P-2000

owner's manual

DELMHORST®
INSTRUMENT CO.
WHEN ACCURACY IS THE POINT.™

1.800.561.8187 www.itm.com information@itm.com

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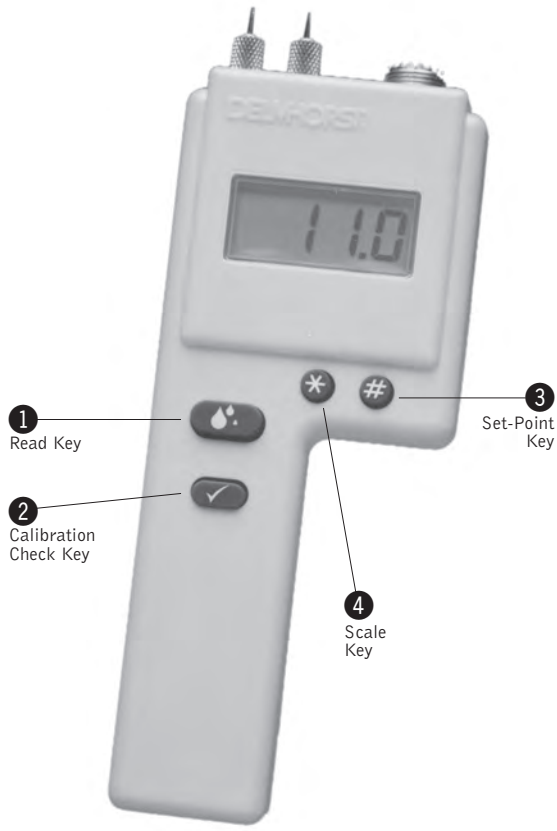

P-2000 FEATURES

- Designed to check the moisture levels in paper products such as cores, corrugated, kraft stock, baled scrap paper, and other paper-based materials
- Resistance technology recognized around the world as the most accurate method for measuring moisture
- Proven microcontroller circuit
- Averages up to 100 accumulated readings
- 4.3%-18% moisture range on paper
- 0-100 reference scale for relative moisture indications in hygroscopic materials
- 5%-40% moisture range on baled scrap paper
- Includes (1) 9-volt battery
- Includes sturdy carrying case
- One year warranty

KEY FUNCTIONS

1 Read: 

Press this key to read the %MC or relative moisture value of the material under test.

2 Check: 

This key, when pressed with the Read key, checks the meter calibration. It also displays the number of readings in memory (up to 100), the average, and the highest stored reading. It also clears the memory.

3 Set-Point: 

This key programs the set-point value. A buzzer will alert you if the meter reads higher than the selected value. It also acts as a scroll key, depending on the function.

4 Scale: 

This key sets the display scale to #1 (paper), #2 (reference), #3 (baled scrap paper).It also acts as a scroll key, depending on the function.

CHECK CALIBRATION

Set the meter to Scale #1 (Paper). Press the calibration check key 2 and the read key 1 simultaneously. The meter is in calibration if it displays 11.1% +/-0.2.

When checking calibration, there is no need to disconnect the external electrode, if attached.

If you check the calibration and the display does not read 11.1%, it is likely an indication of a low battery. If this occurs, change the battery immediately.

Continued use with a low battery may cause the meter to go out of calibration. If you have a fresh battery and the instrument still does not indicate an acceptable calibration, return it to DELMHORST for service. See **Service for Your Meter** section.

Note:

When the battery is removed and then reconnected, the meter displays its software version for one second and then turns itself off. After replacing the battery, you must reset the meter as described in Resetting the Meter section.

A hard Reset is required if, after changing the battery, the display is frozen. This is sometimes caused by the interruption of contact between the battery and battery lead wire. Resolve this

Disconnect the battery. Press and hold the Read key for 15 seconds. Release the Read key. Press and hold the Check key for 15 seconds. Release the Check key. Connect a fresh battery to the lead wire in a single action, making sure to align the poles properly and without interrupting contact. If the display remains frozen, repeat the procedure. If this procedure does not solve the problem, refer to the Service for Your Meter section.

TO SET THE SCALE

Set the scale to #1 for most paper and paper products, #2 for obtaining relative moisture indications on hygroscopic materials for which no established calibration is available, or #3 for baled scrap paper.

- **To change the scale,** press and hold the scale key 4. The meter will display the current scale for one second then scroll forward through the scales.
- **Release the key** to stop at your desired scale.

Changing the scale will automatically reset the set-point value to the default setting for that particular scale. Default settings are as follows:

Scale #1 – 7%
Scale #2 – 50%
Scale #3 – 19%

TO CHANGE THE SET-POINT

- **To change the set-point value** press the set-point key 3. The meter will display the current set-point value for the scale you have chosen for one second.
- **To scroll forward** to a higher value for that scale hold the set-point key 3 while the current set-point is displayed and scroll to the set-point value desired.
- **To scroll backward** through the set-point values, press and release the set-point key 3. Within one second, press and hold the scale key 4. Continue to hold the scale key 4 and the set-point will decrease.
- **When scrolling in either direction,** release the key to stop at your desired set-point.
- **A buzzer sounds** if the meter reads a value higher than the set-point.

You can change the value between 5.0 and 18.0 for Scale #1, 2-99 for Scale #2, and between 6.0 and 39.0 for Scale #3.

INFORMATION ABOUT YOUR READINGS

Readings below the nominal range of each scale will be displayed as a negative number. Readings above the nominal range will be displayed with a blinking number. All under-range and over-range readings should be disregarded. They are not added to the accumulated readings or used in calculation of the average or highest reading.

The meter can accumulate up to 100 readings. After all 100 readings are stored, it will not add new readings until the memory has been cleared. It will also continue to display the average of all 100 readings as a reminder that the memory is full.

►**To add a reading** to the sum of all the previously stored readings, release the read key ❶ within 2 seconds.

When taking and storing readings for a specific material, be sure to clear the meter before moving on to the next scale if you do not want to group all of the readings together.

TO CHECK THE ACCUMULATED READINGS

This feature displays the total number of all accumulated readings for the selected material, the average of those readings, and the highest stored reading.

►**To view the readings,** press and release the calibration check key ❷. First the meter displays the number of accumulated readings for one second, then the average of those readings for two seconds. Then it displays the highest stored reading for two seconds. The total "cycle" time is five seconds.

►**To keep the accumulated readings in memory** release the calibration check key ❷ before the total cycle time is complete.

►**To erase readings,** hold the calibration check key ❷ for more than five seconds. All accumulated readings will be erased and the meter will display "0".

TO RESET METER

- **Press and release** the calibration check key ❷.
- **Within one second,** press and hold the scale key ❹. The meter will display a reset sequence as follows: "141", "7", "2.0", "11.1". The last number, "11.1" is a calibration check.
- **Resetting the meter** clears the memory and restores default settings.

APPLICATIONS

Testing Paper, Paper Cores and Corrugated Products

- **Set the meter scale** for #1 paper. Check that the contact pins are firmly hand tightened.
- **Push the contact pins** into the paper product to their full penetration if possible.
- **Press the read key** ❶. The meter displays the %MC for two seconds.

Since the readings are the result of an "average" calibration, if a high degree of accuracy is required, the meter should be checked on the specific material and corrections determined by the user.

Meter readings indicate moisture content at room temperature of 70° F – 90° F. Meter readings will be affected by lower or higher temperatures. Lower temperatures cause readings to be lower; higher temperatures cause readings to be higher than the actual MC.

The meter tends to read the highest moisture content that is in contact with both pins. If thick samples are not well equalized, it may be necessary to make tests at different depths to determine the degree of uniformity of moisture distribution in the sample.

If the meter is used on stock so thin that the full length of the pins is not entirely embedded in the thickness of the sample, the readings tend to indicate a lower than actual MC. This can be overcome by testing more than one sample in stacks.

Using the 0–100 Arbitrary Scale

This scale is used to test the moisture content of hygroscopic materials for which a calibration is not available. Depending on the material, a special application external electrode, instead of the integral contact pins may be required. Increasing readings on the 0-100 reference scale indicate higher levels of moisture content. These readings can be translated into percent moisture content once a calibration has been developed.

- ▶ **Set the meter scale** for #2. If necessary, attach an external electrode to the meter.
- ▶ **Push the contact pins** into the material or apply the external electrode.
- ▶ **Press the read key** ❶. The meter displays a relative value for two seconds.

The readings may also be used for comparative tests, after meter readings have been related to given conditions for the materials involved. When the meter is used as a gauge for comparative tests, readings should be taken on samples considered to be at "safe" levels or in satisfactory condition. These readings are then used as the "standard" against which subsequent readings on the same material are evaluated.

The "standard" for any given material is related to safe storability or any other property which is important for further production processing.

Testing Baled Scrap Paper

- ▶ Set the meter scale for #3 baled scrap paper. Attach an external electrode to the meter.
- ▶ Push the external electrode into the material being tested.
- ▶ Press the read key ❶. The meter displays the %MC for two seconds.

The level of accuracy of meter readings depends on a number of factors: similarity between the material tested and samples on which the calibration was made; moisture distribution; and chemical application or processing which may affect the electrical properties of the paper product

The required electrode is the H-4 with a #830-series prod. (10"or 18"). A sharp, steel rod to open the hole for the prod may be helpful if the bale is very dense.

A few meter readings in a limited number of specific areas of a large mass can not be projected to indicate an average moisture content of an entire bale.The readings can be very helpful in providing an indication of the overall moisture condition inside the bale and to detect areas of excessive moisture.

Meter readings may be used as an arbitrary guideline in determining whether or not to accept or reject the material. Since checking the moisture condition of bales is performed when buying and selling, the specific value of the meter readings remains an element to be agreed upon between buyer and seller. Such an agreement should consider not only a specific "range" of readings, but the number and location of where they are taken.

The following ranges can be used as a guideline and may help to interpret the readings:

- Readings of 5%–10%, with EMC to 60% RH are usually considered "dry".
- Readings from 11%–20% with EMC to 95% are usually considered "acceptable" but should be taken with some reservation.
- Readings of 20%-40% are considered "wet" and unacceptable.

CARE OF YOUR METER

To keep your meter in good working order:

- Store your meter in a clean, dry place. The protective carrying case provided is an ideal storage place when the meter is not in use.
- Change the 9-Volt battery as needed. Continued use with a low battery may cause the meter to go out of calibration.
- Change contact pins as needed. Keep pin retainers hand tightened.
- Clean the meter, contact pins, and probes with any biodegradable cleaner. Use the cleaner sparingly and on external parts only. Keep the cleaner out of the external connector. **DO NOT IMMERSE THE METER OR ANY ELECTRODE IN WATER.**
- Remove the battery if the meter will not be used for one month or longer.