



 Anupam metals India

Shine across the world



Pipes & Tubes





Products

Pipes & Tubes :

Pipes & Tubes



Material Type:-

Stainless Steel :	ASTMA312 TP 304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/ 310/ 347/904L/ etc.
Carbon Steel :	ASTMA53 GR. B/A106 GR. B/API 5L GRADE B/API 5L GR.X42/46/52/56/60/65/70 /A333 GR. 3/ GR. 6/ etc.
Alloy Steel :	ASTMA335 GR. P1/P5/ P9/ P11/ P22/ P91/ etc.
Others :	Monel, Nickel, Inconel, Hastalloy, Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, Etc.
Types :	Round , Square, Rectangular.
Size :	Upto 72" NB. (Seamless & Welded)
Wall Thickness :	Sch. 5S to Sch. XXS

Sheets & Plates

Sheets & Plates



Material Type:-

Material Grade :	Stainless Steel, Nickel Alloys, Carbon Steel, Alloy Steel, Other Ferrous & Non-Ferrous Metals.
Types :	Sheets & Plates, Coils

Buttweld Fittings:

butt weld pipe fittings.



Material Type:-	
Stainless Steel :	ASTMA403 WP 304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/ 310/ 347/904L/ etc.
Carbon Steel :	ASTM A234 WPB / A420 WPL3/ A420 WPL6/ MSS-SP-75 WPHY 42/46/52/56/60/65/70 etc.
Alloy Steel :	ASTMA234 WP1/ WP5/ WP9/ WP11/ WP22/ WP91/ etc.
Others : :	Monel, Nickel, Inconel, Hastalloy, Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.
Types :	Elbow, Tee, Reducer, Return Bends, Stub-Ends, Cap , Collar, Cross, Insert etc.
Size :	1/8" NB TO 48" NB. (Seamless & Welded)
Wall Thickness :	Sch. 5S To Sch. XXS

Flanges:

Flanges



Material Type:-	
Stainless Steel :	ASTMA182 F304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/ 310/ 347/904L/ etc.
Carbon Steel :	ASTMA105/A105N/A694F42/46/52/56/60/65/ 70 /A350 LF3/A350 LF2, etc.
Alloy Steel :	ASTMA182 F1/ F5/ F9/ F11/ F22/ F91/ etc..
Others :	Monel, Nickel, Inconel, Hastalloy, Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.
Types :	Weldneck , Slipon, Blind, Socket Weld , Lap Joint, Spectacles, Ring Joint, Orifcae,
L	o n g
	Weldneck, Deck Flange, etc.
Size :	1/8" NB TO 72" NB and also non standard, Large size Flanges can be manufactured
Class :	150#, 300#, 400#, 600#, 900#, 1500# & 2500#.

Forged High Pressure Fittings Socket Weld & Threaded :

Forged High Pressure Fittings, Socket, Weld & Threaded



Material Type:-

Stainless Steel :	ASTMA182 F304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/ 310/ 347/ 904L/ etc.
Carbon Steel :	ASTMA105/A105N/A694 F42/46/52/56/60/65/70 /A350 LF3/A350 LF2, etc.
Alloy Steel :	ASTMA182 F1/ F5/ F9/ F11/ F22/ F91/ etc.
Others :	Monel, Nickel, Inconel, Hastalloy, Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.
Types :	Elbow, Tee, Union, Cross, Coupling, Cap, Bushing , Plug, Swage Nipple, Welding Boss, Hexagon Nipple, Barrel Nipple, Welding Nipple, Parraler Nipple, Street Elbow, Hexagon Nut, Hose Nipple, Bend, Adapter, Insert, Cross, Weldolet, Elbowlet, Sockolet, Thredolet, Nipolet, Letrolet, etc.
Size :	1/8" NB TO 4" NB. (Socketweld & Threaded)
Class :	150# , 3000#, 6000#, 9000#.

Rods, Bars, Hollow Bar & Wires

Rods, Bars, Hollow Bar & Wires.



Material Type:-

Material Grade	Stainless Steel, Carbon Steel, Alloy Steel, Monel, Inconel, Nickel, Nickel Alloys, " Aluminium, Aluminium Alloys, Copper, Copper Alloys, High Speed Steel, Brass, Phosphor Bronze, Bronze etc.
Types	Round, Hollow Round, Square, hexagonal, Rectangular, Threaded Round Bars,
Size:	0.2mm to 600 mm

Structural Steel & Flat Bars

Structural Steel & Flat Bars



Material Type:-	
Material Grade	Stainless Steel & Carbon Steel
Types	Flats, Strips, Channels, I-Beams, H-Beams, Angles, Tie Rods,
Size	All Internationally acceptable Standards.

Fasteners:

Stainless Steel Fasteners, Bolt Fasteners.



Material Type:-	
Stainless Steel :	AISI 302, 304, 304L, 316, 316L, 310, 317, 317L, 321, 347, 410, 420, 904L etc.
Carbon Steel :	Bare Condition, Galvanized, Phosphetised, Cadmium Plated, Hot Deep Galvanized, Blackened, Nickel Chrome Plated, etc.
Alloy Steel :	4.6, 5.6, 6.6, 8.8, 10.9 & 12.9/ 'R', 'S', 'T' Conditions.
Non Ferrous Metal :	Copper, Brass, Aluminium, Titanium, Nichrome, Al. Bronze Phosphorous Bronze, etc.
Types :	Bolts, Nuts, Washers, Anchor Fasteners, Stud Bolts, Eye Bolt, Stud, Threaded Rod, Cotter Pin, Socket Screw, Fine Fasteners & Spares, Foundation Fasteners, etc.

Name	UNS	Wev rkstoff	C	MN	P	S	SI	CR	NI	MO	CU	CO	TA	TI	AL	FE	B	NB(CB)	W	V	ZR	N	MG	SN	PB	R.E.	AG	SE	BI	HF	Others	
Nickel 200	N02200	2.4060/2.4066	0.150	0.35		0.010	0.35		99.00 Min		0.25					0.40																
Nickel 201	N02201	2.4061/2.4068	0.020	0.35		0.010	0.35		99.0 Min		0.25					0.40																
Monel 400	N04400	2.4360/2.4361	0.300	2.00		0.020	0.50		63.00 Min		28.0-34.0					1.00-2.50																
Monel R405	N04405		0.300	2.00		0.025-0.06	0.50		63.00 Min		28.0-34.0					2.50																
Monel K500	N05500	2.4374/2.4375	0.250	1.50	0.020	0.010	0.50		63.00 Min		27.0-33.0			0.35-0.85	2.30-3.15	2.00							0.006	0.006							ZN - 0.020	
Inconel 600	N06600	2.4816	0.150	1.00		0.015	0.50	14.0-17.0	72.00 Min		0.50					6.00-10.0																
Inconel 601	N06601	2.4851	0.100	1.00		0.015	0.50	21.0-25.0	58.0-63.0			1.00			1.00-1.70	Balance																
Inconel 617	N06617	2.4663	0.05-0.10	0.70	0.012	0.008	0.70	20.0-23.0	Balance	8.0-10.0	0.50	10.0-13.0		0.020-0.60	0.60-1.50	2.00	0.006															
Inconel 625	N06625	2.4856	0.100	0.50	0.015	0.015	0.50	20.0-23.0	58.00 Min	8.0-10.0		1.00		0.40	0.40	5.00		3.15-4.15														
Inconel 718	N07718	2.4668	0.080	0.35	0.015	0.015	0.35	17.0-21.0	50.0-55.0	2.80-3.30	0.30	1.00	0.05	0.65-1.15	0.20-0.80	Balance	0.006	4.75-5.50						5ppm			3ppm	0.3ppm				
Inconel X750	N07750	2.4669	0.080	1.00		0.010	0.50	14.0-17.0	70.00 Min		0.50	1.00		2.25-2.75	0.40-1.00	5.00-9.00		0.70-1.20														
Incoloy 800	N08800	1.4876	0.100	1.50	0.015	0.015	1.00	19.0-23.0	30.0-35.0		0.75			0.15-0.60	0.15-0.60	39.50 Min																
Incoloy 800H	N08810	1.4876	0.05-0.10	1.50	0.015	0.015	1.00	19.0-23.0	30.0-35.0		0.75			0.15-0.60	0.15-0.60	39.50 Min																GRAIN SIZE >=5
Incoloy 800HT	N08811	1.4876	0.06-0.10	1.50	0.015	0.015	1.00	19.0-23.0	30.0-35.0		0.75			0.25-0.60	0.85-1.20	39.50 Min																GRAIN SIZE >=5
Incoloy 825	N08825	2.4858	0.050	1.00	0.020	0.010	0.50	19.5-23.5	38.0-46.0	2.50-3.50	1.50-3.00			0.60-1.20	0.20	22.00 Min																
Hastelloy C22	N06022	2.4602	0.015	0.50	0.020	0.020	0.080	20.0-22.0	Balance	12.5-14.5		2.50		0.60-1.20	0.20	2.00-6.00			2.50-3.50	0.35												
Hastelloy C276	N10276	2.4819	0.010	1.00	0.040	0.030	0.080	14.5-16.5	Balance	15.0-17.0		2.50				4.00-7.00			3.00-4.50	0.35												
Hastelloy B-2	N10665	2.4617	0.010	1.00	0.020	0.010	0.10	0.40-1.00	Balance	26.0-30.0	0.05	1.00				1.60-2.00			3.00-4.50	0.35												
Hastelloy X	N06002	2.4665	0.05-0.15	1.00	0.015	0.010	1.00	20.5-23.5	Balance	8.00-10.0		0.50-2.50			0.10	17.0-20.0	0.005		0.20-1.00													
Maraging C250 (Udimar)	K92890		0.030	0.10	0.010	0.010	0.10	0.50	17.0-19.0	4.60-5.20	0.50	7.00-8.50		0.30-0.50	0.05-0.15	Balance	0.004				0.01											
Maraging C300 (Udimar)	K93120		0.030	0.10	0.010	0.010	0.10	0.50	18.0-19.0	4.60-5.20	0.50	8.50-9.50		0.50-0.80	0.05-0.15	Balance	0.003				0.01											
Maraging C350			0.030	0.10	0.010	0.010	0.10	0.50	18.0-19.0	4.60-5.20	0.50	11.5-12.5		1.30-1.60	0.05-0.15	Balance	0.003				0.01											
Rene 41 (Udimet R41)	N07041		0.05-0.12	0.10		0.015	0.50	18.0-20.0	Balance	9.00-10.5		10.0-12.0		3.00-3.30	1.40-1.60	5.00	0.003 -0.01															
Multimet N155	R30155		0.08-0.16	1.00 -2.00			1.00	20.0-22.5	19.0-21.0	2.5-3.5		18.5-21.0	0.75 -1.25						2.00-3.00			0.10- 0.20										
Haynes 25(Udimet-L605)	R30605		0.05-0.15	1.00 -2.00		0.030	0.40	19.0-21.0	9.00-11.0			Balance				3.00			14.0-16.0													
Haynes 188 (Udimet)	R30188		0.05-0.15	1.25	0.020	0.015	0.20- 0.50	21.0-23.0	20.0-24.0			Balance				3.00	0.015		13.0-15.0													LA - 0.03- 0.15
Waspaloy	N07001	2.4654	0.02-0.10	1.00	0.030	0.030	0.75	18.0-21.0	Balance	3.50-5.00	0.50	12.0-15.0		2.75-3.25	1.20-1.60	2.00	0.003-0.01				0.02 0.12											
MP35N	R30035		0.025	0.15	0.015	0.010	0.15	19.0-21.0	33.0-37.0	9.00-11.0		Balance		1.00		1.00	0.01															
MP159 C	R30159							19.00	25.5	7.00		35.7		3.00	0.20	9.00		0.60														
Cobalt Alloy B6	R30006		0.90-1.40 2.00	0.50-		0.20- 2.00	0.20	28.0- 32.0	3.00	1.50				Balance				3.00				3.50-5.50										
Invar 36	K93600	1.3912	0.100	0.60	0.025	0.025	0.35	0.25	35.0-38.0			0.50		0.10	0.10	Balance					0.10											
Invar 42	K94200		0.050	0.80	0.025	0.025	0.030	0.25	42 Min			1.00			0.15	Balance																
Kovar C	K94610		0.040	0.50			0.20	0.20	29.00	0.20	0.20	17.00		0.10	0.10	53.00					0.10		0.10									
Al6XN (Alloy 25-6HN)	N08367		0.030	2.00	0.040	0.030	1.00	20.0-22.0	23.5-25.5	6.00-7.00	0.75					Balance						0.18 -0.25										
Ni-Span C902	N09902		0.060	0.80	0.040	0.04	1.00	4.90-5.75	41.0-43.5					2.20-2.75	0.30-0.80	Balance																

High Nickel Special Alloy

Name	UNS	Wev rkstoff	C	MN	P	S	SI	CR	NI	MO	CU	CO	TA	TI	AL	FE	B	NB(CB)	W	V	ZR	N	MG	SN	PB	R.E.	AG	SE	BI	HF	Others	
Jethete M152 C	S64152		0.120	0.80			0.20	11.70	2.70	1.70						Balance				0.30		0.04										
Alloy A286	S66286	1.4980	0.080	2.00			1.00	13.5-16.0	24.0-27.0	1.00-1.75				1.90-2.30	0.35	Balance	0.003-0.10			0.10-0.50												
Alloy 330	N08330	1.4864	0.08	2.00	0.030	0.030	0.75-1.50	17.0-20.0	34.0-37.0		0.50					Balance								0.025	0.005							
Alloy DS	N08330	1.4862	0.10	0.80-1.50		0.030	1.90-2.60	17.0-19.0	34.5-41.0		0.50					Balance																
Alloy 926 (Alloy 25-6Mo)	N08926	1.4529	0.020	1.00	0.030	0.010	0.50	20.0-21.0	24.0-26.0	6.00-7.00	0.50-1.50					Balance															0.15-0.25	
Alloy 33	R20033	1.4591	0.015	2.00	0.020	0.010	0.50	31.0-35.0	30.0-33.0	0.50-2.00	0.30-1.20					Balance																0.35-0.60
Alloy 31	N08031		0.015	2.00	0.020	0.010	0.30	26.0-28.0	30.0-32.0	6.00-7.00	1.00-1.40					Balance																0.15-0.25
Alloy 20	N08020	2.4660	0.020	1.00-2.00	0.020	0.005	0.70	19.0-21.0	36.5-38.0	2.00-3.00	3.00-4.00					Balance		0.10-0.30														
Incoloy Alloy 925	N09925	2.4852	0.030	1.00	0.030	0.030	0.50	19.5-22.5	42.0-46.0	2.50-3.50	1.50-3.00			1.90-2.40	0.10-0.50	22.00 Min		0.50														
Alloy G-3	N06985	2.4619	0.015	1.00			1.00	21.5-23.5	Balance	6.00-8.00	1.50-2.50	5.00				18.0-21.0		0.20-0.50	1.50													
Alloy 50 Plus	N06650	2.4850	0.030	0.50			0.50	18.0-21.0	Balance	9.50-12.5				0.10	0.05-0.50	12.0-16.0		0.05-0.50	0.50-2.50		0.001-0.03	0.05-0.20	0.005-0.03								CA 0.001-0.01	
Alloy 59	N06059	2.4605	0.010	0.50	0.015	0.005	0.10	22.0-24.0	Balance	15.0-16.5		0.30			0.10-0.40	1.50																
Alloy C-4	N06455	2.4610	0.009	1.00	0.020	0.010	0.05	14.5-17.5	Balance	14.0-17.0				0.70		3.00																
Crofer 22 APU		1.4760	0.030	0.30-0.80	0.050	0.020	0.50	20.0-24.0			0.50				0.03-0.20	0.50	Balance															LA - 0.04-0.20
Alloy 45 TM	N06045	2.4889	0.05-0.12	1.00	0.015	0.010	2.5-3.00	26.0-29.0	45.00 Min		0.30				0.20	21.0-29.0										0.05-0.15						
Alloy 602 CA	N06025	2.4633	0.15-0.25	0.10			0.50	24.0-26.0	Balance		0.10-0.10			0.10-0.20	1.80-2.40	8.00-11.0					0.010										Y - 0.05-0.12	
Alloy 690	N06690	2.4642	0.050	0.50		0.015	0.50	27.0-31.0	58.00 Min		0.50					7.00-11.0																
Alloy 75 (Nimonic)	N06075	2.4951	0.08-0.13	1.00			0.30-0.70	19.0-21.0	Balance		0.50			0.20-0.60	0.30	5.00																
Alloy C-263	N07263	2.4650	0.04-0.08	0.60	0.015	0.007	0.40	19.0-21.0	Balance	5.60-6.10	0.20	19.0-21.0		1.90-2.40	0.30-0.60	0.70	0.005				0.020			0.002		0.0005					AG - 0.0005	
Rene 77			0.05-0.09					14-15.25	56.11-60.8	3.90-4.50		14.2-15.75		3.00-3.70	4.00-4.60	0.05-0.09																
Rene 80			0.15-0.19	0.20		0.015	0.20	13.7-14.3	Balance	3.70-4.30		9.00-10.0		4.80-5.20	2.80-3.20	0.20	0.01-0.02		3.70-4.30		0.02-0.10											
Rene 95			0.04-0.09					12.0-14.0	59.32-65.4	3.30-3.70		7.00-9.00		2.30-2.70	3.30-3.70		0.006-0.015	3.30-3.70	3.30-3.70		0.03-0.07											
Rene 125 C			0.11					8.90	59.00	2.00		10.00	3.80	2.50	4.80		0.015		7.00		0.05										1.50	
Rene 220C			0.02-0.04					18.0-20.0	51.46-59.0	3.00-3.40		11.0-13.0	3.00-3.50	0.90-1.10	0.50		0.004	5.00-5.50														
Rene N4C			0.060					9.80	62.00	1.50		7.50	4.80	3.50	4.20		0.004	0.50	6.00												0.15	
Rene N5C			0.050					7.00	63.00	1.50		7.50	6.50		6.20		0.004		5.00						3.00					0.15	Y - 0.015	
Alloy 80A (Nimonic)	N07080	2.4952	0.10	1.00		0.015	1.00	18.0-21.0	Balance		0.20	2.00		1.80-2.70	1.00-1.80	3.00	0.008				0.15			0.0025								
Alloy 81 (Nimonic)			0.05	0.50		0.015	0.50	30.00	Balance	0.30	0.20	2.00		1.80	0.90	1.00	0.003				0.06											
Alloy 86 (Nimonic)C			0.05					25.00	Balance	10.00												0.015									CE - 0.03	

Name	UNS	Wev rkstoff	C	MN	P	S	SI	CR	NI	MO	CU	CO	TA	TI	AL	FE	B	NB(CB)	W	V	ZR	N	MG	SN	PB	R.E.	AG	SE	BI	HF	Others	
Alloy 90 (Nimonic)	N07090	2.4632	0.13	1.00		0.015	1.00	18.0-21.0	Balance		0.20	15.0-21.0		2.00-3.00	1.00-2.00	1.50	0.02				0.15				0.002							
Alloy 901 (Nimonic)C	N09901	2.4662	0.10	0.50		0.030	0.40	12.50	42.50	5.75	0.50	1.00		2.90	0.35	Balance																
Alloy 91			0.10	1.00			1.00	27.0-30.0	Balance		0.50	19.0-21.0		1.90-2.70	0.90-1.50	1.00	0.002-0.01	0.40-1.10			0.10											
Alloy Pe11 (Nimonic)			0.03-0.08	0.20		0.015	0.50	17.0-19.0	37.0-41.0	4.75-5.75	0.50	1.00		2.20-2.50	0.70-1.00	Balance	0.001				0.02-0.05											
Alloy Pe16 (Nimonic)			0.04-0.08	0.20		0.015	0.50	15.5-17.5	40.0-43.0	2.80-3.80	0.50	2.00		1.10-1.30	1.10-1.30	Balance	0.005				0.02-0.04			0.0015				0.0001				
Alloy Pk33 (Nimonic)			0.07	0.50		0.015	0.50	16.0-20.0	Balance	5.00-9.00	0.20	12.0-16.0		1.50-3.00	1.70-2.50	1.00	0.005				0.06											
Alloy 520 (Udimet)			0.02-0.06					18.0-20.0	Balance	5.50-7.00		11.0-14.0		2.90-3.25	1.80-2.30		0.004-0.01		0.80-1.20													
Alloy 720 (Udimet)			0.01-0.02					15.5-16.5	Balance	2.75-3.25		14.0-15.5		4.75-5.25	2.25-2.75		0.01-0.02		1.00-1.50		0.025-0.05											
Alloy D979 (Udimet)	N09979		0.080	0.75			0.75	14.0-16.0	42.0-48.0	3.00-4.50				2.70-3.30	0.75-1.30	Balance	0.008-.016		3.00-4.50													
Nickel 270	N02270	2.4050	0.02	0.003		0.003	0.005		99.9 Min		0.01			0.005		0.05							0.005									
Nickel 205	N02205		0.15	0.35		0.008	0.15		99.0 Min		0.15			0.01-0.05		0.20							0.01-0.08									
Nickel 212		2.4110	0.10	1.50-2.50			0.20		97.0 Min		0.20					0.25							0.20									
Monel 404	N04404		0.15	0.10		0.024	0.10		52.0-57.0		Balance				0.05	0.50																
Monel 401	N04401		0.10	2.25		0.015	0.25		40.0-45.0		Balance	0.25				0.75																
Alloy TD (Incotherm)C			0.01				1.40	22.00	Balance	3.00																						
Brightray Alloy 35			0.15	1.00		0.010	1.00-3.00	18.0-21.0	34.0-37.0							Balance																
Brightray Alloy B	N06004	2.4867	0.15	1.00		0.010	0.75-1.60	14.0-18.0	57.0 Min							Balance																
Brightray Alloy C	N06003	2.4869	0.15	1.00		0.010	0.75-1.60	19.0-21.0	Balance							1.00																
Brightray Alloy FC			0.05	1.20			2.30	18.00	37.00							42.00																
Incoloy Alloy 28	N08028	1.4563	0.030	2.50	0.030	0.030	1.00	26.0-28.0	30.0-34.0	3.00-4.00	0.60-1.40					Balance																
Incoloy Alloy 945/945X	N09945		0.005-.04	1.00	0.030	0.030	0.50	19.5-23.0	45.0-55.0	3.00-4.00	1.50-3.00			0.50-2.50	0.01-0.70	Balance		2.50-4.50														
Incoloy Alloy 27-7Mo	S31277		0.020	3.00	0.030	0.010	0.50	20.5-23.0	26.0-28.0	6.50-8.00	0.50-1.50					Balance						0.30-0.40										
Incoloy Alloy 803	S35045		0.06-0.10	1.50		0.015	1.00	25.0-29.0	32.0-37.0		0.75			0.15-0.60	0.15-0.60	Balance																
Incoloy Alloy 832			0.050	0.40		0.005	0.70	19.5-21.0	8.75-15.50	0.40	0.75			0.40	0.15	Balance																
Incoloy Alloy 864	S35135		0.080	1.00		0.015	0.60-1.00	20.0-25.0	30.0-38.0	4.00-4.80				0.40-1.00		Balance																
Incoloy Alloy 890C	N08890		0.10	1.00	0.030	0.015	1.80	25.00	42.50	1.50	0.75		0.20	1.00	0.10	Balance		0.40														

Name	UNS	Wev rkstoff	C	MN	P	S	SI	CR	NI	MO	CU	CO	TA	TI	AL	FE	B	NB(CB)	W	V	ZR	N	MG	SN	PB	R.E.	AG	SE	BI	HF	Others
Incoloy Alloy 903	N19903								36.0-40.0			13.0-17.0		1.00-1.85	0.30-1.15	Balance		2.40-3.50													
Incoloy Alloy 907	N19907						0.07-0.35		35.0-40.0			12.0-16.0		1.30-1.80	0.20	Balance		4.30-5.20													
Incoloy Alloy 908	N09908		0.030	1.00	0.015	0.005	0.50	3.75-4.50	47.0-51.0		0.50	0.50		1.20-1.80	0.75-1.25	Balance	0.012	2.70-3.30													
Incoloy Alloy 909	N19909		0.060				0.25-0.50		35.0-40.0			12.0-16.0		1.30-1.80	0.15	Balance		4.30-5.20													
Incoloy Alloy Ma956	S67956		0.10	0.30	0.020			18.5-21.5	0.50		0.15	0.30		0.20-0.60	3.75-5.75	Balance														Y - 0.30-0.70	
Inconel Alloy 050	N06950		0.020	1.00	0.040	0.015	1.00	19.0-21.0	50.00 Min	8.00-10.0	0.50	2.50			0.40	15.0-20.0		0.50	1.00												
Inconel Alloy 601GC			0.03-0.08			0.015	1.00	23.0-25.0	58.0-63.0A		1.00				0.80-1.70	Balance					0.07-0.25	0.02-0.07									
Inconel Alloy 603XL			0.30	0.30			2.00	15.0-23.0	Balance	4.00				0.50	0.50										0.10						
Inconel Alloy 625LCF	N06626	2.4856	0.03	0.50	0.015	0.015	0.15	20.0-23.0	58.00 Min	8.0-10.0		1.00		0.40	0.40	5.00		3.15-4.15B				0.020									
Inconel Alloy 686	N06686		0.01	0.75	0.04	0.02	0.08	19.0-23.0	Balance	15.0-17.0				0.02-0.25		2.00			3.00-4.40												
Inconel Alloy 693	N06693		0.15	1.00		0.01	0.50	27.0-31.0	Balance		0.50			1.00	2.50-4.00	2.50-6.00		0.50-2.50													
Inconel Alloy 706	N09706		0.06	0.35	0.020	0.015	0.35	14.5-17.5	39.0-44.0A		0.30	1.00		1.50-2.00	0.40	Balance	0.006	2.50-3.30B													
Inconel Alloy 718SPF			0.05	0.35	0.015	0.002	0.35	17.0-21.0	50.0-55.0A	2.80-3.30	0.30	1.00		0.65-1.15	0.20-0.80	Balance	0.006	4.75-5.25B				0.01									
Inconel Alloy 725/725HS	N07725		0.03	0.35	0.015	0.010	0.20	19.0-22.5	55.0-59.0	7.00-9.50				1.00-1.70	0.35	Balance		2.75-4.00													
Inconel Alloy 740C			0.03	0.30			0.50	25.00	Balance	0.50		20.00		1.80	0.90	0.70		2.00													
Inconel Alloy 751	N07751		0.10	1.00		0.01	0.50	14.0-17.0	70.00 MinA		0.50			2.00-2.60	0.90-1.50	5.00-9.00		0.70-1.20B													
Inconel Alloy 783	R30783		0.03	0.50	0.015	0.005	0.50	2.50-3.50	26.0-30.0		0.50	Balance		0.10-0.40	5.00-6.00	24.0-27.0	0.003-.012	2.50-3.50													
Inconel Alloy MA754C	N07754		0.05					20.00	78.00					0.50	0.30	1.00														Y - 0.60	
Inconel Alloy MA758C			0.05					30.00	Balance					0.50	0.30	1.00														Y - 0.60	
Inconel Alloy N06230	N06230	2.4733	0.05-0.15	0.30-1.00	0.030	0.015	0.25-0.75	20.0-24.0	Balance	1.00-3.00		5.00			0.20-0.50	3.00	0.015		13.0-15.0											LA - 0.005-0.050	
Inconel 738			0.15-0.20	0.20		0.015	0.30	15.7-16.3	Balance	1.50-2.00		8.00-9.00	1.50-2.00	3.20-3.70	3.20-3.70	0.50	0.005-.015	0.60-1.10	2.40-2.80		0.05-0.15										
Inconel 713			0.20	1.00		0.015	1.00	11.0-14.0	Balance	3.50-5.50				0.25-1.25	5.50-6.50	5.00		1.0-3.08													

ASTM A312 Chemical Requirements

Composition, %B																		
Grade	UNS Designation ^A	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Titanium	Columbium	Tantalum, max	Nitrogen ^c	Vanadium	Copper	Cerium	Boron	Aluminum
..	S20400	0.030	7.0-9.0	0.045	0.030	1.00	15.0-17.0	1.50-3.00	..	..	..	..	0.15-0.30	..	..	..	..	..
TPXM-19	S20910	0.06	4.0-6.0	0.045	0.030	1.00	20.5-23.5	11.5-13.5	1.50-3.00	..	0.10-0.30	..	0.20-0.40	0.10-0.30	..	..	..	..
TPXM-10	S21900	0.08	8.0-10.0	0.045	0.030	1.00	19.0-21.5	5.5-7.5	..	..	..	..	0.15-0.40	..	..	..	..	..
TPXM-11	S21904	0.04	8.0-10.0	0.045	0.030	1.00	19.0-21.5	5.5-7.5	..	..	..	..	0.15-0.40	..	..	..	..	..
TPXM-29	S24000	0.08	11.5-14.5	0.060	0.030	1.00	17.0-19.0	2.3-3.7	..	..	..	..	0.20-0.40	..	..	..	..	..
TP304	S30400	0.08	2.00	0.045	0.030	1.00	18.0-20.0	8.0-11.0	..	..	..	..	..	..	..	..	..	..
TP304L	S30403	0.035D	2.00	0.045	0.030	1.00	18.0-20.0	8.0-13.0	..	..	..	..	..	..	..	..	..	..
TP304H	S30409	0.04-0.10	2.00	0.045	0.030	1.00	18.0-20.0	8.0-11.0	..	..	..	..	..	..	..	0.03-0.08	..	..
..	S30415	0.04-0.06	0.80	0.045	0.030	1.00-2.00	18.0-19.0	9.0-10.0	..	..	..	..	0.12-0.18	..	..	..	..	..
TP304N	S30451	0.08	2.00	0.045	0.030	1.00	18.0-20.0	8.0-18.0	..	..	..	..	0.10-0.16	..	..	..	..	..
TP304LN	S30453	0.035	2.00	0.045	0.030	1.00	18.0-20.0	8.0-12.0	..	..	..	..	0.10-0.16	..	..	..	..	..
..	S30600	0.018	2.00	0.02	0.02	3.7-4.3	17.0-18.5	14.0-15.5	0.20	..	..	..	..	..	0.50	max	..	0.80-1.50
..	S30615	0.16-0.24	2.00	0.030	0.03	3.2-4.0	17.0-19.5	13.5-16.0	..	..	..	..	..	..	..	..	..	..
..	S30815	0.05-0.10	0.80	0.040	0.030	1.40-2.00	20.0-22.0	10.0-12.0	..	..	..	..	0.14-0.20	..	..	0.03-0.08	..	..
TP309S	S30908	0.08	2.00	0.045	0.030	1.00	22.0-24.0	12.0-15.0	0.75	..	..	..	..	..	..	..	..	..
TP309H	S30909	0.04-0.10	2.00	0.045	0.030	1.00	22.0-24.0	12.0-15.0	..	..	..	..	..	..	..	..	..	..
TP309Cb	S30940	0.08	2.00	0.045	0.030	1.00	22.0-24.0	12.0-16.0	0.75	..	10 X C	..	..	..	..	..	..	..
TP309Hcb	S30941	0.04-0.10	2.00	0.045	0.030	1.00	22.0-24.0	12.0-16.0	0.75	..	min, 1.10	..	..	..	..	..	..	..
..	S31002	0.015	2.00	0.020	0.015	0.15	19.0-22.0	24.0-26.0	0.10	..	..	..	0.10	..	..	..	..	..
TP310S	S31008	0.08	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	0.75	..	..	..	..	..	..	..	..	..
TP310H	S31009	0.04-0.10	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	..	..	..	..	..	..	..	..	..	..
TP310Cb	S31040	0.08	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	0.75	..	10 X C	..	..	..	..	..	..	..
TP310Hcb	S31041	0.04-0.10	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	0.75	..	min, 1.10	..	..	..	..	..	..	..
..	S31050	0.025	2.00	0.020	0.015	0.4	24.0-26.0	20.5-23.5	1.6-2.6	..	..	..	0.09-0.15	..	0.50-1.00	..	..	..
..	S31254	0.020	1.00	0.030	0.010	0.80	19.5-20.5	17.5-18.5	6.0-6.5	..	..	..	0.18-0.22	..	..	..	..	..
..	S31272	0.08-0.12	1.5-2.00	0.030	0.015	0.25-0.75	14.0-16.0	14.0-16.0	1.00-1.40	0.30-0.60	..	..	..	..	..	..	0.004-0.008	..
TP316	S31600	0.08	2.00	0.045	0.030	1.00	16.0-18.0	11.0-14.0E	2.00-3.00	..	..	..	..	..	..	..	..	..
TP316L	S31603	0.035D	2.00	0.045	0.030	1.00	16.0-18.0	10.0-14.0	2.00-3.00	..	..	..	..	..	..	..	..	..
TP316H	S31609	0.04-0.10	2.00	0.045	0.030	1.00	16.0-18.0	11.0-14.0E	2.00-3.00	..	..	..	..	..	..	..	..	..
..	S31635	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-12.0	2.00-3.00	5X	..	..	..	..	..	..	..	..
TP316N	S31651	0.08	2.00	0.045	0.030	1.00	16.0-18.0	11.0-14.0E	2.00-3.00	min, 0.70	..	..	0.10	..	..	..	..	..
TP316LN	S31653	0.035	2.00	0.045	0.030	1.00	16.0-18.0	11.0-14.0E	2.00-3.00	..	..	..	0.10-0.16	..	..	..	..	..
TP317	S31700	0.08	2.00	0.045	0.030	1.00	18.0-20.0	11.0-14.0	3.0-4.0	..	..	..	..	..	..	..	..	..
TP317L	S31703	0.035	2.00	0.045	0.030	1.00	18.0-20.0	11.0-15.0	3.0-4.0	..	..	..	..	..	..	..	..	..
..	S31725	0.03	2.00	0.040F	0.030	1.00	18.0-20.0	13.5-17.5	4.0-5.0	..	..	..	0.10	..	0.75	..	..	..
..	S31726	0.03	2.00	0.040F	0.030	1.00	17.0-20.0	14.5-17.5	4.0-5.0	..	..	..	0.10-0.20	..	0.75	..	..	..
TP321	S32100	0.08	2.00	0.045	0.030	1.00	17.0-19.0	9.0-12.0	..	G	..	..	0.10	..	..	..	..	..
TP321H	S32109	0.04-0.10	2.00	0.045	0.030	1.00	17.0-19.0	9.0-12.0	..	H	..	..	..	..	..	..	..	..

Continued

Grade	UNS Designation ^A	Composition, %B																
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Titanium	Columbium	Tantalum, max	Nitrogen ^C	Vanadium	Copper	Cerium	Boron	Aluminum
...	S32615	0.07	2.00	0.045	0.030	4.8-6.0	16.5-19.5	19.0-22.0	0.30-1.50	...	...	...	...	...	1.50-2.50	...	...	...
...	S32654	0.020	2.0-4.0	0.030	0.005	0.50	24.0-25.0	21.0-23.0	7.0-8.0	...	...	...	0.45-0.55	...	0.30-0.60	...	...	...
...	S33228	0.04-0.08	1.00	0.020	0.015	0.30	26.0-28.0	31.0-33.0	...	...	...	...	0.05-0.10	...	...	...	...	0.025
...	S34565	0.03	5.0-7.0	0.030	0.010	1.00	23.0-25.0	16.0-18.0	4.0-5.0	...	...	...	0.40-0.60	...	...	...	...	...
TP347	S34700	0.08	2.00	0.045	0.030	1.00	17.0-19.0	9.0-13.0	...	...	...	...	...	...	...	...	...	...
TP347H	S34709	0.04-0.10	2.00	0.045	0.030	1.00	17.0-19.0	9.0-13.0	...	...	...	...	...	...	...	...	...	...
TP347LN	S34751	0.005-0.020	2.00	0.045	0.030	1.00	17.0-19.0	9.0-13.0	...	...	...	0.06-0.10	...	...	...	...	...	...
TP348	S34800	0.08	2.00	0.045	0.030	1.00	17.0-19.0	9.0-13.0	...	...	0.10	...	...	...	...	...	...	...
TP348H	S34809	0.04-0.10	2.00	0.045	0.030	1.00	17.0-19.0	9.0-13.0	...	...	0.10	...	...	...	...	...	...	...
...	S35045	0.06-0.10	1.50	...	0.015	1.00	25.0-29.0	32.0-37.0	...	0.15-0.60...	...	...	...	0.75	...	0.03-0.08	...	0.15-0.60
...	S35315	0.04-0.08	2.00	0.040	0.030	1.20-2.00	24.0-26.0	34.0-36.0	...	...	...	...	0.12-0.18	...	...	...	...	...
TPXM-15	S38100	0.08	2.00	0.030	0.030	1.50-2.50	17.0-19.0	17.5-18.5	...	...	...	...	...	...	...	...	...	...
...	N08367	0.030	2.00	0.040	0.030	1.00	20.0-22.0	23.5-25.5	6.0-7.0	...	...	...	0.18-0.25	...	0.75	...	...	...
...	N08904	0.020	2.00	0.040	0.030	1.00	19.0-23.0	23.0-28.0	4.0-5.0	...	...	...	0.10	...	1.00-2.00	...	...	...
...	N08926	0.020	2.00	0.030	0.010	0.50	24.0-26.0	19.0-21.0	6.0-7.0	...	...	...	0.15-0.25	...	0.50-1.50	...	...	...

A New designation established in accordance with Practice E 527 and SAE J1086.

B Maximum, unless otherwise indicated.

C The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.

D For small diameter or thin walls or both, where many drawing passes are required, a carbon maximum of 0.040 % is necessary in grades TP304L and TP316L. Small outside diameter tubes are defined as those less than 0.500 in. [12.7 mm] in outside diameter and light wall tubes as those less than 0.049 in. [1.20 mm] in average wall thickness (0.044 in. [1.10 mm] in minimum wall thickness).

E For welded TP316, TP316N, TP316LN, and TP316H pipe, the nickel range shall be 10.0-14.0 %.

F For welded pipe, the phosphorus maximum shall be 0.045 %.

G The titanium content shall be not less than five times the carbon content and not more than 0.70 %.

H The titanium content shall be not less than four times the carbon content and not more than 0.60 %.

I The columbium content shall be not less than ten times the carbon content and not more than 1.00 %.

J The columbium content shall be not less than eight times the carbon content and not more than 1.0 %.

K Grade S34751 shall have a columbium (niobium) plus tantalum content of not less than 15 times the carbon content.

Annealing Requirements

Grade or UNS Designation ^A	Heat Treating Temperature ^B	Cooling/Testing Requirements
All grades not individually listed below: TP321H, TP347H, TP348H	1900°F [1040°C]	C
Cold finished	2000°F [1100°C]	D
Hot finished	1925°F [1050°C]	D
TP304H, TP316H		
Cold finished	1900°F [1040°C]	D
Hot finished	1900°F [1040°C]	D
TP309H, TP309HCb, TP310H, TP310HCb	1900°F [1040°C]	D
S30600	2010–2140°F [1100–1170°C]	D
S30815, S31272	1920°F [1050°C]	D
S31254, S32654	2100°F [1150°C]	D
S33228	2050–2160°F [1120–1180°C]	D
S34565	2050–2140°F [1120–1170°C]	D
S35315	2010°F [1100°C]	D
N08367	2025°F [1110°C]	D
N08904	2000°F [1100°C]	D
N08926	2010°F [1100°C]	D

- A New designation established in accordance with Practice E 527 and SAE J1086.
- B Minimum, unless otherwise stated.
- C Quenched in water or rapidly cooled by other means, at a rate sufficient to prevent reprecipitation of carbides, as demonstrable by the capability of passing Practices A 262, Practice E. The manufacturer is not required to run the test unless it is specified on the purchase order. Note that Practices A 262 requires the test to be performed on sensitized specimens in the low-carbon and stabilized types and on specimens representative of the as-shipped condition for other types. In the case of low-carbon types containing 3 % or more molybdenum, the applicability of the sensitizing treatment prior to testing shall be a matter for negotiation between the seller and the purchaser.
- D Quenched in water or rapidly cooled by other means.

Permitted Variations in Wall Thickness

NPS Designator	Tolerance, % from Nominal	
	Over	Under
1/8 to 2 1/2 incl., all t/D ratios	20.0	12.5
3 to 18 incl., t/D up to 5 % incl.	22.5	12.5
3 to 18 incl., t/D > 5 %	15.0	12.5
20 and larger, welded, all t/D ratios	17.5	12.5
20 and larger, seamless, t/D up to 5 % incl.	22.5	12.5
20 and larger, seamless, t/D > 5%	15.0	12.5

where:

t = Nominal Wall Thickness

D = Ordered Outside Diameter

Tensile Requirements

Grade	UNS Designation	Tensile Strength, min ksi[Mpa]	Yield Strength, min ksi[MPa]
...	S20400	95[635]	48[330]
TPXM-19	S20910	100[690]	55[380]
TPXM-10	S21900	90[620]	50[345]
TPXM-11	S21904	90[620]	50[345]
TPXM-29	S24000	100[690]	55[380]
TP304	S30400	75[515]	30[205]
TP304L	S30403	70[485]	25[170]
TP304H	S30409	75[515]	30[205]
...	S30415	87[600]	42[290]
TP304N	S30451	80[550]	35[240]
TP304LN	S30453	75[515]	30[205]
...	S30600	78[540]	35[240]
...	S30615	90[620]	40[275]
...	S30815	87[600]	45[310]
TP309S	S30908	75[515]	30[205]
TP309H	S30909	75[515]	30[205]
TP309Cb	S30940	75[515]	30[205]
TP309HCb	S30941	75[515]	30[205]
...	S31002		73[500]30[205]
TP310S	S31008	75[515]	30[205]
TP310H	S31009	75[515]	30[205]
TP310Cb	S31040	75[515]	30[205]
TP310HCb	S31041	75[515]	30[205]
...	S31050:		
t≤0.25in.		84[580]	39[270]
t>0.25in.		78[540]	37[255]
...	S31254:		
t≤0.187in.[5.00mm]		98[675]	45[310]
t>0.187in.[5.00mm]		95[655]	45[310]
TP316	S31272	65[450]	29[200]
TP316L	S31600	75[515]	30[205]
TP316H	S31603	70[485]	25[170]
...	S31609	75[515]	30[205]
TP316N	S31635	75[515]	30[205]
TP316LN	S31651	80[550]	35[240]
TP317	S31653	75[515]	30[205]
TP317L	S31700	75[515]	30[205]
...	S31703	75[515]	30[205]
...	S31725	75[515]	30[205]
...	S31726	80[550]	35[240]
TP321	S32100:		
Welded		75[515]	30[205]
Seamless:			
≤3/8in.		75[515]	30[205]
>3/8in.		70[485]	25[170]
TP321H	S32109:		
Welded		75[515]	30[205]
Seamless:			
≤3/16in.		75[515]	30[205]
>3/16in.		70[480]	25[170]
...	S32615	80[550]	32[220]
...	S32654	109[750]	62[430]
...	S33228	73[500]	27[185]
...	S34565	115[795]	60[415]
TP347	S34700	75[515]	30[205]
TP347H	S34709	75[515]	30[205]
TP347LN	S34751	75[515]	30[205]
TP348	S34800	75[515]	30[205]
TP348H	S34809	75[515]	30[205]
...	S35045	70[485]	25[170]
...	S35315	94[650]	39[270]
TPXM-15	S38100	75[515]	30[205]
...	N08367:		
t≤0.187		100[690]	45[310]
t≤0.187		95[655]	45[310]
...	N08904	71[490]	31[215]
...	N08926	94[650]	43[295]
Elongation in 2in. or 50mm (or 4D), min. %:		Longitudinal	Transverse
All Grades except S31050 and S32615		35	25
S32615, S31050		25	...
N08367		30	...

Stainless Steel Pipes Weight Chart

SIZE INCH	OD MM	SCH-5S		SCH-10S		SCH-40S		SCH-80S		SCH-160S	
		MM	Kg/M	MM	Kg/M	MM	Kg/M	MM	Kg/M	MM	Kg/M
1/4	13.7			1.65	0.50	2.24	0.64	3.02	0.81		
3/8	17.1			1.65	0.64	2.31	0.86	3.20	1.12		
1/2	21.3	1.65	0.81	2.11	1.02	2.77	1.29	3.73	1.65	4.75	1.98
3/4	26.7	1.65	1.03	2.11	1.30	2.87	1.71	3.91	2.23	5.54	2.95
1	33.4	1.65	1.31	2.77	2.13	3.38	2.54	4.55	3.29	6.35	4.31
1-1/4	42.2	1.65	1.68	2.77	2.73	3.56	3.44	4.85	4.53	6.35	5.70
1-1/2	48.3	1.65	1.93	2.77	3.16	3.68	4.11	5.08	5.49	7.14	7.36
2	60.3	1.65	2.42	2.77	3.99	3.91	5.52	5.54	7.60	8.71	11.28
2-1/2	73.0	2.11	3.75	3.05	5.35	5.16	8.77	7.01	11.59	9.53	15.15
3	88.9	2.11	4.59	3.05	6.56	5.49	11.47	7.62	15.51	11.10	21.68
3-1/2	101.6	2.11	5.26	3.05	7.53	5.74	13.78	8.08	18.92		
4	114.3	2.11	5.93	3.05	8.50	6.02	16.32	8.56	22.67	13.49	34.05
5	141.3	2.77	9.61	3.40	11.74	6.55	22.10	9.53	31.44	15.88	49.86
6	168.3	2.77	11.48	3.40	14.04	7.11	28.70	10.97	43.22	18.26	68.58
8	219.1	2.77	14.90	3.80	20.12	8.18	43.20	12.70	65.64	23.01	112.89
10	273.0	3.40	22.95	4.19	28.20	9.27	61.22	12.70	82.78	28.58	174.90
12	323.8	3.96	31.71	4.57	36.53	9.53	74.94	12.70	98.96	33.32	242.31
14	355.6	3.96	34.87	4.78	41.99	9.53	82.50	12.70	109.05	35.71	285.96
16	406.4	4.19	42.20	4.78	48.07	9.53	94.61	12.70	125.20	40.49	370.82
18	457.2	4.19	47.53	4.78	54.15	9.53	106.83	12.70	141.35	45.24	466.24
20	508.0	4.78	60.23	5.54	69.70	9.53	118.95	12.70	157.51	50.01	573.33
22	558.8	4.78	66.31	5.54	76.75	9.53	131.07	12.70	173.66	53.90	682.15
24	609.6	5.54	83.80	6.35	95.92	9.53	143.20	12.70	189.82	59.54	820.41
26	660.4					9.53	155.22	12.70	205.85		
28	711.2					9.53	167.39	12.70	222.06		
30	762.0	6.35	120.15	7.92	149.55	9.53	179.56	12.70	238.28		
32	812.8					9.53	191.73	12.70	254.50		
34	863.6					9.53	203.90	12.70	270.72		
36	914.4					9.53	215.83	12.70	286.62		

ASTM A106 Chemical Requirements

Grade A	Composition, %		
	Grade B	Grade C	
Carbon, maxA	0.25	0.30	0.35
Manganese	0.27–0.93	0.29–1.06	0.29–1.06
Phosphorus, max	0.035	0.035	0.035
Sulfur, max	0.035	0.035	0.035
Silicon, min	0.10	0.10	0.10
Chrome, maxB	0.40	0.40	0.40
Copper, maxB	0.40	0.40	0.40
Molybdenum, maxB	0.15	0.15	0.15
Nickel, maxB	0.40	0.40	0.40
Vanadium, maxB	0.08	0.08	0.08

A For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted up to a maximum of 1.35 %.

B These five elements combined shall not exceed 1 %.

Tensile Requirements

	Grade A		Grade B		Grade C	
Tensile strength, min, psi [Mpa]	48 000 [330]		60 000 [415]		70 000 [485]	
Yield strength, min, psi [Mpa]	30 000 [205]		35 000 [240]		40 000 [275]	
	Longitudinal	Transverse	Longitudinal	Transverse	Longitudinal	Transverse
Elongation in 2 in. [50 mm], min, %: Basic minimum elongation transverse strip tests, and for all small sizes tested in full section	35	25	30	16.5	30	16.5
When standard round 2-in. [50-mm] gage length test specimen is used	28	20	22	12	20	12
For longitudinal strip tests	A		A		A	
For transverse strip tests, a deduction for each 1/32-in. [0.8-mm] decrease in wall thickness below 5/16 in. [7.9 mm] from the basic minimum elongation of the following percentage shall be made		1.25		1.00		1.00
<p>A The minimum elongation in 2 in. [50 mm] shall be determined by the following equation:</p> $e = 625\,000A^{0.2} / U^{0.9}$ <p>for inch-pound units, and</p> $e = 1\,940A^{0.2} / U^{0.9}$						

for SI units,

where:

e = minimum elongation in 2 in. [50 mm], %, rounded to the nearest 0.5 %,

A = cross-sectional area of the tension test specimen, in.2 [mm2], based upon specified outside diameter or nominal specimen width and specified wall thickness, rounded to the nearest 0.01 in. 2 [1 mm2]. (If the area thus calculated is equal to or greater than 0.75 in. 2 [500 mm2], then the value 0.75 in.2 [500 mm2] shall be used.), and

U = specified tensile strength, psi [MPa].

ASTM A333 Chemical Requirements

Element	Composition, %								
	Grade1 ^A	Grade3	Grade4	Grade6 ^A	Grade7	Grade8	Grade9	Grade10	Grade11
Carbon,max	0.30	0.19	0.12	0.30	0.19	0.13	0.20	0.20	0.10
Manganese	0.40–1.06	0.31–0.64	0.50–1.05	0.29–1.06	0.90max	0.90max	0.40–1.06	1.15–1.50	0.60max
Phosphorus,max	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.035	0.025
Sulfur,max	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.015	0.025
Silicon	...	0.18–0.37	0.08–0.37	0.10min	0.13–0.32	0.13–0.32	...	0.10–0.35	0.35max
Nickel	...	3.18–3.82	0.47–0.98	...	2.03–2.57	8.40–9.60	1.60–2.24	0.25max	35.0–37.0
Chromium	...	...	0.44–1.01	...	...	...	...	0.15max	0.50max
Copper	...	...	0.40–0.75	...	...	...	0.75–1.25	0.15max	...
Aluminum	...	...	0.04–0.30	...	...	...	...	0.06max	...
Vanadium,max	...	...	...	...	...	...	...	0.12	...
Columbium,max	...	...	...	...	...	...	...	0.05	...
Molybdenum,max	...	...	...	...	...	...	...	0.05	0.50max
Cobalt	...	...	...	...	...	...	...	...	0.50max

^AFor each reduction of 0.01 % carbon below 0.30 %, an increase of 0.05 % manganese above 1.06 % would be permitted to a maximum of 1.35 % manganese.

Stress Relieving of Test Pieces

Metal Temperature ^{A,B}		Minimum Holding Time, h/in. [min/mm] of Thickness		
Grades 1, 3, 6, 7, and 10		Grade 4 ^C		
°F	°C	°F	°C	
1100	600	1150	620	1 [2.4]
1050	565	1100	600	2 [4.7]
1000	540	1050	565	3 [7.1]

^AFor intermediate temperatures, the holding time shall be determined by straight-line interpolation.

^Bgrade 8 shall be stress relieved at 1025 to 1085°F, [550 to 585°C], held for a minimum time of 2 h for thickness up to 1.0 in. [25.4 mm], plus a minimum of 1 h for each additional inch [25.4 mm] of thickness and cooled at a minimum rate of 300°F [165°C]/h in air or water to a temperature not exceeding 600°F [315°C]. C
Unless otherwise specified, Grade 4 shall be stress relieved at 1150°F [620°C].

Tensile Requirement

Tensile strength, min Yield strength, min	Grade 1		Grade 3		Grade 4		Grade 6		Grade 7		Grade 8		Grade 9		Grade 10		Grade 11	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	Mpa	psi	MPa	psi	MPa
	55 000	380	65 000	450	60 000	415	60 000	415	65 000	450	100 000	690	63 000	435	80 000	550	65 000	450
	30 000	205	35 000	240	35 000	240	35 000	240	35 000	240	75 000	515	46 000	315	65 000	450	65 000	450
	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse
Elongation in 2 in. or 50 mm, (or 4D), min, %: Basic minimum elongation for walls 5/16 in. [8 mm] and over in thickness, strip tests, and for all small sizes tested in full section	35	25	30	20	30	16.5	30	16.5	30	22	22	...	28	...	22	...	18 ^A	
When standard round 2-in. or 50-mm gage length or proportionally smaller size test specimen with the gage length equal to 4D (4 times the diameter) is used	28	20	22	14	22	12	22	12	22	14	16	...	...	...	16	...	...
For strip tests, a deduction for each 1/32in. [0.8 mm] decrease in wall thickness below 5/16 in. [8 mm] from the basic minimum elongation of the following percentage	1.75 ^B	1.25 ^B	1.50 ^B	1.00 ^B	1.50 ^B	1.00 ^B	1.50 ^B	1.00 ^B	1.50 ^B	1.00 ^B	1.25 ^B	...	1.50 ^B	...	1.25 ^B	...	...
Wall Thickness	Elongation in 2 in. or 50 mm, min, % ^C																	
	Grade 1		Grade 3		Grade 4		Grade 6		Grade 7		Grade 8		Grade 9		Grade 10			
in.	mm	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	Longi- tudinal	Trans- verse	
5/16 (0.312)	8	35	25	30	20	30	16	30	16	30	22	22	...	28	...	22	...	
9/32 (0.281)	7.2	33	24	28	19	28	15	28	15	28	21	21	...	26	...	21	...	
1/4 (0.250)	6.4	32	23	27	18	27	15	27	15	27	20	20	...	25	...	20	...	
7/32 (0.219)	5.6	30	...	26	...	26	...	26	...	26	...	18	...	24	...	18	...	
3/16 (0.188)	4.8	28	...	24	...	24	...	24	...	24	...	17	...	22	...	17	...	
5/32 (0.156)	4	26	...	22	...	22	...	22	...	22	...	16	...	20	...	16	...	
1/8 (0.125)	3.2	25	...	21	...	21	...	21	...	21	...	15	...	19	...	15	...	
3/32 (0.094)	2.4	23	...	20	...	20	...	20	...	20	...	13	...	18	...	13	...	
1/16 (0.062)	1.6	21	...	18	...	18	...	18	...	18	...	12	...	16	...	12	...	

^A Elongation of Grade 11 is for all walls and small sizes tested in full section.

^B The following table gives the calculated minimum values

^C Calculated elongation requirements shall be rounded to the nearest whole number.

Note—The preceding table gives the computed minimum elongation values for each 1/32-in. [0.80-mm] decrease in wall thickness. Where the wall thickness lies between two values shown above, the minimum elongation value is determined by the following equation:

Grade	Direction of Test	Equation
1	Longitudinal	$E = 56t + 17.50$ [E = 2.19t + 17.50]
	Transverse	$E = 40t + 12.50$ [E = 1.56t + 12.50]
3	Longitudinal	$E = 48t + 15.00$ [E = 1.87t + 15.00]
	Transverse	$E = 32t + 10.00$ [E = 1.25t + 10.00]
4	Longitudinal	$E = 48t + 15.00$ [E = 1.87t + 15.00]
	Transverse	$E = 32t + 6.50$ [E = 1.25t + 6.50]
6	Longitudinal	$E = 48t + 15.00$ [E = 1.87t + 15.00]
	Transverse	$E = 32t + 6.50$ [E = 1.25t + 6.50]
7	Longitudinal	$E = 48t + 15.00$ [E = 1.87t + 15.00]
	Transverse	$E = 32t + 11.00$ [E = 1.25t + 11.00]
8 and 10	Longitudinal	$E = 40t + 9.50$ [E = 1.56t + 9.50]
	Longitudinal	$E = 48t + 13.00$ [E = 1.87t + 13.00]

where:

E = elongation in 2 in. or 50 mm, in %, and
t = actual thickness of specimen, in. [mm].

Impact Requirements for Grades 1,3,4,5,6,7,9 and 10

Size of Specimen, mm	Minimum Average Notched Bar Impact Value of Each Set of Three Specimens ^A		Minimum Notched Bar Impact Value of One Specimen Only of a Set ^A	
	ft·lbf	J	ft·lbf	J
10 by 10	13	18	10	14
10 by 7.5	10	14	8	11
10 by 6.67	9	12	7	9
10 by 5	7	9	5	7
10 by 3.33	5	7	3	4
10 by 2.5	4	5	3	4

A. Straight line interpolation for intermediate values is permitted.

Impact Temperature

Grade	Minimum Impact Test Temperature	
	°F	°C
1	-50	-45
3	-150	-100
4	-150	-100
6	-50	-45
7	-100	-75
8	-320	-195
9	-100	-75
10	-75	-60

Impact Temperature Reduction

Specimen Width Along Notch or Actual Material Thickness	Temperature Reduction, Degrees Colder ^A			
	in.	mm	°F	°C
0.394	10 (standard size)		0	0
0.354	9		0	0
0.315	8		0	0
0.295	7.5 (3/4 std. size)		5	3
0.276	7		8	4
0.262	6.67 (2/3 std. size)		10	5
0.236	6		15	8
0.197	5 (1/2 std. size)		20	11
0.158	4		30	17
0.131	3.33 (1/3 std. size)		35	19
0.118	3		40	22
0.099	2.5 (1/4 std. size)		50	28

A. Straight line interpolation for intermediate values is permitted.

ASTM A335 Chemical Requirement

Composition, %									
Grade	UNS Designation ^A	Carbon	Manga- nese	Phosp- horus, max	Sulfur, max	Silicon	Chromium	Molybdenum	Others
P1	K11522	0.10–0.20	0.30–0.80	0.025	0.025	0.10–0.50	...	0.44–0.65	...
P2	K11547	0.10–0.20	0.30–0.61	0.025	0.025	0.10–0.30	0.50–0.81	0.44–0.65	...
P5	K41545	0.15 max	0.30–0.60	0.025	0.025	0.50 max	4.00–6.00	0.45–0.65	...
P5b	K51545	0.15 max	0.30–0.60	0.025	0.025	1.00–2.00	4.00–6.00	0.45–0.65	...
P5c	K41245	0.12 max	0.30–0.60	0.025	0.025	0.50 max	4.00–6.00	0.45–0.65	... ^B
P9	S50400	0.15 max	0.30–0.60	0.025	0.025	0.25–1.00	8.00–10.00	0.90–1.10	...
P11	K11597	0.05–0.15	0.30–0.60	0.025	0.025	0.50–1.00	1.00–1.50	0.44–0.65	...
P12	K11562	0.05–0.15	0.30–0.61	0.025	0.025	0.50 max	0.80–1.25	0.44–0.65	...
P15	K11578	0.05–0.15	0.30–0.60	0.025	0.025	1.15–1.65	...0.44–0.65	.	..
P21	K31545	0.05–0.15	0.30–0.60	0.025	0.025	0.50 max	2.65–3.35	0.80–1.06	...
P22	K21590	0.05–0.15	0.30–0.60	0.025	0.025	0.50 max	1.90–2.60	0.87–1.13	...
P23	K41650	0.04–0.10	0.10–0.60	0.030 max	0.010 max	0.50 max	1.90–2.60	0.05–0.30	V 0.20–0.30 Cb 0.02–0.08 B 0.0010–0.006 N 0.0015 max Al 0.030 max W 1.45–1.75 Ni 0.40 max Ti 0.005–0.060 Ti/N \$ 3.5C
P24	K30736	0.05–0.10	0.30–0.70	0.020	0.010	0.15–0.45	2.20–2.60	0.90–1.10	V 0.20–0.30 Ti 0.06–0.10 N 0.012 max Al 0.02 max B 0.0015–0.007
P36	K21001	0.10–0.17	0.80–1.20	0.030 max	0.025 max	0.25–0.50	0.30 max	0.25–0.50	Ni 1.00 1.30 Cu 0.50–0.80 Cb 0.015–0.045 V 0.02 max N 0.02 max Al 0.050 max V 0.18–0.25 N 0.030–0.070 Ni 0.40 max Al 0.02 max Cb 0.06–0.10 Ti 0.01 max Zr 0.01 max V 0.15–0.25 N 0.03–0.07 Ni 0.40 max Al 0.02 max Cb 0.04–0.09 W 1.5–2.00 B 0.001–0.006 Ti 0.01 max Zr 0.01 max
P91	K91560	0.08–0.12	0.30–0.60	0.020	0.010	0.20–0.50	8.00–9.50	0.85–1.05	V 0.18–0.25 N 0.030–0.070 Ni 0.40 max Al 0.02 max Cb 0.06–0.10 Ti 0.01 max Zr 0.01 max V 0.15–0.25 N 0.03–0.07 Ni 0.40 max Al 0.02 max Cb 0.04–0.09 W 1.5–2.00 B 0.001–0.006 Ti 0.01 max Zr 0.01 max
P92	K92460	0.07–0.13	0.30–0.60	0.020	0.010	0.50 max	8.50–9.50	0.30–0.60	V 0.18–0.25 N 0.03–0.07 Ni 0.40 max Al 0.02 max Cb 0.04–0.09 W 1.5–2.00 B 0.001–0.006 Ti 0.01 max Zr 0.01 max
P122	K92930	0.07–0.14	0.70 max	0.020	0.010	0.50 max	10.00–11.50	0.25–0.60	V 0.15–0.30 W 1.50–2.50 Cu 0.30–1.70 Cb 0.04–0.10 B 0.0005–0.005 N 0.040–0.100 Ni 0.50 max Al 0.020 max Ti 0.01 max Zr 0.01 max
P911	K91061	0.09–0.13	0.30–0.60	0.020 max	0.010 max	0.10–0.50	8.5–9.5	0.90–1.10	V 0.18–0.25 Ni 0.40 max Cb 0.060–0.10 B 0.0003–0.006 N 0.04–0.09 Al 0.02 max W 0.90–1.10 Ti 0.01 max Zr 0.01 max

^A New designation established in accordance with Practice E527 and SAE J 1086, Practice for Numbering Metals and Alloys (UNS).

^B Grade P 5c shall have a titanium content of not less than 4 times the carbon content and not more than 0.70 %; or a columbium content of 8 to 10 times the carbon content.

^C Alternatively, in lieu of this ratio minimum, the material shall have a minimum hardness of 275 HV in the hardened condition, defined as after austenitizing and cooling to room temperature but prior to tempering. Hardness testing shall be performed at mid-thickness of the product. Hardness test frequency shall be two samples of product per heat treatment lot and the hardness testing results shall be reported on the material test report.

Heat Treatment Requirements^A

Grade	Heat Treat Type	Normalizing Temperature, min or range °F [°C]	Cooling Media	Subcritical Annealing or Tempering Temperature, min or range °F [°C]
P1	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1200 [650]
	subcritical anneal	...	...	1200-1300 [650-705]
P2	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
	subcritical anneal	...	...	1200-1300 [650-705]
P5	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
P5b	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
P5c	subcritical anneal	...	...	1325-1375 [715-745]
P9	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
P11	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1200 [650]
P12	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1200 [650]
	subcritical anneal	...	...	1200-1300 [650-705]
P15	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1200 [650]
P21	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
P22	full or isothermal anneal	...	...	...
	normalize and temper	...	...	1250 [675]
P23	normalize and temper	1900-1975 [1040-1080]	air or accelerated cooling	1350-1470 [730-800]
	normalize and temper	1800-1870 [980-1020]	air or accelerated cooling	1350-1420 [730-770]
P36	normalize and temper ^B	1650 [900]	...	1100 [595]
P91	normalize and temper	1900-1975 [1040-1080]	...	1350-1470 [730-800] ^C
	quench and temper ^D	1900-1975 [1040-1080]	...	1350-1470 [730-800]
P92	normalize and temper	1900-1975 [1040-1080]	E	1350-1470 [730-800]
P122	normalize and temper	1900-1975 [1040-1080]	...	1350-1470 [730-800]
P911	normalize and temper	1900-1975 [1040-1080]	E	1365-1435 [740-780]

^A Where ellipses (...) appear in this table there is no requirement.

^B Alternatively, Grade P36, Class 2 shall be cooled from the austenitizing temperature by accelerated cooling in air or by liquid quenching.

^C Except when Supplementary Requirement S7 is specified by the purchaser.

^D When mutually agreed upon between the manufacturer and the purchaser, quenching and tempering shall be permitted for thicknesses greater than 3 in. [75 mm].

^E Accelerated cooling from the normalizing temperature shall be permitted for section thicknesses greater than 3 in. [75 mm].

Tensile Requirements

Grade									
	P1, P2	P12	P23	P24	P91	P92, P911 P36 Class 1	P122	P36Class 2	All Others
Tensile strength, min:									
ksi									
Mpa	55	60	74	85	85	90	90	95.5	60
	380	415	510	585	585	620	620	660	415
Yield strength, min:									
ksi	30	32	58	60	60	64	58	66.5	30
Mpa	205	220	400	415	415	440	400	460	205

Elongation Requirements

	All grades except P23, P36, P91, P92, P122, and P911		P23, P24, P91, P92, P122, and P 911		P36
	Longitudinal	Transverse	Longitudinal	Transverse	Longitudinal
Elongation in 2 in. or 50 mm, (or 4D), min, %: Basic minimum elongation for wall 5/16 in. [8 mm] and over in thickness, strip tests, and for all small sizes tested in full section	30	20	20	...	15
When standard round 2-in. or 50-mm gage length or proportionally smaller size specimen with the gage length equal to 4D (4 times the diameter) is used	22	14	20	13	...
For strip tests a deduction for each 1/32-in. [0.8 mm] decrease in wall thickness below in. [8 mm] from the basic minimum elongation of the following percentage points shall be made	1.50 ^A	1.00 ^A	1.00 ^A	...	1.00 ^A

Calculated Minimum Elongation Values

Wall Thickness		Elongation in 2 in. or 50 mm, min, %				
		All grades except P23, P36, P91, P92, P122, and P911		P23, P24, P91, P92, P122, and P911		P36
in.	mm	Longitudinal	Transverse	Longitudinal	Longitudinal	
5/16 (0.312)	8	30	20	20		15
9/32 (0.281)	7.2	28	19	19		14
1/4 (0.250)	6.4	27	18	18		13
7/32 (0.219)	5.6	26	...	17		12
3/16 (0.188)	4.8	24	...	16		11
5/32 (0.156)	4	22	...	15		10
1/8 (0.125)	3.2	21	...	14		9
3/32 (0.094)	2.4	20	...	13		8
1/16 (0.062)	1.6	18	...	12		7

Permissible Variations in Outside Diameter

NPS [DN] Designator	Over		Under	
	in.	mm	in.	mm
1/8 to 1 1/2 [6 to 40], incl. Over 1 1/2 to 4 [40 to 100], incl.	1/64 (0.015) 1/32 (0.031)	0.40 0.79	1/64 (0.015) 1/32 (0.031)	0.40 0.79
Over 4 to 8 [100 to 200], incl. Over 8 to 12 [200 to 300], incl. Over 12 [300]	1/16 (0.062) 3/32 (0.093) 6 1 % of the specified outside diameter	1.59 2.38	1/32 (0.031) 1/32 (0.031)	0.79 0.79

Permitted Variations in Wall Thickness

NPS [DN] Designator	Tolerance, % from Specified	
	Over	Under
1/8 to 2 1/2 [6 to 65] incl., all t/D ratios ^A Above 2 1/2 [65], t/D # 5 % ^A Above 2 1/2 [65], t/D > 5 % ^A	20.0 22.5 15.0	12.5 12.5 12.5

^A t = Specified Wall Thickness; D = Specified Outside Diameter.



Asa Pipe Schedules
 Wall = Wall Thickness In Milli Meter
 Wt = Weight In Kg Per Meter

Steel Seamless Pipe Dimensions & Weight

Nominal Pipe size	O D mm	Schedule 10		Schedule 20		Schedule 30		Standard		Schedule 40		Schedule 60		Extra Strong		Schedule 80		Schedule 100		Schedule 120		Schedule 140		Schedule 160		Schedule Extra Strong		
		Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	Wall	Wt.	
1/8	10.3							1.7	0.357	1.7	0.357	2.4	0.470	2.4	0.470													
1/4	13.7							2.2	0.625	2.2	0.625	3.0	0.804	3.0	0.804													
3/8	17.1							2.3	0.848	2.3	0.804	3.2	1.10	3.2	1.10													
1/2	21.3							2.8	1.26	2.8	1.26	3.7	1.62	3.7	1.62													
3/4	26.7							2.9	1.68	2.9	1.68	3.9	2.19	3.9	2.19													
1	33.4							3.4	2.50	3.4	2.50	4.5	3.23	4.5	3.23													
1 1/4	42.2							3.6	3.38	3.6	3.38	4.9	4.46	4.9	4.46													
1 1/2	48.3							3.7	4.05	3.7	4.05	5.1	5.40	5.1	5.40													
2	60.3							3.9	5.43	3.9	5.43	5.5	7.47	5.5	7.47													
2 1/2	73.0							5.2	8.62	5.2	8.62	7.0	11.4	7.0	11.4													
3	88.9							5.5	11.3	5.5	11.3	7.6	15.3	7.6	15.3													
3 1/2	101.6							5.7	13.6	5.7	13.6	8.1	18.6	8.1	18.6													
4	114.3							6.0	16.1	6.0	16.1	8.6	22.3	8.6	22.3													
5	141.3							6.6	21.8	6.6	21.8	9.5	30.9	9.5	30.9													
6	168.3							7.1	28.2	7.1	28.2	11.0	42.5	11.0	42.5													
8	219							8.2	42.5	8.2	42.5	10.3	53.1	10.3	53.1													
10	273.0							9.3	60.2	9.3	60.2	12.7	81.5	12.7	81.5													
12	323.9							9.5	73.8	9.5	73.8	14.3	109.0	14.3	109.0													
14	355.6							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
16	406.4							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
18	457.2							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
20	508.0							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
22	558.8							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
24	609.6							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
26	660.4							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
28	711.2							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
30	762.0							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
32	812.8							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
34	863.6							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													
36	914.4							9.5	81.2	9.5	81.2	15.1	126.0	15.1	126.0													



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