MILLARD WIRE

Specification Sheet

Last Modified: May 27, 2017

C46400

Naval Brass, Uninhibited

Chemical Composition

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

	Cu	Fe	Pb	Sn	Zn
Min./Max.	59.0-62.0	0.1	0.2	.50-1.0	Rem.
Nominal	60	-	-	0.7	39.2

Note: Cu + Sum of Named Elements, 99.6% min.

Applicable Specifications

Product	Specification
Bar	AMS 4611, 4612 ASTM B21 FEDERAL QQ-B-639 SAE J463, J461
Bar, Forging	ASTM B124
Bolts	ASTM F468
Forgings, Die	ASTM B283
Nuts	ASTM F467
Plate	FEDERAL QQ-B-639
Plate, Clad	ASTM B432
Plate, Condenser Tube	ASME SB171 ASTM B171
Rod	AMS 4611, 4612 ASTM B21 SAE J463, J461
Rod, Forging	ASTM B124
Screws	ASTM F468
Shapes	ASTM B21
Shapes, Forging	ASTM B124
Sheet	FEDERAL QQ-B-639
Strip	FEDERAL QQ-B-639 SAE J461, J463
Studs	ASTM F468
Wire, Metallizing	MILITARY MIL-W-6712

Millard Wire & Specialty Strip Co.

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Common Fabrication Processes

Blanking, Drawing, Forming and Bending, Heading and Upsetting, Hot Forging and Pressing, Hot Heading and Upsetting, Shearing

Fabrication Properties

Joining Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene Welding	Good
Gas Shielded Arc Welding	Fair
Coated Metal Arc Welding	Not Recommended
Spot Weld	Good
Seam Weld	Fair
Butt Weld	Good
Capacity for Being Cold Worked	Fair
Capacity for Being Hot Formed	Excellent
Forgeability Rating	90
Machinability Rating	30

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	800	427
Annealing Maximum	1300	705
Annealing Time		
Hot Works Minimum	1455	791
Hot Works Maximum	1545	84

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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 (0.2% offset)	Yield Strength (0.05% offset)	El	Rockwell Hardness				Vickens Hardness	Brinell Hardness		Shear Strength	Fatigue Strength	Izod Impact Strength
	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
Tube																			
H80	0	35	TYP	68	88	66	–	–	18	95	–	–	–	–	–	–	–	–	0
	0			20	607	455	–	–	18	95	–	–	–	–	–	–	–	–	0
Flat Products																			
O50	0.04	0	TYP	68	62	30	–	–	40	60	–	–	57	–	–	–	41	–	0
	1			20	427	207	–	–	40	60	–	–	57	–	–	–	283	–	0
Rod																			
H01	2	8	TYP	68	67	40	–	–	35	75	–	–	–	–	–	–	43	–	0
	51			20	462	276	–	–	35	75	–	–	–	–	–	–	296	–	0
O50	1	0	TYP	68	63	30	–	–	40	60	–	–	–	–	–	–	42	–	0
	25.4			20	434	207	–	–	40	60	–	–	–	–	–	–	290	–	0
O60	1	0	TYP	68	57	25	–	–	47	55	–	–	–	–	–	–	40	–	0
	25.4			20	393	172	–	–	47	55	–	–	–	–	–	–	276	–	0
O60	0.25	0	TYP	68	58	27	–	–	45	56	–	–	–	–	–	–	40	–	0
	6.35			20	400	186	–	–	45	56	–	–	–	–	–	–	276	–	0
H01	0.25	10	TYP	68	70	48	–	–	25	80	–	–	–	–	–	–	43	–	0
	6.35			20	483	331	–	–	25	80	–	–	–	–	–	–	296	–	0
Flat Products																			
M20	1	0	TYP	68	55	25	–	–	50	55	–	–	55	–	–	–	40	–	0
	25.4			20	379	172	–	–	50	55	–	–	55	–	–	–	276	–	0
O60	0.25	0	TYP	68	58	25	–	–	49	56	–	–	55	–	–	–	40	–	0
	6.35			20	400	172	–	–	49	56	–	–	55	–	–	–	276	–	0
Rod																			
H02	0.25	20	TYP	68	80	57	–	–	20	85	–	–	–	–	–	–	45	–	0
	6.35			20	552	393	–	–	20	85	–	–	–	–	–	–	310	–	0
Flat Products																			
O50	0.25	0	TYP	68	60	28	–	–	45	58	–	–	56	–	–	–	41	–	0
	6.35			20	414	193	–	–	45	58	–	–	56	–	–	–	283	–	0
Rod																			
H01	1	8	TYP	68	69	46	–	–	27	78	–	–	–	–	–	–	43	–	0
	25.4			20	476	317	–	–	27	78	–	–	–	–	–	–	296	–	0
O50	2	0	TYP	68	62	28	–	–	43	60	–	–	–	–	–	–	42	–	0
	51			20	427	193	–	–	43	60	–	–	–	–	–	–	290	–	0
H02	1	20	TYP	68	75	53	–	–	20	82	–	–	–	–	–	–	44	–	0
	25.4			20	517	365	–	–	20	82	–	–	–	–	–	–	303	–	0
O50	0.25	0	TYP	68	63	30	–	–	40	60	–	–	–	–	–	–	42	–	0
	6.35			20	434	207	–	–	40	60	–	–	–	–	–	–	290	–	0
O60	2	0	TYP	68	56	25	–	–	47	55	–	–	–	–	–	–	40	–	0
	51			20	386	172	–	–	47	55	–	–	–	–	–	–	276	–	0
Flat Products																			
H01	0.04	0	TYP	68	70	58	–	–	17	75	–	–	68	–	–	–	43	–	0
	1			20	483	400	–	–	17	75	–	–	68	–	–	–	296	–	0

*Fatigue Strength: 100 x 10^6 cycles, unless indicated as [N]X 10^6.

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Physical Properties

Property	US Customary	Metric
Melting Point – Liquidus	1650 F	899 C
Melting Point – Solidus	1630 F	888 C
Density	0.304 lb/in^3 at 68 F	8.41 gm/cm^3 @ 20 C
Specific Gravity	8.41	8.41
Electrical Resistivity	39.90 ohms-cmil/ft @ 68 F	6.63 microhm-cm @ 20 C
Electrical Conductivity	26 %IACS @ 68 F	0.152 MegaSiemens/cm @ 20 C
Thermal Conductivity	67 Btu · ft/(hr · ft2·°F)at 68F	116.0 W/m · °K at 20 C
Coefficient of Thermal Expansion	11.80 ·10^{-6} per °F (68-572 F)	21.2 ·10^{-6} per °C (20-300 C)
Specific Heat Capacity	0.090 Btu/lb/°F at 68 F	377.1 J/kg · °K at 293 K
Modulas of Elasticity in Tension	15000 ksi	103400 MPa
Modulus of Rigidity	5600 ksi	38610 MPa

Tempers Most Commonly Used

Flat Products	
BAR, DRAWN	H01, H02, O50, O60
BAR, ROLLED	H01, O50, O60
PLATE	H02, M20, O60
STRIP, ROLLED	H01, O50

Other	
ROD	H01, H02, M30, O50, O60
SHAPES	H01, M30
TUBE	H58, H80

Typical Uses

Builders Hardware

Lock Pins

Electrical

Precision Shipboard Equipment

Builders Hardware

Nuts, Rivets, Bolts

Industrial

Structural Uses, Condenser Plates, Welding Rod, Bushings, Bearings, Valve Stems, Balls, Aircraft Turn buckle Barrels, Heat Exchanger Tube, Hub Cones, Bearings, Dies, Golf Ball Production, Pressure Vessels

Typical Uses (cont'd)

Marine

Propeller Shafts, Turn buckles, Shafting, Propeller Shafts, Decorative Fittings, Marine Hardware

Ordnance

Grommets, Eyelets, Screws, Rivets, Pins, Fasteners

Industrial

Air Pressure Conveyer Systems, Bead Chain, Springs, Chain

Marine

Missile Components

Other

Baffle Plates and Flanges

Plumbing

Fittings

Casting Characteristics

No casting characteristics for this alloy.