

<b>E-M-CalBasics_10</b>	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
<b>Temperature and humidity adjustment basics</b>	<b>Instruction Manual</b>
	Document Type
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# Temperature and humidity adjustment basics



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## 1 Overview

All ROTRONIC HygroClip devices use a software based temperature and humidity adjustment function that is both precise and simple to use. Depending on the type of device, the temperature and humidity signals can be directly adjusted using the device own display and keypad or the device may have to be connected to a PC (please consult the device instruction manual).

The purpose of this note is to provide some basic recommendations to users that are not already familiar with the calibration and adjustment of humidity temperature measuring devices. This note also provides instructions on the use of the ROTRONIC humidity standards. These standards can be used to calibrate and adjust the humidity signal when no humidity generator is available.

Detailed instructions regarding the procedure for adjusting temperature and humidity are provided either in the device instruction manual or in the ROTRONIC HW4 software manual.

## 2 Basic recommendations

### 2.1 *Temperature calibration and adjustment*

Note: the stability of the Pt100 RTD sensor used by the ROTRONIC probes to measure temperature is such that temperature calibration in the field is usually not required.

#### 2.1.1 Calibration in a liquid bath



Using a liquid bath is probably the best method for calibrating or adjusting a temperature probe against a certified SPRT and thermometer.

Stability and uniformity of temperature depend both on the design of the bath and on the type of liquid being used.

Prior to immersion any dust filter should be removed from the probe. Both the Pt100 RTD and the ROTRONIC Hygromer IN1 sensor can be directly immersed without any protective shield in the Fluorinet Electronic Liquid from 3M. These liquids are an electrical insulator and have no known adverse effect on the humidity sensor. The liquid should be selected to match the temperature of calibration. For example, Fluorinet FC-77 can be used in the temperature range of -25...25°C. The boiling point is 97°C and the pour point is -110°C. Fluorinet FC-43 can be used in the temperature range of 25...80°C. The boiling point is 174°C and the pour point is -50°C. Immersing a ROTRONIC probe in a liquid bath disturbs the bath. Time must be allowed for the bath to stabilize (about 20 minutes). Following immersion in the Fluorinet liquid the humidity sensor takes a translucent appearance and should be allowed to dry for about 12 hours.

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## 2.1.2 Calibration in air

Despite its apparent simplicity, calibration in air can be tricky, primarily because of temperature gradients. In order to be able to correctly calibrate and adjust the temperature measurements provided by a probe, you must be able to meet the following requirements:

- Both the probe and the reference thermometer should be ventilated by the same stream of air. Any dust filter used to protect the sensors should be carefully removed from the probe. If the probe has a protective slotted cap (no filter element), this may be left on the probe.
- Air velocity at the sensor should be within the limits of 200 to 500 feet/minute (1 to 2.5 meters/second). Any comparison between two instruments at a velocity under 200 feet/minute may not be valid. Air velocity above 500 feet/minute may damage the unprotected humidity sensor.
- The temperature of the air stream should be practically constant.

## 2.2 Humidity calibration and adjustment

If possible, calibrate and adjust the probe at a temperature of 18 to 25°C. During calibration and adjustment avoid soaking the probe at high humidity (60%RH and above) for periods of time in excess of 30 minutes.



Use of a humidity generator is probably the fastest method for calibrating and adjusting humidity at several values. When using a humidity generator to calibrate or adjust a probe, make sure that the probe is as fully immersed in the generator as possible to minimize the effect of room temperature on the humidity sensor. In general it is good practice to qualify from time to time a humidity generator both for temperature and humidity gradients.

Photo: ROTRONIC HygroGen humidity generator

When you do not have access to a humidity generator, ROTRONIC provides easy-to-use, certified humidity standards (see below). When calibrating or adjusting a probe against a ROTRONIC humidity standard do not place the probe close to an air vent or a heater and do not directly expose the probe to sun rays. Room temperature should be stable to  $\pm 0.25^\circ\text{C}$  or better during the period of time required for each calibration point.

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### 3 ROTRONIC humidity standards (RHS)

To use the ROTONIC humidity standards you will need a calibration device that is suitable for your probe.

#### 3.1 Calibration device

The calibration device is a small airtight container that fits on the probe and seals around the humidity sensor. During calibration, a known reference humidity is produced inside the calibration device by means of a humidity standard (usually an aqueous salt solution).

The following calibration devices are available from ROTRONIC:



ER-15: for 15mm diameter probes  
 ER-05: for 5 mm diameter probes  
 EM-15 for probe type IE  
 ERV-15 for probe type IW

ER-15 calibration device installed on a probe

#### 3.2 General description of the humidity standards

The ROTRONIC certified standards are available in boxes of 5 glass ampoules of the same value, which can be stored indefinitely. Standards in the range of 5 to 95 %RH are non-saturated aqueous salt solutions that are precisely titrated at our factory for the right concentration. The 0 %RH humidity standard is made of small granules of a highly porous ceramic that have been dried at a high temperature. A Material Safety Data Sheet is available for each standard. Since most standards are a salt solution, parts which have come in contact with the liquid should be cleaned after each use.



Each box of standards comes with a certificate that provides statistical information on the manufacturing batch of the standard.

Information on the effect of temperature on each standard is provided on the cover of each box of standard. Both the ROTRONIC HW4 software and a number of HygroClip instruments can automatically compensate for the effect of temperature on the standards and no further correction is required.

The value of the standards is not affected by altitude.

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### 3.3 *Instructions for using the standards*

- Install the calibration device on the probe so that the receptacle (or solution holder) is under the probe. Check for a tight fit and remove the receptacle from the calibration device.
- Place one fiber disc (each box of standards includes 5 discs) in the receptacle of the calibration device. The purpose of this disc is to prevent accidental spilling of the solution inside the calibration device or on the humidity sensor.
- Tap the top of the ampoule so that all liquid drops to the bottom of the ampoule. Snap off top and empty contents on fiber disc. Since the ampoule is made of glass, exercise proper caution (gloves, safety glasses) when snapping off the top.
- Put the receptacle back on the calibration device and make sure that the solution does not come in contact with the sensor: The solution inside the calibration device should never be on top of the sensors.
- Allow at least 60 minutes to insure that the calibration device, the solution and the sensor are in a state of equilibrium. This is verified by monitoring the display.
- After adjusting the probe, remove the receptacle from the calibration device. Throw away the wet disc (non reusable). Thoroughly wash and wipe dry the receptacle.

## 4 Document releases

Doc. Release	Date	Notes
_10	Feb. 11, 2008	Original release