Design Controls Worksheet

Department of Bioengineering
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Micropump ID: DCW-1

Due Date: 4/6/2020 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 the printhead resulting in motor temperature when located in the 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 the circuit.

Design Inputs

Requirements Matrix

Requirement ID	Requirement
DI-1	The User Interface shall allow the user to set a pump flow rate.
DI-2	The design files shall include assembly, hardware, configurations, and drawings.
DI-3	The design shall be resistant to warping due to high temperatures.
DI-4	The design shall allow individual pump heads to be detached or stop when it is a part of a multi-pump.
DI-5	The design shall eliminate the use of breadboard or prototype parts in the circuit.

Design Outputs

Design Outputs Matrix

Requirement ID	Requirement
DO-1	The motor turns at a different calculated rate through inputting flow rate and tubing diameter from users
DO-2	The design files include assembly, hardware, configurations, and drawings.
DO-3	The pump housing does not change shape at 39 ^{o}C.
DO-4	Various micropumps rotate with one motor.
DO-5	The design will include a pcb.

Design Verification: **The evaluation of whether or not a product, service, or system complies with a regulation, requirement, specification, or imposed condition. It is often an internal process.**

Verification Matrix – Write at least 5 Verification tests that

Requirement ID	Description	Expected Value	Measured Value	Pass/Fail
DI-1	The micropump flow can calculate stepper rate by taking in the user interface: tubing type and desired volumetric flow rate for speed control			
DI-2	Solidworks files are available and accessible	N/A	N/A	
DI-3	The design must be able to withstand warping at the incubator temperature of 39 degree Celsius	>= 39 degree Celsius	N/A	
DI-4	Varying number of pumps can be turned by a single motor at an acceptable rate.	5 pumps	N/A	
DI-5	The micropump must be able to pump fluids without the need of breadboard or large prototype parts		N/A	

Design Validation:

Validation Matrix

User Need ID	Description	Expected Value	Measured Value	Pass/Fail
UN-1	The stepper speed is controlled by taking in tubing type and desired volumetric flow rate, code can be executed from any reasonable inputs. If no valid input is	Flow rate = 0.5 mL/ms	N/A	

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	received, the default speed will run.	Tubing diameter = 0.3 cm		
UN-2	Solidworks files are available and accessible.	N/A	N/A	
UN-3	Pump housing withstands warping at 39 ºC	>= 39 degree Celsius	N/A	
UN-4	Multiple pumps can be turned using a single motor. Individual specific pumps can be stopped and/or replaced within the multi-pump.	1-5 pumps	N/A	
UN-5	The micropump pumps fluids at the set speed and volume without the use of breadboard or prototype parts in the circuit.	Desired set speed	N/A	