Users Manual
For
Advanced Yerzley Oscillograph AYO-IV
by
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Introduction

AYO-III is the testing machine called for in ASTM D945-06 for determining the mechanical properties of rubber and plastics in small deformations. AYO-IV is the current version of the system automated with a displacement transducer, a data acquisition unit and custom software. AYO-III plotted the test output on graph paper and required manual calculations. AYO-IV is completely automated. The test results are evaluated by the data analysis software and reports are saved in text files.

Software Installation

AYO-IV is normally delivered with the software installed on the accompanying personal computer. If needed, software can be installed as follows:

1. Install the data acquisition software per instructions of the manufacturer from the CD provided.
2. Connect the data acquisition unit to a USB port on your PC and run the "**Instacal**" utility so as to identify the particular data acquisition hardware to the software package just installed.
3. Create a directory called **Yerzley** on your C drive, that is: **C:\Yerzley**
4. Copy the contents of the CD provided by Tavdi Corp into this directory.
5. Create a "shortcut" on your desktop to **Yerzley.exe** in this directory.

Now you are ready to use the software.

Usage

Upon startup, Yerzley software displays a program window with menus on top and a data acquisition window that is immediately active displaying the displacement of the test specimen as shown in Figure 1.

The main window in Figure 1 is used to display the results of the particular test upon completion. As will be seen in Figures 3 through 5, each test requires the

specification of an output file. These file names are of the form “FileName.txt”. Each file contains the raw data as well as the evaluated results. Being “text” files, they can be opened by any text editor or even a word processor. These text files can also be imported into a spreadsheet program such as Excel for further processing.

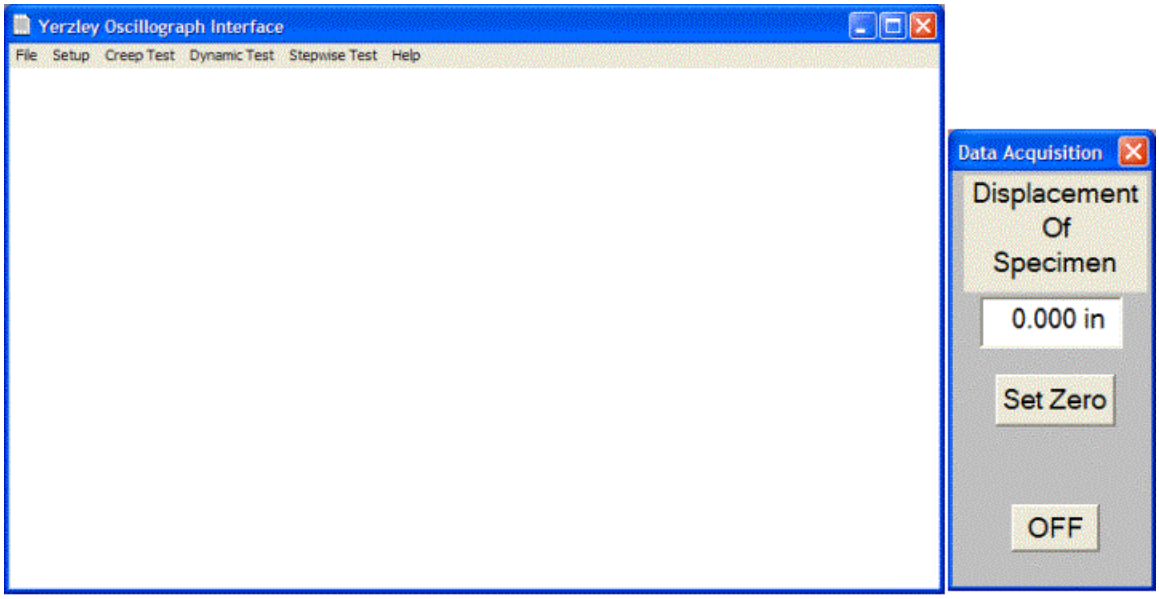

Figure 1. Yerzley System windows upon startup.

The graphical display is saved in a file with the same name but a different extension, namely “emf”. Thus “FileName.emf” files (Windows Extended Meta Files) can be included in any formal report and/or used in a presentation.

The **File** menu is used to exit the system. All three tests should start with the use of the **Setup** menu shown in figure 2. The oscillograph beam should be “conditioned” per ASTM D945-06; which, means that it should be balanced on the knife-edge before the test specimen is installed.

In the Setup dialog box, the three fields identified as:

- Material Designation
- Test Sequence ID
- Operator ID

Are text fields that organizations may use to identify the particular test. These fields are simply passed on to the printable report file “FileName.txt” for each test.

The “**Rate**” parameter specifies the sampling rate of the data acquisition unit during dynamic tests and during the impact phase of the Creep & Set test. In all

our testing, the default value of 100 samples/second has proven to be very satisfactory. We strongly suggest that it be not changed.

The "**Duration**" parameter specifies the duration of the dynamic test as well as the duration of the initial impact phase of the Creep & Set test. Usually 3 to 4 seconds are sufficient for hard rubber materials, softer and springier material may require up to 10 seconds.

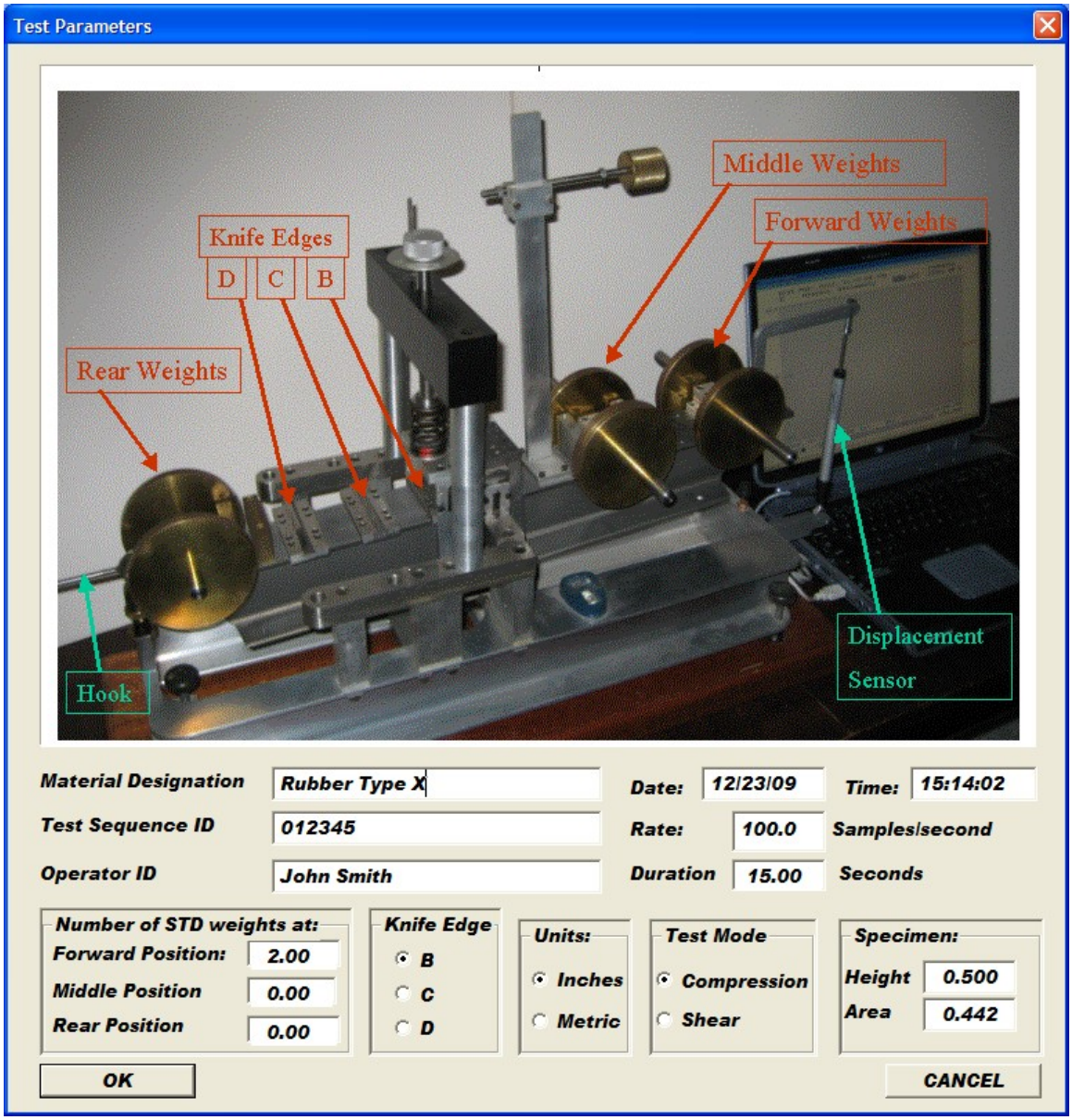

Figure 2. The startup dialog box

The Number of standard weights must be specified accurately in terms of numbers and position as indicated in figure 2. If ½ or ¼ weights are in use enter them as decimal fractions; such as, 2.5.

Normally knife edge B is used. The use of knife edges C & D require the partial disassembly and reconfiguration of the oscillograph.

Selection of **Units** and **Test Mode** will actually select the proper specimen dimensions as specified in the ASTM standard. These numbers should not be changed, as they are part of the standard and implemented as such in this software.

For user convenience, the setup screen contents are saved from session to session.

Test for Creep & Set

As mentioned above as well as in the standard, Creep & Set tests start with an impact phase of “duration” seconds. Creep time starts after the impact phase and creep is measured as the deflection between the end of the impact phase and the creep phase.

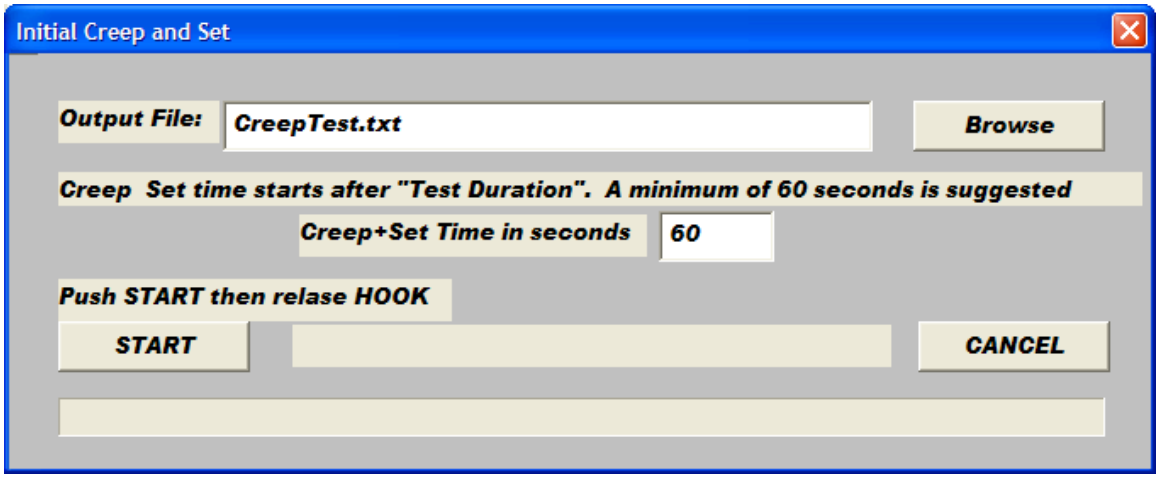

Figure 3. The Creep & Set Test dialog box

At the end of the creep phase, the user is asked to measure and enter the “set” using the machines micrometer. Then a plot of the test and the report file are displayed similar to figure 4 below.

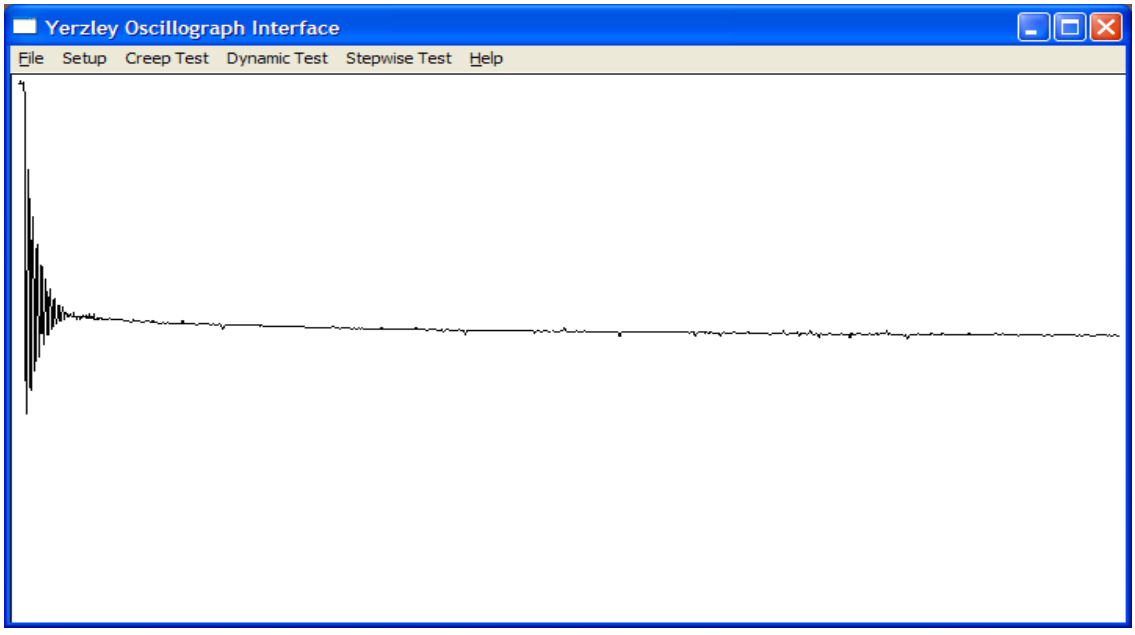

Figure 4. A typical creep test plot with impact phase at the beginning.

Test for Dynamic Parameters

For a dynamic parameter test, the user needs to specify the output file in the dialog box in figure 5. The test "duration" is specified in the Setup dialog box as it is used by both this test and creep test.

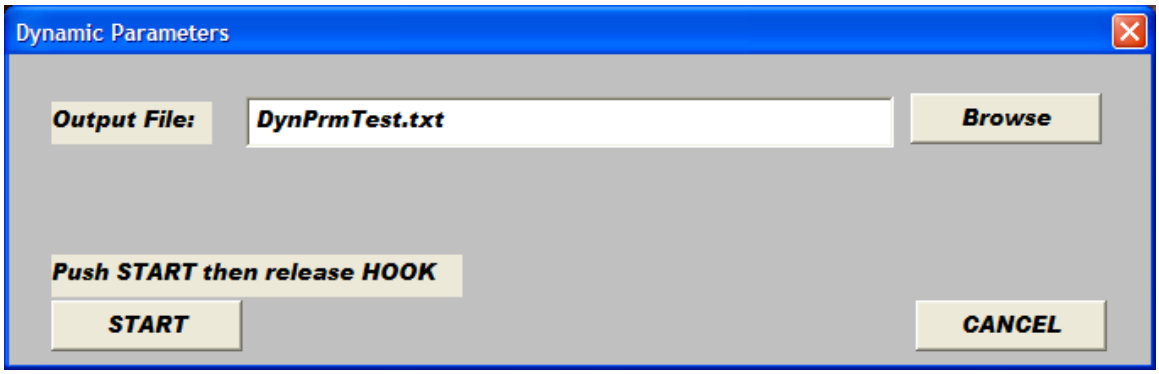

Figure 5. Dynamic Parameters Test dialog box

Upon completion of the test run, the plot and report are presented as illustrated in figure 6.

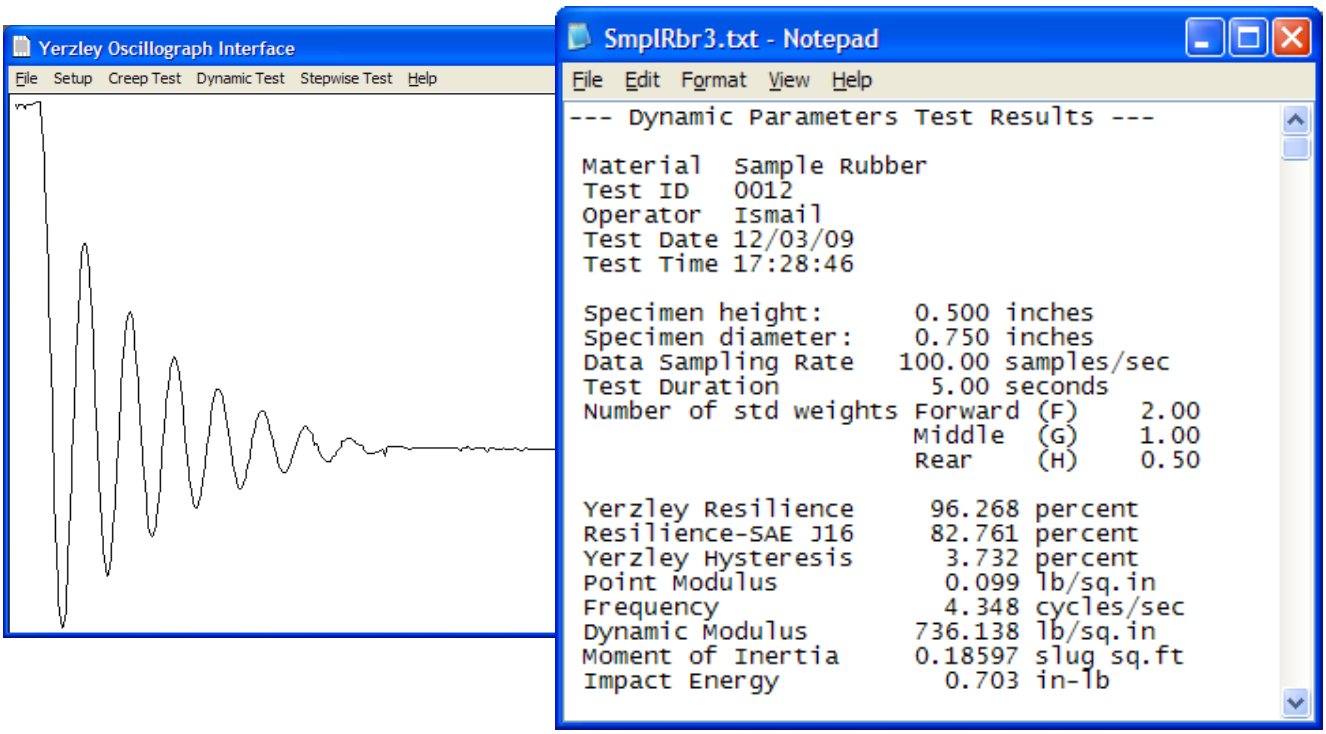

Figure 6. Typical Dynamic Test results plot and report.

Stepwise Test for Static Parameters

As in creep & set as well as dynamic parameters test, the user is asked to specify an output file name additionally, time between weight additions must be specified and the weight load point must be selected.

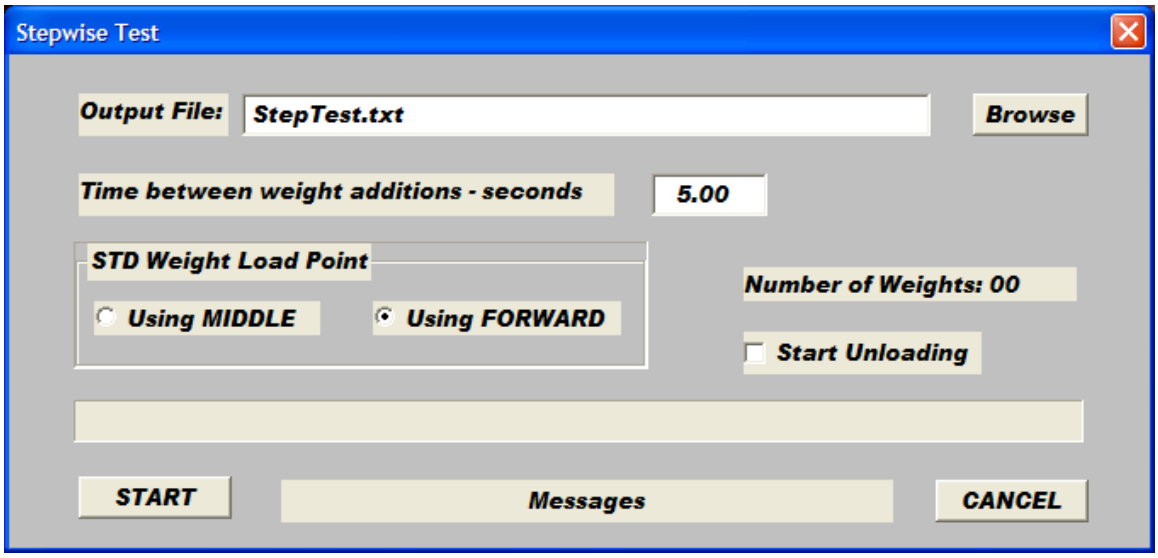

Figure 6. Dialog box for Stepwise Test for static parameters

To run the test, push START button. The buttons caption will change to CONTINUE. Load the first weight on the chosen load bar then push CONTINUE as instructed with messages at the bottom of the screen.

As each weight is added and the CONTINUE button is activated, the number of weights on the machine will be displayed and the progress bar will tick off the seconds. As specified in the standard, a test can be run till all 14 weights are loaded or, one can start unloading at any time by checking the “Start Unloading” box while the progress bar is active.

Figure 7 shows the results of a stepwise test viewed in Excel. Yerzley software also displays the stress vs. strain curve on the screen as well as the evaluated data in the specified text file. This file can be input into Excel where other plots can be fashioned as needed. The hysteresis between loading and unloading is clearly visible.

--- Stepwise Compression Test Results ---

Material Rubber Type XYZW
Test ID 012345
Operator John Smith
Test Date 12/22/09
Test Time 13:07:17

Specimen height: 0.500 in
Specimen area : 0.442 sq.in
Data Sampling Rate 100.00 samples/sec
Test Duration 5.00 seconds
Number of std weights Forward (F) 4.00
Middle (G) 2.00
Rear (H) 0.00

Static Modulus at 25 percent of loading curve..: 770.11 psi
Static Modulus at 25 percent of unloading curve: 822.95 psi

Number of Load/Displacement samples 29

Displacement	Load	Strain	Stress
0	0	0	0
0.018	7.069	0.035	15.992
0.034	14.137	0.067	31.984
0.049	21.205	0.098	47.976
0.063	28.274	0.126	63.968
0.078	35.342	0.155	79.96
0.09	42.411	0.18	95.952
0.102	49.479	0.205	111.945
0.114	56.548	0.228	127.937
0.125	63.617	0.25	143.929
0.135	70.685	0.27	159.921
0.144	77.754	0.288	175.913
0.153	84.822	0.305	191.905
0.16	91.89	0.321	207.897
0.168	98.959	0.336	223.889
0.164	91.89	0.328	207.897
0.158	84.822	0.316	191.905
0.15	77.754	0.301	175.913
0.144	70.685	0.288	159.921
0.136	63.617	0.273	143.929
0.127	56.548	0.254	127.937
0.117	49.479	0.234	111.945
0.106	42.411	0.212	95.952
0.095	35.342	0.191	79.96
0.083	28.274	0.166	63.968
0.07	21.205	0.14	47.976
0.055	14.137	0.11	31.984
0.036	7.069	0.071	15.992
-0.007	0	0	0

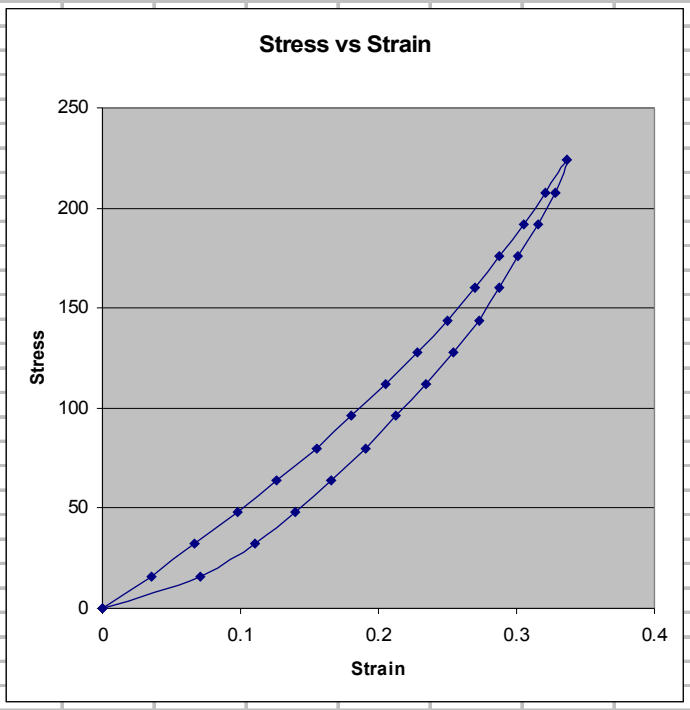

Figure 7. Results of a Stepwise Test viewed in Excel.