

# Kestrel<sup>®</sup> 3500 Pocket Weather<sup>™</sup> Meter with Backlight

Thank you for purchasing the Kestrel 3500 Pocket Weather Meter. This instrument will measure the following environmental conditions:

- wind speed
- maximum wind gust
- average wind speed
- temperature (air, water snow)
- wind chill
- relative humidity
- heat stress index
- dewpoint
- wet bulb temperature
- barometric pressure
- altitude

Plus additional features:

- clock
- data hold function
- automatic power-down function
- 3-hour pressure trend
- backlight

## OPERATION

**1) Slide off cover.**

**2) Turn on.** Press the center button (Ⓚ) to turn on the unit.

**3) Select measurement.** Press the right arrow (▶) to scroll through the measurements listed below. Press the left arrow (◀) to scroll through the measurements in reverse order. The instantaneous measurements will be displayed. Each measurement screen is preceded by a brief hint to clarify which measurement is being displayed. (See *Understanding the Measurements* section for more information.)

**4) Select the unit of measure.** While holding Ⓚ, press ▶ to scroll through the units of measure listed below.

Mode	Hint	Icon	Units of Measure
Clock	---	---	12-hr, 24-hr
Wind Speed	SPd		m/s, ft/min, km/h, mph, kt, B
Max Gust	SPd	MAX	m/s, ft/min, km/h, mph, kt, B
Avg Speed	SPd	AVG	m/s, ft/min, km/h, mph, kt, B
Temperature	dEG		C, F
Wind Chill	chill		C, F
Humidity	r.h.		%
Heat Stress Index	H.I.		C, F
Dewpoint	d.P.		C, F
Wet Bulb Temp	bulb		C, F
Barometric Pressure*	bAro		hPa, inHg
Altitude	Alt		m, ft

\* Only one of the pressure icons will be displayed, indicating the 3-hour pressure trend.

- ↑ pressure rising quickly (rise more than +0.18 inHg)
- ↗ pressure rising (rise within +0.06 inHg and +0.18 inHg)
- pressure stable (remain within -0.06 and +0.06 inHg)
- ↘ pressure falling (drop within -0.06 inHg and -0.18 inHg)
- ↓ pressure falling quickly (drop more than -0.18 inHg)

**5) Hold mode.** While holding Ⓚ, press ◀ to hold the time and all of the measured values. The word "HOLD" will blink to indicate the Hold Mode. Press ◀ or ▶ to view the other measurements in Hold Mode. While holding Ⓚ, press ◀ to exit the Hold Mode. This mode can be useful for taking measurements when unable to view the display.

**6) Turn on the backlight.** Press Ⓚ to activate the backlight for 10 seconds. If ◀ or ▶ are pressed while the backlight is illuminated, the backlight will remain illuminated for another 10 seconds. Press Ⓚ while the backlight is illuminated to manually turn off the backlight.

**7) Adjust the clock.** Simultaneously press ◀ and ▶ to adjust the clock. While the clock is blinking, press ◀ or ▶ to adjust the clock. Hold ◀ or ▶ to adjust the times quickly. Simultaneously press ◀ and ▶ to exit the clock adjustment.

**8) Adjust the reference altitude.** Obtain your altitude from a topographic map or landmark to use as your reference altitude. From the barometric pressure screen, simultaneously press ◀ and ▶ buttons to adjust the reference altitude. Press ◀ or ▶ to adjust the reference altitude, or hold ◀ or ▶ to adjust the value quickly. Simultaneously press ◀ and ▶ to exit the reference altitude adjustment.

**9) Adjust the reference pressure.** Obtain your barometric pressure reading from a local weather source to use as your reference pressure. From the altitude screen, simultaneously press ◀ and ▶ buttons to adjust the reference pressure. Press ◀ or ▶ to adjust the reference pressure, or hold ◀ or ▶ to adjust the value quickly. Simultaneously press ◀ and ▶ to exit the reference pressure adjustment.

**10) Turn off.** Hold Ⓚ for 2 seconds to manually turn off the unit. The unit will automatically turn off if no buttons have been pressed for 45 minutes.

## UNDERSTANDING THE MEASUREMENTS

**Wind Speed** - average over the previous three seconds. The measurement will be accurate for air flow through the front or rear of the unit.

**Maximum Wind Gust** - maximum 3 - second wind speed since the unit was turned on.

**Average Wind Speed** - average wind speed since the unit was turned on.

**Temperature** - instantaneous temperature of the thermistor, which is located at the end of the long coiled leads in the open cavity below the impeller. The exposed thermistor will respond quickly to changes in temperature when air flows past it. For fastest response, either hold the unit into the wind or wave the unit side to side for 15 seconds. Readings should be taken in the shade. Water and snow temperatures can be taken by hold the unit in the water or snow.

**Wind Chill** - combination of wind speed and temperature, as defined by the US National Weather Service. Wind chill is the effective temperature on a human or animal at low temperatures due to wind speed. Wind chill readings will be the same as the temperature readings above 45°F or below 3 mph.

**Relative Humidity** - amount of moisture in the air compared to the amount of moisture the air can hold for the given temperature, represented as a percent. Because relative humidity is also a function of the temperature, the response time will be dependent on the temperature response time (see temperature section above). Readings should be taken in the shade.

**Heat Stress** - combination of temperature and humidity, as defined by the US National Weather Service. Heat stress is the effective temperature on a human or animal at high temperatures due to humidity. Heat stress readings will be the same as the temperature readings below 70°F.

**Dewpoint** - calculated based on temperature and humidity measurements, as a measure of moisture content in the air. If the dewpoint is very close to the temperature, the air is humid. If the temperature and dewpoint are the same, dew will form. If this happens below freezing, frost will form.

**Wet Bulb Temperature** - calculated based on temperature and humidity measurements, as a measure of evaporation rate. If the wet bulb temperature is very close to the air temperature, the air is humid. Wet bulb temperature is typically measured by swinging a mercury thermometer with a wet sock on its end for several minutes.

**Altitude and Barometric Pressure** - the Kestrel 3500 will measure station pressure in order to calculate barometric pressure and altitude. Changes in either air pressure or altitude will affect these readings, so it's important to make adjustments as necessary.

First, you will need to obtain either (a) the current barometric pressure or (b) the altitude of your location. You can obtain your current barometric pressure by contacting a local airport or weather service. Set this value as your reference pressure on the ALTITUDE screen to determine your altitude. Otherwise, you can obtain your altitude from a topographic map or local landmark. Set this value as your reference altitude on the BAROMETRIC PRESSURE screen to determine your barometric pressure.

There are two examples for when and how to use the BAROMETRIC PRESSURE and ALTITUDE screens. First, assume that you know the altitude from one of the sources above. Set the reference altitude on the BAROMETRIC PRESSURE screen to this elevation. As long as you remain at home, you can accurately track changes in the barometric pressure. However, the measurement on the ALTITUDE screen also changes. This value will fluctuate as pressure fronts pass through your location. Since you know your house is not changing elevation, you can ignore this screen.

Now let's assume that you are planning a day hike and you'd like to track your altitude. Before starting, you'll need to adjust the reference pressure on the ALTITUDE screen. You can do this by simply adjusting the reference pressure until you reach the elevation of your house. The reference pressure will be the same as the pressure reading on the BAROMETRIC PRESSURE screen. You can now track the altitude as you hike. You can ignore the values on the BAROMETRIC PRESSURE screen, since the pressure changes are predominantly due to changes in elevation.

As with all pressure altimeters, it must be assumed that any change in pressure due to weather is small over the course of one day. If you were to encounter an elevation landmark, you can adjust the reference pressure until the altitude matches the landmark elevation. This will correct the altitude for any pressure changes due to weather.

## MAINTENANCE

### Storing Your Kestrel

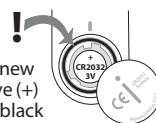
Avoid storing your Kestrel where it will be exposed to temperatures above 80° C [176° F] or below -30° C [-22° F] for extended periods of time. Doing so may cause permanent damage. (Note that the inside of a car parked in the hot sun can reach very high temperatures.)

### Use of the Lanyard and Cover

The cover can be captured on the lanyard to avoid loss. First, remove the cord poplock. Then feed the lanyard end through the large opening in the cover and out the slot. Replace the poplock on the lanyard.

### Replacing the Battery

When your display flashes the low battery indicator (Ⓚ), replace the battery. Use a large coin to open the battery compartment. Insert a new CR2032 coin cell (available where watch batteries are sold), positive (+) pole up. When replacing the battery door, be sure to keep the black rubber o-ring seated in the groove on the case back.



**Kestrel**  
Pocket Weather Meters

Thank you for purchasing a Kestrel Pocket Weather Meter! Please register your Kestrel within 10 days of receipt to activate your warranty coverage. (If product is not registered, two-year warranty coverage will start on date of manufacture.)

This information will be kept confidential. Any information collected about our customers will not be sold or distributed, and will be used for the business of Nielsen-Kellerman only. We are conducting this survey in order to improve the quality of our product. Thank you for your cooperation and we appreciate your time.

The team at Nielsen-Kellerman stands proudly behind our products. If you have any questions or comments please feel free to call us at 1.800.784.4221 or visit our website at [www.nkhome.com](http://www.nkhome.com).

Sincerely,

*Katu*

Nielsen-Kellerman  
Sales Department

## Why does the Impeller Appear Imbalanced?

It is NORMAL for the impeller to oscillate as it comes to a stop. It is NOT improperly balanced. Rather, it contains a very small magnet which responds to the earth's magnetic fields. This does not affect the accuracy of the wind speed readings because the magnetic field applies both a braking and an accelerating force which cancel each other. The impeller has been calibrated to provide wind speed readings accurate to within at least  $\pm 3\%$ .

## High Speed Use

After several hours of sustained operation over 25 M/S (~49 KT, 90 KM/H, 56 MPH or 4,923 FPM), the Kestrel will lose some accuracy due to wear of the sapphire bearings in the impeller.

## Replacing the Impeller

Press FIRMLY on the sides of the black impeller housing with your thumbs to remove the entire assembly. When inserting the new impeller, be sure the arrow is facing the display side of the unit, and is aligned with the top of the meter. Press on the sides of the housing rather than the center.

## Taking Accurate Humidity, Heat Stress and Dewpoint Measurements

The patented system for measuring relative humidity allows for extremely fast and accurate readings. The sensor is located in the large hole on the rear of the unit. Even extreme and abrupt changes in the surrounding humidity will be measured within several minutes. To test this, place your hand around the rear of the unit. Within several seconds, the humidity will increase dramatically. After removing your hand, the humidity will quickly begin to decrease. Next, place your hand near the rear of the unit and wave the unit back and forth. The humidity will not change because the air flow is diluting the humidity from your hand.

This example shows the importance of keeping air flow past the sensor while taking a measurement. If there is no natural air flow past the sensor, wave the unit back and forth. It is also reasonable to lay the unit down on a solid surface for several minutes to allow the sensor to adjust.

## Sensor Calibration

All the sensors have been factory calibrated to be accurate within specifications. For recalibration, you may either return it to Nielsen-Kellerman for factory calibration, or contact NK for field calibration instructions. Humidity Field Calibration Kits are also available for sale online.

## BEAUFORT SCALE

The Beaufort Scale is a system for estimating wind force without the use of instruments based on the visible effects of the wind on the physical environment. The behavior of smoke, waves, trees, etc., is rated on a 13 point scale. The scale was devised in 1805 by the British naval Commander Sir Francis Beaufort (1774-1857) and is still commonly used by mariners.

Force	Description	Kts
0	Calm	0
1	Light Air	1-3
2	Light Breeze	4-6
3	Gentle Breeze	7-10
4	Moderate Breeze	11-16
5	Fresh Breeze	17-21
6	Strong Breeze	22-27
7	Near Gale	28-33
8	Gale	34-40
9	Strong Gale	41-47
10	Storm	48-55
11	Violent Storm	56-63
12+	Hurricane	64+

## WARRANTY & SERVICE

### Warranty

Every unit is fully tested at our factory for measurement accuracy and waterproof integrity. Your Kestrel is covered by a full parts and labor warranty for two years from your date of purchase. The provisions of this warranty do not apply to: a) batteries, whether contained in a unit or sold individually; b) units which have been subjected to misuse, negligence, accident or improper maintenance or application; c) humidity sensors damaged by excess contact with salt water; or d) units which have been repaired or altered by a party other than Nielsen-Kellerman's employees or agents without Nielsen-Kellerman's prior written consent.

### Parts and Service

To order replacement parts for your Kestrel or obtain service please contact Nielsen-Kellerman or your original place of purchase.

## ADDITIONAL INFORMATION



What is a "Kestrel"? The American Kestrel is the smallest North American falcon. Beautiful and highly adaptable, it can be found virtually everywhere in North America. It is unique among falcons for its ability to both hover at very low speeds and dive at very high speeds.



Assembled in the USA. The Kestrel 3500 is protected by US Patents 5,783,753, 5,939,645 and 6,257,079. Other patents pending. Nielsen-Kellerman reserves the right to change product specifications. © 2004. Kestrel, the Kestrel logo, Pocket Weather, NK and the NK logo are trademarks of the Nielsen-Kellerman Co.

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## SPECIFICATIONS

### Accuracy (Within OPERATIONAL RANGE at right)

Wind Speed	$\pm 3\%$ of reading
Temperature	$\pm 1^\circ\text{C}$
Wind Chill	$\pm 2^\circ\text{C}$
Wet Bulb Temp	$\pm 2^\circ\text{C}$
Dewpoint	$\pm 3^\circ\text{C}$ (above 20% RH)
Heat Index	$\pm 3^\circ\text{C}$
Relative Humidity	$\pm 3\%$
Pressure	$\pm 3\text{hPa}$
Altitude	$\pm 30\text{m}$ (at standard atmospheric conditions)
Altitude Resolution	1m

### Response Time

Wind Speed, Pressure, Altitude	1 Second
Temperature, Relative Humidity, Wind Chill, Heat Index, Dewpoint, Wet Bulb	<1 Minute under most conditions.

### Operational Range

Units of Measure	Low	High
Knots	0.6	78
Meters per Second	0.3	40
Kilometers per Hour	1.0	144
Miles per Hour	0.7	89
Feet per Minute	59	7877
Beaufort Force	1	16
Celsius	-29	70
Fahrenheit	-20	158
Percent Humidity	5	95
Meters	-500	9000
Feet	-1500	30000
Hectopascal (or mbar)	870.0	1080.0
Inches Mercury	25.70	31.90

## Sensors

Impeller: 25 mm. [1 in.] diameter, sapphire bearings, light weight. User-replaceable impeller/housing assembly.

Temperature Sensor: Hermetically sealed precision thermistor.

Humidity Sensor: Capacitive sensor.

Pressure Sensor: Monolithic Silicon Piezoresistive sensor.

## Display

Type: Reflective 4.5 digit LCD.

Digit Height: 8 mm. [0.31 in.].

Update: 1 second.

Temperature Limitations: Normal operation from  $-15^\circ\text{C}$  to  $50^\circ\text{C}$  [ $5^\circ\text{F}$  to  $122^\circ\text{F}$ ]. Below  $-15^\circ\text{C}$  [ $5^\circ\text{F}$ ] the display fluid will freeze. Above  $50^\circ\text{C}$ , the display will turn black. This is temporary and display will function properly when unit is returned to normal temps. Accurate readings may be taken by keeping the unit warmer than  $-15^\circ\text{C}$  [ $5^\circ\text{F}$ ], or cooler than  $50^\circ\text{C}$  [ $122^\circ\text{F}$ ] and exposing it for the minimum time necessary to take a reading (less than one minute).

Auto Shutdown: After 45 minutes of no button presses.

## Environmental

Sealing: Electronics enclosure IP67 – water resistant to 1 m. [3 ft.]. Floats.

Shock: Drop tested to 2 m. [6 ft.].

Storage Temperature:  $-30^\circ\text{C}$  to  $80^\circ\text{C}$  [ $-22^\circ\text{F}$  to  $176^\circ\text{F}$ ].

## Physical

Buttons: Three sealed tactile rubber buttons control all functions.

Battery: User-replaceable CR2032 coin cell. Typical life, 300 hours.

Impeller: 25 mm. [1 in.] diameter, sapphire bearings, light weight. User-replaceable impeller/housing assembly.

Case: Slip-on case prevents damage to display and moving parts.

Dimensions: Unit: 4.8 x 1.7 x 0.7 in [122 x 42 x 18 mm]; case: 4.8 x 1.9 x 1.1 (122 x 48 x 28 mm).

Weight: Unit 2.3 oz [65g]; case 1.3 oz [37 g].

For more information or more detailed specifications, please visit [www.nkhome.com](http://www.nkhome.com).



## NIELSEN-KELLERMAN

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E-mail [kestrel@nkhome.com](mailto:kestrel@nkhome.com)

**Please fill out the product registration below and mail it to: Kestrel Registration, 21 Creek Circle, Boothwyn, PA 19061.**

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

COUNTRY: \_\_\_\_\_ TELEPHONE NUMBER: \_\_\_\_\_

EMAIL ADDRESS: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_ DATE OF PURCHASE: \_\_\_\_\_

MODEL: 1000  2000  2500  3000  3500  4000  4000 NV  4100

MALE:  FEMALE:

AGE: 18-24  25-36  37-48  49-56  57+

AVERAGE HOUSEHOLD INCOME: <\$25,000  \$26,000-45,000   
46,000-75,000  \$76,000-100,000  \$100,000+

WHERE DID YOU PURCHASE YOUR KESTREL?  
\_\_\_\_\_

HOW DID YOU LEARN ABOUT KESTREL POCKET WEATHER METERS?  
\_\_\_\_\_

PRIMARY USE (CAMPING, FIRE FIGHTING, AGRICULTURE, ETC.):  
\_\_\_\_\_

SECONDARY USE:  
\_\_\_\_\_

FAVORITE MAGAZINE:  
\_\_\_\_\_