



OSPREY[®] ALLOY H-X FOR ADDITIVE MANUFACTURING

DATASHEET

GENERAL DESCRIPTION

Osprey[®] HX-AM nickel alloy is a powder manufactured by vacuum inert gas atomization, capable of achieving good mechanical properties, including elongation and toughness and oxidation resistance at high temperature. This grade of metal powder is designed for processing by Additive Manufacturing, including Laser - Powder Bed Fusion (L-PBF), for aerospace applications including combustor components and furnace equipment.

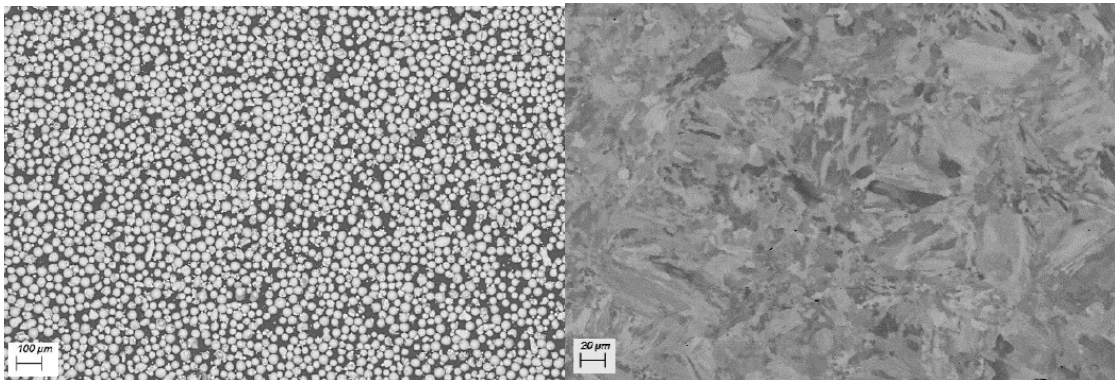
- Good mechanical strength and oxidation resistance
- Suitable for applications in aerospace and chemical process industry.

CHEMICAL COMPOSITION

Chemical composition (nominal), wt%

| Ni | Cr | Fe | Mo | Co | W | Si | Mn | P | S | C |
|---------|----|----|-----|-----|-----|------|------|--------|--------|-------|
| Balance | 21 | 18 | 9.0 | 1.0 | 0.7 | ≤0.2 | ≤0.1 | ≤0.015 | ≤0.015 | ≤0.15 |

POWDER MORPHOLOGY



SEM micrographs of Osprey[®] H-X a) -53 +15 μm powder with spherical morphology and b) a section through the printed L-PBF material, which notably shows the absence of cracks.

POWDER SIZE DISTRIBUTION

Available in a range of customized powder sizes suitable for different applications and AM platforms.

Metal Injection Moulding

<32 µm, <22 µm, <16 µm, <10 µm, <5 µm

Binder Jet

<45 µm, <38 µm, <22 µm, <16 µm

Laser Powder Bed Fusion (L-PBF)

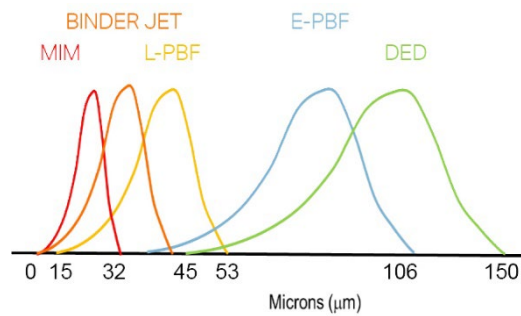
e.g. 53 to 15 µm, and 45 to 20 µm

Electron Beam Powder Bed Fusion (E-PBF)

106 to 45 µm

Direct Energy Deposition (DED)

150 to 53 µm and 90 to 45 µm



Other powder size range distributions are available by request.

MECHANICAL PROPERTIES

Typical mechanical properties of as-built Osprey[®] HX-AM powder L-PBF in heat-treated condition (Solution annealing 1177 °C, for 15 minutes, followed by water quench) evaluated at room temperature and at high temperature (815°C).

Metric units

| Condition | Direction | Proof strength | Tensile strength | E-modulus | Elongation | Impact toughness |
|------------------------|------------|-------------------|------------------|-----------|------------|------------------|
| | | R _{p0.2} | R _m | | A | J |
| | | MPa | MPa | GPa | % | |
| As built | Horizontal | 627 | 820 | 194 | 31 | 105 |
| | Vertical | 522 | 684 | 171 | 41 | 156 |
| Heat treated | Horizontal | 444 | 770 | 227 | 40 | 156 |
| | Vertical | 390 | 637 | 194 | 52 | 194 |
| As built ¹⁾ | Vertical | 212 | 292 | 110 | 21 | |

1) Tested at 815°C

Imperial units

| Condition | Direction | Proof strength | Tensile strength | E-modulus | Elongation | Impact toughness |
|------------------------|------------|-------------------|------------------|-------------------|------------|------------------|
| | | R _{p0.2} | R _m | | A | |
| | | ksi | ksi | ksi ¹⁾ | % | Ft.lbs |
| As built | Horizontal | 91 | 119 | 28,137 | 31 | 77 |
| | Vertical | 76 | 99 | 24,802 | 41 | 115 |
| Heat treated | Horizontal | 64 | 112 | 32,924 | 40 | 115 |
| | Vertical | 57 | 92 | 28,137 | 52 | 143 |
| As built ¹⁾ | Vertical | 31 | 42 | 15,954 | 21 | |

1) Tested at 815°C

Typical Vicker's Hardness levels (ASTM E92, ISO 6507-1, JIS Z2244, GB/T 4340.1) in L-PBF heat-treated condition.

| Condition | Hardness HV |
|------------------|------------------------|
| As built | 245 |
| Heat treated | 208 |