

Cover page

OC-ETP®
HIGH CONDUCTIVITY COPPER BUSBAR

Inside

Oriental Copper Co.,Ltd.

The movement of electricity in the Asian region is receiving a jolt of safety and efficiency, as Oriental Copper has opened the first high conductivity copper busbar manufacturing plant in Thailand. Copper busbars are an essential element of the electrical systems of all modern buildings, particularly high rise. Oriental Copper's factory has introduced new technology to the region as it is the first semi-automatic copper busbar factory in Southeast Asia to utilize the under-water extrusion method, the latest technological advancement in copper busbar production. Oriental Copper's output will accommodate not only all of Thailand's requirements for busbars but much of Southeast Asia as well, thereby contributing to enhance regional electrical safety. Oriental Copper's busbar production facility is located in the Amata Nakorn Industrial Estate in Chonburi.

Back Cover

Oriental Copper Co.,Ltd.

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Factory: 700 /45 M.6 Amata Nakorn Industrial Estate, Klongtumru Sub-District, Amphur Muang, Cholburi 20000 Thailand.

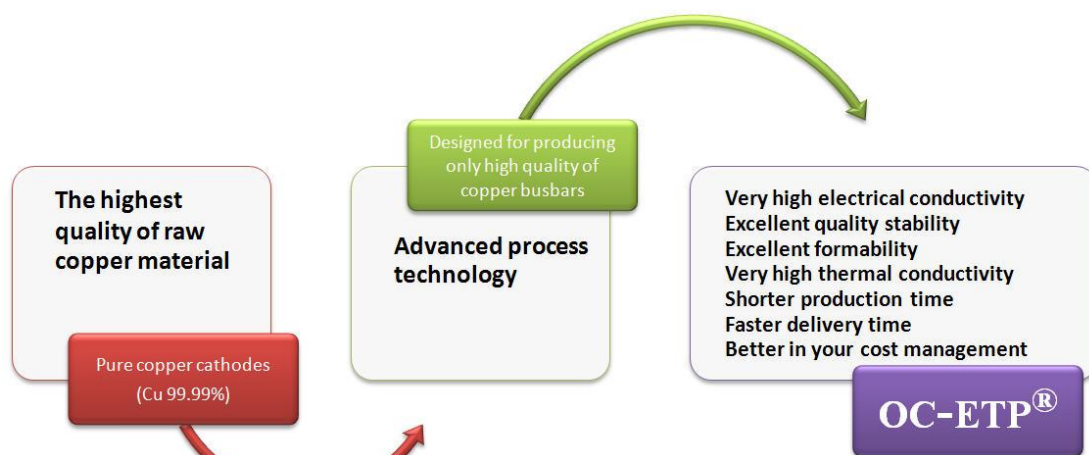
Oriental Copper's quality policy is: "determined to produce quality products to customer satisfaction"

OC-ETP® - From Right Materials to Right Solutions

OC-ETP® - 利用正确材料得到正确解决方案

Copper busbar in electrical applications requires several key electrical and mechanical properties which include high electrical conductivity, good formability and surface flatness. These key properties rely greatly upon the quality of raw material and consistency of production process. Through a state-of-the-art production process specifically designed for copper busbar production, **OC-ETP®** is cast from the highest purity copper cathode available from mines and smelters (grade "A" LME registered brand). The purity of the raw material and the high quality production process make **OC-ETP®** an excellent choice for all technical and economical solutions relating to electrical applications dealing with copper busbar and busduct. In addition, **OC-ETP®** offers excellent thermal conductivity, perfect for heat exchange applications, ideal where limited space is important for e.g. CPU-heat sinks.

铜汇流排的电气应用有几项主要的电气与机械性能需求，包括导电性高、成型良好、表面平整。这些主要性能植基于原料质量与一贯的加工程序。透过专为铜汇流排设计的特殊先进工艺，我们将矿冶界所能觅得最高纯度的纯铜阴极原料(A级LME登录品牌)铸制成**OC-ETP®**。正确的材料加上正确的功法，使得**OC-ETP®**适用于铜汇流排与铜汇流导管电气应用的所有机械性及经济性解决方案。此外，**OC-ETP®**还能提供优异的热传导性，极适合空间有限的热交换应用，例如CPU散热片。



OC-ETP® 示意图

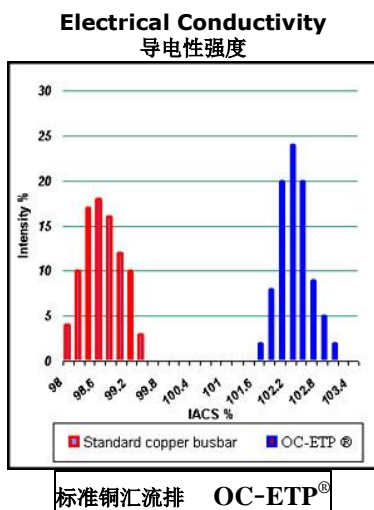
<p>最高质量铜原料</p>	<p>专为生产高质量铜汇流排而设计</p>	<p>导电性极高 质量极稳定 成型性极佳 热传导性极高 生产时间短 交货快速 改善您的成本管理</p>
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纯铜阴极 (Cu99.99%)	先进加工技术	OC-ETP®
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- **Right Conductivity** 导电性极高

Electrical conductivity of any electrical conductor is dependent upon the purity of conductor. OC-ETP® is cast from pure copper cathodes with a purity of 99.99 %. This high purity of the raw material enables OC-ETP® to offer a better electrical conductivity than conventional copper busbars. The electrical conductivity of OC-ETP® is better than 101% IACS (International Annealed Copper Standard), while conventional copper busbars normally have electrical conductivity levels of 98.0% IACS.

任何电气导体的导电性皆取决于导体的纯度。OC-ETP®是以99.99 %的纯铜阴极所铸制。相较于传统铜汇流排，OC-ETP®可提供极高的导电性。OC-ETP®的导电性甚至可达到高于100% IACS（国际炼铜标准），而一般铜汇流排最高只能达到98.0% IACS。

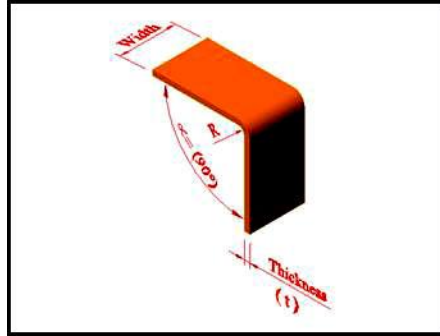


- **Right Formability** 正确成型

Formability is a term used to express how good copper busbar can be bent without cracking. Formability is expressed as the minimum bend radius (R) divided by the thickness (t); the smaller the R/t, the better the formability. The formability of copper busbar is a result of the grain size structure of the conductor itself. The OC-ETP® process produces a fine and a smaller copper grain size structure, offering superior formability than conventional copper busbars.

「成型性」系指铜汇流排被弯曲而不破裂的特性。其表示方式为弯曲半径(R)除以厚度(t)。R/t越小，成型性越佳。铜汇流排的成型性乃与其本身结构颗粒的大小有关。OC-ETP®的制造工法产生的铜结构颗粒最小，其成型性比传统铜汇流排来得优异。

Bending 弯曲



- **Right Flatness** 平整度佳

The flatness of copper busbar is vital to jointing efficiency. The better flatness also reduces machining work required during preparation of the jointing surface. **OC-ETP®** has less than 50 µm flatness tolerance which allows superior jointing efficiency.

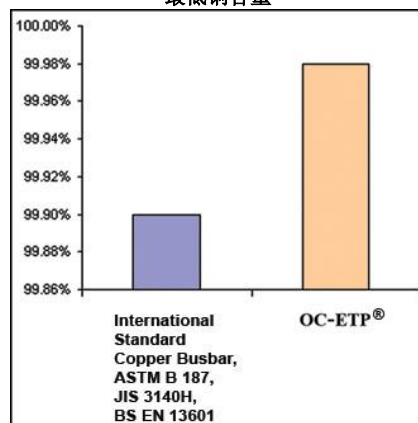
铜汇流排的平整度攸关其连结效率。较佳的平整度也能降低结合表面所需的整备程序。**OC-ETP®**的平整度误差优于50 µm，远超过产生优异结合效率实际所需的平整度。

- **Right Quality** 正确质量

With a high copper purity of 99.99%, the raw materials, computerized control system and a special process to homogenize the billet temperature (soaking chamber), quality of **OC-ETP®** is consistently high. Figure 4 illustrates percentage of copper content for standard copper busbar and **OC-ETP®** copper busbar.

高纯度(99.99%)的纯铜原料、计算机化的控制系统以及均衡铜胚温度(浸泡舱)的特殊工法，造就**OC-ETP®**质量的极度稳定性。图4 显示标准铜汇流排与**OC-ETP®**汇流排的纯度百分比。

Minimum Percentage of Copper Content
最低铜含量



国际标准铜汇流排, ASTM B 187, JIS 3140H, BS EN 13601

- **Right Production Process** 正确生产程序

OC-ETP® is produced from a state-of-the-art production process, specifically designed to produce copper busbar. The process offers the finest copper grain size structure and its surface is free from oxidation and discoloration. The production process of **OC-ETP®** is very flexible. It can switch to a different size of busbar within a few minutes enabling **OC-ETP®** to produce smaller quantities of different sizes at very short notice. This makes **OC-ETP®** the perfect choice for shorter production times and faster delivery for the benefit of our customers.

OC-ETP®系以专为生产铜汇流排的先进工法所制成。该工法可提供铜结构颗粒的最小尺寸，使其表面不会氧化与褪色。**OC-ETP®**的产制程序极具弹性，仅需几分钟即可变更**OC-ETP®**的汇流排生产尺寸，因此可迅速供应少量但尺寸繁杂的汇流排产品。这样的有利组合使得**OC-ETP®**的生产与交货时间更短，因而可大大改善成本管理。

- **Right Thermal Conductivity 正确的热传导性**

Thermal conductivity is particularly important for electronic and IT applications. **OC-ETP®** is used in computer applications where thermal conductivity is paramount. **OC-ETP®** has very high thermal conductivity due to high purity of copper; flatness control is also critical for the fine tolerances required. **OC-ETP®** has successfully supplied quality products to the major heat sink producers for years.

热传导性对于电子与信息产业应用尤其重要。**OC-ETP®**使用于极需考虑热传导性的计算机应用。多年来，**OC-ETP®**业已成功供应高质量产品给散热器的主要生产厂商。

- **Right Property for Welding and Brazing 适合熔焊与铜焊的正确特性**

OC-ETP® can be jointed by soldering, brazing and gas shield arc welding without adverse effect.

OC-ETP®可藉由锡焊、铜焊及惰性气体电弧焊等方式作无缺陷地结合。

Copper Busbar, Rods and Tapes

铜汇流排、铜棒及铜带, 铜带

Copper Busbar and Rod

铜汇流排、铜棒及铜带

Copper busbar and rods manufactured by Oriental Copper Co. Ltd. are available in both high conductivity electrolytic tough pitch (OC-ETP®) and high conductivity Oxygen Free (OF) copper. Both OC-ETP® and OF are produced with high purity copper with an electrical conductivity of approximately 101% IACS.

东方铜业所生产的铜汇流排及铜棒分为「高导电性强韧密度电解纯铜(OC-ETP®)」与「高导电性无氧纯铜(OF)」两种铜材。OC-ETP®与OF两者皆为导电性接近101% IACS的高纯度铜料。

Standards

标准

Copper busbar and rods are produced to meet International Standards such as JIS, BS EN, DIN, ASTM, AS/NZS and TIS as required by customers. Copper busbar and rods for electrical purposes are covered by the following International Standards.

铜汇流排及铜棒的产制均符合客户要求的各种国际标准，包括JIS、EN、ASTM、AS/NZ及TIS。供电气使用的铜汇流排及铜棒其符合的国际标准如下。

	JIS	EN	ASTM	AS/NZ	TIS
Busbar 汇流排	3140	13601	B 187	1567	408 - 1982
Rods 铜棒	3250	13601	B 187	1567	408 - 1982

Properties 特性

The raw materials are pure copper cathodes grade "A" London Metal Exchange Registered Brand with copper purity of 99.99%, thus making high quality copper busbar and rods to meet International Standards required.

使用的原料乃纯度99.99%、为伦敦金属交易所登录厂牌的A级阴极纯铜，因而铜汇流排及铜棒能够符合所要求的国际标准。

- | | |
|--------------------------------------|------------------------|
| 1) Volume Resistivity at 20°C/ 68°F | 1.7241-1.7070 μΩcm |
| 2) Volume Conductivity at 20°C/ 68°F | 58.00-58.58 MS/m |
| 3) Density | 8.91 g/cm ³ |
| 4) Melting Point | 1083 °C |
| 5) Corrosion Resistance | Very Good |

于20°C/ 68°F时的体积电阻率 1.7241-1.7070 Ms/cm
于 20°C/ 68°F时的体积导电率 58.00-58.58 Ms/m
抗腐蚀性 极佳

(No. 3-4-5 not yet translate)

Temper All tempers
强化 所有强化方式

Applications 应用

- * Electrical applications : Switchboards, Switchgears, Busduct, etc.
- * Non-Electrical : Aluminium Smelters

- * 电气应用: 配电盘、汇流管道等
- * 非电气应用: 铝精炼业

Packing 包装

Wooden Boxes : Wrapped with paper and plastic.
Bundles : Wrapped with paper and plastic.

木箱: 以纸与塑料包裹
捆束: 以纸与塑料包裹

Copper Tapes 铜带

Copper tapes (supplied in coils), are also available in both **OC-ETP**[®] and OF with high electrical conductivity of approximately 101% IACS and manufactured to BS 1432, EN 13601, or other international equivalent standards depending on width / thickness ratio

本公司也供有导电性约达101% IACS、符合BS 1432/EN 13601或依其它同等国际标
准宽 / 厚比产制的**OC-ETP**[®]与OF铜带(卷筒装)。

Conductor size: 10-75 mm. width, 2.0-5.0 mm. thickness
Standard coil size: ID 300 mm. minimum
OD 1,000 mm. maximum
Length upon agreement
Temper: Annealed / Soft grade
Applications: Earthing tape / Mechanical Forging and Stamping

导体尺寸: 宽10-75 mm、厚2.0-5.0 mm
标准卷筒尺寸: 最小内径 300 mm
最大外径 1,000 mm
长度依合同
强化: 退火 / 柔软级

应用:

接地带 / 机械式锻制与标记

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Copper Profile 铜异型材

Oriental Copper's years of expertise in producing semi-finished products has enabled us to consistently produce quality copper profiles. Our advanced technology enables the availability of copper profiles as per customers' drawings.

东方铜业生产半成品的多年经验让我们有能力持续制造高质量的铜异型材产品。我们的先进技术可依据客户的图说提供各种铜异型材。

Copper Profiles for Electrical Applications 电气用铜异型材

In electrical applications, there are many critical parts that use copper profiles that need exact dimensions. Oriental Copper can produce copper profiles with strict dimensional tolerances such as C-connectors, L-shapes, Y-shapes, H-shapes, etc.

铜异型材在电器应用上需要控制许多临界部分。东方铜业可生产尺寸误差严谨的铜异型材，如C型接头、角型、Y型、H型等。

Copper Profiles for Heat Sinks or CPU Coolers 散热器或CPU冷却器用铜异型材

Copper profiles for heat sinks or CPU coolers are available in both high conductivity electrolytic tough pitch copper (OC-ETP[®]) and high conductivity Oxygen Free copper (OF). With our experience and technology, Oriental Copper can produce copper profiles with less than 50 μm flatness tolerance. Our copper parts can be used without the need for machining, thereby saving customer processing times and costs.

散热器或CPU冷却器用铜异型材分为「高导电性强韧密度电解纯铜(OC-ETP[®])」与「高导电性无氧纯铜(OF)」两种铜材。东方铜业的经验技术可生产平整误差低于50 μm的铜异型材。我们生产的铜零件无需加工即可使用，因而能省下加工时间与成本。

Technical Information 技术数据

	OC-ETP [®]	OF
Purity of copper 铜料纯度	99.98% up	99.99%
Density 密度(kg/dm ³)	8.9	8.9
Electrical Conductivity 导电率 (%IACS)	>100	>100
Thermal Conductivity 热传导率 (W/m °K)	394	394
Thermal Expansion 热膨胀 (10 ⁻⁶ / °K)	16.8	16.8
Melting temperature 熔点 (°C)	1083	1083

Applications 应用

Hydro-generators, Turbo-generators, Wind-generators, Electrical appliances, Heat Sinks or CPU Coolers, etc.

制氢机、电器、散热片或CPU冷却器等。 (Not complete translation)

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Fabricated Product 组装产品

Oriental Copper's fabricated copper busbar provides a speedy, convenient, and economical solution for switchboard and switchgear makers.

东方铜业组装产品可为配电盘制造厂提供快速、方便且经济的解决方案。

High Quality and Easy Installation 高质量与安装便利

Advanced technology fabrication machines, experienced teamwork and use of high-quality materials, OC-ETP® assures that fabricated copper busbars produced and supplied are reliable and accurate, as per customers' designs and specifications, to enable easy and convenient installations.

配合技术先进的组装机具、经验纯熟的作业团队以及高质量原料的使用，东方铜业能确保生产与供应准确可靠、完全符合客户设计规范的OC-ETP®组装铜汇流排，以利轻松便捷的安装作业。

Customer's Benefits 客户利益

- ✦ Reduce internal scrap 减少内部下脚料(废料)
- ✦ Save processing time 节省加工时间
- ✦ Ease of installation 轻松安装
- ✦ Enrich profit margins 强化挤型边缘
- ✦ Reduce maintenance cost for equipment 减少设备保养成本
- ✦ Quick delivery 交货快速

Fabrication Processes Include 组装制程包括

- ✦ Punching 冲床
- ✦ Bending 打弯
- ✦ Tapping 分接头
- ✦ Cutting 切割
- ✦ Tin Plating 镀锡
- ✦ Welding 焊接
- ✦ **Twisting** 扭绞
- ✦ Countersink etc. 钻埋头孔等

Applications 应用

Switchboards, Switchgears, etc.

配电盘等

Tin-plated Copper Busbar 镀锡铜汇流排

Tin-plated copper busbar helps upgrade design and provide the best quality for switchgears, switchboards, electrical panels, power transformers and busducts by:-
镀锡铜汇流排有助于提升设计水平，并能供应具下列优点的最佳质量配电盘、电器控制箱、电源变压器及汇流管道：

Extended Long-Life 寿命延长

Tin, a soft white metal can easily be polished, scratch brushed or flow melted to give a bright finish. It is non-toxic and there is minimal affect from organic acids and Sulphur compounds do not readily tarnish tin. It is not impaired by either air or water, but reacts with hydrochloric acid to form stannous chloride. Tin is one of the less susceptible metals to corrosion attack. Tin-plated copper busbar protects against atmospheric corrosion and hence provides longer life in corrosive atmospheres.

锡是柔软的白色金属，可擦亮、刮刷或融熔以获得光亮的表面。其无毒性且不受有机酸类腐蚀。硫磺化合物不易使锡失去光泽。锡亦不受空气或水份侵蚀，但会与氯化氢作用生成二价锡氯化物。锡是最不易被腐蚀的金属之一。镀锡铜汇流排可抗大气腐蚀，因此能延长腐蚀性环境中的使用寿命。

Better Joint Efficiency 接点效率较佳

Tin-coating applied to the contact surfaces prevent or delay oxidation when operating at high temperatures or in extreme environments for long term usage. Oriental Copper Co. Ltd. produces and supplies high quality tin-plated copper busbar that results in improvements in efficiency by increasing jointing surface and reducing the resistance of the joint.

为预防或延迟在较高温度或恶劣环境中作业时的氧化作用——尤其是在长期使用状况下，将接点表面镀锡极为重要。东方铜业股份有限公司生产及供应的高质量镀锡铜汇流排可增加接合面积与降低接合点电阻，因而能够改善效率。

Consistent Tin Coating 镀锡均匀

Oriental Copper Co., Ltd. conducts a test for measuring the thickness of tin-coating by a computerized system which is recorded on our Mill Test Certificate. Hence, our customers can be assured of the consistency of the tin-coating.

东方铜业股份有限公司以计算机化系统进行镀锡厚度的测量试验，其结果记录于本公司的铣床测试证明中。因此，我们的客户能藉以确认镀锡的厚度。

Acceptable and Worldwide Recognition 接受度高与举世认同

Tin-plated copper busbars, complying with International Standards and produced by Oriental Copper Co. Ltd., are accepted in principle markets in Japan, USA, Europe countries, Taiwan R.O.C., United Arab Emirates, the Kingdom of Saudi Arabia, and more than 50 other countries all over the world.

东方铜业股份有限公司制造符合国际标准的镀锡铜汇流排，而广受各国主要市场的接受与认同，包括日本、欧美国家、台湾、阿联、沙特阿拉伯，以及全球其它50余个国家。

Specification 规范

Oriental Copper Co. Ltd. produces and supplies high quality tin-plated copper busbar as per International Standards such as JIS, DIN, BS and ASTM.

东方铜业股份有限公司制造镀锡铜汇流排所依据的国际标准包括JIS、DIN、BS 及 ASTM 等。

Process: In-house tin-plating controlled by computerised system
制程: 厂内镀锡作业均由计算机化控制系统管控

The Purity of Coating Material: Tin anode, 99.5% up
Coating Thickness: 3, 5 or 10 microns and as per customer's requirement

Mill Test Certificate: - Adhesion Test
- Tin Thickness Test

电镀层材料纯度: 锡阳极 99.5% 以上
镀层厚度: 3, 5 或 10 微米，亦可依客户要求
铣床测试证明: - 附着测试
- 镀锡厚度测试

Applications 应用

Switchboards, Switchgears, Electrical Panels, Power Transformers, Busduct, etc.
配电盘、电器控制箱、电源变压器、汇流管道等

Silver-Bearing Copper / Copper Alloy

含银铜 / 铜合金

Silver bearing copper is another quality product of Oriental Copper Co. Ltd. To meet requirements of customers, the addition of a small amount of silver in the copper improves the resistance to softening of materials. Most applications for this material are commutator bars and segment in traction motor and various industrial DC motors. Oriental Copper Co. Ltd. can produce silver-bearing copper in any shape according to customer's requirement.

含银铜是东方铜业股份有限公司的另一项高质量产品。为符合客户需求，添加的少许银含量可提高材料的抗软化性能。这种材料的主要应用多为整流器铜棒与牵引马达以及各种工业直流马达的电枢分隔(segment)。东方铜业股份有限公司可依客户需求产制任何形状的含银铜。

Specifications of commutator bars / segment

整流器铜棒 / 电枢分隔 规范

- IEC 60356
- BS 1434 : 1985
- JIS C 2801 : 1995

Chemical Composition 化学成分 (%)

JIS C 2801:1995

Class 分级	Cu	Cu+Ag	Ag
Class 1	99.9以上	-	-
Class 2	-	99.9 以上	0.15 至 0.25
Class 3	-	99.9以上	0.08 至 0.12
Class 4	-	99.9以上	0.06 至 0.10

Applications 应用

Commutator Bars, Segments in traction motor and various industrial DC motors, Vacuum Interrupters, Stators & Rotors of Turbo-Generators, etc.

整流器铜棒、牵引马达及各种工业直流马达的电枢分隔、真空断路器(消弧室)、涡轮发电机的静子与转子等。

Typical Commutator Drawings

OC offers any shapes of commutator bar according to customer's requirement

Customer's benefit

- ✓ Strict tolerance control
- ✓ Optimize metal utilization, no scrap and defect
- ✓ Save processing time

- ✓ Minimize tooling cost
- ✓ Reduce production cost
- ✓ Enhance product efficiency
 - Reduce spark problem
 - Reduce heat during operation
- ✓ Ready to install
- ✓ Short delivery lead time
- ✓ Value engineering backup

OC's Quality Assurance

- Precision measurement by CMM and modern measuring instruments
- Control according to International Standards and customer specifications
- Mill Test Certificate

Copper Anode for Electroplating

Oriental Copper's copper anodes are made from the highest purity copper cathodes (grade "A" LME registered brand) with purity of 99.99%. Our advanced extrusion technology enables us to produce the finest copper anodes with the excellent essential properties for electroplating process.

Oriental Copper's copper anodes are available in:

- **Electrolytic Tough Pitch Copper Anodes (Cu-ETP)**
- **Phosphorous Copper Anodes (Cu-DHP)**
- **Oxygen Free Copper Anodes (Cu-OF)**

Feature:

- **Phosphorous Copper Anode (Cu-DHP)**
 - Highest purity copper
 - Very low impurity resulting in minimal sludge development
 - Very Fine and uniform grain structure
 - Oil Free
 - Smooth and unique surface shape allows even dissolution
 - Consistent Phosphorous content and well distribution
 - Black film fast generated and stably adhered

- **Oxygen Free Copper Anode (Cu-OF) and Electrolytic Tough Pitch (Cu-ETP)**

- Highest purity copper
- Very low impurity resulting in minimal sludge development
- Very Fine and uniform grain structure
- Oil Free
- Smooth and unique surface shape allows even dissolution
- Consistent dissolution

Chemical Composition:

	Nominal composition					
	Cu	Phosphorous	Lead	Zinc	Nickel	Iron
Cu-ETP	xxxxx	xxxxx	xxx	xxxx	xxxx	xxx
Cu-DHP	99.93 Min	0.04 – 0.065	<0.003	<0.003	<0.003	<0.003
Cu-OF	99.99 Min	< 0.0003	<0.0005	<0.0001	<0.001	<0.001

Standards Specification:

Standards	JIS 3250	BS EN 1976	Din 1787
Alloy No.	C1100	Cu-ETP	E-Cu57
Alloy No.	C1220	Cu-DHP	SF-Cu
Alloy No.	C1020	Cu-OF	OF-Cu

Anode Shapes & Sizes

Shape	Size
Ball Picture	Dia 16, 25, 28, 50 mm or Customer requirement
Nugget Picture	12 x 12 mm 16 x 16 mm 20 x 25 mm 25 x 25 mm or Customer requirement
Rectangular	Thickness 10-20 mm, Width 100-200 mm or customer requirement

Oval

80 x 30 mm

Packing:

Standard packaging: 20 kgs/cardboard Box and 1,000 kgs/Pallet

Rectangular: Wooden Boxes 1mT./Box

Or according to Customer requirement

20 kgs/cardboard Box

1,000 Kgs/Pallet

Wooden Boxes 1mT/Box

Application:

Electrolytic Tough Pitch (Cu-ETP) - for surface treatment, Lead frame and Steel

Phosphorous Copper (Cu-DHP) - mainly used for the plating of Printed Circuit Boards (PCB)

Oxygen free Copper (Cu-OF) - for surface treatment, Lead frames and Steel