oerlikon
metco

Material Product Data Sheet
Nickel Chromium – Aluminum Thermal Spray Powders

Thermal Spray Powder Products:
Metco 443NS, Amdry 960, Amdry 510

1 Introduction

Metco™ 443NS and Amdry™ 960 are aluminum clad nickel chromium alloyed powders that undergo an exothermic reaction when sprayed. The reaction is vigorous enough to assure more consistent bonding to the substrate and better interparticle bonding than that obtained non-exothermic materials.

Plasma-sprayed Metco 443NS and Amdry 960 coatings are self-bonding and can be used for high temperatures oxidation and corrosion resistant coatings. They are recommended as a bond coat for ceramic top coats and for salvage and buildup of worn or mismachined parts made of nickel, nickel alloys or machinable corrosion-resistant steels.

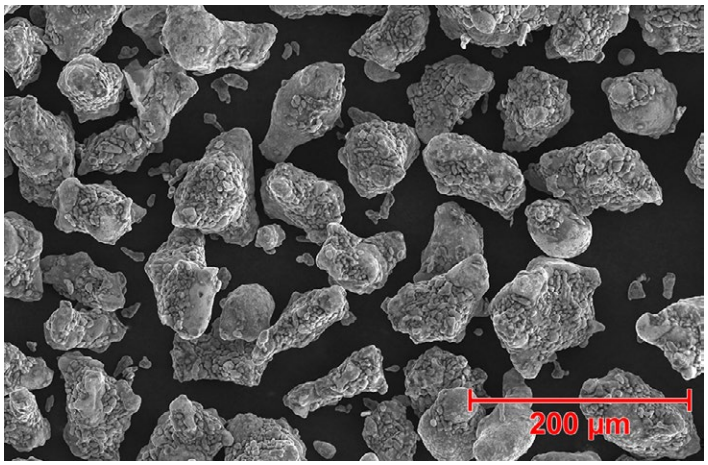
Thermosprayed Metco 443NS and Amdry 960 coatings are not self-bonding. They should only be used on surfaces that have been properly prepared using a standard method of surface preparation. These coatings are recommended as abradable coatings for high temperature performance in machine element clearance control applications and as a bond coat for ceramic top coats.

Amdry 510 is a gas atomized NiCrAl alloyed powder. Coatings sprayed with Amdry 510 have a long service life against spallation and exhibit superior resistance to oxidation and corrosive gas attack.

1.1 Typical Uses and Applications

- Bond coat for thermal barrier coatings in turbine engine components and heat treating fixtures.
- Abradable coatings for machine element clearance control and turbine engine components.
- Salvage and restoration of worn or mismachined nickel, nickel alloy or machinable corrosion-resistant steel substrates.

Quick Facts	
Classification	Composite or alloy, nickel-based
Chemistry	NiCrAl
Manufacture	Mechanically clad or gas atomized
Morphology	Irregular or spheroidal
Apparent Density	1.4 – 4 g/cm^3
Purpose	Wear and corrosion protection
Service Temperature	≤ 980 °C (1800 °F)
Process	Atmospheric plasma spray, combustion powder Thermospray™ or HVOF



Morphology of Metco 443NS, a mechanically clad powder

2 Material Information

2.1 Chemical Composition

Product	Chemical Composition (nominal wt. %)				
	Ni	Cr	Al	Others (max)	Organics (max)
Metco 443NS	Bal.	15.5 – 21.5	4.0 – 8.0	7.0	4.0
Amdry 960	Bal.	16.0 – 21.0	4.5 – 7.0	7.0	4.0
Amdry 510	Bal.	19.0 – 25.0	8.0 – 12.0	2.0	–

2.2 Particle Size Distribution and Other Characteristics

Product	Nominal Particle Size Distribution (µm)	Morphology	Manufacturing Method
Metco 443NS	–125 +45	Irregular	Mechanically Clad
Amdry 960	–125 +45	Irregular	Mechanically Clad
Amdry 510	–44 +22	Spheroidal	Gas Atomized

Particle size equal to or above 45 µm determined by sieve analysis; below 45 µm by laser diffraction (Microtrac). Other particle size distributions are available on request.

2.3 Key Selection Criteria

- Choose the product that meets the required customer material specification
- Metco 443NS and Amdry 960 have coarse particle size distributions and can be applied using atmospheric plasma spray (APS) or combustion powder Thermospray™. APS coatings of these powders are self-bonding.
- Amdry 510 has a fine particle size distribution and can be applied using HVOF when low porosity and low oxide content are required in the coatings. Coatings sprayed with Amdry 510 provide better oxidation resistance, corrosion resistance and longer service life than Metco 443 and Amdry 960.

2.4 Related Products

- Coatings plasma-sprayed with nickel-chromium alloyed powder, such as Metco 43C-NS, Metco 43F-NS, and Metco 43VF-NS can also be used ro resist oxidation and corrosive gases up to 980 °C (1800 °F). However, coatings of Metco 443 and Amdry 960 are self-bonding and have better oxidation resistance, can be applied thicker, have equivalent as-sprayed surface roughness as bond coats for ceramics and are more easily machined.
- Metco 450NS and Amdry 956 are mechanically clad composite materials of nickel and aluminum, exhibit an exothermic reaction during the spray process and self-bond to steel substrates. The are often used for salvage and buildup. However, the service temperatures of these coatings are lower (max. 800 °C, 1475 °F) compared to those sprayed using the products in this data sheet.
- Metco 444 is a nickel, chromium, molybdenum, aluminum composite powder. It was especially developed to produce machinable “stainless” type coatings with low shrink, good wear and excellent corrosion resistance properties for hard bearing applications. Coating of Metco 444 are self-bonding without thickness limits. However, the maximum service temperature of coatings of Metco 444 is 870 °C (1600 °F), lower than that of the plasma-sprayed Metco 443NS and Amdry 960 coatings.
- Metco 442 is also a self-bonding stainless composite powder that produces coatings having a high macrohardness of 39 HRC as a result of precipitation hardening. However, the service temperature of coatings with Metco 442 is up to 760 °C (1400 °F).
- Metco 461NS is a patented, nickel chroumium-alumnium-cobalt-yttria composite powder designed to produce self-bonding coatings that can be used for oxidation and corrosion resistant applications at temperatures up to 980 °C (1800 °F). The formation of Al_2O_3-$Y2O_3$ during spraying improves high temperature cohesive strength within the coating and aids in applications where flexing is important.

2.5 Customer Specifications

Product	Customer Specification
Metco 443NS	Avio 4800M/12 Canada Pratt & Whitney CPW 369 CFM International CP 6006 Chromalloy BZ-003 Type 4 GE B50A890 GE B50TF119, Class A GKN Aerospace MTL 116 GKN Aerospace PM 819-47 Honeywell 91547-M3956 Honeywell EMS 57748, Type I, Class 2 Honeywell FP 5045, Type XVIII MTU MTS 1077 Pratt & Whitney PWA 1347 Rolls-Royce Corporation EMS 56772 Rolls-Royce OMAT 3/135 Rolls-Royce plc MSRR 9507/14 Rolls-Royce plc RRMS 40038 Snecma DMR 33.018
Amdry 960	CFM International CP 6006 GE B50A890 GE B50TF119, Class A GKN Aerospace PM 819-47 Honeywell 91547-M3956 Honeywell EMS 57748, Type I, Class 2, except paragraph 1.3.2 MTU MTL 116 Pratt & Whitney PWA 1347 Rolls-Royce OMAT 3/135 Rolls-Royce plc MSRR 9507/14 Rolls-Royce plc RRMS 40038 Snecma DMR 33.018

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification		Typical Data	
		Metco 443NS and Amdry 960	Amdry 510
Recommended Process		Atmospheric plasma spray or combustion powder Thermospray™	Atmospheric plasma spray or HVOF
Macrohardness	HRB	80 – 90	
Microhardness	DPH300	200 – 260	
Porosity	vol. %	< 5	
Oxide Content	vol. %	1 – 20	
Surface Roughness Ra			
as sprayed	µm	8.9 – 20.3	
	µin	350 – 800	
machined	µm	0.5 – 1.5	
	µin	20 – 60	
ground (60 grit SiC)	µm	5 – 20	
	µin	0.1 – 0.5	
Bond Strength *	MPa	51.7 – 68.9	
	psi	7500 – 10000	

Note: Data provided is typical and variability can be expected. Changes in spray process, equipment or parameters can significantly change coating results.
* Using FM 1000 Epoxy Tape

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		
Atmospheric Plasma	**Combustion Powder**	**HVOF**
Metco 9MB series	Metco 5P-II	DiamondJet series
Metco F4 series	Metco 6P-II series	WokaJet series
TriplexPro series		WokaStar series
SimplexPro series		

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 443NS	1000300	5 lb (approx. 2.25 kg)	Stock	Global
	1000596	25 lb (approx 11 kg)	Stock	Global
Amdry 960	1001051	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 510	1002396	10 lb (approx. 4.5 kg)	Special Order	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 applicable to 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.
Metco 443NS	50-173
Amdry 960	50-173
Amdry 510	50-424

www.oerlikon.com/metco
info.metco@oerlikon.com