



Description:

This is a fully modular renewable energy training system engineered for laboratory education and applied research. It integrates solar photovoltaic (PV), wind energy, and lithium-ion battery storage technologies on a single platform, enabling comprehensive experimentation in renewable power electronics, energy management, and microgrid operation. The system complies with IEC 61215, IEC 62109, IEC 61400, IEC 62619, and CE standards.

1. SYSTEM OVERVIEW

System Type : Modular renewable energy training system for laboratory education and experiments

Modules Included : Solar PV, wind energy, lithium-ion battery storage

Primary Application : Renewable energy, power electronics, and microgrid laboratory experiments

2. SOLAR PHOTOVOLTAIC (PV) MODULE

PV Module Rating : Approximately 150 – 300 W

Charge Controller : MPPT charge controller for PV system

Simulator Interface : Provision for solar simulator interface or outdoor PV connection

3. WIND ENERGY MODULE

Wind Turbine : Small-scale wind turbine generator, rated 200 – 300 W, permanent magnet generator

Power Conditioning : Rectifier and charge controller module integrated

4. BATTERY STORAGE MODULE

Battery Type : Lithium-ion energy storage module

Capacity : 0.5 – 1 kWh

BMS : Integrated Battery Management System (BMS) with protection and monitoring

5. HYBRID ENERGY CONTROLLER

Controller Function : Hybrid renewable energy controller integrating solar, wind, and battery

Bus Architecture : DC bus architecture for hybrid energy system experiments

Output Terminals : DC and AC output terminals for load connection

Inverter Option : Grid-tie or standalone inverter module (optional, configuration-dependent)

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.



Export Sales: +91-9829132777
 India Sales: +91-9588842361



IT-2013, Ramchandrapura Industrial Area,
 Sitapura Extension, Jaipur-302022, India.



info@tesca.in
 www.tescaglobal.com

6. MEASUREMENT & DATA ACQUISITION

Measurement Modules : Digital modules for voltage, current, power, and energy

Accuracy : $\pm 1\%$ or better for all electrical parameters

Display / Interface : Digital display or PC-based monitoring and data acquisition interface

Data Export : Standard format data export (CSV or equivalent)

7. EXPERIMENTAL CAPABILITIES

PV Experiments : PV I-V and P-V characteristics, MPPT performance studies

Wind Experiments : Wind power generation analysis

Battery Experiments : Charging / discharging characteristics

Hybrid Studies : Hybrid energy management and DC bus performance analysis

8. MECHANICAL & STRUCTURAL

Construction : Modular panel on laboratory frame or mobile trolley

Experiment Manuals : Supplied with printed and soft-copy manuals for minimum 10 laboratory experiments

9. STANDARDS & COMPLIANCE

Standards : IEC 61215, IEC 62109, IEC 61400, IEC 62619, and relevant CE standards

Application : Suitable for undergraduate and postgraduate electrical engineering laboratory use

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