SAS Prealignment Platform V4 Initial Test Results

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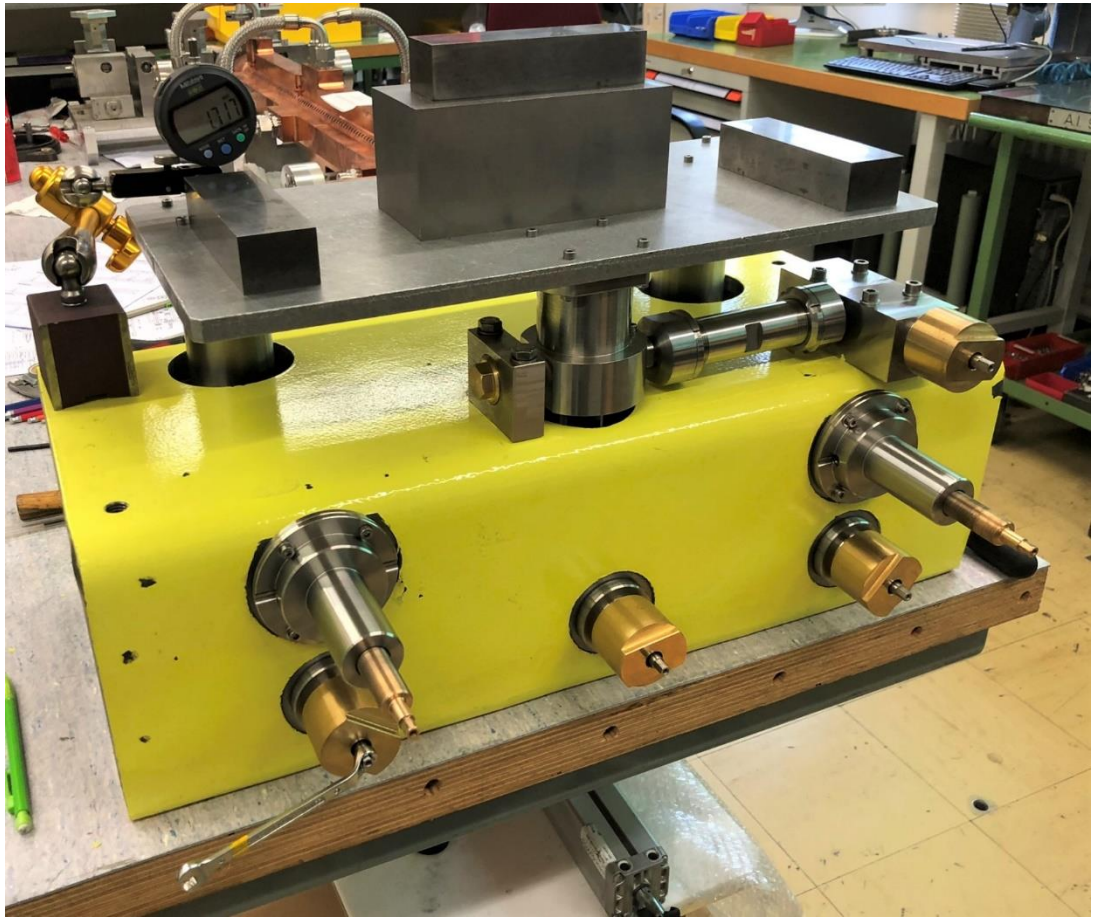
SAS Prealignment Platform V4

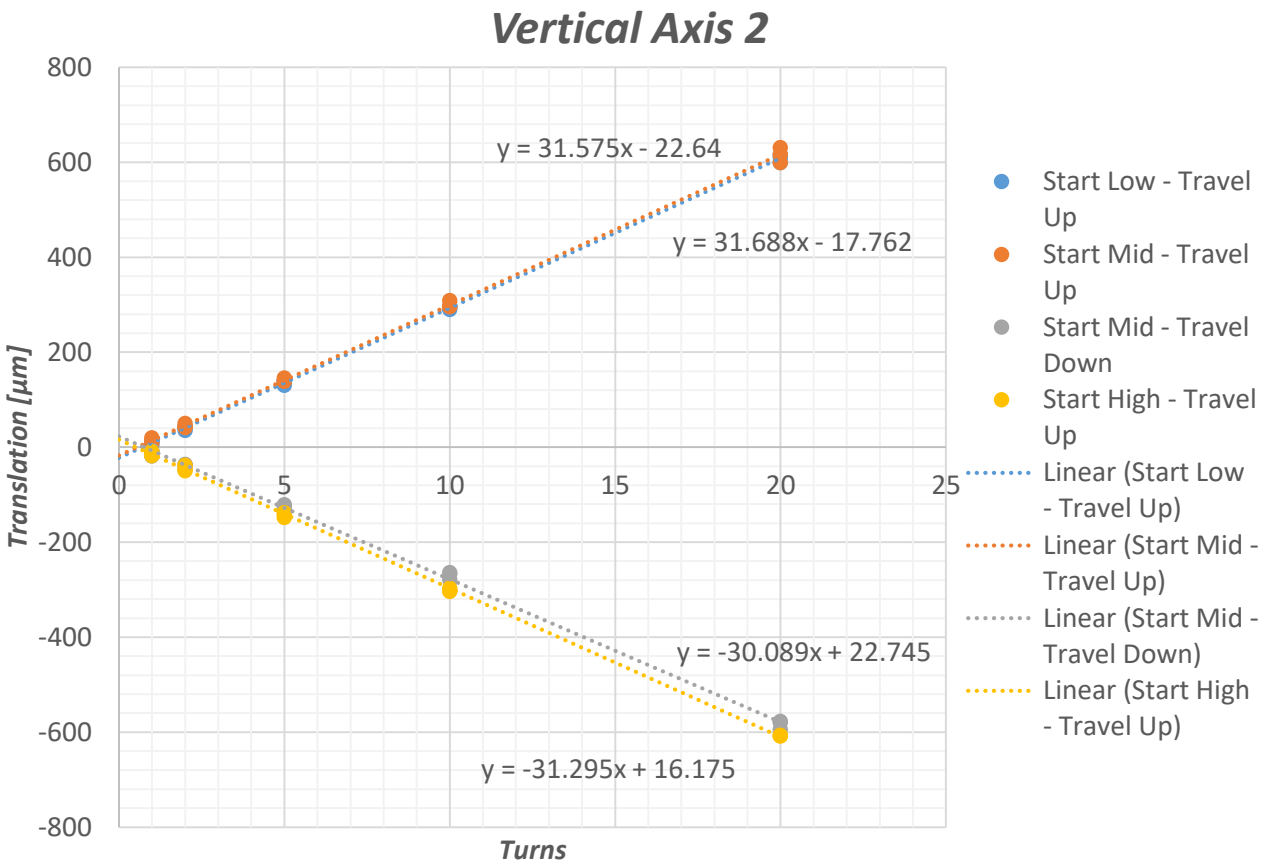
- Measuring individual axis adjustment using a contact DTI

- Manual individual axis adjustment



Vertical Axis 2 Results

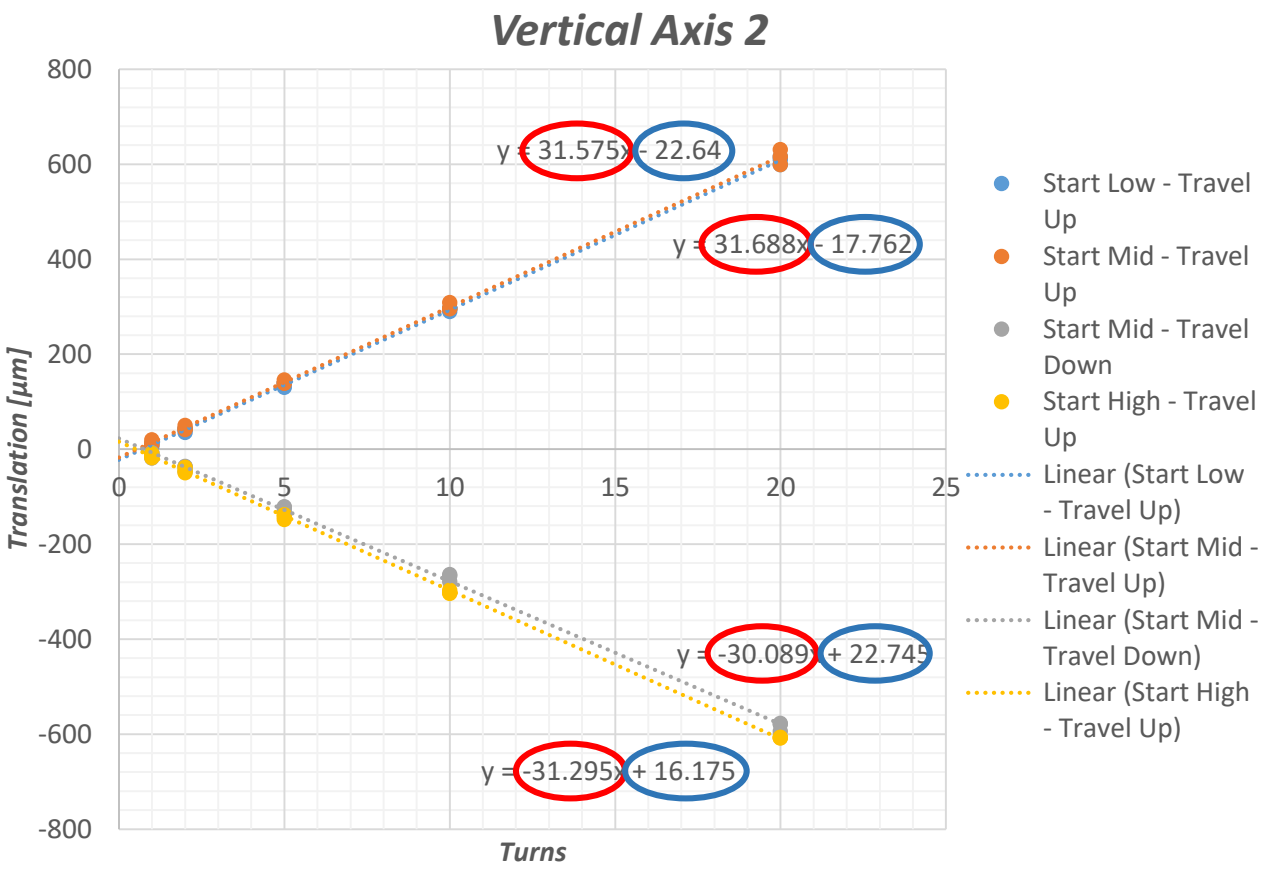
- Test procedure:
  - The axis is moved to a certain position:
    - Low limit of travel
    - Mid point in the travel
    - High limit of the travel
  - The position is approached in the opposite direction to the direction being measured
    - In order to *maximise* the backlash
  - The axis is then adjusted 1, 2, 5, 10, & 20 turns, and the resulting translation is recorded.
    - This was repeated 3 times
  - Translation against number of turns produces the graph right:



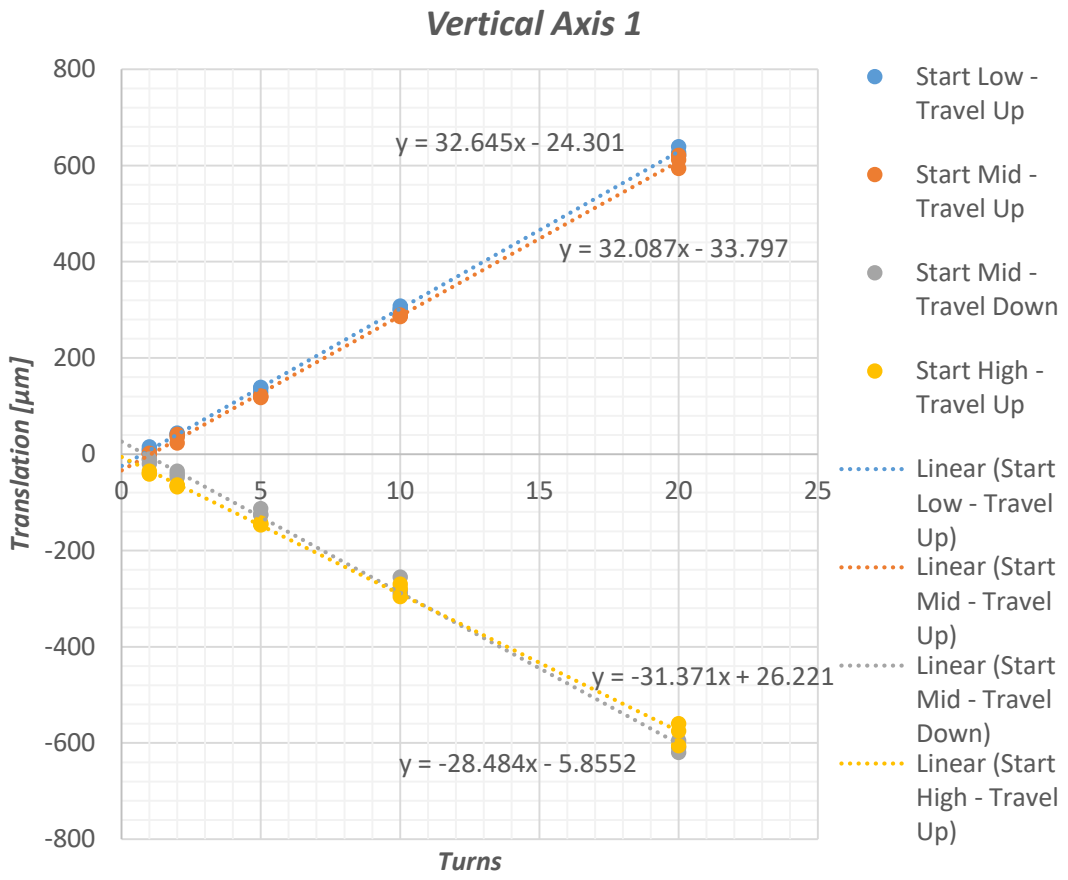
Vertical Axis 2 Results

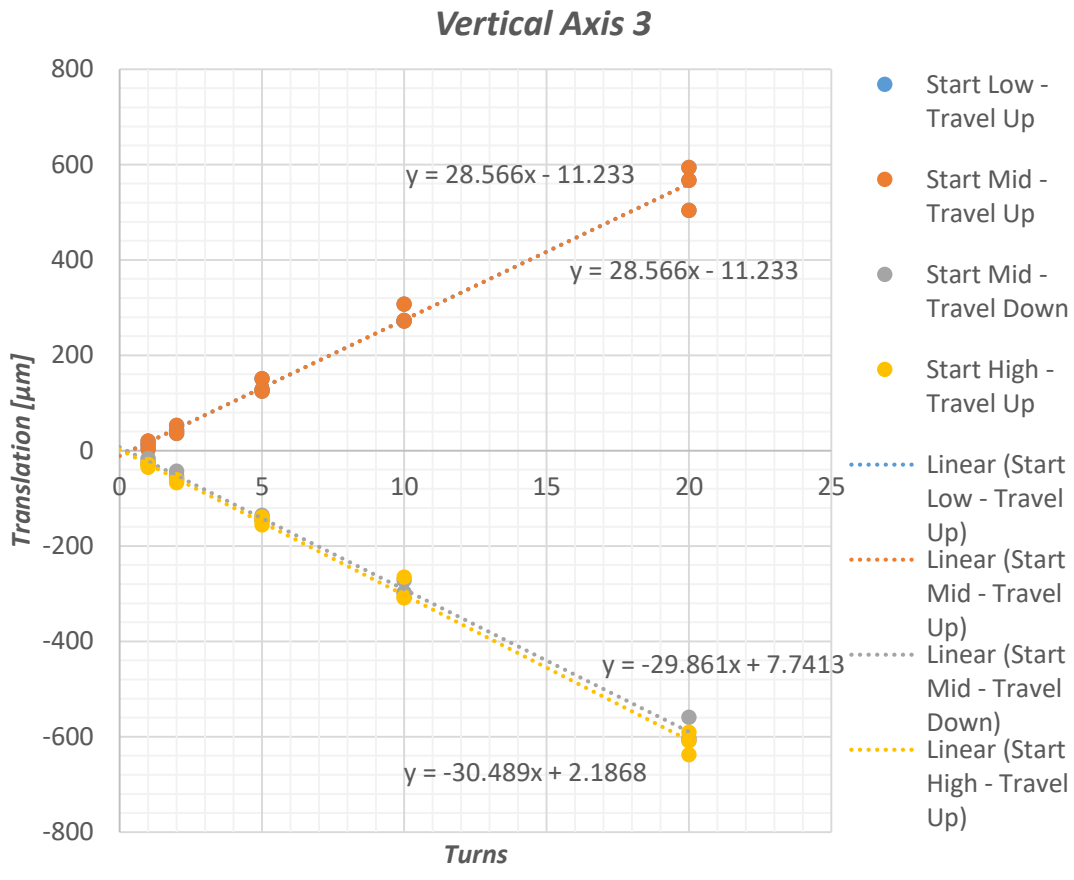
- If a straight line is fitted to the data:
  - The gradient of the line is the adjustment rate
  - The y-intersect is a measure of the backlash
- Summary of the Vertical 2 Axis

Rate [µm]	Backlash [µm]
31.575	22.640
31.688	17.762
30.089	22.745
31.295	16.175
Average: 31.162	Average: 19.831

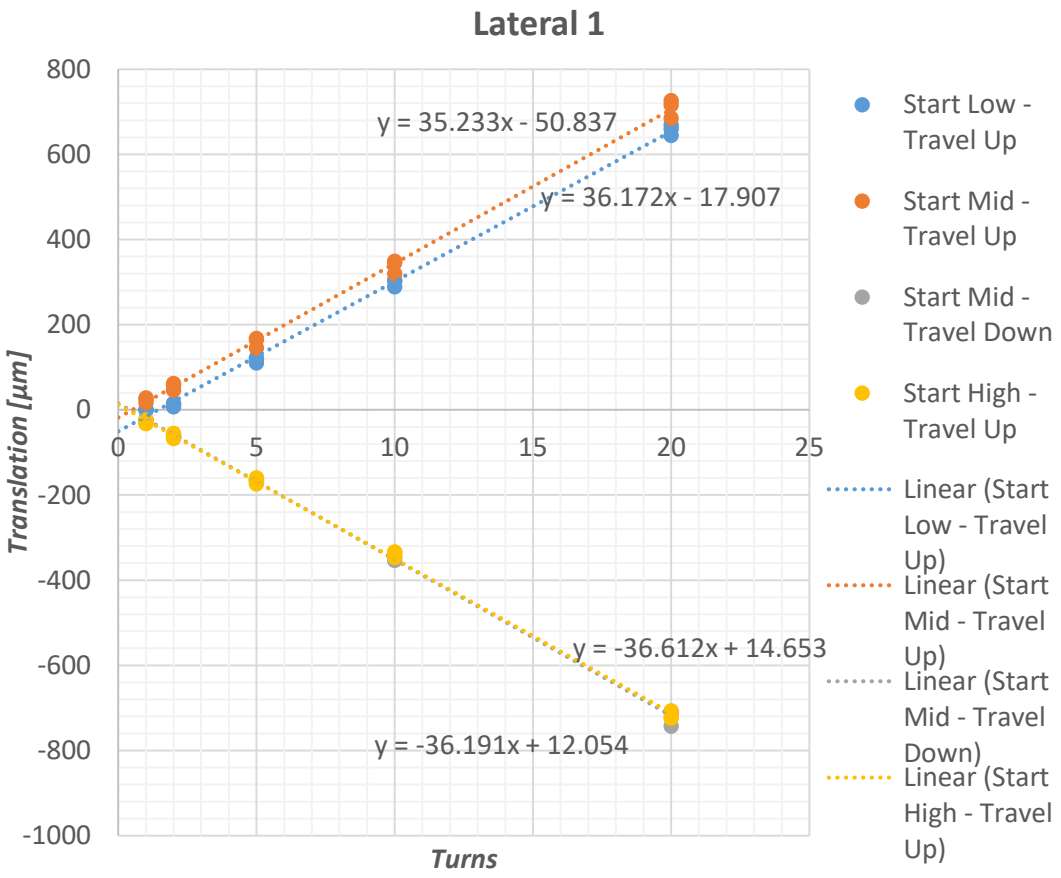


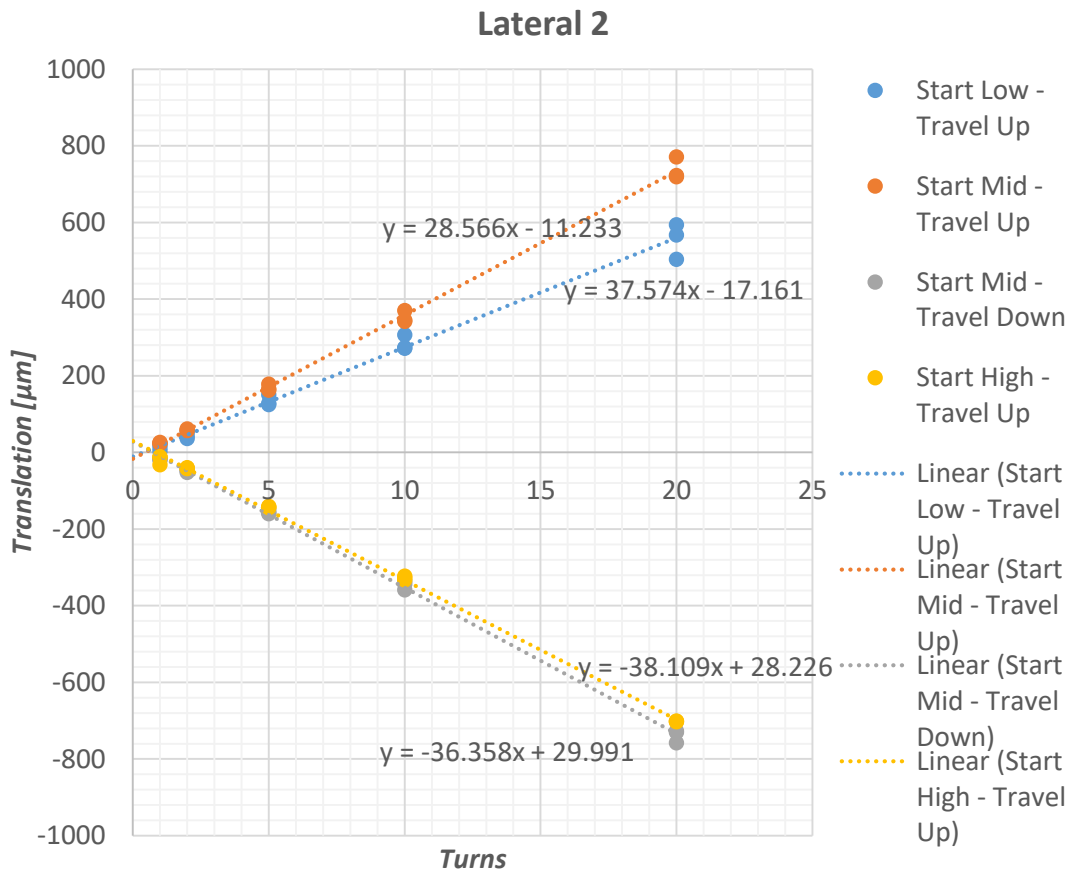
Vertical 1 and Vertical 3





Lateral 1 and Lateral 2



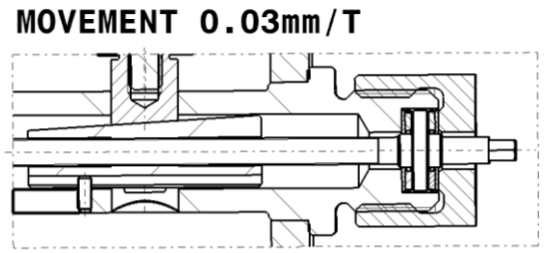


Result summary table

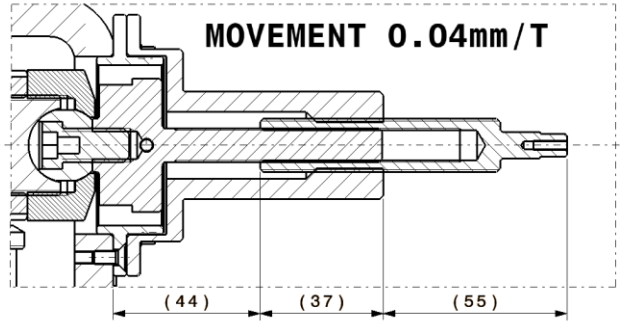
Axis	Axis Type	Measured Rate [µm/turn]	Design Rate [µm/turn]	Backlash [µm]	Backlash [turns]	Range [mm]
Vertical 1	Wedge	31.147	30	22.544	0.724	2.581
Vertical 2	Wedge	31.162	30	19.830	0.636	2.663
Vertical 3	Wedge	29.370	30	8.099	0.276	2.693
Lateral 1	Differential Thread	36.052	40	23.863	0.662	2.755
Lateral 2	Differential Thread	35.591	40	27.722	0.779	2.9601
Longitudinal	Wedge	32.409	30	17.578	0.542	2.559

Adjustment behaving as designed.
Very similar to previous prototypes.
*Range measurements based off limited testing, may need repeating

Wedge Mechanism



Differential Thread Mechanism

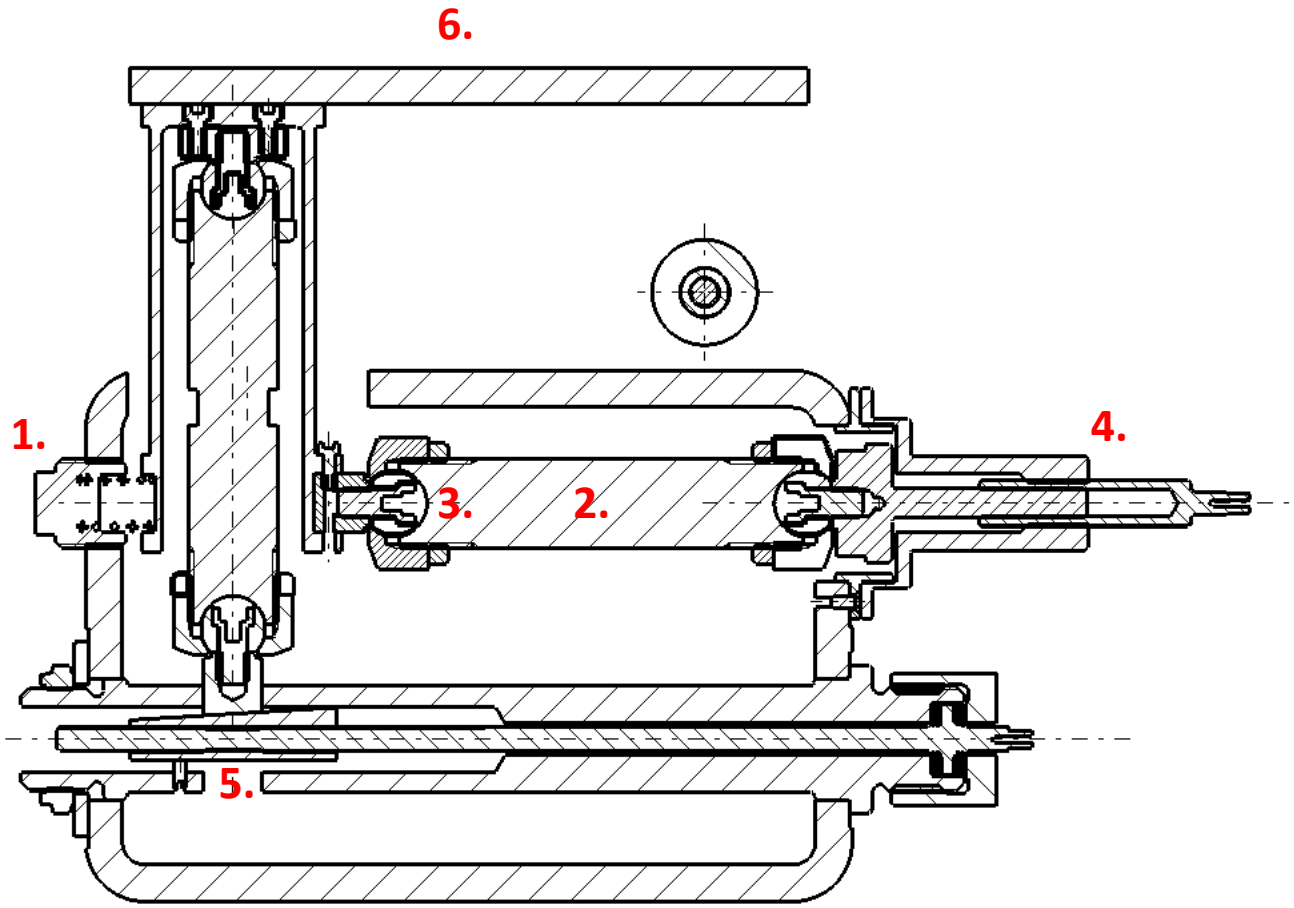


Noticed Unwanted Behaviour

Increasing the compression of spring (1) increases the compressive load on the joint (2), and therefore bearings (3). This decreases the backlash in the differential thread mechanism (4) and increases the stiffness of the joint, which helps the vibration performance.

Increasing this force increases the friction on the bearing (3) which means that the wedge (5) can lose contact with the fork when lowering the vertical axis.

This can be corrected by increasing the weight on the plate (6).



Structure Mass

The results of the testing shown here were carried out with a single tungsten block providing the structure weight.

This is ~16kg and considerably lighter than a fully assembled structure.

Further testing will be down with two blocks ~32kg to more closely replicate the behaviour of the platform and structure.