

At Home With Brass

Some Domestic Applications for Alpha
Alloy Brass Wire

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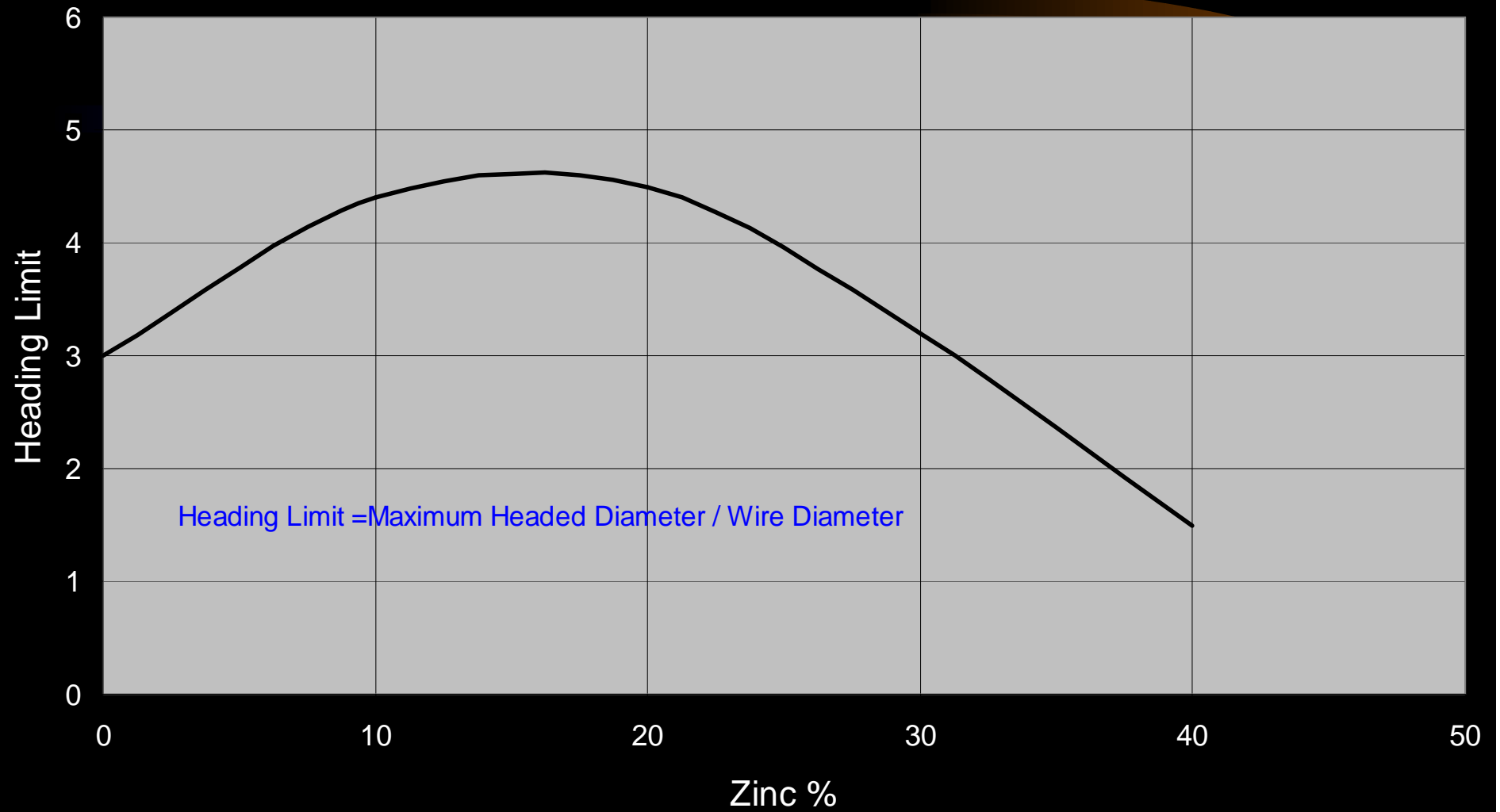
Customer Requirements

- Individual customers can take in one year, lengths of wire that if joined up as one piece could encircle the world.
- They demand consistent properties along these huge distances.
- Ultimate Tensile Strength (range 300 to 850 N/mm², tolerances typically +/- 25N/mm²)

Customer Requirements cont.

- Yield or Proof Strength (range 140 to 830 N/mm², tolerances typically +/- 15N/mm²)
- Electrical Resistivity (range 3.9 to 6.6 microhm cm at 20oC, tolerances typically +/- 3% of nominal)
- Heading Limit 1.5 to 4.6
- Minimal reaction to end use environment.

Effect of Zinc Content on the Formability of Brass Single Blow Machines



Customer Requirements cont.


- Consistency can only be achieved by:
- Close control over compositions both with respect to additions and impurities.
- Disciplined production routines managed to ISO9000 quality system standards.
- The selective use of modern technology.

Metal Melting and Casting.

- Metal is melted under nitrogen in a graphite crucible heated by electrical resistance elements. There is no oxidation of the melt.
- Charges are weighed out with precision to provide close control over composition.
- Liquid metal sinks to the bottom of the crucible where it is solidified in water cooled dies as 19mm round section.

Metal Melting and Casting

cont.....

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- As-cast' rod is pulled through the dies and coiled for convenience.
 - Long transmission times ensure good alloy mixing. Compositional variation typically is only 25% of BSEN12166 tolerances.



Metal Store

Only refined (virtually impurity free) metals and some internally generated scrap are used to make the alloys.



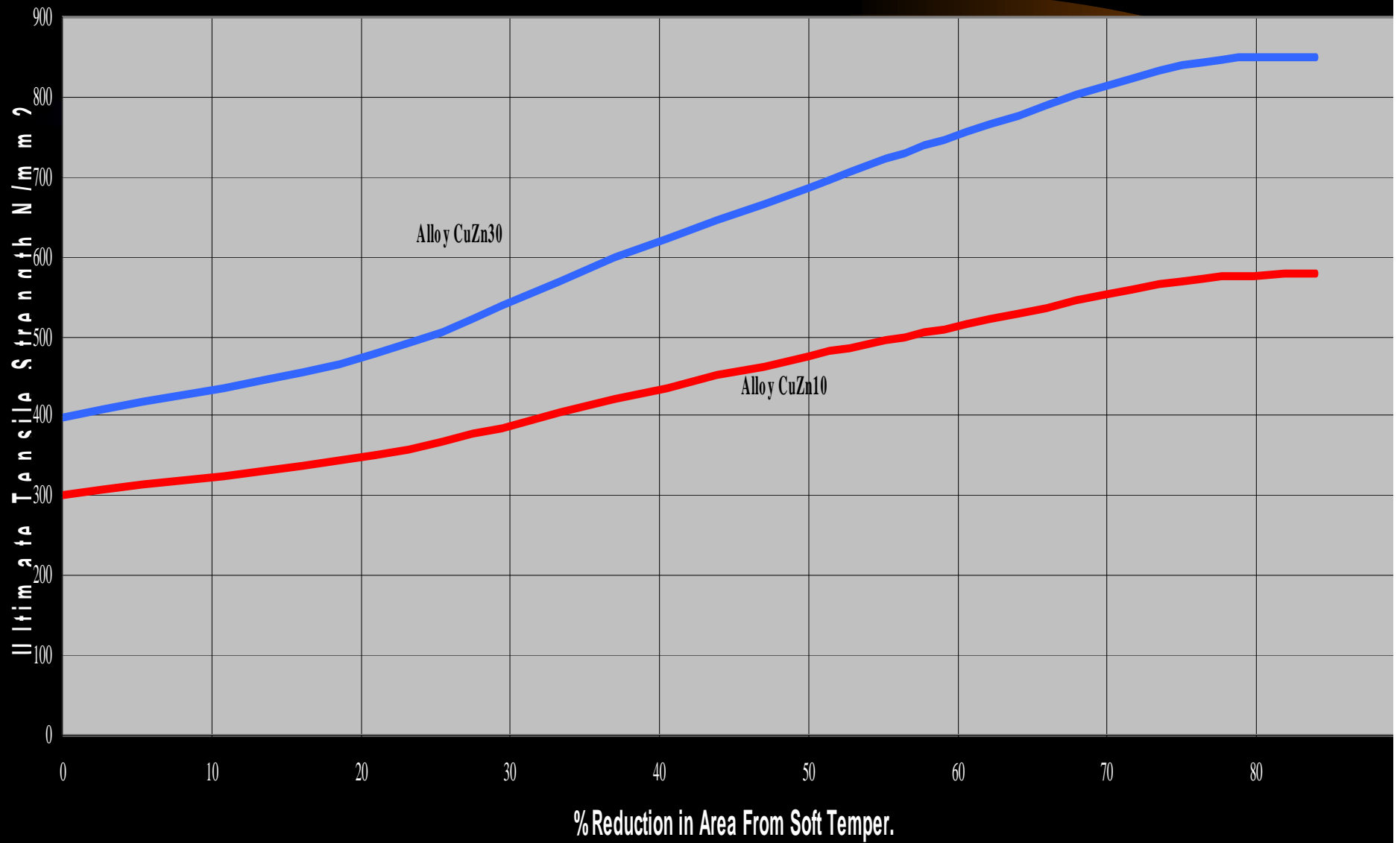
Coiling Cast
Rod

Coils weigh a tonne and are 400metres long.

Work Hardening and Softening.

- When metal is bent, stretched or otherwise manipulated it 'work hardens' until it cannot take any more without breaking.
- Brass can be softened again by heating it to a temperature high enough to cause its crystal structure to reform, typically 500°C.
- Wire is produced from 'as-cast' rod by a series of cold working and annealing cycles.

Work Hardening Curves For Two Brass Alloys



Rod Rolling.



- The first work hardening operation is rod rolling.
- A six stand Buhler mill reduces rod section from 19mm round to 10mm hexagon. A second pass takes the wire to 5 mm across flats.

Buhler Mill Rod Rolling



Rolling conditions controlled by PC

Annealing

- Alloys containing 20% or more zinc are annealed at 10mm and at 5mm.
- Alloys containing less than 20% zinc are annealed at 5mm only.
- All alloys are also annealed as drawn wire at sizes dictated by the mechanical properties specified for the end product.

Annealing cont.....



- The mechanical properties of end products depends critically on grain size control.
- Ebner annealed rod and wire has the same grain size throughout a 6000kg load and from load to load.

Ebner Annealing

Six 1000kg coils or twelve 500kg reels are stacked in an Ebner furnace and bright annealed under an atmosphere of 25% hydrogen and 75% nitrogen..

At this stage each reel carries about 500kg of wire measuring more than 30 km in length.



Wire Drawing

- High speed multi-die wire drawing machines elongate the wire by reducing its cross-sectional area.
- Final reductions in cross-sectional area are selected to give required mechanical properties.
- Tempers available range from Soft typically 300 N/mm² to Spring Hard typically 850N/mm².

Electroplating

- Brasses are inherently resistant to a wide range of corrosive environments.
- Even better results are obtained when tin coatings are applied.
- Brasses are easy to join by soldering.
- Wires pre-plated with solder over a copper or nickel undercoat are used for automated joining applications.

Electroplating cont.....



- Coatings of uniform thickness are now applied using high speed reel to reel machines.
- Coating thickness can be measured to nearest tenth of a micron.

Domestic Applications: Florescent Tubes

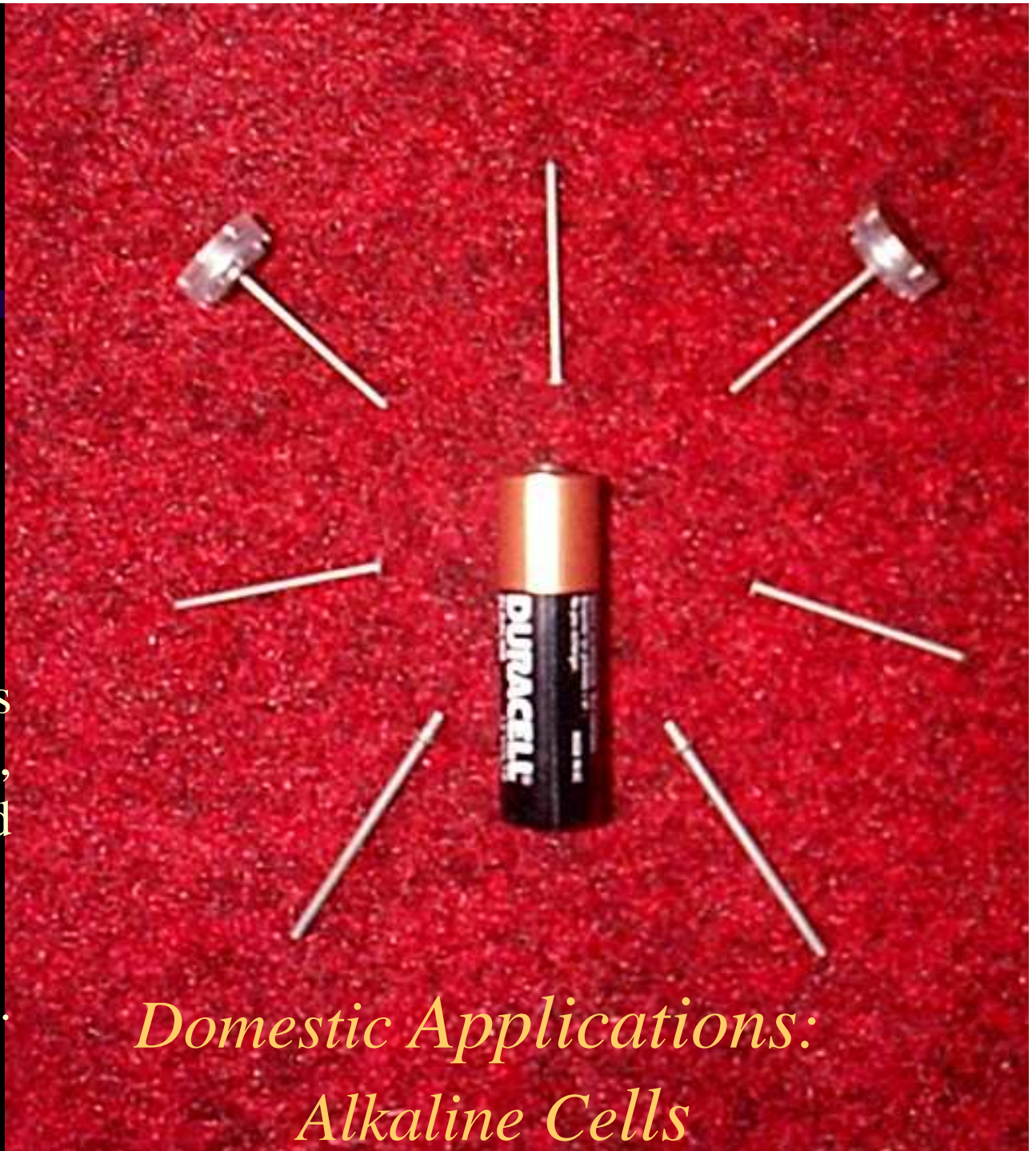


Four little studs (two at each end) connect fluorescent tubes to their fittings. A single operation cold extrusion process produces the complex hollow shape from solid wire. CuZn30 was selected because of its extreme malleability, good corrosion resistance, high electrical conductivity and high strength.

The alkaline cell is built around a central anode 'charge collector' made from tin plated CuZn30 wire.

The anodes are shaped in the form of nails or rivets

The application requires low electrical resistivity, high rigidity, good cold heading properties and zero reaction to the alkaline environment.



*Domestic Applications:
Alkaline Cells*




Domestic Applications: Gas and Water Fittings

Cast iron pipe networks are being replaced with plastic extrusions. Fittings are used to weld one length of pipe to another. Brass wire is inlaid in the fitting and acts as an electrical resistance element for the welding process. Tolerance on resistance per metre is only $\pm 3\%$.
Guaranteed for fifty years.



Domestic Applications: Zip Fasteners

The selection of materials is at the whim of the designer but CuZn10 and CuZn20 are often used. Flattened wire is fed into cold forming presses. Good malleability is essential. Low zinc brasses are long wearing, strong and most importantly they have a pleasing gold colour although the one show above has an 'antique finish..

A coiled yellow brass wire is shown against a dark red, textured background. The wire is made of multiple strands twisted together, forming a thick, flexible rope. It is coiled into a large circle with two smaller loops on the right side. The text is centered within the circle.

CuZn30 and CuZn37 wires are used to hang pictures. The stranded construction adds flexibility to the wires' high strength.

Domestic Applications: Picture Frame Wire



CuZn30 wire forms part of the electrical system operating the cord retraction mechanism

*Domestic Applications:
Vacuum Cleaners*

Domestic Applications: Conclusions

Brasses have many domestic uses due to a unique combination of properties including:

- High strength and good ductility.
- Excellent malleability and plasticity.
- Easy to weld or solder. Plated option.
- Good corrosion resistance. Plated option.
- Low electrical resistivity.
- Pleasing appearance.

At home with brass

The end.....

