LOWSTIR™

Low Cost Friction Stir Welder

Manufactured in the EU by
The LowStir Consortium

LowStir™ is a low cost friction stir welding system with full weld monitoring that can be retro fitted to milling machines to join aluminium with a thickness of 2 – 8 mm.

The unit has been tested by TWI, BAE Systems UK, Sapa, Aeronautical Research and Test Institute of the Czech Republic and Instytut Spawalnictwa.

Benefits of friction stir welding include:

- Improved weld properties (e.g. strength, fatigue) compared to arc welding or riveting. Joint efficiencies of 75-96% have been reported depending on materials
- Because it is a solid phase process (where the materials are joined without melting), no shielding gases or filler materials are required. Furthermore, there is almost complete elimination of weld distortion and solidification defects.
- Operators do not need special qualifications or certification. There's no arc welding, gas emissions or weld spatter involved.
- Vastly reduced preparation and reworking time reduces costs, time and labour requirements
- Low power consumption. The only energy required is to rotate the tool and apply force to it to create the frictional heat. Without the large current requirements of arc welding, energy consumption can be reduced by 80% plus.

Why LowStir?

The development and take up of friction stir welding has been significant over the last few years. It is a major technique used in applications such as airframes and aircraft components, ship decking and structures, rail carriages, automotive components, bridge components, pressure vessels, and space launch systems. Large companies have sufficient capital to invest in new purpose-built friction stir welding equipment. However, for small businesses, these set-up costs are prohibitively high.

An alternative is to use retro fitted standard milling machines. However, these do not have the process monitoring required to ensure high quality weld joints. LowStir comes with a weld monitoring system plus software to display real time numerical values of forces, torque, the temperature adjacent to the system electronics and (if desired) the tool temperature. This enables you to measure key weld parameters (as identified by TWI) to ensure high quality welds every time.

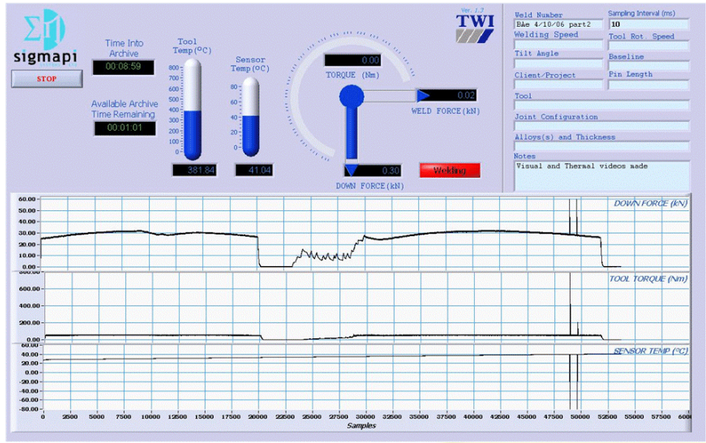
Fitting the LowStir sensor head to a milling machine is normally done with a standard ISO taper which we can supply ready connected to the head if you specify the size required (for example, ISO 50).

The LowStir unit is capable of measuring:

- Down force (Fz) to 50 kN
- Lateral force (Fxy) to 25 kN
- Torque (Mz) to 100 Nm
- Temperature of the internal electronics (to warn of overheating)
- Optionally, the temperature of any moving part.

The unit will run at rotation speeds of up to 3000 rpm.

The data log rate is software selectable from 1 to 100 Hz.



Information gathered by the LowStir sensor unit is displayed to the operator in a clear and straightforward manner using a laptop PC.

The instrument panel displays real time numerical values of forces; torque; the temperature adjacent to the system electronics and, if desired, the tool temperature. Real-time event markers can be added to allow correlation between process conditions/stages and the recorded data.

The display also shows the current captured data values for the weld in progress indicating whether they are within the acceptable range for satisfactory welding. A multi-graph facility is available to allow the operator to select sensor values to graph and compare.

The main display screen has buttons to start and stop recording of data. Alternatively an automatic trigger facility exists for initiating the recording of data.

Required Machine Specifications

Parameter	Specified Range
Spindle speed range	0 - 3000 rpm
Z axis traverse speed	0 - 1500 mm/min
X axis traverse speed	0 - 3000 mm/min
Z axis travel	500 mm
Z axis max workpiece size	750 mm
X axis travel	2000 mm
Y axis travel	2000 mm
Spindle tilt angle	0 - 5°
Z axis load	0 - 30 KN
X axis load	0 - 20 KN
Spindle torque	0 - 80 N·m

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LowStir is marketed and manufactured by The LowStir Consortium:

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Fatronik (Spain)
Sigmapi Systems Ltd (UK)
Suffolk Precision Ltd (UK)

LOSTIR was a project part funded by the European Commission to develop a low cost friction stir weld monitoring system that can be retro fitted to milling machines to facilitate their application to friction stir welding. LowStir is the product developed from that project.