FIRST RENEWABLE ENERGY GROUP LIMTED

WM-1KW WIND TURBINE

Operation Manual

****Please read carefully before using it. ****

1. Application

The wind power generator is an equipment to convert wind energy into electric power which is changed into storage battery group. It can be widely used in rich wind areas but without normal energy supply from any power system .It is capable of providing power for lighting, TV, telecommunication equipment and so on.

2. Structure and Main performance

The unit is mainly composed of wind rotor, permanent magnet generator, tail vane, stand, electric controller, storage batteries, electric inverter, electric cable, etc. (Fig1)

Main technical performances

Rotor Diameter (m)	2.8
Material and number of the blades	Reinforced fibber glass*3
Rated power	1000
Rated wind speed (m/s)	9
Startup wind speed (m/s)	3
Working wind speed (m/s)	3–25
Survived wind speed	40
Rated rotate speed(r/min)	500
Working voltage	DC 48V
Generator style	Three phase, permanent magnet
Charging method	Constant voltage current saving
Speed regulation method	Tail turning and electric magnet
Stop method	Brake by hand drag
Tower height (m)	6
Weight (kg)(not including batteries and inverter power supplier)	175
Life time	20 years

3. Preparation

3.1 Filling in electrolyte and do initial charge according to technical regulations.

3.2 Unpack and check the machine parts.

3.3 Choose an open and flat place with no barriers around for wind turbine installation.

To avoid circuit power loses, should make the distance between wind turbine and batteries as short as possible, usually it should be less than 30m.

3.4 Foundation installation

3.41 Dig a cubic hole in the center of the ground with size of 40X40X40cm. Then dig four triangular pits at the place of A, B, C, and D, which are symmetrically 4 meters from the central hole in four directions. The diagonals of A-C and B-D vertically intersect at the center of square hole. The depth and side length are 70cm. (Fig 2)

3.42 Fix the 4 foundation bolts onto the base plate. Screw on the M16 nuts respectively until the top of bolt is 15mm out of nut. Let the axe of pin dead against BD or AC. The Base plate should be 4-5cm above the ground. Then adjust the base plate in level and concrete the cubic hole. The mixture ratio of concrete is cement: sand: cobble= 1:2:3.

3.43 Hold the top of chain, and put the anchor horizontally into the base of pit following the outboard side. Lay crushed stone (about 2~5kg) into the pits, then concrete them; Lay crushed stone into the pits and concretes them again. Repeat until cram the triangular pit. Finally draw the guy wires toward the ground center with an angle of 60-degree from the ground. Hold the chain，concrete the pit until the middle part of the top link, the other half is out of the concrete. (Fig 3)

3.44 The protection period of the concrete basement is 100 hours. During this period, don't install the wind turbines.

4. Installation procedure

4.1 Select a sunshine day without wind (wind speed smaller than 3m/s)

4.2 Adjust the Base plate in level, then put the washer onto the foundation bolt, fasten the nuts. Fit together the upper, middle, lower mast. Fall the mast on the "A" pit. Link the mast bottom to the base plate with Φ16 pin, then put on the washer and connects them with ringent pin.

4.3 Draw the guy wires in four directions. Bend the tip of the steel wire to a ferrule, the length of which is about 20cm. Then fasten it with two wire-clamps. Put the rings for guy wires onto the top of mast. Then close upon the four ferrules and thrill through the annulus of the ring respectively. Finally shove them to the outshoot of mast.

4.4 Put the heart ringer for steel wire across the "o" loop of turnbuckle, and then rip the steel wire into the heart ringer. Bend for a ferrule; no less than 30cm long, fasten with wire-clamps. Hook the turnbuckles of A, B and D pits to the chain of anchor. Draw back the mast, and then hook the turnbuckle and anchor chain. Adjust the length of steel wire through turnbuckles to plumb the mast. Install the stay bar to the lower mast，fix up it with M12 bolts. Untie "U" shape screw between anchor and turnbuckle of pit C. Connect the steel wire of C

pit and the top of stay bar and fasten it. Then adjust until the steel wire between stay bar and mast in strain state.

4.5 Put a 1m bracket into pit A. Loose the “U” shape screw buckle in pit B and pit D (About 5cm length). Untie the link of the “U” shape screw and the ground anchor chain in pit C. Fall down the mast slowly; support the steel wire pothook with20cm height stow-wood.

4.6 Insert the cable through the bottom to the top of the mast with a steel wire(¢2~3mm) and extend out about 20 to 50cm. Connect the 3 thrum of the cable (which derivative from the slip ring) with the terminal block.

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4.7 Install the generator onto the mast top through the sleeve. Fasten the screw.

4.8 Assemble the tail rod to the rotating body, setting the M10 holes correctly, insert the spring washer; screw the four M10X25 inner six angle nuts tightly. (FIG5)

4.9 There are two holes can be chosen on the trough shape clamp of the tail rod and two holes distributing on the two sides of the tail vane tie-in’s axes, whose diameter is 11. Insert the tie-in of tail vane into the trough shape clamp of the tail rod, insert M10X60 bolt into the ø11 holes correctly, put on washer10, spring washer 10 and M10 self-locked nuts, Adjust the tail rod angle against the level plane according to the local wind resources and electricity consumptions (it can be adjusted to four angles). Decrease the angle can increase the rotating speed of the rotor. Then insert the screw shaft into ø11, screw the adjusting bolt and nut (M10). After adjusting, tighten the two self-locked nuts. (See fig.6).

4.10 Before leaving the factory, every rotor had been assembled and passed the balance adjustment. For easy transport, the rotor had been disassembled. When reassembling the rotor, please check the marks on the parts, so as to make them return to the former positions, then fit the M10×80 screws, washers, M10 self-locked nuts one by one. Tighten the nuts with a small force first, then measuring the distances between the centre point to the tip end of blades a, b, c, the distance among the three sizes should less than 5mm, then tighten the nuts firmly. The tighten torque should be 40 – 45 N.m (see fig.7).

4.11 Assemble the blade-rotor on the axes of generator, put on the flat washer, spring washer one by one, and then screw the self-locked nut tightly。

4.12 Assemble the nose cone to the rotor hub with M6 screws, spring washers and flat washers.

4.13 Draw backs the mast through chain jack; connect the screw buckle of pit C to the anchor. Adjust the length of the screw buckle in four directions. Strain the steel wires to make the mast in its vertical position. Strain the steel wire until it can rebound lightly when gives a transverse force.

4.14 Check the wire block, screw buckle and all connecting point. Make sure it is safety. Then wrap and blocked them with galvanized wire. Put anticorrosive grease on wire block, screw buckle and all links where necessary.

4.15 The two connectors of battery is anode and cathode, connect them in series to be a group. Choose the lead whose sectional area is 6 square millimeters as connect wire. The wire of anode is marked by red color; and cathode is marked by black (or yellow, or blue). All connect point should fix up by splicing fitting to ensure electric conduction is good. In order to prevent acid corruptness of the splicing fitting and connecting pole, spread a layer of protection grease on them..

4.16 Connect the red wire of anode of the batteries to the anode pole of the controller or control-Inverter; then, connect the black wire of cathode of the batteries to the cathode pole the controller or control-Inverter. Connectors must be tightened firmly and ensure good electric conduction.

4.17 Connect the 3 output wires of the generator to the 3-connector poles of the controller or control-inverter respectively. During the process of connecting, the “open & close” switch on the controller or control-inverter box should keep on “close” position..

4.18 According to different requirements, there are two kinds of output: DC and AC. Please connect according to marks on the socket. Take care for safe operation when the output is AC220V.

5. Application notice

5.1 Application principles

5.1.1 Please read the specification carefully before using. Do not install or uninstall in windy day.

5.1.2 The off-grid wind turbine charges the batteries through controller or control-inverter. When there is no wind, it consumes the electricity from the battery group. Therefore, after discharging, the batteries should be recharged timely, especially for lead-acid batteries. If the batteries cannot be recharged timely after over discharging, the working life of the batteries will be reduced. So, the users should regulate the consuming of electricity according to local wind condition and the output of the wind generator.

5.1.3 After passing full wave bridge rectification, the 3-phase AC electricity generated by wind generator output DC voltage, and then charge the battery. The voltage of the battery group should be equal to the DC voltage of the wind generator (after rectification), so the enginery can exert its full efficiency. The input DC voltage of matched inverter should be equal to the working voltage of wind turbine.

5.1.4 The input DC voltage of the matched inverter should be equal with working voltage of the wind generator (after rectification).

5.2 Safety regulations

5.2.1 Forbidden the wind generator running without any load, or running at a very high rotating speed continually.

5.2.2 Checking the tower condition regularly, if there are any loosen phenomenon, it should be tighten immediately, so as to prevent the falling down of the wind turbine.

5.2.3 When running speed of the rotor is higher, people are forbidden to stay under the wind turbine.

5.2.4 When wind speed is more than 24 m/s, the wind turbine should be stopped artificially.

5.2.5 When vibration or strange noise is found during working, please stop the wind turbine and check the reasons.

5.2.6 The power supply line of the wind generator should be arranged independently, it can not be mixed used with other power supply lines. DC power supply is more safe and economic for illuminators; for home electric appliances, the AC power supply line (from inverter) should be used; it is suggested that the connector of the refrigerator should insert in the special plug seat with time lapse function

5.2.7. When connect the electric line of the wind generating system, the battery lines must be first connected to the controller & inverter box, then connect the three lines of the generator to the controller. When disconnect the electric line of the wind generating system, the three generator lines must be first disconnected from the controller, then disconnect the two lines of the battery group from the controller & inverter box.

5.2.8 The “open & close” switch on the controller & inverter box should keep at “open” position in normal conditions. Only when the batteries have been full charged or for protect the system against storm wind, the switch can be put on “close” position. It is not allowed to move the switch when wind is stronger and rotor is rotating at high speed, turning the switch to “close” position when rotor is rotating slowly.

5.2.9. The batteries should be set on a place where far from fare resource and heat resource, the gas generated from charging and discharging process should be easy go out of the room.

5.3.Keep the rotor balance, eliminate vibration

When the blades lost balance caused by outside damage and create strong vibration, the wind generator must be stopped and checked, until the trouble is eliminated. The attached special tools should be used for disassembling the rotor, remove the nut and washer from the axes end of generator first, screw the special sleeve onto the hub firmly, then drive the M16 × 30 screw into the sleeve, so as to remove the rotor from the shaft of the generator(see fig.8). After repairing, the un-balance torque should less than 0.02N.m.

6. The maintenance of the wind generator

The products are divided into two kinds: common product and high quality product (no maintenance), the common product need following maintenances regularly.

6.1. Checking, cleaning and lubricating all rotating parts one time per year.

6.2 Before rain season, cleaning outside and paint antirust grease on the surface of all fixed connecting parts once a year.

6.3 Lubricating and maintenance bearing of generator one time per operating year.

6.4. Cleaning, rust removing and painting all exposed parts one time per every two years.
The maintenance of high quality product (AA)
a. Exposed parts are made by stainless steel or have passed special long time effective rust-protection treatment, so the outside of those parts don't need maintenance.
b. The generator has adopted high grade bearings and high grade lithium grease, the bearings need to be checked after operating for 5 years, if it is necessary, add some grease to the bearings.

7. Elimination of breakdown

The wind generator is designed and manufactured according to trouble- free and non-maintenance principle, if the installation and operation are correct, the breakdown will not appear in normal conditions. In case of breakdown has happened, please consult following table.

Breakdown	reason	Eliminating method
Wind generator vibrating strongly	1. Pull rope of steel wire is loose. 2. Fixed bolts of blades are loose. 3. Blade is defective caused by outside force. 4. Ices over on the surface of blades, cause unbalance.	1. Tighten the steel wire rope appropriate. 2. Tighten the loose parts. 3. Replace a new one and adjust the rotor to balance state again. 4. Eliminating the attached ices.
Direction regulating is ineffective	1. There is too much greasy filth in the rotating body. Rotating part is deformed by outside force. 2. The clearance between vertical shaft and sleeve is too small, or there is no movable axial clearance.	1. Clearing away the dirty filth, and make a lubricating maintenance. 2. Recover and correct the deformation.
unusual noise	1. Fixed parts is loose 2. Generator bearing is damaged 3. Wind rotor is rubbing with other part.	1. Put the wind turbine down to the ground, check every fixed part, and take measures. 2. Replace the damaged bearing. 3. Checking and eliminating the trouble.

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The rotating speed of the wind rotor is reduced obviously	1. Blade pitch control is ineffective. 2. Stator winding is short –circuit or output circuit is short pass. 3. Break disk is rubbing. 4. Switch is set at “close” position:	1. Checking and eliminating the trouble, then making lubrication and maintenance. 2. Find out short circuit position, split the lines and isolate them.. 3. Readjust the break gap. 4. Set switch at “open” position.
The output voltage of the generator is low	1. The rotating speed of the generator is low. 2. Permanent magnet rotor has lost its magnet. 3. The conductivity of connect point between slip ring and output circuit is weak. 4. There is short circuit in rectifier. 5. Circuit line of low voltage electricity transmit is too long, or the diameter of wire is too thin.	1. Finding out the reason, restoring to normal rotating speed. 2. Charging magnet, or change the rotor of generator. 3. Cleaning slip ring and contact point, so as to reduce resistance. 4. Replace. 5. Shortening the circuit line or increase the diameter of the wires, so as to reduce circuit electricity loss.
There are not output electric current in AC circuit of the Generator	1. There are circuit break in AC lines of the generator, or the fuse is fused. 2. There are circuit break in output line. 3. Stator winding is burnt, circuit is broken.	1. Find out the reason, and connect the wires. 2. Find out the break point, then connect the wires. 3. Disassemble, then repair and recover it
AC output is in normal condition, but there is not DC output current	1. DC fuse is fused. 2. Output circuit is broken.	1. Replace. 2. Find out the break point and connect the wires.
Output capacity of the batteries is insufficient	1. Output voltage of the generator is too low, or electricity is generated at all. 2. The connector of the battery is corroded by acid, conductivity is weak. 3. Battery is failure	1. Checking and eliminating the trouble. 2. Cleaning the connectors, enable them have a good contact and tighten the connectors. 3. Replace the damaged battery

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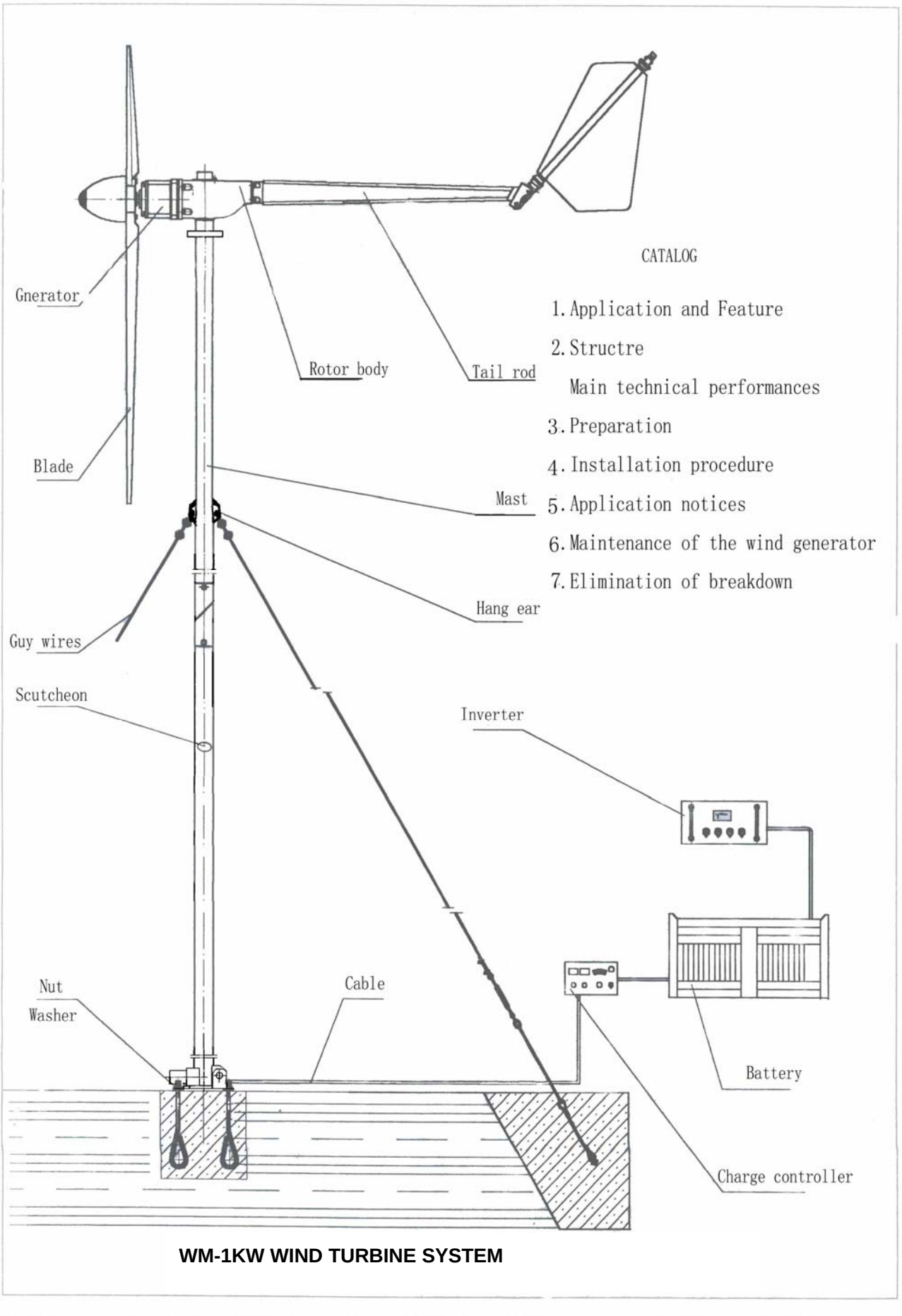

CATALOG

WM-1KW WIND TURBINE SYSTEM

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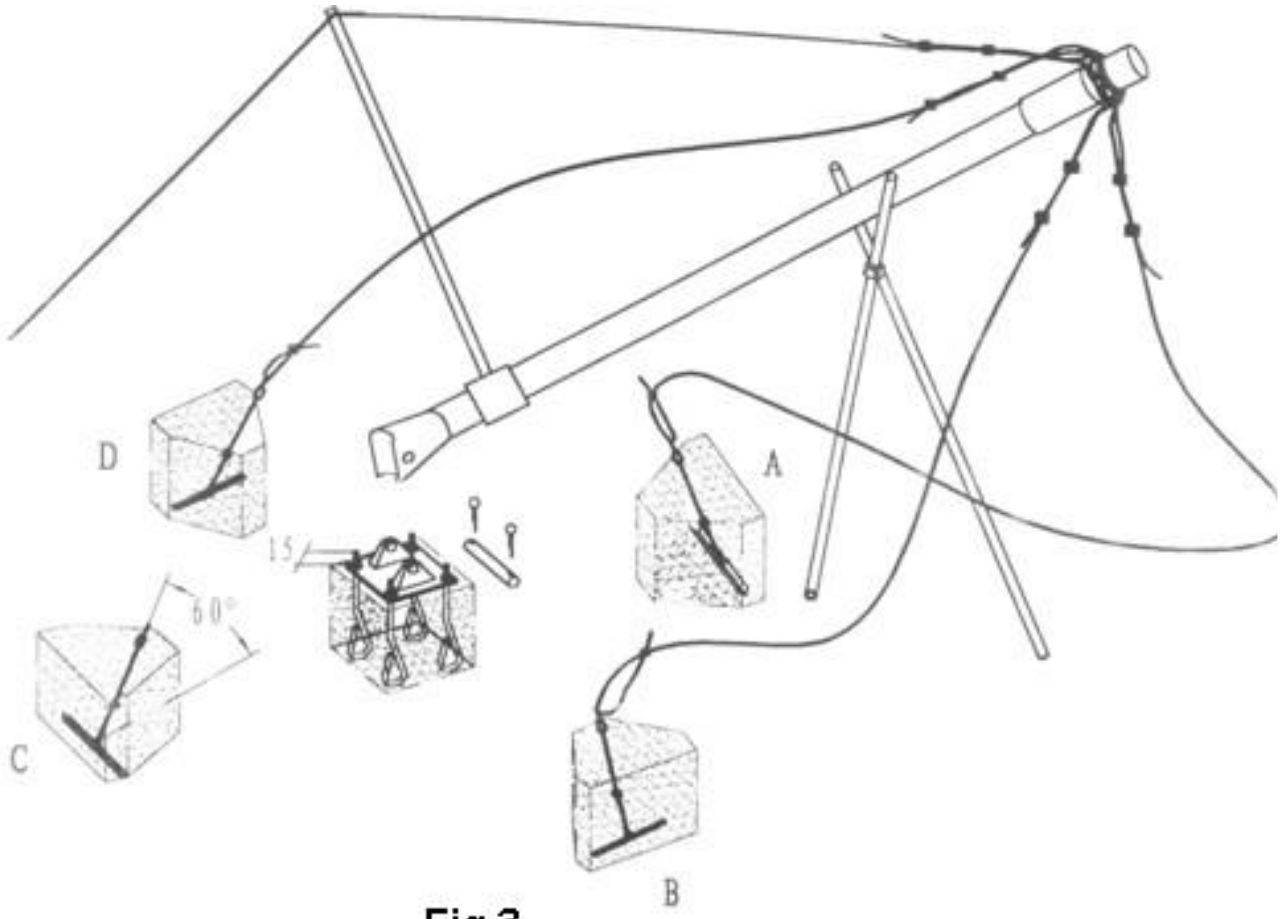

Fig 3

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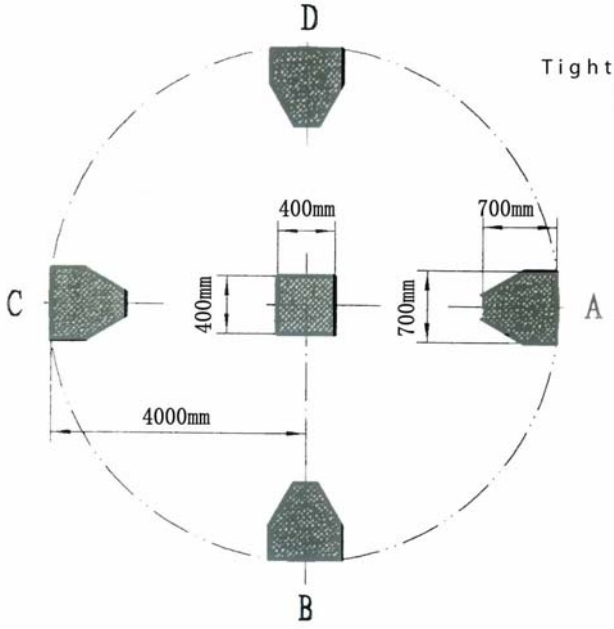

Fig 2.

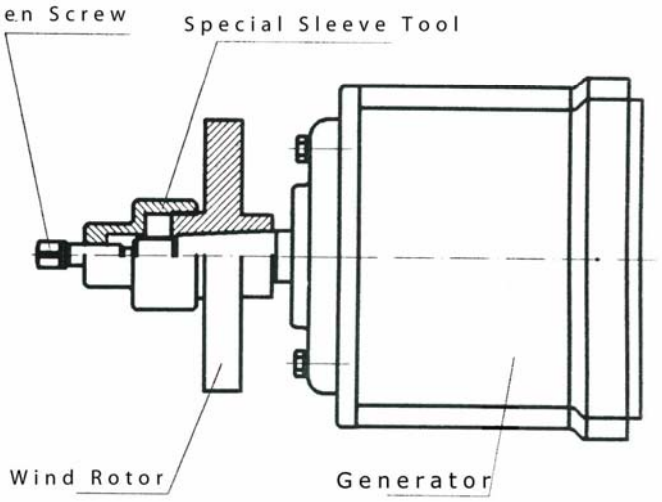

Fig 8.

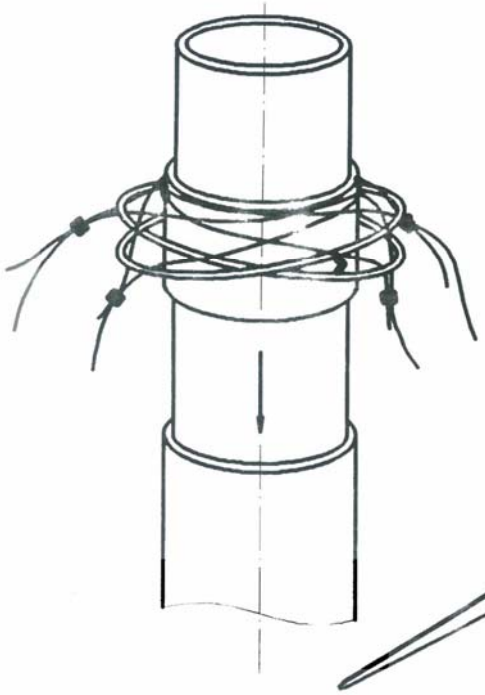

Fig 4.

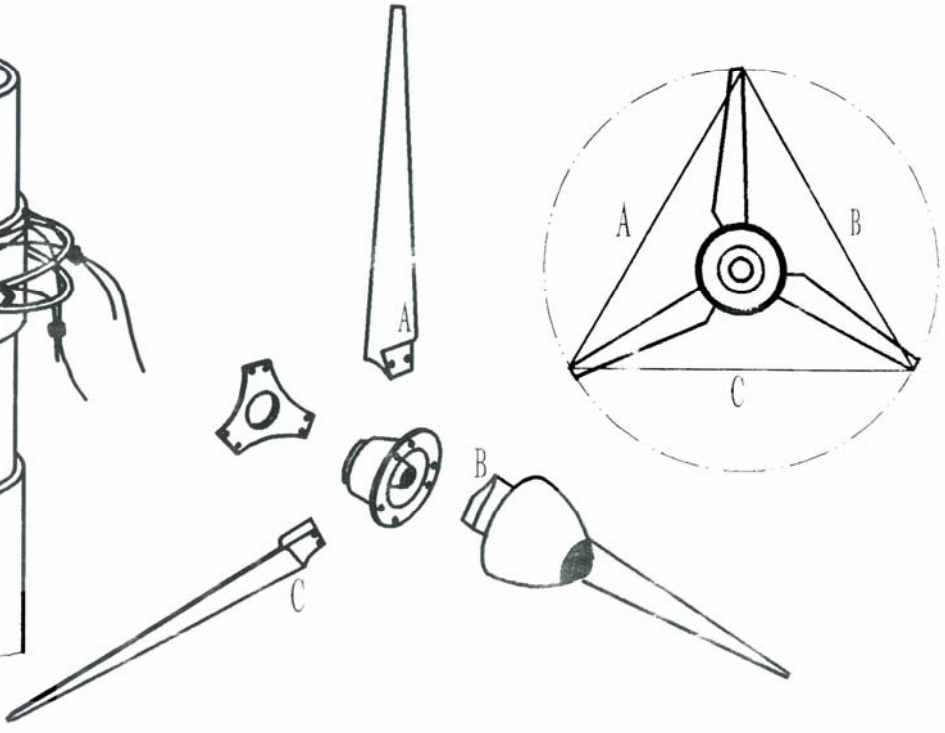

Fig 7.

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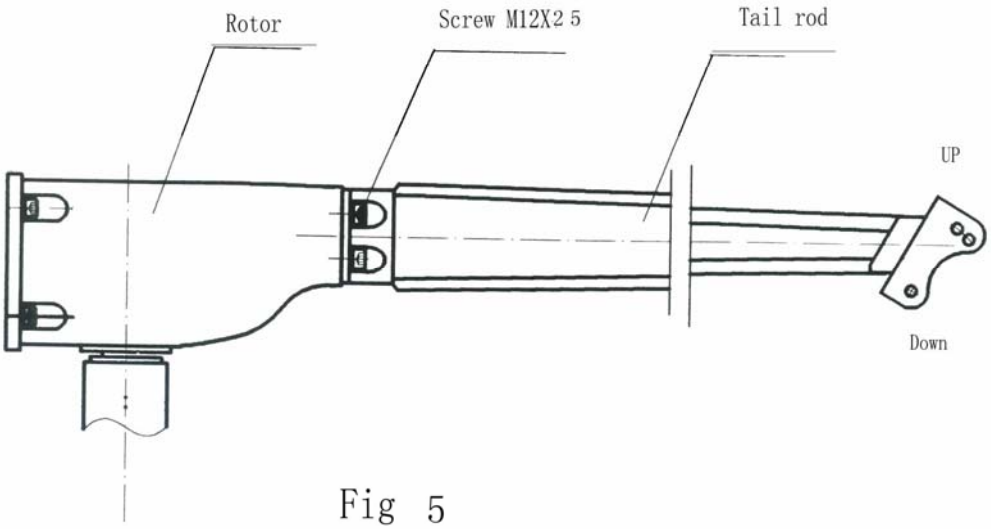
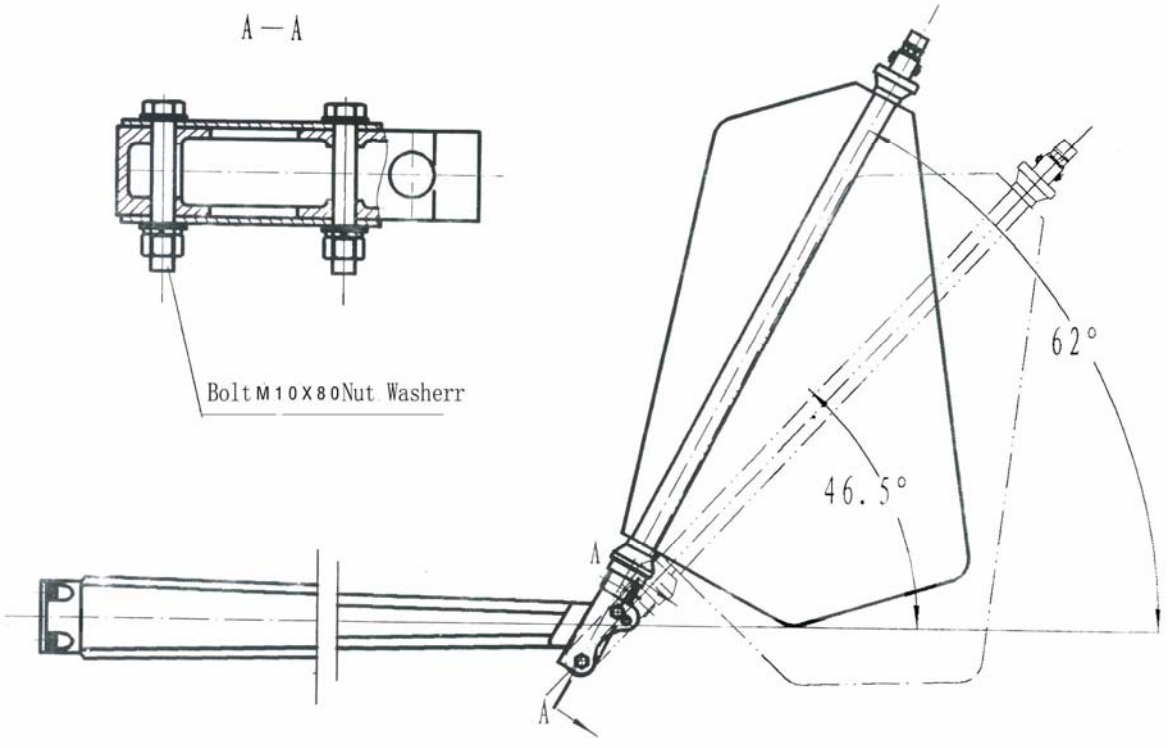


Fig 5



Four angle position (46.5° 、 50° 、 58.5° 、 62°)

Fig 6 Tail vane

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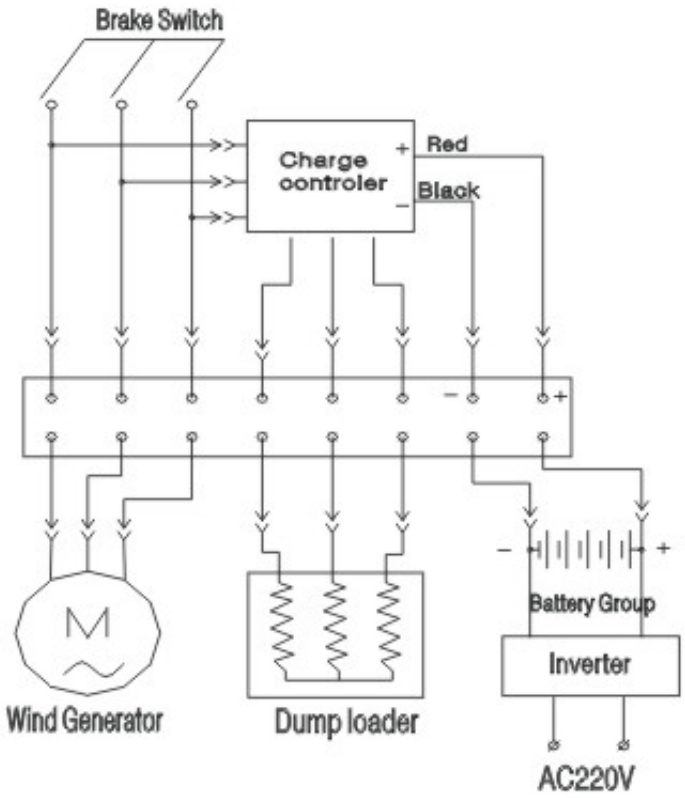

WM-1KW WIND TURBINE WIRING DRAWING