

2024421

by Matthew Perry

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Sink Accessory Prototype

Matthew Perry

Reminder of Aims and Objectives

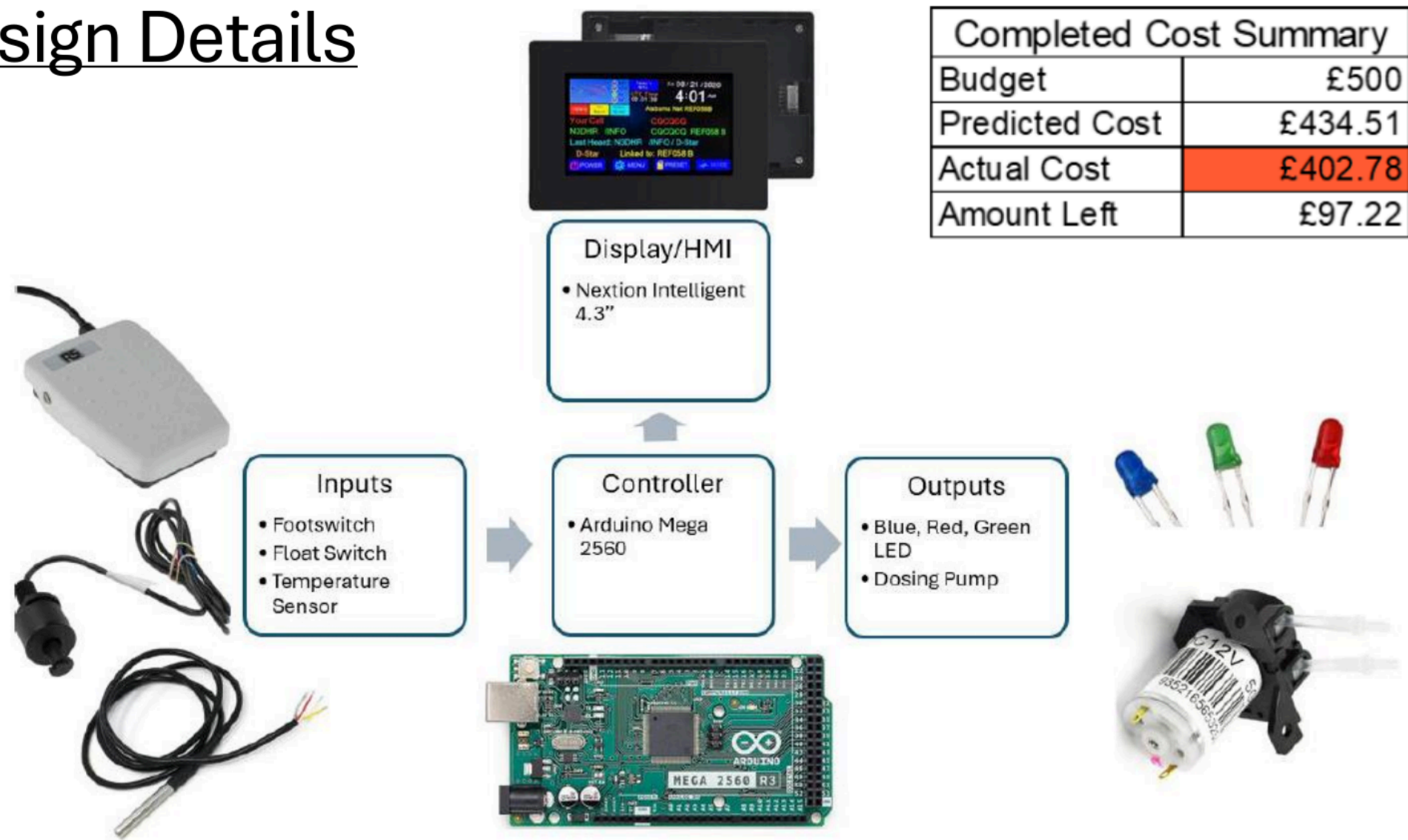
- Develop a prototype to assist medical professionals by monitoring the following key parameters:
 - Cleaning time
 - Dosing
 - Temperature
 - Visual Indicators
- Integration of systems into one calibrated solution will enhance compliance with BS EN ISO 13485.

Functional Design Specification

Functional Design Specification Key	
Reference	Characteristics
A	Physical
B	Software
C	Safety
D	Alarms
E	Performance

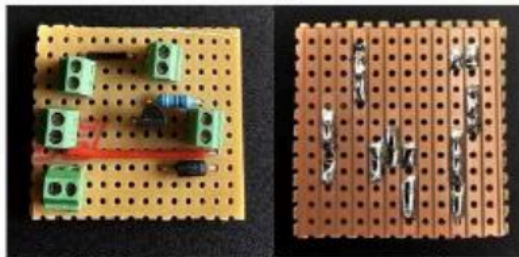
A1.3	The dosing pump must have a yellow cover near the tubing connections.
C1.2	Guarding must be provided around the pump connections to prevent accidental spray.
C1.5	Clearly indicate potential electrical hazard.
C1.6	Control box must have a minimum IP rating of IP55 (IEC 60529).
D1.2	A red and green out of limits indicator must be provided for temperature.
D1.3	Overdue service alarm (Annual alarm).

Design Details

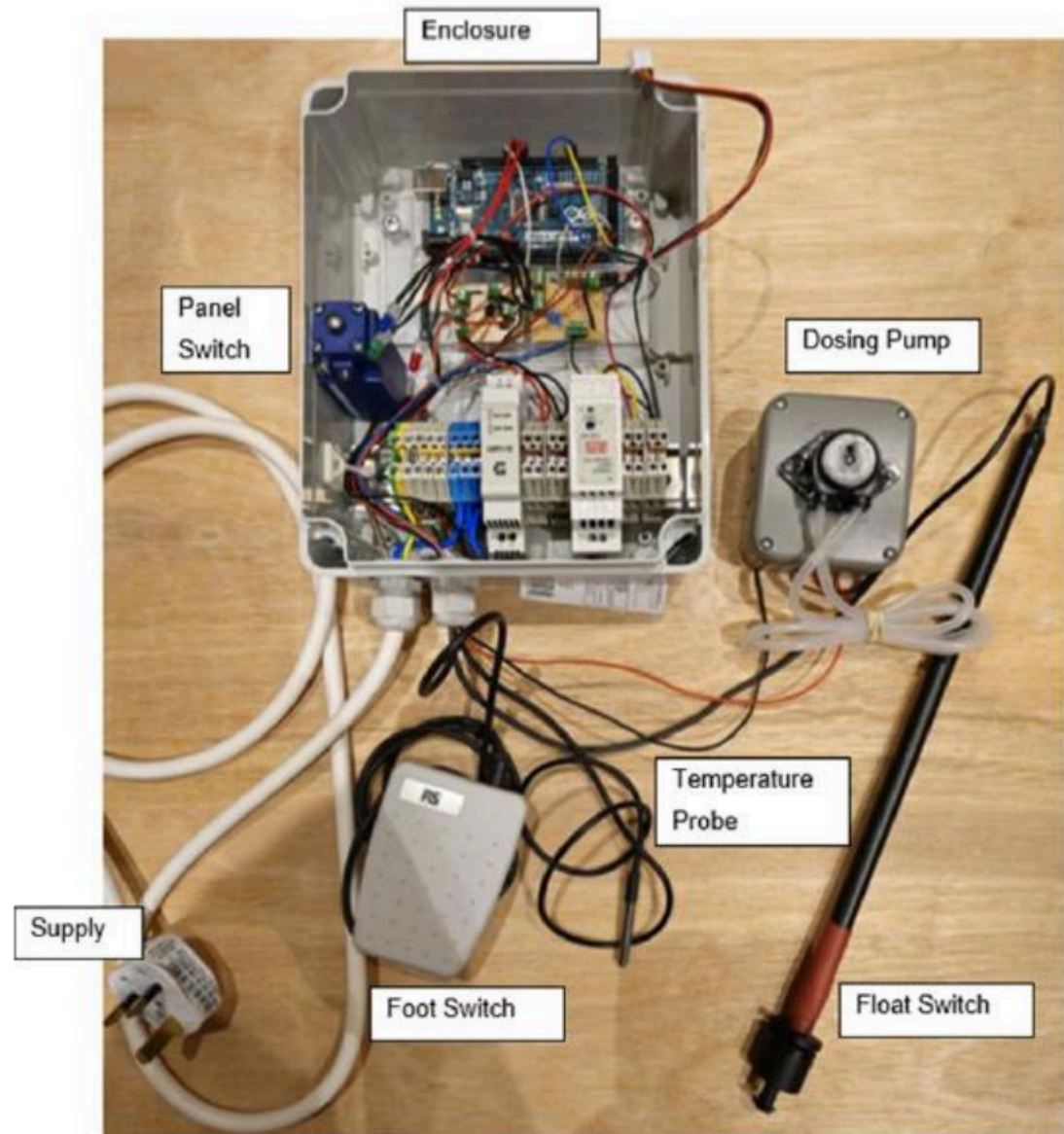
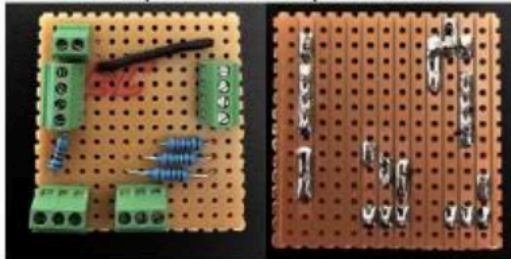


Construction Phase

Transistor Switching Circuit & 12V



5V Outputs and Temperature In



Software

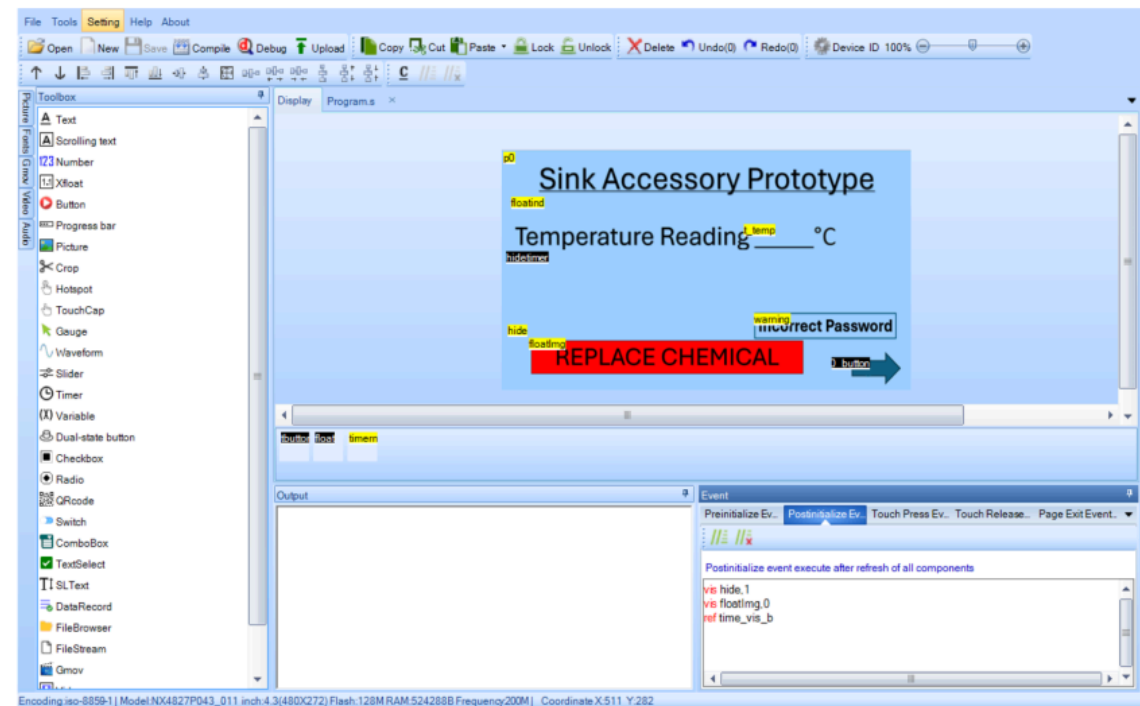
Arduino IDE

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Bsc3ProjectCommented | Arduino IDE 2.3.4
File Edit Sketch Tools Help

Bsc3ProjectCommented.ino

1 //Libraries
2 #include <OneWire.h> // Temperature sensor
3 #include <DallasTemperature.h> // Temperature sensor
4 #include <Nextion.h> // Communication for Nextion
5
6 // Pin definitions
7 #define ONE_WIRE_BUS 50 // Temp sensor
8 const int ledLow = 5; //Blue
9 const int ledMedium = 6; // Green
10 const int ledHigh = 7; // Red
11 const int pumpPin = 8; //Pump signal
12 const int footSwitchPin = 52; // Footswitch
13 const int floatSwitchPin = 53; // Floatswitch
14
15 // Initialise libraries
16 OneWire oneWire(ONE_WIRE_BUS);
17 DallasTemperature sensors(&oneWire);
18
19 // Nextion objects where objectname page number, ID
20 NexText t_temp = NexText(0, 4, "t_temp"); // t_temp (object name), 0 (page number), 4 (ID)
21 NexNumber t_offset = NexNumber(0, 8, "t_offset");
22 NexNumber t_amount = NexNumber(0, 7, "t_amount");
23 NexText t_remaining = NexText(0, 6, "t_remaining");
24 NexNumber t_dosetime = NexNumber(0, 9, "t_dosetime");
25
26 NexButton b_start = NexButton(0, 5, "b_start");
27 NexButton b_manual = NexButton(1, 7, "b_manual");
28 NexButton b_red = NexButton(1, 3, "b_red");
29 NexButton b_green = NexButton(1, 5, "b_green");
30 NexButton b_blue = NexButton(1, 4, "b_blue");
31 NexButton b_pump = NexButton(1, 6, "b_pump");
32
```

Nextion Editor



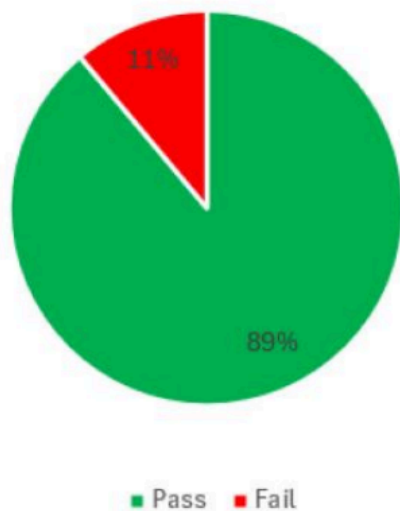
Testing Phase

- 18 tests covering 5 key characteristics referenced to the FDS

Test Plan						
Test Number	FDS Reference	Description	Expected Result	Actual Result	Pass/Fail	Evidence
1	A1	Press the footswitch.	Dosing sequence starts immediately after pressing the footswitch.			
2	B1	Place calibrated probe next to systems temperature probe in a container filled with water at 27 degrees by using a calibrated probe.	The systems temperature reading is within 1 +/- degree of the calibrated probe reading between 26 and 28 degrees.			
3	B1.1	Fill container with water at 23 degrees referencing a calibrated probe for accuracy. Using the systems digital display alter offsets/potentiometers to match. Check display to ensure system is reading 23 degrees.	The systems temperature probe is calibrated accurately, matching the reading of the calibrated reference probe and on the system displays within +/- 1 degree (Between 22 and 24 degrees).			
10	C1	Select settings page, password should be requested and enter wrong password.	Entry is denied and a message states that the password is incorrect.			
13	D1.1	Fill a container and insert the dosing lance. Remove the lance and then check the display.	An alarm indicates that the bottle is empty on the digital display.			
17	E1.2	Set dosing time to achieve 100ml, insert lance into a 500ml cylinder and press footswitch to commence dosing. Record result and repeat the action 3 times.	Recorded results are within +/- 5% of each other. Results read between 95ml to 105ml.			
18	E1.3	Check the repeatability of the float switch by removing and inserting the lance from a container filled with water, while checking the display. Repeat the action 3 times.	A low-level alarm indicator is shown each time after removal and then cleared after re-inserted.			

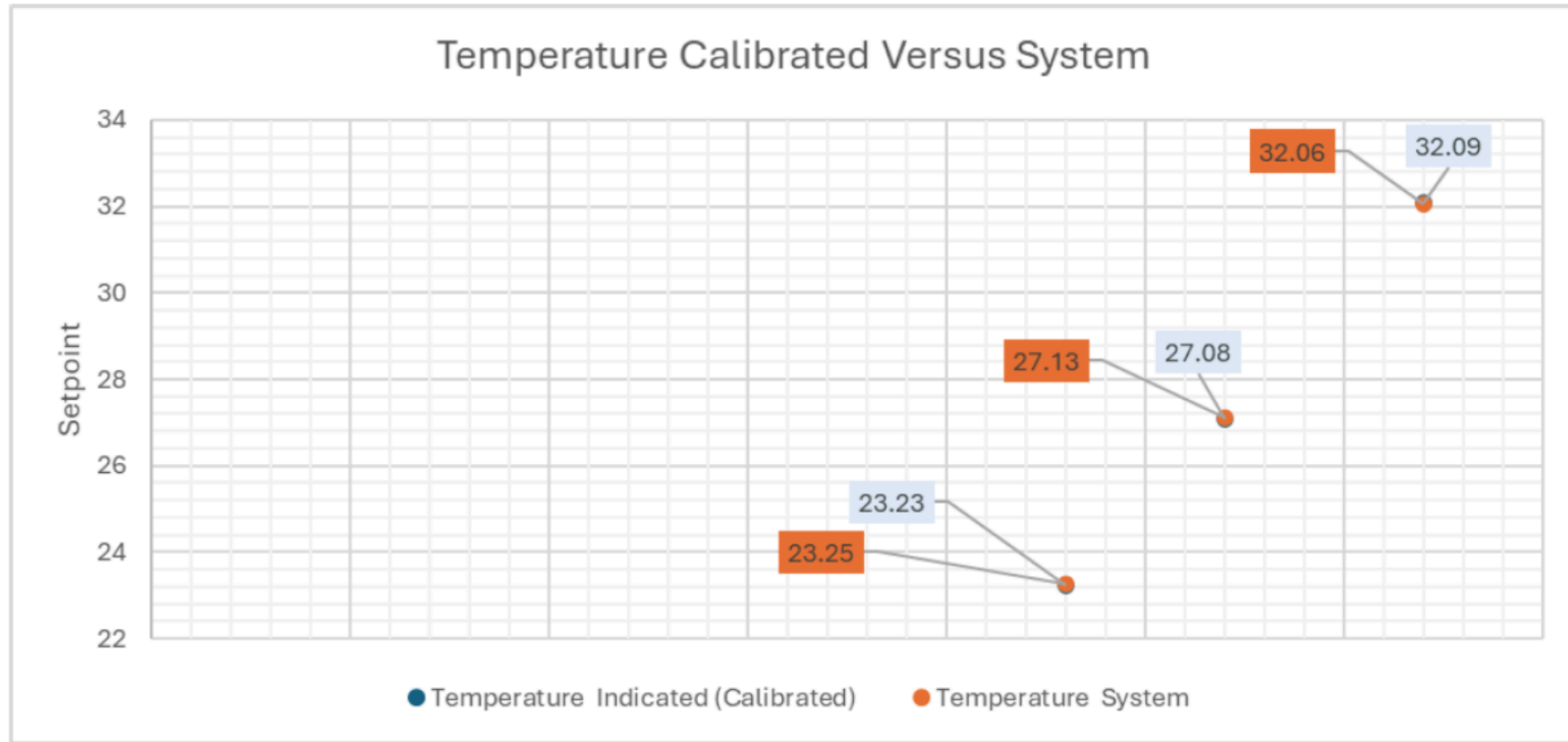
Testing Results

Pass/Fail Result of Testing



14	D1.2	Check red and green indicator for temperature out of limits. Using calibrated reference probe ensure the water is below 23 degrees and then check the indicator. Increment the temperature by 1 degree up until 32 and check the indicator. Lastly, increase the temperature past 32 degrees and check the indicator.	The indicator shows the following: - Below 23 degrees = Red - Between 23-32 degrees = Green - Above 32 degrees = Red	LED shown as follows : 23 degrees or below = Blue Between 23-32 degrees = Green Above 32 degrees = Red	Fail	Figure 37
15	D1.2	Check the service alarm by setting the calibrated date, then amend the current date to a year later in the settings page.	Annual service alarm will appear on user interface.	N/A	Fail	N/A

Testing Results

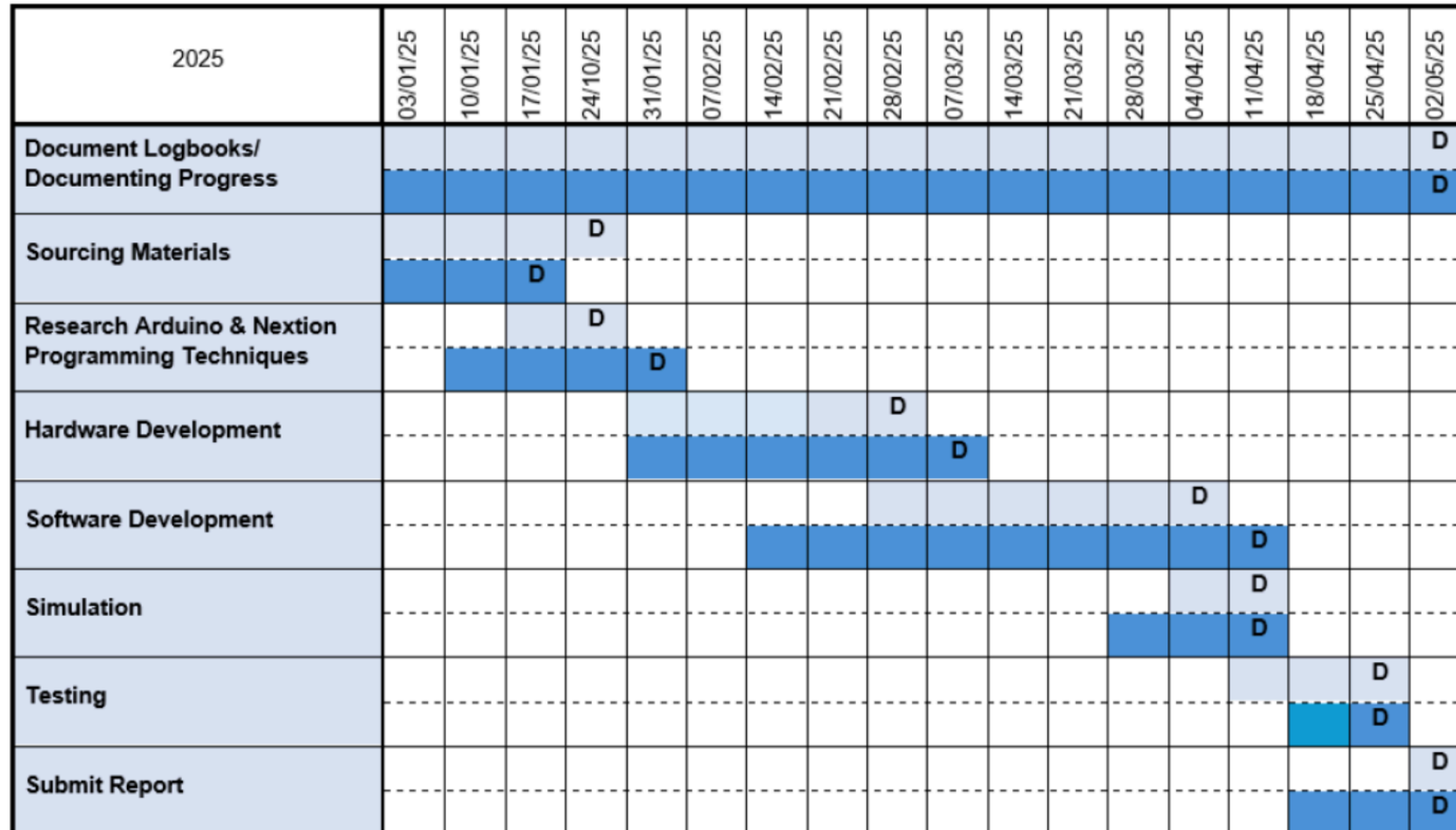


Evaluation

Constraints

- Ethical
- Environmental & Sustainability
- Legal & Commercial

Gantt Chart



Overall Conclusions & Recommendations

- Total cost: £402
- Pass rate 89%
- Met majority of FDS
- High accuracy for low budget
- Key Characteristics from aims & objectives met
- IP Rating
- Design Software
- Custom PCB

2024421

GRADEMARK REPORT

FINAL GRADE

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GENERAL COMMENTS

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MATTHEW PERRY

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1. ENGAGEMENT WITH LITERATURE

2. KNOWLEDGE AND UNDERSTANDING

3. COGNITIVE AND INTELLECTUAL

4. PRACTICAL APPLICATION

5. TRANSFERABLE SKILLS