FOCUS LaVa

LASER BEAM WELDING IN VACUUM

• LaVa is the acronym for Laser welding under Vacuum and combines the well known benefits of laser welding with those of a low pressure environment.

• At a wide pressure range between 0.1 - 100 mbar the keyhole is much more stable which results in up to twice the welding depth at a given laser power.

• Another advantage of the vacuum environment is a significant reduction of pores and weld spatter. The investigation of laser welds performed under vacuum demonstrates impressive results e.g. for welding of copper.

• The FOCUS LaVa is configured and offered with different types of laser in the power range between 500-4000 W.
Flexible system configuration

There are two standard configurations for solid-state lasers:

- **FOCUS LaVa 500-2000 with single- / multi-mode laser**
  - 1070nm SM fibre laser with 500W, 1kW or 2kW
  - 1070nm MM fibre laser with 1kW or 2kW
  - optional 2D Wobbleoptics (with optional water cooling for power >500W)
  - OptiShield ® for protection of laser entrance windows against contamination and with 140 mm z-travel for focus adjustment
  - spot size down to < 50 μm (SM) or < 130 μm (MM)
  - laser source with forced air cooling as 19”rack-mount unit (500W SM laser)
  - laser source with water cooling as separate standalone unit (1kW, 2kW SM/MM laser)

- **FOCUS LaVa 1000-6000 with single- / multi-mode laser**
  - 1070nm MM fibre laser with 1, 2, 3, 4, 5 or 6kW
  - conventional welding optics
  - optional 2D Wobbleoptics (with water cooling)
  - OptiShield ® for protection of laser entrance windows against contamination and with 200 mm z-travel for focus adjustment
  - stand alone laser source with water cooling
  - spot size down to approx. 100 μm

- **FOCUS LaVa Custom**
  - integration of other laser sources (SM, MM different wavelengths and power) or customers existing laser into the LaVa control system
  - 1D/2D/3D Scanner with 100 mm to 200mm z-travel
  - conventional welding optics
  - optional 1D / 2D scanner/wobble optics (with/without water cooling)

Technical details:

- **LaVa dimensions:**
  - footprint 2 m x 2 m plus laser unit (> 1 kW)
  - vacuum chamber 500 mm x 500 mm x 400 mm
  - maximum size of parts 250 mm x 230 mm x 170 mm

- **CNC-system**
  - Linear speed in x and y of 0,1...100 mm/s (6 m/min)
  - positioning accuracy < 30 μm
  - positioning reproducability < 10 μm

- **Pumping system**
  - evacuation time: 10 s (100 mbar) 60 s (0.1 mbar)
  - precise regulation of chamber pressure

Positive impact of reduced pressure on welding of copper with laser

has been investigated by the Welding and Joining Institute of the Technical University of Aachen (RWTH Aachen) /Germany in a recent public funded project (DVS AIF Projekt (18.707N): 

“... at a very early project state we already could demonstrate the very positive impact of a reduced pressure on the welding seam quality."

This project is supported by FOCUS GmbH as member of the associated project committee.

Positive impact of reduced pressure on weld sputter

has been demonstrated by the Institute of Joining and Welding Technology, Technical University of Braunschweig in a public funded project (DVS AIF (17.560N_15-1) of the German welding association:

“... we could prove that the welding quality has improved in all aspects under low pressure due to a minimized plasma plume.”

Ambient pressure

See the video on our website:
https://www.focus-e-welding.de/laser-welding-under-vacuum/