# Wood Moisture Tester HM-540

# Kett



# **Operating Manual**

Thank you for purchasing this product.

Please read the operating manual carefully and use this product properly.

### **Safety Precautions**

If the safety precautions for the wood moisture tester are not observed damage to property may result. While the safety of the product has been given considerable attention, read the precautions in the operating manual and use the instrument properly.

#### Observe the safety precautions.

Read the precautions noted in the operating manual.

#### • Do not use if broken.

Immediately contact our service representative if the unit malfunctions or does not operate properly.

#### Meaning of warning symbols.

In order to prevent damage resulting from erroneously operating the equipment, the following symbols are indicated in the operating manual and on the product. These symbols have the following meanings.

## Note

Items which the user should be aware of in order to use the unit safely.

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### 1. Features of Wood Moisture Tester HM-540

This unit is a handy high-frequency moisture tester with integrated main unit and sensor section. Specifying the thickness of the wood and the specific gravity allows the moisture of various kinds of woods to be measured. The moisture can be measured just by pushing this device against an object to be measured, and therefore, the surface of the wood is not spoiled. You can utilize this device as a device for moisture management in the industry of handling wood including timber drying factories, antiseptic treatment factories, lumber mills, plywood mills, wooden furniture factories, housing manufacturers, and construction firms. This device has been authorized as a good moisture content meter (authorization number: 1-21-001) in "Authorization as Moisture Content Meter Used for Conifer Timber" by the Japan Housing and Wood Technology Center.

#### • Measuring principle

The more wood contains moisture, the larger the high frequency capacity becomes. Measuring after obtaining the relationship between the moisture and high frequency capacity allows the moisture to be obtained. This device displays a moisture value by applying this principle.



### 2. Specifications

Measurement method	:	High frequency capacitance (20MHz)
Application	:	Wood
Measurement range	:	2 - 150% (specific gravity and tree species dependent)
Measurement precision	:	Standard error: 0.5% or less (our standard sample, cedar/cypress: 20% or less)
		Drying method: JIS Z 2101:2009
Data memory	:	999 points
Compensation function	:	Thickness : 10-40 mm
		Specific gravity : 0.1 to 1.25 (up to 3 setting values storable)
		Moisture : slope (0-2.50), offset (-9.9-9.9)
		Temperature : Automatic (10-40°C), Manual (-10-70°C)
Other functions	:	Statistics, Auto power off, Auto hold, Upper limit alarm, etc.
Display	:	128 × 64 dot matrix LCD
Power supply	:	9V alkaline battery (006P) ×1
Power consumption	:	350 mW
Dimensions and weight	:	72 (W) ×146 (D) ×118 (H) mm, approx. 0.39 kg
Accessories	:	9V alkaline battery (006P) ×1, carrying pouch, specific gravity table,
		operating manual
Options	:	Data Logger Software HDL-02 (USB)

### 3. Part Names

#### <Main unit>



#### <Accessories>







Γ	 -	1
	1	
_		

Batteries (9V) 9V alkaline battery (006P) ×1 Carrying pouch

Specific gravity table Op

**Operating Manual** 

<Options>



Data Logger Software HDL-02

### 4. Description of Display



Item No.	Items to be displayed		
1	This indicator is displayed when the remaining battery capacity is insufficient.		
2	The data number is displayed when the data memory is set.		
3	An icon ( III) is displayed when the measured value is held.		
(4)	The selected object to be measured is displayed. When SG is selected, the value of the specific gravity is displayed.		
(5)	The date [Year/ month/ day] and time are displayed.		
6	The icon ((1)) is displayed when the correction setting of the measured value is conducted.		
7	The measured moisture value (%) is displayed. When the value exceeds the measurable range, "Over Range" is displayed.		
8	The thickness setting value of the object to be measured is displayed.		

#### 5. Battery Installation

The power supply of this unit uses one 9V (006P alkaline) battery.



Pull your thumb in the direction of the arrow to remove the battery compartment lid.



Put in the battery properly with attention to the positive (+) and negative (-) directions.

### 6. Measurement Mode



Step	Operation	Display	Operation description
2	Measurement	2021/04/01 15:23 12.2% Ceder 40mm Example) Measurement results	<ul> <li>When this unit is held as shown in the illustration and the electrode of the moisture detection section is lightly pushed against an object to be measured, the measurement result is displayed.</li> <li>* The moisture scale of this unit is designed to be lightly pushed against an object to be measured as shown in the illustration as a standard state.</li> <li>* The measurement result is displayed while the moisture detection section is pushed against an object to be measured. Pressing the HOLD button during measurement allows the measurement result to be held and the measurement result remains displayed even after releasing it from the object. Pressing the HOLD button again cancels the holding function.</li> <li>* When the moisture value exceeds the measurable range. "Over Range" is displayed.</li> </ul>
	Space with 80 mm or more		(When a thin plate is measured) When an object to be measured is 40 mm or less in thickness, provide space of 80 mm or more below the measurement point and measure it.
3	Completion of measurement		When measurement is completed, turn off the power.

### 7. Various settings

• When the extreme key is pressed on the measurement screen, a setting can be selected from 1 through 7.



1	Material selection	(P.13)	5	Auto hold settings	(P.17)
2	Temperature compensation	(P.14)	6	Display settings	(P.18)
3	Thickness compensation	(P.15)	7	Extension functions	(P.19)
4	Alarm settings	(P.16)			

- \* Refer to the page (P. ) indicated in parentheses for the functions or purpose of each pattern.
- \* Four items are displayed on the screen, but pressing the [▲] or [▼] key allows the cursor to scroll up or down to the 1 through 7 settings in this order.
- \* The set item is kept until it is set even after the power is turned off.

#### 1 Material selection

Select the object to be measured for moisture.

- Select "Material" with the [▲] and [▼] keys on the setting screen and press the key.
- (2) Press the [▲] and [▼] keys to select the measurement target (ceder, cypress, SG), and press the key to confirm.
- (3) The screen will automatically return to the measurement screen. Confirm that the selected timber name is displayed.
  - \* When SG is selected, the specific gravity value is selected from the range of 0.10 through 1.25.
  - \* When SG is selected, the specified specific gravity value is displayed on the measurement screen.
  - \* Up to three SGs are storable.



Material

Temperature compensation is automatically conducted on the basis of the temperature sensed with the internal temperature sensor. When the temperature difference between the timber and this unit is 10°C or more, or when the temperature of the timber to be measured is 40°C or more, select the manual setting, and enter the temperature of the timber to be measured.

- Select "Temperature C." with the [▲] and [▼] keys on the setting screen, and press the key.
- (2) Select "Automatic" or "Manual" with the [▲] and [▼] keys, and press the key to confirm.
  - \* When the manual compensation is selected, the selection is conducted from the range of -10 through 70°C.
- (3) The settings are saved and the measurement screen automatically be displayed.





When an object to be measured is 40 mm or less in thickness, compensation calculation using the plate thickness is conducted.

- Select "Thickness C." with the [▲] and [▼] keys on the setting screen, and press the key.
- (2) Press the [▲] and [▼] keys to select the plate thickness.
   When the plate thickness is 40 mm or more, enter 40 mm.
  - \* The plate thickness that can be specified is the range of from 10 through 40 mm.
- (3) Pressing the extreme key will save the settings and automatically display the measurement screen. Confirm that specified plate thickness is displayed on the measurement screen.
  - \* When an object to be measured is 40 mm or more in thickness, enter 40 mm.
  - \* When the timber thickness is less than 40 mm, refer to "9. Precautions in measurement" on page 29.
  - \* The plate thickness can be specified for each object to be measured (cedar, cypress, and SG). The selected object to be measured is updated with the specified thickness at that point.



#### 4 Alarm settings

The upper limit moisture can be specified. When the measured moisture value exceeds the specified value, a buzzer sounds.

- (2) Select "On" with the [▲] and [▼] keys, and press the even to confirm.
- (3) Press the  $[\blacktriangle]$  and  $[\blacktriangledown]$  keys to select the moisture value.
  - \* The moisture value that can be specified is the range of 2 through 40%.
- (4) Pressing the est key will save the settings and automatically display the measurement screen.



#### 5 Auto hold settings

When the measured value is stable for a certain period, the measurement result screen can be automatically held.

- Select "Autohold" with the [▲] and [▼] keys on the setting screen, and press the key.
- (2) Select "On" with the  $[\blacktriangle]$  and  $[\nabla]$  keys, and press the  $\mathbb{H}$  key to confirm.
- (3) Pressing the extreme key will save the settings and automatically display the measurement screen.
  - \* Releasing this device from the measurement target, raising it in the air in the state that the measurement result is held, and pushing it against the target again allows the hold state to be automatically cancelled and measurement to start.
  - \* When the hold function is automatically activated and is cancelled, a buzzer sounds.
  - \* Pressing the HOLD button in the state of holding the measurement result allows the hold state to be cancelled.
  - \* When the measurement value is unstable, refer to "9. Precautions in measurement" on page 29.

Temperature C. Thickness C. Alarm Autohold

Off On The brightness of the backlight and contrast can be adjusted.

- Select "Display" with the [▲] and [▼] keys on the setting screen, and press the key.
- (2) Select "Backlight" or "Contrast" with the [▲] and [▼] keys, and press the 
   key to confirm.
- (3) Select "Backlight" or "Contrast" with the  $[\blacktriangle]$  and  $[\blacktriangledown]$  keys
  - \* The backlight brightness is selectable from three levels; bright, moderate, and light off.
  - \* The contrast is selectable from 1 (low) through 10(high).
- (4) Pressing the key will save the settings and automatically display the measurement screen.
  - \* Activation of the backlight shortens the battery life.
  - \* If no operation is conducted for approx. 10 seconds, the backlight goes out for battery saving. If an operation is conducted, the backlight comes on again.

Thickness C.
Alarm
Autohold
Display
Backlight
Backlight Contrast
Backlight Contrast

Advanced settings can be conducted such as storing or outputting the measured data and correction of moisture values.

Refer to "8. Extension functions" for each setting of the extension functions.

### 8. Extension functions [Other settings]

 When the end key is pressed on the measurement screen and an extension function is selected on the setting screen, each item of the extension functions can be selected from 1 through 7.



- \* Refer to the page indicated in parentheses for the functions or purpose of each pattern.
- \* Four items are displayed on the screen, but pressing the [▲] or [▼] key allows the cursor to scroll up or down to the 1 through 7 settings in this order.
- \* The set item is kept until it is set even after the power is turned off.

1 Statistics

Statistical calculations are conducted with the use of the data stored in the memory. Maximum values, minimum values and standard deviations are displayed.

- Select "Statistics" with the [▲] and [▼] keys on the extension screen, and press the 
  key.
- (2) Select the range of data numbers used for calculation with the [▲] and [▼] keys, and press the select the keys to confirm.
- (3) The calculation result will be displayed. Pressing the [▲] or
   [♥] keys allows the screen to be scrolled up or down to display the average value and standard deviation.
- (4) Pressing the HOLD key will automatically display the measurement screen.
  - \* If the number of data stored in the memory is one or less, the statistical calculation cannot be used. When "No Data" is displayed on the screen, store two or more pieces of data.
  - \* The data deleted according to "2 Memorized data display" on page 22 cannot be used for the statistical calculation.

Statistics Memorized Data Correction Data Memory





The data stored in the memory is displayed. In addition, selected data can be deleted.

- Select "Memorized Data" with the [▲] and [▼] keys on the extension screen, and press the key.
- (2) The stored data number, measurement targets, and measured values are displayed in list form. Up to three pieces of data can be displayed at a time, but pressing the [▲] or [▼] key allows the cursor to scroll up or down to display the preceding and subsequent data.
- (3) When data is deleted, move the cursor on the number of the data to be deleted, and press the key. When the screen to confirm whether the deletion is determined is displayed, press the [▲] or [▼] key to move the cursor on Yes, and click on it. When data is not deleted, select No.



001 Ceder	12.3%
002 Ceder	12.5%
003 Ceder	12.1%



(4) Pressing the HOLD key will automatically display the mea-

surement screen.

#### **3** Moisture value correction

The measured moisture value is compensated with the use of the linear expression (ax+b).

- Select "Correction" with the [▲] and [▼] keys on the extension screen, and press the key.
- (2) Then move the cursor to "On" and press the street key.
- (3) Enter a slope correction value. Select the correction value with the [▲] and [▼] keys, and press the key to confirm.
  - \* The slope correction value is in the range of 0 through 2.50, and selectable in steps of 0.01.
- (4) Enter an offset correction value. Select the correction value with the [▲] and [▼] keys, and press the ■ key to confirm.
  - \* The offset correction value is in the range of -9.9 through 9.9, and selectable in steps of 0.1.

Statistics Memorized Data Correction Data Memory





- (5) The set correction value will be saved and the measurement screen will automatically be displayed.
  - \* If the moisture value is not corrected, select "Disable", and press the 🔜 key.
  - \* If the moisture value correction is selected, the correction icon () is displayed on the measurement screen.
  - \* The correction value can be specified for each object to be measured (cedar, cypress, and SG). The selected object to be measured is updated with the specified correction value at that point.

#### • Example of moisture value correction

Example 1) When the measured moisture value before correction is 10.1%, and the slope is set to 1.20 and the offset is set to 0.1

 $10.1 \times 1.20 + 0.1 = 12.22 \rightarrow 12.2\%$ 

Example 2) When the measured moisture value before correction is 15.5%, and the slope is set to 1.10 and the offset is set to -0.1

 $15.5 \times 1.10 - 0.1 = 16.95 \rightarrow 17.0\%$ 

The measured data can be stored in the internal memory.

- Select "Data Memory" with the [▲] and [▼] keys on the extension screen, and press the key.
- (2) Select "On" with the  $[\blacktriangle]$  and  $[\blacktriangledown]$  keys.
- (3) Pressing the key will save the settings and automatically display the measurement screen.
  - \* If it is not necessary to save the data, select "Off" and press the E
  - \* When the HOLD button is pressed at measurement or the autohold function is activated, the measured data is stored from the data No. 1 and in order. When the data No. exceeds 999, the number returns to No. 1 and the old data is overwritten by the new one.
  - \* To see the stored data, conduct "2 Memorized data display" on page 22.
  - \* To externally output the stored data, conduct "5 Data output" on page 26.



#### 5 Data output

The measured data stored in the internal memory can be outputted to a PC.

- \* To output the data to a PC, data logger software, HDL-02, (option) is required. Use the software on Windows with Microsoft Excel.
- Select "Data Output" with the [▲] and [▼] keys on the extension screen, and press the extension key.
- (2) Select "Transmit" with the  $[\blacktriangle]$  and  $[\triangledown]$  keys.
- (3) Pressing the experiment will output the data to the PC and automatically display the measurement screen.
  - \* If it is not necessary to output the data, select "Return" and press the End key.
  - \* Execute the data logger software, HDL-02, on the PC side, and let it be in the state of waiting for receiving data. For details, refer to the operating manual attached to HDL-02.
  - \* If communication with the PC cannot be established for a fixed time, the measurement screen automatically resumes.

Memorized Data Correction Data Memory Data Output



The measured data stored in the internal memory can be fully deleted.

- Select "Data Output" with the [▲] and [▼] keys on the extension screen, and press the extension key.
- (2) Select "Clear All Data" again with the  $[\blacktriangle]$  and  $[\triangledown]$  keys.
- (3) Pressing the key will delete all saved data and automatically display the measurement screen.
  - \* When data is not deleted, press the 📰 key.
  - \* All the measured data in the internal memory is deleted, the data No. returns to zero.
  - \* When only the specific data is deleted, start with "2 Memorized data display" on page 22.
  - \* Even after this operation is conducted, all the functions and correction settings are not deleted. Only the measured data stored in the internal memory is deleted.



The settings of date and time can be conducted.

- Select "Date and Time" with the [▲] and [▼] keys on the extension screen, and press the key.
- (2) Adjust the year. Select the year with the [▲] and [♥] keys, and press the key to confirm.
- (3) In the same way, adjust the "month, date, hour, and minute."
- (4) The settings are saved and the measurement screen automatically be displayed.





### 9. Notes Regarding Measurement

- Select a plane surface for measuring as much as possible to bring the moisture detection section into intimate contact with the surface.
- When an object to be measured is less than 40 mm in thickness, provide space of 80 mm or more below the measurement point and measure it.



• When an object to be measured is less than 10 mm in thickness, make the mea-

suring target 10 mm or more by stacking plural pieces of timber that are the same material and conduct measurement.

- The surface area of the object to be measured should be larger than 130 × 55 mm to prevent the moisture detection section from moving beyond the edge of the object.
- Put this device on an object to be measured to place the electrode of the moisture detection section in parallel with

the fiber direction of timber as shown in the illustration, and then, conduct measurement.



#### Notes

- Copying some or all of the contents of this user manual without prior written consent is strictly prohibited.
- The contents of this user manual may be changed at any time in the future without any prior notice.
- The appearance and/or representations of the products and parts depicted in this user manual may not appear exactly as their actual counterparts, but this does not affect their operation or functionality.
- This user manual was intended to be written as clearly and accurately as possible. However, if you are
  unclear about anything in this user manual or notice any missing information, please contact us directly.
- We cannot be held responsible for any actions or effects resulting from the execution of any operations outlined in this user manual.



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