

Humanetics Innovative Solutions, Inc.

Max and Min Femur Certification Analysis Flex PLI

IG GTR9-PH2 9th Meeting

Introduction

- ▶ In order to control and monitor femur performance it was requested by the Informal Group to review max and min femur corridors for input into the manual for inverse and pendulum dynamic certification.
- ▶ This is in addition to the femur zero crossover timing corridors proposed
- ▶ These corridors when established should help inform users that the femur is functioning correctly and to take steps to correct if not.

Data Requirement & Corridor Margin

- ▶ Legs must be to master leg specification
- ▶ Legs must be passing all regulation corridors
- ▶ $\pm 5\%$ has been considered to the max and min result as a margin for assessment

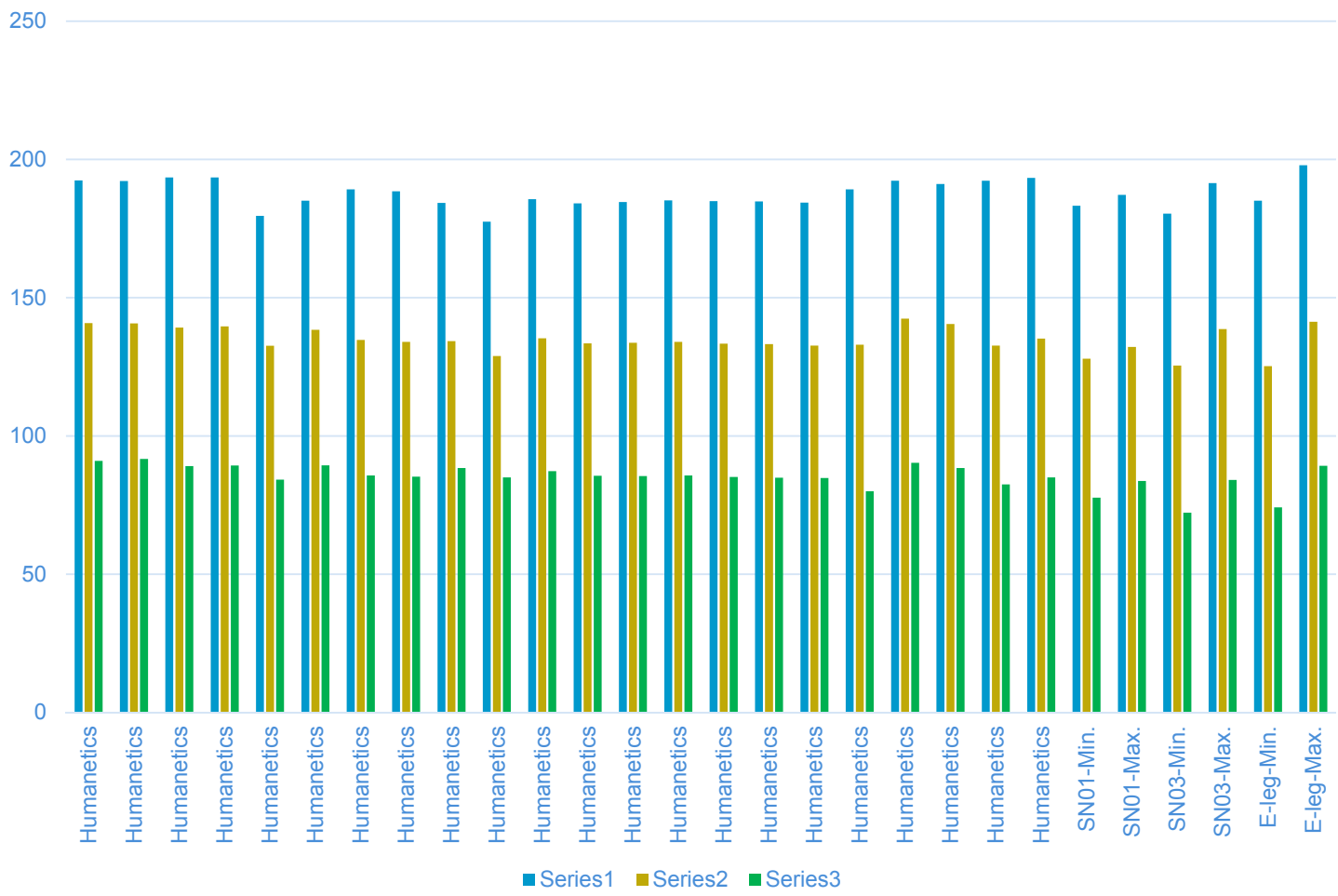
Femur Results Pendulum

	F1 (Nm)	F2 (Nm)	F3 (Nm)
Humanetics	192.4	140.8	91
Humanetics	192.2	140.7	91.7
Humanetics	193.5	139.2	89.1
Humanetics	193.5	139.6	89.3
Humanetics	179.6	132.6	84.2
Humanetics	185.1	138.4	89.4
Humanetics	189.2	134.7	85.7
Humanetics	188.5	134	85.3
Humanetics	184.3	134.3	88.4
Humanetics	177.5	128.9	85
Humanetics	185.6	135.3	87.3
Humanetics	184.1	133.5	85.6
Humanetics	184.6	133.7	85.5
Humanetics	185.2	134	85.7
Humanetics	184.9	133.4	85.2
Humanetics	184.8	133.2	84.9
Humanetics	184.4	132.7	84.8
Humanetics	189.2	133	80
Humanetics	192.3	142.4	90.3
Humanetics	191.1	140.5	88.4
Humanetics	192.3	132.7	82.5
Humanetics	193.3	135.2	85
SN01-Min.	183.2	128.0	77.7
SN01-Max.	187.2	132.2	83.7
SN03-Min.	180.4	125.5	72.2
SN03-Max.	191.4	138.7	84.1
E-leg-Min.	185.1	125.3	74.2
E-leg-Max.	197.9	141.3	89.2

	F1 (Nm)	F2 (Nm)	F3 (Nm)
Upper Corridor Max Result	197.9	142.4	91.7
Lower Corridor Min Result	177.5	125.3	72.2
Potential Upper Corridor (Max +5%)	207.8	149.5	96.3
Potential Lower Corridor (Min -5%)	168.6	119.0	68.6
Range	39.1	30.5	27.7

Femur Moments Pendulum Graphic

Femur Pendulum



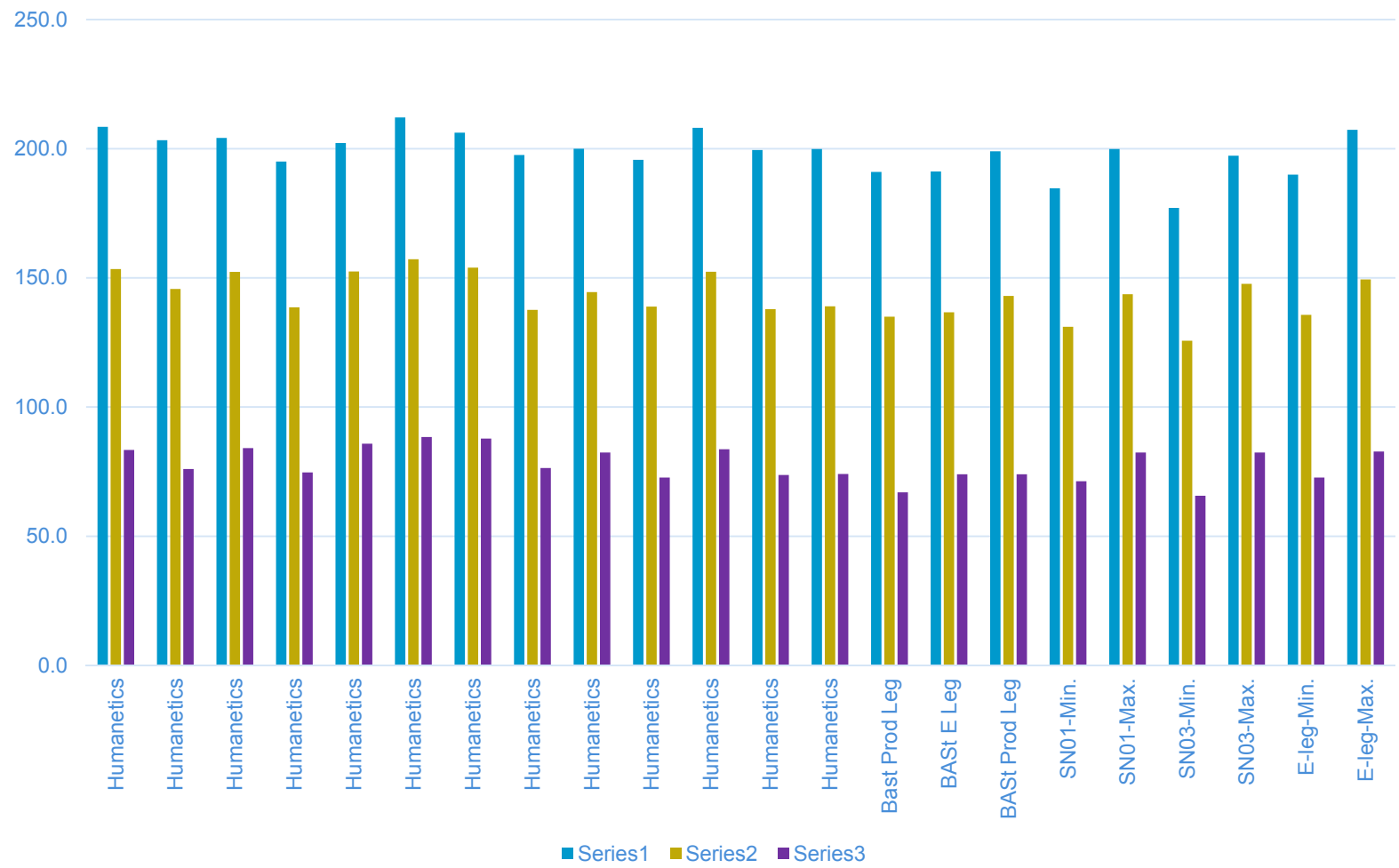
Femur Results Inverse

	F1 (Nm)	F2 (Nm)	F3 (Nm)
Humanetics	208.5	153.4	83.4
Humanetics	203.3	145.7	76.0
Humanetics	204.2	152.3	84.1
Humanetics	195.1	138.6	74.7
Humanetics	202.2	152.5	85.8
Humanetics	212.1	157.2	88.4
Humanetics	206.2	154.0	87.8
Humanetics	197.6	137.6	76.4
Humanetics	200.0	144.5	82.4
Humanetics	195.7	138.9	72.7
Humanetics	208.1	152.4	83.7
Humanetics	199.5	137.9	73.7
Humanetics	199.9	139.0	74.1
Bast Production Leg	191.0	135.0	67.0
BAS T E Leg	191.2	136.7	74.0
BAS T Production Leg	199.0	143.0	74.0
SN01-Min.	184.7	131.1	71.3
SN01-Max.	199.9	143.7	82.4
SN03-Min.	177.1	125.7	65.7
SN03-Max.	197.3	147.7	82.4
E-leg-Min.	190.0	135.7	72.7
E-leg-Max.	207.3	149.4	82.8

	F1 (Nm)	F2 (Nm)	F3 (Nm)
Upper Corridor Max Result	212.1	157.2	88.4
Lower Corridor Min Result	177.1	125.7	65.7
Potential Upper Corridor (Max +5%)	222.7	165.1	92.8
Potential Lower Corridor (Min -5%)	168.2	119.4	62.4
Range	54.5	45.6	30.4

Femur Moments Inverse Graphic

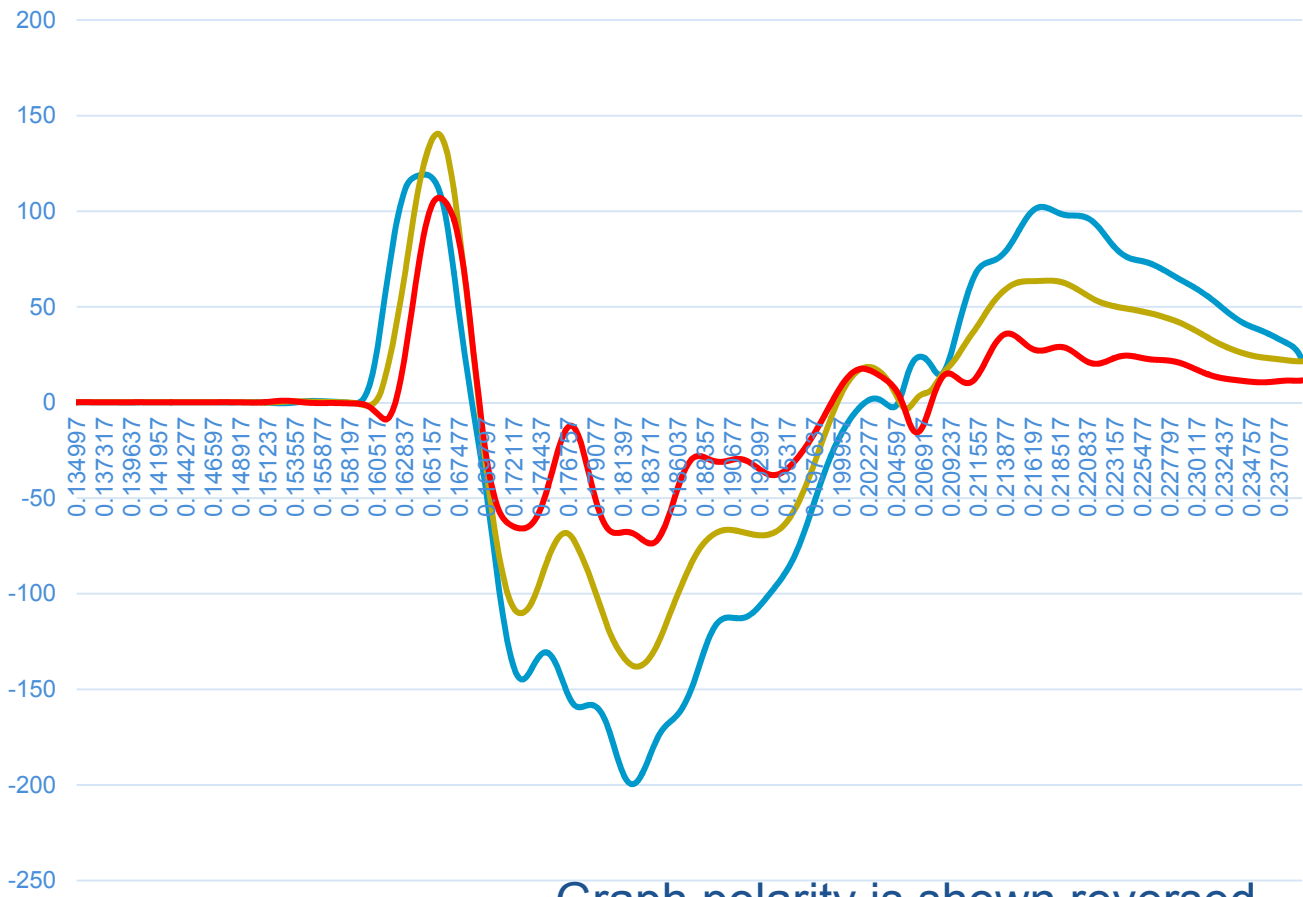
Femur Inverse



Summary

- ▶ The pendulum results show a spread of max and min values and the range is relatively narrow
- ▶ The inverse results show all the max and min values on a single leg. The range is wider than the pendulum.
- ▶ Humanetics require more results from other labs to finalize these corridors before adding to the manual.
- ▶ This would then follow the process used for data gathering on setting the regulated corridors using different labs and before users reject legs due to corridors not being met despite meeting the regulated channels

Random Inverse Femur Zero Crossing Timing Check



Graph polarity is shown reversed
Timing for Femur channels above 40 to 43 ms
Inside corridor of 28 to 58



Thank You