

# Material Product Data Sheet

## Tungsten Carbide – Chromium Carbide – Nickel

**Powder Products:**  
**WOKA 3702, WOKA 3702-1, WOKA 3703**

### 1 Introduction

WOKA™ 3700 series materials are agglomerated and sintered powders for thermal spray, containing 73% tungsten carbide and 20% chromium carbide as hard phase materials in a nickel matrix that functions as a binder for the carbide particles. The particle shape is mainly spheroidal.

WOKA 3702-1 has an adjusted, tighter chemical composition and a lower apparent density than the standard WOKA 3700 series materials. This results in higher deposition efficiencies and denser coatings for improved corrosion resistance while maintaining the good oxidation and wear properties of coatings produced using the WOKA 3700 series materials.

These materials are applied using the HVOF or plasma spray process whenever resistance to wear and corrosion in hydrous solutions is required; e.g., for oil and gas applications and in the paper industry. Coatings of these materials are thermally stable up to 700 °C (1290 °F). The finer grades produce very tough and dense coatings that are often used in the “as sprayed” condition without further finishing.

HVOF coatings of these materials are dense and show good bonding strength.

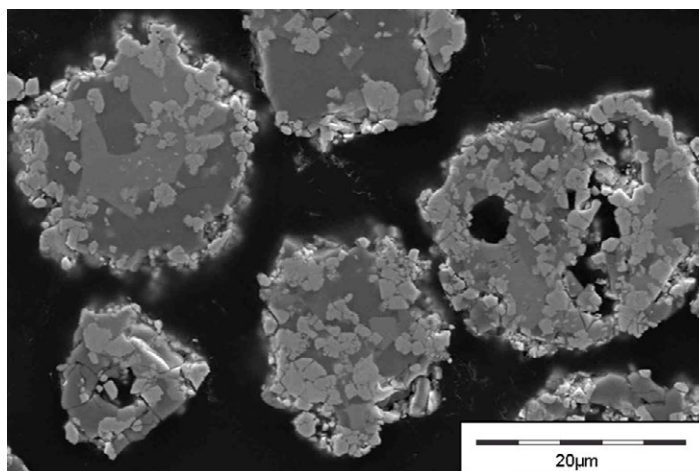
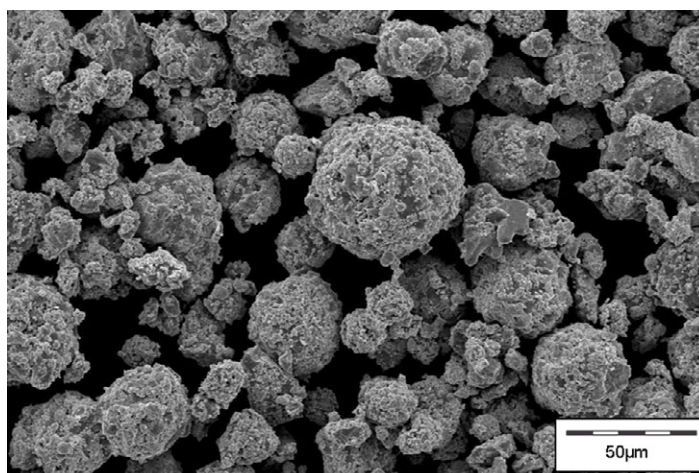
#### 1.1 Typical Uses and Applications

Recommended for applications requiring dense, smooth coatings with excellent oxidation and corrosion resistance at service temperatures up to 700 °C (1290 °F), such as:

- Pins for Oil and Gas
- Mud pump rotors
- Mud rotor rotors
- Paper rollers
- Pump rotors, seals and bearings
- Slush pump piston rods
- Deflector rolls
- Dump valves
- Forging tools
- Oil field equipment
- Compressor shafts

#### Quick Facts

Classification	Carbide, tungsten-based
Chemistry	WC 20Cr <sub>3</sub> C <sub>2</sub> 7Ni
Manufacture	Agglomerated and sintered
Morphology	Spheroidal
Apparent Density	3.6 – 4.9 g/cm <sup>3</sup>
Flowability	Free-flowing
Service Temperature	< 700 °C (1290 °F)
Purpose	Corrosive / oxidative wear resistance
Process	HVOF or HVOF



SEM Photomicrographs showing the morphology (top) and the microstructure (bottom) of WOKA 3703 powder.

## 2 Material Information

### 2.1 Chemical Composition (all products)

Product	Weight Percent (nominal)					
	Formula	W	Cr	Ni	C <sub>TOTAL</sub>	Fe
WOKA 3702	WC 20Cr <sub>3</sub> C <sub>2</sub> 7Ni	Balance	19.0 – 24.0	5.5 – 8.5	5.7 – 6.5	< 0.5
WOKA 3702-1	WC 20Cr <sub>3</sub> C <sub>2</sub> 7Ni	Balance	17.5 – 19.5	6.0 – 8.0	6.5 – 8.0	< 0.5
WOKA 3703	WC 20Cr <sub>3</sub> C <sub>2</sub> 7Ni	Balance	19.0 – 24.0	5.5 – 8.5	5.7 – 6.5	< 0.5

### 2.2 Particle Size Distribution

Product	Nominal Range µm	Primary Carbide Size	Apparent Density (g/cm <sup>3</sup> )
WOKA 3702	-45 +15	Medium	4.3 – 4.9
WOKA 3702-1	-45 +15	Medium	3.7 – 4.3
WOKA 3703	-45 +11	Medium	4.2 – 4.8

Size analysis below 20 µm using laser diffraction (Microtrac), Size analysis 20 µm and above using sieve. Other particle size distributions are available on request.

### 2.3 Key Selection Criteria

Main selection criteria for choosing a WOKA 3700 series material:

- Particle size distributions are optimized for a variety of HVOF guns on the market today. See Section 2.5 for recommendations.
- WOKA 3702-1 is an optimized material designed for high deposition efficiency and coatings with lower porosity. It is the material of choice to meet coating economic targets or when very dense coatings with improved corrosion resistance are required.
- For applications requiring good abrasion resistance or good toughness, choose WOKA 3702-1.
- WOKA 3702 or WOKA 3703 are the best choices for applications requiring good resistance to cavitation or corrosion.
- Desired as-sprayed surface roughness. For the smoothest possible surface, choose a product with the lowest particle size distribution appropriate for the spray process and spray gun to be used. In addition, finer particle size fractions lead to finer as-sprayed surfaces.

### 2.4 Related Products

- For applications where a higher hardness is required choose a tungsten carbide material with a cobalt-chromium matrix such as WOKA 365x series products or WOKA 360x series products.
- If better corrosion resistance in HCl solutions is required, use a tungsten carbide material with a cobalt-chromium matrix such as WOKA 365x series products, or WOKA 360x series products.
- If higher service temperature is required or better corrosion resistance in NaOH solutions, choose a chromium carbide with a nickel-chromium matrix such as WOKA 71xx, WOKA 72xx or WOKA 73xx series products.



## 4 Commercial Information

### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
WOKA 3702	1041117	5 kg (approx. 11 lb)	Stock	Global
WOKA 3702-1	1081343	5 kg (approx. 11 lb)	Stock	Global
WOKA 3703	1041150	5 kg (approx. 11 lb)	Stock	Europe

Note: For products available in both kilogram and pound weights, the kilogram package will be supplied to unspecified regions (Africa, Asia/Pacific, Japan and Middle East) unless the pound package is specifically requested by the customer.

### 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

Please choose 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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).

Product	SDS No.
WOKA 3702	50-890
WOKA 3702-1	50-2555
WOKA 3703	50-890