

Fact Sheet 10: laser welding



Introduction

The word laser is an acronym for *Light Amplification by Stimulated Emission of Radiation*. Laser spot welding has been a feature of the jewellery industry for the last decade and is fast becoming a staple in larger workshops. Used primarily to solve production problems, its main uses and advantages are:

Invisible joins

Invisible joining in platinum, palladium, gold, silver, titanium and other jewellery metals because when laser welding you can use thin wire in the same alloy as the item being welded as a welding medium

Sizing of rings

For the same reason as above, thin wire can be used in the same alloy as the ring and the join welded together with no visible seams.

Porosity in castings

Holes can be easily filled with a small piece of wire in the same alloy as the casting, even after polishing.

Re-tipping of claws

Because the laser is very accurate (typically 0.2mm beam diameter) and very little heat is generated at the point of welding, you have the ability to repair and re-tip claws on jewellery without the need to remove the stone first.

Tacking

It is very easy to tack work together to hold it in place ready for soldering.

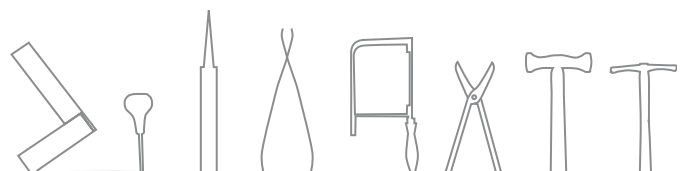
Pre-finishing of pieces

Use of the laser means you can prepare separate component parts to a finished state and then laser weld them together at the end of the process. This leads to very interesting creative possibilities.

Multiple welds

Due to the relatively small amount of heat generated at the weld point, laser spot welding is ideal for complex pieces that require multiple joins and will retain the hardness in for example a sprung wire.

In order to understand the technology and its potential in your designs, it helps to learn the basics of laser welding by attending a short course. You should learn enough to be up and running with the technology in a few days and smoothly operate and achieve reasonable results within a few weeks.



Approaching a laser welding specialist

As with any new technology, the disadvantage of implementing it mainly centres around the cost of the equipment. Although this cost is gradually reducing over time, most laser spot welders cost many thousands of pounds.

If you want to employ laser welding in your work, you have a number of options. Firstly you can invest in a piece of equipment yourself, or you can pay for time on laser spot welders at some of the educational centres in the industry.

Your final option is to outsource to one of the 'jobbing' laser welding companies springing up around the country – these are often very trade-orientated with the majority of work coming from established jewellers, setters, mounting companies and therefore well versed in fixing problems.

Preparing your work for laser welding

As with conventional soldering, you need to prepare your work. Ensure it is clean and grease free and if wanting a seam welded, ensure edges are touching. If you are unsure, consult the laser welding specialist and they will be able to tell you what is and isn't possible.

The sort of work you could give a laser specialist could be:

- * Filling porosity in a casting – particularly useful if you've found it after you've finished and polished the piece.
- * Sizing a platinum ring – where you don't want the seam to be visible.
- * Repairs – often work that cannot be solved by any other means can be laser welded. For example a pair of opal earrings where the earring post has fallen off – this is an ideal application for the laser as the heat is so localised it won't affect the opal.
- * You could create a piece with lots of separate components, polish and finish all of them; set stones and then laser assemble them to create a finished piece.
- * Any welding where heat is an issue e.g. through discolouration or effect of heat.
- * You are at the final stages of finishing something and it breaks.
- * Tacking prior to soldering

Costing and pricing

As with traditional bench jewellers, the cost will be based on the time spent on the laser and your preparation work can have an effect on how much time the laser specialist has to spend on your work. As a general rule, laser specialists charge by the minute so the more time you can spend preparing your work the less time is spent at the laser. Also, if they have to go to the bench to make an adjustment, there will be a cost involved.

As with all your costing and pricing, this cost needs to be integrated in to the final cost for your piece.

Laser welding FAQ

Q: Can you laser weld all metals?

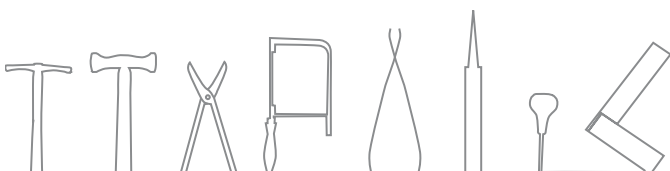
A: Generally, platinum and 18ct gold weld the best, as is stainless steel. Silver and 9ct gold can be problematic as a lot of power is required. Both titanium and palladium need argon. Base metal jewellery, electro plated silver, aluminium, copper, brass can be problematic.

Q: Can you weld two different metals together.

A: You can. It depends on the metal but you may have problems as one metal may have a lower melting point than the other.

Q: Lasers seem to be very expensive, are they worth this cost?

A: Laser welders are expensive and if you compare this to other tools within our industry, it is indeed at the very top end of this range. However, you have to consider the potential of such technology to pay back its investment within months due to its time saving attributes. The ability to realise designs that could otherwise not be possible using traditional solder techniques is also priceless.



“Seriously thinking about Fair Trade Gold now whereas before it was a curiosity.”

Glossary

Beam diameter (Ø)

Parameter setting that dictates the size of the beam

Feeder wire

Wire used to fill weld, usually of same alloy as piece to be welded, drawn down to approximately 0.25mm diameter

Focal point

Optimal point at which to hold material for laser welding within the welding chamber

Frequency (Hz)

The frequency of the laser pulse

Laser

Light Amplification by Stimulated Emission of Radiation

LSW

Laser Spot Welder

Milliseconds (ms)

The laser pulse duration

Nd YAG

Crystal used as the lasing medium in laser spot welder (Neodymium-doped Yttrium Aluminium Garnet)

Welding chamber

The area in which the piece to be welded is held

Voltage (V)

Parameter setting that dictates the power of the laser beam

Further reading

Laser spot welding: technical guidelines and innovative applications for the jewellery industry, Publ Goldsmiths' Company 2004, ISBN 0140 0541

Introduction to Precious Metals – Metallurgy for Jewellers and Silversmiths, Chapter 13, Mark Grimwade, Publ A&C Black 2009, ISBN: 978-0-7136-8758-3

Databases of industry specific trade services

The following websites hold information about trade services, equipment suppliers, products and educational courses:

benchpeg: www.benchpeg.com

The jewellery industry's leading creative and digital communications network

British Jewellers' Association Trade

Product Search: www.bja.org.uk

A membership organisation that represents the jewellery industry

Ganoksin: www.ganoksin.com

An international online resource for the jewellery industry

The Goldsmiths' Company Technical Portal:

www.thegoldsmiths.co.uk

A supplier database of trade-to-trade services and suppliers

Acknowledgements

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