Research Infrastructure, EEE Department

FLUKE 438 Power Analyzer

Key Features

Record Phase voltages, Phase currents, Crest factor, Harmonics, frequency and flicker.

Specifications : P-N 0-1000V, RMs; 5-6000A; 42.5-57.5 Hz; Harmonics : DC, 1 to 50 Grouping: Harmonic groups according to IEC 61000-4-7; Flicker : 1mn pst 1-20

Target : Small industries seeking elementary power quality measurements; researchers working on power electronics

Smart Grid

Key features

Renewable energy sources with real time monitoring and smart loads

Specifications

1 kW solar panel without tracking; 1 kW solar panel with tracking and 1 kW wind turbine with weather monitoring sensors; 48W battery with charge controller; 10 , 300 W, controllable smart loads ; Data acquisition system for real time monitoring of the smart grid system.

Target : Researchers working in areas of renewable energy and smart grid

Software

Software	Function	Target
ETAP 16.0	Power System Studies	Small industries to study power distribution, voltage and current profiles
PSIM	Power Electronics Circuits simulation	Research scholars
ALTAIR FLUX	Machine design and thermal analysis	Small machine manufacturers to improve design and thermal management.

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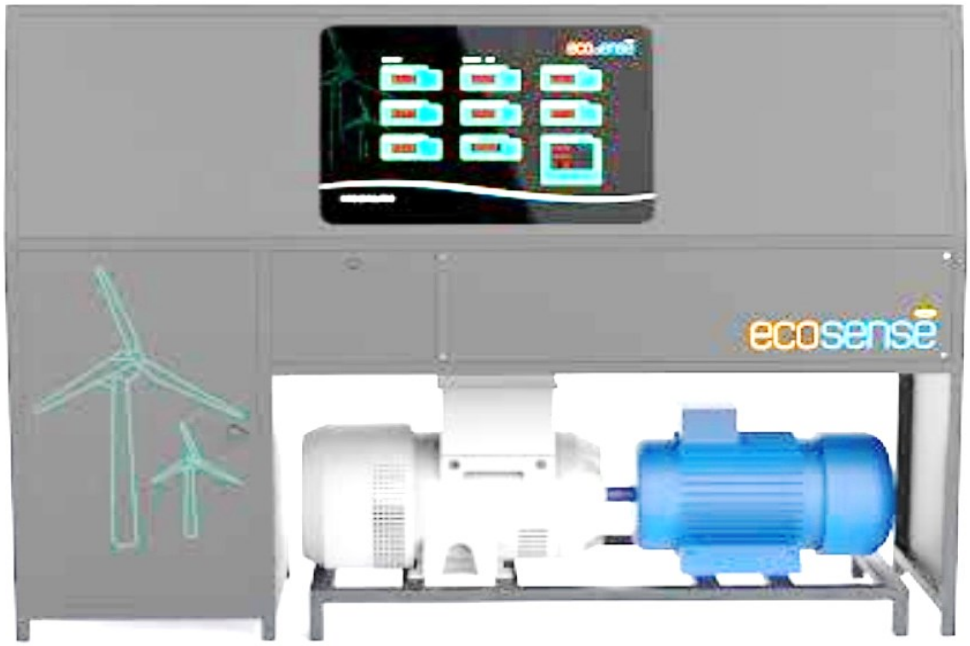
Faculty Incharge: Dr.K.UmaRao ,Professor, EEE Dept.

Wind Turbine Emulator



Features

- Capable of demonstrating the behavior of 1*k*W wind turbine (i.e. power V/s wind speed behavior, turbine torque V/s turbine speed behaviour)for any feasible sudden change in wind speed and direction in real time.

- Exhibits static behaviour close to real wind turbine.

- Intuitive graphical user interface & data acquisition for control and monitoring of various parameters.

- Capability to change the wind turbine parameters (within permissible range). Standard wind turbine model can be directly selected and emulated.

- FPGA board for solving the differential equations in real time, additionally onboard ADC channels and PWM port for power electronics converter/inverter firing.

- Suitable for Hardware-in-Loop simulations.

- Slip ring induction generator is mechanically coupled to gear box.

- Power conditioning unit (diode bridge rectifier and three phase inverter) is provided.

- Sensor board senses the rectifier DC-Link voltage, Generated voltage and currents.

Four Channel Solar PV Emulator

PV Emulator is a programmable power supply designed to emulate solar panels. With fast transient response, the emulator responds to change in load conditions and maintains the output on IV characteristics of the selected panel for a given ambient condition. It is a flexible instrument designed to emulate output of solar panels from different manufacturers, variations due to time of the day, effect of season and different geographical locations of installation.

The PV Emulator uses an internal algorithm to adjust V_{OC} (Open circuit voltage) and I_{SC} (short-circuit current) so as to match the solar panel selected by the user based on ambient temperatures, solar radiation levels etc. The power outputted by solar panels depends on lot of parameters. These parameters are dynamic and interdependent; making it a complex process to predict the response of the PV system. PV emulator takes into account the weather conditions at the time of year specified, position of the sun at the hour specified, location of the panel, positioning of the panel and technology & manufacturer of the panel to estimate the response the solar panel. Emulator then makes sure the response matches to that of actual panel under all the load conditions within range. The user is presented with complete

set of information with tables and plots on user application. The emulator is capable of storing up to twenty five I-V curves into its memory, with a programmed time interval range of one hour. It can emulate the I-V curve for the complete day for PV inverter testing or dynamic I-V curve transient testing.

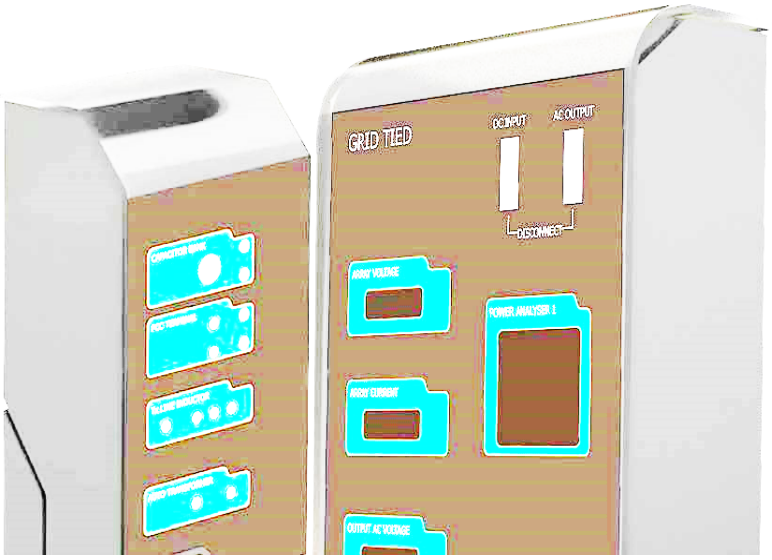
Benefits

- User controlled, cost effective way to test response of PV system for wide range of solar panels
- Simulate the I-V curve under varying environmental conditions
- Actual measured meteorological data of earth is used to simulate IV curve
- Test and verify different parameters of PV system like – MPPT tracking algorithm of PV inverter, efficiency of MPPT tracking
- Measure and verify the overall efficiency and conversion efficiency of PV inverter for variety of solar panel and in varying weather conditions
- Does not require external setup for data monitoring and data acquisition. LCD displays output characteristics and software application presents user with tables, plots and simulation parameters

Key Features

- Four channels each with 0-50V at 8A
- Simultaneous and independent use of multiple channels
- Ability to connect channels in series or in parallel
- Fast transient response for any solar panel simulation
- Built in profiles to use the emulator in standalone mode without connection to internet or computer
- Emulator comes with a free “cloud based application” software for controlling and viewing all details of the simulation
- With the cloud based application, there are no concerns associated with downloading, installing, updating and troubleshooting. All of these are taken care of on server side
- User can control the emulator via any computer and Android tablet that run modern browsers
- Manual control over IV curve to emulate solar panel in user-specific conditions
- Comprehensive selection of solar panel models from various manufacturers
- Ability to create and store user made panels with controllable characteristics

A solar PV Grid Tied Training system



Features

- A Solar Grid-tied System is a grid connected PV system which links solar power generated by the PV modules to the mains. It acts as an interactive medium where the demand for electricity is fulfilled by the conglomeration of PV and mains. This product gives a deep insight into the dynamics of a Grid Tied system and its operation and maintenance.

- The grid tied system consists of a solar PV array connected to a grid tied inverter through a changeover switch. A voltmeter and an ammeter is connected to measure the panel output voltage and current respectively. The AC output of the grid tied inverter is connected to the point of common coupling (PCC) through a power analyzer.

- The power analyzer measures the power delivered by the solar panel into the grid. A standalone inverter, connected to a battery bank through a voltmeter and ammeter, acts as a virtual grid for the system.

- The battery bank is charged through a battery charger using single phase AC as input. The output of the standalone inverter is connected to an auto transformer which is used to adjust the voltage level of the virtual grid.

- An inductor is connected in series in the system to depict the effect of transmission line inductance present in a real power system.

- A current sensor and voltage sensor are connected to observe the current and voltage waveform present in the grid.

- A power analyzer is then connected before the point of common coupling (PCC) to measure the flow of power to and from the grid. At PCC a capacitor bank is also connected through a multiple throw switch for power factor improvement. At the output the load is connected through an output ammeter and a voltmeter.

Targets: Researchers / Industries working in areas of renewable energy Syestem

Faculty Incharge: Dr. Srivani S.G, Associate Professor, EEE Dept.