Datasheet
Tool and high-speed steel

Osprey® M2

Osprey® M2 is a high-speed steel alloyed with tungsten and molybdenum. It is typically used in drill bits.

UNS
T11302

ASTM, AISI
A600, M2

EN Number
1.3343

Powder designed for
Metal Injection Moulding (MIM)
Additive Manufacturing (AM)

Product description

Osprey® M2 is a high-speed steel alloyed with tungsten and molybdenum. M2 is a general-purpose, high-speed steel exhibiting well-balanced toughness, wear resistance and red hardness properties. This grade is commonly used in cold work punches and dies, as well as high speed tool and cutting applications such as drills and milling processes.

This metal powder is manufactured by Inert Gas Atomization (IGA), producing a powder with a spherical morphology which provides good flow characteristics and high packing density. In addition, the powder has a low oxygen content and low impurity levels, resulting in a metallurgically clean product with enhanced mechanical performance.

Chemical composition (nominal), %

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Fe	Bal.
C	0.78-1.05
Cr	3.75-4.50
Ni	0.3
Mo	4.5-5.5
Si	0.2-0.45
Mn	0.15-0.40
W	5.50-6.75
V	1.75-2.20
Co	

Powder characteristics and morphology

Powder for Metal Injection Moulding (MIM)

Osprey® MIM powder has a spherical morphology, resulting in high packing density. This enables the manufacture of feedstocks with high powder loading, which not only minimizes binder costs but also reduces part shrinkage during debinding and sintering. Spherical powder also has excellent flow characteristics, resulting in reduced tool wear and consistent mould filling.

Osprey® MIM powder's low oxygen content allows better control of carbon and consistency during sintering. Low oxygen levels, together with high packing density, also facilitate faster sintering.

Particle size distribution

Powder for Additive Manufacturing

Osprey® metal powder for Additive Manufacturing is available in a wide range of particle size distributions that are tailored to the individual Additive Manufacturing systems. They can also be tailored to the particular requirements of the end application, both in terms of mechanical performance and surface finish.

Typical particle size distributions for Additive Manufacturing

Typical particle size distributions for Additive Manufacturing
Process technology
Size
Binder jetting
≤ 16, ≤ 22, ≤ 32, ≤ 38, ≤ 45
Laser - Powder Bed Fusion (L-PBF)
15 to 53 and 10 to 45
Electron beam - Powder Bed Fusion (E-PBF)
45 to 106
Direct Energy Deposition (DED)
53 to 150

Powder for Metal Injection Moulding (MIM)

Osprey® metal powder for Metal Injection Moulding (MIM) is available in a wide range of particle size distributions, from under 5 µm up to 38 µm. The table shows our standard particle size distributions for MIM powders.

Size (µm)	D10 (µm)	D50 (µm)	D90 (µm)
≤ 38	5.5	13.0	31.0
≤ 32	5.0	12.0	29.0
80% ≤ 22	4.5	11.5	27.0
90% ≤ 22	4.0	10.5	22.0
90% ≤ 16	3.5	8.0	16.0

*Particle size measurements performed using a Malvern laser particle size analyzer, typical D10,

D50 and D90 provided.

Tailor-made particle size distributions are available on request. Contact us to discuss your specific requirements.

Mechanical properties

Metal Injection Moulding (MIM)

Feedstocks of M2 powders (80% -22 µm) were prepared by TCK using their proprietary binder formulation to achieve a powder loading level of 61.8% corresponding to a 17.4% shrinkage factor. The feedstocks were molded in an Arburg injection molding unit to produce green standard MIM tensile and Charpy test specimens.1

A series of sintering cycles was run at temperatures in the range 1220–1250 °C with a standard heating profile of: 2 °C/min ramp to 1000 °C, 60 min hold, 2 °C/min ramp to sintering temperature, 60 min hold and furnace cool under a nitrogen atmosphere.

After austenitizing at 1190 °C and double tempering at 550 °C, samples were subject to tensile and hardness testing.

	Sintering temperature, °C	Relative density, %	Yield strength, MPa	Tensile strength, MPa	Elongation, %	Hardness, Hv/HRC
Osprey® M2, 80% -22 µm (heat-treated)	1220	84.6	876	1205	1	428/43
Osprey® M2, 80% -22 µm (heat-treated)	1240	97.4	1263	1647	1.5	863/66
Osprey® M2, 80% -22 µm (heat-treated)	1250	99.9	1201	1330	-	874/66

Additive Manufacturing (AM)

Mechanical properties for Binder Jet (BJ) printed Osprey® M2 material, 90 % -22 µm powder, evaluated in room temperature in a heat-treated condition. Samples were printed by ExOne™.

	Relative density, %	Hardness, HRC
Osprey® M2 Binder Jet (heat treated)	98.5-99.5	62-65

1Sintering and Properties of MIM M2 High Speed Steel Produced by Prealloy and Master Alloy Routes, Powdermet 2015; M.A. Kearns; K. Murray; V. Ryabinin; E. Gonzalez.

Testing

All Osprey® metal powders are supplied with a certificate of analysis containing information on the chemical composition and particle size distribution. Information on other powder characteristics is available upon request.

Packaging

A wide range of packaging options is available, from 5kgs plastic bottles to 250kg metal drums.

5 kg (11 lbs) Plastic bottles
6 kg (13 lbs) Plastic bottles
10 kg (22 lbs) Plastic bottles
20 kg (44 lbs) Metal cans
100 kg (220 lbs) Steel drums
150 kg (330 lbs) Steel drums
250 kg (551 lbs) Steel drums
All packaging materials are suitable for air, sea and road freight.

Contact us for more information and to discuss your packaging requirements.

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