

FRICITION STIR WELDING (FSW)



# Robotic FSW Production Systems

# GRENZEBACH | ROBOTIC FRICTION STIR WELDING SOLUTIONS

**Robotic Friction Stir Welding (FSW) allows joining metals, such as aluminum and its alloys, magnesium and copper with high efficiency and flexibility.**

Being an experienced system integrator and supplier of turnkey FSW production systems, Grenzebach provides the overall process solution for industrial series production. Having handled large scale FSW production projects, we know what it takes to provide an industrialized overall solution.

Our robotic FSW systems, developed specifically for the requirements of the FSW process, allow us to offer flexible and cost-efficient FSW solutions for various industrial applications.

With production capabilities in three continents and a professional 24/7 service organization with locations in all relevant time zones Grenzebach is always close to you. The family owned company with its global footprint employs about 1,500 people around the world.

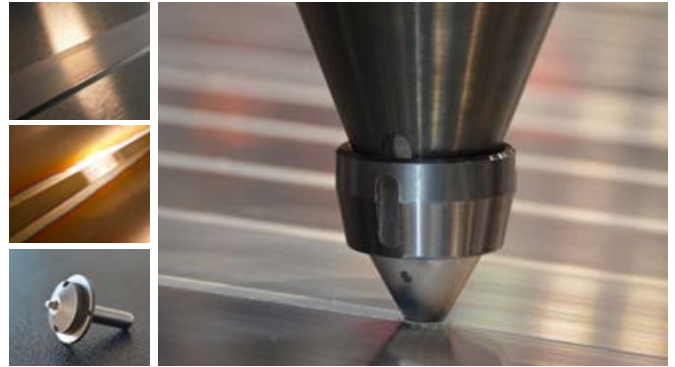
**Robotic FSW system with two welding stations for simultaneous welding and loading/unloading of components**



- A) HMI / process & system control
- B) FSW welding head with FSW tool
- C) Welding station 1
- D) Welding station 2
- E) Industrial robot
- F) Safety housing with automatic roller shutters

## Welding parameters FSW robot system

Welding speed ..... up to 2,000 mm/min  
Welding depth ..... up to 10 mm  
Process forces axial ..... up to 10 kN  
Process forces radial ..... up to 5 kN  
Spindle rotation ..... up to 10,000 min<sup>-1</sup>



## Advantages of Friction Stir Welding

- High reproducible seam strength and surface quality
- Joining temperature below the melting point and thus reduced residual welding stresses / shrinkage
- Usually no seam preparation or rework required
- No filler wire and shielding gas required
- Low energy consumption, high productivity
- No workplace pollution by dust, arc, fume, spatter, radiation etc.
- Low process forces and thus reduced component distortion
- No metallurgical porosity and hot crack formation
- Joining of dissimilar joints in different types of manufacture possible (e.g. rolled, casted, extruded, forged, etc.)

## Grenzebach FSW product and service portfolio

- FSW process and application consultancy
- Feasibility evaluation
- Test weldings / process development
- Design / manufacture of application-specific welding fixtures & FSW tools
- Prototyping and pre-series production
- Contract manufacturing
- Turnkey FSW production systems (robot, gantry, orbital systems)
- Production support, trainings
- Spare parts service
- 24/7 service line & remote support

## Target industries

- Automotive / E-Mobility
- Aerospace
- Power electronics / energy transmission
- Consumer electronics
- Aluminum processing and many more



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