ELBRODUR® – Alloys
for resistance welding

KME

KME Germany GmbH & Co. KG
ELBRODUR®
[EN]

KME Germany GmbH & Co. KG
Extruded and Drawn Products

KME is one of the world's largest manufacturer of copper and copper alloy products. KME manufactures a wide range of semi-finished, finished and special products across Europe and Asia.

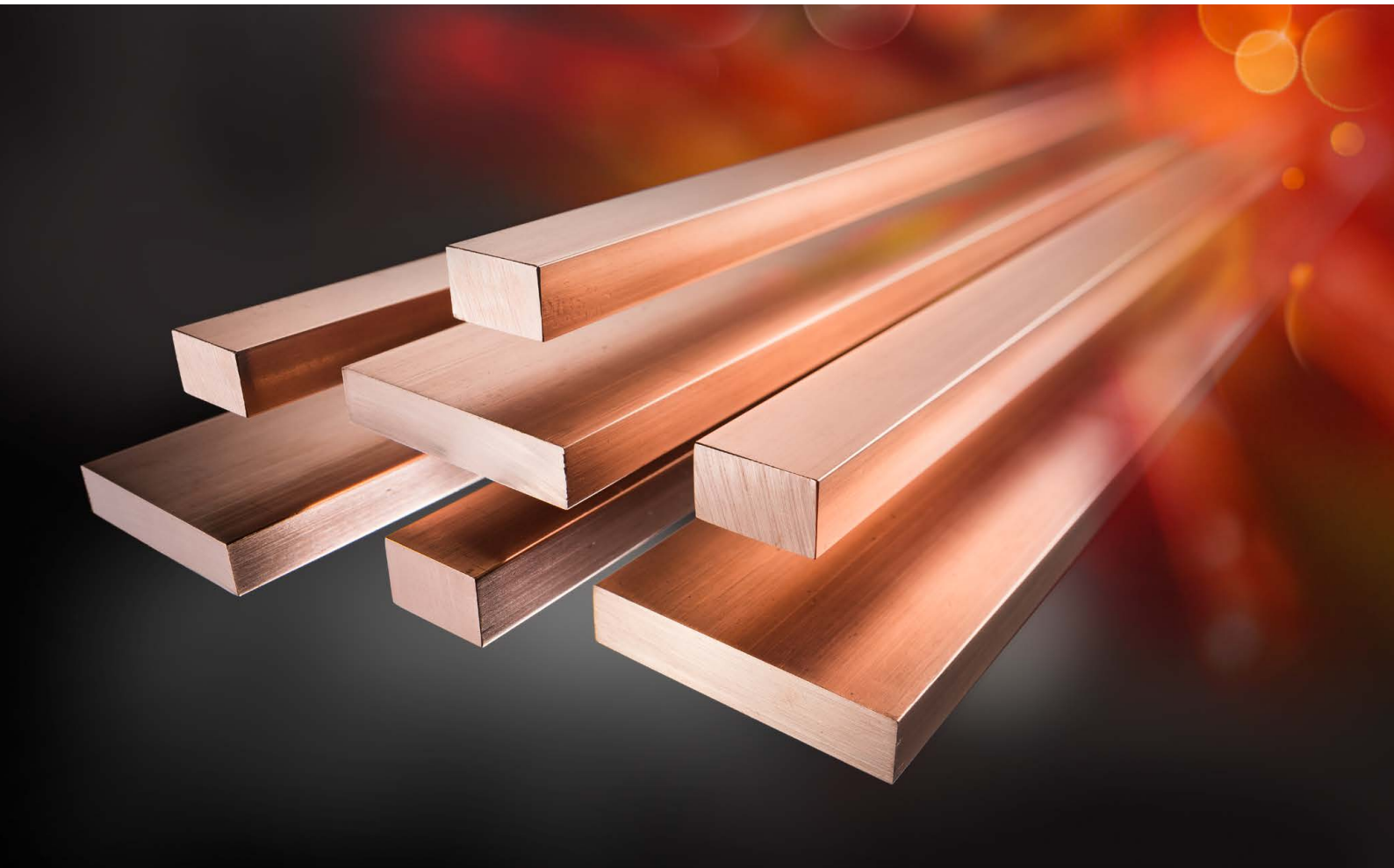
The business unit extruded and drawn products within KME's special products division is specialized in the manufacture of materials for resistance welding. For nearly fifty years now it has been producing the most varied alloys designed to meet the different requirements of industrial welding techniques.

KME 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.

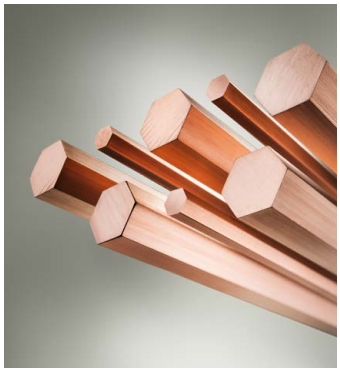
ELBRODUR® B

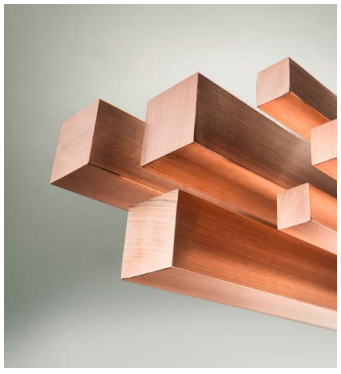
ELBRODUR® B (CuCo2Be) is a high-strength age-hardened electrode material featuring particularly high hardness along with medium electrical conductivity. For spot, projection and butt welding. Suitable for high-strength, corrosion-resistant alloyed steels as well as nickel and nickel alloys.

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	155 – 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

		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
Hardness 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

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

* ≥ 16% for cold bending material

Shapes, sizes and tempers

Rod

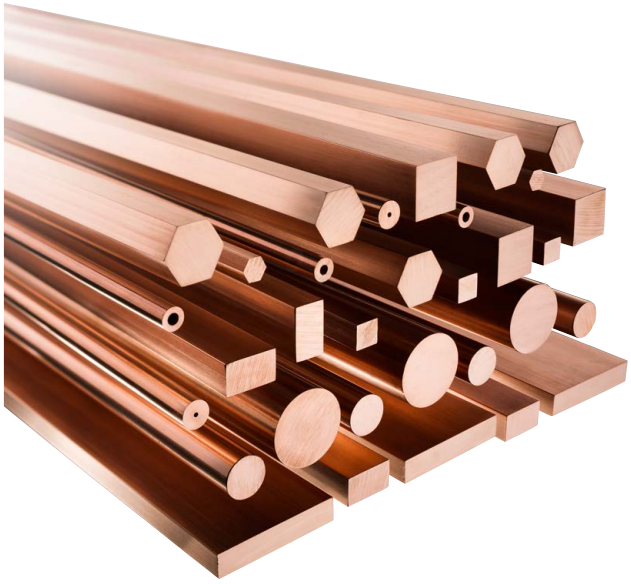
Dia. (mm)

B	A	B
3	10	25 – 30

Rod

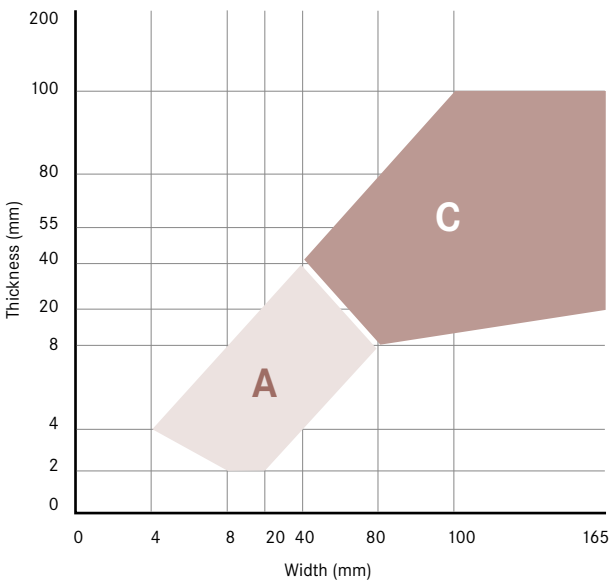
Width a/f (mm)

B	A	B
5	10	20 – 25



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)
rods/tubes

ELBRODUR® G
(CuCr1Zr)
strip/sheet/plate

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 2.5/62.5		≥ 130
Hardness HV30		≥ 135
Hardness HRB		≥ 69
El. conductivity	MS/m	≥ 45
El. conductivity	% IACS	≥ 78

		R 370	R 440	R 490
Tensile strength R_m	MPa	≥ 370	≥ 440	≥ 490
Yield strength $R_{p0.2}$	MPa	≥ 270	≥ 390	≥ 450
Elongation A	%	≥ 18	≥ 10	≥ 10
Reduction of Area Z	%	≥ 40	≥ 40	-
Hardness HBW 2.5/62.5		≥ 120	≥ 135	≥ 150
Hardness HV30		≥ 125	≥ 140	≥ 155
Hardness HRB		≥ 66	≥ 71	≥ 77
El. conductivity	MS/m	≥ 45	≥ 45	≥ 44
El. conductivity	% IACS	≥ 78	≥ 78	≥ 76

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

Strip of ELBRODUR® G

Thickness (mm)	Tempers
≥ 0.1 - < 2.5	R 440, R490

Plate and sheet of ELBRODUR® G

Thickness (mm)	Tempers
≥ 2.5 – < 4.0	R 440, R 490
≥ 4.0 – < 10	R 440
≥ 10 – < 60	R 370, R 440
≥ 60 – < 100	R 370

Further sizes and special grades on request.

ELBRODUR® B
(CuCo2Be)

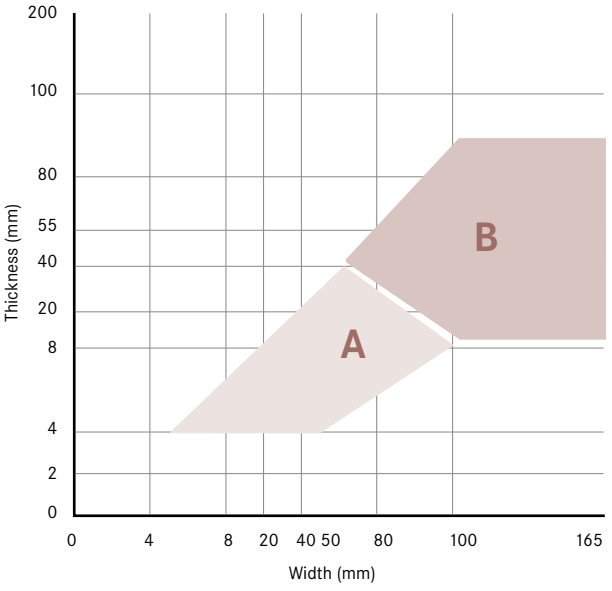
ELBRODUR® D
(CuNi2,5SiCr)

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 2.5/187.5		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 2.5/187.5		≥ 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 5 – 60 | B 60 – 165

Rod

Width a/f (mm)

A 5 – 50 | B 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 10 – 50 | B 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 KME.
- 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			
		Europe	International	USA	France
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)

KME 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	8.8	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

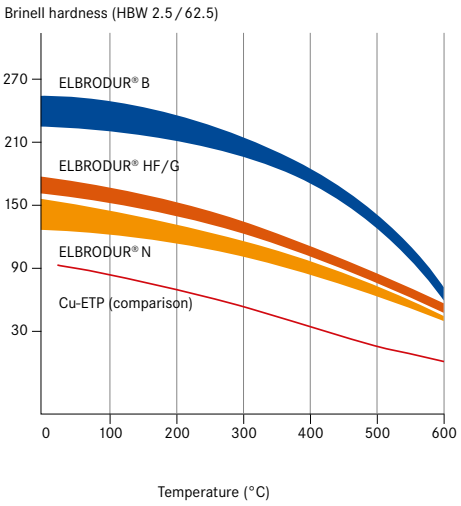
Nominal hardness at elevated temperatures.

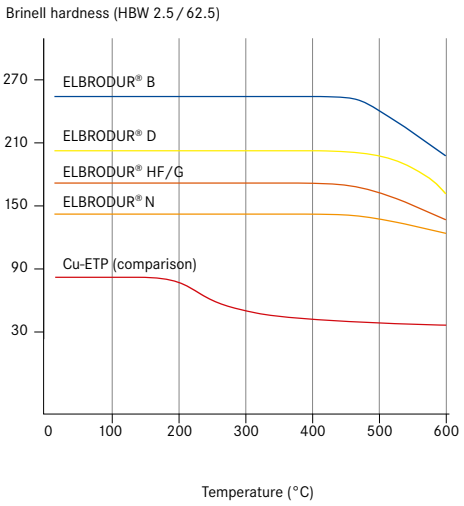
Resistance to softening

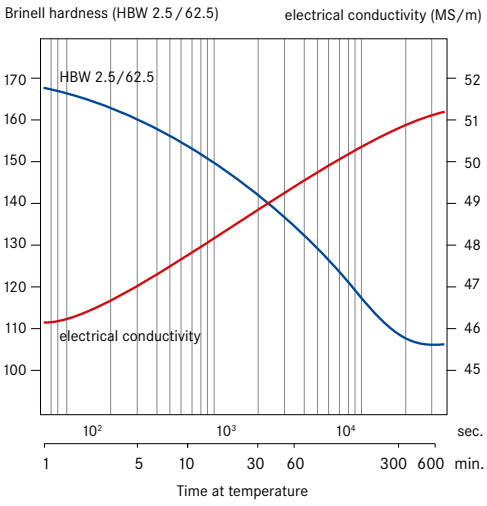
Nominal hardness at ambient temperature after heating for 30 minutes to the temperatures shown.

Resistance to softening

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







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

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

- 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.

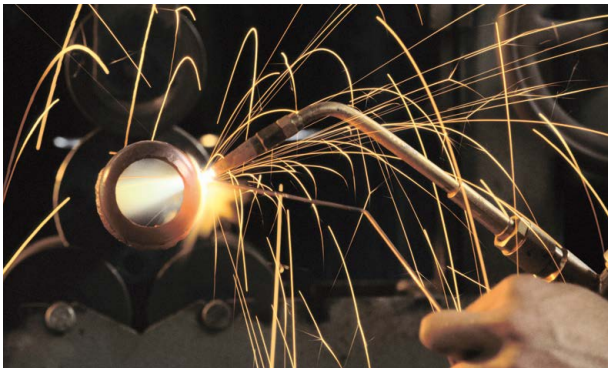
Application standards: resistance welding electrode materials

KME	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

KME		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.*



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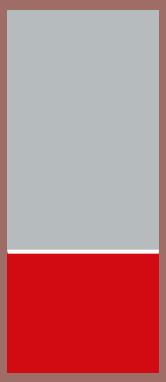
Special Products



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