



H. KRAMER & CO.

TIN BRONZE (88-10-0-2) C90500

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	40,000-50,000
Yield Strength, p.s.i. (0.5% EXT).....	20,000-23,000
Elongation, % in 2"	24-43
Reduction of Area, %	20-40
Modulus of Elasticity (Million pounds per sq. in.)	14-16
Brinell Hardness Number, 500 kg.....	75-85
Compression Strength, p.s.i.	
.001" set.....	13,000-16,000
.010" set.....	44,000-48,000
.100" set.....	.....
Impact Strength (Izod) ft. lbs.....	10.0
Specific Gravity	8.7-8.8
Density, lbs. per cu. in. ....	.314-.318
Patternmakers' Shrinkage, in./ft.....	6/32-7/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	10.5-11.5
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-400° F).....	.000010
Specific Heat .....	.....
Melting Range. °F.....	1570-1830
Pouring Temp., Light Castings	2000-2300
Pouring Temp., Heavy Castings.....	1900-2100
Machinability, % free cutting brass.....	40
Fatigue Strength, (p.s.i.) 100 Million cycles	13,000
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

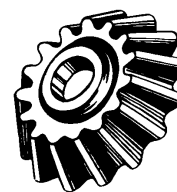
NOMINAL COMPOSITION

Cu	88
Sn	10
Zn	2

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Bearings & bushings
- Pump impellers
- Piston rings
- Pump bodies
- Valves and parts
- Steam fittings
- Gears



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (905) Formerly B30 (1A)
- A.S.T.M. (Castings) B584 (905) and B505 (905)
- A.S.T.M. Castings B271 (905) and B22D (905)
- Federal Specifications (Castings) QQ-C-390A (905)
- S.A.E. (Castings) No. 905 Formerly 62
- A.M.S. (Castings) 4845D



H. KRAMER & CO.

TIN BRONZE (88-8-0-4) NAVY "G" C90300

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	40,000-50,000
Yield Strength, p.s.i. (0.5% EXT).....	18,000-22,000
Elongation, % in 2"	25-50
Reduction of Area, %	20-40
Modulus of Elasticity (Million pounds per sq. in.)	13-16
Brinell Hardness Number, 500 kg.....	60-75
Compression Strength, p.s.i.	
.001" set.....	12,000-14,000
.010" set.....	.....
.100" set.....	.....
Impact Strength (Charpy) ft. lbs.....	14.0
Specific Gravity	8.6-8.8
Density, lbs. per cu. in. ....	.311-.318
Patternmakers' Shrinkage, in./ft.....	6/32-7/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	12-13
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-350° F).....	.000010
Specific Heat .....	.....
Melting Range. °F.....	1570-1832
Pouring Temp., Light Castings	2000-2300
Pouring Temp., Heavy Castings	1900-2100
Machinability, % free cutting brass	40
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

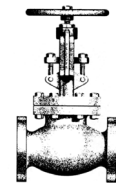
NOMINAL COMPOSITION

Cu	88
Sn	8
Zn	4

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Bearings & bushings
- Pump impellers
- Piston rings
- Pump bodies
- Valves and parts
- Steam fittings
- Gears



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (903) Formerly B30 (1B)
- A.S.T.M. (Castings) B271 (903) and B584 (903)
- Federal Specifications (Castings) B505 (903)
- Federal Specifications (Ingots) QQ-C-525B (5) and QQ-C-390A (903)
- Military Specifications (Castings) MIL-C-15345G (8).
- MIL-C-11866B (26), MIL-C-22087 (3) and MIL-C-22229(1)
- S.A.E. (Castings) No. 903 Formerly 620



H. KRAMER & CO.

LEADED TIN BRONZE (88-6-1.5-4.5) NAVY "M" C92200

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	40,700
Yield Strength, p.s.i. (0.5% EXT).....	16,400
Elongation, % in 2"	45
Reduction of Area, %	40
Modulus of Elasticity (Million pounds per sq. in.)	13.1
Brinell Hardness Number, 500 kg.....	64
Compression Strength, p.s.i.	
.001" set	15,100
.010" set	18,000
.100" set	38,400
Impact Strength (Charpy) ft. lbs.....	19
Specific Gravity	8.65
Density, lbs. per cu. in. ....	.312
Patternmakers' Shrinkage, in./ft.....	12/64
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	14.32
Thermal Conductivity, % of Cu.	17.7
Coefficient of Thermal	
Expansion (70°-500° F).....	.00001015
Specific Heat .....	.....
Melting Range, °F.....	1518-1810
Pouring Temp., Light Castings	2000-2300
Pouring Temp., Heavy Castings	1900-2150
Machinability, % free cutting brass	42
Fatigue Strength, (p.s.i.) 100 Million cycles	11,000
Creep Strength, p.s.i.	
creep rate of 0.00001% per hour	350° F 550° F 550° F
(0.1% in 10,000.hrs.)	16,000 11,200 6,200

NOMINAL COMPOSITION

Cu	88
Sn	6
Pb	1.5
Zn	4.5

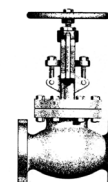
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Known as steam or valve bronze
- High grade steam metal or valve bronze involving temperatures up to 550° F
- Steam pressure castings
- Valve bodies subject to medium high pressure
- Backing for babbitt lined bearings
- Carburetors
- Automobile brackets
- Oil pumps
- Gears
- Electrical castings
- Bushings
- High duty bearings
- Ornamental bronze

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (922) Formerly B30 (2A)
- A.S.T.M. (Castings) B61. B584 (922). B271 (922) and B505 (922)
- Federal Specifications (Ingot) QQ-C-525B (1)
- Federal Specifications (Castings) QQ-C-390A (922)
- Military Specifications (Castings) MIL-C-15345G (9). and MIL-B-16541A
- S.A.E. (Castings) No. 922 Formerly 622





LEADED TIN BRONZE (87-8-1-4) C92300

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	36,000-44,000
Yield Strength, p.s.i. (0.5% EXT).....	16,000-24,000
Elongation, % in 2"	28-45
Reduction of Area, %	24-40
Modulus of Elasticity (Million pounds per sq. in.)	10.6-16.0
Brinell Hardness Number, 500 kg.....	60-75
Compression Strength, p.s.i.	
.001" set.....	9,000-11,000
.010" set.....	.....
.100" set.....	32,000-38,000
Impact Strength (Izod) ft. lbs.	12-15
Specific Gravity	8.70-8.87
Density, lbs. per cu. in. ....	.314-.320
Patternmakers' Shrinkage, in./ft.....	6/32-7/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	10-12
Thermal Conductivity, % of Cu.	12-13
Coefficient of Thermal	
Expansion (70°-350° F).....	.000010
Specific Heat .....	.....
Melting Range, °F.....	1570-1830
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings	1920-2100
Machinability, % free cutting brass	50
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001 %	
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	87
Sn	8
Pb	1
Zn	4

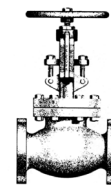
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Strong general utility structural bronze for use under severe conditions
- Valves, expansion joints, special high pressure pipe fittings
- Steam pressure castings
- High pressure valves

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot B30 (923 Formerly B30 (2B)
- A.S.T.M. (Castings) B584 (923), B271 (923) and B505 (923)
- Federal Specifications (Ingot) QQ-C-525B (6 and 6X)
- Federal Specifications (Castings) QQ-C-390A (923)
- Military Specifications (Castings) MIL-C-15345G (10)
- S.A.E. (Castings) 923 Formerly 621





H. KRAMER & CO.

LEADED TIN BRONZE (87-10-1-2) C92600

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	36,000-46,000
Yield Strength, p.s.i. (0.5% EXT).....	18,000-26,000
Elongation, % in 2"	20-35
Reduction of Area, %	15-30
Modulus of Elasticity (Million pounds per sq. in.)	10.6-16
Brinell Hardness Number, 500 kg.....	65-80
Compression Strength, p.s.i.	
.001" set	12,000-14,000
.010" set	40,000-46,000
.100" set	7-10
Impact Strength (Izod) ft. lbs.	8.70-8.87
Specific Gravity .....	.314-.320
Density, lbs. per cu. in.	3/16-7/32
Patternmakers' Shrinkage, in./ft.	
Electrical Conductivity	10-12
% of annealed Copper at 20° C. (I.A.C.S.)	12-13
Thermal Conductivity, % of Cu.	
Coefficient of Thermal	
Expansion (70°-350° F).....	.000010
Specific Heat	
Melting Range, °F.....	1550-1800
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings	1920-2100
Machinability, % free cutting brass	50
Fatigue Strength, (p.s.i.) 100 Million cycles	
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.) .....	.....

NOMINAL COMPOSITION

Cu	87
Sn	10
Pb	1
Zn	2

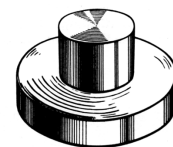
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Commercial bronze for high duty bearings where wear-resistance is essential
- Strong, general utility structural bronze for use under severe conditions
- Bolts, nuts, gears
- Heavy pressure bearings and bushings to use against hardened steel
- Valves, expansion joints, special high pressure pipe fittings
- Pump pistons
- Bearings, elevator and electrical work
- Steam pressure castings
- High pressure valves
- Automobile bushings

CORRESPONDS TO OR IS SIMILAR TO:

Federal Specifications (Castings) QQ-C-309A (926)
A.M.S. (Castings) 4846A





H. KRAMER & CO.

HIGH LEADED TIN BRONZE (80-10-10) C93700

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	39,200
Yield Strength, p.s.i. (0.5% EXT).....	17,900
Elongation, % in 2"	30
Reduction of Area, %	24
Modulus of Elasticity (Million pounds per sq. in.)	11.6
Brinell Hardness Number, 500 kg.....	67
Compression Strength, p.s.i.	
.001" set.....	17,700
.010" set.....	22,200
.100" set.....	46,600
Impact Strength (Charpy) ft. lbs.....	11
Specific Gravity	9.00
Density, lbs. per cu. in. ....	.325
Patternmakers' Shrinkage, in./ft.....	8/64
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	10.14
Thermal Conductivity, % of Cu.	12.1
Coefficient of Thermal	
Expansion (70°-400° F).....	.0000103
Specific Heat .....	.....
Melting Range, °F.....	1403-1705
Pouring Temp., Light Castings	2000-2250
Pouring Temp., Heavy Castings	1850-2100
Machinability, % free cutting brass	97
Fatigue Strength, (p.s.i.) 100 Million cycles	13,000
Creep Strength, p.s.i.	
creep rate of 0.00001% 350° F 450° F 550° F	
per hour (0.1% in 10,000 hrs.) 10,400 7,400 1,800	

NOMINAL COMPOSITION

Cu	80
Sn	10
Pb	10

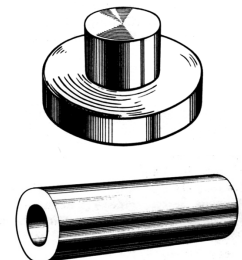
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Standard general purpose bushing or bearing alloy
- Bearing metal, good anti-friction and wearing properties for high speed and heavy pressures bearing service. Bearings for heavy pressure not machined by broaching.
- Cast bearings and bushings and castings to resist some of the mild acids as are found in mine waters
- Acid-resisting bronze for paper-mill sulphite liquor
- Excellent wearing material under conditions of high speed, heavy pressure, shock and vibration
- Used for most types of machine bearings
- Roll neck bearings
- Lathe bearings
- Babbit-lined armature bearings for electric locomotives

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (937) Formerly B30 (3A)
- A.S.T.M. (Castings) B584 (937), B271 (937), B22 (937) and B505 (937)
- S.A.E. (Castings) No. 93 Formerly 64 and 792
- A.M.S. (Castings) 4827C and 4842A
- Federal Specifications (Castings) QQ-C-309A (937)





H. KRAMER & CO.

HIGH LEADED TIN BRONZE (83-7-7-3) C93200

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	33,000-42,000
Yield Strength, p.s.i. (0.5% EXT).....	17,000-20,000
Elongation, % in 2"	25-40
Reduction of Area, %	20-35
Modulus of Elasticity (Million pounds per sq. in.)	14.5
Brinell Hardness Number, 500 kg.....	60-70
Compression Strength, p.s.i.	
.001" set .....	....
.010" set .....	....
.100" set	46,000
Impact Strength (Izod) ft. lbs.	6
Specific Gravity	8.85-8.90
Density, lbs. per cu. in. ....	.320-.322
Patternmakers' Shrinkage, in./ft.....	6/32-7/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	12.3
Thermal Conductivity, % of Cu. ....	....
Coefficient of Thermal	
Expansion (30°-200° F).....	.000010
Specific Heat .....	....
Melting Range, °F.....	1570-1790
Pouring Temp., Light Castings	2000-2250
Pouring Temp., Heavy Castings	1900-2050
Machinability, % free cutting brass.....	70
Fatigue Strength, (p.s.i.) 100 Million cycles	16,000
Creep Strength, p.s.i.	
Creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	....

NOMINAL COMPOSITION

Cu	83
Sn	7
Pb	7
Zn	3

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- General utility bearing alloy
- Bushings
- Automobile fittings

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (932) Formerly B30 (3B)
- A.S.T.M. (Castings) B584 (932), B271 (932) and B505 (932)
- Federal Specifications (Ingot) QQ-C-525B (12)
- Federal Specifications (Castings) QQ-C-390A (932)
- Military Specifications (Castings) MIL-C-15345B (12)
- S.A.E. (Castings) No. 932 Formerly 660





H. KRAMER & CO.

HIGH LEADED TIN BRONZE (85-5-9-1) C93500

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	28,000-35,000
Yield Strength, p.s.i. (0.5% EXT).....	15,000-18,000
Elongation, % in 2"	25-35
Reduction of Area, %	20-35
Modulus of Elasticity (Million pounds per sq. in.)	11-13
Brinell Hardness Number, 500 kg.....	55-65
Compression Strength, p.s.i.	
.001" set.....	13,000
.010" set.....	....
.100" set.....	....
Impact Strength (Izod) ft. lbs.	8
Specific Gravity	8.87
Density, lbs. per cu. in. ....	.320
Patternmakers' Shrinkage, in./ft.....	3/16
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	15
Thermal Conductivity, % of Cu. ....	....
Coefficient of Thermal	
Expansion (70° -400F).....	.0000099
Specific Heat	
Melting Range. °F.....	1570-1830
Pouring Temp., Light Castings	2000-2200
Pouring Temp., Heavy Castings	1900-2100
Machinability, % free cutting brass	70
Fatigue Strength, (p.s.i.) 100 Million cycles .....	....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	....

NOMINAL COMPOSITION

Cu	85
Sn	5
Pb	9
Zn	1

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Machine tool bearings
- General bearing uses



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (935) Formerly B30 (3C)
- A.S.T.M. (Castings) B584 (935), B271 (935) and B505 (935)
- Federal Specification (Castings) QQ-C-390A (935)
- S.A.E. (Castings) No. 935 Formerly 66



H. KRAMER & CO.

HIGH LEADED TIN BRONZE (78-7-15) C93800

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	28,000-35,000
Yield Strength, p.s.i. (0.5% EXT).....	14,000-20,000
Elongation, % in 2"	20-32
Reduction of Area, %	16-25
Modulus of Elasticity (Million pounds per sq. in.)	10.5
Brinell Hardness Number, 500 kg.....	50-60
Compression Strength, p.s.i.	
.001" set	13,000-16,000
.010" set .....	.....
.100" set	38,000-48,000
Impact Strength (Izod) ft. lbs.	4-6
Specific Gravity	9.10-9.40
Density, lbs. per cu. in. ....	.329-.340
Patternmakers' Shrinkage, in./ft.....	6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	11.7
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70° -400° F).....	.0000103
Specific Heat .....	.....
Melting Range, °F.....	1700-1750
Pouring Temp., Light Castings	2000-2250
Pouring Temp., Heavy Castings	1900-2100
Machinability, % free cutting brass.....	80
Fatigue Strength, (p.s.i.) 100 Million cycles	10,000
Creep Strength, p.s.i.	
creep rate of 0.00001% .....	.....
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	78
Sn	7
Pb	15

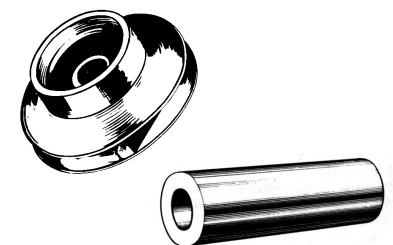
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Locomotive engine castings and general service bearings for moderate pressure
- Driving box, engine and trailer truck brasses, hub liners
- General purpose wearing metal for rod bushings, shoes and wedges
- Used in freight car bearings
- Backs for lined journal bearings for locomotive tenders, passenger cars and freight equipment cars
- A good bearing bronze, used largely where acid-resisting metal is required
- Mine water pump parts (corrosion-resisting)
- Mining machinery
- Bearings requiring lining metal for facing or lining
- Rolling mill bearings
- Brass and copper rolling mill neck bearings

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (938) Formerly B30 (3D)
- A.S.T.M. (Castings) B584(938), B66, B271 (938) and B505 (938)
- Federal Specifications (Ingot) QQ-C-525B (7)
- Federal Specifications (Castings) QQ-C-390A (938)
- Military Specifications (Castings)
- S.A.E.—938 Formerly 67
- A.M.S. (Castings) 4825B





H. KRAMER & CO.

LEADED RED BRASS (85-5-5-5) C83600

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	35,300
Yield Strength, p.s.i. (0.5% EXT).....	15,100
Elongation, % in 2"	32
Reduction of Area, %	30
Modulus of Elasticity (Million pounds per sq. in.)	12.4
Brinell Hardness Number, 500 kg.....	62
Compression Strength, p.s.i.	
.001" set.....	14,400
.010" set.....	17,400
.100" set.....	37,500
Impact Strength (Charpy) ft. lbs.....	11
Specific Gravity	8.83
Density, lbs. per cu. in. ....	.318
Patternmakers' Shrinkage, in./ft.....	11/64
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	15.08
Thermal Conductivity, % of Cu.	18.3
Coefficient of Thermal	
Expansion (70° -400° F).....	.00001006
Specific Heat .....	.....
Melting Range, °F.....	1568-1849
Pouring Temp., Light Castings	2100-2350
Pouring Temp., Heavy Castings	1950-2150
Machinability, % free cutting brass	84
Fatigue Strength, (p.s.i.) 100 Million cycles	11,000
Creep Strength, p.s.i.	
creep rate of 0.00001% 350° F 450° F 550° F	
per hour (0.1 % in 10,000 hrs.).....	12,500 11,100 7,000

NOMINAL COMPOSITION

Cu	85
Sn	5
Pb	5
Zn	5

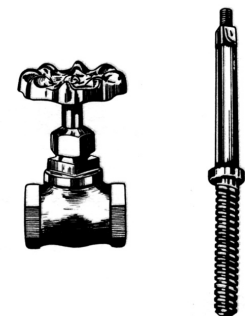
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Known as "Ounce Metal," a high grade red brass for general service
- General castings requiring fair strength, soundness and good machining qualities
- Castings used for hydrostatic pressures
- Low pressure valve bodies
- Pipe fittings
- Gasoline and oil line fittings
- Small pump castings
- Water pump impellers
- Fire equipment fittings
- Plumbing goods
- Trolley line parts
- Ornamental fixtures
- Small gears

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (836) Formerly B30 (4A)
- A.S.T.M. (Castings) B584 (836), B62, B271 (836) and B505 (836)
- Federal Specifications (Ingot) QQ-C-525B (2)
- Federal Specifications (Castings) QQ-C-390A (836)
- Military Specifications (Castings) MIL-C-15345B(1), MIL-C-22087A (2), MIL-C-11866B (25) and MIL-C-22229A (2)
- S.A.E. (Castings) No. 836 Formerly 40
- A.M.S. 4855B





H. KRAMER & CO.

LEADED RED BRASS (83-4-6-7) C83800

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	30,000-38,000
Yield Strength, p.s.i. (0.5% EXT).....	12,000-17,000
Elongation, % in 2"	25-35
Reduction of Area, %	20-30
Modulus of Elasticity (Million pounds per sq. in.)	13.3
Brinell Hardness Number, 500 kg.....	50-60
Compression Strength, p.s.i.	
.001" set	11,000-12,000
.010" set .....	.....
.100" set	28,000-30,000
Impact Strength (Izod) ft. lbs.....	8
Specific Gravity	8.6-8.7
Density, lbs. per cu. in. ....	.311-.314
Patternmakers' Shrinkage, in./ft.....	6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	15.3
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-400° F).....	.00001
Specific Heat .....	.....
Melting Range, °F.....	1550-1840
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings	1950-2150
Machinability, % free cutting brass.....	90
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	83
Sn	4
Pb	6
Zn	7

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- A general purpose free-machining red brass alloy
- Air, gas and water fittings
- Valves
- Pipe fittings
- Plumbers' supplies and specialties
- Injectors
- Common hydraulic pressure castings
- Pumps and pump bodies
- Hardware and fittings
- Railroad catenary and overhead fittings
- Carburetors

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (838) Formerly B30 (4B)
- A.S.T.M. (Castings) B584 (838), B271 (838) and B505 (838)
- Federal Specifications (Castings) QQ-C-390A (838)





LEADED SEMI RED BRASS (81-3-7-9) C84400

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	29,000-39,000
Yield Strength, p.s.i. (0.5% EXT).....	13,000-17,000
Elongation, % in 2"	20-30
Reduction of Area, %	15-27
Modulus of Elasticity (Million pounds per sq. in.)	13.0
Brinell Hardness Number, 500 kg.....	50-60
Compression Strength, p.s.i.	
.001" set.....	....
.010" set.....	....
.100" set.....	....
Impact Strength (Izod) ft. lbs.....	6-10
Specific Gravity	8.60-8.80
Density, lbs. per cu. in. ....	.311-.318
Patternmakers' Shrinkage, in./ft.....	6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	16.6
Thermal Conductivity, % of Cu. ....	....
Coefficient of Thermal	
Expansion (70°-400° F).....	.00001
Specific Heat	
Melting Range, °F.....	1549-1840
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings.....	1950-2150
Machinability, % free cutting brass.....	90
Fatigue Strength, (p.s.i.) 100 Million cycles .....	....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	....

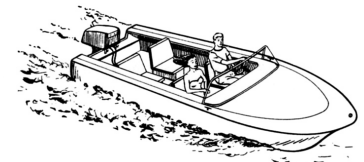
NOMINAL COMPOSITION

Cu	81
Sn	3
Pb	7
Zn	9

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Low pressure valves and fittings
- General hardware fittings
- Ornamental castings
- Plumbing supplies and fixtures



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (844) Formerly B30 (5A)
- A.S.T.M. (Castings) B584 (844), B271 (844) and B505 (844)
- Federal Specifications (Ingot) QQ-C-525B (11)
- Federal Specifications (Castings) QQ-C-309A (844)



H. KRAMER & CO.

LEADED SEMI RED BRASS (76-2½-6½-15) C84800

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	37,800
Yield Strength, p.s.i. (0.5% EXT).....	14,900
Elongation, % in 2"	37
Reduction of Area, %	29
Modulus of Elasticity (Million pounds per sq. in.)	15,2
Brinell Hardness Number, 500 kg.....	59
Compression Strength, p.s.i.	
.001" set	12,800
.010" set	15,800
.100" set	34,300
Impact Strength (Charpy) ft. lbs.....	12
Specific Gravity	8.77
Density, lbs. per cu. in. ....	.317
Patternmakers' Shrinkage, in./ft.....	11/64
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	16.41
Thermal Conductivity, % of Cu.	18.41
Coefficient of Thermal	
Expansion (70°-500° F).....	.0000104
Specific Heat .....	.....
Melting Range, °F.....	1527-1748
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings	1950-2150
Machinability, % free cutting brass.....	90
Fatigue Strength, (p.s.i.) 100 Million cycles	11,000
Creep Strength, p.s.i.	
creep rate of 0.00001% 350° F 400° F 550° F	
per hour (0.1% in 10,000 hrs.).....	11,900 8,000 3,000

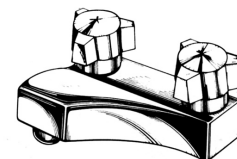
NOMINAL COMPOSITION

Cu	76
Sn	2.5
Pb	6.5
Zn	15

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Plumbing fixtures, cocks and faucets, stops and wastes
- Air and gas fittings
- General hardware fittings
- Low pressure valves and fittings



CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (848) Formerly B30 (5B)
A.S.T.M. (Castings) B584 (848), B271 (848) and B505 (848)



BiAlloy (89-5-0-3-3Bi) C89836

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	33,000
Yield Strength, p.s.i. (0.5% EXT).....	14,000
Elongation, % in 2"	20
Reduction of Area, %	-
Modulus of Elasticity (Million pounds per sq. in.)	-
Brinell Hardness Number, 500 kg.....	65
Compression Strength, p.s.i.	
.001" set.....	-
.010" set.....	-
.100" set.....	-
Impact Strength (Charpy) ft. lbs.....	-
Specific Gravity	8.8
Density, lbs. per cu. in. ....	.318
Patternmakers' Shrinkage, in./ft.....	
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	18
Thermal Conductivity, % of Cu.	-
Coefficient of Thermal	
Expansion (70°-500° F).....	-
Specific Heat	-
Melting Range, °F.....	1580-1885
Pouring Temp., Light Castings	2100-2300
Pouring Temp., Heavy Castings	1950-2150
Machinability, % free cutting brass.....	85
Fatigue Strength, (p.s.i.) 100 Million cycles	
Creep Strength; p.s.i.	
creep rate of 0.00001% 350° F 400° F 550° F	
per hour (0.1 % in 10,000 hrs.)	

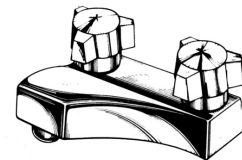
NOMINAL COMPOSITION

Cu	89
Sn	5
Pb	0
Zn	3
Bi:	3

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Plumbing fixtures, cocks and faucets, stops and wastes.



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 C89836
- A.S.T.M. (Castings) B584 C89836



LEADED YELLOW BRASS (72-1-3-24) C85200

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	35,000-40,000
Yield Strength, p.s.i. (0.5% EXT).....	12,000-14,000
Elongation, % in 2"	30-50
Reduction of Area, %	20-40
Modulus of Elasticity (Million pounds per sq. in.)	14.0
Brinell Hardness Number, 500 kg.....	40-55
Compression Strength, p.s.i.	
.001" set.....	8,000-10,000
.010" set.....	.....
.100" set.....	28,000-32,000
Impact Strength () ft. lbs. ....	.....
Specific Gravity	8.45-8.55
Density, lbs. per cu. in. ....	.305-.309
Patternmakers' Shrinkage, in./ft.....	5/32-6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	18.6
Thermal Conductivity, % of Cu.	20-30
Coefficient of Thermal	
Expansion (70° 200° F).....	.0000115
Specific Heat .....	.....
Melting Range, °F.....	1700-1750
Pouring Temp., Light Castings	2000-2100
Pouring Temp., Heavy Castings	1850-2000
Machinability, % free cutting brass.....	80
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

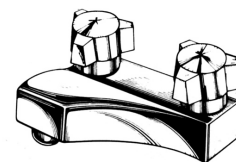
NOMINAL COMPOSITION

Cu	72
Sn	1
Pb	3
Zn	24

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Yellow brass alloy for general purposes
- Yellow alloy for plumbers' fitting, fixtures and trimming
- Ferrules
- Valves and fittings
- Hardware
- Ornamental work
- Chandeliers
- Andirons



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (852) Formerly B30 (6A)
- A.S.T.M. (Castings) B584 (852) and B271 (852)
- Federal Specifications (Castings) QQ-C-390A (852)



H. KRAMER & CO.

LEADED YELLOW BRASS (67-1-3-29) C85400

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	30,000-38,000
Yield Strength, p.s.i. (0.5% EXT).....	11,000-15,000
Elongation, % in 2"	30-40
Reduction of Area, %	25-35
Modulus of Elasticity (Million pounds per sq. in.)	12-14
Brinell Hardness Number, 500 kg.....	40-60
Compression Strength, p.s.i.	
.001" set.....	8,000-10,000
.010" set.....	.....
.100" set.....	28,000-32,000
Impact Strength () ft. lbs. ....	.....
Specific Gravity	8.40-8.50
Density, lbs. per cu. in. ....	.303-.307
Patternmakers' Shrinkage, in./ft.....	6/32-7/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	19.6
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-200° F).....	.0000112
Specific Heat .....	.....
Melting Range, °F.....	1700-1725
Pouring Temp., Light Castings	1950-2100
Pouring Temp., Heavy Castings	1850-1950
Machinability, % free cutting brass	80
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	67
Sn	1
Pb	3
Zn	29

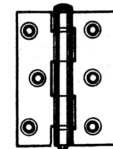
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- General purpose yellow casting alloy
- Light castings not subject to high internal pressure
- Furniture hardware
- Hardware fittings
- Ornamental castings
- Radiator fittings
- Ship trimmings
- Gas cocks, coach trimmings, cast spray nozzles, light fixtures, battery clamps
- Valves and fittings

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (854) Formerly B30 (6B)
- A.S.T.M. (Castings) B854 (854) and B271 (854)
- Federal Specifications (Castings) QQ-C-390A (854)
- S.A.E. (Castings) No. 854 Formerly 41





H. KRAMER & CO.

LEADED YELLOW BRASS (63-1-1-34.7-.3) C85700

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	45,000-55,000
Yield Strength, p.s.i. (0.5% EXT).....	16,000-20,000
Elongation, % in 2"	40-55
Reduction of Area, %	35-50
Modulus of Elasticity (Million pounds per sq. in.)	13-15
Brinell Hardness Number, 500 kg.....	65-80
Compression Strength, p.s.i.	
.001" set.....	....
.010" set.....	....
.100" set.....	....
Impact Strength () ft. lbs. ....	....
Specific Gravity	8.30-8.47
Density, lbs. per cu. in. ....	.300-.306
Patternmakers' Shrinkage, in./ft.....	8/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	21.8
Thermal Conductivity, % of Cu. ....	....
Coefficient of Thermal	
Expansion (70°-500° F).....	.000012
Specific Heat .....	....
Melting Range, °F.....	1675-1725
Pouring Temp., Light Castings	1950-2150
Pouring Temp., Heavy Castings	1850-2000
Machinability, % free cutting brass.....	80
Fatigue Strength, (p.s.i.) 100 Million cycles .....	....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	....

NOMINAL COMPOSITION

Cu	63
Sn	1
Pb	1
Zn	34.7
Al	.3

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- "Navy" yellow brass
- Spring bushing alloy
- Hardware
- Fittings
- Ornamental castings
- Plumbers' flanges, scupper pipes, etc.
- Ship trimmings



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (857) Formerly B30 (6C)
- A.S.T.M. (Castings) B584 (857) and B271 (857)
- Federal Specifications (Castings) QQ-C-390A (857)
- Military Specifications (Castings) MIL-C-15345G (3)



H. KRAMER & CO.

KRAMER "S" MANGANESE BRONZE LEADED HIGH STRENGTH YELLOW BRASS (60,000-15) C86400

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	60,000-78,000
Yield Strength, p.s.i. (0.5% EXT).....	25,000-40,000
Elongation, % in 2"	15-30
Reduction of Area, %	15-30
Modulus of Elasticity (Million pounds per sq. in.)	15.0
Brinell Hardness Number, 3500 kg.....	110-120
Compression Strength, p.s.i.	
.001" set.....	20,000-26,000
.010" set.....	.....
.100" set.....	85,000-90,000
Impact Strength (Izod) ft. lbs.....	20-40
Specific Gravity	8.0-8.4
Density, lbs. per cu. in. ....	.289-.303
Patternmakers' Shrinkage, in./ft.....	7/32-8/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	19.3
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-400° F).....	.0000114
Specific Heat .....	.....
Melting Range, °F.....	1675-1725
Pouring Temp., Light Castings	1900-2050
Pouring Temp., Heavy Castings	1750-1900
Machinability, % free cutting brass	60
Fatigue Strength, (p.s.i.) 100 Million cycles	
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Free-machining manganese bronze
- Valve stems
- Marine castings and fittings
- Pump bodies
- Gas engine bases
- Lever arms
- Brackets
- Gears



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot B30 (864) Formerly B30 (7A)
- A.S.T.M. (Castings) B584 (864), B271 (864) and B505 (864)
- Federal Specifications (Ingot) QQ-C-523A (D)
- Federal Specifications (Castings) QQ-C-390A (864)



H. KRAMER & CO.

KRAMER "A" MANGANESE BRONZE C86500 (HIGH STRENGTH YELLOW BRASS) (65,000-20)

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	71,000
Yield Strength, p.s.i. (0.5% EXT).....	25,800
Elongation, % in 2"	30
Reduction of Area, %	38
Modulus of Elasticity (Million pounds per sq. in.)	15.4
Brinell Hardness Number, 3000 kg.....	130
Compression Strength, p.s.i.	
.001" set.....	23,800
.010" set.....	35,200
.100" set.....	78,900
Impact Strength (Charpy) ft. lbs.....	32
Specific Gravity	8.32
Density, lbs. per cu. in. ....	.301
Patternmakers' Shrinkage, in./ft.....	15/64
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	20.64
Thermal Conductivity, % of Cu.	22.1
Coefficient of Thermal	
Expansion (70°-300° F).....	.0000107
Specific Heat .....	.....
Melting Range, °F.....	1583-1616
Pouring Temp., Light Castings	1900-2000
Pouring Temp., Heavy Castings	1750-1900
Machinability, % free cutting brass.....	26
Fatigue Strength, (p.s.i.) 100 Million cycles	21,250
Creep Strength, p.s.i.	
creep rate of 0.00001% 250° F 350° F 450° F	
per hour (0.1% in 10,000 hrs.).....	28,000 6,200 1,700

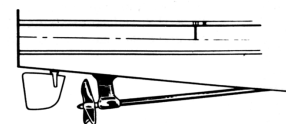
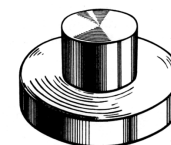
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Substitute for steel and malleable iron castings
- Propeller hubs and blades and other parts in contact with salt or fresh water
- Valve stems, engine framing, complicated lever arms and parts of machinery requiring both strength and toughness
- Gears
- Liners
- Hub caps
- Strength castings
- Bearings

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (865) Formerly B30 (8A)
- A.S.T.M. (Castings) B584 (865) and B271 (865)
- Federal Specifications (Ingot) QQ-C-523A (A and F)
- Federal Specifications (Castings) QQ-C-390A (865)
- Military Specifications (Castings) MIL-C-1534G (4), MIL-C-228087A (5) and MIL-C-22229A (7)
- S.A.E. (Castings) No. 865 Formerly 43
- A.M.S. (Castings) 4860A





H. KRAMER & CO.

KRAMER "SX" MANGANESE BRONZE C86200 KRAMER F-55 MANGANESE BRONZE C86100 (HIGH STRENGTH YELLOW BRASS) (90,000-18)

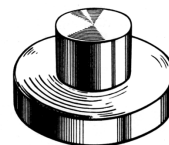
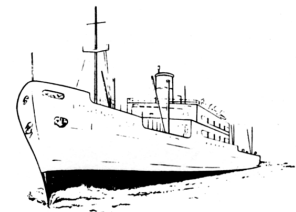
MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	91,000-97,000
Yield Strength, p.s.i. (0.2% Offset)	46,000-50,000
Elongation, % in 2"	19-25
Reduction of Area, %	16-27
Modulus of Elasticity (Million pounds per sq. in.)	14.5-16.0
Brinell Hardness Number, 3000 kg.....	170-195
Compression Strength, p.s.i.	
.001" set.....	50,000
.010" set.....	.....
.100" set.....	.....
Impact Strength (Izod) ft. lbs.....	12
Specific Gravity	7.8-7.9
Density, lbs. per cu. in. ....	.285
Patternmakers' Shrinkage, in./ft.....	8/32-10/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	7-8
Thermal Conductivity, % of Cu. ....	.....
Coefficient of Thermal	
Expansion (70°-400° F).....	.000012
Specific Heat .....	.....
Melting Range. °F.....	1650-1725
Pouring Temp., Light Castings	1950-2150
Pouring Temp., Heavy Castings	1800-1950
Machinability, % free cutting brass	30
Fatigue Strength, (p.s.i.) 100 Million cycles	
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Marine castings
- Gears
- Bushings and bearings
- Gun mounts



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (862) Formerly B30 (8B)
- A.S.T.M. (Castings) B584 (862) and B271 (862)
- Federal Specifications (Ingot) QQ-C-523A (B and E)
- Federal Specifications (Castings) QQ-C-390A (861 and 862)
- Military Specification MIL-C-15345G (5), MIL-C-22087A (7), MIL-C-11866B (20) and MIL-C-22229A (9 and 10)
- S.A.E. (Castings) No. 862 Formerly 430A



H. KRAMER & CO.

KRAMER "XX" MANGANESE BRONZE C86300 (HIGH STRENGTH YELLOW BRASS) (110,000-12)

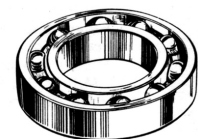
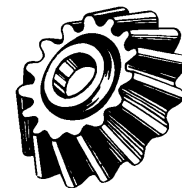
MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	119,000
Yield Strength, p.s.i. (0.2% Offset)	83,100
Elongation, % in 2"	18
Reduction of Area, %	20
Modulus of Elasticity (Million pounds per sq. in.)	14.2
Brinell Hardness Number, 3000 kg.....	225
Compression Strength, p.s.i.	
.001" set.....	71,400
.010" set.....	97,200
.100" set.....	.....
Impact Strength (Charpy) ft. lbs.....	14
Specific Gravity	7.66
Density, lbs. per cu. in. ....	.277
Patternmakers' Shrinkage, in./ft.....	9/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	8.00
Thermal Conductivity, % of Cu.	9.05
Coefficient of Thermal	
Expansion (70° -500° F).....	.0000119
Specific Heat .....	.....
Melting Range, °F.....	1625-1693
Pouring Temp., Light Castings	1950-2150
Pouring Temp., Heavy Castings	1800-1950
Machinability, % free cutting brass.....	8
Fatigue Strength, (p.s.i.) 100 Million cycles	25,000
Creep Strength, p.s.i.	
creep rate of 0.00001% 250° F 350° F 450° F	
per hour (0.1% in 10,000 hrs.)	56,500 19,000 500

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Extra heavy duty high strength alloy
- Spur gears
- Gibs
- Cams
- Bridge parts
- Large valve stems
- Gears
- Bearings (slow speed heavy load)
- Screw down nuts
- Hydraulic cylinder parts



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (863) Formerly B30 (8C)
- A.S.T.M. (Castings) B584 (863), B22 (863), B271 (863) B505 (863)
- Federal Specifications (Ingot) QQ-C-523A (C)
- Federal Specifications (Castings) QQ-C-390A (863)
- Military Specifications (Castings) MIL-C-15345G (6).
- MIL-C-22087A (9), MIL-C-22229A (8) and MIL-C-11866B (21)
- S.A.E. (Castings) No. 863 Formerly 430B
- A.M.S. (Castings) 4862B



H. KRAMER & CO.

KRAMER "M" ALUMINUM BRONZE (88-3-9) C95200

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	70-000-87,000
Yield Strength, p.s.i. (0.5% EXT).....	25,000-30,000
Elongation, % in 2"	22-38
Reduction of Area, %	20-36
Modulus of Elasticity (Million pounds per sq. in.)	16-18
Brinell Hardness Number, 3000 kg.....	110-140
Compression Strength, p.s.i.	
.001" set.....	27,000-31,000
.010" set.....	.....
.100" set.....	65,000-70,000
Impact Strength (Izod) ft. lbs.....	35-50
Specific Gravity	7.8
Density, lbs. per cu. in. ....	.281
Patternmakers' Shrinkage, in./ft.....	10/32-11/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	12.2
Thermal Conductivity, % of Cu.	15.0
Coefficient of Thermal	
Expansion (70°-250° F).....	.0000095
Specific Heat .....	.....
Melting Range, °F.....	1907-1913
Pouring Temp., Light Castings	2050-2200
Pouring Temp., Heavy Castings	2000-2100
Machinability, % free cutting brass	20
Fatigue Strength, (p.s.i.) 100 Million cycles	25,000
Creep Strength, p.s.i.	
creep rate of 0.00001% 500° F 600° F 700° F	
per hour (0.1% in 10,000 hrs.).....	12,000 7,200 4,600

NOMINAL COMPOSITION

Cu	88
Fe	3
Al	9

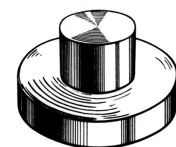
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- General utility aluminum bronze maintaining strength at elevated temperatures
- Resistant to mild but not strong alkalis
- Acid resisting pump parts
- Pickling tank castings and baskets
- Valve seats, valve guides, valve stem
- Marine equipment, propellers
- Worm wheels
- Welding jaws
- Bearings and bushings
- This alloy has high corrosion resistance to many chemicals. For specific application, contact supplier

CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (952) Formerly B30 (9A)
- A.S.T.M. (Castings) B148 (952), B271 (952) and B505 (952)
- Federal Specifications (Ingot) QQ-B-675B (952)
- Federal Specifications (Castings) QQ-C-309A (952)
- Military Specifications (Castings) MIL-C-22087A (16)
and MIL-C-22229A (5)
- S.A.E. (Castings) No. 952 Formerly 68A





H. KRAMER & CO.

KRAMER "I" ALUMINUM BRONZE (89-1-10) C95300

MECHANICAL AND PHYSICAL PROPERTIES

	As Cast	Heat Treated
Tensile Strength, p.s.i.	70,000-85,000	80,000-95,000
Yield Strength, p.s.i. (0.5% EXT).....	30,000-35,000	40,000-55,000
Elongation, % in 2"	20-35	12-16
Reduction of Area, %	15-30	12-16
Modulus of Elasticity (Million pounds per sq. in.)	14-16	.....
Brinell Hardness Number, 3000 kg.....	110-160	160-225
Compression Strength, p.s.i.		
.001" set.....	16,000-20,000	35,000-45,000
.010" set.....	.....	.....
.100" set.....	75,000-83,000	.....
Impact Strength (Izod) ft. lbs.....	30-36	.....
Specific Gravity	7.30-7.65	.....
Density, lbs. per cu. in. ....	.264-.276	.....
Patternmakers' Shrinkage, in./ft.....	7/32-10/32	.....
Electrical Conductivity		
% of annealed Copper at 20° C. (I.A.C.S.)	16	13.8
Thermal Conductivity, % of Cu.	16	.....
Coefficient of Thermal		
Expansion (70°-500° F).....	.0000091-98	.0000097
Specific Heat .....	.....	.....
Melting Range. °F.....	1904-1913	.....
Pouring Temp., Light Castings	2050-2200	.....
Pouring Temp., Heavy Castings.....	1950-2100	.....
Machinability, % free cutting brass.....	35	.....
Fatigue Strength, (p.s.i.) 100 Million cycles..	.....	.....
Creep Strength, p.s.i.		
creep rate of 0.00001%		
per hour (0.1% in 10,000 hrs.).....	.....	.....

NOMINAL COMPOSITION

Cu	89
Fe	1
Al	10

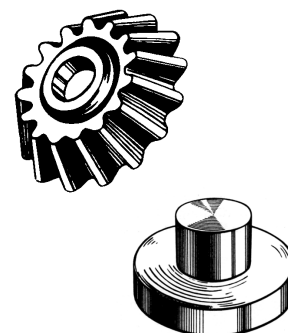
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- General purpose aluminum bronze subject to heat-treatment, maintaining strength at elevated temperatures
- Resistant to mild but not too strong alkalies
- Pickling baskets
- Steel mill stripper nuts, slippers and heavy duty feed nuts
- Spur, helical, bevel, internal gears
- Valve seats
- Bushings and bearings
- Marine equipment
- Welding jaws
- This alloy has high corrosion resistance to many chemicals. For specific applications, contact supplier.

CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (953) Formerly B30 (9B)
A.S.T.M. (Castings) B148 (953). B271(953) and B505 (953)
Federal Specifications (Ingot) QQ-B-675-B (953)
Federal Specifications (Castings) QQ-C-390A (953)
Military Specifications (Castings) MIL-C-11866B (22)
S.A.E. (Castings) No. 953 Formerly 68B





H. KRAMER & CO.

KRAMER "R" ALUMINUM BRONZE C95400 KRAMER "C" ALUMINUM BRONZE C95410

MECHANICAL AND PHYSICAL PROPERTIES

	As Cast	Heat Treated
Tensile Strength, p.s.i.	75,000-95,000	90,000-100,000
Yield Strength, p.s.i. (0.5% EXT).....	30,000-41,000	45,000 - 52,000
Elongation, % in 2"	12-20	6-15
Reduction of Area, %	12-20	7-18
Modulus of Elasticity (Million pounds per sq. in.)	16-20	15-19.5
Brinell Hardness Number, 3000 kg.....	150-185	190-235
Compression Strength, p.s.i. ....		.....
.001" set .....	.....	.....
.010" set .....	.....	.....
.100" set	100	
Impact Strength (Izod) ft. lbs.....	7-22	
Specific Gravity	7.52	
Density, lbs. per cu. in. ....	.272	
Patternmakers' Shrinkage, in./ft.....	7/32-10/32	
Electrical Conductivity		
% of annealed Copper at 20° C. (I.A.C.S.)	11-14	10-12
Thermal Conductivity, % of Cu.	18	
Coefficient of Thermal		
Expansion (70°-500 F) .....	.000009	
Specific Heat .....	.....
Melting Point, °F.....	1880-1900	
Pouring Temp., Light Castings	2300	
Pouring Temp., Heavy Castings	2150	
Machinability, % free cutting brass	20	
Fatigue Strength, (p.s.i.) 100 Million cycles ..	32,000	
Creep Strength, p.s.i.		
creep rate of 0.00001 %	600° F	700° F 800° F
per hour (0.1% in 10,000 hrs.).....	7,400	4,400 2,900

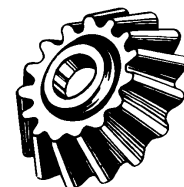
NOMINAL COMPOSITION

	KRAMER "R"	KRAMER "C"
Cu	86	84
Fe	4	4
Al	10	10
Ni		2

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Gears
- Worm wheels
- Bushings
- Pump parts
- Propeller blade bushings
- Valve seats
- Landing gear parts



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (954) Formerly B30 (9C)
- A.S.T.M. (Castings) B148 (954) and B271 (954) B505 (954)
- Federal Specifications (Ingot) QQ-B-675B (954)
- Federal Specifications (Castings) QQ-C-390A
- Military Specifications (Castings) MIL-C-15345G (13)
- A.M.S. (Castings) 4870-71
- A.M.S. (Castings) 4872-73



H. KRAMER & CO.

KRAMER "N" ALUMINUM BRONZE (81-4-11-4) C9550

MECHANICAL AND PHYSICAL PROPERTIES

	As Cast	Heat Treated
Tensile Strength, p.s.i.	90,000-105,000	110,000-124,000
Yield Strength, p.s.i. (0.5% EXT).....	40,000-50,000	60,000-80,000
Elongation, % in 2"	7-20	5-12
Reduction of Area, %	10-20	6-14
Modulus of Elasticity (Million pounds per sq. in.)	18-20	18-20
Brinell Hardness Number, 3000 kg.....	175-210	215-260
Compression Strength, p.s.i.		
.001" set.....	.....	.....
.010" set.....	.....	.....
.100" set.....	120	.....
Impact Strength (Charpy) ft. lbs.....	9	.....
Specific Gravity	7.5	
Density, lbs. per cu. in. ....	.272	
Patternmakers' Shrinkage, in./ft.....	7/32-8/32	
Electrical Conductivity		
% of annealed Copper at 20° C. (I.A.C.S.)	8.0-9.5	
Thermal Conductivity, % of Cu.	12.0	
Coefficient of Thermal		
Expansion (70°-500° F).....	.0000085	
Specific Heat .....	.....
Melting Point, °F.....	1900	
Pouring Temp., Light Castings	2300	
Pouring Temp., Heavy Castings	2150	
Machinability, % free cutting brass.....	20	
Fatigue Strength, (p.s.i.) 100 Million cycles	31,000	
Creep Strength, p.s.i.		
creep rate of 0.00001%	600° F	700° F
per hour (0.1% in 10,000 hrs.).....	10,500	5,500
		2,400

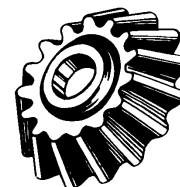
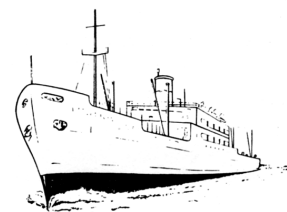
NOMINAL COMPOSITION

Cu	81
Fe	4
Ni	4
Al	11

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Bushings and bearings
- Gears
- Cams
- Worm wheels
- Wear parts
- Dies
- Corrosion resistant castings
- Valve parts
- Pump parts



CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (955) Formerly B30 (9D)
A.S.T.M. (Castings) B148 (955) and B271 (955) B505 (955)
Federal Specifications (Ingot) QQ-B-675 B505 (955)
Federal Specifications (Castings) QQ-C-39CA (955)
Military Specifications (Castings) MIL-C-15345G (14),
MIL-C-22087A (8), MIL-C-22229A (6)
A.M.S. (Castings) 955 Formerly 4880



H. KRAMER & CO.

KRAMER "N-I" ALUMINUM BRONZE (81-4-9-5-1) C95800

MECHANICAL AND PHYSICAL PROPERTIES

	As Cast
Tensile Strength, p.s.i.	88,000-96,000
Yield Strength, p.s.i. (0.5% EXT).....	35,000-40,000
Elongation, % in 2"	18.0-28.0
Reduction of Area, %	18.0-28.0
Modulus o. Elasticity (Million pounds per sq. in.).....	16.5
Brinell Hardness Number, 3000 kg.....	150-170
Compression Strength, p.s.i.	
.001" set.....	
.010" set.....	
.100" set.....	100
Impact Strength (Izod) ft. lbs.....	20
Specific Gravity	7.64
Density, lbs. per cu. in. ....	.276
Patternmakers' Shrinkage, in./ft.....	.....
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	7.1
Thermal Conductivity, % of Cu.	20.8
Coefficient of Thermal	
Expansion (68°-212° F).....	.000009
Specific Heat	
Melting Range, °F.....	1910-1940
Pouring Temp., Light Castings	2300
Pouring Temp., Heavy Castings	2150
Machinability, % free cutting brass	20
Fatigue Strength, (p.s.i.) 100 Million cycles	31.000
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	

NOMINAL COMPOSITION

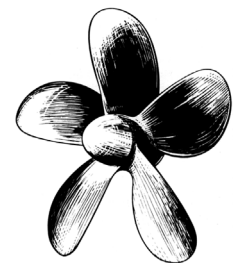
KRAMER "N-I"

Cu	81
Fe	4
Al	9
Ni	5
Mn	1

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Propellers and marine equipment
- Any application where extreme corrosion resistance is required
- Where weldability is desired
- Valve Parts
- Pump Parts



CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (958)
A.S.T.M. (Castings) B148 (958) and B271 (958)
Military Specifications (Castings) MIL-C-15345 (28).
MIL-B-21230A (1) and MIL-B-24480
Federal Specifications (Castings) QQ-C-390A (958)



H. KRAMER & CO.

LEADED NICKEL BRASS (NICKEL SILVER) (57-2-9-20-12) C97300

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	30,000-40,000
Yield Strength, p.s.i. (0.5% EXT).....	15,000-20,000
Elongation, % in 2"	10-25
Reduction of Area, %	7-20
Modulus of Elasticity (Million pounds per sq. in.)	16.0
Brinell Hardness Number, 500 kg.....	50-60
Compression Strength, p.s.i.	
.001" set.....	.....
.010" set.....	.....
.100" set.....	.....
Impact Strength () ft. lbs. ....	.....
Specific Gravity	8.80-8.90
Density, lbs. per cu. in. ....	.318-.322
Patternmakers' Shrinkage, in./ft.....	4/32-6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	5.7
Thermal Conductivity, % of Cu.	7.3
Coefficient of Thermal	
Expansion (70°-500 F) .....	.000009
Specific Heat .....	.....
Melting Range, °F.....	1850-1904
Pouring Temp., Light Castings	2200-2400
Pouring Temp., Heavy Castings	2000-2200
Machinability, % free cutting brass.....	70
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	57
Sn	2
Pb	9
Zn	20
Ni	12

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- A free-machining leaded nickel brass
- Hardware fittings
- Valves
- Valve trimmings
- Plumbing fixtures
- Statuary
- Ornamental castings

CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (973) Formerly B30 (10A)
A.S.T.M. (Castings) B584 (973) and B271 (973)
Military Specifications (Castings) MIL-C-153456(7)





H. KRAMER & CO.

LEADED NICKEL BRASS (NICKEL SILVER) (60-3-5-16-16) C97400

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	35,000-45,000
Yield Strength, p.s.i. (0.5% EXT).....	17,000-24,000
Elongation, % in 2"	15-30
Reduction of Area, %	15-30
Modulus of Elasticity (Million pounds per sq. in.)	15.0
Brinell Hardness Number, 500 kg.....	65-80
Compression Strength, p.s.i.	
.001" set.....	.....
.010" set.....	.....
.100" set.....	.....
Impact Strength () ft. lbs. ....	.....
Specific Gravity	8.80-8.90
Density, lbs. per cu. in. ....	.318-.322
Patternmakers' Shrinkage, in./ft.....	6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	5-6
Thermal Conductivity, % of Cu.	7.0
Coefficient of Thermal	
Expansion (70°-500 F).....	.0000166
Specific Heat .....	.....
Melting Range °F.....	1958-2012
Pouring Temp., Light Castings	2250-2450
Pouring Temp., Heavy Castings.....	2050-2250
Machinability, % free cutting brass.....	60
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

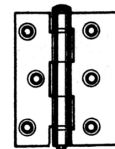
NOMINAL COMPOSITION

Cu	60
Sn	3
Pb	5
Zn	16
Ni	16

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- A free-machining leaded nickel brass
- Valves
- Valve fittings and trimmings
- Pipe fittings
- Plumbers' fittings and fixtures
- Hardware
- Boat and railroad car fittings
- Ornamental castings
- Statuary





H. KRAMER & CO.

LEADED NICKEL BRONZE (NICKEL SILVER) (64-4-4-8-20) C97600

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	47,100
Yield Strength, p.s.i. (0.5% EXT).....	26,000
Elongation, % in 2"	22
Reduction of Area, %	21
Modulus of Elasticity (Million pounds per sq. in.)	19.1
Brinell Hardness Number, 500 kg.....	85
Compression Strength, p.s.i.	
.001" set.....	24,300
.010" set.....	30,600
.100" set.....	57,200
Impact Strength (Charpy) ft. lbs.....	11
Specific Gravity	8.90
Density, lbs. per cu. in. ....	.321
Patternmakers' Shrinkage, in./ft.....	4/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	4.79
Thermal Conductivity, % of Cu.	6.0
Coefficient of Thermal	
Expansion (68°-500°F) .....	.0000093
Specific Heat .....	.....
Melting Range, °F.....	2027-2089
Pouring Temp., Light Castings	2300-2600
Pouring Temp., Heavy Castings	2250-2400
Machinability, % free cutting brass.....	71
Fatigue Strength, (p.s.i.) 100 Million cycles	15,500
Creep Strength, p.s.i.	
creep rate of 0.00001% 450° F 550° F	
per hour (0.1% in 10,000 hrs.).....	32,500 22,200

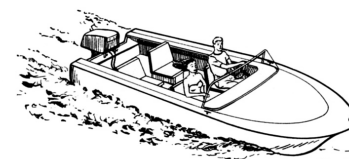
NOMINAL COMPOSITION

Cu	64
Sn	4
Pb	4
Zn	8
Ni	20

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Free-machining leaded nickel bronze
- Valves
- Fittings
- Marine castings
- Ship trimmings
- Furniture trim
- Hardware
- Building trim
- Ornamental castings



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (976) Formerly B30 (11A)
- A.S.T.M. (Castings) B584 (976) and B271 (976)
- Military Specifications (Castings)



H. KRAMER & CO.

LEADED NICKEL BRONZE (NICKEL SILVER) (66-5-2-2-25) C97800

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	50,000-65,000
Yield Strength, p.s.i. (0.5% EXT).....	26,000-40,000
Elongation, % in 2"	15-25
Reduction of Area, %	15-30
Modulus of Elasticity (Million pounds per sq. in.) .....	.....
Brinell Hardness Number, 3000 kg.....	120-150
Compression Strength, p.s.i.	
.001" set.....	.....
.010" set.....	.....
.100" set.....	.....
Impact Strength () ft. lbs. ....	.....
Specific Gravity	8.80-8.90
Density, lbs. per cu. in. ....	.318-.322
Patternmakers' Shrinkage, in./ft.....	6/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	4-5
Thermal Conductivity, % of Cu.	6.5
Coefficient of Thermal	
Expansion (70°-500 F).....	.0000097
Specific Heat .....	.....
Melting Range. F.....	2084-2156
Pouring Temp., Light Castings.....	2400-2600
Pouring Temp., Heavy Castings.....	2300-2400
Machinability, % free cutting brass.....	60
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

NOMINAL COMPOSITION

Cu	66
Sn	6
Pb	2
Zn	2
Ni	25

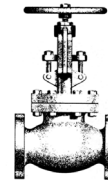
USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Corrosion resistant alloy for some organic liquids
- Dairy and soda fountain parts
- Valves and valve seats for elevated temperatures
- Ornamental castings
- Hardware
- Musical instrument keys
- A permanently white nickel bronze

CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (978) Formerly B30 (11B)
A.S.T.M. (Castings) B584 (978) and B271 (978)





H. KRAMER & CO.

EVERDUR—(95-1-4) C87300 SILICON BRONZE (92-4-4) C87610

MECHANICAL AND PHYSICAL PROPERTIES

Tensile Strength, p.s.i.	55,000-65,000
Yield Strength, p.s.i. (0.5% EXT).....	22,000-30,000
Elongation, % in 2"	18-55
Reduction of Area, %	16-50
Modulus of Elasticity (Million pounds per sq. in.)	15-18
Brinell Hardness Number, 500 kg.....	85-120
Compression Strength, p.s.i.	
.001" set.....	15,000-22,000
.010" set.....	50,000-70,000
.100" set.....	.....
Impact Strength (Izod) ft. lbs.....	15-60
Specific Gravity	8.3-8.4
Density, lbs. per cu. in. ....	.303
Patternmakers' Shrinkage, in./ft.....	7/32-8/32
Electrical Conductivity	
% of annealed Copper at 20° C. (I.A.C.S.)	4.5-6.5
Thermal Conductivity, % of Cu.	7
Coefficient of Thermal	
Expansion ( ).....	.....
Specific Heat	
Melting Range, °F.....	1580-1780
Pouring Temp., Light Castings	2000-2150
Pouring Temp., Heavy Castings	1850-1950
Machinability, % free cutting brass.....	40
Fatigue Strength, (p.s.i.) 100 Million cycles .....	.....
Creep Strength, p.s.i.	
creep rate of 0.00001%	
per hour (0.1% in 10,000 hrs.).....	.....

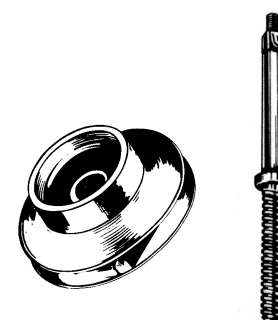
NOMINAL COMPOSITION

NAVY			
TOMBASIL		EVERDUR	
Cu	92	Cu	95
Si	4	Si	4
Zn	4	Mn	1

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Bearings
- Bells
- Impellers
- Pump parts
- Valve parts
- Marine fittings
- Corrosion resisting castings



CORRESPONDS TO OR IS SIMILAR TO:

- A.S.T.M. (Ingot) B30 (872) Formerly B30 (12A)
- A.S.T.M. (Castings) B584 (872) and B271 (872)
- Federal Specifications (Castings) QQ-C-390A (872)
- Military Specifications (Castings) MIL-C-22229A (4) and MIL-C-11866B (19)



H. KRAMER & CO.

KRAMER TOMBASIL® (82½-4-13½) C87500 - SAND KRAMER TOMBASIL® (82½-4-13½) C87800 - DIE

MECHANICAL AND PHYSICAL PROPERTIES

	Sand Cast	Die Cast
Tensile Strength, p.s.i.	67,800	85,000
Yield Strength, p.s.i. (0.5% EXT).....	30,000	50,000
Elongation, % in 2"	17	25
Reduction of Area, %	20	.....
Modulus of Elasticity (Million pounds per sq. in.)		15.4
Brinell Hardness Number, 3000 kg.....	134	.....
Compression Strength, p.s.i.		
.001" set.....	26,500	.....
.010" set.....	43,000	.....
.100" set.....	83,500	.....
Impact Strength (Charpy) ft. lbs.....	32	.....
Specific Gravity	8.27	.....
Density, lbs. per cu. in. ....	.299	.....
Patternmakers' Shrinkage, in./ft.....	15/64	.....
Electrical Conductivity		
% of annealed Copper at 20° C. (I.A.C.S.)	6.07	.....
Thermal Conductivity, % of Cu.	6.72	.....
Coefficient of Thermal		
Expansion (70°-500° F).....	.0000109	.....
Specific Heat .....	.....	.....
Melting Range, °F.....	1510-1683	.....
Pouring Temp., Light Castings	1900-2000	.....
Pouring Temp., Heavy Castings.....	1800-1900	.....
Machinability, % free cutting brass.....	50	.....
Fatigue Strength, (p.s.i.) 100 Million cycles	22,000	.....
Creep Strength, p.s.i.		
creep rate of 0.00001%	350° F .. 450° F	550° F
per hour (0.1% in 10,000 hrs.).....	28,000 .. 11,000	1,400

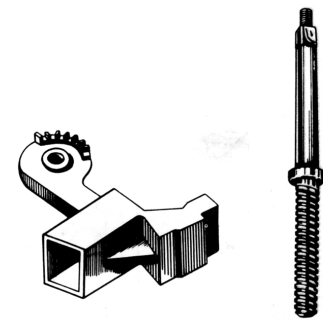
NOMINAL COMPOSITION

Cu	82.5
Si	4
Zn	13.5

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Bearings
- Gears
- Impellers
- Rocker Arms
- Valve Stems



CORRESPONDS TO OR IS SIMILAR TO:

A.S.T.M. (Ingot) B30 (875) Formerly B30 (13B)
A.S.T.M. (Castings) B854 (875), B271 (875) and
B176 (ZS144A)
Federal Specifications (Castings)
Military Specifications (Castings) MIL-C-22087A (4)



H. KRAMER & CO.

KRAMER WHITE TOMBASIL® C99700

MECHANICAL AND PHYSICAL PROPERTIES

	Sand or Chill Cast	Die Cast
Tensile Strength, p.s.i.	46,000-90,000	55,000-65,000
Yield Strength, p.s.i. (0.5% EXT).....	18,000-45,000	25,000-28,000
Elongation, % in 2"	7-50	10-20
Reduction of Area %	10-45	10-45
Modules of Elasticity (Million pounds per sq. in.)	15-17 × 10 ⁶	15-17 × 10 ⁶
Brinell Hardness Number 3000 kg.....	100-180	110-125
Compression Strength, p.s.i.		
.001" set.....		
.010" set.....		
.100" set.....		
Impact Strength () ft. lbs.....		
Specific Gravity	8.2	
Density, lbs. per cu. in. ....	.296	
Patternmakers' Shrinkage, in./ft.....	.25	
Electrical Conductivity.....		
% of annealed Copper at 20 C. (I.A.C.S.).....	2.8-3.2	
Thermal Conductivity, % of Cu.		
Coefficient of Thermal.....		
Expansion (70-400° F		
Specific Heat		
Melting Range, ° F.....	1615-1655	
Pouring Temp., Light Castings	1800-1900	
Pouring Temp., Heavy Castings	1700-1800	
Machinability,-% free cutting brass.....	40-94	
Fatigue Strength, (p.s.i.) 100 Million cycles		
Creep Strength, p.s.i.		
creep rate of 0.00001 %.....		
per hour (0.1 % in 10,000 hrs.).....		

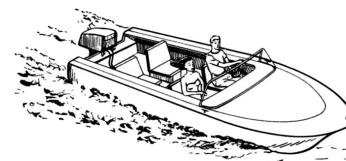
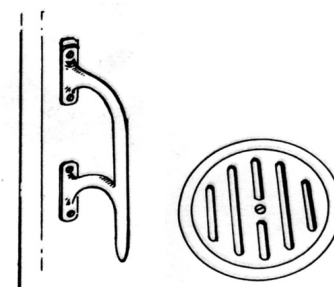
NOMINAL COMPOSITION

Cu	58.0
Ni	5.0
Mn	12.0
Zn	22.0
Others	3.0

USES

In selecting an alloy, consideration should be given to properties, foundry adaptability, and cost. This alloy has proved itself in the following applications:

- Building hardware
- Architectural and ornamental
- Marine hardware
- Plumbing fixtures and accessories
- Drain covers
- Automotive hardware
- Food handling equipment (pumps)
- Swimming pool hardware



- Polished "Silvery" Luster (Eliminates Chrome-Plating in Many Applications)
- Casts Easily in Sand, Permanent Mold or Die Casting
- Excellent Machinability
- High Resistance to Corrosion and Staining
- Easy to Weld