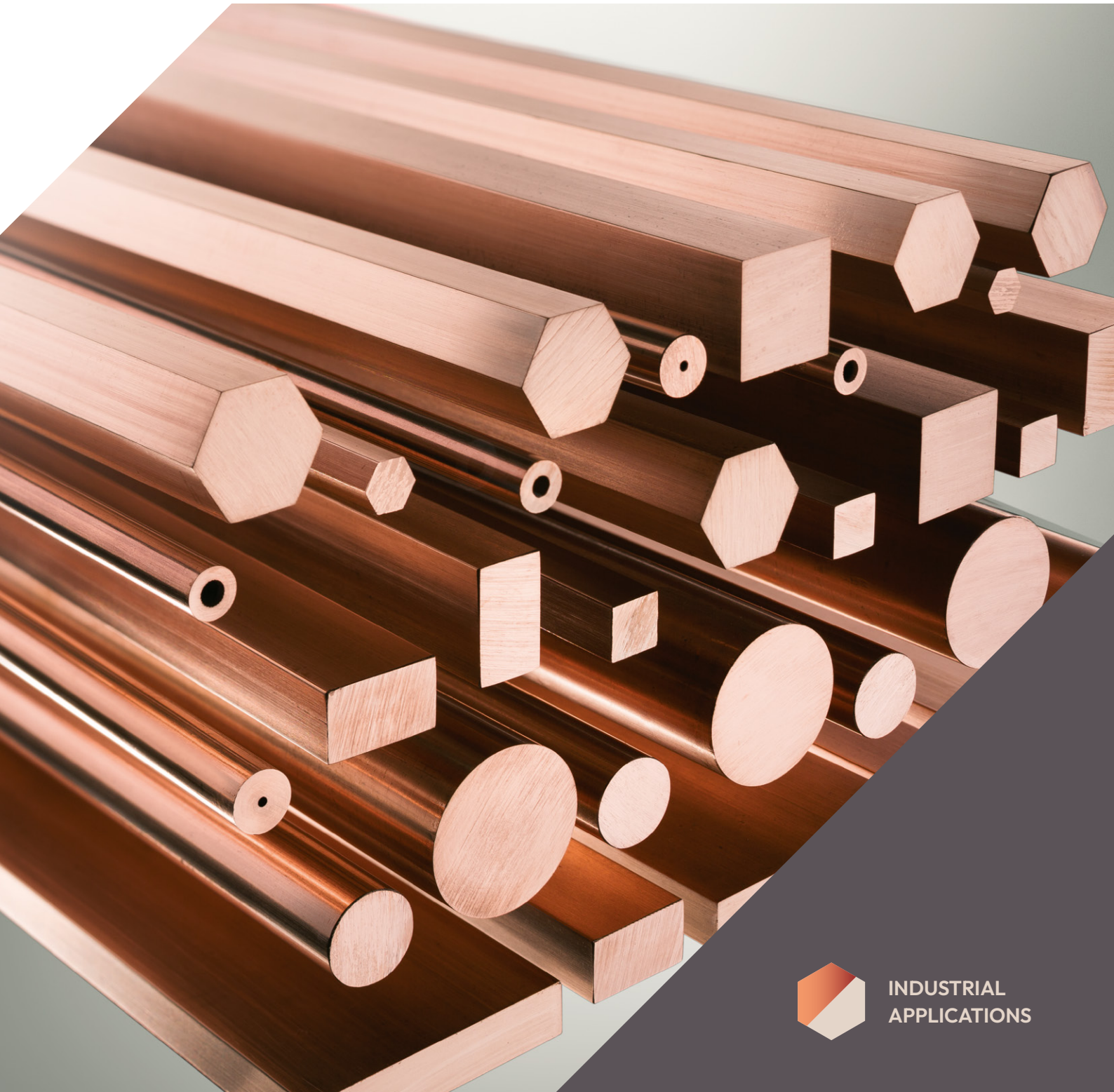
cunova

ELBRODUR®

Alloys for Resistance Welding



INDUSTRIAL
APPLICATIONS

ELBRODUR®

Extruded and Drawn Products

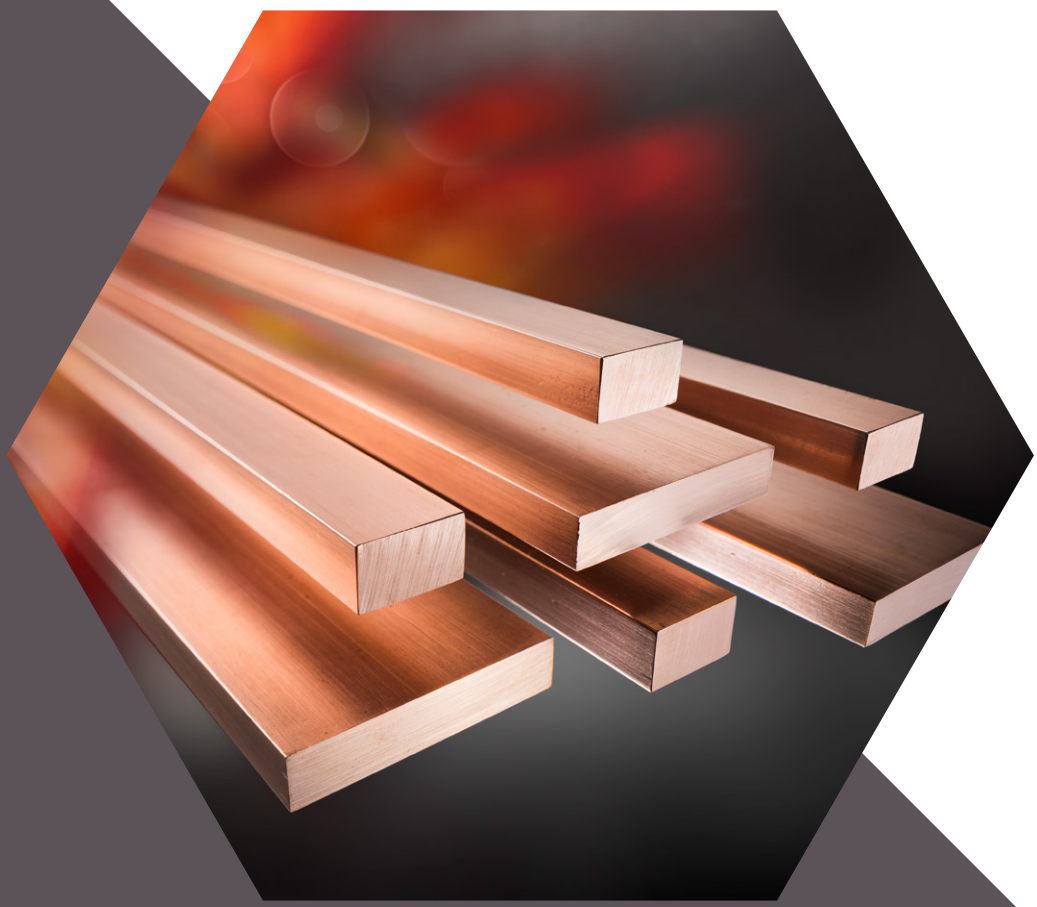
As one of the largest manufacturers of semi-finished products made of copper and copper alloys, cunova offers the best possible product solutions for customers from a wide range of industries. Our product range offers a broad spectrum with high product quality and is available worldwide. The product 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 mate-rial 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 (CuCr1Zr) is age-hardened electrode material for bending applications.

ELBRODUR® L

ELBRODUR® L (CuAg0.10P) is a work-hardened electrode material with very high electrical conductivity, comparable to that of pure copper; however, it has a higher softening temperature than copper.
It is particularly suitable for spot welding aluminium materials.

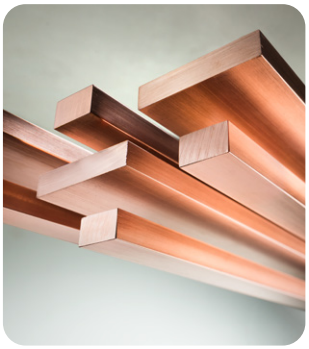
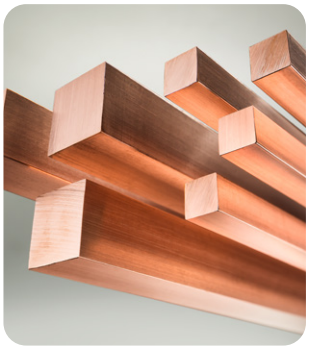
ELBRODUR® B

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)

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.

Shapes, sizes and tempers

Rod

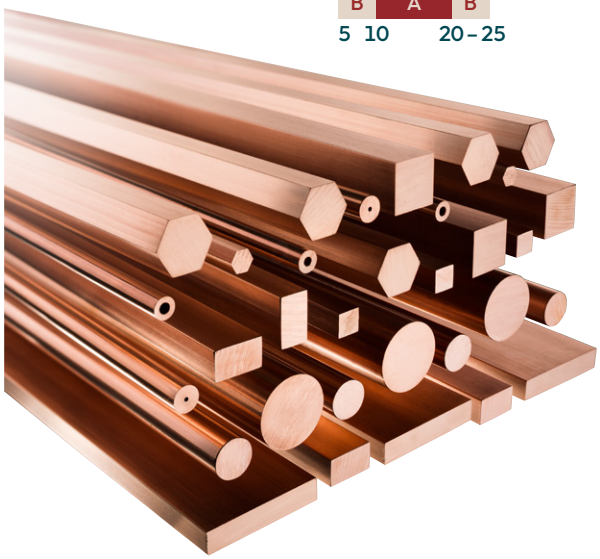
Dia. (mm)

B	A	B
3	10	25 – 30

Rod

Width a/f (mm)

B	A	B
5	10	20 – 25



Further sizes and special grades on request.

ELBRODUR® N (CuCr1Zr)

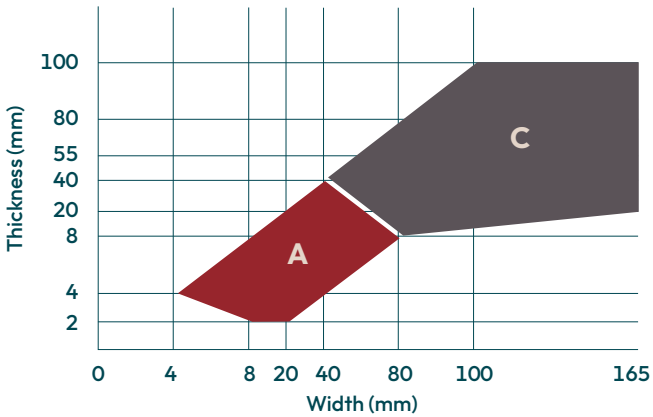
Mechanical and physical properties

		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

Bar



Rod

Dia. (mm)

A	B	C
> 30	50	60 – 165

Rod

Width a/f (mm)

A	B	C
> 25	40	60 – 100

ELBRODUR® G (CuCr1Zr) Stangen/Rohre

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.)

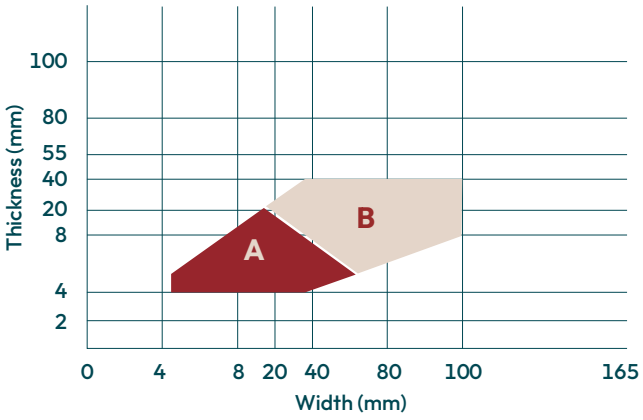
Further sizes and special grades on request.

ELBRODUR® L (CuAg0,10P)

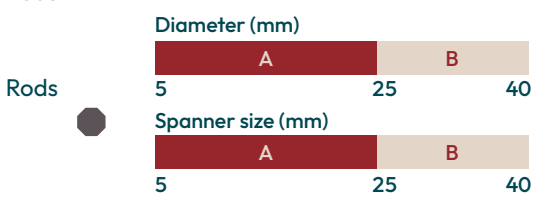
Technical specifications

		A	B
Tensile strength R_m	**MPa**	≥ 330	≥ 280
Yield point $R_{p0,2}$	**MPa**	≥ 290	≥ 240
Elongation at break A	**%**	≥ 5	≥ 10
Constriction Z	**%**	≥ 70	≥ 70
Hardness HBW 2,5/62,5		≥ 100	≥ 90
Hardness HV30		≥ 105	≥ 95
Hardness HRB		≥ 58	≥ 54
Electrical conductivity	**MS/m**	55 – 58	55 – 58
Electrical conductivity	**% IACS**	95 – 100	95 – 100

Form of supply, dimensional and strength ranges



Rods



Other dimensions / special grades available on request.

ELBRODUR® B (CuCo2Be)

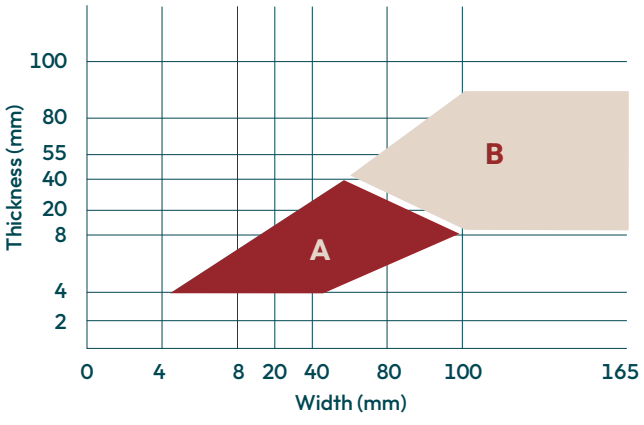
ELBRODUR® D (CuNi2,5SiCr)

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



Rod

Dia. (mm)

A B

5 60 165

Rod

Width a/f (mm)

A B

5 50 100

Special grades for chain welding electrodes on request.

Bar

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

Rod

Dia. (mm)

A B

10 50 145

Rod

Width a/f (mm)

A

10 50

Further sizes and special grades on request.

SPECIAL PARTS

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

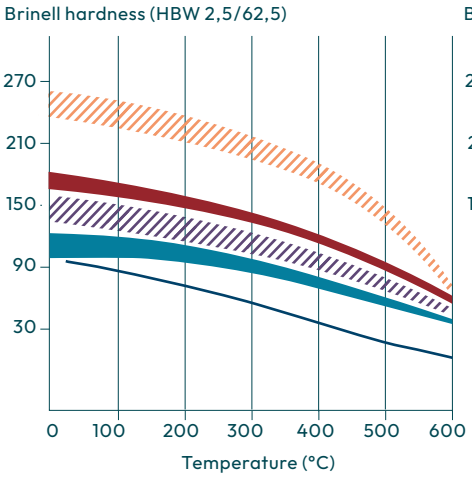
Hardness			Electrical conductivity MS/m (% IACS)
HBW 2,5/62,5	HV 30	HRB	
155 – 190	160 – 195	81 – 91	≥ 44 (≥ 76)

ELBRODUR®

Technological Properties

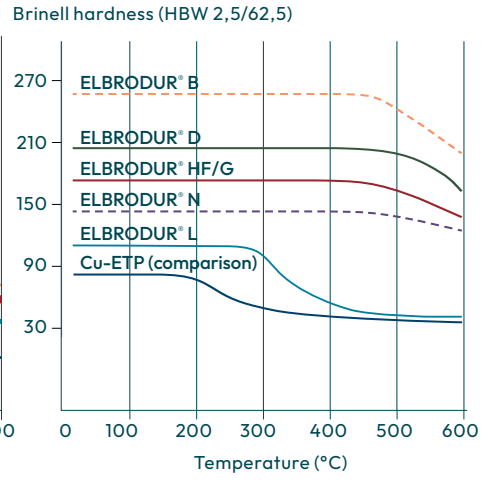
cunova Alloys		ELBRODUR® HF	ELBRODUR® N	ELBRODUR® G	ELBRODUR® L	ELBRODUR® B	ELBRODUR® D
Nominal composition	**Gew. - %**	Cr 0,65 Zr 0,08 Cu rem. other elements: 0.2 max.	Cr 0,65 Zr 0,08 Cu rem. other elements: 0.2 max.	Cr 0,65 Zr 0,12 Cu rem. other elements: 0.2 max.	Ag 0,1; Cu + Ag ≥ 99,95	Co 2,2 Be 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	8,8	8,9
Melting temp. (liquidus)	**°C**	1075	1075	1075	1082	1056	1060
Coefficient of linear thermal expansion 20°C - 300°C)	**10^{-6}/K**	18,0	18,0	18,0	17,7	17,8	18,0
Modulus of elasticity	**kN/mm²**	120	120	120	120	120	140
Thermal cond. at 20°C	**W/(m·K)**	330	330	330	380	230	220
Softening temperature	**°C**	475	475	475	350	500	475

High-temperature properties
Nominal hardness at elevated temperatures.



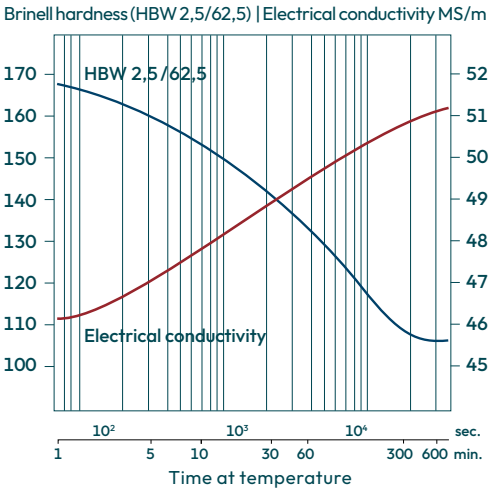
- ELBRODUR® B
- ELBRODUR® HF/G
- ELBRODUR® N
- ELBRODUR® L
- Cu-ETP (comparison)

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

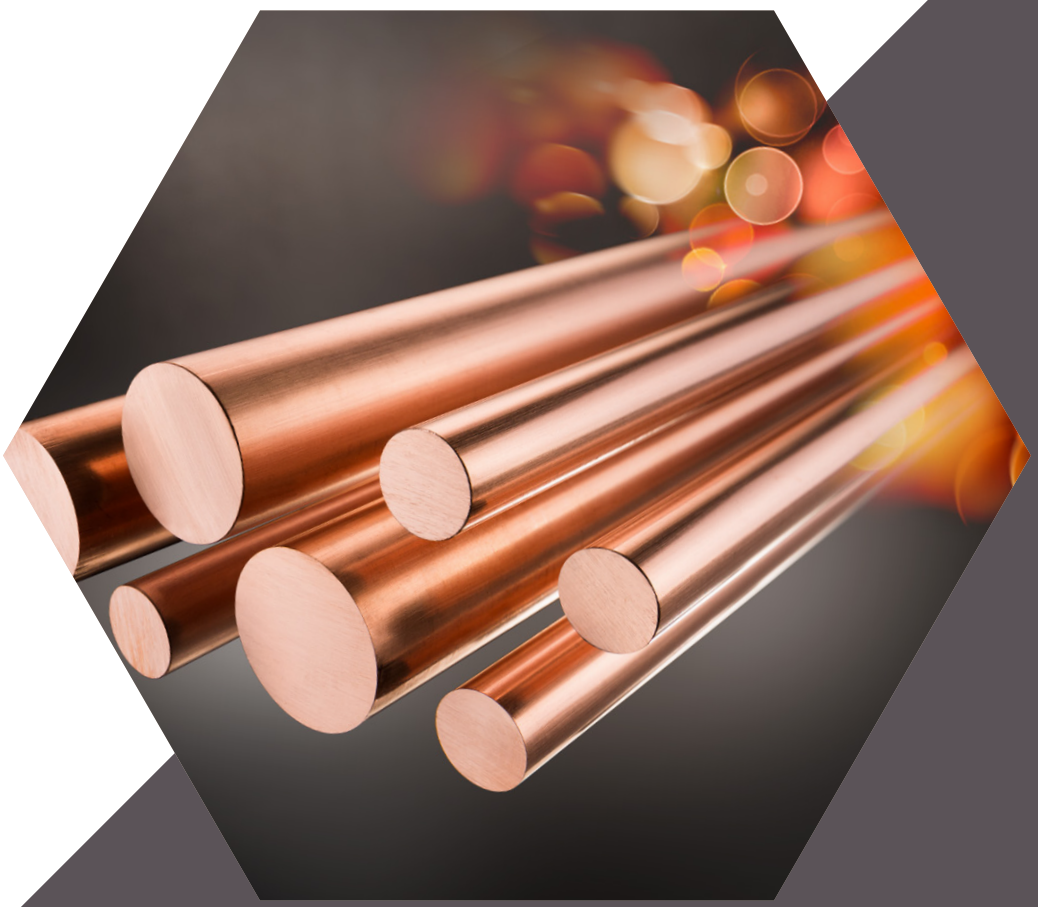


- ELBRODUR® B
- ELBRODUR® D
- ELBRODUR® HF/G
- ELBRODUR® N
- ELBRODUR® L
- Cu-ETP (comparison)

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



- 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*
L	**CuAg0,10P**	CW016A	CUAG0,1(P)	C 10700/OFS
B	**CuCo2Be**	CW104C	CUCO2BE	C 17500
D	**CuNi2, 5SiCr**	-	-	C 18000

* Composition may differ slightly from other standard specifications.

Further information on ELBRODUR®:

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