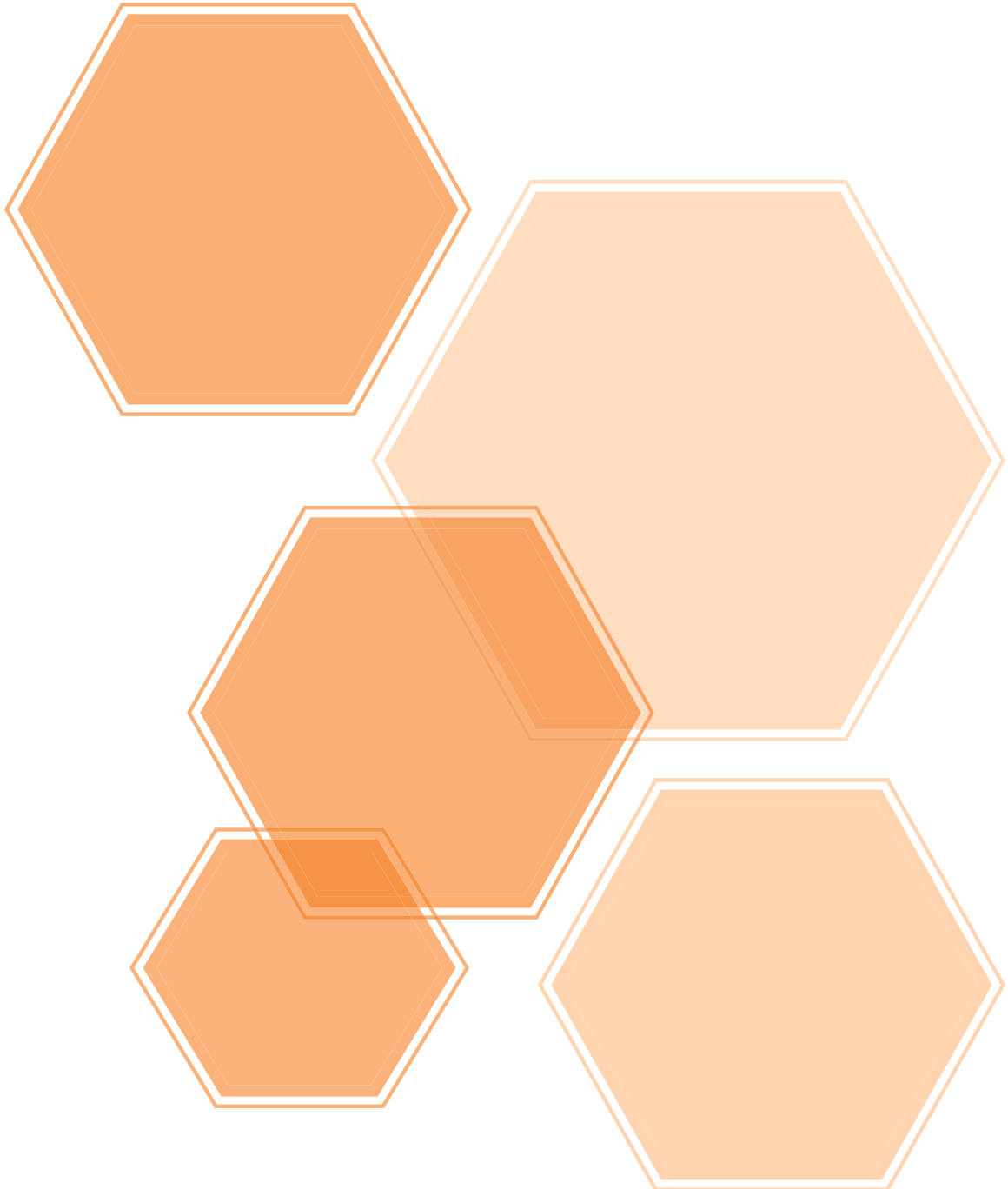


Low Lead Copper Rod Alloys



Working With Copper: Low Lead Copper Rod Alloys

UNS #	Common Name	Machining Index (a)	Chip Type (b)	Cu	Pb	Zn	Sn	Fe	Al
C21000	Gilding, 95%	20	III	94.0 - 96.0 (1)	0.03	Rem.		0.05	
C22000	Commercial Bronze, 90%	20	III	89.0 - 91.0 (1)	0.05	Rem.		0.05	
C22600	Jewelry Bronze, 87.5%	30	III	86.0 - 90.0 (1)	0.05	Rem.		0.05	
C23000	Red Brass, 85%	30	III	84.0 - 86.0 (1)	0.05	Rem.		0.05	
C24000	Low Brass, 80%	30	III	78.5 - 81.5 (1)	0.05	Rem.		0.05	
C26000	Cartridge Brass	30	III	68.5 - 71.5 (2)	0.07	Rem.		0.05	
C26130	Arsenical Cartridge Brass	30	III	68.5 - 71.5 (2)	0.05	Rem.		0.05	
C26200	Cartridge Brass, 68.5%	30	III	67.0 - 70.0 (2)	0.07	Rem.		0.05	
C26800	Yellow Brass, 66%	30	III	64.0 - 68.5 (2)	0.15	Rem.		0.05	
C27000	Yellow Brass, 65%	30	III	63.0 - 68.5 (2)	0.1	Rem.		0.07	
C27450	Plumbing Brass	70	I	60.0 - 65.0	0.25	Rem.		0.35	
C28000	Muntz Metal, 60%	40	II	59.0 - 63.0 (2)	0.3	Rem.		0.07	
C46400	Naval Brass, Uninhibited	30	II	59.0 - 62.0 (3)	0.2	Rem.	.5 - 1.0	0.1	

All element amounts are listed as percentages. Any amounts not listed as a range are considered the maximum allowable amount.

Working With Copper: Low Lead Copper Rod Alloys

Other Named Elements	Soldering (c)	Brazing (c)	Manufacturability	Forging Rating	Plating (d)	Recycling (e)	Other (f)
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Piercing and Punching, Shearing, Spinning, Squeezing and Swaging, Stamping	Listed as "good" in old CDA books		A	
	A	A	Blanking, coining, drawing, etching, forming, heading, upsetting, hot forging, roll threading, knurling, bending, piercing, punching, shearing, spinning, squeezing, swaging, and stamping	Listed as "good" in old CDA books		A	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
.02 - .08 As	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			B	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Coining, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Drawing, Etching, Forming and Bending, Heading and Upsetting, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping			A	
	A	A	Blanking, Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Machining, Shearing	95		A	
	A	A	Blanking, Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Machining, Shearing	90		A	
	A	A	Blanking, Drawing, Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Hot Heading and Upsetting, Machining, Shearing	90		B	

Working With Copper: Low Lead Copper Rod Alloys

UNS #	Common Name	Machining Index (a)	Chip Type (b)	Cu	Pb	Zn	Sn	Fe	Al
C50700	Tin Bronze	20	III	Rem. (4)	0.05		1.5 - 2.0	0.1	
C51000	Phos. Bronze, 5% A	20	III	Rem. (4)	0.05	0.3	4.2 - 5.8	0.1	
C52100	Phos. Bronze, 8% C	20	III	Rem. (4)	0.05	0.2	7.0 - 9.0	0.1	
C61000	Alum. Bronze 7%	30	III	Rem. (4)	0.02	0.2		0.5	6.0 - 8.5
C61400	Alum. Bronze, 7%	30	III	Rem. (4)	0.01	0.2		1.5 - 3.5	6.0 - 8.0
C61800	Alum. Bronze, 10%	40	II	Rem. (4)	0.02	0.02		.5 - 1.5	8.5 - 11.0
C62300	Alum. Bronze, 9%	50	II	Rem. (4)	—		0.6	2.0 - 4.0	8.5 - 10.0
C62400	Alum. Bronze, 10.5%	50	II	Rem. (4)	—		0.2	2.0 - 4.5	10.0 - 11.5
C62500	Alum. Bronze, 13%	20	II	Rem. (4)	—			3.5 - 5.5	12.5 - 13.5
C63000	Nickel-Alum. Bronze, 10%	40	II	Rem. (4)	—	0.3	0.2	2.0 - 4.0	9.0 - 11.0
C63020	Nickel-Manganese-Alum. Bronze, 11%	40	II	74.5 min. (1)	0.03	0.3	0.25	4.0 - 5.5	10.0 - 11.0
C63200	Nickel-Alum. Bronze, 9%	40	III	Rem. (4)	0.02			3.5 - 4.3 (5)	8.7 - 9.5
C64200	Arsenical Silicon-Alum. Bronze, 7%	60	II	Rem. (4)	0.05	0.5	0.2	0.3	6.3 - 7.6
C64700	Silicon-Nickel Bronze	20	III	Rem. (4)	0.1	0.5		0.1	
C65100	Low Silicon Bronze B	30	III	Rem (4)	0.05	1.5		0.8	
C65500	High Silicon Bronze A	30	III	Rem. (4)	0.05	1.5		0.8	
C65600	Silicon Bronze	30	III	Rem. (4)	0.02	1.5	1.5	0.5	0.01
C66800	Non-lead Manganese Bronze	30	II	60.0 - 63.0 (4)	0.5	Rem.	0.3	0.35	0.25
C67000	Manganese Bronze B	30	III	63.0 - 68.0 (4)	0.2	Rem.	0.5	2.0 - 4.0	3.0 - 6.0
C67500	Manganese Bronze A	30	II	57.0 - 60.0 (4)	0.2	Rem.	.5 - 1.5	.8 - 2.0	0.25
C69300	Silicon Brass	70	I	73.0 - 77.0 (4)	0.1	Rem.	0.2	0.1	

All element amounts are listed as percentages. Any amounts not listed as a range are considered the maximum allowable amount.

Working With Copper: Low Lead Copper Rod Alloys

Other Named Elements	Soldering (c)	Brazing (c)	Manufacturability	Forging Rating	Plating (d)	Recycling (e)	Other (f)
0.3 P			Blanking, Drawing, Forming and Bending, Shearing, Stamping			B	
.03 - .35 P	A	A	Blanking, Drawing, Forming and Bending, Heading and Upsetting, Roll Threading and Knurling, Shearing, Stamping			B	
.03 - .35 P	A	A	Blanking, Drawing, Forming and Bending, Shearing, Stamping			B	
.10 Si	C	D	Blanking, Drawing, Forming and Bending, Heading, Maching and Roll Threading	70		B	
1.0 Mn .015 P	D	C	Blanking, Drawing, Forming and Bending, Heading, Machining and Roll Threading			B	
.10 Si	C	B	Drawing, Hot forging, Hot pressing, Machining	50		B	
.50 Mn .25 Si 1.0 Ni	D	C	Bending, Forging, Hot forging, Hot pressing, Machining, Welding	75		B	
.30 Mn .25 Si	D	C	Hot bending, Hot forging, Machining	75		B	
2.0 Mn	D	C	Hot bending, Hot forging, Machining			B	
1.5 Mn .25 Si 4.0 - 5.5 Ni	D	C	Forging, Hot forming, Machining	75		B	
1.5 Mn 4.2 - 6.0 Ni .20 Co	D	C	Forging, Hot forming, Machining			B	
1.2 - 2.0 Mn .10 Si 4.0 - 4.8 Ni	C	C	Forging, Hot forming, Machining, Welding	70		B	
1.0 Mn 1.5 - 2.2 Si .25 Ni .15 As	D	C	Forging, Hot forming, Machining			B	
.40 - .8 Si 1.6 - 2.2 Ni			Forging, Hot forming, Machining			B	
.7 Mn .8 - 2.2 Ni	A	A	Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Roll Threading and Knurling, Squeezing and Swaging			B	
.50 - 1.3 Mn 2.8 - 3.8 Si .6 Ni	B	A	Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Machining, Roll Threading and Knurling, Squeezing and Swaging	40		B	
1.5 Mn 2.8 - 4.0 Si			Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Machining, Roll Threading and Knurling, Squeezing and Swaging			B	
2.0 - 3.5 Mn 0.5 - 1.5 Si .25 Ni	A	A	Hot bending, Hot forging, Machining			B	
2.5 - 5.0 Mn			Hot bending, Hot forging, Machining			B	
.05 - .50 Mn	A	A	Hot Forging and Pressing, Heading and upsetting, Machining	80		B	
2.7 - 3.5 Si .04 - .15 P .10 Ni	A	B	Hot Forging, Forming and Bending, Machining, Shearing	95		B	

Working With Copper: Low Lead Copper Rod Alloys

Footnotes

- (1) Cu + Sum of named elements, 99.8% min.
- (2) Cu + Sum of named elements, 99.7% min.
- (3) Cu + Sum of named elements, 99.6% min.
- (4) Cu + Sum of named elements, 99.5% min.
- (5) Fe content shall not exceed Ni content
- (a) Machinability Index is a generalized comparison of an alloy to C36000, which has a machinability Index of 100. The numbers are for comparison purposes only; changes in machine operations and tooling may give different results.

(b)



Type I alloy (C36000)
produces small, fragmented chips.



Type II alloy (C64200)
produces curly, often brittle chips.



Type III alloy (C18200)
produces long, stringy chips.

- (c) A = Excellent
B = Good
C = Fair
D = Not Suitable
- (d) In general, all copper alloys exhibit good platability characteristics. However, due to the many operational and often proprietary differences in plating systems, an alloy should be tested in the specific system being considered to insure it provides an acceptable appearance.
- (e) A = Can be recycled with other alloys in "typical" recycling stream.
B = Can be recycled into the same alloy but must be segregated from most other alloys during recycling.
NOTE: It is always a good idea to check with a mill or supplier for their specifications and handling requirements for recycled materials.
- (f) Additional information on sources, mechanical properties and physical properties of copper alloys can be found at the Copper Development Association web site www.copper.org

This data sheet has been prepared for the use of engineers, designers and purchasing managers involved in the selection, design or machining of copper rod alloys. It has been compiled from information supplied by testing, research, manufacturing, standards, and consulting organizations that Copper Development Association Inc. believes to be competent sources for such data. However, CDA assumes no responsibility or liability of any kind in connection with the data or its use by any person or organization and makes no representations or warranties of any kind thereby.

Notes

Working With Copper: Low Lead Copper Rod Alloys



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