



# LaserForm<sup>®</sup> CoCrF75 (A)

Cobalt-chromium-molybdenum alloy fine-tuned for use with ProX DMP 320 metal printer producing industrial parts with high corrosion and wear resistance that also require high temperature resistance. In addition to various industrial applications, LaserForm CoCrF75 (A) is also suitable for medical applications.

LaserForm CoCrF75 (A) is formulated and fine-tuned specifically for 3D Systems DMP 320 metal 3D Printers to deliver high part quality and consistent part properties. The print parameter database that 3D Systems provides together with the material has been extensively developed, tested and optimized in 3D Systems' part production facilities that hold the unique expertise of printing 500,000 challenging metal production parts in various materials year over year. And for your 24/7 production 3D Systems' thorough Supplier Quality Management System guarantees consistent, monitored material quality for reliable results.

## Material Description

Cobalt-chromium-molybdenum alloys are known for their high strength and hardness and retain these properties even at elevated temperatures. In addition, they spontaneously form a protective passive film, which makes LaserForm CoCrF75 (A) both corrosion resistant and biocompatible.

These benefits make LaserForm CoCrF75 (A) the ideal material for medical tools and devices, molds and dies, industrial, high wear applications and parts requiring high strength at elevated temperatures. In biomedical applications, LaserForm CoCrF75 (A) is ideal for dental implants and prostheses.

## Classification

The chemical composition of LaserForm<sup>®</sup> CoCr F75 conforms to the requirements of the ASTM F75, ISO 5832 and ISO 22674 standards, and is indicated in the table below in wt%.

## Mechanical Properties<sup>1,2,3</sup>

MEASUREMENT	CONDITION	METRIC		U.S.	
		AFTER ANNEAL	AFTER HIP	AFTER ANNEAL	AFTER HIP
Young's modulus (GPa   ksi)	ASTM E8M	225 ± 5	225 ± 5	32650 ± 730	32650 ± 730
Ultimate strength (MPa   ksi)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		1030 ± 70 1000 ± 30	1020 ± 70 950 ± 40	150 ± 10 145 ± 5	150 ± 10 140 ± 5
Yield strength Rp0.2% (MPa   ksi)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		540 ± 30 520 ± 30	510 ± 30 475 ± 20	80 ± 5 75 ± 5	75 ± 5 70 ± 5
Elongation at break (%)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		29 ± 6 29 ± 4	29 ± 6 23 ± 3	29 ± 6 29 ± 4	29 ± 6 23 ± 3
Hardness, Rockwell C	ASTM E18	25 ± 5	39 ± 3	25 ± 5	39 ± 3
Impact toughness* (J   ft-lb)	ASTM E23	52 ± 3	NA	39±2	NA

## Thermal Properties<sup>5</sup>

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K)   Btu/(h.ft <sup>2</sup> .°F))	at 20°C / 120 °F	14	8
CTE - Coefficient of thermal expansion (µm/(m.°C)   µ inch/(inch. °F))	in the range of 20 to 600 °C	14	8
Melting range (°C   °F)		1350 - 1430	2460 - 2610

<sup>1</sup> Parts manufactured with standard parameters on a ProX DMP 320, Config B

<sup>2</sup> Values based on average and standard deviation

<sup>3</sup> HIP indicates hot isostatic pressing post treatment

<sup>4</sup> Tested with Charpy V-notch impact test specimens type A at room temperature

<sup>5</sup> Values based on literature

NA = Not available

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## Electrical Properties<sup>5</sup>

MEASUREMENT	METRIC	U.S.
Electrical resistivity (nΩ.m   μΩ.in)	874	34

## Physical Properties

MEASUREMENT	METRIC		U.S.	
	AS BUILT AND AFTER STRESS RELIEF	AFTER HIP	AS BUILT AND AFTER STRESS RELIEF	AFTER HIP
Density				
Relative, based on pixel count <sup>1</sup> (%)	>99,9	≈100	>99,9	≈100
Absolute theoretical <sup>5</sup> (g/cm <sup>3</sup>   lb/in <sup>3</sup> )	8.35		0.302	

## Surface Quality<sup>1</sup>

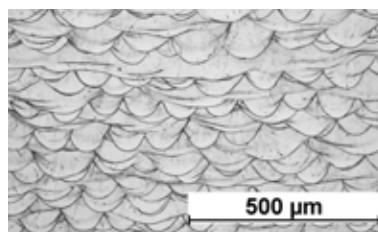
MEASUREMENT	METRIC		U.S.	
	AS BUILT	SAND BLASTED	AS BUILT	SAND BLASTED
Surface Roughness R <sub>a</sub>				
Vertical direction (Z) (μm   μin)	9 - 13	3 - 5	350 - 510	120 - 200

## Chemical Composition

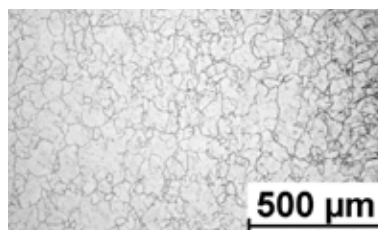
ELEMENT	% OF WEIGHT
Co	Bal.
Cr	27.00-30.00
Mo	5.00-7.00
Ni	≤0.50
Fe	≤0.75
C	≤0.35
Si	≤1.00
Mn	≤1.00
W	≤0.20
P	≤0.020
B, S	≤0.010
N	≤0.25
Al, Ti	≤0.10

<sup>1</sup> Parts manufactured with standard parameters on a ProX DMP 320, Config B

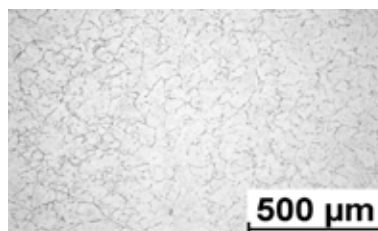
<sup>5</sup> Values based on literature



Microstructure as built



Microstructure after anneal



Microstructure after HIP



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