

**MANUAL**

**Standalone soilless barrel**

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#### Prerequisites to run a standalone soilless vertical barrel

The standalone soilless vertical barrel can provide many soilless grow spaces on a very small footprint. The standard setup comes with a closed base (capacity is ~34 liters), that serves as reservoir for a submersible pump and creates an internal circulation of the liquid irrigating through the top water buffer.

The liquid can be

- mineral fertilizer (hydroponics) or
- liquid from another alternative organic fertilizer source like fish in aquaponics.

In order to operate such a soilless setup successfully, you will need to make yourself familiar with the basic procedures and also acquire the necessary utensils in order to be able to measure and operate the system. For hydroponics you will need to monitor and adjust a few parameters in order to generate a good yield from your plants. You will need an EC meter and a pH meter at minimum and of course other equipment to produce seedlings, the water soluble fertilizer, pH adjuster, 2-inch net pots, growing medium (e.g. rock wool), seeds etc. All this information is basic horticulture knowledge and can be found on the internet. Ideally you have a good friend that can help you ask the right questions if you are beginning to dive into soilless plant growing.

You will need to find a good spot for your soilless vertical barrel where plants can get sufficient sunlight, ventilation and can thrive in a suitable climate for your crop. That might be a balcony or terrace or ideally a greenhouse. If you plan to operate indoors you might need supplemental lighting too. Because the unit usually uses a submersible pump, you will need electricity to operate it.

#### **Required...**

- Depending on the height of your barrel (is always a variable in aponix setups), you will need a submersible aquarium pump. The max. flow rate of the water buffer that is filled by the pump is 2-3 liters per minute (not more). That is a pump that can push liquid to the height of the barrel top plus x. Usually that is a 20-30W pump you can also use for an aquarium. If you run too much water into the top water buffer, excess water will run through the overflow directly back into the reservoir. If your pump is too powerful, you should add a valve in between the pump and the top buffer to fine tune the amount of water.
- You should run your pump on a mechanical timer depending on the substrate and amount of UV-radiation, humidity and air temperature. The idea is to prevent stress for your plants from drying and keep the medium moist. You could start with once every 60 or 90mins irrigation of 5/15mins and see how your plants are doing and adjust from there. Please do not drown small plants with too much water.

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- You will need to test and maintain the liquid within certain ideal ranges. In hydroponics for leafy greens you try to keep these basic parameters:
  - EC: 0.9 to 1.5mS
  - pH: 5.8 to max 7.0
  - Liquid temperature: 16 to 24C

There are many other parameters. If you are starting with hydroponics these ones are the ones you focus on. In order to test for EC, pH and temperature you will need additional measuring equipment that you can buy online.

- Depending on the height of your barrel, you will need to get a hose of the length of the barrel height plus a bit extra. The hose diameter will depend on the spigot metrics on your pump. The usual connector is a  $\frac{3}{4}$  inch outside thread that you want to connect to.
- Please plan and get these missing parts before you start. It all depends on how you ordered your parts. Think about how the liquid is circulating, that way you will quickly see if there is anything missing.

### **Recommended**

- In hydroponics you insert pre-grown seedlings of the crops you like to grow in 2" net pots. You can grow them yourself or buy them locally. If you chose to grow them yourself you like to chose a suitable medium (for example rockwool, but there are also alternatives) and grown them in the appropriate 2-inch net pots that you can later transplant into the vertical barrel.
- A typical beginner mistake is to plant all grow spaces at once. If you are planning crops with different grow cycles that's fine. Just think about which crops will be mature when. That is your 'production planning'.

### **Height of the barrels and grow spaces**

One barrel has a diameter of 57cm on the outside surface. The number of grow spaces depends on the setup of your ring segments. You can increase grow space with the height of your barrel by just adding more ring segments. For larger plants you can use the closed spacer parts in your ring segments and stack your assembled ring segments accordingly. Each ring segment adds 15cm of height. The standing base has a height of ~20cm.

### **Basic ring segment assembly**

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Full ring segments always consist of 6 pieces. In order to assemble these pieces, please keep in mind that the goal is to build full ring segment that we like to stack into our vertical barrel later. You will have a hard time or even break connections if pieces are not aligned.



This is how the alignment would look like on the assembly. We are building a full horizontal ring segment (a full circle). It works the same way for the assembly of all other available 'grow adapter' pieces. All pieces are interchangeable, so you can configure the barrel surface for individual plant spacing.



Use your thumbs in front of your belly and push until you hear the click. Proceed with all 6 pieces you intend to assemble and close the ring segment also with a click the same way.



If you like to disassemble the individual pieces, grab them like shown in front of your belly. Hands pull back, belly pushes against. Note: You do not need to disassemble fully assembled ring segments for cleaning! Please check the maintenance info on how to clean after a growing cycle.



## Scope of delivery

Depending on the configuration of your planned setup and what you purchased, these will be the parts that you will need for the assembly:

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1/6th parts: closed (spacer) and ones with actual grow adapters in the form of net pot inserts.



One ring segment is assembled using 6 of the 1/6th parts on the left. You can assemble as you plan your surface layout. Be creative!

Example: Alternating with spacer



Closed standing base – available with pre-drilled holes or no additional holes

If you like to add a float valve or overflow, you can use the three flat areas to drill your own holes.



Special part: The revision piece:

When you assemble the lowest ring segment, do yourself a favor and add this part. By opening and closing the large cap it allows to reach inside a running barrel and pull out anything that might have fallen inside or reach for your pump.



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The top irrigation water buffer is put on top of the topmost ring segment. It will be filled with water from the pump and irrigate through the 24 small holes on the inside by applying water to the inside wall of the barrel.

Please make sure your vertical barrel is standing straight, not tilted.

There is one elevated hole. This is the overflow. In case the pump delivers too much water, excess water just drops back into the reservoir. Please aim for not having to use this overflow! If you pump delivers too much water, you can always insert a valve between your pump and the water buffer to fine-tune the amount of water. The goal is to find a flow rate where max half of the volume of the waterbuffer is filled and the same amount of liquid is pulled down for irrigation.

The black connection is supposed to be mounted into the 2<sup>nd</sup> hole in the center. This is where you connect your pump to fill the buffer.

There might be cases where there is no hole in the center. If you need it (for filling from below) you can always drill it yourself.

The version without this hole is the irrigation buffer that is filled from the top, usually the top lid by a sprinkler from which you removed the spinner, basically turning it into a micro tap or just an open but fixed hose.



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The black part on the image on the right is a spigot with an inside thread to be threaded onto the centered fitting, that should already be mounted to the center hole.

Depending on the version this might be included or not. The standard spigot has a diameter for a 3/4 inch hose. There is also a 1/2 inch version.

The top lid covers the water in the buffer.



## Assembly

### ***Step 1 – Start with the closed base place submersible pump***

Info: All parts can also be purchased with or without pre-drilled holes, so you can decide where and how you organize drainage by drilling your own holes.

Each base has 3 flat areas that can be used to drill and attach other connections. For example if you are building a grey-water filter with this part or like to integrate a floating vent to auto refill.



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Place the submersible pump with the mounted hose inside the base.

a) The hose will stay inside the barrel and will later be threaded onto the top water buffer.

b) The electricity cord needs to go through one of the dents in the bases rim! Do this before you start to stack ring segments!

This is how it will look later with the stacked ring segments.



The purpose of the dents in the rim of the base is, that it lets water that came to the outside of the barrel back into the reservoir instead of onto your floor. Water on the outside might appear in the form of droplets running downwards if you have wild leafy plants.





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#### ***Step 2 – Assemble ring segments and stack them***

Stack your planned ring segments. There are 4 possible positions between each level. The idea is to have the ideal position for your planned crop to grow and thrive.

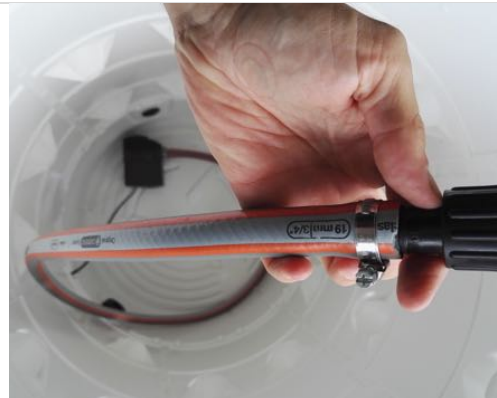
Beginner mistake: If you plant too dense, your plants do not have the space to thrive and might have limited exposure to UV light and CO<sub>2</sub>, and also are competing against each other for these resources.

Do not forget the lowest ring segment with the special revision part.



#### ***Step 3 – Connect you pump to the top water buffer***

The end of the hose that you already connected to the pump outlet now needs to be connected to the top irrigation buffer.



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You can lift the buffer part while it is connected to the submerged pump.

Put the buffer on the top ring segment now.

If you got the pre-assembled hose to connect to a pump from us, you will probably also have a valve for additional fine tuning. It might look like this:



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#### **Step 4 – Fill your base with water and run the pump**

Now you can fill the base, your reservoir with water through the revision opening.

Depending on the source of the water you might want to read up on what works best for your purpose. Topics: de-gase chlorine, use of rainwater, carbon hardness, pH.

Later this 'water' will be prepared as the nutrient solution – water plus the right amount of fertilizer maintained at ideal conditions and concentration during the growth cycle of your plants. If using liquid fertilizer in soilless growing systems this is new or unknown to you, please read up on it! If you only use water, your plants will not thrive and very soon show deficiencies.



Once you run your pump, the top buffer should slowly fill up.

Ideally you use a timer and fill the buffer as needed. The capacity is ~7 liters. Excess water runs back to the base through the overflow.

Once the buffer is filled, the duration for the irrigation is ~3mins. Please make sure to check if the 24 small irrigation holes do not get clogged over time and can do their job. Each grow space has 2 holes for irrigation. The vertical barrel should be level.



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Once the liquid circulates from the reservoir through the inside of the barrel your grow spaces look like this – see the dripping on the backside. That is where the roots of your plant will be once you insert pre-grown seedlings in 2-inch net pots. There is an inside wing structure that directs the water on to the root area of your plants and ensures even irrigation regardless how high your barrel is and even if it is not straight but tilted a bit.



### Maintenance and cleaning

From time to time you should harvest your vertical barrel completely, unstack the ring segments and power-wash the growing equipment to remove algae and pathogens. The materials are heavy duty commercial horticulture grade and we made it very hard for you to break them. You can use steam, pressure or light bleach or mix of that as with any other horticulture equipment too. The materials are thermoplastics! There are temperature and pressure limits.

To wash away salt buildup we recommend to soak the parts to be cleaned in a citric acid or vinegar solution to soften the adhesion. After rinsing the still assembled ring segments should be cleaned using a power washer. Make sure you hit all the hidden areas including the connections.

Very high pressure plus heat >80C will harm the surface of the material. Too concentrated bleach will harm the surface over time. You should use a light acidic solution. If you notice that the over each cycle there are more algae attaching to the materials, you will have to soak parts for longer and cleaning gets a bit more laborious.

### Materials used

All materials we use have been specifically certified as 'food-safe' by the raw material companies. In general the quality of the materials used are very similar if not the same even without explicit food grade certificate.

For more information on the materials used please see section 'Quality / Materials' on our webpage: <http://www.aponix.eu/vertical-barrel-soil-less/quality-and-usability/>

### **1/6 parts for ring segment assembly**

As of January 2017 all 1/6<sup>th</sup> parts are made from ASA (Acrylester-Styrol-Acrylnitril).

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Properties: Highest possible UV-resistant, Antistatic, dirt-repellent, long-living, inherently stable, shatter-proof, heat-resisting, having a stable color.

#### ***Lids, buffer and standing bases***

PVC sheets vacuum molded. The raw materials used for the aponix parts come from trustworthy German providers who have to comply to very strict European rules (see: REACH directive / Verordnung (EG) Nr. 1907/2006 zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe). Raw material providers have confirmed their materials use tin and zinc instead of lead based stabilizers. We can provide more detailed information or original certificates if necessary.

Development status as of September 2017: The vertical barrel is in its first large series production, manufactured in Germany. We did our best to select the most durable and suitable materials available. The aponix.eu vertical barrel concept is patented.

