GROW it™
RAPID PROTOTYPING & MANUFACTURING

Cobalt Chrome

Utilizing the DMLS process, metal parts of the most complex geometries are grown layer-by-layer (at a thicknesses of 20 microns) directly from 3D CAD data, fully automated, without tooling. The parts have excellent mechanical properties (typically better than cast parts), and (with post polishing) high detail resolution and exceptional surface quality. During the sintering process, the metal powder is melted entirely to create a fully dense, fine, homogenous structure. Unique geometric freedom of design enables DMLS to form cavities and undercuts which, with conventional methods, can only be produced with great difficulty, if at all.

Technical Data

GENERAL PROCESS DATA		METRIC	ENGLISH
Minimum recommended layer thickness		20 µm	0.8 mil
Typical achievable tolerance		.127 first mm, .051 each mm after	.005 first in., .002 each in. after
Minimum wall thickness		0.3mm	0.012 in
Surface roughness (µm)	as built	approx. Ra 10 µm, Rz 40 - 50 µm	Ra 0.39, Rz 1.6 - 2.0 mil
Surface roughness (µm)	after polishing	Rz up to < 1µm	Rz up to < 0.04 mil
Volume rate	standard parameters (no Skin & Core, full melting, full density, maximum strength)	1.6 mm^3/s	0.35 in^3/h
Volume rate	faster Skin & Core parameters (full melting, full density)	3.0 mm^3/s	0.66 in^3/h

PHYSICAL AND CHEMICAL PROPERTIES	METRIC	ENGLISH
Material composition	Co: 60 - 65 wt-%	
Material composition	Cr: 26 - 30 wt-%	
Material composition	Mo: 5 - 7 wt-%	
Material composition	Si: max. 1.0 wt-%	
Material composition	Mn: max. 1.0 wt-%	
Material composition	Fe: max. 0.75 wt-%	
Material composition	C: max. 0.16 wt-%	
Material composition	Ni: max. 0.10 wt-%	
Relative density with standard parameters	approx. 100 %	
Density with standard parameters	8.29 g/cm^3	0.300 lb/in^3

MECHANICAL PROPERTIES OF PARTS AT 20 °C		METRIC	ENGLISH
Ultimate tensile strength (MPIF 10)	in horizontal direction (XY)	1300 MPa ± 50 Mpa	189 ksi ± 7 ksi
Ultimate tensile strength (MPIF 10)	in vertical direction (Z)	1150 MPa ± 50 Mpa	167 ksi ± 7 ksi
Yield strength (Rp 0.2 %) (MPIF 10)	in horizontal direction (XY)	960 MPa ± 50 Mpa	139 ksi ± 7 ksi
Yield strength (Rp 0.2 %) (MPIF 10)	in vertical direction (Z)	880 MPa ± 50 Mpa	128 ksi ± 7 ksi
Elongation at break (MPIF 10)	in horizontal direction (XY)	11 % ± 2 %	11 % ± 2 %
Elongation at break (MPIF 10)	in vertical direction (Z)	9 % ± 1 %	9 % ± 1 %
Elongation at break (MPIF 10)	after hot isostatic pressing (HIP)	21 - 24 %	21 - 24 %
Young's Modulus (MPIF 10)	in horizontal direction (XY)	220 GPa ± 20 Gpa	29 msi ± 3 msi
Young's Modulus (MPIF 10)	in vertical direction (Z)	220 GPa ± 20 Gpa	29 msi ± 3 msi
Fatigue life	in vertical direction (Z) at 0-400 MPa load range and 20 Hz	approx. 7.2 million cycles	
Hardness (DIN EN ISO 6508-1)		35 - 45 HRC	

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THERMAL PROPERTIES OF PARTS		METRIC	ENGLISH
Coefficient of thermal expansion	over 20 - 500 °C (36 - 900 °F)	13.6 x 10-6 m/m °C	7.6 x 10-6 in/in °F
Coefficient of thermal expansion	over 500 - 1000 °C (900 - 1800 °F)	15.1 x 10-6 m/m °C	8.4 x 10-6 in/in °F
Thermal conductivity	at 20 °C (36 °F)	13 W/m °C	90 Btu/(h ft² °F/in)
Thermal conductivity	at 300 °C (540 °F)	18 W/m °C	125 Btu/(h ft² °F/in)
Thermal conductivity	at 500 °C (900 °F)	22 W/m °C	153 Btu/(h ft² °F/in)
Thermal conductivity	at 1000 °C (1800 °F)	33 W/m °C	229 Btu/(h ft² °F/in)
Maximum operating temperature		1150 °C	2100 °F
Melting range		1350 - 1430 °C	2460 – 2600 °F

About Cobalt Chrome

EOS CobaltChrome MP1 is a fine powder mixture, which produces parts in a cobalt-chrome-molybdenum-based superalloy. This class of superalloy is characterized by having excellent mechanical properties (strength, hardness etc.), corrosion resistance and temperature resistance. Such alloys are commonly used in biomedical applications such as dental and medical implants, and also for high-temperature engineering applications such as in aero engines.

This material is ideal for many part-building applications (DirectPart) such as functional metal prototypes, small series products, individualised products or spare parts. Using standard parameters the mechanical properties are fairly uniform in all directions. Parts made from EOS CobaltChrome MP1 can be machined, spark-eroded, welded, micro shot-peened, polished and coated if required.

About GROWit

GROWit™ is a privately held additive manufacturing company located in Irvine, California, dedicated to improving design through engineering and rapid prototyping. We strive to be at the cutting edge, bringing both knowledge and resources directly to customers. With our team of engineers, we help guide customers to the process that best suits their specific application, without holding a bias to a specific platform or technology.

Why do we call ourselves GROWit? Due to the layer-by-layer nature of Additive Manufacturing, a part often looks like it is growing within the machine – just like a plant grows from the ground. Rather than using the terms “building” or “fabricating”, the term “growing” is commonly used within the industry; thus the origin of our name, GROWit.

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