



Technical Data

Ferguson Metals, Inc. ♦ Hamilton, Ohio

Stainless Steels

Chromium-Nickel-Molybdenum

Types 316 (S31600),

316L (S31603), 317 (S31700),

317L (S31703)

GENERAL PROPERTIES

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.

Applications for Types 316 and 316L alloys include acetic acid compounds, brandy vats, corn products refining equipment, fasteners, kettles for cooking ketchup, pharmaceutical processing equipment, phosphate industry parts, photographic film processing equipment, pitting-corrosion resistance, pulp and paper processing equipment, smokestacks, textile finishing equipment, textile mill kiers, water softener tanks, wire cloth and screens (industrial) and yeast tubes. Applications for Type 317 alloy includes dyeing equipment, flue gas desulfurization units, ink manufacturing equipment, pitting-corrosion resistance, pulp and paper processing equipment.

Types 316, 316L, 317 and 317L are available in sheet, strip and plate to ASTM A240 and ASME SA-240 and other pertinent specifications.

CHEMICAL COMPOSITION

Represented by ASTM A240 and ASME SA-240

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

PHYSICAL PROPERTIES

Melting Range:	2540-2630°F (1390-1440°C)
Density	0.29 lb/in ³ (8.027 g/cm ³)
Modulus of Elasticity in Tension	29 x 10 ⁶ psi (200 GPa)
Modulus of Shear:	11.9 x 10 ⁶ psi (82 GPa)

LINEAR COEFFICIENT OF THERMAL EXPANSION

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

THERMAL CONDUCTIVITY

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

The overall heat transfer coefficient of metals is determined by factors in addition to thermal conductivity of the metal. The ability of Types 302, 304 and 304L to maintain clean surfaces often allows better heat transfer than other metals having higher thermal conductivity.

SPECIFIC HEAT

°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

ELECTRICAL RESISTIVITY

Type	Value at 68°F (20°C)	
	Microhm-in.	Microhm-cm
316	29.1	74.0

MECHANICAL PROPERTIES

Room Temperature Tensile 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 MECHANICAL PROPERTIES REQUIRED BY, ASTM A240 AND ASME SA-240

Property	Type 316 (S31600)	Type 316L (S31603)	Type 317 (S31700)	Type 317L (S31703)
Yield Strength, 0.2% Offset				
psi	30,000	25,000	30,000	30,000
MPa	205	170	205	205
Ultimate Tensile Strength,				
psi	75,000	70,000	75,000	75,000
MPa	515	485	515	515
Percent Elongation in 2 in. or 51 mm	40.0	40.0	35.0	40.0
Hardness, Max.,				
Brinell	217	217	217	217
RB	95	95	95	95