

# ***Kestrel***<sup>®</sup>

## ***Pocket Weather™ Meters***

### ***FAQ***

#### **How can I be sure that the Kestrel's readings are accurate?**

Every single Kestrel manufactured at NK is calibrated for every single value, either directly against NIST-traceable standards or against an intermediary standard that is calibrated on a regular schedule. Every unit is shipped with a FREE Certificate of Conformity that states what calibrations were performed, and the certified performance specifications. For an additional charge, NK can provide a NIST-traceable Certificate of Calibration that specifies exactly which values were measured in each multi-point calibration, and details the calibrated standard used for testing. Kestrel's 30-day satisfaction guarantee covers accuracy concerns as well.

#### **What about checking accuracy in the field?**

The Kestrel measures your conditions right where you are using it. For this reason, it is often misleading to try to verify its performance against other sources, such as a weather report on TV, or even a weather station waaaaay over there. The best bet is to get the Kestrel right next to a known accurate standard and give it time to equilibrate to the location. If you're lucky enough to have access to multiple Kestrels, put them all in the same location and compare them.

#### **What makes the Kestrel impeller so special?**

The Kestrel impeller measures 1 inch across, and turns on a Swiss precision pivot mounted on sapphire bearings. Its large size ensures accurate readings even if pointed off-angle from the wind, and its very low start-up speed allows measurement of the lightest puffs of wind. If damaged, a new calibrated impeller can be purchased and popped in without tools, restoring like-new performance.

#### **What's that curly looking thing?**

That's the patented Kestrel temperature sensor. Unlike most watches and other products with temperature measurement, the Kestrel sensor is outside the case to ensure it measures the air, not your hand or pocket. The "curls" serve to further isolate the temperature sensor from the effects of the case temperature.

**How does the Kestrel measure altitude?**

The Kestrel uses an atmospheric pressure sensor and calculates altitude based on a standard atmosphere. This is just like the altimeter in an airplane, or an altimeter watch. It's more accurate than a GPS altimeter, but does require periodic reset of the reference pressure to eliminate weather effects.

**How does the altimeter work?**

The Kestrel's uses a pressure-based altimeter. This means that if the air pressure changes the altitude will change. That is why it is important to always check that your references are correct.

**Is the reference pressure the same as an altimeter setting?**

The Kestrel models with altimeter calculate altitude from barometric pressure in exactly the same manner and according to the same rules as an aircraft altimeter. The "reference pressure" on the Altitude screen is the same as the altimeter setting obtained from a local airfield.

**Does the Kestrel have a GPS in it?**

No, not yet. We may add basic GPS location to a future Kestrel model, but we'll leave the full-blown mapping and navigation to the companies that specialize in GPS as much as we specialize in weather.

**Does the Kestrel measure WBGT?**

No. "Wet Bulb Globe Temperature" requires use of a large (heavy) black brass globe and a naturally aspirated wet bulb, neither of which can be accurately replicated in a small handheld device. Numerous Kestrel models display the NWS Heat Stress Index as well as the Web Bulb Temperature. These values, combined with a common sense evaluation of the impact of the sun, provide excellent guidance on the dangers of heat stress or exhaustion and the need for hydration.

**Do you really mean MADE in the USA?**

Yes. The entire Kestrel line is designed and built in the USA. Some electronic components have to be sourced overseas these days, but we buy American wherever we can. All of our injection molded parts are sourced from Wisconsin and New York, for example.

**Who do I call if I have a problem?**

You call us! In Australia, call 02-6258 9380. From our Customer Service Representatives to the owner of the company, we all answer the phone and know these products inside and out. If you have a problem, we'll fix it. Kestrels hardly ever break, but if they do, they're covered by a five-year warranty. Even if your Kestrel is out of the warranty period you can trade yours in for a brand new unit at a significant discount under our Customer Care Discount Program.

**Are Kestrel meters RoHS Compliant?**

Yes, all Kestrel meters are RoHS (Reduction of Hazardous Substances) Compliant.

### **Why do I need to reset my reference?**

All Kestrel's with barometric pressure and altitude measurements require you to enter a known reference. The Kestrel uses a pressure-based altimeter to calculate the current barometric pressure and altitude. Over time as the air pressure changes it is important to check your references to make sure they are correct. A general rule of thumb is to check your references every 3-5 hours (if you are using you Kestrel for more than 3 hours at a time).

### **My impeller is making a rattling/clicking/whirring noise, is that normal?**

It is common for the Kestrel to make a rattling noise with a wind speed from 5 to 10 miles per hour. This is completely normal and accurate.

To better understand why the impeller rattles, one needs to know what is inside. Inside the plastic housing, there are four separate parts. The fan, two sapphire jewel bearings and a metal pin. The fan rotates around the metal pin which is held in the plastic housing by the jewel bearings. For the fan to move freely (to not cause excess friction) there is a small space (on either side) between the end of the metal pin and the jewel bearing. The space between the metal pin and the jewel bearing is what causes the rattle. Some impellers can be louder than others, but the accuracy will be the same.

### **Can I recalibrate my RH myself or does it need to come back in for service?**

There are two ways to recalibrate the Kestrel's humidity sensor. The easiest is to send it to us (your unit should only have to be with us for 5 days and we have many options for fast shipping). The other option is to use the Field Calibration Kit (while this method is a bit technical, you can calibrate as many units as you like).

### **Do I need to recalibrate my temperature?**

The Kestrel's temperature sensor is calibrated when it is first manufactured. There is no need to recalibrate the temperature in the field, but you can always test it against a local known accurate standard (remember to give the Kestrel time to equilibrate to the location).

### **Do I need to recalibrate my wind speed?**

Each Kestrel impeller is calibrated individually. This makes it easy to recalibrate your Kestrel, just pop the impeller out of the Kestrel and replace with a new one.



**My impeller is broken; do I need to send in the whole unit?**

No, if your impeller breaks then you can swap it out with a replacement impeller. There is no wasted time waiting for your Kestrel to be serviced, and with a replacement impeller your unit will be recalibrated as well.

**Can I customize my Kestrel?**

Any Kestrel 4000 series Meter can be customized to suit your needs perfectly. You can disable any readings that aren't important to your application. Plus these Kestrel Meters feature User Screens, which are three screens that display any three readings at the same time. These screens can be customized to show the readings that are most important to you, or they can be turned off. Data storage is customizable as well. You can set the Kestrel to log data automatically - anywhere from every 2 seconds to every 12 hours, manually - with the press of the capture button, or both.

**How does the Kestrel log data, and can it upload the data to a computer?**

The Kestrel 4000 series features anywhere from a 1400-2000 data point logger depending on the model. The user can set the Kestrel to store data automatically at a predetermined interval (anywhere from every 2 seconds to once every 12 hours), and/or data can be stored manually with a single button press. Each data point is stored with the date and time, and can be viewed as in chart form. The minimum, maximum and average values are stored for each reading as well. Data can be uploaded to a PC using the available Kestrel Interface (available as USB or serial).

**Can the Kestrel 4000 series communicate directly with a PDA or computer?**

No. Due to the rapidly changing standards for product communication, data upload is presently limited to a USB or serial interface to communicate with a PC. Additional communication options may be developed in the future.

**How does the Kestrel 4500's crosswind calculator work?**

The 4500 features a built-in digital compass that allows you to measure the wind speed and direction. In order to display the crosswind, simply point the Kestrel down the runway or target and set the reference heading. Then hold the 4500 into the wind and it automatically calculates the crosswind with respect to the reference heading. It also calculates the headwind/tailwind the same way (headwinds are positive values and tailwinds are negative).

**What is Delta T?**

Delta T is the spread between the wet bulb temperature and the dry bulb temperature. Delta T offers a quick guide to determining acceptable spraying conditions. For example, it is not recommended to apply pesticides when Delta T is above 10 - a range of 2 to 8 is ideal. With the Kestrel 3500 Delta T, the calculation is done for you, accurately and simply. The Kestrel 3500 Delta T incorporates barometric pressure correction in its wet bulb temperature calculation, ensuring accuracy even on low pressure days, at high altitudes, and in the very dry weather when Delta-T monitoring is important. No other hand-held weather meter offers this feature with this level of accuracy.

### **What is Heat Stress, and how does it affect me?**

Heat Stress is the combination of air temperature and humidity that gives a description of how the temperature feels. This is not the actual air temperature. For example, if the air temperature is 90 degrees Fahrenheit and the relative humidity is 55% then the air will feel like it is 97 degrees.

### **Does Heat Stress affect livestock differently than people?**

Actually, it does. The chart below from Iowa State University Department of Agriculture and Biosystems Engineering outlines the levels at which heat stress can threaten cattle. Charts for other animals can be found on their website.

### **Why is it important to know the weather conditions, and how can the Kestrel 4250 help me win races?**

Weather affects your performance. Environmental conditions such as relative humidity, density altitude, dewpoint and wind speed all influence your car. By monitoring these conditions and analyzing how weather patterns from previous races change your car's performance, you are able to make more informed dial-in and tuning decisions. Since the Kestrel 4250 Racing Weather Tracker is portable and accurate, it enables you to monitor the weather conditions that concern you right at the track, not at the trailer miles away.

### **I've seen a lot of high dollar weather units on the market, yours is so inexpensive, can it really be accurate?**

The engineers at NK have been working on the Kestrel's functionality for over ten years, and have been awarded four patents on their innovative engineering. Additionally, each and every Kestrel is calibrated against NIST-traceable standards, and can be recalibrated in the field or factory. We're so sure of Kestrel Meter's functionality that we guarantee each Kestrel for five-years, and each one comes with a Certificate of Conformity.

### **How can I be sure the Kestrel 4250 is giving me the pressure readings that I'm looking for?**

The engineers at NK have been working on the Kestrel's functionality for over ten years, and have been awarded four patents on their innovative engineering. Additionally, each and every Kestrel is calibrated against NIST-traceable standards, and can be recalibrated in the field or factory. We're so sure of Kestrel Meter's functionality that we guarantee each Kestrel for five-years, and each one comes with a Certificate of Conformity.

### **How does the Kestrel CFM function work?**

To measure volume airflow (CFM), simply select the duct shape that you will be measuring - either circular or rectangular - then enter the duct size, and hold the Kestrel into the air flow. Readings are automatically calculated and displayed on the screen in either cfm, m<sup>3</sup>/h, m<sup>3</sup>/m, m<sup>3</sup>/s or L/s. The Kestrel also features an averaging function that allows users to measure the air flow for a duct where the flow is variable. The user simply selects the averaging mode and traces the duct. It also has a hold feature if you need to take a measurement inside a duct that you can't see - just "hold" the value and it will be frozen on the screen until you can look at it. The Kestrel has an easy-to-read screen with step-by-step instructions on it to, making it extremely simple to use.

### **How does the Kestrel 4300 automatically measure evaporation rate?**

The user simply measures the concrete temperature via IR or a probe thermometer and enters the concrete temperature into the Kestrel. When measuring temperature, humidity and wind speed (all components of evaporation rate) it is optimal to position the Kestrel facing into the wind, 20 inches above the concrete. Shade the Kestrel's thermistor (temperature sensor) so it is not in direct sunlight. For the best accuracy, use the Kestrel's convenient averaging mode to average the evaporation rate over the recommended 6-10 seconds.

### **Why are the RH readings on my Kestrel sometimes different than my sling?**

It is not uncommon for the humidity measurements to differ when comparing the Kestrel Meter to a sling psychrometer (or belt kit). Typically, you might see that the sling gives a reading 5-10% higher than the Kestrel Meter.

Slings are susceptible to the following errors which will all result in an error in the high side:

- If the sock on the wet bulb thermometer is not clean
- If the water used for the wet bulb thermometer is not clean
- If the sling is not swung around long enough
- If the thermometer measurements are not read quickly enough

Unfortunately, all of the common errors with a sling psychrometer will yield humidity readings that err on the high side. With a properly calibrated Kestrel Meter and sling, and with proper use, the humidity measurements are likely to both be within the manufacturer's specification.

Also:

The apparatus needs to be swung around in order to create airflow around the mercury tubes. Once the thermometers have stopped spinning (in order to take a reading), the measurements may have changed.

Most thermometers are somewhat difficult to read accurately within two degrees.

The humidity readings need to be interpreted using a chart. This chart will yield inaccurate humidity values by several percent if either dry bulb or wet bulb temperatures are incorrect by even one degree.

If psychrometer measurements are taken at an altitude other than sea level, a corrected humidity chart must be used. Otherwise humidity readings will be incorrect by at least several percent.

It is also important to use the Kestrel Meter correctly in order to measure an accurate humidity. Ideally, the instrument should be left in the environment for at least 15 minutes. This allows the entire unit to equilibrate to the surrounding conditions. If this is not possible, especially if the Kestrel Meter is being moved to significantly different conditions, then it is best to hold the instrument into an air flow of at least 3mph for 15-30 seconds. If there is no wind, the unit can be waved back and forth to create air flow past the sensors for the same amount of time.

With a properly calibrated Kestrel Meter and sling, and with proper use, the humidity measurements are likely to both be within the manufacturer's specification.

### **How can I ensure that my Kestrel's RH readings are as accurate as possible?**

It is also important to use the Kestrel Meter correctly in order to measure an accurate humidity. Ideally, the instrument should be left in the environment for at least 15 minutes. This allows the entire unit to equilibrate to the surrounding conditions. If this is not possible, especially if the Kestrel Meter is being moved to significantly different conditions, then it is best to hold the instrument into an air flow of at least 3mph for 15-30 seconds. If there is no wind, the unit can be waved back and forth to create air flow past the sensors for the same amount of time.

### **Why does my humidity reading seem inaccurate?**

If the humidity sensor housing (located above the rear label) is wet, the Kestrel® cannot take an accurate humidity reading. If the sensor does become wet, shake the unit vigorously to remove the water, and then let it dry completely before use. If the sensor comes in contact with salt water, rinse it thoroughly with clean water, then shake it and allow it to dry.

The humidity sensor has been factory calibrated to be accurate to within  $\pm 3\%$ . If your Kestrel® appears to no longer meet this specification, it may need to be recalibrated. NK now offers a Relative Humidity Calibration Kit for your home use.

### **Using the "BARO" screen**

The reading on a mercury barometer will change if the altitude of the barometer is changed. The reading on the K4000 BARO screen will also change. The indicated pressure for a mercury barometer (the height of the mercury column) is necessarily station pressure - the actual pressure at whatever altitude the barometer happens to be. To determine barometric pressure from station pressure, a calculation is performed

which has the effect of reducing station altitude to sea level. If the station is above sea level, the barometric pressure will be higher than the station pressure, if the station is below sea level, the barometric pressure will be lower than station pressure.

Although a mercury barometer cannot directly indicate barometric pressure (except at sea level), the K4000 (or any electronic pressure gage) can, because the conversion from station to barometric pressure can be done electronically.

To measure and display barometric pressure on the BARO screen, your K4000 must know the local altitude. With this information it performs

the calculation which converts station pressure to barometric pressure.

To display barometric pressure simply set the reference altitude in the BARO screen to your altitude.

To measure and display station pressure on the BARO screen, set the reference altitude to zero.

### Using the “ALTITUDE” Screen

Because the pressure of the earth’s atmosphere changes in a regular, and well characterized way with altitude, it is possible to use a barometer to measure altitude.

The K4000 (and other electronic instruments) store the details of what is known as the “ICAO Standard Atmosphere”. The Standard Atmosphere is a model and, subject to certain assumptions, specifies an altitude for any pressure. A moment’s thought will show that the actual atmosphere is almost never standard, and that therefore errors in pressure based altimetry are to be expected .

To measure and display altitude on the K4000, the local barometric pressure must be known, and entered in the reference screen. Frequently this value is NOT known, and herein lies one of the two fundamental problems with pressure altimetry. The other is the sometimes significant deviation of the atmosphere from the assumed standard atmosphere.



N14821 C Tick Compliant  
Only Australian supplied units.



**Knowledge Center**  
Read technical support posts, FAQs, and usage advice.  
Share product knowledge with other users.

**FIVE-YEAR WARRANTY**  
Kestrel Reliability & Quality is Now Backed by a 5-Year Warranty

**DD**  
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**PRACTICAL SAILOR**  
The product has been tested and recommended by Practical Sailor  
the independent consumer magazine for sailors. For more information, go to www.practical-sailor.com  
2008 EDITOR'S CHOICE

**MIP**  
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AT WORLD OF CONCRETE  
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