HygroLab C1 Bench-Top Indicator
User Guide

Table of contents

1 Overview ... 3
2 General description ... 4
2.1 Configuration software ... 4
2.2 Power supply ... 4
2.3 Probe inputs ... 4
2.4 Measured parameters ... 4
2.5 Calculated parameters ... 4
2.6 Alarm Indication on the display ... 5
2.7 Real time clock ... 5
2.8 Back panel and digital interface ... 5
3 Basic operation ... 6
3.1 Display ... 6
3.2 Keypad ... 7
3.3 ON/OFF key ... 7
3.4 Internal menu ... 8
3.5 Frequently used settings ... 11
3.5.1 Unit system ... 11
3.5.2 Date and time ... 11
3.5.3 Select the calculated parameter for a probe input ... 11
3.5.4 Select which probe and/or parameters are shown on the display ... 11
3.6 Connecting the HygroLab C1 to a PC ... 11
3.7 Practical advice for measuring humidity ... 12
4 Aw Measurement ... 12
4.1 Enabling Aw Measurement ... 12
4.2 Water activity measurement settings: ... 13
4.3 Aw probe usage guidelines ... 13
4.4 Using the AwQuick mode ... 14
4.5 Using the AwE mode ... 17
4.6 Viewing the captured data (automatic data capture enabled) ... 19
5 User configurable settings and functions ... 20
5.1 Factory default settings ... 20
5.2 Interaction between the HygroLab C1 and HygroClip 2 probe ... 21
5.3 User defined parameter ... 21
6 Maintenance ... 22
6.1 Periodic calibration check of the HygroClip 2 probe ... 22
6.2 Cleaning or replacing the probe dust filter ... 22
6.3 Firmware updates ... 22
7 Probe Calibration and Adjustment Procedures ... 23
7.1 Overview ... 23
7.2 Calibration against a reference environment ... 23
7.3 Calibration against a reference HygroClip 2 probe ... 24
7.4 Adjustment of humidity and temperature ... 24
8 Technical data ... 25
8.1 Specifications ... 25
8.2 Dew point accuracy ... 26
9 Accessories ... 27
10 Supporting documents ... 27
11 Document releases ... 28

Applicability:

This manual is valid for the HygroLab C1 with firmware version 1.xx, where 1.xx can be 1.0a, 1.1b etc. Changes to the last two digits of the version number reflect minor firmware changes that do not affect the manner in which the instrument should be operated.

1 Overview

The HygroLab C1 is a multifunction bench-top indicator that can read simultaneously up to 4 HygroClip 2 digital humidity-temperature probes. The HygroLab C1 is primarily designed for measuring the water activity (aw) of foods, pharmaceuticals and cosmetics. The HygroLab C1 can also be used in other laboratory applications that require measuring humidity and temperature.

The HygroLab C1 is equipped with both a USB and an Ethernet interface.

The HygroLab C1 features two distinct operating modes:

► **Aw Measurement**: This specialized mode is used for measuring the water activity (Aw) of product samples and materials in bulk such as powders, seeds, etc. When set to operate in the water activity mode, the HygroLab C1 automatically displays humidity as Aw (1.000 a_w = 100 %RH). The Aw Mode offers the following options:

- **Accelerated water activity measurement (AwQuick):** permits measuring the water activity of most products in typically 5 minutes. The measurement starts simultaneously for all four probe inputs and is ended automatically.

- **Conventional water activity measurement (AwE):** the measurement starts simultaneously for all four probe inputs. The HygroLab C1 automatically detects full equilibrium conditions and ends the measurement at that time.

The HygroLab automatically signals the end of each water activity measurement and offers the option of automatically capturing both the end result and the value of temperature in 4 separate data bins (one non-volatile memory per probe). Up to 500 records can be captured per probe and each record is stamped for date and time. Data viewing can be done from the keypad and the data can be saved to a PC using the Rotronic HW4 software.

► **Standard Mode**: in this mode the HygroLab C1 can be used as a general purpose indicator with the following functions:

- Relative humidity and temperature data measured by up to 4 HygroClip 2 digital probes
- Calculated humidity parameter such as dew / frost point or other, for up to 4 HygroClip 2 probes
- Up to 4 user defined calculations such as the difference between the temperature and the dew point measured by a probe, the average of the temperature measured by two probes, etc.

The HygroLab C1 is available with a wide assortment of HygroClip 2 humidity-temperature probes to meet almost any requirement. The HygroClip 2 probes feature well proven, durable sensors. Digital signal processing ensures consistent product performance and also facilitates the task of field maintenance with features such as potentiometer free – digital calibration.

2 General description

2.1 Configuration software

Most of the HygroLab C1 settings can be configured directly from the keypad. However, some of the settings and access to some of the functions requires connecting the HygroLab C1 to a PC running the HW4 software version 3.1 or higher, using either USB or Ethernet. For instructions see the following HW4 manual: **E-M-HW4v3-F2-019**

2.2 Power supply

The HygroLab C1 requires the power adapter model AC1211 (100…240 VAC – 12 VDC, 200 mA).

As an alternative, the HygroLab C1 can also be powered via the USB port (no power adapter - current draw: about 70 mA). In this case, the Ethernet port is inactive and cannot be used.

2.3 Probe inputs

The HygroLab C1 has 4 probe inputs designed for use with all HygroClip 2 digital probes with the standard UART interface (see also Back panel and digital interface options).

Pin-Out Diagram

1: RXD (UART- digital probe)
2: GND (digital and power)
3: V+: 3.3 VDC nominal
4: Not used
5: Not used
6: Not used
7: TXD (UART – digital probe)

2.4 Measured parameters

The HygroClip 2 probe measures relative humidity with a ROTRONIC Hygromer® IN1 capacitive sensor and temperature with a Pt100 RTD.

2.5 Calculated parameters

The HygroLab C1 can calculate any of the following parameters based on the humidity and temperature values measured by the probe (to select the calculated parameter, use either the keypad or the HW4 software > Device Manager):

- Dew point (Dp) above and below freezing
- Frost point (Fp) below freezing and dew point above freezing
- Wet bulb temperature (Tw)
- Enthalpy (H)
- Vapor concentration (Dv)
- Specific humidity (Q)
- Mixing ratio by weight (R)
- Vapor concentration at saturation (Dvs)
- Vapor partial pressure (E)
- Vapor saturation pressure (Ew)

Note: calculating some of the above parameters requires barometric pressure as an input parameter. A fixed barometric pressure value can be specified using either the keypad or the ROTRONIC HW4 software.

In addition, the HygroLab C1 can display for each probe input a user defined calculation such as the difference between the temperature and the dew point measured by a probe, the average of the temperature measured by two probes, etc. Configuration of the HygroLab C1 for a user defined calculation requires the Rotronic HW4 software version 3.1 or higher (see separate document **E-M-HW4v3-F2-019**)

2.6 Alarm Indication on the display

Depending on the type of alarm, the display shows either a symbol or a text when the HygroLab C1 detects an alarm condition:

- Out-of-limits value (defined with the HW4 software for each probe input, includes measured values and calculated parameter).
- Display of fixed values when no probe is connected the input. Easily identified humidity and temperature values can be specified with the HW4 software for each probe input.
- Bad RH sensor or major sensor failure (open or shorted sensor – humidity and temperature)

2.7 Real time clock

The HygroLab C1 clock keeps track of the date and time and can be adjusted from the keypad. Using the HW4 software, the clock can be synchronized with the PC date and time. The clock does not automatically adjust for daylight saving time (DST).

2.8 Back panel and digital interface

As an option, the HygroLab C1 is available with any of the following digital interfaces:

- USB only (can be used to power the HygroLab C1)
- Ethernet only (RJ45)
- USB and Ethernet (only one interface can be used at any time)

Use of the Ethernet interface always requires the HygroLab to be powered with the AC1211 power adapter.

HygroLab C1 back panel showing the four probe inputs as well as the USB and Ethernet ports:

3 Basic operation

3.1 Display

The LC display has a backlight which can be set to be on all the time or whenever a key is pressed. The backlight can also be disabled.

Using the HygroLab C1 Menu > Display Settings > Mode, the display mode can be changed as shown below:

Standard:

- **%RH**
- **Temperature**
- **Date and time**

3-line display:

- **%RH**
- **Temperature**
- **Calculated parameter**
- **No date and time**

The display can also be configured to show a trend indicator on each line:

▲: increasing value
▼: decreasing value
Both arrows: stable

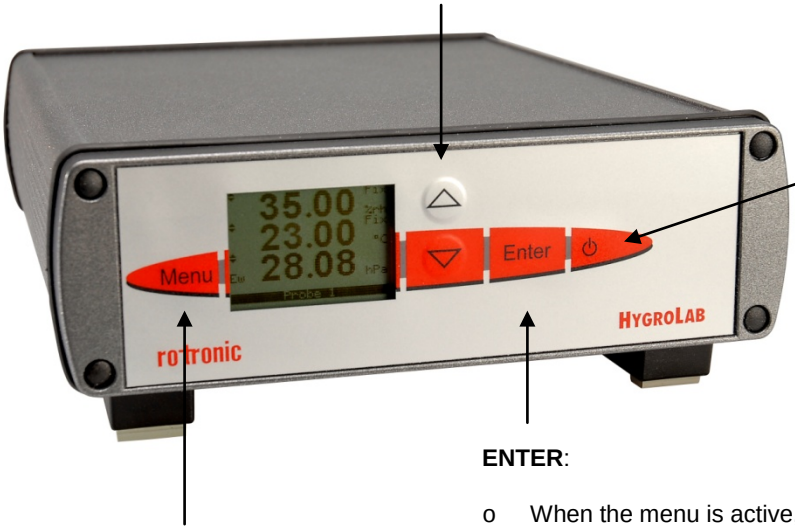
In the event of an alarm the symbol **[!]** appears to the right of the value.

The bottom of the display shows the date and time as well as which probe is currently selected:

3.2 Keypad

UP / DOWN:

- Changes the probe being displayed
- When the menu is active, use to navigate the menu, make a selection or change a value



ON/OFF:

Turns the instrument on or off.

ENTER:

- When the menu is active, use to confirm the selection of a menu item, effect a change of settings and confirm any change
- In the Aw Mode, use to start, hold or stop the water activity measurement function

MENU: Activates the internal menu. Press this key again to go back to the previous sub-menu or to exit the menu

3.3 ON/OFF key

The ON/OFF key is used as follows:

- To turn the instrument on: press the ON/OFF key
- To turn the instrument off: press the ON/OFF key

3.4 Internal menu

Note: Unauthorized access to the menu can be prevented by disabling “display menu”
(use the HW4 software > Device Manager > Display)

Main Menu	Menu Items	Submenu Items	Selections or Information	Notes
Device Info	Serial Nbr		Serial number	
	Version		Firmware version	
	Type		Device type	
	Name		Device name	User defined
Device Settings	Pressure			Fixed barometric pressure value required for calculating some psychrometric parameters
	Unit Sys		Metric / English	
	Ref. Probe		1 / 2 / 3 / 4	Reference probe input used to adjust probes connected to the other inputs
Display Settings	Trend		ON / OFF	Trend indication on the display
	Decimals		1 or 2	Display resolution
	Mode		Standard H+T+Calc	See 4.1.1
	Contrast			LC display contrast adjustment
	Back Light		Key Press/ON/OFF	Display backlight mode
Time Settings	Date			Press on ENTER when highlighted and use UP or Down to adjust
	Date Fmt		dd mm yyyy mm dd yyyy yyyy mm dd	Date format
	Separator		. or / or -	Date separator
	Time			Press on ENTER when highlighted and use UP or Down to adjust
	Time Fmt		24h / 12 h	Time format

Main Menu	Menu Items	Submenu Items	Selections or Information	Notes
Aw Settings	Enable AW		ON / OFF	Enable = ON changes the display as follows: o Humidity unit changes to a_w o No calculated parameter
	SaveResult		ON / OFF	ON: When the Aw measurement is ended, both the end result and temperature are saved in the following data bins: Probe 1: to Bin 1 Probe 2: to Bin 2, etc.
	Mode		AwQuick / AwE	o AwQuick: accelerated water activity measurement o AwE: conventional water activity measurement
	Dwell Time		minutes	Dwell time (AwQuick)
	AwQ Temp		°C / minute	Temperature stability definition (AwQuick)
	AwE Temp		°C / minute	Temperature stability definition (AwE)
	AwE Humi		a_w / minute	Humidity stability definition (AwE)
Data Storage				o Displays the names of the 4 data bins Bin 1 = Probe 1 Bin 2 = Probe 2, etc. o Press on ENTER to select the highlighted data bin
	View Samples			o Shows the individual data records o Use the up and down keys to navigate the records
	Summary			Shows the minimum, maximum and average values for the data bin
	Clear Data			Clears the data bin

Main Menu	Menu Items	Submenu Items	Selections or Information	Notes
Probe Settings	Calc 1… 4		Psychrometric Parameter. See 2.5	Calculated parameter Probe 1, 2, 3, 4
	Formula 1…4		ON / OFF	User defined calculation Probe 1, 2, 3, 4 (requires HW4 software) When ON, this calculation replaces the psychrometric parameter both on the local on the display and on a PC monitor (HW4 software)
Probe Actions (select probe input first)	Probe Info		Serial Number Version Probe Name	
	Humi Adjust	Acquired Points	Lists the cal. points present in the probe memory (a max. of 10 points are shown)	Additional Options: o Clear all cal. points o Clear the last point
		Acquire Ref Probe		Saves value measured by the reference probe as a cal. point
		Acquire Ref Value	Manual entry: known reference environment	Saves value entered manually as a cal. point
		Start Adjustment	Adjusts the probe	Effect depends on number of calibration points in probe memory
		Reset to Factory		Returns the probe to the initial factory adjustment
	Temp Adjust	Acquired Points	Lists the cal. points present in the probe memory (a max. of 2 points are shown)	Additional Options: o Clear all cal. points o Clear the last point
		Acquire Ref Probe		Saves value measured by the reference probe as a cal. point
		Acquire Ref Value	Manual entry: known reference environment	Saves value entered manually as a cal. point
		Start Adjustment	Adjusts the probe	Effect depends on number of calibration points in probe memory
		Reset to Factory		Returns the probe to the original factory adjustment
	Set as reference Probe			Sets the selected probe as the reference probe

NOTE: use the MENU key to go back one step from any sub-menu or to exit the entire menu (this may require several key presses).

3.5 Frequently used settings

3.5.1 Unit system

Press the MENU key and select Device Settings > Unit Sys. Press ENTER to activate the Unit Sys menu item, use the UP or DOWN arrow key to change the unit system. Press ENTER to confirm and press MENU to exit.

The HW4 software can also be used to change the unit system.

WARNING: changing the unit system does not change the numerical value of the fixed barometric pressure used in some psychrometric calculations. Always verify and modify as required the numerical pressure value after changing the unit system.

3.5.2 Date and time

Press the MENU key and select Time Settings > Date or Time. Press ENTER to activate either the Date or the Time menu item, use the UP or DOWN arrow key to change the Date or the Time. After each change, the cursor moves to the right. When done, press ENTER to confirm and press MENU to exit.

To change either the date or the time format, Press the MENU key and select Time Settings > Date Fmt or Time Fmt. Press ENTER to activate either the Date Fmt or the Time Fmt menu item, use the UP or DOWN arrow key to change the Date or the Time format. When done, press ENTER to confirm and press MENU to exit.

The HW4 software can also be used to set the clock of the HygroLab C1 to the PC date and time.

3.5.3 Select the calculated parameter for a probe input

Press the MENU key and select Probe Settings > Calc1 to Calc 4. Press ENTER to activate the Calc sub-menu, use the UP or DOWN arrow key to select the calculated parameter. Press ENTER to confirm and press MENU to exit.

3.5.4 Select which probe and/or parameters are shown on the display

Press the MENU key and select Display Settings > Mode. Press ENTER to activate the Mode menu item, use the UP or DOWN arrow key to select the display mode. Press ENTER to confirm and press MENU to exit.

Use the UP or DOWN arrow key to change the probe being displayed.

NOTE: The calculated parameter is shown only if enabled for the probe input that is selected (MENU > Probe Settings).

3.6 Connecting the HygroLab C1 to a PC

USB connection: connect the HygroLab C1 to the USB port of a PC with the ROTRONIC HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC prior to connecting the HygroLab C1 as explained in the HW4 manual **E-M-HW4v3-Main.** Both the driver and the installation instructions are located on the HW4 CD and are also available from the Rotronic website.

Ethernet connection: use of the Ethernet interface requires configuring the HygroLab C1 so as to ensure compatibility with the LAN to which the HW4 PC is connected. See document E-M-TCPIP-Conf available from our website.

3.7 Practical advice for measuring humidity

The most common source of error when measuring relative humidity is a difference between the temperature of the probe and the temperature of the environment. At a humidity condition of 50 %RH, a temperature difference of 1°C (1.8 °F) typically results in an error of 3 %RH on relative humidity.

It is always good practice to monitor the display for temperature stability. The probe should be given sufficient time to equilibrate with the environment to be measured. The larger the initial temperature difference between the probe and the environment to be measured, the more time temperature equilibration requires. This time can be shortened, and errors avoided, by using the probe configuration that fits best for your application.

In extreme situations, condensation may occur on the sensors when the probe is colder than the environment. As long as the humidity / temperature limits of the humidity sensor are not exceeded, condensation does not alter the calibration of the sensor. However, the sensor has to dry out before it can provide a valid measurement.

Non-moving air is an excellent insulator. When there is no air movement, surprising differences in temperature and humidity can noted over short distances. Air movement at the probe generally results in measurements that are both faster and more accurate.

4 Aw Measurement

When enabled to measure water activity, the HygroLab C1 automatically displays humidity as Aw (1.000 a_w = 100 %RH) and offers the following options:

- **AwE mode**: the HygroLab C1 waits for the full equilibration of the measured product and probe. For most products, this takes from 30 to 60 minutes. The HygroLab C1 automatically detects equilibrium conditions (humidity and temperature) and ends the measurement at that time by freezing the display.

- **AwQuick mode**: the HygroLab C1 uses an algorithm to accelerate the water activity measurement and provides a result in typically 5 minutes. The measurement ends automatically and the display is frozen. When temperature conditions are stable (both at the product and probe), the value measured with the AwQuick mode is generally within ± 0.005 aw of the value that would be obtained by waiting for full equilibration of the product and probe.

NOTE: See technical paper **E-T-AW** (Measuring Water Activity) for basic information on water activity and its applications.

4.1 Enabling Aw Measurement

To enable the HygroLab C1 to measure water activity:

- Press the MENU key and select "**Aw Settings**". Press ENTER to activate the menu.
- With the "**Enable Aw**" menu item highlighted, press ENTER and use the UP or DOWN arrow key to select ON. Press ENTER to confirm the selection.
- Optional: Use the DOWN arrow key to select the "**SaveResult**" menu item and press ENTER. Use the UP or DOWN arrow key to select either ON or OFF. Press ENTER to confirm the selection
- Use the DOWN arrow key to select the "**Mode**" menu item and press ENTER. Use the UP or DOWN arrow key to select either AwQuick or AWE. Press ENTER to confirm the selection.
- The settings for either the AwQuick or AWE function can be changed after using the UP or DOWN arrow key to highlight the setting and by pressing on ENTER. Use the UP or DOWN arrow key to change each digit. Press ENTER to move the cursor to the right. When done, press ENTER to save the value.
- Press MENU twice to fully exit the menu.

4.2 Water activity measurement settings:

Setting	Applies to	Notes
Dwell Time	AwQuick	The HygroLab C1 waits the specified amount of time before processing the humidity data with the AwQuick algorithm. Recommended value: 3 or 4 minutes.
AWQ-Temp	AwQuick	The HygroLab C1 considers temperature to be stable when the rate of change of the temperature signal is less than the specified value. Recommended value: 0.01 °C / min
AWE-Temp	AwE	The HygroLab C1 considers temperature to be at equilibrium when the rate of change of the temperature signal is less than the specified value. Recommended value: 0.01 °C / min
AWE-Humi	AwE	The HygroLab C1 considers humidity to be at equilibrium when the rate of change of the humidity signal is less than the specified value. Recommended value: 0.0001 Aw / min
SaveResult	AwQuick AwE	When the Aw measurement is ended, the result is saved in the following data bins: Probe 1: Bin 1, Probe 2: Bin 2, Probe 3: Bin 3, Probe 4: Bin 4

4.3 Aw probe usage guidelines

1) **HC2-AW probe**: 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 HC2-AW probe is not powered and the instrument is not receiving a signal from the probe.

2) **Measuring with less than 4 probes**: both the AwQuick and AwE functions run simultaneously for all HygroLab C1 probe inputs. We strongly recommend to either disconnect or to power down any unused probe.

IMPORTANT:

- The measurement starts simultaneously for all probe inputs (**disconnect or power off any unused probe)**
- Usually, the measurement ends at a different time for each probe. When using multiple probes, the HygroLab C1 emits a short beep whenever a probe is done measuring. A long beep indicates that the last probe is done. When Data Storage is enabled, the end result of each probe end result is stored in memory (bins 1 to 4)
- Each probe can be displayed by using the UP or the DOWN key
- Pressing ENTER resets all probe inputs and discards any measurement result that has not been stored.

4.4 Using the AwQuick mode

The HygroLab C1 uses an algorithm to project the full equilibrium value (water activity) of the product sample:

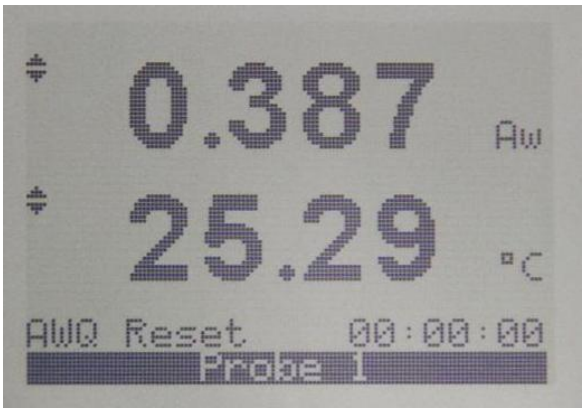
1) The value of the humidity signal is constantly monitored
2) The stability of the temperature signal is constantly monitored
3) After an initial period of time (dwell time), the humidity data is used to project the end value of the equilibration process (water activity). The measurement ends automatically as soon as the projected Aw value is stable. At that time, the HygroLab C1 freezes the display.

The measurement is automatically ended and typically requires about 5 to 6 minutes.

With the default dwell time of 4 minutes, the difference between the AwQuick function and the conventional measurement method is typically 0.005 aw or less. The value of the dwell time can be set by the user (see SETTINGS) and is a tradeoff between speed of measurement and accuracy. Generally, a longer dwell time produces more accurate results but causes measurements to take longer.

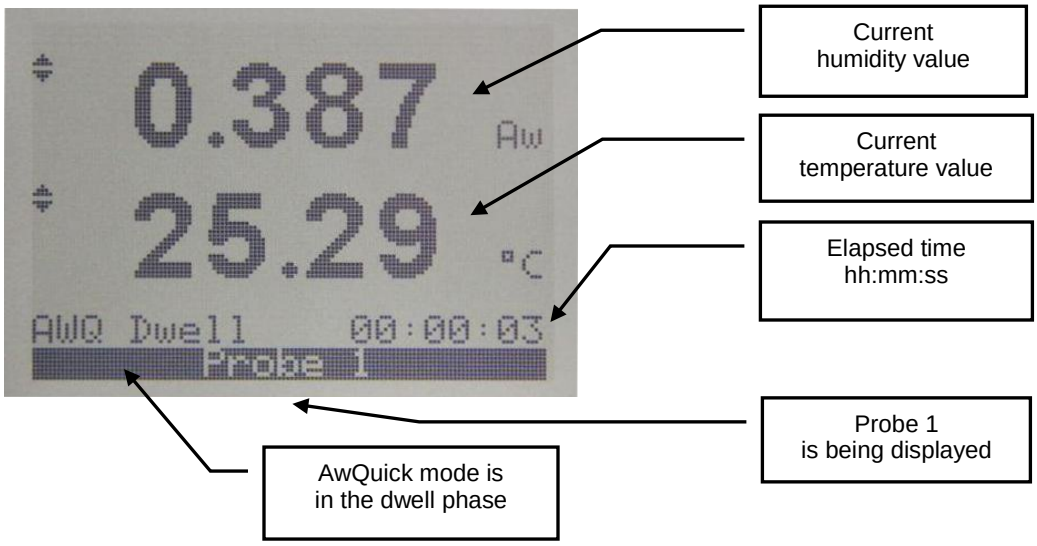
The value of temperature shown at the end of the measurement is the average temperature during the measurement. The HygroLab C1 displays a trend indicator to the left of the temperature value. This is used to verify that temperature was stable during the measurement.

1. AWQ Reset: the HygroLab C1 is ready to start measuring all connected probes

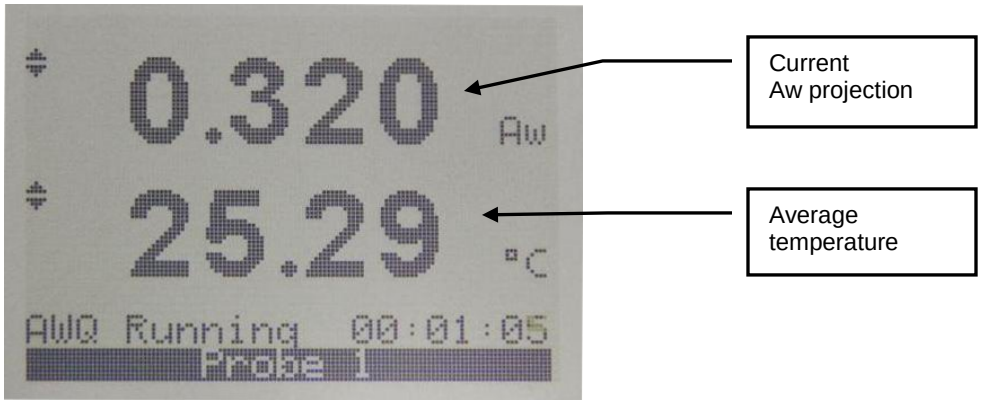


When ready to measure, press on the ENTER key.

2. **AWQ Dwell**: the measurement is in the “dwell” phase



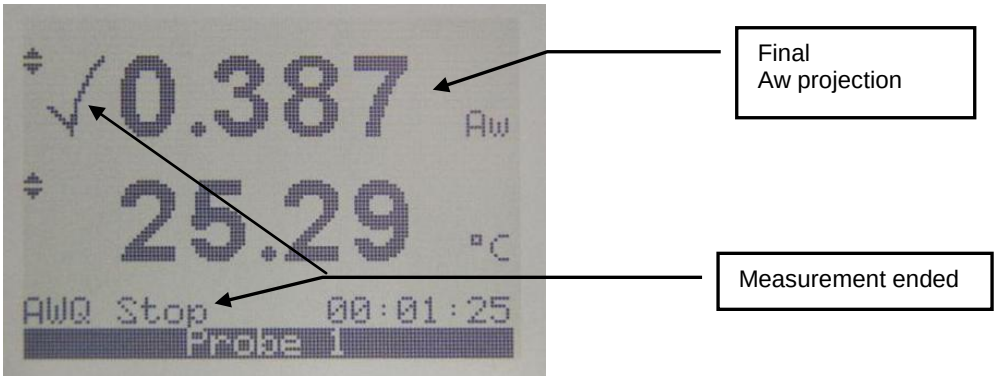
3. **AWQ Running**: at the end of the “dwell” phase the HygroLab C1 starts projecting the end result



4. AWQ Ended: when the projection is stable for a probe being displayed, the HygroLab C1 automatically ends the measurement and freezes the display for that probe. A check mark appears to the left of the water activity value. In addition the HygroLab C1 can be set with the HW4 software to emit an acoustic signal (Beep) lasting 5 seconds when the last probe is done. The acoustic signal can be stopped by pushing a key (do not press the ENTER key).

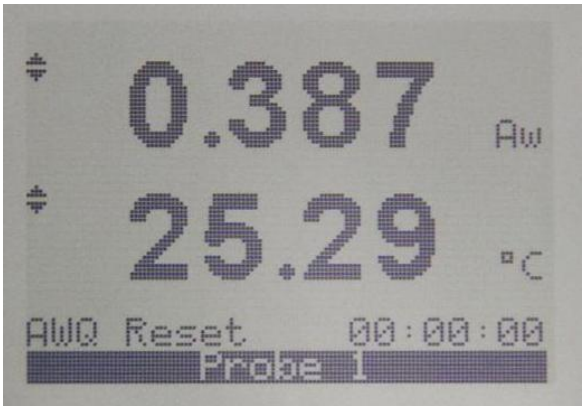
When several probes are connected to the HygroLab C1, use the UP or DOWN key to view each probe.

IMPORTANT: do not press the ENTER key until you have reviewed each probe.



5. AWQ Reset: write down the measurement for each probe or use the automatic data capture function. This function can be enabled from the keypad: MENU > Aw Settings > SaveResult > ON. The Aw value measured by probe 1 is saved to Data Bin 1. Probe 2 is saved to Data Bin 2, etc.

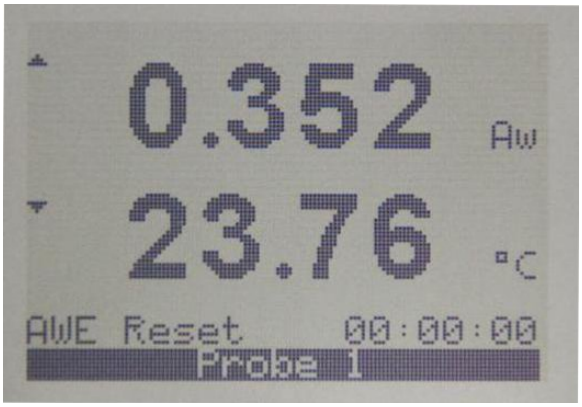
Press ENTER. The HygroLab C1 is ready to start a new measurement



4.5 Using the AwE mode

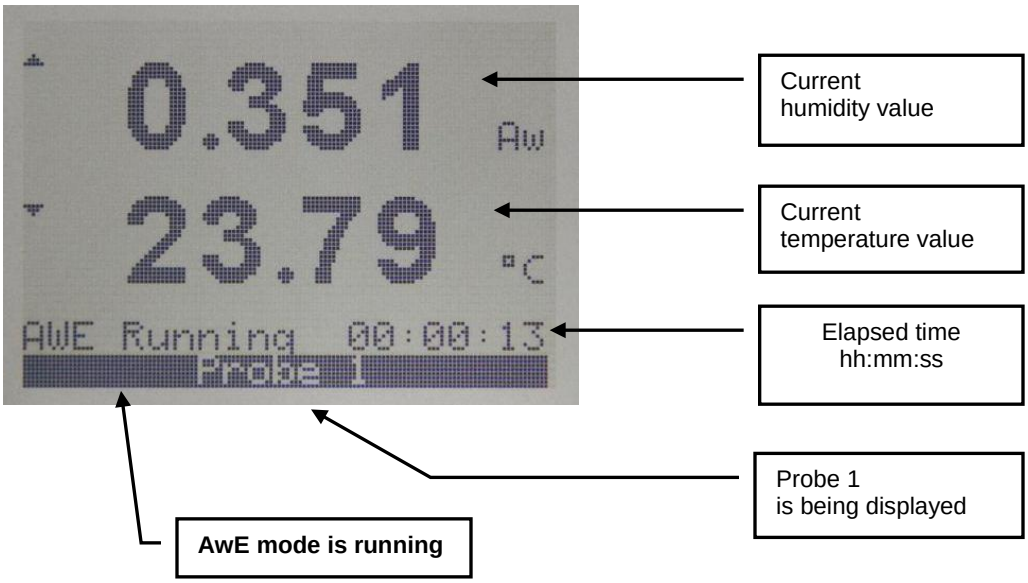
The HygroLab C1 monitors the water activity and temperature values measured by the probe. When both values are at equilibrium during a few minutes, the measurement is automatically ended. Depending both on the product being measured and on the stability of temperature, measurements typically require 30 to 60 minutes.

1. **AWE Reset**: the HygroLab C1 is ready to start a measurement using up to 4 probes



When ready to measure, press on the ENTER key.

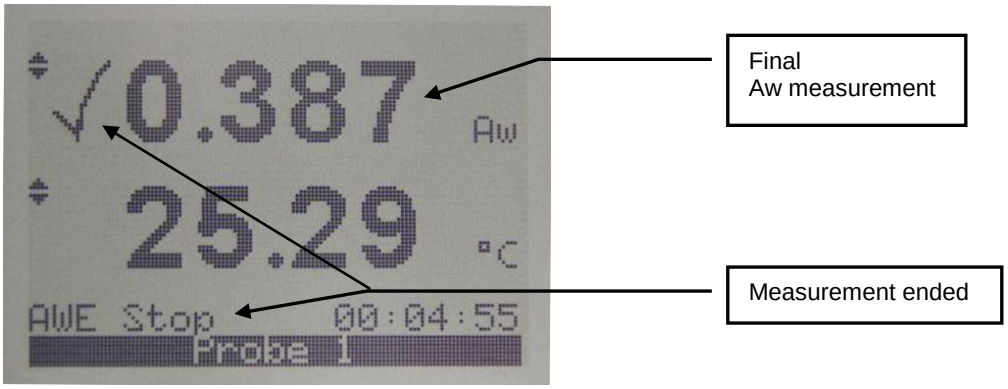
2. **AWE Running**: the HygroLab C1 starts monitoring the humidity and temperature signals for equilibrium



3. AWE Ended: when both the humidity and temperature signals measured by a probe are stable, the HygroLab C1 automatically ends the measurement and freezes the display for that probe. A check mark appears to the left of the water activity value. In addition the HygroLab C1 can be set with the HW4 software to emit an acoustic signal (Beep) every 5 seconds when the last probe is done. The acoustic signal can be stopped by pushing a key (do not press the ENTER key).

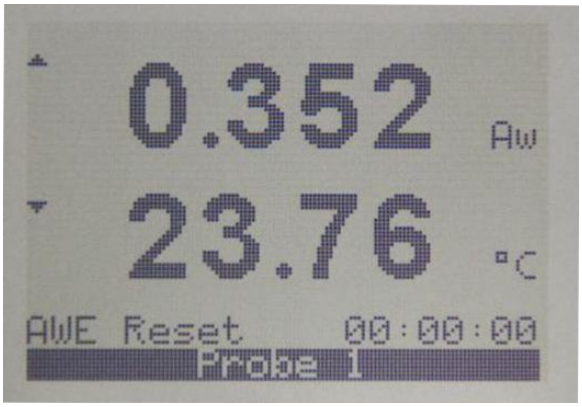
When several probes are connected to the HygroLab C1, use the UP or DOWN key to view each probe.

IMPORTANT: do not press the ENTER key until you have reviewed each probe.



4. AWE Reset: write down the measurement for each probe or use the automatic data capture function. This function can be enabled from the keypad: MENU > Aw Settings > SaveResult > ON. The Aw value measured by probe 1 is saved to Data Bin 1. Probe 2 is saved to Data Bin 2, etc.

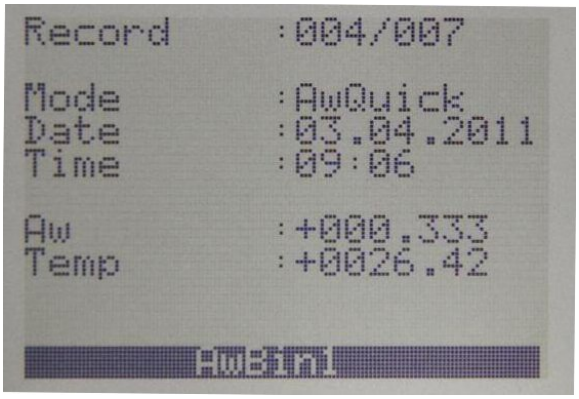
Press ENTER. The HygroLab C1 is ready to start a new measurement



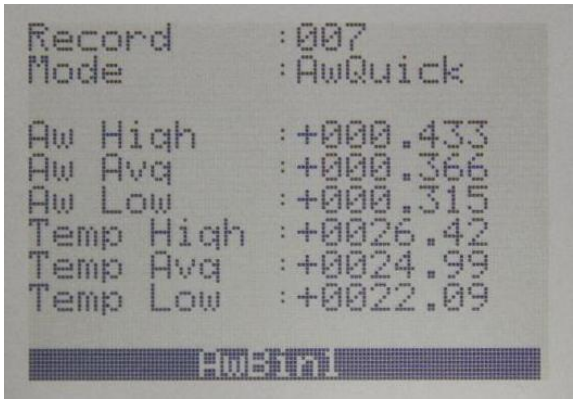
4.6 Viewing the captured data (automatic data capture enabled)

Press the MENU key and select Data Storage. See 3.4 Internal Menu for instructions.

- **View Samples**: view individual data records



- **Summary**: view the maximum, minimum and average values



- **Clear Data**: erase the contents of the data-bin

Press MENU to exit.

The captured data can be saved to a PC running the Rotronic HW4 software v3.1 or higher (see separate document **E-M-HW4v3-F2-019)**

5 User configurable settings and functions

The HygroLab C1 can be used just as any conventional humidity and temperature indicator. Making use of the HygroLab C1 configurable settings and functions is entirely up to the user and the appropriate settings depend on the user application. We have provided below a short description of the HygroLab C1 functions and also indicated the factory default settings.

5.1 Factory default settings

Notes:

- Configuration of the HygroLab C1 and probe by the user and access to its functions requires a PC with the ROTRONIC HW4 software (version 3.1 or higher) installed. Any available digital interface option can be used to connect the HygroLab C1 to the PC.
- Settings and functions that can also be accessed from the keypad are marked with the letter **K** (see also Operation > Internal Menu).

HygroLab C1 Configurable Settings		Factory default
Device write protection		Disabled
RS-485 address		0
Device name		Instrument model
Fixed barometric pressure value	K	1013.25 hPa (29.92 In Hg or 14.70 PSI)
Date and time	K	Time zone dependent
Unit system (Metric or English)	K	Metric, except USA: English
Date and time format, date separator	K	European format (except North America)
Input name		Probe 1, Probe 2, Probe 3 or Probe 4
Psychrometric calculation for the input	K	No calculation
Display backlight	K	On Key Press
Displayed parameters / display mode	K	Humidity and temperature + date and time
Display resolution	K	2 decimals
Trend indicator (display)	K	Enabled
Menu access from keypad		Enabled
User Defined Calculation	K	Disabled
Humidity / temperature calibration	K	Enabled
Humidity / temperature adjustment	K	Enabled
Aw Measurement	K	Disabled
Automatic data capture (Aw measurement)	K	Disabled
Device write protection		Disabled
Out-of-limit values alarm		Disabled
Monitor sensor alarms		Enabled (this function cannot be disabled)
Simulator mode (fixed values)		Disabled

For a detailed description of all HygroClip 2 probe (AirChip 3000) functions see document
E-T-AC3000-DF-V1

Instructions regarding the configuration of the HygroLab C1 and probes as well as access to the functions are provided in the following manuals:

E-M-HW4v3-F2-019
E-M-HW4v3-F2-001
E-M-HW4v3-Main (§ 6.5)
E-M-HW4v3-DR-001
E-M-HW4v3-A2-001
E-M-AC3000-CP

5.2 Interaction between the HygroLab C1 and HygroClip 2 probe

It is important to note that when used together, the HygroLab C1 indicator and HC2 probe (HygroClip 2) constitute a 2-component system. Each system component has its own microprocessor, firmware and functions. Some of these functions are unique to each system component. Other functions are found in both components.

The functions and settings of the HygroLab C1 indicator and HygroClip 2 probe (HC2) operate together as indicated below:

Function / Setting	HygroLab C1	HC2	Notes
Device protection	X	X	Individual to the HygroLab C1 and HC2 probe
RS-485 address	X	X	Individual to the HygroLab C1 and HC2 probe
Device Name	X	X	User defined description The device name of the HC2 probe is not displayed by HW4 and is replaced with the HygroLab C1 Input Name
Calculation	X	X	Psychrometric calculation HygroLab C1 setting overrides HC2 probe setting
Simulator function	X	X	Generates fixed humidity and / or temperature value When enabled, the HygroLab C1 settings override the HC2 probe settings
Unit system	X	X	The HygroLab C1 setting overrides HC2 probe setting. The HC2 probe settings still apply when the probe is used alone Make sure to use the same humidity symbol and the same temperature unit for both the HygroLab C1 and probe.
Out-of-limits value alarm	X	X	The HygroLab C1 settings are independent from the HC2 probe settings. The HC2 probe settings have no effect on the HygroLab C1 and out-of-limits values defined at the probe level do not generate a HygroLab C1 alarm.

5.3 User defined parameter

Using the HW4 software, the HygroLab C1 can be enabled to calculate for each probe input a user defined parameter such as the difference between the temperature and the dew point measured by a probe, the average of the temperature measured by two probes, etc.

The user defined parameters can be shown on the display by turning on the Formula option (HygroLab C1 internal menu - accessed from the keypad). For additional explanations and instructions see the following HW4 manual: **E-M-HW4v3-F2-019**.

6 Maintenance

6.1 Periodic calibration check of the HygroClip 2 probe

Both the Pt 100 RTD temperature sensor used in the probe 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 significant pollution may require more frequent verifications.

6.2 Cleaning or replacing the probe dust filter

See document E-M-HC2 Probes-V1

6.3 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.

WARNING: for reasons of compatibility update the current instrument Firmware only with a Firmware file with the same “Main” version. Examples: **1**.0a → **1**.5b = OK, **1**.3b → **2**.1d = NOT OK

Procedure for updating the firmware:

- Connect the HygroLab C1 to a USB port of a PC with the ROTRONIC HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC as explained in the HW4 manual **E-M-HW4v3-Main**

  Note: the Ethernet port can be also used to connect the HygroLab C1 to the HW4 PC.
  .
- Copy the firmware update file from the ROTRONIC website to the PC.
- Start HW4 software on the PC and search for the HygroLab C1 (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the HygroLab C1, expand the device tree to its functions. Select Device Manager. In the Device Manager menu bar select Tools > Firmware Update.
  For instructions see document **E-M-HW4v3-F2-019**

7 Probe Calibration and Adjustment Procedures

7.1 Overview

The HygroLab C1 uses two distinct and separate procedures:

1) Acquisition and capture of calibration points to the memory of a probe or device
2) Adjustment of the probe or device based on the calibration points present in the probe or device memory

When the purpose is just to calibrate the probe or device, use only procedure 1. Up to 2 temperature calibration points and up to100 humidity calibration points can be held indefinitely in the probe or device memory. No calibration point is saved within the HygroLab C1 itself. A calibration protocol can be printed with the HW4 software. Either the HW4 software or the HygroLab C1 can be used at any time to delete unwanted calibration points from the probe or device memory.

Adjustment can be carried out at any time after calibration, even several days later. Adjustment is a purely electronic process based on memorized data and the probe or device does not need to be exposed to any specific environment.

Notes:

- Instructions for using the ROTRONIC calibration devices and humidity standards are provided in document **E-M-CalBasics**
- Probe adjustment is available in the water activity mode, but when using this function humidity is shown as %RH as opposed to a_w.

7.2 Calibration against a reference environment

Connect the probe to be calibrated to the HygroLab C1. Expose the probe to a known environment (or to a humidity standard or to a saturated salt solution) and wait for full equilibrium.

- Press the UP or the DOWN key and select the probe input to which the device is connected.
- Press MENU and select Probe Actions. Press ENTER to activate the menu.
- Use the DOWN arrow key to select either "**Humi Adjust**" or "**Temp Adjust**" (in any order).
- Press ENTER to confirm and open the next sub-menu. Use the DOWN arrow key to select the "**Acquire (Ref. Value)**" menu item and press ENTER to confirm.

- **Humi Adjust**: the HygroLab C1 displays both the current humidity read by the probe to be calibrated and the reference humidity (known environment). Use the DOWN key to highlight the reference value and press ENTER. Use the UP or DOWN arrow key to change each digit. Press ENTER to move the cursor to the right. When done, press ENTER to save the value. Use the DOWN arrow key to select <Acquire>. Press ENTER to activate the Acquire function. Press ENTER to confirm and save the calibration point to the probe memory. The HygroLab C1 automatically exits the menu.
- **Temp Adjust**: the HygroLab C1 displays both the current temperature read by the probe to be calibrated and the reference temperature (known environment). Use the DOWN key to highlight the reference value and press ENTER. Use the UP or DOWN arrow key to change each digit. Press ENTER to move the cursor to the right. When done, press ENTER to save the value. Use the DOWN arrow key to select <Acquire>. Press ENTER to activate the Acquire function. Press ENTER to confirm and save the calibration point to the probe memory. The HygroLab C1 automatically exits the menu.

Note: the procedure can be repeated with different reference environments so as to accumulate several calibration points (temperature: maximum 2 points, humidity: maximum 100 points).

7.3 Calibration against a reference HygroClip 2 probe

Connect the reference probe to any input of the HygroLab C1. Press MENU > Probe Actions. Use the DOWN key to highlight **Set as Ref. Probe** and select the probe. Press ENTER.

Connect the probe to be calibrated to any of the other inputs of the HygroLab C1. Use the UP or the DOWN key to display the probe to be calibrated.

Expose both probes to the same stable environment and wait for full equilibrium with the environment. Whenever possible, provide some ventilation.

- Press the MENU key and select Probe Actions. Press ENTER to activate the menu.
- Use the DOWN arrow key to select either "**Humi Adjust**" or "**Temp Adjust**" (this can be done in any order).
- Press ENTER to confirm and open the next sub-menu. Use the DOWN arrow key to select the "**Acquire (Ref. Probe)**" menu item and press ENTER to confirm.
- **Humi Adjust**: the HygroLab C1 displays both the current humidity read by the probe to be calibrated and the value provided by the reference probe. Press ENTER to accept the calibration point. Press ENTER to confirm and save the calibration point to the probe memory. The HygroLab C1 automatically exits the menu.
- **Temp Adjust**: the HygroLab C1 displays both the current temperature read by the probe to be calibrated and the value provided by the reference probe. Press ENTER to accept the calibration point. Press ENTER to confirm and save the calibration point to the device memory. The HygroLab C1 automatically exits the menu.

Note: the procedure can be repeated under different conditions so as to accumulate several calibration points (temperature: maximum 2 points, humidity: maximum 100 points).

7.4 Adjustment of humidity and temperature

After saving calibration points to the memory of a probe, the HygroLab C1 can be used to do a humidity and temperature adjustment of up to 4 probes (one probe at a time). Humidity and temperature adjustment are two separate processes.

- Use the UP or the DOWN arrow key to display the probe to be adjusted
- Press the MENU key and select Probe Actions. Press ENTER to activate the menu.
- Use the DOWN arrow key to select either "**Temp Adjust**" or "**Humi Adjust**" (we recommend selecting Temp Adjust first). The following steps are the same for a temperature or a humidity adjustment.
- Press ENTER to confirm and open the next sub-menu.
- Optional: with the "Show Acquired Points" menu item selected press ENTER and review the calibration points present in memory. This submenu allows you to delete unwanted calibration points. Press MENU when done.
- Use the DOWN arrow key to select the "**Start Adjustment**" menu item and press ENTER to confirm.
- Press ENTER to activate the Adjust function. After completing the adjustment process, this function automatically erases the calibration points in the probe memory. When done adjusting, the HygroLab C1 automatically exits the menu.

8 Technical data

8.1 Specifications

General	HygroLab C1
Device type	Humidity-temperature bench-top indicator with 4 probe inputs (HygroClip 2 digital probe) and real time clock (date and time)
Power	Model AC1211 power adapter (100…240 VAC – 12 VDC, 200 mA). The USB interface can be used to power the HygroLab C1 (no power adapter required - current draw: about 70 mA). Use of the Ethernet interface always requires a power adapter.

Operating modes	HygroLab C1
AW measurement	Display of water activity and temperature o AwE : conventional measurement o AwQuick : accelerated measurement
Standard mode	Display of %RH, temperature + calculated parameter Display of analog probe measurement

Probe inputs	HygroLab C1
Number of probe inputs	4
Probe type	HygroClip 2 digital humidity temperature probe

Humidity and temperature measurement	HygroClip 2 probe
See document **E-M-HC2 Probes** > Specifications	

Calculated parameters	HygroLab C1
Psychrometric calculations	Dew point (Dp) above and below freezing Frost point (Fp) below freezing and dew point above freezing Wet bulb temperature (Tw) Enthalpy (H) Vapor concentration (Dv) Specific humidity (Q) Mixing ratio by weight (R) Vapor concentration at saturation (Dvs) Vapor partial pressure (E) Vapor saturation pressure (Ew)

Start-up time and data refresh rate	HygroLab C1
Start-up time	3 s (typical)
Data refresh rate	1 s (typical)

Functions	HygroLab C1
Water activity measurement	o Conventional water activity measurement o Accelerated water activity measurement o Automatic end of measurement o Simultaneous measurement of up to 4 probes

Functions	HygroLab C1
Automatic Data capture	o Available only when Aw measurement is enabled o 4 separate data bins (one for each probe input) o Up to 500 records per data bin: Aw end value, temperature + date and time stamp
Probe Calibration / Adjustment	o Can be used to calibrate and adjust HygroClip 2 probes o Fully fledged calibration and adjustment function o Calibration against reference probe or reference environment
User defined parameter	o Using the HW4 software, the HygroLab C1 can be set to calculate one user defined parameter per probe input

General specifications	HygroLab C1
Display	LC, 3 lines, backlight, trend, alarm indication Resolution: 3 decimals water activity 1 or 2 decimals other parameters
Display modes	Water activity and temperature %RH and temperature + date and time %RH, temperature and calculated parameter %RH or temperature or calculated parameter + date and time
Housing material	ABS, Aluminum
Housing protection grade	IP21
Overall dimensions	236 x 172 x 70 mm (9.3 x 6.8 x 2.8”)
Weight	1000 g (2 lb 0.5 oz)

Conformance to standards	HygroLab C1
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
Solder type	Lead free (RoHS directive)
FDA / GAMP directives	Compatible

Environmental limits	HygroLab C1
Storage and transit	-20…+70 °C / 0…100 %RH, non condensing
Operating limits at electronics	-10….60 °C (limited by LC display) 0…100 %RH, non condensing
Temperature limits at probe	Depends on probe model
Maximum humidity at probe	100 %RH up to 80 °C (176 °F) 75 %RH at 100 °C (212 °F) 45 %RH at 125 °C (260 °F) 15 %RH at 150 °C (302 °F)
Maximum air velocity at probe	20 m/s (3,935 ft /min)
Critical environments	Humidity sensor: as per DV04-14.0803.02 - Critical chemicals

8.2 Dew point accuracy

See document **E-M-HC2 Probes** > Dew point accuracy

9 Accessories

For accessories and parts such as the HW4 configuration software, service cables, calibration accessories and spare dust filters, please see document **E-M-HC2-accessories**

10 Supporting documents

Document File Name	Contents
E-M-HC2 Probes-V1	HygroClip 2 (HC2) Humidity Temperature Probes, User Guide
E-M-HC2-accessories	Accessories and parts for probes, indicators and transmitters
E-T-AC3000-DF-V1	AirChip 3000 Description and Main Functions
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-F2-019	HW4 software version 3: HygroLab C1 hand-held indicator and probes Device Manager and Data Recording functions
E-M-HW4v3-F2-001	HW4 software version 3: Device Manager – HC2 probe series
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-AC3000-CP	AirChip 3000 Communication Protocol
E-M-CalBasics	Temperature and humidity calibration basics Instructions for using the ROTRONIC humidity standards
E-T-HumiDefs	Humidity Definitions
E-T-AW	Measuring water activity
E-M-TCPIP-Conf	Configuration procedures for ROTRONIC devices with Ethernet (TCP/IP) interface

Note: The above documents can be downloaded from our website. All document file names have an extension corresponding to the document release number. This extension is not shown in the above table.

11 Document releases

Doc. Release	Date	Notes
_10	May 18, 2011	Original release