

Material Product Data Sheet

Nickel – 5 % Aluminum Thermal Spray Powders

Thermal Spray Powder Products:

Amdry 956, Metco 450NS, Metco 450P, Metco 480NS, Diamalloy 4008NS

1 Introduction

Coatings of Amdry™ 956, Metco™ 450NS, Metco 450P, Metco 480NS and Diamalloy™ 4008NS are general purpose materials for restoration of worn or mismachined components. They are also used as bond coats for OEM-specified and general industrial applications under top coats such as ceramics and compressor abrasives. Nickel aluminum coatings have good oxidation resistance up to 800 °C (1470 °F).

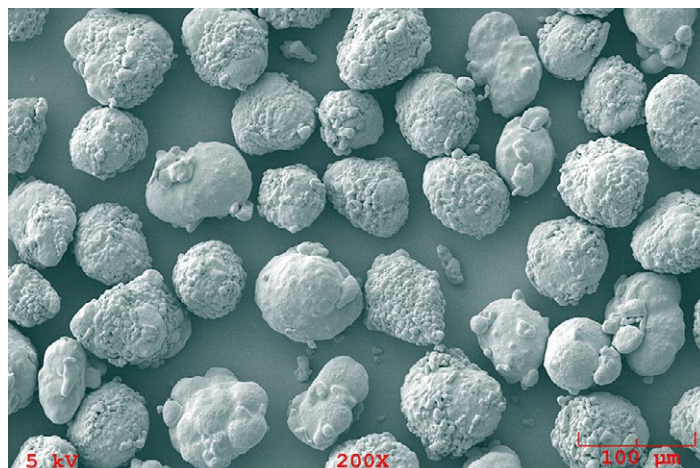
Amdry 956, Metco 450NS and Metco 450P exhibit an exothermic reaction during the spray process and are considered self-bonding to steel substrates. These powders are mechanical clad composites of aluminum and nickel. Metco 480NS and Diamalloy 4008NS powders are gas atomized. They also result in dense, well-bonded coatings, but are recommended for more critical corrosion applications than Amdry 956 or Metco 450NS. Diamalloy 4008NS has a finer particle size distribution and is designed for the HVOF spray process. Amdry 956, Metco 450NS, Metco 450P and Metco 480NS are designed to be applied using atmospheric plasma spray or combustion powder Thermospray™ processes.

1.1 Typical Uses and Applications

- Salvage and build-up for restoration applications.
- High-temperature particle erosion resistance.
- Oxidizing atmosphere resistance below 800 °C (1470 °F).
- Bond coat for ceramic or abrasives with service temperatures up to 800 °C (1470 °F).

Quick Facts

Classification	Metal, nickel-based
Chemistry	Ni 5Al
Manufacture	Mechanically clad or gas atomized
Morphology	Spheroidal
Apparent density	3.5 – 4.5 g/cm ³
Service temperature	< 800 °C (1470 °F)
Purpose	Bond coat or restoration
Process	HVOF, Atmospheric Plasma Spray or Combustion Powder Thermospray™



Mechanically Clad (top), Gas Atomized (bottom)

2 Material Information

2.1 Chemical Composition

Product	Chemical Composition (wt. %)		
	Ni	Al	Other (max)
Amdry 956	Balance	4.0 – 5.5	2.5
Metco 450NS	Balance	4.0 – 5.5	2.5
Metco 450P	Balance	3.0 – 4.5	2.5
Metco 480NS	Balance	4.0 – 5.5	1
Diamalloy 4008NS	Balance	4.0 – 5.5	1

2.2 Additional Powder Characteristics

Product	Nominal Range (µm)	Screen Analysis (%)	
		+88 µm (max)	-44 µm (max)
Amdry 956	-90 +45	3	5
Metco 450NS	-90 +45	3	5
Metco 450P	-90 +45	3	5
Metco 480NS	-90 +45	3	5

Product	Nominal Range (µm)	Microtrac Analysis (% cumulative)			
		+62 µm (max)	+44 µm (max)	+22 µm (max)	-16 µm (max)
Diamalloy 4008NS	-45 +11	0.2	13	80	4

Microtrac by laser light diffraction per ASTM C 1070; screen analysis per ASTM Standard B214

2.3 Other Physical Properties

Product	Apparent Density (g/cm ³)	Manufacture	Morphology
Amdry 956	3.7 ± 0.3	Mechanically Clad	Spheroidal
Metco 450NS	3.7 ± 0.3	Mechanically Clad	Spheroidal
Metco 450P	3.7 ± 0.3	Mechanically Clad	Spheroidal
Metco 480NS	3.8 ± 0.3	Gas Atomized	Spheroidal
Diamalloy 4008NS	3.9 ± 0.3	Gas Atomized	Spheroidal

2.4 Key Selection Criteria

- Choose the product that meets the required customer material specifications.
- Amdry 956, Metco 450NS and Metco 450P create an exothermic reaction during spraying, that result in a quasi-metallurgical bond with some substrates such as steels.
- Metco 480NS and Diamalloy 4008NS are fully alloyed products that result in coatings with better corrosion resistance and can be used in applications where corrosion resistance is critical.
- Metco 450P is a premium grade composite that has been designed to produce coatings that are more readily machined than coatings of Amdry 956 or Metco 450NS. Metco 450P is recommended for applications where grinding is undesirable.
- Amdry 956, Metco 450NS, Metco 450P and Metco 480NS can be applied using atmospheric plasma spray or combustion powder Thermospray™ thermal spray processes.

- Diamalloy 4008NS is sized for application with the HVOF spray process and results in denser coatings with finer as-sprayed and machined surface finishes.

2.5 Related Products

- Coatings of Metco 452 and Metco 453 have better machinability than coatings of Amdry 956 or Metco 450NS.
- Amdry 960, Metco 443NS and Metco 461NS produce coatings with better high temperature oxidation and hot corrosion resistance than coatings of products in this data sheet.
- Amdry 962 and Amdry 995 series of products produce coatings with excellent oxidation and hot corrosion resistance and higher service temperatures.
- Diamalloy 4700 is a high temperature, oxidation resistant alternative to Diamalloy 4008NS, which is also suitable for HVOF application.
- Please refer to the data sheets of the related products for further information.

2.6 Customer Specifications

Product	Customer Specification	
Amdry 956	Canada Pratt & Whitney CPW 247 Chromalloy BZ-003 Type 39 GKN Aerospace PM 819-37 Honeywell M3951 1080 Rolls-Royce Corporation EMS 56757 Rolls-Royce OMAT 3/188A Rolls-Royce plc RRMS 40022 Turbomeca LA 657 Ed. 1 PA2 Ind.0	CFM International CP 6007 GE B50TF56, CI A Honeywell EMS EMS 57746, Type 1, Class 2 Industria de Turbo Propulsores SMM-902 MTU MTS Pratt & Whitney PWA 1337 Rolls-Royce Corporation PMI 1163 Rolls-Royce plc MSRR 9507/5 Snecma DMR 33.011
Metco 450NS	Avio 4800M/3 CFM International CP 6007 GE B50A891 Honeywell EMS 57746, Type I, Class 2 Honeywell M3951 MTU MTS 1080 Pratt & Whitney PWA 1337 Rolls-Royce Corporation EMS 56757 Rolls-Royce OMAT 3/188 Rolls-Royce plc RRMS 40022 Snecma DMR 33.011	Canada Pratt & Whitney CPW 247 Chromalloy BZ-003 Type 39 GE B50TF56, CI A Honeywell FP 5045, Type XV Industria de Turbo Propulsores SMM-902 Northrup Grumman GM 3010-4B, Tp IV, Gr B Praxair PS-036009 Rolls-Royce Corporation PMI 1163 Rolls-Royce plc MSRR 9507/5 SAE International AMS 5739 U.S. Military MIL-P-83348, Comp H, Tp 1, CI 2
Metco 450P	Rolls-Royce plc MSRR 9507/43	
Metco 480NS	Canada Pratt & Whitney CPW 490 GE B50TF56, CI B Honeywell EMS 57746, Type I, CI 1 Rolls-Royce plc MSRR 9507/5	CFM International CP 6007 (except moisture) GKN Aerospace PM 819-56 (special order) Pratt & Whitney PWA 1380
Diamalloy 4008NS	GE B50TF56, CI C Rolls-Royce Corporation EMS 39661	Pratt & Whitney PWA 36334-1S

3 Coating Information

3.1 Key Thermal Spray Coating Information

All data is approximate and will vary depending on spray process, coating equipment and parameters used.

		Amdry 956	Metco 450NS	Metco 450P	Metco 480NS	Diamalloy 4008
Recommended coating processes ^a		APS or CP	APS or CP	APS or CP	APS or CP	HVOF
Macrohardness		65 – 80 HRB	65 – 80 HRB	65 – 75 HRB	65 – 80 HRB	25 HRC
Typical porosity	vol. %	< 5	< 5	< 5	< 5	< 3
Density	g/cm ³	7.2 – 7.4	7.2 – 7.4	7.2 – 7.4	7.2 – 7.4	7.2 – 7.4
Max service temp.	°C	800	800	800	800	800
	°F	1470	1470	1470	1470	1470
Bond strength (min) ^b	MPa	20.7	20.7	20.7	68.9	62.0
	psi	3000	3000	3000	10000	9000
Recommended finishing		Grind	Grind	Machine	Machine / Grind	Grind
Surface roughness (Ra)						
As sprayed	µm	11.4 – 15.2	11.4 – 15.2	11 – 17	12.7 – 17.9	6.3 – 8
	µin	450 – 600	450 – 600	450 – 650	500 – 700	250 – 350
Machined	µm	---	---	0.6 – 1.0	2.5 3.8	---
	µin	---	---	25 – 40	100 – 150	---
Ground	µm	0.30 – 0.36	0.30 – 0.36	–	0.15 – 2.0	1 – 1.5
	µin	12 – 14	12 – 14	–	6 – 8	40 – 60

^a APS = Atmospheric Plasma Spray; CP = Combustion Powder Thermospray; HVOF = High Velocity Oxy-Fuel Spray

^b Low carbon steel, ground substrate, plasma sprayed

3.3 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		
Atmospheric Plasma	Combustion Powder	HVOF
Metco 3MB series	Metco 5P-II	DiamondJet series
Metco 9MB series	Metco 6P-II series	WokaJet series
Metco 11MB		
Metco F4 series		
Metco SM F-100 Connex		
Metco SM F-210		
TriplexPro series		
SinplexPro series		

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Amdry 956	1001049	5 lb (approx. 2.25 kg)	Stock	Global
Metco 450NS	1000089	5 lb (approx. 2.25 kg)	Stock	Global
	1000130	25 lb (approx. 11.3 kg)	Special Order	Global
Metco 450P	1000439	5 lb (approx. 2.25 kg)	Special Order	Global
Metco 480NS	1000576	5 lb (approx. 2.25 kg)	Stock	Global
Diamalloy 4008NS	1000801	5 lb (approx. 2.25 kg)	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Carefully tumble contents prior to use to prevent segregation, but avoid breakdown of friable components.
- Open containers should be stored in a drying oven at temperatures to prevent moisture pickup.

4.3 Safety Recommendations

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

Product	SDS No.
Amdry 956	50-793
Metco 450NS	50-180
Metco 450P	50-180
Metco 480NS	50-187
Diamalloy 4008NS	50-187