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TTD Series of  
Universal Testing Machines  
Specification Sheets

**Revised: November 2011**



**Specifications for the following Models:**

- TTD-5KN (5 kN / 1,100 lb Capacity)
- TTD-10KN (10 kN / 2,200 lb Capacity)
- TTD-25KN (25 kN / 5,600 lb Capacity)
- TTD-35KNI (35 kN / 8,000 lb Capacity)
- TTD-50KN (50 kN / 11,000 lb Capacity)
- TTD-65KN (65 kN / 14,000 lb Capacity)

## 1.0 Introduction to the TTD Series

The TTD Series of testing machines consists of six bench top mounted universal testing machines which can be used for tensile and compression testing in the range from 5 kN (1,100 lb) up to 65 kN (14,000 lb). These include the following models and their rated testing capacities:

TTD-65KN (65 kN / 15,000 lb Capacity)  
TTD-50KN (50 kN / 11,000 lb Capacity)  
TTD-35KNI (35 kN / 8,000 lb Capacity)  
TTD-25KN (25 kN / 5,500 lb Capacity)  
TTD-10KN (10 kN / 2,200 lb Capacity)  
TTD-5KN ( 5 kN / 1,100 lb Capacity)

In addition, other versions of the TTD are available with optional features to which these Specification Sheets refer. Figure 1 shows an overall view of a Model TTD-10KN which shows the typical design including motor controls and display of the standard TTD series machines. An "H" version of the TTD models are also available which features an optional High Speed feature for quick adjustment in position of the machine's crosshead. This feature involves installation of the high/low speed clutch system used in the Adelaide Testing Machines TTS Series of computer controlled universal testing machines. The addition of this feature adds versatility and speed to completing tests in which the crosshead must travel large distances during the course of a test. Figure 2 shows a front view of the base of the machine and Figure 3 shows a view of the digital display and the motor control switches which controls the motion of the crosshead of the testing machine. On the "H" version of the TTD Series, an additional selector switch labelled Fast/Adj is included to switch from the adjustable low speed range to the high fixed speed for crosshead adjustment.

The machines in the TTD series feature a double ball screw driven loading crosshead which vertically travels up and down between the upright ball screws. The lower ends of the ball screws are mechanically coupled to a variable speed DC servomotor with tachometer feedback for accurate closed loop speed control. The crosshead motion is controlled by front panel mounted Up/Down and Off/On selector switches. The test speed range is accurately preset between 0- 99.9 mm/min using a 3 digit speed control selector. Special versions of the TTD Series machines can be supplied for other test speed ranges.

Figure 4 shows an overall view of the large internal clearance version Model TTD-35KNI configured with optional upper and lower compression platens. Figure 5 shows the motor control switches and the 3 digit speed control selector on the frontpanel. In addition, the Optional Crosshead Position Display is shown to the left of the motor control switches. The major dimensions and main part designations of the models in the TTD series are shown in Figure 6. The systems may also be configured with either tensile and compression grips or other specialized test fixtures.

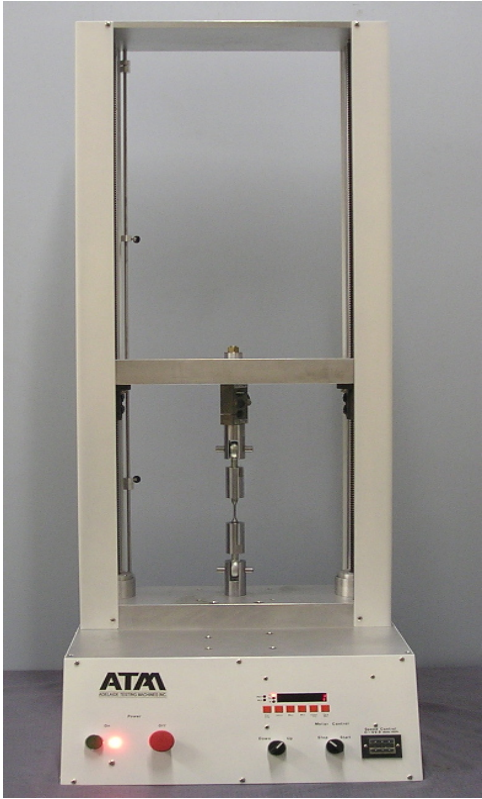


Figure 1  
Overall View of the Model TTD-10KN  
(10 kN / 2,200 lb Capacity)

Figure 2  
Front Panel Showing AC  
Power and Motor Control  
Switches

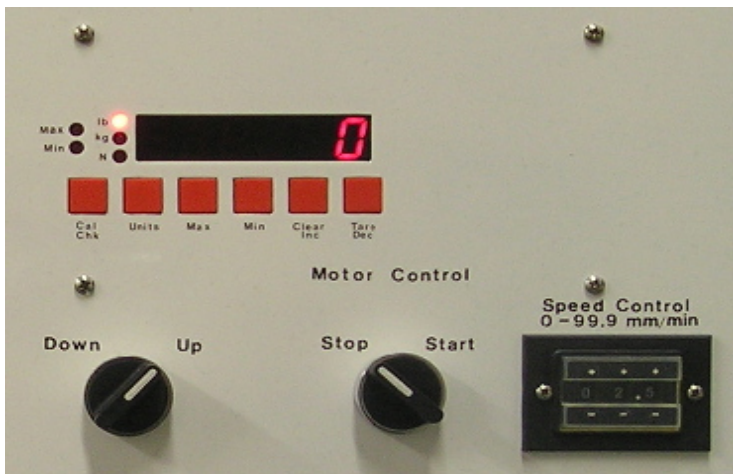


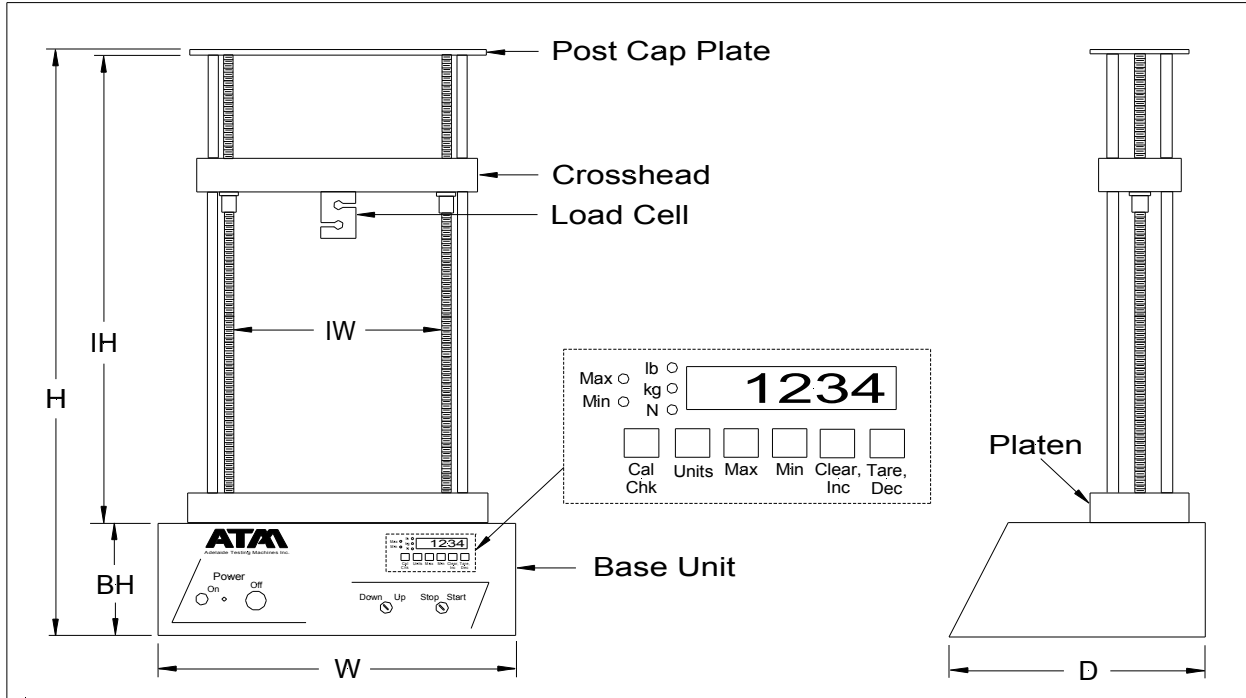
Figure 3  
Closeup View of the  
Motor Control Switches  
and the Digital Display



Figure 4  
Overall View of the Model TTD-35KNI  
(35 kN / 8,000 lb Capacity)



Figure 5  
Motor Control System and Crosshead Position Option



**Model Number**

Description	TTD-5KN	TTD-10N	TTD-25KN	TTD-35KNI	TTD-50KN	TTD-65KN
Overall Ht., H	135.9 (53.5)	136.5 (53.8)	142.4 (56.0)	142.4 (56.0)	146.5(57.7)	146.5 (57.7)
Platen to Top Ht., IH	114.3 (45.0)	127.0 (50.0)	119.1 (46.9)	120.1 (47.3)	119.4 (47.0)	119.4 (47.0)
Base Height, BH	20.3 (8.0)	21.0 (8.3)	21.8 (8.6)	22.1 (8.7)	26.0 (10.2)	26.0 (10.2)
Maximum Width, W	54.4 (21.4)	54.4 (21.4)	61.0 (24.0)	110.0 (43.3)	65.0 (25.6)	65.0 (25.6)
Inner Working Width, IW	38.0 (15.0)	38.0 (15.0)	40.5 (16.0)	91.4 (43.3)	65.0 (25.6)	65.0 (25.6)
Maximum Depth, D	48.3 (19.0)	48.3 (19.0)	49.5 (19.5)	102.9 (40.5)	54.6 (21.5)	54.6 (21.5)
<b>Test Speed Range</b>						
(at Rated Capacity)						
mm/min	5 - 99.9	5 - 99.9	5 - 99.9	12.5 - 250	5 - 99.9	5 - 99.9
in/min	0.2- 4.0	0.2 - 4.0	0.2 - 4.0	0.5 - 9.99	0.2 - 4.0	0.2 - 4.0
<b>Machine Stiffness,</b>						
(measured at mid stroke						
length position)						
kN/mm	7.0	10.0	17.5	44.0	55	79
lb/in	40,000	57,000	100,000	250,000	315,000	450,000
Stroke Length, cm (in)	----- 92 (36) -----					
Machine Mass, kg	90	95	115	410	190	215
Weight, lb	200	210	250	900	420	475

**NOTE :**

1. Machine Mass/Weight values do not include ball screw covers, safety doors or other options.
2. Ball screw covers option reduces the stroke length by a minimum of 10 cm (4.0 in)
3. Specifications and Dimensions are Subject to Change Without Notice

Figure 6  
Major Dimensions of the TTD Series of  
Tensile/Compression Testing Machines

## 2.0 Motor Control System

The motor control system for the TTD series of testing machines consists of a DC servo amplifier, a DC power supply for powering the servo amplifier, a DC servo motor/tachometer, and the electrical control circuitry. The servo amplifier is a four quadrant regenerative operation high switching frequency motor controller which is operated in tachometer feedback (speed control) mode. The high frequency operation results in a very compact size, high efficiency, and accurate speed regulation when a tachometer is utilized for the closed loop control parameter. Operation with the tachometer feedback control is possible to as low as 2% of the maximum rated speed at reduced load capacity for the particular TTD series machine in use. The same line of DC servo amplifiers is also utilized in the ATM TTS Series of computer controlled tension/compression testing machines using an encoder for the feedback element for very accurate low speed control.

The electrical control circuitry to control the crosshead consists of the following control elements. The Down/Up selector switch setting determines the movement direction of the crosshead when the motor is running. The Off/On selector switch will cause the motor to begin rotating and moving the crosshead at the speed indicated by the 3 digit vernier Speed Control. The speed range for the TTD Series machines is typically 0 - 99.9 mm/min. Special versions of the TTD Series machines may have been configured for 0 - 9.99 in/min or other ranges. The lower limit of the speed for full capacity operation of the standard TTD series of testing machines is typically 5 mm/min (0.2 in/min) although the machines may be operated at a reduced load capacity below this low speed limit range.

In addition, if the machine has been configured as the "H" version with the high speed option, an additional Fast/Adj selector switch is included as part of the motor control circuitry. If the Fast/Adj switch is set in the Fast position the Operator may use the Down/Up and Off/On selector switches to move the crosshead at a fixed speed of approximately 300 mm/min (12 in/min). In the Fast switch position, the speed is NOT adjustable using the Speed Control 3 digit vernier. Also note the following regarding the "H" version:

### **Cautions for TTD Systems with the "H" Version**

- 1) The TTD "H" Series of machines is not designed for load application when the Fast selection is in use. It is intended only for rapid adjustment of the crosshead vertical position prior to or after a test has been completed.
- 2) DO NOT switch between the Fast and the Adj selector position when the crosshead is in motion. This may damage the motor servo amplifier if this is done.

Mounted on the rear panel of the base of the TTD series machines is a Speed Control toggle switch with the settings of Int and Ext. Figure 7 shows this switch along with the BNC and 6 contact Amphenol connectors for

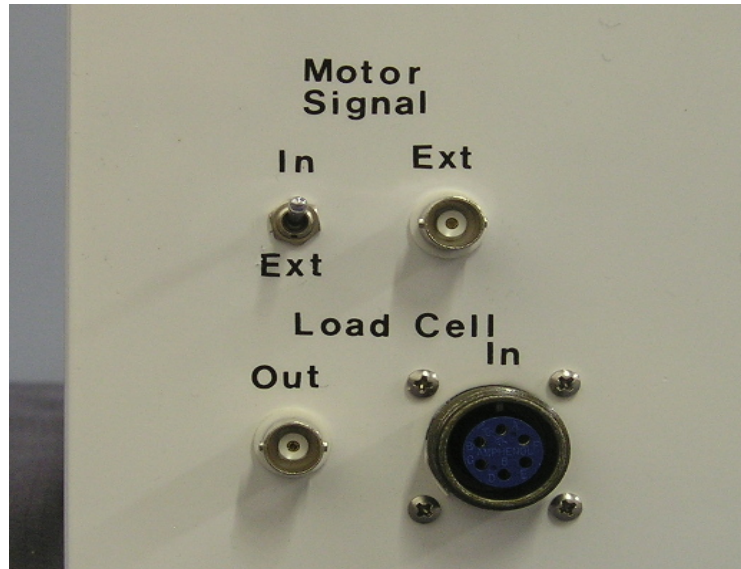


Figure 7  
Rear Panel of the TTD Series showing  
Int/Ext Switch Location and Load Cell Connectors

the load cell. The Int position will utilize the 3 digit vernier on the front of the machine for setting the crosshead speed. If the Speed Control toggle switch is set at the Ext position, the Crosshead Speed will be controlled by the speed control signal applied to the Ext BNC connector mounted next to the Speed Control toggle switch. The voltage range of the speed control signal is -5 VDC to +5 VDC. The speed range will correspond to the range of control as indicated on the 3 digit vernier on the front panel. The Stop / Start selector switch on the front panel must be in the Start position to utilize the Ext signal. The Ext feature is designed for use with an external control signal.

### 3.0 Load Display System

The microprocessor controlled test display performs the multiple functions of excitation and amplification of the load cell signal, scaling the calibrated load cell signal to the display in one of three Operator chosen Units, continuously monitoring the maximum compressive and tensile loads applied to the load cell, monitoring the status of the upper and lower crosshead limit switches, and the operation of taring (ie. zeroing) the load cell if any changes in the grips or test setup affecting the unloaded state of the load cell have been made.

The display board utilizes a very stable DC conditioner module which is used to supply the 10 VDC excitation voltage for the load cell and also to amplify the mV level output signal from the load cell to the +/-10 VDC range. The load cell signal is measured using a 12 bit A/D converter whose sampling rate is controlled by the on board microprocessor. The

microprocessor also serves the functions of monitoring the front panel mounted switches, monitoring the maximum and minimum load cell signal, checking for crosshead limit switch closures, reading and storing the operator input load limits, and monitoring for load cell capacity limits. The load display is updated approximately three times per second when no other switches are pressed. Internally, the A/D converter is monitoring the load cell signal approximately 800 samples/second which results in a very accurate calculation of maximum tension or compression loads.

### **3.1 Overview of the Display Features**

The load display system was designed to overcome some of the shortcomings of the various displays which are presently available in the market place for amplification and display of load cell signals. Most of these externally display to their digital display and internally calculate maximum and minimum loads at the same low speed rate of typically around 3 operations/second. The TTD Series machines display updates at 3.125 operations/second but internally at over an 800 Hz conversion rate. The high speed conversion rate is necessary in testing of certain materials or products which may undergo very fast load changes at the time of sample failure. The typical displays that are available may inaccurately calculate the failure load in situations of rapid load changes when only a 3 conversions/second sampling rate is utilized.

The TTD display board also has been designed with specific features such as Operator input of lower load limits than the load cell capacity for test situations where a test is to be stopped after a preset test load has been applied. If the preset load limit is reached the motor will stop rotating in the set test direction. The load can then be decreased by reversing the test direction. The Operator can also choose to display the load in one of three most commonly used Engineering Units (ie. lb, kg, N) which may be beneficial for test applications requiring different testing units. The Operator may also perform a fast tare of the load cell to zero out any initial load fluctuations on the display due to load grips setup or initial warmup fluctuations.

The following section details the operations which are performed using the individual keys.

### **3.2 Main Display Function Key Descriptions**

#### **3.2.1 Single Key Input Operations**

The single key input operations are described as follows:

##### **a) Cal Chk (Calibration Check)**

An accuracy check of the load cell calibration can be quickly made by use of this key input. The ATM load cell provided is of a full strain gage



bridge Wheatstone type which utilizes four strain gages for measurement of the load. Pressing the Cal Chk switch places a resistor in parallel with one of the four strain gages which results in the production of an unbalanced bridge and a load cell output reading. The Operator can then compare this reading to that taken when the load cell was originally calibrated to determine if any significant changes have developed. A difference of > 2% may indicate that the load cell has either been damaged, the internal DC conditioner Gain changed, or the load cell cable has been damaged. The correct value for the Cal Chk reading for the Operator's machine determined during Factory Calibration is provided.

The following steps must be followed to accurately perform a load cell calibration check.

- 1) Place the load cell in an unloaded condition by removing any existing load coupling between the lower grip mounted on the platen and the load cell grip.
- 2) Stop the crosshead motion completely by setting the Motor Off/On selector switch to the Off position.
- 3) Zero the load cell by pressing the Tare key switch.
- 4) A calibration check is made by pressing and holding the Cal Chk key switch and comparing the displayed value with that recorded during the Factory Calibration.
- 5) If there is a significant difference between the displayed reading and the Factory Calibration reading, this may indicate that the load cell cable or the load cell has been damaged.
- 6) Press the Clear/Inc switch to reset the Maximum and Minimum stored values. The Maximum and Minimum readings stored during a Cal Chk procedure may overwrite the previous readings making the stored readings inaccurate and unreliable for the previously performed test.

#### **b) Set Units**

The Set Units key switch allows the Operator to select between three Engineering Units for the display. The choices of Units are lb, kg, or N. Pressing this switch will cause the LED next to the indicated Unit to light and the reading on the display to be updated to the selected Unit.

**Note:** For the Max and Min keys, the load cell signal output corresponding to these keys have been designated in the following way.

**Maximum value:** Largest load cell output value closest to +10 volts which corresponds to the maximum tension loadcell capacity

**Minimum value:** Largest load cell output value closest to -10 volts which corresponds to the maximum compression load cell capacity.

#### **c) Max**

The Max key switch is used to display the internally recorded maximum

tension load or smallest compression load (ie. closest to zero load) since the Clear button was last pressed. This load was calculated by sampling the load cell signal at over 800 Hz. The load will be displayed in the Engineering Unit which has been selected.

**d) Min**

The Min key switch is used to display the internally recorded maximum compression load or smallest tension load (ie. closest to zero load) since the Clear button was last pressed. This load was calculated by sampling the load cell signal at over 800 Hz. The load will be displayed in the Engineering Unit which has been selected.

**e) Clear**

The Clear key switch is used to reset the microprocessor display to start recording the maximum and minimum load cell readings. This switch would typically be pressed before the start of a test to ensure that the new Maximum and Minimum load cell readings have been properly stored during a test.

**f) Tare**

The Tare key switch is pressed to zero the load cell if a change in the loading grips arrangement has been made or if the system is still warming up. This is a software tare and is not recorded by the microprocessor memory when the AC power switch is turned off.

**3.2.2 Combined Key Operations**

Four combined key operations are used to change the Operator settable load limits. If these limits are exceeded during a test, the motor will stop and an Error message will be displayed. If the maximum load limit is reached or the high limit switch is activated, the Error message E HI will be displayed. If the minimum load limit is reached or the lower limit switch is activated, the Error message E LO will be displayed. The combined key operations to change the load limits are described as follows.

**a) Max and Clear**

Pressing and holding the Max and Clear key switches simultaneously will increment the Operator settable maximum load limit from the present setting.

**b) Max and Tare**

Pressing and holding the Max and Tare key switches simultaneously will decrement the Operator settable maximum load limit from the present setting.

**c) Min and Clear**

Pressing and holding the Min and Clear key switches simultaneously will increment the Operator settable minimum load limit from the present setting.

**d) Min and Tare**

Pressing and holding the Min and Tare key switches simultaneously will decrement the Operator settable minimum load limit from the present setting.

**4.0 Options and Accessories**

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

**A. TTD Series High/Low Speed Clutch Option - Part No.: TTD\*\*KNH.000**

The TTD Series machines may be supplied with the same high/low speed clutch option that is built into our TTS Series of computer controlled machines to expand the low speed range of the TTD Series machines. The TTD Series machine with this option will have a lower speed range as set by the 3 digit speed control of 0 - 99.9 mm/minute and a high speed preset speed of between 8 - 10 "/min. This allows the machine to be used for accurate testing in the lower speed range which expands its test capability over a wide range of materials.

- Notes:**
- 1) The low or high speed clutch range is selected by use of an additional selector switch mounted on the front panel of the TTD Series machine. All other controls remain the same.
  - 2) The high speed setting is preset and is not adjustable by the Operator.
  - 3) The high speed setting of the machine is intended only for setup applications and is not meant to be used for testing applications.

**B. Position (Displacement) Readout Option - Part No.: TTD.MICPOS**

The TTD Series of testing machines may be upgraded with a displacement readout display to indicate the location of the crosshead during a test. Option includes a digital display mounted on the front panel of the machine and an encoder mounted inside the machine for calculating the position.

**C. Break Detector - Part No.: TTDBRKDET**

Consists of a separate digital display and processor board to detect the peak load of the test based on an Operator Input of the % Load Drop from the peak detected load of the test. Works in both the tension and compression directions for determining peak load. When the peak load is detected the machine motor is shut off to stop the test. The Peak Load is then read off the main microprocessor display.

**D. TTD Series Data Acquisition Package - Part No.: TTD.DAP**

The TTD Series of testing machines may be upgraded with a data acquisition package consisting of a special version of our Model TC-100

Tensile/Compression software package which is used to control and acquire data from our different lines of computer controlled testing machines. Information on some of the features of the TC-100 software package can be obtained from our website under the TTS series of testing machines. The data acquisition package consists of the Model TC-100 Tension/Compression software package and our 12 bit A/D D/A I/O Data Acquisition card. The software will monitor the load cell signal and the actuator stroke position (ie. if Position Readout option is purchased for TTD Series) available at BNC connectors on the rear of the TTD Series machine and allow Real-Time display of the test as either Load vs. Time or Load vs. Actuator Position.

**E. Optional Safety Shield - Part No.: TTDS\*\*KN.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 TTD 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.

**F. Optional Dust Covers (Bellows) on Ball Screws**

**Vinyl Type Part No.: TTDS\*\*KN.VINBSC**

**Fabric Type Part No: TTDS\*\*KN.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.

**G. Optional Safety Shield Door Switches (Price for switches for 1 Safety Shield Package) - Part No.: TTDSERIES.SAFSW**

Switches will monitor the open/close condition of the safety doors. In the TTD Series, opening a door will cause the motor to stop running if the Start/Stop selector switch is in the Start position.

**H. Optional Load Cells**

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

**I. Test Grips**

A wide selection of test grips are available to perform tensile,

compression, bending, and tear tests and others. Please contact ATM with your specific requirements for grips and fixtures.

**J. High Temperature Testing Ovens**

ATM can supply split tube and box type chambers for applications of the TTD Series requiring elevated temperature testing. Please contact ATM with your specific elevated temperature testing needs.

**K. Other Modifications**

ATM can supply special versions of the TTD Series machines for applications where the standard models available will not meet the needs. Modifications that can be supplied include increased stroke length, increased spacing between the ball screws, guided compression plates, modified speed ranges, and others. Please contact ATM if you require a special modification of a TTD Series to meet your testing requirements.