



QUICK START GUIDE

2025

THE AL13 POWER TOWER™

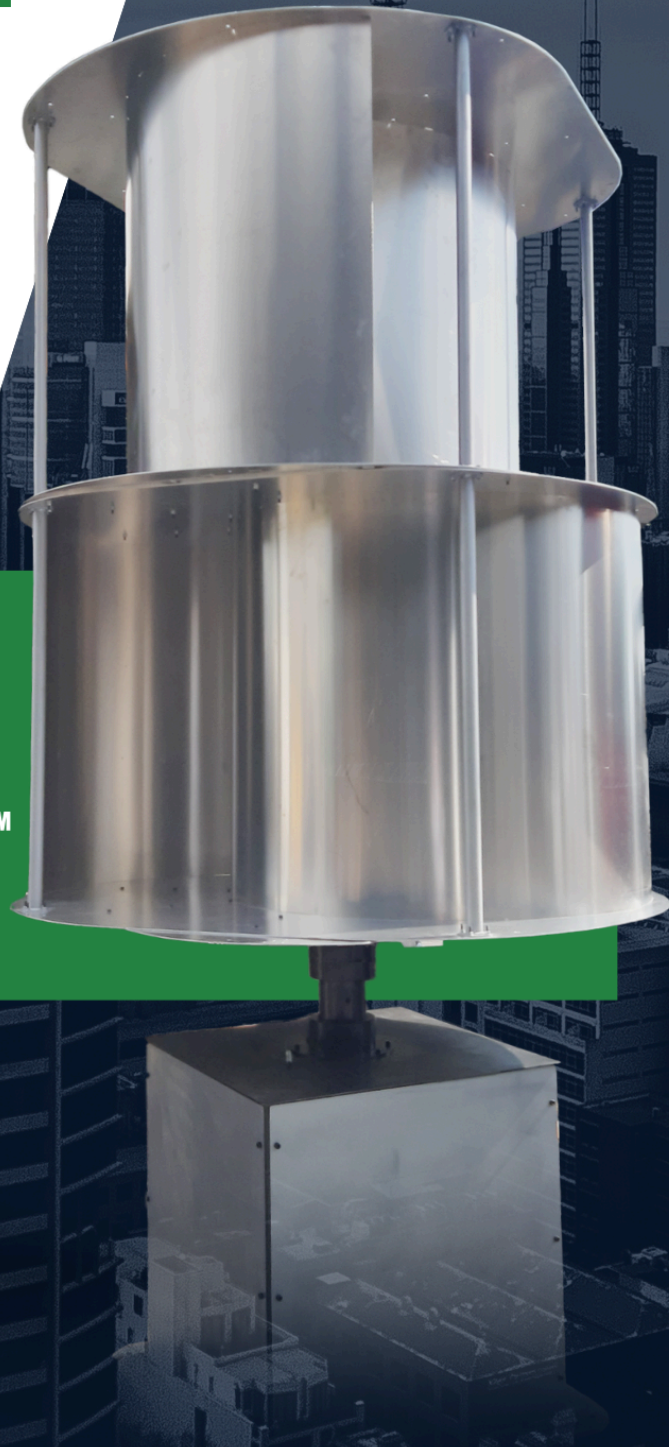




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Introduction & Recommendations

Thank you for purchasing our products. This guide will highlight some basic and important information. For more detailed information about wind energy, please see the resources at www.flowerturbines.com

This is called the AL13 Power Tower [™] because the atomic number of aluminum is 13. In this product, the blades are made of aluminum, which is cheap and easily recyclable.

The Power Tower comes in modules of height 1 meter each and diameter of 1.6 meters each. They are built to stack on top of each other up to 8 modules, whichever fits the size of the project the best.

The PowerTower is a simpler but equally effective version of our Tulips' internal aerodynamic advantages, but it also has one of its own. The alternating modules at right angles to each other enable smoother uptake of wind from any direction. For that reason, most customers will prefer 2, 4, 6, or 8 modules, but there is no reason not to order 1, 3, 5, or 7 if the size is more suitable for your project.

The blades are easy to assemble, and they ship flat. The base is heavy, strong, and box-shaped.

Depending on the number of modules and the project wind speed, we will pick electronics for your project. Our salespeople will try to find the solution that works for you. Most of the time, you will want to connect it to the grid to reduce your home or business electric bill. It can be used on or off grid. It can be used on the ground or on roofs. In many cases, commercial roofs will be strong enough to handle a turbine with 2 modules, but it is your responsibility to check roof suitability with your own engineer.

For the first module:

Each turbine has a weight of 462 pounds (210 kilograms) and the base is 10.7 square feet (1 square meter), so it has a force of 462 pounds per square foot (210 kilograms per square meter).

Each module added has a weight of 139 pounds (63 kilograms) and the base is 10.7 square feet (1 square meter).

Below is a table of the number of modules and their respective weights and base sizes.



Table 1: AL13 Power Tower™ Weights and Sizes

(All weights are shown without charge controllers.)

Modules	Total Weight (in kg)	Total Weight (in lbs)	Size of Base (in square meters)	Size of Base (in square feet)	kg/square meter	pounds/square foot
2	336.00	740.75	1.00	10.70	336.00	69.23
3	399.00	879.64	1.00	10.70	399.00	82.21
4	462.00	1018.54	1.00	10.70	462.00	95.19
5	525.00	1157.43	1.00	10.70	525.00	108.17
6	588.00	1296.32	1.00	10.70	588.00	121.15
7	651.00	1435.21	1.00	10.70	651.00	134.13
8	714.00	1574.10	1.00	10.70	714.00	147.11

For 4 modules and greater, there is a pole installed nearby to provide an upper bearing to balance the modules even better. That pole weighs 70 kilograms (154 pounds) for the stack of 4 modules.

The turbines provide the electricity to an inverter to connect to the grid. Due to the different inverter types available in US and EU compatible countries, we recommend no less than 5 and preferably 10 turbines with or without solar panels in the US, but the EU inverters we have available can handle even one turbine at a time. However, your return on investment will improve the more turbines you put into a group, so we advise using no less than 5 together, because the turbines perform better together.

The arrangement may be on or off the grid.

In both cases, they will usually have a charge controller that connects the turbine generator to a battery, and, for a grid connection, an on-grid inverter. In our EU-compatible models, our smaller installations allow for grid connection without a battery, as some of our inverters are produced with charge controllers included.

The electricity generated usually is arranged as follows:

1. The turbine shaft is connected to a permanent magnet generator of 24 or 48 volts that produces AC power that needs to be adjusted for use.



2. The next step for the electricity is to pass through a charge controller which rectifies the AC to usable DC power.
3. The DC power from the charge controller then either goes to a battery, usually 12, 24, or 48 volts, which is often a source for off-grid power, or to a battery/inverter combination or inverter alone that goes to the grid. As mentioned, in the EU for some projects, the controller is built into the inverter. In all cases, the specifics will depend on your project (parameters like size of the turbines, wind speed, number of turbines in the project, etc.), and we may give you a custom solution using the elements above or similar ones. For many small on-grid projects in countries with US-type voltage, the on-grid inverter will be connected to a 48 volt battery.

You may choose the battery you want to go with the system.

You may choose to have us buy it for you or buy it yourself. We sometimes recommend you purchase it yourself, as batteries may be difficult to transport.

When you choose a battery, it needs to have voltage compatible with the system we make for you. Our staff will help you with that. You will need to decide how much back-up power you want your battery to have. Most batteries will be sold by “ampere hours”. You can multiply that number by the battery voltage to get the number of watts. Let us say that you find a battery with 1000 watts. If you decide that you want to have storage available to power a 10 watt light bulb, this battery will do so for 100 hours. This calculation is approximate, and, if you want emergency backup, you should buy somewhat more than the amount you think you will need.

Output per AL13 Power Tower™ turbine in various numbers

Below are power curves/tables for the expected power of each turbine when appropriately placed in a group of 3, 5, or 10. Your sales representative will help you understand how to place them in groups. A power curve is a table or plot of wind speed versus expected power. Your actual results can be higher if you have strong gusts and lower, depending on the electronics used for the project.

The following tables provide an overview of the power output generated by a single AL13 Power Tower™ turbine alone through groups of 10. It demonstrates how wind speed, measured in meters per second and miles per hour, influences the turbine's energy production, expressed in watts.

Efficiency rises the more turbines grouped in a bouquet.

Use these tables to estimate the energy output based on wind speeds in your area.



Table 2: Power Output of A Single Turbine by Wind Speed

(Watts produced by a each Power Tower™ turbine, when alone, at various heights, shown in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	2m (height)	4m (height)	6m (height)	8m (height)	Power Output (Watts)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.1	0.2	0.3	0.4	0.1	0.2
1.0	0.8	1.6	2.5	3.5	0.8	1.6
1.5	2.7	5.4	8.4	11.7	2.7	5.4
2.0	6.3	12.9	19.8	27.6	6.3	12.9
2.5	12.3	25.2	38.7	54.0	12.3	25.2
3.0	21.3	43.5	66.9	93.3	21.3	43.5
3.5	33.8	69.1	106.2	148.2	33.8	69.1
4.0	50.4	103.2	158.5	221.2	50.4	103.2
4.5	71.7	147.0	225.7	314.9	71.7	147.0
5.0	98.4	201.6	309.6	432.0	98.4	201.6
5.5	131.0	268.3	412.1	575.0	131.0	268.3
6.0	170.0	348.4	535.0	746.5	170.0	348.4
6.5	216.2	442.9	680.2	949.1	216.2	442.9
7.0	270.0	553.2	849.5	1,185.4	270.0	553.2
7.5	332.1	680.4	1,044.9	1,458.0	332.1	680.4
8.0	403.0	825.8	1,268.1	1,769.5	403.0	825.8
8.5	483.4	990.5	1,521.1	2,122.4	483.4	990.5



9.0	573.9	1,175.7	1,805.6	2,519.4	573.9	1,175.7
9.5	674.9	1,382.8	2,123.5	2,963.1	674.9	1,382.8
10.0	787.2	1,612.8	2,476.8	3,456.0	787.2	1,612.8
10.5	911.3	1,867.0	2,867.2	4,000.8	911.3	1,867.0
11.0	1,047.8	2,146.6	3,296.6	4,599.9	1,047.8	2,146.6
11.5	1,197.2	2,452.9	3,766.9	5,256.1	1,197.2	2,452.9
12.0	1,360.3	2,786.9	4,279.9	5,972.0	1,360.3	2,786.9
12.5	1,537.5	3,150.0	4,837.5	6,750.0	1,537.5	3,150.0
13.0	1,729.5	3,543.3	5,441.5	7,592.8	1,729.5	3,543.3
13.5	1,936.8	3,968.1	6,093.9	8,503.1	1,936.8	3,968.1
14.0	2,160.1	4,425.5	6,796.3	9,483.3	2,160.1	4,425.5
14.5	2,399.9	4,916.8	7,550.8	10,536.0	2,399.9	4,916.8
15.0	2,656.8	5,443.2	8,359.2	11,664.0	2,656.8	5,443.2

Table 3: Power Output of A Single Turbine in a Bouquet of 3 Turbines by Wind Speed
 (Watts produced by a each Power Tower™ turbine, in a group of three turbines, at various heights, shown in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	2m (height)	4m (height)	6m (height)	8m (height)	Power Output (Watts)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.1	0.2	0.4	0.5	0.8	0.2
1.0	0.8	1.4	2.8	4.3	6.0	1.4
1.5	2.7	4.6	9.5	14.6	20.4	4.6
2.0	6.3	11.0	22.6	34.7	48.4	11.0



2.5	12.3	21.5	44.1	67.7	94.5	21.5
3.0	21.3	37.2	76.2	117.0	163.3	37.2
3.5	33.8	59.1	121.0	185.8	259.3	59.1
4.0	50.4	88.2	180.6	277.4	387.1	88.2
4.5	71.7	125.5	257.2	395.0	551.1	125.5
5.0	98.4	172.2	352.8	541.8	756.0	172.2
5.5	131.0	229.2	469.6	721.1	1,006.2	229.2
6.0	170.0	297.6	609.6	936.2	1,306.4	297.6
6.5	216.2	378.3	775.1	1,190.3	1,660.9	378.3
7.0	270.0	472.5	968.1	1,486.7	2,074.5	472.5
7.5	332.1	581.2	1,190.7	1,828.6	2,551.5	581.2
8.0	403.0	705.3	1,445.1	2,219.2	3,096.6	705.3
8.5	483.4	846.0	1,733.3	2,661.9	3,714.2	846.0
9.0	573.9	1,004.3	2,057.5	3,159.8	4,409.0	1,004.3
9.5	674.9	1,181.1	2,419.9	3,716.2	5,185.4	1,181.1
10.0	787.2	1,377.6	2,822.4	4,334.4	6,048.0	1,377.6
10.5	911.3	1,594.7	3,267.3	5,017.6	7,001.3	1,594.7
11.0	1,047.8	1,833.6	3,756.6	5,769.1	8,049.9	1,833.6
11.5	1,197.2	2,095.2	4,292.5	6,592.1	9,198.3	2,095.2
12.0	1,360.3	2,380.5	4,877.1	7,489.8	10,450.9	2,380.5
12.5	1,537.5	2,690.6	5,512.5	8,465.6	11,812.5	2,690.6
13.0	1,729.5	3,026.6	6,200.8	9,522.7	13,287.5	3,026.6
13.5	1,936.8	3,389.4	6,944.2	10,664.2	14,880.3	3,389.4
14.0	2,160.1	3,780.1	7,744.7	11,893.6	16,595.7	3,780.1



14.5	2,399.9	4,199.8	8,604.4	13,214.0	18,438.1	4,199.8
15.0	2,656.8	4,649.4	9,525.6	14,628.6	20,412.0	4,649.4

Table 4: Power Output of A Single Turbine in a Bouquet of 5 Turbines by Wind Speed
 (Watts produced by a each Power Tower™ turbine, in a group of five turbines, at various heights, shown in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	2m (height)	4m (height)	6m (height)	8m (height)	Power Output (Watts)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.1	0.2	0.5	0.7	1.0	0.2
1.0	0.8	1.8	3.7	5.6	7.9	1.8
1.5	2.7	6.1	12.4	19.1	26.6	6.1
2.0	6.3	14.4	29.4	45.2	63.0	14.4
2.5	12.3	28.0	57.5	88.2	123.1	28.0
3.0	21.3	48.5	99.3	152.5	212.8	48.5
3.5	33.8	77.0	157.7	242.1	337.8	77.0
4.0	50.4	114.9	235.3	361.4	504.3	114.9
4.5	71.7	163.6	335.1	514.6	718.0	163.6
5.0	98.4	224.4	459.6	705.9	985.0	224.4
5.5	131.0	298.6	611.8	939.5	1,311.0	298.6
6.0	170.0	387.7	794.3	1,219.8	1,702.0	387.7
6.5	216.2	492.9	1,009.8	1,550.8	2,164.0	492.9
7.0	270.0	615.6	1,261.3	1,937.0	2,702.7	615.6
7.5	332.1	757.2	1,551.3	2,382.4	3,324.2	757.2
8.0	403.0	918.9	1,882.7	2,891.3	4,034.4	918.9
8.5	483.4	1,102.2	2,258.3	3,468.0	4,839.1	1,102.2



9.0	573.9	1,308.4	2,680.7	4,116.7	5,744.3	1,308.4
9.5	674.9	1,538.8	3,152.7	4,841.7	6,755.8	1,538.8
10.0	787.2	1,794.8	3,677.2	5,647.1	7,879.7	1,794.8
10.5	911.3	2,077.7	4,256.8	6,537.2	9,121.7	2,077.7
11.0	1,047.8	2,388.9	4,894.3	7,516.3	10,487.9	2,388.9
11.5	1,197.2	2,729.7	5,592.5	8,588.5	11,984.0	2,729.7
12.0	1,360.3	3,101.4	6,354.2	9,758.2	13,616.1	3,101.4
12.5	1,537.5	3,505.5	7,182.0	11,029.5	15,390.0	3,505.5
13.0	1,729.5	3,943.2	8,078.8	12,406.7	17,311.7	3,943.2
13.5	1,936.8	4,415.9	9,047.3	13,894.0	19,387.0	4,415.9
14.0	2,160.1	4,925.0	10,090.2	15,495.7	21,621.8	4,925.0
14.5	2,399.9	5,471.7	11,210.4	17,215.9	24,022.2	5,471.7
15.0	2,656.8	6,057.5	12,410.5	19,059.0	26,593.9	6,057.5

Table 5: Power Output of A Single Turbine in a Bouquet of 10 Turbines by Wind Speed
(Watts produced by a each Power Tower™ turbine, in a group of ten turbines, at various heights, shown in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	2m (height)	4m (height)	6m (height)	8m (height)	Power Output (Watts)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.1	0.4	0.9	1.4	1.9	0.4
1.0	0.8	3.5	7.3	11.1	15.6	3.5
1.5	2.7	12.0	24.5	37.6	52.5	12.0
2.0	6.3	28.3	58.1	89.2	124.4	28.3
2.5	12.3	55.4	113.4	174.2	243.0	55.4
3.0	21.3	95.6	196.0	300.9	419.9	95.6



3.5	33.8	151.9	311.2	477.9	666.8	151.9
4.0	50.4	226.7	464.5	713.3	995.3	226.7
4.5	71.7	322.8	661.3	1,015.6	1,417.2	322.8
5.0	98.4	442.8	907.2	1,393.2	1,944.0	442.8
5.5	131.0	589.4	1,207.5	1,854.3	2,587.5	589.4
6.0	170.0	765.2	1,567.6	2,407.4	3,359.2	765.2
6.5	216.2	972.8	1,993.1	3,060.9	4,271.0	972.8
7.0	270.0	1,215.0	2,489.4	3,822.9	5,334.3	1,215.0
7.5	332.1	1,494.5	3,061.8	4,702.1	6,561.0	1,494.5
8.0	403.0	1,813.7	3,715.9	5,706.5	7,962.6	1,813.7
8.5	483.4	2,175.5	4,457.1	6,844.8	9,550.9	2,175.5
9.0	573.9	2,582.4	5,290.8	8,125.1	11,337.4	2,582.4
9.5	674.9	3,037.2	6,222.5	9,556.0	13,333.9	3,037.2
10.0	787.2	3,542.4	7,257.6	11,145.6	15,552.0	3,542.4
10.5	911.3	4,100.8	8,401.6	12,902.4	18,003.4	4,100.8
11.0	1,047.8	4,714.9	9,659.9	14,834.8	20,699.7	4,714.9
11.5	1,197.2	5,387.5	11,037.9	16,951.1	23,652.6	5,387.5
12.0	1,360.3	6,121.3	12,541.1	19,259.6	26,873.9	6,121.3
12.5	1,537.5	6,918.8	14,175.0	21,768.8	30,375.0	6,918.8
13.0	1,729.5	7,782.7	15,944.9	24,486.9	34,167.7	7,782.7
13.5	1,936.8	8,715.6	17,856.4	27,422.4	38,263.8	8,715.6
14.0	2,160.1	9,720.3	19,914.9	30,583.5	42,674.7	9,720.3
14.5	2,399.9	10,799.4	22,125.7	33,978.8	47,412.2	10,799.4
15.0	2,656.8	11,955.6	24,494.4	37,616.4	52,488.0	11,955.6



As illustrated in the power curves, the energy output significantly increases with the number of turbines positioned in a bouquet as well as higher wind speeds. By leveraging the Bouquet Effect™, turbines work together to enhance efficiency, delivering greater energy production than individual units. Proper placement and alignment are key to optimizing performance and maximizing the benefits of wind energy.

In all cases, you will have the greatest benefit by using more turbines to achieve a stronger Bouquet Effect™.

Safety Warnings

Although our turbines are made with safety in mind, a few precautions are necessary:

1. Prevent accessibility to children.
2. Packaging and small parts can cause choking, do not allow small children to have access to them.
3. The unit should be used in a protected area. If on the ground, each unit should be surrounded by a chain link fence (so wind can pass through) and secured with a lock.
4. Do not place your hand inside the turbine while it is in operation. If the turbine is spinning at low speeds, you can carefully slow it down manually by gently applying pressure with a thick, non-metallic object, such as a sturdy rubber or wooden tool. This minimizes the risk of injury and protects the turbine components. Never use a metal object or excessive force to stop the turbine.
5. Do not run your fingers along any of the blade or metal edges, since they may still have sharp areas.
6. Depending on the project, a certified electrician and/or contractor should do installation work.
7. Hire a licensed/bonded installer for roof mounting.
8. Hire a licensed contractor or sub-contractor to pour and install concrete/foundational mounting.
9. Consult local regulations and ensure compliance with all local building codes and grid connection regulations.



10. Keep the products stored in a dry environment at room temperature up to the date of installation.

Parts Breakdown

1. **Turbine (top)**

This consists of a generator which attaches to the turbine shaft above and an adapter below to enable the generator to connect to it from a fixed location on a stationary structure.

2. **Base (bottom)**

This is made of strong steel and has places to connect to the ground. The ideal is drilling into concrete. Rooftop installations can usually be made into concrete or steel frames on the roof.

3. **Electrical components**

- a. **Generator**

- b. **Charge Controller**

Our custom-designed charge controller consumes minimal background electricity, reducing battery drain when not in use. It has:

- A light indicating charging status.
- A switch to stop the turbine.

- c. **Battery (Optional)**

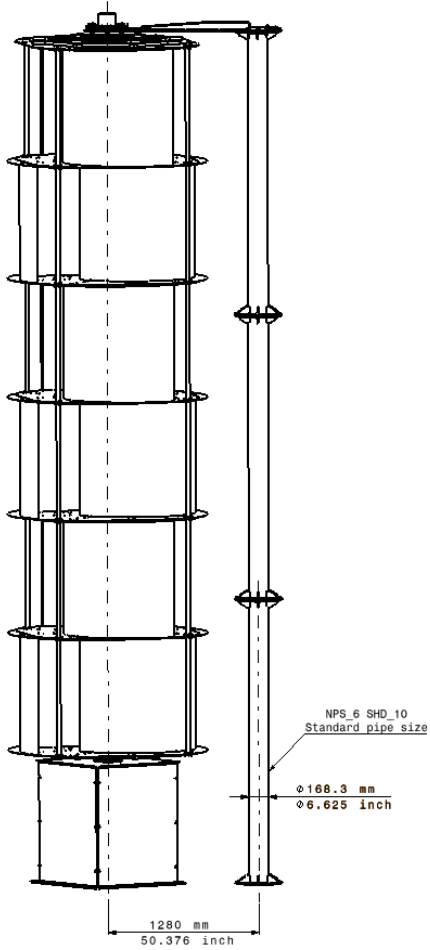
- d. **Inverter**

4. **Brake (electronic and/or mechanical)**

The AL13 Power Tower™ has an electronic brake and a simple mechanical brake. There is also programming in the control system to brake at certain wind speeds automatically.

5. **Pole (for 4 modules and more)**

This is placed adjacent to the Power Tower and can stabilize one or two at a time. The distance between the Power Tower center line and the pole is 1280 mm (50.376in), The pole's DIA is 168.3mm(6.625in) due to the standard pipe size (NPS 6, SHD 10).



The exact distance between the unit's central shaft and the pole is 50.367 in (1280 mm). The pole's diameter is 6.625 in (168.3mm).

Tools & Hardware

1. **Tools** (not provided)

A variety of wrenches will be needed, depending on the product.

- a. 16mm socket wrench
- b. 6mm, 8mm, or 10mm Allen wrench
- c. Forklift or Crane as needed

2. **Hardware** (provided):

- a. Large Tulip Turbine (in 2 pieces)
- b. Base
- c. Pole (For stacks of 4+)



Substructure Preparation

1. Fencing

We recommend a chain link fence so wind can pass through.

2. Foundation

Determining the foundation specifications is the job of your local civil engineer. We have made some calculations to be helpful. A larger base saves concrete and is lower. If you want to place the turbine high, you need a lot more concrete.

3. Mounting Turbine to Base

Mounting Turbines to the Base

Concrete may be poured into the ground and the turbine attached, or a block of concrete may be used. A typical base would be at least 1500 x 1500 mm, 1000 mm high

When on a roof, you need to consult with your civil engineer.

The 2-module unit is similar to our 2-meter Tulip. Below is the information on the concrete base recommended to hold speeds of 35 meters per second.

Table 6: Variety of Bases for 2 m AL13 Power Tower™ Turbines

(Dimensions and necessary concrete sizes for 2-meter high AL13 Power Tower™ turbines, depending on case)

Length (mm)	Width (mm)	Height (mm)	Concrete Volume (cubic meters)	Remarks
1000	1000	2200	2.3	The normal base used for a 2-meter high AL13 Power Tower™.
1000	2000	700	1.4	This keeps the 1000 mm for each turbine next to each other so that the turbines can be clustered, but gives a wider overall base in the other direction. Note that less concrete is needed because the base is larger.
900	900	6200	5	Maximizing height in a reasonable fashion.



Conclusion: Normal use is a base 1000x1000.

A larger base saves concrete and is lower. If you want to place the turbine high, you need a lot more concrete.

The 5-meter Tulip is somewhat equivalent to the 7 or 8 meter AL13 Power Tower™.

This is calculated for steady wind at 35 m/s.

Table 7: Variety of Bases for 5 m AL13 Power Tower™ Turbines

(Dimensions and necessary concrete sizes for 5-meter high AL13 Power Tower™ turbines, depending on case)

Length (mm)	Width (mm)	Height (mm)	Concrete Volume (cubic meters)	Remarks
2500	2500	900	5.6	The normal base used for a 5-meter high AL13 Power Tower™.
2500	4000	500	5	Low and long base: This keeps the 2750 mm for each turbine next to each other so that the turbines can be clustered aerodynamically, but gives a wider overall base in the other, non-bouqued direction. Note that less concrete is needed because the base is larger.
2100	2100	2000	9	Maximizing height (2 m) in a reasonable fashion. More concrete needed for stability.
1900	1900	4000	14	Maximizing height (4m); significantly higher concrete requirement.

Conclusion: Normal use is a base 2500x2500. A larger base saves concrete and is lower. If you want to place the turbine high, you need a lot more concrete.

Connecting Electrical Components

This can vary depending on your system. A licensed electrician should be used. Installation must be conducted by a licensed and registered professional to ensure compliance with all local electrical codes and standards.



The generator will have three output wires. All three should be connected separately to the appropriate connection on the controller or inverter. It does not matter which wire attaches to which connecting pole on the controller or inverter. Some controllers may have multiple poles but label three for wind. Only those should be used.

We recommend replacing the oil once every two years, more often in settings of average wind more than 7 meters per second, less often in winds below 5 meters per second. The bearings have nipples for ingress and egress of the oil.

Below is a table of some compatible bearing greases:

Table 8: Greases Compatible with Medium Tulip Turbines

BEARING	GREASE BRAND	GEAR
Aralub HLP2	ARAL	Aralub LFZ1
Rhus L 474/2	MOTUL/BECHEM	Berulit GA 400
Energrease LS - EP2	BP	Energol WRL/GR 154 GS
Grease LMX	CASTROL	
Beacon EP2	ESSO	Surret Fluid NX
Mobilux EP2	MOBIL	Mobilgear OGL 007
Retina EP2 - Alvania EPLF2	SHELL	Malléus GL 205
Multis EP2 - Lical EP2	TOTAL	Ceran AD+

Maintenance

1. General inspection and listen for noise. We recommend an annual check of your turbines.
2. Check for loose wires. Inspect all electrical connections, including those between the turbine, charge controller, and inverter, to ensure they are secure and properly connected. Look for signs of wear, corrosion, or damage in the wiring. If you find any loose or damaged wires, tighten the connections or replace the wires as needed to maintain optimal performance and safety.



3. We recommend greasing for adequate lubrication once every two years, more often in settings of average wind more than 7 meters per second, less often in winds below 5 meters per second.

Troubleshooting

This section addresses common issues you might encounter and provides basic steps for troubleshooting your turbine system. If the issue persists, please contact Flower Turbines support.

1. General Troubleshooting

- **Loose Connections:** Ensure all screws and bolts are securely tightened.
- **Misaligned Parts:** Re-align parts if they do not fit as expected.
- **Regular Checks:** Periodically check the assembly for any loose components or wear and tear.

2. Turbine Not Spinning

- **Possible Causes:**
 - Low wind speed below the cut-in threshold (0.7 m/s or 1.57 mph).
 - Debris or obstruction in or around the turbine.
 - Mechanical or electrical component failure.
- **Solutions:**
 - Verify wind speed in the area.
 - Inspect the turbine for debris or obstructions and clear them if present.
 - The turbine might not be performing well because of poor placement. Ideally turbines should be in an open area and exposed to the wind. If the turbine is on a rooftop, its blades should be as high above the railings as possible.
 - Check for loose or disconnected wires in the generator or charge controller.
 - To diagnose slow and hard spinning, start by disconnecting the electrical connection. An electrical components may be inhibiting the turbine, which could be due to various factors, such as a full battery, the charge controller or inverter settings, or a problem with the generator. Our generators are designed with low starting torque, making them an unlikely cause. The electronics may have their own manuals, which you should consult as needed.
 - If there is slow spinning, and the problem persists when disconnecting the electronics, the most common cause could be found along the central shaft. If the generator is tightly fixed on the bottom and not aligned in a continuous and straight vertical orientation with the rest of the shaft, there could be resistance. The coupling between the generator and the shaft could also slow down the turbine. The bearings are often a cause of slow turbine movement. Perhaps they



are due for a greasing or the supplier produced faulty bearings. The seal around the bearings could be tight. If a new greasing doesn't solve the problem, then you should contact us with the problem and we will contact our engineers.

3. Low or No Power Output

- **Possible Causes:**
 - Low wind speeds or inconsistent gusts.
 - Faulty connections to the charge controller or inverter.
 - Malfunction in the generator or charge controller.
- **Solutions:**
 - Confirm wind conditions meet operational thresholds.
 - Inspect all wiring connections for secure and proper setup.
 - Verify that the charge controller and inverter are operational. Contact support for advanced troubleshooting.

4. Unusual Noise or Vibration

- **Possible Causes:**
 - Loose components (blades, shaft, or base).
 - Worn or damaged bearings.
 - Misalignment in the turbine assembly.
- **Solutions:**
 - Conduct a visual inspection for loose bolts or parts. Tighten if necessary.
 - Schedule maintenance to grease or replace worn bearings.
 - Ensure the turbine is securely mounted on a stable foundation.

5. Brake Not Engaging Automatically

- **Possible Causes:**
 - Programming issue in the charge controller.
 - Electrical connection failure in the braking system.
- **Solutions:**
 - Have a licensed electrician reset the charge controller.
 - Inspect connections to the brake system for faults or corrosion.

6. Controller or Indicator Light Malfunction

- **Possible Causes:**
 - Faulty controller unit.
 - Disconnected or damaged wiring.
- **Solutions:**
 - Verify power is reaching the controller.
 - Check for loose or damaged connections and secure them.



- Replace the controller if needed and contact support for assistance.

7. Turbine Stopped Working After a Storm

- **Possible Causes:**
 - Excessive wind speeds caused damage to components.
 - Debris lodged in or around the turbine.
- **Solutions:**
 - Inspect the turbine for visible signs of damage and remove debris.
 - Verify the integrity of the blades, shaft, and base.
 - Contact a licensed professional or Flower Turbines support for repairs.

Liability Disclaimer

The manufacturer assumes no liability for any damages, injuries, or losses resulting from failure to comply with the specified assembly guidelines and safety standards. It is imperative that all assembly procedures be performed by certified professionals to uphold the product warranty, ensure safety, and preserve operational integrity. Unauthorized assembly or modification will void all warranties and protections provided by the manufacturer.

Warranty Information

1. **Warranty Statement for Flower Turbines:**

Flower Turbines warrants that its turbines are free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the original purchaser.

2. **Exclusions:**

This warranty does not cover damage caused by misuse, neglect, improper installation, accidents, acts of nature, or unauthorized modifications.

3. **Claim Process:**

To initiate a warranty claim, the original purchaser must submit a claim along with proof of purchase. Flower Turbines reserves the right to inspect the product and determine the validity of the claim.

4. **Limitation of Liability:**



Flower Turbines' liability under this warranty is limited to repairing or replacing the defective product at its discretion and excludes any incidental or consequential damages from product use.

5. Extent of Warranty:

This warranty is valid only for the original purchaser and is non-transferable.

Frequently Asked Questions

1. Q: What are the dimensions of each turbine?

A: Each set of blades (module) is 3.281 ft (1 m) H x 5.77 ft (1.7 m) W. A stack of 4 (including base) would be 16.25 ft (4.953 m) H and a stack of 6 modules (including base) is 22.8 ft (6.953 m) H.

2. Q: How much does each turbine weigh?

A: The weight of a 2 module unit is ≈740.5lb (336kg). Total weight for a 4 module unit is ≈1018.5lb (462kg). Total weight for a 6 module unit is ≈1228lb (557kg).

3. Q: What are the minimum and maximum wind speeds?

A: The cut-in wind speed is 0.7m/s (1.57mph) and maximum survival wind speed is 54m/s (120.8mph). Our custom charge controllers include a built-in braking control for safety in high winds that may exceed the turbine's max wind speed ability.

4. Q: What are the lowest and highest temperatures at which the turbines will operate?

A: These turbines will operate at a range of 5°F to 122°F (-15°C to 50°C).

5. Q: How long will my turbines last?

A: These units are designed to operate for twenty (20) years, but we recommend checking them annually for any damage that could impact their lifespan.



Contact Information

For further assistance or inquiries, please contact us at:

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Appendix

