

# Material Product Data Sheet

## Cemented Tungsten Carbide Cobalt Hard Metal Grit for Hard Face Applications

### Powder Products:

**WOKA 50155, WOKA 50168, WOKA 50174,  
WOKA 50178, WOKA 50966, WOKA 50972,  
WOKA 50973, WOKA 50974, WOKA 50975,  
WOKA 50976**

### 1 Introduction

WOKA™ HM Grit materials are cemented tungsten carbide particles (SCTC) having a tightly controlled irregular, blocky shape. Particle size distributions are also strictly regulated. WOKA HM Grit materials are wet easily during surfacing and deposits containing these materials are tough, resist abrasion and tolerant of bending stresses. WOKA HM Grit materials are available in a wide range of sizes, including very coarse powders for cutting applications. Finer sizes are appropriate for applications where erosion is a concern, and can be blended with coarser sizes to enhance the erosion characteristics of the deposit.

These products can be blended as a hard-phase filler material in nickel or iron hard facing rods and wires. Blend products with finer particle size distributions with cobalt-, iron- or nickel-based self-fluxing alloy powders using a hard phase to matrix ratio of 30 to 60 % for PTA or laser cladding applications.

WOKA HM Grits are resistant to dissolution and phase transformation during surfacing, particularly when using PTA or GMAW (MIG) processes. There is no embrittlement of the matrix alloy and deposits are crack-free.

Particle sizes of 212 µm and below have a hardness of 2000 to 2300 HV0.1. Coarser particle sizes have a hardness of 1400 to 1800 HV0.1. SCTC powders are comparable to CTCP powders with respect to ductility and hardness.

#### 1.1 Typical Uses and Applications:

- Construction equipment wear plates
- Tunnelling machinery
- Agricultural harvester blades and wear plates
- Mining equipment crushers, classification screens and wear plates
- Heavy equipment mixer blades

### Quick Facts

Classification	Carbide, tungsten-based (SCTC)
Chemistry	WC 6Co
Manufacture	Sintered and crushed
Morphology	Blocky and Irregular
Apparent Density	6.5 – 8.0 g/cm <sup>3</sup>
Bulk Density	14 – 15 g/cm <sup>3</sup>
Hardness	1400 – 2300 HV0.1
Service Temperature	< 600 °C (1100 °F)
Purpose	Hard phase blend component for wear resistance, impact resistance and cutting
Process	Oxy-acetylene welding, spray and fuse powder welding, PTA, laser cladding



SEM photomicrographs of WOKA HM grit. Top: exterior spheroidal morphology. Bottom: fully dense interior structure.

## 2 Material Information

### 2.1 Chemical Composition

Product	Chemical Composition (nominal wt.%)								
	W	Co	C	Fe	Nb	Ni	Ta	Ti	Total All Other
All Products	Balance	5.0 – 10.5	5.0 – 6.5	0.5 (max)	0.5 (max)	0.5 (max)	1.0 (max)	0.5 (max)	1.0 (max)

### 2.2 Particle Size Distribution, Manufacturing Method, Density and Former Product Designation

Product	Nominal Particle Size Distribution	Manufacturing Method	Nominal Apparent Density Range (g/cm <sup>3</sup> )
WOKA 50155	-90 +45 µm	Sintered and Crushed	6.5 – 8.0
WOKA 50168	-90 +53 µm		
WOKA 50174	-70 +100 mesh (-212 +150 µm)		
WOKA 50178	-700 +300 µm		
WOKA 50966	-1.1 +0.8 mm		
WOKA 50972	-8.0 +6.35 mm		
WOKA 50973	-9.5 +8.0 mm		
WOKA 50974	-3.2 +1.6 mm		
WOKA 50975	-4.8 +3.2 mm		
WOKA 50976	-6.4 +4.8 mm		

- Analysis for particle sizes 45 µm and below determined by laser diffraction (Microtrac); determination above 45 µm by sieve analysis in accordance with ASTM B214, including the use of this methodology for particle sizes above 850 µm
- Other particle size distributions are available on request

### 2.3 Recommended Hardfacing Process

Product	Laser Cladding	PTA	Spray and Fuse Powder Welding	Oxy-Acetylene
WOKA 50155	●	●	●	
WOKA 50168	●	●	●	
WOKA 50174	◐	◐		
WOKA 50178				●
WOKA 50966				●
WOKA 50972				●
WOKA 50973				●
WOKA 50974				●
WOKA 50975				●
WOKA 50976				●

● = Recommended process; ◐ = Acceptable process. See Section 2.4 for further information.

## 2.4 Key Selection Criteria

- All materials are sintered and crushed.
- Choose the material most appropriate for the surfacing process to be used and the surface characteristics desired.
- For surfaces where a cutting effect or an abrasive surface is desired, choose from among the products having the coarsest size distributions.
- For erosion resistance, choose WOKA 50155, WOKA 50168 or WOKA 50174. These materials can also be combined with coarser products to enhance the erosion resistance of the deposit.
- Products with a finer particle size distribution are for use with laser cladding, PTA or spray and fuse surfacing processes.
- Products with a coarser particle size distribution are appropriate for oxy-acetylene welding. These products can also be used for 'drop-in' (gravity feed) directly into the melt pool.
- WOKA 50155 or WOKA 50168 are recommended for spray and fuse powder welding in combination with other types of carbide powders, or as a blend component with a self-fluxing for laser cladding and PTA applications to produce dense and homogeneous overlay structures.

## 2.5 Related Products

- Oerlikon Metco offers a variety of other tungsten carbide products appropriate for use as blend materials. These include cemented tungsten carbide pellets (CTCP), fused tungsten carbide (CTC), spheroidized fused tungsten carbide (CTC-S), and monocrystalline tungsten carbide (MTC). Please review their respective datasheets for further information and their appropriate use for various surfacing processes.
- Oerlikon Metco also offers pure chromium carbide products that can be used as a blend materials for higher temperature applications, or when additional corrosion resistance is needed.
- In addition to blend materials, Oerlikon Metco offers a wide range of carbide-containing hard facing products for use with various processes. Please see the appropriate datasheet or contact your sales representative for more information. These products include:
  - Spray and fuse products applied using thermal spray processes that contain tungsten carbide with a nickel-based, self-fluxing alloy matrix, such as Metco 36C, Metco 31C-NS, Metco 32C, Metco 34F and WOKA 7703, among others.
  - Ready-to-use blends of carbide hard phase and self-fluxing matrix materials for PTA and laser cladding.
  - A variety of carbide-containing tubular rods for oxy-acetylene welding, as well as carbide-containing electrodes, wires and flexible rope for arc welding.

## 3 Coating Information

### 3.1 Key Overlay Characteristics

Characteristic				Data
Microhardness <sup>a</sup>	SCTC	HV0.1	Fine particle sizes Coarse particle sizes	2000 to 2300 1400 to 1800
Hardphase / Matrix Blend Ratio				30 to 60 %

<sup>a</sup> Fine particle sizes are 212 µm and below

- Overlays containing SCTC will have lower hardness compared to other tungsten carbide types, but offer strong abrasion resistance in combination with very good impact resistance.
- As a result of low dissolution during processing, deposits containing SCTC HM Grits produce crack-free welds without embrittlement of the matrix alloy.
- SCTC HM Grit materials wet easily to the substrate and / or the matrix.
- SCTC HM Grits may be blended with spheroidal carbide types to prevent settling of the carbides during processing.
- Coarser particle size distributions offer good cutting effects in combination with good ductility and abrasion resistance.

## 4 Commercial Information

### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
WOKA 50155	1086362	10 lb (approx. 4.5 kg)	Special Order	Global
WOKA 50168	1063249	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50174	1065248	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50178	1079419	5 kg (approx. 11 lb)	Stock	Global
WOKA 50966	1069302	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50972	1067898	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50973	1067896	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50974	1067893	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50975	1067894	5 kg (approx. 11 lb)	Special Order	Global
WOKA 50976	1067895	5 kg (approx. 11 lb)	Special Order	Global

### 4.2 Handling Recommendations

- Store in the original, closed container in a dry location.
- Opened containers should be stored in a drying oven to prevent moisture pickup
- Tumble contents prior to use to avoid separation.

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

Product	SDS No.
WOKA 50155	50-1445
WOKA 50168	50-1227
WOKA 50174	50-1227
WOKA 50178	50-1227
WOKA 50966	50-1227
WOKA 50972	50-1227
WOKA 50973	50-1227
WOKA 50974	50-1227
WOKA 50975	50-1227
WOKA 50976	50-1227