MAKINO
Promise of Performance

MS1

Fe-based Alloy Powder
53/20 µm, Gas Atomized
Designed for Additive Manufacturing, L-PBF

Chemical composition similar to DIN 1.2709, A646, M300, X3NiCoMoTi 18-9-5

DESCRIPTION

MS1 is a gas atomized maraging steel alloy powder engineered for additive manufacturing (AM).This material is characterized by its good mechanical properties and its ability to be age-hardened by heat treatment to obtain very high strength and hardness properties. The material benefits from a nickel martensitic structure, enabling the material to reach a hardness level of up to 55 HRC.

The material properties make it ideal for many tooling applications for die casting, injection moulding, and extrusion. It also exhibits high performance characteristics that finds its use in aerospace and automotive applications as well.

KEY PROPERTIES

- High strength and toughness
- High hardness
- Good machinability
- Good wear resistance
- High temperature performance

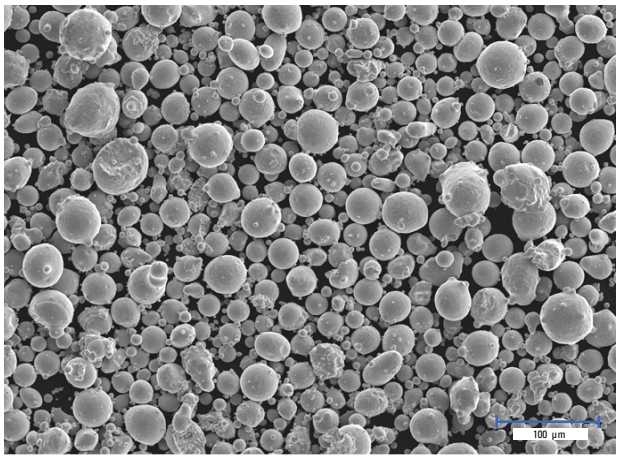
APPLICATIONS

- Die casting
- Injection moulding
- Extrusion tools
- Motorsport parts
- Aerospace components

POWDER CHEMICAL COMPOSITION

Element	Min. (wt%)	Max. (wt%)
Fe	Bal.	Bal.
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
Si	-	0.1
C	-	0.02

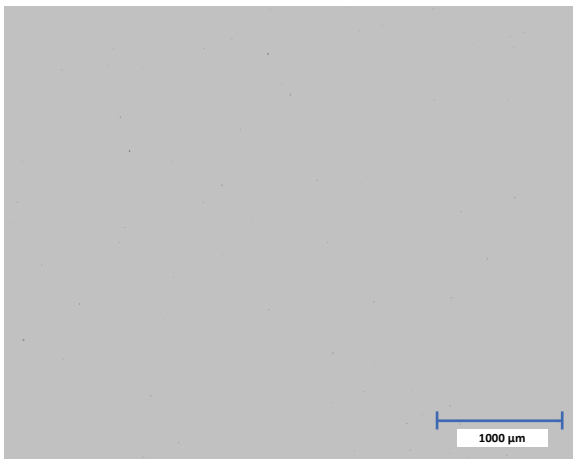
SEM IMAGE



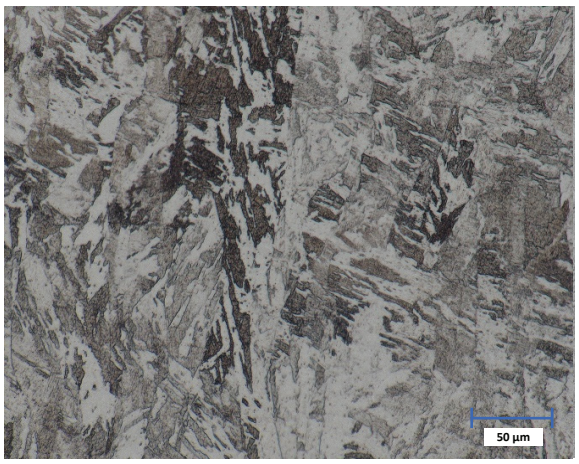
POWDER PROPERTIES (ISO 4490, ISO 3923-1)

Particle Size Distribution (µm)	Hall Flow (s/50g)	Apparent Density (g/cm³)
20 – 53	17.8	4.15

MICROGRAPHS



Polished Surface



Microstructure

MECHANICAL PROPERTIES (ISO 6892-1)

Condition	Orientation	Ultimate Tensile Strength (MPa)	0.2% Yield Strength (MPa)	Elongation at Break (%)
As-Built	Horizontal	713 ± 6	653 ± 12	55 ± 5
	Vertical	660 ± 14	613 ± 4	48 ± 1
Heat-Treated	Horizontal	1820 ± 23	1725 ± 43	12 ± 1
	Vertical	1890 ± 67	1808 ± 89	48 ± 1

PHYSICAL PROPERTIES

Average Defect Percentage (%)	Density (g/cm³)
< 0.10	> 8.12

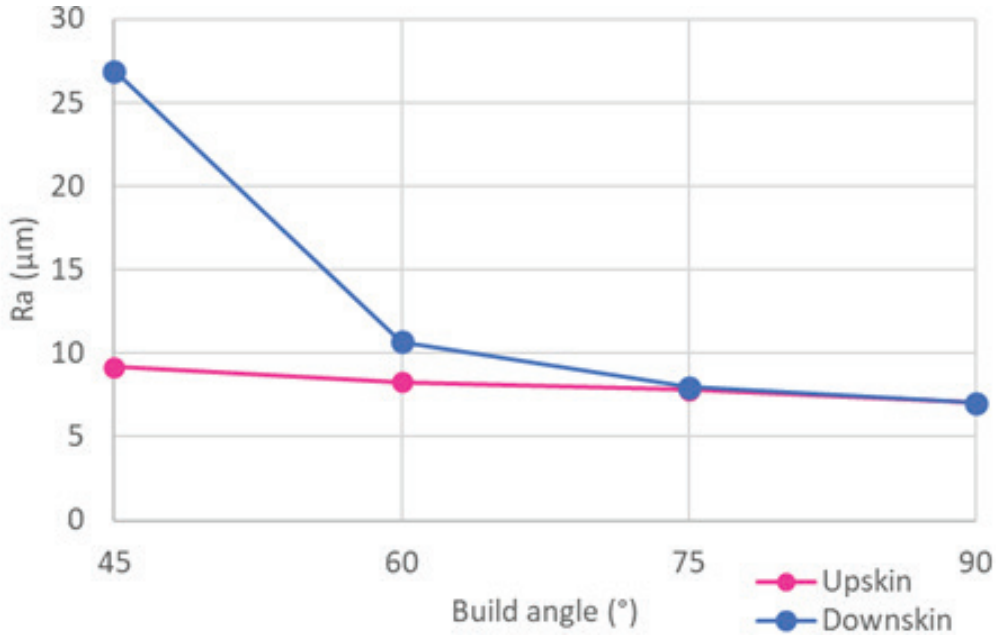
MELTING POINT

Celsius (°C)	Fahrenheit (°F)
1371 - 1399	2500 - 2550

HARDNESS (ISO 6507-1)

$HV_{0.3}$
228

SURFACE ROUGHNESS



PROCESS INFORMATION:

The properties reported in this Technical Data Sheet are applicable to Makino AM powders tested and distributed by Makino and processed on Makino LMD machine utilizing parameters in accordance with relevant operating guidelines (inclusive of setup conditions and maintenance). The properties are obtained by following recommended protocols. Further information regarding the methods used by Makino can be provided upon inquiry.

DISCLAIMER:

The data and information provided represent, to the best of our knowledge, standard or average values and do not constitute guarantees for upper and lower limit parameters. The recommended applications for the material disclosed are exclusively for illustrative purposes that help the reader to conduct their independent assessments. These suggestions are not intended to be expressed or implied warranties of suitability for the specified applications or any other purposes. The information included may be subject to change at any time without prior notification.

CONTACT US:

Our Safety Datasheet (SDS) is available upon request. For more information or support please contact Makino at sales-am@makino.com.sg or visit www.makino.com.sg

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