



## Product Summary

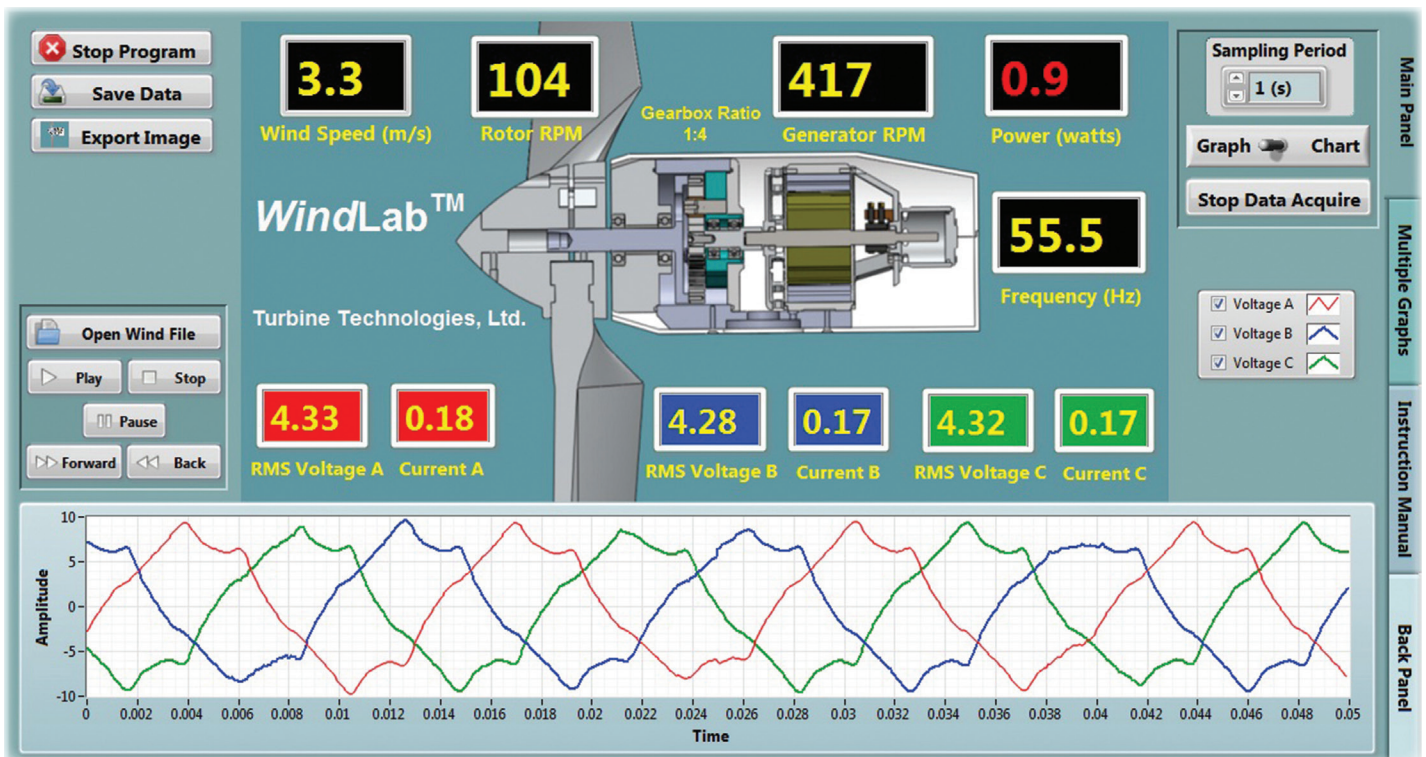
- Programmable, Variable Speed Wind Source
- Adjustable Pitch Hub Accepts Custom Blades for Comparative Testing
- Three-Phase Electrical Generator with Adjustable Rotor Core Excitation
- National Instruments™ Data Acquisition System Configured With LabVIEW™
- Shipped Ready to Operate

### Students will learn: Fundamentals of wind turbine operation and three phase electrical power generation.

#### Description

The system features a programmable wind fan and wind tunnel enclosure. The wind is ducted through a straightener vane to remove fan induced air rotation, providing a real-world wind flow pattern. The one meter diameter wind turbine features a three blade configuration with manual pitch adjustment. Blades can be easily changed for comparative testing.

A USB connected National Instruments™ data acquisition system is fully integrated and pre-calibrated. Sensors measure system parameters for a LabVIEW™ virtual instrument on the provided laptop computer. This system displays real time data and has interactive operator control. Run data can be recorded for playback or follow-on analysis. The data acquisition software is user configurable and all source code is open.

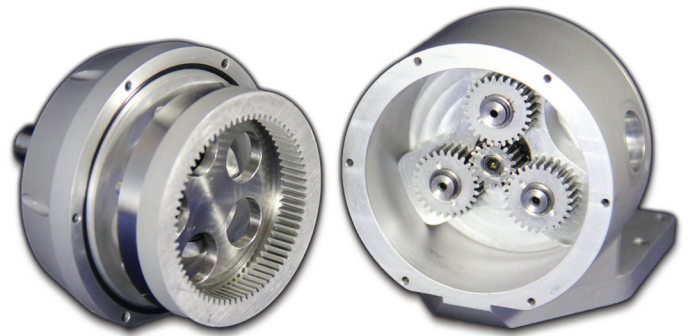


#### Data Acquisition System Included



The turbine rotor shaft drives a precision machined alloy planetary gear box, which multiplies turbine rotor shaft RPM by 4. The three phase generator features an adjustable range, DC excited, eight pole rotor and an eight pole, three phase stator. The generator gondola nacelle features a built in "cutaway" section to allow the generator to be viewed during operation. Three rheostats can be collectively set with even resistance values to provide balanced load across all phases, or unevenly set to demonstrate uneven loading characteristics on an electrical generation system.

All components are mounted on a portable chassis allowing the entire system to be conveniently moved for use and storage. Visible metal surfaces are stainless steel or anodized aluminum. The steel chassis is powder coated for durability. A comprehensive Operator's Manual details all aspects of system operation. Summary operating checklists allow rapid mastery of system operation. Safety instructions address all operating conditions.



### Details

#### Dimensions

**WindLab™:** 67 w x 45 d x 76 h inches  
(170 w x 114 d x 193 h cm)

**As Shipped:** 70 w x 48 d x 82 h inches  
(178 w x 122 d x 208 h cm)

#### Weight

**WindLab™:** 712 lbs (323 kg)

**As Shipped:** 792 lbs (359 kg)

#### Operating Conditions / Limitations

**Wind Fan:** Limited to 8.2 Amp Electrical Current Draw  
(fuse protected)

**Generator:** 7.5 Volts, 0.25 Amp, 3.25 Watts  
(Limited for Safety)

#### Operating Requirements

**Typical Laboratory or Classroom Setting Power:**  
208V single-phase 50/60Hz fused at 15 amp

#### Instrumentation

##### Data Acquisition System:

National Instruments™ Hardware  
Windows® Laptop Computer  
(all Software Loaded and Pre-calibrated)  
Single Cable USB to PC Connection  
Custom Virtual Instrument Display  
(Configurable Data Output)

##### Installed Data Acquisition Sensors / Channels:

Wind Speed  
Wind Turbine Rotor RPM  
Generator RPM  
Generator Frequency  
Generator Voltage for Each Phase  
Current Draw for Each Phase  
Total Power Output

##### Control Panel Mounted Displays/Controls:

Wind Speed  
Turbine RPM  
Voltage (3 total, one for each phase)  
Current (3 total, one for each phase)  
Load Rheostats (3 total, one for each phase)

### *Experimental Opportunities*

WindLab™ enables students and researchers to readily conduct in-depth experimentation and analysis of wind turbine electric power generation.

**Aeronautical and structural engineering students** will learn the principles of airfoil design. They can also design alternate airfoil rotor blades for comparison testing.

**Control engineering students** will gain valuable knowledge with the programmable wind fan that can be operated manually or programmed to automate specific wind profiles. User programmed wind scenarios can demonstrate/determine wind turbine power generation performance. The programmable wind speed capabilities can even be used to run actual wind data profiles from full-scale wind turbine sites to help determine site potential.

**Electrical engineering students** will especially appreciate the purpose-built three-phase electric generator on WindLab™. With adjustable resistive loading on each phase, and adjustable rotor core excitation, users can experiment with the affects of unbalanced loading at various generation speeds, while experiencing the hands-on operation of a true three-phase electric power generation system.

**Mechanical engineering students** will gain knowledge and experience with the on-board rotor to generator speed amplification gear box.

### *Purchase Specifications*

- A wind turbine electric power plant designed for engineering education and research.
- A programmable wind fan and scale wind turbine mounted in a rigid, mobile wind tunnel cabinet.
- Wind fan to be driven by on-board, variable frequency drive with panel mounted speed controller.
- Wind turbine to be industry-standard three blade horizontal axis configuration with adjustable/replaceable blades.
- Wind turbine to drive planetary gear configuration step-up gear box.
- Generator to consist of a three phase, DC excited 8 pole rotor, eight pole three phase stator, with alternating current output.
- Unit to include operator panel-mounted generator voltage and current meters for each power phase.
- Load to be supplied by three operator panel-mounted rheostats, adjusted equally for balanced load, or unequally for unbalanced load scenarios.
- To be supplied with a USB based digital data acquisition system complete with computer and user configurable data acquisition software capable of measuring, recording and displaying analog, digital and frequency signals, including: Wind Speed, Turbine Rotor Speed, Generator RPM, Voltage, Current, Power and Frequency.
- Equipped with calibrated transducers capable of measuring all elements required for data acquisition system.
- All metal surfaces to be stainless steel, anodized or powder coated to promote durability and wear resistance.
- Provided with a comprehensive Operator's Manual with design, operation and construction information.
- Provided with summary operating checklists and safety instructions for all operating conditions.



**WindLab™ has a free two year warranty on the entire system**

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**All WindLab™ specifications are subject to change**