

# Laser Surface Engineering LSE Fiber-Laser System

Sulzer Innotec

Sulzer Innotec operates a fiber laser with 1.5 kW output power as a new and innovative laser beam source. Due to its excellent beam quality it is well suited for keyhole welding applications as well as laser metal forming i.e. build-up welding and laser cladding applications. The small overall size and the high electrical efficiency of the fiber laser make mobile laser welding applications possible at the customers site.

The associated handling system is a special purpose machine designed by Sulzer Innotec with a maximum of flexibility regarding part geometry as well as part size. The multi-role design allows worldwide on-site operation in different configurations.

## Handling System

### Special purpose machine

- 5 CNC-axes:
  - 3 translative axes X-Y-Z: 0.7 x 0.7 x 0.5 m
  - 2 rotative axes B-C:  $\pm 180^\circ$ ,  $360^\circ$  in the turning/rotating table
- 2 rotative axes manually adjustable D-E:  $360^\circ$ ,  $\pm 90^\circ$  in the processing head
- Turning-/rotating table moveable or even removable
- Bridge with translative axes adjustable in height
- CNC-control Sinumerik 840D with 5-axes simultaneous welding ability
- Offline programming ability
- Different configurations for stationary as well as mobile operating conditions (see overleaf)



## Laser

### Ytterbium Fiber-Laser

- 50 W - 1.5 kW output power
- Wave length 1070 nm
- CW or pulse operation

## Applications

### Technology based

- CNC-controlled
- Conduction welding
- Keyhole welding up to 4 mm weld depth
- Laser metal forming i.e build-up welding
- Laser cladding
- 5-axes simultaneous welding
- Laser applications on Fe-,Ni-, Co-based materials as well as Al- and Ti-alloys
- On-site operation possible for laser application on machinery which is difficult to move f.e. turbine shafts or precision casings

### Market based

- Reconditioning in the power generation business
- Aero engine component repair
- Mold tool and forging die manufacturing
- Special machine manufacturing
- Single copies as well as high-volume production
- Small-sized as well as large-sized parts



## Our Partners

Highly qualified experts at Innotec are our partners for

- One-stop-shop manufacturing solutions, manufacturing and welding engineering and consulting
- Mechanical precision workshop and prototyping
- Conventional welding processes and heat treatment
- Testing and metrology
- Material and surface technology
- Corrosion and corrosion protection, friction and abrasion
- Material and failure analysis

Sulzer Markets and Technology AG

### Sulzer Innotec

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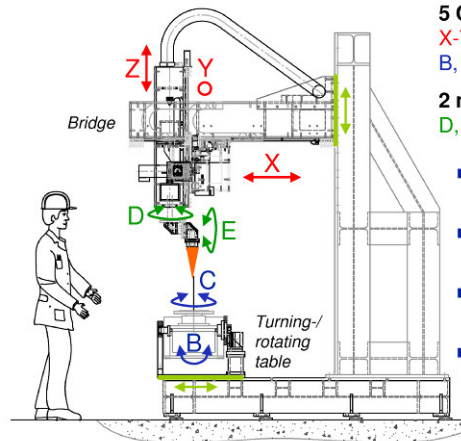
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## Setup I (stationary operation)



### 5 CNC axes

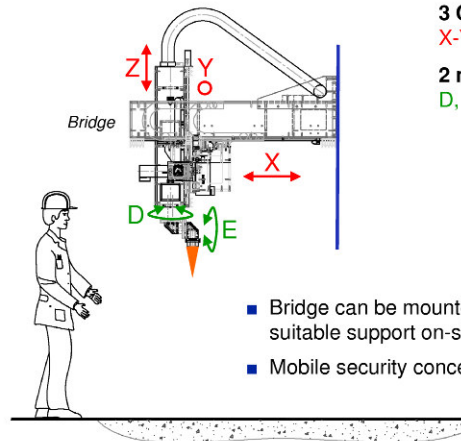
X-Y-Z = 700 x 700 x 500 mm  
B, C = ±180°, 360°

### 2 manual axes

D, E = 360°, ±90°

- Turning-/rotating table moveable or even removable
- Bridge position adjustable in height
- 5-axes simultaneous welding supported
- Stationary security concept

## Setup II (mobile operation)



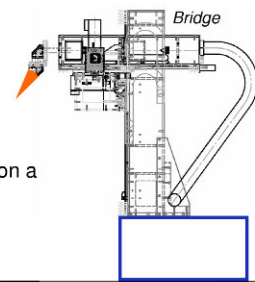
### 3 CNC axes

X-Y-Z = 700 x 700 x 500 mm

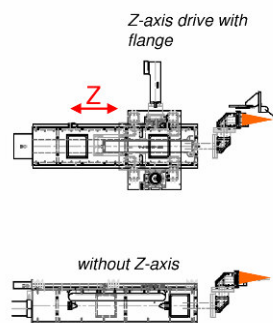
### 2 manual axes

D, E = 360°, ±90°

- Bridge can be mounted on a suitable support on-site
- Mobile security concept



## Setup III und IV (mobile operation)



### 1 or without CNC axis

Z = 500 mm

### 2 manual axes

D, E = 360°, ±90°

- Z-axis with laser head
- Operation either with or without Z-axis drive
- Integration in an on-site handling system such as a lathe
- Mobile security concept

## Equipment



**1.5 kW Fiber-Laser system**  
5+2 CNC-axes  
X-Y-Z 0.5 x 0.5 x 0.7 m  
B,C,D,E ±180°,360°,360°,±90°  
On-site operation possible



**2 kW CO<sub>2</sub>-Laser system**  
Gantry robot, 6 CNC-axes  
X-Y-Z 2.7 x 1.8 x 0.9 m  
A,B,C 360°,±90°,360°  
Integrated digitizing system



**150 W Nd:YAG-Laser system**  
Peak pulse power 10 kW  
Boom range 1.2 m  
Hand operated  
On-site operation possible