

STELLITE 31

STELLITE™ 31 ALLOY

TECHNICAL DATA

CASTINGS & POWDER METALLURGY | HVOF & PLASMA SPRAY DEPOSITION | PTA WELD DEPOSITION

NOMINAL COMPOSITION (MASS %) AND PHYSICAL PROPERTIES

Co	Cr	W	C	Ni	Others	Hardness	Density	Melting Range
Base	26	7.5	0.5	10.5	Mo, Fe, Si	25-35 HRC *	8.61 g/cm ³ 0.311 lb/in ³	1340-1395°C 2245-2545°F

* Hardness dependent on amount of work hardening.

STELLITE™ COBALT-BASED 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.

STELLITE 31 is a cobalt-base, high-temperature superalloy having high tensile and creep properties. It is superior in stress-rupture properties to many alloys commercially available, especially at 1700°F (926°C) and 1800°F (980°C). **STELLITE 31** is resistant to oxidizing and reducing atmospheres up to 2100°F (1150°C). It has excellent resistance to thermal and mechanical shock. Due to its high temperature properties, **STELLITE 31** is often used in gas turbine engines in areas subject to hot gas erosion, as well as furnace working tools that require a combination of mechanical integrity and hot wear resistance.

CORROSION RESISTANCE

STELLITE 31 is resistant to both oxidizing and reducing gases up to 2100°F (1150°C) and hence prevents scaling of gas turbine components. This alloy has excellent resistance to nitric and phosphorus acids, and at room temperature to sulfuric acid.

STELLITE 31 is superior to **STELLITE 6** in hydrochloric acid. Exposure test coupons should be used to verify performance when possible due to variations resulting from temperature, pH concentrations, and contamination.



Stellite 31 cast microstructure

WEAR

During sliding, hot metal-on-metal wear, **STELLITE 31** forms an adherent oxide film which helps to prevent adhesive transfer. This has been used to advantage in jet engine spacer bushings and burner can retaining nuts. **STELLITE 31** is useful where thermal fatigue is combined with metal-on-metal wear and has been successfully used for metal-working tools, such as extrusion dies and drills used to tap metallurgical furnaces.

FINISHING

Due to the rate of work hardening in the solution annealed condition, it is best to machine this alloy in the aged condition. The alloy can be machined by all common methods using carbide tools. Low speeds and a positive cut will help to avoid burnishing.



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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)
µm/m.K	10.49	11.75	12.49	13.05	13.45	13.9	14.35	14.8	15.19
µ-inch/inch.F	5.83	6.53	6.94	7.25	7.47	7.72	7.97	8.22	8.44

NOMINAL TENSILE PROPERTIES AT ROOM TEMPERATURE

	Ultimate Tensile Strength Rm		Yield Stress Rp (0.2%)		Elongation	Elastic Modulus	
	ksi	MPa	ksi	MPa	A(%)	ksi	GPa
Casting	107	740	63	430	10	30,000	207

NOMINAL HOT HARDNESS (BRINELL HARDNESS NUMBER)

	20°C (68°F)	93°C (200°F)	204°C (400°F)	316°C (600°F)	427°C (800°F)	538°C (1000°F)	649°C (1200°F)	760°C (1400°F)	871°C (1600°F)	982°C (1800°F)
Casting	228	—	—	165	162	139	137	125	116	64

THERMAL AND ELECTRICAL PROPERTIES

	Approximate Value at Room Temperature
Thermal conductivity	102 BTU-in/hr/ft²/°F
Electrical resistivity	38.2 µ-ohm.inch

PRODUCT FORMS AND CROSS-REFERENCE SPECIFICATIONS

STELLITE 31 is available as a casting, powder metallurgy components, and powder.

SPECIFICATION	PRODUCT FORM
UNS R30031	Castings, P/M Components, Powder
AMS 5382	Castings
ASTM A732 Gr.31	Castings

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