**Method for Measurements:**

Calibration results should be documented so that the traceability of all measurements can be demonstrated and so that the calibration can be reproduced under conditions that are close to the original ones. In some cases, a verification result is included in the calibration certificate or report, indicating whether the equipment meets the specified requirements or not. The documentation can be in the form of handwritten notes, typed documents, microfilm, or in electronic or magnetic memory or other data media. The maximum permissible error can be determined by the metrological function or by reference to published specifications from the manufacturer of the measurement equipment.

**The sensor we use:**

A digital force gauge (<https://docs.rs-online.com/ebc3/A700000007226729.pdf>)

With the force gauge, we can record our measurements onto an SD card. The contents of the SD card are transferred to a computer and converted into an Excel file. The graph created in Excel can be compared to the graph generated by the software connected to the power cable. From the graphs, we can make adjustments in the code to optimize the machine’s weight. The force gauge samples at 1 Hz (1 sample per second). We need to fix the program so it samples at the same frequency. We also need to devise a method to synchronize our graphs.

**How measurements should be performed:**

The measurements should be static to achieve the best possible repeatability and reproducibility. By incrementally increasing the machine's weight at regular intervals in a static position, it becomes easier to compare the graphs generated with an accurate stability between different measurements. The weight should be increased in 5 kg intervals up to a maximum of 50 kg. One suggestion is to create a function in Python where we increase the weight linearly, for example, by 1 kg per second to ensure all measurements are taken with the smallest amount of human errors that can affect the data.

**Materials:**

* Digital force gauge with force sensor
* Power cable
* Powersupply
* Strap
* Encoder
* Sensor
* Motor
* Hardware to connect the parts
* Operating software
* Carabiner
* Handle

**Procedure:**

1. Plug the machine into a power outlet, start the program in Python, and calibrate the machine.
2. Reset the force gauge and its SD card.
3. Attach the force sensor between the belt and a stationary point.
4. Set the starting weight.
5. Method for synchronizing the graphs
6. Start the recording function on both the computer and the force sensor.
7. Run the implemented sine function for a few periods at a slow frequency, allowing the force sensor to capture many measurements per period.
8. Then switch to the "linear program."
9. Perform the measurements.
10. Document any potential sources of error.
11. Transfer the measurement data and convert it into graphs in Excel.
12. Synchronize the graphs.

Each measurement should be repeated 5 times so the outcomes can be compared. Then, an average value will be taken from the measurements recorded on both the computer and the force gauge, which will be plotted as graphs and compared. We will increase the weight by 5 kg approximately every 10 seconds until we implement a linear function in the program that can increase the weight at an exact time.

**Conclusion:**

Our method of recording data this way is to ensure the best and easiest repeatability, reproducibility and stability for us and others that want to do a similar product. We use the sensor because it is a state of the arc force gauge ensuring small measurement uncertainty and it has features good enough for our goals. This validating our method of recording data and making the data usable to accomplish our goal of calibrating our product so it has an offset of ± 0.5 Kg / ± 1.1 pounds.