STELLITE® 4 ALLOY

TECHNICAL DATA

Nominal Composition (mass %) and Physical Properties

Co	Cr	W	C	Others	Hardness	Density	Melting Range
Base	28.5	13.5	0.7	Ni, Fe, Si, Mo	40-50 HRC	8.80 g/cm³ 0.318 lb/in³	2276-2473°F 1246-1356 °C

Stellite® cobalt base alloys consist of complex carbides in an alloy matrix. They are resistant to wear, galling and corrosion and retain these properties at high temperatures. Their exceptional wear resistance is due mainly to the unique inherent characteristics of the hard carbide phase dispersed in a CoCr alloy matrix.

Description

This alloy has a similar carbon content to **Stellite®** 6 but with a higher tungsten content. The result is the formation of tungsten carbides along with the chromium carbides for improved abrasion resistance. The higher tungsten content results in a stronger matrix with improved high temperature properties for hot forming dies. These properties along with the high chromium to carbon ratio leaves more chromium in the matrix for higher corrosion resistance for oxidizing environments. The result is a material with an excellent combination of heat, abrasion and corrosion.

Corrosion Resistance

Stellite® Alloy 4 has higher corrosion resistance than **Stellite®** alloy 6 in oxidizing environments such as nitric and sulphuric acids. This improvement is due to the higher chromium content in the cobalt rich matrix making this material suitable for pump components. The alloy has excellent resistance to manganese dioxide, carbon particles and ammonium and zinc chlorides, used in the manufacturing of dry batteries. Corrosion resistance will vary depending on acid concentration, temperature, stress and contamination thus production exposure tests are recommended.

Wear

The higher tungsten content of **Stellite®** alloy 4 gives improved high temperature properties and an increase in abrasive wear resistance over **Stellite®** alloy 6, but not as good as **Stellite®** alloy 12 or 3. Adhesive wear is similar to **Stellite®** alloy 6, but resistance improves as the load increases. Galling resistance is excellent. The alloy is brittle and withstands less impact than either **Stellite®** alloy 6 or 12. This material is suitable for high temperature abrasion in corrosive environment.

Finishing

Similar to **Stellite®** alloy 12 in that it is more difficult to machine than **Stellite®** alloy 6 but easier than **Stellite®** alloy 3, satisfactory results are obtained with carbide tip tools while grinding produces a finer surface finish. Stress relieve treatments before and during are recommended.

Nominal Thermal Expansion Coefficient (from 20°C/68°F to stated temperature)

	100°C (212°F)	200°C (392°F)	300°C (572°F)	400°C (752°F)	500°C (932°F)	600°C (1112°F)	700°C (1292°F)	800°C (1472°F)	900°C (1652°F)	1000°C (1832°F)
µ-inch/inch.°F	5.28	5.56	5.9	6.11	6.45	6.67	6.9	7.11	7.5	9.0

Nominal Tensile Properties at Room Temperature

	Ultimate Tensile Strength Rm		Yield Stress Rp(0.2%)		Elongation	Elastic Modulus	
	ksi	MPa	ksi	MPa	A(%)	ksi	MPa
Castings	136.4	940	102.6	707	<1	34,100	$235x10^3$

Nominal Hot Hardness (DPH) as-cast

20°C (68°F)	100°C (212°F)	200°C (392°F)	300°C (572°F)	400°C (752°F)	500°C (932°F)	600°C (1112°F)	700°C (1292°F)	800°C (1472°F)	900°C (1652°F)
505	490	479	438	409	387	333	244	183	124

Thermal and Electrical Properties

	Approximate value at Room Temperature
Thermal conductivity	102 Btu-in/hr/ft^2/°F
Electrical resistivity	36.1 µ-ohm.inch

Applications

The standard **Stellite®** 4 has found use in applications involving corrosion and wear such as pump sleeves and impellors. For high temperature wear the material has been used for dies in hot pressing or extrusion of copper and aluminum. The modified alloy Stellite 48 resists abrasion and corrosion from manganese dioxide, carbon particles and ammonium and zinc chlorides used in the dry battery industry.

Available forms

Cast components, weld rod or powder

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