Length Compare Users Guide

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Introduction

The Length Compare utility calculates an En score for each overlapping result from two sets of measurements. The En score is an objective way to compare individual results taking into account the measurement uncertainty.

This utility is cross platform and can be run on various operating systems.

Overview

The Length Compare utility consists two editors for the length data along with two graphs showing the data and calculated En score. Illustration 1 shows the main window of the Length Compare utility.

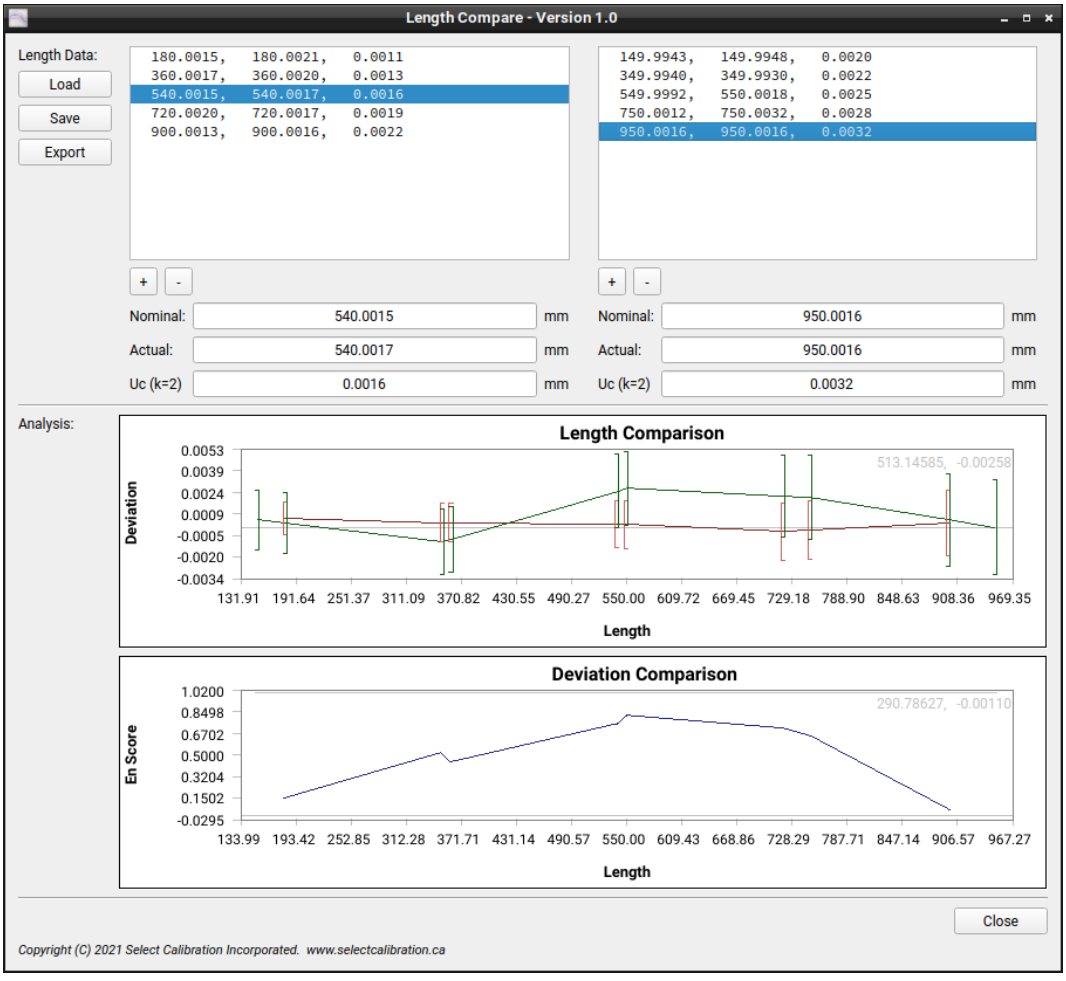

Illustration 1: Length Compare utility main window.

Option:

Option	*Description*
Load	Load a length comparison file. The file extension used is '.lencomp'. *Drag and drop can be used to load a length comparison data file.*
Save	Save the current data to a length comparison file.
Export	Export the current data to a text file.
Close	Close the *Length Compare* utility.

Length Editor

The length editor allows the user to input the nominal, actual, and measurement uncertainty for one for more samples. There are two identical length editors shown side by side. Illustration 2 shows an example of the length editor.

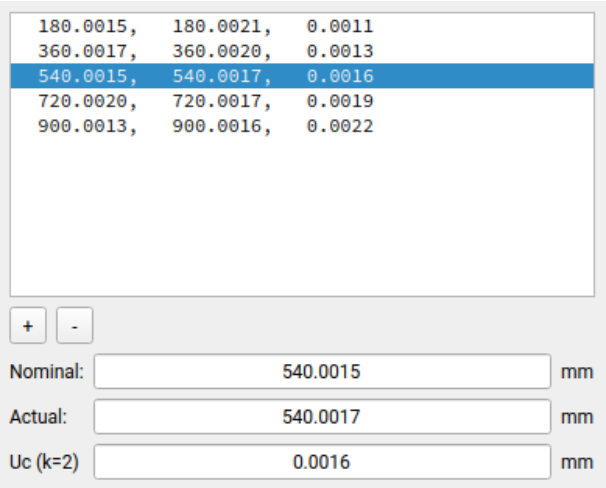

Illustration 2: Length editor.

Option:

Option	*Description*
+	Add a new entry. The nominal length, actual length, and uncertainty are assigned generic values.
-	Remove selected length entries.
Nominal	Nominal of the length entry.
Actual	Actual of the length entry.
Uc (k=2)	Expanded measurement uncertainty of the measurement length.

There is no practical limit to the number of measurement samples that can be used.

Graphical Output

Two graphs are created based on the input data. The *Length Comparison* graph, as shown in illustration 3, shows the deviation between the two sets of input data along with the measurement uncertainty. Illustration 5 shows the calculated En value for all overlapping measurements in the graph titled *Deviation Comparison*.

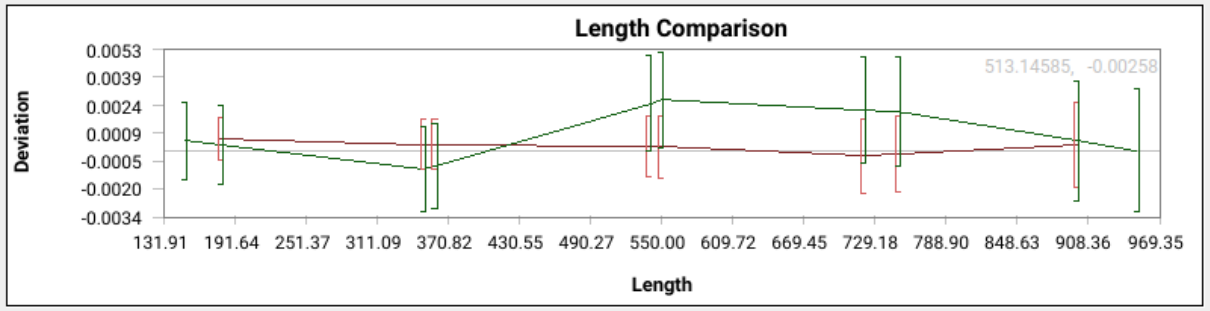

Illustration 3: Comparison of deviation and uncertainty between the two sets of input data.

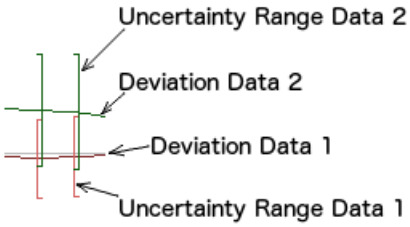

Illustration 4: Length Comparison legend

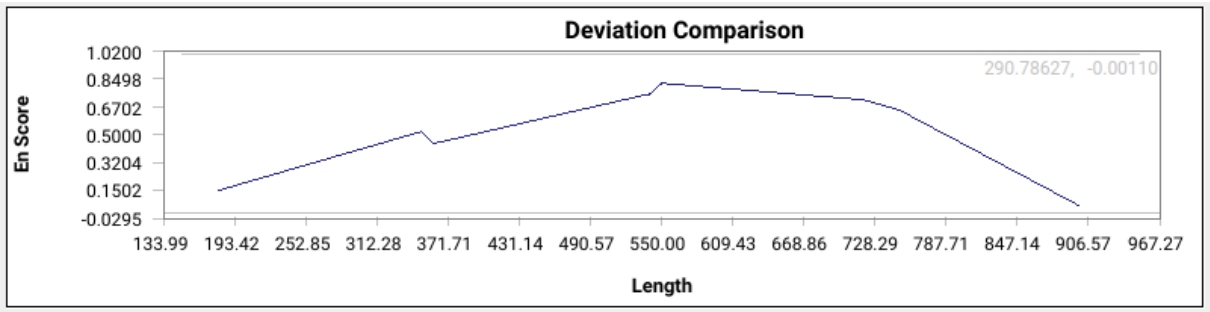

Illustration 5: Calculated En score for each data point.

Data Sample Positions

The individual sample positions are taken at lengths derived from both input data sets. If two sets of lengths are within 1 mm only one of the two input lengths are used. Illustration 3 shows examples of several input lengths that are similar enough where two sets of calculations appear side by side.

En Score Calculation

The En score is calculated by the following general formula:

$$En = \frac{|(A-B)|}{\sqrt{(AUc^2 + BUc^2)}}$$

where:

En = En Score
A = Length deviation A
B = Length deviation B
AUc = Measurement uncertainty for A
BUc = Measurement uncertainty for B

Example:

A = 0.0004, Uc(k=2) = 0.0031
B = 0.0002,Uc(k=2) = 0.0023
abs[A-B] = 0.0002
En = 0.0002 / $\sqrt{(0.0031^2 + 0.0023^2)}$
En = 0.05

Exported File

The exported file contains the input data and calculated En scores where there is overlap. Data that is extrapolated beyond the range of either input is shown with a placeholder (------).

Comparison Data

Position	Dev. A	Dev. B	Uc A	Uc B	En
149.9948	0.0007	0.0005	------	0.0020	------
180.0021	0.0006	0.0003	0.0011	0.0020	0.1408
349.9930	0.0003	-0.0010	0.0013	0.0022	0.5164
360.0020	0.0003	-0.0008	0.0013	0.0022	0.4360
540.0017	0.0002	0.0024	0.0016	0.0025	0.7511
550.0018	0.0002	0.0026	0.0016	0.0025	0.8155
720.0017	-0.0003	0.0021	0.0019	0.0028	0.7141
750.0032	-0.0002	0.0020	0.0020	0.0028	0.6448
900.0016	0.0003	0.0005	0.0022	0.0031	0.0526
950.0016	0.0005	0.0000	------	0.0032	------

En Avg: 0.5089
En Max: 0.8155

Revision History

Date	*Version*	*Changes*
Jan 28, 2021	1.0	New Program