

Datasheet

Austenitic stainless steel

Osprey® 904L

Osprey® 904L is a high-alloy austenitic stainless steel characterized by very good resistance to general corrosion in sulphuric, phosphoric and acetic acid as well as to pitting and SCC.

UNS

N08904

ASTM, AISI

904L

EN Name

X1NiCrMoCu25-20-5

EN Number

1.4539

ISO

4539-089-04-I

Powder designed for

Metal Injection Moulding (MIM)

Additive Manufacturing (AM)



Product description

Osprey® 904L is a high-alloy austenitic stainless steel characterized by very good resistance to

general corrosion in sulphuric, phosphoric and acetic acid as well as very good resistance to pitting corrosion and stress corrosion cracking (SCC).

Main characteristics of Osprey® 904L

Very good resistance to attacks in acidic environments, e.g. sulfuric, phosphoric and acetic acid

Very good resistance to pitting in neutral chloride-bearing solutions

Much better resistance to crevice corrosion than steels of the ASTM 304 and ASTM 316 types

Very good resistance to stress corrosion cracking

Good weldability

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 | 0.02 |
| Cr | 19.0-23.0 |
| Ni | 23.0-28.0 |
| Mo | 4.0-5.0 |
| Si | 1.0 |
| Mn | 2.0 |
| S | 0.035 |
| P | 0.045 |

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 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

Test samples were made by Laser Powder Bed Fusion (L-PBF) technology, based on a GE Concept Laser M2 machine operated by Flono Additive. The testing followed the general principles defined in ISO 17296-3 covering the main characteristics and corresponding test methods for porosity, hardness, tensile and Charpy impact testing. In addition to ASTM F3122-14 - Standard Guide for Evaluating Mechanical Properties of Metal Materials Made via Additive Manufacturing Processes.

The Osprey® 904L powder used had a powder size distribution of 15 to 45 microns. The as-built samples were mechanically post processed (by turning, milling, cutting, grinding etc.) according to the standard-compliant test specimen requirements. A selection of as-built samples were heat treated (for stress relief) according to the instruction of the material type. Typically, 904L stainless steels can be solution annealing heat-treated at 1050 to 1150°C, following by rapid cooling in air or water.

Sample orientation; 90° - perpendicular to build plate (vertical).

| Condition | Direction | Yield strength | Tensile strength | Elongation | Impact toughness | Hardness |
|-----------|-----------|----------------|------------------|------------|------------------|----------|
| | | Rp0.2 | Rm | A | | |

| | | MPa | MPa | % | J | HRC |
|---------------------|-----------|----------------|------------------|---------------|------------------|----------------|
| L-PBF, as built | Vertical | 533 (12.5 SD) | 707 (2.7 SD) | 26.5 (0.7 SD) | 141 (2.3 SD) | 8.06 (0.11 SD) |
| L-PBF, heat treated | Vertical | 406 (11.5 SD) | 705 (8.1 SD) | 29.2 (2.2 SD) | 144 (3.5 SD) | 8.66 (0.05 SD) |
| Condition | Direction | Yield strength | Tensile strength | Elongation, % | Impact toughness | Hardness |
| | | Rp0.2 | Rm | A | | |
| | | ksi | ksi | % | J/cm2 | HRC |
| L-PBF, as built | Vertical | 77.3 (1.8 SD) | 103 (0.4 SD) | 26.5 (0.7 SD) | 176 | 8.06 (0.11 SD) |
| L-PBF, as built | Vertical | 58.9 (1.7 SD) | 102 (1.2 SD) | 29.2 (2.2 SD) | 180 | 8.66 (0.05 SD) |

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.