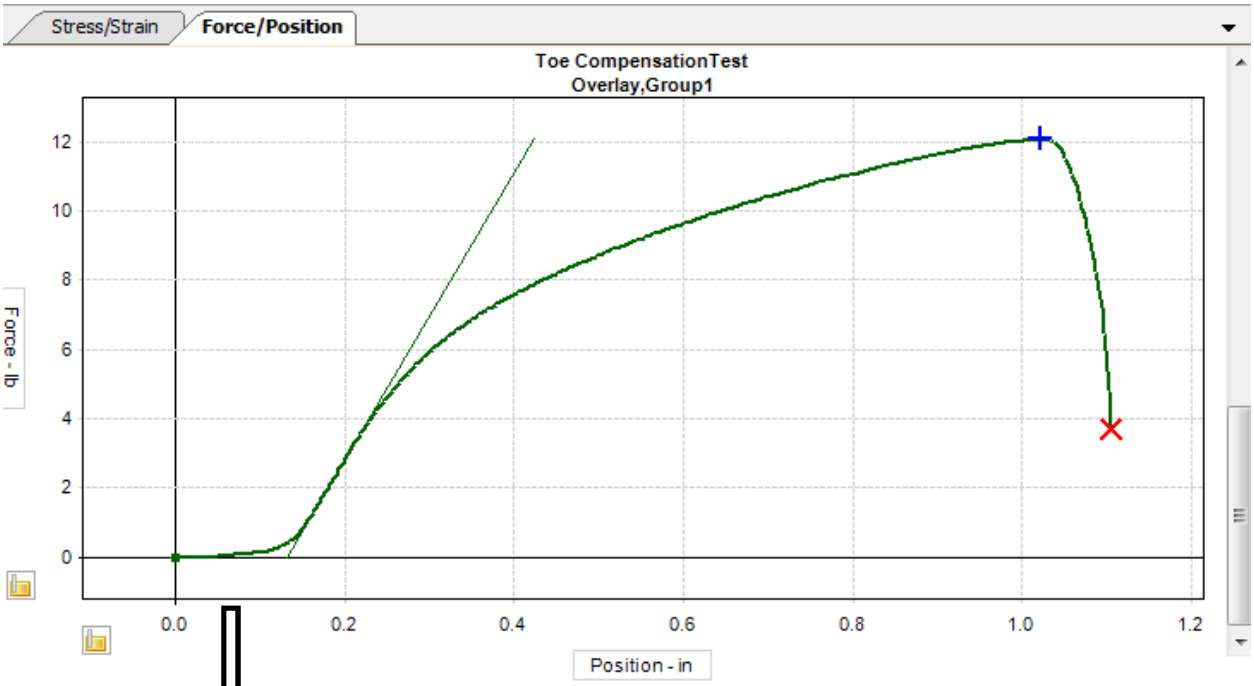
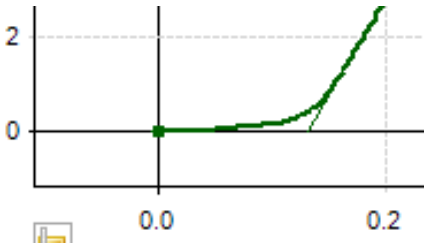
Toe Compensation:

-Non-Linear region called a Toe that can be seen at the beginning of a tensile curve caused by slack in the material and tensile machine fixturing. This take up of slack must be accounted for to accurately calculate values for modulus, strain/elongation, TEA, Yield Point. A toe compensation method corrects the X-Axis zero point on the stretch/strain. The graph below shows a test run with no Toe Compensation Method.



Toe Region



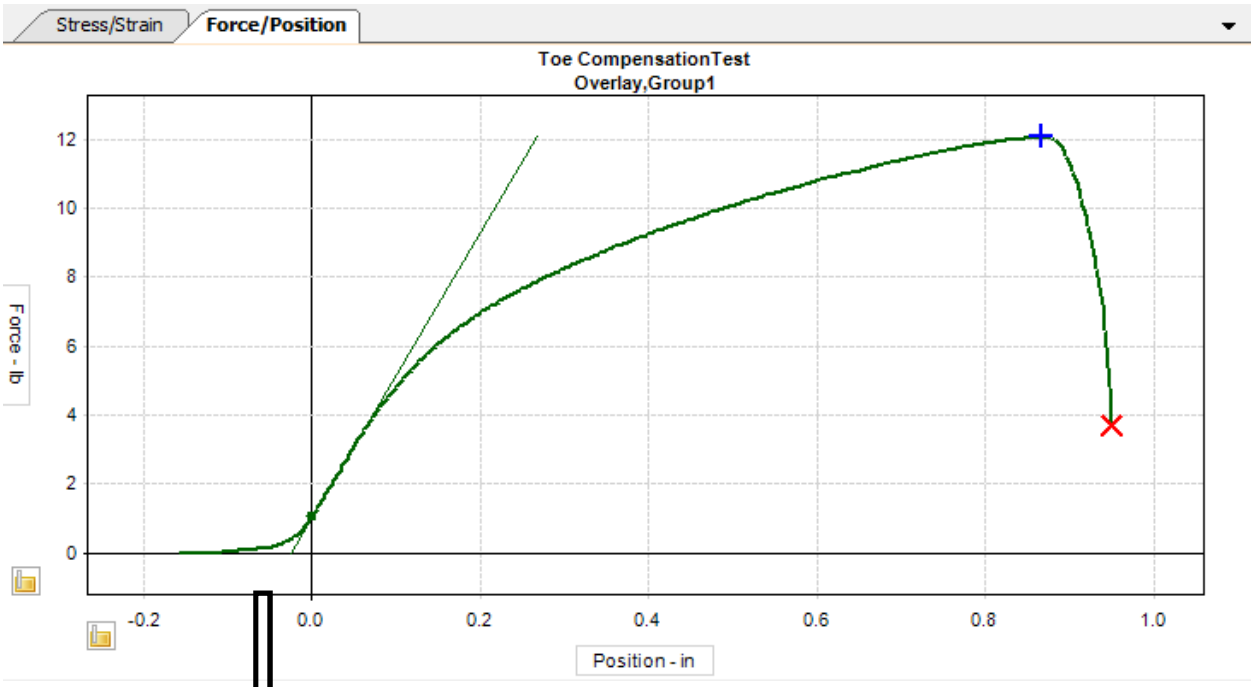
Graph and analysis start at Position = Zero regardless of any Pretension or additional elongation from slack or fixture deflection. This initial drawn out portion of the curve is the toe region where slack is being taking up as tension is applied to the sample

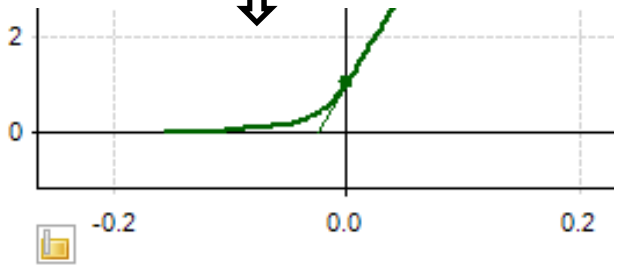
Sample	Peak Load lb	Peak Elongation %	Young's Modulus psi
Toe CompensationTest	12.07	34.04	4137.69

Toe Compensation Methods

Pretension:

Pretension is a user determined force value which becomes the new starting point for analysis. Any data before that point is not included in the Force and Position analysis. This helps to remove some of the unwanted Toe Region and maintain some repeatability. The graph above has no Toe Compensation method. So the starting point for analysis is the first data point collected in the test when displacement or strain equals zero. Now if we use the same test but use PRETENSION set to 1lb, the starting point will shift to the right once the value (force) on the y-axis reaches 1lb.





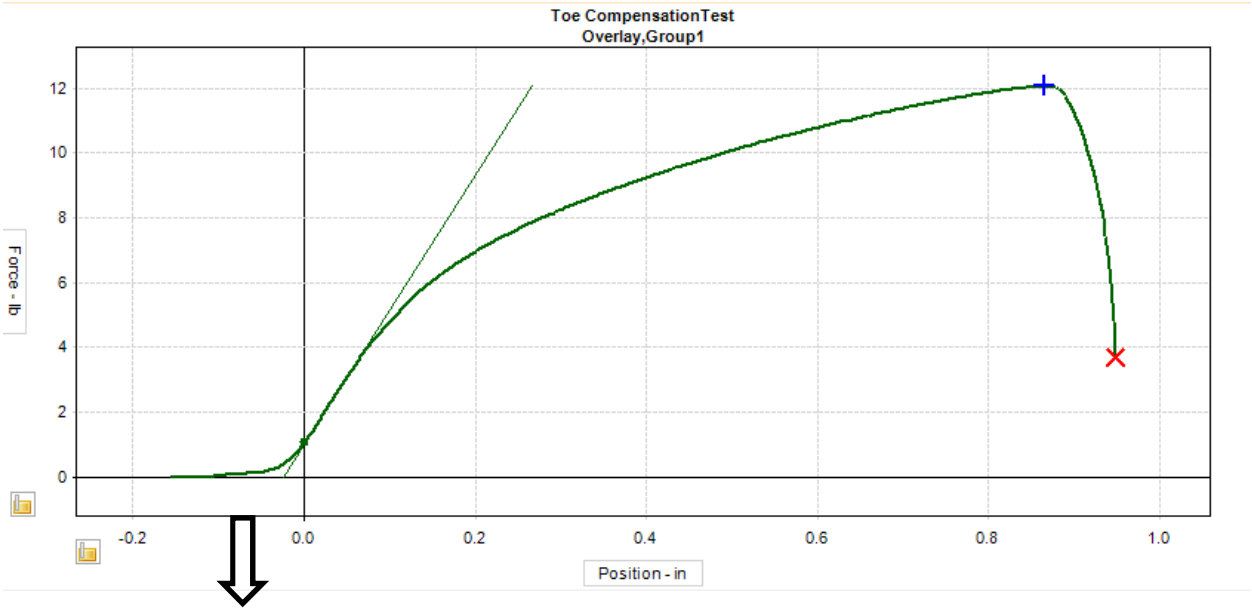
Graph and analysis start at Pretension Setting = 1lb. The Toe Region and the beginning of the Linear/Elastic region of the curve are cut off before analysis and the graph is shifted. Note the decrease in Peak elongation below from 34.04% to 28.84%. This is because our starting position point moved to the right, removing all elongation up to the Pretension point.

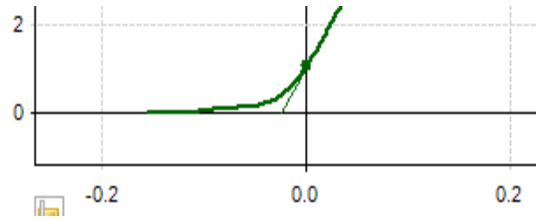
Sample	Peak Load lb	Peak Elongation %	Young's Modulus psi
Toe CompensationTest	12.07	28.84	4137.69

Toe Compensation Methods

True Calculated Zero:

This method is similar to the Pretension Toe Compensation method. It uses pretension as a parameter to begin analysis, but also adds any elongation/displacement that takes place before the pretension value is reached during the test. This distance or slack taken up is added to the initial gage length or test span setting, thus resulting in a more accurate value for peak elongation and other analysis





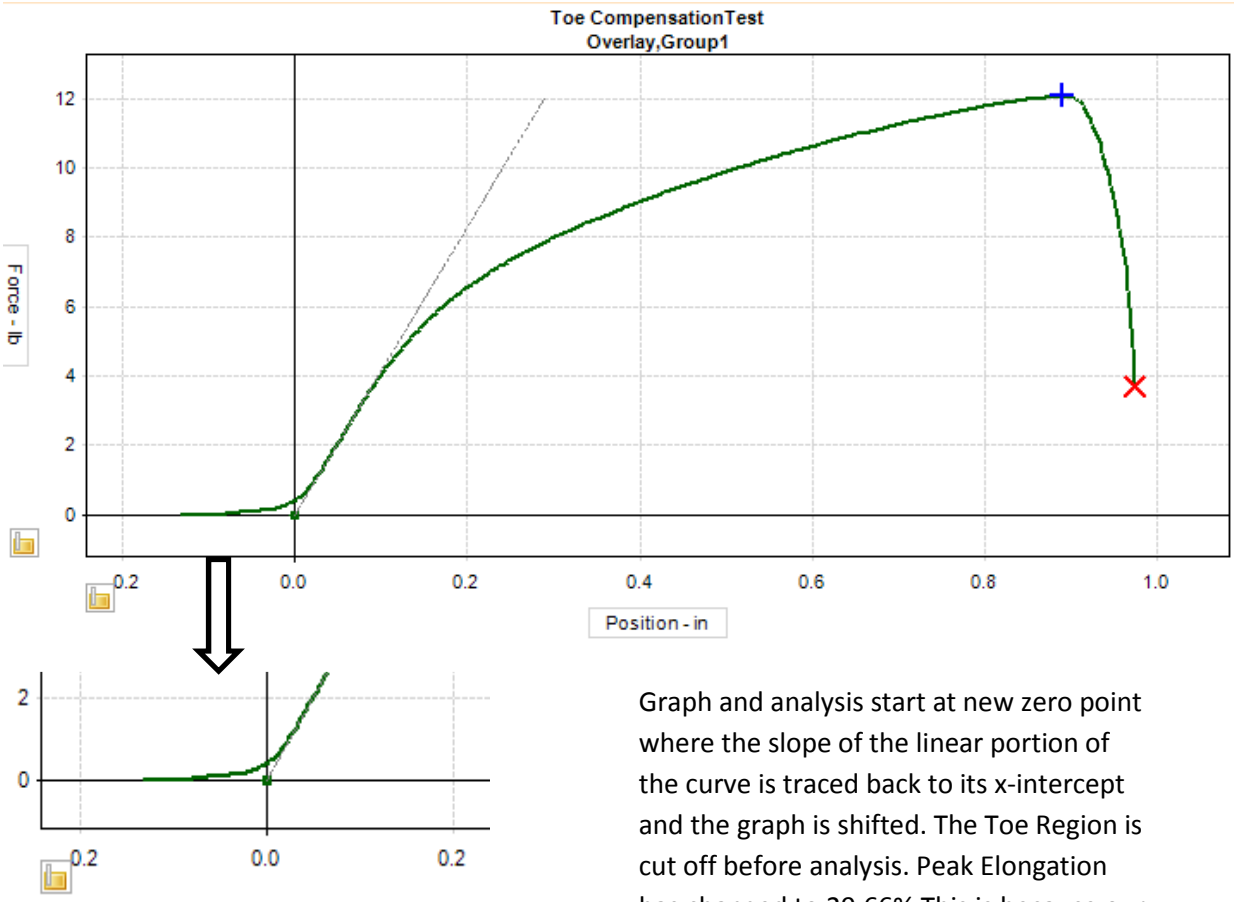
Graph and analysis start at new zero point where the where the pretension criteria is met and the graph is shifted. The distance travelled before the new zero point is added to the initial gage length. Peak Elongation has changed to 27.42%. This is because our starting position point moved to the right when compared with the initial test with no toe compensation. The increased gage length value also increases the Modulus.

Sample	Peak Load lb	Peak Elongation %	Young's Modulus psi
Toe CompensationTest	12.07	27.42	4352.75

Toe Compensation Methods

Modulus Slope:

This method is preferred when the material exhibits a region of linear behavior prior to its yield point. Modulus Slope adjusts the existing curve to find a new zero point. This zero point is calculated from the Slope of the Linear/Elastic region of the curve. Then a regression line is traced back to the X-axis. The point where the slopes regression line intercepts the x-axis is the new zero or start point for analysis. Data before this point is excluded. This helps to remove some of the unwanted Toe Region and maintain some repeatability.



Graph and analysis start at new zero point where the slope of the linear portion of the curve is traced back to its x-intercept and the graph is shifted. The Toe Region is cut off before analysis. Peak Elongation has changed to 29.66% This is because our starting position point moved to the right when compared with the initial test with no toe compensation.

Sample	Peak Load lb	Peak Elongation %	Young's Modulus psi
Toe CompensationTest	12.07	29.66	4137.69