	222 648	222 621		0.658	
23 x 1.5	222 649	222 622		0.808	
29 x 1.5	222 650	222 623		1.030	
35 x 1.5	222 651	222 624		1.258	
41 x 1.5	222 652	222 625		1.490	
53 x 1.5	222 653	222 626		1.944	
54 x 2.0	222 667	222 670		2.581	
70 x 2.0	222 654	222 627		3.405	
85 x 2.0	222 655	222 628		4.157	
104 x 2.0	222 656	222 629		5.108	
129 x 2.0	222 657	222 630		6.360	
154 x 2.0	222 658	222 631		7.612	
204 x 2.0	801 798	801 795		10.116	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404		Weight[kg/m]	Quality CD
13 x 1.5	222 659	222 677		0.428	
19 x 1.5	222 660	222 678		0.658	
23 x 1.5	222 661	222 679		0.808	
29 x 1.5	222 662	222 680		1.030	
35 x 1.5	222 663	222 681		1.258	
41 x 1.5	222 664	222 682		1.490	
53 x 1.5	222 665	222 683		1.944	
54 x 2.0	222 671	222 684		2.581	
70 x 2.0	222 672	222 685		3.405	
85 x 2.0	222 673	222 686		4.157	
104 x 2.0	222 674	222 687		5.108	
129 x 2.0	222 675	222 688		6.360	
154 x 2.0	222 676	222 689		7.612	
204 x 2.0	801 801	801 802		10.116	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404		Weight[kg/m]	Quality BC
13 x 1.5	222 703	222 711		0.428	
19 x 1.5	222 704	222 381		0.658	
23 x 1.5	222 705	222 383		0.808	
29 x 1.5	222 706	222 384		1.030	
35 x 1.5	222 707	222 385		1.258	
41 x 1.5	222 708	222 386		1.490	
53 x 1.5	222 709	222 387		1.944	
54 x 2.0	222 632	222 669		2.581	
70 x 2.0	222 603	222 393		3.405	
85 x 2.0	222 604	222 394		4.157	
104 x 2.0	222 584	222 491		5.108	
129 x 2.0	222 710	222 712		6.360	
154 x 2.0	222 760	222 761		7.612	
204 x 2.0	801 807	801 812		10.116	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404		Weight[kg/m]	Quality BD
13 x 1.5	222 724	222 736		0.428	
19 x 1.5	222 725	222 737		0.658	
23 x 1.5	222 726	222 738		0.808	
29 x 1.5	222 727	222 739		1.030	
35 x 1.5	222 728	222 740		1.258	
41 x 1.5	222 729	222 741		1.490	
53 x 1.5	222 730	222 742		1.944	
54 x 2.0	222 731	222 743		2.581	
70 x 2.0	222 732	222 744		3.405	
85 x 2.0	222 733	222 745		4.157	
104 x 2.0	222 734	222 746		5.108	
129 x 2.0	222 735	222 747		6.360	
154 x 2.0	222 763	222 764		7.612	
204 x 2.0	801 815	801 816		10.116	

# DIN 11866

DIN 11866 (draft, when published, obtainable at Beuth Verlag GmbH, D-10722 Berlin) describes the seamless and welded pipes for aseptic purposes and the chemical and pharmaceutical industries.

The dimensions are oriented to the fittings and connection pieces of DIN 11864 and the draft of DIN 11865.

In connection with DIN 11866 the following normative reference is made:  
 DIN 2413-1, DIN 2559-1, DIN 2609, DIN 11864-1, DIN 11864-2, E DIN 11865,  
 DIN 17457, DIN17458, DIN EN 10088-1, DIN EN 10204, DIN EN ISO 1127, ASME- BPE 1997.

**The pipes described are subdivided into pipes of the series:**

- A pipe dimensions acc. to DIN 11850 extended by DN 6 + 8
- B pipe dimensions acc. to DIN EN ISO 1127
- C pipe dimensions acc. to ASME-BPE 1997

**The steel types are made of the standard materials 1.4404, 1.4435 and 1.4539.**  
 (The material 1.4539 is traded only for ISO pipe dimensions).

**The requirements for the pipes are as follows:**

- annealed
- free from fat or oil deposits
- metallicly bright
- without dried staining substances
- end of pipe planned for edge form 1 acc. to DIN 2559-1 (orbital welding)
- end of pipe sealed with end caps
- packaging in PE hoses

**Acc. to DIN 11866, the order data typically comprises:**

	Examples
Outside pipe diameter and wall thickness	41 x 1.5
Manufactured length	approx. 6,000 mm
Material / grade	no.1.4404
Hygienic class	H2 ...
Certificates	3.1B acc. to DIN EN 10204
Delta ferrite content	to be stated optionally, DF class 1-3
Test class according to DIN 17457	Pk1 oder Pk2

**The inner and outer surface are differentiated into the hygiene classes:**

- Outer surface:**
- without nominal Ra value: pickled or bright-annealed
  - with nominal Ra value: typ. ground Ra < 0.8 µm

**Inner surface:**

Hygienic class	inner area	seam area typ. inside	surface executed acc. to DIN 17457 / 17458
H1	Ra < 1.6 µm	Ra < 3.2 µm	k2g or k3g
H2	Ra < 0.8 µm	Ra < 1.6 µm	n2, k2g or k3g
H3	Ra < 0.8 µm	Ra < 0.8 µm	K2g or k3g
H4	Ra < 0.4 µm	Ra < 0.4 µm	l2, n2, k2g or k3g
H5	Ra < 0.25 µm	Ra < 0.25 µm	l2 or n2

Complementary information on the delta ferrite content is provided by the DF class (delta ferrite class). The quoted content always corresponds to the condition upon delivery and is divided into three categories: DF class 1 < 3.0%, DF class 2 < 1.0 % and DF class 3 < 0.5%.

The surface quality of the hygienic class 2 comes up to the standard DIN 11850.  
 Please observe that pipes delivered by AWH are always pickled on the outside.

## Pipe according to DIN 11866 - Series A

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H1
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1	inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1		
8 x 1.0	225 120	225 100	225 160	225 140	0.174	
10 x 1.0	225 121	225 101	225 161	225 141	0.226	
13 x 1.5	225 122	225 102	225 162	225 142	0.428	
19 x 1.5	225 123	225 103	225 163	225 143	0.651	
23 x 1.5	225 124	225 104	225 164	225 144	0.800	
29 x 1.5	225 125	225 105	225 165	225 145	1.024	
35 x 1.5	225 126	225 106	225 166	225 146	1.247	
41 x 1.5	225 127	225 107	225 167	225 147	1.471	
53 x 1.5	225 128	225 108	225 168	225 148	1.917	
70 x 2.0	225 129	225 109	225 169	225 149	3.375	
85 x 2.0	225 130	225 110	225 170	225 150	4.120	
104 x 2.0	225 131	225 111	225 171	225 151	5.063	
125 x 2.0	225 132	225 112	225 172	225 152	6.304	
150 x 2.0	225 133	225 113	225 173	225 153	7.545	
204 x 2.0	225 134	225 114	225 174	225 154	10.027	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H2
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2	inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2		
8 x 1.0	225 220	225 200	225 260	225 240	0.174	
10 x 1.0	225 221	225 201	225 261	225 241	0.226	
13 x 1.5	225 222	225 202	225 262	225 242	0.428	
19 x 1.5	225 223	225 203	225 263	225 243	0.651	
23 x 1.5	225 224	225 204	225 264	225 244	0.800	
29 x 1.5	225 225	225 205	225 265	225 245	1.024	
35 x 1.5	225 226	225 206	225 266	225 246	1.247	
41 x 1.5	225 227	225 207	225 267	225 247	1.471	
53 x 1.5	225 228	225 208	225 268	225 248	1.917	
70 x 2.0	225 229	225 209	225 269	225 249	3.375	
85 x 2.0	225 230	225 210	225 270	225 250	4.120	
104 x 2.0	225 231	225 211	225 271	225 251	5.063	
125 x 2.0	225 232	225 212	225 272	225 252	6.304	
150 x 2.0	225 233	225 213	225 273	225 253	7.545	
204 x 2.0	225 234	225 214	225 274	225 254	10.027	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H3
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3	inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3		
8 x 1.0	225 320	225 300	225 360	225 340	0.174	
10 x 1.0	225 321	225 301	225 361	225 341	0.226	
13 x 1.5	225 322	225 302	225 362	225 342	0.428	
19 x 1.5	225 323	225 303	225 363	225 343	0.651	
23 x 1.5	225 324	225 304	225 364	225 344	0.800	
29 x 1.5	225 325	225 305	225 365	225 345	1.024	
35 x 1.5	225 326	225 306	225 366	225 346	1.247	
41 x 1.5	225 327	225 307	225 367	225 347	1.471	
53 x 1.5	225 328	225 308	225 368	225 348	1.917	
70 x 2.0	225 329	225 309	225 369	225 349	3.375	
85 x 2.0	225 330	225 310	225 370	225 350	4.120	
104 x 2.0	225 331	225 311	225 371	225 351	5.063	
125 x 2.0	225 332	225 312	225 372	225 352	6.304	
150 x 2.0	225 333	225 313	225 373	225 353	7.545	
204 x 2.0	225 334	225 314	225 374	225 354	10.027	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H4
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4	inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4		
8 x 1.0	225 420	225 400	225 460	225 440	0.174	
10 x 1.0	225 421	225 401	225 461	225 441	0.226	
13 x 1.5	225 422	225 402	225 462	225 442	0.428	
19 x 1.5	225 423	225 403	225 463	225 443	0.651	
23 x 1.5	225 424	225 404	225 464	225 444	0.800	
29 x 1.5	225 425	225 405	225 465	225 445	1.024	
35 x 1.5	225 426	225 406	225 466	225 446	1.247	
41 x 1.5	225 427	225 407	225 467	225 447	1.471	
53 x 1.5	225 428	225 408	225 468	225 448	1.917	
70 x 2.0	225 429	225 409	225 469	225 449	3.375	
85 x 2.0	225 430	225 410	225 470	225 450	4.120	
104 x 2.0	225 431	225 411	225 471	225 451	5.063	
125 x 2.0	225 432	225 412	225 472	225 452	6.304	
150 x 2.0	225 433	225 413	225 473	225 453	7.545	
204 x 2.0	225 434	225 414	225 474	225 454	10.027	

## Pipe according to DIN 11866 - Series B

Quality H1	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4404	1.4404	1.4435	1.4435	
		inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1	inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1	
	10.2 x 1.6	226 120	226 100	226 160	226 140	0.342
	13.5 x 1.6	226 121	226 101	226 161	226 141	0.473
	17.2 x 1.6	226 122	226 102	226 162	226 142	0.619
	21.3 x 1.6	226 123	226 103	226 163	226 143	0.782
	26.9 x 1.6	226 124	226 104	226 164	226 144	1.005
	33.7 x 2.0	226 125	226 105	226 165	226 145	1.573
	42.4 x 2.0	226 126	226 106	226 166	226 146	2.005
	48.3 x 2.0	226 127	226 107	226 167	226 147	2.298
	60.3 x 2.0	226 128	226 108	226 168	226 148	2.894
	76.1 x 2.0	226 129	226 109	226 169	226 149	3.678
	88.9 x 2.3	226 130	226 110	226 170	226 150	4.943
	114.3 x 2.3	226 131	226 111	226 171	226 151	6.393
	139.7 x 2.6	226 132	226 112	226 172	226 152	8.847
	168.3 x 2.6	226 133	226 113	226 173	226 153	10.692
	219.1 x 2.6	226 134	226 114	226 174	226 154	13.970

Quality H2	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4404	1.4404	1.4435	1.4435	
		inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2	inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2	
	10.2 x 1.6	226 220	226 200	226 260	226 240	0.342
	13.5 x 1.6	226 221	226 201	226 261	226 241	0.473
	17.2 x 1.6	226 222	226 202	226 262	226 242	0.619
	21.3 x 1.6	226 223	226 203	226 263	226 243	0.782
	26.9 x 1.6	226 224	226 204	226 264	226 244	1.005
	33.7 x 2.0	226 225	226 205	226 265	226 245	1.573
	42.4 x 2.0	226 226	226 206	226 266	226 246	2.005
	48.3 x 2.0	226 227	226 207	226 267	226 247	2.298
	60.3 x 2.0	226 228	226 208	226 268	226 248	2.894
	76.1 x 2.0	226 229	226 209	226 269	226 249	3.678
	88.9 x 2.3	226 230	226 210	226 270	226 250	4.943
	114.3 x 2.3	226 231	226 211	226 271	226 251	6.393
	139.7 x 2.6	226 232	226 212	226 272	226 252	8.847
	168.3 x 2.6	226 233	226 213	226 273	226 253	10.692
	219.1 x 2.6	226 234	226 214	226 274	226 254	13.970

Quality H3	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4404	1.4404	1.4435	1.4435	
		inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3	inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3	
	10.2 x 1.6	226 320	226 300	226 360	226 340	0.342
	13.5 x 1.6	226 321	226 301	226 361	226 341	0.473
	17.2 x 1.6	226 322	226 302	226 362	226 342	0.619
	21.3 x 1.6	226 323	226 303	226 363	226 343	0.782
	26.9 x 1.6	226 324	226 304	226 364	226 344	1.005
	33.7 x 2.0	226 325	226 305	226 365	226 345	1.573
	42.4 x 2.0	226 326	226 306	226 366	226 346	2.005
	48.3 x 2.0	226 327	226 307	226 367	226 347	2.298
	60.3 x 2.0	226 328	226 308	226 368	226 348	2.894
	76.1 x 2.0	226 329	226 309	226 369	226 349	3.678
	88.9 x 2.3	226 330	226 310	226 370	226 350	4.943
	114.3 x 2.3	226 331	226 311	226 371	226 351	6.393
	139.7 x 2.6	226 332	226 312	226 372	226 352	8.847
	168.3 x 2.6	226 333	226 313	226 373	226 353	10.692
	219.1 x 2.6	226 334	226 314	226 374	226 354	13.970

Quality H4	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4404	1.4404	1.4435	1.4435	
		inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4	inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4	
	10.2 x 1.6	226 420	226 400	226 460	226 440	0.342
	13.5 x 1.6	226 421	226 401	226 461	226 441	0.473
	17.2 x 1.6	226 422	226 402	226 462	226 442	0.619
	21.3 x 1.6	226 423	226 403	226 463	226 443	0.782
	26.9 x 1.6	226 424	226 404	226 464	226 444	1.005
	33.7 x 2.0	226 425	226 405	226 465	226 445	1.573
	42.4 x 2.0	226 426	226 406	226 466	226 446	2.005
	48.3 x 2.0	226 427	226 407	226 467	226 447	2.298
	60.3 x 2.0	226 428	226 408	226 468	226 448	2.894
	76.1 x 2.0	226 429	226 409	226 469	226 449	3.678
	88.9 x 2.3	226 430	226 410	226 470	226 450	4.943
	114.3 x 2.3	226 431	226 411	226 471	226 451	6.393
	139.7 x 2.6	226 432	226 412	226 472	226 452	8.847
	168.3 x 2.6	226 433	226 413	226 473	226 453	10.692
	219.1 x 2.6	226 434	226 414	226 474	226 454	13.970

## Pipe according to DIN 11866 - Series C

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H1
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1	inside Ra< 1.6 / 3.2 µm outside grinded Ra< H1o	inside Ra< 1.6 / 3.2 µm outside stand. acc. to DIN H1		
6.35 x 0.89	227 120	227 100	227 160	227 140	0.121	
9.53 x 0.89	227 121	227 101	227 161	227 141	0.191	
12.7 x 1.65	227 122	227 102	227 162	227 142	0.453	
19.05 x 1.65	227 123	227 103	227 163	227 143	0.713	
25.4 x 1.65	227 124	227 104	227 164	227 144	0.973	
38.1 x 1.65	227 125	227 105	227 165	227 145	1.493	
50.8 x 1.65	227 126	227 106	227 166	227 146	2.013	
63.5 x 1.65	227 127	227 107	227 167	227 147	2.533	
76.2 x 1.65	227 128	227 108	227 168	227 148	3.053	
101.6 x 2.11	227 129	227 109	227 169	227 149	5.210	
152.4 x 2.77	227 130	227 110	227 170	227 150	10.287	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H2
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2	inside Ra< 0.8 / 1.6 µm outside grinded Ra< H2o	inside Ra< 0.8 / 1.6 µm outside stand. acc. to DIN H2		
6.35 x 0.89	227 220	227 200	227 260	227 240	0.121	
9.53 x 0.89	227 221	227 201	227 261	227 241	0.191	
12.7 x 1.65	227 222	227 202	227 262	227 242	0.453	
19.05 x 1.65	227 223	227 203	227 263	227 243	0.713	
25.4 x 1.65	227 224	227 204	227 264	227 244	0.973	
38.1 x 1.65	227 225	227 205	227 265	227 245	1.493	
50.8 x 1.65	227 227	227 206	227 266	227 246	2.013	
63.5 x 1.65	227 227	227 207	227 267	227 247	2.533	
76.2 x 1.65	227 228	227 208	227 268	227 248	3.053	
101.6 x 2.11	227 229	227 209	227 269	227 249	5.210	
152.4 x 2.77	227 230	227 210	227 270	227 250	10.287	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H3
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3	inside Ra< 0.8 / 0.8 µm outside grinded Ra< H3o	inside Ra< 0.8 / 0.8 µm outside stand. acc. to DIN H3		
6.35 x 0.89	227 320	227 300	227 360	227 340	0.121	
9.53 x 0.89	227 321	227 301	227 361	227 341	0.191	
12.7 x 1.65	227 322	227 302	227 362	227 342	0.453	
19.05 x 1.65	227 323	227 303	227 363	227 343	0.713	
25.4 x 1.65	227 324	227 304	227 364	227 344	0.973	
38.1 x 1.65	227 325	227 305	227 365	227 345	1.493	
50.8 x 1.65	227 326	227 306	227 366	227 346	2.013	
63.5 x 1.65	227 327	227 307	227 367	227 347	2.533	
76.2 x 1.65	227 328	227 308	227 368	227 348	3.053	
101.6 x 2.11	227 329	227 309	227 369	227 349	5.210	
152.4 x 2.77	227 330	227 310	227 370	227 350	10.287	

Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]	Quality H4
	1.4404	1.4404	1.4435	1.4435		
	inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4	inside Ra< 0.4 / 0.4 µm outside grinded Ra< H4o	inside Ra< 0.4 / 0.4 µm outside stand. acc. to DIN H4		
6.35 x 0.89	227 420	227 400	227 460	227 440	0.121	
9.53 x 0.89	227 421	227 401	227 461	227 441	0.191	
12.7 x 1.65	227 422	227 402	227 462	227 442	0.453	
19.05 x 1.65	227 423	227 403	227 463	227 443	0.713	
25.4 x 1.65	227 424	227 404	227 464	227 444	0.973	
38.1 x 1.65	227 425	227 405	227 465	227 445	1.493	
50.8 x 1.65	227 426	227 406	227 466	227 446	2.013	
63.5 x 1.65	227 427	227 407	227 467	227 447	2.533	
76.2 x 1.65	227 428	227 408	227 468	227 448	3.053	
101.6 x 2.11	227 429	227 409	227 469	227 449	5.210	
152.4 x 2.77	227 430	227 410	227 470	227 450	10.287	

# DIN EN ISO 1127 for rust-proof steel pipes similar to DIN 11850

The ISO pipes are described in terms of dimensions in the standard "DIN EN ISO 1127 seamless stainless steel pipes" (issued by Beuth Verlag GmbH, D-10722 Berlin). This standard derives from the standards DIN 2462 (dimensions of seamless pipes) and DIN 2463 (dimensions of welded pipes).

Here, the dimensions, limit dimensions and lengths are defined. Contrary to the previous DIN 2462 and 2463, the definitions for seamless and welded pipes are integrated into one standard, thus omitting the differences between both standards.

The following limit dimensions are defined:

a. for the outside diameter in tolerance classes

- D1 ( $\pm 1.5\%$  mit min.  $\pm 0.75$  mm)
- D2 ( $\pm 1\%$  mit min.  $\pm 0.5$  mm)
- D3 ( $\pm 0.75\%$  mit min.  $\pm 0.3$  mm)
- D4 ( $\pm 0.5\%$  mit min.  $\pm 0.1$  mm)

b. for the wall thickness

- T1 ( $\pm 15\%$  mit min.  $\pm 0.6$  mm)
- T2 ( $\pm 12.5\%$  mit min.  $\pm 0.4$  mm)
- T3 ( $\pm 10\%$  mit min.  $\pm 0.2$  mm)
- T4 ( $\pm 7.5\%$  mit min.  $\pm 0.15$  mm)
- T5 ( $\pm 5\%$  mit min.  $\pm 0.1$  mm)

ISO pipes are manufactured from hot rolled sheet metal. The surface quality related to the parent material, which is described as slight "orange-peel skin" cannot be improved by polishing, contrary to the pipe standard DIN 11850 and others (cold rolled strip parent material).

Further determinations regarding the surface quality (roughness etc.) and ferrite content are not taken into consideration for ISO pipes.

CC	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301	1.4541	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• no heat treatment</li> <li>• pickling of inside surface</li> <li>• pickling of outside surface</li> <li>• up to a <math>\varnothing</math> 76.1 D4, otherwise D3</li> <li>• S = 1.6 T4</li> <li>• above 1.6 T3</li> </ul>	21.3 x 1.6	805 001	805 011	805 021	805 031	0.789
	26.9 x 1.6	805 002	805 012	805 022	805 032	1.010
	33.7 x 2.0	805 003	805 013	805 023	805 033	1.580
	42.4 x 2.0	805 004	805 014	805 024	805 034	2.020
	48.3 x 2.0	805 005	805 015	805 025	805 035	2.310
	60.3 x 2.0	805 006	805 016	805 026	805 036	2.920
	76.1 x 2.0	805 007	805 017	805 027	805 037	3.700
	88.9 x 2.0	805 008	805 018	805 028	805 038	4.350
	114.3x2.0	805 009	805 019	805 029	805 039	5.620

CD	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301	1.4541	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• no heat treatment</li> <li>• pickling of inside surface</li> <li>• grinding of outside surface</li> <li>• up to a <math>\varnothing</math> 76.1 D4, otherwise D3</li> <li>• S = 1.6 T4</li> <li>• above 1.6 T3</li> </ul>	21.3 x 1.6	805 101	805 111	805 121	805 131	0.789
	26.9 x 1.6	805 102	805 112	805 122	805 132	1.010
	33.7 x 2.0	805 103	805 113	805 123	805 133	1.580
	42.4 x 2.0	805 104	805 114	805 124	805 134	2.020
	48.3 x 2.0	805 105	805 115	805 125	805 135	2.310
	60.3 x 2.0	805 106	805 116	805 126	805 136	2.920
	76.1 x 2.0	805 107	805 117	805 127	805 137	3.700
	88.9 x 2.0	805 108	805 118	805 128	805 138	4.350
	114.3x2.0	805 109	805 119	805 129	805 139	5.620

BC	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301	1.4541	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickling of inside surface</li> <li>• pickling of outside surface</li> <li>• up to a <math>\varnothing</math> 76.1 D4, otherwise D3</li> <li>• S = 1.6 T4</li> <li>• above 1.6 T3</li> </ul>	21.3 x 1.6	805 201	805 211	805 221	805 231	0.789
	26.9 x 1.6	805 202	805 212	805 222	805 232	1.010
	33.7 x 2.0	805 203	805 213	805 223	805 233	1.580
	42.4 x 2.0	805 204	805 214	805 224	805 234	2.020
	48.3 x 2.0	805 205	805 215	805 225	805 235	2.310
	60.3 x 2.0	805 206	805 216	805 226	805 236	2.920
	76.1 x 2.0	805 207	805 217	805 227	805 237	3.700
	88.9 x 2.0	805 208	805 218	805 228	805 238	4.350
	114.3x2.0	805 209	805 219	805 229	805 239	5.620

BD	Dimensions	Item no.	Item no.	Item no.	Item no.	Weight[kg/m]
		1.4301	1.4541	1.4404	1.4571	
<ul style="list-style-type: none"> <li>• annealed</li> <li>• pickling on inside surface</li> <li>• grinding on outside surface</li> <li>• up to a <math>\varnothing</math> 76.1 D4, otherwise D3</li> <li>• S = 1.6 T4</li> <li>• above 1.6 T3</li> </ul>	21.3 x 1.6	805 301	805 311	805 321	805 331	0.789
	26.9 x 1.6	805 302	805 312	805 322	805 332	1.010
	33.7 x 2.0	805 303	805 313	805 323	805 333	1.580
	42.4 x 2.0	805 304	805 314	805 324	805 334	2.020
	48.3 x 2.0	805 305	805 315	805 325	805 335	2.310
	60.3 x 2.0	805 306	805 316	805 326	805 336	2.920
	76.1 x 2.0	805 307	805 317	805 327	805 337	3.700
	88.9 x 2.0	805 308	805 318	805 328	805 338	4.350
	114.3x2.0	805 309	805 319	805 329	805 339	5.620

# SMS tube execution similar to DIN 11850 and OD tube similar to ASTM A269/270

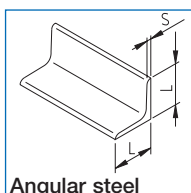
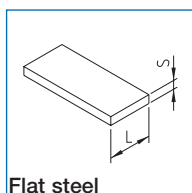
Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404	Item no. 1.4571	Weight[kg/m]	Quality CC
SMS pipe					
25 x 1.2	222 546	222 575	222 553	0.715	
38 x 1.2	222 547	222 565	222 554	1.106	
51 x 1.2	222 548	222 564	222 579	1.496	
63.5 x 1.5	222 545	222 583	222 892	2.329	
76.1 x 1.6	222 372	222 466	222 375	2.985	
101.6 x 2	222 374	222 456	222 389	4.988	
US standard					
12.7 x 1.65	222 952	222 920	222 984	0.46	
19.05 x 1.65	222 953	222 924	222 985	0.72	
25.4 x 1.65	222 954	222 928	222 986	0.98	
38.1 x 1.65	222 955	222 932	222 987	1.51	
50.8 x 1.65	222 956	222 936	222 988	2.03	
63.5 x 1.65	222 957	222 940	222 989	2.56	
76.1 x 1.65	222 958	222 944	222 990	3.08	
101.6 x 2.11	222 959	222 948	222 991	5.26	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404	Item no. 1.4571	Weight[kg/m]	Quality CD
SMS pipe					
25 x 1.2	222 559	222 613	222 893	0.715	
38 x 1.2	222 551	222 614	222 894	1.106	
51 x 1.2	222 560	222 615	222 895	1.496	
63.5 x 1.5	222 569	222 400	222 896	2.329	
76.1 x 1.6	222 460	222 407	222 897	2.985	
101.6 x 2	222 821	222 408	222 898	4.988	
US standard					
12.7 x 1.65	222 960	222 921	222 992	0.46	
19.05 x 1.65	222 961	222 925	222 993	0.72	
25.4 x 1.65	222 962	222 929	222 994	0.98	
38.1 x 1.65	222 963	222 933	222 995	1.51	
50.8 x 1.65	222 964	222 937	222 996	2.03	
63.5 x 1.65	222 965	222 941	222 997	2.56	
76.1 x 1.65	222 966	222 945	222 998	3.08	
101.6 x 2.11	222 967	222 949	222 999	5.26	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404	Item no. 1.4571	Weight[kg/m]	Quality BC
SMS pipe					
25 x 1.2	222 362	222 593	222 901	0.715	
38 x 1.2	222 561	222 594	222 902	1.106	
51 x 1.2	222 438	222 595	222 903	1.496	
63.5 x 1.5	222 496	222 562	222 904	2.329	
76.1 x 1.6	222 497	222 596	222 905	2.985	
101.6 x 2	222 600	222 601	222 906	4.988	
US standard					
12.7 x 1.65	222 968	222 922	223 000	0.46	
19.05 x 1.65	222 969	222 926	223 001	0.72	
25.4 x 1.65	222 970	222 930	223 002	0.98	
38.1 x 1.65	222 971	222 934	223 003	1.51	
50.8 x 1.65	222 972	222 612	223 004	2.03	
63.5 x 1.65	222 973	222 942	223 005	2.56	
76.1 x 1.65	222 974	222 946	223 006	3.08	
101.6 x 2.11	222 975	222 950	223 007	5.26	

Dimensions	Item no. 1.4301/1.4307	Item no. 1.4404	Item no. 1.4571	Weight[kg/m]	Quality BD
SMS pipe					
25 x 1.2	222 476	222 478	222 911	0.715	
38 x 1.2	222 566	222 899	222 912	1.106	
51 x 1.2	222 482	222 908	222 913	1.496	
63.5 x 1.5	222 891	222 563	222 914	2.329	
76.1 x 1.6	222 500	222 907	222 915	2.985	
101.6 x 2	222 909	222 910	222 916	4.988	
US standard					
12.7 x 1.65	222 976	222 923	223 008	0.46	
19.05 x 1.65	222 977	222 927	223 009	0.72	
25.4 x 1.65	222 978	222 931	223 010	0.98	
38.1 x 1.65	222 979	222 935	223 011	1.51	
50.8 x 1.65	222 980	222 918	223 012	2.03	
63.5 x 1.65	222 981	222 943	223 013	2.56	
76.1 x 1.65	222 982	222 947	223 014	3.08	
101.6 x 2.11	222 983	222 951	223 015	5.26	

## Flat steel / Angular steel



### Flat steel

- Sharp-edged
- Cut from hot rolled sheet metal

### Angular steel according to DIN 1028

- Rounded edges
- Hot rolled

		Flat steel		Angular steel	
L	S	Item no./ 1.4301	Weight[kg/m]	Item no./ 1.4301	Weight[kg/m]
20	3	040017	0.471	065000	0.88
20	4	040015	0.628		
20	5	040014	0.785		
20	6	040096	0.942		
20	8	040013	1.260		
20	10	040012	1.570		
25	3	040010	0.589	065002	1.12
25	4	040008	0.785		
25	5	040007	0.981		
25	6	040090	1.180		
25	8	043500	1.570		
30	3	040006	0.707	065006	1.36
30	4	040005	0.942	065008	1.78
30	5	040003	1.180		
30	6	040002	1.410		
30	8	040001	1.880		
30	10	040097	2.360		
35	4			065010	2.10
35	5	040250	1.370		
40	3	040900	0.942	570085	
40	4	040027	1.260	570080	2.42
40	5	040028	1.570	570090	2.97
40	6	040029	1.880		
40	8	040031	2.510		
40	10	040033	3.140		
50	3	040095	1.180		
50	4	040105	1.570		
50	5	040041	1.960	570100	3.77
50	6	040042	2.360	065016	4.47
50	8	040043	3.140		
50	10	040044	3.930		
60	3	40707	1.413		
60	4	040707	1.880		
60	5	040093	2.360		
60	6	040051	2.830		
60	8	040052	3.770		
60	10	040053	4.710		
80	5	040092	3.140		
80	6	040065	3.770	065018	5.42
80	8	040066	5.020	570140	9.66
80	10	040067	6.280		
100	5	040077	3.930		
100	6	040098	4.710		
100	8	040099	6.280		
100	10	040079	7.850	065026	15.10
120	6	040092	5.65		
120	8	043094	7.540		
120	10	040088	9.420		
150	6	040603	7.070		
150	8	040604	9.420		
150	10	43303	11.770		

Other dimensions on request

## Square tube / Rectangular tube

### Square tube

Square tube				
L1	L2	S	Item no.	Weight[kg/m]
15	15	1	801004	0.468
15	15	1.5	801008	0.702
20	20	1	801012	0.624
20	20	1.5	801020	0.936
20	20	2	801024	1.248
25	25	1	801028	0.780
25	25	1.25	801032	0.938
25	25	1.5	801036	1.145
25	25	2	801040	1.502
30	30	1.5	801052	1.404
30	30	2	801056	1.803
30	30	3	801060	2.720
35	35	1	801072	2.148
35	35	1.5	801068	1.638
35	35	2	801072	2.117
40	40	1.5	801080	1.872
40	40	2	801084	2.454
40	40	3	801092	3.744

Square tube				
L1	L2	S	Item no.	Weight[kg/m]
50	50	1.5	801105	2.340
50	50	2	801109	3.080
50	50	3	801117	4.542
60	60	2	801121	3.709
60	60	3	801129	5.616
60	60	4	801360	7.217
80	80	2	801133	4.992
80	80	3	801141	4.988
80	80	4	801147	9.770
100	100	2	801962	6.332
100	100	3	801149	9.422
100	100	4	801153	12.460
120	120	2	801168	7.457
120	120	3	801164	11.184
120	120	4	801162	15.030

### Rectangular tube

Rectangular tube				
L1	L2	S	Item no.	Weight[kg/m]
30	20	1.5	801186	1.170
30	20	2	801190	1.560
40	20	1.25	801062	1.140
40	20	1.5	801193	1.404
40	20	2	801197	1.802
40	30	1.5	801203	1.638
40	30	2	801205	2.184
50	25	1.5	801209	1.755
50	25	2	801212	2.340
50	30	1.5	801216	1.872
50	30	2	801220	2.451
50	30	3	801870	3.507
60	30	1.5	801224	2.106
60	30	2	801228	2.753
60	30	3	801586	2.808
60	40	2	801236	3.078
60	40	3	801244	4.680

Rectangular tube				
L1	L2	S	Item no.	Weight[kg/m]
80	40	2	801248	3.709
80	40	3	801256	5.616
80	40	4	802193	7.078
80	60	2	801741	4.354
80	60	3	801260	6.384
80	60	4	801262	8.509
100	40	2	801264	4.680
100	40	3	801272	7.020
100	50	2	801276	4.670
100	50	3	801280	6.950
100	50	4	802150	9.129
100	60	3	802225	7.403
100	60	4	802226	9.770
120	60	2	802278	5.621
120	60	3	802210	8.354
120	60	4	801965	11.318

### Round steel DIN 671

D	Item no.	Weight[kg/m]
	<b>1.4301</b>	
4	050007	0.099
6	050019	0.222
8	050031	0.395
10	050043	0.617
12	050055	0.888
14	050067	1.208
16	050079	1.578
18	050091	1.999
20	050104	2.466

Other dimensions on request



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