

# Material Product Data Sheet

## Nickel-Based Flux Cored Welding Wire Filled with Hard Phases

### Welding Products: WokaDur NiE-Tube, WokaDur NiE-Tube-Plus, WokaDur NiE-TM

#### 1 Introduction

The WokaDur™ NiE-Tube family of weld hard face products consist of a nickel-based flux cored welding wire filled with tungsten-based hard phases. The difference between the products is the carbide hardness and grain size and shape:

- **WokaDur NiE-Tube** is a pure nickel tubular wire filled with cast tungsten carbide (CTC).
- **WokaDur NiE-Tube-Plus** is a pure nickel tubular wire filled with spherical cast tungsten carbide (CTC-S) that has a higher hardness and a coarser grain size compared to WokaDur NiE-Tube.
- **WokaDur NiE-TM** is a pure nickel tubular wire with high melting temperature macrocrystalline tungsten carbide (MTC) of intermediate hardness that has a grain size comparable to WokaDur NiE-Tube.

The chemical composition and the select carbide grain size distribution of the WokaDur NiE-Tube series of products result in hardface deposits that are extremely resistant to abrasive and erosive particles, while remaining very ductile. Deposits are crack-free with very uniform carbide distributions. These products provide outstanding wear resistance, owing to the carbide content of 48 to 66 % (depending on wire diameter). The specialized coating results in excellent welding characteristics. They can be applied on mild and low alloy steels with a maximum carbon content of 0.5 %.

#### 1.1 Typical Uses and Applications:

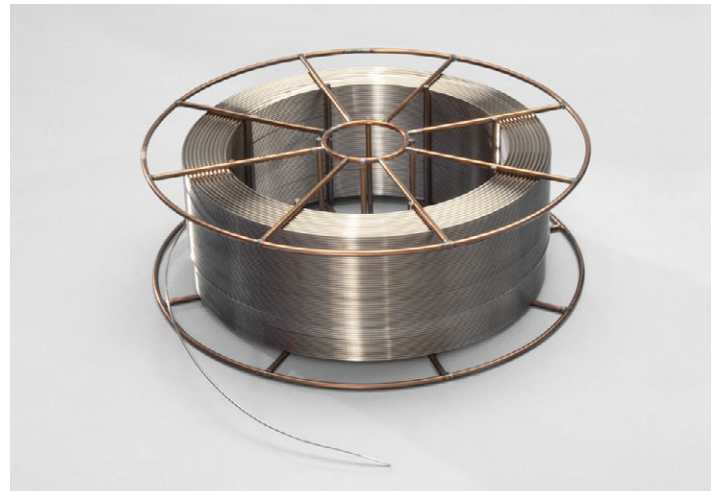
WokaDur NiE-Tube products are designed for application using MIG welding for protection against very harsh abrasive wear in mining, lumbering and wood mills, chemical processing and food processing:

- Mining and dredging buckets
- Plowshares
- Chemical processing
- Mixer plates
- Agricultural components
- Log and tree debarking equipment
- Pipeline elbows
- Oil and gas drill string stabilizers

#### Quick Facts

Classification	Nickel-based cored wire, tungsten carbide filled
Chemistry	50.8W 45Ni 2.4C 1.8B
Manufacture	Flux-cored wire
Carbide Hardness	1600 – 3100 HV0.1
Deposit Hardness*	50 – 65 HRC (1 <sup>st</sup> pass)
Weld Deposit Density	12.2 g/cm <sup>3</sup>
Service Temperature	≤ 500 °C (930 °F)
Purpose	Wear resistance
Process	MIG welding

\* WokaDur NiE-TM: Deposit Hardness = 45 – 50 HRC



WokaDur NiE-Tube tungsten carbide-filled nickel-cored wire.

## 2 Material Information

### 2.1 Chemical Composition

Product	Nominal Chemical Composition (wt.%)				Carbide Type	Carbide Hardness HV0.1
	C <sub>TOTAL</sub>	W	Ni	B		
WokaDur NiE-Tube	2.4	Balance	45	1.8	CTC	2000 – 2300
WokaDur NiE-Tube-Plus	2.4	Balance	45	1.8	CTC-S	2700 – 3100
WokaDur NiE-TM	3.5	Balance	45	1.8	MTC	1600 – 2100

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

Product	Primary Carbide Grain Size (µm)	Available Spool Weights (kg)	Available Wire Diameters (mm)	Filler (wt. %)
WokaDur NiE-Tube	45 – 250	15	1.6	48 – 52
		25	2.4	52 – 56
			2.8	60 – 66
WokaDur NiE-Tube-Plus	300 – 700	15	1.6	48 – 52
WokaDur NiE-TM	45 – 250	15	1.4	46 – 48
		25	1.6	48 – 52
			2.4	52 – 56
			2.8	60 – 66

Other primary carbide grain sizes, lengths and diameters are available on request.

### 2.3 Key Selection Criteria

- WokaDur NiE-Tube is an excellent choice for hardfaced surfaces where maximum wear protection, combined with corrosion resistance, is required.
- WokaDur NiE-Tube-Plus for applications that benefit from a hardface deposit that has a higher hardness than can be produced using the other products as a result of its spherical cast tungsten carbide.
- WokaDur NiE-TM has a higher resistance against carbide dissolution during weld processing. It is often easier to weld than the other products and produces welded deposits with a wear resistance comparable to that of WokaDur NiE-Tube.
- WokaDur NiE-Tube products meet DIN EN 14700: T Ni20.

### 2.4 Related Products

Oerlikon Metco also offers WokaDur NiE dip-coated electrodes. Please see datasheet DSMW-0012. 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, PB or PC
- Multilayer deposits are possible (standard 1 pass)
- Shield gas: DIN EN ISO 14175:2008 -M12 (2.5% CO<sub>2</sub> and 97.5% Argon)
- Use reverse polarity (electrode-positive; DC+), pulse arc mode is preferred
- Preheating of the substrate may be necessary, depending on the parent material
- Use a “push” technique for down-hand positioning during processing. Testing of the welding technique for coverage and uniformity using the same welding parameters and wire on scrap metal is recommended.
- Use a short arc to avoid melting the tungsten carbide particles, thereby minimizing dissolution
- Avoid excessive puddling during processing
- Post-weld processing requires a slow cool down phase under moisture-free conditions
- Deposits are not machinable or forgeable, but can be ground to dimension or finished with diamond tools

## 3.2 Recommended Welding Parameters

Rod Diameter	Voltage	Current Intensity	Shielding Gas Flow Rate	Wire Feed Rate
1.4 mm	17 – 19 V	170 – 200 A	15 – 20 l/min (31.8 – 42.4 ft <sup>3</sup> /h)	7 – 8 m/min (23.0 – 26.2 ft/min)
1.6 mm	17 – 19 V	170 – 200 A	15 – 20 l/min (31.8 – 42.4 ft <sup>3</sup> /h)	7 – 8 m/min (23.0 – 26.2 ft/min)
2.4 mm	18 – 20 V	180 – 220 A	15 – 20 l/min (31.8 – 42.4 ft <sup>3</sup> /h)	4 – 5 m/min (13.1 – 16.4 ft/min)
2.8 mm	20 – 22 V	230 – 280 A	15 – 20 l/min (31.8 – 42.4 ft <sup>3</sup> /h)	4 – 5 m/min (13.1 – 16.4 ft/min)

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 Deposit Hardness

(Dependent on the wt. % of powder content):

WokaDur NiE-Tube: 52 – 58 HRC

WokaDur NiE-Tube-Plus: > 58 HRC

WokaDur NiE-TM: 47 – 55 HRC

## 3.4 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.	Spool Weight	Wire Diameter	Availability	Distribution
WokaDur NiE-Tube	1058943	15 kg (33 lb)	1.6 mm (0.063 in)	Stock	Global
WokaDur NiE-Tube	1064386	15 kg (33 lb)	2.4 mm (0.095 in)	Special Order	Global
WokaDur NiE-Tube	1065449	25 kg (55 lb)	2.8 mm (0.110 in)	Special Order	Global
WokaDur NiE-Tube-Plus	1065040	15 kg (33 lb)	1.6 mm (0.063 in)	Special Order	Global
WokaDur NiE-TM	1065236	15 kg (33 lb)	1.4 mm (0.055 in)	Stock	Global
WokaDur NiE-TM	1063645	15 kg (33 lb)	1.6 mm (0.063 in)	Stock	Global
WokaDur NiE-TM	1063646	15 kg (33 lb)	2.4 mm (0.095 in)	Special Order	Global
WokaDur NiE-TM	1063647	25 kg (55 lb)	2.8 mm (0.110 in)	Special Order	Global

## 4.2 Handling Recommendations

- Powder-filled composite wires may be prone to moisture pickup and must be stored in a dry environment.
  - Avoid temperature fluctuations of greater than 5 °C (9 °F).
  - Maintain storage at a humidity level of ≤ 60 % at 15 to 25 ° (59 to 77 °F) or ≤ 50 % at 25 to 35 °C (77 to 95 °F).
  - Do not store for more than 5 years. Older wire should be redried.
  - If slightly affected by moisture, the wire may be redried at a temperature of 150 °C (300 °F) for 6 hours. Longer drying times of up to 12 hours at temperatures up to 200 °C (390 °F) can be employed if necessary. Redry no more than 6 times.
  - Wires exposed to severe water contamination, exposed to the atmosphere for long periods and/or exhibit oxidation or corrosion cannot be redried and should be scrapped.

## 4.3 Safety Recommendations

See SDS 50-1085 (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.