



PROBE MATERIAL ANALYZER

MODEL PMA-1000

OPERATING INSTRUCTIONS

CHEMINSTRUMENTS

510 COMMERCIAL DRIVE

FAIRFIELD, OHIO 45014

(513) 860-1598

www.cheminstruments.com

Revision 1.1

August 3, 2017

CONTENTS

PRODUCT DESCRIPTION	3
SPECIFICATIONS.....	4
UNPACKING.....	5
ASSEMBLY.....	6
KEY COMPONENTS	7
THEORY OF OPERATION	8
POWER UP	8
SAFETY FEATURES	8
POSITIONING LOAD CELL ASSEMBLY	9
PROBE AND FIXTURES.....	9
LOAD CELL CALIBRATION.....	9
SETTING TEST PROFILES.....	11
RUNNING A TEST	11
MAINTENANCE	14
TROUBLESHOOTING	14
MAINTENANCE PROCEDURES	14

PRODUCT DESCRIPTION

Congratulations on the purchase of your new ChemInstruments Probe Material Analyzer. This versatile, user-friendly, carefully designed instrument allows you to characterize various materials including viscoelastic polymers, adhesives and compounds through the insertion, dwell, and retraction of custom probe sensors.



WARNING: This equipment can cause injury if not used properly. It is the operator's responsibility to observe all safety rules and warnings.

The unit has the following features:

- Over 9 inches of available probe travel distance.
- User selectable data acquisition area.
- Control speed, dwell and distance parameters.
- Measures in tensile and compression simultaneously.
- Separate speed control for all three test parameters (insertion, dwell & retraction).
- Determine insertion test parameter by force or distance.
- Current test status and data collection constantly displayed.
- Automatic overload protection.
- Preset jog speed of 15 inches per minute.
- Automatic return to test start position.
- Selectable units of measure: Kilograms, Grams, Newtons, Pounds, and Ounces.
- Includes EZ-Lab System software.

SPECIFICATIONS

Electrical	Model specific 120V model: 120 VAC, 50/60 Hz, 2 amps 240V model: 240 VAC, 50/60 Hz, 2 amps
Operating Temperature	32 – 150 degrees Fahrenheit (0 – 70 degrees Celsius)
Humidity	0 – 55% relative humidity
Speed	0.02 – 40 inches/minute (1-64 centimeters/minute)
Start Force	5 – 50 grams or 0 which is no start force
Test Force	5 – 5000 grams
Insertion Distance	0.025 – 4 inches (0.05 – 10 centimeters)
Dwell Time	0 – 60 seconds
Retraction Distance	0.025 – 4 inches (0.05 – 10 centimeters)
Physical Dimensions	Width: 14 inches (35 centimeters) Depth: 18 inches (45 centimeters) Height: 23 inches (58 centimeters) Weight: 39 pounds (18 kilograms)

UNPACKING

ChemInstruments has made every effort to ensure that the PMA-1000 arrives at your location without damage. Carefully unpack the instrument and check for any damage that may have occurred during shipment. If any damage did occur during transit, notify the **carrier** immediately.

The ChemInstruments PMA-1000 consists of the following parts:

- The test frame, which includes the motor/drive mechanism and the data acquisition system.
- An envelope with this manual.
- EZ Lab software and manual.
- RS-232 serial cable
- Power cord.

Make sure all of these components are present before discarding packaging material.



ASSEMBLY

Carefully remove the test frame/data acquisition assembly from the packaging and set it on a sturdy bench top. Check the physical dimensions listed previously for the space required for the instrument. As with any precision piece of laboratory equipment, it is preferable to locate the PMA-1000 in an area where temperature and humidity are controlled to standard conditions of 72 ± 2 degrees Fahrenheit and $50 \pm 5\%$ relative humidity.



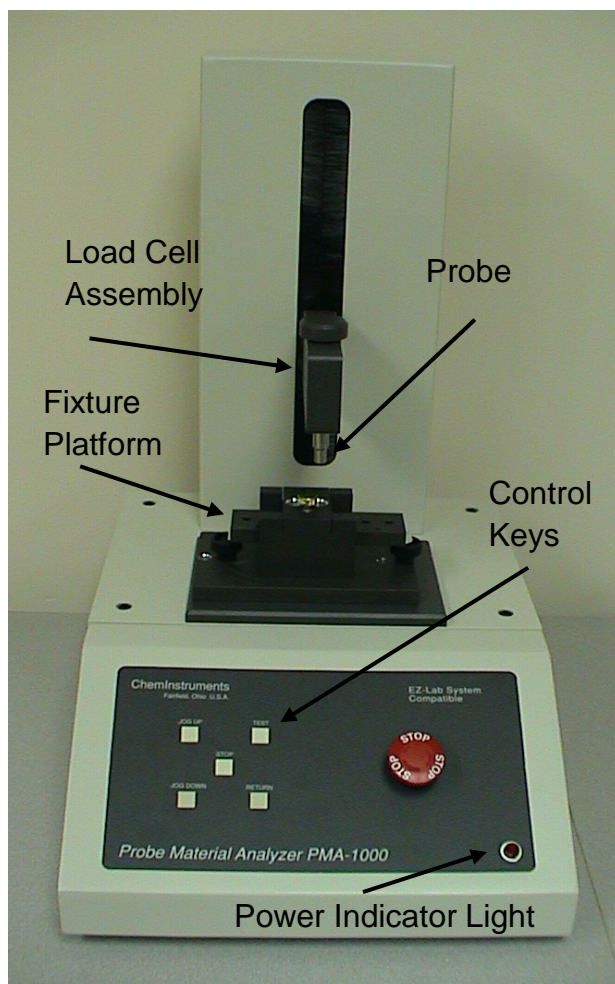
WARNING: Make sure the power source matches the requirements of the PMA-1000. Damage will occur if this unit is plugged into the incorrect power supply.

Connect the power cord to its receptacle on the backside of the control cabinet. Complete the connection by inserting the male end of the power cord into an appropriate AC outlet. Notice that the on/off power switch is located directly beside the power cord receptacle on the backside of the test frame.



KEY COMPONENTS

- **POWER SWITCH** is located on the back panel of the control cabinet directly beside the power cord connection.
- **LOAD CELL ASSEMBLY** consists of the mounting bracket for the load cell and the probe.
- **FIXTURE(S)** used to secure test samples directly below the probe.
- **PROBE** various types available to attach to the Load Cell Assembly.
- **CONTROL KEYS** used to position the Load Cell Assembly and Probe, start and stop a test, and return to start position.
- **POWER INDICATOR LIGHT** indicates that the PMA-1000 test platform is powered up and functional.
- **E-STOP** emergency stop button.
- **RS232 CONNECTION** data output port for downloading test data.



THEORY OF OPERATION

This system can operate using force or distance as the control parameter and measures forces during operation in both tensile and compression. By controlling the speed and distance of the vertical probe, we are able to record the unique signature of the test sample.

Control of the PMA-1000 requires that the machine be connected to a computer that is running EZ Lab. The control keys on the PMA-1000 will only work while connected to EZ Lab. See the EZ Lab manual for details on how to install and use EZ Lab.

POWER UP

Turn on the master power switch located on the back panel of the control cabinet next to the power line receptacle. The power indicator light will be illuminated when power is on.



WARNING: Operating temperature for this equipment is 32 to 150 degrees Fahrenheit (0 to 70 degrees Celsius). The equipment needs to be completely free of condensation, inside and out, before applying power.

SAFETY FEATURES

The PMA-1000 has numerous safety features incorporated into its design and operation. Two of these features need to be understood for proper operation.

The first is the “E-stop” button. This red button when pushed shuts off all power to the PMA-1000. After releasing this button you will have to wait until the PMA-1000 goes through its normal startup sequence before you can use the PMA in a normal manner.

The second feature is overload protection for the load cell. If the load cell senses a force 10% greater than its maximum rating, the crosshead will stop and an error message is displayed. If the overload occurs during a test, the test will be aborted.

POSITIONING LOAD CELL ASSEMBLY

Before running a test it is necessary to position the load cell assembly at the appropriate start point. The travel length of the test and any fixtures being used in the test will determine the start point. Use the following procedure to move the load cell assembly. Use caution when moving the load cell assembly downward to avoid damaging the load cell. The load cell assembly will be traveling at the preset jog speed of 15 inches per minute and should not come in contact with the sample fixture.

1. You must enter the main screen for the Probe Material Analyzer in EZ Lab for any movement of the load cell assembly.
2. To move the load cell assembly upward, press and hold the JOG UP control key. Releasing this key will stop motion.
3. To move the load cell assembly downward, press and hold the JOG DOWN control key. Releasing this key will stop motion.

PROBE AND FIXTURES

There are numerous options to select for probes. In general, all probes will screw into the load cell assembly extension. Please take care when attaching probe. Do not put pressure on the extension of the load cell or attached the probe. Load cell damage can be caused by applying excessive force or torque on this apparatus.

LOAD CELL CALIBRATION

It is important to calibrate the load cell to ensure that reliable data will be gathered. A calibration procedure is built into the software of the Probe Material Analyzer. This procedure should be followed upon first use of the PMA-1000 and whenever necessary thereafter. The following is the step-by-step procedure for calibrating the load cell.

You will use EZ Lab to control the calibration sequence of the PMA-1000.



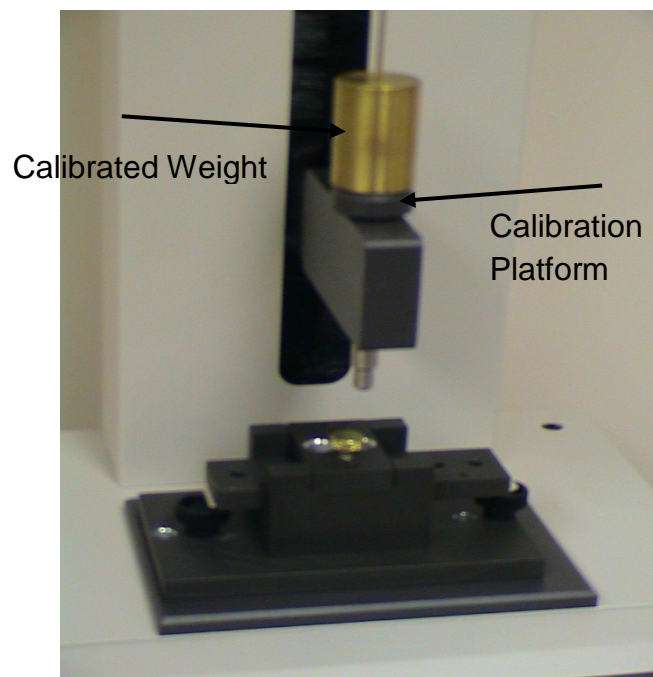
Make sure that the PMA-1000 has been powered on for 30 minutes before proceeding with calibration.



The calibration sequence defaults to grams as the unit of measure. Make sure that your calibration weights and entries are in grams.

LOAD CELL CALIBRATION PROCEDURE

1. Move the load cell assembly with probe attached to the midpoint of the mast.
2. Open EZ Lab and select PROBE MATERIAL ANALYZER from the main menu.
3. Select the CALIBRATE button located in the upper portion of the left setup section in EZ Lab.
4. Follow the on-screen instructions precisely making sure you position the calibration weight correctly on the calibration platform. See picture below.
5. The calibration process requires 2 known weights – a lighter weight and a heavier weight. The lighter weight can be no weight at all.
6. When finished, check the accuracy by placing another calibrated weight of different value on the calibration platform.
7. Repeat the calibration procedure if necessary.



SETTING TEST PROFILES

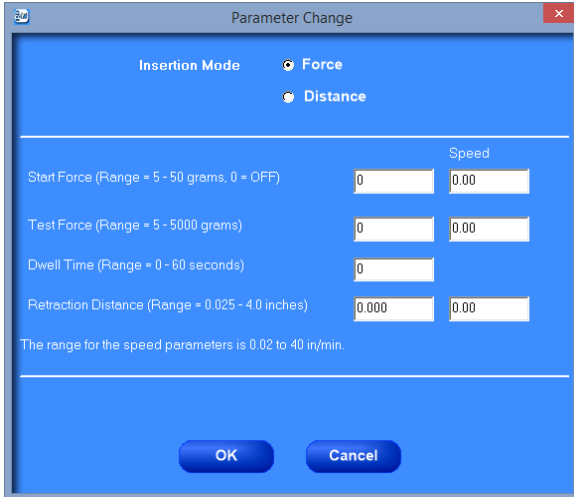
The profile parameters control the operation of the test. The parameters can be set manually or by selecting an existing test method. The “Parameter Change” button allows you to change the parameters manually. The “Test Method Change” button allows you to create, delete, or select a pre-programmed test method. See the EZ Lab manual for details on using the test method screen.

The machine will operate in either force or distance mode.

In force mode, the probe is inserted into the test substrate until a test force is measured. The probe is then retracted from the substrate.

In distance mode, the probe is inserted into the test substrate until a distance has been reached. The probe is then retracted from the substrate.

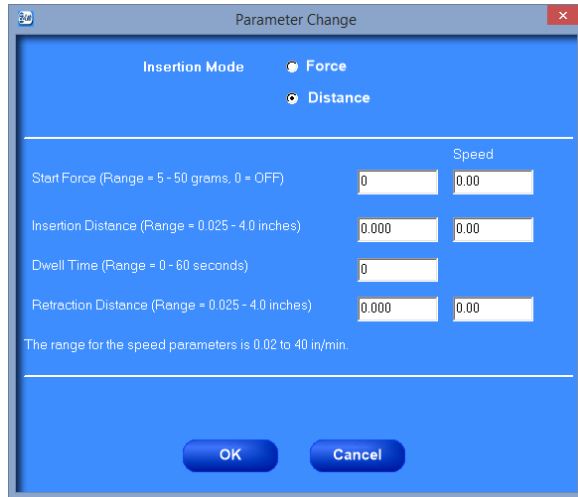
The parameters include start force, test force or insertion distance, dwell time, and retraction distance. See screen shots below.



The screenshot shows the "Parameter Change" dialog box with the "Force" radio button selected under "Insertion Mode". The parameters are as follows:

Parameter	Value	Speed
Start Force (Range = 5 - 50 grams, 0 = OFF)	0	0.00
Test Force (Range = 5 - 5000 grams)	0	0.00
Dwell Time (Range = 0 - 60 seconds)	0	
Retraction Distance (Range = 0.025 - 4.0 inches)	0.000	0.00

The range for the speed parameters is 0.02 to 40 in/min.



The screenshot shows the "Parameter Change" dialog box with the "Distance" radio button selected under "Insertion Mode". The parameters are as follows:

Parameter	Value	Speed
Start Force (Range = 5 - 50 grams, 0 = OFF)	0	0.00
Insertion Distance (Range = 0.025 - 4.0 inches)	0.000	0.00
Dwell Time (Range = 0 - 60 seconds)	0	
Retraction Distance (Range = 0.025 - 4.0 inches)	0.000	0.00

The range for the speed parameters is 0.02 to 40 in/min.

RUNNING A TEST

Test data is collected at a rate of 400 Hz. Eight samples are measured every 2.5 milliseconds and averaged as a single data point every 20 milliseconds.

NOTE: Make sure the load cell has been calibrated before conducting a test.

TEST OPERATION

The following is a summary of the test operation sequence.

1. The Test button is pressed from the front panel of the PMA-1000.
2. If looking for a “Start Force”, the system will move down at the “Start Force Speed” until the “Start Force” is measured.
3. The system will continue moving down, either looking for the “Test Force” or “Insertion Distance” and moving at either the “Test Force Speed” or “Insertion Distance Speed”.
4. The system will stop the motor and dwell for the “Dwell Time”.
5. When the “Dwell Time” is complete, the motor will reverse direction and move up the distance specified by “Retraction Distance”. The motor will move at the “Retraction Distance Speed” during this movement.
6. Test data is collected during all three periods of the test.
7. The test data is uploaded to EZ Lab where it can be graphed as a whole collection of data points or as the individual sections of the test.

RETURN TO START POINT

The PMA-1000 has the ability to return the load cell assembly back to the start of the previous test. The return speed is 15 inches per minute.

If “Auto Return” is on, then the load cell assembly will automatically return to the start position at the completion of the test.

If “Auto Return” is off, the load cell assembly can still be returned to the start position by pressing the RETURN control key on the front panel of the PMA-1000.

CHECK FOR BREAK

The PMA-1000 can be set up to stop a test when a break in the test substrate has been detected. The system will only check for a break during the “Retraction Distance” portion of the test. The system must measure more than 5 grams of force before checking for a break. If a break is detected, the load cell assembly will continue to move until the retraction distance is complete but test data will not be collected any longer. The system will not “Auto Return” if a break has been detected during a test.

MAINTENANCE

TROUBLESHOOTING

The troubleshooting chart describes some problems that may occur over time. After determining the problem, follow one of the following maintenance procedures.

Table 1 – Troubleshooting Chart

Problem	Possible Cause	Procedure
Load Cell Assembly does not move during a test	Motor is not allowing the assembly to move	Replace motor
Data measurement consistently low/high	Improper calibration	Check calibration
	Bad calibration	Refer to load cell calibration
Calibration drifts	Bad or damaged load cell	Replace load cell

MAINTENANCE PROCEDURES

As with any precision equipment it is important to provide care and maintenance to ensure proper performance and long life. General cleaning and care will ensure accurate test and trouble free performance.