

BELMONT BERYLLIUM COPPER ALLOY 4977

2% Beryllium Copper. Trade Designations: Alloy 20C, CDA 825

COMPOSITION — PERCENT			
	NOMINAL	MINIMUM	MAXIMUM
Copper	97.2	Remainder	
Beryllium	2.0	1.90	2.15
Cobalt*	.5	.35	.65
Silicon	.25	.20	.35
Nickel**	....	....	.20
Iron	....	....	.25
Aluminum	....	....	.15
Tin	....	....	.10
Lead	....	....	.02
Zinc	....	....	.10
Chromium	....	....	.10

NEAREST APPLICABLE SPECIFICATIONS	
Centrifugal Continuous Die Investment	MIL-C-22087, Comp. 10 ICI-Cu-2-10780
Permanent Mold Sand	QQ-C-390, Alloy X6 MIL-C-19464, Class II AMS 4890

*Cobalt plus nickel. **Nickel is a residual element and shall not be intentionally added to the melt.

PHYSICAL PROPERTIES	ENGLISH UNITS	METRIC UNITS
Melting Point (Liquids)	1800 F	982 C
Melting Point (Solids)	1575 F	857 C
Density	.292 lb./cu. in. @ 68 F	8.09 gm./cu. cm. @ 20 C
Specific Gravity	8.09	8.09
Coefficient of Thermal Expansion	.0000094 per °F from 68 F to 392 F	.000017 per °C from 20 C to 200 C
Thermal Conductivity	75 Btu./sq. ft./ft./hr./°F @ 68 F	.174 cal./sq. cm./cm./sec./°C @ 20 C
Electrical Conductivity*	18 % IACS @ 68 F	.104 Megmho-cm. @ 20 C
Specific Heat	.10 Btu./lb./°F @ 68 F	.10 cal./gm./°C @ 20 C
Modulus of Elasticity (Tension)	18,500 ksi	13,000 Kg./sq. mm.

*Volume basis in as-cast condition except for precipitation hardening alloys which are in the full heat treated condition.

CHARACTERISTICS AND USES

Excellent fluidity. One of the best alloys for investment casting and sand casting. Responds to heat treatment. Meets RWMA Class 4 requirements for resistance welding. Used

for general engineering applications - cams, bushings, valves, pump parts, lever arms. Molds for plastic parts, safety tools, ornamental and jewelry parts.

FABRICATION PRACTICES

Stress Relieving Temperature — 400 F or 200C

Time at Temperature — 1 Hour per Inch of Section Thickness

Responds to Heat Treatment — Yes

Solution Heat Treating Temperature — 1450-1475 F or 788-802 C

Time at Temperature — 1 Hour per Inch of Section Thickness

Quenching Medium — Water

Precipitation Hardening Temperature — 650 F or 343 C

Time at Temperature — 3 Hours
Quenching Medium — Air

Suitability for being joined by:

Soldering Fair

Brazing Fair

Oxyacetylene Welding Not Recommended

Carbon Arc Welding Fair

Gas Shielded Arc Welding Fair

Coated Metal Arc Welding Fair

Machinability Rating

(Free Cutting Brass = 100) 20

TYPES OF CASTING

- Centrifugal Permanent Mold
 Continuous Plaster
 Die Sand
 Investment Other (Pressure)

CASTING CHARACTERISTICS

Effect of Section Size on Soundness and Mechanical Properties	Medium
Patternmakers Shrinkage (in./ft.)	3/16
Drossing	Medium
Gassing	Medium
Fluidity	High
Shrinkage	Medium
Casting Yield	Medium

MECHANICAL PROPERTIES

(TEST BAR VALUES)

PROPERTY	AS CAST (SAND)				HEAT TREATED			
	ENGLISH UNITS		METRIC UNITS		ENGLISH UNITS		METRIC UNITS	
	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
Tensile Strength - ksi (kg/mm ²)	80	....	56.2	155.0	160	109.0	112.5
Yield Strength - ksi (kg/mm ²) (.5% Extension Under Load)
(.2% Offset)	45	....	31.6	115.0	....	80.8	....
Elongation in 2 inches (50mm) - percent	20	....	20	0	1	0	1
Hardness								
Rockwell	B82	....	B82	C38	C40	C38	C40
Compressive Strength - ksi (kg/mm ²)								
0.1 in. set/in.	90	....	63.3
Impact Strength - ft.-lbs.								
Izod	8	....	....
Charpy V-Notch
Proportional Limit - ksi (kg/mm ²)	100.0	110	70.3	77.3
Fatigue Strength (100 million cycles) - ksi (kg/mm ²)	24	....	16.9

GENERAL FOUNDRY PRACTICE

Molding and gating practice should follow procedures for manganese bronze and aluminum bronze as beryllium copper is prone to dross formation also.

Melt in a slightly oxidizing atmosphere.
Suggested pouring range 1850° - 2050°F (1010° - 1121°C).

Do not overheat as drossing tendency is increased and beryllium losses are aggravated.

No melting flux is required, and as beryllium has a great affinity for oxygen it serves as its own deoxidizer, so no deoxidizer is needed.

Degas with dry nitrogen if treatment is needed.

INGOT SIZES

2 Section - 5 lb. Ingot, Cut Bar - Cross Section 3/4" x 1/2" x 1" lengths, 2" lengths, etc.

Also available: 10c, 35c, 50c, 70c, 165c, 245c, 275c.

