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PRODUCT DATA SHEET

Grades 410, 410L, 410S

Stainless Steels

UNS S41000, S41003, 41008

Stainless steel grade 410 is a medium carbon martensitic stainless steel of intermediate chromium content. It can be hardened and tempered by heat treatment to high strength. It has good corrosion resistance compared to carbon steel. It is mainly used for its high strength and wear resistance, often at moderately elevated temperatures.

Two variations of the base grade 410 are also available: grade 410L has increased formability and weldability, and grade 410S is stabilised with niobium for the same purpose.

Chemical Composition (ASTM A240, Plate, sheet & strip)

Grade	UNS	Chromium	Nickel	Carbon	Manganese	Silicon	Sulphur	Phosphorus	Others
410	S41000	Min	11.50 %	-	-	-	-	-	-
		Max	13.50 %	0.75 %	0.15 %	1.00 %	1.00 %	0.030 %	0.040 %
410L	S41003	Min	10.50 %	-	-	-	-	-	N
		Max	12.50 %	1.50 %	0.03 %	1.50 %	1.00 %	0.030 %	0.040 %
410S	S41008	Min	11.50 %	-	-	-	-	-	Nb = 9(C+N)
		Max	13.50 %	0.60 %	0.08 %	1.00 %	1.00 %	0.030 %	0.040 %

Mechanical Properties (ASTM A240 Plate, sheet & strip)

Grade		0.2% Proof Stress MPa	Tensile Strength MPa	Elongation %	Hardness HRB	Hardness HB	(Hardness HV)
410	Min	205	450	20.0			
	Max				96	217	(210)
410L	Min	275	455	18		223	(223)
410S	Min	205	415	22.0	89	183	(210)

Equivalent Specifications

Steel	Country	Specification	Equivalence to ASTM A240
410	USA	ASTM A240	Exact
410	Australia	AS1449	Exact
X12Cr13	1.4006	Europe	Mechanical properties differ
SUS410	Japan	JIS G4305	Near
410L	USA	ASTM A240	Exact
410L	Australia	AS1449	No equivalent
X2Cr12	1.4003	Europe	Mechanical properties differ
SUS410L	Japan	JIS G4305	Mechanical properties differ
410S	USA	ASTM A240	Exact
410S	Australia	AS1449	Exact
	Europe	EN10088	No equivalent
SUS410S	Japan	JIS G4305	Exact

Typical Applications Knives, surgical instruments, high strength bolts, spindles, nozzles, shafts, impellers, springs, valves, compressor & turbine wheels.

Description Martensitic stainless steels are selected when good tensile strength, creep and fatigue strength are needed, in combination with moderate corrosion resistance.

Grade 410 is a medium carbon martensitic stainless steel containing about 11% chromium, the minimum amount for the formation of a passive surface film on stainless steels. It can be heat treated to high strength levels with good ductility. The high chromium content gives high hardenability, and heavy sections can be through hardened.

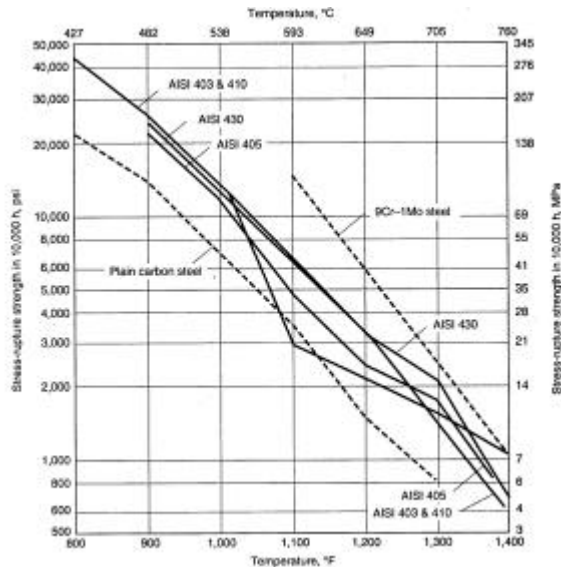
Austral Wright Metals can supply these grades as plate, sheet and strip, bar, rod, seamless and welded tube, forgings and forging billet, wire, high strength bolts, and as castings (grade CA-15).

Corrosion Resistance: Grade 410 will maintain a bright and shiny appearance in moderate atmospheres, but will tarnish in industrial and marine environments. The surface rust film developed is unsightly, but does not indicate rapid corrosion.

Grade 410 has good general corrosion in most potable waters, but if chlorides are present pitting and crevice corrosion will occur. Pitting will also occur in high carbonate waters that are low in oxygen. Stress corrosion is rare in chloride solutions, but may occur with exposure to hydrogen and caustic soda, especially in the hardened condition.

Heat Resistance: Grade 410 has good resistance to scaling in intermittent service up to about 810°C, and to about 700°C in continuous service. Susceptibility to 475°C embrittlement is minimal, but sigma phase may form after long exposures at high temperature, with loss of ductility.

410 is frequently used in applications requiring strength at high temperatures, and the stress-rupture strength is a useful improvement on carbon steel:



10,000 hour rupture strengths of 400 series stainless steels. (F.J.Claus, Stainless Steels, Engineer's guide to high temperature materials, p86-128, 1969, Addison Wesley)

Pressure Vessels AS1210-1997
Pressure Vessels specifically allows the use of grades 410, as plate, seamless and welded pipe and tube, and bar, and 410S as plate.

Cryogenic Properties: Grade 410 becomes embrittled at temperatures below about 0°C, and is not recommended for use at cryogenic temperatures.

Fabrication: Grade 410 can be fabricated by all the methods used for carbon steels.

Machinability: Martensitic grades of stainless steel are always machined in the annealed condition. Grade 410 is fairly readily machinable, and is rated about 60% of ASTM B1212.

Welding: Grade 410 is more difficult to weld than austenitic stainless steels, due to high hardenability. Appropriate preheat and welding procedures are critical for success. The weld metal and HAZ may undergo hydrogen induced cold cracking. The base grade 410 is most difficult to weld, and variants 410L and 410S have been developed to improve weldability. Grade 410L is ferritic in structure, and behaves like grade 409 in welding.

AS1554.6:1994 specifies grade 309 as prequalified welding consumables for 410. Electrodes to AWS A5.4 E410-XX and A5.22 E410T-X, and filler metal AWS A5.9 ER410 may be used for a weld metal of matching strength, but precautions must be taken to avoid hydrogen embrittlement.

Heat treatment: The heat treatment of 410 is very similar to that of carbon and low alloy steels.

Physical Properties

Property	Range	Value	Unit	Property	Range	Value	Unit
Density		7,800	kg/m ³	Coefficient of Thermal Expansion	0 – 100°C	9.9	X 10 ⁻⁶ /°C
Modulus of Elasticity	Tension	200	GPa		0 – 315°C	11.4	
Poisson's Ratio		0.30			0 – 540°C	11.6	
Electrical Resistivity	20°C	570	n? .m	Thermal Conductivity	100°C	24.9	W/m.°C
Magnetic Permeability	Approx	700 – 1000			500°C	28.7	
Melting Range		1480 - 1530	°C	Specific Heat	0 – 100°C	460	J/kg.°K