

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type Page 1 of 18

Water Activity and Temperature Probe HC2-AW-USB

User Guide



E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 2 of 18

Table of contents

1	Overview	3
2	Dimensional drawing	3
3	General description	4
3.1	Power supply.....	4
3.2	Measured parameters	4
3.3	Digital interface	4
3.4	Cable and connector	4
3.5	Sensor protection (dust filter)	4
4	Required accessories	5
5	Operation	6
5.1	Initial steps	6
5.2	Preparation of the product samples	7
5.3	Water activity measurement with HW4	8
6	Maintenance	16
6.1	Cleaning or replacing the dust filter.....	16
6.2	Periodic calibration check	16
6.3	Validation of the output signals transmission	16
7	Firmware updates	16
8	Specifications	17
9	Supporting documents	18
10	Document releases	18

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 3 of 18

Applicability:

This manual applies to the HC2-AW-USB probe with firmware version 1.x (RoPCB firmware), where 1.x can be 1.8, 1.9, etc. Changes to the last digit of the version number reflect minor firmware changes that do not affect the manner in which the probe should be operated.

Note: this manual has been updated to reflect changes made with the introduction of version 3.2.0 of the ROTRONIC HW4 software. Software screenshots appearing in this manual may not apply to previous versions of HW4.

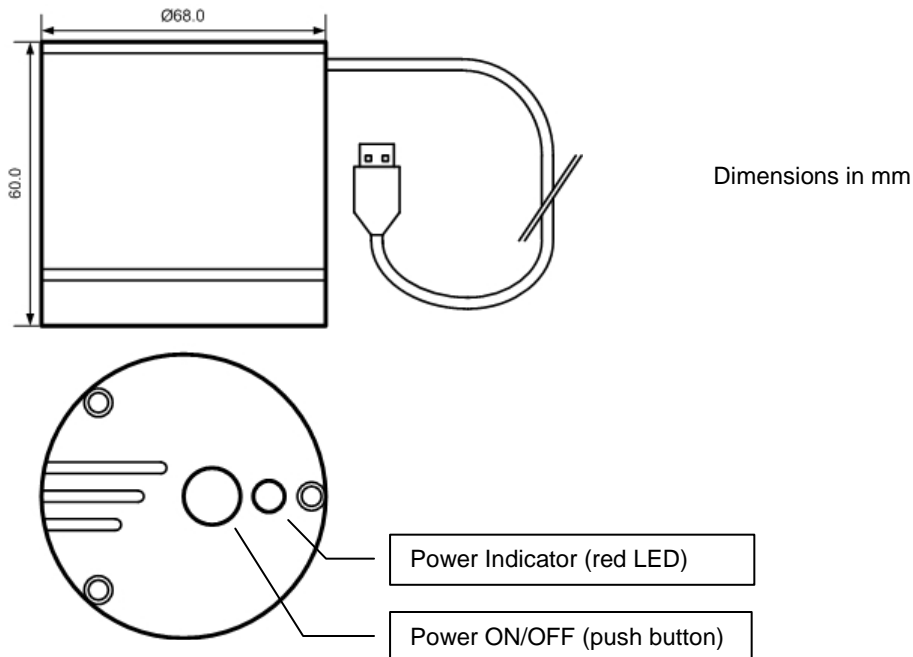
1 Overview

The HC2-AW-USB is a digital humidity-temperature probe based on the AirChip 3000 technology. .

The HC2-AW-USB probe plugs directly to the USB port of a PC running the HW4 software (Professional Edition with AwQuick, version 3.0.1 or higher) and is designed strictly for PC-based water activity measurement of liquids, pastes, powders and product in chunks.

The ability for the user to easily update the AirChip 3000 firmware means that the HC2-AW-USB probe can be kept up-to-date regarding any future functionality improvement.

2 Dimensional drawing



E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 4 of 18

3 General description

3.1 Power supply

The HC2-AW-USB probe is directly powered from the USB port of a PC (see below). When connected to a USB port, the probe can be powered or unpowered by pressing on the red button ON / OFF located on top of the probe. The red LED located next to the ON / OFF button is lit when the probe is powered.

Nominal values of a USB port: 5 VDC, 100 mA

3.2 Measured parameters

The HC2-AW-USB probe measures water activity with a ROTRONIC Hygromer[®] capacitive sensor and temperature with a Pt100 RTD.

3.3 Digital interface

The HC2 probe features a USB interface that allows two-way communication between a PC and the probe.

3.4 Cable and connector

The HC2-AW-USB is equipped with a hard wired cable (length: 3 m / 9.8 ft") ended with a standard USB connector.

3.5 Sensor protection (dust filter)



The sensors of the HC2-AW-USB probe are protected with a wire mesh dust filter held in place by a snap-ring

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 5 of 18

4 Required accessories

Use of the HC2-AW-USB probe requires the following:

1) PC or Laptop

The following are the minimum values required of the PC or laptop. It is highly recommended to exceed these values.

- o Processor: 1 GHz
- o RAM: 512 MB
- o Available hard disk space: 50 MB
- o Monitor: SVGA, 1280 x 960, 65535 colors
- o One free USB port

Operating system: Windows XP Service Pack 2 or Vista, Windows 7 with the Microsoft .NET framework (version 2.0 or higher) installed.

2) HW4 Software Professional Edition with AwQuick

HW4 Professional with AwQuick is a special version of HW4 Professional designed to facilitate measurement of the water activity (Aw) of foods, pharmaceuticals, etc. This version includes all the features of the regular HW4 Professional Edition. Two modes are available for measuring water activity: AwE and AwQuick. Both modes can be used with any of our instruments. In the AwE mode, HW4 monitors the natural equilibration of the product being measured and automatically stops the measurement process when equilibrium is reached. With most products, natural equilibrium requires from 45 to 90 minutes. The AwQuick mode reduces the time required to measure water activity to a few minutes, usually with almost the same accuracy as the AwE mode.

3) ROTRONIC USB driver

Communication between the HC2-AW-USB probe and the HW4 PC requires the ROTRONIC USB driver to be installed on the PC. The driver is included in the HW4 CD-ROM

4) Sample holder and disposable sample cups



WP-40S sample holder with removable depth reduction insert.



The PS-14 cups (shallow) are suitable for calibrating the probe with the Rotronic certified humidity standards or with saturated salt solutions. In general, use the shallow cups for a liquid, a paste or a powder. Use the PS-40 (deep) sample cups for products in bulk (large chunks).

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 6 of 18

5 Operation

5.1 Initial steps

Note: The HC2-AW-UBS probe is designed for use with a PC or laptop running the HW4 software Professional Edition with AwQuick (version 3.1 or higher). For detailed instructions regarding installing and using the HW4 software see the following documents:

- E-M-HW4v3-Main
- E-M-HW4v3-F2-020

1. On your PC, use Control Panel to verify that the Microsoft .Net Framework is installed:

- Windows XP: use Control Panel and Add or Remove Programs
- Vista or Windows 7: Control Panel > Programs and Features.

If the framework is not already installed, install it from the HW4 CD. Note that you will need to restart your PC after installing the framework.

HW4 Software






1. **INSTALL Microsoft .NET Framework V2.x**
2. **INSTALL ROTRONIC HW4**
3. **Exit**

Note:
HW4 requires the Microsoft .NET framework V2.x to be installed

- ROTRONIC Website
- Humidity and Temperature measuring systems
- Online Support



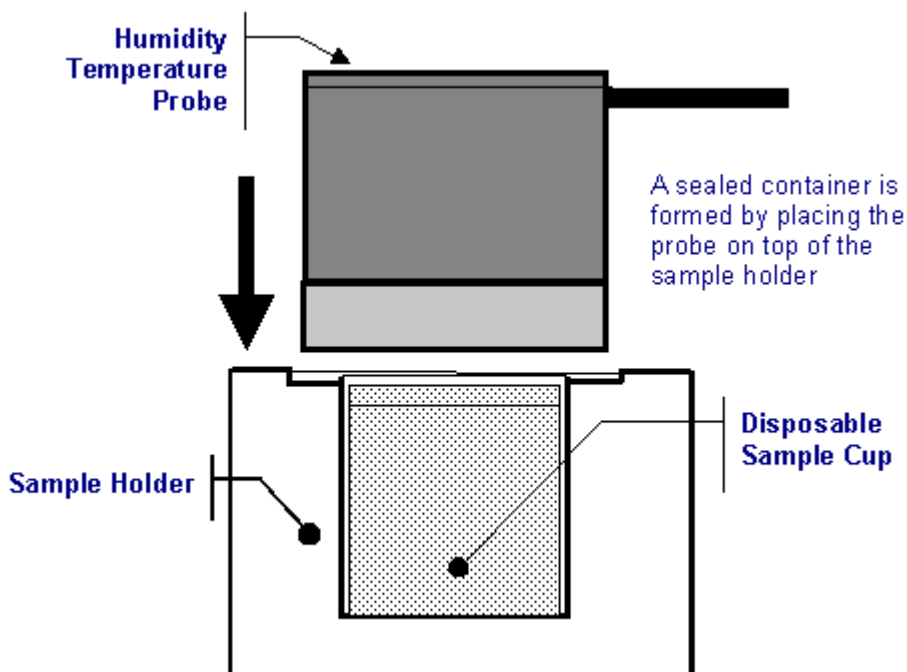
2. Install the HW4 software
3. Make sure that HW4 is not running. Connect the HC2-AW-USB probe to a USB port of your PC. Check that the red LED on top of the probe is lit. This indicates that the probe is being powered. If necessary, power the probe by pressing once on the red button located on top of the probe. When the red LED is not lit, the probe is not powered and the PC is not receiving a signal from the probe. When asked by Windows point to the ROTRONIC USB driver (located in the HW4 installation folder, subfolder USB_driver)

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 7 of 18

4. Start HW4. In the HW4 main menu bar click on Devices and Groups > Search for Master Devices > USB Masters. After being discovered by HW4, the probe appears in the left pane of the HW4 main screen (device tree). Select the probe with the mouse to make the values currently measured by the probe appear in the right pane of the HW4 main screen.

5.2 Preparation of the product samples

The HC2-AW-USB probe is designed for use with the WP-40S sample holder with removable depth reduction insert.



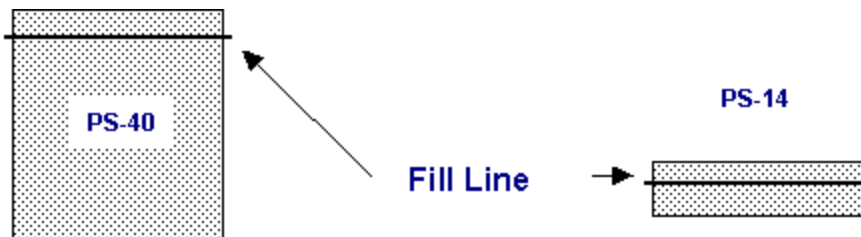
The WP-40S sample holder can be used with two different sizes of disposable sample cups (PS-14: shallow / PS-40: deep). Use the shallow sample cups (PS-14) together with the depth reduction insert. The PS-14 cups are suitable for calibrating the probe with the Rotronic certified humidity standards or with saturated salt solutions. In general, use the shallow cups for a liquid, a paste or a powder. Use the PS-40 deep sample cups for products in bulk (large chunks).

The disposable sample cups serve two purposes:

- (a) Provide a means storing product samples prior to measurements so that they can come to the same temperature as the probe.
- (b) Prevent contamination across samples.

Prior to measurements, fill a number of disposable sample cup with the products to be measured. **Usually, filling up to 1/3 of the cup is sufficient.** To avoid soiling the probe, do not fill the cup above the fill line (see below).

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 8 of 18



5.2.1 Additional guidelines

a) Measure water activity only in a temperature stable area. This is an essential requirement! Do not measure on a bench that is located near a heater, an AC vent or an open window. Avoid direct exposure of the probe and/or product samples to sun light (heating effect). For best accuracy, temperature should not change by more than 0.01°C / minute (0.0075 °C / minute in the case of product with a water activity > 0.80 aw)

b) Prior to measurements, place each product sample in a disposable sample cup with the cover on. Place the cups in the same general area as the probe. Allow for sufficient time for the samples to come to the temperature of the probe (usually room temperature). A frequent mistake is to measure product samples which have been kept overnight in a refrigerator without first allowing them to come to room temperature. Another mistake is to measure samples coming straight from a hot manufacturing process. To measure water activity at a temperature other than room temperature, place both the probe and the product samples in an incubator set at the desired temperature.

c) Prior to using the probe, verify the integrity and cleanliness of the sealing O-ring located under the probe

d) Avoid warming up the probe, the sample holder or the product sample by touching or holding for too long in your hand.

5.3 Water activity measurement with HW4

5.3.1 Water activity measurement modes

The AwE / AwQuick tab is available only with HW4 Professional with AwQuick. HW4 features two modes for measuring water activity and the name of the tab depends on which mode has been selected.

- **AwE mode**

In this mode HW4 monitors the stability of both temperature and humidity. The measurement is automatically ended as soon as both humidity and temperature reach equilibrium. The natural (or static) equilibration of most products typically requires from 45 to 60 minutes and can take as long as a couple of hours.

- **AwQuick mode:**

In the AwQuick mode, HW4 uses an algorithm to project the full equilibrium value (water activity) of the measured product. The measurement is automatically ended and typically requires about 5 minutes.

HW4 performs the following tasks:

- 1) The value of the humidity signal is constantly monitored
- 2) The stability of the temperature signal is constantly monitored
- 3) After an initial period of time (dwell time), HW4 uses the humidity data to project the end value of the equilibration process (water activity). The measurement ends automatically as soon as the projected Aw value is stable.

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 9 of 18

With the dwell time set to 4 minutes, measurements typically require about 5 minutes. When temperature conditions are stable (both at the product and probe), the measurement obtained with the AwQuick mode is generally within ± 0.005 aw of the measurement that would be obtained by waiting for full equilibration (AwE mode).

5.3.2 Mode selection and settings

To select the mode and to enter or modify the settings to be used in each mode, select Settings and Tools in the HW4 main menu bar. Under Settings and Tools select HW4 Global Settings and select the AwQuick Mode / AwE Mode tab (the name of this tab changes depending on the mode that is currently selected).

The screenshot shows the 'HW4 Global Settings Form' window. The 'AwQuick Mode' tab is selected, indicated by a radio button. The settings for this mode are:

- Dwell Time [min]: 4
- Temperature stability [°C/min]: 0.01

The 'AwE Mode' tab is also visible but not selected. Its settings are:

- Humidity stability [Aw/min]: 0.0001
- Temperature stability [°C/min]: 0.01

At the bottom of the window, there are three buttons: 'OK', 'Cancel', and 'Help'.

Note: the values shown above are the most frequently used.

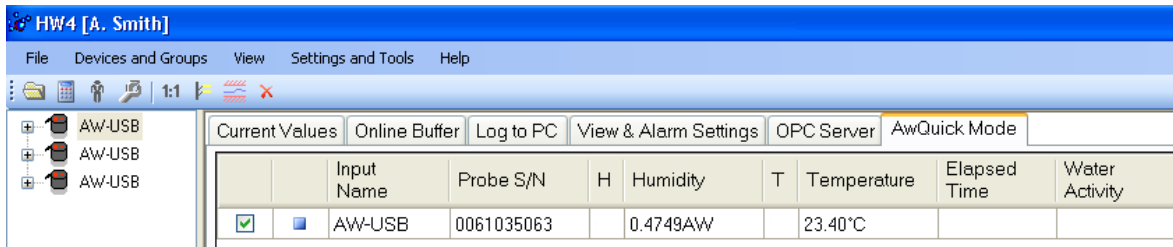
IMPORTANT: Both the selected mode and its settings apply globally to all instruments and probes. To select the mode and to enter or modify the settings to be used in each mode, click on the Settings button located on the AwE / AwQuick tab.

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
Document title	Document Type
	Page 10 of 18

5.3.3 Working with individual probes or with a group of probes

Working with individual probes

Probes just discovered by HW4 (HW4 Main Menu Bar > Devices and Groups > Search for Master Devices > USB Masters) are shown individually in the Device Tree.



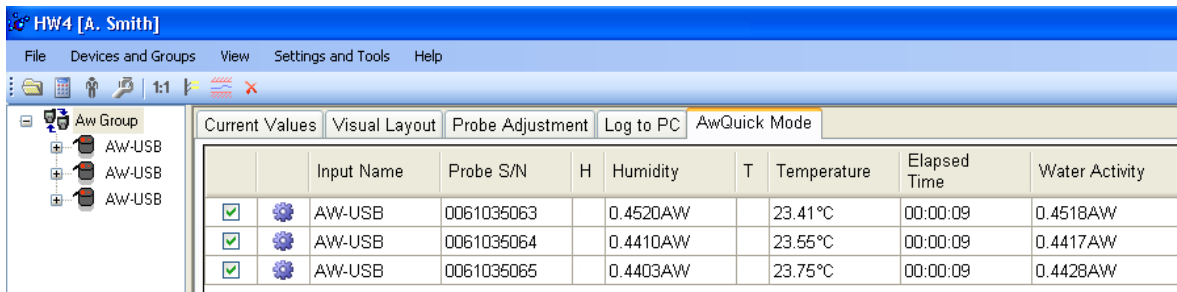
At any time only one probe can be selected in the Device Tree. After selecting a probe, the user can start measuring water activity with that probe.

HW4 can run several water activity measurements concurrently. Select any probe and start measuring water activity with that probe. Select another probe and start measuring water activity with that other probe. The water activity measurement process (AwQuick or AwE mode) runs independently for each probe. When measuring water activity with several individual probes simultaneously, it is incumbent to the user to change from time to time the probe selected in the Device Tree so as to find out when the measurement is ended.

Note: the bottom of the form has 3 text fields labeled “Batch Number”, “Product Name” and “Comments”. The contents of these fields will appear on the water activity measurement report, assuming that the user decides to generate such a report. To customize the contents of these fields for each probe, wait until one of the probes is done and enter a text in each field just before clicking on the “Generate report” button. Select another probe and proceed in the same manner.

Working with a group of probes

Probes that have been discovered by HW4 can be put into a group created by the user as illustrated below:



Working with a group of probes offers the convenience of monitoring all probes at the same time. However, the contents text fields labeled “Batch Number”, “Product Name” and “Comments” are shared by all probes within the group and cannot be customized for each individual probe.

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 11 of 18

5.3.4 Measurement procedure (AwQuick or AwE Mode)

- 1) Select an individual probe or a group of probes in the Device Tree (left pane of the HW4 main screen)
- 2) In the right pane of the HW4 main screen, select the AwE / AwQuick tab (the label of this tab changes depending on which mode is currently selected in the HW4 Global Settings). Note that the right pane is slightly different depending on whether an individual probe or a group of probe has been selected in the Device Tree.

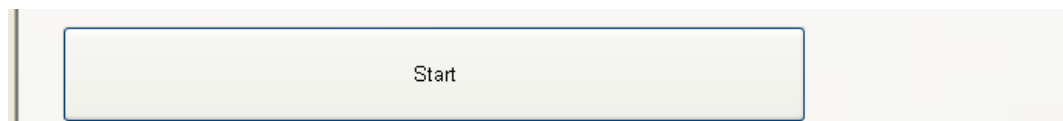
Current Values	Visual Layout	Probe Adjustment	Log to PC	AwQuick Mode		
	Input Name	Probe S/N	H Humidity	T Temperature	Elapsed Time	Water Activity

Current Values	Visual Layout	Probe Adjustment	Log to PC	AwE Mode		
	Input Name	Probe S/N	H Humidity	T Temperature	Elapsed Time	Water Activity

- 3) Select the probe or probes to be used for the measurement by clicking on the box located to the left of the probe (a check mark appears when the probe is selected).

Current Values	Visual Layout	Probe Adjustment	Log to PC	AwQuick Mode		
<input type="checkbox"/>	Input Name	Probe S/N	H Humidity	T Temperature	Elapsed Time	Water Activity
<input checked="" type="checkbox"/>	AW-USB	0061035063	0.4244AW	23.43°C		
<input checked="" type="checkbox"/>	AW-USB	0061035064	0.4181AW	23.71°C		
<input type="checkbox"/>	AW-USB	0061035065	0.4164AW	23.76°C		

- 4) To start the measurement, click on the Start button located at the bottom of the form.



A small blue symbol appears to the left of the probe to indicate that the measurement is in progress. After a while trend indicators also appear next to the water activity and temperature readings.

Current Values	Visual Layout	Probe Adjustment	Log to PC	AwQuick Mode		
<input checked="" type="checkbox"/>	Input Name	Probe S/N	H Humidity	T Temperature	Elapsed Time	Water Activity
<input checked="" type="checkbox"/>	AW-USB	0061035063	→ 0.4254AW	→ 23.43°C	00:02:09	
<input checked="" type="checkbox"/>	AW-USB	0061035064	→ 0.4187AW	→ 23.70°C	00:02:09	
<input type="checkbox"/>	AW-USB	0061035065	0.4174AW	23.79°C		

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 12 of 18

- 5) When HW4 detects equilibrium condition, the measurement ends automatically and the symbol to the left of the probe changes to green. The result appears in the “Water Activity” column.

Current Values		Visual Layout	Probe Adjustment	Log to PC	AwQuick Mode				
		Input Name	Probe S/N	H	Humidity	T	Temperature	Elapsed Time	Water Activity
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	AW-USB	0061035063		0.4257AW		23.43°C	00:04:24	0.4378AW
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	AW-USB	0061035064		0.4196AW		23.71°C	00:04:24	0.4322AW
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	AW-USB	0061035065		0.4183AW		23.78°C	00:04:24	0.4308AW

- 6) Optional: at this time you may want to enter a Batch Number, a Product Name and Comments in the fields located at the bottom of the form. This information will appear in the water activity measurement report should you choose to generate such a report.

Batch Number	<input type="text" value="TEST 1"/>
Product Name	<input type="text" value="Product Example"/>
Comments	<input type="text" value="Test Example"/>

- 7) Optional: click on the button labeled “Generate report” to generate a water activity report.

<input type="button" value="Generate report"/>
--

- 8) The process is ended by clicking on the Stop button located at the bottom of the form. At this time a new measurement can be started.

<input type="button" value="Stop"/>

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 13 of 18

5.3.5 Water activity measurement report

NOTE: Generate and save Protocols" must be enabled in HW4 Global Settings > Events tab

Prior to clicking on the Stop button, click on the "Generate report" button to generate a measurement report. HW4 opens a dialog box that allows the user to specify a file name and a location. The report is saved as a text file (extension txt).

The screenshot shows a text file named 'C:\HW4_32b_DATA\ROTRONIC_HW4\DOC\TEST 5.txt'. The file content is as follows:

```

AwQuick Mode
Batch Number: TEST 1
Product Name: Product Example
Comments: Test Example

Date: Monday, November 05, 2012
Time:12:50:42

Input Name: AW-USB
Probe S/N: 0060812364
Elapsed Time: 00:03:24
Water Activity: 0.9750AW
Temperature: 23.50°C

Input Name: AW-USB
Probe S/N: 0060812369
Elapsed Time: 00:03:24
Water Activity: 0.9760AW
Temperature: 23.51°C

Configured by
HW4 User name: A. Smith
User description:Administrator
User ID number:10B2DDF7F8F2B6CA

HW4 Information
Version:V3.2.0 Beta (Build 12299)
HW4 ID:01 33818035

User Events File
c:\hw4_32b_data\rotronic_hw4\event\HW4USER_2012.evt

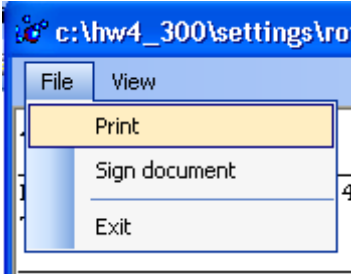
Authentication Stamp
AF340640

AUTHENTICATION STAMP OK

```

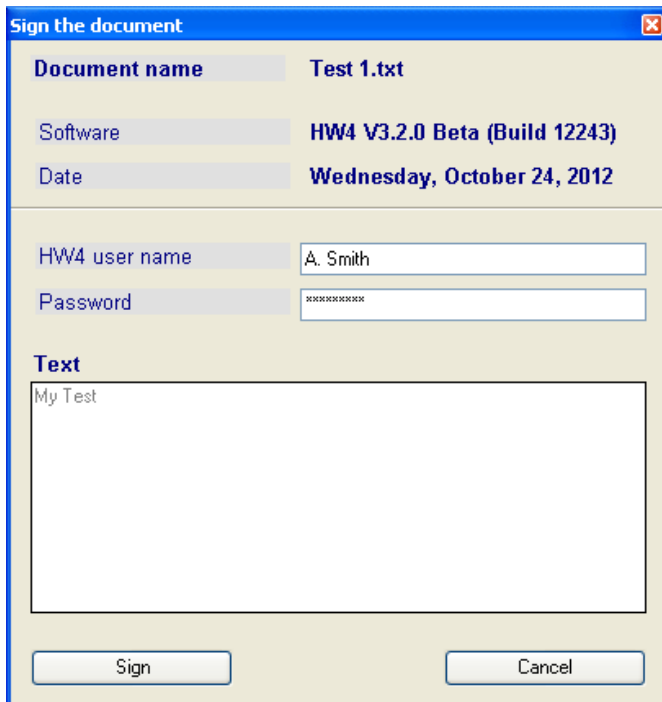
E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 14 of 18

Use the report menu bar to sign and / or print the report.



5.3.6 Signing the report

Select "Sign document" from the file menu to add your HW4 user name and a comment text to the report. For authentication purposes you will need to enter your password.



E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type Page 15 of 18

A new section is inserted at the bottom of the report:

```

[#E][HW4 user signature]
Name: A. Smith
Description: Administrator
ID: 10B2DDF7F8F2B6CA
Date: Wednesday, October 24, 2012
Document: Test 1.txt
Software: HW4 V3.2.0 Beta (Build 12243)

Text:
My Test

[#e]Signature ID
9176D8

```

AUTHENTICATION STAMP OK

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 16 of 18

6 Maintenance

6.1 *Cleaning or replacing the dust filter*

Depending on the conditions of measurement, the wire mesh dust filter (model W24) should be checked from time to time. Corroded, discolored or clogged filters should be replaced.

6.2 *Periodic calibration check*

Both the Pt100 RTD temperature sensor and associated electronics are very stable and should not require any calibration after the initial factory adjustment.

Long term stability of the ROTRONIC Hygromer humidity sensor is typically better than 1 %RH per year. For maximum accuracy, calibration of the probe should be verified every 6 to 12 months. Applications where the probe is exposed to contaminants may require more frequent verifications. Calibration and adjustment of the HC2 probe is done with a PC with the HW4 software installed (version 3.0.1 or higher).

Procedure for adjusting the HC2 probe with the ROTRONIC HW4 software:

- Connect the HC2-AW-USB probe to the HW4 PC as explained in the HW4 manual **E-M-HW4v3-Main**
- Start HW4 software on the PC and search for the HC2 probe. (HW4 Main Menu Bar > Devices and Groups > Search for USB masters.
- After finding the HC2-AW-USB probe with HW4, expand the device tree to see the probe functions and select **Probe Adjustment**.
- For further instructions see HW4 manual **E-M-HW4v3-A2-001**

6.3 *Validation of the output signals transmission*

If so desired, transmission of the HC2-AW-USB probe output signals can be validated by using the probe simulator function. The HW4 software is required to enable and configure this function. When the function is enabled the probe generates digital and analog signals corresponding to values specified by the user.

7 Firmware updates

Firmware updates will be available on the ROTRONIC website for downloading. Firmware files are given a name that shows both to which device the file applies and the version number of the firmware. All firmware files have the extension HEX

Procedure for updating the firmware:

- Connect the HC2-AW-USB probe to the HW4 PC as explained in the HW4 manual **E-M-HW4v3-Main**
- Copy the firmware update file from the ROTRONIC website to the PC.
- Start HW4 software on the PC and search for the HC2 probe. (HW4 Main Menu Bar > Devices and Groups > Search for USB masters.
- After finding the HC2-AW-USB probe, expand the device tree to see the probe functions. Select Device Manager. In the Device Manager menu bar select Tools > Firmware Update. For instructions see document **E-M-HW4v3-F2-020**

E-M-HC2-AW-USB-V1_11	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide	Instruction Manual
	Document Type
Document title	Page 17 of 18

8 Specifications

General	
Device type	Humidity temperature probe
Mechanical configuration	See models

Power supply and connections	
Supply voltage (VDD)	5 V (supplied from a USB port to which the probe is connected)
Nominal current consumption	< 25 mA

Humidity measurement	
Sensor	ROTRONIC Hygromer [®] WA-1
Measuring range	0...100 %RH (0.000 to 1.000 aw)
Measurement accuracy at 23 °C	±0.8 %RH (w. standard adjustment profile)
Repeatability	0.3 %RH
Long term stability	< 1 %RH / year

Temperature measurement	
Sensor	Pt100 RTD, IEC 751 1/3 class B
Measuring range	-40...85 °C (-40...185 °F)
Measurement accuracy at 23 °C	±0.1 °C
Repeatability	0.05°C
Long term stability	< 0.1°C / year

Start-up time and data refresh rate	
Start-up time	1.5s (typical)
Data refresh rate	1.0s (typical)

Digital interface	
Interface type	USB 2.0
Signal cable length	3 m (9.8.4 ft)

General specifications	
Housing material	Barrel: aluminum (top) , stainless steel (bottom)
Dust filter material	Stainless steel wire mesh
Physical dimensions	60 mm (H) x 68 mm (diameter)
Probe cable length	0.95 m (37.5")
Weight	approx. 541 g (1 lb 3.1 oz)

Conformity to standards	
CE / EMC immunity	EMC Directive 2004/108/EG: EN 61000-6-1: 2001, EN 61000-6-2: 2005 EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11 No measurement is possible in the presence of electromagnetic emissions
Solder type	Lead free (RoHS directive)
FDA / GAMP directives	compatible

Environmental limits	
Storage and transit	-40...+85 °C / 0...100 %RH, non condensing

E-M-HC2-AW-USB-V1_11 Document code	Rotronic AG Bassersdorf, Switzerland Unit
Water Activity and Temperature Probe HC2-AW-USB: User Guide Document title	Instruction Manual Document Type
	Page 18 of 18

Critical environments	Humidity sensor: as per DV04-14.0803.02 - Critical chemicals
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9 Supporting documents

Document File Name	Contents
E-M-HW4v3-DIR	List of the HW4 manuals
E-M-HW4v3-Main	HW4 software version 3: General instructions and functions common to all devices
E-M-HW4v3-F2-020	HW4 software version 3: HC2-AW-USB Water Activity Probe Device configuration and AirChip 3000 functions
E-M-HW4v3-A2-001	HW4 software version 3: Probe Adjustment function AirChip 3000 devices
E-M-HW4v3-DR-001	HW4 software version 3: Data Recording Function AirChip 3000 Devices
E-M-CalBasics	Temperature and humidity adjustment basics Instructions for using the ROTRONIC humidity standards

Note: All document file names have an extension corresponding to the document release number (example of a first release: E-M-HW4v3-Main_10). This extension is not shown in the above table.

10 Document releases

Doc. Release	Date	Notes
_10	Nov. 3, 2011	Original release
_11	Nov. 13, 2012	Updated to HW4 v. 3.2.0