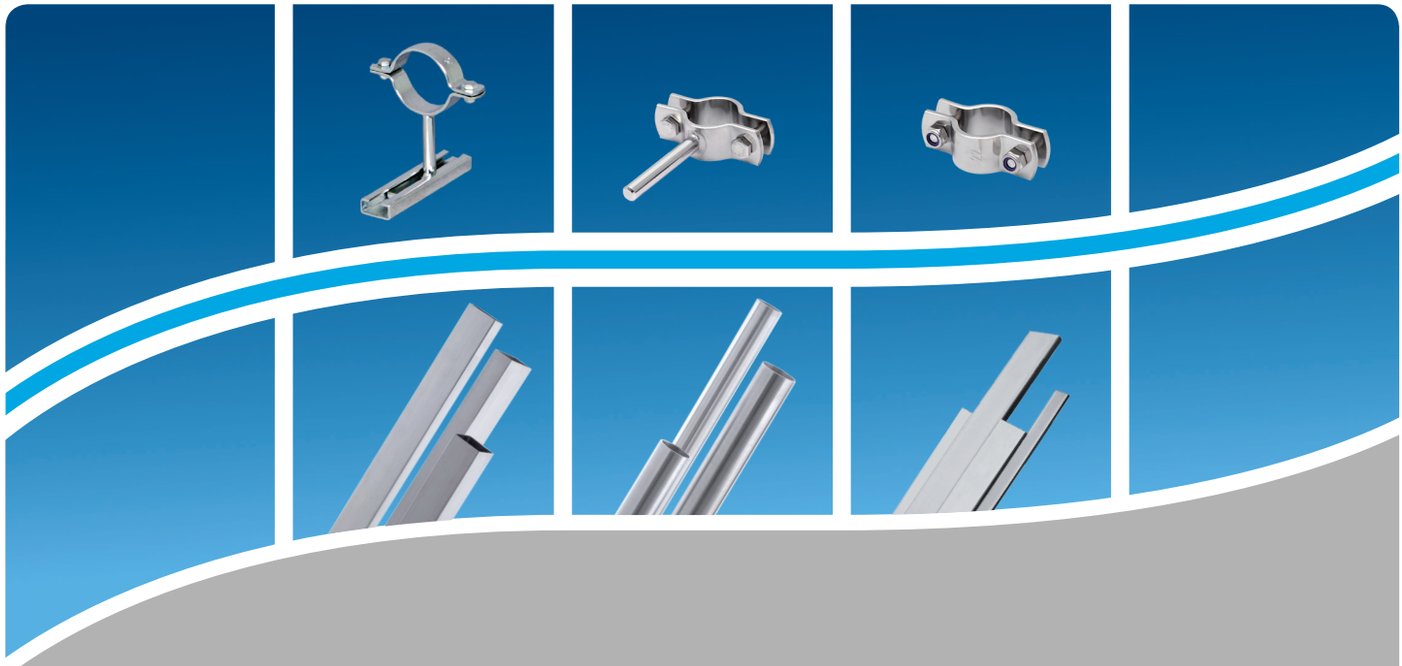
AWH
NEUMO Ehrenberg Group

Pipes & Accessories



Edition 6.0

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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 ferritic 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 ferritic 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 ferritic 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

In 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 characterised 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.

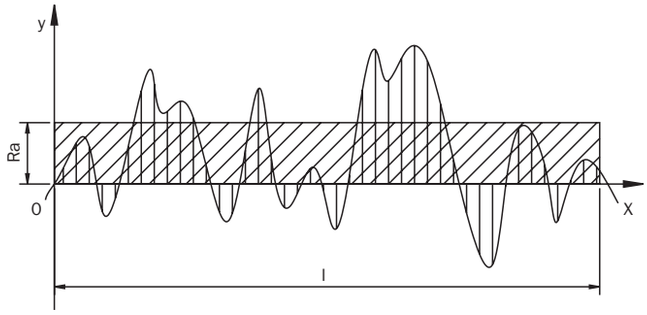
The average roughness height (peak-to-valley height) Rz (µm)
is the arithmetical mean value from the individual roughness depths of five adjacent individual measurement sections (acc. to DIN EN ISO 4287). The highest and the lowest points on each individual measurement section are used as the basis for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

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

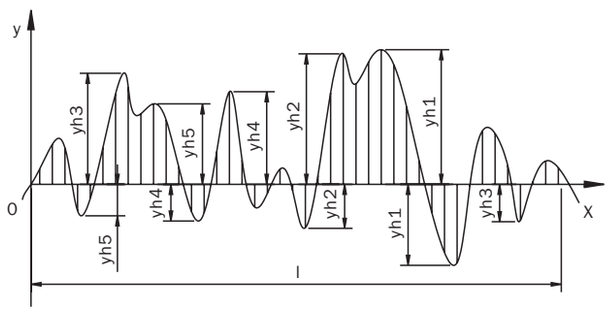
Other roughness depths, such as the mean spacing of profile irregularities RSm, maximum profile peak height Rp or the maximum profile valley depth RM are not relevant to the food industry because of the transparency.

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 of May 2005 and DIN 17457 of July 1985

Comparison

NEW **DIN EN 10217-7 / 2005 Technical delivery condition** **Table 2**			**OLD** **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, heat treated, descaled		d2	pickled heat treated		
W1R (b)	welded from hot-rolled or cold-rolled sheet metal or strip 1D, bright an-nealed	metallically bright	d3	scale-free heat treated		
W2 (b)	welded from cold-rolled sheet metal or strip 2D, 2E, 2B, descaled	metallically clean	k1	pickled	CC	pickled
W2A (b)	welded from cold-rolled sheet metal or strip 2D, 2E, 2B, heat treated, descaled	with the exception of the welded seam much smoother than W1 and W1A	k2	pickled heat treated	BC	pickled heat treated
W2R (b)	welded from cold-rolled sheet metal or strip 2D, 2E, 2B, bright annealed	metallically bright	k3	scale-free heat treated	BC	scale-free heat treated
WCA	welded from hot-rolled or cold-rolled sheet metal or strip 1D, 2D, 2E, 2B, heat treated, if suitable, at least 20 % cold formed, heat treated, with recrys-tallised weld metal, descaled	metallically clean, welded seam hardly visible	l1	pickled		
WCR	welded from hot-rolled or cold-rolled sheet metal or strip 1D, 2D, 2E, 2B, heat treated, if suitable, at least 20 % cold formed, bright annealed, with recrystallised weld metal	metallically bright, welded seam hardly visible	l2	scale-free heat treated		
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 en-quiry 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 en-quiry 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 for 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-Heat number-TC1-W2b-X-12345)

DIN EN 10217-7

In General

DIN EN 10217-7 (DIN purchased from Beuth Verlag GmbH, 10722 Berlin) describes the technical delivery conditions for "Welded steel tubes for pressure purposes". The calculation value for the welded seam is set at 1.0 in this standard.

The pipes described in this way are essentially used in pressure 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 dimensions standard	Example: DIN EN ISO 1127
- Outer pipe diameter and wall thickness	Example: 114.3 x 3.6
- Test class	Example: TC 1
- Production length	Example: approx. 6000 mm
- Material number	Example: 1.4541
- Tolerance classes	Example: D2, T3
- Design type acc. to DIN EN 10217-7, table 2	Example: W1 (b)

Test Category

Test category 1 (scope of testing of DIN EN 10204 3.1)	- DIN 17457 (old) **PK 1** - DIN EN 10217-7 (new) **TC 1**
Test category 2 (scope of testing of AD 2000-W2)	- DIN 17457 (old) **PK 2** - DIN EN 10217-7 (new) **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-ferritic 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
	Notched bar impact test at room temperature (option 8)			11.6	DIN EN 10045-1
	Tensile 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

DIN EN 10204 : 2004 describes the "Types of Inspection Documents"			
Designation of the inspection documents acc. to DIN EN 10204		**Content of the document**	**Confirmation of document by**
Type	**English**		
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 authorised by the production department to perform acceptance or the party authorised 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

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

2.4 Distributor

Organisation 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.

Pressure Equipment Directive 2014/68/EC

In 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 A1)
- 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/EC
- Agreement on the proper restamping of materials and products for pressure equipment

Applicability

The pressure equipment directive states that only complete piping or containers 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 in two groups

1. Parts which are given no CE marking

- Butterfly valves DN10 - DN100
- Strainers up to DN65
- Level indicator, mixer tap
- Non-return valves DN25 - 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 "A1" acc. to the pressure equipment directive.

Pressure Equipment Directive 2014/68/EC

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

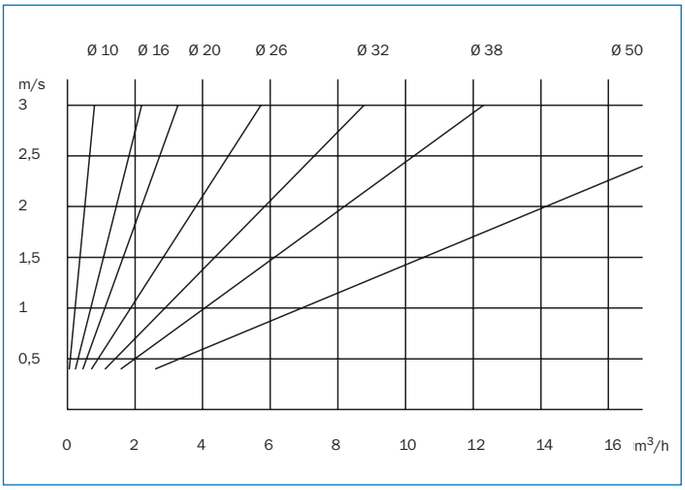
Flow Rates

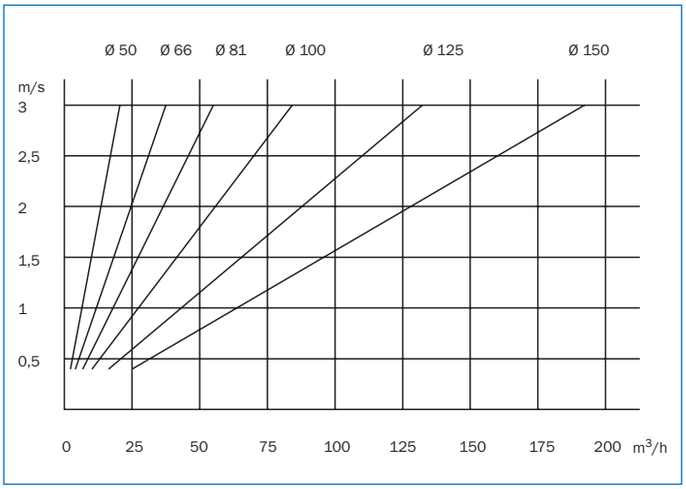
Reference Values for Flow Rates

Operating 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 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 = (increase in wall thickness to compensate thickness tolerance) This value is determined from the wall thickness tolerance T1-T5 acc. to DIN EN ISO 1127 standard.
c2 = 0 (supplement for corrosion and wear, does not apply under normal conditions for austenitic steels)

Table of Strength Values

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) + c1 + c2
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

Auxiliary calculation
Determination c1
s = 1.015 mm
T3 (± 0.10 % 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

In 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 the welding speed and the 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 following Distinctions are made regarding the Types of Documentation

Material acc. to DIN 17007	Abbreviated name acc. to DIN 17006	Properties and areas of application	Additional material recommendation
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	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

In General

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

DIN EN 10357 (2014-3) replaces DIN 11850 at the beginning of 2014. Fundamental changes to DIN 11850:
- Tube series 1 and 2 have been replaced and supplemented by series A to D.
- Series A replaces DIN series 2, series B replaces DIN series 1, series C corresponds to ISO and series D corresponds to OD and SMS.

With regard to EN 10357 the following normative references must be provided: DIN EN 2768, DIN 11851, DIN 11852, 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 the titanium-stabilised material 1.4571. Which is no longer included 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 Unions

- Threaded pipe union acc. 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 acc. to DIN 32676	for butt welding
- Unions acc. to ISO 2037	for butt welding
- Unions acc. 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	Example: BC bright annealed W2R(b) or matt pickled W2A(b) and annealed (acc. to DIN EN 10217-7)
- Outer pipe diameter and wall thickness	Example: 41 x 1.5
- Production lengths	Example: approx. 6000 mm ± 100 mm
- Material	Example: 1.4404
- Documentation	Example: 3.1
- Test class acc. to DIN EN 10217-7	Example: TC1 or TC2

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

Surface Properties

	Inner surface	Outer surface
CC	pickled W2(b) and passivated Ra < 0.8 µm welded seam area Ra < 1.6 µm	pickled W2(b) and passivated
CD	pickled W2(b) and passivated Ra < 0.8 µm welded seam area Ra < 1.6 µm	ground, Ra < 1.0 µm
BC	annealed and pickled, or bright annealed, W2A(b) or W2R(b) Ra < 0.8 µm welded seam area Ra < 1.6 µm	pickled and passivated or bright annealed W2A(b) or W2R(b)
BD	annealed and pickled, or bright annealed, W2A(b) or W2R(b) Ra < 0.8 µm welded seam area Ra < 1.6 µm	ground Ra < 1.0 µm

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.

Pipe acc. to DIN EN 10357 Series A

Pipe acc. to DIN EN 10357 Series A - Quality CC

		1.4307 (304L) TC1	1.4404 (316L) TC1	1.4307 (304L) TC2	1.4404 (316L) TC2	
DN DIN	Dimensions	Article No.	Article No.	Article No.	Article No.	Weight [kg/m]
15	19 x 1.5	222 029	222 034	222 648	222 621	0.658
20	23 x 1.5	222 066	222 071	222 649	222 622	0.808
25	29 x 1.5	222 109	222 114	222 650	222 623	1.033
32	35 x 1.5	222 154	222 159	222 651	222 624	1.258
40	41 x 1.5	222 190	222 195	222 652	222 625	1.484
50	53 x 1.5	222 237	222 242	222 653	222 626	1.934
65	70 x 2	222 265	222 270	222 654	222 627	3.405
80	85 x 2	222 282	222 287	222 655	222 628	4.157
100	104 x 2	222 299	222 304	222 656	222 629	5.108
125	129 x 2	222 316	222 321	222 657	222 630	6.360
150	154 x 2	222 327	222 332	222 658	222 631	7.612
200	204 x 2	801 794	801 793	801 798	801 795	10.116

- unannealed
- pickled inside
- pickled outside

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series A - Quality CD

		1.4307 (304L) TC1	1.4404 (316L) TC1	1.4307 (304L) TC2	1.4404 (316L) TC2	
DN DIN	Dimensions	Article No.	Article No.	Article No.	Article No.	Weight [kg/m]
15	19 x 1.5	222 031	222 036	222 660	222 678	0.658
20	23 x 1.5	222 068	222 073	222 661	222 679	0.808
25	29 x 1.5	222 111	222 116	222 662	222 680	1.033
32	35 x 1.5	222 156	222 161	222 663	222 681	1.258
40	41 x 1.5	222 192	222 197	222 664	222 682	1.484
50	53 x 1.5	222 239	222 244	222 665	222 683	1.934
65	70 x 2	222 267	222 272	222 672	222 685	3.405
80	85 x 2	222 284	222 289	222 673	222 686	4.157
100	104 x 2	222 301	222 306	222 674	222 687	5.108
125	129 x 2	222 318	222 323	222 675	222 688	6.360
150	154 x 2	222 329	222 334	222 676	222 689	7.612
200	204 x 2	801 796	801 819	801 801	801 802	10.116

- unannealed
- pickled inside
- ground outside

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series A - Quality 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

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series A - Quality 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

- annealed

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series B

- unannealed
- pickled inside
- pickled outside

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series B - Quality 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
- ground outside

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series B - Quality 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

- annealed

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series B - Quality 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
- ground outside

- formerly DIN 11850

Pipe acc. to DIN EN 10357 Series B - Quality 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

Pipe with Special Dimensions

Pipe acc. to DIN EN ISO 1127 / old DIN 2463

			1.4307 (304L) TC1	1.4404 (316L) TC1		
DN DIN	Dimensions	alternativ zu	Article No.	Article No.		Weight [kg/m]
10	12 x 1	DIN EN 10357 Series B	800 032	800 056		0.275
10	12 x 1.5	old series	800 062	800 086		0.394
10	13 x 1.5	DIN EN 10357 Series A	801 998	801 989		0.432
200	204 x 2	DIN EN 10357 Series A	801 794	801 793		10.116
250	254 x 2		801 808	801 832		12.620
300	304 x 2		801 844	801 846		15.120

- unannealed
- pickled inside
- pickled outside
- welded seam not smoothed

- other qualities on request

Pipe acc. to DIN EN ISO 1127 / old DIN 2463 - ground outside

			1.4307 (304L) TC1	1.4404 (316L) TC1		
DN DIN	Dimensions	alternativ zu	Article No.	Article No.		Weight [kg/m]
10	12 x 1	DIN EN 10357 Series B	800 033	801 010		0.275
10	12 x 1.5	old series	800 063	800 064		0.394
10	13 x 1.5	DIN EN 10357 Series A	801 070	801 058		0.432

- unannealed
- pickled inside
- ground outside acc. to DIN EN 10357
- welded seam not smoothed

- other qualities on request

"Old series" Pipe - W

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN DIN	Dimensions	Article No.	Article No.			Weight [kg/m]
25	28 x 1.25	222 570	222 586			0.830
40	40 x 1.25	222 571	222 504			1.216
50	52 x 1.25	222 572	222 587			1.574
65	70 x 1.5	222 573	222 588			2.573

- unannealed
- pickled inside
- pickled outside
- surface acc. to DIN EN 10357

- other qualities on request

"Old Series" Pipe similar to DIN 11850

- unannealed
- pickled inside
- pickled outside

"Old Series" Pipe similar to DIN 11850 - Quality CC

		1.4307 (304L) TC1	1.4404 (316L) TC1	1.4307 (304L) TC2	1.4404 (316L) TC2	
DN DIN	Dimensions	Article No.	Article No.	Article No.	Article No.	Weight [kg/m]
15	18 x 1.5	222 019	222 024	222 224	222 409	0.620
20	22 x 1.5	222 055	222 060	222 241	222 434	0.770
25	28 x 1.5	222 098	222 103	222 260	222 444	0.995
32	34 x 1.5	222 143	222 148	222 263	222 505	1.221
40	40 x 1.5	222 179	222 184	222 279	222 508	1.446
50	52 x 1.5	222 226	222 231	222 397	222 510	1.897

- unannealed
- pickled inside
- ground outside

"Old Series" Pipe similar to DIN 11850 - Quality 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

"Old Series" Pipe similar to DIN 11850 - Quality 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
- ground outside

"Old Series" Pipe similar to DIN 11850 - Quality 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 EN 10357 Series C

Pipe acc. to DIN EN 10357 Series C - Quality CC

- unannealed
- pickled inside
- pickled outside

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN ISO	Dimensions	Article No.	Article No.			Weight [kg/m]
17,2	17,2 x 1,6	222 341	222 345			0.615
21,3	21,3 x 1,6	222 357	222 348			0.789
26,9	26,9 x 1,6	222 358	222 349			1.014
33,7	33,7 x 2	222 359	222 350			1.588
42,4	42,4 x 2	222 737	222 351			2.023
48,3	48,3 x 2	222 360	222 355			2.319
60,3	60,3 x 2	222 361	222 352			2.920
76,1	76,1 x 2	222 449	222 455			3.711
88,9	88,9 x 2	222 399	222 369			4.352
114,3	114,3 x 2	222 808	222 809			5.624

Pipe acc. to DIN EN 10357 Series C- Quality CD

- unannealed
- pickled inside
- ground outside

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN ISO	Dimensions	Article No.	Article No.			Weight [kg/m]
17,2	17.2 x 1.6	222 346	222 347			0.615
21,3	21.3 x 1.6	222 484	222 802			0.789
26,9	26.9 x 1.6	222 486	222 807			1.014
33,7	33.7 x 2	222 487	222 810			1.588
42,4	42.4 x 2	222 801	222 356			2.023
48,3	48.3 x 2	222 488	222 814			2.319
60,3	60.3 x 2	222 489	222 816			2.920
76,1	76.1 x 2	222 817	222 465			3.711
88,9	88.9 x 2	222 492	222 541			4.352
114,3	114.3 x 2	222 511	222 542			5.624

Pipe acc. to DIN EN 10357 Series C - Quality BC

- annealed

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN ISO	Dimensions	Article No.	Article No.			Weight [kg/m]
17,2	17.2 x 1.6	222 480	222 481			0.615
21,3	21.3 x 1.6	222 044	222 040			0.789
26,9	26.9 x 1.6	222 082	222 080			1.014
33,7	33.7 x 2	222 445	222 464			1.588
42,4	42.4 x 2	222 447	222 439			2.023
48,3	48.3 x 2	222 589	222 463			2.319
60,3	60.3 x 2	222 590	222 440			2.920
76,1	76.1 x 2	222 530	222 502			3.711
88,9	88.9 x 2	222 457	222 462			4.352
114,3	114.3 x 2	222 591	222 582			5.624

Pipe acc. to DIN EN 10357 Series C - Quality BD

- annealed
- ground outside

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN ISO	Dimensions	Article No.	Article No.			Weight [kg/m]
17,2	17.2 x 1.6	222 512	222 086			0.615
21,3	21.3 x 1.6	222 518	222 041			0.789
26,9	26.9 x 1.6	222 523	222 081			1.014
33,7	33.7 x 2	222 524	222 514			1.588
42,4	42.4 x 2	222 529	222 826			2.023
48,3	48.3 x 2	222 534	222 515			2.319
60,3	60.3 x 2	222 537	222 494			2.920
76,1	76.1 x 2	222 533	222 517			3.711
88,9	88.9 x 2	222 538	222 555			4.352
114,3	114.3 x 2	222 539	222 085			5.624

Pipe acc. to DIN EN 10357 Series D

- unannealed
- pickled inside
- pickled outside

Pipe acc. to DIN EN 10357 Series D - Quality CC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
25	25 x 1.2	222 546	222 575			0.715
25	25.4 x 1.6	222 364	222 451			0.954
38	38 x 1.2	222 547	222 565			1.106
38	38.1 x 1.6	222 366	222 452			1.462
51	50.8 x 1.6	222 368	222 453			1.971
51	51 x 1.2	222 548	222 564			1.496
63,5	63.5 x 1.5	222 545	222 583			2.329
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
76,1	76.1 x 2	222 449	222 455			3.711
101,6	101.6 x 2	222 374	222 456			4.988

- unannealed
- pickled inside
- ground outside

Pipe acc. to DIN EN 10357 Series D - Quality CD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
25	25 x 1.2	222 559	222 613			0.715
25	25.4 x 1.6	222 806	222 403			0.954
38	38 x 1.2	222 551	222 614			1.106
38	38.1 x 1.6	222 458	222 404			1.462
51	50.8 x 1.6	222 459	222 405			1.971
51	51 x 1.2	222 560	222 615			1.496
63,5	63.5 x 1.5	222 569	222 400			2.329
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
76,1	76.1 x 2	222 817	222 465			3.711
101,6	101.6 x 2	222 821	222 408			4.988

- annealed

Pipe acc. to DIN EN 10357 Series D - Quality BC

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
25	25 x 1.2	222 362	222 593			0.715
25	25.4 x 1.6	222 049	223 059			0.954
38	38 x 1.2	222 561	222 594			1.106
38	38.1 x 1.6	222 371	222 602			1.462
51	50.8 x 1.6	222 616	223 060			1.971
51	51 x 1.2	222 438	222 595			1.496
63,5	63.5 x 1.5	222 496	222 562			2.329
63,5	63.5 x 1.6	222 495	222 550			2.480
76,1	76.1 x 1.6	222 497	222 596			2.985
76,1	76.1 x 2	222 530	222 502			3.711
101,6	101.6 x 2	222 600	222 601			4.988

- annealed
- ground outside

Pipe acc. to DIN EN 10357 Series D - Quality BD

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
25	25 x 1.2	222 476	222 478			0.715
25	25.4 x 1.6	222 281	223 061			0.954
38	38 x 1.2	222 566	222 899			1.106
38	38.1 x 1.6	222 153	222 666			1.462
51	50.8 x 1.6	222 887	223 062			1.971
51	51 x 1.2	222 482	222 908			1.496
63,5	63.5 x 1.5	222 891	222 563			2.329
63,5	63.5 x 1.6	222 280	223 017			2.480
76,1	76.1 x 1.6	222 500	222 907			2.985
76,1	76.1 x 2	222 533	222 517			3.711
101,6	101.6 x 2	222 909	222 910			4.988

Pipe acc. to DIN 11866

In 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 (2008) 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 2005

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 category TC2 DIN 10217-7 - DIN 10246-5

Typical Ordering Data acc. to DIN 11866

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

Surface Properties

Outer surface:
- without Ra specification: pickled or bright annealed
- with Ra specification: typ. ground Ra < 1.0 µm an additional "o" is added to the marking for the hygiene class (e.g. H2o)

Inner surface:

Hygiene class	Inner surface	Inner seam area	Typical production process - post-processing of the main tubes
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 rework by means of 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

Permissible max. 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 - acc. to DIN 11866 permissible max. Operating Pressures at a Temperature of 20 °C

	Nominal diameters														
DN	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200
	Permissible operating pressures in bar for pipes														
Series A	400	320	369	253	209	165	137	117	90	91	75	61	49	41	31
Series B	502	379	298	240	190	190	151	132	106	84	82	64	59	49	38
Series C	449	299	416	277	208		138	104	83	69		66		58	

The permissible operating pressures have been calculated for seamless and welded pipes (v=1) with the calculation value for material number 1.4404 acc. to DIN EN 10088-2:2005-09, table 10 - product shape C (cold strip) taking into consideration utilisation of the permissible calculation voltage of 100 % in the welded seam.

Table C.2 - acc. to DIN 11866 permissible max. Operating Pressures at a Temperature of 150 °C

	Nominal diameters														
DN	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200
	Permissible operating pressures in bar for pipes														
Series A	254	203	234	160	132	105	87	74	57	58	47	39	31	26	19
Series B	318	240	189	152	120	120	95	84	67	53	52	40	37	31	24
Series C	284	189	264	176	132		88	66	52	44		42		36	

The permissible operating pressures have been calculated for seamless and welded pipes (v=1) with the calculation value for material number 1.4404 acc. to DIN EN 10088-2:2005-09, table 15 - 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 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 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 Steinless 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 outer 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 ferritic/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.

OD Tube ASTM A269/270 (US standard) annealed

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
1/2"	12.7 x 1.65	222 952	222 920			0.46
3/4"	19.05 x 1.65	222 953	222 924			0.72
1"	25.4 x 1.65	222 954	222 928			0.98
1 1/2"	38.1 x 1.65	222 955	222 932			1.51
2"	50.8 x 1.65	222 956	222 936			2.03
2 1/2"	63.5 x 1.65	222 957	222 940			2.56
3"	76.1 x 1.65	222 958	222 944			3.08
4"	101.6 x 2.11	222 959	222 948			5.26

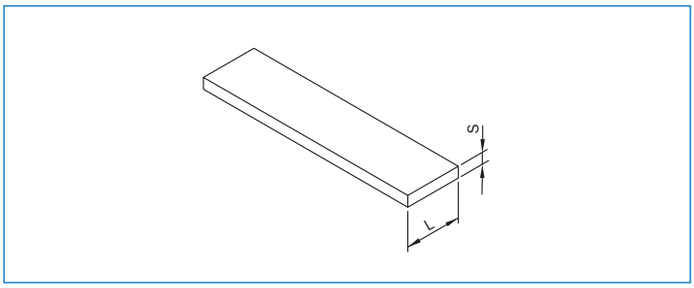
- annealed
- pickled inside
- inner Ra < 0,8 / 1,6 µm
- pickled outside
- welded

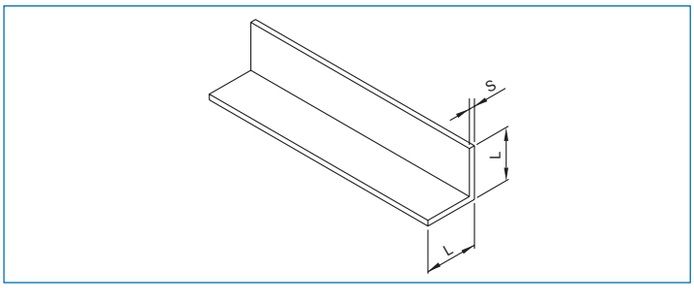
OD Tube ASTM A269/270 (US standard) annealed/ground

		1.4307 (304L) TC1	1.4404 (316L) TC1			
DN Inch	Dimensions	Article No.	Article No.			Weight [kg/m]
1/2"	12.7 x 1.65	222 960	222 921			0.46
3/4"	19.05 x 1.65	222 961	222 925			0.72
1"	25.4 x 1.65	222 962	222 929			0.98
1 1/2"	38.1 x 1.65	222 963	222 933			1.51
2"	50.8 x 1.65	222 964	222 937			2.03
2 1/2"	63.5 x 1.65	222 965	222 941			2.56
3"	76.1 x 1.65	222 966	222 945			3.08
4"	101.6 x 2.11	222 967	222 949			5.26

- annealed
- pickled inside
- inner Ra < 0,8 / 1,6 µm
- ground outside
- welded

Flat Steel / Angled Steel





Flat Steel

		1.4301 (304)/1.4307 (304L)	
L	S	Article No.	Weight [kg/m]
20	3	040 017	0.471
20	4	040 015	0.628
20	5	040 014	0.785
20	6	040 096	0.942
20	8	040 013	1.260
20	10	040 012	1.570
25	3	040 010	0.589
25	4	040 008	0.785
25	5	040 007	0.981
25	6	040 090	1.180
25	8	043 500	1.570
30	3	040 006	0.707
30	4	040 005	0.942
30	5	040 003	1.180
30	6	040 002	1.410
30	8	040 001	1.880
30	10	040 097	2.360
35	5	040 250	1.370
40	3	040 900	0.942
40	4	040 027	1.260
40	5	040 028	1.570
40	6	040 029	1.880
40	8	040 031	2.510
40	10	040 033	3.140
50	3	040 095	1.180
50	4	040 105	1.570
50	5	040 041	1.960
50	6	040 042	2.360
50	8	040 043	3.140
50	10	040 044	3.930
60	3	40 707	1.413
60	4	040 707	1.880
60	5	040 093	2.360
60	6	040 051	2.830
60	8	040 052	3.770
60	10	040 053	4.710
80	5	040 092	3.140
80	6	040 065	3.770
80	8	040 066	5.020
80	10	040 067	6.280
100	5	040 077	3.930
100	6	040 098	4.710
100	8	040 099	6.280
100	10	040 079	7.850
120	6	043 092	5.650
120	8	043 094	7.540
120	10	040 088	9.420
150	6	040 603	7.070
150	8	040 604	9.420
150	10	43303	11.770

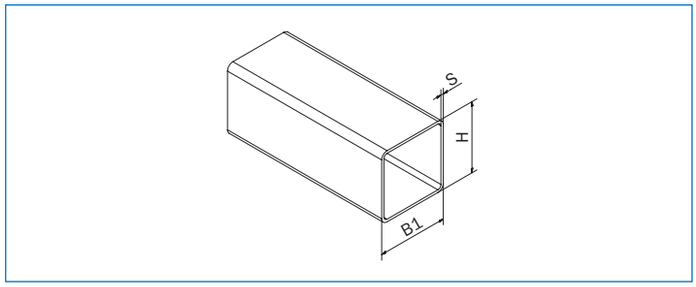
other dimensions on request

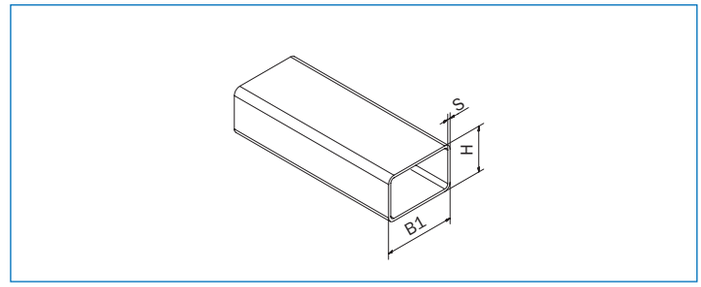
Angle Steel

		1.4301 (304)/1.4307 (304L)	
L	S	Article No.	Weight [kg/m]
20	3	065 000	0.88
25	3	065 002	1.12
30	3	065 006	1.36
30	4	065 008	1.78
35	4	065 010	2.10
40	4	570 080	2.42
40	5	570 090	2.97
50	5	570 100	3.77
50	6	065 016	4.47
60	6	065 018	5.42
80	8	570 140	9.66
100	10	065 026	15.10

other dimensions on request

Square Tube / Round Steel



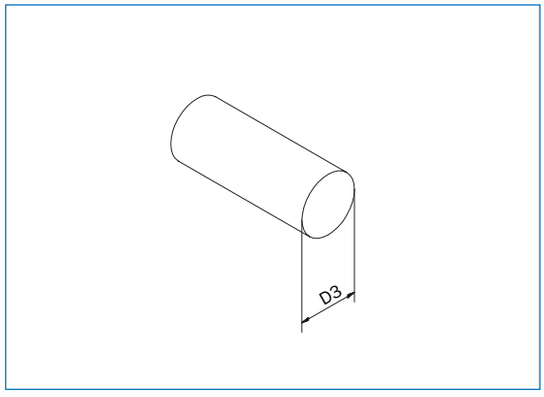


Square Tube

			1.4301 (304)	
B1	H	S	Article No.	Gewicht [kg/m]
15	15	1	801 004	0.453
15	15	1.5	801 008	0.661
20	20	1	801 012	0.613
20	20	1.5	801 020	0.910
20	20	2	801 024	1.176
25	25	1	801 028	0.772
25	25	1.25	801 032	0.921
25	25	1.5	801 036	1,140
25	25	2	801 040	1.494
30	30	1.5	801 052	1.379
30	30	2	801 056	1.813
30	30	3	801 060	2.645
35	35	1,5	801 068	1.618
35	35	2	801 072	2.132
40	40	1.5	801 080	1.857
40	40	2	801 084	2.451
40	40	3	801 092	3.602
50	50	1.5	801 105	2.336
50	50	2	801 109	3.089
50	50	3	801 117	4.559
60	60	2	801 121	3.727
60	60	3	801 129	5.516
60	60	4	801 360	7.255
80	80	2	801 133	5.003
80	80	3	801 141	7.430
80	80	4	801 147	9.807
100	100	2	801 962	6.279
100	100	3	801 149	9.343
100	100	4	801 153	12.358
120	120	2	801 168	7.555
120	120	3	801 164	11.258
120	120	4	801 162	14.910
other dimensions on request				

Rectangular Tube

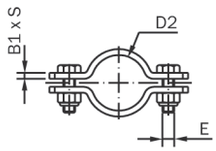
			1.4301 (304)	
B1	H	S	Article No.	Gewicht [kg/m]
30	20	1.5	801 186	1.140
30	20	2	801 190	1.494
40	20	1.25	801 062	1.112
40	20	1.5	801 193	1.379
40	20	2	801 197	1.813
40	30	1.5	801 203	1.618
40	30	2	801 205	2.133
50	25	1.5	801 209	1.738
50	25	2	801 212	2.292
50	30	1.5	801 216	1.858
50	30	2	801 220	2.451
50	30	3	801 870	3.602
60	30	1.5	801 224	2.097
60	30	2	801 228	2.771
60	30	3	801 586	4.081
60	40	2	801 236	3.090
60	40	3	801 244	4.559
80	40	2	801 248	3.728
80	40	3	801 256	5.516
80	40	4	802 193	7.255
80	60	2	801 741	4.366
80	60	3	801 260	6.473
80	60	4	801 262	8.531
100	40	2	801 264	4.366
100	40	3	801 272	6.473
100	50	2	801 276	4.685
100	50	3	801 280	6.952
100	50	4	802 150	9.169
100	60	3	802 225	7.430
100	60	4	802 226	9.807
120	60	2	802 278	5.641
120	60	3	802 210	8.387
120	60	4	801 965	11.083
other dimensions on request				



Round Steel DIN EN 10278

	1.4301 (304)/1.4307 (304L)	
D3	Article No.	Weight [kg/m]
4	050 007	0.099
6	050 019	0.222
8	050 031	0.395
10	050 043	0.617
12	050 055	0.888
14	050 067	1.208
16	050 079	1.578
18	050 091	1.998
20	050 104	2.466
other dimensions on request		

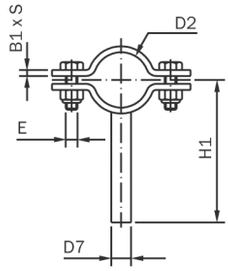
Pipe Clamps for Pipe acc. to DIN EN 10357



Note packaging unit!
Delivered unassembled!

Pipe Clamp without Shaft Series A/B

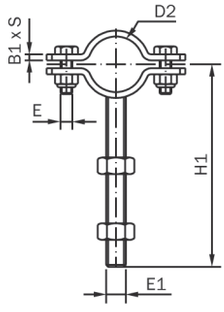
DN DIN	D2	E	B1	S	Weight [kg]
10	12	M6	20	3	0.02
15	18	M6	20	3	0.04
20	22	M6	20	3	0.07
25	28	M6	20	3	0.05
32	34	M6	20	3	0.10
40	40	M6	20	3	0.10
50	52	M6	20	3	0.08
65	70	M6	20	3	0.09
80	85	M6	25	3	0.15
100	104	M6	25	3	0.23
125	129	M8	30	3	0.41
150	154	M8	30	3	0.96
200	204	M8	40	4	1.80
250	254	M10	40	4	3.60



Note packaging unit!
Delivered unassembled!

Pipe Clamp with Shaft Series A/B

DN DIN	D2	D7	H1	E	B1	S	Weight [kg]
10	12	8	64	M6	20	3	0.04
15	18	8	67	M6	20	3	0.07
20	22	8	69	M6	20	3	0.10
25	28	10	72	M6	20	3	0.10
32	34	10	75	M6	20	3	0.12
40	40	10	77	M6	20	3	0.13
50	52	12	84	M6	20	3	0.13
65	70	12	93	M6	20	3	0.16
80	85	12	100.5	M6	25	3	0.27
100	104	12	110	M6	25	3	0.32
125	129	16	140	M8	30	3	0.48
150	154	16	180	M8	30	3	1.04
200	204	20	240	M8	40	4	1.90
250	254	22	250	M10	40	4	3.70



Delivered unassembled!

Pipe Clamp with threaded Shaft Series A/B

DN DIN	D2	H1	E	E1	B1	S	Weight [kg]
10	12	74	M6	M8	20	3	0.04
15	18	77	M6	M8	20	3	0.07
20	22	79	M6	M8	20	3	0.08
25	28	102	M6	M10	20	3	0.10
32	34	105	M6	M10	20	3	0.11
40	40	108	M6	M10	20	3	0.12
50	52	114	M6	M12	20	3	0.13
65	70	123	M6	M12	20	3	0.16
80	85	130.5	M6	M12	25	3	0.27
100	104	140	M6	M12	25	3	0.32
125	129	168.5	M8	M16	30	3	0.48
150	154	202	M8	M16	30	3	1.04
200	204	255	M8	M20	40	4	1.90

Pipe Clamps for Pipe acc. to DIN EN 10357

Pipe Clamp without Shaft Series A/B

	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	3,41	70004 000 010 10	3,41	70004 000 010 20	
15	3,41	70004 000 015 10	3,41	70004 000 015 20	
20	3,41	70004 000 020 10	3,41	70004 000 020 20	
25	2,59	70004 000 025 10	2,59	70004 000 025 20	
32	2,97	70004 000 032 10	2,97	70004 000 032 20	
40	3,05	70004 000 040 10	3,05	70004 000 040 20	
50	3,58	70004 000 050 10	3,58	70004 000 050 20	
65	3,87	70004 000 065 10	3,87	70004 000 065 20	
80	5,32	70004 000 080 10	5,32	70004 000 080 20	
100	6,06	70004 000 100 10	6,06	70004 000 100 20	
125	19,23	70004 000 125 10	19,23	70004 000 125 20	
150	23,96	70004 000 150 10	23,96	70004 000 150 20	
200	38,05	70004 000 200 10	38,05	70004 000 200 20	
250	48,50	70004 000 250 10	48,50	70004 000 250 20	

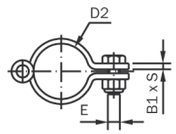
Pipe Clamp with Shaft Series A/B

	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	4,94	70005 000 010 10	4,94	70005 000 010 20	
15	4,94	70005 000 015 10	4,94	70005 000 015 20	
20	4,94	70005 000 020 10	4,94	70005 000 020 20	
25	4,58	70005 000 025 10	4,58	70005 000 025 20	
32	4,81	70005 000 032 10	4,81	70005 000 032 20	
40	5,04	70005 000 040 10	5,04	70005 000 040 20	
50	5,58	70005 000 050 10	5,58	70005 000 050 20	
65	6,32	70005 000 065 10	6,32	70005 000 065 20	
80	7,73	70005 000 080 10	7,73	70005 000 080 20	
100	8,52	70005 000 100 10	8,52	70005 000 100 20	
125	24,78	70005 000 125 10	24,78	70005 000 125 20	
150	34,24	70005 000 150 10	34,24	70005 000 150 20	
200	54,36	70005 000 200 10	54,36	70005 000 200 20	
250	67,88	70005 000 250 10	67,88	70005 000 250 20	

Pipe Clamp with threaded Shaft Series A/B

	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	6,37	70008 000 010 10	6,37	70008 000 010 20	
15	6,37	70008 000 015 10	6,37	70008 000 015 20	
20	6,37	70008 000 020 10	6,37	70008 000 020 20	
25	5,53	70008 000 025 10	5,53	70008 000 025 20	
32	5,71	70008 000 032 10	5,71	70008 000 032 20	
40	5,83	70008 000 040 10	5,83	70008 000 040 20	
50	6,42	70008 000 050 10	6,42	70008 000 050 20	
65	7,27	70008 000 065 10	7,27	70008 000 065 20	
80	10,00	70008 000 080 10	10,00	70008 000 080 20	
100	10,79	70008 000 100 10	10,79	70008 000 100 20	
125	33,06	70008 000 125 10	33,06	70008 000 125 20	
150	44,54	70008 000 150 10	44,54	70008 000 150 20	
200	65,17	70008 000 200 10	65,17	70008 000 200 20	

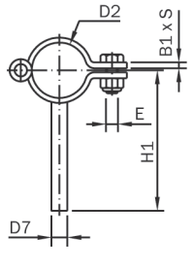
Pipe Clamps for Pipe acc. to DIN EN 10357



Delivered unassembled!

Pipe Clamp, hinged without Shaft Series A/B

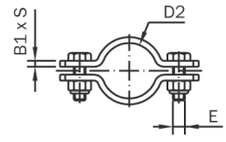
DN DIN	D2	E	B1	S	Weight [kg]
25	28	M8	25	2	0.05
32	34	M8	25	2	0.07
40	40	M8	25	2	0.07
50	52	M10	30	3	0.08
65	70	M10	30	3	0.09
80	85	M10	30	3	0.15
100	104	M10	30	3	0.23



Delivered unassembled!

Pipe Clamp, hinged with Shaft Series A/B

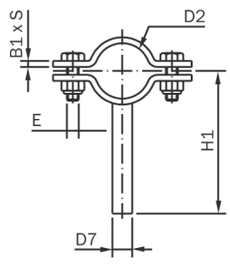
DN DIN	D2	D7	H1	E	B1	S	Weight [kg]
25	28	10	71	M8	25 x 2		0.10
32	34	10	74	M8	25 x 2		0.10
40	40	10	77	M8	25 x 2		0.11
50	52	12	83	M10	30 x 3		0.13
65	70	12	92	M10	30 x 3		0.15
80	85	12	100	M10	30 x 3		0.27
100	104	12	109	M10	30 x 3		0.30



Note packaging unit!
Delivered unassembled!

Pipe Clamp, without Shaft Series D

DN Inch	D2	E	B1	S	Weight [kg]
1"	25.4	M6	20	3	0.08
1 1/4"	31.8	M6	20	3	0.09
1 1/2"	40	M6	20	3	0.10
2"	50.8	M6	20	3	0.11
2 1/2"	63.5	M6	20	3	0.13
3"	76.2	M6	25	3	0.19
4"	101.6	M6	25	3	0.26



Note packaging unit!
Delivered unassembled!

Pipe Clamp, with Shaft Series D

DN Inch	D2	D7	H1	E	B1	S	Weight [kg]
1"	25.4	10	71	M6	20	3	0.12
1 1/4"	31.8	10	74	M6	20	3	0.12
1 1/2"	40	10	77	M6	20	3	0.13
2"	50.8	12	84	M6	20	3	0.15
2 1/2"	63.5	12	90	M6	20	3	0.19
3"	76.2	12	96	M6	25	3	0.234
4"	101.6	12	109	M6	25	3	0.34

Pipe Clamps for Pipe acc. to DIN EN 10357

Pipe Clamp, hinged without Shaft Series A/B

1.4301 (304)/polished			1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
25	11,33	70009 000 025 10	11,33	70009 000 025 20	
32	12,09	70009 000 032 10	12,09	70009 000 032 20	
40	12,84	70009 000 040 10	12,84	70009 000 040 20	
50	13,53	70009 000 050 10	13,53	70009 000 050 20	
65	15,14	70009 000 065 10	15,14	70009 000 065 20	
80	17,29	70009 000 080 10	17,29	70009 000 080 20	
100	17,77	70009 000 100 10	17,77	70009 000 100 20	

Pipe Clamp, hinged with Shaft Series A/B

1.4301 (304)/polished			1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
25	14,65	71009 000 025 10	14,65	71009 000 025 20	
32	15,45	71009 000 032 10	15,45	71009 000 032 20	
40	16,16	71009 000 040 10	16,16	71009 000 040 20	
50	18,00	71009 000 050 10	18,00	71009 000 050 20	
65	19,61	71009 000 065 10	19,61	71009 000 065 20	
80	21,76	71009 000 080 10	21,76	71009 000 080 20	
100	22,25	71009 000 100 10	22,25	71009 000 100 20	

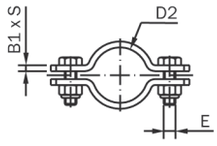
Pipe Clamp, without Shaft Series D

1.4301 (304)/polished			1.4301 (304)/matt		
DN Inch	Price/EUR	Article No.	Price/EUR	Article No.	
1"	3,81	70019 000 100 10	3,81	70019 000 100 20	
1 1/4"	3,97	70019 000 114 10	3,97	70019 000 114 20	
1 1/2"	3,05	70004 000 040 10	3,05	70004 000 040 20	
2"	4,45	70019 000 200 10	4,45	70019 000 200 20	
2 1/2"	5,45	70019 000 212 10	5,45	70019 000 212 20	
3"	4,40	71004 000 065 10	4,40	71004 000 065 20	
4"	8,31	70019 000 400 10	8,31	70019 000 400 20	

Pipe Clamp, with Shaft Series D

1.4301 (304)/polished			1.4301 (304)/matt		
DN Inch	Price/EUR	Article No.	Price/EUR	Article No.	
1"	5,81	71020 000 100 10	5,81	71020 000 100 20	
1 1/4"	5,96	71020 000 114 10	5,96	71020 000 114 20	
1 1/2"	5,04	70005 000 040 10	5,04	70005 000 040 20	
2"	6,45	71020 000 200 10	6,45	71020 000 200 20	
2 1/2"	7,90	71020 000 212 10	7,90	71020 000 212 20	
3"	6,91	71005 000 065 10	6,91	71005 000 065 20	
4"	10,77	71020 000 400 10	10,77	71020 000 400 20	

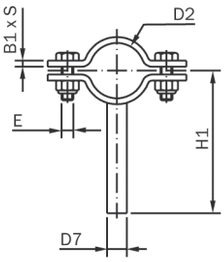
Pipe Clamps for Pipe acc. to DIN EN 10357



Note packaging unit!
Delivered unassembled!

Pipe Clamp, light Version, without Shaft Series C

DN ISO	D2	E	B1	S	Weight [kg]
21.3	22	M6	20	3	0.07
26.9	26.9	M6	20	3	0.08
33.7	34	M6	20	3	0.10
42.4	42.4	M6	20	3	0.10
48.3	48.3	M6	20	3	0.11
60.3	60.3	M6	20	3	0.13
76.1	76.1	M6	25	3	0.19
88.9	88.9	M6	25	3	0.27
114.3	114.3	M6	25	3	0.30
139.7	139.7	M8	30	3	1.10
168.3	168.3	M8	40	4	1.80
219.1	219.1	M10	40	4	2.20



Note packaging unit!
Delivered unassembled!

Pipe Clamp, light Version, with Shaft Series C

DN ISO	D2	D7	H1	E	B1	S	Weight [kg]
21.3	22	8	69	M6	20	3	0.10
26.9	26.9	10	71	M6	20	3	0.11
33.7	34	10	75	M6	20	3	0.12
42.4	42.4	10	79	M6	20	3	0.15
48.3	48.3	10	82	M6	20	3	0.16
60.3	60.3	12	88	M6	20	3	0.18
76.1	76.1	12	96	M6	25	3	0.234
88.9	88.9	12	103	M6	25	3	0.39
114.3	114.3	12	115	M6	25	3	0.40
139.7	139.7	16	146	M8	30	3	1.21
168.3	168.3	16	188	M8	40	4	1.95
219.1	219.1	20	248	M10	40	4	2.52

Pipe Clamps for Pipe acc. to DIN EN 10357

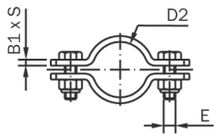
Pipe Clamp, light Version, without Shaft Series C

	1.4301 (304)/polished		1.4301 (304)/matt		
DN ISO	Price/EUR	Article No.	Price/EUR	Article No.	
21.3	3,41	70004 000 020 10	3,41	70004 000 020 20	
26.9	2,59	71004 000 020 10	2,59	71004 000 020 20	
33.7	2,97	70004 000 032 10	2,97	70004 000 032 20	
42.4	3,79	71004 000 032 10	3,79	71004 000 032 20	
48.3	3,87	71004 000 040 10	3,87	71004 000 040 20	
60.3	4,02	71004 000 050 10	4,02	71004 000 050 20	
76.1	4,40	71004 000 065 10	4,40	71004 000 065 20	
88.9	6,01	71004 000 080 10	6,01	71004 000 080 20	
114.3	6,70	71004 000 100 10	6,70	71004 000 100 20	
139.7	20,35	71004 000 125 10	20,35	71004 000 125 20	
168.3	24,72	71004 000 150 10	24,72	71004 000 150 20	
219.1	39,07	71004 000 200 10	39,07	71004 000 200 20	

Pipe Clamp, light Version, with Shaft Series C

	1.4301 (304)/polished		1.4301 (304)/matt		
DN ISO	Price/EUR	Article No.	Price/EUR	Article No.	
21.3	4,94	70005 000 020 10	4,94	70005 000 020 20	
26.9	4,58	71005 000 020 10	4,58	71005 000 020 20	
33.7	4,81	70005 000 032 10	4,81	70005 000 032 20	
42.4	5,35	71005 000 032 10	5,35	71005 000 032 20	
48.3	5,53	71005 000 040 10	5,53	71005 000 040 20	
60.3	5,94	71005 000 050 31	5,94	71005 000 050 20	
76.1	6,91	71005 000 065 10	6,91	71005 000 065 20	
88.9	8,42	71005 000 080 10	8,42	71005 000 080 20	
114.3	9,23	71005 000 100 10	9,23	71005 000 100 20	
139.7	25,39	71005 000 125 10	25,39	71005 000 125 20	
168.3	35,00	71005 000 150 10	35,00	71005 000 150 20	
219.1	55,38	71005 000 200 10	55,38	71005 000 200 20	

Pipe Clamps for Pipe acc. to DIN EN 10357



Delivered unassembled!

Pipe Clamp, DIN 3567, heavy Version

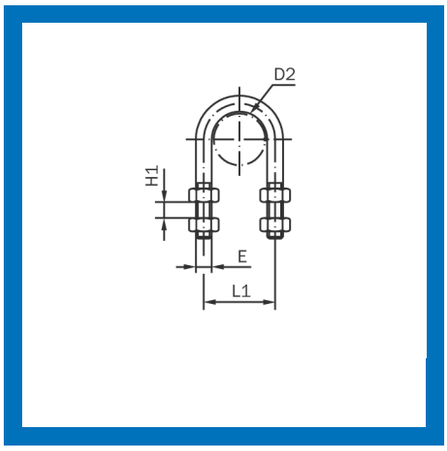
DN	D2	E	B1	S	Weight [kg]
20	25	M10	30	5	0.22
20	27	M10	30	5	0.22
25	30	M10	30	5	0.24
25	34	M10	30	5	0.24
32	38	M10	30	5	0.27
32	43	M10	30	5	0.27
40	45	M10	30	5	0.30
40	49	M10	30	5	0.30
50	54	M12	40	6	0.58
50	57	M12	40	6	0.58
50	61	M12	40	6	0.58
65	70	M12	40	6	0.66
65	77	M12	40	6	0.66
80	84	M12	40	6	0.75
80	89	M12	40	6	0.75
100	104	M16	50	8	1.63
100	108	M16	50	8	1.63
100	115	M16	50	8	1.63
125	129	M16	50	8	1.83
125	133	M16	50	8	1.83
125	140	M16	50	8	1.83
150	154	M16	50	8	2.08
150	159	M16	50	8	2.08
150	169	M16	50	8	2.08
200	204	M16	50	8	2.64
200	216	M16	50	8	2.64
200	220	M16	50	8	2.64
250	254	M20	60	8	3.90
250	273	M20	60	8	3.90
300	305	M20	60	8	4.48
300	324	M20	60	8	4.48

Pipe Clamps for Pipe acc. to DIN EN 10357

Pipe Clamp, DIN 3567, heavy Version

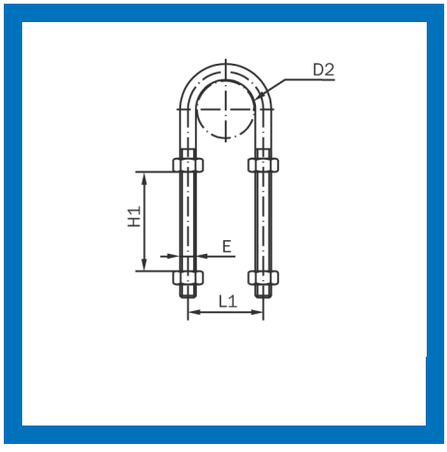
	1.4301 (304)/polished		1.4301 (304)/matt		
DN	Price/EUR	Article No.	Price/EUR	Article No.	
20	5,07	72004 000 025 10	5,07	72004 000 025 20	
20	5,14	72004 000 027 10	5,14	72004 000 027 20	
25	5,14	72004 000 030 10	5,14	72004 000 030 20	
25	5,40	72004 000 034 10	5,40	72004 000 034 20	
32	6,06	72004 000 038 10	6,06	72004 000 038 20	
32	6,14	72004 000 043 10	6,14	72004 000 043 20	
40	6,32	72004 000 045 10	6,32	72004 000 045 20	
40	6,40	72004 000 049 10	6,40	72004 000 049 20	
50	9,77	72004 000 054 10	9,77	72004 000 054 20	
50	9,95	72004 000 057 10	9,95	72004 000 057 20	
50	10,28	72004 000 061 10	10,28	72004 000 061 20	
65	10,95	72004 000 070 10	10,95	72004 000 070 20	
65	11,46	72004 000 077 10	11,46	72004 000 077 20	
80	13,48	72004 000 084 10	13,48	72004 000 084 20	
80	13,89	72004 000 089 10	13,89	72004 000 089 20	
100	25,06	72004 000 104 10	25,06	72004 000 104 20	
100	26,59	72004 000 108 10	26,59	72004 000 108 20	
100	27,77	72004 000 115 10	27,77	72004 000 115 20	
125	29,46	72004 000 129 10	29,46	72004 000 129 20	
125	30,12	72004 000 133 10	30,12	72004 000 133 20	
125	31,81	72004 000 140 10	31,81	72004 000 140 20	
150	32,80	72004 000 154 10	32,80	72004 000 154 20	
150	33,14	72004 000 159 10	33,14	72004 000 159 20	
150	35,23	72004 000 169 10	35,23	72004 000 169 20	
200	39,53	72004 000 204 10	39,53	72004 000 204 20	
200	39,86	72004 000 216 10	39,86	72004 000 216 20	
200	40,70	72004 000 220 10	40,70	72004 000 220 20	
250	48,78	72004 000 254 10	48,78	72004 000 254 20	
250	54,25	72004 000 273 10	54,25	72004 000 273 20	
300	67,70	72004 000 305 10	67,70	72004 000 305 20	
300	75,96	72004 000 324 10	75,96	72004 000 324 20	

Pipe Mounting Bracket "U" Form for Pipe acc. to DIN EN 10357



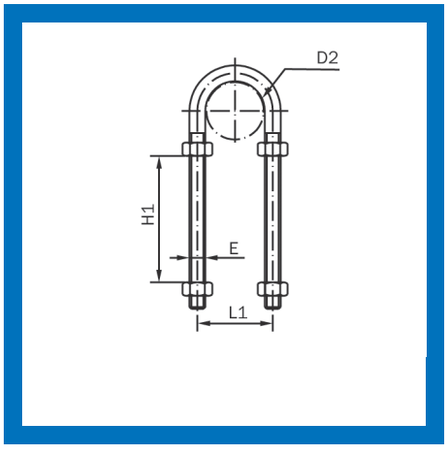
Pipe Mounting Bracket "U" Form, short , Series A/B

DN DIN	D2	L1	H1	E	Weight [kg]
10	13	20	8	M6	0.03
15	19	26	8	M6	0.03
20	23	30	8	M6	0.03
25	29	38	8	M8	0.03
32	35	44	8	M8	0.03
40	41	50	8	M8	0.06
50	53	62	8	M8	0.07
65	70	80	8	M8	0.08
80	85	97	8	M10	0.15
100	104	116	8	M10	0.18
125	129	143	8	M12	0.21
150	154	168	8	M12	0.37
200	204	218	8	M12	0.48



Pipe Mounting Bracket "U" Form, medium , Series A/B

DN DIN	D2	L1	H1	E	Weight [kg]
10	13	20	54	M6	0.05
15	19	26	54	M6	0.05
20	23	30	54	M6	0.05
25	29	38	54	M8	0.05
32	35	44	54	M8	0.05
40	41	50	54	M8	0.10
50	53	62	54	M8	0.11
65	70	80	54	M8	0.12
80	85	97	54	M10	0.22
100	104	116	54	M10	0.25
125	129	143	54	M12	0.28
150	154	168	54	M12	0.46
200	204	218	54	M12	0.57



Pipe Mounting Bracket "U" Form, long , Series A/B

DN DIN	D2	L1	H1	E	Weight [kg]
10	13	20	100	M6	0.07
15	19	26	100	M6	0.07
20	23	30	100	M6	0.07
25	29	38	100	M8	0.07
32	35	44	100	M8	0.07
40	41	50	100	M8	0.14
50	53	62	100	M8	0.15
65	70	80	100	M8	0.16
80	85	97	100	M10	0.28
100	104	116	100	M10	0.31
125	129	143	100	M12	0.34
150	154	168	100	M12	0.54
200	204	218	100	M12	0.66

Pipe Mounting Bracket "U" Form for Pipe acc. to DIN EN 10357

Pipe Mounting Bracket "U" Form, short , Series A/B

	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	5,55	71014 000 010 10	5,55	71014 000 010 20	
15	5,55	71014 000 015 10	5,55	71014 000 015 20	
20	5,55	71014 000 020 10	5,55	71014 000 020 20	
25	4,94	71014 000 025 10	4,94	71014 000 025 20	
32	5,27	71014 000 032 10	5,27	71014 000 032 20	
40	6,17	71014 000 040 10	6,17	71014 000 040 20	
50	6,63	71014 000 050 10	6,63	71014 000 050 20	
65	7,19	71014 000 065 10	7,19	71014 000 065 20	
80	11,07	71014 000 080 10	11,07	71014 000 080 20	
100	14,01	71014 000 100 10	14,01	71014 000 100 20	
125	14,81	71014 000 125 10	14,81	71014 000 125 20	
150	22,81	71014 000 150 10	22,81	71014 000 150 20	
200	35,36	71014 000 200 10	35,36	71014 000 200 20	

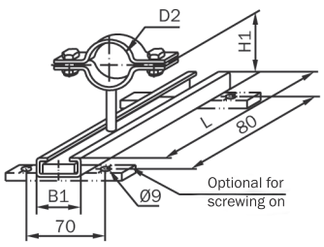
Pipe Mounting Bracket "U" Form, medium , Series A/B

	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	5,78	70014 000 010 10	5,78	70014 000 010 20	
15	5,78	70014 000 015 10	5,78	70014 000 015 20	
20	5,78	70014 000 020 10	5,78	70014 000 020 20	
25	5,19	70014 000 025 10	5,19	70014 000 025 20	
32	5,53	70014 000 032 10	5,53	70014 000 032 20	
40	6,42	70014 000 040 10	6,42	70014 000 040 20	
50	6,91	70014 000 050 10	6,91	70014 000 050 20	
65	7,44	70014 000 065 10	7,44	70014 000 065 20	
80	11,53	70014 000 080 10	11,53	70014 000 080 20	
100	14,53	70014 000 100 10	14,53	70014 000 100 20	
125	15,32	70014 000 125 10	15,32	70014 000 125 20	
150	23,45	70014 000 150 10	23,45	70014 000 150 20	
200	36,59	70014 000 200 10	36,59	70014 000 200 20	

Pipe Mounting Bracket "U" Form, long , Series A/B

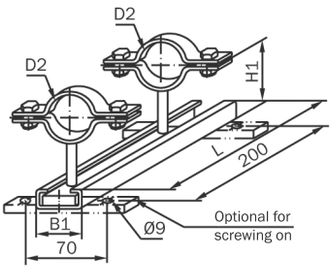
	1.4301 (304)/polished		1.4301 (304)/matt		
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	
10	6,37	72014 000 010 10	6,37	72014 000 010 20	
15	6,37	72014 000 015 10	6,37	72014 000 015 20	
20	6,37	72014 000 020 10	6,37	72014 000 020 20	
25	5,65	72014 000 025 10	5,65	72014 000 025 20	
32	6,09	72014 000 032 10	6,09	72014 000 032 20	
40	7,09	72014 000 040 10	7,09	72014 000 040 20	
50	7,62	72014 000 050 10	7,62	72014 000 050 20	
65	8,24	72014 000 065 10	8,24	72014 000 065 20	
80	12,74	72014 000 080 10	12,74	72014 000 080 20	
100	16,09	72014 000 100 10	16,09	72014 000 100 20	
125	16,90	72014 000 125 10	16,90	72014 000 125 20	
150	25,67	72014 000 150 10	25,67	72014 000 150 20	
200	39,45	72014 000 200 10	39,45	72014 000 200 20	

Sliding Clamp Systems for Pipe acc. to DIN EN 10357



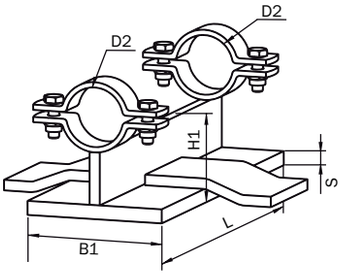
Sliding Clamp System, light (one clamp), Series A/B

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



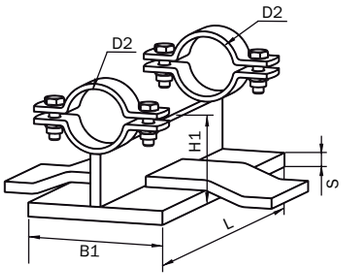
Sliding Clamp System, light (two clamps), Series A/B

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/B - 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/B - 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/B

	1.4301 (304)/polished (for welding		1.4301 (304)/matt (for welding)		1.4301 (304) /polished (for screwing)		1.4301 (304)/matt (for screwing)	
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/B

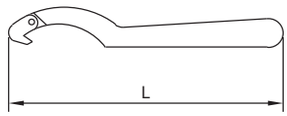
	1.4301 (304)/polished (for welding)		1.4301 (304)/matt (for welding)		1.4301 (304)/ polished (for screwing)		1.4301 (304)/matt (for screwing)	
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.	Price/EUR	Article No.	Price/EUR	Article No.
10	27,54	71051 000 010 10	27,54	71051 000 010 20	33,29	73051 000 010 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/B - 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	

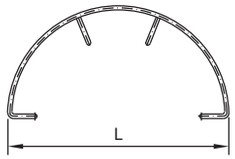
Sliding Clamp System, heavy (two clamps), Series A/B - Version B

	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	



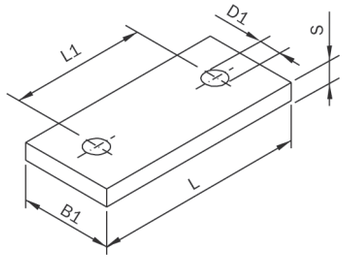
Spanner Stainless Steel

DN DIN	L
10 - 20	175
25 - 40	290
50 - 100	290



Round Material Hose Support

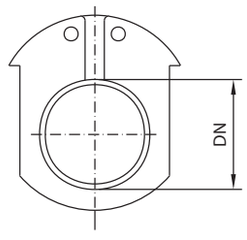
L
400



other dimensions on request

Retaining Flange

B1	D1	L	L1	S	Weight [kg]
60	11.5	130	100	8	0.50



Clamping Device

DN DIN	Weight [kg]
10	1.30
15	1.35
20	1.40
25	1.50
32	1.50
40	1.60
50	2.00
65	2.50
80	2.80
100	3.70

Assembly Accessories

Spanner Stainless Steel

1.4301 (304)		
DN DIN	Price/EUR	Article No.
10 - 20	22,93	70043 010 020 25
25 - 40	24,30	70043 025 040 25
50 - 100	33,87	70043 050 100 25

Round Material Hose Support

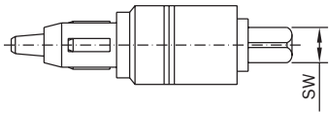
1.4301 (304)/matt		
L	Price/EUR	Article No.
400	108,70	70046 000 400 20

Retaining Flange

1.4301 (304)		
B1	Price/EUR	Article No.
80	11,17	70050 060 130 08

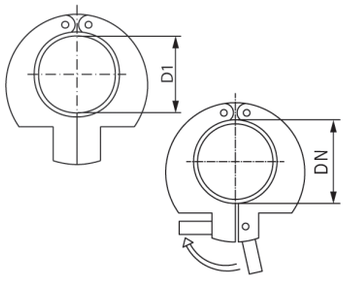
Clamping Device

DN DIN	Price/EUR	Article No.
10	287,25	70033 000 010 94
15	287,25	70033 000 015 94
20	287,25	70033 000 020 94
25	287,25	70033 000 025 94
32	314,95	70033 000 032 94
40	351,30	70033 000 040 94
50	482,80	70033 000 050 94
65	583,15	70033 000 065 94
80	799,45	70033 000 080 94
100	891,20	70033 000 100 94



Pipe Roll for Pipe acc. to DIN EN 10357 Series A/B

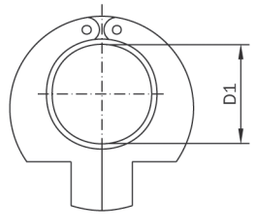
DN DIN	SW	Weight [kg]
10	8	0.35
15	8	0.37
20	8	0.38
25	12	0.70
32	12	1.05
40	14	1.54
50	14	2.37
65	16	4.15
80	22	7.90
100	22	10.50



Standard Quick Lock

Pipe Saw Tool for Pipe acc. to DIN EN 10357 Series A/B

DN DIN	D1	Weight [kg]
10	12	0.60
10	13	0.58
15	18	0.55
15	19	0.55
20	22	0.53
20	23	0.50
25	28	0.70
25	29	0.63
32	34	0.63
32	35	0.92
40	40	0.83
40	41	0.82
50	52	0.97
50	53	1.32
65	70	2.00
80	85	2.15
100	104	2.65
125	129	4.30
150	154	4.78
200	204	6.20



Pipe Saw Tool for Pipe acc. DIN EN 10357 Series C

DN ISO	D1	Weight [kg]
17.2	17.2	0.55
21.3	21.3	0.52
26.9	26.9	0.71
33.7	33.7	0.63
42.4	42.4	1.14
48.3	48.3	1.04
60.3	60.3	1.58
76	76	2.50
88.9	88.9	2.65
114.3	114.3	3.20

Assembly Accessories

Pipe Roll for Pipe acc. to DIN EN 10357 Series A/B

DN DIN	Price/EUR	Article No.
10	203,35	70034 000 010 94
15	203,35	70034 000 015 94
20	203,35	70034 000 020 94
25	249,20	70034 000 025 94
32	257,00	70034 000 032 94
40	262,20	70034 000 040 94
50	302,85	70034 000 050 94
65	423,95	70034 000 065 94
80	575,40	70034 000 080 94
100	757,95	70034 000 100 94

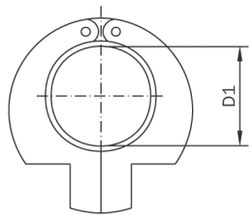
Pipe Saw Tool for Pipe acc. to DIN EN 10357 Series A/B

	Standard		with Quick Lock System	
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.
10	116,00	70037 000 010 94	166,20	70037 000 012 97
10	141,90	70037 000 010 96	190,40	70037 000 013 97
15	116,00	70037 000 015 94	166,20	70037 000 015 97
15	141,90	70037 000 015 96	190,40	70037 000 019 97
20	116,00	70037 000 020 94	166,20	70037 000 020 97
20	145,40	70037 000 020 96	193,90	70037 000 023 97
25	119,40	70037 000 025 94	171,40	70037 000 025 97
25	154,10	70037 000 025 96	202,50	70037 000 029 97
32	119,40	70037 000 032 94	171,40	70037 000 032 97
32	161,00	70037 000 032 96	212,90	70037 000 035 97
40	124,60	70037 000 040 94	178,30	70037 000 040 97
40	169,60	70037 000 040 96	221,50	70037 000 041 97
50	133,30	70037 000 050 94	190,40	70037 000 050 97
50	233,70	70037 000 050 96	285,60	70037 000 053 97
65	214,60	70037 000 065 94	273,50	70037 000 065 97
80	283,80	70037 000 080 94	342,70	70037 000 080 97
100	353,10	70037 000 100 94	410,20	70037 000 100 97
125			811,60	70037 000 125 97
150			1.019,30	70037 000 150 97
200			1.277,10	70037 000 200 97

Quick Lock
- **further development of the wellknown pipe saw tool**
- **easy to use**
- **flexible use for fittings**

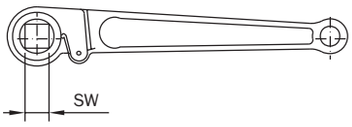
Pipe Saw Tool for Pipe acc. DIN EN 10357 Series C

DN ISO	Price/EUR	Article No.
17.2	141,90	70037 000 010 95
21.3	141,90	70037 000 015 95
26.9	145,40	70037 000 020 95
33.7	154,10	70037 000 025 95
42.4	169,60	70037 000 032 95
48.3	178,30	70037 000 040 95
60.3	261,30	70037 000 050 95
76	275,20	70037 000 065 95
88.9	342,70	70037 000 080 95
114.3	688,70	70037 000 100 95



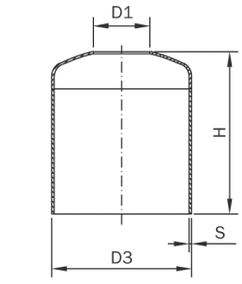
Pipe Saw Tool for Pipe acc. to DIN EN 10357 Series D

DN Inch	D1	Weight [kg]
1"	25.4	0.72
1 1/4"	31.8	0.65
1 1/2"	38.1	0.85
2"	50.8	0.99
2 1/2"	63.5	2.15
3"	76.2	2.50
4"	101.6	2.75



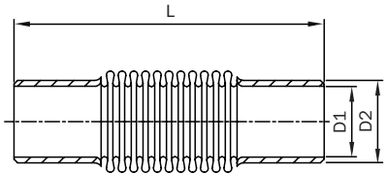
Ratchet

DN	SW	Weight [kg]
10 - 20	8	0.29
25 - 32	12	0.29
40 - 50	14	0.29
65	16	0.42
80 - 100	22	0.63



Bell for Welding

DN DIN	D3	D1	S	H	Weight [kg]
15	53	19.2	1.5	150	0.40
20	53	23.2	1.5	150	0.40
25	85	29,2	2	150	0.80
32	104	35.2	2	150	1.10
40	104	41.2	2	150	1.00
50	129	53.2	2	150	1.30
65	154	70.3	2	150	1.50
80	204	85.3	2	150	2.00
100	204	104.3	2	150	2.00



Bellow

DN DIN	D1	D2	L	Weight [kg]
25	25	28	120	0.13
32	31	34	120	0.17
40	37	40	120	0.19
50	49	52	120	0.20
65	66	70	120	0.30
80	81	85	120	0.36
100	100	104	120	0.60

Pipe Saw Tool for Pipe acc. to DIN EN 10357 Series D

DN Inch	Price/EUR	Article No.
1"	119,40	70038 000 100 94
1 1/4"	119,40	70038 000 114 94
1 1/2"	124,60	70038 000 112 94
2"	133,30	70038 000 200 94
2 1/2"	214,60	70038 000 212 94
3"	283,80	70038 000 300 94
4"	353,10	70038 000 400 94

Ratchet

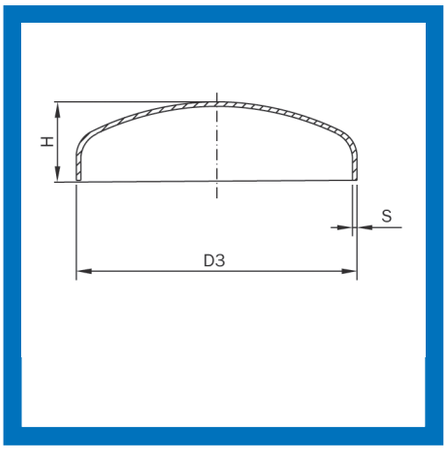
DN	Price/EUR	Article No.
10 - 20	76,15	70036 000 010 94
25 - 32	86,55	70036 000 025 94
40 - 50	86,55	70036 000 040 94
65	93,45	70036 000 065 94
80 - 100	105,55	70036 000 080 94

Bell for Welding

	1.4301 (304)/1.4541/polished		1.4301 (304)/1.4541/matt	
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.
15	27,66	70029 000 015 10	27,66	70029 000 015 20
20	28,79	70029 000 020 10	28,79	70029 000 020 20
25	33,46	70029 000 025 10	33,46	70029 000 025 20
32	35,10	70029 000 032 10	35,10	70029 000 032 20
40	35,10	70029 000 040 10	35,10	70029 000 040 20
50	42,90	70029 000 050 10	42,90	70029 000 050 20
65	42,90	70029 000 065 10	42,90	70029 000 065 20
80	42,90	70029 000 080 10	42,90	70029 000 080 20
100	49,37	70029 000 100 10	49,37	70029 000 100 20

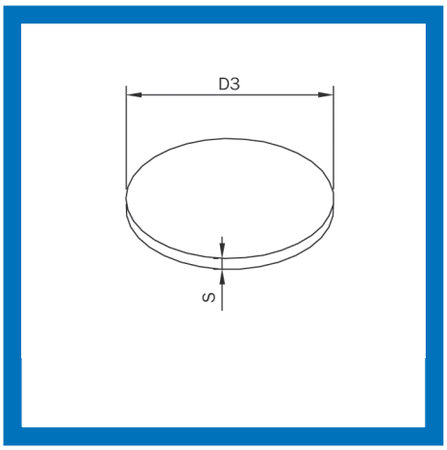
Bellow

	1.4541 /metal bright		1.4571 (316Ti)/metal bright	
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.
25	116,35	10085 000 025 14	132,50	10085 000 025 34
32	134,95	10085 000 032 14	153,90	10085 000 032 34
40	152,10	10085 000 040 14	173,40	10085 000 040 34
50	181,85	10085 000 050 14	207,20	10085 000 050 34
65	215,05	10085 000 065 14	245,25	10085 000 065 34
80	273,65	10085 000 080 14	311,70	10085 000 080 34
100	324,95	10085 000 100 14	371,20	10085 000 100 34



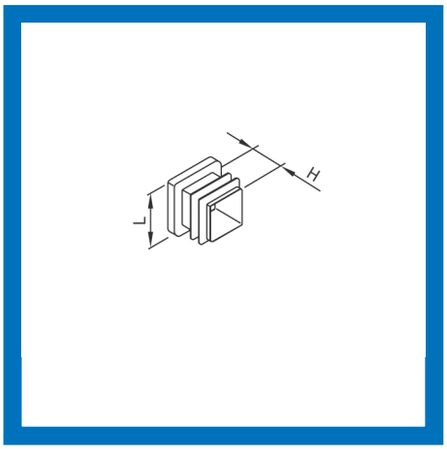
Dished Head similar to DIN EN 10253-4

DN DIN	D3	S	H	Weight [kg]
15	19	1.5	13	0.010
20	22	1.5	12	0.012
20	23	1.5	12	0.012
25	28	1.5	15	0.017
25	29	1.5	17	0.022
32	34	1.5	14	0.024
32	35	1.5	14	0.024
40	40	1.5	18	0.032
40	41	1.5	17	0.032
50	52	1.5	18	0.044
50	53	1.5	18	0.044
65	70	2	23	0.106
80	85	2	27	0.152
100	104	2	36	0.286
125	129	2	33	0.322
150	154	2	40	0.444
200	204	2	61	0.916



Sheet metal blank

D3	S	Weight [kg]
28	1.5	0.010
34	1.5	0.010
40	1.5	0.020
52	1.5	0.030
70	1.5	0.050
88	1.5	0.070
110	1.5	0.110
128	2	0.200
150	2	0.280
165	3	0.510
210	3	0.820
250	3	1,160



Lamellar Plug for Square Tubes

L	H	Weight [kg]
20	12	0.003
25	12	0.004
30	12	0.005
35	15	0.007
40	15	0.008
50	15	0.012
60	24	0.020
80	17	0.031
100	23.2	0.069
200	25.8	0.092

Dished Head similar to DIN EN 10253-4

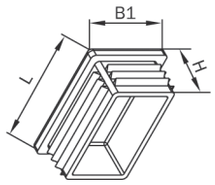
	1.4307 (304L)		1.4404 (316L)	
DN DIN	Price/EUR	Article No.	Price/EUR	Article No.
15	3,91	271 6384	4,31	271 6312
20	4,25	271 6364	4,71	271 6449
20	4,25	271 6385	4,71	271 6343
25	4,25	270 1671	4,71	270 1639
25	4,38	271 6387	4,93	271 6349
32	5,04	271 6191	5,62	271 6039
32	5,04	271 6097	5,62	271 6017
40	4,99	270 1668	5,60	270 1665
40	5,44	271 6555	6,19	271 6098
50	7,37	271 6382	8,30	271 6136
50	7,37	271 6383	8,30	271 6362
65	7,61	271 6105	8,70	271 6044
80	9,39	271 6197	10,87	271 6058
100	11,82	270 5133	14,51	271 6062
125	15,10	271 6126	16,76	271 6069
150	19,26	271 6128	23,22	271 6077
200	27,07	271 6130	31,20	271 6257

Sheet metal blank

	1.4541	
D3	Price/EUR	Article No.
28	1,97	40 001
34	2,31	40 000
40	2,48	40 002
52	2,81	40 003
70	3,15	40 004
88	4,27	40 016
110	4,68	40 018
128	9,89	40 019
150	13,60	40 020
165	23,73	40 021
210	31,15	40 022
250	37,57	40 023

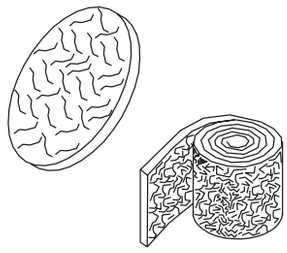
Lamellar Plug for Square Tubes

L	Price/EUR	Article No.
20	0,98	330 6780
25	1,08	330 6999
30	1,23	330 7000
35	1,49	330 7005
40	1,59	330 7010
50	2,00	330 7020
60	2,92	330 7030
80	4,30	330 7040
100	7,40	330 7043
200	7,90	330 7047



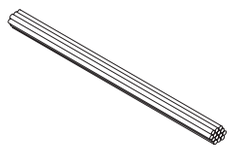
Lamellar Plug for Rectangular Pipes

L	B1	H	Weight [kg]
30	20	11.5	0.003
40	20	11.5	0.005
50	30	14.5	0.008
50	40	12.2	0.011
60	30	17.5	0.011
60	40	14.5	0.012
80	40	18.5	0.020
80	60	19	0.026
100	40	15	0.019
100	50	25	0.032
100	60	24.6	0.034
120	60	20	0.043



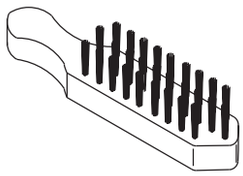
Scotch Disc and Scotch Belt

Shape	D3	Width	Length
Disk	115		
Belt		100	1000



Welding Wire

D3
1
1.2
1.6
2
2.4



Stainless Steel Brush

Version
2-row
3-row
4-row

Handle body not made of stainless steel!

Assembly Accessories

Lamellar Plug for Rectangular Pipes

L	Price/EUR	Article No.
30	1,00	330 7076
40	1,30	330 7075
50	1,60	330 7021
50	1,60	330 7050
60	2,30	330 7071
60	2,30	330 7072
80	3,40	330 7041
80	3,40	330 7073
100	6,60	330 7048
100	6,60	330 7044
100	6,60	330 7046
120	7,10	330 7045

Scotch Disc and Scotch Belt

Shape	Price/EUR	Article No.
Disk	7,80	6892
Belt	59,60	6890

Welding Wire

	1.4316		1.4576		1.4430	
D3	Price/EUR	Article No.	Price/EUR	Article No.	Price/EUR	Article No.
1	18,96	35001	22,05	35016	18,61	35022
1.2	15,17	35002	22,42	35015	19,60	35020
1.6	14,44	35003	19,08	35014	19,80	35021
2	13,78	35004	18,96	35013	15,65	35019
2.4	13,45	35005			15,40	35018

Stainless Steel Brush

	V2A		V4A		
Version	Price/EUR	Article No.	Price/EUR	Article No.	
2-row	8,60	8426			
3-row	8,80	8424	32,15	8421	
4-row	10,05	8422			

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