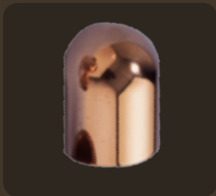




lebronze alloys



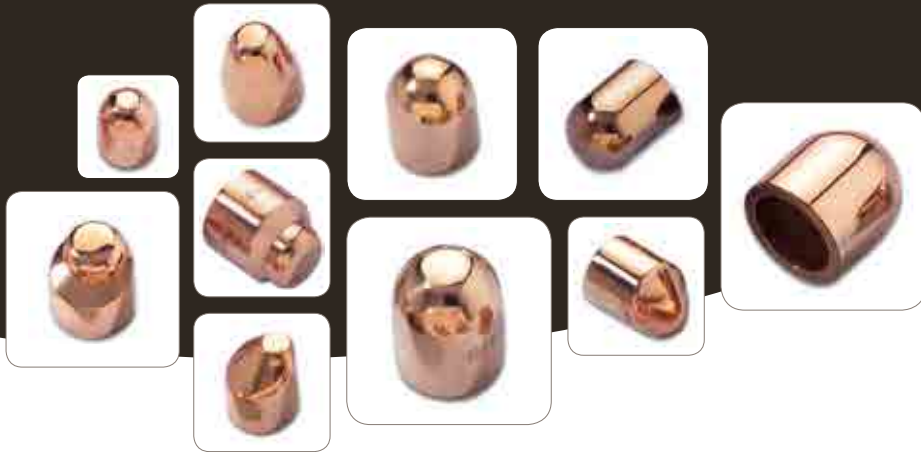
Powerode[®]

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 to our specialist engineering department and qualified TOP SOLID technicians.



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 $\mu\Omega\text{cm}$	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		
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.

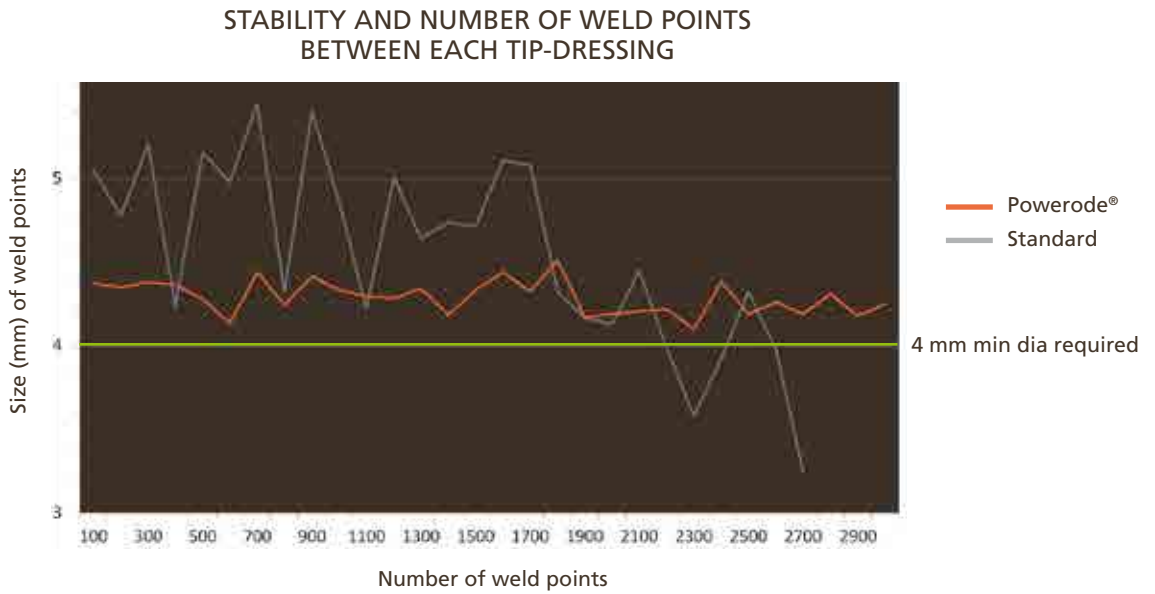
POWERODE® CAPS

Effective and stable protective layer



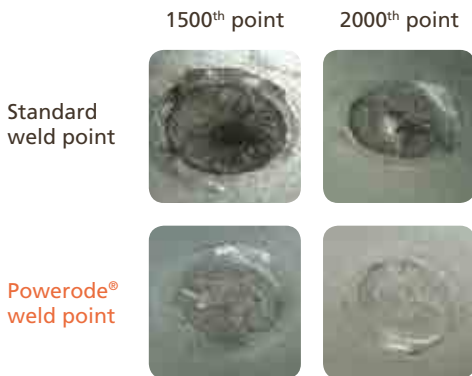
Powerode® properties ensures both tip-dressing and corrosion are reduced.

► 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

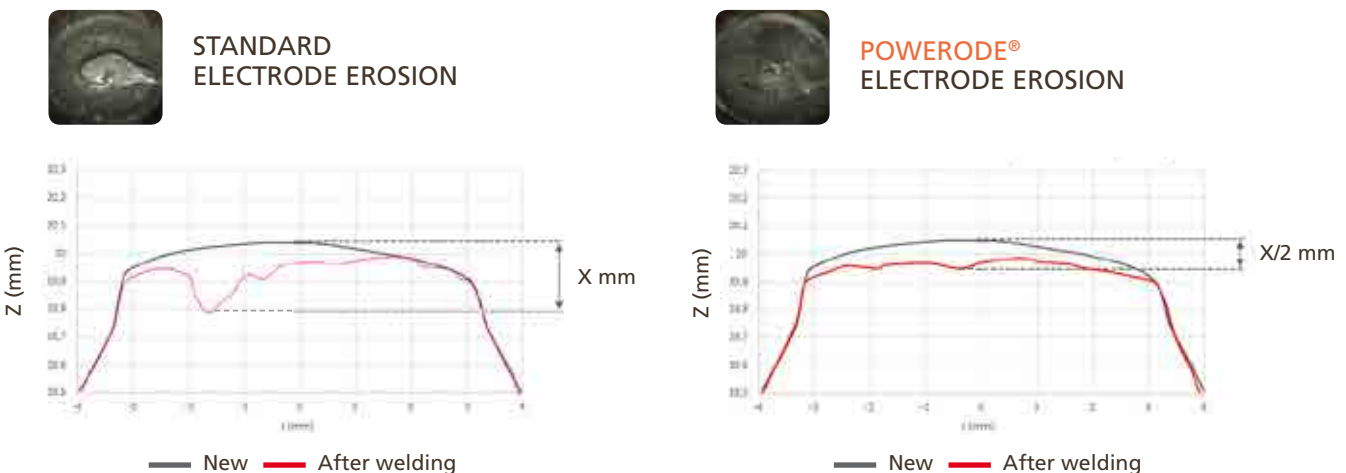


Standard caps: a degradation appears after 1500 spot welds. This effect increases with the number of spots: 50% of spot welds have potential quality issues and risk of sticking increases.

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.



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

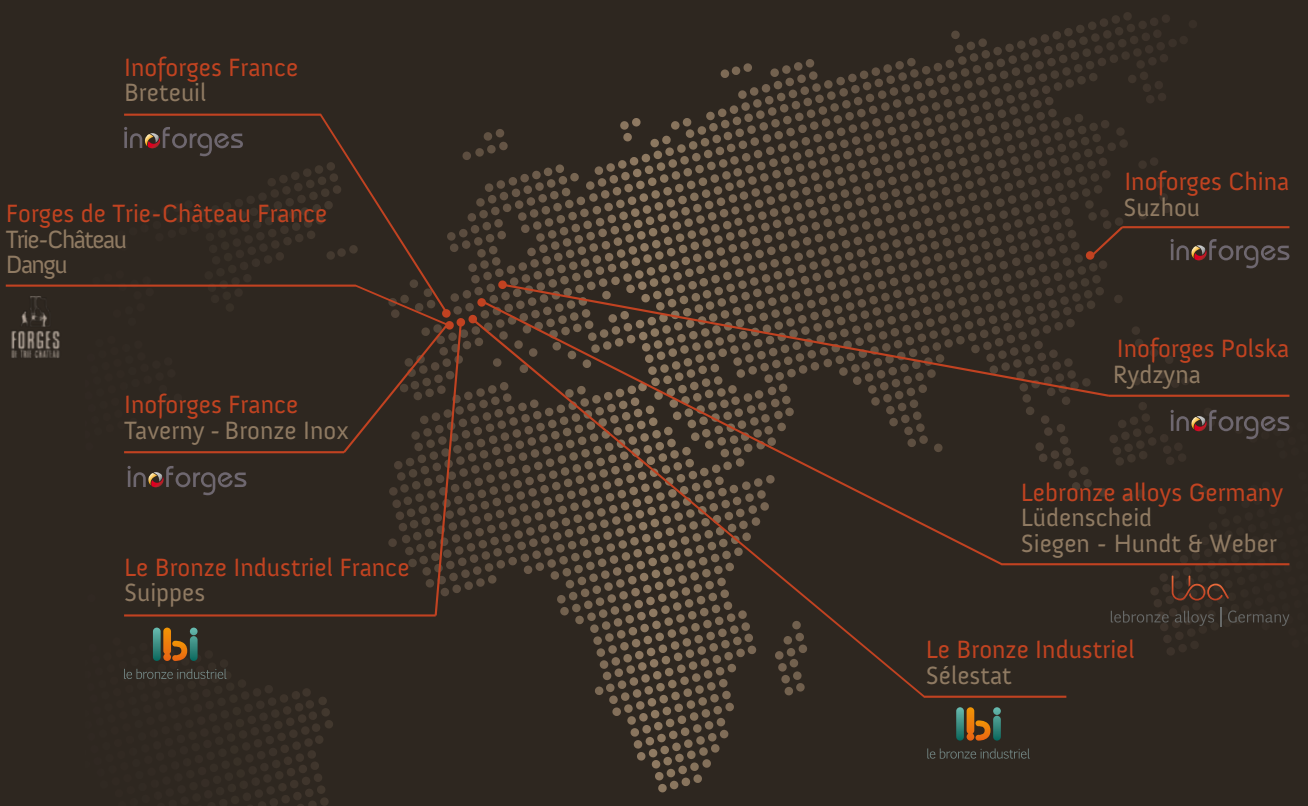
Alloy	Standards <i>Nearest international standards</i>	Nominal composition %										Physical properties						Mechanical properties																					
		Cu	Cr	Zr	Co	Be	Ni	Fe	Si	Others	Density	Electrical conductivity %ACS	Electrical resistivity at 20°c, µΩcm	Thermal conductivity 20° to 200°C W/mk	Coeff. of expansion 20° to 200° c x 10 ⁻⁶ K ⁻¹	Relative magnetic permeability	Young's modulus kN/mm ²	Conditions																					
												TER = Quenched, cold worked and aged TR = Quenched and aged T = Quenched						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	IV	2,15	320	17,5	1,01	120	Cold formed Electrodes 13 ≤ Ø ≤ 20 mm - 0,5 in. ≤ Ø ≤ 0,8 in. Machined Electrodes 10 ≤ Ø ≤ 40 mm - 0,40 in. ≤ Ø ≤ 1,57 in.												160	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								
CuCr12r 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	IV	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								
CuCr12r 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	IV	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	IV	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	IV	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. Plate 25 ≤ thickness ≤ 250 1 in. ≤ thickness ≤ 10 in. Rods 19,05 ≤ Ø ≤ 50,8 mm 0,75 in. ≤ Ø < 2 in. TER condition Rods 50,8 ≤ Ø ≤ 76,2 mm 2 in. ≤ Ø ≤ 3 in. TER condition Rods 19,05 ≤ Ø ≤ 150 mm 0,75 in. ≤ Ø ≤ 5,9 in. TR condition Rods 19,05 ≤ Ø ≤ 150 mm 0,75 in. ≤ Ø ≤ 5,9 in. T condition						1050	152	850	123	2	320	1140	165	965	140	2	340		
																				Rings TR condition						1050	152	850	123	2	320								
																				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 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	Rods 12,7 ≤ Ø ≤ 25,4 mm - 0,5 in. ≤ Ø ≤ 1 in. Rods 25,4 ≤ Ø ≤ 50,8 mm - 1 in. ≤ Ø ≤ 2 in. Rods 50,8 ≤ Ø ≤ 114,3 mm - 2 in. ≤ Ø ≤ 4,5 in. Rods 114,3 ≤ Ø ≤ 381 mm - 4,5 in. ≤ Ø ≤ 15 in.						655	95	590	86	9	≥195	≥90	650	94	500	72	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							
CuNi2Si NS6 C18000	RWMA class 3: C18000	Remainder	0,6			2,3	0,6						8,8	IV	3,83	180	16	1,01	130	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.



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