

High Performance Nickel Based Corrosion Resistant Alloy



HPAlloy C-276

October 2011

HPAlloy C-276 Product Description

Excellent Resistance to Corrosion
Alloy C-276 is a nickel-molybdenumchromium wrought alloy that is generally considered a versatile corrosion-resistant alloy. Alloy C-276 is an improved wrought version of alloy C in that it usually doesn't need to be solution heat-treated after welding and has

vastly improved fabricability. This alloy resists the formation of grainboundary precipitates in the weld heat-affected zone, thus making it suitable for most chemical process applications in the as-welded condition.

High Performance Alloys can make hot rolled, cold worked, & strain hardened high performance stainless steel bars inhouse now. Ask for our GFM Bulletin for more information about our bar processing capabilities. We have expanded to enhance product availability. HPA also does a full line of high strength nickel based alloys.

Nominal Chemistry

Ni	Co	Cr	Mo	W	Fe	Si	Mn	C	V	P	S
Bal.	2.5	14.5-15.0	3.0-4.5	4.0-7.0	0.08	1.0	0.01	0.035	0.025	0.010	
	Max	16.5	17.0			Max	Max	Max	Max	Max	Max

Typical Mechanicals					
Properties	UTS	0.2% YS	Elon.	R/A	Hardness
Condition	(Ksi)	(Ksi)	(%)	(%)	(Rockwell)
Annealed	116	57	47	70	B 91
CWA Level 2	142	126	31	67	C 28

Properties & General Data

Alloy C-276 has excellent resistance to localized corrosion and to both oxidizing and reducing media. Because of its versatility, alloy C-276 can be used where "upset" conditions are likely to occur or in multipurpose plants.

Alloy C-276 has excellent resistance to a wide variety of chemical process environments, including strong oxidizers such as ferric and cupric chlorides, hot contaminated media (organic and inorganic), chlorine, formic and acetic acids, acetic anhydride, and seawater and brine solutions. It is used in flue gas desulfurization systems because of its excellent resistance to sulfur compounds and chloride ions encountered in most scrubbers. Alloy C-276 has excellent resistance to pitting, stress-corrosion cracking, and oxidizing atmospheres up to 1900F (1038C). It is also one of the few materials that withstands the corrosive effects of wet chlorine gas, hypochlorite and chlorine dioxide.

Questions?? Call (800)HPALLOY

- Density 75°C 0.285 lb/in
- Specific Gravity 7.88
- Thermal Expansion Coefficient (70 to 200°F)
9.0X10⁻⁶ in/in/Deg F
- Electrical Resistivity (68°F) 492 Ohms/ cir mil ft
- Tensile Modulus of Elasticity 28x10⁶ psi
- Torsional Modulus of Elasticity 10x10⁶ psi

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Fabrication and Welding Data

Fabricated by a Variety of Methods

Alloy C-276 can be forged, hot-upset and impact extruded. Although the alloy tends to work-harden, it can be successfully deep-drawn, spun, press formed or punched. All of the common methods of welding can be used to weld alloy C-276, although the oxyacetylene and submerged arc processes are not recommended when the fabricated item is intended for use in corrosion service. Special precautions should be taken to avoid excessive heat in-put.

Available in Wrought Form

Alloy C-276 is available in the form of plate, sheet, strip, billet, bar, wire, covered electrodes, pipe and tubing.

Heat-Treatment

Wrought forms of alloy C-276 are furnished in the solution heat-treated condition unless otherwise specified. Alloy C-276 is normally solution heat-treated at 20500F (11 210C) and rapid quenched. Parts which have been hot-formed should be solution heat-treated prior to final fabrication or installation, if possible.

ASME Boiler and Pressure Vessel Code

Alloy C-276 plate, sheet, strip, bar, tubing and pipe are covered by ASME specifications SB-574, SB-575, SB-619, SB-622 and SB-626 under UNS number N10276.

Physical Property	Temp., °F	British Units	Temp., °C	Metric Units
Density	72	0.321 lb./in ³	22	8.89 g/cm ³
Melting Range	2415-2500	.	1323-1371	
Electrical Resistivity	75	51 microhm-in.	24	1.30 microhm-m
Mean coefficient of Thermal Expansion	75-200	6.2 microinches/in.-°F	24-93	11.2 x 10 ⁻⁶ m/m•K
	75-400	6.7 microinches/in.-°F	24-204	12.0 x 10 ⁻⁶ m/m•K
	75-600	7.1 microinches/in.-°F	24-316	12.8 x 10 ⁻⁶ m/m•K
	75-800	7.3 microinches/in.-°F	24-427	13.2 x 10 ⁻⁶ m/m•K
	75-1000	7.4 microinches/in.-°F	24-538	13.4 x 10 ⁻⁶ m/m•K
Thermal conductivity	-270	50 Btu-in./ft. ² -hr.-°F	-168	7.2 W/m•K
	-100	60 Btu-in./ft. ² -hr.-°F	-73	8.6 W/m•K
	0	65 Btu-in./ft. ² -hr.-°F	-18	9.4 W/m•K
	100	71 Btu-in./ft. ² -hr.-°F	38	10.2 W/m•K
	200	77 Btu-in./ft. ² -hr.-°F	93	11.1 W/m•K
	400	90 Btu-in./ft. ² -hr.-°F	204	13.0 W/m•K
	600	104 Btu-in./ft. ² -hr.-°F	316	15.0 W/m•K
	800	117 Btu-in./ft. ² -hr.-°F	427	16.9 W/m•K
	1000	132 Btu-in./ft. ² -hr.-°F	538	19.0 W/m•K

Some typical applications include equipment components in chemical and petrochemical organic chloride processes and processes utilizing halide or acid catalysts. Other industry applications are pulp and paper (digesters and bleach areas), scrubbers and ducting for flue gas desulfurization, pharmaceutical and food processing equipment.

Alloy C-276 is a nickel-chromium-molybdenum alloy with universal corrosion resistance unmatched by any other alloy. It has outstanding resistance to a wide variety of chemical process environments including ferric and cupric chlorides, hot contaminated mineral acids, solvents, chlorine and chlorine contaminated (both organic and inorganic), dry chlorine, formic and acetic acids, acetic anhydride, sea water and brine solutions and hypochlorite and chlorine dioxide solutions. Alloy C-276 also resists formation of grain boundary precipitates in the weld heat affected zone making it useful for most chemical processes in the as-welded condition. It has excellent resistance to pitting and stress corrosion cracking.

Alloy C-276 sheet 0.044" thick in the heat-treated condition at 2050°F, rapid quenched, has an average olsen cup depth of 0.48". C-276 can be successfully fabricated by many methods. The alloy tends to work harden but with the proper care, the alloy is readily hot and cold formed. Complete information on welding, machining and forming is available.

Stock Sizes :	Rounds	Flats
1/16"		■
1/8"		■
3/16"		■
1/4"		■
3/8"		■
1/2"	■	■
3/4"	■	
1"	■	
1-1/4"	■	
1-1/2"	■	
1-3/4"	■	
2"	■	
2-1/4"	■	
2-1/2"	■	
2-3/4"	■	
3"	■	
3-1/2"	■	
4"	■	
5"	■	
6"	■	

MACHINING DATA

Machinability Rating
 AISI B 1112 100%
 Type 304 S.S. 45%
 Nitronic 50 21%

Based on 1" Dia Annealed (R_B 95) 5 hour form tool life using high-speed tools.

Carbide tools are suggested, for rates better than 50% of Type 304.

Suggested starting rates are:

Single Point turning :
Roughing - 90-140 SFM
Finishing - 120-190 SFM

Drilling : 30 to 50 SFM

Reaming : 90 SFM

Side and Slot Milling :
Roughing - .25" depth - 0.007"/tooth 125SFM
Finishing - .050" depth - 0.009"/tooth 140SFM

These rates are for carbide tools, Type C-2 for roughing, drilling and reaming. Type C-3 for finishing.

Alloy produces good surface finish.

Specifications Listed

UNS	N10276
DIN	2.4819
Bar	ASTM B574 / ASME SB574 DIN 2.4819 17752
Plate/Sheet	ASTM B575 / ASME SB575 DIN 2.4819 17750
Pipe & Tube	SPECIALS ASTM B619 / ASME SB619 ASTM B622 / ASME SB622 ASTM B626 / ASME SB626 DIN 2.4819 17751
Forgings	ASTM B564 / ASTM B574 ASTM B366
Welding Wire AWS ER	
NACE	MR-01-75

The typical properties listed on page one can be provided in rounds, wire, ribbon, strip & flat bar upon request. We have some highstrength rounds & strip in stock, but will be glad to make a particular form, size or strength to meet our customers' exacting needs. See our GFM Edition Bulletin for further details on lead times & size capacities for high strength bar or long length requirements.

Industry Applications

- Superior corrosion resistance
- Almost double the yield strength
- Exceptionally low magnetic permeability
- Outstanding cryogenic properties
- Outstanding corrosion resistance

Corrosion Properties

CHARACTERISTICS

One of the few alloys resistant to wet chloride gas, hypochlorite and chlorine dioxide solutions.

Exceptional resistance to strong solutions of oxidising salts, such as ferric and cupric chlorides.

Not prone to grain boundary precipitation in the as welded condition and therefore suitable for many chemical process applications.

APPLICATIONS

Digesters and bleach plants in the paper industry.

Components exposed to sour gas.

Equipment for flue-gas desulphurisation plants.

Evaporators, heat exchangers, filters and mixers used in sulphuric acid environments.

Sulphuric acid reactors.

Organic chloride process equipment.

Equipment for processes utilising halide or acid catalysts.



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