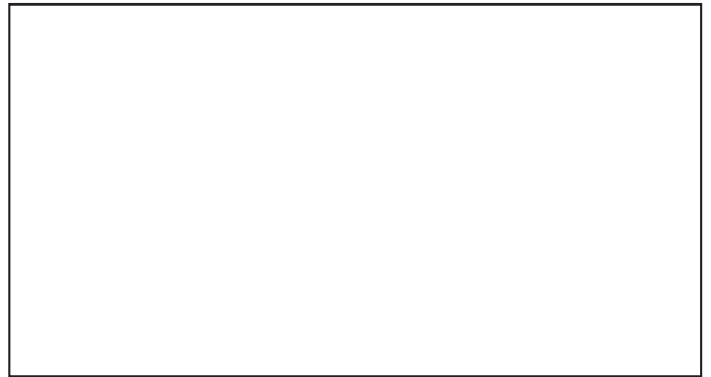# Kestrel®

USER GUIDE
Kestrel 5000 Environmental Meter
Kestrel 5100 Racing Weather Meter
Kestrel 5200 Professional Environmental Meter

CONTENTS

MEASUREMENTS	Icon	5000 Environmental	5100 Racing	5200 Professional
Wind Speed | Air Speed (mph | fpm | Bft | m/s | km/h | kt)		•	•	•
Temperature (˚F | ˚C) | Wind Chill (˚F | ˚C)		•	•	•
Relative Humidity (%) | Heat Stress Index (˚F | ˚C)		•	•	•
Dewpoint Temp (˚F | ˚C) | Wet Bulb Temp (˚F | ˚C)		•	•	•
Station Pressure (inHg | hPA | psi | mb)		•	•	•
Barometric Pressure (inHg | hPA | psi | mb)		•	•	•
Altitude(m | ft) | Density Altitude (m | ft)		•	•	•
Moisture Content | Humidity Ratio (Grains) (gpp, g/kg)			•	•
Air Density (lb/ft^3, kg/m^3)			•	•
Relative Air Density (RAD) (%)			•	•
Evaporation Rate (lb/ft^2/hr, kg/m^2/hr)				•
Volume Air Flow (cfm, m³/hr, m³/m, m³/s, L/s)				•
Delta T (˚F | ˚C)				•
FEATURES		**5000 Environmental**	**5100 Racing**	**5200 Professional**
LiNK Connectivity & Kestrel LiNK Mobile App	N/A	o	o	o
Backlit Display switchable white or Night-Vision preserving red	N/A	•	•	•

o *optional*

FRONT

BACK

REPLACEABLE IMPELLER

IMPELLER COVER

TEMPERATURE SENSOR

SERIAL NUMBER

HUMIDITY SENSOR

PRESSURE SENSOR

SUNLIGHT READABLE DISPLAY

AA BATTERY (1)
(Lithium recommended)

OPTIONS/EXIT

CAPTURE BACKLIGHT

BATTERY DOOR

DATA TRANSFER PORT

SELECT

SCROLL/ADJUST

LANYARD ATTACHMENT

BATTERY DOOR LATCH

POWER

4
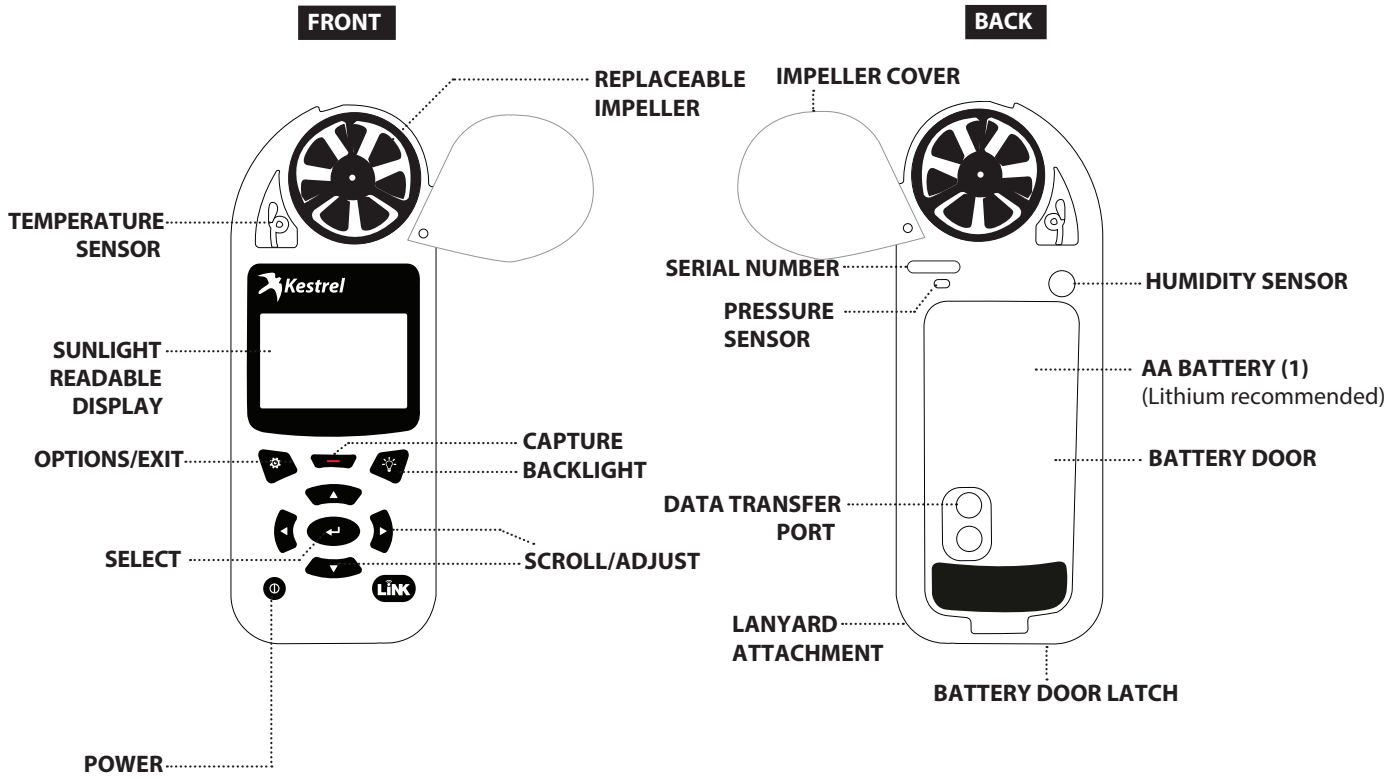
Button	Name	Function
◐	POWER	Turns Kestrel on and off. Press for on, hold for two seconds to turn off.
⚙	OPTIONS/ EXIT	Enter the main Options menu or exit a menu.
↵	SELECT	Access Settings on any measurement screen or select a menu option to enter its submenu or confirm a task.
▲▼	UP/DOWN	Scroll up and down through measurement screens or menus. Adjust values when entering text in name menus.
◀▶	LEFT/ RIGHT	Scroll options left and right. Adjust values in combo menus and setting submenus.
▬	CAPTURE	In Weather Mode, manually capture all environmental values.
☀	BACK-LIGHT	Turn backlight on or off. (Also turns off automatically after one minute.)

Most system-wide and weather setup options are accessed from the main Options menu by pressing the ⚙ button from any Weather Measurement Screen or the main Targeting Screen.

- **BLUETOOTH**
  - » Bluetooth On/Off
- **DATA PORT**
- **MEMORY OPTIONS**
  - » Clear Log
  - » Auto Store
  - » Store Rate
  - » Overwrite
- **GRAPH SCALE**
- **DISPLAY**
  - » Auto Shutdown
  - » Contrast
  - » Backlight
- **SYSTEM**
  - » Time & Date
  - » Measurements
  - » Units
  - » Lang
  - » Batt
  - » Factory Restore
- **ABOUT**
  - » Version
  - » Legal

TYPES OF MENU ITEMS

```
Task              Go
Submenu...
Setting           On
Combo Field...   Yes▼
⚙ exit      ◄►    adjust
```
```
Locked Value
Locked Value...
```
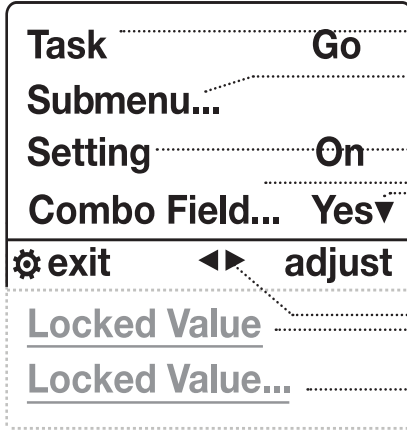
»Tasks are executed by highlighting the field and pressing Select.

»The presence of a submenu is indicated by a "…" following a field.

» Highlight the field and press Select to enter a submenu.

» Adjust a setting by pressing left or right.

» An arrow indicates there are additional fields off screen.

» Adjust the value of a Combo Field by pressing left or right.

» Enter the Combo Field sub menu by pressing select.

» Navigation buttons indicate available actions on the current screen.

» Locked values are either driven by another value or cannot be edited on the current screen.

» Locked values may have submenus which are entered by pressing select.

6

MORE MEASUREMENTS

Measurement & Icon   Units   Graph of Stored Data Log   Data Point Value   Data Point Scroll Bar

🌡 Temp °F	🌡 Temp °F	🌡 Temp °F	🌡 69.3 °F
76.5	Min 40.8 / Avg 67.5 / Max 80.3	(graph)	(graph)
↵ settings	↵ start	↵ data	25 June 4:48:31pm

Data Point Time Stamp

Current Measurement Screen	**Min Ave Max Screen**	**Data Graph Screen**	**Data Points Screen**
Press ↵ SELECT to enter settings menu for that measurement.	Press ↵ SELECT to start, stop and clear the Min/Avg/Max tracking.	Press ↵ SELECT to enter the Data Log Detail Screen to view logged data points.	Press LEFT/RIGHT to scroll through data points. Press OPTIONS to exit Data Log Details Screen.

MORE MEASUREMENTS

» The ▲▼ UP/DOWN buttons navigate between all weather measurements set to "On" in Options|Measurements.

» The ◄► LEFT/RIGHT buttons scroll between the three display screens for the measurement.

» The ⚙ OPTIONS button exits the **settings** submenu and Data Log Detail Screen.

7

1. **INSTALL BATTERY.** Slide the battery door latch and open door. Insert the provided AA lithium battery as indicated by the label. Replace the battery door, ensuring it "clicks" fully into place.
2. **POWER ON KESTREL.** Press ⏻ to power on Kestrel.
3. **ENTER OPTIONS MENU.** Press ⚙ to enter the Options Menu.
4. **SET AUTO STORE RATE.** Scroll to and select **Memory Options**. Scroll to **Auto Store** and ensure it is set to **ON**. Scroll to **Store Rate** and adjust to desired frequency of automatic weather data logging.
5. **SET OVERWRITE.** Scroll to and select Memory Options. Scroll to Overwrite and set to On to allow the data log to wrap once full and to OFF to stop logging when full.
6. **SET GRAPH SCALE.** Scroll to and select Graph Scale. Scroll to and select the desired measurement type. Adjust the Set High and Set Low values to bound the desired display values.
7. **SET AUTO SHUTDOWN.** Scroll to and select **Display**. Scroll to **Auto Shtdwn** and choose a time window after which the Kestrel will shut down without any button presses.
8. **SET BACK LIGHT COLOR.** Scroll to and select **Display**. Scroll to **Backlight** and set to either **White** or **Red**. White is very bright and ideal for any dim light use. Red is reduced brightness and a wavelength selected to preserve adapted night vision for true dark operations.
9. **SET DATE AND TIME.** Scroll to and select **System**. Scroll to and select **Time & Date**. Adjust the time and date.

10. **TURN ON/OFF MEASUREMENT SCREENS.** Scroll to and select **System**. Scroll to and select **Measurements**. Set measurement screens to either **On** or **Off** as desired.
11. **SET UNITS.** Scroll to and select **System**. Scroll to and select **Units**. To change all units select **Global**, then set **Global to Imperial** or **Metric,** and then scroll to **Apply** and select **Go.** To set units individually, scroll to each measurement type in the **Units** submenu and set to the desired units. Units can also be set in the **Settings** menu for each measurement.
12. **SET LANGUAGE.** Scroll to and select **Lang.** Adjust to desired language: **English, Deutsche, Francais, Espanol.**

8

ALTIMETER AND BAROMETER

The Kestrel employs a stable, accurate pressure sensor to measure station pressure, the unadjusted air pressure in your location.

» To use your Kestrel to measure barometric pressure (station pressure adjusted for local elevation), you must enter a correct reference value for your altitude. Accurate barometric readings require that no elevation changes be made while taking measurements.

» To use your Kestrel to measure altitude changes (changes in station pressure associated with changes in elevation), you must enter a correct reference value for your starting barometric pressure. Accurate altitude readings depend on stable, weather related barometric air pressure while measurements are taken.

» Synched values between the Altitude and Barometer measurement screens allow reference value updates on either screen to automatically update reference values on the other.

☐ *Note! You cannot use your Kestrel as a barometer and altimeter simultaneously.*

SETTING REFERENCE VALUES ON BARO MEASUREMENT SCREEN:

» Scroll to the **Baro** measurement screen and select **Settings.**

» Adjust either the Altitude or the Barometric Pressure value to a local, known value obtained from a mapping reference, GPS, or accurate weather station in the same location.

SETTING REFERENCE VALUES ON ALTITUDE MEASUREMENT SCREEN:

» Scroll to the **ALTITUDE** measurement screen and select **Settings**.

» Adjust either the Altitude or the Barometric Pressure value to a local, known value obtained from a mapping reference, GPS, or accurate weather station in the same location.

☐ *Note! You should enter new reference values whenever you are using the Altimeter or Barometer functions and your location or the weather conditions have changed.*

USING MIN/ AVG/ MAX

Pressing the right scroll button from any Current Measurement Screen will open the Min/Avg/Max Screen. The capture process is linked for all measurement screens, capturing Min/Avg/Max values on one measurement screen will capture Min/Avg/Max values over the same time period for all measurements. Each new Min/Avg/Max capture overwrites the previously captured value from all measurements.

CAPTURING MIN/AVG/MAX VALUES:

» Scroll to the Min/Avg/Max Screen of the desired measurement. This can be done by scrolling right from the desired Current Measurement Screen or scrolling vertically from another measurement's Min/Avg/Max Screen.

» Press Select to **Start** a new Min/Avg/Max capture.

» Press Select to **Stop** the capture period and view Min, Avg, and Max values.

» Press Select to **Clear** the Min/Avg/Max values.

CONNECTING TO DEVICES USING LiNK

If your Kestrel is marked LiNK on the bottom front label, it can be connected wirelessly to other LiNK-compatible devices. LiNK is powered by *Bluetooth* Smart®, also known as *Bluetooth*® LE, which is available in most iOS devices released after 2014 and Android devices released after 2015, as well as in a USB Dongle available from Kestrel that supports connectivity to Windows and Mac OS devices. LiNK-enabled Kestrel units can connect to mobile devices running Kestrel LiNK to install firmware updates. LiNK-enabled units can can be run wirelessly to computers using the Kestrel Dongle.

CONNECTING TO A COMPUTER, MOBILE PHONE OR TABLET:

»   On your phone or tablet, follow the links at **www.kestrelinstruments.com** to locate Kestrel LiNK for iOS or Android in the App or Play store and install on your mobile device.

OR

»   On your computer, follow the links at **www.kestrelinstruments.com** and install on your computer. Insert your Kestrel USB Dongle (available separately) into an open USB port.

»   On the Kestrel, open the Options Menu and select **Bluetooth**. Set **Bluetooth** to **On**. The Kestrel's Status will change to **Available**, indicating that it is available for pairing with a computer or mobile device.

❏ *Note! LiNK range is typically 100 ft/30M line of sight. Shorter distances should be expected if there are obstacles such as walls or metal enclosures. Range is also impacted by the signal strength of the other device.*

CONNECTING TO COMPUTERS USING USB CABLE

All Kestrel 5 Series units can connect to a computer via the Data Transfer Port using the USB Data Transfer Cable available separately. Kestrel LiNK software is available for Windows and Mac for downloading logged weather data and installing firmware updates.

CONNECTING TO A COMPUTER USING USB CABLE:

»   On your computer, follow the links to locate Kestrel LiNK for PC or Mac and install on your computer.

»   In the Options Menu of the Kestrel, scroll to **Data Port** and set to **On**.

»   Connect the USB Data Transfer Cable to the Data Transfer Port on the back of the Kestrel unit.

»   Insert the USB plug into an available USB port on your computer and follow the instructions in Kestrel LiNK for connecting to your unit.

CREATING, VIEWING, & EXPORTING DATA LOGS

In addition to taking live measurements, your Kestrel 5 Series weather meter is a powerful data logger. The Kestrel will automatically create a time stamped data log of all measurements at the logging interval you set. Additional log points can also be captured manually. Logged data can be accessed four ways:

»   Viewed on the Kestrel Meter on the Data Graph Screen and Data Log Detail Screens.

»   Exported to an iOS or Android mobile device using the Kestrel LiNK mobile apps available in the App Store and Google Play Store. Requires a Kestrel LiNK-enabled meter and a compatible Bluetooth® Smart/LE devices.

»   Exported to a PC or Mac using Kestrel LiNK software and a Kestrel USB Dongle (available separately). Requires a Kestrel LiNK-enabled meter

»   Exported to your Windows or Mac computer using Kestrel LiNK software and a Kestrel USB Data Transfer Cable (available separately). All 5 Series Kestrel meters can connect to Kestrel LiNK using a Kestrel USB Data Transfer Cable.

TURNING ON AND ADJUSTING AUTOMATIC DATA LOGGING:

»   In the main Options menu, scroll to and select **Memory Options**. Scroll to and select **Auto Store** and set to **ON**. Scroll to **Store Rate** and adjust to desired frequency of automatic weather data logging.

»   In the Memory Options sub menu scroll to **Overwrite** and set to **On** to allow the data log to wrap once full and **Off** to stop logging when full.

»   When **Auto Store** is set to **On**, the Kestrel unit will automatically begin logging at the rate set in **Store Rate**.

MANUAL DATA LOGGING:

»   Individual data points can be added to the log at any time by pressing the Capture button.

»   Manual capture simply adds every measurement to the data log at the capture time/date.

VIEWING LOGGED DATA ON THE KESTREL METER:

»   Scroll to the Graph Data Screen of the desired measurement. This can be done by scrolling right from the desired Current Measurement Screen or scrolling vertically from another measurement's Graph Data Screen.

»   A graph of the most recently logged data points will be displayed and continue to grow at the selected store rate.

»   To view individual data log points, or to view graph data older than what is shown in the Graph Data Screen, press Select to open the Data Log Detail Screen. Scrolling left or right will move the bar highlighting individual data points. Log values are shown in the upper left and the time stamp is shown along the bottom. Press Exit to return to the Graph Data Screen.

12

» To change the resolution of the graph, scroll to and select **Graph Scale** in the Options menu. Scroll to and select the desired measurement type. Adjust the **Set High** and **Set Low** values to bound the desired display values.

EXPORTING DATA LOGS TO A MOBILE DEVICE:
» Follow the links at **www.kestrelinstruments.com** to locate Kestrel LiNK in the App or Play store and install on your mobile device.
» Follow the directions in the Kestrel LiNK app and in the section of this manual titled Pairing with a Computer, Mobile Phone or Tablet: to connect the mobile device to the Kestrel.
» The Kestrel's new logged data will automatically be added to the app's log whenever the devices are connected.
» To export logged data to a .csv file for further analysis, go to the **Stats** page of the app or the **Manage Data Logs** screen on the **Manage** page.
» Hit the **Export Data** button. Choose a method for exporting the data and follow the in-app prompts to send.

EXPORTING DATA LOGS TO A COMPUTER:
» Follow the links at **www.kestrelinstruments.com** to download Kestrel LiNK to a PC or Mac computer. Install.

Use one of the following two methods to connect your Kestrel to your computer.

1. **Connect your LiNK-enabled Kestrel Meter to your computer wirelessly:**
   » Purchase a Kestrel LiNK Dongle and install in your computer's USB port.
   » Follow the instructions in the "Pairing with a Computer, Mobile Phone or Tablet" section of this manual along with the Kestrel LiNK program to pair the Kestrel and your computer.

2. **Connect your Kestrel 5 Series Meter to your computer using a Kestrel USB Data Transfer Cable:**
   » Purchase a Kestrel USB Data Transfer Cable.
   » In the main Options menu, scroll to and select **Data Port** and set to **On**.
   » Insert the USB Data Transfer Cable into an open USB port and the Data Transfer Port on the back of the Kestrel unit.

Once connected
» Follow the directions in the Kestrel LiNK program to confirm the connection.
» In the Kestrel LiNK software, choose a data log from the Logs window and click on the Export to File button.
» Choose a file export directory on your computer and click on the Ok button.

MEASURING AIR FLOW

Kestrel 5200 Professional Units Only
Kestrel Professional Meters can calculate air flow through a duct by combining user input information about the size and shape of the duct with the measured air velocity. In addition to reading the instantaneous Air Flow off the main measurement screen, a more accurate result may be obtained by capturing an average air flow on the Min/Ave/Max screen while traversing the duct. Capturing an average can be particularly helpful when measuring ducts with registers or dimensionally uneven air flow.

» From any current measurement screen, scroll to **AIR FLOW** and select **Settings.**
» Set Shape to match the shape of the duct, either **Rect** (rectangle) or **Circle**.
» Input the dimensions of the duct by setting **Length** and **Width** for a **Rectangle** or **Diameter** for a **Circle** duct and press **exit.**

14

MEASURING EVAPORATION RATE

Kestrel 5200 Professional Units Only

Kestrel Professional Meters can calculate a concrete evaporation rate (ACI 308) by combining a user input concrete temperature with measured air temperature, wind speed and relative humidity. Concrete mix temperature is generally measured with a probe or infrared thermometer and should be read at the time of making the evaporation rate measurement.

MEASURING EVAPORATION RATE:

1. From any current measurement screen, scroll ▲▼ to **EVAP** and select **Options** ⚙.
2. Measure the temperature of the concrete mix and set **Mix Temp** to the correct value, then press **exit** ⚙.
3. To take a reading, hold the unit vertically, approximately 20 inches above the surface of the concrete while facing the rear of the unit directly into the wind. To avoid inaccurate Evaporation Rate readings due to thermal loading it is best to shade the Kestrel. (Be sure the source of shade is not obstructing the wind speed measurement.)
4. The ACI recommends taking a 6-10 second average of the evaporation rate to account for fluctuating wind speeds. To measure an average Evaporation Rate, scroll right from the Current Measurement Screen to the Min/Avg/Max Screen and press select to manually **start** and **stop** a capture.

The Kestrel Concrete Pro Jobsite Weather Kit equips you with a portable, hands-free monitoring option. The kit includes a vane mount for wind direction in addition to a sturdy mini tripod with extension rod that sits at 20 inches above concrete (ACI recommended height for measuring).

15

The concrete evaporation rate solver can calculate the evaporation rate for different sets of environmental conditions. The solver can be loaded with an automatic 10 second average capture of the current conditions or the user can input the conditions manually. After conditions are entered, the evaporation rate and plastic shrinkage cracking risk will be displayed. Conditions can then be changed row by row to understand the effect on the Evaporation Rate.

» From any current measurement screen, scroll to **EVAP** and select **Options** ✿**.**

» **Set Mix Temp** to the measured or anticipated value, then scroll ▲▼ to Use Solver and press select.

❑ *Note: any subsequent changes to the Mix Temp will be used to calculate Evaporation Rate on the current measurement screen as well as on the Solver screen.*

» **Capture 10 second average:** A new Capture can be initiated at any time to obtain 10 second average values for the temperature, wind speed and relative humidity. Scroll down to New Capture and press Select. A reminder to capture conditions 20" above the pour site appears. Press Select to begin the capture. A countdown timer indicates the seconds remaining until the Capture is complete. Once complete, the Solver screen is populated with the average conditions.

» **Changing conditions and Manual conditions entry:** scroll up or down to highlight the condition and press <> to change the value. The Evap rate and corresponding risk level at the top of the screen is updated instantly.

❑ *Note: Dashes will display until the values are manually adjusted or until the first environmental Capture is performed.*

» **Reset:** Scroll down and press Select on the Reset row to reset the conditions to the values of the last 10s capture.

❑ *Note: 10s capture data is cleared when the Kestrel power is turned off. If no 10s capture data is available, selecting Reset will clear all conditions.*

» **Exit:** Scroll to Exit and press select to exit the solver and return to the Evap Options screen.

Evaporation Rate

Evap:	0.02	HIGH	LOW / MED / HIGH
Air Temp		92	*Cracking Risk*
Mix Temp		80	
Humidity		23	
Wind Speed		11▼	

Arrow indicates the ability to scroll up or down to view additional items listed on the screen.

WEATHER GLOSSARY

DIRECTION – Compass heading in true or magnetic North.

WIND SPD – Wind Speed is the measurement of the wind passing through the impeller. For greatest accuracy, point the back of the Kestrel directly into the wind.

CROSWND – Crosswind uses the internal compass and a user selected heading to calculate the crosswind component of the full wind.

HEADWND – Headwind uses the internal compass and a user selected heading or target direction to calculate the headwind component of the full wind.

TEMP – Ambient Temperature is the temperature measured at the thermistor. For best results, ensure the thermistor is not exposed to direct sunlight and is exposed to good airflow.

CHILL – Wind Chill is a calculated value of the perceived temperature based on temperature and wind speed.

HUMIDITY – Relative Humidity is the amount of moisture currently held by the air as a percentage of the total possible moisture that the air could hold.

HEAT INDEX – Heat Index is a calculated value of the perceived temperature based on temperature and relative humidity.

DEW POINT – Dew Point is the temperature at which water vapor will begin to condense out of the air.

WET BULB – Wet Bulb is the lowest temperature that can be reached in the existing environment by cooling through evaporation. Wet Bulb is always equal to or lower than ambient temperature.

BARO – Barometric Pressure is the local atmospheric pressure (also called station or absolute pressure) adjusted to mean pressure. An accurate reading depends on a correct altitude input and unchanging altitude while measuring.

ALTITUDE – Altitude is the vertical distance above mean sea level associated with given atmospheric pressure. An accurate reading depends on correct initial barometric pressure input and stable barometric pressure while measuring.

STATION – Station Pressure (Absolute Pressure) is the pressure exerted by the atmosphere at the location.

DENS ALT – Density Altitude is the altitude at which the density of the theoretical standard atmospheric conditions (ISA) would match the actual local air density.

MOISTURE | HUM RATIO – Moisture Content or Humidity Ratio is the ratio between the mass of water vapor measured in the air to the mass of dry air with no water vapor. (Not available in Environmental models)

DENSITY - Air density is the mass of the measured air per unit volume. (Not available in Environmental models)

RAD – Relative Air Density is the ratio of the measured air density to the air density at sea level using the International Civil Aviation Organization (ICAO) standard reference conditions. (Not available in Environmental models)

EVAP – Evaporation Rate (based on ACI 308) is a guide to how quickly concrete will lose moisture in the measured pour environment. (Not available in Environmental or Racing models)

AIR FLOW – Volume Air Flow is a measure of the volume of air passing through a duct of a shape and size defined by the user. (Not available in Environmental or Racing models)

DELTA T – Delta T is the difference between the wet bulb and the dry bulb temperature and is used to determine acceptable agricultural spraying conditions. (Not available in Environmental or Racing models)

MIX TEMP – The temperature of the concrete mix. This can be measured using an insertion thermometer as per ASTM C1064, by an embedded thermocouple, or by an IR surface thermometer.

IMPELLER REPLACEMENT

❏ *Press only the sides of the impeller when removing and inserting to avoid damaging the precision hub bearing. [🔲 Figure 1] .*

» Press FIRMLY on the impeller module to remove it.
» Insert the new impeller so the side that has the small triangle (close to the perimeter) faces the front of the Kestrel when installed.

🔲 *Figure 1*

» Orient one "arm" of the module straight up . [🔲 Figure 2]. The impeller can be pushed in from either side.

🔲 *Figure 2*