

# Material Product Data Sheet

## Tungsten Carbide Filled Tubular Steel Welding Rod

### Welding Products:

#### WokaDur A, WokaDur A-Plus, WokaDur AM

### 1 Introduction

WokaDur™ A is steel- or nickel-plated tubular steel welding rod filled with first-melt quality cast tungsten carbide (CTC). WokaDur A-Plus is similar to WokaDur A, except it is filled with first-melt quality spherical cast tungsten carbide (CTC-S), which has a higher hardness. WokaDur A and WokaDur A-Plus can be supplied nickel-plated, if so desired by the customer.

WokaDur AM is a nickel-plated steel tubular rod filled with monocrystalline tungsten carbide (MTC).

These products have been designed for hardfacing of low alloyed steel by oxy-acetylene welding.

#### 1.1 Typical Uses and Applications

WokaDur A, WokaDur A-Plus and WokaDur AM produce hard overlay deposits on mild or low-alloyed steels with a carbon content up to 0.5%. The main applications are tooling for mining, oil drilling, deep drilling, clay processing and brick manufacturing. The chemical composition of WokaDur A and WokaDur AM allows their use in the food industries for applications with direct contact to comestibles. Typical applications where these products are used:

- Road and highway construction equipment
- Mining equipment
- Oilfield equipment
- Deep drilling equipment
- Agitators in chemical and food industries

### Quick Facts

Classification	Steel rod, tungsten carbide filled
Chemistry	WFeC
Deposit Hardness	50 – 65 HRC
Manufacture	Filled tubular rod
Carbide Hardness	1700 – 3100 HV0.1
Weld Deposit Density	12.4 g/cm <sup>3</sup>
Service Temperature	≤ 500 °C (930 °F)
Purpose	Wear resistance
Process	Oxy-acetylene welding



WokaDur A 4 mm tungsten carbide-filled welding rod.

## 2 Material Information

### 2.1 Chemical Composition and Hardness

Product	Nominal Chemical Composition (wt.%)				Carbide Hardness HV0.1	Deposit Hardness HRC	Hard Phase wt. %
	C <sub>TOTAL</sub>	Fe	W	Mn			
WokaDur A	2.4	40	balance	---	2000 – 2300	55 – 60	58 – 62
WokaDur A-Plus	2.4	40	balance	---	2700 – 3100	60 – 65	58 – 62
WokaDur AM	4.6	30	balance	1.2	1700 – 2000	50 – 55	68 – 72

### 2.2 Primary Carbide Grain Size and Type, Available Lengths and Diameters

Product	Primary Carbide Grain Size mm	Primary Carbide Type	Available Lengths	Available Diameters
WokaDur A	0.2 – 3.0	Cast (CTC) (W <sub>2</sub> C-WC)	350 mm (13.75 in) 500 mm (19.5 in) 700 mm (27.5 in)	3.2 mm (0.13 in) 3.5 mm (0.14 in) 4.0 mm (0.16 in) 5.0 mm (0.20 in) 6.0 mm (0.24 in)
WokaDur A-Plus	0.2 – 0.7	Spherical Cast (CTC-S) (W <sub>2</sub> C-WC)	700 mm (27.5 in)	3.5 mm (0.14 in) 4.0 mm (0.16 in) 5.0 mm (0.20 in) 6.0 mm (0.24 in)
WokaDur AM	0.075 – 0.18	Monocrystalline (MTC) (WC)	700 mm (27.5 in)	3.2 mm (0.13 in) 4.0 mm (0.16 in) 4.7 mm (0.18 in)

Other primary carbide grain sizes, lengths and diameters are available on request and can be tailored for on-site conditions and special applications.

### 2.3 Key Selection Criteria

The main selection criteria for choice of product are:

- WokaDur A is filled with cast tungsten carbide [W<sub>2</sub>C-WC] having a carbide hardness of 2000 to 2300 HV0.1. The carbide content is approximately 60 % depending on the grain size. The rods can be nickel-plated if desired by the customer.
- WokaDur A-Plus filled with spherical cast tungsten carbide [W<sub>2</sub>C-WC] having a carbide hardness of 2700 to 3100 HV0.1. The morphology and hardness of the spherical cast tungsten carbide produces deposits with higher wear resistance than can be achieved using standard crushed cast carbide. The rods can be nickel-plated if desired by the customer. WokaDur A-Plus is recommended for applications that require additional hardness and wear resistance.
- WokaDur AM is filled with monocrystalline tungsten carbide [WC]. Monocrystalline tungsten carbide is a highly wear-resistant carbide with less dissolution during

welding. As a result of the high hard phase content, the carbide coverage in overlay deposits of WokaDur AM are very dense and evenly distributed. WokaDur AM rods are supplied nickel-plated.

- WokaDur A, WokaDur A-Plus and WokaDur AM meet EN 14700: T Fe20.

### 2.4 Related Products

Oerlikon Metco offers a wide variety of carbide-containing hardfacing welding products in a number of forms designed for convenient application. Products are available for oxy-acetylene welding, MIG / open arc welding and powders for PTA welding. These products are available with different carbide types and hardness, matrix materials and matrix materials so customers can choose a product that is suitable for both their budget and surface application. Please contact your Oerlikon Metco Account Representative for additional information.

### 3 Coating Information

#### 3.1 Key Welding Recommendations

- The surface to be welded should be free from grease, oil, fats, lipids, rust and other foreign matter
- Use welding positions PA or PB (DIN EN ISO 6947)
- Multilayer welding is possible (1 to 3 passes)
- It is essential to slowly and uniformly preheat the substrate to a temperature of approximately 400 to 600 °C (750 to 1110 °F), depending on the type of base material
- Use a slightly excessive acetylene feather
- Apply the material uniformly using a dabbing technique within the torch flame to produce an even droplet pattern
- Avoid excessive puddling during processing
- Sweat the deposit to the base metal with minimum penetration
- Deposits are not machinable or forgeable, but can be ground to dimension or finished with diamond tools

#### 3.2 Recommended Welding Parameters

Parameter	Recommended Setting	
Carrier Gas	Oxygen	
Carrier Gas Pressure	5 – 7 bar	70 – 100 psi.
Fuel Gas	Acetylene	
Fuel Gas Pressure	0.7 – 1.0 bar	10 – 14
Nozzle Size	6 – 9 mm	

Above parameters are for welding on a mild steel substrate with a carbon content of 0.1 % and a thickness of 15 mm (0.59 in).

#### 3.3 Welding Parameter Development

For specific application needs, Oerlikon Metco can provide parameter advice and parameter development services may be available.

## 4 Commercial Information

### 4.1 Ordering Information and Availability

Product	Order No.	Package Size	Rod Diameter	Rod Length	Carbide Grain Size (mm)	Color Code
WokaDur A	1068689	5 kg (11 lb)	3.2 mm (0.13 in)	700 mm (27.5 in)	0.5	–
WokaDur A	1065178	5 kg (11 lb)	3.5 mm (0.14 in)	350 mm (13.75 in)	0.5	White
WokaDur A	1065179	5 kg (11 lb)	3.5 mm (0.14 in)	500 mm (19.5 in)	0.2 – 0.7	–
WokaDur A	1067544	5 kg (11 lb)	3.5 mm (0.14 in)	700 mm (27.5 in)	0.5	White
WokaDur A	1065464	5 kg (11 lb)	4.0 mm (0.16 in)	350 mm (13.75 in)	0.5	White
WokaDur A	1065180	5 kg (11 lb)	4.0 mm (0.16 in)	500 mm (19.5 in)	0.2 – 0.7	–
WokaDur A	1065465	5 kg (11 lb)	4.0 mm (0.16 in)	700 mm (27.5 in)	0.5	White
WokaDur A	1067538	5 kg (11 lb)	5.0 mm (0.20 in)	350 mm (13.75 in)	0.5	White
WokaDur A	1065181 <sup>a</sup>	5 kg (11 lb)	5.0 mm (0.20 in)	500 mm (19.5 in)	0.2 – 0.7	–
WokaDur A	1065470 <sup>a</sup>	5 kg (11 lb)	5.0 mm (0.20 in)	700 mm (27.5 in)	0.5	Blue
WokaDur A	1065183	5 kg (11 lb)	6.0 mm (0.24 in)	350 mm (13.75 in)	0.5	White
WokaDur A	1067556	10 kg (22 lb)	6.0 mm (0.24 in)	700 mm (27.5 in)	0.5	White
WokaDur A	1065759 <sup>a</sup>	5 kg (11 lb)	6.0 mm (0.24 in)	700 mm (27.5 in)	3.0	Blue
WokaDur A-Plus	1065472	5 kg (11 lb)	3.5 mm (0.14 in)	700 mm (27.5 in)	0.2 – 0.7	–
WokaDur A-Plus	1067570	10 kg (22 lb)	4.0 mm (0.16 in)	700 mm (27.5 in)	0.5	Brown
WokaDur A-Plus	1067572	5 kg (11 lb)	5.0 mm (0.20 in)	700 mm (27.5 in)	0.5	Brown
WokaDur A-Plus	1067574	5 kg (11 lb)	6.0 mm (0.24 in)	700 mm (27.5 in)	0.5	Brown
WokaDur AM	1077015	10 kg (22 lb)	3.2 mm (0.13 in)	700 mm (27.5 in)	0.075 – 0.18	–
WokaDur AM	1065184	10 kg (22 lb)	4.0 mm (0.16 in)	700 mm (27.5 in)	0.075 – 0.18	–
WokaDur AM	1067566	5 kg (11 lb)	4.7 mm (0.18 in)	700 mm (27.5 in)	0.075 – 0.18	–

Please note:

- When ordering WokaDur A or WokaDur A-Plus, please specify if rods should be nickel-plated.
- All materials are globally available on a Special Order basis, except as otherwise noted. Please allow adequate lead time.

<sup>a</sup> These products are stocked.

### 4.2 Handling Recommendations

- Store in the original, closed container in a dry location.
- Open containers should be stored in a drying oven to prevent moisture pickup.

### 4.3 Safety Recommendations

See SDS 50-1079 (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.