

**NDT**

**JAMES INSTRUMENTS**

*Non Destructive Test Equipment*



**T-M-170**

**Aquameter**

Operator's Manual

Original Instructions: Revision February 2012

## Notice

---



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

Aquameter™ is a registered trademark of James Instruments Inc. and is property of its respective owner.

**© 2012 James Instruments Inc. All rights reserved.**

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without prior written permission of James Instruments.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because James Instruments is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, James Instruments assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

## Table of Contents

---

Introduction.....	1
Features .....	1
Aquameter Overview.....	2
Feature List.....	3
Procedure.....	4
Alarm Limits.....	8
Considerations .....	9
Battery Replacement.....	10
Appendix 1: Pin Code Table .....	10
Appendix 2: Search/Density Code Table .....	13
Maintenance.....	15
Replacing Pin Probes .....	15
Safety .....	16
Specifications .....	16
Warranty Information.....	18
Repair Policy .....	26

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: 2/2/2012

## Introduction

---

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

---

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



Figure 1: Aquameter System Overview



## 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

---

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

---

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.)

---

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

---

- 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

---

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

---

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



## Appendix 1: Pin Code Table

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 radiate, 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

---

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	Calophyllumbrasilense, 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

---

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

---

### 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

---

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

## Specifications

---

### 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

---

### 1. Contract

Unless otherwise stated all sales transactions are expressly subject to these terms and conditions. Modification or additions will be recognized only if accepted in writing by an authorized Officer of James Instruments Inc. (hereinafter referred to as “James” or the “Company”), or an officially designated representative. PROVISIONS OF BUYER'S PURCHASE ORDER OR OTHER DOCUMENTS THAT ADD TO OR DIFFER FROM THESE TERMS AND CONDITIONS ARE EXPRESSLY REJECTED. NO WAIVER OF THESE TERMS AND CONDITIONS OR ACCEPTANCE OF OTHERS SHALL BE CONSTRUED AS FAILURE OF THE COMPANY TO RAISE OBJECTIONS.

### 2. Warranties

The Company only warrants the equipment manufactured or supplied by the Company as set forth herein. James makes no other warranties, either expressed or implied (including without limitation, warranties as to merchantability or fitness for a particular purpose). In no event shall James be liable for any type of special, consequential, incidental, or penal damages, whether such damages arise out of or are a result of breach of contract, warranty, negligence, strict liability or otherwise. Warranty shall not apply where the equipment manufactured or supplied has been subject to accident, alteration, misuse, abuse, improper storage, packing, force majeure, improper operation, installation, or servicing. In addition, the following shall constitute the sole and exclusive remedies of Buyer for any breach by James of its warranty hereunder.



### **a. New Products**

James warrants the equipment manufactured or supplied by James as set forth herein. This limited warranty can only be exercised by the original purchaser of the equipment from James or authorized James Agent and is not transferable to any subsequent owner or party. This limited warranty gives you specific legal rights, and you may also have other rights which vary from case to case.

### **i. For James Equipment**

James warrants that James's equipment will be free from defects in materials and workmanship for a period of twenty-four (24) months on the electronic portion and six (6) months on the mechanical portion from the date of shipment of equipment from James to Buyer. Should any defects be found and reported by the Buyer during the applicable limited warranty period, the defect will be corrected upon return of the item to James. James will, during the applicable new equipment warranty period, provide the necessary replacement parts and labor to correct the defect.

Excluded from the new equipment warranty are all consumable and wear and tear items such as impact bodies, penetrators, connection cables, etc. These items are subject to usual wear and tear during usage. Refer to the Consumable, Wear and Tear Items section of this warranty document.

### **Option For Extended Limited Warranty Coverage**

The original purchaser of any new equipment of James which have been identified or labeled by James from time to time in James's sole discretion as being eligible for extended warranty coverage shall have the option to purchase certain extensions of the applicable limited warranty provided hereunder to the electronic portion of any such items for either a twelve (12), twenty-four (24) or thirty-six (36) month period (up to a possible maximum limited warranty coverage period for the electronic portions of such new James equipment of sixty (60) months) by purchasing any such twelve (12), twenty-four (24) or thirty-six (36) month limited warranty extension period either at the time of the purchase of any such item(s) or within ninety (90) days from the date of delivery of the subject item(s) of the original purchaser of such item(s). The price for each such extended limited warranty coverage period shall be as determined by the Company from time to time and all such purchases of any extended warranty coverage periods shall only be effective upon a completed purchase order and payment directly between James and the original purchaser of any such item(s). The extended warranty coverage periods are only valid with respect to the original purchaser of such

item(s) from the Company and such extended warranty coverage is not transferable to subsequent owners of the subject item(s) or any other parties. Upon the purchase of any extended limited warranty coverage period, the Company will issue a certificate to Buyer evidencing the details of the applicable extended warranty coverage period purchased by the Buyer.

**ii. For Other Manufacturer's Products Supplied by James**

Products of other manufacturers supplied as such by James are warranted by James only to the extent of any warranty provided by the original manufacturer, if any.

**iii. For Parts and Sub-Assemblies**

Parts or sub-assemblies purchased by the Buyer to perform its own repair work etc. are warranted as provided hereunder by James for six (6) months from date of shipment of material from James to Buyer.

**iv. For Consumables, Wear and Tear Items**

James supplies consumable items and items subject to wear and tear during normal usage of James supplied products. These items are not covered under warranty. Buyer is to check for proper fit, form and function of such items upon receipt of such items. In case of a defect condition, Buyer can return the item to James for evaluation within thirty (30) days of

the date of shipment to the Buyer. James reserves the exclusive right to issue full, partial, or no credit to the Buyer based on the condition of the returned item and circumstances related to the return. Examples of items in this category: connection cables, test blocks, impact bodies, penetrators, probes, extraction liquids, calibration liquids, pins, recording paper, test plugs, etc.

### **b. Calibration and Repair**

#### **i. For Calibration Services**

James does not warrant the calibration of any equipment. James does however warrant the equipment manufactured by it, in proper working condition, to be capable of being adjusted to meet James printed specifications, if any, for accuracy and performance as to the particular model type during the period of warranty applicable as stated above.

#### **ii. For Repair Services**

James warrants repair work performed under the direct control and supervision of James personnel for a period of three (3) months from the date repairs are completed either at James or at the customer site. Should the defect for which the repair work was performed reoccur within this period, James

will supply the necessary parts and labor (repair at James facility) or parts (repair at Buyer facility) required to repair the original equipment defect for which the repair parts and labor were required. Additional repair charges that may be incurred in conjunction with any repair service warranty event will be invoiced at the James customer service rates and policies in effect at the time of the event.

Excluded are all consumable and wear and tear items such as impact bodies, probes, connection cables, etc. These items are subject to usual wear and tear during usage. Refer to the Consumable Wear and Tear Item section of this warranty document.

### **c. Warranty Claims**

#### **i. For Warranty Claim Processing**

James has established James organizations in the Americas, and Europe. Please visit the James web site [www.ndtjames.com](http://www.ndtjames.com) for latest address and contact information for the James organization nearest you.

### **3. Regulatory Laws and/or Standards**

The performance of the parties hereto is subject to the applicable laws of the United States. The Company takes reasonable steps to keep its products in conformity with various nationally recognized standards and such regulations, which may affect its products. However, the Company recognizes that its products are utilized in many regulated applications and that from time to time



## Warranty Information

---

standards and regulations are in conflict with each other. The Company makes no promise or representation that its product will conform to any federal, provincial, state or local laws, ordinances, regulations, codes or standards except as particularly specified and agreed upon for compliance in writing as a part of the contract between Buyer and the Company. The Company prices can not include the cost of any related inspections or permits or inspection fees.

### 4. Notices

Notice by either the Company or Buyer will be made only by facsimile or similar electronic transmission, effective on the first business day after confirmed receipt, or by letter addressed to the) other party at its address as provided in this Agreement, effective three (3) business days after deposit with the U.S. Postal Services, postage prepaid, or one (1) business day after deposit with a recognized overnight express service.

### 5. Interpretation

Should any term or provision contained In the contract contravene or be invalid under applicable law, the contract shall not fail by reason thereof but shall be construed in the same manner as if such term or provision had not appeared therein.

### 6. Assignability

Neither this contract nor any claim arising directly or indirectly out of or in connection herewith shall be assignable by Buyer or by operation of law, without the prior written consent of Company. This document shall be binding upon and inure to the benefit of each party hereto and their respective permitted successors and assigns.

## 7. Governing Law

This Agreement shall be governed by and construed in accordance with the internal laws of the State of Illinois, without regard to its conflict of laws provisions. Buyer and the Company expressly agree to submit to the personal jurisdiction of the federal and/or state courts sitting in Chicago, Illinois, U.S.A. and agree that such courts may be utilized if necessary to obtain injunctive or any other relief. The Hague Convention and the United Nations Convention on Contracts for the International Sale of Goods shall not apply to the construction or interpretation of these Standard Terms and Conditions or affect any of its provisions.

END.

### Promat (HK) Ltd

901 New Trend Centre, 704 Prince Edward Road, San Po Kong, Kowloon, Hong Kong

寶時(香港)有限公司 香港九龍新蒲崗太子道東 704 號新時代商業中心 901 室

Tel.: (852) 2661 2392 Fax.: 2661 2086 e-mail: info@promat.hk Website: <http://www.promat.hk>



*Your Solution To Testing Instrument*