

Material Product Data Sheet

Aluminum Bronze / Polyester Abradable Powders

Thermal Spray Powder Products: Metco 604NS, Metco 605NS, Metco 610NS

1 Introduction

Metco™ 604NS, Metco 605NS and Metco 610NS are powder materials designed to produce abradable coatings for aerospace and industrial turbine clearance control applications operating in marine environments where corrosion from salt is a concern.

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 metal matrix of these powders is a pre-alloyed aluminum bronze material. A specially formulated polyester material is combined with the aluminum bronze matrix material to form a low-density coating structure. In the case of Metco 604NS and 605NS, the polyester is blended with the metallic constituent. Metco 610NS is a composite material where the polyester constituent is clad to the metallic constituent using a solid organic binder.

Coatings of Metco 605NS provide resistance to fretting between mating surfaces with tests indicating excellent sliding wear fatigue protection for titanium alloys at contact pressures up to 345 MPa (50,000 psi). The coating exhibits sufficiently high strength to resist deformation under load. With excellent anti-galling performance Metco 605NS is sufficiently soft to avoid damage to titanium surfaces. The lubricity in the coating sufficiently maintains low frictional forces.

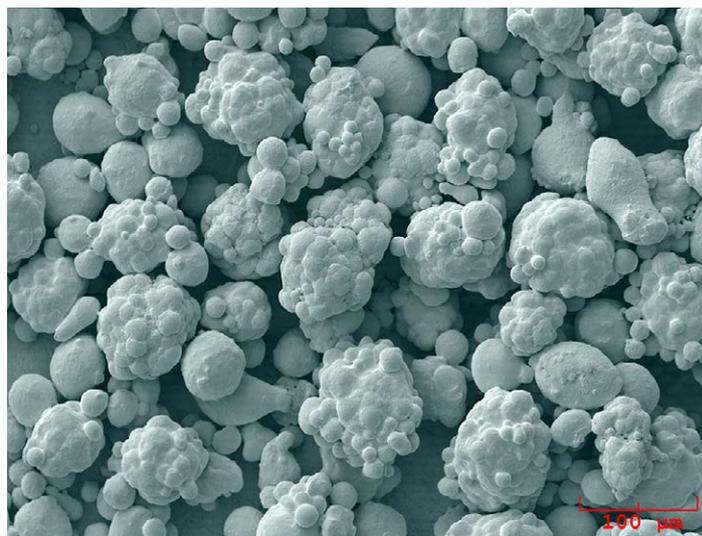
1.1 Typical Uses and Applications:

Abradable coatings for:

- Mating surfaces against rotating components at service temperatures up to 650 °C (1200 °F), including titanium up to 550 °C (1020 °F).
- Labyrinth seal coatings against 17-4 PH steel or Inconel knife edges.

Quick Facts

Classification	Abradable, copper-based
Chemistry	Aluminum bronze + polyester
Manufacture	Mechanically clad or blended
Morphology	Irregular
Purpose	Clearance control
Service temperature	≤ 650 °C (1200 °F)
Process	Atmospheric plasma spray



Photomicrograph of Metco 610NS aluminum bronze / polyester abradable coating material.

Metco 605NS:

- Lubricious coatings resistant to fretting wear on titanium alloy substrates at high contact pressures.
- In general, these materials are used as the insulating layer in a two-part TBC system, consisting of a thermal sprayed bond coat and YSZ top coat. For some applications, they are used as intermediate layers between an oxidation-resistant bond coat and a more porous, low-K TBC system.

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)					
	Copper	Aluminum	Polyester	Organic Solids	Iron	Other (max)
Metco 604NS	85	8.5	5	---	1	0.2
Metco 605NS	80	8.5	10	---	1	0.2
Metco 610NS	75	7.5	14.5	1.5	1	0.3

2.2 Particle Size Distribution and Manufacturing Method

Product	Nominal Range μm	Manufacturing Method
Metco 604NS	-125 +11	Blended
Metco 605NS	-88 +11	Blended
Metco 610NS	-150 +22	Mechanically Clad

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

2.3 Key Selection Criteria

- Always choose the material that meets the customer material and process specifications.
- In general, coatings will be more porous and friable with increased polyester content. Therefore, if additional abrasability is required, Metco 610NS may be a better choice than Metco 604NS or Metco 605NS.
- Lower polyester content will result in coatings that exhibit somewhat higher macrohardness and erosion resistance. Therefore, coatings of Metco 604NS will be harder and more erosion resistant than coatings of Metco 605NS and Metco 610NS.
- As a result of the composite nature of Metco 610NS, it is generally easier to achieve consistent coating results with this material. However, use of Metco 610NS should be limited to applications where the additional coating porosity is desirable.

2.4 Related Products

- Metco 604NS, Metco 605NS and Metco 610NS offer higher in-service temperature capability than comparable aluminum-based abrasable materials such as Metco 601NS and Amdry 2010, and the nickel-based graphite products such as Metco 307NS and Metco 308NS.
- These aluminum bronze materials also show improved corrosion resistance in marine environments over the previously mentioned products. For example, room temperature immersion testing in deionized water and seawater demonstrates that Metco 610NS coatings are more corrosion resistant than Metco 601NS coatings.
- Abradability of these coatings is comparable to that of Metco 307NS and Metco 308NS, while room-temperature erosion resistance is improved. These products are especially recommended for use in applications that are incompatible with nickel alloy coatings.
- For anti-fretting applications, Metco 605NS is a proven and reliable choice. However, coatings of Metco 58NS or Amdry 958 demonstrate superior, state-of-the-art anti-fretting characteristics.

2.5 Customer Specifications

Product	Customer Specifications
Metco 604NS	Avio 4800M/34 Sikorsky SS9212
Metco 605NS	Boeing D210-12051-1 GE A8Y5 Honeywell EMS 57728, Type II Honeywell M3964 Rolls-Royce plc MSRR 9507/40
Metco 610NS	Honeywell EMS 57728, Type I

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification (as sprayed)	Metco 605NS	Metco 610NS		
Recommended Process	Atmospheric Plasma Spray	Atmospheric Plasma Spray		
Macrohardness (HR15Y)	75 ± 10	60 ± 10		
Density (g/cm ³)	4.2 – 4.9	3.8		
Typical Porosity (vol %)	6 – 10	6 – 10		
Fugitive Phase (vol %)	30 – 35	37 – 41		
Tensile Bond Strength (2-part epoxy)	11.7 – 14.5 MPa	1700 – 2100 psi	6.9 – 11.0 MPa	1000 – 1600 psi

Please note that actual values may vary based on part configuration and spray parameters used. For key coating information on Metco 604NS, please review the relevant customer coating specification.

3.2 Post-Coating Polyester Removal

The polyester constituent in these powders begins to degrade at temperatures above 350 °C (660 °F). Removal of the polyester is recommended for coating service conditions above this temperature to prevent uncontrolled burning. For service temperatures below 345 °C (650 °F), removal of the polyester is a design option.

The recommended procedure for removing the polyester is a burn-out cycle in an atmospheric oven at 540 °C (1000 °F) for 2 hours. An alternative burn-out cycle of 435 °C (815 °F) for 8 hours can be used.

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 3MB series

Metco 9MB series

Metco 11MB

TriplexPro

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 604NS	1006131	5 lb (approx. 2.25 kg)	Stock	Global
Metco 605NS	1000331	5 lb (approx. 2.25 kg)	Stock	Global
Metco 610NS	1000586	5 lb (approx. 2.25 kg)	Special Order	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.
- Prior to spraying, invert the container several times to minimize segregation.
- Excessive mechanical tumbling may break down powder constituents and create segregation.

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 (Resources – Safety Data Sheets).

Product	SDS No.
Metco 604NS	50-190
Metco 605NS	50-388
Metco 610NS	50-389

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Information is subject to change without prior notice.