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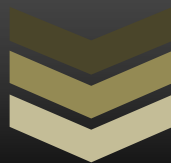
# USER'S MANUAL

## GH-2KW and GH-3KW

Wind Turbine

OFF-GRID system

2021 Edition



**QINGDAO GREEF NEW ENERGY EQUIPMENT CO.,LTD**

Add: No.6 Changchengnan Road,  
Chengyang District, Qingdao, China

E-mail: [service@greefenergy.com](mailto:service@greefenergy.com)

Tel: +86-532-67731422-802

Fax: +86-532-67731422-808

Website: [www.greefenergy.com](http://www.greefenergy.com)



## **Congratulations on your purchase and welcome to our family!**

Dear GREEF Owner,

Thank you for your purchase of GREEF series wind turbine. You have just selected the most cost-effective, technologically advanced renewable energy appliance available for a home or small business. We congratulate you on your choice and are confident you will experience years of dependable service.

Before going any further, We strongly recommend that you read and Familiarize yourself with its contents. This manual contains important information concerning your wind turbine system and its operational characteristics.

The conditions of your warranty are dependent upon the proper installation of your wind turbine.

If you meet any problem when installation, please call during working hours (Monday-Friday 8:00 am to 6:00 pm – Beijing time). Our phone number is **+86 532-67731422**, or you can contact us by **service@greefenergy.com**.

Again, welcome to our family and thank you for investing in the future of wind energy with GREEF wind turbine.

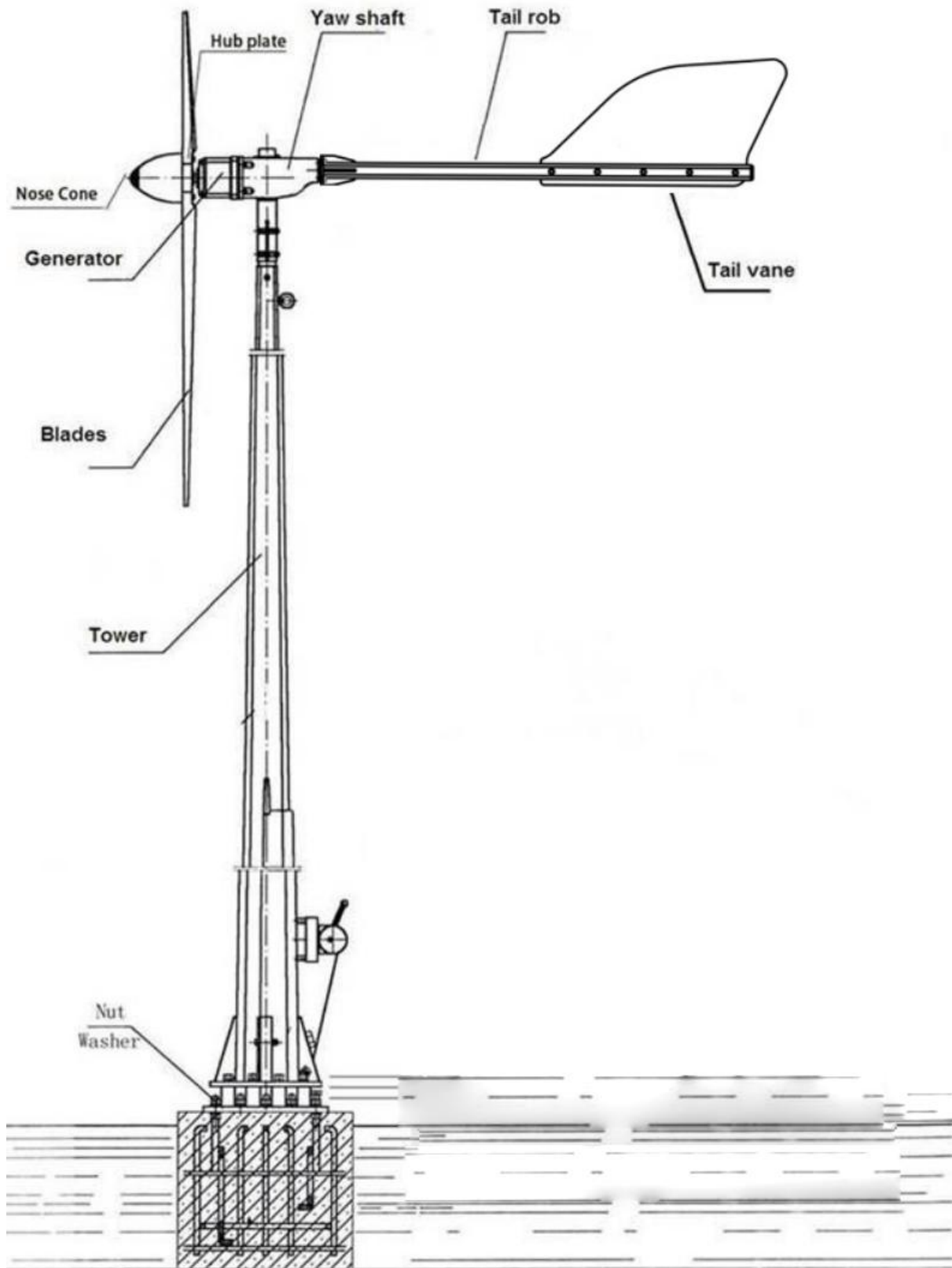
Sincerely,

**QINGDAO GREEF NEW ENERGY EQUIPMENT CO.,LTD**

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# COMPONENTS OVERVIEW



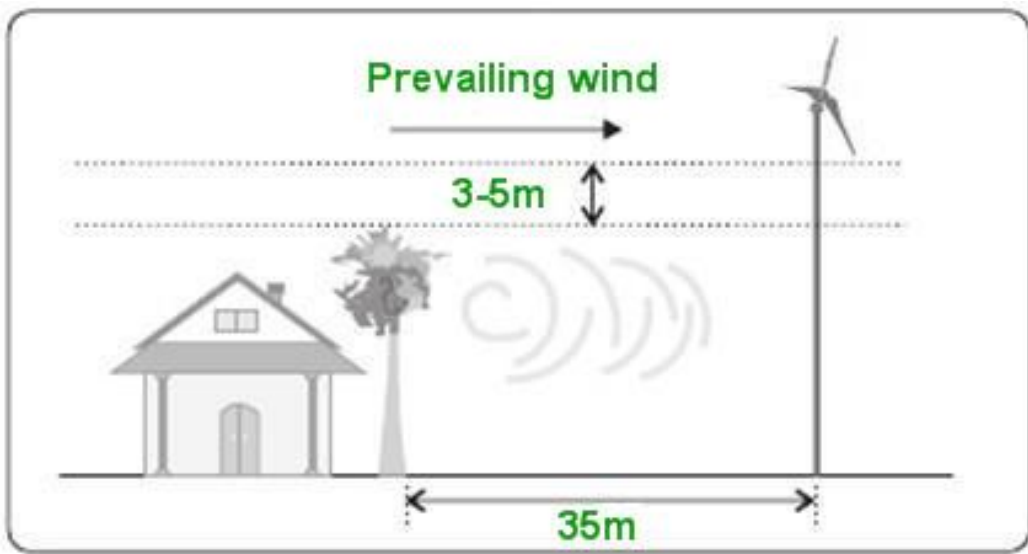
## Technical specifications

Model	GH-2KW	GH-3KW
<b>Performance</b>		
Rated Power	2000W	3000W
Max Power	3000W	4000W
Start Wind Speed	3m/s(6.72mph)	3m/s(6.72mph)
Rated Wind Speed	10m/s(22.4mph)	10m/s(22.4mph)
Working Wind Speed	3-25m/s(6.72-56 mph)	4-25m/s (8.96-56 mph)
Safety Wind Speed	40m/s(89.6mph)	50m/s(112mph)
<b>Physical Parameters</b>		
Blades Length	1.6M(5.25ft)	1.9M(6.23ft)
Blades Rotor Diameter	3.2M(10.50ft)	4M(13.12ft)
Blades Material &Quantity	FRP /3PCS	FRP /3PCS
Top Weight	68kg	150kg
Swept Area	8.04 m <sup>2</sup>	8.04 m <sup>2</sup>
Tower Height	6m(19.68ft.) Free folding tower	8m(26.24ft.) Free Stand tower
<b>Generator Parameters</b>		
Generator Type	Permanent Magnet Generator	Permanent Magnet Generator
Rated Speed	400RPM	300RPM
Start Torque	0.8N.M	2.5N.M
Option Voltage	24-350VAC	48-240VAC
Protection Method	Electromagnetic Brake +PWM	Electromagnetic Brake +PWM
Protection Grade	IP54	IP54
Working Temperature	-40-50°C	-40-50°C
Life time	20 Years	20 Years

# Installation

## Sitting Finding the Best Location for GH-3KW series

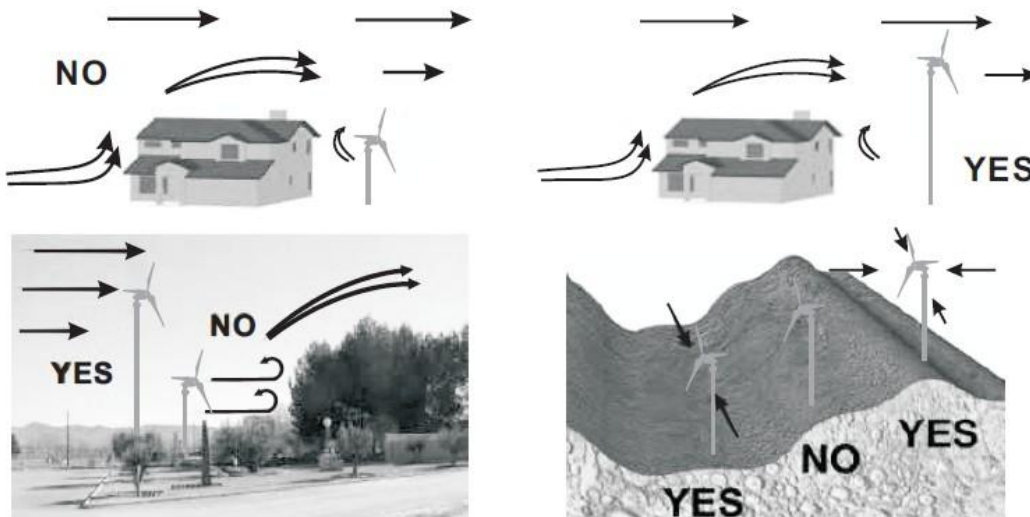
The best location to install a wind turbine is often a compromise. Local building restrictions, the height of surrounding structures, wire length, and available open space may require GREEF wind turbine be installed in a less than optimum location. In general, wind turbine will produce more power if 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-3KW 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 .

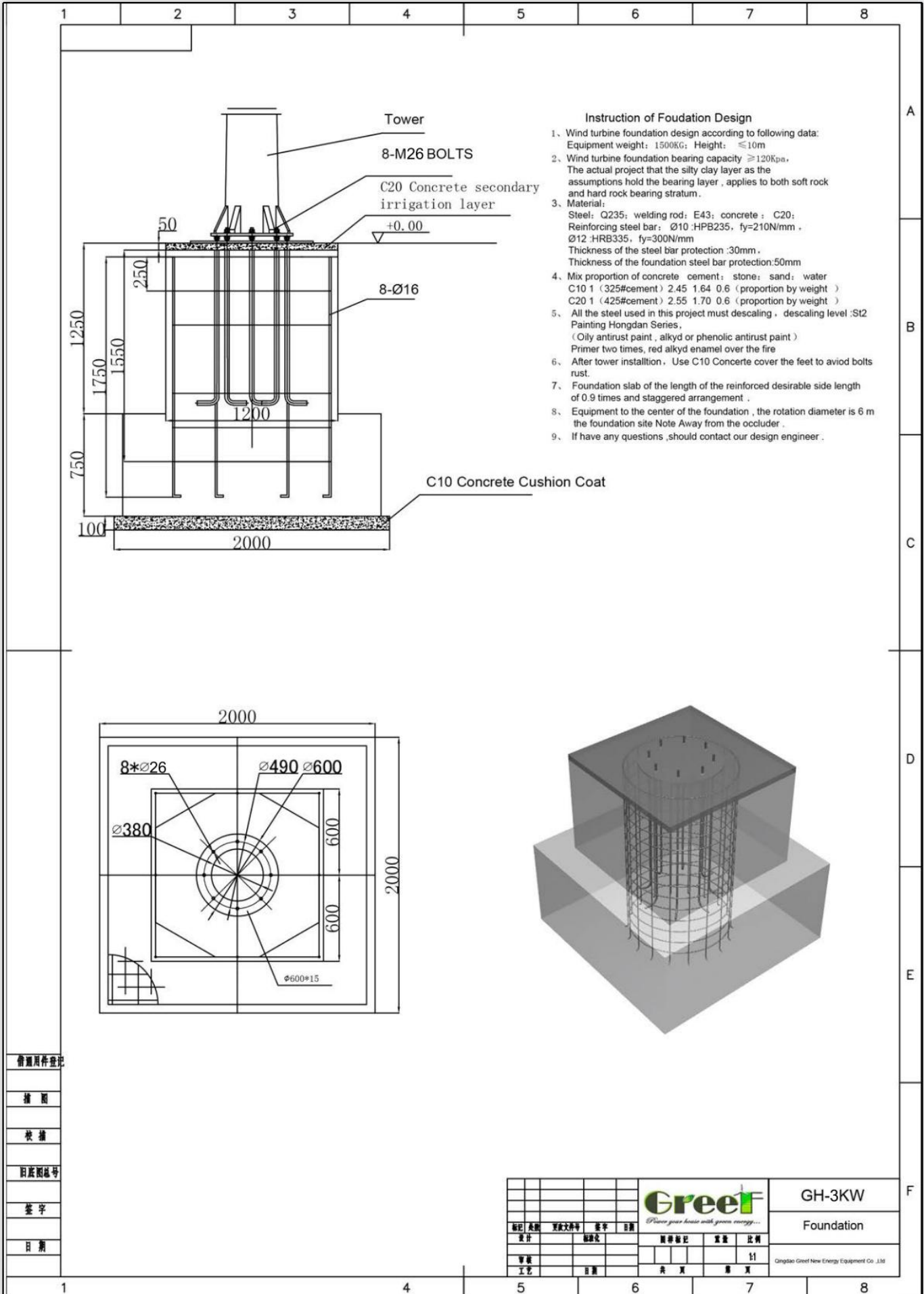
## **Tower Foundation Structure**

There are several types of towers that can be used with GH-3KW wind generator. It is essential that GH-3KW 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 2000mm x 2000mm x 2000mm 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.



繪圖用件登記

繪圖

校核

圖底圖號

簽字

日期

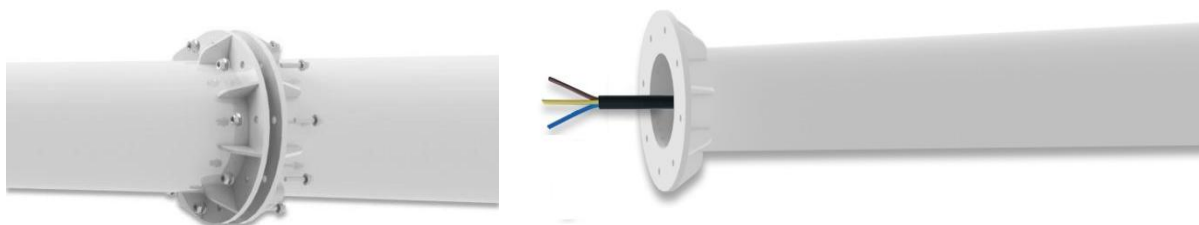
				 GH-3KW Foundation	
設計	審核	繪圖	日期	圖樣號	比例
工藝	日期	共	頁	第	頁



Wind Turbine Foundation model: GH-3KW. 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 <sup>2</sup> : O-HRB335, fy=300N/mm <sup>2</sup> .  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 Stand Tower Installation

Check the terrain around foundation; clean the installation site for tower placement and installation. Place lower mast and middle mast on level ground, clean the flanges; make the masts in one line, put silicon glue on contact surfaces for better sealing. Insert bolts and tighten nuts to couple the upper mast flange and middle mast flange.



### CAUTION

Note: Please tighten all nuts and bolts with socket wrenches and with proper torque, do not damage their coating to avoid corrosion. It is critical that bolts be equally tightened in a sequential pattern diametrically opposed to each other)

## 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 M30 $\times$ 60, fix tower temporarily.

Insert two hexagon bolts M16 $\times$ 55 in 2— $\phi 17$  side holes, put on flat washer 16, spring washer 16 and use spanner to fasten M16 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 M30 $\times$ 60 bolts and M30 nuts under foundation bolts. Please fasten the other 9 sets of adjusting nut, bolts and nuts in order of adjusting nuts, bolts, nuts. Fasten M30 $\times$ 60 bolts in diagonal order. Fasten torque is 870~900Nm. Fasten the two M16 X50 by two sides.

## Wind Turbine Assembly

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

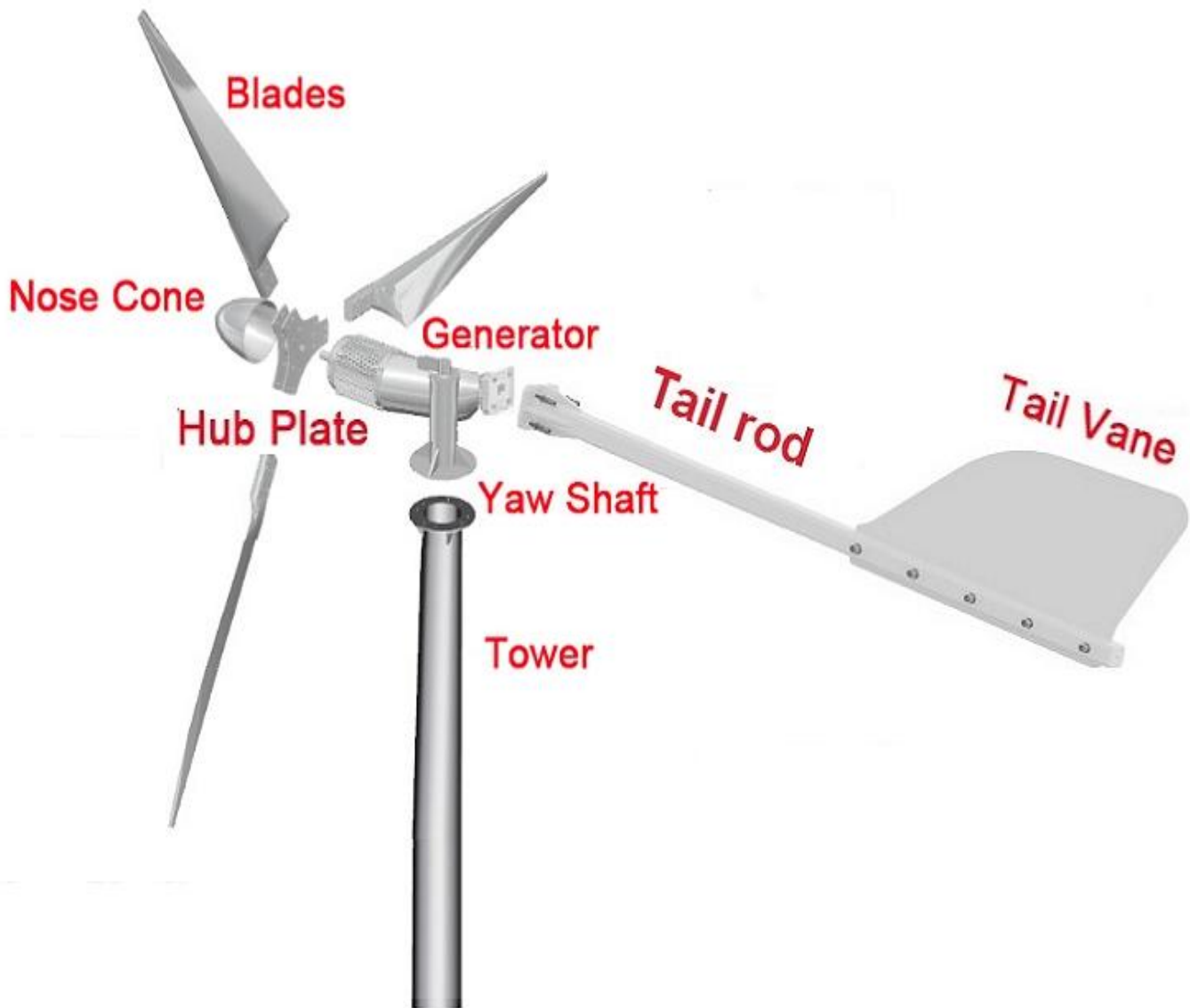
2 Insert the cable through the bottom to the top of the mast with a steel wire ( $\phi 2\sim 3\text{mm}$ ) and extend out about 20 to 50cm. Connect the 3 thrum of the cable (which derivative from the slip ring) with the terminal block.



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

3 Get the assist from crane or other devices to install the generator onto the mast top through the sleeve. Fasten the screw.

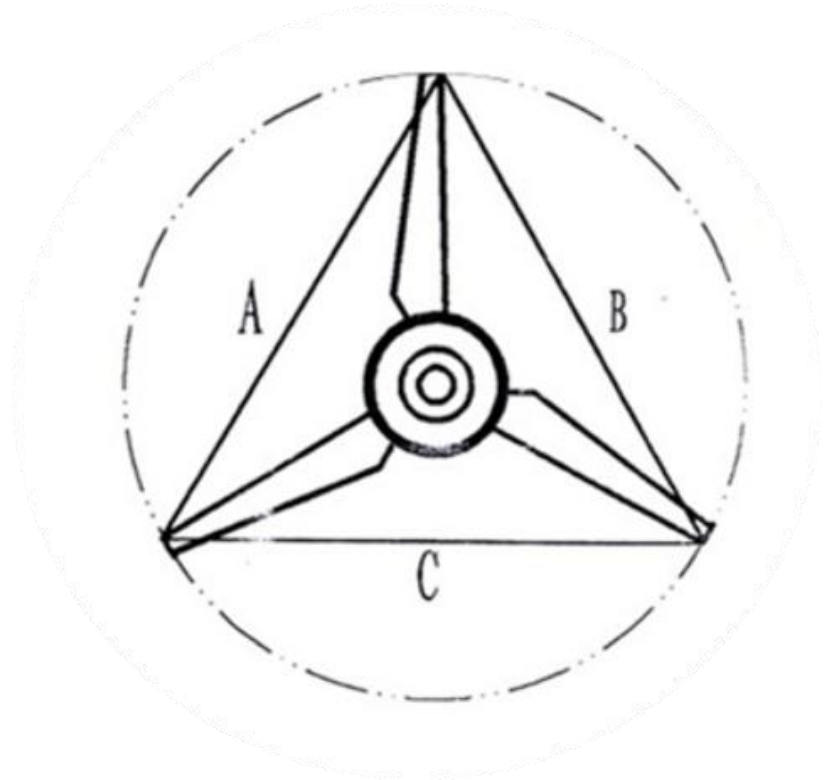
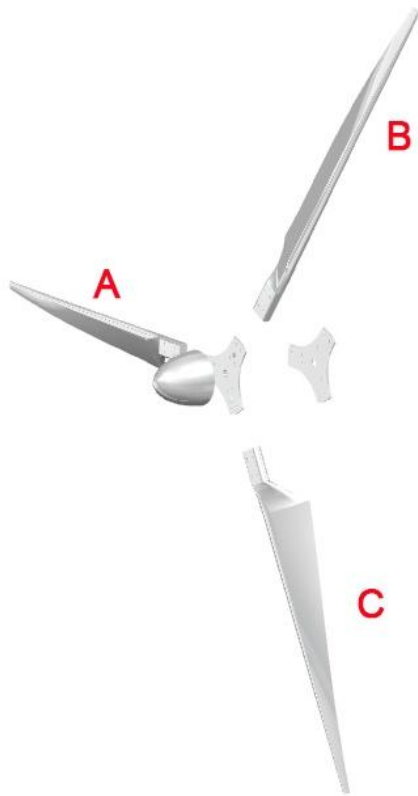
4 Assemble the tail rod to the rotating body, setting the M10 holes correctly, insert the spring washer; screw the four M10 $\times$ 25 inner six angle nuts tightly.



5 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

7 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。

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



**Notice: Please don't mix one package 3pcs blades with other package !**

## Electrical device connection

\*Please refer to the controller inverter manual for details of the electrical wiring section.

## 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 tighten in 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

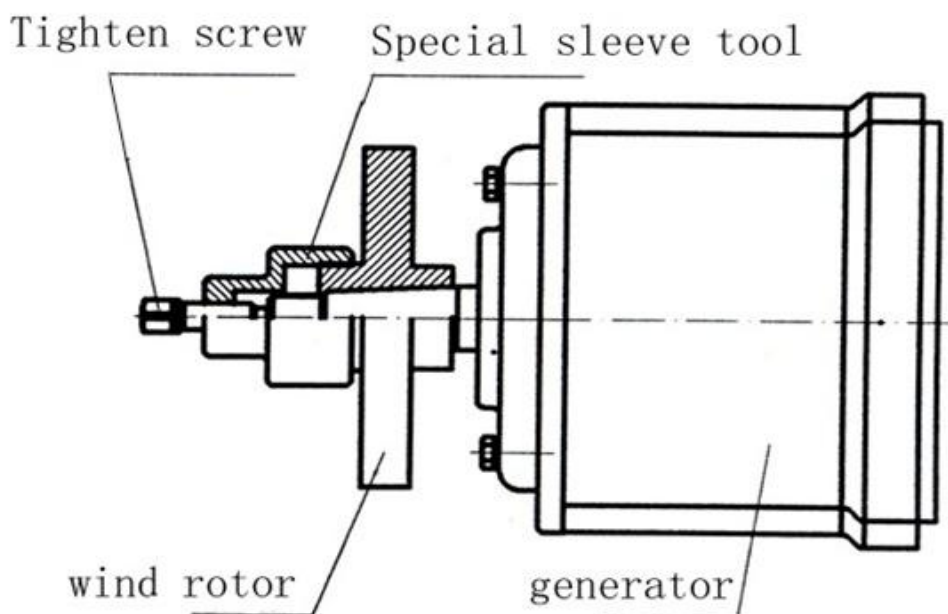
supply lines. DC power supply is safe and economic for illumination; for domestic electric appliances, the AC power supply from inverter should be used. It is suggested that the connector of the refrigerator should insert in the special plug seat which has the function of time lapse.

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 loose 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.below). After repairing, the torque should 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-3KW 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-3KW that may experience damage is the blades, for example, from flying debris during a high wind storm. For this reason GREEF wind generator company recommends GH-3KW 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-3KW 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-3KW 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
<b>Wind generator vibrating excessively</b>	1. Steel cables have become loose. 2. Blade fixing bolts are loose.	1. Adjust the steel cables. 2. Tighten the loose bolts

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

## Warranty service

Respected customers:

Thank you for choosing "GREEF" new energy products.

We always provide a comprehensive range of services before, during and after sales. "GREEF NEW ENERGY guarantee as follows:

### **I. Warranty period:**

**GH series wind turbine are free 3years warranty**

**GW series OFF-GRID controller are free 1years warranty.**

(1) The warranty period is start from the date of on the guarantee card .

(2) Free maintenance services during the warranty period the cost involved be borne by the company, do not charge a fee to customers, free warranty if any damage outside the warranty period, the company will charge a fee for labor costs and materials.

(3) The warranty period, company's quality problems caused by the maintenance of the freight borne by the company. if not under warranty or not quality problem, all the freight &charges by the customer. Tax is should be paid by customer in their own country all the time .

### **II. Warranty:**

We will provide the approved products for all customers to provide maintenance services. But in order to enable the two sides can enjoy fairTreatment, for the following reasons for failure or damage, we will not provide free warranty.

(1) When beyond the warranty period;

(2) Disasters, leaving damage to the product caused by accident;

(3) The user-transport, carrying, falling, collision and damage caused by the failure;

(4) The product as user-modification, and other failures caused by improper use and damage;

(5) The users' unmorally operation, like test with other equipment, and caused by the failure;

(6) Customer open and repair device without our guide and cause damage.

### **III. Maintenance services implementation:**

(1) If your machine meet any problem, please take photos and video to send to our service department and explain the details of the problems. or send to the sales which you contact before.

(2)Our engineers will check the problem, and give you suggestions to solve the problem. Most of the small problem can be solved after engineer guide.

(3)If we find that any parts need to be replacement, we will send the parts to customers.

Quality reason:

GREEF afford products cost &freight for replacement within warranty period. Not including Import charge and duty.

Other reason: GREEF will give free service ,and all cost need pay by customer.

(4) If a major problem in our products, we will send engineers to provide appropriate support.

### **IV. Fees:**

For the warranty, we will charge a fee (fee = fee + replacement parts technical service fees), we will provide timely material Price (cost) .