

Material Product Data Sheet

99 % Nickel Powders and Wires

Powder Products: Metco 56C-NS
Wire Products: Metco Nickel

1 Introduction

Metco™ 56C-NS is a pure nickel powder that can be thermal sprayed to salvage and build up surfaces of worn or mis-machined nickel and nickel alloy parts. The produced coatings are hard, dense and readily machinable.

These products can be used instead of Monel for applications which require corrosion-resistant coatings that are slightly harder than Monel coatings, but with good machinability. They can be applied using either atmospheric plasma spray or combustion powder Thermospray™.

Metco Nickel is a wire product used for corrosion protection in an alkaline environments. It also provides very high corrosion resistance in water, marine and melts. Coatings are well-adhered to the substrate and are relatively dense compared to many wire sprayed coatings. These properties allow this material to be useful for the restoration of nickel-based substrates. When necessary, coatings of Metco Nickel can be machined to dimension with fair surface finishes.

Metco Nickel coatings can also be used for chloride cleaning solutions and chemical applications. It is resistant up to 320 °C (610 °F) in sulfuric acid environments. As thermal sprayed nickel coatings are inherently more porous than bulk nickel substrates, a sealer should be considered to fill the porosity thereby enhancing the corrosion resistance.

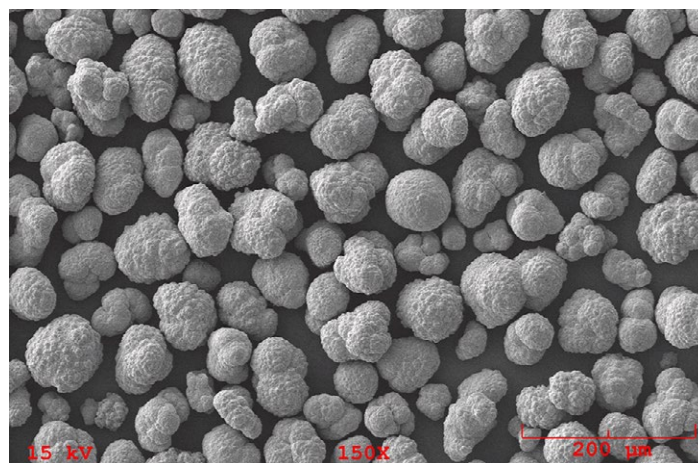
1.1 Typical Uses and Applications:

Typically used for:

- Corrosion resistant coating for chemical processing equipment
- Resistance to alkaline environments Corrosion resistance in marine and aqueous environments
- Resistance to sulfuric acid environments
- Salvage and buildup of worn or mis-machined components made of nickel or nickel alloys

Quick Facts

Classification	Metal, pure nickel	
Chemistry	99.0+ Ni (typical)	
Manufacture	Powder:	Precipitated
	Wire:	Drawn
Morphology	Powder:	Globular
Apparent Density	Powder:	approx. 3.4 g/cm ³
Purpose	Corrosion resistance, salvage and restoration	
Melting Point	1453 °C (2647 °F)	
Process	Powder:	Atmospheric Plasma Spray or Combustion Powder Thermospray,
	Wire:	Combustion Wire Spray



Top: SEM photomicrographs of Metco 56C-NS, showing morphology that is typical for these products. Bottom: Typical coil for Metco Nickel wire

2 Material Information

2.1 Chemical Composition, Particle Size Distribution and Manufacturing Method

Product	Chemical Composition (wt. %) Ni (min)	Nominal Particle Size Distribution or Wire Diameter)	Manufacturing Method	Recommended Spray Process
Metco 56C-NS	99.3	-75 +45 μ	Precipitated	APS or CPS
Metco Nickel	99.0	3.2 mm (1/8 in)	Solid drawn wire	CWS

Powder particle size measured by sieve analysis.

APS = Atmospheric Plasma Spray; CPS = Combustion Powder Therospray; CPW = Combustion Wire Spray

2.2 Key Selection Criteria

2.2.1 Powder Products

- Metco 56C-NS produces coatings that bond well to nickel and nickel alloy substrates, and are readily machined with carbide tools.
- Coatings applied using the combustion powder Therospray™ process have very high deposition efficiencies that can exceed 90 % whereas plasma sprayed coatings are typically in the range of 65 % – 80 %.

2.2.2 Wire Products

Choose Metco Nickel for coatings that:

- Provide high corrosion resistance in alkaline and marine environments
- Provide corrosion protection on chemical processing equipment
- Resist weak sulfuric acid environments

2.3 Related Products

2.3.1 Powder Products

- Other products can also be used for salvage and build-up of nickel-based alloys such as Diamalloy 1005, Diamalloy 1006, Amdry 1718 and Diamalloy 4004NS.
 - These products are applied using the HVOF spray process and have different coating properties from those of Metco 56C-NS. The HVOF coatings generally have higher bond strengths (>69 MPa / 10000 psi), high corrosion resistance and high temperature capability.
 - They are appropriate for use on superalloy components such as substrates of Inconel 625, 717, 718 and Rene 80. They should be used when higher service

temperatures (≤ 800 °C / 1470 °F), better corrosion resistance and stronger coatings are required that cannot be achieved using pure nickel coatings.

- Amdry 1718 can be applied using liquid-fuel HVOF, gas-fuel HVOF or atmospheric plasma spray.

2.3.2 Wire Products

- Metco NiCu, a Monel-type wire, is a good choice for reducing environments.
- Oerlikon Metco offers wires with a variety of nickel-chromium based chemistries, which can be considered for higher temperature corrosion and oxidation. Please contact your Oerlikon Metco Account Manager for more information.
- Metco AlMg wire is recommended for weak alkaline environments and offshore applications.
- If application using thermal spray processes that employ powder feedstocks are preferred, Metco 56C-NS or Metco 56F-NS pure nickel powder can be used.
- For oxidation resistance up to 1100 °C (2010 °F) or resistance to acidic or alkaline solutions, Amdry 6200, Metco 101NS, Metco 101SF, Amdry 6204 and Metco 6203 can be used effectively. In addition to oxidation and corrosion resistance, those coatings provide good resistance to abrasive and sliding wear and are applied using atmospheric plasma spray.
- For weak acidic environments, particularly for chemical processing equipment, Amdry 6250 is recommended. This material is applied using the atmospheric plasma spray process.
- For more aggressive sulfuric environments, consider choosing an HVOF-sprayed NiCrMo alloy such as Diamalloy 4006.

2.4 Customer Specifications

Product	Customer Specification
Metco 56C-NS	Rolls-Royce OMAT 3/144 Rolls-Royce plc MSRR 9513
Metco Nickel	American Welding Society (AWS) C2.25/C2.25M W-Ni-3

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	APS	CPS	CWS
Product	Metco 56C-NS	Metco 56C-NS	Metco Nickel
Macrohardness HRB	60	45 to 50	55 to 65
Microhardness HV0.1	125 to 170	125 to 150	N.R.
Density g/cm ³	7.2	7.2	7.55
Porosity vol. %	< 1	< 1	N.R.
Bond Strength MPa psi	14 – 31 2000 – 4500	N.R. N.R.	N.R.
Finishing	Easily machined using carbide tools, light cuts and high work speeds		Machine / Grind
Post Coat Processing	---		Due to the porous nature of coatings, application of a sealer may be needed to inhibit penetration of corrosives

Notes:

1. N.R = Not Reported
2. Values shown may vary from actual achieved values depending on the coating process, equipment, gun hardware, parameters used and the thickness of the applied coating. Refer to coating parameter sheets for starting point parameters and typical coating results on specific equipment.

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

APS	CPS	CWS
TriplexPro-210	Metco 6P-II series	Metco 16E series
SimplexPro series	Metco 5P-II	
F4MB-XL series		
Metco 9MBM		

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Wire Diameter	Package Size	Availability	Distribution
Metco 56C-NS	1000364	---	5 lb (approx. 2.25 kg)	Stock	Global
Metco Nickel	1006307	3.2 mm (1.8 in)	25 lb (11.3 kg) Coil	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Powder Products:
 - Tumble contents prior to use to prevent segregation.
 - Open containers should be stored in a drying oven at temperatures below 38 °C (100 °F) 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 web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).

Product	SDS Index No.
Metco 56C-NS	50-120
Metco Nickel	50-235

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