

304/304L

(UNS S30400/S30403)

304 stainless is a low-carbon (0.08% max) version of basic 18-8, also known as 302. Type 302 has 18% chromium and 8% nickel. Due to its lower carbon content, Type 304 has a slightly lower strength than 302. Type 304 is used in welding applications, because the low carbon allows some exposure in the carbide precipitation range of 800°F - 1500°F without the need for post-annealing operations. The severity of the corrosive environments may necessitate annealing after welding or the use of 304L. Type 304L has a carbon content of 0.03% or less.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Si
Max		Max	Max		Max	Max	Max
0.035	24.0-26.0	2.0	0.75	19.0-22.0	0.045	0.03	1.00

Specifications:

ASTM A312, A376, A358, A269, A249, A403, A182, A351,
ASME SA312, SA376, SA358, SA269, SA269, SA249, SA403, SA182, SA351

Typical Applications:

- Sanitary systems
- Dairy and food processing
- Heat exchangers, evaporators
- Feedwater heaters

Tensile Requirements:

Tensile Strength (KSI) = 70, Yield Strength (KSI) = 25
To convert KSI to MPA, multiply by 6.895

Availability:

- Seamless Pipe: 1/4" - 24"
- Weld Pipe: 1/2" - 36"
- Butt-Weld Fit: 1/2" - 36"
- Butt-Weld Fit SMLS: 1/2" - 36"
- Pressure Fittings: 1/4" - 4"
- 150# Fittings/Nipples: 1/4" - 6"
- Valves: 1/2" - 24"
- Tubing: 1/4", 3/8", 1/2", 3/4", 1"
- Flanges: 1/2" - 36"
- Bar: 1/8" - 12"

310S/310H

(UNS S31008)

310S has excellent resistance to oxidation under constant temperatures up to 2000°F. Cyclic conditions can reduce oxidation resistance, and a maximum operating temperature of 1900°F is generally recommended if cycling is involved. Because 310S has a lower coefficient of expansion than most 300 stainless steels, 310S may be used in operations involving moderately severe thermal cycling, such as rapid air cooling. 310S is widely used in moderately carburizing atmospheres such as petro-chemical plants.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Si
Max		Max	Max		Max	Max	Max
0.08	24.0-26.0	2.0	0.75	19.0-22.0	0.045	0.03	1.00

Specifications:

ASTM A312, A403, A182
ASME SA312, SA403, SA182

Typical Applications:

- Heat exchanger and heat recuperator tubing
- Molten salt applications
- Sulfur-bearing gas atmospheres

Availability:

- Seamless Pipe: 1/2" - 8"
- Weld Pipe: 8" - 12"
- Butt-Weld Fittings: 1/2" - 8"
- Bar: 1" - 8"

Tensile Requirements:

Tensile Strength (KSI) = 75
Yield Strength (KSI) = 30
To convert KSI to MPA, multiply by 6.895

316/316L

(UNS S31600/S31603)

Type 316 is a molybdenum steel possessing improved resistance to pitting by solutions containing chlorides and halides. It provides excellent tensile, creep and stress-rupture strengths at elevated temperatures. It is also very resistant to corrosion. Type 316 is also available in high carbon, known as 316H, and low carbon, known as 316L.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Si
Max		Max	Max		Max	Max	Max
0.035	16.0-18.0	2.0	2.0-3.0	10.0-14.0	0.045	0.03	1.00

Specifications:

ASTM A312, A376, A358, A269, A249, A403, A182, A351, A479, A276
ASME SA312, SA376, SA358, SA269, SA249, SA182, SA276, SA403, SA479, SA351

Typical Applications:

- Nuclear, chemical processing, rubber, plastics, pulp/paper, pharmaceutical and textile industries
- Heat exchangers, condensers, and evaporators

Tensile Requirements:

Tensile Strength (KSI) = 70, Yield Strength (KSI) = 25
To convert KSI to MPA, multiply by 6.895

Availability:

- Seamless Pipe: 1/4" - 24"
- Weld Pipe: 1/2" - 36"
- Butt-Weld Fit: 1/2" - 36"
- Butt-Weld Fit SMLS: 1/2" - 36"
- Flanges: 1/2" - 24"
- Pressure Fittings: 1/4" - 4"
- 150# Fittings/Nipples: 1/4" - 6"
- Valves: 1/2" - 24"
- Tubing: 1/4", 3/8", 1/2", 3/4", 1"
- Bar: 1/8" - 8"

C-276

(UNS N10276)

Alloy C-276 is an improved wrought version of Alloy C. It has excellent corrosion resistance with improved fabricability. C-276 can be hot-worked and cold-formed by conventional procedures. It can be joined by welding methods and resists the formation of grain boundary precipitates in the weld-affected area. Therefore, it is suitable for most chemical process applications in the asweld condition. Type C-276 resists stress-corrosion cracking and is resistant to oxidation at temperatures up to 1900°F.

Specifications:

ASTM B619, B366, B564, B574
ASME SB619, SB366, SB564, SB574

Typical Applications:

- Chemical processing
- Pollution control
- Pulp and paper
- Other severe environments or conditions

Availability:

- Welded Pipe: 1/2" - 12"
- Seamless Pipe: 1/2" - 4"
- Butt-Weld Fittings: 1/2" - 12"
- Flanges: 1/2" - 12"
- Valves: 1/2" - 8"
- Bar: 1" - 9"

Tensile Requirements:

Tensile Strength (KSI) = 110
Yield Strength (KSI) = 52.6
To convert KSI to MPA, multiply by 6.895

Chemical Composition %

C	Co	Cr	Fe	Mn	Mo	Ni	P	S	Si	V	W
Max	Max			Max			Max	Max	Max	Max	
0.01	2.5	14.5 - 16.5	4.0 - 7.0	1.0	15.0 - 17.0	BAL	.04	.03	0.08	0.35	3.0 - 4.5

Duplex 2205

(UNS S31803/S32205)

2205 is ferritic-austenitic stainless steel which combines many of the beneficial properties of both ferritic and austenitic steels. The steel has very good pitting and corrosion resistance, and high mechanical strength as a result of the high chromium and molybdenum contents of 2205. It also had good weldability and can be welded using most of the techniques for stainless steels. When correctly welded the heat-affected zone contains sufficient austenite to avoid risk of localized corrosion, as a result of the balanced composition of 2205.

Specifications:

ASTM B790, B815, B182
ASME SB790, SB815, SB182

Typical Applications:

- Heat exchangers, tube & pipe for oil & gas
- Heat exchangers and pipes in desalination plants
- Pressure vessels, pipes, & tanks for various chemicals and chlorides
- Rotors, fans, shafts, and press rolls where high corrosion fatigue is needed

Availability:

- Seamless Pipe: 1/2" - 8"
- Weld Pipe: 1/2" - 12"
- Butt-Weld Fittings: 1/2" - 12"
- Flanges: 1/2" - 12"
- Bar: 1" - 8"

Tensile Requirements:

Tensile Strength (KSI) = 95
Yield Strength (KSI) = 65
To convert KSI to MPA, multiply by 6.895

Chemical Composition %

C	Cb	Fe	Mn	Mo	N	Ni	P	S	Si
Max			Max				Max	Max	Max
0.030	22.0 - 23.0	BAL	2.0	3.00 - 3.50	0.14 - 0.20	4.50 - 6.50	0.030	0.020	1.0

254SMO®

(UNS S31254)

254SMO is an austenitic steel designed for maximum pitting and crevice corrosion resistance. Due to high levels of chromium, molybdenum, and nitrogen, 254SMO is suited for high chlorided environments such as seawater, brackish water, pulp mill bleach plants and other high chloride process streams. 254SMO has been found to be technically adequate and a less costly substitute for nickel based alloys and titanium, in new construction. 254SMO is readily fabricated and welded.

Specifications:

ASTM A312, A403, A182
ASME SA312, SA403, SA182

Typical Applications:

- Seawater handling equipment
- Pulp mill bleach systems
- Tall oil distillation columns and equipment
- Chemical processing equipment
- Food processing equipment
- Desalination equipment
- Flue gas desulfurization scrubbers

Availability:

- Weld Pipe: 1/2" - 12"
- Seamless Pipe: 1/2" - 8"
- Butt-weld Fittings: 3/4" - 12"
- Flanges: 3/4" - 12"
- Bar: 1" - 8"

Tensile Requirements:

Tensile Strength (KSI) = 94
Yield Strength (KSI) = 44
To convert KSI to MPA, multiply by 6.895

Chemical Composition %

C	Cr	Cu	Mn	Mo	N	Ni	P	Si	S
Max			Max				Max	Max	Max
0.02	19.5 - 20.5	0.5 - 1.0	1	6.0 - 6.5	0.18 - 0.22	17.5 - 18.5	0.03	0.80	0.010

Inconel 625

(UNS N06625)

Inconel 625 is a nickel-chromium alloy used for its high strength, excellent fabricability and great corrosion resistance. Service temperatures for Inconel 625 range from cryogenic to 1800°F. The strength of Inconel 625 is derived from the stiffening effect of molybdenum, so that precipitation-hardening treatments are not required. This combination of elements is responsible for superior resistance to a wide range of corrosive environments of unusual severity, as well as high temperature effects such as oxidation and carburization.

Chemical Composition %

C	Cr	Fe	Ni	Al	Ti	Mo	Cb+Ta	Mn	Si	P	S	Co
Max		Max	Min	Max	Max			Max	Max	Max	Max	Max
0.10	20.0-23.0	5.0	58.0	0.40	0.40	8.0-10.00	3.15-4.15	0.50	0.50	0.015	0.015	1.0

Specifications:

ASTM B443, B705, B366, B446, B564
ASME SB443, SB705, SB366, SB446, SB564

Typical Applications:

- Used for structures in contact with seawater and subject to high mechanical stress
- Flue gas scrubber components
- Chimney linings
- Superphosphoric acid production equipment
- Sour gas production tubes
- Offshore industry, marine equipment

Availability:

- Welded Pipe: 1/2" - 8"
- Butt-Weld Fittings: 1/2" - 8"
- Flanges: 1/2" - 8"
- Bar: 1" - 4 1/2"

Tensile Requirements:

Tensile Strength (KSI) = 120 - 150
Yield Strength (KSI) = 60 - 95

AL6XN®

(UNS N08367)

AL6XN is a low carbon, high purity, nitrogen-bearing "super-austenitic" stainless alloy. AL6XN alloy was designed to be a seawater resistant material and has been since proven to be resistant to a broad range of corrosive environments. The low carbon and high nitrogen contents in AL6XN minimize the precipitation of carbides and secondary phases that can occur during welding. AL6XN has improved properties over stainless steel and duplex grades. AL6XN is 50% stronger than stainless and is easily welded.

Chemical Composition %

Cr	Mo	C	P	Mn	Si	N	Ni	S	Cu	Fe
		Max	Max	Max	Max			Max	Max	
20.0-22.0	6.0-7.0	0.03	0.04	2.0	1.0	0.18-0.25	23.5-25.5	0.03	0.75	BAL

Specifications:

ASME SA182, SA240, SA249, SA312, SA479, SB366, SB462, SB564, SB675, SB676, SB688, SB691
ASTM A182, A240, A249, A312, A479, B366, B462, B472, B564, B675, B676, B688, B691, B804

Availability:

- Seamless: 1/2" - 8"
- Butt-Weld Fittings: 1/2" - 12"
- Flanges: 1/2" - 12"
- Bar: 1/2" - 8"

Tensile Requirements:

Tensile Strength (KSI) = 95, Yield Strength (KSI) = 655

Typical Applications:

- Flue gas desulfurization equipment
- Reverse osmosis desalination equipment and pumps
- Chemical process tanks and pipelines
- Seawater heat exchangers
- Tall oil distillation columns and packing
- Offshore oil and gas production equipment
- Pulp bleaching plant washers, vats, press rolls and pipelines
- Salt dryers

Monel

(UNS N04400)

Monel 400 is a nickel-copper alloy that is resistant to sea water and steam at high temperatures. Monel 400 is a solid solution alloy that can be hardened only by cold working. It has high strength and toughness over a wide temperature range, as well as excellent resistance to a range of corrosive environments. While Monel 400 is widely used in many fields, it is especially common in marine and chemical processing. It has great mechanical properties at subzero temperatures and can be used in temperatures up to 1000°F. This nickel alloy is especially to hydrochloric and hydrofluoric acids when they are de-aerated.

Chemical Composition %

Ni	C	Mn	Fe	S	Si	Cu
	Max	Max	Max	Max	Max	
63.0	0.3	2.0	2.5	0.024	0.5	28.0-34.0

Specifications:

ASTM B165, B725, B163, B127, B164, B564, B366
ASME SB127, SB163, SB164, SB165, SB751, SB775, SB366, SB730

Availability:

- Seamless: 1/2" - 8"
- Welded: 8" - 12"
- Butt-Weld Fittings: 1/2" - 12"
- Flanges: 1/2" - 12"
- Pressure Fittings: 1/2" - 2"
- Tubing: 1/4", 3/8", 1/2"
- Valves: 1/2" - 8"
- Bar: 1" - 8"

Typical Applications:

- Marine Engineering
- Chemical and Hydrocarbon processing equipment
- Gasoline and Freshwater tanks
- Crude Petroleum Still
- De-aerating heaters
- Boiler feed water heaters and other heat exchangers
- Valves, pumps, shafts, fittings, and fasteners
- Industrial heat exchangers
- Chlorinated Solvents