



# Specification Sheet

Last Modified: May 13, 2017

## C11300

Tough Pitch with Ag

### Chemical Composition

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

	Cu <sup>(1)</sup>	Ag
Min./Max.	99.90 min	.027 min
Nominal	-	-

(1) Cu value includes Ag.

(2) In troy ounce: Min = 8, Max = 0 and Nom = 0

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.

### Applicable Specifications

Product	Specification
Bands, Projectile Rotating	MILITARY MIL-B-20292
Bar	ASTM B152 SAE J463, J461
Bar, Bus	ASTM B187
Brazing Filler Metal	FEDERAL QQ-B-650
Pipe, Bus	ASTM B188
Plate	ASTM B152 SAE J461, J463
Rod, Bus	ASTM B187
Shapes, Bus	ASTM B187
Sheet	ASTM B152 SAE J463, J461
Sheet, Clad	ASTM B506

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## Millard Wire & Specialty Strip Co.

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## Applicable Specifications (cont'd)

Product	Specification
Strip	ASTM B152 SAE J461, J463
Strip, Clad	ASTM B506
Tube, Bus	ASTM B188
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 B246, B33
Wire, Hard Drawn	ASTM B1 FEDERAL QQ-W-343
Wire, Soft	ASTM B3, B48 FEDERAL QQ-W-343
Wire, Stranded	ASTM B8, B496, B470, B172, B173, B286, B229, B226, B174 FEDERAL QQ-B-575
Wire, Trolley	ASTM B116, B47

## 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	900	483
Annealing Maximum	1400	761
Annealing Time		
Hot Works Minimum	1400	761
Hot Works Maximum	1600	



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## 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 (0.05% offset)		EI	Rockwell Hardness				Vickers Hardness	Brinell Hardness			Shear Strength	Fatigue Strength	Izod Impact Strength	
					F	ksi	ksi	ksi	%	B		C	F	30T	500		500	3000	ksi				ksi
	in.	%		F	ksi	ksi	ksi	ksi	%	B	C	F	30T	500	500	3000	ksi	ksi	MPa	MPa	MPa	ft-lb	J
	mm.			C	MPa	MPa	MPa	MPa															
<b>Flat Products</b>																							
M20	0.25	0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	-	-	-	0	
	6.35			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	-	-	-	0	
H04	0.25	0	TYP	68	50	45	-	-	12	50	-	90	-	-	-	-	28	-	-	-	-	0	
	6.35			20	345	310	-	-	12	50	-	90	-	-	-	-	193	-	-	-	-	0	
H02	0.04	0	TYP	68	42	36	-	-	14	40	-	84	50	-	-	-	26	-	-	-	-	0	
	1			20	290	248	-	-	14	40	-	84	50	-	-	-	179	-	-	-	-	0	
<b>Rod</b>																							
M20	1	0	TYP	68	32	10	-	-	55	-	-	40	-	-	-	-	22	-	-	-	-	0	
	25.4			20	221	69	-	-	55	-	-	40	-	-	-	-	152	-	-	-	-	0	
<b>Shapes</b>																							
M30	0.5	0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	-	-	-	0	
	12.7			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	-	-	-	0	
M20	0.5	0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	-	-	-	0	
	12.7			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	-	-	-	0	
<b>Flat Products</b>																							
H04	0.04	0	TYP	68	50	45	-	-	6	50	-	90	57	-	-	-	28	-	-	-	-	0	
	1			20	345	310	-	-	6	50	-	90	57	-	-	-	193	-	-	-	-	0	
<b>Rod</b>																							
H04	0.25	40	TYP	68	55	50	-	-	10	60	-	94	-	-	-	-	29	-	-	-	-	0	
	6.35			20	379	345	-	-	10	60	-	94	-	-	-	-	200	-	-	-	-	0	
<b>Wire</b>																							
OS050	0.08	0	TYP	68	35	-	-	-	35	-	-	-	-	-	-	-	24	-	-	-	-	0	
	2			20	241	-	-	-	35	-	-	-	-	-	-	-	165	-	-	-	-	0	
<b>Flat Products</b>																							
H01	0.25	0	TYP	68	38	30	-	-	35	25	-	70	-	-	-	-	25	-	-	-	-	0	
	6.35			20	262	207	-	-	35	25	-	70	-	-	-	-	172	-	-	-	-	0	
H08	0.04	0	TYP	68	55	50	-	-	4	60	-	94	63	-	-	-	29	-	-	-	-	0	
	1			20	379	345	-	-	4	60	-	94	63	-	-	-	200	-	-	-	-	0	
<b>Rod</b>																							
OS050	1	0	TYP	68	32	10	-	-	55	-	-	40	-	-	-	-	22	-	-	-	-	0	
	25.4			20	221	69	-	-	55	-	-	40	-	-	-	-	152	-	-	-	-	0	
<b>Wire</b>																							
H08	0.08	0	TYP	68	66	-	-	-	1	-	-	-	-	-	-	-	33	-	-	-	-	0	
	2			20	455	-	-	-	1	-	-	-	-	-	-	-	228	-	-	-	-	0	
<b>Flat Products</b>																							
H04	1	0	TYP	68	45	40	-	-	20	45	-	85	-	-	-	-	26	-	-	-	-	0	
	25.4			20	310	276	-	-	20	45	-	85	-	-	-	-	179	-	-	-	-	0	
H00	0.25	0	TYP	68	36	28	-	-	40	10	-	60	-	-	-	-	25	-	-	-	-	0	
	6.35			20	248	193	-	-	40	10	-	60	-	-	-	-	172	-	-	-	-	0	
OS050	0.25	0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	-	-	-	0	
	6.35			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	-	-	-	0	
<b>Rod</b>																							
H04	2	16	TYP	68	45	40	-	-	20	45	-	85	-	-	-	-	26	-	-	-	-	0	
	51			20	310	276	-	-	20	45	-	85	-	-	-	-	179	-	-	-	-	0	
H04	1	35	TYP	68	48	44	-	-	16	47	-	87	-	-	-	-	27	-	-	-	-	0	
	25.4			20	331	303	-	-	16	47	-	87	-	-	-	-	186	-	-	-	-	0	
<b>Flat Products</b>																							
M20	0.04	0	TYP	68	34	10	-	-	45	-	-	45	-	-	-	-	23	-	-	-	-	0	
	1			20	234	69	-	-	45	-	-	45	-	-	-	-	159	-	-	-	-	0	
<b>Shapes</b>																							
OS050	0.5	0	TYP	68	32	10	-	-	50	-	-	40	-	-	-	-	22	-	-	-	-	0	
	12.7			20	221	69	-	-	50	-	-	40	-	-	-	-	152	-	-	-	-	0	



## 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
					ksi	ksi	ksi	%		B	C	F	30T	500	500	3000	ksi	ksi	ft-lb	
					MPa	MPa	MPa	MPa									MPa	MPa	J	
<b>Wire</b>																				
H04	0.08	0	TYP	68	55	-	-	-	1	-	-	-	-	-	-	-	29	-	0	
	2			20	379	-	-	-	1	-	-	-	-	-	-	-	200	-	0	
<b>Flat Products</b>																				
OS050	0.04	0	TYP	68	34	11	-	-	45	-	-	45	-	-	-	-	23	-	0	
	1			20	234	76	-	-	45	-	-	45	-	-	-	-	159	-	0	
<b>Flat Products</b>																				
H04	0.5	15	TYP	68	40	32	-	-	30	35	-	-	-	-	-	-	26	-	0	
	12.7			20	276	221	-	-	30	35	-	-	-	-	-	-	179	-	0	
<b>Flat Products</b>																				
H01	0.04	0	TYP	68	38	30	-	-	25	25	-	70	36	-	-	-	25	-	0	
	1			20	262	207	-	-	25	25	-	70	36	-	-	-	172	-	0	
H00	0.04	0	TYP	68	36	28	-	-	30	10	-	60	25	-	-	-	25	-	0	
	1			20	248	193	-	-	30	10	-	60	25	-	-	-	172	-	0	
H10	0.04	0	TYP	68	57	53	-	-	4	62	-	95	64	-	-	-	29	-	0	
	1			20	393	365	-	-	4	62	-	95	64	-	-	-	200	-	0	

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

## Physical Properties

Property	US Customary	Metric
Melting Point - Liquidus	1980° F	1082° C
Density*	0.322 lb/in <sup>3</sup> at 68° F	8.91 gm/cm <sup>3</sup> @ 20° C
Specific Gravity**	8.91	8.91
Electrical Resistivity	10.40 ohms-cmil/ft @ 68° F	1.73 microhm-cm @ 20° C
Electrical Conductivity	100 %IACS @ 68° F	0.585 MegaSiemens/cm @ 20° C
Thermal Conductivity	224 Btu·ft/(hr·ft <sup>2</sup> ·°F) at 68°F	387.7 W/m·°K at 20° C
Coefficient of Thermal Expansion	$9.80 \cdot 10^{-6}$ per °F (68-572° F)	$17.6 \cdot 10^{-6}$ 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

\*Actual value is .321 – .323.

\*\*Actual value is 8.89 – 8.94.



## 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
WIRE, DRAWN	H04, H06, O60
WIRE, ROLLED	H04, O60

Other	
ROD	H04, M20, O60
SHAPES	H04, M20, M30, O60
WIRE	H00, H01, H04, H08, O60

## Typical Uses

### Architecture

Spouting

### Automotive

Gaskets, Radiators, Radiator and Heat Exchanger Fins

### Electrical

Radio Parts, Bus Bars, Terminals, Switches, Contacts, Fuse Clips, Transformer Windings, Conductivity Wire, Windings, Commutator Bars and Segments, Generator Coils

### Industrial

Printed Circuit Foil, Clad Metals, Printing Rolls, Chemical Process Equipment

## Casting Characteristics

No casting characteristics for this alloy.