

# 'Design in Brass'

Introduction to Brass

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# Brass (Copper-Zinc)

- Types
  1. Maximum Cold Working
  2. Cold Working + Machining
  3. Hot Working or Casting



# Alloying elements added to Brass

Element		Property Improved
Lead	1 to 3%	Machinability
Manganese Aluminium Silicon Nickel Iron	0.75 to 2.5%	Yield strength Up to 500MN/m <sup>2</sup>
Aluminium Arsenic Tin	0.4 to 1.5%	Corrosion Resistance especially in sea water



# Strength

- Yield strength
  - range YS 250 to 500 MPa



# Machinability

- Brass sets the standard by which other materials are judged
- Slight reduction in ductility when lead present



# Comparisons of Machinability

Metal	Metal Removal Rate cm <sup>3</sup> /min	Comment
Brass (Leaded)	100	No lubricant needed Excellent surface finish
Aluminium (Free-machining grade)	80	Lubricant needed
Mild steel	36	Lubricant needed Poor finish
Stainless steel (304)	6	Very slow Much vibration Poor surface finish



# Recyclability

- Almost 100% of brass manufactured in the UK is made from recycled copper and brass
- Process scrap has a high value - approx. 40% of the virgin alloy (variable)
- Legislation



# Cost-effectiveness

- Close tolerances
- Tooling costs
- Ease of machining
- Good corrosion resistance
- High scrap value
- Long service life



# UK and European Standards

- Standards form part of the complex technical language used in the communication between producers of alloys, manufacturers, designers and stockists and any technical person concerned with materials usage



# American Standards

- UNS (Unified Numbering System) is the accepted alloy designation system in North America for wrought and cast copper alloy products
- Managed by ASTM and SAE



# Properties of Importance

- Formability - hot and cold
- Castability
- Machinability
- Soldered and brazed
- Attractive colours
- Good surface finish



# Properties of Importance

- Strength+Ductility
- No brittle-ductile transition temperature
- Electrical conductivity
- Thermal conductivity
- Corrosion resistance
- Recyclability



# Brass

- Types  $\alpha$  ,  $\alpha + \beta$
- Alloying elements
- Strength
- Machinability
- Recyclability
- Cost-effectiveness
- Standards
- Important properties

