

LaserForm[®] Maraging Steel (B)

Maraging Steel fine-tuned for use with ProX[®] DMP 200 and ProX[®] DMP 300 metal printers producing industrial parts and tool inserts with a combination of high-strength and excellent hardness.

LaserForm Maraging Steel (B) is formulated and fine-tuned specifically for 3D Systems ProX DMP 200 and 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

With properties like 1.2709, this steel is easily heat-treatable in a simple age-hardening process resulting in excellent hardness and strength. LaserForm Maraging Steel (B) has good wear resistance. In regards to post-processing, the material shows good weldability and machinability. LaserForm Maraging Steel (B) is ideal for innovative tool and mold designs including conformal cooling channels for injection molding, die casting and extrusion. The material is also used for high-performance aerospace, automotive and other industrial applications which require high strength and wear resistance.

Classification

The chemical composition of LaserForm Maraging Steel (B) with additional restrictions compared to the DIN 1.2709 standards is indicated in the table below in % of weight.

Mechanical Properties^{1,2}

MEASUREMENT	CONDITION	METRIC			U.S.		
		AS BUILT	AFTER STRESS RELIEF	AFTER AGEING	AS BUILT	AFTER STRESS RELIEF	AFTER AGEING
Young's modulus (GPa ksi)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		160 ± 30 145 ± 30	160 ± 20 155 ± 20	185 ± 20 165 ± 20	23200 ± 4400 21000 ± 4400	23200 ± 2900 22500 ± 2900	26800 ± 2900 24000 ± 2900
Ultimate strength (MPa ksi)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		1180 ± 20 1050 ± 40	1130 ± 20 1100 ± 40	2190 ± 50 2140 ± 50	170 ± 3 150 ± 6	165 ± 3 160 ± 6	320 ± 7 310 ± 7
Yield strength Rp0.2% (MPa ksi)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		950 ± 60 780 ± 60	800 ± 50 790 ± 50	1870 ± 80 1750 ± 80	140 ± 9 115 ± 9	115 ± 7 115 ± 7	270 ± 12 255 ± 12
Elongation at break (%)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		13 ± 3 13 ± 3	13 ± 3 13 ± 3	3 ± 1.5 1.5 ± 0.5	13 ± 3 13 ± 3	13 ± 3 13 ± 3	3 ± 1.5 1.5 ± 0.5
Reduction of area (%)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		55 ± 5 60 ± 5	55 ± 10 50 ± 10	12 ± 5 7 ± 5	55 ± 5 60 ± 5	55 ± 10 50 ± 10	12 ± 5 7 ± 5
Hardness, Rockwell C	NF EN ISO 6508-1	36 ± 2	33 ± 2	55 ± 3	36 ± 2	33 ± 2	55 ± 3

¹ Parts manufactured with standard parameters on ProX[®] DMP 200 and ProX[®] DMP 300

² Values based on average and double standard deviation

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Thermal Properties¹

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K) Btu/(h.ft.°F))	at 20°C / 120 °F	20.9	12.1
CTE - Coefficient of thermal expansion (µm/(m.°C) µ inch/(inch . °F))	in the range of 20 to 600 °C	10	5.6
Melting range (°C °F)		1430 - 1450	2610 - 2640

Electrical Properties¹

MEASUREMENT	METRIC	U.S.
Electrical resistivity (µΩ.m µΩ.in)	0.44	17.32

Physical Properties

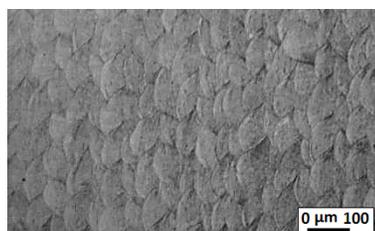
MEASUREMENT	METRIC		U.S.
	AS BUILT, AFTER STRESS RELIEF AND AFTER AGEING	AS BUILT, AFTER STRESS RELIEF AND AFTER AGEING	
Density			
Relative, based on pixel count ² (%)		>99,5	
Absolute theoretical ¹ (g/cm ³ lb/in ³)	8.06		0.291

Chemical Composition

ELEMENT	% OF WEIGHT
Fe	Bal.
Ni	17.00-19.00
Co	9.00-11.00
Mo	4.00-6.00
Ti	0.90-1.10
Si	≤1.00
Mn	≤1.00
C	≤0.03

¹ Values based on literature

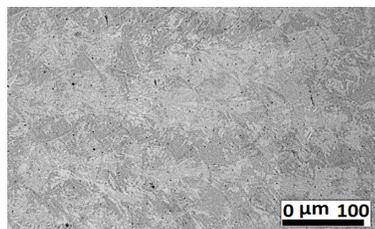
² Parts manufactured with standard parameters on a ProX DMP 200 and 300



Microstructure as built



Microstructure after stress relief



Microstructure after ageing



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