



**T-M-170**

**Aquameter**

**Operator's Manual**

**Original Instructions: Revision August 2011**

## Notice

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The James Instruments Aquameter™ has been tested in accordance with the EU regulations governing Electro-Magnetic compliance and it meets required directives.

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We: James Instruments Inc.

Of: Chicago, IL

*In accordance with the following Directive(s):*

2006/95/EC      Low Voltage Directive

*hereby declare that:*

Equipment      Aquameter

Model Number      T-M-170

*is in conformity with the applicable requirements of the following documents*

Ref. No.	Title	Edition/date
ASTM F 2659	Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and Other Floor Slabs and Screeds Using a Non-Destructive Electronic Moisture Meter.	2010
ASTM D 4444	Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters.	2008

EN 61000-6-3	Electromagnetic Compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments.	2007
EN 61000-6-2	Electromagnetic Compatibility (EMC) Part 6-2: Generic Standards—Immunity for Industrial Environments.	1999

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

Signed:

A handwritten signature in black ink, appearing to read "Michael W. Hoag". The signature is fluid and cursive, with a large loop at the end of the last name.

Name: Michael Hoag

Position: President, James Instruments Inc.

Location: Chicago, IL

On: 8/2/2011

## Introduction

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The James Instruments Aquameter (T-M-170) is a powerful and versatile instrument which is used for measuring the dampness in building materials. This product enables building surveyors and other practitioners to measure the moisture levels of building elements such as walls, floors and other materials simply by switching between two different modes of operation – Pin and Search/Density.

### Features

- Small, lightweight, and easy to carry
- Convenient to use and operate
- Digital display gives a precise moisture reading
- Alarm values can be set by users
- Automatic power shut off to conserve battery power



## Aquameter Overview

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The following is an overview of all of the external features of the Aquameter.



Figure 1: Aquameter System Overview



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## Feature List

<b>Item #</b>	<b>Description</b>
1	Pin Probe
2	Search Probe
3	Symbol for Search Mode
4	Display
5	Jack for RS232C Interface
6	Color Coded LED
7	Up/Hold Key
8	Select Key
9	Jack for External Pin Probe
10	Down/Zero Key
11	Power Key
12	Battery Compartment/Cover (Back Side)

## Procedure

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- 1) After installing the batteries, press and release the power key, to turn 'ON' the Aquameter.
- 2) To verify the material code setting, press and release the Select key. The material code will be displayed for about 5 seconds. During this time, the code setting can be changed by using the Up/Hold or Down/Zero keys; when 'cdxx' is on the display.

Here 'cd' is the abbreviation for 'code', and 'xx' refers to the material number. By continuing to press (or hold) the Up/Hold or Down/Zero key, the material code will advance to next number once every second. Adjust this value until the material code is properly set for the material being tested.

2a) Code Selection for the **Pin Mode**. The material code for the Pin-type mode is listed in the Pin Code table on page 10 - Appendix 1. If the material to be measured is not listed in the table, select the standard code 'cd00'. Do this also if the material code must be ascertained by the standard oven-drying method.

**2b) Code selection for the Search/Density Mode.**

The standard material code for the search/density mode is 'cd10'; which is suitable for measuring materials whose density is like that of pine, fir, oak etc. The user can carry out an accurate measurement by selecting one of the material codes between 'cd01' and 'cd20.' The greater the density of the material to be measured, the larger the material code number to be selected. For measuring moisture in a concrete wall, the user should select a code around 'cd18'.

**2c) Factors affecting the choice of material code.**

There are many factors that affect the material code, for instance: different places, different soil - even if in the same place will lead to a different code for the same material. The best way to ascertain the material code is based on standard tests done by oven-drying commercial samples of the material to be measured. The code by which the measuring results are closest to those of the oven-drying method is the right code. Write down the code number for such material(s) for later use.

3) Moisture measurement. Check which operational mode the instrument is in by looking at the symbol '(●)' in the display. It is in a **Search Mode** if the symbol '(●)' shows up on the display. And it is in a **Pin Mode** if the display is without this symbol.

3a) Measurements if in a **Pin Mode**. Connect the Pin Probe into the external jack on the side of the test unit. (See Fig.1) Pop off the top of the Pin probe using your thumbs. (**Caution – the pins are very sharp.**) Push the pins firmly into the surface of the material, about 6 mm deep at the test point.

3b) Measurements if in a **Search Mode**. Hold the unit firmly in your hands, and using your thumbs, pop off the top of the test unit to expose the white sensor bar. This is the search probe for the unit. Place the search probe against the surface of the material (ie. a wall, floor, etc...) to be measured.

3c) Read the moisture level value from the display, and note the moisture condition of the material from the tri-color coded LED. (See display specs. or Alarm Limits below for more information.)

3d) To hold the max. value during measurements, just depress the Up/HOLD key until the symbol 'max' appears on the display. To display again the instant values, just press the Up/HOLD key until the symbol 'max' disappears from the display.

4) Zero Adjustment. The Zero adjustment feature enables the user to compensate for the effects of changes in both temperature and humidity. The Zero adjustment should be carried out independently in different modes.

4a) To perform a Zero Adjustment while in a **Pin Mode**, press the Power key to switch the meter 'on'. Verify the unit is in a Pin Mode (see steps 3 and 5). Let the pins of the meter touch nothing except the surrounding air. Press the Down/Zero key to make the meter display read '0'. The meter is now zeroed.

4b) To perform a Zero Adjustment while in a **Search/Density Mode**. Keep the search probe of the meter at least 15 cm away from the surface of any material. Then press the Down/Zero key to make the meter display '0'. The meter is now zeroed.



5) Changing the measurement mode. To switch between modes, press and hold the Select key until the letters 'CH' appears on the display. When this is seen, release the Select key, and the mode has now changed to the other mode. Which mode is the Aquameter in now? (See step 3 above to verify.)

## Alarm Limits

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1) There is a Tri-color coded LED indicating the status of moisture. It is controlled by 2 alarm limits. The factory settings are: AL1 = 13 and AL2 = 18. Thus, if the reading is  $<AL1$ , the LED is **Green**. If the reading is  $>AL2$ , the LED is **Red**. And if the reading lies between AL1 and AL2, the LED is **Yellow**. (Note: Users can adjust the alarm limits above according to their needs; see below.)

2) How to set the alarm limits.

2a) Depress and hold the Select key until 'AL1' or 'AL2' appears on the Display. (This should take about 7-9 seconds after pressing the Select key.)

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2b) These values can be adjusted according to your needs by pressing the Up or Down keys. Then when complete, press the Select key again to return to the measurement mode. (**Warning:** If the second limit AL2 is less than the first limit AL1, the setting is invalid, and the factory settings for AL1 and AL2 are restored to AL1 = 13 and AL2 = 18 automatically.)

## Considerations

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- 1) Although this instrument is designed with a high input resistance, and adequate insulation; please store it in a dry, dustproof place when not in use.
- 2) The measured results may vary, if taking the measurement from different directions of the surface. This is because water in the material tested may not be distributed evenly throughout.
- 3) Although this instrument is designed to measure the surface (or near to surface) moisture level, it is not meant to be used on a wet surface.



## Battery Replacement

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When the battery symbol appears on the display, it is time to check or replace the batteries. Open the back compartment of the unit. Remove the old batteries, and install new ones; paying close attention to the battery polarity.

## Appendix 1: Pin Code Table

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Code	Material
Cd00	Abies grandis, Acer macrophyllum, Maple, Acer saccharum, Pine (scots), yellow Pine, Dalbergia latifolia, Dipterocarpus zeylanicus, Eucalyptus microcorys, Fraxinus excelsior, Cupressus spp, Pinus contorta, Pterygota bequaertii, Quercus robur, Pinus sylvestris, Balsa, Boxwood (maracaibo), red Gum (American), Gum spotted, Gurjun, Birch, Cypress (African) Karri, Oak (European), Oak (Japanese), black Poplar, Redwood (Baltic European), Rosewood (Indian), Pine (lodgepole), Tallowood, Walnut (American), Kapur



Cd01	Araucaria bidwilli, Eucalyptus crebra, Eucalyptus saligna, Flindersia brayleyana, Fraxinus Americana, Intsia bijuga, Podocarpus dacrydioides, Sequoia sempervirens, Pinus pinaster, Gum (southern), Mahogany (west Indian), Douglas fir, Maple (queensland), red (light or dark) Meranti, white Meranti, Redwood (Californian), Walnut (new guinea), white Pine (new Zealand), Araucaria angustifolia
Cd02	Distemonanthus benthamianus, Jarrah, Endiandra palmerstonii, Erythrophleum spp, Abies alba, Fagus sylvatica, Grevillea robusta, Juglans regia, Larix deciduas, Larix occidentalis, Podocarpus spicatus, picea abies, Pinus caribaea, Pinus nigra, Pinus palustris, Pinus ponderosa, Pinus radiata, Taxus baccata, Thuja plicata, Tsugaheterophylla, red Cedar (western), Chestnut, Greenheart, Hemlock (western), Larch (European), Larch (Japanese), Queensland walnut, red Seraya, Spruce, Silky oak (African), Silky oak (Australian), Pine (Corsican), Pine, radiate, Walnut (European), Walnut (queensland), Whitewood, Yew, Pine (ponderosa), Stringybark, Oak (tasmanese)
Cd03	Khaya senegalensis, Podocarpus totara, Quercus cerris, Ulmus American, Ulmus procera, Ulmus thomasii, Afzelia, Kauri (new Zealand), Lime, Elm (English), white Elm, Matai, Oak (Turkey), Pyinkado

## Appendix 1: Pin Code Table

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Cd04	Acer pseudoplatanus, Carya glabra, Sycamore, Cassipourea elliotti, Dipterocarpus (keruing), Teak, Cordia aliodora, Larix occidentalis, Pterocarpus soyauxii, Hickory, Padauk (African)
Cd05	Afromosia elata, Diospyros virginiana, Gonystylus macrophyllum, Pterocarpus indicus, Afromosia, Amboyna, Basswood, Coachwood, Persimmon
Cd06	Calophyllumbrasiliense, Guarea cedrata, white Guarea
Cd07	Abies procera, Agathis robusta, Betula pendula, Croton megalocarpus, Prunus avium, Agba, Birch (European), Cedar (west Indian), black Guarea, Kauri (queensland), Walnut (African), Cherry (european), Utile
Cd08	Chipboard, Paper
Cd09	Building, Wall, Concrete

## Appendix 2: Search/Density Code Table

Density	Code	Materials
Kg/m <sup>3</sup>		(Only for Reference)
200	1	
220	2	
240	3	Foam
		Soft Wood
320	4	Felt
400	5	Peat
		Charcoal
440	6	Coke
480	7	White Lime
520	8	
560	9	Veneer
		Timber, Chipboard
600	10	Pine, Fir, Oak
800	11	Leather, Slag, Kerosene, Alcohol
		Polyethylene
1000	12	Soft Coal, Bamboo, Paraffin
		ABS
1200	13	Clunch, Organic Glass
		Asphaltum, Lime
1400	14	Bakelite, Fiberboard
		Rubber
1600	15	Stone, Sand (Dry)
		Clayey Brick

## Appendix 2: Search/Density Code Table

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1800	16	Asbestine Board
		Vitriol (87%)
2000	17	Sand (Wet)
		Bricklaying, Firebrick
2200	18	Quartz Glass
		Concrete, Asbestos, Plaster
2500	19	China, Glass
3000	20	Marble, Granite, Magnetite

## Maintenance

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### Replacing Pin Probes

After using the Aquameter Pin Probes a number of times to puncture various materials, the Pin Probes will begin to wear down and become dull or break. In this event, the Pin Probes should be replaced.

Included with the Aquameter are two replacement Pin Probes. Using a pair of pliers, unscrew the two Pin Probes from the sensor and discard them. Screw in the two replacement Pin Probes and tighten with pliers.



## Safety

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- Do not drop in water
- Use caution with Pin Probes, as they are sharp and can puncture the skin

## Specifications

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### Aquameter T-M-170

#### Display:

4 digits, 10 mm LCD

Tri-Color coded LED indication

- **Green** - represents a safe, dry air state
- **Yellow** - represents a borderline state
- **Red** - represents a damp state

#### Measurement Range:

0 - 80% (cd00 for Pin type)

(cd10 for Search/Density type)

#### Material Codes:

Cd00~cd09 in a pin mode (standard code:cd00)

Cd00~cd20 in a search mode (standard code:cd10)

**Power Off (2 modes):**

Manual 'OFF' - at any time

Auto 'OFF'- after 5 minutes from last key operation

**Operating Conditions:**

Temperature: 0 - 50°C

Humidity: below 90% RH (Relative Humidity)

**Dimensions:**

165mm x 62mm x 26 mm

(~6.5 in. x 2.4in. x 1.0 in)

**Weight:**

175g (not including batteries)

**Standard Accessories Included:**

- Carrying Case 1 pc.
- Operation Manual 1 pc.
- Separate Probe 1 pc.
- AAA Batteries 4 pcs.
- Replacement Pins 2 pcs.



## Warranty Information

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James Instruments Inc. warrants to the original user, that each product of its manufacture is free from defects in material and factory workmanship.

James Instruments Inc. obligation under this warranty is limited to correction without charge, any part found to have material or workmanship defects when returned to its factory, transportation, prepaid, within 12 months of manufacture.

James Instruments Inc. shall not be liable for loss, damage, or expenses directly or indirectly from the use of its product or from any other cause.

James Instruments Inc. shall declare the warranty void if it is found that the equipment has been opened, misused or tampered with.



## Repair Policy

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United States | Canada | International

Ship the instrument in a box that meets UPS, Fed Ex, and standard shipping regulations. Enclose a note describing the problem(s) you are having. Include the name and phone number of the contact person in your organization.

The instrument will be evaluated within one week of receipt. The contact person will be notified with an estimate of the cost of the repair.

Upon receipt of your authorization of repair and payment terms, delivery time will be 2 weeks from that day.

If you need the repair back sooner than this, you have the option of paying an express service fee of 10 percent of the purchase price of said instrument, plus the repair cost. With this service, you can receive the instrument back within 3 working days in the USA (5 working days for Europe).

International repair shipments must contain a commercial invoice listing the instrument being returned and must contain the words:



Country of manufacture: USA

Instrument being returned to manufacturer for repair  
– no value for customs, value for carriage only.



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