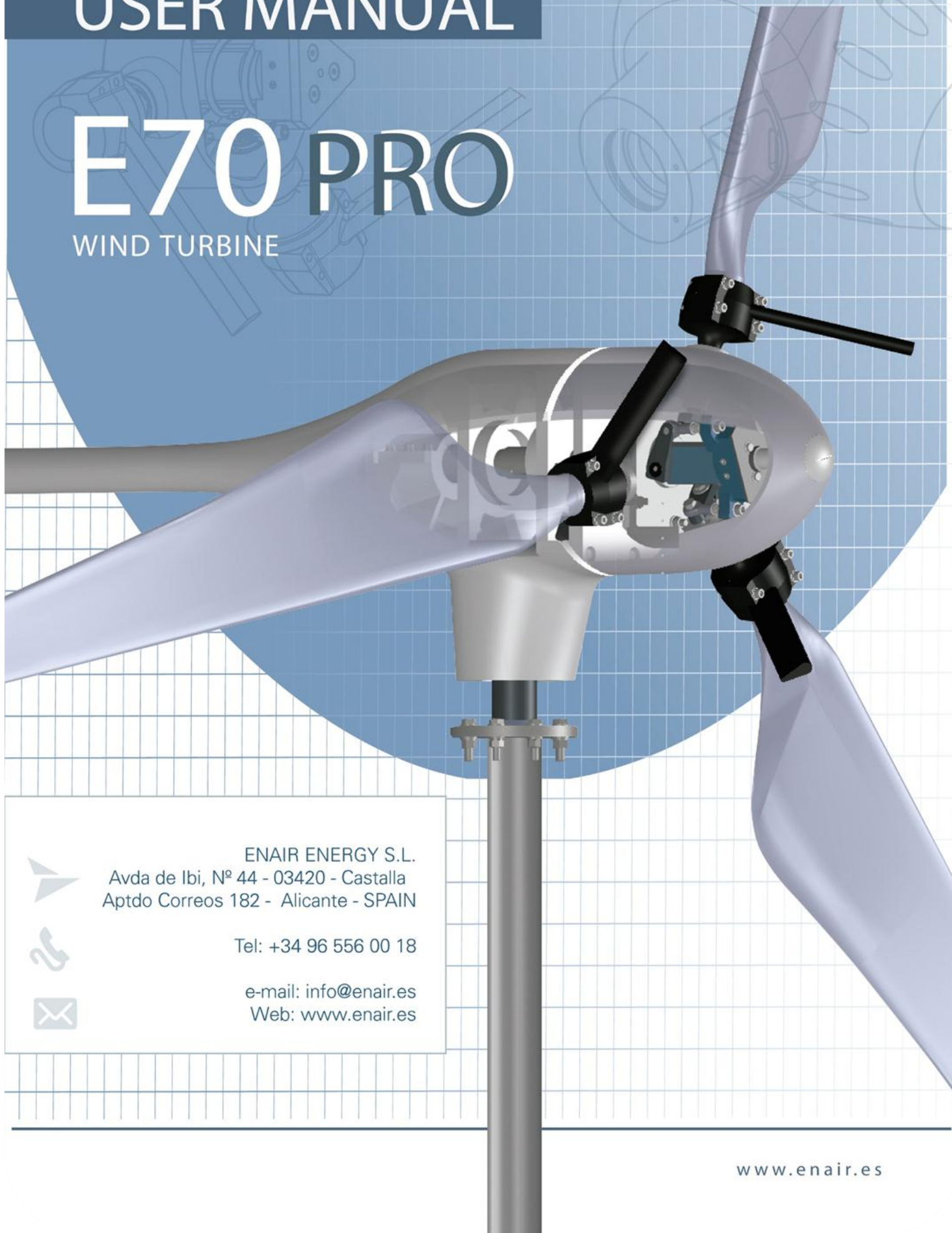


# USER MANUAL



# E70 PRO

WIND TURBINE



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## Welcome and thank you for choosing ENAIR

You have acquired a wind turbine for home and industrial use, excellent energy efficiency and manufactured with high quality materials.



**Please, prior to installing your wind turbine, read carefully the paragraphs "5. INSTALLATION "and "9. WARRANTY", there you will find instructions to register your installation and the warranty.**

If you have any comments or questions to us, please contact our Customer Service department by writing to: [info@enair.es](mailto:info@enair.es)

In this manual you will find all the details of operation and maintenance of our wind turbines.



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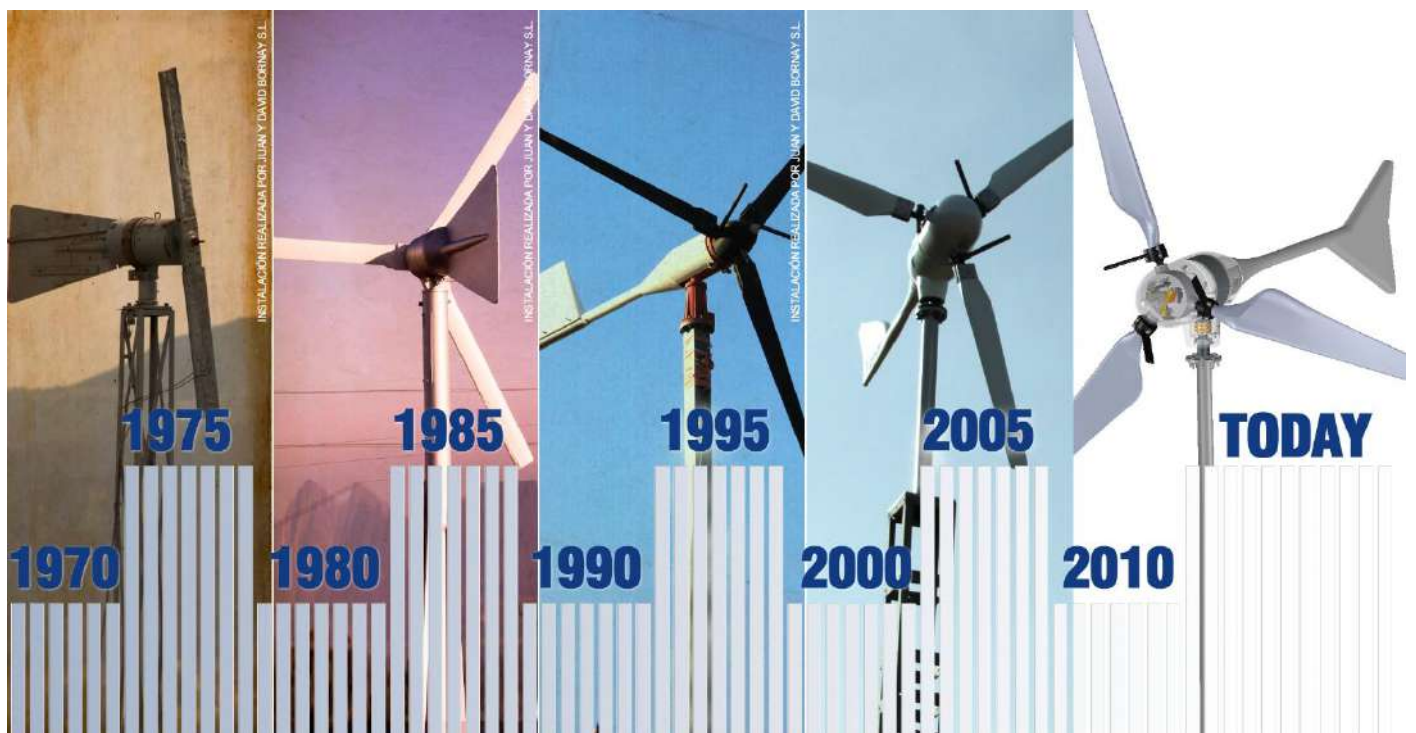


## 1. About ENAIR

Enair works with the illusion of collaborating in the transition to a sustainable energy model, which increasingly have more in weight renewable energy and distributed generation. For this ambitious target, Enair has an important R & D department, composed of professionals with extensive experience in the field of wind energy. This team is dedicated to developing products in which the design, reliability and efficiency are the main features.

Enair activity focuses primarily on small wind energy power, with a range that is currently composed of the models up to 50kW. For the development of this activity we have various specialized production centres in each of the subjects, spread throughout Spain, but mainly in the province of Alicante where ENAIR, has the headquarter a development centre and test field. In Castalla Alicante, our products undergo a first phase of essay, development and verification testing and then undergo successfully the most demanding certifications of the market.

This whole development process of the product part is supervised by David Bornay; who is dedicated since 1970 to develop different types of turbines of small and medium power until today. With innovative base, the whole team of ENAIR is continuously incorporating improvements to our turbines. According to recent market studies, we believe that you purchased the best wind turbine, which in his power range, and market available is.



## 2. The small wind sector

The small wind turbine is regulated by the manufacturing standards of IEC-61400. Within these standards are subcategories of the standard such as IEC-61400-2, -12, -11, etc. each feature sets that small wind turbines must comply with robustness, power curve, noise, etc. requirements. Compliance with these rules is essential to ensure that a "small wind" has the quality required therein. At present there are very few countries which require manufacturing standards for wind turbine installations. Countries that do not require these fulfilments, are exposed to the option that any type of home wind turbine without safety and warranty standards can be installed. This should be avoided as it should be ensured that only product installations with high performance and reliability are installed.

### 2.1 Beaufort Scale

Beaufort scale is a scale used globally to establish measures commonly used as a reference for assigning names to certain currents of wind. This scale is important to keep in mind, especially from grade 8 upwards, at which the wind can cause damage to the wind turbine by swirling object.

Grade	usual name	observable effects on land	Speed (m/s)	Speed (km/h)
0	Calm	Vertical smoke.	0 to 0,2	0 to 1
1	Light breeze	leaning smoke, flags and weathervanes do not move	0,2 to 1,4	1 to 5
2	Weak -very weak breeze	You feel the wind in your face. the leaves of the trees, flags and weathervanes move	1,4 to 3	6 to 11
3	Weak -faint breeze	The leaves of the trees are shaken the flags wave	3 to 5,3	12 to 19
4	Moderate breeze	Dust and small pieces of paper rises small branches move.	5,6 to 7.8	20 to 28
5	Fresh -fresh breeze	Small trees move. Small waves in ponds.	7,8 to 10,5	29 to 38
6	Fresh –strong breeze	Large branches move. Whistling wires power lines. Difficulty with umbrellas.	10,5 to 13,1	39 to 49
7	Strong -wind	All trees in motion. It is difficult to walk against the wind	13,1 to 17	50 to 61
8	Temporal -hard	Thin branches of trees are broken. Usually you cannot walk against the wind	17 to 20,5	62 to 74
9	Temporal hard -very strong	Uprooted trees and damaged buildings.	20,5 to 24,5	75 to 88
10	severe storm	Serious damage buildings.	24,5 to 28,3	89 to 102
11	Temporal hard	Widespread destruction.	28,3 to 32,5	103 to 117
12	Hurricane	Enormous damage.	More than 32,5	More than 118



## 2.2 Applications

The applications for our wind turbines are multiple and include different types of installations, for isolated power grid installations as well as for installations connected to the network and through energy-producing facilities.

Here are some typical installations for different uses:

### Telecommunications

For wireless telecommunications should be placed transmission antennas in remote locations that are capable of transmitting the signals over long distances, on these occasions rarely electricity reaches these places, isolated energy systems are the guarantee for optimal operation of the station.



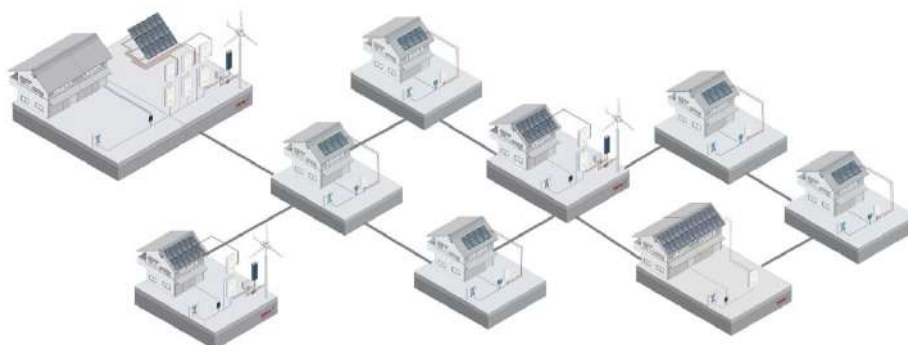
### Farms, small industries, greenhouses, etc.

For facilities of farms and greenhouses, the best solutions are Smart Grid networks that combine renewable energy, accumulation support network and generators. Another solution is Self-Consumption



### Houses, Country Hotels,

There are many houses and rural hotels where access to conventional electricity grid is impossible or economically unviable. In these cases, isolated systems are the solution to cover the own needs. When there is access to the electricity grid the solution is the installation of self-consumption.



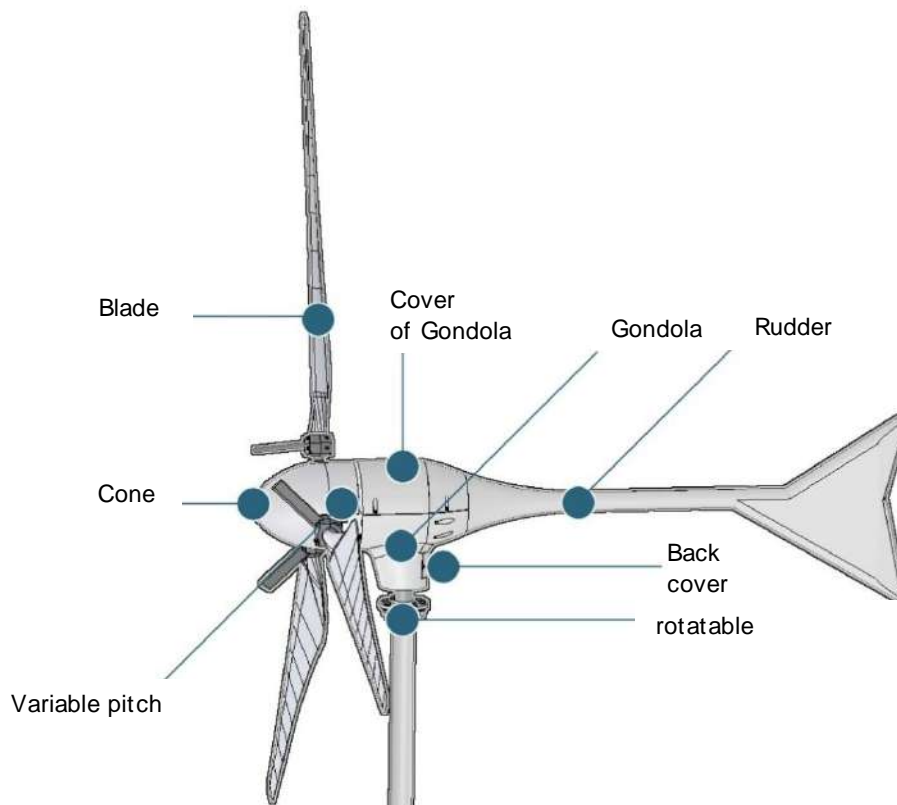
### 3. You have yourself an Enair

#### 3.1 About the turbine ENAIR

ENAIR is a wind turbine which belongs to the field of small wind, simple operation and easy assembly.

Targeting is done passively by a rudder that works as a weathervane, he always keeps the aero generator downwind. Once the wind impinges on the blades, the kinetic energy of wind is transformed into rotational kinetic energy. The variable pitch system regulates the rotational speed for high wind speeds. The generator converts this rotational kinetic energy into electrical energy.

Structurally the wind turbine has: a main body, which provides the connection between the coupling of the tower, the helm orientation, generator and the variable pitch system, is isolated from the outside by the cone piece, a housing protects the internal mechanism.



**3.2 Innovations ENAIR - PRO**

**New Design**

The centre of gravity coincides with the axis of rotation.

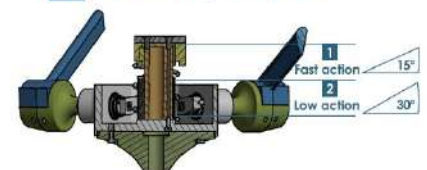
The fast orientation allows more effective, faster and better wind catching.



**Variable Pitch Pro, 2 Speeds**

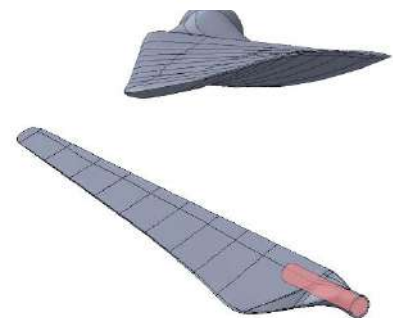
2 position variable pitch, which achieves optimum wind angle uptake in all cases plus extra protection for over wind speed

**2 Action Speed, Pitch**



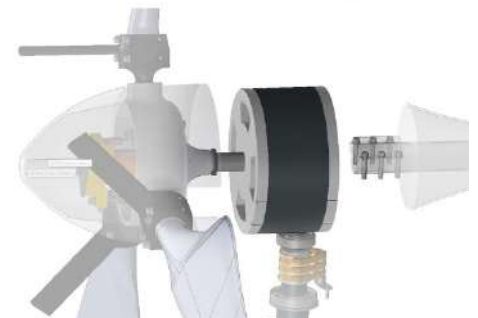
**Shovels, optimized with CFD**

It has been used Dynamics Computational Fluids for greater aerodynamic efficiency, so that increase the power generated in low winds, optimizing the profile up to 94%.



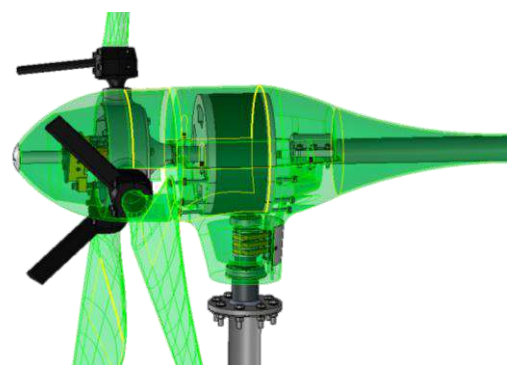
**Generator improved by 15%**

30 poles generator, increases efficiency in relation to the rpm and achieves superior performance because less heat



**Materials: 85% aluminium and fiberglass**

Structural materials are mostly aluminium and fiberglass, which cause better isolation and protection against aggressive, saline and humid environments.





### 3.3 Service Life

ENAIR has been designed for a service life of over 25 years, even in the most adverse conditions, such as extremely salty environments or locations with high average wind speeds.

**UV resistance:**

All paints used have high resistance to light and UV radiation to protect aging and fading caused by the sun.

**Resistance to high wind speeds:**

The wind turbine is designed to fully maintain its structural integrity for specific wind speeds of 60 m / s (216 km / h or 135 mph) (Class I according to IEC 61400-2 standard), which would correspond to a tempestuous storm.

It is also designed to withstand the constant mechanical loads occurring at sites with average wind speeds of 9 m/s (32 km / h or 20 mph) acting constantly on the wind turbine.

**Corrosion resistance:**

Structural design with fiberglass and aluminium, as well as the application of surface treatments allow the wind turbine to be installed place with extreme conditions: desert, marine environments, etc.

To prevent corrosion of metal parts, specific nautical paintings are applied, based on protective rubber.

Type of parts	Corrosion Protection
Made of aluminium	Anodized + anticorrosion paint
Made of steel	Anticorrosive paint or cataphoresis + cataphoresis + galvanized + corrosion paint
Standard hardware elements	AISI 316 stainless steel

**Water-tightness:**

The interior spaces are completely sealed to prevent moisture penetration that may deteriorate internal components by placing a series of gaskets complete sealings.

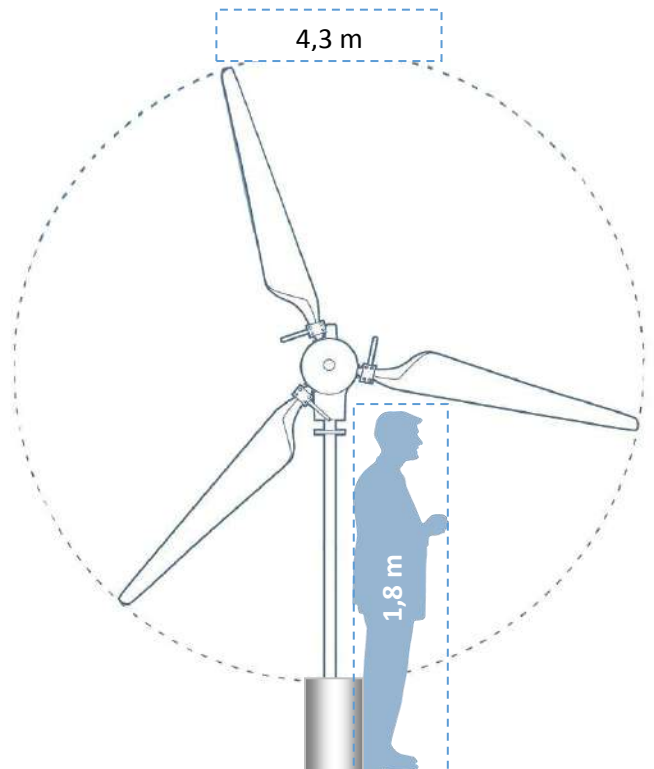
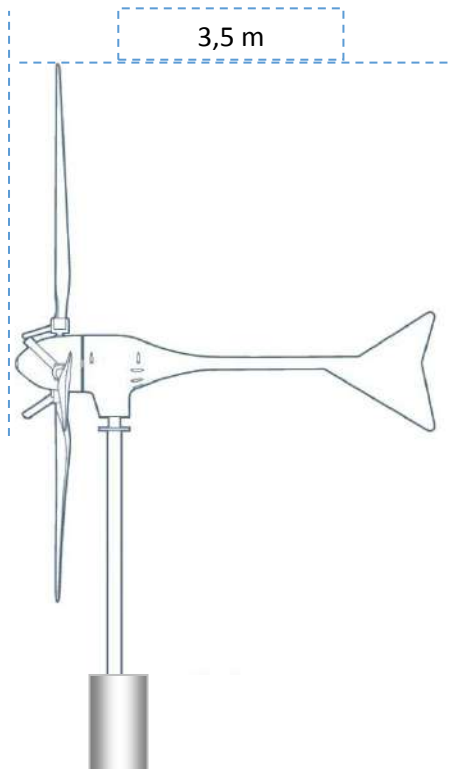
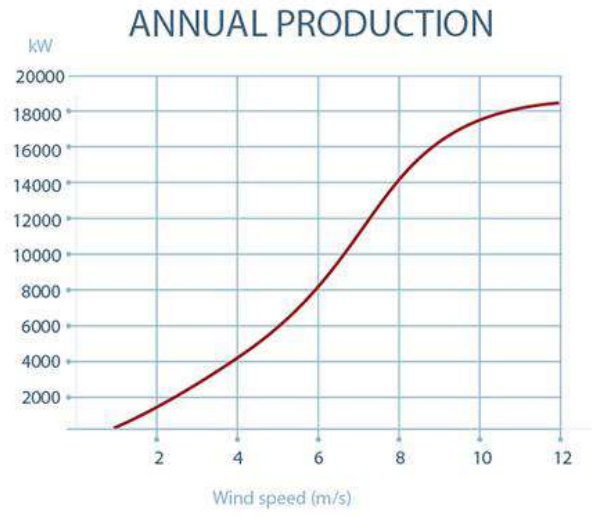
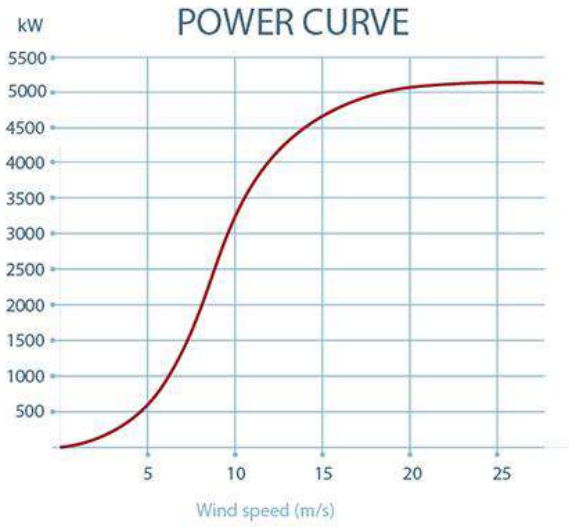
Location of the joint	Feature of the joint
Cone	
Carcass	Cancellous string EPDM 6mm
Back cover	

### 3.4 Technical Information

 TECHNICAL, ELECTRICAL AND OPERATIONAL FEATURES	
Number of Blades	3
Propellers material	Fibreglass epoxy resins and polyurethane core.
Generator	250 rpm   neodymium magnets
Power	5500 W
Rated power curve	4000 W
Voltage	24 / 48 / 220
Wind class	IEC / NVNI - A
Diameter	4,3 m
Turning sense	Clockwise
Swept area	14,5 m <sup>2</sup>
Weight	165 kg
Applications	Isolated connection batteries, electric grid connection.
Wind to start	1,8 m/s
Rated speed	12 m/s
Speed regulation of pitch	13 m/s
Supports speed:	More than 60 m/s
Efficient generation range	From 2 to more than 60 m/s
Type	Upwind horizontal rotor.
Orientation	Rudder passive guidance system.
Power control	Passive variable, centrifugal pitch system.
Transmission	Direct
Brake	Electrical
Controller	Optional grid connection and battery charging.
Inverter	Efficiency 95%; MPPT algorithm.
Noise	Minimised: due to the design of the blades and low revolutions. 1% more that the environmental noise of the wind.
Anti corrosive protection	Fully sealed design, with elements of metal cataphoresis, epoxy paint for salt environments of water proof coating.
Tower	12, 15 y 18 m, folding, cable-stayed or jolousie.



Performance curves



### 3.5 Before installation

### 3.6 Where your wind turbine should be located

The ENAIR wind turbine placement is as important as the available wind.

The following considerations should be taken into account:



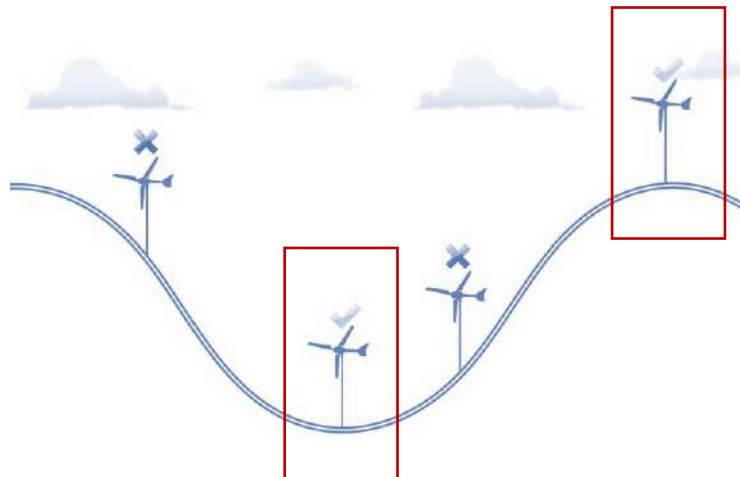
**ATTENTION:** Your dealer can provide technical assistance in locating the best emplacement for your ENAIR.

#### **Tower height:**

In general, the produced power will be greater, as higher the tower is because the wind speed increases with height. You must consider that a taller tower is a major economic investment which on the other hand is most often easily amortizable.

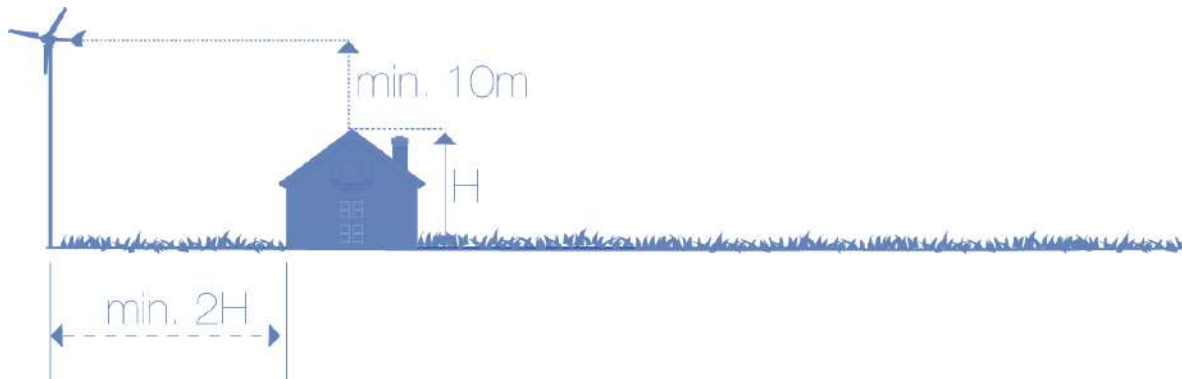
#### **Land shape**

Normally the highest point has the best winds, although areas around river valleys, large hills or mountains and large forests can affect the wind resource.



**Obstructions:**

Every obstacle that interferes the movement of the wind is affecting both its direction and speed. The most common obstructions are houses and trees. It is generally recommended to install the tower 10 meters above any obstruction and with a distance twice the height of the obstruction.



For example, if you have a house 5 meters tall and a tree 7 meters near where you want to install your ENAIR, it should be allocated to 17 meters above ground (7 m the highest obstacle + 10 m) 10 meters from the house ( $5 \times 2$ ) and 14 meters from the tree ( $7 \times 2$ ).

**Buildings:**

On buildings, before placing a wind turbine, ensure that the structure of the building can withstand the wind turbines weight and stresses during its operation.

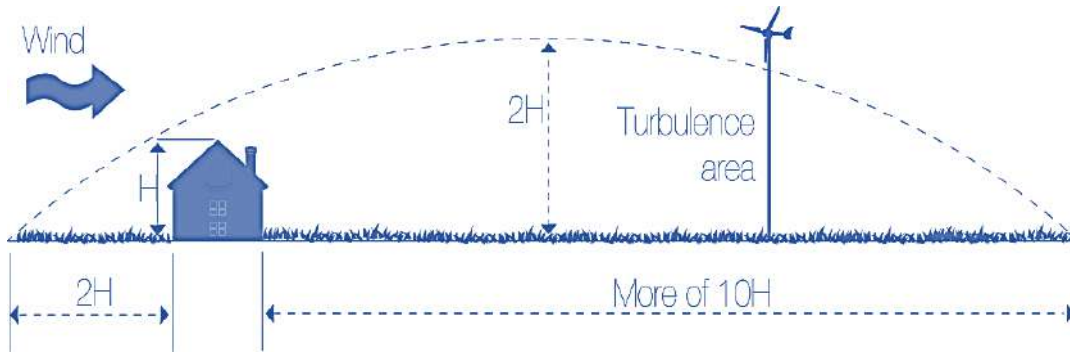


The wind turbine should be placed about 3 meters back from the facade of the building, and about 2-3 meters above the highest point. Consider also the surrounding buildings and the “wind rose” .

**Areas where there is a clear direction of the prevailing wind:**

In the environment of an obstacle an area of turbulence is produced.

- Dimensions of turbulence area are defined by the height of the object.
- The Location is defined by the direction of the prevailing wind

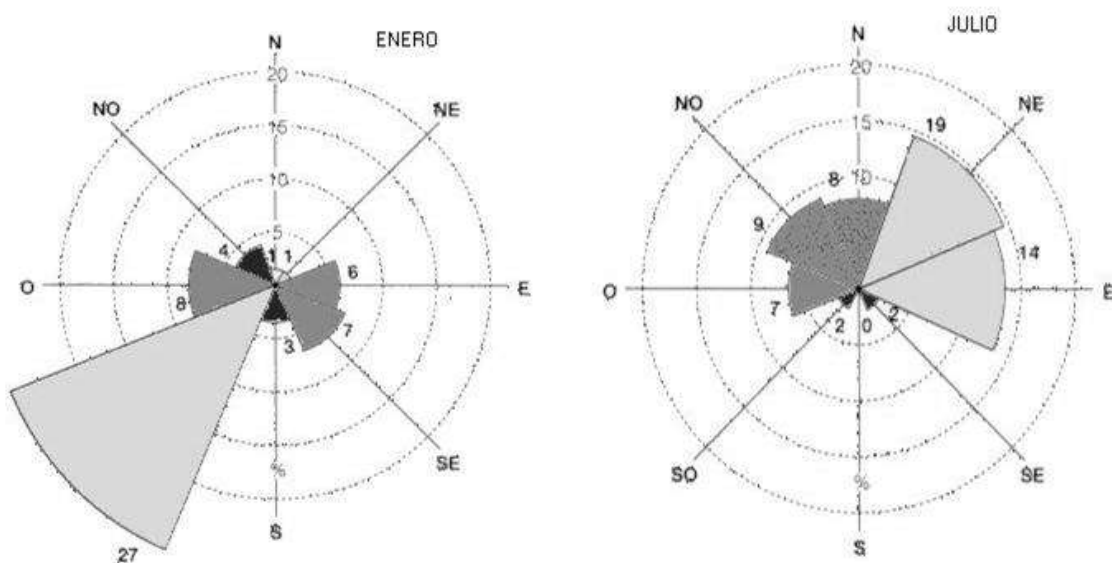


The dimensions of the area of turbulence in the downwind area (over 10H), are conditioned by the width of the object (A):

- If  $A < 3H \rightarrow$  Size of area downwind 20H
- If  $A \leq 3H \rightarrow$  Size of area downwind 10H (most common situation)

**Prevailing winds:**

It is important to know from where the most frequent and strongest winds come from, in regarding of the area where you want to install ENAIR 70. To the extent possible, this direction must be free of obstructions. In order to know this, data is gathered with an anemometer and a wind vane to measure the direction and wind speed over a period of time. The outcome of the measurements is called "wind rose". An example of the aforementioned wind rose is shown below, the right shows the wind situation in summer and the left in winter. As can be seen, they are completely different, so a detailed study of the demand for electricity in both seasons will be very useful.





## 4. Packing and assembly

### 4.1 Packaging Machine

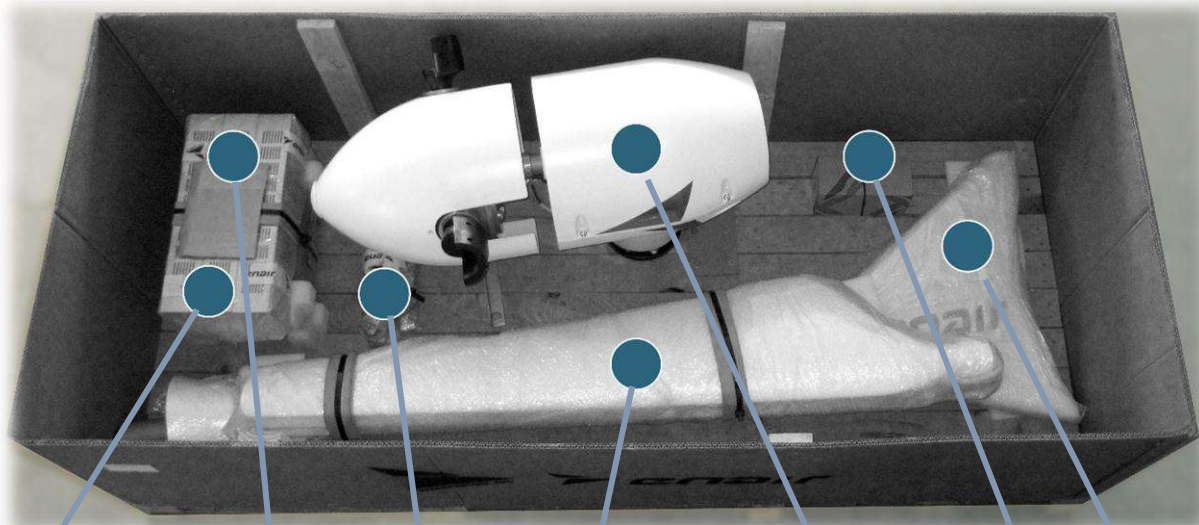
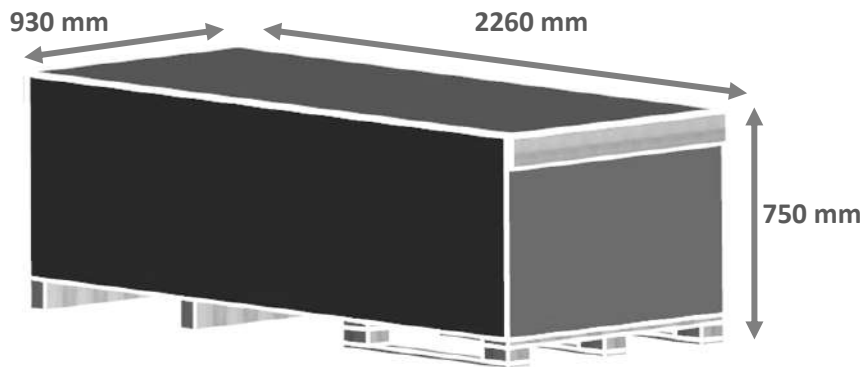
The wind turbine is supplied in two packages:

Package 1:

- Main Body + generator + variable pitch
- Screws (see details below)
- 1 rudder guidance
- 3 blades
- Controller / Resistance / Switch Braking / inverter
- Investor (optional depending on model)

Package 2: (Optional according to customer request)

- Tower



Controller /  
Resistance / Investor  
(Operational)

Installation  
Manual

Screws

Kit shovels

Main body  
Generator and  
Variable pitch

Brake

Rudder

## List of parts:

- 3 blades
- 1 variable pitch
- 1 coupling: Variable pitch - generator
- 1 generator
- 1 main body
- 1 covering for the main body
- 1 rudder
- 1 coupling: axis of rotation – Tower
- 1 set of brushes
- 1 set of copper rings

## Screws:

Screws (metric x length)	Joining pieces	Tightening torque	Quantity
M10 x 40	Rudder - gondola	46Nm / 34Lb.ft	6
M10 x 80	PMG - gondola	46Nm / 34Lb.ft	12
M14 x 60	Axis of rotation - Tower	127Nm / 93.5Lb.ft	8
M8 x 20	Cover - Gondola	5Nm / 3.5Lb.ft	4
M10 x 70	Counterweights - spoons	46Nm / 34Lb.ft	12
M10 x 50	Counterweights – spoons	46Nm / 34Lb.ft	3
M8 x 20	Brush- gondola	23Nm / 17Lb.ft	2
M14 x 60	Support variable pitch - axis PMG	127Nm / 93.5Lb.ft	1
M12 x 50	Base variable pitch - support PV	79Nm / 58Lb.ft	6



**CAUTION: Apply the recommended values of pairs indicated in the table, use torque meter wrenches to tighten them.**

The ENAIR is designed and built for easy, quick and safe installation.

If a bigger torque than recommended is applied, it can damage the parts connected by those screws.

If the applied torque is below the recommended, there is risk of vibrations.

## SAFETY RECOMMENDATIONS

These safety recommendations should be taken into account during installation and during maintenance of the ENAIR:

- ENAIR complies with international safety standards, to ensure that your installation should never be dangerous.
- ENAIR is designed so that the installation is safe, but there are common risks like with any electromechanical equipment.
- ENAIR must be installed according to the instructions of this manual and in compliance with local and national standards.
- ENAIR installation must be performed by qualified professionals.
- **During installation make sure that your wind turbine is braking (with the 3 phases short-circuited) and disconnected from the electrical installation.**
- Perform installation operations a calm day, the wind should be less than 6 m / s.
- Never stand under the tower during installation or maintenance operations.
- For safe installation at least two people are needed.
- During installation always use proper safety equipment: helmet, safety shoes, gloves, safety glasses ...



**ATTENTION: ENAIR is not responsible for the inappropriate use of the wind turbine. The wind turbine should never be handled without the explicit permission of the installer or manufacturer. Improper handling of the wind turbine can result in electrocution and burns, and will be reasons for cancellation of the guarantee.**

## 4.2 Installing the machine

The wind turbine assembly is divided into five simple steps. These steps should be followed in the order shown below .

### Step 1: Electrical connections

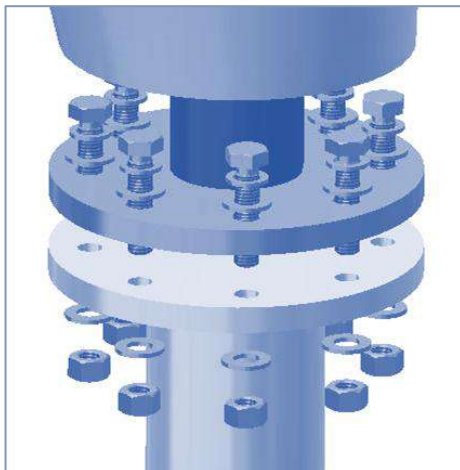


Join the three electrical connectors from the brushes with the cables installed in the tower.

To prevent that the weight of the connected cables pulls on the brushes, they should be winded three times around a prepared welded part at the top of the tower.



### Step 2: Placement on the tower



#### Screws:

Hexagonal screw bonding toe: DIN 933 M-14x55 INOX A2  
8  
Pressure washer screw M14 bonding.: DIN 127 zinc plated  
8  
Washers screw union: DIN 125 M14 zinc plated  
16  
Binding screw nut: DIN 934 M14 INOX A2  
8



#### Tools:

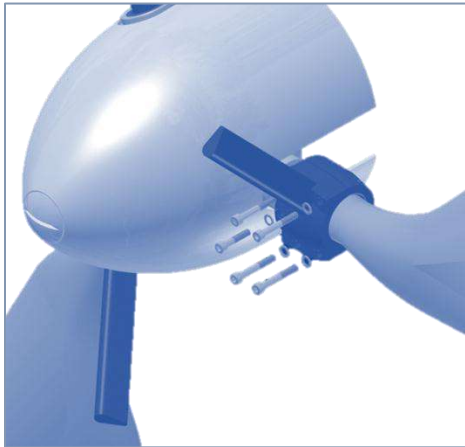
22 spanner, hexagonal of 22 and torque wrench



#### Tightening torque:

127 Nm oder 93.5 Lbf.ft

**Step 3: Shovels**



**Screws:**

Allen screw scoop-holder: DIN 912 A2 M10x70 INOX	12
Allen screw scoop-holder: DIN 912 A2 M10x50 INOX	3
Pressure Washers screw union: DIN 127 M-10 zinc plated	15



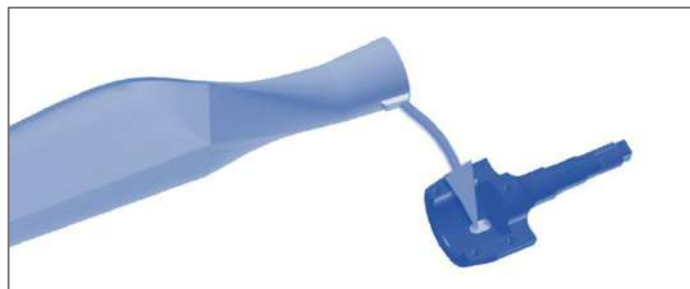
**Tools:**

17 spanner, hexagonal of 17 and torque wrench

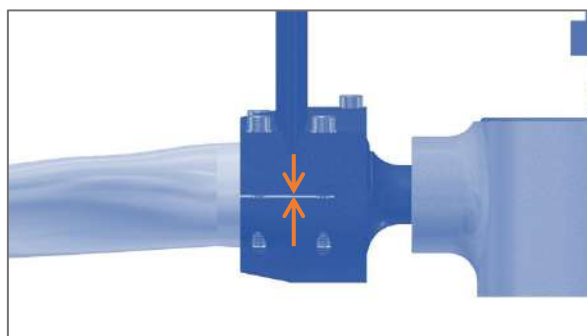


**Tightening torque** : 46 Nm oder 34 Lbf.ft

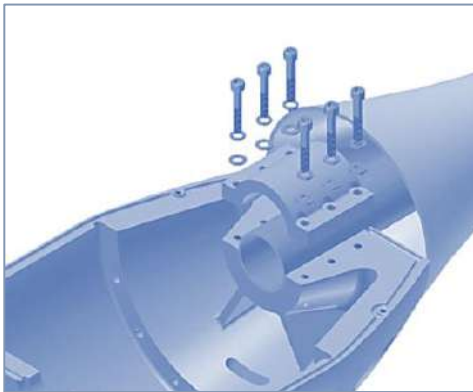
To ensure proper assembly of the blades, there is a protrusion on the blade that should fit with the corresponding hole in the conical scoop.



**ATTENTION:** By tightening, there must remain a small clearance between the bucket and the counterweight



**Step 4: Rudder**



- Screws:**  
 Allen screw clamp: DIN 912 A2 M10x55 INOX 6  
 Clamp pressure Washers: DIN 127 M-10 zinc plated 6  
 Clamp Washers: DIN 125 M-10 zinc plated 6



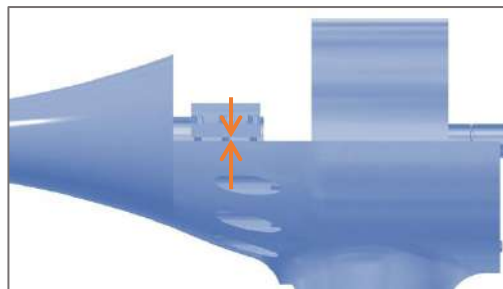
- Tools:**  
 Allen glass 8, extension cable and torque wrench



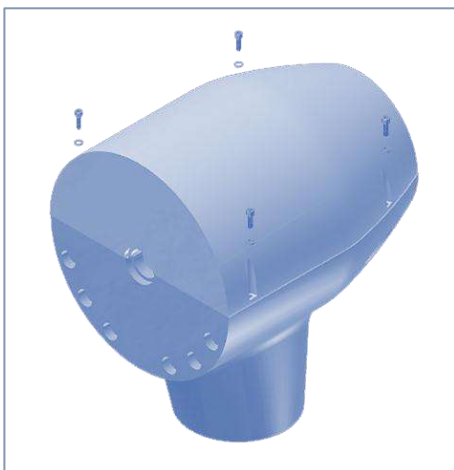
**Tightening torque:** 46 Nm oder 34 Lbf.ft



**ATTENTION:** By tightening, there must remain a small clearance between the clamp and the nacelle



**Step 5: Upper casing**



- Screws:**  
 Allen screw casing: DIN 912 M8x25 A2 STAINLESS 4  
 casing pressure Washers: DIN 127 M7 zinc plated 4  
 casing Washers: DIN 125 M8 zinc plated 4



- Tools:**  
 Glass Allen 8, extension cable and torque wrench

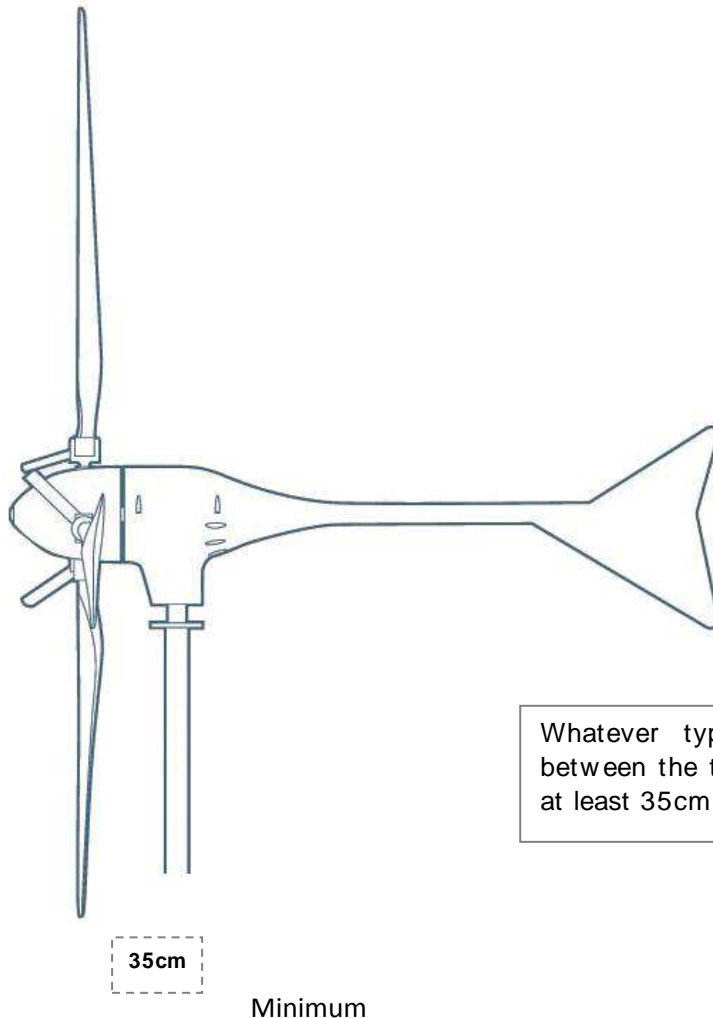


**Tightening torque :** 5 Nm or 3.7 Lbf.ft



## 5. Installation

\* Observations to consider in the installation:



Whatever type of tower the minimum distance between the tip of the blade and the tower must be at least 35cm.

### **Note:**

The towers must always be certified by ENAIR prior to installation to ensure the integrity of the machine and the correct operation thereof. The installation will be out of warranty if the tower does not have the proper accreditation ceded by ENAIR and screws are not correct to withstand the vibration and forces.

### 5.1 Manual brake

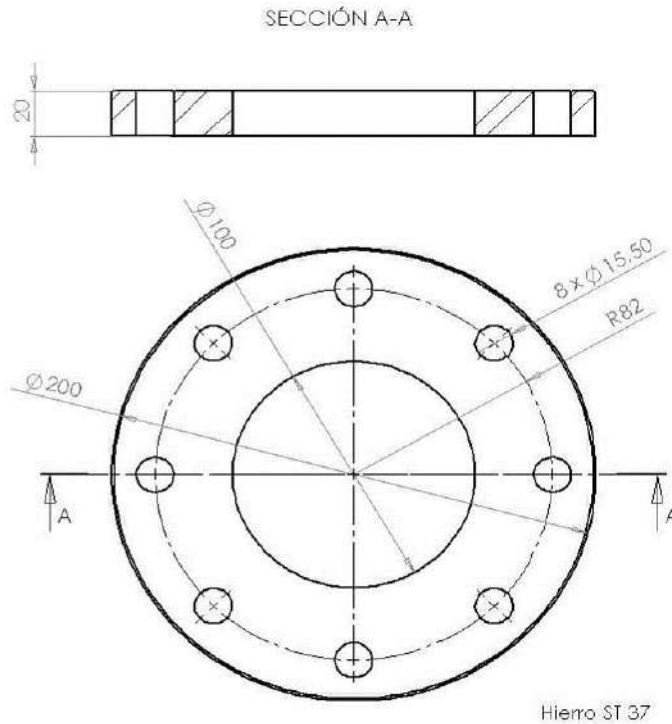


**CAUTION:** It is mandatory to install the wind turbine manual brake switch between the wind turbine and the wind turbine controller. If not acquired from Enair, purchase a thermal three-phase circuit breaker (63A) with crossed phases.

## 5.2 Coupling flange and tower

For customers who have their own tower, below there is the coupling plane between the rotation axis of ENAIR 70PRO and tower. This coupling must be welded to the top of the tower and bolted to the axis of rotation of the turbine.

**Screw: Quality 8.8 zinc plated M14x50mm**



The tower must withstand 1000 kg at peak and load for the following data for the design:

ENAIR	Weight	Thrust	Overturning moment
E70PRO*	160 kg	4250 N	1350 Nm

\* The data provided has been obtained in accordance with IEC 61400-2 and does not include safety factors.

The straps welding head of the tower must be clean so that contact with the toe is good and vibrations are not produced.

The connection between the top of the tower and the bottom of the wind turbine has to be done as such that the bolts can withstand the forces and moments calculated for the whole wind turbine + tower.

Screw : 8.8 galvanized M20x55 with 2 washers and lock nut M20

**6. Maintenance**

The ENAIR is designed to function optimally with minimal maintenance, the equipment will have a lifespan of over 25 years.

Machinery components ENAIR 70 PRO must only be handled by competent technical personnel. Under no circumstances unqualified personnel will take care of maintenance, unless he/she is directly led by a qualified technician.

All hardware elements that are handled during maintenance must be tightened with a torque wrench according to the torque table.

The frequency of maintenance depends on the average wind speed at its location.

**Wind class:**

Wind class	Average wind speed at the location of the installation		
	m/s	km/h	mph
1	<5.6	<20.1	<12.53
2	5.6 – 6.4	20.1 – 23.04	12.53 – 14.32
3	6.4 - 7	23.04 – 27.2	14.32 – 15.66
4	7 – 7.5	25.2 – 27	15.66 – 16.78
5	7.5 - 8	27 – 28.8	16.78 – 17.9
6	8 – 8.8	28.8 – 31.68	17.9 – 19.69
7	>8.8	>31,68	>19.69



**CAUTION: Not following the plan of wind turbine maintenance voids the warranty.**

**Preventive maintenance plan:**

Wind class	1	2	3	4	5	6	7
Tighten screw of blades, rudder axis of rotation, toe and tower.							A month after installation
Visual inspection (both Windmill and the tower), check for abnormal noise and vibration	A month after installation and after storms or winds exceeding 25 m / s (90 km / h, 56 mph)						
1 - Tighten screws rudder axis of rotation and toe	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Every 12 months</p> </div> <div style="text-align: center;"> <p>Every 8 months</p> </div> </div>						
2 - Tighten screws other tower (e.g. joints, couplings ...)							
3 - Greasing bearings in the variable pitch							
4 - Greasing the whole variable pitch							
5 - Checking the status of the blades, special attention to the leading edge							
6 - Checking the correct operation of the variable pitch							
7 - Checking paint, search for damage and rust spots							
8 - Inspecting the carbon brushes, slip rings and connecting cables							
9 - Replacing carbon brushes	Every 15 years (indicative)						Every 10 years ( indicative)



**CAUTION: Do not follow the plan of wind turbine maintenance voids the warranty.**



**CAUTION:** Do not perform any maintenance operation in high winds situations.



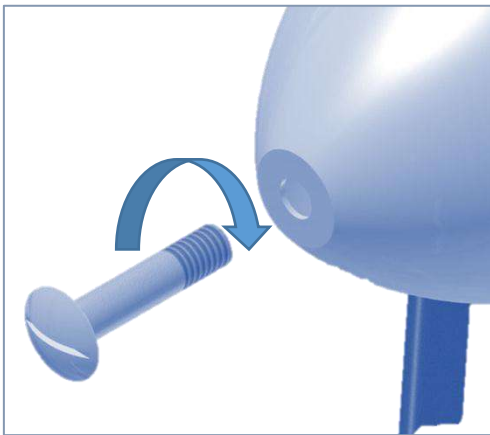
**CAUTION:** Before performing any maintenance, stop the mill, using the braking contactor.



**CAUTION:** Attach one of the blades of the ENAIR to the lift basket to prevent rotation of the rotor during maintenance

### Step 1: Remove Cone

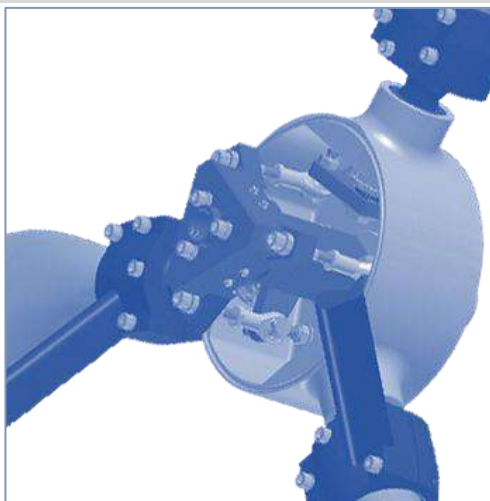
To perform maintenance operations, it will be necessary to remove the cone and the rear cover.



To remove the cone, you can use any wrench or any elongated object that fits into the screw slot.

**To loosen, torque in the opposite direction of the usual loosening must be applied.**

### Step 2: Visual Inspection interior elements



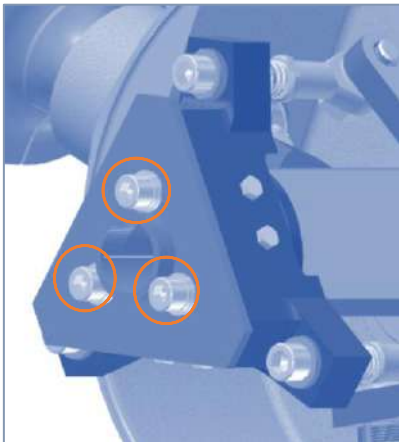
Visually verify that there are no loose parts and everything is properly screwed.

Check slackness of parts, simply by moving with hand.

**All screws should be tightened and parts must not show slackness.**

**Step 3: tighten up the indicated screws.**

**Slide guide**



With the proper tool, verify the indicated tightness of the screws.

**3x DIN912 – M10 x 35**

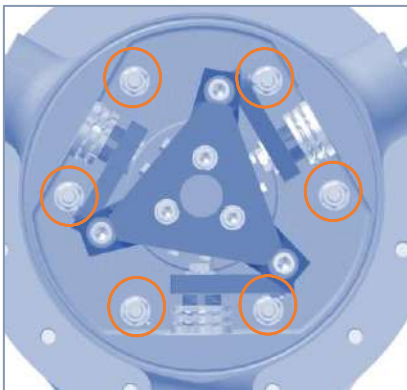
**Tools:**

Allen wrench and torque wrench 8



**Tightening torque:** 46 Nm or 33 Lbf.ft

**Variable-pitch coupling plate**



**6 x DIN931 – M12 x 50**  
**6 x DIN985 – M12 Nut**

**Tools:**

end spanner 19, 19 hexagonal socket, extension and torque wrench



**Tightening torque:** 62 Nm or 46 Lbf.ft

**Counter-weights**



**4 x DIN912 – M10 x 80**  
**1 x DIN912 – M10 x 50**

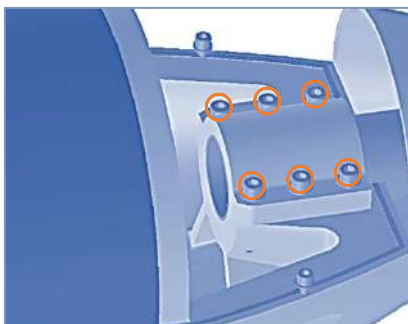
**Tools:**

Wrench and torque wrench 8



**Tightening torque:** 46 Nm or 33 Lbf.ft

**Rudder**



**6 x DIN912 – M10 x 50**

**Tools:**

Wrench and torque wrench 8



**Tightening torque :** 46 Nm or 33 Lbf.ft



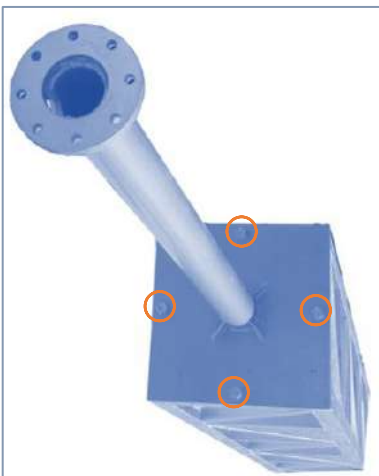
### Rotable

**Tools:**

22 end spanner, hexagonal of 22 and torque wrench

**Tightening:** 91 Nm or 67 Lbf.ft

### Toecap

**Tools:**

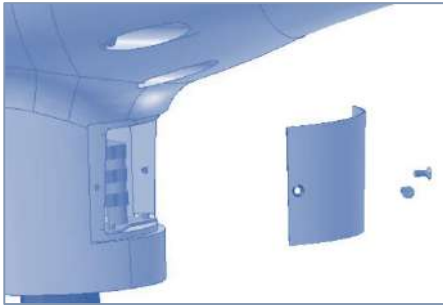
22 end spanner, hexagonal of 22 and torque wrench

**Tightening:** 91 Nm or 67 Lbf.ft

In case of using a lattice tower installation, you must also check its screws.



**WARNING:** It is also important to check the electrical connections on the charge controller, batteries, inverter and resistors.

**Step 4: Review of brushes.****Back cover**

To check the brushes, it is necessary to remove the back cover and follow the steps.

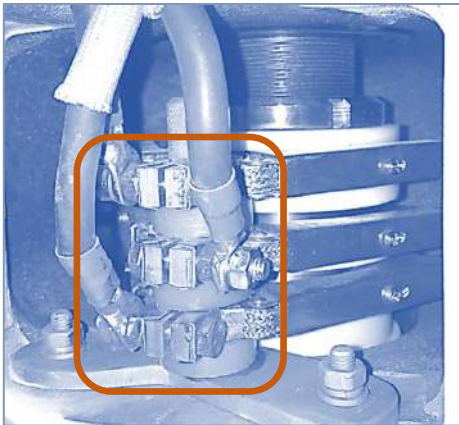
**Tools:**

4 hexagon socket and torque wrench



**Tightening:** 5 Nm o 3.7 Lbf.ft

Screw cap carbon brushes DIN 7991 M-6x16  
A2 INOX 2

**Carbon brushes**

Check the cable connections with the brushes and verify that they are in contact with the slip rings



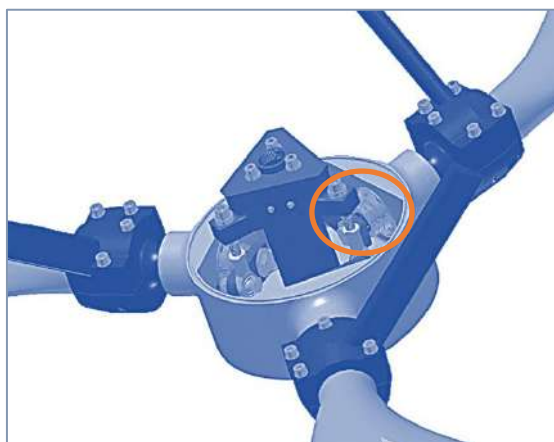
**ATTENTION:** after removing the sealing caps and housings it is very important to make sure they close tight again. If the gasket is in a bad condition, then seal with silicone.

**Step 5: Greasing critical parts.**

Type of grease: Lubricating grease for extreme pressure and high temperatures.

Physical characteristics of grease	
Texture	Filiform
Colour	blue green or brown
Classification NL6Z	Grade 2
(60 cycles) worked penetration	280 1/10 mm
Dropping point	230 °C
Source soap	aluminum complex

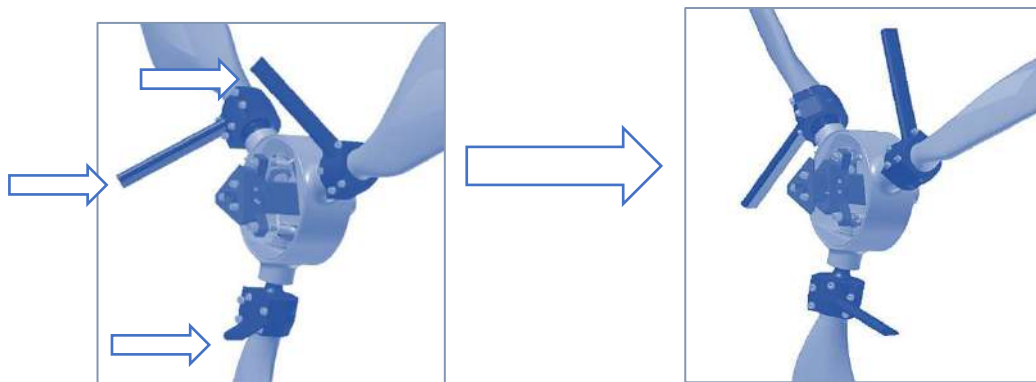
**Bearing**



Check that the bearing is greased and add in the event of absence.  
This must be done in each of the rolling bearing of the blades.

**Step 6: Checking the Variable pitch.**

1. Press with two persons the three torque levers simultaneously, resistant spring force must be noticeable
2. The levers must reach the limit position.
3. Releasing the levers, should cause a return to their initial position



**Step 7: Check the blades**

Review the surface of the blades, paying particular attention to the leading edge; it is normal that a slight wear is observable. If you find larger damage to the surface, than you have to replace all the three blades.



**Step 8: Verification of painting**

Inspect the entire outer surface of ENAIR. Repaint if necessary.

Paint characteristics		
White paint	Polyurethane paint, RAL 9003	High resistance to corrosion and UV radiation
Black paint	Polyurethane paint, RAL 9004	

## 7. Frequently Asked Questions

### 1. What is the right size for my installation?

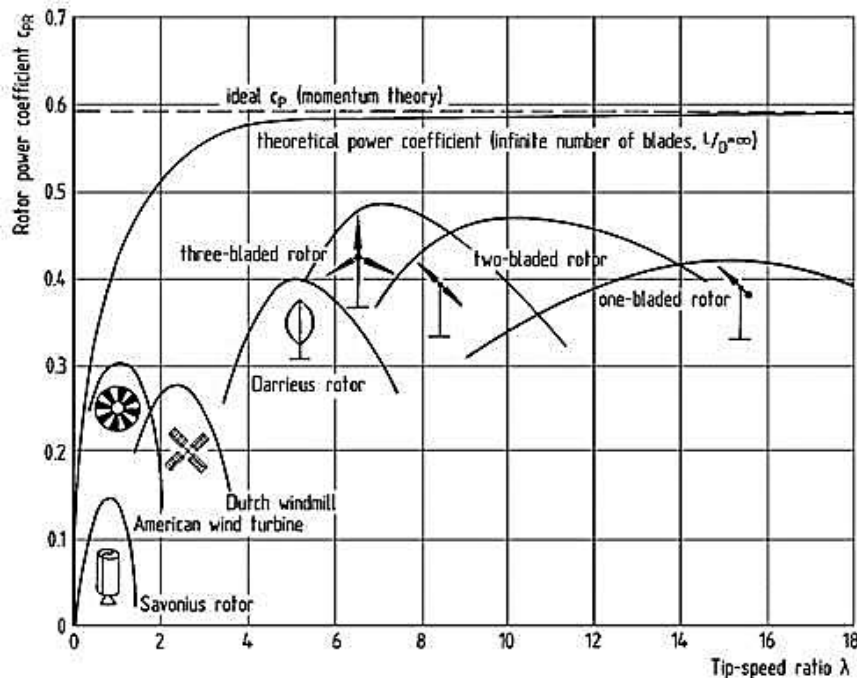
The following table shows a guide to which wind turbine chosen depending on the wind and electricity consumption. For reference, a normal household consumes about 4000kWh annually, while a large consumer can be about 6000 or 15000kWh.

For Wind Turbine model suitable for installation have the eCon application of calculation and design of facilities in 4 steps that will recommend the most appropriate model for you. [www.enair.es/app](http://www.enair.es/app)

### 2. Why install a Horizontal Axis Wind Turbine and 3 blades instead of other designs?

Horizontal 3-blade wind turbines offer the highest efficiency based on their design and the Betz Law, which defines the maximum theoretical conversion factor between the energy carried by the wind to power absorbed by the turbine blades. This conversion factor is the power coefficient  $C_p$  Wind Turbine, and its maximum value is  $C_p = 0.59$ , precisely by the Law of Betz.

Each type of wind turbine design, whether 2-blade or multiblade vertical axis have different coefficients limited by the design of the wind turbine itself. In the



following table you can see these coefficients.

As shown in the chart, the best design according to physical laws is the 3-blade model horizontal wind turbine. This is the most common and widespread design worldwide.

### 3. How much space do I need?

In theory, a wind turbine works better when less obstacles are in the path of the wind, but with a sufficient distance from the obstacles, the effect can be minimised.

A wind turbine should be placed at a horizontal distance of at least twice the height of the closest obstacles and at least 10m higher than the closest obstacles. For further explanations, please consult the chapter "Installation".

### 4. Are Wind turbines noisy?

The ENAIR wind turbines are designed to be silent as its rated speed is between 200 and 250rpm depending on the model. Considering the height at which they are, they will be virtually unnoticeable by someone who is standing at its base.

Having a 33% lower rpm than other existing wind turbines, it makes the longevity 3 times higher than the high-revving models.

### 5. Birds affect small wind turbines?

It is unlikely that a bird impacts the blades of a small wind turbine as ENAIR, rotating at low speed (between 200 and 250 rpm depending on the model) and not located at the height to which migratory birds make their long journeys, which makes it even more unlikely.

### 6. Can I use a wind generator for my heating system?

Yes, you can use a wind turbine to heat water. Simply connect the controller output to an electric heater. What you should consider is that normally the heating energy consumption is considerably higher than electricity, so you will need to have larger equipment.

### 7. Can I connect my equipment to the network?

Small wind turbines themselves can be connected to the distribution network. This requires using a compatible inverter with the network and that the installation is approved by the local utility company, which require compliance with the standards and regulation with which a connection to the grid can be built.

Each model of our turbines has been tested for this purpose in period of one year, with a very good result.

### 8. How long do the turbines produce electricity?

This depends greatly on the chosen location, the average wind speed and its constancy.

In a suitable location, a wind turbine produces electricity about 75% of the time, but not always at rated power. For a year it is normal to produce between 20 or 30% of which would generate at nominal power running all the time. This value is known as capacity factor.



### **9. How long does a wind turbine work?**

Our wind turbines are designed to last more than 20 years. This is due to its robust design, quality of materials, the anti-corrosion treatments and a completely sealed design that prevents moisture and other particles from entering the system and the inability of the birds nesting in them during windless periods.

All this means that our design does not deteriorate even in aggressive environments like near the sea, where saline air and the sand particles usually cause corrosion and erosion.

### **10. Can I have my own wind turbine?**

Small wind turbines are the perfect choice for individuals, communities and small businesses that want to generate their own energy. The chosen characteristics of the location (average wind speed, location and topography) determine the size and type of wind turbine used in each case

### **11. How do I know if I have enough wind?**

The wind speed is influenced by the local topography and nearby obstacles such as trees and buildings. Wind direction sometimes can be very variable with risk of being affected by turbulence due to the nearby obstacles. So when in doubt, it is best to contact professionals engaged in the installation of small wind turbines.

Normally, with an average of 5 m / s it is worthwhile installing a small wind turbine.

Our technical department will inform you about the average speed at your particular location. In order to do this, please fill in the contact form on: [www.enair.es](http://www.enair.es)

### **12. How does a wind turbine produce electricity?**

Roughly a wind turbine works as follows: the blades take advantage of wind energy to generate a torque on the generator. This, depending on the speed and the force exerted by the blades and its axis, generate electricity, which will reach the controller and the inverter. These electronic components convert electricity continuously for whatever purpose its needed like charging batteries, direct consumption or feeding electricity to the grid.

### **13. How tall is a small wind turbine?**

The tower height can vary considerably, depending on the type of turbine and the location. Generally, the tower of small wind turbines ranges from 10 to 20m. The higher the tower, the more constant and faster are the winds.

Furthermore, to determine the total height of the system, one must take into account the diameter of the blades, which typically ranges between 1.5 and 10m.



**14. I need some kind of permission to install my wind turbine?**

The installation of small wind turbines may require some kind of permission. This often depends on the height of the tower, the autonomous region or the country in which you want to install. When in doubt it is best to consult a professional or the competent authority in each case.

**15. What materials are used in the ENAIR?**

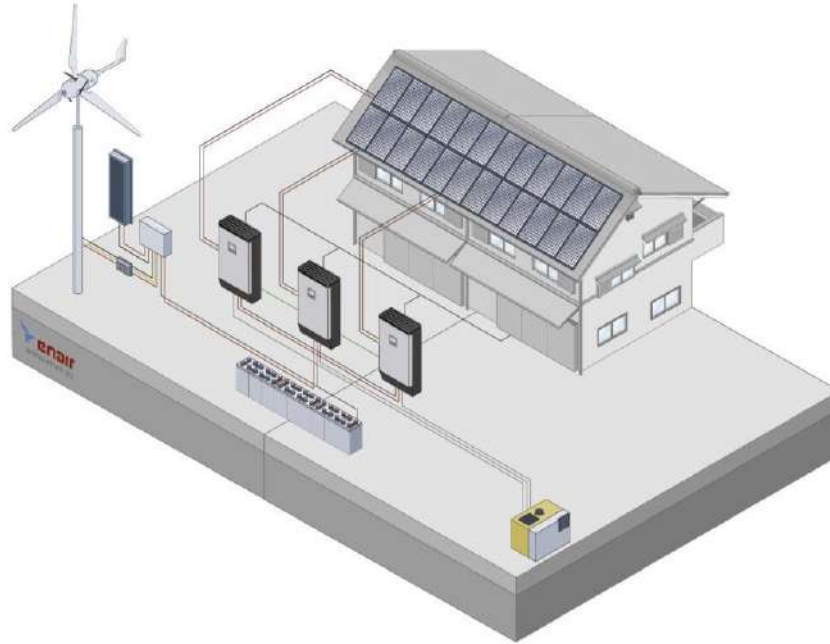
The structural parts of our wind turbines are made of stainless steel and aluminium. Blades and other components are made of copper, plastic, polyester resin and fiberglass.

All parts are adequately protected against corrosion, either by hot dip galvanizing or by various surface treatments aimed to have adequate protection even in salty environments. Furthermore, the entire assembly is sealed to prevent ingress of water, dust or any kind of substance inside. In this way the electrical components are safe and well protected.



## 8. Electrical diagrams

### 8.1 Connection continuous bus

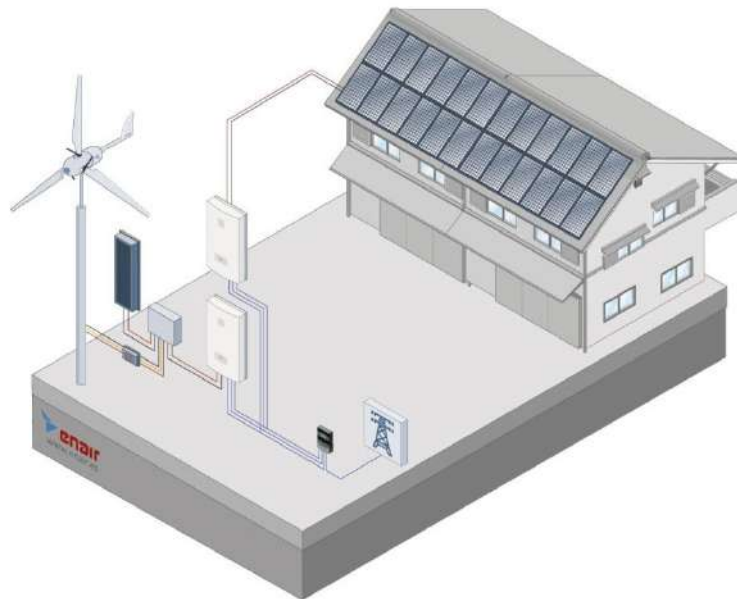


To determine the cable section downstream separating the wind turbine controller battery charging, check the following table, where you can see the cable copper conductor, associated with the model of Wind Turbine:

Model	20-40 m	40-60 m	60-80 m	80-100 m
Enair 70 / 24v	16 mm <sup>2</sup>	25 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>
Enair 70 / 48v	16 mm <sup>2</sup>	16 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>

Section mm <sup>2</sup>	10	16	25	35	50
Section AWG	7	5	3	1	0
Diameter (mm)	3.57	4.51	5.64	6.68	7.98
Diameter (in)	0.141	0.178	0.222	0.263	0.314

**8.2 Alternating bus connection**



To determine the cable section downstream separating the wind turbine controller battery charging, check the following table, where you can see the cable copper conductor, associated with the model of the wind turbine:

Model	20-40 mts	40-60 mts	60-80 mts	80-100 mts
Enair 70 / 220v	10 mm <sup>2</sup>	10 mm <sup>2</sup>	16 mm <sup>2</sup>	25 mm <sup>2</sup>

## 9. Warranty

### LIMITED WARRANTY CONDITIONS

ENAIR ENERGY SL ensures that the ENAIR wind turbines are free from defects in material and workmanship for a period of 48 months from the date of purchase or 60 months from the manufacture of that product, under normal and individual use proper installation, commissioning and periodic maintenance.

The warranty covers repair or replacement of damaged parts and labour in our workshops.

### EXCLUSIONS AND LIMITATIONS OF WARRANTY

This warranty shall not apply if the client or user previously not been returned duly completed warranty card. The warranty does not cover wind turbines that have not passed the periodic maintenance indicated in the manual and is properly sealed.

Generally, they are exempt from the guarantee rights established herein, damage and malfunctions or service of wind turbines ENAIR originating in:

- 1) Negligent, improper or inappropriate use of the product.
- 2) Failure to observe the instructions for installation, use, maintenance and periodic reviews established in the equipment manual, and technical and safety rules in force, local, national or international standing, which were applicable at any time (Electrotechnical Regulation of Low voltage, and Technical Instructions, electromagnetic compatibility, etc.)
- 3) Manipulations performed by unqualified personnel. Understood by staff competent professionals with experience in electrical installations, companies engaged in distribution, sale or installation of RES.
- 4) Damage caused by natural disasters (floods, plagues, earthquakes, hurricanes, cyclones, tornadoes, lightning, hail, fires ...), vandalism, actions of third parties or any other force majeure outside the normal operating conditions of the equipment and control of ENAIR ENERGY S.L.
- 5) Impact of flying objects coming or majeure force.
- 6) Torre or structural failure when not furnished by ENAIR ENERGY S.L.
- 7) 1) Products that have not been paid in full.



Intervention costs arising from dismantling the faulty equipment or the subsequent reinstallation of equipment parts warranty rights established herein do not cover transportation costs of wind turbines or defective items, of returning to ENAIR ENERGY S.L. It does not cover, also.

ENAIR ENERGY S.L we reserve the right to supply a different model of wind turbine or component to resolve claims accepted under guarantee, as a replacement and if the original model is no longer manufactured. In this case, the new model will be of equal or higher performance.

ENAIR ENERGY S.L it undertakes to make use of the obligations described in the conditions of this Limited Warranty, and in the event of repair or replacement of default attributable to the manufacturer, cover the transport costs of the subsequent return to the address registered customer and have them available within a maximum period of 60 days from the date of receipt.

Si ENAIR ENERGY S.L were to determine that the problem of the wind turbine is not due to a defect in materials and workmanship, then the Customer shall bear the costs of testing and processing generated.

Defective complained Products which do not meet the specifications will become the property of ENAIR ENERGY S.L., as soon as they have been replaced or paid.

Any return of material and replacement by ENAIR ENERGY SL under warranty conditions, constitute full settlement and release of all subsequent claims of any person covered by damages or other relief, and will be an impediment to any I dispute subsequently presented to the person who accepts an agreement of this type.

#### **LIMITATION OF LIABILITY**

ENAIR ENERGY S.L it will not be liable to the customer, directly or indirectly, for any failure or delay in the implementation of its warranty obligations, which may be caused by majeure force or any other unforeseen incident to the will of ENAIR ENERGY S.L.

ENAIR responsibility for ENERGY S.L. arising from this Guarantee Certificate is limited to the obligations expressed above, expressly excluding any liability for consequential damages such as loss of income or operating profits.

When the subject of the claim is the result of improper installation, ENAIR ENERGY S.L. shall be liable only when explicitly that installation was part of the scope of supply of the sales contract.

Any other security that is not expressly mentioned in this certificate is excluded.



To activated the warranty of the wind turbine, it is necessary to send this duly signed and stamped by the installer document. Once the document is registered, the wind turbine will have 4-year warranty up from the moment of installation or 5 years since manufacture registered.

Model: <b>ENAIR PRO</b>	<b>User</b>
Wind Turbine Power: .....	Name: .....
Serial Nº/ voltage: .....	Address: .....
Installation date: .....	Zip Code:.....Location: .....
Stamp and signature Installer:	Province/State: .....
	Telephone: .....
	e-mail: .....



Send this duly completed, signed and stamped document scanning and copying:  
[info@enair.es](mailto:info@enair.es) or postal address

**ENAIR ENERGY S.L**  
Avda. de Ibi Nº 44 C.P. 03420  
A.P. 182 Castalla (Alicante) ESPAÑA



## 9.1 Warranty activation

To activate the guarantee you have to enter the following web <https://www.enair.es/garantia> and access with the serial number that appears in the manual of the wind turbine.

Warranty Access Data

**Serial number Wind Turbine**

It is necessary to fill in the user's data in order to inform you when to carry out the preventive maintenance

Information of the owner of the wind turbine

<p><b>Model:</b></p> <input style="width: 90%; border: 1px solid #ccc;" type="text" value="Model"/>	<p><b>Voltage:</b></p> <input style="width: 90%; border: 1px solid #ccc;" type="text" value="Voltage"/>	<p><b>Name:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Name"/>	<p><b>CIF or DNI:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="CIF or DNI"/>
<p><b>Installation Date:</b></p> <input style="width: 90%; border: 1px solid #ccc;" type="text" value="Installation Date"/>	<p><b>** Wind</b></p> <input style="width: 90%; border: 1px solid #ccc;" type="text" value="Wind"/>	<p><b>Address:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Address"/>	<p><b>C.P.:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Postal Code"/>
<p><b>Town:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Town"/>		<p><b>Province:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Province"/>	<p><b>Country:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Country"/>
<p><b>Phone:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Phone"/>		<p><b>Email:</b></p> <input style="width: 95%; border: 1px solid #ccc;" type="text" value="Email"/>	

\*\* The wind speed must be entered in m/s , this way we will set a time period for each revision.

*Once the warranty is activated, the mechanical parts of the wind turbine will have a 4-year guarantee from the invoice date or 5 years from the date of manufacture. The warranty of the associated electronics is 2 years from invoice date*



## 9.2 Inspection and maintenance plan

Periodically by mail you will be notified of the date of the next maintenance, remember that the non-execution of the maintenance cancels the warranty.

Once the maintenance has been done, it has to be registered on the web for validity, non-registration, voids the guarantee

Access
+ Periodic Maintenance
 Maintenance List

Periodic maintenance registry

<b>Maintenance performed by the company:</b> <input type="text" value="Nombre Empresa"/>	<b>Installer Email:</b> <input type="text" value="Email"/>	<b>Operator name:</b> <input type="text" value="Nombre Operario"/>
<b>** Next maintenance date</b> <input type="text" value="DD/MM/YYYY"/>	<div style="background-color: #add8e6; padding: 2px; border: 1px solid #add8e6;"> <b>** Upcoming maintenance information</b> </div>	<b>Maintenance date:</b> <input type="text" value="DD/MM/YYYY"/>

Select the actions performed

<input type="checkbox"/> 1- Re-tightening of screws, rudder, swivel and tip <hr/> <input type="checkbox"/> 3- Greased of variable pitch bearings <hr/> <input type="checkbox"/> 5- Checking the state of the blades, special attention to the leading edge <hr/> <input type="checkbox"/> 7- Checking the paint, troubleshooting and rust points <hr/> <input type="checkbox"/> 9- Replacing brushes	<input type="checkbox"/> 2- Re-tightening of other tower screws (eg splices, fittings ...) <hr/> <input type="checkbox"/> 4- Greased of variable pitch assembly <hr/> <input type="checkbox"/> 6- Checking the correct operation of the variable pitch <hr/> <input type="checkbox"/> 8- Inspection of brushes, slip rings and connecting cables
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Observations

Add Maintenance ↗

The application allows to obtain a list with all the maintenance done to the wind turbine

Access
+ Periodic Maintenance
Maintenance List

Maintenance and Reviews List

⚙ Maintenance nº 1 - 📅

<b>Company:</b> Enair Energy S.L. <b>Date:</b> 16-05-2016	<b>Operator:</b> Maria Jose <b>Next Date:</b> 16-05-2017
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<input type="checkbox"/> Re-tightening of screws, rudder, swivel shaft, toe and tower <hr/> <input checked="" type="checkbox"/> 1- Re-tightening of screws, rudder, swivel and tip <hr/> <input checked="" type="checkbox"/> 3- Greased of variable pitch bearings <hr/> <input checked="" type="checkbox"/> 5- Checking the state of the blades, special attention to the leading edge <hr/> <input checked="" type="checkbox"/> 7- Checking the paint, troubleshooting and rust points <hr/> <input checked="" type="checkbox"/> 9- Replacing brushes	<input type="checkbox"/> <hr/> <input checked="" type="checkbox"/> 2- Re-tightening of other tower screws (eg splices, fittings ...) <hr/> <input checked="" type="checkbox"/> 4- Greased of variable pitch assembly <hr/> <input checked="" type="checkbox"/> 6- Checking the correct operation of the variable pitch <hr/> <input checked="" type="checkbox"/> 8- Inspection of brushes, slip rings and connecting cables
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Observations:



ENAIR ENERGY S.L.  
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Aptdo Correos 182 - Alicante - SPAIN



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e-mail: [info@enair.es](mailto:info@enair.es)