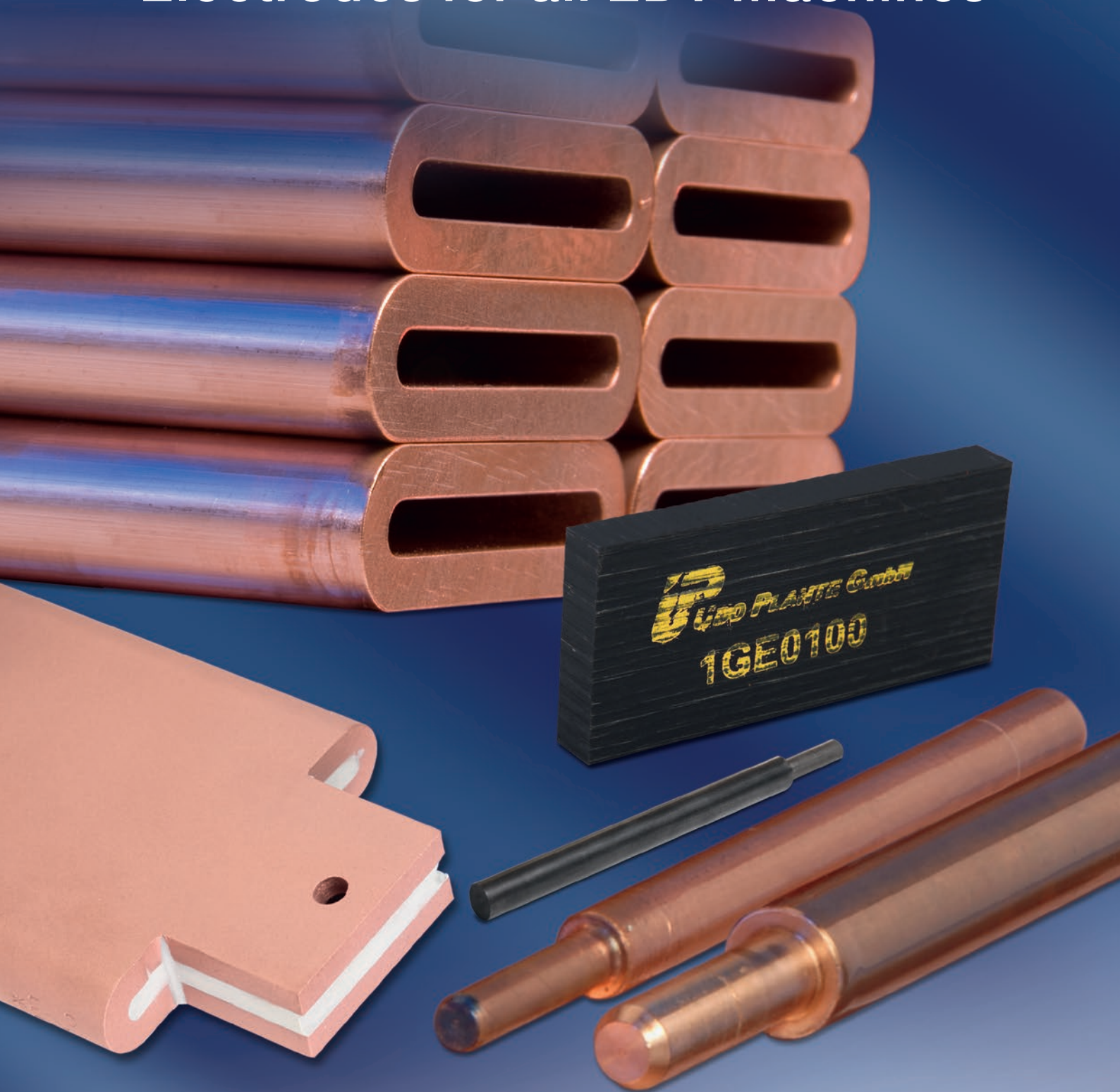


EDT Electrodes

Electrodes for all EDT Machines



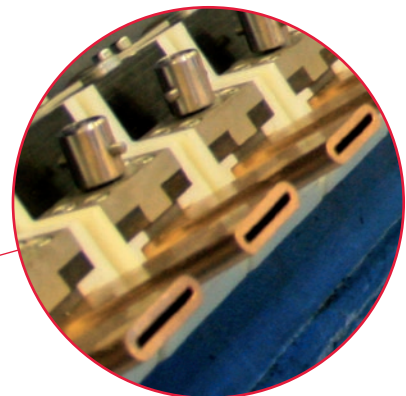
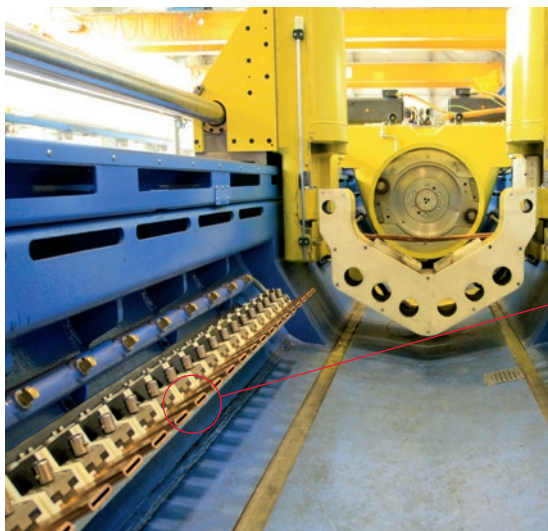
About Us

Udo Plante GmbH is among the leading global manufacturers of electrodes for roll texturing machines.

Your customers have a variety of requirements for the surface properties of their metal sheets. These properties are the most important aspect of the sheets, and they are determined by the texture of your rolls.

Roll texture determines the surface structure and the roughness of the metal sheet. The type of electrode in the EDT machine determines the quality of this texture.

We have been supplying high quality electrodes to renowned operators of EDT machines since 1996. Our product portfolio includes hollow profile copper (CE), bar (PE), and graphite (GE) electrodes in a variety of dimensions and metallurgies.



Publication of the photo with the kind permission of H. Kleinknecht & Co. GmbH

Our Offers

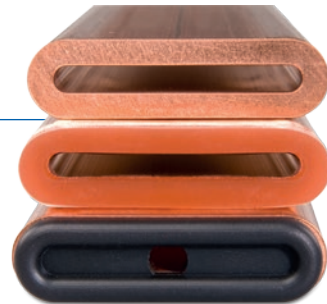


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[CE Electrodes](#)

Hollow profile copper electrodes for Waldrich and Kleinknecht EDT machines

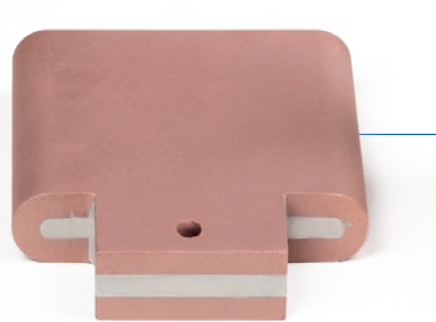
Page 4
[CE Electrodes](#)
with seals



Page 6

[IN Electrodes](#)

Hollow profile copper electrodes for Ingersoll EDT machines



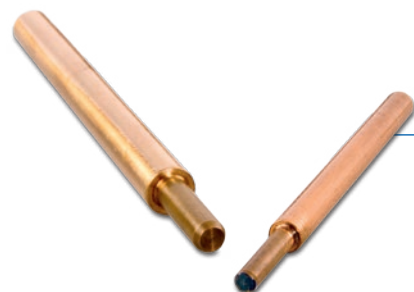
Page 8
[GE Electrodes](#)
Graphite electrodes for all EDT machines



Page 10

[PE Electrodes](#)

Bar electrodes for Sarclad and Herkules EDT machines



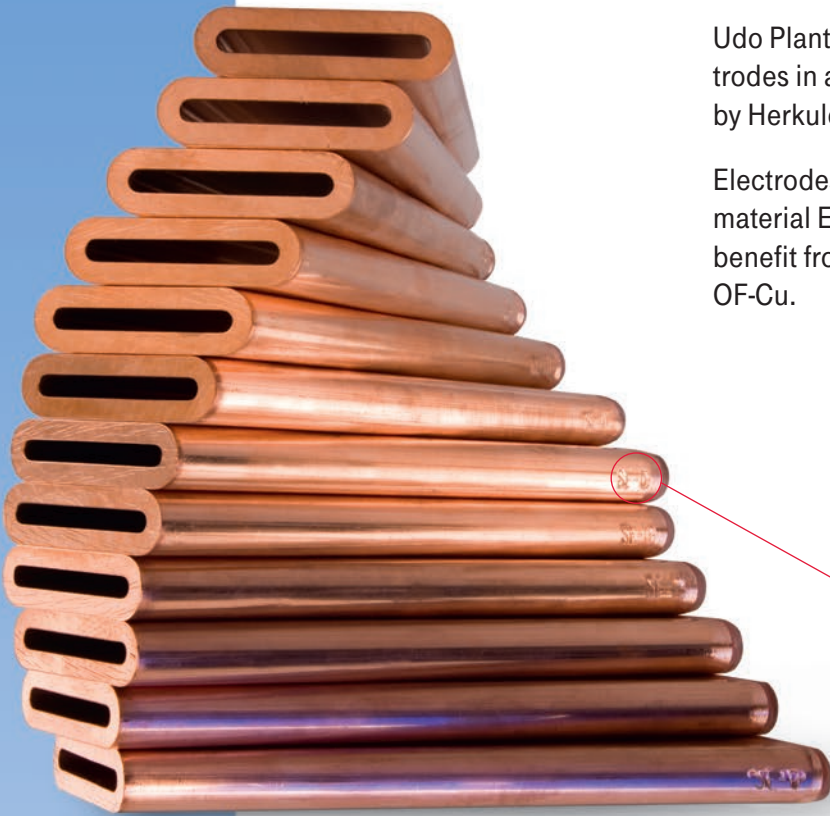
Page 12
[Accessories](#)
for all EDT machines



CE Electrodes

Udo Plante GmbH supplies hollow profile copper electrodes in all required lengths for EDT machines produced by Herkules, Kleinknecht, and Waldrich Siegen.

Electrodes for EDT machines are normally made of the material E-Cu. Highly sensitive texturing procedures can benefit from higher quality materials, such as SE-Cu or OF-Cu.



All CE electrodes are stamped with the UP logo.

Seals

Optionally we offer two different seals for hollow profile copper electrodes.



CE2 bonded polyurethane seal

2	C	E	2	1	0	0	-	-	-
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CE1 plug-in NB reusable rubber seal

3 Performance Levels

Udo Plante GmbH offers three levels of electrode performance to fulfill any roll texturing requirement. The electrode performance is matched to the sensitivity of the EDT process and the quality requirements of the customer.

Standard Performance 1CE

1CE electrodes are made of copper produced by electrolytic refining and contain oxygen, with a high conductivity of $57 \text{ m}/\Omega \text{ mm}^2$ as a minimum.

Advanced Performance 2CE

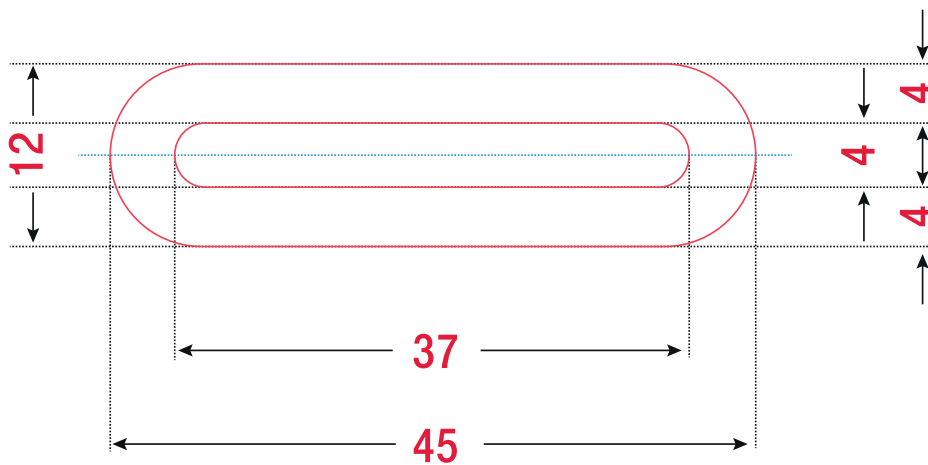
2CE electrodes are made of ultra pure, deoxidized copper with a low residual phosphorus content and a high conductivity of $58 \text{ m}/\Omega \text{ mm}^2$ as a minimum.

High Performance 3CE

3 CE electrodes consist of ultra pure, non-deoxidized, oxygen-free copper containing no elements that can be vaporized under vacuum, and have a high conductivity of up to $59 \text{ m}/\Omega \text{ mm}^2$ as a minimum.

Electrode lengths

CE hollow profile copper electrodes are available in all required lengths.



Our stock material

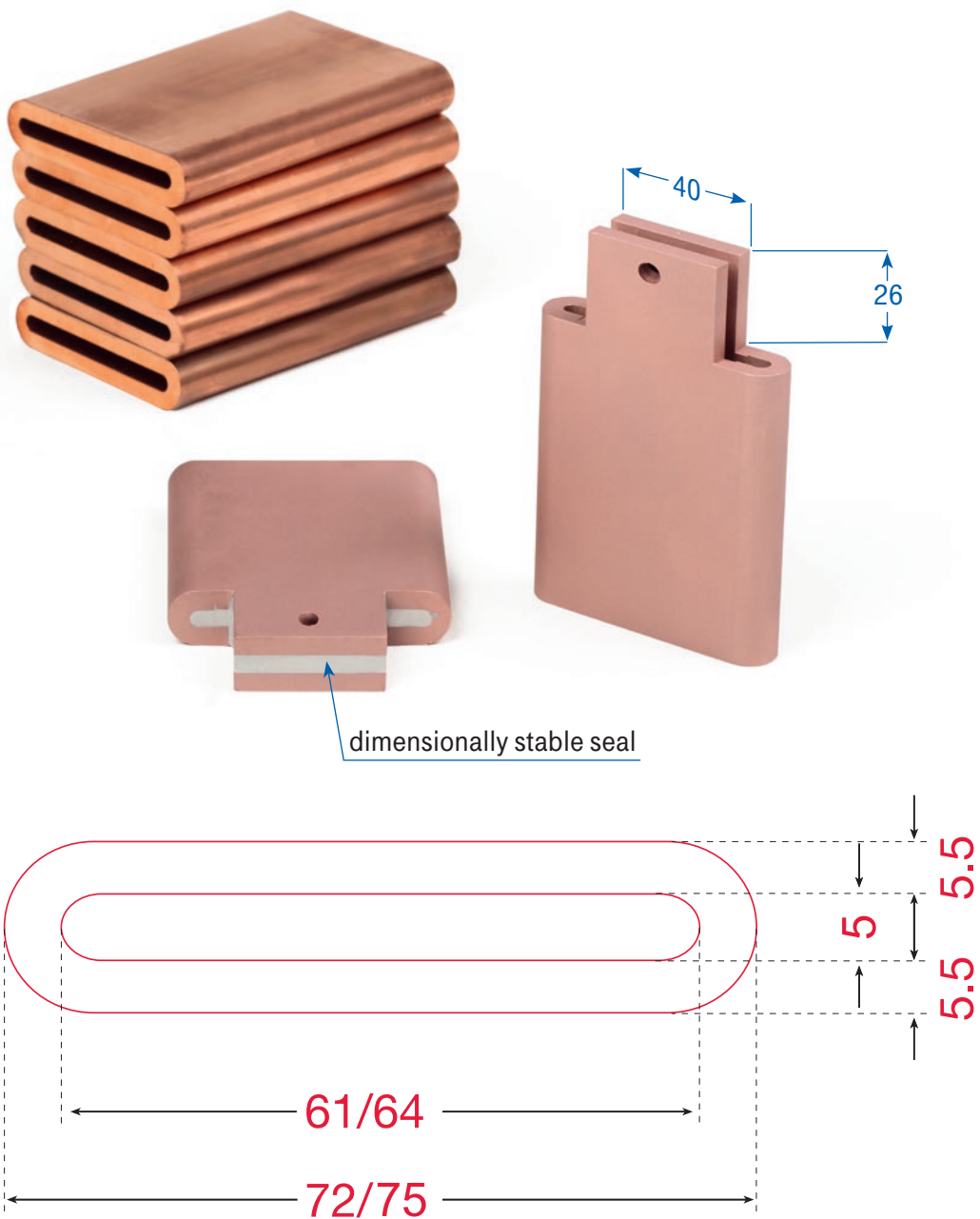
Ordering number	Seal	Material	Width in mm	Length in mm
1CE0100	-	E-Cu	45	100
1CE0110	-	E-Cu	45	110
1CE2110	CE2	E-Cu	45	110
1CE0125	-	E-Cu	45	125
1CE0125-50	-	E-Cu	50	125
1CE0130	-	E-Cu	45	130
1CE0150	-	E-Cu	45	150
2CE0150	-	SE-Cu	45	150
2CE2150	CE2	SE-Cu	45	150

IN Electrodes

IN electrodes are made from blocks of one of several types of ultra pure copper, either E-Cu, SE-Cu, or OF-Cu. These copper blocks are hot extruded to create a precise profile, resulting in the shape of the IN electrode.

This procedure makes it possible to produce a homogeneous structure free from air, oxide or slag inclusions, gas bubbles, or other inhomogeneities. Such impurities could drastically affect the electrical conductivity at different points, which could have adverse effects on the texturing results and lead to “banding”.





Conventional electrodes from other suppliers are made by using a powder-metallurgical procedure. In this procedure, copper powder of a certain grain size is brought into a mold under high temperature and high pressure and sintered under inert gas conditions (**H**ot **I**sostatic **P**ressing- **HIP**).



	IN Electrodes	Powder-metallurgical electrodes
Material	ultra pure copper E-Cu, SE-Cu or OF-Cu	sintered copper powder
Structure	Homogenous Free from air and slag inclusions, gas bubbles and other nonhomogeneities	Nonhomogenous
Specific weight (in kg/dm ³)	8.93	6.5-7.1 A difference in compression will result in different burn-off during the EDT procedure
Weight per electrode (in g)	721	511
Conductivity (in m/Ω mm ²)	min. 57	35

*for same size 1IN0110-75

4 Good Reasons why you should prefer IN electrodes to conventional powder-metallurgically produced electrodes:

-  **Fewer electrode changes** due to a more than 30% longer lifetime
-  **Higher process safety** due to electrodes with a homogeneous structure
-  **Lower losses** due to 62% more electrical conductivity
-  **Higher quality** for the EDT procedure due to a more even electrode burn-off

Conclusion:

Due to their homogenous structure, IN electrodes minimize the risk of “banding” on rolls. Compared to conventional powder-metallurgically produced electrodes, a more even burn-off is always guaranteed.

Our stock material

Ordering number	Seal	Material	Width in mm	Length in mm
1IN0110-75	dimensionally stable seal	E-Cu	75	110
2IN0110-75	dimensionally stable seal	SE-Cu	75	110
1IN0110-72	dimensionally stable seal	E-Cu	72	110
2IN0110-72	dimensionally stable seal	SE-Cu	72	110

As a leading manufacturer of EDT electrodes, we offer isostatically pressed graphite electrodes for use in roll texturing machines.

Thanks to a targeted raw material selection performed according to the most demanding criteria, and due to application-specific comparative tests, we can offer EDT graphite electrodes with consistent quality and a high level of performance.



1GE0100

Pure graphite electrode of Plangraph 1



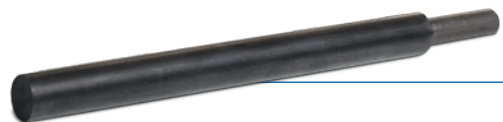
2GE0100-7228

Graphite electrode with a copper content of 28% of Plangraph 2



2GE0100-7228-8

Graphite bar electrode with a copper content of 28% of Plangraph 2 with M6x20 internal thread



2GE0126-7228-95

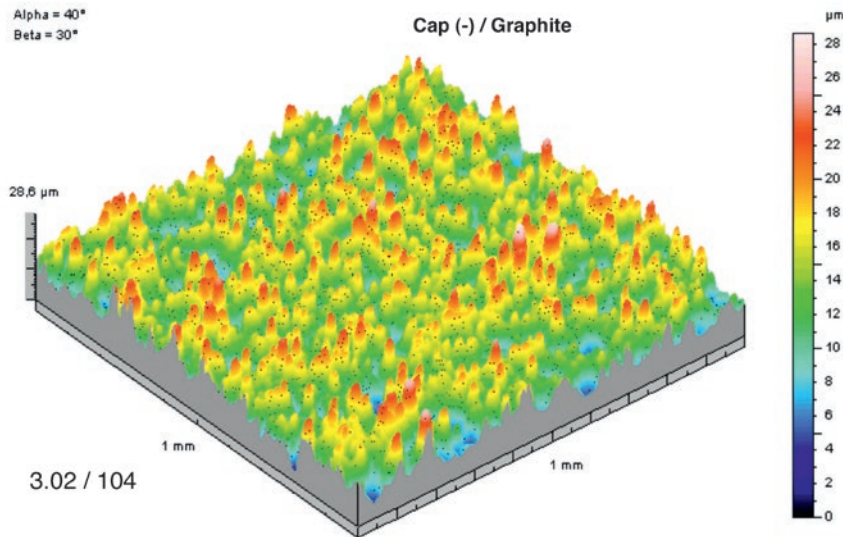
Graphite bar electrode with a copper content of 28% of Plangraph 2 with shaft

Our stock material

Ordering number	Metal content in %	Material	Dimensions in mm	Bore in mm	Length in mm
1GE0100	0	Plangraph 1	45x12	-	100
2GE0100-7228	28	Plangraph 2	45x12	-	100
2GE0126-7228-95	28	Plangraph 2	Ø9.5	-	126
2GE0100-7228-8	28	Plangraph 2	Ø8	-	100
2GE0100-7228-8-3	28	Plangraph 2	Ø8	Ø3	100

Climbing the Highest Peaks

A comparative test between copper and graphite electrodes shows the difference among the peak densities for a given roughness (Ra value).



Comparison of electrode types:

2CE2150	Hollow profile copper
1GE0100	Plangraph 1 (solid graphite)
2GE0100-7228	Plangraph 2 (72% graphite/28% copper)

The result

The hollow profile copper electrodes achieve a peak density of only **63 peaks per cm** in Cap (-) mode with a roughness of approx. 3.0 μm Ra.

In the same mode, **Plangraph 1** electrodes (solid graphite) can achieve a much greater peak density of **104 peaks per cm**.

Plangraph 2 electrodes (72% graphite/28% copper) produce an even higher peak density of **120 peaks per cm**.

Overview

Electrode	Mode	Roughness in μm Ra	Peak number in units/cm
2CE2150	Cap(-)	3.06	63
Hollow copper profile			
2CE2150	Impulse(+)	3.06	76
Hollow copper profile			
1GE0100	Cap(-)	3.02	104
Plangraph 1			
2GE0100-7228	Cap(-)	3.06	120
Plangraph 2			

PE Electrodes

Udo Plante GmbH supplies bar electrodes in all required lengths for EDT machines made by Herkules and Sarclad.

Bar electrodes are manufactured from specially modified alloys with tight machining analysis tolerances. These tolerances are guaranteed according to DIN EN ISO 9001. Further mechanical processing is performed on modern CNC machines according to the DIN EN ISO 9002 quality management system.

Electrodes for Sarclad and Herkules EDT machines can be supplied in any lengths and diameters required for your installation.



PE Electrodes

Sockets and other accessories see page 12

Higher requirements – higher quality

The insulating protective coating is made of a flexible, transparent insulating varnish consisting of modified silicone resin.

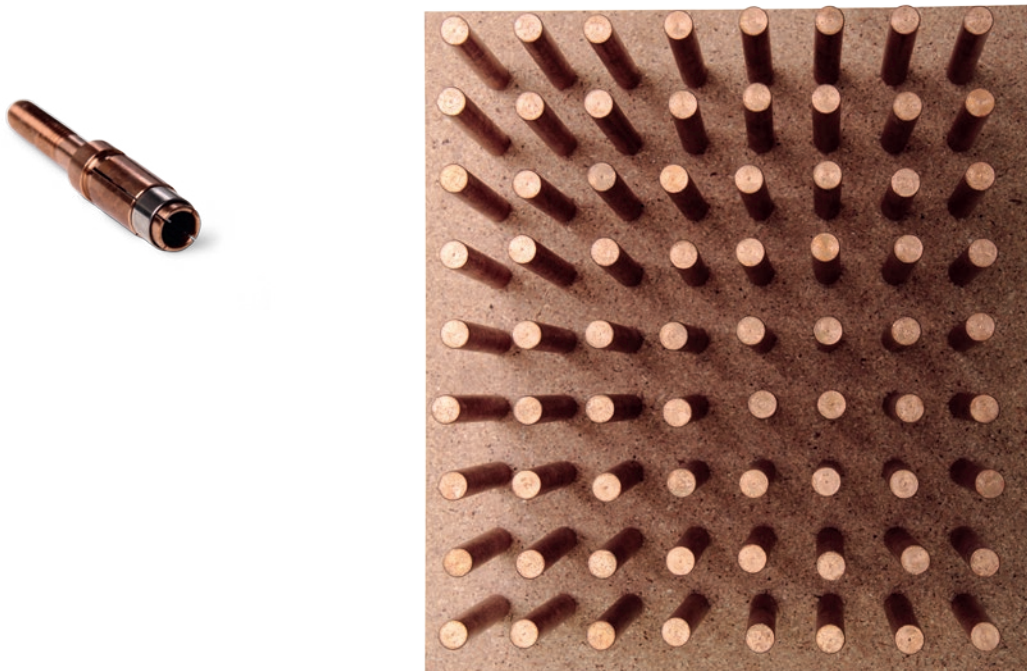
Trust is a good thing – control is a better one

The protective varnish can be seen under UV light in order to check the homogeneity of the coating



Shorter installation time due to user-friendly packaging

Bar electrodes are supplied on plug boards in a packaging unit of 72 units. This ensures easy handling during the installation into the machine as well as effective protection of the electrodes and the insulating varnish against damage during transport.

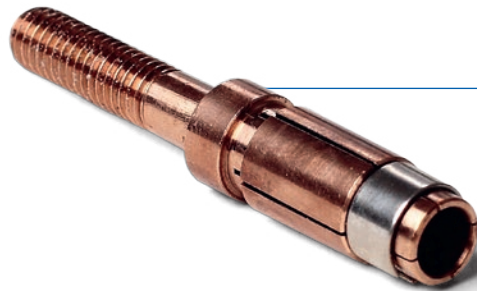


Our stock material

Ordering number	Protect varnish	Material	Diameter in mm	Length in mm
4PE3126-95	PE3	Special alloy	9.5	126
4PE3100-60	PE3	Special alloy	6.0	100

Accessories

In addition to our electrode portfolio, we can offer you a multitude of accessories for your EDT machine. The following is a selection of our most common accessories.



UP Socket

Threaded clamping bush for bar electrodes

UP Insulation Shell

Matching insulation cap for socket and bar electrode in lengths of 37.2 mm and 29.3 mm

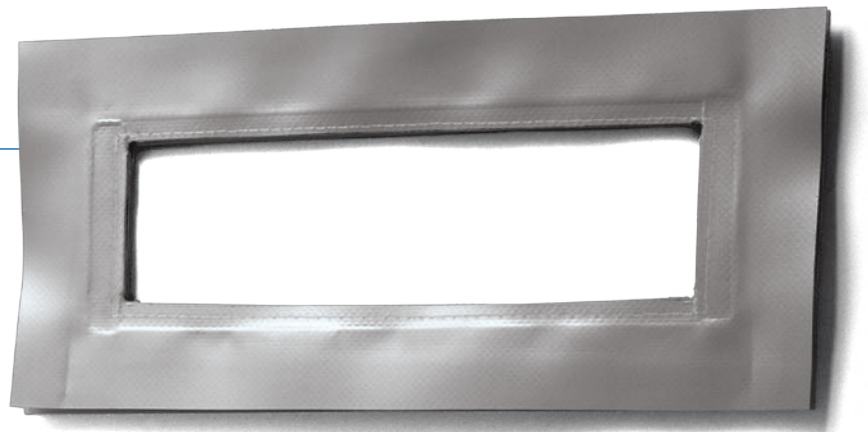


CE1 Seal

Plug-in reusable rubber seal

UP Bellows

High quality bellows for all frame dimensions



Images are not true to scale

Accessories

UP Seals Gasket

Roll seals of all shapes and sizes



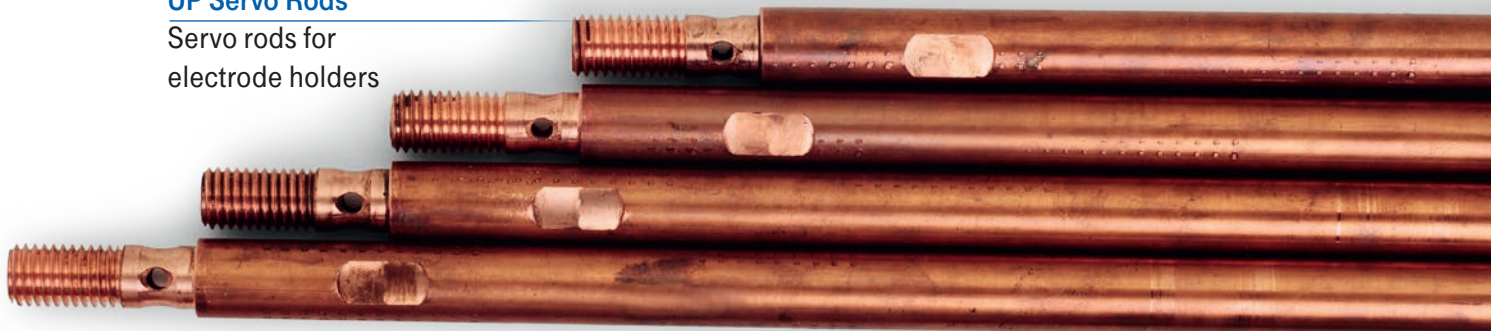
UP Flexible Connectors

Flexible connectors in all desired lengths and with all required connection bores.



UP Servo Rods

Servo rods for electrode holders



Images are not true to scale

Materials, Dimensions and weight

Hollow profile copper electrodes CE/IN, Cu qualities

Materials overview

All CE and IN copper hollow profiles are extruded and drawn.

All materials are free from beryllium.

		1 CE/1 IN	2 CE/2 IN	3 CE/3 IN
Designation	previous	E-Cu	SE-Cu	OF-Cu
	new	Cu-ETP	Cu-HCP	Cu-OFE
Material number		CR021A	CR009A	
electrical conductivity	$\frac{\text{m}}{\Omega \cdot \text{mm}^2}$	min. 57	min. 58	min. 59
min. Cu content	in %	99.90 ¹	99.95 ¹	99.99 ¹

Dimensions CE	in mm	45x12x4xLength
Dimensions IN	in mm	75x16x5.5xLength
		72x16x5.5xLength

Length CE	Weight ² in g/unit
100 mm	325
110 mm	357
125 mm	406
130 mm	422
150 mm	487

Length IN	Weight ² in g/unit
102 mm	620 ³

¹ incl. Ag

² approx. weight

³ excluding weight of cutout

Length tolerance +1 -0 mm

cut at right angle and cleanly deburred

Bar electrodes PE

Material overview

4 P E 3 1 2 6 - 9 5

Material		Copper alloy
Physical properties		
Density	$\frac{\text{kg}}{\text{dm}^3}$	8.8
Melting range	C°	910 – 1040
Elasticity module	$\frac{\text{kN}}{\text{mm}^2}$	115
Thermal conductivity	$\frac{\text{W}}{\text{m} \cdot \text{K}}$	75
Elongation coefficient	$\frac{1}{\text{K}}$	18.5 – 10 ⁻⁶
Electrical conductivity	$\frac{\text{m}}{\Omega \cdot \text{mm}^2}$	9.5 – 10.5
Specific electrical resistance	$\frac{\Omega \cdot \text{mm}^2}{\text{m}}$	0.095 – 0.105

Graphite electrodes GE

Plangraph

Graphite electrodes for roll texturing machines

	Plangraph 1	Plangraph 2
Performance	A-	A
Grain size (μ)	>6.9	12
Yield strength (N/mm ²)	60	80
Specific resistance (μ Ω m)	12.7	6
Metal content %	0	28
Specific weight (kg/dm ³)	1.78	2.6

The physical data listed for each Plangraph material are approximate values that are not binding.

Our Partner

H. KLEINKNECHT & Co. GmbH, a renowned electrical equipment manufacturer from Siegen, Germany, has been designing and implementing electrical equipment and technological control systems for roll grinding machines and roll texturing machines for decades.

They have equipped and modernized more than 60 EDT machines all over the world with new electrical control systems and generators. More than 2,600 EDT generators are in use every day in the roll industry and have proven to be extremely stable.

With the ambition to create more of their own equipment, KLEINKNECHT developed their own high end roll texturing machine, based on their long-standing experience in the area of roll surface treatment, which offers a multitude of innovative and patented new features.

Highly modern linear motor technology is used for electrode adjustment, ensuring the highest possible gap control accuracy over the entire electrode stroke.

The positioning of the individual eroding axes for a fast spark transmission is achieved with the use of a very sensitive gap voltage control system (GAP-Voltage-Control), developed by KLEINKNECHT itself, separate from the spark generator.

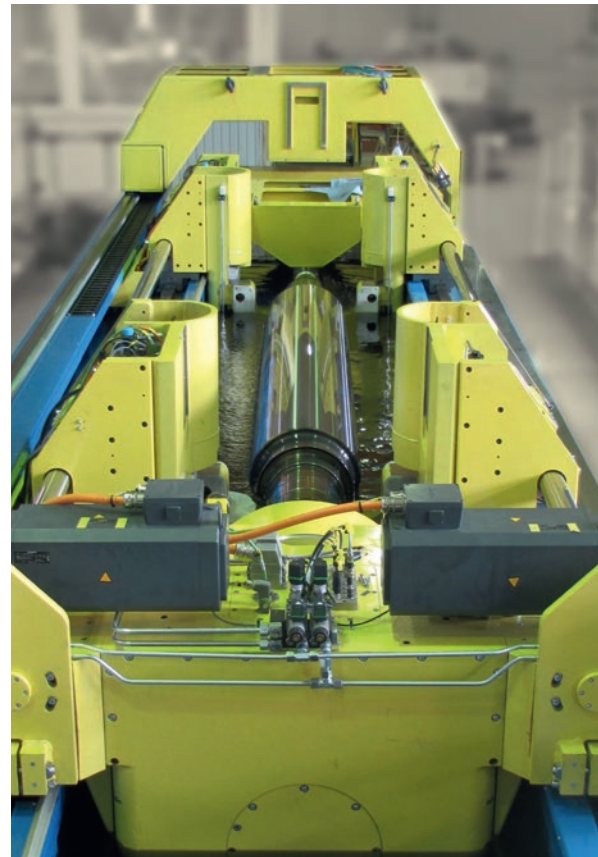
With its innovative ideas, the new KLEINKNECHT EDT machine has made the known weak points of conventional EDT machines a thing of the past.

KLEINKNECHT has been active in the area of roll grinding machines for more than 60 years. More than 1,000 control systems for roll grinding machines have been delivered. Of these, more than 300 are CNC-based systems for new and modernized machines. Today, the KLEINKNECHT GPC2 control system can be found on roll grinding machines from Waldrich Siegen, Herkules, Meuselwitz, Naxos, Lynson, and other manufacturers.

In the last few years, KLEINKNECHT has become a one-stop solution for complex retrofits and modernizations of roll grinding machines. Today, KLEINKNECHT can service not only the electrical components of roll grinders, but also all their mechanical aspects.

Operators of roll grinding machines and EDT machines can rely on first-class service as well as on a safe long-term spare parts supply.

Furthermore, Udo Plante GmbH and KLEINKNECHT have cooperated in the field of electrode development for EDT machines for many years.



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