

# ALLOY 642

## C64200 - SILICON ALUMINUM BRONZE

C64200 is an engineering alloy at least as resistant to corrosion as copper itself, but much stronger. C64200 is manufactured mostly in the form of round, hexagonal, and octagonal rods for hot forming and free machining. C64200 is considered to be of the best valve stem alloys. Other applications include gears, marine hardware, nuts, pole line hardware, and valve bodies and components.

## C64200 STANDARDS & PROPERTIES

Calculations are theoretically based on the density of C64200 = 0.278 lb/cu in @ 68 F.

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

	Cu <sup>(1)</sup>	Al	As	Fe	Pb	Mn	Ni <sup>(2)</sup>	Si	Sn	Zn
<b>Min./Max.</b>	Rem.	6.3-7.6	.15	.30	.05	.10	.25	1.5-2.2	.20	.50
<b>Nominal</b>	91.2	7.0	-	-	-	-	-	1.8	-	-

(1) Cu value includes Ag.

(2) Ni value includes Co.

Note: Cu + Sum of Named Elements, 99.5% min.

### Applicable Specifications

Product	Specification
Bar	AMS 4631 ASME SB150 ASTM B150
Bar, Forging	ASTM B124
Bolts	ASTM F468
Forgings, Die	AMS 4631 ASME SB283 ASTM B283
Nuts	ASTM F467
Rod	AMS 4631 ASME SB150 ASTM B150 SAE J461, J463
Rod, Forging	ASTM B124
Screws	ASTM F468
Shapes	ASTM B150
Shapes, Forging	ASTM B124
Studs	ASTM F468

### Common Fabrication Processes

Forging, Hot Forming, Machining

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**Fabrication Properties**

Joining Technique	Suitability
Soldering	Not Recommended
Brazing	Fair
Oxyacetylene Welding	Not Recommended
Gas Shielded Arc Welding	Fair
Coated Metal Arc Welding	Fair
Spot Weld	Fair
Seam Weld	Fair
Butt Weld	Fair
Capacity for Being Cold Worked	Poor
Capacity for Being Hot Formed	Excellent
Forgeability Rating	80
Machinability Rating	60

**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			Vickers Hard.			Brinell Hard.	Shear Strength	Fatigue Strength*	Izod Impact Strength
										B	C	F 30T	500	500	3000				
	in.	%		F	ksi	ksi	ksi	ksi	%							ksi	ksi	ft-lb	
	mm.			C	MPa	MPa	MPa	MPa								MPa	MPa	J	
<b>Bar</b>																			
M30	0.75	0	TYP	68	75	35	-	-	32	77	-	-	-	-	-	-	-	0.0	
	19			20	517	241	-	-	32	77	-	-	-	-	-	-	-	0.0	
<b>Rod</b>																			
H04	1.5	10	TYP	68	93	60	-	-	26	90	-	-	-	-	-	-	-	0.0	
	38			20	641	414	-	-	26	90	-	-	-	-	-	-	-	0.0	
H04	0.75	15	TYP	68	102	68	-	-	22	94	-	-	-	-	-	59	50	0.0	
	19			20	703	469	-	-	22	94	-	-	-	-	-	407	345	0.0	
M30	0.75	0	TYP	68	75	35	-	-	32	77	-	-	-	-	-	-	-	0.0	
	19			20	517	241	-	-	32	77	-	-	-	-	-	-	-	0.0	
O50	0.5	0	TYP	68	92	58	-	-	22	98	-	-	-	-	-	-	-	0.0	
	12.7			20	634	400	-	-	22	98	-	-	-	-	-	-	-	0.0	
O50	0.75	0	TYP	68	90	55	-	-	28	89	-	-	-	-	-	-	-	0.0	
	19			20	621	379	-	-	28	89	-	-	-	-	-	-	-	0.0	
<b>Forgings</b>																			
M10	2	0	TYP	68	79	38	-	-	30	78	-	-	-	-	-	-	-	0.0	
	51			20	545	262	-	-	30	78	-	-	-	-	-	-	-	0.0	

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**Physical Properties**

	US Customary	Metric
Melting Point - Liquidus	1840 F	1004 C
Melting Point - Solidus	1800 F	982 C
Density	0.278 lb/in <sup>3</sup> at 68 F	7.7 gm/cm <sup>3</sup> @ 20 C
Specific Gravity	7.69	7.69
Electrical Resistivity	113.0 ohms-cmil/ft @ 68 F	18.79 microhm-cm @ 20 C
Electrical Conductivity	8 %IACS @ 68 F	0.047 MegaSiemens/cm @ 20 C
Thermal Conductivity	26.0 Btu · ft/(hr · ft <sup>2</sup> ·°F)at 68F	45.0 W/m · °K at 20 C
Coefficient of Thermal Expansion	10.0 · 10 <sup>-6</sup> per °F (68-572 F)	18.0 · 10 <sup>-6</sup> per °C (20-300 C)
Specific Heat Capacity	0.09 Btu/lb/°F at 68 F	377.1 J/kg · °K at 293 K
Modulus of Elasticity in Tension	16000 ksi	110000 MPa
Modulus of Rigidity	6000 ksi	41370 MPa

**Tempers Most Commonly Used**

Flat Products	
BAR, DRAWN	H04, H58, M30, O50

Other	
ROD	H04, M30, O50
SHAPES	M30

**Typical Uses**

Automotive, Valve Guides, Automobile Engines, Electrica Pol Line, Hardware, Fasteners,  
Bolts, Nuts. Industrial Valve Stems, Gears, Cams, Valve Bodies, Valve Components, Marine Hardware.