



TESTING MACHINES, INC.

Measuring up to your standards



83-76

DIGITAL ELMENDORF TEAR TESTER

TMI – Testing Machines Inc.

40 McCullough Drive, New Castle, DE 19720 USA • Phone: (302) 613-5600 • Fax: (302) 613-5619 • responsecenter@testingmachines.com

www.industrialphysics.com



TESTING MACHINES, INC.

Measuring up to your standards

*Worldwide Headquarters
Sales and Service*

40 McCullough Drive
New Castle, DE 19720 USA
Phone: 302-613-5600
Toll Free: 800-678-3221
Fax: 302-613-5619
www.industrialphysics.com

Dear Valued Customer:

You are now the proud new owner of quality physical testing equipment manufactured by Testing Machines Inc., the industry's leader for over 80 years. TMI has a long-standing commitment to quality products and customer satisfaction.

To aid in setup, calibration, and operation of all Testing Machines Inc. equipment, we offer telephone assistance by our Technical Support Department, available Monday through Friday from 8:30 AM to 5:00 PM EST. TMI also offers on-site Preventative Maintenance and Calibration service.

In the unlikely event that your equipment requires warranty repair service, or if you need to arrange for non-warranty repair service, please follow the instructions on the repair policy page located in this manual. Supplying the requested information on the repair policy page enables our Technical Support Staff to service your needs faster.

Please contact us at (302) 613-5600 if additional information is required.

Sincerely,

Testing Machines, Inc.

1 IMPORTANT SAFETY INSTRUCTIONS

Read all of these instructions carefully before operating the instrument.

1. Save these instructions for future reference.
2. Follow all warnings and instructions that are marked on the instrument.
3. This instrument should only be operated by trained personnel.
4. Unplug the instrument from the wall outlet before cleaning. Wipe the outside surfaces with a damp cloth only.
5. Do not use this instrument near water.
6. Do not place the instrument on an unstable cart, stand, or table.
7. Only operate the instrument from the type of power source indicated on the label.
8. For safety, this product is equipped with a three-wire grounding type plug. This plug will only fit into a grounding type power outlet. If you are unable to insert the plug into the outlet, contact your electrician to replace the outlet with the proper type. **Do not defeat the purpose of the grounding-type plug.**
9. Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
10. If an extension cord is used with this product, make sure that the total ampere ratings of the product(s) plugged into the extension cord do not exceed the extension cord ampere rating. Extension cords must have a minimum insulation rating of 600v.
11. Do not remove any panels from the tester. Never push objects of any kind into any openings in the instrument's covers. Failure to heed this warning could result in fire or electric shock. Never spill liquid of any kind on the instrument.
12. Do not attempt to service this product yourself. Opening or removing covers may expose you to dangerous high voltages.



13. At the end of its service life, dispose of the product according to the relevant statutory regulations.
14. Refer all servicing to Testing Machines' Technical Support Staff:

Testing Machines Inc.
Customer Service Department
40 McCullough Drive
New Castle, DE 19720 USA
Phone: (800) 678-3221 or (302) 613-5600
Fax: (302) 613-5619
Email: responsecenter@testingmachines.com
Web: www.industrialphysics.com

15. Unplug the unit from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - ◆ When the power cord or plug is damaged or frayed.
 - ◆ If liquid has been spilled into the product.
 - ◆ If the product has been exposed to rain or water.
16. Adjust only those controls that are covered by the operating instructions. Improper adjustments of other controls may result in damage to the instrument and will often require extensive work by a technician to restore the unit to normal operation.

17. Back-up Battery:

Inside the Instrument tester a CR2032 type coin battery is used on the microcontroller PCB to provide the necessary power to the timekeeping memory chip of the instrument during the power off period. This to maintain the clock, calendar and setup information.



When the battery is worn out it may only be replaced by a trained service engineer!
When the battery is worn out dispose it under the ordinance of each local government or the law issued by relating government.



The battery contains organic electrolyte.
In case of electrolyte leakage from the battery, and an eventual contact with this electrolyte to the operator the actions described below are required.

In case of eye contact:

Flush the eyes with plenty of clean water for at least 15 minutes immediately, without rubbing. Take a medical treatment. If appropriate procedures are not taken, this may cause an eye irritation.

In case of skin contact:

Wash the contact areas off immediately with plenty of water and soap. If appropriate procedures are not taken, this may cause sores on the skin.

In case of inhalation:

Remove to fresh air immediately. Take a medical treatment

In case of electrolyte leakage, take it up with absorbent cloth.
This may only be done by a trained service engineer!

18. Instrument Labels:

The following labels can be found on the instrument.



Sharp Point

19. Additional Warnings:



Use caution when operating the sample grips; they present a Clamping hazard. Ensure all body parts are clear before operating them.

Use caution when operating the knife; it presents a Cutting hazard. Ensure all body parts are clear before operating it.

Use caution when operating the pendulum; it presents a Collision hazard. Ensure all body parts are clear before operating it.

2 TABLE OF CONTENTS

1	IMPORTANT SAFETY INSTRUCTIONS.....	3
2	TABLE OF CONTENTS.....	5
3	INTRODUCTION	5
4	APPLICATION.....	5
5	SPECIFICATIONS	6
6	ACCESSORIES	6
7	UNPACKING THE INSTRUMENT.....	7
8	LIST OF EQUIPMENT	7
9	FEATURES.....	7
10	NAME AND FUNCTION OF PARTS	7
11	SET-UP.....	9
	11.1 MACHINE	9
	11.2 ALIGNMENT.....	9
	11.3 CALIBRATION.....	10
12	OPERATION	11
	12.1 STARTUP	11
	12.2 INSTRUMENT CONTROLS	11
	12.2.1 RUN TESTS MENU.....	12
	12.2.2 TEST SETTINGS MENU.....	13
	12.2.3 MACHINE OPTIONS MENU.....	14
	12.2.4 MAINTENANCE MENU.....	15
13	MAINTENANCE.....	16
	13.1 CLEANING.....	16
	13.2 REPLACEMENT OF CUTTING BLADE	16
	13.3 CHANGING PENDULUMS.....	17
14	TERMS AND CONDITIONS OF SALE.....	18

3 INTRODUCTION

The Digital Tear Tester is a sophisticated piece of laboratory equipment. It is important that the Operating Instructions are read before any attempt is made to operate the Tear Tester. The instructions in this manual will guide the operator, step by step, through the first test.

Throughout this manual the expected touch screen icons are displayed. These icons show the user vital information pertaining to the function of the tester.

4 APPLICATION

The Digital Tear Tester is used to measure the tearing resistance of one or more sheets through a fixed distance. The work performed in tearing is measured by the loss of energy of the pendulum. The Tear Tester is equipped with an optical encoder which measures the angular position of the pendulum during the tearing operation. The instrument is calibrated to display the average force exerted when a pre-determined number of plies are torn simultaneously.

5 SPECIFICATIONS

- **Power:** 120/240VAC 50/60 Hz
- **Air:** 600 kPa (87 psi) - IG4 Instrument Grade Air (ISO Class 1-4-1) 1/4" OD Tubing
- **Output:** USB, RS-232
- **Dimensions:** 13" x 12.5" x (16" without pendulum or 22.5" with pendulum)
- **Weight (approx.):** 23 lbs.
- **Standards:** TAPPI T-414, ASTM D1922, D1424, ISO 1974, CPPA d.9, AS/NZ 1301.400S, BS 4468, and SCAN P-11
-

6 ACCESSORIES

Hardware		
Description	Part #	Installation
3200 gram pendulum	83-11-06	Field Installation (by customer)
6400 gram pendulum	83-11-07	Field Installation (by customer)
Universal pendulum (200, 400, 800, & 1600 gram pendulums)	83-11-08	Field Installation (by customer)

Software		
Description	Part #	Installation
GraphMaster Software	03-84	Web download with USB Dongle

7 UNPACKING THE INSTRUMENT

SAVE THE BOX

Please save all the original packing material in the event that the tester must be returned. Prior to returning any item, the customer **MUST** obtain a Return Material Authorization Number (RA #) from the industrial Physics Customer Service Department.

8 LIST OF EQUIPMENT

Included in the packaging of your Tear Tester will be the following components:

- 1 Instruction Manual with Calibration Documents
- 1 Universal Power Supply
- 1 Line Cord
- 1 Stylus

9 FEATURES

- Pneumatic clamp for superior repeatability
- Multiple Data Export options: USB flash drive, USB
- ESC/POS printer, RS232, GraphMaster™ software
- 7” digital touchscreen display
- Easily interchangeable pendulums
- Automatic calibration
- Onboard statistics (average, min, max, standard deviation)

10 NAME AND FUNCTION OF PARTS

The Digital Tear Tester incorporates high-tech capabilities with user-friendly, menu driven software to ease use and speed testing. The part names, functions, and descriptions of the parts are listed below.

On/Off Switch – main power switch for the unit.

Touchscreen – a 7” touchscreen for machine control

Swing and Clamp Buttons – hardware buttons that control the clamps and the swing release of the pendulum

Pendulum Lock/Release – a pneumatically operated release mechanism. Holds pendulum in its upright position while in idle mode.

Pneumatic Air Grips – two clamps, one located on the upright of the machine and the other on the pendulum. They hold the sample during slitting and tearing.

Cutter Handle – a hand operated lever attached to a razor blade used to slit the sample prior to tearing.

Razor Blade – a sharp knife used to cleanly slit the sample prior to testing. The blade needs replacement when it no longer provides a sharp, non-ragged cut.

Pendulum Knob – a large, silver knob which holds the pendulum in place on the optical encoder shaft.

Level – located on the top of the upright of the unit, the level is used to ensure the front and rear feet of the machine are aligned properly on the table or benchtop.

Leveling Pads – four feet located on the bottom of the unit, used in conjunction with the level to align the tester on the table or benchtop.

Optical Encoder – a measuring device used to determine the force needed to tear the sample. Located at the pivot point of the pendulum inside of the upright.

Quick Disconnect for Pendulum Air Grip – a quick disconnect connection for the air supply to the air grip located on the pendulum. This only needs to be detached when changing pendulums.

Air Pressure Gauge – an externally visible gauge which measures the air pressure being sent to the cylinders of the unit. The air pressure will determine the clamping force holding the samples in place.

Inlet Air Pressure Regulator – governs the inlet air pressure to the clamps and cylinders of the unit. It can be adjusted from 0 psi up to inlet air pressure, not to exceed 100 psi.

Upright – supports the pendulum and mounted air grip as well as housing the air regulator, air pressure gauge and optical encoder.

USB Connector – output port to a USB printer or thumb drive

RS-232 Connector – RS232 output via USB connection

Air Inlet – the main air supply for the unit.

Power Supply Connector – connects power supply to tester.

Power Supply – an AC adapter whose input is an AC outlet and outputs to the power supply connector on the rear of the unit.

NOTE: You should only use a power supply provided by TMI specifically for your instrument. The supply tested for this application is the Mean Well GST60A24-P1J (60W, 24V, 2.5A). Your instrument may require that the supply be modified for fit; contact TMI for details.

Pendulum – any one of six standard pendulums ranging from 200g up to 6400g.

Calibration Weight – a weight distinctive to each specific weight pendulum. This weight is used to calibrate the unit and set the scale for the pendulum.

Datum Reference Pin – a reference point used to ensure that the left and right leveling pads are aligned such that the unit is level with the free hanging pendulum.

11 SET-UP

11.1 MACHINE

1. Place the tester in an environment that is free from shock and vibration, on a flat level surface that is strong enough to support the load of the tester. Use the four adjustable legs on the tester and turn them until level.
2. Unscrew the pendulum knob. This knob should only be on hand tight. Once the pendulum knob has been completely withdrawn, remove the washer.
3. Slide the pendulum on the shaft in the pre-test position. (This should be the upright or idle position.) Be careful when handling the pendulum as not to damage the air grip.
4. Replace the washer and push it on until it touches the pendulum.
5. Replace the pendulum knob and tighten it **hand tight only! DO NOT USE ANY TOOLS TO TIGHTEN THE PENDULUM KNOB!** Once the pendulum knob is in place, the pendulum shouldn't have any play forward or backward.

NOTE: In the case of the 200g pendulum, both washers are placed in front of the pendulum.

6. Loop the air hose that is connected to the air grip over the shaft and insert it into the air connector on the left side of the upright. The air hose should be clamped to the pendulum upright using the clamp.

NOTE: Be sure to leave enough slack in the hose so that it does not restrict a full swing of the pendulum.

7. Connect an air hose to the air inlet on the rear of the machine.
8. Connect the air hose to a filtered, dry air source.
9. Plug power source into a filtered or clean AC outlet.
10. Set air pressure regulator so that the air pressure gauge reads **at least 45 psi**. A higher value is recommended depending upon the sample and the desired clamping pressure. (See **Appendix A** for relationship between incoming air pressure and clamping force.)
11. If the 3200g or 6400g pendulum is to be used, it is recommended to secure the tester to a bench or tabletop in order to avoid energy losses.

11.2 ALIGNMENT

1. With the Digital Tear Tester placed on a flat surface, level the front and rear of the unit using the built-in level and the leveling pads.
2. Turn "ON" the power switch. The home screen will appear.
3. Press the "Swing" button. The pendulum will swing. Allow the pendulum to come to rest while it is hanging freely.

4. Adjust the left and right leveling pads so that the reference marking on the edge of the pendulum is aligned with the Datum Pin. Be sure that the front and the rear of the unit remains level using the built-in level.
5. Return the pendulum and turn the power switch “OFF”.

11.3 CALIBRATION

1. Turn “ON” the power switch; the home screen will appear.
2. Ensure the correct pendulum capacity is selected for the pendulum you are using. If not, change it on the “Test Settings” screen.
3. Press the “Swing” button to release the pendulum.
4. The pendulum will swing and then the display will prompt you to return the pendulum.
5. Mount the calibration weight. Press the “Swing” button.
6. The pendulum will swing and then the display will prompt you to return the pendulum.
7. The unit is now calibrated and the touchscreen displays the calibration results.

12 OPERATION

12.1 STARTUP

Upon initial power-up, you will be in the Run Tests menu.

The following is a detailed look at each menu and their functions.

12.2 INSTRUMENT CONTROLS

The Instrument controls are broken down into four main menus:

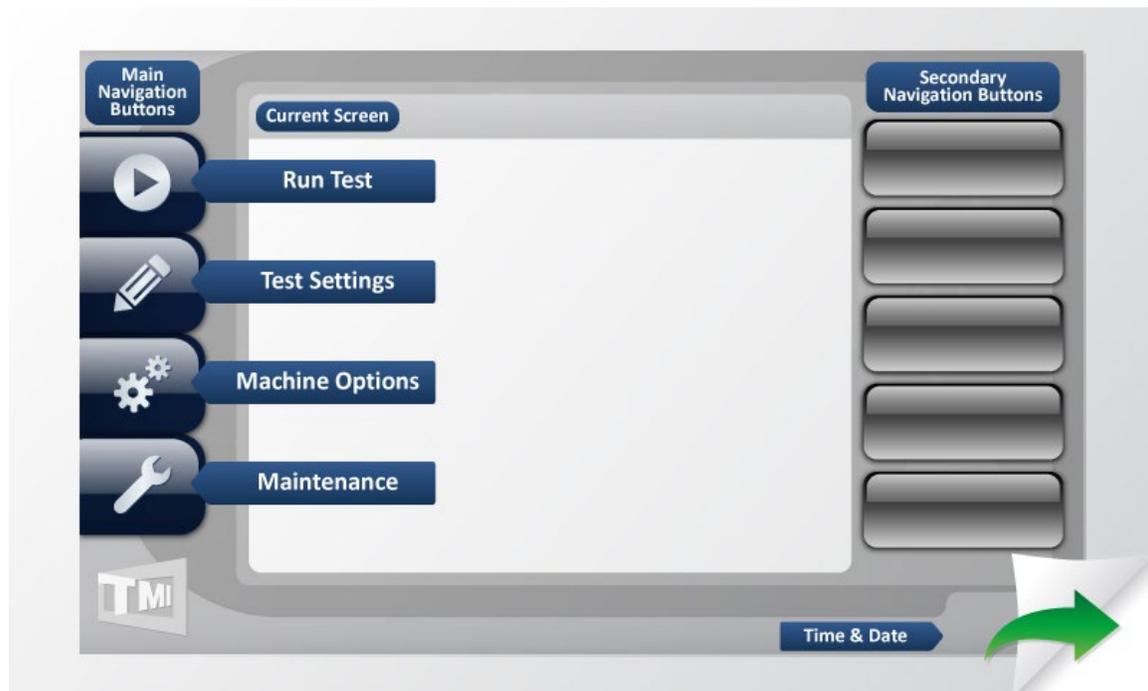
Run Tests Menu

Test Settings Menu

Machine Options Menu

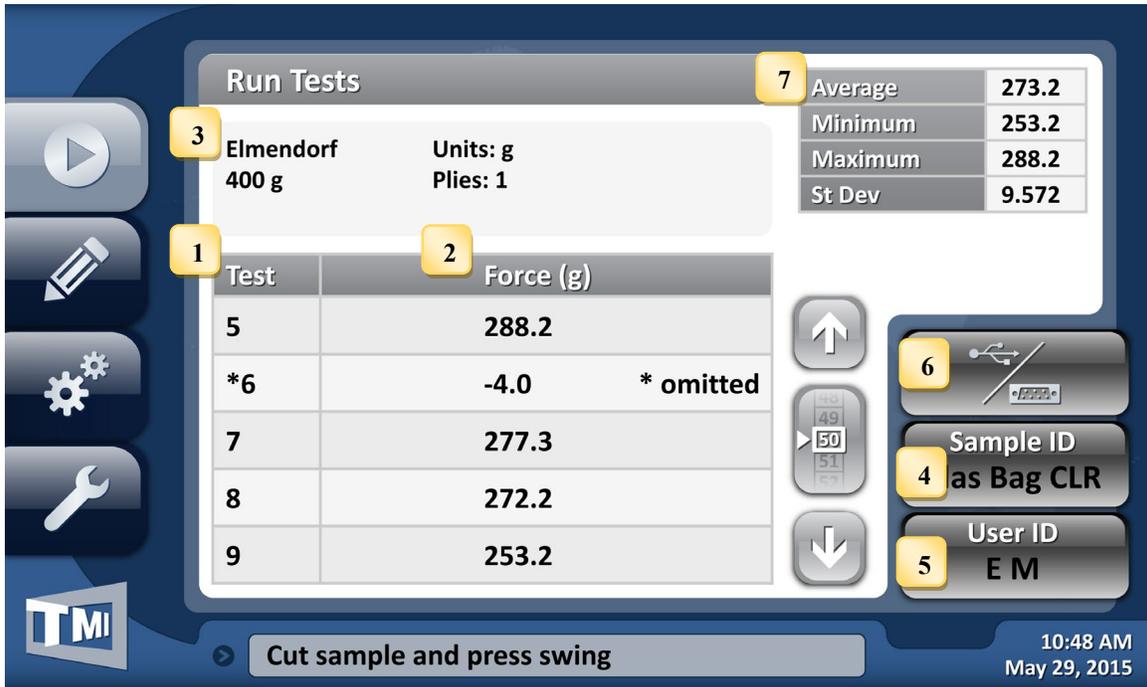
Maintenance Menu

They can be selected by pressing one of the four large buttons to the left side of the screen shown below.



12.2.1 RUN TESTS MENU

This is the menu where the user will initiate tests and view all test results data.

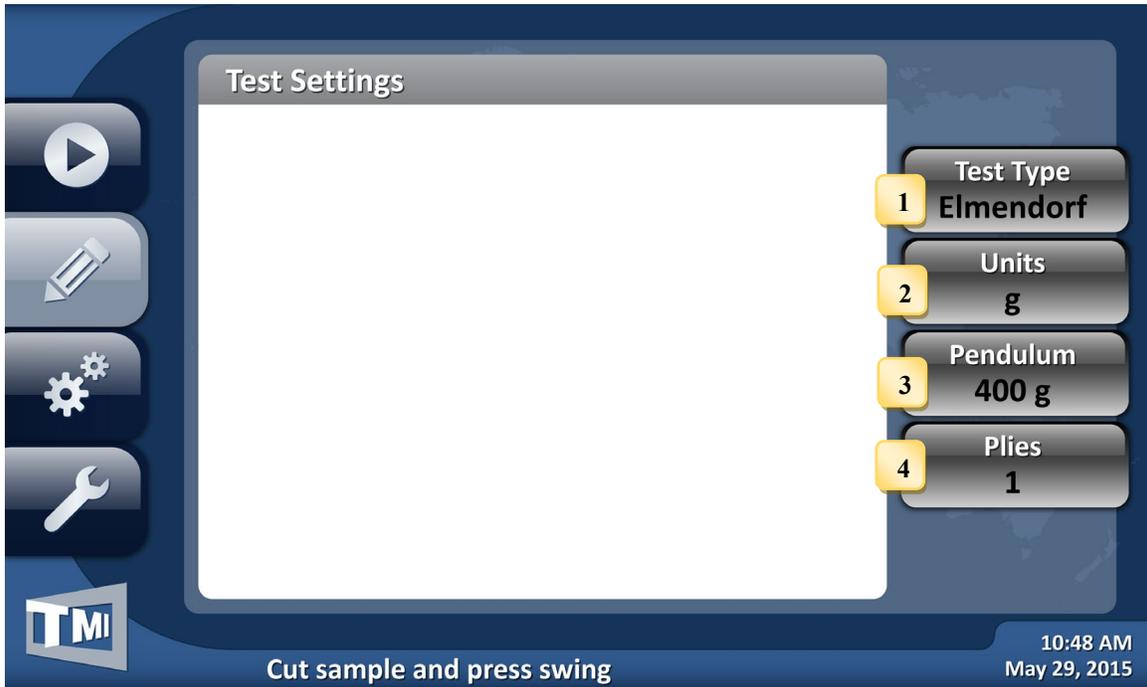


- 1. TEST #**
An automatically incremented identifier for each test.
- 2. FORCE**
The required energy to tear a sample during a test (see Test Settings menu for alternate units).
- 3. CURRENT TEST SETTINGS**
This window displays the current test settings that are selected in the Test Settings Menu.
- 4. SAMPLE ID**
A user-defined sample identifier. Clicking on this button will open a full keyboard (shown right) where the user can enter a Sample ID of his/her choice.
- 5. USER ID**
A user-defined user identifier. Clicking on this button will open a full keyboard (shown right) where the user can enter a User ID of his/her choice.
- 6. EXPORT OPTIONS**
Takes you directly to the Export menu where instrument output options can be selected. (For more information see Export in the Machine Options Menu section)
- 7. STATISTICS**
Statistics are calculated for the current sample and displayed in the table. Results with a break type of invalid will be excluded from the statistics.



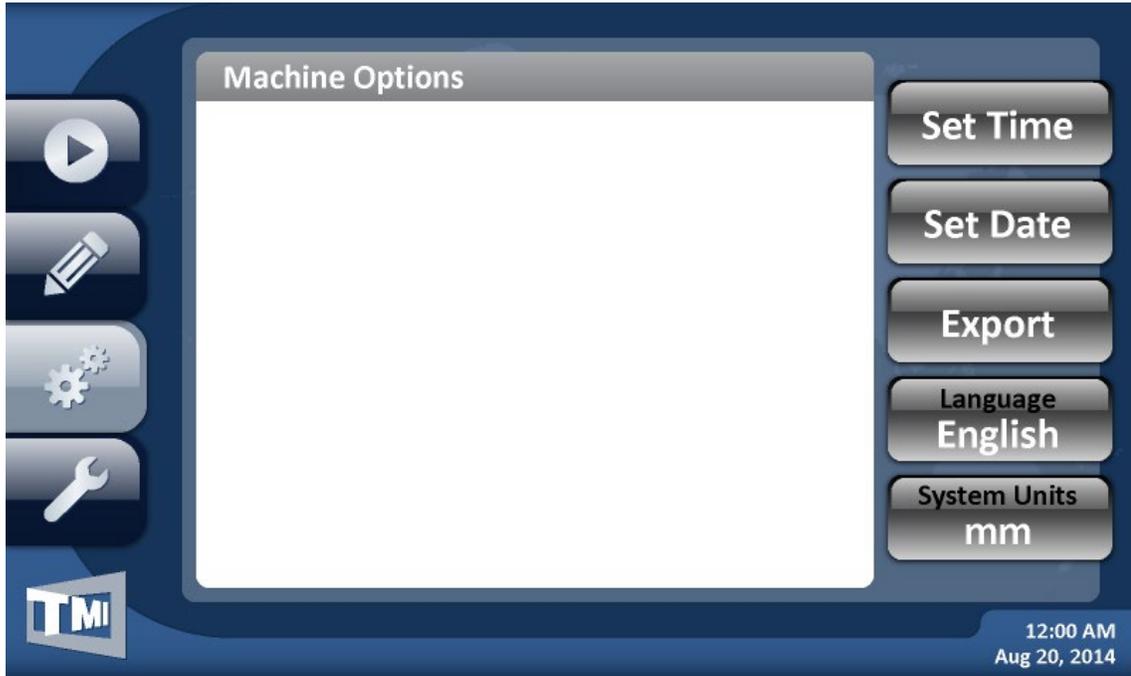
12.2.2 TEST SETTINGS MENU

This is the menu where all of the test-specific settings are selected



- 1. TEST TYPE**
The test type should be Elmendorf
- 2. UNITS**
Select the units that test results will be reported in. Available units include:
Grams, % of pendulum capacity, millinewtons, lbs
- 3. PENDULUM SIZE**
Enter the pendulum capacity
- 4. PLIES**
Number of plies in the test sample

12.2.3 MACHINE OPTIONS MENU



SET TIME AND SET DATE

Select the current date and time for the instrument.



EXPORT

The export function of the instrument can be configured to use RS232 or USB communication.

The USB-A jack allows the connection of a Mass Storage Device (flash/thumb/jump drive) or a Point of Sale style tape printer. When the Flash Drive is inserted, a green icon will appear at the bottom of the display to show that the device is recognized. Press the button in Sample Report to export an entire set of results in a report format.

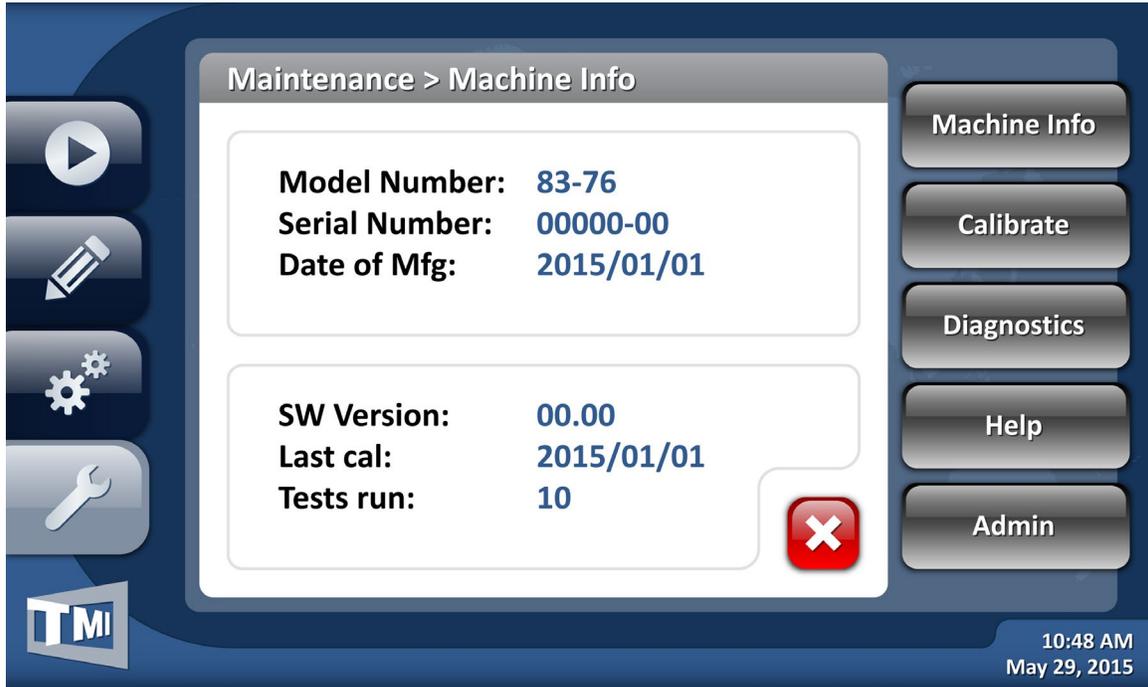
Mini USB “RS232” connection: This outputs test data to TMI’s GraphMaster software, or suitable logging program. The format may be alternated between GraphMaster style and a plain text comma delimited style by selecting the GraphMaster and RS232 check boxes in the export menu. Port settings are shown below.

RS232 Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Handshaking	None

LANGUAGE

The 83-76 has been designed to support a selection of ten different languages: Though the initial release of the software will only support English, the following alternate languages are planned to be supported in the future: Spanish, French, German, Dutch, Italian, Finnish, Polish, Russian, and Turkish.

12.2.4 MAINTENANCE MENU



MACHINE INFO displays the following:

MODEL NUMBER
SERIAL NUMBER
DATE OF MANUFACTURE
SOFTWARE VERSION
DATE OF LAST CALIBRATION
TESTS RUN- the total number of tests run on the instrument since its date of manufacture.

CALIBRATE will initiate the calibration procedure for the current pendulum on the instrument.

DIAGNOSTICS

The diagnostics menu displays useful instrument feedback such as:
ENCODER COUNTS- current location of the spindle
DATE
USB- displays whether a device is properly connected or not
AIR (PSI)- displays the current system air pressure as measured by the tear tester in pounds per square inch
This menu will also display the current state of the clamp, key, door, and any errors.

HELP

The help screen shows the layout of the screen menus

ADMIN

The Admin screen is intended to be used by the service engineers of the TMI Group Companies. It shows the following data:

Lock Test Setups- allows test settings to be locked and un-editable

Disable Door- Disables the door switch to allow testing without the use of the safety shield

Bootload FW- This unit's firmware is field upgradable by service technicians

Reset Cal Date- resets the date of the most recent calibration date to the current date

Factory Reset

Full- Resets all parameters including date of manufacture

Partial- Does not reset serial number, date of last cal, date of mfg, and number of tests ran

Note: All these routines are key/password protected and are intended for use by a qualified service engineer.

13 MAINTENANCE

13.1 CLEANING

The Digital Tear Tester should be kept clean and dry under normal operating conditions. Following a few suggestions will add years to the life of the machine.

- ◆ In time, the Digital Tear Tester may and will become covered with paper fibers. These fibers should be cleaned off periodically so as not to interfere with the operation of the instrument.
- ◆ The faces of the specimen clamps must be kept clean to ensure a good contact surface for clamping the specimen. **DO NOT** clean them with any chemicals or abrasive cleaners. These would scratch the surface and, therefore, the surfaces which contact the specimen may be impaired. Just wipe them with a dry, lint-free cloth to remove any paper fibers or other residues.

13.2 REPLACEMENT OF CUTTING BLADE

The cutting blade should be replaced any time the blade fails to provide a clean, sharp slit in the sample. When the initial slit in the paper becomes ragged, this is a good indication that the blade needs replacement. The cutting blade can be easily replaced without the removal of the pendulum.

1. Unplug power supply from the wall outlet and disconnect the air supply from the machine.
2. Firmly grasp and support the pendulum with one hand and press the pendulum lock/release down with the other hand
3. Swing the pendulum through and past its regular arc. The pendulum should now be on the opposite side of the machine from its usual "resting" position.
4. While holding the pendulum out of the way (a second person would be helpful here) remove the two screws which are holding the razor blade in place. Remove the razor blade and discard.

5. Replace the razor blade with a new one, replace the two screws and tighten so that they are hand tight.
6. The cutting blade will need to be adjusted so that the depth of cut is $0.787'' \pm 0.005''$. It is recommended that a qualified service engineer make this adjustment.
7. Gently return the pendulum to its original, upright position resting against the pendulum lock/release.

13.3 CHANGING PENDULUMS

If many types of samples in different ranges are tested, then it may be necessary to change the pendulum to accommodate the samples being tested.

1. Turn power switch to "OFF" and unplug the power supply from the wall outlet.
2. Disconnect the air hose which supplies air to the air grip on the pendulum by uncoupling the quick air disconnect located on the upright.
3. Unscrew the pendulum knob which holds the pendulum in place at its pivot point by turning the pendulum knob counter-clockwise. **USE NO TOOLS!** This knob should only be on hand tight. Once the pendulum knob has been completely withdrawn, remove the washer which rests against the pendulum.
4. Gently pull the pendulum off the shaft. Be careful when handling the pendulum as not to damage the air grip.
5. Slide the replacement pendulum on the shaft in the same position the previous pendulum was removed (this should be the upright, or idle position).
6. Replace the washer and push it on until it touches the pendulum.
7. Replace the pendulum knob and tighten it **hand tight only! DO NOT USE ANY TOOLS TO TIGHTEN THE PENDULUM KNOB!** Once the pendulum knob is in place, the pendulum shouldn't have any play forward or backward.

APPENDIX A – CLAMPING PRESSURE OF PNEUMATIC GRIPS

The clamping force applied by the pneumatic grips on the sample is directly proportional to the set air pressure. This pressure can be regulated by the inlet air pressure regulator located on the right side of the upright. The operator can regulate the clamping force by adjusting the air pressure as indicated by the air pressure gauge. For any set air pressure, the clamping force on the sample can be calculated by the following formula:

$$\text{Clamping Force} = \frac{\text{Air Pressure} \times .306 \text{ (in}^2\text{)}}{\text{Setting (psi)}}$$

where:

Air Pressure Setting = the inlet air pressure, in psi, as read on the air pressure gauge.

.306 (in²) = the area of the piston in the pneumatic grip.

Additionally, the clamping pressure can be calculated. When using standard grips, the cross sectional area is .625 in². The following equation can be used to calculate the clamping pressure at any given set air pressure:

$$\text{Clamping Pressure} = \frac{\text{Air Pressure} \times .306 \text{ (in}^2\text{)}}{\text{Setting (psi)} \times .625 \text{ (in}^2\text{)}}$$

where:

Air Pressure Setting = the inlet air pressure, in psi, as read on the air pressure gauge.

.306 in² = the area of the piston in the pneumatic grip.

.625 in² = the surface area of the pneumatic grips.

14 TERMS AND CONDITIONS OF SALE

All purchases from TMI are subject to TMI's Standard Terms and Conditions linked below. The TMI Terms and Conditions are an integral part of each business transaction, as indicated in TMI's price bulletins, quotations or order acknowledgements provided.

All materials delivered, services provided, and work performed by TMI are subject to the Terms and Conditions listed on the linked document.

Please visit <http://www.industrialphysics.com/testing-machines-terms-and-conditions> to download the complete Terms and Conditions of Sale document in PDF format.

CE DECLARATION OF CONFORMITY

BÜCHEL B.V.
Molenbaan 19
2908LL Capelle aan den IJssel The Netherlands
Tel: +31 107 900100
E-mail: buchel@buchelbv.com
Web: www.industrialphysics.com

Declare under sole responsibility that the following product:

Models 83-76-01-0001, 83-76-01-0002 Tear Tester

Comply to the following directives and harmonised standards:

2014/30/EU **Electro magnetic Compatibility standards (EMC)**

EN 61326-1 : 2013
EN 61000-3-2 : 2014
EN 61000-3-3 : 2013

2014/35/EU **EC Low Voltage Directive (LVD)**

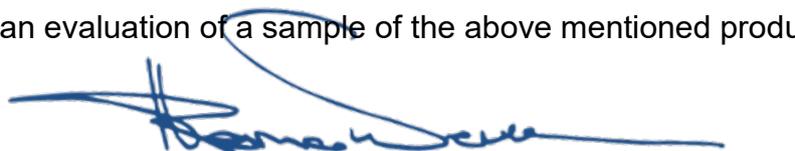
EN 61010-1 : 2010

2011/65/EC **Restriction of hazardous substances (RoHS)**

EN 50581 : 2012

This certificate is based on an evaluation of a sample of the above mentioned product

Issued on behalf of BÜCHEL B.V.



Remco Wever, Managing Director (Büchel B.V.)

Date of Issue: June 2022