



P-2000

Version 2.0

PAPER MOISTURE METER OPERATION MANUAL



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Model P-2000

Owners Manual

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P-2000 FEATURES

- Designed to check the moisture levels in paper products such as craft stock, baled scrap paper, and other materials
- Resistance technology recognized around the world as the most accurate method for measuring moisture
- Averages up to 100 accumulated readings
- 4.3%-18% moisture range on paper
- 0-100 reference scale for relative moisture indications in various hygroscopic materials
- 5%-40% moisture range on baled scrap paper
- Digital readout
- includes (1) 9-volt battery
- Proven microcontroller circuit
- One year warranty
- 60 years of proven quality, accuracy and service



This product is covered by EU directive 2002/96/EC (WEEE). For disposal please contact your supplier or local authorities for instructions as to best do so.

BUTTON FUNCTIONS

READ

#1



Reads the %MC value

CHECK

#2



Checks the meter calibration. Displays the average of up to 1 00 accumulated readings; displays the highest stored reading; erases the readings from memory.

SET-POINT

#3



Displays the current set-point. Also acts as an arrow (scroll) key to increase the set-point value in 1 % increments. A buzzer will alert you if the meter reads higher than the selected %MC value.

SCALE

#4



Displays the meter scale as #1 (paper); #2 (0-1 00 reference); #3 (baled scrap paper). Also acts as a toggle to change among the three scales and as an arrow key to decrease the set-point value.

When the battery is replaced, the meter displays in succession, 7.0 – 2.0 and 11.1 and then turns itself off. After replacing the battery, you must reset the meter as described on page 4.

CALIBRATION CHECK

- INTERNAL

Press the calibration check button (#2) and the read button (#1) simultaneously. Meter is in calibration if it displays 11.1%, regardless of the scale setting.

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. We recommend NOT to use rechargeable batteries.

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 EUROPE for service. See "**Service for Your Meter**" section.

- USING MCS-2X (Moisture Content Standard)

Set the meter to scale #1.

For checking with a pin-type (MCS-2X), touch the center (common) contact and one of the side contacts with the pins on the meter, and press the read button (#1). The display should show the value of the contacted side of the MCS.



For checking with a prod-type (MCS-2X-CLIP), insert the prod in the clips, with the tip in the center clip and the lower metal band in either of the outer clips and press the read button (#1). The display should read the value indicated on the contacted side of the MCS.



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 button (#4). The meter will display the current scale for one second then scroll forward through the scales.
- **Release the button** 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 button (#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 button (#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 button (#3). Within one second, press and hold the scale button (#4). Continue to hold the scale button (#4) and the set-point will decrease.
- **When scrolling in either direction**, release the button to stop at your desired set-point.
- **A buzzer sounds** if the meter reads a %MC 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 1 00 readings. After all 1 00 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 button (#1) 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 given material you have chosen, the average of those readings, and the highest stored reading.

- **To view the readings**, press and release the calibration check button (#2). 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 button (#2) before the total cycle time is complete.
- **To erase readings**, hold the calibration check button (#2) for more than five seconds. The total, average and highest readings will be displayed as above, followed by a zero to indicate all readings have been erased.

TO RESET METER

- **Press and release** the calibration check button (#2).
- **Within one second** press and hold the scale button (#4). 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 button (#1)**. 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 button (#1)**. 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 button (#1)**. 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 hardly 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 as 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 IMMERS THE METER OR ANY ELECTRODE IN WATER.
- ✓ Remove the battery if the meter will not be used for one month or longer.

SERVICE FOR YOUR METER

- ✓ Pack your meter securely. Enclose a purchase order or letter with a brief description of the problem.
- ✓ There is no need to call us for a return authorization number if you are within the EU. Customers outside the EU must contact us for more specific instructions prior to returning a meter.
- ✓ Include your name, address, daytime phone and fax numbers or e-mail address. If you believe the meter is under warranty, please provide the original sales slip or invoice.
- ✓ Ship via UPS, Express Mail, Priority Mail or any overnight courier who provides prompt service. Do not use standard parcel post.
- ✓ Insure your instrument for its full value and ship prepaid. We are not responsible for damage in transit.
- ✓ We do not accept COD shipments or cover any incoming freight or duty charges on returned merchandise
- ✓ Turnaround time on repairs is approximately two weeks.
- ✓ We will call you with an estimate if you specifically request one, or if we determine that the meter may be too costly to repair.

- ✓ Non-warranty repairs will be returned via UPS/COD unless you have already established other payment terms. There is no COD service outside the EU.
- ✓ Payments have to be made by Bank transfer prior to the return shipment. A proforma invoice will be raised in advance.
- ✓ Warranty repairs will be returned at no charge if shipped within the EU via GLS Ground Service. Freight charges for expedited services (i.e., Federal Express, UPS/2 Day, UPS/1 Day, etc.) are the customer's responsibility and will be charged as per the above terms.

WARRANTY

DELMHORST EUROPE, referred to hereafter as DELMHORST, guarantees your moisture meter for one year from date of purchase and any optional electrodes against defects in material or workmanship for 90 days. If, within the warranty period of the meter, you find any defect in material or workmanship return the meter following the instructions in the "Service for Your Meter" section. This limited warranty does not cover abuse, alteration, misuse, damage during shipment, improper service, unauthorized or unreasonable use of the meter or electrodes. This warranty does not cover batteries, pin assemblies, or pins. If the meter or any optional electrodes have been tampered with, the warranty shall be void. At our option we may replace or repair the meter. DELMHORST shall not be liable for incidental or consequential damages for the breach of any express or implied warranty with respect to this product or its calibration. With proper care and maintenance the meter should stay in calibration; follow the instructions in the "**Care of Your Meter**" section.

Under no circumstances shall DELMHORST be liable for any incidental, indirect, special, or consequential damages of any type whatsoever, including, but not limited to, lost profits or downtime arising out of or related in any respect to the meters or electrodes and no other warranty, written, oral or implied applies. DELMHORST shall in no event be liable for any breach of warranty or defect in this product that exceeds the amount of purchase of this product. The express warranty set forth above constitutes the entire warranty with respect to Delmhorst meters and electrodes and no other warranty, written, oral, or implied applies. This warranty is personal to the customer purchasing the product and is not transferable.

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For already 65 years, Delmhorst is a leading brand for high-quality resistance moisture meters. Today the Delmhorst range consists of a complete line of portable moisture meters for a variety of different applications including woodworking / lumber, agriculture, construction and paper.

DECLARATION OF CONFORMITY

Manufacturer's Name: Delmhorst Instrument Co.

Manufacturer's Address: 51 Indian Lane East
Towaco, NJ 07082
USA

Council Directive(s): 89/336/EEC - Meets EMC directive
73/23/EEC - Not required. Voltage used or generated
is not within scope of Low Voltage Directive.

Standard(s) to which Conformity is declared :

EN 50082-1:1992- EMC Generic immunity standard
EN 50081-1:1992- EMC Generic emission standard
EN 55011:1991- Limits and methods of measurement of
radio disturbance characteristics of (ISM) equipment.

Type of Product : Paper Moisture Meter

Model No. P-2000

I, the undersigned, hereby declare that the product specified above conforms to the above Directive(s) and Standard(s).



Thomas Laurenzi, President
Delmhorst Instrument Co.
NJ, USA

