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PRODUCT DATA SHEET

NITRONIC[?] 50, 50HS UNS S20910

Stainless Steel

NITRONIC 50 is a high strength austenitic stainless steel with excellent corrosion resistance, used where grades 316 and 316L are only marginal. **NITRONIC 50HS** is a higher strength version, available only in heavy section bar.

Chemical Composition

Element	%	Element	%
Chromium	20.5 – 23.5%	Nitrogen	0.2 – 0.4%
Nickel	11.5 – 13.5%	Niobium	0.1 – 0.3%
Molybdenum	1.5 – 3.0%	Vanadium	0.1 – 0.3%
Manganese	4.0 – 6.0%	Carbon	0.06% max
Iron	balance		

Typical Applications Pumps, valves and fittings, fasteners, cables, chains, screens & wire cloth, marine hardware, boat shafting, non magnetic fasteners & chains, heat exchanger parts, in the petroleum, petrochemical, chemical, pulp and paper, textile, food processing & marine industries.

Specified Minimum Mechanical Properties, annealed and high strength bar

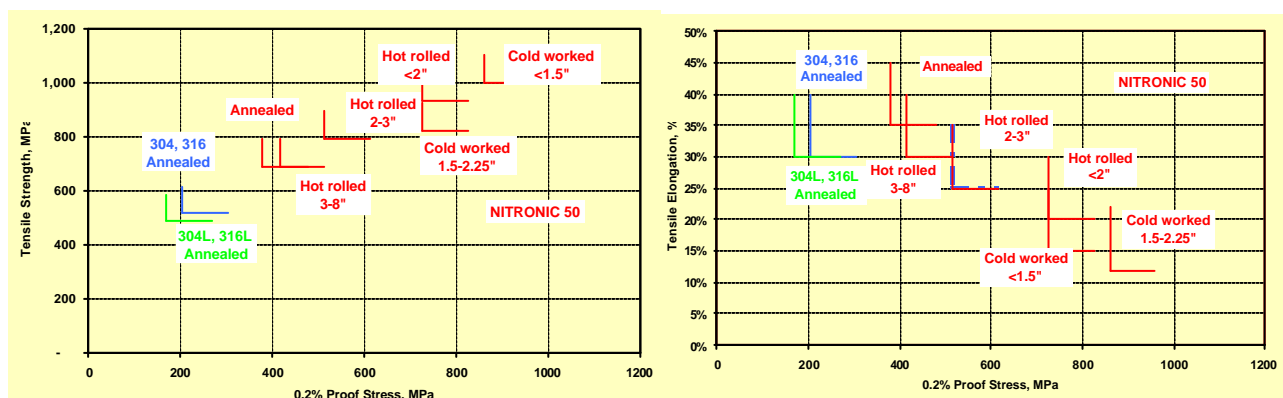
Property	Unit	NITRONIC 50		NITRONIC 50HS	
		Up to 171 mm to 170 mm diameter	171 mm to 258mm diameter	63 mm to 152 mm diameter	153 mm to 216mm diameter to 242mm diameter
0.2% Proof Stress	MPa	380	345	760	620
Tensile Strength	MPa	690	655	895	860
Elongation	% in 2"	35	20	15	20

All NITRONIC 50 and 50HS is supplied with a test certificate proving compliance with these minimum mechanical properties.

Description NITRONIC 50 is an austenitic stainless steel with an outstanding combination of strength, toughness and corrosion resistance. It can be supplied in the annealed condition, with yield strength over 50% higher than grades 316 and 316L, with better corrosion resistance. It is also available as NITRONIC 50HS with high strength, attained by special processing techniques. The superior strength of NITRONIC 50HS is size dependent, approaching that of annealed bars at diameters of over 75 mm, but at sizes up to 32 mm a yield strength of 895 MPa can be obtained - about four times the strength of grade 316.

Austral Wright Metals can supply Nitronic 50 as bar, wire, forgings, forging billets and precision balanced shafts. Nitronic 50HS is available as bar and precision balanced shafts.

Comparison of tensile properties of bars of NITRONIC 50, 50HS and grades 304(L), 316(L) (ASTM A479)



The technical advice and recommendations made in this Product Data Sheet should not be relied on or acted upon without conducting your own further investigations, including corrosion exposure tests where needed. Please consult current editions of standards for design properties. Austral Wright Metals assumes no liability in connection with the information in this Product Data Sheet.

Corrosion Resistance: The high chromium and molybdenum contents of NITRONIC 50 & 50HS give outstanding corrosion resistance, superior to grades 316 and 316L in many media, and rivalling nickel alloys in seawater. For most applications, the 1065°C annealed condition provides adequate corrosion resistance and a higher strength level. In very corrosive media, or where the material is to be used in the as welded condition, the 1120°C condition should be specified. NITRONIC 50HS bars are useful for applications such as shafts & bolts, but do not quite have the corrosion resistance of the annealed condition in all environments.

After exposure to 5% NaCl fog at 35°C for 500 hours, and after exposure to marine atmospheres 24 m from the high water line at Kure Beach, USA, for 7½ years, no change was visible in NITRONIC 50. Similar exposure to marine atmospheres produces light staining on grade 316 stainless steel.

NITRONIC 50 has given satisfactory service in challenging corrosion conditions such as pump parts for sodium carbamate (an intermediate in the production of urea), in sour gas service for oilfield equipment, in food handling equipment and in boat shafting used in seawater.

As with other austenitic stainless steels, NITRONIC 50 may undergo stress corrosion cracking in hot chloride environments. Testing in boiling 42% magnesium chloride solution, a very accelerated test, shows NITRONIC 50 is between grades 304 and 316 in cracking resistance. There is little difference in susceptibility whether in the annealed, high strength or cold drawn conditions.

Fabrication: The fabricating equipment and techniques used for austenitic stainless steels can be used. In-process annealing should be done at 1120°C. Cooling practices are the same as those required for grade 304. Forging temperatures of 1175°C to 1230°C are recommended.

Machinability: Slower speeds and higher feeds are required compared to austenitic stainless steels. NITRONIC 50 can be machined at approximately half the cutting rate used for grades 304 and 316. Heavy machines and tools are needed. Tools should not be allowed to slide over the alloy, & cutting action should be initiated as soon as possible. The alloy gives good surface finish.

Welding: NITRONIC 50 has good welding characteristics, similar to austenitic stainless steels. Any of the usual arc welding processes can be used. Preheat or post weld annealing are not generally needed. To avoid weld metal hot cracking, choose weld filler metal to give a ferrite number of about 6. Retaining the low magnetic permeability of parent metal requires post weld heat treatment to remove the ferrite.

NITRONIC 50W welding consumables are available to give welds of comparable strength and corrosion resistance to the base metal. Sound weld joints of lower strength and corrosion resistance may be made using conventional austenitic filler metals such as grades 308(L) and 309(L).

Physical Properties

Property	at	value	Unit	Property	at	value	Unit
Density		7,800	Kg / m ³	Coefficient	21 - 93 °C	16.2	X 10 ⁻⁶ / °C
Modulus of Elasticity	Tension	193.1	GPa	of Thermal	21 - 204°C	16.6	X 10 ⁻⁶ / °C
	Torsion	71.7	GPa	Expansion	21 - 540°C	18.4	X 10 ⁻⁶ / °C
Poisson's Ratio		0.259		Thermal	150°C	15.6	W/m. °K
Electrical Resistivity	21°C	0.82	microhm.m	Conductivity	315°C	17.9	W/m. °K

NITRONIC 50 is non-magnetic, even when severely cold worked (magnetic permeability 1.004 or less).

NITRONIC 50 is covered by the following specifications, as grade XM-19 (UNS S20910)

Specification	Title
ASTM A240	Heat-resisting chromium & chromium-nickel stainless steel plate, sheet & strip for pressure vessels
ASTM A479	Stainless steel bars & shapes for use in boilers & other pressure vessels
ASTM A276	Stainless steel bars & shapes
ASTM A580	Stainless steel wire
ASTM A182	Forged or rolled alloy -steel pipe flanges, forged fittings, & valves & parts for high temperature service
ASTM A193	Alloy steel & stainless steel bolting materials for high temperature service (grade B8R)
ASTM A194	Carbon & alloy steel nuts for bolts for high pressure & high temperature service (grade 8R)
ASTM A249	Welded austenitic steel boiler, superheater, heat-exchanger, & condenser tubes
ASTM A269	Seamless & welded austenitic stainless steel tubing for general service
ASTM A312	Seamless & welded austenitic stainless steel pipes
ASTM A351	Pressure containing castings of austenitic & duplex stainless steels, (grade CG6MMN)
ASTM A403	Wrought austenitic stainless steel piping fittings
ASTM A358	Electric fusion welded austenitic chromium nickel alloy steel pipe for high temperature service
AMS 5764B	Bars, forgings, extrusions & rings, 22Cr 12.5Ni 5Mn 2.2Mo 0.20Cb 0.30N 0.20V, solution heat treated
ASME	Design allowables (listed in Table UHA-23 of section VIII Division 1)
ASME	Design values (listed in section III, Division 1, appendices)