

## Material Product Data Sheet

# Tungsten Carbide/12 % Cobalt – 25 % Nickel-Based Superalloy Thermal Spray Powder Blend

### Thermal Spray Powder Products: Metco 5803

#### 1 Introduction

Metco™ 5803 is comprised of an agglomerated tungsten carbide /12 wt.% cobalt powder, mechanically blended with a 25 wt.% nickel-based superalloy powder. This product was specifically developed as a thermal sprayed alternative for hard chromium plating that is qualified for this use under U.S. Military Specification MIL-STD-1687A.

Coatings of this material have excellent corrosion resistance and are easily machined using single-point machine bits. They can also be honed or finished using conventional (non-diamond) grinding techniques to obtain the surface finish required for the application. Field tests have shown that Metco 5803 coatings exhibit fatigue properties equal to or better than chromium plating. The coatings are resistant to wear by abrasion, contact with hard surfaces, particle erosion and fretting at temperatures up to 500 °C (930 °F). Coatings also have excellent submerged saltwater corrosion resistance and have been successfully used on large hydraulic steering rams. Salt fog tests (ASTM B117) show corrosion resistance comparable to hard chromium plating.

Metco 5803 is best applied using gas-fueled HVOF spray processes.

#### 1.1 Typical Uses and Applications:

Metco 5803 is typically used for:

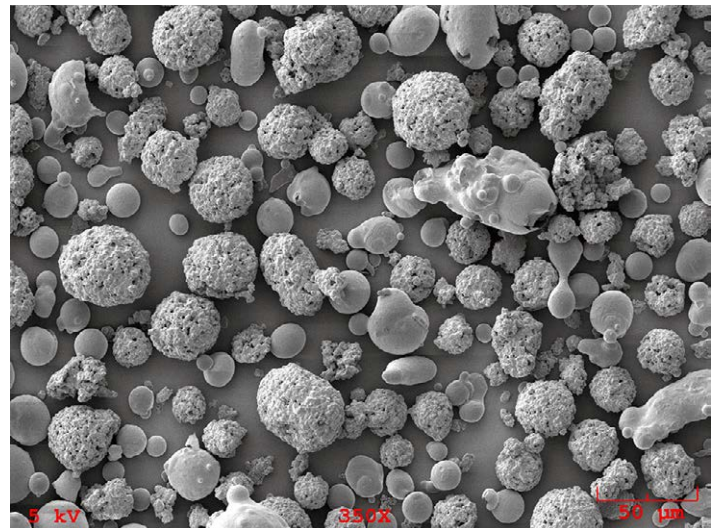
- Hard chromium replacement
- Corrosion resistance
- Abrasion resistance
- Erosion resistance
- Fretting resistance
- Sliding wear resistance

Typical coated components include:

- Steering rams
- Hydraulic rods
- Compressor rods
- Gate and ball valves
- Pump rotors
- Down hole drilling components

#### Quick Facts

Classification	Carbide, tungsten-based
Chemistry	WC 12Co 25(Ni Superalloy)
Manufacture	Blend
Morphology	Spheroidal/Irregular
Apparent Density	3.6 g/cm <sup>3</sup>
Purpose	Wear and corrosion resistance
Service Temperature	≤ 500 °C (930 °F)
Process	HVOF



## 2 Material Information

### 2.1 Chemical Composition (nominal wt. %)

Product	WC 12Co	Ni	Cr	W	Mo	Cu	C	B	Fe
Metco 5803	75.0	13.5	5.0	2.5	2.25	1.0	0.25	0.25	0.25

### 2.2 Particle Size Distribution, Apparent Density, Carbide Grain Size and Manufacturing Method

Product	Nominal Particle Size Distribution (µm)	Apparent Density (g/cm <sup>3</sup> )	Carbide Grain Size (µm)	Manufacturing Method
Metco 5803	-63 +5	3.6	Coarse	Blend

Particle size measured by laser diffraction (Microtrac)

### 2.3 Key Selection Criteria

- Choose Metco 5803 when a carbide material with a wide range of wear resistant properties is desired, particularly when corrosion in salt (seawater) environments is a concern.

### 2.4 Related Products

- WC 12Co and WC 17Co powders such as WOKA 31XX and WOKA 32XX series products and other Metco, Amdry or Diamalloy WC Co products have higher hardness and better wear resistance but lower corrosion resistance.
- WC 10Co 4Cr powders such as Metco 5164 and 5165 can be used to replace hard chromium plating on landing gears. These materials are tightly controlled for aerospace applications.
- WC 10Co 4Cr powders that are also suitable as thermal spray replacement materials for hard chromium plating are Amdry 5843, WOKA 36XX series, Metco 5163, Metco 5164, Metco 5847 and Metco 5842. These materials are recommended for applications where both wear (abrasion, erosion, fretting) and corrosion resistance are required. The CoCr matrix provides higher corrosion

resistance than Co matrixes. They are also used in the paper industry for protecting rolls against wear in wet corrosive environments.

- WOKA 36XX series materials (agglomerated and sintered WC 9Co 5Cr 1Ni) are the best choice whenever corrosion resistant coatings, coupled with high abrasion resistance, are needed. Corrosion resistance equals or surpasses galvanic chromium plating, especially in HCl environments.
- Diamalloy 3006, a NiCr clad Cr<sub>3</sub>C<sub>2</sub> product, produces coatings with comparable hardness and corrosion resistance with a finer microstructure that can be ground using an aluminum oxide wheel.
- If solid particle erosion, high temperature wear and oxidation resistance up to approximately 800 °C (1470 °F) is required, Cr<sub>3</sub>C<sub>2</sub>-NiCr products, such as WOKA 71XX, 72XX or 73XX series, can be used. These coatings are excellent hard chromium alternatives, with especially good corrosion resistance in chloride, acidic and alkaline environments. They are also used for hydraulic cylinders.

### 2.5 Customer Specifications

Product	Customer Specification
Metco 5803	U.S. Military MIL-STD-1687A

### 3 Coating Information

#### 3.1 Key Thermal Spray Coating Information

Specification		Typical Data (Metco 5803 sprayed with DiamondJet™ DJ2700 using propylene fuel gas)
Recommended Spray Process		HVOF
Deposit Efficiency (approximate)	%	62
Macrohardness	HR15N	91 – 92
Microhardness	HV0.3	925 – 975
Oxide Content	vol. %	< 4
Porosity	vol. %	< 1
Recommended Machining		Single point carbide tool, hone/grind for finish

#### 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 HVOF Spray Guns

DiamondJet

### 4 Commercial Information

#### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 5803	1001586	5 lb (approx. 2.25 kg)	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 at temperatures below 38 °C (100 °F) to prevent moisture pickup.

#### 4.3 Safety Recommendations

See SDS 50-502 (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.