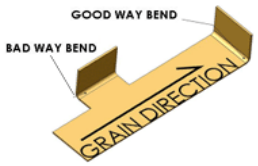
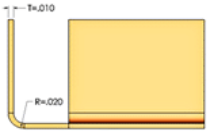
Material Specification and Formability

COOPER ALLOYS I

UNS Number Alloy	Temper	Heat Treatment	Density		Modulus of Elasticity		Yield Strength		See figure I. Formability* Min. R/t for 90° bend		Elect. Cond. % IACS at 68° F	Thermal Conductiv.	Elongation
			lb/in^3	g/cm^3	10^4 psi	10^3 kg/mm^3	ksi	Kg/mm^2	Goog	Bad.			
C101	Soft	-	0.323	8.9	-	17	26-38	-	0	0	-	-	35
	½ H	-	0.323	8.9	-	17	37-46	-	0	0.5	-	-	20
	H	-	0.323	8.9	-	17	43-50	-	1	2	-	-	8
	EH	-	0.323	8.9	-	17	47-56	-	2	3	-	-	3
	SH	-	0.323	8.9	-	17	50-58	-	3	-	-	-	3
	ES	-	0.323	8.9	-	17	min 52	-	-	-	-	-	2
C102	Soft	-	0.323	8.9	-	17	26-38	-	0	0	101	226	35
	½ H	-	0.323	8.9	-	17	37-46	-	0	0.5	101	226	20
	H	-	0.323	8.9	-	17	43-50	-	1	2	101	226	8
	EH	-	0.323	8.9	-	17	47-56	-	2	3	101	226	3
	SH	-	0.323	8.9	-	17	50-58	-	3	-	101	226	3
	ES	-	0.323	8.9	-	17	min 52	-	-	-	101	226	2
C104	Soft	-	0.323	8.9	-	17	26-38	-	0	0	-	226	35
	½ H	-	0.323	8.9	-	17	37-46	-	0	0.5	-	226	20
	H	-	0.323	8.9	-	17	43-50	-	1	2	-	226	8
	EH	-	0.323	8.9	-	17	47-56	-	2	3	-	226	3
	SH	-	0.323	8.9	-	17	50-58	-	3	-	-	226	3
	ES	-	0.323	8.9	-	17	min 52	-	-	-	-	226	2
C 110	Soft	-	0.322	8.9	-	17	26-38	-	0	0	-	226	35
	½ H	-	0.322	8.9	-	17	37-46	-	0	0.5	-	226	20
	H	-	0.322	8.9	-	17	43-50	-	1	2	-	226	8
	EH	-	0.322	8.9	-	17	47-56	-	2	3	-	226	3
	SH	-	0.322	8.9	-	17	50-58	-	3	-	-	226	3
	ES	-	0.323	8.9	-	17	min 52	-	-	-	-	226	2
C 122	AM	-	0.323	8.9	-	17	26-38	-	-	-	85	196	35
	¼ HM	-	0.323	8.9	-	17	34-42	-	-	-	85	196	23
	½ HM	-	0.323	8.9	-	17	37-46	-	-	-	85	196	20
	HM	-	0.323	8.9	-	17	43-52	-	-	-	85	196	9
	SHM	-	0.323	8.9	-	17	47-56	-	-	-	85	196	4
	XHM	-	0.323	8.9	-	17	50-58	-	-	-	85	196	3
	XHMS	-	0.323	8.9	-	17	min 52	-	-	-	85	196	max 3
C 1091	Soft	-	0.323	8.9	-	17	26-38	-	0	0	100	226	35
	½ H	-	0.323	8.9	-	17	37-46	-	0	0.5	100	226	20
	H	-	0.323	8.9	-	17	43-50	-	1	2	100	226	8
	EH	-	0.323	8.9	-	17	47-56	-	2	3	100	226	3
	SH	-	0.323	8.9	-	17	50-58	-	3	-	100	226	3
	ES	-	0.323	8.9	-	17	min 52	-	-	-	100	226	2
C 1093	Soft	-	0.322	8.9	-	17	26-38	-	-	-	101	226	35
	½ H	-	0.322	8.9	-	17	34-42	-	-	-	101	226	20
	H	-	0.322	8.9	-	17	37-46	-	-	-	101	226	8
	EH	-	0.322	8.9	-	17	47-56	-	-	-	101	226	3
	SH	-	0.322	8.9	-	17	50-58	-	-	-	101	226	3
	ES	-	0.322	8.9	-	17	min 52	-	-	-	101	226	2

FIGURE I





FORMABILITY RATIO = RADIUS/THICKNESS
.020/.010 = 2

FIGURE I

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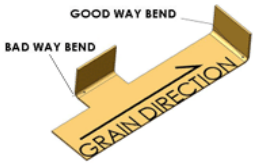
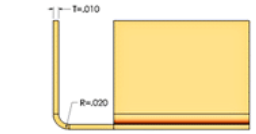
Material Specification and Formability

COOPER ALLOYS II

UNS Number Alloy	Temper	Heat Treatment	Density		Modulus of Elasticity		Yield Strength		See figure I. Formability* Min. R/t for 90° bend		Elect. Cond. % IACS at 68° F	Thermal Conductiv.	Elongation
			lb/in^3	g/cm^3	10^4 psi	10^3 kg/mm^3	ksi	Kg/mm^2	Good	Bad			
C17200 Brush Alloy 25 Beryllium Cooper	A	As Rolled	0.298	8.25	19	13.5	30-55	21-39	0	0	-	-	-
	¼ H	As Rolled	0.298	8.25	19	13.5	60-80	42-57	0	0	-	-	-
	½ H	As Rolled	0.298	8.25	19	13.5	75-95	52-67	0.5	1	-	-	-
	H	As Rolled	0.298	8.25	19	13.5	90-115	63-81	1	2.9	-	-	-
	AT	3hr. at 600 F (315 C)	0.302	8.36	19	13.5	140-175	98-124	-	-	-	-	-
	¼ HT	3hr. at 600 F (315 C)	0.302	8.36	19	13.5	150-185	105-130	-	-	-	-	-
	½ HT	2hr. at 600 F (315 C)	0.302	8.36	19	13.5	160-195	112-138	-	-	-	-	-
	HT	2hr. at 600 F (315 C)	0.302	8.36	19	13.5	165-205	116-145	-	-	-	-	-
C17200 Brush Alloy 190 Beryllium Cooper	AM	Mill Hardened	0.302	8.36	19	13.5	70-95	49-67	0	0	-	-	-
	¼ HM	Mill Hardened	0.302	8.36	19	13.5	80-110	56-78	0.5	0.5	-	-	-
	½ HM	Mill Hardened	0.302	8.36	19	13.5	95-125	66-88	0.5	1	-	-	-
	HM	Mill Hardened	0.302	8.36	19	13.5	110-135	77-95	2	2	-	-	-
	SHM	Mill Hardened	0.302	8.36	19	13.5	125-140	87-99	2.8	3.2	-	-	-
	XHM	Mill Hardened	0.302	8.36	19	13.5	135-170	94-120	4	5	-	-	-
	XHMS	Mill Hardened	0.302	8.36	19	13.5	150-180	105-127	5	10	-	-	-
C17200 Brushform 290 Beryllium Cooper	TM00	Mill Hardened	0.302	8.36	19	13.5	75-95	52-67	0	0	-	-	-
	TM02	Mill Hardened	0.302	8.36	19	13.5	95-115	66-81	0	0	-	-	-
	TM04	Mill Hardened	0.302	8.36	19	13.5	115-135	80-95	1	1	-	-	-
	TM06	Mill Hardened	0.302	8.36	19	13.5	135-155	94-109	2.5	2	-	-	-
	TM08	Mill Hardened	0.302	8.36	19	13.5	155-175	108-124	3.5	3	-	-	-
C17000 Brush Alloy 165 Beryllium Cooper	A	As Rolled	0.3	8.3	19	13.5	28-55	19-39	0	0	-	-	-
	¼ H	As Rolled	0.3	8.3	19	13.5	60-80	42-57	0	0	-	-	-
	½ H	As Rolled	0.3	8.3	19	13.5	75-95	52-67	0.5	1	-	-	-
	H	As Rolled	0.3	8.3	19	13.5	90-115	63-81	1	2.9	-	-	-
	AT	3hr. at 600 F (315 C)	0.304	8.41	19	13.5	130-165	91-117	-	-	-	-	-
	¼ HT	2hr. at 600 F (315 C)	0.304	8.41	19	13.5	135-175	94-124	-	-	-	-	-
	½ HT	2hr. at 600 F (315 C)	0.304	8.41	19	13.5	150-180	105-127	-	-	-	-	-
	HT	2hr. at 600 F (315 C)	0.304	8.41	19	13.5	155-180	108-127	-	-	-	-	-
	AM	Mill Hardened	0.304	8.41	19	13.5	70-95	49-67	1	1	-	-	-
	¼ HM	Mill Hardened	0.304	8.41	19	13.5	80-110	56-78	1.5	1.7	-	-	-
	½ HM	Mill Hardened	0.304	8.41	19	13.5	95-125	66-88	1.9	2.2	-	-	-
	HM	Mill Hardened	0.304	8.41	19	13.5	110-135	77-95	3.8	5.1	-	-	-
	SHM	Mill Hardened	0.304	8.41	19	13.5	125-140	87-99	5	7.7	-	-	-
	XHM	Mill Hardened	0.304	8.41	19	13.5	135-165	94-117	6.1	10.4	-	-	-
C17510 Brush Alloy 3 Beryllium Cooper	A	As Rolled	0.319	8.83	20	14	20-45	14-32	0	0	-	-	-
	H	As Rolled	0.319	8.83	20	14	55-80	38-57	0.5	0.5	-	-	-
	AT	3hr. at 900 F (480 C)	0.319	8.83	20	14	80-100	56-71	1	1	-	-	-
	HT	2hr. at 900 F (480 C)	0.319	8.83	20	14	95-120	66-85	2	2	-	-	-
	HTR	Mill Hardened	0.319	8.83	20	14	110-140	77-99	2.8	3.5	-	-	-
	HTC	Mill Hardened	0.319	8.83	20	14	50-75	35-53	1	1	-	-	-
C17410 Brush Alloy 174 Beryllium Cooper	½ HT	Mill Hardened	0.318	8.8	20	14	80-100	56-70	0.5	0.5	-	-	-
	HT	Mill Hardened	0.318	8.8	20	14	100-120	70-84	1.2	5	-	-	-
C17510 Brush Alloy 3 Beryllium Cooper	A	As Rolled	0.319	8.83	20	14	20-45	14-32	0	0	-	-	-
	H	As Rolled	0.319	8.83	20	14	55-80	38-57	0.5	0.5	-	-	-
	AT	3hr. at 900 F (480 C)	0.319	8.83	20	14	80-100	56-71	1	1	-	-	-
	HT	2hr. at 900 F (480 C)	0.319	8.83	20	14	95-120	66-85	2	2	-	-	-
	HTR	Mill Hardened	0.319	8.83	20	14	110-140	77-99	2.8	3.5	-	-	-
	HTC	Mill Hardened	0.319	8.83	20	14	50-75	35-53	1	1	-	-	-
C17410 Brush Alloy 174	½ HT	Mill Hardened	0.318	8.8	20	14	80-100	56-70	0.5	0.5	-	-	-
	HT	Mill Hardened	0.318	8.8	20	14	100-120	70-84	1.2	5			

FIGURE I





FORMABILITY RATIO = RADIUS/THICKNESS
.020/.010 = 2

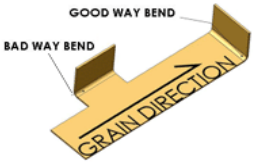
FIGURE I

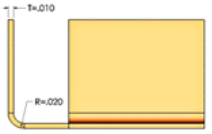
Material Specification and Formability

BRASS ALLOYS I

UNS Number Alloy	Temper	Heat Treatment	Density		Modulus of Elasticity		Yield Strength		See figure I. Formability* Min. R/t for 90° bend		Elect. Cond. % IACS at 68° F	Thermal Conductiv.	Elongation
			lb/in^3	g/cm^3	10^4 psi	10^3 kg/mm^3	ksi	Kg/mm^2	Good	Bad			
C 210 (Cu95Zn5)	Soft	-	0.32	8.9	-	17	34-40	-	0	0	56	135	45
	½ H	-	0.32	8.9	-	17	42-52	-	0	0	56	135	17
	H	-	0.32	8.9	-	17	50-59	-	0	0	56	135	5
	EH	-	0.32	8.9	-	17	56-64	-	0.5	1	56	135	2
	SH	-	0.32	8.9	-	17	60-68	-	1	2	56	135	2
	ES	-	0.32	8.9	-	17	61-69	-	1.5	3	56	135	1
C 220 (Cu90Zn10)	Soft	-	0.318	8.8	-	17	34-42	-	0	0	44	109	47
	½ H	-	0.318	8.8	-	17	47-57	-	0	1	44	109	12
	H	-	0.318	8.8	-	17	57-66	-	0.5	2	44	109	4
	EH	-	0.318	8.8	-	17	64-72	-	1	3	44	109	4
	SH	-	0.318	8.8	-	17	69-77	-	1.5	-	44	109	1
	ES	-	0.318	8.8	-	17	72-80	-	1.5	-	44	109	1
C 226 (Cu87Zn13)	Soft	-	0.317	-	-	17	37-45	-	0	0	40	100	-
	½ H	-	0.317	-	-	17	49-59	-	0	1	40	100	-
	H	-	0.317	-	-	17	60-69	-	0.5	2	40	100	-
	EH	-	0.317	-	-	17	69-77	-	1	3	40	100	-
	SH	-	0.317	-	-	17	75-83	-	1.5	-	40	100	-
	ES	-	0.317	-	-	17	79-86	-	1.5	-	40	100	-
C 230 (Cu85Zn15)	Soft	-	0.316	8.75	-	17	39-47	-	0	0	37	92	45
	½ H	-	0.316	8.75	-	17	51-61	-	0	0	37	92	18
	H	-	0.316	8.75	-	17	63-72	-	0	1.5	37	92	7
	EH	-	0.316	8.75	-	17	72-80	-	1.5	-	37	92	4
	SH	-	0.316	8.75	-	17	78-86	-	2.5	-	37	92	3
	ES	-	0.316	8.75	-	17	89-90	-	-	-	37	92	1
C 240 (Cu80Zn20)	Soft	-	0.313	8.7	-	16	44-54	-	0	0	32	81	50
	½ H	-	0.313	8.7	-	16	55-65	-	0	0	32	81	18
	H	-	0.313	8.7	-	16	68-77	-	0	0	32	81	4
	EH	-	0.313	8.7	-	16	78-87	-	0.5	1.5	32	81	2
	SH	-	0.313	8.7	-	16	85-93	-	1.5	-	32	81	1
	ES	-	0.313	8.7	-	16	89-97	-	3	-	32	81	1
C 260 (Cu70Zn30)	Soft	-	0.308	8.55	-	16	45-61	-	0	0	28	70	53
	½ H	-	0.308	8.55	-	16	57-67	-	0	0	28	70	32
	H	-	0.308	8.55	-	16	71-81	-	0	1.5	28	70	13
	EH	-	0.308	8.55	-	16	83-92	-	1.5	2.5	28	70	5
	SH	-	0.308	8.55	-	16	91-100	-	-	-	28	70	3
	ES	-	0.308	8.55	-	16	95-104	-	-	-	28	70	2
C 268 (Cu66Zn34)	Soft	-	0.306	-	-	15	44-61	-	-	-	27	67	52
	½ H	-	0.306	-	-	15	55-65	-	-	-	27	67	36
	H	-	0.306	-	-	15	68-78	-	-	-	27	67	19
	EH	-	0.306	-	-	15	79-89	-	-	-	27	67	7
	SH	-	0.306	-	-	15	86-95	-	-	-	27	67	5
	ES	-	0.306	-	-	15	90-99	-	-	-	27	67	max 5
C26000 Brass	H	Not Age Hardenable	0.308	8.53	16	11.3	60-75	42-53	1	1.5	28	69	-

FIGURE I





FORMABILITY RATIO = RADIUS/THICKNESS
.020/.010 = 2

FIGURE I

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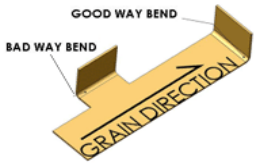
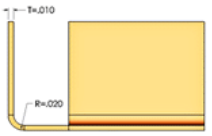
Material Specification and Formability

BRASS ALLOYS II

UNS Number Alloy	Temper	Heat Treatment	Density		Modulus of Elasticity		Yield Strength		See figure I. Formability* Min. R/t for 90° bend		Elect. Cond. % IACS at 68° F	Thermal Conductiv.	Elongation
			lb/in^3	g/cm^3	10^4 psi	10^3 kg/mm^3	ksi	Kg/mm^2	Good	Bad			
C 350 (Cu62Zn37Pb1)	Soft	-	0.306	-	-	15	47-59	-	0	0	27	-	-
	½ H	-	0.306	-	-	15	55-65	-	0	0	27	-	-
	H	-	0.306	-	-	15	62-72	-	0	1.5	27	-	-
	EH	-	0.306	-	-	15	79-89	-	1.5	2.5	27	-	-
	SH	-	0.306	-	-	15	86-95	-	-	-	27	-	-
	ES	-	0.306	-	-	15	90-99	-	-	-	27	-	-
C 353 (Cu62Zn36Pb2)	Soft	-	0.306	-	-	15	46-54	-	0	0	27	-	-
	½ H	-	0.306	-	-	15	55-65	-	0	0	27	-	-
	H	-	0.306	-	-	15	68-78	-	0	1.5	27	-	-
	EH	-	0.306	-	-	15	79-89	-	1.5	2.5	27	-	-
	SH	-	0.306	-	-	15	86-95	-	-	-	27	-	-
	ES	-	0.306	-	-	15	90-99	-	-	-	27	-	-
C 411 (Cu91Zn8Sn5)	Soft	-	0.318	8.8	-	16	38-44	-	-	-	32	75	43
	½ H	-	0.318	8.8	-	16	49-60	-	-	-	32	75	13
	H	-	0.318	8.8	-	16	61-72	-	-	-	32	75	6
	EH	-	0.318	8.8	-	16	67-78	-	-	-	32	75	4
	SH	-	0.318	8.8	-	16	73-83	-	-	-	32	75	3
	ES	-	0.318	8.8	-	16	min 78	-	-	-	32	75	max 2
C 422 (Cu87.5Zn11.5Sn1)	Soft	-	0.318	8.8	-	16	41-49	-	-	-	31	75	45
	½ H	-	0.318	8.8	-	16	54-65	-	-	-	31	75	16
	H	-	0.318	8.8	-	16	67-79	-	-	-	31	75	4
	EH	-	0.318	8.8	-	16	75-85	-	-	-	31	75	2
	SH	-	0.318	8.8	-	16	82-92	-	-	-	31	75	2
	ES	-	0.318	8.8	-	16	min 88	-	-	-	31	75	max2
C 425 (Cu88.5Zn9.5Sn2)	Soft	-	0.316	8.55	-	16	41-47	-	0	0	28	69	48
	½ H	-	0.316	8.75	-	16	57-69	-	0	0	28	69	20
	H	-	0.316	8.75	-	16	70-82	-	0	1	28	69	6
	EH	-	0.316	8.75	-	16	76-88	-	0	1	28	69	4
	SH	-	0.316	8.75	-	16	84-94	-	1	2	28	69	3
	ES	-	0.316	8.75	-	16	min 92	-	-	-	28	69	2
C 4252 (Cu89.5Zn8Sn2.25Ni13 Fe.13P.03)	Soft	-	0.318	8.8	-	16	-	-	-	-	30	75	-
	½ H	-	0.318	8.8	-	16	58-73	-	-	-	30	75	20
	H	-	0.318	8.8	-	16	76-91	-	-	-	30	75	10
	EH	-	0.318	8.8	-	16	88-103	-	-	-	30	75	6
	SH	-	0.318	8.8	-	16	95-110	-	-	-	30	75	4
	ES	-	0.318	8.8	-	16	100-114	-	-	-	30	75	3

FIGURE I





FORMABILITY RATIO = RADIUS/THICKNESS
.020/.010 = 2

FIGURE I

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