

Test Document

Precision Testing

Test 1 - Does it show the same value for a given object?

Equipment Used

- Coffee Grinder
- Timemore [Black Mirror Nano Scale](#)
- [Breadboard prototype](#)

Criteria

- Given: An object of known weight
- When: The object is removed and placed again
- Then: The scale should display the same value each time
- Acceptable Range: $\pm 10\%$

Results

Placement	Control (g)	Test (g)	Percent Error (%)
1	380.4	380.3	0.02
2	380.4	380.4	0
3	380.4	380.5	0.05

The object was picked up and placed three times after the initial placement, as seen in the [video](#). The results of this test fall within the acceptable range, therefore the system is precise. However, the weight output tends to fluctuate, likely due to noise.

Test 2 - Does it show the same value over a long period of time?

Equipment Used

- Coffee Grinder
- Timemore [Black Mirror Nano Scale](#)
- [Breadboard prototype](#)

Criteria

- Given: An object of known weight
- When: The object remains on the scale for an extended period of time
- Then: The scale should continuously show the same weight for the same period of time

- Acceptable Range: $\pm 5\%$

Results

Time (s)	Control (g)	Test (g)	Percent Error (%)
5	298.7	298.4	0.10
15	298.7	298.5	0.07
30	298.7	298.9	0.07

When an object remains on the scale, the weight display tends to fluctuate; however, because the fluctuations are within an acceptable range below 5%, the system is still precise. The weight fluctuation could be potentially be solved through noise reduction measures and a redesign the load cell chassis.

Accuracy Testing

Test 1 - Benchmark weight against existing products

Equipment Used

- Coffee scoop (light weight)
- Metal bottle (medium weight)
- Coffee Grinder (heavy weight)
- Timemore [Black Mirror Nano Scale](#)
- [Breadboard prototype](#)

Criteria

- Acceptable Range: $\pm 10\%$

Results

Object	Control (g)	Test (g)	Percent Error (%)
Coffee Scoop	16.3	16.3	0
Metal Bottle	299.7	299.3	0.13
Coffee Grinder	380.8	380.2	0.15

All tests were within an acceptable range, therefore, our system is accurate.

Test 2 - Benchmark time against computer/phone clock

Equipment Used

- Timemore [Black Mirror Nano Scale](#)
- Breadboard prototype

Criteria

- Acceptable Range: $\pm 5\%$

Results

As shown in the [video](#), both timers seem to increment at the same rate. Therefore, we can say that our system is accurate in its timing.

Test 3 - Benchmark flow-rate calculation against existing products

Equipment Used

- Timemore [Black Mirror Nano Scale](#)
- [Breadboard](#) prototype
- Metal cup
- Paper cup

Criteria

- Given: Water flows from a container at a known flow rate
- When: Water flows onto the scale
- Then: The scale should display an accurate flow rate measurement

Result

We have determined from our [test](#) that a more consistent, controllable method should be used to measure flow rate. In the future, we'll use an object that provides a consistent flow rate (such as a funnel) and benchmark the scale against the Timemore scale.

Manual Testing

Equipment Used

- Timemore [Black Mirror Nano Scale](#) (or any timer)
- [Breadboard](#) prototype
- Any weight

Test 1 - Check sleep timer functionality after inactivity

Procedure

- Wake up the scale by pressing the wakeup button
- Place weight on scale and wait 30 seconds
- Observe if the scale remains on after 30 seconds
- Remove weight and leave the scale idle for 30 seconds
- Observe if the scale automatically powers off after 30 seconds
- Pass Criteria: The scale turns on when power button is pressed and turns off after 30 seconds of no activity

Result

In the [video](#), an object is placed on the scale to prevent the system from going to sleep. At 32 seconds, the object is removed and the system shuts off 30 seconds later at 1:02. This accurate shows the sleep timer is functioning properly.