

Datasheet  
Superalloys

# Osprey® 625

Osprey® 625 is a solution-hardened nickel-based superalloy alloyed with molybdenum and niobium. It has very high corrosion resistance and is typically used in demanding applications with high demand on low concentrations of residual elements.

UNS

N06625

EN Name

NiCr22Mo9Nb

EN Number

2.4856

DIN

NiCr22Mo9Nb

Powder designed for

- Additive Manufacturing (AM)
- Cold spray
- Hot Isostatic Pressing (HIP)
- Metal Injection Moulding (MIM)



## Product description

Osprey® 625 is a solution-hardened nickel-based superalloy alloyed with molybdenum and niobium. The alloy is characterized by very high corrosion resistance and is typically used in demanding applications with high demand on low concentrations of residual elements. Osprey® 625 is an alloy of the same type as Inconel® 625\*.

Osprey® 625 can be used in a wide range of temperatures from -196°C to 815°C (-321°F to 1,500°F). However, it should be noted that prolonged exposure to temperatures above 600°C (1,100°F) may lead to embrittlement.

### Main characteristics of Osprey® 625:

- Extremely good corrosion resistance in widely varying acidic and chloride containing environments
- High strength
- Excellent fabrication properties

This metal powder is manufactured by either induction melting under Vacuum Inert Gas Atomization (VIGA) or melting under argon prior to 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.

\*Inconel® is a trademark owned by Huntington Alloys Corporation.

### Chemical composition (nominal), %

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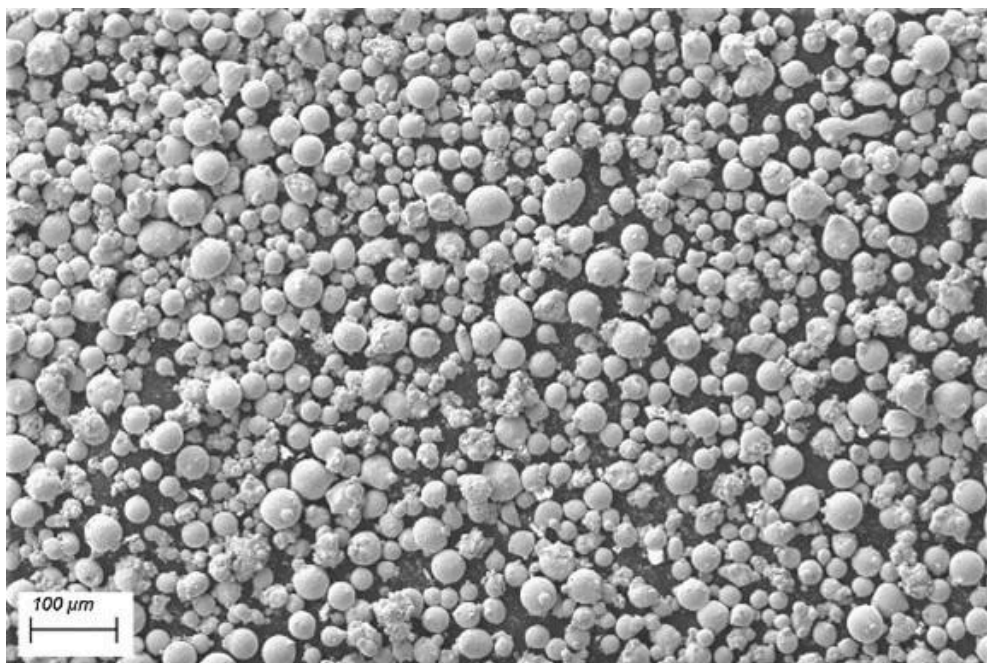
Ni	58.0 min
Fe	≤5.0
C	≤0.1
Cr	20.0-23.0
Mo	8.0-10.0
Al	≤0.4
Ti	≤0.4
Nb	3.15-4.15 (Nb+Ta)
Co	≤1.0
Mn	≤0.5
Si	≤0.5
P	≤0.015
S	≤0.015

## 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.



*The powder morphology of Osprey® 625 powder, shown here for additive manufacturing, is typically spherical, with smooth surface and low level of powder satellites.*

### **Powder for Cold spray**

Osprey® metal powder for cold spray is characterized by a spherical morphology and good flow properties. Accurate control of the powder composition and particle size distribution ensure consistent performance both throughout a single batch as well as between different batches of the same alloy.

### **Powder for Hot Isostatic Pressing (HIP)**

Osprey® HIP powder has a spherical morphology, resulting in 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.

### **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

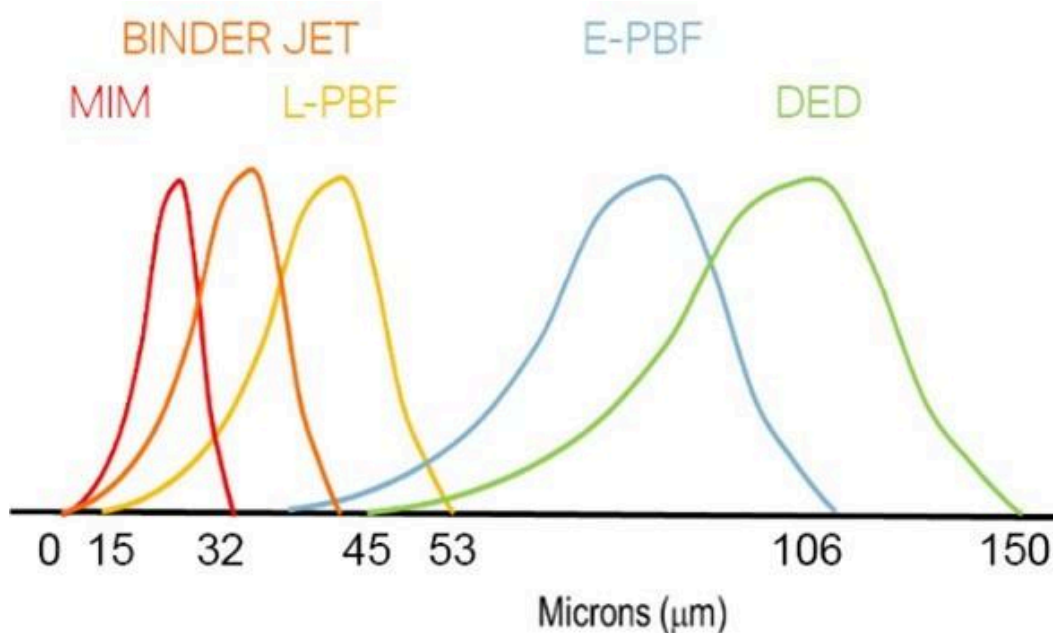
also reduces part shrinkage during debinding and sintering. Spherical powder also has excellent flow characteristics, resulting in reduced tool wear and consistent mould filling.

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.*

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 Cold spray

Osprey® metal powder for Cold spray is available in a wide range of particle size distributions, from 5 µm to 45 µm. Our standard range of Cold spray powder includes the following particle size distributions:

- 20 to 45 µm

- 15 to 38  $\mu\text{m}$
- 10 to 32  $\mu\text{m}$
- 5 to 25  $\mu\text{m}$

### **Powder for Hot Isostatic Pressing (HIP)**

Osprey® powder for Hot Isostatic Pressing (HIP) is available in a broad size range, typically <250 microns, resulting in a high packing density and tap density. Low oxygen levels, together with high packing density, also facilitate faster sintering.

### **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  $\mu\text{m}$  up to 38  $\mu\text{m}$ . The table shows our standard particle size distributions for MIM powders.

Size ( $\mu\text{m}$ )	D10 ( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )	D90 ( $\mu\text{m}$ )
$\leq 38$	5.5	13.0	31.0
$\leq 32$	5.0	12.0	29.0
$80\% \leq 22$	4.5	11.5	27.0
$90\% \leq 22$	4.0	10.5	22.0
$90\% \leq 16$	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

Typical mechanical properties of as-built and heat-treated material produced by Laser - Powder Bed Fusion (L-PBF) evaluated at room temperature.

Alternative heat treatments can be applied to optimize the mechanical properties, balancing tensile strength and elongation.

Condition	Direction	Yield strength (Rp0.2), MPa	Tensile strength (Rm), MPa	E-modulus, GPa <sup>1)</sup>	Elongation (A), %	Impact toughness, J
As built	Horizontal	664	891	144	60	-
As built	Vertical	420	915	190	46	-
Heat treated <sup>2)</sup>	Horizontal	590	945	-	44	145
Heat treated <sup>2)</sup>	Vertical	544	842	-	51	163

Condition	Direction	Yield strength (Rp0.2), ksi	Tensile strength (Rm), ksi	E-modulus, ksi <sup>1)</sup>	Elongation (A), %	Impact toughness, ft/lb
As built	Horizontal	96	129	21	60	-
As built	Vertical	61	99	28	46	-
Heat treated <sup>2)</sup>	Horizontal	86	112	-	44	107
Heat treated <sup>2)</sup>	Vertical	79	92	-	51	120

1) X103

2) Heat-treated material (1,000°C/1,832°F, 1h, air cooled)

## Hardness

Typical Vicker's Hardness levels (ASTM E92, ISO 6507-1, JIS Z2244, GB/T 4340.1) as well as HRC values for Osprey® 625 Laser - Powder Bed Fusion (L-PBF) material.

Condition	HV0.5	HRC
As built	299	31
Solution annealed <sup>1)</sup>	238	22
Solution annealed <sup>2)</sup>	231	21

1) Heat-treated material (1,048°C/1,918°F, 1 hour, air cooled)

2) Heat-treated material (1,048°C/1,918°F, 1 hour, water cooled)

## Physical properties

### Wrought material data, typical values

Density	8.44 g/cm <sup>3</sup> (0.30 lb/in <sup>3</sup> )
Thermal conductivity	9.2 W/mK to 10.7 W/mK
Coefficient of thermal expansion <sup>1)</sup>	12.8 10 <sup>-6</sup> K <sup>-1</sup>
Melting range	1,290–1,350 °C (2,354–2,462°F)

1) In the range of 0–100°C (32–212°F)

## Typical application areas

Osprey® 625 is an extremely versatile nickel-based alloy, suitable for use in both oxidizing and reducing acidic environments. Examples are:

- Hydrochloric acid
- Nitric acid
- Phosphoric acid
- Chloride-containing environments

The grade can also be used for a wide range of temperatures from -196 to 815°C (-321 to 1,500°F).

Typical areas of use include hydraulic systems, heat exchangers and high-temperature applications. Some industrial examples are:

- High-temperature aerospace
- Chemical process industry
- Power industry

## 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.