GROW it™
RAPID PROTOTYPING & MANUFACTURING

Stainless Steel

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		0.3 - 0.4 mm	0.012 - 0.016 in
Surface roughness (µm)	after shot-peening	Ra 2.5 - 4.5 µm, Ry 15 - 40 µm	Ra 0.1 - 0.2 mil, Ry 0.6 - 1.6 µm
Surface roughness (µm)	after polishing	Rz up to < 0.5 µm (can be very finely polished)	
Volume rate	standard parameters (20 µm layers, full density)	2 mm³/s	0.44 in³/h
Volume rate	Inner core parameters (Skin & Core style, full density)	4 mm³/s	0.88 - 1.1 in³/h

PHYSICAL AND CHEMICAL PROPERTIES	METRIC	ENGLISH
Material composition	steel including alloying elements	
Material composition	Cr (15 – 17.5 wt-%)	
Material composition	Ni (3 - 5 wt-%)	
Material composition	Cu (3 - 5 wt-%)	
Material composition	Mn (max. 1 wt-%)	
Material composition	Si (max. 1 wt-%)	
Material composition	Mo (max. 0.5 wt-%)	
Material composition	Nb (0.15 - 0.45 wt-%)	
Material composition	C (max. 0.07 wt-%)	
Relative density with standard parameters	approx. 100 %	
Density with standard parameters	7.8 g/cm³	0.28 lb/in³

MECHANICAL PROPERTIES OF PARTS		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
Ultimate tensile strength	after stress relieving at 650 °C (1170 °F) for 1 hour	approx. 1200 Mpa	approx. 174 ksi
Yield strength (Rp 0.2 %) (MPIF 10)	in horizontal direction (XY)	540 ±50 Mpa	78 ±7 ksi
Yield strength (Rp 0.2 %) (MPIF 10)	in vertical direction (Z)	500 ±50 Mpa	73 ± 7 ksi
Elongation at break (MPIF 10)		25 ± 5 %	25 ± 5 %
Young's Modulus (MPIF 10)		170 ± 20 Gpa	25 ± 3 msi
Young's Modulus (MPIF 10)	after stress relieving at 650 °C (1170 °F) for 1 hour	approx. 195 Gpa	approx. 29 msi
Hardness	as built	approx. 230 ± 20 HV1	
Hardness	ground & polished	approx. 250 - 400 HV1	

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THERMAL PROPERTIES OF PARTS		METRIC	ENGLISH
Coefficient of thermal expansion	over 20 - 600 °C (68 - 1080 °F)	14 x 10-6 m/m °C	7.8 x 10-6 in/in °F
Thermal conductivity	at 20 °C (68 °F)	13 W/m °C	90 Btu/(h ft² °F/in)
Thermal conductivity	at 100 °C (212 °F)	14 W/m °C	97 Btu/(h ft² °F/in)
Thermal conductivity	at 200 °C (392 °F)	15 W/m °C	104 Btu/(h ft² °F/in)
Thermal conductivity	at 300 °C (572 °F)	16 W/m °C	111 Btu/(h ft² °F/in)
Maximum operating temperature		550 °C	1022 °F

About Stainless Steel

EOS StainlessSteel GP1 is a pre-alloyed stainless steel in fine powder form. Its composition corresponds to US classification 17-4 and European 1.4542. This kind of steel is characterized by having good corrosion resistance and mechanical properties, especially excellent ductility in laser processed state, and is widely used in a variety of engineering applications.

This material is ideal for many part-building applications (DirectPart) such as functional metal prototypes, small series products, individualised products or spare parts. Parts made from EOS StainlessSteel GP1 can be post-processed with just about any standard metal processing procedure such as machining, spark-eroding, welding, micro shot-peening, polishing, electropolishing, and coating, 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 rapid prototyping, 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.

GROWit
20918 Bake Parkway
Suite 106
Lake Forest, CA
92630

(p) 949 305 4004
(f) 949 305 4915
www.growit3d.com
sales@growit3d.com

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