

Maraging Steel (MS1)

MS1 is a low-carbon maraging steel powder used in DMLS when parts need very high strength after heat treatment. We print near-net, machine critical features while the part is still workable, then age harden to final hardness and strength.

18Ni300 / 1.2709

Equivalent maraging steel families

8.0–8.1 g/cm³

Typical density range for EOS MS1 parts

15–65 µm

Generic powder particle size distribution

About this alloy

EOS MS1 chemistry corresponds to 18% Ni Maraging 300, AMS 6514, and X3NiCoMoTi 18-9-5. It is commonly used for tooling inserts, high-strength mechanical components, and wear-focused applications that need steel-level performance plus additive geometry freedom.

Typical applications

Injection molding tools and inserts with conformal cooling, high-strength mechanical engineering parts, structural hardware under heavy load, and wear-resistant tooling details.

Powder chemical composition (wt.-%)

ELEMENT	MIN.	MAX.
Fe	Balance	Balance
Ni	17.0	19.0
Co	8.5	9.5
Mo	4.5	5.2
Ti	0.6	0.8
Al	0.05	0.15
Cr	—	0.5
Cu	—	0.5
C	—	0.03
Mn	—	0.1
Si	—	0.1
P	—	0.01
S	—	0.01

Published process options

SYSTEM	LAYER	BUILD RATE	MIN. WALL	INERT GAS	HARDNESS AFTER HT
EOS M 290	40 µm	4.2 mm³/s	0.3–0.4 mm	Nitrogen	Peak ~54 HRC
EOS M 290	50 µm	Published by EOS	0.3–0.4 mm	Nitrogen	50–57 HRC typical

EOS publishes both 40 µm and 50 µm M 290 options for MS1. The 40 µm profile includes a reported average defect level of 0.04%.

Mechanical properties, heat treated (ISO 6892-1)

PROCESS	ORIENTATION	YIELD RP0.2 [MPA]	TENSILE RM [MPA]	ELONGATION A [%]	MODULUS E [GPA]
EOS M 290, 40 µm	Vertical	2010	2100	4.0	190
EOS M 290, 40 µm	Horizontal	2020	2085	4.5	190
EOS M 290, 50 µm	Vertical	2000	2100	2.0	—
EOS M 290, 50 µm	Horizontal	2030	2100	3.0	—

Hardness, fatigue, and defects

PROPERTY	TYPICAL VALUE	CONDITION
Hardness after heat treatment	50–57 HRC	Solution anneal + age-hardened
Peak hardness condition	~54 HRC	Age at 490 °C for 6 h
Fatigue strength (heat treated)	~650 MPa	Representative OEM value
Average defects (M 290, 40 µm)	0.04%	Published EOS process data

Coefficient of thermal expansion (ASTM E228)

TEMPERATURE	CTE
25–100 °C	10.6×10 ^{K}
25–200 °C	10.9×10 ^{K}
25–300 °C	11.2×10 ^{K}
25–400 °C	11.5×10 ^{K}

Heat treatment route

1) Solution annealing: 2 h at 940 °C (±10 °C), then rapid air cooling to below 32 °C (about 5 to 60 °C/min). 2) Aging: 6 h at 490 °C (±10 °C), then air cool. Processing can be done in vacuum or inert gas. As-built parts are machinable; aging raises hardness above 50 HRC.

Source and notes

Values are drawn from the EOS MaragingSteel MS1 material data sheet, status 07/2022 ([OEM source](#)). Results vary with machine settings, orientation, part geometry, and post-processing. They are not a guarantee of part properties.

Full page: <https://www.evologymfg.com/manufacturing-capabilities/dmls-direct-metal-laser-sintering/maraging-steel>