

Physical Properties

Density 0.304 lb/in ³ 8.42 g/cm ³	Magnetic Permeability <1.02
Specific Gravity 8.42	Specific Heat 32-212°F 0.11 Btu/lb-°F (0-100°C) 460 Joules/kg-°K

Linear Coefficient of Thermal Expansion

Average from 70°F (21°C) to °F (°C)		Linear Coefficient of Thermal Expansion	
		10 ⁻⁶ /°F	10 ⁻⁶ /°C
200	93	6.9	12.4
400	204	7.3	13.1
600	316	7.6	13.7
800	427	7.9	14.2
1000	538	8.1	14.6
1200	649	8.4	15.1
1400	760	8.7	15.7

Thermal Conductivity

Temperature		Thermal Conductivity	
°F	(°C)	Btu-ft/h-ft ² -°F	W/m-°K
70	21	8.6	14.8
200	93	8.9	15.4
400	204	9.9	17.1
600	316	10.8	18.7
800	427	11.9	20.6
1000	538	13.0	22.5

Elastic Modulus, Modulus of Rigidity, and Poisson's Ratio

Temperature		Elastic Modulus (E)		Modulus of Rigidity (G)		Poisson's Ratio (μ)
°F	(°C)	Units of 10 ⁵ psi GPa		Units of 10 ⁵ psi GPa		(μ)
70	21	30	207	11	76	0.29

Creep and Stress Rupture Properties

Typical stress rupture properties of Alloy 600 are presented below in comparison to some other materials. The data indicate that Alloy 600 has modest load carrying ability in the temperature range in which creep and stress rupture are design criteria.

Temperature °F (°C)	Alloy	Stress, psi (MPa) to Produce Rupture in					
		10 hr		100 hr		1000 hr	
1000 (538)	304	—		43,000	(297)	34,000	(234)
	600	74,000	(510)	50,000	(345)	34,000	(234)
	A-286	100,000	(690)	95,000	(655)	88,000	(607)
1200 (649)	304	—		23,000	(159)	16,000	(110)
	600	34,000	(234)	23,000	(159)	14,500	(100)
	800	40,000	(276)	32,000	(221)	21,000	(145)
1350 (732)	600	20,000	(138)	13,500	(93)	9,200	(63)
	A-286	49,000	(338)	35,000	(241)	21,000	(145)

Heat Treatment

Alloy 600 is not hardenable by heat treatment. The alloy can only be strengthened by cold working. Annealing is conducted to soften the material after cold working operations. Softening begins at 1600°F (871°C) and can be conducted to about 2100°F (1149°C). At temperatures of 1800°F (982°C) or higher, grain growth will occur rapidly. However, very short time at 1900°F (1038°C) may be used to soften the material without producing undue grain growth. Slow cooling or quenching produces approximately the same hardness in Alloy 600.

Processing

Cold Forming

Alloy 600 exhibits the excellent cold forming characteristics normally associated with chromium-nickel stainless steels. The high nickel content prevents the austenite to martensite transformation which can occur when Alloys 301 or 304 stainless steels are cold formed. The alloy has a lower work hardening rate than Alloys 301 or 304 and can be used in multiple draw forming operations where relatively large amounts of deformation occur between anneals.

If a high temperature anneal is conducted on the Alloy 600 to produce a relatively large grain size for elevated temperature properties, extensive forming produces a visibly undulated surface called "orange peel." This surface characteristic is produced by the large grain size and is usually considered detrimental to the properties of the material.



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