



CORROSION MATERIALS

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ISO 9001:2015 Certified
ISO Registered Since 1993

Description

Alloy 600 is a nickel-chromium-iron, solid solution strengthened alloy used for applications that require corrosion and elevated temperature resistance. Service temperatures for alloy 600 can be from cryogenic to 2000°F. This alloy also has good workability, weldability and high strength.

Industries and Applications

The unique properties of alloy 600 make it useful in various applications across several industries. Chemical process industry applications include heaters, condensers and trays. Heat-treat industry applications include muffles, retorts, baskets and other furnace fixtures. Aerospace industry applications include exhaust liners, turbine seals and air-frame components. Alloy 600 is also used in the nuclear industry because of its resistance to corrosion in high purity water.

Resistance to Corrosion

With 72% minimum nickel, this alloy is resistant to many organic and inorganic compounds and also offers good corrosion resistance in reducing conditions. The high nickel content lowers the chances for stress corrosion cracking for this alloy in the annealed condition. The high nickel content also improves resistance to carburizing, nitriding and thermal fatigue, while maintaining an austenitic structure so it retains ductility. Increased chromium in the alloy offers high temperature resistance to sulfur compounds as well as resistance to oxidizing compounds at elevated temperatures or in corrosive media. Alloy 600 has excellent resistance to alkalis and is one of the few materials suitable for use in strong solutions of magnesium chloride at elevated temperatures. Typical corrosion in $MgCl_2$ is roughly 1 mpy. When applicable, material for severe service should be fully stress relieved prior to use.

Fabrication and Heat Treatment

Alloy 600 can be hot or cold formed using typical processes. Hot working should be performed between 1600°F and 2250°F, avoiding any work between 1200°F and 1600°F as the ductility decreases in this temperature range. The cold work hardening rate is less than 304 stainless steel yet higher than mild steel. Welding alloy 600 can be achieved via shielded metal-arc welding using AWS ENiCrFe-3 electrode. Filler metal AWS ERNiCr-3 can be used when TIG and MIG welding. Alloy 600 is slightly more machinable compared to 304 stainless steel and should be performed with tooling large enough to handle the loads. Alloy 600 machining requires heavy-duty equipment along with sharp tooling and proper cutting fluids. Annealing of alloy 600 without excessive grain growth can be performed at 1850°F for 15 minutes at temperature. Fine grain material typically has better corrosion resistance and higher tensile, fatigue and impact properties.

TECHNICAL DATA SHEET

ALLOY 600

UNS N06600 / W.Nr. 2.4816

Chemical Composition (%)

(Ni+Co) Nickel + Cobalt	72.0 min
(Cr) Chromium	14.0 to 17.0
(Fe) Iron	6.00 to 10.00
(Mn) Manganese	1.00 max
(Si) Silicon	0.50 max
(Cu) Copper	0.50 max
(C) Carbon	0.15 max
(S) Sulfur	0.015 max

Physical Properties

Density @ Room Temp.	0.304 lb/in. ³
Melting Range	2470°F to 2575°F
Specific Heat @ 70°F	0.103 Btu/lb•°F
Electrical Resistivity	620 Ω •circ•mil/ft
Elastic Modulus @ Room Temp.	31 x 10 ³ ksi
Shear Modulus @ Room Temp.	11.72 x 10 ³ ksi
Thermal Conductivity @ 70°F	103 Btu•in/ft ² •h•°F
Coefficient of Thermal Expansion @ 70°F to 200°F	7.4 μ in/in•°F
Magnetic Permeability	1.010 @ 200 oersted
Curie Temperature	-192°F

Modulus of Elasticity

Temperature (°F)	Youngs Modulus (10 ³ ksi)	Shear Modulus (10 ³ ksi)
72	31.1	11.72
400	29.7	11.32
800	27.8	10.68
1000	26.7	10.29
1400	24.3	9.24
1800	21.0	7.85

The information contained in this technical data sheet is intended to be used as a guide and may be revised at any time without prior notice. The information is believed to be reliable and accurate, however Corrosion Materials does not make any warranty or assume any legal liability with respect to the accuracy, completeness or usefulness of the information.

Mechanical Properties¹

Product Form	Condition	Tensile (min. ksi)	0.2% Yield (min. ksi)	Elongation (min. %)	Hardness (HRB) ²
Bar	Annealed (hot or cold worked)	80	35	30	65 to 90
Seamless Pipe/Tube	Annealed (hot worked)	75 to 80	25 to 30	35	65 to 90
	Annealed (cold worked)	80	30 to 35	30 to 35	
Welded Pipe/Tube	Annealed	80	35	30	65 to 90

¹ Size dependent for properties with range listed ² Typical hardness, no requirement per ASTM/ASME specification. NACE MR0103 hardness is 35HRC max

100 hour Gas Carburization Tests | Weight Gain, mg/cm²

Alloy	Hydrogen + 2% Methane at 1700 °F	Hydrogen + 2% Methane + 5% Ar at 2000 °F
Alloy 600	2.66	12.30
Alloy 800HT®	4.94	21.58
330 Stainless Steel	6.42	24.00

Corrosion Rates in Sulfuric Acid

H ₂ SO ₄ % Concentration	Corrosion Rate at Room Temp. (mpy)	Corrosion Rate at Boiling (mpy)
10	3.2	135
20	2.0	186
30	2.5	216
40	1.8	700
60	1.9	-
80	22.3	-
98	7.4	-

Thermal Properties

Temperature (°F)	Linear Expansion (μin./in. • °F)	Thermal Conductivity (Btu·in/ft ² ·h•°F)
Room Temp.	5.8	103
200	7.4	109
400	7.7	121
600	7.9	133
1000	8.4	158
1400	8.9	186
1800	9.3	-

Applicable Specifications

Form ¹	ASTM	ASME	Other
Bar	B166, B564 ²	SB166, SB564 ²	AMS 5665 ³
Seamless Tube & Pipe	B167	SB167	-
Welded Tube	B516	SB516	-
Welded Pipe ⁴	B517	SB517	-

¹All Material to be supplied in the annealed condition. ²Dual certified to ASTM B564 & ASME SB564 for product 3.500" diameter and larger. ³Chemistry only.

⁴All welded pipe ≥6.000" X-Ray inspected per ASME Section VIII, Division 1, #UW-51.

Please contact Corrosion Materials for a complete list of items available from our extensive inventory, as well as our value-added processing services.

We supply a complete range of items in many alloys, including C-276, 22, B-2, B-3®, 200/201, 400, 405, K-500, 625, 600, 800H/HT®, 20, F255, 6B, Titanium Gr. 2 and Titanium Gr. 5.

Our machine shop, welding shop and processing departments are equipped with state-of-the-art manufacturing equipment allowing Corrosion Materials the ability to provide the service you desire along with the economic and technical advantages you need and deserve.

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