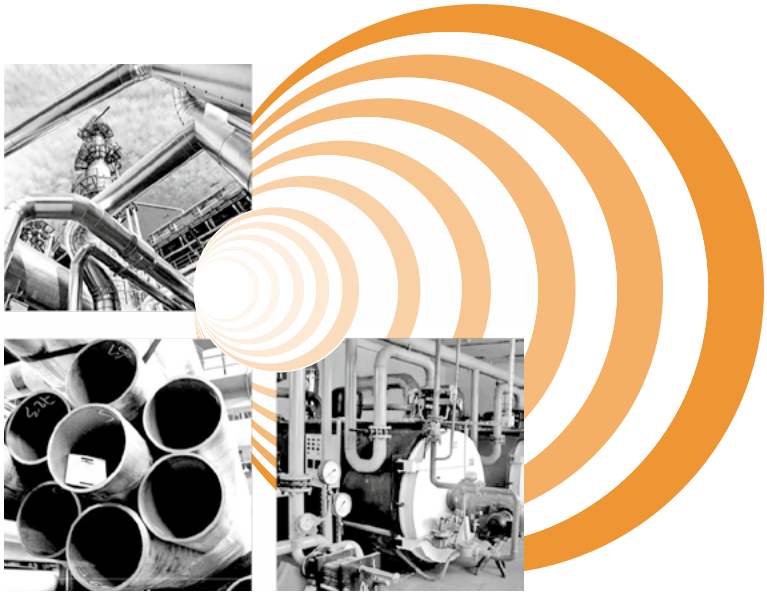

Process & Power Generation

TMK provides tube and pipe serving the power generation industry where critically high temperatures and pressures necessitate rigorous quality standards. Made of carbon, alloy and stainless steel and in accordance with DIN EN, BS EN and ASTM standards, TMK produces a broad range of high quality cold-drawn and hot-rolled tube and pipe for process and power generation applications. Cold-drawn pipe is manufactured at our Sinarsky plant (from purchased tubular billets or from semi finished hot extruded pipes made at our Volzhsky plant). Hot-rolled pipe is produced at our Russian plants. Pipe is made in random lengths from 3 to 12m and fixed lengths upon customer request.

Producers

Plant Location	Standards	OD, mm	WT, mm	Method
Volzhsky Pipe Plant /Russia/	DIN EN 10216-1,2, ASTM A106-13, A210-02 (2012), A333-13	42 - 406,4	4 - 34,8	Seamless, hot-rolled
	ASTM A 213-14, A312-14, A335-11	42,2 - 406,4	on request	Stainless, hot-rolled
Seversky Tube Works /Russia/	DIN EN 10217-1, ASTM A 106-13	88,9 - 323,8	4 - 23,58	Seamless, hot-rolled
	DIN EN 10217-1	21,3 - 508	2,9 - 12,5	ERW
Sinarsky Pipe Plant /Russia/	DIN EN 10216-1,2,3, ASTM A106-13	33,4 - 168,3	2,9 - 18,26	Seamless, hot-rolled
	EN 10216-1,2,3, ASTM A106-13, A179-90a (2012), A192-02 (2012)	10,3 - 76,2	1,73 - 9,53	Seamless, cold-drawn
	DIN EN 10216-5, ASTM A213-14, A312-14	10,29 - 60,30	1,24 - 5,54	Stainless, cald-drawn
TAGMET /Russia/	EN 10216-1, ASTM A106	114,3 - 273,8	7,1 - 28,58	Seamless, hot-rolled
Artrom /Romania/	EN 10216-2, ASTM A106, A210	21,3-219,1	2,3 - 60	Seamless, hot-rolled
	DIN EN 10216-2, ASTM A179-90a (2012), A210-02 (2012)	15,88 - 210	1,5 - 20	Seamless, cold-drawn

List of Standards and Ranges for Process and Power Generation

Standarts	OD mm	WT mm	Steel Grade
Carbon and alloyed steel			
DIN EN 10216-1 Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 1: Non-alloy steel tubes with specified room temperature properties.	16 - 273	1,8 - 60	P195TR1, P235TR1, P265TR1, P195TR2, P235TR2, P265TR2.
DIN EN 10216-2 Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties.	16 - 245	1,8 - 60	St.45.8,St.35.8,17Mn5, 19Mn5, 15Mo3,16Mo3,13CrMo4-5, P235GH, P265GH
DIN EN 10216-3 Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 3: Alloy fine grain steel tubes	16 - 219,1	1,8 -60	P355N, P355NH, P275NL1, P355NL1
DIN EN 10217-1 Welded steel tubes for pressure purposes - Technical delivery conditions - Part 1: Non-alloy steel tubes with specified room temperature properties;	21,3 - 508	4,0 - 12,5	P195TR1, P195TR2, P235 TR1, P235 TR2, P265 TR1, P265TR2
ASTM A106-13 Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service	17,1 - 406,4	1,65 - 28,58	Grade A, Grade B, Grade C
ASTM A210-02(2012) Standard Specification for Seamless Medium-Carbon Steel Boiler and Superheater Tubes	19,05 - 127	2,11-12,7	Grade A-1, Grade C
ASTM A179/A179M-90a(2012) Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes	15,88 - 88,9	1,65- 7,62	Low carbon steel
ASTM A192-02(2012) Standard Specification for Seamless Carbon Steel Boiler Tubes for High-Pressure Service	19,05 - 114,3	2,11 - 11,53	Low carbon steel
DIN 17175 Seamless Tubes of Heat-resistant Steels/ SUPERSEDE BY DIN EN 10216-2	10 - 219,1	1,8 - 60	St 35.8, St 45.8, 15Mo3, 13CrMo4-4
Stainless steel			
DIN EN 10216-5 Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 5: Stainless steel tubes	21,34 - 60,32	3,73 - 3,91	X5CrNiMo17-12-2, X2CrNiMo17-12-2 X6CrNiTi18-10, X5CrNi18-10, X2CrNi19-11
ASTM A335-11 Standard Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service	42,2 - 406,4	on request	P5, P9, P11, P12, P22, P91 and others
ASTM A213-14 Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes	20,6 - 127	2,87 - 12,7	T5, T9, T91, T22, TP304, TP316, TP304L, TP316L, TP 321
ASTM A312-14 Standard Specification for Seamless, Welded, and Heav'ly Cold Worked Austenitic Stainless Steel Pipes	42,16 - 219,1	on request	TP304/TP304L, TP321/JR321L, TP347/TP347H TP316/TR316L, TR316Ti
Low temperature service			
DIN EN 10216-4 Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 4: Non-alloy and alloy steel tubes with specified low temperature properties	16 - 219,1	1,8 - 60	P215NL; P265NL
ASTM A333-13 Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness	17,1 - 406,4	1,65 - 25,4	Grade 1; Grade 6
ASTM A 334 ASTM A334-04a(2010) Standard Specification for Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service	17,1 - 219,1	1,65 - 25,4	Grade 1; Grade 6

Mechanical Properties acc. to DIN EN 10216-2

Steel Grades		Tensile testing at room temperature							Impact Strength				
Grade designation	Material Number	Upper Yield strength ReH Mpa minimum For T≤ 16 mm				Tensile Strength	Elongation at fracture A% minimum		Minimum average value KV J at temperature in °C				
		T<16	16<T<40	40<T<60	60<T<100		longitud.	transverse	Longitudinal			transverse	
			Mpa	Not less		Mpa			20	0	-10	20	0
P195GH	1,034	195	-	-	-	320...440	27	25	-	40e	28d	-	27c
P235GH	1,034	235	225	215	-	360... 500	25	23	-	40e	28d	-	27c
P265GH	1,042	265	255	245	-	410... 570	23	21	-	40e	28d	-	27c
20MnNb6	1,047	355	345	335	-	500... 650	22	20	-	40e	-	-	27c
16Mo3	1,541	280	270	260	-	450... 600	22	20	40e	-	-	27c	-
8MoB5-4	1,545	400	-	-	-	540... 690	19	17	40e	-	-	27c	-
14MoV6-3	1,771	320	320	310	-	460... 610	20	18	40e,f	-	-	27c	-
10CrMo5-5	1,733	275	275	265	-	410... 560	22	20	40e	-	-	27c	-
13CrMo4-5	1,733	290	290	280	-	440... 590	22	20	40e	-	-	27c	-
10CrMo9-10	1,738	280	280	270	-	480... 630	22	20	40e	-	-	27c	-
HCrMo9-10	1,738	355	355	355	-	540... 680	20	18	40e	-	-	27c	-
25CrMo4	1,721	345	34S	345	-	540... 690	18	15	40e,f	-	-	27c	-
20CrMoV13-5-5	1,777	590	590	590	-	740... 880	16	14	40e,f	-	-	27c	-
15NiCuMoNb5-6-4	1,636	440	440	440	440e	610...780	19	17	40e,f	-	-	27c	-
7CrWVMoNb9-6	1,820	400	400	400	-	510...740	20	18	40e,f	-	-	27c	-
7CrMoVTiB10-10	1,737	450	430	430h	-	565...840	17	15	40e,f	-	-	27c	-
XllCrMo5+l	1.7362+1	175	175	175	175	430... 580	22	20	40e	-	-	27c	-
XllCrMo5+NTl	1.7362+NT1	280	280	280	280	480... 640	20	18	40e	-	-	27c	-
XllCrMo5+NT2	1.7362+NT2	390	390	390	390	570... 740	18	16	40e	-	-	27c	-
XllCrMo9-l+l	1.7386+1	210	210	210	-	460....640	20	18	40e	-	-	27c	-
XllCrMo9-l+NT	1.7386+NT	390	390	390	-	590... 740	18	16	40e	-	-	27c	-
X10CrMoVNb9-l	1,490	450	450	450	450	630...830	19	17	40e,f	-	-	27c	-
X10CrWMoVNb9-2	1,490	440	440	440	440	620...850	19	17	40e,f	-	-	27c	-
XllCrMoWVNb9-l-l	1,490	450	450	450	450	620...850	19	17	40e,f	-	-	27c	-
X20CrMoVll-l	1,492	490	490	490	490	690...840	17	14	40e,f	-	-	27c	-

Dimensional Range according to DIN EN 10216-2

OD mm	Wall Thickness, mm																				OD mm
	1,6	1,8	2,0	2,3	2,6	2,9	3,2	3,6	4,0	4,5	5,0	5,6	6,3	7,1	8,0	8,8	10,0	11,0	12,5	14,2	
10,2																					10,2
12,0																					12,0
12,7																					12,7
13,5																					13,5
14,0																					14,0
16,0																					16,0
17,2																					17,2
18,0																					18,0
19,0																					19,0
20,0																					20,0
21,3																					21,3
22,0																					22,0
25,0																					25,0
25,4																					25,4
26,9																					26,9
30,0																					30,0
31,8																					31,8
32,0																					32,0
33,7																					33,7
35,0																					35,0
38,0																					38,0
40,0																					40,0
42,4																					42,4
44,5																					44,5
48,3																					48,3
51,0																					51,0
54,0																					54,0
57,0																					57,0
60,3																					60,3
63,5																					63,5
70,0																					70,0
73,0																					73,0
76,1																					76,1
82,5																					82,5
88,9																					88,9
101,6																					101,6
108,0																					108,0
114,3																					114,3
127,0																					127,0
133,0																					133,0
139,7																					139,7
141,3																					141,3
152,4																					152,4
159,0																					159,0
168,3																					168,3
177,8																					177,8
193,7																					193,7
219,1																					219,1
244,5																					244,5
273,0																					273,0
323,9																					323,9
355,6																					355,6
406,4																					406,4
457,0																					457,0
508,0																					508,0
559,0																					559,0
610,0																					610,0
660,0																					660,0
711,0																					711,0
OD mm	1,6	1,8	2,0	2,3	2,6	2,9	3,2	3,6	4,0	4,5	5,0	5,6	6,3	7,1	8,0	8,8	10,0	11,0	12,5	14,2	OD mm
	Wall Thickness, mm																				

- EN 10216-2 Standard Range TMK Scheduled: - Hot Rolled - Cold Drawn

OD mm	Wall Thickness, mm																		OD mm
	16,0	17,5	20,0	22,2	25,0	28,0	30,0	32,0	36,0	40,0	45,0	50,0	55,0	60,0	65,0	70,0	80,0	90,0	100,0	
10,2																				10,2
12,0																				12,0
12,7																				12,7
13,5																				13,5
14,0																				14,0
16,0																				16,0
17,2																				17,2
18,0																				18,0
19,0																				19,0
20,0																				20,0
21,3																				21,3
22,0																				22,0
25,0																				25,0
25,4																				25,4
26,9																				26,9
30,0																				30,0
31,8																				31,8
32,0																				32,0
33,7																				33,7
35,0																				35,0
38,0																				38,0
40,0																				40,0
42,4																				42,4
44,5																				44,5
48,3																				48,3
51,0																				51,0
54,0																				54,0
57,0																				57,0
60,3																				60,3
63,5																				63,5
70,0																				70,0
73,0																				73,0
76,1																				76,1
82,5																				82,5
88,9																				88,9
101,6																				101,6
108,0																				108,0
114,3																				114,3
127,0																				127,0
133,0																				133,0
139,7																				139,7
141,3																				141,3
152,4																				152,4
159,0																				159,0
168,3																				168,3
177,8																				177,8
193,7																				193,7
219,1																				219,1
244,5																				244,5
273,0																				273,0
323,9																				323,9
355,6																				355,6
406,4																				406,4
457,0																				457,0
508,0																				508,0
559,0																				559,0
610,0																				610,0
660,0																				660,0
711,0																				711,0
OD mm	16,0	17,5	20,0	22,2	25,0	28,0	30,0	32,0	36,0	40,0	45,0	50,0	55,0	60,0	65,0	70,0	80,0	90,0	100,0	OD mm
	Wall Thickness, mm																			

Chemical Composition % acc. to DIN EN 10216-2

Steel Grade	Material Number	C	Si	Mn	P max.	S max.	Cr	Mo
P195GH	1,034	≤0,13	≤0.35	≤0,70	0,025	0,02	≤0,30	≤0.08
P235GH	1,034	≤0,16	≤0,35	≤1,20	0,025	0,02	≤0,30	≤0,08
P265GH	1,042	≤0,20	≤0,40	<1,40	0,025	0,02	≤0,30	≤0,08
20MnNb6	1,047	≤0,22	0,15 to 0,35	1.00 to 1,50	0,025	0,02	—	—
16Mo3	1,541	0,12 to 0,20	≤0,35	0,40 to 0,90	0,025	0,02	≤0,30	0,25 to 0,35
8MoB5-4	1,545	0,06 to 0,10	0,10 to 0,35	0,60 to 0,80	0,025	0,02	≤0,20	0,40 to 0,50
14MoV6-3	1,771	0,10 to 0.15	0,15 to 0,35	0,40 to 0,70	0,025	0,02	0,30 to 0.60	0,50 to 0,70
10CrMo5-5	1,733	≤ 0,15	0,50 to 1,00	0,30 to 0,60	0,025	0,02	1,00 to 1,50	0,45 to 0,65
13CrMo4-5	1,733	0,10 to 0,17e	≤0,35	0,40 to 0,70	0,025	0,02	0,70 to 1.15	0,40 to 0.60
10CrMo9-10	1,738	0,08 to 0,14	S 0,50	0,30 to 0,70	0,025	0,02	2,00 to 2,50	0,90 to 1,10
11CrMo9-10	1,738	0,08 to 0,15	≤0.50	0,40 to 0.80	0,025	0,02	2,00 to 2,50	0,90 to 1,10
25CrMo4	1 7218	0,22 to 0,29	≤ 0,40	0,60 to 0,90	0,025	0,02	0,90 to 1.20	0,1 5 to 0,30
20CrMoV1 3-5-5	1,777	0,17 to 0,23	0,15 to 0,35	0,30 to 0,50	0,025	0,02	3,00 to 3.30	0,50 to 0,60
15NiCuMoNb5-6-4	1,636	≤0,17	0,25 to 0,50	0,80 to 1,20	0,025	0,02	50,3	0,25 to 0,50
7CrWVMoNb9-6	1,820	0,04 to 0,10	≤0,50	0,10 to 0,60	0,03	0,01	1,90 to 2.60	0,05 to 0,30
7CrMoVTiB10-10	1,737	0,05 to 0,10	0,15 to 0,45	0,30 to 0,70	0,02	0,01	2,20 to 2,60	0,90 to 1,10
X11CrMo5+l X11CrMo-5+NT1 X11CrMo5+NT2	1.7362+1 1.7362+NT1 17362+NT2	0,08 to 0,15	0,15 to 0,50	0,30 to 0,60	0,025	0,02	4,00 to 6,00	0,45 to 0,65
X11CrMo9-1+l X11Cr-Mo9-1+NT	1.7386+1 1.7386+NT	0,08 to 0,15	0,25 to 1,00	0,30 to 0,60	0,025	0,02	8,00 to 10.00	0,90 to 1,10
X10CrMoVNb9-1	1,490	0,08 to 0,12	0,20 to 0,50	0,30 to 0,60	0,02	0,01	8,00 to 9,50	0,85 to 1,05
X10CrWMoVNb9-2	1,490	0,07 to 0,13	≤0,50	0,30 to 0,60	0,02	0,01	8,50 to 9,50	0,30 to 0,60
X11CrMoVWNb9-1-1	1,490	0,09 to 0,13	0,10 to 0,50	0.30 to 0,60	0,02	0,01	8,50 to 9,50	0,90 to 1,10
X20CrMoV11-1	1,492	0,17 to 0,23	0,15 to 0,50	s 1,00	0,025	0,02	10,00 to 12.50	0,80 to 1,20

Chemical Composition % acc. to DIN EN 10216-2

Outside Diameter D mm	Tolerance on D	Tolerances on T for a T/D ratio			
		≤ 0.025	> 0.025 < 0.050	> 0.050 <0.10	>0.10
D≤ 219.1	± 1% or ±0.5 mm whichever is the greater	±12.5 % or ± 0.4 mm whichever is the greater			
D > 219.1		±20%	±15%	±12.5%	± 10 %[a]

[a] For outside diameters D > 355.6 mm it is permitted to exceed the upper wall thickness locally by a further 5 % of the wall thickness T

Ni	AI	Cu	Nb	Ti max.	V	Cr+Cu+ Mo+N max.	others
≤0,30	> 0.020"	≤ 0,30c	≤0,010d	0,040d	≤ 0,02d	0,7	—
≤0,30	> 0,020"	≤ 0,30c	≤0,010d	0,040d	≤ 0,02d	0,7	—
≤0,30	> 0,020"	≤ 0,30c	≤ 0,010d	0,040d	≤ 0,02d	0,7	—
—	≤ 0,060	≤ 0,30c	0,015 to 0,10	—	—	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	—	—	—
—	≤ 0,060	≤ 0,30c	—	0,06	—	—	B: 0,002 to 0,006
≤0,30	≤ 0,040	≤ 0,30c	—	—	0,22 to 0,28	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0.30	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0,30	≤ 0,040	≤ 0,30c	—	—	0,45 to 0,55	—	—
1,00 to 1,30	≤ 0,050	0,50 to 0,80	0,015 to 0,045	—	—	—	—
—	≤ 0,030	—	0,02 to 0,08	—	0,20 to 0,30	—	N<0,03 B:0,0005 to 0.006 W:1,45to 1,75
—	≤ 0,020	—	—	0,05 to 0,10	0,20 to 0,30	—	N< 0,010 B: 0,0015 to 0,0070
—	50,04	≤ 0,30c	—	—	—	—	—
—	≤ 0,040	≤ 0,30c	—	—	—	—	—
≤0,40	50,04	≤ 0.30c	0,06 to 0,10	—	0,18 to 0,25	—	N: 0,030 to 0,070
≤0,40	≤ 0,040	—	0,04 to 0,09	—	0,15 to 0,25	—	N: 0,030 to 0,070 B: 0,001 to 0.006 W: 1,50 to 2,00
0,10 to 0,40	≤ 0,040	—	0,06 to 0,10	—	0,18 to 0,25	—	N: 0,050 to 0,090 B: 0,000 5 to 0,005 W: 0,90 to 1,10
0,30 to 0,80	≤ 0,040	≤ 0.30c	—	—	0.25 to 0,35	—	—

Dimensional Range acc. to ASTM A106-13

OD mm	Wall Thickness, mm																						
	1,65	2,0	3,0	3,5	4,0	4,5	5,0	5,6	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
10,3																							
13,7																							
17,1																							
21,3																							
26,7																							
33,4																							
42,4																							
44,5																							
48,3																							
51,0																							
54,3																							
57,0																							
60,3																							
63,5																							
70,0																							
73,0																							
76,1																							
82,5																							
88,9																							
101,6																							
108,0																							
114,3																							
127,0																							
133,0																							
139,7																							
141,3																							
152,4																							
159,0																							
168,3																							
177,8																							
193,7																							
219,1																							
244,5																							
273,0																							
323,9																							
355,6																							
406,4																							

TMK Scheduled

- Cold drawn

- Hot Rolled

Correlation Between DIN EN and ASTM Grades

EN	ASTM					
DIN EN 10216-2	A 106	A 179	A 192	A 210	A 213	A 335
P195GH	Grade A	low carbon	low carbon			
P235GH						
P265GH	Grade B			Grade A1		
	Grade C			Grade C		
20MnNb6						
16Mo3						P1
8MoB5-4						
14MoV6-3						
10CrMo5-5					T11	P11
13CrMo4-5					T12	P12
10CrMo9-10					T22	P22
11CrMo9-10						
25CrMo4						
20CrMoV 13-5-5						
15NiCuMoNb5-6-4					T36	P36
7CrWVMoNb9-6						
7CrMoVTiB10-10						
X11CrMo5+I					T5	P5
XUCrMo5+NTl						
XHCrMo5+NT2						
X11CrMo9-1+I					T9	P9
XllCrMo9-l+NT						
X10CrMoVNb9-1					T91	P91
X10CrWMoVNb9-2					T92	P92
XllCrMoWVNb9-1-1					T911	P911
X20CrMoVll-l						

Mechanical Properties of Stainless Steel Tubes according to ASTM A213-14

Grade	UNS Designation	Tensile strength ksi (MPa) minimum	Yield strength ksi (MPa) minimum	Elongation in 2 in (50 mm) % minimum	Hardness, maximum	
					Brinell/Vickers	Rockwell
TP 304	S30400	75 (515)	30(205)	35	192HBW / 200HV	90 HRB
TP 304L	S30403	70(485)	25 (170)	35	192HBW / 200HV	90 HRB
TP 316	S31600	75 (515)	30(205)	35	192HBW / 200HV	90 HRB
TP 316L	S31603	70(485)	25 (170)	35	192HBW / 200HV	90 HRB

Marking is according to the standards and customers' requests.

Mechanical Properties of Stainless Steel Tubes according to ASTM A312-14

Grade	UNS Designation	Tensile strength ksi (MPa) minimum	Yield strength ksi (MPa) minimum	Elongation in 2 in (50 mm) %, minimum	
				longitudinal	transverse
TP 304	S30400	75(515)	30(205)	35	25
TP 304L	S30403	70 (485)	25 (170)	35	25
TP 316L	S31603	70 (485)	25 (170)	35	25
TP 321	S32100				
≤ ⅜ in.		75(515)	30(205)	35	25
> ⅜ in.		70 (485)	25 (170)	35	25

Marking is according to the standards and customers' requests.

Mechanical Properties of Stainless Steel Tubes according to DIN EN 10216-5

Steel grade		Tensile testing at room temperature					Impact strength KV J, minimum			Heat treatment		Intergranular corrosion resistance
Grade designation	Material number	Yield strength		Tensile strength MPa	Elongation A% minimum		At room temperature °C		at -196 °C	Temperature for solid solution	Cooling media	
		Rp 0,2 MPa minimum	Rp 0,2 MPa minimum		longitud.	transverse	longitud.	transverse				
X2CrNi19-11	1,430	180	215	460-680	40	35	100	60	60	1000-1100	w,a	
X5CrNi18-10	1,4301	195	230	500-700	40	35	100	60	60	1000-1100	w,a	
X6CrNiTi1810	1,4541	180	215	460-680	35	30	100	60	60	1020-1120	w,a	
X2CrNiMo17-12-2	1,4404	190	225	490-690	40	30	100	60	60	1020-1120	w,a	
X5CrNiMo17-12-2	1,4401	205	240	510-710	40	30	100	60	60	1020-1120	w,a	
w - water, a – air for sufficiently rapid cooling												

Marking is according to the standards and customers' requests.