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 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.

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