Quick Start Guide

ProCheck Water Activity Handheld Readout Device

AQUA LAB® BY DECAGON

Surface Water Activity

Surface Water Activity or a_w was developed to account for the intensity with which water associates with various non-aqueous constituents and solids. Simply stated, it is a measure of the energy status of the water in a system. It is defined as the vapor pressure of water in a substance divided by that of pure water at the same temperature; therefore, pure distilled water has a water activity of exactly one. Higher aw substances support more microorganisms. Bacteria usually require at least 0.91, and fungi at least 0.7. Water migrates from areas of high a_w to areas of low aw. For example, if honey ($a_w \approx 0.6$) is exposed to humid air ($a_w \approx 0.7$) the honey will absorb water from the air.

Water can occur in different forms, it originates from different sources, and its measurement in terms of availability is often overlooked in buildings. This concept of water availability is well known in microbiology and food science as water activity. In buildings it is known as equilibrium relative humidity, surface relative humidity, or surface water activity. To measure surface water activity, the system has to be in equilibrium, meaning the temperature should be constant and no net flow of water occurs from the substrate to air or vice versa.

$$\text{Water Activity} = \frac{\text{vapor pressure of air above sample}}{\text{vapor pressure of pure water at the same temperature}}$$

For decades water activity has been referenced in standards, books and journals regarding mold in the indoor environment. However, until recently the measurement of water activity has been unavailable in the built environment. We are excited to take our technology and expertise from the disciplines of food science and microbiology and make water activity measurements available to professionals that focus on minimizing the effects of mold indoors.

> Together we can solve the problems mold creates in the indoor environment by understanding the differences between moisture content, relative humidity and surface water activity.

It will take some effort to change the way we think about buildings and moisture but we can solve the mold problem. We look forward to understanding your application for water activity and helping you achieve your goals. If we can ever be of any assistance please contact us.

AquaLab
USA AquaLab Sales 509-332-2756
USA AquaLab Customer Support 509-332-5601

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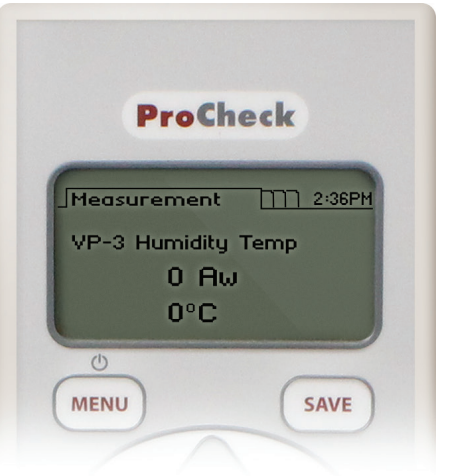
Taking Measurements

Procheck Handheld Readout Device

The sensors with 5 inch cables are used with the ProCheck readout device for quick monitoring of building materials. In the carrying case you will find the ProCheck Operator's Manual which explains how to navigate the menus and select the VP-3 Humidity Sensor. Apart from buildings, the VP-3 sensor can be used in weather stations which are sold by the Environmental Monitoring Division of Decagon Devices and measures vapor pressure, humidity, and temperature. By connecting the sensor to the white chamber head and sealing the chamber against a substrate, you create an equilibrated chamber that can provide a water activity measurement of the substrate in question. The white head can be removed and the black VP-3 sensor can be used to measure relative humidity.



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If the ProCheck doesn't show this screen after it boots up, click on the Menu button until you see the configuration screen. On this screen **scroll down** to Sensor List and press **Enter**. Then scroll down until you see VP-3 Humidity, Temp. Press **Enter** and then the **Menu** button until you see the Measurement Screen. Once you are on the Measurement screen you will see a 0 value under a_w and 0 degrees C.

Once you press the **Enter** button you will begin to see the water activity reading and temperature of the substrate in question. After you have installed each of your sensors in their desired locations and the chambers have come to equilibrium, you can connect each sensor to the ProCheck one at a time and gather your readings.

Downloading Data to Your Computer

1. On the inside cover of the ProCheck Operator's Manual you will find a CD. Install the Utility Software. A USB driver will automatically download with the software.

2. Connect the ProCheck to your computer using the serial-to-USB cable provided. Make sure the ProCheck is turned on

3. In the Utility Software select "Set Date/Time" from the Actions Menu. This will automatically synchronize the instrument's date and time with your computer.

4. Click Connect and then click Download.

Install Sensors

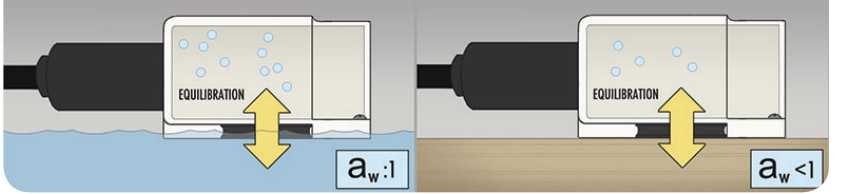
The wall mount sensor should be mounted on a clean surface with the cable pointing down if possible and the seal pointing towards the surface. The sensor can be adhered to the substrate using the two adhesive foam strips by removing the tape backing or can be attached using the two self-tapping mounting screws.

Equilibrium

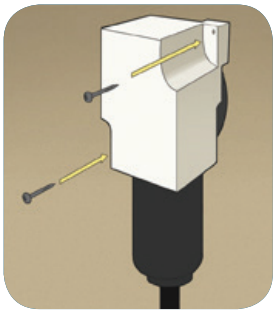
Please note that the rubber seal must make a tight seal to the substrate being tested. If a proper seal is not made the sensor will measure the relative humidity of the room. When a proper seal is made the air in the white chamber comes to equilibrium with the substrate. When equilibrium is reached you are properly measuring the surface water activity of the substrate.

Please note that the screws will be a better option if the substrate is very wet. Equilibration times will vary depending on the properties of the substrate. For example, drywall or wood will equilibrate faster than a wall painted with an oil based paint. The painted wall will emit water differently than a non-painted wall and therefore equilibration times may vary.

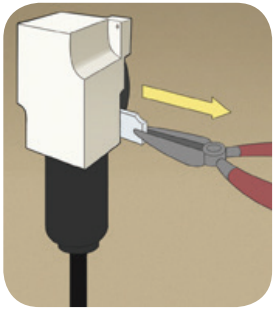
Leaving the sensor on the wall until the reading has stabilized is the best way to know if the chamber has come to equilibrium. Be aware that the equilibration can be several hours for some building materials. When using the self-tapping screws, it is important that the screws are tightened only to the point that they secure the wall mount. Tightening beyond this point may cause the screw to strip the wall that it is mounted against. If this happens you will not have a proper seal.



Water Wood



Mounting Screws



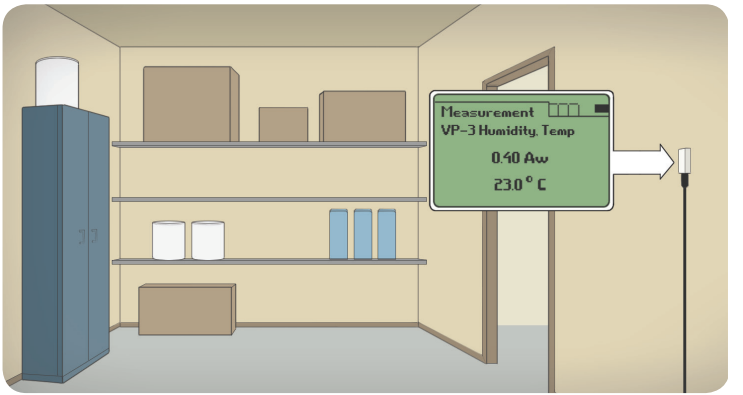
Adhesive Strip

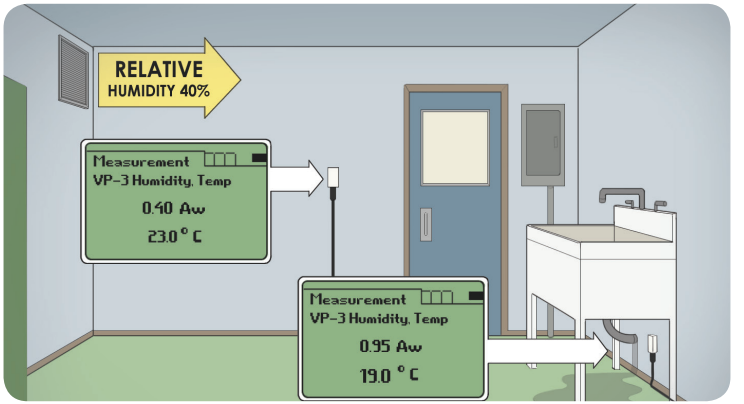
Removal of Wall Mount Sensor When Adhesive is Used

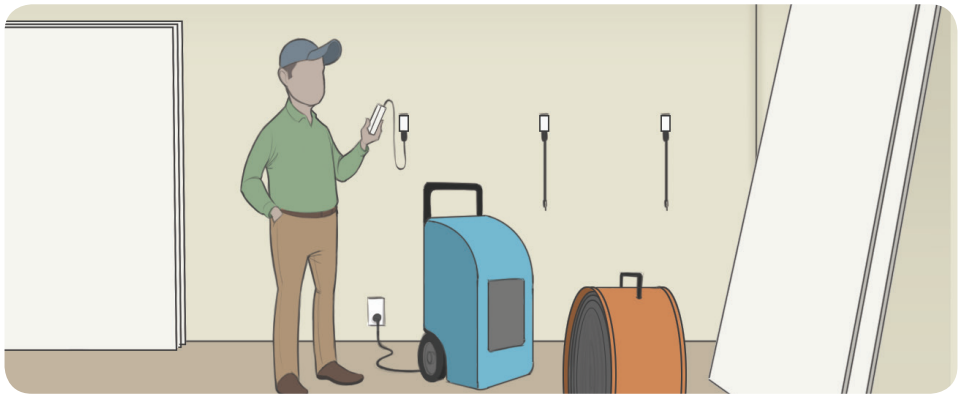
The wall mount is designed so that the adhesive foam strips on the top and bottom can be grabbed by pliers and pulled gently sideways thereby stretching the foam strip which removes it from the wall. Apart from buildings, the VP-3 sensor is used in weather stations which are sold by the Environmental Monitoring Division of Decagon Devices and measures vapor pressure, humidity, and temperature. By connecting the sensor to the white chamber head and sealing the chamber against a substrate, you create an equilibrated chamber that can provide a water activity measurement of the substrate in question. If you would also like to measure relative humidity you can simply remove the white head off the sensor and use the VP-3 to gather humidity readings of the environment.

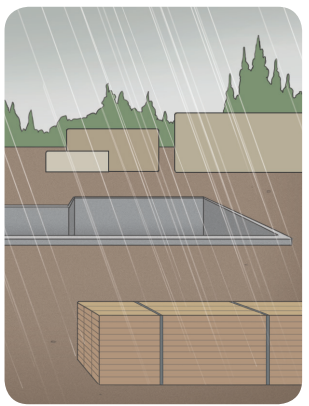
Spatial Variability

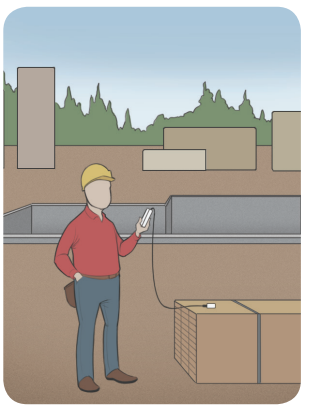
Knowing where to place the sensors can be tricky. Moisture intrusion can come from almost anywhere and spatial variability of a room can be infinite due to a variety of factors including the different building materials used and how and where the dampness is entering the building. Although spatial variability is a concern, having a firm understanding of the differences between relative humidity, water activity, and moisture content can help you start to troubleshoot what is happening and prevent mold growth in high risk areas.

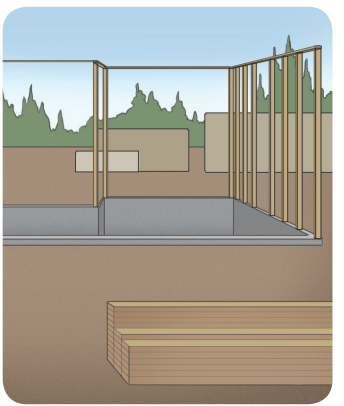












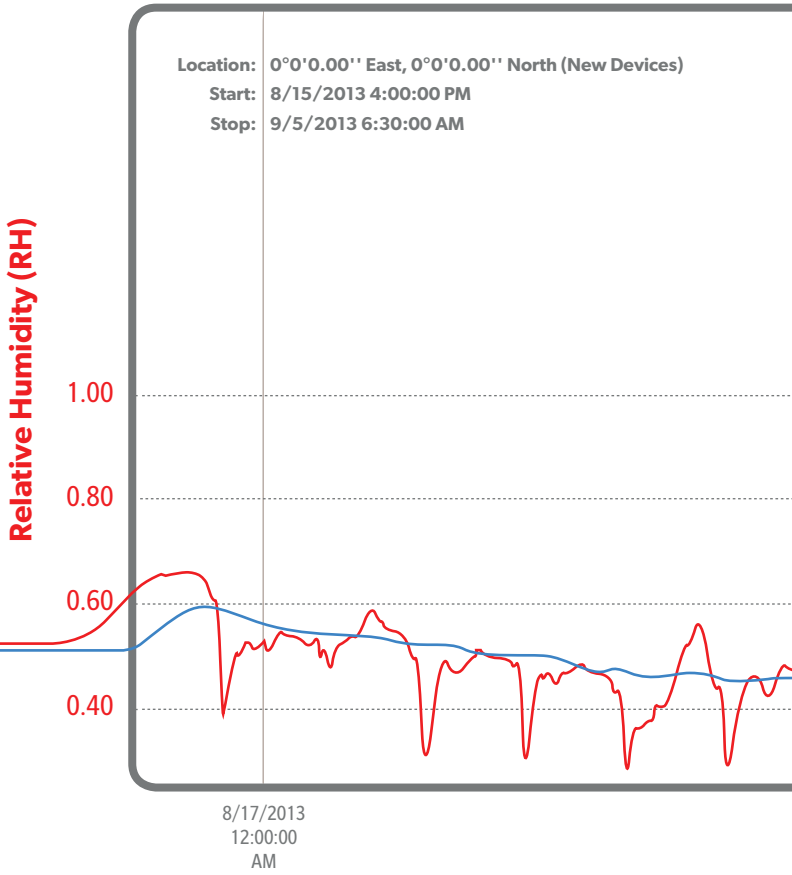
Even if an environment is held at a stable relative humidity, the water activities of materials that are damp can remain high and mold. The water activities of these problem areas will need to be monitored until the water activity has dropped below 0.600. No mold or microorganisms can grow below 0.600 a_w. A great strategy includes finding where the moisture is located, maintaining a low ambient relative humidity, and using water activity sensors to monitor when the materials are verifiably dry lower than a water activity value where mold cannot grow.

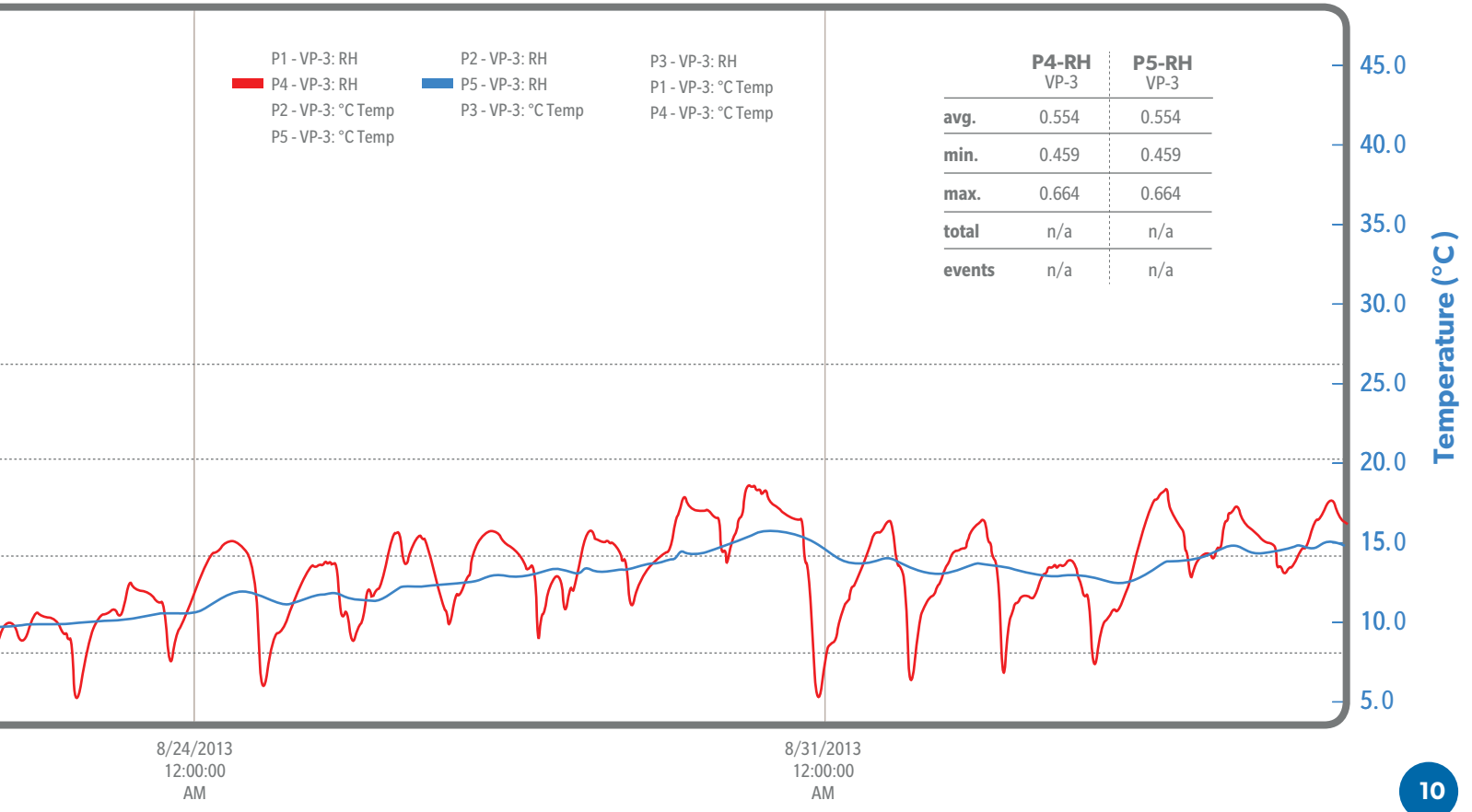
Viewing Results

Software Interface

DataTrac 3 provides you with an almost real-time graphical picture of your data. DataTrac 3 displays your logger status, manages multiple data loggers, and creates meaningful metrics that allow you to understand what drives changes in environmental conditions by seeing all of your recorded data on one graph.

Note: (DataTrac 3) example shown is an approximation of actual data points.





	P4-RH VP-3	P5-RH VP-3
avg.	0.554	0.554
min.	0.459	0.459
max.	0.664	0.664
total	n/a	n/a
events	n/a	n/a

ProCheck

27-01-16

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2365 NE Hopkins Court, Pullman, WA 99163
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