Technical Requirements Specification

for

PPE 1447 AEOLUS

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Revision history

Use the revision history to document the changes included in each new published version. Please replace this example *revision history with your own.*

Name	Date	Changes	Version
Ahmed Ahmzadai Dorlanne Droz Larue Le Fur	3/12/2014	Initial draft	0.1 draft
Sylvain Larue – Amrou Ahmed	14/01/2015	More accurate version	

Table of Contents

The table of contents should preferably fit on a single page for readability and navigability. Playing with the TOC styles can help get it to fit. (This may not however be possible)

1 Purpose

This specification document will refer to the requirement that AEOLUS must satisfy. AEOLUS is a portable wind turbine that gives the user the opportunity to charge small electronic devices. You will find the functional requirements, the specifications about the interfaces of our system, about Performances and the constraints.

2 Documentation and terminology

2.1 Reference documents

Document	Number	Attached?	Application
CDC	Code, number, version	Yes/No	The role of the document relative to this document

2.2 Glossary

2.2.1 Acronyms

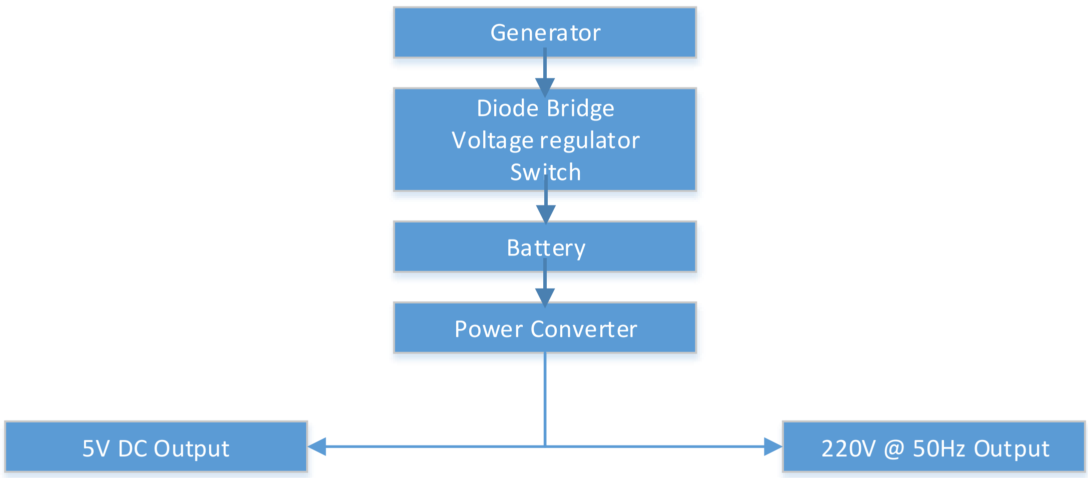
Acronym	Meaning	Explanation
AC	Alternating current	The flow of electric charge periodically reverses direction.
DC	Direct current	the flow of electric charge is only in one direction
V	Volts	difference in electric potential between two points
W	Watts	derived unit of power
A	Ampere	unit of electric current
cm	Centimeter	Unit of length
mm	Millimeter	Unit of length

3 Product presentation

The place that electronics devices such as smartphones, tablets or laptops take in our lives doesn't stop growing. With this growth comes the need to always find electricity to power those devices. But the ecological context in which we are makes us wanting to find ways to produce clean energy.

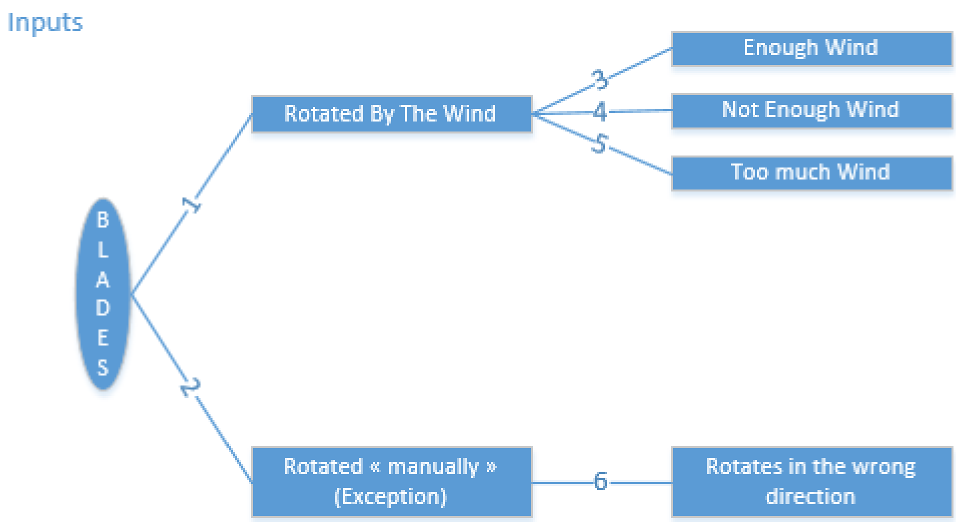
Aeolus is a small wind turbine that gives the user the opportunity to load any electronic device thanks to the power produced by the wind energy. So it will be really useful to find electricity to charge all your devices wherever you are (as long as there is wind) in the world, even if it is just to be able to send that one e mail to your wife to tell her that you are alive.

The figure below shows how the energy chain works and state the different blocks that we will have to develop.



4 Functional Requirements

4.1 Functional perimeter



Outputs

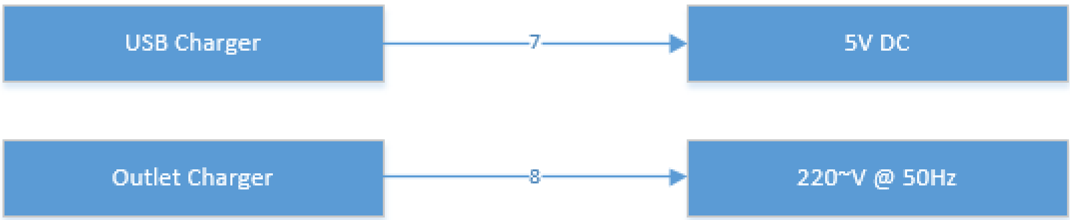


Diagram of the different use case of the system

The different numbers of the diagram correspond to the different utilizations scenarios of the system described in the following subsection. (e.g. **(2)** in the subsection correspond to the case stated 2 in the diagram)

4.2 There is enough wind (1)-(3)

The engine speed is satisfied. The battery is loading. As the battery is loading the user can choose to use two outputs.

- ➔ USB output (the 12V current in the battery will be converted to 5V current) **(7)**
- ➔ Outlet output (the 12 V current in the battery will be converted to 220V current) **(8)**

4.3 There is not enough wind (1)-(4)

The engine speed is not satisfied. The battery is not loading or very slowly.

4.4 There is too much wind (1)-(5)

A resistor will be used to avoid overvoltage and to dissipate the surplus of energy. The battery won't charge as long as the wind decreases enough to get back to the right.

4.5 The turbine are not turning in the right way (2)

It triggers security system: diode that protects the circuit.

5 Interface requirements

5.1 Hardware interface 1

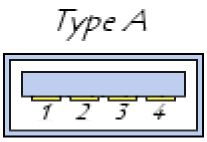
The first Hardware interface will be the 12V to 220V power inverter. We will detail in the following sub sections each interface and then the global Hardware interface.

5.1.1 USB port

The USB port will allow the User to load any small device such as smartphones or Mp3. We can use any type of USB port (1.0, 2.0 and 3.0) because we do not care about the speed of data transfer because we only use it to as a power supply.

Main characteristics of the USB port:

- Connectors known as **type A**, where the shape is rectangular and generally used for less bandwidth intensive devices (keyboard, mouse, webcam, etc.);



Power supply +5V (*VBUS*) 100mA maximum
Data (*D-*)
Data (*D+*)
Mass (*GND*)

5.1.2 Outlet

The outlet will have a classic voltage output like the one you have at home. It will provide 220V monophasic current at 50Hz. It should be compatible with European outlets.
They are Type C outlets aka “Europlugs”. They support up to 250V and 2,5A

5.1.3 Global power inverter

We would buy The BESTEK converter 12V-220V 300W from AMAZON

(http://www.amazon.fr/BESTEK-convertisseur-alimenter-lordinateur-portable/dp/B00GINASFA/ref=pd_sim_sbs_light_1?ie=UTF8&refRID=0RS5EGYEA054WS1QG8PY)


This will be the Hardware interface that the user will see and on which he will directly plug his electronic devices either on the outlet or on the USB port.

This device gives a continuous power of 300W.

The outlet converts the voltage from 12 Volts/DC in input to 220 Volts/AC output.
The two USB ports (1A and 2.1A) will be use to load small devices such as smartphones and tablets.
The box is made of aluminium and the whole thing weight 510g.
Its dimensions are 12cm*8cm*4cm.

6 Performance Requirements

The system will have to deliver exactly **5V on the USB port and 220V@50Hz on the outlet port**.

For this to be possible we would need the generator to produce a voltage between 8 and 12V

The system should be able to fully load a portable device such as a phone or a laptop in under a day.

7 External requirements and constraints

7.1 Standards and compatibility requirements

The system has to be compatible with USB and European outlets.

7.2 Physical requirements

- ➔ The whole system should not exceed 10 kg to be considered portable. Once it is creased, it should fit in a small sport bag (about 20 L).

- ➔ We have chosen to design our wind turbine with a vertical axis. Compared to the horizontal one, the vertical axis makes the rotation of the wind turbine easier to start. Indeed to start the rotation the vertical axis needs less force and moreover the blades will be bigger in surface so it would catch more wind as we are very low in altitude.

- ➔ Another characteristic of this axis is the global resulting shape of the whole system, it will be much easier to mount and demount as you could see in the model.

And the most important one would be that the rotation of the axis of the wind turbine would be the same that the rotation of the generator.

7.3 Environmental requirements

The system should be able to resist wind gusts as its purpose is to collect wind so it should not fall when submitted to wind. It will operate outdoors so it should be waterproof in case it rains. The box in which the electronic will be must not rust and should be waterproof and have a perfect isolation for safety reasons.

7.4 Packaging and labeling requirements

For the packaging, the wind turbine part (see the model) must be foldable in order to fit in a case of a small sport bag size.

7.5 Documentation requirements

We must provide a complete instruction manual of how to use the wind turbine. Another manual will explain how to build the exact same system, so we will provide a list of components with their specifications and where to find them.

8 MODELISATION OF THE SYSTEM

We have done a 3D modelisation of the system using SolidWorks. It is most likely our final design.