Specification Sheet: 317LMN
(UNS S31726) W. Nr. 1.4439

A Corrosion Resistant Austenitic Stainless Steel with a High Molybdenum and Nitrogen Content Developed for Use in Chloride Containing Environments

Alloy 317LMN (UNS S31726) is an austenitic chromium-nickel-molybdenum stainless steel with corrosion resistance superior to 316L and 317L. The higher molybdenum content, combined with an addition of nitrogen, provides the alloy with its enhanced corrosion resistance, especially in acidic chloride containing service. The combination of molybdenum and nitrogen also improves the alloys resistance to pitting and crevice corrosion.

The nitrogen content of Alloy 317LMN acts as a strengthening agent giving it a higher yield strength than 317L. Alloy 317LMN is also a low carbon grade which enables it to be used in the as-welded condition free from chromium carbide precipitation on the grain boundaries.

Alloy 317LMN is non-magnetic in the annealed condition. It cannot be hardened by heat treatment, only by cold working. The alloy can be easily welded and processed by standard shop fabrication practices.

Applications

- Air Pollution Control — flue gas desulfurization systems, stack liners, absorbers, ducts, dampers, and fans
- Chemical and Petrochemical Processing
- Food and Beverage Processing
- Pharmaceutical Equipment

Standards

ASTM ..... A 240
ASME ..... SA 240

Chemical Analysis

Weight % (all values are maximum unless a range is otherwise indicated)

Chromium	17.0 min.–20.0 max.	**Manganese**	2.00
Nickel	13.5 min.–17.5 max.	**Phosphorus**	0.045
Molybdenum	4.0 min.–5.0 max.	**Sulfur**	0.030
Nitrogen	0.10 min.–0.20 max.	**Silicon**	0.75
Carbon	0.030	**Iron**	Balance

Physical Properties

Density
0.290 lbs/in^3
8.0 g/cm^3

Specific Heat
0.12 BTU/lb-°F (32–212°F)
502 J/kg-°K (0–100°C)

Modulus of Elasticity
29.0 x 10^6 psi
200 GPa

Thermal Conductivity 212°F (100°C)
8.7 BTU/hr/ft^2/ft/°F
1.26 W/m-°K

Melting Range
2540–2630°F
1393–1443°C

Electrical Resistivity
33.5 Microhm-in at 68°F
85.1 Microhm-cm at 20°C

Mean Coefficient of Thermal Expansion

Temperature Range			
°F	°C	in/in °F	cm/cm °C
68–212	20–100	8.9 x 10^{-6}	16.03 x 10^{-6}

Mechanical Properties

Typical Values at 68°F (20°C)

Yield Strength 0.2% Offset		Ultimate Tensile Strength		Elongation in 2 in.	Hardness	Reduction in Area
psi	(MPa)	psi	(MPa)	%		%
35,000	205	80,000	550	40	96 Rockwell B	69

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Corrosion Resistance

The higher molybdenum and nitrogen content of Alloy 317LMN assures superior general and localized corrosion resistance in most media when compared with 304/304L, 316/316L and even 317L stainless steels. Environments that don't attack 304/304L stainless steel will normally not corrode 317LMN. One exception, however, are strongly oxidizing acids such as nitric acid. Alloys that contain molybdenum generally do not perform as well in these environments.

Alloy 317LMN has excellent corrosion resistance in a wide range of chemicals. It resists attack in sulfuric acid, hydrochloric acid, acidic chlorine and phosphoric acid. It is used in handling hot organic and fatty acids often present in food and pharmaceutical processing applications.

Because of its low carbon content, Alloy 317LMN should be utilized when it will be exposed to temperatures in the chromium carbide precipitation range of 800–1500°F (427–816°C). The higher nitrogen content of 317LMN further retards the precipitation of sigma phase as well as carbides.

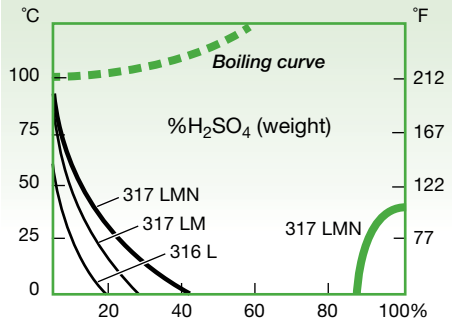
In general, austenitic stainless steels are subject to chloride stress corrosion cracking in halide service. Although 317LMN is somewhat more resistant to stress corrosion cracking than 304/304L stainless steels, because of its higher molybdenum content, it is still susceptible.

The higher chromium, molybdenum and nitrogen content of 317LMN enhance its ability to resist pitting and crevice corrosion in the presence of chlorides and other halides. The Pitting Resistance Equivalent including Nitrogen number (PREN) is a relative measure of pitting resistance. The following chart offers a comparison Alloy 317LMN and other austenitic stainless steels.

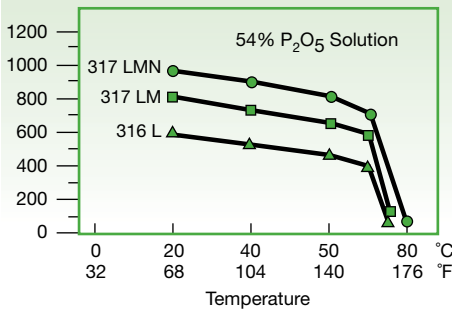
ALLOY	PRE	ALLOY	PRE
316	25	317LMN	38
317L	30	SSC-6MO	48
317LM	34	625	52
904L	36	276	69

PRE = *Cr + 3.3Mo + 30N*

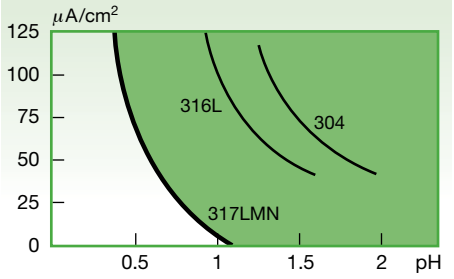
General Corrosion Resistance



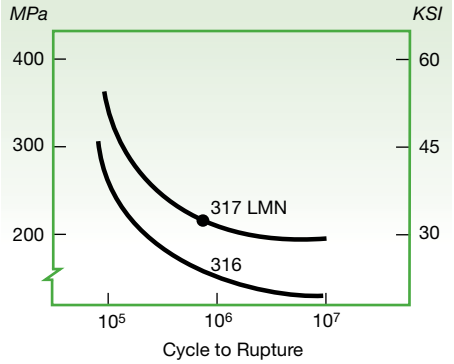
Threshold Chloride Concentration *(ppm)*



Localized Resistance. Crevice corrosion resistance in a 30g/l Na Cl 20°C (68°F) solution.



Fatigue Corrosion Resistance



Fabrication Data

Alloy 317LMN can be easily welded and processed by standard shop fabrication practices.

Hot Forming

Working temperatures of 1652–2102°F (900–1150°C) are recommended for hot working processes. Do not work this alloy below 1742°F (950°C). If the final forming temperature falls below this threshold, a solution anneal of 1976–2156°F (1080–1180°C) is necessary. Rapid quenching is required.

Cold Forming

The alloy is quite ductile and forms easily. The addition of molybdenum and nitrogen implies more powerful processing equipment may be necessary when compared with the standard 304/304L grades.

Welding

Alloy 317LMN can be readily welded by most standard processes including TIG/GTAW, MIG/GMAW, MMAW and SAW. A post weld heat treatment is not necessary.

Machining

The cold work hardening rate of Alloy 317LMN makes it less machinable than 410 stainless steel. The table below provides relevant machining data.

Operation	Tool	Lubrication	CONDITIONS					
			Depth-mm	Depth-in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Turning	High Speed Steel	Cutting Oil	6	.23	0.5	.019	11–16	36–52
			3	.11	0.4	.016	18–23	59–75
			1	.04	0.2	.008	25–30	82–98
	Carbide	Dry or Cutting Oil	6	.23	0.5	.019	70–80	230–262
			3	.11	0.4	.016	85–95	279–313
			1	.04	0.2	.008	100–110	328–361
			Depth of cut-mm	Depth of cut-in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Cutting	High Speed Steel	Cutting Oil	1.5	.06	0.03–0.05	.0012–.0020	16–21	52–69
			3	.11	0.04–0.06	.0016–.0024	17–22	56–72
			6	.23	0.05–0.07	.0020–.0027	18–23	59–75
			Drill ø mm	Drill ø in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Drilling	High Speed Steel	Cutting Oil	1.5	.06	0.02–0.03	.0007–.0012	10–14	33–46
			3	.11	0.05–0.06	.0020–.0024	12–16	39–52
			6	.23	0.08–0.09	.0031–.0035	12–16	39–52
			12	.48	0.09–0.10	.0035–.0039	12–16	39–52
					Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Milling Profiling	High Speed Steel	Cutting Oil			0.05–0.10	.002–.004	10–20	33–66

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