intertek
Total Quality. Assured.

ARCIMOTO INC.
UN38.3 TRANSPORTATION TESTING

SCOPE OF WORK
Model Number: 006099

REPORT NUMBER
105083187DET-001

ISSUE DATE

May-22-2023

PAGES
42

DOCUMENT CONTROL NUMBER
RT-L-AMER-DET-003

45000 Helm Street
Suite 150
Plymouth Twp., MI 48170

Telephone: 734-582-2900
Facsimile: 734-582-2901
www.intertek.com

Yui Zojo
Arcimoto Inc.
2034 W. 2nd Ave.
Eugene, OR 97402-4630
Phone: (913) 522-7439
E-mail Address: yuiz@arcimoto.com

DATE RECEIVED: JUL/12/2022
DATE TESTED: AUG/03/2022 through MAR/27/2023

WORK REQUESTED / APPLICABLE DOCUMENTS:

Per the client's request and in accordance with UN Manual of Test and Criteria, Seventh revised edition, Amendment 1; "Recommendations on the Transport of Dangerous Goods," Section 38.3 "Lithium metal and lithium-ion batteries" and our quotation number Qu-01264203, dated May/12/2022; perform Battery Testing as described below:

- T1 – Altitude Simulation
- T2 – Thermal Test
- T3 – Vibration
- T4 – Shock
- T5 – External Short Circuit

DESCRIPTION OF TEST SAMPLES:

SAMPLE DESCRIPTION: Four (4) 006099 Lithium-ion Battery Packs

MANUFACTURER: Arcimoto Inc.

MODEL NUMBER: 006099

RATINGS: 50.96V 192Ah

SPECIFICATION SECTIONS T1 through T5:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Condition of Test Sample: Production

Testing Performed at:
Intertek
45000 Helm Street, Suite 150
Plymouth Twp., MI 48170

Photographs of Sample	
	
BATTERY PACK - FRONT	BATTERY PACK - BACK

RESULT SUMMARY: The tested samples met the test requirements. See below breakout for tests performed.

Specification Section	Test Description	Results
T1	Altitude Simulation	Pass
T2	Thermal Test	Pass
T3	Vibration	Pass
T4	Shock	Pass
T5	External Short Circuit	Pass

Michael Moore	Rich Byczek
Battery Engineer	Technical Director
May 22, 2023	
Report No.: 105083187DET-001	

EQUIPMENT LIST:

Asset #	Description	Manufacturer	Model	Serial#	Last Cal	Next Cal Due
161336	BATTERY TESTER	PEC NORTH AMERICA	SBT 8050/12 Channel	10030003	APR/14/2022	APR/14/2023
169029	SCALE	AEDAM	GFK 330aH	AE82650	MAY/09/2022	MAY/09/2023
372-210	DIGITAL MULTIMETER	FLUKE	77 IV	38990065	NOV/10/2022	NOV/10/2023
373-135	DATA ACQ/SWITCH UNIT	KEYSIGHT	34972A	MY49021271	JAN/20/22	JAN/20/23
376-019	DC POWER SUPPLY	MASTECH	HY3030E	388405	VBU	VBU
161279	ALTITUDE CABINET	ENTELA	N/A	Y10349	RO	RO
161279.1	PRESSURE TRANSDUCER	FAIRCHILD	TA870212A	366027	FEB/02/2022	FEB/02/2023
376-080P	ENVIRONMENTAL CHAMBER	THERMOTRON	SE-1000-10-10	46843	MAR/25/2022	MAR/25/2023
376-041	SIGNAL PROCESSOR	VIBRATION RESEARCH	VR9500	951C711D	JUL/05/2022	JUL/05/2023
376-058	ACCELEROMETER	PCB	353B15	LW197022	AUG/11/2022	AUG/11/2023
160112	VIBRATION AMP	UNHOLTZ-DICKIE	TA-117SA-560	1987	VBU	VBU
160122	VIBRATION SHAKER	UNHOLTZ-DICKIE	#560	290	RO	RO
375-298	11,000 LB SHAKER	ETS SOLUTIONS	M544A/GT900M	SH1506182-2	RO	RO
375-298.1	ELECTRODYNAMIC SHAKER – 11KLBF	ETS SOLUTIONS	MPA712/M544A/GT900M	SH1506182-2	RO	RO
375-352	ACCELEROMETER	PCB	J353B15	207241	MAR/22/2022	MAR/22/2023
375-237	ACCELEROMETER	PCB	353B15	LW196640	NOV/11/2021	NOV/11/2022
372-211	DIGITAL MULTIMETER	FLUKE	77 IV	38990370	OCT/17/2021	OCT/17/2022
375-487	ACCELEROMETER	PCB	320C15	25091	DEC/30/2021	DEC/30/2022
376-190	ENVIRONMENTAL CHAMBER	CINCINNATI SUB ZERO	ZPS-64-1-10-SC/WC	ZP2149623	OCT/28/2022	OCT/28/2023
376-031	SWITCHING POWER SUPPLY	TEKPOWER	TP3010E	119484	VBU	VBU
376-086	BATTERY HITESTER	HIOKI	3554	150520162	MAR/30/2022	MAR/20/2023
373-444	DATA ACQ/SWITCH UNIT	KEYSIGHT	32972A	MY49006745	DEC/15/2022	DEC/15/2023

**VBU = "Verified Before Use"*

**RO = "Reference Only"*

SECTION 1

T1 – ALTITUDE SIMULATION

Date Received: JUL/12/2022
Date(s) Tested: AUG/03/2022 through AUG/04/2022

Description of Samples:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Purpose:
This test simulates air transport under low-pressure conditions.

Test Procedure:
Prior to testing the voltage and mass were measured on each sample. The samples were then placed into an altitude cabinet, stored at a pressure of 11.6 kPa or less for six (6) hours at ambient temperature. After testing, the voltage and mass were measured on each sample.

Acceptance Criteria:
Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

T1 – ALTITUDE SIMULATION

Results:

The test samples conformed to the acceptance criteria; there was no mass loss, no leakage, no venting, no disassembly, no rupture, no fire and the open circuit voltage of each test sample after testing was not less than 90% of its voltage immediately prior to this procedure.

T1 - Altitude								
Sample No.	Pre Conditioning Cycles	Voltage Pre Test (VDC)	Voltage Post Test (VDC)	%Change (Not Greater Than 10%)	Weight Pre Test (Grams)	Weight Post Test (Grams)	%Change (Not Greater Than 0.1%)	Meets requirement
1	25	58.10	58.05	0.09	52908	52902	0.01	Pass
2	25	58.08	58.03	0.09	52870	52870	0.00	Pass
3	1	58.07	58.04	0.05	52858	52858	0.00	Pass
4	1	58.04	58.02	0.03	52868	52868	0.00	Pass

Appendix:

Appendix A – Photograph
Appendix B – Altitude Simulation Graph

Disposition of Test Samples:

At the completion of testing, the samples continued to T2 – Thermal Test.

SECTION 2

T2 – THERMAL TEST

Date Received: JUL/12/2022
Date(s) Tested: AUG/04/2022 through AUG/16/2022

Description of Samples:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Purpose:
This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

Test Procedure:
Prior to testing the voltage and mass were measured on each sample. The samples were placed into an environmental chamber and stored for twelve (12) hours at 72°C ± 2°C, followed by storage of equal time at a temperature of -40°C ± 2°C. The maximum time interval between test temperature extremes was 30 minutes. This procedure was repeated 10 times, after which all samples were stored for 24 hours at ambient temperature. After testing the voltage and mass were measured on each sample.

Acceptance Criteria:
Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

T2 – THERMAL TEST

Results:

The test samples conformed to the acceptance criteria; there was no mass loss, no leakage, no venting, no disassembly, no rupture, no fire and the open circuit voltage of each test sample after testing was not less than 90% of its voltage immediately prior to this procedure.

T2 - Thermal								
Sample No.	Pre Conditioning Cycles	Voltage Pre Test (VDC)	Voltage Post Test (VDC)	%Change (Not Greater Than 10%)	Weight Pre Test (Grams)	Weight Post Test (Grams)	%Change (Not Greater Than 0.1%)	Meets requirement
1	25	58.08	57.81	0.46	52902	52894	0.02	Pass
2	25	58.03	57.81	0.38	52870	52862	0.02	Pass
3	1	58.04	57.66	0.65	52858	52850	0.02	Pass
4	1	58.02	57.64	0.65	52868	52860	0.02	Pass

Appendix:

Appendix A – Photograph
Appendix C – Thermal Test Graph

Disposition of Test Samples:

At the completion of testing, the samples continued to T3 – Vibration.

SECTION 3

T3 – VIBRATION

Date Received: JUL/12/2022
Date(s) Tested: AUG/17/2022 through SEP/26/2022

Description of Samples:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Purpose:
This test simulates vibration during transport.

Test Procedure:
Prior to testing the voltage and mass were measured on each sample. The samples were firmly secured to the platform of the vibration machine without distorting the packs in such a manner as to faithfully transmit the vibration. The test samples were subjected to sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle was repeated 12 times for a total of three (3) hours for each of the three (3) mutually perpendicular mounting positions of the sample. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1g is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 2g occurs (approximately 25 Hz). A peak acceleration of 2g is then maintained until the frequency is increased to 200 Hz. After testing the voltage and mass were measured on each sample.

Acceptance Criteria:
Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

T3 – VIBRATION

Results:

The test samples conformed to the acceptance criteria; there was no leakage, no venting, no disassembly, no rupture and no fire and the open circuit voltage of each test cell or battery after testing was not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

T3 - Vibration								
Sample No.	Pre Conditioning Cycles	Voltage Pre Test (VDC)	Voltage Post Test (VDC)	%Change (Not Greater Than 10%)	Weight Pre Test (Grams)	Weight Post Test (Grams)	%Change (Not Greater Than 0.1%)	Meets requirement
1	25	57.81	57.79	0.03	52894	52890	0.01	Pass
2	25	57.81	57.79	0.03	52862	52860	0.00	Pass
3	1	57.66	57.64	0.03	52850	52848	0.00	Pass
4	1	57.64	57.62	0.03	52860	52858	0.00	Pass

Appendices:

Appendix A – Photographs
Appendix D – Vibration Plots

Disposition of Test Samples:

At the completion of testing, the samples continued to T4 – Shock.

SECTION 4

T4 – SHOCK

Date Received: JUL/12/2022
Date(s) Tested: SEP/26/2022 through NOV/22/22

Description of Samples:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Purpose:
This test simulates possible impacts during transport.

Test Procedure:
Prior to testing the voltage and mass were measured on each sample. The samples were secured to the testing machine by means of a rigid mount with support on all mounting surfaces of each test battery. Each sample was subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be eleven (11) milliseconds. Table 1 provides the formulas below are provided to calculate the appropriate minimum peak accelerations.

Battery	Minimum peak acceleration	Pulse duration
Small batteries	150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass*}\right)}$ whichever is smaller	6 ms
Large batteries	50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass*}\right)}$ whichever is smaller	11 ms

* Mass is expressed in kilograms.

Table 1: T4 – Shock Peak Acceleration Formula

The peak acceleration for these large battery packs is 23.83g.

Each sample was subjected to three (3) shocks in the positive direction followed by three (3) shocks in the negative direction of the three mutually perpendicular mounting positions. After testing the voltage and mass were measured on each sample.

T4 – SHOCK

Acceptance Criteria:

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Results:

The test samples conformed to the acceptance criteria; there was no leakage, no venting, no disassembly, no rupture and no fire and the open circuit voltage of each test cell or battery after testing was not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

T4 - Shock								
Sample No.	Pre Conditioning Cycles	Voltage Pre Test (VDC)	Voltage Post Test (VDC)	%Change (Not Greater Than 10%)	Weight Pre Test (Grams)	Weight Post Test (Grams)	%Change (Not Greater Than 0.1%)	Meets requirement
1	25	57.79	57.77	0.03	52890	52892	0.00	Pass
2	25	57.79	57.77	0.03	52860	52858	0.00	Pass
3	1	57.64	57.62	0.03	52848	52844	0.01	Pass
4	1	57.62	57.60	0.03	52858	52856	0.00	Pass

Appendices:

Appendix A – Photographs
Appendix E – Shock Plots

Disposition of Test Samples:

At the completion of testing, the samples continued to T5 – External Short Circuit.

SECTION 5

T5 – EXTERNAL SHORT CIRCUIT

Date Received: JUL/12/2022
Date(s) Tested: MAR/20/2022 through MAR/27/2022

Description of Samples:
Four (4) 006099 Lithium-ion Battery Packs, sample numbers:

25 Cycles, 100% SOC
- SN 1
- SN 2

1 Cycle, 100% SOC
- SN 3
- SN 4

Purpose:
This test simulates an external short circuit.

Test Procedure:
The battery to be tested shall be heated for a period of time necessary to reach a homogenous stabilized temperature of 57°C ± 4°C, measured on the external case. This period of time depends on the size and design of the battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least twelve (12) hours for large batteries. Then the samples shall be subjected to a short circuit condition with a total external resistance of less than 0.1 Ohm at 57°C ± 4°C. This short circuit condition continued for one (1) hour after the sample's external case temperature returned to 57°C ± 4°C. The samples were observed for a further six (6) hours for the test to be concluded.

Actual pre-test measured resistance:
SN 1 = 0.3mΩ
SN 2 = 0.3mΩ
SN 3 = 0.3mΩ
SN 4 = 0.4mΩ

Acceptance Criteria:
Batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.

T5 – EXTERNAL SHORT CIRCUIT

Test Procedure Notes:
Client provided test fixture containing two copper bars, a steel extender for the positive terminal, and 5 contactors in parallel. Sample voltage and temperature were monitored during the test. Current was not recorded and confirmed with client prior to testing.

The test fixture was activated by powering the contactors with 24V, 2.5A. Multiple contactors welded shut during each test and were replaced according to the document "Procedure To Replace a Shorted Contactor in The Battery Module Shorting Bar" provided by the client. Resistance was measured before each test.

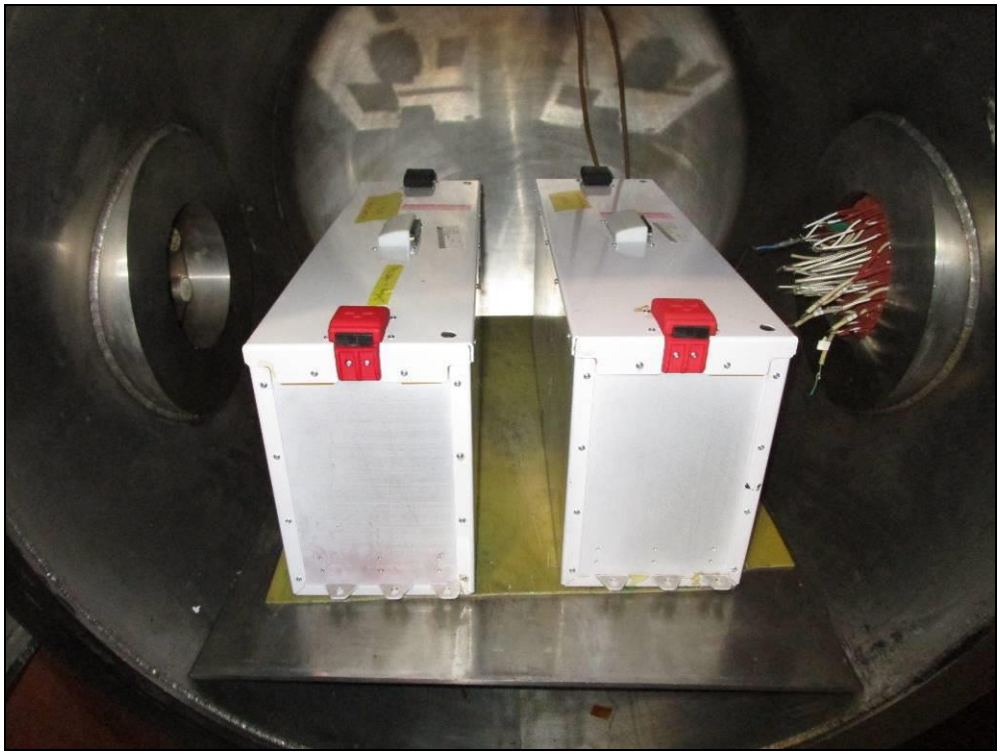
Samples were placed in a thermal chamber and exposed to a temperature of 57°C ± 4°C for 12 hours before being transferred to a room temperature bunker controlled at 22C for testing. As a result, the external case temperature at the start of test was less than 53°C, but the internal temperatures did not have sufficient time to cool down.

Results:
The test samples conformed to the acceptance criteria; at the completion of testing the batteries' external temperature did not exceed 170°C and there was no disassembly, no rupture or fire within six hours of this test.

Appendices:
Appendix A – Photograph
Appendix F – External Short Circuit Graphs

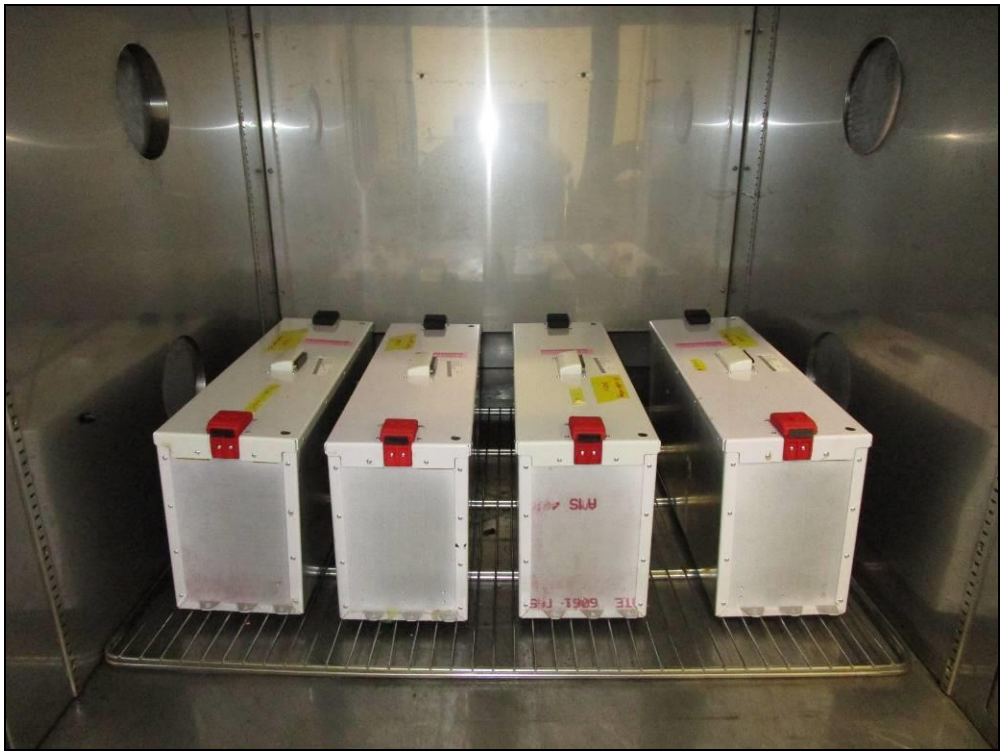
Disposition of Test Samples:
At the completion of testing, the samples were returned to the client.

APPENDIX A – PHOTOGRAPHS
T1 – Altitude Simulation



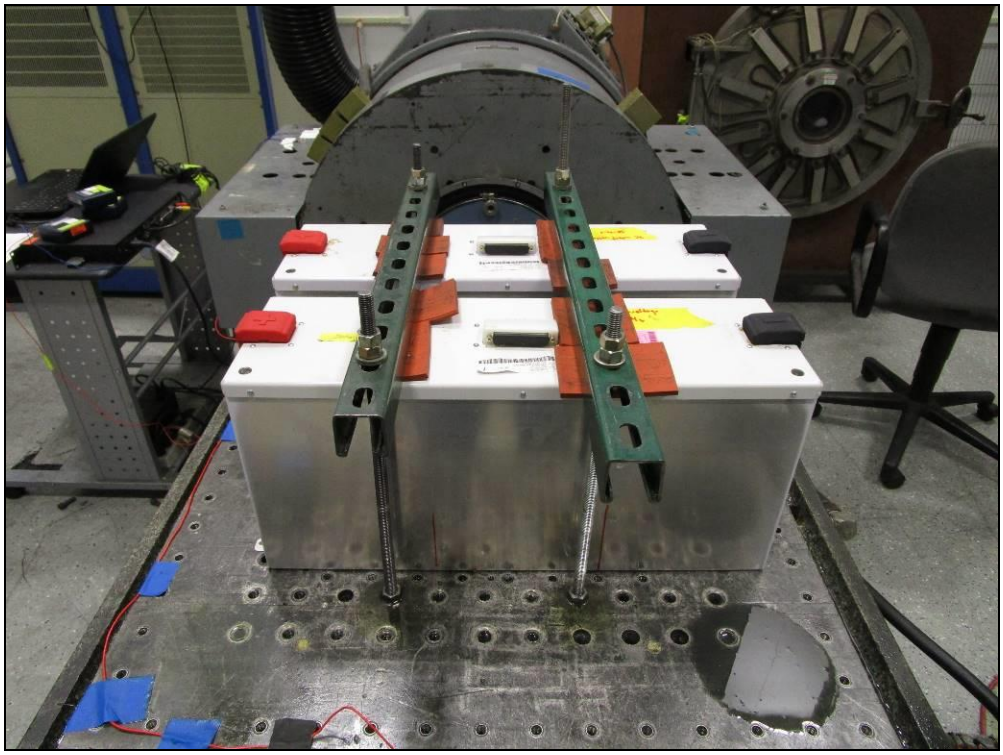
Photograph 1: Altitude Simulation

APPENDIX A – PHOTOGRAPHS
T2 – Thermal Test

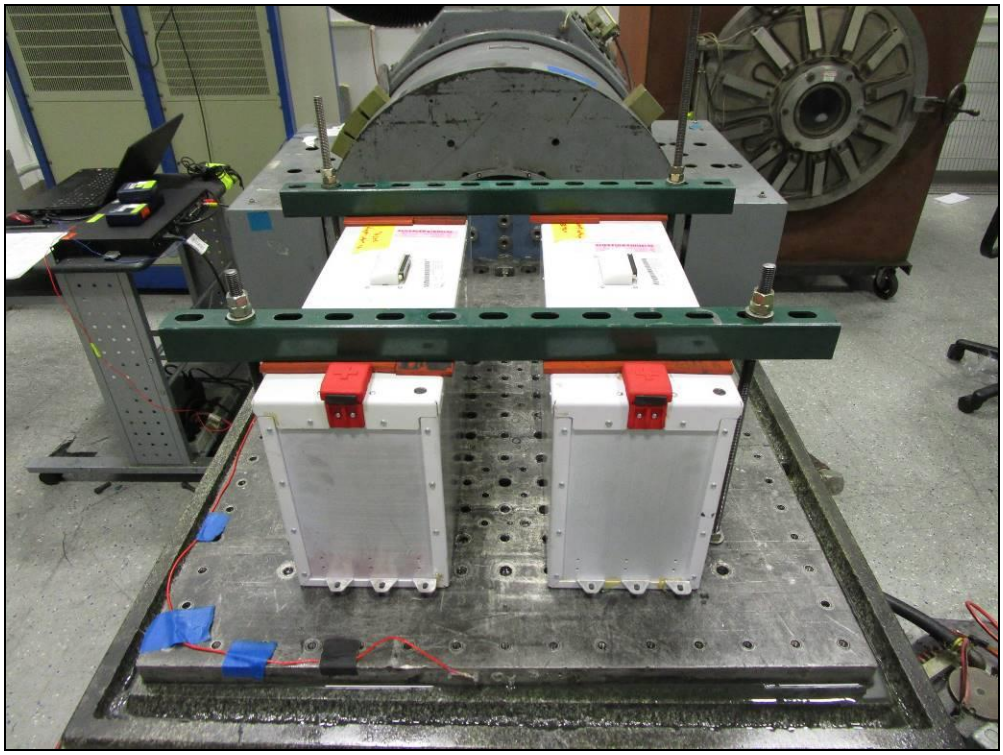


Photograph 2: Thermal Test Setup

APPENDIX A – PHOTOGRAPHS
T3 – Vibration



Photograph 3: Vibration Test – Fore/Aft Direction

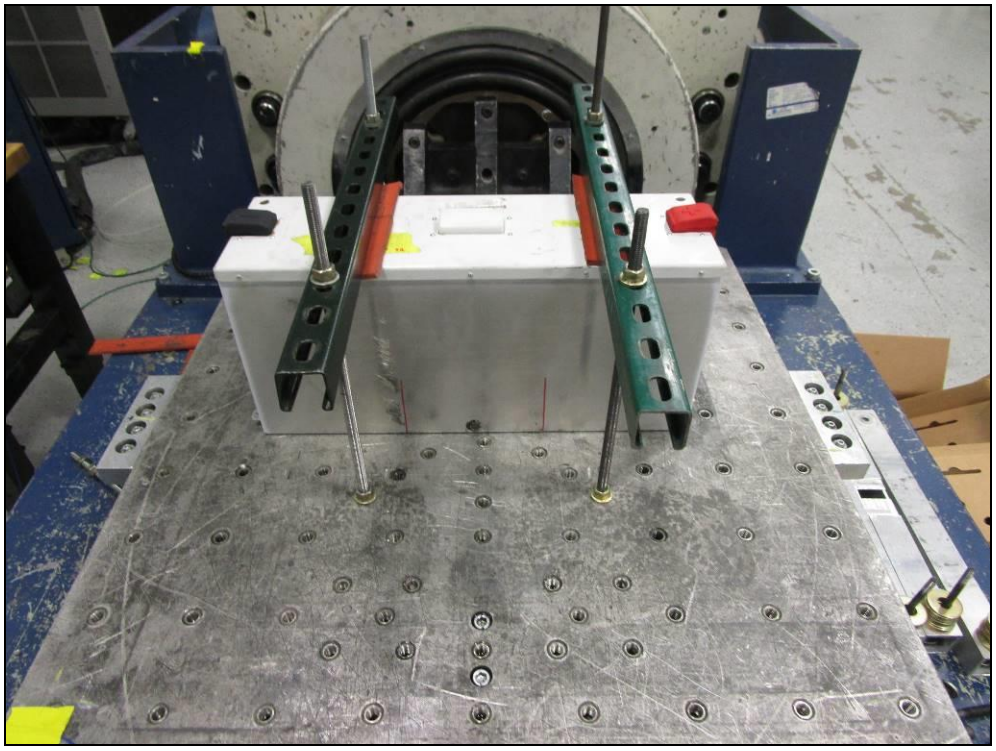


Photograph 4: Vibration Test – Lateral

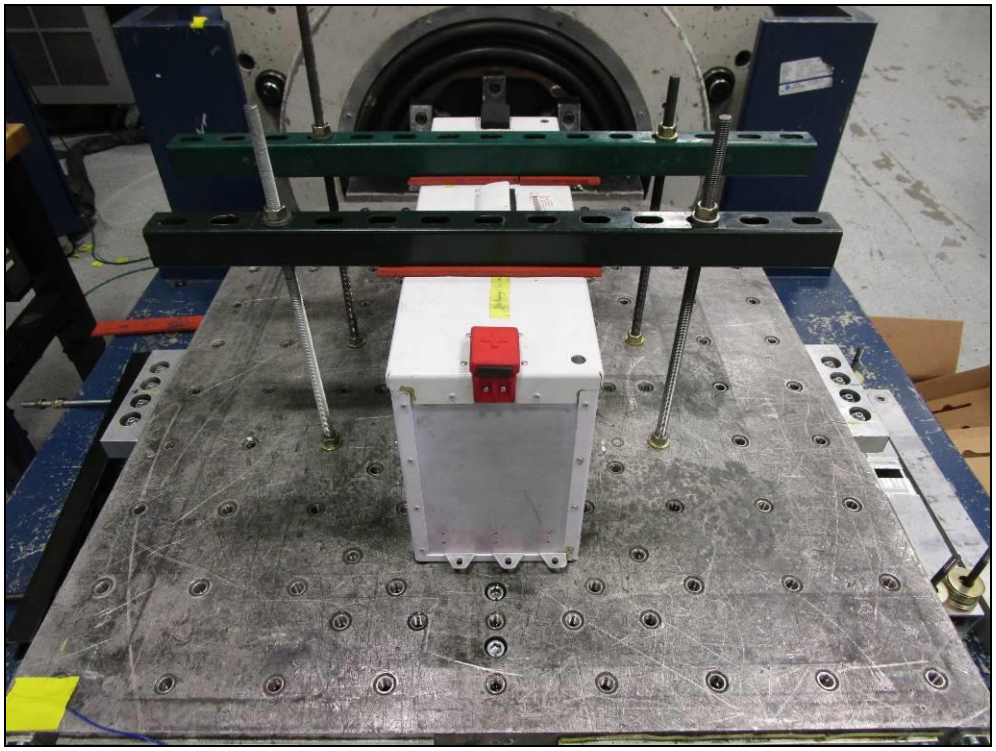
APPENDIX A – PHOTOGRAPHS
T3 – Vibration

Photograph 5: Vibration Test – Vertical Direction

APPENDIX A – PHOTOGRAPHS
T4 – Shock

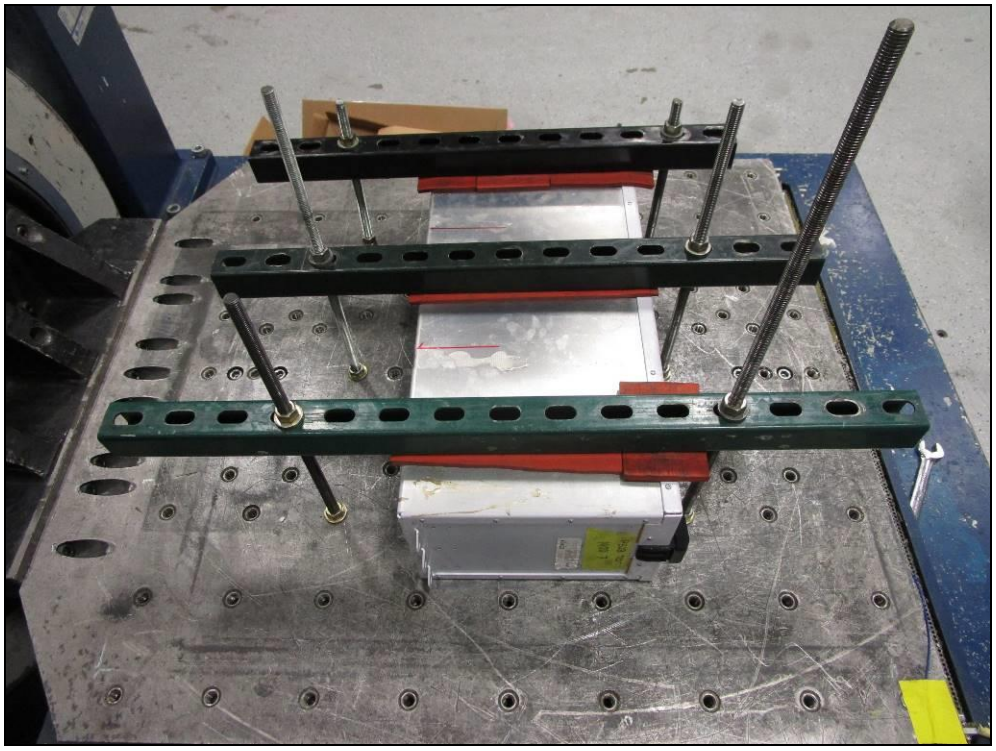


Photograph 6: Shock Test – Fore/Aft Positive and Negative Direction



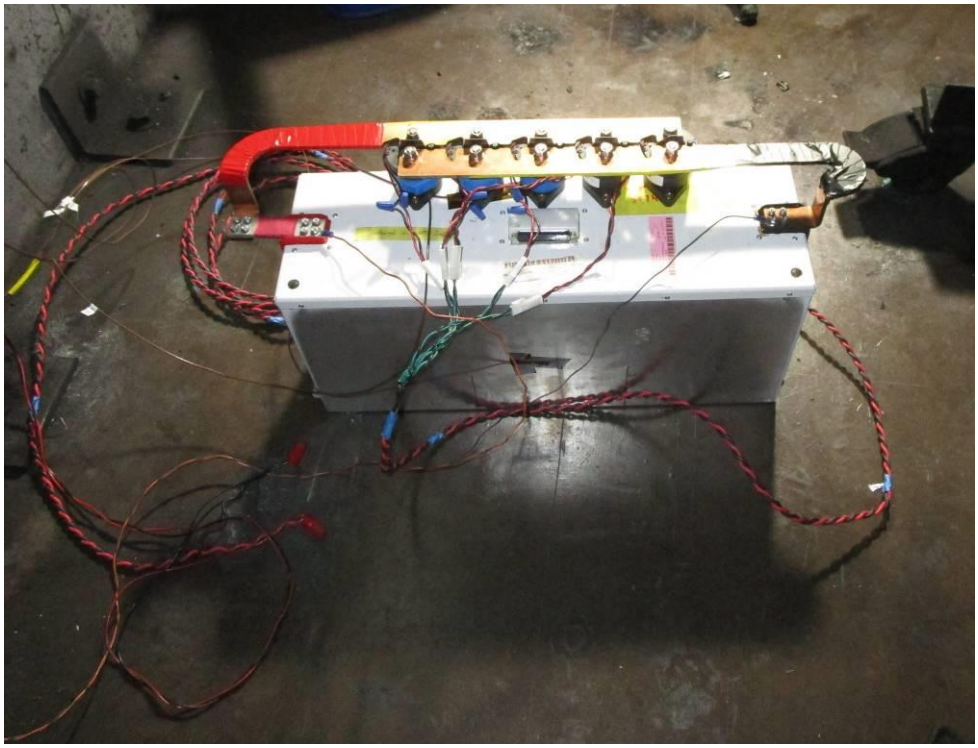
Photograph 7: Shock Test – Lateral Positive and Negative Direction

APPENDIX A – PHOTOGRAPHS
T4 – Shock



Photograph 8: Shock Test – Vertical Positive and Negative Direction

APPENDIX A – PHOTOGRAPHS
T5 – External Short Circuit



Photograph 9: External Short Circuit

APPENDIX B
T1 – Altitude Simulation Graph

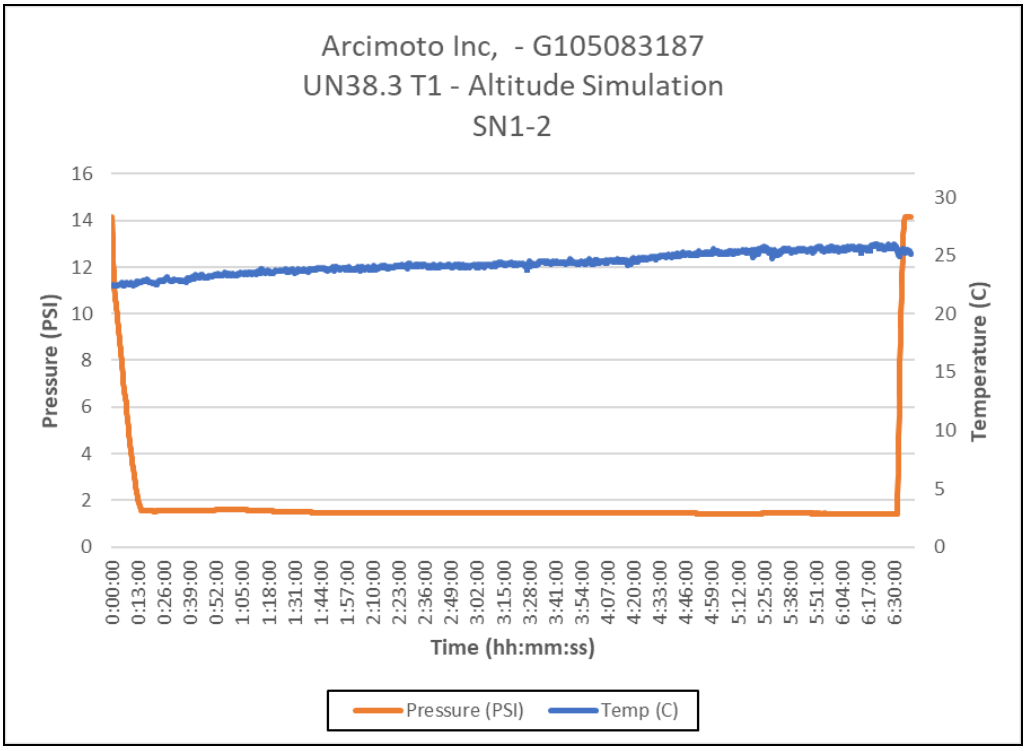


Figure 1: Altitude Simulation Graph SN1-2

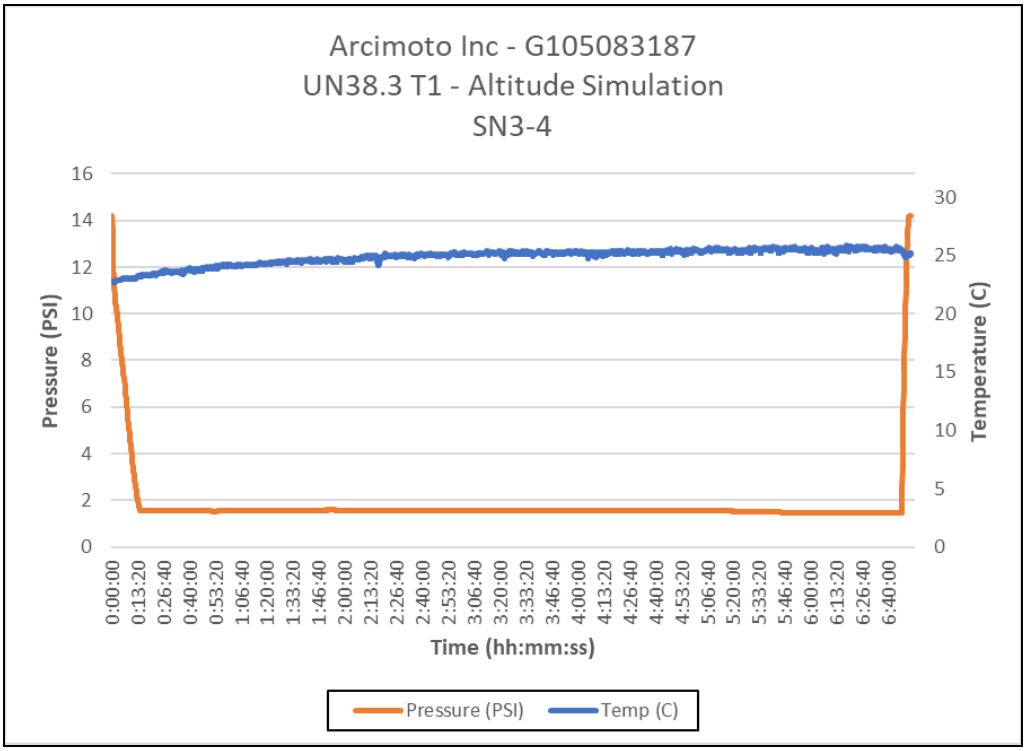


Figure 2: Altitude Simulation Graph SN3-4

APPENDIX C
T2 – Thermal Test Graph

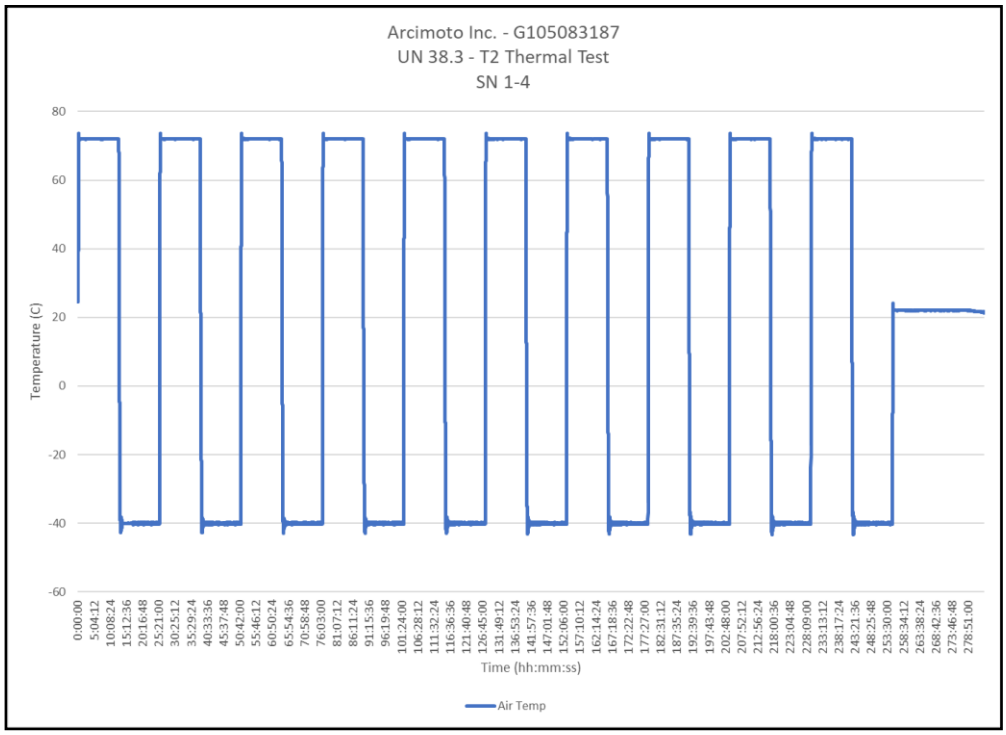


Figure 3: Thermal Test Graph SN1-4

APPENDIX D
T3 – Vibration Plots

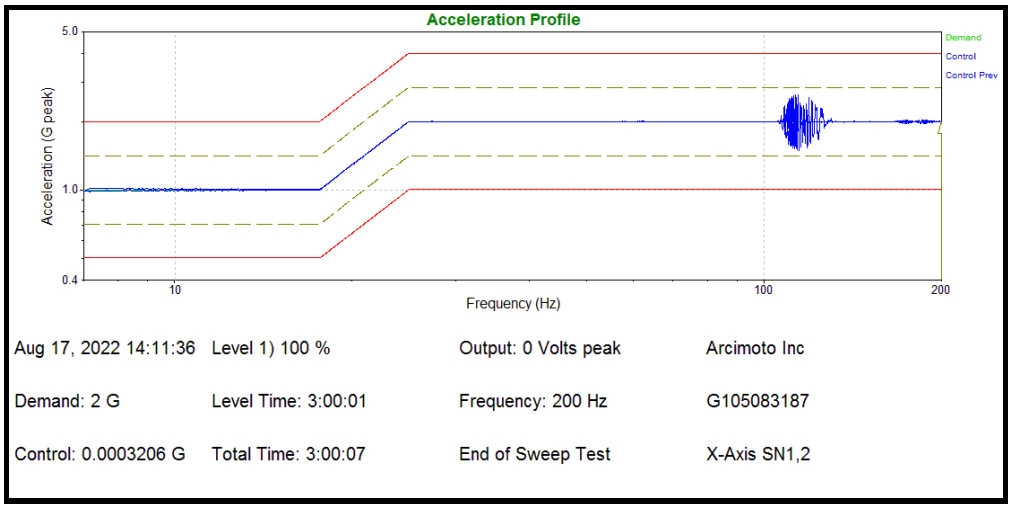


Figure 4: Vibration Plot – Fore/Aft Direction SN1-2

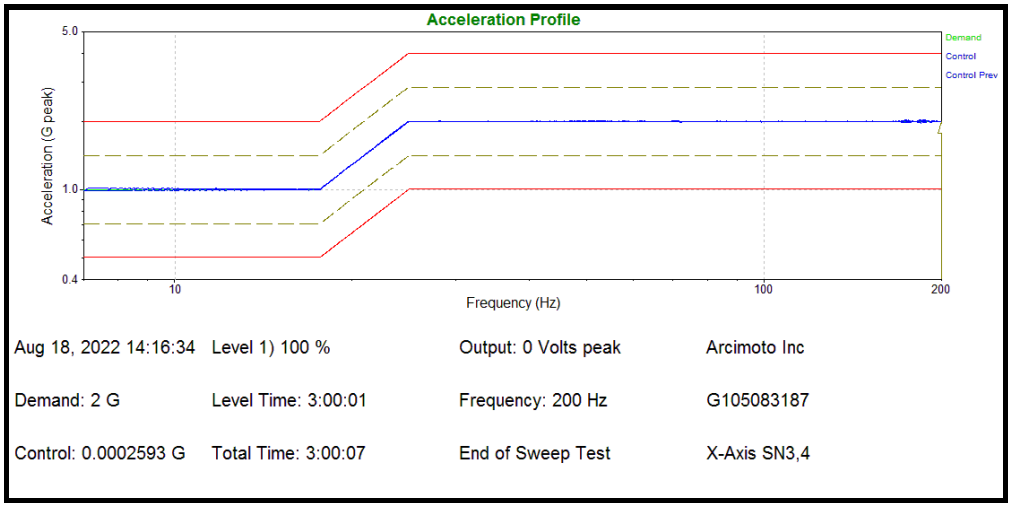


Figure 5: Vibration Plot – Fore/Aft Direction SN3-4

APPENDIX D
T3 – Vibration Plots

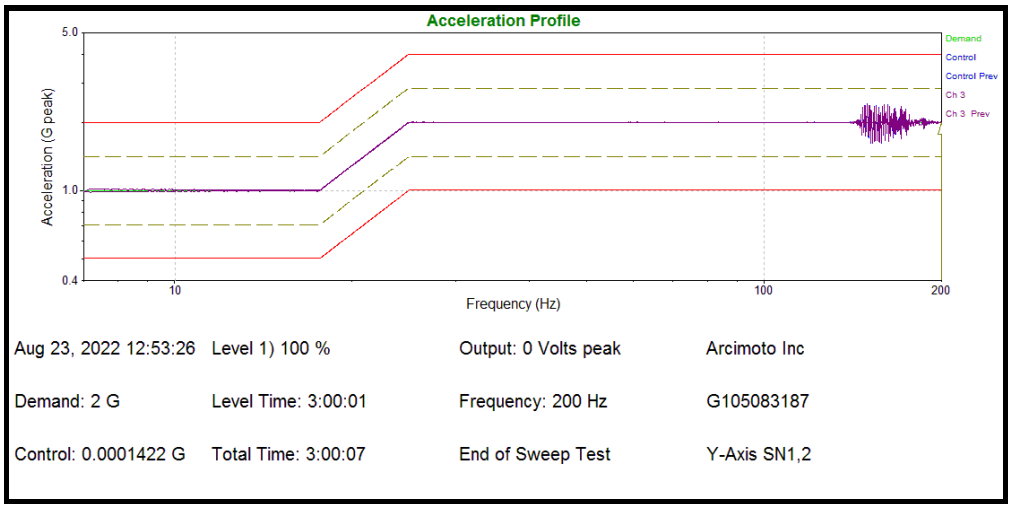


Figure 6: Vibration Plot – Lateral Direction SN1-2

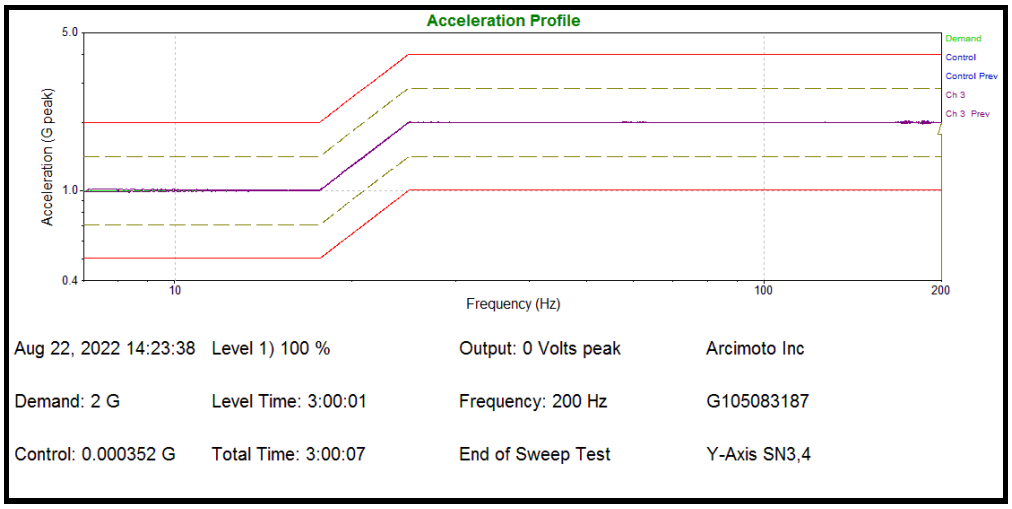


Figure 7: Vibration Plot – Lateral Direction SN3-4

APPENDIX D
T3 – Vibration Plots

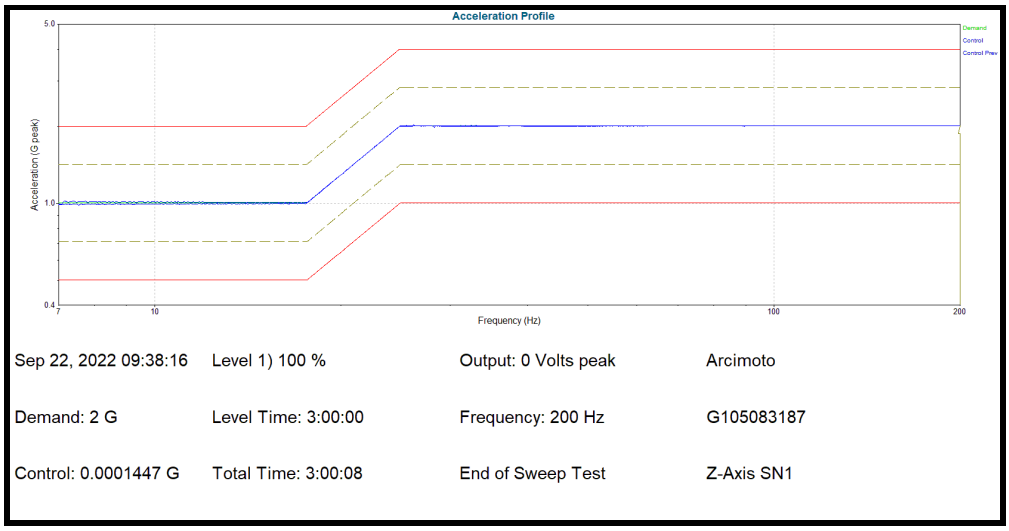


Figure 8: Vibration Plot – Vertical Direction SN1

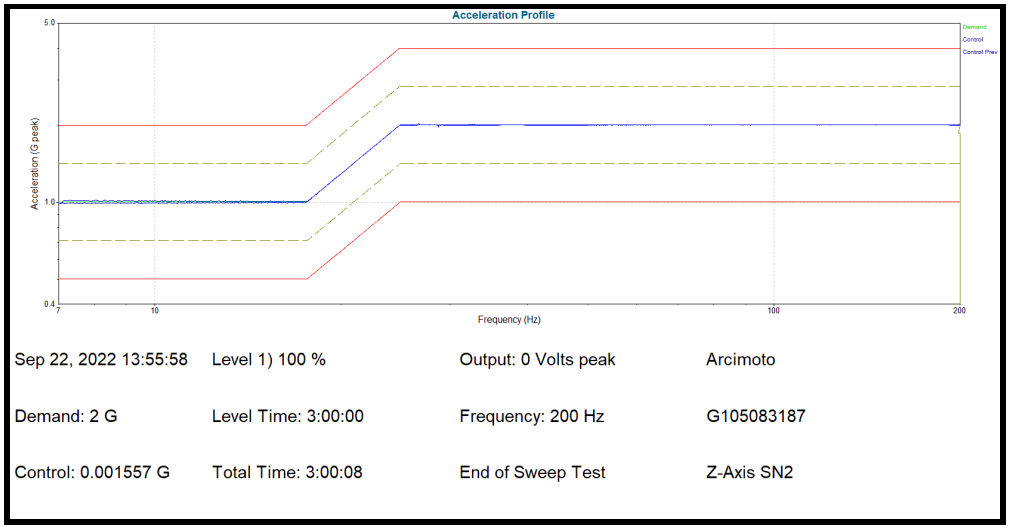


Figure 9: Vibration Plot – Vertical Direction SN2

APPENDIX D
T3 – Vibration Plots

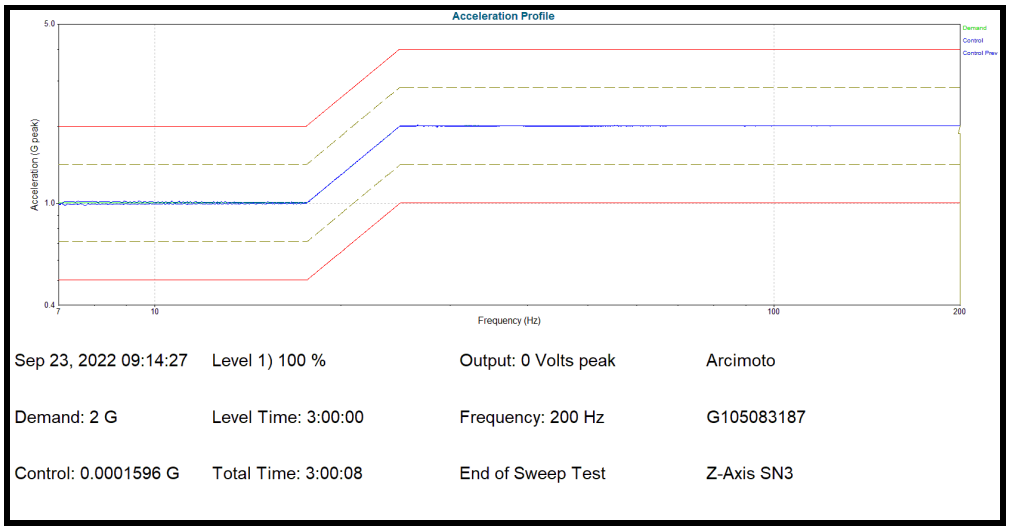


Figure 10: Vibration Plot – Vertical Direction SN3

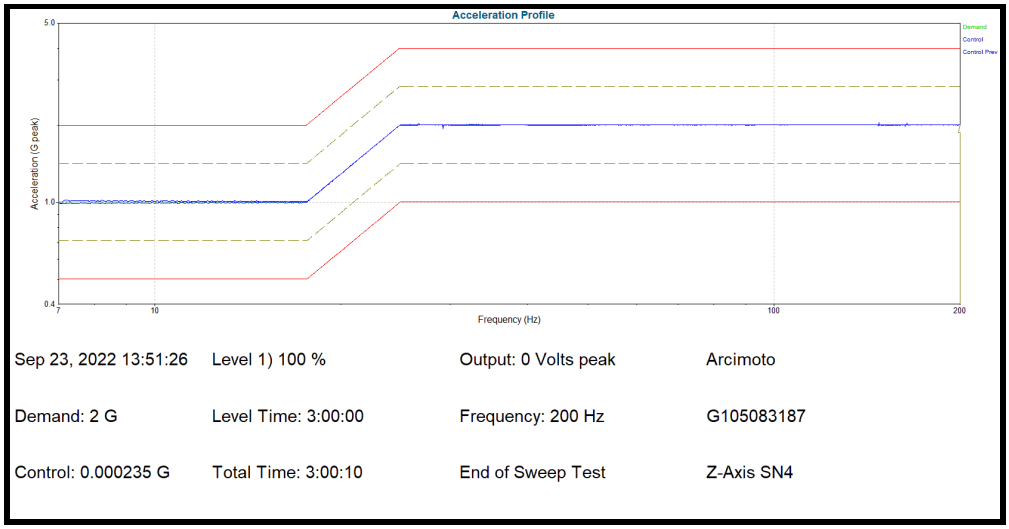


Figure 11: Vibration Plot – Vertical Direction SN4

APPENDIX E
T4 – Shock Plots

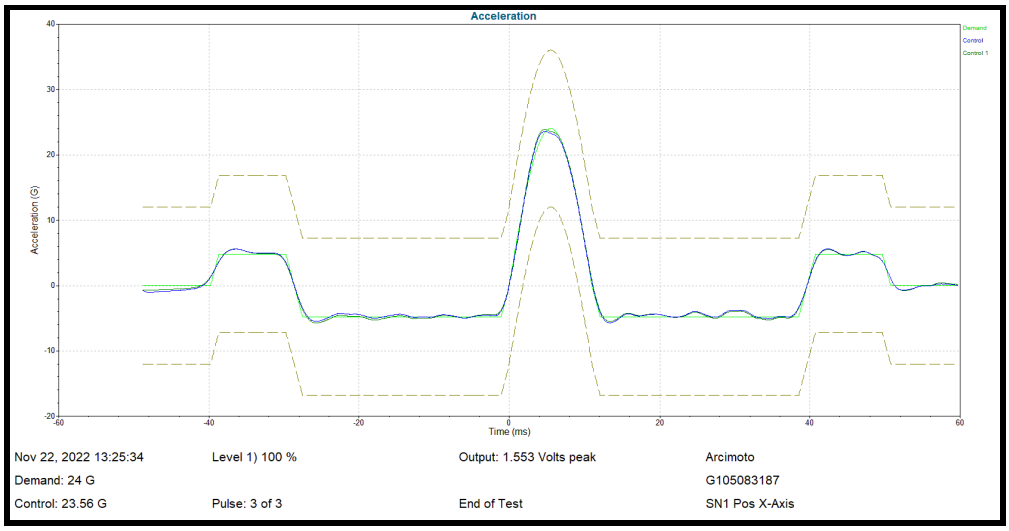


Figure 12: Shock Plot –Fore/Aft, Positive Direction SN1

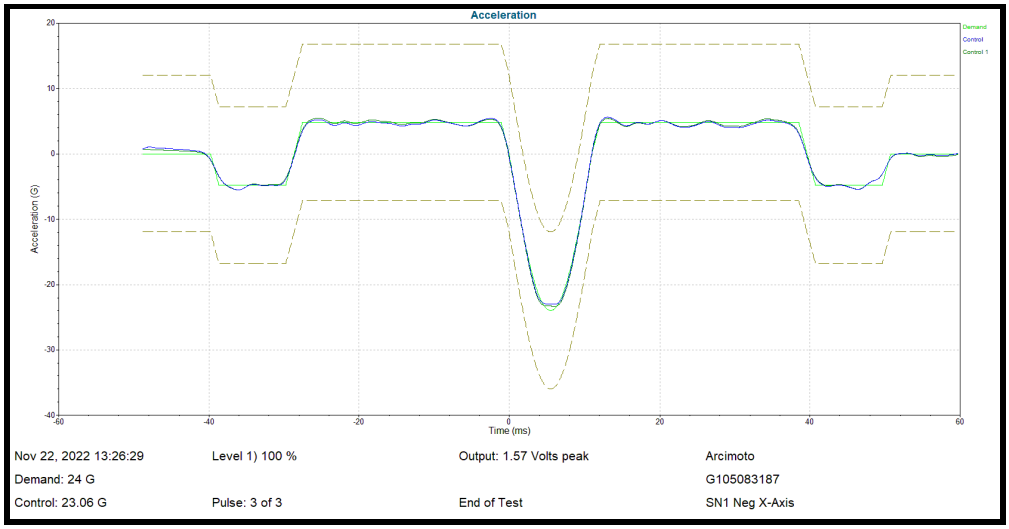


Figure 13: Shock Plot –Fore/Aft, Negative Direction SN1

APPENDIX E
T4 – Shock Plots

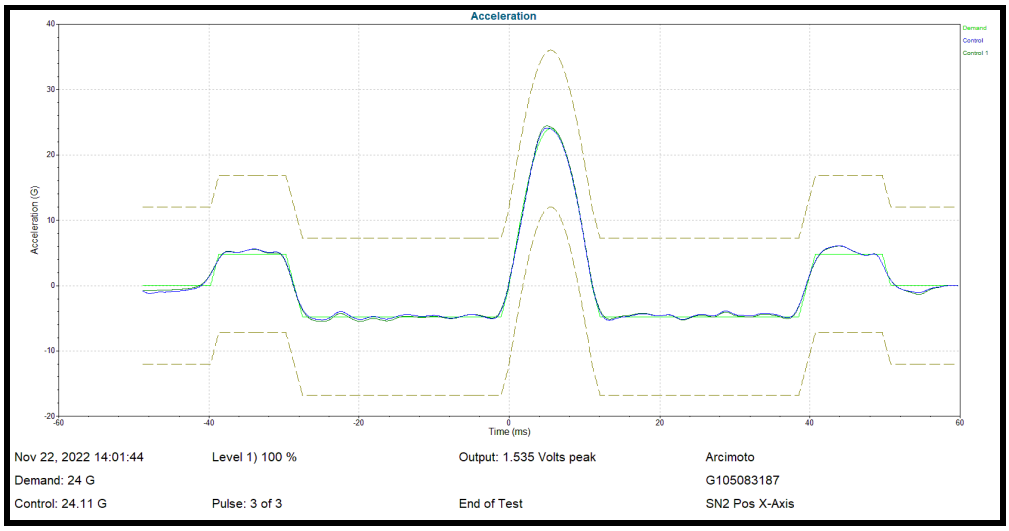


Figure 14: Shock Plot –Fore/Aft, Positive Direction SN2

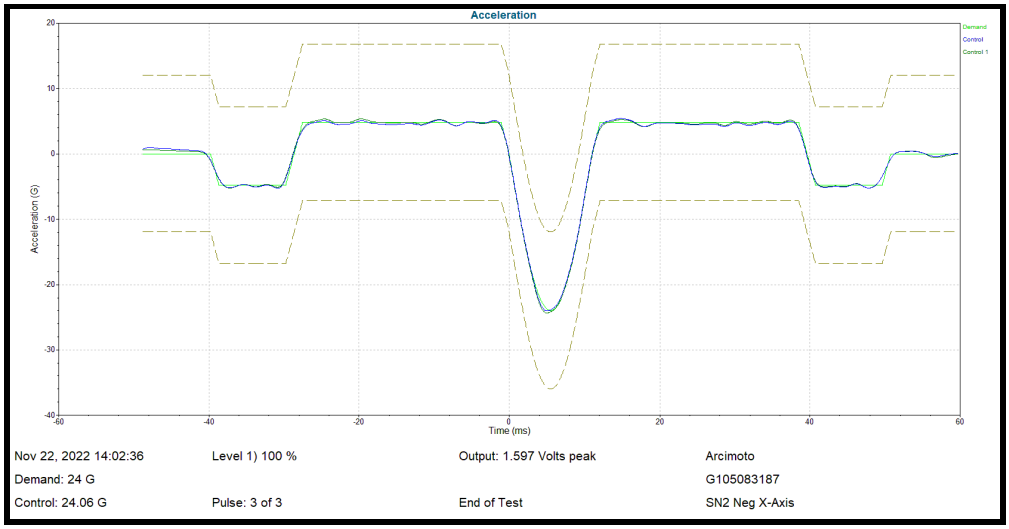


Figure 15: Shock Plot –Fore/Aft, Negative Direction SN2

APPENDIX E
T4 – Shock Plots

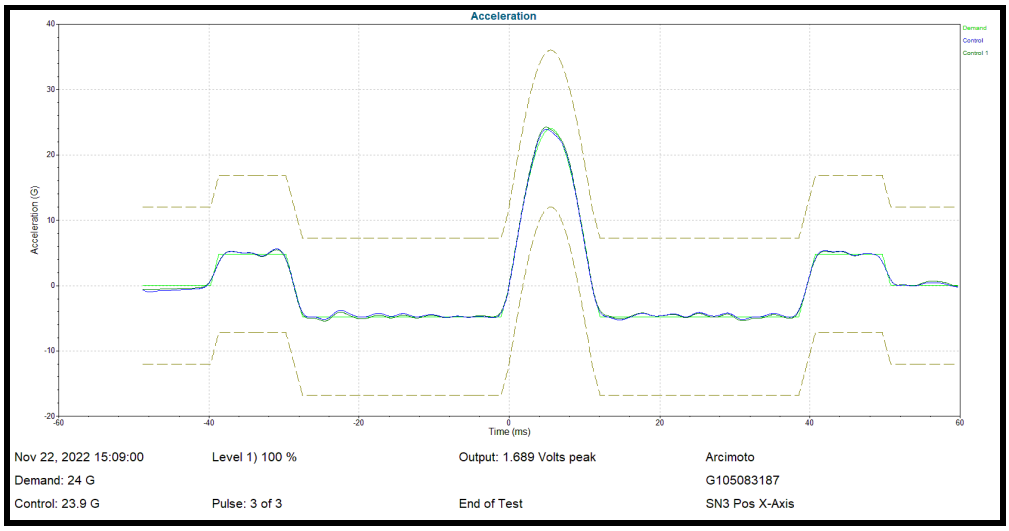


Figure 16: Shock Plot –Fore/Aft, Positive Direction SN3

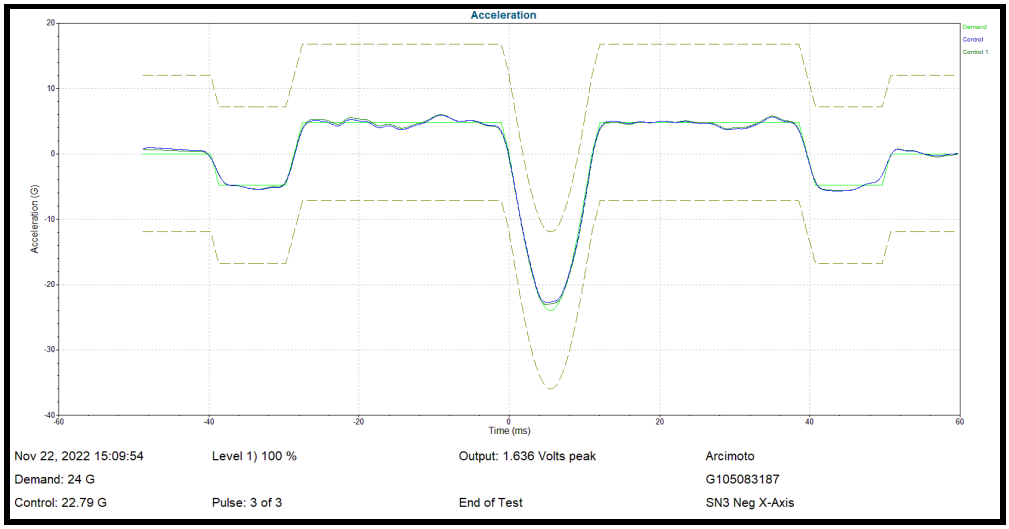


Figure 17: Shock Plot –Fore/Aft, Negative Direction SN3

APPENDIX E
T4 – Shock Plots

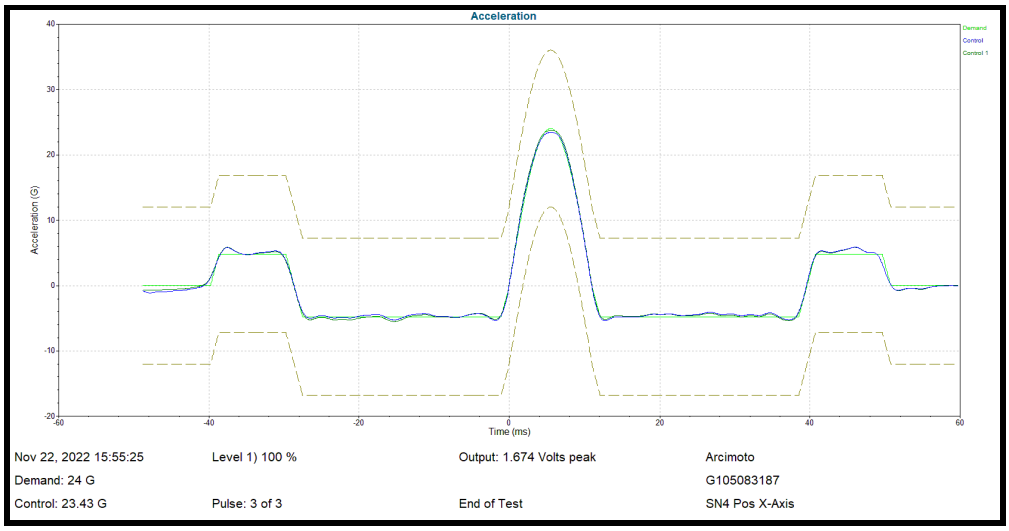


Figure 18: Shock Plot –Fore/Aft, Positive Direction SN4

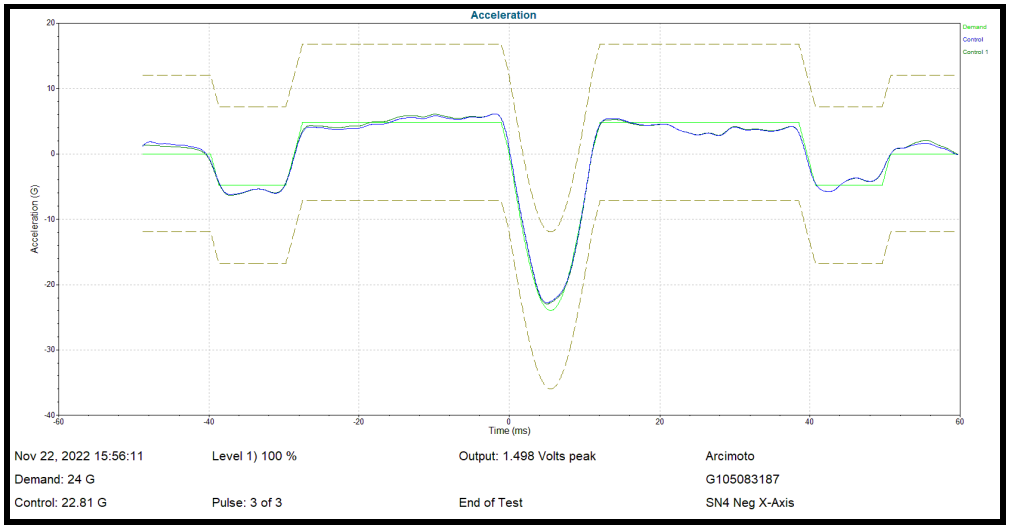


Figure 19: Shock Plot –Fore/Aft, Negative Direction SN4

APPENDIX E
T4 – Shock Plots

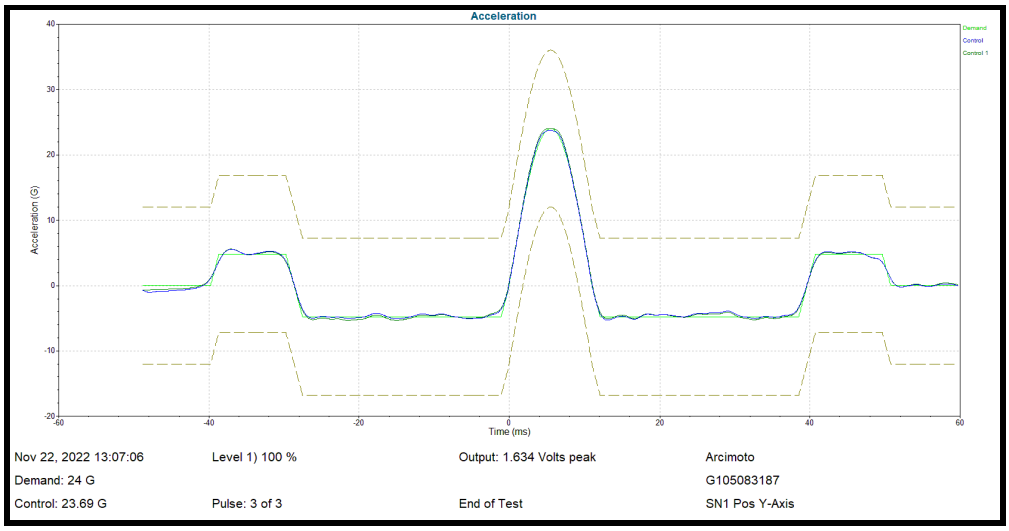


Figure 20: Shock Plot – Lateral, Positive Direction; SN1

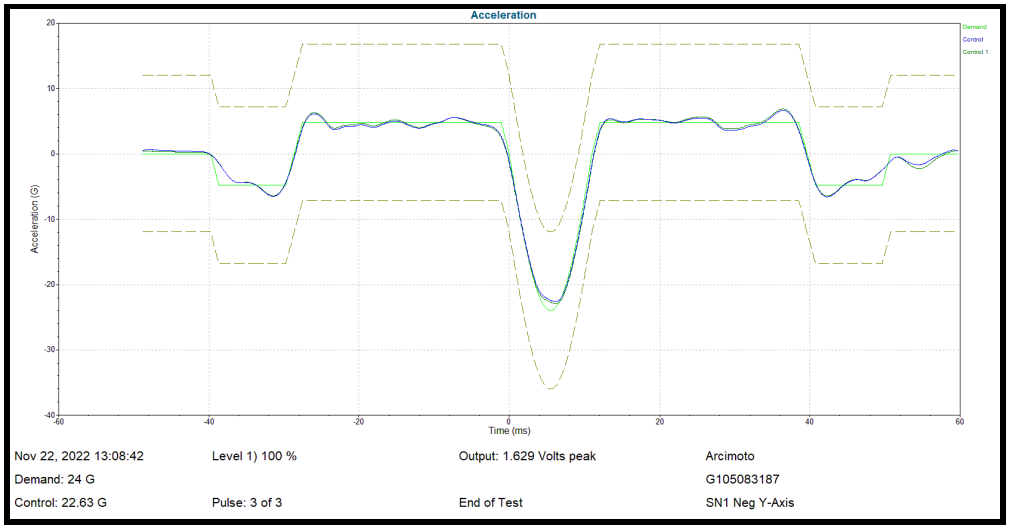


Figure 21: Shock Plot – Lateral, Negative Direction; SN1

APPENDIX E
T4 – Shock Plots

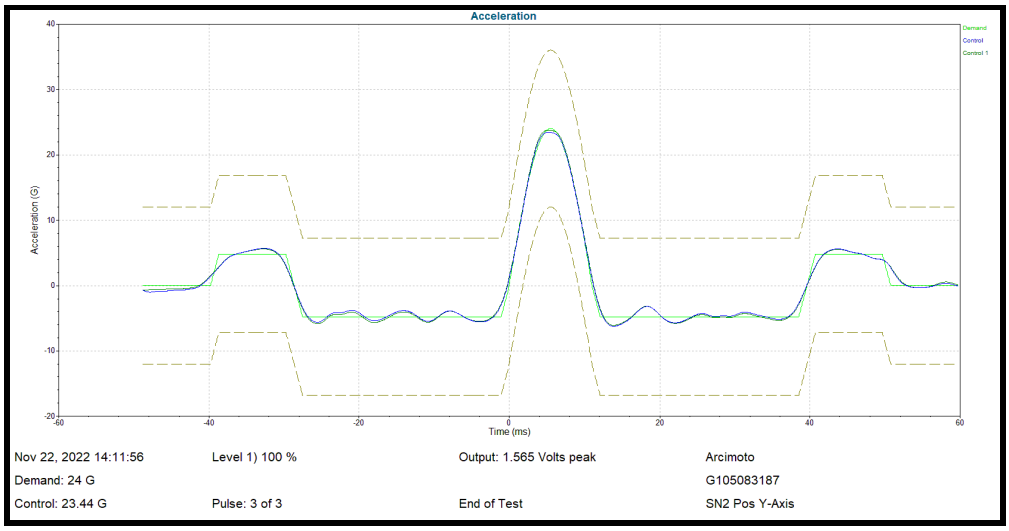


Figure 22: Shock Plot – Lateral, Positive Direction; SN2

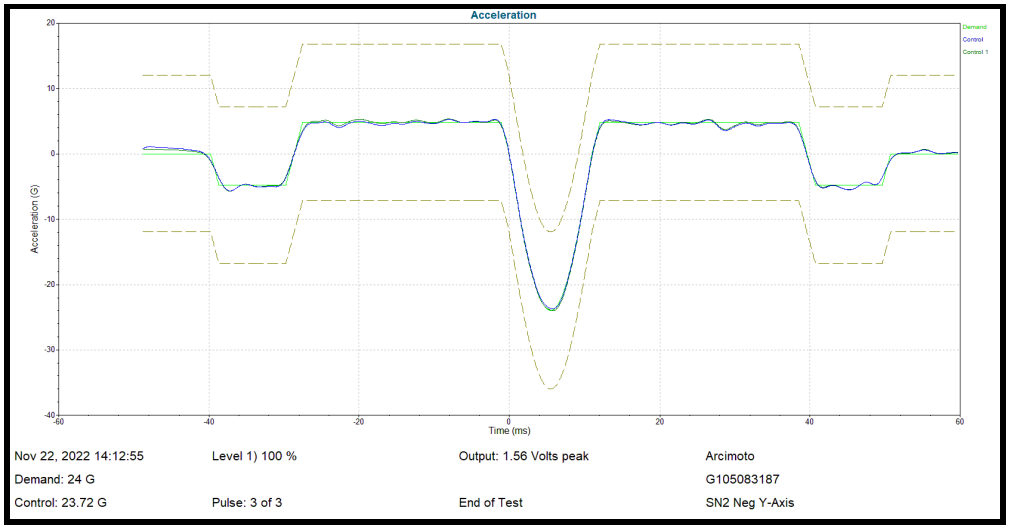


Figure 23: Shock Plot – Lateral, Negative Direction; SN2

APPENDIX E
T4 – Shock Plots

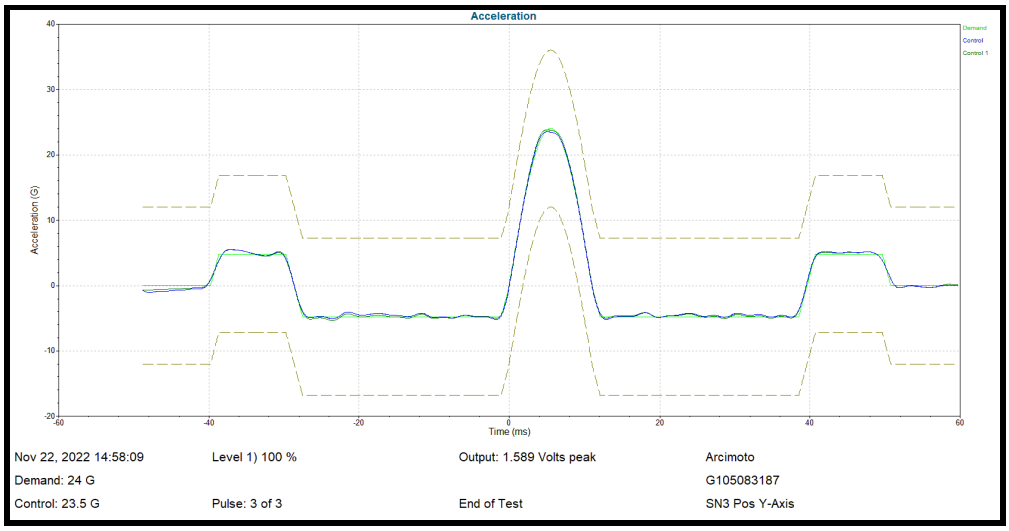


Figure 24: Shock Plot – Lateral, Positive Direction; SN3

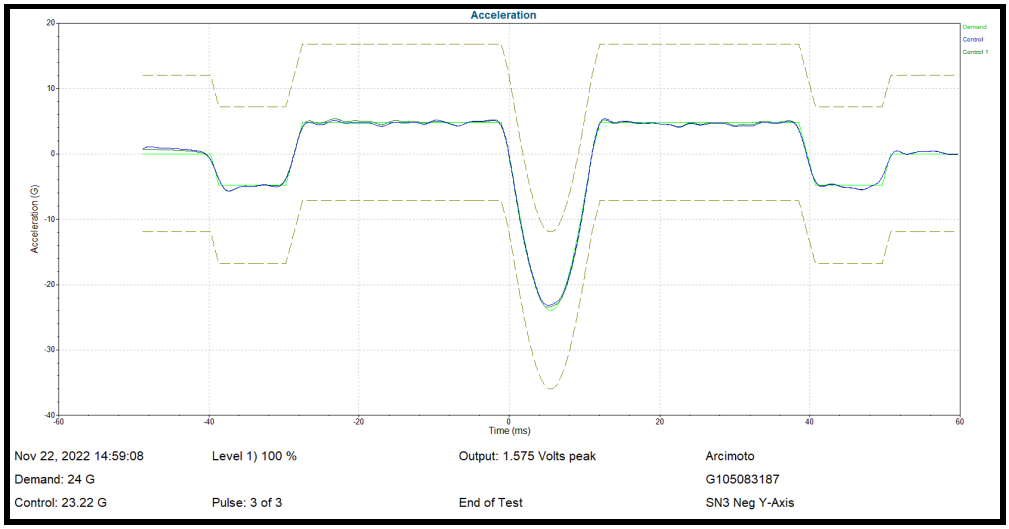


Figure 25: Shock Plot – Lateral, Negative Direction; SN3

APPENDIX E
T4 – Shock Plots

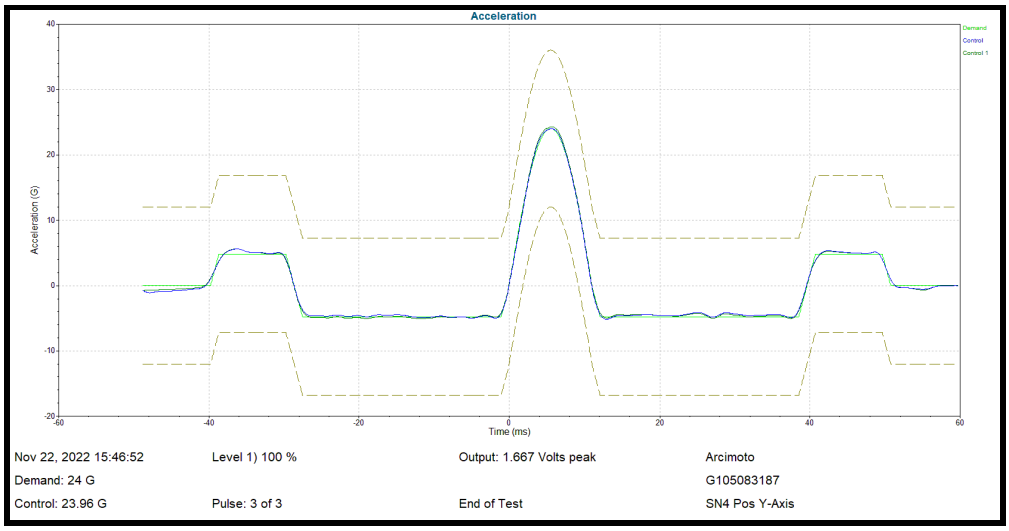


Figure 26: Shock Plot – Lateral, Positive Direction; SN4

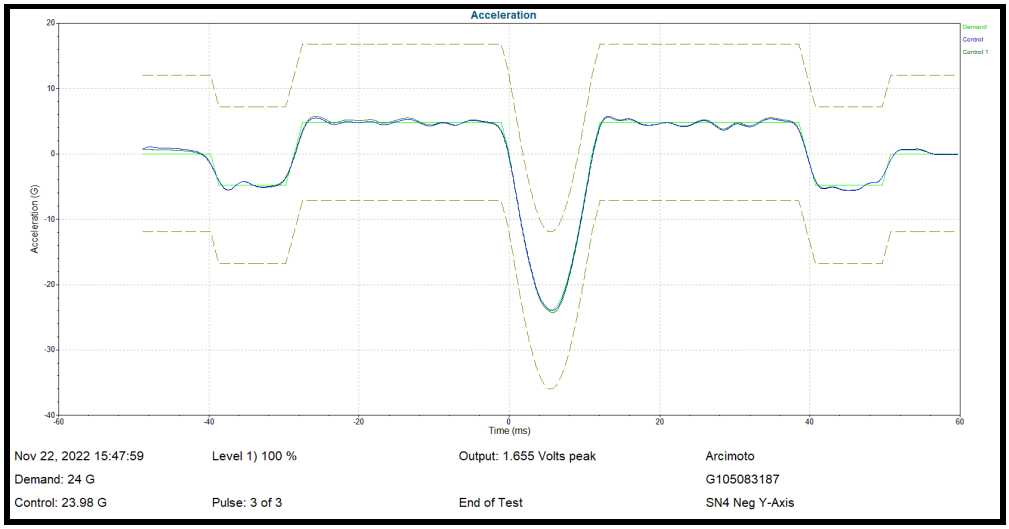


Figure 27: Shock Plot – Lateral, Negative Direction; SN4

APPENDIX E
T4 – Shock Plots

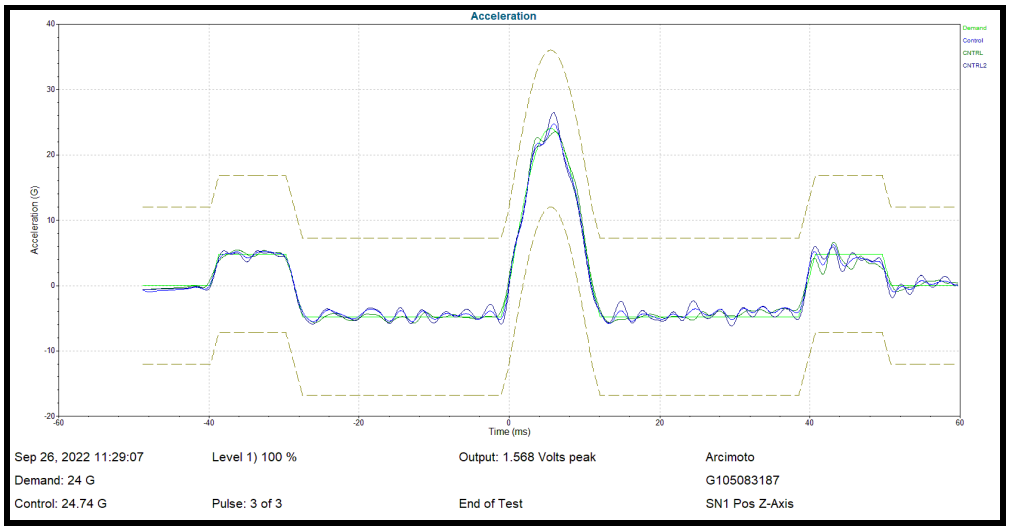


Figure 28: Shock Plot – Vertical, Positive Direction SN1

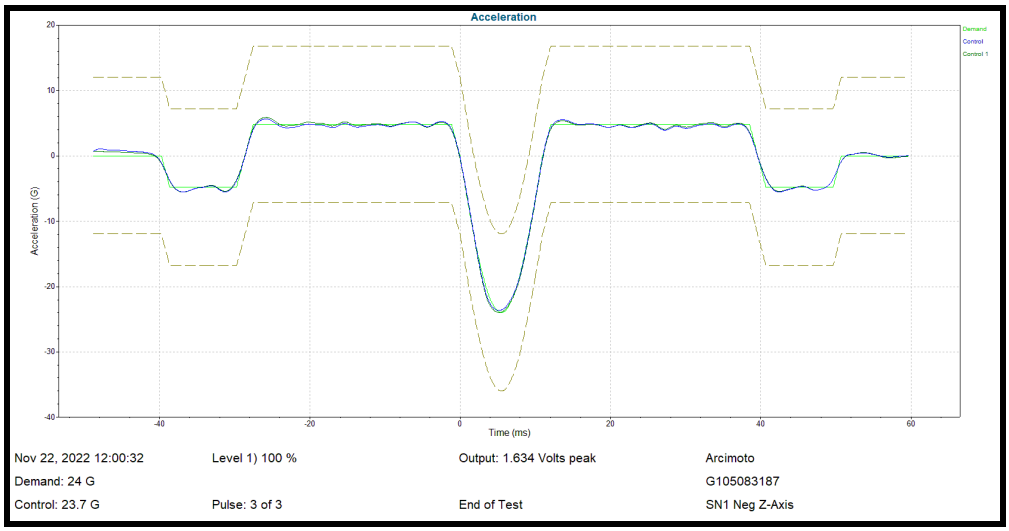


Figure 29: Shock Plot – Vertical, Negative Direction SN1

APPENDIX E
T4 – Shock Plots

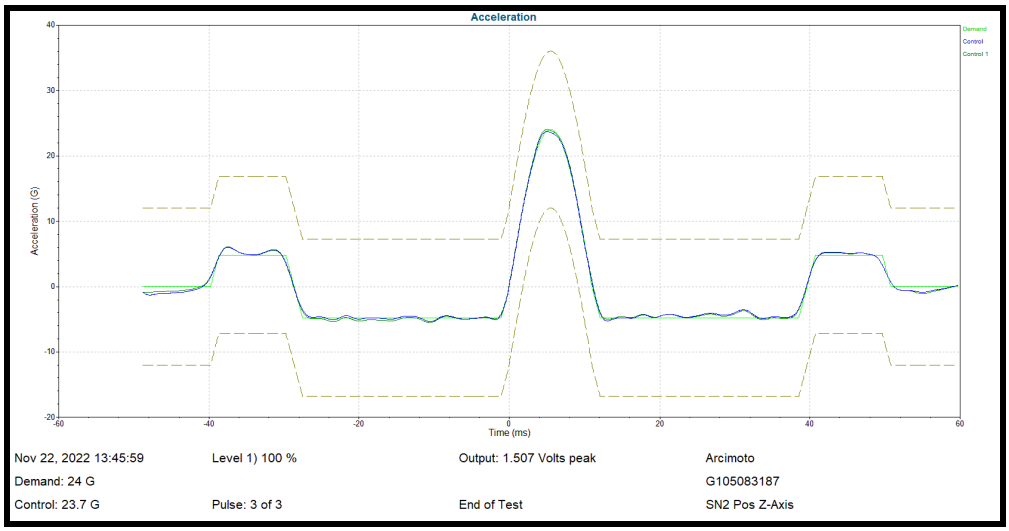


Figure 30: Shock Plot – Vertical, Positive Direction SN2

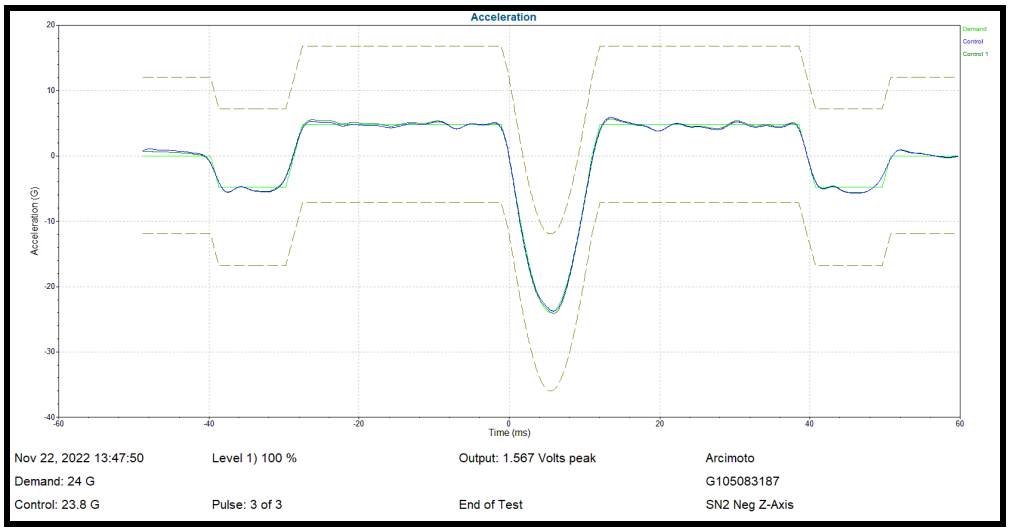


Figure 31: Shock Plot – Vertical, Negative Direction SN2

APPENDIX E
T4 – Shock Plots

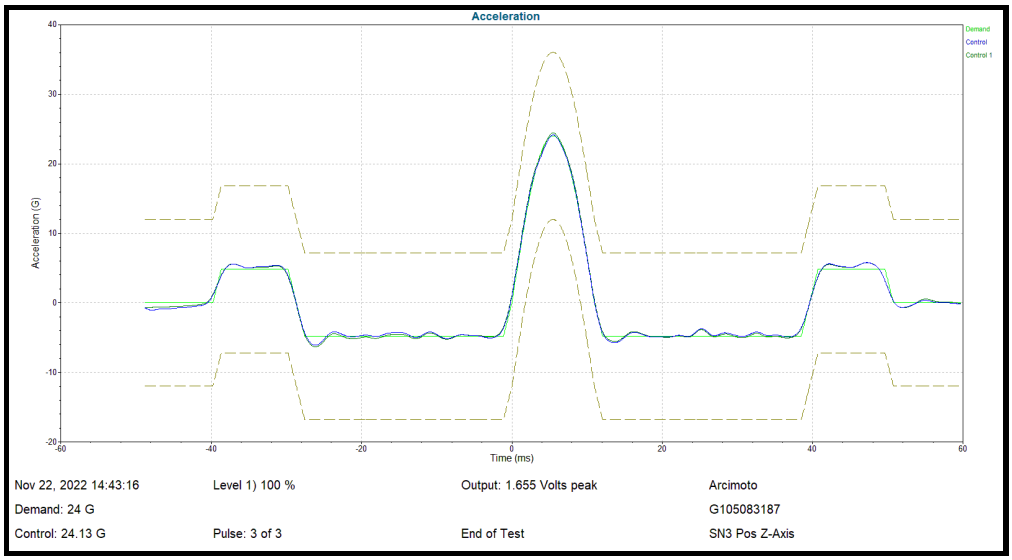


Figure 32: Shock Plot – Vertical, Positive Direction; SN3

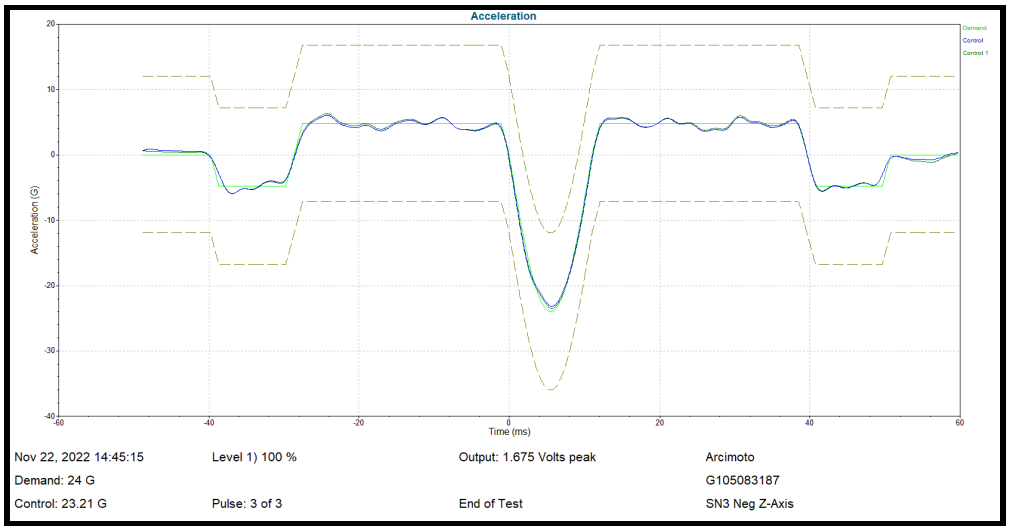


Figure 33: Shock Plot – Vertical, Negative Direction SN3

APPENDIX E
T4 – Shock Plots

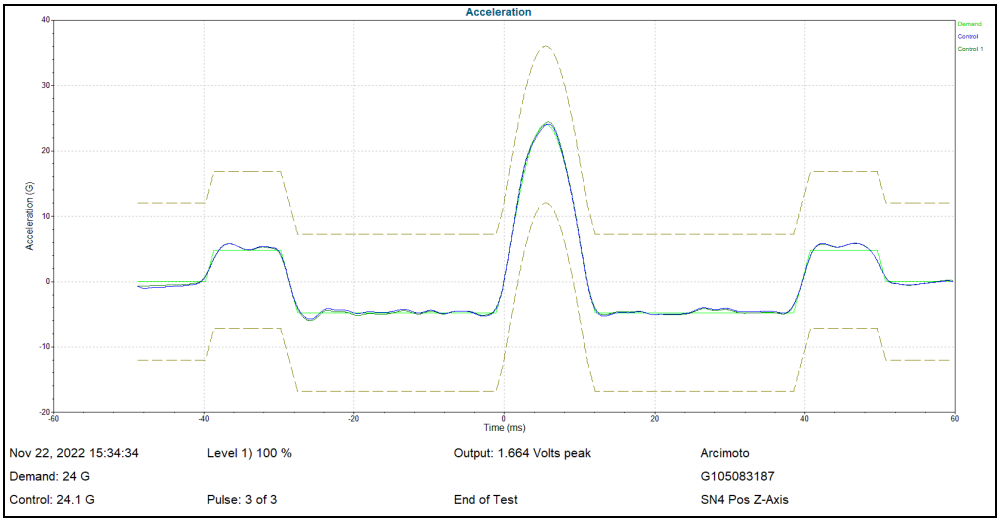


Figure 34: Shock Plot – Vertical, Positive Direction SN4

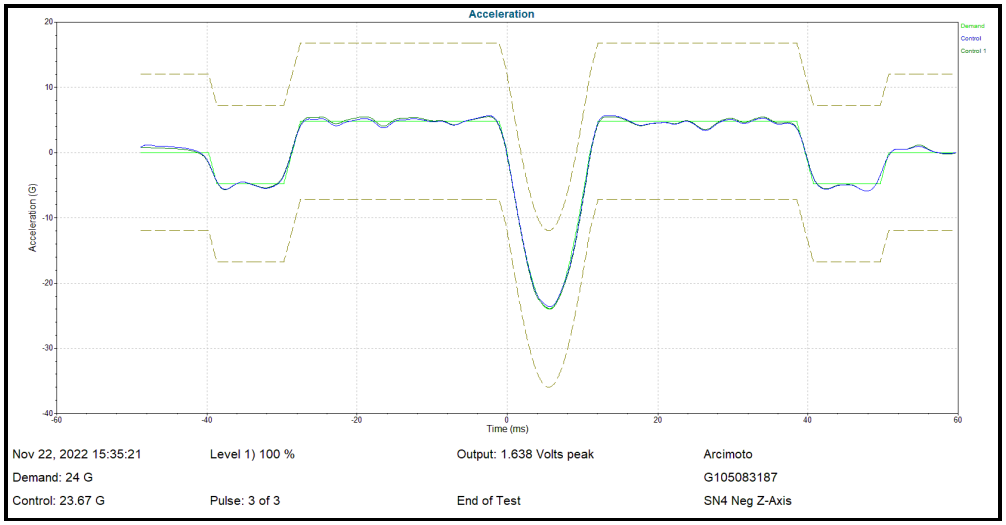


Figure 35: Shock Plot – Vertical, Negative Direction SN4

APPENDIX F
T5 – External Short Circuit Graphs

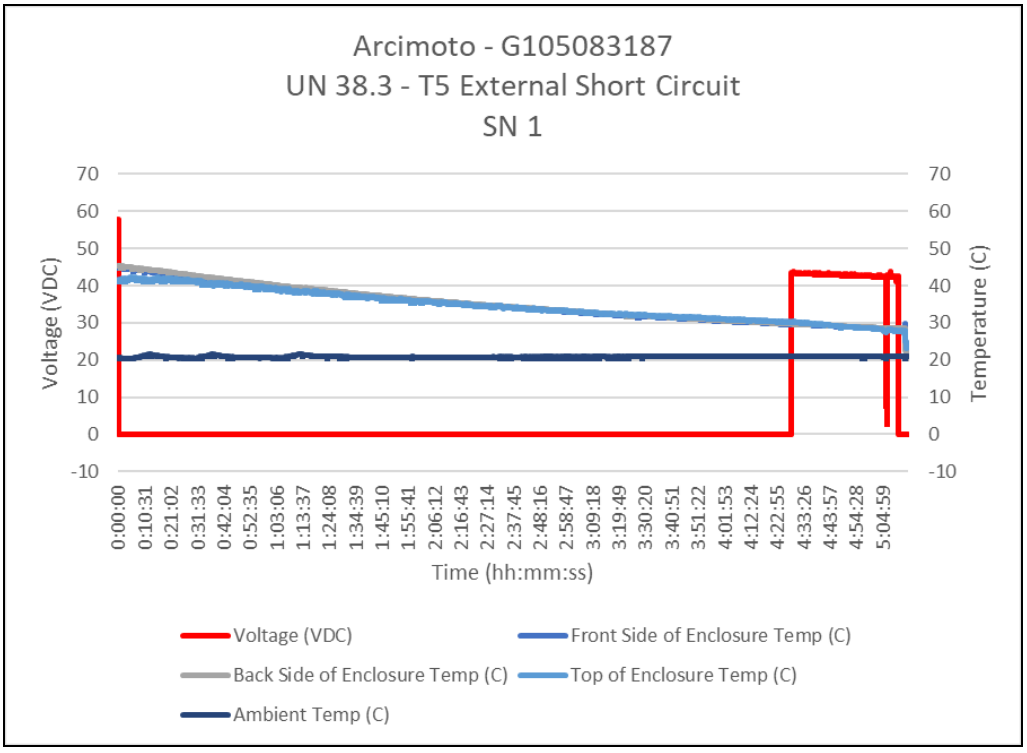


Figure 36: External Short Circuit Graph – Voltage / Temperature vs. Time SN1

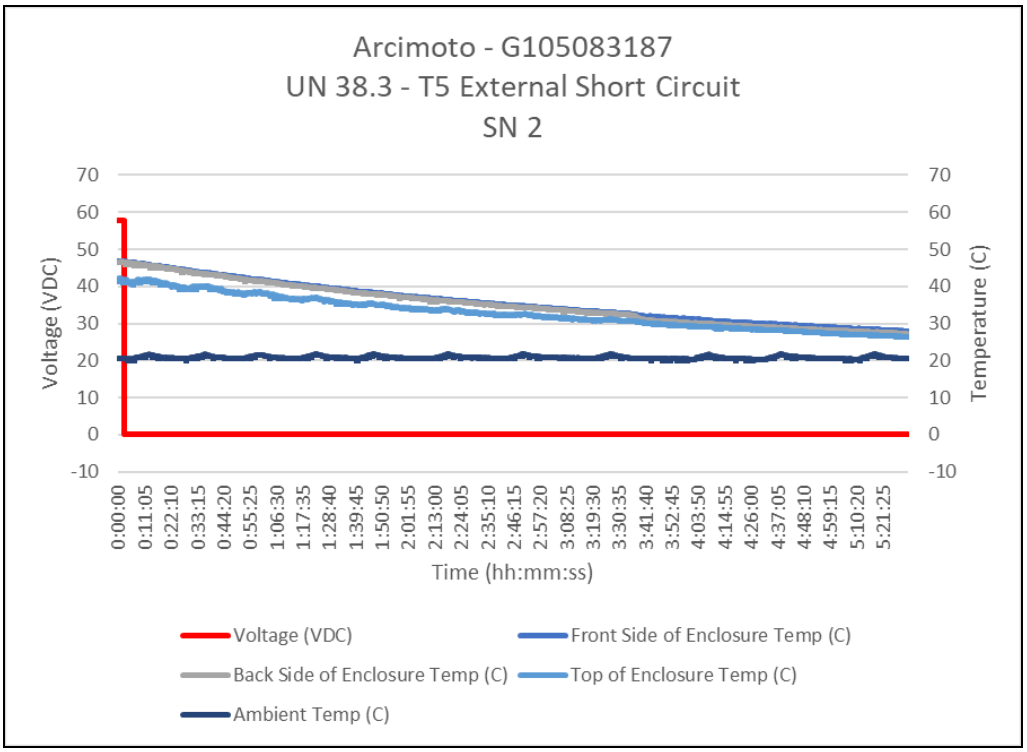


Figure 37: External Short Circuit Graph – Voltage / Temperature vs. Time SN2

APPENDIX F
T5 – External Short Circuit Graphs

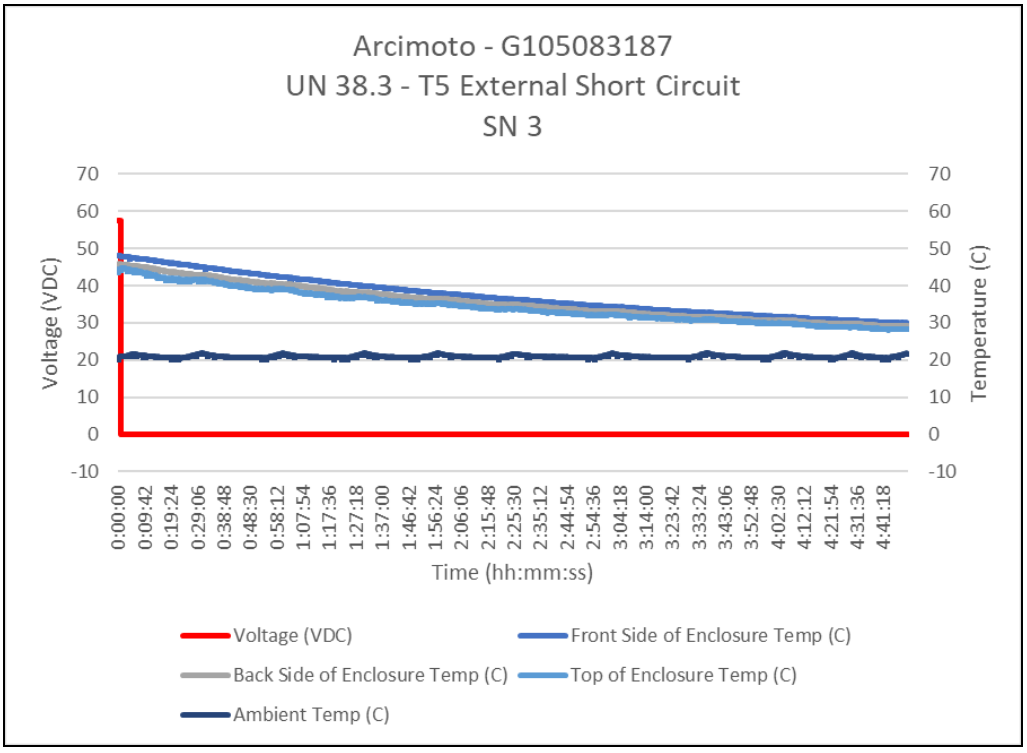


Figure 38: External Short Circuit Graph – Voltage / Temperature vs. Time SN3

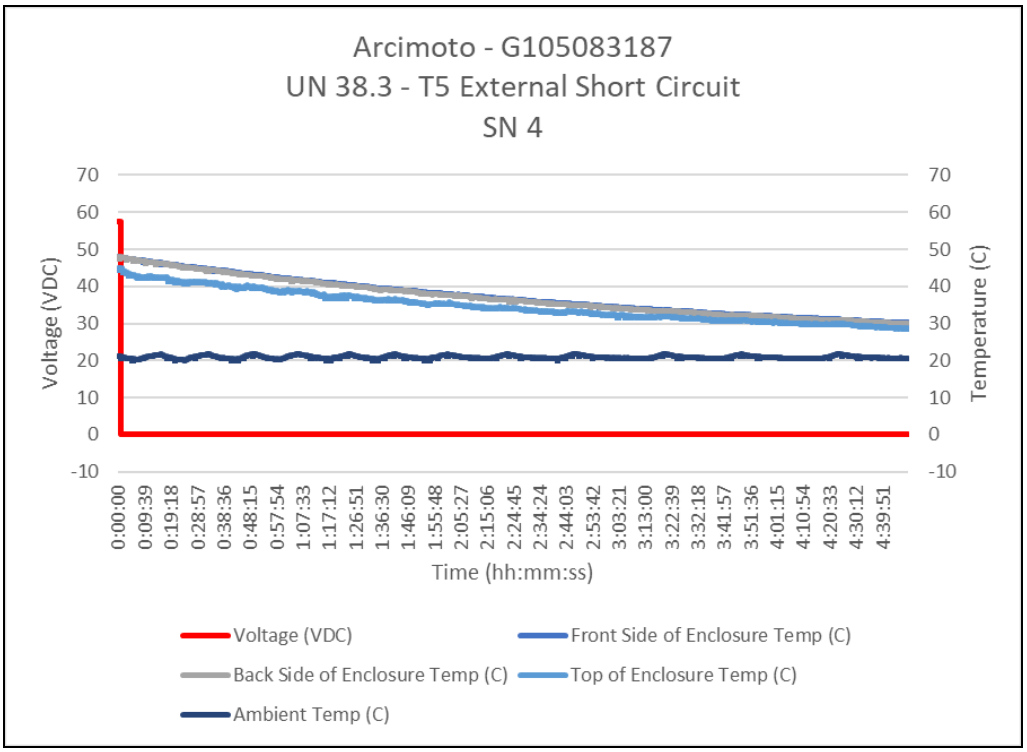


Figure 39: External Short Circuit Graph – Voltage / Temperature vs. Time SN4

LITHIUM CELLS OR BATTERIES TEST SUMMARY IN ACCORDANCE WITH SUB-SECTION 38.3 OF UN MANUAL OF TESTS AND CRITERIA

BATTERY TRANSPORTATION INFORMATION

Name of cell, battery, or produce manufacturer, as applicable:

Item Number: 006009
Item Name: N/A
Item Description: Lithium-ion Rechargeable Battery

Cell, battery, or product manufacturer's contact information to include address, phone number, email address, and website for more information:
Arcimoto Inc.
2034 W. 2nd Ave.
Eugene, OR 97402-4630
USA
Phone: 913-522-7439
Email: yuiz@arcimoto.com
Website: www.arcimoto.com

Name of test laboratory to include address, phone number, email address, and website for more information:

Intertek Testing Services NA
45000 Helm Street, Suite 150
Plymouth, MI 48170
734.582.2900
www.intertek.com

A unique test report identification number:

105083187DET-001

Date of test report:
22-May-2023

Description of cell or battery to include at a minimum: Lithium ion or Lithium metal cell or battery; Mass; Watt-hour rating or lithium content; Physical description of the cell/battery; and model number(s):

Cell or Battery chemistry: Lithium-ion NiMnCoO2

Cell or Battery type: Lithium-ion

Mass: 52.9 kg

Watt-hour Rating or lithium content: 9.8 kWh

Physical description, including dimensions: Rectangular Battery Pack

Dimensions: 23 x 10 x 6 inches

Model number(s): 006009

List of tests conducted and results:	(Pass/Fail)
Test T.1: Altitude Simulation	Pass
Test T.2: Thermal Test	Pass
Test T.3: Vibration	Pass
Test T.4: Shock	Pass
Test T.5: External Short Circuit	Pass
Test T.6: Impact/Crush	Not applicable
Test T.7: Overcharge	Not applicable
Test T.8: Forced Discharge	Not applicable

Testing additional comments:

Reference to assembled battery testing requirements, if applicable: 38.3

Reference to the revised edition of the *UN Manual of Tests and Criteria* used, and to amendments, thereto, if any:
Seventh Revised Edition, Amendment 1

For air transport only:
Does the cell or battery comply with the 30% State Charge?
Yes

PRODUCT CLASSIFICATION FOR TRANSPORT (According to UN-DGP)

UN Classification:
UN 3480

Proper Shipping Name:
Lithium-ion batteries

Signature with name and title of signatory as an indication of the validity of information provided:

Date document was generated:
22-May-2023:

This document remains valid as long as no changes, modifications, or additions are made to the model(s) described in this document, after being transported from a Arcimoto Inc. facility.
The model(s) has (have) been classified according to the applicable transport regulations and the *UN Manual of Tests and Criteria* as of the date of certification. The model(s) must be packaged, labeled, and documented according to country and other international regulations for transportation.