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Nickel Alloy 625

Type 625 Alloy (UNS Designation NO6625) is an austenitic nickel-based superalloy possessing excellent resistance to oxidation and corrosion over a broad range of corrosive conditions, including jet engine environments and in many other aerospace and chemical process applications. The alloy has outstanding strength and toughness at temperatures ranging from cryogenic temperature to 2000°F (1093°C). Type 625 alloy also has exceptional fatigue resistance. It derives its strength from the solid solution strengthening effects of molybdenum and columbium on the nickel-chromium matrix.

Although the alloy was developed for high temperature strength, its highly alloyed composition provides a high level of general corrosion resistance to a wide range of oxidizing and non-oxidizing environments.

Specifications

AMS: 5401, 5402, 5581, 5599, 5666, 5837

ASME: SB-443, SB-444, SB-446, SB-704, SB-705, SB-366

ASTM: B443, B444, B446, B704, B705, B366

UNS: NO6625

W. Nr./EN: 2.4856

Chemical Composition, %

	C	Mn	P	S	Si	Cr	Ni	Mo	Cb	Ti	Al	Fe	Ta
Min	--	--	--	--	--	20.0	Balance	8.0	3.15	--	--	--	--
Max	0.10	0.50	0.015	0.015	0.50	23.0	Balance	10.0	4.150	0.40	0.40	5.0	0.05

Resistance to Corrosion: The high level of chromium and molybdenum in Type 625 alloy provides a high level of pitting and crevice corrosion resistance to chloride contaminated media, such as sea water, neutral salts and brines

Features

- Possesses a high degree of formability
- Shows better weldability than many highly alloyed nickel base alloys
- Resistant to intergranular corrosion even in the welded condition

Applications

- Aerospace Turbines
- Heat Exchangers
- Pressure Vessels
- Chemical Processing
- Bellows
- Expansion Joints

Physical Properties

Density: 0.303 lb/in^3 (8.44 g/cm^3)
Specific Gravity: 8.44
Melting Range: 2350 – 2460°F (1280 – 1350°C)
Specific Heat: 0.098 Btu/lb X °F (410 Joules/kg X °K)
Magnetic Permeability: (75°F, 200 oersted): 1.0006

Nickel Alloy 625

Thermal Conductivity

Temperature Range		Linear Coefficients of Thermal Expansion1 · 10-6		Thermal Conductivity2 3	
°C	°F	/°C	/°F	W/m·K	Btu/(hr/ft²/in/°F)
-157	-250	-	-	7.3	4.2
-129	-200	-	-	7.4	4.3
-73	-100	-	-	8.3	4.8
-18	0	-	-	9.2	5.3
21	70	-	-	9.9	5.7
38	100	-	-	10	5.8
93	200	12.8	7.1	10.7	6.3
204	400	13.1	7.3	12.6	7.3
316	600	13.3	7.4	14.2	8.2
427	800	13.7	7.6	15.7	9.1
538	1000	14	7.8	17.5	10.1
649	1200	14.8	8.2	19	11
760	1400	15.3	8.5	20.8	12
871	1600	15.8	8.8	22.8	13.2
927	1700	16.2	9	-	-
982	1800	-	-	25.3	14.6

(a) Average coefficient from 70°F (21°C) to temperature shown
(b) Measurements made at Battelle Memorial Institute
(c) Material annealed 2100°F (1149°C)

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Electrical Resistivity

Temperature		
°C	°F	microhm-cm
21	70	128.9
38	100	129.6
93	200	131.9
204	400	133.9
316	600	134.9
427	800	135.9
538	1000	137.9
649	1200	137.9
760	1400	136.9
871	1600	135.9
982	1800	134.9
1093	2000	133.9

Mechanical Properties

Typical Short Time Tensile Properties as a Function of Temperature

Typical room temperature tensile properties of material annealed at 1920F (1065C) follow

Temperature		0.2% Yield Strength		Ultimate Tensile Strength		
°F	°C	psi	MPa	psi	MPa	Elongation Percent
1920	1065	63,000	430	136,000	940	51.5