KX INOX

STAINLESS STEEL
TUBE & PIPES

WENZHOU KAIXIN METAL CO.,LTD
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Classification of steels

Austenitic steels

The main advantage of steels of the austenitic class are their high performance characteristics (strength, plasticity, and corrosion resistance in most environments) and good processability. Hence, austenitic corrosion resistant steels are widely applied as a construction material in various mechanical engineering industries.

Austenitic-ferritic steels

The advantage of this steel group is the increased yield strength as compared to austenitic single-phase steels, no grain-growth tendency providing maintenance of double-phase structure, less content of scarce nickel and good weldability. Austenitic-ferritic steels are widely applied in various industries of the advanced technology, particularly in chemical engineering, shipbuilding, and aircraft industry.

Ferritic steels

These steels are used in the manufacture of products for application in an oxidizing environment (e.g. in nitric acid solutions), for household devices, in food and consumer goods industries, and for the heat-exchange equipment in power-plant engineering. Ferritic chromium steels keep high corrosion resistance in nitric acid, ammonia water, ammonia nitrate, mixture of nitric, phosphorus and hydrofluoric acids, and in other aggressive environments as well.

Martensitic-ferritic steels

Martensitic-ferritic steels keep high corrosion resistance in atmosphere conditions and mildly aggressive environments (diluted salt/acid solutions), and high mechanical properties. Generally these steels are used for products such as cutting tools, particularly cutters, and for springing elements and constructions in contact with mildly aggressive environments in food and chemical industries.

Nickel and iron-nickel based alloys

When manufacturing chemical apparatus, particularly for use in sulphuric and hydrochloric acid, steels maintaining corrosion resistance higher than austenitic steels such as iron-nickel, nickel-molybdenum, chrome-nickel and chrome-nickel-molybdenum based alloys shall be used.

Duplex and super duplex steels

Corrosion resistant steels keeping fine-grain mixed microstructure of ferrite and austenite and containing approximately 26% Cr and 6.5 % Ni. Corrosion resistance of duplex stainless steels is similar to austenitic stainless steels. However, duplex stainless steels keep higher strength, tensile yield strength and better resistance to stress corrosion cracking than the austenitic equivalents.

Application areas of steel grades

Grade	Applications
Austenitic steels	
TP 304	General purpose stainless steel with good corrosion resistance for most applications. Used for: Bar rails, Boat railings, Canopy supports, Chemical processing equipment, Chemical tubing, Column covers, Duct works, Feed-water tubes, Food preparation equipment, Food processing equipment, Heat exchanger tubes, Hypodermic needles, Ladders, Mechanical & structural components, Pharmaceutical processing equipment, Piping systems, Railings (architectural), Traffic barriers, Water pipes.
TP 304LN, 316LN	Boiler, super-heater, heat-exchanger tubes.
TP 304H	Higher carbon content than 304L, for increased strength, particularly at elevated temperatures.
TP 304L	Chemical plant and food processing equipment, where freedom from sensitisation is required in plate thicknesses.
TP 316 / 316L	Excellent in a range of atmospheric environments and many corrosive media – generally more resistant than 304. Subject to pitting and crevice corrosion in warm chloride environments, and to stress corrosion cracking above about 60°C. Considered resistant to potable water with up to about 1000mg/L chlorides at ambient temperatures, reducing to about 500mg/L at 60°C. 316/316L is usually regarded as the standard "marine grade stainless steel", but it is not resistant to warm sea water. In many marine environments 316 does exhibit surface corrosion, usually visible as brown staining. This is particularly associated with crevices and rough surface finish.
TP 316H	Similar oxidation resistance to TP 316. Main areas of application: Heat exchangers, furnaces, chemical and petrochemical plant.
TP 347H, 310H	Boiler, super-heater, heat-exchanger tubes providing higher creep-rupture strength.
TP 321	Heat exchanger tubing, Chemical processing tubing, Pressure tank tubing. Suitable for heat resisting applications to 800ºC.
TP 321H	This is the high carbon version of TP 321 which ensures greater creep resistance. Behaves much the same as TP 321 in oxidation resistance. Main applications: Heat exchangers, furnaces, boilers in chemical and petrochemical plant.
TP 316Ti	A titanium stabilised version of 316 used where good resistance to intergranular corrosion and high temperature strength is required.
TP 317 / 317 L	Chemical processing tubing, Dyeing equipment, Ink manufacturing equipment, Pulp & paper manufacturing equipment.
Super-Austenitic Steels	
N08904 (TP 904L)	High resistance to general corrosion in e.g. sulphuric and acetic acids, crevice corrosion, stress corrosion cracking, pitting in chloride bearing solutions.
Ferritic and Martensitic steels	
TP 405	Used for applications where hardening upon cooling from high temperatures must be avoided. Has excellent long-time stability up to 1200°F.
TP 410	General purpose grade for use in mildly corrosive environments.
TP 430 / 430 Ti	Mechanical & structural tubing, Architectural tubing, Heat exchanger tubing, Condensers, Re-heaters, Evaporators.
Duplex	
S32205 / S31803	Typically used in heat exchangers, gas scrubbers, fans, chemical tanks, flowlines, marine and refinery applications.
Superduplex	
S32750 S32760	Superduplex is an austenitic ferritic Iron Cromium-Nickel alloy with Molybdenim addition. It has good resistance to pitting corrosion, and a high tensile strength.

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Steel grades correlation in different standards

		ASTM (USA)	UNS (USA)	B.S. (UK)	EN / DIN (Germany)	AFNOR NF (France)	UNI (Italy)	SS (Sweden)	JIS (Japan)	GB/PR (China)	KS (Korea)
General service and we corrosiont	Austenitic	304	S30400	304S31 / 304S15	1.4301	Z7 CN 18-09/ Z6 CN 18-09	X5CrNi18 10	2333	SUS 304	0Cr18Ni9	STS 304
		304L	S30403	304S11	1.4306	Z2 CN 18-10	X2CrNi18 11	2352	SUS 304L	00Cr19Ni10	STS 304L
					1.4307	Z3 CN 18-10					
		304LN	S30453	304S61	1.4311	Z3 CN 18-10 Az		2371	SUS 304LN	00Cr18Ni 10N	STS 304LN
		316	S31600	316S31	1.4401	Z7 CND 17-11-02	X5CrNiMo 17 12	2347	SUS 316	0Cr17Ni 12Mo2	STS 316
				316S33/ 316S31	1.4436	Z7 CND 18-12-03	X5CrNiMo 17 13	2343			
		316L	S31603	316S11/ 316S14	1.4404	Z3 CND 17-11-02 / Z3 CND 18-12-02	X5CrNiMo 17 12	2348	SUS 316L	00Cr17Ni 14Mo2	STS 316L
				316S13/ 316S11	1.4435	Z3 CND 18-14-03	X2CrNiMo 17 13	2353			
		316N	S31651	–	–	–		–	–	–	–
		316LN	S31653	316S61	1.4406	Z3 CND 17-11 Az		–	SUS 316LN	00Cr17Ni 12Mo2N	STS 316LN
		316Ti	S31635	320S31	1.4571	Z6 CNDT 17-12-02	X6CrNiMo Ti17 13	2350	SUS 316Ti	0Cr18Ni12 Mo2Ti	STS 316Ti
		316H	S31609	316S52	1.4401/ 1.4919	Z6 CND 17-12-02	X8CrNiMo 17 12	–	–	–	–
		321	S32100	321S31	1.4541	Z6 CNT 18-10	X6CrNiTi18 11	2337	SUS 321	1Cr18Ni9Ti	STS 321
		317	S31700	317S16	1.4449	–		–	SUS 317		
		317L	S31703	317S12	1.4438	Z3 CND 19-15-04		2367	SUS 317L	00Cr19Ni13 Mo3	STS 317L
		347	S34700	347S31	1.4550	Z6 CNNb 18-10	X6CrNiNb 18 11	2338	SUS 347	0Cr18Ni11 Nb	STS 347
		904L	N08904	904S13	1.4539	Z2 NCDU 25-20		2562	–	–	STS 317J5L
	Duplex	–	S31803	–	1.4462	Z2 CND 22-05 Az		2377	–	–	–
		–	S32205	318S13	1.4462	Z3 CND 22-05 Az		2377	SUS 329J3L	00Cr22 Ni5Mo3N	STS 329J3L
	Ferritic	405	S40500	405S17	1.4002	Z6 C Al 13		–	SUS 405		
		410	S41000	410S21	1.4006	Z12C13	X12Cr13	2302	SUS 410	1Cr12	STS 410
		430	S43000	430S17	1.4016	Z8 C17	X8Cr17	2320	SUS 430	1Cr17	STS 430
		430Ti	–	–	1.4510	Z8 CT17		–	SUS 430LX	–	–
	SuperDuplex	–	S32750	–	1.4410	–		–	–	–	–
		–	S32760	–	–	–		–	–	–	–
Heat resistant	Austenitic	304H	S30409	304S51	1.4948	Z6 CN 18-09	X8CrNi 18 10	2333	SUS 304	1Cr18Ni9	STS 304
		321H	S32109	321S51	1.4878	Z6 CNT 18-10	X8CrNiTi 18 11	2337	SUS 321		
		347H	S34709	347S51	–	–	X8CrNiNb 18 11	2347	–	–	–
		310S	S31008	310S16/ 310S24	1.4845	Z8 CN 25-20/ Z12 CN 25-20	X6CrNi 25 20	2361	SUS 310S	0Cr25Ni20	STS 310S
		310H	S31009	–	–	–		–	–	–	–
		314	S31400	–	1.4841	Z15 CNS25-20	–	–	–	–	–

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Chemical composition

Steel grade	Tube standard	Chemical composition, %.				
		C	Mn	P	S	Si
Austenitic stainless steels						
TP 304	A269, A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 304L	A269, A213, A312	≤0.035	≤2.00	≤0.045	≤0.030	≤1.00
TP 304H	A213, A312	0.04-0.10	≤2.00	≤0.045	≤0.030	≤1.00
TP 304N	A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 304LN	A269, A213, A312	≤0.035	≤2.00	≤0.045	≤0.030	≤1.00
TP 310S	A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 310H	A213, A312	0.04-0.10	≤2.00	≤0.045	≤0.030	≤1.00
TP 316	A269, A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 316L	A269, A213, A312	≤0.035	≤2.00	≤0.045	≤0.030	≤1.00
TP 316H	A213, A312	0.04-0.10	≤2.00	≤0.045	≤0.030	≤1.00
TP 316Ti	A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤0.75
TP 316N	A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 316LN	A269, A213, A312	≤0.035	≤2.00	≤0.045	≤0.030	≤1.00
TP 317	A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 317L	A213, A312	≤0.035	≤2.00	≤0.045	≤0.030	≤1.00
TP 321	A269, A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 321H	A213, A312	0.04-0.10	≤2.00	≤0.045	≤0.030	≤1.00
TP 347	A269, A213, A312	≤0.08	≤2.00	≤0.045	≤0.030	≤1.00
TP 347H	A213, A312	0.04-0.10	≤2.00	≤0.045	≤0.030	≤1.00
TP 347HFG	A213	0.06-0.10	≤2.00	≤0.045	≤0.030	≤1.00
N08904	A269, A312	≤0.02	≤2.00	≤0.040	≤0.030	≤1.00
1.4301	EN 10216-5	≤0.07	≤2.00	≤0.040	≤0.030	≤1.00
1.4306	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.030	≤1.00
1.4307	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.030	≤1.00
1.4311	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.030	≤1.00
1.4401	EN 10216-5	≤0.07	≤2.00	≤0.040	≤0.030	≤1.00
1.4404	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.030	≤1.00
1.4435	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.030	≤1.00
1.4429	EN 10216-5	≤0.03	≤2.00	≤0.040	≤0.015	≤1.00
1.4436	EN 10216-5	≤0.05	≤2.00	≤0.040	≤0.030	≤1.00
1,4541	EN 10216-5	≤0.08	≤2.00	≤0.040	≤0.015	≤1.00
1.4571	EN 10216-5	≤0.08	≤2.00	≤0.040	≤0.030	≤1.00
1.4828	SEW 470	≤0.20	≤2.00	≤0.045	≤0.030	1.5-2.5
1.4845	SEW 470	≤0.15	≤2.00	≤0.045	≤0.030	≤0.75
1.4878	SEW 470	≤0.12	≤2.00	≤0.045	≤0.030	≤1.00
TU Z 6 CN 18 9	NF A 49-117, NF A 49-217	≤0.09	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 2 CN 18 10	NF A 49-117, NF A 49-217	≤0.03	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 12 CN 25 20	NF A 49-117	≤0.16	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 6 CNT 18 10	NF A 49-117	≤0.09	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 6 CNDT 17 12	NF A 49-117	≤0.09	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 6 CNT 18 10	NF A 49-217	≤0.09	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 2 CND 17 12	NF A 49-117, NF A 49-217	≤0.03	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 6 CND 17 11	NF A 49-117, NF A 49-217	≤0.08	≤2.04	≤0.045	≤0.035	≤1.05
TU Z 2 CND 18 14	NF A 49-217	≤0.03	≤2.04	≤0.025	≤0.020	≤1.05
Ferritic stainless steels						
TP 405	A268	≤0.08	≤1.00	≤0.040	≤0.030	≤1.00
TP 410	A268	≤0.15	≤1.00	≤0.040	≤0.030	≤1.00
TP 430	A268	≤0.12	≤1.00	≤0.040	≤0.030	≤1.00
TP 430Ti	A268	≤0.10	≤1.00	≤0.040	≤0.030	≤1.00
1.4002	DIN EN 10297-2	≤0.08	≤1.00	≤0.040	≤0.030	≤1.00
1.4006	DIN EN 10297-2	0.08-0.15	≤1.50	≤0.040	≤0.030	≤1.00
1.4016	DIN EN 10297-2	≤0.08	≤1.00	≤0.040	≤0.030	≤1.00
1.4510	DIN EN 10297-2	≤0.05	≤1.00	≤0.040	≤0.030	≤1.00
TU Z 12 C 13	NF A 49-217	≤0.16	≤1.05	≤0.045	≤0.035	≤1.05
TU Z 10 C 17	NF A 49-217	≤0.13	≤1.05	≤0.045	≤0.035	≤1.05
Duplex stainless steels						
S31803	A789	≤0.03	≤2.00	≤0.030	≤0.020	≤1.00
S32205	A789	≤0.03	≤2.00	≤0.030	≤0.020	≤1.00
1.4462	EN 10216-5	≤0.03	≤2.00	≤0.035	≤0.015	≤1.00
TU Z 2 CND 22 05 03	NF A 49-217	≤0.03	≤2.04	≤0.035	≤0.025	≤1.05
Super duplex stainless steels						
S32750	A789	≤0.03	≤1.20	≤0.035	≤0.020	≤0.80
S32760	A789	≤0.05	≤1.00	≤0.030	≤0.010	≤1.00

Chemical composition, %.						
Cr	Ni	Mo	N	Nb	Ti	Others
Austenitic stainless steels						
18.0-20.0	8.0-11.0	-	-	-	-	-
18.0-20.0	8.0-12.0	-	-	-	-	-
18.0-20.0	8.0-11.0	-	-	-	-	-
18.0-20.0	8.0-11.0	-	0.10-0.16	-	-	-
18.0-20.0	8.0-11.0	-	0.10-0.16	-	-	-
24.0-26.0	19.0-22.0	-	-	-	-	-
24.0-26.0	19.0-22.0	-	-	-	-	-
16.0-18.0	11.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	10.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	11.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	10.0-14.0	2.00-3.00	≤0.10	-	5*(C+N)-0.70	-
16.0-18.0	10.0-13.0	2.00-3.00	0.10-0.16	-	-	-
16.0-18.0	10.0-13.0	2.00-3.00	0.10-0.16	-	-	-
18.0-20.0	11.0-14.0	3.00-4.00	-	-	-	-
18.0-20.0	11.0-15.0	3.00-4.00	-	-	-	-
17.0-19,0	9.0-12.0	-	-	-	5*C-0.70	-
7.0-19.0	9.0-12.0	-	-	-	4*C-0.60	-
17.0-19.0	9.0-13.0	-	-	10*C-1.00	-	-
17.0-19.0	9.0-13.0	-	-	8*C-1.00	-	-
17.0-19.0	9.0-13.0	-	-	8*C-1.10	-	-
19.0-23.0	23.0-28.0	4.0-5.0	≤0.10	-	-	Cu 1.00-2.00
17.0-19.5	8.0-10.5	-	≤0.11	-	-	-
18.0-20.0	10.0-12.0	-	≤0.11	-	-	-
17.5-19.5	8.0-10.0	-	≤0.11	-	-	-
17.0-19.5	8.5-11.5	-	0.12-0.22	-	-	-
16.5-18.5	10.0-13.0	2.0-2.5	≤0.11	-	-	-
16.5-18.5	10.0-13.0	2.0-2.5	≤0.11	-	-	-
17.0-19.0	12.5-15.0	2.5-3.0	-	-	-	-
16.5-18.5	11.0-14.0	2.5-3.0	0.12-0.22	-	-	-
16.5-18.5	10.5-13.0	2.5-3.0	-	-	-	-
17.0-19.0	9.0-12.0	-	-	-	5*C-0.70	-
16.5-18.5	10.5-13.5	2.0-2.5	-	-	5*C-0.70	-
19.0-21.0	11.0-13.0	-	-	-	-	-
24.0-26.0	19.0-22.0	-	-	-	-	-
17.0-19.0	9.0-12.0	-	-	-	4*C-0.80	1.4878
17.0-20.2	8.00-11.10	-	-	-	-	-
17.0-20.2	9.00-12.15	-	-	-	-	-
24.0-26.2	19.00-22.15	-	-	-	-	-
17.0-20.2	9.00-12.15	-	-	-	5*C-0.65	-
16.0-18.2	10.50-13.15	1.9-2.5	-	-	5*C-0.65	-
17.0-20.2	9.00-12.15	-	-	-	5*C-0.65	-
16.0-18.2	10.50-13.15	2.0-2.5	-	-	-	-
16.0-18.2	10.00-12.65	2.0-2.5	-	-	-	-
17.0-18.7	13.00-16.15	2.2-3.1	-	-	-	-
Ferritic stainless steels						
11.5-14.5	≤0.50	-	-	-	-	Al 0.10-0.30
11.5-13.5	-	-	-	-	-	-
16.0-18.0	-	-	-	-	-	-
16.00-19.50	0.75	-	-	-	5*C-0.75	-
12.0-14.0	-	-	-	-		Al 0.10-0.30
11.5-13.5	≤0.75	-	-	-		-
16.0-18.0	-	-	-	-		Al 0.10-0.30
16.0-18.0	-	-	-	-	(4(C+N)+0.15) - 0,80	-
11.5-13.7	≤0.55	-	-	-	-	-
16.0-18.2	≤0.55	-	-	-	-	-
Duplex stainless steels						
21.0-23.0	4.5-6.5	2.5-3.5	0.08-0.20	-	-	-
22.0-23.0	4.5-6.5	3.0-3.5	0.14-0.20	-	-	-
21.0-23.0	4.5-6.5	2.5-3.5	0.10-0.22	-	-	-
21.0-23.2	4.50-6.65	2.5-3.6	0.07-0.21	-	-	-
Super duplex stainless steels						
24.0-26.0	6.0-8.0	3.0-5.0	0.24-0.32	-	-	Cu ≤0.50
24.0-26.0	6.0-8.0	3.0-4.0	0.20-0.30	-	-	W 0.50-1.00

STAINLESS STEEL PIPE DIMENSIONS & WEIGHTS

NOMINAL PIPE SIZE		Outside Diameter	SCH 5 S		SCH 10 S		SCH 20 S		SCH 40 S		SCH 80 S	
DN	Inch	mm	WT(mm)	kg/mtr.	WT(mm)	kg/mtr.	WT(mm)	kg/mtr.	WT(mm)	kg/mtr.	WT(mm)	kg/mtr
6	1/8	10.29	0.89	0.23	1.24	0.28	1.50	0.33	1.73	0.37	2.41	0.47
8	1/4	13.72	1.24	0.39	1.65	0.50	2.00	0.59	2.24	0.64	3.02	0.81
10	3/8	17.15	1.24	0.49	1.65	0.64	2.00	0.76	2.31	0.86	3.20	1.12
15	1/2	21.34	1.65	0.81	2.11	1.01	2.50	1.18	2.77	1.29	3.73	1.64
20	3/4	26.67	1.65	1.03	2.11	1:30	2.50	1.51	2.87	1.71	3.91	2.22
25	1	33.40	1.65	1.31	2.77	2.12	3.00	2.28	3.38	2.54	4.55	3.28
32	11/4	42:16	1.65	1.67	2.77	2.73	3.00	2.94	3.56	3.44	4.85	4.52
40	11/2	48.26	1.65	1.92	2.77	3.15	3.00	3.39	3.68	4.10	5.08	5.48
50	2	60.33	1.65	2.42	2.77	3.99	3.50	4.97	3.91	5.52	5.54	7.59
65	21/2	73.03	2.11	3.74	3.05	5.34	3.50	6.08	5.16	8.76	7.01	11.57
80	3	88.90	2.11	4.58	3.05	6.55	4.00	8.49	5.49	11.45	7.62	15.48
100	4	114.30	2.11	5.92	3.05	8.48	4.50	12.35	6.02	16.30	8.56	22.63
125	5	141.30	2.77	9.59	3.40	11.72	5.00	17.04	6.55	22.07	9.52	31.36
150	6	168.28	2.77	11.46	3.40	14.01	5.50	22.38	7.11	28.65	10.97	43.14
200	8	219.08	2.77	14.98	3.76	20.24	6.35	33.77	8.18	43.13	12.70	65.5
250	10	273.05	3.40	22.74	4.19	27.94	6.35	42.00	9.27	60.64	12.70	82.00
300	12	323.85	3.96	31.42	4.57	36.19	6.35	50.00	9.52	74.21	12.70	98.00

STAINLESS STEEL TUBE DIMENSIONS & WEIGHTS

WALL THICKNESS IN MM	0.5	0.7	0.9	1.0	1.2	1.5	1.6	2.0	2.6	3.0	3.2	3.6
OD in mm	kg/mtr.											
6.35	0.07	0.10	0.12	0.13	0.15	0.18	0.19	-	-	-	-	-
9.52	0.11	0.15	0.19	0.21	0.25	0.30	0.32	-	-	-	-	-
12.70	0.15	0.21	0.27	0.29	0.35	0.42	0.44	-	-	-	-	-
14.00	0.17	0.23	0.29	0.33	0.38	0.47	0.50	-	-	-	-	-
15.87	0.19	0.27	0.34	0.37	0.44	0.54	0.57	0.69	-	-	-	-
19.00	0.23	0.32	0.41	0.45	0.53	0.66	0.70	0.85	-	-	-	-
19.05	0.23	0.32	0.41	0.45	0.54	0.66	0.70	0.85	1.07	-	-	-
25.00	0.31	0.43	0.54	0.60	0.71	0.88	0.94	1.15	1.46	-	-	-
25.40	0.31	0.43	0.55	0.61	0.73	0.90	0.95	1.17	1.48	1.68	1.78	-
31.75	-	-	0.69	0.77	0.92	1.13	1.21	1.49	1.89	2.16	2.28	-
38.10	-	-	0.84	0.93	1.11	1.37	1.46	1.81	2.31	2.63	2.79	3.11
44.50	-	-	-	-	1.30	1.61	1.72	2.13	2.72	3.11	3.30	3.68
50.80	-	-	-	-	1.49	1.85	1.97	2.44	3.13	3.59	3.81	4.25
63.50	-	-	-	-	-	2.33	2.48	3.08	3.96	4.54	4.82	5.39
76.20	-	-	-	-	-	2.80	2.98	3.71	4.78	5.49	5.84	6.53
88.90	-	-	-	-	-	-	3.49	4.35	5.61	6.44	6.86	7.68
101.60	-	-	-	-	-	-	4.00	4.98	6.44	7.40	7.87	8.82

STAINLESS SQUARE PIPE DIMENSIONS & WEIGHTS

Wall Thickness in mm	0.9	1.0	1.2	1.5	1.6	2.0	2.6	3.0	3.2	3.6	4.0	4.5
Size in mm	kg/mtr											
15 x 15	0.41	0.45	0.54	0.66	0.70	0.85	1.07	-	-	-	-	-
20 x 20	0.55	0.61	0.73	0.90	0.95	1.17	1.48	-	-	-	-	-
25 x 25	0.69	0.77	0.92	1.13	1.21	1.49	1.89	2.16	2.28	-	-	-
30 x 30	0.84	0.93	1.11	1.37	1.46	1.81	2.31	2.63	2.79	3.11	3.41	3.78
35 x 35	-	-	1.30	1.61	1.72	2.13	2.72	3.11	3.30	3.68	4.05	4.50
40 x 40	-	-	1.49	1.85	1.97	2.44	3.13	3.59	3.81	4.25	4.68	5.21
50 x 50	-	-	-	-	2.48	3.08	3.96	4.54	4.82	5.39	5.95	6.64
60 x 60	-	-	-	-	2.98	3.71	4.78	5.49	5.84	6.53	7.22	8.07
70 x 70	-	-	-	-	-	4.35	5.61	6.44	6.86	7.68	8.49	9.50
80 x 80	-	-	-	-	-	4.98	6.44	7.40	7.87	8.82	9.76	10.92

STAINLESS STEEL RECTANGLE SECTION DIMENSIONS & WEIGHTS

Wall Thickness in mm	0.9	1.0	1.2	1.5	1.6	2.0	2.6	3.0	3.2	3.6	4.0	4.5
Size in mm	kg/mtr											
30 x 20	0.69	0.77	0.92	1.13	1.21	1.49	1.89	2.16	-	-	-	-
40x20	0.84	0.93	1.11	1.37	1.46	1.81	2.31	2.63	-	-	-	-
50 x 30	-	-	1.49	1.85	1.97	2.44	3.13	3.59	3.81	4.25	-	-
60 x 20	-	-	1.49	1.85	1.97	2.44	3.13	3.59	3.81	4.25	4.68	5.21
75 x 25	-	-	-	2.33	2.48	3.08	3.96	4.54	4.82	5.39	5.95	6.64
60 x 40	-	-	-	2.33	2.48	3.08	3.96	4.54	4.82	5.39	5.95	6.64
70 x 30	-	-	-	2.33	2.48	3.08	3.96	4.54	4.82	5.39	5.95	6.64
80 x 40	-	-	-	2.80	2.98	3.71	4.78	5.49	5.84	6.53	7.22	8.07
70 x 50	-	-	-	2.80	2.98	3.71	4.78	5.49	5.84	6.53	7.22	8.07
90 x 30	-	-	-	2.80	2.98	3.71	4.78	5.49	5.84	6.53	7.22	8.07
80 x 60	-	-	-	-	-	4.35	5.61	6.44	6.86	7.68	8.49	9.50
100 x 60	-	-	-	-	-	4.98	6.44	7.40	7.87	8.82	9.76	10.92
120 X 60	-	-	-	-	-	5.62	7.26	8.35	8.89	9.96	11.03	12.35

Hot finished tubes

General Tubes and pipes

General tubes & pipes are used as piping components and line pipe in a variety of industries such as the chemical and petrochemical industries, the oil and gas industries, power generation, processing, in the food and drink industries, in metallurgy, and many others. In subsea media general tubes & pipes are be used as line pipe, flowlines, risers, and as hydraulic & gas injection lines. In topside media general tube & pipe are used as utility and process piping, sea water piping systems and LNG piping.

Furnace tubes

Furnace tubes are mainly used in petrochemical industry as process tubes in cracking furnaces for refineries and ethylene\propylene plants. Oil refinery cracking processes allow the production of «light» products such as liquefied petroleum gas (LPG). In a typical ethylene furnace the pyrolysis reaction is endothermic and for this reason, furnace tube material must be suitable to accommodate the high process temperature.

Hollow Bars

Hollow bar – also called seamless mechanical tubing – is a tubular product made with properties and characteristics suitable for subsequent transformation into numerous cylindrical components and hollow products for different engineering purposes. Applications for hollow bar include aerospace, electronics, medical, military, food processing, transportation and the chemical and petrochemical industry. Hollow bars are widely used in general engineering industry.

Boiler tubes (nuclear industry)

Boiler tubes for nuclear power generation are used within the secondary cycle of nuclear power stations and form the tube components of a steam generation boiler. Special safety requirements are required for nuclear boiler tubes, due to their critical application.

Cold finished tubes

Heat-exchanger tubes

Heat-exchanger tubes are designed for heat transfer and mostly used in processes such as heating, cooling, ventilation, condensation and evaporation (of liquids, gases, steam and their various combinations). Heat-exchanger tubes are used in the following equipment: shell & tube heat exchangers, plate & frame heat exchangers, cooling towers, air coolers and many others.
The main industries using heat-exchanger tubing are chemical & petrochemical, power generation (including nuclear), oil & gas and others such as the food & beverage industries, pulp & paper and transportation.

Instrumentation tubes

Instrumentation tubes are widely used for hydraulic & pneumatic control systems, fuel supply lines and pressure sensors lines for the transportation industry. They are also used for onshore control panels, topside processing facilities and subsea manifolds in the oil and gas industry; for high purity tubes in the semiconductor industry, for advanced engineering fuel rods and control tubes; and for cooling circuits and brake cylinders in the automotive industry.

Boiler tubes

Boiler tubes are used in thermal power-generation and heating, as components of utility and industrial boilers. Boiler tubes in power-generation are used only for utility boilers to generate steam for the production of electricity. Boilers for industrial applications produce steam or hot water for process applications in a range of sectors such as biomass firing (in fluidized bed boilers), heating, the pulp and paper industry (recovery boilers), in waste to energy plants and in a number of chemical processes. Boilers are used in all combustion systems (including conventional coal, oil and gas) and are designed to withstand high pressure and high temperature conditions.

General Tubes and pipes

General tubes & pipes are used as piping components or line pipes in a range of industries such as the chemical and petrochemical industries, in the oil and gas industries, in power generation, processing, food and drink, metallurgy, and many others. In subsea media general tubes & pipes are used as line pipes, flowlines, risers, hydraulic & gas injection lines. In topside media general tubes & pipes are used as utility and process piping, sea water piping systems and as LNG piping.

Standards:ASTM A312/A312M,ASME SA-312/SA-312M ASTM A376/A376M,ASME SA-376/SA-376M

Steel grades: TP 304, TP 304L, TP 304H, TP 310S, TP 310H, TP 316, TP 316L, TP 316H, TP 317, TP 317 L, TP 321, TP 321H, TP 347, TP 347H

tube and pipe sizes in NPS — CF tubes — HF and CF tubes — HF tubes

Outside diameter			Wall thickness															
			Sch 5S		Sch 10S		Sch 30S		Sch 40S		Sch 80S		Sch 120S		Sch 160S		Sch XXS	
NPS	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/8	0.405	10.29			0.049	1.24	0.057	1.45	0.068	1.73	0.095	2.41						
1/4	0.540	13.72			0.065	1.65	0.073	1.85	0.088	2.24	0.119	3.02						
3/8	0.675	17.15			0.065	1.65	0.073	1.85	0.091	2.31	0.126	3.20						
1/2	0.840	21.34	0.065	1.65	0.083	2.11	0.095	2.41	0.109	2.77	0.147	3.73			0.188	4.78		
3/4	1.050	26.67	0.065	1.65	0.083	2.11	0.095	2.41	0.113	2.87	0.154	3.91			0.219	5.56		
1	1.315	33.40	0.065	1.65	0.109	2.77	0.114	2.90	0.133	3.38	0.179	4.55			0.250	6.35	0.358	9.09
1¼	1.660	42.16	0.065	1.65	0.109	2.77	0.117	2.97	0.140	3.56	0.191	4.85			0.250	6.35	0.382	9.70
1½	1.900	48.26	0.065	1.65	0.109	2.77	0.125	3.18	0.145	3.68	0.200	5.08			0.281	7.14	0.400	10.15
2	2.375	60.33	0.065	1.65	0.109	2.77	0.125	3.18	0.154	3.91	0.218	5.54			0.344	8.74	0.436	11.07
2½	2.875	73.03	0.083	2.11	0.120	3.05	0.188	4.78	0.203	5.16	0.276	7.01			0.375	9.53	0.552	14.02
3	3.500	88.90	0.083	2.11	0.120	3.05	0.188	4.78	0.216	5.49	0.300	7.62			0.438	11.13	0.600	15.24
3½	4.000	101.60			0.120	3.05	0.188	4.78	0.226	5.74	0.318	8.08			0.500	12.70	0.636	16.15
4	4.500	114.30			0.120	3.05	0.188	4.78	0.237	6.02	0.337	8.56	0.380	11.13	0.531	13.49	0.674	17.12
5	5.563	141.30							0.258	6.55	0.375	9.52	0.500	12.70	0.625	15.88	0.750	19.05
6	6.625	168.28							0.280	7.11	0.432	10.97	0.562	14.27	0.719	18.26	0.864	21.95
8	8.625	219.08							0.322	8.18	0.500	12.70	0.719	18.26	0.906	23.01	0.875	22.23
10	10.750	273.05							0.365	9.27	0.549	15.09	0.844	21.44				
12	12.750	323.85							0.406	10.31	0.688	17.48						

HF sizes in NPS

Permitted variations in outside diameter and wall thickness (acc. to ASTM A 999/ASTM A 530)

Outside diameter, inch (mm)	Permitted variations in OD, mm	
	over	under
10.29-42.16	0.4	0.8
60.33-114.3	0.8	0.8
114.4-219.8	1.6	0.8

Outside diameter, inch (mm)	Permitted variations in WT, %	
	over	under
10.29-73.03	20	12.5
88.9-219.8 WT/OD≤5%	22.5	12.5
88.9-219.8 WT/OD>5%	15	12.5

Standards:ASTM A213/A213M,ASME SA-213/SA-213M ASTM A269/A269M

Steel grades: (Standards: ASTM A213/A213M, ASME SA-213/SA-213M) TP304, TP304L, TP304H, TP304N, TP304LN, TP309S, TP310S, TP310H, TP316, TP316L, TP316H, TP316Ti, TP316N, TP316LN, TP317, TP317L, TP321, TP321H, TP347, TP347H

(Standard: ASTM A269/A269M) TP304, TP304L, TP304LN, TP316, TP316L, TP316LN, TP317, TP321, TP347.

Outside diameter		Wall thickness																							
inch	mm	0.4	0.5	0.6	0.71	0.89-0.91	1.0	1.2 (1.22-1.24)	1.4-1.5	1.6 (1.63-1.65)	1.83-1.9	2.0-2.03	2.11	2.2-2.3	2.4-2.5	2.6-2.64	2.7 2.77-2.8	3.0-3.05	3.18-3.2	3.5-3.6	4.0	4.4-4.5	5.0	5.5	6.0
	4.00	■	■	■	■	■	■																		
	6.00	■	■	■	■	■	■	■	■	■	■	■	■												
1/4	6.35	■	■	■	■	■	■	■	■	■	■	■	■												
	7.00	■	■	■	■	■	■	■	■	■	■	■	■												
5/16	7.94	■	■	■	■	■	■	■	■	■	■	■	■												
	8.00	■	■	■	■	■	■	■	■	■	■	■	■												
	9.00	■	■	■	■	■	■	■	■	■	■	■	■												
3/8	9.53	■	■	■	■	■	■	■	■	■	■	■	■												
	10.00	■	■	■	■	■	■	■	■	■	■	■	■												
	10.20	■	■	■	■	■	■	■	■	■	■	■	■												
7/16	11.11	■	■	■	■	■	■	■	■	■	■	■	■	■											
	12.00	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
1/2	12.70	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
	13.00	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
	13.50	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
9/16	14.0-14.3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
	15.0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
5/8	15.88	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
	16.00	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
11/16	17.2-17.5			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	18.00			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
3/4	19.0-19.05			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	20.00			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
13/16	20.6-21.34				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	22.00				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
7/8	22.23				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
15/16	23.81				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	25.00				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
1	25.40				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	26.70				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	26.9				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	28.00				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	30.00					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1¼	31.75					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	32.00					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	33.40						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	33.70						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	35.00						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	36.00						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1½	38.10							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	40.00							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	42.0-42.4							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1¾	44.45							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	48.0-48.3							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2	50.80							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	54.0									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	57.00									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2⅜	60.3-60.33									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2½	63.50												■	■	■	■	■	■	■	■	■	■	■	■	■
2¾	69.85												■	■	■	■	■	■	■	■	■	■	■	■	■
3	76.1-76.2												■	■	■	■	■	■	■	■	■	■	■	■	■
3½	88.90												■	■	■	■	■	■	■	■	■	■	■	■	■
4	101.60																	■	■	■	■	■	■	■	■
	108.00																	■	■	■	■	■	■	■	■
4½	114.30																	■	■	■	■	■	■	■	■

Standards:ASTM A790/A790M;ASME SA-790/SA-790M

Steel grades: S31803, S32205, S32750, S32760

tube and pipe sizes in NPS — CF tubes — HF and CF tubes — HF tubes

Outside diameter			Wall thickness													
			Sch 5S		Sch 10S		Sch 40S		Sch 80S		Sch 120S		Sch 160S		Sch XXS	
NPS	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
3/8	0.675	17.15			0.065	1.65	0.091	2.31	0.126	3.20						
½	0.840	21.34	0.065	1.65	0.083	2.11	0.109	2.77	0.147	3.73						
¾	1.050	26.67	0.065	1.65	0.083	2.11	0.113	2.87	0.154	3.91						
1	1.315	33.40	0.065	1.65	0.109	2.77	0.133	3.38	0.179	4.55						
1¼	1.660	42.16	0.065	1.65	0.109	2.77	0.140	3.56	0.191	4.85						
1½	1.900	48.26	0.065	1.65	0.109	2.77	0.145	3.68	0.200	5.08						
2	2.375	60.33	0.065	1.65	0.109	2.77	0.154	3.91	0.218	5.54			0.344	8.74	0.436	11.07
2½	2.875	73.03	0.083	2.11	0.120	3.05	0.203	5.16	0.276	7.01			0.375	9.53	0.552	14.02
3	3.500	88.90	0.083	2.11	0.120	3.05	0.216	5.49	0.300	7.62			0.438	11.13	0.600	15.24
3½	4.000	101.60			0.120	3.05	0.226	5.74	0.318	8.08			0.500	12.70	0.636	16.15
4	4.500	114.30			0.120	3.05	0.237	6.02	0.337	8.56	0.380	11.13	0.531	13.49	0.674	17.12
5	5.563	141.30					0.258	6.55	0.375	9.52	0.500	12.70	0.625	15.88	0.750	19.05
6	6.625	168.28					0.280	7.11	0.432	10.97	0.562	14.27	0.719	18.26	0.864	21.95
8	8.625	219.08							0.500	12.70	0.719	18.26	0.906	23.01	0.875	22.23

Dimensional tolerances (acc. to ASTM A999, ASTM A530)

Outside diameter,mm	Outside diameter tolerances
10.29 - 48.26	+0.4mm,-0.8mm
48.27 - 114.43	+0.8mm,-0.8mm
114.40 - 219.8	+1.6 mm,-0.8mm

Outside diameter,mm	Wall thickness tolerances
10.29 - 73.03	+20.0%, -12.5%
88.9-457.2 WT/D≤5%	+22.5%, -12.5%
88.9-457.2 WT/D>5%	+15.0%, -12.5%

Standards:ASTM B829,ASTM B407,ASTM B729 ASTM B668,ASTM B423,ASTM B163

Alloy grades: N08800, N08825, N08904, N08811, N08020, N08028, N06600

Basic product for heat exchanger tubing

Outside diameter			Nominal wall thickness, mm									
			Sch 5S		Sch 10S		Sch 30S		Sch 40S		Sch 80S	
NPS	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
⅛	0.405	10.29			0.049	1.24	0.057	1.45	0.068	1.73	0.095	2.41
¼	0.540	13.72			0.065	1.65	0.073	1.85	0.088	2.24	0.119	3.02
⅜	0.675	17.15			0.065	1.65	0.073	1.85	0.091	2.31	0.126	3.20
½	0.840	21.34	0.065	1.65	0.083	2.11	0.095	2.41	0.109	2.77	0.147	3.73
¾	1.050	26.67	0.065	1.65	0.083	2.11	0.095	2.41	0.113	2.87	0.154	3.91
1	1.315	33.40	0.065	1.65	0.109	2.77	0.114	2.90	0.133	3.38	0.179	4.55
1 ¼	1.660	42.16	0.065	1.65	0.109	2.77	0.117	2.97				
1 ½	1.900	48.26	0.065	1.65	0.109	2.77	0.125	3.18				
2	2.375	60.33	0.065	1.65	0.109	2.77	0.125	3.18				

Mechanical properties

Steel grade	Tensile strength, min, N/mm²	Yield strength, min, N/mm²	Elongation in 2" or 50 mm, min,%
N08904	490	215	35
N08800	520	205	30
N08811	450	170	30
N08020	550	240	30
N08028	500	214	40
N08825	586	241	30
N06600	552	241	30

Dimensional tolerances

Outside diameter, inch (mm)	Permitted variations in OD, inch (mm)		Permitted variations in wall thickness, %	
	over	under	over	under
Over 0.400 (10) to ⅜ (16) excl	0.005 (0.13)	0.005 (0.13)	15	15
⅜ (16) to 1 ½ (38) incl.	0.0075 (0.19)	0.0075 (0.19)	10	10
Over 1 ½ (38) to 3 (76) incl.	0.010 (0.25)	0.010 (0.25)	10	10

Standard :EN 10216-5

Steel grades:

Steel code	Designation
1.4301	X5CrNi 18 10
1.4306	X2CrNi 19 11
1.4541	X6CrNiTi 18 1
1.4401	X5CrNiMo 17 12 2
1.4404	X2CrNiMo 17 12 2
1.4436	X3CrNiMo 17 13 3
1.4435	X2CrNiMo 18 14 3
1.4571	X6CrNiMoTi 17 12 2
1.4462	X2CrNiMoN 22 5 3

Steel code	Designation
"+DIN EN 10297-2"	
1.4006	X12Cr 13
1.4016	X6Cr 17
1.4510	X3CrTi 17
"+SEW 470"	
1.4878	X12CrNiTi 18 9
1.4845	X12CrNi 25 21
1.4828	X15CrNiSi 20 12
1.4841	X15CrNiSi 25 20

tube and pipe sizes in NPS — CF tubes — HF and CF tubes — HF tubes

Outside diameter	Wall thickness																																								
mm	0.5	0.6	0.9	1.0	1.2	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.6	2.9	3.0	3.2	3.6	3.7	4.0	4.5	4.7	5.0	5.4	5.6	6.0	6.3	7.1	8.0	8.8	10.0	11.0	12.5	14.2	16.0	17.5	20.0	22.2	25.0	28.0	30.0	32.0	35.0
4.0	CF	CF	CF	CF																																						
5.0	CF	CF	CF	CF																																						
6.0	CF	CF	CF	CF	CF	CF	CF	CF	CF																																	
6.35	CF	CF	CF	CF	CF	CF	CF	CF	CF																																	
8.0	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																														
9.0	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																														
10.0	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
10.2	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
11.0	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
12.0	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
12.7	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
13.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
13.5				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																											
14.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																										
15.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																										
16.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																							
17.2				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																							
18.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																							
19.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																							
20.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
21.3				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
22.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
24.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
25.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
25.4				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																	
26.9				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
28.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
30.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
31.8				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
32.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
33.7				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
35.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
38.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
40.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
42.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
42.4				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
44.5				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF																
48.3				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF															
50.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF															
51.0				CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF															
54.0						CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF															
57.0						CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF										
60.3						CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF									
63.5						CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF									
70.0									CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF							
76.1									CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF					
82.5									CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF			
88.9									CF	CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF			
101.6										CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
108.0										CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
114.3										CF	CF	CF	CF	CF	CF	CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF/CF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
127.0																					HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
133.0																					HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
139.7																					HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF
159.0																						HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	
168.3																						HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	
219.3																											HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF		
245.0																												HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF	HF		

KX INOX

Additional requirements(acc. to DIN 28180)

Steel grades:

Steel code	Designation
1.4301	X5CrNi 18 10
1.4401	X5CrNiMo 17 12 2
1.4541	X6CrNiTi 18 10
1.4571	X6CrNiMoTi 17 12 2

Outside diameter,mm	Wall thickness,mm				
16	1.2	1.6	2	2.6	3.2
20	1.2	1.6	2	2.6	3.2
25	1.2	1.6	2	2.6	3.2
30	1.2	1.6	2	2.6	3.2
38	1.2	1.6	2	2.6	3.2

Tolerances:

Outside diameter tolerances tubes from austenitic stainless steel

Outside diameter, mm	Tolerance class 1, mm	Tolerance class 2, mm
16	± 0.10	± 0.30
20		
25	± 0.12	
30	± 0.15	
38	± 0.20	± 0.40

Wall thickness tolerances

Outside diameter	Wall thickness tolerances:	
	Up to 2	More than 2
Tolerance class 1 and 2	± 0.20	±10% from wall thickness
Tolerance class 3	± 0.20	+ 15% - 10% from wall thickness

Length tolerances

Length	Tolerances
≤ 5 000	+5 0
> 5 000 ≤ 10 000	+ 10 0
> 10 000	Upon agreement

KX INOX

U-bent tubes

Steel grades

Ferrite	Austenite	Duplex	Superduplex	Ni – alloys*
TP410	TP 304/304L	UNS S31803	UNS S32750	UNS N06600
	TP 316/316L	UNS S32205	UNS S32760	UNS N08020
	TP 316Ti	1.4462(X2CrNiMoN 22 5 3)		UNS N00880
	TP 317/317L			UNS N08825
	TP 321			UNS N08904
	TP 347			
	1.4301 (X5CrNi 18 10)			
	1.4401 (X5CrNiMo 17 12 2)			
	1.4541 (X6CrNi 18 10)			
	1.4571 (X5CrNiMoTi 17 12 2)			

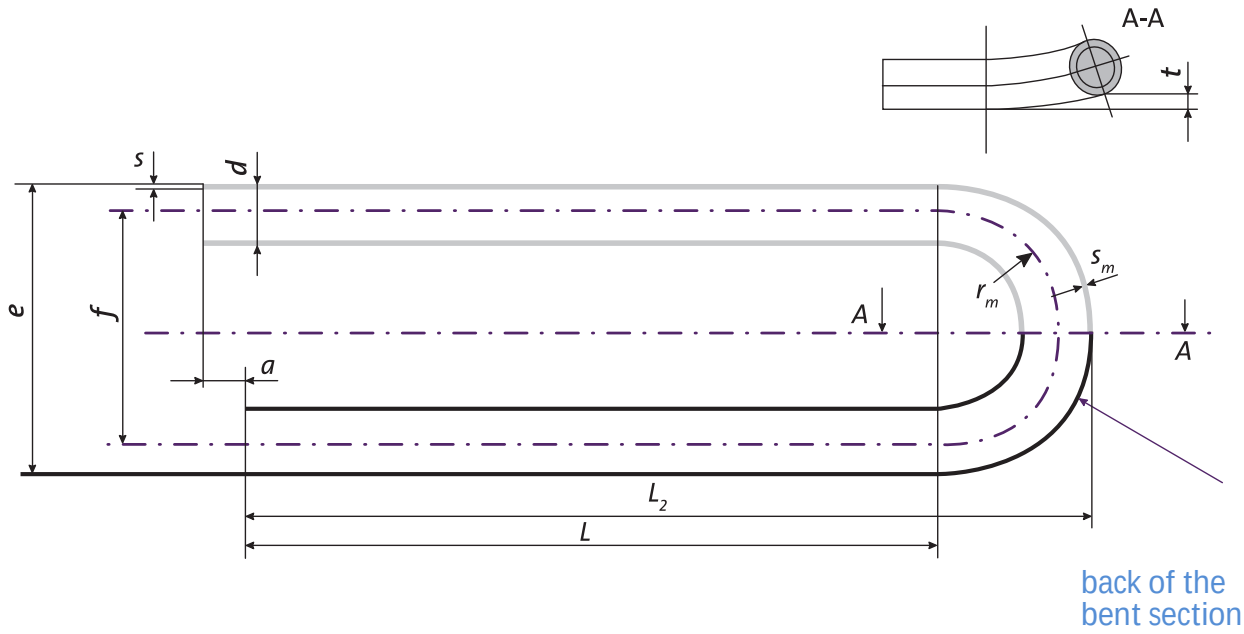
* – Tubes of other alloys and steel grades can be produced in trial lots.

Technical requirements

Straight tubes for bending(ASTM/ASME A/SA 213;ASTM B729;ASTM B 407;ASTM B 423;ASTM A 789; DIN 28180;EN 10216-5)

U-BENT TUBES:

TEMA RCB 2.31 – Standards of the Tubular Exchanger Manufacturers Association (9th edition).
ASTM A688 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Feedwater Heater Tubes.
ASTM B163 – Standard technical requirements for tubes of nickel and nickel alloy for condensers and heat exchangers.
DIN 28179 – Steel U-tubes for tubular heat exchangers - Technical delivery conditions.
Customer specifications.



Available range

OD	Wall thickness, mm																				
mm	0.81	0.89	0.91	1.00	1.20	1.25	1.40	1.50	1.60	1.65	1.80	2.00	2.11	2.20	2.40	2.60	2.77	2.80	3.00	3.20	3.40
12.70		■	■	■	■	■	■	■	■	■											
13.72		■	■	■	■	■	■	■	■	■											
14.00		■	■	■	■	■	■	■	■	■											
15.88	■	■	■	■	■	■	■	■	■	■											
15.90	■	■	■	■	■	■	■	■	■	■											
16.00	■	■	■	■	■	■	■	■	■	■											
17.20					■	■	■	■	■	■											
19.05					■	■	■	■	■	■	■	■	■	■	■	■	■				
20.00					■	■	■	■	■	■	■	■	■	■	■	■	■				
21.30									■	■	■	■	■	■	■	■	■				
25.00									■	■	■	■	■	■	■	■	■	■	■	■	■
25.40									■	■	■	■	■	■	■	■	■	■	■	■	■
26.90											■	■	■	■	■	■	■	■	■	■	■
30.00											■	■	■	■	■	■	■	■	■	■	■
31.80												■	■	■	■	■	■	■	■	■	■
38.10												■	■	■	■	■	■	■	■	■	■

BENDING RADIUS – from 1.5 OD to 1250 mm.
When ordering tubes with R ≤ 1.5D it is necessary to agree precision of geometrics.
STRAIGHT TUBES MAXIMUM LENGTH (before bending) – 26 000 mm upon agreement
LEG LENGTH – min 1 meter, max 10.5 meters (for max R=1250 mm)
HYDROSTATIC TEST – maximum test pressure 600 bar, soaking 10 sec. with demineralized water. Compressed air cleaning after hydro-test.

Heat Treatment

Heat treatment is carried out by resistometric method on a curved part of the tube and on straight parts 300 mm in length by heating the tube to the required temperature (see table below), and then soaking and rapid cooling of the tube to the temperature 370 C & below. Nitrogen blow-off tubes used before and during the process of heat treatment to protect the inner and outer surface from oxidation.

Grades	Temperature, C°	Soaking time, sec.
TP410	780-800	30...55
TP 304/304L/316/316L/316Ti/ 317/317L/321/347	1050 ± 10	20...45
UNS S31803/ UNS S32205	1070	30...40
UNS S32750	1075	55...60
UNS S32760	1120	40...60
UNS N08904	1120	20...30
UNS N08800/ UNS N08020 / UNS N08028	1150	15...20
UNS N08825	1070	20...30
UNS N06600	1070	15...20

Marking – before bending by marking machine all over the tube length (bent section after heat treatment without marking). Marking is also possible after bending on the straight parts of U-bent tube.
Packaging – closed wooden boxes of corresponding dimensions for each tube length, radius, diameter, according to PO requirements or in bundles wrapped in polyethylene film with plastic clamping spacers on each tube.
Transportation – a truck with capacity of 20 tonnes, body length 13.6 m, width 2.46 m.

Hollow Bar

CENTRAVIS PRODUCTION UKRAINE PJSC produces standard sizes range most requested by machinery manufacturers, specified in the table. Requirements to hollow bars are in accordance with EN 10216-5 and ASTM A312.

The company produces a range of additional sizes not included in the standards. Also production of hollow bars according to NF A 49-317 is possible.

Hollow Bar - standard sizes

Outside diameter, mm	Inside diameter, mm	Pipe length, m		Theoretical weight, kg/m
		min	max	
50.0	32.0	3.0	11.0	9.1
56.0	40.0	3.0	12.0	9.5
56.0	45.0	3.0	17.0	6.8
56.0	36.0	3.0	12.0	11.3
56.0	30.0	3.0	12.5	13.8
60.0	50.0	3.0	14.0	6.8
60.0	45.0	3.0	13.0	9.7
60.0	40.0	3.0	13.0	12.3
63.0	45.0	3.0	12.0	12.0
63.0	40.0	3.0	11.5	14.6
63.0	36.0	3.0	9.5	16.5
63.0	32.0	3.0	9.0	18.2
63.0	50.0	3.0	12.0	9.1
65.0	54.0	3.0	14.5	8.1
70.0	50.0	3.0	10.5	14.8
71.0	60.0	3.0	12.0	8.9
71.0	56.0	3.0	12.0	11.7
71.0	45.0	3.0	8.5	18.6
71.0	40.0	3.0	11.5	21.2
71.0	36.0	3.0	7.0	23.1
75.0	60.0	3.0	11.5	12.5
75.0	56.0	3.0	9.5	15.3
75.0	50.0	3.0	13.5	19.3
75.0	40.0	3.0	11.5	24.8
75.0	45.0	3.0	12.0	22.2
80.0	63.0	3.0	12.0	15.0
80.0	56.0	3.0	12.0	20.1
80.0	50.0	3.0	11.5	24.0
80.0	45.0	3.0	10.5	27.0
80.0	44.0	3.0	10.0	27.5
80.0	40.0	3.0	9.5	29.6
85.0	45.0	3.0	8.5	32.1
88.0	70.0	3.0	11.5	17.5
90.0	75.0	3.0	12.5	15.3
90.0	71.0	3.0	12.0	18.9
90.0	68.0	3.0	11.5	21.4
90.0	63.0	3.0	10.0	25.5
90.0	56.0	3.0	8.5	30.6
90.0	50.0	3.0	8.0	34.5
95.0	75.0	3.0	11.5	21.0
95.0	67.0	3.0	9.0	28.0
95.0	50.0	3.0	11.0	40.2
100.0	80.0	3.0	10.5	22.2
100.0	71.0	3.0	8.0	30.6
100.0	63.0	3.0	10.5	37.2
100.0	56.0	3.0	10.5	42.3
106.0	90.0	3.0	11.0	19.3
106.0	85.0	3.0	9.0	24.7
106.0	80.0	3.0	8.0	29.8
106.0	71.0	3.0	11.0	38.2
106.0	63.0	3.0	10.5	44.8
106.0	56.0	3.0	9.0	49.9
112.0	95.0	3.0	9.5	21.7
112.0	90.0	3.0	10.5	27.4
112.0	80.0	3.0	11.0	37.9
112.0	71.0	3.0	9.0	46.3
112.0	63.0	3.0	8.5	52.9
118.0	95.0	3.0	10.5	30.2
118.0	90.0	3.0	11.0	35.9
118.0	80.0	3.0	9.0	46.4
118.0	71.0	3.0	7.5	54.8
118.0	63.0	3.0	7.0	61.4
125.0	100.0	3.0	10.5	34.7
125.0	95.0	3.0	9.5	40.7
125.0	90.0	3.0	8.5	46.4
125.0	80.0	3.0	7.0	56.9
125.0	71.0	3.0	6.5	65.3
132.0	106.0	3.0	9.5	38.2
132.0	98.0	3.0	8.0	48.2
132.0	90.0	3.0	7.0	57.5
132.0	80.0	3.0	6.0	68.0
132.0	71.0	3.0	5.5	76.3
140.0	112.0	3.0	8.0	43.5
140.0	106.0	3.0	7.0	51.6
140.0	100.0	3.0	6.5	59.2
140.0	90.0	3.0	5.5	70.9
140.0	80.0	3.0	5.0	81.4
150.0	132.0	3.0	9.5	31.3
150.0	125.0	3.0	7.5	42.4
150.0	118.0	3.0	6.5	52.9
150.0	112.0	3.0	5.5	61.4
150.0	106.0	3.0	5.0	69.4
150.0	90.0	3.0	6.5	88.8
150.0	95.0	3.0	6.5	83.1
150.0	80.0	3.0	6.0	99.3
160.0	132.0	3.0	6.0	50.4
160.0	122.0	3.0	6.0	66.1
160.0	120.0	3.0	6.5	69.1
160.0	112.0	3.0	7.0	80.5
170.0	140.0	3.0	6.5	57.3
170.0	130.0	3.0	7.0	74.0
170.0	118.0	3.0	6.0	92.3
170.0	106.0	3.0	5.0	108.9
175.0	145.0	3.0	5.0	59.2
175.0	159.0	3.0	6.5	32.9
180.0	150.0	3.0	6.5	61.0
180.0	140.0	3.0	6.0	78.9
180.0	130.0	3.0	5.5	95.6
180.0	125.0	3.0	5.0	103.4
190.0	160.0	3.0	6.5	64.7
190.0	150.0	3.0	5.5	83.8
190.0	140.0	3.0	4.5	101.7
190.0	132.0	3.0	4.5	115.1
190.0	123.0	3.0	4.0	129.3
190.0	118.0	3.0	4.0	136.7
190.0	106.0	3.0	3.5	153.3
200.0	170.0	3.0	5.5	68.4
200.0	160.0	3.0	5.0	88.8
200.0	150.0	3.0	4.0	107.9
200.0	140.0	3.0	3.5	125.8
200.0	130.0	3.0	3.5	142.4
212.0	180.0	3.0	5.0	77.3
212.0	170.0	3.0	5.0	98.9
224.0	180.0	3.0	4.0	109.6
236.0	206.0	3.0	3.5	81.8
236.0	216.0	3.0	4.5	55.7
236.0	220.0	3.0	5.0	45.0
240.0	220.0	3.0	4.0	56.7
240.0	224.0	3.0	4.5	45.8
250.0	234.0	3.0	3.5	47.7

Tolerances

Under Hollow Bars production permissible variations in OD are plus tolerance, in ID are minus tolerance.

Outside diameter range	achining tolerances			
mm	For the outside diameter OD	For the inside diameter ID	For eccentricity (centre offset) E	For out-of-straightness h
50 ≤D ≤250	-0/+2% (min +1/-0 mm)	+0/-2% (min +0/-1 mm)	10%	1 mm/m

One of the key parameters in hollow bar production is eccentricity. In order to keep eccentricity to the minimum CPU employs a process where billets are pre-drilled and expanded prior to extrusion. Other operations used to minimize eccentricity include vertical pre-heating before extrusion and a system of precision calibration of tooling. This ensures uniform wall thickness in cross section, which directly affects eccentricity.

Thanks to the above process improvements CPU has a distinct advantage over other manufacturers of hollow bars.

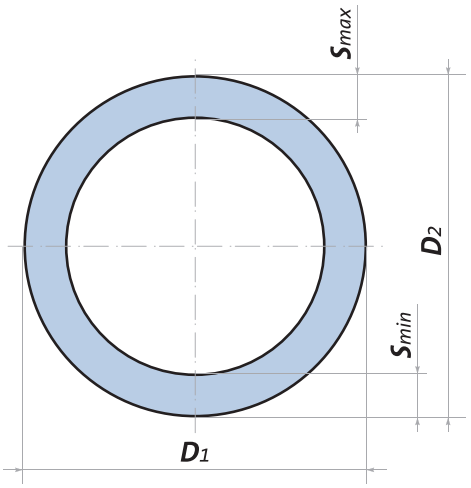
Hollow Bar eccentricity (displacement of tube ID with respect to its OD, i.e. deviation from a common center) is given by formula 1 (in %) or by formula 2 (in mm):

where E is eccentricity, %; $$E = \frac{(S_{max} - S_{min})}{(S_{max} + S_{min})} \times 100\% \quad (1)$$

S_{min}, S_{max} – actual tube WT (min, max), mm.

where E is eccentricity, mm; $$E = \frac{(S_{max} - S_{min})}{2}, \text{mm} \quad (2)$$

S_{min}, S_{max} – actual tube WT (min, max), mm.



The Company also produces Mechanical Tubing to ASTM A511. Mechanical tubing according to ASTM A511-Standard sizes

Outside diameter inches	Wall thickness inches	Outside diameter mm	Wall thickness mm
2.00	0.188 to 0.500	50.80	4.78 to 12.70
2.25	0.188 to 0.750	57.15	4.78 to 19.05
2.50	0.188 to 0.750	63.50	4.78 to 19.05
2.75	0.188 to 0.875	69.85	4.78 to 22.23
3.00	0.188 to 0.875	76.20	4.78 to 22.23
3.12	0.188 to 0.875	79.38	4.78 to 22.23
3.25	0.188 to 0.875	82.55	4.78 to 22.23
3.50	0.188 to 0.875	88.90	4.78 to 22.23
3.75	0.250 to 0.875	95.25	6.35 to 22.23
4.00	0.250 to 0.875	101.60	6.35 to 22.23
4.25	0.250 to 1.000	107.95	6.35 to 25.40
4.50	0.250 to 1.000	114.30	6.35 to 25.40
4.75	0.250 to 1.000	120.65	6.35 to 25.40
5.00	0.250 to 1.000	127.00	6.35 to 25.40
5.25	0.250 to 1.000	133.35	6.35 to 25.40
5.50	0.250 to 1.000	139.70	6.35 to 25.40
5.75	0.250 to 1.000	146.05	6.35 to 25.40

Outside diameter inches	Wall thickness inches	Outside diameter mm	Wall thickness mm
6.00	0.250 to 1.000	152.40	6.35 to 25.40
6.25	0.250 to 1.500	158.75	6.35 to 38.10
6.50	0.250 to 1.500	165.10	6.35 to 38.10
6.75	0.375 to 1.500	171.45	9.53 to 38.10
7.00	0.375 to 1.500	177.80	9.53 to 38.10
7.25	0.375 to 1.500	184.15	9.53 to 38.10
7.50	0.375 to 1.500	190.50	9.53 to 38.10
7.75	0.375 to 1.500	196.85	9.53 to 38.10
8.00	0.375 to 1.500	203.20	9.53 to 38.10
8.25	0.375 to 1.500	209.55	9.53 to 38.10
8.50	0.375 to 1.500	215.90	9.53 to 38.10
8.75	0.500 to 1.500	222.25	12.70 to 38.10

Tolerances:

Permissible Variations in Outside Diameter, Wall Thickness (Hot-Finished Round Tubing)

Specified Nominal Inch Size, Outside Diameter, in. [mm]	Prevailing Range of Commercially Available Metric Sizes, mm	Ratio of Wall Thickness to Outside Diameter	Outside Diameter and Wall Thickness Tolerances					
			Outside Diameter, in. [mm]		Wall Thickness, %			
					Over 0.172 [4.37] to 0.203 in. [5.16 mm], incl		Over 0.203 in. [5.16 mm]	
			Over	Under	Over	Under	Over	Under
Under 3 [75]	Under 76.1	all wall thickness	0.023 [0.6]	0.023 [0.6]	14	14	12.5	12.5
3 [75] to 5½ [140], excl	76.1 to 139.7, excl	all wall thickness	0.031 [0.8]	0.031 [0.8]	14	14	12.5	12.5
5½ [140] to [200],excl	139.7 to 203.2, excl	all wall thickness	0.047 [1.2]	0.047 [1.2]	14	14	12.5	12.5
8 [200] to 10¾ [275],excl	203.2 to 273.1 excl	5 % and over	0.047 [1.2]	0.047 [1.2]	-	-	12.5	12.5
10¾ [275] to 12¾ [325],incl	273.1 to 323.9, incl	under 5 %	0.063 [1.6]	0.063 [1.6]	-	-	12.5	12.5

Standard steel grades

Hollow bars and Mechanical tubing are supplied in a range of specially selected stainless and acid-resistant standard grades chosen to cover the majority of corrosion and processing problems that occur in daily practice.

USA			France		Germany		
UNS	Designation (Grade)	Standard ASTM	Designation	Standard NF	Material No.	Designation DIN	Standard DIN
S 30400	MT 304 (TP 304)	A 511 (A312)	Z6CN18.09	A49-117	1.4301	X5CrNi18.10	EN 10216-5
S 30403	MT304L (TP 304L)	A 511 (A312)	Z2CN18.10	A49-317 (A49-117)	1.4306	X2CrNi19.11	EN 10216-5
S 31600	MT316 (TP 316)	A 511 (A312)	Z6CND17.11	(A49-117)	1.4401	X5CrNiMo17.12.2	EN 10216-5
S 31603	MT316L (TP 316L)	A 511 (A312)	Z2CND17.12	A49-317 (A49-117)	1.4404	X2CrNiMo17.12.2	EN 10216-5

List of standards in production

ASTM A213/A213M, ASME SA213/SA213M
Seamless ferritic and austenitic alloy-steel boiler, superheater, and heat-exchanger tubes

ASTM A268/A268M, ASME SA268/SA268M
Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service

ASTM A269/A269M
Seamless and Welded Austenitic Stainless Steel Tubing for General Service

ASTM A312/A312M, ASME SA312/SA312M
Seamless and welded austenitic stainless steel pipes

ASTM A376/A376M, ASME SA376/SA376M
Seamless austenitic steel pipes for high-temperature central-station service

ASTM A511
Seamless stainless steel mechanical tubing

ASTM A789/A789M, ASME SA789/SA789M
Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service

ASTM A790/A790M, ASME SA790/SA790M
Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe

ASTM B167, B407, B444, B829
Standard specifications for Nickel and Nickel Alloys Seamless Pipe and Tube

DIN 17459
Seamless circular high-temperature austenitic stainless steel tubes

DIN 28180
Seamless steel tubes for tubular heat exchangers

EN 10216-5
Seamless steel tubes for pressure purposes

NF A 49-117
Seamless plain-end ferritic and austenitic stainless steel tubes for pipelines and other use

NF A 49-217
Seamless ferritic, austenitic and austenitic-ferritic stainless steel tubes for heat exchangers

NF A 49-317
Seamless plain-end austenitic stainless steel mechanical tubing

UNI 6904
Seamless tubes of special alloyed corrosion and heat resisting stainless steel