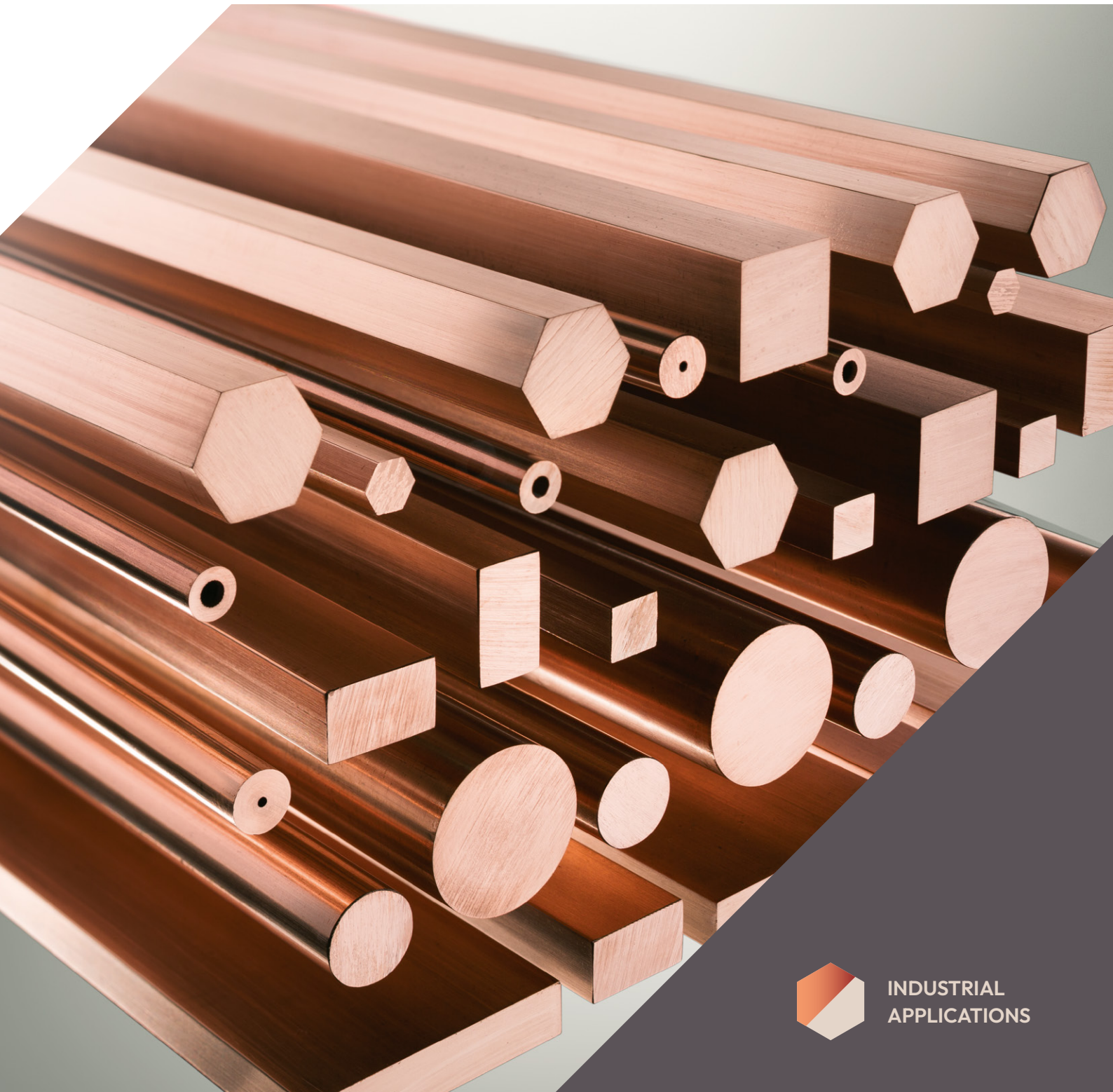




CUNOVA

ELBRODUR®

Alloys for Resistance Welding



**INDUSTRIAL
APPLICATIONS**

Extruded and Drawn Products

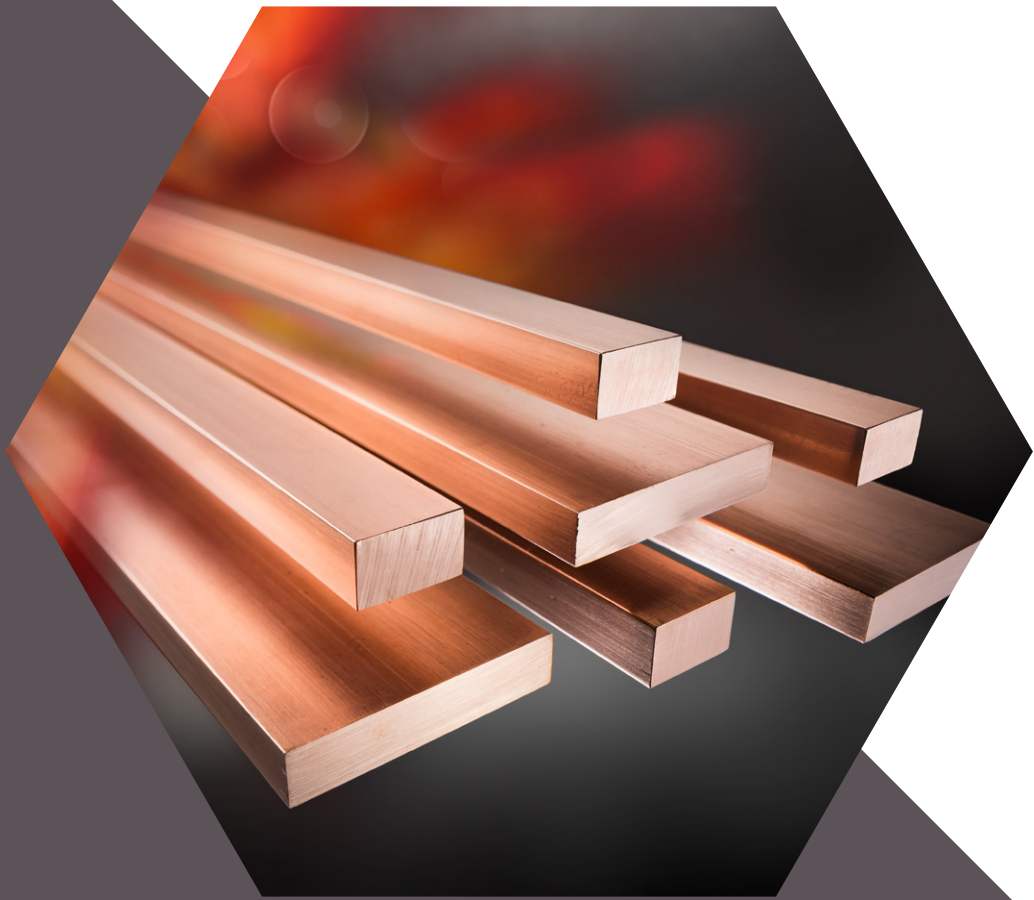
As one of the largest manufacturers of semi-finished products made of copper and copper alloys, cunova offers the best possible product solutions for customers from a wide range of industries. Our product range offers a broad spectrum with high product quality and is available worldwide. The product area "extruded and drawn products", which is part of the "Industrial Applications" division, specialises in the production of materials for machining.

cunova has been in the manufacture of materials for resistance welding electrodes for several decades now; it moreover supplies the input material for the highly stressed parts in blowpipes for fusion welding.

The performance requirements to be met by resistance welding electrode materials can be briefly described as follows: It is the job of the electrode to transmit the required heavy electric currents to the workpiece.

To keep electrode dissipation – due to current being turned into heat – to a minimum the material should have high electrical conductivity.

Moreover the electrode should not deform when applying the specific pressure which is necessary for the welding process. Because of the inevitable rise in temperature which is experienced in the process, the electrode material should retain adequate hardness at elevated temperatures and be highly resistant to softening.



ELBRODUR®

Its trademarked ELBRODUR® alloys satisfy in perfect fashion the performance demands which such materials are expected to meet:

- High electrical and thermal conductivity
- High strength
- High resistance to softening (high softening temperature)
- Retention of high hardness at elevated temperatures (high elevated temperature strength)

ELBRODUR® HF

ELBRODUR® HF (CuCr1Zr) is a high-strength age-hardened electrode material for spot welding, in particular high-cycle continuous or roller spot welding. Suitable for all steels – including alloyed and stainless grades – and for coated and galvanized sheet.

ELBRODUR® N

ELBRODUR® N (CuCr1Zr) is age-hardened electrode material for spot, projection and butt welding. Suitable for carbon steels, galvanized sheet, brass, bronze and nickel. Can in certain cases be used for aluminium alloys as well.

Recommendations on use

ELBRODUR® N should be used, instead of ELBRODUR® HF, if the electrodes employed for projection, butt and spot welding are > 30 mm in diameter or > 25 mm in width across flats. If you want to join dissimilar metals, pick the type of ELBRODUR® which is best suited for the job. In case of welding coated sheet, the coating should be even and uniform.

ELBRODUR® G

ELBRODUR® G (CuCrZr) is age-hardened electrode material for bending applications.

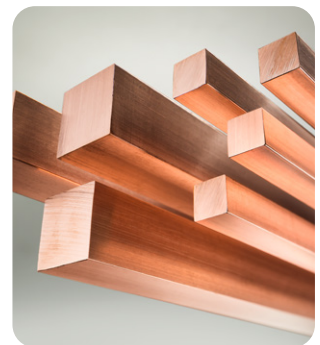
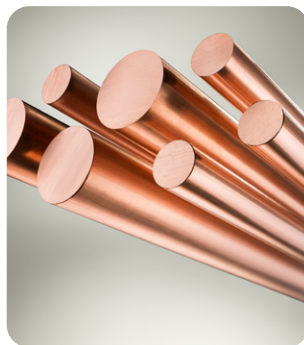
ELBRODUR® B

ELBRODUR® B (CuCo2Be) is a high-strength age-hardened electrode material featuring particularly high hardness along with medium electrical conductivity. For spot, projection and butt welding. Suitable for high-strength, corrosion-resistant alloyed steels as well as nickel and nickel alloys.

Special grades for chain welding electrodes, on request.

ELBRODUR® D

ELBRODUR® D (CuNi2.5SiCr) is a beryllium-free high-strength, age-hardened electrode material featuring a higher softening temperature and high electrical conductivity – partly serving as an alternative to ELBRODUR® B. Suitable for the resistance welding of bus conductors, for projection welding, and for consumable and butt welding electrodes. Also suitable for high-strength sections and plungers of die casting machines.



ELBRODUR® HF (CuCr1Zr)

ELBRODUR® N (CuCr1Zr)

Mechanical and physical properties

	A	B	C*
Tensile strength R_m MPa	≥ 540	≥ 490	≥ 460
Yield strength $R_{p0,2}$ MPa	≥ 470	≥ 440	≥ 400
Elongation A %	≥ 10	≥ 10	≥ 16
Reduction of Area Z %	≥ 50	≥ 50	≥ 60
Hardness HBW 2,5/62,5	160–185	150–180	140–165
Hardness HV30	165–190	160–185	145–170
Hardness HRB	81–90	79–89	73–83
El. conductivity MS/m	≥ 44	≥ 44	≥ 46
El. conductivity % IACS	≥ 76	≥ 76	≥ 80

* Special grade for cold bending.
Coils / Wire up to 10 mm O.D. or width a/f.

	A	B	C
Tensile strength R_m MPa	≥ 440	≥ 390	≥ 370
Yield strength $R_{p0,2}$ MPa	≥ 390	≥ 270	≥ 255
Elongation A %	≥ 10	≥ 12*	≥ 18
Reduction of Area Z %	≥ 40	≥ 40	≥ 40
Härte HBW 2,5/62,5	135–170	130–155	120–150
Hardness HV30	140–175	135–160	125–155
Hardness HRB	71–85	69–79	65–77
El. conductivity MS/m	≥ 46	≥ 46	≥ 46
El. conductivity % IACS	≥ 80	≥ 80	≥ 80

* ≥ 16 % for cold bending material

Shapes, sizes and tempers

Rod



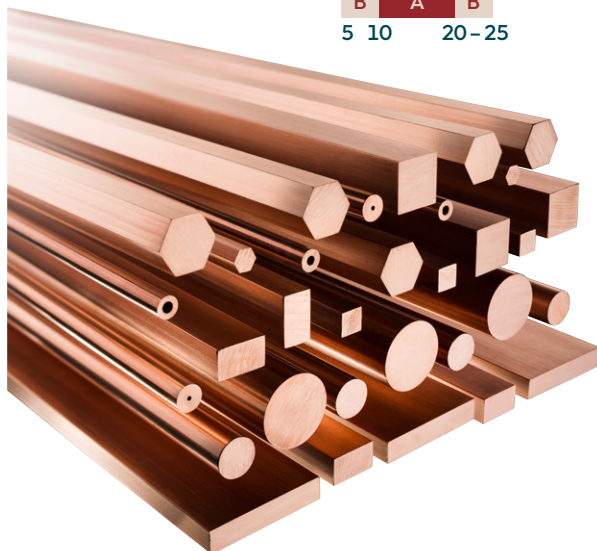
Dia. (mm)



Rod



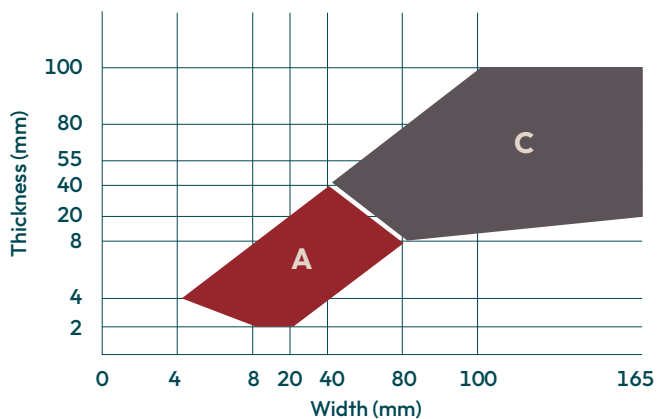
Width a/f (mm)



Further sizes and special grades on request.

Shapes, sizes and tempers

Bar



Rod



Dia. (mm)



Rod



Width a/f (mm)



ELBRODUR® G (CuCr1Zr) Rods / Tubes

Mechanical and physical properties

Tensile strength R_m	MPa	≥ 420
Yield strength R_{p0,2}	MPa	≥ 350
Elongation A	%	≥ 16
Reduction of Area Z	%	≥ 50
Hardness HBW 2,5/187,5		≥ 130
Hardness HV30		≥ 135
Hardness HRB		≥ 69
El. conductivity	MS/m	≥ 45
El. conductivity	% IACS	≥ 78

Dimensions: Rods and tubes: ≥ 50 mm Ø
(smaller diameters for bending, see
ELBRODUR® HF/N.)

Further sizes and special grades on request.

ELBRODUR® B (CuCo2Be)

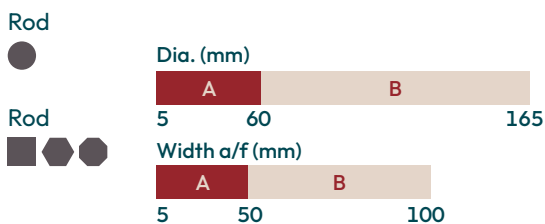
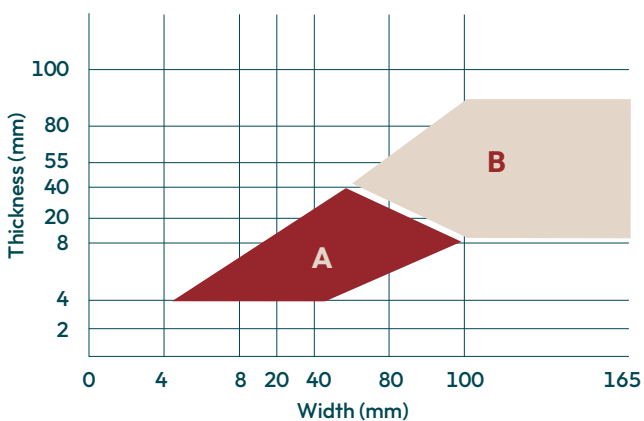
ELBRODUR® D (CuNi2,5SiCr)

Mechanical and physical properties

	A	B
Tensile strength R_m MPa	≥ 740	≥ 690
Yield strength $R_{p0,2}$ MPa	≥ 610	≥ 570
Elongation A %	≥ 10	≥ 12
Reduction of Area Z %	≥ 20	≥ 15
Hardness HBW 2,5/62,5	230–280	220–280
Hardness HV30	240–300	230–300
Hardness HRB	99–108	97–108
El. conductivity MS/m	≥ 26	≥ 26
El. conductivity % IACS	≥ 45	≥ 45

	A	B
Tensile strength R_m MPa	≥ 660	≥ 570
Yield strength $R_{p0,2}$ MPa	≥ 570	≥ 460
Elongation A %	≥ 10	≥ 10
Reduction of Area Z %	≥ 25	≥ 25
Hardness HBW 2,5/62,5	≥ 185	≥ 185
Hardness HV30	≥ 195	≥ 195
Hardness HRB	≥ 90	≥ 90
El. conductivity MS/m	≥ 26	≥ 26
El. conductivity % IACS	≥ 45	≥ 45

Shapes, sizes and tempers



Bar



A Thickness = 2 – 10 mm, Width = 10 – 75 mm
Thickness to Width Ratio 1 : 20 max.

Rod



Rod

Rod

Special grades for chain welding electrodes on request.

Further sizes and special grades on request.

ELBRODUR® - Special Tubes/Contact Tubes

Use the advantages of this quality product:

- Narrow tolerances
- High strength
- High electrical conductivity
- High heat conductivity
- High softening temperature (approx. 500°C/930°F)
- Economical processing
- Regular high quality

Standard range of dimensions (selection)

ID in mm	OD in mm						
	6.0	7.0	8.0	9.0	10.0	12.0	13.0
0.80		X	X				
0.93	X	X	X	X	X		
1.00	X	X	X	X	X	X	X
1.16	X	X	X	X	X	X	
1.20	X	X	X	X	X	X	
1.39	X	X	X	X	X	X	X
1.62		X	X	X	X	X	X
1.93			X	X	X	X	X
2.05			X	X	X	X	X

- Tubes with outer hex. form may also be supplied.
- Manufactured length 2-5 meters.
- Fixed lengths according to agreement.
- Minimum quantity of each dimension 250 kgs.
- Tubes made of ELBRODUR® HF, which are primarily used for wire contact nozzles in robotics production, are a speciality of cunova.
- Due to the high quality, calibrating of drilling is unnecessary.

Tolerances (in mm)

	middle OD	middle ID
Round tubes	+/- 0.05 mm	+/- 0.03 mm
Hexagonal tubes	+/- 0.05 mm	+/- 0.075 mm

Unequal wall thickness ≤ +/- 4 %. We reserve the right to make technical changes.

Alloy characteristics and standards

ELBRODUR® Type	Composition (approx. value, weight-%)	Standards			
		Europa	International	USA	Frankreich
HF	Cr 0.65	EN	CEN/TS 13388	RWMA	NF EN ISO 5182
	Zr 0.08				
	Cu rem.	CW106C	CuCr1Zr	Cl. 2	A2/3

Hardness			Electrical conductivity MS/m (% IACS)
HBW 2,5/62,5	HV 30	HRB	
155 - 190	160 - 195	81 - 91	≥ 44 (≥ 76)

Technological Properties

Chemical, mechanical and physical properties (nominal values)

cunova Alloys		ELBRODUR® HF	ELBRODUR® N	ELBRODUR® G	ELBRODUR® B	ELBRODUR® D
Nominal composition	wt. - %	Cr 0,65 Zr 0,08 Cu rem. other elements: 0.2 max.	Cr 0,65 Zr 0,08 Cu rem. other elements: 0.2 max.	Cr 0,65 Zr 0,12 Cu rem. other elements: 0.2 max.	Co 2,2 Be 0,55 Cu rem. other elements: Ni + Fe 0.5 max. others 0.5 max.	Ni 2,5 Si 0,65 Cr 0.3 Cu rem. other elements: 0.3 max.
Density at 20°C	g/cm³	8.9	8.9	8.9	8.9	8.9
Melting temp. (liquidus)	°C	1075	1075	1075	1056	1060
Coefficient of linear thermal expansion (20°C - 300°C)	10 ⁻⁶ /K	18.0	18.0	18.0	17.8	18.0
Modulus of elasticity	kN/mm²	120	120	120	120	140
Thermal cond. at 20°C	W/(m·K)	330	330	330	230	220
Softening temperature	°C	475	475	475	500	475

High-temperature properties

Nominal hardness at elevated temperatures.

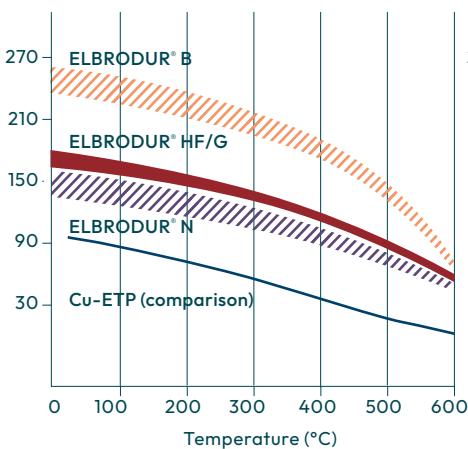
Resistance to softening

Nominal hardness at ambient temperature after heating for 30 minutes to the temperatures shown.

Resistance to softening

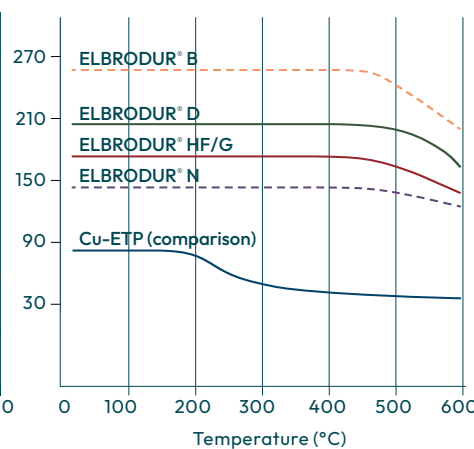
Nominal hardness and electrical conductivity of ELBRODUR® HF at ambient temperature, after heating to 600°C for the given times.

Brinell hardness (HBW 2,5/62,5)



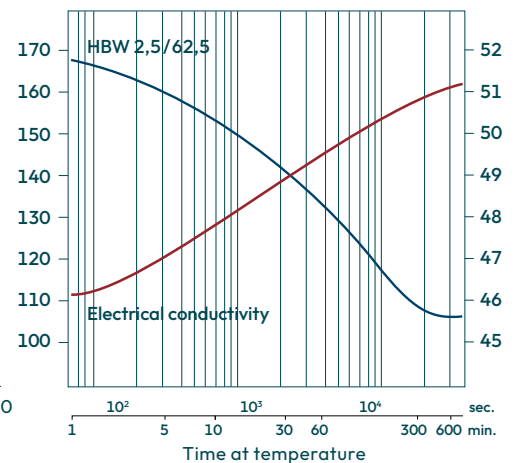
- ELBRODUR® B
- ELBRODUR® HF/G
- ELBRODUR® N
- Cu-ETP (comparison)

Brinell hardness (HBW 2,5/62,5)

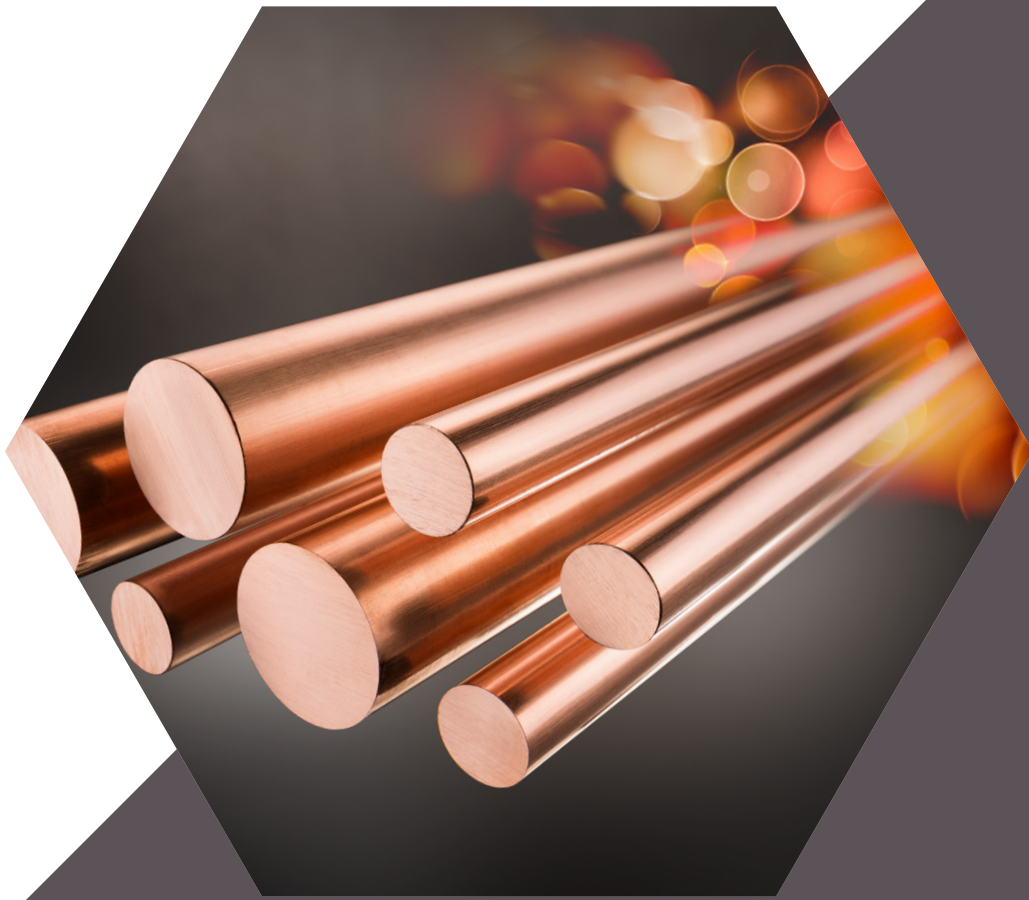


- ELBRODUR® B
- ELBRODUR® D
- ELBRODUR® HF/G
- ELBRODUR® N
- Cu-ETP (comparison)

Brinell hardness (HBW 2,5/62,5) | Electrical conductivity MS/m



- Electrical conductivity
- HBW 2,5/62,5



APPLICATIONS

Standards

Depending on the particular type of alloy, ELBRODUR® materials are supplied either in cold-worked condition, or in cold-worked and age-hardened condition. A rise in temperature above the softening temperatures indicated for the different electrode materials will significantly lower their mechanical and physical properties.

Where brazed joints are inevitable, careful consideration should be given to the likely loss of hardness in alloys of the age-hardened type, and to the fact that localized rises in temperature (hot spots) in non-symmetrical bodies can lead to cracking. This is why such alloys should preferably be worked by machining or cold forming - extrusion, bending.

If the material is to undergo extrusion or bending, a special grade of the HF, G and N types of ELBRODUR® can be furnished featuring somewhat lower hardness.



Application standards: resistance welding electrode materials

cunova	Europe	International	USA	UK	France
Germany: DIN EN ISO 5182		ISO 5182	RWMA - Alloys	BS EN ISO 5182	NF EN ISO 5182

National and international standard designations of ELBRODUR® - Alloys

cunova		Europe	International	USA
ELBRODUR® Type	Alloy	EN 12163/Rods EN 12165/Forging Stock EN 12166/Wire EN 12167/Profiles	CEN/TS 13388:2008	UNS No
HF/N/G	CuCr1Zr	CW106C	CUCR1ZR	C 18150* C 18200* C 18400*
B	CuCo2Be	CW104C	CUCO2BE	C 17500
D	CuNi2, 5SiCr	-	-	C 18000

* Composition may differ slightly from other standard specifications.



Further information on ELBRODUR®:

T +49 541 321-2144
info@cunova.com
www.cunova.com

cunova GmbH
Klosterstrasse 29
49074 Osnabrück
Germany

® = registered trademark

All changes reserved. MCO390723.

Owing to limitations in printing technology,
the colours reproduced in this brochure should
be regarded as approximate equivalents to
the colours described.