

# Material Product Data Sheet

## Tungsten Carbide – 10 % Nickel – 5 % Chromium Powder

### Thermal Spray Powder Products: **New!** WOKA 3552

#### 1 Introduction

WOKA™ 3552 is a spheroidal, agglomerated and sintered powder for thermal spray that has a uniform distribution of 85% tungsten carbide with medium carbide size as the hard phase constituent and 15% nickel-chromium alloy as a binder metal.

Coatings made from tungsten carbide materials protect against fretting, abrasion and hammer (impact) wear and sliding wear. WOKA 3552 has been designed to produce coatings that are wear resistant in a seawater environment. The use above 500 °C (930 °F) is not recommended. As WOKA 3552 is cobalt-free, it can be used in radioactive environments.

WOKA 3552 coatings have a higher hardness than tungsten carbide – nickel coatings as a consequence of the hardening effect of chromium in the binder alloy, but toughness is reduced. The hardness of a WOKA 3552 coating is slightly lower than that of a tungsten carbide-cobalt-chromium coating.

HVOF coatings of WOKA 3552 are dense, show good bond strength and are more homogeneous than coatings applied using atmospheric plasma spray or combustion powder flame spray.

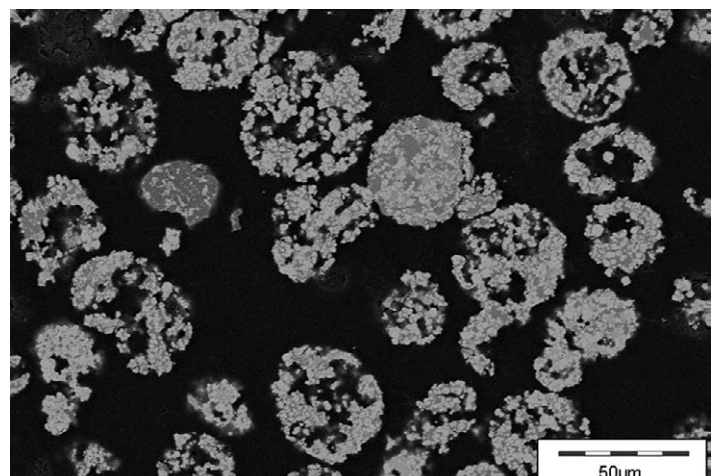
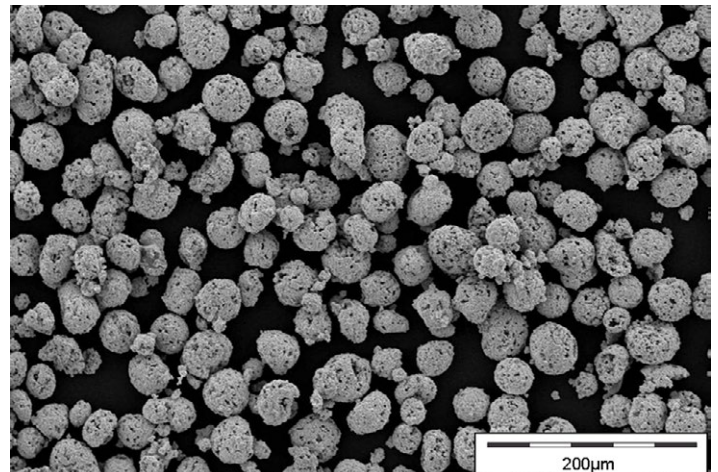
#### 1.1 Typical Uses and Applications

Typical applications for WOKA 3552 coatings include:

- Downhole mandrels for oil drilling
- Ball valves
- Couplings in offshore applications
- Components used in submerged seawater environments
- Steel mill quenching rollers
- Sluice gate hydraulic rods
- Hydraulic rods for transport containers

#### Quick Facts

Classification	Carbide, tungsten-based
Chemistry	WC 10Ni 5Cr
Manufacture	Agglomerated and sintered
Morphology	Spheroidal
Carbide Size	Medium
Apparent Density	3.7 – 4.3 g/cm <sup>3</sup>
Service Temperature	< 500 °C (930 °F)
Purpose	Corrosive wear resistance
Process	HVOF



SEM Photomicrographs showing the morphology (top) and the microstructure (bottom) of WOKA 3552.

## 2 Material Information

### 2.1 Chemical Composition (all products)

Product	Weight Percent (nominal)				
	W	C	Ni	Cr	Fe
WOKA 3552	Balance	4.8 – 5.6	8.5 – 11.5	4.4 – 5.6	< 0.3

### 2.2 Particle Size Distribution

Product	Nominal Range µm	D95 µm	D5 µm	Primary Carbide Size	Apparent Density g/cm <sup>3</sup>
WOKA 3552	-45 +15	45	15	medium	3.7 – 4.3

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

- Choose WOKA 3552 for applications where wear resistance is needed, especially in seawater or saline environments.
- Choose WOKA 3552 for applications where the wear resistance of a tungsten carbide coating is desirable, but the presence of cobalt cannot be tolerated.
- For applications where higher hardness or higher wear resistance is required choose:
  - A tungsten carbide material with a cobalt-chromium matrix such as WOKA 365x series products or WOKA 360x series products.
  - A material that contains both chromium carbide and tungsten carbide, such as WOKA 75xx series.
  - For applications where higher toughness is required choose tungsten carbide materials with a nickel matrix without chromium such as WOKA 33xx or WOKA 35xx series products.

### 2.4 Related Products

- For use at service temperatures greater than 500 °C (930 °F) choose:
  - A chromium carbide, which can withstand service temperatures up to 870 °C (1600 °F), such as WOKA 71xx, WOKA 72xx or WOKA 73xx series products.
  - A material that contains both chromium carbide and tungsten carbide, such as WOKA 75xx series, which can withstand service temperatures up to 700 °C

### 2.5 Recommended Spray Guns

Product	Diamond Jet	WOKAJet / WOKAStar / JP5000	K2	Jet Kote	Top Gun / HV2000
WOKA 3552	●	●	●	●	–

### 3 Coating Information

#### 3.1 Key Thermal Spray Coating Information

Characteristic	Typical Data <sup>a</sup>		
Recommended Process	HVOF (gas-fuel or liquid-fuel)		
Microhardness	HV0.3	1000 – 1400	
Macrohardness	HR15N	> 89	
Porosity	< 1 %		
Wear Rate	ASTM G65 B	< 12 mm <sup>3</sup>	< 0.00073 in <sup>3</sup>
Corrosion Resistance	Better than WC-Co-Cr, WC-Co and WC-Ni coatings in saltwater environments		
Maximum Service Temperature	500 °C		930 °F
Deposition Efficiency	35 – 50 %		

<sup>a</sup> Depending on the HVOF spray gun used, parameter used and coating thickness applied.

#### 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

WokaJet

WokaStar

### 4 Commercial Information

#### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
WOKA 3552	1069962	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 SDS 50-1456 (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).

Information is subject to change without prior notice.