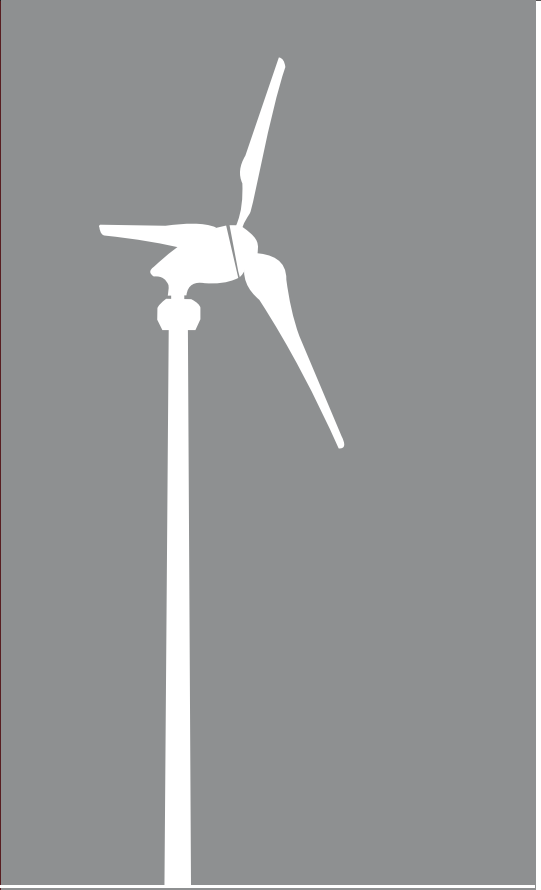


HOPEFUL

WIND ENERGY TECHNOLOGY

Airforce4.1

5KW grid-tied system

User's manual

CE

Hopeful Wind Energy Technology Co., Ltd.

Congratulations on your purchase and welcome to our family!

Dear Airforce 4.1 Owner,

Thank you for your purchase of Airforce 4.1. 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, please complete and return the enclosed **Warranty Registration Card**, or register online via **www.hopefulenergy.com**. The conditions of your warranty are dependent upon the proper installation of Airforce 4.1. Furthermore, this will assure you of being kept up-to-date with the latest developments from Hopeful Wind Energy. 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. Please call during working hours (Monday-Friday 8:30 am to 5:00 pm – Beijing time). Our phone number is **+86 756-3819866** or **3819868**, or you can contact us by **info@hopefulenergy**. **com**.

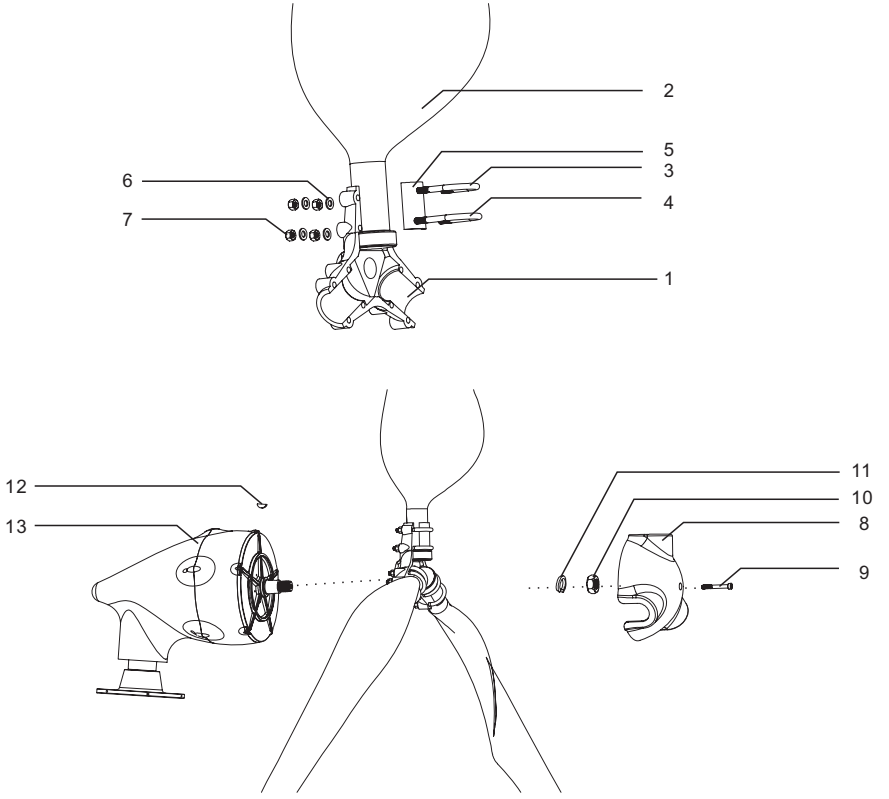
Again, welcome to our family and thank you for investing in the future of wind energy with Airforce 4.1.

Sincerely,

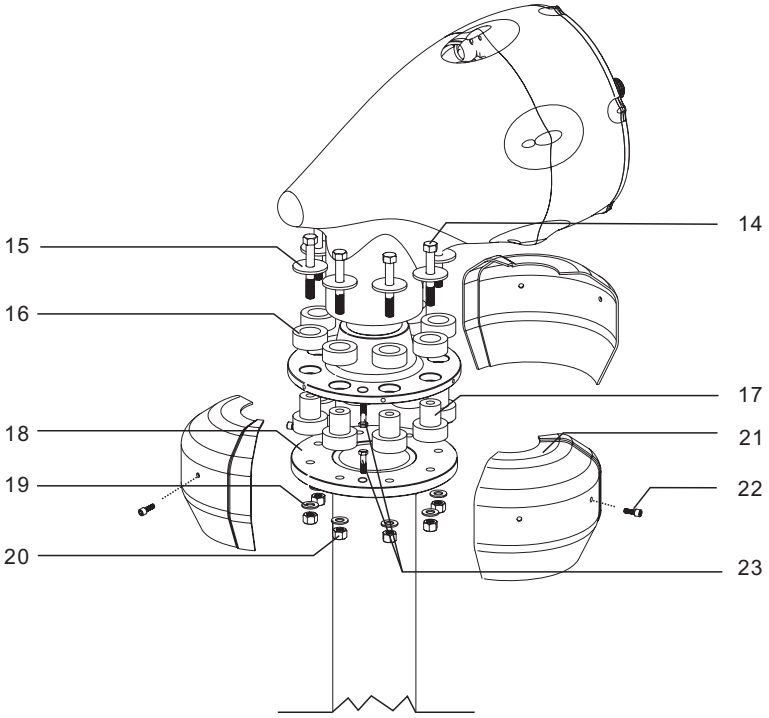
Hopeful Wind Energy Technology Co., Ltd.

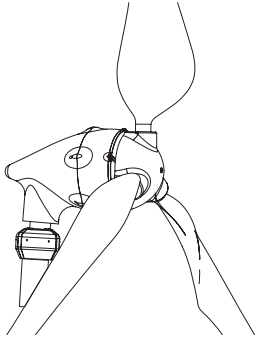
Table of Contents

Basic Components



Item	Descriptions	Quantity
1	Hub	1
2	Blade	3
3	Short U bolt M10-95mm	3
4	Long U bolt M10-105mm	3
5	Blade root shim	3
6	Washer Φ10.5mm	12
7	M10 Nut	12
8	Nosecone	1
9	Bolt M10-65mm	1
10	Nut M30 x 2	1
11	Spring washer Φ31mm	1
12	Woodruff key	1
13	Generator	1





Item	Descriptions	Quantity
14	Bolt M12 x 85mm	8
15	Washer 50-Φ12.5mm	8
16	Suspension rubber washer A	8
17	Suspension rubber washer B	8
18	Tower flange Φ240−Φ120mm	1
19	Flat gasket 25-12.5mm	8
20	M12 Nut	8
21	Cover of vibration isolator	3
22	Socket head screw M6 x 15mm	6
23	M6 bolt	2

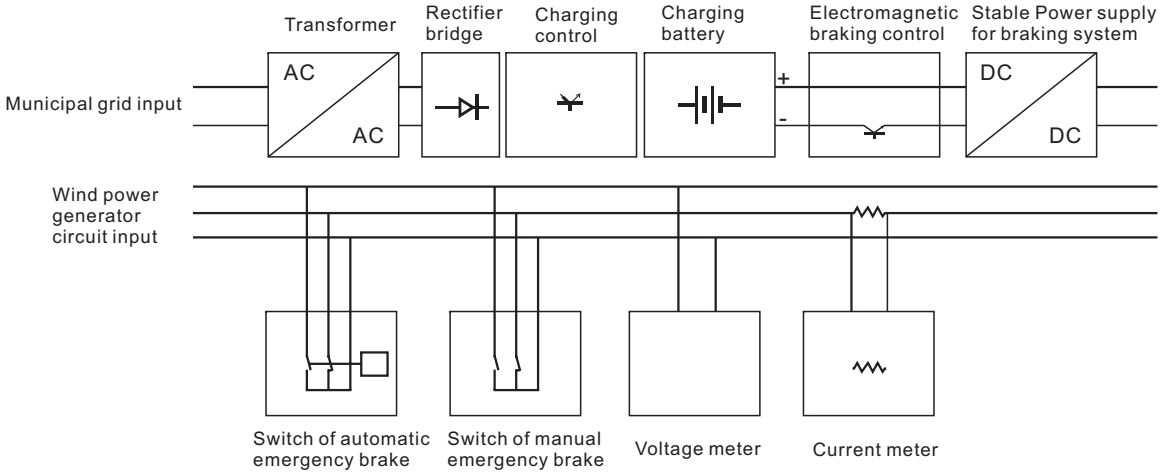
Introduction of the controller

This manual is applicable for 5KW grid-tied wind power generator unit and its power generation system.

Main functions of the controller

- It adopts an embeded microprocessor as its core control unit with PWM function.
- It possesses a dual protection function—automatic braking of wind turbine over-loading(over-loading of voltage and current) and emergency stop.
- Protection from over-charging of battery.
- Protection from reverse connection of charging battery.
- Protection from electrical shock and voltage surges.

Electrical circuit chart of the controller

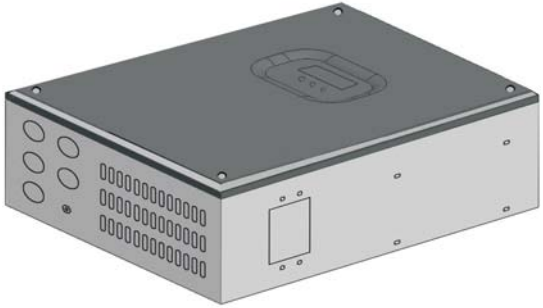


Introduction of the controller

Main technological specifications of the controller refer to table 1.

Table 1

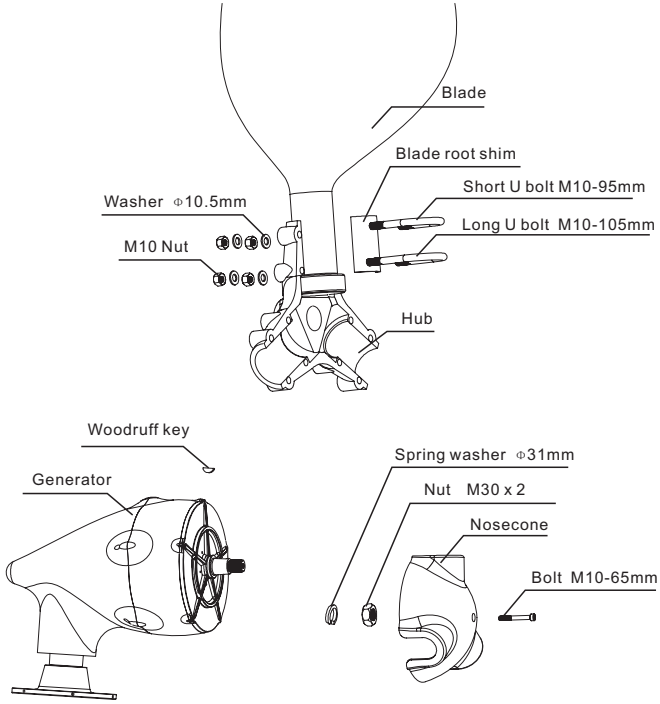
Item	Spec.
Max output alternating current voltage（V）	438
Max output current（A）	8
Max output power of the generator(kw)	6
The capacity of charging battery	100Ah/24V
The protection voltage of over-charging(V)	28.8
The recovery voltage of over-charging(V)	26
Time of automatic braking resuming	36 hours
Electrical source output of electromagnetic braking	150W/24V
Voltage of exterior working electrical source(V)	220V/110V/100W
The protection grade of controller's crust	Ip20
Applied temperature(℃)	0---50
Operating height above sea level(m)	≦5000
The external size of controller (mm)	370(W)x260(H)x184(D)
The total weight of controller(kg)	10.7



Controller for 5 kw grid-tied system

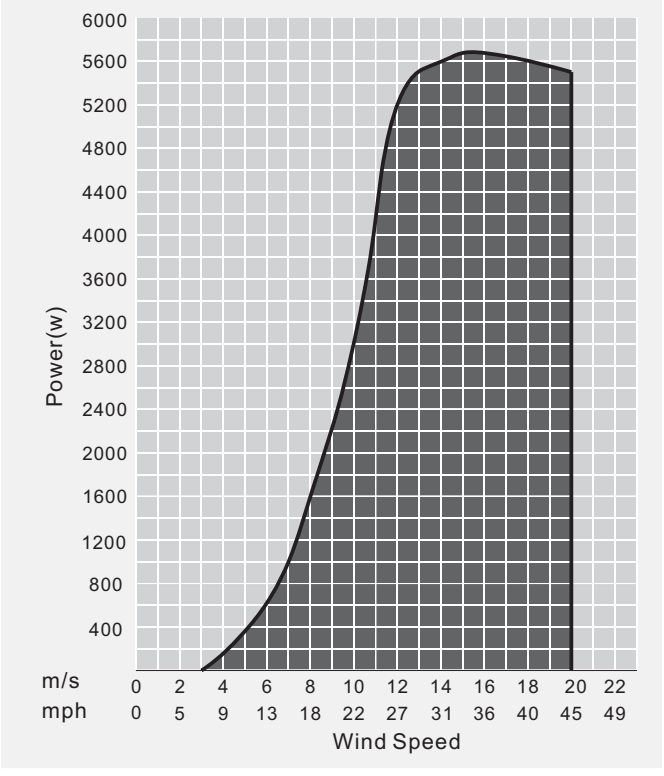
Technical Specifications

Model	Airforce 4.1 – 5 KW grid-tied system
Max. output power	5 KW
Rated wind speed	12 M/S(27 MPH)
Max. wind speed	25 M/S(56 MPH)
Survival wind speed	60 M/S(134 MPH)
Start-up wind speed	1.8 M/S(4 MPH)
Cut-in wind speed	3 M/S(7 MPH)
Rated rotational speed	450 RPM
Max. rotational speed	580 RPM
No. of blades	3
Rotor diameter	4.09 M
Blade length	2.02 M
Blade material	FRP
Generator	3 phase PM generator
Braking system	Electromagnetic braking system control
Type	Downwind rotor
Yaw	passive
Total weight	95 KG
Warranty	5 years
Controller	Protection controller for generator
Grid-tided inverter	120/240VAC,50/60HZ (optional)
Tower	18 M(optional)



Curves of Performance

Curves of Performance--5 kw grid-tied system.



Important Safety Instructions

Read these instructions in their entirety before installing or operating.

Professional installation: Hopeful Wind Energy strongly recommends Airforce 4.1 be installed by trained professionals.

1) SAVE THESE INSTRUCTIONS. This manual contains important instructions for Airforce 4.1 that must be followed during installation and maintenance.
2) Read, understand and respect all warnings.
3) Do not install Airforce 4.1 around standing water.
4) Do not install Airforce 4.1 on a windy day. The allowed wind speed should be less than 2 m/s(4mph).
5) Install Airforce 4.1 in accordance with local related electric code and local building codes.
6) If required by local authorities, always obtain a building permit before construction.
7) A minimum of 2 adults are required to safely lift or move Airforce 4.1. Use proper equipment such as hydraulic hoists to lift Airforce 4.1.
8) Always wear appropriate protective personal equipment such as closed toe work shoes, hard hat, work gloves, and safety glasses when working on or installing Airforce 4.1.
9) If unusual noise or abnormal operation is observed from Airforce 4.1, turn off the machine and contact authorized service personnel.

Important Safety Instructions

10) Shut Airforce 4.1 “OFF” if ice accumulates on blades to avoid possible injury resulting from ice flying off blades.

11) This wind generator complies with international safety standards and therefore the design or its installation must never be compromised.

a. Do not open the nacelle cover , doing so without factory authorization will void the warranty.

b. Apply the proper torque to all fasteners.

c. Torque field wire connections to Airforce 4.1 to 2.3-2.5 N·m. Refer to Electrical Connections section of this manual (electrical connections to Airforce 4.1 on page 16).

d. Install only on a Professional Engineer (PE) certified tower.

e. Do not paint the blades.

12) Use only proper grounding techniques as established by local related electric code.

13) Properly complete the warranty registration card (or you can log on our website **www.hopefulenergy.com** to finish its electronic format); failure to complete and return the card may affect your warranty.

14) Airforce 4.1 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.

15) Airforce 4.1 uses high voltage and is potentially dangerous. Be sure to use all safety precautions at all times.

In this manual

IMPORTANT: Please take note

TIP: Helpful information to ease the installation

Professional installation: highly recommended

Warning: Risk of injury or death – proceed with extreme caution

The content of your Airforce 4.1 shipment

When you've received the shipment of Airforce 4.1, please check all parts should be included as followed:

Item	Descriptions	Part No.	Quantity
1	Hub	A05	1
2	Blade	A06	3
3	Short U bolt M10-95mm	A09	3
4	Long U bolt M10-105mm	A10	3
5	Blade root shim	A07	3
6	Washer Φ10.5mm	A11	12
7	M10 Nut	A12	12
8	Nosecone	A02	1
9	Bolt M10-65mm	A01	1
10	Nut M30 x 2	A03	1
11	Spring washer Φ31mm	A04	1
12	Woodruff key	A13	1
13	Generator	A33	1

Item	Descriptions	Part No.	Quantity
14	Bolt M12 x 85mm	B24	8
15	Washer 50-Φ12.5mm	B32	8
16	Suspension rubber washer A	B22	8
17	Suspension rubber washer B	B23	8
18	Tower flange Φ240-Φ120mm	B21	1
19	Flat gasket 25-12.5mm	B25	8
20	M12 Nut	B26	8
21	Cover of vibration isolator	B29	3
22	Socket head screw M6 x 15mm	B30	6
23	Controller(HE-W385B)	B33	1
24	Cable connection handle	B31	1
25	M6 bolt	B28	2
26	Earthing wire10 AWG (6 mm^2) 100mm	B27	1

TIP: Every part equipped to Airforce 4.1 has its own part number. If there is any fault found on these parts during the installation or operation, you can contact Hopeful Energy or your local dealers by tracking these part numbers for timely repair or replacement.

Airforce 4.1 Limited 5—Year Warranty

WIND TURBINE WARRANTY AGREEMENT

Hardware Warranty

Hopeful Wind Energy Technology Co., Ltd. (“Hopeful Energy”) will repair or replace free of charge any part or parts of the Hopeful Energy Airforce 4.1 wind generator determined by Hopeful Energy to be defective in materials and/or workmanship under normal authorized use consistent with product instructions for a period of five 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 Hopeful Energy, its dealers and affiliates under the warranty is, at Hopeful Energy'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- Hopeful Energy additions or modifications or other problems not due to defects in Hopeful Energy's workmanship or materials. No warranty will apply if the wind generator (i) has been altered or modified except by Hopeful Energy, (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Hopeful Energy (iii), or (iv) has been exposed to winds exceeding 134 mph (60 m/s), or has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Hopeful Energy's repair facility determines that the problem with the wind generator is not due to a defect in Hopeful Energy's workmanship or materials, then the party requesting warranty service will be responsible for the costs of all necessary repairs and expenses incurred by Hopeful Energy.

Warranty Claims & Return Procedures

In order to be eligible for service under this warranty the Customer MUST return the **Warranty Registration Card** or log on **www.hopefulenergy.com** to complete the warranty registration within 30 days of purchasing the wind generator. Additionally, the Customer must submit a service request for the wind generator covered by this warranty within the warranty period by contacting Hopeful Energy in writing or via telephone and obtaining a Return Authorization (“RA”) number. This RA must be obtained before

Airforce 4.1 Limited 5—Year Warranty

WIND TURBINE WARRANTY AGREEMENT

returning any product under this warranty. Notification must include a description of the alleged defect, the manner in which the wind generator was used, the serial number, and the original purchase date in addition to the name, address, and telephone number of the party requesting warranty service. Within 3 business days of the date of notification, Hopeful Energy will provide the Customer with a RA number and the location to which the Customer must return the defective wind generator. Any wind generator requiring warranty repair shall be transported at the expense and risk of the party requiring warranty service, including but not limited to proper packaging of the product. The Customer must return the entire wind generator kit within 30 days after issuance of the RA number. Hopeful Energy will be under no obligation to accept any returned wind generator that does not have a valid RA number. Customer's failure to return the wind generator within 30 days of its receipt of a RA number may result in cancellation of the RA. All parts that Hopeful Energy replaces shall become Hopeful Energy's property on the date Hopeful Energy ships the repaired wind generator or part back to the Customer. Hopeful Energy will use all reasonable efforts within five days of receipt of the defective wind generator to repair or replace such wind generator. If a warranty claim is invalid for any reason, the Customer will be charged at Hopeful Energy's current rates for services performed and will be charged for all necessary repairs and expenses incurred by Hopeful Energy.

Disclaimer

EXCEPT FOR THE EXPRESSED WARRANT SET FORTH ABOVE, HOPEFUL ENERGY 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, WETHER 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. HOPEFUL ENERGY EXPRESSLY DISCLAIMS ALL LIABILITY FOR BODILY INJURIES OR DEATH THAT MAY OCCUR. DIRECTLY OR INDIRECTLY, BY UES OF THE PRODUCT BY ANY PERSON. ALL OTHER WARRANTIES ARE EXPRESSLY WAIVED BY THE CUSTOMER.

Airforce 4.1 Limited 5—Year Warranty

WIND TURBINE WARRANTY AGREEMENT

Limitation of Lliability

UNDER NO CIRCUMSTANCES WILL HOPEFUL ENERGY OR ITS AFFILIATES OR DEALERS BE LIABLE OR RESPONSIBLE FOR ANY LOSS OF USE, INTERRUPTION OF ANY BUSINESS, LOST PROFITS, LOST DATA, OR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OF ANY KIND REGARDLESS OF THE FORM OF ACTION, WETHER IN CONTRACT, TORT(INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, RESULTING FROM THE DEFECT, REPAIR, REPLACEMENT, SHIPMENT OR OTHERWISE, EVEN IF HOPEFUL ENERGY OR ITS AFFILIATES OR DEALERS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Neither Hopeful Energy nor its affiliates or dealers 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.

Installation

Prior to Installation

Intended Use

Airforce 4.1 is a wind powered electricity generator. It is designed to supplement the electrical power provided by the local electrical utility company in residential applications by connecting to the main AC utility panel via a user equipped special AC inverter. Airforce 4.1 may also be utilized to provide power with battery based residential electrical systems or utility grid connected systems with battery backup. A typical Airforce 4.1 installation is depicted in the figure on page 14 of this manual. Airforce 4.1 is designed to operate at sites with average wind speeds no less than 5 m/s(11mph). The installation of Airforce 4.1 at sites with higher average wind speeds will accelerate component wear and require more frequent inspections.

Unintended Use

Utilizing Airforce 4.1 for other than its intended purposes or with inappropriate equipment or modifying Airforce 4.1 is not authorized by us and will void the warranty and may result in serious or even fatal injury. Observe the following precautions.

IMPORTANT: Precautions listed here cannot address all the possible misuses of Airforce 4.1 therefore contact us if there is any doubt or question regarding the installation or use of Airforce 4.1.

- Observe all related electrical code requirements including tower grounding requirements, electrical disconnect switches, wires size and type.
- Do not use unauthorized fasteners. Use fasteners supplied with Airforce 4.1. Contact your dealer for authorized replacement fasteners.
- Observe fastener torque requirements.
- Do not attempt to modify Airforce 4.1 in any fashion – internally or externally.
- Do not install blades other than those supplied with Airforce 4.1. Use only genuine replacement blades supplied by us.
- Do not attempt to use a power source other than the wind to power Airforce 4.1 – for example connecting pulleys or as water powered turbine.

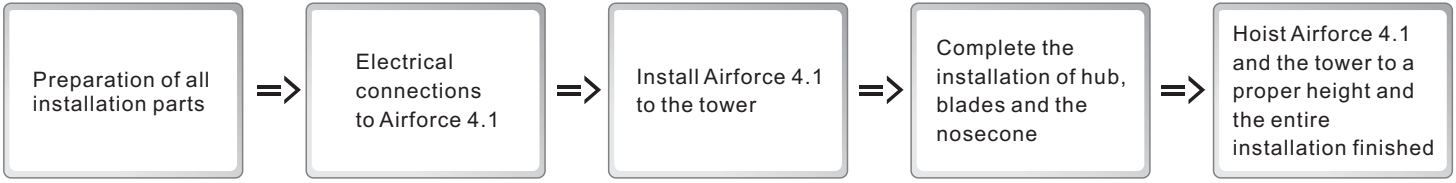
Installation

Prior to Installation

Installation Personnel

Hopeful Wind Energy recommends professional installation of Airforce 4.1. While Airforce 4.1 is not difficult to install, and many homeowners have successfully installed their own Airforce 4.1, knowledge of local zoning and building code requirements, construction techniques, as well as residential electrical systems is required for a safe installation.

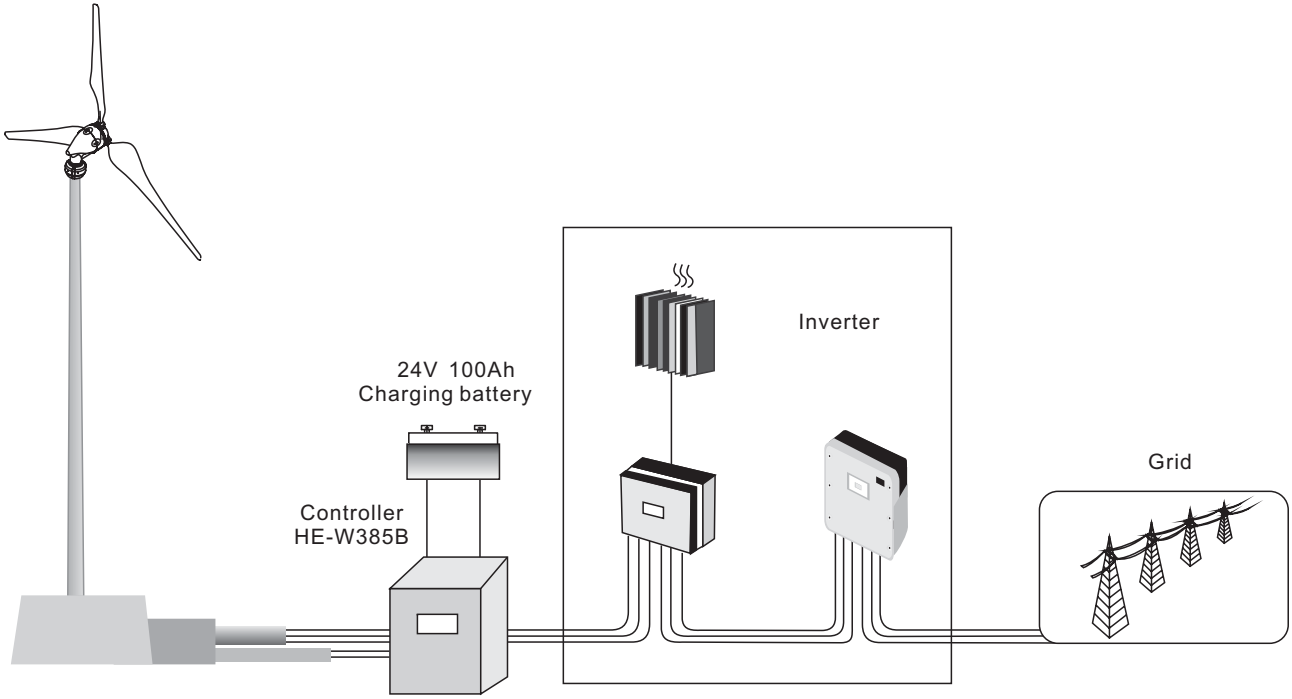
Sequence of Installation



Installation

Prior to Installation

Typical Airforce 4.1 Installation



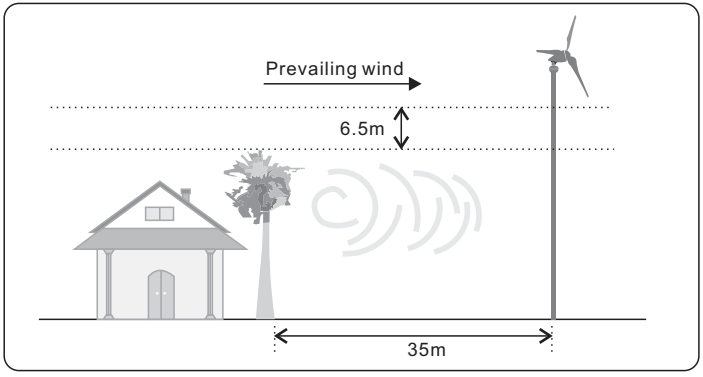
Installation

Prior to Installation

Sitting—Finding the Best Location for Airforce 4.1

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 Airforce 4.1 be installed in a less than optimum location.

In general Airforce 4. 1 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, 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 metre for Airforce 4.1.

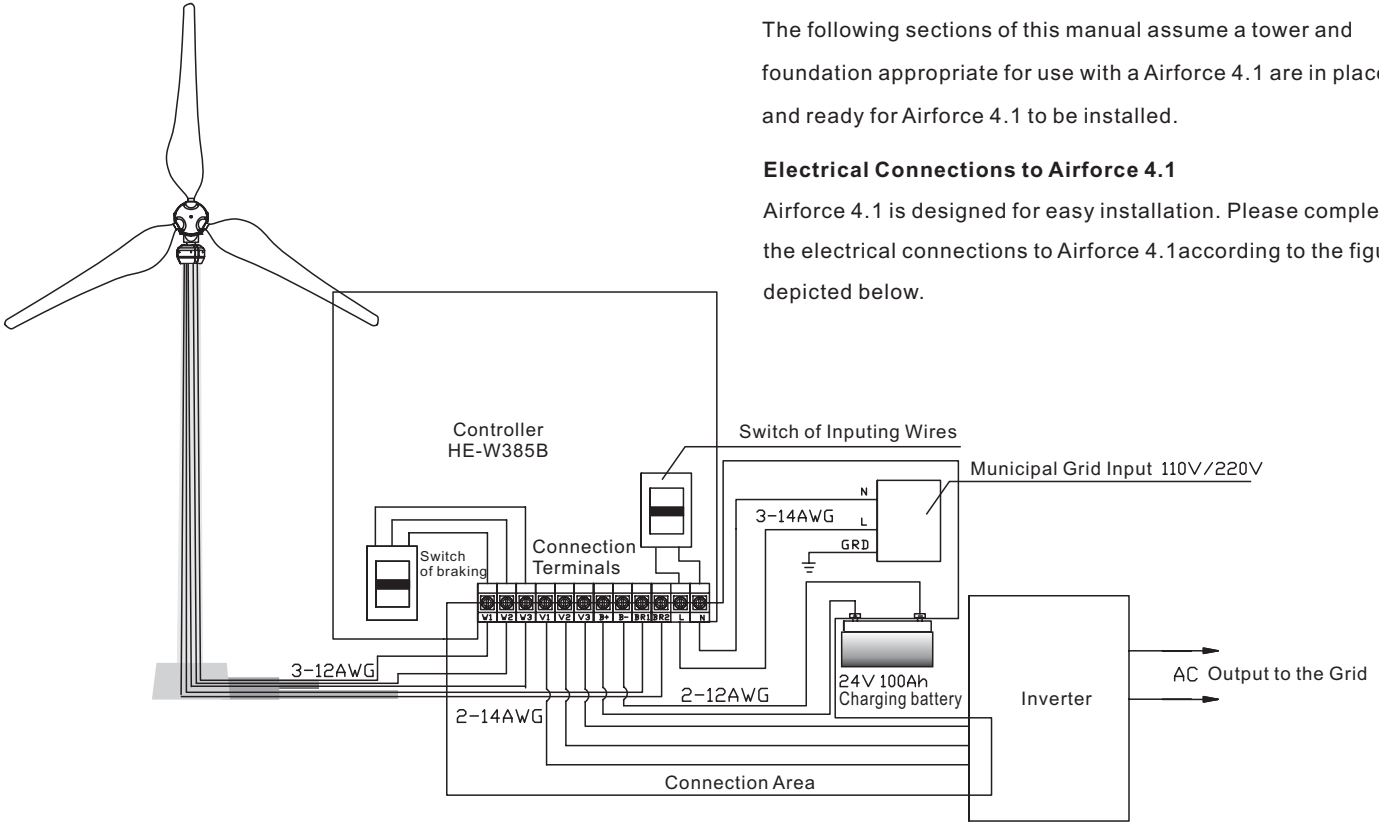
Installation

Introduction

The following sections of this manual assume a tower and foundation appropriate for use with a Airforce 4.1 are in place and ready for Airforce 4.1 to be installed.

Electrical Connections to Airforce 4.1

Airforce 4.1 is designed for easy installation. Please complete the electrical connections to Airforce 4.1according to the figure depicted below.



Installation

Wire Sizing

Measure the distance from the electrical utility panel and Airforce 4.1, include the tower height. Refer to the table below and based on the measured distance and system voltage select the appropriate wire size. Battery charging systems may utilize smaller gauge wire than indicated in the Wire Size Table. The smaller wires are based on allowing 4% voltage line loss for battery charging systems compared to 2% line losses indicated in the Wire Size Table.

Wire Size Table

Wire Size	Maximum Distance			
	120 V	120/208 V	230 V	120/240 V
4 AWG (25 mm^2)	197 m	270 m	285 m	310 m
6 AWG (16 mm^2)	124 m	170 m	179 m	195 m
8 AWG (10 mm^2)	78 m	93. 3 m	113 m	123 m
10 AWG (6 mm^2)	49 m	67 m	70. 7 m	77 m
12 AWG (4 mm^2)	31 m	42. 4 m	44. 5 m	48. 5 m
14 AWG (2. 5 mm^2)	20 m	26. 5 m	28 m	30. 5 m

Installation

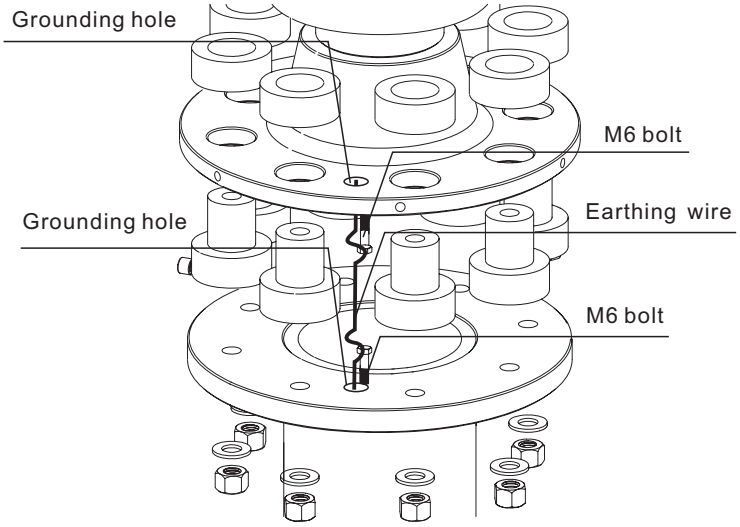
Grounding

All electrical systems must be grounded in accordance with local and national standards. Grounding provides protection from electrical shock, voltage surges and static charge build up.

Note: The instructions in this section are provided as reference, local electrical codes and standards have precedence over these instructions.

Please complete the grounding following the requirements depicted in the accompanying figure.

Note: When processing the grounding, make sure the grounding holes on the vibration isolator base and tower flange are aligned properly, or the grounding and the installation of suspension rubber washers would be affected.



Installation

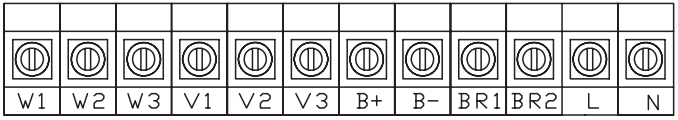
Requirements of Installation—controller for 5 kw grid-tied system

Installation of components

- According to its protection grade, the controller should be installed in an indoor environment with dryness and ventilation and beside the controller, there should not be any substance of flammability.
- The controller should be installed vertically and hanged firmly.
- Before the cable connection, push the manual braking switch of wind generator to " on " in case electric shock accidents will occur from the operation of wind generator during the connection.
- Follow the signs below the connection terminals, connect the cables of related equipments properly. The section of cable refers to table 2.
- After the correct connection, shut the manual braking switch of wind generator to " off ", then the generator is under operation.

Table 2 Section table of external connective cables

Model	Wind generator Spec.	Spec. of charging battery	Spec. of brake
HE-W385B	12AWG ($4mm^2$ x3)	12AWG ($4mm^2$ x2)	14AWG ($2.5mm^2$ x2)



W1、W2、W3： Wind generator input(phase-sequence free)

V1、V2、V3： Wind generator output(phase-sequence free)

B+： Positive pole of charging battery

B-： Negative pole of charging battery

BR1: Brake input terminal (polarity free)

BR2: Brake input terminal (polarity free)

L: Grid power input

N: Grid power input

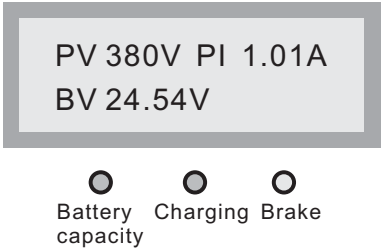
Installation

Requirements of Installation—controller for 5 kw grid-tied system

Inspection

The display screen of operation state and the operation indicator lights

When the controller is working, the display screen and indicator lights will show the operating conditions in different working status. Details refer to the figure below and table 3.



Descriptions in the display screen.

PV 380V： The voltage from the wind generator is 380 V

PI 1.01A： The current from the wind generator is 1.01A

BV 24.54V: The charging voltage is 24.54 V

Table 3 Table of operation indicator lights

	State of lights	System operation condition
Indicator light of the capacity of charging battery. (green)	Constantly on	The charging battery is in full capacity.
	Flashing	The charging battery is not in full capacity.
	Off	The charging battery is under over-discharging.
Charging indicator light.(green)	Flashing	The wind generator is charging the battery.
Indicator light of automatic braking. (orange)	On	Automatic braking.
	Off	There is an interval or the automatic braking is not started.

Installation

Requirements of Installation—controller for 5 kw grid-tied system

Matters needing attention during installation and operation

- Before connecting the controller, make sure all the equipments such as the wind generator unit, the inverter, charging battery unit, lightning protection device and cables are properly selected, configured and installed.
- Check the grounding insulation resistance in all equipments, it should be in accordance to the technological requirements of wind-solar power generation system.
- The controller is an electrical device with high voltages, unauthorized professionals are not allowed to open the cover of the chassis in case that electrical shock and damages are caused. Furthermore, this device must be appropriately grounded, with the grounding resistance not higher than 4Ω.
- This device must be firmly placed on a position which is away from hand's reach and make sure that there is a surrounding environment of ventilation and no substance of flammability.
- When this device is under installation, disassembly or inspection, make sure to push the manual braking switch of the wind generator to “on”.

Installation

The use of cable connection handle

For the safety and convenience of cable connection, Airforce 4.1 is specially equipped with a safety cable connection handle (refer to figure 1 on page 23). Connect cables long enough to Airforce 4.1, then finish the connection between the cable connection handle and cables from Airforce 4.1, corresponding to the serial numbers of connection terminals in the cable connection handle(refer to figure 1 on page 23). Position Airforce 4.1 to the top of the tower and bolt it to the tower.

Note the wire size that can be connected directly to Airforce 4.1 is 12AWG（4mm^2 x3）and 14AWG（2.5mm^2 x2）. Refer to Wire Sizing Section of this manual for instructions on selecting correct size wire.

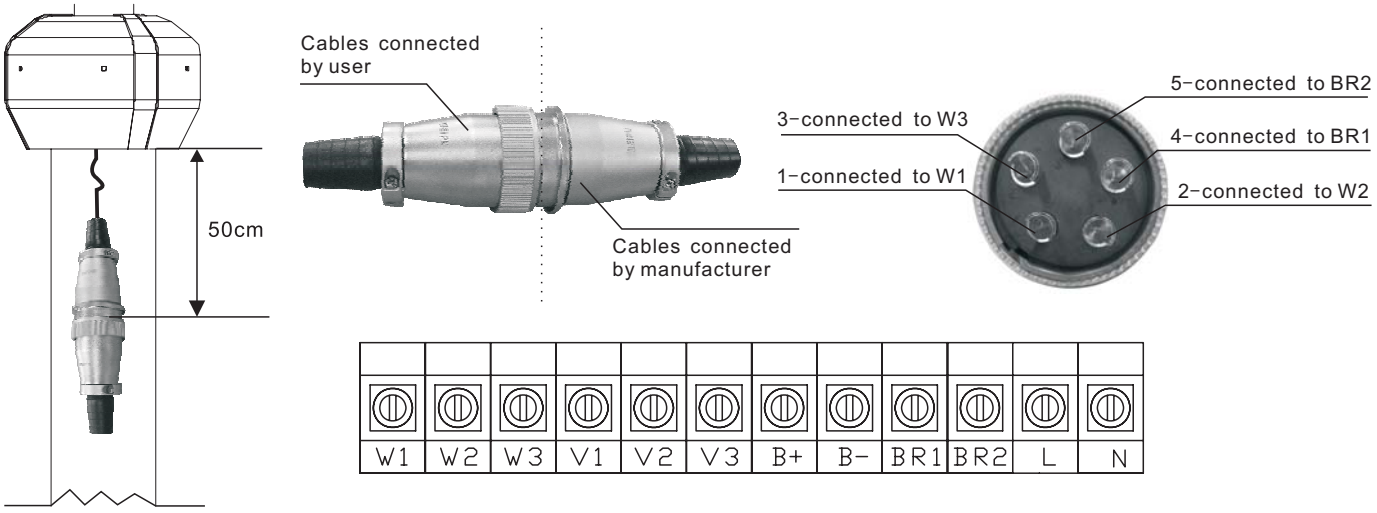
With controller connected to the circuit, process the basic test of braking by applying the braking switch on one side of the controller box:

- Do not shut the braking switch to “ on ”,wait approximately 5 minutes and attempt to rotate main blade shaft; blade should be noticeably easier to turn than with braking switch shut to“ on ”.
- Shut the braking switch to “ on ”and verify that Airforce 4.1 has returned to its “braked” mode. If Airforce 4.1 fails this test check connections and repeat test – test MUST be passed before proceeding.

Caution: Electrical Shock Hazard - use extreme care when making electrical measurements on live electrical systems.

Installation

The installation of the cable connection handle



Connection terminals of controller

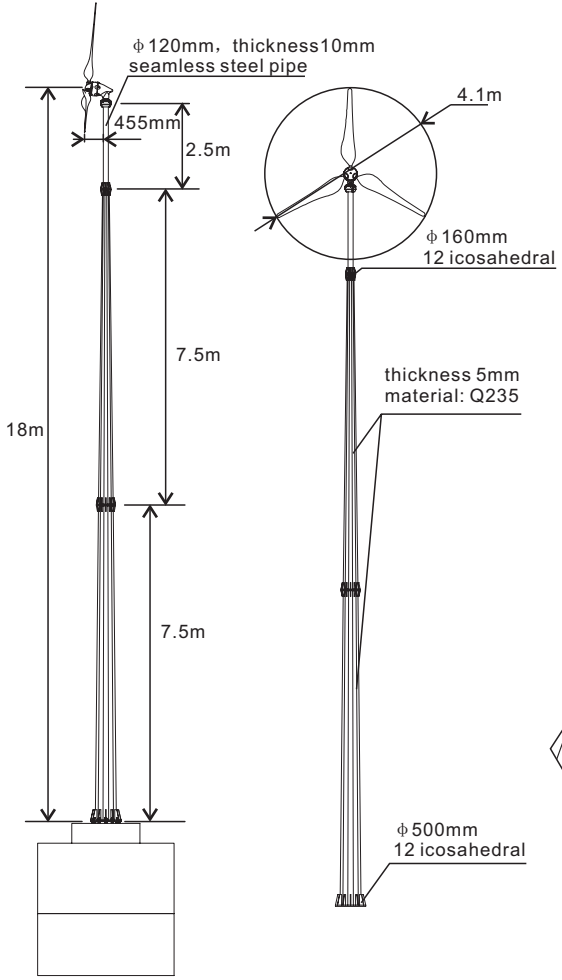
Figure 1

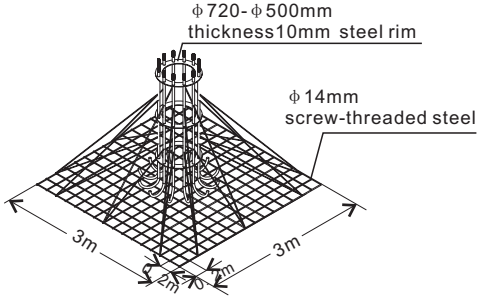
Installation

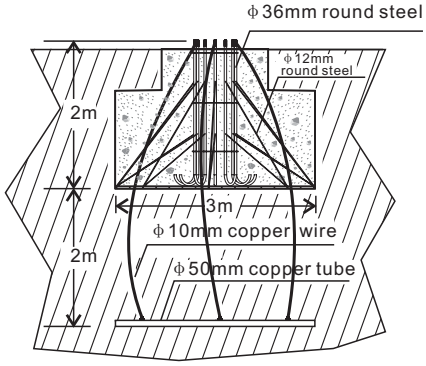
Installing Airforce 4.1 on a tower

There are several types of towers that can be used with Airforce 4.1. It is essential that Airforce 4.1 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 refer to the figure beside）



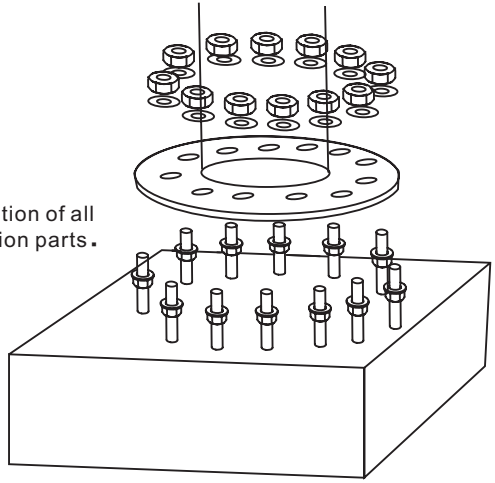




Installation

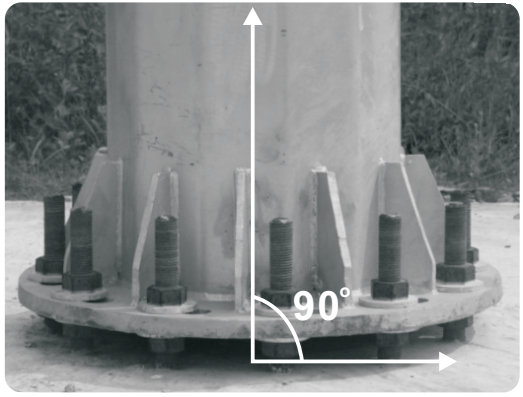
Installation of the tower base

Important: When bolting the tower to the ground, make sure that the tower is secured uprightly, which is one of the crucial factors affecting the performance of Airforce 4. 1.The bolts are not only used to secure the tower but also helpful for adjusting the tower's verticality.



1.Preparation of all installation parts.

2.Lift up the tower by a crane and move it to a proper position.



3. Bolt the tower to the ground and adjust the verticality.

Installation

Regardless of the tower design and height you select, there are two critical areas that must be considered when selecting the tower. These are the stub tower height and blade clearance, refer to figure 2.

Warning: Working on towers is dangerous and should be left to professionals with proper safety equipment and training.

IMPORTANT: Hopeful's Warranty is only extended to installations that are made on a properly engineered tower. Hopeful reserves the right to deny any warranty claim in which an improperly designed tower is used.

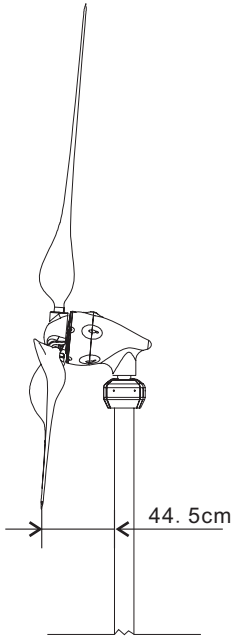


Figure 2

Installation

Bolting Airforce 4.1 to the Tower

The following section provides directions for bolting Airforce 4.1 to the tower. Before Airforce 4.1 is bolted to the tower complete the electrical connections as described in the “ELECTRICAL CONNECTIONS” section of this manual.

Bolting Airforce 4.1 to the tower is most easily accomplished at ground level as in the case with a tilt-up tower. Alternately Airforce 4.1 may be bolted to the tower on the ground, and the tower with Airforce 4.1 hoisted into position as an assembly; or Airforce 4.1 may be hoisted to an already erected tower. These latter two options require specialized equipment and training and should only be attempted by trained professionals.

- As depicted in figure 3 , insert the suspension rubber washer B to the vibration isolator base, tighten the suspension rubber washer B and A through the vibration isolator base.
- Install the washer on the bolt, insert the bolt through the suspension rubber washer B, suspension rubber washer A and the tower flange. (refer to figure 3)
- Install nuts and flat gasket on bolts to secure Airforce 4.1 to the tower.
- Torque the vibration isolator bolts to 5 N·m in two steps. First torque all bolts to 3 N·m, then tighten all bolts to 5 N·m.
- Mount the covers of vibration isolator using six M6 socket head screws.Refer to figure 3.

Warning: Do not attempt to hoist a tower and Airforce 4.1 into position using a sling attached to Airforce 4.1; Airforce 4.1 **CANNOT** support the hanging weight of a tower.

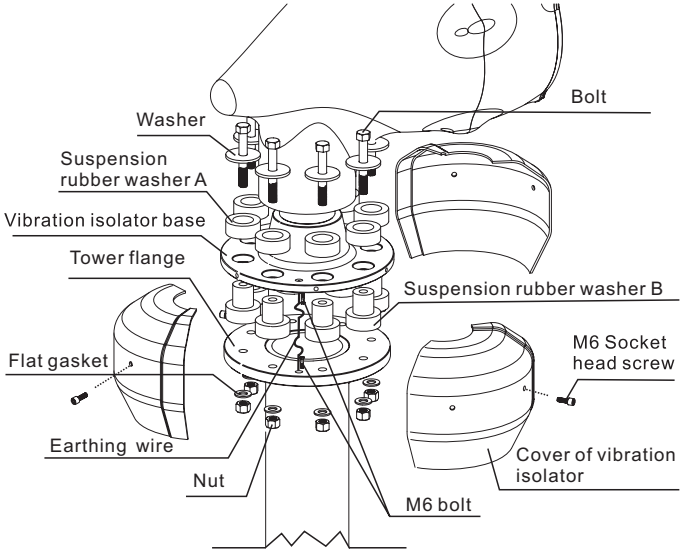


Figure 3

Installation

Blades and Nosecone Assembly

Installing the Blades (Hub Not on Turbine)

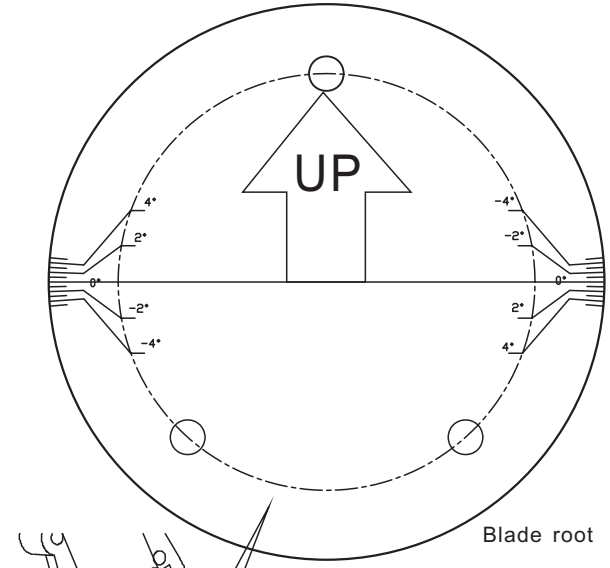
Proper installation of the blades is critical for safe operation. The blade nuts and bolts are a unique grade of steel and are specially coated to prevent corrosion. DO NOT substitute different nuts and bolts. Spare nuts and bolts are provided with Airforce 4.1.

Carefully follow these instructions to obtain secure bolted joints and maximum corrosion protection, particularly in corrosive marine environments.

- Start the assembly by positioning a blade between the hub and the U bolt. Assemble the blade to the hub with the tick mark on the blade root corresponding accurately to the mouth of the hub [at sites with average wind speeds less than 5m/s(11mph), use the " -2′ " tick mark; at sites with average wind speeds between 5m/s(11mph) and 7m/s(16mph), use the " 0′ " tick mark ; at sites with average wind speeds above 7m/s(16mph), use the " 2′ " tick mark. Refer to the figure beside.]

  Note: During the adjustment of the blade's installation angle, always make sure that the "UP arrow mark" oriented upward. (refer to the figure beside)

Important: The applied installation angle of the blade may affect directly the performance of the whole power generation system, you must install the blades to the hub accurately following the tick mark requirements based on the annual average wind speed at the operating site.

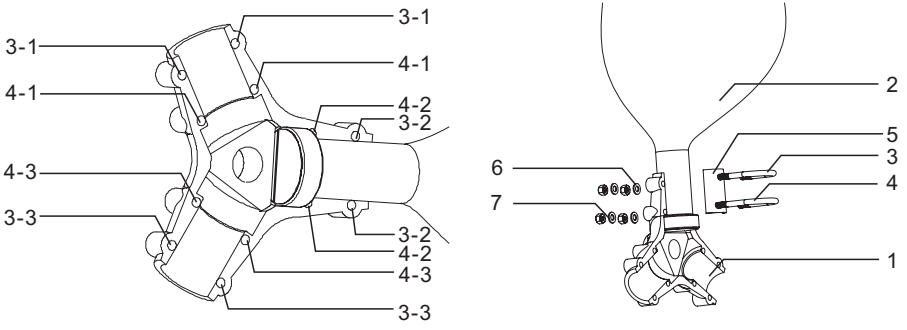


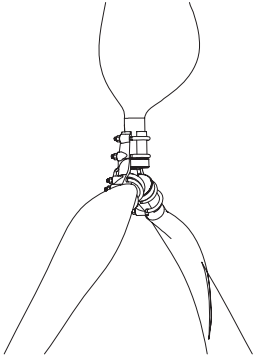
Installation

Blades and Nosecone Assembly

- Install the bolts by passing the bolt through the BLADE HUB. Note: must use washers supplied by Hopeful Energy(refer to Item 5 in figure 4) and pay attention to the installing positions of the bolts with different lengths.(refer to figure 4)
- Leave the nuts loose until all blades are installed and then tighten the bolts just enough to clamp the blades between the hub and the U bolt.(refer to figure 4)

TIP: **DO NOT** substitute nuts, bolts or washers.Contact Hopeful Energy for replacements.**DO NOT** apply lubricants to nuts or bolt threads.**RECHECK** bolt torque after lightening bolts.





Item	Descriptions	Quantity
1	Hub	1
2	Blade	3
3	Short U bolt M10-95mm	3
4	Long U bolt M10-105mm	3
5	Washer	3
6	Washer Φ10.5mm	12
7	M10 Nut	12

Figure 4

Installation

Blades and Nosecone Assembly

Bolt Tightening Sequence

- Torque the blade bolts to 55 N·m in two stages.
- Following the Blade Bolt Tightening Sequence shown – torque each bolt to 55 N·m in two stages.
- After completing the first torque of 30 N·m, following the Blade Bolt Tightening Sequence, and tighten each bolt to 55 N·m.
- The blades are now assembled to the hub and ready for installation onto the turbine rotor shaft.
- Coat the inside diameter of the blade hub with a multipurpose lithium grease to prevent corrosion between the hub and shaft.
- Position the entire hub / blade assembly onto the shaft and make sure that the groove on the hub is corresponding accurately to the groove on the shaft. Then with its circular surface at the direction to the shaft, insert and tighten the woodruff key to the groove between the hub and the shaft.(refer to figure 5)
- Put the spring washer on the shaft, tighten the shaft nut to 150 N·m and secure the hub.

Installing the Nosecone

- Install the nosecone with one M10 socket head bolt. (refer to figure 5)

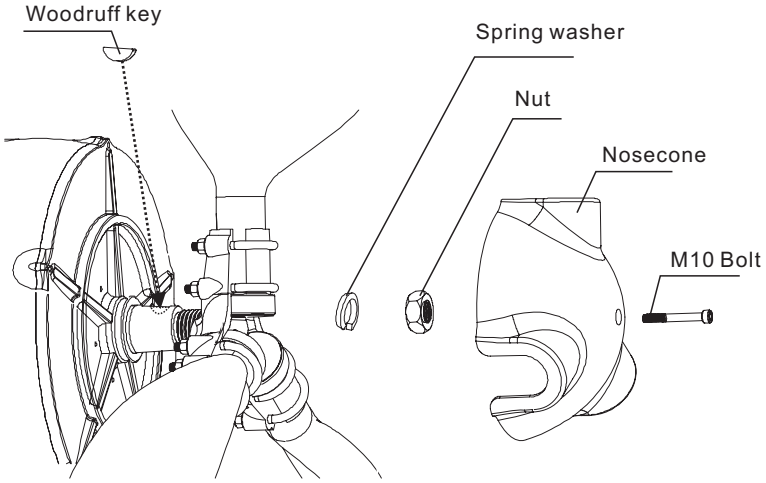


Figure 5

Installation

Final Electrical Tests

At this point Airforce 4.1 should be bolted to the tower and all the ancillary equipment – blades, nosecone, yaw shield, controller and a special A/C inverter equipped by user– attached.

Prior to tilting the tower into position, the following final electrical tests should be performed:

- With power turned off attempt to rotate the blades – there should be noticeable resistance although the leverage provided by the blade will make it possible to rotate the blades.
- Turn on power and attempt to rotate the blades after approximately 5 minutes. There should be noticeably less resistance required to rotate the blades.
- Turn off the power and verify that Airforce 4.1 returns to a “braked” condition.

Do not attempt to put Airforce 4.1 into service until these tests passed. If tests passed, tower may be tilted into position and placed into service.

Operation and Maintenance

Manual Operation of Airforce 4.1

When there is an abnormal over speed happens to Airforce 4.1 under a strong wind but the discharging and braking system cannot be started in time, press down the red button of emergency shutdown on the controller's main panel. After the wind speed has returnedto normal, turn the red button clockwise to its former position, then Airforce 4.1 will resume normal operation. If there is still abnormality, call the professionals for an inspection.

Maintenance

After 25 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 blade mounting hardware – hub bolts, nuts and washers – 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 25 years. All bearings and rotating components were designed for a 25-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 , Airforce 4.1 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 Airforce 4.1 that may experience damage is the blades, for example from flying debris during a high wind storm. For this reason Hopeful Wind Energy recommends Airforce 4.1 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 Airforce 4.1 use the opportunity to perform the following inspections:

- Remove the yaw shield, and wipe off any grease that may have seeped from the yaw bearing.
- Verify the yaw bearing snap ring is still properly seated in the snap ring groove within the nacelle. (this is the snap ring located just below the yaw bearing).
- Check the tightness of the (6) yaw bolts with a torque wrench. All yaw bolts should be torqued to 5 N·m.

Operation and Maintenance

- Reinstall the yaw shield and secure the fasteners.
- Check tightness of blade bolts with torque wrench. All blade bolts should be torqued to 55 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 Airforce 4.1 and note any potential damage or problem.

Service

The internal components of Airforce 4.1 should only be serviced by qualified technicians specifically trained to perform the service. Under no circumstances should untrained technicians attempt to perform service or repairs unless under the direct guidance of a trained technician.

Service operations that were performed during the installation of Airforce 4.1, for example bolting on the blades or bolting Airforce 4.1 to the tower may be performed as necessary by the user /operator.

Troubleshooting

Check the connections as "close" to Airforce 4.1 as possible. Depending on the installation this may be at the utility panel or at a disconnect switch. The connections may also be checked at yaw terminals (see Electrical Connections Section in this manual), however, this will require removing Airforce 4.1 from the tower.

Measure this voltage and additional troubleshooting information may be accessed without the need to remove the turbine. Contact your local dealer or Hopeful Service.

Meanwhile, check the operation condition of the controller and the information on the display screen. Process the troubleshooting following the inspection requirements on page 20 in this manual.

Emergency Shutdown

Manual emergency shutdown—When a serious fault occurred to Airforce 4.1, press down the red button on the controller's main panel to shutdown Airforce 4.1 for necessary repair.

Automatic emergency shutdown—If Airforce 4.1's internal microprocessor determines a serious internal fault has occurred, it will execute an Emergency Stop – an E-Stop. An E-Stop will only take place if the fault is severe and requires servicing Airforce 4.1's internal components . Refer to the Key Operating Characteristics

Operation and Maintenance

section of this manual for a complete description of the Airforce 4.1's various “shut down” modes including Emergency Stops.

Resetting an Emergency Stop requires special equipment and can only be accomplished by a trained technician. If you suspect your Airforce 4.1 has executed an Emergency Stop, contact Airforce 4.1 Technical Support.

Warning: There is risk of electric shock from both AC and DC voltages within Airforce 4.1.Do not attempt to open the controller box to access the internal components .AC source should always be disconnected, the turbine restrained from yawing, and blades secured from rotating prior to servicing or serious or fatal injury may occur.

Key Operating Characteristics

The Airforce 4.1 operates by converting the kinetic energy of the wind into rotational motion that turns an alternator and ultimately produces usable electric power. In actuality this is a great oversimplification of Airforce 4.1's operation since it must very precisely match the frequency and voltage of the special A/C inverter equipped by user in order to power your home and its appliances.

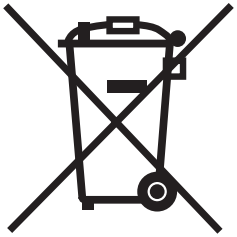
Airforce 4.1 will begin producing power in a wind of approximately 3 m/s(7mph).At that speed the blades will rotate at approximately 120 rpm. Once it has started producing power, it will continue to produce power at lower speeds down to 80 rpm and less than 3m/s(7mph).As the wind speed increases, the blade speed will also increase. If a condition occurs that causes the rotational speed to exceed 580 rpm, Airforce 4.1 will shut down for approximately 36 hours after which it will resume normal operation unless a fault is detected causing it to remain shut down. It is important to set the elevation for the turbine to operate correctly. If it is not set, the turbine may experience premature shut downs.

If a wind gust exceeds 20 m/s(45mph), then the Airforce 4.1 will shut down for 36 hours. However, in order to raise the efficience of the whole generation system, when the wind speed returns to normal, the user can restart Airforce 4. 1 by processing a manual reset---firstly disconnect the electrical source and battery unit, then resume the connection to normal.

Warning: Though the manual reset is easy to carry out, the user should ask professionals to finish it in case there are risks of electrical shock.

Operation and Maintenance

Disposal of Airforce 4.1



This symbol shown on Airforce 4.1 or its packaging indicates it may not be treated as household waste. Dispose of Airforce 4.1 properly by handing the entire turbine assembly over to the applicable collection point for recycling of electrical equipment.

By ensuring Airforce 4.1 is disposed of correctly, you will help prevent harm to the environment, which may be caused by inappropriate disposal of this product. The recycling of materials will help conserve natural resources. For more detailed information about recycling of Airforce 4.1, please contact your local waste disposal authorities, your household waste disposal service or the store where you purchased Airforce 4.1.

Airforce 4.1 was manufactured in compliance with the Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment 2002/95/EC (RoHS) and therefore does not contain any of the materials regulated by that standard.

Warning: Power to Airforce 4.1 **MUST BE TURNED OFF** prior to servicing.

Frequently Asked Questions

1) **What happens if I lose power from my utility company?**

If there is a power outage the Airforce 4.1 will shut down within one second. It will resume normal operation when power is restored. There are many safety requirements of a utility-tied inverter. We strongly suggest our users apply an inverter in accordance with these requirements.

2) **Does the Airforce 4.1 have lightning protection?**

Yes, the Airforce 4.1 has lightning protection. The Airforce 4.1 can handle 6000 Volts as required by related regulations and standards. If you live in a lightning prone area Hopeful Wind Energy recommends an additional lightning arrestor at the base of the tower.

3) **What should I do if I'm expecting a severe storm?**

The Airforce 4.1 is designed for very high winds, but it is always a good idea to shut Airforce 4.1 down if there is going to be a severe storm to protect against any flying debris.

Frequently Asked Questions

4) **How do I shut down Airforce 4.1?**

To turn off Airforce 4.1 all you need to do is turn off the breaker Airforce 4.1 is connected to. This will cause NO damage to the unit.

5) **Can I leave Airforce 4.1 unattended?**

Yes, the Airforce 4.1 is designed to operate without any user input. If there is any fault it will shut down on its own.

6) **What do I do if Airforce 4.1 is facing upwind even though there is a strong wind?**

If the Airforce 4.1 is not tracking correctly, you should check to see if the tower is level.

7) **When should I contact an authorized service technician?**

a. If there is any unusual vibration coming from Airforce 4.1.

b. If you hear any noise that sounds like mechanical interference.

c. If the Airforce 4.1 is connected to the utility power (i.e. all breakers and disconnects are turned on), the wind is blowing, but the Airforce 4.1 is not turning very fast.

8) **Can I mount Airforce 4.1 to my roof?**

Roof and building mount is not recommended. Because of the size and weight of the wind generator, Airforce 4.1 needs to be mounted on a PE certified tower to ensure the quietest and safest system. Roof mounting will invalidate the warranty.

9) **What should I do if ice forms on Airforce 4.1 blades?**

To avoid the possibility of injury from ice breaking loose from the blades and injuring anyone, Airforce 4.1 should be turned OFF if ice accumulates on the blades.

TIP: Anything else you want to ask, please log on our website **www.hopefulenergy.com**,we'll answer your questions within 3 business days.

Cut along this line

HOPEFUL
WIND ENERGY TECHNOLOGY

Warranty Registration Card

Product serial number: _____

Your Information

Email: _____

First name: _____ Last name: _____

Address: _____

City: _____ State/Province: _____

Country: _____

Zip/Postal Code: _____ Phone: _____

Date of Purchase: _____ Date of completion: _____

About Your Dealer

Dealer Name: _____

Dealer Address: _____

Dealer City: _____ Dealer Country: _____

Dealer Phone: _____

About Your System

Model: _____ Tower Height: _____

Battery Capacity: _____ Inverter specification: _____

Purpose of use:

Please complete this Warranty Registration Card in its integrity and accuracy and its original should be sent back to Hopeful Energy or its local dealers within 30 days after you've purchased the product.

NOTICE: The Warranty will be treated as void if the product is NOT registered within 30 days after you've purchased this instrument.

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