Datasheet
Precipitation hardening stainless steel

Osprey® 17-4 PH

Osprey® 17-4 PH is a precipitation hardening stainless steel with good resistance to general corrosion and well-defined heat treatment for high strength and hardness.

UNS
S17400

ASTM, AISI
630

EN Name
X5CrNiCuNb16-4

EN Number
1.4548

DIN
X5CrNiCuNb16-4

Powder designed for

- Additive Manufacturing (AM)
- Metal Injection Moulding (MIM)
- Micro-MIM

Product description

Osprey® 17-4 PH is a precipitation hardening stainless steel with good resistance to general corrosion and well-defined heat treatment for high strength and hardness. The alloy is typically used in medical tools and devices, aerospace applications, electronics and consumer goods, and general-purpose applications.

The powder for Metal Injection Moulding (MIM) has material properties that achieve typical values and exceed minimum values, according to MPIF Standard 35.

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	≤0.07
Cr	15.5-17.5
Si	1.0
Mn	≤1.0
S	≤0.04
P	≤0.03
Cu	3.0-5.0
Nb	0.15-0.45
Mo	≤0.3
Ni	3.0-5.0

Powder characteristics and morphology

Powder for Additive Manufacturing

Osprey® metal powder for Additive Manufacturing is characterized by a spherical morphology and high packing density, which confer good flow properties. For powder bed processes these are essential when applying fresh powder layers to the bed to ensure uniform and consistent part build.

For blown powder processes, such as Direct Energy Deposition (DED), good flow ensures uniform build rates. Tight control of the particle size distribution also helps ensure good flowability. Low oxygen powders result in clean microstructures and low inclusion levels in the finished parts.

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.

Powder for Micro-MIM

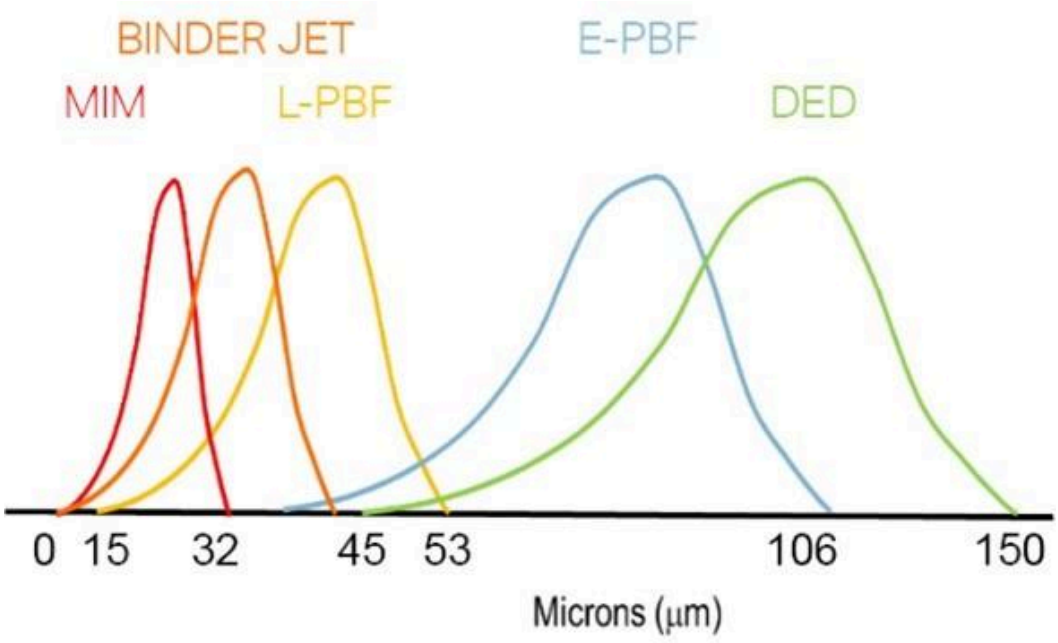
Osprey® Micro-MIM powder has a spherical morphology, resulting in high packing density. This enables the manufacture of feedstocks with high powder loading, which not only minimizes binder costs but also reduces part shrinkage during debinding and sintering. Spherical powder also has excellent flow characteristics,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

Osprey® Micro-MIM powders' low oxygen content allows better control of carbon and consistency during sintering. Low oxygen, together with high packing density, also facilitates 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.

Process technology	Size (µm)
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.

Powder for Micro-MIM

Osprey® metal powder for Micro-Metal Injection Moulding (Micro-MIM) has the following typical particle size distributions:

	D10 (%)	D50 (%)	D90 (%)
90% – 10 µm	3.0	5.7	9.8
80% – 5 µm	1.9	3.4	6.0

*Particle size measurements performed using a Malvern laser particle size analyzer.

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

Mechanical properties

Typical mechanical properties of material produced by Laser - Powder Bed Fusion (L-PBF) in as-built and heat-treated conditions evaluated in room temperature, as measured in independent research. Heat treatment: H900 aolution annealed (1,051°C/1,924°F for 1h in hydrogen) and aged (482°C/900°F for 1h in nitrogen).

Condition	Yield strength (Rp0.2), MPa	Tensile strength (Rm), MPa	Elongation (A), %	Hardness, HV (HRC)*	Density, g/cc	Density, %
As built	860	905	20	230 (22)	7.7	99
Heat treated	1,116	1,358	5.1	450 (45)	7.7	99

Condition	Yield strength (Rp0.2), ksi	Tensile strength (Rm), ksi	Elongation (A), %	Hardness, HRC*	Density, lb/in3	Density, %
As built	125	131	20	230 (22)	0.28	99
Heat treated	162	197	5.1	450 (45)	0.28	99

*Typical Vicker's Hardness levels (ASTM E92, ISO 6507-1, JIS Z2244, GB/T 4340.1) as well as HRC values (ASTM E18, ISO 6508-1, JIS Z2245, GB/T 230) in the Laser - Powder Bed Fusion (L-PBF) as-built and heat-treated conditions.

Physical properties

Wrought material, typical values

Density	7.8 g/cm3(0.28 lb/in3)
Thermal conductivity (H900 heat treatment tested at 149°C/ 300°F)	17.9 W/mK
Coefficient of thermal expansion*	10.8 µm/m°K
Melting range	1,404–1,440°C(2,559–2,624°F)

Typical application areas

Osprey® 17-4PH is used in a wide range of industries, such as medical, aerospace, chemical, oil/gas and general engineering. Application include:

- Surgical and dental instruments
- Aerospaceturbine blades and structures
- Valves and engine components
- Gears and shafts

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 are available, from 1 kg (2.2 lb) to 200 kg (440 lb)*.

Contact our team who can support you with selecting the right packaging for your product and application.

*Some packaging options may not be available for all products due to international shipping regulations.