

 Products

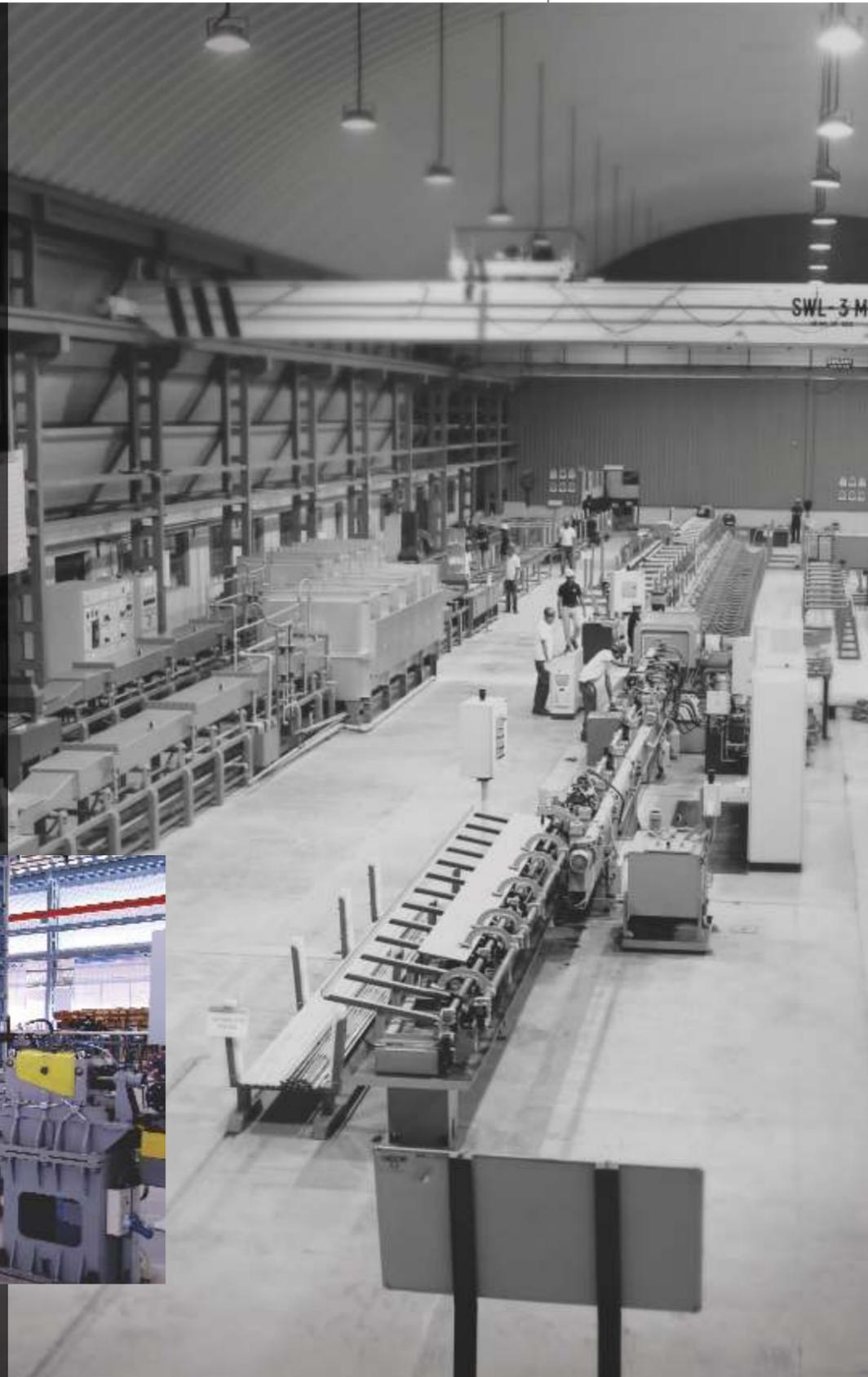
**Stainless Steel Seamless Tubes & U Tubes
(High Precision & Heat Exchanger Tubing)
– Annealed & Pickled**

Product Range –

Outside Diameter:	6.00 mm to 101.60 mm
Wall Thickness:	0.70 mm to 8.00 mm
Grades:	TP 304/L/H, TP 316/L/H/Ti, TP 310/H/L/S, TP 317/L, TP 321/H, TP 347/H, TP 405, TP 409, TP 410, TP 430, UNS S 31500, 31803, 32205, 32750, 32760.
Specifications:	ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN).

Applications:

- ❖ Heat Exchangers
- ❖ Chemical & Petrochemical
- ❖ Gas Industry
- ❖ Nuclear Power Generation
- ❖ Pressure Vessels
- ❖ Marine Equipments
- ❖ Food Processing
- ❖ Automotive
- ❖ Aerospace



**Stainless Steel Seamless Tubes
(Hydraulic & Instrumentation Tubing)
– Bright Annealed**

Product Range –

Outside Diameter:	6.00 mm to 60.00 mm
Wall Thickness:	0.70 mm to 8.00 mm
Grades:	TP 304/L/H, TP 316/L/H/Ti, TP 310/H/L/S, TP 317/L, TP 321/H, TP 347/H, TP 405, TP 409, TP 410, TP 430, UNS S 31500, 31803, 32205, 32750, 32760.
Specifications:	ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN).

Applications:

- ❖ Oil & Gas Extraction
- ❖ Chemical & Petrochemical
- ❖ Nuclear Power
- ❖ Food & Beverage Processing
- ❖ Automotive
- ❖ Aerospace



Stainless Steel Seamless Pipes – Annealed & Pickled

Product Range –

Outside Diameter:	1/8" NPS to 12" NPS
Wall Thickness:	SCH 5S to SCH XXS
Grades:	TP 304/L/H (304L: 8% Ni and 10% Ni), TP 316/L/H/Ti (316L: 10% Ni and 11% Ni), TP 317/L, TP 321/H, TP 347/H, UNS S 31500, 31803, 32205, 32750, 32760.
Specifications:	ASTM, ASME, DIN EN (GERMAN)

Applications:

- ❖ Onshore and Offshore Oil and Gas Production, Exploration and Transport (OCTG – Oil Country Tubular Goods)
- ❖ Chemical & Petrochemical
- ❖ Energy and Power Generation
- ❖ Mechanical and Plant Engineering
- ❖ Liquefaction Projects



Stainless Steel Welded Pipes, Tubes & U Tubes – (Annealed – Pickled & Bright Annealed)

Product Range –

Outside Diameter:	12.70 mm to 114.30 mm
Wall Thickness:	0.70 mm to 12.70 mm
Grades:	TP 304/L/H, TP 316/L/H/Ti, TP 317/L, TP 321/H, TP 347/H, TP 405, TP 409, TP 410, TP 430, UNS S 31500, 31803, 32205, 32750, 32760.
Specifications:	ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN).

Applications:

- ❖ Heat Exchangers, Condensers & Pressure Vessels
- ❖ Chemical & Petrochemical
- ❖ Gas Industry
- ❖ Power Generation
- ❖ Pressure Vessels
- ❖ Marine Equipments
- ❖ Food & Beverage Processing
- ❖ Automotive
- ❖ Pulp & Paper

MATERIAL	ASTM GRADE	UNS GRADE	DIN EN GRADE	STEEL NAME	AFNOR (NF)	JIS GRADE
Austenitic	TP 304	S30400	1.4301	X5CrNi18-20	Z 6 CN 18.09	SUS304TB
	TP 304L	S30403	1.4306	X2CrNi19-11		
	TP 304L	S30403	1.4307	X2CrNi18-9	Z 2 CN 18.10	SUS304LTB
	TP 304H	S30409	1.4948	X6CrNi18-10	Z 6 CN 19.10	SUS304HTB
	TP 310S	S31008	1.4845	X8CrNi25-21		SUS310STB
	TP 310H	S31009				
			1.4335	X1CrNi25-21		
	TP 316	S31600	1.4401	X5CrNiMo17-12-2	Z 6 CND 17.11	SUS316TB
	TP 316L	S31603	1.4404	X2CrNiMo17-12-2	Z 2 CND 17.12	SUS316LTB
	TP 316H	S31609	1.4918	X6CrNiMo17-13-2	Z 10 CND 18.10	SUS316HTB
	TP 316 Ti	S31635	1.4571	X6CrNiMoTi17-12-2	Z 2 CND 17.12	SUS316TiTB
	TP 321	S32100	1.4541	X6CrNiTi18-10	Z 6 CNT 18.10	SUS321TB
	TP 321H	S32109	1.4941	X6CrNiTiB18-10	Z 10 CND 18.10	SUS321HTB
	TP 347	S34700	1.4550	X6CrNiNb18-10	Z 6 CNNB 18.10	SUS347TB
TP 347H	S34709	1.4912	X7CrNiNb18-10	Z 6 CN 19.10	SUS347HTB	
Ferritic & Martensitic	TP 405	S40500	1.4002	X6CrAl13	Z 6 CAL 13	SUS 405TB
	TP 410	S41000	1.4006	X12Cr13	Z 12 C 13	SUS 410TB
	TP 430	S43000	1.4016	X6Cr17	Z 10 C 17	SUS 430TB
Ferritic / Austenitic		UNS S31803				
	2205	UNS S32205	1.4462	X2CrNiMoN22-5-3	Z 2 CND 22.06	
	2507	UNS S32750	1.4410	X2CrNiMoN25-7-4	Z 5 CND 20.12	
		UNS S32760	1.4501	X2CrNiMoCuWN25-7-4		

 Specifications

ASTM / ASME STANDARD	
A 213 / SA 213	Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater and Heat-Exchanger Tubes
A 249 / SA 249	Welded Austenitic Steel Boiler, Superheater, Heat Exchanger and Condenser Tubes
A 268 / SA 268	Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
A 269	Seamless and Welded Austenitic Stainless Steel Tubing for General Services
A 312 / SA 312	Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes
A 376 / SA 376	Seamless Austenitic Steel Pipe for High-Temperature Service
A 688 / SA 688	Seamless and Welded Austenitic Stainless Steel Feedwater Heater Tubes
A 789 / SA 789	Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Services
A 790 / SA 790	Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe
A 999 / SA 999	General Requirement for Alloy and Stainless Steel Pipe
A 1016 / SA 1016	General Requirement for Ferritic Alloy Steel, Austenitic Alloy Steel and Stainless Steel Tubes
EUROPEAN STANDARD	
DIN EN 10216-5	Seamless Steel Tubes for Pressure Purposes
DIN EN 10217-7	Welded Steel Tubes for Pressure Purposes
DIN EN 10297-2	Seamless Steel Tubes for Mechanical and General engineering Purposes
DIN EN 10305-1	Steel Tubes for Precision application
GERMAN STANDARD	
DIN 11850	Stainless Steel Tubes for the Food and chemical industries - Dimensions, materials
DIN 17455	General Purpose Welded Circular Stainless Steel Tubes
DIN 17456	General Purpose Seamless Circular Stainless Steel Tubes
DIN 17457	Welded Circular austenitic Stainless Steel tubes Subject to special requirement
DIN 17458	Seamless Circular austenitic Stainless Steel tubes Subject to special requirement
DIN 28180	Seamless Steel Tubes for Heat Exchanger
DIN 11850	Welded Tubes and Pipes for food,beverages,chemical & pharmaceuticals Industry
RUSSIAN STANDARD	
GOST 9941	Seamless and Warm-Deformed Tubes made from Corrosion-Resistant Steel
NORSOK STANDARD	
Norsok M - 650	Qualification of Manufacturers of Special Material
Norsok M 630	Material Data Sheets and element data sheers for Piping



Chemical Composition Of Stainless Steel

ASTM GRADE	UNS GRADE	DIN EN GRADE	STEEL NAME	JIS GRADE	C	Mn	P	S	Si	Cr	Ni	Mo	N	Nb	Ti	Cu	Al	W	B	HEAT TREATMENT TEMPERATURE
TP 304	S30400	-	-	-	0.080	2.00	0.045	0.030	1.000	18.00 - 20.00	8.00 - 11.00									1040°C min.
-	-	1.4301	X5CrNi18-20	-	0.070	2.00	0.040	0.015	1.000	17.00 - 19.50	8.00 - 10.50		0.100 Max.							1000 - 1100°C
				SUS304TB	0.080	2.00	0.040	0.030	1.000	18.00 - 20.00	8.00 - 11.00									1010°C min.
TP 304L	S30403	-	-	-	0.035	2.00	0.045	0.030	1.000	18.00 - 20.00	8.00 - 12.00									1040°C min.
-	-	1.4307	X2CrNi18-9	-	0.030	2.00	0.040	0.015	1.000	17.50 - 19.50	8.00 - 10.00		0.100 Max.							1000 - 1100°C
				SUS304LTB	0.030	2.00	0.040	0.030	1.000	18.00 - 20.00	9.00 - 13.00									1010°C min.
TP 304H	S30409	-	-	-	0.04 - 0.10	2.00	0.045	0.030	1.000	18.00 - 20.00	8.00 - 11.00									1040°C min.
-	-	1.4948	X6CrNi18-10	-	0.04 - 0.08	2.00	0.035	0.015	1.000	17.00 - 19.00	8.00 - 11.00									1000 - 1080°C
				SUS304HTB	0.04 - 0.10	2.00	0.040	0.030	0.750	18.00 - 20.00	8.00 - 11.00									1040°C min.
TP 310S	S31008	-	-	-	0.080	2.00	0.045	0.030	1.000	24.00 - 26.00	19.00 - 22.00									1040°C min.
-	-	1.4845	X8CrNi25-21	-	0.100	2.00	0.045	0.015	1.500	24.00 - 26.00	19.00 - 22.00		0.11							1050 - 1150°C
				SUS310STB	0.080	2.00	0.040	0.030	1.500	24.00 - 26.00	19.00 - 22.00									1030°C min.
TP 310H	S31009	-	-	-	0.04 - 0.10	2.00	0.045	0.030	1.000	24.00 - 26.00	19.00 - 22.00									1040°C min.
-	-	1.4335	X1CrNi25-21	-	0.020	2.00	0.025	0.010	0.250	24.00 - 26.00	20.00 - 22.00	0.200								1030 - 1110°C
TP 316	S31600	-	-	-	0.080	2.00	0.045	0.030	1.000	16.00 - 18.00	11.00 - 14.00	2.00 - 3.00								1040°C min.
-	-	1.4401	X5CrNiMo17-12-2	-	0.070	2.00	0.040	0.015	1.000	16.50 - 18.50	10.00 - 13.00	2.00 - 2.50	0.100 Max.							1020 - 1120°C
				SUS316TB	0.080	2.00	0.040	0.030	1.000	16.00 - 18.00	10.00 - 14.00	2.00 - 3.00								1010°C min.
TP 316L	S31603	-	-	-	0.035	2.00	0.045	0.030	1.000	16.00 - 18.00	10.00 - 14.00	2.00 - 3.00								1040°C min.
-	-	1.4404	X2CrNiMo17-12-2	-	0.030	2.00	0.040	0.015	1.000	16.50 - 18.50	11.00 - 13.00	2.00 - 2.50	0.100 Max.							1020 - 1120°C
				SUS316LTB	0.030	2.00	0.040	0.030	1.000	16.00 - 18.00	12.00 - 16.00	2.00 - 3.00								1010°C min.
TP 316H	S31609	-	-	-	0.04 - 0.10	2.00	0.045	0.030	1.000	16.00 - 18.00	11.00 - 14.00	2.00 - 3.00								1040°C min.
-	-	1.4918	X6CrNiMo17-13-2	-	0.04 - 0.08	2.00	0.035	0.015	0.750	16.00 - 18.00	12.00 - 14.00	2.00 - 2.50								1020 - 1100°C
				SUS316HTB	0.04 - 0.10	2.00	0.030	0.030	0.750	16.00 - 18.00	11.00 - 14.00	2.00 - 3.00								1040°C min.
TP 316 Ti	S31635	-	-	-	0.08	2.00	0.045	0.030	0.750	16.00 - 18.00	10.00 - 14.00	2.00 - 3.00	0.10		5(C+N)-0.70					1040°C min.
-	-	1.4571	X6CrNiMoTi17-12-2	-	0.08	2.00	0.040	0.015	1.000	16.50 - 18.50	10.50 - 13.50	2.00 - 2.50	-		5XC TO 0.70					1020 - 1120°C
				SUS316TiTB	0.08	2.00	0.040	0.030	1.000	16.00 - 18.00	10.00 - 14.00	2.00 - 3.00			5XC					920°C min.
TP 321	S32100	-	-	-	0.08	2.00	0.045	0.030	1.000	17.00 - 19.00	9.00 - 12.00				5(C+N)-0.70					1040°C min.
-	-	1.4541	X6CrNiTi18-10	-	0.08	2.00	0.040	0.015	1.000	17.00 - 19.00	9.00 - 12.00				5XC TO 0.70					1020 - 1120°C
				SUS321TB	0.08	2.00	0.040	0.030	1.000	17.00 - 19.00	9.00 - 13.00				5XC					920°C min.
TP 321H	S32109	-	-	-	0.04 - 0.10	2.00	0.045	0.030	1.000	17.00 - 19.00	9.00 - 12.00				5(C+N)-0.70					1100°C min.
-	-	1.4941	X6CrNiTiB18-10	-	0.04 - 0.08	2.00	0.035	0.015	1.000	17.00 - 19.00	9.00 - 12.00				5XC TO 0.80					1070 - 1150°C
				SUS321HTB	0.04 - 0.10	2.00	0.030	0.030	0.750	17.00 - 20.00	9.00 - 13.00				4XC TO 0.60					1050°C min.
TP 347	S34700	-	-	-	0.08	2.00	0.045	0.030	1.000	17.00 - 20.00	9.00 - 13.00			10XC-1.10				0.0015 TO 0.0050		1040°C min.
-	-	1.4550	X6CrNiNb18-10	-	0.08	2.00	0.040	0.015	1.000	17.00 - 19.00	9.00 - 12.00			10XC TO 1.00						1020 - 1120°C
				SUS347TB	0.08	2.00	0.040	0.030	1.000	17.00 - 19.00	9.00 - 13.00			10XC						980°C min.
TP 347H	S34709	-	-	-	0.04 - 0.10	2.00	0.045	0.030	1.000	17.00 - 19.00	9.00 - 13.00			8XC-1.10						1100°C min.
-	-	1.4912	X7CrNiNb18-10	-	0.04 - 0.10	2.00	0.040	0.015	1.000	17.00 - 19.00	9.00 - 12.00		0.10	10XC TO 1.20						1070 - 1125°C
				SUS347HTB	0.04 - 0.10	2.00	0.030	0.030	1.000	17.00 - 19.00	9.00 - 13.00			8XC-1.00						1095°C min.
TP 405	S40500	-	-	-	0.08	1.00	0.040	0.030	1.000	11.50 - 14.50	0.50 (MAX)						0.10 - 0.30			650° C Min.
-	-	1.4002	X6CrAl13	-	0.08	1.00	0.040	0.015	1.000	12.00 - 14.00	-						0.10 - 0.30			750 - 850°C
TP 410	S41000	-	-	-	0.15	1.00	0.040	0.030	1.000	11.50 - 13.50	-									650° C Min.
-	-	1.4006	X12Cr13	-	0.018 - 0.15	1.50	0.040	0.015	1.000	11.50 - 13.50	0.75									950 - 1010°C
TP 430	S43000	-	-	-	0.12	1.00	0.040	0.030	1.000	16.00 - 18.00	-									650° C Min.
-	-	1.4016	X6Cr17	-	0.08	1.00	0.040	0.015	1.000	16.00 - 18.00	-									750 - 850°C
-	UNS S31803	-	-	-	0.03	2.00	0.030	0.020	1.000	21.00 - 23.00	4.50 - 6.50	2.50 - 3.50	0.08 - 0.20							1020°- 1100°C
2205	UNS S32205	-	-	-	0.03	2.00	0.030	0.020	1.000	22.00 - 23.00	4.50 - 6.50	3.00 - 3.50	0.14 - 0.20							1020°- 1100°C
-	-	1.4462	X2CrNiMoN22-5-3	-	0.03	2.00	0.035	0.015	1.000	21.00 - 23.00	4.50 - 6.50	2.50 - 3.50	0.10 - 0.22							1020°- 1100°C
2507	UNS S32750	-	-	-	0.03	1.20	0.030	0.020	0.800	24.00 - 26.00	6.00 - 8.00	3.00 - 5.00	0.24 - 0.30		0.50					1025°- 1125°C
-	-	1.4410	X2CrNiMoN25-7-4	-	0.03	2.00	0.035	0.015	1.000	24.00 - 26.00	6.00 - 8.00	3.00 - 4.50	0.24 - 0.35							1040°- 1120°C
-	UNS S32760	-	-	-	0.05	1.00	0.030	0.010	1.000	24.00 - 26.00	6.00 - 8.00	3.00 - 4.00	0.20 - 0.30		0.50 - 0.10		0.50 - 1.00			1070°- 1140°C
-	-	1.4501	X2CrNiMoCuWN25-7-4	-	0.03	1.00	0.035	0.015	1.000	24.00 - 26.00	6.00 - 8.00	3.00 - 4.00	0.20 - 0.30				0.50 - 1.00			1040°- 1120°C

SURFACE CONDITION		
SYMBOL	PROCESS ROUTE	SURFACE CONDITION
CFD	COLD FINISHED HEAT TREATED, DESCALED	METALLICALLY CLEAN
CFA	COLD FINISHED BRIGHT ANNEALED	METALLICALLY BRIGHT
CFG	COLD FINISHED HEAT TREATED, GROUND	METALLICALLY BRIGHT-GROUND, THE TYPE OF GRINDING AND DEGREE OF ROUGHNESS SHALL BE AGREED AT THE TIME OF ENQUIRY AND ORDER
CFP	COLD FINISHED HEAT TREATED, POLISHED	METALLICALLY BRIGHT-POLISHED, THE TYPE OF POLISHING AND DEGREE OF ROUGHNESS SHALL BE AGREED AT THE TIME OF ENQUIRY AND ORDER

DIMENSIONS	OUTSIDE DIAMETER	WALL THICKNESS
TOLERANCE ACCORDING TO EN ISO 1127		
D4 / T4	± 0.50 % OR MIN. ± 0.10 MM WHICHEVER IS THE GREATER	± 7.50 % OR ± 0.15 MM WHICHEVER IS THE GREATER
D3 / T3	± 0.70 % OR MIN. ± 0.30 MM WHICHEVER IS THE GREATER	± 10 % OR ± 0.20 MM WHICHEVER IS THE GREATER
TOLERANCE ACCORDING TO ASTM A312 / ASTM A 999		
> 10.30 ≤ 48.30	OD. + 0.40 MM / - 0.80 MM	Thk. -12.50 %
> 48.30 ≤ 114.30	OD. + 0.80 MM / - 0.80 MM	Thk. -12.50 %
>114.30 ≤ 219.10	OD. + 1.60 MM / - 0.80 MM	Thk. -12.50 %
>219.10 < 457.00	OD. + 2.40 MM / - 0.80 MM	Thk. -12.50 %
TOLERANCE ACCORDING TO ASTM A213 / ASTM A 1016		
≤ 25.40	OD. + 0.10 MM / - 0.11 MM	Thk. - 0.00 / + 20.0 %
> 25.4 ≤ 38.10	OD. + 0.15 MM / - 0.15 MM	Thk. - 0.00 / + 20.0 %
> 38.10 ≤ 50.80	OD. + 0.20 MM / - 0.20 MM	Thk. - 0.00 / + 22.0 %
> 50.80 ≤ 63.50	OD. + 0.25 MM / - 0.25 MM	Thk. - 0.00 / + 22.0 %
> 63.50 ≤ 76.20	OD. + 0.30 MM / - 0.30 MM	Thk. - 0.00 / + 22.0 %
> 76.20 ≤ 101.60	OD. + 0.38 MM / - 0.38 MM	Thk. - 0.00 / + 22.0 %
> 101.60	OD. + 0.38 MM / - 0.64 MM	Thk. - 0.00 / + 22.0 %