wieland
concast

Reference Guide

Reference Guide

Fifth edition

wieland
concast

P +1 800 626 7071 I concast.com

Wieland Concast
14315 State Route 113
Wakeman, OH 44889
P +1 800 626 7071

Manufactured in the United States of America

ISBN 979-8-88955-709-8

Introduction

Since its inception 15 years ago, the Wieland Contact Reference Guide has become one of the industry's most trusted technical companions. This comprehensive resource is a living document that continues to captures the collective expertise of hundreds of dedicated professionals from across the industry, creating an indispensable reference that our customers, employees, and partners rely on daily.

The Wieland Concast Reference Guide is a comprehensive technical resource that provides detailed information about copper alloys. Organized into three primary sections — continuous cast, extruded or cast-and-drawn, and lead-free replacement products, the guide precisely identifies each alloy by its UNS number. In addition to its technical specifications, the manual offers insight into Wieland Concast, exploring our history, manufacturing philosophy, casting methods, inventory management, and quality standards. A dedicated section on product tolerances provides an in-depth look at manufacturing precision, and the complete catalog of standard-stocked product sizes ensures engineers and technical professionals have easy access to the information they need.

Table of contents

Continuous-cast products continued

Stocked size schedules continued

Marketing assets 435

Overview

Wieland Concast

As a premier manufacturer of specialty continuous-cast copper alloys, Wieland Concast leverages technology innovation, quality control, and superior customer care to maintain its reputation as a market leader and trusted partner across industries.

Rich history

Wieland Concast is the trusted single-source supplier for customers seeking precision-engineered copper alloys in bars, rods, tubes, rectangles, and custom sizes. Our legacy of innovation began in 1891 as Concast Metal Products Co., producing brass and bronze ingots in Pittsburgh, Pennsylvania. In 1960, we introduced continuous-cast manufacturing, and by 1990, we expanded into copper alloys. The 1995 acquisition of our Birmingham, Ohio, facility added aluminum bronze and manganese bronze to our portfolio. In 2024, we became part of Wieland, strengthening our commitment to quality and innovation.

Our facilities

Wieland Concast maintains the largest inventory of standard-stocked, continuous-cast copper alloys in North America. This inventory of more than 1,100 sizes serves a wide range of industries and end-use applications.

Our Birmingham, Ohio, distribution center is a modern, 70,000-sq.-ft., resource-efficient warehouse. It is located near the Ohio Turnpike and is open six days a week.

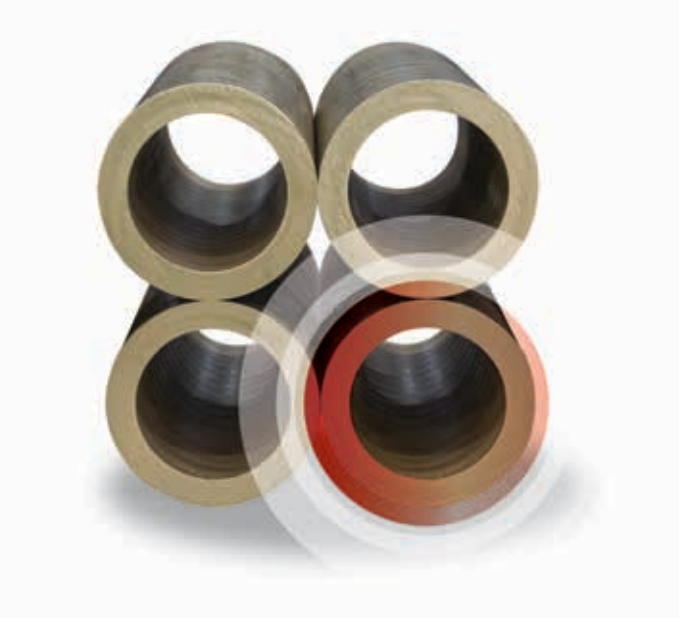
Our Birmingham location is also home to our horizontal continuous-casting production operation and our sales and marketing teams. Our Mars, Pennsylvania, plant houses our vertical continuous-casting operation and our administrative offices.

Our philosophy

Wieland Concast became a market leader by adopting a simple yet effective strategy – we listen to our customers. From initial inquiry to product delivery, our customer-centric approach has been at the heart of everything we do. Our team of metallurgists, chemists, engineers, sales professionals, and service specialists work closely together to address customer needs at every stage. Each account is personally managed by a qualified inside technical sales representative to ensure the highest level of service. Our on-site quality control lab ensures that every product meets or exceeds standards before it leaves our facility. When customers request custom alloys or sizes, we respond quickly, delivering solutions tailored to their exact specifications.

Our markets

Wieland Concast sells its products through major metal distributors across North America and Europe as well as original equipment manufacturers and contract machine shops. Our alloys are integral to a number of industries, including oil and gas, energy, aerospace and aviation, power transmission, transportation, military and defense, heavy equipment, plumbing and fluid management, and hydraulics.



Quality

Our team of dedicated professionals at Wieland Concast is committed to delivering the highest-quality products at a fair value, consistently exceeding our customers' expectations. Our Quality Management System drives our commitment to excellence and continuous improvement.

Our Quality Policy – based on the criteria outlined in ISO 9001 and AS9100 industry standards – promotes and ensures the consistent delivery of superior products by enforcing strict adherence to these specifications.

Certifications

As an ISO 9001-certified manufacturer, we are recognized as the leading producer of continuous-cast copper alloys for customers who value quality as much as we do. We are also AS9100 certified to meet aerospace industry standards. Focused on staying ahead of market trends, we evolve to meet growing demands for product diversity, higher quality, and eco-friendly solutions. Our investments in cutting-edge equipment, advanced product engineering, and comprehensive before- and after-sales support ensure exceptional service.

Casting methods

Vertical continuous casting

Vertical continuous casting has been a cornerstone of Wieland Concast's production for over 30 years. In this process, molten metal flows into a water-cooled die at the bottom of the crucible, where it solidifies. The cast product then moves smoothly downward through rollers beneath the die. With precise temperature control, the rollers carefully withdraw the metal to maintain its grain structure and metallurgical properties.

Horizontal continuous casting

Horizontal continuous casting is ideal for aluminum bronzes, given the material's unique metallurgy. As a result, our Birmingham plant specializes heavily on aluminum bronze production. In this process, molten metal flows from the crucible into a water-cooled die, where it solidifies. Drive rollers then pull the bar along roller tables that support its weight during casting. With precise temperature control, we achieve the desired grain structure and metallurgical properties.

Standard-stocked alloys			
Continuous-cast		Extruded or cast and drawn	
C86300	C89835	C14500	C51000
C90300	C93200	C54400	C63000
C95400	C95500	C63020	C64200
C95510	C95900	C67300	C72900

Inventory

Wieland Concast offers a comprehensive range of stocked and custom-made continuous-cast, extruded, and cast-and-drawn copper alloy products to meet the diverse needs of our customers. Whether you require standard sizes or specialized alloys, we deliver tailored solutions that guarantee exceptional quality, performance, and reliability. (For detailed technical information, please refer to your specific requirement within our Reference Guide.)

In addition, we produce a full line of GreenAlloys™, many of which comply with key regulations, including the Federal Safe Drinking Water Act (SDWA), the Federal Reduction of Lead in Drinking Water Act (S. 3874), California AB1953, and Vermont Act 193. Several of our alloys are also NSF/ANSI/CAN 61-2022 compliant.

Our locations

Mars, Pennsylvania

Our Mars, Pennsylvania, location houses our vertical continuous casting production operation. This facility is located 30 miles north of Pittsburgh and contains our administrative offices.

P +1 724 538 4000 I sales.concast@wieland.com I concast.com

Birmingham, Ohio

Our production facility in Birmingham, Ohio, is located 30 miles west of Cleveland. This location is the site for our vertical continuous casting production as well as our shipping, receiving, and sales and marketing operations.

P +1 440 965 4455 I sales.concast@wieland.com I concast.com

Continuous-cast products

Continuous-cast products

Standard-stocked alloys include C86300, C89835, C90300, C93200, C95400, C95500, AMS 4880–95510, and C95900. When Concast customers request special alloys and special sizes, we respond with products designed to meet their exacting specifications.

We offer special alloys, shapes, and sizes in the ASTM B505, 800, and 900 series specifications. Almost any extruded shape profile can be produced using continuous-cast technology. Wieland Concast can also supply centrifugals up to 30". Custom tubes, rectangles, and unique shapes can be continuous cast to within .005" tolerance in sizes ranging from 0.5" to 16" and cut to custom lengths.

Wieland Concast offers a complete line of stocked and custom-made products.

Product descriptions

Leaded red brass

This group of alloys is typically found in plumbing applications. The most widely used alloy in this family is C84400 leaded semi-red brass is known for reasonable cost with good machining and casting properties. The lead content ensures pressure tightness. Red brass is also used for low-cost bearing materials under low loads.

C83600	C84200	C84800
C83800	C84400	C85700

Leaded tin bronze

The lead content in these alloys is between 7 percent and 15 percent. High-leaded tin bronzes are free cutting and retain favorable thermal conductivity and good lubricity due to the lead content. Alloy C93200 is considered this family's workhorse alloy and is widely used in many bearing applications.

C92200	C92700	C93200
C92300	C92800	

Manganese bronze

Manganese bronzes can operate under very high loads and speeds. Besides excellent mechanical qualities, these alloys have good corrosion resistance. The standard alloy in this group is high tensile C86300, which is comprised of copper, manganese, aluminum, and iron. This combination raises the tensile strength to over 110,000 ksi.

C86200	C86300	C86500

Aluminum bronze

Aluminum bronze is the highest strength standard copper-based alloy. Wieland Concast produces C95400, C95500, AMS 4880-C95510, and C95900 aluminum bronze alloys as standard-stocked products in standard sizes of rounds, tubes, and rectangles. Aluminum, in conjunction with iron and nickel, acts as a strengthener in these alloys. All of the aluminum bronzes can be heat treated, further increasing tensile strengths.

C95200	C95500	C95900
C95300	C95510	
C95400	C95520HT	
C95410	C95800	

Product descriptions continued

High tin bronze

High tin bronze alloys are typically found in gear, high-strength bushing and bearing applications where high strength, low speeds, and heavy loads are present. Other high-strength applications for these alloys are pump impellers, piston rings, steam fittings, and valve bodies. High tin bronze castings are utilized in movable bridge components, turntables for bridges, and other structures for fixed and expansion bearings with slow or intermittent movement and heavy loads.

C90300	C90810	C91600
C90500	C91000	C91700
C90700	C91100	
C90800	C91300	

Nickel silver bronze

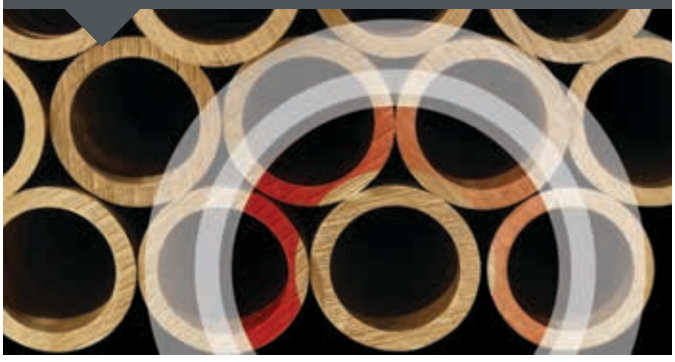
Nickel silvers are alloys that contain copper, nickel, and zinc. Also called nickel brasses, the silver refers to their attractive silver shine. The nickel silvers have moderately high strength and good corrosion resistance. Nickel silver bronze alloys consist of copper, tin, lead, zinc, and nickel. They have low to moderate strength and good corrosion resistance. They are used in food and beverage handling equipment, decorative hardware, electroplated tableware, optical and photographic equipment, and musical instruments. The alloys are UNS C97300 to C97800.

C97300	C97600	C97800

Common continuous-cast alloys

- C83600
- C83800
- C84200
- C84400
- C84800
- C85700
- C86200
- C86300
- C86400
- C86500
- C86700
- C87850
- C89320
- C89325
- C89520
- C89831
- C89833
- C89835
- C89844
- C90300
- C90500
- C90700
- C90800
- C90810
- C91000
- C91100
- C91300
- C91600
- C91700
- C92200
- C92300
- C92500
- C92700
- C92800
- C92900
- C93200
- C93400
- C93500
- C93600
- C93700
- C93800
- C93900
- C94000
- C94100
- C94300
- C94700*
- C94800
- C95200
- C95300*
- C95400*
- C95410*
- C95500*
- C95510
- C95520HT
- C95600
- C95800
- C95900
- C96400
- C96900HT
- C97300
- C97600
- C97800
- C99500

*Also available in heat-treated condition.



Continuous-cast product list

Common continuous-cast products, product forms, and size ranges

Copper alloy UNS no.	Product description	Solid bar stock		Tubes		Rectangles	
		Avail.	Size range	Avail.	Size range	Avail.	Size range
C83600	Leaded red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C83800	Leaded red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84200	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84400	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84800	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C85700	Leaded yellow brass	X	1/2" to 13" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86200	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86300*	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86400	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86500	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86700	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C87850	Silicon brass	X	Consult mill	X	Consult mill	X	Consult mill
C89320	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89325	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89520	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89831	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89833	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89835*	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89844	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C90300*	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90500	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90700	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90800	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C90810	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91000	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91100	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91300	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91600	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91700	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C92200	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92300	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92500	Nickel-phosphor bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92700	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92800	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92900	Leaded nickel-tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93200*	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93400	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"

*Standard-stocked alloy.
Please consult mill for minimum I.D., minimum thickness, and minimum wall thickness.

Continuous-cast product list continued

Copper alloy UNS no.	Product description	Solid bar stock		Tubes		Rectangles	
		Avail.	Size range	Avail.	Size range	Avail.	Size range
C93500	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93600	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93700	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93800	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93900	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94000	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94100	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94300	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94700	Nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94700HT	Nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94800	Leaded nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C95200	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95300	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95300HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95400*	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95400HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95410	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95410HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95500*	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95500HT	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95510*	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 13" O.D.	X	Up to 15"
C95520HT	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95600	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95800	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95900*	Aluminum bronze	X	1" to 5" O.D.		Consult mill	X	Up to 7"
CONCAST380	Aluminum bronze	X	1" to 5" O.D.			X	Up to 10"
C96400	Copper-nickel	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C96900HT	Copper-nickel	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C97300	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C97600	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C97800	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C99500	Special alloy	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"

*Standard-stocked alloy.
Please consult mill for minimum I.D., minimum thickness, and minimum wall thickness.
All alloys also available as near-net shape, solid hex bar, and hex tube except Concast380 which is not available as hex tube.

C83600

Continuous cast

Product description	Leaded red brass
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C83600	B505 B505M B271 B271M B62	J461 J462	4855	WW-P-460 WW-U-516	MIL-C-11866 MIL-V-18436	Ounce metal

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
84.00-86.00	4.00-6.00	4.00-6.00	4.00-6.00	0.30	1.50	1.00	0.005	0.08	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Typical uses

Architecture

Ornamental fixtures

Builders hardware

Hardware

Building

Cooling equipment, heating equipment, lightning protection, trowels for cement working

Electrical

Electrical equipment, electrical hardware, switches

Fasteners

Large hold-down screws

Industrial

Air actuators, bearing segments for steel industry, bearings, bushings, couplings, furnaces, handles for dental equipment, impellers, low pressure valves, pressure blocks for steel industry, printing presses, pump fixtures, pump parts, pumps, rings, small gears, transducer housings, valve bodies, valve bodies for the water meter industry, valves, valves for the water meter industry

Marine

Marine products, parts for boats

Plumbing

Faucets, fixtures, pipe fittings

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C83600	84	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
36	248	19	131	15	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1850 °F	1010 °C
Melting point – solidus	1570 °F	854 °C
Density	0.318 lb/in³ at 68 °F	8.83 gm/cm³ at 20 °C
Specific gravity	8.83	8.83
Electrical conductivity	15% IACS at 68 °F	0.087 MegaSiemens/cm at 20 °C
Thermal conductivity	41.6 Btu/sq ft/ft hr/ °F at 68 °F	72 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.090 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	13500 ksi	93100 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Fair
Machinability rating	84

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium
Shrinkage during freezing	Medium

Casting characteristics provided by CDA

C83800

Continuous cast	
Product description	Leaded red brass
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Hardware

Electrical

Electrical components, switches

Industrial

Air/gas/water fittings, bushings, pump fixtures, railroad catenary fittings, valves

Plumbing

Plumbing fixtures

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C83800	B505 B505M B271 B271M B584	J461 J462		WW-U-516		Hydraulic bronze

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
82.00-83.80	5.00-7.00	3.30-4.20	5.00-8.00	0.30	1.50	1.00	0.005	0.08	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C83800	90	0.312

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	15	97	16	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1840 °F	1004 °C
Melting point – solidus	1550 °F	843 °C
Density	0.312 lb/in³ at 68 °F	8.64 gm/cm³ at 20 °C
Specific gravity	8.64	8.64
Electrical conductivity	15% IACS at 68 °F	0.087 MegaSiemens/cm at 20 °C
Thermal conductivity	41.8 Btu/sq ft/ft hr/ °F at 68 °F	72.4 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	13300 ksi	91700 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Fair
Machinability rating	90

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C84200

Continuous cast	
Product description	Leaded semi-red brass
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

General hardware

Industrial

Bushings, fittings for oil lines, low-pressure valves, small gears, small pump castings, plumbing

Plumbing

Couplings, elbows, pipe fittings, plugs, tees, unions

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C84200	B505 B505M			WW-P-460		

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
78.00-82.00	2.00-3.00	4.00-6.00	10.00-16.00	0.40	1.50	0.80	0.005	0.08	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C84200	80	0.311

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
32	221	16	110	13	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1820 °F	993 °C
Melting point – solidus	1540 °F	838 °C
Density	0.311 lb/in³ at 68 °F	8.61 gm/cm³ at 20 °C
Specific gravity	8.61	8.61
Electrical conductivity	16.4% IACS at 68 °F	0.095 MegaSiemens/cm at 20 °C
Thermal conductivity	41.8 Btu/sq ft/ft hr/ °F at 68 °F	72.4 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96500 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Fair
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C84400

Continuous cast

Product description	Leaded semi-red brass
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C84400	B505 B505M B271 B271M B584			WW-U-516		Valve metal

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
78.00-82.00	6.00-8.00	2.30-3.50	7.00-10.00	0.40	1.50	1.00	0.005	0.08	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
[2]Ni value includes Co.
Note: Single values represent maximums.

Typical uses

Architecture

Ornamental fixtures

Builders hardware

Cases for dead bolt locks, dead bolt locks, door hardware for prisons, hardware

Building

Cooling equipment, heating equipment

Consumer

Musical instruments

Electrical

Electrical equipment

Industrial

Low-pressure fittings, pump fixtures, valve bodies for the water industry, valve seat, valves, valves for water meters

Marine

Boat parts, marine hardware, nuts for transducers

Plumbing

Fixtures, pipe fittings

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C84400	90	0.314

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	15	103	16	55	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1840 °F	1004 °C
Melting point – solidus	1549 °F	843 °C
Density	0.314 lb/in³ at 68 °F	8.69 gm/cm³ at 20 °C
Specific gravity	8.69	8.69
Electrical conductivity	16.4% IACS at 68 °F	0.095 MegaSiemens/cm at 20 °C
Thermal conductivity	41.8 Btu/sq ft/ft hr/ °F at 68 °F	72.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	13000 ksi	89600 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Fair
Machinability rating	90

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Medium
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C84800

Continuous cast	
Product description	Leaded semi-red brass
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

General hardware, hardware, stops, washers

Industrial

Air line fittings, fittings, gas line fittings, low-pressure valves

Plumbing

Cocks, faucets, plumbing fittings, plumbing fixtures

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C84800	B505 B505M B271 B271M					Plumbing goods brass

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
75.00-77.00	5.50-7.00	2.00-3.00	13.00-17.00	0.40	1.50	1.00	0.005	0.08	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C84800	90	0.310

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	15	103	16	655	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1750 °F	954 °C
Melting point – solidus	1530 °F	832 °C
Density	0.31 lb/in³ at 68 °F	8.58 gm/cm³ at 20 °C
Specific gravity	8.58	8.58
Electrical conductivity	16.4% IACS at 68 °F	0.095 MegaSiemens/cm at 20 °C
Thermal conductivity	41.6 Btu/sq ft/ft hr/ °F at 68 °F	72 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Fair
Machinability rating	90

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Medium
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C85700

Continuous cast	
Product description	Leaded yellow brass
Solids	1/2" to 13" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Door hardware for prisons, ornamental hardware, window hardware

Consumer

Musical instruments

Industrial

Mechanical components where aesthetics are important

Marine

Marine hardware, ship trim

Plumbing

Fittings, flanges

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C85700	B505 B505M B271 B271M B176					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1,2]	Al (%)	Si (%)
58.00-64.00	0.80-1.50	0.50-1.50	32.00-40.00	0.70	1.00	0.80	0.05

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C85700	80	0.304

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	14	97	15	75	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1725 °F	941 °C
Melting point – solidus	1675 °F	913 °C
Density	0.304 lb/in³ at 68 °F	8.41 gm/cm³ at 20 °C
Specific gravity	8.41	8.41
Electrical conductivity	22% IACS at 68 °F	0.128 MegaSiemens/cm at 20 °C
Thermal conductivity	48.5 Btu/sq ft/ft hr/ °F at 68 °F	83.9 W/m at 20 °C
Coefficient of thermal expansion 68-572	12 · 10^{-6} per °F (68-572 °F)	20.7 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	87000 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C86200

Continuous cast	
Product description	Manganese bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Brackets, structual parts

Fasteners

Screw down nuts

Industrial

Bushings, cams, frames, gears, high-strength machine parts, hooks, marine racing propellors, press dies, shafts, struts, valve stems, wear rings for pressing dies for wood pulp industry, worm gears

Marine

Boat parts, clamps, marine castings, rudders

Ordnance

Gun mounts

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C86200	B505 B505M B271 B271M	J461 J462		QQ-C-523	MIL-C-11866	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1,2]	Al (%)	Mn (%)
60.00-66.00	0.20	0.20	22.00-28.00	2.00-4.00	1.00	3.00-4.90	2.50-5.00

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C86200	30	0.288

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
90	621	45	310	18	180	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1725 °F	941 °C
Melting point – solidus	1650 °F	899 °C
Density	0.288 lb/in³ at 68 °F	7.97 gm/cm³ at 20 °C
Specific gravity	7.97	7.97
Electrical conductivity	8% IACS at 68 °F	0.044 MegaSiemens/cm at 20 °C
Thermal conductivity	20.5 Btu/sq ft/ft hr/ °F at 68 °F	35.5 W/m at 20 °C
Coefficient of thermal expansion 68-572	12 · 10^{-6} per °F (68-572 °F)	20.7 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability*	1.24	1.24

Physical properties provided by CDA

*Field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Poor
Brazing	Poor
Oxyacetylene welding	Good
Gas shielded arc welding	Fair
Coated metal arc welding	Good
Machinability rating	30

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High

Casting characteristics provided by CDA

C86300

Standard-stocked product*	Continuous cast

Product description	Manganese bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144" *Solids and tubes are standard stocked
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C86300	B505 B505M B271 B271M	J461 J462		QQ-C-523	MIL-C-11866	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1,2]	Al (%)	Mn (%)
60.00-66.00	0.20	0.20	22.00-28.00	2.00-4.00	1.00	5.00-7.50	2.50-5.00

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Typical uses

Builders hardware

Brackets

Electrical

Electrical components, switches

Fasteners

Screw down nuts

Industrial

Bridge pins, bushings, cams, forming dies for wood pulp industry, frames, gears, gib, high-strength machine parts, hooks, hydraulic cylinder parts, large valve stems, propellers, slow-speed/ heavy-load bearings, struts, wear rings for forming dies for wood pulp industry

Marine

Boat parts, clamps, covers for marine hardware, marine hardware, rudders

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C86300	8	0.283

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
110	758	62	427	14	223	

Mechanical properties according to ASTM B505/B505M-23

Note: Compression Deformation Limit min 55 ksi/380 MPa

Physical properties

	US customary	Metric
Melting point – liquidus	1693 °F	923 °C
Melting point – solidus	1625 °F	885 °C
Density	0.283 lb/in³ at 68 °F	7.83 gm/cm³ at 20 °C
Specific gravity	7.83	7.83
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	20.5 Btu/sq ft/ft hr/ °F at 68 °F	35.5 W/m at 20 °C
Coefficient of thermal expansion 68-572	12 · 10^{-6} per °F (68-572 °F)	20.7 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14200 ksi	97900 MPa
Magnetic permeability*	1.09	1.09

Physical properties provided by CDA

*Field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Poor
Brazing	Poor
Oxyacetylene welding	Poor
Gas shielded arc welding	Poor
Coated metal arc welding	Good
Machinability rating	8

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High

Casting characteristics provided by CDA

C86400

Continuous cast	
Product description	Manganese bronze
Solids	1/2" to 9" O.D.
Tubes	1" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Chemical composition							
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[2]	Al (%)	Mn (%)
56.00-62.00	0.50-1.50	0.50-1.50	34.00-42.00	0.40-2.00	1.00	0.50-1.50	0.10-1.50

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni.
Note: Single values represent maximums.

[2]Ni value includes Co.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C86400	65	0.301

Typical uses

Builders hardware

Door hardware for prisons, window hardware

Consumer

Musical instruments, piano keys

Electrical

Electrical components, electrical equipment, switches

Fasteners

Screw down nuts

Industrial

Bearing cage blanks, bearings, brackets, bushings, cams, fittings, lever arms, light-duty gears, machinery parts, propellers, pump fixtures, roller bearings, valve stems

Plumbing

Fixtures

Mechanical properties

Tensile strength, typ		Yield strength, at 0.5% extension under load, typ		Elongation, in 2 in. or 50 mm, typ	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
65	448	25	172	20	90	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1583 °F	862 °C
Density	0.301 lb/in³ at 68 °F	8.33 gm/cm³ at 20 °C
Specific gravity	8.33	8.33
Electrical conductivity	19% IACS at 68 °F	0.110 MegaSiemens/cm at 20 °C
Thermal conductivity	51 Btu/sq ft/ft hr/ °F at 68 °F	88.3 W/m at 20 °C
Coefficient of thermal expansion 68-392	11 · 10^{-6} per °F (68-392 °F)	19 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96527 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Fair
Brazing	Fair
Oxyacetylene welding	Poor
Gas shielded arc welding	Poor
Coated metal arc welding	Poor
Machinability rating	65

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High

Casting characteristics provided by CDA

C86500

Continuous cast

Product description	Manganese bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C86500	B505 B505M	J461 J462	4860	QQ-C-390, C3 QQ-B-726, Class A	MIL-C-22229, Comp 7	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1,2]	Al (%)	Mn (%)
55.00-60.00	0.40	1.00	36.00-42.00	0.40-2.00	1.00	0.50-1.50	0.10-1.50

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Typical uses

Automotive

Weld guns

Builders hardware

Brackets

Electrical

Electrical hardware

Industrial

Compressors, forming dies for wood pulp industry, frames, gears, hooks, lever arms, machinery, machinery parts (substituted for steel and malleable iron), machinery parts requiring high strength, pressing dies for wood pulp, struts, wear rings for pressing dies for wood pulp industry

Marine

Boat parts, clamps, covers for marine hardware, propellers for salt and fresh water, rudders

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C86500	26	0.301

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
70	483	25	172	25	130	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1583 °F	862 °C
Density	0.301 lb/in³ at 68 °F	8.33 gm/cm³ at 20 °C
Specific gravity	8.33	8.33
Electrical conductivity	22% IACS at 68 °F	0.128 MegaSiemens/cm at 20 °C
Thermal conductivity	49.6 Btu/sq ft/ft hr/ °F at 68 °F	85.8 W/m at 20 °C
Coefficient of thermal expansion 68-212	11.3 · 10^{-6} per °F (68-212 °F)	19.5 · 10^{-6} per °C (20-100 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability*	1.09	1.09

Physical properties provided by CDA

*Field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Fair
Brazing	Fair
Oxyacetylene welding	Poor
Gas shielded arc welding	Poor
Coated metal arc welding	Poor
Machinability rating	26

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High

Casting characteristics provided by CDA

C86700

Continuous cast	
Product description	Manganese bronze
Solids	1/2" to 13" O.D.
Tubes	1 1/8" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Brackets

Fasteners

Screw down nuts

Industrial

Bearings, cams, fittings, lever arms, machinery parts, moderate-duty gears, propellers, valve stems

Plumbing

Marine hardware, propellers

Chemical composition							
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[2]	Al (%)	Mn (%)
55.00-60.00	0.50-1.50	1.50	30.00-38.00	1.00-3.00	1.00	1.00-3.00	0.10-3.50

Chemical composition provided by CDA

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C86700	55	0.301

Mechanical properties

Tensile strength, typ		Yield strength, at 0.5% extension under load, typ		Elongation, in 2 in. or 50 mm, typ	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
85	586	42	290	20	155	

Mechanical properties provided by CDA

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1583 °F	862 °C
Density	0.301 lb/in³ at 68 °F	8.33 gm/cm³ at 20 °C
Specific gravity	8.33	8.33
Electrical conductivity	17% IACS at 68 °F	0.097 MegaSiemens/cm at 20 °C
Coefficient of thermal expansion 68-392	11 · 10^{-6} per °F (68-392 °F)	19 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103422 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Fair
Brazing	Fair
Oxyacetylene welding	Poor
Gas shielded arc welding	Poor
Coated metal arc welding	Poor
Machinability rating	55

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High

Casting characteristics provided by CDA

C87850

Continuous cast	GreenAlloys™

Product description	Silicon brass
Solids	Consult mill for sizes
Tubes	Consult mill for sizes
Rectangles	Consult mill for sizes
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C87850 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Valve bodies for water

Marine

Marine products

Plumbing

Faucets, plumbing fittings, water meter cases

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C87850	B505 B505M					

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P	Ni (%)[1]	Mn (%)	Sb (%)	Si (%)
75.00-78.00	0.02*-0.09	0.30	remain.	0.10	0.05-0.20	0.20	0.10	0.10	2.70-3.40

Chemical composition according to ASTM B505/B505M-23

*Pb content is greater than 0.02%. [1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C87850	70	0.3

Mechanical properties

Mechanical properties according to ASTM B505/B505M-19

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
65	448	25	172	8	103	

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1571 °F	855 °C
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	21.8 Btu/sq ft/ft hr/ °F at 68 °F	37.8 W/m at 20 °C
Coefficient of thermal expansion 68-212	10.3 · 10^{-6} per °F (68-212 °F)	17.8 · 10^{-6} per °C (20-100 °C)
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Coefficient of thermal expansion 68-572	10.4 · 10^{-6} per °F (68-572 °F)	18 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15200 ksi	104801 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Machinability rating	70

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	High
Gassing	Low
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C89320

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89320 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, 2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Fasteners

Washers

Industrial

Backs for lined bearings, cam bushings for diesel engines, crankshaft main bearings, deep well pump bowl bushings, deep well pump line shaft bearings, electric motor bearings, general utility bearings, guide bushings for piston rods, guide bushings for valves, hydraulic gland seals, main bearings for presses, piston pin bearings, pump sleeves, rod bushings, rolling mill bearings, seals, sleeve bushings, spacer bushings, wrist pin bushings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C89320	B505 B505M					

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
87.00-91.00	0.09	5.00-7.00	1.00	0.20	0.30	1.00	0.005	4.00-6.00	0.08	0.35	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89320	80	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	18	124	15	70	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1913 °F	1045 °C
Melting point – solidus	1702 °F	928 °C
Density	0.318 lb/in³ at 68 °F	8.8 gm/cm³ at 20 °C
Electrical conductivity	14.7% IACS at 68 °F	0.082 MegaSiemens/cm at 20 °C
Thermal conductivity	32.4 Btu/sq ft/ft hr/ °F at 68 °F	56.1 W/m at 20 °C
Modulas of elasticity in tension	13900 ksi	95827 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89325 Lead-free replacement for C937

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89325 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bushings, high-speed/ high-pressure bearings

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70	0.08	0.50	0.005

Chemical composition provided by CDA

[1]0.01 - 2.0% as any single or combination of Ce La or other rare earth(x) elements as agreed upon. (x)ASM International definition: one of the group of chemically similar metals with atomic numbers 57 through 71 commonly referred to as lanthanides. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89325	80	0.323

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	12	83	4	73	

Physical properties

	US customary	Metric
Melting point – liquidus	1805 °F	985 °C
Melting point – solidus	1432 °F	777 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	10.8% IACS at 68 °F	0.062 MegaSiemens/cm at 20 °C
Thermal conductivity	29 Btu/sq ft/ft hr/ °F at 68 °F	50.2 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.089 Btu/lb/ °F at 68 °F	372.9 J/kg at 20 °C
Modulas of elasticity in tension	16400 ksi	113074 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/32
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89520 EnviroBrass II

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89520 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, 2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Plumbing

Plumbing castings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C89520	B584					

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Bi (%)[2]	S (%)	Sb (%)	Se (%)[2]
85.00-87.00	0.09	5.00-6.00	4.00-6.00	0.20	1.00	0.005	1.60-2.20	0.08	0.25	0.80-1.10

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co. [2]Bi:Se >= 2:1
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89520	85	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
25	172	18	124	6	54	

Physical properties

	US customary	Metric
Melting point – liquidus	1842 °F	1006 °C
Melting point – solidus	353 °F	178 °C

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	85

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Medium
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C89831 Lead-free replacement for C844

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89831 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bushings, high-speed/ high-pressure bearings

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70	0.08	0.25	0.005

Chemical composition provided by CDA

[1]0.01 - 2.0% as any single or combination of Ce La or other rare earth(x) elements as agreed upon. (x)ASM International definition: one of the group of chemically similar metals with atomic numbers 57 through 71 commonly referred to as lanthanides. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89831	85	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
29	200	13	90	5	55	

Physical properties

	US customary	Metric
Melting point – liquidus	1893 °F	1033 °C
Melting point – solidus	1518 °F	825 °C
Density	0.318 lb/in³ at 68 °F	8.81 gm/cm³ at 20 °C
Specific gravity	8.81	8.81
Electrical conductivity	20.38% IACS at 68 °F	0.117 MegaSiemens/cm at 20 °C
Thermal conductivity	50 Btu/sq ft/ft hr/ °F at 68 °F	86.6 W/m at 20 °C
Coefficient of thermal expansion 68-392	$10 \cdot 10^{-6}$ per °F (68-392 °F)	$17.3 \cdot 10^{-6}$ per °C (20-200 °C)
Specific heat capacity	0.092 Btu/lb/ °F at 68 °F	385.4 J/kg at 20 °C
Modulas of elasticity in tension	13700 ksi	94458 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Poor
Machinability rating	85

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	5/32
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89833 Lead-free replacement for C836

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89833 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Industrial

Corrosion-resistant/ pressure-tight castings, impellers, pumps

Chemical composition											
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70	0.08	0.25	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89833	81	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	14	97	6	60	

Physical properties

	US customary	Metric
Melting point – liquidus	1877 °F	1025 °C
Melting point – solidus	1454 °F	790 °C
Density	0.317 lb/in³ at 68 °F	8.78 gm/cm³ at 20 °C
Specific gravity	8.78	8.78
Electrical conductivity	17.8% IACS at 68 °F	0.103 MegaSiemens/cm at 20 °C
Thermal conductivity	41 Btu/sq ft/ft hr/ °F at 68 °F	71 W/m at 20 °C
Coefficient of thermal expansion 68-392	13 · 10^{-6} per °F (68-392 °F)	22.5 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.085 Btu/lb/ °F at 68 °F	356.1 J/kg at 20 °C
Modulas of elasticity in tension	15500 ksi	106869 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Poor
Machinability rating	81

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	11/64
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89835 Lead-free replacement for C932, C836, C844

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 8" O.D.
Tubes	1 1/8" to 14" O.D.**
Rectangles	Up to 15"
Standard lengths	105" *Solids and tubes are standard stocked **Consult mill for wall thickness
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89835 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Industrial

Housing, small gears

Industrial

Faucets, pipe fittings, plumbing goods, pump components, water pump impellers

Chemical composition											
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70	0.08	0.35	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89835	70	0.321

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	14	97	6	65	

Physical properties

	US customary	Metric
Melting point – liquidus	1855 °F	1012 °C
Melting point – solidus	1445 °F	785 °C
Density	0.321 lb/in³ at 68 °F	8.89 gm/cm³ at 20 °C
Specific gravity	8.89	8.89
Electrical conductivity	14.5% IACS at 68 °F	0.084 MegaSiemens/cm at 20 °C
Thermal conductivity	38 Btu/sq ft/ft hr/ °F at 68 °F	65.8 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.093 Btu/lb/ °F at 68 °F	389.6 J/kg at 20 °C
Modulas of elasticity in tension	16900 ksi	116522 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89844 Lead-free replacement for C844

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89844 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Plumbing

Fittings/valves for potable water

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00	0.08	0.25	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89844	70	0.31

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
28	193	13	90	5	55	

Physical properties

	US customary	Metric
Melting point – liquidus	1850 °F	1010 °C
Melting point – solidus	1550 °F	853 °C
Density	0.31 lb/in³ at 68 °F	8.58 gm/cm³ at 20 °C
Specific gravity	8.58	8.58
Electrical conductivity	16.8% IACS at 68 °F	0.095 MegaSiemens/cm at 20 °C
Thermal conductivity	46.7 Btu/sq ft/ft hr/ °F at 68 °F	80.9 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.08 Btu/lb/ °F at 68 °F	335.2 J/kg at 20 °C
Modulas of elasticity in tension	13000 ksi	89622 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Medium
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C90300

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144" *Solids is standard stocked
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Building

Heavy construction equipment

Fasteners

Swivel

Industrial

Bearings, bushings, gear blanks, gears, piston rings, pump bodies, pump impellers, valve bodies, valves

Plumbing

Steam fittings

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-89.00	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90300	30	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
44	303	22	152	18	70	

Physical properties

	US customary	Metric
Melting point – liquidus	1832 °F	1000 °C
Melting point – solidus	1570 °F	854 °C
Density	0.318 lb/in³ at 68 °F	8.8 gm/cm³ at 20 °C
Specific gravity	8.8	8.8
Electrical conductivity	12% IACS at 68 °F	0.069 MegaSiemens/cm at 20 °C
Thermal conductivity	43.2 Btu/sq ft/ft hr/ °F at 68 °F	74.8 W/m at 20 °C
Coefficient of thermal expansion 68-392	$10 \cdot 10^{-6}$ per °F (68-392 °F)	$17.3 \cdot 10^{-6}$ per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96527 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	30

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C90500

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C90500	B505 B505M B22 B22M B143-IA	62 J461 J462	4845	QQ-C-390, D6 QQ-B-1005, Comp 16	MIL-B-11553, Comp 16	Gun metal

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-89.00	0.30	9.00-11.00	1.00-3.00	0.20	1.50	1.00	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.7% min. Single values represent maximums.

Typical uses

Builders hardware

Clamps

Building

Heavy construction equipment

Electrical

Connectors

Fasteners

Nuts

Industrial

Bearings, bushings, expansion bearings, finishing dies for wood pulp industry, gear blanks, gears, piston rings, pump bodies, pump impellers, seal rings, valve bodies, valves, worm gears

Plumbing

Steam fittings, water conditioners

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C90500	30	0.315

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
44	303	25	172	10	75	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1570 °F	854 °C
Density	0.315 lb/in³ at 68 °F	8.72 gm/cm³ at 20 °C
Specific gravity	8.72	8.72
Electrical conductivity	11% IACS at 68 °F	0.064 MegaSiemens/cm at 20 °C
Thermal conductivity	43.2 Btu/sq ft/ft hr/ °F at 68 °F	74.8 W/m at 20 °C
Coefficient of thermal expansion 68-572	11 · 10^{-6} per °F (68-212 °F)	19.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	30

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C90700

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Bearings, bearings for heavy loads and relatively low speeds, gear boxes, gears, restaurant equipment, speed reducers, valve bodies, worm gears, worm wheels

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C90700	B505 B505M	65 J461 J462				Tin bronze, 65

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
88.00-90.00	0.50	10.00-12.00	0.50	0.15	1.50	0.50	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90700	20	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	25	172	10	102	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1528 °F	831 °C
Density	0.317 lb/in³ at 68 °F	8.77 gm/cm³ at 20 °C
Specific gravity	8.77	8.77
Electrical conductivity	10% IACS at 68 °F	0.056 MegaSiemens/cm at 20 °C
Thermal conductivity	40.8 Btu/sq ft/ft hr/ °F at 68 °F	70.6 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.2 · 10^{-6} per °F (68-392 °F)	18.4 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	20

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	High
Gassing	Medium-high
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C90800

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C90800 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Speed reducers, worm gears

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[2]	Ni (%)[3]	Al (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.5% max. [3]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90800		0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	17	117	10	65	

C90810

Continuous cast	GreenAlloys™

Product description	High tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C90810 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bearings, gears, shafts, worm gears

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[2]	Ni (%)[3]	Al (%)	S (%)	Sb (%)	Si (%)
remain.	0.25	11.00-13.00	0.30	0.15	0.15-0.80	0.50	0.005	0.05	0.20	0.005

Chemical composition provided by CDA

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.5% max. [3]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90810	20	0.323

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
					95	

C91000

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C91000 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bearings, piston rings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C91000	B505 B505M			QQ-C-390, D2 QQ-B-1005, Comp 9	MIL-B-16262, Grade III	Tin bronze, 65

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	S (%)	Sb (%)	Si (%)
84.00-86.00	0.20	14.00-16.00	1.50	0.10	1.50	0.80	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C91000	20	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207				105	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1760 °F	960 °C
Melting point – solidus	1505 °F	818 °C
Electrical conductivity	9% IACS at 68 °F	0.054 MegaSiemens/cm at 20 °C
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	20

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C91100

Continuous cast	
Product description	High tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Electrical

Hollow conductors

Industrial

Bearings, bushings, piston rings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C91100	B22 B22M					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[2]	Ni (%)[3]	Al (%)	S (%)	Sb (%)	Si (%)
82.00-85.00	0.25	15.00-17.00	0.25	0.25	1.00	0.50	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B22/B22M-17

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.5% max. [3]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C91100	10	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
					135	

Physical properties

	US customary	Metric
Melting point – liquidus	1742 °F	950 °C
Melting point – solidus	1505 °F	818 °C
Electrical conductivity	8% IACS at 68 °F	0.049 MegaSiemens/cm at 20 °C
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	10

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	High
Gassing	Medium-high
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C91300

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C91300 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Consumer

Bells

Industrial

Bearings, bushings, piston rings, valve bodies

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C91300	B505 B505M B22 B22M		7322	QQ-C-390, D1		

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
79.00-82.00	0.25	18.00-20.00	0.25	0.25	1.50	0.50	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C91300	10	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
					160	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1632 °F	889 °C
Melting point – solidus	1505 °F	818 °C
Electrical conductivity	7% IACS at 68 °F	0.04 MegaSiemens/cm at 20 °C
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	10

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	High
Gassing	Medium-high
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C91600

Continuous cast	
Product description	High tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Fasteners

Nuts

Industrial

Bearings, bushings, fittings, gears, piston rings, pump impellers, steam castings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C91600	B427			QQ-C-390, F1		

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-89.00	0.25	9.70-10.80	0.25	0.20	0.30	1.20-2.00	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B427-21

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C91600	20	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
45	310	25	172	10	85	

Mechanical properties according to ASTM B427-21

Physical properties

	US customary	Metric
Melting point – liquidus	1887˚F	1031˚C
Melting point – solidus	1575˚F	857˚C
Density	0.32 lb/in³ at 68˚F	8.86 gm/cm³ at 20˚C
Specific gravity	8.86	8.86
Electrical conductivity	10% IACS at 68˚F	0.058 MegaSiemens/cm at 20˚C
Thermal conductivity	40.8 Btu/sq ft/ft hr/˚F at 68˚F	70.6 W/m at 20˚C
Coefficient of thermal expansion 68-392	$9 \cdot 10^{-6}$ per˚F (68-392˚F)	$15.5 \cdot 10^{-6}$ per˚C (20-200˚C)
Specific heat capacity	0.09 Btu/lb/˚F at 68˚F	377.1 J/kg at 20˚C
Modulas of elasticity in tension	16000 ksi	110000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	20

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

C91700

Continuous cast	
Product description	High tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Gears, heavy load/relatively low-speed bearings, worm gears, worm wheels

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C91700	B427					Nickel gear bronze

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	S (%)	Sb (%)	Si (%)
84.00-87.00	0.25	11.30-12.50	0.25	0.20	0.30	1.20-2.00	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B427-21

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C91700	20	0.316

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	17	117	10	65	

Mechanical properties according to ASTM B427-21

Physical properties

	US customary	Metric
Melting point – liquidus	1859 °F	1015 °C
Melting point – solidus	1563 °F	851 °C
Density	0.316 lb/in³ at 68 °F	8.75 gm/cm³ at 20 °C
Specific gravity	8.75	8.75
Electrical conductivity	10% IACS at 68 °F	0.058 MegaSiemens/cm at 20 °C
Thermal conductivity	40.8 Btu/sq ft/ft hr/ °F at 68 °F	70.6 W/m at 20 °C
Coefficient of thermal expansion 68-392	$9 \cdot 10^{-6}$ per °F (68-392 °F)	$15.5 \cdot 10^{-6}$ per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic Permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	20

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

C92200

Continuous cast

Product description	Leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C92200	B505 B505M B61 B143-2A	622 J461 J462		QQ-C-390, D4 QQ-B-1005, Comp 1	MIL-B-11553, Comp 1 MIL-B-16541	Navy M bronze

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-90.00	1.00-2.00	5.50-6.50	3.00-5.00	0.25	1.50	1.00	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Typical uses

Architecture

Ornamental castings

Building

Cooling equipment, heating equipment

Fasteners

Nuts

Industrial

Bearings, bushings, cryogenic valves, fittings used to 550 °F, gears, medium-pressure hydraulic equipment, piston rings, pump impellers, pumps used to 550 °F, valve components, valves for water meters

Marine

Marine castings

Plumbing

Medium-pressure steam equipment to 550 °F

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C92200	42	0.312

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
38	262	19	131	18	65	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1810 °F	988 °C
Melting point – solidus	1518 °F	826 °C
Density	0.312 lb/in³ at 68 °F	8.64 gm/cm³ at 20 °C
Specific gravity	8.64	8.64
Electrical conductivity	14% IACS at 68 °F	0.083 MegaSiemens/cm at 20 °C
Thermal conductivity	40.2 Btu/sq ft/ft hr/ °F at 68 °F	69.6 W/m at 20 °C
Coefficient of thermal expansion 68-572	$10 \cdot 10^{-6}$ per °F (68-572 °F)	$17.3 \cdot 10^{-6}$ per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96500 MPa
Incipient melting	600 °F	316 °C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Excellent
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	42

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C92300

Continuous cast

Product description	Leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Structural castings

Fasteners

Nuts

Industrial

Bearings, bushings, gears, high pressure hydraulic equipment, piston rings, pump impellers, pump parts, valve bodies

Plumbing

High-pressure steam equipment

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C92300	B505 B505M B143-2B	621 J461 J462		QQ-C-390, D3 QQ-B-1005, Comp 6	MIL-B-11553, Comp 6	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.30-1.00	7.50-9.00	2.50-5.00	0.25	1.50	1.00	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C92300	42	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	19	131	16	70	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1570 °F	854 °C
Density	0.317 lb/in³ at 68 °F	8.77 gm/cm³ at 20 °C
Specific gravity	8.77	8.77
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	43.2 Btu/sq ft/ft hr/ °F at 68 °F	74.8 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96500 MPa
Incipient melting	600 °F	316 °C

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	42

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C92500

Continuous cast	
Product description	Nickel-phosphor bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Automotive

Automotive synchronizer rings

Industrial

Gears

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C92500	B505 B505M	J461 J462				

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
85.00-88.00	1.00-1.50	10.00-12.00	0.50	0.30	1.50	0.80-1.50	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C92500	30	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	24	165	10	80	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Density	0.317 lb/in³ at 68 °F	8.7 gm/cm³ at 20 °C
Specific gravity	8.7	8.7
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa
Incipient Melting	600 °F	316 °C

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	30

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium-high
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C92700

Continuous cast	
Product description	Leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Fasteners

Lead screw nuts

Industrial

Bearings, bushings, gears, heavy-duty bearings, pump impellers, pump pistons, steam fittings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C92700	B505 B505M	63 J461 J462				

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-89.00	1.00-2.50	9.00-11.00	0.70	0.20	1.50	1.00	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C92700	45	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
38	252	20	138	8	77	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1800 °F	982 °C
Melting point – solidus	1550 °F	843 °C
Density	0.317 lb/in³ at 68 °F	8.78 gm/cm³ at 20 °C
Specific gravity	8.78	8.78
Electrical conductivity	11% IACS at 68 °F	0.064 MegaSiemens/cm at 20 °C
Thermal conductivity	27.2 Btu/sq ft/ft hr/ °F at 68 °F	47 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa
Incipient melting	600 °F	316 °C

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	45

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C92800

Continuous cast	
Product description	Leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Bushings, corrosion-resistant castings, piston rings

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C92800	B505 B505M		7320			

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
78.00-82.00	4.00-6.00	15.00-17.00	0.80	0.20	1.50	0.80	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C92800	70	0.317

Physical properties

	US customary	Metric
Melting point – liquidus	1751 °F	955 °C
Melting point – solidus	1505 °F	818 °C
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C92900

Continuous cast	
Product description	Leaded nickel-tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Cams, gears, general-service bearings, impellers for mine water, pump bodies, wear plates, worm gears

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C92900	B505 B505M					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
82.00-86.00	2.00-3.20	9.00-11.00	0.25	0.20	1.50	2.80-4.00	0.005	0.05	0.25	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C92900	40	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
45	310	25	172	8	75	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1887 °F	1031 °C
Melting point – solidus	1575 °F	857 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	9% IACS at 68 °F	0.053 MegaSiemens/cm at 20 °C
Thermal conductivity	33.6 Btu/sq ft/ft hr/ °F at 68 °F	58.2 W/m at 20 °C
Coefficient of thermal expansion 68-392	9.5 · 10^{-6} per °F (68-392 °F)	16.4 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96500 MPa
Incipient melting	600 °F	316 °C

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	40

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C93200

Standard-stocked product	Continuous cast

Product description	Leaded tin bronze
Solids	3/8" to 13" O.D.
Tubes	1" to 16" O.D.*
Rectangles	Up to 20"
Standard lengths	105" *Consult mill for wall thickness
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93200	B505 B505M	J461 J462		QQ-C-390, E7 QQ-B-1005, Comp 12	MIL-B-11553, Comp 12	Bearing bronze

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
81.00-85.00	6.00-8.00	6.30-7.50	2.00-4.00	0.20	1.50	1.00	0.005	0.08	0.35	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C93200	70	0.322

Typical uses

Automotive

Automotive fittings

Fasteners

Washers

Industrial

Bearings, bearings for cranes, bushings, diesel engine wrist pin bushings, fittings, forging press toggle lever bearings, fuel pump bushings, general purpose bushings, hydraulic press main lining, hydraulic press stuffing box, insert bearings, linkage bushings for presses, machine parts, machine tool bearings, main spindle bearings, pump fixtures, pump impellers, pumps, roll neck bearings, rolling mill bearings, thrust washers, trunion bearings, water pump bushings

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	20	138	10	65	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1790 °F	977 °C
Melting point – solidus	1570 °F	854 °C
Density	0.322 lb/in³ at 68 °F	8.91 gm/cm³ at 20 °C
Specific gravity	8.91	8.91
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	33.6 Btu/sq ft/ft hr/ °F at 68 °F	58.2 W/m at 20 °C
Coefficient of thermal expansion 68-212	10 · 10^{-6} per °F (68-212 °F)	17.3 · 10^{-6} per °C (20-100 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14500 ksi	100000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	7/32
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C93400

Continuous cast	
Product description	High-leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Fasteners

Washers

Industrial

Bearings, bushings, corrosion-resistant castings, pump impellers, slide bars, thrust bearings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93400	B505 B505M	J461 J462		QQ-C-390, E8 QQ-B-1005, Comp 8	MIL-B-11553, Comp 8	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
82.00-85.00	7.00-9.00	7.00-9.00	0.80	0.20	1.50	1.00	0.005	0.08	0.50	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C93400	70	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
34	234	20	138	8	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	33.6 Btu/sq ft/ft hr/ °F at 68 °F	58.2 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	11000 ksi	75800 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Medium
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C93500

Continuous cast	
Product description	High-leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Automotive

Backing for babbitt-lined bearings

Industrial

Bearings, corrosion-resistant castings, high-speed/light-load bushings, mild acidic applications, pump impellers

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93500	B505 B505M B144-3C	66 J461 J462		QQ-C-390, E9 QQ-B-1005, Comp 14	MIL-B-11553, Comp 14	

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
83.00-86.00	8.00-10.00	4.30-6.00	2.00	0.20	1.50	1.00	0.005	0.08	0.30	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C93500	70	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	16	110	12	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1570 °F	854 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	15% IACS at 68 °F	0.088 MegaSiemens/cm at 20 °C
Thermal conductivity	40.7 Btu/sq ft/ft hr/ °F at 68 °F	70.4 W/m at 20 °C
Coefficient of thermal expansion 68-392	9.9 · 10^{-6} per °F (68-392 °F)	17.1 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14500 ksi	100000 MPa
Incipient melting	600 °F	316 °C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

C93600

Continuous cast	
Product description	High-leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Backs for lined bearings, bushings for corrosion/ lubrication/pressure, cam bushings for diesel engines, crankshaft main bearings, deep well pump line shaft bearings, electric motor bearings, flow monitor valves, guide bushings for piston rods, guide bushings for valves, hydraulic gland seals, locomotive bearing parts, main bearings for presses, piston pin bearings, pump sleeves, rod bushings, rolling mill bearings, seals, sleeve bushings (for cranes, etc.), spacer bushings (for pumps, etc.), steel mill bushings, wrist pin bushings

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C93600	B505 B505M					

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)	Sb (%)	Si (%)
79.00-83.00	11.00-13.00	6.00-8.00	1.00	0.20	1.50	1.00	0.005	0.08	0.55	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C93600	80	0.325

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
33	227	20	138	10	65	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1720 °F	938 °C
Melting point – solidus	1550 °F	843 °C
Density	0.325 lb/in³ at 68 °F	9 gm/cm³ at 20 °C
Specific gravity	9	9
Electrical conductivity	11% IACS at 68 °F	0.064 MegaSiemens/cm at 20 °C
Thermal conductivity	28.5 Btu/sq ft/ft hr/ °F at 68 °F	49.36 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96516 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C93700

Continuous cast	
Product description	High-leaded tin bronze
Solids	1/2" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93700	B505 B505M	J461 J462		QQ-C-390, E10	MIL-B-11553, Comp 23	Bearing bronze 80-10-10 bronze

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)[1]	P (%)	Ni (%)[2]	Al (%)	S (%)	Sb (%)	Si (%)
78.00-82.00	8.00-11.00	9.00-11.00	0.80	0.70	1.50	0.50	0.005	0.08	0.50	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Fe shall be 0.35% max, when used for steel-backed bearings. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Typical uses

Builders hardware

Brackets

Fasteners

Nuts, washers for engines

Industrial

Applications requiring acid resistance to sulphite fluids, bearing plates, bearings, bushings, bushings for high speed and heavy pressure, corrosion-resistant castings, crank shafts, high speed/heavy load bearings, impellers, machine parts, parts for steel mill maintenance, pressure-tight castings, pumps, slide guides for steel mills

Marine

Large bearings for ships

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C93700	80	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	20	138	6	60	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1705 °F	929 °C
Melting point – solidus	1403 °F	762 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	10% IACS at 68 °F	0.059 MegaSiemens/cm at 20 °C
Thermal conductivity	27.1 Btu/sq ft/ft hr/ °F at 68 °F	46.9 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	11000 ksi	75800 MPa
Incipient melting	600 °F	316 °C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

C93800

Continuous cast	
Product description	High-leaded tin bronze
Solids	1" to 13" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Acid resisting applications, backs for lined journal bearings for locomotives, backs for lined journal bearings for passenger cars, bearings, freight car bearings, general service bearings for moderate pressure, industrial centrifuges, low-friction/ moderate pressure bushings, machine parts, pump bodies for acid mine water, pump impellers for acid mine water, pumps, railroad applications, railroad engine casings, wearing material for rod bushings, wearing material for shoes, wearing material for wedges

Marine

Large bearings for ships

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93800	B505 B505M	J461 J462		QQ-C-390, E6 QQ-B-1005, Comp 19	MIL-B-11553, Comp 19	Anti-acid metal SAE 67

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)	Sb (%)	Si (%)
75.00-79.00	13.00-16.00	6.30-7.50	0.80	0.15	1.50	1.00	0.005	0.08	0.80	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C93800	80	0.334

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
25	172	16	110	5	55	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1730 °F	943 °C
Melting point – solidus	1570 °F	854 °C
Density	0.334 lb/in³ at 68 °F	9.25 gm/cm³ at 20 °C
Specific gravity	9.25	9.25
Electrical conductivity	11% IACS at 68 °F	0.066 MegaSiemens/cm at 20 °C
Thermal conductivity	30.2 Btu/sq ft/ft hr/ °F at 68 °F	52.3 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	10500 ksi	72400 MPa
Incipient melting	600 °F	316 °C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Poor
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C93900

Continuous cast	
Product description	High-leaded tin bronze
Solids	1" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Bearings, pump bodies, pump impellers for mine water

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C93900	B505 B505M	67 J461 J462		QQ-C-390, E5		79-6-15

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)	Sb (%)	Si (%)
76.50-79.50	14.00-18.00	5.00-7.00	1.50	0.40	1.50	0.80	0.005	0.08	0.50	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 98.9% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C93900	80	0.334

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
25	172	16	110	5	63	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1730 °F	943 °C
Melting point – solidus	1570 °F	854 °C
Density	0.334 lb/in³ at 68 °F	9.25 gm/cm³ at 20 °C
Specific gravity	9.25	9.25
Electrical conductivity	11% IACS at 68 °F	0.066 MegaSiemens/cm at 20 °C
Thermal conductivity	30.2 Btu/sq ft/ft hr/ °F at 68 °F	52.3 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	11000 ksi	75800 MPa
Incipient melting	600 °F	316 °C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Poor
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C94000

Continuous cast	
Product description	High-leaded tin bronze
Solids	1" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

High-speed bearings for light loads, high-speed/ light-to-medium-pressure bushings, soft bushings, railroad applications, soft metal applications

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C94000	B505 B505M	J461 J462		QQ-C-390, E2 QQ-B-1005, Comp 13	MIL-B-11553, Comp 13	

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)[2]	Sb (%)	Si (%)
69.00-72.00	14.00-16.00	12.00-14.00	0.50	0.25	1.50	0.50-1.00	0.005	0.25	0.50	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co. [2]For continuous castings, S shall be 0.25% max.
Note: Cu + sum of named elements, 98.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C94000	80	0.334

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
					80	

Mechanical properties according to ASTM B505/B505M-23

C94100

Continuous cast	
Product description	High-leaded tin bronze
Solids	1" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Thrust block

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C94100	B505 B505M			QQ-C-390, E5	MIL-B-16261, Grade X	

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)[2]	Sb (%)	Si (%)
72.00-79.00	18.00-22.00	4.50-6.50	1.00	0.25	1.50	1.00	0.005	0.25	0.80	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co. [2]For continuous castings, S shall be 0.25% max.
Note: Cu + sum of named elements, 98.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C94100	80	0.336

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
25	172	17	117	7	50	

Mechanical properties according to ASTM B505/B505M-23

C94300

Continuous cast	
Product description	High-leaded tin bronze
Solids	1" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

High-speed bearings for light loads, high-speed/light-to-medium pressure bushings, railroad applications, soft bushings, soft metal applications

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C94300	B505 B505M	J461 J462		QQ-C-390, E1 QQ-B-1005, Comp 18	MIL-B-16261, Grade V	Soft bronze

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	S (%)[2]	Sb (%)	Si (%)
67.00-72.00	23.00-27.00	4.50-6.00	0.80	0.15	1.50	1.00	0.005	0.25	0.80	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co. [2]For continuous castings, S shall be 0.25% max.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C94300	80	0.336

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
21	145	15	103	7	45	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Density	0.336 lb/in³ at 68˚F	9.3 gm/cm³ at 20˚C
Specific gravity	9.3	9.3
Electrical conductivity	9% IACS at 68˚F	0.053 MegaSiemens/cm at 20˚C
Thermal conductivity	36.2 Btu/sq ft/ft hr/˚F at 68˚F	62.7 W/m at 20˚C
Specific heat capacity	0.09 Btu/lb/˚F at 68˚F	377.1 J/kg at 20˚C
Modulas of elasticity in tension	10500 ksi	72400 MPa
Incipient melting	600˚F	316˚C
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing*	Poor
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C94700

Continuous cast	
Product description	Nickel-tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Electrical

Circuit breaker parts

Industrial

Bearings, feeding mechanisms, gears, nozzles, piston cylinders, shift forks, valve components, wear guides

Note: Also available in a heat-treated condition.

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C94700	B505 B505M B947 B292-A	J461 J462		QQ-C-390, F2		Cast nickel-tin bronze

Chemical composition

Cu (%)	Pb (%)[1]	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
85.00-90.00	0.09	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005	0.20	0.05	0.15	0.005

Chemical composition according to ASTM B505/B505M-23

[1]It is possible that the mechanical requirements of Copper Alloy UNS No. C94700 in the heat-treated condition will not be attained if the lead content exceeds 0.01%.
[2]Ni value includes Co.
Note: Cu + sum of named elements, 98.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C94700	30	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
45	310	20	138	25	85	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1880 °F	1027 °C
Melting point – solidus	1660 °F	904 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	31.2 Btu/sq ft/ft hr/ °F at 68 °F	54 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.9 · 10^{-6} per °F (68-392 °F)	18.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Excellent
Oxyacetylene welding	Fair
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	30

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C94700HT

Continuous cast	
Product description	Nickel-tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	24"*
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Consult mill for other lengths

Typical uses

Electrical

Circuit breaker parts

Industrial

Bearings, feeding mechanisms, gears, nozzles, piston cylinders, shift forks, valve components, wear guides

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C94700	B505 B505M B947 B292-A	J461 J462		QQ-C-390, F2		Cast nickel-tin bronze

Chemical composition

Cu (%)	Pb (%)[1]	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
85.00-90.00	0.09	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005	0.20	0.05	0.15	0.005

Chemical composition according to ASTM B505/B505M-23

[1]It is possible that the mechanical requirements of Copper Alloy UNS No. C94700 in the heat-treated condition will not be attained if the lead content exceeds 0.01%.
[2]Ni value includes Co.
Note: Cu + sum of named elements, 98.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C94700HT	30	0.32

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
75	517	50	345	5	180	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C94800

Continuous cast	
Product description	Leaded nickel-tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Builders hardware

Structural castings

Industrial

Bearings, gear components, machinery parts, motion translation devices

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C94800	B505 B505M B948 B292-B			QQ-C-390, F3		

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
84.00-89.00	0.30-1.00	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005	0.20	0.05	0.15	0.005

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 98.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C94800	50	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	20	138	20	80	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1880 °F	1027 °C
Melting point – solidus	1660 °F	904 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	22.3 Btu/sq ft/ft hr/ °F at 68 °F	38.6 W/m at 20 °C
Coefficient of thermal expansion 68-572	10.9 · 10^{-6} per °F (68-572 °F)	18.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	50

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C95200

Continuous cast	
Product description	Aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95200	B505 B505M	68A J461 J462		QQ-C-390, G6 QQ-B-671, Class 1	MIL-B-16033, Class 1	Aluminum bronze 9A

Chemical composition

Cu (%)	Fe (%)	Al (%)
86.00 min	2.50-4.00	8.50-9.50

Chemical composition according to ASTM B505/B505M-23

Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Typical uses

Electrical

Electrical hardware

Fasteners

Nuts

Industrial

Acid-resistant pumps, bearing liners, bearings, bushings, gears, high-strength clamps, hot mill guides, hydrant parts, large gear parts, mild alkali applications, pickling equipment, pickling tanks, plungers, pump parts, pump rods, thrust pads, valve bodies, valve seats, valves, wear plates, welding jaws, worm wheels, worms

Marine

Covers for marine hardware, marine engines, marine hardware, propellers

Ordnance

Gun mountings, gun slides

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95200	20	0.276

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
68	469	26	179	20	125	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1913 °F	1045 °C
Melting point – solidus	1907 °F	1042 °C
Density	0.276 lb/in³ at 68 °F	7.64 gm/cm³ at 20 °C
Specific gravity	7.64	7.64
Electrical conductivity	11% IACS at 68 °F	0.064 MegaSiemens/cm at 20 °C
Thermal conductivity	29.1 Btu/sq ft/ft hr/ °F at 68 °F	50.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	$9 \cdot 10^{-6}$ per °F (68-572 °F)	$15.5 \cdot 10^{-6}$ per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103400 MPa
Magnetic permeability*	1.1	1.1
Poisson's ratio	0.31	0.31

Physical properties provided by CDA

*Field strength 16000 A/m (200 Oersteds)

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Excellent
Coated metal arc welding	Good
Machinability rating	20

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/4
Shrinkage in solidification	High
Shrinkage during freezing	High

Casting characteristics provided by CDA

C95300

Continuous cast	
Product description	Aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95300	B505 B505M	68B J461 J462		QQ-C-390, G7 QQ-B-671, Class 2	MIL-B-16033, Class 2	Aluminum bronze 9B

Chemical composition

Cu (%)	Fe (%)	Al (%)
86.00 min	0.80-1.50	9.00-11.00

Chemical composition according to ASTM B505/B505M-23

Note: Cu + sum of named elements, 99.0% min. Unless otherwise noted, single values represent maximums.

Typical uses

Electrical

Connectors

Fasteners

Stripped nuts

Industrial

Bearing segment for the steel industry, cams, gears, high-strength clamps, high-temperature applications, large hold-down screws, mining machine parts, pickling baskets, pickling hooks, pressure blocks for the steel industry, valve bodies, welding jaws

Marine

Covers for marine hardware, marine equipment

Note: Also available in a heat-treated condition.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95300	55	0.272

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
70	483	26	179	25	125	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1913 °F	1045 °C
Melting point – solidus	1904 °F	1040 °C
Density	0.272 lb/in³ at 68 °F	7.53 gm/cm³ at 20 °C
Specific gravity	7.53	7.53
Electrical conductivity	13% IACS at 68 °F	0.075 MegaSiemens/cm at 20 °C
Thermal conductivity	36.3 Btu/sq ft/ft hr/ °F at 68 °F	62.8 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa
Magnetic permeability*	1.07	1.07

Physical properties provided by CDA

*Field strength 8 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Excellent
Coated metal arc welding	Good
Machinability rating	55

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95300HT

Continuous cast	
Product description	Aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	24"*
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Consult mill for other lengths

Typical uses

Electrical

Connectors

Fasteners

Stripped nuts

Industrial

Bearing segment for the steel industry, cams, gears, high-strength clamps, high-temperature applications, large hold-down screws, mining machine parts, pickling baskets, pickling hooks, pressure blocks for the steel industry, valve bodies, welding jaws

Marine

Covers for marine hardware, marine equipment

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95300	B505 B505M	68B J461 J462		QQ-C-390, G7 QQ-B-671, Class 2	MIL-B-16033, Class 2	Aluminum bronze 9B

Chemical composition

Cu (%)	Fe (%)	Al (%)
86.00 min	0.80-1.50	9.00-11.00

Chemical composition according to ASTM B505/B505M-23

Note: Cu + sum of named elements, 99.0% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95300HT	55	0.272

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
80	552	40	276	12	132	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C95400

Standard-stocked product	Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 12" O.D.*
Rectangles	Up to 15"
Standard lengths	144" *Consult mill for wall thickness
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95400 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Automotive

Weld guns

Fasteners

Large hold-down screws, nuts

Industrial

Bearing segments for the steel industry, bearings, bushings, gears, heavily loaded worm gears, high-strength clamps, landing gear parts, machine parts, pawl, pickling hooks, pressure blocks for the steel industry, pump parts, spur gears, valve bodies, valve guides, valve seats, valves, worm gears

Marine

Covers for marine hardware, ship building

Ordnance

Government fittings

Note: also available in heat-treated condition

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95400	B505 B505M	J461 J462		QQ-C-390, G5 QQ-B-671, Class 3	MIL-B-16033, Class 3	Aluminum Bronze 9C

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95400	60	0.269

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
85	586	32	221	12	170	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1880 °F	1027 °C
Density	0.269 lb/in³ at 68 °F	7.45 gm/cm³ at 20 °C
Specific gravity	7.45	7.45
Electrical conductivity	13% IACS at 68 °F	0.075 MegaSiemens/cm at 20 °C
Thermal conductivity	33.9 Btu/sq ft/ft hr/ °F at 68 °F	58.7 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	15500 ksi	107000 MPa
Magnetic permeability*	1.27	1.27
Magnetic permeability**	1.2	1.2

Physical properties provided by CDA

*As cast, field strength 16 kA/m **TQ 50 temper, field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	60

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95400HT

Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 12" O.D.*
Rectangles	Up to 15"
Standard lengths	24"**
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95400 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Consult mill for wall thickness **Consult mill for other lengths

Typical uses

Automotive

Weld guns

Fasteners

Large hold-down screws, nuts

Industrial

Bearing segments for the steel industry, bearings, bushings, gears, heavily loaded worm gears, high-strength clamps, landing gear parts, machine parts, pawl, pickling hooks, pressure blocks for the steel industry, pump parts, spur gears, valve bodies, valve guides, valve seats, valves, worm gears

Marine

Covers for marine hardware, ship building

Ordnance

Government fittings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95400	B505 B505M	J461 J462		QQ-C-390, G5 QQ-B-671, Class 3	MIL-B-16033, Class 3	Aluminum Bronze 9C

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95400HT	60	0.269

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
95	655	45	310	10	177	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C95410

Continuous cast	
Product description	Aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Bearings, bushings, gears, pickling baskets, pickling hooks, spur gears, valve components, worms

Note: Also available in heat-treated condition.

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C95410	B505 B505M					

Chemical composition				
Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50-2.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95410	60	0.269

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
85	586	32	221	12	170	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1880 °F	1027 °C
Density	0.269 lb/in³ at 68 °F	7.45 gm/cm³ at 20 °C
Specific gravity	7.45	7.45
Electrical conductivity	13% IACS at 68 °F	0.075 MegaSiemens/cm at 20 °C
Thermal conductivity	33.9 Btu/sq ft/ft hr/ °F at 68 °F	58.7 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	15500 ksi	107000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	60

Fabrication properties provided by CDA

C95410HT

Continuous cast	
Product description	Aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	24"*
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Consult mill for other lengths

Typical uses

Industrial

Bearings, bushings, gears, pickling baskets, pickling hooks, spur gears, valve components, worms

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95410	B505 B505M					

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50-2.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95410HT	60	0.269

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
95	655	45	310	10	177	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C95500

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.**
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95500 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Solids is standard stocked **Consult mill for wall thickness

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95500	B505 B505M	J461 J462		QQ-C-390, G3	MIL-B-16033, Class 4	Aluminum Bronze 9D

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	3.00-5.00	3.00-5.50	10.00-11.50	3.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Typical uses

Builders hardware

Window hardware

Consumer

Musical instruments, piano keys

Electrical

Electrical hardware

Fasteners

Stuffing box nuts

Industrial

Aircraft components, bearings, bushings, gears, glands, glass molds, handgun recoil mechanisms, hot mill guides, landing gear parts, machine parts, pickling equipment, piston guides, pump fluid ends, sewage treatment applications, valve bodies, valve components, valve guides, valve seats, wear plates, welding jaws, worm wheels, worms

Marine

Covers for marine hardware, marine applications, marine hardware, ship building

Ordnance

Government fittings

Note: also available in heat-treated condition

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95500	50	0.272

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
95	655	42	290	10	208	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1930 °F	1054 °C
Melting point – solidus	1900 °F	1038 °C
Density	0.272 lb/in³ at 68 °F	7.53 gm/cm³ at 20 °C
Specific gravity	7.53	7.53
Electrical conductivity	8% IACS at 68 °F	0.049 MegaSiemens/cm at 20 °C
Thermal conductivity	24.2 Btu/sq ft/ft hr/ °F at 68 °F	41.9 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa
Magnetic permeability*	1.32	1.32
Magnetic permeability**	1.2	1.2
Poisson's Ratio	0.32	0.32

Physical properties provided by CDA

*As cast, field strength 16 kA/m **TQ 50 temper, field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	50

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95500HT

Continuous cast	GreenAlloys™

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.*
Rectangles	Up to 15"
Standard lengths	24"**
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95500HT is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Consult mill for wall thickness **Consult mill for other lengths

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95500	B505 B505M	J461 J462		QQ-C-390, G3	MIL-B-16033, Class 4	Aluminum bronze 9D

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	3.00-5.00	3.00-5.50	10.00-11.50	3.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Typical uses

Builders hardware

Window hardware

Consumer

Musical instruments, piano keys

Electrical

Electrical hardware

Fasteners

Stuffing box nuts

Industrial

Aircraft components, bearings, bushings, gears, glands, glass molds, handgun recoil mechanisms, hot mill guides, landing gear parts, machine parts, pickling equipment, piston guides, pump fluid ends, sewage treatment applications, valve bodies, valve components, valve guides, valve seats, wear plates, welding jaws, worm wheels, worms

Marine

Covers for marine hardware, marine applications, marine hardware, ship building

Ordnance

Government fittings

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95500HT	50	0.272

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
110	758	62	427	8	228	Heat treated

Mechanical properties according to ASTM B505/B505M-23

AMS 4880-C95510

Standard-stocked product*	Continuous cast

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 13" O.D.**
Rectangles	Up to 15"
Standard lengths	24"***
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Tubes is standard stocked **Consult mill for wall thickness ***Consult mill for other lengths

Typical uses

Industrial

Bearings requiring abrasion resistance/good ductility/retention of hardness at moderate temperatures, bushings, hydraulic seal components, landing gear bushings and bearings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95510		J461 J462	4880			

Chemical composition

Cu (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	0.20	0.30	2.00-3.50	4.50-5.50	9.70-10.90	1.50

Chemical composition according to AMS 4880

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.8% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95510	50	0.272

Mechanical properties

Tensile strength, min		Yield strength at 0.2% offset, min		Elongation, in 4D, min	Brinell hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max BHN	
105.0	724	62.5	431	9	192 to 248	Castings <4.0, heat treated
95.0	655	56.0	386	9	192 to 248	Castings 4.0+, heat treated

Mechanical properties according to AMS 4880

C95520HT

Continuous cast	
Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 13" O.D.
Rectangles	Up to 15"
Standard lengths	24"*
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Consult mill for other lengths

Typical uses

Industrial

Aircraft components, bearings, bushings, machine tool parts, piston guides, wear rings, worm wheels

Marine

Hardware, propeller hubs, shafts, sleeves, wear rings, worm gears

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95520	B505 B505M		4881	QQ-C-390B, Type III		

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)
74.50 min	0.03	0.25	0.30	4.00-5.50	4.20-6.00	10.50-11.50	0.20	0.05	1.50	0.15

Chemical composition according to AMS 4881

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95520HT	45	0.272

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength at 0.2% offset, min		Elongation, in 4D, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
125	860	90	621	2	262	Castings <2.00, heat treated

Mechanical properties according to AMS 4881

C95600

Continuous cast	
Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Electrical

Cable connectors, terminals

Industrial

Gears, valve stems, worms

Chemical composition			
Cu (%)	Ni (%)[1]	Al (%)	Si (%)
88.00 min	0.25	6.00-8.00	1.80-3.20

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95600	60	0.278

Mechanical properties

Tensile strength, typ		Yield strength at 0.5% extension typ		Elongation	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
75	517	34	234	18	140	

Mechanical properties provided by CDA

Physical properties

	US customary	Metric
Melting point – liquidus	1840 °F	1004 °C
Melting point – solidus	1800 °F	982 °C
Density	0.278 lb/in³ at 68 °F	7.7 gm/cm³ at 20 °C
Specific gravity	7.7	7.7
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	22.3 Btu/sq ft/ft hr/ °F at 68 °F	38.6 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.2 · 10^{-6} per °F (68-572 °F)	15.9 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103422 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Fair
Machinability rating	60

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	High
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95800

Continuous cast	
Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Fasteners

Nuts

Industrial

Bushings, gears, machinery, pickling equipment, propeller blades, propeller hub, shafts, valve bodies, wear plates, worm wheels, worms

Marine

Covers for marine hardware, marine hardware, ship building, valves in contact with sea water

Plumbing

Elbows

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95800	B505 B505M			QQ-C-390, G8		Alpha nickel-aluminum bronze

Chemical composition

Cu (%)	Pb (%)	Fe (%)[1]	Ni (%)[1,2]	Al (%)	Mn (%)	Si (%)
79.00 min	0.03	3.50-4.50	4.00-5.00	8.50-9.50	0.08-1.50	0.10

Chemical composition according to ASTM B505/B505M-23

[1]Fe content shall not exceed Ni content. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95800	20	0.276

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
85	586	35	241	18	159	

Mechanical properties according to ASTM B505/B505M-23

Note: C95800 provided as cast or temper annealed.

Physical properties

	US customary	Metric
Melting point – liquidus	1940 °F	1060 °C
Melting point – solidus	1910 °F	1043 °C
Density	0.276 lb/in³ at 68 °F	7.64 gm/cm³ at 20 °C
Specific gravity	7.64	7.64
Electrical conductivity	7% IACS at 68 °F	0.041 MegaSiemens/cm at 20 °C
Thermal conductivity	20.8 Btu/sq ft/ft hr/ °F at 68 °F	36 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.105 Btu/lb/ °F at 68 °F	440 J/kg at 20 °C
Modulas of elasticity in tension	16500 ksi	114000 MPa
Magnetic permeability*	1.05	1.05
Poisson's ratio	0.32	0.32

Physical properties provided by CDA

*Field strength is 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	20

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95900

Standard-stocked product	Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1" to 5" O.D.
Tubes	Consult mill
Rectangles	Up to 7"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95900 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Die components, gears, gibs, worm drives

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95900	B505 B505M					

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
remain.	3.00-5.00	0.50	12.00-13.50	1.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95900	10	0.255

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
					241	

Mechanical properties according to ASTM B505/B505M-23

CONCAST380

Standard-stocked product	Continuous cast

Product description	Aluminum bronze
Solids	1" to 5" O.D.
Rectangles	2" to 3"
Standard lengths	144"
Shape/form	Semi-finished; mill stock or near-net shapes; bar stock; squares; hex; plate; profile or structural shape; flats/rectangular bar

Typical uses

Industrial

Cold rolling metal dies and guides where a hardness minimum is specified

Chemical composition				
Cu (%)	Fe (%)	Al (%)	Co (%)	Mn (%)
Remain	4.50-6.50	14.00-16.00	2.50	3.25

Note: Single values represent maximums.

Machinability

Alloy	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
CONCAST380		0.25

Mechanical properties

Tensile strength, min		Yield strength at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
					340	

C96400

Continuous cast	
Product description	Copper-nickel
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Industrial

Fittings, pump bodies, pump fixtures, steam fittings

Marine

Boat parts, elbows/ flanges/pump bodies/ valves used for sea water corrosion resistance

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C96400	B505 B505M					70-30 Copper nickel

Chemical composition									
Cu (%)	Pb (%)	Fe (%)	P (%)	Ni (%)[1]	C (%)	Mn (%)	S (%)	Si (%)	Nb (%)
Remain	0.01	0.25-1.50	0.02	28.00-32.00	0.15	1.50	0.02	0.50	0.50-1.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C96400	20	0.323

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
65	448	35	241	25		

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	2260 °F	1238 °C
Melting point – solidus	2140 °F	1171 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	5% IACS at 68 °F	0.029 MegaSiemens/cm at 20 °C
Thermal conductivity	16.4 Btu/sq ft/ft hr/ °F at 68 °F	28.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	21000 ksi	144791 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Not recommended
Gas shielded arc welding*	Good
Coated metal arc welding*	Good
Machinability rating	20

Fabrication properties provided by CDA.

*Filler metal R CuNi, or E CuNi.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	Medium
Effect of section size	Low
Fluidity	High
Gassing	High
Patternmakers shrinkage (inches per foot)	7/32
Shrinkage in solidification	High

Casting characteristics provided by CDA

C96900HT

Continuous cast	
Product description	Copper-nickel
Solids	Consult mill
Tubes	2" to 14" O.D.
Rectangles	Consult mill
Standard lengths	24"*
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar *Consult mill for other lengths

Typical uses

Industrial

Bushings, bearings, chemical processing equipment, components for oil refineries, fittings, steam fittings

Marine

Component parts for sea water corrosion resistance, elbows/flanges/propeller sleeves/pump bodies/ pump impellers/valves to resist sea water

Plumbing

Plumbing parts

Chemical composition								
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Ni (%)[1]	Mg (%)	Mn (%)	Si (%)	Nb (%)
Remain	0.02	7.50-8.50	0.50	14.50-15.50	0.15	0.05-0.30	0.30	0.10

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Mechanical properties

Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D or 2 in. or 50 mm min	Brinell hardness	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
110	758	105	724	4		Heat treated Rockwell C32

Mechanical properties according to ASTM B505/B505M-23

C97300

Continuous cast	
Product description	Nickel silver bronze
Solids	3/4" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 14"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Architecture

Ornamental castings, statuary

Builders

Hardware

Industrial

Valves

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C97300	B505 B505M					15% Nickel silver

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
53.00-58.00	8.00-11.00	1.50-3.00	17.00-25.00	1.50	0.05	11.00-14.00	0.005	0.50	0.08	0.35	0.15

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C97300	70	0.321

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	15	103	8	55	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1904 °F	1040 °C
Melting point – solidus	1850 °F	1010 °C
Density	0.321 lb/in³ at 68 °F	8.89 gm/cm³ at 20 °C
Specific gravity	8.89	8.89
Electrical conductivity	6% IACS at 68 °F	0.033 MegaSiemens/cm at 20 °C
Thermal conductivity	16.5 Btu/sq ft/ft hr/ °F at 68 °F	28.6 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	High
Effect of section size	Medium
Fluidity	High
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C97600

Continuous cast

Product description	Nickel silver bronze
Solids	3/4" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 14"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Architecture

Ornamental castings

Builders hardware

Door hardware for prison doors, hardware, window hardware

Consumer

Piano keys

Industrial

Pumps, valves

Marine

Marine furniture

Plumbing

Sanitary fittings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C97600	B505 B505M					20% Nickel silver

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
63.00-67.00	3.00-5.00	3.50-4.50	3.00-9.00	1.50	0.05	19.00-21.50	0.005	1.00	0.08	0.25	0.15

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C97600	70	0.321

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	276	20	138	10	80	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	2089 °F	1143 °C
Melting point – solidus	2027 °F	1108 °C
Density	0.321 lb/in³ at 68 °F	8.9 gm/cm³ at 20 °C
Specific gravity	8.9	8.9
Electrical conductivity	5% IACS at 68 °F	0.029 MegaSiemens/cm at 20 °C
Thermal conductivity	13 Btu/sq ft/ft hr/ °F at 68 °F	22.6 W/m at 20 °C
Coefficient of thermal expansion 68-392	9.3 · 10^{-6} per °F (68-392 °F)	16.1 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	19000 ksi	131000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Medium-high
Effect of section size	Medium
Fluidity	High
Gassing	Medium-high
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C97800

Continuous cast	
Product description	Nickel silver bronze
Solids	3/4" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 14"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Architecture

Ornamental castings

Builders Hardware

Hardware

Consumer

Musical instruments components

Industrial

Fittings for dairy and food processing, valves

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C97800	B505 B505M					25% Nickel silver

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
64.00-67.00	1.00-2.50	4.00-5.50	1.00-4.00	1.50	0.05	24.00-27.00	0.005	1.00	0.08	0.20	0.15

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.6% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C97800	60	0.32

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
45	310	22	152	8	130	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	2156 °F	1180 °C
Melting point – solidus	2084 °F	1140 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	4% IACS at 68 °F	0.026 MegaSiemens/cm at 20 °C
Thermal conductivity	14.7 Btu/sq ft/ft hr/ °F at 68 °F	25.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.7 · 10^{-6} per °F (68-572 °F)	16.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	19000 ksi	131000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	60

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Medium-high
Effect of section size	Medium
Fluidity	High
Gassing	Medium-High
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C99500

Continuous cast	
Product description	Special alloy
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 14"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Electrical

Electrical parts

Industrial

Gears for mining equipment, propeller wheels, valve stems

Marine

Outboard marine components

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C99500	B505 B505M B763					

Chemical composition

Cu (%)	Pb (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)	Si (%)
Remain	0.09	0.50-2.00	3.00-5.00	3.50-5.50	0.50-2.00	0.50	0.50-2.00

Chemical composition according to ASTM B505/B505M-23

[1]Not including Co.
Note: Cu + sum of named elements, 99.7% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C99500	50	0.3

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
70	483	40	276	12	145	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Specific gravity	8.3	8.3
Electrical conductivity	10% IACS at 68 °F	0.057 MegaSiemens/cm at 20 °C
Coefficient of thermal expansion 68-572	8.3 · 10^{-6} per °F (68-572 °F)	14.3 · 10^{-6} per °C (20-300 °C)
Modulas of elasticity in tension	19000 ksi	131000 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Gas shielded arc welding	Good
Machinability rating	50

Fabrication properties provided by CDA.

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	Medium
Effect of section size	Low
Fluidity	Medium
Gassing	Low
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

Extruded or cast and drawn products

Extruded or cast and drawn products

Wieland Concast's line of standard-stocked extruded or cast and drawn products includes C14500, C51000, C54400, AMS 4640-C63000, AMS 4590-C63020, AMS 4634-C64200, C67300, AMS 4596-C72900, AMS 4597-C72900, and AMS 4598-C72900. Our non-standard extruded or cast and drawn products include C23000, C24000, C26000, C31400, C31600, C46400, C52100, C53400, C62400, C64210, C65100, C67400, C67410, C67600, C69300, C69400, and C69430.

The term "extruded and drawn mill products" applies to sheet, rod, bar, tube, plate and wire produced by rolling and extrusion mills, as well as forging. Each of these products start with metal that has been cast into a form or shape that is suitable for further processing into a specific product.

Our extruded or cast and drawn products are cast and cold drawn. Rods are brought to final dimensions by one or more cold drawing operations with suitable intermediate anneals when necessary. After the final draw, the rods are straightened mechanically and cut to the desired length.

Cold drawing improves size consistency, mechanical properties, and machinability.

Standard-stocked and non-standard extruded or cast and drawn products

- 14500
- 23000
- 24000
- 26000
- 31400
- 31600
- 46400
- 51000
- 52100
- 53400
- 54400
- 62400
- 63000
- 63020
- 64200
- 64210
- 65100
- 67300
- 67400
- 67410
- 67600
- 69300
- 69400
- 69430
- 72900

Extruded or cast and drawn product list

Copper alloy UNS no.	ASTM spec	AMS spec	Tempers						Product description	Round size range	Hex/oct size range
C14500*	B301				H02	H04			Tellurium copper	0.375 to 2.75	
C23000	B927			H01	H02	H04			Red brass 85%	0.375 to 2.75	
C24000	B927			H01	H02	H04			Low brass 80%	0.375 to 2.5	0.375 to 2.0
C26000	B927			H01	H02	H04			Cartridge brass 70%	0.375 to 2.5	0.375 to 2.0
C31400*	B140				H02	H04			Leaded commercial bronze	0.375 to 2.0	0.375 to 2.0
C31600	B140				H02	H04			Leaded commercial bronze[2]	0.375 to 2.0	0.375 to 2.0
C46400	B21				H02				Naval brass, uninhibited	0.5 to 2.75	0.5 to 2.75
C51000*	B139	4625				H04		H08	Phosphor bronze 5% A	0.375 to 2.5	0.375 to 2.0
C52100	B139					H04			Phosphor bronze 8% C	0.375 to 2.5	0.375 to 2.0
C53400	B139					H04			Phosphor bronze B-1	0.375 to 2.5	0.375 to 2.0
C54400*	B139					H04			Phosphor bronze B-2	0.375 to 2.5	0.375 to 2.0
C62400	B150		HR50						Aluminum bronze 11%	0.5 to 3.0	
C63000*	B150	4640	HR50						Nickel-aluminum bronze	0.375 to 10.0	0.5 to 2.0
C63020*	B150	4590	TQ50						Nickel-aluminum bronze	0.75 to 4.0	
C64200*	B150	4634	HR50						Aluminum bronze	0.1875 to 6.0	0.5 to 2.0
C64210	B150		HR50						Aluminum silicon bronze	0.3125 to 3.0	0.5 to 2.0
C65100	B98				H02	H04	H06		Low-silicon bronze B	0.375 to 2.0	0.375 to 2.0
C67300*[1]					H02				Manganese bronze	0.75 to 3.0	
C67400[1]									Manganese bronze	0.75 to 3.0	0.375 to 2.0
C67410									Manganese bronze	0.75 to 3.0	0.375 to 2.0
C67600	B138				H02	H04			Manganese bronze	0.75 to 2.0	
C69300	B371				H02				Lead-free brass	0.125 to 3.0	0.375 to 2.5
C69400	B371					H04			Silicon red brass	0.375 to 2.0	0.375 to 2.0
C69430	B371					H04			Silicon red brass	0.375 to 2.0	0.375 to 2.0
C72900*		4596	TX 00						Copper nickel-tin bronze		
C72900*		4597	TX TS						Copper nickel-tin bronze	0.75 to 3.14	
C72900*		4598	TX 00						Copper nickel-tin bronze		

*Standard-stocked alloy. [1]SAE J463 specification. [2](nickel-bearing).

C14500

Standard-stocked product	Extruded and drawn

Product description	Tellurium copper
Tempers	H02 half hard, H04 hard
Solids	3/8" to 2 3/4" O.D.*
Rectangles	Consult mill
Standard lengths	144" * Consult mill for other sizes

Typical uses

Architecture

Fire protection

Electrical

Electrical connectors, motor parts, soldering copper, switch parts, transistor bases

Industrial

Forgings, furnace-brazed articles, screw machine products, soldering tips, welding torch tips

Plumbing

Fixtures, plumbing fittings, sprinkler heads

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C14500	B124 B124M B301 B301M	J461 J463				Tellurium-bearing (PTE)

Chemical composition

Cu (%)[1]	P (%)	Te (%)
99.90 min	0.004-0.012	0.40-0.70

Chemical composition according to ASTM B301/B301M-13(2020)

[1]Includes silver, tellurium, and phosphorus
Note: Includes oxygen-free or deoxidized grades with deoxidizers (such as phosphorus, boron, lithium, or other) in an amount agreed upon. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C14500	85	0.323

Mechanical properties

Mechanical properties according to ASTM B301/B301M-13(2020)
C14500
H02 half hard

Size range 1/16" diameter rod to 1/4" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
38	260	30	205	8	76	

Size range over 1/4" diameter rod to 2 5/8" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
38	260	30	205	12	76	

C14500
H04 hard

Size range 1/16" diameter rod (round only) to 1/4" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or specimen thickness, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
48	330	40	275	4	81	

Size range over 1/4" diameter rod (round only) to 1 1/4" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
44	305	38	260	8	81	

Size range over 1 1/4" diameter rod (round only) to 3" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
40	275	35	240	8	81	

Physical properties

	US customary	Metric
Melting point – liquidus	1976 °F	1080 °C
Melting point – solidus	1924 °F	1051 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	93% IACS at 68 °F	0.539 MegaSiemens/cm at 20 °C
Thermal conductivity	205 Btu/sq ft/ft hr/ °F at 68 °F	355 W/m at 20 °C
Coefficient of thermal expansion 68-212	9.5 · 10^{-6} per °F (68-212 °F)	16.5 · 10^{-6} per °C (20-100 °C)
Coefficient of thermal expansion 68-392	9.7 · 10^{-6} per °F (68-392 °F)	16.8 · 10^{-6} per °C (20-200 °C)
Coefficient of thermal expansion 68-572	9.9 · 10^{-6} per °F (68-572 °F)	17.1 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.092 Btu/lb/ °F at 68 °F	385.5 J/kg at 20 °C
Modulas of elasticity in tension	17000 ksi	117212 MPa
Modulas of rigidity	6400 ksi	44127 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Not recommended
Spot weld	Not recommended
Seam weld	Not recommended
Butt weld	Fair
Capacity for being cold worked	Good
Capacity for being hot formed	Good
Forgeability rating	65
Machinability rating	85

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1200
Hot treatment	1400	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Cold – Drawing, machining, moderate cold heading;
Hot – Extrusion, forging (closed die only)

Common fabrication processes provided by CDA

C23000

Extruded and drawn	
Product description	Red brass 85%
Tempers	H01 quarter hard, H02 half hard, H04 hard
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C23000	B927 B927M					

Chemical composition

Cu (%)	Pb (%)	Zn (%)	Fe (%)
84.00-86.00	0.05	Remain	0.05

Chemical composition according to ASTM B927/B927M-23

Note: Cu + sum of named elements, 99.8% min. Single values represent maximums.

Typical uses

Architecture

Etching parts, trim, weather strip

Builders hardware

Kick plates

Consumer

Badges, coinage, compacts, costume jewelry, dials, fire extinguisher cases, lipstick containers, medallions, nameplates, plaques, rouge boxes, tokens, zippers

Electrical

Conduit, rotor bars (AC motors), screw shells, sockets

Fasteners

Eyelets, fasteners

Industrial

Condensor tubes, fire extinguishers, flexible metal hose, heat exchanger shells, heat exchangers, pickling crates, pump cylinder liners, radiator cores, tags, tubing for heat exchangers, tubing for instrumentation

Other

Fire hose couplings

Plumbing

Fittings, j-bends, pipe, pipe nipples, pipe service lines, pump lines, service lines, traps

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C23000	30	0.316

Mechanical properties

Mechanical properties according to ASTM B927/B927M-23
C23000
H01 quarter hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
44	305	20	140	15		

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
42	290	17	115	17		

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
40	275	15	103	19		

C23000
H02 half hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345	30	205	7	70	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
45	310	27	185	10	70	

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
40	275	25	170	12	70	

C23000
H04 hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
63	435	40	275	5	82	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415	37	255	7	82	

Size range over 1" to 2" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
58	400	35	240	9	82	

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1770 °F	966 °C
Density	0.313 lb/in³ at 68 °F	8.67 gm/cm³ at 20 °C
Specific gravity	8.67	8.67
Electrical conductivity	32% IACS at 68 °F	0.186 MegaSiemens/cm at 20 °C
Thermal conductivity	81 Btu/sq ft/ft hr/ °F at 68 °F	140.3 W/m at 20 °C
Coefficient of thermal expansion 68-572	10.6 · 10^{-6} per °F (68-572 °F)	18.4 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110317 MPa
Modulas of rigidity	6000 ksi	41369 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Good
Coated metal arc welding	Not recommended
Spot weld	Fair
Seam weld	Not recommended
Butt weld	Good
Capacity for being cold worked	Excellent
Capacity for being hot formed	Good
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1350
Hot treatment	1450	1650

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, coining, drawing, etching, forming and bending, heading and upsetting, piercing and punching, roll threading and knurling, shearing, spinning, squeezing and swaging, stamping

Common fabrication processes provided by CDA

C24000

Extruded and drawn	
Product description	Low brass 80%
Tempers	H01 quarter hard, H02 half hard, H04 hard
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Architecture

Medallions, ornamental components, spandrels

Builders Hardware

Decorative panels

Consumer

Clock dials, musical instrument parts, plaques

Electrical

Battery caps, rotor bars (AC motors)

Industrial

Flexible hose, flexible hose bellows, pump lines, welding wire

Other

Tokens

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C24000	B927 B927M					

Chemical composition

Cu (%)	Pb (%)	Zn (%)	Fe (%)
78.50-81.50	0.05	Remain	0.05

Chemical composition according to ASTM B927/B927M-23

Note: Cu + sum of named elements, 99.8% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C24000	30	0.313

Mechanical properties

Mechanical properties according to ASTM B927/B927M-23
C24000
H01 quarter hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
47	325	25	170	18	55	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
45	310	20	140	20	55	

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
43	295	18	125	22	55	

C24000
H02 half hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
53	365	33	230	10	70	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
48	330	30	205	13	70	

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
43	295	28	195	15	70	

C24000
H04 hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
68	470	45	310	8	82	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	450	40	275	10	82	

Size range over 1" to 2" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415	35	240	12	82	

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1770 °F	966 °C
Density	0.313 lb/in³ at 68 °F	8.67 gm/cm³ at 20 °C
Specific gravity	8.67	8.67
Electrical conductivity	32% IACS at 68 °F	0.186 MegaSiemens/cm at 20 °C
Thermal conductivity	81 Btu/sq ft/ft hr/ °F at 68 °F	140.3 W/m at 20 °C
Coefficient of thermal expansion 68-572	10.6 · 10^{-6} per °F (68-572 °F)	18.4 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110317 MPa
Modulas of rigidity	6000 ksi	41369 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Good
Coated metal arc welding	Not recommended
Spot weld	Fair
Seam weld	Not recommended
Butt weld	Good
Capacity for being cold worked	Excellent
Capacity for being hot formed	Fair
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1300
Hot treatment	1500	1650

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, drawing, etching, forming and bending, heading and upsetting, piercing and punching, roll threading and knurling, shearing, spinning, squeezing and swaging, stamping

Common fabrication processes provided by CDA

C26000

Extruded and drawn	
Product description	Cartridge brass 70%
Tempers	H01 quarter hard, H02 half hard, H04 hard
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C26000	B927 B927M	J461 J463				70/30

Chemical composition

Cu (%)	Pb (%)	Zn (%)	Fe (%)
68.50-71.50	0.07	Remain	0.05

Chemical composition according to ASTM B927/B927M-23

Note: Cu + sum of named elements, 99.7% min. Single values represent maximums.

Typical uses

Architecture

Grillwork

Automotive

Electrical connectors, heater cores, odometer contacts, radiator cores, radiator tanks, radiator tube, tanks, thermostats

Builders Hardware

Decorative hardware, door knobs, finish hardware, hinges, kick plates, locks, push plates

Consumer

Bird cages, buttons, chain links, coinage, costume jewelry, etched articles, fireplace screens, lamps, pen/pencil inserts and clips, planters, shells (electrical sockets), snaps, syringe parts, watch parts

Electrical

Flashlight shells, lamp fixtures, reflectors, screw shells, terminal connectors

Fasteners

Eyelets, fasteners, grommets, pins, rivets, screws

Industrial

Air pressure conveyer systems, bead chain, chain, heat exchangers, liners, power cylinders, pumps, sound-proofing equipment, springs, tubing for instruments and machines, wire screens

Ordnance

Ammunition, ammunition cartridge cases, mechanical housings for lighters, shells (mechanical housings for ammunition)

Other

Stencils, washers

Plumbing

Bathroom fixtures, faucet escutcheons, fittings, plumbing accessories, plumbing brass goods, traps

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C26000	30	0.308

Mechanical properties

Mechanical properties according to ASTM B927/B927M-23
C26000
H01 quarter hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345	30	205	20	55	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
48	330	25	170	24	55	

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
46	315	20	140	28	55	

C26000
H02 half hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
57	395	35	241	15	70	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
54	370	32	220	20	70	

Size range over 1" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345	30	205	25	70	

C26000
H04 hard

Size range under ½" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
70	485	50	345	10	82	

Size range ½" diameter rod to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	450	45	310	15	82	

Size range over 1" to 2" diameter rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or 4x thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415	40	275	20	82	

Physical properties

	US customary	Metric
Melting point – liquidus	1750 °F	954 °C
Melting point – solidus	1680 °F	916 °C
Density	0.308 lb/in³ at 68 °F	8.53 gm/cm³ at 20 °C
Specific gravity	8.53	8.53
Electrical conductivity	28% IACS at 68 °F	0.162 MegaSiemens/cm at 20 °C
Thermal conductivity	70 Btu/sq ft/ft hr/ °F at 68 °F	121.2 W/m at 20 °C
Coefficient of thermal expansion 68-572	11.1 · 10^{-6} per °F (68-572 °F)	19.2 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110317 MPa
Modulas of rigidity	6000 ksi	41369 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Good
Coated metal arc welding	Not recommended
Spot weld	Fair
Seam weld	Not recommended
Butt weld	Good
Capacity for being cold worked	Excellent
Capacity for being hot formed	Fair
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1400
Hot treatment	1350	1550

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

C31400

Continuous cast and drawn	
Product description	Leaded commercial bronze
Tempers	H02 half hard
Solids	3/8" to 2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144" *H02 half hard temper is standard stocked

Typical uses

Builders hardware

Door knobs

Electrical

Connectors for wire and cable, electrical plug-type connectors

Fasteners

Nuts, screws

Industrial

Pickling crates, pickling fixtures, pickling racks, screw machine parts

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C31400	B140 B140M				MIL-V-18436	

Chemical composition				
Cu (%)	Pb (%)	Zn (%)	Fe (%)	Ni (%)
87.50-90.50	1.30-2.50	Remain	0.10	0.70

Chemical composition according to ASTM B140/B140M-22

Note: Cu + sum of named elements, 99.6% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C31400	80	0.319

Mechanical properties

Mechanical properties according to ASTM B140/B140M-22
C31400
H02 half hard

Size range ½" diameter and under

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345	30	205	7	61	

Size range over ½" diameter to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
45	310	27	185	10	61	

Size range over 1" diameter

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
40	275	25	170	12	58	

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1850 °F	1010 °C
Density	0.319 lb/in³ at 68 °F	8.83 gm/cm³ at 20 °C
Specific gravity	8.83	8.83
Electrical conductivity	42% IACS at 68 °F	0.246 MegaSiemens/cm at 20 °C
Thermal conductivity	104 Btu/sq ft/ft hr/ °F at 68 °F	180 W/m at 20 °C
Coefficient of thermal expansion 68-572	10.2 · 10^{-6} per °F (68-572 °F)	17.6 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	17000 ksi	117212 MPa
Modulas of rigidity	6400 ksi	44127 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Spot weld	Not recommended
Seam weld	Not recommended
Butt weld	Fair
Capacity for being cold worked	Good
Capacity for being hot formed	Poor
Machinability rating	80

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1200

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

C31600

Continuous cast and drawn	
Product description	Leaded commercial bronze (nickel-bearing)
Tempers	H02 half hard
Solids	3/8" to 2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Builders hardware

Hardware

Electrical

Connectors

Fasteners

Fasteners, nuts, screws

Industrial

Screw machine parts

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C31600	B140 B140M				MIL-V-18436	

Chemical composition					
Cu (%)	Pb (%)	Zn (%)	Fe (%)	P (%)	Ni (%)
87.50-90.50	1.30-2.50	Remain	0.10	0.04-0.10	0.70-1.20

Chemical composition according to ASTM B140/B140M-22

Note: Cu + sum of named elements, 99.6% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C31600	80	0.320

Mechanical properties

Mechanical properties according to ASTM B140/B140M-22
C31600
H02 half hard

Size range ½" diameter and under

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345	30	205	7	61	

Size range over ½" diameter to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
45	310	27	185	10	61	

Size range over 1" diameter

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
40	275	25	170	12	58	

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1850 °F	1010 °C
Density	0.32 lb/in³ at 68 °F	8.86 gm/cm³ at 20 °C
Specific gravity	8.86	8.86
Electrical conductivity	32% IACS at 68 °F	0.187 MegaSiemens/cm at 20 °C
Thermal conductivity	81 Btu/sq ft/ft hr/ °F at 68 °F	140.2 W/m at 20 °C
Coefficient of thermal expansion 68-572	10.2 · 10^{-6} per °F (68-572 °F)	17.6 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	17000 ksi	117212 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Spot weld	Not recommended
Seam weld	Not recommended
Butt weld	Fair
Capacity for being cold worked	Good
Capacity for being hot formed	Poor
Machinability rating	80

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1200

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

C46400

Continuous cast and drawn	
Product description	Naval brass, uninhibited
Tempers	H02 half hard
Solid rounds	1/2" to 2 3/4" O.D.
Hex	1/2" to 2 3/4" O.D.
Rectangles	Consult mill
Standard lengths	144"

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C46400	B21 B21M	J461 J463		QQ-B-639		

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)
59.00-62.00	0.20	0.50-1.00	Remain	0.10

Chemical composition according to ASTM B21/B21M-20

Note: Cu + sum of named elements, 99.6% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C46400	30	0.304

Typical uses

Builders Hardware

Lock pins

Electrical

Precision shipboard equipment

Fasteners

Bolts, nuts, rivets

Industrial

Aircraft turnbuckle barrels, balls, bearings, bushings, condenser plates, dies for golf ball production, heat exchanger tubes, hub cones, pressure vessels, structural uses, valve stems, welding rod

Marine

Decorative fittings, hardware, propeller shafts, shafting, turnbuckles

Ordnance

Missile components

Other

Baffle plates and flanges

Plumbing

Fittings

Mechanical properties

Mechanical properties according to ASTM B21/B21M-20
C46400
H02 half hard

Size range ½" and under

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
60	414	27	186	22		

Size range over ½" to 1" inclusive rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
60	414	27	186	25	60-80	

Size range over 1" to 2" inclusive rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
58	400	26	179	25	55-80	

Size range over 2" to 3" inclusive rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
54	372	25	172	25	55-80	

Size range over 3" to 4" inclusive rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
54	372	22	152	27	55-80	

Size range over 4"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
54	372	22	152	30	55-80	

Physical properties

	US customary	Metric
Melting point – liquidus	1650 °F	889 °C
Melting point – solidus	1630 °F	888 °C
Density	0.304 lb/in³ at 68 °F	8.41 gm/cm³ at 20 °C
Specific gravity	8.41	8.41
Electrical conductivity	26% IACS at 68 °F	0.151 MegaSiemens/cm at 20 °C
Thermal conductivity	67 Btu/sq ft/ft hr/ °F at 68 °F	116 W/m at 20 °C
Coefficient of thermal expansion 68-572	11.8 · 10^{-6} per °F (68-572 °F)	20.4 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103420 MPa
Modulas of rigidity	5600 ksi	38611 MPa

Physical properties provided by CDA

Fabrication properties

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

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1100
Hot treatment	1200	1500

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, drawing, forming and bending, heading and upsetting, hot forging and pressing, hot heading and upsetting, shearing

Common fabrication processes provided by CDA

C51000

Standard-stocked product*	Extruded and drawn

Product description	Phosphor bronze 5% A
Tempers	H04 hard, H08 spring
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144" *H04 hard temper solids is standard stocked

Typical uses

Architecture

Bridge bearing plates

Electrical

Electrical connectors, electrical flexing contact blades, electromechanical spring components, electronic and precision instrument parts, electronic connectors, fuse clips, resistance wire, switch parts, wire brushes

Fasteners

Cotter pins, fasteners, lock washers

Industrial

Beater bar, bellows, bourdon tubes, chemical hardware, clutch disks, diaphragms, perforated sheets, pressure-responsive elements, sleeve bushings, springs, textile machinery, truss wire, welding rods

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C51000	B139 B139M	J461 J463	4625			

Chemical composition					
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
Remain	0.05	4.20-5.80	0.30	0.10	0.03-0.35

Chemical composition according to ASTM B139/B139M-12(2024)

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C51000	20	0.320

Mechanical properties

Mechanical properties according to ASTM B139/B139M-12(2024)
C51000
H04 hard

Size range ¼" to ½" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
70	485			13	87	

Size range over ½" to 1" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415			15	87	

Size range over 1" round and hexagonal

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
55	380			18	87	

C51000
H08 spring

Size range 0.026" to ½" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
115	790					

C51000 continued

Size range over 1/16" to 1/8" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
110	760					

Size range over 1/8" to 1/4" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
105	725			3.5		

Size range over 1/4" to 3/8" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
100	690			5		

Size range over 3/8" to 1/2" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
90	620			9	95	

Physical properties

	US customary	Metric
Melting point – liquidus	1920˚F	1049˚C
Melting point – solidus	1750˚F	954˚C
Density	0.32 lb/in³ at 68˚F	8.86 gm/cm³ at 20˚C
Specific gravity	8.86	8.86
Electrical conductivity*	15% IACS at 68˚F	0.088 MegaSiemens/cm at 20˚C
Thermal conductivity	40 Btu/sq ft/ft hr/˚F at 68˚F	69.2 W/m at 20˚C
Coefficient of thermal expansion 68-572	9.9 · 10^{-6} per˚F (68-572˚F)	17.1 · 10^{-6} per˚C (20-300˚C)
Specific heat capacity	0.09 Btu/lb/˚F at 68˚F	377.1 J/kg at 20˚C
Modulas of elasticity in tension	16000 ksi	110310 MPa
Modulas of rigidity	6000 ksi	41370 MPa

Physical properties provided by CDA

*Determined on an alloy containing 5% tin and .2% phosphorus. This value will vary with the composition.

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Fair
Gas shielded arc welding	Good
Coated metal arc welding	Fair
Spot weld	Good
Seam weld	Fair
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Poor
Machinability rating	20

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, drawing, forming and bending, heading and upsetting, roll threading and knurling, shearing, stamping

Common fabrication processes provided by CDA

C52100

Continuous cast and drawn	
Product description	Phosphor bronze 8% C
Tempers	H04 hard
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C52100	B139 B139M					

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
Remain	0.05	7.00-9.00	0.20	0.10	0.03-0.35

Chemical composition according to ASTM B139/B139M-12(2024)

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Typical uses

Architecture

Bridge bearing plates

Building

Thermostat bellows

Consumer

Coinage, cymbals, power conductor for electro-surgical pencil

Electrical

Cold headed parts, electrical connectors, electrical flexing contact blades, electronic connectors, fuse clips, switch parts, wire brushes

Fasteners

Cotter pins, heavy duty fasteners, lock washers

Industrial

Beater bar, bellows, bourdon tubing, chemical hardware, heavy duty clips, clutch disks, cold headed parts, diaphragms, doctor blades for the paper industry, gears, perforated sheets, pinions, pneumatic hammers, sleeve bushings, heavy duty springs, helical extension springs, helical torsion springs, textile machinery, thrust bearings, truss wire, welding wire, well drill equipment

Marine

Marine parts

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 ° F)
C52100	20	0.318

Mechanical properties

Mechanical properties according to ASTM B139/B139M-12(2024)
C52100
H04 hard

Size range ¼" to ½" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
85	585			12	93	

Size range over ½" to 1" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
75	515			15	93	

Size range over 1" round and hexagonal

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415			20	93	

Physical properties

	US customary	Metric
Melting point – liquidus	1880˚F	1027˚C
Melting point – solidus	1620˚F	882˚C
Density	0.318 lb/in³ at 68˚F	8.8 gm/cm³ at 20˚C
Specific gravity	8.8	8.8
Electrical conductivity	13% IACS at 68˚F	0.076 MegaSiemens/cm at 20˚C
Thermal conductivity	36 Btu/sq ft/ft hr/˚F at 68˚F	62.3 W/m at 20˚C
Coefficient of thermal expansion 68-572	10.1 · 10^{-6} per˚F (68-572˚F)	17.4 · 10^{-6} per˚C (20-300˚C)
Specific heat capacity	0.09 Btu/lb/˚F at 68˚F	377.1 J/kg at 20˚C
Modulas of elasticity in tension	16000 ksi	110310 MPa
Modulas of rigidity	6000 ksi	41370 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Fair
Gas shielded arc welding	Good
Coated metal arc welding	Fair
Spot weld	Good
Seam weld	Fair
Butt weld	Excellent
Capacity for being cold worked	Good
Capacity for being hot formed	Poor
Machinability rating	20

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, drawing, forming and bending, shearing, stamping

Common fabrication processes provided by CDA

C53400

Continuous cast and drawn	
Product description	Phosphor bronze B-1
Tempers	H04 hard
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Industrial

Bearings, bushings, fasteners

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C53400	B139 B139M					

Chemical composition					
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
Remain	0.80-1.20	3.50-5.80	0.30	0.10	0.03-0.35

Chemical composition according to ASTM B139/B139M-12(2024)

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C53400	70	0.320

Mechanical properties

Mechanical properties according to ASTM B139/B139M-12(2024)
C53400
H04 hard

Size range 1/16" to 1/4" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	450			8	86	

Size range 1/4" to 1/2" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415			10	86	

Size range over 1/2" to 1" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
55	380			12	86	

Size range over 1" round and hexagonal

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345			15	86	

Physical properties

	US customary	Metric
Melting point – liquidus	1920˚F	1049˚C
Melting point – solidus	1750˚F	954˚C
Density	0.32 lb/in³ at 68˚F	8.91 gm/cm³ at 20˚C
Specific gravity	8.91	8.91
Electrical conductivity	15% IACS at 68˚F	0.08 MegaSiemens/cm at 20˚C
Thermal conductivity	40 Btu/sq ft/ft hr/˚F at 68˚F	69.28 W/m at 20˚C
Coefficient of thermal expansion 68-572	9.9 · 10^{-6} per˚F (68-572˚F)	17.1 · 10^{-6} per˚C (20-300˚C)
Modulas of elasticity in tension	16000 ksi	110310 MPa
Modulas of rigidity	6000 ksi	41300 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Poor
Gas shielded arc welding	Fair
Coated metal arc welding	Poor
Spot weld	Fair
Seam weld	Fair
Butt weld	Good
Capacity for being cold worked	Good
Capacity for being hot formed	Poor
Machinability rating	70

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Bending, blanking, forming, knurling, machining, roll threading, shearing, stamping, upsetting

Common fabrication processes provided by CDA

C54400

Standard-stocked product	Extruded and drawn

Product description	Phosphor bronze B-2
Tempers	H04 hard
Solids	3/8" to 2 3/4" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144" *Solids is standard stocked

Typical uses

Electrical

Electrical connectors

Industrial

Bearings, bushings, gears, pinions, screw machine products, shafts, sleeve bearings, thrust bearings, thrust washers, valve parts

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C54400	B139 B139M	J461 J463				

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
Remain	3.00-4.00	3.50-4.50	1.50-4.50	0.10	0.01-0.50

Chemical composition according to ASTM B139/B139M-12(2024)

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C54400	80	0.320

Mechanical properties

Mechanical properties according to ASTM B139/B139M-12(2024)
C54400
H04 hard

Size range 1/16" to 1/4" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	450			8	86	

Size range 1/4" to 1/2" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415			10	86	

Size range over 1/2" to 1" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
55	380			12	86	

Size range over 1" round and hexagonal

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
50	345			15	86	

Physical properties

	US customary	Metric
Melting point – liquidus	1830 °F	999 °C
Melting point – solidus	1700 °F	927 °C
Density	0.320 lb/in³ at 68 °F	8.89 gm/cm³ at 20 °C
Specific gravity	8.89	8.89
Electrical conductivity	19% IACS at 68 °F	0.111 MegaSiemens/cm at 20 °C
Thermal conductivity	50 Btu/sq ft/ft hr/ °F at 68 °F	86.5 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.6 · 10^{-6} per °F (68-572 °F)	16.6 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15000 ksi	103420 MPa
Modulas of rigidity	5600 ksi	38610 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Spot weld	Not recommended
Seam weld	Not recommended
Butt weld	Fair
Capacity for being cold worked	Good
Machinability rating	80

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Blanking, drawing, forming and bending, machining, shearing, stamping

Common fabrication processes provided by CDA

C62400

Extruded and drawn	
Product description	Aluminum bronze 11%
Tempers	HR50 drawn and stress relieved
Solids	1/2" to 3" O.D.*
Standard lengths	144" *Consult mill for other sizes

Typical uses

Fasteners

Nuts

Industrial

Bushings, cams, drift pins, gears, hydraulic bushings, support bushings, tie rods, valve balls, wear plates, welding wire

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C62400	B150 B150M	J461 J463				

Chemical composition					
Cu (%)[1]	Sn (%)	Fe (%)	Al (%)	Mn (%)	Si (%)
Remain	0.20	2.00-4.50	10.00-11.50	0.30	0.25

Chemical composition according to ASTM B150/B150M-19

[1]Cu value includes Ag.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C62400	50	0.269

Mechanical properties

Mechanical properties according to ASTM B150/B150M-19
C62400
HR50 drawn and stress relieved temper

Size range ½" and under rod

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
95	655	45	310	10		

Size range over ½" to 1" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
95	655	45	310	12		

Size range over 1" to 2" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
90	620	43	295	12		

Size range over 2" to 3" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
90	620	40	275	12		

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1880 °F	1027 °C
Density	0.269 lb/in³ at 68 °F	7.45 gm/cm³ at 20 °C
Specific gravity	7.45	7.45
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	34 Btu/sq ft/ft hr/ °F at 68 °F	59 W/m at 20 °C
Coefficient of thermal expansion 68-572	$9 \cdot 10^{-6}$ per °F (68-572 °F)	$15.6 \cdot 10^{-6}$ per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	17000 ksi	117212 MPa
Modulas of rigidity	6400 ksi	44127 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Not recommended
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	80
Machinability rating	50

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1100	1200
Hot treatment	1400	1625

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Hot bending, hot forging

Common fabrication processes provided by CDA

AMS 4640-C63000

Standard-stocked product*	Extruded and drawn

Product description	Nickel-aluminum bronze
Tempers	HR50 drawn and stress relieved, or TQ50 temper annealed
Solids	3/8" to 10" O.D.
Hex	1/2" to 2" O.D.
Standard lengths	144" *Solids is standard stocked

Typical uses

Industrial

Aircraft parts, balls, bearings, bushings, cams, condenser tube for power stations and desalting units, corrosion-resistant articles, gears, heat exchanger flanges, hydraulic bushings for earth-moving equipment, plunger tips, pump parts, pump shafts, shafting, structural members, tanks, valve balls, valve guides, valve seats, welded piping systems

Marine

Bolts, nuts, propellers, pump parts, ship propellers

Plumbing

Faucets

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C63000	B150 B150M	J461 J463	4640		QQ-C-465B AMD1	

Chemical composition

Cu (%)[1]	Sn (%)	Zn (%)	Fe (%)	Ni (%)	Al (%)	Mn (%)	Si (%)
Remain	0.20	0.30	2.00-4.00	4.00-5.50	9.00-11.00	1.50	0.25

Chemical composition according to AMS 4640

[1]Cu value includes Ag.
Note: Cu + Ag + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$ F)
C63000	30	0.274

Mechanical properties

Mechanical properties according to AMS 4640
C63000
HR50 drawn and stress relieved temper, or TQ50 temper annealed

Size range up to 1" rounds, hexagons, and octagons inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HB	
110	760	68	470	10	201-248	

Size range over 1" to 2" rounds, hexagons, and octagons inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HB	
110	760	60	415	10	201-248	

Size range over 2" to 3" rounds, hexagons, and octagons inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HB	
105	725	55	380	10	187-241	

Size range over 3" to 5" rounds, hexagons, and octagons inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HB	
100	690	50	345	10	187-241	

Physical properties

	US customary	Metric
Melting point – liquidus	1930 °F	1054 °C
Melting point – solidus	1895 °F	1035 °C
Density	0.274 lb/in³ at 68 °F	7.58 gm/cm³ at 20 °C
Specific gravity	7.58	7.58
Electrical conductivity	7% IACS at 68 °F	0.041 MegaSiemens/cm at 20 °C
Thermal conductivity	22.6 Btu/sq ft/ft hr/ °F at 68 °F	39.1 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	17500 ksi	120650 MPa
Modulas of rigidity	6400 ksi	44127 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Not recommended
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Good
Forgeability rating	75
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1100	1300
Hot treatment	1450	1700

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Forging, hot forming

Common fabrication processes provided by CDA

AMS 4590-C63020

Standard-stocked product	Extruded and drawn

Product description	Nickel-aluminum bronze
Tempers	TQ50 quenched and tempered
Tubes	2 3/4" to 6" O.D.
Solids	3/4" to 4" O.D.
Hex	Consult mill
Standard lengths	24"

Typical uses

Aerospace

Bearings, bushings

Industrial

Bearings, forming dies for roll bearings, hydraulic bushings for earth-moving equipment, valve balls, valve parts (cryogenic)

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C63020	B150 B150M		4590			

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)
Remain	0.03	0.25	0.30	4.00-5.50	4.20-6.00	10.00-11.00	0.20	0.05	1.50	0.15

Chemical composition according to AMS 4590

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68˚F)	Density (gm/cu3 at 20˚C)
C63020		0.275	7.6

Mechanical properties

Mechanical properties according to AMS 4590
C63020
TQ50 quenched and tempered

Size range up to 1" diameter inclusive

Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 2 in. (50.8 mm) or 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
135	931	100	689	6	26	

Size range over 1" to 2" diameter inclusive

Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 2 in. (50.8 mm) or 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
130	896	95	655	6	26	

Size range over 2" to 4" diameter inclusive

Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 2 in. (50.8 mm) or 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
130	896	90	621	6	26	

Physical properties

	US customary	Metric
Melting point – liquidus	1940 to 1967 °F	1060 to 1075 °C
Density	0.274 lb/in³ at 68 °F	7.6 gm/cm³ at 20 °C
Specific gravity	7.6	7.6
Electrical Resistivity	132.33 ohms-cmil/ft at 68 °F	22.0 microhm-cm at 20 °C
Thermal conductivity	31.2 Btu/sq ft/ft hr/ °F at 68 °F	54.0 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.4 · 10^{-6} per °F (68-572 °F)	17.0 · 10^{-6} per °C (20-300 °C)

Physical properties provided by CDA

AMS 4634-C64200

Standard-stocked product*	Extruded and drawn

Product description	Aluminum bronze
Tempers	HR50 drawn and stress relieved
Solids	3/16" to 6" O.D.
Hex	1/2" to 2" O.D.
Standard lengths	144" *Solids is standard stocked

Typical uses

Automotive

Valve guides (automobile engine)

Electrical

Pole line hardware

Fasteners

Bolts, nuts

Industrial

Cams, gears, valve bodies, valve components, valve stems

Marine

Hardware

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C64200	B150 B150M	J461 J463	4634	QQ-C-465		

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[2]	Al (%)	Mn (%)	Si (%)
Remain	0.05	0.20	0.50	0.30	0.25	6.30-7.60	0.10	1.50-2.20

Chemical composition according to AMS 4634

[1]Cu value includes Ag. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$ F)
C64200	60	0.278

Mechanical properties

Mechanical properties according to AMS 4634
C64200
HR50 drawn and stress relieved temper

Size range up to ½" bars and rods inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness, internal	Remarks
ksi	MPa	ksi	MPa	%	HRB	
90	621	45	310	9	>80 inclusive	

Size range over ½" to 1" bars and rods inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness, internal	Remarks
ksi	MPa	ksi	MPa	%	HRB	
85	586	45	310	12	>80 inclusive	

Size range over 1" to 2" bars and rods inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness, internal	Remarks
ksi	MPa	ksi	MPa	%	HRB	
80	552	42	290	12	>80 inclusive	

Size range over 2" to 3" bars and rods inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness, internal	Remarks
ksi	MPa	ksi	MPa	%	HRB	
75	517	35	241	15	>80 inclusive	

Physical properties

	US customary	Metric
Melting point – liquidus	1840 °F	1004 °C
Melting point – solidus	1800 °F	982 °C
Density	0.278 lb/in³ at 68 °F	7.69 gm/cm³ at 20 °C
Specific gravity	7.69	7.69
Electrical conductivity	8% IACS at 68 °F	0.047 MegaSiemens/cm at 20 °C
Thermal conductivity	26 Btu/sq ft/ft hr/ °F at 68 °F	45 W/m at 20 °C
Coefficient of thermal expansion 68-572	10 · 10^{-6} per °F (68-572 °F)	17.3 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110317 MPa
Modulas of rigidity	6000 ksi	41369 MPa

Physical properties provided by CDA

Fabrication properties

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

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1100	1300
Hot treatment	1300	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Forging, hot forming, machining

Common fabrication processes provided by CDA

C64210

Extruded and drawn	
Product description	Aluminum silicon bronze
Tempers	HR50 drawn and stress relieved
Solids	5/16" to 3" O.D.
Hex	1/2" to 2" O.D.
Standard lengths	144"

Typical uses

Electrical

Pole line hardware

Industrial

Bearings (high strength/ corrosion resistant), bushings (aircraft), chemical-process equipment, pickling equipment, valve bodies, valve stems

Marine

Bolts, lock washers, nuts, screws

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C64210	B150 B150M					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[2]	Al (%)	Mn (%)	Si (%)	As (%)
Remain	0.05	0.20	0.50	0.30	0.25	6.30-7.00	0.10	1.50-2.00	0.15

Chemical composition according to ASTM B150/B150M-19

[1]Cu value includes Ag. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C64210	60	0.278

Mechanical properties

Mechanical properties according to ASTM B150/B150M-19
C64210
HR50 drawn and stress relieved temper (unless noted otherwise)

Size range under ½" rod and bar

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
90	620	45	310	9	80-100	

Size range ½" to 1" rod and bar inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
85	585	45	310	12	80-100	

Size range over 1" to 2" rod and bar inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
80	550	42	290	12	80-100	

Size range over 2" to 3" rod and bar inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
75	515	35	240	15	70-95	

Size range over 3" to 4" rod and bar inclusive (M20 as hot rolled)

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
70	485	30	205	15	65-95	

Size range over 4" rod and bar (M30 as hot extruded)

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
70	485	25	170	15	65-95	

Physical properties

	US customary	Metric
Density	0.278 lb/in³ at 68 °F	7.7 gm/cm³ at 20 °C
Specific gravity	7.7	7.7

Physical properties provided by CDA

C65100

Extruded/cast and drawn	
Product description	Low-silicon bronze B
Tempers	H02 half hard, H04 hard, H06 extra hard
Solids	3/8" to 2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Electrical

Conduit, motor (rotor bars), pole line hardware

Fasteners

Bolts, cable clamps, cap screws, fasteners, machine screws, nuts, rivets, screws, u bolts

Industrial

Heat exchanger tube, hydraulic pressure lines, oil refinery plumbing tube, welding rod

Marine

Hardware

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C65100	B98 B98M					

Chemical composition

Cu (%)[1]	Pb (%)	Zn (%)	Fe (%)	Mn (%)	Si (%)
Remain	0.05	1.50	0.80	0.70	0.80-2.00

Chemical composition according to ASTM B98/B98M-13(2019)

[1]Cu value includes Ag.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$ F)
C65100	30	0.316

Mechanical properties

Mechanical properties according to ASTM B98/B98M-13(2019)
C65100
H02 half hard

Size range up to ½" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
55	380	20	140	11	60-85	

Size range over ½" to 2" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
55	380	20	140	12	60-85	

C65100
H04 hard

Size range up to ½" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
65	450	35	241	8	65-90	

Size range over ½" to 2" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
65	450	35	241	10	65-90	

C65100
H06 extra hard

Size range up to ½" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
85	585	55	380	6	75-95	

Size range over ½" to 1" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
75	515	45	310	8	75-95	

Size range over 1" to 1½" rod inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max HRB	
75	515	40	275	8	75-95	

Physical properties

	US customary	Metric
Melting point – liquidus	1940 °F	1060 °C
Melting point – solidus	1890 °F	1032 °C
Density	0.316 lb/in³ at 68 °F	8.75 gm/cm³ at 20 °C
Specific gravity	8.75	8.75
Electrical conductivity	12% IACS at 68 °F	0.07 MegaSiemens/cm at 20 °C
Thermal conductivity	33 Btu/sq ft/ft hr/ °F at 68 °F	57.1 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.9 · 10^{-6} per °F (68-572 °F)	17.1 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	17000 ksi	117212 MPa
Modulas of rigidity	6400 ksi	44127 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Excellent
Coated metal arc welding	Fair
Spot weld	Excellent
Seam weld	Good
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Excellent
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250
Hot treatment	1300	1300

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Forming and bending, heading and upsetting, hot forging and pressing, roll threading and knurling, squeezing and swaging

Common fabrication processes provided by CDA

C67300

Standard-stocked product	Extruded and drawn

Product description	Manganese bronze
Tempers	H02 half hard
Solids	3/4" to 3" O.D.
Hex	Consult mill
Standard lengths	144"

Typical uses

Fasteners

Fasteners, lead screw nuts

Industrial

Bearings, bearings (pins), bushings, clutch bearings, drive shafts, gears and cams, idler pins, piston heads, propeller shafts, pump parts, seal rings, shaft bushings, sleeve bearings, spindles, thrust bearings, wear plates

Marine

Hardware, valve seats

Other

Connecting rods

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C67300		J461 J463				

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)	Si (%)
58.00-63.00	0.40-3.00	0.30	Remain	0.50	0.25	0.25	2.00-3.50	0.50-1.50

Chemical composition according to SAE J463

[1]Ni value includes Co.
Note: Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$ F)
C67300	70	0.300

Mechanical properties

Mechanical properties according to SAE J463
C67300
H02 half hard

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
65	450	40	275	12	70	

Size range over 1" to 3" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
58	400	35	240	15	70	

Size range over 3"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
52	360	30	205	18	65	

Physical properties

	US customary	Metric
Melting point – liquidus	1605 °F	874 °C
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Specific gravity	8.3	8.3
Electrical conductivity	22% IACS at 68 °F	0.13 MegaSiemens/cm at 20 °C
Thermal conductivity	55 Btu/sq ft/ft hr/ °F at 68 °F	95 W/m at 20 °C
Coefficient of thermal expansion 68-572	11 · 10^{-6} per °F (68-572 °F)	19 · 10^{-6} per °C (20-300 °C)
Modulas of elasticity in tension	17000 ksi	117212 MPa

Physical properties provided by CDA

Common fabrication processes

Hot forming, hot pressing, machining

Common fabrication processes provided by CDA

C67400

Extruded and drawn	
Product description	Manganese bronze
Tempers	Extruded and drawn
Solids	3/4" to 3" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Industrial

Bushings, cams, chain guides, food conveyor chain, gears, shafts, wear plates

Other

Connecting rods

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C67400		J461 J463				

Chemical composition								
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)	Si (%)
57.00-60.00	0.50	0.30	Remain	0.35	0.25	0.50-2.00	2.00-3.50	0.50-1.50

Chemical composition according to SAE J463

[1]Ni value includes Co.
Note: Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C67400	30	0.292

Mechanical properties

Mechanical properties according to SAE J463
C67400
Extruded and drawn

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
78	540	40	275	8	84	

Size range over 1" to 2" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
75	515	40	275	10	80	

Size range over 2" to 3" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
70	485	36	250	12	78	

Physical properties

	US customary	Metric
Melting point – liquidus	1625 °F	885 °C
Melting point – solidus	1590 °F	866 °C
Density	0.292 lb/in³ at 68 °F	8.08 gm/cm³ at 20 °C
Specific gravity	8.08	8.08
Electrical conductivity	23% IACS at 68 °F	0.13 MegaSiemens/cm at 20 °C
Thermal conductivity	58 Btu/sq ft/ft hr/ °F at 68 °F	100.5 W/m at 20 °C
Coefficient of thermal expansion 68-572	11 · 10^{-6} per °F (68-572 °F)	19 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110317 MPa
Modulas of rigidity	6000 ksi	41369 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Fair
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Fair
Coated metal arc welding	Not recommended
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	100
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1100
Hot treatment	1100	1250

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Hot forging and pressing, machining

Common fabrication processes provided by CDA

C67410

Extruded and drawn	
Product description	Manganese bronze
Solids	3/4" to 3" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Industrial

Bushings, cams, chain guides, food conveyor chain, gears, shafts, wear plates

Other

Connecting rods

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C67410						Copper zinc

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)	Al (%)	Mn (%)	Si (%)
55.00-59.00	0.80	0.50	Remain	1.00	2.00	1.30-2.30	1.00-2.40	0.70-1.30

Chemical composition provided by CDA

[1]Cu value includes Ag.
Note: Single values represent maximums.

C67600

Extruded and drawn	
Product description	Manganese bronze
Tempers	H02 half hard, H04 hard
Solids	3/4" to 2" O.D.
Hex	Consult mill
Standard lengths	144"

Typical uses

Industrial

Gate valve stems, valve balls, welding rod

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C67600	B138 B138M			QQ-B-728		

Chemical composition					
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Mn (%)
57.00-60.00	0.50-1.00	0.50-1.50	Remain	0.40-1.30	0.05-0.50

Chemical composition according to ASTM B138/B138M-11(2017)

[1]Cu value includes Ag.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C67600	60	0.302

Mechanical properties

Mechanical properties according to ASTM B138/B138M-11(2017)
C67600
H02 half hard

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
72	496	36	248	13	90	

Size range over 1" to 2½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
70	483	35	241	15	90	

Size range over 2½"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	448	32	221	17	90	

C67600
H04 hard

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
80	552	56	386	8		

Size range over 1" to 2½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
76	524	52	359	10		

Size range over 2½"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
68	469	45	310	16		

Physical properties

	US customary	Metric
Melting point – liquidus	1630 °F	888 °C
Melting point – solidus	1590 °F	866 °C
Density	0.302 lb/in³ at 68 °F	8.36 gm/cm³ at 20 °C
Electrical conductivity	24% IACS at 68 °F	0.14 MegaSiemens/cm at 20 °C
Thermal conductivity	61 Btu/sq ft/ft hr/ °F at 68 °F	105.65 W/m at 20 °C
Coefficient of thermal expansion 68-572	11.8 · 10^{-6} per °F (68-572 °F)	20.4 · 10^{-6} per °C (20-300 °C)
Modulas of elasticity in tension	15000 ksi	103422 MPa
Modulas of rigidity	5600 ksi	38611 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Fair
Spot weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	80
Machinability rating	30

Fabrication properties provided by CDA

C69300

Extruded and drawn	GreenAlloys™

Product description	Lead-free brass
Tempers	H02 half hard
Solids	1/8" to 2 1/2" O.D.
Tubes	Consult mill
Hex	3/8" to 1" O.D.
Standard lengths	144"
Compliance	C69300 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Automotive

Fluid connectors, sensor bodies, thermostat parts

Industrial

Automatic screw machine parts, bolts, condenser tube plates, nuts, pneumatic fittings, pump parts, screw machine parts, valve bodies for water, valve stems

Marine

Marine products, propeller shafts

Plumbing

Faucet stems, faucets, plumbing fittings, water meter cases

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C69300	B371 B371M					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Mn (%)	Si (%)
73.00-77.00	0.02*-0.09	0.20	remain.	0.10	0.04-0.15	0.10	0.10	2.70-3.40

*Pb content is greater than 0.02%. [1]Cu value includes Ag. [2]Ni value includes Co.

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C69300	85	0.300

Mechanical properties

Mechanical properties according to ASTM B371/B371M-19
C69300
H02 half hard

Size range up to ½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approve	
85	585	45	310	5	85	

Size range over ½" to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approx	
75	515	35	240	10	80	

Size range over 1" to 2 ½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approx	
70	480	30	205	10	75	

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1571 °F	855 °C
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Specific gravity	8.3	8.3
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	21.8 Btu/sq ft/ft hr/ °F at 68 °F	37.76 W/m at 20 °C
Coefficient of thermal expansion 68-212	10.3 · 10^{-6} per °F (68-212 °F)	17.8 · 10^{-6} per °C (20-100 °C)
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Coefficient of thermal expansion 68-572	10.4 · 10^{-6} per °F (68-572 °F)	18 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15200 ksi	104801 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Good
Gas shielded arc welding	Good
Coated metal arc welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	95
Machinability rating	85

Fabrication properties provided by CDA

Thermal properties

Treatment	Min*	Max*	Value*	Time*
Stress relief			0	
Solution treatment				0
Annealing	932	1112		
Hot treatment	1202	1517		

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit. **For stress relief, solution treatment and annealing - time is measured in hours/inch of thickness. For precipitation heat treatment - time is measured in hours.

Common fabrication properties

Forming and bending, machining, shearing

Common fabrication properties provided by CDA

C69400

Extruded and drawn	
Product description	Silicon red brass
Tempers	H04 hard
Solids	3/8" to 2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Industrial

Valve stems

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C69400	B371 B371M					

Chemical composition				
Cu (%)[1]	Pb (%)	Zn (%)	Fe (%)	Si (%)
80.00-83.00	0.30	Remain	0.20	3.50-4.50

Chemical composition according to ASTM B371/B371M-19

[1]Cu value includes Ag.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C69400	30	0.296

Mechanical properties

Mechanical properties according to ASTM B371/B371M-19
C69400
H04 hard

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
80	550	40	250	15	95	

Size range over 1" to 2" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
75	515	35	241	15	95	

Size range over 2"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
65	450	35	241	15	95	

Physical properties

	US customary	Metric
Melting point – liquidus	1685 °F	918 °C
Melting point – solidus	1510 °F	821 °C
Density	0.296 lb/in³ at 68 °F	8.19 gm/cm³ at 20 °C
Specific gravity	8.19	8.19
Electrical conductivity	6.2% IACS at 68 °F	0.04 MegaSiemens/cm at 20 °C
Thermal conductivity	15 Btu/sq ft/ft hr/ °F at 68 °F	25.98 W/m at 20 °C
Coefficient of thermal expansion 68-572	11.2 · 10^{-6} per °F (68-572 °F)	19.3 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110310 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	80
Machinability rating	30

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	800	1200
Hot treatment	1200	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Common fabrication processes

Forging, screw machining

Common fabrication processes provided by CDA

C69430

Extruded and drawn	
Product description	Silicon red brass
Tempers	H04 hard
Solids	3/8" to 2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144"

Typical uses

Industrial

Valve stems

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C69430	B371 B371M					

Chemical composition					
Cu (%)[1]	Pb (%)	Zn (%)	Fe (%)	Si (%)	As (%)
80.00-83.00	0.30	Remain	0.20	3.50-4.50	0.03-0.06

Chemical composition according to ASTM B371/B371M-19

[1]Cu value includes Ag.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C69430	30	0.260

Mechanical properties

Mechanical properties according to ASTM B371/B371M-19
C69430
H04 hard

Size range up to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
80	550	40	276	15	95	

Size range over 1" to 2" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
75	515	35	241	15	95	

Size range over 2"

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
65	450	35	241	15	95	

Physical properties

	US customary	Metric
Melting point – liquidus	1685 °F	918 °C
Melting point – solidus	1510 °F	821 °C
Density	0.26 lb/in³ at 68 °F	7.19 gm/cm³ at 20 °C
Specific gravity	7.19	7.19
Electrical conductivity	6.2% IACS at 68 °F	0.04 MegaSiemens/cm at 20 °C
Thermal conductivity	15 Btu/sq ft/ft hr/ °F at 68 °F	25.98 W/m at 20 °C
Coefficient of thermal expansion 68-572	11.2 · 10^{-6} per °F (68-572 °F)	19.3 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110310 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Good
Capacity for being hot formed	Excellent
Forgeability rating	80
Machinability rating	30

Fabrication properties provided by CDA

Common fabrication processes

Forging, screw machining

Common fabrication processes provided by CDA

AMS 4596-C72900 (Hardiall®)

Standard-stocked product	Extruded and drawn

Product description	Copper nickel-tin bronze
Tempers	TX 00 solution annealed and spinodal hardened
Solids	0.75" to 4.25" (19.05 mm to 107.95 mm) O.D.* *Consult mill for other shapes/sizes

Chemical composition

Ni + Co (%)	Sn (%)	Fe (%)	Zn (%)	Mn (%)	Cb (%)	Mg (%)	Pb (%)	Cu (%)
14.50-15.50	7.50-8.50	0.50	0.50	0.30	0.10	0.15	0.02	Remain

Chemical composition according to AMS 4596

Note: Copper + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

AMS	Machinability rating	Density (lb/in^3)	Density (g/cm^3)
AMS 4596-C72900		0.323	8.94

Typical uses

Aerospace

Brakes, compression fit airframe fasteners, control surface and actuator bushings and bearings, door hardware, electronic system connectors, helicopter controls, hydraulic actuators, landing gear bushings and bearings, steering joints, valves, wheel bearings, wing flap bearings

Electrical

Connectors, contacts, controls, miniaturized sockets, relay elements, switches

Industrial

Springs, wire

Marine

Marine components

Oil and gas

Bearings, bushings, drilling components, sucker rod, valve guide bushing couplings

Mechanical properties

Mechanical properties according to AMS 4596
TX 00 solution annealed and spinodal hardened

Size range up to 4.249" (108 mm) inclusive (nominal thickness between parallel sides) bars, rods

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
132	910	107	738	9.5	30	

Size range 4.250" to 8.500" (108 to 216 mm) inclusive (nominal thickness between parallel sides) bars, rods

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
127	876	108	745	3	30	

Physical properties

	US customary	Metric
Melting point – liquidus	2039 °F	1115 °C
Melting point – solidus	1742 °F	950 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	7.8% IACS at 68 °F	0.045 MegaSiemens/cm at 20 °C
Thermal conductivity	17 Btu/sq ft/ft hr/ °F at 68 °F	29.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.1 · 10^{-6} per °F (68-572 °F)	15.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 293 °C
Modulas of elasticity in tension	18500 ksi	127554 MPa
Modulas of rigidity	7500 ksi	51711 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Excellent
Coated metal arc welding	Excellent
Spot weld	Excellent
Seam weld	Excellent
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Good

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1515	
Hot treatment	1200	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

AMS 4597-C72900 (Hardiall®)

Standard-stocked product	Extruded and drawn

Product description	Copper nickel-tin bronze
Tempers	TX TS solution annealed, cold finished and spinodal hardened
Solids	0.75" to 3.54" (19.05 mm to 89.92 mm) O.D.* *Consult mill for other shapes/sizes

Chemical composition

Ni + Co (%)	Sn (%)	Fe (%)	Zn (%)	Mn (%)	Cb (%)	Mg (%)	Pb (%)	Cu (%)
14.50-15.50	7.50-8.50	0.50	0.50	0.30	0.10	0.15	0.02	Remain

Chemical composition according to AMS 4597

Note: Copper + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

AMS	Machinability rating	Density (lb/in^3)	Density (g/cm^3)
AMS 4597-C72900		0.323	8.94

Typical uses

Aerospace

Brakes, compression fit airframe fasteners, control surface and actuator bushings and bearings, door hardware, electronic system connectors, helicopter controls, hydraulic actuators, landing gear bushings and bearings, steering joints, valves, wheel bearings, wing flap bearings

Electrical

Connectors, contacts, controls, miniaturized sockets, relay elements, switches

Industrial

Springs, wire

Marine

Marine components

Oil and gas

Bearings, bushings, drilling components, sucker rod, valve guide bushing couplings

Mechanical properties

Mechanical properties according to AMS 4597
TX TS solution annealed, cold finished and spinodal hardened

Size range up to 1.60" (40 mm) exclusive nominal thickness between parallel sides (bars, rods); nominal wall thickness (tubing)

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
165	1137	155	1069	6	34	

Size range 1.60" to 3.25" (40 to 83 mm) inclusive nominal thickness between parallel sides (bars, rods); nominal wall thickness (tubing)

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
156	1075	148	1020	3	34	

Physical properties

	US customary	Metric
Melting point – liquidus	2039 °F	1115 °C
Melting point – solidus	1742 °F	950 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	7.8% IACS at 68 °F	0.045 MegaSiemens/cm at 20 °C
Thermal conductivity	17 Btu/sq ft/ft hr/ °F at 68 °F	29.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.1 · 10^{-6} per °F (68-572 °F)	15.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 293 °C
Modulas of elasticity in tension	18500 ksi	127554 MPa
Modulas of rigidity	7500 ksi	51711 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Excellent
Coated metal arc welding	Excellent
Spot weld	Excellent
Seam weld	Excellent
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Good

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1515	
Hot treatment	1200	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

AMS 4598-C72900 (Hardiall®)

Standard-stocked product	Extruded and drawn

Product description	Copper nickel-tin bronze
Tempers	TX 00 solution annealed and spinodal hardened
Tubes	2.36" to 7.25" (59.94 mm to 184.15 mm) O.D.* *Consult mill for other shapes/sizes

Chemical composition

Ni + Co (%)	Sn (%)	Fe (%)	Zn (%)	Mn (%)	Cb (%)	Mg (%)	Pb (%)	Cu (%)
14.50-15.50	7.50-8.50	0.50	0.50	0.30	0.10	0.15	0.02	Remain

Chemical composition according to AMS 4598

Note: Copper + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

AMS	Machinability rating	Density (lb/in^3)	Density (g/cm^3)
AMS 4598-C72900		0.323	8.94

Typical uses

Aerospace

Brakes, compression fit airframe fasteners, control surface and actuator bushings and bearings, door hardware, electronic system connectors, helicopter controls, hydraulic actuators, landing gear bushings and bearings, steering joints, valves, wheel bearings, wing flap bearings

Electrical

Connectors, contacts, controls, miniaturized sockets, relay elements, switches

Industrial

Springs, wire

Marine

Marine components

Oil and gas

Bearings, bushings, drilling components, sucker rod, valve guide bushing couplings

Mechanical properties

Mechanical properties according to AMS 4598
TX 00 solution annealed and spinodal hardened

Size range 1.10" (28 mm) to 7.25" (184 mm) inclusive nominal outside diameter (tube); forward extruded

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
131	903	104	717	8	30	

Size range 7.25" (184 mm) to 13.6" (330 mm) inclusive nominal outside diameter (tube); back extruded

Ultimate tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D, min	Rockwell "C" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRC	
130	896	108	745	5	30	

Physical properties

	US customary	Metric
Melting point – liquidus	2039 °F	1115 °C
Melting point – solidus	1742 °F	950 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	7.8% IACS at 68 °F	0.045 MegaSiemens/cm at 20 °C
Thermal conductivity	17 Btu/sq ft/ft hr/ °F at 68 °F	29.4 W/m at 20 °C
Coefficient of thermal expansion 68-572	9.1 · 10^{-6} per °F (68-572 °F)	15.8 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 293 °C
Modulas of elasticity in tension	18500 ksi	127554 MPa
Modulas of rigidity	7500 ksi	51711 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Gas shielded arc welding	Excellent
Coated metal arc welding	Excellent
Spot weld	Excellent
Seam weld	Excellent
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Good

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	1515	
Hot treatment	1200	1600

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit.

Lead-free replacement products

Lead-free replacement products

Copper and copper alloys have long been very important materials for pipes, fittings, faucets, and plumbing components.

Within our lead-free replacement alloys, lead is replaced by other elements, but the products still offer exceptional lubricity, tightness, wear, strength, hardness, and machinability.

Bronze metals have always been recyclable, sustainable, and environmentally friendly. At Wieland Concast, we promise to deliver a broad range of alloys that are free of the elements that threaten health and the environment. Our lead-free replacement alloys have extremely low-lead content, some as low as 0.05%. Wieland Concast manufactures a broad selection of lead-free replacement alloys. These products offer the same exceptional value, quality, and performance for which Wieland Concast is known.

Regulatory-compliant alloys

The Safe Drinking Water Act (SDWA) of 1974 governs drinking water quality and was established to minimize chemical and bacterial contamination of drinking water.

The most recent change involves the 2011 Reduction of Lead in Drinking Water Act which amended the SDWA. S. 3874 was effective January of 2014 and redefines SDWA Section 1417(d) to lower the maximum lead content of the wetted surfaces of plumbing products from 8.0% to a weighted average of 0.25%.

Wieland Concast is a leader in the manufacturing of environmentally friendly copper alloys. We are proud to be at the forefront of the lead-free movement by offering regulatory-compliant alloys. Ranging from aluminum bronze to high tin bronze, our lead-free replacement alloys are manufactured to ASTM B standards and specifications and meet the requirements of the "S. 3874–Reduction of Lead in Drinking Water Act" and California legislation "AB1953."

Exceptional quality alloys without the concerns surrounding the use of lead.

Common lead-free replacement alloys

- C69300
- C87850
- C89325
- C89831
- C89833
- C89835
- C89844
- C90300
- C90800
- C90810
- C95400*
- C95500*
- C95900

*Also available in heat-treated condition.

Product descriptions

C89835, a lead-free C932 replacement

Wieland Concast offers C89835 as a standard-stocked inventory item. C89835 is a lead-free replacement for alloys C932, C836, and C844. This standard-stocked alloy supports the market demand for lead-free material and compliance with the S. 3874–Reduction of Lead in Drinking Water Act, effective January 2014.

C89835

Bismuth-based alloys

A group of alloys, which include C89325, C89831, and C89844, are produced using a patented process in which lead is replaced with bismuth to create pressure-tight plumbing fittings and fixtures. It also has excellent machinability. Wieland Concast is one of the few continuous cast foundries in the nation that produces this series of lead-free copper alloys.

C89325 C89833 C89844
C89831 C89835

High tin bronze

High tin bronze alloys are typically found in gear, high-strength bushing and bearing applications where high strength, low speeds, and heavy loads are present. Other high-strength applications for these alloys are pump impellers, piston rings, steam fittings, and valve bodies.

C90300 C90800 C90810

Aluminum bronze

Among standard copper-based alloys, aluminum bronze offers the highest strength. All of the aluminum bronzes can be heat treated, further increasing tensile strength.

C95400 C95500 C95900

Silicon brass

Silicon brass is a copper alloy that removes lead from the product and adds a small amount of silicon (2%-4%) to improve the performance of the alloy during the manufacturing processes.

C69300 C87850

Lead-free product list

Copper Alloy UNS No.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)
C69300[†]	73.00-77.00	0.02[4]-0.09	0.20	Rem.	0.10	0.04-0.15	0.10			0.10		0.10	2.70-3.40
C87850	75.00-78.00	0.02[4]-0.09	0.30	Rem.	0.10	0.05-0.20	0.20			0.10		0.10	2.70-3.40
C89325	84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70		0.08	0.50	0.005
C89831	87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70		0.08	0.25	0.005
C89833	86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70		0.08	0.25	0.005
C89835*	85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70		0.08	0.35	0.005
C89844	83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00		0.08	0.25	0.005
C90300*	86.00-89.00[1]	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00	0.005			0.05	0.20	0.005
C90800	85.00-90.00[1]	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005			0.05	0.20	0.005
C90810	Rem.[1]	0.25	11.00-13.00	0.30	0.15	0.15-0.80[2]	0.50	0.005			0.05	0.20	0.005
C95400[5]*	83.00 min				3.00-5.00		1.50	10.00-11.50		0.50			
C95500[5]*	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50		3.50			
C95900	Rem.				3.00-5.00		0.50	12.00-13.50		1.50			

[†]Lead-Free Brass *Standard-stocked alloy. [1]In determining Cu min., Cu may be calculated as Cu + Ni.
[2]For continuous castings, P shall be 1.5%, max. [3]Ni value includes Co. [4]Pb content is greater than 0.02%.
[5]Also available in heat-treated condition.
Note: Unless otherwise noted, single values represent maximums.

C69300

Extruded and drawn	GreenAlloys™

Product description	Lead-free brass
Tempers	H02 half hard
Solids	1/8" to 2 1/2" O.D.
Tubes	Consult mill
Hex	3/8" to 1" O.D.
Standard lengths	144"
Compliance	C69300 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Automotive

Fluid connectors, sensor bodies, thermostat parts

Industrial

Automatic screw machine parts, bolts, condenser tube plates, nuts, pneumatic fittings, pump parts, screw machine parts, valve bodies for water, valve stems

Marine

Marine products, propeller shafts

Plumbing

Faucet stems, faucets, plumbing fittings, water meter cases

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C69300	B371 B371M					

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Mn (%)	Si (%)
73.00-77.00	0.02*-0.09	0.20	remain.	0.10	0.04-0.15	0.10	0.10	2.70-3.40

*Pb content is greater than 0.02%. [1]Cu value includes Ag. [2]Ni value includes Co.

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C69300	85	0.300

Mechanical properties

Mechanical properties according to ASTM B371/B371M-19
C69300
H02 half hard

Size range up to ½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approve	
85	585	45	310	5	85	

Size range over ½" to 1" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approx	
75	515	35	240	10	80	

Size range over 1" to 2 ½" inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or thickness of specimen, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	max HRB approx	
70	480	30	205	10	75	

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1571 °F	855 °C
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Specific gravity	8.3	8.3
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	21.8 Btu/sq ft/ft hr/ °F at 68 °F	37.76 W/m at 20 °C
Coefficient of thermal expansion 68-212	10.3 · 10^{-6} per °F (68-212 °F)	17.8 · 10^{-6} per °C (20-100 °C)
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Coefficient of thermal expansion 68-572	10.4 · 10^{-6} per °F (68-572 °F)	18 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15200 ksi	104801 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Good
Gas shielded arc welding	Good
Coated metal arc welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Forgeability rating	95
Machinability rating	85

Fabrication properties provided by CDA

Thermal properties

Treatment	Min*	Max*	Value*	Time*
Stress relief			0	
Solution treatment				0
Annealing	932	1112		
Hot treatment	1202	1517		

Thermal properties provided by CDA

*Temperature is measured in Fahrenheit. **For stress relief, solution treatment and annealing - time is measured in hours/inch of thickness. For precipitation heat treatment - time is measured in hours.

Common fabrication properties

Forming and bending, machining, shearing

Common fabrication properties provided by CDA

C87850

Continuous cast	GreenAlloys™

Product description	Silicon brass
Solids	Consult mill for sizes
Tubes	Consult mill for sizes
Rectangles	Consult mill for sizes
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C87850 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Valve bodies for water

Marine

Marine products

Plumbing

Faucets, plumbing fittings, water meter cases

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C87850	B505 B505M					

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P	Ni (%)[1]	Mn (%)	Sb (%)	Si (%)
75.00-78.00	0.02*-0.09	0.30	remain.	0.10	0.05-0.20	0.20	0.10	0.10	2.70-3.40

Chemical composition according to ASTM B505/B505M-23

*Pb content is greater than 0.02%. [1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C87850	70	0.3

Mechanical properties

Mechanical properties according to ASTM B505/B505M-19

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
65	448	25	172	8	103	

Physical properties

	US customary	Metric
Melting point – liquidus	1616 °F	880 °C
Melting point – solidus	1571 °F	855 °C
Density	0.3 lb/in³ at 68 °F	8.3 gm/cm³ at 20 °C
Electrical conductivity	8% IACS at 68 °F	0.046 MegaSiemens/cm at 20 °C
Thermal conductivity	21.8 Btu/sq ft/ft hr/ °F at 68 °F	37.8 W/m at 20 °C
Coefficient of thermal expansion 68-212	10.3 · 10^{-6} per °F (68-212 °F)	17.8 · 10^{-6} per °C (20-100 °C)
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Coefficient of thermal expansion 68-572	10.4 · 10^{-6} per °F (68-572 °F)	18 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	15200 ksi	104801 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Good
Spot weld	Good
Seam weld	Good
Butt weld	Good
Capacity for being cold worked	Poor
Capacity for being hot formed	Excellent
Machinability rating	70

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	Medium
Fluidity	High
Gassing	Low
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C89325 Lead-free replacement for C937

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89325 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bushings, high-speed/ high-pressure bearings

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70	0.08	0.50	0.005

Chemical composition provided by CDA

[1]0.01 - 2.0% as any single or combination of Ce La or other rare earth(x) elements as agreed upon. (x)ASM International definition: one of the group of chemically similar metals with atomic numbers 57 through 71 commonly referred to as lanthanides. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89325	80	0.323

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	12	83	4	73	

Physical properties

	US customary	Metric
Melting point – liquidus	1805 °F	985 °C
Melting point – solidus	1432 °F	777 °C
Density	0.323 lb/in³ at 68 °F	8.94 gm/cm³ at 20 °C
Specific gravity	8.94	8.94
Electrical conductivity	10.8% IACS at 68 °F	0.062 MegaSiemens/cm at 20 °C
Thermal conductivity	29 Btu/sq ft/ft hr/ °F at 68 °F	50.2 W/m at 20 °C
Coefficient of thermal expansion 68-392	10.3 · 10^{-6} per °F (68-392 °F)	17.8 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.089 Btu/lb/ °F at 68 °F	372.9 J/kg at 20 °C
Modulas of elasticity in tension	16400 ksi	113074 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	80

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/32
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89831 Lead-free replacement for C844

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89831 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bushings, high-speed/ high-pressure bearings

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70	0.08	0.25	0.005

Chemical composition provided by CDA

[1]0.01 - 2.0% as any single or combination of Ce La or other rare earth(x) elements as agreed upon. (x)ASM International definition: one of the group of chemically similar metals with atomic numbers 57 through 71 commonly referred to as lanthanides. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.0% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89831	85	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
29	200	13	90	5	55	

Physical properties

	US customary	Metric
Melting point – liquidus	1893 °F	1033 °C
Melting point – solidus	1518 °F	825 °C
Density	0.318 lb/in³ at 68 °F	8.81 gm/cm³ at 20 °C
Specific gravity	8.81	8.81
Electrical conductivity	20.38% IACS at 68 °F	0.117 MegaSiemens/cm at 20 °C
Thermal conductivity	50 Btu/sq ft/ft hr/ °F at 68 °F	86.6 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.092 Btu/lb/ °F at 68 °F	385.4 J/kg at 20 °C
Modulas of elasticity in tension	13700 ksi	94458 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Poor
Machinability rating	85

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	5/32
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89833 Lead-free replacement for C836

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89833 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Industrial

Corrosion-resistant/ pressure-tight castings, impellers, pumps

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70	0.08	0.25	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89833	81	0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	14	97	6	60	

Physical properties

	US customary	Metric
Melting point – liquidus	1877 °F	1025 °C
Melting point – solidus	1454 °F	790 °C
Density	0.317 lb/in³ at 68 °F	8.78 gm/cm³ at 20 °C
Specific gravity	8.78	8.78
Electrical conductivity	17.8% IACS at 68 °F	0.103 MegaSiemens/cm at 20 °C
Thermal conductivity	41 Btu/sq ft/ft hr/ °F at 68 °F	71 W/m at 20 °C
Coefficient of thermal expansion 68-392	13 · 10^{-6} per °F (68-392 °F)	22.5 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.085 Btu/lb/ °F at 68 °F	356.1 J/kg at 20 °C
Modulas of elasticity in tension	15500 ksi	106869 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Poor
Machinability rating	81

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	11/64
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89835 Lead-free replacement for C932, C836, C844

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 8" O.D.
Tubes	1 1/8" to 14" O.D.**
Rectangles	Up to 15"
Standard lengths	105" *Solids and tubes are standard stocked **Consult mill for wall thickness
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89835 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, (4) Vermont Act 193, and is NSF/ANSI/CAN 61-2022 compliant

Typical uses

Industrial

Housing, small gears

Industrial

Faucets, pipe fittings, plumbing goods, pump components, water pump impellers

Chemical composition											
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70	0.08	0.35	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89835	70	0.321

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
30	207	14	97	6	65	

Physical properties

	US customary	Metric
Melting point – liquidus	1855 °F	1012 °C
Melting point – solidus	1445 °F	785 °C
Density	0.321 lb/in³ at 68 °F	8.89 gm/cm³ at 20 °C
Specific gravity	8.89	8.89
Electrical conductivity	14.5% IACS at 68 °F	0.084 MegaSiemens/cm at 20 °C
Thermal conductivity	38 Btu/sq ft/ft hr/ °F at 68 °F	65.8 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.093 Btu/lb/ °F at 68 °F	389.6 J/kg at 20 °C
Modulas of elasticity in tension	16900 ksi	116522 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Low
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	1/8
Shrinkage in solidification	Low

Casting characteristics provided by CDA

C89844 Lead-free replacement for C844

Continuous cast	GreenAlloys™

Product description	Bismuth tin bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 9" O.D.
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C89844 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Plumbing

Fittings/valves for potable water

Chemical composition

Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1]	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00	0.08	0.25	0.005

Chemical composition provided by CDA

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.3% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C89844	70	0.31

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
28	193	13	90	5	55	

Physical properties

	US customary	Metric
Melting point – liquidus	1850 °F	1010 °C
Melting point – solidus	1550 °F	853 °C
Density	0.31 lb/in³ at 68 °F	8.58 gm/cm³ at 20 °C
Specific gravity	8.58	8.58
Electrical conductivity	16.8% IACS at 68 °F	0.095 MegaSiemens/cm at 20 °C
Thermal conductivity	46.7 Btu/sq ft/ft hr/ °F at 68 °F	80.9 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.08 Btu/lb/ °F at 68 °F	335.2 J/kg at 20 °C
Modulas of elasticity in tension	13000 ksi	89622 MPa

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Not recommended
Coated metal arc welding	Not recommended
Machinability rating	70

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	High
Drossing	Medium
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C90300

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1/2" to 10" O.D.
Tubes	1" to 16" O.D.
Rectangles	Up to 20"
Standard lengths	144" *Solids is standard stocked
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar

Typical uses

Building

Heavy construction equipment

Fasteners

Swivel

Industrial

Bearings, bushings, gear blanks, gears, piston rings, pump bodies, pump impellers, valve bodies, valves

Plumbing

Steam fittings

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[1,2]	Al (%)	S (%)	Sb (%)	Si (%)
86.00-89.00	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90300	30	0.318

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
44	303	22	152	18	70	

Physical properties

	US customary	Metric
Melting point – liquidus	1832 °F	1000 °C
Melting point – solidus	1570 °F	854 °C
Density	0.318 lb/in³ at 68 °F	8.8 gm/cm³ at 20 °C
Specific gravity	8.8	8.8
Electrical conductivity	12% IACS at 68 °F	0.069 MegaSiemens/cm at 20 °C
Thermal conductivity	43.2 Btu/sq ft/ft hr/ °F at 68 °F	74.8 W/m at 20 °C
Coefficient of thermal expansion 68-392	10 · 10^{-6} per °F (68-392 °F)	17.3 · 10^{-6} per °C (20-200 °C)
Specific heat capacity	0.09 Btu/lb/ °F at 68 °F	377.1 J/kg at 20 °C
Modulas of elasticity in tension	14000 ksi	96527 MPa
Magnetic permeability	1	1

Physical properties provided by CDA

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing*	Good
Oxyacetylene welding	Fair
Gas shielded arc welding	Fair
Coated metal arc welding	Fair
Machinability rating	30

Fabrication properties provided by CDA

*Since brazing is performed within the hot-short range, strain must be avoided during brazing and cooling.

Casting characteristics

Casting attribute	Level
Casting yield	Medium
Drossing	Low
Effect of section size	High
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	Medium

Casting characteristics provided by CDA

C90800

Continuous cast	GreenAlloys™

Product description	Tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C90800 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Speed reducers, worm gears

Chemical composition										
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[2]	Ni (%)[3]	Al (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005	0.05	0.20	0.005

Chemical composition according to ASTM B505/B505M-23

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.5% max. [3]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90800		0.317

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
35	241	17	117	10	65	

C90810

Continuous cast	GreenAlloys™

Product description	High tin bronze
Solids	1" to 6" O.D.
Tubes	1" to 6" O.D.
Rectangles	Up to 10"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C90810 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Bearings, gears, shafts, worm gears

Chemical composition

Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[2]	Ni (%)[3]	Al (%)	S (%)	Sb (%)	Si (%)
remain.	0.25	11.00-13.00	0.30	0.15	0.15-0.80	0.50	0.005	0.05	0.20	0.005

Chemical composition provided by CDA

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.5% max. [3]Ni value includes Co.
Note: Cu + sum of named elements, 99.4% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C90810	20	0.323

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
					95	

C95400

Standard-stocked product	Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 12" O.D.*
Rectangles	Up to 15"
Standard lengths	144" *Consult mill for wall thickness
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95400 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Automotive

Weld guns

Fasteners

Large hold-down screws, nuts

Industrial

Bearing segments for the steel industry, bearings, bushings, gears, heavily loaded worm gears, high-strength clamps, landing gear parts, machine parts, pawl, pickling hooks, pressure blocks for the steel industry, pump parts, spur gears, valve bodies, valve guides, valve seats, valves, worm gears

Marine

Covers for marine hardware, ship building

Ordnance

Government fittings

Note: also available in heat-treated condition

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95400	B505 B505M	J461 J462		QQ-C-390, G5 QQ-B-671, Class 3	MIL-B-16033, Class 3	Aluminum Bronze 9C

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95400	60	0.269

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
85	586	32	221	12	170	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1900 °F	1038 °C
Melting point – solidus	1880 °F	1027 °C
Density	0.269 lb/in³ at 68 °F	7.45 gm/cm³ at 20 °C
Specific gravity	7.45	7.45
Electrical conductivity	13% IACS at 68 °F	0.075 MegaSiemens/cm at 20 °C
Thermal conductivity	33.9 Btu/sq ft/ft hr/ °F at 68 °F	58.7 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	15500 ksi	107000 MPa
Magnetic permeability*	1.27	1.27
Magnetic permeability**	1.2	1.2

Physical properties provided by CDA

*As cast, field strength 16 kA/m **TQ 50 temper, field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Good
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	60

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95400HT

Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1/2" to 10" O.D.
Tubes	1 1/8" to 12" O.D.*
Rectangles	Up to 15"
Standard lengths	24"**
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95400 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Consult mill for wall thickness **Consult mill for other lengths

Typical uses

Automotive

Weld guns

Fasteners

Large hold-down screws, nuts

Industrial

Bearing segments for the steel industry, bearings, bushings, gears, heavily loaded worm gears, high-strength clamps, landing gear parts, machine parts, pawl, pickling hooks, pressure blocks for the steel industry, pump parts, spur gears, valve bodies, valve guides, valve seats, valves, worm gears

Marine

Covers for marine hardware, ship building

Ordnance

Government fittings

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95400	B505 B505M	J461 J462		QQ-C-390, G5 QQ-B-671, Class 3	MIL-B-16033, Class 3	Aluminum Bronze 9C

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
83.00 min	3.00-5.00	1.50	10.00-11.50	0.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95400HT	60	0.269

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
95	655	45	310	10	177	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C95500

Standard-stocked product*	Continuous cast	GreenAlloys™

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.**
Rectangles	Up to 15"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95500 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Solids is standard stocked **Consult mill for wall thickness

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95500	B505 B505M	J461 J462		QQ-C-390, G3	MIL-B-16033, Class 4	Aluminum Bronze 9D

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	3.00-5.00	3.00-5.50	10.00-11.50	3.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Typical uses

Builders hardware

Window hardware

Consumer

Musical instruments, piano keys

Electrical

Electrical hardware

Fasteners

Stuffing box nuts

Industrial

Aircraft components, bearings, bushings, gears, glands, glass molds, handgun recoil mechanisms, hot mill guides, landing gear parts, machine parts, pickling equipment, piston guides, pump fluid ends, sewage treatment applications, valve bodies, valve components, valve guides, valve seats, wear plates, welding jaws, worm wheels, worms

Marine

Covers for marine hardware, marine applications, marine hardware, ship building

Ordnance

Government fittings

Note: also available in heat-treated condition

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in³ at 68 °F)
C95500	50	0.272

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (500 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
95	655	42	290	10	208	

Mechanical properties according to ASTM B505/B505M-23

Physical properties

	US customary	Metric
Melting point – liquidus	1930 °F	1054 °C
Melting point – solidus	1900 °F	1038 °C
Density	0.272 lb/in³ at 68 °F	7.53 gm/cm³ at 20 °C
Specific gravity	7.53	7.53
Electrical conductivity	8% IACS at 68 °F	0.049 MegaSiemens/cm at 20 °C
Thermal conductivity	24.2 Btu/sq ft/ft hr/ °F at 68 °F	41.9 W/m at 20 °C
Coefficient of thermal expansion 68-572	9 · 10^{-6} per °F (68-572 °F)	15.5 · 10^{-6} per °C (20-300 °C)
Specific heat capacity	0.1 Btu/lb/ °F at 68 °F	419 J/kg at 20 °C
Modulas of elasticity in tension	16000 ksi	110000 MPa
Magnetic permeability*	1.32	1.32
Magnetic permeability**	1.2	1.2
Poisson's Ratio	0.32	0.32

Physical properties provided by CDA

*As cast, field strength 16 kA/m **TQ 50 temper, field strength 16 kA/m

Fabrication properties

Technique	Suitability
Soldering	Good
Brazing	Fair
Oxyacetylene welding	Not recommended
Gas shielded arc welding	Good
Coated metal arc welding	Good
Machinability rating	50

Fabrication properties provided by CDA

Casting characteristics

Casting attribute	Level
Casting yield	Low
Drossing	High
Effect of section size	Low
Fluidity	Medium
Gassing	Medium
Patternmakers shrinkage (inches per foot)	3/16
Shrinkage in solidification	High

Casting characteristics provided by CDA

C95500HT

Continuous cast	GreenAlloys™

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 9" O.D.*
Rectangles	Up to 15"
Standard lengths	24"**
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95500HT is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193 *Consult mill for wall thickness **Consult mill for other lengths

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95500	B505 B505M	J461 J462		QQ-C-390, G3	MIL-B-16033, Class 4	Aluminum bronze 9D

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	3.00-5.00	3.00-5.50	10.00-11.50	3.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Unless otherwise noted, single values represent maximums.

Typical uses

Builders hardware

Window hardware

Consumer

Musical instruments, piano keys

Electrical

Electrical hardware

Fasteners

Stuffing box nuts

Industrial

Aircraft components, bearings, bushings, gears, glands, glass molds, handgun recoil mechanisms, hot mill guides, landing gear parts, machine parts, pickling equipment, piston guides, pump fluid ends, sewage treatment applications, valve bodies, valve components, valve guides, valve seats, wear plates, welding jaws, worm wheels, worms

Marine

Covers for marine hardware, marine applications, marine hardware, ship building

Ordnance

Government fittings

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$F)
C95500HT	50	0.272

Note: HT = heat treated.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	typical BHN	
110	758	62	427	8	228	Heat treated

Mechanical properties according to ASTM B505/B505M-23

C95900

Standard-stocked product	Continuous cast	GreenAlloys™

Product description	Aluminum bronze
Solids	1" to 5" O.D.
Tubes	Consult mill
Rectangles	Up to 7"
Standard lengths	144"
Shape/form	Semi-finished, mill stock or near-net shapes, anode, bar stock, billet/bloom, squares, hex, plate, profile or structural shape, flats/ rectangular bar
Compliance	C95900 is compliant with key legislation including (1) Federal Safe Drinking Water Act - SDWA, (2) S. 3874 Federal Reduction of Lead in Drinking Water Act, (3) California AB1953, and (4) Vermont Act 193

Typical uses

Industrial

Die components, gears, gibs, worm drives

Similiar or equivalent specification

CDA	ASTM	SAE	AMS	Federal	Military	Other
C95900	B505 B505M					

Chemical composition

Cu (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
remain.	3.00-5.00	0.50	12.00-13.50	1.50

Chemical composition according to ASTM B505/B505M-23

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 °F)
C95900	10	0.255

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 2 in. or 50 mm, min	Brinell hardness (3000 kg load)	Remarks
ksi	MPa	ksi	MPa	%	minimum BHN	
					241	

Mechanical properties according to ASTM B505/B505M-23

Special applications

Special applications

Overview

Concast offers a wide variety of special application products, including proprietary alloys, copper anodes, near-net shapes, and custom shapes. Concast Metal Products also offers secondary processes to enhance material properties and performance such as heat treating, stress relieving, temper annealing, and centerless grinding. Research and development in the area of proprietary alloys is also a facet of what Concast can provide.

Proprietary alloys

Concast will work with engineers to develop proprietary alloys that require unique properties such as tensile, yield, elongation, lubrication, high temperature, or aesthetics.

Developing unique copper alloy products for our customer's specific needs.

Special applications continued

Near-net shapes

Near-net shapes, also called custom shapes, from Wieland Concast offer the industry's best value in copper alloy bar stock. Utilizing near-net shapes allows for decreased raw material purchases and reduced scrap. The amount of machining is lessened due to faster throughput. As an end result, tooling costs are lowered and equipment life is extended. Near-net shapes can be developed to the customer's exacting specifications based on the end-use parts being produced.

Anodes

Wieland Concast produces brass anodes and phos-copper anodes for a variety of plating applications.

Brass anodes are used extensively in decorative applications, from light fixture plating to manufactured cabinet hardware. Plastic parts finished with decorative chrome plating also utilize phos-copper anodes in the plating process.

Brass anodes are available in either C24000 (80/20) or C26000 (70/30) alloys. Other brass alloys may be available upon request.

Phos-copper anodes are used to electroplate rotogravure rolls for the printing industry. Phos-copper anodes are key components in printed circuitry, specialized electrical ground rods, and many other plating applications.

Phos-copper anodes are produced in either low-phos (0.02%-0.04% phos) or high-phos (0.04%-0.06% phos).

We ship our anodes in both bar and nugget forms. Special sizes and grades are available on a made-to-order basis.

Tolerances

Tolerances

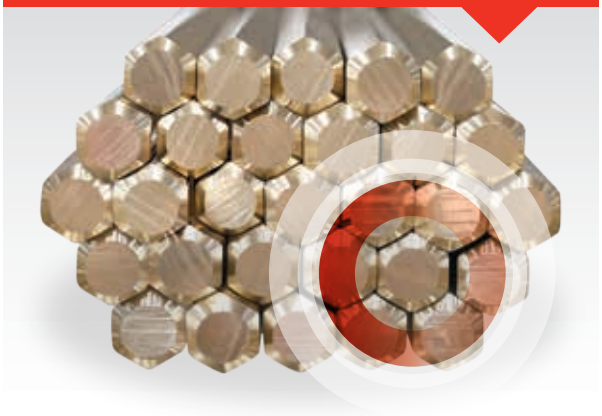
Our capabilities

Our ability to hold consistent tolerances with minimum variation makes our products ideal for CNC equipment. We are able to perform to this high standard by utilizing precision-machined in-house dies. Additional finishing allowance for tubes and rounds over 13 inches in length is .007 inches per linear inch due to curvature (TIR) inherent in longer lengths of material. This standard applies to both I.D. and O.D. Additional finishing allowance for rectangles over 13 inches in length is .0035 inches per linear inch due to curvature (TIR) in longer lengths of material. This standard applies to both thickness and width. These tolerances found in Wieland Concast products are significantly better than sand, centrifugal, and other types of casting methods.

Straightness tolerances are also critical due to the increased speed capabilities of new generation CNC equipment. All of our bars and tubes are Medart® straightened enabling them to exceed ASTM B505 straightness requirements. As a result, our customers are able to utilize the optimum performance of their equipment with the result of increasing their competitive advantage.

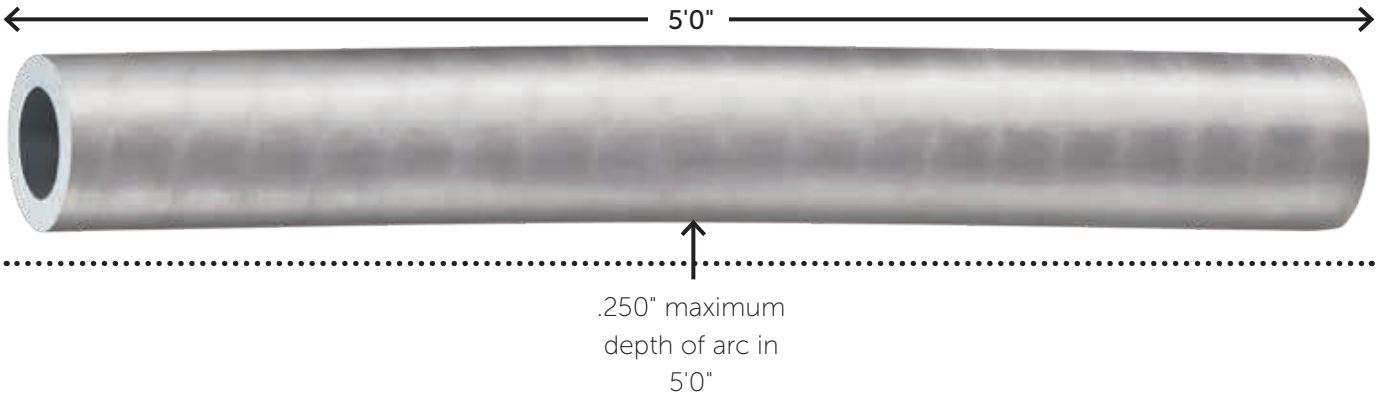
Wieland Concast products can be ordered to the cast size or "to finish to" condition. Our standard stock is produced oversized in the "to finish to" condition so the customer will be assured the size ordered will finish machine to that size with as little as .031 inches of material to be removed.

Our material tolerances allow for the optimum performance of modern machining equipment.

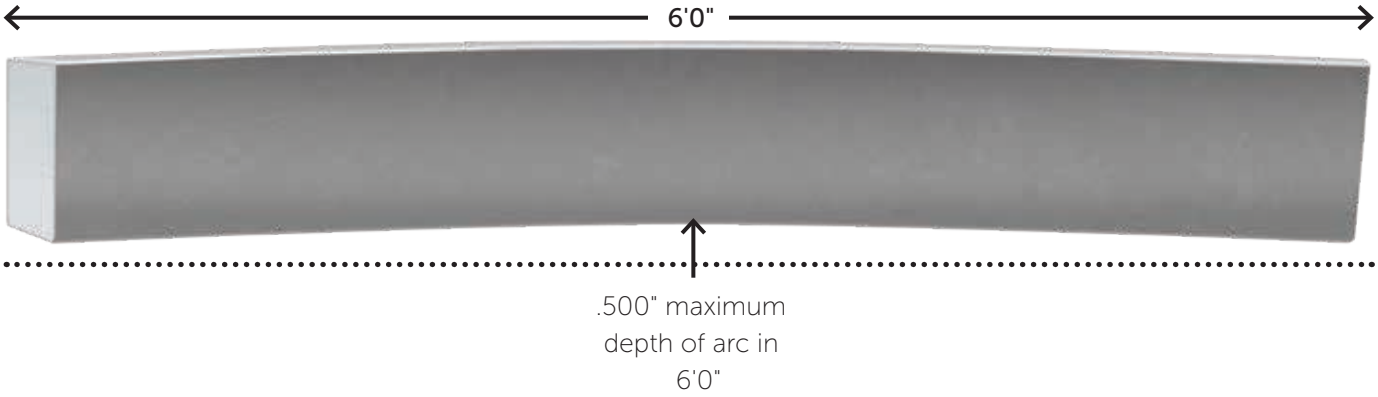


Straightness specifications

Round Rod or Tube



Bar and Shape



Produced to meet or exceed ASTM B505

Straightness tolerances cast products

Product	Length* ft (m)	Maximum curvature† (depth of arc), in. (mm)
Round rod or tube	up to 10 (3.05)	1/4 (6.4) in any 5-ft (1.52-m) portion
Round rod or tube	10 (3.05) and over	1/2 (13) in any 10-ft (3.05-m) portion*
Bar and shape	any length	1/2 (13) in any 6-ft (1.83-m) portion*†

*Total length.
†Applicable to any longitudinal surface or edge.

Straightness tolerances are critical due to the increased speed capabilities of the new generation CNC equipment. All of our bars and tubes are Medart® straightened enabling them to exceed ASTM B505 straightness requirements.This allows our customers to utilize the optimum performance of their equipment with the result of increasing their competitive advantage.

Cast to size tolerances

Leaded bronze tubes and solids

Diameter tolerances for AS CAST leaded bronze tubes and solids

Diameter tolerances of the casting, inches.

Finished outside diameter	Inside diameter	Outside diameter
Up to 3.999" inclusive	-0.033" to +0.012"	-0.005" to +0.005"
4.000" to 5.000" inclusive	-0.046" to +0.016"	-0.008" to +0.008"
5.001" to 9.000" inclusive	-0.064" to +0.032"	-0.016" to +0.016"
9.001" to 16.000" inclusive	-0.064" to +0.032"	-0.016" to +0.032"

Cast to size tolerances

Leaded bronze rectangles

Diameter tolerances for AS CAST leaded bronze rectangles

Diameter tolerances of the casting, inches.

Distance between parallel surfaces	Thickness	Width
Up to 3.999" inclusive	-0.016" to +0.016"	-0.016" to +0.016"
4.000" to 5.000" inclusive	-0.016" to +0.016"	-0.016" to +0.016"
Over 5.000"	-0.016" to +0.016"	-0.016" to +0.016"

Cast to size tolerances

Aluminum bronze tubes and solids

Diameter tolerances for AS CAST aluminum bronze tubes and solids

Diameter tolerances of the casting, inches.

Finished outside diameter	Inside diameter	Outside diameter
Up to 3.000" inclusive	-0.033" to +0.012"	-0.010" to +0.010"
3.001" to 4.000" inclusive	-0.050" to +0.015"	-0.015" to +0.015"
4.001" to 5.500" inclusive	-0.070" to +0.025"	-0.020" to +0.020"
Over 5.50"	-0.090" to +0.035"	-0.025" to +0.025"

Cast to size tolerances

Aluminum bronze rectangles

Diameter tolerances for AS CAST aluminum bronze rectangles

Diameter tolerances of the casting, inches.

Distance between parallel surfaces	Thickness	Width
Up to 3.000" inclusive	-0.020" to +0.020"	-0.020" to +0.020"
3.001" to 4.000" inclusive	-0.020" to +0.020"	-0.020" to +0.020"
4.001" to 5.500" inclusive	-0.020" to +0.020"	-0.020" to +0.020"
Over 5.500"	-0.025" to +0.025"	-0.025" to +0.025"

To finish to tolerances

Leaded bronze tubes and solids

Concast standard inventory of bars and shapes are produced oversized to finish machine to the print of part size.

Concast can cast to a near-net shape with as little as 0.015" variation to the shape.

Finishing allowances added for TO FINISH TO leaded bronze tubes and solids

Finish allowances added to finished or print dimensions of the part, inches.

Finished outside diameter	Inside diameter	Outside diameter
Up to 2" inclusive	-0.0190" to -0.0640"	+0.0300" to +0.0400"
Over 2" to 4" inclusive	-0.0190" to -0.0640"	+0.0340" to +0.0440"
Over 4" to 5" inclusive	-0.0470" to -0.1090"	+0.0550" to +0.0710"
Over 5" to 9" inclusive	-0.0620" to -0.1580"	+0.0780" to +0.1100"
Over 9" to 12" inclusive	-0.0780" to -0.1820"	+0.0940" to +0.1340"
Over 12" to 16" inclusive	-0.1020" to -0.2140"	+0.1180" to +0.1660"

To finish to tolerances

Leaded bronze rectangles

Finishing allowances added for TO FINISH TO leaded rectangles

Finish allowances added to finished or print dimensions of the part, inches.

Finished width	Thickness	Width
Up to 3.999" inclusive	+0.047" to +0.079"	+0.047" to +0.079"
Over 4" to 5" inclusive	+0.078" to +0.110"	+0.078" to +0.110"
Over 5.001"	+0.109" to +0.141"	+0.109" to +0.141"

To finish to tolerances

Aluminum bronze tubes and solids

Finishing allowances added for TO FINISH TO aluminum bronze tubes and solids

Finish allowances added to finished or print dimensions of the part, inches.

Finished outside diameter	Inside diameter	Outside diameter
Up to 3" inclusive	-0.0505" to -0.0955"	+0.0525" to +0.0725"
Over 3" to 4 1/2" inclusive	-0.0900" to -0.1450"	+0.0790" to +0.1090"
Over 4 1/2" to 5 1/2" inclusive	-0.1000" to -0.1650"	+0.1050" to +0.1450"
Over 5 1/2"	-0.1350" to -0.2100"	+0.1630" to +0.2130"

To finish to tolerances

Aluminum bronze rectangles

Concast standard inventory of bars and shapes are produced oversized to finish machine to the print of part size.

Concast can cast to a near-net shape with as little as 0.015" variation to the shape.

Finishing allowances added for TO FINISH TO 959 aluminum bronze rectangles

Finish allowances added to finished or print dimensions of the part, inches.

Finished width, inches	Thickness	Width
Up to 9 1/2" inclusive	+0.163" to +0.263"	+0.113" to +0.163"
Over 9 1/2"	+0.163" to +0.263"	+0.163" to +0.263"

Finishing allowances added for TO FINISH TO aluminum bronze rectangles

Finish allowances added to finished or print dimensions of the part, inches.

Finished width, inches	Thickness	Width
Up to 3" inclusive	+0.067" to +0.107"	+0.043" to +0.083"
Over 3" to 5 1/2" inclusive	+0.067" to +0.107"	+0.043" to +0.083"
Over 5 1/2" to 12" inclusive	+0.087" to +0.127"	+0.063" to +0.113"
Over 12"	+0.163" to +0.263"	+0.125" to +0.225"

Note: Thickness of rectangles 3" and greater will use the over 12" wide tolerances.

Dimensional tolerances for cold drawn leaded commercial bronze

Alloys C31400, C31600

Manufactured to:

Designation: B140/B140M-12(2017)

Standard Specification for Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bar, and Shapes

Tolerances to:

Designation: B249/B249M-23

Standard Specification for General Requirements for Extruded and Drawn Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

Diameter tolerance

	Round	Hexagon & octagon
Up to 0.500" inclusive	+/- 0.0015"	+/- 0.003"
Over 0.500" to 1.00" inclusive	+/- 0.002"	+/- 0.004"
Over 1.00" to 2.00" inclusive	+/- 0.0025"	+/- 0.005"
Over 2.00"	0.15% of the diameter	0.30% of the flat to flat

Example of the over 2" diameter tolerance:

2.5" diameter x 0.0015 (0.15%) = 0.00375" round to 0.004". Therefore, the tolerance would be +/- 0.004"

2.5" hexagon x 0.003 (0.30%) = 0.0075" round to 0.008". Therefore, the tolerance would be +/- 0.008"

Dimensional tolerances for cold drawn phosphor bronze

Alloys C51000, C52100, C53400, C54400

Manufactured to:

Designation: B139/B139M-12(2024)

Standard Specification for Phosphor Bronze Rod, Bar and Shapes

Tolerances to:

Designation: B249/B249M-23

Standard Specification for General Requirements for Extruded and Drawn Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

Diameter tolerance

	Round	Hexagon & octagon
Up to 0.500" inclusive	+/- 0.002"	+/- 0.004"
Over 0.500" to 1.00" inclusive	+/- 0.003"	+/- 0.005"
Over 1.00" to 2.00" inclusive	+/- 0.004"	+/- 0.006"
Over 2.00"	0.20% of the diameter	0.40% of the flat to flat

Example of the over 2" diameter tolerance:

2.5" diameter x 0.002 (0.20%) = 0.005". Therefore, the tolerance would be +/- 0.005"

2.5" hexagon x 0.004 (0.40%) = 0.010". Therefore, the tolerance would be +/- 0.010"

Dimensional tolerances for cold drawn nickel-aluminum bronze

Alloy C63000

Manufactured to:

Designation: B150/B150M-19

Standard Specification for Aluminum Bronze Rod, Bar and Shapes

Tolerances to:

Designation: B249/B249M-23

Standard Specification for General Requirements for Extruded and Drawn Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

Diameter tolerance

	Round	Hexagon & octagon
Up to 0.500" inclusive	+/- 0.002"	+/- 0.004"
Over 0.500" to 1.00" inclusive	+/- 0.003"	+/- 0.005"
Over 1.00" to 2.00" inclusive	+/- 0.004"	+/- 0.006"
Over 2.00"	0.20% of the diameter	0.40% of the flat to flat

Example of the over 2" diameter tolerance:

2.5" diameter x 0.002 (0.20%) = 0.005". Therefore, the tolerance would be +/- 0.005"

2.5" hexagon x 0.004 (0.40%) = 0.010". Therefore, the tolerance would be +/- 0.010"

Dimensional tolerances for cold drawn aluminum bronze

Alloy C64200

Manufactured to:

Designation: B150/B150M-19

Standard Specification for Aluminum Bronze Rod, Bar and Shapes

Tolerances to:

Designation: B249/B249M-23

Standard Specification for General Requirements for Extruded and Drawn Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

Diameter tolerance

	Round	Hexagon & octagon
Up to 0.500" inclusive	+/- 0.002"	+/- 0.004"
Over 0.500" to 1.00" inclusive	+/- 0.003"	+/- 0.005"
Over 1.00" to 2.00" inclusive	+/- 0.004"	+/- 0.006"
Over 2.00"	0.20% of the diameter	0.40% of the flat to flat

Example of the over 2" diameter tolerance:

2.5" diameter x 0.002 (0.20%) = 0.005". Therefore, the tolerance would be +/- 0.005"

2.5" hexagon x 0.004 (0.40%) = 0.010". Therefore, the tolerance would be +/- 0.010"

Dimensional tolerances for cold drawn low-silicon bronze

Alloy C65100

Manufactured to:

Designation: B98/B98M-13(2019)

Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes

Tolerances to:

Designation: B249/B249M-23

Standard Specification for General Requirements for Extruded and Drawn Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

Diameter tolerance

	Round	Hexagon & octagon
Up to 0.500" inclusive	+/- 0.0015"	+/- 0.003"
Over 0.500" to 1.00" inclusive	+/- 0.002"	+/- 0.004"
Over 1.00" to 2.00" inclusive	+/- 0.0025"	+/- 0.005"
Over 2.00"	0.15% of the diameter	0.30% of the flat to flat

Example of the over 2" diameter tolerance:

2.5" diameter x 0.0015 (0.15%) = 0.00375" round to 0.004". Therefore, the tolerance would be +/- 0.004"

2.5" hexagon x 0.003 (0.30%) = 0.0075" round to 0.008". Therefore, the tolerance would be +/- 0.008"

Stocked size schedules

Stocked size schedules

Included in this section:

C14500
C51000 Lead-Free Replacement
C54400
AMS 4640-C63000
AMS 4590-C63020
AMS 4634-C64200
C67300
AMS 4596-C72900 (Hardiall®)
AMS 4597-C72900 (Hardiall®)
AMS 4598-C72900 (Hardiall®)
C86300
C89835 Lead-Free Replacement for C932, C836, C844
C90300
C93200
C95400
C95500
AMS 4880-C95510
C95900

Over 1,100 standard-stocked options available for immediate shipment.

C14500 Size schedule

Standard-stocked product	Extruded and drawn

ASTM B301 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.375	0.037	0.438	1.125	0.321	3.851	2.000	1.014	12.170
0.500	0.063	0.760	1.250	0.396	4.753	2.250	1.284	15.403
0.625	0.099	1.188	1.375	0.479	5.752	2.500	1.585	19.016
0.750	0.143	1.711	1.500	0.570	6.845	2.750	1.918	23.010
0.875	0.194	2.392	1.625	0.670	8.034			
1.000	0.254	3.042	1.750	0.777	9.318			

C51000 Size schedule

Standard-stocked product	Extruded and drawn

ASTM B139 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
3/8	0.035	0.417	13/16	0.167	2.000	1 1/2	0.569	6.833
7/16	0.049	0.583	7/8	0.188	2.250	1 5/8	0.660	7.917
1/2	0.063	0.750	15/16	0.222	2.267	1 3/4	0.771	9.250
9/16	0.083	1.000	1	0.250	3.000	1 7/8	0.882	10.583
5/8	0.097	1.167	1 1/8	0.319	3.833	2	1.007	12.083
11/16	0.118	1.417	1 1/4	0.396	4.750	2 1/4	1.271	15.250
3/4	0.139	1.667	1 3/8	0.472	5.667	2 1/2	1.569	18.833

*H04 hard temper is standard stocked
Hexes available upon request.

C54400 Size schedule

Standard-stocked product	Extruded and drawn

ASTM B139 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
3/8	0.035	0.417	7/8	0.188	2.250	1 3/4	0.771	9.250
7/16	0.049	0.583	15/16	0.222	2.667	1 7/8	0.882	10.583
1/2	0.063	0.750	1	0.250	3.000	2	1.007	12.083
9/16	0.083	1.000	1 1/8	0.319	3.833	2 1/4	1.271	15.250
5/8	0.097	1.167	1 1/4	0.396	4.750	2 1/2	1.569	18.833
11/16	0.118	1.417	1 3/8	0.472	5.667	2 3/4	1.917	23.000
3/4	0.139	1.667	1 1/2	0.569	6.833			
13/16	0.167	2.000	1 5/8	0.660	7.917			

Hexes available upon request.

AMS 4640-C63000 Size schedule

Standard-stocked product | Extruded and drawn

Solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.3750	0.030	0.362	1.6250	0.559	6.708	4.2500	3.879	46.542
0.5000	0.054	0.652	1.7500	0.656	7.867	4.5000	4.391	52.689
0.5625	0.068	0.816	1.8750	0.756	9.073	4.7500	4.872	58.468
0.6250	0.082	0.989	2.0000	0.846	10.152	5.0000	5.350	64.196
0.6875	0.102	1.222	2.0625	0.898	10.770	5.2500	5.930	71.158
0.7500	0.119	1.431	2.1250	0.949	11.388	5.5000	6.479	77.739
0.8125	0.141	1.702	2.2500	1.077	12.923	5.7500	7.059	84.700
0.8750	0.165	1.978	2.3750	1.189	14.262	6.0000	7.800	93.600
0.9375	0.189	2.240	2.5000	1.319	15.824	6.5000	9.091	109.091
1.0000	0.213	2.561	2.6250	1.454	17.443	6.7500	9.800	117.600
1.0625	0.240	2.875	2.7500	1.592	19.108	7.0000	10.491	125.895
1.1250	0.267	3.205	2.8750	1.778	21.336	7.5000	12.099	145.186
1.1875	0.297	3.561	3.0000	1.977	23.727	8.0000	13.557	162.679
1.2500	0.334	4.008	3.2500	2.393	28.717	8.5000	15.410	184.920
1.3750	0.399	4.791	3.5000	2.658	31.895	9.0000	17.422	209.075
1.4375	0.444	5.334	3.7500	3.052	36.632	9.5000	19.028	228.336
1.5000	0.480	5.760	4.0000	3.485	41.820	10.0000	21.267	255.200

AMS 4590-C63020 Size schedule

Standard-stocked product	Extruded and drawn

Tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
1.500	x	2.750	1.151	13.812	2.500	x	4.250	2.570	30.845	3.000	x	5.000	3.468	41.620
	x	3.000	1.462	17.542								5.500	4.604	55.248
					2.750	x	4.500	2.761	33.137			6.000	5.850	70.198
1.750	x	3.250	1.625	19.500			5.500	4.917	59.005					
										4.000	x	6.000	4.304	51.648
2.000	x	3.500	1.787	21.449										
		4.000	2.600	31.195										

Solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.121	1.452	1.750	0.660	7.920	2.750	1.630	19.560
1.000	0.216	2.592	2.000	0.862	10.344	3.000	1.940	23.280
1.250	0.337	4.044	2.250	1.091	13.092	4.000	3.449	41.388
1.500	0.485	5.820	2.500	1.347	16.164			

AMS 4634-C64200 Size schedule

Standard-stocked product | Extruded and drawn

Solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.1875	0.008	0.092	0.8750	0.170	2.036	2.0000	0.876	10.507
0.2500	0.014	0.170	0.9375	0.194	2.326	2.1250	1.005	12.063
0.3125	0.022	0.268	1.0000	0.222	2.664	2.2500	1.122	13.464
0.3750	0.031	0.369	1.0625	0.249	2.984	2.3750	1.339	16.067
0.4375	0.042	0.509	1.1250	0.279	3.351	2.5000	1.389	16.672
0.5000	0.055	0.665	1.2500	0.343	4.113	2.7500	1.664	19.972
0.5625	0.070	0.838	1.3750	0.415	4.977	3.0000	1.988	23.854
0.6250	0.086	1.026	1.5000	0.504	6.053	4.0000	3.557	42.686
0.6875	0.104	1.252	1.6250	0.582	6.978	5.0000	5.456	65.468
0.7500	0.125	1.504	1.7500	0.674	8.090	6.0000	8.027	96.319
0.8125	0.145	1.736	1.8750	0.771	9.250			

C67300 Size schedule

Standard-stocked product	Extruded and drawn

SAE J463 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.3750	0.033	0.397	1.1875	0.334	4.008	1.8750	0.835	10.025
0.5000	0.066	0.787	1.2500	0.358	4.297	2.0000	0.951	11.409
0.5620	0.073	0.870	1.3750	0.452	5.427	2.1250	1.035	12.421
0.7500	0.134	1.603	1.4375	0.487	5.840	2.2500	1.160	13.925
0.8750	0.175	2.105	1.5000	0.535	6.425	2.5000	1.433	17.192
1.0000	0.237	2.848	1.5625	0.578	6.936	2.7500	1.733	20.801
1.0625	0.266	3.190	1.6250	0.605	7.262	3.0000	2.063	24.755
1.1250	0.301	3.611	1.7500	0.731	8.775			

AMS 4596-C72900 (Hardiall®) Size schedule

Standard-stocked product	Extruded and drawn

AMS 4596 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	2.250	1.286	15.427	3.750	3.571	42.853
1.000	0.254	3.047	2.500	1.587	19.046	4.000	4.063	48.758
1.250	0.397	4.761	2.625	1.750	20.998	4.500	5.142	61.709
1.500	0.571	6.857	2.750	1.921	23.046	5.000	6.349	76.184
1.750	0.778	9.333	3.000	2.286	27.426	5.500	7.682	92.182
1.875	0.893	10.713	3.250	2.682	32.188	6.000	9.142	109.705
2.000	1.016	12.189	3.500	3.111	37.330	6.750	11.570	138.845

AMS 4597-C72900 (Hardiall®) Size schedule

Standard-stocked product	Extruded and drawn

AMS 4597 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	1.250	0.397	4.761	1.750	0.778	9.333
1.000	0.254	3.047	1.500	0.571	6.857	2.000	1.016	12.189

AMS 4598-C72900 (Hardiall®) Size schedule

Standard-stocked product	Extruded and drawn

AMS 4598 tubes

Nom size I.D	x	O.D.	Weight per inch	Weight per foot	Nom size I.D	x	O.D.	Weight per inch	Weight per foot	Nom size I.D	x	O.D.	Weight per inch	Weight per foot
2.750	x	4.500	3.458	41.500	3.653	x	6.374	6.896	82.760	6.440	x	8.560	8.210	98.520
3.500	x	5.000	3.374	40.492	3.750	x	5.000	2.765	33.180	7.000	x	8.000	3.7916	45.500
		5.500	4.549	54.590	5.000	x	7.000	6.200	74.400					
		5.875	5.628	67.540										

*Consult mill for other shapes/sizes.

C86300 Size schedule

Standard-stocked product	Continuous cast

ASTM B505 tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
1	x	1 1/2	0.368	4.417	2 1/2	x	3	0.833	10.000	4	x	4 1/2	1.569	18.833
		2	0.764	9.167			3 1/2	1.667	20.000			5	2.639	31.667
		2 1/2	1.292	15.500								6	5.326	63.917
		3	1.903	22.833	3	x	3 1/2	1.076	12.917					
		4	3.556	42.667			4	1.951	23.417	5	x	6	3.528	42.333
							5	4.104	49.250			7	6.396	76.750
1 1/2	x	2	0.514	6.167										
					3 1/2		4 1/4	1.875	22.500					
1 3/4	x	2 1/4	0.588	7.055			4 3/4	2.868	34.417					
							5 1/2	4.514	54.167					
2	x	2 1/4	0.368	4.417										
		2 1/2	0.667	8.000										
		2 3/4	0.972	11.667										
		3	1.299	15.583										
		3 1/2	2.118	25.417										
		4	2.965	35.583										
		5	5.111	61.333										
		6	7.771	93.250										

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
1	0.257	3.083	3	2.069	24.833	5	5.806	69.667
1 1/2	0.542	6.500	3 1/2	2.861	34.333	6	8.569	102.833
2	0.944	11.333	4	3.688	44.250			
2 1/2	1.438	17.250	4 1/2	4.792	57.500			

C89835 Size schedule

Standard-stocked product | Continuous cast | GreenAlloys™

Tubes

Nominal size I.D.	x	O.D.	Weight per inch	Weight per foot
0.500	x	1.250	0.363	4.356
		1.500	0.541	6.492
		1.750	0.750	9.000
0.750	x	1.250	0.290	3.480
		1.500	0.470	5.640
		1.750	0.677	8.124
		2.000	0.921	11.052
		2.250	1.194	14.328
1.000	x	1.250	0.185	2.220
		1.500	0.362	4.344
		1.750	0.572	6.862
		2.000	0.816	9.792
		2.250	1.089	13.068
		2.500	1.393	16.716
		2.750	1.729	20.748
		3.000	2.100	25.200
		3.250	2.562	30.743
		3.500	3.000	36.000
		4.000	4.076	48.571
1.250	x	1.500	0.226	2.712
		1.750	0.435	5.220
		2.000	0.680	8.160
		2.250	0.952	11.424
		2.500	1.257	15.084
		2.750	1.592	19.104
		3.000	1.960	23.520
		3.250	2.419	29.029
		3.500	2.857	34.289
1.500	x	1.750	0.267	3.204
		2.000	0.512	6.144
		2.250	0.784	9.408
		2.500	1.089	13.068
		2.750	1.424	17.088
		3.000	1.791	21.492
		3.250	2.248	26.971
		3.500	2.686	32.229
		3.750	3.162	37.943
		4.000	3.743	44.914
		4.500	4.737	56.844
1.750	x	2.250	0.585	7.020
		2.500	0.889	10.668
		2.750	1.225	14.700
		3.000	1.592	19.104
		3.250	2.038	24.457
		3.500	2.486	29.829
		3.750	2.952	35.429
2.000	x	2.500	0.658	7.896
		2.750	0.994	11.928
		3.000	1.361	16.332
		3.250	1.810	21.714
		3.500	2.248	26.971
		3.750	2.714	32.571
		4.000	3.314	39.771
		4.500	4.316	51.788
		5.000	5.523	66.342
2.250	x	2.750	0.731	8.772
		3.000	1.100	13.200
		3.250	1.533	18.400
		3.500	1.981	23.772
		3.750	2.448	29.371
2.500	x	3.000	0.804	9.648
		3.250	1.238	14.857
		3.500	1.676	20.114
		3.750	2.152	25.829
		4.000	2.752	33.029
		4.500	3.768	45.221
2.750	x	3.500	1.349	16.114
		3.750	1.819	21.829
		4.000	2.419	29.029
		4.500	3.448	41.370
3.000	x	3.500	0.981	11.771
		3.750	1.448	17.371
		4.000	2.057	24.686
		4.500	3.095	37.141
		5.000	4.308	51.695
3.250	x	3.750	1.048	12.571
		4.000	1.666	20.000
		4.500	2.711	32.534
		5.000	3.924	47.088
3.500	x	4.000	1.238	14.857
		4.500	2.296	27.550
		5.000	3.509	42.103
3.750	x	4.500	1.849	22.187
4.000	x	5.000	2.583	31.000
4.250	x	5.000	2.073	24.881

Solids

Size O.D.	Weight per inch	Weight per foot
1.000	0.276	3.314
1.250	0.429	5.143
1.500	0.610	7.314
1.750	0.829	9.943
2.000	1.076	12.914
2.250	1.352	16.229
2.500	1.667	20.000
2.750	2.010	24.114
3.000	2.390	28.686
3.500	3.156	37.871
4.000	4.160	49.916
4.500	5.247	62.958
5.000	6.459	77.512

C90300 Size schedule

Standard-stocked product	Continuous cast	GreenAlloys™

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
1	0.278	3.333	3	2.361	28.333	5	6.549	78.583
1 1/2	0.597	7.167	3 1/2	3.201	38.417	5 1/2	7.813	93.750
2	1.049	12.583	4	4.215	50.583	6	9.493	113.917
2 1/2	1.646	19.750	4 1/2	5.319	63.833			

C93200 Size schedule

Standard-stocked product | Continuous cast

ASTM B505 tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
1/2	x	1	0.224	2.692
		1 1/8	0.291	3.589
		1 1/4	0.383	4.598
		1 3/8	0.458	5.495
		1 1/2	0.561	6.729
		1 3/4	0.766	9.196
		2	1.019	12.224
5/8	x	1	0.187	2.243
		1 1/8	0.262	3.140
		1 1/4	0.346	4.150
		1 3/8	0.439	5.271
		1 1/2	0.533	6.393
3/4	x	1	0.140	1.682
		1 1/8	0.215	2.579
		1 1/4	0.308	3.701
		1 3/8	0.393	4.710
		1 1/2	0.495	5.944
		1 5/8	0.579	6.953
		1 3/4	0.701	8.411
		2	0.944	11.327
		2 1/4	1.215	14.579
		2 1/2	1.523	18.280
7/8	x	1 1/8	0.168	2.019
		1 1/4	0.262	3.140
		1 3/8	0.336	4.037
		1 1/2	0.449	5.383
		1 5/8	0.551	6.617
		1 3/4	0.645	7.738
		1 7/8	0.776	9.308
		2	0.897	10.766
		2 1/4	1.168	14.019
1	x	1 1/4	0.187	2.243
		1 3/8	0.290	3.477
		1 1/2	0.393	4.710
		1 5/8	0.495	5.944
		1 3/4	0.607	7.290
		1 7/8	0.720	8.636
		2	0.850	10.206
		2 1/4	1.112	13.346
		2 3/8	1.262	15.140
		2 1/2	1.421	17.047
		2 3/4	1.757	21.084
		3	2.131	25.570
		3 1/4	2.523	30.280
		3 1/2	2.963	35.551
		4	4.000	48.000
1 1/8	x	1 3/8	0.206	2.467
		1 1/2	0.308	3.701
		1 5/8	0.411	4.935
		1 3/4	0.533	6.393
		2	0.785	9.421
		2 1/8	0.907	10.879
		2 1/4	1.056	12.673
1 1/4	x	1 1/2	0.234	2.804
		1 5/8	0.336	4.037
		1 3/4	0.467	5.607
		1 7/8	0.589	7.065
		2	0.710	8.523
		2 1/8	0.841	10.093
		2 1/4	0.981	11.776
		2 1/2	1.290	15.477
		2 3/4	1.626	19.514
		3	2.000	24.000
		3 1/4	2.411	28.935
		3 1/2	2.832	33.981
		4	3.869	46.430
1 3/8	x	1 5/8	0.271	3.252
		1 3/4	0.364	4.374
		1 7/8	0.486	5.832
		2	0.636	7.626
		2 1/8	0.766	9.196
		2 1/4	0.907	10.879
		2 3/8	1.065	12.785
		2 1/2	1.206	14.467
1 1/2	x	1 3/4	0.280	3.364
		1 7/8	0.393	4.710
		2	0.551	6.617
		2 1/8	0.673	8.075
		2 1/4	0.822	9.869
		2 3/8	0.981	11.776
		2 1/2	1.131	13.570
		2 3/4	1.458	17.495
		3	1.841	22.093
		3 1/4	2.252	27.028
		3 1/2	2.664	31.963
		3 3/4	3.150	37.794
		4	3.710	44.523
		4 1/2	4.776	57.308
1 5/8	x	2	0.430	5.159
		2 1/8	0.579	6.953
		2 1/4	0.729	8.748
		2 3/8	0.879	10.542
		2 1/2	1.028	12.336
		2 5/8	1.196	14.355
		2 3/4	1.355	16.262
		3	1.748	20.972
1 3/4	x	2	0.327	3.925
		2 1/8	0.477	5.720
		2 1/4	0.626	7.514
		2 3/8	0.776	9.308
		2 1/2	0.935	11.215
		2 5/8	1.084	13.009
		2 3/4	1.262	15.140
		3	1.645	19.738
		3 1/4	2.056	24.673
		3 1/2	2.486	29.832
		3 3/4	2.879	34.542
		4	3.533	42.393
		4 1/4	4.019	48.224
1 7/8	x	2 1/4	0.514	6.168
		2 3/8	0.673	8.075
		2 1/2	0.822	9.869
		2 5/8	0.972	11.664
		2 3/4	1.159	13.907
		3	1.495	17.944
2	x	2 1/4	0.355	4.262
		2 3/8	0.551	6.617
		2 1/2	0.710	8.523
		2 5/8	0.869	10.430
		2 3/4	1.037	12.449
		2 7/8	1.215	14.579
		3	1.430	17.159
		3 1/4	1.832	21.981
		3 1/2	2.252	27.028
		3 3/4	2.738	24.42
		4	3.308	39.701
		4 1/2	4.364	52.374
		5	5.533	66.393
		5 1/2	7.009	84.112
		6	8.467	101.607
2 1/8	x	2 5/8	0.738	8.860
		2 3/4	0.879	10.542
		2 7/8	1.093	13.121
		3	1.299	15.589
		3 1/2	2.121	25.458
2 1/4	x	2 3/4	0.785	9.421
		2 7/8	0.953	11.439
		3	1.150	13.794
		3 1/8	1.327	15.925
		3 1/4	1.570	18.841
		3 1/2	2.000	24.000
		3 3/4	2.467	29.607
		4	3.056	36.673
		4 1/4	3.533	42.393

C93200 Size schedule continued

ASTM B505 tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
2 3/8	x	2 3/4	0.589	7.065
		2 7/8	0.813	9.757
		3	1.009	12.112
		3 1/4	1.355	16.262
		3 1/2	1.785	21.421
		4	2.841	34.093
2 1/2	x	2 3/4	0.439	5.271
		3	0.869	10.430
		3 1/8	1.065	12.785
		3 1/4	1.280	15.364
		3 1/2	1.720	20.636
		3 3/4	2.187	26.243
		4	2.776	33.308
		4 1/4	3.318	39.813
		4 1/2	3.804	45.645
		4 3/4	4.355	52.262
		5	5.019	60.224
		5 1/2	6.467	77.607
		6	7.953	95.439
2 5/8	x	3 1/2	1.542	18.505
2 3/4	x	3 1/4	0.944	11.327
		3 1/2	1.364	16.374
		3 3/4	1.850	22.206
		4	2.449	29.383
		4 1/4	3.000	36.000
		4 1/2	3.495	41.944
		4 3/4	4.056	48.673
		5 3/4	6.981	83.776
2 7/8	x	4	2.299	27.589
3	x	3 1/2	0.963	11.551
		3 3/4	1.495	17.944
		4	2.112	25.346
		4 1/4	2.664	31.963
		4 1/2	3.140	28.00
		4 3/4	3.738	44.860
		5	4.346	52.150
		5 1/2	5.869	70.430
		6	7.280	87.364
		6 1/2	8.888	106.654
		7	10.607	127.290
		8	14.402	172.822
3 1/4	x	3 3/4	1.037	12.449
		4	1.710	20.523
		4 1/4	2.271	27.252
		4 1/2	2.720	32.636
		4 3/4	3.318	39.813
		5	3.925	47.103
		5 1/2	5.439	65.271

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
3 1/2	x	4	1.234	14.804
		4 1/4	1.804	21.645
		4 1/2	2.346	28.150
		4 3/4	2.897	34.766
		5	3.523	42.280
		5 1/4	4.336	52.037
		5 1/2	5.065	60.785
		6	6.495	77.944
		6 1/2	8.093	97.121
3 3/4	x	4 1/2	1.916	22.991
		4 3/4	2.449	29.383
		5	3.065	36.785
		5 1/2	4.636	55.626
		6	6.056	72.673
4	x	4 1/2	1.393	16.710
		4 3/4	1.972	23.664
		5	2.598	31.178
		5 1/4	3.430	41.159
		5 1/2	4.121	49.458
		6	5.589	67.065
		6 1/2	7.178	86.131
		7	8.907	106.879
		7 1/2	10.748	128.972
		8	12.710	152.523
		9	17.000	204.000
4 1/4	x	4 3/4	1.467	17.607
		5	2.084	25.009
		5 1/4	2.935	35.215
		5 1/2	3.617	43.402
		6	5.093	61.121
		6 1/2	6.673	80.075
4 1/2	x	5	1.650	19.800
		5 1/4	2.346	28.150
		5 1/2	3.103	37.234
		6	4.551	54.617
		6 1/2	6.159	73.907
		7	7.860	94.318
4 3/4	x	5 1/4	1.822	21.869
		5 1/2	2.523	30.280
		5 3/4	3.234	38.804
		6	3.972	47.664
		6 1/2	5.579	66.953
5	x	5 1/2	1.925	23.103
		5 3/4	2.636	31.626
		6	3.393	40.710
		6 1/2	5.000	60.000
		7	6.710	80.523
		7 1/2	8.561	102.729
		8	10.505	126.056
		9	14.813	177.757
		10	20.056	240.673
		11	26.067	312.800

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
5 1/4	x	7	6.084	73.009
5 1/2	x	6	2.103	25.234
		6 1/2	3.692	44.299
		7	5.421	65.047
		7 1/2	7.262	87.140
		8	9.224	110.692
5 3/4	x	6 3/4	3.832	45.981
		7 1/4	5.636	67.626
		7 1/2	6.561	78.729
		8 1/2	10.654	127.850
6	x	6 1/2	2.252	27.028
		6 3/4	3.121	37.458
		7	3.991	47.888
		7 1/4	4.907	58.879
		7 1/2	5.832	69.981
		8	7.804	93.645
		8 1/2	9.916	118.991
		9	12.112	145.346
		10	17.103	205.234
		11	22.421	269.047
		12	28.271	339.252
6 1/2	x	7 1/4	3.374	40.486
		7 1/2	4.299	51.589
		8	6.262	75.140
		8 1/2	8.374	100.486
		9	10.589	127.065
		9 1/2	13.093	157.121
7	x	7 3/4	3.589	43.065
		8	4.598	55.178
		8 1/2	6.692	80.299
		9	8.916	106.991
		9 1/2	11.421	137.047
		10	13.897	166.766
		11	19.271	231.252
		12	25.168	302.019
7 1/2	x	8 1/2	4.916	58.991
		9	7.112	85.346
		9 1/2	9.617	115.402
		10	12.019	144.224
		10 1/2	14.757	177.084
8	x	9	5.308	63.701
		9 1/4	6.505	78.056
		9 1/2	7.729	92.748
		10	10.196	122.355
		10 1/2	12.841	154.093
		11	15.561	186.729
		12	21.421	257.047
		13	28.383	340.598

C93200 Size schedule continued

ASTM B505 tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
8 1/2	x	9 1/2	5.869	70.430
		10	8.159	97.907
		10 1/2	10.738	128.860
		11 1/2	16.748	200.972
9	x	10	6.159	73.907
		10 1/4	8.589	103.065
		10 1/2	8.673	104.075
		11	11.327	135.925
		11 1/2	14.224	170.692
		12	17.290	207.477
		14	31.952	383.429
9 1/2	x	10 1/2	6.477	77.720
		11	9.075	108.897
		11 1/2	11.850	142.206
		12 1/2	18.355	220.262

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
10	x	11	6.794	81.533
		11 1/2	9.533	114.393
		12	12.551	150.617
		13	19.159	229.907
		14	26.019	312.224
		16	42.848	514.171
10 1/2	x	11 1/2	7.065	84.785
		12	9.925	119.103
		12 1/2	13.364	160.374
		13	16.701	200.411
11	x	12	7.486	89.832
		12 1/2	10.879	130.542
		13	13.953	167.439
		14	20.841	250.093

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
11 1/2	x	13	11.140	133.682
		13 1/2	14.542	174.505
		14 1/2	21.570	258.841
12	x	13 1/2	11.813	141.757
		14	15.131	181.570
		15	22.477	269.720
		16	31.686	380.229
12 1/2	x	14	12.320	147.840
13	x	14 1/2	12.727	152.726
		15	16.858	202.296
13 1/2	x	15 1/2	16.907	202.879
14	x	15 1/2	13.430	161.159
		16	17.692	212.299

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot
3/8	0.043	0.516
1/2	0.075	0.897
5/8	0.112	1.346
3/4	0.159	1.907
7/8	0.215	2.579
1	0.271	3.252
1 1/8	0.346	4.150
1 1/4	0.421	5.047
1 3/8	0.579	6.953
1 1/2	0.607	7.290
1 5/8	0.701	8.411
1 3/4	0.813	9.757
1 7/8	0.925	11.103
2	1.056	12.673

Size O.D.	Weight per inch	Weight per foot
2 1/8	1.187	14.243
2 1/4	1.327	15.925
2 3/8	1.477	17.720
2 1/2	1.636	19.626
2 5/8	1.794	21.533
2 3/4	1.972	23.664
2 7/8	2.150	25.794
3	2.346	28.150
3 1/4	2.738	32.860
3 1/2	3.168	38.019
3 3/4	3.636	43.626
4	4.178	50.131
4 1/4	4.710	56.523
4 1/2	5.271	63.252

Size O.D.	Weight per inch	Weight per foot
4 3/4	5.841	70.093
5	6.439	77.271
5 1/4	7.206	86.467
5 1/2	7.916	94.991
6	9.336	112.037
6 1/2	10.907	130.879
7	12.636	151.626
7 1/2	14.486	173.832
8	16.411	196.935
9	20.673	248.075
10	25.607	307.290
11	30.822	369.869
12	35.701	428.411
13	43.215	518.579

C93200 Size schedule continued

ASTM B505 rectangles

Nominal size thickness	x	width	Weight per inch	Weight per foot
1/4	x	4	0.466	5.589
		8	0.986	11.836
		12	1.445	17.342
3/8	x	4	0.630	7.562
		8	1.308	15.669
		12	1.932	23.178
1/2	x	1	0.226	2.712
		2	0.432	5.178
		3	0.637	7.644
		4	0.788	9.452
		5	1.048	12.575
		6	1.274	15.288
		7	1.452	17.425
		8	1.623	19.479
		9	1.863	22.356
		10	2.048	24.575
		12	2.507	30.082
		14	2.856	34.274
		15	2.993	35.918
5/8	x	1	0.281	3.370
		2	0.521	6.247
		3	0.767	9.205
		4	0.966	11.589
		5	1.260	15.123
		6	1.507	18.082
		7	1.753	21.041
		8	1.932	23.178
		9	2.247	26.959
		10	2.493	29.918
		12	2.986	35.836
		14	3.479	41.753
		15	3.603	43.233

Nominal size thickness	x	width	Weight per inch	Weight per foot
3/4	x	1	0.322	3.863
		2	0.610	7.315
		3	0.897	10.767
		4	1.123	13.479
		5	1.466	17.589
		6	1.726	20.712
		7	2.034	24.411
		8	2.281	27.370
		9	2.610	31.315
		10	2.849	34.192
		12	3.377	40.521
		14	4.034	48.411
		16	4.562	54.740
		18	4.979	59.753
1	x	1	0.418	5.014
		2	0.712	8.548
		3	1.048	12.575
		4	1.466	17.589
		5	1.884	22.603
		6	2.253	27.041
		7	2.616	31.397
		8	2.932	35.178
		9	3.349	40.192
		10	3.658	43.890
		11	4.089	49.068
		12	4.267	51.205
		13	4.822	57.863
		14	5.185	62.219
		15	5.555	66.658
		16	5.918	71.014
		18	6.658	79.890
		20	7.185	86.219
1 1/4	x	1	0.507	6.082
		2	0.959	11.507
		3	1.411	16.932
		4	1.788	21.452
		5	2.315	27.781
		6	2.767	33.205
		7	3.219	38.630
		8	3.596	43.151
		9	4.123	49.479
		10	4.575	54.904
		11	5.027	60.329
		12	5.390	64.685
		13	5.925	71.096
		14	6.377	76.521
		15	6.671	80.055

Nominal size thickness	x	width	Weight per inch	Weight per foot
1 1/2	x	2	1.021	12.247
		3	1.514	18.164
		4	2.123	25.479
		5	2.575	30.904
		6	3.158	37.890
		7	3.671	44.055
		8	4.240	50.877
		9	4.705	56.466
		10	5.219	62.630
		11	5.740	68.877
		12	6.411	76.932
1 3/4	x	4	2.445	29.342
		8	4.918	59.014
2	x	4	2.781	33.370
		8	5.562	66.740
		11	7.562	90.740
		12	8.322	99.863
3	x	11	11.096	133.151
4	x	4	5.384	64.603
		11	14.651	175.808
6	x	10	19.836	238.027
6 1/4	x	6 1/4	13.062	156.740
8	x	8	21.137	253.644

C95400 Size schedule

Standard-stocked product | Continuous cast | GreenAlloys™

ASTM B505 tubes

Nominal Size I.D	x	O.D.	Weight per inch	Weight per foot
3/4	x	1 1/4	0.278	3.333
		1 1/2	0.431	5.167
		1 3/4	0.611	7.333
		2	0.819	9.833
7/8	x	1 1/4	0.243	2.917
1	x	1 3/8	0.271	3.250
		1 1/2	0.347	4.167
		1 3/4	0.528	6.333
		2	0.736	8.833
		2 1/4	0.972	11.667
		2 1/2	1.236	14.833
		3	1.840	22.083
		3 1/2	2.618	31.417
		4	3.438	41.250
1 1/4	x	1 3/4	0.417	5.000
		2	0.625	7.500
		2 1/4	0.861	10.333
		2 1/2	1.118	13.417
		2 3/4	1.396	16.750
		3	1.729	20.750
		3 1/2	2.514	30.167
1 1/2	x	1 7/8	0.382	4.583
		2	0.486	5.833
		2 1/4	0.722	8.667
		2 1/2	0.986	11.833
		2 3/4	1.278	15.333
		3	1.590	19.083
		3 1/2	2.389	28.667
		4	3.201	38.417
		4 1/2	4.132	49.583
1 3/4	x	2 1/8	0.438	5.250
		2 1/4	0.556	6.667
		2 1/2	0.806	9.667
		2 3/4	1.111	13.333
		3	1.431	17.167
		3 1/4	1.854	22.250
		3 1/2	2.257	27.08
		3 3/4	2.611	31.333
		4	2.965	35.583
2	x	2 3/8	0.493	5.917
		2 1/2	0.625	7.500
		2 3/4	0.910	10.917
		3	1.243	14.917
		3 1/4	1.681	20.167
		3 1/2	2.042	24.500
		3 3/4	2.438	29.250
		4	2.861	34.333
		4 1/2	3.799	45.583
		5	4.917	59.000
		6	7.507	90.083
2 1/4	x	2 5/8	0.549	6.583
		2 3/4	0.694	8.333
		3	1.007	12.083
		3 1/4	1.458	17.500
		3 1/2	1.826	21.917
		3 3/4	2.243	26.917
		4	2.674	32.083
2 1/2	x	3	0.771	9.250
		3 1/4	1.208	14.500
		3 1/2	1.590	19.083
		3 3/4	1.986	23.833
		4	2.417	29.000
		4 1/2	3.333	40.000
		5	4.472	53.667
		6	7.076	84.917
2 3/4	x	3 1/4	0.951	11.417
		3 1/2	1.306	15.667
		3 3/4	1.729	20.750
		4	2.146	25.750
		4 1/4	2.590	31.083
		4 1/2	3.042	36.500
3	x	3 1/2	1.021	12.250
		3 3/4	1.431	17.167
		4	1.854	22.250
		4 1/4	2.299	27.583
		4 1/2	2.785	33.417
		5	3.924	47.083
		5 1/2	5.090	61.083
		6	6.549	78.583
		7	9.396	112.750
3 1/4	x	3 3/4	1.111	13.333
		4	1.535	18.417
		4 1/2	2.451	29.417
		5	3.611	43.333
3 1/2	x	4	1.208	14.500
		4 1/4	1.653	19.833
		4 1/2	2.125	25.500
		5	3.264	39.167
		5 1/2	4.417	53.000
		6	5.882	70.583
3 3/4	x	4 3/4	2.313	27.750
4	x	4 1/2	1.361	16.333
		4 3/4	1.972	23.667
		5	2.528	30.333
		5 1/2	3.667	44.000
		6	5.139	61.667
		7	7.993	95.917
		8	11.222	134.667
4 1/4	x	5	2.104	25.250
4 1/2	x	5	1.708	20.500
		5 1/4	2.181	26.167
		5 1/2	2.819	33.833
		6	4.301	51.667
		6 1/2	5.639	67.667
		7 1/2	8.729	104.750
5	x	5 1/2	1.840	22.083
		5 3/4	2.660	31.917
		6	3.361	40.333
		6 1/2	4.722	56.667
		7	6.201	74.417
		8	9.431	113.167
5 1/2	x	6 1/2	3.639	43.667
6	x	7	3.9861	47.833
	x	8	7.236	86.833
		9	10.868	130.417
6 1/2	x	7 1/2	4.271	51.250
7	x	8	4.556	54.667
	x	9	8.257	99.083
	x	10*	12.070	144.840
8	x	10*	8.980	107.760
	x	11*	13.490	161.880
	x	12*	18.430	221.160
8 1/2	x	10 1/2*	9.196	110.352
9	x	11*	9.980	119.760
9	x	12*	14.910	178.920
10	x	12*	10.970	131.640

*Available in 13" minimum lengths and 1" increments above 13".

C95400 Size schedule continued

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
1/2	0.069	0.833	2 1/4	1.146	13.750	4 3/4	5.083	61.000
5/8	0.097	1.167	2 1/2	1.396	16.750	5	5.625	67.500
3/4	0.139	1.667	2 3/4	1.688	20.250	5 1/2	6.764	81.167
7/8	0.188	2.250	3	2.000	24.000	6	8.194	98.333
1	0.243	2.917	3 1/4	2.389	28.667	6 1/2	9.556	114.667
1 1/4	0.368	4.417	3 1/2	2.771	33.250	7	11.049	132.583
1 1/2	0.521	6.250	3 3/4	3.153	37.833	8	14.333	172.000
1 5/8	0.611	7.333	4	3.576	42.917	9	18.007	216.083
1 3/4	0.701	8.417	4 1/4	4.035	48.417			
2	0.910	10.917	4 1/2	4.500	54.000			

C95400 Size schedule continued

ASTM B505 rectangles

Nominal size thickness	x	width	Weight per inch	Weight per foot
1/4	x	1	0.103	1.233
		1 1/2	0.144	1.726
		2	0.192	2.301
		2 1/2	0.240	2.877
		3	0.281	3.370
		4	0.377	4.521
		5	0.459	5.507
		6	0.596	7.151
		12	1.130	13.562
3/8	x	1	0.137	1.644
		1 1/2	0.199	2.384
		2	0.260	3.123
		2 1/2	0.322	3.863
		3	0.384	4.603
		3 1/2	0.452	5.425
		4	0.507	6.082
		5	0.630	7.562
		6	0.795	9.534
		8	1.041	12.493
		12	1.521	18.247
1/2	x	1/2	0.089	1.068
		1	0.171	2.055
		1 1/4	0.212	2.548
		1 1/2	0.253	3.041
		2	0.329	3.945
		2 1/2	0.411	4.932
		3	0.486	5.836
		3 1/2	0.568	6.822
		4	0.644	7.726
		5	0.801	9.616
		6	0.993	11.918
		8	1.315	15.781
		10	1.630	19.562
		12	1.938	23.260
5/8	x	1	0.205	2.466
		1 1/2	0.301	3.616
		2	0.397	4.767
		2 1/2	0.493	5.918
		3	0.589	7.068
		4	0.781	9.370
		5	0.973	11.671
		6	1.199	14.384
		8	1.562	18.740

Nominal size thickness	x	width	Weight per inch	Weight per foot
3/4	x	3/4	0.192	2.301
		1	0.247	2.959
		1 1/2	0.356	4.274
		2	0.466	5.589
		2 1/2	0.582	6.986
		3	0.692	8.301
		3 1/2	0.801	9.616
		4	0.918	11.014
		5	1.144	13.726
		6	1.404	16.849
		8	1.836	22.027
		12	2.678	32.137
1	x	1	0.315	3.781
		1 1/4	0.390	4.685
		1 1/2	0.459	5.507
		1 3/4	0.534	6.411
		2	0.610	7.315
		2 1/2	0.753	9.041
		3	0.897	10.767
		3 1/2	1.041	12.493
		4	1.192	14.301
		5	1.479	17.753
		6	1.801	21.616
		7	2.068	24.822
		8	2.370	28.438
		12	3.493	41.918
		15	4.925	59.096
1 1/4	x	1 1/4	0.473	5.671
		1 1/2	0.568	6.822
		1 3/4	0.658	7.890
		2	0.747	8.959
		2 1/2	0.925	11.096
		3	1.103	13.233
		3 1/2	1.281	15.370
		4	1.466	17.589
		5	1.808	21.699
		10	3.637	43.644
1 1/2	x	1 1/2	0.671	8.055
		1 3/4	0.774	9.288
		2	0.890	10.685
		2 1/2	1.103	13.233
		3	1.308	15.699
		3 1/2	1.527	18.329
		4	1.740	20.877
		5	2.144	25.726
		6	2.651	31.808
		12	5.130	61.562
		15	6.911	82.932

Nominal size thickness	x	width	Weight per inch	Weight per foot
1 3/4	x	2	1.027	12.329
		2 1/2	1.274	15.288
		3	1.514	18.164
		4	2.014	24.164
		5	2.507	30.082
		10	5.007	60.082
2	x	2	1.171	14.055
		2 1/2	1.445	17.342
		3	1.726	20.712
		3 1/2	2.000	24.000
		4	2.295	27.534
		6	3.459	41.507
		12	6.870	82.438
		15	8.918	107.014
2 1/2	x	2 1/2	1.795	21.534
		3	2.137	25.644
		4	2.836	34.027
		5	3.527	42.329
		6	4.240	50.877
		12	8.445	101.342
		15	11.075	132.904
3	x	3	2.541	30.493
		4	3.384	40.603
		6	5.089	61.068
		15	13.123	157.479
3 1/2	x	15	15.151	181.808
4	x	4	4.466	53.589
		15	17.226	206.712
6	x	6	9.986	119.836

C95500 Size schedule

Standard-stocked product*	Continuous cast	GreenAlloys™

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
1.000	0.243	2.917	2.500	1.424	17.083	4.000	3.646	43.750
1.500	0.535	6.417	3.000	2.035	24.417			
2.000	0.924	11.083	3.500	2.806	33.667			

AMS 4880-C95510 Size schedule

Standard-stocked product | Continuous cast

Tubes

Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot	Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot	Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot
2.000 x 1.000	0.739	8.868	3.500 x 1.500	2.476	29.712	5.750 x 4.250	3.979	47.748
2.250 x 1.250	0.867	10.404	2.500	1.639	19.668	6.000 x 3.000	6.469	77.628
1.500	0.707	8.484	3.750 x 2.000	2.437	29.244	3.750	5.556	66.672
2.500 x 1.000	1.242	14.904	2.500	1.943	23.316	4.500	4.433	53.196
1.500	1.002	12.024	2.750	1.764	21.168	5.375	2.397	28.764
1.750	0.821	9.852	4.000 x 2.000	2.860	34.320	6.500 x 4.000	6.608	79.296
2.750 x 1.500	1.254	15.048	2.500	2.505	30.060	5.000	4.704	56.448
1.750	1.008	12.096	4.125 x 3.125	1.923	23.076	7.000 x 4.000	8.000	96.000
2.875 x 1.875	1.149	13.788	4.250 x 3.000	2.311	27.732	8.000 x 6.000	7.347	88.164
3.000 x 1.500	1.515	18.180	4.500 x 2.500	3.327	39.924	8.500 x 6.000	8.866	106.392
2.000	1.210	14.520	3.000	2.792	33.504	6.500	7.568	90.816
3.125 x 2.125	1.378	16.536	5.000 x 3.000	4.207	50.484	11.000 x 9.000	9.867	118.404
3.250 x 2.000	1.657	19.884	3.750	3.012	36.144	12.000 x 10.250	9.794	117.528
2.250	1.512	18.144	5.500 x 3.500	4.396	52.752	13.000 x 10.000	16.564	198.768

C95900 Size schedule

Standard-stocked product | Continuous cast | GreenAlloys™

ASTM B505 rectangles

Nominal size thickness	x	width	Weight per inch	Weight per foot
1/4	x	1	0.160	1.917
		2	0.285	3.417
		3	0.313	3.750
		4	0.542	6.500
		5	0.667	8.000
		6	0.799	9.583
		7	0.924	11.083
		8	1.049	12.583
		9	1.181	14.167
		10	1.306	15.667
		12	1.563	18.750
3/8	x	1	0.201	2.417
		2	0.361	4.333
		3	0.424	5.083
		4	0.681	8.167
		5	0.833	10.000
		6	0.993	11.917
		7	1.153	13.833
		8	1.313	15.750
		9	1.472	17.667
		10	1.632	19.583
		12	1.958	23.500
1/2	x	1	0.236	2.833
		2	0.431	5.167
		3	0.521	6.250
		4	0.813	9.750
		5	1.007	12.083
		6	1.194	14.333
		7	1.389	16.667
		8	1.576	18.917
		9	1.771	21.250
		10	1.958	23.500
		12	2.319	27.833
5/8	x	1 1/2	0.326	3.917
3/4	x	1	0.319	3.833
		2	0.576	6.917
		3	0.729	8.750
		4	1.083	13.000
		5	1.340	16.083
		6	1.597	19.167
		7	1.847	22.167
		8	2.104	25.250
		9	2.361	28.333
		10	2.611	31.333
		12	3.118	37.417
1	x	1	0.396	4.750
		2	0.715	8.583
		2 1/2	0.785	9.417
		3	0.931	11.167
		4	1.229	14.750
		5	1.514	18.167
		6	1.813	21.750
		7	2.313	27.750
		8	2.632	31.583
		9	2.951	35.417
		10	3.264	39.167
		12	3.951	47.417
1 1/2	x	4	1.792	21.500
1 3/4	x	2 1/2	1.257	15.083
2	x	5	2.771	33.250
2 1/2	x	4	2.868	34.417
		7	4.757	57.083

ASTM B505 rectangles (metric sizes)

Nominal size thickness	x	width	Weight per inch	Weight per foot
20 mm	x	50 mm	0.486	5.833
20 mm	x	75 mm	0.711	8.532
20 mm	x	80 mm	0.764	9.167
20 mm	x	100 mm	0.944	11.333
20 mm	x	125 mm	1.174	14.083
20 mm	x	150 mm	1.390	16.680
20 mm	x	160 mm	1.507	18.083

ASTM B505 solids

Size O.D.	Weight per inch	Weight per foot
1	0.236	2.833
1 1/4	0.354	4.250
1 1/2	0.507	6.083
1 3/4	0.701	8.417
2	0.875	10.500
2 1/4	1.104	13.250
2 1/2	1.347	16.167
3	1.938	23.250
3 1/2	2.694	32.333
4	3.431	41.167
4 1/2	4.549	54.583
5	5.368	64.417

Technical information

Technical information

Included in this section:

- Casting is key
- Continuous-cast product list
- Extruded or cast and drawn product list
- Lead-free product list (chemical composition)
- Continuous-cast products chemical composition
- Continuous-cast specification cross reference
- Continuous-cast application cross reference
- Continuous-cast hardness ratings
- Continuous-cast machinability ratings
- Corrosion ratings of continuous-cast copper alloys in various media
- Extruded or cast and drawn product chemical composition
- Extruded or cast and drawn product typical uses
- Extruded or cast and drawn hardness ratings
- Extruded or cast and drawn machinability ratings
- Lead-free hardness ratings
- Lead-free machinability ratings
- Chemical symbols for elements

We are a trusted resource for informed industry decisions.

Casting is key

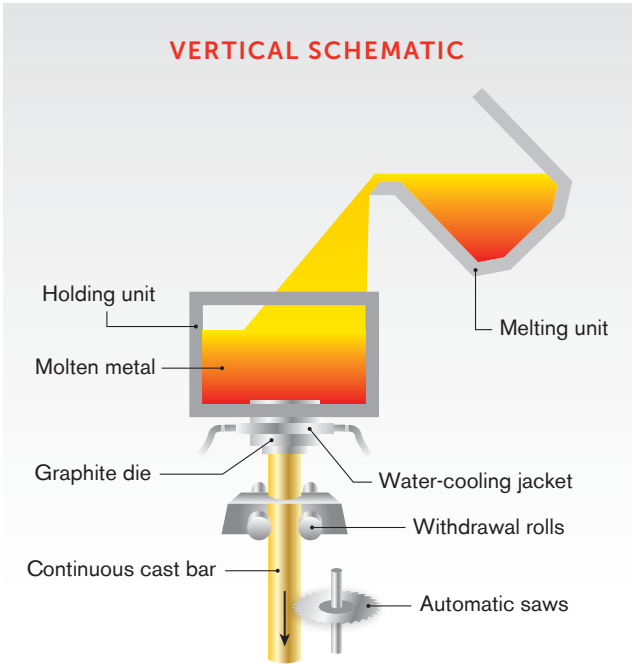
Through decades of experience, Concast has proven that superior products are created through vertical or horizontal continuous casting methods. The preferred casting technique is determined by the alloy and by the size range being produced.

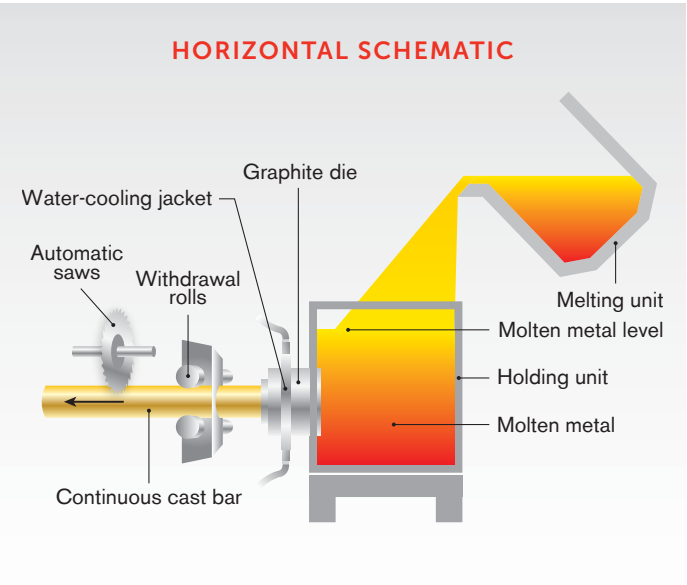
Vertical continuous casting

Vertical continuous casting has been the strength of Wieland Concast's production for over a third of a century. As the metal flows down into a water-cooled die at the bottom of the crucible during vertical continuous casting, solidification of the alloy occurs. The cast product continues smoothly downward through rollers beneath the die. With precise temperature control, the rollers carefully withdraw the cast metal to determine its grain structure and metallurgical properties.

Horizontal continuous casting

Horizontal continuous casting is best suited for aluminum bronzes due to the material's metallurgy. As a result, our Birmingham plant has been dedicated almost exclusively to the production of aluminum bronze. During horizontal continuous casting, metal flows out the front of the crucible and into a water-cooled die where solidification takes place. Drive rollers pull the bar along roller tables that support the weight of the bar while it casts. With precise control of temperature, the desired grain structure and metallurgical properties are created.





Continuous-cast product list

Common continuous-cast products, product forms, and size ranges

Copper alloy UNS no.	Product description	Solid bar stock		Tubes		Rectangles	
		Avail.	Size range	Avail.	Size range	Avail.	Size range
C83600	Leaded red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C83800	Leaded red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84200	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84400	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C84800	Leaded semi-red brass	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C85700	Leaded yellow brass	X	1/2" to 13" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86200	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86300*	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86400	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86500	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C86700	Manganese bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C87850	Silicon brass	X	Consult mill	X	Consult mill	X	Consult mill
C89320	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89325	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89520	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89831	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89833	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89835*	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C89844	Bismuth tin bronze	X	1/2" to 10" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C90300*	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90500	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90700	Tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C90800	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C90810	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91000	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91100	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91300	Tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91600	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C91700	High tin bronze	X	1" to 6" O.D.	X	1" to 6" O.D.	X	Up to 10"
C92200	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92300	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92500	Nickel-phosphor bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92700	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92800	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C92900	Leaded nickel-tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93200*	Leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93400	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"

*Standard-stocked alloy.
Please consult mill for minimum I.D., minimum thickness, and minimum wall thickness.

Continuous-cast product list continued

Copper alloy UNS no.	Product description	Solid bar stock		Tubes		Rectangles	
		Avail.	Size range	Avail.	Size range	Avail.	Size range
C93500	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93600	High-leaded tin bronze	X	1/2" to 13" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93700	High-leaded tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93800	High-leaded tin bronze	X	1" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C93900	High-leaded tin bronze	X	1" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94000	High-leaded tin bronze	X	1" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94100	High-leaded tin bronze	X	1" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94300	High-leaded tin bronze	X	1" to 10" O.D.	X	1" to 16" O.D.	X	Up to 10"
C94700	Nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94700HT	Nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C94800	Leaded nickel-tin bronze	X	1/2" to 10" O.D.	X	1" to 16" O.D.	X	Up to 20"
C95200	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95300	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95300HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95400*	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95400HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95410	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95410HT	Aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95500*	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95500HT	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95510*	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 13" O.D.	X	Up to 15"
C95520HT	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95600	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95800	Nickel-aluminum bronze	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C95900*	Aluminum bronze	X	1" to 5" O.D.		Consult mill	X	Up to 7"
CONCAST380	Aluminum bronze	X	1" to 5" O.D.			X	Up to 10"
C96400	Copper-nickel	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C96900HT	Copper-nickel	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 15"
C97300	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C97600	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C97800	Nickel silver bronze	X	3/4" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"
C99500	Special alloy	X	1/2" to 9" O.D.	X	1-1/8" to 9" O.D.	X	Up to 14"

*Standard-stocked alloy.
Please consult mill for minimum I.D., minimum thickness, and minimum wall thickness.
All alloys also available as near-net shape, solid hex bar, and hex tube except Concast380 which is not available as hex tube.

Extruded or cast and drawn product list

Copper alloy UNS no.	ASTM spec	AMS spec	Tempers						Product description	Round size range	Hex/oct size range
C14500*	B301				H02	H04			Tellurium copper	0.375 to 2.75	
C23000	B927			H01	H02	H04			Red brass 85%	0.375 to 2.75	
C24000	B927			H01	H02	H04			Low brass 80%	0.375 to 2.5	0.375 to 2.0
C26000	B927			H01	H02	H04			Cartridge brass 70%	0.375 to 2.5	0.375 to 2.0
C31400*	B140				H02	H04			Leaded commercial bronze	0.375 to 2.0	0.375 to 2.0
C31600	B140				H02	H04			Leaded commercial bronze[2]	0.375 to 2.0	0.375 to 2.0
C46400	B21				H02				Naval brass, uninhibited	0.5 to 2.75	0.5 to 2.75
C51000*	B139	4625				H04		H08	Phosphor bronze 5% A	0.375 to 2.5	0.375 to 2.0
C52100	B139					H04			Phosphor bronze 8% C	0.375 to 2.5	0.375 to 2.0
C53400	B139					H04			Phosphor bronze B-1	0.375 to 2.5	0.375 to 2.0
C54400*	B139					H04			Phosphor bronze B-2	0.375 to 2.5	0.375 to 2.0
C62400	B150		HR50						Aluminum bronze 11%	0.5 to 3.0	
C63000*	B150	4640	HR50						Nickel-aluminum bronze	0.375 to 10.0	0.5 to 2.0
C63020*	B150	4590	TQ50						Nickel-aluminum bronze	0.75 to 4.0	
C64200*	B150	4634	HR50						Aluminum bronze	0.1875 to 6.0	0.5 to 2.0
C64210	B150		HR50						Aluminum silicon bronze	0.3125 to 3.0	0.5 to 2.0
C65100	B98				H02	H04	H06		Low-silicon bronze B	0.375 to 2.0	0.375 to 2.0
C67300*[1]					H02				Manganese bronze	0.75 to 3.0	
C67400[1]									Manganese bronze	0.75 to 3.0	0.375 to 2.0
C67410									Manganese bronze	0.75 to 3.0	0.375 to 2.0
C67600	B138				H02	H04			Manganese bronze	0.75 to 2.0	
C69300	B371				H02				Lead-free brass	0.125 to 3.0	0.375 to 2.5
C69400	B371					H04			Silicon red brass	0.375 to 2.0	0.375 to 2.0
C69430	B371					H04			Silicon red brass	0.375 to 2.0	0.375 to 2.0
C72900*		4596	TX 00						Copper nickel-tin bronze		
C72900*		4597	TX TS						Copper nickel-tin bronze	0.75 to 3.14	
C72900*		4598	TX 00						Copper nickel-tin bronze		

*Standard-stocked alloy. [1]SAE J463 specification. [2](nickel-bearing).

Lead-free product list

Copper Alloy UNS No.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)
C69300[†]	73.00-77.00	0.02[4]-0.09	0.20	Rem.	0.10	0.04-0.15	0.10			0.10		0.10	2.70-3.40
C87850	75.00-78.00	0.02[4]-0.09	0.30	Rem.	0.10	0.05-0.20	0.20			0.10		0.10	2.70-3.40
C89325	84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70		0.08	0.50	0.005
C89831	87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70		0.08	0.25	0.005
C89833	86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70		0.08	0.25	0.005
C89835*	85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70		0.08	0.35	0.005
C89844	83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00		0.08	0.25	0.005
C90300*	86.00-89.00[1]	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00	0.005			0.05	0.20	0.005
C90800	85.00-90.00[1]	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005			0.05	0.20	0.005
C90810	Rem.[1]	0.25	11.00-13.00	0.30	0.15	0.15-0.80[2]	0.50	0.005			0.05	0.20	0.005
C95400[5]*	83.00 min				3.00-5.00		1.50	10.00-11.50		0.50			
C95500[5]*	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50		3.50			
C95900	Rem.				3.00-5.00		0.50	12.00-13.50		1.50			

[†]Lead-Free Brass *Standard-stocked alloy. [1]In determining Cu min., Cu may be calculated as Cu + Ni.
[2]For continuous castings, P shall be 1.5%, max. [3]Ni value includes Co. [4]Pb content is greater than 0.02%.
[5]Also available in heat-treated condition.
Note: Unless otherwise noted, single values represent maximums.

Continuous-cast products chemical composition

Copper alloy UNS no.	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Co (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)	Se (%)
C83600	Leaded red brass	84.00-86.00[1]	4.00-6.00	4.00-6.00	4.00-6.00	0.30	1.50	1.00[1]	0.005				0.08	0.25	0.005	
C83800	Leaded red brass	82.00-83.80[1]	5.00-7.00	3.30-4.20	5.00-8.00	0.30	1.50	1.00[1]	0.005				0.08	0.25	0.005	
C84200	Leaded semi-red brass	78.00-82.00[1]	2.00-3.00	4.00-6.00	10.00-16.00	0.40	1.50	0.80[1]	0.005				0.08	0.25	0.005	
C84400	Leaded semi-red brass	78.00-82.00[1]	6.00-8.00	2.30-3.50	7.00-10.00	0.40	1.50	1.00[1]	0.005				0.08	0.25	0.005	
C84800	Leaded semi-red brass	75.00-77.00[1]	5.50-7.00	2.00-3.00	13.00-17.00	0.40	1.50	1.00[1]	0.005				0.08	0.25	0.005	
C85700	Leaded yellow brass	58.00-64.00[1]	0.80-1.50	0.50-1.50	32.00-40.00	0.70		1.00[1]	0.80						0.05	
C86200	Manganese bronze	60.00-66.00[1]	0.20	0.20	22.00-28.00	2.00-4.00		1.00[1]	3.00-4.90			2.50-5.00				
C86300*	Manganese bronze	60.00-66.00[1]	0.20	0.20	22.00-28.00	2.00-4.00		1.00[1]	5.00-7.50			2.50-5.00				
C86400	Manganese bronze	56.00-62.00[1]	0.50-1.50	0.50-1.50	34.00-42.00	0.40-2.00		1.00	0.50-1.50			0.10-1.50				
C86500	Manganese bronze	55.00-60.00[1]	0.40	1.00	36.00-42.00	0.40-2.00		1.00	0.50-1.50			0.10-1.50				
C86700	Manganese bronze	55.00-60.00[1]	0.50-1.50	1.50	30.00-38.00	1.00-3.00		1.00	1.00-3.00			0.10-3.50				
C87850	Silicon brass	75.00-78.00	0.02[2]-0.09	1.50	30.00-38.00	1.00-3.00		1.00	1.00-3.00			0.10-3.50				
C89320	Bismuth tin bronze	87.00-91.00	0.09	5.00-7.00	1.00	0.20	0.30	1.00	0.005		4.00-6.00		0.08	0.35	0.005	
C89325	Bismuth tin bronze	84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005		2.70-3.70		0.08	0.50	0.005	
C89520	Bismuth tin bronze	85.00-87.00	0.09	5.00-6.00	4.00-6.00	0.20		1.00	0.005		1.60-2.20[4]		0.08	0.25		0.80-1.10[4]
C89831	Bismuth tin bronze	87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005		2.70-3.70		0.08	0.25	0.005	
C89833	Bismuth tin bronze	86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005		1.70-2.70		0.08	0.25	0.005	

*Standard-stocked alloy. [1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]*Pb content is greater than 0.02%. [3]Ni value includes Co. [4]Bi:Se >= 2:1
Note: Single values represent maximums.

Continuous-cast products chemical composition continued

Copper alloy UNS no.	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Co (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)	Se (%)
C89835*	Bismuth tin bronze	85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005		1.70-2.70		0.08	0.35	0.005	
C89844	Tin bronze	83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005		2.00-4.00		0.08	0.25	0.005	
C90300*	Tin bronze	86.00-89.00[1]	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00[1]	0.005				0.05	0.20	0.005	
C90500	Tin bronze	86.00-89.00[1]	0.30	9.00-11.00	1.00-3.00	0.20	1.50	1.00[1]	0.005				0.05	0.20	0.005	
C90700	Tin bronze	88.00-90.00[1]	0.50	10.00-12.00	0.50	0.15	1.50	0.50[1]	0.005				0.05	0.20	0.005	
C90800	Tin bronze	85.00-89.00[1]	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005				0.05	0.20	0.005	
C90810	High tin bronze	Rem.[1]	0.25	11.00-13.00	0.30	0.15	0.15-0.80[2]	0.50	0.005				0.05	0.20	0.005	
C91000	Tin bronze	84.00-86.00[1]	0.20	14.00-16.00	1.50	0.10	1.50	0.80	0.005				0.05	0.20	0.005	
C91100	High tin bronze	82.00-85.00[1]	0.25	15.00-17.00	0.25	0.25	1.00[2]	0.50	0.005				0.05	0.20	0.005	
C91300	Tin bronze	79.00-82.00[1]	0.25	18.00-20.00	0.25	0.25	1.50	0.50[1]	0.005				0.05	0.20	0.005	
C91600	High tin bronze	86.00-89.00[1]	0.25	9.70-10.80	0.25	0.20	0.30	1.20-2.00	0.005				0.05	0.20	0.005	
C91700	High tin bronze	84.00-87.00[1]	0.25	11.30-12.50	0.25	0.20	0.30	1.20-2.00	0.005				0.05	0.20	0.005	
C92200	Leaded tin bronze	86.00-90.00[1]	1.00-2.00	5.50-6.50	3.00-5.00	0.25	1.50	1.00[1]	0.005				0.05	0.25	0.005	
C92300	Leaded tin bronze	85.00-89.00[1]	0.30-1.00	7.50-9.00	2.50-5.00	0.25	1.50	1.00[1]	0.005				0.05	0.25	0.005	
C92500	Nickel-phosphor bronze	85.00-88.00[1]	1.00-1.50	10.00-12.00	0.50	0.30	1.50	0.80-1.50[1]	0.005				0.05	0.25	0.005	
C92700	Leaded tin bronze	86.00-89.00[1]	1.00-2.50	9.00-11.00	0.70	0.20	1.50	1.00[1]	0.005				0.05	0.25	0.005	
C92800	Leaded tin bronze	78.00-82.00[1]	4.00-6.00	15.00-17.00	0.80	0.20	1.50	0.80[1]	0.005				0.05	0.25	0.005	

*Standard-stocked alloy. [1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]For continuous castings, P shall be 1.50% max. [3]Ni value includes Co.
Note: Single values represent maximums.

Continuous-cast products chemical composition continued

Copper alloy UNS no.	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[5]	Al (%)	Co (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)	Se (%)
C92900	Leaded nickel-tin bronze	82.00-86.00[1]	2.00-3.20	9.00-11.00	0.25	0.20	1.50	2.80-4.00[1]	0.005				0.05	0.25	0.005	
C93200*	Leaded tin bronze	81.00-85.00[1]	6.00-8.00	6.30-7.50	2.00-4.00	0.20	1.50	1.00[1]	0.005				0.08	0.35	0.005	
C93400	High-leaded tin bronze	82.00-85.00[1]	7.00-9.00	7.00-9.00	0.80	0.20	1.50	1.00[1]	0.005				0.08	0.50	0.005	
C93500	High-leaded tin bronze	83.00-86.00[1]	8.00-10.00	4.30-6.00	2.00	0.20	1.50	1.00[1]	0.005				0.08	0.30	0.005	
C93600	High-leaded tin bronze	79.00-83.00	11.00-13.00	6.00-8.00	1.00	0.20	1.50	1.00	0.005				0.08	0.55	0.005	
C93700	High-leaded tin bronze	78.00-82.00	8.00-11.00	9.00-11.00	0.80	0.70[3]	1.50	0.50	0.005				0.08	0.50	0.005	
C93800	High-leaded tin bronze	75.00-79.00	13.00-16.00	6.30-7.50	0.80	0.15	1.50	1.00	0.005				0.08	0.80	0.005	
C93900	High-leaded tin bronze	76.50-79.50	14.00-18.00	5.00-7.00	1.50	0.40	1.50	0.80	0.005				0.08	0.50	0.005	
C94000	High-leaded tin bronze	69.00-72.00	14.00-16.00	12.00-14.00	0.50	0.25	1.50	0.50-1.00	0.005				0.25[6]	0.50	0.005	
C94100	High-leaded tin bronze	72.00-79.00	18.00-22.00	4.50-6.50	1.00	0.25	1.50	1.00	0.005				0.25[6]	0.80	0.005	
C94300	High-leaded tin bronze	67.00-72.00	23.00-27.00	4.50-6.00	0.80	0.15	1.50	1.00	0.005				0.25[6]	0.80	0.005	
C94700	Nickel-tin bronze	85.00-90.00	0.09[2]	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005			0.20	0.05	0.15	0.005	
C94700HT	Nickel-tin bronze	85.00-90.00	0.09[2]	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005			0.20	0.05	0.15	0.005	
C94800	Leaded nickel-tin bronze	84.00-89.00	0.30-1.00	4.50-6.00	1.00-2.50	0.25	0.05	4.50-6.00	0.005			0.20	0.05	0.15	0.005	
C95200	Aluminum bronze	86.00 min				2.50-4.00			8.50-9.50							
C95300	Aluminum bronze	86.00 min				0.80-1.50			9.00-11.00							
C95300HT	Aluminum bronze	86.00 min				0.80-1.50			9.00-11.00							

*Standard-stocked alloy. [1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]It is possible that the mechanical requirements of Copper Alloy UNS No. C94700 in the heat-treated condition will not be attained if the lead content exceeds 0.01%. [3]Fe shall be 0.35% max when used for steel-backed bearings. [5]Ni value includes Co. [6]For continuous castings, S shall be 0.25% max.
Note: Unless otherwise noted, single values represent maximums. HT = heat treated.

Continuous-cast products chemical composition continued

Copper alloy UNS no.	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Co (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)	Se (%)
C95400*	Aluminum bronze	83.00 min				3.00-5.00		1.50	10.00-11.50			0.50				
C95400HT	Aluminum bronze	83.00 min				3.00-5.00		1.50	10.00-11.50			0.50				
C95410	Aluminum bronze	83.00 min				3.00-5.00		1.50-2.50	10.00-11.50			0.50				
C95410HT	Aluminum bronze	83.00 min				3.00-5.00		1.50-2.50	10.00-11.50			0.50				
C95500*	Nickel-aluminum bronze	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50			3.50				
C95500HT	Nickel-aluminum bronze	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50			3.50				
C95510* (AMS 4880)	Nickel-aluminum bronze	78.00 min		0.20	0.30	2.00-3.50		4.50-5.50	9.70-10.90			1.50				
C95520HTA	Nickel-aluminum bronze	74.50 min	0.03	0.25	0.30	4.00-5.50		4.20-6.00	10.50-11.50	0.20		1.50			0.15	
C95600	Nickel-aluminum bronze	88.00 min						0.25	6.00-8.00						1.80-3.20	
C95800	Nickel-aluminum bronze	79.00 min	0.03			3.50-4.50[2]		4.00-5.00[2]	8.50-9.50			0.80-1.50			0.10	
C95900*	Aluminum bronze	Rem.				3.00-5.00		0.50	12.00-13.50			1.50				
CONCAST380	Aluminum bronze	Rem.				4.50-6.50			14.00-16.00	2.50		3.25				
C96400B	Copper-nickel	Rem.	0.01			0.25-1.50	0.02	28.00-32.00				1.50	0.02		0.50	
C96900HT[C]	Copper-nickel	Rem.	0.02	7.50-8.50	0.50			14.50-15.50				0.05-0.30			0.30	
C97300	Nickel silver bronze	53.00-58.00	8.00-11.00	1.50-3.00	17.00-25.00	1.50	0.05	11.00-14.00	0.005			0.50	0.08	0.35	0.15	
C97600	Nickel silver bronze	63.00-67.00	3.00-5.00	3.50-4.50	3.00-9.00	1.50	0.05	19.00-21.50	0.005			1.00	0.08	0.25	0.15	
C97800	Nickel silver bronze	64.00-67.00	1.00-2.50	4.00-5.50	1.00-4.00	1.50	0.05	24.00-27.00	0.005			1.00	0.08	0.20	0.15	
C99500	Special alloy	Rem.	0.09		0.50-2.00	3.00-5.00		3.50-5.50	0.50-2.00			0.50			0.50-2.00	

*Standard-stocked alloy. [1]In determining Cu min, Cu may be calculated as Cu + Ni. [2]Fe content shall not exceed Ni content. [3]Ni value includes Co (excluding C99500).
[A]Chemical requirements for other elements: Cr 0.05%, max. [B]Chemical requirements for other elements: C 0.15%, max and Nb 0.50-1.50%. [C]Chemical requirements for other elements: Mg 0.15%, max and Nb 0.10%, max.
Note: Unless otherwise noted, single values represent maximums. HT = heat treated.

Continuous-cast specification cross reference

Product description	CDA	ASTM			Asarcon	SAE			AMS	Federal		Military		Other designation
Leaded red brass	C83600 C83800	B505 B505	B62	B145, 4A B145, 4B	55 46	40	J461	J462	4855 4855	QQ-C-390, B5 QQ-C-390, B4	QQ-B-1005, Comp 2 QQ-B-1005, Comp 17	MIL-B-11553, Comp 2	MIL-C-15345, ALLOY 1	Ounce metal Hydraulic bronze
Leaded semi-red brass	C84200 C84400 C84800	B505 B505 B505		B145, 5A	37					QQ-C-390, B1 QQ-C-390, B2	QQ-B-1005, Comp 3 QQ-B-1005, Comp 11	MIL-B-11553, Comp 3 MIL-B-11553, Comp 11		Valve metal Plumbing goods brass
Leaded yellow brass	C85700									QQ-C-390, A1	QQ-B-621, Class A		MIL-C-15345, ALLOY 3	Leaded naval brass
High-strength yellow brass	C86200 C86300 C86400 C86500	B505 B505 B505 B505				430A 430B 43	J461 J461 J461	J462 J462 J462	 4860	QQ-C-390, C4 QQ-C-390, C7 QQ-C-390, C2 QQ-C-390, C3	QQ-B-726, Class B QQ-B-726, Class D QQ-B-726, Class A	MIL-C-22229, Comp 9 MIL-C-22229, Comp 8 MIL-C-22229, Comp 7		
Manganese bronze	C86700	B271	B584	B763										
Silicon brass	C87850	B505												
Bismuth tin bronze	C89320 C89325 C89520 C89831 C89833 C89835 C89844	B505 B584 B585	 B763											

Continuous-cast specification cross reference continued

Product description	CDA	ASTM			Asarcon	SAE			AMS	Federal		Military		Other designation
Tin bronze	C90300 C90500 C90700 C90800 C91000 C91300	B505 B505 B505 B427 B505 B505	 B22 B22, A	B143, 1B B143, A 	80 100 110 190	620 62 65 	J461 J461 J461 	J462 J462 J462 	 4845 7322A	QQ-C-390, D5 QQ-C-390, D6 QQ-C-390, D2 QQ-C-390, D1	QQ-B-1005, Comp 3 QQ-B-1005, Comp 16 QQ-B-1005, Comp 9 	MIL-B-11553, Comp 5 MIL-B-11553, Comp 16 MIL-B-16262, Grade III 	 	 Gun metal Tin bronze, 65
High tin bronze	C90800 C91100 C91600 C916700	 B22 B427								QQ-C-390, F1				
Leaded tin bronze	C92200 C92300 C92700 C92800	B505 B505 B505 B505	B61 B143, 2B 	B143, 2A 	61 81 102 	622 621 63 	J461 J461 J461 	J462 J462 J462 	 7320	QQ-C-390, D4 QQ-C-390, D3 	QQ-B-1005, Comp 1 QQ-B-1005, Comp 6 	MIL-B-11553, Comp 1 MIL-B-11553, Comp 6 	MIL-B-16541 	Navy M bronze Ring metal
Nickel phosphor bronze	C92500	B505					J461	J462						
Leaded nickel-tin bronze	C92900	B505	B427, D		102N									
Leaded tin bronze	C93200	B505	B144, 3B		77	660	J461	J462		QQ-C-390, E7	QQ-B-1005, Comp 12	MIL-B-11553, Comp 12		Bearing bronze
High-leaded tin bronze	C93400 C93500 C93600 C93700 C93800	B505 B505 B505 B505 B505	 B144, 3C B22, C B66	 B144, 3A B144, 3D	88 59 1010 715	 66 64 	 J461 J461 	 J462 J462 	 	QQ-C-390, E8 QQ-C-390, E9 QQ-C-390, E10 QQ-C-390, E6	QQ-B-1005, Comp 8 QQ-B-1005, Comp 14 QQ-B-1005, Comp 19	MIL-B-11553, Comp 8 MIL-B-11553, Comp 14 MIL-B-11553, Comp 23 MIL-B-11553, Comp 19	 	 Bearing bronze; 80-10-10 bronze Anti-acid metal; SAE 67

Continuous-cast specification cross reference continued

Product description	CDA	ASTM			Asarcon	SAE			AMS	Federal		Military		Other designation
High-leaded tin bronze continued	C93900 C94000 C94100 C94300	B505 B505 B505 B505			616 520	67	J461 J461	J462 J462		QQ-C-390, E4 QQ-C-390, E2 QQ-C-390, E5	QQ-B-1005, Comp 13	MIL-B-11553, Comp 13 MIL-B-16261, Grade X QQ-C-390, E1	QQ-B-1005, Comp 18	79-6-15 MIL-B-16261, Grade V
Nickel-tin bronze	C94700 C94700HT	B505 B505	947 947	B292, A B292, A	50N 50N		J461 J461	J462 J462		QQ-C-390, F2 QQ-C-390, F2				Cast nickel-tin bronze Cast nickel-tin bronze
Leaded nickel-tin bronze	C94800	B505	948	B292, B	51N					QQ-C-390, F3				
Aluminum bronze	C95200 C95300 C95300HT C95400 C95400HT C95410 C95410HT C95900 CONCAST380	B505 B505 B505 B505 B505 B505 B505 B505				68A 68B 68B	J461 J461 J461 J461 J461	J462 J462 J462 J462 J462		QQ-C-390, G6 QQ-C-390, G7 QQ-C-390, G7 QQ-C-390, G5 QQ-C-390, G5	QQ-B-671, Class 1 QQ-B-671, Class 2 QQ-B-671, Class 2 QQ-B-671, Class 3 QQ-B-671, Class 3	MIL-B-16033, Class 1 MIL-B-16033, Class 2 MIL-B-16033, Class 2 MIL-B-16033, Class 3 MIL-B-16033, Class 3		Aluminum bronze 9A Aluminum bronze 9B Aluminum bronze 9B Aluminum bronze 9C Aluminum bronze 9C
Nickel aluminum bronze	C95500 C95500HT C95510 C95520HT C95600 C95800	B505 B505 B505 B148 B505	 B763				J461 J461 J461	J462 J462 J462	 4880 4881	QQ-C-390, G3 QQ-C-390, G3 QQ-C-390B, Type III QQ-C-390, G8		MIL-B-16033, Class 4 MIL-B-16033, Class 4		Aluminum bronze 9D Aluminum bronze 9D Alpha nickel-aluminum bronze
Copper-nickel	C96400 C96900HT	B505 B505								QQ-C-390, X9				70-30 copper nickel
Nickel silver bronze	C93700 C97600 C97800	B505 B505 B505												15% nickel silver 20% nickel silver dairy metal 25% nickel silver
Special alloy	C99500	B505	B763											

Note: HT = heat treated.

Continuous-cast application cross reference

Application	Recommended alloys (copper alloy UNS no.)						
acid resisting applications	C93800						
acid-resistant pumps	C95200						
air actuators	C83600						
air line fittings	C84800						
air/gas/water fittings	C83800						
aircraft components	C95500						
applications requiring acid resistance to sulfite fluids	C93700						
automotive fittings	C93200						
automotive synchronizer rings	C92500						
backing for babbitt-lined bearings	C93500						
backs for lined bearings	C89320	C93600					
backs for lined journal bearings for locomotives	C93800						
backs for lined journal bearings for passenger cars	C93800						
bearing cage blanks	C86400						
bearing liners	C95200						
bearing segments for steel industry	C83600	C95300	C95400				
bearings	C86400 C91100 C93400 C95200	C86700 C91300 C93500 C95400	C90300 C91600 C93700 C95410	C90500 C92200 C93800	C90700 C92300 C93900	C90810 C92700 C94700	C91000 C93200 C94800
bearings for cranes	C93200						
bearings for heavy loads and relatively slow speeds	C90700						
bearings plates	C93700						
bearings requiring abrasion resistance /good ductility/retention of hardness at moderate temperatures	C95510						
bells	C91300						
boat parts	C84400	C86200	C86300	C86400	C86500		
brackets	C86200	C86300	C86500	C86700	C93700		
bridge pins	C86300						
bushings	C83600 C90300 C92700 C95410	C83800 C90500 C92800 C95500	C84200 C91100 C93200 C95510	C86200 C91300 C93400 C95800	C86300 C91600 C93700	C86400 C92200 C95200	C89325 C92300 C95400
bushings for corrosion/lubrication/pressure	C93600						
bushings for high speed and heavy pressure	C93700						
cable connectors	C95600						
cam bushings for diesel engines	C89320	C93600					
cams	C86200	C86300	C86400	C86700	C92900		
cases for dead bolt locks	C84400						
circuit breaker parts	C94700						
clamps	C86200	C86300	C86500	C90500			
cocks	C84800						
cold rolling metal dies and guides where a hardness minimum is specified	C380						
compressors	C86500						
connectors	C90500	C95300					
cooling equipment	C83600	C84400	C92200				
corrosion-resistant castings	C92800	C93400	C93500	C93700			
corrosion-resistant/pressure-tight castings	C89831	C89833					
couplings	C83600	C84200					
covers for marine hardware	C86300 C95800	C86400	C86500	C95200	C95300	C95400	C95500
crank shafts	C93700						
crankshaft main bearings	C89320	C93600					
cryogenic valves	C92200						
dead bolt locks	C84400						
deep well pump bowl bushings	C89320						
deep well pump line shaft bearings	C89320	C93600					
die components	C95900						

Continuous-cast application cross reference continued

Application	Recommended alloys (copper alloy UNS no.)						
diesel engine wrist pin bushings	C93200						
door hardware for prisons	C84400	C85700	C86500				
elbows	C84200	C95800					
elbows/flanges/pump bodies/valves used for sea water corrosion resistance	C96400						
electric motor bearings	C89320	C93600					
electrical components	C86300	C86400					
electrical equipment	C86400						
electrical hardware	C86500	C95200	C95500				
electrical parts	C99500						
expansion bearings	C90500						
faucets	C83600	C84800	C87850	C89835			
feeding mechanisms	C94700						
finishing dies for wood pulp industry	C90500						
fittings	C84800	C86400	C86700	C91600	C93200	C96400	
fittings for dairy and food processing	C97800						
fittings for oil lines	C84200						
fittings used to 550˚f	C92200						
fittings/valves for potable water	C89844						
fixtures	C83600	C84400	C86400				
flanges	C85700						
flow monitor valves	C93600						
forging press toggle lever bearings	C93200						
forming dies for wood pulp industry	C86300	C86500					
frames	C86200	C86300	C86500				
freight car bearings	C93800						
fuel pump bushings	C93200						
furnaces	C83600						
gas line fittings	C84800						
gear blanks	C90300	C90500					
gear boxes	C90700						
gear components	C94800						
gears	C86200 C91700 C95200 C95900	C86300 C92200 C95300	C86500 C92300 C95400	C90500 C92500 C95410	C90700 C92700 C95500	C90810 C92900 C95600	C91600 C94700 C95800
gears for mining equipment	C99500						
general hardware	C84200	C84800					
general purpose bushings	C93200						
general service bearings for moderate pressure	C93800						
general utility bearings	C89320						
general-service bearings	C92900						
gibs	C86300	C95900					
glands	C95500						
glass molds	C95500						
government fittings	C95400	C95500					
guide bushings for piston rods	C89320	C93600					
guide bushings for valves	C89320	C93600					
gun mounts	C86200	C95200					
gun slides	C95200						
handgun recoil mechanisms	C95500						
handles for dental equipment	C83600						
hardware	C83600	C83800	C84400	C84800	C97600	C97800	
heating equipment	C83600	C84400	C92200				
heavily loaded worm gears	C95400						
heavy construction equipment	C90300	C90500					

Continuous-cast application cross reference continued

Application	Recommended alloys (copper alloy UNS no.)						
heavy load/relatively slow-speed bearings	C91700						
heavy-duty bearings	C92700						
high pressure hydraulic equipment	C92300						
high speed/heavy load bearings	C93700						
high-pressure steam equipment	C92300						
high-speed bearings for light loads	C94000	C94300					
high-speed/high-pressure bearings	C89325	C89831					
high-speed/light-load bushings	C93500						
high-speed/light-to-medium-pressure bushings	C94000	C94300					
high-strength clamps	C95200	C95300	C95400				
high-strength machine parts	C86200	C86300					
high-temperature applications	C95300						
hollow conductors	C91100						
hooks	C86200	C86300	C86500				
hot mill guides	C95200	C95500					
housings	C89835						
hydrant parts	C95200						
hydraulic cylinder parts	C86300						
hydraulic gland seals	C89320	C93600					
hydraulic press main lining	C93200						
hydraulic press stuffing box	C93200						
hydraulic seal components	C95510						
impellers	C83600	C89831	C89833	C93700			
impellers for mine water	C92900						
industrial centrifuges	C93800						
insert bearings	C93200						
landing gear bushings and bearings	C95510						
landing gear parts	C95400	C95500					
large bearings for ships	C93700	C93800					
large gear parts	C95200						
large hold-down screws	C83600	C95300	C95400				
large valve stems	C86300						
lead screw nuts	C92700						
lever arms	C86400	C86500	C86700				
light-duty gears	C86400						
lightning protection	C83600						
linkage bushings for presses	C93200						
locomotive bearing parts	C93600						
low pressure fittings	C84400						
low pressure valves	C83600	C84200	C84800				
low-friction/moderate pressure bushings	C93800						
machine parts	C93800	C95400	C95500				
machine tool bearings	C93200						
machinery	C86500	C95800					
machinery parts	C86400	C86700	C93200	C93700	C94800		
machinery parts (substituted for steel and malleable iron)	C86500						
machinery parts requiring high strength	C86500						
main bearings for presses	C89320	C93600					
main spindle bearings	C93200						
marine applications	C95500						
marine castings	C86200	C92200					
marine engines	C95200						
marine equipment	C95300						
marine fittings	C86400						
marine furniture	C97600						

Continuous-cast application cross reference continued

Application	Recommended alloys (copper alloy UNS no.)						
marine hardware	C84400 C95800	C85700	C86300	C86400	C86700	C95200	C95500
marine products	C83600	C87850					
marine racing propellers	C86200						
mechanical components where aesthetics are important	C85700						
medium-pressure hydraulic equipment	C92200						
medium-pressure steam equipment to 550˚F	C92200						
mild acidic applications	C93500						
mild alkali applications	C95200						
mining machine parts	C95300						
moderate-duty gears	C86700						
motion translation devices	C94800						
musical instrument components	C97800						
musical instruments	C84400	C87500	C86400	C95500			
nozzles	C94700						
nuts	C92200 C93700	C95200	C95400	C95800	C90500	C91600	C92300
nuts for transducers	C84400						
ornamental castings	C97300	C97600	C97800	C92200			
ornamental fixtures	C83600	C84400					
ornamental hardware	C85700						
outboard marine components	C99500						
parts for boats	C83600						
parts for steel maintenance	C93700						
pawl	C95400						
piano keys	C86400	C95500	C97600				
pickling baskets	C95300	C95410					
pickling equipment	C95200	C95500	C95800				
pickling hooks	C95300	C95400	C95410				
pickling tanks	C95200						
pipe fittings	C83600	C84200	C84400	C89835			
piston cylinders	C94700						
piston guides	C95500						
piston pin bearings	C89320	C93600					
piston rings	C90300	C90500	C91000	C91000	C91300	C91600	
plugs	C84200						
piston rings	C90300	C90500	C91000	C91000	C91300	C91600	
plugs	C84200						
piston rings	C90300	C90500	C91000	C91000	C91300	C91600	
plugs	C84200						
piston rings	C90300 C92300	C90500 C92800	C91000	C91000	C91300	C91600	C92200
plugs	C84200						
plumbing	C84200						
plumbing castings	C89520						
plumbing fittings	C84800	C87850					
plumbing fixtures	C84800	C83800					
plumbing goods	C89835						
plungers	C95200						
press dies	C86200						
pressing dies for wood pulp	C86500						
pressure blocks for steel industry	C83600	C95300	C95400				
pressure-tight castings	C93700						
printing presses	C83600						
propeller blades	C95800						
propeller hub	C95800						

Continuous-cast application cross reference continued

Application	Recommended alloys (copper alloy UNS no.)						
propeller wheels	C99500						
propellers	C86300	C86400	C86700	C95200			
propellers for salt and fresh water	C86500						
pump bodies	C90300	C90500	C92900	C93900	C96400		
pump bodies for acid mine water	C93800						
pump components	C89835						
pump fixtures	C83600	C83800	C84400	C86400	C93200	C96400	
pump fluid ends	C95500						
pump impellers	C90300 C93400	C90500 C93500	C91600	C92200	C92300	C92700	C93200
pump impellers for acid mine water	C93800						
pump impellers for mine water	C93900						
pump parts	C83600	C92300	C95200	C95400			
pump pistons	C92700						
pump rods	C95200						
pump sleeves	C89320	C93600					
pumps	C83600	C89831	C89833	C93200	C93700	C93800	C97600
pumps used to 550˚f	C92200						
railroad applications	C93800	C94000	C94300				
railroad catenary fittings	C83800						
railroad engine casings	C93800						
restaurant equipment	C90700						
rings	C83600						
rod bushings	C89320	C93600					
roll neck bearings	C93200						
roller bearings	C86400						
rolling mill bearings	C89320	C93200	C93600				
rudders	C86200	C86300	C86500				
sanitary fittings	C97600						
screw down nuts	C86300	C86200	C86400	C86700			
seal rings	C90500						
seals	C89320	C93600					
sewage treatment applications	C95500						
shafts	C86200	C90810	C95800				
shift forks	C94700						
ship building	C95400	C95500	C95800				
ship trim	C85700						
sleeve bushings	C89320						
sleeve bushings (for cranes, etc.)	C93600						
slide bars	C93400						
slide guides for steel mills	C93700						
slow-speed/heavy-load bearings	C86300						
small gears	C83600	C84200	C89835				
small pump castings	C84200						
soft bushings	C94000	C94300					
soft metal applications	C94000	C94300					
spacer bushings	C89320						
spacer bushings (for pumps, etc.)	C93600						
speed reducers	C90700	C90800					
spur gears	C95400	C95410					
statuary	C97300						
steam castings	C91600						
steam fittings	C90300	C90500	C92700	C96400			
steel mill bushings	C93600						
stops	C84800						

Continuous-cast application cross reference continued

Application	Recommended alloys (copper alloy UNS no.)						
stripped nuts	C95300						
structural castings	C92300	C94800					
structural parts	C86200						
struts	C86200	C86300	C86500				
stuffing box nuts	C95500						
switches	C86300	C86400					
swivel	C90300						
tees	C84200						
terminals	C95600						
thrust bearings	C93400						
thrust block	C94100						
thrust pads	C95200						
thrust washers	C93200						
transducer housings	C83600						
trowels for cement working	C83600						
trunnion bearings	C93200						
unions	C84200						
valve bodies	C83600 C95300	C90300 C95400	C90500 C95500	C90700 C95800	C91300	C92300	C95200
valve bodies for the water industry	C84400						
valve bodies for the water meter industry	C83600						
valve bodies for water	C87850						
valve components	C92200	C94700	C95410	C95500			
valve guides	C95400	C95500					
valve seat	C84400	C95200	C95400	C95500			
valve stems	C86200	C86400	C86700	C95600	C99500		
valves	C83600 C97300	C83800 C97600	C84400 C97800	C90300	C90500	C95200	C95400
valves for the water meter industry	C83600						
valves for water meters	C84400	C92200					
valves in contact with sea water	C95800						
washers	C84800	C89320	C93200	C93400			
washers for engines	C93700						
water conditioners	C90500						
water meter cases	C87850						
water pump bushings	C93200						
water pump impellers	C89835						
wear guides	C94700						
wear plates	C92900	C95200	C95500	C95800			
wear rings for forming dies for wood pulp industry	C86300						
wear rings for pressing dies for wood pulp industry	C86200	C86500					
wearing material for rod bushings	C93800						
wearing material for shoes	C93800						
wearing material for wedges	C93800						
weld guns	C86500	C95400					
welding jaws	C95200	C95300	C95500				
window hardware	C85700	C86400	C95500	C97600			
worm drives	C95900						
worm gears	C86200 C95400	C90500	C90700	C90800	C90810	C91700	C92900
worm wheels	C90700	C91700	C95200	C95500	C95800		
worms	C95200	C95410	C95500	C95600	C95800		
wrist pin bushings	C89320	C93600					

Continuous-cast hardness ratings

Copper alloy UNS no.	Product description	Hardness type	Typical or minimum	Hardness
C94300	High-leaded tin bronze	Brinell 500 kg load	Typical	45
C94100	High-leaded tin bronze	Brinell 500 kg load	Typical	50
C89520	Bismuth tin bronze	Brinell 500 kg load	Minimum	54
C84400	Leaded semi-red brass	Brinell 500 kg load	Typical	55
C84800	Leaded semi-red brass	Brinell 500 kg load	Typical	55
C89831	Bismuth tin bronze	Brinell 500 kg load	Typical	55
C89844	Bismuth tin bronze	Brinell 500 kg load	Typical	55
C93800	High-leaded tin bronze	Brinell 500 kg load	Typical	55
C97300	Nickel silver bronze	Brinell 500 kg load	Typical	55
C83600	Leaded red brass	Brinell 500 kg load	Typical	60
C83800	Leaded red brass	Brinell 500 kg load	Typical	60
C84200	Leaded semi-red brass	Brinell 500 kg load	Typical	60
C89833	Bismuth tin bronze	Brinell 500 kg load	Typical	60
C93400	High-leaded tin bronze	Brinell 500 kg load	Typical	60
C93500	High-leaded tin bronze	Brinell 500 kg load	Typical	60
C93700	High-leaded tin bronze	Brinell 500 kg load	Typical	60
C93900	High-leaded tin bronze	Brinell 500 kg load	Typical	63
C89835	Bismuth tin bronze	Brinell 500 kg load	Typical	65
C92200	Leaded tin bronze	Brinell 500 kg load	Typical	65
C93200	Leaded tin bronze	Brinell 500 kg load	Typical	65
C93600	High-leaded tin bronze	Brinell 500 kg load	Typical	65
C89320	Bismuth tin bronze	Brinell 500 kg load	Typical	70
C90300	Tin bronze	Brinell 500 kg load	Typical	70
C92300	Leaded tin bronze	Brinell 500 kg load	Typical	70
C89325	Bismuth tin bronze	Brinell 500 kg load	Typical	73
C85700	Leaded yellow brass	Brinell 500 kg load	Typical	75
C90500	Tin bronze	Brinell 500 kg load	Typical	75
C92900	Leaded nickel-tin bronze	Brinell 500 kg load	Typical	75
C92700	Leaded tin bronze	Brinell 500 kg load	Typical	77
C92500	Nickel-phosphor bronze	Brinell 500 kg load	Typical	80
C94000	High-leaded tin bronze	Brinell 500 kg load	Typical	80
C94800	Leaded nickel-tin bronze	Brinell 500 kg load	Typical	80
C97600	Nickel silver bronze	Brinell 500 kg load	Typical	80
C91600	High tin bronze	Brinell 500 kg load	Typical	85
C94700	Nickel-tin bronze	Brinell 500 kg load	Typical	85
C86400	Manganese bronze	Brinell 500 kg load	Typical	90
C90800	Tin bronze	Brinell 500 kg load	Typical	95
C90810	Tin bronze	Brinell 500 kg load	Typical	95
C91700	High tin bronze	Brinell 500 kg load	Typical	95
C90700	Tin bronze	Brinell 500 kg load	Typical	102
C87850	Silicon brass	Brinell 500 kg load	Minimum	103
C91000	Tin bronze	Brinell 500 kg load	Typical	105
C92800	Leaded tin bronze	Rockwell "B"	Minimum	72*
C95300	Aluminum bronze	Brinell 3000 kg load	Typical	125
C95200	Aluminum bronze	Brinell 3000 kg load	Typical	125
C86500	Manganese bronze	Brinell 3000 kg load	Typical	130
C97800	Nickel silver bronze	Brinell 3000 kg load	Typical	130
C95300HT	Aluminum bronze	Brinell 3000 kg load	Typical	132
C91100	High tin bronze	Brinell 3000 kg load	Typical	135
C95600	Nickel-aluminum bronze	Brinell 3000 kg load	Typical	140

*Brinell equivalent 114 (500 kg load). Note: HT = heat treated.

Continuous-cast hardness ratings continued

Copper alloy UNS no.	Product description	Hardness type	Typical or minimum	Hardness
C96400	Copper-nickel	Brinell 3000 kg load	Typical	140
C99500	Special alloy	Brinell 500 kg load	Typical	145
C86700	Manganese bronze	Brinell 3000 kg load	Typical	155
C95800	Nickel-aluminum bronze	Brinell 3000 kg load	Typical	159
C91300	Tin bronze	Brinell 3000 kg load	Typical	160
C95400	Aluminum bronze	Brinell 3000 kg load	Typical	170
C95410	Aluminum bronze	Brinell 3000 kg load	Typical	170
C95400HT	Aluminum bronze	Brinell 3000 kg load	Typical	177
C95410HT	Aluminum bronze	Brinell 3000 kg load	Typical	177
C86200	Manganese bronze	Brinell 3000 kg load	Typical	180
C94700HT	Nickel-tin bronze	Brinell 3000 kg load	Typical	180
C95510 (AMS 4880)	Nickel-aluminum bronze	Brinell 3000 kg load	Minimum	192
C95500	Nickel-aluminum bronze	Brinell 3000 kg load	Typical	208
C86300	Manganese bronze	Brinell 3000 kg load	Typical	223
C95500HT	Nickel-aluminum bronze	Brinell 3000 kg load	Typical	228
C95900	Aluminum bronze	Brinell 3000 kg load	Minimum	241
C95520HT	Nickel-aluminum bronze	Brinell 3000 kg load	Minimum	262
C96900HT	Nickel-tin bronze	Rockwell "C"	Minimum	32*
CONCAST380	Aluminum bronze	Brinell 3000 kg load	Minimum	340

*Brinell equivalent 301 (3000 kg load). Note: HT = heat treated.

Continuous-cast machinability ratings

Copper alloy UNS no.	Product description	Machinability
C83800	Leaded red brass	90
C84400	Leaded semi-red brass	90
C84800	Leaded semi-red brass	90
C89520	Bismuth tin bronze	85
C89831	Bismuth tin bronze	85
C83600	Leaded red brass	84
C89833	Bismuth tin bronze	81
C84200	Leaded semi-red brass	80
C85700	Leaded yellow brass	80
C89320	Bismuth tin bronze	80
C89325	Bismuth tin bronze	80
C93600	High-leaded tin bronze	80
C93700	High-leaded tin bronze	80
C93800	High-leaded tin bronze	80
C93900	High-leaded tin bronze	80
C94000	High-leaded tin bronze	80
C94100	High-leaded tin bronze	80
C94300	High-leaded tin bronze	80
C87850	Silicon brass	70
C89835	Bismuth tin bronze	70
C89844	Bismuth tin bronze	70
C92800	Leaded tin bronze	70
C93200	Leaded tin bronze	70
C93400	High-leaded tin bronze	70
C93500	High-leaded tin bronze	70
C97300	Nickel silver bronze	70
C97600	Nickel silver bronze	70
C86400	Manganese bronze	65
C95400	Aluminum bronze	60
C95400HT	Aluminum bronze	60
C95410	Aluminum bronze	60
C95410HT	Aluminum bronze	60
C95600	Nickel-aluminum bronze	60

Copper alloy UNS no.	Product description	Machinability
C97800	Nickel silver bronze	60
C86700	Manganese bronze	55
C95300	Aluminum bronze	55
C95300HT	Aluminum bronze	55
C94800	Leaded nickel-tin bronze	50
C95500	Nickel-aluminum bronze	50
C95500HT	Nickel-aluminum bronze	50
C95510 (AMS 4880)	Nickel-aluminum bronze	50
C99500	Special alloy	50
C92700	Leaded tin bronze	45
C95520HT	Nickel-aluminum bronze	45
C92200	Leaded tin bronze	42
C92300	Leaded tin bronze	42
C92900	Leaded nickel-tin bronze	40
C86200	Manganese bronze	30
C90300	Tin bronze	30
C90500	Tin bronze	30
C92500	Nickel phosphor bronze	30
C86500	Manganese bronze	26
C90700	Tin bronze	20
C90810	High tin bronze	20
C91000	Tin bronze	20
C91600	High tin bronze	20
C91700	High tin bronze	20
C94700	Nickel-tin bronze	30
C94700HT	Nickel-tin bronze	30
C95200	Aluminum bronze	20
C95800	Nickel-aluminum bronze	20
C96400	Copper-nickel	20
C91100	High tin bronze	10
C91300	Tin bronze	10
C95900	Aluminum bronze	10
C86300	Manganese bronze	8

Note: HT = heat treated.

Corrosion ratings of continuous-cast copper alloys in various media

Ratings: A = Recommended B = Acceptable C = Not recommended

Corrosive medium	Copper	Tin bronze	Leaded tin bronze	High-leaded tin bronze	Leaded red brass	Leaded semi-red brass	Leaded yellow brass	Leaded high-strength yellow brass	High-strength yellow brass	Aluminum bronze	Leaded nickel brass	Leaded nickel bronze	Silicon bronze	Silicon brass
Acetate solvents	B	A	A	A	A	A	B	A	A	A	A	A	A	B
Acetic acid														
20%	A	C	B	C	B	C	C	C	C	A	C	A	A	B
50%	A	C	B	C	B	C	C	C	C	A	C	B	A	B
Glacial	A	A	A	C	A	C	C	C	C	A	B	B	A	A
Acetone	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Acetylene[1]	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Alcohols[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Aluminum chloride	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Aluminum sulfate	B	B	B	B	B	C	C	C	C	A	C	C	A	A
Ammonia, moist gas	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Ammonia, moisture-free	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ammonium chloride	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Ammonium hydroxide	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Ammonium nitrate	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Ammonium sulfate	B	B	B	B	B	C	C	C	C	A	C	C	A	A
Aniline and aniline dyes	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Asphalt	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Barium chloride	A	A	A	A	A	C	C	C	C	A	A	A	A	C
Barium sulfide	C	C	C	C	C	C	C	C	B	C	C	C	C	C
Beer[2]	A	A	B	B	B	C	C	C	A	A	C	A	A	B
Beet sugar syrup	A	A	B	B	B	A	A	A	B	A	A	A	B	B
Benzine	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Benzol	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Boric acid	A	A	A	A	A	A	B	A	A	A	A	A	A	A
Butane	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Calcium bisfulfite	A	A	B	B	B	C	C	C	C	A	B	A	A	B
Calcium chloride, acid	B	B	B	B	B	B	C	C	C	A	C	C	A	C
Calcium chloride, alkaline	C	C	C	C	C	C	C	C	C	A	C	A	C	B
Calcium hydroxide	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Calcium hypochlorite	C	C	B	B	B	C	C	C	C	B	C	C	C	C
Cane sugar syrups	A	A	B	A	B	A	A	A	A	A	A	A	A	B
Carbonated beverages	A	C	C	C	C	C	C	C	C	A	C	C	A	C
Carbon dioxide, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Carbon dioxide, moist[2]	B	B	B	C	B	C	C	C	C	A	C	A	A	B
Carbon tetrachloride, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Carbon tetrachloride, moist	B	B	B	B	B	B	B	B	B	B	B	A	A	A
Chlorine, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Chlorine, moist	C	C	B	B	B	C	C	C	C	C	C	C	C	C
Chromic, acid	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Citruc, acid	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Copper sulfate	B	A	A	A	A	C	C	C	C	B	B	B	A	A

[1]Acetylene forms an explosive compound with copper when moist or when certain impurities are present and the gas is under pressure. Alloys containing less than 65% Cu are satisfactory under this use. When gas is not under pressure other copper alloys are satisfactory.
[2]Copper and copper alloys resist corrosion by most food products. Traces may be dissolved and allect taste or color. In such cases, copper metals are often tin coated.

Corrosion ratings of continuous-cast copper alloys in various media continued

Ratings: A = Recommended B = Acceptable C = Not recommended

Corrosive medium	Copper	Tin bronze	Leaded tin bronze	High-leaded tin bronze	Leaded red brass	Leaded semi-red brass	Leaded yellow brass	Leaded high-strength yellow brass	High-strength yellow brass	Aluminum bronze	Leaded nickel brass	Leaded nickel bronze	Silicon bronze	Silicon brass
Cottonseed oil[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Creosole	B	B	B	B	B	C	C	C	C	A	B	B	B	B
Ethers	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ethylene glycol	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ferric chloride, sulfate	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Ferrous chloride, sulfate	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Formaldehyde	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Formic acid	A	A	A	A	A	B	B	B	B	A	B	B	B	C
Freon	A	A	A	A	A	A	A	A	A	A	A	A	A	B
Fuel oil	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Furfural	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gasoline	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gelatin[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Glucose	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Glue	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Glycerin	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Hydrochloric or muriatic acid	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Hydrofluoric acid	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Hydrofluosilicic acid	B	B	B	B	B	C	C	C	C	B	C	C	B	C
Hydrogen	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Hydrogen peroxide	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrogen sulfide, dry	C	C	C	C	C	C	C	C	C	B	C	C	B	C
Hydrogen sulfide, moist	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Lacquers	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Lacquer thinners	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Lactic acid	A	A	A	A	A	C	C	C	C	A	C	C	A	C
Linseed oil	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Liquors														
Black	B	B	B	B	B	C	C	C	C	B	C	C	B	B
Green	C	C	C	C	C	C	C	C	C	B	C	C	C	B
White	C	C	C	C	C	C	C	C	C	A	C	C	C	B
Magnesium chloride	A	A	A	A	A	C	C	C	C	A	C	C	A	B
Magnesium hydroxide	B	B	B	B	B	B	B	B	B	A	B	B	B	B
Magnesium sulfate	A	A	A	A	B	C	C	C	C	A	C	B	A	B
Mercury and mercury salts	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Milk[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Mosasses[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Natural gas	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nickel chloride	A	A	A	A	A	C	C	C	C	B	C	C	A	C
Nickel sulfate	A	A	A	A	A	C	C	C	C	A	C	C	A	C
Nitric acid	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Oleic acid	A	A	B	B	B	C	C	C	C	A	C	A	A	B
Oxalic acid	A	A	B	B	B	C	C	C	C	A	C	A	A	B
Phosphoric acid	A	A	A	A	A	C	C	C	C	A	C	A	A	A
Picric acid	C	C	C	C	C	C	C	C	C	C	C	C	C	C

[2]Copper and copper alloys resist corrosion by most food products. Traces may be dissolved and allect taste or color. In such cases, copper metals are often tin coated.

Corrosion ratings of continuous-cast copper alloys in various media continued

Ratings: A = Recommended B = Acceptable C = Not recommended

Corrosive medium	Copper	Tin bronze	Leaded tin bronze	High-leaded tin bronze	Leaded red brass	Leaded semi-red brass	Leaded yellow brass	Leaded high-strength yellow brass	High-strength yellow brass	Aluminum bronze	Leaded nickel brass	Leaded nickel bronze	Silicon bronze	Silicon brass
Potassium chloride	A	A	A	A	A	C	C	C	C	A	C	C	A	C
Potassium cyanide	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Potassium hydroxide	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Potassium sulfate	A	A	A	A	A	C	C	C	C	A	C	C	A	C
Propane gas	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sea water	A	A	A	A	A	C	C	C	C	A	C	C	B	B
Soap solutions	A	A	A	A	B	C	C	C	C	A	C	C	A	C
Sodium bicarbonate	A	A	A	A	A	A	A	A	A	A	A	A	A	B
Sodium bisulfate	C	C	C	C	C	C	C	C	C	A	C	C	C	C
Sodium carbonate	C	A	A	A	A	C	C	C	C	A	C	C	C	A
Sodium chloride	A	A	A	A	A	B	C	C	C	A	C	C	A	C
Sodium cyanide	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Sodium hydroxide	C	C	C	C	C	C	C	C	C	A	C	C	C	C
Sodium hypochlorite	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sodium nitrate	B	B	B	B	B	B	B	B	B	A	B	B	A	A
Sodium peroxide	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Sodium phosphate	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium sulfate, silicate	A	A	B	B	B	B	C	C	C	A	C	C	A	B
Sodium sulfide, thiosulfate	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Stearic acid	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sulfur, solid	C	C	C	C	C	C	C	C	C	A	C	C	C	C
Sulfur chloride	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sulfur dioxide, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sulfur dioxide, moist	A	A	A	B	B	C	C	C	C	A	C	C	A	B
Sulfur trioxide, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sulfuric acid														
78% or less	B	B	B	B	B	C	C	C	C	A	C	C	B	B
78% to 90%	C	C	C	C	C	C	C	C	C	B	C	C	C	C
90% to 95%	C	C	C	C	C	C	C	C	C	B	C	C	C	C
Fuming	C	C	C	C	C	C	C	C	C	A	C	C	C	C
Tannic acid	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Tartaric acid	B	A	A	A	A	A	A	A	A	A	A	A	A	A
Toluene	B	B	A	A	A	B	B	B	B	B	B	B	B	A
Trichlorethylene, dry	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Trichlorethylene, moist	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Turpentine	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Varnish	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Vinegar	A	A	B	B	B	C	C	C	C	B	C	C	A	B
Water, acid mine	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Water, condensate	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Water, potable	A	A	A	A	A	A	B	B	B	A	A	A	A	A
Whiskey[2]	A	A	C	C	C	C	C	C	C	A	C	C	A	C
Zinc chloride	C	C	C	C	C	C	C	C	C	B	C	C	B	C
Zinc sulfate	A	A	A	A	A	C	C	C	C	B	C	A	A	C

[2]Copper and copper alloys resist corrosion by most food products. Traces may be dissolved and allect taste or color. In such cases, copper metals are often tin coated.

Extruded or cast and drawn product chemical composition

Copper alloy UNS no.	ASTM spec	AMS spec	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)	As (%)	Te (%)
C14500*	B301		Tellurium copper	99.90 min[3]					0.004-0.012								0.40-0.70
C23000	B927		Red brass 85%	84.00-86.00	0.05		Rem.	0.05									
C24000	B927		Low brass 80%	78.50-81.50	0.05		Rem.	0.05									
C26000	B927		Cartridge brass 70%	68.50-71.50	0.07		Rem.	0.05									
C31400*	B140		Leaded commercial bronze	87.50-90.50	1.30-2.50		Rem.	0.10		0.70							
C31600	B140		Leaded commercial bronze (nickel-bearing)	87.50-90.50	1.30-2.50		Rem.	0.10	0.04-0.10	0.70-1.20							
C46400	B21		Naval brass, uninhibited	59.00-62.00	0.20	0.50-1.00	Rem.	0.10									
C51000*	B139	4625	Phosphor bronze 5% A	Rem.	0.05	4.20-5.80	0.30	0.10	0.03-0.35								
C52100	B139		Phosphor bronze 8% A	Rem.	0.05	7.00-9.00	0.20	0.10	0.03-0.35								
C53400	B139		Phosphor bronze B-1	Rem.	0.08-1.20	3.50-5.80	0.30	0.10	0.03-0.35								
C54400*	B139		Phosphor bronze B-2	Rem.	3.00-4.00	3.50-4.50	1.50-4.50	0.10	0.01-0.50								
C62400	B150		Aluminum bronze 11%	Rem.		0.20		2.00-4.50			10.00-11.50			0.30	0.25		
C63000*	B150	4640	Nickel-aluminum bronze	Rem.		0.20	0.30	2.00-4.00		4.00-5.50[2]	9.00-11.00			1.50	0.25		
C63020*	B150	4590	Nickel-aluminum bronze	Rem.	0.03	0.25	0.30	4.00-5.50		4.20-6.00	10.00-11.00	0.20	0.05	1.50	0.15		
C64200*	B150	4634	Aluminum bronze	Rem.	0.05	0.20	0.50	0.30		0.25[2]	6.30-7.60			0.10	1.50-2.20	0.09	

*Standard-stocked alloy. [1]Cu value includes Ag. [2]Ni value includes Co. [3]Includes tellurium and phosphorus
Note: Unless otherwise noted, single values represent maximums.

Extruded or cast and drawn product chemical composition continued

Copper alloy UNS no.	ASTM spec	AMS spec	Product description	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[2]	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)	As (%)	Te (%)
C64210	B150		Aluminum silicon bronze	Rem.[1]	0.05	0.20	0.50	0.30		0.25[2]	6.30-7.60			0.10	1.50-2.00	0.09	
C65100	B98		Low-silicon bronze B	Rem.[1]	0.05		1.50	0.80						0.70	0.80-2.00		
C67300*†			Manganese bronze	58.00-63.00[1]	0.40-3.00	0.30	Rem.	0.50		0.25[2]	0.25			2.00-3.50	0.50-1.50		
C67400†			Manganese bronze	57.00-60.00	0.50	0.30	Rem.	0.35		0.25[2]	0.50-2.00			2.00-3.50	0.50-1.50		
C67410			Manganese bronze	55.00-59.00[1]	0.80	0.50	Rem.	1.00		2.00	1.30-2.30			1.00-2.40	0.70-1.30		
C67600	B138		Manganese bronze	57.00-60.00[1]	0.50-1.00	0.50-1.50	Rem.	0.40-1.30						0.05-0.50			
C69300	B371		Lead-free brass	73.00-77.00[1]	0.02[A]-0.09	0.20	Rem.	0.10	0.04-0.15	0.10				0.10	2.70-3.40		
C69400	B371		Silicon red bronze	80.00-83.00[1]	0.30		Rem.	0.20							3.50-4.50		
C69430	B371		Silicon red bronze	80.00-83.00[1]	0.30		Rem.	0.20							3.50-4.50	0.03-0.06	
C72900*[B]		4596	Copper nickel-tin bronze	Rem.	0.02	7.50-8.50	0.50	0.50		14.50-15.50[2]				0.30			
C72900*[B]		4597	Copper nickel-tin bronze	Rem.	0.02	7.50-8.50	0.50	0.50		14.50-15.50[2]				0.30			
C72900*[B]		4598	Copper nickel-tin bronze	Rem.	0.02	7.50-8.50	0.50	0.50		14.50-15.50[2]				0.30			

*Standard-stocked alloy. †SAE J463 specification. [1]Cu value includes Ag. [2]Ni value includes Co. [A]Pb content is greater than 0.02%. [B]Chemical requirements for other elements: Cb 0.10%, max and Mg 0.15%, max.
Note: Single values represent maximums.

Extruded or cast and drawn typical uses

Copper alloy UNS no.	Product description	Architecture	Automotive	Builders hardware	Consumer	Electrical	Fasteners	Industrial	Marine	Ordnance	Other	Plumbing
C14500	Tellurium copper	fire protection				electrical connectors, motor parts, soldering copper, switch parts, transistor bases		forgings, furnace brazed articles, screw machine products, soldering tips, welding torch tips				fixtures, plumbing fittings, sprinkler heads
C23000	Red brass 85%	etching parts, trim, weather strip		kick plates	badges, coinage, compacts, costume jewelry, dials, fire extinguisher cases, lipstick containers, medallions, nameplates, plaques, rouge boxes, tokens, zippers	conduit, rotor bars (AC motors), screw shells, sockets	eyelets, fasteners	condensor tubes, fire extinguishers, flexible metal hose, heat exchanger shells, heat exchangers, pickling crates, pump cylinder liners, radiator cores, tags, tubing for heat exchangers, tubing for instrumentation			fire hose couplings	fittings, j-bends, pipe, pipe nipples, pipe service lines, pump lines, service lines, traps
C24000	Low brass 80%	medallions, ornamental components, spandrels		decorative panels	clock dials, musical instrument parts, plaques	battery caps, rotor bars for AC motors		flexible hose, flexible hose bellows, pump lines, welding wire			tokens	
C26000	Cartridge brass 70%	grillwork	odometer contacts, heater cores, thermostats, electrical connectors, radiator cores, radiator tube, radiator tanks, tanks	locks, push plates, finish hardware, kick plates, decorative hardware, door knobs, hinges	snaps, planters, fireplace screens, etched articles, bird cages, coinage, chain links, pen/pencil inserts and clips, syringe parts, watch parts, costume jewelry, buttons, shells, electrical sockets, lamps	terminal connectors, flashlight shells, lamp fixtures, reflectors, screw shells	pins, rivets, fasteners, grommets, eyelets, screws	air pressure conveyer systems, sound proofing equipment, springs, chain, bead chain, tubing for instruments and machines, heat exchangers, pump cylinders, wire screens, pumps, liners, power cylinders		ammunition cartridge cases, mechanical housings for lighters, mechanical housings for ammunition, ammunition	stencils, washers	fittings, bathroom fixtures, plumbing accessories, faucet escutcheons, traps, plumbing brass goods
C31400	Leaded commercial bronze			door knobs		electrical plug type connectors, connectors for wire and cable	nuts, screws	pickling crates, pickling fixtures, pickling racks, screw machine parts				
C31600	Leaded commercial bronze (nickel-bearing)			hardware		connectors	fasteners, nuts, screws	screw machine parts				
C46400	Naval brass, uninhibited			lock pins		precision shipboard equipment	bolts, nuts, rivets	aircraft turnbuckle barrels, balls, bearings, bushings, condenser plates, dies for golf ball production, heat exchanger tubes, hub cones, pressure vessels, structural uses, valve stems, welding rod	decorative fittings, hardware, propeller shafts, shafting, turnbuckles	missile components	baffle plates and flanges	fittings
C51000	Phosphor bronze 5% A	bridge bearing plates				resistance wire, fuse clips, electromechanical spring components, electrical flexing contact blades, electrical connectors, electronic connectors, wire brushes, switch parts, electronic and precision instrument parts	fasteners, cotter pins, lock washers	bourdon tubes, bellows, perforated sheets, chemical hardware, truss wire, springs, sleeve bushings, diaphragms, clutch disks, pressure responsive elements, beater bar, textile machinery, welding rods				

Extruded or cast and drawn typical uses continued

Copper alloy UNS no.	Product description	Aerospace	Architecture	Automotive	Builders hardware	Consumer	Electrical	Fasteners	Industrial	Marine	Other	Plumbing
C52100	Phosphor bronze 8% C		bridge bearing plates		thermostat bellows	power conductor for electro-surgical pencil, coinage, cymbals	electronic connectors, electrical connectors, cold headed parts, electrical flexing contact blades, electrical flexing contact blades, wire brushes, switch parts, fuse clips	cotter pins, fasteners, heavy duty, lock washers	cold headed parts, thrust bearings, truss wire, pneumatic hammers, doctor blades, paper industry, bourdon tubing, well drill equipment, clutch disks, welding wire, diaphragms, beater bar, bellows, springs, helical extension, springs, helical torsion, clips, heavy duty, gears, pinions, textile machinery, perforated sheets, chemical hardware, springs, heavy duty, sleeve bushings	marine parts		
C53400	Phosphor bronze B-1								bushings, bearings, fasteners			
C54400	Phosphor bronze B-2						electrical connectors		bushings, gears, pinions, screw machine products, thrust washers, valve parts, sleeve bearings, thrust bearings, bearings, shafts			
C62400	Aluminum bronze 11%							nuts	bushings, cams, drift pins, gears, hydraulic bushings, support bushings, tie rods, valve balls, wear plates, welding wire			
C63000 (AMS 4640)	Nickel-aluminum bronze								balls, bearings, bushings, cams, condenser tube for power stations and desalting units, corrosion resistant articles, gears, heat exchanger flanges, hydraulic bushings for earth moving equipment, plunger tips, pump parts, pump shafts, shafting, structural members, tanks, valve balls, valve guides, valve seats, welded piping systems	nuts, propellers, pump parts, bolts, ship propellers		faucets
C63020 (AMS 4590)	Nickel-aluminum bronze	bushings, gears							bearings, forming dies for roll bearings, hydraulic bushings for earth moving equipment, valve balls, valve parts- cryogenic, dies			
C64200 (AMS 4634)	Aluminum bronze			valve guides, automobile engine			pole line hardware	bolts, nuts	cams, gears, valve bodies, valve components, valve stems	hardware		
C64210	Aluminum silicon bronze						pole line hardware		bushings, aircraft, valve bodies, valve stems, pickling equipment, bearings, high-strength/corrosion-resistant chemical process equipment	nuts, bolts, lock washers, screws		
C65100	Low-silicon bronze B						conduit, pole line hardware, motor, rotor bars	bolts, cable clamps, cap screws, machine screws, nuts, rivets, u bolts, fasteners, screws	oil refinery plumbing tube, heat exchanger tube, welding rod, hydraulic pressure lines	hardware		
C67300	Manganese bronze							fasteners, lead screw nuts	bearings, bushings, drive shafts, gears/cams, idler pins, piston heads, propeller shafts, pump parts, seal rings, shaft bushings, sleeve bearings, spindles, thrust bearings, wear plates, clutch bearings	hardware, valve seats	connecting rods	
C67400	Manganese bronze								bushings, cams, chain guides, food conveyor chain, gears, shafts, wear plates		connecting rods	

Extruded or cast and drawn typical uses continued

Copper alloy UNS no.	Product description	Aerospace	Automotive	Electrical	Industrial	Marine	Oil and gas	Other
C67410	Manganese bronze				bushings, cams, chain guides, food conveyor chain, gears, shafts, wear plates			connecting rods
C67600	Manganese bronze				gate valve stems, valve balls, welding rod			
C69300	Lead-free brass		fluid connectors, sensor bodies, thermostat parts					
C69400	Silicon red brass				valve stems			
C69430	Silicon red brass				valve stems			
C72900 (AMS 4596)	Copper nickel-tin bronze	landing gear bushings and bearings, control surface and actuator bushings and bearings, wing flap bearings, wheel bearings, brakes, door hardware, hydraulic actuators, valves, steering joints, helicopter controls, compression fit airframe fasteners, electronic system connectors		connectors, contacts, controls, miniaturized sockets, relay elements, switches	springs, wire	marine components	bushings, bearings, drilling components, sucker rod, valve guide bushing couplings	
C72900 (AMS 4597)	Copper nickel-tin bronze	landing gear bushings and bearings, control surface and actuator bushings and bearings, wing flap bearings, wheel bearings, brakes, door hardware, hydraulic actuators, valves, steering joints, helicopter controls, compression fit airframe fasteners, electronic system connectors		connectors, contacts, controls, miniaturized sockets, relay elements, switches	springs, wire	marine components	bushings, bearings, drilling components, sucker rod, valve guide bushing couplings	
C72900 (AMS 4598)	Copper nickel-tin bronze	landing gear bushings and bearings, control surface and actuator bushings and bearings, wing flap bearings, wheel bearings, brakes, door hardware, hydraulic actuators, valves, steering joints, helicopter controls, compression fit airframe fasteners, electronic system connectors		connectors, contacts, controls, miniaturized sockets, relay elements, switches	springs, wire	marine components	bushings, bearings, drilling components, sucker rod, valve guide bushing couplings	

Extruded or cast and drawn hardness ratings

Copper alloy UNS no.	Product description	Temper	Hardness type	Typical or min. or max.	Hardness
C14500	Tellurium copper	H02, H04	Brinell 500 kg load	Typical	H02-76, H04-81
C23000	Red brass 85%				
C24000	Low brass 80%	H01, H02, H04	Rockwell "B"	Typical	H01-55, H02-70, H04-82
C26000	Cartridge brass 70%	H01, H02, H04	Rockwell "B"	Typical	H01-55, H02-70, H04-82
C31400	Leaded commercial bronze	H02	Rockwell "B"	Typical	61
C31600	Leaded commercial bronze*	H04	Rockwell "B"	Typical	61
C46400	Naval brass, uninhibited	H02	Rockwell "B"	Min. to max.	55-80
C51000	Phosphor bronze 5% A	H04, H08	Rockwell "B"	Typical	87
C52100	Phosphor bronze 8% C	H04	Rockwell "B"	Typical	93
C53400	Phosphor bronze B-1	H04	Rockwell "B"	Typical	86
C54400	Phosphor bronze B-2	H04	Rockwell "B"	Typical	80
C62400	Aluminum bronze 11%				
C63000 (AMS 4640)	Nickel-aluminum bronze	HR50, TQ50	Brinell 3000 kg load	Min. to max.	187-248
C63020 (AMS 4590)	Nickel-aluminum bronze	TQ50	Rockwell "C"	Min.	26
C64200 (AMS 4634)	Aluminum bronze	HR50	Rockwell "B"	Min.	80
C64210	Aluminum silicon bronze	HR50	Rockwell "B"	Min. to max.	65-100
C65100	Low-silicon bronze B	H02, H04, H06	Rockwell "B"	Min. to max.	60-95
C67300	Manganese bronze	H02	Rockwell "B"	Min.	65
C67400	Manganese bronze		Rockwell "B"	Min.	78
C67410	Manganese bronze				
C67600	Manganese bronze	H02, H04	Rockwell "B"	Typical	90
C69300	Lead-free brass	H02	Rockwell "B"	Max.	85
C69400	Silicon red brass	H02, H04	Rockwell "B"	Typical	95
C69430	Silicon red brass	H02, H04	Rockwell "B"	Typical	95
C72900 (AMS 4596)	Copper nickel-tin bronze	TX 00	Rockwell "C"	Min.	30
C72900 (AMS 4597)	Copper nickel-tin bronze	TX TS	Rockwell "C"	Min.	34
C72900 (AMS 4598)	Copper nickel-tin bronze	TX 00	Rockwell "C"	Min.	30

*(nickel-bearing).

Extruded or cast and drawn machinability ratings

Copper alloy UNS no.	Product description	Machinability
C14500	Tellurium copper	85
C69300	Lead-free brass	85
C31400	Leaded commercial bronze	80
C31600	Leaded commercial bronze (nickel-bearing)	80
C54400	Phosphor bronze B-2	80
C67410	Manganese bronze	80
C53400	Phosphor bronze B-1	70
C67300	Manganese bronze	70
C64200 (AMS 4634)	Aluminum bronze	60
C64210	Aluminum silicon bronze	60
C67600	Manganese bronze	60
C62400	Aluminum bronze 11%	50
C23000	Red brass 85%	30
C24000	Low brass 80%	30
C26000	Cartridge brass 70%	30
C46400	Naval brass, uninhibited	30
C63000 (AMS 4640)	Nickel aluminum bronze	30
C65100	Low-silicon bronze B	30
C67400	Manganese bronze	30
C69400	Silicon red brass	30
C69430	Silicon red brass	30
C51000	Phosphor bronze 5% A	20
C52100	Phosphor bronze 8% C	20
C63020 (AMS 4590)	Nickel aluminum bronze	
C72900 (AMS 4596)	Copper nickel-tin bronze	
C72900 (AMS 4597)	Copper nickel-tin bronze	
C72900 (AMS 4598)	Copper nickel-tin bronze	

Lead-free hardness ratings

Copper alloy UNS no.	Product description	Temper	Hardness type	Typical or min. or max.	Hardness
C89831	Bismuth tin bronze	M07	Brinell 500 kg load	Typical	55
C89844	Bismuth tin bronze	M07	Brinell 500 kg load	Typical	55
C89833	Bismuth tin bronze	M07	Brinell 500 kg load	Typical	60
C89835	Bismuth tin bronze	M07	Brinell 500 kg load	Typical	65
C90300	Tin bronze	M07	Brinell 500 kg load	Typical	70
C89325	Bismuth tin bronze	M07	Brinell 500 kg load	Typical	73
C69300	Lead-free brass	H02	Rockwell "B" hardness	Max.	80
C90800	Tin bronze	M07	Brinell 500 kg load	Typical	95
C90810	High tin bronze	M07	Brinell 500 kg load	Typical	95
C87850	Silicon brass	M07	Brinell 500 kg load	Min.	103
C95400	Aluminum bronze	M07	Brinell 3000 kg load	Typical	170
C95400HT	Aluminum bronze	TQ50	Brinell 3000 kg load	Typical	177
C95500	Nickel-aluminum bronze	M07	Brinell 3000 kg load	Typical	208
C95500HT	Nickel-aluminum bronze	TQ50	Brinell 3000 kg load	Typical	228
C95900	Aluminum bronze	M07	Brinell 3000 kg load	Min.	241

Note: HT = heat treated.

Lead-free machinability ratings

Copper alloy UNS no.	Product description	Machinability
C69300	Lead-free brass	85
C89831	Bismuth tin bronze	85
C89833	Bismuth tin bronze	81
C89325	Bismuth tin bronze	80
C87850	Silicon brass	70
C89835	Bismuth tin bronze	70
C89844	Bismuth tin bronze	70
C90300	Tin bronze	60
C95400	Aluminum bronze	60
C95400HT	Aluminum bronze	50
C95500	Nickel-aluminum bronze	50
C95500HT	Nickel-aluminum bronze	30
C90800	Tin bronze	20
C90810	High tin bronze	20
C95900	Aluminum bronze	10

Note: HT = heat treated.

Chemical symbols for elements

Chemical element	Symbol
Aluminum	Al
Antimony	Sb
Arsenic	As
Berylium	Be
Bismuth	Bi
Boron	B
Cadmium	Cd
Calcium	Ca
Carbon	C
Chromium	Cr
Cobalt	Co
Copper	Cu
Iron	Fe
Lead	Pb
Lithium	Li

Chemical element	Symbol
Magnesium	Mg
Manganese	Mn
Mercury	Hg
Nickel	Ni
Niobium/Columbium	Nb/Cb
Phosphorous	P
Selenium	Se
Silicon	Si
Silver	Ag
Sulfur	S
Tellurium	Te
Titanium	Ti
Tin	Sn
Zinc	Zn
Zirconium	Zr

Marketing assets

Marketing assets

Included in this section:

- 500 Series Brochure
- Aircraft and Aerospace Brochure
- AMS 4590-C63020 Brochure
- AMS 4640-C64200 Brochure
- AMS 4880-C95510 Brochure
- C67300 Brochure
- C69300 Brochure
- C89835 Brochure
- C96900HT Brochure
- Extruded or Cast and Drawn Products Brochure
- Fraction, Decimal, Millimeter Conversion Chart
- Hardiall® C72900 Brochure
- Hardiall® C72900 and Wieland Concast Brochure
- Lead-Free and Low-Lead Alloys Brochure
- Near-Net Shapes Flyer
- Oil and Gas Brochure
- Power Transmission and Control Brochure
- Plumbing Brochure

Materials that provide a greater sense of our vast capabilities.

wieland concast

500 series cast and drawn alloys

Wieland Concast is the only domestic producer of phosphor bronze

There is power in the right choice

Wieland Concast today means value for the future. By selecting us as your supplier of extruded or cast and drawn alloys, you are creating immediate value for your business—value that you can pass on to your customers.

Wieland Concast is the ideal partner to deliver 500 series phosphor bronze alloys, offering the quality, service, and value essential for your business's success.

500 series phosphor bronze

Copper alloy UNS No.	ASTM	Temper(s)
C51000*	B139	H04 hard, H08 spring
C52100	B139	H04 hard
C53400	B139	H04 hard
C54400*	B139	H04 hard

*Standard-stocked alloy, C51000 only as H04 hard temper.

Wieland Concast 500 series alloys provide:

- A domestic option for phosphor bronze
- Wear resistance and stiffness due to the addition of phosphor
- Corrosion resistance and strength due to the incorporation of tin

500 series overview

Typical uses

Category	Applications
Architecture	bridge bearing plates
Building	thermostat bellows
Consumer	coinage, cymbals, power conductor for electro-surgical pencil
Electrical	cold headed parts, electrical connectors, electrical flexing contact blades, electromechanical spring components, electronic and precision instrument parts, electronic connectors, fuse clips, resistance wire, switch parts, wire brushes
Fasteners	cotter pins, fasteners, heavy duty fasteners, lock washers
Industrial	beater bar, bellows, bourdon tubing, chemical hardware, heavy duty clips, clutch disks, cold headed parts, diaphragms, doctor blades for the paper industry, gears, perforated sheets, pinions, pneumatic hammers, pressure responsive elements, sleeve bushings, springs, heavy duty springs, helical extension springs, helical torsion springs, textile machinery, thrust bearings, truss wire, welding rods, welding wire, well drill equipment
Marine	marine parts

Chemical composition

Copper alloy UNS no.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
C51000	Rem.	0.05	4.20-5.80	0.30	0.10	0.03-0.35
C52100	Rem.	0.05	7.00-9.00	0.20	0.10	0.03-0.35
C54400	Rem.	3.00-4.00	3.50-4.50	1.50-4.50	0.10	0.01-0.50
C54400	Rem.	3.00-4.00	3.50-4.50	1.50-4.50	0.10	0.01-0.50

Note: single values represent maximinums.

Stocked size schedules*

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
3/8	0.035	0.417	7/8	0.188	2.250	1 3/4	0.771	9.250
7/16	0.049	0.583	15/16	0.222	2.267	1 7/8	0.882	10.583
1/2	0.063	0.750	1	0.250	3.000	2	1.007	12.083
9/16	0.083	1.000	1 1/8	0.319	3.833	2 1/4	1.271	15.250
5/8	0.097	1.167	1 1/4	0.396	4.750	2 1/2	1.569	18.833
11/16	0.118	1.417	1 3/8	0.472	5.667	2 3/4**	1.917	23.000
3/4	0.139	1.667	1 1/2	0.569	6.833			
13/16	0.167	2.000	1 5/8	0.660	7.917			

*Consult mill for other shapes / sizes. **Only applicable to C54400.

Aircraft and aerospace

wieland concast

Alloys characterized by corrosion, wear, and impact resistance as well as the high-strength characteristics that are required for the aircraft and aerospace industry.

Aircraft and aerospace alloys		
AMS 4640-C63000	AMS 4634-C64200	AMS 4598-C72900
AMS 4590-C63020	AMS 4596-C72900	AMS 4880-C95510
AMS 4633-C64200	AMS 4597-C72900	AMS 4881-C95520

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Industry-specific applications:

- Landing gear bushings and bearings
- Door hardware control surface and actuator bearings and bushings
- Wheel bearings
- Brakes valves
- Hydraulic actuators
- Wing flap bearings
- Steering joints
- Electronic system connectors
- Compression fit airframe fasteners

General information

AMS	Material description	Tempers
4640-C63000*	Aluminum bronze	HR50 drawn and stress relieved (3/8" to 3" O.D.). TQ50 temper annealed (> 3" O.D.)
4590-C63020*	Nickel aluminum bronze	TQ50 quenched and tempered
4633-C64200	Silicon aluminum bronze	HR50 drawn and stress relieved
4634-C64200*	Silicon aluminum bronze	Stress relieved
4596-C72900*†	Copper nickel-tin bronze	TX00 solution annealed and spinodal hardened
4597-C72900*†	Copper nickel-tin bronze	TX TS solution annealed, cold finished and spinodal hardened
4598-C72900*†	Copper nickel-tin bronze	TX00 solution annealed and spinodal hardened
4880-C95510*	Nickel aluminum bronze	TQ50 quench hardened and temper annealed
4881-C95520	Nickel aluminum bronze	Quench hardened and temper annealed

**standard-stocked alloy.* *†Wieland Concast is a North American supplier of Hardiall® C72900 produced by Lebronze alloys.*

Chemical composition														
AMS	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)	Mg (%)	As (%)	Cb (%)
4640-C63000	remain.		0.20	0.30	2.00-4.00	4.00-5.50	9.00-11.00			1.50	0.25			
4590-C63020	remain.	0.03	0.25	0.30	4.00-5.50	4.20-6.00	10.00-11.00	0.20	0.05	1.50	0.15			
4633-C64200	remain.	0.05	0.20	0.50	0.30	0.25	6.30-7.60			0.10	1.50-2.20		0.15	
4634-C64200	remain.	0.05	0.20	0.50	0.30	0.25	6.30-7.60			0.10	1.50-2.20			
4596-C72900	remain.	0.02	7.50-8.50	0.50	0.50	14.50-15.50				0.30		0.15		0.10
4597-C72900	remain.	0.02	7.50-8.50	0.50	0.50	14.50-15.50				0.30		0.15		0.10
4598-C72900	remain.	0.02	7.50-8.50	0.50	0.50	14.50-15.50				0.30		0.15		0.10
4880-C95510	78.00 min		0.20	0.30	2.00-3.50	4.50-5.50	9.70-10.90			1.50				
4881-C95520	74.50 min	0.03	0.25	0.30	4.00-5.50	4.20-6.00	10.50-11.50	0.20	0.05	1.50	0.15			

Note: Unless otherwise noted, single values represent maximums.

AMS 4590-C63020

wieland concast

Containing over 10% aluminum by weight, C63020 is a nickel-aluminum bronze known for its high strength and corrosion resistance. Wieland Concast provides this alloy as a standard-stocked product.

Product description	Nickel-aluminum bronze
Tempers	TQ50 quenched and tempered
Tubes	2 3/4" to 6" O.D.
Solids	3/4" to 4" O.D.
Hex	Consult mill (not standard stocked)
Standard lengths	24"

Wieland Concast certifications:
AS9100:2016 | ISO 9001:2015

Product characteristics

- Standard shape: round tubes and solids
- Standard length: 24"
- 23 sizes in stock

Typical uses:

Industrial:
- bearings, bushings, forming dies for roll bearings, hydraulic bushing for earth moving equipment, valve balls, valve parts

AMS 4590-C63020 overview

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Co (%)	Cr (%)	Mn (%)	Si (%)
Remain	0.03	0.25	0.30	4.00-5.50	4.20-6.00	10.00-11.00	0.20	0.05	1.50	0.15

Chemical composition according to AMS 4590

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Mechanical properties

Size range, diameter inclusive	Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 2 in. (50.8 mm) or 4D, min	Rockwell "C" hardness
inches	ksi	MPa	ksi	MPa	%	min HRC
up to 1	135	931	100	689	6	26
over 1 to 2	130	896	95	655	6	26
over 2 to 4	130	896	90	621	6	26

Stocked size schedule

Tubes

Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot	Nominal size I.D	x	O.D.	Weight per inch	Weight per foot
1.500	x	2.750	1.151	13.812	2.500	x	4.250	2.570	30.845	3.000	x	5.000	3.468	41.620
	x	3.000	1.462	17.542								5.500	4.604	55.248
					2.750	x	4.500	2.761	33.137			6.000	5.850	70.198
1.750	x	3.250	1.625	19.500			5.500	4.917	59.005					
										4.000	x	6.000	4.304	51.648
2.000	x	3.500	1.787	21.449										
		4.000	2.600	31.195										

Solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.121	1.452	1.750	0.660	7.920	2.750	1.630	19.560
1.000	0.216	2.592	2.000	0.862	10.344	3.000	1.940	23.280
1.250	0.337	4.044	2.250	1.091	13.092	4.000	3.449	41.388
1.500	0.485	5.820	2.500	1.347	16.164			

AMS 4634-C64200

wieland concast

C642 aluminum bronze offers excellent corrosion resistance, machinability, and strength. It is a standard-stocked item in 32 of the most popular sizes.

Product description	Aluminum bronze
Tempers	HR50 drawn and stress relieved
Solids	3/16" to 6" O.D.
Hex*	1/2" to 2" O.D.
Standard lengths	144" *Available, but not standard stocked

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Standard stocked

Wieland Concast provides C642 as a standard-stocked product

Typical uses:

Automotive:
- valve guides (automobile engine)

Electrical:
- pole line hardware

Fasteners:
- bolts, nuts

Industrial:
- cams, gears, valve bodies, valve components, valve stems

Marine:
- hardware

AMS 4634-C64200 overview

Chemical composition								
Cu (%)[1]	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[2]	Al (%)	Mn (%)	Si (%)
Remain	0.05	0.20	0.50	0.30	0.25	6.30-7.60	0.10	1.50-2.20

Chemical composition according to AMS 4634

[1]Cu value includes Ag. [2]Ni value includes Co.
Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Mechanical properties

Size range, bars and rods inclusive	Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4D, min	Hardness, internal
inches	ksi	MPa	ksi	MPa	%	HRB
up to 1/2	90	621	45	310	9	>80 inclusive
over 1/2 to 1	85	586	45	310	12	>80 inclusive
over 1 to 2	80	552	42	290	12	>80 inclusive
over 2 to 3	75	517	35	241	15	>80 inclusive

Stocked size schedule

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.1875	0.008	0.092	0.8750	0.170	2.036	2.0000	0.876	10.507
0.2500	0.014	0.170	0.9375	0.194	2.326	2.1250	1.005	12.063
0.3125	0.022	0.268	1.0000	0.222	2.664	2.2500	1.122	13.464
0.3750	0.031	0.369	1.0625	0.249	2.984	2.3750	1.339	16.067
0.4375	0.042	0.509	1.1250	0.279	3.351	2.5000	1.389	16.672
0.5000	0.055	0.665	1.2500	0.343	4.113	2.7500	1.664	19.972
0.5625	0.070	0.838	1.3750	0.415	4.977	3.0000	1.988	23.854
0.6250	0.086	1.026	1.5000	0.504	6.053	4.0000	3.557	42.686
0.6875	0.104	1.252	1.6250	0.582	6.978	5.0000	5.456	65.468
0.7500	0.125	1.504	1.7500	0.674	8.090	6.0000	8.027	96.319
0.8125	0.145	1.736	1.8750	0.771	9.250			

AMS 4880-C95510

wieland concast

Wieland Concast produces AMS 4880-C95510 alloy, a standard-stocked alloy with over 40 popular sizes available, suitable for industries such as marine, and oil and gas.

Product description	Nickel-aluminum bronze
Solids	1/2" to 9" O.D.
Tubes	1 1/8" to 13" O.D.
Rectangles	Up to 15"
Standard lengths	24"*

**Consult mill for other lengths*

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Typical uses:

Oil and gas:
- Bushings, hydraulic seal components

General:
- Bearings requiring abrasion resistance / good ductility / retention of hardness at moderate temperatures

AMS 4880-C95510 overview

Chemical composition						
Cu (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)
78.00 min	0.20	0.30	2.00-3.50	4.50-5.50	9.70-10.90	1.50

Chemical composition according to AMS 4880

[1]Ni value includes Co.
Note: Cu + sum of named elements, 99.8% min. Unless otherwise noted, single values represent maximums.

Mechanical properties

Tensile strength, min		Yield strength at 0.2% offset, min		Elongation, in 4D, min	Brinell hardness	Remarks
ksi	MPa	ksi	MPa	%	min to max BHN	
105.0	724	62.5	431	9	192 to 248	Castings <4.0, heat treated
95.0	655	56.0	386	9	192 to 248	Castings 4.0+, heat treated

Mechanical properties according to AMS 4880

Stocked size schedule

Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot	Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot	Nom. Size O.D. x I.D.	Weight Per Inch	Weight Per Foot
2.000 x 1.000	0.739	8.868	3.500 x 1.500	2.476	29.712	5.750 x 4.250	3.979	47.748
2.250 x 1.250	0.867	10.404	2.500	1.639	19.668	6.000 x 3.000	6.469	77.628
1.500	0.707	8.484	3.750 x 2.000	2.437	29.244	3.750	5.556	66.672
2.500 x 1.000	1.242	14.904	2.500	1.943	23.316	4.500	4.433	53.196
1.500	1.002	12.024	2.750	1.764	21.168	5.375	2.397	28.764
1.750	0.821	9.852	4.000 x 2.000	2.860	34.320	6.500 x 4.000	6.608	79.296
2.750 x 1.500	1.254	15.048	2.500	2.505	30.060	5.000	4.704	56.448
1.750	1.008	12.096	4.125 x 3.125	1.923	23.076	7.000 x 4.000	8.000	96.000
2.875 x 1.875	1.149	13.788	4.250 x 3.000	2.311	27.732	8.000 x 6.000	7.347	88.164
3.000 x 1.500	1.515	18.180	4.500 x 2.500	3.327	39.924	8.500 x 6.000	8.866	106.392
2.000	1.210	14.520	3.000	2.792	33.504	6.500	7.568	90.816
3.125 x 2.125	1.378	16.536	5.000 x 3.000	4.207	50.484	11.000 x 9.000	9.867	118.404
3.250 x 2.000	1.657	19.884	3.750	3.012	36.144	12.000 x 10.250	9.794	117.528
2.250	1.512	18.144	5.500 x 3.500	4.396	52.752	13.000 x 10.000	16.564	198.768

C67300

wieland concast

Wieland Concast produces C67300 manganese bronze as a standard-stocked alloy offering exceptional strength, wear, and corrosion resistance.

Product description	Manganese bronze
Tempers	H02 half hard
Solids	3/8" to 3" O.D.
Hex	Consult mill
Standard lengths	144"*

**Consult mill for other lengths*

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Typical uses:

Fasteners:
- fasteners, lead screw nuts

Industrial:
- bearings, bushings, drive shafts, gears/cams, idler pins, piston heads, propeller shafts, pump parts, seal rings, shaft bushings, sleeve bearings, spindles, thrust bearings, wear plates, clutch bearings

Marine:
- hardware, valve seats

Other:
- connecting rods

C67300 overview

Chemical composition								
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	Ni (%)[1]	Al (%)	Mn (%)	Si (%)
58.00-63.00	0.40-3.00	0.30	Remain	0.50	0.25	0.25	2.00-3.50	0.50-1.50

Chemical composition according to SAE J463

[1]Ni value includes Co.
Note: Single values represent maximums.

Mechanical properties

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, in 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	min HRB	
65	448	40	276	12	70	Size range: up to 1" inclusive
58	400	35	241	15	70	Size range: over 1" to 3" inclusive
55	380	30	205	18	65	Size range: over 3"

Mechanical properties according to SAE J463

Stocked size schedule

Size O.D.	Weight Per Inch	Weight Per Foot	Size O.D.	Weight Per Inch	Weight Per Foot	Size O.D.	Weight Per Inch	Weight Per Foot
0.3750	0.033	0.397	1.1875	0.334	4.008	2.0000	0.951	11.409
0.5000	0.066	0.787	1.2500	0.358	4.297	2.1250	1.035	12.421
0.5620	0.073	0.870	1.3750	0.452	5.427	2.2500	1.160	13.925
0.7500	0.134	1.603	1.4375	0.487	5.840	2.5000	1.433	17.192
0.8750	0.175	2.105	1.5000	0.535	6.425	2.7500	1.733	20.801
1.0000	0.237	2.848	1.5625	0.578	6.936	3.0000	2.063	24.755
1.0625	0.266	3.190	1.7500	0.731	8.775			
1.1250	0.301	3.611	1.8750	0.835	10.025			

C69300

wieland concast

Wieland Concast provides C69300†, an excellent replacement for leaded fittings. With its corrosion-resistant properties, it is an outstanding solution for water supply and plumbing applications.

†C69300 ECO BRASS® is produced by our partner, Wieland Chase.

Product description	Lead-free* brass
Tempers	H02 half hard
Solids	0.375" to 2.50"
Hex	0.437" to 2.00"
Shapes	Consult mill
Standard lengths	144"**

*This product complies with 0.25% weighted average lead content on wetted surfaces in accordance with Safe Water Drinking Act (SDWA) / Federal Public Law No. 111-380.

**Consult mill for other lengths

C69300 compliance

- Federal Safe Drinking Water Act - SDWA
- S.3874 Reduction of Lead in Drinking Water Act
- NSF/ANSI/CAN 61-2022

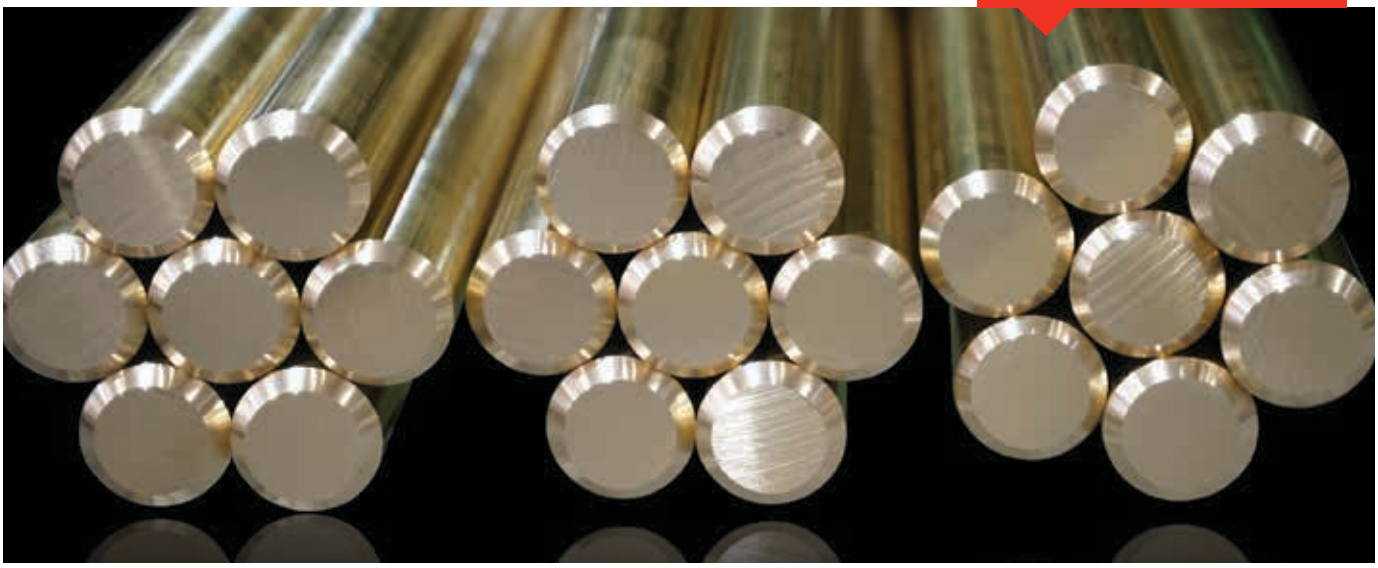
Typical uses:

Automotive:
- fluid connectors, sensor bodies, thermostat parts

Industrial:
- automatic screw machine parts, bolts, condenser tube plate, nuts, pneumatic fittings, pump parts, screw machine parts, valve bodies for water, valve stems

Marine:
- marine products, propeller shafts

Plumbing:
- faucet stems, faucets, plumbing fittings, water meter cases



C69300 overview

Chemical composition								
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)	Mn (%)	Si (%)
73.00-77.00	0.09 max	0.20 max	Remain	0.10 max	0.04-0.15	0.10 max	0.10 max	2.70-3.40

Chemical composition according to ASTM B371

Diameter / tolerances +/–

Diameter	Round	Hexagonal, octagonal
>0.150"-0.500"	0.002"	0.004"
>0.500"-1.000"	0.003"	0.005"
>1.000"-2.000"	0.004"	0.006"
>2.000"	0.20%	0.40%

Mechanical properties

Tensile strength, min	Yield strength, at 0.5% extension under load, min	Elongation, in 4x diameter or specimen thickness, min	Rockwell "B" hardness	Size range
ksi	ksi	%	max HRB approx	
85	45	5	85	Up to 0.500" inclusive
75	35	10	80	Over 0.500" to 1.000" inclusive
70	30	10	75	Over 1.000" to 2.500" inclusive

Mechanical properties according to ASTM B371

Fabrication properties

Technique	Suitability	Technique	Suitability	Technique	Suitability
Soldering	Excellent	Coated Metal Arc Welding	Good	Capacity for Cold Working	Poor
Brazing	Good	Spot Weld	Good	Capacity for Hot Forming	Excellent
Oxyacetylene Welding	Good	Seam Weld	Good	Forgeability Rating	95
Gas Shielded Arc Welding	Good	Butt Weld	Good	Machinability Rating	85

C89835

wieland concast

Wieland Concast offers 100 sizes of C89835, a lead-free C932 replacement, as a standard-stocked† inventory item. This alloy is also a suitable replacement for C836 and C844.

†Solids and tubes are standard stocked

Product description	Bismuth tin bronze
Solids	1/2" to 8" O.D.
Tubes	1 1/8" to 14" O.D.*
Rectangles	Up to 15"
Standard lengths	105"

*Consult mill for wall thickness

Wieland Concast certifications:
AS9100:2016 | ISO 9001:2015

C89835 compliance

- Federal Safe Drinking Water Act – SDWA
- S.3874 Reduction of Lead in Drinking Water Act
- California AB1953
- NSF/ANSI/CAN 61-2022

Typical uses:

Plumbing:
- faucets, pump components, pipe fittings, plumbing goods, water pump impellers

Industrial:
- housings, small gears

C89835 overview

Chemical composition										
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)	Al (%)	Bi (%)	S (%)	Sb (%)	Si (%)
85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70	0.08	0.35	0.005

Chemical composition provided by CDA Note: Single values represent maximums.

Stocked size schedule

Tubes

Nominal size I.D.	x	O.D.	Weight per inch	Weight per foot
0.500	x	1.250	0.363	4.356
		1.500	0.541	6.492
		1.750	0.750	9.000
0.750	x	1.250	0.290	3.480
		1.500	0.470	5.640
		1.750	0.677	8.124
		2.000	0.921	11.052
		2.250	1.194	14.328
1.000	x	1.250	0.185	2.220
		1.500	0.362	4.344
		1.750	0.572	6.862
		2.000	0.816	9.792
		2.250	1.089	13.068
		2.500	1.393	16.716
		2.750	1.729	20.748
		3.000	2.100	25.200
		3.250	2.562	30.743
		3.500	3.000	36.000
		4.000	4.076	48.571
1.250	x	1.500	0.226	2.712
		1.750	0.435	5.220
		2.000	0.680	8.160
		2.250	0.952	11.424
		2.500	1.257	15.084
		2.750	1.592	19.104
		3.000	1.960	23.520
		3.250	2.419	29.029
		3.500	2.857	34.289
1.500	x	1.750	0.267	3.204
		2.000	0.512	6.144
		2.250	0.784	9.408
		2.500	1.089	13.068
		2.750	1.424	17.088
		3.000	1.791	21.492
		3.250	2.248	26.971
		3.500	2.686	32.229
		3.750	3.162	37.943
		4.000	3.743	44.914
		4.500	4.737	56.844

Nominal size I.D.	x	O.D.	Weight per inch	Weight per foot
1.750	x	2.250	0.585	7.020
		2.500	0.889	10.668
		2.750	1.225	14.700
		3.000	1.592	19.104
		3.250	2.038	24.457
		3.500	2.486	29.829
		3.750	2.952	35.429
2.000	x	2.500	0.658	7.896
		2.750	0.994	11.928
		3.000	1.361	16.332
		3.250	1.810	21.714
		3.500	2.248	26.971
		3.750	2.714	32.571
		4.000	3.314	39.771
		4.500	4.316	51.788
		5.000	5.523	66.342
2.250	x	2.750	0.731	8.772
		3.000	1.100	13.200
		3.250	1.533	18.400
		3.500	1.981	23.772
		3.750	2.448	29.371
2.500	x	3.000	0.804	9.648
		3.250	1.238	14.857
		3.500	1.676	20.114
		3.750	2.152	25.829
		4.000	2.752	33.029
		4.500	3.768	45.221
2.750	x	3.500	1.349	16.114
		3.750	1.819	21.829
		4.000	2.419	29.029
		4.500	3.448	41.370
3.000	x	3.500	0.981	11.771
		3.750	1.448	17.371
		4.000	2.057	24.686
		4.500	3.095	37.141
		5.000	4.308	51.695

Nominal size I.D.	x	O.D.	Weight per inch	Weight per foot
3.250	x	3.750	1.048	12.571
		4.000	1.666	20.000
		4.500	2.711	32.534
		5.000	3.924	47.088
3.500	x	4.000	1.238	14.857
		4.500	2.296	27.550
		5.000	3.509	42.103
3.750	x	4.500	1.849	22.187
4.000	x	5.000	2.583	31.000
4.250	x	5.000	2.073	24.881

Solids		
Size O.D.	Weight per inch	Weight per foot
1.000	0.276	3.314
1.250	0.429	5.143
1.500	0.610	7.314
1.750	0.829	9.943
2.000	1.076	12.914
2.250	1.352	16.229
2.500	1.667	20.000
2.750	2.010	24.114
3.000	2.390	28.686
3.500	3.156	37.871
4.000	4.160	49.916
4.500	5.247	62.958
5.000	6.459	77.512

C96900HT

wieland concast

Alloy C96900HT, also designated CuNi15Sn8A, is spinodal hardened (CX), reflecting properties similar to copper beryllium alloys.

Product description	Copper-nickel
Solids	Consult mill
Tubes	2" to 14" O.D.*
Rectangles	Consult mill
Standard lengths	52"**
Shape / form	semi-finished, mill stock or near-net shapes, anode, bar stock, billet / bloom, squares, hex, plate, profile or structural shape, flats / rectangular bar

**Consult mill for wall thickness*
***Consult mill for other lengths*

Typical uses:

Industrial / off-road / mining / heavy equipment
- Bushings, bearings, fittings, wear plates

Oil / gas
- Bushings, bearings, fittings, components for oil refineries

Aircraft / aerospace
- Landing gear bushings and bearings

C96900HT

Chemical composition			
Cu (%)	Sn (%)	Ni (%)[1]	Mn (%)
76.80	8.00	15.00	0.20

Chemical composition according to ASTM B505/B505M-23

Mechanical properties

Tensile strength, min		Yield strength, at 0.2% offset, min		Elongation, in 4D or 2 in. or 50 mm min	Brinell hardness	Remarks
ksi	MPa	ksi	MPa	%	min BHN	
110	758	105	724	4		Heat treated Rockwell C32

Mechanical properties according to ASTM B505/B505M-23

Key features and benefits:

- Corrosion resistance
- Wear resistance
- Impact resistance
- High strength
- Excellent bearing performance
- High stiffness ratio
- Nonmagnetic
- Exceptional lubricity
- Excellent machinability

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

wieland concast

Extruded or cast and drawn alloys

There is power in the right choice

Wieland Concast today means value for the future. By selecting us as your supplier of extruded or cast and drawn alloys, you are creating immediate value for your business—value that you can pass on to your customers.

Wieland Concast is the right choice to provide you the extruded or cast and drawn alloy quality, service, and value you need to make your business a success.

Products

Standard stocked			
C14500	C51000	C54400	C63000
C63020	C64200	C67300	C72900

Also available			
C23000	C26000	C31400	C31600
C52100	C62400	C65100	C67400
C67410	C69300	C69400	

Wieland Concast extruded or cast and drawn products are characterized by:

- More consistent tolerances
- Increased mechanical properties
- Improved machinability and productivity

General information

Copper alloy UNS no.	ASTM spec	AMS spec	Tempers							Product description	Round size range	Hex/oct size range
C14500*	B301				H02		H04			Tellurium copper	0.375 to 2.75	
C23000	B927			H01	H02		H04			Red brass	0.375 to 2.5	
C26000	B927			H01	H02		H04			Cartridge brass	0.375 to 2.5	0.375 to 2.0
C31400	B140				H02		H04			Leaded commercial bronze	0.375 to 2.0	0.375 to 2.0
C31600	B140				H02		H04			Leaded commercial bronze[1]	0.375 to 2.0	0.375 to 2.0
C51000*	B139	4625					H04		H08	Phosphor bronze	0.375 to 2.5	0.375 to 2.0
C52100	B139						H04			Phosphor bronze	0.375 to 2.5	0.375 to 2.0
C54400*	B139						H04			Phosphor bronze	0.375 to 2.75	0.375 to 2.0
C62400	B150		HR50							Aluminum bronze	0.5 to 3.0	
C63000*	B150	4640	HR50							Nickel-aluminum bronze	0.375 to 10.0	0.5 to 2.0
C63020*	B150	4590	TQ50							Nickel-aluminum bronze	0.75 to 4.0	
C64200*	B150	4634	HR50							Aluminum bronze	0.1875 to 6.0	0.5 to 2.0
C65100	B98				H02		H04	H06		Low-silicon bronze	0.375 to 2.0	0.375 to 2.0
C67300*[2]					H02					Manganese bronze	0.562 to 3.0	
C67400[2]										Manganese bronze	0.75 to 3.0	0.375 to 2.0
C67410										Manganese bronze	0.75 to 3.0	0.375 to 2.0
C69300	B371				H02					Lead-free brass	0.125 to 2.5	0.375 to 1.0
C69400	B371						H04			Silicon red brass	0.375 to 2.0	0.375 to 2.0
C72900[3]		4596								Copper nickel-tin bronze	0.75-6.75	
C72900[3]		4597								Copper nickel-tin bronze	0.75-2.0	
C72900[3]		4598								Copper nickel-tin bronze	4.5-8.56	

* Standard-stocked alloy. [1](Nickel-bearing). [2]SAE J463 specification. [3]Hardiall® C72900 produced by Lebronze alloys.

Chemical composition

Copper alloy UNS no.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)	Al (%)	Mn (%)	Si (%)
C14500[A]	99.90 min					0.004-0.012				
C23000	84.00-86.00	0.05		Rem.	0.05					
C26000	68.50-71.50	0.07		Rem.	0.05					
C31400	87.50-90.50	1.30-2.50		Rem.	0.10		0.70			
C31600	87.50-90.50	1.30-2.50		Rem.	0.10	0.04-0.10	0.70-1.20			
C51000	Rem.	0.05	4.20-5.80	0.30	0.10	0.03-0.35				
C52100	Rem.	0.05	7.00-9.00	0.20	0.10	0.03-0.35				
C54400	Rem.	3.00-4.00	3.50-4.50	1.50-4.50	0.10	0.01-0.50				
C62400	Rem.		0.20		2.00-4.50			10.00-11.50	0.30	0.25
C63000	Rem.[1]		0.20	0.30	2.00-4.00		4.00-5.50[2]	9.00-11.00	1.50	0.25
C63020[B]	Rem.	0.03	0.25	0.30	4.00-5.50		4.20-6.00	10.00-11.00	1.50	0.15
C64200[C]	Rem.[1]	0.05	0.20	0.50	0.30		0.25[2]	6.30-7.60	0.10	1.50-2.20
C65100	Rem.[1]	0.05		1.50	0.80				0.70	0.80-2.00
C67300	58.00-63.00[1]	0.40-3.00	0.30	Rem.	0.50		0.25[2]	0.25	2.00-3.50	0.50-1.50
C67400	57.00-60.00[1]	0.50	0.30	Rem.	0.35		0.25[2]	0.50-2.00	2.00-3.50	0.50-1.50
C67410	55.00-59.00[1]	0.80	0.50	Rem.	1.00		2.00	1.30-2.30	1.00-2.40	0.70-1.30
C69300	73.00-77.00[1]	0.02[3]-0.09	0.20	Rem.	0.10	0.04-0.15	0.10		0.10	2.70-3.40
C69400	80.00-83.00[1]	0.30		Rem.	0.20					3.50-4.50
C72900[D]	Rem.	0.02	7.50-8.50	0.50	0.50		14.50-15.50[2]		0.30	

[1]Cu value includes Ag. [2]Ni value includes Co. [3]Pb content is greater than 0.02%. [A]Chemical requirements for other elements: Te 0.40-0.70%.
[B]Chemical requirements for other elements: Co 0.20%, max and Cr 0.05%, max. [C]Chemical requirements for other elements: As 0.09%, max.
[D]Chemical requirements for other elements: Cb 0.10%, max and Mg 0.15%, max.

Note: Unless otherwise noted, single values represent maximums.

wieland concast

Fraction, decimal, millimeter conversion chart

	Inches	Millimeters
1/64	.0156	0.396
1/32	.0312	0.793
3/64	.0468	1.190
1/16	.0625	1.587
5/64	.0781	1.984
3/32	.0937	2.381
7/64	.1093	2.778
1/8	.1250	3.175
9/64	.1406	3.571
5/32	.1562	3.968
11/64	.1718	4.365
3/16	.1875	4.762
13/64	.2031	5.159
7/32	.2187	5.556
15/64	.2343	5.953
1/4	.2500	6.350
17/64	.2656	6.746
9/32	.2812	7.143
19/64	.2968	7.540
5/16	.3125	7.937
21/64	.3281	8.334
11/32	.3437	8.731
23/64	.3593	9.128
3/8	.3750	9.525
25/64	.3906	9.921
13/32	4062	10.318
27/64	.4218	10.715
7/16	.4375	11.112
29/64	.4531	11.509
15/32	.4687	11.906
31/64	.4843	12.303
1/2	.5000	12.700

	Inches	Millimeters
33/64	.5156	13.096
17/32	.5312	13.493
35/64	.5468	13.890
9/16	.5625	14.287
37/64	.5781	14.684
19/32	.5937	15.081
39/64	.6093	15.478
5/8	.6250	15.875
41/64	.6406	16.271
21/32	.6562	16.668
43/64	.6718	17.065
11/16	.6875	17.462
45/64	.7031	17.859
23/32	.7187	18.256
47/64	.7343	18.653
3/4	.7500	19.050
49/64	.7656	19.446
25/32	.7812	19.843
51/64	.7968	20.240
13/16	.8125	20.637
53/64	.8281	21.034
27/32	.8437	21.431
55/64	.8593	21.828
7/8	.8750	22.225
57/64	.8906	22.621
29/32	9062	23.018
59/64	.9218	23.415
15/16	.9375	23.812
61/64	.9531	24.209
31/32	.9687	24.606
63/64	.9843	25.003
1	1.000	25.400

Millimeter, decimal, fraction conversion chart

mm	in	
0.1	.0039	
0.2	.0079	
0.3	.0118	
0.397	.0156	1/64
0.4	.0157	
0.5	.0197	
0.6	.0236	
0.7	.0276	
0.794	.0313	1/32
0.8	.0315	
0.9	.0354	
1.0	.0394	
1.1	.0433	
1.191	.0469	3/64
1.2.	0472	
1.3	.0512	
1.4	.0551	
1.5	.0591	
1.588	.0625	1/16
1.6	.0630	
1.7	.0669	
1.8	.0709	
1.9	.0748	
1.984	.0781	5/64
2.0	.0787	
2.1	.0827	
2.2	.0866	
2.3	.0906	
2.381	.0938	3/32
2.4	.0945	
2.5	.0984	
2.6	.1024	
2.7	.1063	
2.778	.1094	7/64
2.8	.1102	
2.9	.1142	
3.0	.1181	
3.1	.1220	
3.175	.1250	1/8
3.2	.1260	
3.3	.1299	
3.4	.1339	
3.5	.1378	
3.572	.1406	9/64
3.6	.1417	
3.7	.1457	
3.8	.1496	
3.9	.1535	
3.969	.1563	5/32
4.0	.1575	
4.1	.1614	
4.2	.1654	
4.3	.1693	
4.366	.1719	11/64
4.4	.1732	
4.5	.1772	
4.6	.1811	
4.7	.1850	
4.763	.1875	3/16
4.8	.1890	
4.9	.1929	
5.0	.1969	
5.1	.2008	

mm	in	
5.159	.2031	13/64
5.2	.2047	
5.3	.2087	
5.4	.2126	
5.5	.2165	
5.556	.2188	7/32
5.6	.2205	
5.7	.2244	
5.8	.2283	
5.9	.2323	
5.953	.2344	15/64
6.0	.2362	
6.1	.2402	
6.2	.2441	
6.3	.2480	
6.350	.2500	1/4
6.4	.2520	
6.5	.2559	
6.6	.2598	
6.7	.2638	
6.747	.2656	17/64
6.8	.2677	
6.9	.2717	
7.0	.2756	
7.1	.2795	
7.144	.2813	9/32
7.2	.2835	
7.3	.2874	
7.4	.2913	
7.5	.2953	
7.541	.2969	19/64
7.6	.2992	
7.7	.3031	
7.8	.3071	
7.9	.3110	
7.938	.3125	5/16
8.0	.3150	
8.1	.3189	
8.2	.3228	
8.3	.3268	
8.334	.3281	21/64
8.4	.3307	
8.5	.3346	
8.6	.3386	
8.7	.3425	
8.731	.3438	11/32
8.8	.3465	
8.9	.3504	
9.0	.3543	
9.1	.3583	
9.128	3594	23/64
9.2	.3622	
9.3	.3661	
9.4	.3701	
9.5	.3740	
9.525	.3750	3/8
9.6	.3780	
9.7	.3819	
9.8	.3858	
9.9	.3898	
9.922	.3906	25/64
10.0	.3937	
10.1	.3976	

mm	in	
10.2	.4016	
10.3	.4055	
10.319	.4063	13/32
10.4	.4094	
10.5	.4134	
10.6	.4173	
10.7	.4213	
10.716	.4219	27/64
10.8	.4252	
10.9	.4291	
11.0	.4331	
11.1	.4370	
11.113	.4375	7/16
11.2	.4409	
11.3	.4449	
11.4	.4488	
11.5	.4528	
11.509	.4531	29/64
11.6	.4567	
11.7	.4606	
11.8	.4646	
11.9	.4685	
11.906	.4688	15/32
12.0	.4724	
12.1	.4764	
12.2	.4803	
12.3	.4843	
12.303	.4844	31/64
12.4	.4882	
12.5	.4921	
12.6	.4961	
12.7	.5000	1/2
12.8	.5039	
12.9	.5079	
13.0	.5118	
13.097	.5156	33/64
13.1	.5157	
13.2	.5197	
13.3	.5236	
13.4	.5276	
13.494	.5313	17/32
13.5	.5315	
13.6	.5354	
13.7	.5394	
13.8	.5433	
13.891	.5469	35/64
13.9	.5472	
14.0	.5512	
14.1	.5551	
14.2	.5591	
14.288	.5625	9/16
14.3	.5630	
14.4	.5669	
14.5	.5709	
14.6	.5748	
14.684	.5781	37/64
14.7	.5787	
14.8	.5827	
14.9	.5866	
15.0	.5906	
15.081	.5938	19/32
15.1	.5945	
15.2	.5984	

mm	in	
15.3	.6024	
15.4	.6063	
15.478	.6094	39/64
15.5	.6102	
15.6	.6142	
15.7	.6181	
15.8	.6220	
15.875	.6250	5/8
15.9	.6260	
16.0	.6299	
16.1	.6339	
16.2	.6378	
16.272	.6406	41/64
16.3	.6417	
16.4	.6457	
16.5	.6496	
16.6	.6535	
16.669	.6563	21/32
16.7	.6575	
16.8	.6614	
16.9	.6654	
17.0	.6693	
17.066	.6719	43/64
17.1	.6732	
17.2	.6772	
17.3	.6811	
17.4	.6850	
17.463	.6875	11/16
17.5	.6890	
17.6	.6929	
17.7	.6968	
17.8	.7008	
17.859	.7031	45/64
17.9	.7047	
18.0	.7087	
18.1	.7126	
18.2	.7165	
18.256	.7188	23/32
18.3	.7205	
18.4	.7244	
18.5	.7283	
18.6	.7323	
18.653	.7344	47/64
18.7	.7362	
18.8	.7402	
18.9	.7441	
19.0	.7480	
19.050	.7500	3/4
19.1	.7520	
19.2	.7559	
19.3	.7598	
19.4	.7638	
19.447	.7656	49/64
19.5	.7677	
19.6	.7717	
19.7	.7756	
19.8	.7795	
19.844	.7813	25/32
19.9	.7835	
20.0	.7874	
20.1	.7913	
20.2	.7953	
20.241	.7969	51/64

mm	in	
20.3	.7992	
20.4	.8031	
20.5	.8071	
20.6	.8110	
20.638	.8125	13/16
20.7	.8150	
20.8	.8189	
20.9	.8228	
21.0	.8268	
21.034	.8281	53/64
21.1	.8307	
21.2	.8346	
21.3	.8386	
21.4	.8425	
21.431	.8438	27/32
21.5	.8465	
21.6	.8504	
21.7	.8543	
21.8	.8583	
21.828	.8594	55/64
21.9	.8622	
22.0	.8661	
22.1	.8701	
22.2	.8740	
22.225	.8750	7/8
22.3	.8780	
22.4	.8819	
22.5	.8858	
22.6	.8898	
22.622	.8906	57/64
22.7	.8937	
22.8	.8976	
22.9	.9016	
23.0	.9055	
23.019	.9063	29/32
23.1	.9094	
23.2	.9134	
23.3	.9173	
23.4	.9213	
23.416	.9219	59/64
23.5	.9252	
23.6	.9291	
23.7	.9331	
23.8	.9370	
23.813	.9375	15/16
23.9	.9409	
24.0	.9449	
24.1	.9488	
24.2	.9528	
24.209	.9531	61/64
24.3	.9567	
24.4	.9606	
24.5	.9646	
24.6	.9685	
24.606	.9688	31/32
24.7	.9724	
24.8	.9764	
24.9	.9803	
25.0	.9843	
25.003	.9844	63/64
25.1	.9882	
25.2	.9921	
25.3	.9961	
25.400	1.0000	1

Hardiall® C72900

wieland concast

A spinodal hardened alloy ideal for applications where the load required exceeds the performance of copper-nickel-aluminum-based materials.

Hardiall products

AMS	UNS	Temper	Composition
4596	C72900	TX 00	CuNi15Sn8
4597	C72900	TX TS	CuNi15Sn8
4598	C72900	TX 00	CuNi15Sn8

Hardiall is a registered trademark of Lebronze alloys.

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Hardiall advantages:

- Excellent high-friction wear resistance
- Excellent lubricity
- Low magnetic sensitivity
- Excellent machinability
- Maximum corrosion resistance
- High galling resistance
- An ideal substitute for beryllium copper

Hardiall® C72900 overview

Chemical composition								
Ni + Co (%)	Sn (%)	Fe (%) max	Zn (%) max	Mn (%) max	Cb (%) max	Mg (%) max	Pb (%) max	Cu (%)
14.50-15.50	7.50-8.50	0.50	0.50	0.30	0.10	0.15	0.02	remain.

AMS 4596 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	2.250	1.286	15.427	3.750	3.571	42.853
1.000	0.254	3.047	2.500	1.587	19.046	4.000	4.063	48.758
1.250	0.397	4.761	2.625	1.750	20.998	4.500	5.142	61.709
1.500	0.571	6.857	2.750	1.921	23.046	5.000	6.349	76.184
1.750	0.778	9.333	3.000	2.286	27.426	5.500	7.682	92.182
1.875	0.893	10.713	3.250	2.682	32.188	6.000	9.142	109.705
2.000	1.016	12.189	3.500	3.111	37.330	6.750	11.570	138.845

AMS 4597 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	1.250	0.397	4.761	1.750	0.778	9.333
1.000	0.254	3.047	1.500	0.571	6.857	2.000	1.016	12.189

AMS 4598 tubes

Nom. size I.D. x O.D.	Weight per inch	Weight per foot	Nom. size I.D. x O.D.	Weight per inch	Weight per foot	Nom. size I.D. x O.D.	Weight per inch	Weight per foot
3.000 x 4.500	3.015	36.179	3.500 x 5.000	3.374	40.492	6.440 x 7.660	4.718	56.615
			5.875	5.922	71.070	8.560	8.613	103.355

wieland
concast

Hardiall® C72900 and Wieland Concast

Aircraft and aerospace

The aircraft and aerospace industry requires an alloy which demonstrates excellent lubricity, wear, and galling resistance such as Hardiall® C72900. Hardiall is ideal for applications where the load required exceeds the performance of copper-nickel-aluminum-based alloys.

Typical uses

- Landing gear bushings and bearings
- Control surface and actuator bushings and bearings
- Wing flap bearings
- Wheel bearings
- Brakes
- Door hardware
- Hydraulic actuators
- Valves
- Steering joints
- Helicopter controls
- Compression fit airframe fasteners
- Electronic system connectors

Key features and benefits:

- High strength
- Corrosion resistance
- Erosion resistance
- Magnetic resistance
- Excellent lubricity
- Excellent wear resistance
- Excellent machinability
- Easy implementation
- Galling resistance

Oil and gas

The oil and gas industry requires an alloy which provides outstanding metal-to-metal wear, as well as resistance to corrosion, temperature and pressure such as Hardiall® C72900. Hardiall supports both offshore and onshore systems utilizing both vertical and directional drilling products.

Typical uses

- Bushings
- Bearings
- Chemical processing equipment
- Components for oil refineries
- Fittings
- Steam fittings
- Drilling components
- Sucker rod
- Valve guide bushing couplings
- Springs
- Wire
- Marine components

Key features and benefits:

- High strength
- Corrosion resistance
- Erosion resistance
- Magnetic resistance
- Excellent lubricity
- Excellent wear resistance
- Excellent machinability
- Easy implementation
- Galling resistance

C72900 (Hardiall®) overview

Chemical composition

Ni + Co (%)	Sn (%)	Fe (%)	Zn (%)	Mn (%)	Cb (%)	Mg (%)	Pb (%)	Cu (%)
14.50-15.50	7.50-8.50	0.50	0.50	0.30	0.10	0.15	0.02	Rem.

Note: Single values represent maximums.

Stocked size schedules*

AMS 4596 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	2.250	1.286	15.427	3.750	3.571	42.853
1.000	0.254	3.047	2.500	1.587	19.046	4.000	4.063	48.758
1.250	0.397	4.761	2.625	1.750	20.998	4.500	5.142	61.709
1.500	0.571	6.857	2.750	1.921	23.046	5.000	6.349	76.184
1.750	0.778	9.333	3.000	2.286	27.426	5.500	7.682	92.182
1.875	0.893	10.713	3.250	2.682	32.188	6.000	9.142	109.705
2.000	1.016	12.189	3.500	3.111	37.330	6.750	11.570	138.845

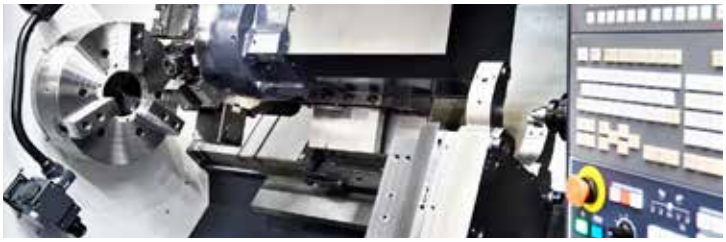
AMS 4597 solids

Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot	Size O.D.	Weight per inch	Weight per foot
0.750	0.143	1.714	1.250	0.397	4.761	1.750	0.778	9.333
1.000	0.254	3.047	1.500	0.571	6.857	2.000	1.016	12.189

AMS 4598 tubes

Nom. size I.D. x O.D.	Weight per inch	Weight per foot	Nom. size I.D. x O.D.	Weight per inch	Weight per foot	Nom. size I.D. x O.D.	Weight per inch	Weight per foot
3.000 x 4.500	3.015	36.179	3.500 x 5.000	3.374	40.492	6.440 x 7.660	4.718	56.615
			5.875	5.922	71.070	8.560	8.613	103.355

**Consult mill for other shapes/sizes.*



Wieland Concast is a supplier of Hardiall® C72900 produced by Lebronze alloys. This standard-stocked alloy is available to AMS 4596, 4597, and 4598 specifications.

NOTE: Hardiall is a registered trademark of Lebronze alloys.

Lead-free and low-lead alloys

wieland concast

Copper and copper alloys are essential materials for plumbing, with a continued growing trend to reduce lead in plumbing systems. Lead-free replacement alloys maintain exceptional quality and performance without the use of lead.

Lead-free / low-lead alloys			
C69300	C89833	C90800	C95900
C87850	C89835	C90810	
C89325	C89844	C95400	
C89831	C90300	C95500	

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Industry-specific applications:

- Bearings
- Bushings
- Corrosion-resistant/ pressure-tight castings
- Faucet stems
- Faucets
- Fittings/valves for potable water
- Gear blanks
- Gears
- High-speed/high-pressure bearings
- Impellers
- Marine products
- Pipe fittings
- Pumps
- Water meter cases
- Valve bodies for water

Lead-free / low-lead alloys overview

	Copper Alloy UNS No.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[4]	Al (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)
Silicon Brass														
	C69300[†]	73.00-77.00	0.02[1]-0.09	0.20	Rem.	0.10	0.04-0.15	0.10			0.10		0.10	2.70-3.40
	C87850	75.00-78.00	0.02[1]-0.09	0.30	Rem.	0.10	0.05-0.20	0.20			0.10		0.10	2.70-3.40
Bismuth Tin Bronze														
	C89325	84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70		0.08	0.50	0.005
	C89831	87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70		0.08	0.25	0.005
	C89833	86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70		0.08	0.25	0.005
	C89835	85.00-89.00	0.09	6.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70		0.08	0.35	0.005
	C89844	83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00		0.08	0.25	0.005
High Tin Bronze														
	C90300	86.00-89.00[2]	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00	0.005			0.05	0.20	0.005
	C90800	85.00-90.00[2]	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005			0.05	0.20	0.005
	C90810	Rem.[2]	0.25	11.00-13.00	0.30	0.15	0.15-0.80[3]	0.50	0.005			0.05	0.20	0.005
Aluminum Bronze														
	C95400	83.00 min				3.00-5.00		1.50	10.00-11.50		0.50			
	C95500	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50		3.50			
	C95900	Rem.				3.00-5.00		0.50	12.00-13.50		1.50			

[†]Lead-free brass [1]Pb content is greater than 0.02%. [2]In determining Cu min., Cu may be calculated as Cu + Ni.
[3]For continuous castings, P shall be 1.5%, max. [4]Ni value includes Co.
Note: Unless otherwise noted, single values represent maximums.

Lead-Free Alloy Low-Lead Alloy Standard-Stocked Alloy Other Available Alloy

Near-net shapes

wieland concast

Wieland Concast keeps our customers one step ahead by providing near-net alloy shapes for parts with specific end-use applications. This process results in faster throughput, lower tooling costs, and extended equipment life.

Common near-net shape alloys

Standard stocked		Other	
C86300	C89835	C83600	C84400
C90300	C93200	C90500	C90700
C95400	C95500	C96900HT	
C95510	C95900		

Certifications:
ISO 9001:2015 I AS9100:2016

Utilizing near-net shapes reduces:

- Raw material purchases
- Machining requirements and times
- Scrap generation

Other made-to-order custom manufacturing capabilities

- Packaging
- Labeling
- Barcoding
- Cutting to length
- Certifying

For further information please contact us here:
P +1 440 965 4455 I sales.concast@wieland.com I concast.com

Oil and gas

wieland concast

Alloys characterized by corrosion, wear, and impact resistance as well as the high-strength characteristics that are required for the oil and gas industry.

Products

Standard stocked			
C63000	C63020	C64200	C72900
C86300	C93200	C95400	C95500
C95510			

Also available			
C95400HT	C95410	C95500HT	C95520HT
C95800	C96900HT		

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Empowering the future of energy

Wieland Concast's commitment to oil and gas and other energy-related sectors can be seen in our experience and unwavering dedication to excellence in service and quality. We offer a diverse range of products that are the driving force behind mission-critical applications and end uses—including bearings, bushings, seals, and pump components.

General information

Copper alloy UNS no.	Material description	Applications
C63000*, C63020*	Nickel-aluminum bronze	Bearings, bolts, bushings, cams, fittings, gears, high-strength clamps, high-strength machine parts, hooks, hydraulic bushings, hydraulic cylinder parts, insert bearings, large valve stems, machine parts, machine tool bearings, marine hardware, nuts, propellers, pump fixtures, pump parts, pumps, roll neck bearings, shafting, spur gears, structural members, thrust washers, trunion bearings, valve components
C64200*, C95400*, C95400HT, C95410	Aluminum bronze	
C72900*†, C96900HT	Copper nickel-tin	
C86300*	Manganese bronze	
C93200*	Leaded tin bronze	
C95500*, C95500HT, C95510*, C95520HT, C95800	Nickel-aluminum bronze	

*standard-stocked alloy. †Wieland Concast is a North American supplier of Hardiall® C72900 produced by Lebronze alloys.

Chemical composition

Copper alloy UNS no.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)	Al (%)	Mg (%)	Mn (%)	S (%)	Sb (%)	Si (%)	Cb (%)	Nb (%)
C63000	remain.		0.20	0.30	2.00-4.00		4.00-5.50	9.00-11.00		1.50			0.25		
C63020	remain.	0.03	0.25	0.30	4.00-5.50		4.20-6.00	10.00-11.00		1.50			0.15		
C64200	remain.	0.05	0.20	0.50	0.30		0.25	6.30-7.60		0.10			1.50-2.20		
C72900*	remain.	0.02	7.50-8.50	0.50	0.50		14.50-15.50		0.15	0.30				0.10	
C86300	60.00-66.00	0.20	0.20	22.00-28.00	2.00-4.00		1.00	5.00-7.50		2.50-5.00					
C93200	81.00-85.00	6.00-8.00	6.30-7.50	2.00-4.00	0.20	0.15	1.00	0.005			0.08	0.35	0.005		
C95400 C95400HT	83.00 min				3.00-5.00		1.50	10.00-11.50		0.50					
C95410	60.00-66.00				3.00-5.00		1.50-2.50	10.00-11.50		0.50					
C95500 C95500HT	60.00-66.00				3.00-5.00		3.00-5.50	10.00-11.50		3.50					
C95510	78.00 min		0.20	0.30	2.00-3.50		4.50-5.50	9.70-10.90		1.50					
C95520HT	74.50 min	0.03	0.25	0.30	4.00-5.50		4.20-6.00	10.50-11.50		1.50	0.20		0.15		
C95800		0.03			3.50-4.50		4.00-5.00	8.50-9.50		0.80-1.50			0.10		
C96900HT		0.02	7.50-8.50	0.50			14.50-15.50		0.15	0.05-0.30			0.30		0.10

* (AMS 4596, 4597, 4598)
Note: Unless otherwise noted, single values represent maximums. See Wieland Concast website for more detailed chemical information.

Power transmission and control alloys

wieland concast

High-performance bronze alloys engineered and manufactured to withstand the toughest stress and wear of PTC components.

PTC Alloys

Standard stocked			
C86300	C90300	C93200	C95400
C95500			
Also available			
C90700	C91100	C92900	C93700
C93800			

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

Typical uses:

- Linear drives and gears
- Production equipment
- Bearings
- Hydraulics
- Compressed air

Power transmission and control-related alloy properties

General information

Copper alloy UNS no.	ASTM	Material description	Benefits
C86300*	B505	Manganese Bronze	hardness, good corrosion resistance, high wear resistance
C90300*	B505	Tin Bronze	hardness, good corrosion resistance, high wear resistance
C90700	B505	Tin Bronze	hardness, good corrosion resistance, high wear resistance
C91100	B22	High Tin Bronze	hardness, good corrosion resistance, high wear resistance
C92900	B505	Leaded Nickel-Tin Bronze	good corrosion resistance, high wear resistance
C93200*	B505	Leaded Tin Bronze	high wear resistance, semi-self-lubricating, good pressure tightness
C93700	B505	High-Leaded Tin Bronze	high wear resistance, semi-self-lubricating, good pressure tightness
C93800	B505	High-Leaded Tin Bronze	high wear resistance, semi-self-lubricating, good pressure tightness
C95400*	B505	Aluminum Bronze	high strength, tarnish resistant, good anti-frictional characteristics, good corrosion resistance
C95500*	B505	Nickel-Aluminum Bronze	high strength, tarnish resistant, good anti-frictional characteristics, good corrosion resistance

*standard-stocked alloy.

Chemical composition

Copper alloy UNS no.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)[3]	Ni (%)[4]	Al (%)	Mn (%)	S (%)	Sb (%)	Si (%)
C86300	60.00-66.00[1]	0.20	0.20	22.00-28.00	2.00-4.00		1.00	5.00-7.50	2.50-5.00			
C90300	86.00-89.00[1]	0.30	7.50-9.00	3.00-5.00	0.20	0.05	1.00	0.005		0.05	0.20	0.005
C90700	88.00-90.00[1]	0.50	10.00-12.00	0.50	0.15	0.30	0.50	0.005		0.05	0.20	0.005
C91100	82.00-85.00[1]	0.25	15.00-17.00	0.25	0.25	1.00	0.50	0.005		0.05	0.20	0.005
C92900	82.00-86.00[1]	2.00-3.20	9.00-11.00	0.25	0.20	1.50	2.80-4.00	0.005		0.05	0.25	0.005
C93200	81.00-85.00[1]	6.00-8.00	6.30-7.50	1.00-4.00	0.20	1.50	1.00	0.005		0.08	0.35	0.005
C93700	78.00-82.00	8.00-11.00	9.00-11.00	0.80	0.70[2]	1.50	0.50	0.005		0.08	0.50	0.005
C93800	75.00-79.00	13.00-16.00	6.30-7.50	0.80	0.15	1.50	1.00	0.005		0.08	0.80	0.005
C95400	83.00 min				3.00-5.00		1.50	10.00-11.50	0.50			
C95500	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50	3.50			

[1]In determining Cu min., Cu may be calculated as Cu + Ni. [2]Fe shall be 0.35% max. when used for steel-backed bearings.
[3]For continuous castings, P shall be 1.5% max. [4]Ni value includes Co.
Note: Unless otherwise noted, single values represent maximums.

Plumbing

wieland concast

Wieland Concast ensures the plumbing industry receives the highest-quality low-lead and lead-free copper alloys.

Products

Standard stocked			
C89835	C90300	C95400	C95500
C95900			
Also available			
C69300	C87850	C89325	C89831
C89833	C89844	C90800	C90810

Wieland Concast certifications

- AS9100:2016-certified quality management system
- ISO 9001:2015-certified quality management system

The enduring value of copper

For centuries, plumbers have relied on the strength and durability of copper and copper alloys in products including pipes, fittings, faucets, and plumbing components. At Wieland Concast, we build on this legacy by providing industry-leading solutions for fluid management and plumbing applications.

Chemical composition

Copper alloy UNS no.	Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)	Ni (%)[3]	Al (%)	Bi (%)	Mn (%)	S (%)	Sb (%)	Si (%)
Standard stocked													
C89835	85.00-89.00	0.09	2.00-7.50	2.00-4.00	0.20	0.10	1.00	0.005	1.70-2.70		0.08	0.35	0.005
C90300	86.00-89.00[2]	0.30	7.50-9.00	3.00-5.00	0.20	1.50	1.00[2]	0.005			0.05	0.20	0.005
C95400	83.00 min				3.00-5.00		1.50	10.00-11.50		0.50			
C95500	78.00 min				3.00-5.00		3.00-5.50	10.00-11.50		3.50			
C95900	remain.				3.00-5.00		0.50	12.00-13.50		1.50			
Also available													
C69300†	73.00-77.00[1]	0.02-0.09	0.30	remain.	0.10	0.05-0.20	0.20			0.10		0.10	2.70-3.40
C87850	75.00-78.00	0.02-0.09	0.30	remain.	0.10	0.05-0.20	0.20			0.10		0.10	2.70-3.40
C89325	84.00-88.00	0.10	9.00-11.00	1.00	0.15	0.10	1.00	0.005	2.70-3.70		0.08	0.50	0.005
C89831	87.00-91.00	0.10	2.70-3.70	2.00-4.00	0.30	0.05	1.00	0.005	2.70-3.70		0.08	0.25	0.005
C89833	86.00-91.00	0.09	4.00-6.00	2.00-6.00	0.30	0.05	1.00	0.005	1.70-2.70		0.08	0.25	0.005
C89844	83.00-86.00	0.20	3.00-5.00	7.00-10.00	0.30	0.05	1.00	0.005	2.00-4.00		0.08	0.25	0.005
C90800	85.00-90.00[2]	0.25	11.00-13.00	0.25	0.15	0.30	0.50	0.005			0.05	0.20	0.005
C90810	remain.[2]	0.25	11.00-13.00	0.30	0.15	0.15-0.80[4]	0.50	0.005			0.05	0.20	0.005

[1]Cu value includes Ag [2]In determining Cu min., Cu may be calculated as Cu + Ni. [3]Ni value includes Co.
[4]For continuous castings, P shall be 1.5%, max. †C69300 ECO BRASS® is produced by our partner, Wieland Chase.
Note: Unless otherwise noted, single values represent maximums.

Industry-specific applications:

- Bathroom fixtures
- Faucet components
- Fittings
- Fixtures
- Pipe service lines
- Pump components
- Sprinkler heads
- Steam fittings
- Traps
- Valves
- Water meter cases
- Water pump impellers

Wieland.
Creating value for generations.

Wieland Concast | P 440-965-4455 | sales.concast@wieland.com | concast.com