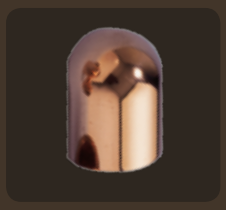
lebronze alloys



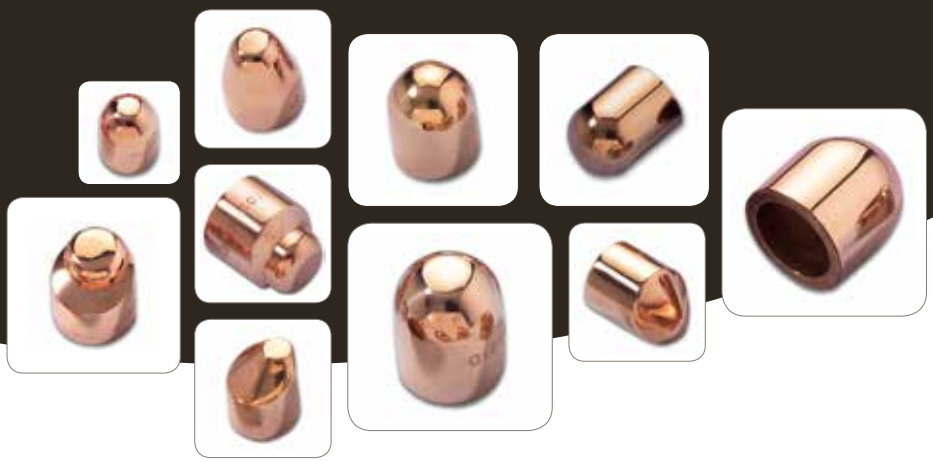
Powerode®

the universal high performance electrode

Powerode®: a dedicated and exclusive process

Lebronze alloys has always been committed to a process of continuous improvement. This allied with a Research & Development programme launched in partnership with specific automotive manufacturers led to the set up of a new dedicated and exclusive patented manufacturing process for the electrodes. The welding performance of Powerode® and its new revolutionary electrodes offers improvements in comparison with the highest standards available within this sector.

Powerode® is available in all cap types for both CuCrZr cold-formed and machined electrodes.



Powerode® positives

▸ Market leading purity

Composition		Standard	Powerode®
% Cr	min	0.45%	0.45%
	max	1.00%	0.80%
% Zr	min	0.03%	0.03%
	max	0.15%	0.09%
Total impurities including Fe + Si	max	0.38%	0.15%

▸ Higher conductivity

Composition		Standard	Powerode®
Resistivity in µΩcm	min		
	average		2.05
	max	2.30	2.15
Conductivity in %IACS	min	75%	80%
	average		85%
	max		
Conductivity in MS / m	min	43.5	46.5
	average		48.8
	max		
Variation within batch			5%

▸ Higher resistance to softening

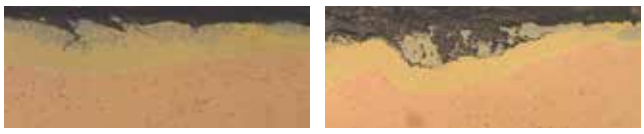
Composition		Standard	Powerode®
Hardness in HV as delivered	min	160	165
	average		175
	max		
	variation within batch		10%
Hardness in HV after heat treatment at 500°C for 8 hours	min	90	125
	average	125	145
	max		
	variation within batch	50%	10%

▸ Self-protecting layer

Whilst welding Powerode® generates a self-protecting layer which inhibits the corrosion of the welding cap.

STANDARD CAPS

No protective layer: "tearing" effect



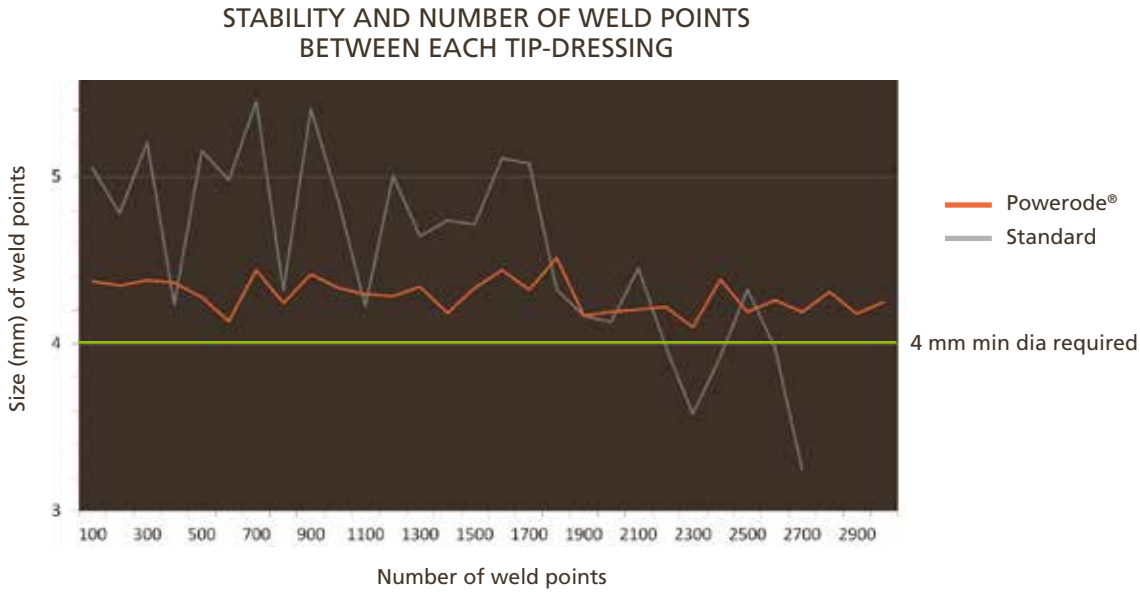
Surface damage requires frequent tip-dressing.

POWERODE® CAPS

Effective and stable protective layer

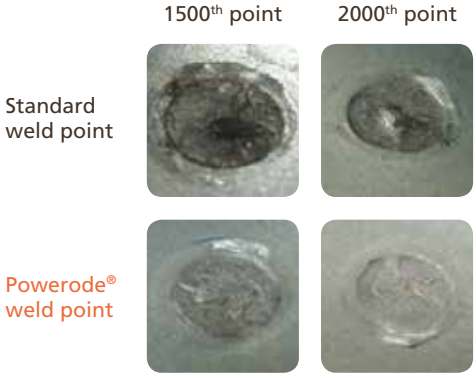
Powerode® properties ensures both tip-dressing and corrosion are reduced.

▸ Stable, repeatable and enhanced results



Unlike standard electrodes, Powerode® guarantees a stable spot size and maintains performance, even when exceeding 2000 points.

▸ Improved aspect and no sticking effect



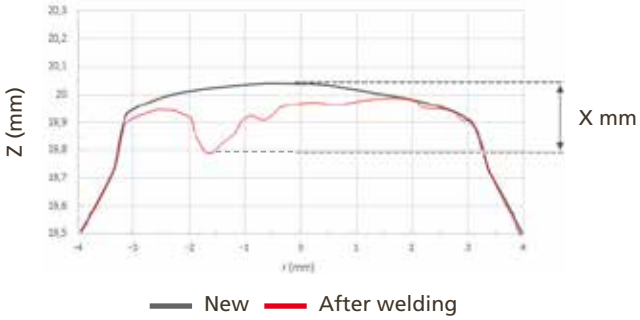
Standard caps: a degradation appears after 1500 spot welds. This effect increases with the number of spots: 50% of spot welds have potential quality issues and risk of sticking increases.

Powerode® caps: weld point remains nice and stable all along life cycle. Risk of sticking is drastically reduced.

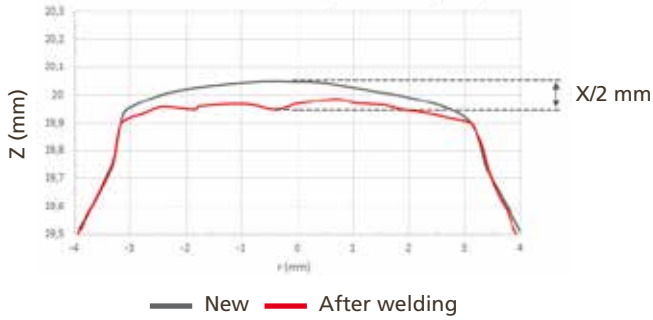
▸ Reduction in tip-dressing

Powerode® inhibits damage to the electrode surface which reduces the amount of material to be removed during dressing.

STANDARD
ELECTRODE EROSION



POWERODE®
ELECTRODE EROSION



Other products for resistance welding applications

- Rods and hollows from 8 to 380 mm OD
- Flats, squares and plates from 10 mm thickness
- Seam welding wheels up to 900 mm OD
- Stamped and machined connectors for welding guns

Experts in resistance welding

For over 50 years, Lebronze alloys has been an international reference in the Automotive industry for resistance welding products. Our expertise, firstly developed in France and Germany, is now recognized in 35 countries. Being a major partner to almost all car builders involves important duties: not only manufacturing high quality alloys and electrodes but also by being a pioneer in innovation.

All our products are manufactured 100% in our own dedicated facilities where melting, casting, extrusion, drawing, heat treatment, machining and cold forming operations, are permanently controlled by our experienced Engineering and Quality Assurance staff. This uniqueness guarantees complete traceability and thus perfect control of quality, and improves the reliability of our supply chain.

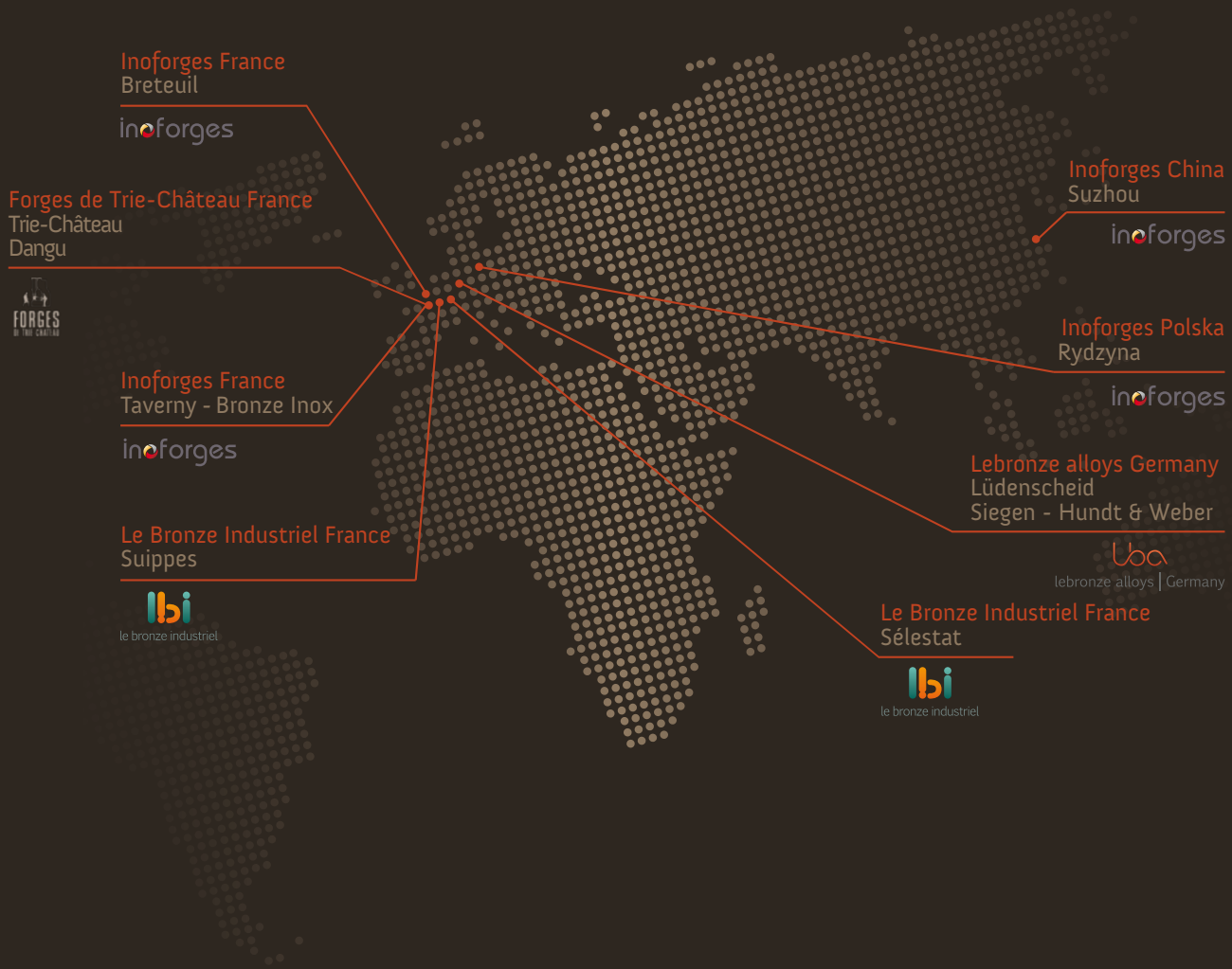
Alloys and Standards

Alloy	Standards *Nearest international standards*	Nominal composition %									Physical properties							Conditions *TER = Quenched, cold worked and aged* *TR = Quenched and aged* *T= Quenched*	Mechanical properties						
																			Tensile strength		Yield strength 0,2% offset		Elongation 5,65 $\sqrt{S}$	Hardness	
		Cu	Cr	Zr	Co	Be	Ni	Fe	Si	Others	Density	Electrical conductivity %IACS	Electrical resistivity at 20°c µΩcm	Thermal conductivity 20° to 200°C W/mk	Coeff. of expension 20° to 200° c x 10^{-6} K^{-1}	Relative magnetic permeability	Young's modulus kN/mm^2		Mpa ≥ ; * = Mpa ≤	ksi ≥ ; * = Mpa ≤	Mpa ≥	ksi ≥	% ≥	HB	HRB
Powerode®	**ASTM: C18100-C18150 MIL 19311 RWMA class 2 SAE CA 184 BS 2874 CC 102 EN 12163, EN 12165, EN 12420, EN 12167 CW106C, CW105C DIN 17666 WN 2.1293 DIN 17672 DIN 44759 NFA 82100 ISO 5182 A2/3 ISO 1336**	Remainder	0,45 to 0,8	0,03 to 0,09				≤ 0,08		≤ 0,2	8,9	≥ 80	≤ 2,15	320	17,5	1,01	120	Cold formed Electrodes 13 ≤Ø≤20 mm - 0,5 in. ≤Ø≤ 0,8 in.						160	
																		Machined Electrodes 10 ≤Ø≤40 mm - 0,40 in. ≤Ø≤ 1,57 in.						150	
																		Round rod 10 ≤ Ø ≤ 25,4 mm - 0,40 in. ≤ Ø ≤ 1 in. Square, flat, hexagone, thickness 10 ≤ Ø ≤ 25,4 mm 0,40 in. ≤ Ø ≤ 1 in. TER condition	480	70	420	61	18	150	
CuCr1Zr CRM16 C18150	**ASTM: C18100-C18150 MIL 19311 RWMA class 2 SAE CA 184 BS 2874 CC 102 EN 12163, EN 12165, EN 12420, EN 12167 CW106C, CW105C DIN 17666 WN 2.1293 DIN 17672 DIN 44759 NFA 82100 ISO 5182 A2/3 ISO 1336**	Remainder	0,4 to 1	0,03 to 0,15				≤ 0,08		≤ 0,2	8,9	≥ 75	≤ 2,3	320	17,5	1,01	120	Round rod 10 ≤ Ø ≤ 25,4 mm - 0,40 in. ≤ Ø ≤ 1 in. Square, flat, hexagone, thickness 10 ≤ Ø ≤ 25,4 mm 0,40 in. ≤ Ø ≤ 1 in. TER condition	480	70	420	61	18	150	
																		Round rod 26 ≤ Ø ≤ 45 mm - 1. in. < Ø ≤ 1,80 in. Square, flat, hexagone, thickness 26 to 60 mm 1,02 in. to 2,4 in. TER condition	480	70	420	61	18	140	
																		Round rod 45 < Ø ≤ 80 mm - 1,80 in. < Ø ≤ 3,15 in. Temper TER	440	64	360	52	18	140	
																		Round rod 20 ≤ Ø ≤ 350 mm - 0,80 in. ≤ Ø ≤ 13,8 in. Square, flat of equivalent section TR condition	350	51	240	35	20	120	
																		Plate 16 ≤ thickness ≤ 250 mm - 0,60 in. ≤ thickness ≤ 10 in. TR condition	380	55	280	41	20	120	
																		Plate 4 ≤ thickness ≤ 10 mm - 0,16 in. ≤ thickness ≤ 0,40 TER condition	400	58	350	51	10	125	
CuCr1Zr CRM16E C18150	**ASTM: C18100-C18150 MIL 19311 RWMA class 2 SAE CA 184 BS 2874 CC 102 EN 12163, EN 12165, EN 12420, EN 12167 CW106C,CW105C DIN 17666 WN 2.1293 DIN 17672 DIN 44759 NFA 82100 ISO 5182 A2/3 ISO 1336**	Remainder	0,4 to 1	0,03 to 0,25				≤ 0,08		≤ 0,2	8,9	≥ 75	≤ 2,3	320	17	1,01	120	Discs and rings TR condition	380	55	280	41	15	130	
CuZr ZR16X C15000	**ASTM: C15000 RWMA class 1 DIN 17666 wn 2.1580 DIN 17672 ISO 5182 A2/4 EN 12163, EN 12167, EN 12420 CW120C**	Remainder		0,15							8,9	≥ 85	≤ 2,05	320	17	1,01	110	TER condition	320	46	280	41	18	120	
CuCo2Be CB4	**BS 2874 CC 112 DIN 17666 wn 2.1285 DIN 17672- DIN 44759 ISO 1187- NFA 82100 *ASTM B441- B534- B 870: C 17500* *MIL 46087- RWMA class 3* *SAE CA 184***	Remainder			2,2	0,5					8,9	≥ 38	≤ 4,5	200	17,5	1,01	130	Section < 1000 mm^2 - < 1,550 $in.^2$ TR or TER condition	700	101	650	94	10	240	
																		Section ≥ 1000 mm^2 - ≥ 1,550 $in.^2$ TR condition	700	101	550	80	15	220	
CuBe2 CBE2 C17200	**ASTM B196: C 17200 AMS 4533: C17200 AMS 4535: C17200 RWMA class 4 QQC 530 DIN 17666, DIN 17672 wn 2.1247 NFL 14709 EN 12163 CW 101C**	Remainder			≥ 0,2	1,8 to 2					8,3	28	6	110	17	1,01	130	Discs 200 ≤ Ø ≤ 400 mm 7,9 in. ≤ Ø ≤ 15,7 in.	1050	152	850	123	2	320	
																		Plate 25 ≤ thickness ≤ 250 1 in. ≤ thickness ≤ 10 in.	1140	165	965	140	2	340	
																		Rods 19,05 ≤ Ø < 50,8 mm 0,75 in. ≤ Ø < 2 in. TER condition	1240	180	1061	154	3	360	
																		Rods 50,8 ≤ Ø ≤ 76,2 mm 2 in. ≤ Ø ≤ 3 in. TER condition	1210	175	1040	151	4	360	
																		Rods 19,05 ≤ Ø ≤ 150 mm 0,75 in. ≤ Ø ≤ 5,9 in. TR condition	1150	167	965	140	4	340	
																		Rods 19,05 ≤ Ø ≤ 150 mm 0,75 in. ≤ Ø ≤ 5,9 in. T condition	570	83			35	150	80
																		Rings TR condition	1050	152	850	123	2	320	
CuNi2Si NS5 C18000	**DIN 17666 wn 2.0855 DIN 17672 wn 2.0855 DIN 44759 cl A3.2 NFL 14-701 ISO 1187 EN 12163, EN 12167, EN 12420, EN 12165 CW111C DTD 498**	Remainder					2,3		0,6		8,8	38	4,5	180	16	1,01	130	Section ≤ 1000 mm^2 - ≤ 1,55 in. TER temper	650	94	590	86	10	≥195	
																		1000 <section ≤ 2800 mm^2 - 1,55 $in.^2$ <section ≤ 4,3 $in.^2$ TR temper	650	94	500	72	10	≥195	
																		2800 <section ≤ 60 000 mm^2 - 4,3 $in.^2$ <section ≤ 93 $in.^2$ TR temper	590	86	440	64	8	≥190	
																		Section> 60 000 mm^2 - section > 93 $in.^2$ TR temper	490	71	340	49	8	≥160	
CuNi2Si NS6 C18000	**RWMA class 3: C18000**	Remainder	0,6				2,3		0,6		8,8	≥ 45	≤ 3,83	180	16	1,01	130	Rods 12,7 ≤ Ø ≤ 25,4 mm - 0,5 in. ≤ Ø ≤ 1 in.	655	95	590	86	9	≥195	≥90
																		Rods 25,4 ≤ Ø ≤ 50,8 mm - 1in. ≤ Ø ≤ 2 in.	650	94	500	72	9	≥195	≥90
																		Rods 50,8 ≤ Ø ≤ 114,3 mm - 2 in. ≤ Ø ≤ 4,5 in.	610	88	500	72	9	≥195	≥90
																		Rods 114,3 ≤ Ø ≤ 381 mm - 4,5 in. ≤ Ø ≤ 15 in.	610	88	345	50	9	≥195	≥90
																		Square, rectangle Section ≥ 500 mm^2 - section ≥ 0,77 $in.^2$, thickness ≤ 25 mm - thickness ≤ 1 in.	655	95	590	86	9	≥195	≥90
																		Square, rectangle Thickness > 25 mm - thickness > 1 in.	610	88	345	50	9	≥195	≥90
																		Forged Plate 19 ≤ thickness ≤ 25 mm - 0,75 in. ≤ thickness ≤ 1 in.	650	94	345	50	9	≥195	≥90
																		Forged plate 25 ≤ thickness ≤ 51 mm - 1 in. ≤ thickness ≤ 2 in.	620	90	345	50	9	≥195	≥90
																		Forged plate Thickness > 51 mm - thickness > 2 in.	610	88	345	50	9	≥195	≥90

lebronze alloys

Lebronze alloys group is established from the integration of different companies specializing mainly in copper alloys but also aluminium alloys and speciality steels.

Thanks to a diversified know-how, the group is today at the heart of heavy industries such as Aerospace, Oil & Gas, Power, Railway but also in sectors manufacturing smaller equipment and products. With about 1,100 employees and 10 complementary facilities, we offer all industrial technologies (foundry, extrusion, forging, hot stamping, wire drawing, machining, centrifugal and sand casting). The group's commitment is to find appropriate and optimized solutions for every sector's requirements.



Contacts

Christophe de Laforcade (Deputy Sales Director) - cdelaforcade@lebronze-alloys.com
Julien Furstoss (Chief Commercial Officer) - jfurstoss@lebronze-alloys.com
contact@lebronze-alloys.com

www.lebronze-alloys.com