

“Do I have a good site for wind power?”

Wind-powered systems can be cost effective if the average wind speed is 9 mph or more at the location of the wind generator. If you are using wind off grid in combination with photovoltaic power, it may be cost effective if good wind is available only during part of the year. When the wind speed doubles, the power delivered is eight times as great. Most wind generators are designed to deliver maximum power at a wind speed of 30 mph. At 15 mph, they will deliver about 1/8 their rated power. To avoid turbulence, a wind generator should be mounted at

least 20 feet higher than any obstruction within 300 feet. If you measure wind speed at ground level, you can expect about 1.5 times the wind speed 30 feet up, which equates to about three times the power. At 120 feet above the ground, wind speed will be twice what is measured at ground level and power output will be more than twice the output at 30 feet, and about 6 times the output at ground level.

The power output of a wind generator decreases roughly 3% for every 1000 feet of elevation.

Measuring Wind Speed

Before installing a wind-power generator, make a measurement for the wind-power resource at the site. Local weather data will be helpful, but wind is very site-specific based on local terrain, site elevation, wind direction, and any obstructions such as trees or buildings. Average wind speeds should be calculated, along with peak wind speeds during storm events.

APRS

Wind Data Loggers

The Wind Data Logger is an affordable and easy-to-use tool for wind site evaluation and wind generator performance analysis. It records wind speed, time and date directly to a Secure Digital (SD) card to provide convenient data downloads. The logging interval is adjustable from 10 to 50,000 seconds (16.6 hours). The 2 gigabyte SD card (included) will store a year of data at 30 second intervals and many years of data at longer logging intervals. Microsoft Excel, OpenOffice.org, or practically any spreadsheet program can be used to view, graph, and analyze your wind data. Easy to use web-based software is provided. Simply upload the data and the software will automatically plot the data as well as provide basic statistics. The DataLogger is housed in a waterproof enclosure.

The solar powered models come with a 10-watt module, a side-of-pole mount for the module and a 7 amp-hour battery. The AC model operates on 90 to 264 VAC or 125 to 370 VDC and does not come with a solar module and battery. The #40R anemometer is a rugged, extra heavy duty version of the 3-cup anemometer.



Description	Item code
APRS 6060 wind data logger - solar powered	016-00270
APRS 6063 #40R wind data logger - solar powered	016-00271
APRS 6061 wind data logger - AC Powered	016-00273
APRS 6062 #40R wind data logger - AC Powered	016-00274

Kestrel

Wind and Weather Meters

The **Kestrel 1000** measures instantaneous maximum and average wind speeds. Measurement unit options are knots, meters per second, kilometers per hour, miles per hour, feet per minute and Beaufort. Hold it up to measure wind speed. Large, easy-to-read liquid crystal display with +/-3% accuracy. Measures down to 0.3 m/s (0.67 mph). Impeller and protective housing pop out for easy and inexpensive replacement. Includes slip-on hard case that protects the impeller, buttons and display from damage in your pocket or toolbox. It is waterproof and it floats. The replaceable battery provides 400 hours of use. 5-year warranty.



The **Kestrel 2000** has all the features of the model 1000, and is also capable of measuring both wind temperatures as well as speed. The Kestrel 2000's external temperature sensor and waterproof casing allow you to gauge the temperature of water and snow, as well as open air. Hard slid-on case included. 5-year warranty.

The **Kestrel 4000** has all the features of the model 2000, plus the capability to store up to 2000 points of weather data in order to track changes over time, with data storage, graphing functions, and computer interface technology. You can view data as graphs on the Kestrel 4000 display, or with Kestrel's Communicator Software and a Kestrel interface. Data can be downloaded to a PC or Mac for long-term storage, in-depth analysis and detailed charting. Kestrel Interface kits are available with either a serial port connection or USB port connection, and include an interface cradle unit, serial or USB cable and CD with upload easy-to-use software. The 4000 comes with a soft carry pouch. Carry case optional. 5-year warranty.

Description	Item code
Kestrel 1000 pocket wind meter	016-00253
Kestrel 2000 pocket thermo/wind meter	016-00256
Kestrel 4000 pocket weather station	016-00259
Kestrel 4000 computer interface - USB	016-00260
Kestrel 4000 computer interface - serial port	016-00261
Kestrel 4000 K4000 carry case	016-00263
Kestrel replacement impeller for all models	016-00255

Southwest Windpower

Skystream 3.7

The Southwest Windpower Skystream 3.7 is the first all-inclusive UL Recognized wind generator (with controls and inverter built in) that provides quiet, clean electricity in low winds. Designed to be grid tied and to supplement or completely cover the power needs of residential homes or small businesses. Available for 120, 240 and 208 VAC operation (120VAC model for off-grid only). Comes with a guy-less monopole or sectional monopole tower, or a kit for assembling a guyed tower with locally purchased pipe and anchors. Its sleek 12-ft diameter, swept-wing blades and elegant form make Skystream an attractive addition to any home, and because it operates at a low rpm, Skystream is as quiet as the trees blowing in the wind.

If the site fits the following criteria, Southwest Windpower's Skystream 3.7 may work for you:

- At least 10 mph average wind speed (best results at 12 mph or more)
- The property is at least a half acre and has unobstructed views
- The local zoning allows a structure that is at least 54 inch tall
- The utility has an existing interconnection agreement for homeowners

With a rated capacity of 2.4 kW, the Skystream grid-tie models can provide an estimated energy production of 400 kWh per month in areas with a 12 mph average windspeed. The Skystream will begin producing power at about 8 mph. At about 20 mph, the blades achieve a rotational speed of 330 rpm. This is Skystream's rated speed and will remain at that speed if the wind speed increases. In very high winds, the Skystream will automatically shut down.

The Skyview Wireless PC Interface works with the Skyview Software to send and receive data to and from the Skystream wind turbine so that you can monitor system performance, change setup options, install updates, and troubleshoot the wind turbine. Connection to the PC is via the included wireless-to-USB interface.

NOTE: The 120 volt model of Skystream is NOT Underwriters Laboratories (UL) Recognized and MAY NOT be connected to the electric utility grid. The 120 VAC version is limited to 1.5kW continuous power, as is designed for off-grid "AC-coupled" systems with a bi-directional battery-based inverter (Sunny Island, OutBack, Magnum sine wave, or Schneider XW)

To order, use the item code determination table below to get the item code for the Skystream wind system that you want to order. Each Skystream wind system includes the Skystream 3.7, choice of monopole or guyed tower, Skyview monitoring software and wireless-to-USB adaptor, the Skylevel tower leveling kit, and a 5-year limited warranty.



Choose digits from each section to get part number										
Item code determination	Base part number	Land	Marine	Tower height (feet)			Tower type	Voltage		
Monopole Tower	016-1	1	2	45	55	70	2	-120	-240	-208
Guyed Tower Kit	016-1	1	2	-	42	70	3	-120	-240	-208

Example: A Marine Skystream and 45' Sectional Tower for 240 volt operation is 016-12452-240

Model	Description	Item code
SMarT Foundation kit 45' monopole	Complete Foundation kit including anchor bolts for 45' monopole towers	016-01421
SMarT Foundation kit 55' monopole	Complete Foundation kit including anchor bolts for 55' monopole towers	016-01431
SMarT Foundation kit 70' monopole	Complete Foundation kit including anchor bolts for 70' monopole towers	016-01437
42" Foundation bolt kit	Includes bolts and bolt template for 45-ft monopole tower on pier or pad-pier foundation	016-01023
42" Foundation bolt kit	Includes bolts and bolt template for 55-ft monopole tower on pier or pad-pier foundation	016-01433
52" Foundation bolt kit	Includes bolts and bolt template for 70-ft monopole tower on pier or pad-pier foundation	016-01439
Gin pole kit for 45' sectional	Gin pole and hardware for 45' 0" sectional monopole towers	016-01114
Hinge plate kit for 45' sectional	Hinge plate and hardware for 45' sectional monopole towers	016-01427
Motorized mechanical lift	Mechanical Jack Screw Lifting Device or 70' sectional monopole tower	016-01441
Tower adaptor kit (5")	Incl alum casting and hdw to attach Skystream to Whisper 500 guyed tower kits or any 5" Sch 40 pipe	016-01017
Skylevel	Skylevel monopole tower leveling kit - extra unit (one included with Skystream system already)	016-01405
Skylevel viewer	Skylevel viewer interface software kit - extra unit (one included with Skystream system already)	016-01406
Skyview Interface Kit	Extra Skyview Interface Kit (in addition to the one included with Skystream system)	016-01019

Southwest Windpower

The Whisper 100 and 200 from Southwest Windpower are shipped in a 24-volt configuration, but can easily be changed to 12, 36, or 48 volts by the installer. The included controller is adjustable for use with 12-, 24-, 36- and 48-volt battery systems and the voltage can be adjusted for any battery type. The control can be set to stop the blade from spinning when the battery is fully charged, avoiding wear when power is not needed. The control has a "selectable silent mode" setting that allows the user to select any specific period to automatically turn the wind turbine on or off. Whisper 200 is also available with nominal 120V and 230V output.

An optional digital display may be added to the control to display total kilowatt hours, peak amps, and peak and average wind speed. To measure wind speed, the optional wind speed sensor must be ordered. Use NRG model #40 anemometer available at: www.nrgsystems.com/



All Whisper generators have a 5-year warranty.

Whisper 100 Wind Generator

The Whisper 100 is designed to operate in a site with wind speed averages of 12 mph and greater. It delivers 900 watts peak power at 28 mph (12.5 m/s). It can provide 100+ kWh per month, 3.4 kWh per day, in a 12 mph average wind speed location. The 100, with its 7 ft. (2.1 m) rotor diameter and 40 sq. ft. swept area, is rugged enough for extreme environments. The Marine version is sealed and powder-coated for use in coastal and nautical environments.

Whisper 200 Wind Generator

The Whisper 200 is designed for the user who lives in low to moderate wind speed averages (less than 12 mph). The bigger brother to the 100, the 200 features a 10 ft (3.1 m) 3-blade rotor diameter and an 80 sq. ft. swept area that provides the user with greater output at low wind speed averages. The 200 has twice the swept blade area, providing double the potential energy, compared to the 100. It delivers 1000 watts peak power at 28 mph (12.5 m/s), but has a higher output than the 100 at lower wind speeds.

Whisper 500 Wind Generator

The Whisper 500 is a 3000-watt rated turbine that will deliver in excess of 500 kWh per month in a 12 mph wind. This machine has a 14-foot, 2 blade rotor providing 500 sq. ft. of swept area. It features a handmade fiberglass and foam core blade for smooth, high efficiency operation and low wind start-up. It also incorporates the patented "angle governor" design for quiet operation in high winds. The 500 is an excellent machine for village power projects, farms, ranches, backup power and remote homes with large energy demands. The Whisper 500 comes in two boxes and is shipped truck freight. Available in 24- and 48-volt DC versions.

Description	Weight	Item code
Whisper 100 w/ charge controller	73 lbs	016-01154
Whisper 100 w/o charge controller	70 lbs	016-01155
Whisper 100 Marine w/ charge controller	80 lbs	016-01162
Whisper 200 w/ charge controller	85 lbs	016-01180
Whisper 200 w/o charge controller	80 lbs	016-01181
Whisper 200-120 volt w/o charge controller	80 lbs	016-01199
Whisper 200-230 volt w/o charge controller	80 lbs	016-01198
Whisper 200 Marine w/ charge controller	90 lbs	016-01189
Charge controller display for 100/200/500	1 lb	016-01211
Whisper 500 w/ charge controller 24V	310 lbs	016-01144
Whisper 500 w/ charge controller 48V	310 lbs	016-01145

Whisper 500 high voltage (HV) generators and transformers available for long distance applications. Call for info.

Towers

A tilt-up pole tower is economical and easier to install. Wiring and mounting of the generator are done before the tower is erected. No climbing necessary. Purchase steel tubing locally to save freight.

Whisper 100/200 Tower Kits

Whisper 100/200 tower kits come in 24' (7.2m), 30' (9m), 50' (15m), 65' (19.5m), and 80' (24m) heights. Each tower kit comes with all hardware necessary to install a tower, except guy supports, pipe and cement. All parts bolt or clamp together and no welding is required. These tower kits use 2-1/2" (63.5mm) CQ40 fence pipe or Schedule 40 water pipe. Actual O.D. is 2.875" (73mm).

Whisper 500 Tower Kits

Whisper 500 Tower Kits are available in 30' (9.1m), 42' (12.8m) and 70' (21.3m) heights. Uses 5" Schedule 40 pipe.

Earth Auger Sets

Screw-in auger-type guy anchors can be used in loamy and gravelly soils. Other soil types may require concrete footings or expansion bolts. Use 36" and 48" augers with Whisper 100/200 installations and 48" and 60" augers on Whisper 500 installations. Consult an engineer or geologist if you have questions about guy supports. Do not use these auger sets with Whisper 500 towers.

Description	Item code
Whisper 100 & 200 24' guyed tower kit	016-01083
Whisper 100 & 200 30' guyed tower kit	016-01089
Whisper 100 & 200 50' guyed tower kit	016-01095
Whisper 100 & 200 65' guyed tower kit	016-01098
Whisper 100 & 200 80' guyed tower kit	016-01101
Whisper 500 30' guyed tower kit	016-01110
Whisper 500 42' guyed tower kit	016-01104
Whisper 500 70' guyed tower kit	016-01107
36 Galvanized auger set of 4 - 24' 27' towers	016-01116
48 Galvanized auger set of 4 - 32'-50' towers	016-01122
60 Galvanized auger set of 4 - 65'-80' towers	016-01125
Whisper 100/200 60 amp brake switch	016-01227

AIR X 400W and AIR Breeze 200W Wind Generators

The AIR Breeze, introduced in 2007, is the next generation of the AIR X turbine. Both are available in land and marine versions. The quieter AIR Breeze features newly designed blades and higher power output at wind speeds below 12 MPH. Because of its increased efficiency at lower wind speeds and advanced blade design, the AIR Breeze is the best choice for small wind applications unless average wind speed it well over 12 MPH.

The Marine versions are corrosion-proofed for use in coastal and nautical applications. A white powder-coated housing and sealed electronics prevent damage from salt spray.

All units weigh 13 lbs, have a 46-inch rotor diameter and come with a 3-year warranty. The AIR Breeze is rated at 200 watts at 28 MPH wind and the Air X is rated at 400 watts at 28 MPH wind. A stop switch is included with the Marine versions; it can be ordered separately (016-01351; \$33) for the Land versions.

	AIR X	AIR Breeze
Volts / Use	Item code	Item code
12V Land	016-01032	016-00985
24V Land	016-01035	016-00984
48V Land	016-01037	016-00986
12V Marine	016-01050	016-00987
24V Marine	016-01053	016-00989
48V Marine	016-01055	016-00990

AIR-Industrial Wind Generators

The Air-Industrial is capable of resisting the harsh environments that generally accompany mountaintop telecommunication sites, environmental monitoring sites and off-shore oil platforms. It has specially formulated blade material that can stand up to sub-zero temperatures, and its blades are spaced farther from the tower so that it can operate at sustained winds up to 130 miles per hour. Maintenance-free performance, easy installation and high power output make the AIR-Industrial ideal for any remote battery-charging application. The AIR-Industrial does not have an internal controller, so an external controller must be installed on the battery bank. The recommended external controllers are Morningstar TriStar TS-45 or TS-60, or a Xantrex C40. Set controller in "diversion load" configuration and add an air- or water-heating diversion load (see page 137). 3-year warranty.



Description	Item code
AIR403 12V Industrial w/o controller	016-01056
AIR403 24V Industrial w/o controller	016-01062
AIR403 48V Industrial w/o controller	016-01074

AIR Tower Kits

AIR tower kits are available in roof mount, 27' (8.1m) and 45' (13.5m) heights. These kits are Professional Engineer Certified (PE Certified). Each tower kit comes with all hardware necessary to install a tower, except guy supports, pipe and cement. All parts bolt or clamp together and no welding is required. Purchase 1-7/8" steel tubing from chain link fence supplier. Roof mounts include vibration isolators, wall brace clamps and a safety leash, but do not include pole or lag screws.



Earth Auger Sets

Screw-in "auger" type guy anchors can be used in loamy and gravelly soils. Other soil types may require concrete footings or expansion bolts. Consult an engineer or geologist if you have questions about guy supports.

MidNite Solar Stop Switch

MidNite Solar's Stop Switch allows you to stop an AIR wind generator and disconnect it from the battery, all with one motion. NEMA 1 indoor enclosure.



Description	Item code
AIR Marine tower hardware kit	016-01128
9' AIR Marine aluminum mast and 2 stays	016-01131
Roof kit without roof seal	016-01134
Roof kit with roof seal	016-01137
Roof seal – for roof mount kit	016-01140
27' AIR guyed tower kit (AIR only)	016-01086
45' AIR guyed tower kit (AIR only)	016-01092
29' EZ Tower kit including pipe and anchors	016-01081
36" Auger – set of 4; use with 24' & 27' towers	016-01113
36 Galvanized auger set of 4; for 24' & 27' towers	016-01116
48 Auger set of 4 32' - 50' towers	016-01119
48 Galvanized auger set of 4 32'-50' towers	016-01122
MidNite Solar Stop Switch	053-00121
30 amp circuit breaker kit	016-01225
50 amp circuit breaker kit	016-01226
100 amp circuit breaker kit	016-01222
Amp meter kit	016-01223
Stop Switch for Land Versions	016-01351
Diversion load for Air Industrial	016-01078

American Zephyr

Airdolphin Wind Generators

Zephyr combines advanced wind turbine technology with Japan's world-renowned manufacturing craftsmanship, to successfully develop the Airdolphin wind turbine — a next-generation, low-mass wind turbine which instantly adapts to changing wind conditions, from slight to stormy.

The total weight of the Airdolphin is 17.5 kg (38.5 lbs). Unlike larger turbines, the Airdolphin's low mass allows it to be mounted on existing structures like remote telecommunication towers, transmission line pylons and billboards, as well as near roads, railways and airports. Even factory and urban rooftops can become cost effective locations for producing usable electrical power.

The blades of each Airdolphin are created with Zephyr's patented SD blade technology (noise reduction ridges). Their designers were inspired by the feather patterns of owl wings, which allow owls to fly in silence. This technology applies a series of thin ridges to the surface of each blade, creating micro vortices to keep the airflow attached to the airfoil longer than conventional blades, thus reducing decibel count.



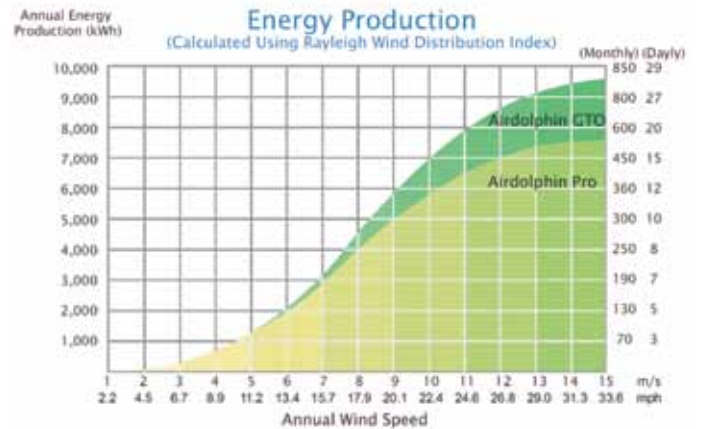
Intelligent Power Management System

By realizing constant blade rotation speed, operation of the wind turbine has been made much more silent and secure. Their original and patented technology maintains uniform rotor spinning speeds while encountering turbulent gusts found in cities or raging winds at remote locations. These attributes are crucial for small wind turbines because they are often installed in cities where turbulence is caused by tall buildings. When the wind speed increases beyond 20 m/s (44.7 mph), the Airdolphin continues delivering output power at a reduced rpm eliminating the need for cut-out entirely. The intelligent power management system inside the turbine achieves its outstanding performance by software driven microprocessors including control firmware, an internal battery charge controller monitoring voltage and charging rates in a variety of climatic conditions, a web interface, and data logging functions.

Zephyr wind turbines are built with bolt-less self-fitting body parts, inspired by Japanese traditional block puzzle craftsmanship. This technique ensures an exact fit and provides superb resistance to adverse weather conditions, greatly minimizing maintenance requirements. All units come with a 5-year warranty.

24-volt and 48-volt battery charging models have built in charge controllers. The grid-tie GTO has a 250 VDC output and requires a separate grid-tie inverter. Zephyr recommends using an SMA 3000US or 4000US inverter for grid-tie applications

All turbines mount on a 1.5-inch Schedule 40 pipe at the top of the tower. Maximum pipe diameter is 1-15/16 inches. American Zephyr towers are made by American Resource and Energy (ARE) and are very heavy-duty sectional monopole (guy-less) towers. The 30-, 45-, and 60-foot towers can be raised with a crane or with the optional Gin Pole kit. 80-foot and 100-foot towers, and motorized lifting jacks for them, are available – call for pricing and lead time (typically 90-days).



Airdolphin model	Description	Item code
Wind Turbine		
Z-1000-24	Mark-Zero 24 VDC 1000-watt charger	016-03011
Z-1000-48	Pro 48 VDC 1000-watt charger	016-03013
Z-1000-250	GTO 1000-watt 250 V for grid-tie	016-03015
Accessory		
RM-1000(E)-24	Remote monitor for 24 volt turbine	016-03020
RM-1000(E)-24	Remote monitor for 48 volt turbine	016-03022
RM-1000(E)-24	Remote monitor for 250 volt turbine	016-03024
Monopole tower - 30 foot		016-03041
Monopole tower - 45 foot		016-03043
Monopole tower - 60 foot		016-03045
Gin pole for 30', 45', 60' towers with 8 anchor bolts and 2 templates		016-03062