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metco

# Material Product Data Sheet
## Aluminum Silicon Hexagonal Boron Nitride Abradable

**Powder Products: Metco 320NS, Metco 320**

### 1 Introduction

Metco™ 320NS and Metco 320 are an aluminum silicon alloy powders composited with hexagonal boron nitride. They are designed for use as abradable coating materials in clearance control systems. They have been approved as a high temperature compressor abradable for various engines, replacing other abradable materials for service temperatures up to 450 °C (842 °F). Coatings of Metco 320NS and Metco 320 offer improved corrosion resistance, particularly in marine environments. They employ hexagonal boron nitride as a lubricant, which is more inert than other abradable lubricants such as graphite.

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 AlSi matrix is used in many abradable coating systems because of its good combination of erosion resistance and abradability against various blade materials, including titanium alloys.

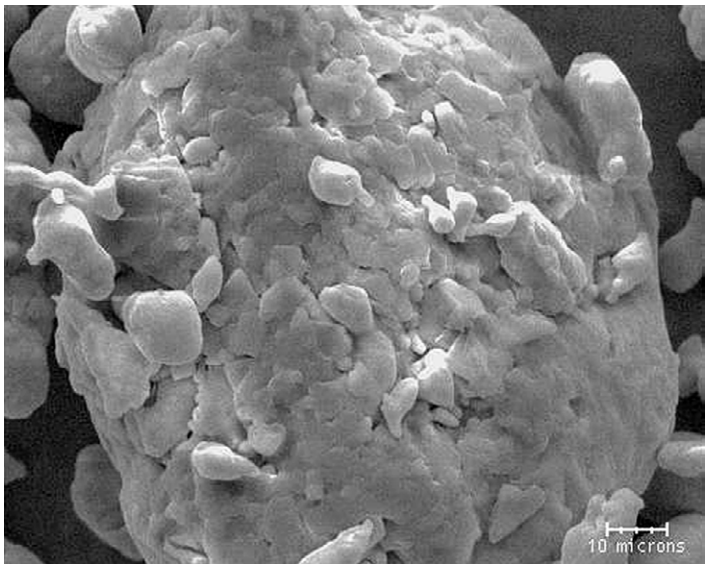
Hexagonal boron nitride (hBN) is a very inert lubricant that improves abradability by reducing frictional heating on contact with the blade at high translational speeds. It also helps weaken the interparticle bond strength within the aluminum silicon matrix for better friability.

### 1.1 Typical Uses and Applications:

Clearance control coatings for:

- High pressure compressor seal applications with service temperatures up to 450 °C (842 °F)
- Gas turbine engine labyrinth air seals, axial and radial compressor seals, turbocharger housing throat areas
- Depending on the application, coatings are run against untipped titanium, steel or nickel blades

| Quick Facts | |
|---|---|
| Classification | Abradable, aluminum based |
| Chemistry | AlSi/hBN |
| Manufacture | Mechanically clad |
| Morphology | Spheroidal |
| Service Temperature | ≤ 450 °C (840 °F) |
| Purpose | Clearance control |
| Process | Atmospheric Plasma Spray |



## 2 Material Information

### 2.1 Chemical Composition

| Product | Weight Percent (nominal) | | | |
|---|---|---|---|---|
| | Al | Si | Boron Nitride | Organic Binder |
| Metco 320NS | Balance | 8 | 20 | 8 |
| Metco 320 | Balance | 8 | 20 | 8 |

### 2.2 Additional Powder Characteristics

| | Particle Size Distribution | | Color | Morphology |
|---|---|---|---|---|
| | Nominal Range | D50 | | |
| Metco 320NS | -212 +22 µm | 63 µm | Grey | Spheroidal |
| Metco 320 | -212 +22 µm | N.R. [a] | Grey | Spheroidal |

Particle size analysis for upper particle size using sieve in accordance with ASTM B214; lower size analysis and D50 determined using laser diffraction (Microtrac).
[a] N.R. = not reported.

### 2.3 Key Selection Criteria

- Choose the material appropriate for the customer specification required.
- Metco 320NS and Metco 320 offer an excellent combination of erosion resistance, corrosion resistance and abradability.
- Coatings of Metco 320NS or Metco 320 are compatible to run against untipped titanium, nickel alloy and steel blades and seal fins.

### 2.4 Related Products

- At comparable erosion resistance and abradability, coatings of Metco 320NS or Metco 320 exhibit better corrosion resistance than Metco 313NS and similar Al-Si-graphite materials. Therefore, Metco 320NS or Metco 320 are the materials of choice for new compressor designs in the temperature regime up to 450 °C ( 840 °F ).
- Use Metco 2042 for applications against untipped titanium blades and seal fins, if the application temperature exceeds the Metco 320NS capability.
- At application temperatures up to 325 °C ( 620 °F ), Metco 601NS or Amdry 2010 may be a better selection than Metco 320NS, if improved abradability and reduced abradable transfer to the contact partner is required.

### 2.5 Customer Specifications

| Product | Customer Specification |
|---|---|
| Metco 320NS | Industria de Turbo Propulsores SMM-905<br>MTU MTS 1544<br>Pratt and Whitney PMCS 5128-1<br>Rolls-Royce OMAT 3/252<br>Rolls-Royce plc MSRR 9507/66<br>Rolls-Royce plc RRMS 40023<br>Snecma DMR 33.100 |
| Metco 320 | GE B50TF331 |

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information [a]

| Specification | Typical Data | |
|---|---|---|
| Recommended Process | Atmospheric Plasma Spray | |
| Bond Coat | A high temperature bond coat is required, Metco 450NS, Amdry 956, Metco 443NS or Amdry 960 are recommended choices | |
| Macrohardness HR15Y | 45 – 70 | |
| GE Erosion Number [b] | 3 – 5 s/mil | |
| Bond Strength (nominal) | 10 – 17 MPa | 1500 – 2500 psi |
| Coating Density | 1.7 g/cm$^3$ | |
| Maximum Service Temperature | 450 °C | 842 °F |
| Thermal Conductivity | 25 W/m·K | |
| Thermal Expansion | 26 x 10$^{-6}$/K | |

[a] For comprehensive information to achieve correct Metco 320NS or Metco 320 coating characteristics, please refer to Metco Solutions Flash SF-0011.
[b] GE test procedure E50TF121

### 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 Atmospheric Plasma Spray Guns | |
|---|---|
| TriplexPro™ series | Metco 9MB series |
| SinplexPro™ series | Metco F4MB-XL series |

## 4 Commercial Information

### 4.1 Ordering Information and Availability

| Product | Order No. | Package Size | Availability | Distribution |
|---|---|---|---|---|
| Metco 320NS | 1001587 | 5 lb (approx. 2.25 kg) | Stock | Global |
| Metco 320 | 1304665 | 2.5 kg (approx. 5.5 lb) | Stock | Global |

### 4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents prior to use to prevent segregation.
- Open containers should be stored in a drying oven to prevent moisture pickup.

### 4.3 Safety Recommendations

See SDS 50-375 (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).



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