
Test Report Number: **104248** **Issue 1**

Customer Name & Address: Sonardyne International Ltd

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Customer Order Number: 83463

Test Sample(s) Description: 8326-005 Battery Assembly

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Issue Date:

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*The results detailed herein relate only to the test item(s) submitted for testing.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.*

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1 Introduction

This report details the environmental testing carried out on twenty eight 8326-005 Battery Assemblies as supplied by Sonardyne International Ltd.

The test items were subjected to the environmental tests detailed in Section 4 of this report, following the guidelines of the test standard defined in Table 1, and as detailed in Alphatech quotation ATQ-258-18-10-PL.

The testing was performed between 26th November and 11th December 2018.

Test:	ST/SG/AC10/11/Rev6 Reference:
Altitude	Section 38.3.4.1: Test T1
Thermal	Section 38.3.4.2: Test T2
Sinusoidal Vibration	Section 38.3.4.3: Test T3
Shock	Section 38.3.4.4: Test T4
External Short Circuit	Section 38.3.4.5: Test T5

Table 1: Environmental Test Standard

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2 Equipment List

Description:	Serial No:	Calibration Due:
Gallenkamp OVA031.XX1.5 Altitude Chamber	A120204	n/a
Comark C9557 Pressure Meter	49293/14	28 th Aug 2019
Votsch VTS7027-20 Temperature Chamber	6082600010	28 th Oct 2019
Sentek M4040A-PA140-LSO Shaker System	160810S 160810A	n/a
CI Spider-80X Vibration Controller	2599648	11 th Jan 2019
41A16 Accelerometer	20364	20 th Nov 2019
MTS 846.241 Shock System	929.41-01	n/a
Data Physics Vibration Controller	74341	29 th Apr 2019
352B10 Accelerometer	P152487	26 th Sep 2019
Pico Technology Data Logger	AV365/625	25 th Mar 2019
Type K Thermocouples	Th01 to Th08	25 th Mar 2019
Keithley 2000-20 DMM	0696856	18 th Feb 2019
CTS C-40/600 Climatic Chamber	27094	4 th Nov 2019

Table 2: Equipment List

3 Test Item Details

Description:	Part No:	Serial No:
Primary (non rechargeable) Lithium-Thionyl Chloride (Li-SOCl ₂) AA-sized cells Type LS14500 with additional diode and polyswitch protection. The battery back is made of nine cells in parallel (1S9P), diode OR circuit protects against back charge. The pack is protected by the polyswitch rated to 2.6A hold current and 5A trip current. 0.164kg, 84Wh	8326-005	320767-001 320767-002 320767-005 320767-006 320767-007 320767-008 320767-010 320767-011

Table 3: Test Item Details

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4 Test Plan

The following tables define the environmental test profiles to which the test items were subjected.

4.1 Altitude

ST/SG/AC10/11/Rev6: Section 38.3.4.1: Test T1	
Pressure:	< 11.6kPa
Duration:	6 hours

Table 4: Altitude

4.2 Thermal

ST/SG/AC10/11/Rev6: Section 38.3.4.2: Test T2	
Severity:	-40°C to +75°C
Transition:	< 30 minutes
Dwell Times:	6 hours
Duration:	10 cycles

Table 5: Thermal

4.3 Sinusoidal Vibration

ST/SG/AC10/11/Rev6: Section 38.3.4.3: Test T3	
Profile:	7 to 17.6 Hz 1 g_n pk 17.6 to 49.7 Hz 0.8mm pk 49.7 to 200 Hz 8 g_n pk
Sweep Type:	Logarithmic
Sweep Time:	1 sweep cycle = 15 minutes
Duration:	12 sweep cycles in each of three mutually perpendicular axes

Table 6: Sinusoidal Vibration

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4.4 Shock

ST/SG/AC10/11/Rev6: Section 38.3.4.4: Test T4	
Pulse Shape:	Half Sine
Pulse Width:	6ms
Acceleration:	150g _n
Duration:	3 shocks in each direction of three mutually perpendicular axes

Table 7: Shock

4.5 External Short Circuit (Non UKAS)

ST/SG/AC10/11/Rev6: Section 38.3.4.5: Test T5	
Temperature:	+57 ± 4°C
Short Circuit:	< 0.1 Ω
Duration:	The short is applied once the battery external case temperature is stabilised at +57 ± 4°C. The short is continued for 1 hour after the battery external case temperature has returned to +57 ± 4°C. The chamber temperature is maintained for a further 6 hours.

Table 8: External Short Circuit (Non UKAS)

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4.6 Test Item Mounting

The following figures depict the orientations of the test items during the applied tests.



Figure 1: Test Item Mounting: Altitude, Thermal, Vibration & External Short Circuit

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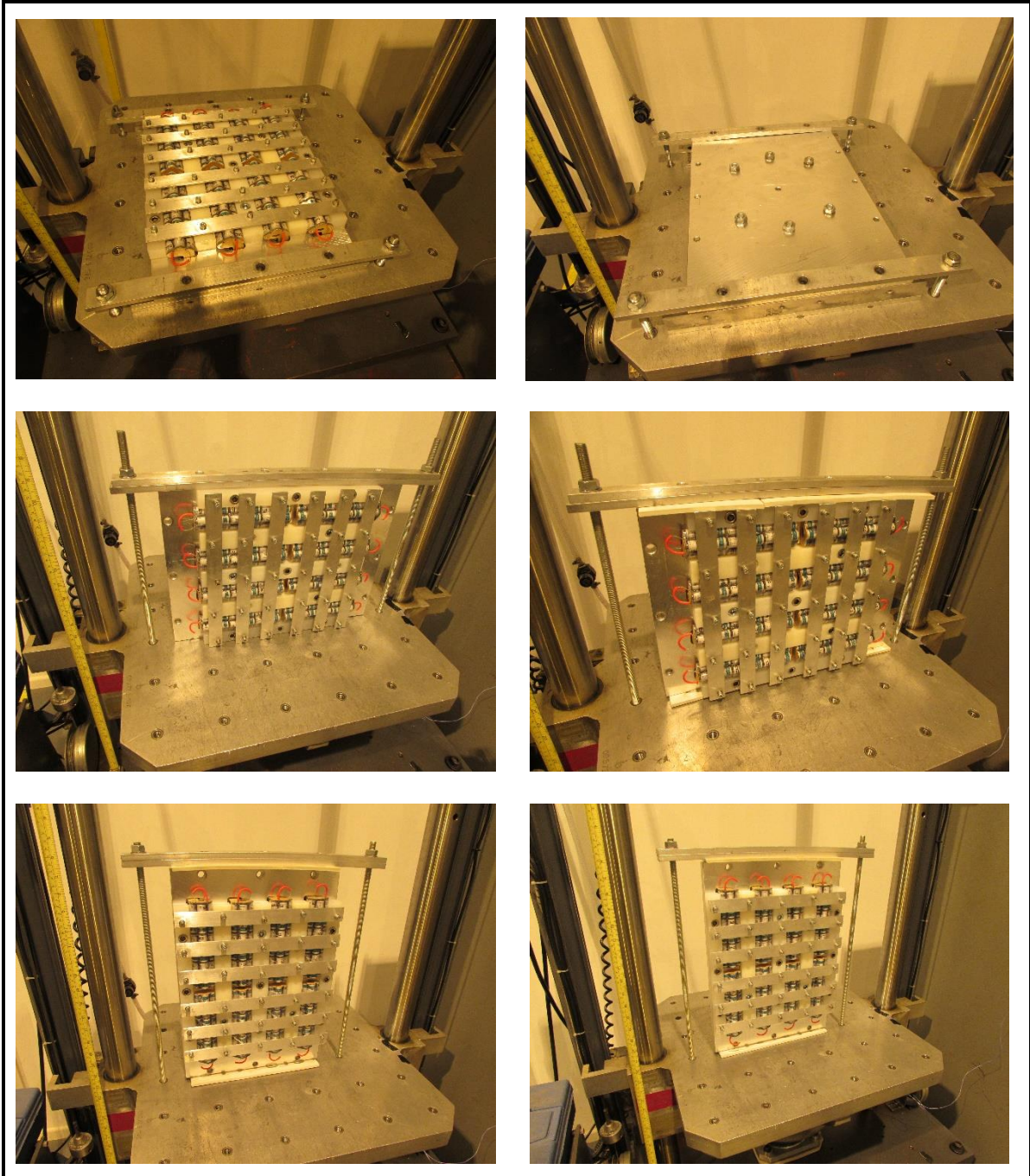


Figure 2: Test Item Mounting: Shock

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5 Test Results

The following sections present the results of the applied testing. The order in which they are presented is the order in which they were performed.

5.1 Altitude

During and on completion of the applied test, the battery assemblies met the requirements as defined in section 38.3.4.1.3 of UN regulation ST/SG/AC10/11/Rev6.

The pressure was maintained below 11.6kPa for the duration of the test.

5.2 Thermal

During and on completion of the applied test, the battery assemblies met the requirements as defined in section 38.3.4.2.3 of UN regulation ST/SG/AC10/11/Rev6.

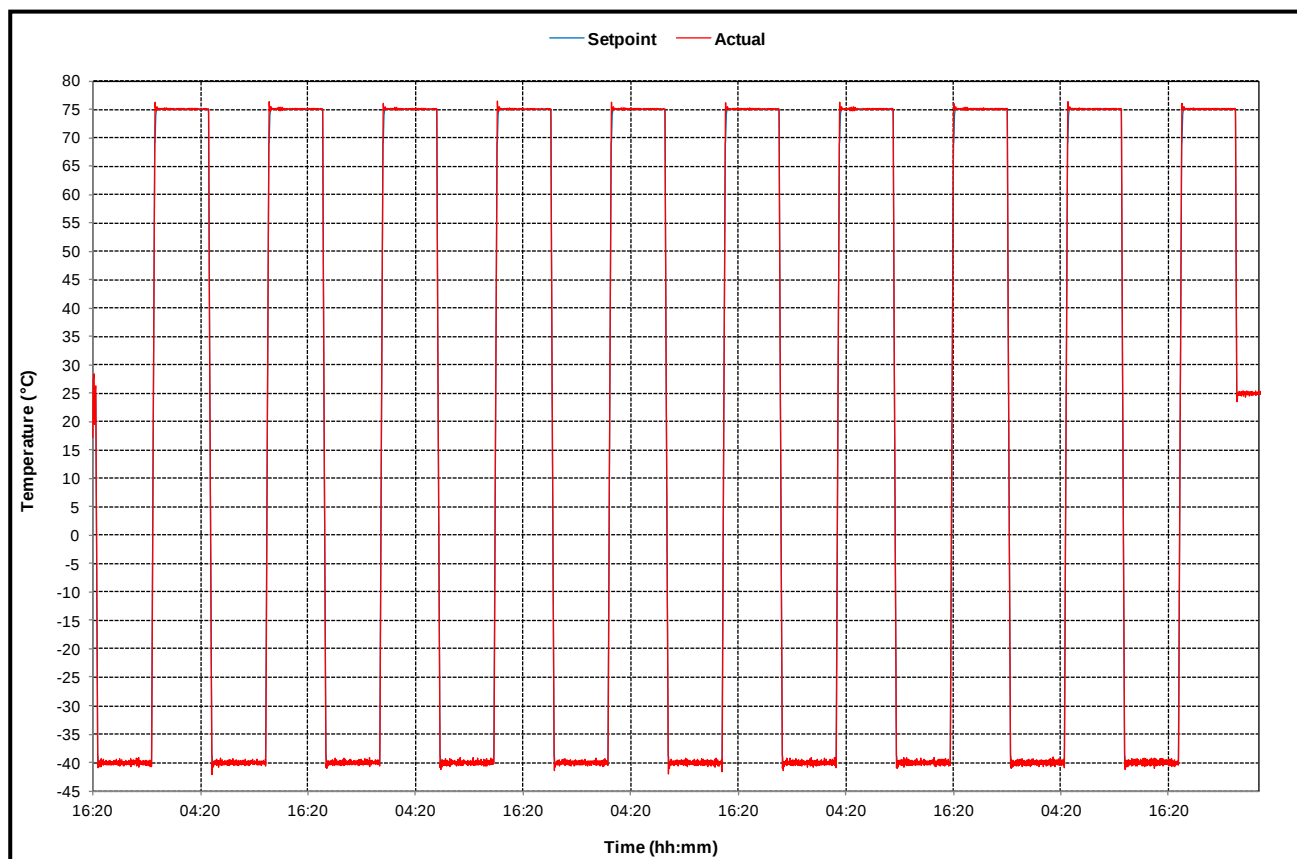


Figure 3: Thermal Test Profile

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5.3 Sinusoidal Vibration

During and on completion of the applied test, the battery assemblies met the requirements as defined in section 38.3.4.3.3 of UN regulation ST/SG/AC10/11/Rev6.

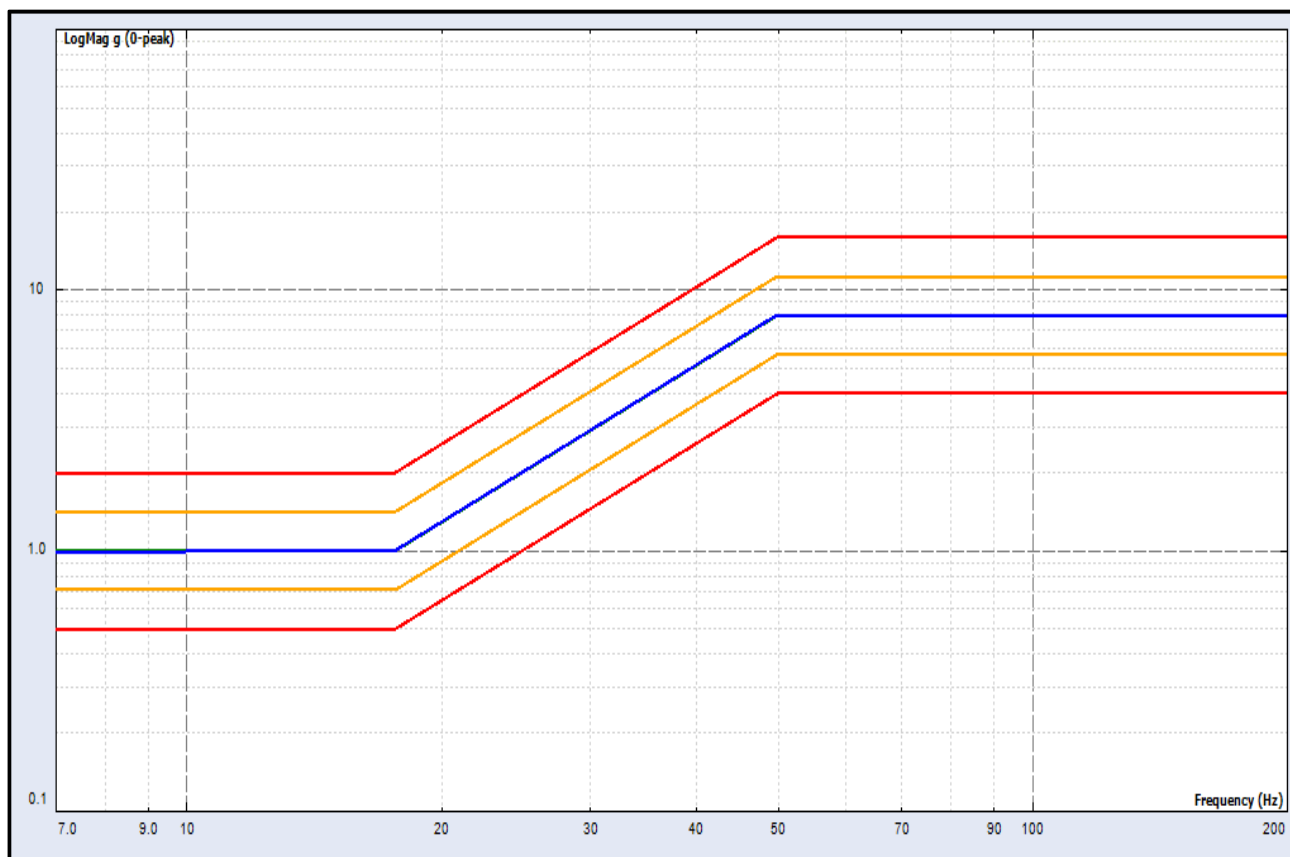


Figure 4: Sinusoidal Vibration Test Profile

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5.4 Shock

During and on completion of the applied test, the battery assemblies met the requirements as defined in section 38.3.4.4.3 of UN regulation ST/SG/AC10/11/Rev6.

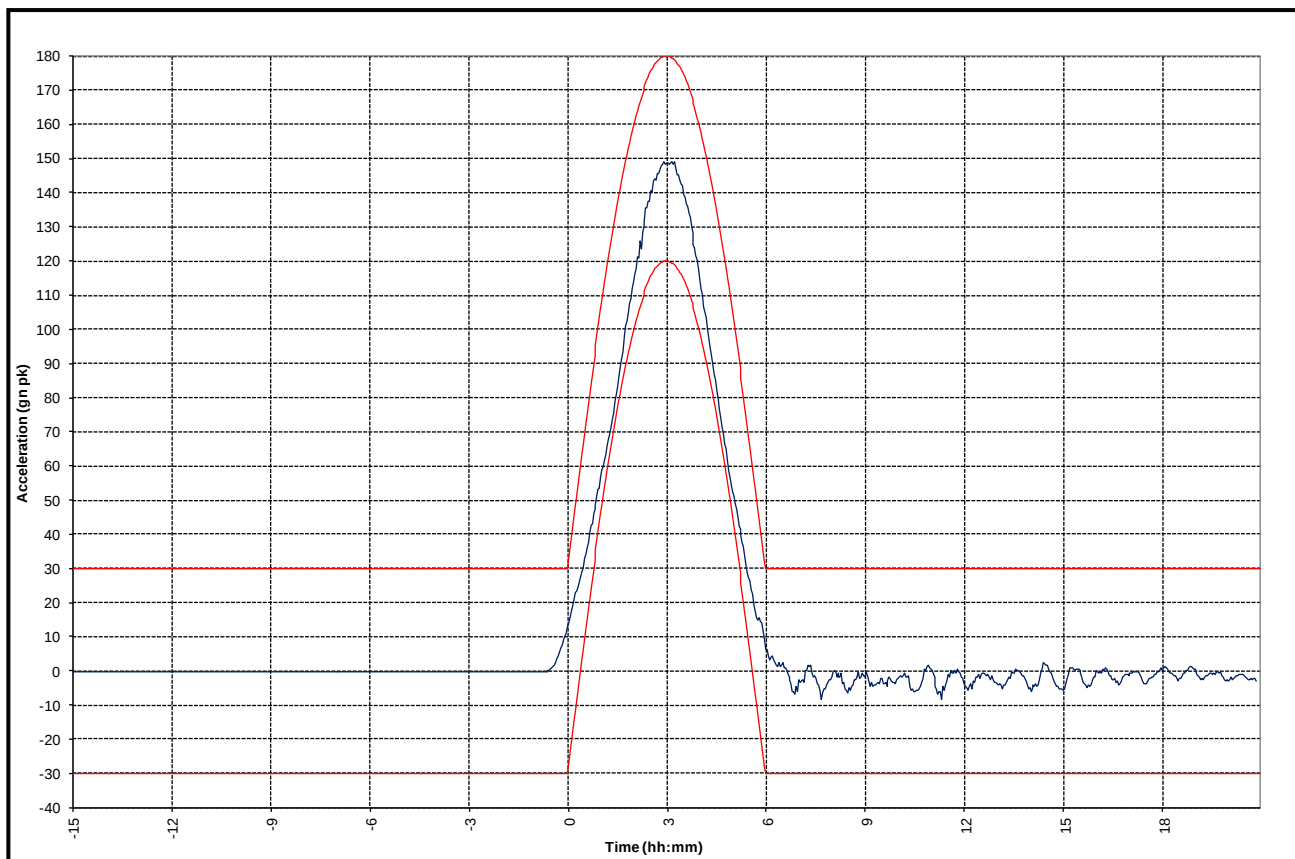


Figure 5: Shock Test Profile

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5.5 External Short Circuit (Non UKAS)

During and on completion of the applied test, the battery assemblies met the requirements as defined in section 38.3.4.5.3 of UN regulation ST/SG/AC10/11/Rev6.

Short circuit applied from 08:45 and 14:10, as depicted in Figure 6.

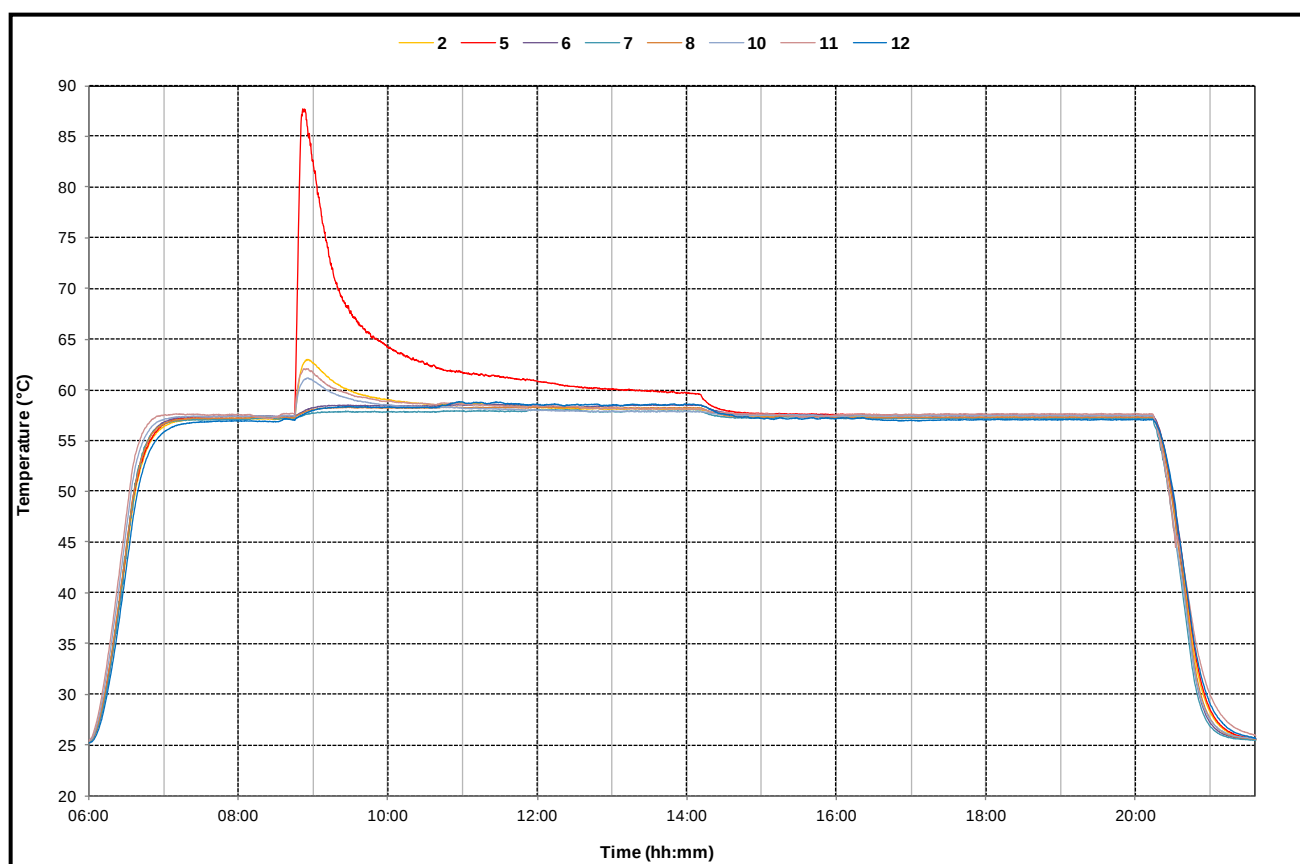


Figure 6: External Short Circuit Test Profile

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5.6 Measurements

The following measurements were performed using calibrated equipment; however, these measurements are outside the scope of Alphatech's UKAS schedule of accreditation.

	Pre Test		Post Altitude		Post Thermal		Post Vibration		Post Shock	
Serial Number	OCV (v)	Mass (g)	OCV (v)	Mass (g)	OCV (v)	Mass (g)	OCV (v)	Mass (g)	OCV (v)	Mass (g)
01	3.67	164.50	3.67	164.48	3.74	164.46	3.71	164.45	3.71	164.45
02	3.57	164.81	3.59	164.80	3.71	164.75	3.71	164.75	3.71	164.75
05	3.56	164.20	3.58	164.20	3.71	164.19	3.71	164.18	3.71	164.18
06	3.67	163.92	3.66	163.90	3.74	163.86	3.71	163.85	3.71	163.85
07	3.67	164.32	3.67	164.28	3.74	164.26	3.71	164.26	3.71	164.26
08	3.67	164.49	3.67	164.46	3.74	164.40	3.71	164.39	3.71	164.38
10	3.56	164.36	3.58	164.32	3.71	164.30	3.71	164.30	3.71	164.29
11	3.58	164.46	3.53	164.43	3.71	164.42	3.71	164.42	3.71	164.42

Table 9: Measurements

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6 Conclusions

The detailed tests were performed in accordance with the defined environmental test standard.

During and on completion of the defined environmental tests, the battery assemblies met the requirements of the aforementioned UN Regulation.

The mass and open circuit voltage measurements detailed in section 5.6 of this report were performed using calibrated equipment; however, these measurements are outside the scope of Alphatech's UKAS schedule of accreditation.

7 Revision History

Revision Level	Summary of Changes
1	Initial Release

Table 10: Revision History

END OF REPORT