

Analog module for combining medical oxygen with patient's breathing air in MakAir

Combine and adjust the percentage of oxygen purity in the air that the patient breathes with the help of a ventilators are very important in the process of healing each person in hospitals.

Weak patients such as the elderly and children and others with special conditions such as asthma

When connected to a ventilator, they will have problems if they do not receive more oxygen than the normal amount of oxygen in the room air (21 percent approximately).

Therefore, all functional and basic ventilators must be equipped with the ability to combine oxygen.

Mass-produced ventilators do not usually have to be able to perform the compounding operation accurately, unlike anesthesia machines.

Another group of ventilators only mix oxygen, but the user can not adjust the amount of mixing (like LTV950)

So we decided to give this feature to MakAir so that it can receive medical oxygen and combine with the patient's incoming air. In addition, the MakAir user can adjust the volume of oxygen between zero liters per hour to 8 liters per hour.

Items Needed

- Pneumatic Pu Od 6mm Polyurethane Hose
- Pneumatic Pu Air Hose 5/16 Or 8mm Od Polyethylene
- Pneumatic Pu Od 4 mm Polyurethane Hose
- RS PRO Tee Tube-to-Tube Adaptor Push in 6 mm, Push in 6 mm to Push in 6 mm, Tube-to-Tube Connection (x2)
- RS PRO Straight Threaded Adaptor, R 3/4 male to Push in 6 mm, Threaded-to-Tube Connection (x5)
- Legris LF3000 Series Elbow Threaded Adaptor, G 1/8 Male to Push in 8 mm male, Threaded-to-Tube Connection Style (x2)
- RS PRO Stainless Steel Circular Straight Coupler 3/4in Rc(T) Female x 3/4in Rc(T) Female (x3)
- Straight Male Hose Coupling 3/8in, 3/8 in BSP Male
- Festo Air Hose Black Polyurethane 12mm
- FEMALE BSPP TEE CONNECTOR, G1/8 (x1)

- 4mm Hose to 1/8 NPT Male Swivel Elbow Fitting (x2)
- 4mm Hose to 1/16 NPT Male Swivel Elbow Fitting (x2)
- Parker C Series Stainless Steel 316 Check Valve, 0.33 psi Cracking Pressure, 1/8" NPT Female(x1)
- STRAIGHT BRASS BARBED HOSE JOINER CONNECTOR COUPLER - RACES, 6MM (x1)
- Stainless Steel 6mm to 12mm Hose Pipe Clamps Clips Fastener (x2)
- Legris po hose 4 x 2mm
- Pressure Gauge 1/4" for Pressure Reducer Pressure Regulator Oxygen o2 Autogen (0 - 16 Bar)
- Ohmeda Oxygen Quick-Connecter female - standard size/bolt fixed

Assembly steps:

To simplify and avoid ambiguity, we divide the oxygen flow circuit into two parts and describe each one separately.

- The Circuit is placed before manometer
- The Circuit if placed after manometer

At First we refer to the path in front of the manometer. The task of this section is to receive oxygen from the source and enter it into the circuit of the device and at the same time show the pressure of the inlet flow of oxygen to the user. This part can receive oxygen in two separate ways and is equipped with an oxygen pressure gauge that displays the input oxygen pressure up to 16 Bar.

Follow the steps below to create this section:

- Cut the 6 mm hose to the following sizes: - 20 cm (x3) - 5 cm - 3 cm - 10 cm
- Cut a piece of silicone hose to a length of 15 cm
- Remove a 10 cm 6 mm thick piece of hose on one side
- Take a piece of hose 10 cm thick 6 mm, stick [RS PRO Straight Threaded Adaptor, R 3/4 male to Push in 6 mm, Threaded-to-Tube Connection] on one side and [the STRAIGHT BRASS BARBED HOSE JOINER CONNECTOR COUPLER - RACES, 6MM] on the other side.

Next, connect the pre-cut silicone hose to the coupler and secure the grip. The side connected to the 3/4 nut must be connected to the check valve inlet with a clamp.

Note that each check valve only works in one correct direction, so pay attention to the arrow on the valve.



After connecting these items to the check valve You have to take the 3 cm hose and insert one side into another [RS PRO Straight Threaded Adaptor, R 3/4 male to Push in 6 mm, Threaded-to-Tube Connection]

Finally, connect the nut to the check valve outlet

The result should be like this



- In the next step, pick the Ohmeda Oxygen Quick-Connector. For this part You will need to attach a female double head coupling to install a 6 mm hose converter and conduct oxygen.

For this purpose, take a 3/4 coupling and connect it to the connector and connect the other side of the coupling to a [RS PRO Straight Threaded Adaptor, R 3/4 male to Push in 6 mm, Threaded-to-Tube Connection]

Finally, take 5 cm hose piece and attach it to the structure

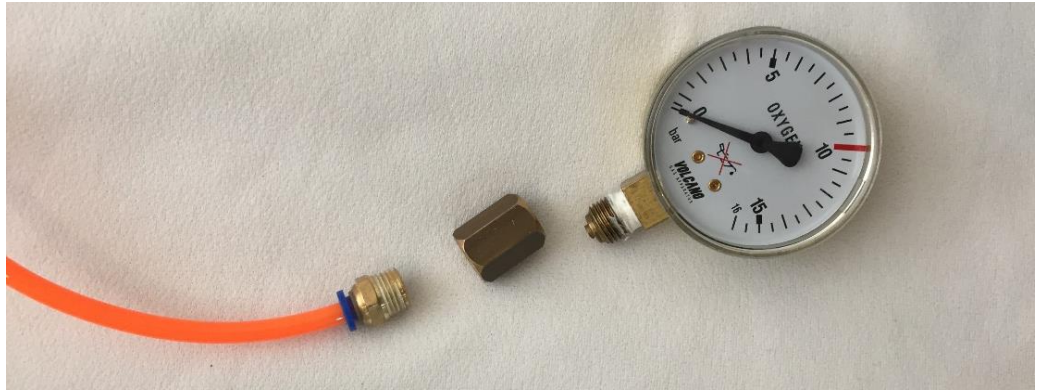


- In the next step, take a [RS PRO Tee Tube-to-Tube Adaptor Push in 6 mm, Push in 6 mm to Push in 6 mm, Tube-to-Tube Connection] and Connect two 6 mm hoses to the previous two structures and add a 20 cm hose to the last slot.



- In the next step, we want to prepare the part related to the pressure gauge. Like the quick connector sector, we need a couple of couplings and a 3.4 to 6mm adaptor

The coupling is connected between the pressure gauge and the 3.4 inch to 6 mm converter and the 20 cm hose is connected to the end of the converter.



- As shown above, the other remaining parts are connected to another T-shaped connector.
- Finally, a suitable connection must be prepared to connect the structure to the tube manometer piece.



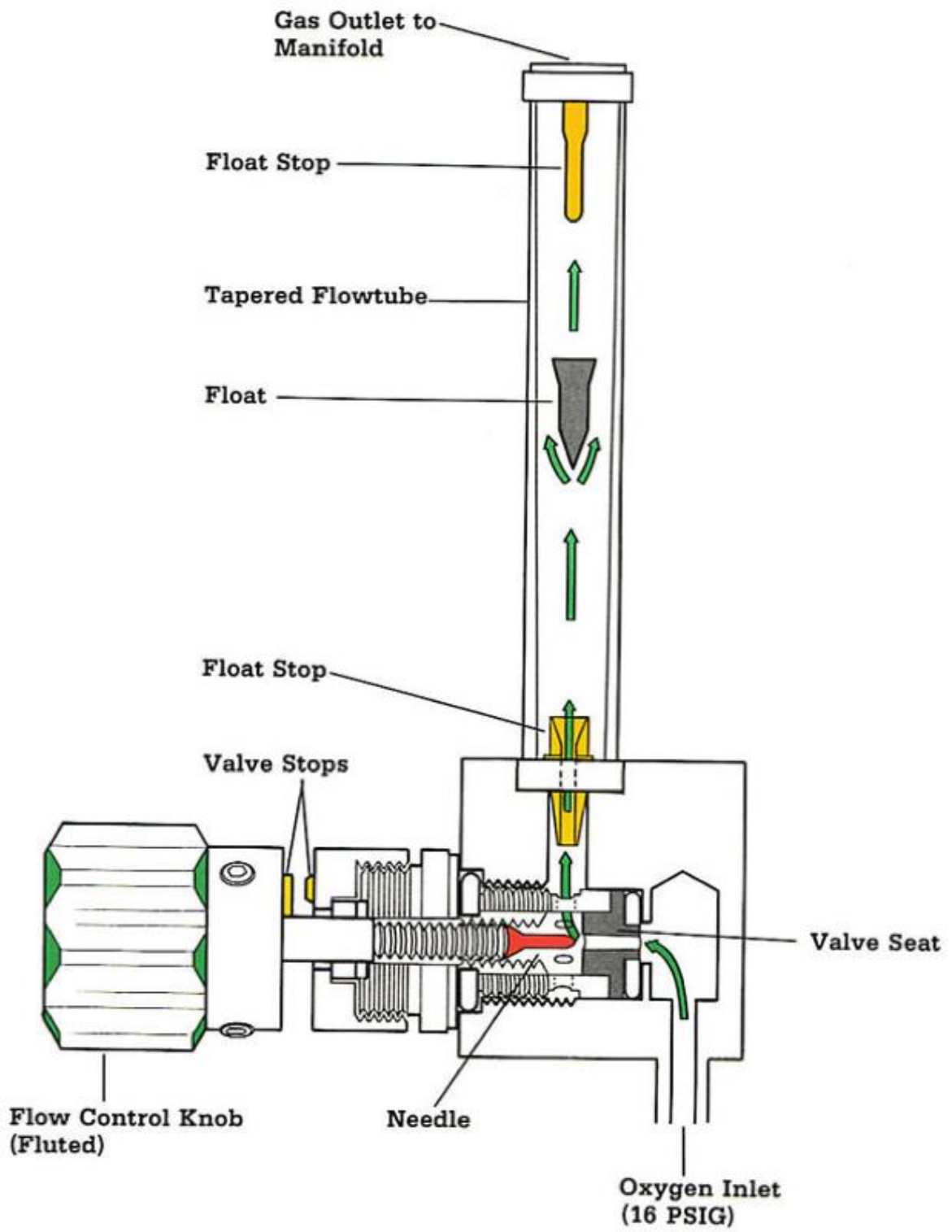
The first part is complete for now.

Tube flowmeter:

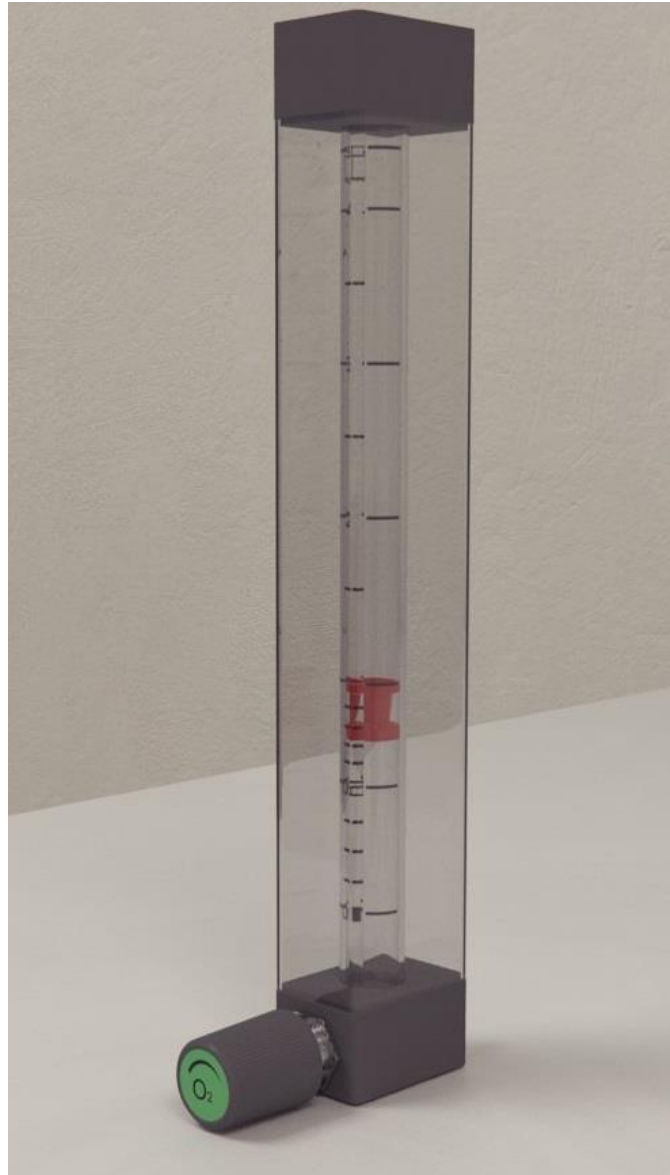
The amount of combined oxygen with the patient's respiratory air can be a quantitative element for the treatment process that can be stored and classified, or can create more accurate in applying the amount of the oxygen to the device by the treatment staff.

Mass-produced ventilators use advanced technologies to combine oxygen, but since the MakAir is designed for Force majeure conditions, we replace a simple and practical mechanism.

Tube flowmeters used in anesthesia machines are cheap and affordable options. They can even be made in large numbers with the help of lathe and three-dimensional casting.







All manometer tubes have an auxin inlet from the bottom of the block with 1/8-inch nut. Rare and older models use 3/4-inch nuts, which can be fixed with a coupling.

Similarly, the output of flowmeter tubes is usually 1/8 inch (Female).

Pneumatic route after flowmeter:

To make this part of the circuit, which is responsible for transferring the regulated oxygen from the flowmeter and mixing it with the air mixer, it is as follows:

- Prepare a 30 cm piece of [Festo Air Hose Black Polyurethane 12mm] hose

Fill one end of the hose with 1/8 gear coupling and the other end with 3/4 gear coupling and use clamp to ensure



- At this stage, cut 15 cm of 8 mm polyurethane hose and connect an 8 mm to 1/8-inch converter to one end and an 8 mm to 3/4-inch converter to the other end.



- Next, the 3/4-inch connection should be connected to a coupling on the female end of this size and the other end of the coupling should be connected to the black hose.



- Cut two pieces of 15 cm ligris hose and place a 1/16 elbow on one side and a 1/8 elbow on the other side.



1/16 Connections enters the oxygen blender.

- Pick the [FEMALE BSPP TEE CONNECTOR, G1/8] up and Connect the 1/8 part of the ligature hoses that we mentioned.
At the end Connect the 8 mm hose in the third slot.



