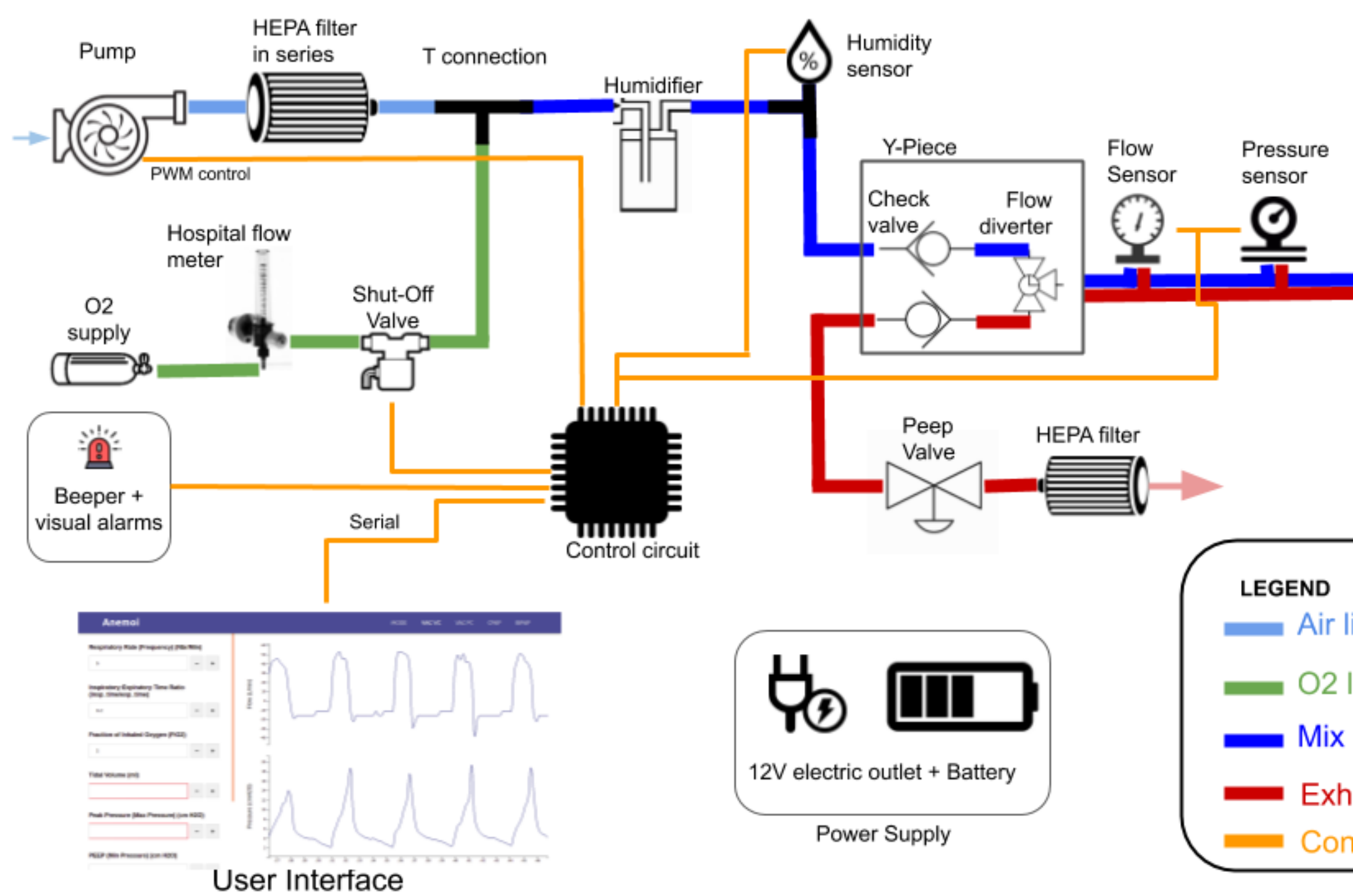


Assembly Instruction

All the instructions to build our prototype, from hardware to the software. For the list of materials, BOM is available [HERE](#)

Mechanical assembly

Except for the Y-piece, the flow and pressure sensors that are close to the patient, all the components fit into a 450 x 600 x 300mm box.
Refer to the functionnal block diagram for hardware connection

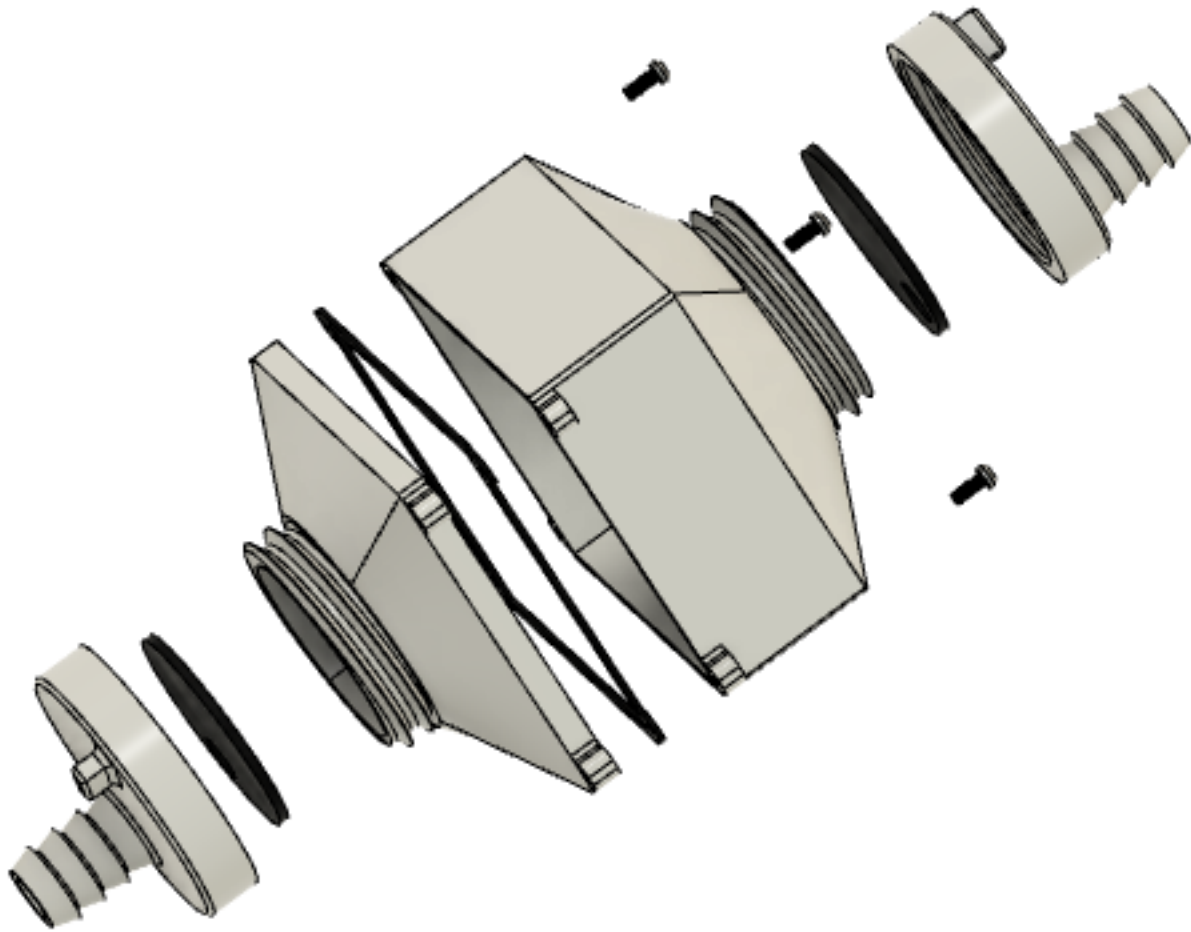


Pump

1. Add 30cm of the 15mm tube at the end of the pump for the HEPA filter in series.

HEPA Filter

1. From anemoi_CAD_3D_mesh_filter_box_series, 3D Print:
 - anemoi_CAD_3D_mesh_filter_box_bottom.stl
 - anemoi_CAD_3D_mesh_filter_box_top.stl
 - anemoi_CAD_3D_mesh_filter_box_tube_connector.stl (x2)
2. Cut in rubber the following joint using the stl dimensions:
 - anemoi_CAD_3D_mesh_filter_box_joint_not_printed.stl



- anemoi_CAD_3D_mesh_filter_box_joint_top_not_printed.stl or use a gasket
3. Assemble the system with four (4) M4 screws with the HEPA filter inside as shown.
 4. Connect the filter to the tube from the pump and add another one (30cm) for the T-Connection.

Shut-Off Valve

1. Connect the entry of the Shut-Off Valve to the tube from the hospital flow meter.
2. Add another tube (20cm) for the T-conection and connnect it.

T-connection

1. Connect the tube coming from the Shut-Off Valve to the vertical bar of the T-connection.
2. Connect the tube coming from the Filter to the horizontal bar of the T.
3. Add another tube (60cm) to the last connection for the humidifier.



Humidifier

1. From anemoi_CAD_3D_mesh_humidifier, 3D Print:
 - anemoi_CAD_3D_mesh_humdifier_tube.stl
 - anemoi_CAD_3D_mesh_humidifer_cap.stl
2. Assemble the 3D parts, and the other required pieces (anemoi_CAD_3D_mesh_humdifier_jar_not_printed.stl, - anemoi_CAD_3D_mesh_humdifier_humidifier_top_not_printed.stl) (Masson's jar in canada)
3. Add water (SEE anemoi_user_instruction for water quantity).
4. Connect the tube coming from the T-connection to the tube connector connected to the anemoi_CAD_3D_mesh_humdifier_tube.stl
5. Add another tube (20cm) to the other connector with another T-connection for the Humidity sensor.

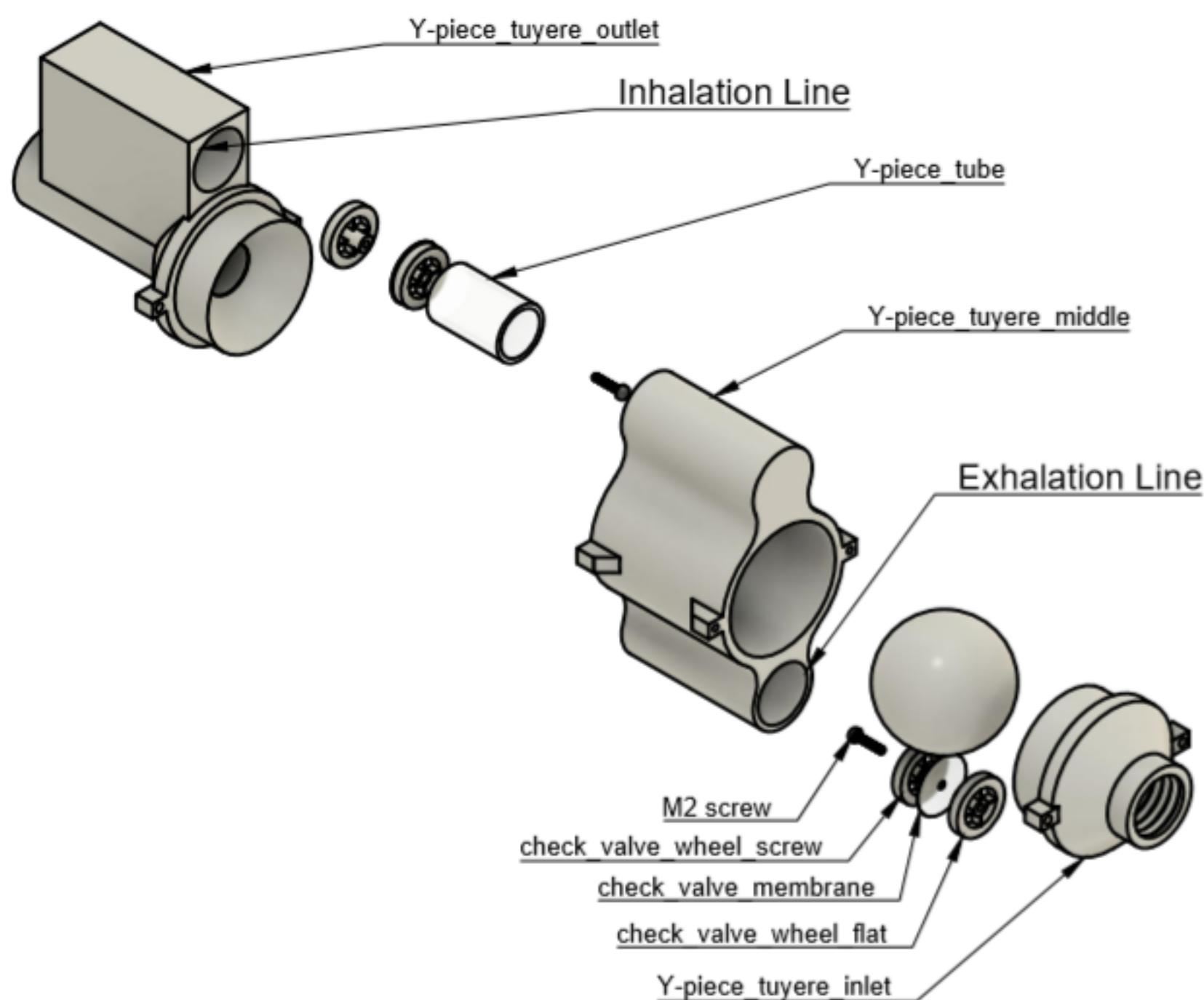
Humidity sensor

1. From anemoi_CAD_3D_mesh_sensor_box, 3D Print:
 - anemoi_CAD_3D_mesh_sensor_box_top.stl
 - anemoi_CAD_3D_mesh_sensor_box_bottom.stl
2. Cut in rubber the following joint using the stl dimensions:
 - anemoi_CAD_3D_mesh_sensor_box_joint.stl
3. Assemble the component as shown while putting the humidity sensor inside and letting the electric cables go out through the bottom hole.
4. Seal the bottom hole with silicone
5. Connect the tube from the T-connection to the tube connector of the sensor box.
6. Add a long tube to the other part of the T-connection, it will go to the patient.



Y-Piece

1. From



anemoi_CAD_3D_mesh_Y-piece, 3D Print:

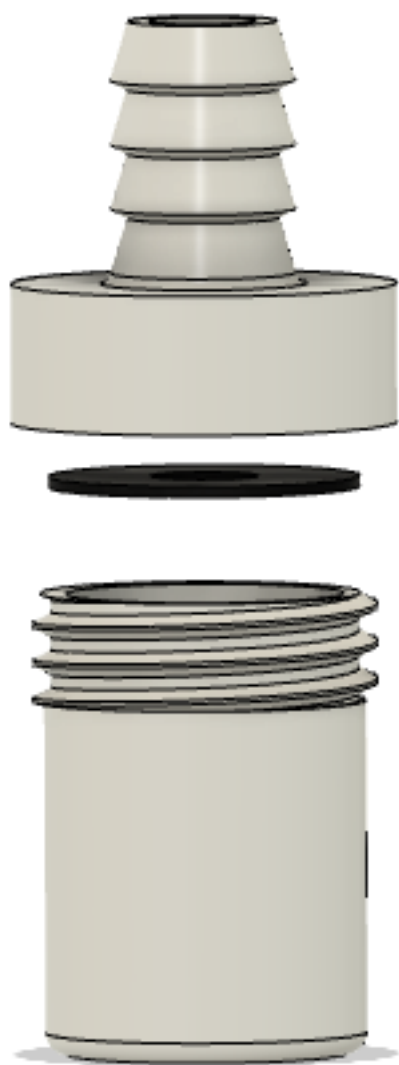
- 2 x anemoi_CAD_3D_mesh_check_valve_wheel_flat.stl
- 2 x anemoi_CAD_3D_mesh_check_valve_wheel_screw.stl
- anemoi_CAD_3D_mesh_Y-piece_tuyere_outlet.stl
- anemoi_CAD_3D_mesh_Y-piece_tuyere_middle.stl
- anemoi_CAD_3D_mesh_Y-piece_tuyere_outlet.stl

2. Make 2 membranes with the dimensions of check_valve_wheel_flat. Use Ziploc bag (or similar fine flexible plastic fabric).
3. With a M2 screw, Screw the check_valve_wheel_screw, check_valve_membrane and check_valve_wheel_flat.
4. Repeat step 3 for the second check valve.
5. Insert one of the check valves in the Y-piece_tuyere_outlet upper hole. Make sure to first insert the check_valve_wheel_screw so that the air can only enter the Y-piece_tuyere_outlet
6. Insert a 27 mm long plastic tube in the Y-piece_tuyere_outlet upper hole.
7. Screw the Y-piece_tuyere_outlet and the Y-piece_tuyere_middle together. Make sure that the tube is connected with the biggest rectangular hole. You will have to look inside the Y-piece_tuyere_middle to know which rectangular hole is the biggest.

8. Insert the ping-pong ball and screw the Y-piece_tuyere_middle with the Y-piece_tuyere_outlet.
9. Finally, insert the second check valve in the Y-piece_tuyere_middle. Make sure to insert the check_valve_wheel_flat first so that the CO2 can only exit the Y-piece_tuyere_middle
- 10 . Connect the tube from the T-connection to inhalation line entrey and add a tube (10cm) with a T-connection.

Flow sensor

1. From anemoi_CAD_3D_mesh_venturi_flow_meter 3D print:
 - anemoi_CAD_3D_mesh_venturi_flow_meter.stl
2. Connect the four (4) vinyl tubes (10mm OD, 6mm ID) to the connectors.
3. Connect two (2) tubes from the same line to the same differential pressure sensor (BMP280).
4. Connect the two other tubes to the other pressure sensors.
5. Connect the tube from the Y-piece to the entry of the venturi.
6. Add another tube at the end of the venturi with a T-Connection for the pressure sensor.



Pressure Sensor

1. From anemoi_CAD_3D_mesh_sensor_box, 3D Print:
 - anemoi_CAD_3D_mesh_sensor_box_top.stl
 - anemoi_CAD_3D_mesh_sensor_box_bottom.stl
2. Cut in rubber the following joint using the stl dimensions:
 - anemoi_CAD_3D_mesh_sensor_box_joint.stl
3. Assemble the components as shown while putting the pressure sensor inside and letting the electric cables go out through the bottom hole.
4. Seal the bottom hole with silicones
5. Connect the tube from the T-connection to the tube connector of the sensor box.
6. The next tube connector will be for the patient

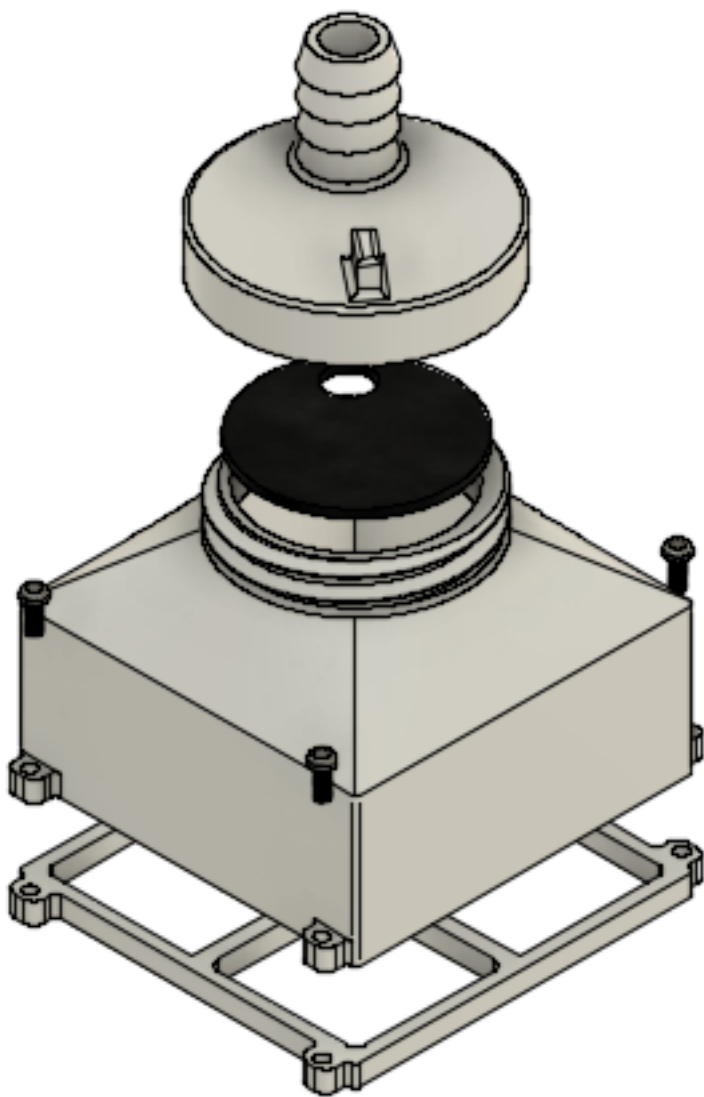
Peep Valve

The peep valve is the same component as the humidifier. The peep pressure is reached by putting the right amount of water inside the jar.

1. From anemoi_CAD_3D_mesh_humidifier, 3D Print:
 - anemoi_CAD_3D_mesh_humdifier_tube.stl
 - anemoi_CAD_3D_mesh_humidifer_cap.stl
2. Assemble the 3D parts, and the other require pieces (anemoi_CAD_3D_mesh_humdifier_jar_not_printed.stl, anemoi_CAD_3D_mesh_humdifier_humidifier_top_not_printed.stl).
3. Add water (Fill enough water to reach 20cmH2O, more informaton will come).
4. Connect the tube coming from the Y-piece to the tube connector connected to the anemoi_CAD_3D_mesh_humdifier_tube.stl
5. Add another tube to the other connector for the filter Box Tip.



Filter Box Tip

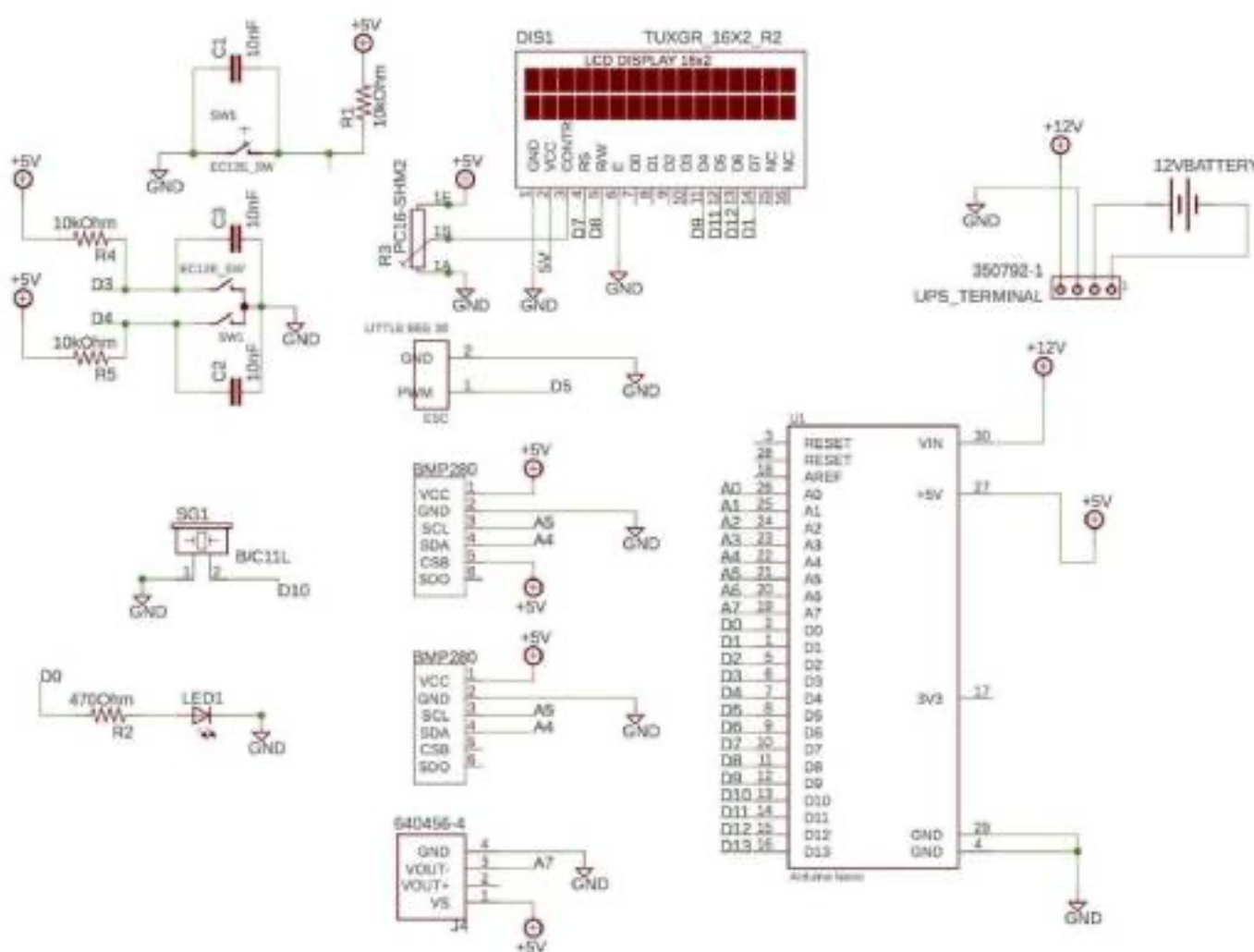


1. From anemoi_CAD_3D_mesh_filter_box_tip, 3D print:
 - anemoi_CAD_3D_mesh_filter_box_bottom.stl
 - anemoi_CAD_3D_mesh_filter_box_holder.stl
 -

anemoi_CAD_3D_mesh_filter_box_tube_connector.stl

2. Cut in rubber the following joint using the stl dimensions:
 - anemoi_CAD_3D_mesh_filter_box_joint_top_not_printed.stl or use a gasket.
3. Assemble the system with four (4) M4 screws with the HEPA filter inside as shown.
4. Connect to the tube coming from the Peep Valve.

Electrical assembly



Arduino Connection

Use the following schematic to connect all the sensors and control to the arduino.

There is :

- The Pump
- The Shut-Off Valve
- Humidity sensor
- 2 x differential pressure sensors (for the flow)
- Pressure

sensor

Power Supply

1. Connect the circuit with UPS and make sure the wires are firmly tightened inside the terminal.
2. Connect the battery to the UPS.

Raspberry Pi

To monitor and control the data recieved by the arduino, a Raspberry Pi has been used. Just connect the arduino to the Pi with the USB cable

To download the PCB design click [HERE](#)

Software installation

Arduino installation

<https://github.com/jeanromainroy/anemoi#arduino>

Raspberry Pi installation

<https://github.com/jeanromainroy/anemoi#raspberry>