

Micropump Module

ID: DCW-1

Design Controls Worksheet

Due Date: 2/13/2020 11:59 PM, Canvas Upload

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Improvement on Existing Design




User Needs

User Needs Matrix

ID	Description
UN-1	Improved UX / UI to allow for operator control.
UN-2	Improve Solidworks files to include assembly, hardware, configurations and drawings.
UN-3	Eliminate warping of printhead resulting to motor temperature when located in incubator.
UN-4	A method to stop or detach pump heads individually when part of a multi-pump design.
UN-5	Eliminate breadboard or prototype parts in circuit .

Design Inputs

Requirements Matrix

Requirement ID	Requirement
DI-1	The user interface  should allow the user to set a pump flow rate.
DI-2	The user experience should add an LED to indicate the status of the motor (on or off). 
DI-3	Improved SolidWorks files should allow for an easier method to assemble the design. 
DI-4	The design should improve the insertion of the tube into the motor.
DI-5	The design should prevent tube slippage.

Design Outputs

Design Outputs Matrix



Requirement ID	Requirement
DO-1	The user shall be able to set different pump flow rates via a user interface.
DO-2	The user shall know the status of the motor (on/off) with an LED light (green/red).
DO-3	The SolidWorks files shall include updated parts.
DO-4	The design shall have an easier method to insert the tube into an updated pump housing unit.
DO-5	The design shall prevent the tube from slipping caused by motor rotation.


Design Verification

Verification Matrix

Requirement ID	Description	Expected Results	Pass/Fail
DO-1	The flowrate of the pump can be adjusted through the user interface.	Increased set flow rate should correspond to increased motor speed.	All the verifications are expected to meet the specifications.
DO-2	The status of the motor will be indicated by the color of the LED; green is on and red is off.	The LED light should turn red when the motor is not in motion and green when the motor is in rotation.	
DO-3	The SolidWorks files will include the following for the design: exploded assembly view, drawings, and a final rendering.	The updated SolidWorks files should aid in assembling the design.	
DO-4	The new design of the pump housing unit will allow for easier insertion of the tube.	The flow rate should still be the same as the previous design. In addition, the improved design will be able to maintain the position of the tube within the grooved pump housing unit and around the rotors.	
DO-5	The placement of the heat shrink tube will prevent the tube from slipping.	The tube should not slip when the motor rotates; it should stay in place.	

Design Validation

Validation Matrix

User Need ID	Description	Expected Results	Pass/Fail
DO-1	The user can easily change the flow rate of the pump.	The user will have a better user experience with the improved design.	All the verifications are expected to meet the specifications.
DO-2	The user will have an easier method of monitoring if the motor is turned on or off based on the color of the LED.		
DO-3	The design will be easier to assemble using the updated SolidWorks files. 		
DO-4	The user will have ease placing the tube in the grooved pump housing unit and around the pump rotors.		
DO-5	The user will not experience any stuttering of the motor as the heat shrink tube will secure the tubing.		