

### Introduction

PowderRange metal Additive Manufacturing powders from Carpenter Additive are developed with the needs of the busy AM facility in mind.

- ▶ Easy ordering
- ▶ Standard specifications
- ▶ 24-hour shipment
- ▶ Sold in easy-to-handle multiples of 10 kgs
- ▶ Easy repeat orders to optimize inventory management

This leaves you free to concentrate on the design and build of your AM parts, confident that PowderRange metal AM powders from Carpenter Additive will add reliability and consistency to your AM built parts.

### Characteristics

PowderRange M300 Tool Steel is an age hardenable martensitic tool steel with exceptional mechanical properties, specifically a high tensile strength and hardness. It is easily heat treated, with superior mechanical properties being achieved after age hardening.

The high carbon tool steels, such as H13 or M2, which are typically used in tooling and moulding applications are very difficult to process by conventional Laser Powder Bed Fusion. PowderRange M300 offers a comparable alternative, in terms of mechanical properties, but with proven AM suitability. PowderRange M300 maintains strict control on residual alloying elements to optimize for AM.

### Applications

PowderRange M300 Tool Steel is used for a range of applications where exceptional tensile strength and hardness are required, and therefore lends itself to tooling applications. Specific examples are tool inserts for injection moulding and die-casting, as well as functional components.

## Chemical composition

Element		Minimum wt%	Maximum wt%
Al	ALUMINUM	0.05	0.15
C	CARBON		0.03
Cr	CHROMIUM		0.25
Co	COBALT	8.5	10.0
Cu	COPPER		0.5
Fe	IRON	Balance	
Mn	MANGANESE		0.10
Mo	MOLYBDENUM	4.5	5.2
Ni	NICKEL	17.00	19.00
N	NITROGEN		0.10
O	OXYGEN		0.10
P	PHOSPHORUS		0.010
Si	SILICON		0.10
S	SULFUR		0.010
Ti	TITANIUM	0.8	1.2

## Particle size distribution – CT PowderRange M300 E

Size	Value	Method
-45 µm	10 Weight %	Sieve Analysis
+106 µm	10 Weight %	Sieve Analysis

### Mechanical properties (indicative only)

Property		As built	After Heat Treatment
Tensile Strength [1]	Horizontal Direction (XY)	1000 - 1200 MPa 145- 174 ksi	1900 - 2100 MPa 275.6- 304.6 ksi
	Vertical Direction (Z)	1000 - 1200 MPa 145- 174 ksi	1900 - 2100 MPa 275.6- 304.6 ksi
Yield Strength [1]	Horizontal Direction (XY)	1000 - 1100 MPa 145- 159.5 ksi	1850 - 2050 MPa 268.3- 297.3 ksi
	Vertical Direction (Z)	900 - 1100 MPa 130.5- 159.5 ksi	1850 - 2050 MPa 268.3- 297.3 ksi
Young's Modulus [1]	Horizontal Direction (XY)	150 - 170 GPa 21.8- 24.7 Msi	160 - 200 GPa 23.2- 29 Msi
	Vertical Direction (Z)	140 - 160 GPa 20.3- 23.2 Msi	160 - 200 GPa 23.2- 29 Msi
Elongation [1]	Horizontal Direction (XY)	6 - 14 %	2 - 4 %
	Vertical Direction (Z)	6 - 14 %	2 - 4 %
Hardness [2]		30 - 40 HRC	50 - 60 HRC
Coefficient of Thermal Expansion [3]	10 – 11 × 10 <sup>-6</sup> m/mK		
Thermal Conductivity [3]	15 - 20 W/mK		

1. As built. Mechanical testing in accordance with ISO 6892

2. As built. Hardness test in accordance with ISO 6508

3. In the range of 20°C (68°F) to 100°C (212°F)

Range of mechanical properties encompasses expected values across multiple machine platforms

## Similar materials

Company	Alternative Title
LPW	M300 Tool Steel
UNS	1.2709
Other Generic Names	Maraging Steel
3D Systems	CL 50WS
Concept Laser	MS1*
EOS	N/A
Realizer	N/A
Renishaw	1.2709
SLM Solutions	Tool Steel 1.2709-A LMF
TRUMPF	M300 Tool Steel

## Ordering information

PowderRange M300 is available from stock and dispatched within 24 hours of receipt of order. Our PowderRange metal AM powders are sold in multiples of 10 kgs giving you the flexibility to order just the volume you need to maintain efficient material stock levels.

All our PowderRange materials are supplied with a full metal powder certification to Carpenter Additive's standard material specification, reporting size distribution, flow, chemistry and morphology.

Code	Description	Unit volumes
CT PowderRange M300 E	Electron Beam powder bed fusion machines	10 kgs

## Further information

To make an enquiry, please contact [powderrange@carpenteradditive.com](mailto:powderrange@carpenteradditive.com). Alternatively, call +44 (0)1928 240 530. You can visit us at [www.carpenteradditive.com](http://www.carpenteradditive.com).