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Kestrel Environmental Meters – Instructions for Relative Humidity Field Calibration

Please read this document fully and carefully before attempting calibration of your instrument.

Kestrel environmental meters with Relative Humidity sensors are calibrated using two known humidity points. To minimize the errors over the range 15% to 90%, the calibration points should be at approximately 75% and 32%. This can be achieved by using saturated salts of magnesium chloride and sodium chloride:

**	5°C	10°C	15°C	20°C	25°C
Magnesium Chloride	33.6%	33.5%	33.3%	33.1%	32.8%
Sodium Chloride	75.7%	75.7%	75.6%	75.7%	75.3%

Before commencing, ensure that your instrument and the calibration chambers are in a stable, sheltered environment at a temperature as close as possible to one of the above values.

This environment and the necessary components for the calibration are conveniently included in the Kestrel Calibration Kit package which comprises:-

- Two clear jars with colour coded salt chamber labels, plastic grids and sealing lids supplies of the two salts, chambers with stand offs and sealing lids
- One clear jar with no grid (for water)
- One bag with magnesium chloride slurry and colour coded label
- One bag with sodium chloride slurry and colour coded label
- One insulated RH calibration kit bag.

The insulated RH calibration kit bag and jar of water are used to create a stable environment. The jar of water will stabilise the temperature inside the bag. The saturated salt solutions generate well defined humidities when they are confined to the contained environment of the two gridded jars inside the insulated, stabilised bag. In order to prepare the R-P-R calibration kit, fill the water jar with room temperature water, place in the insulated bag. In each of the salt chamber jars, pour the salts from their sealed bags into the jar, and arrange the plastic grid over them. Then tightly seal the lid and place in the insulated bag and zip up the bag. Leave for at least 10 hours in a controlled temperature environment – air conditioned office or centrally heated domestic environment

Having provided a suitable environment either with your own seperate components, or with the Kestrel calibration kit, proceed with the following steps for your instrument. Note that in the following descriptions the term “Cal Kit” refers to either the prepared insulated bag of the Kestrel kit, or your own prepared stable environment.

Three-Button Kestrel 3000/3500

1. With the Kestrel 3000/3500 turned off hold the left button while pressing the centre button -the display will read “P1”

2. Press the centre button to display the first calibration value. Check that the displayed value is relevant to your stable temperature for the magnesium chloride (eg 33.1% at 20°C). If correct, simply press the centre button to skip to step 3. If' it is necessary to change the value, use the left arrow button to adjust the value down, and the right arrow button to adjust it up. When the desired number is displayed, press the centre button to continue to setting the second calibration value. The display will read “P2”

3. Press the centre button to display the second calibration value. Check that the displayed value is relevant to your stable temperature for the sodium chloride (eg 75.7% at 20°C).). If correct, simply press the centre button to skip to exit value setting. If it is necessary to change the value, use the left arrow button to adjust the value down, and the right arrow button to adjust it up. When the desired number is displayed press the centre button to exit value setting. The display will read "C1."

4. Press the centre button to begin the calibration count-down. The display will toggle between "C1" and the number of minutes remaining in the calibration.

5. Place the unit into the magnesium chloride chamber. Close the jar tightly, place it inside the Cal Kit and zip the bag closed. Leave the Cal Kit undisturbed for 60 minutes. After that time, remove the Kestrel from the chamber. The display should read "C2", indicating that the first calibration point is finished and the unit is ready for the second point.

6. Thoroughly wipe off any magnesium chloride clinging to the Kestrel or lanyard. Press the centre button to begin the calibration count-down for the second point. The display will toggle between"C2"and the number of minutes remaining in the calibration.

7. Place the unit into the sodium chloride chamber. Close the jar tightly, place it inside the Cal Kit, and zip the bag closed. Leave the Cal Kit undisturbed for 60 minutes. After that time, remove the Kestrel from the chamber. The display should read "End" indicating that the second calibration point is finished.

8. Press the centre button to return to the normal mode of operation. Wipe or rinse the unit clean. Your Kestrel is now recalibrated and ready to take accurate measurements.

Kestrel 4000/4100

1) Turn on the Kestrel 4000/4100. When the Time/Date display is shown, Press the Power Button again and with the ▲/▼ keys select the "System" menu. Press the ▼button to highlight the "Humidity Cal" option. Press the ◄ or ► button to enter the humidity cal setup screen.

2) Press the ▼ button to highlight "Period". Use the ◄ and ► arrow buttons to adjust the setting for the length of time that the Kestrel will remain in each humidity chamber. The default and recommended setting is 60 minutes.

3) Press the ▼ button to highlight "RH Point 1". Use the ◄ and ►buttons to adjust and set the humidity value for the first calibration chamber (33.1% at 20°C for the magnesium chloride chamber).

4) Press the ▼ button to highlight "RH Point 2". Use the ◄ and ► arrow buttons to adjust and set the humidity value for the second calibration chamber (75.7% at 20°C for the sodium chloride chamber).

5) Press the ▲ button to highlight "Start 1". Press the ◄ or ► button to begin the 1st calibration period. A timer will appear next to "Start 1" and will immediately begin counting down the calibration period in seconds (i.e. beginning with 3600 for 60 minutes).

6) Place the unit into the magnesium chloride chamber. Close the jar tightly, place it inside the Cal Kit and zip the bag closed. Leave the Cal Kit undisturbed for 60 minutes (or other time period selected in step 2). After that time, remove the Kestrel from the first chamber. The display should be on "Start 1" with the counter no longer visible, indicating that the timer has counted down to "0" and the first calibration point is

finished. The unit is now ready for the second point.

7) Thoroughly wipe off any magnesium chloride clinging to the Kestrel or lanyard. Use the down arrow key to highlight "Start 2". Press the ◄ or ► button to begin the second calibration period. A timer will appear next to"Start 2" and will begin counting down the second period in seconds.

8) Place the unit into the sodium chloride chamber. Close the jar tightly, place it inside the Cal Kit and zip the bag closed. Leave the Cal Kit undisturbed for 60minutes. After that time, remove the Kestrel from the first chamber. The display should again show "Start 2" highlighted with the timer no longer visible, indicating that the second calibration point is finished.

9) Press the power button twice to exit the calibration and main menus and return to the normal mode of operation. Your Kestrel 4000/4100 is now recalibrated and ready to take accurate measurements.

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Alternative Salts Characteristics

If Sodium Chloride or Magnesium Chloride are not available, alternatives may be used as follows:-

**	5.0°C	10.0°C	15.0°C	20.0°C	25.0°C
Lithium chloride	11.3	11.3	11.3	11.3	11.3
Potassium carbonate	43.1	43.1	43.1	43.2	43.2
Sodium bromide	63.5	62.2	60.7	59.1	57.6
Potassium chloride	87.7	86.8	85.9	85.1	84.3
Potassium sulphate	98.5	98.2	97.9	97.6	97.3

** Table value reference:

Lewis Greenspan, 'Humidity fixed points of binary saturated aqueous solutions', J. of Research, National Bureau of Standards, 81A (1977) pp 89-96