

# Material Product Data Sheet

## Aluminum Silicon Polymer Thermal Spray Powders

### Powder Products:

**Metco™ 601NS, Metco 601NS-1, Amdry™ 2010, Amdry XPT 268, Amdry 2000, Metco 1602A**

### 1 Introduction

Aluminum Silicon – Polymer powders produce abradable coatings for clearance control applications where the rotating component 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 powders produce coatings with excellent rub characteristics. They provide the optimum balance between the desired properties of abrasibility, erosion resistance and hardness.

Specifically designed to meet current gas turbine Original Equipment Manufacturer (OEM) specifications for clearance control coatings, these products, and in particular, Metco 601NS, have long, proven track records and are well known, worldwide. In fact, Metco 601NS has an exemplary service reputation, with many thousands of engine components having been coated with this material and millions of flight hours logged, making Metco 601NS a mainstay product within the aerospace industry.

A new addition to the product family is Metco 1602A which is designed for improved corrosion resistance where engines are exposed to harsher environments.

Metco 601NS-1 is offered as an interchangeable product to Metco 601NS. Based on in-house sprayability and abrasibility testing comparing the two products, Metco 601NS-1 exhibits identical processing and service properties to those of Metco 601NS. Metco 601NS-1 utilizes a secondary source of polyester which ensures availability through an additional source of supply.

Coatings using these powder materials are best applied using the atmospheric plasma spray process.

#### 1.1 Typical Uses and Applications:

Applications include lightweight clearance control coatings for:

- Aerospace turbine engine low pressure compressor
- Automotive and industrial turbochargers

### Quick Facts

Classification	Abradable, aluminum based
Chemistry	AlSi-Polymer
Manufacture	Blended or mechanically clad
Morphology	Irregular, rounded
Apparent Density	≈ 0.9 g/cm <sup>3</sup>
Service Temperature	≤ 325 – 350 °C (615 – 660 °F)
Purpose	Clearance control coatings
Process	Atmospheric Plasma Spray



Abradable coatings can be used against untipped titanium alloy, nickel alloy and steel blades at service temperatures up to:

Service Temperature	Products
325°C (615°F)	Metco 601NS      Metco 601NS-1 Amdry 2010      Metco 1602A
345 °C (650°F)	Amdry 2000
350 °C (660 °F)	Amdry XPT 268

Metco 601NS, Metco 601NS-1 and Amdry 2010 can also be used against untipped aluminum alloy radial impeller blading.

## 2 Material Information

### 2.1 Chemical Composition

Product	Weight Percent (nominal)							
	Al	Si	Mo	Cr	Polyester	Polyimide	Boron Nitride	Organic Binder
Metco 601NS	Balance	7	---	---	40	---	---	---
Metco 601NS-1	Balance	7	---	---	40	---	---	---
Amdry 2010	Balance	7	---	---	40	---	---	---
Amdry XPT-268	Balance	9	---	---	20	---	6	---
Amdry 2000	Balance	6	---	---	---	47	---	6
Metco 1602A	Balance	6	1	1	40	---	---	---

### 2.2 Particle Size Distribution and Manufacturing Method

	Nominal Range $\mu\text{m}$	Manufacturing Method
Metco 601NS	-125 +11	Blended
Metco 601NS-1	-125 +11	Blended
Amdry 2010	-125 +11	Blended
Amdry XPT-268	-125 +11	Mechanically Clad and Blended
Amdry 2000	-149 +11	Mechanically Clad
Metco 1602A	-125 +11	Blended

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

### 2.3 Key Selection Criteria

- While Metco 601NS, Metco 601NS-1 and Amdry 2010 are similar products, Metco 601NS is the recommended material of choice because it has the:
  - Best availability worldwide
  - Longest-standing track record in service with millions of reliable flight hours
  - Best availability in high volume to large-scale users
  - Highest number of customer specification (OEM) approvals (see Section 2.5)
  - Best technical and parameter support by Oerlikon Metco as a result of our long experience with this product
- Metco 601NS-1 is fully interchangeable with Metco 601NS and manufactured using raw materials from different sources to maintain security of supply.
- Coatings of Amdry 2010 have higher erosion resistance than coatings of Metco 601NS and Metco 601NS-1 when tested according to GE specification E50TF121. This is the result of different raw materials.
- Coatings of Amdry 2000 can be used at slightly higher temperatures than Metco 601NS, Metco 601NS-1 or Amdry 2010; however, abrasability is not as good as for Metco 601NS or Metco 601NS-1.

- Coatings of Amdry XPT-268 exhibit the highest erosion resistance and bond strength, and can be used at temperatures up to 345 °C (650 °F) with little blade wear; however, abrasability is not as good as Metco 601NS, Metco 601NS-1 or Amdry 2010 coatings.
- Coatings of Metco 1602A are suited to more demanding engine conditions where high corrosion resistance is a key requirement; e.g. high humidity conditions, multiple environment exposure at high engine cycle frequencies, salt laden air and marine operating conditions.
- Always choose the material that meets the customer material and process specifications.

### 2.4 Related Products

- When coatings with service temperatures above 350 °C (660 °F) for use against untipped titanium blades are required, then abrasable coating materials such as Metco 320NS, Metco 2042 or Metco 610NS are recommended.
- AlSi-polymer coatings have better galvanic corrosion resistance compared to coatings of AlSi-graphite, such as Metco 311NS and Metco 313NS, but worse than CuAl-polyester, such as Metco 604NS, Metco 605NS and Metco 610NS.

## 2.5 Customer Specifications

Product	Customer Specification	
Metco 601NS	Avio 4800M/23 Canada Pratt & Whitney CPW 928 GKN Aerospace PM 819-30 Honeywell 91547-M3955 Honeywell FP 5091 Pratt & Whitney PWA 1349 Rolls-Royce Corporation PMI 1210 Rolls-Royce plc MSRR 9507/15 Snecma DMR 33.087	Canada Pratt & Whitney CPW 517 Chromalloy BZ-003 Type 34 GE B50TF222, CI A Honeywell EMS 57735, Type I MTU MTS 1081 Rolls-Royce Corporation EMS 38900 Rolls-Royce OMAT 3/143 Rolls-Royce plc RRMS 40019 Turbomeca LA 657 Ed. 1 PW1 Ind. 0
Metco 601NS-1	Honeywell EMS 57735, Type I	
Amdry 2010	Canada Pratt & Whitney CPW 517 Honeywell EMS 57735, Type I Pratt & Whitney PWA 1349 Rolls-Royce OMAT 3/143B	GE B50TF222, CI A & C Honeywell 91547-M3955 Praxair PAB360
Amdry XPT-268	Rolls-Royce Corporation EMS 56723 Rolls-Royce plc RRMS 40021	Rolls-Royce Corporation PMI 1364
Amdry 2000	Rolls-Royce Corporation EMS 56767	Rolls-Royce Corporation PMI 1332
Metco 1602A	Honeywell EMS 57735, Type II	

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

Characteristic	Typical Data				
	Metco 601NS Metco 601NS-1	Amdry 2010	Amdry XPT-268	Amdry 2000	Metco1602A
Recommended Process	Atmospheric Plasma Spray (all materials)				
Macrohardness [HR15Y]	70	75	75	60	70
Nominal Bond Strength [MPa (psi)]	9.7 (1400)	11.5 (1670)	23.4 (3400)	8.0 (1160)	11.5 (1670)
Coating Density [g/cm <sup>3</sup> ]	1.5	1.6	1.9	1.2	1.5
Erosion Resistance <sup>a</sup> [s/mm (s/0.001 in)]	157 (4)	197 (5)	236 (6)	157 (4)	197 (5)
Deposition Efficiency [%] <sup>b</sup>	≤ 65	≤ 65	≤ 65		≤ 65
Max Service Temperature [°C (°F)]	325 (615)	325 (615)	345 (650)	350 (660)	325 (615)
Thermal Conductivity [W/m·K]	0.53	0.53			
Thermal Expansion [10 <sup>-6</sup> /K]	20 to 30	20 to 30	20 to 30		20 to 30
Incursion Rub Performance <sup>c</sup>	Excellent	Excellent	Good	Good <sup>d</sup>	Excellent <sup>e</sup>
Corrosion Resistance	Moderate corrosion resistance under typical aero service conditions				Excellent <sup>f</sup>
Post Finishing Technique	Use a sharply pointed, high-speed steel bit, light feeds, fast work speed and traverse rate				

<sup>a</sup> In accordance with GE E50TF121

<sup>b</sup> Significantly higher deposit efficiencies can be expected using Metco's TriplexPro™ and SinplexPro™ series plasma spray guns

<sup>c</sup> Against titanium alloy blades under typical incursion conditions

<sup>d</sup> Slight blade wear and some conditions

<sup>e</sup> Reduced grooving and blade 'pick-up'

<sup>f</sup> Resists general and blistering corrosion in humid, marine, high-engine cycle frequency environments

### 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 Atmospheric Plasma Spray Guns

Metco 3MBM
Metco 9MBM
Metco F4MB-XL series
TriplexPro™ series
SinplexPro™ series
Metco SM F-100 CONNEX
Metco SM F210

## 4 Commercial Information

### 4.1 Ordering Information and Availability

	Order No.	Package Size	Availability	Distribution
Metco 601NS	1000298	5 lb (approx. 2.25 kg)	Stock	Global
Metco 601NS-1	1305342	2.5 kg (approx. 5.5 lb)	Special Order	Global
Amdry 2010	1001065	5 lb (approx. 2.25 kg)	Stock	Global
Amdry XPT-268	1002392	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 2000	1001064	5 lb (approx. 2.25 kg)	Stock	Global
Metco 1602A	1305410	2.5 kg (approx. 5.5 lb)	Special Order	Global

### 4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents prior to use to prevent segregation.
- Remove desiccant bag prior to use, where applicable.
- 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 correct SDS (Safety Data Sheet) for the product of interest localized for the country where the material will be used. SDS are available from the Oerlikon web site at [www.oerlikon.com/metco](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).

Product	SDS No.
Metco 601NS	50-189
Metco 601NS-1	50-189
Amdry 2010	50-189
Amdry XPT-268	50-821
Amdry 2000	50-778
Metco 1602A	50-2294

Information is subject to change without prior notice.