

World Sailing Manufacturer Control System

Title: Scanner Report for Hydrofoil Registration with Class

Olympic Class: IKA Formula Kite

Equipment Item: – Chubanga Frontwing V4w Mark II

Project				
World Sailing Manufacturer Control System				
Title				
Scanner Report: IKA Formula Kite – Chubanga Frontwing V4w				
Revision	By	Date	Description of change	Checked
A	OG	11/08/2026	First Issue	FG

Overview

As part of the World Sailing Manufacturer Control System project, which focuses on improving the quality of Olympic Equipment, World Sailing Technical Department performed an audit to Chubanga, in World Sailing Office in London to assess the new Mark II model.

In accordance with the IKA Formula Kite registration process for the 2028 Olympic Quad 10 Frontwings were scanned during the audit.

The analysis presented in this report is limited to a number of control points on specific cross sections. The scanner permits to analyse many more aspects and areas of the geometry of the equipment.

Coordinate System

Figure 1 shows the coordinate system defined to analyse the Frontwing.

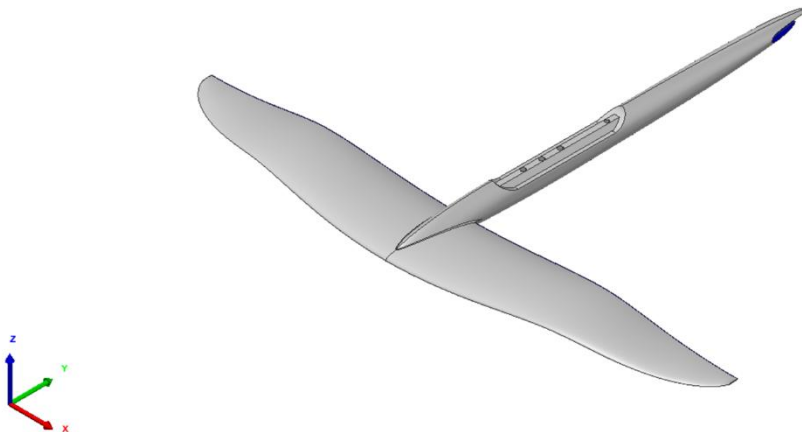


Figure 1 - Definition of the Coordinate System

Cross Sections

Figure 2 shows the Cross Sections (in yellow) defined to analyse the Frontwing.

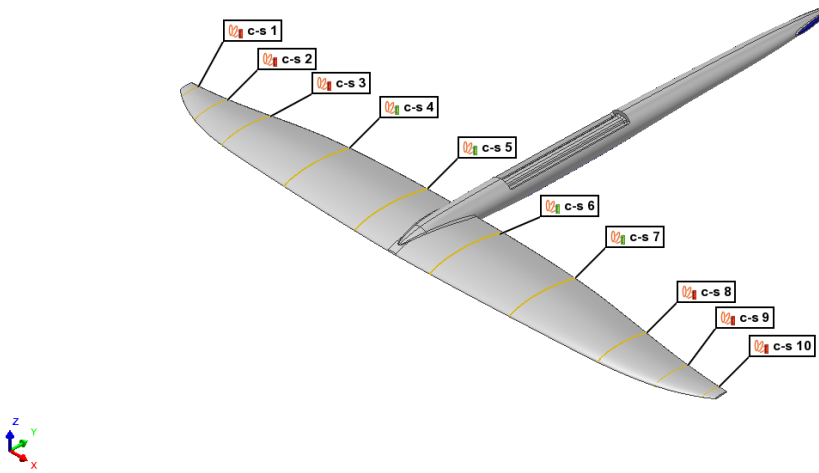


Figure 2 - Definition of Cross Sections

Name	Positioning
c-s 1	10 mm from the tip
c-s 2	50 mm from the tip
c-s 3	250 mm from the symmetry plane (X=0)
c-s 4	150 mm from the symmetry plane (X=0)
c-s 5	50 mm from the symmetry plane (X=0)
c-s 6	50 mm from the symmetry plane (X=0)
c-s 7	150 mm from the symmetry plane (X=0)
c-s 8	250 mm from the symmetry plane (X=0)
c-s 9	50 mm from the tip
c-s 10	10 mm from the tip

Callipers

For each Cross Section, 3 Callipers are defined. Figure 3 shows the positioning of the Callipers a Cross Section. The Callipers measure the thickness in specific points of the Cross Sections.



Figure 3 - Callipers definition for one of the Cross Sections

Name	Positioning
#_LE	5 mm from the Leading Edge of the Cross Section
#_MAX	On the maximum thickness of the Cross Section
#_LE	5 mm from the Trailing Edge of the Cross Section

Surface Distance Points

For each Cross Section, 2 Surface Distance Points are defined. Figure 4 shows the positioning of the Surface Distance Points.

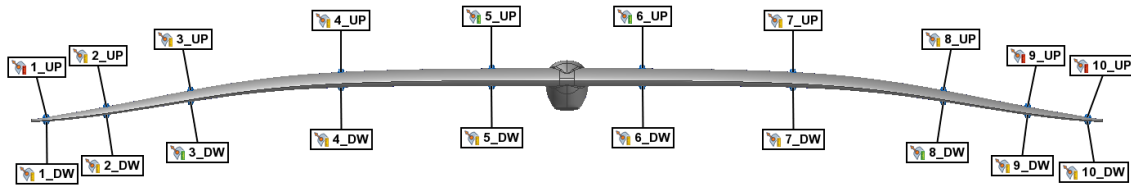


Figure 4 - Surface Distance Points definition

The Surface Distance Points measure the spatial distance between the Upper (Z positive) and Lower (Z negative) surfaces of the CAD file and the scanned equipment. Figure 5 shows a Surface Distance Point in a specific Cross Section measuring the spatial distance between the CAD file (grey) and the scanned equipment (yellow).

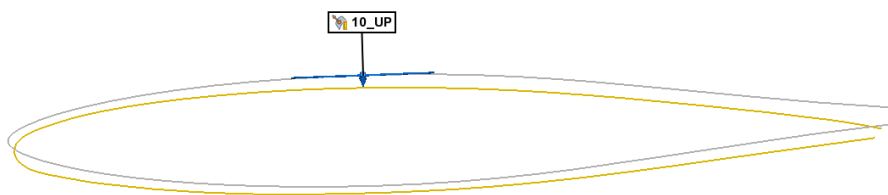


Figure 5 - Definition of Surface Distance Points on a Cross Section

Colour Map

Figure 6 shows the Colour Map of both Upper and Lower surfaces of a Frontwing.

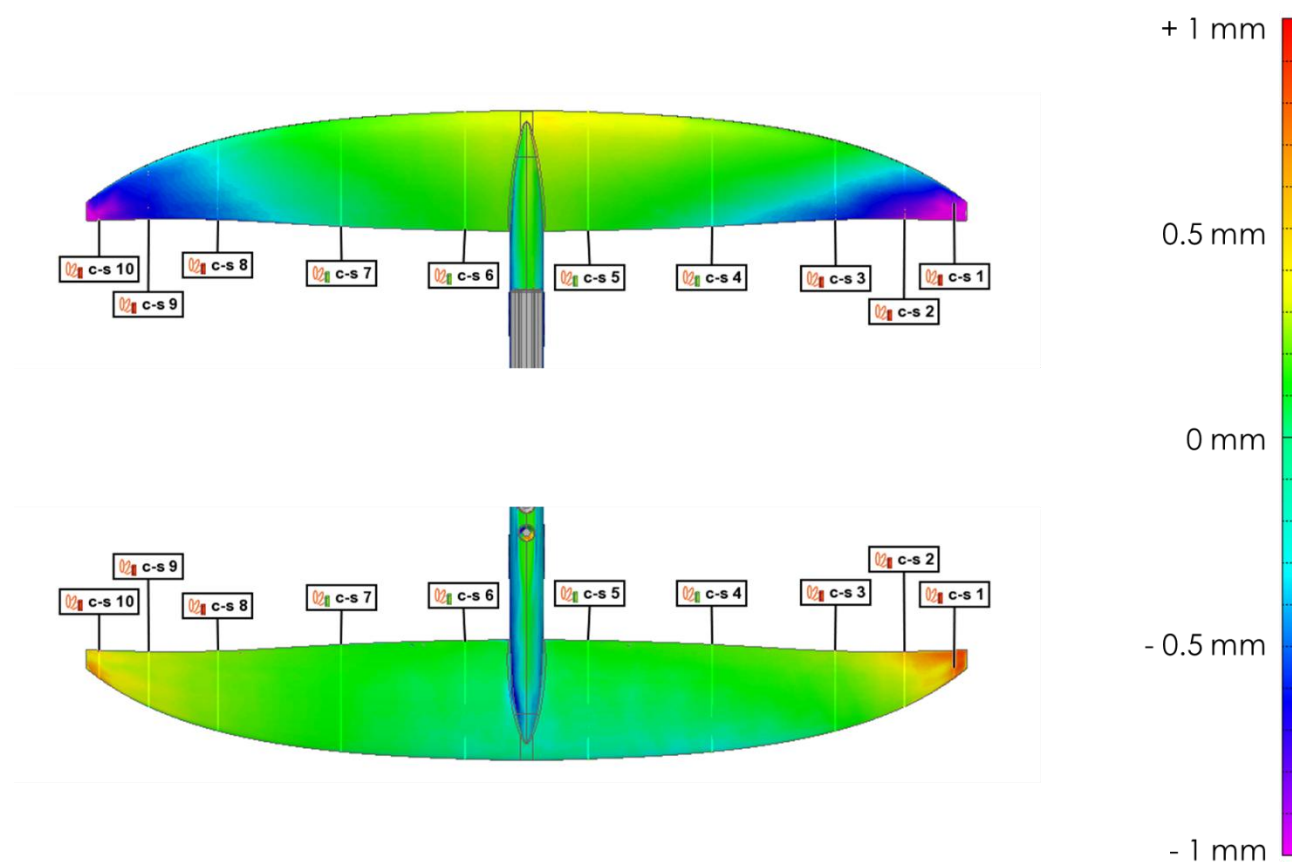


Figure 6 - Colour Map of the Upper (top) and Lower (bottom) surfaces of the Frontwing

The Colour Map shows the measure of the spatial distance between the Upper (Z positive) and Lower (Z negative) surfaces of the CAD file and the scanned equipment, as the Surface Distance Points.

Analysis

For each Frontwing the following measurement (Value) are evaluated:

- Upper Surface Distance for each Cross Section (#_UP)
- Lower Surface Distance for each Cross Section (#_DW)
- Thickness at 5mm from the Leading Edge for each Cross Section (#_LE)
- Maximum Thickness for each Cross Section (#_MAX)
- Thickness at 5mm from the Trailing Edge for each Cross Section (#_TE)
- Span of the foil as distance from Tip to Tip

Surface Distance	Surface Distance	Calliper	Calliper	Calliper
1_UP	1_DW	1_LE	1_MAX	1_TE
2_UP	2_DW	2_LE	2_MAX	2_TE
3_UP	3_DW	3_LE	3_MAX	3_TE
4_UP	4_DW	4_LE	4_MAX	4_TE
5_UP	5_DW	5_LE	5_MAX	5_TE
6_UP	6_DW	6_LE	6_MAX	6_TE
7_UP	7_DW	7_LE	7_MAX	7_TE
8_UP	8_DW	8_LE	8_MAX	8_TE
9_UP	9_DW	9_LE	9_MAX	9_TE
10_UP	10_DW	10_LE	10_MAX	10_TE

For each measurement the average (Mean) is calculated:

$$Mean = \frac{\sum_{i=1}^{10} Value}{10}$$

In order to have a uniform scale to compare the results of measurements, all the Values are normalized against the Mean:

$$Norm.Value = Value - Mean$$

Results

The table in the next page shows the normalised values (in mm) for each foil, minimum and maximum deviations and the standard deviation for each control. ± 0.4 mm has been selected for visualisation purposes. The maximum, minimum and standard deviation values are also plotted.

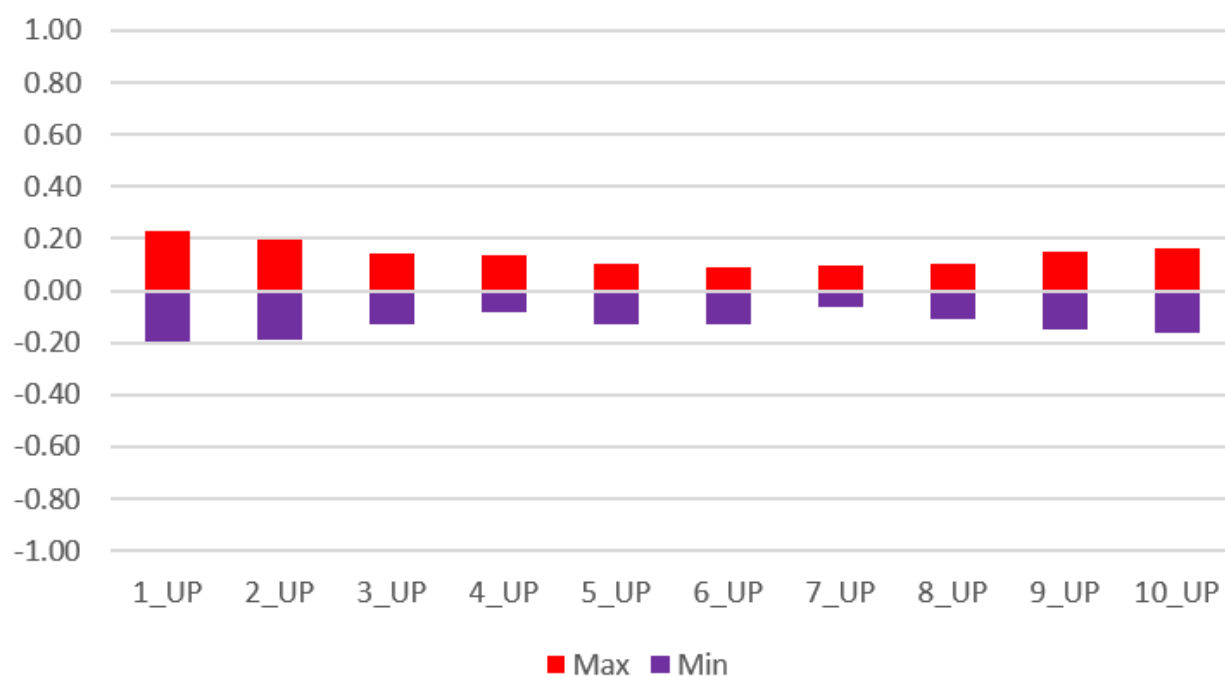
The following pages show the charts of the results for the 10 Frontwings:

- Blue Line: Norm. Value (mm)
- Red Lines: ± 0.4 mm
- X-Axis: 1 to 10 foils

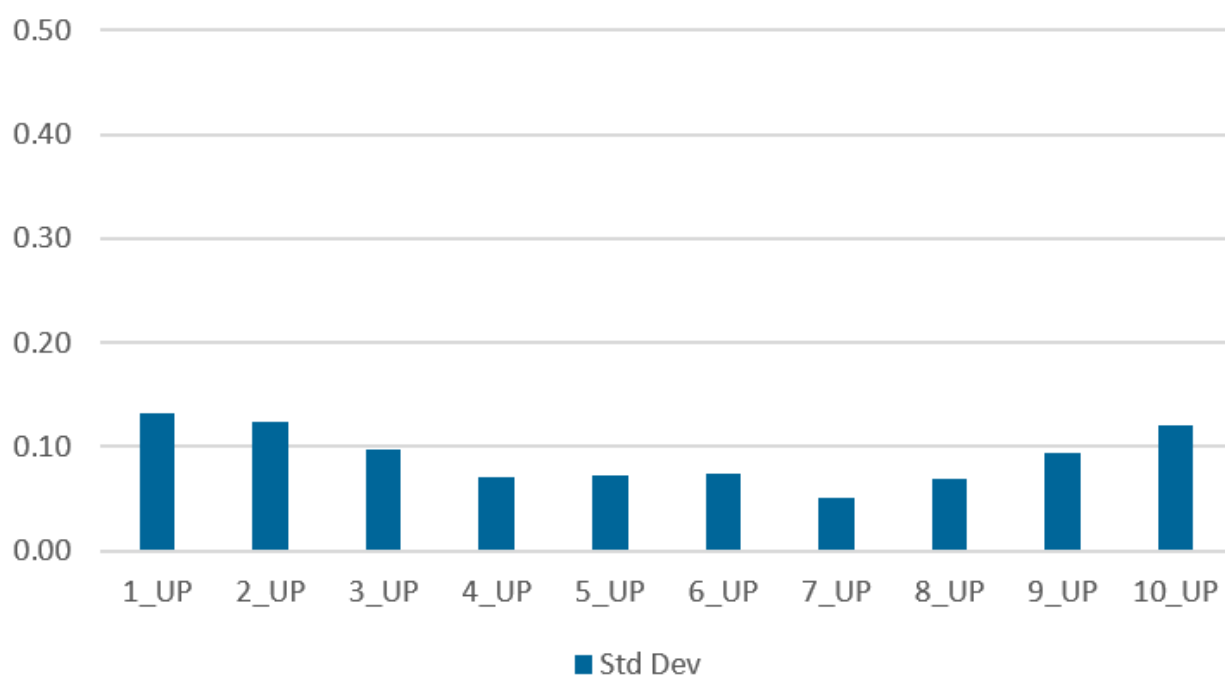
Following the charts, the colour maps are presented.

Control	Foil 1	Foil 2	Foil 3	Foil 4	Foil 5	Foil 6	Foil 7	Foil 8	Foil 9	Foil 10	Min	Max	StdDev
1_UP	0.10	-0.19	-0.09	0.00	0.19	0.23	-0.09	-0.04	0.04	-0.14	0.23	-0.19	0.13
2_UP	0.09	-0.19	-0.07	-0.06	0.20	0.15	-0.08	0.01	0.11	-0.16	0.20	-0.19	0.12
3_UP	0.11	-0.13	-0.07	-0.09	0.14	0.06	-0.04	0.06	0.10	-0.13	0.14	-0.13	0.10
4_UP	0.14	-0.05	-0.07	-0.04	0.02	-0.05	-0.02	0.09	0.06	-0.08	0.14	-0.08	0.07
5_UP	0.09	-0.02	-0.03	0.06	-0.08	-0.13	0.01	0.10	0.06	-0.04	0.10	-0.13	0.07
6_UP	0.07	0.00	-0.06	0.09	-0.11	-0.13	0.01	0.08	0.04	0.00	0.09	-0.13	0.07
7_UP	0.10	-0.05	-0.03	0.01	-0.01	-0.06	-0.03	0.05	0.06	-0.03	0.10	-0.06	0.05
8_UP	0.10	-0.11	0.01	-0.07	0.10	0.02	-0.06	0.00	0.06	-0.06	0.10	-0.11	0.07
9_UP	0.13	-0.15	0.03	-0.09	0.15	0.07	-0.09	-0.06	0.05	-0.04	0.15	-0.15	0.09
10_UP	0.14	-0.17	0.01	-0.05	0.16	0.15	-0.16	-0.15	0.05	0.02	0.16	-0.17	0.12
1_DW	0.08	0.17	-0.20	-0.03	-0.19	-0.23	0.00	0.31	-0.01	0.10	0.31	-0.23	0.17
2_DW	0.07	0.15	-0.15	0.01	-0.23	-0.14	0.03	0.20	-0.04	0.09	0.20	-0.23	0.13
3_DW	0.06	0.07	-0.11	0.04	-0.18	-0.08	0.00	0.14	0.00	0.05	0.14	-0.18	0.09
4_DW	0.07	-0.03	-0.08	0.03	-0.03	-0.04	-0.02	0.07	0.09	-0.06	0.09	-0.08	0.06
5_DW	0.04	-0.10	-0.04	-0.04	0.12	0.00	-0.03	0.01	0.14	-0.10	0.14	-0.10	0.08
6_DW	0.06	-0.11	-0.06	-0.08	0.15	0.03	-0.02	-0.01	0.14	-0.11	0.15	-0.11	0.09
7_DW	0.09	-0.03	-0.04	-0.02	-0.01	-0.05	-0.01	0.04	0.06	-0.02	0.09	-0.05	0.04
8_DW	0.06	0.09	-0.03	0.08	-0.19	-0.14	-0.01	0.05	0.00	0.10	0.10	-0.19	0.09
9_DW	0.00	0.16	-0.03	0.09	-0.25	-0.21	0.01	0.07	-0.03	0.19	0.19	-0.25	0.13
10_DW	0.00	0.18	-0.04	0.03	-0.28	-0.29	0.09	0.16	-0.01	0.17	0.18	-0.29	0.16
1_LE	0.14	0.00	-0.21	-0.04	-0.03	0.01	-0.04	0.24	-0.01	-0.07	0.24	-0.21	0.11
2_LE	0.14	0.02	-0.21	-0.04	-0.04	0.01	-0.04	0.20	0.03	-0.08	0.20	-0.21	0.11
3_LE	0.14	-0.02	-0.15	-0.02	-0.03	0.01	-0.04	0.16	0.03	-0.07	0.16	-0.15	0.09
4_LE	0.13	-0.02	-0.06	-0.05	-0.04	0.00	-0.04	0.09	0.11	-0.12	0.13	-0.12	0.08
5_LE	0.05	-0.05	-0.05	-0.03	0.07	-0.06	0.00	0.05	0.14	-0.12	0.14	-0.12	0.07
6_LE	0.05	-0.02	-0.05	-0.07	0.11	-0.08	-0.01	0.02	0.13	-0.08	0.13	-0.08	0.07
7_LE	0.14	-0.04	0.01	-0.04	-0.03	-0.06	-0.02	0.02	0.08	-0.06	0.14	-0.06	0.06
8_LE	0.12	-0.02	0.06	-0.01	-0.08	-0.15	-0.10	0.06	0.01	0.10	0.12	-0.15	0.08
9_LE	0.07	0.01	0.07	-0.01	-0.09	-0.15	-0.10	0.06	-0.03	0.15	0.15	-0.15	0.09
10_LE	0.10	0.02	0.04	-0.01	-0.10	-0.16	-0.07	0.01	-0.01	0.18	0.18	-0.16	0.09
1_MAX	0.19	-0.02	-0.30	-0.03	0.00	0.00	-0.09	0.26	0.03	-0.04	0.26	-0.30	0.14
2_MAX	0.16	-0.05	-0.22	-0.05	-0.03	0.01	-0.04	0.21	0.07	-0.07	0.21	-0.22	0.12
3_MAX	0.18	-0.06	-0.19	-0.04	-0.04	-0.02	-0.04	0.20	0.10	-0.08	0.20	-0.19	0.12
4_MAX	0.21	-0.09	-0.15	-0.01	-0.01	-0.09	-0.04	0.17	0.15	-0.15	0.21	-0.15	0.12
5_MAX	0.13	-0.11	-0.08	0.01	0.03	-0.13	-0.02	0.11	0.19	-0.14	0.19	-0.14	0.11
6_MAX	0.13	-0.10	-0.11	0.01	0.04	-0.10	-0.02	0.08	0.18	-0.11	0.18	-0.11	0.10
7_MAX	0.18	-0.08	-0.07	-0.01	-0.02	-0.11	-0.04	0.08	0.12	-0.05	0.18	-0.11	0.09
8_MAX	0.16	-0.03	-0.02	0.01	-0.09	-0.12	-0.07	0.05	0.05	0.04	0.16	-0.12	0.08
9_MAX	0.13	0.01	0.00	0.01	-0.10	-0.13	-0.09	0.01	0.02	0.15	0.15	-0.13	0.09
10_MAX	0.14	0.02	-0.03	-0.02	-0.11	-0.15	-0.07	0.01	0.04	0.19	0.19	-0.15	0.10
1_TE	0.16	-0.03	-0.24	0.00	0.00	0.00	-0.11	0.24	0.05	-0.07	0.24	-0.24	0.13
2_TE	0.20	-0.08	-0.21	-0.01	0.00	-0.04	-0.07	0.24	0.07	-0.10	0.24	-0.21	0.13
3_TE	0.21	-0.09	-0.20	0.00	-0.01	-0.04	-0.05	0.20	0.08	-0.10	0.21	-0.20	0.12
4_TE	0.19	-0.10	-0.13	0.02	-0.02	-0.07	-0.07	0.17	0.11	-0.10	0.19	-0.13	0.11
5_TE	0.14	-0.13	-0.09	0.08	-0.02	-0.12	-0.02	0.10	0.17	-0.12	0.17	-0.13	0.11
6_TE	0.13	-0.13	-0.08	0.07	0.03	-0.13	-0.03	0.07	0.17	-0.11	0.17	-0.13	0.11
7_TE	0.20	-0.08	-0.06	0.03	-0.02	-0.11	-0.05	0.07	0.08	-0.05	0.20	-0.11	0.09
8_TE	0.20	-0.02	-0.03	0.02	-0.06	-0.13	-0.09	0.04	0.03	0.05	0.20	-0.13	0.08
9_TE	0.18	0.00	-0.04	-0.02	-0.07	-0.11	-0.08	0.02	0.01	0.11	0.18	-0.11	0.08
10_TE	0.14	0.00	-0.03	0.02	-0.07	-0.14	-0.09	-0.05	0.04	0.18	0.18	-0.14	0.10

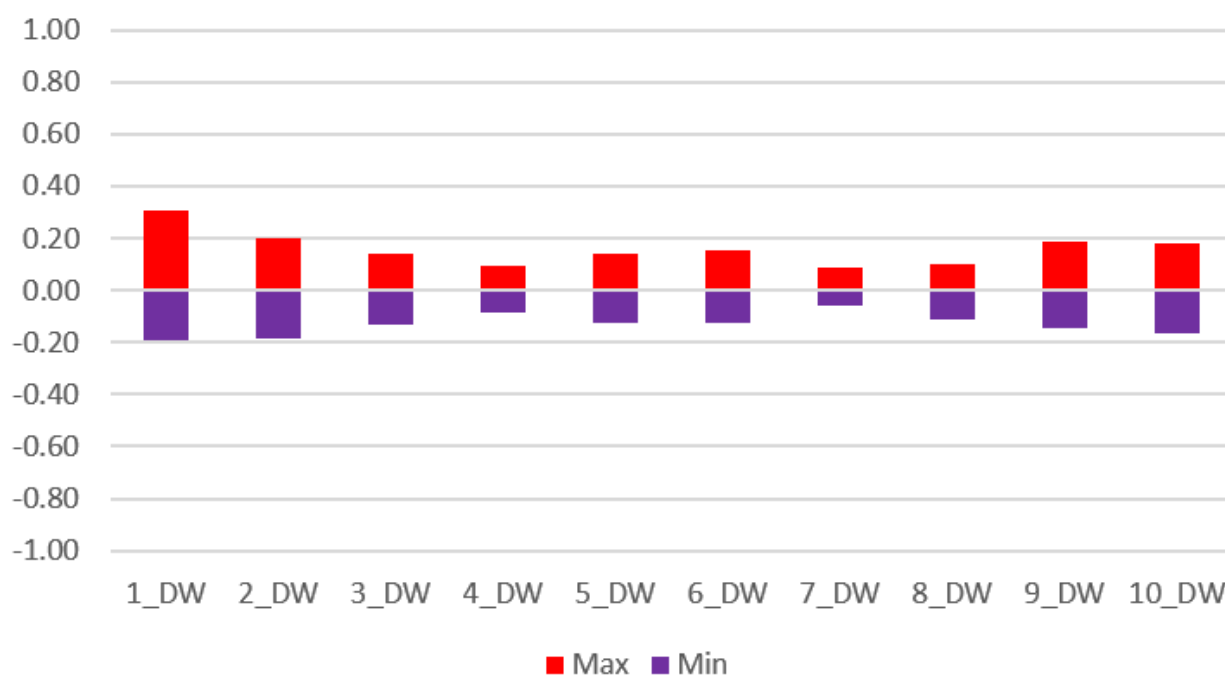
Surface Distance UP



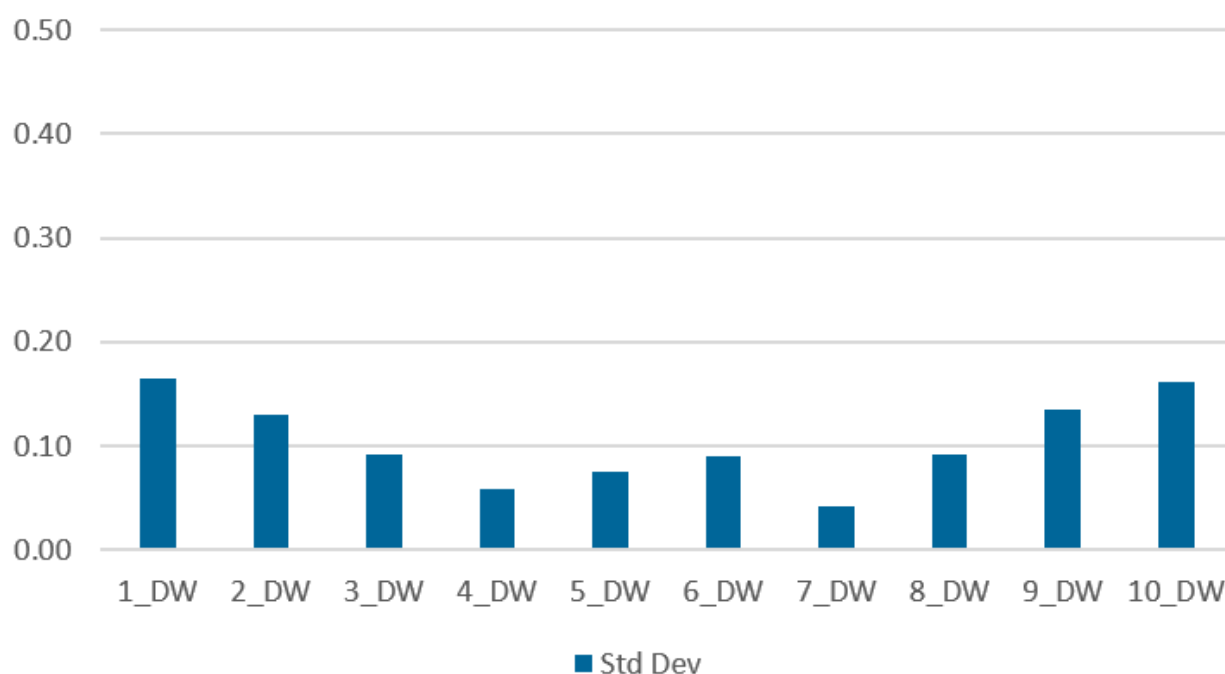
Surface Distance UP



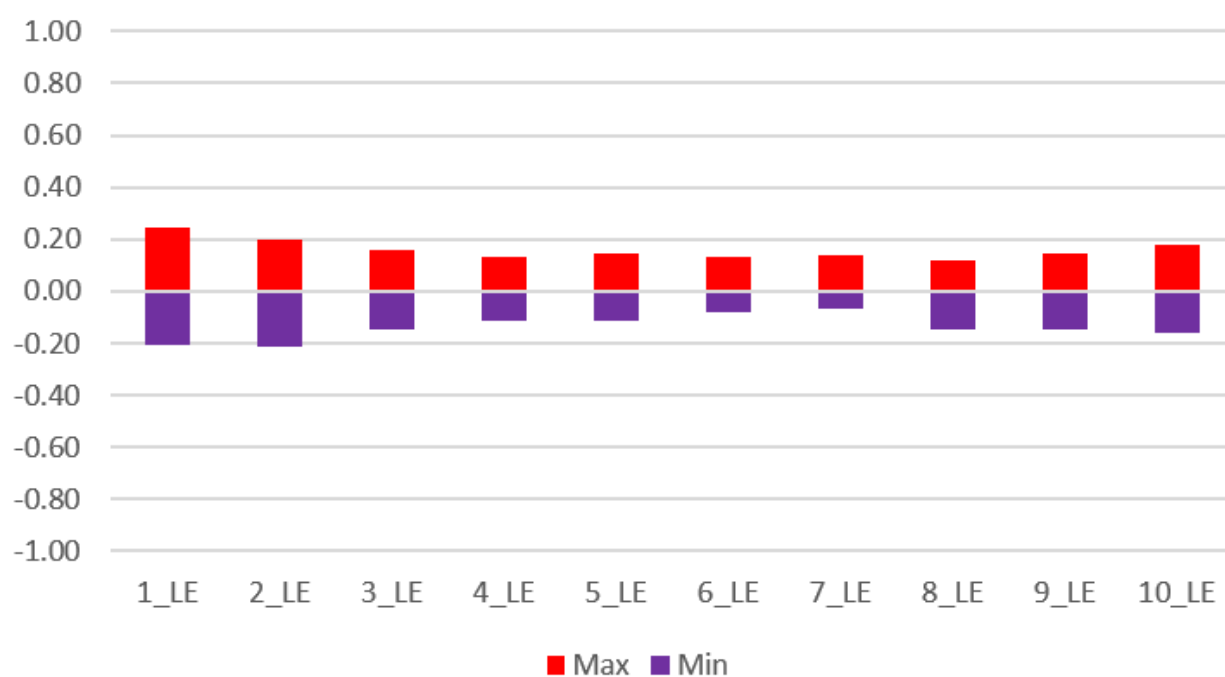
Surface Distance DW



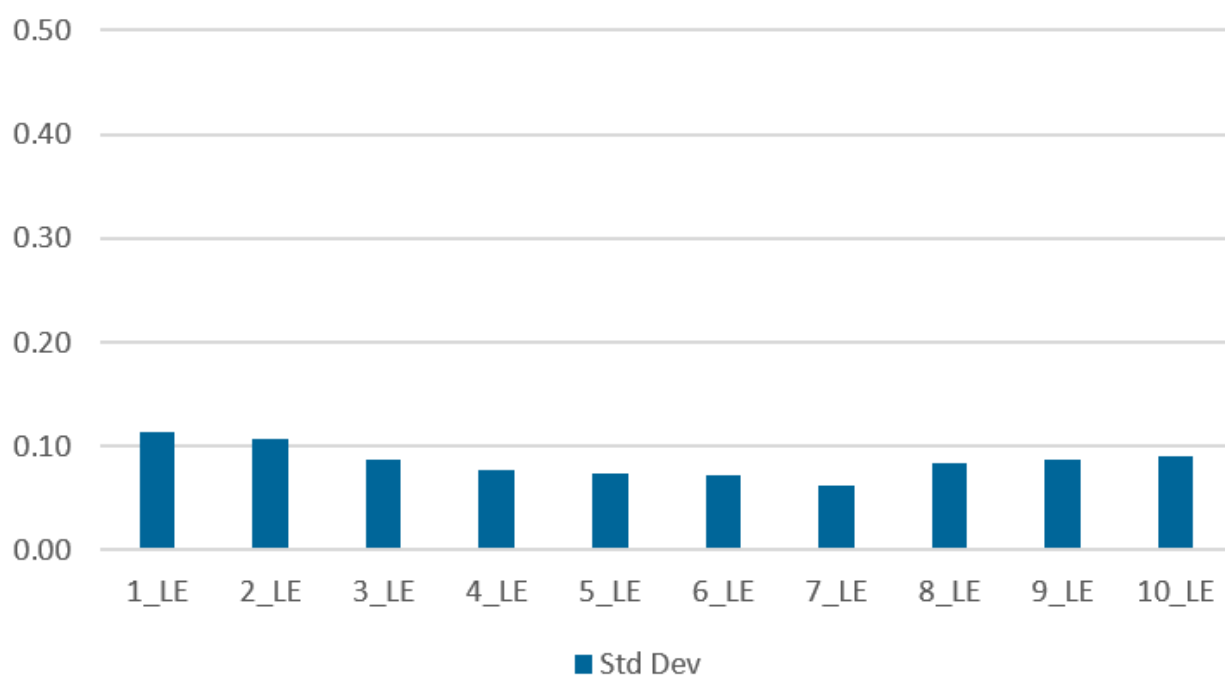
Surface Distance DW



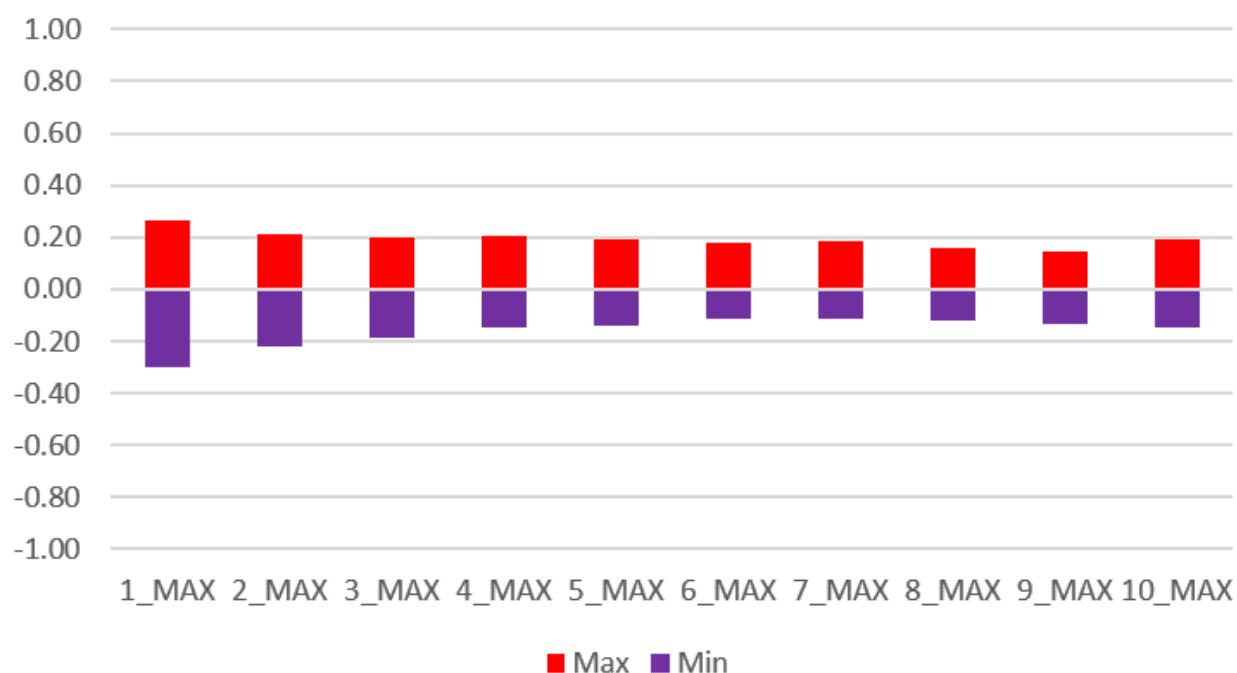
Thickness LE



Thickness LE



Thickness MAX



Thickness MAX

