

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:

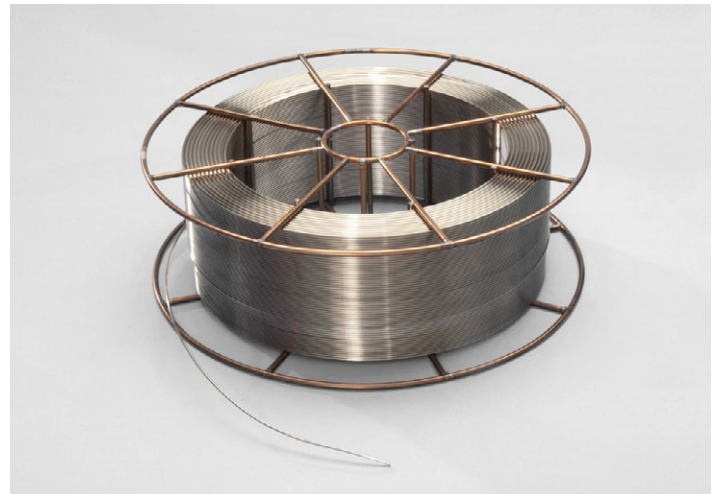
WokaDur NiE-Tube products are designed for application using MIG welding for protection against very harsh abrasive wear in mining, lumbering and wood mills, chemical processing and food processing:

- 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 st pass)
Weld Deposit Density	12.2 g/cm ³
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 _{TOTAL}	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

Metco Joining & Cladding also offers WokaDur NiE dip-coated electrodes. Please see the appropriate datasheet. Metco Joining & Cladding 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 Metco Joining & Cladding 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% CO₂ 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 ³ /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 ³ /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 ³ /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 ³ /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, Metco Joining & Cladding 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	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	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 Metco Joining & Cladding web site at www.metcojoiningcladding.com (Resources – Safety Data Sheets).

Information is subject to change without prior notice.