Micropump Module

ID: MTD-1

Mechanical Testing Protocol

Due Date: 4/6/2020 11:59 PM, Canvas Upload

Mechanical Testing Protocol: – (PP-1)

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Protocol Description – (Mechanical Testing Protocol for PP-1)

With the upgrades that were added to the pump, as described in PP-1, the new design will be tested to verify it meets all the design verifications and validations. To test the new design flow rate, the flow rate of the old design will be timed and compared to that of the new design. The new design will have the same or faster flow rate as the old design.

The user interface will have the calculations needed to adjust the steps per second when the user inputs a flow rate and a tube diameter value. To test that the improved design will have the same or faster flow rate, a timer will be used to time how long it takes for a specific amount of water to get pumped through the micropump. This will then be compared to the old design; both designs should be around the same time.

To display the status of the motor, the LED light should turn green when the motor is turned on and will turn red when the motor is turned off. For all the other improvements, as stated in PP-1, they will be tested in a qualitative manner based on a pass or fail test. Overall, all testing will be defined by a pass or fail; this is done so that all the specifications are met for better user experience.

3D Printing – Mechanical Testing Protocol

Tools and Equipment

#	Tool	Name / # if applicable	Location	Purpose
TE1	Arduino Uno (Micropump circuit)	N/A	Design Lab	To read inputs and referenced in PP-1
TE2	Timer	N/A	Design Lab	To time the flow rate of the new design and compare it to the old one
TE3	3D printed pump housing unit	N/A	Design Lab	Part of the pump design
TE4	3D printed pump rotor	N/A	Design Lab	Part of the pump design

Materials

ID	Material	Name / # if applicable	Location	Purpose
MAT1	Water	N/A	N/A	For flow rate testing
MAT2	Heat shrink tube	HS-615C	Online	To prevent the tube from slipping
MAT3	Tygon tube	N/A	Design Lab	Part of the pump design

Improved Micropump Testing

ID	Test	Pass (Yes)/Fail (No)
IMT1	Does the light turn red when the motor is off?	Pass (seen in the video)
IMT2	Does the light turn green when the motor is on?	Pass (seen in the video)
IMT3	Does the tube stay in place when the heat shrink tube is placed on it?	N/A
IMT4	Does the new pumping design allow for easier insertion of the tubing?	N/A
IMT5	Can the user easily enter different flow rates?	Pass (seen in the video)
IMT6	Does the new design have the same or faster timing as the old design when set to the flow rate to pump water?	N/A

Values to be Recorded

ID	Design	Flow Rate (cm^3/min)	Time (sec)
VR1	Old	Default = 1	25
VR2	Improved		N/A

Notes:

References for Materials

ID	Website Link
MAT2	https://www.amazon.com/innhom-615pcs-Shrink-Tubing-Approved/dp/B07GS7PBHV