

# MINI Wind Turbine

(Order Code KW-MWT, KW-MWTBD)

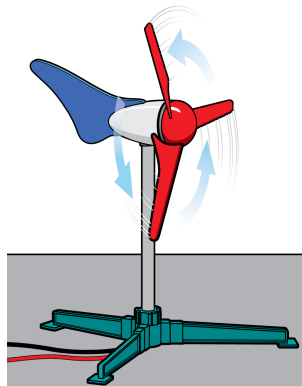
The MINI Wind Turbine kits are perfect for demonstrating how wind turbines function and for desktop wind power experiments. Check out all the kits at: [www.vernier.com/kidwind](http://www.vernier.com/kidwind)

## The MINI Wind Turbine

The MINI Wind Turbine is an easy-to-build turbine that produces enough electricity to power LED bulbs, a Sound and Light Board, and other load devices.

## The MINI Wind Turbine with Blade Design

With the KidWind MINI Wind Turbine with Blade Design kit, you will also be able to use your turbine to make and test blades that you construct yourself. See what happens to wind turbine power output when the number, pitch, and shape of the blades is changed.



**Note:** Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

## What's Included

### MINI Wind Turbine

- MINI Nacelle Assembly
- 10" MINI Aluminum Tower
- MINI Base (hub and 3 legs)
- Red Blade Set
- Sound and Light Board
- Red Alligator Clip Cord
- Black Alligator Clip Cord

### MINI Wind Turbine with Blade Design

- MINI Nacelle Assembly
- 10" MINI Aluminum Tower
- MINI Base (hub and 3 legs)
- Red Blade Set
- Sound and Light Board
- Red Alligator Clip Cord
- Black Alligator Clip Cord
- Wind Turbine Hub
- Digital Multimeter
- Blade Pitch Protractor
- 1/4" × 5" Dowels\* (25)
- 3" × 8" Chipboard Sheet\* (10)

\*This part is a consumable and is excluded from the warranty.

## Assembly Instructions

### Building the MINI Wind Turbine

1. Assemble the base by locking each of the three legs into the hub.
2. Unwrap the wires of your MINI nacelle and feed the wires through the aluminum tower and through the assembled base.
3. Connect the tower to the base.

4. Connect the nacelle to the top of the tower, pulling the excess wire through the bottom of the base as needed.
5. Stand up your MINI Wind Turbine and push the Red Blade Set onto the shaft of the generator.

### Converting to Blade Testing Turbine

The MINI Wind Turbine with Blade Design kit includes a 12-hole crimping hub and blade materials. The KidWind Hub makes it easy to change blades and try your own designs.

Pull off the red plastic blade set. The best way to do this is to pry it off slowly using a screwdriver or something similar. Replace it with the black KidWind Hub, and you are ready to make and test your own blades.

### Using the MINI Wind Turbine

The MINI Wind Turbine comes with a Sound and Light Board that you can connect to the turbine to demonstrate power output. Connect red wires to red and black wires to black.

The MINI Wind Turbine can power a variety of electrical devices beyond the included Sound and Light Board. For more experiment ideas and a complete list of grade-level specific activities, see [www.vernier.com/kidwind](http://www.vernier.com/kidwind)

### Using the MINI Wind Turbine with Blade Design

The MINI Wind Turbine with Blade Design kit comes with a simple multimeter so you can quantify how much power your turbine generates. The following directions will help you connect your kit to the meter in order to record voltage and current.

#### Measuring Voltage

1. Attach the wires from the generator to a Vernier Energy Sensor or the multimeter. Polarity is not relevant at this point.
2. When using a multimeter to check the voltage, select DC volt (V) and set the number to 20.
3. Place your turbine in a windy location or in front of a fan and let it spin. It is normal for the voltage readings to fluctuate because of the inconsistent nature of the wind, unbalanced blades, and natural noise of the generator.

Voltage is related to how fast the DC generator is spinning. The faster it spins, the higher the voltage. With no load on the generator, it has little resistance and can spin very fast. You can measure voltage with no load, but it is more realistic to place a resistor in the circuit and measure the voltage across the resistor. Use 10, 30, 50, or 100 ohm resistors.

#### Measuring Current

To calculate the turbine's power output, you will need to measure current. Current is measured in milliAmperes (1A = 1000 mA).

To measure current, place a load (resistor) in series with a Vernier Current Sensor, Vernier Energy Sensor, or a multimeter so that the generator is forced to

operate. If using a multimeter, set the meter to 200 or 20 mA, which is a typical range for the MINI wind turbines.

The current that the turbine produces depends on the load placed in the circuit and the torque the blades are generating.

## How the Product Works

### Voltage, Resistance, and Current

Voltage (measured in volts) is also called “potential difference” or “electromotive force” (EMF). It is a measure of the amount of “potential energy” available to make electricity flow in a circuit. It is the electric “pressure” causing the current to flow.

Electric current is a measure of the rate at which electric charge (electrons) are flowing through a circuit. It is given in the unit of amperes (“amps”). Smaller amounts of current are often stated in milliAmps (mA). A mA is 1/1000 of an amp.

Electrical resistance is the opposition to the flow of electricity. Measured in ohms, it reflects how much electric “pressure” (voltage) is required to push a given amount of current through part of an electric circuit. Power is the product of current and voltage.

## Troubleshooting

For troubleshooting and FAQs, see [www.vernier.com/til/3220](http://www.vernier.com/til/3220)

## Specifications

Voltage	1–4 volts
Amperage	20–100 milliamps (0.020–0.1 amps)

**Note:** Numbers much higher than these may indicate something is wrong with your unit.

## Repair Information

If you are having trouble with your KidWind MINI Wind Turbine or KidWind MINI Wind Turbine with Blade Design kit, contact Vernier Technical Support at [kidwind@vernier.com](mailto:kidwind@vernier.com) or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

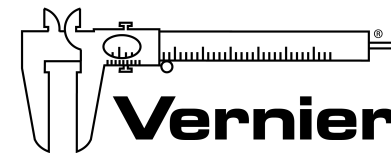
## Accessories/Replacements Parts

Item	Order Code
Go Direct Energy Sensor	GDX-NRG
Vernier Energy Sensor	VES-BTA
Vernier Resistor Board	VES-RB

Item	Order Code
Vernier Variable Load	VES-VL
KidWind Sound and Light Board	KW-SLB

## Warranty

This kit contains many parts. Parts in the kit, excluding consumables (as indicated in the What's included section of this user manual), are warranted for a period of five years.



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