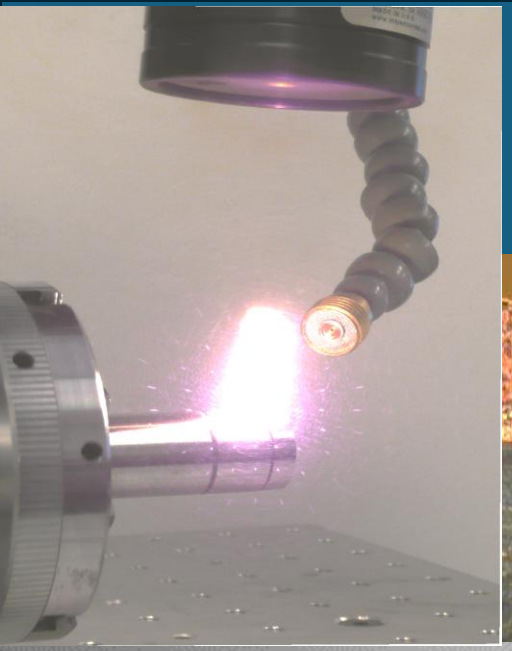
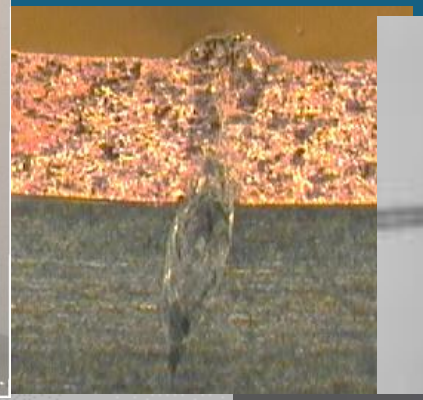
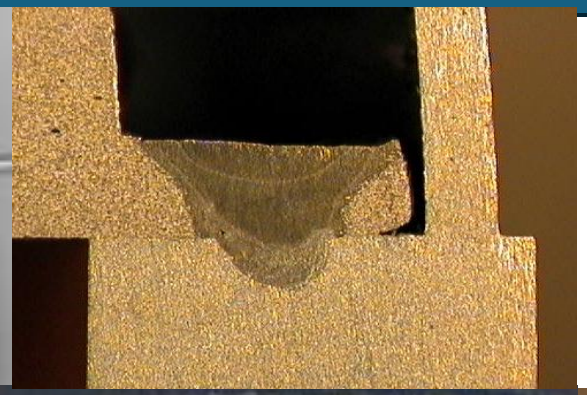
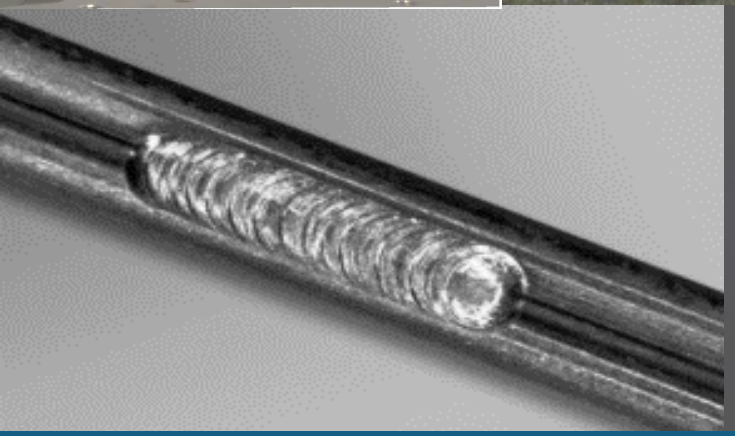
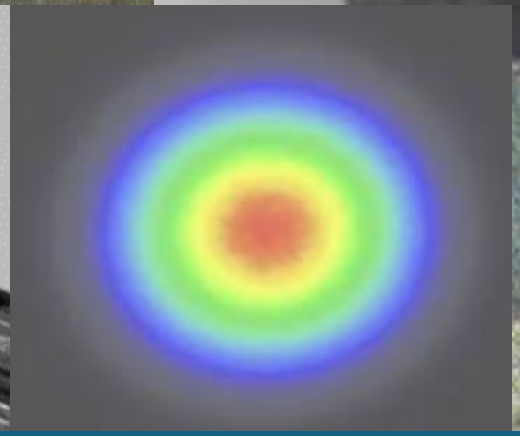
How to be Successful at your Laser Welding Applications



Dr Geoff Shannon

Laser Welding Training Course Introduction

- Course focuses on micro welding, defined by weld depth < 0.04” / 1mm
- Content contains all the practical knowledge needed to set up and maintain a production laser weld
- Content can be tailored towards specific applications & experience of attendees
- Full course requires around 4-6 hours
  - It is recommended to split the full course into 3 sections
- Virtual or on-site
- Pricing $2500, plus travel time + cost if needed
- Contact: Geoff@laserweldingu.com or 408 582 3835

Part 1: Fundamentals of Laser Welding

1. What is a laser
2. How a Laser welds
3. Laser Welding Modes
    - 3.1 Conduction Limited
    - 3.2 Transition Keyhole
    - 3.3 Keyhole/penetration
4. Laser Weld Width/depth capability
5. Examples of laser welds
6. Materials & Plating selection
    - 6.1 Recommended materials
    - 6.2 Weldability of common metals
    - 6.3 Option to cover any/all of the following -
        - 6.3.1 3xx Stainless Steels
        - 6.3.2 4xx Stainless Steels
        - 6.3.3 Copper and copper alloys
        - 6.3.4 Aluminum Alloys
        - 6.3.5 Nickel Alloys
        - 6.3.6 Titanium
    - 6.4 Dissimilar metal welding
    - 6.5 Material Certification
    - 6.6 Platings; tin, nickel, gold
7. Weld Geometry
    - 7.1 Lap
    - 7.2 Fillet
    - 7.3 Butt
    - 7.4 Fit-up Tolerances
        - 7.4.1 Interface Gap
        - 7.4.2 Laser tracking
8. Define The Weld
    - 8.1 Strength, conductivity, hermeticity
    - 8.2 Weld testing; peel, pull, sectioning, microhardness, Xray, ductility
    - 8.3 On site test equipment
    - 8.4 Laser welding standards, guidelines, procedures

Part 2: Optimizing The Weld

9. Lasers and Focus Heads
    - 9.1 Nd:YAG, QCW fiber, CW fiber, Blue Diode
    - 9.2 Pulsed, continuous wave and modulated operation
    - 9.3 Single Mode and Multi Mode
    - 9.4 Blue Diode welding of Copper
    - 9.5 Sizing a laser for power
    - 9.6 Beam delivery Options
10. Focus Heads
    - 10.1 Basics
    - 10.2 Fixed focus heads; 90 degree, in line
    - 10.3 Scan Heads
    - 10.4 Wobble Heads
    - 10.5 Laser Focus Spot Size
    - 10.6 Effect of focus length
    - 10.7 Guidelines for selecting spot size. and fiber & optics
11. Laser Parameters
    - 11.1 Peak & Average Power
    - 11.2 Pulse Width
    - 11.3 Pulsed Seam Welding
    - 11.4 CW Seam Welding
    - 11.5 Pulse Shaping
12. Cover Gas
13. Tooling
14. Optimizing the Weld
    - 14.1 Part Preparation
    - 14.2 Finding the Focus
    - 14.3 Guidelines for Peak Power & Pulse Width
    - 14.4 Guidelines on Power for CW Seam Welding
    - 14.5 Finding the Process Window

Part 3: Maintaining The Weld in Production

15. System Benchmarking
    - 15.1 Measurement options
        - 15.2.1 Average Power & Pulse Energy
        - 15.2.2 Beam Profile (mode)
    - 15.2 Laser, Beam delivery and Focus head
16. Fiber Routing
17. Creating “golden” production parts
18. Weld Troubleshooting Methodology
    - 18.1 Process Drift
    - 18.2 Process Failure
19. Optics basics
20. Changing the cover slide
21. Changing collimator or focus lens
22. In-Process monitoring
23. Q&A, discussion, wrap-up

Additional Optional Modules

24. Single Mode Laser Welding
25. Welding Copper and Aluminum
26. Polymer Welding