



# LaserForm<sup>®</sup> CoCr (B)

Cobalt-chromium-molybdenum alloy fine-tuned for use with DMP Flex 100, ProX<sup>®</sup> DMP 200 and ProX<sup>®</sup> DMP 300 metal printers producing industrial parts with high corrosion and wear resistance that also require high temperature resistance.

LaserForm CoCr (B) is formulated and fine-tuned specifically for 3D Systems DMP Flex 100, ProX<sup>®</sup> DMP 200 and ProX<sup>®</sup> DMP 300 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. For a 24/7 production operation 3D Systems' thorough Supplier Quality Management System guarantees consistent, monitored material quality for reliable process 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 CoCr (B) both corrosion resistant and biocompatible.

These benefits make LaserForm CoCr (B) the ideal material for medical tools and devices, molds and dies, industrial, high wear applications and parts requiring high strength at elevated temperatures.

## Classification

The chemical composition of LaserForm<sup>®</sup> CoCr (B) conforms to the requirements of the ASTM F75 and is indicated in the table below in % of weight.

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

MEASUREMENT	CONDITION	METRIC		U.S.	
		AS-BUILT	AFTER SOLUTION ANNEAL	AS-BUILT	AFTER SOLUTION ANNEAL
Youngs modulus (GPa   ksi)	ASTM E8M				
Horizontal direction - XY		220 ± 40	240 ± 40	31900 ± 5800	34800 ± 5800
Vertical direction - Z		170 ± 40	220 ± 40	24700 ± 5800	31900 ± 5800
Ultimate strength (MPa   ksi)	ASTM E8M				
Horizontal direction - XY		1150 ± 80	1050 ± 50	165 ± 12	150 ± 7
Vertical direction - Z		1090 ± 40	1040 ± 50	160 ± 6	150 ± 7
Yield strength Rp0.2% (MPa   ksi)	ASTM E8M				
Horizontal direction - XY		840 ± 80	590 ± 40	120 ± 12	85 ± 6
Vertical direction - Z		630 ± 40	570 ± 40	90 ± 6	85 ± 6
Elongation at break (%)	ASTM E8M				
Horizontal direction - XY		6 ± 2	33 ± 6	6 ± 2	33 ± 6
Vertical direction - Z		15 ± 4	35 ± 6	15 ± 4	35 ± 6
Reduction of area (%)	ASTM E8M				
Horizontal direction - XY		13 ± 8	31 ± 6	13 ± 8	31 ± 6
Vertical direction - Z		19 ± 8	32 ± 6	19 ± 8	32 ± 6
Hardness, Rockwell C	ASTM E18	32 ± 5	26 ± 5	32 ± 5	26 ± 5

<sup>1</sup> Parts manufactured with standard parameters on DMP Flex 100 and ProX<sup>®</sup> DMP 200

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



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## Thermal Properties<sup>1</sup>

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K)   Btu/(h.ft.°F))	at 20°C / 120 °F	14	8
CTE - Coefficient of thermal expansion ( $\mu\text{m}/(\text{m} \cdot ^\circ\text{C})$   $\mu\text{inch}/(\text{inch} \cdot ^\circ\text{F})$ )	in the range of 20 to 600 °C	14	7.8
Melting range (°C   °F)		1350 - 1430	2460 - 2610

## Electrical Properties<sup>1</sup>

MEASUREMENT	METRIC	U.S.
Electrical resistivity ( $\mu\Omega \cdot \text{m}$   $\mu\Omega \cdot \text{in}$ )	0.87	34.41

## Physical Properties

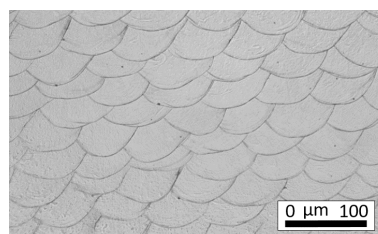
MEASUREMENT	METRIC		U.S.
	AS BUILT AND AFTER SOLUTION ANNEAL	AS BUILT AND AFTER SOLUTION ANNEAL	AS BUILT AND AFTER SOLUTION ANNEAL
Density			
Relative, based on pixel count <sup>2</sup> (%)		>99	
Absolute, theoretical <sup>1</sup> (g/cm <sup>3</sup>   lb/in <sup>3</sup> )	8.30		0.300

## Chemical Composition

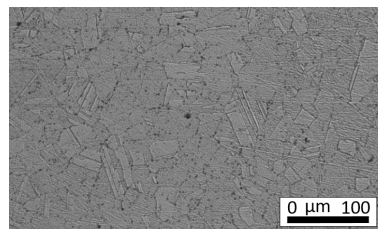
ELEMENT	% OF WEIGHT
Co	Bal.
Cr	28.00-30.00
Mo	5.00-6.00
Ni	0.00-0.10
Fe	0.00-0.50
C	0.00-0.02
Si	0.00-1.00
Mn	0.00-1.00
Cd	0.00-0.02
Be	0.00-0.02
Pb	0.00-0.02

<sup>1</sup> Values based on literature

<sup>2</sup> Parts manufactured with standard parameters on a DMP Flex 100 and ProX<sup>®</sup> DMP 200



Microstructure as built



Microstructure after solution anneal



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