



MILLER STANDARD ALLOY GUIDE

DIEHL Metal

	Cu-Iron	Brass		Tin-Brass	Phosphor Bronze					
ALLOY NO.	194	260	268	425	505	510	511	519	521	524
ASTM Spec No.	B465	B36	B36	B591	B508	B103	B103	B103	B103	B103
MILLER ALLOY NAME & NOMINAL COMPOSITION	194 Cu 97.5% Fe 2.35% P .03% Zn .12%	Cartridge Brass Cu70 Zn30	Yellow Brass Cu 66 Zn 34	Cu 88.5% Zn 9.5% Sn 2%	Phos Bronze Grade E Cu 98.65% Sn 1.45% P 0.1%	Phosphor Bronze 5 % 94.9 Cu 5 Sn 0.1 P Grade A	Phosphor Bronze 4% 95.9 Cu 4 Sn 0.1 P	Phosphor Bronze 6% 93.9 Cu 6 Sn 0.1 P	Phosphor Bronze 8% 91.9 Cu 8 Sn 0.1 P Grade C	Phosphor Bronze 10%-D Cu 90% Sn 10% P .19%

DENSITY Lbs. per cu in. at 68F(x27.68=gms/cu cm at 20°C)	.322	.308	.306	.317	.321	.320	.320	.318	.318	.317
MOD. OF ELAST. x 10 ⁶ PSI, tension (Kgf/mm ² =KSlx.7031)	17	16	15	16	17	16	16	17	16	16
ELECT. COND. % IACS AT 68°F (20°C) as annealed	70	28	27	28	48	15	20	15	13	11
THERM. COND. BTU per sq. ft. per ft. per hr. per °F at 68°F.(20°C)	150	70	67	69	120	40	48.4	35	36	29
COEF. OF TH. EXP. Inches/inch/°F x 10 ⁻⁶ from 68°F to 572°F (20°C to 300°C)	9.8	11.1	11.3	10.2	9.9	9.9	9.9	10.1	10.1	10.2

TENSILE STRENGTH x 1000 PSI (Kgf/mm² = KSI x .7031) **AND YIELD STRENGTH** x 1000 PSI (0.2% offset) Kgf/mm² = KSI x .7031)

ANNEALED	40-63	45-61	44-61	41-47	38-42	46-56	46-54	48-60	56-65	55-75
	16-59	10-33	13-34	13-22	9-17	19-29	16-28	28-40	23-35	
1/4 HARD		49-59	49-59	49-59	41-51	49-61	46-58	53-66	63-75	
		21-46	24-44	20-54	15-46	22-52	20-50	40-55	35-62	
1/2 HARD	53-63	57-67	55-65	57-69	48-58	58-73	55-70	61-76	69-84	76-91
	36-55	42-60	35-53	51-66	37-57	47-68	42-70	55-70	51-75	50-60
3/4 HARD		64-74	62-72	62-74	54-64	68-79	67-82	72-86	80-92	
		55-69	46-60	58-70	51-63	61-75	64-80	67-83	70-85	
HARD	60-70	71-81	68-78	70-82	59-69	76-91	72-87	78-93	85-100	94-109
	53-68	67-78	50-64	66-79	58-67	74-88	70-83	73-90	78-95	
EX. HD.	67-73	83-92	79-89	76-88	65-75	88-103	84-99	91-106	97-112	107-122
	64-71	79-87	64-70	73-85	64-73	85-102	81-96	88-103	92-107	
SPRING	70-76	91-100	86-95	84-94	70-79	95-110	91-105	98-113	105-119	115-129
	67-74	82-91	69-73	81-99	68-77	92-108	88-101	96-111	100-113	
EX. SPR.	73-80	95-104	90-99	92 Min	75-84	100-114	96-109	102-117	110-122	120-133
	70-77	86-93	71-76	87 Min	73-82	98-110	92-104	100-115	105-116	

ELONGATION % in 2 inches (= % in 50mm) **AND ROCKWELL B HARDNESS**.020" gauge and over (Rockwell F or 30 T where noted)

ANNEALED	10-36	40-67	35-70	47-49	43-46	48-62	45-49	50-60	60-67	
		57-94F	63-87F	65-79F	61-77F	73-83F	69-82F		82-91F	
1/4 HARD		34-59	33-52	24-47	19-48	32-50	25-47	35-55	40-60	
		40-65	40-65	46-73	35-62	45-75	23-70		64-85	
1/2 HARD	6-29	19-42	28-45	13-27	8-26	10-38	12-31	50-67	25-49	
	49-70	60-77	57-74	67-83	52-68	60-85	53-81		69-91	
3/4 HARD		8-25	15-35	10-21	4-15	10-20	6-15	12-16	18-32	
		72-82	70-80	74-84	63-73	76-89	69-88		83-96	
HARD	3-11	6-14	10-28	6-13	3-8	9-11	2-12	8-11	12-30	
	67-76	79-86	76-84	81-90	69-78	84-93	80-90		89-97	
EX. HD.	2-3	2-5	5-9	5-8	2-4	2-6	1-6	2-5	10-17	
	72-77	85-91	83-89	86-94	74-81	89-96	86-94		93-100	
SPRING	2-3	1-2	5-6	3-5	2-3	1-3	1-5	3 NOM	3-9	
	73-79	89-93	87-92	89-95	78-84	92-98	88-96		95-102	
EX. SPR.	2 Max	1-2	5 Max	2 Max	1-2	1-3	1-4	1 NOM	2-6	
	75-80	91-95	88-93	92 Min	81-86	94-99	89-97		96-103	

Phone: 800-243-3120 FAX: 203-634-6926 Website: www.themillerco.com

This information serves as a guide to alloy specifications and is not necessarily provided to serve as material specifications for any given part. Diehl assumes no responsibility for its content and prefers to offer assistance in the development of specifications to address specific part requirements.



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	Bronze(ctd)	Nickel Silver				Cu-Ni-Sn	LEADED NICKEL SILVER	
ALLOY NO.	544	735	752	762	770	725	782	792
ASTM Spec No.	B103	B122	B122	B122	B122	B122	B151	B151
MILLER ALLOY NAME & NOMINAL COMPOSITION	Leaded Phosphor Bronze Cu89% Sn4% Zn4% Pb4%	Nickel Silver 72-18 Cu72% Zn10% Ni18%	Nickel silver 65-18 Cu 65% Zn17% Ni18%	Nickel silver 59-12 Cu 59% Zn 29% Ni 12%	Nickel silver 55-18 Cu 55% Zn 27% Ni 18%	Copper-Nickel-Tin Cu88.2% Ni9.5% Sn2.3%	Leaded Nickel Silver Cu 65% Ni8% Zn5% Pb2%	Leaded Nickel Silver Cu 62.7% Ni 12% Pb1.1%

DENSITY Lbs. per cu in. at 68F(x27.68=gms/cu cm at 20°C)	0.321	.319	.316	.310	.314	.314	.314	.316
MOD. OF ELAST. x 10 ⁶ PSI, tension (Kgf/mm ² =KSIx.7031)	15	18	18	18	18	20	17	18
ELECT. COND. % IACS AT 68°F (20°C) as annealed	19	8	6	9	5.5	11	10	6
THERM. COND. BTU per sq. ft. per ft. per hr. per °F at 68°F.(20°C)	50	21.5	19	24	17	31	28	24
COEF. OF TH. EXP. Inches/inch/°F x 10 ⁶ from 68°F to 572°F (20°C to 300°C)	9.6	9	9	9	9.3	9.2	10.3	10.3

TENSILE STRENGTH x 1000 PSI (Kgf/mm2 = KSI x .7031) AND YIELD STRENGTH x 1000 PSI (0.2% offset) Kgf/mm2 = KSI x .7031)

ANNEALED	40-55	50-68	53-63	57-75	61-76	45-65		
	24	15-60	18-32	21-51	23-41	21		
1/4 HARD	47-62	56-69	58-72	65-81	69-87	55-75		
	38	28-58	26-64	36-68	44-83	73 max.		
1/2 HARD	55-70	63-75	66-80	75-91	78-95	65-80	69	70
	57	46-69	48-78	58-82	64-93	68	58	60
3/4 HARD	63-77	69-79	74-86	83-98	88-101			
	66	59-73	69-82	73-91	84-100			
HARD	72-87	73-84	78-91	90-105	92-107	75-90	85	82
	77	67-78	75-90	82-97	90-106	80	73	76
EX. HD.	84-99	79-90	86-98	101-114	102-115	80-95	91	87
	87	72-81	85-97	93-103	101-114	85	76	82
SPRING	91-105	85-93	90-101	109-122	108-120	85-100		
	92 min	78-84	88-99	101-110	107-118	90		
EX. SPR.	96-109	88 Min	96 Min	114 Min	116 Min	90-105		
	95 min	78 Min	95 Min	102 Min	115 Min	95		

ELONGATION % in 2 inches (= % in 50mm) AND ROCKWELL B HARDNESS .020" gauge and over (Rockwell F or 30 T where noted)

ANNEALED	45	11-37	29-42	32-49	39-48			
	70F	81-100F	77-94F	81-100F	77-98F			
1/4 HARD	32	10-25	14-35	20-50	11-41			
	45	66-80	50-75	61-85	70-80	85 max		
1/2 HARD	20	3-16	6-22	6-30	5-24		12	20
	65	75-84	68-82	78-91	81-92	70-90		
3/4 HARD	12	2-5	4-12	4-16	3-13			
	75	77-86	75-87	83-93	86-94			
HARD	6	1-3	3-7	3-6	3-6		4	87
	83	83-88	80-90	90-95	90-96	75-90		
EX. HD.	3	1-2	3-4	1-3	1-2		3	91
	89	86-90	87-94	94-98	95-99	80-95		
SPRING	2 Max	1 Max	1-2	1 Max	1 Max			
	90	89-92	89-96	97-100	97-100	85-95		
EX. SPR.	2 max	1 Max	2 Max	1 Max	1 Max			
	92	89 Min	92 Min	98 Min	98 Min			

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