

PosiTector[®] **CMM IS**

Concrete Moisture Meter - In Situ

Instruction Manual v. 1.0

Conforms to

ASTM F2170

*Standard Test Method
for Determining Relative
Humidity in Concrete Floor
Slabs using in situ Probes.*



Introduction

The **PosiTensor CMM IS** concrete moisture meter measures the relative humidity and temperature in concrete slabs using in situ probes, prior to the application of flooring materials or coatings.

When applying flooring materials or coatings to concrete, it is critical to ensure that the moisture level inside the concrete has decreased to acceptable levels. If not, moisture can accumulate below the flooring or coating, causing discoloration, cupping, buckling, blistering, adhesive failure and mold growth.

Designed in accordance with ASTM F2170, the **PosiTensor CMM IS** provides a complete measurement solution for monitoring the drying process of concrete slabs in compliance with industry standards. The unique design of the **PosiTensor CMM IS** probes allow the user to place them into concrete immediately after the holes are drilled and leave them in place until they reach equilibrium, eliminating the need to reopen the hole at a later date.

PosiTensor CMM IS probes broadcast measurements to the **PosiTensor App** (pg. 9) or **PosiTensor Advanced** instruments (pg. 11) using Bluetooth wireless technology.

The **PosiTensor CMM IS** is available in 3 kit configurations: **Basic, Complete and Professional.**

		
Basic Kit CMMISKITB	Complete Kit CMMISKITC	Professional Kit CMMISKITP3-E
• 3 CMM IS probes • 3 Saturated Salt Solutions • 3 Calibration Check Chambers • 3 Caps • Extraction Tool • Tape Measure • Ten A-76/LR-44 batteries	• 5 CMM IS probes • 5 Saturated Salt Solutions • 5 Calibration Check Chambers • 5 Caps • Extraction Tool • Tape Measure • Vacuum Tool Attachments • Ten A-76/LR-44 batteries • Hard shell carrying case	• PosiTensor DPM3 • 5 CMM IS probes • 5 Saturated Salt Solutions • 5 Calibration Check Chambers • 5 Caps • Extraction Tool • Tape Measure • Vacuum Tool Attachments • Ten A-76/LR-44 batteries • Hard shell carrying case

Expansion Packs

PosiTector CMM IS Expansion Packs are available when additional probes are required. A single expansion pack consists of the following:

- PosiTector **CMM IS** probe
- Calibration Check Chamber
- Saturated Salt Solution (NaCl)
- Cap
- (2) A-76 / LR-44 batteries



NOTE: For instructions on how to use the **PosiTector CMM IS** and the **PosiTector App** in accordance with ASTM F2170, refer to **Setting Up a New ASTM F2170 Project** (pg. 6).

Quick Start

PosiTector CMM IS probes are designed for use with the **PosiTector App** or a **PosiTector Advanced Gage**.

Power-up **PosiTector CMM IS** probes by unscrewing the battery cover and inserting the battery (positive "+" facing up). Replace the battery cover. The probe will begin broadcasting and is now visible to the **PosiTector App** and **PosiTector Advanced** instruments.

To power down the **PosiTector CMM IS** probe, unscrew battery cover and remove battery using a pointed tool, such as the probe extraction tool.



Viewing Readings from PosiTector **CMM IS** probes

PosiTector **CMM IS** measurement values can be viewed using the PosiTector App or a PosiTector Advanced instrument. To record measurement values, see **How to Measure** (pg. 7)

Using the PosiTector App:

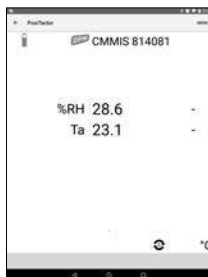
Install the PosiTector App from the App Store (Apple iOS) or Google play (Android).

Open the PosiTector App. Available probes within 10 m (30 feet) will appear as "CMMIS" with the corresponding serial number, as shown below:



The small circle icons to the left of each PosiTector **CMM IS** probe display the most recent Relative Humidity reading. This value is updated every five minutes.

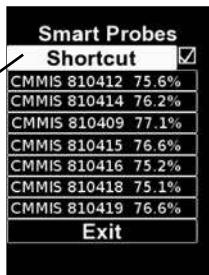
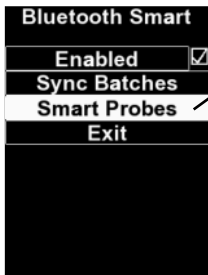
To view measurements from the PosiTector **CMM IS** probe, select it from the search screen. Once connected, a blue light is emitted from the bottom of the probe and values are updated every five seconds and displayed as shown to the right. The battery indicator in the top left corner shows the battery level of the PosiTector **CMM IS** probe.



Using a PosiTector Advanced:

To view available probes, select **Bluetooth Smart** from the gage's **Connect** menu. Then select **Smart Probes** (shown below):

Available probes within 10 m (30 feet) will appear as “**CMM IS**” with the corresponding serial number and latest relative humidity reading, as shown below:



Checking the **Shortcut** box on the Smart Probes screen will enable access to the Smart Probes screen from the gage's main menu:

Select a probe to display its Relative Humidity and Temperature values. Once connected, a blue light is emitted from the bottom of the probe and values are updated every five seconds.

NOTE: When a PosiTector **DPM** environmental probe is attached to the PosiTector body, PosiTector **CMM IS** measurement data can be recorded into the gage's memory. When any other probe is attached, such as a PosiTector **6000** probe, PosiTector **CMM IS** readings can be viewed only.

Calibration & Verification of Accuracy

Calibration

Calibration is typically performed by the manufacturer or a qualified lab. All PosiTector **CMM IS** probes include a Certificate of Calibration. In accordance with ASTM F2170, probes must be recalibrated annually. DeFelsko recommends beginning the calibration interval from either the date of calibration, date of purchase, or date of receipt.

Verification of Accuracy

It is recommended that PosiTector **CMM IS** probes be stored

within the Calibration Check Chamber when not in use. The Calibration Check Chamber and Saturated Salt Solution are designed in accordance with ASTM E104 to maintain a constant relative humidity. Per ASTM F2170, the Calibration Check Chamber and Saturated Salt Solution maintain a constant relative humidity of 75% (at 25° C) and keeps the probe in a ready-to-use condition.

ASTM F2170 requires calibration to be verified within 30 days prior to use. Power-up the probe by inserting a battery, positive (+) side up. Probe calibration is verified by inserting a probe into the Calibration Check Chamber, connecting to either the **PosiTector App** or a **PosiTector Advanced** gage body and taking a measurement (after allowing the probe at least 1 hour to acclimate to the present environment). Probes should report a relative humidity within 2% of the humidity value listed in Table 1 for the corresponding temperature. To simplify the verification process, we recommend using the Cal Check function of the **PosiTector App** or **PosiTector Advanced**. The Cal Check function automatically determines whether a probe is reading within tolerance.

Probes should be allowed to acclimate for at least 24 hours within the Calibration Check Chamber and Soluble Salt Solution before calibration is checked.

It is important to maintain a constant temperature within the Calibration Check Chamber. Relative humidity variation due to temperature fluctuation for the Calibration Check Chamber is shown in Table 1.

Table 1

Extracted from Table A1.1, Equilibrium Relative Humidity Values for Selected Saturated Aqueous Salt Solutions (ASTM E104)

t °C	t °F	Sodium Chloride (RH %)
5	41	75.7 ± 0.3
10	50	75.7 ± 0.3
15	59	75.6 ± 0.2
20	68	75.5 ± 0.2
25	77	75.3 ± 0.2
30	86	75.1 ± 0.2
35	95	74.9 ± 0.2
40	104	74.7 ± 0.2
45	113	74.5 ± 0.2

Example Tolerance Calculation:

At 25° C, the Soluble Salt Solution relative humidity range is 75.3% ± 0.2. Including the ±2% relative humidity tolerance specified in ASTM F2170, a probe would be considered to be in tolerance if it measured between 73.1 – 77.5 %.

NOTE: When the Saturated Salt Solution (Boveda) is completely dry, it will solidify. They should be replaced while there is still moisture present and before they are completely solid.

How to Measure (in accordance with ASTM F2170)

PosiTector CMM IS probes, coupled with the **PosiTector App** or **PosiTector DPM Advanced** simplify the process of viewing, recording and reporting in accordance with ASTM F2170.

Step 1. Evaluate the location to determine how many tests must be performed.

ASTM F2170 specifies that 3 tests must be performed for the first 100 m² (1000 ft²) of concrete and one additional test for each 100 m² (1000 ft²) of concrete. One test must be performed within 3 ft. (1 m) of each exterior wall.

Step 1b (if using the PosiTector App). The **PosiTector App** makes it easy to view, record and report in accordance with ASTM F2170. The app is available within the App Store (Apple iOS) and Google play (Android).

Open the **PosiTector App** and select **F2170** from the top menu bar. Next, select **New Project** and enter the job details.

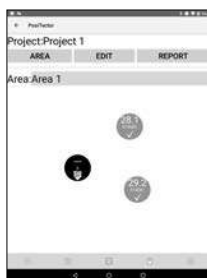
A **PosiTector DPM Advanced** instrument or spare **PosiTector CMM IS** probe can be used to record ambient temperature as required by ASTM F2170. Under Ambient Instrument, select an available **PosiTector DPM Advanced** or **PosiTector CMM IS** probe. To enable broadcasting, ensure the **PosiTector Advanced** is powered on (Bluetooth Smart enabled) or the battery in the **PosiTector CMM IS** probe is installed.



Select **OK** to save the project.

Step 1c (PosiTector App only). If desired, insert a picture or blueprint of the area to be measured. Use the  to take a photo of the blueprint, or use the  to insert an image from the photo gallery. This background image will make it easy to locate each probe within the area.

Step 1d (PosiTector App only). Press the (+) icon at the bottom right of the Project screen and then touch the screen in the desired location to place the hole. The new hole location will be overlayed on the image and will be identified as a circle containing --- 0. Repeat this for each measurement location within the Area. Create additional Areas as required.



Step 2 – Drill the Hole

ASTM F2170 sets out strict requirements for hole depth and diameter. Using a rotary hammer drill with a carbide-tipped masonry drill bit ($\frac{3}{4}$ " diameter), drill the hole to the required depth. Do not use water for cooling or lubrication.

Hole depth requirements according to ASTM F2170:

- Concrete slab drying from one side only:
40% depth from top of slab
- Concrete slab drying from two sides:
20% depth from the top of the slab

Step 3 – Clean and Inspect the Hole

Ensure any dust and debris are removed from the hole. The vacuum attachment included with the **Complete Kit** and **Pro Kit** is ideal for this purpose. It can also be purchased separately from your dealer.

Per ASTM F2170, check the diameter and depth of the hole using the included tape measure. If either dimension is incorrect, the hole must be re-drilled and cleaned. Incorrect hole diameter may cause difficulty inserting or removing a **PosiTector CMM IS** probe.

If using the PosiTector App, touch the circle corresponding to the a hole, and record the location, depth and date/time the hole was drilled. Select **Set Now** to input the current time and date, or input it manually.



Step 4 – Insert the Probe

PosiTector CMM IS probes are designed to be placed into the hole as soon as the hole has been prepared. Remove the probe from the Calibration Check Chamber and Saturated Salt Solution, unscrew the battery cover and insert the battery, (+) positive side up. Replace the cover.

The probe will immediately begin broadcasting readings via Bluetooth, and can be viewed from the **PosiTector App** (pg. 9) or a **PosiTector Advanced** (pg. 11).

Once powered-up and operational, insert and push the probe completely to the bottom of the hole. Cover the hole using the included yellow plastic cap. Per ASTM F2170, the probe must remain in the hole for 72 hours to achieve moisture equilibrium before measurements are recorded.

If using the PosiTector App, touch the circle corresponding to the hole, and select the serial number of the inserted probe to associate that probe with the hole.

Record the date and time each probe is inserted by selecting **Set Now** to automatically set the current time and date, or input it manually.

The screenshot shows the PosiTector app interface. At the top, it says 'PosiTector'. Below that, there are fields for 'Location' (Northern Corner), 'Depth' (Drilled), and a timestamp '2017-12-04 15:45:57' with a 'Set Now' button. The 'Probe' section includes 'Serial Number' (814083), 'Last Cal' (2017-12-01), and 'Inserted' (2017-12-08 09:01:27) with a 'Set Now' button. Below this are 'RH' (28.1) and 'Ta' (22.8) with a 'Measured' button and a timestamp '2017-12-08 09:01:35'. The 'Ambient' section shows 'RH' (34.8) and 'Ta' (22.7) with a 'Measure' button. At the bottom is a 'Notes' section with a text input area.

NOTE: A new battery will continuously power the probe for up to 3 weeks.

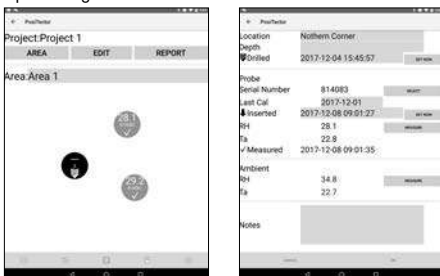
Step 5 – Record Measurements

ASTM F2170 requires waiting 72 hours, before probe measurements are recorded. There is no need to remove the yellow cap or to access the probes in the holes. The probes remain powered-on and broadcasting while in situ.

To Record Measurements Using the **PosiTector App**:

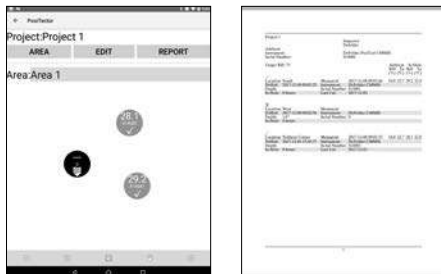
1. Open the **PosiTector App** and select **F2170** from the top menu bar.
2. Open the associated Project.

- Record measurements for each hole in the project:
To record probe measurements, touch the circle corresponding to the hole and touch the **Measure** button to record the Relative Humidity and Temperature within the corresponding hole.



Ambient Relative Humidity and Air Temperature (above the hole) can be recorded using a spare **PosiTensor CMM IS** probe or **PosiTensor DPM Advanced** instrument. The ambient instrument being used is specified within the **Project setup** (pg. 6). Select **Measure**, and then **Ok** to store the displayed values. Alternately, a relative humidity and temperature value can be entered manually.

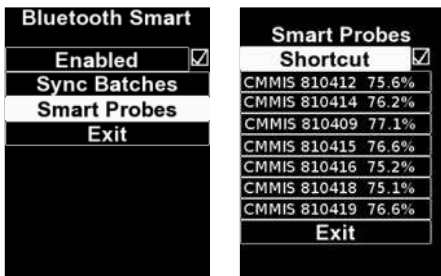
Repeat **Step 3** for each hole in the project. Once readings have been recorded for all holes in the project, professional reports can be generated that conform to ASTM F2170. Select **REPORT** from within the Project to automatically generate the report.



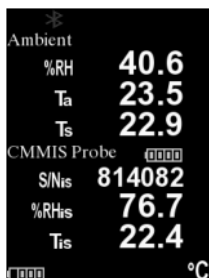
NOTE: More detailed instructions on using the **PosiTensor App** is available in the Help File, located at www.defelsko.com/app-help

To Record Measurements Using a PosiTector **DPM** Advanced:

1. Access the **Connect** Menu within the gage menu.
2. Under **Bluetooth Smart**, select **Smart Probes** (shown below). Available PosiTector **CMM IS** probes will be visible. Select the probe to be recorded.



3. The relative humidity and temperature measured by the PosiTector **CMM IS** probe will be displayed below the ambient relative humidity, air temperature and surface temperature measured by the PosiTector **DPM** probe, as shown below:



To record, ensure a batch is open in memory and press the (+) button on the gage. The displayed readings of the PosiTector **DPM** probe and the PosiTector **CMM IS** probe will be recorded into the gage's memory. If a batch is not currently open, select **New Batch** from the gage's Memory menu. To add measurements to an existing batch, select **Open** from the gage's Memory menu.

Measurements from multiple PosiTector **CMM IS** probes can be recorded within the same batch by repeating the above steps for each probe in the project.

NOTE: If any probe other than the **PosiTector DPM** probe is attached to the **PosiTector Advanced** body while connected to a **PosiTector CMM IS** probe, the gage body will ignore the attached probe and only display the **PosiTector CMM IS** measurements.

Recorded measurement values can be reported using PosiSoft Solutions. See the **PosiTector DPM** Instruction Manual for more information.

Step 6 – Remove the PosiTector CMM IS Probes

The **PosiTector CMM IS** probes are designed to be reusable. Once measurements are complete, use the extraction tool to remove the probes from the holes. Clean any visible debris or concrete dust from the probes and inspect the silicone fins. If the silicone fins are damaged or worn, they should be replaced. If no further tests are required, remove the batteries by unscrewing the battery covers and pushing the battery out using the probe extraction tool and place each probe into a Calibration Check Chambers for storage.

Once testing is complete, the holes should be filled with a cementitious patching compound in accordance with ASTM F2170.

Specifications	Range	Accuracy	Resolution
Temperature	0° to 80° C	± 0.5° C	0.1° C
	32° to 175° F	± 1° F	0.1° F
Humidity	10 to 90%	± 2%*	0.1%
	> 90%	± 3%*	

* 0 – 65° C (32 – 150° F)

Troubleshooting

The **PosiTector CMM IS** Probe does not appear in the **PosiTector App** or in the **PosiTector Advanced Gage Body** after the battery is inserted

Check the battery in the probe and replace if required. Ensure Bluetooth is enabled on the Smart device running the **PosiTector App** or Bluetooth Smart within the **PosiTector** body.

RH value is slow to stabilize

If the probe is exposed to very low humidity for an extended time period and then placed in a high humidity environment, the displayed Relative Humidity (RH) may appear to respond slowly. Allow the probe to stabilize at least 60 minutes for a change of RH greater than 50%. When placed into the Calibration Check Chamber, allow at least 24 hours for the relative humidity to stabilize.

Returning for Service

For issues related to the **PosiTector CMM IS** probes:

1. Install new batteries in the proper alignment as shown within battery compartment.
2. Examine the sensor for debris or damage.
3. Re-attempt measurement.

For Issues related to the **PosiTector Advanced Gage Body**:

1. Perform a Hard Reset as follows:
 - A. Power down the Gage and wait 5 seconds.
 - B. Simultaneously press and hold the (+) and center buttons until the **Reset** symbol appears.

This returns the Gage to a known, "out-of-the-box" condition.

WARNING: All readings in memory will be erased.

2. Update your **PosiTector** gage body and re-attempt measurements.

If these steps do not resolve the issue, visit our Service & Support page for information on sending your Gage to us for a no charge evaluation. See: <http://www.defelsko.com/service>

For issues related to the **PosiTector App**, please refer to the Help File located at: www.defelsko.com/app-help

