

Types 316 (UNS S31600), 316L(S31603), 317 (S31700), and 317L (S31703) are molybdenum-bearing austenitic stainless steels which are more resistant to general corrosion and pitting/crevice corrosion than the conventional chromium-nickel austenitic stainless steels such as Type 304. These alloys also offer higher creep, stress-to-rupture and tensile strength at elevated temperature. In addition to excellent corrosion resistance and strength properties, the Types 316, 316L, 317, and 317L Cr-Ni-Mo alloys also provide the excellent fabricability and formability which are typical of the austenitic stainless steels.

**Specifications**

**ASTM:** A167, A182, A193, A194, A213, A240, A249, A269, A270, A271, A276, A312, A313, A314, A320, A336, A358, A368, A376, A403, A409, A430, A473, A478, A479, A492, A493, A511, A554, A580, A632, A666, A688, A771, A813, A814, A826, F138  
**UNS:** S31600  
**AMS:** 5524, 5573, 5648, 5690, 5696

**Chemical Composition, %**

Element	Percent by Weight			
	Maximum Unless Range is Specified			
	316	316L	317	317L
Carbon	0.08	0.03	0.08	0.03
Manganese	2.00	2.00	2.00	2.00
Silicon	0.75	0.75	0.75	0.75
Chromium	16.00	16.00	18.00	18.00
	18.00	18.00	20.00	20.00
Nickel	10.00	10.00	11.00	11.00
	14.00	14.00	15.00	15.00
Molybdenum	2.00	2.00	3.00	3.00
	3.00	3.00	4.00	4.00
Phosphorus	0.045	0.045	0.045	0.045
Sulfur	0.030	0.030	0.030	0.030
Nitrogen	0.10	0.10	0.10	0.10
Iron	Bal.	Bal.	Bal.	Bal.

**Resistance to Corrosion:** Types 316, 316L, 317 and 317L are more resistant to atmospheric and other mild types of corrosion than Types 302, 304 and 304L. In general, media that do not corrode Types 302, 304, and 304L, will not attack these molybdenum-containing grades. One known exception is highly oxidizing acids such as nitric acid to which the molybdenum-bearing stainless steels are less resistant.

**Features**

- Excellent corrosion resistance
- Higher creep, stress-to-rupture and tensile strength at elevated temperature
- Able to maintain clean surfaces

**Applications**

- Oil & petroleum refining equipment
- Food processing equipment
- Pulp and paper processing equipment
- Soap and photographic handling equipment
- Textile Industry Equipment
- Architectural
- Pharmaceutical processing equipment

**Physical Properties**
**Density: 0.29 lb/in<sup>3</sup> (8.03 g/cm<sup>3</sup>)    Melting Range: 2540-2630°F (1390-1440°C)**
**Modulus of Elasticity in Tension: 29 x 10<sup>6</sup> psi (200 GPa)**
**Modulus of Shear: 11.9 x 10<sup>6</sup> psi (82 GPa)**
**Linear Coefficient of Thermal Expansion**

Temperature Range		Coefficients	
°C	°F	cm/cm·°C	in/in/°F
20-100	62-212	16.5 x 10 <sup>-6</sup>	9.2 x 10 <sup>-6</sup>
20 - 500	68-932	18.2 x 10 <sup>-6</sup>	10.1 x 10 <sup>-6</sup>
20-1000	68-1832	19.5 x 10 <sup>-6</sup>	10.8 x 10 <sup>-6</sup>

**Thermal Conductivity**

Temperature Range			
°C	°F	W/m·K	Btu-in/hr-ft <sup>2</sup> -°F
20-100	68-212	14.6	100.8

**Electrical Resistivity (Annealed Condition)**

Type	Value at 68°F (20°C)	
	Microhm-in	Microhm-cm.
316	29.1	74

## Specific Heat

Temperature Range				
°C	°F		J/kg°K	Btu/lb/°F
20	68		450	0.108
93	200		485	0.116

## Magnetic Permeability

**H/M Annealed:** 1.02 Max @ 200 H

## Mechanical Properties

Minimum mechanical properties for annealed Types 316, 316L, 317 and 317L austenitic stainless steel plate, sheet and strip as required by ASTM specifications A240 and ASME specification SA-240, are shown below.

### Minimum Room Temperature Mechanical Properties, ASTM A240 and A666 Specifications

Property	Type 316 (S31600)	Type 316L (S31603)	Type 317 (S31700)	Type 317L (S31703)
Yield Strength 0.2% Offset psi mpa	30,000 205	25,000 170	30,000 205	30,000 205
Ultimate Tensile Strength psi mpa	75,000 515	70,000 485	75,000 515	75,000 515
Percent Elongation in 2 in. or 51mm	40	40	35	40
Hardness, Max. Brinell RB	217 95	217 95	217 95	217 95