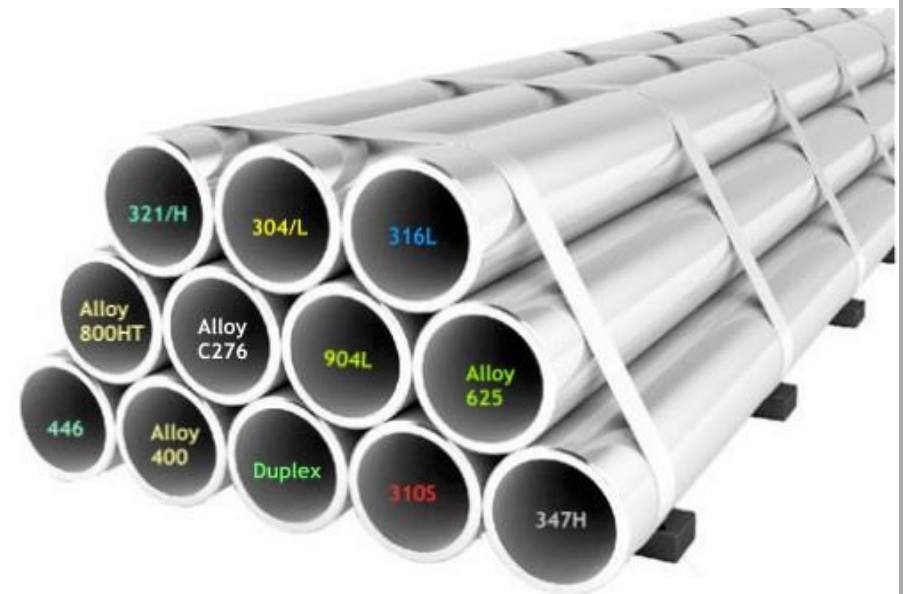


# PHOSPHOR BRONZE

## Datasheet for Phosphor Bronze

- Pipes & Tubes
- Sheets & Plates
- Bars & Rods, Forgings
- Fittings & Flanges
- Nuts & Bolts
- Valves



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# Datasheet for Phosphor Bronze

## Alloy 510, C51000, Alloy 521, C52100, C52400, C53400, Alloy 54400, C54400, Alloy 519

### What is Phosphor Bronze?

- Phosphor bronze is a member of the family of copper alloys. It is composed of copper that is alloyed with 0.5–11% of tin and 0.01–0.35% phosphorus, and may contain other elements to confer specific properties (e.g. lead at 0.5–3.0% to form free-machining phosphor bronze). The addition of tin increases the corrosion resistance and strength of the alloy. The phosphorous increases the wear resistance and stiffness of the alloy. The phosphor bronzes have superb spring qualities, high fatigue resistance, excellent formability and solderability, and high corrosion resistance. They are primarily used for electrical products, other uses include corrosion resistant bellows, diaphragms, and spring washers. The phosphor bronzes are designated as UNS C50100 through C54200. Leaded phosphor bronzes combine good strength and fatigue resistance with good machinability, high wear resistance and corrosion resistance. They are used in applications such as sleeve bearings, thrust washers, and cam followers. They are designated as UNS C53400 through C54400.

### Phosphor Bronze Product Specification

MATERIAL:	Phosphor Bronze
GRADE:	Alloy 510, Alloy 521, Alloy 519, Alloy 544
STANDARD:	ASTM B103, ASTM B139
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

### ASTM Specification of Phosphor Bronze

END PRODUCT	SPECIFICATION
Bar	ASTM B103, B139, SAE J 463, J461
Bearings and Bushings	MILITARY MIL-B-13501
Plate	ASTM B103
Rod	ASTM B139, SAE J 463, J461
Shapes	ASTM B139
Sheet	ASTM B103, SAE J 463, J461
Strip	AMS 4520, ASTM B103, SAE J 463, J461

### Equivalents of Phosphor Bronze

Alloy Description	American Spec.	German Spec.	British Spec.	Typical Material Applications
UNS	SAE	Alloy		Phosphor bronze is used for springs, bolts and various other items used in situations where resistance to fatigue, wear and chemical corrosion are required (e.g., a ship's propellers in a marine environment). The alloy is also used in some dental bridges. The combination of good physical properties, fair electrical conductivity and moderate cost make Phosphor Bronze round, square, flat and special shaped wire desirable for many springs and electrical contacts and a wide variety of wire forms.
Phosphor Bronze Grade I	C54400	CuSn4	PB101	
Phosphor Bronze Grade II	C51000	CuSn5	PB102	

Phosphor Bronze Grade III	C51900	CuSn6	PB103	
Phosphor Bronze IV	C52100	CuSn8	PB104	

### Size Range of Phosphor Bronze

ROUND RODS	8mm To 70 mm
HEX	10mm To 60mm
SQUARE	10mm To 60mm
FLAT	10mm Min Thickness and max Width 120mm
BILLETS	Up to 200 mm
INGOTS	As per Specification

### Chemical Properties of Phosphor Bronze

Alloy	UNS Designation	Tin	Phosphorus	Iron, max	Lead, max	Zinc, max	Copper
510	C51000	4.2-5.8	.030-.35	0.1	0.05	0.3	remainder

### Mechanical Properties of Phosphor Bronze

ASTM Specification	Temper	Tensile Strength	Rockwell B Scale	Superficial (30-T Scale)
		min-max psi	min-max	min-max

Annealed	Annealed	43-58	12-64	24-59
H02	1/2 Hard	58-73	60-85	53-73
H04	Hard Tempered	76-91	84-93	71-78
H06	Extra Hard	88-103	89-96	74-81
H08	Spring Temper	95-110	92-98	76-82
H10	Extra Spring	100-114	94-99	77-83

### Properties of Phosphor Bronze

- Superb spring qualities
- High fatigue resistance
- Excellent formability
- Fine grain
- High corrosion resistance.
- The addition of tin increases the corrosion resistance and strength of the alloy.
- The phosphor increases the wear resistance and stiffness of the alloy.
- C544 Phosphor bronze is one of the finest bearing alloys the industry has to offer.
- Good electrical conductivity
- Very good product for strength performance
- Low coefficient of friction
- Excellent elasticity

### Applications of Phosphor Bronze

Phosphor bronze is used for springs, corrosion resistant bellows, diaphragms, bolts, bushings and bearings, electrical switches with moving or sliding parts, dental bridges, the reed component of organ pipes and various other products or assemblies where resistance to fatigue, wear, and corrosion are required (e.g., ship's propellers in a marine environment).

## Types of Phosphor Bronze Products

Phosphor Bronze Hollow Pipe	Phosphor Bronze Heater for High Temperature
Phosphor Bronze Seamless Pipe	Phosphor Bronze Heat Exchanger Tube
Phosphor Bronze Bush Hex Pipe	Potassium-doped Phosphor Bronze Wire
Phosphor Bronze Round Pipe	Phosphor Bronze Welded Pipe
Phosphor Bronze Alloy Round Pipe	Phosphor Bronze Rotating target
Phosphor Bronze Aero engine tube	Phosphor Bronze Custom Pipe
Phosphor Bronze Alloy Custom Pipe	Phosphor Bronze Thick Wall Pipe
Phosphor Bronze Elliptical and Oval Tube	Phosphor Bronze Thin Wall Pipe
Phosphor Bronze Pipe Fittings	Phosphor Bronze Forging
Phosphor Bronze Strips	Phosphor Bronze Fasteners
Phosphor Bronze Flex pipe	Phosphor Bronze Plates, Sheets and Bars
Phosphor Bronze Alloy Polished Pipe	UNS Phosphor Bronze lined pipe
Phosphor Bronze Exhaust Pipe	Phosphor Bronze Micro Tube
Phosphor Bronze Bar/Billet	Phosphor Bronze Wire/Welding Wire
Phosphor Bronze Boiler Tube	Phosphor Bronze Coil Tubing
Phosphor Bronze Capillary Tube	Phosphor Bronze U Shaped Tube
Phosphor Bronze Rods	Precision Phosphor Bronze Tubing
Phosphor Bronze Suppliers	Phosphor Bronze Pipe Manufacturers

Phosphor Bronze Ingots	Phosphor Bronze Foil
Phosphor Bronze Metals	Phosphor Bronze Crucibles

### Manufacturing Phosphor Bronze Products

<a href="#">Phosphor Bronze Sheet</a>	<a href="#">Phosphor Bronze Plate Cuttings/Profiles</a>	<a href="#">Phosphor Bronze Nuts, Bolts and Fasteners</a>
<a href="#">Phosphor Bronze Plate</a>	<a href="#">Phosphor Bronze Foil, Coil</a>	<a href="#">Phosphor Bronze Wire</a>
<a href="#">Phosphor Bronze Blocks/Slabs</a>	<a href="#">Phosphor Bronze Strip</a>	<a href="#">Phosphor Bronze Ingot</a>
<a href="#">Phosphor Bronze Rod/Bar</a>	<a href="#">Phosphor Bronze Pipes and Tubes</a>	<a href="#">Phosphor Bronze Forgings and Castings</a>
<a href="#">Phosphor Bronze Flanges</a>	<a href="#">Phosphor Bronze Forged Fittings</a>	<a href="#">Phosphor Bronze Buttweld Fittings</a>

### About Metallica Metals – The Steel Pipes Factory

- Established in 1975, the Metallica Metals Group (The Steel Pipes Factory) has its operations spread across major cities in India. We are a pioneer in the stainless steel pipes, nickel alloy products, titanium products, carbon steel pipes and alloy steel pipes manufacturing and processing industry. Our products including pipe fittings, flanges, pipes, sheet plates and valves are exported to over 70 countries across the world, while in India we have supplied to even the remote areas. With over 250 tons of sale in stainless steel and carbon steel pipes every day, Metallica has emerged as a prominent vendor for many buyers in India and Overseas
- More than 3000 tons ready from stock and new production ready in just a few weeks.
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### Our Key Products

#### **STAINLESS STEEL & NICKEL ALLOYS**

Pure Nickel Alloys  
Monel Alloys (Ni-Cu Alloys)  
Inconel (Ni-Cr-Mo) Alloys

#### **INSTRUMENTATION TUBES & FITTINGS**

Instrumentation Tube  
Hydraulic Tubing  
Seamless Tubing

#### **PRODUCTS**

Steel Sheet & Plate  
Steel Coil & Strip  
Steel Pipes

Incoloy Alloys (Ni-Cr-Fe)

Hastelloy Alloys

Stainless Steel 304/304L

Stainless Steel 309S/309H

Stainless Steel 310/310S

Stainless Steel 316/316L

Stainless Steel 316Ti

Stainless Steel 317/317L

Stainless Steel 321/321H

Stainless Steel 347/347H

Stainless Steel 904L

Duplex Steels (UNS S32205, UNS S31803)

Super Duplex Steels (UNS S32760 / UNS  
S32750)

Stainless Steel 254 SMO (UNS S31254 / 1.4547)

Instrumentation Tube Fittings

Double Compression Tube Fittings

Precision Pipe Fittings

Needle & Gauge Valves

Manifold Valves

Steel Tubes

Electropolish Tube

Heat Exchanger Tubes

Steel Bars/Rods & Wire

Fasteners (Nut, Bolt, Washer)

Steel Angle Bars

Hex Steel Bars

Round Steel Bars & Rod

Flat Steel Bars

Forgings, Rings & Forged Blocks

Stainless Steel Pipe

Stainless Steel Seamless Pipe

Stainless Steel Welded Pipe

Stainless Steel Tubes

Stainless Steel Furnace Tubes

Stainless Steel Seamless Tubing

Stainless Steel Heat Exchanger Tubes

Large Diameter Pipe

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