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RIGHT THE FIRST TIME – ON TIME – EVERY TIME



**Right shape.
Right size.
Right now.**

**Quality copper extrusions from
The Specialty Copper Mill**

- ◆ Custom shapes
- ◆ Special alloys
- ◆ Controlled conductivity
- ◆ Rapid turnaround
- ◆ Cut-to-length
- ◆ Detail machining
- ◆ In-house electro-plating
- ◆ In-house tooling

ISO 9001
CERTIFIED

ELECTRIC MATERIALS



Providing engineered solutions since 1915

Commutators



Centrifugally Cast Rings



Electrical Copper Fabrications



DC Bus Bar Systems



Collector Rings



Nonstop Service



with

TEMCO EXPRESS



EMERGENCY COMMUTATOR REPAIR

When you need commutator repair in a hurry, take the Temco Express. We provide continuous service 24 hours a day, 365 days a year.

Here's how it works. When your commutator arrives at our receiving dock – bearing a bright Temco Express label – we start the rebuilding process immediately. And we continue the

process – nonstop – until your commutator is repaired, properly seasoned, tested, and shipped back. No idle time allowed. No corners cut. With Temco Express you get it right the first time, on time, every time.

Call today for more information and your supply of Temco Express labels.

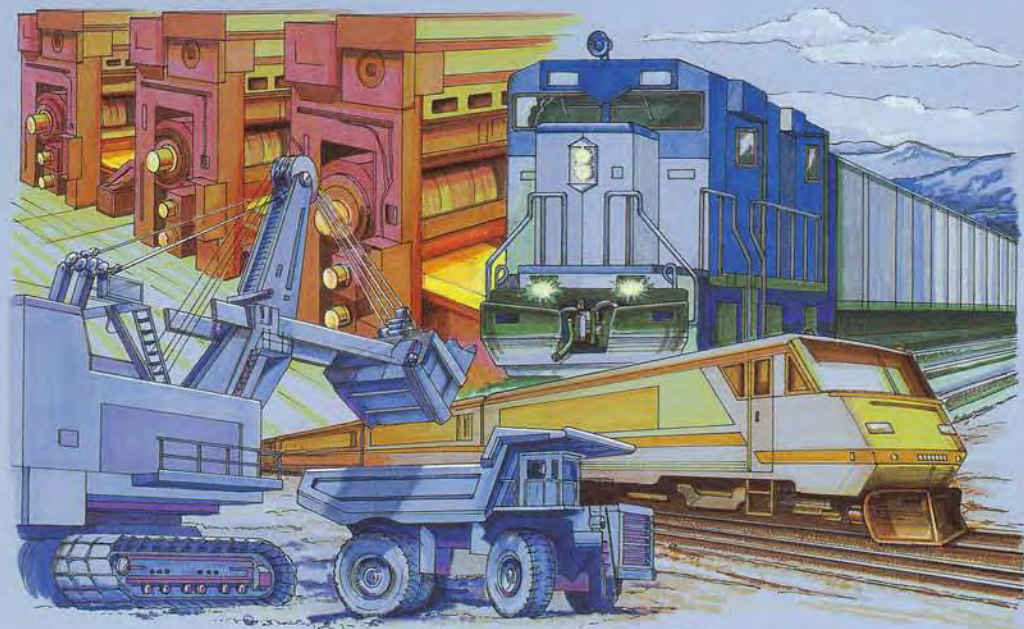


*When you don't have the time,
take the Temco Express.*

ELECTRIC MATERIALS



The Electric Materials Company
50 South Washington
North East, Pennsylvania 16428
Phone: 800-356-2211
Fax: 814-725-3620
<http://www.elecmat.com>
email: sales@elecmat.com



**High
Performance
Commutators**



ELECTRIC MATERIALS



ELECTRIC MATERIALS



Commutators for OEM Applications

Many of the world's leading original equipment manufacturers specify motors built with Electric Materials commutators. Our ability to supply products that precisely adhere to customer specifications is our reason for success.

Vertical integration of our manufacturing process makes it possible. We start with copper from our own mill and control everything else in the process internally.

Here's how it works. One of our engineering cells, dedicated strictly to commutators, reviews our customer's requirements to verify electrical and mechanical specifications.

Silver bearing copper alloys are either hot rolled or extruded then drawn into the required wedge shaped bars and cut to size, or can be pulled from our huge inventory of standard wedge shapes.

Copper segments are stacked and insulated utilizing mica rings, then assembled onto machined steel shells. Welded shells, and related components, are produced by welders certified to ASME codes and military standards. Newly assembled commutators are statically cured in electric ovens.

Static seasoning, balancing, and electronic profiling of commutators, as application requires is closely controlled for greater stability. Traction motor and other high performance commutators are heated and spin seasoned at up to 25% over their normal operating speed to provide dynamic seasoning and to verify stability.





Commutator remanufacturing

Here again, Electric Materials has been highly successful in rebuilding and refilling large commutators. As with OEM commutators, our experienced design engineers evaluate the (required) operational requirements of the motor, conduct stress analysis and create manufacturing drawings for rebuilding the commutator.

Commutators are then disassembled and rebuilt with new copper and mica following the same quality assurance processes applied to new commutators.

The result is a high quality remanufactured commutator that meets the operational demands of the motor users application.



Commutator Capabilities and Processes

Sizes: 5" through 116" brush diameter, up to 144" radial diameter

Types: Either vee or arch bound, diaphragm, glass banded (grooved and banded), shrink ring (external and internal)

Types Can Be Supplied:

OEM: All new steel, copper, mica.

Refilled: Existing steel, new copper, mica

Assembled: New copper, mica, machined and wire banded ready for customer installation on steel components

Reinsulated: Existing steel and copper with new mica (except shrink ring or glass banded types). All reinsulated commutators subject to acceptance based on engineering evaluation

Spin Seasoning: Up to 100" radial diameter, speed up to 10,000 rpm

Heat Curing: Electric ovens up to 14' diameter, temperatures up to 500° F

Pressing: Hydraulic pressing up to 300 tons

Undercutting: Up to 124" brush diameter, 24" bar length

Mica Ring Fabrication: Sectional or finger type

Brazing: Butt, lapp, and insert-brazed risers

Welding: Shell fabrication and repair certified to ASME Codes and Military Standards

Machining: Complete CNC metalworking capabilities

Testing: Complete mechanical, electrical and metallurgical testing and certification equipment

Electrical Rings

Electric Materials is also your best source for high performance collector ring assemblies, slip rings and rotor end rings. Select from a variety of metallurgically certified alloys and conductivity ranges in size from 6" through 55" diameter. Rings can be conventionally cast up to 55" or centrifugally cast up to 35" to meet your requirements.

Call today for complete specifications.



- ◆ The Electric Materials Plant is located 150 miles north of Pittsburgh along Lake Erie, midway between Buffalo and Cleveland.
- ◆ As an independent producer, we are geared to provide customers fast, quality service.
- ◆ We encourage customers to visit our plant when traveling through our area.

ELECTRIC MATERIALS

CASTINGS • FORGINGS • EXTRUSIONS • ROTOR BARS • BUS SYSTEMS • COMMUTATORS

Electric Materials • 50 South Washington • North East, Pennsylvania 16428
Phones: 814-725-9621 • Toll Free: 800-356-2211 • FAX: 814-725-3620
www.elecmat.com • email: sales@elecmat.com

Providing engineered solutions since 1915

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To insure the highest level of quality, every heat is checked prior to pouring to confirm melt temperature and electrical conductivity. Individual samples are taken for detailed chemical analysis.



The molten metal is spun at controlled RPM, producing a denser casting to near net shape.



Centrifugally Cast Copper and Copper Alloy Products

The Electric Materials Company manufactures high performance collector rings, slip rings and rotor end rings using a centrifugal casting process that provides excellent microstructure in a near net shape.

Many copper and copper alloys are available in a wide variety of sizes to meet your specifications.



Rings are machined to precise tolerances and premium quality surface finish.



Metallurgically certified rings are available in a broad range of sizes to meet your specific needs.



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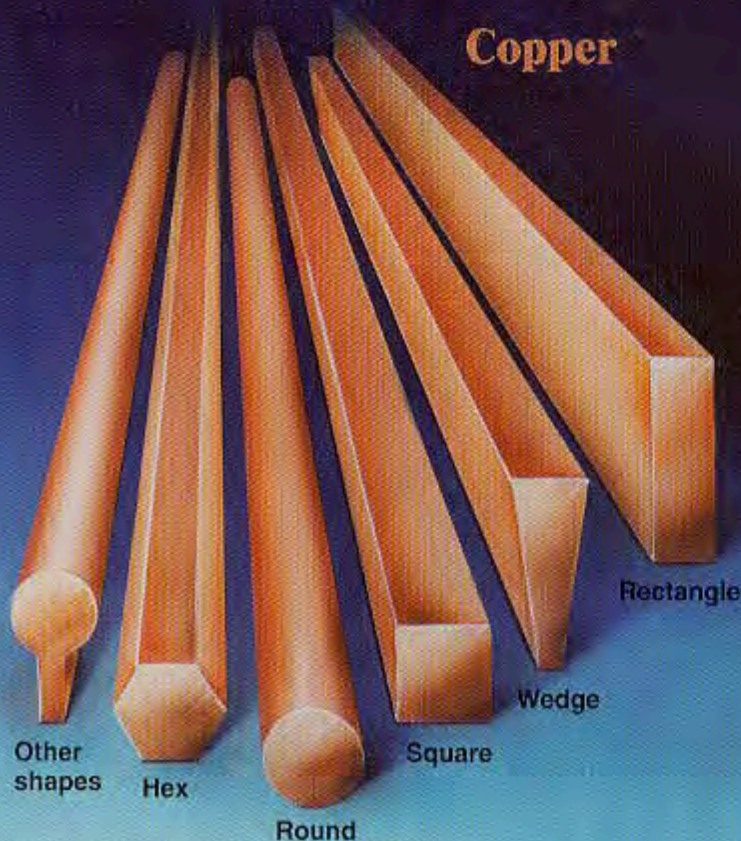
Providing engineered solutions since 1915



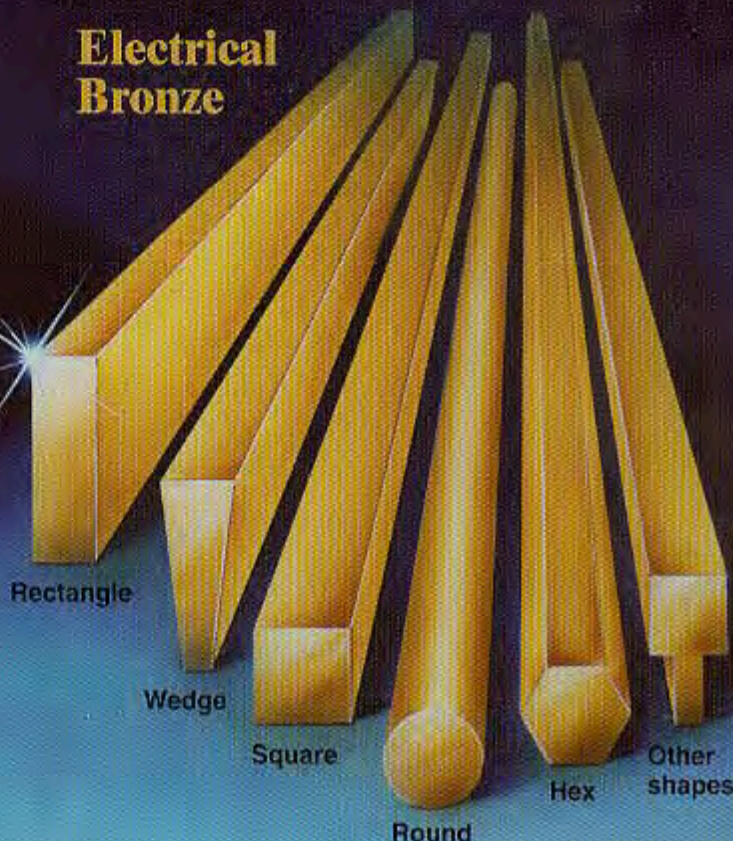
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Copper and electrical bronze bar, rod and extruded shapes

Copper



Electrical Bronze



For bus bars, commutators, rotor bars, coils, anodes, forging stock

For rotor bars and other electrical applications

Standard Sizes/Styles

- ◆ $3/32$ " x $3/8$ " to 1" x 4" flats
- ◆ $1/4$ " to $13/4$ " dia. or square
- ◆ $1/2$ " to $13/4$ " hex. (Consult mill for other sizes).
- ◆ Mill lengths and exact lengths
- ◆ Coils and fabricated forms
- ◆ Edge selections: square, rounded corner, radius corner, full round
- ◆ See back for alloys and additional data.

Other mill services:

- ◆ Cut to length
- ◆ Punching, threading
- ◆ Drilling, tapping
- ◆ Silver or tin plating

Find out more about how The Electric Materials Company can meet your extrusion requirements. Call The Specialty Copper Mill toll free at 800-356-2211 or visit our website www.elecmat.com.

ELECTRIC MATERIALS

Providing engineered solutions since 1915



Bar, rod and extruded shapes

	UNS Number	Nominal Composition	Electrical Conductivity % I.A.C.S.	Applicable ASTM Spec.
Copper	C-11000	99.90% Copper	100%	B-187
	C-10200	99.95% Copper	101%	B-187
	C-10700	99.95% Copper with 25 troy oz. per ton silver	100%	B-187
	C-11300	99.90% Copper with 8 troy oz. per ton silver	100%	B-187
	C-11400	99.90% Copper with 10 troy oz. per ton silver	100%	B-187
	C-11600	99.90% Copper with 25 troy oz. per ton silver	100%	B-187
	C-12220	99.90% Copper with .040-.065 phosphorus	98%	
	C-14700	99.90% Copper with .20 - .50 sulfur	95%	B-301
	C-18200	Copper with .6 - 1.2 chromium	80%	
Electrical Bronze	C-21000	5% Zinc	56% ± 2%	B-36
	C-22000	10% Zinc	45% ± 1.5%	B-36
	C-22600	12.5% Zinc	40% ± 1.5%	
	C-23000	15% Zinc	37% ± 1%	B-36
	C-23030	15% Zinc — .3% Silicon	25% ± 1%	
	C-24000	20% Zinc	32% ± 1%	B-36
	C-64700	2% Nickel — .5% Silicon	21 - 24% Solution Annealed 37 - 45% Age Hardened	B-411 B-411
	C-65100	1.6% Silicon — .3% Manganese	11% ± .1%	B-98
	C-65500	3.2% Silicon — .8% Manganese	6.5% ± .5%	B-98
	C-70100	4% Nickel	25% ± 1%	
	CC-SI-15*	1.2% Silicon — .3% Manganese	15% ± 1%	
	CC-NI-35*	2.4% Nickel	35% ± 1%	
	CC-NI-54*	1% Nickel	54% ± 2%	

* Custom Alloys



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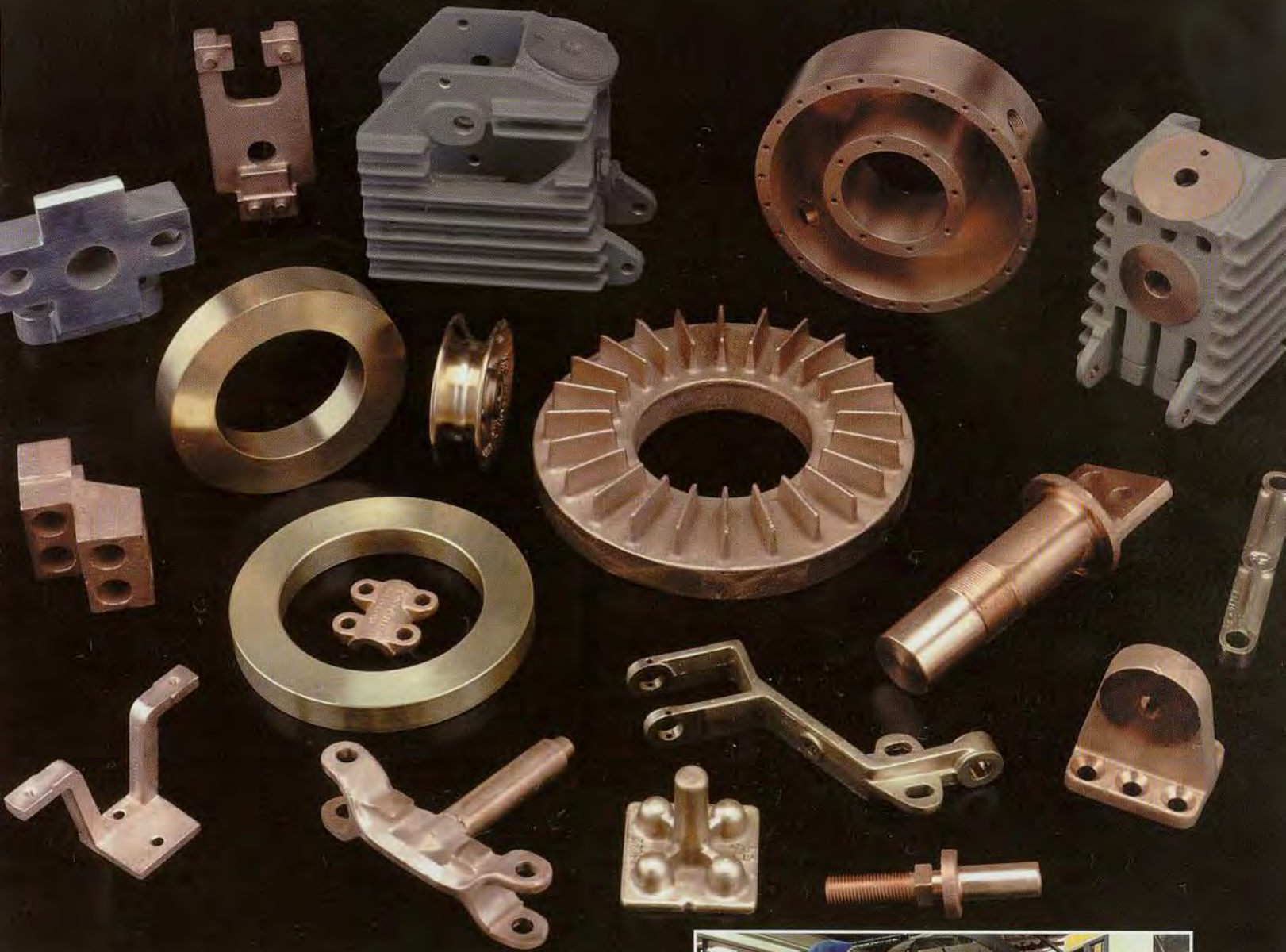
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Right the First Time – On Time – Every Time



Copper and bronze castings from The Specialty Copper Mill

SAND • CENTRIFUGAL • PERMANENT MOLD

The Electric Materials Company specializes in high conductivity copper, copper alloy and aluminum castings for a wide variety of electrical and mechanical applications.

Find out more about how The Electric Materials Company can meet your casting requirements. Call The Specialty Copper Mill toll free at 800-356-2211 or visit our website www.elecmat.com.



ELECTRIC MATERIALS

Providing engineered solutions since 1915



Casting Capabilities

SAND • CENTRIFUGAL • PERMANENT MOLD

Alloy

Pure Copper

Min. Cond. 85%
(Can guarantee 92%-98% if needed)

Chrome Copper

C81500
Min. Cond. 80%, Min. hardness RB60

Any Copper-Zinc Alloy

Up to 20% Zinc content

Copper-Lead-Tin and Zinc Alloys

C83600, C83800, C84400 etc.

Aluminum Bronzes

C95200, C95300, C95400, C95500 and C95600

Copper-Nickel Alloys

C97400 and C97600

Copper-Tin-Zinc Alloys

C90300 and C90500 and others

Pure Aluminum and Aluminum Alloys

Weight and Size

Maximum Weight

750 pounds

Maximum Size

Governed by 750 pound weight limitation

Minimum Size

Governed by 1/8" minimum thickness in any area

Maximum Diameter of Cast Rings

Up to 60 inches. Slotted rings up to 34 inches.

Maximum Length of Rod, Cylinder or Similar Shape

72 inches

Maximum Height or Thickness

36 inches

Other In-house Services

- ◆ Complete secondary machining operations
- ◆ Brazing, welding
- ◆ Silver or tin plating



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Right the First Time – On Time – Every Time



**Copper & Brass
Hammers**

Forged Soldering Coppers

**Electric Brand
Trolley Wheels**

THE ELECTRIC MATERIALS

ELECTRIC MATERIALS



Copper and Brass Hammers

Copper Hammers, conforming to Federal Specification GGG-H-33a Type 2, Class 1, TMP-040, can be furnished with either wooden (hickory) or fiberglass handles.

Hickory handles are air-seasoned, second growth hickory, balanced for length and fully secured for safety. All hickory handled hammers are provided with the head properly cored during casting to allow for internal handle spread when wedging is specified.

Higher strength fiberglass handles, approximately eight times stronger than wooden handles, are offered to reduce handle breakage in applications where severe and damaging usage is expected.

All hammers can be supplied with either hickory or fiberglass handles in sizes including: 1/2, 1, 1 1/2, 2, 3, 4, 5, 6, 8, 10, 12 and 16 lb.

In addition to copper heads, hammers can be furnished with brass, bronze, aluminum bronze or aluminum heads to meet the needs of your requirements.



Specifications

Dimensions in inches

Hammer Weight (pounds)	Face Diameter	Barrel Diameter	Head Length	Over-all Length including Handle
1/2	3/4	1 1/16	2	10 1/2
1	1	1 1/4	2 13/16	12
1 1/2	1 3/16	1 1/2	3 1/16	13
2	1 3/16	1 9/16	3 1/2	13
3	1 1/2	1 13/16	3 3/4	15
4	1 3/4	2 1/16	3 7/8	15
5	2	2 1/4	4 1/8	15
6	2	2 5/8	4 5/8	18
8	2	2 3/4	5 5/8	21
10	2	2 7/8	5 13/16	21
12	2 1/8	3	6 7/8	24
16	2 3/4	3 3/4	7	30



Forged Style S Soldering Coppers

Specifications

Dimensions in inches

Weight per Pair	Copper Diameter	Copper Length	Over-all Length
1	3/4	2 5/8	10 1/8
1 1/2	7/8	3 1/8	10 7/8
2	1	3 5/8	12 3/8
3	1 1/8	4 1/4	13 1/4
4	1 1/4	4 7/8	14 5/8
5	1 5/16	5 1/8	15 1/8
6	1 3/8	5 1/2	15 3/4
8	1 1/2	6	16 3/4
10	1 11/16	6 3/4	17 3/4

Style S Pointed



Style S Flat



Improved balance is inherent in the Style S type, making it the preferred tool of those engaged in hand soldering operations. The head is forged from drawn electrolytic copper rod (99.92% pure) to assure maximum metal density and consequent heat retention.

Rigid Hatchet Type



This hatchet design is made in Style S only and in 3, 4, 6 and 8 lb. per pair sizes.

Numerous other special configurations are produced by The Electric Materials Company and inquiries are welcomed.

Electric Brand™ Trolley Wheels

Continuous quality
since 1915

To attain maximum operating efficiency in current collection, trolley wheels must be of such design and metal composition that they enjoy a long useful life but with minimum wire wear. **Electric Brand** wheels have achieved this performance through constant laboratory tests and the development of carefully alloyed virgin metals. Special attention to precision machining of the wheels eliminates tendencies to chatter and arc.

The **Electric Brand** wheels listed below are standard at TEMCO. Custom made wheels to your specifications are also available



Specifications

Dimensions in inches

Type 237

V Groove – Plain Bore

Catalog Number	O.D.	Flange	Hub	Bore
237	2 ³ / ₈	1/2	7/8	1/2
237B	2 ³ / ₈	1/2	7/8	5/8

Type 250

V Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
250	2 ¹ / ₂	1	1 ¹ / ₄	1/2
250A	2 ¹ / ₂	1	1 ¹ / ₄	5/8
250B	2 ¹ / ₂	1	1 ¹ / ₂	1/2
250C	2 ¹ / ₂	1	1 ¹ / ₂	5/8

Type 300

U Groove – Plain Bore

Catalog Number	O.D.	Flange	Hub	Bore
300	3	1 ³ / ₁₆	7/8	1/2
300A	3	1 ³ / ₁₆	7/8	9/16
300B	3	1 ³ / ₁₆	7/8	5/8

Type 400

V Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
400	4	1 ³ / ₈	1 ¹ / ₂	1/2
400A	4	1 ³ / ₈	1 ¹ / ₂	5/8
400B	4	1 ³ / ₈	1 ¹ / ₂	3/4

Type 425

Special Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
425	4 ¹ / ₄	1 ³ / ₈	1 ¹ / ₂	1/2
425A	4 ¹ / ₄	1 ³ / ₈	1 ¹ / ₂	5/8
425B	4 ¹ / ₄	1 ³ / ₈	1 ¹ / ₂	3/4

Type 435

Special Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
435	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	1/2
435A	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	5/8
435B	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	3/4

Type 437

V Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
437	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	1/2
437A	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	5/8
437B	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	3/4

Type 438

U Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
438	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	1/2
438A	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	5/8
438B	4 ³ / ₈	1 ³ / ₈	1 ¹ / ₂	3/4

Type 500

V Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
500	5	1 ³ / ₈	1 ¹ / ₂	1/2
500A	5	1 ³ / ₈	1 ¹ / ₂	5/8
500B	5	1 ³ / ₈	1 ¹ / ₂	3/4

Type 600

V Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
600	6	1 ³ / ₈	1 ¹ / ₂	5/8
600A	6	1 ³ / ₈	1 ¹ / ₂	3/4
600AE	6	1 ³ / ₈	2	3/4

Type 601

U Groove – Bushed Bore

Catalog Number	O.D.	Flange	Hub	Bore
601	6	1 ³ / ₈	1 ¹ / ₂	5/8
601E	6	1 ³ / ₈	2	5/8

Full service copper forging capabilities from The Specialty Copper Mill

High quality forgings in high conductivity copper, chrome copper (conforming to RWMA Class II), and brass or bronze are available to meet your requirements at The Electric Materials Company.

Starting with forging rod from our own mill or castings from our own foundry, we provide you with single source quality forgings, complete metallurgical lab testing and certification.

Forging, trimming and coining dies are available in-house from our complete die making facility in sizes up to a maximum die block size of 24" x 24".

Our Forge Department is equipped with a full complement of 800 to 3,500 pound hammers for large parts and an impactor for parts as small as a few ounces. Special presses are available for close tolerance work, enhancing finish, flatness and mechanical properties. We can even add your company logo if required.

Other in-house services include heat treating, complete machining, brazing, welding and tin or silver electroplating . . . everything you need to meet your copper forging requirements.

Our Quality Control Department keeps a constant check on gauges, dies, fixtures and processes to assure precision work within the limits of customer tolerances and specifications.

Our products are made with care and concern by expert craftsmen. Call us for a prompt and efficient response to all your needs.

Call The Specialty Copper Mill
toll free today.

800-356-2211

FAX: 814-725-3620



Along with secondary machining, a full range of services such as heat treating, brazing, welding and plating are available—all in-house.

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50 South Washington St.
North East, PA 16428
<http://www.elecmat.com>
email: sales@elecmat.com

Fine line circuitry starts with fine grain structure anodes

You can improve the quality of your fine line etching when you use anodes with a fine grain structure. Electric Materials anodes are made from 99.9% pure copper and processed to insure a very fine grain structure. For you that means better plating uniformity, less additive consumption, better sloughing characteristics and the elimination of pits and nodules.

Put the advantages of high purity, fine grain structure anodes to work in your fine line plating operation. Contact Electric Materials today: 800-356-2211.

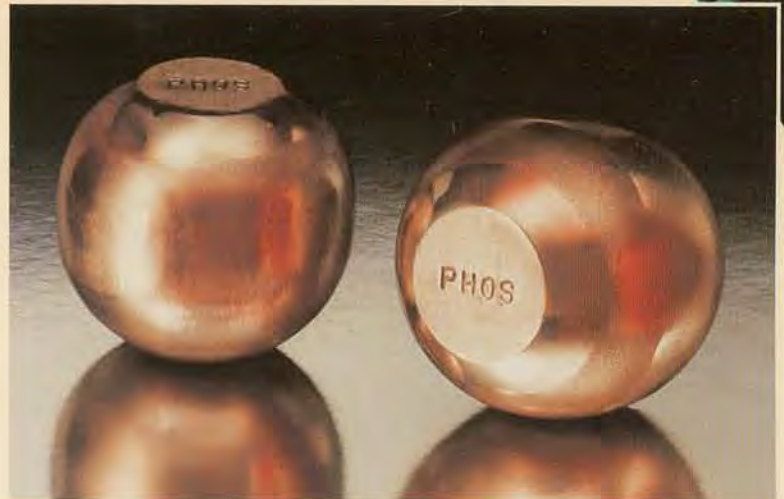
<http://www.elecmat.com>
email:sales@elecmat.com



Electric Materials anode with fine grain structure for high quality plating



Typical cast anode with large grain structure



ELECTRIC MATERIALS





Anode Alloys

CDA Alloy Designation	Composition
C-10200	oxygen-free, 99.95% copper minimum (including silver)
C-11000	electrolytic tough pitch, 99.90% copper minimum (including silver)
C-12220	phosphorus deoxidized, 99.90% copper minimum (including silver) .04-.065 phosphorus

Chemical compositions per Copper Development Association Standards

Sphere

The ball anode is pressed cold from specially prepared rod. Mill processing (hot rolled or extruded) plus drawing assures uniformity of grain structure. The perfect size and shape for use in titanium anode baskets.



Standard ball measures 17/8" dia. – approx. 1 1/4 lbs. each. Packed in 50 lb. cartons or 230 lb. plastic pails.

Other sizes and alloys available on special order.

Oval

Elliptical anodes – cut to specified lengths – can be drilled and tapped per individual specifications. Increased surface area permits quantity plating when other than basket arrangements are used.

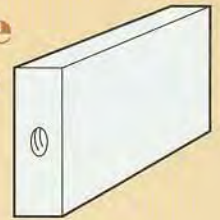


Standard oval – 1 1/2" x 3 1/2" – weight 15.9 lbs. per foot. Tapped 3/8-16 x 1" deep unless otherwise specified.

Other sizes and alloys available on special order.

Rectangle

Rectangular shapes offer a larger range of sizes and are used to advantage where space is a factor.



Size range is from 1/4"-1 3/8" thick by 3"-4 3/4" wide. The flats can also be drilled and tapped to individual specifications.

Other sizes and alloys available on special order.



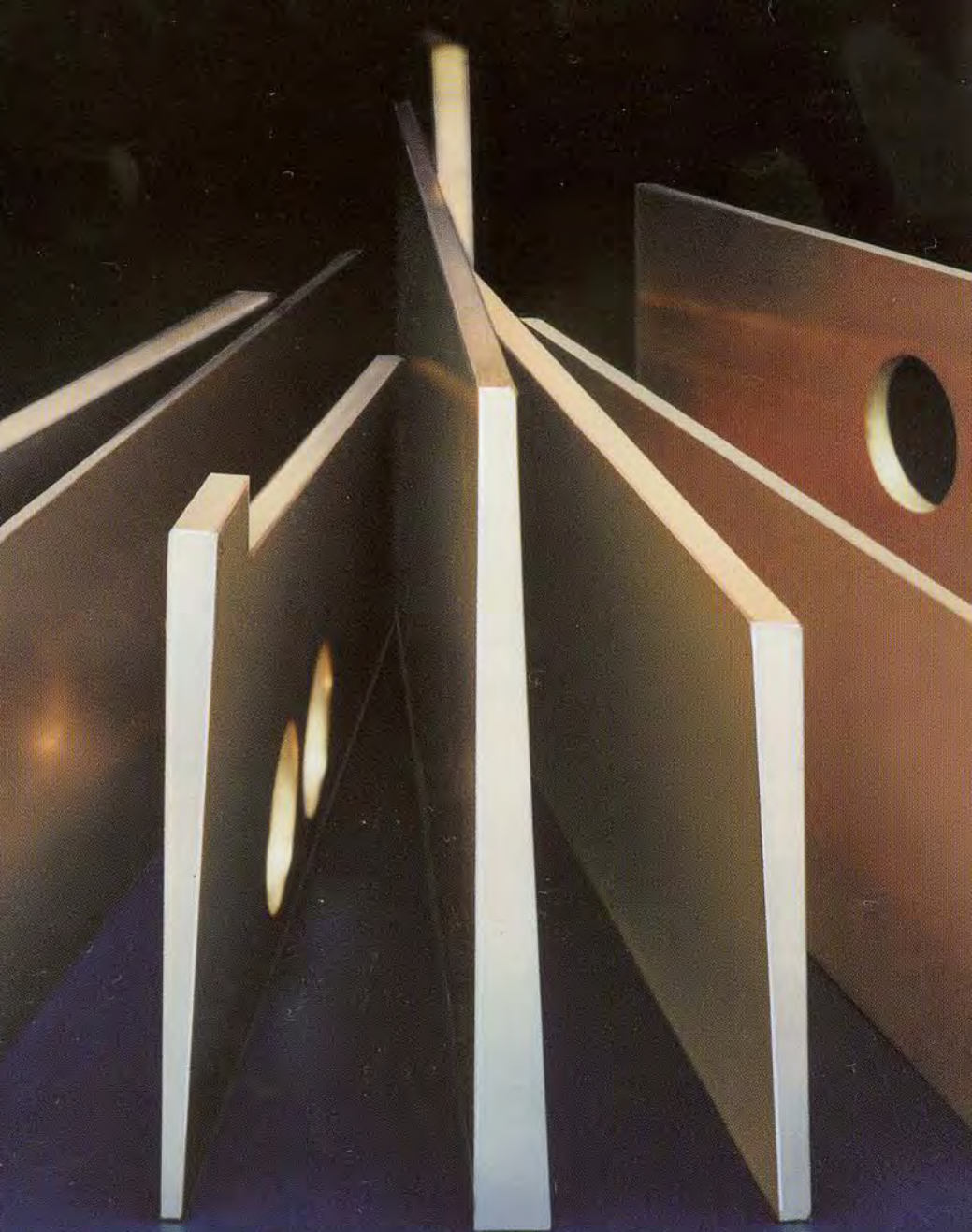
- ◆ The Electric Materials Plant is centrally located 150 miles north of Pittsburgh along Lake Erie, midway between Buffalo and Cleveland.
- ◆ Our complete manufacturing facilities are housed entirely under one roof.
- ◆ As an independent producer, we are geared to serve customers quickly and informatively.
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**Looking for a reliable source for
electrical copper components?**

Look no further . . .

Everything you need is at

OEM and refill commutators/commutator bars

Start to finish capability in commutator design and manufacture with over 75 years experience . . . 5" diameter up through 12' diameter.



Copper and copper alloy rods, bars and extrusions

High quality rods, bars and extrusions from our own specialty mill are available in a virtually unlimited variety of shapes, sizes and lengths. Small production runs and rapid service are our specialty.



Fabricated DC bus bar systems and components

We design, engineer and manufacture to your specifications and supply all bars, clamps, connectors, hardware, insulators, supports and drawings. Start to finish service — all in-house.



ELECTRIC MATERIALS

ETM
©



Centrifugally cast rings

High performance collector rings centrifugally cast to near net shape for superior performance properties and precision machined to exact tolerances.



Electrical copper fabrications

Copper fabrications for virtually any electrical requirement. Complete in-house facilities for extruding, casting, forging, machining, welding and plating in copper and chrome copper alloys. Large or small quantities.

Collector rings

Collector assemblies, slip rings and rotor end rings designed, engineered, produced and tested to your specifications. Remanufacturing services also available.