AIR-PUMP UNIT

The air puff unit is designed in compliance with,

*Medical device **standards**
*Ensuring it meets regulatory requirements for **safety**
*Performance and quality control
*The Air-puff **doesn't harm** the eye.

The air puff unit consists of

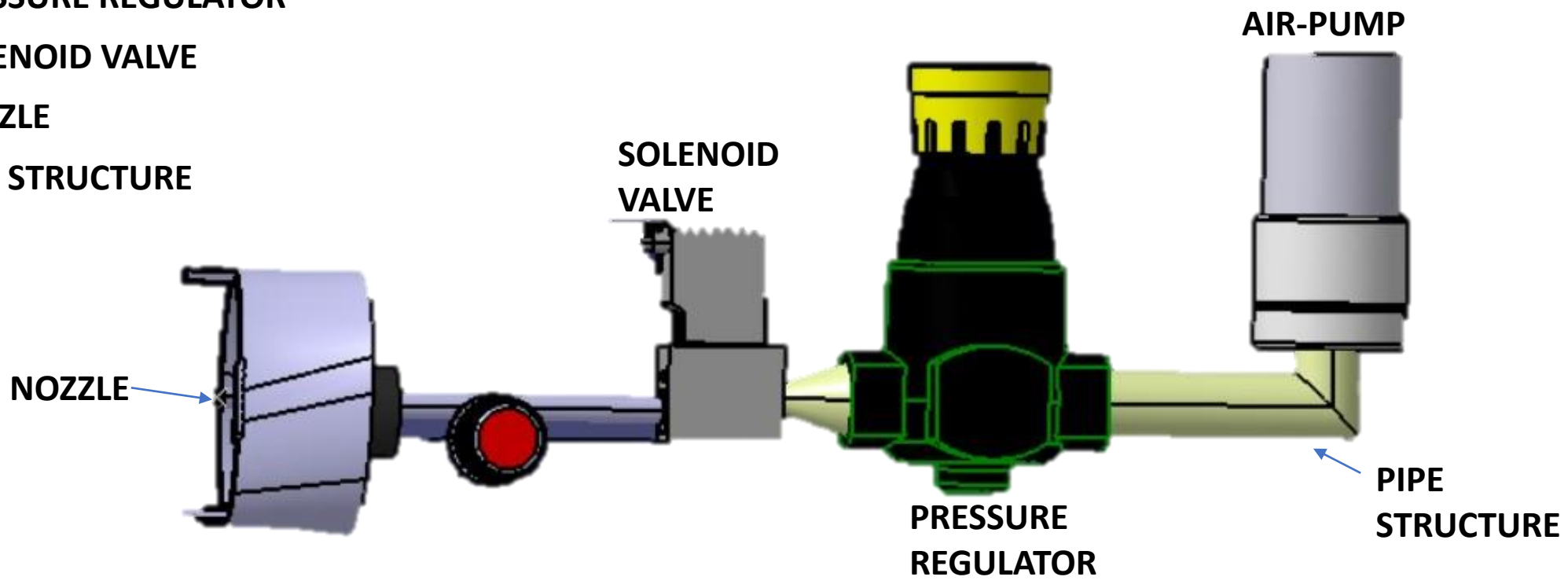
1. AIR-PUMP

2. PRESSURE REGULATOR

3. SOLENOID VALVE

4. NOZZLE

5. PIPE STRUCTURE



1. AIR-PUMP:

To generate the required puff of air ,a **12V DC vacuum air pump** will be used.

*Rated current = **300mA**
*Air pump rate = **4LPM**
* Maximum pressure = **750mmHg**
*Operation will be controlled by a **push button** and the **ESP32**
*It has a length of 68mm and a diameter of 24mm,small in size

2. PRESSURE REGULATOR:

It regulates the pressure coming **from the air pump** and delivers it **to solenoid valve**.

***Miniature air pressure** regulator series
*Ensures air puff is strong enough to flatten the cornea
*Maximum supply pressure = **17.2 bar** (12901.06mmHg)
*Can regulate up to desired air pressure (**50-55 mmHg**)
*Regulate up to **0-4.1bar**

3. SOLENOID VALVE:

The solenoid valve **opens and closes within milliseconds**, providing the **quick air pulse** necessary for accurate tonometry.
The solenoid valve controls the release of a **precise and rapid air puff** directed toward the eye for IOP measurement.

*Flow model = **unidirectional**
*Response time-less than **50ms**
*Operating pressure = **1.2Mpa**
*Flow rate = **0.23Cv(fluid flow)**
*Valve **type-2 way** normally open

4. NOZZLE:

It focuses air puff towards Center of the cornea (3-4mm), ensures the air is delivered in precise.

*Customized 3D printed **ROUND-JET** model
*Diameter = 2mm
*Length = 2cm

From this Nozzle ,we can ensure that delivered **air-pressure** will be **55mmHg**.

5. PIPE STRUCTURE:

Ensuring a **smooth flow of air** within the system ,without **significant loss of pressure**.
Designed to maintain consistent pressure and velocity profiles for optimal performance in the air puff mechanism.

*The pipe structure follows **BERNOULLI'S PRINCIPLE TO AVOID PRESSURE LOSS.**
*Material used in the construction of pipe is **Polyurethane (PU).**

Finally by **calibrating** all the units output ,we can get **controlled output (55mmhg)** to measure the **IOP accurately** without harming the user.

For orientation of cornea : Neon glittering paint is coated in the outer rim of nozzle , to achieve the correct orientation, X shaped mark is made in the hollow part of nozzle, so that the IR emitter and photodiode which are present in the sides of nozzle can align correctly.