HM3.2-2000 WIND TURBINE

Operation Manual

GRADE-AAA

****Please read the manual carefully before using ****

1. The aim of Application

Use wind energy to generate electricity and charge into storage battery group. Through the multi-voltages power supply system, the electricity can be changed into DC and AC used for illumination, home appliances, communication devices and electric tools.

2. Structure and Main technical performances

The unit is mainly composed of blades rotor, rotor, permanent magnet generator, tail vane, tower, charging controller, storage batteries, inverter, electric cable, etc. (See fig.1).

Main technical performances:

Rotor Diameter (m)	3.2
Material of the blades & Number of blades	FRB 3PCs
Rated power/Max power (w)	2000/2800
Rated rotate speed (r/min)	400
Rated wind speed (m/s)	8
Starting wind speed (m/s)	2.5
Working wind speed (m/s)	3 –30
Survived wind speed	50
Working voltage	DC24V/48V/120V/240V/300V
Generator style	Three phase, Permanent magnet A.C
Tower height (m)	9
Weight (kg)(exclude batteries and inverter)	88
Speed regulation method	Yaw
Stop method	Auto brake

3. Preparation

3.1 Prepare batteries, filling in battery water and do initial charging according to technical regulations.

3.2 Check the machine parts according to packing list.

3.3 Select an open and flat place without barriers in surroundings for wind turbine installation. In order to avoid circuit power loses, the distance between wind turbine and batteries should be as short as possible, usually it should be less than 30m.

3.4 Dig a hole which is 800mm in diameter and 2000 –2500mm in depth. Put the base framework, the orientation plate and 8 ground bolts into the hole (See fig.2 and fig.3)

The length of the ground bolts screw on the breechblock should be 42~45mm. The orientation plate should be set horizontally and 100mm higher than the ground.

3.5 The proportion of Concrete mixture is cement: sand: cobble = 1: 2.2: 3.5. To adjust the horizontal position of the orientation plate, please don't let the concrete cover the M24 screw thread pole.

3.6 Protection period of the concrete foundation is 100 hours usually, within this period, please don't install the wind turbines.

4. Installation procedure

4.1 Select a day without wind or wind speed smaller than light breeze.

4.2 First insert the electric cable into the tower tube from its bottom end, and pull the cable out from the top of the tube for about 200mm. Then make a temporary knot. Tie a 6m long and Φ10mm rope on the loop at the top end of the tower mast.

4.3 Make a 4m high tripod upon the foundation; lift the tower mast up by means of a hand pull chain-pulley lift. At this time, the tower mast should aim at the foundation plate, make the four **ø** 24 holes on the bottom of the tower fit with the four M24 thread hole of the foundation plate, insert **ø**24 spring washer and **ø** 24 plate washer, screw on the four M24 screws, to make the tower mast fixed with foundation plate firmly.

4.4 Prepare a 1.5m high platform (or a support frame), by pulling the rope on the tower mast to make the tower mast incline to the platform then tie the tower mast with the platform (or support frame) together (See fig.4).

4.5 Lift the generator with rotor body onto the platform, connect the cable which is out from the top end of the tower mast with the connecter on the electric transmit slip ring, then set the sleeve of the stand shaft into the top tower mast and fixed them together firmly by four sets of M10 screws, spring washers and nuts.

4.6 According to the show on fig.5, assemble the tail rod to the rotor body, set the M10 holes correctly, insert the spring washer and screw on the four M10**×**40 inner hexangular nuts tightly.

4.7 Insert the tie-in of tail vane into the trough shape fastener of the tail rod; insert M12x70 screws into the 2-ø12 holes correctly; put in washer12, spring washer 12 and M12 self-locked nuts. Adjust the angle between tail rod and the horizontal according to the local wind resources and electricity consumptions. Increasing the angle can reduce the running speed of the rotor; decreasing the angle can increase the rotating speed of the rotor. After adjusting, tighten the two self-locked nuts (See fig.6).

4.8 Before leaving the factory, every rotor had been assembled and passed the balance adjustment, for transport, the rotor has 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, and M10 self-locked nuts one by one. Tighten the nuts with a small force first, then measuring the distances between the tip end of blades A, B, C, the distance differences of the three should less than 5mm, then tighten the nuts firmly. The tighten torque should be 30 – 35 N.m (See fig.7).

4.9 Mount the rotor on the generator, put on the flat washer, spring washer one by one, and then tighten the self-locked nut firmly.

4.10 Fix the nose cone to the hub of the rotor by screwing on M6 screws, spring washers and flat washers.

4.11 Make the tower mast in its vertical position by means of hand pull chain-pulley lift or matching winch (select by users), put the bottom of the tower to its position (another 4 ø 24 holes fit with the left 4 of the M24 thread of the foundation plate) put on spring washer and flat washer one by one, tighten 4 pieces of M24 screws and nuts, tighten the screws M16×100 in both sides and tighten M24 nut of the tower pin.

4.12 Make the tower mast to upright by adjusting the screw thread pole of the bolts on the foundation plate. Tighten all the M24 bolts, concrete to fill the gap, mend the foundation. In order to fall down the tower again, the foundation platform should be a little lower than the flange of the tower mast.

4.13 The batteries should be serially connected to a group, two ends connectors are “+” pole and “**-**” pole respectively. The input & out put wires of the battery group and connecting wire between batteries should be 6mm², “+”pole is marked by red color and “-”pole is marked by black (or yellow, or blue) color. All connecting place should use wire connecting clips to ensure the connection is firm and electricity can transit easily. In order to prevent the connecting clips from being eroded by acid, a layer of protection grease should be daubed on them.

4.14 Connect the wire of red “+” pole of the batteries with the “+” pole connector of the electric controller & Inverter box; then, connect the wire of black “-” pole of the batteries with the “-” pole connector of the electric controller & Inverter box. Make sure the connecting place is firmly and electricity can transmit well.

4.15 Connect the three phase output wires of the generator to the connectors of the electric controller & Inverter box respectively.

4.16 According to the different demands of the users, there are two kinds of arrangements for electric box: a) DC output; b) AC output. Please follow the marks on the box to connect with the appliances. Please take

care for safe operation when using the AC220 output,

5. Application notices

5.1 Application principles

5.1.1 The wind turbine should be installed in an open and flat area, where no barriers nearby and wind can flow easy.

5.1.2 Electricity generated from off – grid wind turbine is been used after the storage in the batteries group. When there is no wind, it consumes the electricity of the batteries; when there is sufficient wind, the generator will generate electricity and charge the batteries. Therefore, after discharging, the batteries should be recharged timely, especially for lead-acid batteries. During the application, over discharging, over charging or after over discharging, the batteries cannot be recharged timely, the working life of the batteries will be reduced in above conditions. So, the users should regulate the consuming of the electricity according to local wind condition and the electricity capacity generated by the wind generator.

5.1.3 After passing full wave bridge rectification, The three phase AC electricity generated by wind generator is transit out as DC power, usually are DC24V/DC36V/DC48V/DC120V, in order to exert the efficiency of the system, the voltage of the battery group should be equal to the DC voltage of the wind generator (after rectification).

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 The wind generator is not allowed to rotate unloaded continually 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 in good time to prevent the wind turbine from falling down.

5.2.3 When the rotor is rotating in a high speed, people are not allowed 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 noises are found during the operation, please stop the wind turbine and check.

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 which has the function of time lapse.

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 & inverter box. When disconnect the electric line of the wind generating system, the three generator lines must be first disconnected from the controller & inverter box, then disconnect the two lines of the battery group from the controller & inverter box (See fig.9).

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 protecting the system against storm wind, the switch can be put on “close” position. It is not allowed to turn the switch when wind is stronger and rotor is rotating at high speed. Turn the switch to “close” position when rotor is rotating slowly.

5.2.9. The batteries should be set on a place which is far from fire or heat resource, the gas generated from the charging and discharging process should be expelled from the room.

5.3. Keep the rotor in balance and 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 would be useful for disassembling the rotor. Remove the nut and washer from the shaft end of generator first, screw the

special tool sleeve onto the hub firmly, and then drive the M16×100 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. Check, clean and lubricate all the rotating parts annually.

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

6.3. Lubricate and maintain bearing of generator one time per operating year.

6.4. Clean, remove the rust and paint all exposed parts one time every two years.

The maintenance of high quality product (AAA)

a. Exposed parts are made of stainless steel or have been treated by special long time effective rust-protection treatment, so the surfaces of those parts do not 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 malfunction

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, please consult the following table.

Breakdown	Reason	Eliminating method
Wind generator vibrating strongly	1. Guy wire is loose. 2. Fixed bolts of blades are loose. 3. Blade is damaged by outside force. 4. Ices over on the surface of blades, and cause unbalance.	1. Tighten the steel wire rope appropriately. 2. Tighten the loose parts. 3. Replace a new one and adjust the rotor to balance state again. 4. Eliminate the attached ices.
Direction regulating is ineffective	1. There is too much greasy filth in the rotating body. 2. Rotating part is deformed by outside force. 3. The interspaces between vertical shaft and sleeve are too small, or there is no space for axial move.	1. Clear away the dirty filth, and make a lubricating maintenance. 2. Recover and correct the deformation. 3. Repair and enable the interspaces meet the requirement.
Unusual noise	1. Fixed parts is loose 2. Generator bearing is loose from its seat. 3. Generator bearing is damaged	1. Put the wind turbine down to the ground, check every fixed part, and take measures. 2. Find out the loose place, then repair

	4. Wind rotor is rubbing with other part.	and eliminate the trouble. 3. Replace the damaged bearing. 4. Check and eliminate the trouble.
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. Check and eliminate the trouble, then make lubrication and maintenance. 2. Find out short circuit position, separate 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. There is short circuit in three-phase stator winding. 4. The conductivity of the connect point between slip ring and output circuit is weak. 5. There is short circuit in rectifier. 6. Circuit line is too long, or the diameter of wire is too thin.	1. Find out the reason, restoring to normal rotating speed. 2. Charge magnet, or change the rotor of generator. 3. Find out short circuit position, separate the lines and paint insulating lacquer. 4. Clean slip ring and contacting point, so as to reduce resistance. 5. Replace. 6. Shorten 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 and circuit is broken.	1. Find out the reason, and connect the wires. 2. Find out the beak 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. DC output circuit is broken. 3. Rectifier is damaged.	1. Replace. 2. Find out the beak point then connect the wires. 3. Replace.
Output capacity of the batteries are 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 and the conductivity is weak. 3. Battery is failure	1. Check and eliminate the trouble. 2. Clean the connectors, enable them have a good contact and tighten the connectors. 3. Replace the damaged battery

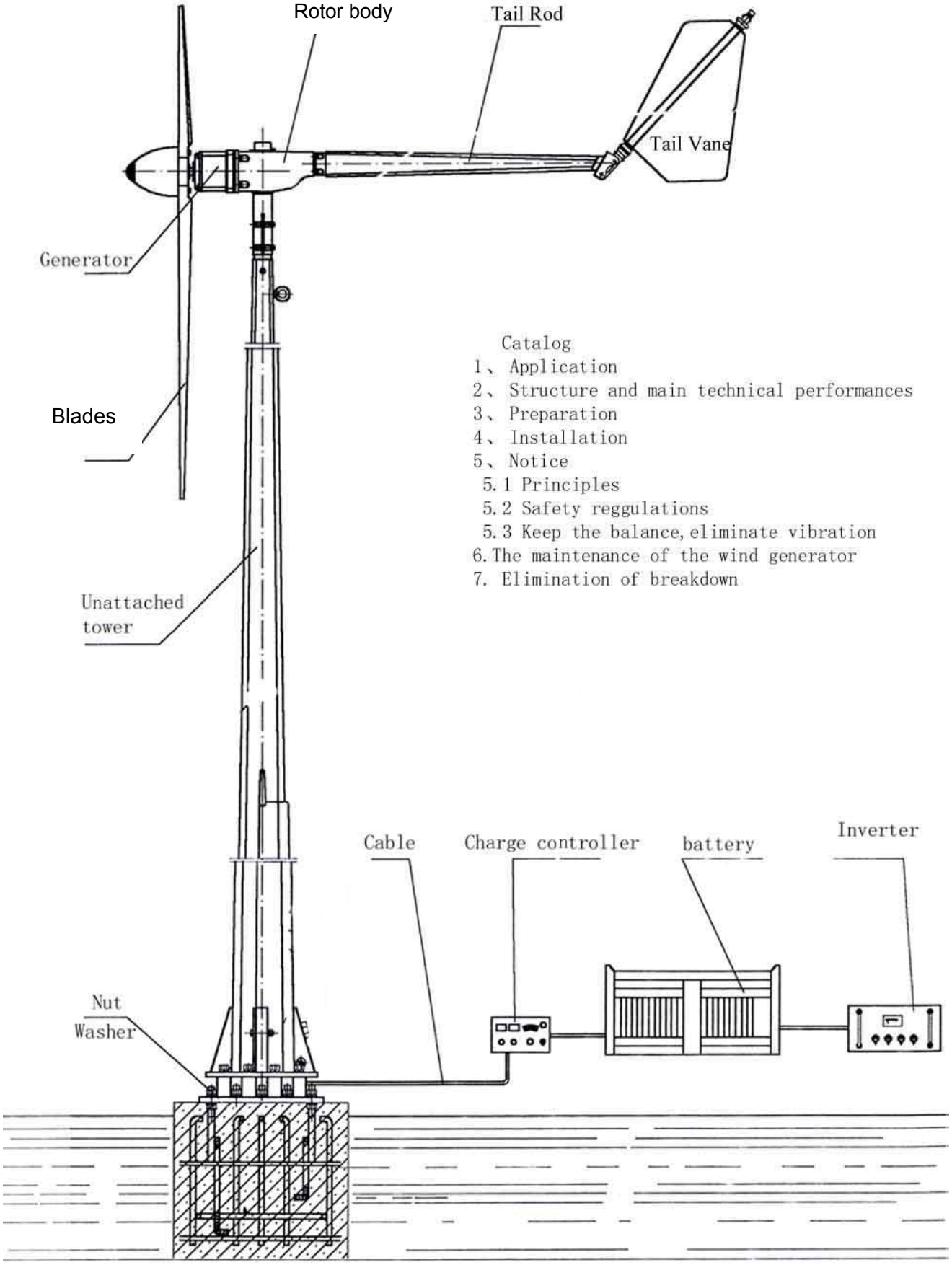
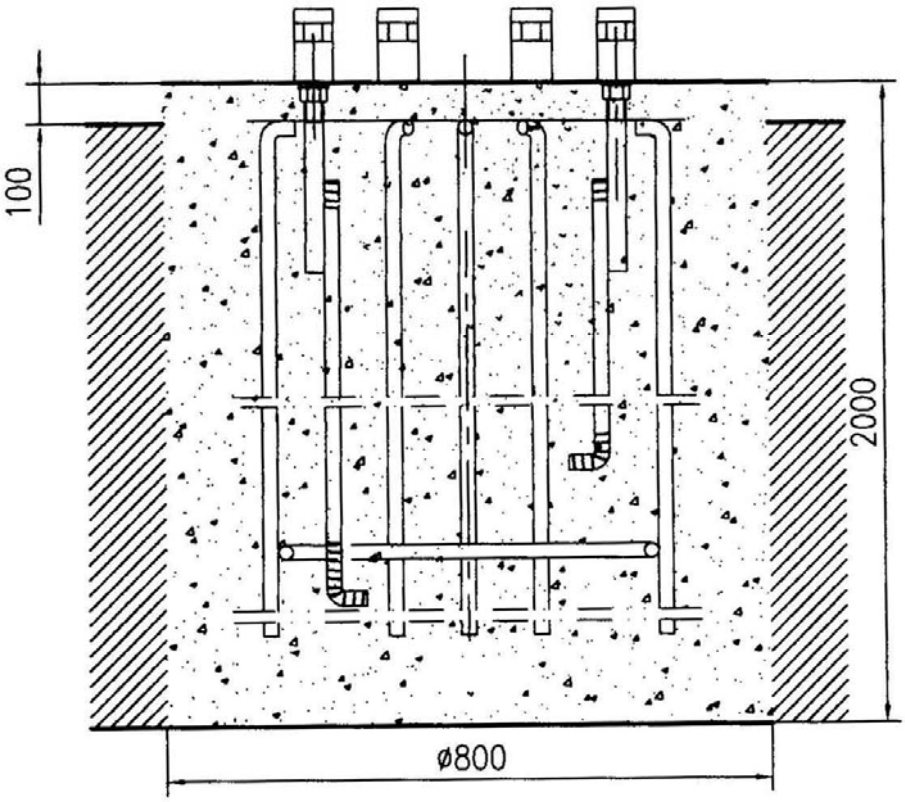


Fig.1 2kw Wind Turbine Off-grid Working System

Tridimensional Cutaway View



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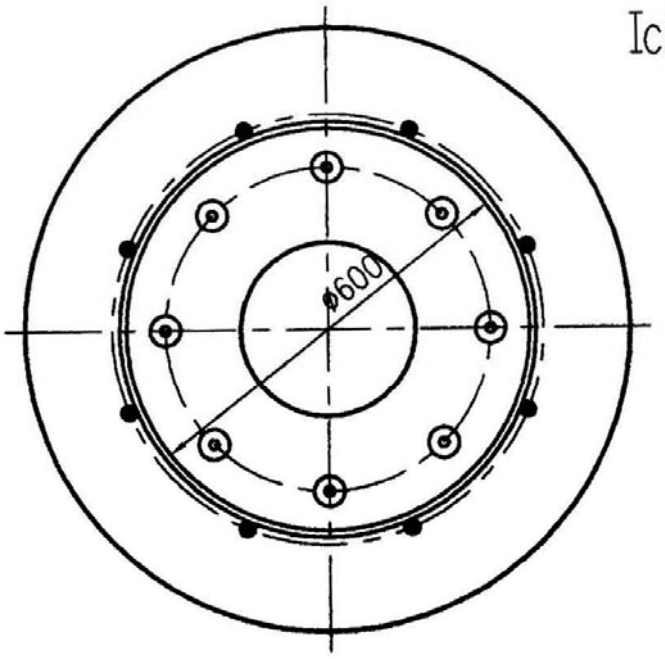
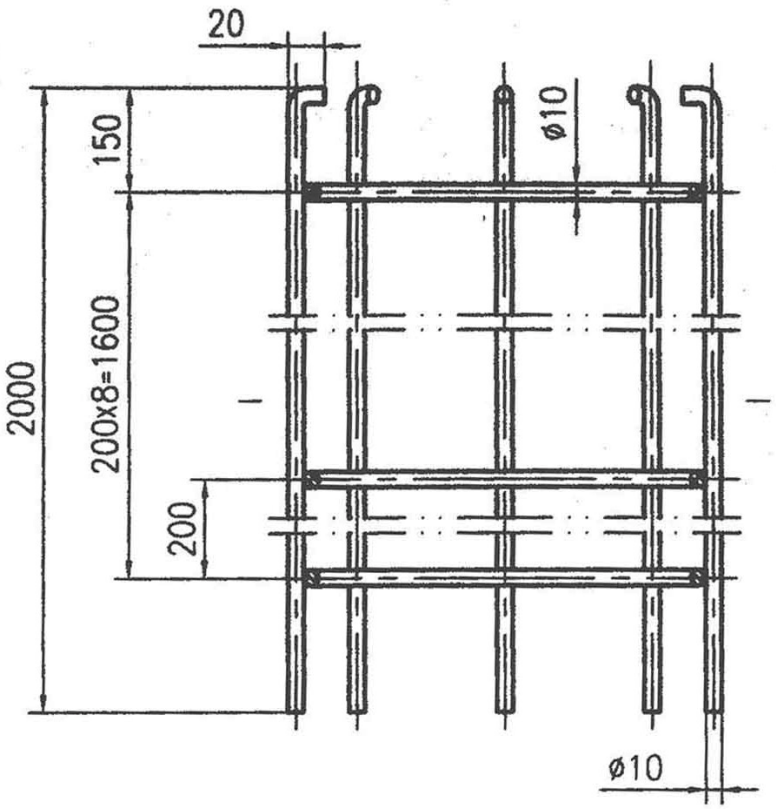


Fig.2 Fundation Drawing



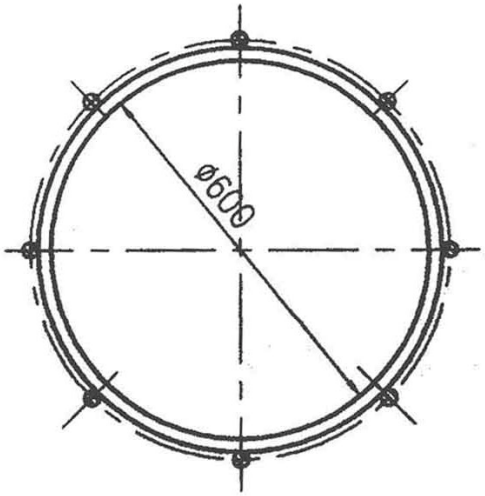


Fig.3 Fundation Framework

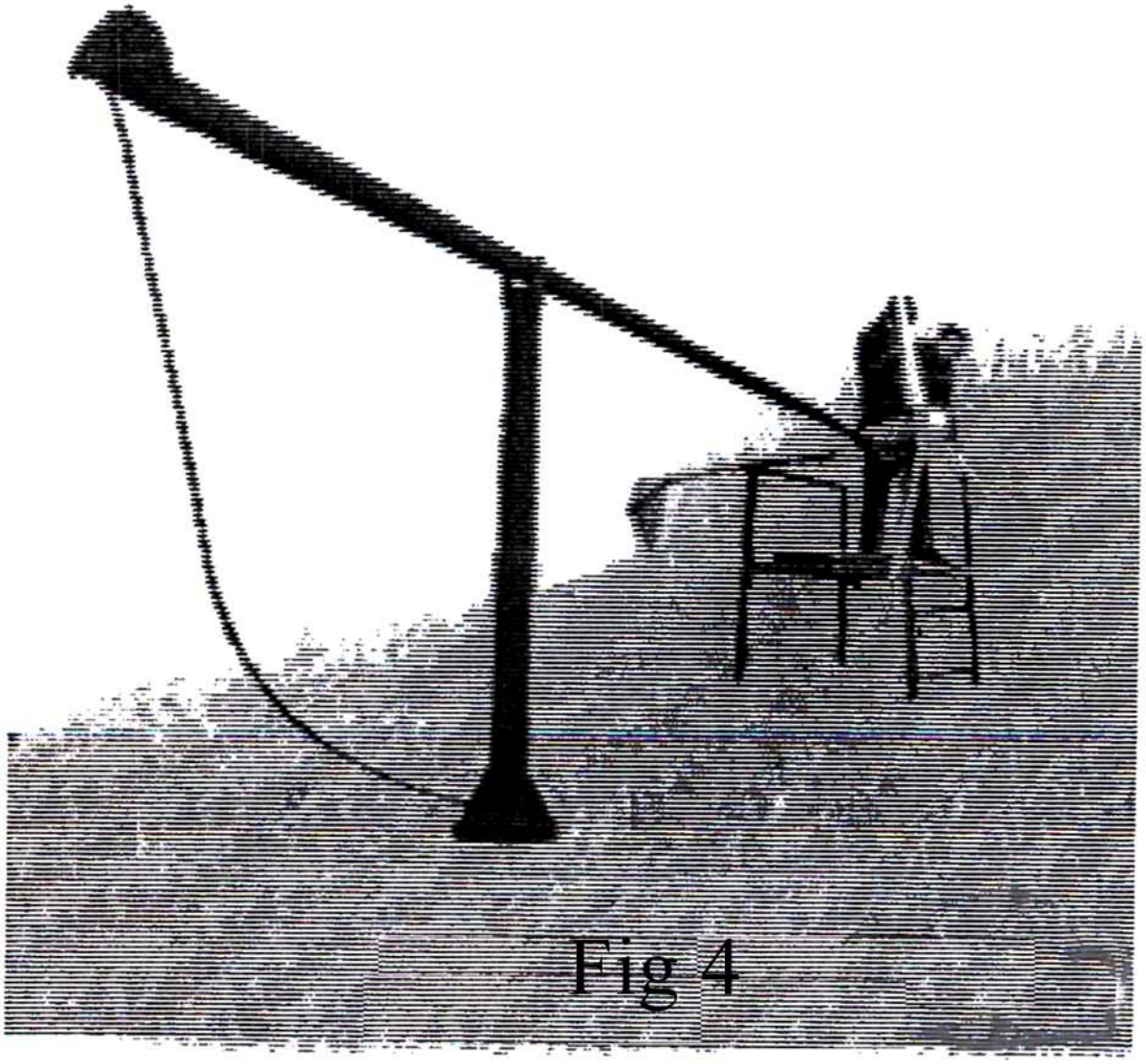


Fig 4

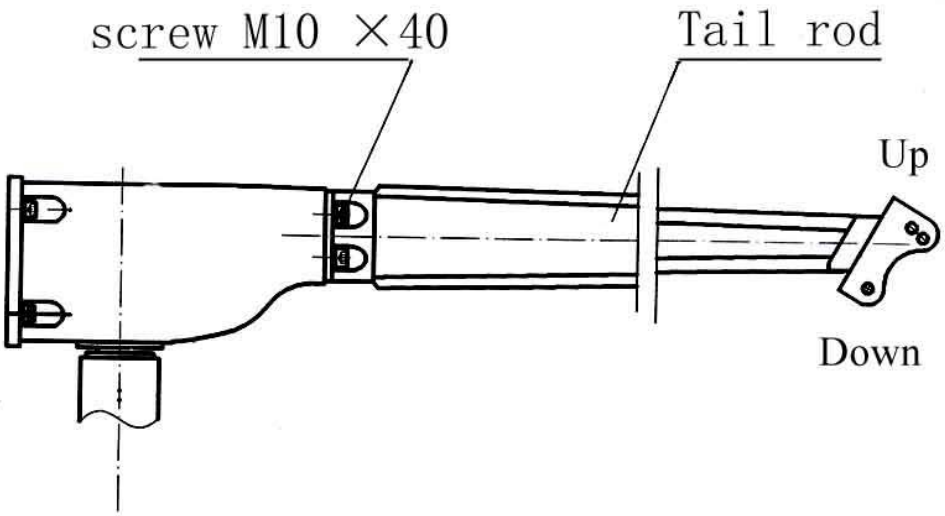


Fig.5 Tail rod

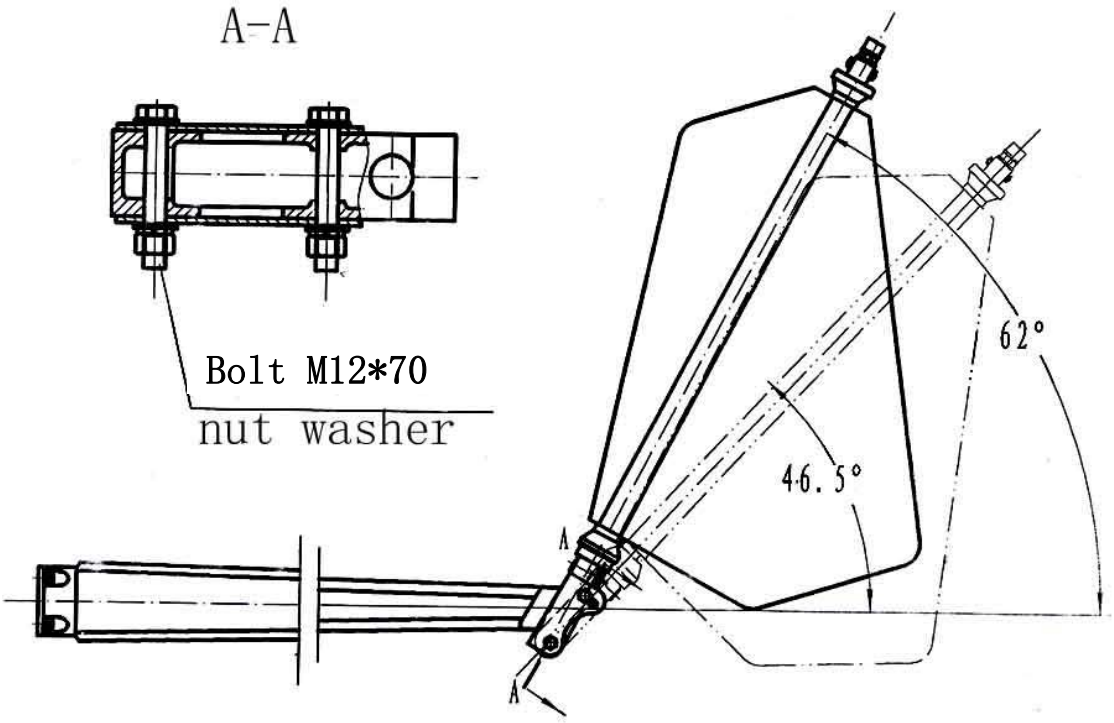


Fig.6 Tail Vane

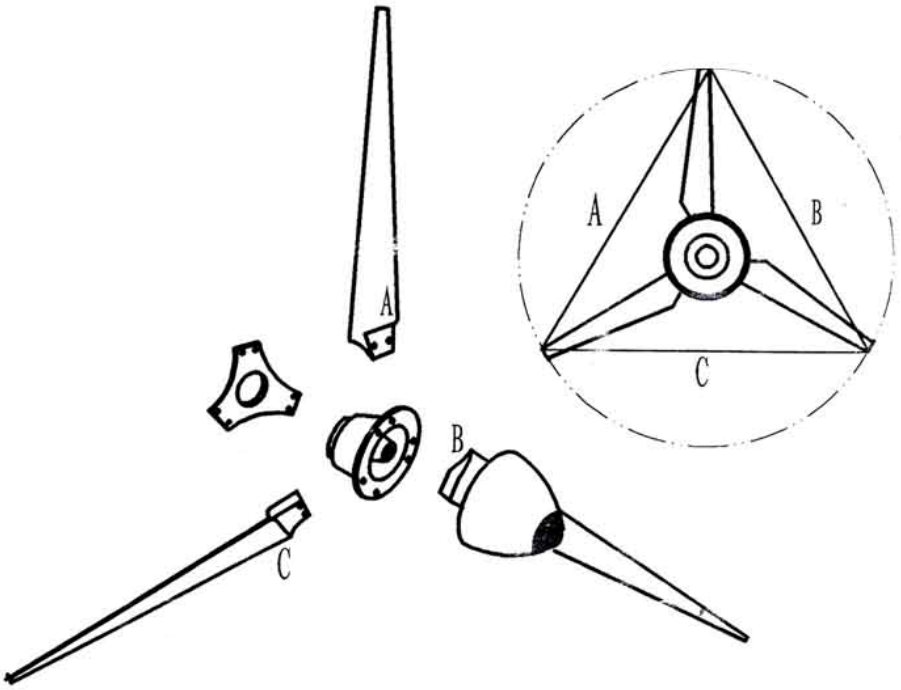


Fig.7 wind Rotor

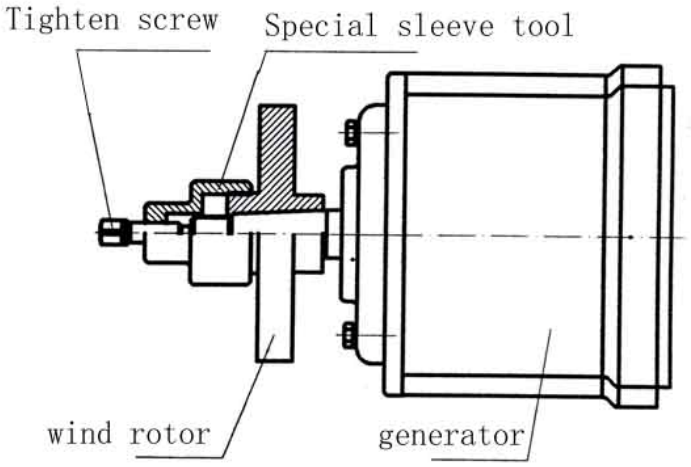


Fig.8 Disassembling of the Rotor

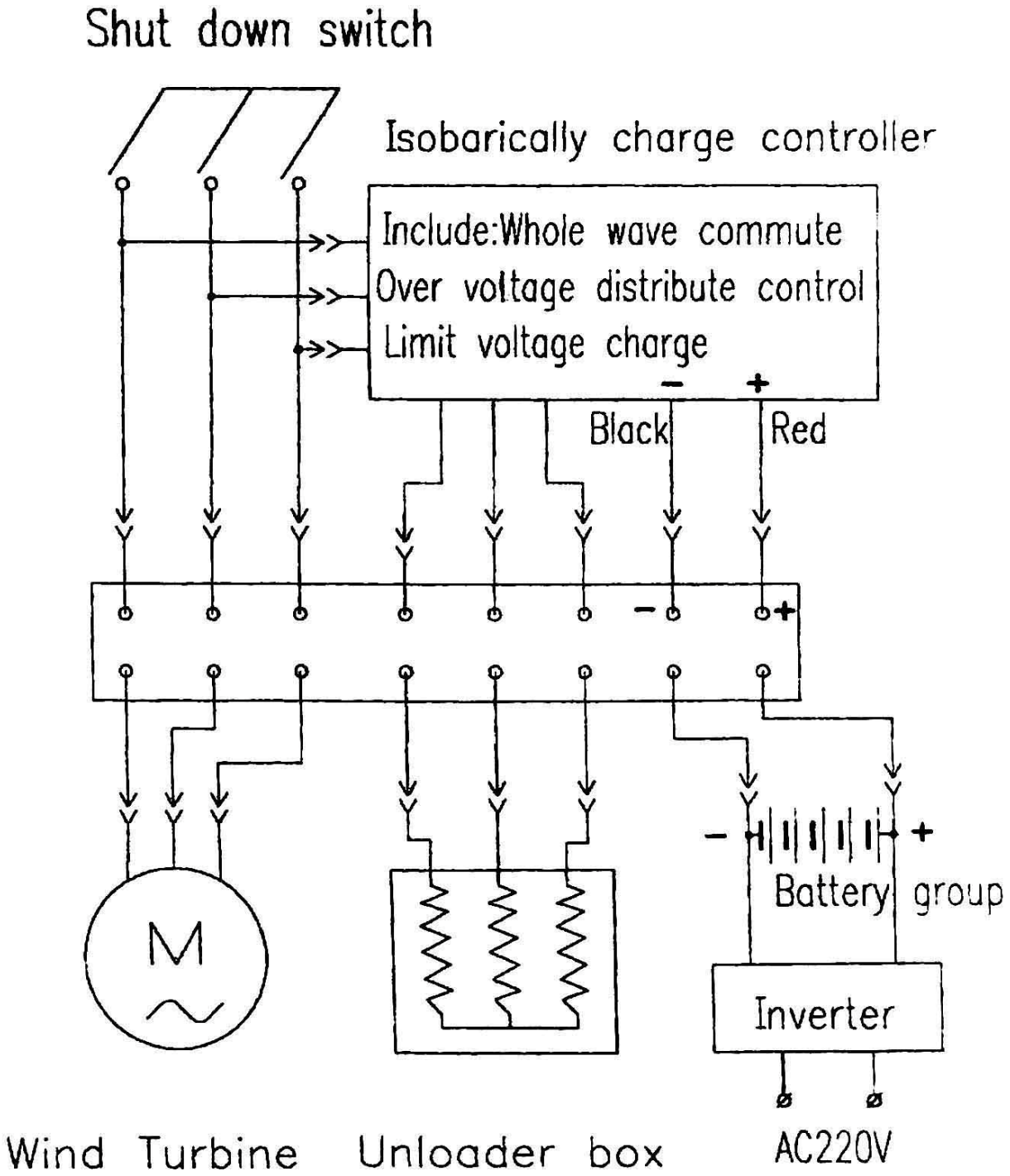


Fig. 9 wiring diagram