

CoCr-0404 powder for additive manufacturing

Process specification

Powder description	Cobalt-chromium alloy powder
Layer thickness	30 µm
Laser power	200 W
Additive manufacturing system	AM250

Material description

CoCr-0404 alloy comprises cobalt alloyed with chromium of mass fraction up to 30% and molybdenum up to 7%, along with other minor elements. The alloy has a high melting point making it stable at high temperatures, along with its high level of corrosion resistance.

The alloy's excellent biocompatibility, strength and wear resistance have also led to it being used widely in the orthopaedics and dental industries. For medical and dental applications Renishaw supply CoCr DG1, for more information refer to document H-5745-9080.

Material properties

- High strength and hardness
- Excellent biocompatibility
- High corrosion resistance
- High temperature resistance

Applications

- Medical and dental (Refer to document H-5745-9080)
- Gas and wind turbines
- Engine components

Generic data - wrought material

Density	8.3 g/cm ³
Thermal conductivity	13 W/mK
Melting range	1260 °C to 1482 °C
Coefficient of thermal expansion (see note 1)	12 10 ⁻⁶ K ⁻¹

Note 1 In the range of 0 °C to 100 °C.

Note 2 Solution treated conditions: 1. Heat to 650 °C ±10 °C, hold for 15 min; 2. Heat to 1000 °C ±10 °C hold for 5 min; 3. Heat to 1050 °C ±10 °C hold for 2 hr; 4. Fast cool to < 60 °C ±10 °C using 2 bar argon quench.

Note 3 Tested at ambient temperature by Nadcap and UKAS accredited independent laboratory. Test ASTM E8. Machined prior to testing.

Note 4 Tested to ASTM E384-11, after polishing.

Note 5 Tested to JIS B 0601-2001 (ISO 97). As built after bead blasting.

Composition of powder

Element	Mass (%)
Cobalt	Balance
Chromium	27.00 to 30.00
Molybdenum	5.00 to 7.00
Manganese	< 1.00
Silicon	< 1.00
Iron	< 0.75
Nickel	< 0.50
Nitrogen	< 0.25
Tungsten	< 0.20
Aluminium	< 0.10
Oxygen	< 0.10
Titanium	< 0.10
Carbon	< 0.05
Phosphorus	< 0.02
Boron	< 0.01
Sulphur	< 0.01

Mechanical properties of additively manufactured parts

	Solution treated (See note 2)
Tensile strength (UTS) (See note 3)	
Horizontal direction (XY)	1104 MPa ±17 MPa
Vertical direction (Z)	1097 MPa ±16 MPa
Yield strength (see note 3)	
Horizontal direction (XY)	714 MPa ±12 MPa
Vertical direction (Z)	683 MPa ±11 MPa
Elongation at break (see note 3)	
Horizontal direction (XY)	16% ±2%
Vertical direction (Z)	21% ±1%
Modulus of elasticity (see note 3)	
Horizontal direction (XY)	220 GPa ±37 GPa
Vertical direction (Z)	221 GPa ±25 GPa
Hardness (Vickers) (see note 4)	
Horizontal direction (XY)	412 HV0.5 ±16 HV0.5
Vertical direction (Z)	400 HV0.5 ±9 HV0.5
Surface roughness (R_a) (See note 5)	
Horizontal direction (XY)	4 µm to 8 µm
Vertical direction (Z)	8 µm to 12 µm

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