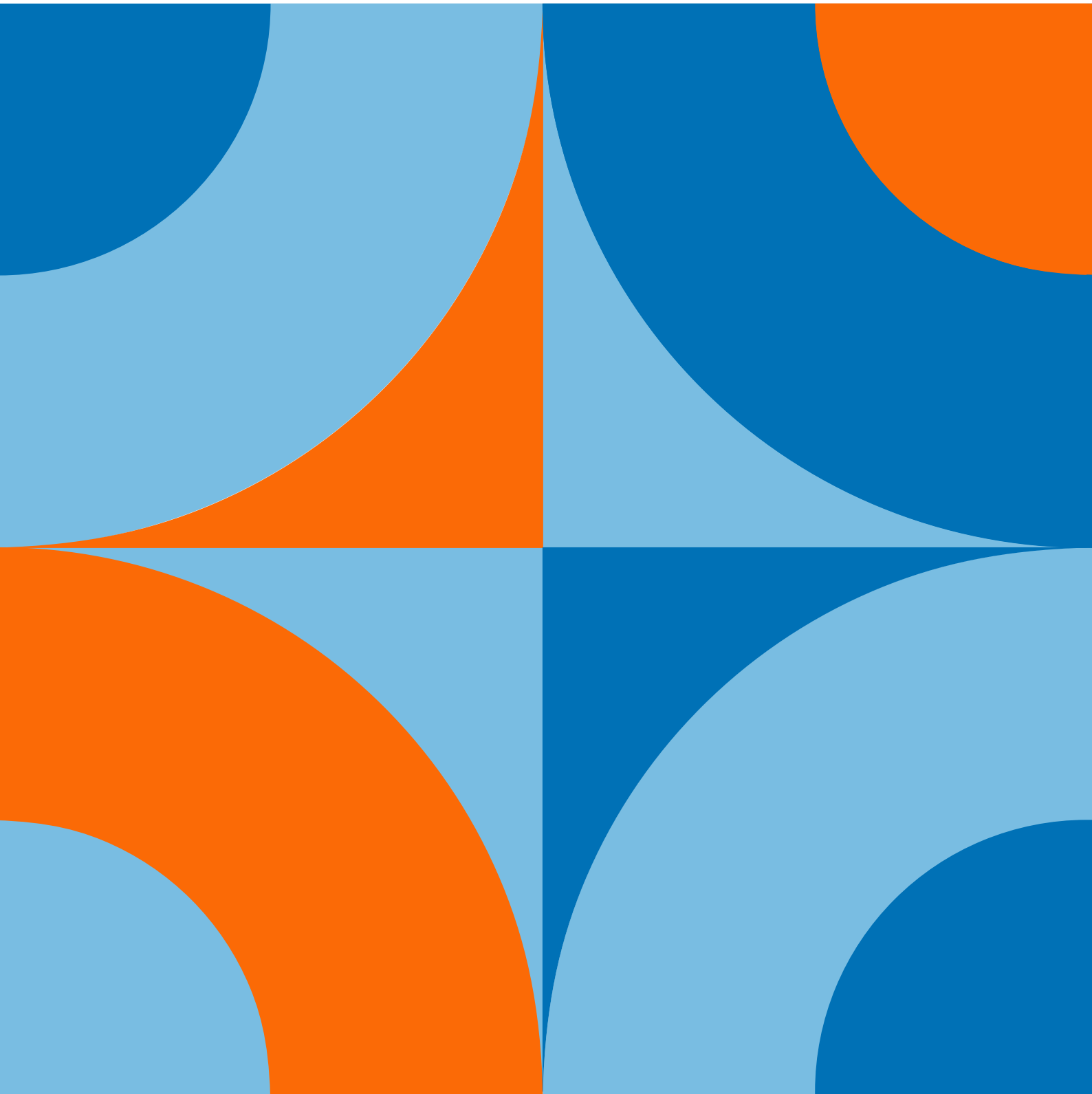
Stainless steel pipes

CATALOGUE

TMK-GROUP.COM



CONTENTS

TMK is an industrial engineering company, a leading supplier of tubular solutions and related services for various industries. TMK manufactures steel pipes, including pipes made of specialty steels and alloys, pipeline systems and other products for the oil and gas, energy, chemical, mechanical engineering, construction and other industries.

The Company unites advanced production sites, including environmentally friendly electric steelmaking operations, a wide range of rolling mills and finishing capacities located across several Russian regions, along with domestic and international representative offices.

TMK also operates facilities for the development and production of pipeline components and equipment for the energy sector, pre-assembled units, heavy engineering products, and other complex items. Thanks to the competencies of the engineering center, a modern fleet of equipment and advanced technologies, the Company delivers comprehensive turnkey infrastructure projects for its customers.

TMK includes oilfield service enterprises incorporated into TMK Oilfield Services and offering pipe repair, thread cutting, inventory management, coating application, and the production of downhole equipment.

The Company is continuously enhancing its R&D expertise, developing advanced solutions through its own R&D Center in Moscow and in Chelyabinsk. The company's facilities provide a full cycle of creating advanced pipe solutions – from concept to testing and production launch.

GOST 9940-81

Seamless hot deformed tubes made for corrosion resistant steel. Specification

STEEL GRADES

08Ch17T (08X17T), 08Ch13 (08X13), 12Ch17 (12X17), 08Ch20N14S2 (08X20H14C2), 10Ch17N13M2T (10X17H13M2T), 10Ch23N18 (10X23H18), 08Ch18N10T (08X18H10T), 08Ch17N15M3T (08X17H15M3T), 15Ch25T (15X25T), 12Ch18N10T (12X18H10T), 08Ch22N6T (08X22H6T), 12Ch18N12T (12X18H12T), 08ChN12T (08XH12T), 04Ch18N10 (04X18H10), 08Ch18N10 (08X18H10), 12Ch18N10 (12X18H10),12Ch18N9 (12X18H9), 17Ch18N9 (17X18H9), 12Ch13 (12X13), 15Ch28 (15X28), 08Ch18N12B (08X18H12B), 08Ch18N12T (08X18H12T)*

* Steel grade designations outside parentheses are provided in accordance with the Key to Steel – Manufacturing and Supply reference book series; steel grade designations in parentheses are provided in accordance with Russian standards.

CHEMICAL COMPOSITION

Steel Grade	Chemical composition, %									
	C	Mn	Si	P	S	Cr	Ni	Mo	Ti	Other
08Ch18N10T	≤0.08	≤2	≤0.8	≤0.040	≤0.02	17.0–19.0	9.0–11.0	–	5xS – 0.7	–
12Ch18N10T	≤0.12	≤2	≤0.8	≤0.040	≤0.02	17.0–19.0	9.0–11.0	–	5xS – 0.8	–
10Ch17N13M2T	≤0.10	≤2	≤0.8	≤0.035	≤0.02	16.0–18.0	12.0–14.0	2.0–3.0	5xS – 0.7	–

MECHANICAL PROPERTIES AT ROOM TEMPERATURE

Steel Grade	Tensile strength, N/mm²	Elongation, %
	Not less than	
08Ch18N10T	510	40
12Ch18N10T	529	40
10Ch17N13M2T	529	35

PIPE DIMENSION TOLERANCES

Outside diameter, mm	Product level, %	
	Regular	Improved
42–325	±1,5	±1,0

Wall thickness, mm	Product level, %	
	Regular	Improved
up to 8	+20.0/-15.0	+12.5/-15.0
from 8 to 20	±15.0	+12.5/-15.0
more than 20	+12.5/-15.0	±12.5

Notes:

1. The chemical composition of steels is regulated by GOST 5632.
2. Pipes of steel grades 08Ch17T, 15Ch28, 12Ch17, and 10Ch17N13M2T are manufactured with a diameter of no more than 219 mm; pipes of steel grade 08Ch17N15M3T are manufactured with a diameter of no more than 140 mm and a size of 159x9 mm; pipes of steel grade 10Ch23N18 are manufactured with a diameter of no more than 168 mm; and pipes of steel grades 08Ch18N12B, 08Ch22N6T, and 08Ch20N14S2 are manufactured with a diameter of no more than 108 mm.
3. Pipes of more than 114 mm in diameter of ferritic and austenitic-ferritic steel grades are manufactured by agreement between the parties.
4. 3 m to 12.1 m long pipes are manufactured by agreement between the parties when entering into the contract.
5. Pipes are supplied with no mill scale and are guaranteed to withstand the design hydraulic pressure.
6. Chemical composition and mechanical properties are indicated for the most popular grades.

SIZE RANGE

Outside diameter, mm	Wall thickness, mm
	3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10 11 12 13 14 15 16 17 18 19 20 22 24 25 26 28 30 32 35 36
42	
48	
57	
60	
68	
73	
76	
83	
89	
95	
102	
108	
114	
121	
127	
133	
140	
146	
152	
159	
168	
180	
194	
219	
245	
273	
325	
351	
356	
377	
402	
406	
426	
450	
457	
465	
480 (485)	
508	
530	

GOST 9941-2022

Seamless cold-formed pipes made of corrosion resistant high-alloy steel. Specification

STEEL GRADES

04Ch18N10 (04X18H10), 08Ch20N14S2 (08X20H14C2), 10Ch23N18 (10X23H18), 08Ch13 (08X13), 12Ch13 (12X13), 12Ch17 (12X17), 15Ch25T (15X25T), 10Ch17N13M2T (10X17H13M2T), 03Ch18N11 (03X18H11), 08Ch18N10T (08X18H10T), 08Ch17N15M3T (08X17H15M3T), 12Ch18N10T (12X18H10T), 08Ch22N6T (08X22H6T), 12Ch18N12T (12X18H12T), 12Ch18N9 (12X18H9), 17Ch18N9 (17X18H9), 06ChN28MDT (06XH28МДТ), 08Ch21N6M2T (08X21H6M2T)*

* Steel grade designations outside parentheses are provided in accordance with the Key to Steel – Manufacturing and Supply reference book series; steel grade designations in parentheses are provided in accordance with Russian standards.

CHEMICAL COMPOSITION

Steel Grade	Chemical composition, %									
	C	Mn	Si	P	S	Cr	Ni	Mo	Ti	Other
04Ch18N10	<0.04	<2.0	<0.8	<0.03	<0.02	17.0-19.0	9.0-11.0	-	-	
08Ch20N14S2	<0.08	<1.5	2.0-3.0	<0.035	<0.025	19.0-22.0	12.0-15.0	-	-	
08Ch18N10T	≤0.08	≤2	≤0.8	≤0.040	≤0.02	17.0-19.0	9.0-11.0	–	5xS – 0.7	–
12Ch18N10T	≤0.12	≤2	≤0.8	≤0.040	≤0.02	17.0-19.0	9.0-11.0	–	5xS – 0.8	–
10Ch17N13M2T	≤0.10	≤2	≤0.8	≤0.035	≤0.02	16.0-18.0	12.0-14.0	2.0-3.0	5xS – 0.7	–
10Ch23N18	<0.10	<2.0	<1.0	<0.035	<0.02	22.0-25.0	17.0-20.0	-	-	
12Ch18N9	<0.12	<2.0	<0.8	<0.040	<0.020	17.0-19.0	8.0-10.0	-	-	–
17Ch18N9	0.13-0.21	<2.0	<0.8	<0.040	<0.020	17.0-19.0	8.0-10.0	-	-	–

PIPE DIMENSION TOLERANCES

Outside diameter, mm	Product level		
	Regular	Improved	Advanced
from 5 to 10	±0.3 mm	±0.2 mm	±0.15 mm
over 10 up to 30	±0.4 mm	±0.3 mm	±0.2 mm
over 30 up to 95	±1.2%	±1.0%	±0.8%
over 95	±1.0%	±1.0%	±0.8%

Wall thickness, mm	Product level		
	Regular	Improved	Advanced
0.2	±0.05 mm	±0.03 mm	–
from 0.3 to 0.4	±0.07 mm	±0.05 mm	–
0.5 to 0.6	±0.10 mm	±0.07 mm	–
from 0.7 to 1	±0.15 mm	±0.10 mm	–
over 1 up to 3	+12.5%/-15.0%	±12.5%	+12.5%/-10.0%
over 3 up to 7	±12.5%	+12.5%/-10.0%	±10.0%
over 7	+12.5%/-10.0%	±10.0%	–

MECHANICAL PROPERTIES

Steel Grade	Tensile strength, N/mm²	Elongation, %
	Not less than	
04Ch18N10	490 (50)	45
08Ch20N14S2	510 (52)	35
08Ch18N10T	549	37
12Ch18N10T	549	35
10Ch17N13M2T	529	35
10Ch23N18	529 (54)	35
12Ch18N9	549 (56)	37
17Ch18N9	568 (58)	35

SIZE RANGE

Outside diameter, mm	Wall thickness, mm (Pipe length within 1.0-25 m, as agreed by the parties)																											
	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.8	2.0	2.2	2.5	2.8	3.0	3.2	3.5	4.0	4.5	5.0	5.5	6.0	9.0	10.0
5								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6											●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
7													●	●	●	●	●	●	●	●	●	●	●	●	●
8													●	●	●	●	●	●	●	●	●	●	●	●	●
9													●	●	●	●	●	●	●	●	●	●	●	●	●
10															●	●	●	●	●	●	●	●	●	●	●
11															●	●	●	●	●	●	●	●	●	●	●
12															●	●	●	●	●	●	●	●	●	●	●
13																●	●	●	●	●	●	●	●	●	●
14																	●	●	●	●	●	●	●	●	●
15																	●	●	●	●	●	●	●	●	●
16																	●	●	●	●	●	●	●	●	●
17																	●	●	●	●	●	●	●	●	●
18																		●	●	●	●	●	●	●	●
19																		●	●	●	●	●	●	●	●
20																			●	●	●	●	●	●	●
21																			●	●	●	●	●	●	●
22																			●	●	●	●	●	●	●
23																			●	●	●	●	●	●	●
24																				●	●	●	●	●	●
25																				●	●	●	●	●	●
27																				●	●	●	●	●	●
28																				●	●	●	●	●	●
30																						●	●	●	●
32																						●	●	●	●
34																						●	●	●	●
35																						●	●	●	●
36																						●	●	●	●
38																						●	●	●	●
40																						●	●	●	●
42																						●	●	●	●
45																						●	●	●	●
48																						●	●	●	●
50																						●	●	●	●
51																						●	●	●	●
53																						●	●	●	●
54																						●	●	●	●
56																						●	●	●	●
57																						●	●	●	●
60																						●	●	●	●
63																								●	●
65																								●	●
68																								●	●
70																								●	●
73																								●	●
76																								●	●
80																								●	●
83																								●	●
85																								●	●
89																								●	●

Note: it is possible to manufacture pipes with intermediate dimensions.

SIZE RANGE

Outside diameter, mm	Wall thickness, mm																										
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	4	4.5	5	5.5	6	6.5	7	8	9	10	11	12
90																												
95																												
100																												
102																												
108																												
110																												
114																												
120																												
130																												
140																												
150																												
160																												
170																												
180																												
190																												
200																												
220																												
250																												
273																												
325																												
377																												
426																												

Sizes that can be manufactured by agreement between the customer and the manufacturer, with all additional requirements to be formalized in written form

SIZE RANGE (CONTINUED)

Outside diameter, mm	Wall thickness, mm																														
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
90																												
95																												
100																												
102																												
108																												
110																												
114																												
120																												
130																												
140																												
150																												
160																												
170																												
180																												
190																												
200																												
220																												
250																												
273																												
325																												
377																												
426																												

ASTM A 213/A 213M, ASME SA 213/SA 213M, ASTM A269

Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheated, and Heat-Exchanger Tubes

STEEL GRADES

T5, T9, T11, T12, T91, T22, TP 304, TP 304L, TP304H, TP 310S, TP 316, TP 316L, TP 316Ti, TP 321, TP 347, TP 347H

MECHANICAL PROPERTIES

Steel Grade	Yield strength, min. N/mm² (MPa)	Tensile strength, min. N/mm² (MPa)	Elongation, min. %	Hardness HRB max.
TP304	205	515	35	90
TP304L	170	485	35	90
TP316	205	515	35	90
TP316L	170	485	35	90
TP316Ti	205	515	35	90
TP321	205	515	35	90
TP347	205	515	35	90
TP304N	205	415	20	90
TP321N	205	515	35	90
TP347N	205	515	35	90
TP310S	205	515	35	90

SIZE RANGE

Outside diameter, mm	Wall thickness, mm	Pipe length, m
5.0–10.0	0.5–1.0	Random length: from 4.0 to 10.0 m Fixed: up to 7.0 Multiple fixed: within fixed range
10.0–20.0	1.0–2.0	
20.0–30.0	1.2–3.0	
30.0–40.0	1.5–4.0	
48.0–127.0; 141.3	2.0–12.7	

ASTM A 312/A 312M, ASME SA 312/SA 312M, ASTM A269/A269M

Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes

STEEL GRADES

TP304, TP304L, TP316L, TP316, TP317L, TP321, TP321H, TP347, TP347H, TP316Ti, TP321L, TP446, TP446H, MT304, MT316, MT321, TP316Ti

MECHANICAL PROPERTIES

Steel Grade	Yield strength, min. N/mm² (MPa)	Tensile strength, min. N/mm² (MPa)	Elongation, min. %	Hardness HRB max.
TP304; MT304	205	515	35	90
TP304L	170	485	35	90
TP316; MT304	205	515	35	90
TP316L; MT321; TP321L	170	485	35	90
TP316Ti	205	515	35	90
TP321	205	515	35	90
TP317L	205	515	35	90
TP347	205	515	35	90
TP304H	205	415	20	90
TP321H	205	515	35	90
TP347H	205	515	35	90
TP310S	205	515	35	90
TP310H	205	515	35	90
TP446	275	485	18	95
TP446H	275	485	18	95

SIZE RANGE

Outside diameter, mm	Wall thickness, mm																						
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	10.31	12.70	14.27	16.15	18.26	20.0	22.23	23.01
5.0–10.0																							
10.0–20.0																							
20.0–30.0																							
30.0–40.0																							
40.0–50.0																							
50.0–60.0																							
60.0–80.0																							
80.0–90.0																							
42.16																							
48.26																							
60.33																							
73.03																							
88.9																							
101.6																							
114.3																							
141.3																							
168.28																							
219.1																							

OUTSIDE DIAMETER TOLERANCES

NPS designator	Permissible variations in outside diameter		DN designator	Permissible variations in outside diameter	
	Under, inches	Over, inches		Over, mm	Under, mm
⅛ - 1½, incl.	1/64 (0.015)	1/32 (0.031)	6-4, incl.	0.4	0.8
over 1½ to 4, incl.	1/32 (0.031)		over 40 to 100	0.8	
over 4 to 8, incl.	1/16 (0.062)		over 100 to 200	1.6	
over 8 to 18, incl.	3/32 (0.093)		over 200 to 450	2.4	
over 18 to 26, incl.	⅛ (0.125)		over 450 to 650	3.2	
over 26 to 34, incl.	5/32 (0.156)		over 650 to 850	4.0	
over 34 to 48, incl.	3/16 (0.187)		over 850 to 1200	4.8	

WALL THICKNESS TOLERANCES

NPS [DN] designator	tolerance, % from nominal	
	Over	Under
⅛ [DN 6] to 2- ½ [DN 65] incl., all t/D ratios	20.0	12.5
3 [DN 80] to 18 [DN 450] incl., t/D up to 5 % incl.	22.5	
3 [DN 80] to 18 [DN 450] incl., t/D >5 %	15.0	
20 [DN 500] and langer, welded, all t/D ratios	17.5	
20 [DN 500] and langer,seamless, t/D up to 5% incl.	22.5	
20 [DN 500] and langer, seamless, t/D >5%	15.0	

In addition to the above, the minimum wall thickness at any point shall not be more than 12.5 per cent less than the specified nominal wall thickness.

DIN EN 10216-5

Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 5: Stainless steel tubes

STEEL GRADES

1.4301 (X5CrNi18-10), 1.4306 (X2CrNi19-11), 1.4307 (X2CrNi18-9), 1.4401 (X5CrNiMo 17-12-2), 1.4404 (X2CrNiMo 17-12-2), 1.4541 (X6CrNiTi 18-10), 1.4571 (X6CrNiMoTi 17-12-2)

SIZE RANGE

Diameter, mm	Wall thickness, mm	Pipe length, mm
Cold-deformed		
5.0-10.0	0.5-1.0	Random: as agreed with the customer Fixed up to 7.0 Multiple fixed within fixed
10.0-20.0	1.0-1.5	
20.0-30.0	1.2-3.0	
30.0-40.0	1.5-4.0	
40.0-50.0	2.0-4.0	
50.0-60.0	3.0-5.0	
60.0-80.0	2.5-5.0	
80.0-90.0	2.9-6.2	

SIZE RANGE (CONTINUED)

Diameter, mm	Wall thickness, mm	Pipe length, mm
	Hot-deformed	
44.5-55.0	4.0-11.0	4.0-24.0 m
60.0	4.0-15.0	
60.3	4.0-15.0	
63.0*	6.5	
76.1	4.0-15.0	
80.0	4.0-15.0	
88.9	4.0-15.0	
101.6	4.0-15.0	
108.0	4.0-15.0	
114.3	5.0-15.0	
133.0	5.0-15.0	
139.7	5.0-15.0	
152.4	6.0-15.0	
159.0	5.0-15.0	
168.3	6.5-15.0	
196.0	7.0-15.0	
219.1	7.0-15.0	
245.0	12.5*-15.0	4.0-6.5 m
273.0	8.0-15.0	

* By agreement between the parties, it is possible to supply pipes with the additional requirement for Hollow bars.

HEAT TREATMENT TYPES:

Pipes are manufactured with or without heat treatment

WELDED STAINLESS STEEL PIPES

KEY MANUFACTURING STANDARDS

Technical standards	
DIN EN 10217-7	Welded steel tubes for pressure purposes — Technical delivery conditions — Part 7: Stainless steel tubes
DIN EN 10357	Austenitic, austenitic-ferritic and ferritic longitudinally welded stainless steel tubes for the food and chemical industry
ASTM A554	Standard Specification for Welded Stainless Steel Mechanical Tubing
ASME SA-268/SA 268-M ASTM A268/268M	Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
ASTM A249	Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes

STEEL GRADES

Steel Classification	Grade			Chemical composition, %									
	ASTM	an analogue according to GOST[4]	EN	C	Si	Mn	Ni	Cr	S	P	N	Mo	Ti
Austenitic	AISI 304	12Ch18N9 (12X18H9)	1.4301	0.08	0.75	2.0	8.0-10.5	18-20	0.03	0.045	0.1	-	-
Austenitic	AISI 304L	03Ch18N10 (03X18H10)	1.4307	0.03	0.75	2.0	8.0-12.0	18-20	0.03	0.045	0.1	-	-
Austenitic	AISI 321	08Ch18N10T (08X18H10T)	1.4541	0.08	0.75	2.0	9-12	17-19	0.03	0.045	0.1	-	0.7
Austenitic	AISI 316L	03Ch17N14M3 (03X17H14M3)	1.4404	0.3	0.75	2.0	10-14	16-18	0.03	0.045	0.41	2-3	-
Austenitic	AISI 316Ti	10Ch17N13M2T (10X17H13M2T)	1.4574	0.08	0.75	2.0	10-14	16-18	0.03	0.045	0.1	2-3	0.7
Austenitic	AISI 201	-	-	0.15	1.0	10	5.5	18	0.05	0.05	0.25	-	-
Ferritic	AISI 409	03Ch13 (03X13)	1.4512	0.03	1.0	1.0	0.5	10.5-11.7	0.02	0.04	0.03	-	-
Martensitic	TP410	-	1.4006	0.15	1	1	-	11.5-13.5	0.03	0.04	-	-	-
Ferritic	AISI 439	04Ch17T (04X17T)	1.4510	0.03	1.0	1.0	0.5	17-19	0.03	0.04	0.03	-	-

Notes:
1. Other steel grades can be used by agreement between the parties.
2. Pipe dimension tolerances are as per technical standards.
3. By agreement between the parties, pipes may be manufactured with tolerances outside the technical standards.
4. In the " Equivalent per GOST" column, steel grade designations outside parentheses are provided in accordance with the Key to Steel – Manufacturing and Supply reference book series; steel grade designations in parentheses are provided in accordance with Russian standards.

SIZE RANGE

Diameter/wall thickness	0.5	0.6	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0
6										
7.5										
8.0										
9.0										
10.0										
12.0										
14.0										
16.0										
18.0										
20.0										
21.3										
22.0										
25.0										
26.9										
28.0										
30.0										
32.0										
33.0										
33.7										
35.0										
38.0										
40.0										
42.4										
45.0										
48.0										
48.3										
50.8										
52.0										
53.0										
57.0										
60.3										
63.5										
70.0										
76.1										
85.0										
88.9										
101.6										
108.0										
114.3										

100% of pipes are inspected as per DIN EN ISO 10893-2.

ASTM A554

Standard Specification for Welded Stainless Steel Mechanical Tubing

STEEL GRADES

MT-304

SIZE RANGE

Diameter/wall thickness		0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0
15.0	15.0								
20.0	10.0								
20.0	20.0								
25.0	25.0								
30.0	15.0								
30.0	20.0								
30.0	30.0								
35.0	15.0								
35.0	35.0								
40.0	10.0								
40.0	20.0								
40.0	25.0								
40.0	30.0								
40.0	40.0								
50.0	25.0								
50.0	30.0								
50.0	50.0								
60.0	40.0								
80.0	80.0								
100.0	60.0								

LENGTH REQUIREMENT

- Random: from 1.5 to 9.0 m
- Fixed: from 3.0 to 9.0 m
- Multiple fixed: up to 9 m and with a 5 mm allowance for each cut

CHEMICAL COMPOSITION

Steel grade	Chemical composition, %						
	C	Mn	P	S	Si	Ni	Cr
Austenitic Steel							
MT-340	0.08	2.00	0.045	0.030	1.00	8.0-11.0	18.0-20.0

OUTSIDE DIMENSION TOLERANCES

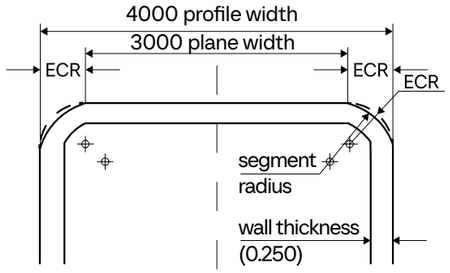
Largest specified outside dimension across flats, inches (mm)	Wall thickness, inches (mm)	±, inches (mm), across flats. Convexity or concavity
up to 1 1/4 (31.8), incl.	All ± 10% of the specified wall thickness	0.015 (0.38)
over 1 1/4 to 2 1/2 (31.8-63.5), incl.		0.020 (0.51)
over 2 1/2 to 5 1/2 (63.5-139.7), incl.		0.030 (0.76)
over 5 1/2 to 8 (139.7-203.2), incl.		0.060 (1.52)

MAXIMUM RADII OF CORNERS

For the purpose of this standard, the corner radius is defined as the Effective Corner Radius (ECR), which is equal to half the difference between the "profile width" and the "width of the flat".

$$ECR = \frac{(\text{Tube Width}) - (\text{Width of Flat})}{2}$$

For this 4' wide shape with a wall thickness of 0.25', the Effective Corner Radius = ECR.
ECR = (4' – 3')/2 = 0.5'



Wall thickness, inches (mm)	Radii of Corners, max, inches (mm)
from 0.020 to 0.049 (from 0.51 to 1.24), incl.	3/32 (2.4)
from 0.049 to 0.065 (from 1.24 to 1.65), incl.	1/8 (3.2)
from 0.065 to 0.083 (from 1.65 to 2.11), incl.	9/64 (3.6)
from 0.083 to 0.095 (from 2.11 to 2.24), incl.	3/16 (4.8)
from 0.095 to 0.109 (from 2.24 to 2.77), incl.	13/64 (5.2)
from 0.109 to 0.134 (from 2.77 to 3.40), incl.	7/32 (5.6)
from 0.134 to 0.156 (from 3.40 to 3.96), incl.	1/4 (6.4)
from 0.156 to 0.200 (from 3.96 to 5.08), incl.	3/8 (9.5)
from 0.200 to 0.250 (from 5.08 to 6.35), incl.	1/2 (12.7)
from 0.250 to 0.375 (from 6.35 to 9.53), incl.	3/4 (19.1)

Wall tolerance is ±10% of nominal wall thickness.

TWIST TOLERANCES

Largest size, inches (mm)	Twist in 3 ft., max, inches (mm/m)
under 1/2 (12.7), incl.	0.050 (1.4)
1/2 – 1 1/2 (12.7–38.1), incl.	0.075 (2.1)
over 1 1/2 to 2 1/2 (38.1–63.5), incl.	0.095 (2.6)
over 2 1/2 to 4 (63.5–101.6), incl.	0.125 (3.5)
over 4 to 6 (from 101.6 to 152.4), incl.	0.250 (6.9)
over 6 (152.4), incl.	0.375 (10.4)

SQUARENESS OF SIDES

$$\pm B = C \times 0{,}006$$

where:
B = tolerance for out-of-square, and
C = length of longest side.
The straightness tolerance of 0.075 in. in 3 ft or 2.1 mm in 1 m using a 3-ft (1 m) straightedge and feeler gage.

SALES OFFICES

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