AEO Lock (1.0) Data Sheet

DI-NDTI- 80603-T1

Date: __4/1/17__

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Blakeley Koziel	ADRIANA BARREDA	4/1/17

- **Pass, or why failed:**
  __Pass__

Requirements:

a. The brace shall withstand a 30 lb weight suspension for 15 seconds
b. The weight shall be hung 6 in from the hinge

Materials Needed:

a. Active Assist Elbow Orthosis
b. Chronometer
c. 30 lb weight
d. 5-10 in bungee chord
e. Ruler

Recorded Values:

a. Distance weight is suspended from hinge (in): __6.0 in__
b. Duration of suspension (s): __18 sec (Test 1); 15 sec (Test 2)__

Test Errors: Weight location: +/- 0.2 inches; Weight: +/- 1 lb

Expected Results: The lock will withstand a 30 lb weight suspension for 15 seconds.

Motor Torque (2.0) Data Sheet

DI-NDTI- 80603-T2

Date: _4|23|17_

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Michael Jveiven	Adriana Barreda Carissa Grijalva	4/23/17

- **Pass, or why failed:**
  A - B : Pass   C - F : Fail (Not enough force applied ie. battery + motor)

Requirements:
a. Device moves on both flexion & extension motion when no weight is added in less than 15 seconds each way
b. Device moves on both full flexion & extension motion when 1 kg weight is added 3in from the hinge, moving in less than 15 seconds each way
c. Device moves on both full flexion & extension motion when 4 kg weight is added 3in from hinge, moving in less than 15 seconds each way

Materials Needed:
a.   Active Assist Elbow Orthosis
b.   Chronometer
c.   1 kg weight
d.   4 kg weight

Recorded Values:
a. Time to flex with no weight: _11.92 sec (Test 1)   11.92 sec (Test 2)_
b. Time to extend with no weight: _11.69 (Test 1)   11.57 sec (Test 2)_
c. Time to flex with 1 kg weight: _Fail_
d. Time to extend with 1 kg weight: _Fail_
e. Time to flex with 4 kg weight: _Fail_
f. Time to extend with 4 kg weight: _Fail_

Test Errors: Location: +/- 0.2 inches; Weight: +/- 0.1 kg

Expected Results: The brace will flex and extend in less than 15 seconds for all 3 of the different weight categories.

Position Tolerance (3.0) Data Sheet

DI-NDTI- 80603-T3

Date: 4/25/17

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Michael Sveiven	Adriana Barreda Carissa Grijalva	4/25/17

- **Pass, or why failed:** Pass
_____

Requirements:

a.   The AEO shall move to the desired angle of 45°
b.   The desired angle shall be within 2.5° of the actual angle

Materials Needed:

a.   Active Assist Elbow Orthosis
b.   Exacta goniometer

Recorded Values:

a.   Actual Angle measured by exacta goniometer: 43.5°
_____

Test Errors: Device error: +/- 2.5°

Limit Calculation:

$$45° + 2.5° = 47.5°$$

$$45° - 2.5° = 42.5°$$

Expected Results:

$$42.5° < Actual\ Angle < 47.5°$$

AEO Sensor (4.0) Data Sheet

DI-NDTI- 80603-T4

Date: _4/26/17_

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Michael Vveiven	Carissa Grijalva	4/26/17

- **Pass, or why failed:** _Pass_

Requirements:

a. Device moves to 45° and is within 2.5° accuracy
b. Device moves to 60° and is within 2.5° accuracy
c. Device moves to 120° and is within 2.5° accuracy

Recorded Values:
a. Angle when device is programmed to 45°: _43° (Test 1) 43° (Test 2)_
b. Angle when device is programmed to 60°: _60° (Test 1) 60° (Test 2)_
c. Angle when device is programmed to 120°: _119° (Test 1) 119° (Test 2)_

Test Errors: Device sensor: +/- 2.5° accuracy

Limit Calculation: Accuracy Requirement: 2.5°
$$Programmed\ Angle - Measured\ Angle =$$
a. $|45° - 43°| = 2°$

b. $|60° - 60°| = 0°$

c. $|120° - 119°| = 1°$

Expected Results:
$$|Programmed\ Angle - Measured\ Angle| < 2.5°$$

Angular Speed (5.0) Data Sheet

DI-NDTI- 80603-T5

Date: 4/23/17

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Michael Jveiven	Carissa Grijalva	4/23/17

- **Pass, or why failed:**

  Pass
  _____

Requirements:

a.   Speed for flexion shall be less than 10°/sec
b.   Speed for extension shall be less than 10°/sec

Materials Needed:
a.   Active Assist Elbow Orthosis
b.   Chronometer

Recorded Values:

a.   Flexion Time: _12.01 sec_
b.   Extension Time: _12.25 sec_
c.   Flexion Speed: $\omega = 120/t$ _9.510 deg/sec_
d.   Extension Speed: $\omega = 120/t$ _9.795 deg/sec_

Expected Results: The flexion and extension velocities will be less than 10°/sec

Sensor App Accuracy (6.0) Data Sheet

DI-NDTI- 80603-T6

Date: _4/26/17_

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Michael Sveiven	Carissa Grijalva	4/26/17

- **Pass, or why failed:** _Pass_

Requirements:

a.   When the device is in full flexion, the iOS application shall read the correct angle within 2.5° of the actual angle

b.   When the device is in full extension, the iOS application shall read the correct angle within 2.5° of the actual angle

Materials Needed:

a.   Active Assist Elbow Orthosis

b.   Exacta goniometer

Recorded Values:

a.   Flexion angle: _119°_

b.   Extension angle: _-1.5°_

Test Errors: Device sensor: +/- 2.5° accuracy

Limit Calculation: Accuracy Requirement: 2.5°

$$|iOS\ Application\ Angle - Measured\ Angle| =$$

a.   Input = 0° $|\ 120° - 119°\ | = 1°$

b.   Input = 0° $|\ -2 - -1.5\ | = 0.5°$

Expected Results:

$$|iOS\ Application\ Angle - Measured\ Angle| < 2.5°$$

Temperature Range (7.0) Data Sheet

DI-NDTI- 80603-T7

Date: 4/28/17

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Tim Shimon	Michael Sugiven	4/28/17

- **Pass, or why failed:**

  Pass
  _____

Requirements:

a.   Device moves 120° in around 15 seconds while hot

b.   Device moves 120° in around 15 seconds while cold

Materials Needed:

a.   Active Assist Elbow Orthosis

b.   Refrigerator programmed to 32°F

c.   Oven preheated to 104°F

d.   iPhone timer

Recorded Values:

a.   Angle reached after Refrigerator: _119°_

b.   Angle reached after Oven: _119°_

c.   Time to reach 120° after Refrigerator: _11.58 sec_

d.   Time to reach 120° after Oven: _11.62 sec_

Test Errors: Refrigerator: +/- 2°; Oven: +/- 2°

Expected Results: The brace will move 120° in around 15 seconds while both hot and cold

Weather (8.0) Data Sheet

DI-NDTI- 80603-T8

Date: _____4/28/17_____

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Blakeley Koziol	Michael Sverven	4/28/17

- **Pass, or why failed:**

_____ Pass _____

Requirements:

a.   The AEO shall move 120° in 15 seconds or less

Materials Required:

a.   Active Assist Elbow Orthosis
b.   Spray bottle full of water
c.   Chronometer

Recorded Values:

a.   Angle device moved: _____120°_____
b.   Time device took to move to angle: _____11.61 sec_____

Expected Results: The device will move 120° in less than 15 seconds

Battery Life (9.0) Data Sheet

DI-NDTI- 80603-T9

Date: _____4|28|17_____

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Carissa Grijalva	Blakeley Koziol	4|28|17

- **Pass, or why failed:** Pass
  _____

Requirements:

a. The battery shall withstand at least 20 cycles continuously in its lifetime
b. The battery life shall last at least an hour

Materials Needed:

a. Active Assist Elbow Orthosis
b. iPhone timer

Recorded Values:

a. Cycles until battery dies: _____109^+ cycles_____
b. Time of battery life: _____10^+ hours_____

Expected Results: The battery will last duration of at least 20 cycles in at least an hour

Battery Recharge (10.0) Data Sheet
DI-NDTI- 80603-T10

Date: _____4/28/17_____

Contractor: _____

Test Performed By:	Test Witnessed By:	Date:
Carissa Grijalva	Blakeley Koziol	4/28/17

- **Pass, or why failed:**

_____Pass_____

Requirements:

a.   Battery recharge from completely dead to fully recharged shall take less than 12 hours

Materials Needed:

a.   12 V 3500mAh Battery
b.   Battery Charging Dock
c.   Outlet
d.   iPhone timer

Recorded Values:

a.   Battery recharge time: _____7 hours_____

Expected Results: The battery will recharge in less than 12 hours