

AMPCO[®] Sintered Alloys



**Products for: - Resistance Welding Electrodes
- Electrical Contact Materials**

Product Definition & Uses

The high electrical and thermal conductivity of copper is combined with arc-resistant and non-welding properties of tungsten and molybdenum, or their carbides, to form extensive series of compositions, each designed to give the best performance for your particular application.

These materials are generally used as electrode materials for resistance welding and similar related applications and for such heavy duty contact applications, relays, switches, etc...

These materials excel in these applications because they will withstand the effects of the arcing to the interruption of large currents.

Typical applications include :

- resistance welding electrodes
- EDM electrodes
- circuit breakers (air and/or oil immersed)
- arcing tips
- make-and-break contacts
- heavy-duty contactors
- relays/switches

Superior Performance

AMPCO refractory alloys are manufactured by the powder metallurgy techniques of pressing, sintering and infiltrating in a very high degree of uniformity, held in the fine-grained microstructure of the finished material. To the user this means an extremely high performance material which will stand up uniformly the most severe applications and outlast other brands.

AMPCO copper-tungsten alloys are of the highest quality available and the physical properties of our alloys are considerably above those specified under RWMA standards.

RWMA Class	AMPCO Grade	Alloy Type
Class 10	A1WC	Copper-Tungsten
Class 11	A10WC	Copper-Tungsten
Class 12	A20/30WC	Copper-Tungsten
Class 13	A100W	Pure Tungsten
Class 14	A100M	Pure Molybdenum

Material Properties

A1W	A10W	A20W	A30W	A100W
56% W 44% Cu	75% W 25% Cu	78% W 22% Cu	80% W 20% Cu	100% W
55-60% IACS	42-50% IACS	42-50% IACS	45% IACS	31% IACS
72-82 HRB	96-99 HRB	97-101 HRB	99-104 HRB	69 HRA
Class 10	Class 11	Class 12	Class 12	Class 13

Other items are available and will be quoted on request:

- Silver-tungsten
- Pure molybdenum
- Wire
- Tubing
- Sheet stock
- Special shapes and forms

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About Sintered Products



Copper-Tungsten

Refractory bi-metal composite produced by a tightly controlled process of pressing and sintering tungsten powder and then infiltrating the sintered material with copper.

Copper Tungsten Grades

Grade	Description	%	RWMA Class	Density Grams/cm ³	Elect. Cond. %IACS	Hardness
A1WC	Tungsten Copper	56% 44%	10	12.60	50-60	72-82R _B
A3WC	Tungsten Copper	68% 32%	10	13.93	48-53	85-92R _B
A5WC	Tungsten Copper	70% 30%	10	14.18	47-52	88-95R _B
A10WC	Tungsten Copper	75% 25%	11	14.80	42-50	96-99R _B
A30WC	Tungsten Copper	80% 20%	12	15.60	41-49	99-104R _B
A10WA	Alloy * Tungsten Copper	75% 25%	*	14.80	25-30	104-110R _B

Note: The values are typical and not to be used for specifications.

* Heat treatable copper alloy. These grades furnished fully heat treated.

Silver-Tungsten

Refractory bi-metal composite produced by a tightly controlled process of pressing and sintering tungsten powder and infiltrating the sintered material with silver.

Silver Tungsten Grades

Grade	Description	%	RWMA Class	Density Grams/cm ³	Elect. Cond. %IACS	Hardness
A50WS	Tungsten Silver	50% 50%	-	13.48	62-70	50-60R _B
A35WS	Tungsten Silver	65% 35%	-	14.77	50-56	80-87R _B
A20WS	Tungsten Silver	78% 22%	EDM ECM	15.56	48-53	90-100R _B

Note: The values are typical and not to be used for specifications.

Molybdenum-Tungsten



Pure Molybdenum and Tungsten refractory metals stocked in both rod and plate form for expedited delivery.

Molybdenum and Tungsten Grades

Grade	Description	%	RWMA Class	Density Grams/cm ³	Elec. Cond. %IACS	Hardness
A100W	Tungsten	100	13	1928	31	69 R _A
A100M	Molybdenum	100	14	10.20	30	89 R _A

Note: The values are typical and not to be used for specifications.

About Applications

RESISTANCE WELDING

A group of welding processes where joining of metal is accomplished by the heat produced from the resistance of the article to flow of electrical current in a circuit of which the article is a part. This occurs when pressure is directed at the electrodes where the electrical circuit is initiated and concluded.

Resistance Welding Electrode Material

Copper-tungsten and silver-tungsten are manufactured for specific use as electrode materials for resistance welding and other similar related electrical contact wear applications.

Refractory alloys are manufactured by the powder metallurgy techniques of pressing, sintering and infiltrating of tungsten with copper or silver. Those alloys are produced under rigid manufacturing fixed processes resulting in a high degree of metallurgical uniformity held in the fine-grained micro-structure of the finished materials. To the user this means an extremely high performance welding electrode which will perform well under most severe applications.

Resistance Welding Electrode Materials

Grade	Description	%	RWMA Class	Density Grams/CC	Elec.Cond. % IACS	Hardness	General Use
A1WC	Tungsten Copper	56% 44%	10	12.60	55-60	72.-82	Flash and butt welding die inserts. Spot welding ferrous metals, stainless steel where the electrode should have higher thermal and electrical conductivity than Class 11 material.
A3WC	Tungsten Copper	68% 32%	10	13.93	48-53	85-92	
A5WC	Tungsten Copper	70% 30%	10	14.18	47-52	88-95	Light duty projection welding dies where welding pressures are not extreme
A10WC	Tungsten Copper	75% 25%	11	14.80	42.-50	94-99	Standard for electrode and die inserts on most flash and buff welding dies. For projection welding dies where welding pressures are moderate, also used for light electrical upsetting, electro forming dies, and seam welder bushing inserts
A30WC	Tungsten Copper	80% 20%	12	15.60	41-59	99-104	For volume production, welding dies where pressures are relatively high, electrical upsetting of nonferrous metals and low carbon steel when used as die facings. Cross wire welding of wire and rod.
A10WA	Tungsten	75%	*	14.80	25-30	104-110	



	Copper Alloy *	25%					Supplied in the fully heat treated condition. Used for electroforming and electrical upsetting where temperatures and pressures are high.
A50WS	Tungsten Silver	50% 50%	-	13.48	62-70	50-60	For special welding applications where a corrosion resistant electrode is needed.
A35WS	Tungsten Silver	65% 35%	-	14.77	50-56	80-87	
A100W	Tungsten	100%	13	19.28	31	69	Pure Tungsten is very hard with low ductility. Principally used to weld nonferrous materials since it will not alloy with them.
A100M	Molybdenum	100%	14	10.20	30	89	Molybdenum is not as hard as tungsten, and can be machined. It has the same application as tungsten.

*Heat treatable copper alloy. These grades furnished fully heat treated.

NOTE: The values are typical and not to be used for specifications.

EDM-ing and ECM-ing

Copper-tungsten and silver tungsten can also be used as materials for EDM (Electrical Discharge Machining) and ECM (Electro Chemical Machining).

Such materials are also manufactured by the powder metallurgy techniques of pressing, sintering and infiltrating tungsten with copper or silver. EDM-, ECM products are produced under the same rigid manufacturing, fixed processes and strict quality control supervision. This assures a high performance electrode providing greater cutting stability, excellent machinability and reduced down time. For extremely close tolerance work, these materials maintain dimensional accuracy and will have longer operating life due to the high metallurgical integrity found in our copper or silver-tungsten electrode materials.

EDMing/ECMing Materials

Grade	Description	%	RWMA Class	Density Grams/cm ³	Elect Cond % IACS	Hardness
A15WC	Tungsten Copper	70% 30%	EDM ECM	14.25	44-52	90-96 R _B
A10WC	Tungsten Copper	75% 25%	11	14.80	42-50	96-99 R _B
A30WC	Tungsten Copper	80% 20%	12	15.60	41-49	99-104 R _B
A20WS	Tungsten Silver	78% 22%	EDM ECM	15.56	48-53	90-100 R _B

NOTE: The values are typical and not to be used for specifications.

Electrical Contact Material

Neither copper nor silver will alloy appreciably with molybdenum or tungsten, but through a tightly controlled powder metallurgy process, one can produce a homogeneous bi-metal for electrical contact use. These bi-metals afford the user superior chemical, mechanical and electrical properties.

In addition, the high electrical and thermal conductivity of the silver or copper along with the arc-resistant and non-welding properties of molybdenum or tungsten, provide the customer with a wide range of bi-metals to best suit their needs.



Because these bi-metals withstand the effects of the arcing incident to the interruption of large current they are often used for circuit breakers, relays, switches and heavy duty contractors.

Electric Contact Materials

Grade	Description	%	RWMA Class	Density Grams/cm³	Elect Cond % IACS	Hardness
A3WC	Tungsten Copper	68% 32%	10	13.93	48.53	85-92 R _B
A5WC	Tungsten Copper	70% 30%	10	14.18	47-52	88-95 R _B
A10WC	Tungsten Copper	75% 25%	11	14.80	42-50	96-99 R _B
A30WC	Tungsten Copper	80% 20%	12	15.60	41-49	99-99 R _B
A50WS	Tungsten Silver	50% 50%	-	13.48	62-70	50-60 R _B
A35WS	Tungsten Silver	65% 35%	-	14.77	50-56	80-87 R _B
A20WS	Tungsten Silver	78% 22%	EDM ECM	15.56	48-53	90-100 R _B

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