

[주] 하이에너지 코리아

**HE-3000**

**Wind Turbine**

**System Manual**



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# 1. Safety Notes Before Use




HE-3000 Wind Turbine is designed by considering the safety for its user. However, the wind turbine has risks structural, mechanical, and electric. Therefore, to assemble and install wind turbines, priority consideration needs to be given to the safety.

In addition, it is important to be aware of the risk electric, mechanical, and rotary.

This manual includes structure, procedure, safety maintenance required to install and maintain HE-3000 Wind Turbine.

Before installing HE-3000 Wind Turbine, it is necessary to read this manual.

The following symbols must be remembered as the sign of risk elements, safety note and etc. in this manual.

	This sign indicates a hazard. Don't do the activity described along with this sign. Great care is needed.
	This sign indicate a great problem and damaged device expected to be caused when operating the device on a unstable condition. Caution is required.
	This symbol indicates the notice to be learned certainly during the process.

## 1.1. Mechanical risk elements

- Rotary blades have their inherently mechanical risks.
- The blades of HE-3000 Wind Turbine are made of strong aluminum alloy.
- The edge is so sharp that great care is needed not to get a cut.

### **WARNING**

- Don't touch the rotating axis.
- Don't stop the rotating axis with hands.
- Don't install HE-3000 Wind Turbine on the low place people can reach.
- Don't let anything touch rotating blades.

## 1.2. Electrical risk elements

- HE-3000 Wind Turbine is designed with great delicacy in order to avoid electrical risk elements.
- If the wire wrongly connected or smaller than regulatory requirement is used, overload can cause heat or fire on the wire.
- Therefore, it is important to use the wire with proper capacity.

## 1.3. Note in assembling

- HE-3000 Wind Turbine is released after all the parts are assembled completely.

- External Darrieus Blades and Internal Savonius Blades have only to be assembled.
- This manual indicates the relationship between assembly and wiring in detail.

### **WARNING**

- Great caution is required for safety all the time during the assembling process.
- Helmet and gloves should be worn for the safety.

#### **1.4. Note in installing**

- The fall of wind turbine installed at the high place can lead to the great risk. Therefore, as much installation as possible is required to be carried on the safe ground.
- It needs to use lift or crane and wear safety gear such as helmet, gloves, safety belt and safety hook when installing.
- In addition, it needs to install wind turbine by deciding to install in a day with no wind. Prepare the tool before construction.

### **CAUTION**

- The installation needs to be carried on the ground as soon as possible.
- Safety gear such as helmet, gloves and safety belt should be worn for the safety.

- After checking the battery is not connected to the facility, the installation needs to be carried.
- The wiring of the generator of HE-3000 Wind Turbine needs to be connected to the ground and then the installation needs to be carried with the blades of wind turbine not rotating.
- The rotary axis of wind turbine is required to be placed rightly all the time. Otherwise, it can be difficult to correct distorted blades or level out wind turbine.
- The wind turbine is required to be carried by deciding to install in a day clear and with no wind.

### **1.5. Note in operating**

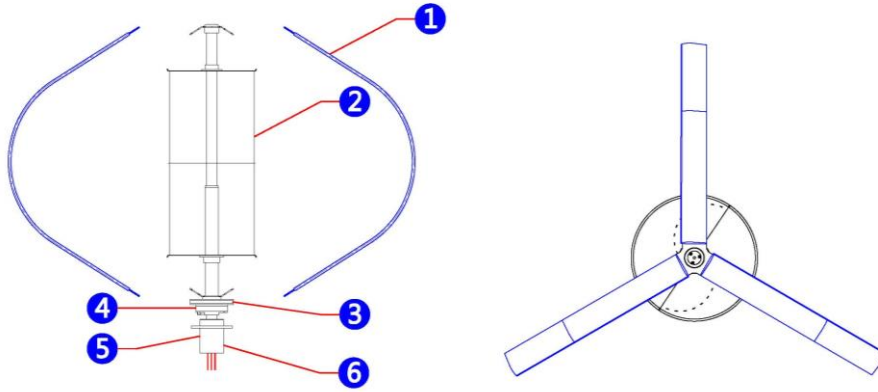
- The pole(tower), blades, and electrical wiring of wind turbine need to be checked periodically.
- The blades of wind turbine were designed and produced with hard material but if the blades are hit by external material during the rotation, their damage can be caused to the blades.
- Don't approach the wind turbine during the rotation.

## **2. Overview of HE-3000 Wind Turbine**

HE-3000 vertical axis wind turbine is consisting of External Darrieus Blades and Internal Savonius Blades in a S-type as the double structure of drag and lift.

Refer to Picture 1 for the external looks of wind turbine.

[Picture] HE-3000 Wind Turbine System



1	External blade	2	Internal blade	3	Generator
4	Manual Brake	5	Damper	6	R,S,T Wires

## 2.1. Dimension of HE-3000

- The following Table 1 indicates the technical dimension of HE-3000 Wind Turbine.

[Table 1] Dimension of HE-3000 Wind Turbine

General Specification of Parts				
Division		Specification of Product		
Rotor	Diameter	4030mm	Rated Rotation Speed	180RPM
	Weight	620kg	Rotation Speed Range	0RPM~230RPM
	Amount	3 units	Material	Aluminum and other alloy
Generator	Rated Output	3000WW	상(Phase)	3 Phase 3 상
	Rated Speed	1800RPM	Rated Voltage	175V
	Pole No.	36 Poles	Rated Current	17A

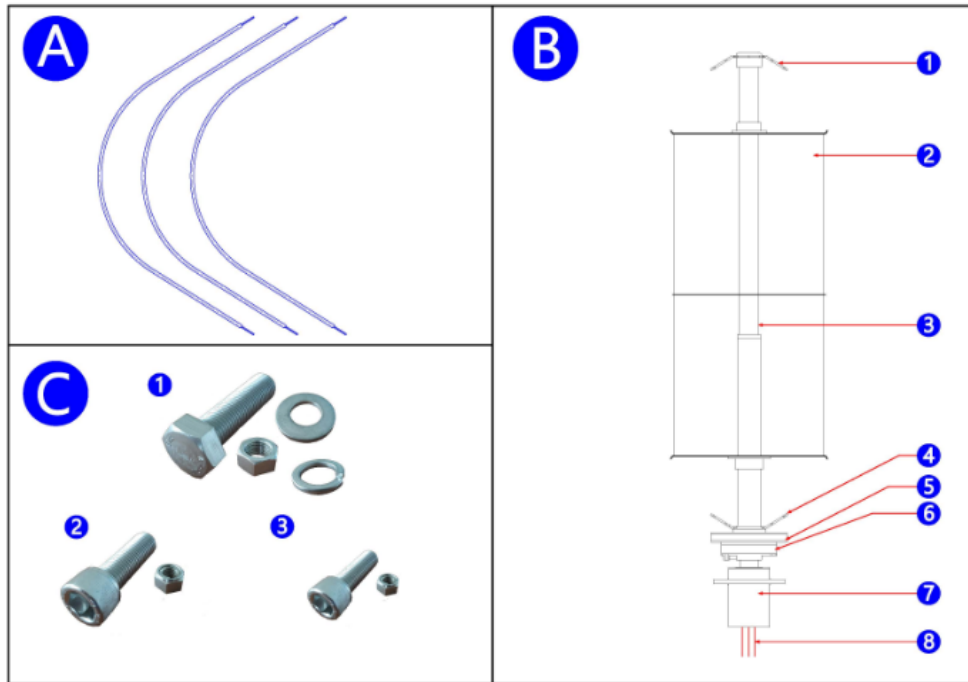
	Type	Permanent magnet phase 3 alternating current dynamo	Rated Frequency	50~60Hz
	Speed Range	0RPM~230RPM	Weight	60kg
	Excitation Control	Permanent Magnet Type		
Support Structure Pole	Type	Structural round tube	Height 높이	6000mm(standard model)
	Material	Steel or SUS		-available from 4000mm at minimum
	Weight	1,060kg (standard model)	Connection type	Bolt(Rock bolt)
	Minimum size(diameter)	Ø355.6mm X 7.9y	Protecting Coating	Molten Zinc Plating and other plating
Controller	Rated Output	3000W	Output Type	Alternating
	Rated Input	Atypical phase 3 175V 1.7A	Rated Output	Single-phase DC 220V 24A (220V 24A)
	Input Frequency	50~60Hz	Output Frequency	50~60Hz
	Overpower Control Type	Automatically connected control	Overvoltage control type	Automatically connected control
	Storage Battery Voltage	48V	System control type	Automatically connected control
Brake	Automatic	Connection Control System if over-speeding		
	Manual	Manual drum brake		

## 2.2. Product Component of HE-3000



- Before start to install, all the components to be given needs to be checked through the component list enclosed. If the parts packed in the package are missing or need to be changed, please contact HI-ENERGY KOREA.

[Table 2] Material List of HE-3000



LABEL	Contents	Amount	LABEL	Contents	Amount
A	External blade	3EA	B-6	Manual Brake	1EA
B-1	Triangle(top)	1EA	B-7	Damper	1EA
B-2	Internal blade	1SET	B-8	R,S,T 3Wires	1EA
B-3	Central axis	1EA	C-1	French Bolt and Nut (M20)	8EA
B-4	Triangle(bottom)	1EA	C-2	Bolt and nut of external blade (M16)	30EA
B-5	Generator	1EA	C-3	Bolt and nut of external blade (M12)	6EA

- Table 2 shows the foundation components of wind turbine and it is necessary to use the prescribed components.

### 2.3. Controller of HE-3000 System

- The controller of HE-3000 Wind Turbine System is divided into grid connection system and stand-alone system.
- The controller is divided into grid connection system which is connected to the battery of Korea Electric Power Corporation in design of user's system and stand-alone system controller which stores in the independent power (with separate storage) and use if necessary. (attached additional manual)

### **3. Installation and Preparation of Wind Turbine**

Please check again if all the materials and tools along with the products are prepared before installing HE-3000 Wind Turbine System. Keep it in mind that to check all the information about safety and install safely is more important than to prepare all the tools and equipment necessary for installing the products.

#### **3.1. Criteria of deciding the installation place**

- The system of HE-3000 Wind Turbine is designed flexibly in order to satisfy the need and condition of the users. Therefore users can install in all the places users want such as urban area, country, or the roof of the building, or top of the mountain and coast.
- Major core element affecting the operation of all the application programs and the performance of HE-3000 Wind Turbine is wind power and therefore it is important to decide the product after deciding the place where wind sources are plentiful.

## **WARNING**

- Don't install the system of HQ-3000 Wind Turbine in a place where anyone can approach the rotary blades.
- Don't install the system in a place surrounded by obstacles such as trees and power line.
- Don't install the system in a place which is hard to control the wind turbine.

## **CAUTION**

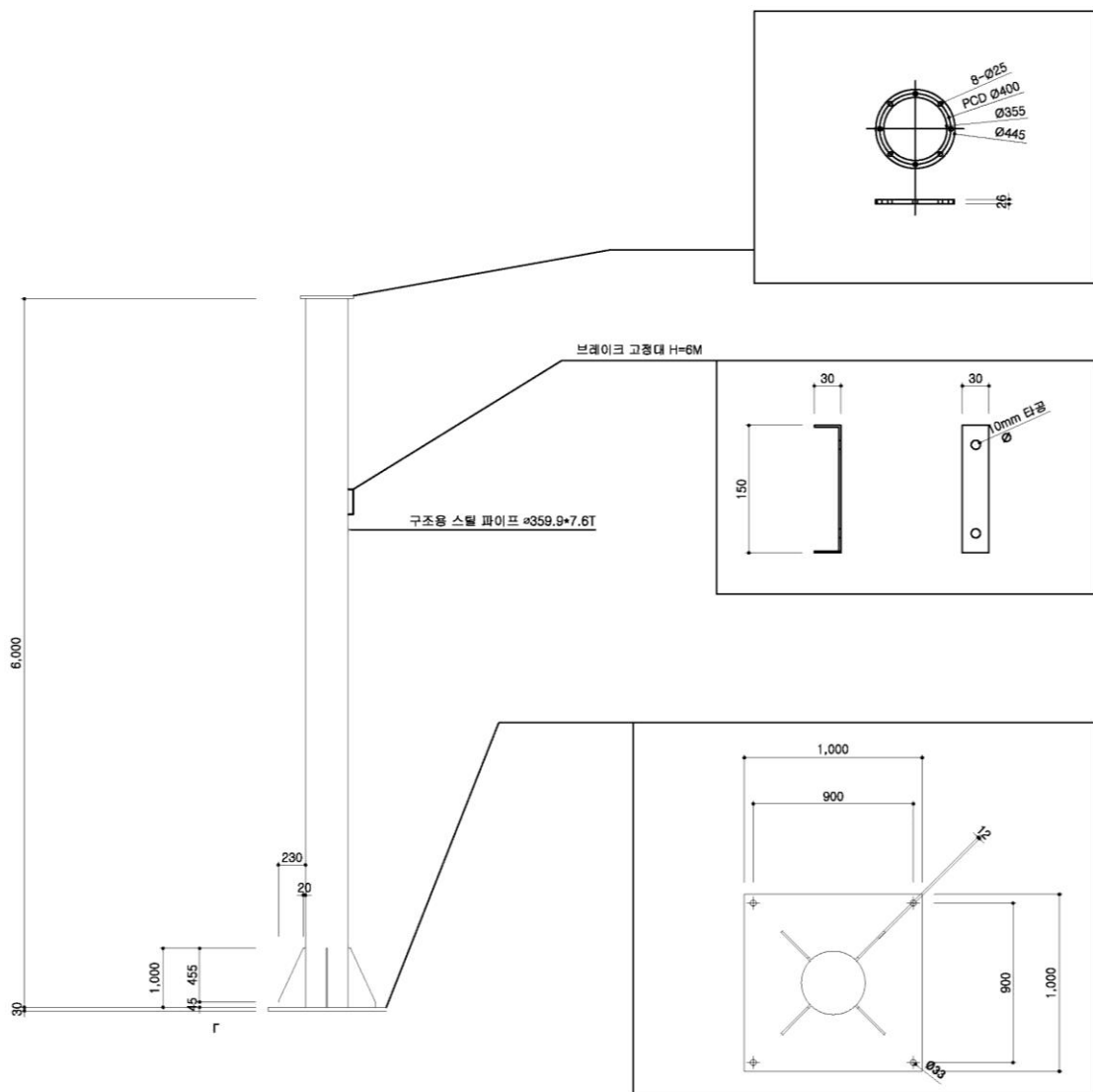
- The respects of the limitation or regulation are subject to the local regulation of the place where the relevant product is installed.
- There is a need to make the system put to earth to prevent the lightning toward HB-3000 Wind Turbine.

### **3.2. Structure (Pole)**

- Average structure height of HE-3000 Wind Turbine is 6m and minimum height of the structure for installing on the ground is more than 4m and the length of the structure for installing roof is more than 3m. HE-3000.
- Depending on the onsite, the height of the structure can be arranged and the structure needs to be calculated for the safety and separately cost is required to be calculated.
- The structure designed by HI-ENERGY KOREA don't need to be purchased in HI-ENERGY KOREA and the structure needs to be produced and used in the same way of the floor plan by local distributor.

- The structure of Picture 2 was designed by considering the structure as basic model of HE-3000 Wind Turbine System. Therefore, this design is applied as standard structure of HE-3000 Wind Turbine System.
- In case of changing the design and the specification of structure, the consideration of the structure is needed. (not included cost)

[Picture 2] Specification Floor Plan of the Structure



## CAUTION

- In case of installing HE-3000 Wind Turbine on the roof or rooftop of the building, the structure of the building needs to be checked to know if the structure can stand the shock of total weight of wind turbine, gust or earthquake. In case of installing rooftop, the height of the structure is recommended to be 3m to 4m at maximum..
- The surroundings need to be checked cautiously when deciding the length of the structure. Be careful not to reach the articles of the surrounding with strong wind or disaster.

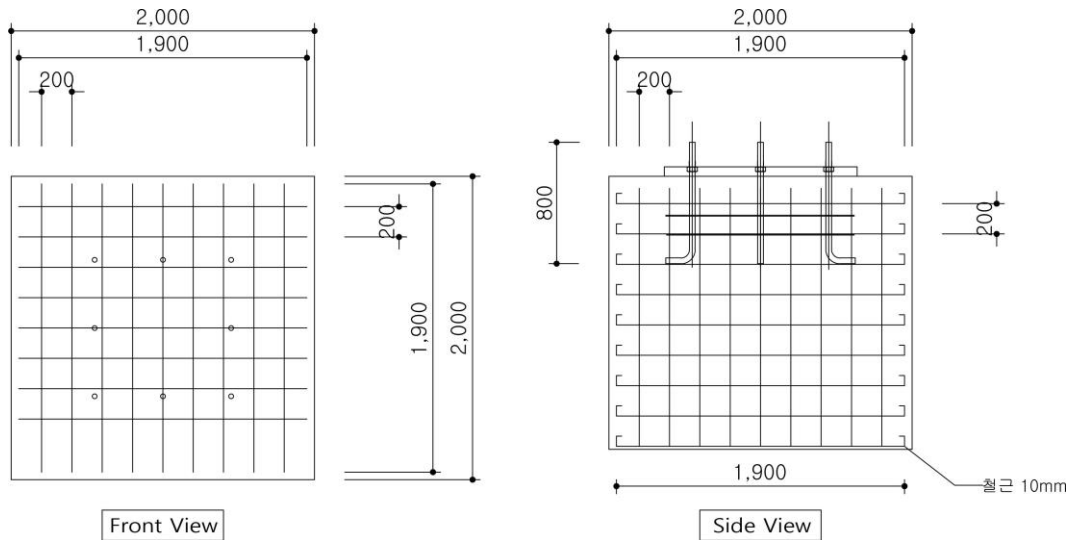
### 3.3. Groundwork

- Regarding the basic fact required to build the foundation of concrete in the HE-3000 Wind Turbine System, separate calculation of the structure needs to be conducted depending on the characteristics of the soil and the condition of the onsite.

#### 3.3.1. Foundation after installation on the ground and on the rooftop

- The foundation based on the design of the structure and the test needs to be 2,000mm in width, 2,000mm in length and 1,800mm in height. Refer to the drawing shown in Picture 3-1..

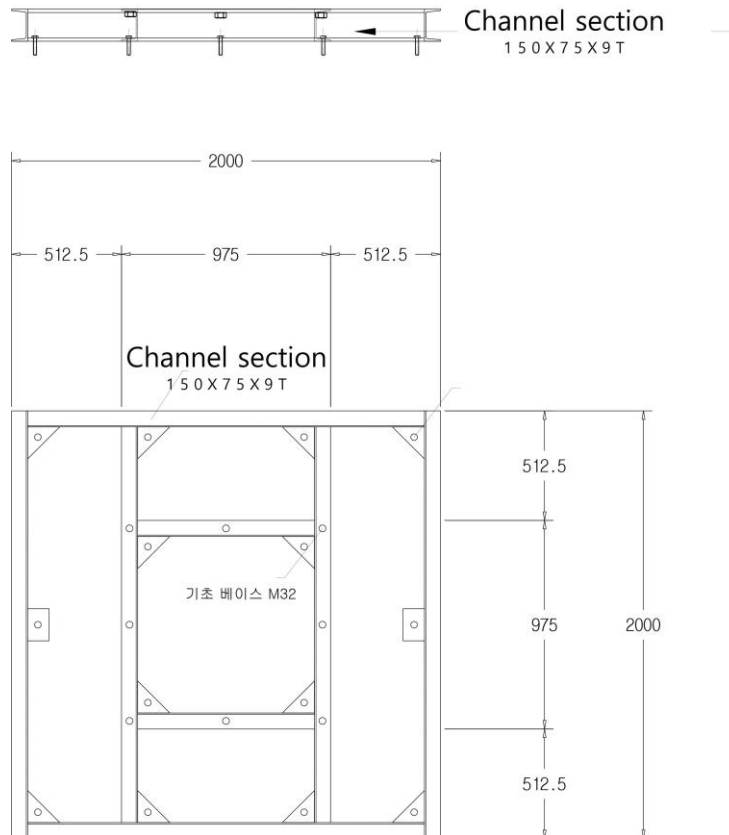
[Picture 3-1] Foundation after installation on the ground



(The details are referred to the floor plan)

- It is important to remove water and space by using an oscillator when concrete is poured into the foundation. After all the concrete is poured, it is required to check if there is space underneath the foundation once again. It is more important to check if the foundation is not rising above the template and gradation is completed (leveled out).
- And then, it is important to use a proper cover to prevent concrete from flowing over the template or rain water from percolating. It needs to wait until concrete is hardened completely before the template is removed (it takes about one week).
- Keep it in mind that the making of the perfect foundation is one of the important factors to succeed in installing the product. Picture 3-2 shows the measurement of the manufactured foundation of the floor used for building the rooftop.
- The structure of Picture 3-2 needs mortar construction after installing channel section type of foundation pad to be used in installing HE-3000 Wind Turbine System on the rooftop like Picture 3-1..

[Picture 3-2] Foundation after installing on the rooftop



- In case of installing HE-3000 Wind Turbine System on the rooftop or roof of the building, contact a construction office or structuring engineer for the advanced inspection of the structure. The structure of the building needs to be strong enough to stand a strong wind and the weight of the HE-3000 Wind Turbine system.
- The pipe is adjusted through the center of the template (if applicable) and the other end of the pipe needs to be pushed in the side of the foundation.
- When the concrete is poured on the foundation, it is important to remove water and space by using oscillator. It is required to check if there is space underneath the foundation. It is more important to check if the foundation is not rising above the template and gradation is completed (leveled out).

- And then, it is important to use a proper cover to prevent concrete from flowing over the template or rain water from percolating. It needs to wait until concrete is hardened completely before the template is removed (it takes about one week).

## **WARNING**

- HE-3000 Wind Turbine Generator is designed to be able to be installed on the roof or rooftop of the building, but it is required to check the structure of the building in advance and if there is no 100 % certainty that the structure is able to be installed, it is good not to install on the rooftop or roof of the building. (conducting the calculation of the structure)
- It is the responsibility of the user to judge whether HE-3000 Wind Turbine System can be installed and operated on the structure such as rooftop or roof of the building. HI-ENERGY KOREA is not responsible for the potential damage or risk factor occurred by the part related to the design of building structure.
- Follow the regulation of the local government and nation in regard to related permission and support-related items in case of installing HE-3000 Wind Turbine system on the rooftop or roof of the building.
- Consult the headquarter or constructor regarding the design and composition after checking the soil in case of installing HE-3000 Wind Turbine System on the ground.

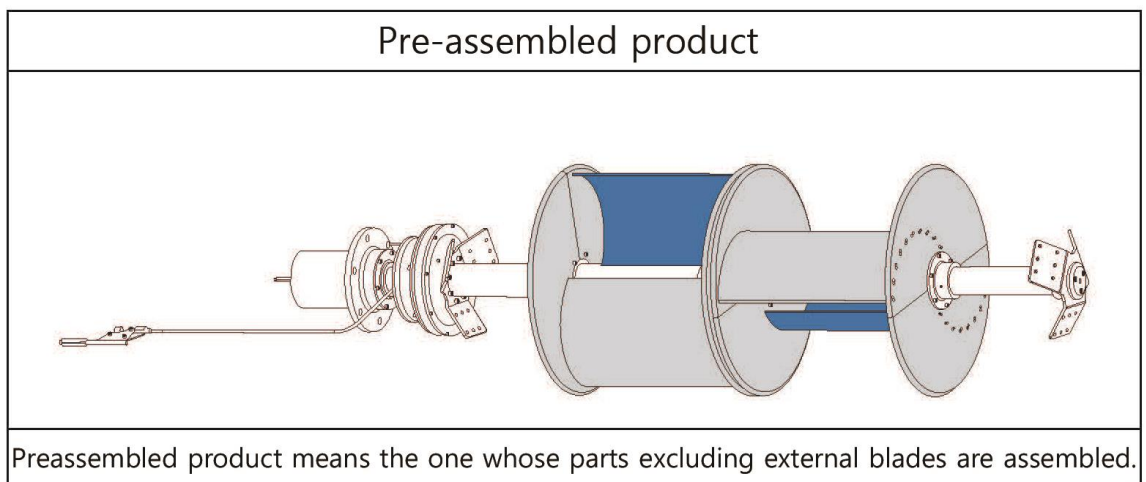


### 3.4. Assembly and Installation of Wind Turbine

#### 3.4.1. Assembly of HE-3000

- The assembly of HE-3000 can be different depending on the type of the purchase type (able to assemble in part). Follow the detailed drawing as follow in order to complete the assembling of all the parts.
- The procedure can be skipped in case of purchasing the product assembled in advance (internal blades).

[Picture 4] Pre-assembled product






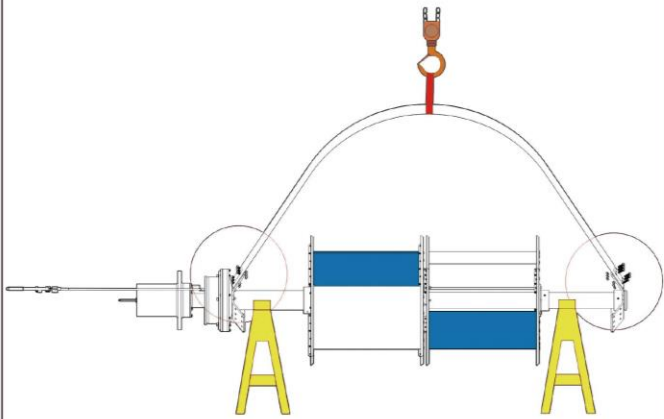
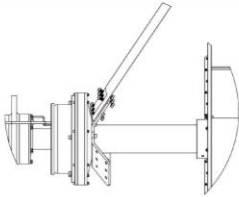
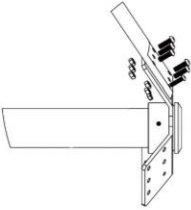
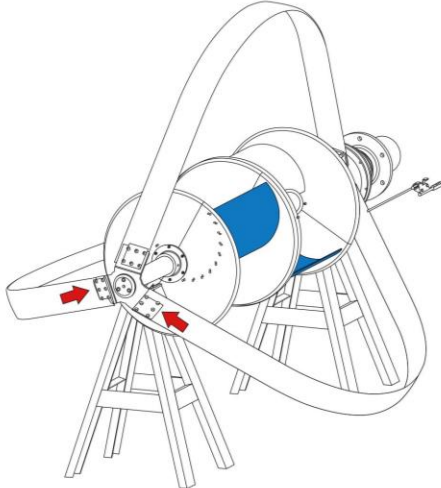
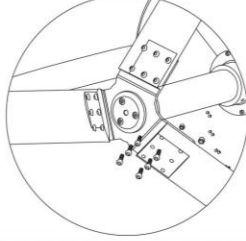
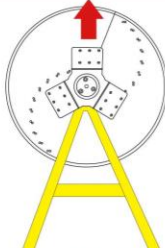
#### 3.4.2. Installing HE-3000



- Check the procedure of the assembly shown in Picture 5 as below once again and check surely if all the screws are locked safely. Loose screw can cause a serious oscillation or partly damage.

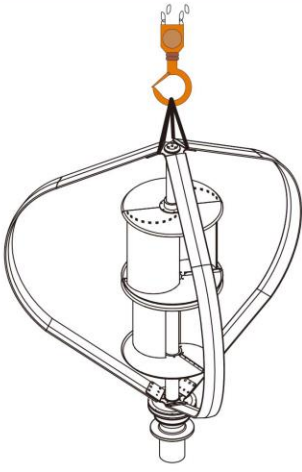
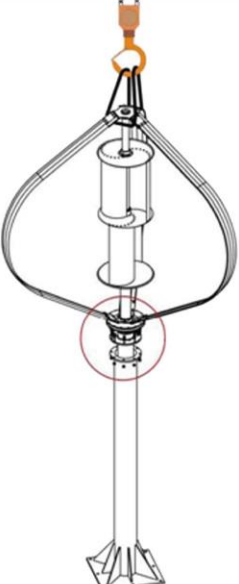
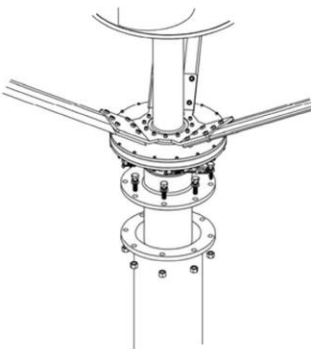
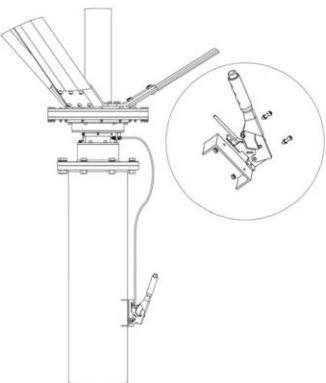
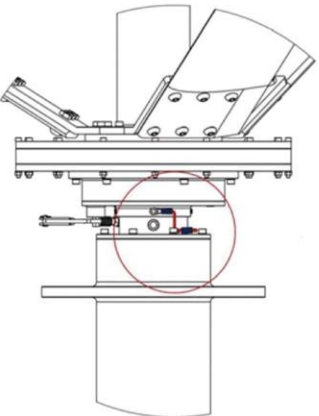
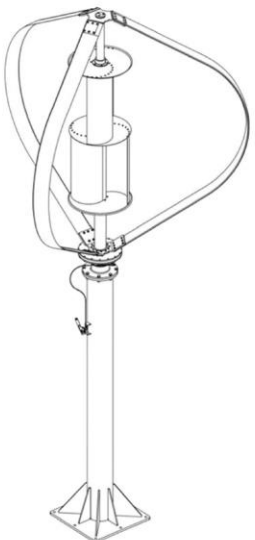
- If HE-3000 Wind Turbine System is to be installed on the particular height, prepare proper safety equipment for processing the installation.

[Picture 5] Parts and procedure for assembling external blades

Assembled Parts and Assembly of External blade		
<b>A</b> 3EA External Blades	<b>B</b> External blade bolt and nut 30EA M16X50mm, rock nut	<b>C</b> External blade bolt and nut 6EA M12X50mm, rock nut
		
		 <p>In connecting blades use M16X50mm rock bolt 5EA M12X50mm, rock bolt 1EA</p>
<p>Connect triangle (top and bottom) with bolts and nuts by raising external blades of wind turbine like the picture. (Warning, use rock nut as a nut)</p>		 <p>In connecting blades use M16X50mm rock bolt 5EA M12X50mm, rock bolt 1EA</p>
		 <p>In connecting blades use M16X50mm rock bolt 5EA M12X50mm, rock bolt 1EA</p>
<p>Connect triangle (top and bottom) with bolts and nuts by raising external blades of wind turbine like the picture. ( Note, use rock nut as a nut)</p>		 <p>Note, the shape of the triangle needs to be like the picture.</p>

All the procedure required for assembling HE-3000 Wind Turbine is completed.

[Picture 6] Procedure to install HE-3000

Combine wind turbine and tower pole		
		
<p>Raise wind turbine like the picture after connecting to the crane.</p>	<p>Move wind turbine to the top part of the tower pole like the picture</p>	<p>Mounting flange is connected to tower pole after connecting R, S, and T wires of wind turbine before connecting to the tower pole wind turbine. 8 bolts and nuts are connected for connecting the tower pole and wind turbine. 8EA Bolt(M20x80 Hex bolt), spring plain washer</p>
		
<p>Fix brake handle safely after channel section steel plate of anchoring disk to fix brake handle. Need spring washer, nut and 2EA of M8x25</p>	<p>Check if the grounding wire is connected though the grounding wire is pre-assembled.</p>	<p>Picture where wind turbine and tower pole are assembled</p>

## NOTICE

- The size and length of 3 proper wires needs to be installed in advance within the tower.
- The wire of R,S, T generator needs to be connected to 3 pre-installed wires.

## 5. Maintenance

### 5.1. Application Range

This procedure applies to the guidance regarding maintenance after takeover.

### 5.2. Goal

This procedure is pertaining to the maintenance other than receiving the complaints from customers. And its goal is to check and maintain the status of wind turbine normally or periodically.

### 5.3. How to maintain

#### A. Wind Turbine

##### 1) Visual Inspection

Inspection Contents	Notice
Whether wind turbine is rotating	

Whether the blades are broken and transformed	
Whether there is serious noise or mechanical sound during rotation	

B. Inverter

1) Visual Inspection(LCD screen)

inspection Contents	Notice
Checking the message of LCD screen on the face of inverter	Refer to the below contents

- How to test inverter

1. In case of initial power supply, LED screen shows the model name of inverter and the version of software.
2. If the power button on the face of inverter is pressed until the buzzer sound is heard, inverter will check the voltage and frequency of the existing power automatically.

Then LED screen shows "Waiting" and if there is no problem, screen shows "Stand by".

This sign will last till the wind speed to start the generation.

3. If rotary RPM of wind turbine reaches 50, LCD screen shows "low wind" , which means the start of the generation when the wind speed reaches the level of generation.
4. If rotary RPM of wind turbine reaches over 78, LCD screen shows the current quantity of power.

C. Controller

1) Comprehensive Inspection

Inspection Contents	Notice
Check if the power is normally provided	AC220V

Whether the switch of POWER BREAKER is properly working	Visual inspection
Whether the generator stops or not when the switch of MANUAL BRAKE is on manually during the generator rotation <sup>4</sup>	OFF condition all the time during normal operation
Whether the generator stops or not when the switch of MANUAL DUMP is on manually during the generator rotation	OFF condition all the time during normal operation
Whether Auto Dump, Auto Brake and the magnetic switch is working automatically during the power supply	Visual inspection
Check how each socket is short circuit	Visual inspection

#### 5.4. Follow-up care

- 1) The flaw and defect detected during onsite inspection needs to be reported to the manager of onsite facilities.
- 2) The internal inspection needs to be conducted according to the general method of maintenance.
- 3) If the facility manager or other staff detects flaw and defect, it needs to report it to relevant company and the staff other than technician should not operate. (But, after the consultation with technicians, the parts to be handled onsite can be processed onsite.)
- 4) The company should accept it within maximum 14 days when receiving complaints from customers (asking after-sales service).  
(If it can't be possible to accept the complaints within 14 days, consult the manager of onsite facility regarding the schedule and progress and process the situation.)

#### 5.5. Product Assurance and Defect Assurance Insurance

- 1) Sales and Installation in Korea

The period of Free and Paid Assurance and Defect Assurance Insurance of the products sold and installed is defined as follows;

Contents	Assurance Period	Division of Free or Paid
Durability of the Product	10 years	Paid after 2 years
Product assurance(blades, generator, and main product)	2 years	Free
Products Assurance(inverter, controller, and charger)	1 year	Free
Defect Assurance Insurance	2 years	Seoul Guarantee Insurance

## 6. A/S Rules

If not disorder, there is an extra charge for calling for service. Therefore, read the manual and provide the consulting through telephone in the case of not able to handle through manual.

### 6.1. Repair for free

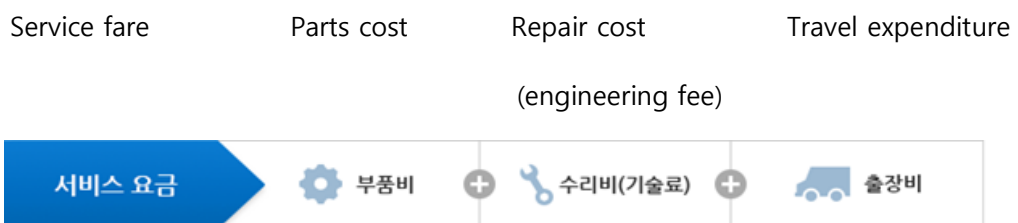
- 1) In case of disorder of function or performance occurring during the normal use within the period of quality assurance
- 2) In case of reoccurring disorder on the same part within 2 months after the repair by CS Professional(engineer)

### 6.2. Repair at a cost

- 1) Product whose warranty runs out
- 2) In case of explanation and simple arrangement of manual without overhaul

- 3) In case of external environment problems such as internet, antenna and wired signal
- 4) In case of connecting or re-connecting product additionally after initial installation of the purchased products
- 5) In case of asking additional installation after purchasing the product in the place other than official distributor
- 6) In case of changing the installation place because of the moved product and moving.
- 7) In case of disorder of the product of other company(including software)
- 8) In case of disorder because of not following the notice of the manual
- 9) In case of disorder caused by using wrongly the electricity capacity
- 10) In case of disorder caused by consumables or optional product not designated by our company
- 11) In case of disorder caused by the repair by the person other than CS professional engineer
- 12) In case of the disorder or damage caused by external shock or falling
- 13) In case of the disorder caused by natural disaster including lightening, fire, earthquake and tsunami
- 14) In case of the consumable parts coming to an end such as battery and lamp

### 6.3. Criteria to decide service fare





- Service fee is consisting of the total amount with parts cost, repair cost, and travel expenditure and each fee is decided as follows.

※ The applied standard can be different when the products are purchased overseas.

1) Parts cost

- Parts cost, equipment cost and etc. required when parts are changed during the repairs
- Parts cost includes 10% of VAT

2) Repair cost

- Repair cost indicates the engineering fee other than parts cost and it is estimated by considering the required time and difficult level during the paid repair but it is included in travel expenditure. Travel expenditure
- Travel expenditure is applied in the case of asking the onsite service and calculated separately for the different region.(In principle, travel expenditure needs to be paid in advance)

Region	Days/person	Amount	Notice
Seoul-Gyeonggi	<b>1 day/ person</b>	<b>150,000</b>	
Chungcheon/Ganwon	<b>1 day/ person</b>	<b>300,000</b>	
Jeolla/Gyeongsang	<b>1 day/ person</b>	<b>500,000</b>	

Highlands and islands	1 day/ person	800,000	Not include room charge
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#### 6.4. Criteria to estimate assurance period

- HI-ENERGY KOREA conducts the assurance for the product as follows according to Consumer Dispute Resolution Criteria by contents announced by Fair Trade Commission.

- Product Warranty Period

- 1) Product Warranty Period mean the time manufacturer or distributor promises to repair free of charge for the defect in quality, performance and function occurring in a normal state to customer. Warranty Period is estimated based on the date of release and the date is according to the Warranty Certificate (including purchase receipt). However, if there is no warranty, warranty condition will be decided in accordance with the warranty certificate issued by the company at the time of manufacturing the relevant product. The warranty period will be estimated by considering 3 months (reflecting circulation period) in the date of production.
- 2) In case of the purchase of used items (items purchased in non-designated distributor or fake), the above warranty period is not applied and in the case that the repair is not available, our company will not be responsible for the damage compensation.
- 3) The warranty for the product delivered with separate contract with our company will be based on the relevant contract.

## 6.5. Warranty Period by Items

- Warranty period of the parts
- Warranty period of the parts means the warranty for each part consisting of the product and the period is as follows;

Items	Warranty for free	Details	Notice
Wind Turbine	<b>2 years</b>	<b>Main body of wind turbine</b>	
Electric and electronic parts	<b>1 years</b>	<b>Inverter, controller, timer, converter, solar panel, LED lamp and others</b>	
Structure	<b>2 years</b>	<b>Support structure</b>	
Others	-	<b>Follow the warranty period of company</b>	

- In case of repairing at a cost and in case that the same disorder occurred during the procedure of using the product normally within 2 months from repair day