



Adelaide Testing Machines Inc.
61 Advance Road Units 5 and 6
Toronto, Ontario, Canada M8Z 2S6
Phone No. Canada and U.S.A.: 1-800-665-8817
Local and International: 1-416-234-0786
Fax No.: 1-416-234-1369
E-mail: atminc@on.aibn.com
Website: www.adelaidetesting.com

TTST Series of Computer Controlled
Tensile/Compression/Torsion Testing Machines
Specification Sheets

Revised: November 2011



Specifications for the following Models:

TTST-10KN (10 kN / 2,200 lb Capacity)
TTST-25KN (25 kN / 5,600 lb Capacity)
TTST-50KN (50 kN / 11,000 lb Capacity)
TTST-65KN (65 kN / 14,000 lb Capacity)

1.0 Introduction to the TTST Series of Testing Machines

The TTST Series comprise four different capacities of computer controlled table top mounted testing machines for performing rotational torsion testing and tensile/compression testing. The Model TT-100 Torsion / Constant Axial Load software is supplied with these machines for control and data acquisition. The flexibility of the software control package allows the TTST series of machines to be used for a wide variety of applications in Quality Control, Research and Development testing of products and components, and for applications in Education demonstrations of mechanical properties of a wide variety of materials. Additional software packages are also available for performing uniaxial tensile/compression tests, constant load creep tests, and low cyclic fatigue testing for both torsional and axial fatigue cycling applications at testing frequencies < 1 Hz.

CAUTION: Axial testing may be performed up to 25 kN (5,600 lb) with tensile/compression rated load cells. Depending upon the load cells purchased with the machine, the tension/torsion/compression load cells available may not be rated in tension to the maximum axial capability of the particular machine. Please contact ATM with information on your exact testing requirements for the TTST series machines and we will recommend the proper load cell for your testing purposes.

The torsion loading of the TTST Series machines is provided by a DC servo electric motor with encoder feedback operating in a closed loop control mode for accurate speed control. The motor speed is mechanically reduced to drive the rotary output shaft which protrudes through the platen of the testing machine. Optional loading grips such as three jaw chuck types can be mounted on this shaft. The movement of the crosshead is controlled by a second mechanically speed reduced DC servo motor with encoder feedback. Figure 1 shows an overall view of the TTST-25KN testing machine complete with a computer control system.

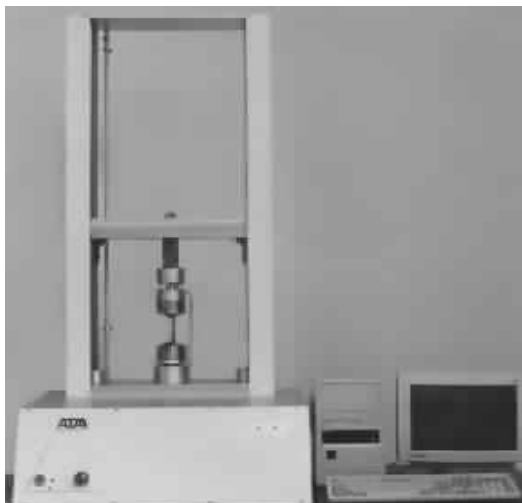


Figure 1
Overall View of the Model
TTST-25KN Testing Machine
and Computer Control System

Views of typical setups for the TTST-25KN for performing rotational torsion and tensile tests are shown in Figures 2 and 3. Figure 2 shows an axial load cell mounted on the lower surface of the crosshead. The upper circular adapter plate (UCAP) is attached to the lower surface of the axial load cell to which the torsion load cell is attached. The optional upper three jaw rotary grip is connected to the lower surface of a torsion load cell using the lower circular adapter plate (LCAP). A round specimen is shown mounted in place between the optional rotary grips. Figure 3 shows the suggested arrangement for performing tension tests. For tensile testing, the upper rotary grip and the torsion load cell and the UCAP have been removed to mount the optional tensile grip. The upper tensile grip is mounted to the lower surface of the axial load cell using a short mounting stud. As shown in Figure 3 the lower rotary grip does not require removal for performing tensile testing. For this arrangement, an axial loading structure consisting of four chrome plated steel posts are threaded onto the top surface of the platen. The axial loading plate is then mounted on top of the steel posts. The lower tensile grip is then mounted on the axial loading plate.

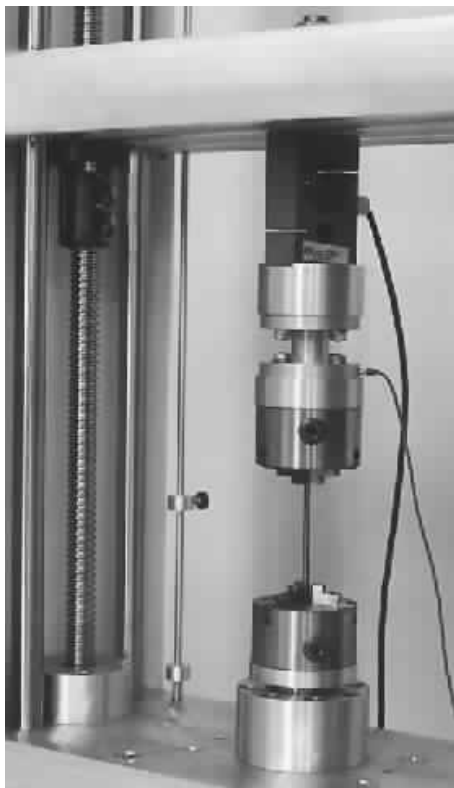


Figure 2
TTST-25KN Setup for
Rotational Torsion Tests



Figure 3
Setup Showing Wedge Type Tensile
Testing Grips with Lower Axial
Loading Platform Installed

In addition, testing grips such as compression platens are also available for performing other types of tests.

2.0 Mechanical Specifications

The diagram and table in Figure 4 shows the major dimensions and part locations of the TTST Series machines. A summary of the mechanical specifications are given as follows:

1. Rotational Test Speed Range: 0.005 - 0.62 rad/s (0.05 - 6 RPM)
at full capacity

2. Axial Loading Range: **Low Speed Clutch:** 0.05 - 75 mm/min
at rated capacity
(0.002 - 3.0 in/min
at rated capacity)
TTST-65KN only: 0.05 - 50 mm/min
at rated capacity
(0.002 - 2.0 in/min
at rated capacity)
High Speed Clutch: 0.50 - 500 mm/min
at 20% rated capacity
(0.020 - 20 in/min
at 20% rated capacity)
TTST-65KN only: 0.05 - 305 mm/min
at 20% rated capacity
(0.002 - 12 in/min
at 20% rated capacity)

3. 76 cm (30 in) maximum specimen length.

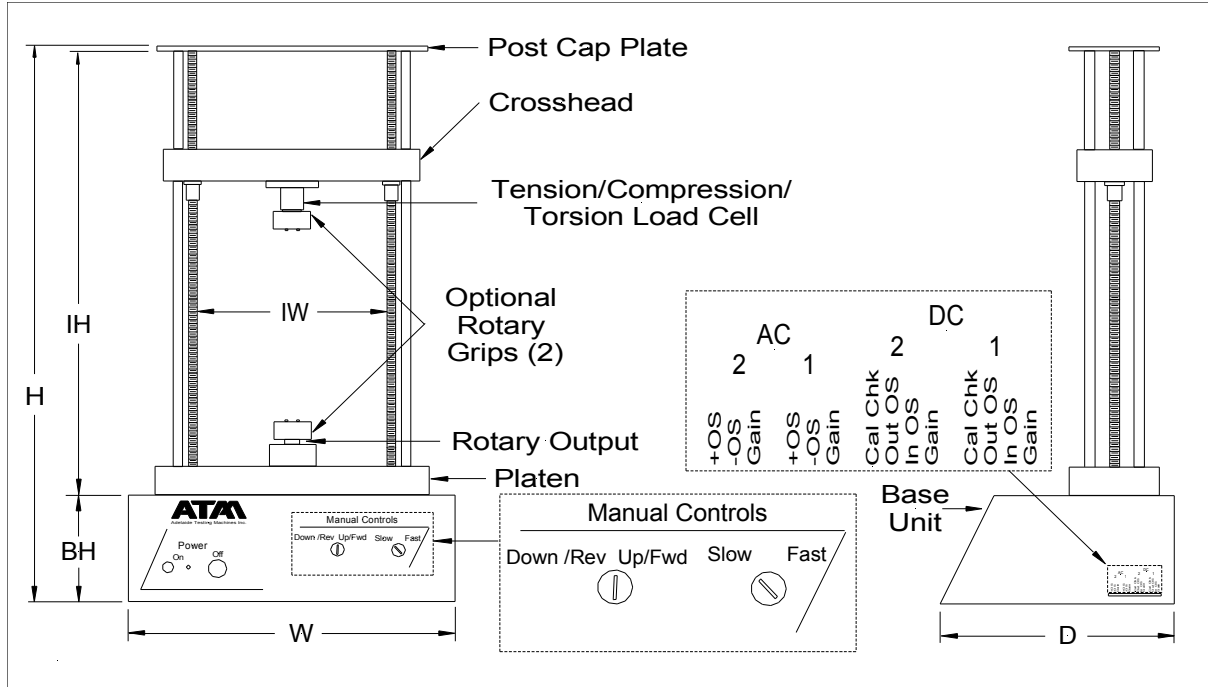
Note: Specimen length can vary depending upon the arrangement of grips and load cells used with the testing machine.

4. Torsion loading is provided by a speed reduced output shaft from a gearbox protruding through the platen. The optional lower torsion loading rotary grip is mounted on this shaft. A DC servo motor is used to drive the input shaft of the gearbox. The loading mechanism of the crosshead consists of two ball screws protruding through the platen of the test machine which drives two linear ball nuts mounted on the lower surface of the crosshead. The crosshead moves vertically between the ball screws. The lower ends of the ball screws are mechanically coupled to a DC servo motor

5. The two drive motors are DC servo motors with rear shaft mounted encoders. The encoders are used for output shaft angular position and angular speed calculations for the rotary shaft and for calculating the crosshead position and linear speed calculations for axial loading.

Power Requirements: 110 - 120 VAC, 60 Hz, 1 phase.
 220 - 240 VAC, 50 Hz, 1 phase on Request

Specifications are Subject to Change without Notice



MODEL NUMBER

DESCRIPTION	TTST-10KN	TTST-25KN	TTST-50KN	TTST-65KN
Load Capacity - Axial kN	10	25	50	65
lb	2,200	5,600	11,000	14,000
Torsion N*m	22	55	110	132
lb*in	200	500	1000	1200
Overall Height, H	150 (59)	162 (60)	156 (61.5)	159 (62.5)
Platen to Top Height, IH	123 (48.5)	123 (48.5)	123 (48.5)	123 (48.5)
Base Height, BH	25.4 (10)	26.7 (10.5)	30.5 (12.0)	31.8 (12.5)
Maximum Width, W	63.5 (25.0)	71.4 (28.1)	74.9 (29.5)	74.9 (29.5)
Inner Working Width, IW	38.0 (15)	40.5 (16)	40.5 (16)	40.5 (16)
Maximum Depth, D	66.0 (26.0)	69.7 (27.5)	73.7 (29.0)	76.2 (30.0)
Stroke Length, cm (in)	----- 76 (30) -----			

Note:

1. Dimensions in Table are given in cm (in)
2. Machine Mass/Weight values do not include actuator bellows cover, safety doors, or other options.
3. Specifications and Dimensions are Subject to Change without Notice

Figure 4
 TTST Series Tensile/Compression/Torsion Testing Machines
 Major Dimensions and Parts Locations

3.0 Computer Requirements and Motor Control System

The TTST Series of machines requires an IBM compatible Pentium type PC system with a color monitor, hard drive, read/writable CD or DVD drive, and a Windows compatible printer for printing test reports. One unused PCI slot must be available on the PC for the servo controller / data acquisition card. The ATM software requires Microsoft Windows2000 or the WindowsXP operating system. The motor control and data acquisition hardware consists of the PCI card, a motor control electronics system, and a combined DC and AC conditioners system. The PCI card features include a combination of 12 bits resolution A/D channels and servo motor controller capability. 16 bits A/D resolution is available as an Option. The PCI card uses the encoder feedback signal and software commands to produce the motor control system command signals for the axial and torsion motors. The motor control system consists of a DC power supply for powering the DC servo motors and individual DC servo amplifier for amplification of the servo controller card command signals.

Note: A 4 channel DC conditioner board is available as an option with the system as a substitute for the standard 2 channel AC / 2 channel DC conditioner board. The 4 channel DC conditioner board is recommended in systems that may require additional load cells and extensometers for the tests to be performed on the system.

Two selector switches mounted on the front panel of the test machine base are used for Manual Control positioning of the crosshead and rotary output control. The crosshead and rotary axis is moved using the left spring loaded selector switch labelled Down/Rev / Up/Fwd. The right selector switch labelled Slow/Fast is used to select the speeds of the manual positioning motion. The speeds corresponding to the Slow/Fast positions are set from within the software. In TTST machines with a clutch system, the crosshead slow or fast speed range clutch is selected by using the F12 function key. Two DC and two AC conditioners are provided in the base of the testing machine on a single circuit board. All of the input connections from the rear panel and front mounted Manual Control switches are made to this board through connectors. The DC conditioners can be used for excitation and amplification of the ATM line of full Wheatstone bridge type load cells. The AC conditioners are used for excitation and amplification of LVDT type devices including certain types of extensometers and other position feedback transducers. Provision is made on the base rear panel for monitoring the conditioner output signals through female type BNC connectors. The 15 turn potentiometers accessible through a slot in the base right side panel are used for the 2 DC conditioners for electrical adjustment of the Gain, Input Offset (In OS), and Output Offset (Out OS) adjust. The AC conditioners have potentiometers for adjustment of the + Offset (+OS), - Offset (-OS), and Gain. In addition, the DC conditioners have a push button Calibration Check (Cal Chk) switch for a quick check of correct DC conditioner calibration. In a typical setup, the DC conditioner 1 is used with the axial load cell signal and DC conditioner 2 is used for the torsion load cell signal.

4.0 Computer Software Description

The TT-100 Tensile/Compression/Constant Axial Load software is the standard torsion testing software included with a TTST Series machine. The software features a user friendly environment to perform the tasks necessary to run the system. The various features are available through use of the Function keys or clicking on the associated boxes. A brief description of the software is given as follows.

The Main Screen of the TT-100 software is shown in Figure 5. When the software is started, the data set and test parameters which are displayed on the X-Y graph are those which were current at the previous software shutdown. This data set and test parameters are stored in the TESTBAK.000 file. The present maximum and minimum torsional loads for the data set are displayed in the Present Data box in the upper left hand screen.

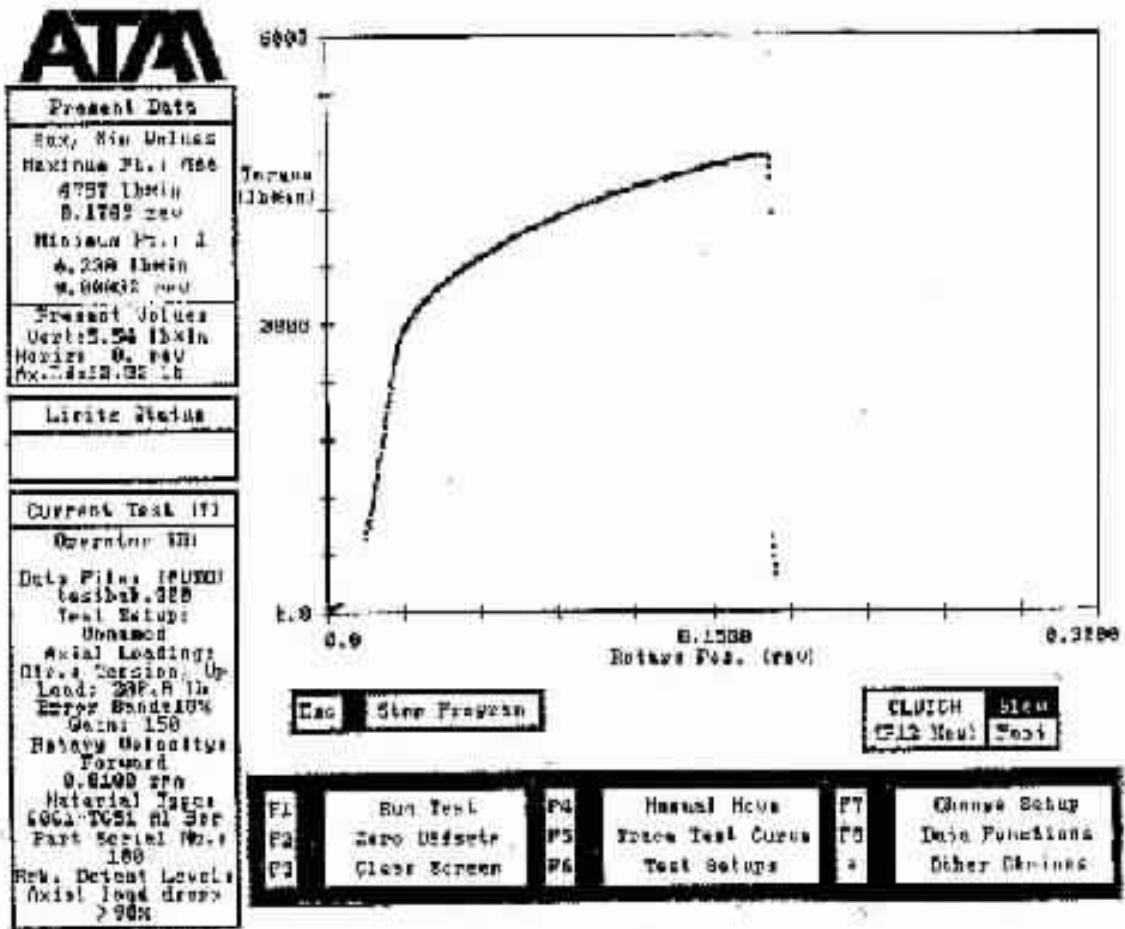


Figure 5
Main Screen Display of the TT-100 Software

The main screen display of the optional TC-100 Tensile/Compression software package for use with the TTST Series is shown in Figure 6. The TT-100 and TC-100 are very similar in their operations. When the TC-100 software is started, the data set and test parameters which are displayed on the X-Y graph are those which were current at the previous software shutdown. The present Tensile/Compressive and Yield Strengths for the data set are displayed in the Present Data box in the upper left hand screen.

Note: The Yield Strength will only be shown if the test was performed with an extensometer or actuator position on the horizontal axis which is required to calculate the strain or the elongation in the specimen.

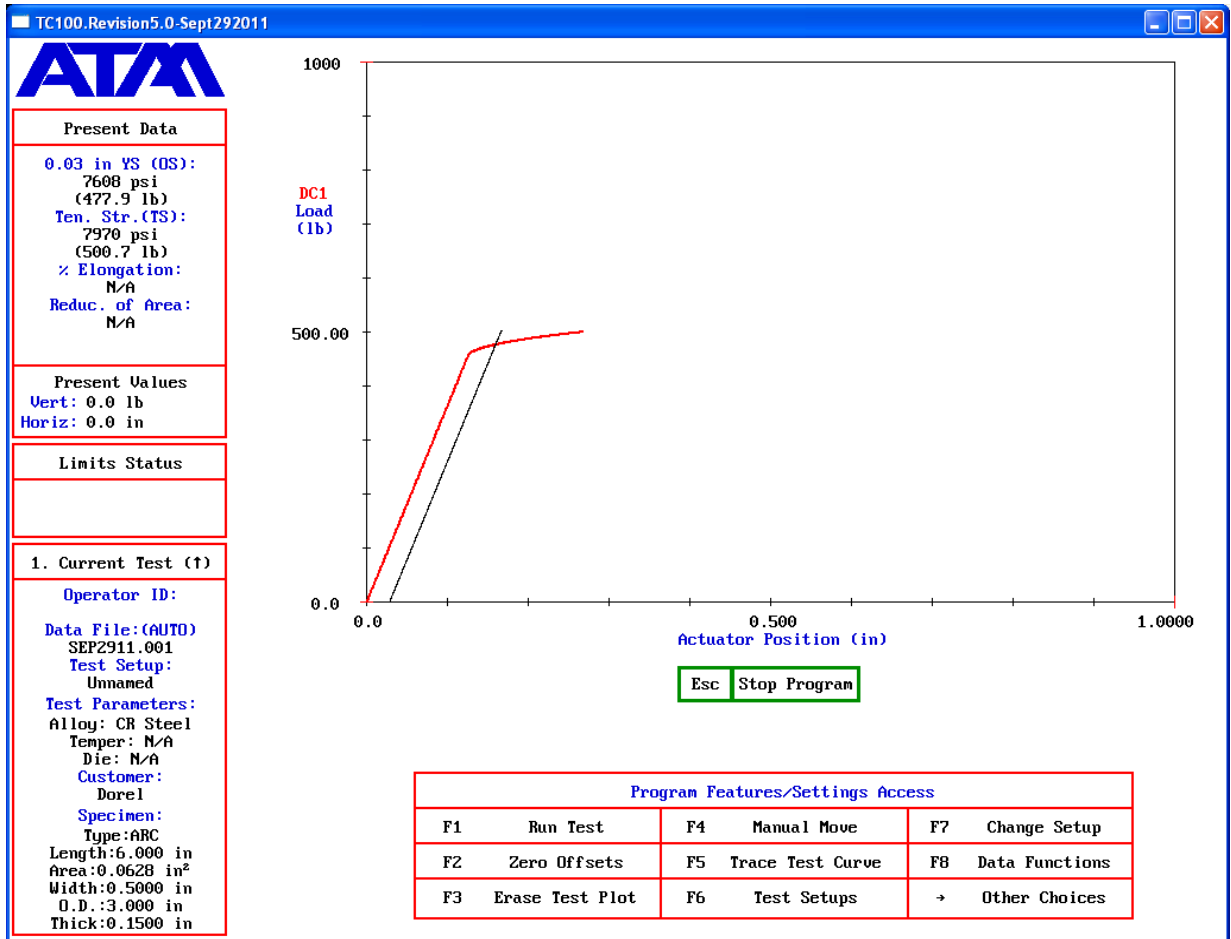


Figure 6
Model TC-100 Main Screen Display

Below the Present Values box, the Limits Status box will show if any axial load, torsional load, axial or rotary position, strain, or time limits are being exceeded. The Current Test box shows test setup parameters such as testing speed, data sampling rate, specimen type, specimen dimensions, etc. Additional screens for the Current Test box are accessed in the Main Screen configuration using the <UP ARROW> key or clicking in this box. The lower

right portion of the screen displays the command descriptions of the keyboard function keys F1 to F8 and the <RIGHT ARROW> key box. The <RIGHT ARROW> key box is selected to display a second set of command descriptions for additional features.

The software design allows a high degree of Operator control of the testing configuration. The Operator can make changes to the display screen with the F7 Change Setup box with minimum disruption of the background display. Up to 1000 data sets can be stored at any given time in the directory which contains the software. The data file named TESTS.NAM contains a listing of the data sets that are available for display. The data set generated during a test can be stored to the hard drive with a filename which the Operator either enters or is automatically generated by the software. An additional archive copy can also be made of the data file to another specified folder. The resulting data files may be reloaded or erased from within the program.

Performing replicate tests is easily accomplished with a minimum number of Operator inputs. The system features the F2 Zero Offsets command for performing a software zeroing of an existing offset load resulting from changes in the test grips or test setup. A Crosshead Return and Rotary Return feature in the TT-100 package which can be activated at test completion will automatically or after an Operator key input return the crosshead and/or rotary shaft to their positions at the start of the test.

During a test, the results are displayed in Real-Time to the monitor on an X-Y plot. The current value of the individual point being displayed is updated during the test in the Present Data box. The test is stopped at a preselected end point determined by such parameters as maximum time limit, axial or torsional load limit, after sample breakage, % load or torsion drop after maximum value, or by pressing/clicking the <Esc> key. In the TC-100 package, values of the Tensile/Compressive Strength, % Elongation, and % RA (ie. Reduction of Area) are calculated and displayed after test completion. The TT-100 package will indicate the maximum and minimum torsion loads at the end of a test. If an extensometer or crosshead position is used for the X axis, in the TC-100 package, the Yield Strength (Y.S.) may also be displayed. At test completion, the individual data points may be scrolled with the F5 Trace Test Curve function using the <LEFT ARROW> and <RIGHT ARROW> keys or by inputting of the number of the data point to be displayed. Also, the data may be replotted by changing the axes scales or with different Engineering Units and the resultant data stored under a different filename. The F8 Data Functions key may be used to display multiple data sets for comparison, storing data sets, or erasing stored data sets.

For simplifying multiple test setup requirements, up to 100 test setups may be stored using the F6 Test Setups feature. These are listed in the SETUP.NAM file. When a test setup is loaded, the current data on the screen is automatically reconfigured for the new test setup X and Y axes and Engineering Units.

Other software features include the capability of printing a test

report to any Windows printer. Figure 7 shows an example of the one page test report format for the TC-100 Tensile/Compression software package. The Operator may change the axes scales of the graph and view the results on the monitor before printout. The test report contains information such as the Test Parameter descriptions which may be preset by the Operator to include such parameters as Order No., Alloy, etc. In addition, the Test Date/Time and the Test Operator are also included in the report.

Adelaide Testing Machines Inc. Test Report

Customer Name: ABC Manufacturing Inc. Test Date/Time: Oct. 25, 2011 at 9:50 pm Test Number: 12
Order No.: 1-2321 Color: Black
Alloy Type: 6061 Temper No.: T651
Test File Name: testbak.000 Operator: Patrick Sooley
Testing Machine - Model No.: TCA-5KNBS Serial No.: A100119

Transducers (Axis)	Type	Model No.	Serial No.
Vertical	DC1.CAL	LF-5KN(RSC-1K)	4587799A
Horizontal	ACTUATOR	N/A	N/A

Test Result Summary: 182 Data Points

Tensile Yield Point (0.050 in - OS): 5795.7 psi (Load: 362.23 lb)
Ultimate Tensile Strength: 6275.3 psi (Load: 392.21 lb)
Actuator Position at: Max. Load: 0.6170 in Break Load: 0.6170 in
% Elongation: 21.600% (2.0000 in Gage Length) % Reduction of Area: N/A
Test Speed: 1.0000 in/min (Tension)
Points Sampling Interval: 0.20000 s A/D Averaging Sample Size: 30 Points
Specimen - Type: SQ Length: 6.0000 in
Width: 0.25000 in
Area: 0.062500 in²
Test Comments:

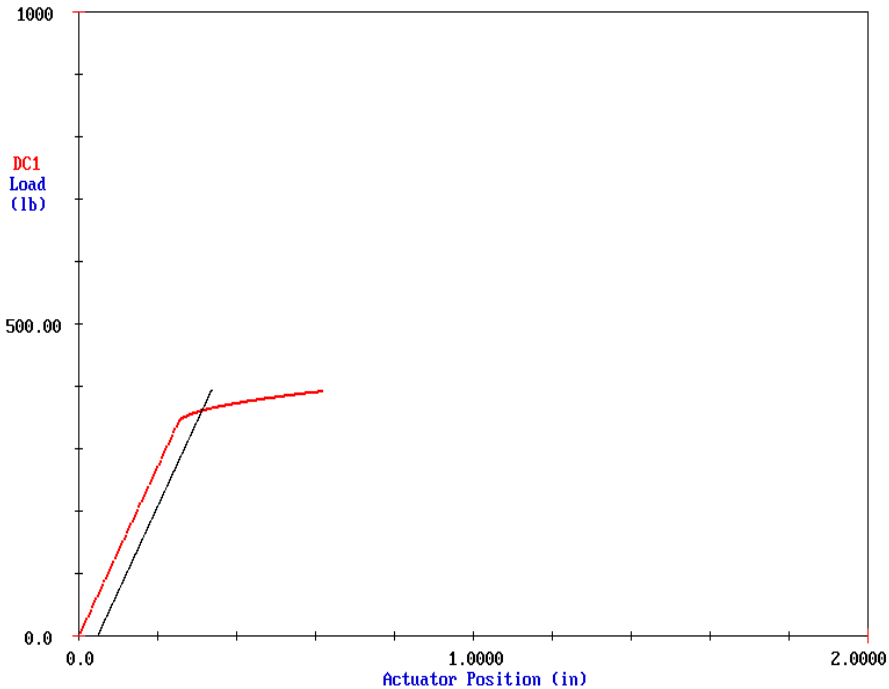


Figure 7
Test report for the TC-100 Tensile/Compression Software

Other software packages are available for performing creep tests and low cycle fatigue cycling tests in both the axial and rotary modes. In addition, existing software packages can be customized for unique testing requirements which can not be handled by the standard software packages. Please contact Adelaide Testing Machines if you have requirements which may not be handled by our standard software packages.

5.0 Options and Accessories

Various options and accessories are available for use with the TTST Series of testing machines. Some of these are listed as follows:

A. Optional 4 Channel DC Conditioner - Part No.: TTST.4CHDC

This amplifier board replaces the 2 Channel DC, 2 Channel AC Conditioner amplifier on the standard system. The additional 2 channels of DC conditioners are useful for systems utilizing multiple load cells and extensometers.

B. Optional Safety Shield - Part No.: TTSTKN.SAF**

The safety shield package consists of two side panels and two front hinged door panels of polycarbonate sheet. The front two door panels are hinged to narrow front polycarbonate panels which are connected to the side panels. The side panels do not open. On the TTST Series, the side panels are attached to the upright sheet metal semi-enclosure protecting the ball screws. The front doors are secured in place by two sliding bolts prior to running a test.

The package includes two hinged front door panels, side panels and all mounting hardware. A complete set must be ordered for both front and rear of the test machine if required.

C. Optional Dust Covers (Bellows) on Ball Screws

Vinyl Type Part No.: TTSTKN.VINBSC**

Fabric Type Part No: TTSTKN.FABBSC**

Two materials are available depending upon the environment in which the machine is to be located. Vinyl type are available for relatively clean laboratory type environments. The more durable rubberized sewn fabric bellows are rated for dirtier environments and for applications where the bellows may be subjected to impact from broken specimens or sharp tools.

D. Optional Safety Shield Door Switches (Price for switches for 1 Safety Shield Package) - Part No.: TTSTSERIES.SAFSW

For this option, limit switches are installed to monitor the open/close condition of the safety doors. In the TTST Series, the open door condition

will stop the motor from operating in both the Manual Control operation of the machine and during the running of a test.

E. Additional Software Packages for TTST Series of Testing Machines

In addition to the standard software package supplied with the machine, other software packages are available to perform a wide variety of tests. Two of these software packages are as follows:

- a) Torsional Creep Testing Software - Part No.: CRT-100
- b) Low Cycle Torsional Fatigue Software (< 1 Hz.) - Part No.: FCT-100

The standard packages may also be customized to include features necessary to perform unique tests on the TTST Series. Please contact ATM if you have questions regarding the features of any of our software products or if you need custom features added.

F. Optional Load Cells

A large selection of optional load cells are available for use with the TTST Series for special testing situations. Please contact ATM if you need assistance selecting a proper size load cell.

G. Extensometers

ATM can provide linear, diametral, biaxial, non contact laser type, and rotary type extensometers for room temperature and elevated temperature testing conditions. They are available in a wide range of deflections for use with the ATM line of software and test equipment. Please contact ATM for your specific requirements for extensometry equipment.

H. Material Testing Grips and Fixtures

An extensive line of material testing grips such as rotary grips with 3, 4, and 6 jaw chucks, wedge loading tensile grips, clevis grips, compression plates, 3 and 4 point bending fixtures, and others can be provided. Special high temperature grips for ceramics testing are also available. ATM can also custom design test grips or test fixtures to test component parts. Please contact ATM for all your test fixture requirements.

I. High Temperature Test Ovens

ATM can supply split tubular or box type testing ovens in a range of temperatures up to 1200 F and a very high temperature line for materials testing up to a maximum temperature capability of 2800 F. These models mount on swing arms which will attach directly to an upright post mounted on a TTST Series machine for this application. When not in use, the swing arms permit the oven to be swung completely out of the way of the load train.

J. Environmental Chambers

Low temperature environmental chambers with temperature and/or humidity control are also available. These chambers are of mainly stainless steel construction and are designed with the same accessibility as the test ovens. Depending on the size of the chamber, they are either mounted on the TTST Series machine by use of swivel arms or are separately attached by use of other means such as a roll out platform.

K. Customized Electronics Packages

The ATM line of DC and AC conditioners may also be supplied in rack mounted versions for excitation and amplification of multiple source Wheatstone bridge type device input signals. Other manufacturer's load cells and extensometers may also be adapted for use with ATM equipment. Please contact ATM for additional information.