

Material Product Data Sheet

Tungsten Carbide – 10 % Cobalt – 4 % Chromium Sintered and Crushed Powders for Thermal Spray

Thermal Spray Powder Products: Amdry™ 5843, WOKA™ 3903

1 Introduction

Tungsten carbide cobalt chromium sintered and crushed powders for thermal spray are typically applied using the HVOF process to produce dense, abrasion and erosion resistant coatings.

The sintered and crushed morphology generally produces coatings with a higher as-sprayed coating density compared to agglomerated and sintered powders. This allows the usage of these coatings on high pressure gate valves and other high pressure components.

Tungsten carbide acts as the wear-resistant hard phase component. The cobalt chromium matrix improves corrosion and erosion resistance, compared with carbides having a cobalt-only matrix.

This class of thermal spray powders is particularly suitable for applications where both wear and corrosion resistance is needed. They also offer better corrosion and cavitation resistance than tungsten-carbide-cobalt coatings. These materials also produce excellent thermal sprayed coating alternatives to hard chromium plating.

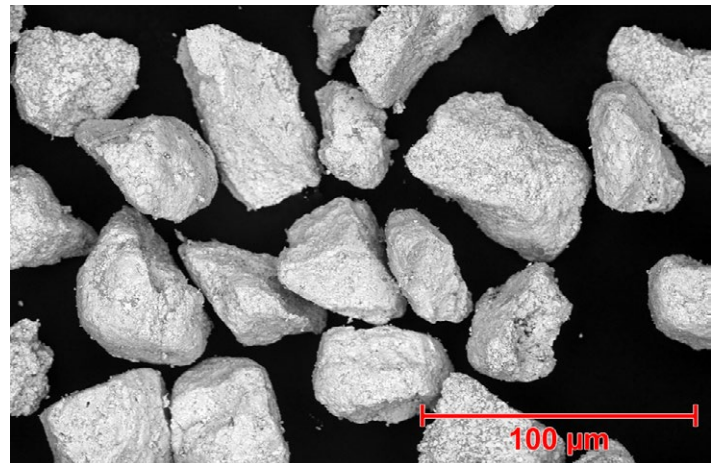
1.1 Typical Uses and Applications

Typical applications include:

- Gate valves
- Resistance to abrasion and cavitation
- Paper and printing cylinders
- Pump impellers, shafts and liners
- Hydroelectric turbine components
- Extruder screws and forging dies
- Steel industry guide rolls and pins

Quick Facts

Classification	Carbide, tungsten-based
Chemistry	WC 10Co 4Cr
Manufacture	Sintered and crushed
Morphology	Angular / blocky
Purpose	Corrosion and wear resistance
Melting Point	Approx. 1480 °C (2700 °F)
Service Temperature	≤ 500 °C (930 °F)
Process	HVOF



SEM photomicrograph of Amdry 5843 showing the powder exterior morphology typical of these products.

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)					
	W	Co	C _{TOTAL}	Cr	Fe	Others
Amdry 5843	Bal.	9.0 – 11.0	5.0 – 5.5	3.5 – 4.5	N.R.	1.0 max
WOKA 3903	Bal.	9.0 – 11.0	4.9 – 6.0	3.1 – 4.9	1.0 max	1.0 max

N.R. = Not Reported

2.2 Particle Size Distribution

Product	Nominal Size Distribution (µm)
Amdry 5843	-45 +16
WOKA 3903	-45 +11

Particle size distribution: Analysis by sieve per ASTM B214 for all upper limits; values of 38 µm and lower based on laser scattering per ASTM B 822 (Microtrac).

2.3 Key Selection Criteria

- Amdry 5843 is a premium grade material which produces coatings that combine excellent abrasion and erosion resistance with corrosion resistance and moderate cavitation resistance.
- For applications where cavitation is not involved, WOKA 3903 is a more economical choice. WOKA 3903 produces coatings with excellent abrasion and erosion resistance. It can be sprayed slightly thicker than Amdry 5843 and produces dense, gas-tight coating structures. Depending on the application, a sealer may be required after spraying.
- Select a material appropriate for the recommended spray process and spray gun to be used. (refer to Section 2.5).

2.4 Related Products

- For many applications, a more economical choice would be one of the agglomerated and sintered carbide materials of the same chemistry, such as Woka 365X series products (see datasheet DSMTS-0025). These products are proven materials for use in applications that require heavy resistance to abrasion and erosion, but they are less suitable for ultra high pressure gate valves or applications where cavitation cannot be excluded.
- For aerospace applications such as landing gears, consider Metco 516X series products (see datasheet DSMTS-0025).
- For applications where more stress tolerance and less corrosion resistance or wear resistance is required,

choose a tungsten carbide – 17 % cobalt material (see datasheet DSMTS-0030) or a chromium carbide – nickel chromium material (see datasheets DSMTS-0022, DSMTS-0027, DSMTS-0031, DSMTS-0042 and DSMTS-0058).

- For applications where service temperatures are greater than 500 °C (930 °F), but less than 700 °C (1290 °F), choose a material that contains both chromium carbide and tungsten carbide, such as Woka 75xx or Woka 37xx series products (see datasheets DSMTS-0056, DSMTS-0059, respectively).
- For better corrosion resistance in alkaline (NaOH), sulfuric acid (H₂SO₄) or saline (NaCl) solutions the following products are recommended:
 - Chromium carbide materials such as Woka 71xx, Woka 72xx or Woka 73xx series products (see datasheets DSMTS-0027, DSMTS-0031 and DSMTS-0058, respectively).
 - Materials that contain both chromium carbide and tungsten carbide, such as Woka 75xx or Woka 37xx series products (see datasheets DSMTS-0056, DSMTS-0059, respectively).
- When service temperatures exceed 700 °C (1290 °F), choose a chromium carbide material with a nickel-chromium matrix such as Woka 71xx, Woka 72xx or Woka 73xx series products (see datasheets DSMTS-0027, DSMTS-0031 and DSMTS-0058, respectively).

2.5 Recommended Spray Process and Spray Guns

Product	HVOF	
	DiamondJet	WokaJet / WokaStar / JP5000
Amdry 5843	●	●
WOKA 3903	●	●

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data
Recommended Spray Process	HVOF
Corrosion Resistance	Good in NaCl (1M), fair in HCl (1M), H ₂ SO ₄ (0.5M) and NaOH (1M)
Porosity ^a	< 0.5 %
Finishing	Diamond grind
Maximum Service Temperature	500 °C 930 °F

^a Data is for Amdry 5843 applied using liquid-fuel or gas-fuel HVOF. Value is dependent on spray gun chosen, spray gun hardware and spray parameters used.

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 series
WokaJet series
WokaStar series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Amdry 5843	1001069	10 lb (approx. 4.5 kg)	Stock	Global
WOKA 3903	1066536	5 kg (approx. 11 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 the SDS (Safety Data Sheet) in the version 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 Index No.
Amdry 5843	50-2011
WOKA 3903	50-1264

Information is subject to change without prior notice.