



C11000

Electrolytic Tough Pitch

Chemical Composition

(%max., unless shown as range or min.)

	Cu ⁽¹⁾	O
Min./Max.	99.90 min	-
Nominal	-	0.04

(1) Cu value includes Ag.

Note: This is a high conductivity copper which has, in the annealed condition a minimum conductivity of 100% IACS except for Alloy C10100 which has a minimum conductivity of 101% IACS. **NOTE:** Oxygen and trace elements may vary depending on the process.

Applicable Specifications

Product	Specification
Bands, Projectile Rotating	MILITARY MIL-B-20292
Bar	ASME SB133 ASTM B152 SAE J463, J461
Bar, Bus	ASTM B187
Bar, Forging	ASTM B124
Bolts	ASTM F468
Brazing Filler Metal	FEDERAL QQ-B-650
Foil, Printed Circuits	ASTM B451
Forgings, Die	ASTM B283
Nuts	ASTM F467
Pipe, Bus	ASTM B188
Plate	AMS 4500 ASTM B152 SAE J463, J461

Millard Wire & Specialty Strip Co.

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Applicable Specifications (cont'd)

Product	Specification
Rod	ASME SB133 MILITARY MIL-C-12166 SAE J463, J461
Rod, Bus	ASTM B187
Rod, Forging	ASTM B124
Screws	ASTM F468
Shapes	SAE J461, J463
Shapes, Bus	ASTM B187
Shapes, Forging	ASTM B124
Sheet	AMS 4500 ASTM B152, B694 SAE J461, J463
Sheet, Building Construction	ASTM B370
Sheet, Clad	ASTM B506
Sheet, Lead Coated	ASTM B101
Sheet, Printed Circuits	ASTM B451
Strip	AMS 4500 ASTM B694, B152 SAE J463, J461
Strip, Building Construction	ASTM B370
Strip, Clad	ASTM B506
Strip, Printed Circuits	ASTM B451
Studs	ASTM F468
Tube, Bus	ASTM B188
Tube, Welded	ASTM B447
Wire, Medium-Hard Drawn	ASTM B2 FEDERAL QQ-W-343
Wire, Coated With Lead Alloy	ASTM B189
Wire, Coated With Nickel	ASTM B355
Wire, Coated With Silver	ASTM B298
Wire, Coated With Tin	ASTM B33, B246
Wire, Flat	AMS 4500 ASTM B272
Wire, Hard Drawn	ASTM B1 FEDERAL QQ-W-343
Wire, Metallizing	MILITARY MIL-W-6712



Applicable Specifications (cont'd)

Product	Specification
Wire, Soft	ASTM B3, B738, B48 FEDERAL QQ-W-343 SAE J461, J463
Wire, Stranded	ASTM B8, B496, B470, B286, B229, B226, B174, B173, B172 FEDERAL QQ-B-575
Wire, Trolley	ASTM B47, B116

Common Fabrication Processes

Blanking, Coining, Coppersmithing, Drawing, Etching, Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Piercing and Punching, Roll Threading and Knurling, Shearing, Spinning, Squeezing and Swaging, Stamping

Fabrication Properties

Joining Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene Welding	Not Recommended
Gas Shielded Arc Welding	Fair
Coated Metal Arc Welding	Not Recommended
Spot Weld	Not Recommended
Seam Weld	Not Recommended
Butt Weld	Good
Capacity for Being Cold Worked	Excellent
Capacity for Being Hot Formed	Excellent
Forgeability Rating	65
Machinability Rating	20



Thermal Properties

Treatment	Temp./Time – US	Temp./Time – SI
Stress Temperature		
Solution Minimum		
Solution Maximum		
Solution Time		
Solution Medium	None	
Precipitation Value		
Precipitation Time		
Precipitation Medium	None	
Annealing Minimum	700	371
Annealing Maximum	1200	649
Annealing Time		
Hot Works Minimum	1400	761
Hot Works Maximum	1600	872

Mechanical Properties

(Measured at Room Temperature, 68°F (20°C))

Temper	Section Size	Cold Work	Typ/Min	Temp	Tensile Strength	Yield Strength (0.5% ext. under load)	Yield Strength (0.2% offset)	Yield Strength (0.05% offset)	EI	Rockwell Hardness				Vickers Hardness	Brinell Hardness		Shear Strength	Fatigue Strength	Izod Impact Strength
					ksi	ksi	ksi	%		B	C	F	30T	500	500	3000	ksi	ksi	ft-lb
	in.	%		F	ksi	ksi	ksi	ksi	%	B	C	F	30T	500	500	3000	ksi	ksi	ft-lb
	mm.			C	MPa	MPa	MPa	MPa									MPa	MPa	J
Flat Products																			
H02	0.04	0.0	TYP	68	42	36	-	-	14	40	-	84	50	-	-	-	26	13	0.0
	1			20	290	248	-	-	14	40	-	84	50	-	-	-	179	90	0.0
M20	0.25	0.0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	0.0
	6.35			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	0.0
Rod																			
M20	1	0.0	TYP	68	32	10	-	-	55	-	-	40	-	-	-	-	22	-	0.0
	25.4			20	221	69	-	-	55	-	-	40	-	-	-	-	152	-	0.0
Shapes																			
M30	0.5	0.0	typ	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	0.0
	12.7			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	0.0
M20	0.5	0.0	typ	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	0.0
	12.7			20	221	69	-	-	50	-	-	40	-	-	-	-	150	-	0.0
Flat Products																			
H04	0.04	0.0	TYP	68	50	45	-	-	6	50	-	90	57	-	-	-	28	13	0.0
	1			20	345	310	-	-	6	50	-	90	57	-	-	-	193	90	0.0
Rod																			
H04	0.25	40	TYP	68	55	50	-	-	10	60	-	94	-	-	-	-	29	-	0.0
	6.35			20	379	345	-	-	10	60	-	94	-	-	-	-	200	-	0.0
Wire																			
OS050	0.08	0.0	TYP	68	35	-	-	-	35	-	-	-	-	-	-	-	24	-	0.0
	2			20	241	-	-	-	35	-	-	-	-	-	-	-	165	-	0.0



C11000 Specification Sheet

Mechanical Properties

(Measured at Room Temperature, 68°F (20°C))

Temper	Section Size	Cold Work	Typ/Min	Temp	Tensile Strength	Yield Strength (0.5% ext. under load)	Yield Strength (0.2% offset)	Yield Strength (0.05% offset)	EI	Rockwell Hardness				Vickers Hardness	Brinell Hardness		Shear Strength	Fatigue Strength	Izod Impact Strength
					ksi	ksi	ksi	ksi		B	C	F	30T	500	500	3000	ksi	ksi	ft-lb
	in.	%		F	ksi	ksi	ksi	ksi	%					500	500	3000	ksi	ksi	ft-lb
	mm.			C	MPa	MPa	MPa	MPa									MPa	MPa	J
Flat Products																			
H08	0.04	0.0	TYP	68	55	50	-	-	4	60	-	94	63	-	-	-	29	14	0.0
	1			20	379	345	-	-	4	60	-	94	63	-	-	-	200	97	0.0
H01	0.25	0.0	TYP	68	38	30	-	-	35	25	-	70	-	-	-	25	-	0.0	
	6.4			20	262	207	-	-	35	25	-	70	-	-	-	172	-	0.0	
Rod																			
OS050	1	0.0	TYP	68	32	10	-	-	55	-	-	40	-	-	-	22	-	0.0	
	25.4			20	221	69	-	-	55	-	-	40	-	-	-	152	-	0.0	
Wire																			
H08	0.08	0.0	TYP	68	66	-	-	-	1	-	-	-	-	-	-	33	-	0.0	
	2			20	455	-	-	-	1	-	-	-	-	-	-	228	-	0.0	
Flat Products																			
H04	1	0.0	TYP	68	45	40	-	-	20	45	-	85	-	-	-	26	-	0.0	
	25.4			20	310	276	-	-	20	45	-	85	-	-	-	179	-	0.0	
OS050	0.25	0.0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	22	-	0.0	
	6.35			20	221	69	-	-	50	-	-	40	-	-	-	152	-	0.0	
H00	0.25	0.0	TYP	68	36	28	-	-	40	10	-	60	-	-	-	25	-	0.0	
	6.35			20	248	193	-	-	40	10	-	60	-	-	-	172	-	0.0	
Rod																			
H04	2	16	TYP	68	45	40	-	-	20	45	-	85	-	-	-	26	-	0.0	
	51			20	310	276	-	-	20	45	-	85	-	-	-	179	-	0.0	
H04	1	35	TYP	68	48	44	-	-	16	47	-	87	-	-	-	27	17	0.0	
	25.4			20	331	303	-	-	16	47	-	87	-	-	-	186	117	0.0	
Tube																			
OS025	0.065	0.0	TYP	68	34	11	-	-	45	-	-	45	-	-	-	23	-	0.0	
	1.65			20	234	76	-	-	45	-	-	45	-	-	-	159	-	0.0	
H80	0.065	40	TYP	68	55	50	-	-	8	60	-	95	63	-	-	20	-	0.0	
	1.65			20	379	245	-	-	8	60	-	95	63	-	-	200	-	0.0	
H55	0.065	15	TYP	68	40	32	-	-	25	35	-	77	45	-	-	26	-	0.0	
	1.65			20	276	221	-	-	25	35	-	77	45	-	-	179	-	0.0	
Flat Products																			
M20	0.04	0.0	TYP	68	34	10	-	-	45	-	-	45	-	-	-	23	-	0.0	
	1			20	234	69	-	-	45	-	-	45	-	-	-	159	-	0.0	
Shapes																			
OS050	0.5	0.0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	22	-	0.0	
	12.7			20	220	69	-	-	50	-	-	40	-	-	-	150	-	0.0	
Wire																			
H04	0.08	0.0	TYP	68	55	-	-	-	1	-	-	-	-	-	-	29	-	0.0	
	2			20	379	-	-	-	1	-	-	-	-	-	-	200	-	0.0	
Flat Products																			
OS050	0.04	0.0	TYP	68	32	10	-	-	45	-	-	40	-	-	-	22	-	0.0	
	1			20	221	69	-	-	45	-	-	40	-	-	-	152	-	0.0	
Shapes																			
H04	0.5	15	TYP	68	40	32	-	-	30	35	-	-	-	-	-	26	-	0.0	
	12.7			20	276	221	-	-	30	35	-	-	-	-	-	179	-	0.0	
Tube																			
OS050	0.065	0.0	TYP	68	32	10	-	-	45	-	-	40	-	-	-	22	-	0.0	
	1.65			20	221	69	-	-	45	-	-	40	-	-	-	152	-	0.0	

*Fatigue Strength: 100×10^6 cycles, unless indicated as $[N] \times 10^6$.



Mechanical Properties (cont'd)

(Measured at Room Temperature, 68°F (20°C))

Temper	Section Size	Cold Work	Typ/Min	Temp	Tensile Strength	Yield Strength (0.5% ext. under load)	Yield Strength (0.2% offset)	Yield Strength (0.05% offset)	EI	Rockwell Hardness				Vickers Hardness	Brinell Hardness			Shear Strength	Fatigue Strength	Izod Impact Strength
										B	C	F	30T		500	500	3000			
	in.	%		F	ksi	ksi	ksi	ksi	%					500	500	3000	ksi	ksi	ft-lb	
	mm.			C	MPa	MPa	MPa	MPa									MPa	MPa	J	
Flat Products																				
H10	0.04	0.0	TYP	68	57	53	-	-	4	62	-	95	64	-	-	-	29	-	0.0	
	1			20	393	365	-	-	4	62	-	95	64	-	-	-	200	-	0.0	
H01	0.04	0.0	TYP	68	38	30	-	-	25	25	-	70	36	-	-	-	25	-	0.0	
	1			20	262	207	-	-	25	25	-	70	36	-	-	-	172	-	0.0	
H00	0.04	0.0	TYP	68	36	28	-	-	30	10	-	60	25	-	-	-	25	-	0.0	
	1			20	248	193	-	-	30	10	-	60	25	-	-	-	172	-	0.0	
OS025	0.04	0.0	TYP	68	34	11	-	-	45	-	-	45	-	-	-	-	23	11	0.0	
	1			20	234	76	-	-	45	-	-	45	-	-	-	-	159	76	0.0	

Physical Properties

Property	US Customary	Metric
Melting Point - Liquidus	1981° F	1083° C
Melting Point - Solidus	1949° F	1065° C
Density*	0.322 lb/in ³ at 68° F	8.91 gm/cm ³ @ 20° C
Specific Gravity	8.91	8.91
Electrical Resistivity	10.30 ohms-cmil/ft @ 68° F	1.71 microhm-cm @ 20° C
Electrical Conductivity**	101 %IACS @ 68° F	0.591 MegaSiemens/cm @ 20° C
Thermal Conductivity	226 Btu · ft/(hr · ft ² ·°F) at 68° F	391.1 W/m·°K at 20° C
Coefficient of Thermal Expansion	9.40·10 ⁻⁶ per °F (68-212° F)	16.9·10 ⁻⁶ per °C (20-100° C)
Coefficient of Thermal Expansion	9.60·10 ⁻⁶ per °F (68-392° F)	17.3·10 ⁻⁶ per °C (20-200° C)
Coefficient of Thermal Expansion	9.80·10 ⁻⁶ per °F (68-572° F)	17.6·10 ⁻⁶ per °C (20-300° C)
Specific Heat Capacity	0.092 Btu/lb·°F at 68° F	393.5 J/kg·°K at 293° K
Modulus of Elasticity in Tension	17000 ksi	117000 MPa
Modulus of Rigidity	6400 ksi	44130 MPa

*Volume and weight basis, minimum value.

Tempers Most Commonly Used

Flat Products	
BAR, DRAWN	H01, H04, H06, O60
BAR, ROLLED	H01, H04, H06, M20, O60
PLATE	H00, M20, O60
SHEET	H00, H02, M20, O60
STRIP, DRAWN	H04, O60
STRIP, ROLLED	H00, H01, H02, H04, H08, H10, M20, O60, OS025
WIRE, DRAWN	H04, H06, O60
WIRE, ROLLED	H04, O60

Other	
ROD	H04, M20, O60
SHAPES	H04, M20, M30, O60
TUBE	H55, H58, H80, O60, OS025
WIRE	H00, H01, H04, H08, O60

Typical Uses

Architecture

Building Fronts, Gutters, Skylight Frames, Roofing, Flashing, Downspouts, Spouting

Automotive

Radiators, Gaskets

Builders Hardware

Cotter Pins, Butts, Ball Floats, Nails, Tacks, Soldering Copper, Rivets

Building

Screening, Wire Screening

Consumer

Christmas Ornaments

Continued...



Typical Uses (cont'd)

Electrical

Switches, Terminals, Trolley Wire, Contacts, Radio Parts, Magnet Wire, Busbars, Terminal Connectors, Conductors, Electrical, Stranded Conductors, Wire, Electrical

Fasteners

Fasteners

Industrial

Pressure Vessels, Chemical Process Equipment, Chlorine Cells, Chimney Cap Screens, Heat Exchangers, Printing Rolls, Anodes, Rotating Bands, Kettles, Pans, Vats, Road Bed Expansion Plates

Casting Characteristics

No casting characteristics available for this alloy.