

# Smart Grid Trainers

Educational Training Equipment for the 21st Century

Bulletin 190-4A

## 190 Series Smart Grid Trainers

### Purpose

The **Hampden 190 Series** of Smart Grid Trainers have been developed to educate students with the technology being used in the field of electrical power generation and distribution. Each individual module will demonstrate a key section of the power grid. When the individual modules are combined a modern smart grid is created.

The Hampden **Model H-190-4** Solar Photovoltaic and Wind Turbine Trainer shall simulate a typical Solar Field and typical Wind Farm. The grid system will have the ability to bring on line the power generated. This power generated can be the main supply to the consumer or it can be bought on line during peak demand as a supplemental source for the grid.

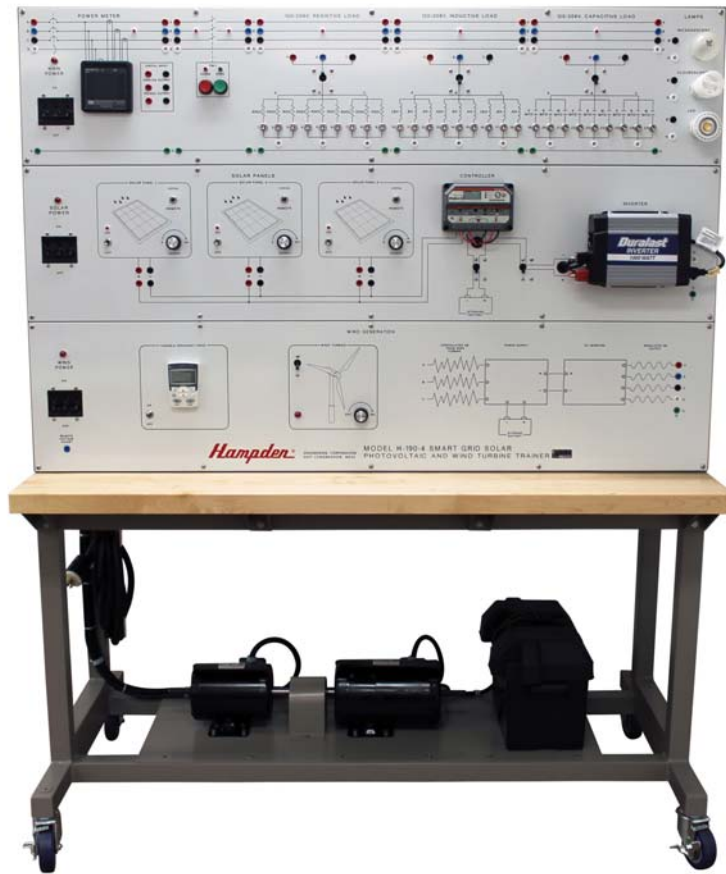
Variable voltage DC power supplies will simulate the power generated from the solar panels. By adjusting the output of the power supply the user can simulate the effect that the environmental conditions will have on the output of the solar panels, such as a cloudy day. The user will also be able to insert faults to simulate defective solar panels.

The Solar panel section will include a Solar Charge Controller and a DC to AC Inverter.

The DC power generated from the Solar Field must be converted to AC before it can be introduced onto the grid.

The user will be able to insert faults to simulate a disabled turbine.

The wind farm will be a representation of wind turbines. The simulation of the wind turbine is a motor coupled to a generator driven by a VFD that regulates frequency, which controls the motor speed.



### Hampden Model H-190-4

Solar Photovoltaic and Wind Turbine Trainer  
Dimensions: 75"H x 60"W x 32"D  
Shipping Weight: 985 lbs.

A power meter is provided to display electrical characteristics such as voltage, amperage, watts, Vars, VA, power factor, and frequency. I/O modules interfaced with a laptop computer provide SCADA control and represent the control room which provides control and feedback at a remote location. The H-190-4 operates as a stand alone or connects to other H-190 Smart Grid Trainers.



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All Hampden units are available for operation at any voltage or frequency

**Hampden**  
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