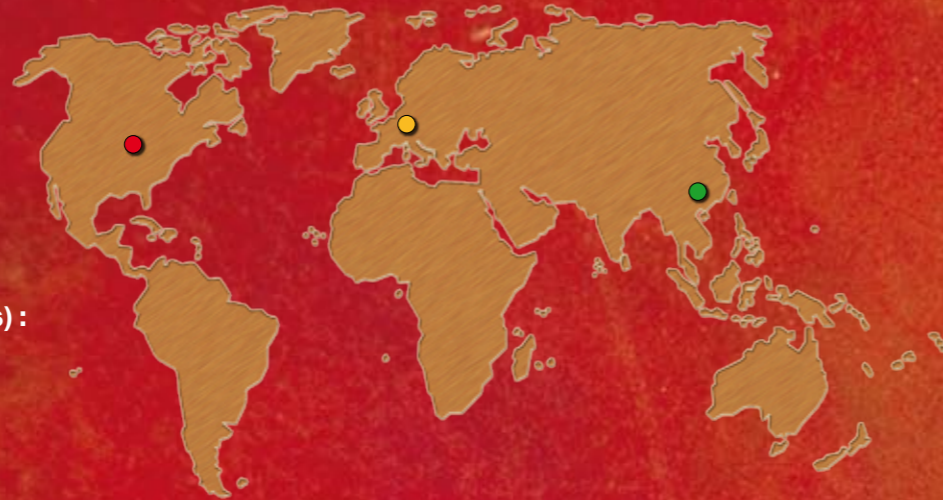


**COMMITTED TO INNOVATIVE PRODUCTS AND SUPERIOR CUSTOMER SERVICE FOR OVER 90 YEARS.**

Ampco Metal is an integrated metal producer, offering under the Ampco® and Ampcoloy® brands the widest range of premium speciality bronzes and copper alloys, famous for their exceptional physical and mechanical properties.

Professional value-added services, exceptional product quality and short delivery times are internationally guaranteed from our warehouses in Europe, USA and China. Round bar, rectangles, tubes and plate are all readily available from stock and cast or forged shapes can be produced specifically to your requirements. In addition to our activity in alloys, Ampco Metal has invested extensively in the latest machining technology and has the expertise to deliver highly competitive, pre-machined or fully-machined precision pieces, as required.



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**AMPCO METAL YOUR SOLUTION PROVIDER** *worldwide*



In addition to the above, Ampco Metal has an extensive network of manufacturing, distribution and commercial facilities throughout Europe, the USA and China.

Please consult [www.ampcometal.com](http://www.ampcometal.com) for your nearest Ampco Metal outlet.

[www.ampcometal.com](http://www.ampcometal.com)  
[info@ampcometal.com](mailto:info@ampcometal.com)



**COPPER-BASED ALLOY SOLUTIONS**

**FULL PRODUCT RANGE  
WORLDWIDE AVAILABILITY  
EXPERT ADVICE**



[www.ampcometal.com](http://www.ampcometal.com)





## YOUR BEST SOURCE FOR PREMIUM COPPER ALLOYS

As one of the world's leading providers of innovative copper-based alloy solutions, Ampco Metal is an international company with production capabilities and essential stockholding throughout Europe, USA and China.

Since the foundation of the Company in 1914, Ampco Metal has dedicated itself to providing complete customer satisfaction, through its exceptional service levels and by supplying our customers with their precise copper alloy needs.

### We offer the broadest range of material forms:

- Continuous Cast Rod, Bar, Tube
- Extruded Rod, Bar, Tube
- Forgings
- Plate
- Welding Wires
- Fully Machined Parts

The continuous development of Ampco Metal alloys and our licensed products, together with our patented production techniques and extensive machining facilities, have resulted in our being able to offer the widest spectrum of metal solutions and services.

Our technical understanding means that Ampco alloys can be tailored to fulfill specific customer requirements. **Only Ampco Metal has the precise engineering and metallurgical expertise to provide true solutions to your application needs.**



## AMPCO METAL – The first name for premium copper alloy solutions

Ampco Metal alloys combine proprietary metallurgical controls and thermal treatments to provide the ultimate in performance and dependability, with exceptional physical and mechanical properties produced through strictly controlled manufacturing and laboratory procedures.

The resulting alloys offer our customers a range of products that stand ready to serve existing markets – exceeding the requirements of the industry's most demanding applications, yet ready to meet the challenges of new and developing market sectors.

By selecting Ampco alloys\* over commercial bronzes, you can achieve:

- 20 – 40% higher wear resistance due to higher mechanical properties
- Trouble-free operations as no nickel contamination
- 30 – 50% greater resistance to corrosion

These factors can result in greater component life and lower maintenance downtime expenditure.



\* Please ask your local Ampco Metal office for advice on our best alloy for your application.





## Aluminium Bronzes

### Ampco 8

Offers excellent corrosion-resistance and outstanding friction tolerance. Used in applications such as fittings, fasteners, ball socket seats, bearings and tie rods in brine slurry equipment.

### Ampco 15\*

Suitable for moderate-wear service bushings, sleeve bearings and bearing races, gears, valve stems, valve guides and seats.

### Ampco 18

The primary Ampco alloy for heavy duty applications involving wear, abrasion and fatigue, where the absence of nickel in its composition significantly reduces the risk of mechanical abrasion with mating steel surfaces. This is the material of choice for wear plates, bearings, tie bar nuts, gears, worm-wheels, tube bending tools, wiper dies and similar applications. Ampco 18 is readily machined and should be used in critical situations where it is essential to avoid unnecessary down-time or damage to moving steel parts. The mechanical properties of Ampco 18 can be enhanced by special heat-treatments devised by Ampco Metal to meet specific customer demands for higher impact resistance or resistance to distortion, especially applicable to the aviation and steel production sectors.

### Ampco 21

Used for heavier loads under abrasive conditions where no impact forces are present, for example, tube bending tools and mandrels, forming rolls, pilot bushings, dies and drill jig bushings. Ampco 21 also offers proven performance in plastic moulding applications such as ejector sleeves and bushings, guide pins and wear plates.

### Ampco 22

Used principally for forming and drawing dies or wear parts under heavy compressive loads together with cam rollers and followers. Ampco 22 is also recommended for plastic mould applications requiring maximum metal to metal wear resistance.

### Ampco 25

A superb high hardness alloy for the efficient production of quality pressings, principally in stainless steel but equally proficient for titanium, low carbon steels and other deep-drawn or formed metals.

With the move towards using thinner, harder steels in many sectors, including automotive production, conventional press tools are prone to rapid heating, leading to mechanical bonding with the moulded component and surface damage (galling), resulting in rejections and poor product quality.

The exceptional sliding and thermal transfer characteristics of Ampco 25 have been proven to eliminate such problems and enable greater deformation levels - such that the number of production stages may be reduced, productivity increased, rejections eliminated and profits enhanced. Readily polished to a high "mirror" finish by conventional methods, Ampco 25 is chosen by the domestic appliance sector for the pressing of scratch-free stainless steel cooker and refrigerator fronts, extractor hoods, cooking utensils and a host of other items that find a place in our day-to-day lives. The prominence of stainless steel in beer barrel production and a subsequent need for higher deformation levels of the thicker steels needed to withstand the rough handling such barrels receive in their use, has resulted in Ampco 25 draw rings becoming the essential choice of manufacturers in this industry.

### Ampco 26

A harder derivative of Ampco 25 for use in exceptional circumstances where severe service conditions are encountered.

### Ampco 642\*

Ideal for a variety of marine hardware applications, valve seats/stems, gears and cams. A non-magnetic alloy, resistant to wear and corrosion, that will withstand relatively high temperatures and is easily machined.

\*Please ask your local Ampco Metal representative for availability.



## Manganese Bronze Alloys

### Ampco 673\*

Widely specified for applications such as bushings, cams, nuts and bolts, connector rods, shafts, worm gears and lead screw nuts in corrosive environments, the higher lead content of Ampco 673 results in an increase of machinability over its sister alloy, Ampco 863, but with a small reduction in mechanical properties.

### Ampco 863\*

The higher strength and corrosion resistance of this alloy make it an ideal material for use in the heavy-duty construction and agricultural equipment sectors. By outperforming conventional bronzes, Ampco 863 has found considerable success in applications such as bearings, worm gears, cams and in particular, segmented bushings and sleeve bearings.



## Nickel-Aluminium Bronzes

### Ampco 45

A high strength alloy with mechanical properties beyond the range of commercial nickel-aluminium bronzes resulting from a special manufacturing process employed by Ampco Metal. Applications that involve abrasive wear, friction, mechanical deformation or chemical erosion such as aircraft bearings/bushings, pump and marine shafts, wear rings, valve spindles and seats or machine tool parts, will benefit from using Ampco 45. The spark-resistance properties of this alloy make it suitable for the production of safety tools and machine tool components used in explosive environments.

### Ampco 483\*

Offers exceptional corrosion and cavitation resistance with high strength, excellent ductility and good weldability. Typical applications are found in marine service, fittings, couplings, fasteners, etc. and for components operating within other corrosive environments.

### Ampco M4

A truly exceptional alloy that has been heat-treated utilising the marannealing process to produce a material with mechanical properties and a strength-weight ratio far exceeding the range of commercial aluminium bronzes. The high hardness of Ampco M4 coupled with superb resistance to deformation and abrasion, makes this material ideal for applications involving heavy dynamic loads, abrasive wear and frictional forces. In particular, Ampco M4 is used extensively in commercial and military aircraft landing gear assemblies, for tube manipulation tools and for parts operating under load in adverse environments, such as the conditions experienced in off-shore drilling situations.

\*Please ask your local Ampco Metal representative for availability.





## Proven quality to outperform ordinary commercial bronzes

### Continuous Cast Round Rod

Aluminium and manganese bronzes manufactured by Ampco Metal utilising the continuous casting process are proven to outperform ordinary commercial bronzes. We maintain an extensive range of stock sizes to ensure a fast response time and material that closely matches your final size requirements.

### Continuous Cast Tube

When the form of your finished parts permits it, considerable savings in both raw material costs and machining time can be achieved by using bronze alloy tubes from Ampco Metal. With one of the largest ranges of stock tubes in the non-ferrous sector, we are confident at being able to meet all of your requirements. For large quantity users, we can produce custom-made tube sizes that optimise your production needs, thus improving your productivity still further. Please consult your local Ampco Metal representative for more details.

### Continuous Cast Rectangular Bar

Aluminium bronzes for applications requiring maximum metal-to-metal wear resistance, stocked in a wide range of sizes and cut to the length that is most efficient for your processing.

### Forged Plate

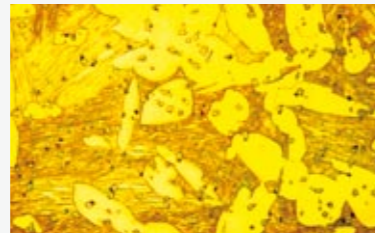
Ampco aluminium bronze alloys are available from stock in the widest range of plate sizes up to and including 260 mm thick (Ampco 18). Forged plate from Ampco Metal exhibits the consistent, defect-free structure demanded by today's manufacturing sector. To further enhance the ease of use of Ampco alloys, such plates are usually supplied in the rough machined condition, thus ensuring a high degree of dimensional stability, minimising waste and reducing machining time.

### Typical Applications

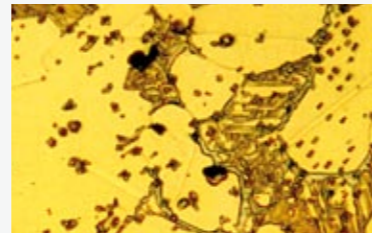
Wear plates, work rest blades, brakes on theme park rides, gear racks, tube-bending tools, wiper dies, drawing and straightening dies, wear strips, bushings and many others.

### AMPCO-PHASE™

Ampco Metal alloys have a unique microstructure that guarantees dependability. Ampco-Phase is achieved through the critical control of foundry techniques and gives Ampco Metal alloys a distinctive, uniform grain microstructure. This is unlike the usually large, segregated and uncontrolled structure found in commercial alloys. You get proven strength, ductility and hardness, which make Ampco-Phase alloys consistently dependable, even in the most severe service requirements. Only Ampco alloys offer the superior performance of manufacturing, and the metallurgical advantage of Ampco-Phase. It's all you need to guarantee the highest quality and dependability from your alloys.



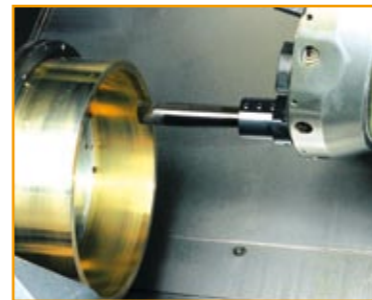
Ampco 18 aluminium bronze microstructure (400x magnification)



Commercial aluminium bronze microstructure (400x magnification)



A broad range of available stock



Premium machining services



Highest-quality results with Ampco

## CHEMICAL COMPOSITION AND PROPERTIES

		ALUMINIUM BRONZES					MANGANESE BRONZES
		AMPCO 18	AMPCO 21	AMPCO 22	AMPCO 25	AMPCO 26	AMPCO 863
Chemical Composition*	Cu	85.5	82.0	81.0	NOT PUBLISHED	NOT PUBLISHED	62.0
	Al	10.5	12.5	13.5			6.0
	Fe	4.0	4.5	5.0			3.0
	Mn	-	1.0	1.0			3.0
	Zn	-	-	-			26.0
Properties**							
Tensile Strength: MPa (ksi)		655 (95)	620 (90)	724 (105)			724 (105)
Yield Str. 0.5% elong: MPa (ksi)		275 (40)	345 (50)	427 (62)		365 (53)	
Elongation: (% in 2* = 50.8mm)		16	0.5	0.1	-	-	18
Hardness: BHN (3000 kg)		179	286	320	369	400	225
Density: kg/dm <sup>3</sup> (lb./cu.in.)		7.45 (.269)	7.20 (.260)	7.06 (.255)	6.95 (.251)	6.95 (.251)	7.83 (.283)

\* / \*\* The above are nominal values. If specific minimum figures are required, please contact your local Ampco Metal representative.





Ampco aluminium bronzes in the extruded and cold finished form offer considerable flexibility to companies engaged in manufacturing parts for heavy duty service where the slightly higher mechanical properties can prove invaluable.

Fully complimenting our range of continuously cast materials in the applications that they can be used in, Ampco extruded products can also be manufactured to much closer tolerances, thus minimising waste and reducing machining time.

Ampco Metal offers its alloy extrusions in the standard forms: round, tube and rectangle. For larger users, "special" shapes can also be produced – please consult with your Ampco Metal representative for further information.

In general, the extrusion process produces alloys with an even finer grain structure and a corresponding increase in mechanical properties.

### CHEMICAL COMPOSITION AND PROPERTIES

		ALUMINIUM BRONZES						NICKEL ALUMINIUM BRONZES			MANGANESE BRONZES	
		AMPCO 8	AMPCO 15	AMPCO 18	AMPCO 21	AMPCO 22	AMPCO 25	AMPCO 642	AMPCO 45	AMPCO 483	AMPCO M-4	AMPCO 673
Chemical Composition*	Cu	90.5	88	86	82	81	NOT PUBLISHED	91	81	81	78	60
	Al	6.7	9	10.5	12.5	13.5		7	10	9	10.5	-
	Fe	2.5	3	3.5	4.5	5		-	3	4	5	-
	Mn	-	-	-	1	1		-	1.0	1.5	1.0	2.5
	Si	-	-	-	-	-		2	-	-	-	1.0
Properties**												
Tensile Strength: MPa (ksi)		552 (80)	655 (95)	724 (105)	758 (110)	724 (105)	>500 (>70)*	620 (90)	814 (118)	724 (105)	1000 (145)	517 (75)
Yield Str. 0.5% elong: MPa (ksi)		352 (51)	345 (50)	358 (52)	413 (60)	427 (62)	>500 (>70)*	345 (50)	517 (75)	365 (53)	800 (115)**	379 (55)
Elongation: (% in 2* = 50.8mm)		35	25	14	1*	.5*	.2	30	15	22	8	15
Proportional limit: MPa (ksi)		241 (35)	138 (20)	193 (28)	234 (34)	331 (48)	-	-	331 (48)	117 (17)	517 (75)	-
Hardness: BHN (3000 kg)		180	174	192	286*	332*	369	166	228	212	286	153
Rockwell		89B	88B	92B	29C	35C	40C	86B	98B	96B	29C	82B
Density: kg/dm <sup>3</sup> (lb./cu.in.)		7.95 (.287)	7.65 (.276)	7.45 (.269)	7.20 (.260)	7.06 (.255)	6.95 (.251)	7.70 (.278)	7.53 (.272)	7.65 (.276)	7.45 (.269)	8.31 (.300)
Electrical Conductivity: % IACS		12	12	12	10	10	9	8	9	7	6 (est.)	18
Thermal Conductivity: CGS (W/mK)		.13 (55)	.13 (55)	.15 (63)	.11 (46)	.10 (42)	.08 (33)	.11 (46)	.09 (38)	.09 (38)	.1 (42)	.09 (38)
BTU/ft./hr./°F		31	31	36	27	24	19	27	22	22	24	22

\* / \*\* The above are nominal values. If specific minimum figures are required, please contact your local Ampco Metal representative.





Ampcoloy High Conductivity Alloys: AA940, AA944, AA972

Ampco Beryllium Copper Alloys: AA83, AA88, AA89, AA91/95

High conductivity alloys that offer a unique combination of properties for demanding and thermal applications.

**Ampcoloy 940**

A superb combination of high thermal and electrical conductivity, with high hardness and strength. Good corrosion and abrasion resistance. Beryllium free.

**Applications:**

Plastic injection mould tools and inserts, plunger tips for cold chamber die casting machines. Moulds for non-ferrous metal casting.

**Ampcoloy 944**

An exceptional combination of higher thermal conductivity, tensile strength, and hardness for high strength applications that require rapid heat removal. Beryllium free.

**Applications:**

Plastic injection mould tools and inserts, butt welding dies, plunger tips, heavy duty electrical and wear components.

- High thermal conductivity for fast removal of heat
- Excellent machining properties
- Retains the inherent corrosion-resistance of copper
- Superb wear resistance
- Easily polished to a high finish

**Ampcoloy 972**

Very high electrical and thermal conductivity, good hardness and high resistance to softening.

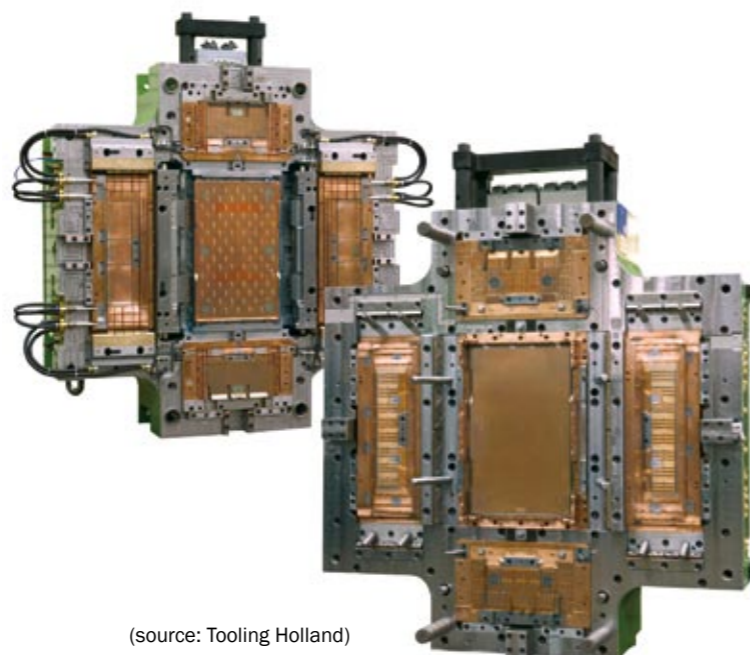
**Applications:**

Welding wheels, electrodes, holder and shanks for resistance welding machines, Clamps for butt and flash welding.

Ampcoloy High Conductivity Alloys are supplied in the mill hardened condition for the convenience of our customers and ease of use.

		BERYLLIUM-FREE ALLOYS			BERYLLIUM-CONTAINING ALLOYS			
		AA 940	AA 944	AA 972	AA 83	AA 88	AA 89	AA 91/95
Chemical Composition (%)	Cu	96.4	90	98.8	Cu	97.5	96.5	97.2
	Be	-	-	-	Be	2.0	0.5	0.5
	Co				Co	0.5	3.0 (Co+Ni)	2.0 (Co+Ni)
	Cr	0.4	1.0	1.0	Cr			
	Ni	2.5	7.0		Ni			
	Zr			0.1	Zr			
	Si	0.7	2.0		Si			
<b>Mechanical Properties @ 20°C (68°F)</b>								
Rockwell Hardness		95B	30C	78B	38C	28C	98B	95B
Brinell Hardness		210	294	140	360	270	230	240
Tensile Strength MPa (ksi)		689 (100)	938 (136)	520 (75)	1310 (190)	890 (129)	740 (107)	723 (105)
Yield Strength MPa (ksi)		510 (74)	730 (106)	370 (53)	827 (120)	680 (98)	680 (98)	537 (78)
Elongation A5 (%)		12	5	13	5	14	12	17
<b>Physical Properties @ 20°C (68°F)</b>								
Electrical Conductivity m/Ω mm <sup>2</sup>		28	18	45	11.6	30	40	26
Electrical Conductivity %IACS		48	30	78	20	52	69	45
Thermal Conductivity W/m °K (Btu/ft/hr)		217 (125)	156 (90)	310 (179)	108 (62)	230 (133)	300 (133)	218 (126)
Elasticity Modulus Gpa (ksi)		131 (19000)	151 (22000)	112 (16000)	131 (19000)	128 (18500)	117 (17000)	117 (17000)
Specific Heat J/g °K (Btu/lb/°F)		0.38 (0.9)	0.38 (0.9)	0.38 (0.9)	0.42 (0.1)	0.42 (0.1)	0.42 (0.1)	0.42 (0.1)
Density g/cm <sup>3</sup> (lb./in <sup>3</sup> )		8.71 (0.315)	8.70 (0.314)	8.87 (0.320)	8.26 (0.298)	8.75 (0.316)	8.75 (0.316)	8.75 (0.316)
Working temperature limit °C (°F)		550 (1020)	400 (750)	500 (930)	300 (572)	450 (840)	450 (840)	450 (840)

The above are nominal values. If specific minimum figures are required, please contact your local Ampco Metal representative.



(source: Tooling Holland)



**WARNING:**

With alloys contains Beryllium, it is recommended that during any operation which is liable to create dust or fumes (for example dry grinding, polishing or welding) precautions should be taken to ensure there is no inhalation or exposure to eyes or skin. Conventional machining (for example milling and turning) is not generally considered hazardous. For further information please consult your Ampco Metal representative.

**Ampcoloy 83**

Exceptionally high hardness and strength, combined with good electrical and thermal conductivity.

**Applications:**

Welding dies for the flash-butt welding in cold-rolling mills. Injection mould tools and inserts in the plastic moulding sector. Special applications in aviation, deep sea water connections.

**Ampcoloy 88**

Especially high hardness and high heat resistance, coupled with good electrical and thermal conductivity.

**Applications:**

Inserts in plastic moulds. Special applications in the resistance welding sector requiring higher strength.

**Ampcoloy 89**

High electrical and thermal conductivity with very good hardness and strength at high temperatures.

**Applications:**

Welding electrodes, electrode holders for resistance welding applications. Seam welding of stainless sheet metals. Welding of reinforcing mesh, Moulds for non-ferrous metal casting. Cooling inserts in steel moulds and plunger pistons. Is suitable for applications with high thermal loads and parts at risk from thermal cracking.

**Ampcoloy 91/95**

High hardness and high heat resistance coupled with good electrical and thermal conductivity.

**Applications:**

Electrodes, electrode holders for the resistance welding sector. Crosswire welding of reinforcing mesh, Moulds for non-ferrous metal casting, plunger tips for cold chamber die casting. Suitable for applications with high thermal loads and parts at risk from thermal cracking.

