

Material Product Data Sheet

Dip-Coated, Tungsten Carbide-Filled Pure Nickel Electrodes

Welding Products:

WokaDur NiE, WokaDur NiE-Plus, WokaDur NiE-M

1 Introduction

WokaDur™ NiE is a dip-coated electrode consisting of tubular pure nickel filled with acicular fused tungsten carbide (CTC) and a specially formulated nickel-based alloy.

WokaDur NiE-Plus is a dip-coated electrode consisting of tubular pure nickel filled with spherical cast tungsten carbide (CTC-S) and a specially formulated nickel-based alloy. The shape and hardness of the spherical cast tungsten carbide produces deposits with much higher hardness and wear resistance compared to standard cast and crushed carbide.

WokaDur NiE-M is a dip-coated electrode consisting of tubular pure nickel filled with macrocrystalline tungsten carbide (MTC) and a specially formulated nickel-based alloy. MTC is stable with minimal dissolution during arc welding. Therefore, the matrix is less affected by carbon diffusion, preventing matrix embrittlement for crack-free overlays.

The chemical composition of these products, combined with the select grain size distribution of the carbides, produce hardface deposits that are extremely resistant to corrosive and abrasive stress, yet are quite ductile. The high carbide content of 66 % – 70 % (depending on diameter), gives deposits outstanding wear resistance compared to other products in this category. A proprietary dip coating ensures excellent welding characteristics and crack-free deposits.

1.1 Typical Uses and Applications:

WokaDur NiE and WokaDur NiE-Plus are used on substrates of ferritic or austenitic steel (with careful preheat and cooling). They are excellent choices for hardfacing of tooling, machine parts, highly abrasive applications in the mining, agriculture, chemical processing and food processing. Typical applications where these products are used include:

- Dredger buckets
- Plough shares
- Feeding screws
- Mixer parts
- Doctor blade edges

Quick Facts

Classification	Electrode, tungsten carbide filled
Chemistry	60.4W 35Ni 3.5C 1.1B
Manufacture	Dip-coated tubular rod
Deposit Hardness	50 – 65 HRC
Carbide Hardness	1700 – 3100 HV0.1
Weld Deposit Density	12.4 g/cm ³
Service Temperature	≤ 500 °C (930 °F)
Purpose	Wear resistance
Process	Manual metal arc welding



WokaDur NiE 5 mm tungsten carbide-filled electrode.

2 Material Information

2.1 Chemical Composition

Product	Nominal Chemical Composition (wt.%)				Carbide Hardness HV0.1	Hard Phase wt. %
	C _{TOTAL}	W	Ni	B		
WokaDur NiE	3.5	balance	35	1.1	2000 – 2300 (CTC)	63 – 67
WokaDur NiE-Plus	3.5	balance	35	1.1	2700 – 3100 (CTC-S)	63 – 67
WokaDur NiE-M	3.5	balance	35	1.1	1700 – 2000 (MTC)	63 – 67

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

Product	Primary Carbide Type	Primary Carbide Grain Size mm	Available Product Forms	Available Diameters
WokaDur NiE	Cast	0.3 – 0.7	350 mm (13.75 in)	4.0 mm (0.16 in) 5.0 mm (0.20 in) 6.0 mm (0.24 in)
WokaDur NiE-Plus	Spherical Cast	0.3 – 0.7	350 mm (13.75 in)	4.0 mm (0.16 in) 5.0 mm (0.20 in)
WokaDur NiE-M	Mono (Macrocrystalline)	0.035 – 0.5	350 mm (13.75 in)	5.0 mm (0.20 in) 6.0 mm (0.24 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 NiE is an excellent product to produce hardface deposits for applications where extreme resistance to corrosive and abrasive stress resistance is required, in combination with the need for a ductile surface.
- WokaDur NiE meets DIN EN 14700: E Ni20.
- Choose WokaDur NiE-Plus for applications where the additional wear resistance and hardness provided by the spherical cast tungsten carbide material is required.
- Choose WokaDur NiE-M for better resistance to carbide dissolution.
- WokaDur NiE can be used to repair worn surfaces previously welded with WokaDur NiA.
- WokaDur NiE can be used on nearly all types of steel substrates, including cast steels, if weldable.

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 AC or DC; DC+ (reverse polarity) is preferred.
- Use any welding position except PG (DIN EN ISO 6947).
- Multilayer deposits are possible (1 to 2 passes).
- Weld immediately after opening package (see section 4.2 Handling Recommendations).
- It is essential to slowly and uniformly preheat complex shapes of high carbon and alloy steel substrates to a temperature of approximately 250 to 400 °C (480 to 750 °F).
- When necessary, nearly vertical welding can be accomplished.
- Current intensity is dependent on the core rod diameter of the electrode (see Section 3.2).
- Avoid excessive puddling during processing using a short arc beam.
- The thickness of the deposit can be controlled by the electrode diameter chosen.
- A slow cool down phase under moisture-free conditions is required after welding.
- Deposits are not machinable or forgeable, but can be ground to dimension or finished with diamond tools.

3.2 Recommended Welding Amperage for Various Diameter Electrodes

Rod Diameter	Current Intensity (A)
4.0 mm (0.16 in)	110 – 130
5.0 mm (0.20 in)	140 – 160
6.0 mm (0.24 in)	170 – 190

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 Length	Rod Diameter	Carbide Grain Size (mm)
WokaDur NiE	1065199	5 kg (11 lb)	350 mm (13.75 in)	4.0 mm (0.16 in)	0.3 – 0.7
WokaDur NiE	1065200	5 kg (11 lb)	350 mm (13.75 in)	5.0 mm (0.20 in)	0.3 – 0.7
WokaDur NiE	1065492	5 kg (11 lb)	350 mm (13.75 in)	6.0 mm (0.24 in)	0.3 – 0.7
WokaDur NiE-Plus	1068871	5 kg (11 lb)	350 mm (13.75 in)	4.0 mm (0.16 in)	0.3 – 0.7
WokaDur NiE-Plus	1075128	5 kg (11 lb)	350 mm (13.75 in)	5.0 mm (0.20 in)	0.3 – 0.7
WokaDur NiE-M	1067612	5 kg (11 lb)	350 mm (13.75 in)	5.0 mm (0.20 in)	0.035 – 0.5
WokaDur NiE-M	1063644	5 kg (11 lb)	350 mm (13.75 in)	6.0 mm (0.24 in)	0.035 – 0.5

Please note: All materials are globally available on a Special Order basis. Please allow adequate lead time.

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.
- If the container has been opened and not used immediately, bake in an oven for 2 hours at 250 °C (480 °F) prior to use.

4.3 Safety Recommendations

See SDS 50-1088 (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 (Resources – Safety Data Sheets).