API 5kW HAWT

5000 WIND TURBINE

Operation Manual

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

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1. Application

Wind energy is used to generate electricity. API Wind turbines are designed for battery charging or grid tie. API wind turbine controllers are designed for coupling the wind turbine to battery banks or Inverters that are designed for coupling to the local Utility grid.

2. Turbine description

The API HAWT system is composed of (turbine) blades, rotor, generator, tail vane, tower, (system) controller, battery bank, inverter or grid tie inverter. (Fig.1).

Main technical specifications:

Rotor Diameter (m)	5
Material and number of blades	FRB & 3pcs
Rated power/Max power (w)	5000/7500
Rated rotate speed (r/min)	240
Rated wind speed (m/s)	8
Starting wind speed (m/s)	3
Working wind speed (m/s)	4 –30
Survived wind speed (m/s)	40
Working voltage	48V DC (off grid) OR 240 AC (grid tied)
Generator style	Three phase, Permanent magnet A.C
Tower height (m)	8
Weight (kg)(exclude batteries and inverter)	380
Speed regulation method	Yaw

3. Preparation

3.1 If your API wind turbine system is for off grid or stand alone power and has batteries please make sure they are filled with electrolyte and charged. Make sure battery bank is proper voltage, size and type for your wind turbine. 24vdc battery banks should be at least 500 to 1000 amp hour. 48 vdc battery banks should be at least 250-500 amp hours. High wind areas usually require larger battery banks to accommodate the higher power production.

3.2 Upon receipt of wind turbine check the parts with the packing list. Also check all parts for freight damage. If any damage is noted contact your freight carrier immediately or call Advance Power for instructions.

3.3 Site selection is critical for optimum wind turbine performance. An open, flat area without obstructions is optimum for installation. Distances between turbine and point of coupling should be kept to a minimum to avoid wire power losses.

3.4 Dig a hole which is 800mm in diameter and 2000 –2500mm in depth. Build a rebar cage and framework. Never use footings without rebar framework in the cement foundation and footings. Place the orientation plate and 8 foundation bolts into the hole (see fig.2 and fig.3)

The length of the foundation bolts screw on the breechblock should be 42~45mm. Set the

orientation plate level and should be 100mm higher than the level plane.
3.5 Concrete mixture ratio is cement: sand: cobble = 1: 2.2: 3.5. When pouring cement, cover foundation bolts and nuts to protect them from the cement.
3.6 Cover and cure the concrete foundation for at least 15 days. Do not install turbine until concrete cures.

4. Installation procedure

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

4.2 Insert the electric cable into the bottom of the tower. Pull the cable out of the top end of the tower about 200mm. Temporarily strain relief or attach the wire securely. Route brake cable from bottom of tower to tower top flange.

4.3 Align turbine head with tail assembly, next to tower top flange. Attach turbine output wires to the wires previously run up the inside of the tower. It is highly recommended to use a terminal block of high quality. Be sure to strain relief wires to avoid pulling weight on the cables, terminal block and wind turbine output wires. Attach cable to brake assembly.

4.4 Attach wind turbine head with tail assembly onto top flange of the tower. Be careful not to pinch wires or brake cable. Align turbine holes with tower top flange holes and insert bolts, washers and nuts. Tighten to appropriate torque. Be sure to tighten bolts and nuts evenly choosing bolts and nuts in a sequential pattern diametrically opposed to each other.

4.5 When using heavy equipment to raise tower and turbine be sure to use caution and pay strict attention to safety, tipping, proper attachment of slings and heavy weight. Pay strict attention to foundation bolts and tower lower flange. Once tower is placed attach 24 flat washers, spring washers, nuts and tighten foundation nuts in a sequential pattern diametrically opposed to each other.

4.6 Before leaving the factory, every blade assembly, hub, rotor have been assembled and balanced. For easy transport, they have been disassembled. When reassembling please check the marks on the parts Be sure to align marked blades with corresponding marks on hub assembly. Assemble with the M10×80 screws, washers, and M10 self-locked nuts one by one. Tighten the nuts with a snug only. Then measure the distances between the center, outside tip point at the end of blades. A, B, C, the distance difference of the three sizes should less than 5mm, then tighten the nuts firmly.

4.7 Torque should be 30 – 35 N.m (see fig.7).

4.8 Mount the blade and rotor assembly onto the generator, put the flat washer, spring washer one by one, then tighten the self-locked nut firmly.

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

4.10 Connect the output wires at the tower base to a disconnect/brake switch. Energize brake mode (short out the three output wires by connecting them together.

4.11 If you are using batteries, make sure batteries are fully charged and connected properly.

4.12 If this is a grid tied application, install the grid tie inverter.

4.13 Connect the wind turbine controller to either the battery bank or grid tie controller, being careful to observe all wire connections and polarity. Make sure all wires are proper type, size and keep turbine output wires in separate wire from control wires.

4.14 Connect load dump resisters to controller. Make sure the PWM (2 wire) circuit and AC dump (3 wire) are connected to proper terminals.
4.15 Switch disconnect/brake switch to “on” (off brake mode).

5. Application notices

5.1 Application principles
5.1.1 The wind turbine should be installed in an open and flat area, with no barriers nearby and easy access to direct wind flows.
5.1.2 Electricity generated by the wind turbine can be used for off – grid or grid tie. Off grid the turbine charges battery banks via the controller. Grid tied turbines feed your local utility company grid with a utility interactive inverters. Both applications utilize a wind turbine controller. Off grid controllers are based on battery bank voltage. Grid tie inverters are based on grid interactive inverter high voltage threshold (-600 vdc).
5.1.3 After the produced wind energy passes through the controller’s full wave bridge rectification, the three phase AC electricity is converted to DC. Battery based systems are based on battery bank nominal voltage. Grid tie voltages and usually “clamped” at around 510 volt to eliminate inverter failure due to high voltage.
5.2 Safety regulations
5.2.1 Never run the wind turbine without a load. Always have the turbine connected to the controller battery/grid. High excessive speeds with no load will destroy the wind turbine and is not covered under warranty.
5.2.2 Check the tower condition regularly, for loosening bolts, nuts and weld failures. If you are using a guy wired tower check guy wire tension regularly.
5.2.3 When wind turbine blades are at moderate to high rpm it is recommended to stay away from turbine.
5.2.4 When wind speed is anticipated to be more than 24 m/s, the wind turbine should be stopped artificially prior to achieving this wind speed.
5.2.5 Vibration or uncommon noises should be checked and rectified immediately.
5.2.6 The wind turbine conductors must be independent of all other circuits. All wires should be in approved conduit. All sensing circuits should be in separate conduits. All conductors must be properly rated for current, voltage and use.
5.2.7. Always hook up battery bank to controller first. Or grid tie inverter to controller, if on grid. Always observe proper polarity and voltage. Then connect wind turbine output wires to controller.
5.2.8. Never turn on the electronic brake while the wind turbine is producing power. This could destroy the wind turbine and is not covered by warranty.
5.2.9. If using batteries be sure to place the battery bank in a properly vented enclosure. Away from flames, sparks and any heat sources.
5.3. The rotor, blades and hub are critical components of the wind turbine. Keeping them balanced and eliminating vibration is critical to a well functioning wind turbine. Be sure to regularly check blades, rotor and hub and adjust or replace when necessary.

6. The maintenance of the wind generator

6.1. Check, clean and lubricate all rotating parts once per year.

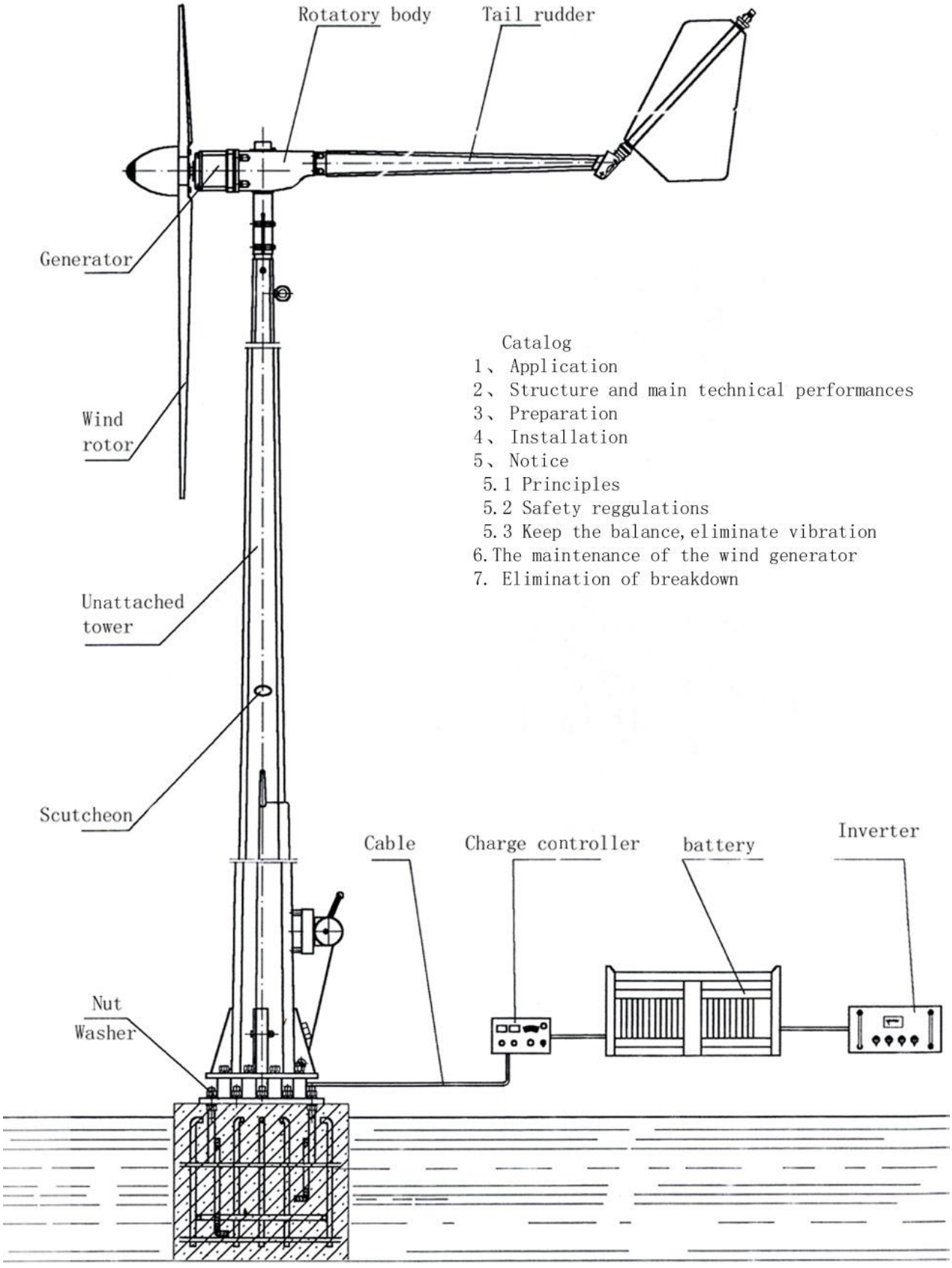
6.2. Before the windy season, inspect wind turbine. Clean and paint any area where the paint has been compromised or rust has appeared.
6.3. Lubricate all moving parts at least once a year.
a. Exposed parts made of stainless steel have a high quality, long lasting rust-prevention treatment and therefore do not need to be painted. Only visual inspection is needed.
b. The generator incorporates, the highest quality sealed bearings available. The bearings should be inspected every 5 years for wear and resistance.

7. Elimination of breakdown

The wind generator is designed and manufactured for long trouble life. However, wind turbines are mechanical and by design are made to be installed in some of the most harsh weather conditions. Therefore periodic maintenance and inspections is crucial. It is also prudent to check the wind turbine after high wind exposure. In case a malfunction has occurred please refer to the below guide. Or, call Advance Power Inc.

Breakdown	Reason	Eliminating method
Wind generator vibrating strongly	1. Guy wire is loose. 2. Blades or hub are loose. 3. Blade is defective, cracked, chipped or broken. 4. Ices over on the surface of blades, cause unbalance.	1. Tighten the steel wire rope appropriate. 2. Tighten the loose parts. 3. Replace and adjust to ensure rotor balance again. 4. Remove ice and snow.
Slow or non moving to the wind	1. There is too much grease/ dirt in the rotating body. Rotating shaft is deformed 2. The clearance between vertical shaft and sleeve is too small, or there is no movable axial clearance.	1. Clean and perform the prescribed lubrication maintenance. 2. Remove and correct the deformation. 3. Repair and enable the clearance meet the requirement.
Unusual noise	1. Visual inspect turbine & tower for loose parts, vibration and cracking 2. Generator bearing is loose in its seat. 3. Generator bearing is damaged 4. Wind turbine rotor is out of balance or in contact with stator.	1. Lower the wind turbine to the ground, check all moving parts. 2. Repair or replace as needed. 3. Replace the damaged bearing. 4. Repair and replace as needed.
The rotating speed of the wind rotor is	1. Blade pitch control is ineffective (if wind turbine is	1. Check and eliminate the trouble, then make lubrication and

noticeably reduced	so equipped) 2. Stator winding is shorted –circuit or output circuit is short pass. 3. Brake disk is rubbing. 4. Stop Switch is set at “close” position:	maintenance. 2. Find short circuit spot, split the lines and isolate them... 3. Readjust the break gap. 4. Set switch to “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 magnetism 3. The conductivity of the connect point between slip ring and output circuit is weak. 4. There is short circuit in rectifier. 5. Circuit wires are too long, or too small for the current and wire run.	1. See item 2 above & restore to normal rotating speed. 2. Charge magnet, or change the rotor of generator. 3. Clean slip ring and contact point, so as to reduce resistance. 4. Replace. 5. Shorten the wire run or increase the wires size, so as to reduce circuit electricity loss.
No electrical output current in AC circuit of the Controller	1. Check that all circuit breaks in AC lines are not tripped. Make sure fuses are not blown. 2. Check all circuits for wire degradation or breaks. 3. Stator winding is burnt and circuit is broken.	1. Reset circuit breakers/ replace fuses with same type/size 2. Replace and repair as needed. 3. Disassemble, replace and repair as needed.
AC output is normal, but there is no DC output current	1. DC fuse is fused. 2. DC circuit is compromised or is broken. 3. Rectifier is damaged.	1. Replace. 2. Replace and repair as needed. 3. Replace.
Batteries are low voltage	1. Output voltage of the generator is too low, or electricity is generated at all. 2. A battery connection is corroded and the conductivity is weak. 3. Battery have failed	1. See above. 2. Clean or replace as needed.. 3. Replace battery bank



Catalog

Fig.1 figure of power genrator

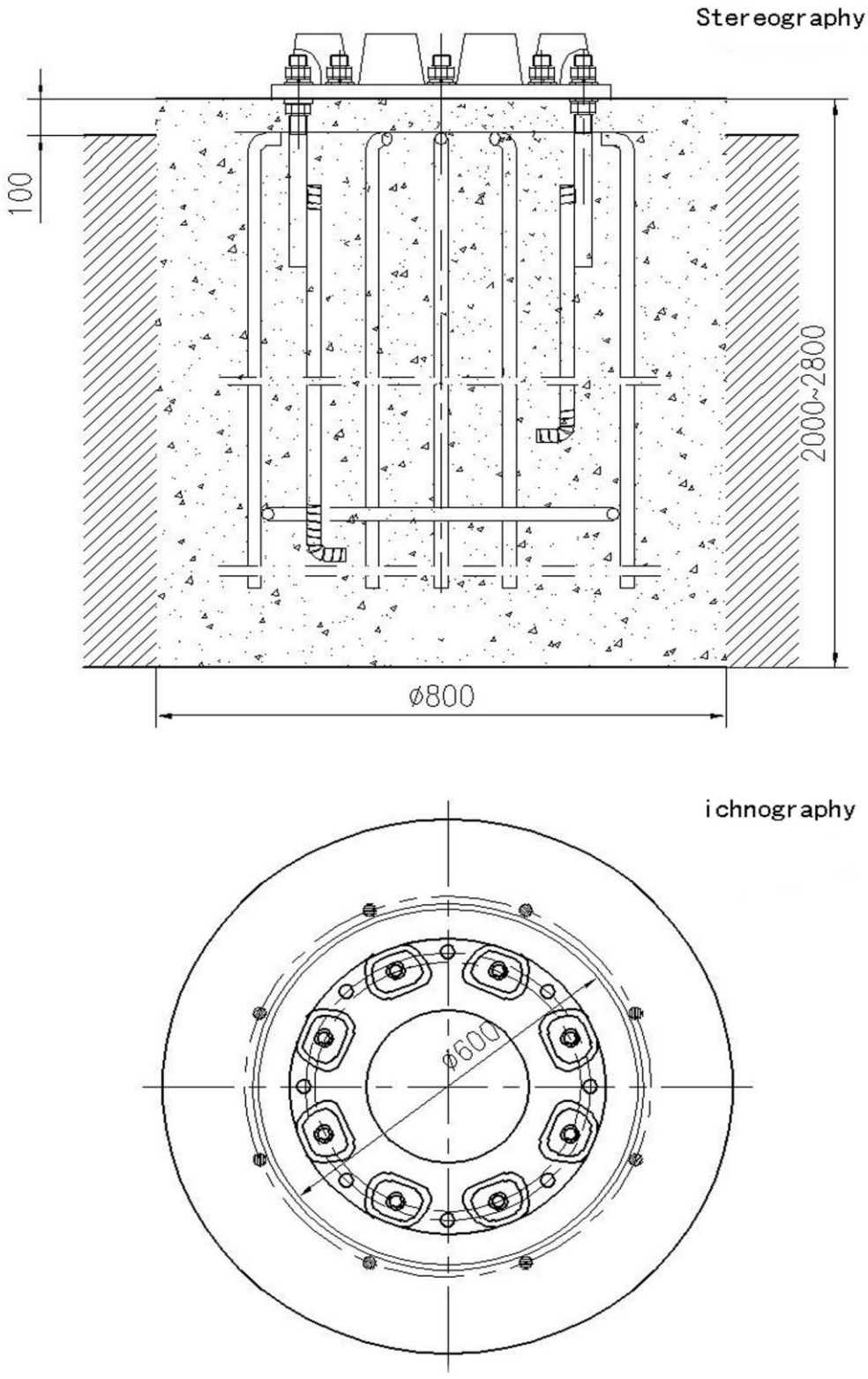
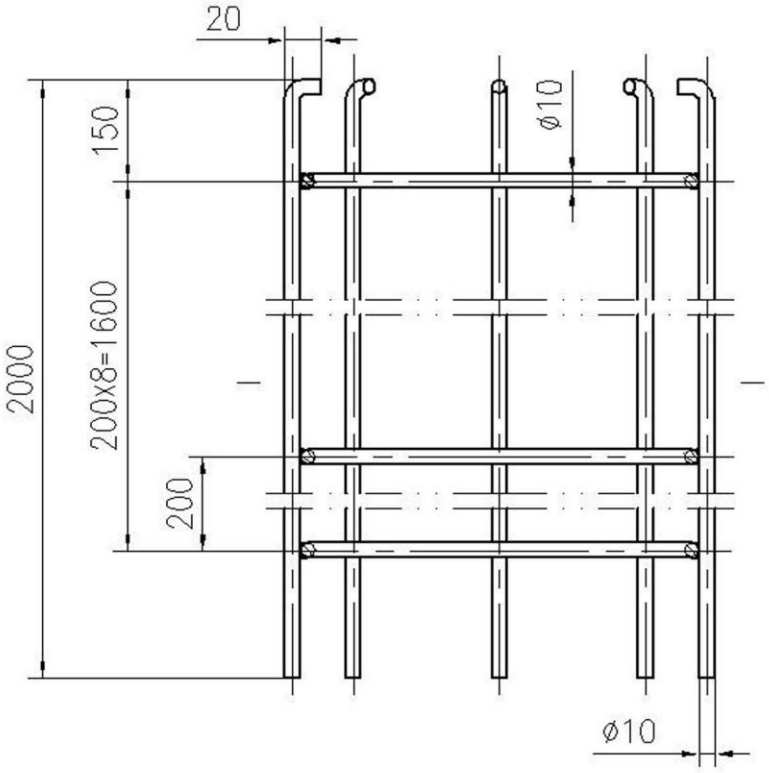


Fig. 2 Foundation



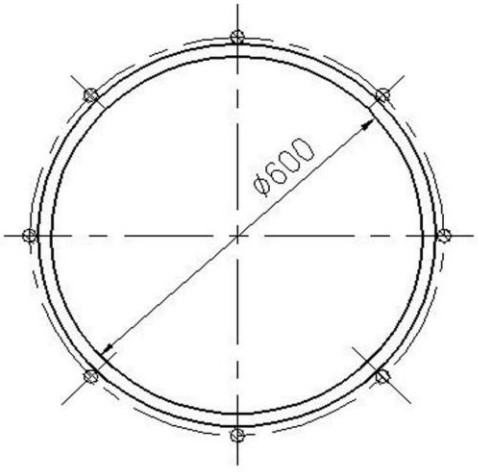


Fig. 3 Foundation Framework

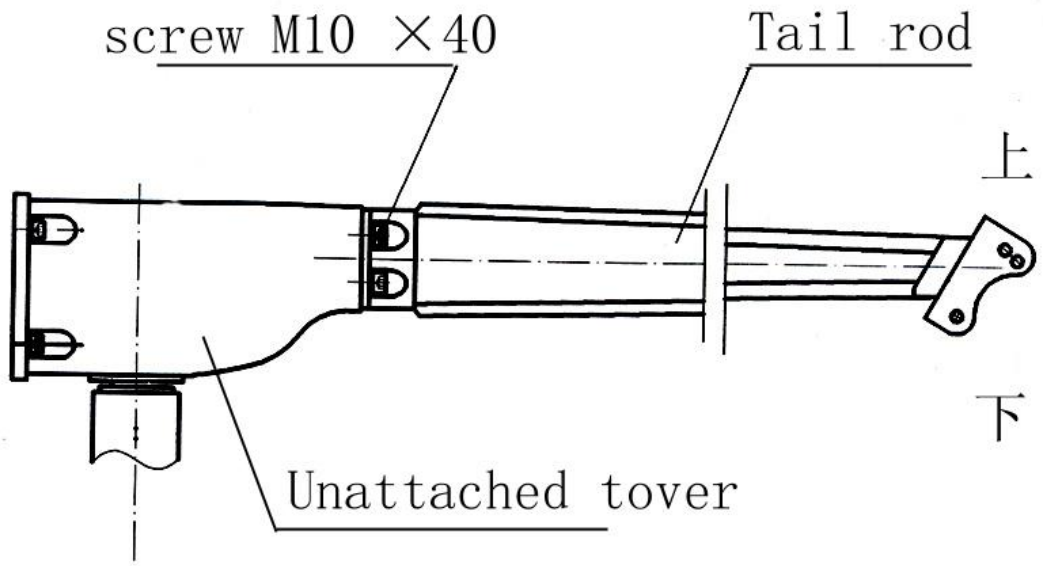


Fig.5 Tail rod

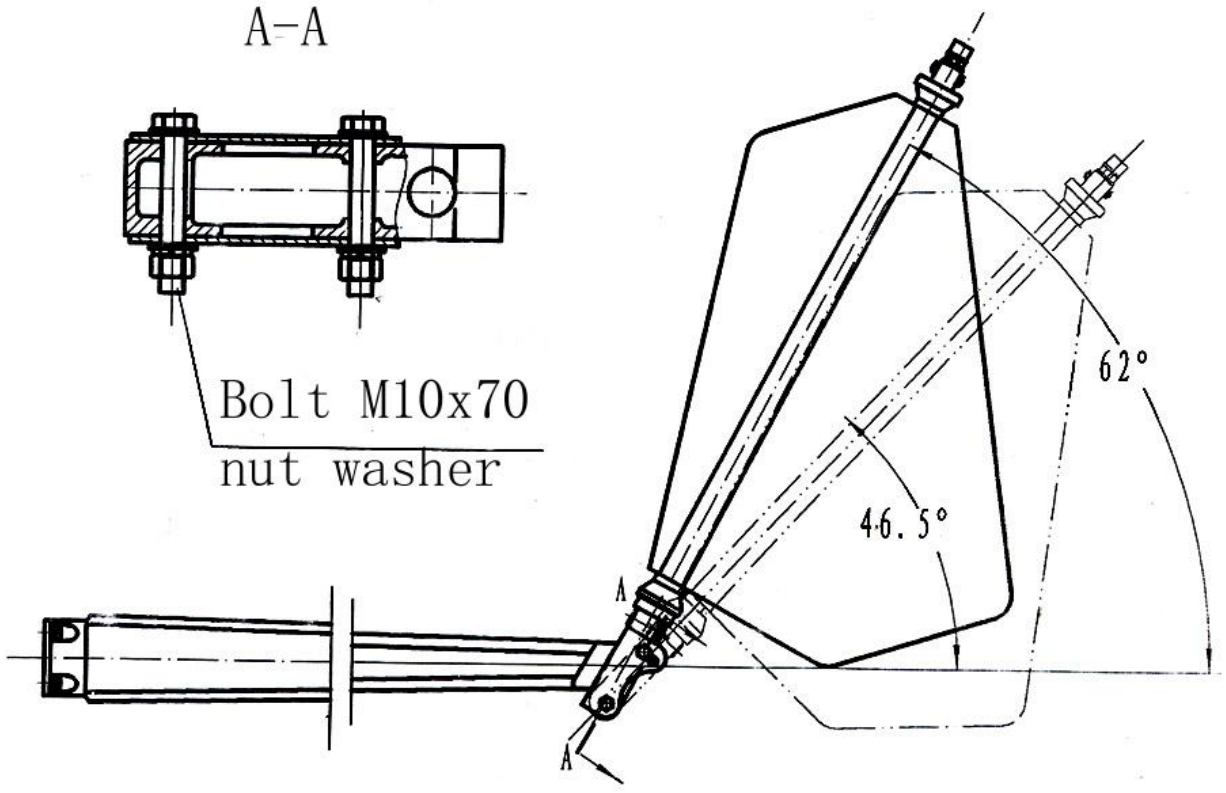


Fig.6 Tail Vane

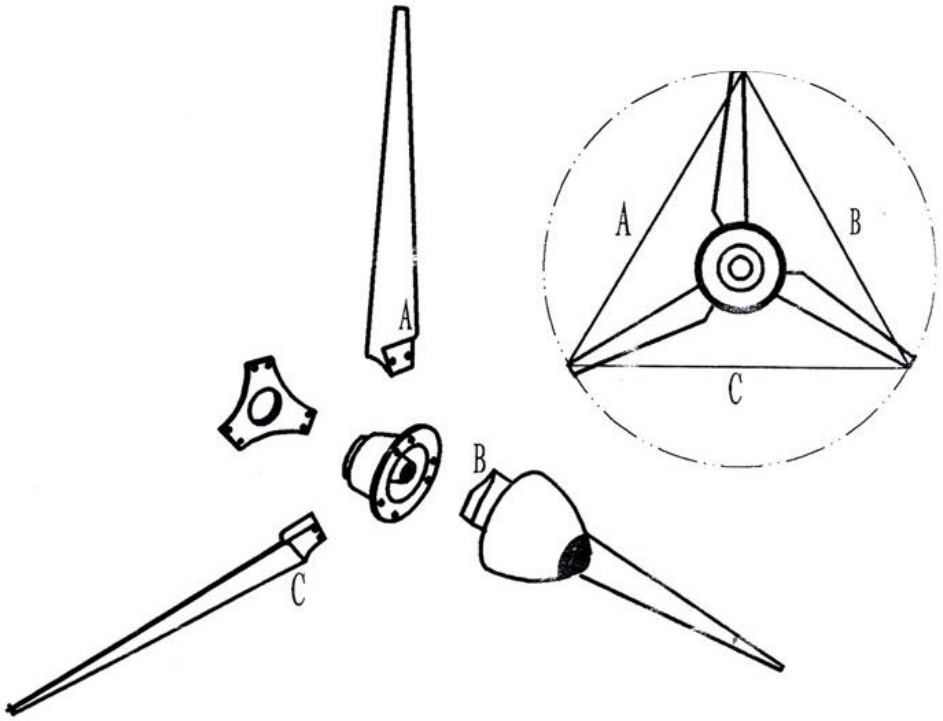


Fig. 7 Wind Rotor

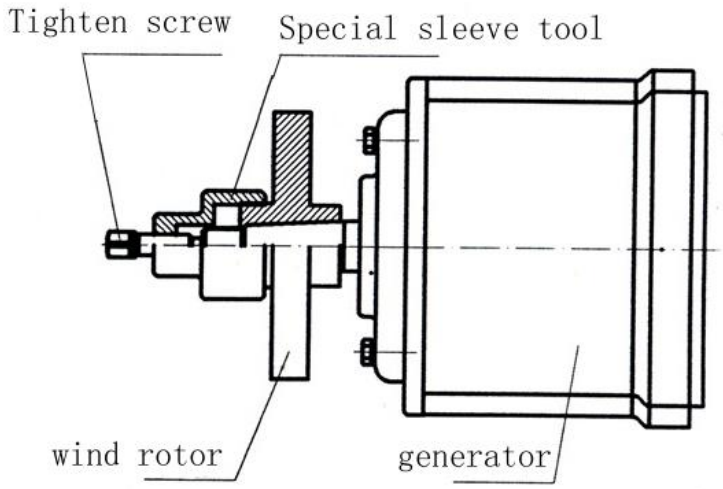


FIG 8 Disassembling of wind rotor

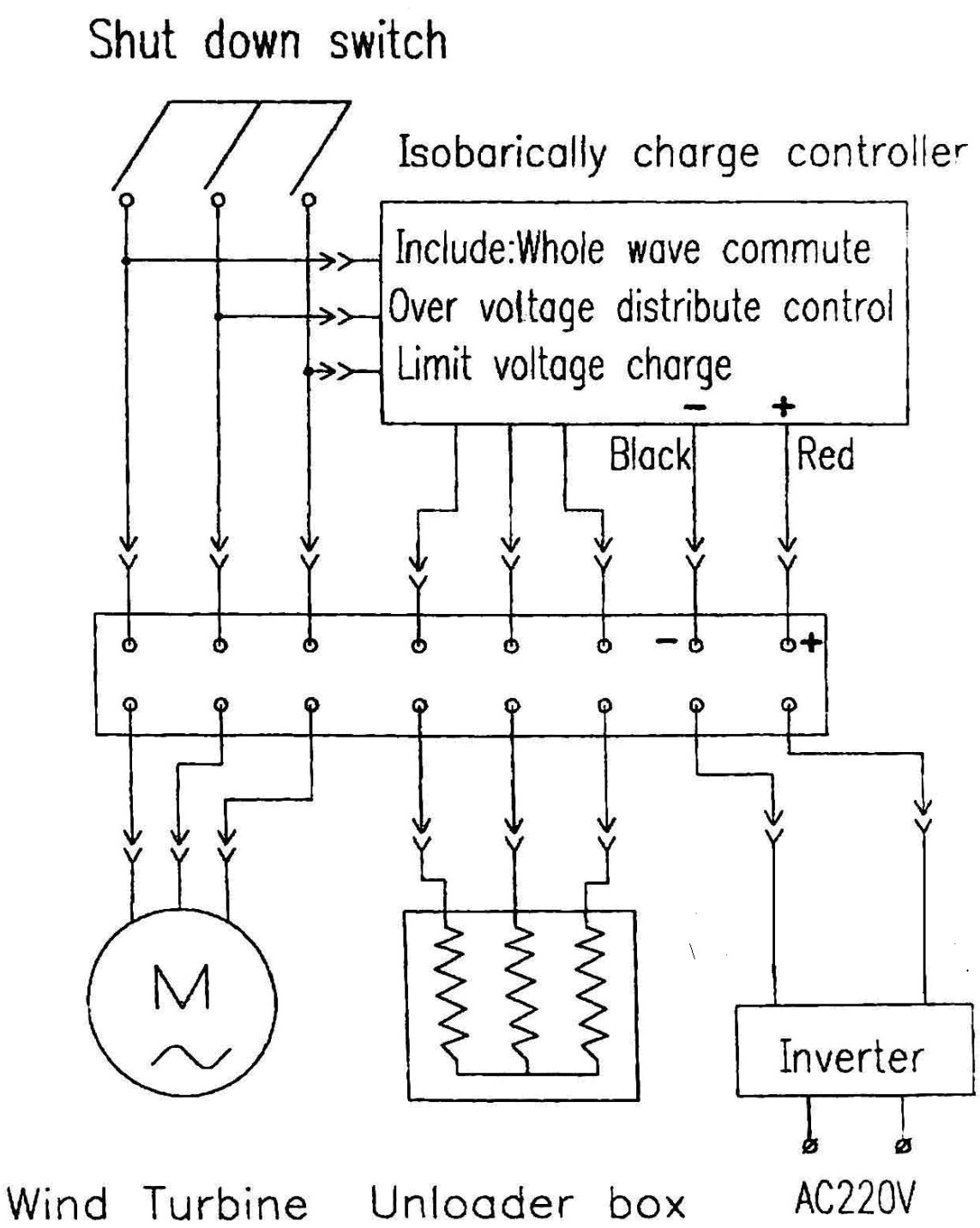


Fig. 9 wiring diagram