Hastelloy C-276 Alloy

Heanjia Super Metals Co., Ltd

The **Hastelloy C-276** alloy is a member of Nickel-Molybdenum-Chromium alloy family that is characterized with an extreme resistance to corrosion. The C-276 alloy is an enhanced quality of corrosion resistance material. It doesn't need to be heat processed after welding and provides extremely improved fabricability. It resists the production of grain precipitation in the welded areas so it is very much fit for using in the chemical processing applications in the welded form. But in the conditions when there is a feasibility of corrosion of alloy C-276 welds, Hastelloy C-22 weld filler metal is recommended for use.
The C-276 corrosion resistance alloy offers superior resistance to the localized corrosion and oxidizing and reducing environments. The versatile hastelloy C-276 can be set into upset conditions to use in the multifunctional places.

Chemical composition of hastelloy C-276 Alloy

Ni	Co	Cr	Mo	W	Fe	Si	Mn	C	V
57	2.5	16	16	4	5	0.08	1	0.01	0.35

Physical Properties of C-276 Alloy

Density	8.89 g/cm.^{3}
Melting Point	2415-2500 oF
Electrical Resistivity	1.30 microhm-m
Mean Coefficient of Thermal Expansion	11.2 x 10^{-6} m/m•K
Thermal Conductivity	7.2 W/m•K
Specific Heat	427 J/kg•K

Electrical and thermal Properties of Hastelloy C-276 Alloy

Temp	Thermal Conductivity	Coeff. Of Expansion	Electrical Resistivity	Young's Modulus
oF	Btu•in./ft2•h°F	10-6 in/in•°F	ohm•cmil/ft	10-3 ksi
-270	50	-	-	-
-100	60	-	0	-
0	65	-	-	-
77	-	-	739.2	29.8
100	71	-	-	-
200	77	6.8	743.8	29.5
400	90	7	749.3	28.6
600	104	7.2	757.7	27.8

Elevated Temperature Dynamic Modulus Properties

Temperature	Young's Modulus	Shear Modulus	Poisson's Ratio
oF	10-3 ksi	10-3 ksi	
70	31.30	11.81	0.33
100	31.18	11.75	0.33
200	30.77	11.57	0.33
300	30.35	11.40	0.33
400	29.92	11.23	0.33
500	29.42	11.05	0.33

Tensile Characteristics of Hastelloy C-276 at Room Temperature:

Alloy Form	Tensile Strength		Yield Strength		Elongation	Hardness
	Ksi	Mpa	Ksi	Mpa	%	Rc
Tubing	105.4	727	45.4	313	70	92
Plate	107.4	741	50.3	347	67	89
Bar	110.0	758	52.6	363	62	88
Sheet	115.5	796	54.6	376	60	86

Tensile properties of solution treated Hastelloy C-276 Alloy

Form	Temp, oF	Tensile strength, ksi	Yield strength, ksi	Elongation, %	Hardness, Rc
Sheet	Room				90
Sheet, 0.078 in.(2.0 mm) thick	400	100.6	51.6	61	
Sheet, 0.094 in.(2.4 mm) thick	400	101.0	39.9	58	
Sheet, 0.063 to 0.187 in. (1.6 to 4.7 mm) thick	400	100.8	42.1	56	
Plate	Room				87
Plate, 3/16 to 1 in. (4.8 to 25.4 mm) thick	400	98.9	38.2	61	
Plate, 1 in.(25.4 mm) thick	400	113.9	52.9	59	

Formability of Hastelloy C-276

Form	**Condition**	**Average Olsen Cup Depth**	
		In.	**mm.**
Sheet, 0.044 in. (1.1mm) thick	Heat-treated at 2050°F (1121°C), Rapid Quenched	0.48	12.2

Average impact strength of Hastelloy C-276 Plate

Condition	**Notch Impact Strength**	
	-320°F	**-196°C**
	ft.-lb.	J
Solution Heat-Treated at: 2050°F (1121°C), Rapid Quenched	263	357
Aged 100 hrs. at: 500°F (260°C) 1000°F (538°C	250	339
	96	130
Aged 1000 hrs. at: 1000°F (538°C)	64	87

Corrosion Resistance Properties of Hastelloy C-276

The **Hastelloy C-276 corrosion resistance alloy** offers tremendous resistance to the various chemical processing conditions such as powerful oxidizer like chlorides of iron and copper, hot mixed organic and inorganic acids, formic and acetic acids, acetic anhydride, and seawater and brine solutions. It offers resistance to the carbide precipitation while welding retains corrosion resistance features in the heated zones of welding points.

The C-276 alloy is used in the desulfurization processes due its very high resistance to compounds containing sulfur and chloride ions found in the scrubs. The alloy offers superior resistance to the pitting and stress corrosion cracking and it is one of the popular metals that are capable to adhere in the impact of hydrated chlorine, hypochlorite, and chlorine dioxide and other mediums.

Aqueous Corrosion rate of Hastelloy C-276 in the Acidic Media:

Media	**Weight %**	Temp, oF	**Average Corrosion Rate per year, Mils***		
			C-276 Alloy	**C-22® alloy**	**C-4 alloy**
Acetic Acid	99	Boiling	<1	No corrosion	No corrosion
Ferric Chloride	10	Boiling	2	<1	
Formic Acid	88	Boiling	1	1	2
Hydrochloric Acid	1	Boiling	13	3	25
Hydrochloric Acid + 42g/l $Fe_2(SO_4)_3$	1	200	41	2	-
Hydrochloric Acid + 2% HF	5	158	26	59	34

Fabrication of Hastelloy C-276

The **Hastelloy C-276 alloy** can be produced, hot set and impact extruded. Though it causes the work toughening, it can be vitally deep drawn, fabricated and stressed. It is welded by using the common and traditional welding methods though oxyacetylene method is not preferred. The serious provisions are followed to prevent the excessive heating of alloy.

The shaped C-276 alloy is prepared in the heat processed solution until it is recommended. The alloy is heat processed at the 2050oF temperature or 1121oC and quickly quenched.

The dehydrated chemical composition of hastelloy electrodes includes C by 0.02 %, Silicon by 0.20 %, Phosphorous by 0.03 % and sulfur by 0.015 %. In the rigorous corrosive conditions the

Hastelloy C-276 alloy is utilized as the most trusted alloy. The excellent service in the tough conditions for several years has proven the quality performance of this alloy.

The **Hastelloy C-276 alloy** is purposeful in the chemical processing and other industrial operations and it has become the prior choice of engineers. Before employing in the industry, the Hastelloy C-276 alloy goes through the exacting process, chemical controls, heat mechanical treatments, analysis and criteria for the rigid norms. Moreover the welded alloy specimen offers the enhanced functionality.

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