

RFSSW SERIES

SOLID-STATE SPOT WELDING SYSTEM

Refill Friction Stir Spot Welding (RFSSW) uses frictional heating to join two sheets in an overlapping configuration as would be done with conventional resistance spot welding. This solid-state welding process has desirable characteristics common to other solid state joining processes.

Most notably, RFSSW can easily join aluminum and magnesium alloys without filler metal or shielding gas. Sub-one-second cycle times have been demonstrated using the Bond RFSSW system in aluminum alloys.

The most common application for RFSSW is automotive spot welding, but the process can be used for spot repair of cast metals and for closing keyholes left by friction stir welding, for example.

THE RFSSW PROCESS

The process is performed in three stages:

- The non-rotating clamping ring contacts the upper material and applies a downward force, effectively clamping the two pieces of material together. This collar also restrains outward material flow throughout the process.
- Then, the rotating shoulder and probe contact the part within the clamping ring. The shoulder continues plunging into the workpiece material as the probe retracts. The retracting probe provides a space into which material displaced by the shoulder can flow. The shoulder plunge continues until the depth is sufficient to form a bond between the upper and lower sheets (in the case of lap welds).
- The probe and shoulder then reverse directions, bringing the ends of the shoulder and probe back flush with the workpiece surface. During this stage of the process, the probe forces material back into the cavity formed by the retracting shoulder.



The interface between the plates is bonded by plastic deformation under heat and pressure, creating a strong, solid-state weld between the two layers. Upon completion of the welding cycle, the weld is nearly flush with the surface, showing little evidence that anything has occurred.

ADVANTAGES OF RFSSW

- Produces very high quality welds in aluminum and many other materials.
- Capable of dissimilar material joining.
- Less sensitive to surface contamination and oxide.
- Lower energy consumption.
- Eliminates rivets or other fasteners, reducing part count.
- Improves cosmetic appearance.

RFSSW SERIES SPECIFICATIONS *

	RS2	
SHOULDER	MAX TRAVEL SPEED	MAXIMUM FORCE
	3,500 mm/min [138 in/min]	20 kN [4,500 lbs]
	STROKE	CONTROL
	120 mm [4.7 in]	Position control, force feedback
PROBE	MAX TRAVEL SPEED	MAXIMUM FORCE
	2,000 mm/min [80 in/min]	15 kN [3,400 lbs]
	STROKE	CONTROL
	-10 mm / +18 mm relative to shoulder	Position control, force feedback
CLAMPING RING	STROKE	FORCE
	20 mm [0.8 in] relative to shoulder	2 to 9 kN [500 to 2,000 lbs] adjustable through setup
SPINDLE (SELECT AT TIME OF ORDER)	MAX ROTATION SPEED	TORQUE
	6,000 rev/min	23 N-m @ 5,600 rev/min
	4,000 rev/min	36 N-m @ 3,600 rev/min
MASS OF UNIT	100 kg [220 lbs] w/std. 165 mm anvil	
THROAT DEPTH	165 mm [6.5 in], standard	
OPTIONS	Extended throat depth, 609 mm [24 in], 160 kg [353 lbs] Other sizes upon request.	

*Actual values may vary slightly.

Combined force of Clamp Ring + Shoulder + Pin limited to 40 kN

