

# APPLICATION EXAMPLE

## SHOCK ABSORBER LOAD TESTING

### THE APPLICATION

We believe that there's no better way of understanding our products than putting ourselves in our customers' shoes.

We saw an opportunity to do this when a member of the team bought a new bike. We wanted to investigate the magnitude of loads being transferred through its shock absorber.

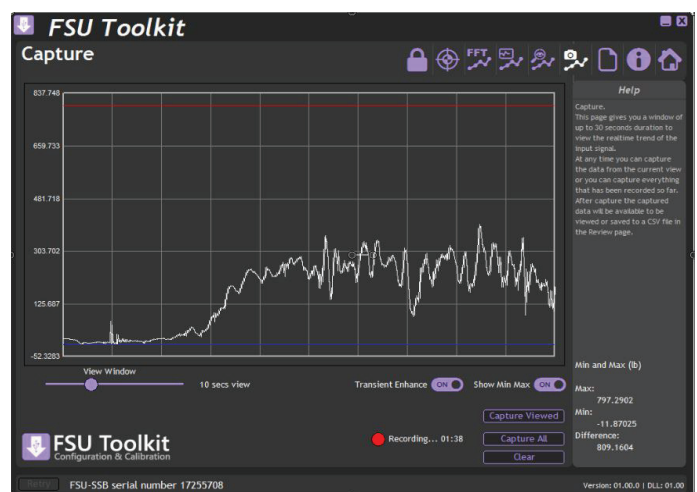
We took the Mantracourt Fast USB Strain Module and connected it to a custom load pin provided by **Aero Sense Technologies**. The pin was positioned in place of the bolt at the front end of the shock absorber.

The fine detail of the dynamic loads was guaranteed by the high speed measurement of the FSU at 4800sps and the unprecedented stability across temperature ranges of the **Micro-Measurements Advanced Sensors Technology** strain gauges with modulus compensation.



### KEY BENEFITS

- High speed measurement at 4800 samples per second and 13 bit noise free resolution provided high accuracy results and ensured the fine detail of the dynamic load
- Simple USB 'Plug and Measure' device allowed quick setup
- Powerful Toolkit software allowed real-time data analysis of the suspension testing
- Micro-Measurements strain gauge provided unprecedented stability across temperature ranges, making it ideal for the outdoor nature of the testing



Powerful FSU Toolkit software showing changes in dynamic loads in real-time.



# THE PROJECT: SHOCK ABSORBER LOAD TESTING

## THE APPLICATION

We decided to investigate the change in loading under different settings of the bike's damper during drop testing. This would help infer the bike's behaviour as it goes up and down hill or over bumps.

## THE CHALLENGE

There are three key elements that played an important role in the success of this project.

- ▶ Loads needed to be established with millisecond detail. Therefore, capturing the information at the highest rate possible was key in ensuring that no information was missed out.
- ▶ Due to the outdoor nature of the testing, the strain gauges in the pin needed to remain stable over a wide range of temperatures.
- ▶ The application required a bespoke design of the pin to fit the design of the mountain bike.



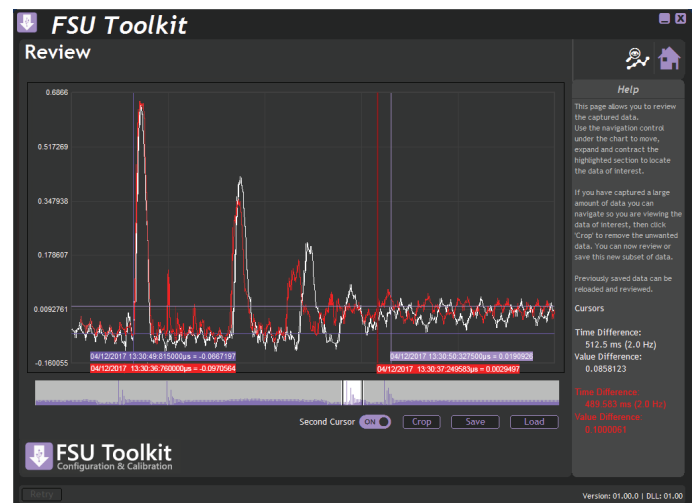
## THE SOLUTION

A load pin was attached to the suspension (as shown in the image of the bike below), which was connected to the FSU device. The FSU, in turn, was then connected directly to a USB port of a PC.

With this, we were able to see how the different damping settings affected the loading in the shock absorber. The fast measurement rate allowed detailed analysis.

We tested how the rebound speed of our bike's damper affects its shock absorption features after a 250mm drop. Initially, we set our bike's pneumatic shock absorber to quick rebound (white line). We then proceeded to perform the same test using slow rebound settings (red line).

## THE RESULTS



(Please note that the data from the two tests shown on this image was merged manually.)

We can see that the quick rebound (white line) bounces back further and has less ringing. The slow rebound (red line) has an extra small peak in between the first and second peaks.

We can see that the slower rebound settings (red line) stabilise the bounce quicker (489ms vs 515ms as shown in the bottom right corner of the toolkit).



# SHOCK ABSORBER LOAD TESTING

## ABOUT OUR APPLICATION PARTNERS

**Aero Sense Technologies** is an AS9100 certified company focusing on the design and manufacture of strain gauge sensors and transducers for the measurement of force, load and torque.

**Micro-Measurements Advanced Sensors Technology** applies tangible specification and manufacturing process improvements, along with industry-exclusive strain gauge sensor design techniques, for direct customer benefit. AS strain gauges offer improved grid-resistance tolerance and grid-to-grid temperature matching compared to traditional gauges.

## MANTRACOURT PRODUCTS USED

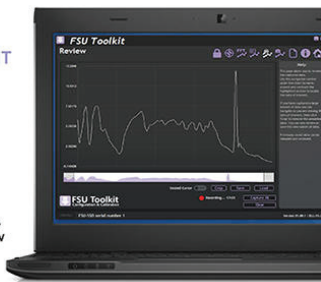
A complete system consists of one **Mantracourt** FSU-SSB. The device is connected to a laptop with a full version of Windows running a copy of the dedicated FSU toolkit. The software comes free of charge.



**FSU-SSB**  
Fast USB Strain Module

EASY TO USE,  
INTUITIVE TOOLKIT  
SOFTWARE  
FOR FAST AND  
PAINLESS SET-UP

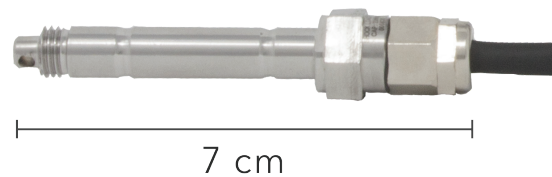
- Connect in seconds
- Intuitive interface
- Configure, calibrate, modules management, data recording & review



**FSU TOOLKIT**

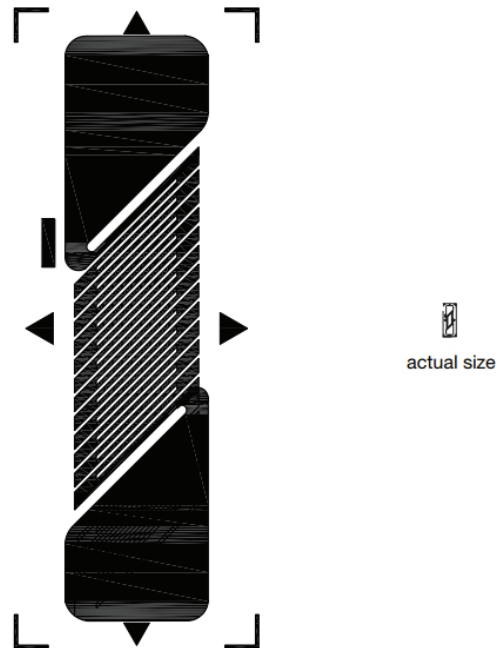
## AERSENSE PRODUCTS USED

The FSU is connected to a bespoke load pin manufactured by Aero Sense Technologies.



## MICRO-MEASUREMENTS ADVANCED SENSORS TECHNOLOGY PRODUCTS USED

Strain Gauges from Micro-Measurements Advanced Sensors Technology are used within the load pin.



4 x N5K-MC-S5033N-10C/DGE4M1 gauges