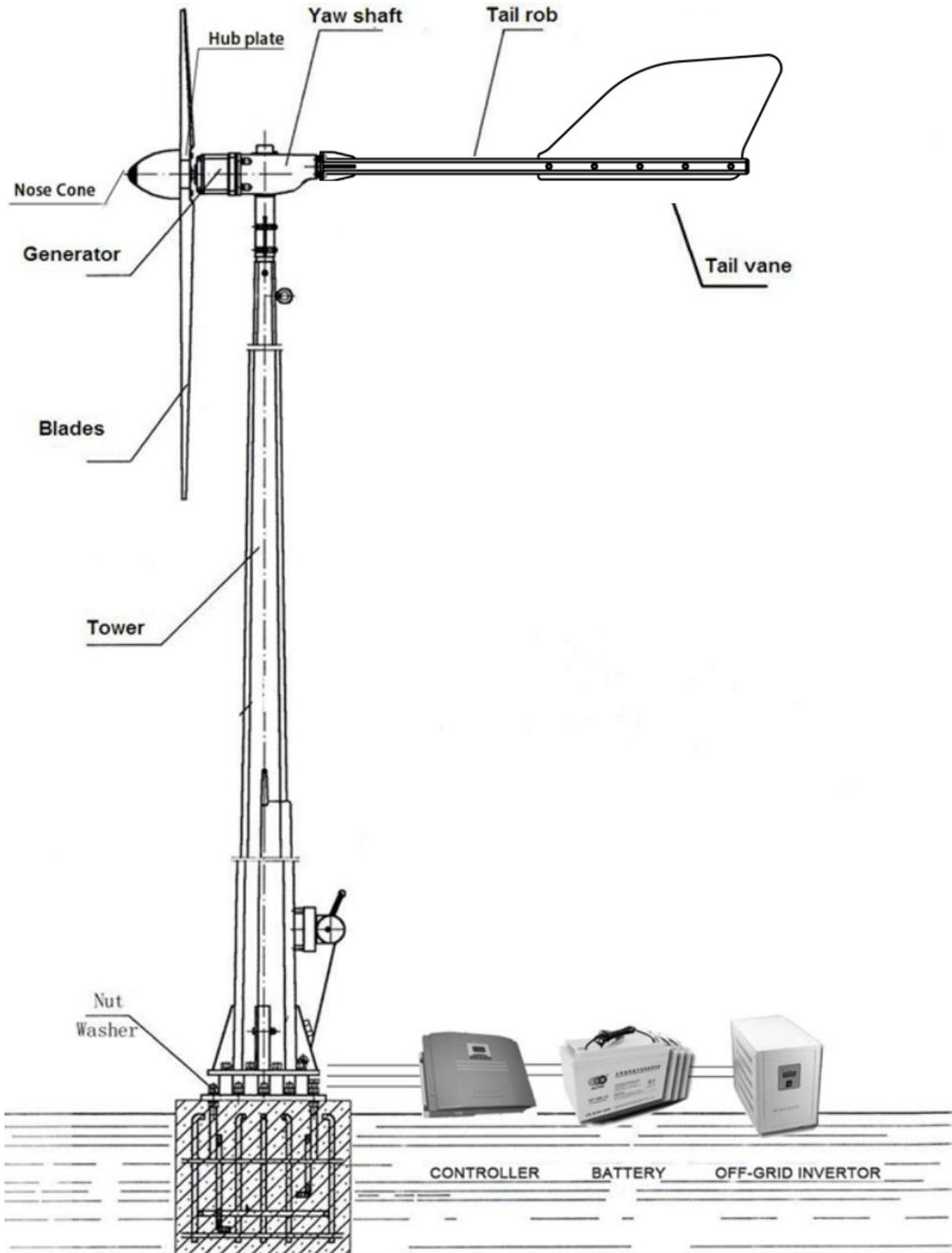


TABLE OF CONTENTS

Components Overview	3
Technical Parameters	4
Performance Curves	5
Noise Report	5
Installation	6
Tower Foundation Structure	7
Free folding tower installation	9
Wind Turbine Assembly	12
Electrical device connection	15
Safety regulations	16
Maintenance	17
Elimination of Problems	17
Warranty service	19

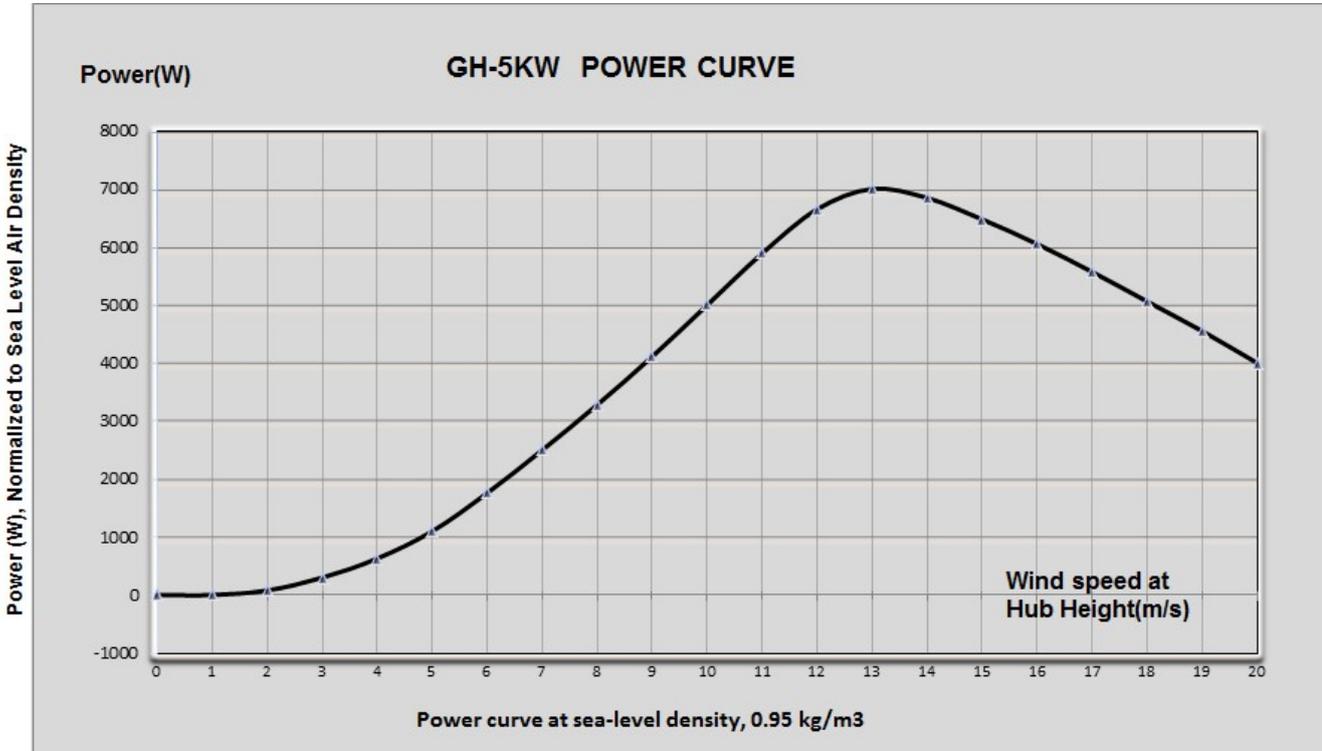
COMPONENTS OVERVIEW



Technical specifications

Model	GH-5KW
Performance	
Rated Power	5000W
Max Power	7000W
Start Wind Speed	3m/s(6.72mph)
Rated Wind Speed	10m/s(22.4mph)
Working Wind Speed	4-25m/s(8.96-56 mph)
Safety Wind Speed	50m/s(112mph)
Physical Parameters	
Blades Length	2.49M(8.17ft)
Blades Rotor Diameter	6M(16.4ft)
Blades Material &Quantity	FRP /3PCS
Top Weight	310kg
Swept Area	19.625 m ²
Tower Height	8m(26.24ft.) Free folding tower
Generator Parameters	
Generator Type	Permanent Magnet Generator
Rated Speed	260RPM
Start Torque	4.5N.M
Option Voltage	48-500VAC
Protection Method	Electromagnetic Brake +PWM
Protection Grade	IP54
Working Temperature	-40-50°C

Performance Curve



Noise Report

Test position: At 15m away from generator (average value of 3 point-rears, left, right.)

Wind Speed (m/s)	3	4	5	6	7	8	9	10	11
Sound(dB)	20.5	22.9	28.7	30.1	32.8	35.7	41.5	41.8	45.8
Wind Speed (m/s)	12	13	14	15	16	17	18	19	20
Sound(dB)	46.6	48.5	52.3	55.2	58.9	61.2	63.1	67.6	68.9

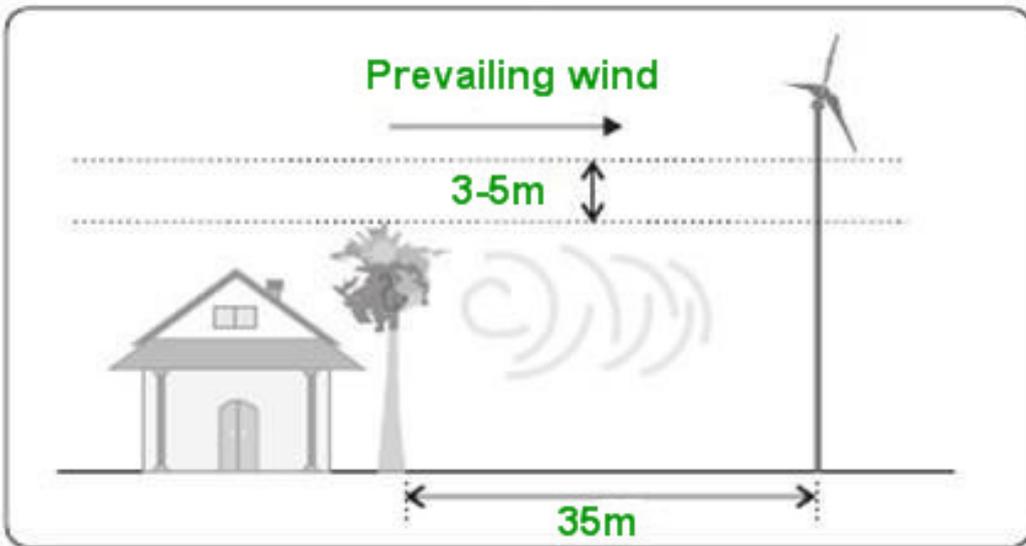
Note: The sound value includes wind noise.

- TIP:** Test position: At 15m away from generator (average value of 3 point-rears, left, right)
- IMPORTANT:** The sound value includes wind noise.
- EQUIPMENT:** Tested by hand held sound level meter

Installation

Sitting Finding the Best Location for GH-5KW series

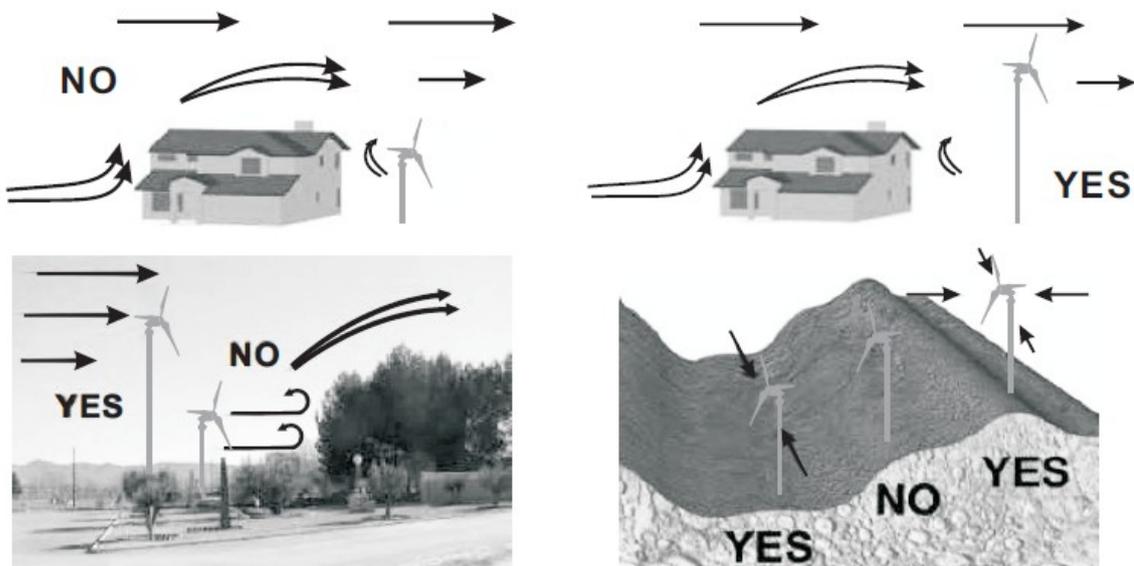
The best location to install a wind turbine is often a compromise. Local building restrictions, the height of surrounding structures, wire length, and available open space may require **ENERGIE TICHE** wind turbine be installed in a less than optimum location. In general, wind turbine will produce more power if installed on a taller tower. However, towers are expensive so it is important to balance performance (tower height) to installed cost in order to achieve the lowest cost of energy and the quickest payback.



Local Requirement

Building codes and installation regulations may vary greatly depending upon country, state, city and local townships. Be sure to obtain all the required building permits BEFORE beginning installation. Additionally, If you use it as OFF-GRID system, be sure to contact the local electrical utility company. Many utility companies will require an "Interconnection Agreement" prior to installation. Some utilities may also require installation of a separate power meter for wind turbine.

Choosing A Proper Site for GH-5KW wind turbine



The place is very important for generated energy and safe in operation (the reference is below):

A good place should meet with two basic requirements: the higher average wind speed and the weaker turbulence.

(i) The average wind speed is higher, the generated power is higher and the generator will generate more electricity.(The wind energy is proportional to three cubed of the wind speed. For example, the wind speed of 5m/s can generate nearly twice more electricity (energy) than that of the wind speeds of 4m/s.)

(ii)If the air current is unstable and the turbulence current is serious, the possibility of damage of the wind power generator will be heavier. It is bad (not good) for the generator to operate well and safe in a long time (many years).what's more, the turbulence current will affect the wind power generator to reduce the generated energy directly. The high wind speed area where the turbulence is serious is absolutely not available as the place of installation.

The tower should be higher, because the height from floor is higher, the wind speed will be heavier, the air current will be more stable. In the flat area, the height of wind power generator should be above 6 meters.

To air current, trees and some buildings will be the barriers. Around the obstacles (barriers), there will be a high, wide, slow-moving and inordinate air current zone. We should avoid installing the wind turbine in this area.

The height of tower should be at least higher 3-5 meters than the highest barriers(obstacles) that within 35m away from generator .

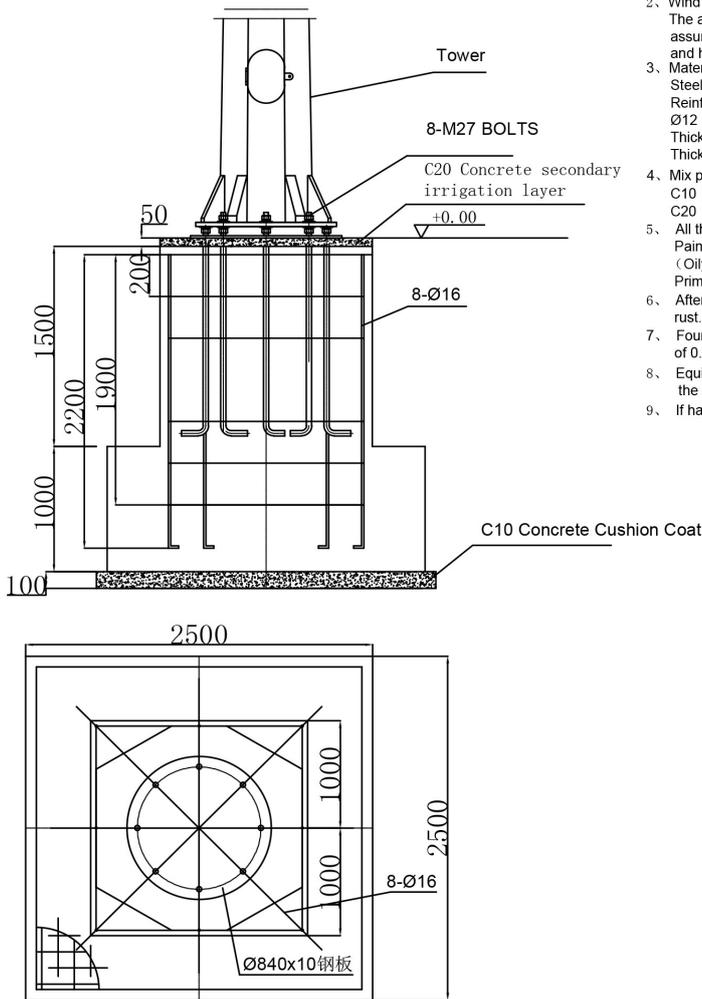
Tower Foundation Structure

There are several types of towers that can be used with GH-5KW wind generator. It is essential that GH-5KW wind generator is installed on a properly engineered tower. One of the leading causes of wind generator failure is use on a poorly designed tower. (Construction of tower foundation as follow)

Excavate a hole 1800mm x 1800mm x 1500mm deep. Install the base framework, orientation plate and 8 ground bolts into the hole (see FIG.2).The ground bolts screws on the breechblock should be 80mm above the concrete. The orientation plate should be level and 100mm higher than the level.

3.5 Concrete mixture C10 & C20. Do not let the concrete cover the M30 screw thread when pouring the concrete.

3.6 Once the concrete foundation has been poured it should be left for about 4 days before installing the Wind Turbine.



Pic 2. Foundation

Instruction of Foudation Design

- 1、 Wind turbine foundation design according to following data:
Equipment weight: 1500KG; Height: ≤10m
- 2、 Wind turbine foundation bearing capacity ≥120kpa,
The actual project that the silty clay layer as the assumptions hold the bearing layer , applies to both soft rock and hard rock bearing stratum .
- 3、 Material:
Steel: Q235; welding rod: E43; concrete : C20;
Reinforcing steel bar : Ø10 :HPB235, fy=210N/mm ,
Ø12 :HRB335, fy=300N/mm
Thickness of the steel bar protection :30mm .
Thickness of the foundation steel bar protection:50mm
- 4、 Mix proportion of concrete cement : stone: sand: water
C10 1 (325#cement) 2.45 1.64 0.6 (proportion by weight)
C20 1 (425#cement) 2.55 1.70 0.6 (proportion by weight)
- 5、 All the steel used in this project must descaling , descaling level :St2
Painting Hongdan Series ,
(Oily antirust paint , alkyd or phenolic antirust paint)
Primer two times, red alkyd enamel over the fire
- 6、 After tower installtion , Use C10 Concerte cover the feet to aviod bolts rust.
- 7、 Foundation slab of the length of the reinforced desirable side length of 0.9 times and staggered arrangement .
- 8、 Equipment to the center of the foundation , the rotation diameter is 6 m the foundation site Note Away from the occluder .
- 9、 If have any questions ,should contact our design engineer .

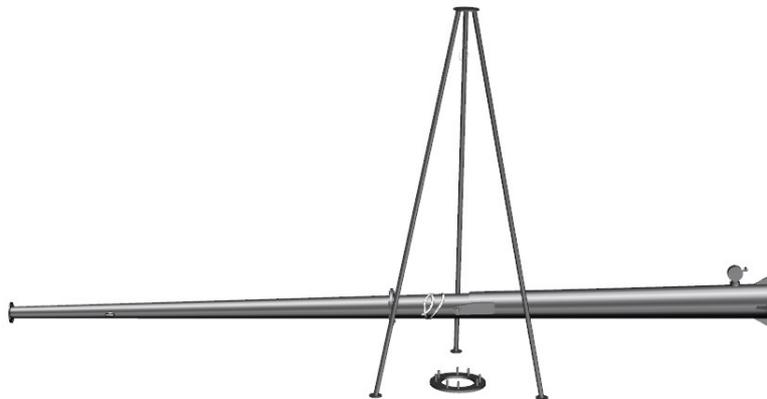
Wind Turbine Foundation model: GH-5KW. Tower height 6~15mtrs	
1	Wind Turbine Foundation groundwork bearing >120kpa
2	Material: Steel Q235, welding rod E43, Concrete C20, reinforced steel bar O-HPB235, fy=210N/mm ² : O-HRB335, fy=300N/mm ² . Protection layer reinforcing steel bar 30mm Foundation layer reinforcing steel bar 50mm
3	Concrete: C10 cement, Carpolite 2.45, Sand 1.64 Water ratio 0.6 Concrete: C20 cement, Carpolite 2.55, Sand 1.70 Water ratio 0.6
4	The steel bars should have all rust removed and painted with antirust paint wth at least two applications
5	When installing the tower paint the base with antirust paint and cover with C10 cement.
6	The length reinforcing steel bar is 0.9 times the side length (foundation bottom plate)

Free Folding Tower Installation

Check the terrain around foundation; clean the installation site for tower placement and installation. move tower close to foundation, and make tilt part at the foundation center (as shown); screw off two sets of hexagon M16×55 bolts, nuts M16, flat washer 16 and spring washer 16, split tower and supporting tower. Tie the lifting tapes on tilt part on main tower. At the same time tie $\Phi 10\text{mm}$, 20m long ropes on tower top and tower bottom, this is for holding tower during lifting.

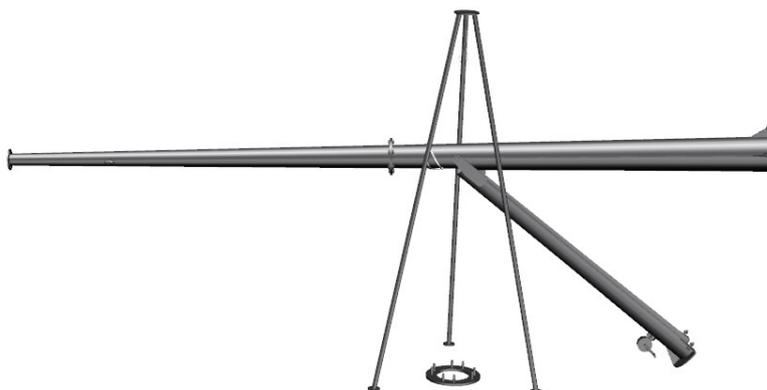


insert two $\Phi 2.5\text{-3mm}$ steel wires; one is going through cable pipe, the other one inside tower, pull in electrical cable and steel wire separately from tower bottom. Use steel wires to help pull out the electrical cables and brake steel wire from tower top (around 400mm), se nylon ropes tie them temporarily.



Place the triangle bracket with hand block on top of foundation, triangle bracket should be 1m higher than supporting tower height. Please confirm that triangle bracket is stable placed, hang the lifting tape on hand block.

To avoid wind turbine turning during lifting, please short circuit three wind turbine output cables at the bottom of tower.

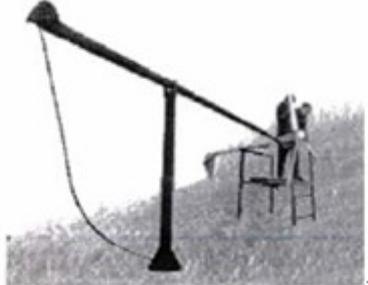


After confirmed safety, use hand block lift tower slowly, at the same time use two ropes on both ends to adjust the direction of tower, and let the supporting tower down. When supporting tower flange is around 50mm high than adjusting nuts, use hand block to align 6— ϕ 35 holes on supporting tower flange with six adjusting nut holes, put on flat washer 30, spring washer 30, use spanner screw in hexagon bolts M30 \times 60. Fix supporting tower temporarily. Take off lifting tapes, remove triangle bracket and take off hand block.



Use free folding tower to install wind turbine

Pull the ropes, when main tower bottom is around 1.5m to ground; hook the hand block on main tower bottom and supporting tower bottom. Release the chains of hand block, use rope to pull down tower top flange till it is around 1m away from ground, place a bracket under it, and use tapes tie tower on bracket. Place a platform (or bracket), use ropes to pull down tower top end and tie it with platform or bracket.



Wind turbine and tower installation

Look the ropes used to tie tower on platform, and tie it on tail rod close to the tail vane. Use hand block lift wind

turbine slowly, at the same time, in case of any twist of supporting tower, please use ropes on tower bottom and on

turbine tail to help tower erection. When wind turbine leave the bracket, loose ropes slowly to lift turbine.

During wind turbine lifting, please use rope on turbine tail rod to help holding wind turbine, in case of any turning of wind rotor and twisting force on supporting tower.



When tower and supporting tower is almost close to each, use $\Phi 20\text{mm}$ rope to wrap 2 circles at the tower bottom, take of the hand block; clean up cables, close tower and supporting tower. (If tower cannot close to supporting tower because of turbine weight, please use crowbar to lift the tower a little bit for easy close.) align $\phi 30$ holes on tower bottom flange with adjusting nuts holes, put on flat washer 30, spring washer 30, use sleeve spanner screw in hexagon bolts $\text{M}30 \times 60$, fix tower temporarily.

Insert two hexagon bolts $\text{M}16 \times 55$ in 2— $\phi 17$ side holes, put on flat washer 16, spring washer 16 and use spanner to fasten $\text{M}16$ nuts. Use 55 spanner turn 3 adjusting nut distributed in 1200.

Adjust the tower to be vertical with horizontal line (vertical error: 4‰ of tower height in mm). Fasten the matched 3 $\text{M}30 \times 60$ bolts and $\text{M}30$ nuts under foundation bolts. Please fasten the other 9 sets of adjusting nut, bolts and nuts in order of adjusting nuts, bolts, nuts. Fasten $\text{M}30 \times 60$ bolts in diagonal order. Fasten torque is 870~900Nm. Fasten the two $\text{M}16 \times 50$ by two sides.

Wind Turbine Assembly

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

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, then put on the washer and connects them with ringing pin.

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 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.5 Insert the cable through the bottom to the top of the mast with a steel wire(\varnothing 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.

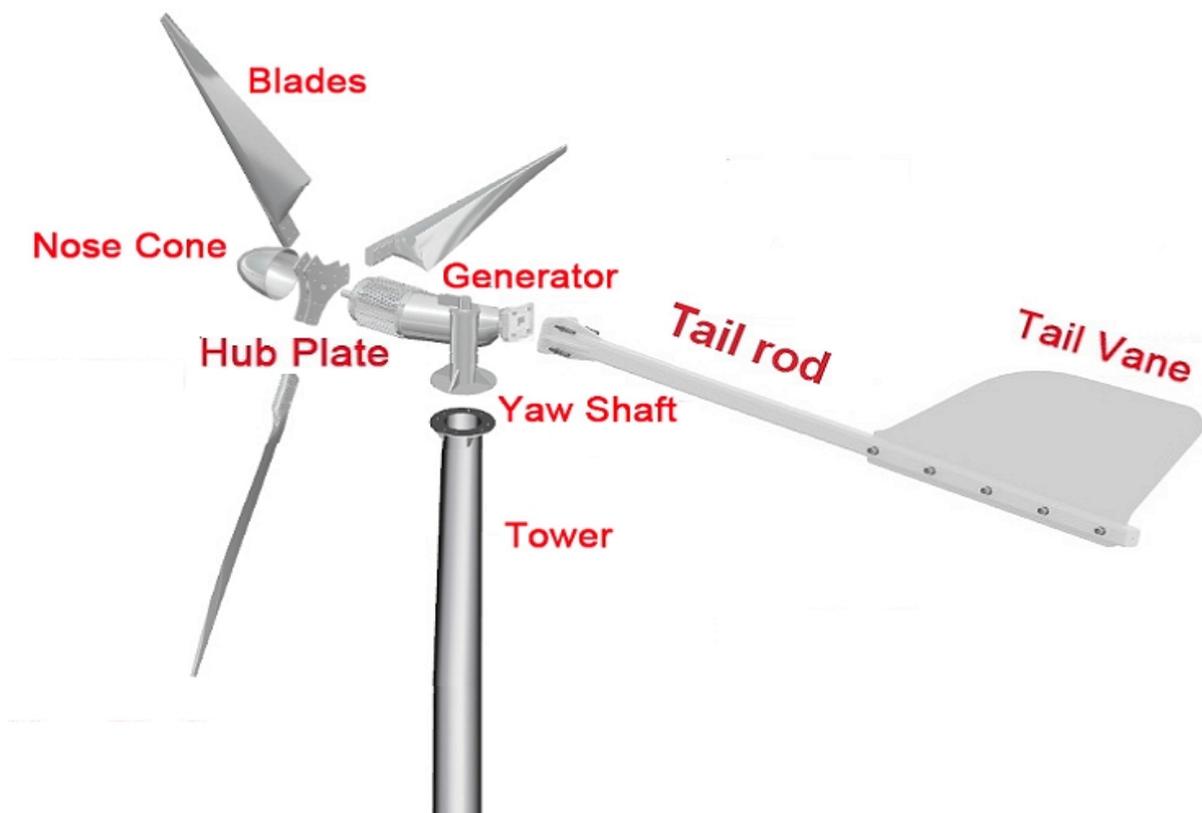


The 3 pcs output cables from the generator are totally same, can connection freely.

6 Get the assist from crane to install the generator onto the mast top through the sleeve. Fasten the screw.

7 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.

8 There are two holes for option 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 \varnothing 11 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 \varnothing 11, screw the adjusting bolt and nut (M10). After adjusting, tighten the two self-locked nuts.



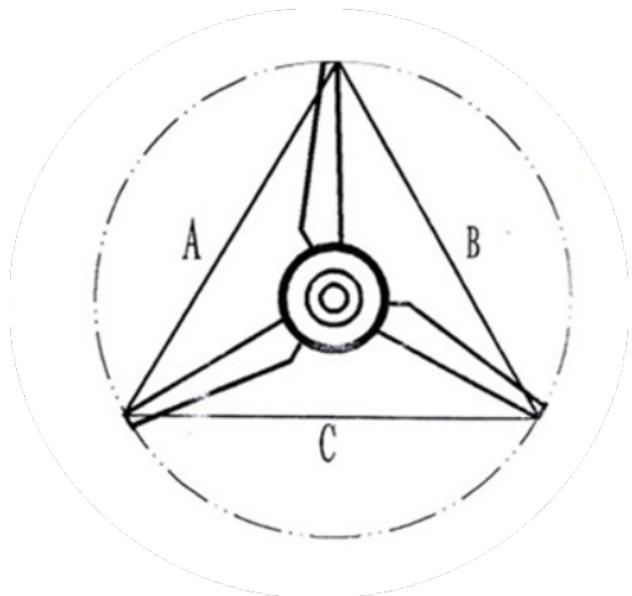
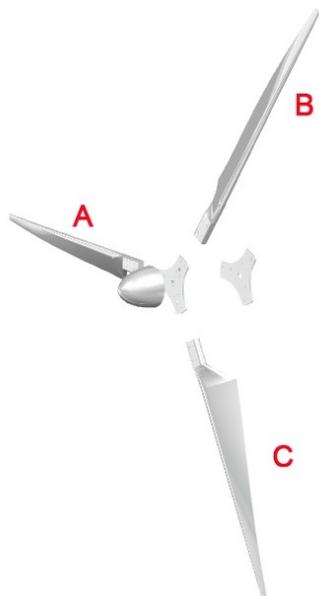
9 Before leaving the factory, every rotor had been assembled and passed the balance adjustment. For easy transport, the rotor had been disassembled. When reassembling the rotor, please check the marks on the parts, so as to make them return to the former positions, then fit the M10×80 screws, washers, 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

10 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.

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

12 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.

13 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



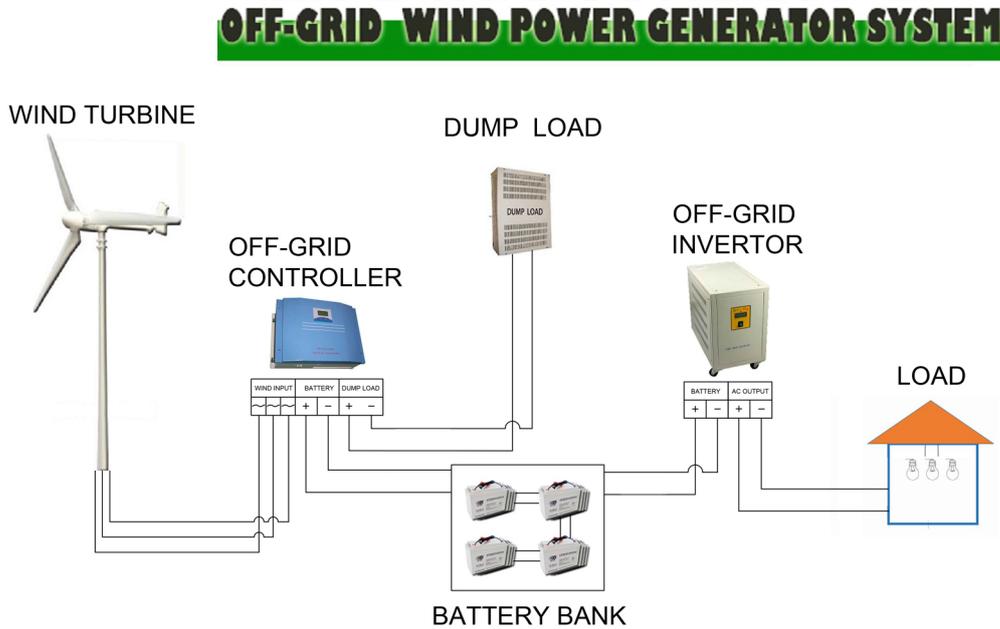
Electrical device connection

After you finish the foundation, then you can prepare the other device for installation

Controller: Please make sure that GH-5KW wind turbine connect with the controller properly

before erect the tower, then make manual stop button on “ BRAKE” position. and inverter connection too. After erect the tower, then turn on the button on the controller (put the switch in “RUN” position).

Electrical device connection as follow:



TIP Details connection please refers to controller and inverter user’s manual.

Cable selection

Cable Sizing (all electrical connections are completed with copper core cables/wires)

Measure the distance from the electrical utility panel and generator output, include the tower height. Refer to the table below and based on the measured distance and system voltage select the appropriate cable size.

Model	voltage	Cable for wind turbine to controller
GH -5KW	220v	3x6mm ²

PROFESSIONAL INSTALLTION Cable model for wind turbine to controller is consider distance from wind turbine tower to controller within 20m,If more longer distance then please tell our engineer ,we will give professional suggestion.

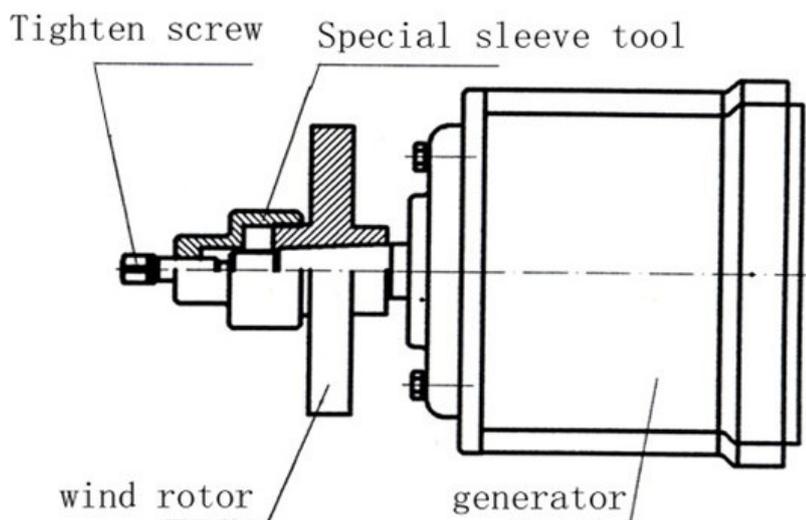
NING Take care for safe operation when connection the wires.

Safety regulations

1 .It is not allowed that the wind generator rotating without any loose continually, or running at a

very high rotating speed continually.

2. Check the tower regularly, if there are any signs of loosening, it should be tightened immediately, to prevent any damage to the wind turbine.
3. When rotation speed of the rotor is high, people must not stay under the wind turbine.
4. When wind speed is more than 24 m/s, the wind turbine should be stopped manually.
5. If vibrations or it becomes noisy during operation, stop the wind turbine and check the reasons.
6. The power supply from the wind generator should be independent and not used with other power supply lines. DC power supply is safe and economic for illumination; for domestic electric appliances, the AC power supply 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.
7. The "RUN & BRAKE" switch on the controller & inverter should keep at "RUN" position in normal operation. Only when the batteries are fully charged or to protect the turbine from very high winds, the switch can be in the "BRAKE" position. DO NOT move the switch when wind is very high and rotor is running at high speed, turn the switch to the "BRAKE" position when rotor is running slowly.
8. The batteries should be stored in a well-ventilated area to ensure that any gases from charging and discharging can escape it should also not get excessively hot or cold.
9. Keeping the rotor in balance and eliminate vibration
When the blades lose balance caused by damage and create strong vibration, the wind generator must be stopped and checked, until the problem is eliminated. Disassembling the rotor, remove the nut and washer from the shaft end of the generator first, screw the special sleeve onto the hub firmly, then turn the M16×100 screws into the sleeve, to remove the rotor from the shaft of the generator (see FIG.8). After repairing, the torque should be less than 0.05N.m.



Maintenance

After 20 years of service the blades MUST be replaced – even if there is not apparent damage. The blades should be replaced as a set. Do not attempt to replace individual blades. All blades mounting hardware – bolts, blade root shims, nuts – should be replaced at the same time. Do NOT attempt to reuse the blade fasteners.

There are no periodic service requirements other than replacing the blades after 20 years. All bearings and rotating components were designed for a 20-year life. This corresponds to a site with an average wind speed of 5 m/s(11mph). Although there are no routine service or maintenance requirements, GH-5KW owners should be observant of any unusual sounds, vibrations or erratic behavior. If unusual behavior is noticed, the best course of action is usually to shut down the turbine and contact the dealer or service center.

One area of GH-5KW that may experience damage is the blades, for example, from flying debris during a high wind storm. For this reason **ENERGETICHE** MADE IN ITALY wind generator company recommends GH-5KW be shut down on an annual basis and an inspection of the blades performed. The inspection may be accomplished using binoculars or by close visual inspection. Inspect for cracks and chips particularly along the edges of the blades.

Any damage is cause for replacing the blades. If in doubt, contact our service center. In the event you must gain access to GH-5KW use the opportunity to perform the following inspections:

- Check tightness of blade bolts with torque wrench. All blade bolts should be torqued to 85 N•m.
- Clean the rotor blades with a mild soap and water. Remove as much of the dead bug matter as possible from the blades.
- Look for any problems with the blades. Such as cracks, or damage to the edges of the rotor blade.

Inspect the face, nacelle, and the rest of the GH-5KW and note any potential damage or problem.

Elimination of problems

The wind generator is designed and manufactured to a high standard and to minimize maintenance, if the installation and operation are correct, problems should not happen under normal conditions.

In case of problems, see the following table.

Problems	Reason	Remedy
Wind generator vibrating excessively	<ol style="list-style-type: none"> 1. Steel cables have become loose. 2. Blade fixing bolts are loose. 3. Blades are damaged. 4. Ices on the surface of the blades has cause the unbalance. 	<ol style="list-style-type: none"> 1. Adjust the steel cables. 2. Tighten the loose bolts 3. Replace the defective blade/s and rebalance. 4. Remove the ice.
Direction regulating is ineffective	<ol style="list-style-type: none"> 1. There is too much grease and dirt in the rotating body. 2. The turning place is damaged by the outside power. 3. The clearance between vertical shaft and sleeve is too small, or there is no axial clearance. 	<ol style="list-style-type: none"> 1. Clean away the grease and dirt and re-grease. 2. Recover and correct the deformation. 3. Adjust the clearance to the required amount.
High noise	<ol style="list-style-type: none"> 1. Fixed parts have become loose 2. Generator bearing has become loose from its seat. 3. Generator bearing is damaged 4. Wind rotor is rubbing on other parts. 5 The stator and rotor is rubbing badly, or the bearing is broken. 	<ol style="list-style-type: none"> 1. Lower the wind turbine, check all fixed parts and take measurements against the specification. . 2. Locate the loose bearing and either tighten or replace, or fined the problem and correct. 3. Replace the damaged bearing. 4. Check and eliminate the trouble. 5. Change the bearing or eliminate the rubbing.
The rotating speed of the wind rotor has reduced.	<ol style="list-style-type: none"> 1. Blade pitch control is wrong. 2. Stator winding or output circuit has short circuited. 3. Break disk is rubbing. 4. Switch is set at "close" position: 5. The stator and rotor is rubbing heavily. 	<ol style="list-style-type: none"> 1. Check and eliminate the problem and lubricate. 2. Find short circuit position, split the lines and isolate. 3. Readjust the break gap. 4. Set switch to the "open" position. 5. Disassemble, check and fix the problem.
The output voltage of the generator is low	<ol style="list-style-type: none"> 1. The rotating speed of the generator is low. 2. Permanent magnet rotor has lost its magnetism. 3. The conductivity of the connection between slip ring and output circuit is low. 4. There is short circuit in rectifier. 5. Circuit line is too long, or the cable diameter is too small. 6. A short circuit in the 3-phase rotor winding. 	<ol style="list-style-type: none"> 1. Check that the rotor is running smoothly. 2. Charge the magnet, or change the generator rotor. 3. Clean the slip ring and contact points to reduce resistance. 4. Replace. 5. Decrease the circuit length or increase the diameter of the cable, to reduce loss. 6. Find the short circuit and insulate it
There is no AC output from the Generator	<ol style="list-style-type: none"> 1. A break in the AC circuit from the generator, or the fuse has blown. 2. A break in the output Cable. 3. Stator winding is burnt out. 	<ol style="list-style-type: none"> 1. Check the fuse replace if blown. Check the cables for a break and reconnect. 2. Find the beak point and reconnect the cable. 3. Disassemble and repair
AC output normal, but there is not DC output current	<ol style="list-style-type: none"> 1. DC fuse has blown. 2. DC output circuit is broken. 3. Rectifier is damaged. 	<ol style="list-style-type: none"> 1. Replace. 2. Find the beak and reconnect the cables. 3. Replace.

5kw Horizontal wind turbine

Output capacity of the batteries is insufficient	<ol style="list-style-type: none">1. Output voltage of the generator is too low, or no electricity is being generated2. The battery connections have corroded.3. Battery failure	<ol style="list-style-type: none">1. Check the rotor and moving parts are running freely.2. Clean the connectors grease and ensure good connection.3. Replace the damaged battery
---	--	---