



Successful Brazing

of

Brass



Johnson Matthey



Joining processes for Designers

Cold processes

Hot processes

Mechanical joints

Adhesives

Soldering

Brazing

Welding

Nuts & Bolts
Bolts
Rivets
Locked Seams
Clinched joints

Various procedures

'In-air processes'
Silver brazing.
Aluminium brazing.
Brazing with copper-base alloys. Dip brazing.

1. 'Enclosed' processes
2. 'In-air' processes

'Enclosed' processes
CAB Furnace brazing.
Vacuum brazing.

MIG/TIG
Gas Friction
Stir
Electron Beam
Laser
Plasma
Resistance



Joining processes for Brass

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Areas covered in this presentation

- What is Silver Brazing?
- Silver Brazing of Brass is Easy!
- Advantages of Joining Brass By Silver Brazing.
- Caution! Points to watch out for...
- Examples of components.

Successful Brazing of Brass

**What is
Silver
Brazing?**





What is Brazing?

- Brazing is a versatile thermal joining process used on most of the common engineering metals and alloys.
- It takes place above 450°C (above 600°C for silver brazing) and below the melting temperature of the metals being joined.



What is Brazing?

- A molten brazing alloy is drawn into a capillary gap between two metals.
- A strong metallurgical bond results from a successful brazing process.
- Most air brazing operations require to use of a chemical flux to protect the metals from oxide formation and promote flow and wetting of the molten brazing alloy.



Brass brazing in action

- The flux protects the brass component during heating.
- 100-200 °C





Brass brazing in action

- The flux goes clear and watery as the component reaches brazing temperature
- 550-600 °C





Brass brazing in action

- The silver brazing alloy melts as and flows as it is touched onto the joint area.
- 700-750 °C





Where Brazing Fits In

- Soldering is similar to brazing but the filler materials are inherently much weaker.
- Welding uses a filler metal, melts the parent metals and produces a larger heat affected zone.
- Soldering below 450°C.
- Silver Brazing 600-900 °C.
- Brass brazing / bronze welding 900 °C+
- Copper brazing 1089°C
- Welding above melting temp of material being joined.

Successful Brazing of Brass

**Silver
Brazing of
Brass is
Easy!**





Brazing of Brass is Easy

- It requires no special alloys or techniques.
- It involves low set up cost - no special equipment is needed.
- Brazing is a straightforward process.



Which Brazing Alloys Can Be Used?

- Silver-Flo Brazing Alloys - Silver, copper, zinc based alloys. Some 20 alloys with differing silver % and brazing characteristics.
- **Silver-flo 55 Melting range 630-660C**
- **Silver-flo 40 Melting Range 650-710C**
- **Silver-flo 302 Melting Range 665-755C**
- **Silver-flo 18 Melting range 784-816C**
- Generally high zinc brasses require 18% silver or more in order to avoid melting or distorting the brass.



Which Brazing Alloys Can Be Used?

- Easy-Flo Brazing Alloys - Silver, Cadmium, copper, zinc based alloys. 7 alloys with differing silver % and brazing characteristics.
- Easy-flo 2 Melting range 608 -617 °C.
- Today companies avoid cadmium bearing alloys.
- These alloys have some of the lowest melting ranges and are useful for leaded brass components.



Which Brazing Alloys Can Be Used?

- **Silver Copper Phosphorus and Copper Phosphorus Brazing Alloys**
- These alloys provide lower cost alternatives and are useful where joint appearance, alloy penetration and joint strength are not as important as cost.
- But never use for Brass to steel or nickel alloys!



Is a Flux Required?

- For brazing brass in air a flux is required with all these alloy types.
- Easy flo Flux is suitable in most cases.



Most common heating methods are recommended

- Hand torch - air / natural gas, propane, oxy-acetylene etc...
 - Fixed burners,
 - HF induction heating,
 - Resistance heating.
-
- But generally not furnace brazing where zinc / zinc oxide can cause problems.

Successful Brazing of Brass

**Advantages of
Joining Brass by
Silver Brazing?**





Advantages of Joining Brass by Brazing

- Strong leak tight joints - good for gas and liquids.
- Joints have good electrical conductivity.
- Joints are smooth and neat in appearance.
- Colour matching on Brass is possible.
- Brass is not distorted or melted during brazing.
- Brazing will readily join brass to other materials and components of different masses
- E.g. copper, copper alloys, mild steel, stainless steel, contact materials AgCd Oxide.

Successful Brazing of Brass

Caution!

**Points to
watch out
for....**





Caution! Points to watch out for when brazing brass.

- *Leaded brass - During brazing lead phases become molten before brazing occurs.*
 - *Cracking can occur in leaded brasses during heating to brazing temperatures.*
 - *A brittle joint can occur as a result of lead being taken up into the molten brazing alloy.*
 - *Lead oxide can reduce satisfactory wetting of the braze.*
-
- ✓ **Generally avoid brazing brasses with high lead contents >2% - E.g.. CZ121, CZ124, CZ130, CZ132**
 - ✓ **Low melting point alloys (Silver-flo 55 and Easy-flo 2), more flux, motion of parts together during brazing and opening up joint gaps are recommended.**



Caution! Points to watch out for when brazing brass.

- *Brasses containing Aluminium form brittle refractory alumina films. Aluminium is taken into the molten brazing alloy. (CZ110, CZ114, CZ135 apply).*
- *Brittle joints, non wetting and poor bonds can result.*
- ✓ **Special Aluminium Bronze Grade Flux will dissolve Aluminium oxide on 2-10% Al Brasses and overcome the problem.**
- *When brass containing Aluminium, Magnesium or Zirconium is being joined to steel a brittle oxide film may form at the brazing alloy / steel interface.*
- ✓ **Plating or use of a copper shim or JM Trifoil may prevent this.**





Caution! Points to watch out for when brazing brass.

- *If selecting a brass that is resistant to dezincification due to for example service in sea-water it is important also to select a brazing alloy which is also resistant to dezincification.*
- *Some Silver brazing alloys are susceptible to dezincification.*
- ✓ **Silver-flo 55, 44, 43 and 60 have been shown to be resistant to dezincification and are widely used in shipbuilding and offshore installations.**




Caution! Points to watch out for when brazing brass.

- *Red staining on brass can occur following brazing.*
- *This is a result of Zinc oxide formation.*
- ✓ The use of a reducing flame and a special flux will overcome this problem.
- ✓ JM Tenacity 14 is recommended.

Successful Brazing of Brass

**Examples of
Brazed Brass
Components on
display**





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**Thank you for watching
this Presentation**

