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metco

Material Product Data Sheet
718 Nickel Alloy for Additive Manufacturing

Powder Products:
MetcoAdd 718 series, MetcoAdd 718 API series

1 Introduction

MetcoAdd™ 718 is a family of nickel-based superalloy powders with chemistry similar to AMS 5662 bar material.

Room temperature static properties of PBF-LB processed and heat treated material coupons have been shown to be comparable to those of AMS 5662.

For reference purposes Oerlikon has processed MetcoAdd 718C using fixed parameters and 40 µm layer thickness to provide data in Section 3 Key Processing Information. Additional testing has been performed by an extensive network of consortia and customer partners on a broader range of machine types. Properties may be optimized based on application specific requirements.

MetcoAdd 718 API series are produced according to the API 6ACRA specification for oil and gas applications.

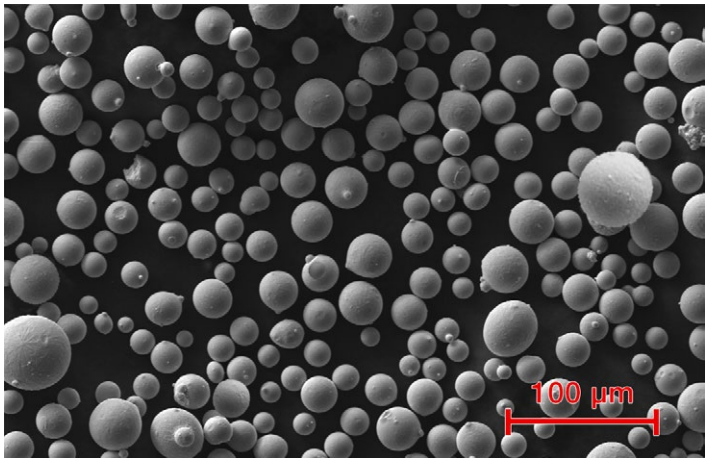
All of our 718 products for additive manufacturing are designed for processing using Laser Powder Bed Fusion (PBF-LB), Electron Beam Powder Bed Fusion (PBF-EB) or Directed Energy Deposition (DED) systems.

1.1 Typical Uses and Applications

- Aerospace: Engine components
- Power Generation: Gas turbine components
- Oil & Gas: Sensors and other components
- Industrial: Various

Quick Facts	
Classification	Alloy, nickel-based
Chemistry	Ni 18Cr 18Fe 5(Nb+Ta) 3Mo 0.6Al 1Ti
Manufacture	Inert gas atomized (Argon)
Morphology	Spherical
Apparent Density	4 to 5 g/cm^3
Solidus	1260 ± 10 °C (2300 ± 18 °F)
Liquidus	1340 ± 10 °C (2444 ± 18 °F)
Process	Laser Powder Bed Fusion (PBF-LB) Electron Beam Powder Bed Fusion (PBF-EB) Directed Energy Deposition (DED) [a]

[a] For additive manufacture printing build-up and/or repair only.



Typical spherical morphology of these gas-atomized powders

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)								
	Ni	Fe	Cr	Nb+Ta	Mo	Al	Ti	C (max)	Other
MetcoAdd 718C	Balance	18	18	5	3	0.6	1	0.08	< 0.5
MetcoAdd 718E	Balance	18	18	5	3	0.6	1	0.08	< 0.5
MetcoAdd 718F	Balance	18	18	5	3	0.6	1	0.08	< 0.5
MetcoAdd 718 API C	53	Balance	18	5 [a]	3	0.5	1	0.045	< 0.5
MetcoAdd 718 API F	53	Balance	18	5 [a]	3	0.5	1	0.045	< 0.5

a While the Nb+Ta nominal value is the same for the MeetcoAdd 718 series and the MetcoAdd 718 API series, the range for the MetcoAdd 718 API series is more tightly controlled at 4.87 to 5.20 wt. %.

2.2 Particle Size Distribution

Product	Nominal Range [µm]	D90 [µm]	D50 [µm]	D10 [µm]	Hall Flow (s/50 g)
MetcoAdd 718C	-45 +15	46	30	18	< 18
MetcoAdd 718E	-63 +20	62	43	29	< 16
MetcoAdd 718F	-106 +45	---	---	---	---
MetcoAdd 718 API C	-63 +16	---	---	---	---
MetcoAdd 718 API F	-106 +45	---	---	---	---

For the nominal range, particle size analysis 45 µm or above measured by sieve (ASTM B214), analysis below 45 µm by laser diffraction (ASTM C 1070, Microtrac). Fractional analysis (D90, D50, D10) by laser diffraction, Hall flow by ASTM B213.

2.3 Key Selection Criteria

- MetcoAdd 718 API series has a chemical composition designed in accordance with the API 6ACRA specification. The chemical composition is more tightly controlled and has lower gas entainment than the MetcoAdd 718 series products.
- Consider choosing one of the MetcoAdd API series products if the formation of titanium nitride or carbon embrittlement is a concern.
- MetcoAdd 718E is a coarser version than MetcoAdd 718C which allow for higher PBF-LB build rates where application and process permit.
- MetcoAdd 718F and MetcoAdd 718 API F are typically used in the DED and EBM process.

2.4 Related Products

- Oerlikon Metco offers other nickel-based and iron-based powders designed for additive manufacturing that have been optimized for either powder fed or powder bed processes. Please contact your Oerlikon Metco Account Representative for more information.
- Oerlikon Metco can produce MetcoAdd 718 series powders or MetcoAdd 718 API series powders in different particle size distributions on request for large volume users.

2.5 Specifications

Product	Specifications (similar to)
MetcoAdd 718C	UNS N07718
MetcoAdd 718E	
MetcoAdd 718F	
MetcoAdd 718 API C	UNS N07718 API 6ACRA
MetcoAdd 718 API F	

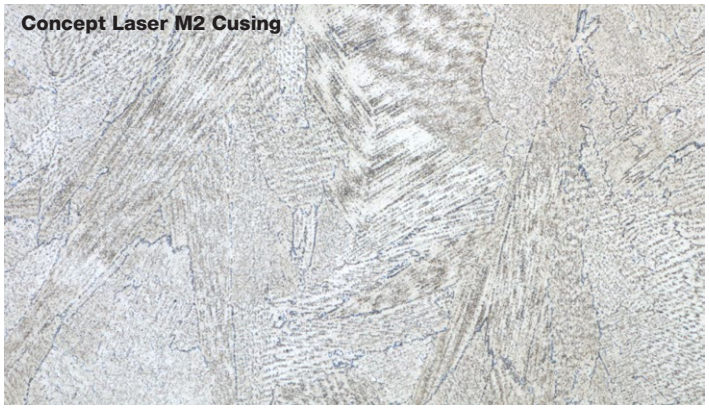
3 Key Processing Information

3.1 Typical Post Heat Treatment Properties (MetcoAdd 718C) [a, b, c, d]

Specification		Concept Laser M2 Cusing	EOS M290
Ultimate Tensile Strength (MPa), XY/Z	ASTM E8	1522 ± 10 / 1415 ± 16	1491 ± 28 / 1380 ± 7
Yield Strength (MPa), XY/Z		1258 ± 46 / 1186 ± 18	1237 ± 27 / 1172 ± 6
Elongation at break %, XY/Z		15 ± 1 / 17 ± 3	15 ± 1 / 19 ± 1
Hardness (VHN_{300g})	ASTM E384-17	471 ± 9	474 ± 7
Relative Density %	Internal Spec.	> 99.9%	> 99.9%

[a] Disclaimer: All data published in this datasheet has been shared for reference purposes only and is not sufficient to design or certify parts. No warranty or guarantee is made against these results.
[b] Bounds are based on one standard deviation of each population with ten samples per orientation and machine. Test specimens were 6.35 mm (0.25 in) diameter round bars machined from coupons of 75 x 75 x 13 mm (3 x 3 x 0.5 in) coupons. Direction XY data is an average of both X and Y horizontal build orientations.
[c] Heat treatment was performed in accordance with AMS 5662 with coupons solution heat treated at 954 °C (1750 °F), held for 1 h and air cooled. Ageing at 718 °C (1325 °F) for 8 h and furnace cooled to 621 °C (1150 °F) for total precipitation time of 18 h and air cooled.
[d] The process parameters and heat treatment of builds produced with other powder cuts of the MetcoAdd 718 series or MetcoAdd 718 API series and/or other AM processes (DED and PBF-EB) may be optimized based on application specific requirements.

3.2 Post Heat Treatment Microstructure, Vertical Build Direction (MetcoAdd 718C)



3.3 Additive Manufacturing Services

Oerlikon AM is an excellent source for pilot and production run additive manufacturing services and is ready to serve your needs. Please contact your Orlikon Metco account manager for more information or contact Oerlikon AM directly through their web site at www.oerlikon.com/am.

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size [a]	Availability	Distribution
MetcoAdd 718C	1096973	5 lb (approx. 2.025 kg)	Stock	Global
MetcoAdd 718E	1100779	10 lb (approx. 4.5 kg)	Special Order	Global
MetcoAdd 718F	1305326	10 lb (approx. 4.5 kg)	Stock	Global
MetcoAdd 718 API C	1534296	5 lb (approx. 2.025 kg)	Stock	Global
MetcoAdd 718 API F	1534295	10 lb (approx. 4.5 kg)	Stock	Global

[a] Larger and/or custom packaging can be arranged for large volume users

4.2 Handling Recommendations

- Blend contents prior to use to prevent segregation
- Keep in the original container, or an approved alternative, tightly closed when not in use
- Powder from previously opened containers should be stored in a humidity-controlled environment

4.3 Safety Recommendations

See the SDS (Safety Data Sheet) in the version localized for the country where the material will be used. SDS are available from the Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).

Product	SDS No.
MetcoAdd 718C	50-789
MetcoAdd 718E	50-1957
MetcoAdd 718F	50-1957
MetcoAdd 718 API C	50-2681
MetcoAdd 718 API F	50-2681

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