

**OPERATOR'S MANUAL
AND
MAINTENANCE INFORMATION
MODEL TM-2 & TM-DX
TEXTURE TEST SYSTEM**

FOOD TECHNOLOGY CORPORATION

45921 Maries Road - Suite 120
Sterling, Virginia 20166

Tel: 703-444-1807 Fax: 703-444-9860
www.foodtechcorp.com

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March 2004

SECTION ONE

This manual contains the information necessary to install, operate and maintain the Food Technology TM-2 and TM-DX Texture Test System. With the advent of the new Model TG4-EI Integrating Texturegauge, many new features, requested by our customers have been added. These units are simple, trouble-free and rugged in operation. However, since they are highly accurate and precise measuring instruments they should be maintained and operated as outlined in this manual.

It is important to note that the CS-1-TU test cell and the FTA-TU force transducer are calibrated as a set with fresh peas and should always be used as a set when making Tenderometer readings. This is because of the fact that the "sharpness" of the cell's blades will effect the tenderometer readings. The FTA-TU force transducer is marked with the serial number of the test cell for which it was calibrated to operate with on the calibration-serial number sticker.

GENERAL DESCRIPTION

The FTC TM-DX Texture Test System consists of four basic parts:

1. The Hydraulic System - consisting of the power unit which supplies the hydraulic pressure and the ram or piston which transmits this pressure into mechanical force.
2. The Test Cell - which holds the sample and applies the "deformation" action to the food sample.
3. The Force Transducer - which mounts between the ram and the test cell and outputs an electrical signal proportional to the force applied.
4. The Texturegauge - which converts the electrical signal from the transducer to a digital display in either Tenderometer Units, newtons, pounds of force, joules or inch-pounds depending on the mode of operation.

SECTION TWO

INSTALLATION

1. Examine the shipping containers for any sign of damage. Notify the carrier if damage to the containers or contents is evident. Otherwise proceed with unpacking and setup.
2. Remove the four bolts that secure the System to the shipping skid from the bottom of the pallet and remove the unit from the skid. Install the rubber leveling feet into the threaded holes that the shipping bolts were in.
3. If there is any sign of oil leakage, remove the fill cap from the top of the power unit and check the oil level by inserting a clean stick into the oil tank. The oil level should be approximately one to two inches from the top of the tank.
4. Place the Texture press on the work surface and level the unit as accurately as possible by rotating the rubber leveling feet.
5. Check that the Main Power switch is in the OFF position and plug the power cord into the AC power source required. *Be certain that the unit's power requirements are compatible with the local power supply. It will be necessary to install a power plug which is compatible with electrical outlets on units shipped out of the United States.*

SECTION THREE

OPERATING INSTRUCTIONS

CONTROLS AND INDICATORS

1. POWER This is the main power switch to the unit.
2. MOTION Controls the directional valve causing the ram to move up or down. *This should always be in the stop position when the unit is idle and when using the "AUTO CYCLE" feature.*
3. "START " BUTTON This button starts the press going down for a test and will automatically zero the Texturegauge at the start of a new test. After the ram reaches the bottom at the end of a test, the press will automatically retract to the top position for preparation for the next test.
4. PUMP POWER Applies AC power to the motor thereby activating the Hydraulic pump. This

switch can be used to turn off the pump between tests to conserve power and reduce noise.

5. PEAK/INTEGRAL When in the "PEAK" position the switch allows the Texturegage to hold the maximum reading encountered, when in the "INTEGRAL" position it allows the gage to calculate the work integral during the down stroke. The center position is used during the zero and calibration process and displays the instantaneous value of force on the Force Transducer.

6. CAL/ZERO SWITCH This switch is used to calibrate the Tenderometer, compensate for the "tare" or weight of the suspended part of the test cell and to zero the texturegage between tests.

7. UP/DOWN SWITCH This switch will increase or decrease the displayed value to adjust the calibration number.

8. THE DISPLAY This is the digital readout presented in Tenderometer Units, newtons, pounds of force, joules or inch-pounds depending on the mode of operation. Units come configured from the factory to display in either "English" (pounds of force, inch pounds of work) or metric (newtons, joules).

PREPARATION AND CALIBRATION

1. Check to see that the force transducer is plugged into corded outlet at the top of the Texturegage and that the unit is level. If your unit is equipped with a "Tenderometer" switch, place the switch in the Tenderometer position for Tenderometer measurements or in the other position for normal force measurement readings.

2. Check that the POSITION SWITCH is in the STOP position, plug the unit into the appropriately rated power source and then turn ON the MAIN POWER.

3. If the ram is not at the top position, move it to the top with the "UP" position switch. Allow the unit to warm up for a few minutes (the display will flash for the duration of the warm up period).

4. Attach the force transducer to the ram by means of the securing pin (the wire should be positioned to the rear), attach the top part of the test cell to the transducer and lock it by turning the small tab on the bottom front of the transducer. Slide the bottom "box" portion of the test cell into its holder in the lower end of the columns.

4. The box of the cell should slide into place easily. If it does not check the machine to see that it is level. How far the bottom part of the cell slides into the press is controlled by an adjustment screw located on the back stop plate of the press columns. This is adjusted at the factory but may be reset if moved so that the top blades slide down the center of the box.

5. With the PEAK/INTEGRAL SWITCH in the center position and the cell and transducer in place, depress the CAL/ZERO SWITCH to ZERO.

6. Now depress and hold the CAL/ZERO SWITCH to CAL to check the force transducer's calibration. If the display is different than the CAL number indicated on the transducer calibration/serial number sticker, increment or decrement the display with the UP/DOWN SWITCH until it reads properly. If your transducer has two stickers, one for a Model FTA-TU use that cal number for tenderometer measurements and the other sticker's cal number for tests in the alternate units. Remember that when it comes to Tenderometers the transducer and the test cell are calibrated as a set, and that they must be used together as a set when making Tenderometer tests.

7. Depress the ZERO switch to clear the cal number from the peak memory and place the waste tray under the unit below the cell.

TESTING FOOD PRODUCTS

Almost any food product may be tested for texture. It is important to note the factors that will effect accurate and consistent reading however. The samples must be a consistent size, either by weight or volume. Variations will affect the readings. The samples must be consistent in preparation. Temperature, exposure to air, cook time, and the location from where the sample is taken, can all have dramatic effects on the texture readings. The speed of the test can also change the readings. Make sure that the down stroke time of the test stays consistent. The standard speed for Tenderometer testing is a time of 30 seconds (plus or minus 5 seconds) for the hydraulic cylinder to go from the top to the bottom of its stroke. This is set at the factory but may be changed if necessary by the silver colored valve sandwiched between the mounting block and the directional control valve, on the top of the hydraulic power unit.

1. Obtain a sample of product representative of the lot to be tested. The composite sample size should be at least two or three times that required for one test. An average of at least three readings on each composite sample will help minimize errors due to normal variables.

2. Remove the test cell, insert the test sample and replace the cover. Then slide the cell box into the cell guides of the Texturepress. Note that the 3 parts of the test cell are stamped with "FRONT" to indicate the proper orientation of the cell.

3. Turn the PEAK/INTEGRAL switch to PEAK position. (Even if the PEAK is not turned on the TG4-EI will remember the highest reading since the ZERO Switch was last depressed). If the reading is other than zero, depress the ZERO switch to zero the peak memory.

4. Depress the START button. The press will proceed down and automatically return to the top position after the test.

5. Record the reading obtained at end of the test. If the integral measurement is desired, toggle the switch to display the value. The peak and integral readings will be automatically zeroed at the beginning of the next test.

6. Remove the cell box and rinse by immersing in water after each test. Wash the blades at intervals

frequent enough to prevent drying. Empty the waste tray as needed.

INTEGRAL MEASUREMENTS

With the INTEGRAL OPTION, the system has the ability to calculate the amount of work done on the sample during the down stroke of a test. The work done equals the multiplication of the force and the distance. Since the force varies during the distance, an integration must occur. In English units the display reads in "inch-pounds", in metric units the display reads in "joules". Since the integral calculation is based on distance, the calculations are performed between two position points; when the ram leaves the top of its stroke and it reaches the bottom. There are two magnetic sensors located on the press columns that are used to locate the top and the bottom of the stroke. The texture gauge must sense *a departure from the top* and *an arrival at the bottom* for an accurate integral to be calculated. Because of this the Integral will not be displayed until the unit has completed its down stroke. If the unit appears to not integrate it may be that the sensors need to be adjusted. Refer to the section on the AUTO CYCLE option for the adjustment procedure.

THE AUTO CYCLE OPTION

The AUTO CYCLE option was developed to speed repetitive testing and make the system easier to use. This option allows the operator to simply fill the test cell and push a button to complete a test.

When the START button is pushed, the hydraulic cylinder goes down, the reading is taken, and the unit returns to its original position after finishing the down stroke. The reading will be held until the test cell is filled and the button is pushed again to start the next test. At that time reading is automatically zeroed and the process is repeated. **When using this feature the up/down ram motion switch must be in the center position or the option will not work.**

There are two sensors located on the cylinder support columns close to the cylinder. These are sealed magnetic switches and are actuated by a magnet located on the anti-rotation bar, close to where the force-transducer connects to the cylinder rod.

In the course of shipping or use the sensors may move slightly or have to be readjusted to allow the full movement of the cylinder. This will be evident if the Auto cycle feature does not perform properly or the cylinder does not retract fully to allow the cell box to be removed.

To adjust the sensors, use the position switch to move the cylinder to the absolute top and bottom. Mark these positions for reference (the anti rotation bar and the support columns work well for this). Then loosen the screws securing the sensor mounting brackets and adjust their position up or down until the cylinder cycles as close to the full stroke as possible. The bottom sensor is not as critical as the top sensor since the last centimeter or two of movement usually reveals little data. The top sensor, however, needs to be set high enough so the cylinder returns close enough to the top to remove the test cell, but low enough so that the magnet actuates it every time and resets the cycle system. It may take a few trials to get it just right but once it is set retighten the mounting brackets to secure the new settings.

SOME NOTES ABOUT THE TG4-EI TEXTUREGAGE

The TG4-EI will hold a complete set of cell calibration numbers in memory. This memory is retained even when power is removed from the unit. One drawback to this type of memory is that there is a finite number of times that it can be erased and rewritten. Therefore to eliminate a failure in the cal number memory, any new calibration number will not be written to memory until it has been set and remained unchanged for ten minutes. Due to thermal electronic changes the displayed cal number may change a small amount as the system is left on. One or two points should not have an adverse affect on the reading and should not require resetting the calibration number.

The display has a few coded displays that have meanings. A flashing display means that the unit is warming up. A zero "walking" across the display means that the force transducer is not connected properly. "]]]]]" means that the unit needs to be zeroed and "[[[[" means that the unit needs to be calibrated. The unit also has a self diagnostic program and if the display will show an error code if something is detected to be wrong by the internal computer. In this case record the display and contact Food Technology Corporation.

AN OVERLOAD

The texturegagage will also monitor the transducer's readings and shut off the hydraulic pressure if the force becomes too high for the capacity of the transducer. This condition, an OVERLOAD, will stop the motion of the ram and the display will show 99999. The operator must then return the MOTION switch to the neutral or center position, and remedy the condition which caused the overload, (for example foreign material in the test sample, too large a sample or the cell not positioned properly). In some cases it will be necessary to remove power from the unit until the hydraulic pressure decreased. Restart the unit with the motion switch in the STOP position and then switch it to the UP position to move the ram out of the overload position.

SECTION FOUR
MAINTENANCE

The FTC Texturepress was designed to give a long and trouble-free life. However, as with any instruments there are some do's and don'ts that should be considered.

The system is water-resistant but NOT waterproof. A water hose should never be used on the unit, especially the Texturegage section. Cleaning may be accomplished by simply wiping the unit down. If the area is to be hosed down, the system should be covered.

The hydraulic power unit should give many years of service without any need for repairs. Periodic checks of the oil level should be all that is required. The oil level should be approximately 1 to 2 inches from the top of the tank. If the unit should ever need oil it can be purchased from Food Technology. We use and recommend Exxon Esstic 33 Hydraulic oil.

The test cell is the heart of the instrument and a little care and special treatment will go a long way in extending its useful life. The cell should be carefully cleaned and dried after each testing session, particularly before it is stored for a period of time. The "sharpness" factor of the blades will gradually change with use, thereby affecting the readings. Depending on the use of the machine, we recommend that the cell and transducer be returned to Food Technology for calibration on an annual or bi-annual basis. They should be carefully packaged and sent in to our plant.

Tenderometer systems can only be calibrated with fresh peas and we do so, in May the field, against a standard maintained at the University of Maryland.

Thank you for your decision to purchase Food Technology Corporation's equipment. We are always available to help with any problems or questions you may have concerning food texture and quality control.

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Sterling, Virginia 20166
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