

## How to set up and use the Simadzu SES-1000 Extensometer with the Shimadzu Autograph AGS-J with Trapezium 2 Software

Setup the Machine:

Turn on the Autograph and the Extensometer (switches are by the AC plugs)

Decide on the length of the sample the extensometer will measure. There are metal spacers that screw into the bottom hand of the extensometer that correspond to the length it will measure. Place the appropriate spacer into the lower hand.

On the SES-1000 pad, by the autograph, push the 'GL' button until the light matches the spacer used. The 'FS' button should be pushed until the light corresponds to the limit you want to measure. Keep in mind, the higher the FS, the lower the accuracy.

Log into the computer

Start up Trapezium2. Username and Password are both ADMIN.

In Trapezium:

Right click 'New'

Click 'Single – Tensile – Standard – Up - Next'

The 'Force/Stroke' tab is used to set limits on the Autograph. 5kN force limit is enough for most materials.

The 'Ext. 1' tab is used to set limits on the Extensometer. First, choose the 'Channel' as 'Aux. 1'. The 'Gauge Length' needs to be the size of the spacer that was put in place earlier. The 'Full Length' needs to be [GL size]x[FS percentage] that you set earlier on the SES-100 pad. You can set the 'Limit' higher than or equal to the 'Full Length', but the accuracy is very poor after the 'Full Length'. Click 'Next'

Set the speed of the autograph. At 1.0mm/min, PP will take several hours to break. 5.0 to 6.0 mm/min is a good rate to still see plastic deformation. 10-15 mm/min is fast. For most purposes, changing the rate isn't necessary. Click 'Next'

If want the graph to output anything other than force and length, you need to put in the dimensions of the bone. Click 'Next'

For almost all uses, the defaults are fine. Click 'Next'

Decide on the axis of the output graph. The 'Stroke' is the length the autograph has moved. 'Ext. 1' is the length the extensometer has moved. The 'Maximum's should be defaulted to the already set maximums. Click 'Next'

Unless a specific style is needed for the report that Trapezium creates, the defaults are fine. Click 'Next'

Click 'Test'

Place the sample:

Open the hands of the extensometer by pulling the small levers forward.

Secure the bone into the clamps of the autograph. Make sure the bone is straight; otherwise the data will be false. The bones generally used need to be placed toward the rear of the clamp for the extensometer hands to hold the bone securely.

Push the extensometer hands together and position them to the desired level on the bone. Keep the hand tightly together (a gap between them larger than the spacer can ruin the data) and push the levers back so the hands squeeze the bone. Squeeze the hands tightly so they make a small indent into the sample if possible.

On the outer rod of the autograph there is a stopper that will halt the machine if the bar reaches it. When this happens, Trapezium freezes. Set that stopper much higher than the autograph will go.

Zero the meters:

Left Click the box on the top of the screen labeled 'Stroke' and select 'To Zero'.

Left Click the box on the top of the screen labeled 'Force' and select 'To Zero'. The autograph will take about 1 minute to zero out and then it will sound a beep.

To zero the extensometer: Press and hold 'Set GL' on the pad and then push 'GL'. Wait about 5 seconds and then press 'Set GL'. Then press and hold 'Set GL' on the pad and then push 'FS'. Wait about 5 seconds and then press 'Set GL'. The box labeled 'Ext. 1' on the top of the screen should now read zero plus or minus the error of the device.

Click 'Start' to collect the data. If the sample extends beyond the limit of the extensometer, a warning will be issued and the data collection on Ext. 1 will stop.