

C93700

Material

Notes: Casting methods recommended for this alloy: Centrifugal, Continuous, Permanent Mold, and Sand.



Applications: Bearings for high speed and heavy pressures, pumps, impellers, corrosion-resistant applications, pressure tight castings.






Classified under: High-lead tin bronzes. ASTM B22; ASTM B584; formerly ASTM B22-C; ASTM B144-3A

Typical data for sand cast test bars. Alloy does not respond to heat treating.


Key Words: High lead tin bronze, ASTM B22, ASTM B584, ASTM B22-C, ASTM B144-3A


Physical Properties	Metric	English	Comments
Density	8.95 g/cc	0.323 lb/in ³	


Mechanical Properties	Metric	English	Comments
Hardness, Brinell	60	60	
Tensile Strength, Ultimate	240 MPa	34800 psi	
	210 MPa @Temperature 230 °C	30500 psi @Temperature 446 °F	
	230 MPa @Temperature 120 °C	33400 psi @Temperature 248 °F	
	270 MPa @Temperature 25.0 °C	39200 psi @Temperature 77.0 °F	
	295 MPa @Temperature -40.0 °C	42800 psi @Temperature -40.0 °F	
Tensile Strength, Yield	125 MPa @Strain 0.500 %	18100 psi @Strain 0.500 %	
	95.0 MPa @Strain 0.200 %, Temperature 120 °C	13800 psi @Strain 0.200 %, Temperature 248 °F	
	95.0 MPa @Strain 0.200 %, Temperature 230 °C	13800 psi @Strain 0.200 %, Temperature 446 °F	
	105 MPa @Strain 0.500 %, Temperature 120 °C	15200 psi @Strain 0.500 %, Temperature 248 °F	
	105 MPa @Strain 0.500 %, Temperature 230 °C	15200 psi @Strain 0.500 %, Temperature 446 °F	
	115 MPa @Strain 0.200 %, Temperature 25.0 °C	16700 psi @Strain 0.200 %, Temperature 77.0 °F	

	125 MPa @Strain 0.500 %, Temperature 25.0 °C	18100 psi @Strain 0.500 %, Temperature 77.0 °F	
	135 MPa @Strain 0.200 %, Temperature -40.0 °C	19600 psi @Strain 0.200 %, Temperature -40.0 °F	
	145 MPa @Strain 0.500 %, Temperature -40.0 °C	21000 psi @Strain 0.500 %, Temperature -40.0 °F	
Elongation at Break	20 %	20 %	in 50 mm
	16 % @Temperature 230 °C	16 % @Temperature 446 °F	
	22 % @Temperature 120 °C	22 % @Temperature 248 °F	
	28 % @Temperature -40.0 °C	28 % @Temperature -40.0 °F	
	30 % @Temperature 25.0 °C	30 % @Temperature 77.0 °F	
Reduction of Area	20 % @Temperature 230 °C	20 % @Temperature 446 °F	
	24 % @Temperature 25.0 °C	24 % @Temperature 77.0 °F	
	26 % @Temperature -40.0 °C	26 % @Temperature -40.0 °F	
	27 % @Temperature 120 °C	27 % @Temperature 248 °F	
Creep Strength	12.0 MPa	1740 psi	for 10E-5%/h, at 288°C
	51.0 MPa	7400 psi	for 10E-5%/h, at 232°C
	71.7 MPa	10400 psi	for 10E-5%/h, at 177°C
Rupture Strength 	120 MPa @Temperature 230 °C, Time 2.70e+6 sec	17400 psi @Temperature 446 °F, Time 750 hour	
	135 MPa @Temperature 230 °C, Time 1.08e+6 sec	19600 psi @Temperature 446 °F, Time 300 hour	
	150 MPa @Temperature 230 °C, Time 234000 sec	21800 psi @Temperature 446 °F, Time 65.0 hour	
	210 MPa @Temperature 175 °C, Time 86400 sec	30500 psi @Temperature 347 °F, Time 24.0 hour	
Tensile Modulus 	45.0 GPa @Temperature 230 °C	6530 ksi @Temperature 446 °F	
	68.0 GPa @Temperature 120 °C	9860 ksi @Temperature 248 °F	
	82.0 GPa @Temperature 25.0 °C	11900 ksi @Temperature 77.0 °F	
	93.0 GPa @Temperature -40.0 °C	13500 ksi @Temperature -40.0 °F	
Compressive Strength	90.0 MPa	13100 psi	at permanent set of 0.1%
	325 MPa	47100 psi	at permanent set of 10%
	95.0 MPa @Temperature 120 °C	13800 psi @Temperature 248 °F	0.1% set
	100 MPa	14500 psi	0.1% set

	@Temperature 240 °C	@Temperature 464 °F	
	105 MPa	15200 psi	0.1% set
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	120 MPa	17400 psi	1% set
	@Temperature 120 °C	@Temperature 248 °F	
	120 MPa	17400 psi	1% set
	@Temperature 240 °C	@Temperature 464 °F	
	140 MPa	20300 psi	0.1% set
	@Temperature -40.0 °C	@Temperature -40.0 °F	
	150 MPa	21800 psi	1% set
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	175 MPa	25400 psi	1% set
	@Temperature -40.0 °C	@Temperature -40.0 °F	
	215 MPa	31200 psi	10% set
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	270 MPa	39200 psi	10% set
	@Temperature 120 °C	@Temperature 248 °F	
	275 MPa	39900 psi	10% set
	@Temperature 240 °C	@Temperature 464 °F	
	350 MPa	50800 psi	10% set
	@Temperature -40.0 °C	@Temperature -40.0 °F	
Fatigue Strength	90.0 MPa	13100 psi	
	@# of Cycles 1.00e+8	@# of Cycles 1.00e+8	
Machinability	80 %	80 %	UNS C36000 (free-cutting brass) = 100%
Izod Impact	7.00 J	5.16 ft-lb	
Charpy Impact	15.0 J	11.1 ft-lb	V-notch

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0000170 ohm-cm	0.0000170 ohm-cm	
	0.0000171 ohm-cm	0.0000171 ohm-cm	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	0.00001776 ohm-cm	0.00001776 ohm-cm	
	@Temperature 65.0 °C	@Temperature 149 °F	
	0.000018125 ohm-cm	0.000018125 ohm-cm	
	@Temperature 90.0 °C	@Temperature 194 °F	
	0.00001851 ohm-cm	0.00001851 ohm-cm	
	@Temperature 120 °C	@Temperature 248 °F	
	0.00001891 ohm-cm	0.00001891 ohm-cm	
	@Temperature 150 °C	@Temperature 302 °F	
	0.00001933 ohm-cm	0.00001933 ohm-cm	
	@Temperature 175 °C	@Temperature 347 °F	
	0.00001977 ohm-cm	0.00001977 ohm-cm	
	@Temperature 210 °C	@Temperature 410 °F	
	0.0000200 ohm-cm	0.0000200 ohm-cm	
	@Temperature 235 °C	@Temperature 455 °F	

Thermal Properties	Metric	English	Comments
CTE, linear 	17.8 µm/m-°C	9.89 µin/in-°F	
	@Temperature 100 °C	@Temperature 212 °F	
	18.0 µm/m-°C	10.0 µin/in-°F	

	@Temperature 130 °C	@Temperature 266 °F
	18.2 µm/m-°C	10.1 µin/in-°F
	@Temperature 165 °C	@Temperature 329 °F
	18.3 µm/m-°C	10.2 µin/in-°F
	@Temperature 185 °C	@Temperature 365 °F
	18.4 µm/m-°C	10.2 µin/in-°F
	@Temperature 215 °C	@Temperature 419 °F
	18.5 µm/m-°C	10.3 µin/in-°F
	@Temperature 20.0 - 200 °C	@Temperature 68.0 - 392 °F
	18.6 µm/m-°C	10.3 µin/in-°F
	@Temperature 235 °C	@Temperature 455 °F
	18.7 µm/m-°C	10.4 µin/in-°F
	@Temperature 270 °C	@Temperature 518 °F
Specific Heat Capacity	0.376 J/g-°C	0.0899 BTU/lb-°F
Thermal Conductivity	46.9 W/m-K	325 BTU-in/hr-ft ² -°F
	@Temperature 20.0 °C	@Temperature 68.0 °F
	47.0 W/m-K	326 BTU-in/hr-ft ² -°F
	@Temperature 20.0 °C	@Temperature 68.0 °F
	48.0 W/m-K	333 BTU-in/hr-ft ² -°F
	@Temperature 40.0 °C	@Temperature 104 °F
	50.0 W/m-K	347 BTU-in/hr-ft ² -°F
	@Temperature 70.0 °C	@Temperature 158 °F
	51.0 W/m-K	354 BTU-in/hr-ft ² -°F
	@Temperature 95.0 °C	@Temperature 203 °F
	52.0 W/m-K	361 BTU-in/hr-ft ² -°F
	@Temperature 125 °C	@Temperature 257 °F
	54.0 W/m-K	375 BTU-in/hr-ft ² -°F
	@Temperature 160 °C	@Temperature 320 °F
	56.0 W/m-K	389 BTU-in/hr-ft ² -°F
	@Temperature 175 °C	@Temperature 347 °F
	59.0 W/m-K	409 BTU-in/hr-ft ² -°F
	@Temperature 205 °C	@Temperature 401 °F
	62.0 W/m-K	430 BTU-in/hr-ft ² -°F
	@Temperature 230 °C	@Temperature 446 °F
Melting Point	762 - 930 °C	1400 - 1710 °F
Solidus	762 °C	1400 °F
Liquidus	930 °C	1710 °F

Processing Properties	Metric	English	Comments
Annealing Temperature	260 °C	500 °F	Stress-Relieving Temperature

Component Elements Properties	Metric	English	Comments
Aluminum, Al	<= 0.0050 %	<= 0.0050 %	
Antimony, Sb	<= 0.50 %	<= 0.50 %	
Copper, Cu	78 - 82 %	78 - 82 %	
Iron, Fe	<= 0.15 %	<= 0.15 %	
Lead, Pb	8.0 - 11 %	8.0 - 11 %	

Nickel, Ni	<= 0.70 %	<= 0.70 %
Phosphorous, P	<= 0.050 %	<= 0.050 %
Silicon, Si	<= 0.0030 %	<= 0.0030 %
Sulfur, S	<= 0.080 %	<= 0.080 %
Tin, Sn	9.0 - 11 %	9.0 - 11 %
Zinc, Zn	<= 0.70 %	<= 0.70 %