



# Handheld Laser Welding Technology – An Impartial Assessment to Support Industrial Adoption



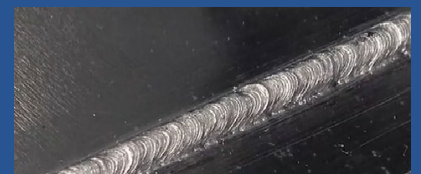
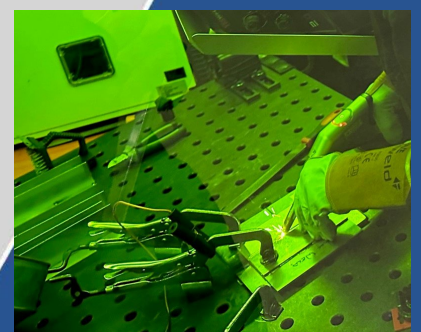
**JOINT INDUSTRY  
PROJECT OUTLINE**

**PROP311304**

**August 2023**

## Project Concept

Handheld laser welding is a new emerging technology. The devices promise faster, more versatile, cost effective and consistent welding results than more conventional manual arc welding processes, such as MIG/MAG or TIG welding. Handheld laser welding devices require an operator holding the system to release the beam and are equipped with safety features that shut off the beam as soon as the system moves away from the workpiece, so offer engineered safety control. However, the lack of a standardised assessment methodology and supporting data, and thus independent validation of the technology's claims, could result in industry being hesitant to adopt this potentially disruptive technology, due to absence of independent validation of its performance, robustness, safe operation and capabilities. The aim of this Joint Industry Project (JIP) is to provide independent third-party assessment and validation of handheld laser welding technology, focusing on demonstration of the ability to make sound welds, health, safety and environmental impacts (e.g. welding fume and scattered radiation), and tolerance of the process in relation to weld quality and mechanical properties. The scope of work will include benchmarking against conventional manual arc welding approaches, including MIG/MAG and TIG welding processes.



**Images courtesy of  
IPG Photonics**

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## Objectives

- Indicate suitability for industrial use by investigating welding parameters and process tolerance around a range of materials, joint configurations and thicknesses, representative of targeted case studies identified by the Sponsors (up to a maximum of five case study scenarios).
- Perform weld quality (e.g. via inspection) and property (e.g. mechanical performance) assessment, in line with specifications of the targeted case studies.
- Perform a secondary emission safety case assessment around weld fume and scattered radiation characterisation, to better understand the impact on Health and Safety of operations.
- Compare laser handheld technology with a relevant more conventional manual welding approach (i.e. arc welding).
- Training and knowledge transfer through a practical workshop to demonstrate technology in action.

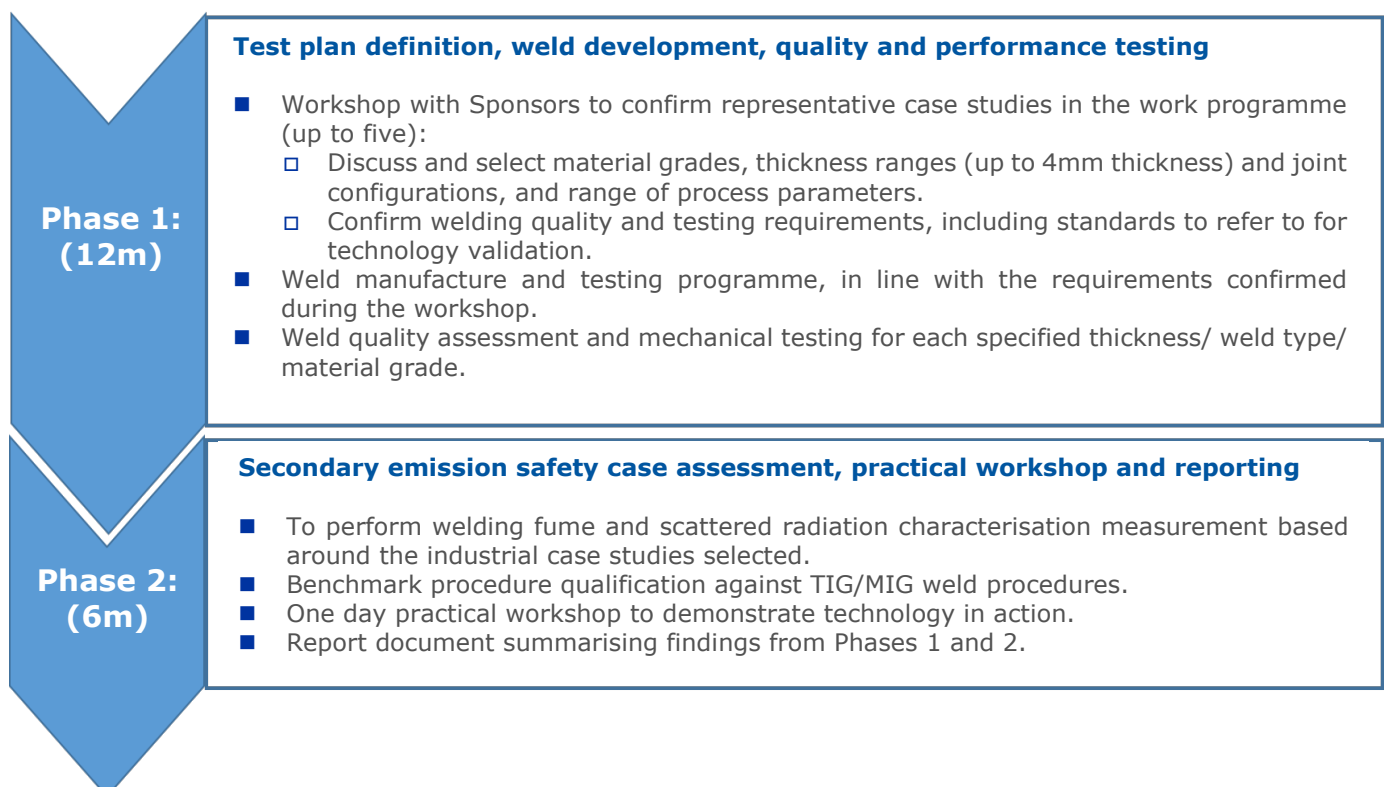
## Benefits

The information generated will provide Sponsors with impartial technical advice on the adoption of handheld laser welding technology in their businesses, contributing to improved understanding of its appropriateness and suitability for use in their manufacturing environments. It will aid sponsors in effective process capability acquisition assessment by considering key factors across a range of case studies, including:

- Key process variables (KPVs) such as welding speed and positioning of nozzle end-effector (in relation to the workpiece).
- Related tolerances of process performance to variation in KPVs.
- Typical flaw/defect type and frequency compared with manual welding / automated laser welding.
- Non-destructive testing / inspection considerations.
- Training and familiarisation with handheld technology.
- Investment and operating costs.

This project will deliver data and information to support decisions on whether the technology is robust, safe, fast, versatile and cost effective for the Sponsors' industrial applications. This aim is to provide a greater level of assurance for those seeking to use laser handheld technology for welding applications, helping to facilitate the adoption of this innovative technology within industry.

## Approach



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## Deliverables

- A technical report summarising findings from:
  - Study of key laser welding parameters for the thicknesses, materials and joint configurations chosen.
  - Laser weld quality evaluation, process robustness study and mechanical testing for the thicknesses, materials and joint configurations chosen.
  - Secondary emission safety case assessment - weld fume and scattered radiation characterisation.
  - Benchmarking with conventional arc welding (e.g. TIG or MIG/MAG as appropriate for the application).
- Practical workshop to stakeholders involved in the project to demonstrate technology in action.

## Price and Duration

The overall estimated price for the work is £250,000 (excluding VAT), over the 18 month project duration.

TWI welcome feedback from potential sponsors on the scope of work and budgeted costs and will seek to tailor the final proposal to maximise value for TWI members.

## Further Information

For further information on how a Joint Industry Project (JIP) runs please visit:

<http://www.twi-global.com/services/research-and-consultancy/joint-industry-projects/>

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