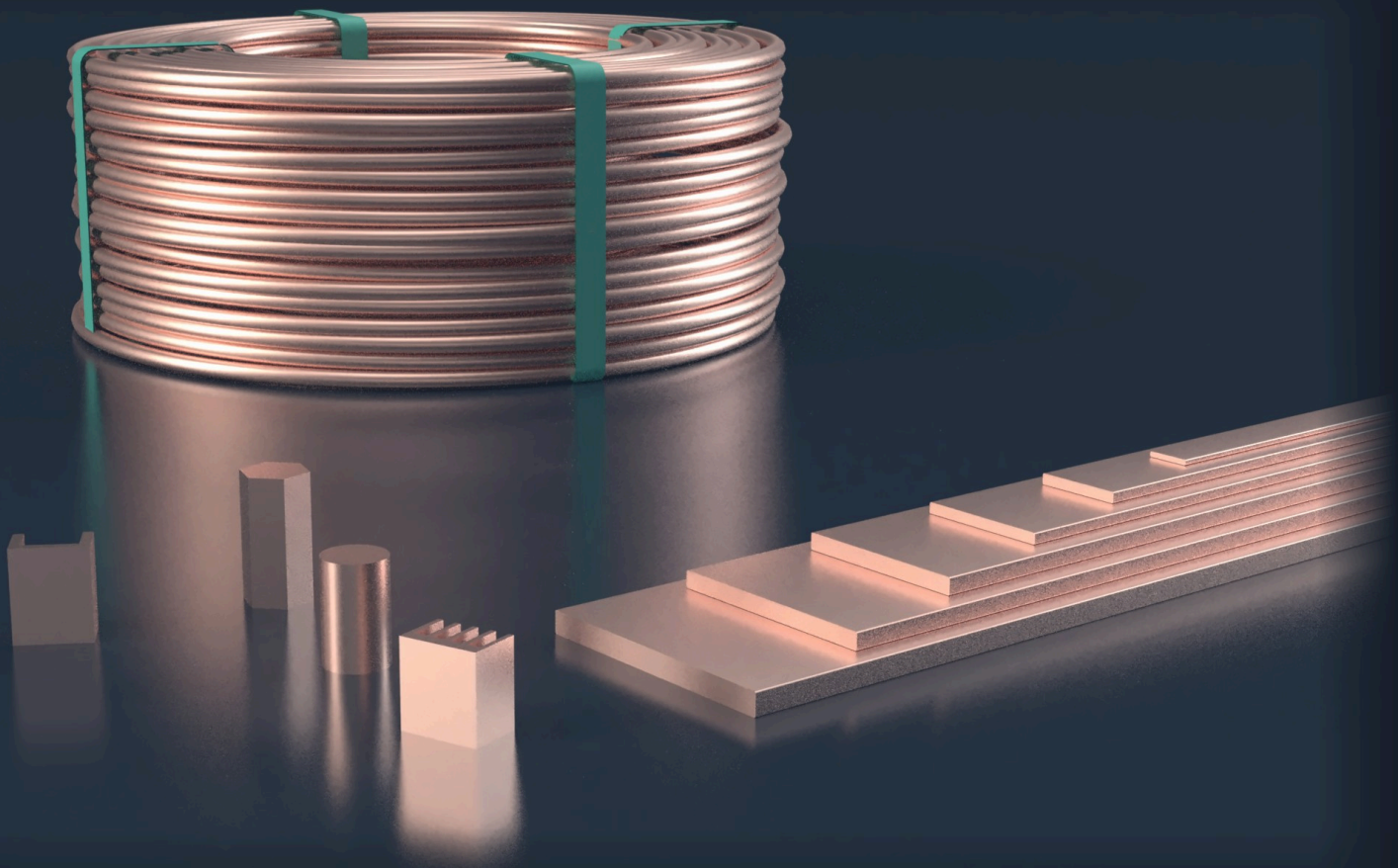




# The copper your process demands: oxygen-free and made to spec.

Busbar, rod, alloys, generator strip and custom profiles in high-purity copper, from our plant in Houston.

**2**

**Why OF copper**  
Versus ETP copper

**3**

**C10100 OFE busbar**  
Specifications and advantages

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**Konform profiles and generator strip**  
Custom shapes, CuAg strip and installed views

**6**

**OF rod and alloys**  
C10100, CuAg, CuSn and CuMg

**7**

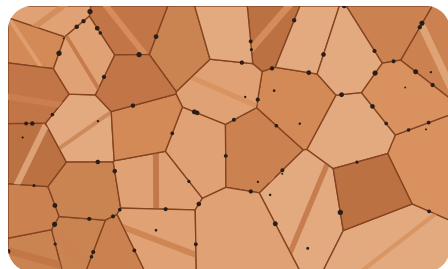
**Standards and contact**  
What we meet and how to order

# Why oxygen-free copper

ETP copper, the most common grade, contains 200 to 400 ppm of oxygen as cuprous oxide ( $\text{Cu}_2\text{O}$ ). Our C10100 OFE copper has 5 ppm at most. That difference determines how the metal behaves when you weld, bend or draw it.

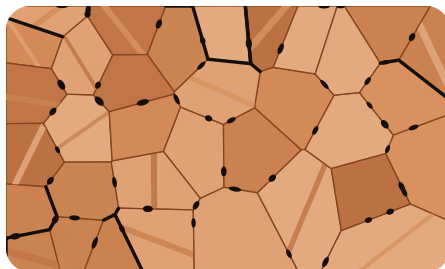
## What happens inside the metal

Illustrative microstructure schematic.



### ETP copper

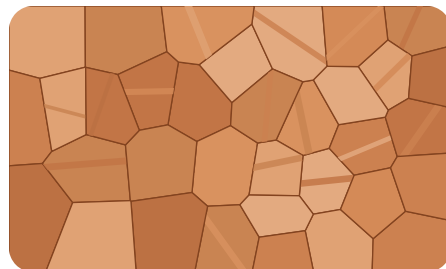
Cuprous oxide ( $\text{Cu}_2\text{O}$ ) particles at the grain boundaries.



### ETP after $\text{H}_2$ brazing

embrittled

Hydrogen reacts with the oxide ( $\text{Cu}_2\text{O} + \text{H}_2 \rightarrow 2\text{Cu} + \text{H}_2\text{O}$ ). Trapped steam opens voids and cracks.



### OFE after $\text{H}_2$ brazing

intact

No oxide, no reaction: the joint stays sound and the metal keeps its ductility.

## OFE vs. ETP copper

Reference values for each grade.

| Property                                    | C10100 OFE copper<br>Rearden     | C11000 ETP copper<br>Most common grade |
|---------------------------------------------|----------------------------------|----------------------------------------|
| Minimum copper                              | 99.99%                           | 99.90%                                 |
| Oxygen                                      | 5 ppm max.                       | 200–400 ppm (typical)                  |
| Electrical conductivity (annealed)          | 101% IACS min.                   | 100% IACS min.                         |
| Thermal conductivity                        | 391 W/m·K                        | 388 W/m·K                              |
| $\text{H}_2$ or reducing-atmosphere brazing | Yes, no embrittlement            | No: embrittles above ~700 °F (370 °C)  |
| Laser or electron-beam welding              | Sound joints, no oxide porosity  | Porosity risk                          |
| Fine wire drawing                           | Fewer breaks: no oxide particles | Oxide particles can cause breaks       |
| High vacuum                                 | Suitable: low outgassing         | Not recommended                        |

### Brazing and welding without embrittlement

Suited to hydrogen, laser and electron-beam processes.

### Top conductivity

101% IACS minimum, annealed.

### More ductility

No oxide particles to start cracks during bending or drawing.

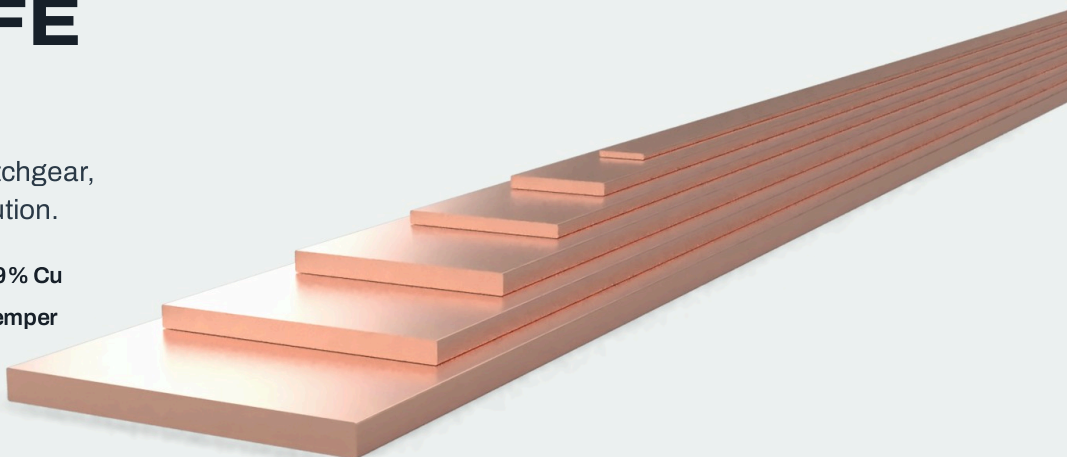
### 99.99% purity

With tight impurity limits, lot after lot.

# C10100 OFE Busbar

Oxygen-free copper bar for switchgear, transformers and power distribution.

|                 |                       |
|-----------------|-----------------------|
| Material        | C10100 OFE, 99.99% Cu |
| Standard        | ASTM B187, H02 temper |
| Sizes           | ~12 standard sizes    |
| Standard length | 12 ft                 |



## Technical specifications

|                         |                                           |
|-------------------------|-------------------------------------------|
| Grade                   | UNS C10100, OFE copper                    |
| Standard                | ASTM B187                                 |
| Copper                  | 99.99% min.                               |
| Oxygen                  | 5 ppm max.                                |
| Electrical conductivity | 101% IACS min. (annealed)                 |
| Standard temper         | H02, half hard                            |
| Hydrogen embrittlement  | Not susceptible                           |
| Supply                  | ~12 standard sizes, 12 ft standard length |

## OFE busbar advantages

- ✓ Laser welding and H<sub>2</sub> brazing **with no porosity or embrittlement.**
- ✓ Edgewise and flatwise bends with **less risk of cracking.**
- ✓ **101% IACS** conductivity, among the highest of any copper grade.
- ✓ A better base for **silver and tin plating**, free of oxide inclusions.

## Fabrication options



**Custom sizes**  
Beyond our ~12 standard sizes.



**Light sections**  
1/8" thick, or 1" wide and under.



**Special lengths**  
Up to 19.5 ft; standard length is 12 ft.



**Cut to length**  
Pieces under 6 ft.



**Rounded edges**  
Radiused edges along the full bar.



**OFE certified to drawing**  
For laser welding, H<sub>2</sub> brazing and defense.

## Applications

Switchgear and panelboards

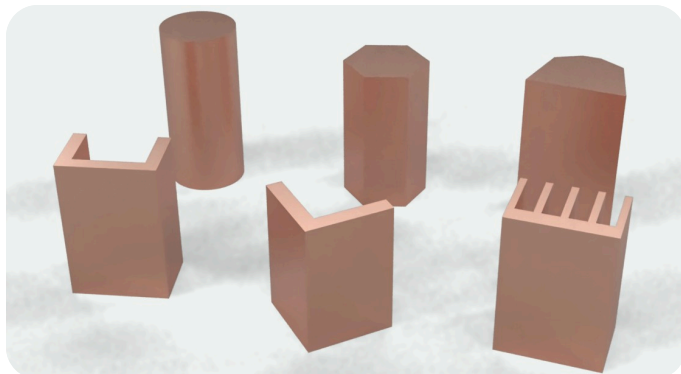
Transformers

Power distribution

Laser welding

H<sub>2</sub> brazing

Defense



## Konform Profiles

Copper profiles in the exact shape of your part, produced by continuous extrusion on our Konform line.

Ideal for: **Connectors** **Terminals**  
**Electrical machinery parts**

| Shape                                                                             |                                                   | Minimum order |
|-----------------------------------------------------------------------------------|---------------------------------------------------|---------------|
|  | <b>Round</b><br>Ø 8 to 90 mm                      | 1 t           |
|  | <b>Hexagonal</b><br>Six-sided bar                 | 1 t           |
|  | <b>Special A</b><br>Channel, angle or grooved     | 2 t           |
|  | <b>Special B</b><br>Multi-face or tight tolerance | 3 t           |
|  | <b>Special C</b><br>Thin or complex section       | 3 t           |

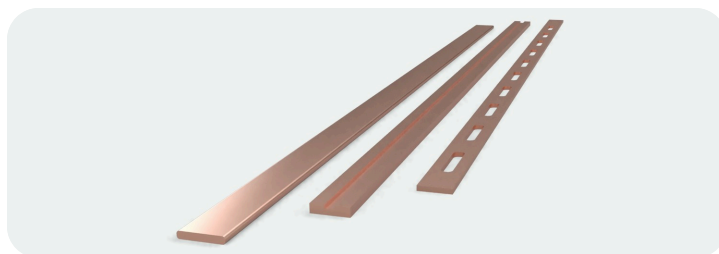
Does your design need a new die? We develop it to order.

|             | Konform<br>Continuous<br>extrusion    | Machining<br>From bar stock | Extrusion<br>Batch process |
|-------------|---------------------------------------|-----------------------------|----------------------------|
| Final shape | <b>Straight from the die</b>          | Part by part                | Straight from the die      |
| Scrap       | <b>Low</b>                            | <b>High, as chips</b>       | Medium, billet butts       |
| Lengths     | <b>Continuous, cut to length</b>      | Limited by the bar          | Limited by the billet      |
| Heating     | <b>Friction-generated; no furnace</b> | Not applicable              | Preheated billet           |

## CuAg Generator Strip

Oxygen-free, silver-bearing copper for generator windings.

|         |                                           |
|---------|-------------------------------------------|
| Grades  | <b>C104 (0.04% Ag) or C107 (0.10% Ag)</b> |
| Section | <b>0.10–0.50" × 0.80–2.00"</b>            |
| Length  | <b>10 to 30 ft</b>                        |
| Temper  | <b>Hard or half hard</b>                  |
| Sales   | <b>Direct from our plant</b>              |



### Why silver-bearing copper

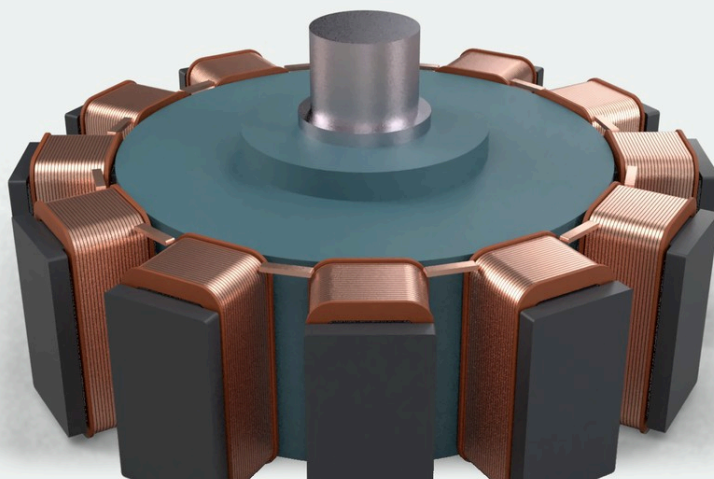
- ✓ **Keeps its hardness after brazing:** silver raises the softening temperature compared with ETP copper.
- ✓ **Resists creep** at generator operating temperatures.
- ✓ **Conductivity virtually equal to pure copper.**
- ✓ **Oxygen-free base:** can be brazed in reducing atmospheres without embrittlement.

Made to order: **Grooves** **Radii** **Special thicknesses** **Ventilation slots** **New dies** **Rush service in 2 weeks or less**

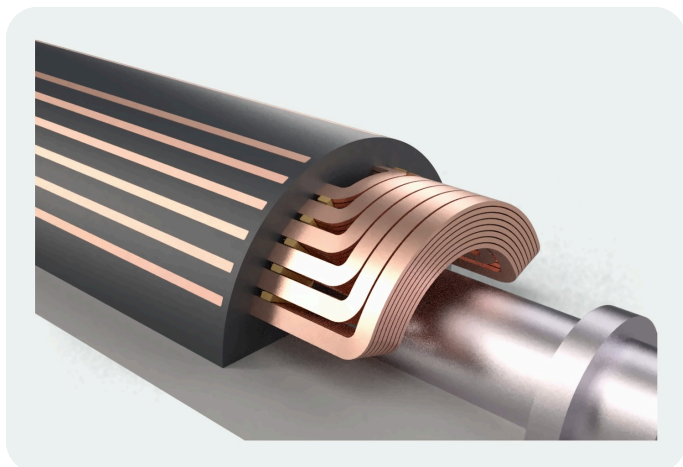
30 ft lengths subject to plant confirmation. See the strip installed in generator rotors on the next page.

# Inside the generator

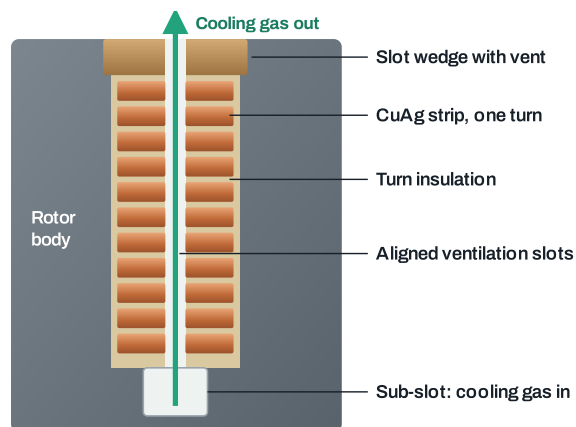
Our CuAg strip goes into the field windings of turbogenerator and hydro generator rotors, where copper must carry current while spinning fast and running hot, year after year.



Hydro generator rotor: each salient pole carries a field coil of CuAg strip wound on edge. Illustrative 3D render.



Turbogenerator rotor end winding: stacked CuAg strips leave the slots and turn around the pole. Illustrative 3D render.



Rotor slot cross-section at a ventilation duct. Schematic.

## Turbogenerator rotors

The strips are stacked in the rotor slots and formed into end turns. At 3,600 rpm, centrifugal force loads the winding nonstop; silver-bearing copper resists the creep that would slowly deform it.

## Hydro generator rotors

The strip is bent on edge into a rectangular coil for each pole. Oxygen-free copper takes the tight edgewise bends, and silver helps the coil keep its hardness after brazing and in service.

## Radial cooling ducts

Punched ventilation slots line up through the stacked turns to form radial ducts. Cooling gas enters through the sub-slot and exits through the wedge.

## Built for rewinds

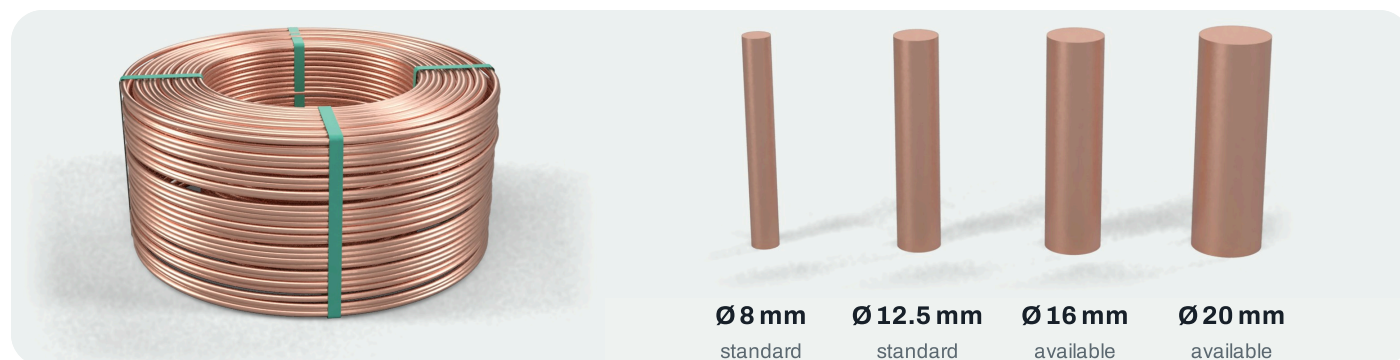
- ✓ **Rush service** in 2 weeks or less for outage schedules.
- ✓ **Lengths up to 30 ft:** fewer brazed joints per coil.
- ✓ **Grooves, radii and special thicknesses** made to your drawing.
- ✓ **Sold direct** from our plant.

# OF Copper Rod C10100

100% U.S., made from U.S.-origin cathode. Oxygen-free copper for wire drawing.

- ✓ **Fine wire drawing with fewer breaks:** no oxide particles.
- ✓ **Annealing in reducing atmospheres** without embrittlement.
- ✓ **101% IACS** for high-efficiency conductors.

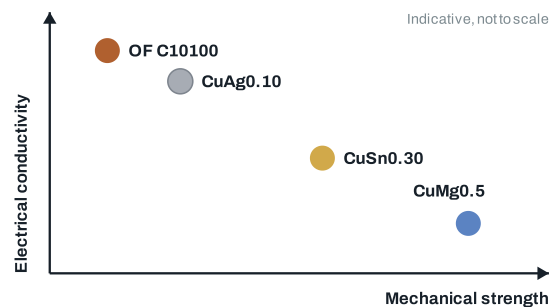
|                 |                          |
|-----------------|--------------------------|
| Standard        | ASTM B49                 |
| Grade           | UNS C10100               |
| Copper / oxygen | 99.99% min. / 5 ppm max. |
| Conductivity    | 101% IACS min.           |
| Diameters       | 8 to 20 mm               |
| Package         | 6,000 lb (2.7 t) coil    |
| Minimum order   | 1 coil                   |



Special diameters to order, from 10 t. Ideal for fine and magnet wire, specialty cables and electronics conductors.

## Made-to-Order Alloys

8 to 20 mm rod in three alloys, for when you need more mechanical or thermal strength than pure copper offers.



| Alloy                     | Alloying element | What it adds                                                                           | Typical applications                      |
|---------------------------|------------------|----------------------------------------------------------------------------------------|-------------------------------------------|
| <b>CuAg0.10</b><br>C10700 | Silver 0.10%     | Higher softening temperature and creep resistance, with near-pure-copper conductivity. | Windings, commutators, contact wire       |
| <b>CuSn0.30</b><br>C14425 | Tin 0.30%        | Higher strength and wear resistance, with good conductivity.                           | Contact wire, high-strength conductors    |
| <b>CuMg0.5</b><br>C18665  | Magnesium 0.5%   | The highest mechanical strength of the three.                                          | Contact wire for high-speed rail catenary |

Produced in monthly campaigns per alloy, with special runs to order. Custom alloy contents available. CuMg0.5 is validated with a pilot run at the plant.

# Five details to choose the right material

- ✓ Your application and process: welding, brazing, drawing...
- ✓ Product and alloy
- ✓ Sizes, tolerances and finishes
- ✓ The standard or certification you require
- ✓ Volume and delivery destination



## Standards and grades we meet

### Busbar

ASTM B187, C10100 OFE copper, H02 temper.

### Alloys

C10700 (CuAg0.10), C14425 (CuSn0.30) and C18665 (CuMg0.5).

### Rod

ASTM B49, C10100 copper from U.S. cathode.

### Generator strip

Oxygen-free silver-bearing copper: C104 (0.04% Ag) or C107 (0.10% Ag).

### Do you resell copper?

If you carry inventory and supply certified material, ask about our distributor program.

### Your Rearden representative

Name

Phone

Email

Rearden Precision, Houston, Texas plant. Plant pickup or delivery anywhere in the U.S.

Properties shown are reference values for each grade. Final specifications are confirmed with each order.