HPAlloy C-276

Product Description

HPAlloy C-276 is a nickel-molybdenum-chromium 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.

Nominal Chemistry

<table>
<thead>
<tr>
<th>Element</th>
<th>Bal.</th>
<th>Min.</th>
<th>Max.</th>
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</thead>
<tbody>
<tr>
<td>Ni</td>
<td>2.5</td>
<td>14.5</td>
<td>16.5</td>
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<tr>
<td>Co</td>
<td>14.5</td>
<td>15.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Cr</td>
<td>3.0</td>
<td>3.0</td>
<td>4.0</td>
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<tr>
<td>Mo</td>
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<td>4.0</td>
<td>7.0</td>
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<tr>
<td>W</td>
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<td>1.0</td>
<td>0.01</td>
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<tr>
<td>Fe</td>
<td>0.035</td>
<td>0.025</td>
<td>0.010</td>
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<tr>
<td>Si</td>
<td>0.035</td>
<td>0.025</td>
<td>0.010</td>
</tr>
<tr>
<td>Mn</td>
<td>0.08</td>
<td>1.0</td>
<td>0.01</td>
</tr>
<tr>
<td>C</td>
<td>1.0</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>0.035</td>
<td>0.025</td>
<td>0.010</td>
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<tr>
<td>P</td>
<td>0.01</td>
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<tr>
<td>S</td>
<td>0.01</td>
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</tr>
</tbody>
</table>

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.

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 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 1900°F (1038°C). It is also one of the few materials that withstands the corrosive effects of wet chlorine gas, hypochlorite and chlorine dioxide.

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

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 28x10^6 psi
Torsional Modulus of Elasticity 10x10^6 psi

Any questions or comments can also be sent via E-Mail to: JKirchner@Technologist.com
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 input.

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 20500°F (11210°C) 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.

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Temp., °F</th>
<th>British Units</th>
<th>Temp., °C</th>
<th>Metric Units</th>
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<tbody>
<tr>
<td>Density</td>
<td>72</td>
<td>0.321 lb./in³</td>
<td>22</td>
<td>8.89 g/cm³</td>
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<tr>
<td>Melting Range</td>
<td>2415-2500</td>
<td></td>
<td>1323-1371</td>
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<tr>
<td>Electrical Resistivity</td>
<td>75</td>
<td>51 microhm-in.</td>
<td>24</td>
<td>1.30 microhm-m</td>
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<td>Mean coefficient of Thermal Expansion</td>
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<td>6.2 microinches/in.-°F</td>
<td>24-93</td>
<td>11.2 x 10⁶ m/m•K</td>
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<tr>
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<td>75-400</td>
<td>6.7 microinches/in.-°F</td>
<td>24-204</td>
<td>12.0 x 10⁶ m/m•K</td>
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<tr>
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<td>75-600</td>
<td>7.1 microinches/in.-°F</td>
<td>24-316</td>
<td>12.8 x 10⁶ m/m•K</td>
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<tr>
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<td>75-800</td>
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<td>24-427</td>
<td>13.2 x 10⁶ m/m•K</td>
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<td>75-1000</td>
<td>7.4 microinches/in.-°F</td>
<td>24-538</td>
<td>13.4 x 10⁶ m/m•K</td>
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<td>Thermal conductivity</td>
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<td>200</td>
<td>77 Btu-in./ft.²-hr.-°F</td>
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<td>90 Btu-in./ft.²-hr.-°F</td>
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<td>13.0 W/m•K</td>
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<td>600</td>
<td>104 Btu-in./ft.²-hr.-°F</td>
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<td>1000</td>
<td>132 Btu-in./ft.²-hr.-°F</td>
<td>538</td>
<td>19.0 W/m•K</td>
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MACHINING DATA

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

Based on 1” Dia Annealed (Rb 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

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.

Industry Applications

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

Any questions or comments can also be sent via E-Mail to: JKirchner@Technologist.com

High Performance Alloys, Inc.
1985 E 500 N
Windfall, IN 46076
(800) HPALLOY
(800) 472-5569
(765) 945-8230
Fax (765) 945-8295