Testing of the other AS Adjustment Stand Prototype

CLIC Module working group

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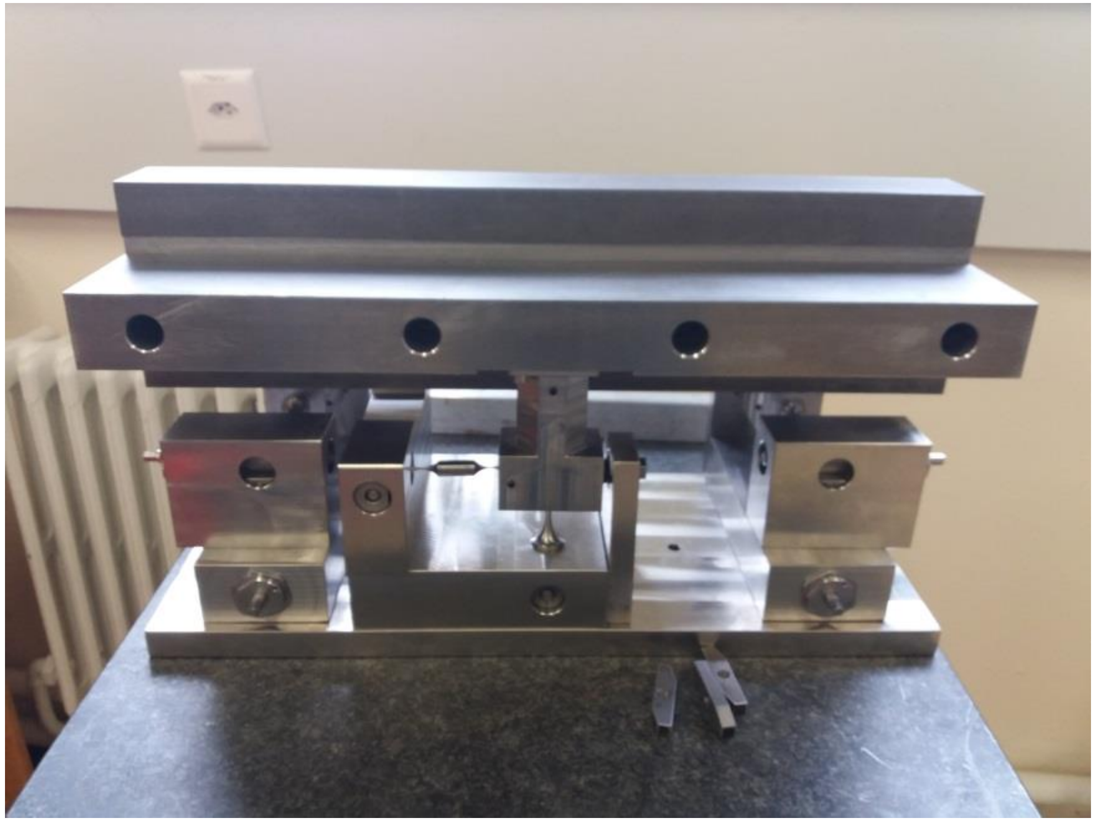
Testing of the other Prototype

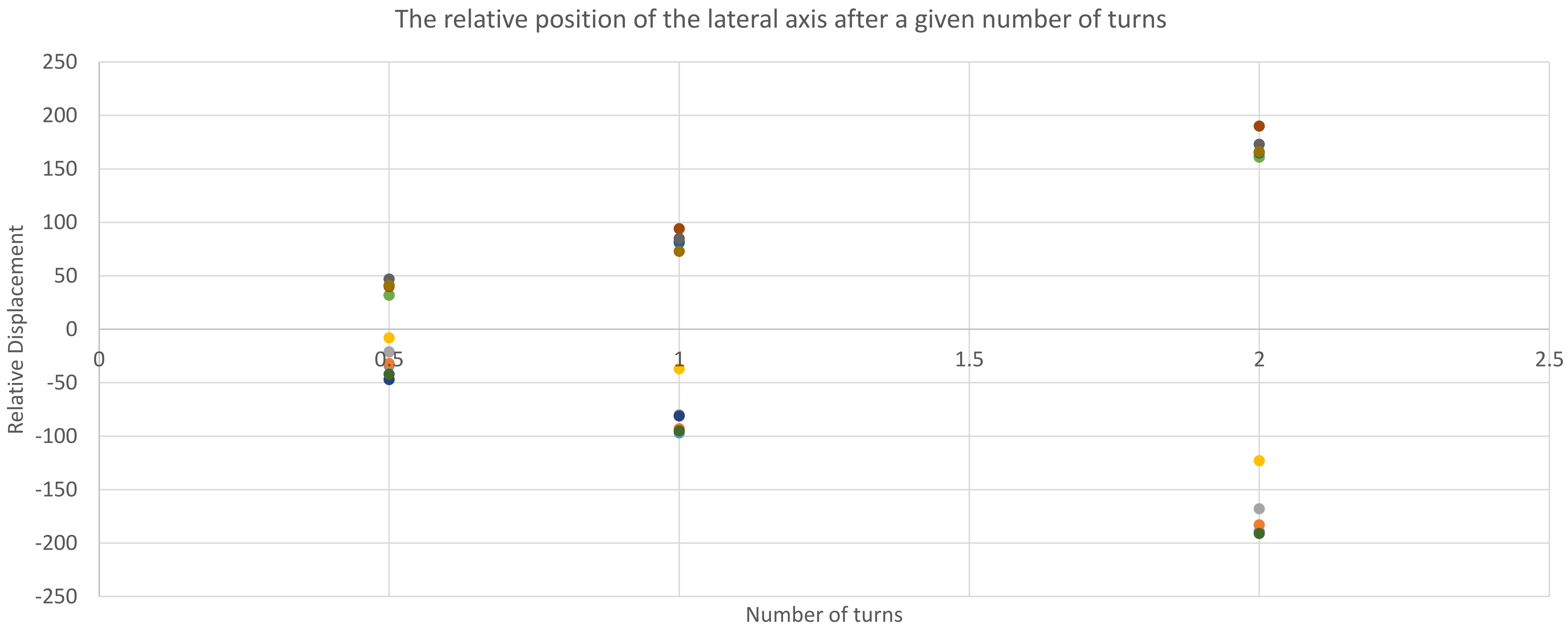
- Measuring and charecterisation of the adjustability of the other adjustment stand prototype carried out by myself and Jukka last week
- Measurements performed with Mitytoyo dial indicator with arm in 169 lab
  - Limited to measuring 1 axis at a time



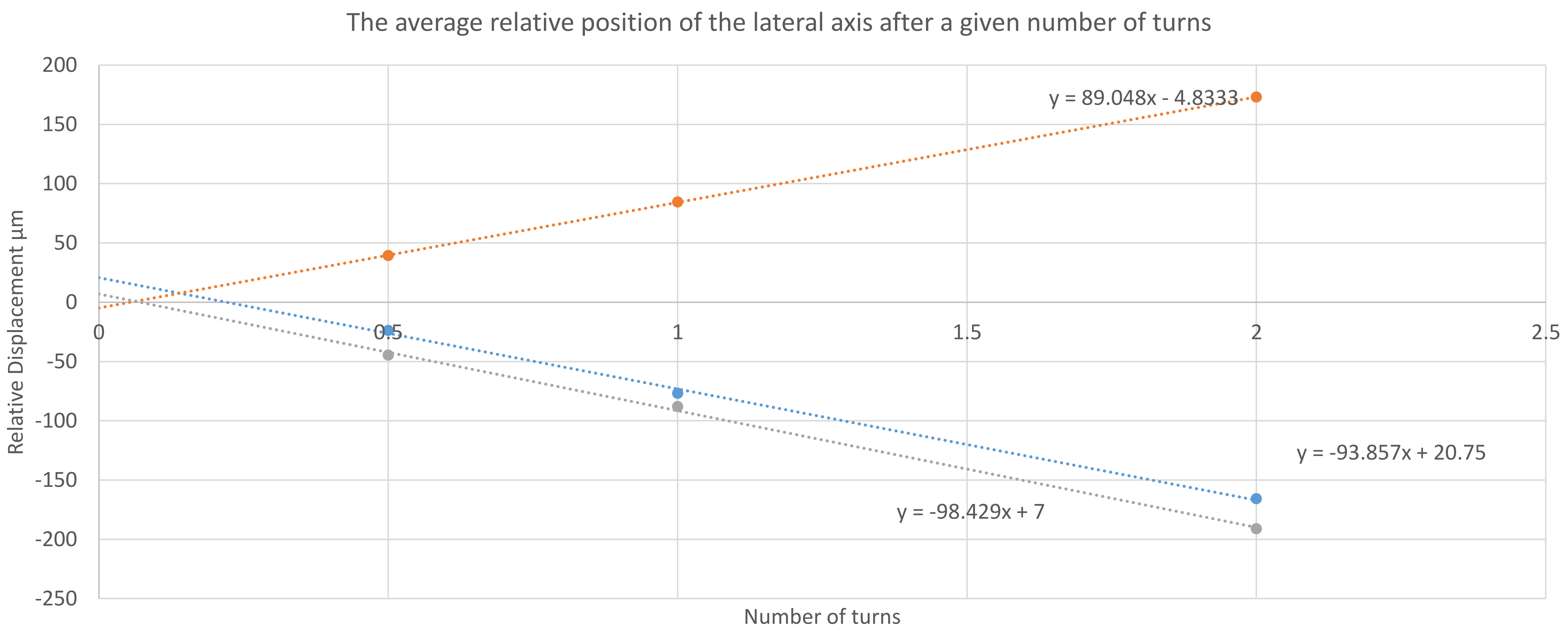
Testing Methodology

1. Each axis is positioned at the nominal centre
2. The DTI is placed directly about the driving flexure
3. The nut is turned until a displacement of 350µm is measured
4. The nut is then turned back 0.5, 1, and 2 turns, and the displacement at each is recorded
    1. The allows a measure of the ‘backlash’ to be recorded, as well as the free-movement performance
5. The whole process is repeated at:
    1. +350µm, +500µm, +EOT (moving in one direction)
    2. +350µm, +500µm, 0, -350µm, -500µm, - EOT (returning in the other direction)
    3. -350µm, -500µm, 0 (returning in the original direction)

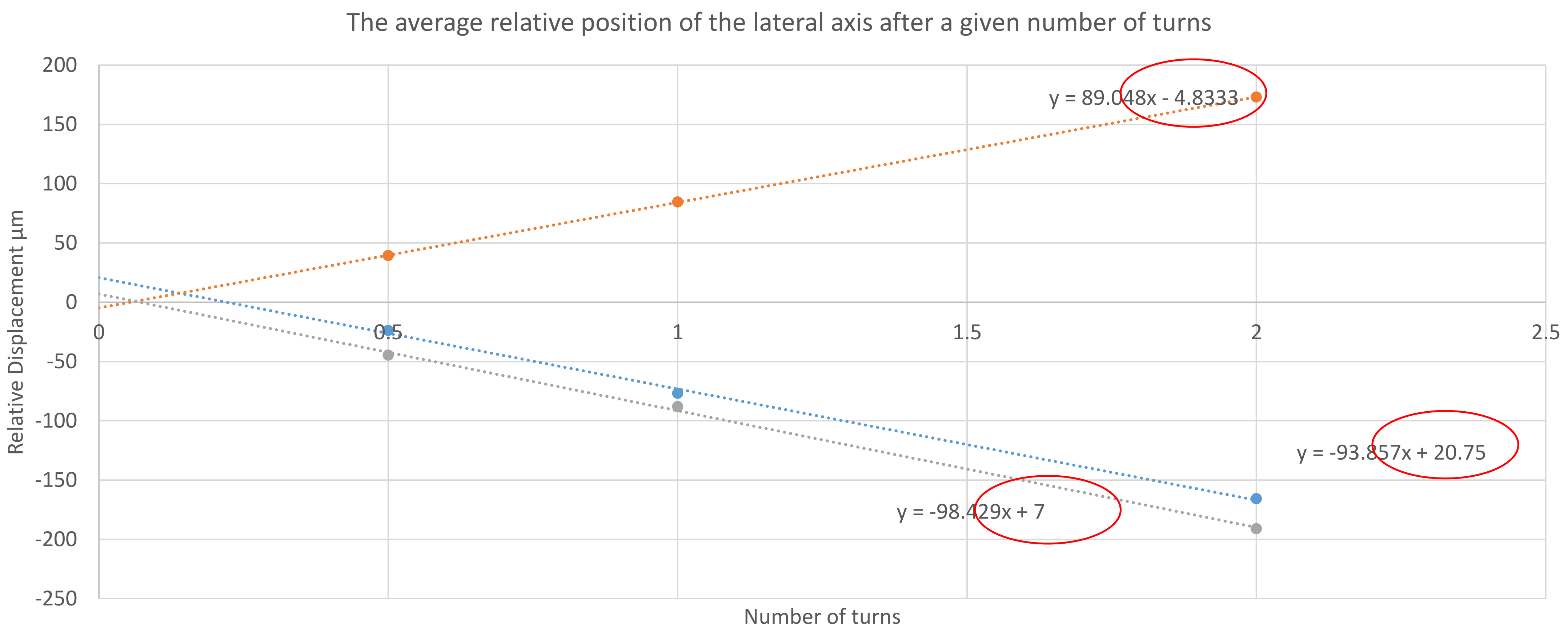
Example Data: Lateral Axis



Averaged Data: Lateral Axis



Averaged Data: Lateral Axis (Backlash)



Measure of ‘Backlash’

- Average backlash across all axes: 16μm
- Maximum backlash (vertical axis 3): 43.5μm

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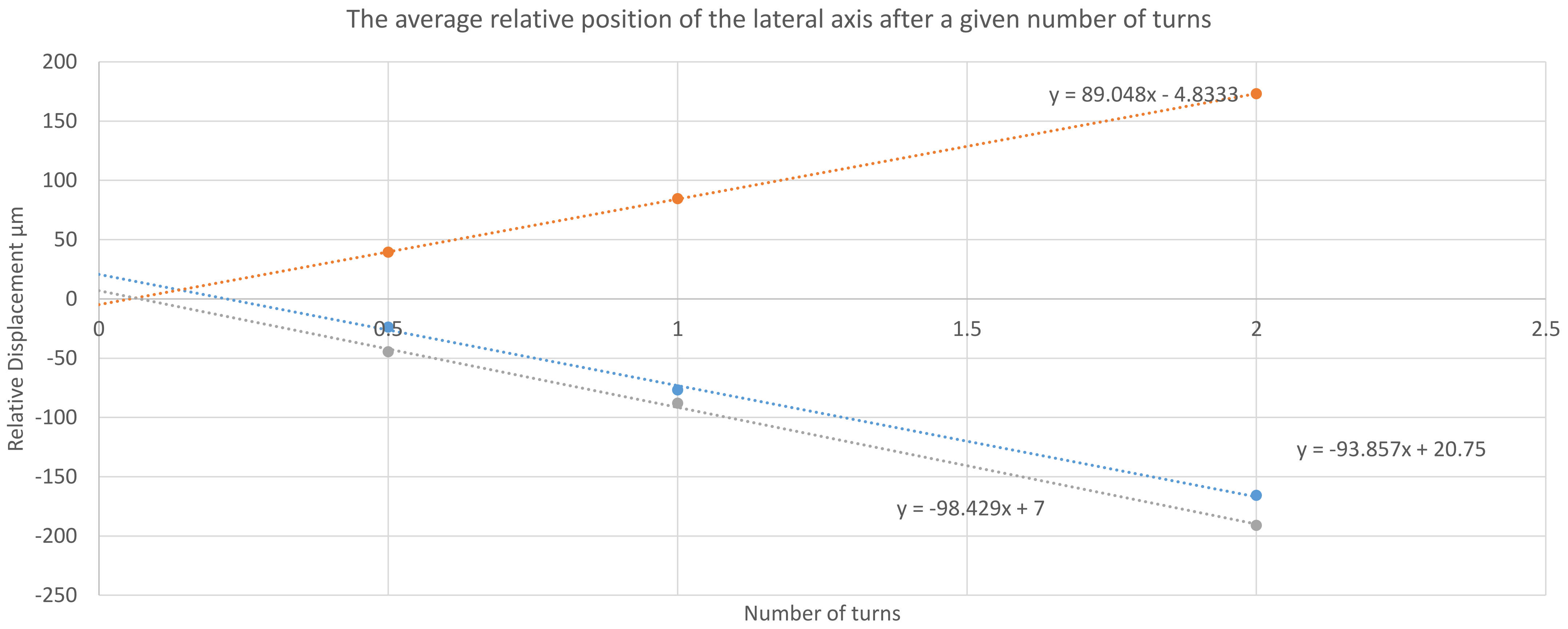
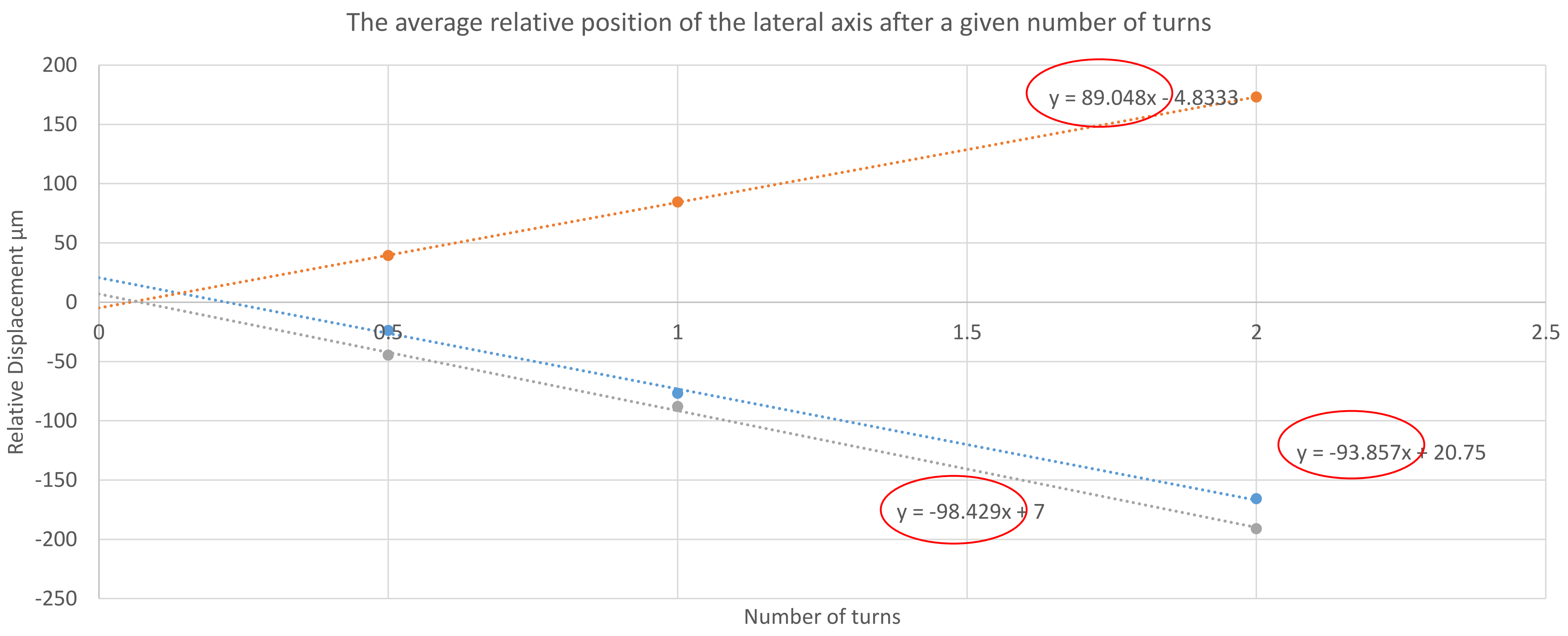
- Required counting revolutions (imprecise)
- On both of the lateral axes we were required to adjust the spring force
- On one of the vertical axes we were required to ‘assist´ the AS in returning

Performance



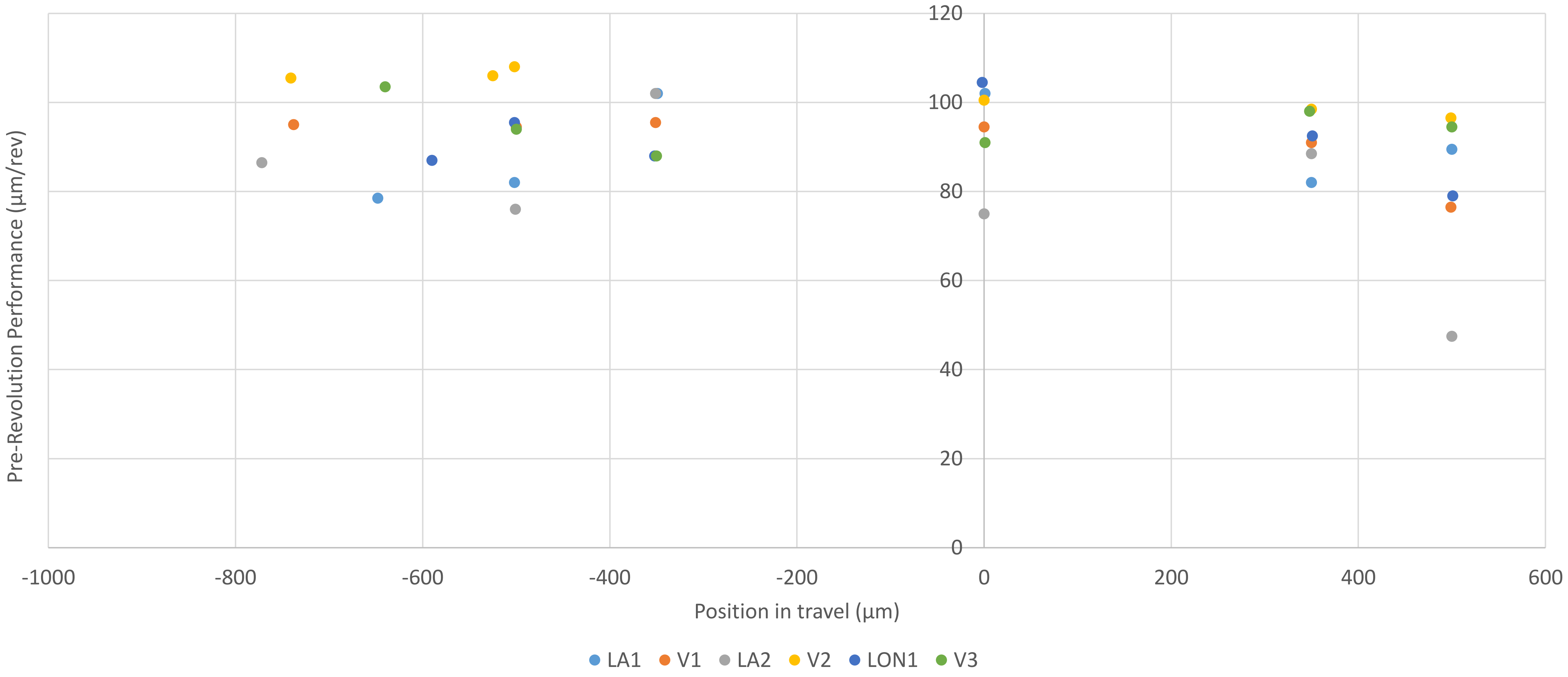
Performance



Per-axis Average Performance

- Lateral 1: 89µm/rev - 98µm/rev
- Lateral 1: 83µm/rev - 92µm/rev
- Longitudinal: **72µm/rev** - 88µm/rev
- Vertical 1: 87µm/rev - 92µm/rev
- Vertical 2: 95µm/rev - **109µm/rev**
- Vertical 3: 94µm/rev - 97µm/rev

Performance Against Position in Travel



Summary/Comparison to other Prototype

- Longitudinal axis does not appear to be limited in range
  - Suggests manufacturing differences caused this limit in the other prototype
- Performance in consistent within and between all the axes to the degree which we would control
  - Methodology required counting revolutions, inevitably adding errors
- Measured by the DTI we could position each axis to within 1µm
  - Measuring individual axes separately

Summary/Comparison to other Prototype

- Inconstancies with the movement in both the lateral axes:
  - Movement was smooth and controllable during the translation (while a torque was being applied)
  - When at the end of the movement (when the torque was removed) there would be a noticeable ‘spring-back’ in the position
  - The happened regardless of the direction of travel, and regardless of the previous revolutions (not backlash)
  - We were able to ‘over-correct’ and achieve the required positioning that way

  - Possibly down to the differences in manufacture for the threaded rods used in this axis