LaserForm® Maraging Steel (A)

Maraging steel fine-tuned for use with ProX® DMP 320 metal 3D printers to produce industrial parts and tool inserts with a combination of high-strength and excellent hardness.

LaserForm Maraging Steel (A) is formulated and fine-tuned specifically for 3D Systems DMP 320 metal 3D Printers to deliver highest part quality and best 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 production parts year over year. Based on extensive testing the below listed part quality data and mechanical properties give you high planning security. 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 (A) has good wear resistance. In regards to post-processing, the material shows good weldability and machinability. LaserForm Maraging Steel (A) 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

Parts built with LaserForm Maraging Steel (A) have a chemical composition that conforms to the compositional requirements of Werkstoff Nr. 1.2709.

Mechanical Properties [1,2]

MEASUREMENT	CONDITION	METRIC			U.S.		
		AS-BUILT	AGEING 1	AGEING 2	AS-BUILT	AGEING 1	AGEING 2
Ultimate strength (MPa | ksi)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		1230 ± 70 1220 ± 20	2210 ± 30 2120 ± 30	2260 ± 30 2160 ± 90	178 ± 10 177 ± 3	320 ± 5 307 ± 5	328 ± 5 313 ± 13
Yield strength Rp0.2% (MPa | ksi)	ASTM E8M						
Horizontal direction[4] - XY Vertical direction[5] - Z		1080 ± 90 1090 ± 50	2125 ± 30 2030 ± 60	2180 ± 40 2070 ± 80	115 ± 13 158 ± 7	308 ± 4 294 ± 9	316 ± 6 300 ± 12
Elongation at break (%)	ASTM E8M						
Horizontal direction - XY Vertical direction - Z		13 ± 2 13 ± 2	5 ± 2 5 ± 2	5 ± 2 2 ± 1	13 ± 2 13 ± 2	5 ± 2 5 ± 2	5 ± 2 2 ± 1
Hardness, Rockwell C	ASTM E18	35 ± 3	55 ± 3	55 ± 3	35 ± 3	55 ± 3	55 ± 3
Impact toughness[6] (J | ft-lb) [3]	ASTM E23	64 ± 5	8 ± 2	7 ± 2	47 ± 4	6 ± 2	5 ± 2

Thermal Properties [4]

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K) | Btu/(h.ft².°F))	at 25°C / 36 °F	20.9	145
CTE - Coefficient of thermal expansion (µm/ (m.°C) | µ inch/(inch. °F)	In the range of 0 to 100 °C	10.0	5.6
Melting range (°C | °F)		1430-1450	2610-2640

[1] Parts manufactured with standard parameters on a ProX DMP 320, Config B
[2] Values based on average and double standard deviation
[3] Tested with Charpy V-notch impact test specimens type A at room temperature
[4] Values based on literature

LaserForm® Maraging Steel (A)

Physical Properties[1]

MEASUREMENT	METRIC		U.S.	
	AS-BUILT	AGEING	AS-BUILT	AGEING
Density				
Relative, based on pixelcount (%)	> 99.8%			
Absolute theoretical (g/cm³ | lb/in3) [1]	8.1		0.293	

Surface Quality[2]

MEASUREMENT	SANDBLASTED METRIC	SANDBLASTED U.S.
Surface Roughness Ra		
Horizontal direction (XY) (µm | µin)	4 - 7	157 - 276
Vertical direction (Z) (µm | µin)	5 - 6	196 - 236

Chemical Composition

ELEMENT	% OF WEIGHT
C	≤ 0.03
Si	≤ 0.10
Mn	≤ 0.15
P	≤ 0.01
S	≤ 0.01
Cr	≤ 0.25
Mo	4.50 - 5.20
Ni	17.0 -19.0
Ti	0.80 - 1.20
Co	8.50 - 10.0
Fe	Rest

Microstructure as built
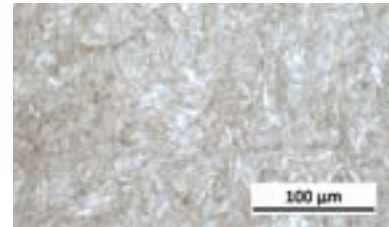
Microstructure ageing 1
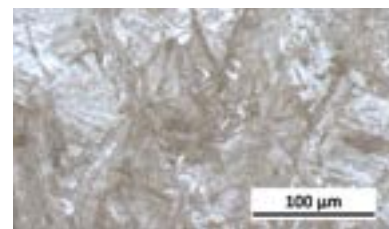
Microstructure ageing 2

3D SYSTEMS®

www.3dsystems.com

[1] Values based on literature
[2] Values based on minimum and maximum rangers