Environmental Testing

For

SRT Marine Technology Ltd

On

em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter

Report No. TRA-035768-26-CR-02A

DECEMBER 2017

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Issue Number	Issue Date	Comments
A	14.12.17	Original

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SUMMARY

At the request of SRT Marine Technology Limited an em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter were submitted for Environmental testing in accordance with BS EN 60945:2002, BS EN 62287-1:2006 and Element Materials Technology Warwick Limited quotation TRA-035768-07 dated 16th November 2017.

Testing consisted of two temperature tests followed by vibration testing. Tests were performed in the following order:

- Low Temperature Functional Test (em-trak B100 with Cobalt II only)
- Dry Heat Functional Test (em-trak B100 with Cobalt II only)
- Vibration – Sinusoidal Cycling

All testing was completed. An Element engineer performed performance checks throughout the tests on the em-trak B100 and Iris AIS700 Class B AIS Transceiver/Splitter using SRT Marine Technology Limited supplied equipment at 12v, 9.6v and 31.2v respectively; no issues were encountered. Visual inspections of the specimen after each test also showed no signs of external damage or degradation.

At the conclusion of the environmental testing the em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter were returned to SRT Marine Technology Limited for further investigation.

Client:	SRT Marine Technology Ltd Wireless House Westfield Industrial Estate Midsomer Norton Bath Somerset BA3 4BS United Kingdom
Specimen Receipt:	7th and 27th November 2017
Date of Test:	27th to 30th November 2017

The work that forms the subject of this report was carried out on behalf of SRT Marine Technology Ltd in accordance with their Order No. POR 006676 under the terms of conditions of Element Materials Technology Warwick Ltd Works Order No. TRA-035768-07.

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1. INTRODUCTION

At the request of SRT Marine Technology Limited one each of an em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter specimen was submitted for Environmental testing in accordance with BS EN 60945:2002, BS EN 62287-1:2006 and Element Materials Technology Warwick Limited quotation TRA-035768-07 dated 16th November 2017.

The purpose of the test was to assess the robustness of the specimens after subjecting them to the specified tests.

2. SPECIMEN

Part Name	em-trak B100 with Cobalt II
Serial No:	41100023510434
Element Stores No:	TRA-035768-S11
Date Received:	27th November 2017

Part Name	Iris AIS700 Class B AIS Transceiver/Splitter
Serial No:	S0922170028
Element Stores No:	TRA-037294-S9
Date Received:	7th November 2017

The specimen was subjected to the tests defined in Section 3.

3. SPECIFICATION

3.1. TEMPERATURE TESTING

3.1.1. LOW TEMPERATURE FUNCTIONAL TEST

In accordance with BS EN 60945:2002, Section 8.4.2.4

Test Condition	-15 °C (± 3 °C)
Soak Duration	10 to 16 hours
Ramp Rates	1 °C/ minute
Post Test Stabilisation	Returned to ambient temperature
Equipment State	Powered on after soak duration

3.1.2. DRY HEAT FUNCTIONAL TEST

In accordance with BS EN 60945:2002, Section 8.2.2

Test Condition	55 °C (± 3 °C)
Soak Duration	10 to 16 hours
Ramp Rates	1 °C/ minute
Post Test Stabilisation	Returned to ambient temperature
Equipment State	Powered

3.2. VIBRATION TESTING

Vibration testing performed on both the em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter simultaneously.

In accordance with BS EN 62287-1:2006, Section 9.2.1 which directly references IEC 60945:2002.

3.2.1. SINUSOIDAL CYCLING

Frequency Range	2 to 100 Hz	
Severity	2 to 13.2 Hz	1mm peak-peak (± 10 %)
	13.2 to 100 Hz	7 m/s^2
Sweep Rate	0.2 octave/minute	
Number of Cycles	1 Cycle	
Equipment State	Powered	
Orientation	3 orthogonal axes	

4. PROCEDURE

4.1. TEMPERATURE TESTING

4.1.1. LOW TEMPERATURE FUNCTIONAL TEST

An unpowered em-trak B100 with Cobalt II was placed upon a wire rack shelf inside a climatic chamber with two PRTs placed close to the specimen and a further PRT attached to its casing. SRT Marine Technology Limited cables were connected to the specimen and run outside of the chamber to allow connection to a laptop and antenna for performance checks. After ramping to -15°C a sixteen hour soak was commenced. At the conclusion of this period power was applied to the em-trak B100 with Cobalt II. A performance check was then carried out whilst the chamber was held at temperature for a further two hours. The chamber was then ramped to ambient temperature and stabilised where an additional performance check was completed. A setup photograph is shown in Figure 1.1.

4.1.2. DRY HEAT FUNCTIONAL TEST

A powered em-trak B100 with Cobalt II was placed upon a wire rack shelf inside a climatic chamber with two PRTs placed close to the specimen and a further PRT attached to its casing. SRT Marine Technology Limited cables were connected to the specimen and run outside of the chamber to allow connection to a laptop and antenna for performance checks. After ramping to 55°C a sixteen hour soak was commenced. A performance check was carried near the end of the soak period whilst the chamber was at 55°C. The chamber was then ramped to ambient temperature and stabilised where an additional performance check was completed.

4.2. VIBRATION TEST

A powered em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter were secured to a fixture plate which was bolted to a head expander in the vertical axis and to a hydrostatic slip plate in the horizontal axes. A tri-axial and uni-axial control accelerometer, utilising an average control strategy, were mounted at diagonally opposed fixing positions close to the specimens. The em-trak B100 with Cobalt II and Iris AIS700 Class B AIS Transceiver/Splitter were performance checked and monitored by an Element engineer using SRT Marine Technology Limited supplied test equipment throughout vibration testing. Setup photographs are shown in Figures 1.2- 1.4.

Performance checks completed throughout testing consisted of applying power to the specimens which were connected by cabling to a laptop and GPS antenna. The ProAIS2 and Tera Term VT software programs were launched from the laptop and used to connect to the specimens. A script in the software programs continued to scroll when the specimens were operating correctly. An LED on each specimen was also operational when powered. All equipment was provided by SRT Marine Technology Limited.

5. RESULTS

5.1. TEMPERATURE TESTING

5.1.1. LOW TEMPERATURE FUNCTIONAL TEST

The Low Temperature Functional Test was satisfactorily completed. Once the specimen had completed the soak period power was applied to em-trak B100 with Cobalt II. A performance check was then completed by an Element engineer at 12v, 9.6v and 31.2v. During all the checks the script on the ProAIS and Tera Term VT software continued to scroll. During the 9.6v and 31.2v checks the LED on the specimen remained lit but changed colour to red. Once the chamber was returned to ambient temperature a further performance check was completed at all three voltages with the same result; no issues were encountered.

Result traces for the temperature test are shown in Figure 2.1

5.1.2. DRY HEAT FUNCTIONAL TEST

The Dry Heat Functional Test was satisfactorily completed. Towards the end of the soak period a performance check was completed by an Element engineer at 12v, 9.6v and 31.2v. During all the checks the script on the ProAIS and Tera Term VT software continued to scroll. During the 9.6v and 31.2v checks the LED on the specimen remained lit but changed colour to red. Once the chamber was returned to ambient temperature a further performance check was completed at all three voltages with the same result; no issues were encountered.

Result traces for the temperature test are shown in Figure 2.2

5.2. VIBRATION TEST

All requested vibration tests were completed. At the end of each axis a performance check was completed by an Element engineer at 12v, 9.6v and 31.2v. During all the checks the script on the ProAIS and Tera Term VT software continued to scroll. During the 9.6v and 31.2v checks the LED on the specimen remained lit but changed colour to red.

Result plots for the Z Axis testing are shown in Figures 3.
Result plots for the Y Axis testing are shown in Figures 4.
Result plots for the Z Axis testing are shown in Figures 5.

At the conclusion of the environmental testing the specimens showed no signs of external damage or degradation and were returned to SRT Marine Technology Limited for further investigation.

6. QUALITY ASSURANCE

Our technical competence and quality control arrangements are in accordance with the conditions of our UKAS accreditation. The quality management system for the Test Laboratory is accredited by the United Kingdom Accreditation Service, designated as UKAS Testing Laboratory No 0026.

The quality assurance system has been approved against the international quality standard ISO 9001 by Lloyd's Register Quality Assurance under their Certificate No LRQ 4007187.

Tests marked 'Not UKAS Accredited' in this document are not included in the UKAS accreditation schedule for Element Materials Technology Warwick Ltd. Opinions and interpretations expressed in this document are outside the scope of UKAS accreditation.

7. EQUIPMENT AND INSTRUMENTATION

7.1. TRACEABILITY

All equipment has been calibrated as required using standards traceable to National or International standards, in accordance with the requirements of BS EN ISO 17025. Traceability is established through UKAS accredited calibration laboratories.

The test equipment and instrumentation used for each test are detailed in Table 1.

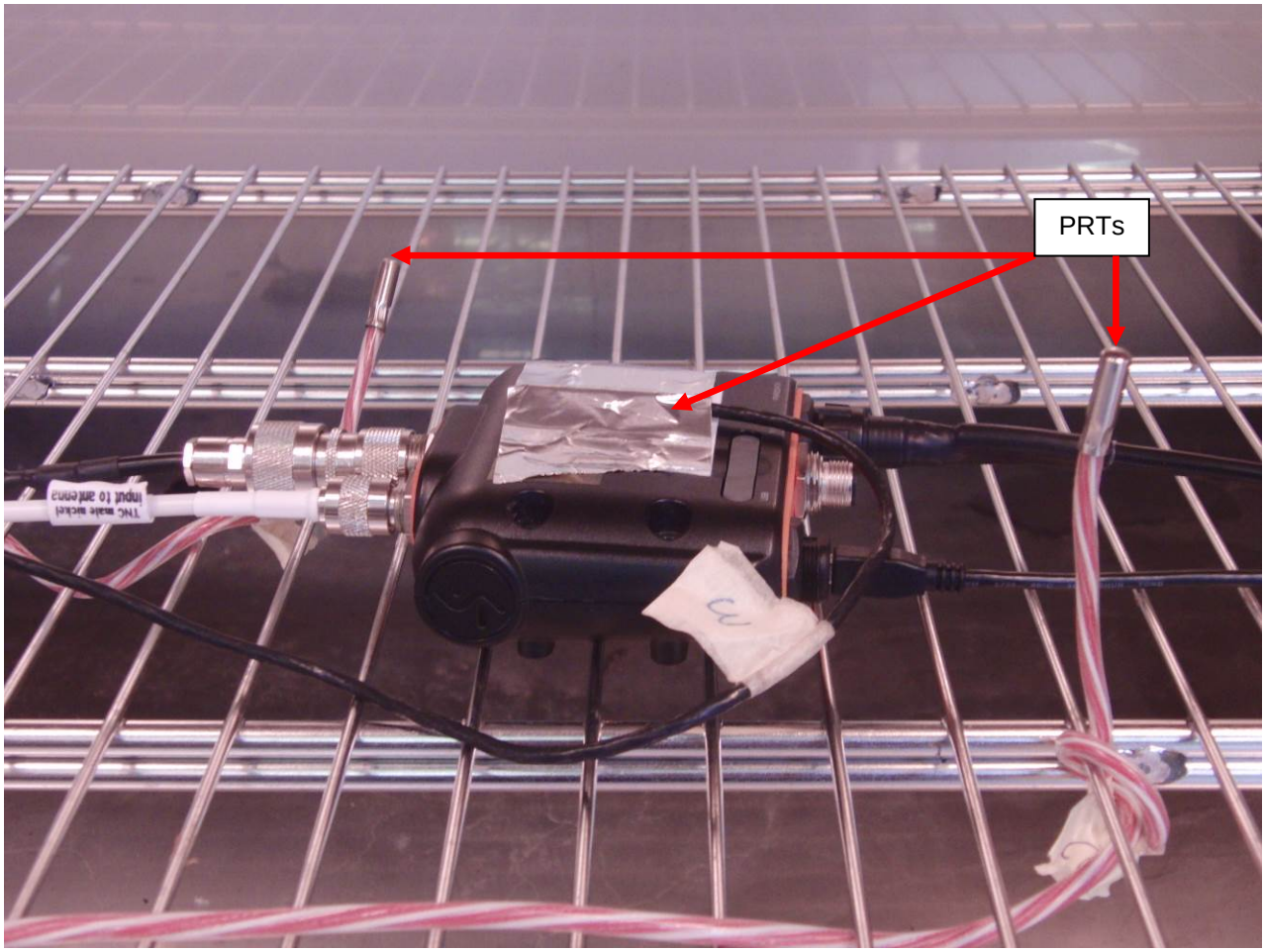
Each item of calibrated equipment and instrumentation was used within its valid calibration period.

7.2. TEST EQUIPMENT AND INSTRUMENTATION

Description	QA Number	Calibration Due Date
Temperature Testing		
Climatic Chamber	7344	20/03/18
Chart Recorder	7073	02/03/18
Platinum Resistance Thermometer	7373	31/08/18
Platinum Resistance Thermometer	7372	31/08/18
Platinum Resistance Thermometer	7263	17/02/18
Vibration Testing		
875 Vibration System	7029	N/A
875 Amplifier	7030	N/A
M+P Vibpilot	7035	13/09/18
M+P Vibpilot	7199	13/09/18
Computer Controller	7036	N/A
Charge Amp	7267	06/07/18
Charge Amp	6381	22/05/18
Accelerometer- Control 1x	7316	16/01/18
Accelerometer- Control 1y	7318	09/01/18
Accelerometer- Control 1z	7319	01/02/18
Accelerometer- Control 2	7114	19/12/17

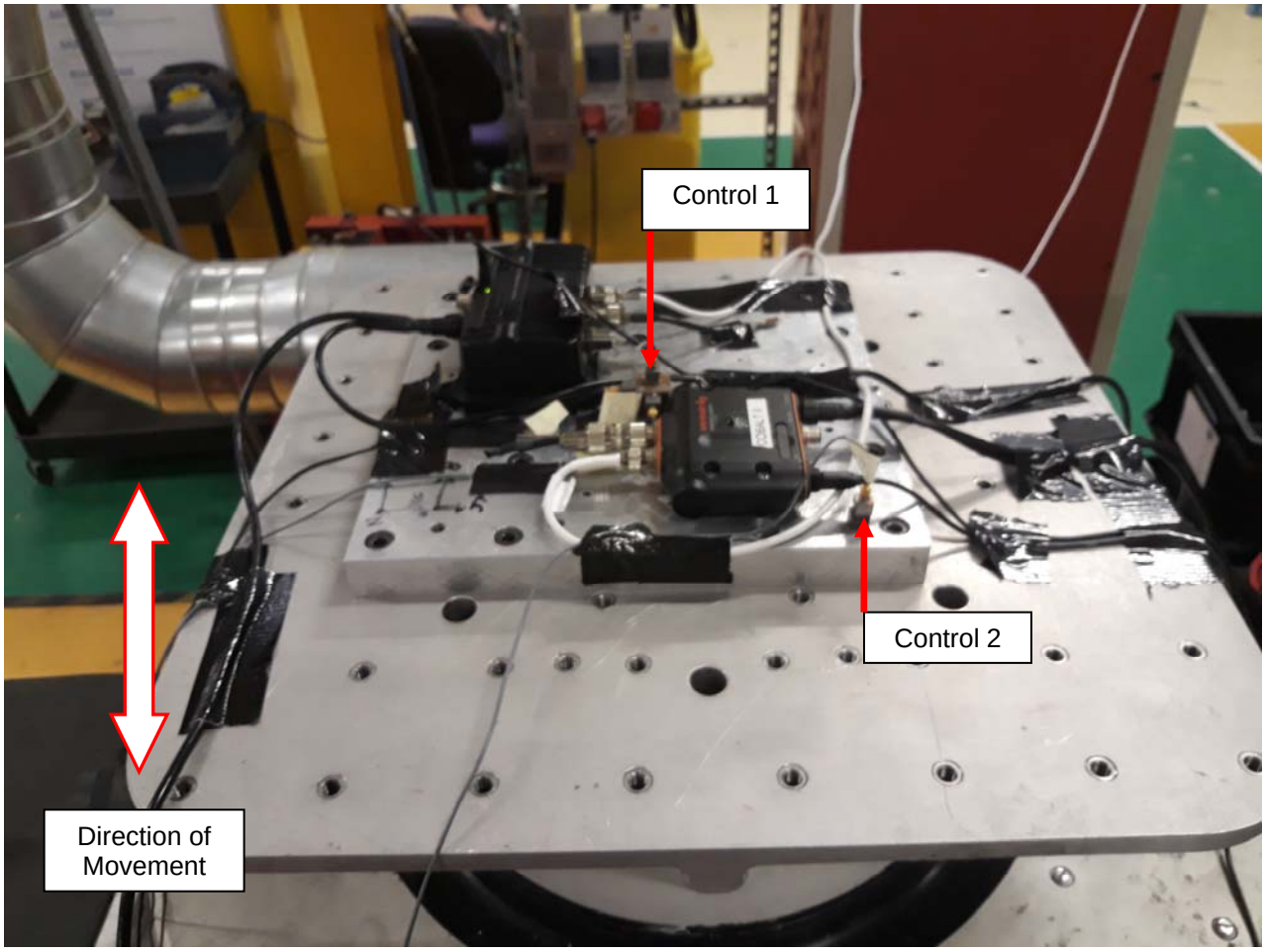
TEST EQUIPMENT AND INSTRUMENTATION

TABLE 1



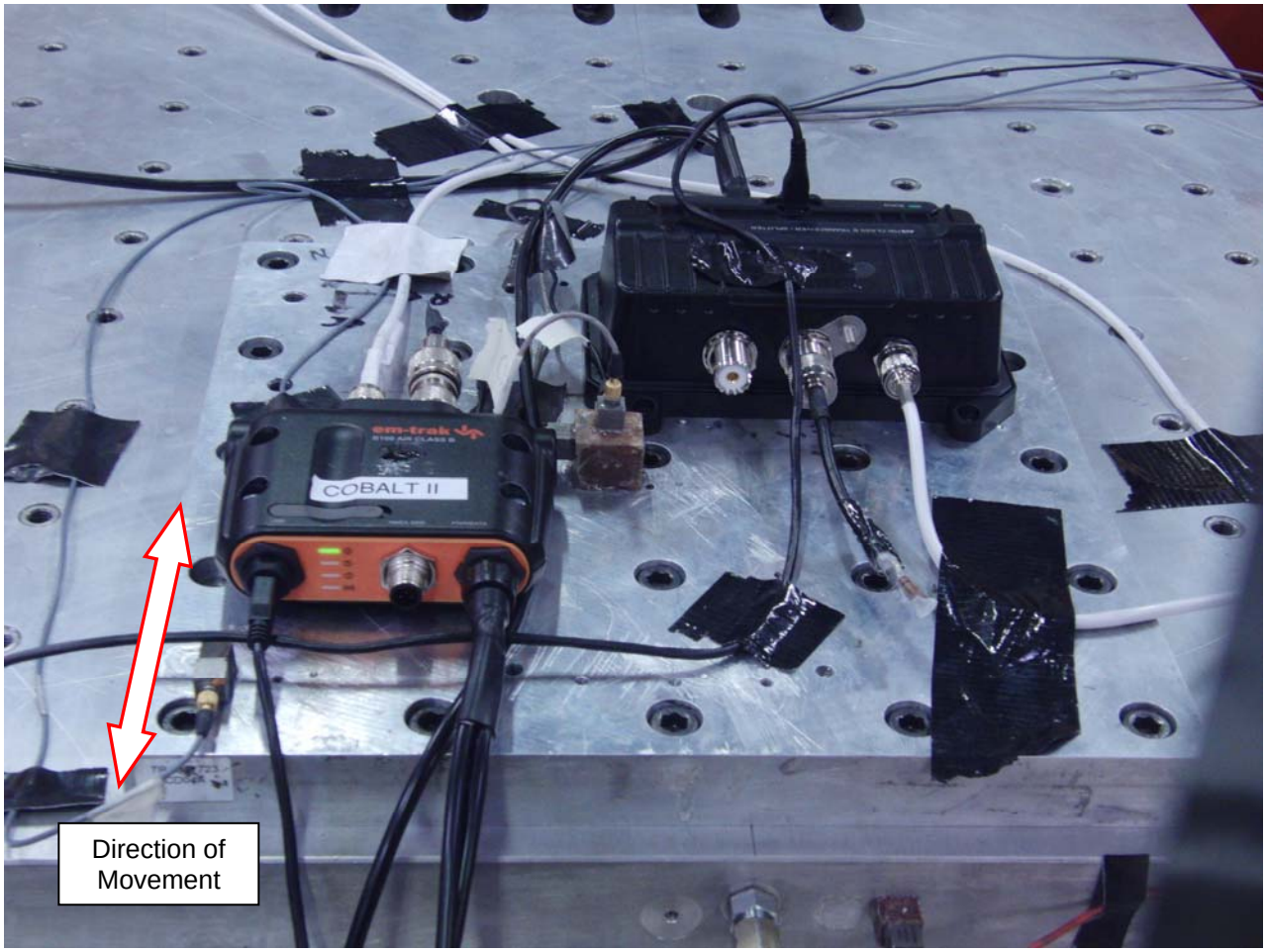
LOW TEMPERATURE AND DRY HEAT TEST INSTRUMENTATION

FIGURE 1.1



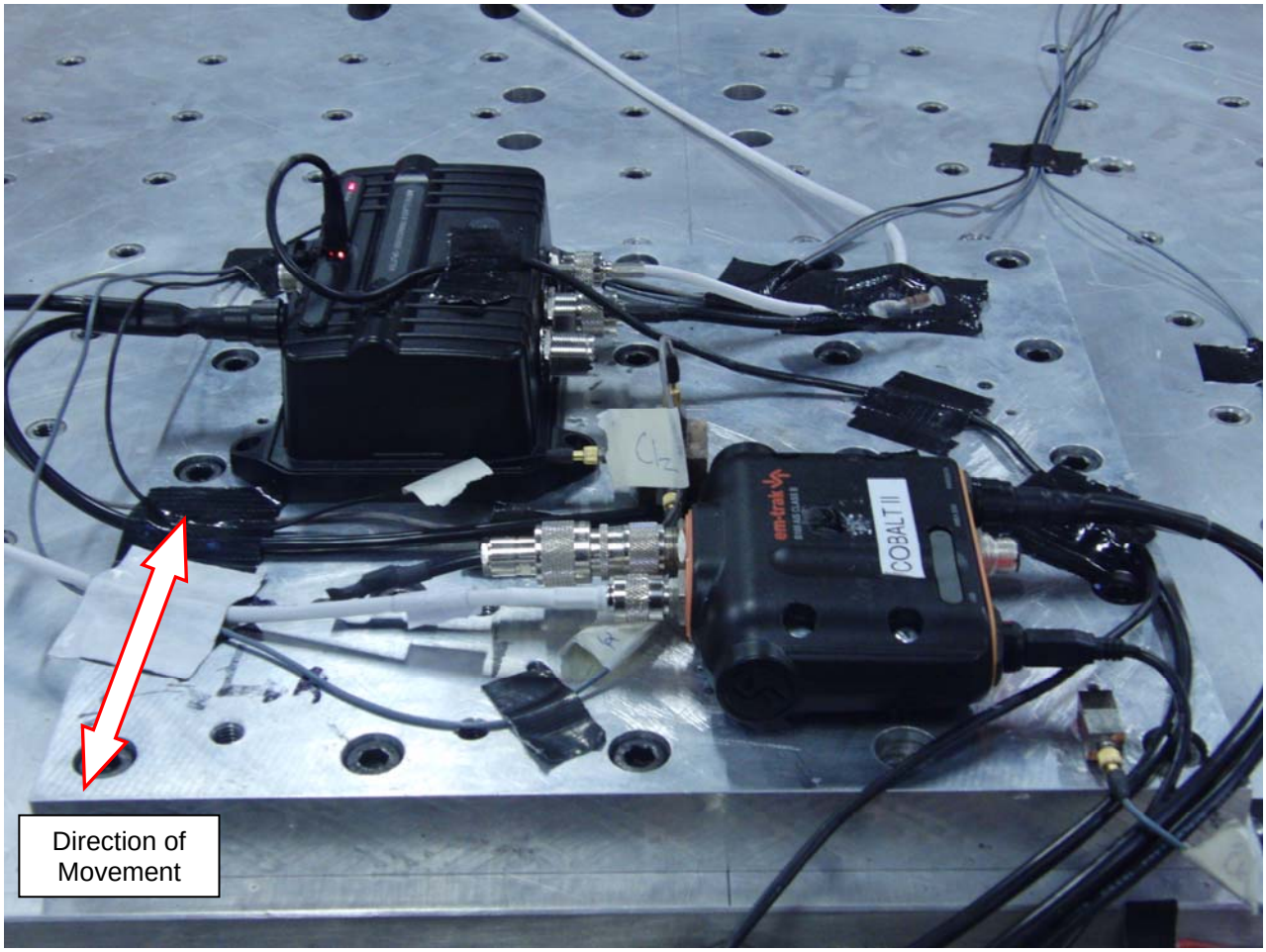
VIBRATION TEST SETUP
Z AXIS

FIGURE 1.2



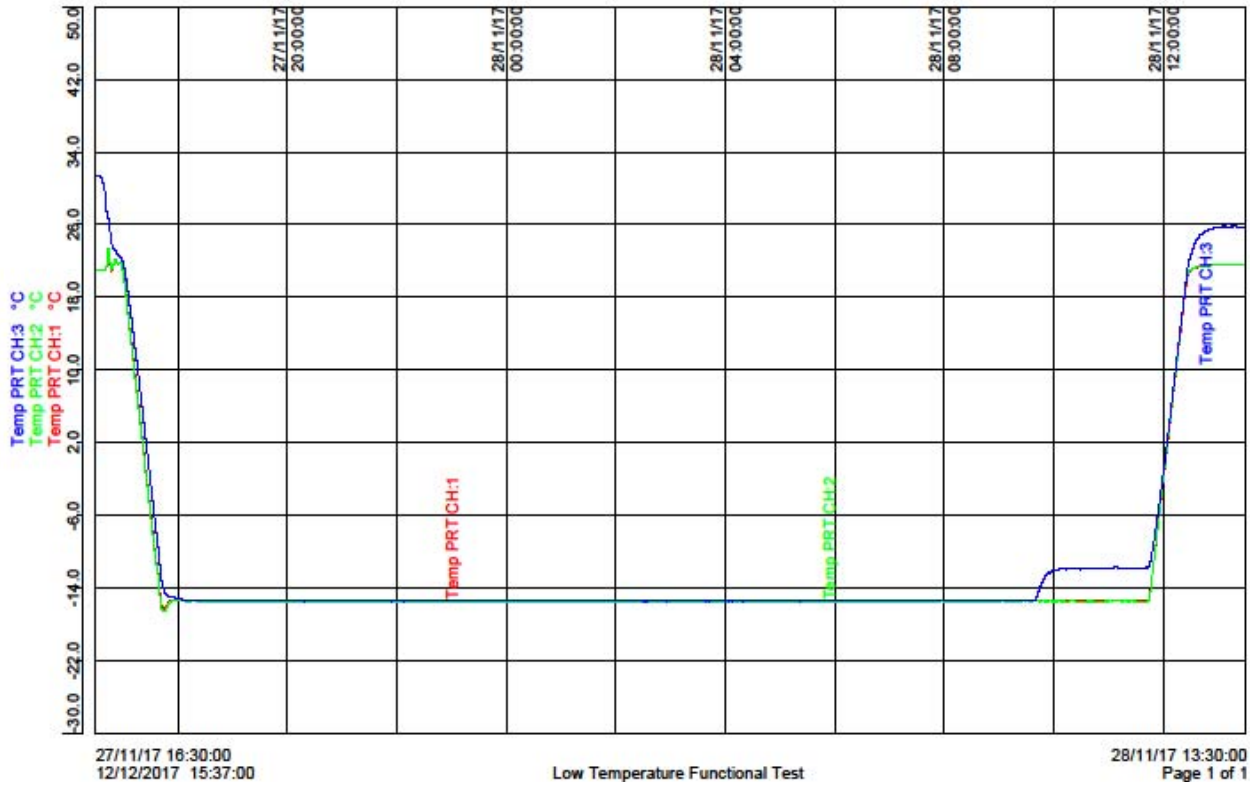
VIBRATION TEST SETUP
Y AXIS

FIGURE 1.3



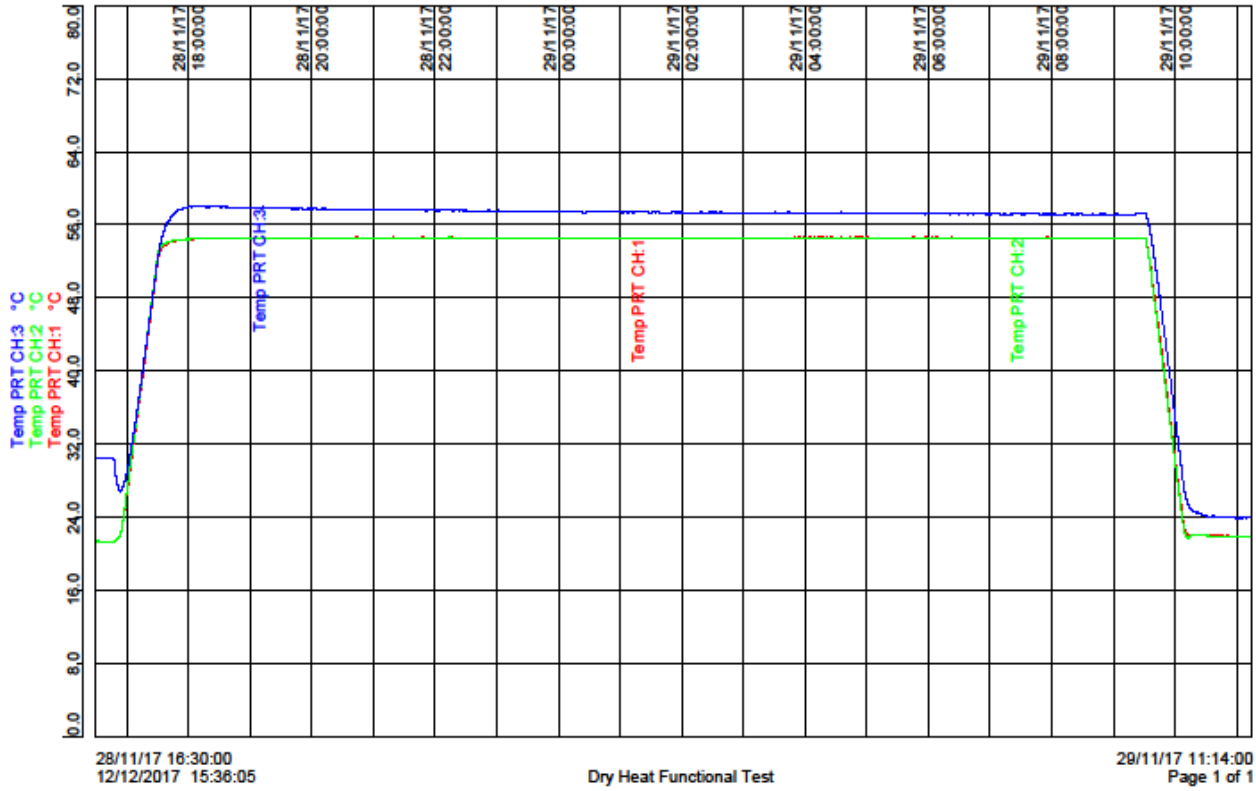
VIBRATION TEST SETUP
X AXIS

FIGURE 1.4



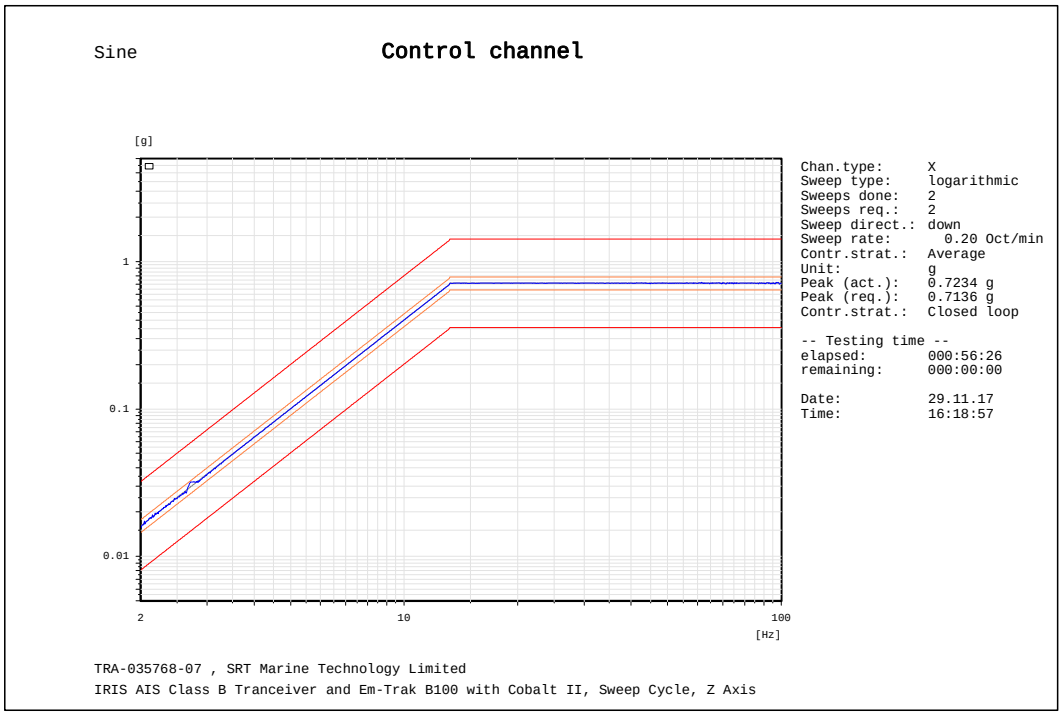
LOW TEMPERATURE FUNCTIONAL TEST
RESULT TRACE

FIGURE 2.1



DRY HEAT FUNCTIONAL TEST
RESULT TRACE

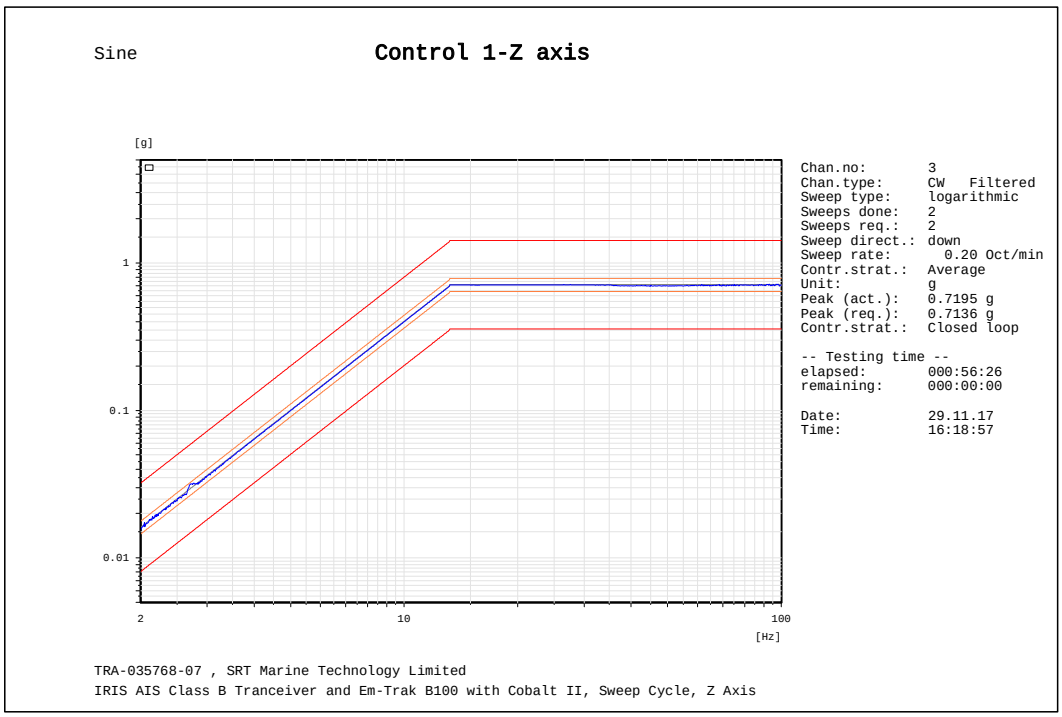
FIGURE 2.2



C:\VcpNT\Daten\m+p\TRA-035768-07 SRT Marine\Run 001 Sine Sweep Cycle Z Axis_002.rsn

RUN001 SINUSOIDAL SWEEP Z AXIS

FIGURE 3.1



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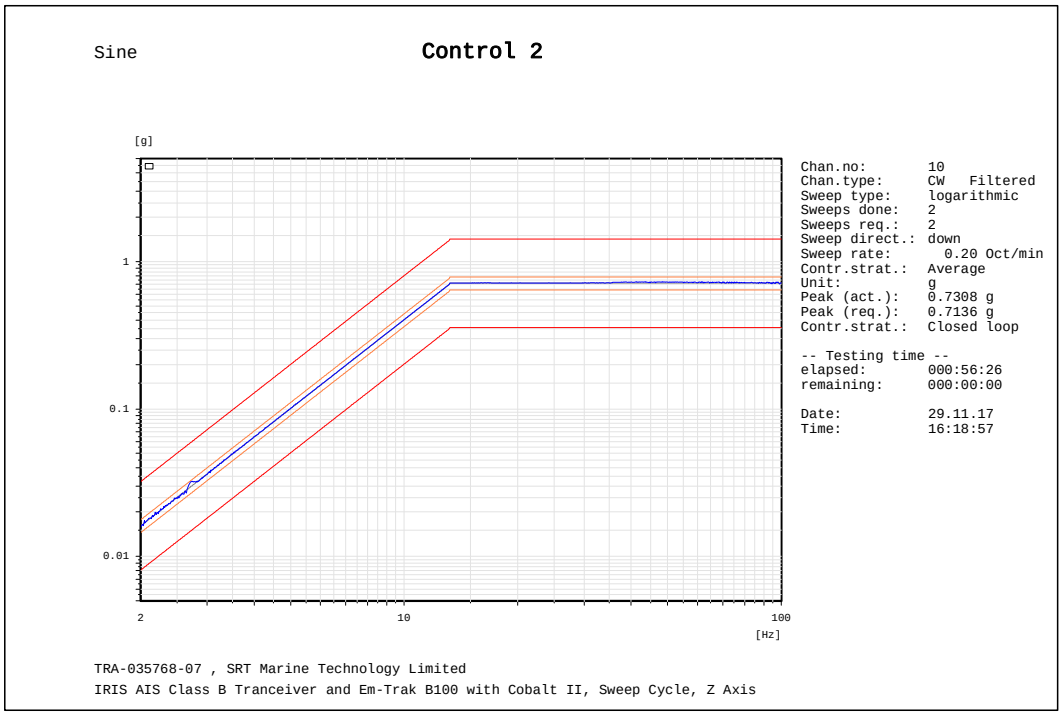
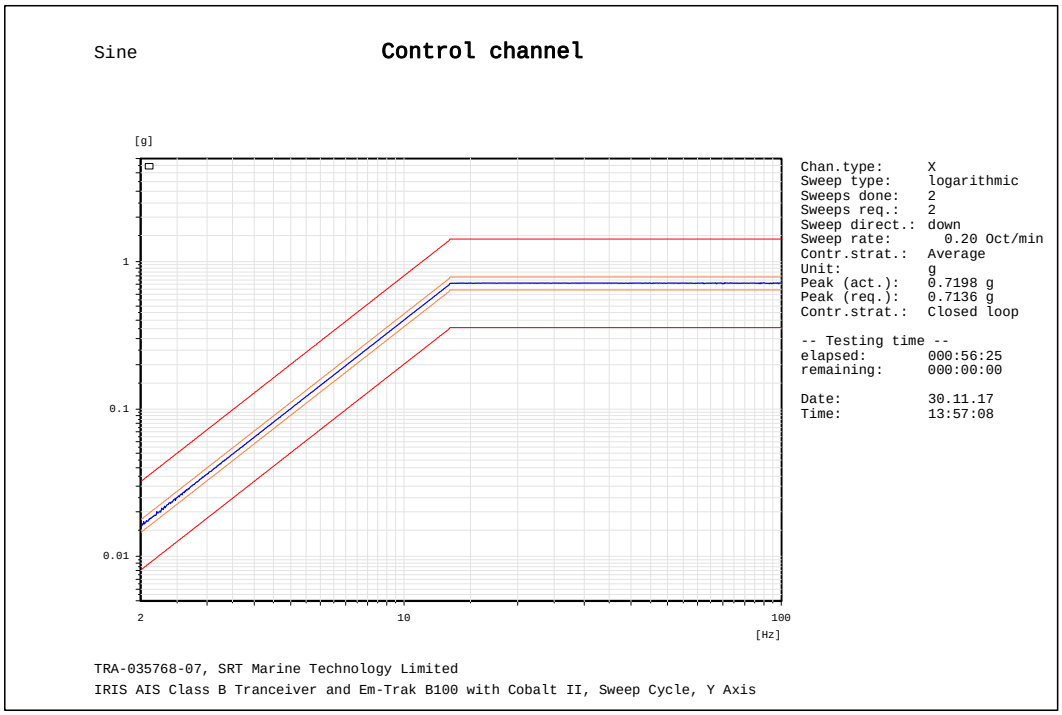
RUN001 SINUSOIDAL SWEEP Z AXIS

FIGURE 3.2



RUN001 SINUSOIDAL SWEEP Z AXIS

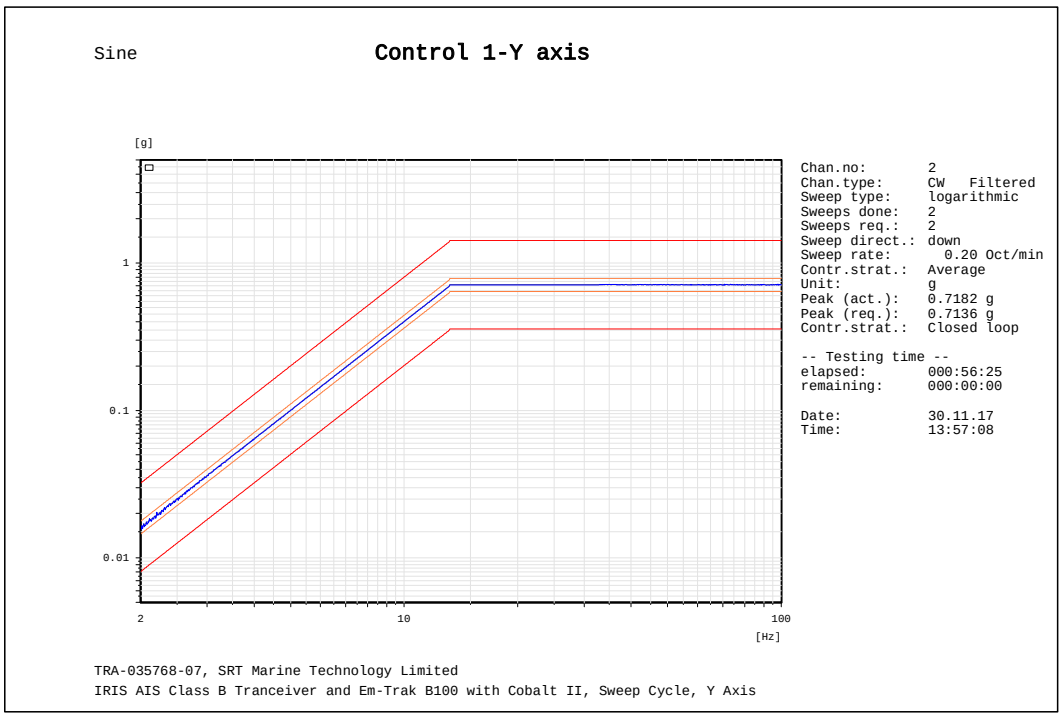
FIGURE 3.3



C:\VcpNT\Daten\m+p\TRA-035768-07 SRT Marine\Run 002 Sine Sweep Cycle Y Axis_002.rsn

RUN002 SINUSOIDAL SWEEP Y AXIS

FIGURE 4.1



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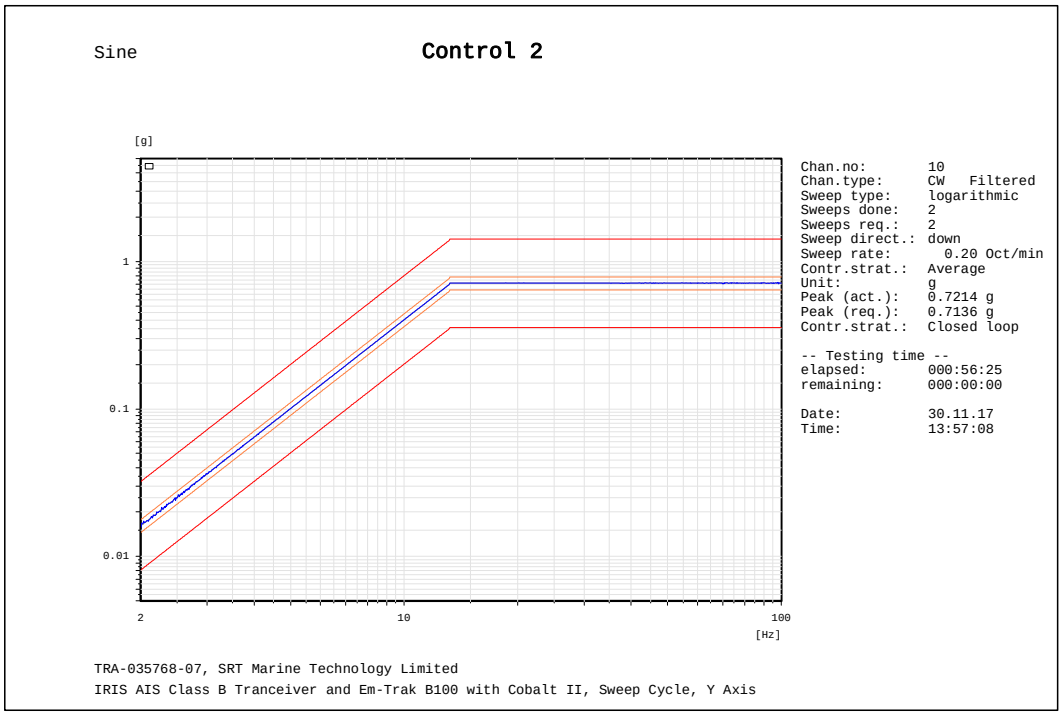
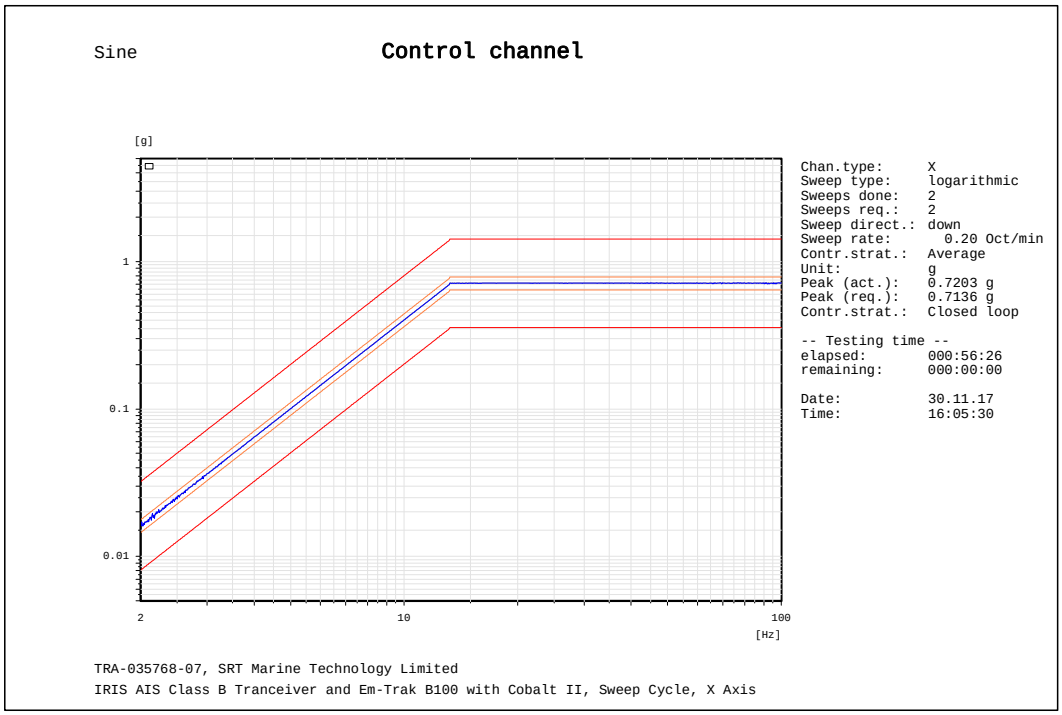
RUN002 SINUSOIDAL SWEEP Y AXIS

FIGURE 4.2



RUN002 SINUSOIDAL SWEEP Y AXIS

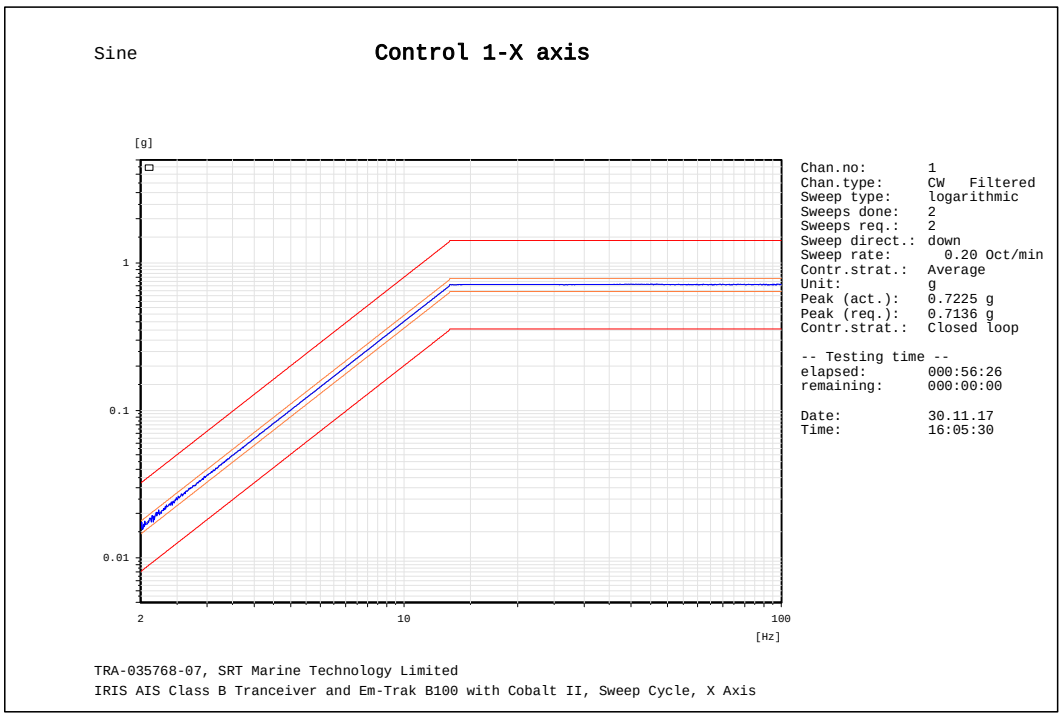
FIGURE 4.3



C:\VcpNT\Daten\m+p\TRA-035768-07 SRT Marine\Run 003 Sine Sweep Cycle X Axis_001.rsn

RUN003 SINUSOIDAL SWEEP X AXIS

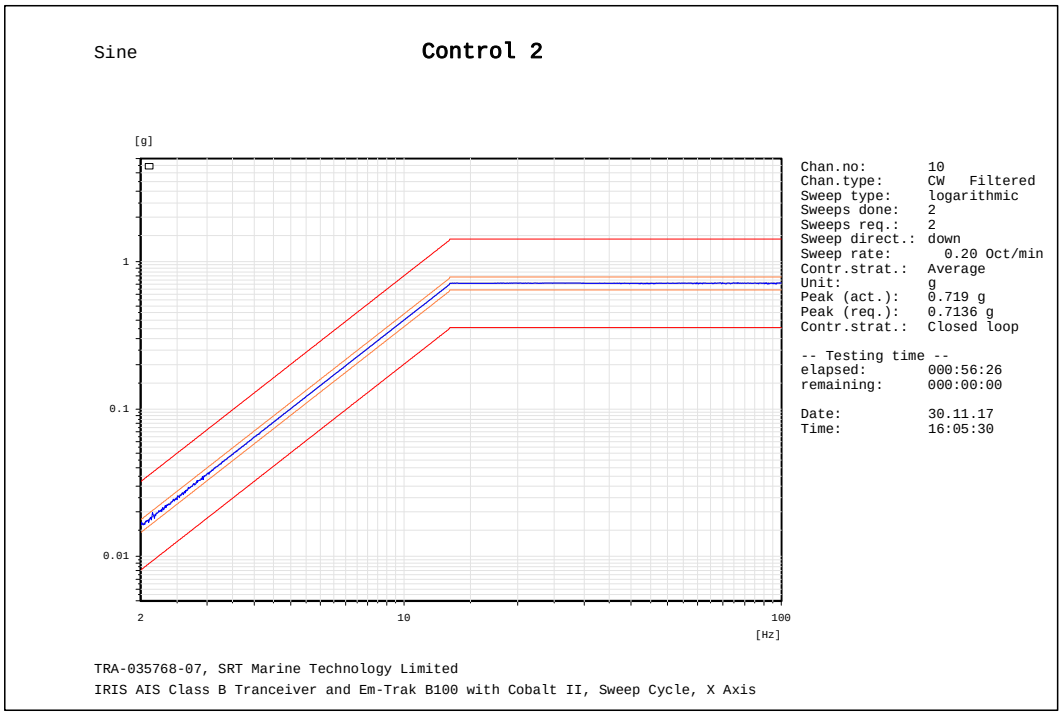
FIGURE 5.1



C:\VcpNT\Daten\m+p\TRA-035768-07 SRT Marine\Run 003 Sine Sweep Cycle X Axis_001.rsn

RUN003 SINUSOIDAL SWEEP X AXIS

FIGURE 5.2



RUN003 SINUSOIDAL SWEEP X AXIS

FIGURE 5.3