

5Kw Wind Turbine Installation and Using Manual

Performance Introduction

Light brand wind turbine is a low speed type which uses wind speed and wind direction sensors to realize the intelligent control. It will stop working when meets with over wind speed or over voltage and owns many advantages such as high working efficiency, easy maintenance and high reliability. The production is the idea small power equipment for farming and pasturing areas which lack regular resources but have abundant wind power, frontier defense sentry near islands and observatory station. It would be able to supply the stable electricity for the electric machines such as illuminant equipment, colorful television and navigation mark.

Structural Characteristics

The light brand wind turbine set is composed of wind wheel, electrical combinations (including generator and gyro), erecting pillar, hauling type tower, anemoscope, wind direction sensors and intelligent controllers etc.

1. Wind wheel: 3 leaves type, laminar flow aerofoil, high rising resistance ratio and good performance.
2. Generator and gyro: integrative design which combines the generator and gyro as a whole. Inter connected structure enhance the intensity and greatly reduce the material and the weight of head.
3. Wind speed and wind direction sensors transmit the digital signals to the controllers to realize the intelligent control. It will automatically adjust the windward angle and stop working when meet with over wind speed or over voltage.

Technical Index

FD6.4-5000 Type

- a. The diameter of wind wheel: 6.4M
- b. Timing manner: automatically adjust the windward angle
- c. Rating wind speed: 10M/S
- d. Rating voltage: 280V
- e. Rating power: 5000W
- f. Generator: three-phase magneto
- g . Rating rotate speed: 200R/MIN
- h . Slowing-down wind speed: 25M/S
- I. Starting-up wind speed: 3.0M/S
- J. Direction adjustment manner: electromotion
- K. The height of tower: 12M
- L. Stopping working voltage: 300V
- M. Protected value of outputting volts d.c.: 210V
- N. Drive method: directly driven by wind wheel
- O. Displaying items: liquid crystal ATM12864D to show the wind speed, voltage, current, alarm state, over voltage or lack of voltage of the battery, over wind speed and communication

situation.

P. Graph of 5KW wind speed and power.

The list and use of system components

1. One set of tower base, pintle bolt and nut. Function: support and fasten the tower.
2. Fastening tightwire
 - a specification 6*19, diameter 12MM, length 9.5M, 4 radix. Function: fasten the tower.
 - b specification 6*19, diameter 5MM, length 9M, 2 radix. Function: fasten assistant pole.
 - c specification 6*19, diameter 5MM, length 30M, 1 radix. Function: it would be used when drawing back the wind turbine.
3. 24 sets of tightwire clamp. Function: fasten both ends of tightwire.
4. Turnbuckles 4 sets of bolts. Function: adjust the uprightness of the tower
5. 4 sets of annular anchor. Function: fasten tower tightwire
6. 2 sets of pulley. Function: Each pulley above and underside will be adopted in order to reduce the highly increasing pull when erecting the wind turbine.
7. 24sets M20 nuts and M20*70 bolts. Function: fasten the joint part of flange
8. One set of anemoscope. Function: inspect the real time wind speed and transfer the data to the controllers.
9. Erecting pole of anemoscope: Function: erecting the anemoscope.
10. One set of dogvane. Function: examine the windward angle of the wind turbine. This part bears direction requirements in which all five fixing holes should be upward.
11. One set of generator and gyro assembly. It contains generator, gyro, wind leaf installation tray, press board and matched bolt. Function: generate electricity and track the wind direction.
12. Dome. Function: lead the wind power from the center of the machine to the leaves to make it fully used.
13. Intelligent controller. Function: the controlling center of wind turbine. It commutes the three-phase alternating current generated by the machine and exports the direct current to electricize the storage battery. Meanwhile it checks the working status of the storage battery and make out corresponding indications. It also receives the signals from the anemoscope and dogvane, do the relevant instructions and reflect all the estate.
14. Four radix of feet bolt. Function: fasten the tower base.
15. Three radix of tower frame: above, middle and below part. Function: support the wind turbine.
16. Assistant tower frames: It would be used when two wind turbine sections are erected.
17. Three wind leaves. Function: to transform the wind power to kinetic energy and drive the generator.

Installation Procedure

Step 1: the Choice of the Installation Location

Wind power means the kinetic energy of moving wind. Wind turbine is the kind of equipment to transform the wind power to circumrotating kinetic power and than change it again to electric power. The equation of the wind power is the cube function of wind speed, which means per increment of 10% wind speed (for example from 9m/sec to 10m/sec), may increase the wind

power by 37%, so does the same increasing rate of wind turbine power. Nearly in all installation fields, the higher the wind turbine stands, the faster the wind speed would be. Therefore, wind turbine should be set up as high as possible and try its best to be away from the barriers.

When selecting the locations, it's necessary to consider the distance between the generator and the pile. The shorter the distance is, the less cable would be used. As a result, less energy waste would be produced during the transmission. While under the circumstances of longer distance, it's better to use much thicker standard cable for the transmission.

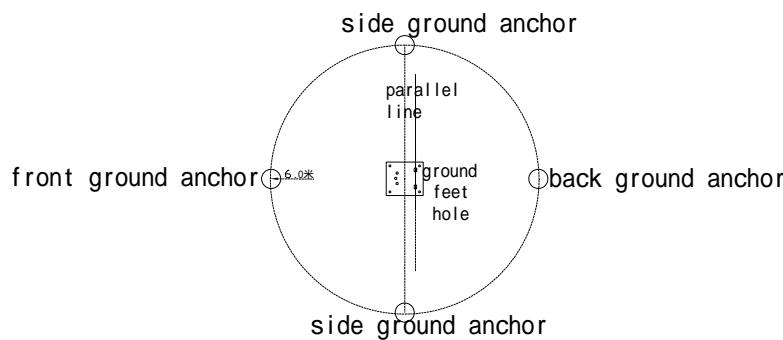
The choice of the location will greatly influence the use of wind turbine!

Step 2: the Layout of Tower Frame, Base and Fastened Anchor.

The position of tower base and fastened anchor is shown in the following chart. Three points need to be adverted:

- a) The base should be on the line between one anchor and the other end one.
- b) The line between two anchors should be parallel the line between two holes on the grounding feet.
- c) On the grounding feet, the side with three screws should near the frontal anchor.

Therefore, it would be able to guarantee the balanced tensile force produced among fastened tightwire and easy for final adjustment, which is closely related with successful erecting of tower. Besides, the height of anchor and the tower base should be in consistent. Any action against above rules will bring the bad results, such as too tight or too loose fastening pull, while over tight pull will incurvate the tower or even break it down.



Step 4: Concrete the Foundation of Base and Anchor

1. Dig the holes according to the last step layout. $0.8M \times 0.8M \times 1.6M$ for central base and $0.8 \times 0.8 \times 1.0M$ for four anchors.
2. C25 concrete should be used. Four anchor bolts will be installed according to the holes on the base and four annular anchors need to be deposited 60° — 80° along the base direction.
3. Finally, check the distance between the four hooks of the anchors and the center of the base (6M) and four anchors should be horizontal.

Step 5: Installation of Tower Base

Fix up the base on the prepared concrete seat by bolts.

Step 6: Assembly of Tower and Wind Turbine

1. Put the infrastructure of tower in the base, insert the axes to the base holes and lock it.
2. Connect the middle part and top part in turn; place it on the sawbuck when assembled.
3. Rip the cable of generator and dogvane into the tower and elicit it on the exit near the grounding feet.
4. Secure the gyro flange and the tower flange with bolts and sling it with chain blocks. **Please notice the axletree should be placed upside in order to set the leaves on it.**
5. Install the wind leaves, cover the press board and screw the bolts. Be careful not to be too tight. Screw them down according to the order shown on Figure 1, 2, 3,4,5,6.
6. Cover the dome.
7. Infix the above aviation connector plugs to the jack under the dogvane and set the dogvane up.

Attention: The installation of dogvane needs direction requirements and all five holes should be upside.

8. Fasten the tightwire on the tower. For the left and right side tightwires, connect them with side anchor directly by turnbuckles. While for the back one, fix it up with the anchor behind along the same length. Be sure that three tightwires won't be enwinded together and the frontal tightwire should be installed later.
9. Connect two assistant poles.
10. Select two thinner tightwires (about 9M) and fix them on the two ears of pole. Drill the frontal tightwire through the ears and put it in the up pulley and fix it up.
11. Infix the assistant poles to the tower by five to six people. Fix the tightwire through the ears on the two sides' anchors and fix them up.
12. Secure the pulley below to the frontal anchor. Fix one end of tightwire (length 30M, width 5MM) to the pulley on the assistant pole. Drill the other end to the pulley below and then through the both pulleys and finally fix it up on the retractor (tractor or chain blocks)

STEP 7: Erecting the Tower

1. Operate the tractor or chain blocks slowly.
2. In order to guarantee the safety, all staff should be away from the working spot (at least 20 meters away)
3. Drive the tractor slowly and the tower will stand up along the moving wire. Stop at each rising 15° and examine the tightwire's tensile force on both sides. Any over tight or loose wire should be regulated by putting down the tower slowly and adjusting the length of tightwire.
4. Go on pulling the wire until the tower stands upright. Put the rest wires through its anchor and fix it up.
5. Inspect and adjust the tension on each fixed tightwire. Over tight force may bend the tower while over loose force may cause the tower unstable and shakable. The perfect force is neither too loose nor too tight and can be adjusted through circumrotating the bolt. The appreciably flabby strain would be much safer than the over tight force.

Step 8: Collocation, Placement and Connection of Storage Battery

1. Storage battery should be emplaced in dry buildings with invariable room temperature.

The surrounding environment should open and ventilated. Confirm the total number of series-wound batteries and then design the shelf to store the batteries, controllers and invertors.

2. 20 sets of 200AH storage batteries would be recommended to match the FD6.4-5000W wind turbine.
3. Put the storage batteries in series. Connect the anode of first battery with the cathode of second one.
4. Coat all connection parts with grease or other antiseptic material. Fuse should be set on the anode of the battery to avoid electromagnetic disturbance. The connecting leading wire between the storage batteries and controllers should be less than 3 meters.

Step 9: Connecting controllers, Anemoscopes and Invertors

- a) On the controllers, the anode of terminals marked “connect storage batteries” should be connected with the anode of last battery while the cathode should be connected with the first one’s cathode end.
- b) There are two cables leading out from the head of generator. One is to test the wind direction signals, in which the aviation plug sticks into the matched socket directly. The other cable, which contains five wires, is to export the electricity and control the signals. Three thicker wires mark the output of generator and two thinner wires mark the export of controlled signals. All anodes and cathodes would be connected in the corresponding terminals behind the controllers.
- c) Anemoscope should be deposited on the roof or other exposed area and should be vertical to the ground.
- d) For the matched cable of anemoscope, one end could be inserted to the socket below the anemoscope and other end should be sticked into the relevant socket in the controllers.
- e) When connecting the invertors, it should be noticed that the import voltage of invertors should be equal to the value of series-wound voltage.
- f) The detailed parameters of invertors can be seen on the instruction manual.

Operation Instruction

1. The knob on the wind turbine panel should indicate the status of “automation” and “starting up”. Under the circumstances, the wind turbine will automatically track the wind direction when the wind speed is over 3M/S. It will also generate crosswind when the battery is full and automatically stop working when the wind speed is over operating limits.
2. When the wind speed is below 3M/S, the wind turbine is windward and certain power exported from the generator. We also expect power generate under the no-windward status, so if we set both “automatic drive” and “manual drive” to the later driver status and modulate “forward bias” or “backward bias” to reach the windward situation, and then change the machine to “automatic drive” again, the system will begin to generate the power.
3. When working in the areas where the wind direction is not stable at all, the wind turbine can be set on “manual drive” status. Therefore, “forward bias” or “backward bias” can be regulated to get with the wind and it won’t be stop automatically when the wind speed is too fast or the storage battery is full.
4. When there is no need for working, “automatic drive” and “manual drive” can be set on later status, so do the “starting-up” and “closing-down” buttons. The wind turbine will into

the wind by leaf apex and stop working automatically.

5. LCD screen reflects the voltage of the battery, electrification current and real time wind speed, it also shows alarm status for excessive wind speed, excessive voltage and short of voltage, going with the alarming sound and relative light indications. The alarm can be canceled by pushing “cancel” and “enter” buttons twice continuously.

6. The wind turbine system is composed of anemoscope, dogvane, generator and gyro assembly, tower, controllers and storage battery.

7. Anemoscope is to inspect the real time wind speed and confirm the “working status” and “non-working status” by SBC. Under the former status, the system will into the wind and generate the power automatically. While the later status can be again divided into two states: “no wind state” or “over wind speed state”. During the first state, the system enter into sleeping situation while under the second state, it will send out the leeway instruction and stop working. The over wind speed is scheduled to be 25M/S and resuming speed is 20 M/S when the equipments leave the factory.

8. Dogvane is to transfer the windward angle to the controllers. When receiving it, controllers will send the signals to the leeway generator and stop yawing.

9. Under normal working status, the system will check the voltage of the storage battery constantly. It will alarm when meet with excessive voltage or lack of voltage and make out the stop working indications in the former state. The excessive voltage alarming limit is set to be 300V, canceling alarming voltage limit 280V and the short of voltage limit 210V when they leave the factory.

Attention: Anemoscope must be installed in the wind turbine, otherwise the system can not work properly.

Maintenance of the System

1. Inspect the electrolyte of the battery periodically (inundating the plate electrode). Distilled water or electrolyte need to be supplied when there is some shortage.
2. Check the degree of tightness of the newly installed machine after working for one month. Fasten it when it becomes flexible.
3. Examine whether the cable contains stranded wire regularly. The first reason for the accident is the malfunction of the anemoscope, and the second reason is the broken cable between the anemoscope and the controllers.
4. **The tower can be put down in no wind weather.**