

Material Product Data Sheet

Nickel Chromium Alloy / Boron Nitride Thermal Spray Powders

Thermal Spray Powder Products: Metco 301C-NS, Metco 301NS

1 Introduction

Metco™ nickel chromium alloy / boron nitride thermal spray powders are designed to produce abrasion resistant coatings for clearance control applications in the compressor section of jet engines.

Clearance control coatings are used in applications where rotating components may come into contact with the coating as a result of design intent or operational surges. The coatings are designed to minimize the wear to the rotating components while maximizing gas path efficiency by providing clearance control in seal areas.

The powder materials discussed herein are cermet composites, consisting of a nickel-chrome alloy, boron nitride, and aluminum, and are manufactured using mechanical cladding techniques.

The powders were designed to produce coatings with varied erosion resistance and abrasion resistance, as desired by the customer to suit the end application, and for service temperatures up to 815 °C (1500 °F). Powders are best applied using the combustion powder Thermospray™ process using either hydrogen or acetylene as the fuel gas.

1.1 Typical Uses and Applications

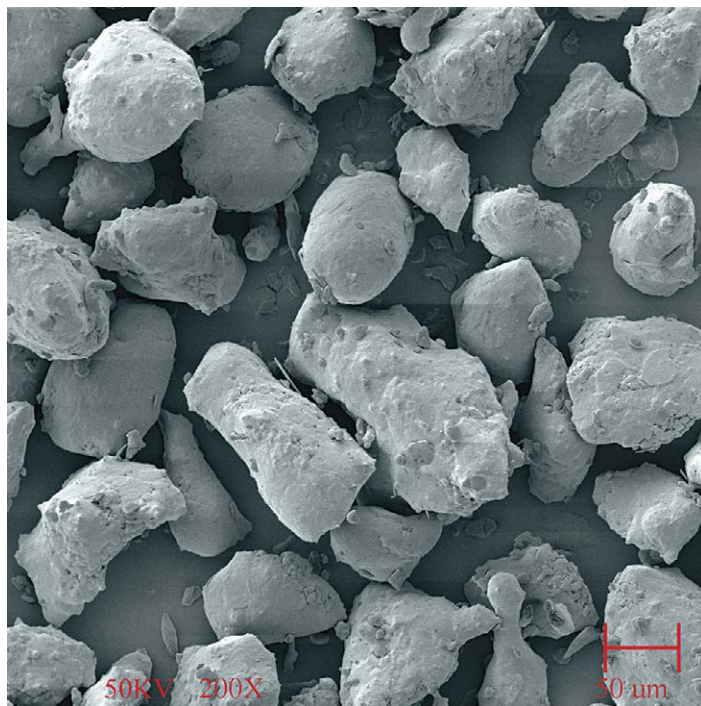
Abrasion resistant coatings for:

- High pressure compressor stages (titanium-based or nickel-based alloy blades)
- Outer and inner air seals
- Jet engine fuel nozzle valve seals

Short term, these coatings can withstand service temperatures up to 815 °C (1500 °F).

Quick Facts

Classification	Abrasion resistant, nickel-based
Chemical formula	Ni 13Cr 8Fe 6.5BN 3.5Al 2Organic binder
Manufacture	Mechanically clad
Purpose	Clearance control coatings
Morphology	Irregular, smooth
Apparent density	3.2 ± 0.2 g/cm ³
Service temperature	≤ 815 °C (1500 °F)
Process	Combustion Powder Thermospray™



SEM Photomicrograph of Metco 301NS powder.

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)					
	Nickel	Chromium	Iron	Boron Nitride	Aluminum	Binder
Metco 301C-NS	67	13	8	6.5	3.5	2
Metco 301NS	67	13	8	6.5	3.5	2

2.2 Particle Size Distribution

Product	Nominal Range μm
Metco 301C-NS	-120 + 45
Metco 301NS	-120 + 45

Upper particle size analysis using sieve in accordance with ASTM B214; lower size analysis using laser diffraction (Microtrac)

2.3 Key Selection Criteria

- For most applications, Metco 301NS is the material of choice.
- Always choose the material that meets the customer material and process specifications.

2.4 Related Products

- Coatings of Metco 301NS and Metco 301C-NS have higher temperature capability than comparable aluminum-silicon abrasable powders such as Al-Si-BN, Al-Si-Graphite, Al-Si-Polyester and Al-Si-Polyimide, as well as Ni-Graphite powders.

- Coatings exhibit improved erosion resistance versus Ni-Graphite coatings.
- While capabilities are similar to coatings of Nickel-Chromium-Aluminum-Bentonite materials, coatings of Metco 301NS and 301C-NS have higher density and improved oxidation resistance resulting from the higher chromium content.
- Similar functionality and temperature capabilities to CoNiCrAlY-based plasma sprayed abrasables.

2.5 Customer Specifications

Product	Customer Specifications
Metco 301C-NS	Avio 4800M/11 MTU MTS 1069 MTL 116 Rolls-Royce OMAT 3/113A Rolls-Royce plc MSRR 9507/10
Metco 301NS	GKN Aerospace PM 819-66 Honeywell 91547-M3976 Honeywell FP 5045, Type XX Honeywell M3970 Pratt & Whitney PWA 1342 Rolls-Royce Corporation EMS 56730 Rolls-Royce Corporation PMI 1410 Snecma DMR 33.085

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification		Data	
Recommended Process		Combustion Powder Thermospray™	
Recommended Fuel Gas ^a		Hydrogen or Acetylene	
Color As Sprayed		Grey	
Surface Profile	As Sprayed (Ra) Machined	30 µm 15 – 20 µm	1200 µin 600 – 800 µin
Macrohardness	HR15Y	45 ± 5 to 58 ± 6	
Density	g/cm ³	4.4 – 4.5	
Weight		0.44 kg/m ² /0.1mm	0.023 lb/ft ² /0.001in
Thickness limitation		None	
Maximum Service Temperature		815 °C	1500 °F
Substrate Preheat Temperature		95 °C	200 °F
Substrate Temperature During Spraying (max)		175 °C	350 °F
Typical Application Rate Per Pass		0.15 mm	0.006 in
Post Finishing Techniques		Machining (tungsten carbide tooling), avoid grinding	

^a For best abrasability, hydrogen is the recommended fuel gas. For applications where better erosion resistance is desired, acetylene can be used as the fuel gas, but some loss of abrasability will be evident.

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 Combustion Powder Spray Guns

Metco 6P-II

Metco 6P-II with Metco 6PT Extension Module

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 301C-NS	1000325	5 lb (approx. 2.25 kg)	Stock	Global
Metco 301NS	1000133	5 lb (approx. 2.25 kg)	Stock	Global

4.2 Handling Recommendations

Store in the original container in a dry location. Open containers should be stored in a drying oven at temperatures below 38 °C (100 °F) to prevent moisture pickup. Tumble contents prior to use to prevent segregation.

4.3 Safety Recommendations

See SDS 50-153 (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).

Information is subject to change without prior notice.