

# WATER ACTIVITY

## WATER ACTIVITY MEASUREMENT

The measurement of water activity or equilibrium relative humidity is a key parameter in the quality control of any moisture sensitive product or material. Water activity is by definition the free or non chemically bound water in foods and other products. The bound water cannot be measured with this method.

### Why is water activity measured?

The free water in a product influences its microbiological, chemical and enzymatic stability. This is especially important in the case of perishable products such as foods, grain, seeds, etc. as well as in the case of medicines and other products of the pharmaceutical and cosmetic industries. If there is too much free water available, the foods spoil, and if there is too little water available, other product properties can be affected.

The table below shows typical growth thresholds below which the specified contaminant cannot replicate and therefore spoil the product. Control of water activity therefore has a significant impact on the shelf life of a product.

The measurement of water activity also supplies useful information on properties such as the cohesion, storability, agglomeration or pourability of powders, tablets, etc. or adherence of coatings.

Based on HygroClip digital technology for high performance and easy digital calibration, ROTRONIC water activity probes are suitable for almost any application. All water activity stations and probes incorporate temperature measurement as standard.

Water activity	Contaminant
aw = 0.91...0.95	Most bacteria
aw = 0.88	Most yeasts
aw = 0.80	Most mildews
aw = 0.75	Halophile bacteria
aw = 0.70	Osmiophile yeasts
aw = 0.65	Xerophile mildew

Water activity measurement stations measure in the range of 0...1 aw which equates to 0...100 %ERH and supply a digital output signal to interface with HygroLab and HygroPalm water activity indicators. Digital calibration can be performed with the help of these instruments, or with PC software. The HC2-AW and AW-DIO measurement stations have a large thermal mass. This means the probes react very slowly to temperature changes so that virtually no variations arise during measurement – especially when using the AW Quick function. The extremely small internal volume of the sensor chamber ensures humidity equilibrium is reached very quickly in the case of all products. The section «Accessories» describes the sample holders, sample containers and sealing mechanism in detail.

## HYGROLAB SERIES

### Applications

Water activity measurements in the laboratory: cheese, meat, tobacco, building materials, pet foods, bakery products, paper, medicines, horticulture, agriculture, etc.

### Use

With AW-DIO probes and insertion probes for bulk materials

### Highlights

- Suitable for many applications
- AW Quick mode for results in typically 4-5 minutes
- High measurement precision
- Long term stability
- Interchangeable measurement stations
- Multichannel display
- Validated PC analysis software



### HYGROLAB 2

Order code HygroLab 2

- 4-channel benchtop display unit for measurement of water activity, temperature and relative humidity
- Display option: aw or %rh
- All psychrometric calculations available
- Definable pressure constant for calculations
- AC power supply
- RS232/485 interface
- Dimensions: 225 x 170 x 70 mm

### HYGROLAB 3

Order code HygroLab 3

- 4-channel benchtop display unit for measurement of water activity, temperature and relative humidity
- All psychrometric calculations available
- Definable pressure constant for calculations or with pressure probe
- Integrated AW Quick function
- AC power supply
- RS232/485 interface
- Dimensions: 225 x 170 x 70 mm



### HYGROLAB 3-E

Order code HygroLab 3-E

- As HygroLab 3, but with Ethernet TCP/IP interface

## HYGROPALM HP23 SERIES

In many situations it can be very useful to measure water activity in production or storage rooms, e.g. inspection of bulk materials to ensure they meet specifications.

The new HP23-AW was developed as a portable solution with most of the functionality of the HygroLab3.

### Applications

Water activity measurements in production processes: random checks of cheese, meat, tobacco, building materials, pet food, bakery products, paper, medicines, horticulture, agriculture, etc.

### Highlights

- Measures humidity and temperature (aw or %rh and °C/°F)
- Calculates absolute humidity
- Software-aided probe calibration / adjustment (one-point / multi-point)
- Range of application 0...1 aw (0...100 %rh) / -10...60 °C
- UART interface
- Battery power monitor
- Trend indicator

### HYGROPALM 23-AW

Order code HP23-AW

- 2 probe inputs for interchangeable HC2 probes, with 9 V battery
- All psychrometric calculations available
- Accelerated measurement of water activity (AW Quick mode):  
allows measurement of most products in typically 4-6 minutes
- Equilibrium humidity measurement (standard mode) with  
automatic detection of equilibrium state
- Adjusted at 23 °C and 10, 35, 80 %rh
- Accuracy:  $\pm 0.8$  %rh (0.008 aw) /  $\pm 0.1$  K (depending on probe used)
- Saves up to 2,000 data records for each of %rh, °C, date, time

Available beginning spring 2009

Not compatible with AW-DIO probe

### AW QUICK

Order code HW4-P-Quick

AW Quick is a highly developed software function for water activity analysis that is integrated in both the HygroLab 3 and in the HP23-AW handheld device. It supplies results in typically five minutes or less. It also allows conventional water activity measurement with automatic detection of humidity equilibrium.



## HYGROPALM AW SETS

The HygroPalm AW sets are the perfect solution for on-site measurements. They are supplied in a tough, lightweight ABS carry case and include everything needed for measurement and calibration.

The difference between the two sets lies in the size of the sample holders and disposable sample containers.

### Applications

Water activity measurements in production areas: checks of cheese, meat, tobacco, building materials, pet food, bakery products, paper, medicines, horticulture, agriculture, etc.

### Highlights

- Measures humidity and temperature (aw or %rh and °C/°F)
- Calculates absolute humidity
- Software-aided probe calibration / adjustment (one-point / multi-point)
- Range of application 0...1 aw (0...100 %rh) / -10...60 °C
- UART interface
- Battery power monitor
- Trend indicators



### AW1-SET-14

Order code HP23-AW-Set-14

- Contains the sample holder WP-14-S/PS-14
- For product samples such as tablets, powders, seeds, powdered spices, tea, etc.

### AW1-SET-40

Order code HP23-AW-Set-40

- Contains the sample holders WP-40/PS-40
- Suitable for measurement of, for example, pet food, ore, nuts, beans, etc.

See «Accessories» for further information.

Available beginning spring 2009

Order information		
Order code HygroPalm AW sets	HP23- AW-Set-14	HP23- AW-Set-40
Consisting of:		
Handheld device	HP23 AW	
Measurement probe	HC2-AW	
Sample holder	WP-14-S	WP-40S
Disposable sample containers	PS-14, 14 mm	PS-40, 40 mm
35 %rh humidity standards	EA35-SCS	
80 %rh humidity standards	EA80-SCS	
50 %rh humidity standards	EA50-SCS	
10 %rh humidity standards	EA10-SCS	
Carry case	AC1124	

## MEASUREMENT STATIONS

Water activity probes with large thermal mass, cable length ~1m

### Applications

For water activity measurements in bulk materials such as flour, grain, spices, etc.

For solid products such as meat, sausage as well as oils, fats, etc.

### Uses

Handheld and bench top devices

### Highlights

- Measures water activity
- Measurement range: 0...1 aw (0...100 %rh), 5...50 °C
- Digital interface

### HC2-AW

Order code HC2-AW

- Water activity probe with large thermal mass
- Cable length ~1m
- UART interface
- Probe with adjustment profile «Standard», factory certificate
- Adjusted at 23 °C and 10, 35, 80 %rh
- Accuracy:  $\pm 0.01$  aw / 0.8 %rh /  $\pm 0.1$  K
- Wire mesh filter with approx. 20...25  $\mu$ m pore size, material DIN1.4401

### HC2-AW-HH

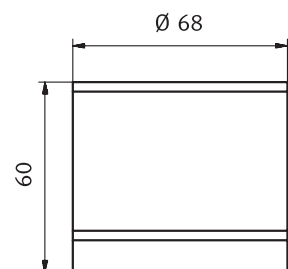
Order code HC2-AW-HH

- Like HC2-AW, but with special sensor for measurements in high humidity range

### AW-DIO

Order code AW-DIO

- Water activity probe with large thermal mass
- Cable length ~1m
- DIO interface for original HygroPalm/HygroLab devices
- Probe with adjustment profile «Standard», factory certificate
- Adjusted at 23 °C and 10, 35, 80 %rh
- Accuracy:  $\pm 0.01$  aw / 1 %rh /  $\pm 0.3$  K
- Wire filter with approx. 20...25  $\mu$ m pore size, material DIN1.4401



## INSERTION PROBE 5 mm, for measurements in bulk materials

### Applications

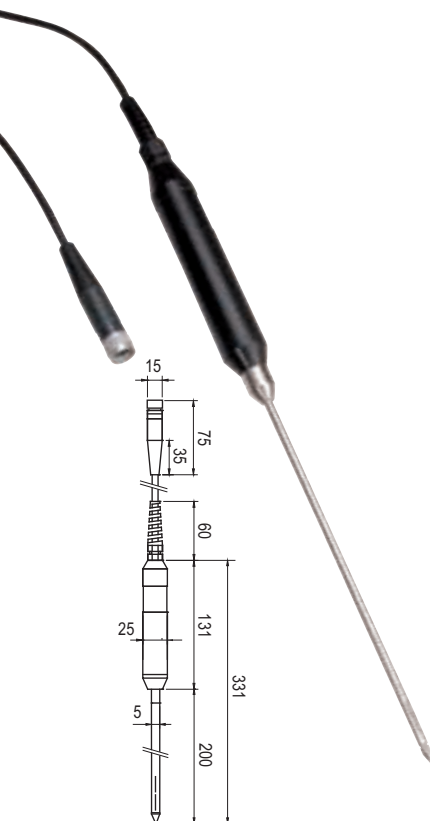
For direct measurement of water activity in dust-free bulk materials: tablets, grain, gel capsules and granulated materials. The HygroClip2 P05 is a stainless steel probe with a diameter of 5 mm and laser-cut slots to allow air to condition the sensors.

### Highlights

- Measures water activity (humidity), temperature and dew point
- Saves up to 2,000 measurement pairs \*
- Range of application: 0...1 aw (0...100 %rh) / -40...85 °C
- UART interface and freely scalable analog signals 0...1 V
- Standard scaling 0...1 V = 0...1 aw (0...100 %rh) / -40...60 °C
- Probe with adjustment profile «Standard», factory certificate

<b>Order code</b>	<b>HC2-P05</b>
Type	∅ 5 x 200 mm, insertion probe with air slots, ~2m TPU cable
Adjustment	At 23 °C and 10, 35, 80 %rh
Accuracy	± 0.015 aw (±1.5 %rh)/±0.3 K
Handle color	Anthracite
Weight	Approx. 160 g

\* Requires HW4 software



## INSERTION PROBES 10 mm, for measurements in bulk materials

### Applications

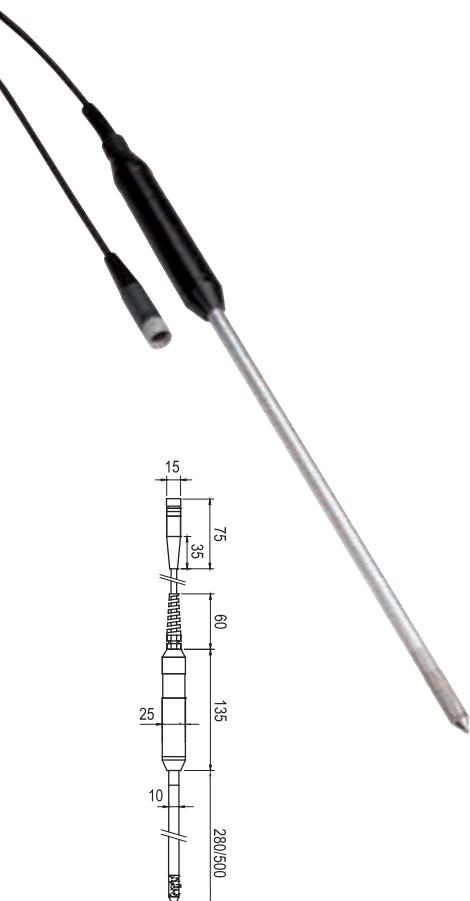
Measurements in dusty bulk materials such as flour, sugar, etc.

### Highlights

- Measures water activity (humidity), temperature and dew point
- Saves up to 2,000 measurement pairs \*
- Range of application: 0...1 aw (0...100 %rh) / -40...85 °C
- UART interface and freely scalable analog signals 0...1 V
- Standard scaling 0...1 V = 0...1 aw (0...100 %rh) / -40...60 °C
- Probe with adjustment profile «Standard», factory certificate

Order code	HC2-HP28	HC2-HP50
Type	Insertion probe with steel sinter filter, ~2m TPU cable	
Adjustment	At 23 °C and 10, 35, 80 %rh	
Accuracy	± 0.008 aw (±0.8 %rh)/±0.1 K	
Probe length	280 mm	500 mm
Handle color	Anthracite	
Steel sinter filter	ET-Z10	
Weight	Approx. 200 g	Approx. 250 g

\* Optional, requires HW4 software



## SAMPLE HOLDERS WP-14-S/40/40TH

The stainless steel sample holders were developed specifically for the water activity probes HC2-AW/AW-DIO. There are two sizes available: WP14-S for small samples (14 mm deep) and WP40 for larger samples (40 mm deep). Both products provide excellent sample containment and optimum temperature stability. The WP-40TH can be used with both disposable sample holders. Material: WP14-S and WP-40: V2A steel, WP-40-TH: brass, nickel-plated.

Order code	WP-14-S	WP-40	WP-40TH
	For PS14	For PS14 and PS40	With water jacket for temperature control
Weight	Approx. 350 g	Approx. 1250 g	Approx. 1550 g



## DISPOSABLE SAMPLE CONTAINERS PS-14/PS-40

The disposable sample containers ensure the optimum sample volume is introduced into the WP-14-S, WP-40 or WP-40TH sample holders. They prevent the sample holders from coming into direct contact with the product being tested, thereby preventing soiling or cross contamination. The sample containers also provide a convenient means of collecting and storing samples.

Order code	PS-14	PS-40
Bag	100 sample containers for WP-14-S	100 sample containers for WP-40 / WP-40TH
Weight	Approx. 880 g	Approx. 1250 g
Volume	18.5 cm <sup>3</sup>	52.6 cm <sup>3</sup>



## CLAMP SEALING MECHANISM

In the case of very dry or very moist samples additional mechanical sealing of the AW measurement station and sample holder may be necessary to prevent external conditions influencing the sample. The AW-KHS provides a strong mechanical seal and is compatible with the WP-40 and WP-40TH sample holders.

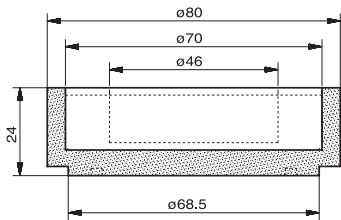
Order code	AW-HKS
Weight	Approx. 1100 g

Calibration devices see page 90

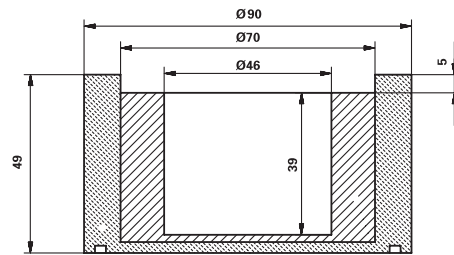


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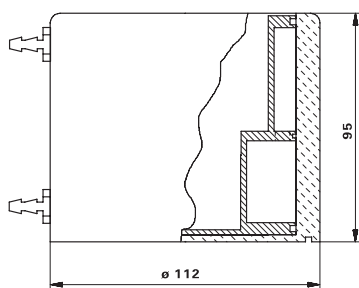
Specifications			
Feature	HygroLab 2	HygroLab 3	HP23-AW
Probe connections	4	4	1
PC interface	RS232/485	TCP/IP or RS232	USB
Networking	Up to 64 devices using RS485		No
Aw Quick mode	Option. Only via PC	Integrated and with PC and HW4 software	Yes, directly readable
Calibration with keypad			
1-point %rh (aw)	Yes		
4-point %rh / 2-point °C/°F	Yes		
Calibration with PC	Yes	Yes	
1-point %rh (aw)	Yes	Yes	
4-point %rh (aw) / 2-point °C/°F	Yes	Yes	
Display units	%rh, aw, °C, °F,	%rh, aw, °C, °F,	
Calculated parameters	Dew point, wet-bulb temperature, enthalpy, ratio of mixture, water vapor content, partial water vapor pressure, saturation water vapor pressure		
Audible signal at end of measurement	No	Yes	No
Electronics operating range	0...99 %rh, -10...60 °C (14...140 °F)		
LC display	3 lines alphanumeric		
Trend indicator	Yes		
Display resolution	0.1 %rh / 0.1 °C/°F, 0.001 aw	0.1 %rh / 0.1 °C/°F, 0.001 aw, 0.01 calculated value °C/°F	0.001 aw 0.01 °C/°F
Housing	Aluminium, 220 x 170 x 55 mm		ABS
Power supply	9 V power supply, via AC power adapter		9 V battery or 9 V power supply unit via mini USB
Current consumption	Max. 20 mA		<10 mA
CE conformity	EN 61000-6-2:2001, EN 61000-6-4:2001		
Weight	1100 g	1100 g	300 g



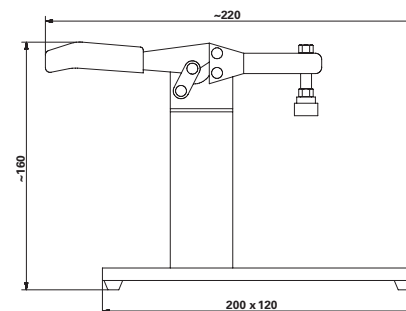
WP-14-S



WP-40



WP-40TH



AW-KHS