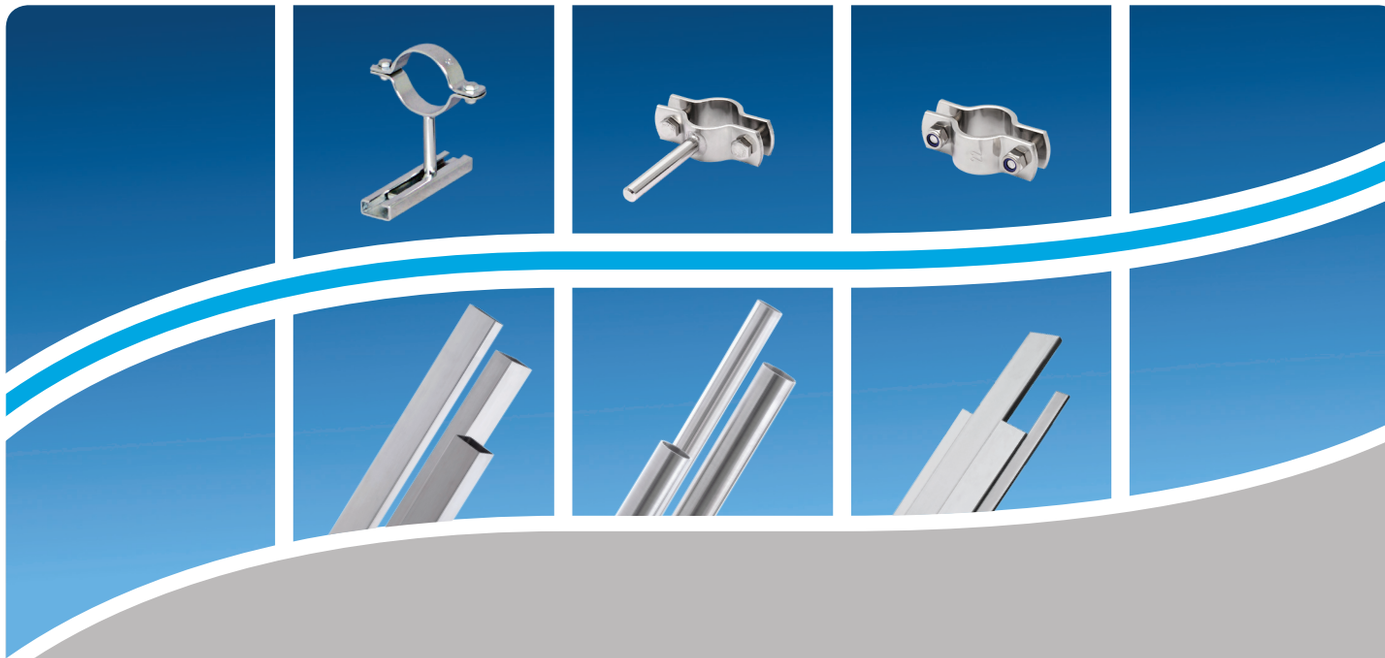
NEUMO
NEUMO Ehrenberg Group

Hygienic Tubes, RHS, Bars and assembly accessories



Edition 2.0

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* An asterisk in the pricing column means: on request

Stainless steel

General

The designation “stainless steel” is a general generic term for rust-proof steels. The chrome content in the steel is generally at least 12 %. This makes it resistant to oxidising corrosive agents. If the chrome alloy or other alloy components, such as Ni, Mo, Ti or Niob, are increased, the resistance to corrosion is also improved.

Sulphur as an alloy component improves the machinability but increases the susceptibility to cracking and the addition of nitrogen improves the mechanical properties. Titanium and niobium are important alloy components for the prevention of intergranular corrosion. These materials are carbide formers which bind the released carbon when exposed to heat.

Because of the various different structures which exist, stainless steels are classified in the groups of austenitic steels and ferrite and martensitic steels.

Properties of austenitic steels

- are not magnetic in an annealed state (can be checked with a magnet)
- work hardening causes the formation of martensite which manifests itself in the low magnetisability
- solution annealing can be used to convert the austenite structure back
- the most important alloy components are min. 18 % chrome and min. 8 % nickel
- have excellent cold forming properties
- have very good toughness properties at very low temperatures (as low as -271 °C)
- are very suitable for welding and are resistant to corrosion
- are the materials most commonly used in the field of stainless steels

Properties of ferrite and martensitic steels

- are magnetic and not as resistant to corrosion as austenitic steels
- the most important alloy component is chrome with a content of 10.5 to 18 %
- the typical ferrite structure cannot be transformed with heat treatment
- higher resistance to chloride-induced transcrystalline stress crack corrosion that austenitic steels
- martensitic steels can be hardened and annealed
- poor welding properties

Types of corrosion

Erosive surface corrosion: Erosive surface corrosion is characterised by even or almost even erosion. Sufficient resistance is assumed if the erosion rate is up to 0.1 mm/year. It occurs with acids and strong alkalis.

Pitting: Localised penetration of the passive layer can cause pitting. Mostly circular corrosion holes which are caused by chlorine, bromine, fluorine or iodine ions with halogen content. Deposits, external rust, slag residue and discolouration on the surface increase the risk of pitting.

Crevice corrosion: Occurs in crevices and has the same mechanisms as pitting. The existing crevices cause a reduction of the available oxygen which prevents the formation of a passivation layer. The lack of circulation/ventilation, i.e. diffusion resistance, can be prevented with a suitable construction.

Contact corrosion: Contact corrosion occurs when different metallic materials which are moistened with an electrolyte come into contacts. The less noble material merges with the more noble material. In practice, stainless steels are the more noble materials compared to many other metallic materials (e.g. non-alloy and low-alloy steels, aluminium). To prevent it, direct contact should be avoided with insulation.

Stress corrosion cracking: A critical type of corrosion for austenitic steel. The tensile stress on the surface, generate by welding, cold forming or alternating loads, for instance, causes fine cracks. Chloride solutions cause corrosion in these heavy ramified transcrystalline cracks. Once corrosion attack has taken place, it quickly spreads over large areas and causes the components to break. Stress corrosion cracking is heavily dependent on temperature. At under 50 °C there damage is very rare. To reduce the risk of stress corrosion cracking it is recommendable to use a suitable annealing method for the components or to increase the nickel content in the steel.

Intergranular corrosion (core decay): To prevent intergranular corrosion it is important to prevent chromium carbides from forming. Improper thermal influences between 450 and 850 °C causes this unwanted formation of chromium carbides. An increased carbon content is particularly damaging. It stimulates the formation of chromium carbides and thus depletes the chrome. These areas of depleted chrome then corrode immediately with a corrosive medium and cause corrosion attack. These kinds of thermal influences occur in the vicinity of welded seams (heat influence zone), for instance.

The use of steels with a low carbon content and suitable heat treatment can prevent this formation of chromium carbides.

Roughness

General

Stainless steels are harmless when used as a standard material in the food and beverage industry, both physiologically and with regard to taste. In addition to the correct selection of material, the properties of the surface which comes into contact with the product during the manufacturing and transportation of food products are crucial. As well as resistance to pitting, the adhesion of microorganisms, product residue and covering, the structure of crusts and the cleaning performance all depend on the surface quality of the material. The average roughness Ra of the roughness profile of the surface is generally used a the gauge. It is determined during cleaning, based on practical experiences, in accordance with the quality of the product, its microbiological hazard or the required hygienic conditions.

The smoothness of the surface cannot be determined using roughness values, such as Ra, alone. A smooth surface is also characterised by large gaps between roughness peaks and valleys and rounded profile shapes. Acc. to recent trials these types of surface only cause low-level interaction with certain products which prevents the formation of coatings and is beneficial for cleaning.

Nowadays smooth surfaces are produced using electrolytic polishing as standard for hygiene requirements. This method, unlike mechanical processing or chemical pickling processes, smooths the surface profiles on a micro scale. The erosion of the top layer also generates a crack-free and pore-free surface which is characterized by the original austenitic crystal structure and thus has the ideal prerequisites for cleaning.

The standardisation of the surface roughness is designed to provide a transparent measurement criterion for manufacturers and suppliers. Additional data on the production of the surface quality, such as electrolytic polishing, grinding, creates a further basis for preventing misunderstandings.

Definition of surface roughness

The following roughness measured values are described in DIN EN ISO 4288. The standard describes how roughness value are determined with electrical surface profiling devices.

The average roughness value Ra (µm)
if the arithmetical mean of the absolute values of profile fluctuation within roughness reference section l.
This means: The sum of individual surfaces which are between the X axis and the actual profile is equal to the surface area of a certain rectangular area. (All individual surfaces are added, regardless of whether they are above or below the middle line). The height of the rectangular area is the Ra value and the width is the length of the reference section. The Ra variable is the preferred variable.

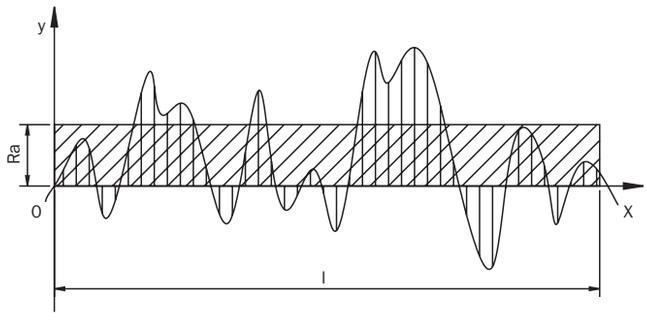
The average roughness height (peak-to-valley height) Rz (µm)
is the arithmetical mean value from the individual roughness depths of five adjacent individual measurement sections (acc. to DIN EN ISO 4287). The highest and the lowest points on each individual measurement section are used as the basis for calculation.

The maximum roughness (peak-to-valley height) Rmax (µm)
is the greatest of the individual roughness depth over the entire measurement section.

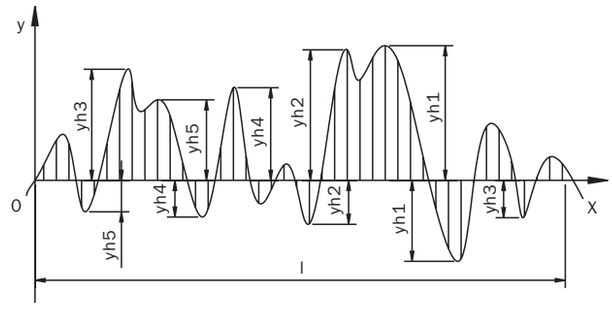
Other roughness depths, such as the mean spacing of profile irregularities RSm, maximum profile peak height Rp or the maximum profile valley depth RM are not relevant to the food industry because of the transparency.

Dependence of the surface roughness on the production methods

Arithmetical mean roughness value Ra



Average roughness height (peak-to-valley height) Rz



Comparison of technical delivery conditions DIN EN 10217-7 and DIN 17457

Comparison						
CURRENT DIN EN 10217-7 Table 2			**WITHDRAWN DIN 17457 Table 6**		**DIN EN 10357 Table 2**	
Abbre-viation	Type of delivery condition (a)	Surface properties	Abbre-viation	Remarks	Abbre-viation	Remarks
W0 (b)	Welded from hot-rolled or cold-rolled sheet metal or strip 1D, 2D, 2E, 2B	welded	d0	Pipes not pickled		
W1 (b)	Welded from hot-rolled or cold-rolled sheet metal or strip 1D, descaled	metallically clean	d1	pickled		
W1A (b)	Welded from hot-rolled or cold-rolled sheet metal or strip 1D, annealed, descaled		d2	pickled annealed		
W1R (b)	Welded from hot-rolled or cold-rolled sheet metal or strip 1D, bright annealed	metallically bright	d3	scale-free annealed		
W2 (b)	Welded from cold-rolled sheet metal or strip 2D, 2E, 2B, descaled	metallically clean	k1	pickled	CL1 CC CL2 CC	pickled
W2A (b)	Welded from cold-rolled sheet metal or strip 2D, 2E, 2B, annealed, descaled	except for welded seam, much smoother than W1 and W1A	k2	pickled annealed	CL1 BC CL2 BC	pickled annealed
W2R (b)	Welded from cold-rolled sheet metal or strip 2D, 2E, 2B, bright annealed	metallically bright	k3	scale-free annealed	CL1 BC CL2 BC	scale-free annealed
WCA	Welded from hot-rolled or cold-rolled sheet metal or strip 1D, 2D, 2E, 2B, annealed, if suitable, at least 20 % cold formed, annealed, with recrystallised weld metal, descaled	metallically clean, welded seam hardly visible	l1	pickled		
WCR	Weeded from hot-rolled or cold-rolled sheet metal or strip 1D, 2D, 2E, 2B, annealed, if suitable, at least 20 % cold formed, bright annealed, with recrystallised weld metal	metallically bright, welded seam hardly visible	l2	scale-free annealed		
WG	ground (c) (normally cold-rolled base material)	ground metallically bright; type of grinding and the roughness to be achieved must be agreed in the enquiry and order (d)	o	ground		
WP	polished (c) (normally cold-rolled base material)	polished metallically bright; type of polishing and the roughness to be achieved must be agreed in the enquiry and order (d)	p	polished		
a b c d	Symbols of the delivery condition acc. to EN 10088-2. If pipes are ordered with smoothed welded seams (“welded seam removed”), the letter “b” has to be added to the abbreviation code for the delivery condition (example: W2Ab) Base material in delivery condition W2, W2A, W2R, WCA or WCR is usually used. It should always be specified in the order whether inside or outside, i.e. whether grinding or polishing is to be performed inside and outside.		g	A “g” is added to the end of the abbreviation code for the design type of pipes with a smoothed welded seam.		

Identification marking for pipes acc. to DIN EN 10217-7

Example: Name of the pipe manufacturer – pipe dimensions – DIN EN 10217-7 – material number – heat number test category - delivery condition marking - party responsible for acceptance - ID number (Manufacturer-70 x 2,0 - DIN EN 10217-7 – 1.4404-Batch-TC1-W2b-X-12345)

DIN EN 10217-7

General

DIN EN 10217-7 (DIN purchased from Beuth Verlag GmbH, 10722 Berlin) describes the technical delivery conditions for “Welded steel pipes for pressure load” AWH pipes according to DIN EN 10217-7 are supplied with a welding seam factor of 1.0.

The pipes described in this way are essentially used in vessel engineering, apparatus engineering and pipeline engineering.

As well as the assessment criteria for the supplied goods, the DIN standard also describes

- the manufacturing method
- the delivery condition
- the chemical compositions
- mechanical and technological properties
- suitability for welding and weldability
- further processing and heat treatment
- chemical corrosion performance
- design types and appearance of the surfaces and the welded connection

Typical ordering data acc. to DIN EN 10217-7

- DIN of the dimensional standard	E.g.: DIN EN ISO 1127
- Outside pipe diameter and wall thickness	E.g.: 114.3 x 3.6
- Test class	E.g.: TC 1
- Manufacture length	E.g.: approx. 6000 mm
- Material number	E.g.: 1.4541
- Tolerance classes	E.g.: D2, T3
- Design type acc. to DIN EN 10217-7, table 2	E.g.: W1 (b)

Test category

Test category 1 (scope of testing of DIN EN 10204 3.1)	- DIN 17457 (withdrawn) **PK 1** - DIN EN 10217-7 (current) **TC 1**
Test category 2 (scope of testing of AD 2000-W2)	- DIN 17457 (withdrawn) **PK 2** - DIN EN 10217-7 (current) **TC 2**

DIN EN 10204

Scope of testing acc. to DIN EN 10217-7					
	Type of testing	**Scope of testing**		**Notes**	**Test standard**
		Test category 1	**Test category 2**		
Binding tests	Heat analysis	one test per heat		11.1	
	Tensile test at room temperature	one test per test unit	two tests per test unit	11.2.1	DIN EN 10002-1
	Ring flattening test or	one test per test unit	each pipe	11.4.1	DIN EN 10233
	Ring tensile test	one test per test unit	each pipe	11.4.2	DIN EN 10237
	Drift expanding test	one test per test unit	each pipe	11.4.3	DIN EN 10234
	Ring expansion test or	one test per test unit	each pipe	11.4.4	DIN EN 10236
	Welded seam bend test	one test per test unit	each pipe	11.5	DIN EN 910
	Leak test	each pipe	each pipe	11.8	DIN EN 10246-2
	Dimensional check	each pipe	each pipe	11.9	
	Visual inspection	each pipe	each pipe	11.10	
	NDT of welded seam (b)	each pipe	each pipe		
	a) Eddy current testing	each pipe	each pipe		DIN EN 10246-3
	b) Ultrasound testing	each pipe	each pipe		DIN EN 10246-7
	c) Ultrasound testing	each pipe	each pipe		DIN EN 10246-9
	d) Radiographic testing	each pipe	each pipe		DIN EN 10246-10
	Material identification	each pipe	each pipe	11.12	
	Testing for crystalline corrosion (option 13) for austenitic and austenitic-ferrite steel types (c)	one test per heat		11.7	DIN ISO 3651-2
Other tests (options)	Part analysis (option 6)	one test per heat		11.1	
	Tensile test at increased temperature (option 11)	acc. to agreement or one test per heat and heat treatment condition	acc. to agreement or one test per heat and heat treatment condition	11.2.2	DIN EN 10002-5
	Tensile test for welded seam (option 22)			11.3	DIN EN 10002-1
	Notch impact test at room temperature (option 8)			11.6	DIN EN 10045-1
	Notch impact test at low temperature (option 12)			11.6	DIN EN 10045-1
	Wall thickness measurement outside the pipe end area (option 24)	each pipe	each pipe	11.9	
	Ultrasound testing of edges of sheet metal/strip to demonstrate doubling (option 17)		each pipe	11.11	DIN EN 10246-17
	Ultrasound testing to demonstrate doubling (option 17)		each pipe	11.11	DIN EN 10246-16
(a) (b) (c)	The choice of test method is left to the manufacturer, taking into consideration the stipulations in table 14. The choice of test method is left to the manufacturer. However, see also foot note a in table 16. Only applies as a binding test for pipes acc. to DIN EN 10357, otherwise it is an optional test (option 13).				
Refer to DIN EN 10217-7 for further technical specifications.					

DIN EN 10204

Die DIN EN 10204: 2004 describes the “Types of test certificates”			
Designation of the inspection documents acc. to DIN EN 10204		**Content of the document**	**Document confirmed by**
Type	**German**		
2.1	Factory document	Confirmation of match to order	the manufacturer
2.2	Factory certificate	Confirmation of match to order with indication of results of non-specific test	the manufacturer
3.1	Acceptance test certificate 3.1	Confirmation of match to order with indication of results of specific test	the party representing the manufacturer authorised by the production department to perform acceptance
3.2	Acceptance test certificate 3.2	Confirmation of match to order with indication of results of specific test	the independent party representing the manufacturer and the purchaser authorized by the production department to perform acceptance or the party authorized to perform acceptance as indicated in the authority regulations
DIN purchased from BEUTH Verlag GmbH, 10722 Berlin			

Explanations for table

2.1 Non-specific test

Testing carried out by the manufacturer using a method which he considered suitable in order to determine whether products, which have been produced using the same product specification and using the same method, match the requirements stipulated in the order.

The tested products do not necessarily need to come from the delivery itself.

2.2 Specific test

Tests which are performed before delivery in accordance with the product specification on the products to be delivered or on test units, of which they are a part, in order to determine whether the products match the requirements stipulated in the order.

2.3 Manufacturer

Organization which produces the respective products in accordance with the requirements of the order with the properties acc. to the product specification.

2.4 Distributor

Organization which receives products from a manufacturer and distributes them without further processing or, if processed, without a change to the basic properties in the order or in the product specification on which the order is based.

2.5 Product specification

All the applicable technical requirements for the production order, stipulated in the production order itself and / or using reference to rules, standards and other specifications, for instances

Test certificates from Armaturenwerk Hötensleben GmbH

AWH has been approved to issue test certificates for 2.1 and 2.2 and restamping certificates.

Furthermore, a 3.1 product or a 3.1. AD 2000-W2 certificate of the raw material can be made available for the product in conjunction with a restamping certificate. AWH has the respective certificate from TÜV Nord for restamping certification.

These certificates for the finished product are sufficient for the notified body (acc. to the pressure vessels directive) as the chemical and physical properties do not change during processing.

The certificates subject to a charge and must be requested at the latest together with placement of the order.

Accreditation to Head Office - A.W.H. GmbH

General

AWH is authorised to produce pressure equipment acc. to the pressure equipment directive.
AWH has a QA department with the relevant welding authorisation, a TÜV restamping certificate and a certificate from TÜV Nord for the manufacture of pressure equipment. Details of certification as follows:

Certification acc. to
- AD 2000 data sheet - HP0
- DIN EN ISO 3834-2 (EN729-2)
- Internal production control with monitoring of acceptance (module A2)
- Quality assurance system acc. to module D1
- Quality assurance system acc. to module D
- Quality assurance system acc. to 2014/68/EC
- Inspection of production facilities for pressure vessels acc. to directive 2014/68/EU
- Agreement on the proper restamping of materials and products for pressure equipment

Scope of application

The pressure equipment directive states that only complete piping or tank can be tested. Therefore no CE marking can be applied to individual components (e.g. individual pipes, screw connection parts, T-pieces, bends and similar parts).

Guideline 1/9 can be referenced. It defines the term “pipeline” exactly (components which have to be tested acc. to the pressure equipment directive): Individual line components, e.g. a pipe or pipe system, pipe fittings, equipment parts, compensators, hose lines or other pressure-retaining components, are not “pipelines”.

For these components the customer can request specific material documentation, e.g. 2.1; 2.2; 3.1 or 3.1 AD 2000-W2 or similar certificates.
The scope of testing is stipulated in the various standards for semi-finished products or the technical rules.
The choice of certificates is determined by the notified body or acc. to the requirements of the purchaser.
When selecting the test certificates the cost factor of the increased testing requirements and the special production technology must also be considered.

Implementation

The requirements for implementation of the pressure equipment directive are based on the classification of the hazard potential.

The following prerequisites are assumed for classification of the hazard potential:
- the product is gaseous
- the product is subject to the hazard classification of “Group 2 (harmless media)”

The hazard potential is greater than for products which are liquid and hazardous.

The following production parts are covered by the pressure equipment directive and are divided up into two groups

1. Parts which are given no CE marking

- Butterfly valves DN10 - DN100
- Strainers up to DN65
- Level indicator, mixer tap
- Non-return valvesDN25 - DN100

Article 4 paragraph 3 states:
- Pressure equipment and/or assemblies which reach limit values no higher than those acc. to points 1.1 to 1.3 of the pressure equipment directive must be engineered and manufactured in accordance with good engineering practice in a member state in order to ensure that they can be used safely. The pressure equipment and/or assemblies must be supplied with sufficient instructions for use and they must bear a marking with which the manufacturer or his representative resident in the community can be identified.
  This pressure equipment and/or assemblies must not bear the CE marking indicated in article 15.

If the customer order parts for a plant or assembly unit which requires acceptance, we can supply the respective factory documentation.
This must be taken into account for order processing.

2. Parts with CE marking

- Strainers DN80 and DN100 fall under category 1
- Strainers DN125 and above fall under category 2
- Butterfly valves DN125 - DN200 fall under category 1

Based on this classification, we have to test in accordance with modules “A” and “A2” acc. to the pressure equipment directive.

Accreditation to Head Office - A.W.H. GmbH

Set-up of the modules

Category	without QA system		with QA system	
	Series production	Individual production	Series production	Individual production
Category I	A - Internal production control			
Category II	A2 - Internal production control with monitoring of acceptance	D1 - Production quality assurance	D1 - Product quality assurance	
Category III	B - EC type test inspection + C2 - Design conformity	B - EC design examination + F - Inspection of products	B - EC type test inspection + E - Product quality assurance B - EC design examination + D - Production quality assurance	H - Comprehensive quality assurance
Category IV	B - EC type test inspection + F - Inspection of products	G - EC individual examination	B - EC type test inspection + D - Production quality assurance	H1 - Comprehensive quality assurance with design examination and special monitoring of production

Description of the modules

Module A:
Internal production control, for products of category I, without QA system

Module A2:
Internal production control with monitoring of acceptance, for products of category II, without QA system

Module B:
EC type examination, only in conjunction with another module, for products of categories III + IV

Module C2:
Conformity with the type, only in conjunction with module B, for products of category III, without QA system

Module D:
Quality assurance for production, only in conjunction with another module, for products of categories III + IV, with QA system

Module D1:
Quality assurance for production, for products of category II, with QA system

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

Module E1:
Quality assurance for product, for products of category II, with QA system

Module F:
Inspection of the products, only in conjunction with module B or B1, for products of categories III + IV, without QA system

Module G:
EC individual examination, for products of category IV, without QA system

Module H:
Comprehensive quality assurance, for products of category III, with QA system

Module H1:
Comprehensive quality assurance with design examination and special monitoring of acceptance, for products of category IV, with QA system

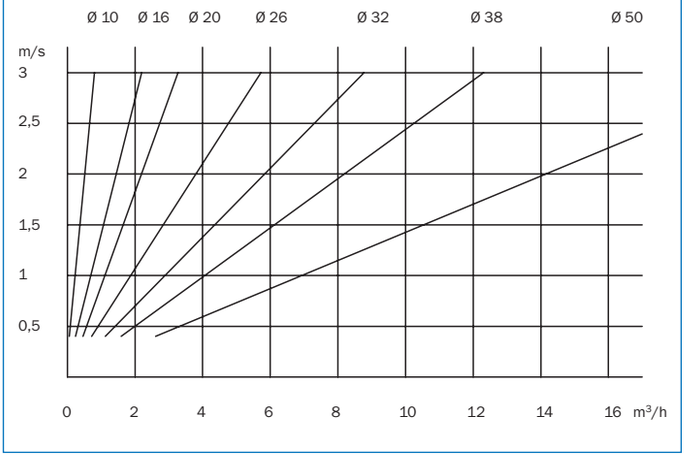
Flow rates

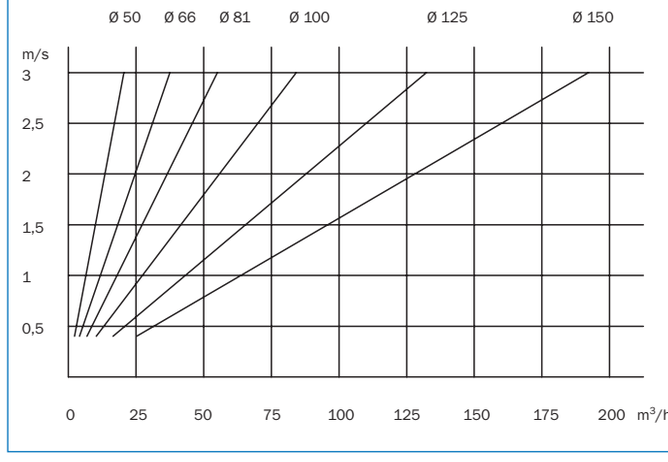
Reference values for flow rates

Equipment		Type of line	Flow rate [m/s]
Water	Drinking 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
	Hot water	Suction line Pressure line	Up to 1.5 Up to 3.0
	Iced water and salt water	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
Cooling agent	Ammoniac	Liquid gas line Gas line	Up to 1.5 1.5 to 20
	Frigen	Liquid gas line Gas line	0.4 to 0.8 8.0 to 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
Cleaning 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
	Condiments	Pressure line	1.5 to 2.0

The values listed in the table are empirical values.
For long pipelines and low pressures it is recommendable to assume lower speeds.

Dependence volume flow/flow rate





Wall thickness calculation

Calculation formula for the wall thickness

The calculation for longitudinally welded pipes with internal positive pressure is performed acc. to AD 2000 data sheet B1.

Calculation formula for the wall thickness

s = Da x p / (20 x K / S x v + p) + c1 + c2

s = wall thickness [mm]
Da = outer diameter of the pipe [mm]
p = highest permitted positive operating pressure [bar]
K = Characteristic value of strength (see table) [N/mm^2]
S = Safety coefficient (acc. to AD 2000 data sheet) = 1.5
v = Characteristic value for calculation of the welded seam
1.0 for pipes acc. to DIN EN 10357 and DIN EN 10217-7
c1 = (Addition to wall thickness to compensate for thickness tolerance.) This value is determined from the wall thickness tolerance T1-T5 from the standard DIN EN ISO 1127.
c2 = 0 (supplement for corrosion and wear, does not apply under normal conditions for austenitic steels)

Table of strength values (according to DIN EN 10088-2)

Type of steel	1.0 yield point at a temperature [°C] of					
	20°C	50°C	100°C	150°C	200°C	250°C
1.4301	230	211	191	172	157	145
1.4307	230	201	181	162	147	137
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
1.4432	225	217	199	181	167	157
1.4539	250	244	235	220	205	190

In accordance with the limit dimensions for the wall thickness (DIN EN ISO 1127) the allowance still has to be factored in.

Example calculation

Given: Outer pipe diameter: Da = 42.4 mm
Material: 1.4301
Positive operating pressure: 45 bar
Operating temperature: 150°C
Limit allowance: D3 (0.75 % with min. ± 0.3 mm)

Sought: required wall thickness s [mm]

Solution: s = Da x p / (20 x K / S x v + p) + c2 + c1
s = 42.4 mm x 45 bar / (20 x 172/1.5 x 0.8 + 45 bar) + 0 + c1
s = 1.015 mm + 0.2 mm

s = 1.215 mm

NR
Determination c1
s = 1.015 mm
T3 (± 10 % with min. ± 0.2 mm)
→ **c1 = 0.2 mm**

The minimum wall thickness is 1.215 mm.

Material parameters

Chemical composition of the steels acc. to DIN EN 10088 Part 1

Type of steel		Reference analysis						
Material	Abbreviated name	C ≤	Si ≤	Mn ≤	Cr	Mo	Ni	other
1.4301	X 5 CrNi 18 10	0.07	1.0	2.0	17.5 - 19.5		8.0 - 10.5	
1.4306	X 2 CrNi 19 11	0.03	1.0	2.0	18.0 - 20.0		10.0 - 12.0	
1.4307	X 2 CrNi 18 9	0.03	1.0	2.0	17.5 - 19.5		8.0 - 10.5	
1.4541	X 6 CrNiTi 18 10	0.08	1.0	2.0	17.0 - 19.0		9.0 - 12.0	Ti ≥ 5 x C to 0.7
1.4401	X 6 CrNiMo 17 12 2	0.07	1.0	2.0	16.5 - 18.5	2.0 - 2.5	10.0 - 13.0	
1.4404	X 2 CrNiMo 17 13 2	0.03	1.0	2.0	16.5 - 18.5	2.0 - 2.5	10.0 - 13.0	
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 x C to 0.7
1.4435	X 2 CrNiMo 18 14 3	0.03	1.0	2.0	17.0 - 19.0	2.5 - 3.0	12.5 - 15.0	S ≤ 0.015
1.4432	X 2 CrNiMo 17 12 3	0.03	1.0	2.0	16.5 - 18.5	2.5 - 3.0	10.5 - 13.0	
1.4539	X 1 CrNiMoCu 25 20 5	0.02	0.7	2.0	19.0 - 21.0	4.0 - 5.0	24.0 - 26.0	Cu 1.2 - 2.0

Yield point and limit temperature

Type of steel		0.2 % yield point [N/mm²] at a temp. °C of											1.0 % yield point [N/mm²] at a temp. °C of											Limit temp.
Material	Abbreviated name	50	100	150	200	250	300	350	400	450	500	550	50	100	150	200	250	300	350	400	450	500	550	in °C
1.4301	X 5 CrNi 18 10	180	157	142	127	118	110	104	98	95	92	90	218	191	172	157	145	135	129	125	122	120	120	300
1.4306	X 2 CrNi 19 11	165	147	132	118	108	100	94	89	85	81	80	200	181	162	147	137	127	121	116	112	109	108	350
1.4307	X 2 CrNi 18 9	165	147	132	118	108	100	94	89	85	81	80	200	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	222	208	196	186	177	167	161	156	152	149	147	400
1.4401	X 6 CrNiMo 17 12 2	193	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	180	165	150	137	127	119	113	108	103	100	98	217	200	180	165	153	145	139	135	130	128	127	400
1.4432	X 2 CrNiMo 17 12 3	182	166	152	137	127	118	113	108	103	100	98	217	199	181	167	157	145	139	135	130	128	127	400
1.4539	X 1 CrNiMoCu 25 20 5	216	205	190	175	160	145	135	125	115	110	105	244	235	220	205	190	175	165	155	145	140	135	400

Minimum values for the 0.2 % and 1.0 % yield point at increased temperatures and reference indications on the limit temperature in case of strain to intergranular corrosion

1)... Up to this temperature (up to 100,000 h) the material has not shown any susceptibility with regards to intergranular corrosion testing.

Remarks: The values refer to parts which are in a solution annealed and quenched condition.
Source: DIN EN 10217-7

Chemical composition of the steels acc. to AISI qualities

Type of steel		Reference analysis						
Material	altern. material no.	C ≤	Si ≤	Mn ≤	Cr	Mo	Ni	other
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 - 3.0	10.0 - 14.0	
316 L	1.4404/1.4435	0.03	1.0	2.0	16.5 - 18.5	2.0 - 3.0	10.0 - 14.0	
904 L	1.4539	0.02	0.7	2.0	19.0 - 21.0	4.0 - 5.0	24.0 - 26.0	

Physical properties of the steels acc. to DIN EN 10088 Part 1

Type of steel		Density	Modulus of elasticity	Tensile strength	Heat exp.	Thermal conduct.	Spec. heat	elec. resistance
Material	Abbreviated name	[kg/dm³]	at 20 °C [N/mm²]	[N/mm²]	20-100 °C [10⁻⁶ K⁻¹]	at 20 °C [W/mK]	at 20 °C [J/kgK]	at 20 °C [Ω mm²/m]
1.4301	X 5 CrNi 18 10	7.90	200	500 - 750	16.0	15	500	0.73
1.4306	X 2 CrNi 19 11	7.90	200	450 - 700	16.0	15	500	0.73
1.4307	X 2 CrNi 18 9	7.90	200	450 - 700	16.0	15	500	0.73
1.4541	X 6 CrNiTi 18 10	7.90	200	540 - 740	16.0	15	500	0.73
1.4401	X 6 CrNiMo 17 12 2	8.00	200	550 - 700	16.0	15	500	0.75
1.4404	X 2 CrNiMo 17 13 2	8.00	200	450 - 700	16.0	15	500	0.75
1.4571	X 6 CrNiMoTi 17 12 2	8.00	200	540 - 690	16.5	15	500	0.75
1.4435	X 2 CrNiMo 18 14 3	8.00	200	500 - 700	16.0	15	500	0.75
1.4432	X 2 CrNiMo 17 12 3	8.00	200	490 - 690	16.0	15	500	0.75
1.4539	X 1 CrNiMoCu 25 20 5	8.00	195	520 - 720	15.8	12	450	1.00

Welding notes

General

The listed base materials are austenitic steels. Due to their chemical composition and the resultant position in the Schaeffler diagram they are very suitable for welding and as a rule can be welded without heat treatment. High-alloy materials are used as additional materials in order to offset the melting loss on alloying elements. When different base materials are combined, the choice of additional material depends on the base material with the highest alloy.

A further important influence factor with regards to the quality of the welded seams is the choice of protective gas. The various physical properties and thermal conductivity of the active and inert protective gases have a significant influence of the penetration profile. The default protective gas for the welding method most commonly used at AWH, i.e. TIG welding, is the inert gas argon. “Pure” argon can be mixed with additives of helium (inert gas) from 30 % to 70 %, of hydrogen (reducing gas) from 2 % to 7.2 % and with minimum admixtures of 0.015 % nitrogen (inert gas).

Argon around 99.996 vol% - default protective gas
- No chemical reaction with the welded goods
- good electric arc ionisation and ignition, also as root protective gas

Argon + hydrogen (5 %) - increases welding speed and penetration
- for welding CrNi steels
- mainly fully mechanical welding (orbital welding) (not for ferrite or duplex steels)

Forming gas N_2 + 10 % H_2 - 4 l/min 1.5 min flushing time with pipe Ø 15 - 20 mm
- 6 l/min 1.5 min flushing time with pipe Ø 33 - 38 mm

For MAG welding Ar + 2.5 % H_2 is used and for MIG welding Ar is used as protective gas.

Welding current sources with pulse technology are recommendable. The benefits of pulse technology are:
- option of lower energy input,
- stable electric arc,
- even root formation,
- better constrained position inclination,
- lower warpage of workpieces,
- better plasticity of the molten bath,
- better gap bridging properties.

The materials are differentiated as follows

Material acc. to DIN 17007	Abbreviated name acc. to DIN 17006	Properties and areas of application	Recommendation Additional material
1.4301 1.4307 1.4541	X 5 CrNi 18 10 X 2 CrNi 18 9 X 6 CrNiTi 18 10	Water and lightly contaminated waste water, food and organic acids, up to a pH value of 4.5 resistant in low-chlorine corrosive agents: Food industry, apparatus engineering, domestic	1.4302 (1.4301), 1.4316, 1.4316 (1.4307) 1.4551, 1.4576 (1.4541)
1.4404 1.4571 1.4432	X 2 CrNiMo 17 12 2 X 6 CrNiMoTi 17 12 2 X 2 CrNiMo 17 12 3	Higher general resistance than the above group, preferred for chem. apparatus engineering, sewage works, paper industry, above all for higher chlorine content: Chemical industry, textile industry, breweries, dairies, drinking water	1.4430, 1.4455 (1.4404), 1.4576
1.4435	X 2 CrNiMo 18 14 3	Higher resistance than the above groups to oxidising acids and corrosive agents with chlorine content; chemical industry, transport containers for chemicals, cellulose industry	1.4430, 1.4576
1.4539	X 1 CrNiMoCu 25 20 5	Particularly suitable for media with chlorine content and sea water. High resistance to reduced acids of medium corrosivity. At room temperature resistant to all concentrations of sulphuric acids, for example.	1.4539, 1.4519

DIN EN 10357

General

DIN EN 10357 was developed for seam welded tubes made of stainless steel for pipe systems in the food, pharmaceutical and chemical industries.

DIN EN 10357 (2021) replaces EN 10357 (2014). Major technical changes compared to the previous edition are as follows:
- Series B dropped, dimensions changed in series C
- Surface finish and roughness and symbols changed.

EN 10357 replaced DIN 11850 at the beginning of 2014.

With regard to EN 10357 the following normative references must be provided: DIN EN 2768, DIN 11851, DIN EN 10374, DIN11853-1 to -3, DIN 11864-1 to -3, DIN 32676, DIN EN 10088-1, DIN EN 10088-2, DIN EN 10204, DIN EN ISO 1127, DIN EN 10217-7

The standard materials 1.4301, 1.4307, 1.4404, 1.4432 and 1.4435 are listed as types of steel.
Material 1.4404 has replaced titanium-stabilized material 1.4571, which is no longer provided for in DIN EN 10357. The end user is responsible for selecting the correct material. In particular for drinking water, for applications in the food and milk processing industry there are strict regulations which may differ from country to country.

Pipe connections

- Pipe fitting according to DIN 11851	for rolling in and butt welding
- Threaded pipe unions acc. to DIN 11864-1 and DIN 11853-1	for butt welding
- Flange connections acc. to DIN 11864-2 and DIN 11853-2	for butt welding
- Clamp connection acc. to DIN 11864-3 and DIN 11853-3	for butt welding
- Clamp connections according to DIN 32676	for butt welding
- Joints according to ISO 2037	for butt welding
- Joints according to BS 4825	for butt welding

Typical ordering data acc. to DIN EN 10357

- technical terms and conditions of delivery acc. to DIN EN 10217-7	E.g.: CL1 BC bright annealed W2Rb or matt pickled W2Ab and annealed (according to DIN EN 10217-7)
- Outside pipe diameter and wall thickness	E.g.: 41 x 1.5
- Manufacture lengths	E.g.: approx. 6000 mm ± 100 mm
- Material	E.g.: 1.4404
- Certificates	E.g.: 3.1
- Test class acc. to DIN EN 10217-7	E.g.: TC1 or TC2

The pipes are marked at least at one end of the supplied pipe.

Surface properties

Product class	Symbol	Inner surface	Outer surface	Heat treatment
CL1 (0.8/1.6 µm)	CL1 CC	pickled W2b and passivated Ra < 0.8µm Welded seam area Ra < 1.6 µm	pickled W2b and passivated	not heat-treated
	CL1 CD	pickled W2b and passivated Ra < 0.8µm Welded seam area Ra < 1.6 µm	ground Ra < 1.0 µm	not heat-treated
	CL1 BC	annealed and pickled, or bright annealed, W2Ab or W2Rb Ra < 0.8µm Welded seam area Ra < 1.6 µm	annealed and pickled, or bright annealed, W2Ab or W2Rb	heat treated
	CL1 BD	annealed and pickled, or bright annealed, W2Ab or W2Rb Ra < 0.8µm Welded seam area Ra < 1.6 µm	ground Ra < 1.0 µm	heat treated
CL2 (0.8/0.8 µm)	CL2 CC	pickled W2b and passivated Ra < 0.8µm Welded seam area Ra < 0.8 µm	pickled W2b and passivated	not heat-treated
	CL2 CD	pickled W2b and passivated Ra < 0.8µm Welded seam area Ra < 0.8 µm	ground Ra < 1.0 µm	not heat-treated
	CL2 BC	annealed and pickled, or bright annealed, W2Ab or W2Rb Ra < 0.8µm Welded seam area Ra < 0.8 µm	annealed and pickled, or bright annealed, W2Ab or W2Rb	heat treated
	CL2 BD	annealed and pickled, or bright annealed, W2Ab or W2Rb Ra < 0.8µm Welded seam area Ra < 0.8 µm	ground Ra < 1.0 µm	heat treated

A distinction is made between the surface quality on the inner surface and the outer surface. It is essentially evaluated acc. to DIN EN 10217-7.

Pressure calculation for pipe acc. to DIN EN 10357

Pipe	max. p at 20 °C	max. p at 150 °C
[mm]	[bar]	[bar]
Series A		
13 x 1.5	332	250
19 x 1.5	219	165
23 x 1.5	179	135
29 x 1.5	140	105
35 x 1.5	115	87
41 x 1.5	98	74
53 x 1.5	75	56
70 x 2.0	76	57
85 x 2.0	62	47
104 x 2.0	50	38
129 x 2.0	41	31
154 x 2.0	34	26
204 x 2.0	26	19
254 x 2.0	20	15
Series C		
12.7 x 1.65	378	285
19.05 x 1.65	241	182
25.4 x 1.65	177	134
38.1 x 1.65	116	87
50.8 x 1.65	86	65
63.5 x 1.65	68	52
76.2 x 1.65	57	43
101.6 x 2.11	55	41
152.4 x 2.77	48	36
Series D		
25 x 1.2	129	98
32.0 x 1.2	100	75
38.0 x 1.2	84	63
51.0 x 1.2	62	47
63.5 x 1.6	67	50
76.1 x 1.6	55	42
101.6 x 2.0	52	39

The permissible operating pressures have been calculated for longitudinally welded pipes (v=1) with the calculation value for material number 1.4307 acc. to DIN EN 10217-7:2015-01, table 6 and 8 – in solution-annealed condition, taking into consideration utilization of the permissible calculation voltage of 100 % in the welded seam.

Tube acc. to DIN EN 10357

Tube acc.DIN EN10357 Quality CL1 CC (Mill Finish)

		1.4301(304L)	1.4404(316L)			
Inch	Dimensions	Article no.	Article no.			Weight [kg/m]
3/4"	19 x 1.5	45047	55047			0.64
1"	25.4 x 1.5	45049	55049			0.88
1 1/2"	38.1 x 1.5	45051	55051			1.37
2"	50.8 x 1.5	45052	55052			1.85
2 1/2"	63.5 x 1.5	45054	55054			2.32
3"	76.1 x 1.5	45055	55055			2.8
4"	101.6 x 1.5	45057	55057			3.75
4"	101.6 x 2	45058	55058			4.98

- unannealed
(not heat treated)
- Pickled O/D
- Inside Ra:0.8/1.6µm

Tube acc.DIN EN10357 Quality CL1 CD (polished O/D)

		1.4301(304L)	1.4404(316L)			
Inch	Dimensions	Article no.	Article no.			Weight [kg/m]
3/4"	19.05 x 1.5	45059	55059			0.64
1"	25.4 x 1.5	45061	55061			0.88
1 1/2"	38.1 x 1.5	45063	55063			1.37
2"	50.8 x 1.5	45064	55064			1.85
2 1/2"	63.5 x 1.5	45066	55066			2.32
3"	76.1 x 1.5	45067	55067			2.8
4"	101.6 x 1.5	45069	55069			3.75
4"	101.6 x 2.0	45070	55070			4.98

- unannealed
(not heat treated)
- Outside polish Ra1.0µm
- Inside Ra:0.8/1.6µm

Tube acc.DIN EN10357 Quality CL1 BC (Mill Finish)

		1.4301(304L)	1.4404(316L)			
Inch	Dimensions	Article no.	Article no.			Weight [kg/m]
1"	25.4 x 1.6	45074	55074			0.95
1 1/2"	38.1 x 1.6	45076	55076			1.46
2"	50.8 x 1.6	45077	55077			1.97
2 1/2"	63.5 x 1.6	45079	55079			2.48
3"	76.1 x 1.6	45080	55080			2.98
4"	101.6 x 2.0	45082	55082			4.98

- comforms to ASTMA270
Fully Annealed
(heat treated)
- Pickled or bright annealed
- Inside Ra:0.8/1.6µm
(pickled or bright annealed)

Tube acc.DIN EN10357 Quality CL1 BD (polished O/D)

		1.4301(304L)	1.4404(316L)			
Inch	Dimensions	Article no.	Article no.			Weight [kg/m]
1/2"	12.7 x 1.6	n/a	55084	offer acc.ASME BPE		0.44
3/4"	19.05 x 1.6	n/a	55085	offer acc.ASME BPE		0.7
1"	25.4 x 1.6	45087	55087			0.95
1 1/2"	38.1 x 1.6	45089	55089			1.46
2"	50.8 x 1.6	45090	55090			1.97
21/2"	63.5 x 1.6	45092	55092			2.48
3"	76.1 x 1.6	45093	55093			2.98
4"	101.6 x 2.0	45095	55095			4.98

- comforms to ASTMA270
Fully Annealed
(heat treated)
- Pickled or bright annealed
- Inside Ra:0.8/1.6µm
(pickled or bright annealed)

Pipe acc. to DIN EN 10357

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm

Pipe acc. to DIN EN 10357 series A – quality CL1 CC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	19 x 1.5	222 029	222 034			0.658
20	23 x 1.5	222 066	222 071			0.808
25	29 x 1.5	222 109	222 114			1.033
32	35 x 1.5	222 154	222 159			1.258
40	41 x 1.5	222 190	222 195			1.484
50	53 x 1.5	222 237	222 242			1.934
65	70 x 2	222 265	222 270			3.405
80	85 x 2	222 282	222 287			4.157
100	104 x 2	222 299	222 304			5.108
125	129 x 2	222 316	222 321			6.360
150	154 x 2	222 327	222 332			7.612
200	204 x 2	801 794	801 793			10.116

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe acc. to DIN EN 10357 series A - quality CL1 CD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	19 x 1.5	222 031	222 036			0.658
20	23 x 1.5	222 068	222 073			0.808
25	29 x 1.5	222 111	222 116			1.033
32	35 x 1.5	222 156	222 161			1.258
40	41 x 1.5	222 192	222 197			1.484
50	53 x 1.5	222 239	222 244			1.934
65	70 x 2	222 267	222 272			3.405
80	85 x 2	222 284	222 289			4.157
100	104 x 2	222 301	222 306			5.108
125	129 x 2	222 318	222 323			6.360
150	154 x 2	222 329	222 334			7.612
200	204 x 2	801 796	801 819			10.116

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm

Pipe acc. to DIN EN 10357 series A - quality CL1 BC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	19 x 1.5	222 030	222 035			0.658
20	23 x 1.5	222 067	222 072			0.808
25	29 x 1.5	222 110	222 115			1.033
32	35 x 1.5	222 155	222 160			1.258
40	41 x 1.5	222 191	222 196			1.484
50	53 x 1.5	222 238	222 243			1.934
65	70 x 2	222 266	222 271			3.405
80	85 x 2	222 283	222 288			4.157
100	104 x 2	222 300	222 305			5.108
125	129 x 2	222 317	222 322			6.360

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe acc. to DIN EN 10357 series A – quality CL1 BD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	19 x 1.5	222 032	222 037			0.658
20	23 x 1.5	222 069	222 074			0.808
25	29 x 1.5	222 112	222 118			1.033
32	35 x 1.5	222 157	222 162			1.258
40	41 x 1.5	222 193	222 198			1.484
50	53 x 1.5	222 240	222 245			1.934
65	70 x 2	222 268	222 273			3.405
80	85 x 2	222 285	222 290			4.157
100	104 x 2	222 302	222 307			5.108
125	129 x 2	222 319	222 324			6.360

Pipe acc. to DIN EN 10357

Pipe acc. to DIN EN 10357 series A – quality CL2 BC

		1.4404 (316L) TC2				
DN DIN	Dimensions	Article no.				Weight [kg/m]
15	19 x 1.5	221 035				0.658
20	23 x 1.5	221 072				0.808
25	29 x 1.5	221 115				1.033
32	35 x 1.5	221 160				1.258
40	41 x 1.5	221 196				1.484
50	53 x 1.5	221 243				1.934
65	70 x 2.0	221 271				3.405
80	85 x 2.0	221 288				4.157
100	104 x 2.0	221 305				5.108
125	129 x 2.0	221 322				6.360

- annealed
- pickled or bright annealed
- inside Ra: 0.8/0.8 µm

Pipe acc. to DIN EN 10357 series A - quality CL2 BD

		1.4404 (316L) TC2				
DN DIN	Dimensions	Article no.				Weight [kg/m]
15	19 x 1.5	221 037				0.658
20	23 x 1.5	221 074				0.808
25	29 x 1.5	221 118				1.033
32	35 x 1.5	221 162				1.258
40	41 x 1.5	221 198				1.484
50	53 x 1.5	221 245				1.934
65	70 x 2.0	221 273				3.405
80	85 x 2.0	221 290				4.157
100	104 x 2.0	221 307				5.108
125	129 x 2.0	221 324				6.360

- annealed
- pickled or bright annealed
- inside Ra: 0.8/0.8 µm
- ground on the outside Ra: 1.0 µm

Pipe acc. to DIN EN 10357

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm
- ground on the outside on request

Pipe acc. to DIN EN 10357 series D – quality CL1 BD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN SMS	Dimensions	Article no.	Article no.			Weight [kg/m]
25	25 x 1.2	222 476	222 478			0.715
32	32 x 1.2	222 367	222 079			0.925
38	38 x 1.2	222 566	222 899			1.106
51	51 x 1.2	222 482	222 908			1.496
63.5	63.5 x 1.6	222 280	223 017			2.480
76.1	76.1 x 1.6	45092	55092			2.985
101.6	101.6 x 2	45093	55093			4.988
4”	101.6 x 2.11	45095	55095			5.26

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm

Pipe acc. to DIN EN 10357 series D – quality CL1 CC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN SMS	Dimensions	Article no.	Article no.			Weight [kg/m]
25	25 x 1.2	222 546	222 575			0.715
32	32 x 1.2	222 544	222 585			0.925
38	38 x 1.2	222 547	222 565			1.106
51	51 x 1.2	222 548	222 564			1.496
63.5	63.5 x 1.6	222 370	222 454			2.480
76.1	76.1 x 1.6	222 372	222 466			2.985
101.6	101.6 x 2	45058	55058			4.988

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe acc. to DIN EN 10357 series D – quality CL1 CD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN SMS	Dimensions	Article no.	Article no.			Weight [kg/m]
25	25 x 1.2	222 559	222 613			0.715
32	32 x 1.2	223 544				0.925
38	38 x 1.2	222 551	222 614			1.106
51	51 x 1.2	222 560	222 615			1.496
63.5	63.5 x 1.6	222 448	222 406			2.480
76.1	76.1 x 1.6	222 460	222 407			2.985
101.6	101.6 x 2	45070	55070			4.988

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm

Pipe acc. to DIN EN 10357 series D – quality CL1 BC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN SMS	Dimensions	Article no.	Article no.			Weight [kg/m]
25	25 x 1.2	222 362	222 593			0.715
32	32 x 1.2	222 363	222 064			0.925
38	38 x 1.2	222 561	222 594			1.106
51	51 x 1.2	222 438	222 595			1.496
63.5	63.5 x 1.6	45079	55079			2.480
76.1	76.1 x 1.6	45080	55080			2.985
101.6	101.6 x 2	45082	55082			4.988

Pipe similar to DIN EN 10357

Pipe similar to DIN EN 10357 – quality CL1 CC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1	222 009	222 014			0.426
20	22 x 1	222 045	222 050			0.526
25	28 x 1	222 087	222 092			0.676
32	34 x 1	222 132	222 137			0.826
40	40 x 1	222 168	222 173			0.977
50	52 x 1	222 215	222 220			1.277

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm

Pipe similar to DIN EN 10357 - quality CL1 CD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1	222 011	222 016			0.426
20	22 x 1	222 047	222 052			0.526
25	28 x 1	222 089	222 094			0.676
32	34 x 1	222 134	222 774			0.826
40	40 x 1	222 1670	222 175			0.977
50	52 x 1	222 217	222 222			1.277

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe similar to DIN EN 10357 - quality CL1 BC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1	222 010	222 015			0.426
20	22 x 1	222 046	222 051			0.526
25	28 x 1	222 088	222 093			0.676
32	34 x 1	222 133	222 138			0.826
40	40 x 1	222 169	222 174			0.977
50	52 x 1	222 216	222 221			1.277

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm

Pipe similar to DIN EN 10357 – quality CL1 BD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1	222 012	222 017			0.426
20	22 x 1	222 048	222 053			0.526
25	28 x 1	222 090	222 095			0.676
32	34 x 1	222 135	222 140			0.826
40	40 x 1	222 171	222 176			0.977
50	52 x 1	222 218	222 223			1.277

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe similar to EN 10357

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm

Pipe similar to EN 10357 – quality CL1 CC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1.5	222 019	222 024			0.620
20	22 x 1.5	222 055	222 060			0.770
25	28 x 1.5	222 098	222 103			0.995
32	34 x 1.5	222 143	222 148			1.221
40	40 x 1.5	222 179	222 184			1.446
50	52 x 1.5	222 226	222 231			1.897

- unannealed
- pickled
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe similar to EN 10357 – quality CL1 CD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1.5	222 021	222 026			0.620
20	22 x 1.5	222 057	222 062			0.770
25	28 x 1.5	222 100	222 105			0.995
32	34 x 1.5	222 145	222 150			1.221
40	40 x 1.5	222 181	222 186			1.446
50	52 x 1.5	222 228	222 233			1.897

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm

Pipe similar to EN 10357 – quality CL1 BC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1.5	222 020	222 025			0.620
20	22 x 1.5	222 056	222 061			0.770
25	28 x 1.5	222 099	222 104			0.995
32	34 x 1.5	222 144	222 149			1.221
40	40 x 1.5	222 180	222 185			1.446
50	52 x 1.5	222 227	222 232			1.897

- annealed
- pickled or bright annealed
- inside Ra: 0.8/1.6 µm
- ground on the outside Ra: 1.0 µm

Pipe similar to EN 10357 – quality CL1 BD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	18 x 1.5	222 023	222 027			0.620
20	22 x 1.5	222 058	222 063			0.770
25	28 x 1.5	222 101	222 106			0.995
32	34 x 1.5	222 146	222 151			1.221
40	40 x 1.5	222 182	222 187			1.446
50	52 x 1.5	222 229	222 234			1.897

Pipe acc. to DIN 11866

General

DIN 11866 describes seamless and welded pipes for aseptics, chemicals and pharmaceuticals.
The dimensions depend on the pipe fittings and connection pieces of DIN 11864 and DIN 11865.

With regard to DIN 11866 the following normative references must be provided:
DIN 2413-1, DIN 2559-1, DIN 2609, DIN 11864-1, DIN 11864-2, DIN 11864-3, DIN 11865, DIN EN 10217-7 (techn. terms and conditions of delivery for welded pipes), DIN EN 10216-5 (techn. terms and conditions of delivery for seamless pipes), DIN EN 10088-1, DIN EN 10204, DIN EN ISO 1127, ASME-BPE 2005.

The described pipes are divided up into pipes of the series:
- A pipe dimensions acc. to DIN EN 10357 series A upgraded with DN6 + DN8
- B pipe dimensions acc. to DIN EN ISO 1127
- C pipe dimensions acc. to ASME-BPE

The materials 1.4435*/1.4404 (316L) and 1.4539 (904L) are listed as the types of steel.
(The material 1.4539 is only a trade item in ISO pipe dimensions), * standard material

Stipulations for the pipes:
- annealed
- free of oil and grease residue
- metallically bright
- without dried staining substances
- pipe ends planned for joint shape 1 acc. to DIN 2559-1 (suitable for orbital welding)
- pipe ends sealed with end caps
- packaging in PE hoses (ground pipes)
- Test class TC2 DIN 10217-7 - DIN 10246-5

Typical ordering data acc. to DIN 11866

Outside pipe diameter and wall thickness	E.g.: 41 x 1.5
Manufacture lengths	E.g.: approx. 6000 mm
Material/material number	E.g.: 1.4435 (1.4404 also available)
Hygiene class	E.g.: H2 ...
Certificates	E.g.: 3.1 acc. to DIN EN 10204
Test class acc. to DIN EN 10217-7	E.g.: TC2
Delta ferrite content	E.g.: To be specified optionally for 1.4435, DF class 1 - 3

Pipe acc. to DIN 11866

Surface properties

Outer surface: - without Ra specification: pickled or bright annealed

- with Ra specification: type ground Ra < 1.0 µm, an additional “o” is added to the hygiene class marking (e.g. H2o).

Inner surface:

Hygiene class	Inner surface	Seam area inside	Typical manufacturing process – finishing of the base pipes
H1	Ra < 1.6 µm	Ra < 3.2 µm	from cold strip* welded, smoothed inner seam, annealed and pickled in a full bath
			or
H2	Ra < 0.8 µm	Ra < 1.6 µm	from cold strip* welded, smoothed inner seam, scale-free annealed
			or
H3	Ra < 0.8 µm	Ra < 0.8 µm	from cold strip* welded, cold drawn (pull-polished), scale-free annealed
			or
H4	Ra < 0.4 µm	Ra < 0.4 µm	seamless, cold drawn (pull-polished), scale-free annealed
			or
H5	Ra < 0.25 µm	Ra < 0.25 µm	only with additional finishing by grinding and/or honing

*cold strip acc. to DIN EN 10088-2:2005-09,Table 6, 2B or 2R.

The DF class (delta ferrite class) also provides additional information of the delta ferrite content of 1.4435.
The specified content always refers to the delivery condition and a distinction is made between three classes:
DF class 1 < 3.0 % in delivery condition, DF class 2 < 1.0 % in delivery condition and DF class 3 < 0.5 % in delivery condition.

The surface quality of hygiene class 2 complies with standard DIN EN 10357.
Note that AWH supplies pipes with outer surfaces which are pickled and ground.

Pipe acc. to DIN 11866

Max. permitted operating pressures

This data up to the max. permissible operating pressures refer to the pipe only in accordance with standard DIN 11866.
This data must not be used for welded constructions or pipe fittings. In this case the AD 2000 rules or other applicable standards must be applied.

Table C.1 – Maximum permissible operating pressures at temperatures of 20 °C and 150 °C in bar

Series A	8 x1.0	10x1.0	13x1.5	19x1.5	23x1.5	29x1.5	35x1.5	41x1.5	53x1.5	70x2	85x2	104x2	129x2.0	154x2.0	204x2.0
max. pressure at 20 °C	328	258	330	232	178	140	115	97	75	78	64	52	42	35	26
max. pressure at 150 °C	263	206	264	175	143	112	92	78	60	63	51	42	33	28	21
Series B	**10.2x1.6**	**13.5x1.6**	**17.2x1.6**	**21.3x1.6**	**26.9x1.6**	**33.7x2.0**	**42.4x2.0**	**48.3x2.0**	**60.3x2.0**	**76.1x2.0**	**88.9x2.3**	**114.3x2.3**	**139.7x2.6**	**168.3x2.6**	**219.1x2.6**
max. pressure at 20 °C	471	344	264	209	163	168	132	115	91	72	71	55	50	42	32
max. pressure at 150 °C	377	275	211	167	131	134	105	92	73	57	56	44	40	33	25
Series C	**6.35x0.89**	**9.53x0.89**	**12.7x1.65**	**19.05x1.65**	**25.4x1.65**		**38.1x1.65**	**50.8x1.65**	**63.5x1.65**	**76.2x1.65**		**101.6x2.11**		**152.4x2.77**	
max. pressure at 20 °C	424	271	368	251	185		121	90	71	59		56		49	
max. pressure at 150 °C	339	216	294	201	148		96	72	57	47		45		39	

The permissible operating pressures have been calculated for longitudinally seam welded and seamless pipes (v=1) with the calculation value for material number 1.4435 acc. to DIN EN 10217-7:2021-06, table 6 - 8 taking into consideration utilisation of the permissible calculation voltage of 100 % in the welded seam.

- **H2**
  inner Ra < 0.8 / 1.6 µm
- **H2o**
  inner Ra < 0.8 / 1.6 µm
  ground on the outside
  Ra < 1.0 µm

Pipe acc. to DIN 11866 - series A - quality H2

		1.4404 (316L)/ H2 TC2	1.4404 (316L)/ H2o TC2			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
15	19 x 1.5	225 203	225 223			0.657
20	23 x 1.5	225 204	225 224			0.808
25	29 x 1.5	225 205	225 225			1.033
32	35 x 1.5	225 206	225 226			1.258
40	41 x 1.5	225 207	225 227			1.484
50	53 x 1.5	225 208	225 228			1.934
65	70 x 2	225 209	225 229			3.405
80	85 x 2	225 210	225 230			4.157
100	104 x 2	225 211	225 231			5.108
125	129 x 2	225 212	225 232			6.360

Further dimensions and designs are available from Neumo GmbH & Co. KG at www.neumo.de.

- **H3**
  inner Ra < 0.8 / 0.8 µm
- **H3o**
  inner Ra < 0.8 / 0.8 µm
  ground on the outside
  Ra < 1.0 µm

* seamless version DIN EN 10216-5

Pipe acc. to DIN 11866 - series A - quality H3

		1.4404 (316L)/ H3 TC2	1.4404 (316L)/ H3o TC2			
DN DIN	Dimensions	Article no.	Article no.			Weight [kg/m]
10	13 x 1.5 *	60186				0.432
15	19 x 1.5	225 303	225 323			0.657
20	23 x 1.5	225 304	225 324			0.808
25	29 x 1.5	225 305	225 325			1.033
32	35 x 1.5	225 306	225 326			1.258
40	41 x 1.5	225 307	225 327			1.484
50	53 x 1.5	225 308	225 328			1.934
65	70 x 2	225 309	225 329			3.405
80	85 x 2	225 310	225 330			4.157
100	104 x 2	225 311	225 331			5.108
125	129 x 2	225 312	225 332			6.360

Further dimensions and designs are available from Neumo GmbH & Co. KG at www.neumo.de.

DIN EN ISO 1127 stainless steel pipes and OD tube ASTM A269/270

DIN EN ISO 1127 stainless steel pipes

The dimensions of ISO pipes are described in the standard “DIN EN ISO 1127 Stainless steel pipes” (purchased BEUTH Verlag GmbH, 10722 Berlin This standard was developed from standards DIN 2462 (dimensions of seamless pipes) and DIN 2463 (dimensions of welded pipes).

It defines dimensions, limit allowances and length dimensions. Compared to the old DIN 2462 and 2463 specifications for seamless and welded pipes are now combined in one standard. Thus the differences between the two standards no longer apply.

The limit dimensions are defined as follows:

a. for the outside diameter in tolerance classes
D1 (± 1.5 % with min. ± 0.75 mm)
D2 (± 1 % with min. ± 0.5 mm)
D3 (± 0.75 % with min. ± 0.3 mm)
D4 (± 0.5 % with min. ± 0.1 mm)

b. for the wall thickness
T1 (± 15 % with min. ± 0.6 mm)
T2 (± 12.5 % with min. ± 0.4 mm)
T3 (± 10 % with min. ± 0.2 mm)
T4 (± 7.5 % with min. ± 0.15 mm)
T5 (± 5 % with min. ± 0.1 mm)

ISO pipes are produced from hot-rolled sheet metal. Unlike qualities acc. to pipe standard DIN EN 10357 (cold strip raw material), the surface quality specific to the raw material, described as “orange peel”, cannot be improved by polishing.

Further definitions of the quality of the surface (roughness etc.) and ferrite content are not included for ISO pipes.

Do you require DIN EN ISO 1127 type pipes? Send your enquiry to our staff and we will be happy to help.

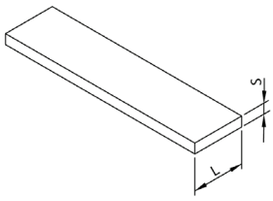
OD tube ASTM A269/270

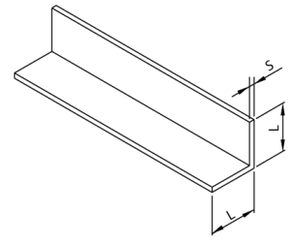
The standards ASTM A269/A270 describe seamless and welded pipes made from austenitic and ferrite/austenitic stainless steel for general and hygienic applications.

They describe the dimensions, limit allowances, type of heat treatment, permissible steel types and the tests which have to be carried out on the pipe.

Do you require ASTM A269/270 pipes? Send your request to our staff. We would be happy to help you.

Flat / angle / round bar





Flat bar

(slit and rolled edge) T304 4mtr lengths

L	S	Article no.	Weight [kg/m]
20	3	29522	0.471
20	5	29554	0.785
20	6	29555	0.942
25	3	29556	0.589
25	5	29558	0.981
30	5	29562	1.18
40	3	29556	0.942
40	5	29568	1.67
40	6	29569	1.88
40	10	29571	3.22
50	3	29573	1.185
50	5	29575	1.975
50	6	29576	2.37
50	10	29578	3.96
60	6	29581	2.844
80	5	29587	3.16
80	8	29589	5.056
80	10	29590	6.32
100	3	31707	2.35
100	5	29591	3.95
100	6	29592	4.74
100	8	29593	6.32
100	10	29594	7.9
150	6	29604	7.07
150	10	31711	11.78

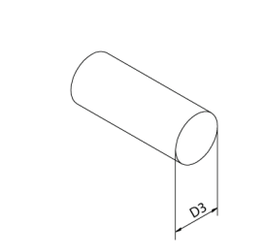
Other dimensions on request

Angle bar

T304 6mtr Lengths

B1	S	Article no.	Weight [kg/m]
20	3	6733	0.877
25	3	6736	1.21
30	3	6742	1.351
40	3	40702	1.99
40	5	6751	2.963
50	3	31760	2.5
50	5	6754	3.753
50	6	6757	4.55
60	6	6760	5.404
80	6	32006	7.94
100	6	6761	9.32

Other dimensions on request



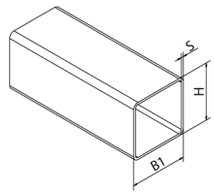
Round bar

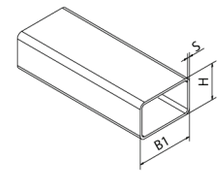
T304

D3	Article no.	Weight [kg/m]
6	18103	0.222
8	18105	0.395
10	18107	0.617
12	18109	0.888
16	18113	1.578
20	18117	2.466

Other dimensions on request

Box / RHS Section





Square 320 grit polish

T304				
B1	H	S	Article no.	Weight [kg/m]
15	15	1.5	7009	0.66
20	20	1.5	7027	0.91
20	20	2	7030	1.18
25	25	1.5	7045	1.18
25	25	2	7048	1.49
25	25	3	16375	2.32
30	30	1.2	7054	1.16
30	30	1.5	7057	1.37
30	30	2	7060	1.84
30	30	3	7066	2.72
40	40	1.5	7096	1.82
40	40	2	7099	2.49
40	40	3	7105	3.67
50	50	1.5	7123	2.39
50	50	2	7126	3.16
50	50	3	7132	4.65
60	60	3	7144	5.66
80	80	2	7156	5.15
80	80	3	7162	7.65
80	80	5	7167	12.39
100	100	3	7177	9.53

Other dimensions on request

Rectangle 320 grit polish

T304				
B1	H	S	Article no.	Weight [kg/m]
40	20	1.5	7294	1.37
50	25	1.5	7315	1.75
50	25	2	7318	2.31
60	40	3	7366	4.65
80	40	2	7375	3.71
80	40	3	7381	5.49
100	50	2	7405	4.68
100	50	3	7408	6.95

Other dimensions on request

Square brushed/mill finish

T304				
B1	H	S	Article no.	Weight [kg/m]
50	50	5	7168	7.41
70	70	3	26811	6.53
80	80	4	7166	9.81
80	80	5	7169	12.39
100	100	4	7181	12.4
100	100	5	7184	15.38
150	150	5	7208	22.4

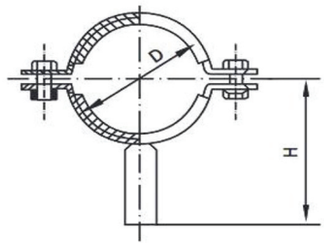
Other dimensions on request

Rectangular brushed/mill finish

T304				
B1	H	S	Article no.	Weight [kg/m]
80	40	4	7385	7.25
100	50	5	7415	11.24
150	100	5	7493	18.8
200	100	5	7514	22.4

Other dimensions on request

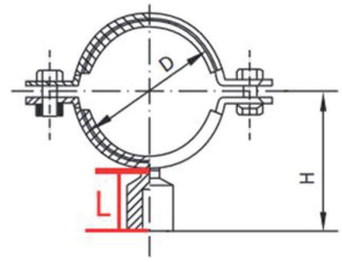
Stainless 304 Pipeclip with Blue Insert Plain Stem



Size	●	H		Screw Bolt	Article no.	Weight [kg/each]
1/2"	12.7	90		M8 x 1.25 x 25	26666	0.17
3/4"	19.05	90		M8 x 1.25 x 25	26667	0.17
1"	25.4	90		M8 x 1.25 x 25	26668	0.26
1 1/4"	31.8	90		M8 x 1.25 x 25	26678	0.27
1 1/2"	38.1	90		M8 x 1.25 x 25	26669	0.28
1 3/4"	44.5	90		M8 x 1.25 x 30	26683	0.3
2"	50.8	90		M8 x 1.25 x 30	26670	0.3
2 1/2"	63.5	90		M8 x 1.25 x 30	26671	0.32
DN65	70	90		M8 x 1.25 x 30	26682	0.34
3"	76.1	90		M8 x 1.25 x 30	26672	0.34
DN80	85	90		M8 x 1.25 x 30	20337	0.35
3"NB	88.9	90		M8 x 1.25 x 30	26679	0.36
4"	101.6	90		M8 x 1.25 x 30	26673	0.38
4"NB	114.3	90		M8 x 1.25 x 30	26680	0.40
129	129	117		M8 x 1.25 x 30	26674	0.42
5"NB	141.3	117		M8 x 1.25 x 30	26684	0.42
6"	154	130		M8 x 1.25 x 30	26675	0.48
6"NB	168.3	130		M8 x 1.25 x 30	26681	0.50
8"	204	155		M8 x 1.25 x 35	26676	0.53
10"	254	180		M8 x 1.25 x 35	26677	0.72

Other dimensions on request

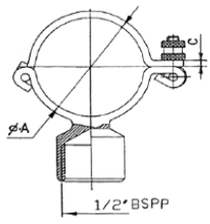
Stainless 304 Pipeclip with Blue Insert M10 Female Boss



Size	●	H	L	Screw Bolt	Article no.	Weight [kg/each]
1/2"	12.7	40	28	M8 x 1.25 x 25	32949	0.17
3/4"	19.05	45	28	M8 x 1.25 x 25	32950	0.17
1"	25.4	48	28	M8 x 1.25 x 25	32951	0.26
1 1/4"	31.8	48	28	M8 x 1.25 x 25	32960	0.26
1 1/2"	38.1	54	28	M8 x 1.25 x 25	32952	0.28
2"	50.8	51	28	M8 x 1.25 x 30	32953	0.3
2 1/2"	63.5	67	28	M8 x 1.25 x 30	32954	0.32
DN65	70	73	28	M8 x 1.25 x 30	32961	0.34
3"	76.1	73	28	M8 x 1.25 x 30	32955	0.34
DN80	85	73	28	M8 x 1.25 x 30	32962	0.36
3"NB	88.9	73	28	M8 x 1.25 x 30	32964	0.36
4"	101.6	86	28	M8 x 1.25 x 30	32956	0.38
4"NB	114.3	90	28	M8 x 1.25 x 30	32965	0.38
5"	129	94	28	M8 x 1.25 x 30	32957	0.42
6"	154	100	28	M8 x 1.25 x 30	32958	0.48
6"NB	168.3	120	28	M8 x 1.25 x 30	32967	0.58
8"	204	140	28	M8 x 1.25 x 35	32963	0.63
10"	254	164	28	M8 x 1.25 x 35	32968	0.73
12"	304	189	28	M8 x 1.25 x 35	32969	0.84

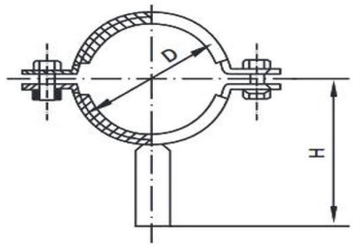
Other dimensions on request

Stainless 304 Pipeclip Hinge BSP Boss



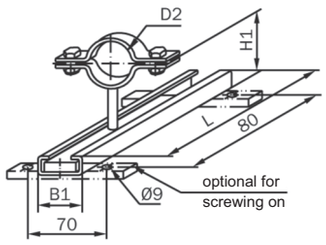
Size mm (Inch)	●	C		Screw Bolt	Article no.	Weight [kg/each]
1/2"	12.7	20		M8 x 16	26685	0.17
3/4"	19.05	20		M8 x 16	26686	0.17
1"	25.4	20		M8 x 16	26687	0.26
1 1/2"	38.1	20		M8 x 16	26688	0.28
2"	50.8	20		M8 x 16	26689	0.3
2 1/2"	63.5	20		M8 x 16	26690	0.32
3"	76.1	20		M8 x 16	26691	0.34
4"	101.6	20		M8 x 16	26692	0.38
Other dimensions on request						

Stainless 304 Pipeclip No Insert Plain Stem



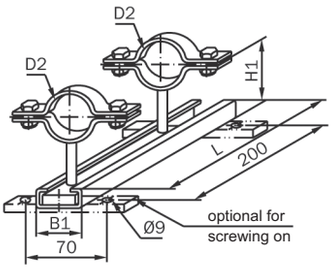
Size mm (Inch)	●	H		Screw Bolt	Article no.	Weight [kg/each]
1"	25.4	90		M8 x 1.25 x 25	32944	0.26
1 1/2"	38.1	90		M8 x 1.25 x 25	32945	0.28
2"	50.8	90		M8 x 1.25 x 30	32946	0.3
2 1/2"	63.5	90		M8 x 1.25 x 30	32947	0.32
3"	76.1	90		M8 x 1.25 x 30	32948	0.34
4"	101.6	90		M8 x 1.25 x 30	32949	0.38
Other dimensions on request						

Sliding clamp systems for pipe acc. to DIN EN 10357



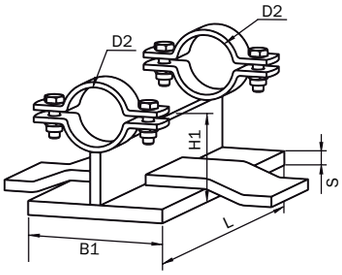
Sliding clamp system, light (one clamp) series A

DN DIN	D2	H1	B1	L	Length offset	Weight [kg]
10	12	64	28	120	50	0.24
15	18	67	28	120	50	0.27
20	22	69	28	120	50	0.28
25	28	72	28	120	50	0.30
32	34	75	28	120	50	0.31
40	40	78	28	120	50	0.32
50	52	84	28	120	50	0.33
65	70	93	28	120	50	0.36
80	85	100.5	28	120	50	0.47
100	104	110	28	120	50	0.52



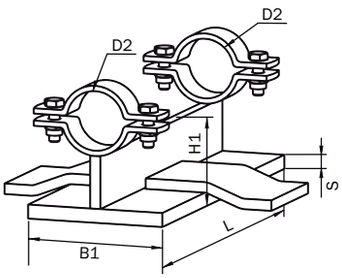
Sliding clamp system, light (two clamps) series A

DN DIN	D2	H1	B1	L	Length offset	Weight [kg]
10	12	64	28	300	100	0.28
15	18	67	28	300	100	0.34
20	22	69	28	300	100	0.36
25	28	72	28	300	100	0.40
32	34	75	28	300	100	0.42
40	40	78	28	300	100	0.44
50	52	84	28	300	100	0.46
65	70	93	28	300	100	0.52
80	85	100.5	28	300	100	0.74
100	104	110	28	300	100	0.84



Sliding clamp system, heavy (two clamps) series A – version A

DN DIN	D2	H1	B1	L	S	Weight [kg]
10	12	66	60	200	6	1.95
15	18	66	60	200	6	1.97
20	22	66	60	200	6	1.98
25	28	66	60	200	6	1.98
32	34	66	60	200	6	2.00
40	40	66	60	200	6	2.00
50	52	66	60	200	6	2.01
65	70	66	60	200	6	2.02
80	85	66	60	200	6	2.08
100	104	66	60	200	6	2.16
125	129	66	60	200	6	2.34
150	154	66	60	200	6	2.89



Sliding clamp system, heavy (two clamps) series A – version B

DN DIN	D2	H1	B1	L	S	Weight [kg]
10	12	85	80	200	5	1.97
15	18	85	80	200	5	1.99
20	22	85	80	200	5	2.00
25	28	85	80	200	5	2.00
32	34	85	80	200	5	2.02
40	40	85	80	200	5	2.02
50	52	85	80	200	5	2.03
65	70	85	80	200	5	2.04
80	85	85	80	200	5	2.10
100	104	85	80	200	5	2.18
125	129	85	80	200	5	2.36
150	154	85	80	200	5	2.91

Sliding clamp systems for pipe acc. to DIN EN 10357

Sliding clamp system, light (one clamp) series A

	1.4301 (304)/pol. (for welding on)		1.4301 (304)/matt (for welding on)		1.4301 (304)/pol. (for screwing on)		1.4301 (304)/matt (for screwing on)	
DN DIN	Price/EUR	Article no.	Price/EUR	Article no.	Price/EUR	Article no.	Price/EUR	Article no.
10	19.36	70051 000 010 10	19.36	70051 000 010 20	25.11	72051 000 010 10	25.11	72051 000 010 20
15	19.36	70051 000 015 10	19.36	70051 000 015 20	25.11	72051 000 015 10	25.11	72051 000 015 20
20	19.36	70051 000 020 10	19.36	70051 000 020 20	25.11	72051 000 020 10	25.11	72051 000 020 20
25	19.03	70051 000 025 10	19.03	70051 000 025 20	24.75	72051 000 025 10	24.75	72051 000 025 20
32	19.23	70051 000 032 10	19.23	70051 000 032 20	24.96	72051 000 032 10	24.96	72051 000 032 20
40	19.46	70051 000 040 10	19.46	70051 000 040 20	25.19	72051 000 040 10	25.19	72051 000 040 20
50	20.00	70051 000 050 10	20.00	70051 000 050 20	25.72	72051 000 050 10	25.72	72051 000 050 20
65	20.74	70051 000 065 10	20.74	70051 000 065 20	26.46	72051 000 065 10	26.46	72051 000 065 20
80	22.17	70051 000 080 10	22.17	70051 000 080 20	27.90	72051 000 080 10	27.90	72051 000 080 20
100	22.96	70051 000 100 10	22.96	70051 000 100 20	28.69	72051 000 100 10	28.69	72051 000 100 20

Sliding clamp system, light (two clamps) series A

	1.4301 (304)/pol. (for welding on)		1.4301 (304)/matt (for welding on)		1.4301 (304)/pol. (for screwing on)		1.4301 (304)/matt (for screwing on)	
DN DIN	Price/EUR	Article no.	Price/EUR	Article no.	Price/EUR	Article no.	Price/EUR	Article no.
10	27.54	71051 000 010 10	27.54	71051 000 010 20	33.29	73051 000 010 10	33.29	73051 000 010 20
15	27.54	71051 000 015 10	27.54	71051 000 015 20	33.29	73051 000 015 10	33.29	73051 000 015 20
20	27.54	71051 000 020 10	27.54	71051 000 020 20	33.29	73051 000 020 10	33.29	73051 000 020 20
25	26.82	71051 000 025 10	26.82	71051 000 025 20	32.55	73051 000 025 10	32.55	73051 000 025 20
32	27.28	71051 000 032 10	27.28	71051 000 032 20	33.01	73051 000 032 10	33.01	73051 000 032 20
40	27.74	71051 000 040 10	27.74	71051 000 040 20	33.47	73051 000 040 10	33.47	73051 000 040 20
50	28.82	71051 000 050 10	28.82	71051 000 050 20	34.54	73051 000 050 10	34.54	73051 000 050 20
65	30.30	71051 000 065 10	30.30	71051 000 065 20	36.03	73051 000 065 10	36.03	73051 000 065 20
80	33.11	71051 000 080 10	33.11	71051 000 080 20	38.84	73051 000 080 10	38.84	73051 000 080 20
100	34.67	71051 000 100 10	34.67	71051 000 100 20	40.42	73051 000 100 10	40.42	73051 000 100 20

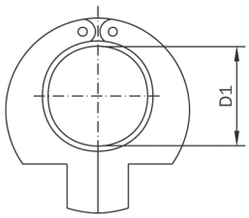
Sliding clamp system, heavy (two clamps) series A – version A

	1.4301 (304)/matt		
DN DIN	Price/EUR	Article no.	
10	30.60	90S00 908 003 43	
15	30.60	90S00 908 003 44	
20	30.60	90S00 908 003 45	
25	30.60	90S00 908 003 46	
32	30.80	90S00 908 003 47	
40	31.05	90S00 908 003 48	
50	31.30	90S00 908 003 49	
65	32.40	90S00 908 003 50	
80	35.85	90S00 908 003 51	
100	36.95	90S00 908 003 52	
125	44.10	90S00 908 003 53	
150	49.05	90S00 908 003 54	

Sliding clamp system, heavy (two clamps) series A – version B

	1.4301 (304)/matt		
DN DIN	Price/EUR	Article no.	
10	41.10	90S00 908 003 30	
15	41.10	90S00 908 003 31	
20	41.10	90S00 908 003 32	
25	41.10	90S00 908 003 33	
32	41.70	90S00 908 003 34	
40	42.50	90S00 908 003 35	
50	43.70	90S00 908 003 36	
65	44.35	90S00 908 003 37	
80	44.95	90S00 908 003 38	
100	46.75	90S00 908 003 39	
125	50.95	90S00 908 003 16	
150	56.90	90S00 908 003 29	

Assembly accessories



Pipe saw tool for pipe DIN EN 10357, series C

T304

DN Inch	D1	Article no.	Weight [kg]
1”	25.4	80000	0.72
1 1/4”	31.8	80001	0.65
1 1/2”	38.1	80002	0.85
2”	50.8	80003	0.99
2 1/2”	63.5	80004	2.15
3”	76.2	80005	2.50
4”	101.6	80006	2.75

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