



OWNER'S MANUAL

Installation

Operation

Maintenance

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Welcome

Phonowind

Congratulations on your purchase and welcome to our family!

Dear Phonowind Owner,

Thank you for your purchase of Phonowind. You have just selected the most technologically advanced, cost-effective 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, please complete and return the enclosed Warranty Registration Card. **The conditions of your warranty are dependent upon the proper installation of Phonowind.** Furthermore, this will assure you of being kept up-to-date with the latest developments from Phonowind. These include new options, performance tips, updated software to maximize output and user notices. It is important to know that we do not sell or distribute your information to any third party. We understand your privacy is important.

If you have any questions or comments, we would like to hear from you. Please call during working hours (Monday-Friday 09:00 - 15:00 CET).

Our phonenumber is +86 25 58638132

+86 25 58638136

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

Sincerely,

Phonowind

Enter the serial and model number below

Serial Number _____

Model Number _____

Safety



WARNING: Read all instructions. Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.

General Safety Rules

- 1) **SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.** This manual contains important instructions for Phonowind that must be followed during installation and maintenance.
- 2) READ and UNDERSTAND all warnings before installation
- 5) Install Phonowind in accordance with National Electric Code(NEC) and local building codes
- 6) Always obtain a building permit before construction
- 7) Always Use safety equipment. Non-skid safety shoes, hard hat, work gloves and safety glasses must be used for appropriate conditions. Ordinary eye or sun glasses are NOT eye protection.
- 8) Turn Phonowind "Stop" if ice accumulates on blades to avoid possible injury resulting from ice blocks dropping from the blades and tail runner
- 9) This wind generator complies with international safety standards and therefore the design or its installation must never be compromised.
 - a. Do not change the structure and function of the generator
 - b. Do not modify the control software.
 - c. Apply the proper torque to all fasteners.
 - d. Install only on a Professional Engineer (PE) certified tower.
- 10) Do not enter the danger area in the process of installation and maintenance. Workers should circle the danger area with warnings and barriers. The danger area's diameter is 20m with the tower as the center.
- 11) Use only proper grounding techniques as established by the NEC
- 12) Ensure the battery and inverter is switched off and the generator is in the stop status before installation and maintenance
- 13) Poor Connection and damaged electric cables must be dismantled and replaced



WARNING: Do not approach the generator in the weather of thunderstorm



WARNING: Do not change the battery connection wires when the generator, controller and inverter work. Please turn off the generator, controller and inverter before disconnect the battery connection wires.



WARNING: Unloading resistance is the important control brake and overload unloading protection component in the system and ensure that it connects the controller effectively. Do not change the unloading resistance connection wires when the generator, controller and inverter work.

- 14) Do not install the generator in the bad weather or when the wind speed is over 5m/s
- 15) Phonowind must be installed in accordance with this manual and local and national building codes. Failure to comply with the manual and local codes will affect and possibly void your warranty.
- 16) Phonowind uses high voltage and is potentially dangerous. Be sure to use all safety precautions at all times.

The Requirement of Personnel

- 1) Only the people who have full civil capacities are allowed to do the related work.
- 2) Only the designated personnel who have trained by manufacturer, read and got a good understanding about the manual, can do the installation and maintenance work of generator.
- 3) The work high above the ground can only be done by the well-trained workers
- 4) There must be one experienced worker to supervise constantly if the workers who are undergoing training want to do any operation on the generator.
- 5) At least two workers do the generator installation and maintenance work simultaneously
- 6) The personnel's protection: to avoid being hit by the falling objects, the workers must put on the safety helmets with locking belts when they are working around the towers. And they must wear the life jackets if the generator is near to the water sites.

Improper Use



WARNING: The generator cannot work without the controller. If there's no controller, make the generator short-circuited. When the controller hasn't work, put the Wind Turbine of controller on the place of "Stop"

- Without the manufacturer's written permission, do not change the structure and function of the generator.
- Do not modify the control software.
- The unqualified personnel are not allowed to do the work of the generator's installation and maintenance.
- Phono wind will not be responsible for the losses caused by improper use.

Mechanical Hazards



WARNING: To avoid being hit by the falling objects, do not enter the danger area in the process of installation and maintenance. Workers should circle the danger area with warning marks and the red and white barriers. The danger area's diameter is 20m with the tower as the center.

- Do not approach the blade and the tail rudder when the generator works.
- In the process of the generator's installation and maintenance, make sure that the generator doesn't work, its output lines are in short circuits and the blade will not move.

Electrical Hazards



WARNING: Before starting the work of any electrical component's installation and maintenance, the generator must enter the "Stop" status and the controller, storage battery and the inverter are without power. The switch cabinet must have the warning sign of no starting. Check whether the generator is with power, grounded and in the status of short circuits or not.

- 1) Poor connection and damaged electric cables must be dismantled and replaced.
- 2) To avoid the over load, the connections of the equipment must meet the requirements of Appendix D.
- 3) Make the generator stop work if there are some network faults.

- 4) The electrical system must be in the security status. Please refer to the requirements of Chapter Five to do the regular maintenance work.
- 5) Only the authorized workers can test the electrical components.
- 6) The off-grid controller and inverter cannot be directly used with the lines that connect the electric network.
- 7) The auxiliary equipment and tools must be insulated. Do check whether there is a problem before use.

Bad Weather



WARNING: Torrential Rain/Lightning Danger: Do not approach the generator in the weather of thunderstorm. If it's in the weather of thunderstorm, the personnel who are close to the tower must leave at once.

- Before the weather of typhoon / tornado / hurricane / sand storms / earthquakes come, user should let the generator stop work and put the tower down. The personnel who are close to the tower must leave at once.
- Under certain climate conditions, the blades will freeze, turn the ponowind "stop", The blades will not work unbalancedly because of the over weight. And the ice blocks may drop from the blades and tail rudder.
- Do not install the generator in the bad weather or when the wind speed is over 5m/s. Please consult Phono Wind technical personnel first if you have special requests.

Battery



WARNING: Please follow the battery instructions to operate it. Do not change the battery connection wires when the generator, controller and inverter work. Please turn off the generator, controller and inverter before disconnect the battery connection wires.



WARNING: Do connect the battery with the controller before starting the off-grid generator.

Unloading Resistance



WARNING: Unloading resistance is the important control brake and overload unloading protection component in the system. Ensure that it connects the controller effectively. Do not change the unloading resistance connection wires when the generator, controller and inverter work. Do please check whether there is a problem before use.

Rotating Components



WARNING: Do not approach the blade and the tail rudder when the generator works

High Temperature Mark



WARNING: This mark mentions the temperature of some parts in the controller exceed 65 centigrade, take care and avoid the possibility of burns

Ventilation Mark



WARNING: This mark mentions that the controller use natural heat dissipation method, pay attention to ventilation

High-Voltage Electric Mark



WARNING: this mark mentions that there is high AC or DC voltage in the controller, the operator should know the proper practices of high-voltage

Warranty

Hardware Warranty

Phonowind will repair or replace free of charge any part or parts of the Phonowind generator determined by Phonowind to be defective in materials and/or workmanship under normal authorized use consistent with product instructions for a period of two years from the date the original purchaser ("Customer") receives the wind generator ("Start Date"). This warranty extends only to the original purchaser. The Customer's sole and exclusive remedy and the entire liability of Phonowind, its suppliers and affiliates under the warranty is, at Phonowind's option, either (i) to replace the wind generator with new or reconditioned wind generator, (ii) to correct the reported problem, or (iii) to refund the purchase price of the wind generator. Repaired or replaced products are warranted for the remainder of the original warranty period.

Restrictions

Problems with the wind generator products can be due to improper use, maintenance, non-Phonowind additions or modifications or other problems not due to defects in Phonowind Energy's workmanship or materials. No warranty will apply if the wind generator (i) has been altered or modified except by Phonowind, (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Phonowind (iii), or (iv) has been exposed to winds exceeding 40 m/s, or has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Phonowind's repair facility determines that the problem with the wind generator is not due to a defect in Phonowind's workmanship or materials, then the party requesting warranty service will be responsible for the costs of all necessary repairs and expenses incurred by Phonowind.

Disclaimer

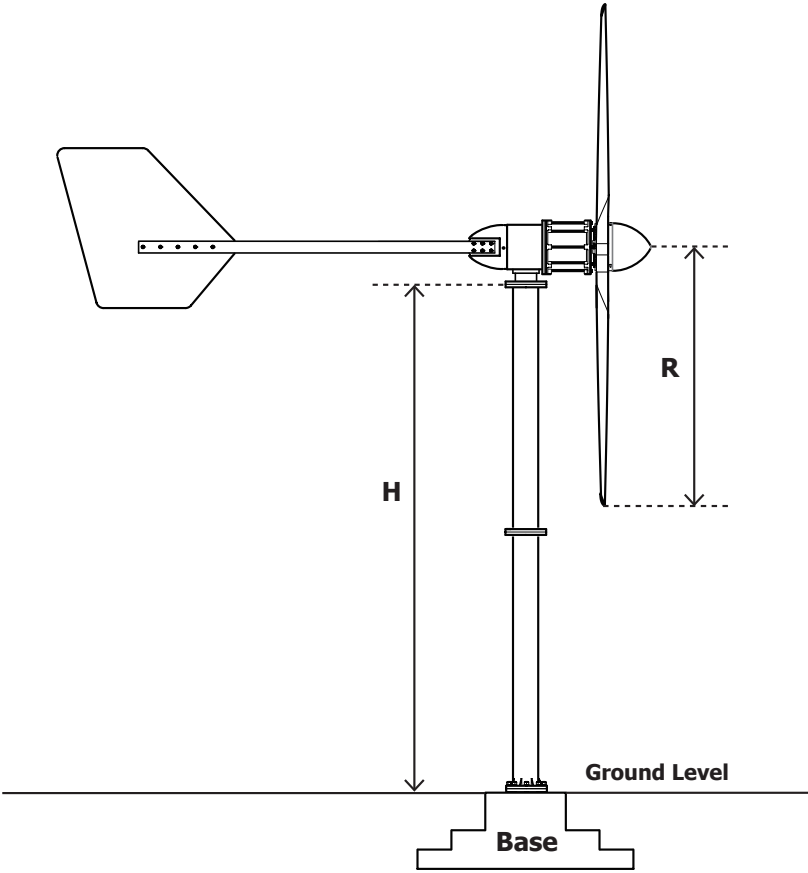
EXCEPT FOR THE EXPRESSED WARRANTY SET FORTH ABOVE, PHONOWIND DISCLAIMS ALL OTHER EXPRESSED AND IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WHETHER OR NOT SIMILAR IN NATURE TO ANY OTHER WARRANTY PROVIDED HEREIN, SHALL EXIST WITH RESPECT TO THE PRODUCT SOLD UNDER THE PROVISIONS OF THESE TERMS AND CONDITIONS. PHONOWIND ENERGY EXPRESSLY DISCLAIMS ALL LIABILITY FOR BODILY INJURIES OR DEATH THAT MAY OCCUR, DIRECTLY OR INDIRECTLY, BY USE OF THE PRODUCT BY ANY PERSON. ALL OTHER WARRANTIES ARE EXPRESSLY WAIVED BY THE CUSTOMER.

Limitation of Liability

UNDER NO CIRCUMSTANCES WILL PHONOWIND ENERGY OR ITS AFFILIATES OR SUPPLIERS BE LIABLE OR RESPONSIBLE FOR ANY LOSS OF USE, INTERRUPTION OF BUSINESS, LOST PROFITS, LOST DATA, OR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OF ANY KIND REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, RESULTING FROM THE DEFECT, REPAIR, REPLACEMENT, SHIPMENT OR OTHERWISE, EVEN IF PHONOWIND ENERGY OR ITS AFFILIATE OR SUPPLIER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. (Note: some states and provinces do not allow the exclusion or limitation of incidental or consequential damages, so these limitations may not apply to you). Neither Phonowind nor its affiliates or suppliers will be held liable or responsible for any damage or loss to any items or products connected to, powered by or otherwise attached to the Hardware. The total cumulative liability to Customer, from all causes of action and all theories of liability, will be limited to and will not exceed the purchase price of the product paid by Customer. This Warranty gives the Customer specific legal rights and the Customer may also have other legal rights that vary from state to state or province to province.)

Introduction

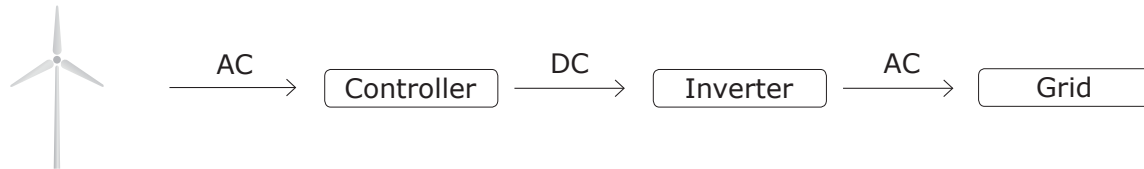
The Phono Wind generator is made of the three-phase permanent direct driving generator, three blades, the rotary table, the passive yawing tail rudder, rotors, the tower, the controller and dump load. See system specification table for the specific parameters.



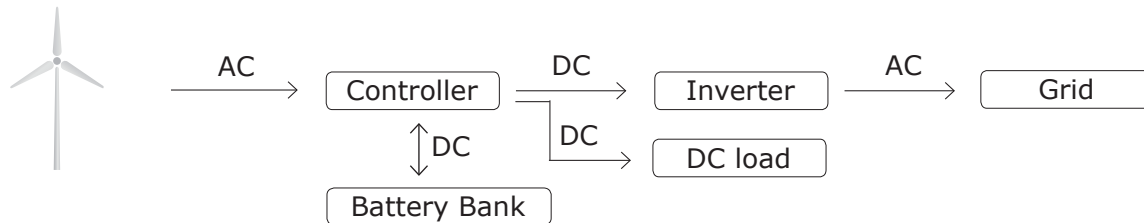
| Model | H | R |
|-----------------------------|-----|-------|
| Phono W-1.0 (PWB01-30-48) | 10m | 1.5m |
| Phono W-2.0 (PWB02-40-48) | 10m | 2m |
| Phono W-3.0 (PWA03-44-240) | 10m | 2.2m |
| Phono W-5.0 (PWA05-50-240) | 10m | 2.5m |
| Phono W-10.0 (PWA10-75-450) | 10m | 3.75m |

Typical Phonowind system installation

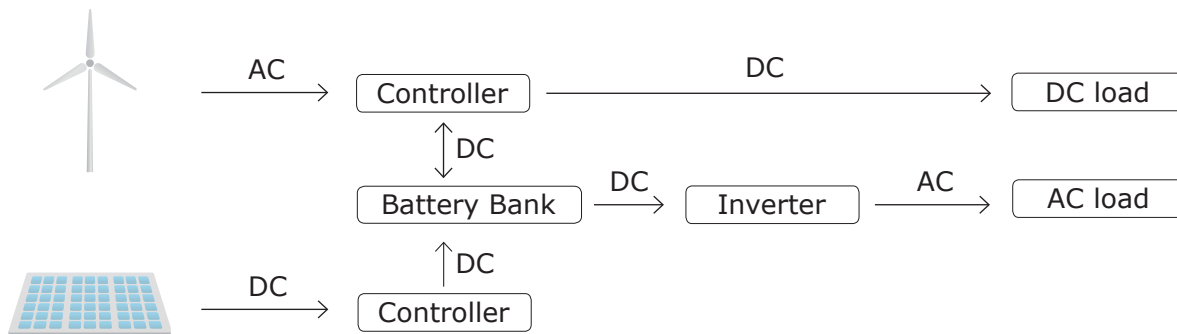
On-Grid



Off-Grid

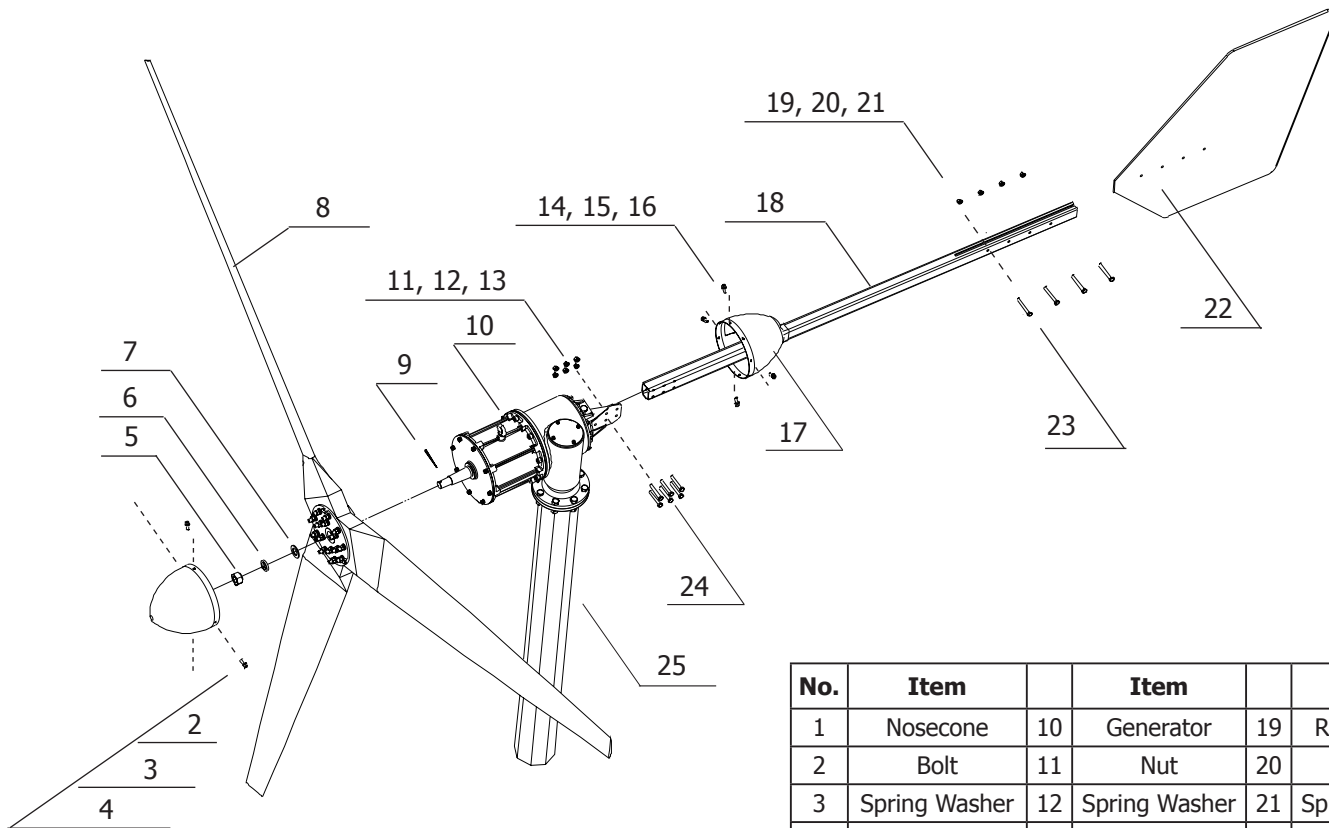


Off-Grid wind - solar hybrid system



Wind Driven Generator System

The wind driven generator system includes the fairing, the rotary table, blades, three-phase permanent direct driving generator, rotors, the trail cover, the tail rudder rod and the tail rudder.



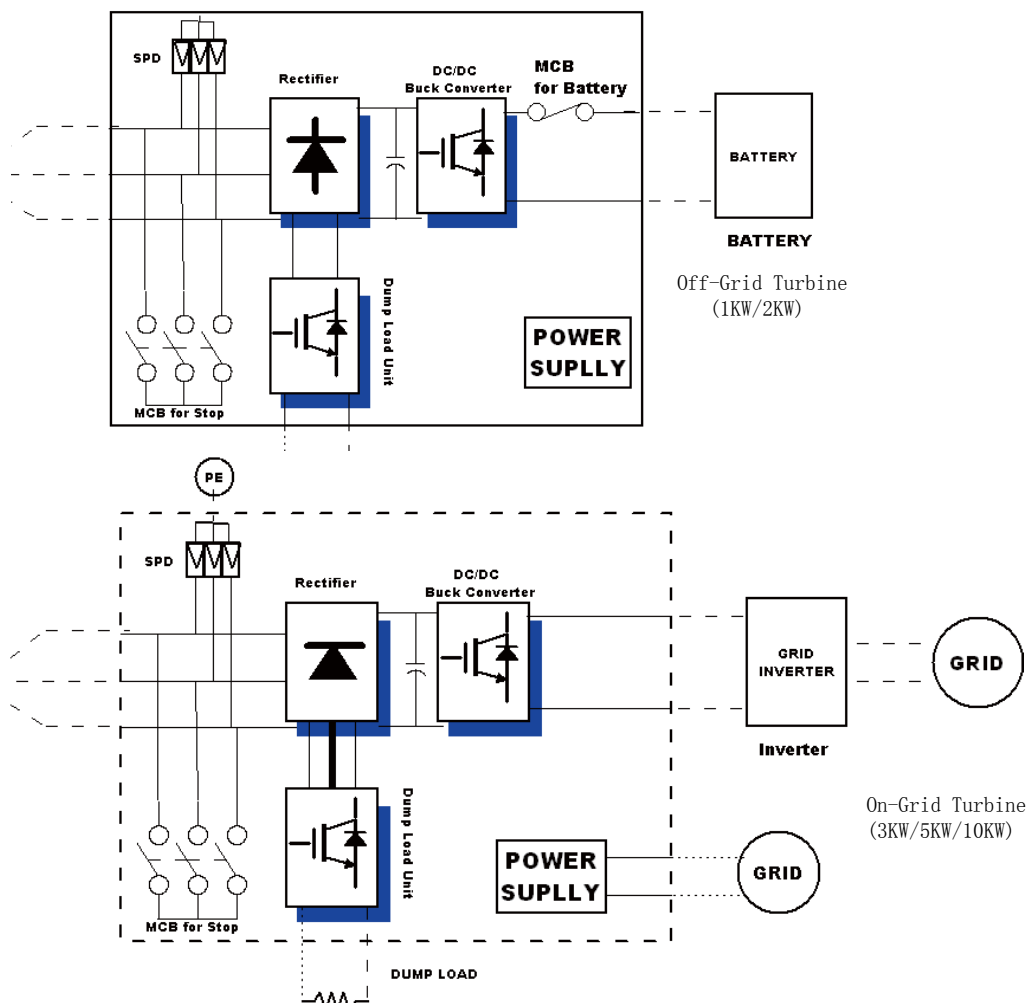
| No. | Item | | Item | | Item |
|-----|-------------------|----|---------------------|----|---------------------|
| 1 | Nosecone | 10 | Generator | 19 | Rudder Pole |
| 2 | Bolt | 11 | Nut | 20 | Nut |
| 3 | Spring Washer | 12 | Spring Washer | 21 | Spring Washer |
| 4 | Plain Washer | 13 | Plain Washer | 22 | <u>Plain Washer</u> |
| 5 | Nut | 14 | Nut | 23 | <u>Rudder Plate</u> |
| 6 | Spring Washer | 15 | Spring Washer | 24 | Nut |
| 7 | Nut | 16 | Plain Washer | 25 | <u>Nut</u> |
| 8 | <u>Wind Rotor</u> | 17 | Tall Cover | 26 | <u>Tower</u> |
| 9 | Cotter Pin | 18 | <u>Rudder Plate</u> | | |

Wind Generator Controller



WARNING: The generator controller must match the dump load that conform to the technical data.

- The Phono generator controller changes AC of the generator's output current to DC and protects the wind driven generator system and the inverter (the battery).
- The Phono generator controller applies only to the Phono generators of the appropriate models. The principles of the On-grid system and the off-grid system are different.



Wind Generator Inverter

- For the inverter, please refer to Appendix B or contact Phono wind for details. Our technicians will recommend you the suitable inverters that meet the local security standards, electricity network standards and your use standards. The MPP that the inverters need will also be offered.
- For the installation, use, maintenance and the warranty of the inverters, please refer to instructions or user manual offered by the inverter suppliers.

Battery

- For the battery, please refer to Appendix C contact Phono for details and our technicians will recommend you the most suitable solutions.
- For the installation, use, maintenance and the warranty of the battery, please refer to the instructions offered by the battery suppliers.

Wires, Joints and Switches

- Please refer to Appendix D to choose the wires, power switches and joints that meet the country and region law and regulations where the generators are used.

Installation



WARNING: Do the generator installation, assembly and running work after reading the complete instructions.



WARNING: Before the installation work, please refer to the packing list to check whether the generator components are complete.



WARNING: For the off-grid system, workers should prepare the batteries and ground terminals while the workers should prepare the terminal boxes that connecting with the power network as well as the terminal boxes for the On-grid system.

Installation Guidelines

- 1) Keep this manual as the content of this manual is very important. In the process of assembly, installation and maintenance, do please follow the content.
- 2) Please read, understand and take all the warnings seriously.
- 3) Do not do the installation work under the bad weather or when the wind speed is over 5m/s.
- 4) Follow the connection requirements in this manual, including the recommended specifications. Use the wires and the joints that meet the local law and regulations where the generators are installed.
- 5) If you notice the abnormal noise or the situation of the generator, please turn off the machine and contact the qualified service staff.
- 6) When installing the wind driven generator, users must follow the related regulations of this manual and the nation. If users don't follow the related regulations of this manual and the nation, it may influence the warranty of the products you bought and make it invalidated.
- 7) the rotating blades are dangerous. Do make sure that nobody will touch the blades in the process of the installation.
- 8) For the On-grid system, please choose the inverters that match the local network and you can contact Phono Wind or local dealers to get.
- 9) For the unclear problems, please contact Phono Wind or local dealers.

Slection of installation Sites

As each installation is diffrent: the heifht of surrounding structures, wire length, and available open space, the best place to install a wind turbine is often a compromise.

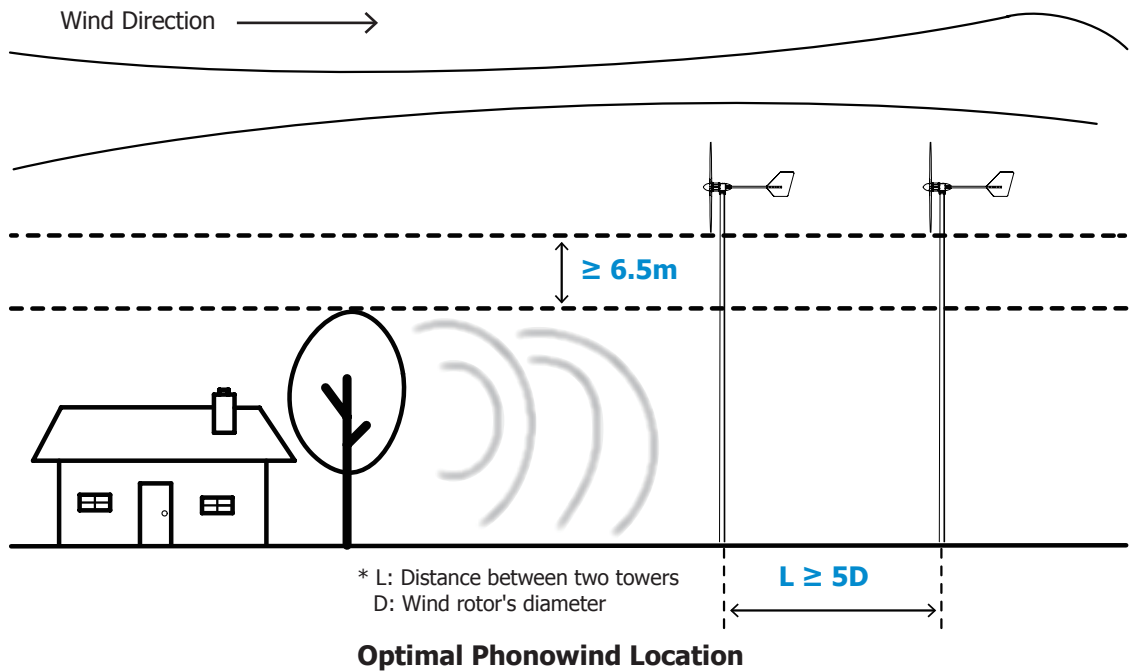
In general, the wind turbine will produce more power if installed on a taller tower. However, the price of the tower increase along with the height of tower, so it is important to balance performance to installed cost in order to achieve the lowest cost of energy and the quickest payback.

Recommendations:

- Install Phonowind 6.5m above any surrounding object within 50m radius
- $L \geq 5D$ (L: Distance between two towers, D: Rotor's diameter)



TIP: Your dealer can help you to determine the best location to install Phonowind



Recommended ambient conditions:

Temperature range:

-30° C to +50° C

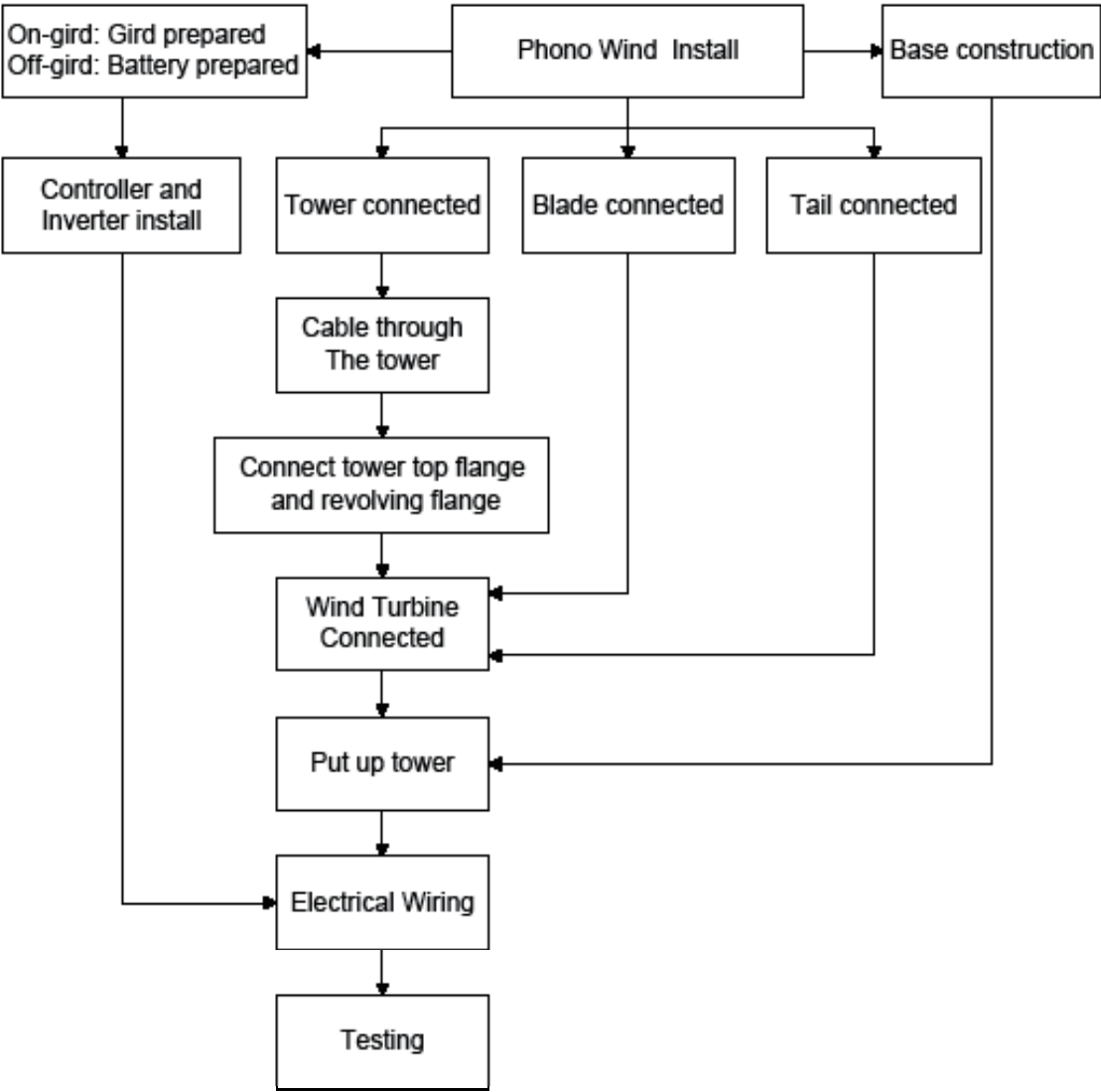
Humidity condition:

Up to 95%

Recommended elevation value:

Below 3000m

Installation Flow Chart



Requirements of Foundation

Pouring the Foundation: Trench the excavation according to the foundation drawing you will use, blind or weld the ground anchors according to its arranged sizes and then put the ground anchors into the excavation and start to pour the concrete after arranging the ground anchors well.

As the concrete's compressive strength is over 32.5Mpa (ISO 679). Users can use the vibrating spear to make the concrete dense.

After pouring the foundation, users should cover it to do the wet maintenance work and the wet maintenance period is 200h. The foundation bolts that are above-ground should be painted with the grease or wrapped with the plastic in case of rusting



Notice: When constructing, users can do the earth terminal work as well. And the resistance to the ground is $\leq 4\Omega$.



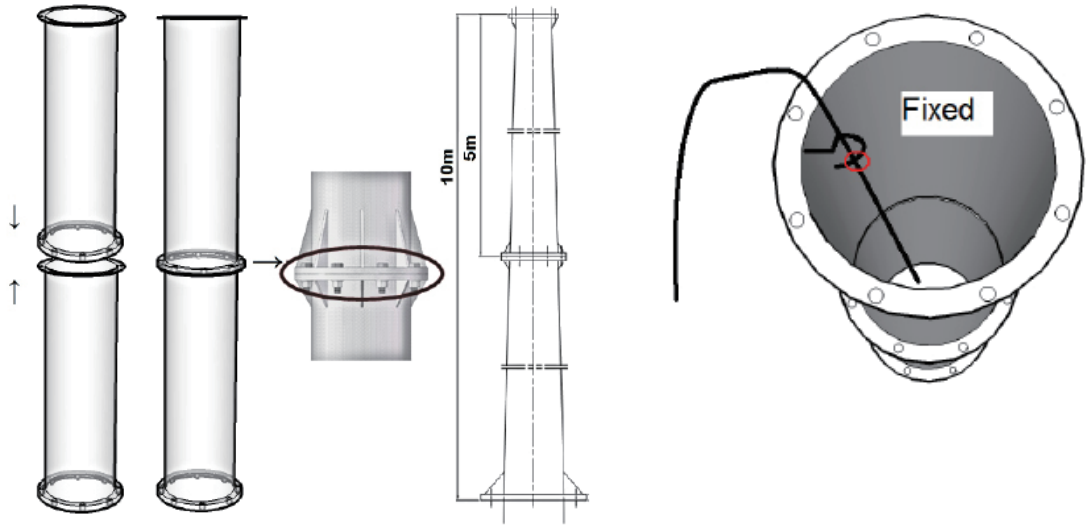
Notice: The foundation construction standards should meet the local laws and regulations. Please refer to the appendix for the foundation construction drawings.



Notice: The foundation soil is very important reference and please consult the civil engineers for the detailed requirements. It should be in accordance with the foundation drawings and the requirements of the construction project.

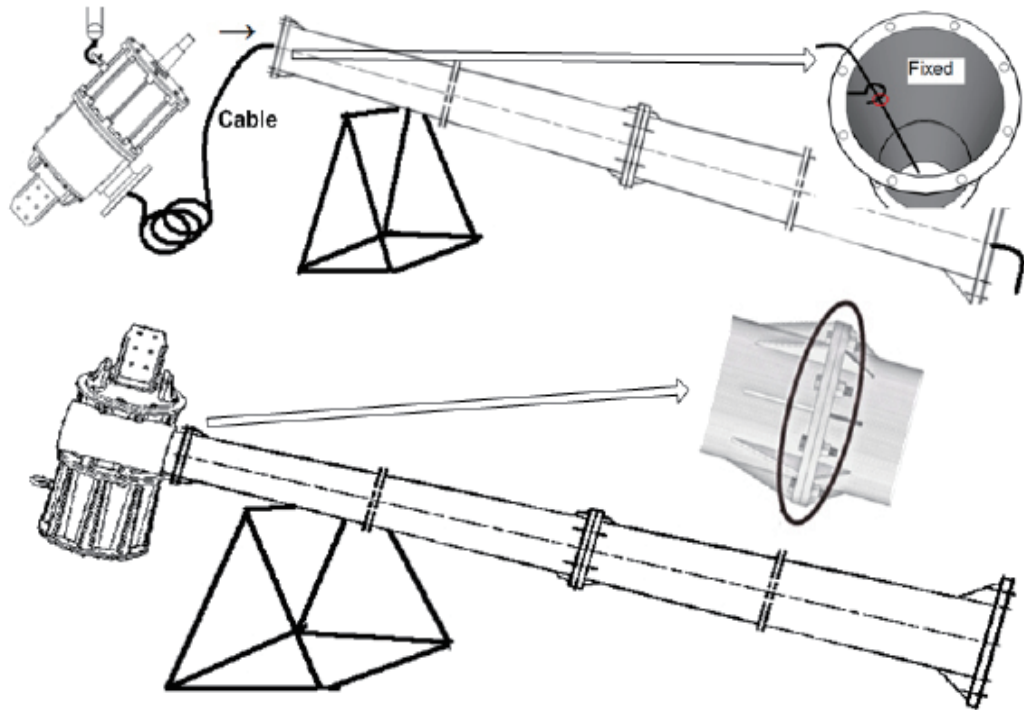
Two Towers Connection

- 1) Following the drawing, use the crane to put the **two towers** together and align the middle flanges.
- 2) Use the bolts to connect the two tower flanges. Please refer to Appendix A for the specifications and the moment of force of bolts.
- 3) **Let the wires go through the tower and connect the cable row of the tower bottom. Let the cable row be in the status of "On" (short-circuit condition) and prevent the blades from rotating stall.**
- 4) **Secure the tower to good ground and the ground resistance value is $\leq 4\Omega$.**



Generator Connection

- 1) Use the crane to hoist the generator and Keep the top of the tower on the same plane.
- 2) Make the lines go through the tower and the lines should 200-250mm longer than the installation of the tower and generator. Place the lines in the lifting hook of the generator installation's tower inner bore.
- 3) Use the crane to hoist the motor, connect the lines of the tower with the outgoing lines of the motor and wrap them with sello tapes.
- 4) Use the bolts to connect the tower's top flange with the rotary flange.
- 5) Please refer to Appendix B for the specifications and moment of force of the bolts

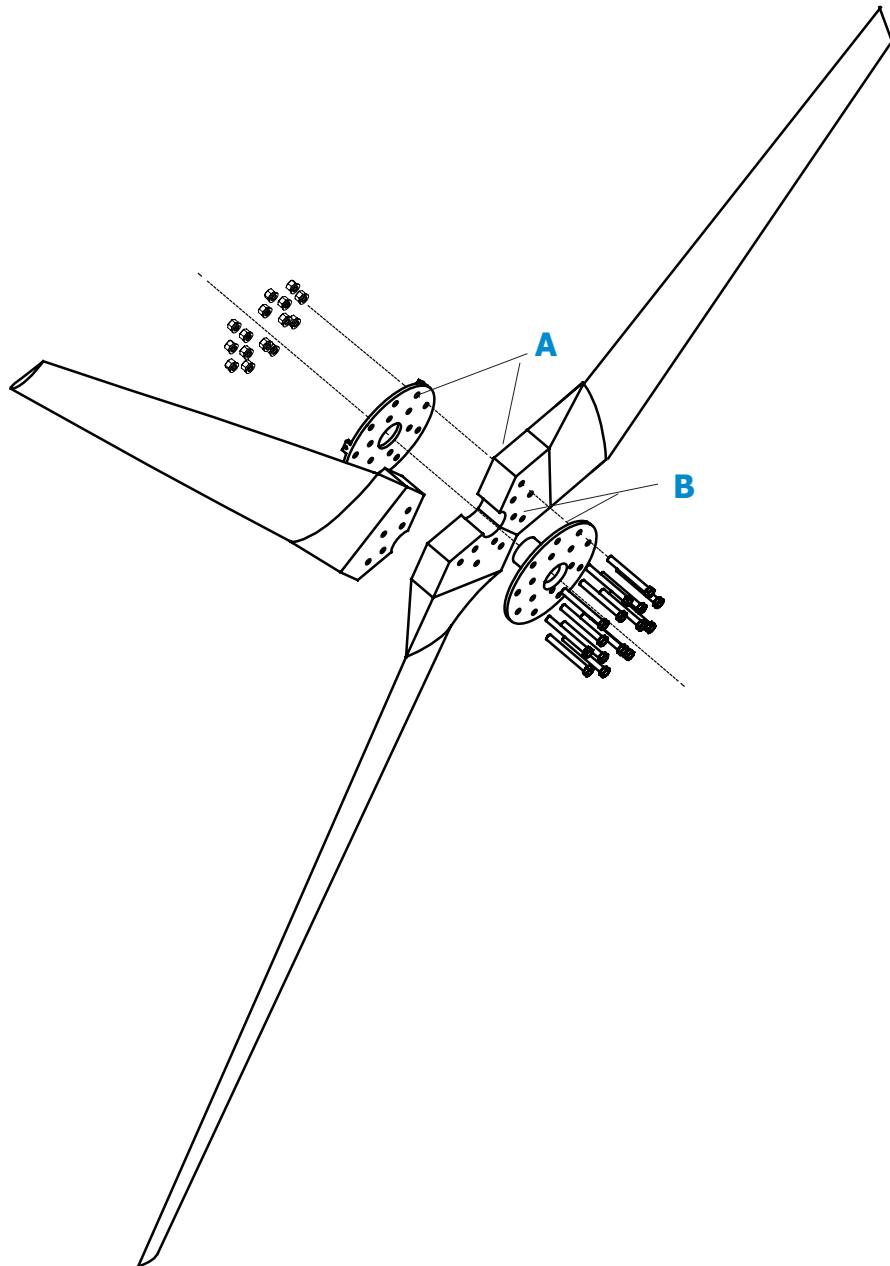


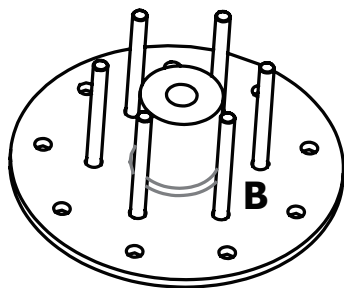
Installation of Blades

- 1) Lock six bolts to the wind roulette and the side B of rear hub faces up.
- 2) Let the side B of the blade root face down, install them on the blade sockets and use the hammer to tap lightly to make the bolts close to the blade sockets. The blade side A faces the wind roulette side A while the blade Side B faces blade socket side B. Install another two blades as this way. Use the rubber hammer to tap the three blade roots to the wind roulette bottoms.
- 3) Install the front hub on the rear hub.
- 4) Screw the nuts with hands but don't tighten them.
- 5) Turn over the whole wind rotor and screw another 9 bolts.
- 6) Turn over the wind rotor again, measure the distance of the blades as the common difference should be $\pm 3\text{mm}$ to make sure that the angle of the three blades is 120° .
- 7) After the measurements and adjusting, install the plain washers and spring washers of the bolts and tighten the nuts.
- 8) Please refer to Appendix B for the specifications and moment of forces of the bolts.

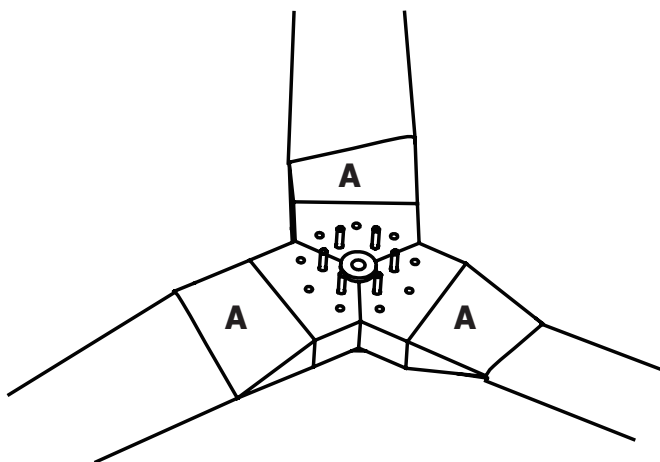


Notice: do add the spring washer and the plain washer to each bolt, tighten them and keep the moment of force same.

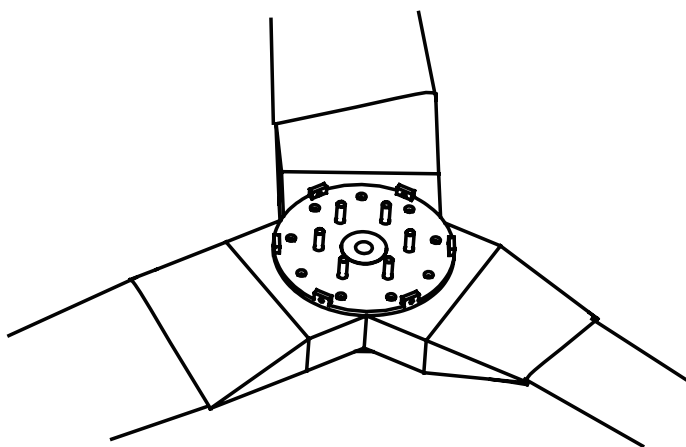




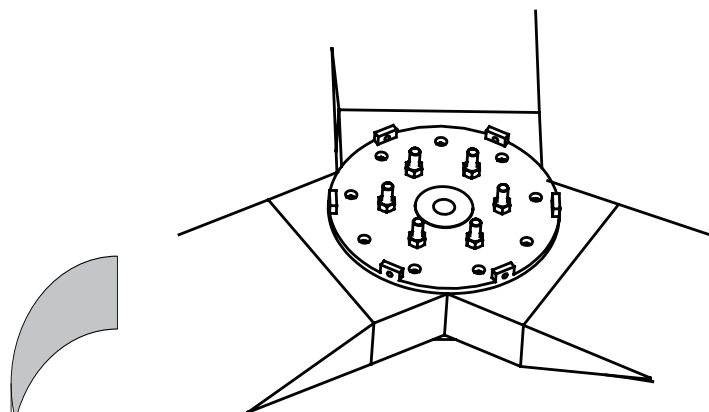
Step 1



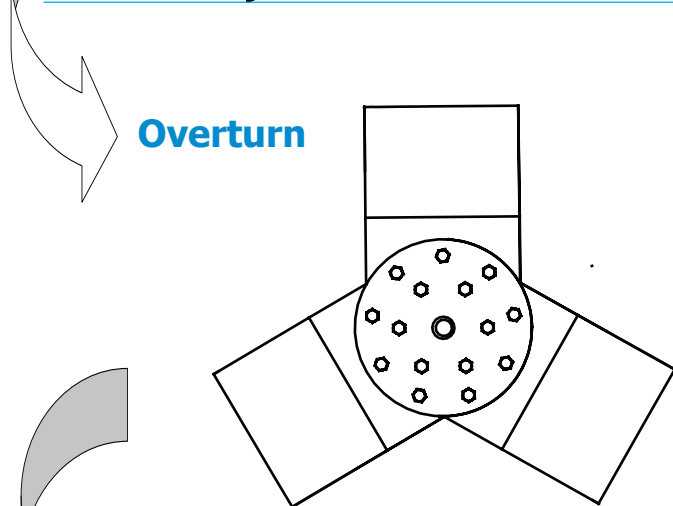
Step 2



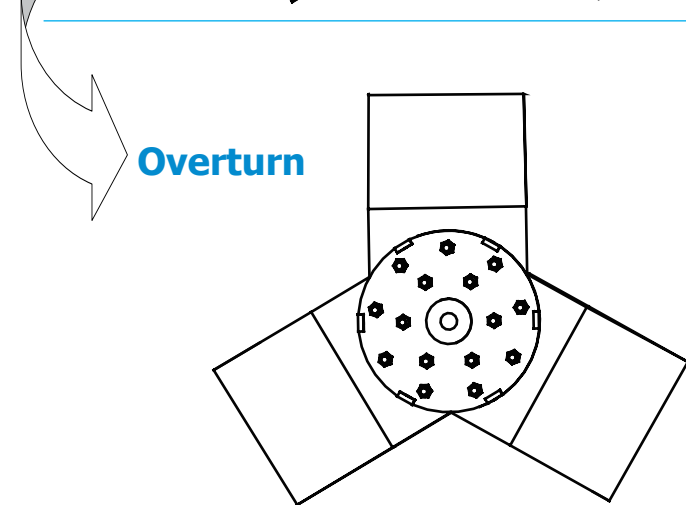
Step 3



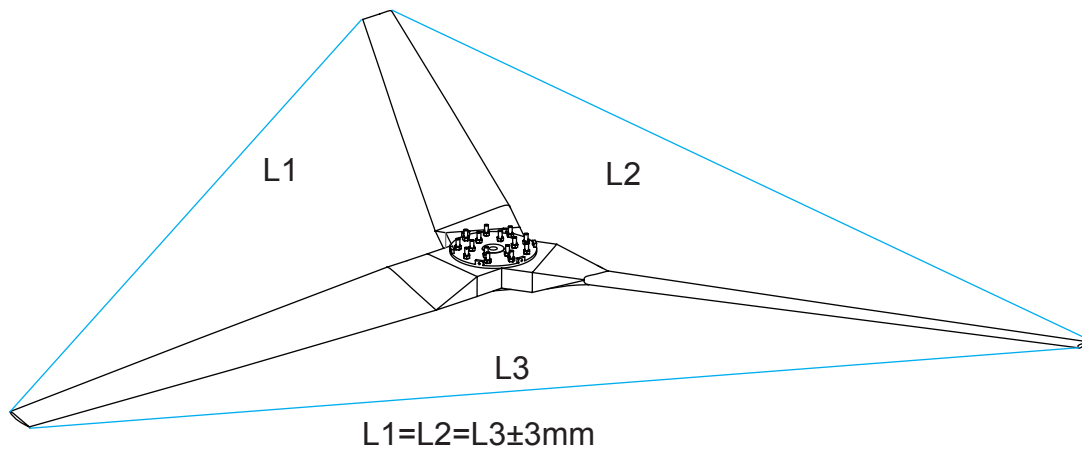
Step 4



Step 5



Step 6

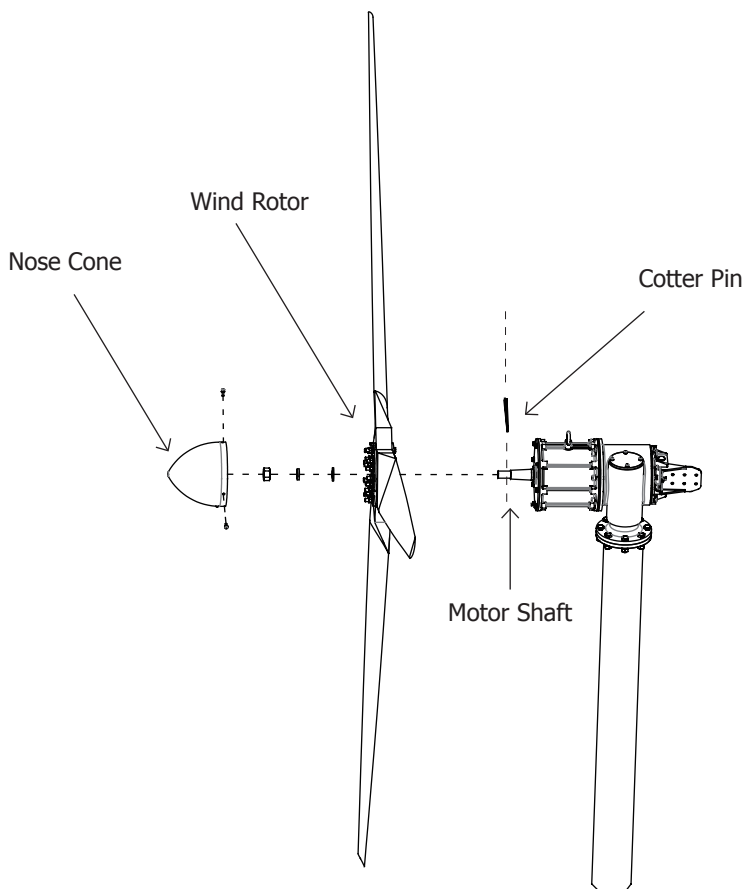


Connections of Rotary Table and Generator

Put the installed wind rotor to the to motor shaft, fix it with nuts, plain washer, spring washer and cotter pin. Install the nose cone and fix it with bolts. Use three screws, connecting bolts, flat washers and spring washers to fix the nose cone on the wind rotor. Please refer to Appendix B for the specifications and moment of forces of the bolts.

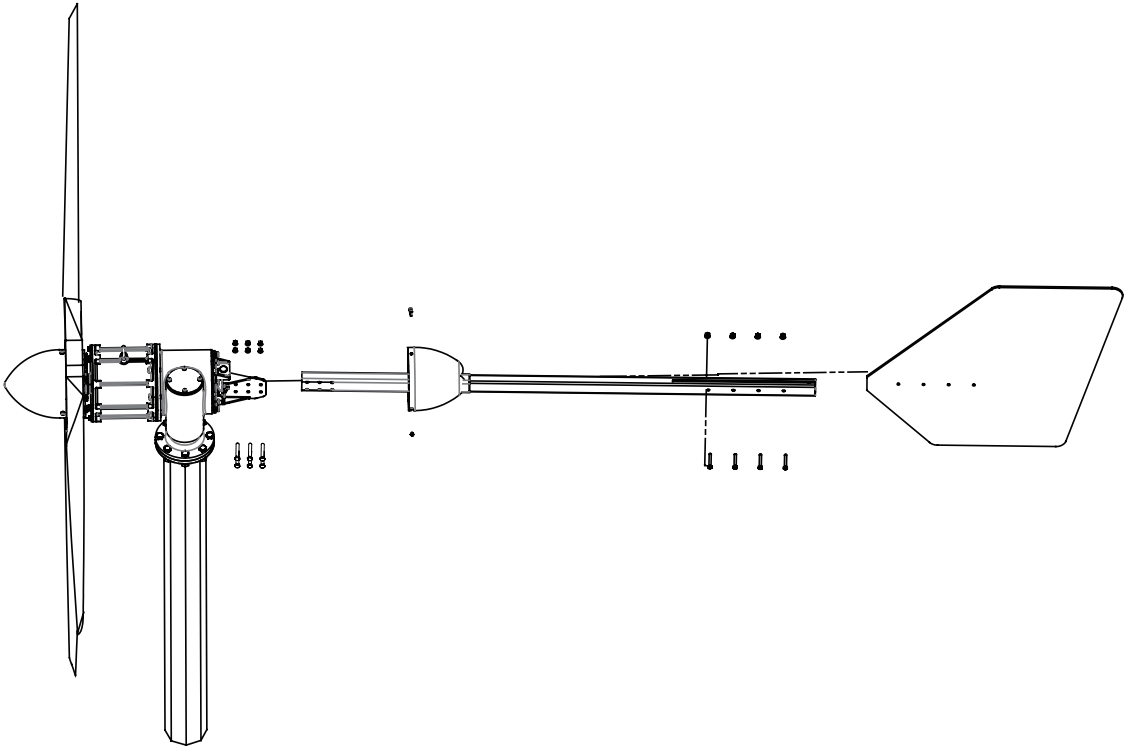


WARNING: When installing, keep the wiring short circuit switch on, which is on the bottom of the tower; or to avoid the accidents causing because of the wind rotor's rotating, make the three-phase wires of generator be in short circuit status.

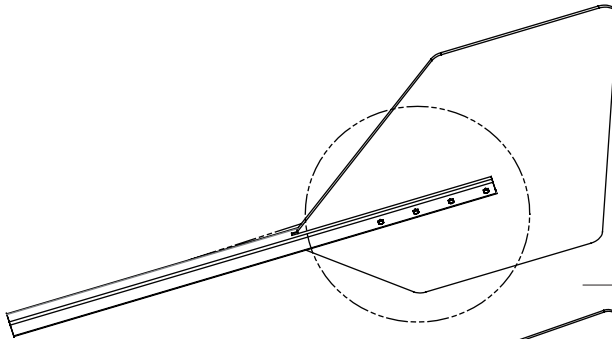


Connections of Tail Rudder and Generator

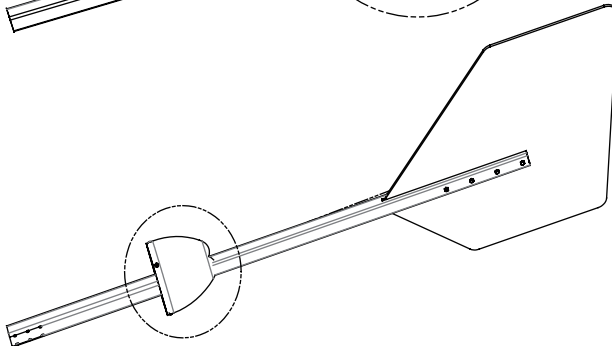
- 1) Fix the tail rudder plate to the tail rudder plate and tighten the bolts.
- 2) put the tail cover through rudder pole
- 3) connect the rudder pole and rudder seat with bolts, nut, spring washers and plain washers.
- 4) connect tail cover and rudder flange with bolts, nut, spring washers and plain washers.



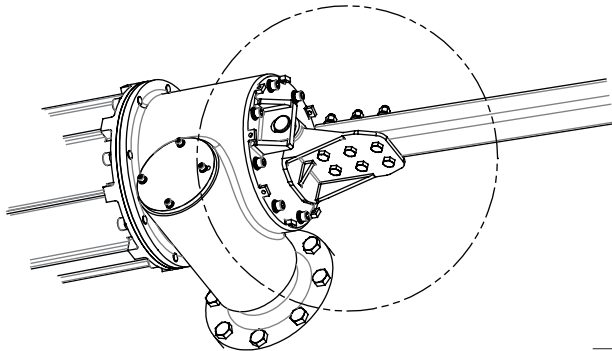
Connections of Tail Rudder and Generator



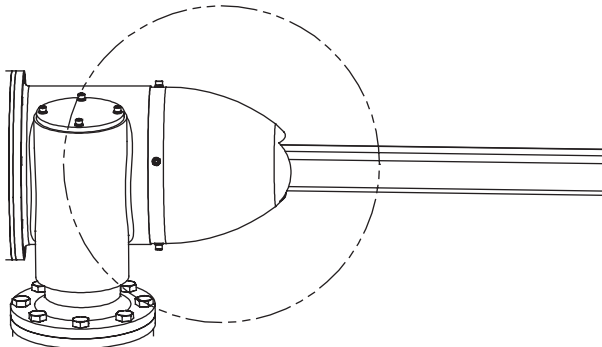
Step 1



Step 2



Step 3



Step 4

Installation of Individual Tower Generator

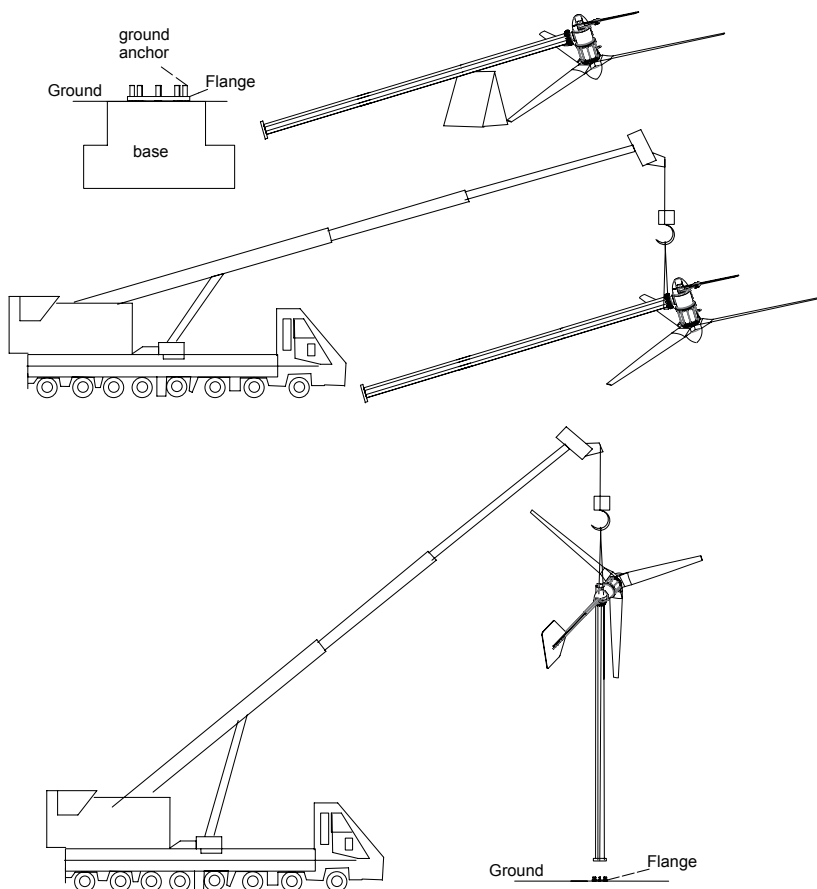
For the independent tower, it needs the 3 tons crane to lift it up, the tower rod should be placed leveled and use the stand to support and tighten the base's bolts after lifting. Fix the top of the tower when lifting and workers can disassemble the ropes.

The professional crane operators lift the tower and the wind driven generator up with the crane. The hanging strips but not the steel wire ropes can be used and in the process of lifting, the hanging strips should be tied to below the top flange of the tower.

Pay attention to the protection of the blades.

After lifting the tower, adjust its position to make the hole under the flange be directed at the foundation's ground anchor and then gradually put all the ground anchors in the holes. Install the washer and the bolt, tighten them and add some solid lubricant to protect it from corrosion. Please refer to the Appendix B for the bolts' specifications and moment of forces.

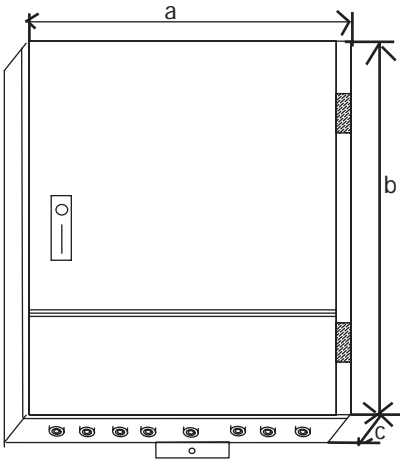
Do please lay down the tower under the no wind weather and prepare a support(same to the one used in installation).



The Installation of Generator Controller

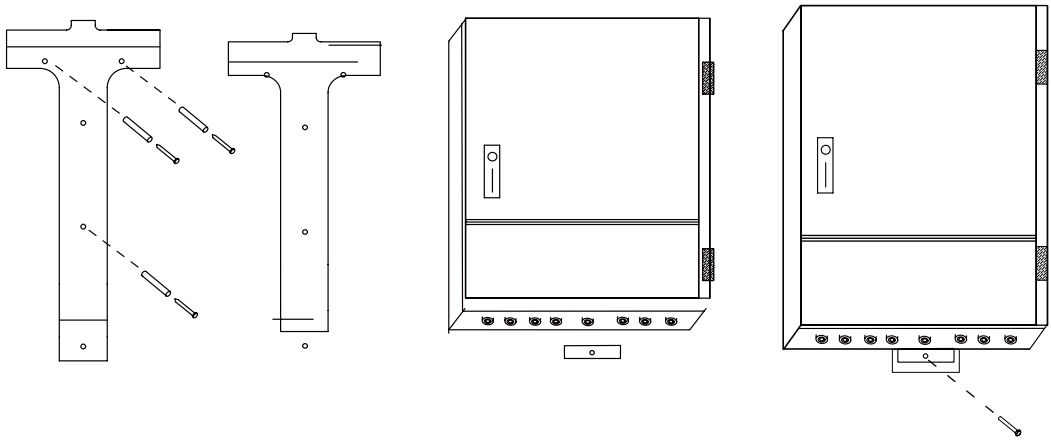
The controller dimensions are as follows:

| TYPE | a/mm | b/mm | c /mm |
|------------------------------|------|------|-------|
| Phono W-1.0, 2.0 | 440 | 570 | 250 |
| Phono W-3.0, 5.0, 10.0 | 550 | 650 | 250 |



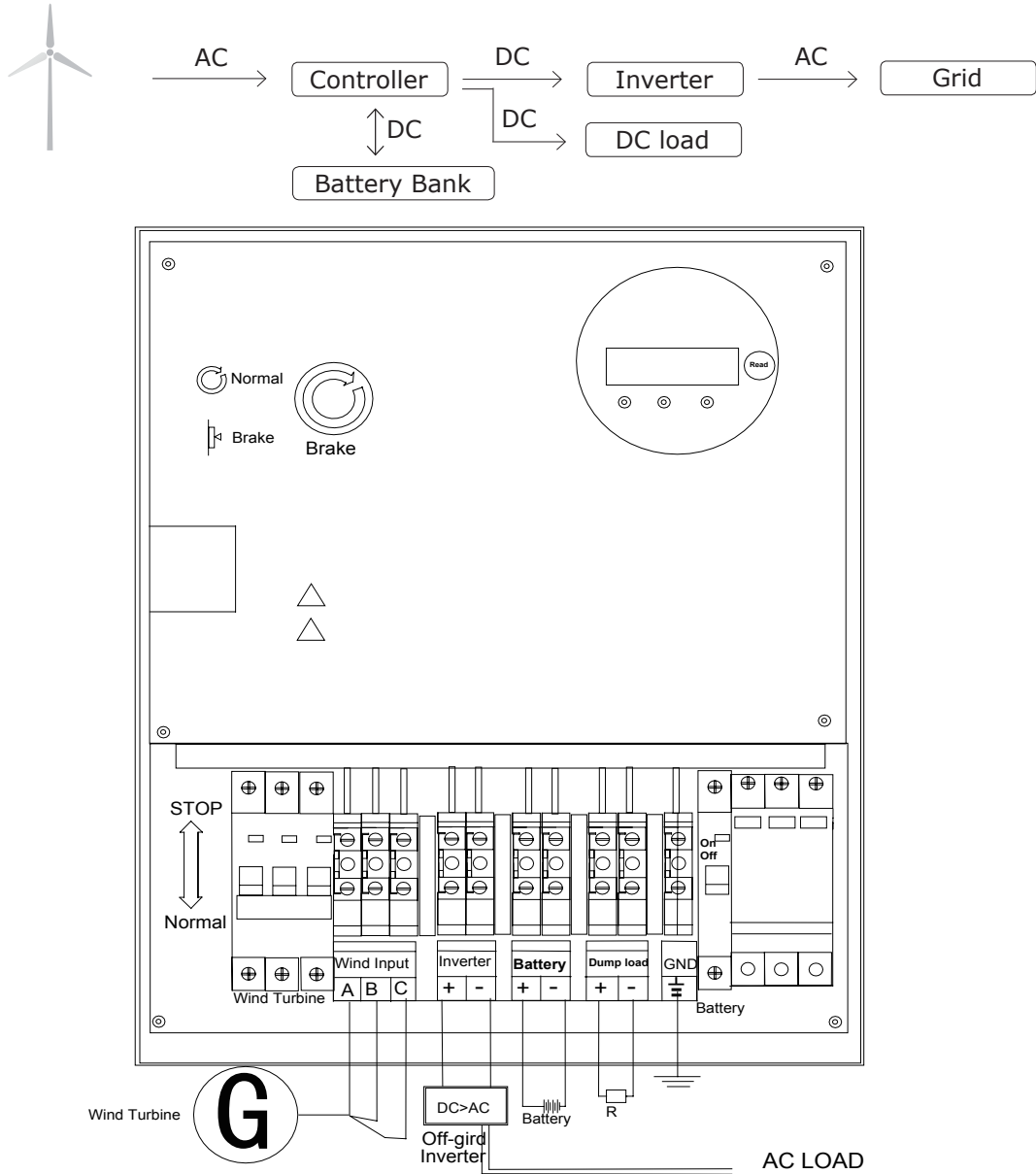
The controller's installation is as follows:

- Choose the solid wall to punch and fix the controller's support.
- Fix the controller on the support and tighten the fixed bolt, which is in the bottom.



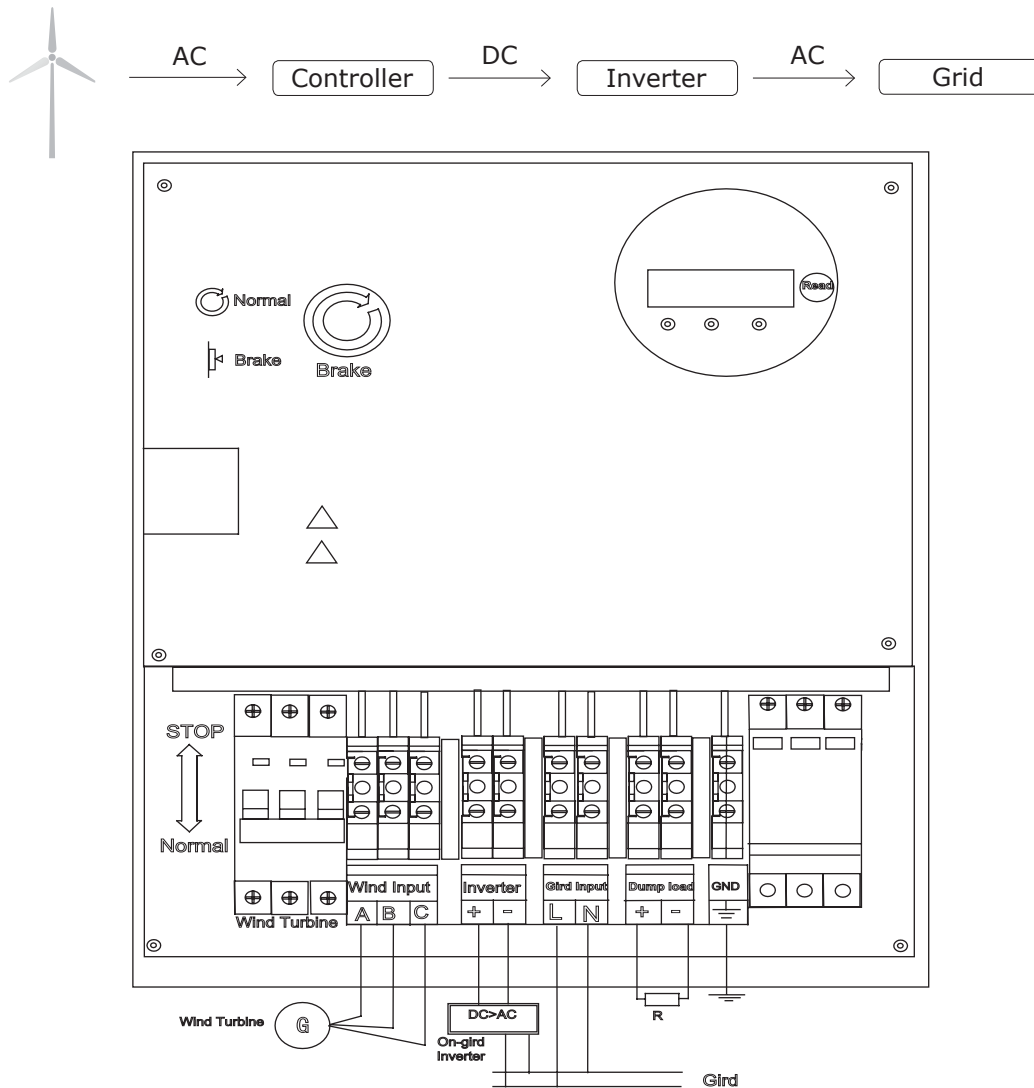
| Cable Recommended Configuration (from tower to controller) | | | | | | |
|---|----------|--------|----------|--------------|--------|----------|
| | 1KW/3kw | | | 2KW/5kw/10kw | | |
| UL | 4X12 AWG | 105° C | 600V | 4X10 AWG | 105° C | 600V |
| CE | 4X4mm2 | 105° C | 300/500V | 4X6mm2 | 105° C | 300/500V |
| Note: PHONO WIND will not provide the cable from tower to controller Users can purchase cable by above recommended information | | | | | | |

Off-grid System Connections



- 1) When connecting the wires, do it according to the order from right to left.
- 2) When connecting the wires, make the Wind Turbine be in the status of "stop" and the Battery On-off is in that of "Off".
- 3) Please refer to Appendix C for the inverter and battery's allocations or contact Phono Wind.
- 4) Please refer to Appendix D for the cable's specifications.

On-grid System Connections



- 1) When connecting the wires, do it according to the order from right to left.
- 2) When connecting the wires, make the Wind Turbine be in the status of "stop" and the Grid is in that of "Off".
- 3) Please refer to Appendix C for the inverter allocations or contact Phono Wind.
- 4) Please refer to Appendix D for the cable's specifications.

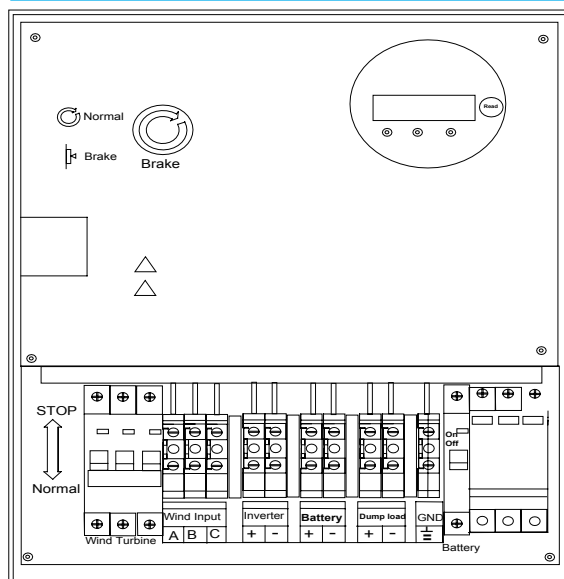
Use of Phonowind

Starting: Off-gird

- 1) Make sure finishing installation according to above procedures and any parts of wind driven generator in good condition.
- 2) Switch on controller, push up Batter on-off to 'ON', then the controller Display starts to work, displaying Battery Voltage normal range should be 42-60, if not, please check storage battery and wiring.
- 3) After 30 seconds, turn BRAKE right at 'Normal', push up Wind turbine at 'Normal', wind driven generator will start to work. If now Wind speed $\geq 2.5\text{m/s}$, system will start to generate electricity.



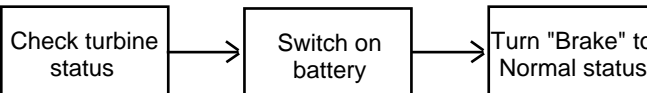
Notice: When wind driven generator first starts after installation, suggests run system at wind speed $\leq 5\text{m/s}$



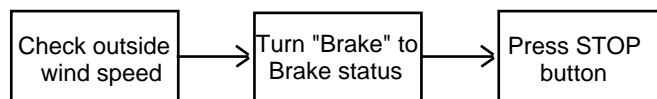
Shut Down

When wind speed $\leq 10\text{m/s}$, press BRAKE switch at 'Brake', then controller Display will display voltage reduce to 'LOCK', at that time, the wind wheel rotating speed slow down obviously, then push down Wind turbine at 'STOP', wind driven generator will stop working.

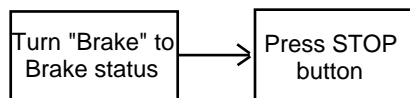
Starting Up Process



Shut Down Process




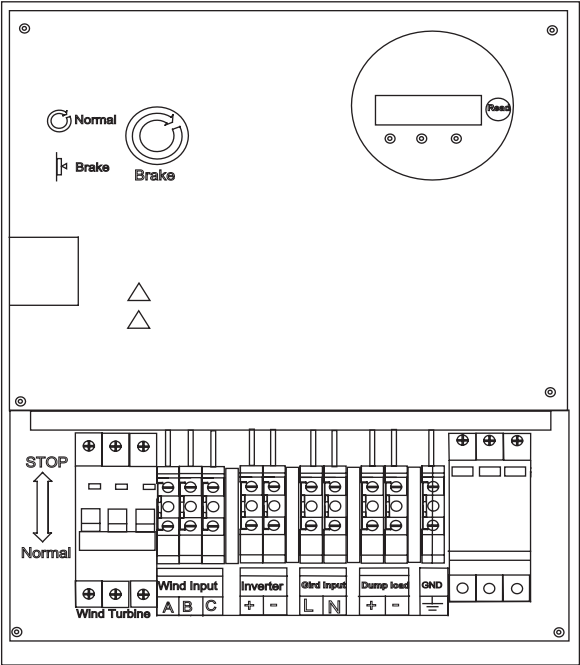
Emergency shut Down Process



Starting: On-gird

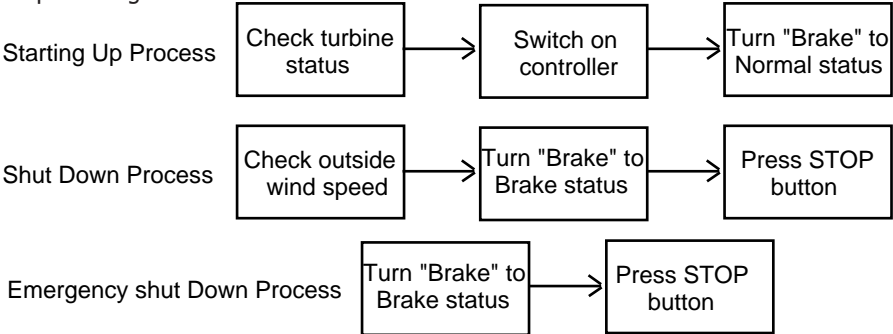
- 1) Make sure finishing installation according to above procedures and any parts of wind driven generator in good condition.
- 2) Switch on controller, pon power on, then the controller Display starts to work, displaying"stop" , if not, please check Gird and wiring.
- 3) After 30 seconds, turn BRAKE right at 'Normal', push up Wind turbine at 'Normal', wind driven generator will start to work. If now Wind speed \geq 2.5m/s, system will start to generate electricity.

 **Notice:** When wind driven generator first starts after installation, suggests run system at wind speed \leq 5m/s



Shut Down

When wind speed \leq 10m/s, press BRAKE switch at 'Brake', then controller Display will display voltage reduce to' LOCK', then push up Wind turbine at 'STOP', wind turbine will stop working.



Maintenance

Contents and Frequencies of Maintenance and Overhaul

| No. | Items | Checking method | Breakdown phenomenon | Frequency |
|-----|--|---|--|-----------|
| 1 | Generator tail rudder vibrate abnormal | Vision check | Tail rudder vibrate dramatically in vertical direction | 3 years |
| 2 | Generator has abnormal noise | Ears to hear (keep distance 10m to tower) | Abnormal noise, intermittently and big noise | 3 years |
| 3 | Yaw | Vision check | Wind speed \leq 8m/s yaw Wind speed \geq 13m/s normal Yaw slowly or stuck | 3 years |
| 4 | Electrical wiring | Vision check | Come off, burnt | 1 year |
| 5 | Controller display panel | Vision check | Abnormal flashing, no display | 1 year |
| 6 | Bearing lubrication | Vision check | Starting slow and turning slow | 1 year |
| 7 | Bolt | Torque wrench | Loose or less than torque regulated | 1 year |
| 8 | Fan blade | Vision check | Flaw, crack | 1 year |
| 9 | Generator set appearance | Vision check | Flaw | 2 years |
| 10 | Tail rudder shaft | Vision check | Wear down | 1 year |
| 11 | Tail rudder plate | Vision check | Flaw | 1 year |
| 12 | Generator output | Multimeter | At working time, three phrase voltage difference is greater than voltage value of 5% no-working time, three phrase resistance is not equal | 1 year |
| 13 | Controller output | Multimeter | No diode characteristic | 1 year |
| 14 | Unloading resistance | Multimeter | More than 20% difference with nominal resistance | 1 year |
| 15 | Resistance to earth | Multimeter | Tower, controller shell resistance to earth is more than 10 Ω | 1 year |

Basic Problems and Solutions of Mechanical Parts

| Breakdown | Cause | Solution |
|---|--|---|
| Wind driven generator shake dramatically | <ul style="list-style-type: none"> • Wind blade loose • Blade deform or defect • Tower bolt loose | <ul style="list-style-type: none"> • Tighten loose part and adjust • Adjust or change blade • Tighten loose part |
| Rotor speed reduces significantly | <ul style="list-style-type: none"> • Generator lacks of lubrication or maintenance. • Generator bearing broken • Rotor blade broken | <ul style="list-style-type: none"> • Lubricate • Exchange • Repair or exchange |
| Speed governing and direction governing ineffective | <ul style="list-style-type: none"> • Rotary bearing lacks grease oil. • Rotary inside has sand or foreign matter. • Tower deform(upper end) • Tail shaft rudder inside has foreign matter, wear down or lack of grease oil. | <ul style="list-style-type: none"> • Lubricate, maintenance • Clear up, lubricate, maintain • Correct • Clear up, lubricate, maintain |
| Abnormal noise | <ul style="list-style-type: none"> • Parts loose • Bearing broken • Generator stator and rotor friction • Blade frozen or broken | <ul style="list-style-type: none"> • Tighten • Exchange • Change bearing and correct • Clean up and exchange |

Basic Problems and Solutions of Electrical Parts

| Breakdown | Cause | Solution |
|--|--|--|
| LED display panel no display | System is not at work or LED wiring loose | Reconfirm the wiring |
| BRAKE has no LED, or did not indicate 'STOP' | The BRAKE button wiring no good or BEAKE broken | Check the wiring or exchange BRAKE button |
| LED has no 'STOP' or 'DXXX' indication, DUMP LOAD still heating | Resistance is still in heat state | Ignore |
| | Unload IGBT at short- circuit | Contact the local dealer or Phono wind |
| Off-grid system, the storage battery voltage is higher than 60v | Storage capacity is small | Exchange allocation |
| | DC/DC mold malfunction | Contact to local dealer or Phono wind. |
| In corresponding wind speed, wind driven generator rotate slow, obviously abnormal | Unloading IGBT at short- circuit | Contact to dealer or Phono wind. |
| | DC/DC mold malfunction | |
| | Wind driven generator wire short-circuit | |
| LED has Err mark | Now the wind driven generator output voltage or power abnormal, in protection alarm status | Waiting for the wind become small, return to work. |

Appendix A: Specification

| System Specification | | | | | |
|---------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Project | Phono W - 1.0 | Phono W - 2.0 | Phono W - 3.0 | Phono W - 5.0 | Phono W - 10.0 |
| Model No. | PWB01-30-48 | PWB02-40-48 | PWA03-44-250 | PWA05-50-280 | PWA10-75-450 |
| Wind Rotor's Diameter | 3m | 4m | 4.4m | 5m | 7.5m |
| Blade Quantity | 3 | 3 | 3 | 3 | 3 |
| Yaw | Mechanic | Mechanic | Mechanic | Mechanic | Mechanic |
| Inlet Air Way | horizontal axis, upwind | horizontal axis, upwind | horizontal axis, upwind | horizontal axis, upwind | horizontal axis, upwind |
| Stop Way | Manual | Manual | Manual | Manual | Manual |
| Cut-in Wind Speed | 3 m/s | 3 m/s | 3 m/s | 3 m/s | 3 m/s |
| <u>Cut-out Wind Speed</u> | <u>18 m/s</u> | <u>18 m/s</u> | <u>18 m/s</u> | <u>18 m/s</u> | <u>18 VDC</u> |
| Rated Wind Speed | 10 m/s | 10 m/s | 10 m/s | 11 m/s | 11 m/s |
| Survival Wind Speed | <u>40 m/s</u> | <u>40 m/s</u> | <u>40 m/s</u> | <u>40 m/s</u> | <u>40 m/s</u> |
| Cut-in Voltage | 37.5 VDC | 37.5 VDC | 50 VDC | 50 VDC | 50 VDC |
| Rated Output Voltage | 48 VDC | 48 VDC | 250 VDC | 280 VDC | 450 VDC |
| Rated Power | 1 Kw | 2 Kw | 3 Kw | 5 Kw | 10 Kw |
| Rated Speed | 380 rpm | 330 rpm | 330 rpm | 280 rpm | 190 rpm |

Appendix: A: Specification

| Turbine Specification | | | | | |
|---------------------------------------|------------------|------------------|------------------|------------------|------------------|
| Project | Phono W - 1.0 | Phono W - 2.0 | Phono W - 3.0 | Phono W - 5.0 | Phono W - 10.0 |
| Model No. | PWG01-10-90 | PWG02-10-90 | PWG03-10-180 | PWG06-16-220 | PWG11-20-420 |
| Generator Type | Three-phase PMSM | Three-phase PMSM | Three-phase PMSM | Three-phase PMSM | Three-phase PMSM |
| Nominal Line Voltage | 90 VAC | 90 VAC | 180 VAC | 220 VAC | 420 VAC |
| Nominal Line Current | 6.7A | 13A | 10A | 16A | 15A |
| Rated Frequency | 31.66 | 27.5 | 27.5 | 37.33 | 31.66 |
| Insulation Grade | A | A | A | A | A |
| Protection Grade | IP54 | IP54 | IP54 | IP54 | IP54 |
| Blade Mass (kg) | 3.58 | 8.45 | 10 | 14.4 | 46 |
| Rotor Mass (kg) | 18.74 | 46.11 | 50.76 | 63.6 | 227.87 |
| Turbine Mass (kg) | 92.5 | 132 | 150 | 282 | 700 |
| Tower Mass (kg) | 320 | 480 | 480 | 585 | 870 |
| Wind turbine controller Specification | | | | | |
| Project | Phono W - 1.0 | Phono W - 2.0 | Phono W - 3.0 | Phono W - 5.0 | Phono W - 10.0 |
| Model No. | PWC01-B-48 | PWC02-B-48 | PWC03-A-250 | PWC06-A-280 | PWC11-A-450 |
| System Voltage Grade (VDC) | 48 VDC | 48 VDC | 250 VDC | 280 VDC | 450 VDC |
| Output Voltage Range (VDC) | 42 - 60 VDC | 42 - 60 VDC | 0 - 260 VDC | 0 -290 VDC | 0 - 450 VDC |
| Generator Rated Power (KW) | 1 | 2 | 3 | 6 | 11 |
| Rectifier DC(A) | 16 | 32 | 12.5 | 22 | 25 |
| Manual Brake | YES | YES | YES | YES | YES |
| Automatic Unloading | YES | YES | YES | YES | YES |
| Protection Grade | IP54 | IP54 | IP54 | IP54 | IP54 |
| NEMA Type | Type 3 | Type 3 | Type 3 | Type 3 | Type 3 |

Appendix: B Phono w-1.0

| Wind Driven Generator Bolt Connections (Phono W - 1.0) | | | | | | |
|--|----------------------------|-----------------|---------------|-------|-------------|-------------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Rudder Pole & Rudder Plate | 3 | M10×40 | 8.8 | 25 | 16mm |
| 2 | Blades & Hub | 15 | M10×90 | 8.8 | 50 | 16mm |
| 3 | Motor Shaft | 1 | M24 | / | 750 | 36mm |
| 4 | Rudder Axis | 1 | Φ 25 | / | 150 | / |
| 5 | Nose Cone, Tail Cover | 3 for each type | M8×20 | 8.8 | 15 | Hexagon Wrench 6# |
| 6 | Turbine & Tower | 6 | M12×55 | 8.8 | 90 | 18mm |

| Connection Torque Table of Towers and Bolts (Phono W - 1.0) | | | | | | |
|---|---------------------|----------|---------------|-------|-------------|-----------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Bottom Flange | 8 | M24 | 8.8 | 750 | 36mm |
| 2 | Tower Middle Flange | 8 | M20×80 | 8.8 | 450 | 30mm |

Appendix: B Phono w-2.0 Phono w-3.0

| Wind Driven Generator Bolt Connections (Phono W - 2.0,3.0) | | | | | | |
|--|----------------------------|-----------------|---------------|-------|-------------|-------------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Rudder Pole & Rudder Plate | 3 | M10×60 | 8.8 | 25 | 18mm |
| 2 | Blades & Hub | 15 | M16×120 | 8.8 | 100 | 24mm |
| 3 | Motor Shaft | 1 | M24 | / | 750 | 36mm |
| 4 | Rudder Axis | 1 | Φ 25 | / | 150 | / |
| 5 | Nose Cone, Tail Cover | 3 for each type | M8×20 | 8.8 | 15 | Hexagon Wrench 6# |
| 6 | Turbine & Tower | 6 | M16×60 | 8.8 | 220 | 24mm |

| Connection Torque Table of Towers and Bolts (Phono W - 2.0,3.0) | | | | | | |
|---|---------------------|----------|---------------|-------|-------------|-----------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Bottom Flange | 8 | M24 | 8.8 | 750 | 36mm |
| 2 | Tower Middle Flange | 8 | M20×80 | 8.8 | 450 | 30mm |

Appendix: B Phono w-5.0

| Wind Driven Generator Bolt Connections(Phono w-5.0) | | | | | | |
|---|----------------------------|-----------------|---------------|-------|-------------|-------------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Rudder Pole & Rudder Plate | 3 | M12×75 | 8.8 | 50 | 18mm |
| 2 | Blades & Hub | 15 | M16×140 | 8.8 | 100 | 24mm |
| 3 | Motor Shaft | 1 | M36 | / | 1600 | 56mm |
| 4 | Rudder Axis | 1 | Φ 30 | / | 150 | |
| 5 | Nose Cone, Tail Cover | 3 for each type | M8×20 | 8.8 | 15 | Hexagon Wrench 6# |

| Connection Torque Table of Towers and Bolts(Phono w-5.0) | | | | | | |
|--|---------------------|----------|---------------|-------|-------------|-----------------|
| No. | Joint | Quantity | Specification | Grade | Force (N•M) | Nut Measurement |
| 1 | Bottom Flange | 12 | M30 | 8.8 | 1200 | 46mm |
| 2 | Tower Middle Flange | 8 | M20×80 | 8.8 | 450 | 34mm |

Appendix: c

Standard Configurations of Storage Battery and the Inverter

| Wind Turbine | Type | Controller | Inverter | Battery |
|--------------------------------|----------|-------------|---------------------------------------|--------------|
| Phono W-1.0 (PWB01-30-48) | Off-gird | PWC01-B-48 | Input: DC42-60V Output:1000W/KVA | 48V 150AH |
| Phono W-2.0 (PWB02-40-48) | Off-gird | PWC02-B-48 | Input: DC42-60V, Output: 2000W/KVA | 48V 300AH |
| Phono W-3.0 (PWA03-44-250) | On-gird | PWC03-A-250 | PVI-3.0-OUTD-W | / |
| Phono W-5.0 (PWA05-50-280) | On-gird | PWC06-A-280 | PVI-6.0-OUTD-W | / |
| Phono W-10.0 (PWA10-75-450) | On-gird | PWC11-A-450 | PVI-10.0-OUTD-W | / |

Appendix: D

Main circuit connecting cable diameters

| Project | Description | 1 Kw | | 2 Kw | | 3 Kw | |
|--|-------------------------|-----------------|---------------------|-----------------|---------------------|-----------------|---------------------|
| | | Maximum Current | Cable | Maximum Current | Cable | Maximum Current | Cable |
| Generator Output (connection distance ≤100m) | Wind generator input AC | 8A | 4mm ² ×4 | 16A | 6mm ² ×4 | 12 | 4mm ² ×4 |
| Controller Output (connection distance ≤20M) | DC output (+,-) | 20A | 6mm ² ×2 | 35A | 6mm ² ×2 | 15 | 6mm ² ×2 |
| Controller Unloading (connection distance ≤20m) | Diversion Load | 24A | 6mm ² ×2 | 45A | 6mm ² ×2 | 24 | 6mm ² ×2 |
| Controller Input (connection distance≤30m) | L,N | / | / | / | / | 0.2 | 2mm ² ×2 |
| Ground Connection (connection distance≤50m) | Connect to ground | / | 6mm ² ×1 | / | 6mm ² ×1 | / | 6mm ² ×1 |

| Project | Description | 5 Kw | | 10 Kw | |
|--|-------------------------|-----------------|---------------------|-----------------|---------------------|
| | | Maximum Current | Cable | Maximum Current | Cable |
| Generator Output (connection distance ≤100m) | Wind generator input AC | 20 | 6mm ² ×4 | 20 | 6mm ² ×4 |
| Controller Output (connection distance ≤20M) | DC output (+,-) | 24 | 6mm ² ×2 | 24 | 6mm ² ×2 |
| Controller Unloading (connection distance ≤20m) | Diversion Load | 30 | 6mm ² ×2 | 29 | 6mm ² ×2 |
| Controller Input (connection distance≤30m) | L,N | 0.2 | 2mm ² ×2 | 0.2 | 2mm ² ×2 |
| Ground Connection (connection distance≤50m) | Connect to ground | / | 6mm ² ×1 | / | 6mm ² ×1 |

Appendix: E

Setting Tools

| Tower Hoisting | | | | | |
|-----------------------------------|------------------------------|-------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|
| Project | Item | Spec | Quantity | Application | Remarks |
| | Use the 5-ton truck to hoist | 5T, ≥15M | 1 | Complete Machine Hoisting | 450 VDC |
| | Hydraulic Station | 15mpa, Stoke:1m | 1 | The installation of Hydraulic Tower | only applied to the Hydraulic Tower |
| Lifting Appliance and the Support | | | | | |
| Project | Item | Spec | Quantity | Application | Remarks |
| | Support | Height:1.5M, Load-bearing :2T | 1 | Supporting the tower | / |
| | Nylon Slings | 2T 6M | 2 | Listing the wind rotor | / |
| | Steel Wire Ropes | φ14mm, 10M | 1 | Lifting | / |
| Tower Assembling | | | | | |
| Project | Item | Spec | Quantity | Application | Remarks |
| | Adjustable Spanners | The maximum opening =46mm | 2 | The tower's basic installation | 5KW |
| | Adjustable Spanners | The maximum opening =36mm | 2 | The tower's basic installation | 1-3KW |
| | Hammer | 12 pounds | 1 | Adjusting the tower | / |
| Supportive Materials | | | | | |
| Project | Item | Spec | Quantity | Application | Remarks |
| | Thread Locking Glue | / | 1 | Tightening the bolts | |
| | Hand Painting | Galvanized: white | Galvanized:1bottle White: 1 bottle | Repair the surface | |

Appendix: E Wind Driven Generator Assembly Tools

| Lifting Appliance | | | | | |
|-------------------|--------------|--------|----------|-------------|---------|
| Project | Item | Spec | Quantity | Application | Remarks |
| | Nylon Slings | 2T, 6M | 2 | Lifting the | |

| Spanners | | | | | |
|----------|----------------------|-------------------------|----------------------------------|---|---------|
| Project | Item | Spec | Quantity | Application | Remarks |
| | Offset Ring Spanners | 16#/18# | 16#: 1pcs | Tail rudder plate | / |
| | Adjustable Spanners | 12 inches | 2 | Connecting the generator with the tower | / |
| | Torque Spanners | Sockets 16# / 18# / 24# | 16#:1pcs 18#:1pcs 24#:1pcs | blades | / |
| | Allen Wrenches | 6# 8# | 2 | Cowls, tail cover | / |

| Other Tools | | | | | |
|-------------|----------------|----------------|----------|---------------------------|---------|
| Project | Item | Spec | Quantity | Application | Remarks |
| | Crow Bars | φ25 length: 1m | 1 | the installation of Tower | / |
| | Hammers | 8 pounds | 1 | the installation of Tower | / |
| | Rubber Hammers | 8pounds | 1 | Tail rudder plate | / |

| Measuring Tool | | | | | |
|----------------|-----------------|-----------|----------|--|---------|
| Project | Item | Spec | Quantity | Application | Remarks |
| | Multimeters | Universal | 1 | Check after installation | / |
| | Tape Measures | 10m | 1 | Measuring the distance of the blade tips | / |
| | Infrared Levels | / | 1 | Measuring the verticality of the towers | / |