

The Kestrel® 3500 Pocket Weather Meter

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Illustration courtesy of Nielsen-Kellerman

As target shooting becomes more competitive, shooters strive to control as many variables as possible. Brass preparation has evolved from simple full length resizing and neck trimming to neck turning, concentricity gauges and neck bushings in the die sets. Powder is no longer dispensed by simple volumetric powder throwers. Instead, very precise throwers like the Harrell Custom Powder Measures are common. Powder charges are commonly measured on electronic scales capable of weighing to 1/100th of a grain. Add in the use of digital calipers and micrometers for bullet, case and seating measurements and the reloading of metallic cartridges rises to a new level of precision. However, ammunition is only one of many variables impacting our shooting.

The quality and condition of the barrels on our rifles, the precision of our scopes, the environmental conditions at the range and the immediate physical and psychological state of the shooter are all major factors.

Environmental conditions are one of the most overlooked factors in today's shooting. Most shooters know that their rifles will shoot a bit better in colder weather than hot weather, and they know that the wind can play havoc with their scores. As such, a variety of wind charts and wind correction tables have been produced by individual shooters to at least compensate for those conditions. But, that is about the limit that most shooters go in considering the environment around them. Not because they don't want to "factor" other variables into their shooting, but because they do not have the equipment necessary to determine them. That changed with the introduction of personal weather stations. Unfortunately not that many

shooters have taken advantage of these useful tools. With the development of micro-electronics, personal weather meters now cost less than a good cell phone or iPod.

Most sophisticated ballistics programs have provisions for inputting environmental data such as elevation, atmospheric pressure, temperature and wind conditions. A pocket or small portable weather meter will accurately yield that data for input into the program. These variables can and do impact your ballistics. You can verify this for yourself by substituting different elevations, atmospheric pressures, temperatures into your ballistic program and analyzing the results. You will find that the effects are significant, possibly even explaining why you didn't shoot as well as expected at your last shoot. It wasn't you after all; it was the environmental conditions which you hadn't compensated for. But, now you can.

The Kestrel 3500 is one of the neatest little devices I've come across in several years. It is priced right with an MSRP of \$249, but discounted by several dealers to \$179. The 3500 is small, compact, reliable, and waterproof. It is MADE IN THE USA and comes with a five-year warranty from the manufacturer. It even floats if you happen to drop it in the lake while fishing.

The Nielsen-Kellerman company of Boothwyn, Pennsylvania, makes several models of the Kestrel for a variety of applications. The 3500 was most suited for hunters and shooters. It provides very precise current readings for the following weather variables:

Barometric Pressure (mb or inHg) – updated every second with 3 hr trend indicator

Altitude (feet or meters) – updated every second

Temperature (F or C) – updated every second

Relative Humidity & Dew Point – updated every minute

Wind Chill – updated every second

Heat Stress Index – updated every minute

Wind Speed (current, average & maximum gust) – updated every second

The only adjustments required to “calibrate” your new Kestrel are for barometric pressure and altitude. These adjustments are probably required for any such portable weather station to insure accuracy. The instructions are very clear and concise, although I must admit that I had to play with the unit for a bit before getting it right. But, once adjusted, it performed as advertised, requiring only a few seconds to readout the correct altitude.

The important question now is whether the accuracy of the Kestrel 3500 meets the advertised specifications. I checked the altitude reading on the Kestrel against my Garmin 60CSx. They were within 35 feet of each other. I compared the temperature reading against a laboratory calibrated scientific thermometer. They were within 1°F of each other. The Kestrel's wind speed reading was within 0.5mph of the wind meter at the university experiment station across the road. And finally, the barometric pressures of my Kestrel and the university station were within 0.05 inHg of each other. I called the airport weather station for the relative humidity of our area. The Kestrel was within 2% of the weather service value.

For the values that I was able to check, the Kestrel was equal to or better in accuracy than the advertised specifications. That was impressive. When you turn on the unit in a new location to obtain an elevation (altitude) reading, you must allow the unit time to stabilize. This takes less than 10 seconds, a bit slower than my Garmin gps unit, but quite acceptable.

All things considered, the Kestrel 3500 is a device that every serious shooter should consider adding to their equipment inventory. The auto shutdown feature kicks in after forty-five minutes with no key-press. That is important to me, as I tend to forget to turn off my electronics, and waste a lot of battery life. The battery life of the Kestrel is estimated at +/- 300 hours, depending on your use of the backlight feature. The unit takes standard CR2032 coin cell batteries which are readily available at most discount stores and drug stores.

The Kestrel is also a great tool for hunters, fishermen and backpackers, providing you with immediate weather conditions. The trend indicator for barometric pressure will alert you to weather fronts approaching your area. And, these folks will find the wind chill and heat stress index features especially useful. Given what we pay for high end fishing, hunting and camping equipment, the Kestrel is inexpensive, and in my opinion, virtually indispensable. From now on, when I venture into the mountains, I will have my cell phone, my Garmin 60CSx and my Kestrel 3500. Try it and I think you'll like it. It even has a clock.

Specification details of the Kestrel 3500

Measurement Response Time	Units	Operational Range	Resolution	Accuracy (+/-)	Specification Range
Wind Speed 1 second	m/s	0.4 to 60.0 m/s	0.1	Larger of 3% of reading or least significant digit	0.4 to 40.0 m/s
	ft/min	59 to 11,948 ft/min	1		59 to 7877 ft/min
	km/h	1.0 to 218.0 km/h	0.1		1.0 to 144.0 km/h
	mph	0.8 to 135.0 mph	1		0.8 to 89.0 mph
	knots	0.6 to 118.3 kt	0.1		0.6 to 78.0 kt
	Beaufort	0 to 12 B	0.1		0 to 12 B
1 inch diameter impeller with precision axle and sapphire bearings. Off-axis accuracy -1% @ 5° off-axis; -2% @ 10°; -3% @ 15°. Calibration drift < 1% after 100 hours use at 16 MPH / 7 m/s. Sustained operation above 60 MPH / 27 m/s will wear impeller rapidly and may cause destruction of impeller. Replacement impeller (NK PN-0801) may be field-installed without tools (US Patent 5,783,753).					
Temperature 1 second	°F	-49.0 to 257.0 °F	0.1	1.8 °F	-20.0 to 158.0 °F
	°C	-45.0 to 125.0 °C	0.1	1.0 °C	-29.0 to 70.0 °C
Measures air, water and snow temperature. Thermally isolated, hermetically sealed, precision thermistor mounted externally (US Patent 5,939,645). Calibration drift negligible.					
Relative Humidity 1 minute	%RH	0.0 to 100.0 %	0.1	3.0 %RH	5.0 to 95.0 % non-condensing
	Polymer capacitive humidity sensor mounted in thin-walled chamber external to case for rapid, accurate response (US Patent 6,257,074). (To achieve stated relative humidity accuracy, unit must be permitted to equilibrate to external temperature when exposed to large, rapid temperature changes and must be kept out of direct sunlight.) Calibration drift +/- 2% over 24 months. Relative humidity may be recalibrated at factory or in field using Kestrel Humidity Calibration Kit (NK PN-0802).				
Pressure 1 second (mb & PSI 4000 model only)	inHg	0.3 to 32.5 inHg	0.01	0.05 inHg	At 77.0 °F, 22.1 to 32.5 inHg
	hPa / mb	10.0 to 1100.0 hPa / mb	0.1	1.5 hPa / mb	At 25.0 °C, 750 to 1100 hPa / mb
	PSI	0.15 to 16.0 PSI	0.01	0.02 PSI	At 77.0 °F, 10.9 to 16.0 PSI
Monolithic silicon piezoresistive pressure sensor with second-order temperature correction. Maximum error over temperature range 32 to 158 °F (0 to 70°C) , +/- 0.06 inHg / +/- 2.0 hPa. Calibration drift typically -0.03 inHg / -1.0 hPa per year. Pressure sensor may be recalibrated at factory or in field.					
Altitude 1 second	ft	-6000 to 30000 ft	1	50 ft	At 77.0 °F, <19,700 ft. Max error +/- 98 ft
	m	-2000 to 9000 m	1	15 m	At 25.0 °C, <6,000 m. Max error +/- 30 m
Temperature compensated pressure (barometric) altimeter.					

Wind Chill 1 second	°F	0.7 to 135.0 MPH, -49.0 to 257.0 °F	0.1	1.8 °F	1.8 to 89.0 mph, -50.0 to 50.0 °F
	°C	0.4 to 60.0 m/s, -45.0 to 125.0 °C	0.1	1.0 °C	0.4 to 40 m/s, -45.6 to 10.0 °C
	Calculated from the primary measurements of wind speed and temperature. Utilizes the NWS Wind Chill Temperature (WCT) Index, revised 2001, with wind speed adjusted by a factor of 1.5 to yield equivalent results to wind speed measured at 10 m above ground. (Specification temperature limits established by WCT Tables.)				
Heat Index 1 minute	°F	0.0 to 100.0 %RH, -49.0 to 257.0 °F	0.1	3.6 °F	70.0 to 130.0 °F, 0 to 100% RH
	°C	0.0 to 100.0 %RH, -45.0 to 125.0 °C	0.1	2.0 °C	21.1 to 54.4 °C, 0 to 100 %RH
	Calculated from the primary measurements of temperature and relative humidity. Utilizes the NWS Heat Index (HI) tables. (Specification temperature limits established by HI tables.)				
Dewpoint 1 minute	°F	0.0 to 100.0 %RH, -49.0 to 257.0 °F	0.1	3.6 °F	-20.0 to 158.0 °F, 20.0 to 95.0% RH
	°C	0.0 to 100.0 %RH, -45.0 to 125.0 °C	0.1	2.0 °C	-29.0 to 70.0 °C, 20.0 to 95.0 %RH
	Calculated from the primary measurements of temperature and relative humidity. Temperature to which the air would need to be cooled at a constant pressure to become saturated.				
Wet Bulb Temperature 1 minute	°F	-49.0 to 257.0 °F, 0.0 to 100.0 %RH, 8.86 to 32.48 inHg	0.1	3.6 °F	32.0 to 100.0 °F, 5.0 to 95.0% RH, 8.86 to 32.48 inHg, <19,700 ft
	°C	-45.0 to 125.0 °C, 0.0 to 100.0 %RH, 300.0 to 1100.0 hPa	0.1	2.0 °C	0.0 to 37.8 °C, 5.0 to 95.0 %RH, -2000 to 9000 hPa, <6000 m
	Calculated from the primary measurements of temperature, relative humidity and pressure. Temperature indicated by a wet bulb psychrometer.				
Max/Avg Wind Speed	One-button clear and restart of Max Wind Gust and Average Wind measurement.				
Pressure Trend	Continuously updating three-hour barometric pressure trend indicator: rising rapidly, rising, steady, falling, falling rapidly.				
Display	Reflective 4 digit LCD. Digit height 0.36 in / 9 mm.				
Display Update	1 second.				
Display Backlight	Aviation green electroluminescent backlight.				
Clock / Calendar	Real-time hours:minutes clock.				
Operational Temperature Range (LCD and Batteries)	The operational temperature range of the liquid crystal display and batteries is 14° F to 131° F / -10 °C to 55 °C. Beyond the limits of the operational temperature range, the unit must be maintained within range and exposed for minimum time necessary to take reading.				
Storage Temperature	-22 °F to 140 °F / -30 °C to 60 °C.				

Auto Shutdown	After 45 minutes of no key presses.
Certifications	CE certified. Individually tested to NIST-traceable standards (written certificate of tests available at additional charge).
Batteries	CR2032, one, included. Average life, 300 hours of use, +/- depending on backlight use.
Environmental	Waterproof (IP67 standard). Drop-tested (MIL.STD.810F; unit only. Substantial impact may damage replaceable impeller.).
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 in / 122 x 48 x 28 mm.
Weight	Unit 2.3 oz / 65 g. Case 1.3 oz / 37 g.