

# FOCUS LAVA

## LASER BEAM WELDING IN VACUUM



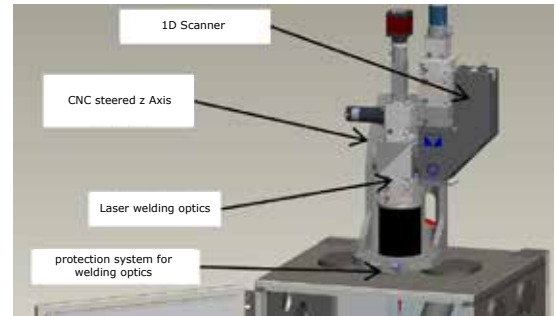
- LaVa is the acronym for Laser welding under Vacuum and combines the well known benefits of laser welding with those of a low pressure environment.
- At a wide pressure range between 0.1 - 100 mbar the keyhole is much more stable which results in up to twice the welding depth at a given laser power.
- 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)



### Positive impact of reduced pressure on weld spatter

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.“*

## 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 reproducibility < 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

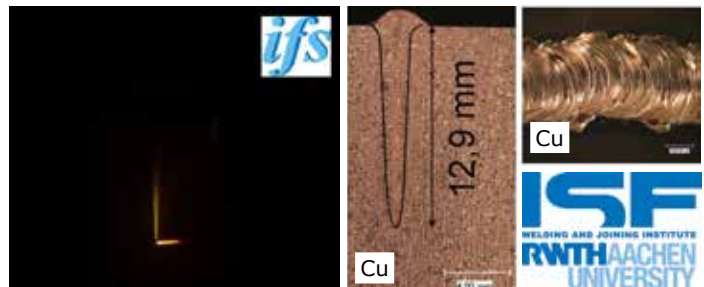
has been investigated by the Welding and Joining Institute of the Technical University of Aachen (RWTH Aachen) /Germany in a recent public funded project (DVS AIF Projekt (18.707N):

*„ 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.



Ambient pressure



1 mbar

See the video on our website:

<https://www.focus-e-welding.de/laser-welding-under-vacuum/>

