

DLXNY-WP01

Wind- Photovoltaic Complementary Training System

Technical Document



The picture only supplies the reference

I. Product Description.

DLXNY-WP01 type wind-photovoltaic complementary training system is made up of photovoltaic power supply device, photovoltaic power supply system, wind power unit, wind power supply system, inverter and load system, monitoring system. It adopts modular construction, each device and system has independent function, can be composed into photovoltaic power generation training system, wind power generation training system.

II. Equipment features.

1. This system adopts three-dimensional structure and standard patchboard, experiment modular exposed completely, strong presence, makes learners into learning roles quickly, complete closed-loop control mode allows users to operate it more humane.

2. The wind-photovoltaic complementary training system adopts ARM control system, a high-performance control type, can fully intelligently control the battery charging & discharge and draught fan brake.

3. Off-grid inverter module boots the front end of an 8-bit MCU driving control, front and rear axles

output MOS FET imported to make more stable performance. We can provide a stable learning process 220V pure sine wave AC power.

4.Wind-photovoltaic complementary training system can make student move and dismount this device by themselves,easy to use,no noise no pollution.

III.Equipment parameter.

(1)Dimension:Photovoltaic power unit 1610×1010×1550mm

Wind power unit 1578×1950×1540mm

Training cabinet 3200×650×2000mm



Figure 1 DLXNY -WP01 Wind- Photovoltaic complementary training system

IV.Module Introduction.

1).Photovoltaic power unit

a)Composition

Photovoltaic power supply equipment is mainly composed of the photovoltaic battery components, delineascope, light sensor, light sensor control box, horizontal direction and pitching direction mechanism, pendulum lever, pendulum lever reduction box, pendulum rod support, single phase AC motor, capacitor, DC motor, proximity switch, micro switch, base support equipment and parts,as figure 1 shows.

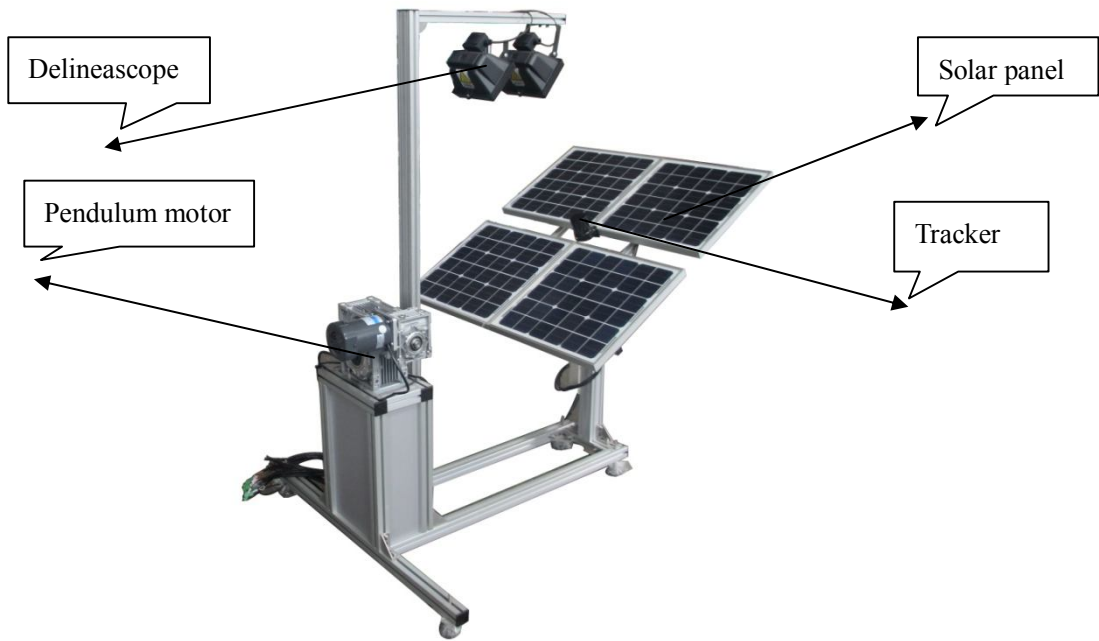
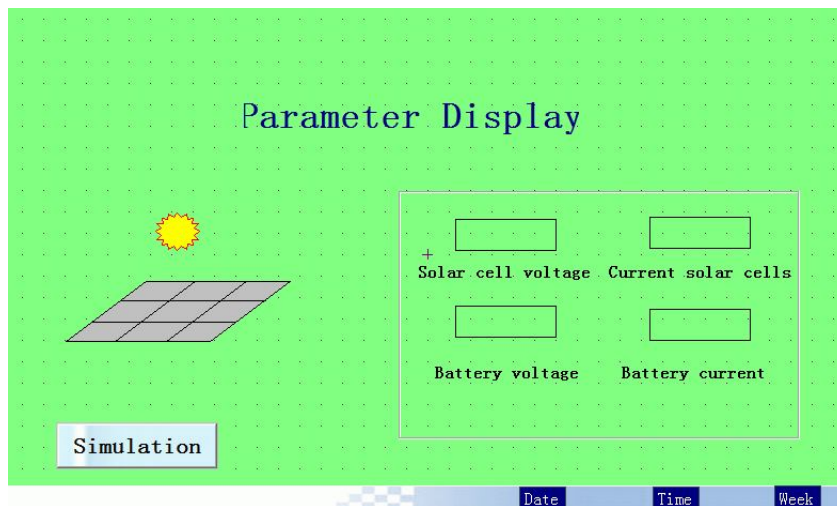
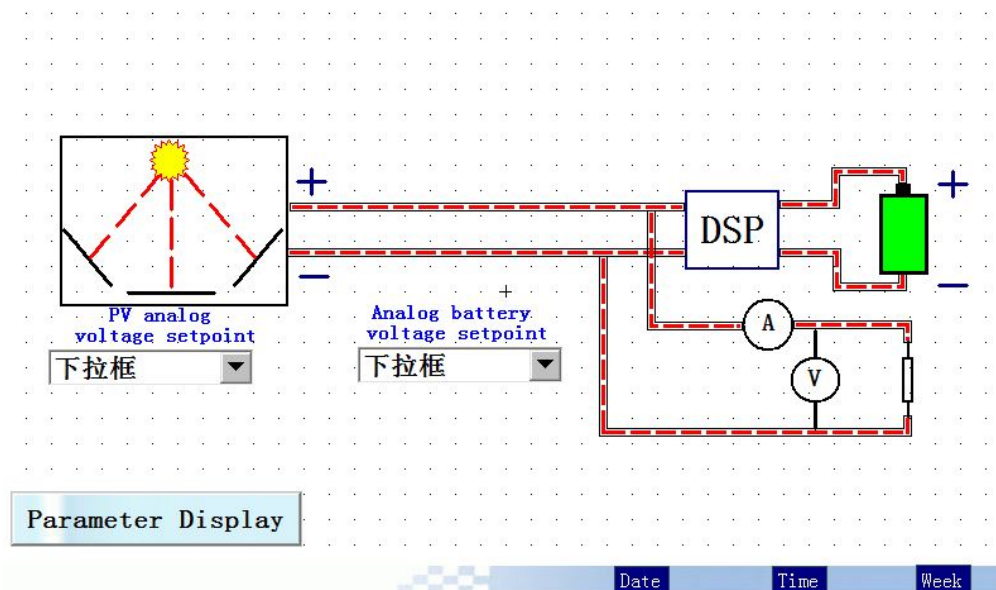


Figure 1 Power Supply for Photovoltaic.





Touch Screen Display Interface

Photovoltaic battery square array is composed of 4 multiplied photovoltaic battery components, light sensor install in the center of battery square array. 2 300W delineascopes install on pendulum bracket, bottom of pendulum connect to the output of reduction box, input of reduction box connect to the single phase DC motor. When machine rotating, delineascope achieve circular motion actuated by reduction box. Pontes between bottom of delineascope and pedestal bracket installed proximity and micro switch, be used to the limit and protection of delineascope location. Horizontal direction and pitching direction mechanism is composed of horizontal movement reduction box, pitching motion reduction, DC motor, proximity & micro switch. When DC motor rotating, horizontal movement reduction box actuate photovoltaic battery square array eastward-moving or westward-moving horizontally, pitching motion reduction actuate photovoltaic battery square array pitch northward-moving or southward-moving, proximity and micro switch are used to the photovoltaic battery square array's limit and protection.

b) Photovoltaic battery component.

Technical Parameter:

Rated power: 20W

Rated voltage: 17.2V

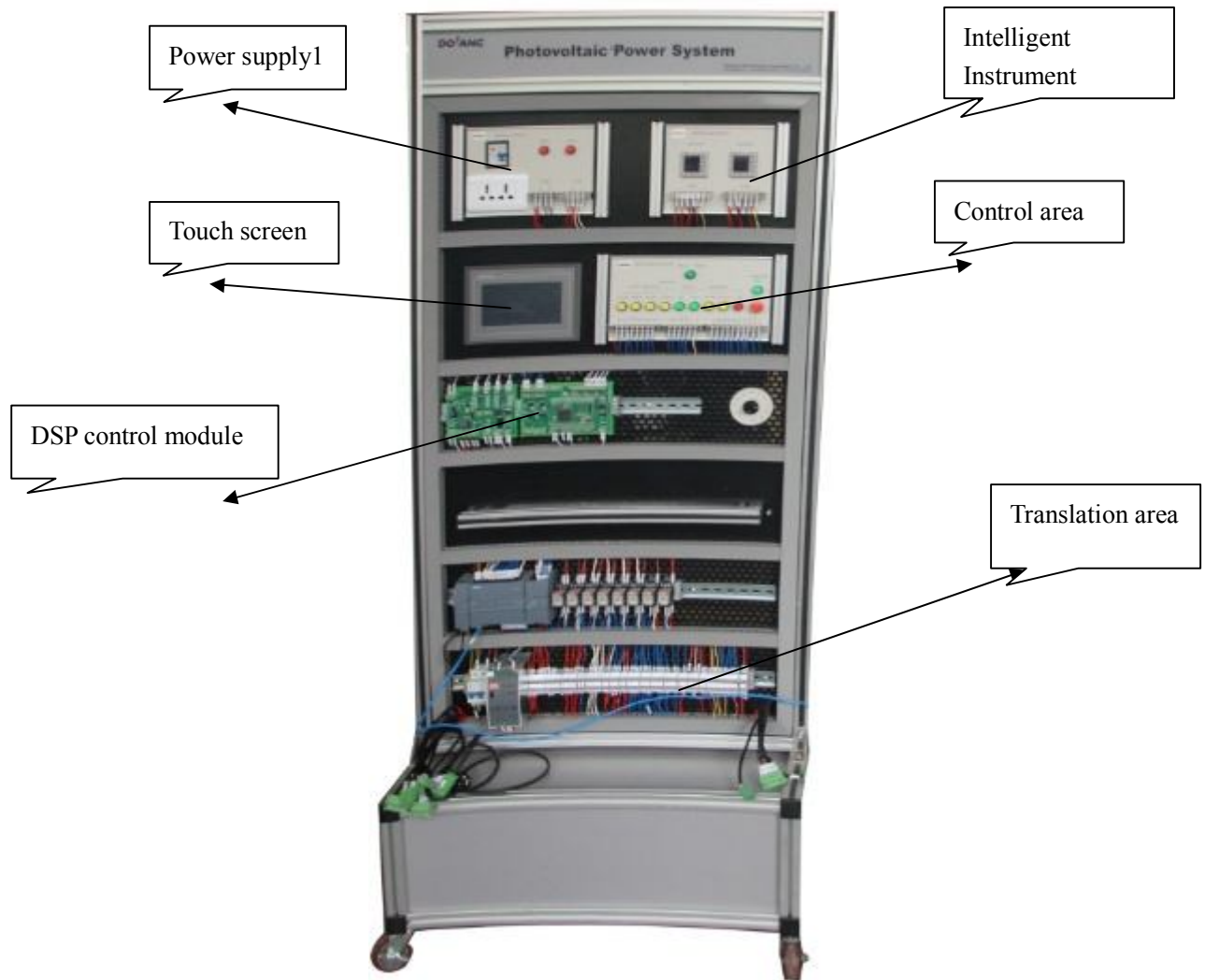
Rate current: 1.17A

Open-circuit voltage: 21.4V

Short-circuit current: 1.27A

Dimension: 430mm×430mm×28mm

2).Photovoltaic power supply system.



a)Composition

Photovoltaic power supply system is mainly composed of photovoltaic power control unit, photovoltaic output display unit, touch screen, photovoltaic power supply control unit, DSP control unit, interface unit, Siemens S7-200 PLC, relay group, wiring exhaust, storage battery, adjustable resistance, circuit breaker, 12 v switch power supply, mesh frame, etc. As shown in figure 3 shows.

b)Control ways

Chase sun function of photovoltaic power supply control unit include 2 state manual control box and automatic control,can manual or automatic operate the 2 axis tracking,light condition,light

movement.

c)Control unite and interface unite.

Battery charging process and charging protection is completed by DSP control unit, interface unit and the process, the battery discharge protection is completed by DSP control unit, interface unit and relay, when the battery discharge voltage is lower than rated value, ARM control unit output signal actuate relay to work , relay normally -closed contact break, cut off the battery discharge circuit.

d)Storage Battery.

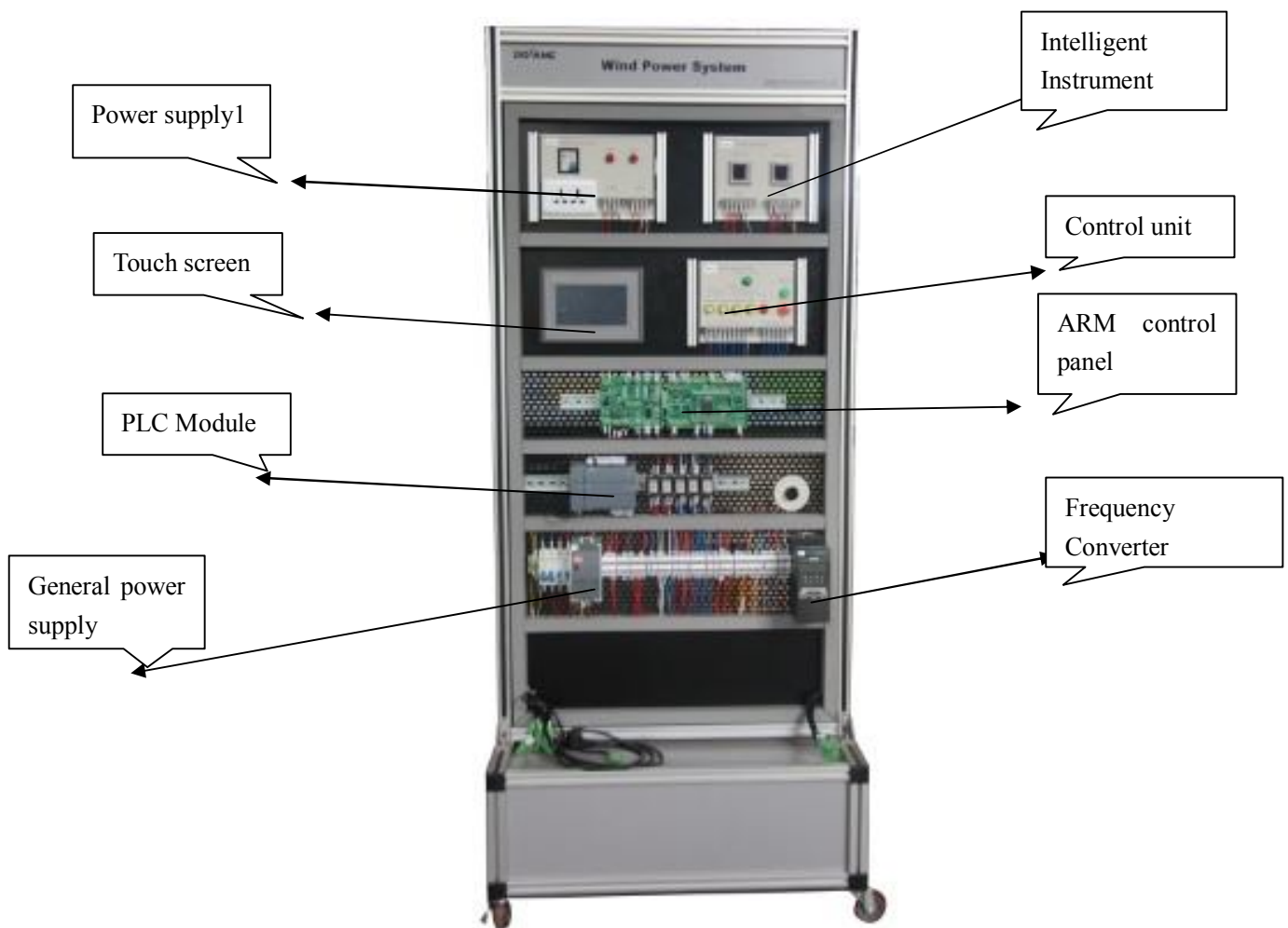
Battery choose section 4 control valve sealed lead acid battery, the main parameters

Capacity 12V 18Ah/20HR

Weight 1.9kg

Dimension 345mm×195mm×20mm

V.Wind power supply equipment.

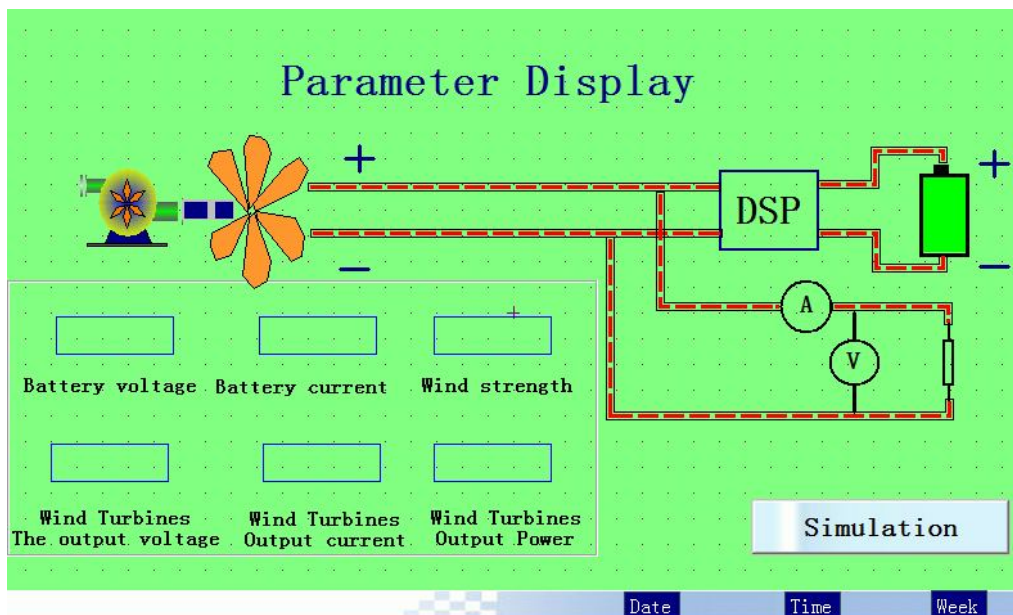


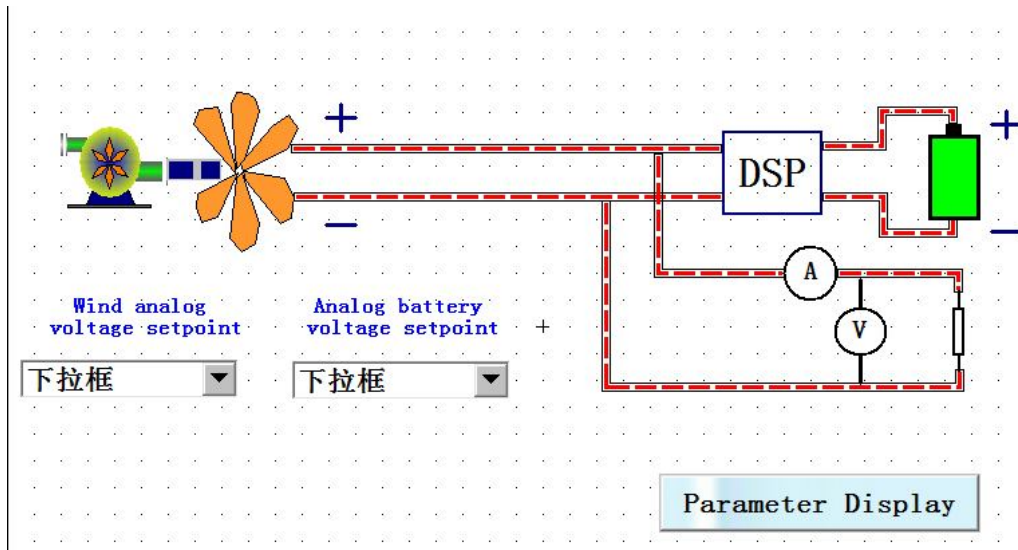
a)Composition

Wind power supply equipment is mainly composed of blade, the wheel hub,engine, engine room, stern rudder, side wind yaw control mechanism, DC motor, tower and foundation, velocimeter, velocimeter bracket, axial flow fan, axial flow fan support, axial flow fan box cover, single-phase AC motor, capacitor, wind field motion box, guardrail, connecting rod, roller, universal wheel, micro switch and proximity switch equipment and parts, as figure 2 shows



Figure 2 Wind-Power supply Equipment





Touch screen display interface

Horizontal permanent magnet synchronous generator is assembled with blade, wheel hub, engine, engine room, stern rudder and side wind yaw control mechanism, install on the tower bracket. Wind filed is composed of axial flow fan, axial flow fan bracket, axial flow fan mask, velocimeter, velocimeter bracket, wind filed movement organization box, transmission gear chain, single phase DC motor, idler wheel, universal wheel, etc. Axial flow fan and axial flow fan mask are install on the top of the wind filed movement organization box, wind filed movement organization is composed of transmission gear chain, single phase DC motor, idler wheel and universal wheel. When the single phase AC motor of wind filed movement organization rotating, transmission gear chain organization drive idler wheel to rotate, wind filed movement organization box circular rotating around the tower pedestal of the wind driven generator, when axial flow fan convey variable winds, it will form a wind filed with variable wind direction and wind speed around wind driven generator.

In variable wind filed, wind driven generator use tail vane achieve passive yaw windward, make the wind driven generator output the biggest electric energy. Velocimeter test the wind quantity of the wind filed, when it beyond safety values, cross wind yaw control organization works, makes the cross wind of tail vane as 45 degrees. Blade rotate speed of wind driven generator slow down. When the wind quantity is too strong, tail crosswind changed as 90 degree, wind driven generator will be braked.

VI Wind power supply system.

a)Composition

Wind power supply system is mainly composed of wind power control unit, wind power output display unit, touch screen, wind power supply control unit, DSP control unit, interface unit, Siemens S7-200 PLC, relay group, wiring the row, the adjustable resistance, circuit breaker, mesh frame, etc.

b)Control style.

The yaw function of Wind power supply control unit include 2 states,manual and automatic,can achieve the operation of the manual or automatic variable wind direction.

Variable wind quantity is achieved by frequency converter control axial wind flow fan,Manual operate the relative button on the frequency converter operation panel,make the frequency of frequency converter between 0-50HZ,the rotate speed of axial flow fan between 0 and rated speed,achieve variable wind quantity output.

c)ARM control unit and crosswind yaw.

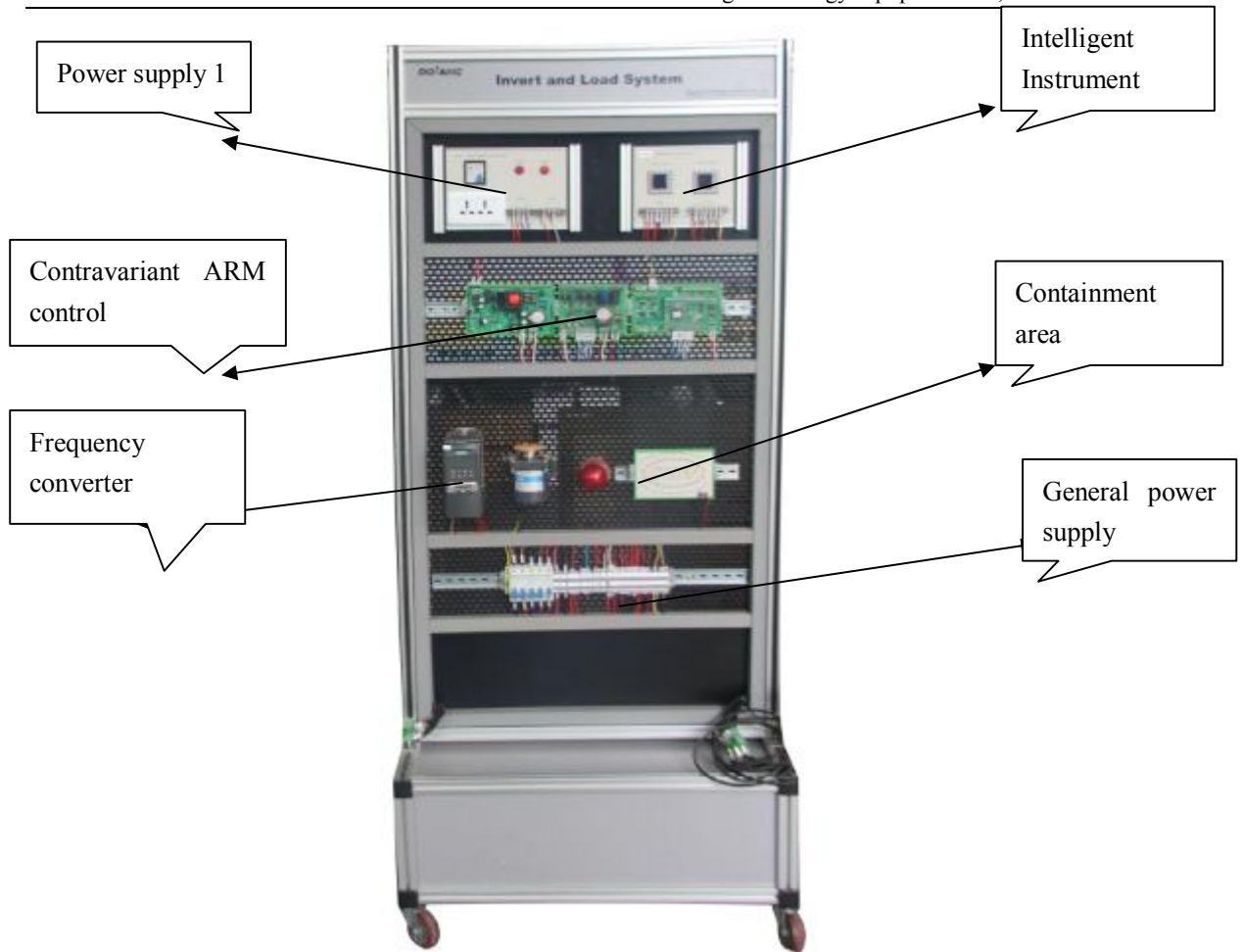
Wind driven generator blade under the action result moment drive wind wheel to rotate,input the torque to the transmission by wheel hub.When the wind speed increased over the rated speed,the rotate speed of wind driven generator is too fast,generator maybe burn down because of overload.

For fixed pitch,when wind speed increased over rated speed,if the airflow separated from blade,wind wheel blade will be “stall” condition,generator can’t be burn down because of overload.

For variable wind wheel,when the wind speed increase,can adjust the angle of attack from airflow to blade according to wind speed.When the wind speed over rated wind speed,output power can steady keep on rated power.Especially in the case of strong wind,wind turbine in the feathering condition,obviously improve the force condition of whole machine.

Most of all the small size wind driven generator is fixed pitch wind wheel,under strong wind circumstance,adopt crosswind yaw control,makes airflow separated from blade, wind wheel blade will be “stall” condition,safety protect the wind driven generator.Besides,it also can keep the rated frequency output by crosswind control wind driven generator.

VII.Inverter and load system.



a) Composition

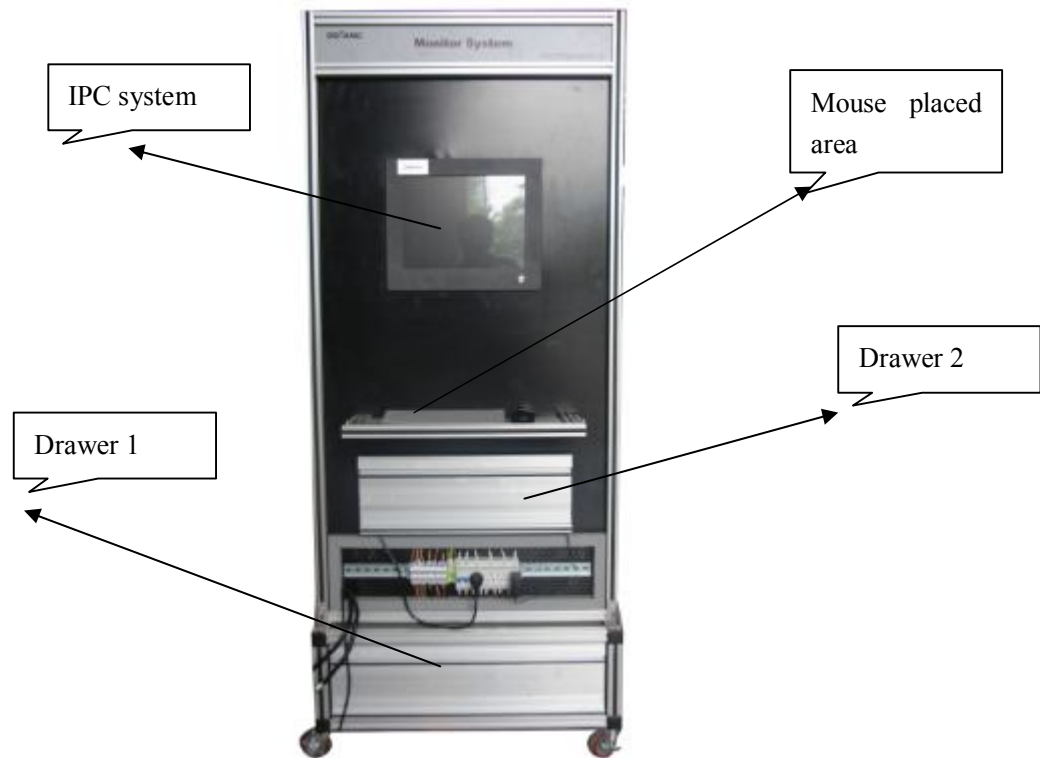
Inverter and load system mainly consists of inverter power control unit, inverter output display unit, inverter, inverter parameter detection module, frequency converter, three-phase ac motor, luminous tube stage lighting module, caution light, wiring the row, the circuit breaker, mesh frame, etc.

Input of inverter provided by photovoltaic power generation system, wind driven generator or generator, inverter output single 220V 50HZ AC power supply. AC governor system is composed of frequency converter and 3 phase AC motor, inverter output AC 220V power supply, that is the input power supply of frequency converter, frequency converter switch single phase 220V into 3 phase 220V for 3 phase 220V AD motor use. The inverter power supply control unit's AC 220 power supply provided by inverter, inverter power supply control unit output DC24V, it be used for luminescent tube stage lighting module. Inverter test module is use to test inverter's dead zone, fundamental wave, SPWM waveform.

b) Inverter.

Inverter is a device to be use to switch low tension DC power supply into high tension AC power supply,it have many different kinds,each operation principle and operation process is different.This inverter is composed of DC - DC booster PWM control chip unit, drive + booster power MOS pipe unit, step-up transformer, SPWM chip unit, high voltage driver chip unit, full bridge inverter power MOS pipe unit, LC filter.

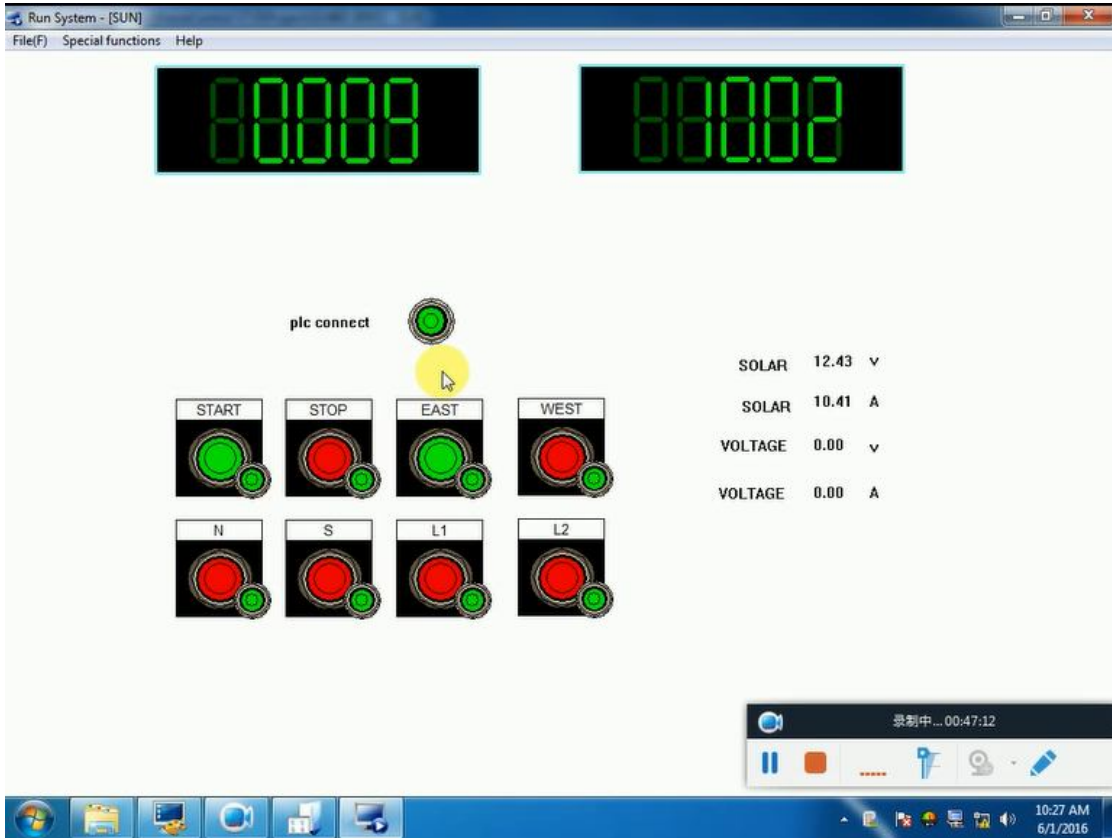
VIII.Monitoring system.



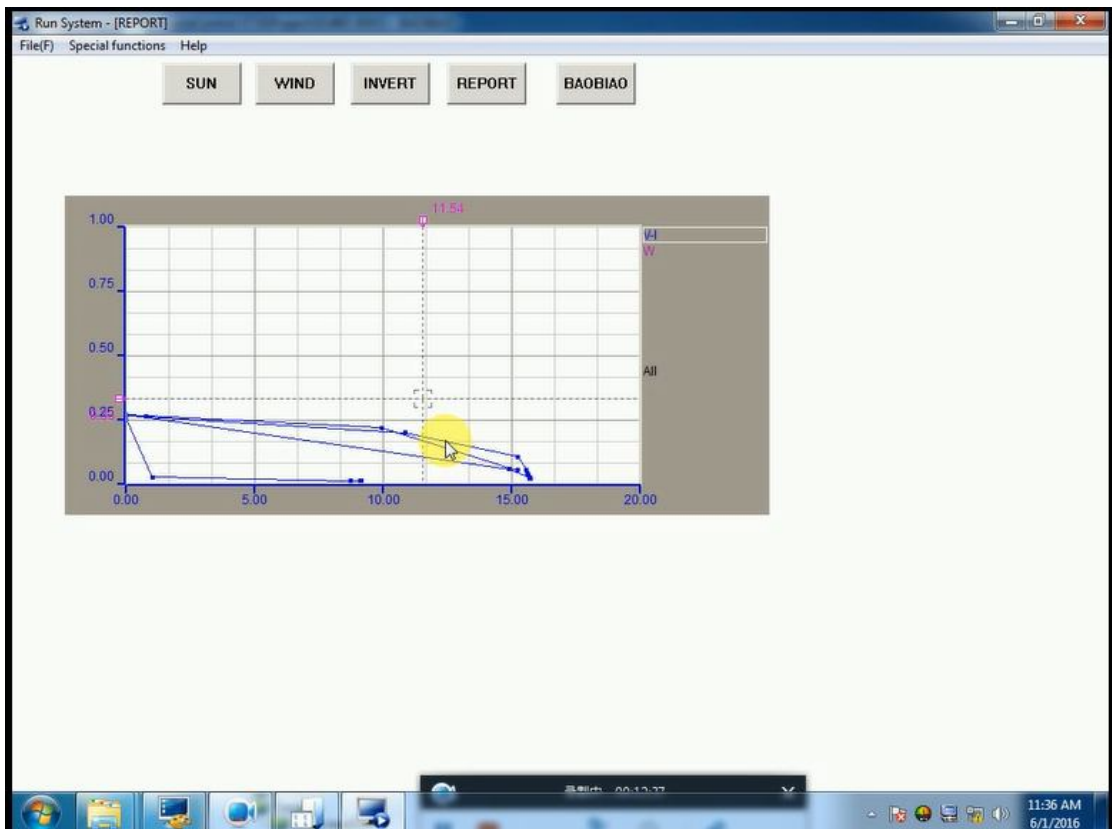
(1).Composition

Monitor and control system is mainly composed of multifunction, keyboard, mouse, the wiring row, the power supply socket, communication line, Microsoft operating system software, force control configuration software component.

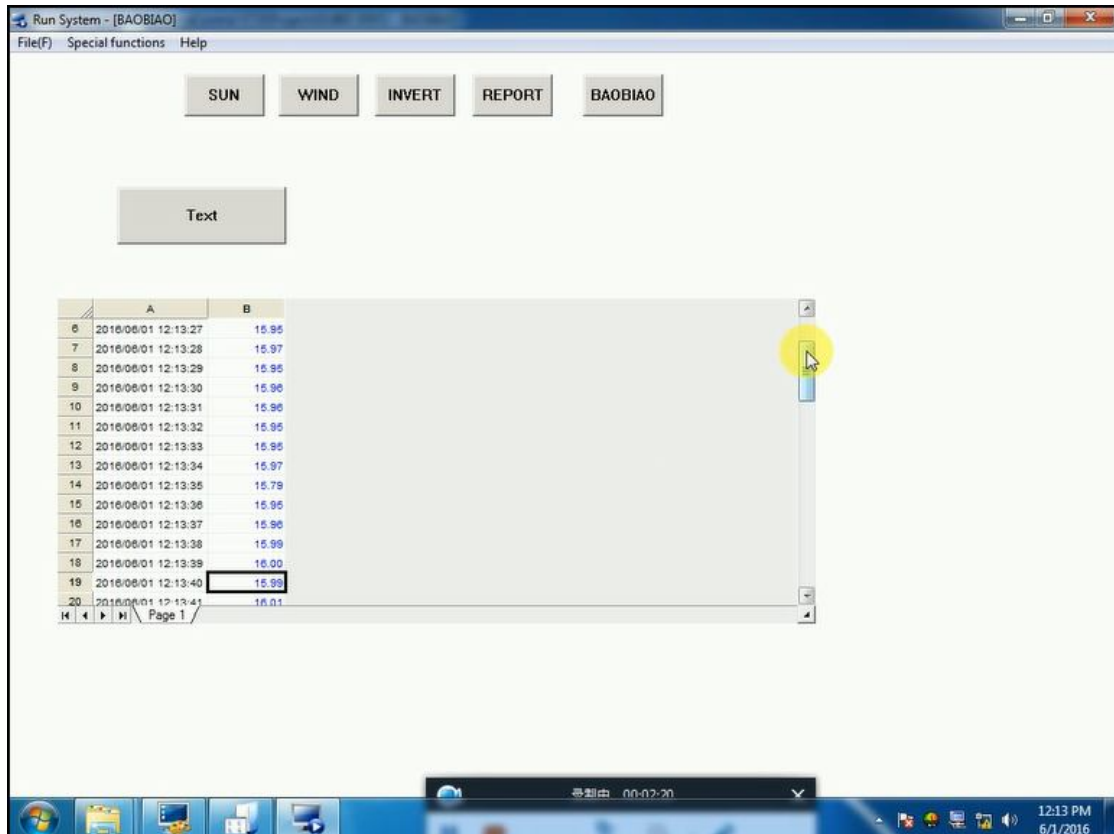
(2).Monitor and control system function



Configuration interface make and display



Draw of Volt-ampere curve,frequency curve



Statement date store,print

a)Communication.

Monitoring system communicate with controller, PLC, instrument.

b)Interface

① Monitoring system has the main interface, photovoltaic power supply system interface, wind power supply system interface, inverter and load system interface, scenery complementary energy conversion interface, respectively show their running state parameters.

②Photovoltaic power supply system interface setting corresponding button, realize photovoltaic battery phalanx automatic tracking.

③Wind power supply system interface Settings corresponding button, realize wind generator side wind yaw control.

④Has the photovoltaic power generation acquisition statements and wind power generation set statements, record photovoltaic output voltage, current, wind generator output voltage, current,

Inverter and load system inverter output voltage, current, power, etc data and print data report.

IX.Main experiment training contents

1,Wind power supply equipment			
Serial number	Name	Technical Parameters	Quantity
1	Horizontal axis permanent magnet generator	Output power: 300W Output (rectification)voltage: > +12V Blade rotate diameter: 1.2m Blade number: 3 Blade material: Fiberglass Start wind speed: 1m/s Cut-over wind speed: 1.5m/s Safety wind speed : 25 m/s Yaw: Program control automatic yaw Yaw motor: working voltage (DC 24V) ,rotating speed (25rpm)	1
2	velocimeter	Output Voltage: 0-5V Wind number of bowls: 3	1
3	Axial flow fan	Flow: 2100m ³ /h Voltage: 380V (Control by frequency converter) Full voltage: 215Pa Frequency: 50Hz power: 0.37Kw Rotating speed: 1400r/min Axial flow fan bracket Axial flow fan mask	1
4	Wind direction control motor	Reduction Ratio: 1: 40 Voltage: AC220V Link of movement organization :Chain wheel	1

2,Photovoltaic power supply equipment			
Serial number	Name	Technical Parameter	Quantity
1	Battery Component	Power: 20W Error: ±5% Output Voltage: 17.2V Output Electric current: 1.17A Open Circuit voltage: 21.4V Short circuit voltage: 1.27A Work environment Temperature: 45°C±2°C Size: 430×430×28mm	4
2	Chase sun sensor	Output voltage: 0-5V Tracking precision: 1 degree Construction: 4 bridge	1
3	Delineascope	Wing arm:Turbine worm (2 reducer casing) Voltage: 220V Frequency: 50Hz Electricity: 1.36A Max frequency: 300W	2
4	Chase sun organization	Construction: Turbine worm (reducer casing) Drive: DC motor Axis Number: double axis two-dimension	1
3,Wind power supply system			
Serial number	name	Technical Parameters	Quantity
1	Power supply control module	Include earth leakage circuit breaker , AC220V and DC24V condition indicator light,power supply socket	1

2	Wind-electricity control module	Include earth leakage circuit breaker, AC220V and DC24V condition indicator light	1
3	Touch screen	7", colors	1
4	Function module	ARM core-board , communication control board, wind driven generation main board	1
5	DC input module	Ampere meter: DC 0-5A Voltage meter: DC 0-500V Connector: RS485	1
6	Wind power control module	Wind speed movement Direction: up time, inverse time Axial flow fan motor control : give air Yaw control: yaw, stop Automatic control: start, sudden stop	1
7	PLC	S7-1200 AC/DC/RELAY	1
8	Communication module	RS422/485	
9	Frequency converter	Siemens V20-0.37Kw	
10	Adjustable resistance	range: 0-1000Ω, Variable adjustable (scale include)	1

4, Photovoltaic (pv) power supply system

Serial number	name	Technical Parameters	Quantity
1	Power supply control module	Include earth leakage circuit breaker , AC220V and DC24V condition indicator light, power supply socket	1
2	Photovoltaic power supply control module	Include earth leakage circuit breaker, AC220V and DC24V condition indicator light	1

3	Touch Screen	7",Color	1
4	Function module	ARM core-board, communication control board,Photovoltaic electricity generation main circuit board	1
5	DC input module	Ampere meter: PA1951-AK1G, DC 0-5A Voltage meter: PZ195U-AK1G, DC 0-500V Interface: RS485	1
6	Photovoltaic power supply control module	Battery board tracking direction: east,south,west,north Project lamp: light1,light2 Protect lamp movement direction: east west,west east,stop Automatic control: Start,sudden stop	1
8	PLC	S7-1200 1214C AC/DC/RELAY	1
9	Extend	DI 8x24VDC/DQ 8xRelay_1	1
10	Adjustable resistance	range: 0-1000Ω, Variable adjustable(scale include)	1
5,Inverter and load system			
Serial number	Name	Technical parameters	Quantity
1	Inverter output display module	Ampere meter: AC 0-5A Voltage Meter: AC 0-500V interface: RS485	1
2	Inverter power supply control module	Include earth leakage circuit breaker,AC220V and DC24V condition indicator light	1
3	Inverter	Input Voltage: DC12V Input voltage range: DC9.5V-15.5V Output voltage: AC220V±5% Rated output ampere: 1.4A	

		<p>Output frequency: 50Hz±0.5Hz</p> <p>Rated frequency: 300VA</p> <p>Output waveform: sine wave</p> <p>waveform distortion: <5%</p> <p>Transform frequency: >85%</p> <p>Experiment module: sine wave inverter principle module</p>	
4	Switch power supply	<p>model: DR-120-24</p> <p>input voltage: AC 220V</p> <p>output voltage: DC 24V</p> <p>output ampere: 5A</p>	1
5	Inverter	siemensV20-0.37Kw	1
6	Motor loading	<p>Frequency: 40W</p> <p>Voltage: AC220V</p> <p>Rotating speed: 1350rpm</p>	1
7	Light loading		1
8	valve control sealed lead-acid battery	<p>Volume 12V 18Ah/20HR</p> <p>Weight 1.9kg</p> <p>size 345mm×195mm×20mm</p>	4

6,Monitoring and control system

Serial number	Name	Technical Parameter	Quantity
1	IPC	6 serial ports, include mouse and keyboard	1
2	Configuration software	English	1

7,Experiment table

Serial number	Name	Technical Parameter	Quantity
1	Patch board	Vertical patch board basic structure:tool cabinet and 4	4

	experiment table	wheels below,vertical patch board above Size: 800(length)×600 (width×2000(height) framework:aluminum alloy section Embedded steel spray Steel size: 1200mm×820mm Thickness of steel: 2mm Plate Hole Specification: Above the hole size6×10mm, Distance of Hole between left and right is 6mm, up and down pitch is 6mm, malposition8mm; Mesh plate with a sliding drawer, the drawer frame profiles using the bottom of 2mm steel plate; Mesh bottom rack mounted pulley	
2	Microsoft operate system	Window7	1
	Communication cable		1
	Experiment instructor	Wind- Photovoltaic Complementary electricity generation system training instructor	

8,Supporting tools, supplies

Serial number	Name	Technical Parameters	Quantity
1	Multimeter (Uni)	Multimeter (Uni)	1
2	Pin terminal crimping tools		1
3	Fork terminal crimping tools		1
4	Small flathead	2.4*40	1

	screwdriver		
5	Small Phillips screwdriver	2.4*40	1
6	Long-handled screwdriver	PH1*150	1
7	Strippers	0.2-1.2m m ²	1
8	scissors	Short mouth small scissors	1
9	Needle-nose pliers	6-150	1
10	Diagonal pliers	6-150	1
11	tweezers		1
12	Electric iron	60W Adjustable	1
13	Super-plastic toolbox	17 "	1
14	charger	12V	1
15	Wire (red)	BVR-2.5 m m ²	50m
16	Wire (red)	BVR-0.75 m m ²	100m
17	Wire (red)	BVR-0.3 m m ²	100m
18	Wire (black)	BVR-2.5 m m ²	50m
19	Wire (white)	BVR-0.3 m m ²	100m
20	Wire (blue)	BVR-0.3 m m ²	300m
21	Crimps	Forked type: \varnothing 1.25-3 100/pack	3
22	Crimps	tube type0.5 1000/pack	1
23	Crimps	tube type2.5	100
24	Solder wire	\varnothing 0.8	1

9,Optional list

1	Installation and	laptop	Lenovo	1	set	Lenovo
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	commissioning tool		Laptop14 "			
		Handheld Digital Oscilloscope,	UTD1025 C	1	Set	Uni-t

X. Training content

- 1) Off-grid wind and solar power system planning;
- 2) Select, install and connect of the photovoltaic cell component according to the power requirements
- 3) Select, install and connect of the wind generator according to the power requirements
- 4) Maximum power point tracking program design of photovoltaic cell modules on basis of MCU;
- 5) Maximum power point tracking program design of wind generator on basis of MCU;
- 6) Battery capacity matching calculation and selection;
- 7) Battery charge and discharge parameters and protection parameter settings;
- 8) Inverter parameters setting;
- 9) Monitoring system configuration and operation;
- 10) Photovoltaic power supply system debugging;
- 11) Wind power system debugging;
- 12) Wind and solar power generation system debugging;
- 13) Power quality monitoring, debugging and analysis.

Video : https://www.youtube.com/watch?v=h_nwz8wTjE