

# Material Product Data Sheet

## High Carbon Iron-Molybdenum Composite Powder

### Thermal Spray Powder Products: Metco 350NS

#### 1 Introduction

Metco™ 350NS is a high carbon iron-molybdenum composite powder developed as a thermal sprayed alternative to hard chrome plating.

The addition of carbon increases the hardness and wear resistance. The formation of surface films effects sliding characteristics of this material. The molybdenum constituent provides good scuff resistance due to its ability to form an lubricious film. The film can be formed by a reaction with the environment or by transferring material from one sliding surface to the other. Sliding then takes place between one of the surfaces and the transferred film.

Molybdenum has very high melting points thus the interaction between substrate and coating particles (bond strength) will be increased due to the higher temperatures involved and longer cooling cycles.

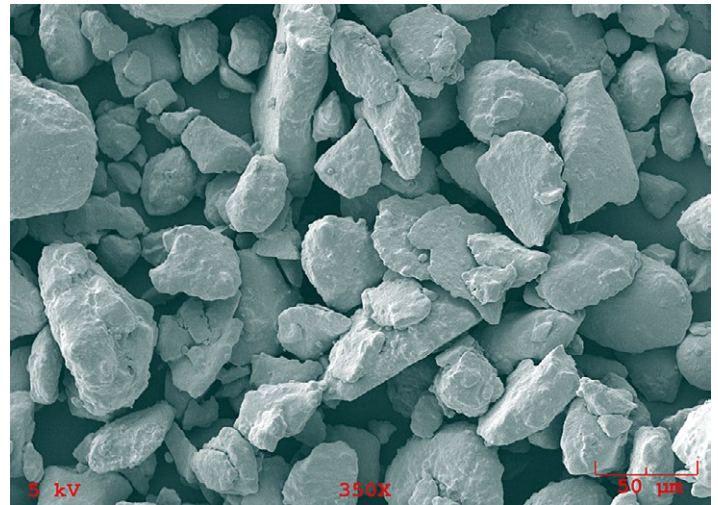
Application and processing temperatures may affect the hardness and wear resistance of these coatings. Thus these coatings are recommended for service temperature below 340 °C (650 °F). Higher temperatures may tend to oxidize the molybdenum constituent which could reduce coating integrity.

#### 1.1 Typical Uses and Applications

- Hard bearing surfaces for shifter forks, synchronizer rings, gear cones and pump seals
- Rebuilding worn, damaged cylinder bore walls and other parts with a hard, wear-resistant surface
- Salvage of mismachined parts
- Abrasion resistance on machine element surfaces
- Sliding wear resistance for piston rings

#### Quick Facts

Classification	Composite, iron based
Chemistry	Fe 16Mo 2C 0.25Mn
Manufacture	Mechanically clad
Morphology	Irregular
Apparent Density	3.1 ± 0.3 g/cm <sup>3</sup>
Purpose	Wear and scuff resistance
Service Temperature	≤ 340 °C (650 °F)
Process	Atmospheric plasma spray or combustion powder Thermospray™



## 2 Material Information

### 2.1 Chemical Composition and Phase Constituents

Product	Chemical Composition (wt. %)			
	Fe	Mo	C	Mn
Metco 350NS	Balance	16 – 20	2 – 4	0.5 max

### 2.2 Particle Size Distribution and Other Characteristics

Product	Nominal Particle Size Distribution	Hall Flow
Metco 350NS	-90 +11 $\mu\text{m}$	18 – 33 s/50 g

Upper particle size distribution determined by sieve; lower size distribution determined by Microtrac.  
Hall flow in accordance with ASTM B213

### 2.3 Key Selection Criteria

- The molybdenum constituent gives rise to coatings with excellent scuff resistance and improves chemical corrosion resistance over 300 series stainless steel substrates.
- The scuff resistance of Metco 350NS coatings are compatible with many mating surfaces, including cast iron, iron-based alloys, aluminum and aluminum alloys.
- Metco 350NS has a unique chemical and synergistic reaction during spraying that produces coatings with excellent wear resistance, with low levels of oxides.
- Metco 350NS can be applied using atmospheric plasma spray or combustion powder Thermospray™, including use of MPS as the combustion powder Thermospray fuel gas.

### 2.4 Related Products

- Molybdenum-based coatings are generally used for sliding wear applications. They have good thermal conductivity, low thermal expansion, good frictional properties and self-bond to steel. Products include:
  - Amdry 313X is a pure molybdenum, agglomerated and spheroidized powder that can be used instead of Metco 350NS when better scuff and corrosion resistance is required.

- Amdry 1371, a blend of self-fusing nickel-based alloy and molybdenum, produces coatings with similar abrasion and scuff resistance, yet slightly better corrosion resistance than coatings of Metco 350NS. Coatings of Amdry 1371 can be used at service temperatures up to 350 °C (660 °F).
- Chromium oxide composites can be considered as alternative materials, particularly for use in various chemical medias as these materials produce very inert coatings. The chromium oxide component contributes hardness, wear-resistance and thermal stability when used in sliding contact. Products include:
  - Amdry 6462 and Amdry 6460 are fused and crushed chromium oxide composites. Coatings of these materials are tough, corrosion and wear resistant with high resistance to mechanical shock compared to other ceramics and has good friction characteristics.

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

Specification		Typical Data (depending on spray process and gun chosen)	
Recommended Spray Process		Atmospheric Plasma Spray or Combustion Powder Thermospray™	
Preparation		When coating aluminum and aluminum alloy substrates, prepare surfaces using steel grit. Metcolite grit is not recommended.	
Surface Roughness Ra	As-Sprayed	6 – 22 µm	300 – 900 µin
	Ground	0.2 – 1.0 µm	7 – 45 µin
Macrohardness		45 – 50 HRC	
Microhardness		600 – 700 HV0.3	
Density		6.9 – 7.2 g/cm <sup>3</sup>	
Porosity		1.0 – 2.5 vol. %	
Oxide Content		5 – 25 vol. %	
Thickness Limits	Combustion Spray	2 mm	0.080 in
	Plasma Spray	0.6 mm	0.025 in
Bond Strength <sup>a</sup>		20 – 41 MPa	3000 – 6000 psi
Maximum Service Temperature		340 °C	650 °F

<sup>a</sup> On grit-blasted substrates; varies depending on substrate composition.

### 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 Spray Guns

Atmospheric Plasma	Combustion Powder
Metco 3MB series	Metco 6P-II series
Metco 9MB series	Metco 5P-II
Metco F4 series	

## 4 Commercial Information

### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 350NS	1000589	25 lb (approx. 11.4 kg)	Stock	Global

### 4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents gently 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 50-159 (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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).

Information is subject to change without prior notice.