

# COPPER ALLOY GUIDE

NOTE: This is not a comprehensive listing of all alloys available by Olin Brass. Contact Olin if additional alloys or tempers are required. This information is presented for alloy comparison purposes and is not intended for use as purchase specifications.

OLIN Alloy No.	COPPERS				HIGH PERFORMANCE ALLOYS								BRASSES						Leaded Brasses		
	102	110	122	1093	151	19020	19025	194	195	197	1972	19080	210	220	226	230	240	260	268	350	353
ASTM Spec. No.	B152	B152	B152	B152	B747	B422	B422	B465	B465	B465	B465	B306	B36	B36	B36	B36	B36	B36	B121	B121	
Olin Alloy Name	Oxygen Free Copper	ETP Copper	DHP Copper	Ag Bearing Low O	Olin 151	Olin 19020	Olin 19025	Olin 194	Olin 195	Olin 197	Olin 1972	Olin 19080	Gliding Metal	Commercial Bronze	Jewelry Bronze	Red Brass	Low Brass	Cartridge Brass	Yellow Brass	Med. Lead Brass	High Lead Brass
Nominal Composition	Cu - Min. 99.95	Cu - Min. 99.9 Oxygen .05 max	Cu - Min. P-.015-.040	Cu - Min. 99.9 Ag Min. 13 oz./ton	Cu - 99.9 Zr - .1	Cu - 98.4 Ni - .5 Sn - .05 P - .05	Cu - 98 Ni - .1 Sn - .9 P - .05	Cu - 97.5 Fe - 2.35 Zn - .12	Cu - 97 Fe - 1.5 P - .18 Sn - .8	Cu - 99 Fe - .6 P - .2 Mg - .05	Cu - 99.4 Fe - .3 P - .1 Mg - .13	Cu - 99.2 Cr - .5 Ag - .1 Fe - .08 Ti - .06 Si - .03	Cu - 95 Zn - 5	Cu - 90 Zn - 10	Cu - 87 Zn - 13	Cu - 85 Zn - 15	Cu - 80 Zn - 20	Cu - 70 Zn - 30	Cu - 66 Zn - 34	Cu - 62 Zn - 37 Pb - 1	Cu - 62 Zn - 36 Pb - 2

DENSITY Lbs. per cu. in. at 68°F (x 27.68 = gms/cu. cm at 20°C)	0.323	0.322	0.323	0.322	0.323	0.322	0.322	0.322	0.322	0.319	0.319	0.320	0.320	0.318	0.317	0.316	0.313	0.308	0.306	0.306	0.306
MOD. OF ELAST. x 10 <sup>3</sup> PSI, tension (Kg/mm <sup>2</sup> = KSI x .7031)	17	17	17	17	17	18.8	18.8	17	17	17	17	20.3	17	17	17	17	16	16	15	15	15
ELECT. COND. % IACS at 68°F (20°C) as annealed	101	101	85	101	95	50	40	60	50	80	80	80	56	44	40	37	32	28	27	26	26
THERM. COND. BTU·in. @ 68°F ft <sup>2</sup> ·hr·°F (20°C)	226	226	196	226	208	115	100	150	115	185	185	185	135	109	100	92	81	70	67	67	67
COEF. OF TH. EXP. inches/inch°F x 10 <sup>4</sup> from 68°F to 572°F (20°C to 300°C)	9.8	9.8	9.8	9.8	9.8	9.7	9.7	9.7	9.6	9.6	9.6	9.8	10	10.2	10.3	10.4	10.6	11.1	11.3	11.3	11.3

	TENSILE STRENGTH x 1000 PSI (N/mm <sup>2</sup> = KSI x 6.895) x 1000 PSI (Kg/mm <sup>2</sup> = KSI x .7031)											YIELD STRENGTH x 1000 PSI (Nominal 0.2% offset) (N/mm <sup>2</sup> = KSI x 6.895) x 1000 PSI (Nominal 0.2% offset or range) (Kg/mm <sup>2</sup> = KSI x .7031)																					
	ANNEALED (TM00 / AM)	1/4 HARD (TM01 / 1/4 HM)	1/2 HARD (TM02 / 1/2 HM)	3/4 HARD (TM03)	HARD (TM04 / HM)	EX. HD. (TM05 / SHM)	SPRING (TM06 / XHM)	EX. SPR. (TM08 / XHMS)	37-42	40-45	43-51	47-56	53-62	59-65	64-71	52 Min	51 Min	34-40	37-42	42-52	46-56	50-59	56-64	60-68	61-69	64-72	68-77	72-80	78-87	83-92	89-97	95-104	90-99
	10	32	37	43	46	50	52 Min	13	35	38	50	56	60	66	82 Min	82 Min	10	30	44	48	53	59	63	68	73	78	83	88	93	98	103	108	113

	ELONGATION Nominal % in 2 inches (= % in 50mm)								ROCKWELL B HARDNESS Nominal-.020" gauge and over (Rockwell F, 30T, 15N or H, where noted)																										
	ANNEALED (TM00 / AM)	1/4 HARD (TM01 / 1/4 HM)	1/2 HARD (TM02 / 1/2 HM)	3/4 HARD (TM03)	HARD (TM04 / HM)	EX. HD. (TM05 / SHM)	SPRING (TM06 / XHM)	EX. SPR. (TM08 / XHMS)	23	26	20 Min	45	47	40	45	50	53	52	50	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86
	35	23	20	14	9	4	3	49F	55F	61F	67F	73F	79F	85F	91F	97F	103F	109F	115F	121F	127F	133F	139F	145F	151F	157F	163F	169F	175F	181F	187F	193F	199F	205F	

OLIN Alloy No.	TIN BRASSES			PHOSPHOR BRONZES					HIGH PERFORMANCE ALLOYS					CUPRO-NICKELS		Cu-Ni-Sn		NICKEL SILVERS		
	422	425	4252	510	511	5118	521	5218	544	638	654	688	7025	7035	706	715	725	752	762	770
ASTM Spec. No.	B591	B591	B591	B103	B103	B103	B103	B103	B103	B422	B96	B96	B422	B422	B122	B122	B122	B122	B122	B122
Olin Alloy Name	Lubralloy	Luballoy X	Olin 4252	5% Phos. Bronze	4% Phos. Bronze	4% Mod. Phos. Bronze	8% Phos. Bronze	8% Mod. Phos. Bronze	Lead-Bearing Bronze	Olin 638	Olin 654	Olin 688	Olin 7025	Olin 7035	10% Copper Nickel	30% Copper Nickel	Cu-Ni-Sn	55-18 Nickel Silver	59-12 Nickel Silver	55-18 Nickel Silver
Nominal Composition	Cu - 87.5 Zn - 11.5 Sn - 1	Cu - 88.5 Zn - 9.5 Sn - 2	Cu - 89.5 Zn - 8 Sn - 2.25 Ni - .13 Fe - .13 P - .03	Cu - 94.9 Sn - 5 P - 0.1	Cu - 95.9 Sn - 4 P - 0.1	Cu - 95.5 Sn - 4.2 Fe - .10 Ni - .10 P - .03	Cu - 91.9 Sn - 8 P - 0.1	Cu - 91.8 Sn - 8 Fe - .10 Ni - .10 P - .03	Cu - 89 Sn - 4 Zn - 3	Cu - 95 Al - 2.8 Si - 1.8 Co - 0.4	Cu - 95.4 Si - 3.0 Sn - 1.5 Cr - 0.4	Cu - 73.5 Zn - 22.7 Al - 3.4 Co - 0.4	Cu - 96.2 Ni - 3 Si - .65 Mg - 0.15	Cu - 96.8 Ni - 1.5 Co - 1.1 Si - 0.6	Cu - 88.6 Ni - 10 Fe - 1.4	Cu - 69.4 Ni - 30 Fe - 4	Cu - 66.2 Ni - 9.5 Sn - 2.3	Cu - 65 Zn - 17 Ni - 18	Cu - 59 Zn - 29 Ni - 12	Cu - 55 Zn - 27 Ni - 18

DENSITY Lbs. per cu. in. at 68°F (x 27.68 = gms/cu. cm at 20°C)	0.318	0.317	0.318	0.320	0.320	0.321	0.318	0.318	0.321	0.299	0.309	0.296	0.318	0.318	0.323	0.323	0.321	0.316	0.310	0.314
MOD. OF ELAST. x 10 <sup>3</sup> PSI, tension (Kg/mm <sup>2</sup> = KSI x .7031)	16	16	16	16	16	16	16	16	15	17	17	17	19	19	18	22	20	18	18	18
ELECT. COND. % IACS at 68°F (20°C) as annealed or mill hardened	31	28	30	15	20	20	13	13	19	10	7	18	40	50	9	4.6	11	6	9	5.5
THERM. COND. BTU·in. @ 68°F ft <sup>2</sup> ·hr·°F (20°C)	75	69	75	40	50	50	36	36	50	22	21	47	100	115	26	17	31	19	24	17
COEF. OF TH. EXP. inches/inch°F x 10 <sup>4</sup> from 68°F to 572°F (20°C to 300°C)	10.2	10.2	10.2	9.9	9.9	9.9	10.1	10.1	9.6	9.5	9.7	10.1	9.8	9.8	9.5	9.0	9.2	9.0	9.0	9.3

	TENSILE STRENGTH x 1000 PSI (N/mm <sup>2</sup> = KSI x 6.895) x 1000 PSI (Kg/mm <sup>2</sup> = KSI x .7031)											YIELD STRENGTH x 1000 PSI (Nominal 0.2% offset) (N/mm <sup>2</sup> = KSI x 6.895) x 1000 PSI (Nominal 0.2% offset or range) (Kg/mm <sup>2</sup> = KSI x .7031)												
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	19	37	54	64	71	75	82 Min	24	35	37	48	56	61	68	82	80	92	85-90	19	28	21	25	36	32

	ELONGATION Nominal % in 2 inches (= % in 50mm)								ROCKWELL B HARDNESS Nominal-.020" gauge and over (Rockwell F, 30T, 15N or H, where noted)											
	ANNEALED (TM00 / AM)	1/4 HARD (TM01 / 1/4 HM)	1/2 HARD (TM02 / 1/2 HM)	3/4 HARD (TM03)	HARD (TM04 / HM)	EX. HD. (TM05 / SHM)	SPRING (TM06 / XHM)	EX. SPR. (TM08 / XHMS)	55	47	63	46	33	35	10 Min	35	30 Min	35	35	40
	45	29	16	7	4	2	2 Max	78F	75F	86F	71F	74(30T)	68F	75F	83F	50Max30T	85F	90F	87F	

- Alloys in White use standard English temper designations  
 - Alloys in Blue use standard English temper designations  
 - Alloys in Yellow use either temper in parenthesis ( ).  
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