High-temperature alloy

Alloy 90

Description

Alloy 90 is a precipitation-hardening nickel-chromium-cobalt wrought superalloy. It was designed to deliver superior creep and stress-rupture strength under sustained high-temperature load up to 920°C, addressing the need for turbine hot-section materials that maintain dimensional stability under prolonged thermal cycling.

Its key properties stem from gamma prime (γ') precipitation strengthened by aluminium and titanium, plus cobalt solid-solution reinforcement. The alloy provides excellent high-temperature tensile strength, thermal fatigue resistance and oxidation resistance, with reliable performance under cyclic thermal stress.

Grade: UNS N07090, Nimonic®90, Alloy 90, W.Nr.2.4632, NiCr20Co18Ti

Chemical Composition (wt%)

Ni	Fe	Mn	C	Si	S	Cr	Al	Ti	P	Co	B	Zr	Cu
Balance						18	1	2		15			

	1.5	0.4	0.13	0.8	0.015	21	2	3	0.02	21	0.02	0.15	0.2

Technical standards

Technical Standards	Product Form
ASTM B637	Bars, Forgings and Forging Stock
AMS 5829	Welding wire

Physical Properties

Room-Temperature Constant Parameters

Item	Typical Value
Density	8.18 g/cm³
Poisson's ratio	0.3
Electrical Resistivity	118 μΩ·cm @20°C
Magnetic property	Non-magnetic

Disclaimer: Data is typical for reference only.

Coefficient of thermal expansion

θ/°C	α/10⁻⁶/°
20–200	12.7
20–400	13.4
20–500	13.8
20–600	14.2
20–700	14.6
20–800	15
20–900	15.4
20–1000	15.8

Modulus of Elasticity

θ/°C	E/GPa
25	220
200	208
425	192
540	184
650	172
870	150
980	134

Shear Modulus

θ/°C	G/GPa
25	82
200	77
425	71
650	63
870	55

Machinability as annealed

Item	Typical Value(Room temperature)
Tensile Strength	1050–1250 MPa
0.2% Yield Strength	650–800 MPa
Elongation	⩾28%
Hardness (HRB)	92–102