# Requirements and specifications for a temperature sensing piHAT

The aim of this report is to outline the requirements and specs of a piHAT which senses temperature to be designed.

# Requirements for possible Use cases

## Home Weather Station

R1.1: Measure temperature accurately to 0.5 °C.
R1.2: Notify user once temperature exceeds a certain voltage.
R1.3: Device should be capable of operating for long continuous periods of time.
R1.4 Should be able to work with any standard Pi.
R1.5 Notify user of the temperature operating range.

## Soil Temperature Monitor

R2.1: Should not be too sensitive to temperatures within a certain range.
R2.2: Should be water resistant.
R2.3: Should not read external temperature accidentally.
R2.4: The device should notify the user when soil temperatures near the end of the acceptable range.

## Geyser Temperature Display

R3.1: Should be able to function properly and accurately even when exposed to temperatures up to 60°C.
R3.2: Should be small and weigh less enough for it to not be a burden on the geyser and affect its functions.
R3.3: Should notify the user when it reaches 60°C.
R3.4: The device should require minimal power to operate fully.

## Refrigerator unit temperature logging

R4.1: The piHAT should log the temperature of the refrigerator at regular intervals
R4.2: Device should not be affected by humidity.
R4.3: The device should be on while the refrigerator is on.

# Q3 Specifications [20]

## Mechanical Specifications

| **Requirement** | **Specification(s)** | **Acceptance Test Criteria** |
|---|---|---|
| **R1.4** Should be able to work with any standard Pi | **S1.1** should include 40pin Pi compliant header<br><br>**S1.2** Should have at least an 8mm gap betweeen the piHAT and raspberry pi. This can be achieved with 10 mm spacers. | Final design meets the specification |
| **R3.2** Should be small in dimensions | **S1.3** Should have 76.0mm x 40.5mm x 7.0mm | Final design dimensions are within limits |

## Electrical Specification

| **Requirement** | **Specification(s)** | **Acceptance Test Criteria** |
|---|---|---|
| **R 1.4** Should be able to work with any standard Pi. | **S1.4** Have an operating voltage of 0-3.3V<br><br>**S1.4** The power supply should step voltage down from 230V. | Have a power supply that is limited to 3.3V |
| **R 3.1** Should be able to measure low temperatures e.g soil temperature and higher ones (e.g for a geyser) | **S1.5** Temperature sensor should have -50°C - 250°C temperature range | The final design will be chamber tested at -50°C and 60°C for 12 hours, the components used in the design should also be able to operate under these |

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|---|---|---|
| | | conditions/ have a specific temperature coefficients. |
| **R1.1:** Measure temperature accurately to 0.5 °C | **S1.6** use a 9 bit resolution temperature sensor eg PT100 | Use an external thermometer to verify if results are accurate. |
| **R1.3:** Device should be capable of operating for long continuous periods of time | **S1.7** have a constant uninterrupted power supply attached to the HAT | Design meets the specification |

# Functional Specifications

| **Requirement** | **Specification(s)** | **Acceptance Test Criteria** |
|---|---|---|
| **R1.2:** Notify user once temperature exceeds a certain voltage. | **S1.8** Blue LED should light up once a temperature of 60°C has been reached. | Design meets the specification. |
| **R1.5** Notify user of the temperature operating range. | **S1.9** Red LED for 0-2V (0-30°C)<br>Green LED for 2-3.2 V( 30 - 59°C)<br>Blue LED for 3.3V (60°C) | Final design is tested for temperatures within each range for each LED. Repeat tests must be done and the piHAT must pass all tests. |
| **R2.2** Should be water-resistant | **S1.10** The outer covering of the sensor should be sealed with a water resistant eg silicone. | Should pass IP53 testing |