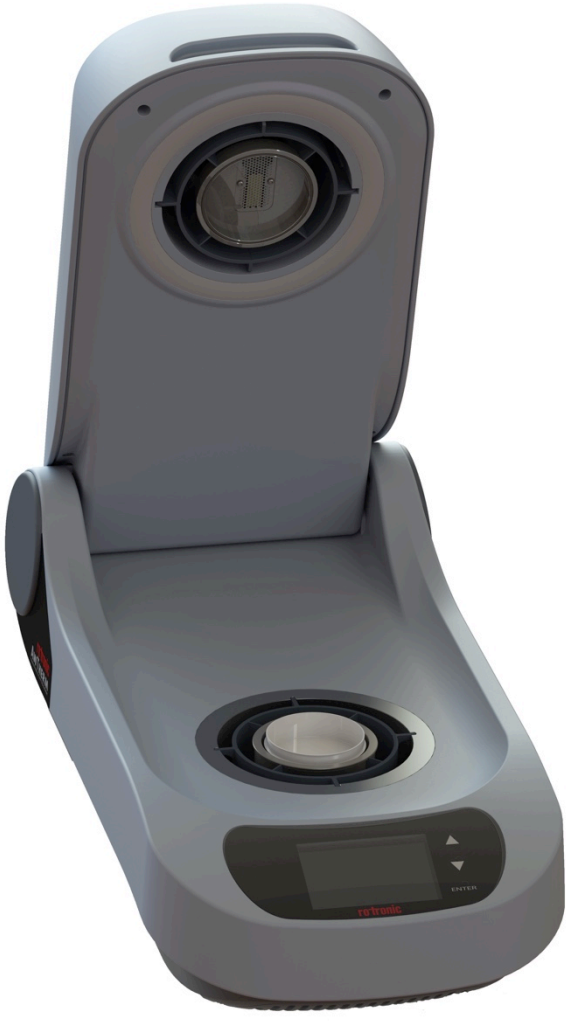
E-M-AwTherm-V1.1 Document code	Rotronic AG Bassersdorf, Switzerland Unit
AwTherm: Water Activity at Controlled Temperature Document title	**Instruction Manual Version 1.1** Document Type

AwTherm



Instruction Manual

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E-M-AwTherm-V1.1 Document code	Rotronic AG Bassersdorf, Switzerland Unit
AwTherm: Important notice before first use Document title	**Advisory Notice** Document Type

Contents of the Standard Supply Package:

- AwTherm stabilised temperature water activity meter with either PS-14 or PS-40 sample cup holder
- HW4-P-Quick-V3 software code sticker
- MicroUSB cable for connection to HW4
- MicroUSB memory stick including HW4 and User Manual
- Power cables for UK or US/EU/CH

E-M-AwTherm-V1.1 Document code	Rotronic AG Bassersdorf, Switzerland Unit
AwTherm: Table of Contents Document title	**Table of Contents** Document Type

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1 Scope of Document

This instruction manual refers to AwTherm running software version Aw-v1.00. To determine the software version your instrument is running please refer to the Device Info screen as shown in Section 3.2.1. Updates are available on www.awtherm.com. This manual refers to the operation, care and maintenance of the instrument itself, and best practices when making measurements. For theory, background and further information on water activity, please refer to www.awtherm.com.

1.1 Introducing the AwTherm

AwTherm is a temperature controlled water activity station – used for determining the water activity of a sample, maintained at a known temperature. Water activity, which is used as a measure of product consistency, is a parameter that is strongly dependent on temperature, and so for consistent, repeatable measurements, it is vital to maintain known and stable thermal conditions.

AwTherm is based on the same technology as the Rotronic HygroGen2 temperature and humidity calibration suite of instruments which manipulate forced air to create highly stable thermal conditions with minimal gradients within the measurement environment.

1.2 Measuring Technology

AwTherm uses a Rotronic HygroClip2 series probe to control and measure conditions.

1.3 Calibration

Calibration is an essential part of any reliable measurement process. AwTherm has a removable measuring head which can be removed entirely (see Section 6.1.1) for calibration of **both** Aw *and* Temperature parameters against references traceable to National Standards, using for example a HygroGen2 temperature and humidity calibration system. The removed head is attached to the HygroGen2 or a PC running Rotronic HW4 software (see section 5) using a special cable (not supplied). Alternatively, the Aw parameter only can be calibrated in situ using Rotronic Calibration Salts and adjusted using HW4 running on a PC connected to the AwTherm via its micro USB port.

2 Setting up the AwTherm

2.1 Physical Location

To ensure correct operation please ensure that:

1. The unit is level and stable;
2. There is at least 15 mm clearance underneath and at least 100 mm at the back of the unit to enable adequate air flow;

2.2 Electrical Supply

Power Isolation

The unit is supplied with a mains cord set. The unit should be disconnected from the electrical supply before the unit is moved, cleaned or has water added or removed.

Earthing

This unit must be earthed. Provision for the safety earth is made through the electrical mains connection (Figure 2, item 5) to which all parts of the unit requiring earthing are internally connected. An earthed electrical supply is required.

Earth Leakage Current

Due to RF filtering there is an earth leakage current, within the limits specified in EN 61010-1:2001. This may affect mains power circuits protected by Residual Current Device (RCD) or Ground Fault Detector (GFD) type circuit breakers (particularly if used in multiples or with other equipment with an earth leakage current on the same supply circuit).

Over Current Protection

To protect the internal circuitry against excess currents, the mains supply to the unit must be connected with the mains cord set provided with the unit and to an appropriate mains supply.

Voltage Rating

The unit is designed to work within the limits of a 110-230 VAC 50-60 Hz mains supply with voltage fluctuations up to ± 10% of the nominal voltage. The unit is rated impulse withstand (over voltage) category II of IEC 60364-4-443. Where occasional voltage transients over 2.5 kV are expected or measured, it may be necessary that the power installation to the unit includes a transient limiting device.

Mains Filtration

If there is risk of power spikes or breaks, it is recommended that an Uninterruptable Power Supply (UPS) is used to provide continued power and mains filtration. This should be rated according to the AwTherm power specifications (see Appendix A5: Electrical Specifications) and the time required to run/shutdown during power outage.

Conductive Pollution

The unit is rated Pollution Degree 2 and must not be operated in environments where conductive pollutants (for example carbon) may enter the unit (this includes excessive moisture ingress).

2.3 AwTherm Assembly



Figure 2-1 - AwTherm Assembly (with lid open, front and rear view)

1) Lid
2) Removable measuring head
3) Sensor
4) Rubber seal
5) Electrical mains connection
6) Heat pump
7) Air flow sleeve
8) Sample cup
9) PSU fan outlet Heat pump fan outlet
10) Heat pump fan outlet
11) Micro USB port
12) Sample cup holder (PS14 or PS40)
13) Touch buttons
14) Screen

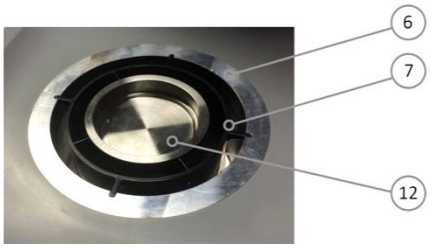


Figure 2-2 Sample Chamber



Figure 2-3 AwTherm Assembly (lid closed)



Figure 2-4 Removable filter (heat pump fan)

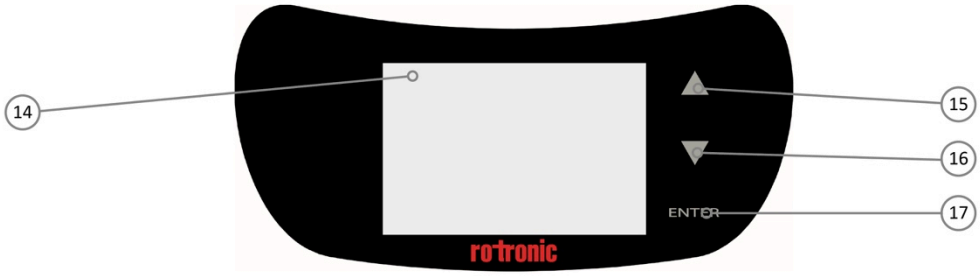


Figure 2-5 AwTherm Touch Interface

15) Touch Button (up)
16) Touch button (down)
17) Touch button (ENTER)
18) Removable heat pump fan filter

2.4 Sample cup size

AwTherm is available in either PS14 (14mm depth) or PS40 (40mm depth) sample cup holder sizes. Alternative sample cup holders are available as accessories (see Section A3: AwTherm Order Codes).

Note that sample equilibrium time is dependent on the sample space, and so the selection of sample cup size should be the smaller PS14 size where possible. For example powders and liquids would merit selecting the smaller PS14 size; samples that are impractical for this size, e.g. large seeds and pet foods, would merit the larger PS40 sample cup.

3 AwTherm Operation

3.1 Switching On

1. Ensure the electrical mains supply is correctly plugged in and switched on.
2. Switch the unit on by pressing the ENTER button once.
3. The fans within the unit will switch on giving an immediate audible indication the unit is powered.
4. The loading screen will display (Figure 3-1)
5. The controller will power up and display the Top Level screen (as shown in Figure 3-2).

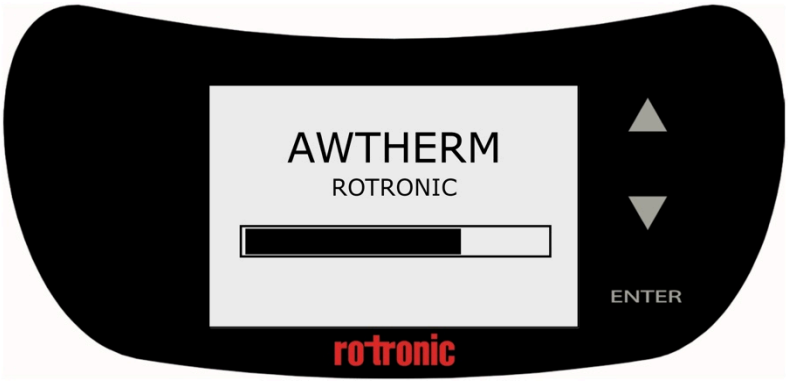


Figure 3-1 Boot screen

On power up:

- The temperature set-point defaults to the last set value.
- The temperature control defaults to automatic mode (controlling the temperature).

3.2 AwTherm Interface

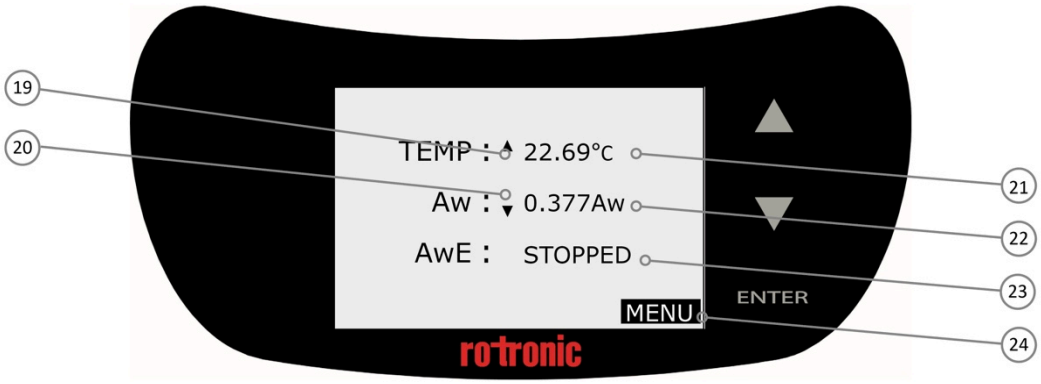


Figure 3-2 AwTherm Top Level Screen

19) Temperature trend indication
20) Aw trend indication
21) Temperature field
22) Live Aw reading
23) Status field
24) MENU

3.2.1 Basic Navigation

The AwTherm interface consists of a Top Level Screen with 3 fields which can be manipulated: (set point) temperature, status, and device settings (Menu). Pressing the up or down arrow scrolls through each of these, highlighting each one in turn. To select one, press the ENTER button. The field will flash, and the functionality activated.

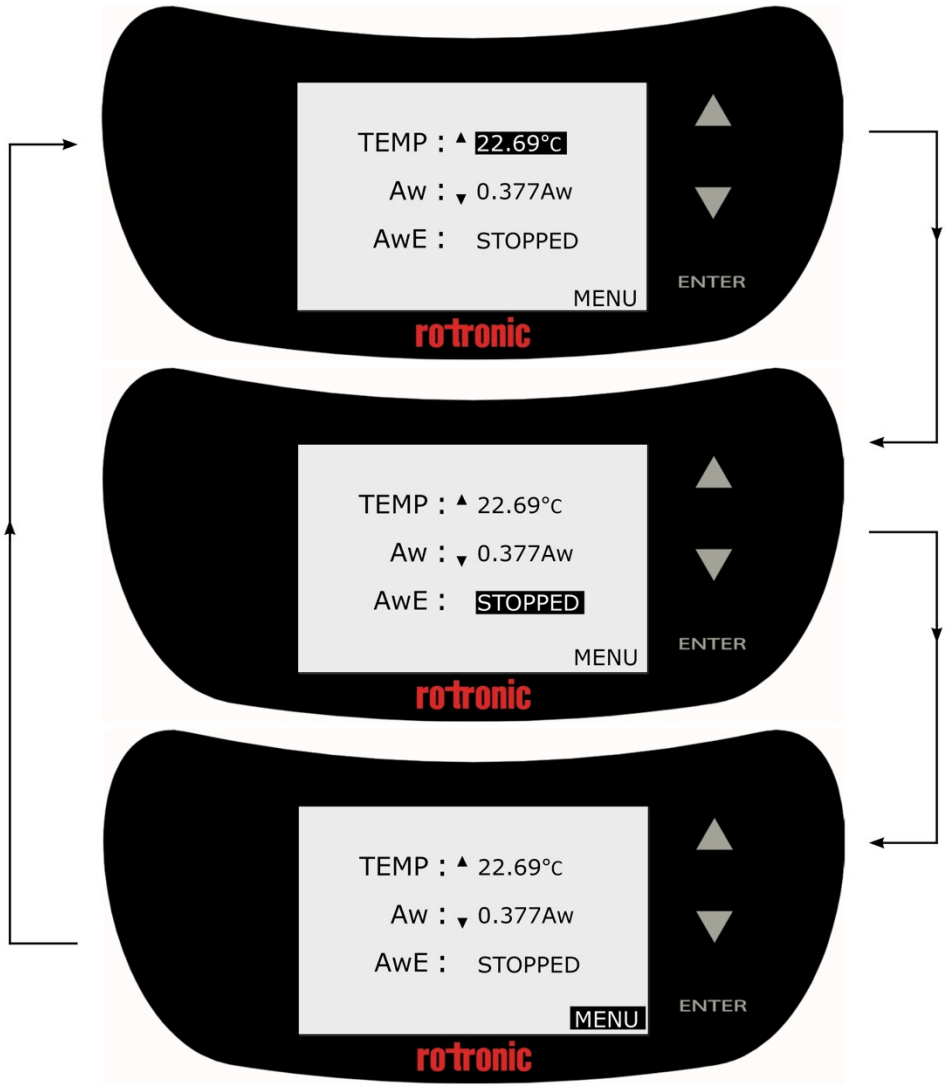


Figure 3-3 Basic Function Navigation

3.2.2 Main Menu

There are a number of AwTherm system and program settings that can be configured. To access the settings, select MENU and press the ENTER button.

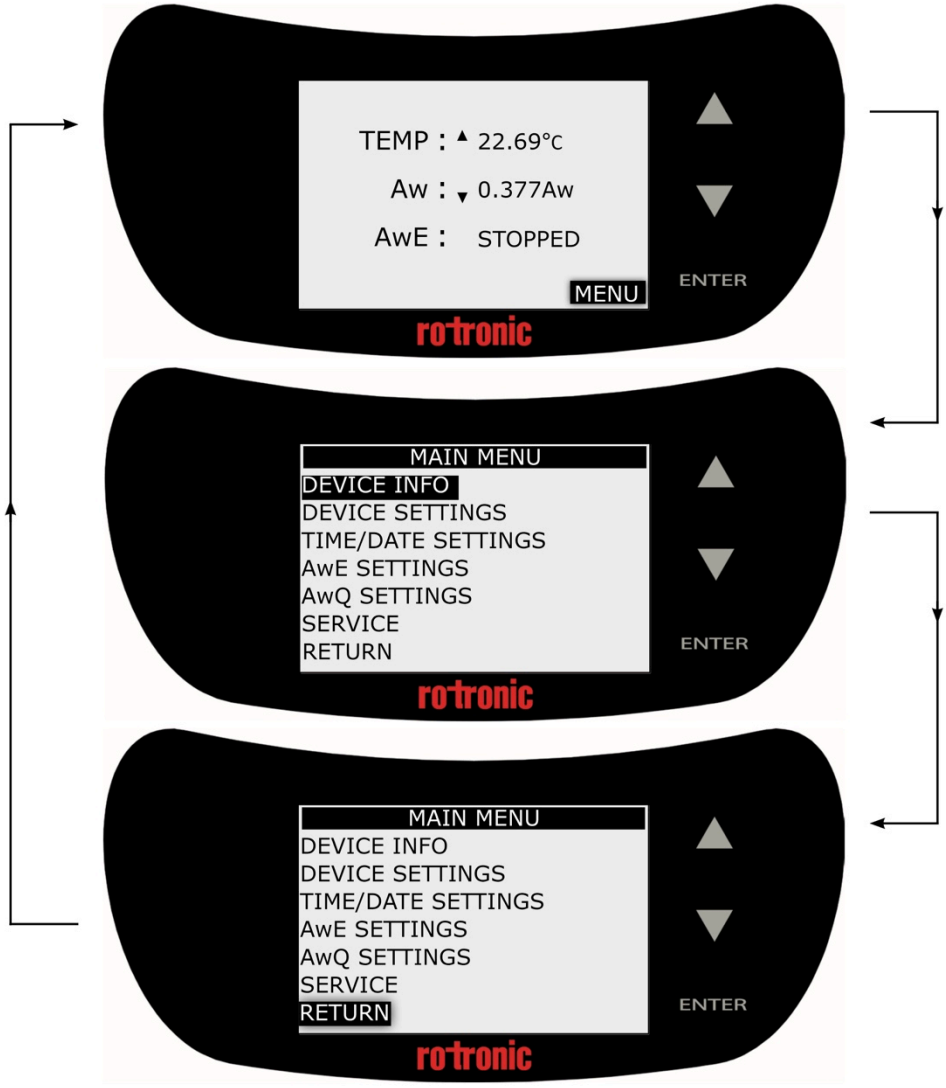


Figure 3-4 Access Device Settings Menu

NB For all menus and sub-menus, to return to the previous screen, scroll down to the RETURN field and press the ENTER button.

Any adjustable parameter can be selected using the UP/DOWN and ENTER touch buttons in the same manner as described for basic menu navigation. The parameter can be adjusted using the UP/DOWN buttons and set by pressing the ENTER button.

Please note, by pressing and holding the up or down arrow keys, the speed of any numeric incrementation will increase (autoscroll).

3.2.3 AwTherm Settings

i) **Device Info** displays the serial numbers of the unit itself, the AirChip Sensor and the firmware version that the AwTherm is running.



Figure 3-5 Device Info

ii) **Device Settings**; Enable or disable temperature control (on by default), disable the Trend Indication for temperature (19) and Aw (20) as shown in Figure 6, and configure the Aw measuring mode: AwE or Aw-Quick (see section , below). Touch buttons can be set to make an audible sound when activated, contrast adjusted (default optimal setting is 35%), and touchpad sensitivity adjusted – from a value from 0-5. Please note, if touch pad has poor responsivity, try each individual setting in turn until best results achieved.

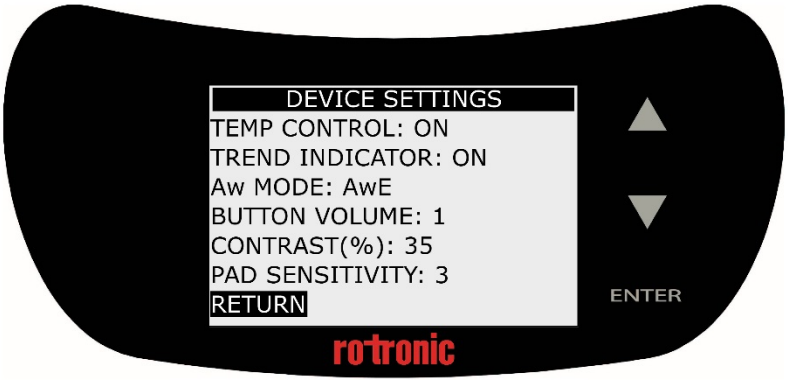


Figure 3-6 Device Settings

iii) **Time/Date Settings**; Date and time can be set and displayed on the AwTherm (off by default).

Time/date is only displayed for convenience and is not used a part of data logging and therefore is not crucial to the operation of the instrument. Data logging is performed using Rotronic HW4 software running on an external PC (see Section 5.1).

Please note the date format [DD/MM/YYYY] is fixed and cannot be changed.

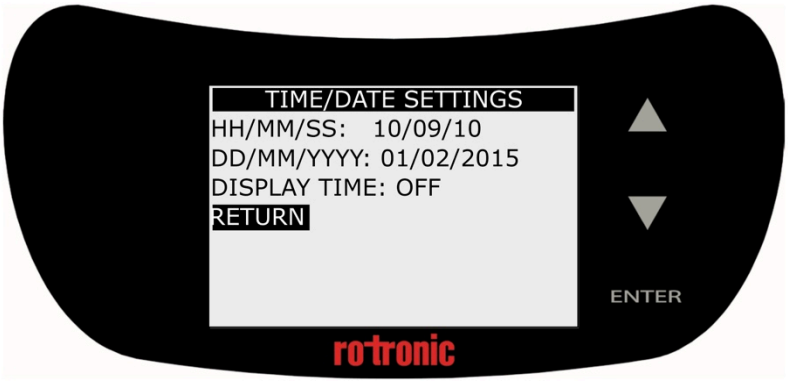


Figure 3-7 Time/date Settings

iv) **AwE Settings**; the AwE Tolerance, Temperature tolerance, and process complete audible beep volume can be configured here. Further details regarding AwE measurement mode are found in Section 3.3.2.

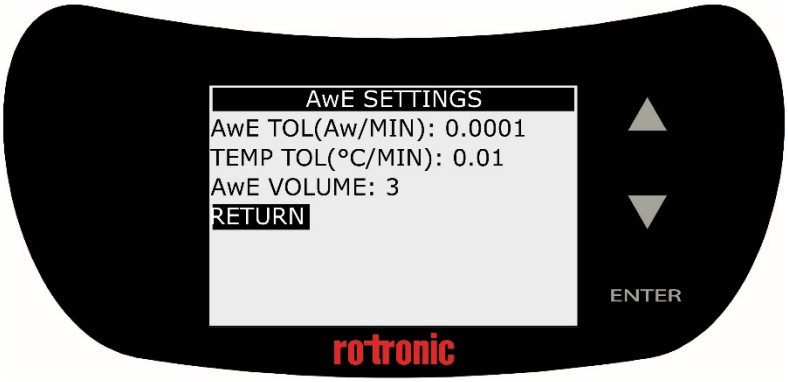


Figure 3-8 AwE Settings

v) **AwQ Settings**; the Aw-Quick dwell time and temperature tolerance, and process complete audible beep volume can be configured here. Further details regarding AwQ measurement mode are found in Section 3.3.3.

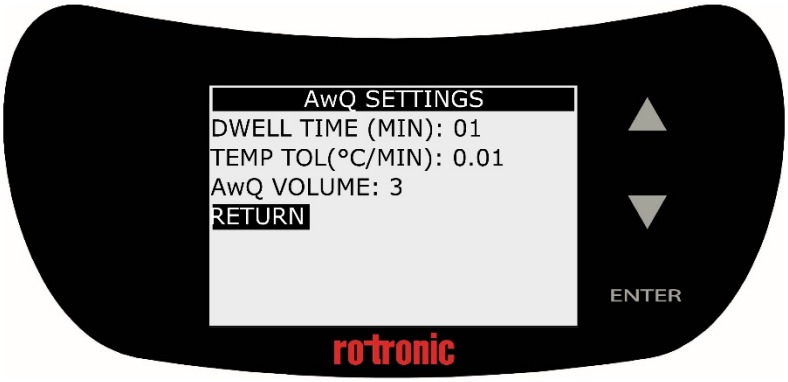


Figure 3-9 AwQ Settings

vi) **Service**; the AwTherm firmware can be updated via this menu using a Micro USB drive inserted into the Micro USB port (11) on the rear of the AwTherm.



Figure 3-10 Service

Select the Update Firmware field and change the NO to YES using the up or down arrow keys and press ENTER. Further details about updating the firmware are found in Section 6.4. There is also an indication of the internal CMOS battery condition.

3.2.4 Setting the AwTherm Set Point Temperature

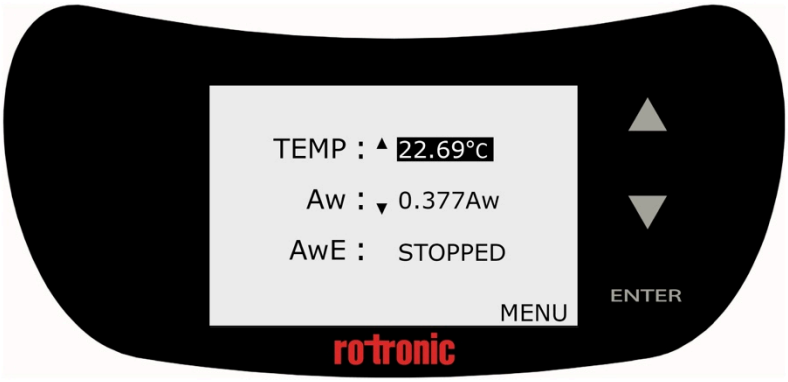


Figure 3-11 AwTherm Top Level Screen

With the Temperature Control parameter turned on (Section 3.2.3), and the lid (1) closed, the AwTherm will control the temperature of the sample chamber environment (12). The heat pump (6) controls the temperature of the air which is circulated through the airflow sleeve (7) around the outside the walls of the sample chamber.

To set the temperature, from the Top Level screen (Figure 3-11), use the up and down arrows to select the Temperature parameter. Press ENTER; the temperature parameter will flash (Figure 3-12) and the label will change to SP (set point).

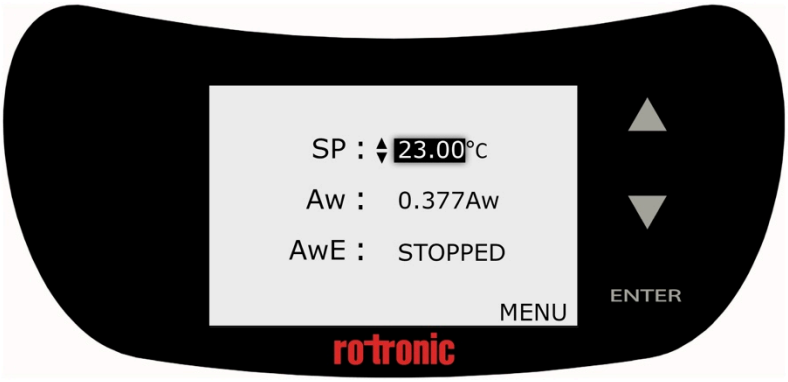


Figure 3-12 Select Temperature parameter

Use the UP/DOWN touch buttons to adjust the value to the desired temperature and press ENTER to accept it.

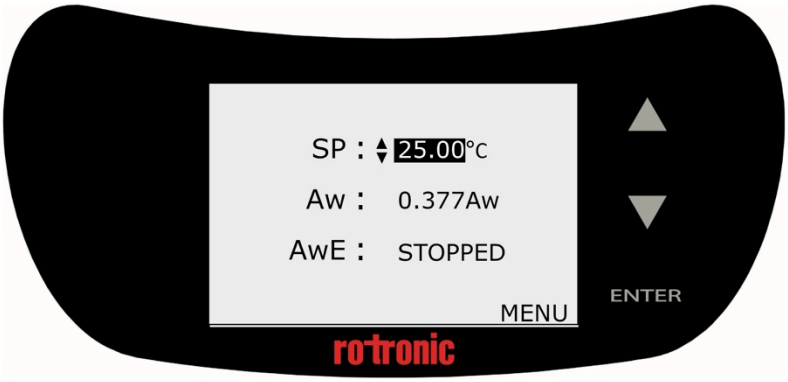


Figure 3-13 Define new Set Point Temperature

AwTherm will now control the temperature of the chamber to the new temperature. The time it takes for the chamber to reach the temperature will depend on the ambient conditions, and the initial and set point temperatures. Depending on the magnitude of the temperature change required, the instrument will slightly overshoot, before coming back and stabilising. The Trend Indicator (19) will show whether the unit is heating or cooling. When stable (to within the defined AwE/AwQ temperature tolerance – see Section 3.3) the Trend Indicator will display up and down indicators simultaneously.

Note that the chamber will reach a stable set point temperature before the sample, depending on the initial temperature of the sample. See Sample Preparation: best practices and operational considerations (Section 4.3) below for further details and advice.

3.3 Making Measurements

AwTherm features two modes for measuring water activity.

● AwE mode:

In this mode AwTherm 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 15 to 60 minutes and can take as long as a couple of hours.

● AwQuick mode:

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

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).

Aw mode can be selected in Device Settings as described above (Section 3.2.3). Load your sample into the instrument, following the guidelines as outlined in Section 4.

3.3.1 Starting a measurement run

To start a measurement run, at the Top Level screen, select the status field and press ENTER.

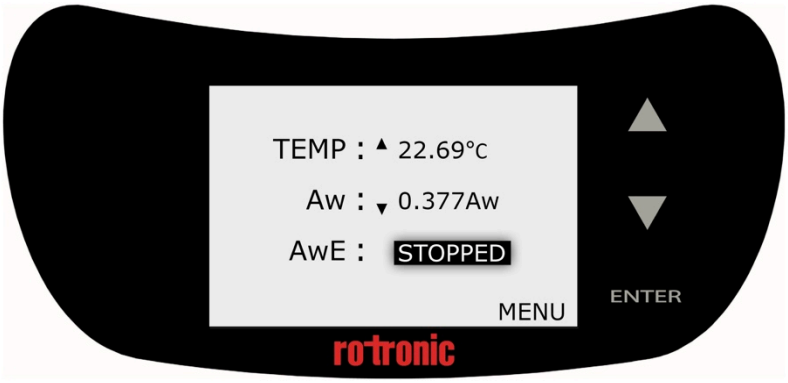


Figure 3-14 Select status field

Then use the UP/DOWN touch buttons to and select START, and then press ENTER.

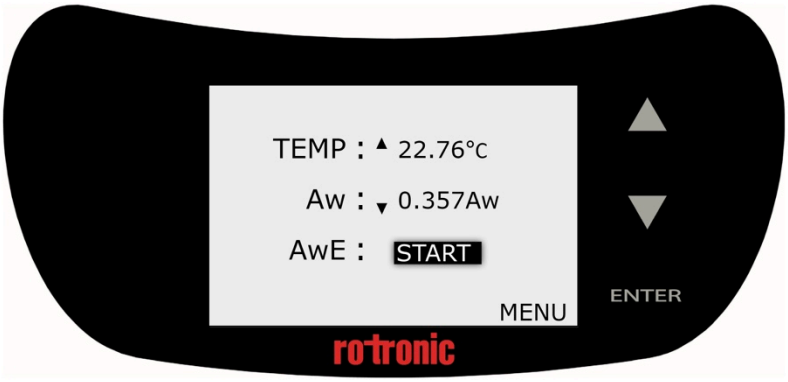


Figure 3-15 Select START and press ENTER

The measurement run will now begin.

At the end of the run, the AwTherm will sound an audible beep (if so configured, see Section 3.2.3) and hold the values on the screen, displaying FINISHED in the status field.

The following section describes the operation of each mode, AwE and AwQ as a flowchart.

3.3.2 AwE Mode

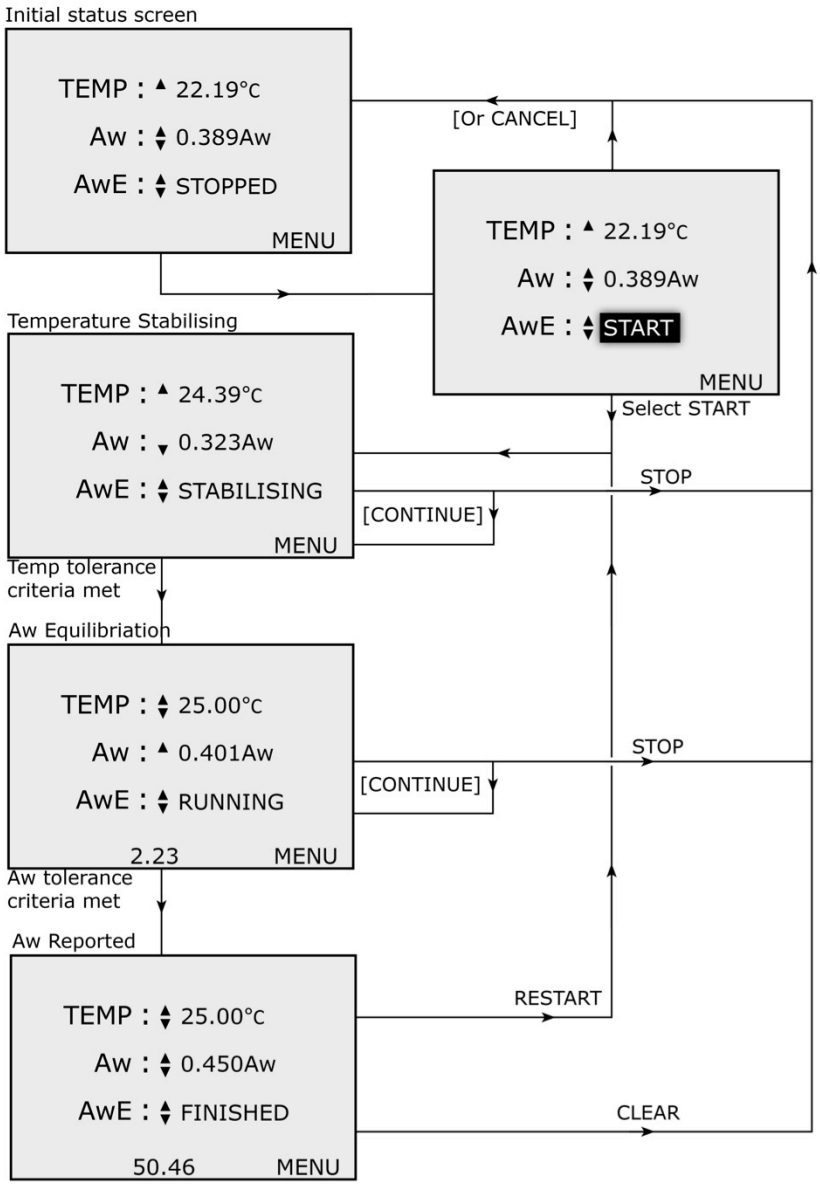


Figure 3-16 AwE process flowchart

3.3.3 AwQ Mode

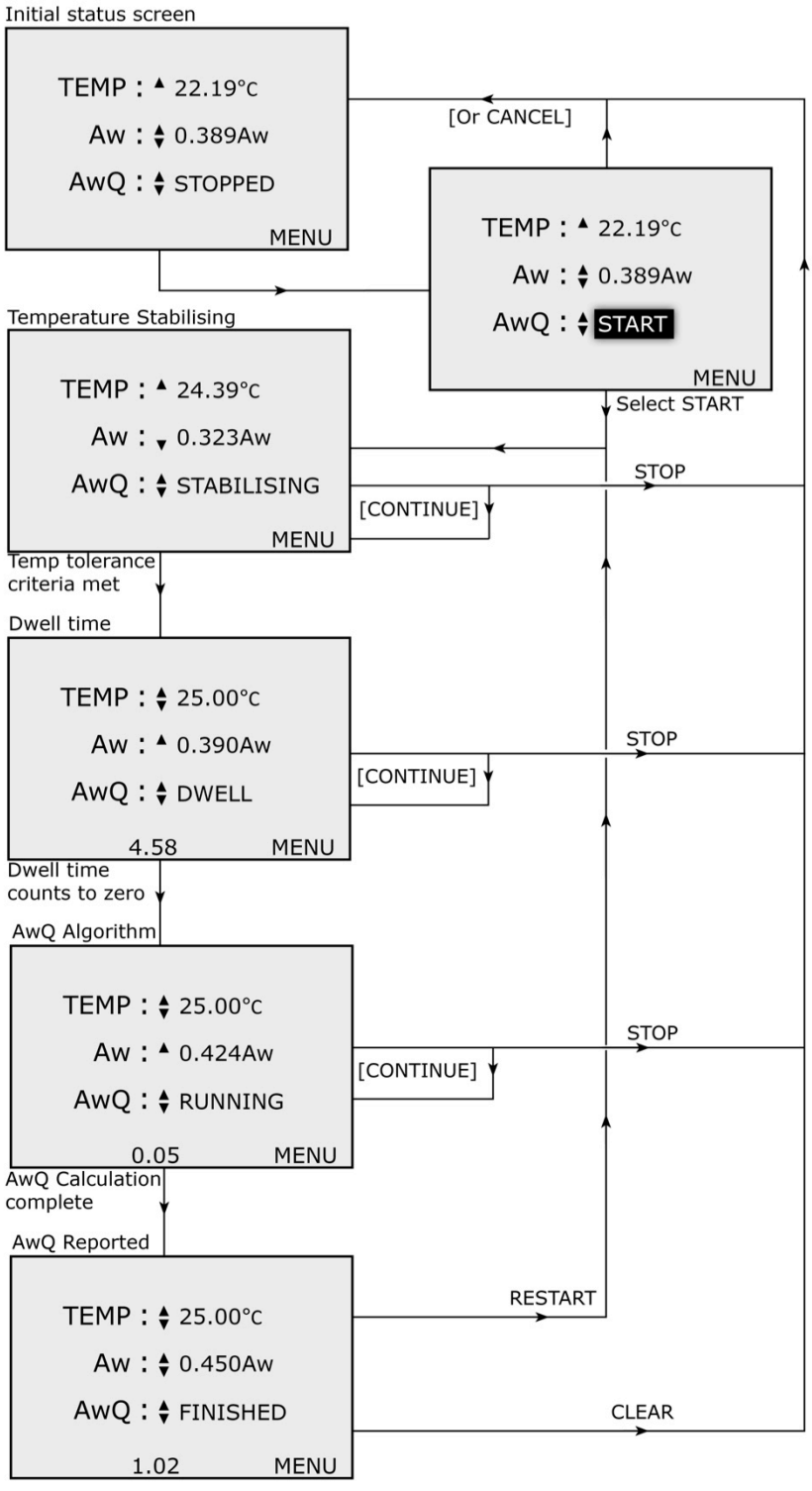


Figure 3-17 AwQ process flowchart

3.4 Switching off the AwTherm

To turn off AwTherm, press and hold the ENTER touch button until the Shutting Down screen appears and the progress bar has completed.

To cancel the shutdown process at any time, simply stop pressing the ENTER touch button.

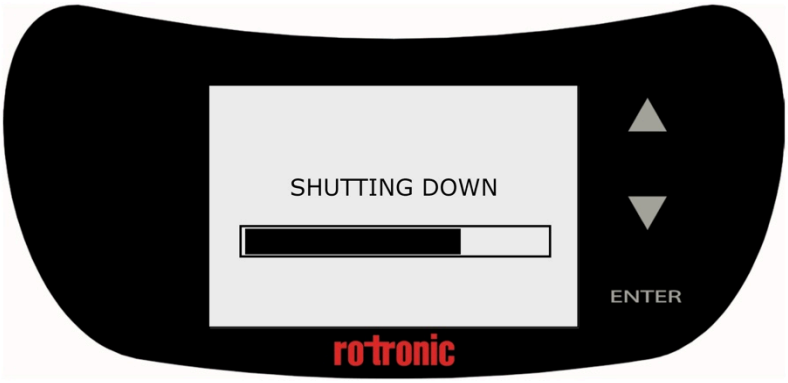


Figure 3-18 Shutting Down screen

DO NOT switch off at the wall before the AwTherm has shutdown.
DO NOT switch off at the back of the AwTherm before it has shutdown.

3.5 Preparing the Unit for Transit or Storage



If the AwTherm needs to be shipped, always use the original double-layer cardboard and foam packaging.

4 Sample preparation

4.1 Protection from environment

Fundamentally any sample will try to come into equilibrium with its environment, so it is vitally important to keep samples as protected from the ambient environment as possible – to avoid its water activity changing before loading into the instrument. This is best achieved by placing the sample in a Rotronic PS14 or PS40 sample cup with a lid in place until the sample is ready to be placed in the instrument and its lid closed.

This is particularly important if the sample is chilled as vapour may condense on the sample, and render any measurement invalid.

4.2 Sample size and temperature equilibration time

Adequate time should be allowed for the sample to reach temperature in order to make a valid measurement. The time taken depends on the size, weight, and specific heat capacity of the sample. Difficulties in knowing the sample has reached the required temperature throughout are mitigated by consistency in procedures and practices as described in the following sections.

4.3 Best Practices

4.3.1 Precondition samples to measurement temperature

If the samples being tested are part of a process, if at all possible, make measurements at the temperature that the sample comes out of the process, and minimize the time taken to load the sample into the AwTherm.

4.3.2 Avoid condensation

If your sample is chilled below ambient or you need to make measurements at low temperatures, there is a risk of condensation forming. Condensation can form on chilled samples or on the inside of the AwTherm when the lid is open. As a guide in normal laboratory conditions, condensation can form on surfaces that are <15°C. It may be necessary to place the AwTherm in a cooler (drier) environment to prevent this occurring

4.3.3 Define procedures

Water activity is a qualitative measurement of product consistency, and so to record useful data, it is vitally important to make measurements in a consistent way. Define procedures: dwell times, tolerances, etc, and be consistent with their implementation.

5 PC Software

5.1 HW4

AwTherm is bundled with ROTRONIC HW4 logging software which can be loaded on any PC running a Windows OS. Once installed simply connect the AwTherm to a PC via the MicroUSB port with the supplied cable.

HW4 features include:

- Instrument configuration
- Data acquisition
- Measurement display and graphing
- Calibration and adjustment

For further details on the AwTherm operation from within HW4, please refer to the HW4 documentation http://www.rotronic.co.uk/productattachments/index/download?id=949

5.2 HW4 Support

Support for HW4 is available via email. Please contact support@rotronic.ch including your full contact details, the AwTherm serial number and HW4 product key, and a description of your query or problem. You will receive a response within a maximum of two working days.

6 Servicing and Maintenance

6.1 AwTherm Calibration

A unique feature of the AwTherm is the ability to remove the entire head to calibrate both the Aw and temperature sensors.

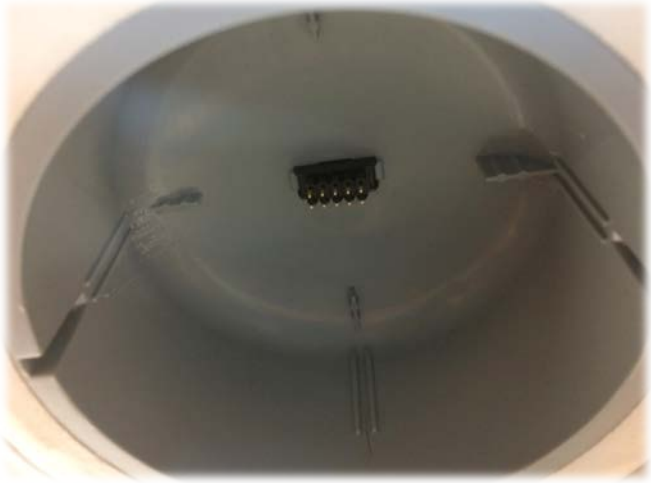
Alternatively, AwTherm can be calibrated in-situ for Aw using Rotronic calibration salts.

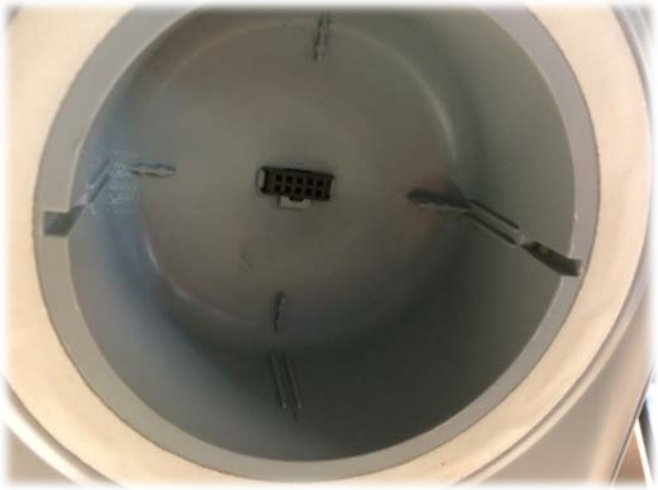
6.1.1 Remove measuring head for calibration

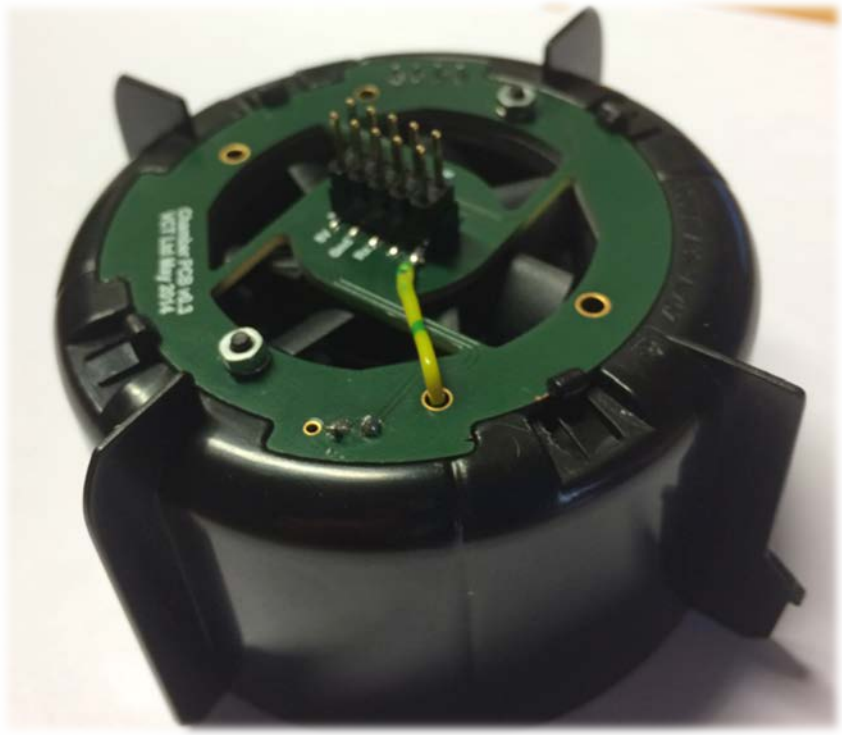














6.1.2 Calibrate in Hygrogen2

To minimise AwTherm downtime, alternative measuring heads can be fitted in place of the existing head while it is being calibrated. To order spare heads, see Appendix A3: AwTherm Order Codes.

6.2 AwTherm Cleaning

Prior to cleaning, the unit should be disconnected from the electrical mains supply.

6.2.1 External surfaces

The external surfaces of the AwTherm may be cleaned with a lint-free cloth dampened with a mild soap solution. Care must be taken not to allow fluids into any of the apertures on the unit.

The fan inlet filter can be cleaned using a vacuum cleaner to remove any particulates.

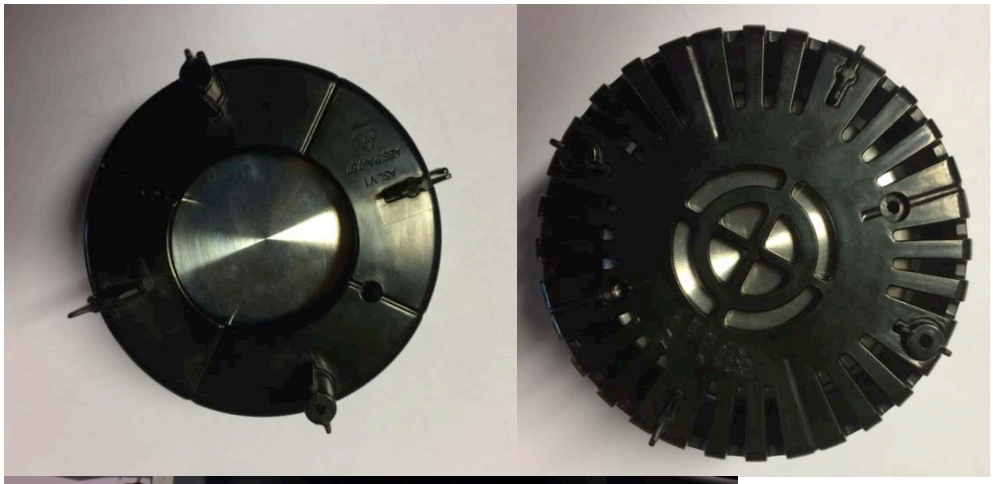
6.2.2 Filter

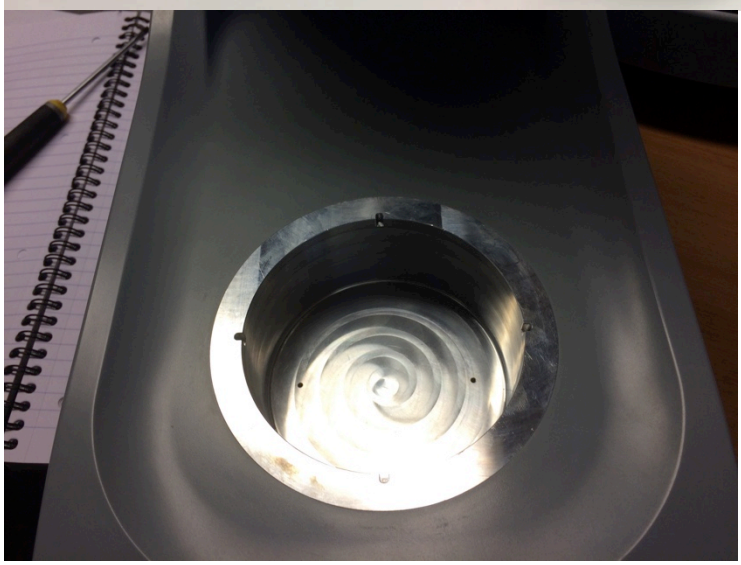


6.2.3 Chamber

Periodically it is recommended that the internal surfaces of the AwTherm chamber. The bottom half can be removed and placed in a dishwasher.







6.3 Annual Servicing of AwTherm

The unit does not require routine user maintenance beyond that described in this Section.

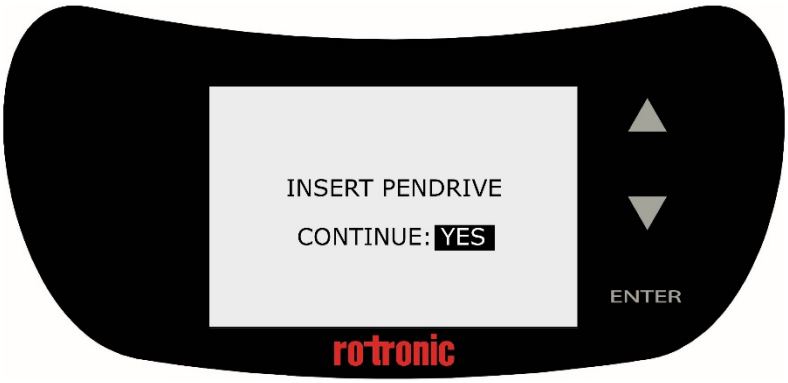
Under no circumstance should the unit be opened by personnel unauthorised by the manufacturer. Doing so will void the manufacturer's warranty, and expose potentially dangerous electrical hazards.

6.4 Firmware Updates

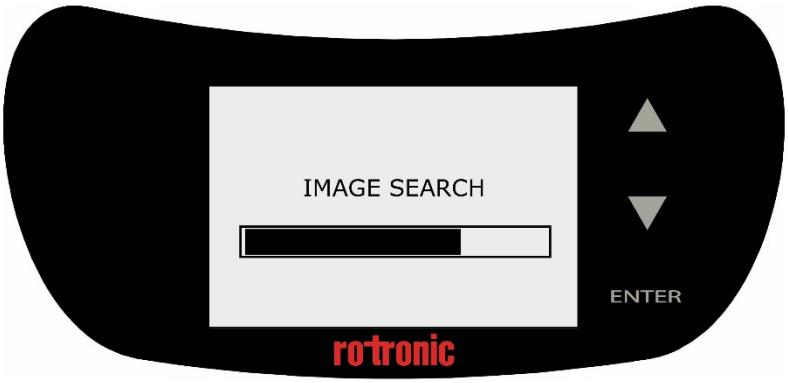
To update the AwTherm firmware, select the Service menu, as described in Section 3.2.3 (vi), and change the default 'NO' to 'YES' and press ENTER to continue.



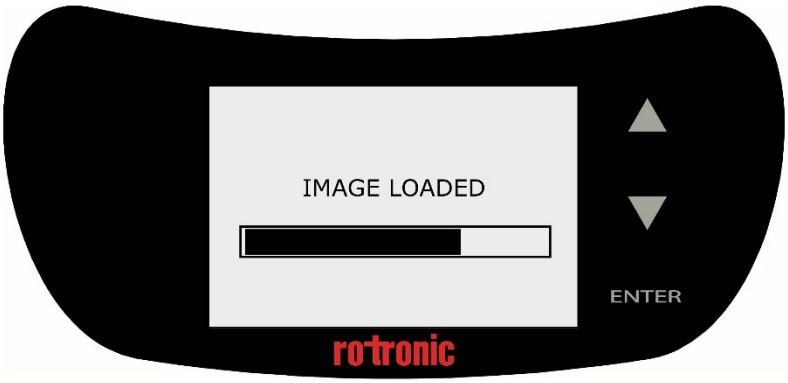
The AwTherm will ask for a pen drive. Insert a micro USB stick loaded with the desired firmware in its root directory. The firmware will be a file called "AW_image.hex"



Select 'YES' and press ENTER to continue. The AwTherm will restart.



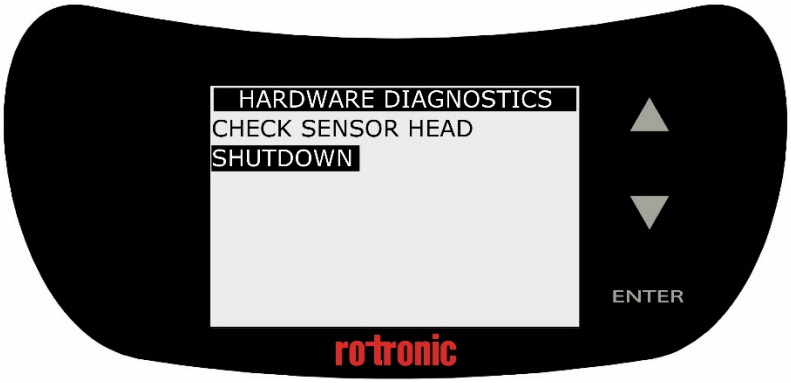
The AwTherm will verify the firmware image and re-flash its memory.



The software will start as normal. You can then check the new software version in Device Info as detailed in Section 3.2.3(i).

A1: AwTherm / Screen Messages

Should the AwTherm fail to communicate with the sensor head, a Hardware Diagnostic page will display.



A2: AwTherm Specifications

General	
Device type	Temperature-stabilized water-activity measurement
Operating conditions	1..40 °C (34..107 °F)
Measurement range	0.005…1.000 aw
Accuracy	±0.005 aw ±0.1 °C (±0.18 °F)
Power supply	110..230 V / 50..60 Hz
Display	8-line LCD with touch operation
Sample sizes	Variable (14 mm / 40 mm)
Technical Information	
Current Consumption	≤2 A
Temperature-control range	0..60 °C (32..140 °F)
Temperature stability	±0.01 °C/min (±0.018 °F/min)
Chamber-temperature gradient	<0.1 °C (<0.18 °F)
Firmware update	Via USB port
Functions	
HW4-compatible	Yes (v 3.6.0 and higher)
aw-Quick function	Yes
Interface	Micro USB
Calibration / Adjustment	Aw & Temperature: HG2-S (probe removed with AwT-CAL) Aw: ROTRONIC humidity standards (via HW4)
Trend indicator	Yes
Probes	
Sensor	HYGROMER® IN-1
Maintenance / Calibration	Annual calibration (recommended)
Long-Term Stability	<0.01 aw/year
Temperature sensor	Pt100, DIN 1/3 Class B
Approval / Conformity	
Standards	ISO 21807
CE / EMC	EMC 2004/108/EC IEC/ EN 61010-1:2010
IP protection	IP21
Housing / Mechanical parts	
Housing material	PC / ABS
Housing dimensions	400 x 180 x 180 mm
Sample container holder dimensions	AwT-PS14: Ø46 x 14 mm AwT-PS40: Ø46 x 40 mm
Weight	4200 g

A3: AwTherm Order Codes

AW-Therm	
AwTherm-PS14	AwTherm Body incl. Standard AwT-MHS and AwT-PS14
AwTherm-PS40	AwTherm Body incl. Standard AwT-MHS and AwT-PS40
AW-Therm SET	
AwTherm-SET	AwTherm Body incl. Standard AwT-MHS and AwT-PS14 AND AwT-PS40
AWTherm Measuring Heads	
AwT-MHS	AwTherm measurement head standard
AWTherm sample container holder	
AwT-PS14	AwTherm sample holder for PS14 (ordered separately), depth 14mm
AwT-PS14	AwTherm sample holder for PS40 (ordered separately), depth 40mm
Sample container	
PS-14	Pack of 100 sample containers for AwT-PS14
PS-40	Pack of 100 sample containers for AwT-PS40

A4: AwTherm Environmental Conditions

This standard applies to equipment designed to be safe at least under the following conditions:

- For indoor use only
- Altitude up to 2000 m
- Ambient temperature 5°C to 40°C
- Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % Relative Humidity at 40 °C
- Pollution degree 2

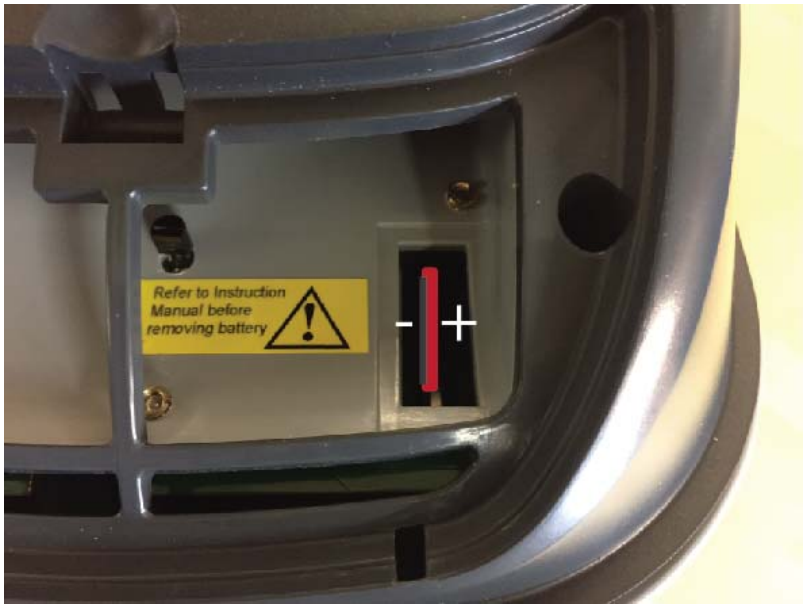
A5: Electrical Specifications

- Input voltage is from 90VAC to 264VAC; Auto Ranging
- Input Frequency range from 47Hz to 63Hz
- Input current is 3.5A at 100VAC or 1.5A at 240VAC
- Power inlet IEC socket

A6: Battery disposal and replacement

Batteries must not be disposed of as ordinary refuse. Please use a local battery recycler.

Replacement batteries are available from Rotronic. These are Lithium rechargeable batteries and must only be replaced with the same type. The replacement battery will be supplied with plastic tweezers; do not use a metal tool to remove the battery as this will cause a short circuit. Be sure to insert the new battery using the correct polarity as shown.



Use of a non-rechargeable battery, or incorrectly inserting the battery could lead to explosion.

B1: AwTherm Warranty Statement

ROTRONIC will grant a warranty for the AwTherm for a period of 24 months from the date of delivery in respect of any evidenced faulty workmanship and materials. The warranty period is extended by a further 24 months when the unit is serviced at a ROTRONIC approved service centre 24 months after the date of supply. Should the instrument be proven not to meet the published specifications or to be contrary to contract upon inspection, the customer shall grant ROTRONIC the opportunity hereunder of repairing the fault by returning the unit carriage paid to ROTRONIC.

Should the supply or delivery of any improvement or replacement not prove possible, the customer may choose between having the purchase price reduced or in demanding the contract of sale to be rescinded (conversion). Damage resulting from natural wear and tear, an act of God or non compliance with the operating instructions shall be excluded from the warranty as well as mechanical interference by the customer or by third parties with plant and equipment of ROTRONIC without its written permission. No liability will be accepted for defects, damage or injury caused due to installation not carried out in accordance with the manufacturer's installation instructions.

The instrument maintains a record of the usage and this may only be reset by an authorised service centre; this will determine the warranty period granted.

B2: Manufacturer & Service Centre Contact Information

Manufacturer/UK Service Centre : Rotronic Instruments (UK) Ltd Crompton Fields Crompton Way Crawley RH10 9EE United Kingdom Phone : +44(0)1293 571000 Fax : +44(0)1293 571008 www.rotronic.co.uk instruments@rotronic.co.uk	Switzerland Service Centre: Rotronic AG Grindelstrasse 6 CH-8303 Bassersdorf Switzerland Phone +41 1 838 1144 Fax +41 1 837 0073 www.rotronic.ch humidity@rotronic.ch	USA Service Centre: Rotronic Instrument Corp. Suite 150 135 Engineers Road Hauppauge, NY 11788, USA Phone +1 631 427 38 98 Fax +1 631 427 39 02 sales@rotronic-sa.com www.rotronic-usa.com
Germany Service Centre : Rotronic Messgeräte GmbH Einsteinstrasse 17-23 76275 Ettlingen Deutschland info@rotronic.de www.rotronic.de Phone +49 7243 383 250 Fax +49 7243 383 260	France Service Centre: Rotronic s.a.r.l. 56, bd de Courcerin, F-77183 Croissy Beaubourg France humidite@rotronic.fr www.rotronic.fr Phone +33 160 95 07 10 Fax +33 160 17 12 56	China Service Centre: Rotronic Shanghai Representative Office 2B,Zao Fong Universe Building No.1800 Zhong Shan West Road, 200233 Shanghai China info@rotronic.cn www.rotronic.cn Phone +86 40 08162018 Fax +86 10 82254374