

Material Product Data Sheet

Nickel Chromium Superalloy Thermal Spray Powders

Thermal Spray Powder Products:
Amdry™ 718, Amdry 718 Cl.B, Amdry 1718,
Diamalloy™ 1006, Amdry 625, Diamalloy 1005,
Diamalloy 1005A

1 Introduction

Oerlikon Metco's nickel-chromium based superalloy powders produce dense, self-bonding, single-step coatings that are oxidation and corrosion resistant at elevated temperatures.

Their compositions are similar to Inconels, thus the coatings have excellent high temperature oxidation and corrosion resistance for restoration and repair of superalloy components. They are also recommended as overlay coatings to protect less noble materials from oxidation.

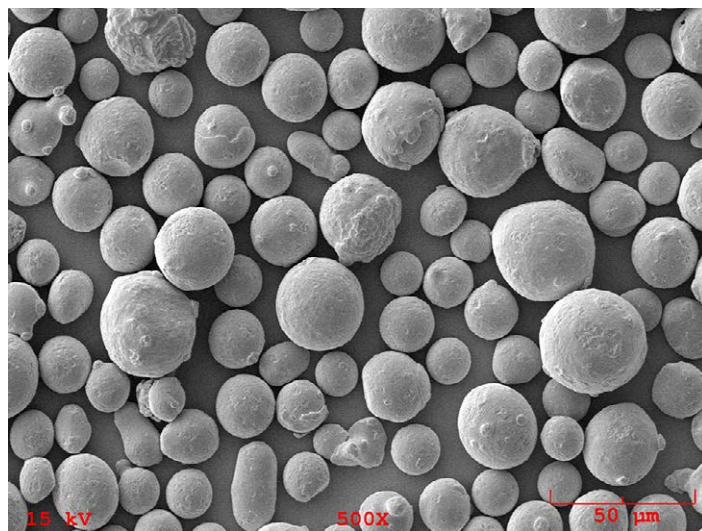
The coatings exhibit high tensile bond strength and thickness limits exceeding 1.5 – 2.5 mm (0.06 – 0.1 in) when sprayed with liquid-fuel or gas-fuel HVOF guns, depending on part geometry. The coatings can be machined, milled, drilled and tapped without chipping and excellent edge retention.

1.1 Typical Uses and Applications

- Repair and restoration of mis-machined and worn superalloy components
- Gas turbine components
- Chemical processing equipment
- Pollution control equipment
- Pump bodies
- Extrusion dies
- Rocket engine components

Quick Facts

Classification	Alloys, nickel-based
Chemistry	Similar to Inconel 625 or Inconel 718
Manufacture	Gas atomization
Morphology	Spheroidal
Purpose	Restoration, oxidation and corrosion resistance
Service Temperature	Inconel 625 type: ≤ 982 °C (1800 °F) Inconel 718 type: ≤ 704 °C (1300 °F)
Process	Atmospheric plasma spray or HVOF



SEM photomicrograph of Diamalloy 1005, showing the gas atomized morphology typical of these materials.

2 Material Information

2.1 Chemical Composition

Product	Chemical Composition (nominal wt. %)							
	Ni	Cr	Fe	Mo	Al	Nb + Ta	Ti	C
Amdry 718	Bal.	19.0	18.0	3.0	0.5	5.1	0.95	0.05
Amdry 718 Cl.B	Bal.	19.0	18.0	3.0	0.5	5.1	0.95	0.05
Amdry 1718	Bal.	19.0	18.0	3.0	0.5	5.1	0.95	0.05
Diamalloy 1006	Bal.	19.0	18.0	3.0	0.5	5.1	0.95	0.05
Amdry 625	Bal.	21.5	2.5	9.0	---	3.7	---	---
Diamalloy 1005	Bal.	21.5	2.5	9.0	---	3.7	---	---
Diamalloy 1005A	Bal.	21.5	2.5	9.0	---	3.7	---	---

2.2 Particle Size Distribution and Other Characteristics

Product	Nominal Particle Size Distribution (µm)		Similar To	Morphology	Manufacturing Method
	-	+			
Amdry 718	-125	+45	Inconel 718	Spheroidal	Gas Atomized
Amdry 718 Cl.B	-90	+45	Inconel 718	Spheroidal	Gas Atomized
Amdry 1718	-45	+15	Inconel 718	Spheroidal	Gas Atomized
Diamalloy 1006	-45	+11	Inconel 718	Spheroidal	Gas Atomized
Amdry 625	-90	+45	Inconel 625	Spheroidal	Gas Atomized
Diamalloy 1005	-45	+11	Inconel 625	Spheroidal	Gas Atomized
Diamalloy 1005A	-53	+20	Inconel 625	Spheroidal	Gas Atomized

Particle size equal to or above 45 µm determined by sieve analysis; below 45 µm by laser diffraction (Microtrac)

2.3 Key Selection Criteria

Amdry 718, Amdry 718 Cl.B, Amdry 1718 and Diamalloy 1006:

- Designed for restoration of worn or mismatched components of Inconel 713C, Inconel 718 or similar substrates.
- These materials have identical chemical compositions and are similar to Inconel 718 which has a typical bulk service temperature up to 704 °C (1300 °F).
- The materials differ primarily in their particle size distribution which has been optimized for various spray guns. (see Section 2.5).
- Product selection may be based on customer specifications (see Section 2.6).

Amdry 625, Diamalloy 1005 and Diamalloy 1005A:

- These materials are designed for restoration of worn or mismatched components of Inconel 625 or similar substrates.
- These materials have identical chemical compositions and are similar in chemical composition to Inconel 625, which has a typical bulk service temperature up to 982 °C (1800 °F).
- The materials differ primarily in their particle size distribution (see Section 2.4). Amdry 625 is sized for plasma spray. Diamalloy 1005 and Diamalloy 1005A are sized for HVOF.
- For better deposition efficiency using liquid-fuel HVOF, Diamalloy 1005A is recommended.

2.4 Related Products

- Metco 4538 [Ni 22Fe 16Cr 1.5Si] produces hard coatings that can be used for heat and oxidation resistance at service temperatures up to 1000 °C (1850 °F).
- Diamalloy 4006 and Metco 700 [NiCrWMo] products produce coatings that resist sliding wear, scuffing, galling and corrosion with high hot hardness.
- Metco 44 [Ni 16Cr 8Fe] produces machinable “stainless” coatings useful for salvage and build-up applications on corrosion-resistant steels, nickel or nickel alloy substrates where high hardness is not required.
- Diamalloy 4004NS [Ni 14Cr 9.5Co 5Ti 4Mo 4W 3Al] is similar to Rene 80. Coatings are oxidation and corrosion resistant up to 1000 °C (1850 °F). Applications include surface restoration of various worn or damaged turbine hot section components.
- Amdry 961, Amdry 962, Amdry 964, Amdry 9621, Amdry 9624 and Amdry 9625 products [NiCrAlY or NiCoCrAlY] produce coatings generally used in aerospace applications and generally post coat diffusion heat treated. They are effective in hot corrosive or oxidizing environments at high temperatures, such as to protect gas turbine blades or vanes, and as oxidation resistant bond coats for thermal barrier coating systems.
- Metco 442 [NiCrAlMoSiBFeTiO₂] produce hard “stainless” type, self-binding coatings with excellent wear resistance and very good corrosion and oxidation resistance.
- Metco 444 [NiCrAlMoFe] produces coatings that are self-bonding, machinable with excellent resistance to oxidation and corrosion.
- Metco 461NS [NiCrAlCoY₂O₃] produces coatings that are self-bonding, oxidation and corrosion resistant that can be used at temperatures up to 980 °C (1800 °F). It is recommended for salvage and repair, or as a bond coat for thermal barrier coating systems.
- Amdry 960 and Metco 443NS [NiCrAl] produce coatings that are recommended for resistance to oxidation and corrosion at high temperatures. Applications include salvage and build-up of worn or mis-machined nickel, nickel alloy or machinable corrosion resistant steel parts.
- Amdry 453X series, Metco 43 series, Metco 4548 and Metco 5640NS [NiCr] products produce dense coatings that are designed to resist oxidation and corrosive gases at temperatures up to 980 °C (1800 °F). They are used to resist heat and prevent scaling of carbon and low alloy steels in hot atmospheres.

2.5 Recommended Spray Guns

Product	Diamond Jet (water-cooled)	WokaJet / WokaStar / JP5000	Atmospheric Plasma Spray
Amdry 718			●
Amdry 718 Cl.B			●
Amdry 1718	●	●	●
Diamalloy 1006	●		
Amdry 625			●
Diamalloy 1005	●	●	
Diamalloy 1005A	●	●	

2.6 Customer Specifications

Product	Specification
Amdry 718	Canada Pratt & Whitney MS 1088 GE B50TF202, CI A Williams WIMS 771
Amdry 718 CI.B	CFM International CP 6025 GE B50TF202, CI B GKN Aerospace PM 819-59 MTU MTS 1376 MTU MTS 1439
Amdry 1718	Canada Pratt & Whitney MS 2025 CFM International CP 6032 GE B50A917 GE B50TF202, CI D MTU MTS 1604 Snecma DMR 33.502
Amdry 625	MTU MTS 1438 Rolls-Royce OMAT 3/270 Williams WIMS 773

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data			
		Amdry 1718	Diamalloy 1006	Diamalloy 1005
Recommended Process		HVOF	HVOF	HVOF
Recommended Spray Guns		DiamondJet (H ₂ O-cooled), WokaJet, WokaStar, JP5000	DiamondJet (H ₂ O-cooled)	DiamondJet (H ₂ O-cooled), WokaJet, WokaStar, JP5000
Deposit Efficiency	%	50	80	70
Macrohardness	HR15N	82 – 83	81 – 82	77 – 78
Microhardness	HV0.3	425 – 440	400 – 425	375 – 390
Bond Strength	MPa	> 69	> 69	> 69
	psi	> 10,000	> 10,000	> 10,000
Porosity	vol. %	< 1	< 1	< 1
Surface Roughness Ra ^a	µm	5.3 – 6.9	6.6 – 7.2	4.3 – 5.1
	µin	210 – 270	260 – 280	170 – 200
Finishing Method	Standard tungsten carbide tool recommended for machining, drilling, milling or grinding of superalloys. Excellent ground finishes can be obtained utilizing a 60 grit silicon carbide wheel. Wet grinding is recommended over dry grinding.			

Data is provided is typical and variability can be expected. Changes in spray process, spray equipment or spray parameters can significantly change coating results.

^a as sprayed

3.2 Coating Parameters

Please contact your Oerlikon Metco Account Representative for parameter availability. For specific coating application requirements, the services of Oerlikon Metco's Coating Solution Centers are available.

Recommended Spray Guns

HVOF	Atmospheric Plasma
DiamondJet series	Metco 9MB series
WokaJet series	Metco F4 series
WokaStar series	TriplexPro series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Amdry 718	1001047	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 718 Cl.B	1001048	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 1718	1001063	5 lb (approx. 2.25 kg)	Stock	Global
Diamalloy 1006	1000785	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 625	1001045	5 lb (approx. 2.25 kg)	Stock	Global
Diamalloy 1005	1000784	5 lb (approx. 2.25 kg)	Stock	Global
Diamalloy 1005A	1085778	10 lb (approx. 4.5 kg)	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents gently prior to use to prevent segregation.
- Open containers should be stored in a drying oven to prevent moisture pickup.
- Remove desiccant prior to use, if applicable.

4.3 Safety Recommendations

See the SDS (Safety Data Sheet) in the localized version 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.
Amdry 718	50-789
Amdry 718 Cl.B	50-789
Amdry 1718	50-789
Diamalloy 1006	50-789
Amdry 625	50-310
Diamalloy 1005	50-310
Diamalloy 1005A	50-310

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Information is subject to change without prior notice.