

RENEWABLE ENERGY SYSTEMS



Make: Hydroenergy
Model: HYDRO_STHERMAL

1. SOLAR THERMAL FPC TRAINER



The Solar Thermal Flat Plate Collector (FPC) Trainer is designed to demonstrate the fundamentals of solar water heating using non-concentrating solar thermal technology. It enables students to analyze thermal performance under varying conditions and understand solar heat transfer principles.

Key Features:

- Real-time temperature and flow measurement
- Adjustable tilt angle for solar optimization
- Integrated data acquisition for analysis

Technical Specifications:

S. No.	Components	Sub- Components	Specifications
1	Flat Plate Collector	Collector Box	
		Length	915 (mm)
		Breadth	810 (mm)
		Glazing Surface	
		Type of glass	Toughen
		Absorber plate	
		Absorber material	Copper
2	Hot Water Tank	Tank Type - Non-Pressurized	
3	Control unit	Temperature meter with sensors	
		Flow meter with sensor	
		Flow regulator	
4	Artificial source of radiation	Halogen Fixture with regulator	
		Power rating	3200 (W)
5	Artificial source of wind speed	Wind speed range	0 to 5 (m/sec)
6	Accessories	Radiation meter	
		Range	0 to 1999 ($\frac{W}{m^2}$)
		Anemometer	
		Wind speed Range	0.4 to 45.0 ($\frac{m}{sec}$)
		Temperature range	-14 to 60 ($^{\circ}C$)
		External Tank	
		Number	2
		Hot water pump	
		Manual, Datalogger	
7	Characteristics	<ul style="list-style-type: none"> •Artificial source of irradiation. •Control of irradiation level as per requirement •Artificial Source of Wind speed with provision to set wind speed as per requirement •Inbuilt facility analogous to rooftop and hot water tank compatible to perform experiment both outdoor and indoor environment. 	
		<ul style="list-style-type: none"> •Provision to perform experiment in both Thermosyphonic and forced mode of operation. •Evaluation of different parameters (UL, FR and efficiency) in both Thermosyphonic and forced mode of operation. •2 auxiliary tanks for non-stop experimentation •Provision to change incident angle of irradiation. •Provision to change tilt angle. •An active measurement panel to measure inlet temperature, outlet temperature, plate temperature, flow of water and wind speed •To be Equipped with handheld solar insolation measuring instrument •To be Equipped with an angle measurement instrument 	



Make: Hydroenergy
Model: HYDRO_SCONC

2. SOLAR PARABOLIC TROUGH TRAINER



This trainer illustrates the working of a concentrating solar thermal system using a parabolic trough to focus sunlight on a receiver tube. It helps in studying thermal energy conversion, tracking mechanisms, and fluid heating applications.

Key Features:

- Solar tracking mechanism (manual/automatic)
- High-temperature fluid circulation system
- Temperature monitoring at multiple points

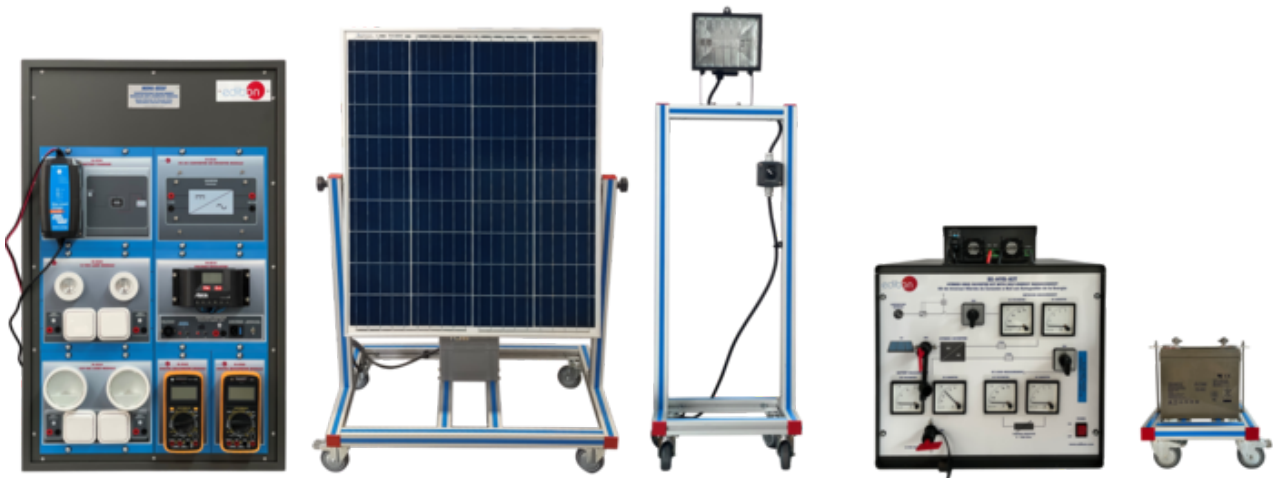
Technical Specifications:

S. No.	Components	Sub-Components	Specifications
1	Heat generating unit with Tracking system	Parabolic Trough collector	
		Reflecting material	SS (acrylic mirror in next version)
		Length	1219.2 (mm)
		Arc length (perimeter)	1828.8 (mm)
		Absorber tube	
		Number	2
		Absorber material	Copper, SS
		Tracking system	
		Mode of tracking	Single axis (dual axis in next version)
2	Storage unit	Supply tanks	
		Material	SS
		Number	2
		Storage tank-1	
		Material	SS
		Storage tank-2 (with heat exchanger)	
		Material	SS
3	Control Unit	Storage tank Insulation	
		Sensors and regulators	
		Temperature meters with sensors	
		Flow meter with sensor	
4	Accessories	Flow Regulator	
		Radiation meter	
		Range	0 to 1999 ($\frac{W}{m^2}$)
		Anemometer	
		Wind speed Range	0.4 to 45.0 ($\frac{m}{sec}$)
		Temperature range	-14 to 60
		Pump -1	
		Type	Hot water
		Pump -2	
		Type	Hot oil
		Pipe and fitting	
		Oil	
5	Characteristics	Type	Therm-oil
		<ul style="list-style-type: none"> •Dual axis sun tracking. •Two types of absorber tubes. •Two types of Working Fluid •Flexibility to change the working fluid •Flexibility to change the absorber tube. •Evaluation of different parameters (UL, FR and efficiency) with oil/ water as working fluid. •Provision to vary the flow rate of fluid. •Provision to change insulation thickness. •An active measurement panel to measure inlet temperature, outlet temperature, plate temperature, flow of water and wind speed 	



Make: Hydrogenergy
Model: HYDRO_PV

3.SOLAR PV TRAINER



The Solar PV Trainer provides practical exposure to photovoltaic power generation, enabling learners to explore solar energy harvesting, electrical characteristics of PV modules, and performance under various conditions.

Key Features:

- Configurable PV array with variable irradiance
- MPPT and load testing modules
- Real-time voltage, current, and power monitoring

Technical Specifications:

1.	Solar Panels (Two Solar Panels of 40Wp each) <ul style="list-style-type: none"> Power Rating Maximum Power Voltage Maximum Power Current Open Circuit Voltage Short Circuit Current Panel Type 	40 Wp 18.33 V 2.39 A 22.25 V 2.53 A Poly crystalline
2.	Artificial Sunlight <ul style="list-style-type: none"> Tube Type Wattage No. Of Tubes per Panel Total No. Of Light Panels 	Halogen 150 W each 6 2
CONTROL UNIT		
3.	Measurement <ul style="list-style-type: none"> Module Voltage Voltmeter Inverter i/p Voltage Voltmeter DC Load Voltage Voltmeter Battery Input Voltage Voltmeter Module Current Ammeter Inverter i/p Current Ammeter DC Load Current Ammeter Battery i/p Current Ammeter Gen. AC Current Ammeter Gen. AC Voltage Voltmeter Temperature Meter 	0-200 V 0-200 V 0-200 V 0-200 V 0-10 A 0-10 A 0-2 A 0-2 A 0-2 A 0-2 A 0-750 V 0-200 degree celcius
4.	Potentiometer <ul style="list-style-type: none"> Rating 	0-200 ohm/150 Watts
5.	Load Box <ul style="list-style-type: none"> AC Load DC Load 	5 Watt CFL 1.5 Watt*8= 12 watt, 12 LEDs
6.	Protection Fuse <ul style="list-style-type: none"> AC Mains 	10 A
	<ul style="list-style-type: none"> Potmeter Battery-1 Battery-2 	1.6 A 5 A 5 A
7.	Battery <ul style="list-style-type: none"> Rating Nos. 	12 V, 4.5 Ah 2
RESEARCH UNIT		
8.	DC-DC Converter	
	Auto Mode	
	<ul style="list-style-type: none"> Input Voltage Output Voltage Maximum Load Current 	25V-15V 13.8 V 2.0 A

Technical Specifications:

	Manual Mode	
	<ul style="list-style-type: none"> Input Voltage Output Voltage Gate Signal Switching Frequency Max. Load Current Topology 	25V-0V Depends on Duty Cycle 5V Peak-Peak 20kHz-80kHz 2.0 A Buck Converter
9.	Inverter <ul style="list-style-type: none"> 150 Watt Single Phase Inverter; Input 12 V DC; Output 220V AC 	
DATA LOGGER AND PLOTTER UNIT		
10.	Terminals <ul style="list-style-type: none"> PV Voltage PV Current MPPT Software MPPT Algorithm	Module o/p Voltage is given at these terminals (150 Volts Max.) Module Current is given at these terminals. (2 Amps. Max) Signals for MPPT can be taken out from these terminals Proprietary Ecosense Software Perturb and Observe
11.	Technical Characteristics <ul style="list-style-type: none"> An active measurement panel to measure different voltages, currents and temperature. 	
	<ul style="list-style-type: none"> User should vary Irradiation to simulate sunlight conditions during the day which further affects the temperature of Solar Panel to study I-V and P-V characteristics under varying irradiation and temperature. Series and Parallel Combination of Solar Panels possible. Provision for Arrangement to tilt solar panels to study the effect of Tilt angle on PV module Power. Shading blades are provided to study the effect of shading on Solar PV. No connections are made internally to encourage user to learn connecting different components together in order to install a standalone Solar PV standalone power plant. Workout power flow calculations of Standalone PV power plant using charge controller, inverter, AC /Dc load and Battery. Option to provide external gate signals to charge controller via Function generator to study effect of change in Duty Cycle of charge controller on PV Power. User can externally feed MPPT signal to study effect of MPPT algorithm on PV Power. User can use his/her own MPPT algorithm to study the effect of MPPT algorithm on PV Power User can plot Real time PV, IV, V vs time, P vs Time, I vs Time curves using proprietary PC Software. Perturb and Observe MPPT Algorithm IP 65 protected PV Panels Equipped with Handheld Solar Insolation measuring instrument Equipped with an angle measurement instrument. Data can be saved in csv format Graphs can be saved in image format 	



Make: Hydroenergy
Model: HYDRO_WIND

4.WIND ENERGY TRAINER



Designed to simulate wind energy generation, this trainer includes a lab-scale wind turbine setup for studying turbine characteristics, power output, and aerodynamic effects under controlled wind conditions.

Key Features:

- Variable-speed wind simulation with fans
- Real-time turbine performance monitoring
- Study of blade angle and wind speed effects

Technical Specifications:

S. No.	Components	Sub-Components	Specifications
1	Generating unit	Generator	
		Type	PMSG (3 phase)
		Power rating	300 (W)
		Rotor	
		No. of blades	3
		Rotor diameter	1.26 m
		Swept area	1.246(m ²)
		Performance parameter	
		Rated wind speed	12.5 ($\frac{m}{sec}$)
		Power generation at rated speed	300(W)
		Cut-in speed	3.5 ($\frac{m}{sec}$)
		Blade	
		Material	Carbon fibre
2	Artificial Wind generating unit	Induction motor	
		Power rating	10 (HP)
		Generated wind speed range	0-15 m/sec
3	Control Unit	Battery	
		Capacity	42 (Ah)/12V
		Inverter	
		Rated power	650(VA)
		Input voltage	12(V)
		Output Voltage	110 V, 60Hz
		Charge controller	
		Rated power	400(W)
		Rated load voltage	12 (V)
		DC voltmeters/ammeter	
		AC voltmeters/ammeter	
		Power analysers	
		Power rating	1KVA
		Tachometer with sensor	
		Anemometer	
4	Accessories	Manual	
5	Characteristics	<ul style="list-style-type: none"> Artificial Wind generator Actual fixed pitch wind turbine in controlled environment An active measurement panel to measure different voltages, currents, Wind speed and RPM. 	

Technical Specifications:

		<ul style="list-style-type: none">• Wind Turbine certified by National Institute of Wind Energy.• Equipped with handheld anemometer.• Datalogging and PC software on demand with option to save data in csv format and graphs in image format.• Provision to vary wind speed.• Evaluation of the efficiency of charge controller.• Cut-in speed of wind turbine can be calculated experimentally.• Evaluation of the Tip Speed ratio (TSR) at different wind speeds.• Evaluation of the coefficient of performance of wind turbine.• User can draw the turbine Power versus wind speed curve.• User can draw the curve between TSR and coefficient of power.• User can draw the power curve of turbine with respect to the rotational speed of rotor at fix wind speeds.• User can study the power analysis at turbine output.• User can study the power analysis at different branches of wind turbine energy system with AC load only.• User can study the power analysis at different branches of wind turbine energy system with DC load only.
--	--	---



Make: Hydroenergy
Model: HYDRO_BMASS

5. BIOMAS DOWNDRAFT GASIFIER



This trainer demonstrates biomass gasification, converting solid biomass into producer gas using a down-draft gasifier. It aids in understanding combustion zones, syngas generation, and renewable fuel applications.

Key Features:

- Visual access to combustion zones
- Gas composition and flow analysis
- Safe, compact setup ideal for labs

Technical Specifications:

S. No.	Technical Parameters
1	Power Output: 2 kW electrical (can support small-scale appliances or lighting systems)
2	Type: Downdraft fixed-bed gasifier
3	Fuel Type: Biomass (wood chips, coconut shells, briquettes, agri-waste)
4	Fuel Consumption: 1 – 1.5 kg/kWh
5	Gasification Efficiency: 70–75%
6	Gas Calorific Value: 4.5 – 5.5 MJ/Nm³
7	Tar Content: < 100 mg/Nm³ (with proper filtration)
8	Cooling & Cleaning: Cyclone separator, scrubbing, and filters
9	Startup Time: 10–15 minutes
10	Operation Mode: Manual or semi-automatic
11	Applications: Lighting, small motors, battery charging, etc.
12	Area Require: 5ft x 5 ft
13	Weight: ~150–200 kg
14	Material: Mild Steel with heat-resistant paint and insulation
15	Supplied with 1 KW portable Generator
16	Emission Standards: Meets local pollution norms (with filtration)