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Report On

Testing of the
Ocean Signal
RescueME MOB1
In accordance with RTCM 11901.1 and IEC 60945

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REPORT ON

Testing of the
Ocean Signal
RescueME MOB1
In accordance with RTCM 11901.1

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June 2018

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DATED

08 June 2018

12 June 2018

12 June 2018





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Product Service

SECTION 1

REPORT SUMMARY

Testing of the
Ocean Signal
RescueME MOB1
In accordance with RTCM 11901.1 and IEC 60945



1.1 INTRODUCTION

The information contained in this report is intended to show verification of testing of the Ocean Signal, RescueME MOB1, to limited requirements of RTCM 11901.1 and IEC 60945.

Objective	To perform Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ocean signal
Model Number(s)	RescueME MOB1
Brandname Holder	N/A
Brandname Model Number(s)	N/A
Serial Number(s)	2886K1642017 0170706044Q (conducted)
Number of Samples Tested	2
Test Specification/Issue/Date	RTCM 11901.1 (2012) IEC 60945 (2002) incorporating corrigendum April 2008
Order Number	4161
Date	27 November 2017
Start of Test	15 December 2017
Finish of Test	20 March 2018
Name of Engineer(s)	S Jones N Douglas C Bowles P Joynson F Van Niekerk C Hedley
Related Document(s)	ISO 694: 2000



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with RTCM 11901.1 is shown below.

Section	Spec. Clause	Test Description	Result	Comments
2.1 - 2.13	8.1.2	Tests for durability and resistance to environmental conditions	-	See Table below for IEC 60945
2.15	8.1.3	Buoyancy test	N/A	
2.16	8.1.4	Controls and indicators tests	-	See section 2.16
-	8.1.5	Activation tests	N/T	
2.17	8.1.6	Test of the Self-Test Mode	Pass	
2.19	8.1.7	Battery Capacity and Low Temperature Test	Pass	See section 2.19
-	8.1.8	Spurious and Out-of-Band Emissions	N/T	
Annex A: DSC Type MSLD System				
-	A.4	Performance Tests – DSC Transmitter	N/T	
-	A.5	Performance Tests – DSC Receiver	N/T	
Annex E: AIS Type MSLD System				
2.19	E.6.5	Battery capacity test	Pass	
-	E.7.1.1.1	Frequency error	N/T	
-	E.7.2	Conducted Power	N/T	
-	E.7.3	Radiated Power	N/T	
-	E.7.3.1.4	Modulation spectrum slotted transmission	N/T	
-	E.7.4	Transmitter test sequence and modulation accuracy	N/T	
-	E.7.5	Transmitter output power versus time function	N/T	
2.26	E.7.6	Spurious emissions from the transmitter	N/T	
Annex E: Link Layer				
-	E.8.2 (E.8.2.1.2 – E.8.2.1.8)	Active mode tests	N/T	
-	E.8.2.1.11 (E.8.2.1.13)	Test mode tests with EPFS data available	N/T	
-	E.8.2.1.14 (E.8.2.1.16)	Test mode tests without EPFS data available	N/T	
Annex F: Internal Navigation Device				
2.18	F.2.2	Scenarios	Pass	

N/A: Not Applicable

N/T: Not Tested



A brief summary of the tests carried out in accordance with IEC 60945 is shown below.

Section	Spec. Clause	Test Description	Result	Comments
2.2	8.2	Dry heat	Satisfactory	
2.3	8.3	Damp heat	Satisfactory	
2.4	8.4	Low temperature	Satisfactory	
2.5	8.5	Thermal shock	Satisfactory	
2.6	8.6	Drop onto hard surface	Satisfactory	
2.7	8.6	Drop into water	Satisfactory	
2.8	8.7	Vibration	Satisfactory	
2.9	8.8	Rain and Spray	Satisfactory	As modified by RTCM 11901.1 clause 8.1.5.2
2.10	8.9	Immersion	Satisfactory	
2.11	8.10	Solar radiation	-	Not tested
2.12	8.11	Oil resistance	-	Not tested
2.13	8.12	Corrosion (salt mist)	-	Not tested
2.14	11.2	Compass safe distance	-	See section 2.13



1.3 DECLARATION OF BUILD

MAIN EUT			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
Ocean Signal Limited			
MODEL NAME/NUMBER			
rescueME MOB1			
PART NUMBER			
740S-01551			
SERIAL NUMBER			
HARDWARE VERSION			
02.00			
SOFTWARE VERSION			
PSU VOLTAGE/FREQUENCY/CURRENT			
6v			
HIGHEST INTERNALLY GENERATED / USED FREQUENCY			
162.025MHz			
FCC ID (if applicable)			
XYE MOB1			
INDUSTRY CANADA ID (if applicable)			
certificate 9296A-MOB1X			
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)			
MSLD device			
COUNTRY OF ORIGIN			
UK			
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)			
161.975 & 162.025 MHz			
RECEIVER FREQUENCY OPERATING RANGE (MHz)			
N/A			
INTERMEDIATE FREQUENCIES			
N/A			
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)			
16K0GXW			
MODULATION TYPES: (i.e. GMSK, QPSK)			
GMSK			
OUTPUT POWER (W or dBm)			
1W			
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
POWER			
FCC ID			
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

Name: Simon Nolan

Position held: Chief Technical Officer

Date: 23/02/2018



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was an Ocean Signal, RescueME MOB1 as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



1.4.2 Monitoring of Performance

Performance Checks and Performance Tests were defined by RTCM 11901.1 as follows:

AIS Performance Check

Method: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Message 1 and Message 14 via a Class A AIS.

AIS Performance Test

Method: Activate the AU in test mode with GPS data available.

Requirements - AIS:

- a) EUT starts transmission after valid GPS data available
- b) Burst of 8 messages in the correct order and correctly populated:
 - AIS 1, Message 14 "MOB TEST"
 - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
 - AIS 2, Message 14 "MOB TEST"
 - It is permissible to start the sequence on AIS 2
- c) User ID as configured
- d) Navigational status = 15 (not defined)
- e) SOG = actual SOG from GPS simulator
- f) Position accuracy flag = according to the RAIM result if provided, otherwise 0
- g) Position = actual position from GPS
- h) COG = actual COG from GPS simulator
- i) Time stamp = actual UTC second (0...59)
- j) Communication state time-out always = 0 with sub message = 0
- k) Transmission of Messages 1 and 14 stops after one burst of 8 messages
- l) Text message in Message 14 is "MOB TEST"
- m) Correct indication as per manufacturer's documentation

Additional DSC Check

Self-Test with GPS data: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Routine RT Call request via the Sailor RT5022 VHF with DSC radio.

Active Mode with GPS data: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Distress Relay via the Sailor RT5022 VHF with DSC radio. Correct MMSI displayed.



Product Service

1.5 DEVIATIONS FROM THE STANDARD

Clause 8.1.2 of RTCM 11901.1 indicates that one single item of equipment should be used for the environmental tests as per IEC60945 (sections 2.2 – 2.12 of this report) and should be carried out in the order given in IEC 60945. The following order of tests was carried out:

- Dry Heat Storage
- Dry Heat Functional
- Low Temperature Storage
- Damp Heat
- Low Temperature Functional
- Thermal Shock
- Drop onto Hard Surface
- Drop into Water
- Vibration
- Rain and Spray
- Immersion

The Battery Capacity Test was carried out on an additional conducted sample 2.

The Manufacturer has provided data with respect to a waiver for the following clauses:

- Solar radiation
- Oil resistance
- Corrosion



Product Service

1.6 MODIFICATION RECORD

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Sample 1

Physical Modification	Description	Fitted by	Date
0	As supplied	N/A	N/A

Sample 2 conducted

Physical Modification	Description	Fitted by	Date
1	GPS Timing altered to provide 5 mins on /off in first hour without GNSS, 5 mins on every 20 mins after.	Manufacturer	N/A



Product Service

SECTION 2

TEST DETAILS

Testing of the
Ocean Signal
RescueME MOB1
In accordance with RTCM 11901.1 and IEC 60945



Product Service

2.1 PRE-TEST CHECKS

2.1.1 Specification Reference

IEC 60945, Clause 8.1

2.1.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0
RescueME MOB1, MMSI 972606044 (TSR0007) and Mod State 1

2.1.3 Date of Test

17 December 2017

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Environmental Conditions

Ambient Temperature 22.7 °C
Relative Humidity 35.2 %

2.1.6 Test Results

Visual Inspection

Prior to the start of the testing schedule the EUTs were visually inspected. No signs of damage were found.

Mechanical and Electrical Check

A check was made to ensure that the EUTs were functional before all upcoming tests.



2.2 DRY HEAT

2.2.1 Specification Reference

IEC 60945, Clause 8.2

2.2.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.2.3 Date of Test

19 – 20 December 2017 (Storage)

06 – 07 January 2018 (Functional)

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Environmental Conditions

Ambient Temperature 17.3 – 19.5 °C

Relative Humidity 26.1 – 51.8 %

2.2.6 Test Setup



Test Setup - Storage and Functional Test



2.2.7 Test Method

Storage Test

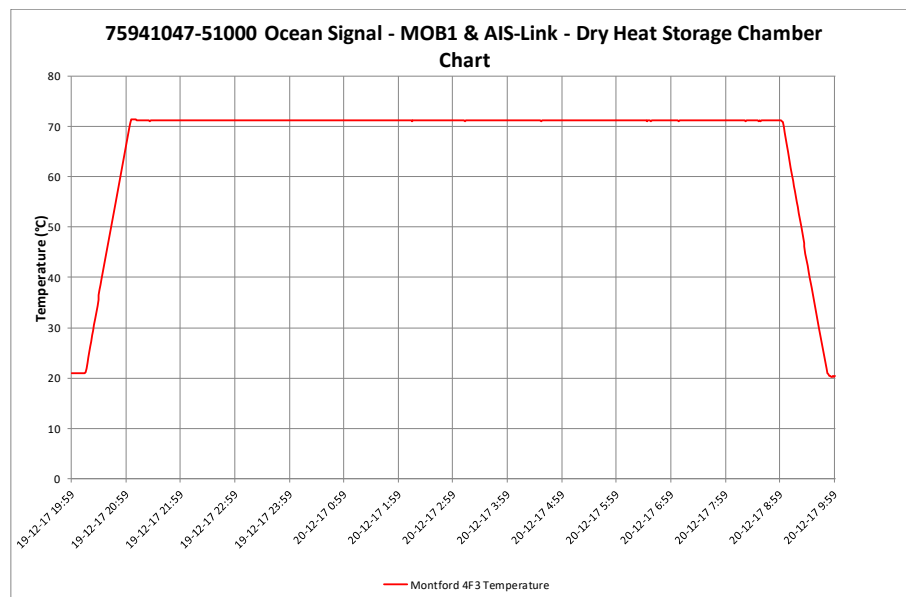
The EUTs were placed in a climatic chamber where the temperature was increased from laboratory ambient temperature to +70 °C. After 12 hours, the temperature was returned to ambient conditions. The EUT was subjected to an AIS Performance Check at the end of the test. An additional DSC self-test check (with GPS data) was carried out.

Functional Test

The EUT was switched on, and placed in a climatic chamber where the temperature was increased from ambient temperature to +55 °C. The conditions remained for a period of 15 hours, during the end of this period the EUT was subjected to an AIS Performance Test and Active mode DSC checks were made. The temperature was returned to laboratory ambient conditions.

After the test, an AIS Performance Check was carried out. An active mode DSC check was carried out.

2.2.8 Test Results



Dry Heat Storage Test Temperature Plot

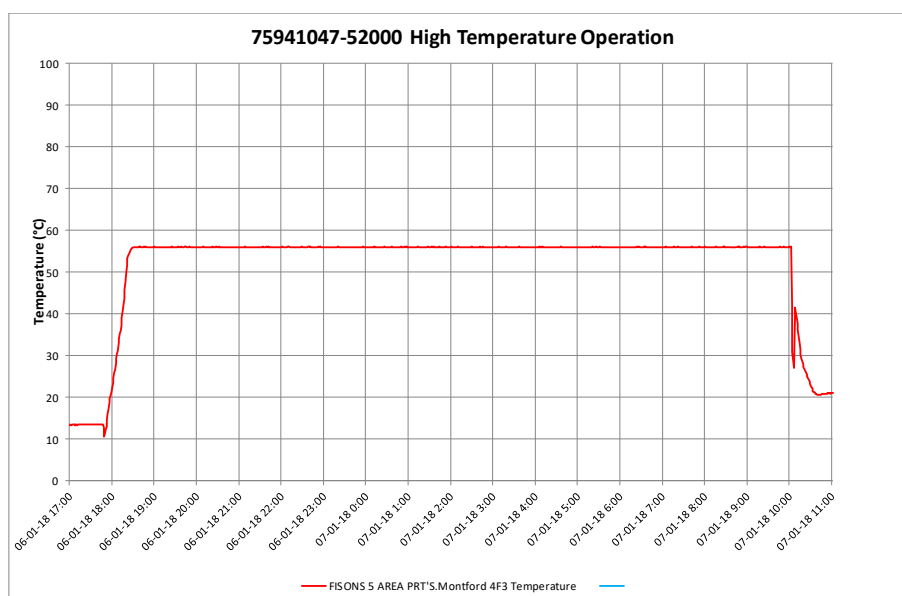


Product Service

Post-Storage Period Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



Dry Heat Functional Test Temperature Plot

Dry Heat Storage Post Test Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message	Y / N	Y	Y

Dry Heat Functional Period Performance Test

Parameter	Units	Result	Limit
EUT starts transmission after valid GPS data available	Y / N	Y	Y
Burst of 8 messages – AIS1/2 alternates	Y / N	Y	Y
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	Y	Y
User ID as configured	Y / N	Y	Y
Nav Status	-	14	14
SOG Error	kn	0.0	< 0.2 (See Note)
Position accuracy flag	1 bit	0	RAIM result / 0
Position Error	m	0	<1
COG	0	0	
Timestamp (UTC)	s	22	0-59
Communication state time-out	1 bit	0	0
Communication state sub message	1 bit	1	1



Product Service

Transmission stops after one burst of 8 messages	Y / N	Y	Y
Text message in Message 14	-	MOB ACTIVE	MOB ACTIVE
Correct indication as per manufacturer's documentation	Y / N	Y	Y

Dry Heat Functional Post Test Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



2.3 DAMP HEAT

2.3.1 Specification Reference

IEC 60945, Clause 8.3

2.3.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.3.3 Date of Test

10 – 11 January 2017

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Environmental Conditions

Ambient Temperature 20.5 – 23.9 °C

Relative Humidity 34.9 – 41.3 %

2.3.6 Test Setup



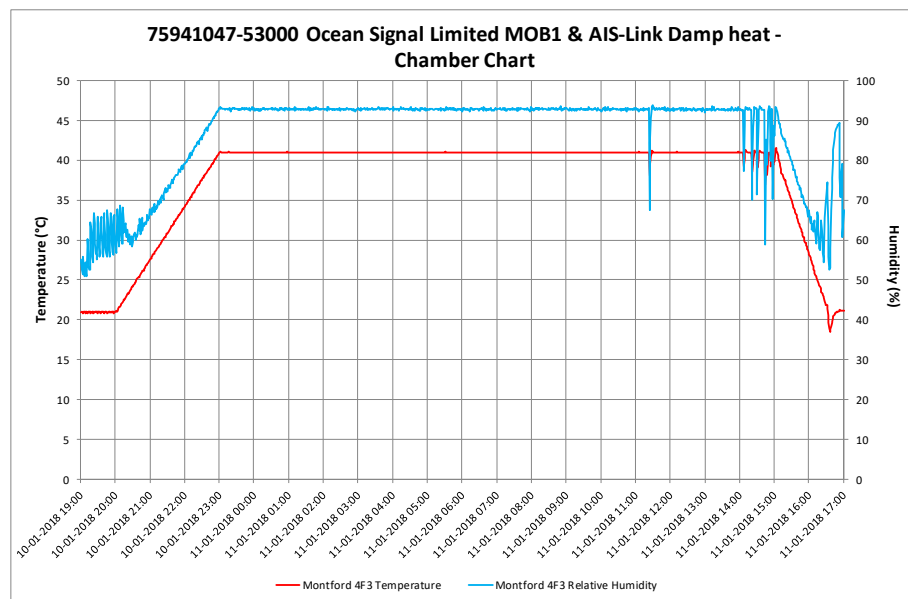
Test Setup



2.3.7 Test Method

The EUT was placed in a climatic chamber with the temperature increased to 40°C and the relative humidity increased to 93% over 3 hours. After 12 hours, the EUT was activated for at least 2 hours (whilst maintaining the damp heat conditions), during this period the EUT was subjected to an AIS Performance Check and DSC Active Mode check.

2.3.8 Test Results



Damp Heat Test Temperature Plot

The change in relative humidity towards the end of the test can be attributed to the opening of the environmental test chamber in order to activate the EUT.

Damp Heat Operational Period Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



2.4 LOW TEMPERATURE

2.4.1 Specification Reference

IEC 60945, Clause 8.4

2.4.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.4.3 Date of Test

07 – 08 January 2018 (Storage Test)
11 – 12 January 2018 (Functional Test)

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Environmental Conditions

Ambient Temperature 13.9 – 24.2 °C
Relative Humidity 30.3 – 41.8 %

2.4.6 Test Setup



Test Setup – Storage and Functional Test



2.4.7 Test Method

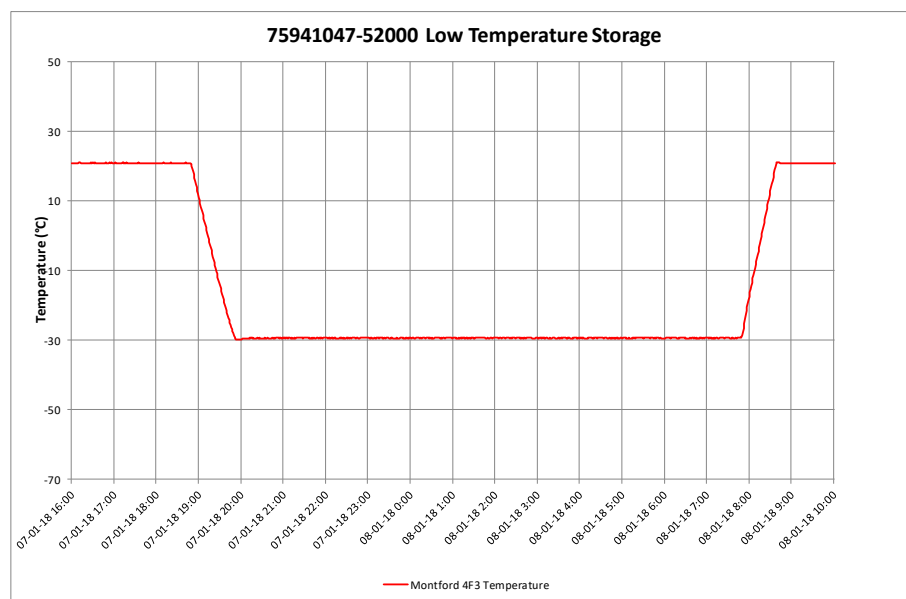
Storage Test

The EUT was placed in a climatic chamber with the temperature reduced to -30°C. After approximately 11.5 hours, the temperature was increased to ambient and the EUT was subjected to an AIS Performance Check, and DSC Active Mode check.

Functional Test

The EUT was placed in a climatic chamber with the temperature reduced to -20°C. After 19 hours, the EUT was activated for at least 2 hours and during this period was subjected to an AIS Performance Test and Check, and a DSC Active Mode check.

2.4.8 Test Results



Low Temperature Storage Plot

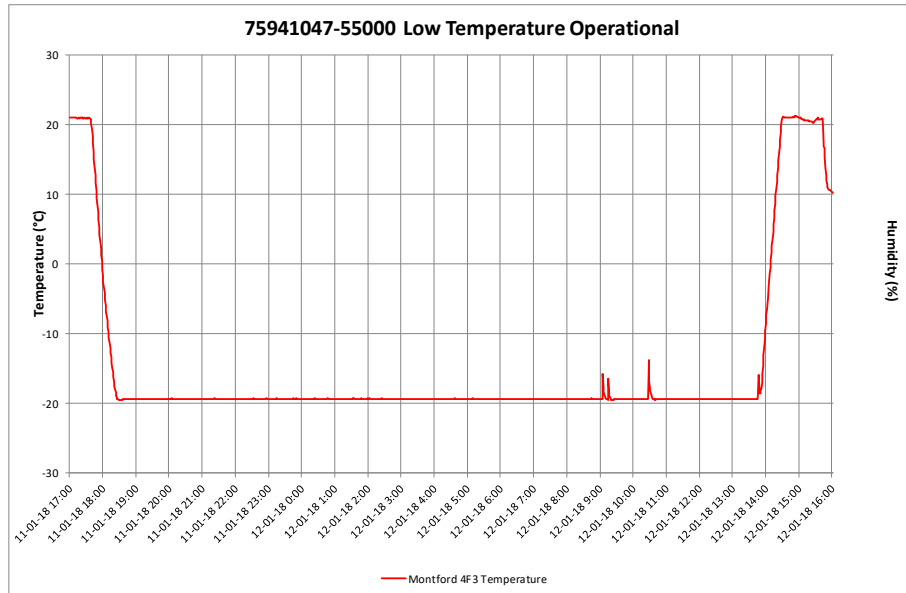
Low Temperature Storage Post Test Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



Product Service



Low Temperature Functional Plot



Low Temperature Functional Test Performance Test (during 2-hour operational period)

Parameter	Units	Result	Limit
EUT starts transmission after valid GPS data available	Y / N	Y	Y
Burst of 8 messages – AIS1/2 alternates	Y / N	Y	Y
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	Y	Y
User ID as configured	Y / N	Y	Y
Nav Status	-	14	14
SOG Error	kn	0	< 0.2
Position accuracy flag	1 bit	0	RAIM result / 0
Position Error	m	>10	< 30
COG	-	0	0
Timestamp (UTC)	s	22	0-59
Communication state time-out	1 bit	0	0
Communication state sub message	1 bit	0	0
Transmission stops after one burst of 8 messages	Y / N	Y	Y
Text message in Message 14	-	MOB ACTIVE	MOB ACTIVE
Correct indication as per manufacturer's documentation	Y / N	Y	Y

Performance Check (Start of 2 hour on time)

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y

Performance Check (End of 2 hour on time)

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



2.5 THERMAL SHOCK

2.5.1 Specification Reference

IEC 60945, Clause 8.5

2.5.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.5.3 Date of Test

31 January 2018

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions

Ambient Temperature 24.9 - 27.4 °C

Relative Humidity 35.7 - 38.8 %

2.5.6 Test Setup



Test Setup (1-hour immersion)

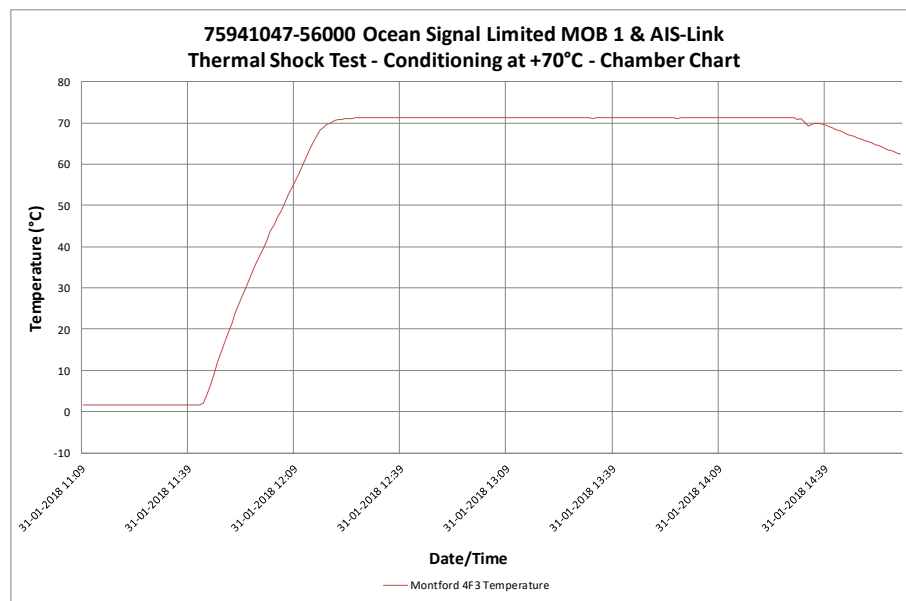


2.1.1 Test Method

The EUT was placed in the pre-conditioning climatic chamber at a temperature of +70 °C for >2 hours

The EUT was then immersed in a water vessel preconditioned at 25 °C, at a level of 100 mm below the surface of the water (measured to the highest point of the EUT) for 1 hour.

2.5.7 Test Results



Preconditioning Temperature Plot

Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



2.6 DROP ONTO HARD SURFACE

2.6.1 Specification Reference

IEC 60945, Clause 8.6

2.6.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.6.3 Date of Test

01 February 2018

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Environmental Conditions

Ambient Temperature 23.8 °C

Relative Humidity 47.9 %

2.6.6 Test Setup



Test Setup



Product Service

2.6.7 Test Method

The EUT was dropped 6 times, once on each face, from a height of 1000 mm $\pm$ 10 mm onto the test surface (solid piece of hardwood).

2.6.8 Test ResultsEUT Response

The EUT did not activate throughout the test.

Visual Inspection

The EUT was examined for external indications of damage; none was found.

Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



Product Service

2.7 DROP INTO WATER (NUA)**2.7.1 Specification Reference**

IEC 60945, Clause 8.6

2.7.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.7.3 Date of Test

08 February 2018

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Environmental Conditions

Ambient Temperature 22.0 °C

Relative Humidity 41.0 %

2.7.6 Test Method

The EUT was dropped three times from a height of 20 m into water. For each drop, the EUT was orientated in a plane mutually perpendicular to the planes of the other drops.



2.7.7 Test Setup



Drop into water test setup

2.7.8 Test Results

EUT Response

Drop 1 (as per above): no indication of activation or damage.

Drop 2 (90° from vertical): no indication of activation or damage.

Drop 3 (inverted): no indication of activation or damage, activation red cover moved to activated position.

Examination

The EUT was subjected to an external visual inspection post-test and no signs of ingress or external damage were observed.



Product Service

Performance Check

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



2.8 VIBRATION

2.8.1 Specification Reference

IEC 60945, Clause 8.7

2.8.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.8.3 Date of Test

08 February 2018

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Environmental Conditions

Ambient Temperature 22.5 - 27.0 °C

Relative Humidity 49.3 - 60.8 %

2.8.6 Test Setup



Test Setup (Up and Down) *

*The EUT (TSR0001) is the item on the left-hand side of the photograph.



Test Setup (Forward and Aft)



Test Setup (Side to Side)



Product Service

2.8.7 Test Method

The EUT was fixed to the vibration table and was subject to the following vibration profiles:

Resonance Sweep

- 5 Hz and up to 13.2 Hz with an excursion of ± 1 mm (7 m/s^2 maximum acceleration at 13.2 Hz);
- above 13.2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s^2 .

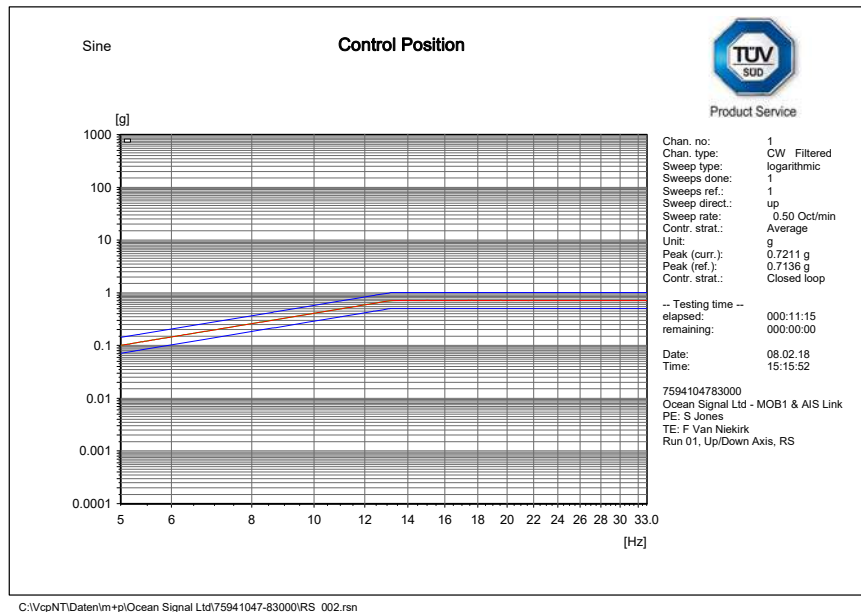
One sweep was performed at a rate of 0.5 octaves / minute.

No resonant frequencies were found and therefore the endurance run was carried out at 30 Hz.

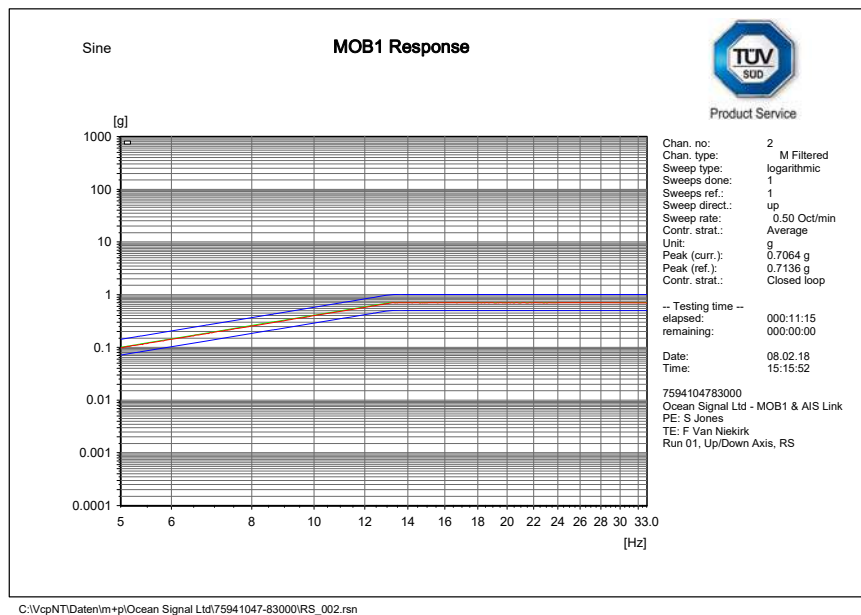
At the end of the test, the EUT was subjected to a Performance Check.



Product Service



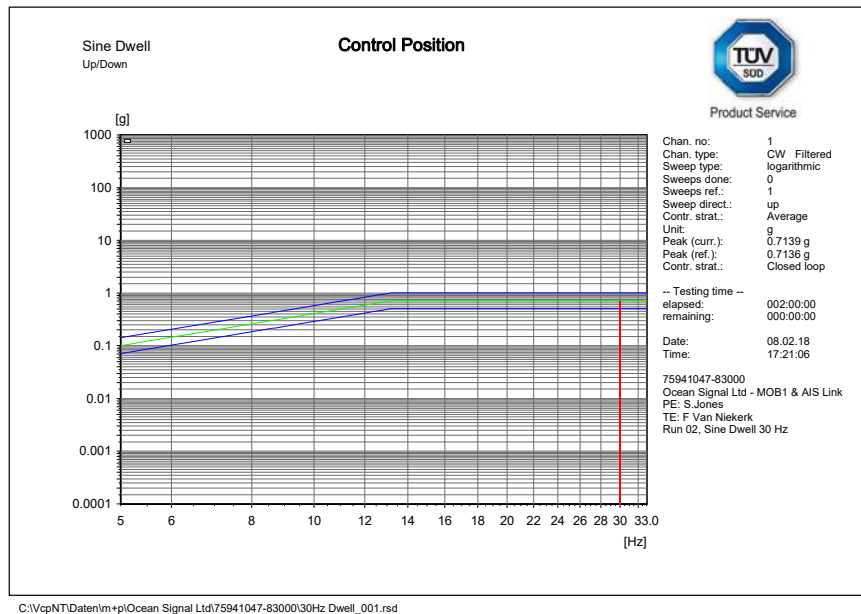
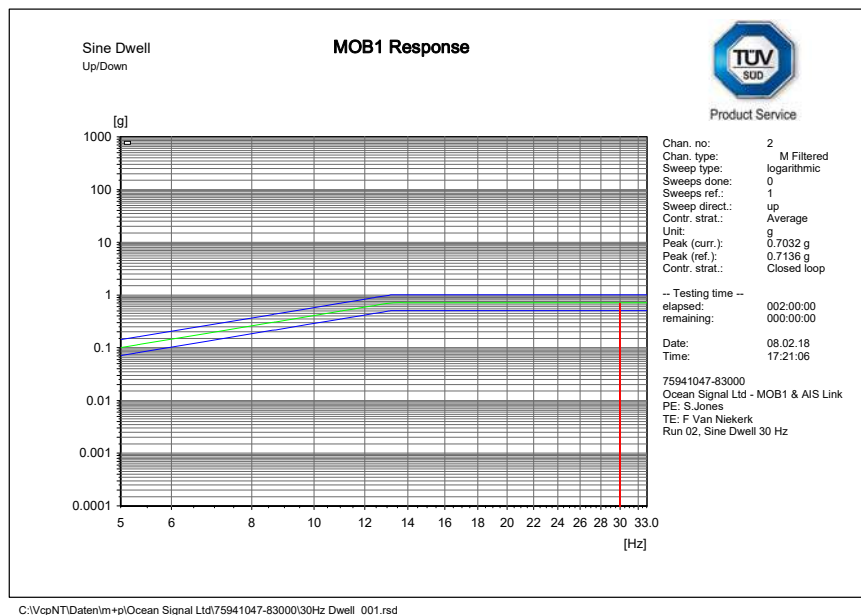
Up and Down Axis – Resonance Search (Control)



Up and Down Axis – Resonance Search (EUT)

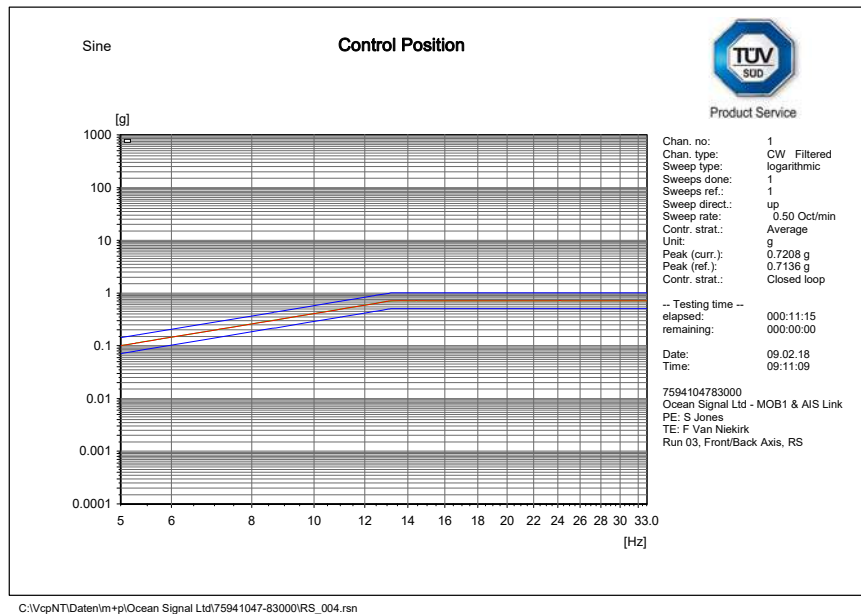


Product Service

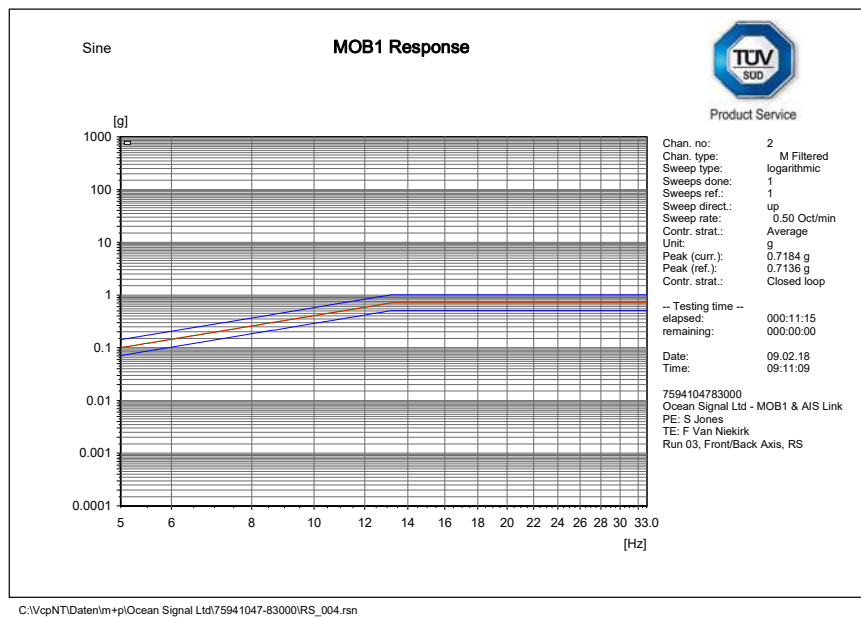
Up and Down Axis – Endurance Run (30 Hz) (Control)Up and Down Axis – Endurance Run (30 Hz) (EUT)



Product Service



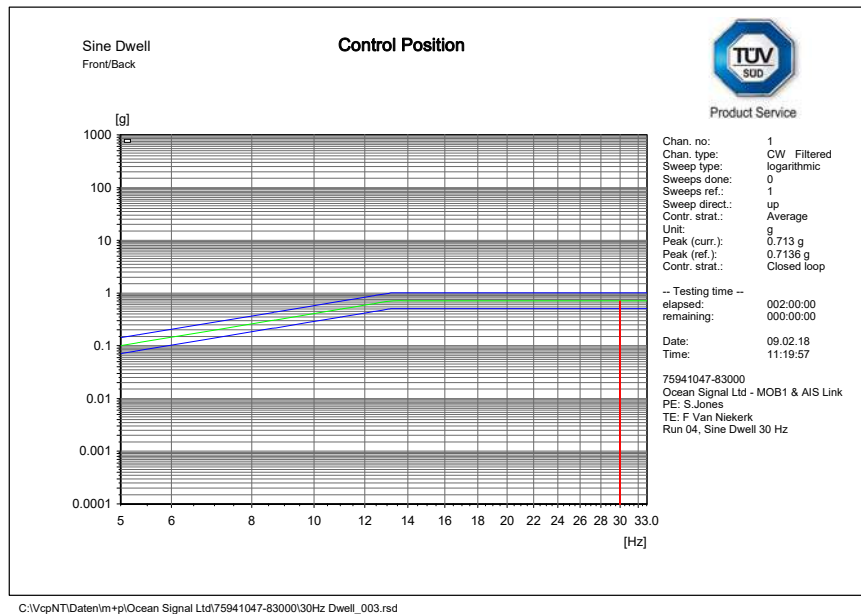
Forward and Aft Axis – Resonance Search (Control)



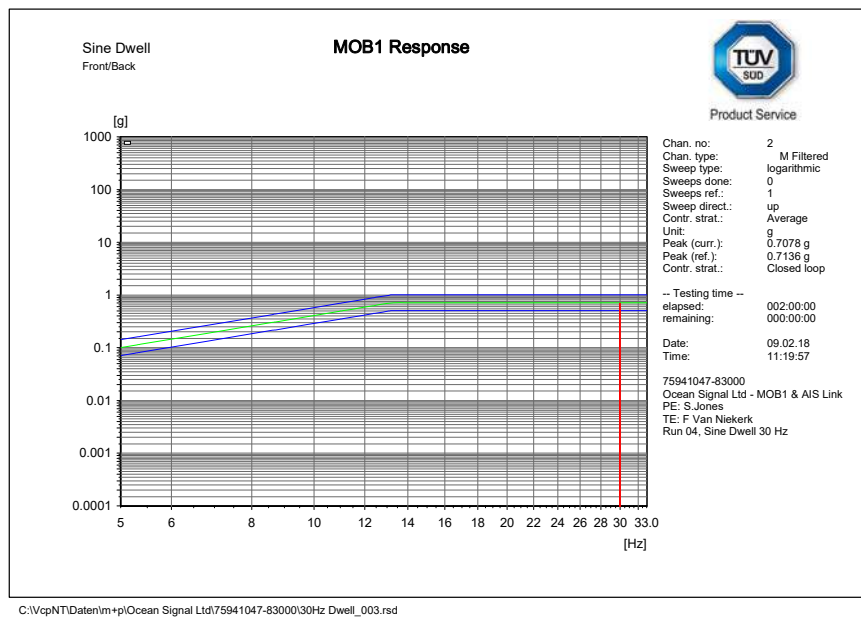
Forward and Aft Axis – Resonance Search (EUT)



Product Service



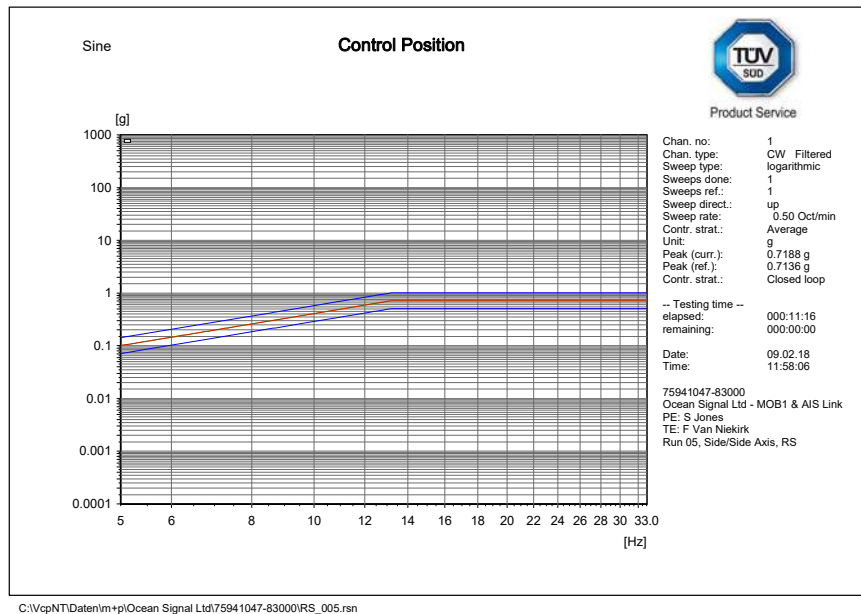
Forward and Aft Axis – Endurance Run (30 Hz) (Control)



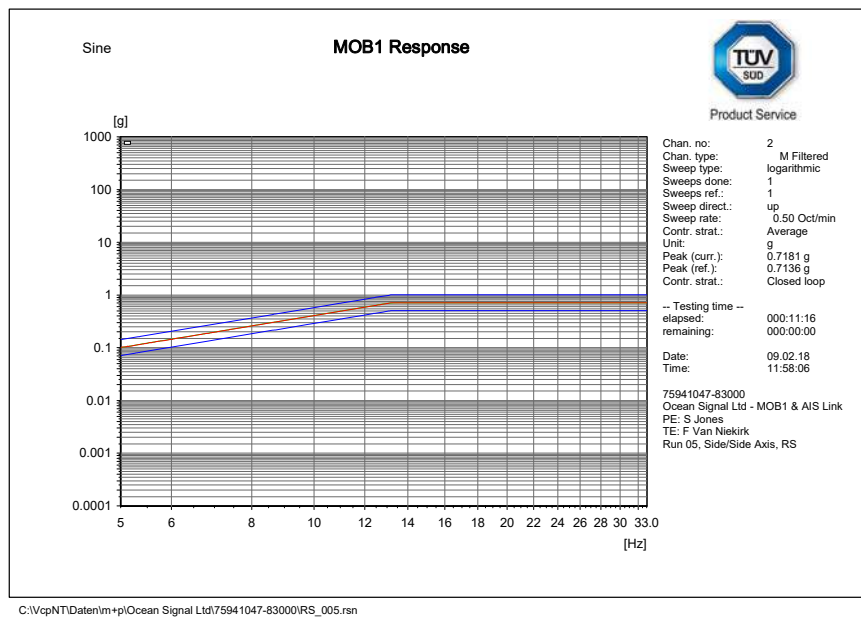
Forward and Aft Axis – Endurance Run (30 Hz) (EUT)



Product Service



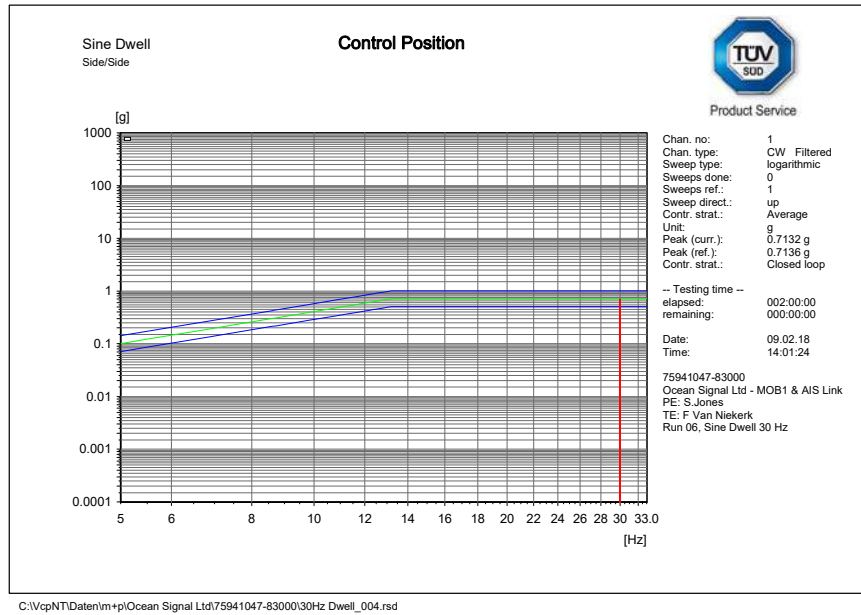
Side to Side Axis – Resonance Search (Control)



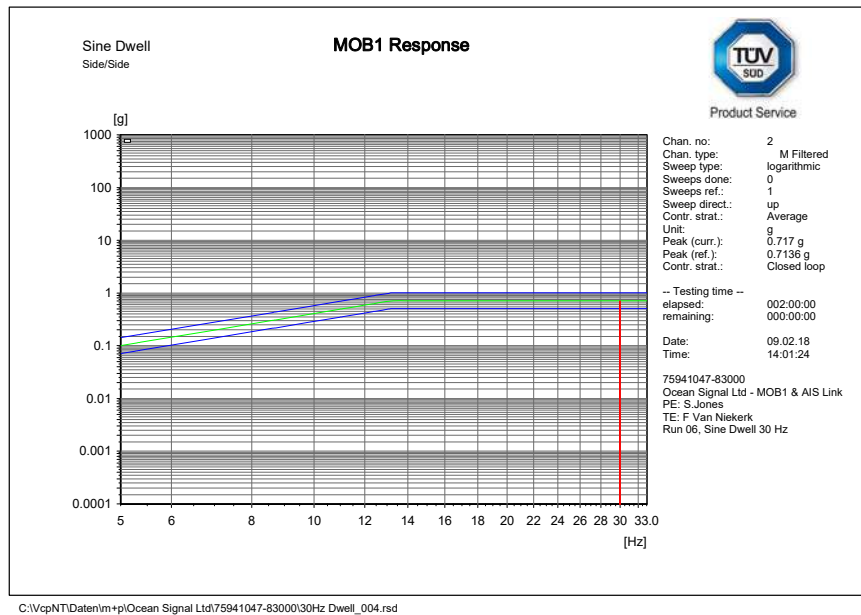
Side to Side Axis – Resonance Search (EUT)



Product Service



Side to Side Axis – Endurance Run (30 Hz) (Control)



Side to Side Axis – Endurance Run (30 Hz) (EUT)



Product Service

2.8.8 Test ResultsPerformance Check Results

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y

Mechanical Inspection

Post-test, no signs of mechanical degradation were witnessed.

Activation Monitoring

During the test the EUT was monitored for signs of activation, none was found.



Product Service

2.9 RAIN AND SPRAY**2.9.1 Specification Reference**

RTCM 110901.1, Clause 8.1.5.2

2.9.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.9.3 Date of Test

13 February 2018

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Environmental Conditions

Ambient Temperature 6 °C
Relative Humidity 79.2%

2.9.6 Test Method

The EUT was sprayed with 3.5% salt solution for 10 minutes. The EUT was sprayed from a distance of 300mm with a flow rate of 10 litres/ minutes.



2.9.7 Test Setup



Test Set Up

2.9.8 Test Results

Examination

On completion of the test, the EUT was inspected for signs of water ingress; none was found.

Performance Check Results

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	
Successful reception of Message 14	Y / N	Y	

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



Product Service

2.10 IMMERSION**2.10.1 Specification Reference**

IEC 60945, Clause 8.9.3
BS EN 60529 IPX 7

2.10.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.10.3 Date of Test

14 February 2018

2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.10.5 Environmental Conditions

Ambient Temperature 25.4 °C
Relative Humidity 32.2 %

2.10.6 Test Method

The EUT was completely submerged in a vessel of water to a depth of 1m for a duration of five minutes.



2.10.7 Test Setup



Test Setup

2.10.8 Test Results

Examination

On completion of the test, the EUT was inspected for signs of water ingress; none was found.

Performance Check Results

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001072	Y / N	Y	Y



Product Service

2.11 SOLAR RADIATION

2.11.1 Specification Reference

IEC 60945, Clause 8.10

See Manufacturer Materials Waiver and Declarations – Annex A.



Product Service

2.12 OIL RESISTANCE

2.12.1 Specification Reference

IEC 60945, Clause 8.11

See Manufacturer Materials Waiver and Declarations – Annex A.



Product Service

2.13 CORROSION (SALT MIST)

2.13.1 Specification Reference

IEC 60945, Clause 8.12

See Manufacturer Materials Waiver and Declarations – Annex A.



Product Service

2.14 COMPASS SAFE DISTANCE**2.14.1 Specification Reference**

IEC 60945, Clause 11.2

2.14.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.14.3 Date of Test

27 February 2018

2.14.4 Environmental Conditions

Ambient Temperature	0°C
Relative Humidity	23.2%

2.14.5 Test Method

A wooden table aligned E-W was used with a compass set in the centre, aligned to read zero. The table was marked to give a graduated scale of distance. The EUT was moved towards the compass until a standard deviation of 0.3° was obtained.

Each orientation of the EUT was tested in this manner with the measurement distance between the compass centre and the EUT being noted.

The test was repeated with readings taken when the compass gave a steering deviation of 0.9°.

The local area Magnetic Flux density (H) at the site of testing was 19.91uT.

The above testing was performed three times with the EUT as follows:

- a. Unpowered.
- b. Normalised.
- c. Power applied.

Prior to performing the tests in accordance with part b above, the EUT was normalised by placing it into Helmholtz Coil Assembly and subjecting it to a magnetic field of 79 A/m.

The test was applied in accordance with the test method requirements of IEC 60945.



Figure 2.14.1 – Test Setup

2.14.6 Test Results

Standard Compass safe distance (mm)	400
Emergency Compass safe distance (mm)	300

Horizontal maximum flux density, Magnetic North (H)	H	19.78
Standard compass deviation limit (degrees)	$5.4/H = A$	$A = 0.3$
Emergency compass deviation limit (degrees)	$18/H = B$	$B = 0.9$

Orientation of the EUT(server)	Un-powered State		Normalised		Powered Up	
	Distance from Compass Centre (mm) at A° deflection	Distance from Compass Centre (mm) at B° deflection	Distance from Compass Centre (mm) at A° deflection	Distance from Compass Centre (mm) at B° deflection	Distance from Compass Centre (mm) at A° deflection	Distance from Compass Centre (mm) at B° deflection
Front	400	230	370	260	360	260
Top	240	170	170	170	220	170
Left Hand Side	340	210	320	220	270	170
Right Hand Side	210	170	240	170	240	170
Underside	340	240	400	240	300	220
Rear	320	230	210	170	260	220



Product Service

2.15 BUOYANCY TEST

2.15.1 Specification Reference

RTCM 11901.1, Clause 8.1.3

Not tested – EUT does not float.



Product Service

2.16 CONTROLS AND INDICATORS TESTS (NUA)**2.16.1 Specification Reference**

RTCM 11901.1, Clause 8.1.4

2.16.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) (including labelling) and Mod State 0
User Manual: V1.04 23/10/2017 (unless indicated otherwise in the table below)

2.16.3 Date of Test

15 February 2018 – 12 March 2018

2.16.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.16.5 Test Results**

Controls and Indicators (including Annex E requirements for AIS type MSLD devices)		
Clause 4.1 AU Controls and Indicators		
Sub clause	Statement	Comment
4.1	All AU controls and indicators shall be: - clearly and durably marked - designed to prevent inadvertent activation	Various labels are affixed to the EUT plastic body and other markings are printed directly onto the various hard plastic enclosure parts, and membrane buttons of the EUT. These markings are clearly visible and provide guidance as to how to operate the EUT. To prevent inadvertent activation the EUT has been designed such that manual activation requires two steps.
	All AU controls and indicators should be: - few in number - kept simple to permit ease of operation.	The EUT controls are limited to the following: ARM (Pull down) Activate (slide across) Test (also the off function)



	The written instructions provided to operate the device are few in number and provide arrows with the written instructions indicating the direction of movement required.	The following pictorial instructions are presented on the EUT: 
	The various modes of the controls should be readily apparent by visual observation.	The labelling and markings are predominately black text on a white background, white text on a grey background. The "T" button is black text on a grey background.
	AUs shall be designed for manual activation.	The EUT is capable of manual activation.
	AUs should be designed for both manual and automatic activation.	The EUT is capable of manual activation and activation by means of the lifejacket activation.
	Not less than two simple, independent actions shall be required for manual activation of the AU. Examples of independent actions include protection of a switch by a removable cover, or two independent switches.	The EUT has been designed such that manual activation requires two steps. Firstly, moving the red arm cap to the lower position then slide the grey cap sideways.



	All AU controls necessary for the correct operation of the AU shall be so designed that personnel wearing appropriately sized 5mm or more neoprene gloves can activate the AU.	Manual activation was simple and possible whilst wearing neoprene gloves.
	A positive visual and/or audible indication that the AU is activated shall be provided.	On activation the EUT LED flashes green and the strobe light activates. The User Guide describes the following: 5.1 Automatic Activation When correctly packed in a lifejacket the MOB1 will automatically activate when the lifejacket inflates. Should the lifejacket fail to fully inflate, it may be necessary to assist the Activation Slide by pulling on the Activation Tape to fully release the Activation Slide. 5.2 Manual Activation  Only activate your MOB1 in situations requiring assistance ONLY in an emergency. Deliberate misuse of your MOB1 may result in a fine.  To manually activate your MOB1 in an emergency, slide the red Arming Slide down. Slide the grey Activation Slide to the Left or Right.  The antenna will be automatically released. Keep the MOB1 well away from your eyes when activating.  The strobe light will start flashing. The MOB1 will automatically start transmitting after 15seconds.  If the MOB1 fails to activate when the slide is removed, press the ON Key down until the green LED starts flashing. Release the key.  Upon activation, the indicator LED will show eight short flashes during AIS transmission and one long flash during DSC transmission. The colour of the flash will be Red during position acquisition and green when the GPS position is being received.  When operating the MOB1, tether the beacon to your body or the life jacket.  Hold your beacon with the antenna standing vertically. Keep the area marked 'Do not obstruct when armed' on the red arming slider free from obstruction, which would interfere with the GPS reception. Covering this area will interfere with the GPS reception.



4.1.1	User controls for AUs with only manual activation	
	AUs provided with only manual activation shall have as a minimum, clearly marked integral manual controls to operate the device in the following modes: ON In the ON mode, the AU is manually activated. TEST See paragraph 4.2. OFF In the OFF mode, the AU is deactivated.	EUT is manual only device is marked for two manual modes off and alert (on) Test function is possible once in- armed mode.



4.1.2	User Controls for AUs with both manual and automatic activation	
	AUs provided with both automatic and manual activation shall have, as a minimum, clearly marked integral manual controls to operate the device in the following modes: READY or ARMED In the READY or ARMED mode, the AU is normally deactivated, but automatically activates when the unit experiences an alerting condition as defined in Section 3.2. Once activated the unit should remain activated until it is switched to the OFF position or manually reset to the READY or ARMED mode. ON In the ON mode, the AU is activated continuously, regardless of whether in or out of the water. This function must be provided by a separate mechanism in addition to the automatic actuator provided in the READY or ARMED mode. It is not sufficient to require the user to short the water contacts (or otherwise simulate automatic activation) for the function of manual activation. TEST See paragraph 4.2. OFF In the OFF mode, the AU is deactivated.	The EUT has manual mode only, there is one action to arm the device and one action to activate the device. Automatic activation only by inflation of the lifejacket. Test mode activated by long actions. Off mode needs a longer activation.
4.1.3	Function of the ON control	
	Transmission of the alert signal shall begin within 30 seconds of switching the control to the ON position. Consideration should be given to delaying transmission of the alert for some initial period not to exceed 30 seconds, to allow users to deactivate the device in the case of an inadvertent activation.	The EUT activates after 15 seconds.
4.1.4	Indicators, Alerting	
	A visual and/or audible indicator detectable by the user shall commence within 5 seconds of the device being activated (both manually and/or automatically), and shall continue until the AU is no longer transmitting its alerting signal. The visual indicator should be visible in direct sunlight, low light, and no light conditions. The audible indicator should have a distinctive alarm tone with a minimum sound output of 85 dBA when measured 10 cm from the AU.	The LED indications and strobe light continue to operate until the EUT is deactivated by the user. Indications cease once the EUT is switched off. The visual indicators were not confirmed in direct sunlight, low light or no light conditions. Audible indicator not tested.



4.1.4.2	Self-test	A visual and/or audible indicator or indicators shall be provided to signal that a self-test was either successful or not successful. If the self-test takes longer than 5 seconds, a different indication should be given that the self-test is in progress. The EUT has three self-test options as described by the Manufacturer in the user manual: 1. Functional test: this test acts as an electronic witness that the device has been operated. Further combinations of Green / Amber / Red LED indications indicate the number of hours used and failure information. 2. DSC transmission test. 3. AIS transmission test. All three test features are initiated in the same way and conclude with a specific LED sequence which details the pass / fail status and further failure information. The user manual states that the LED will provide indication that the self test is in progress. <table border="1"> <thead> <tr> <th colspan="2">Green / Amber Indicator. <i>Changes to Amber after 1 hour of use</i></th><th>Red indicator status</th></tr> <tr> <th>No of Flashes</th><th>No of Hours Used</th><th>Type of Failure</th></tr> </thead> <tbody> <tr> <td rowspan="2">1 Flash</td><td>0 to 1hr (Green)</td><td rowspan="2"></td></tr> <tr> <td>1 to 2hrs (Amber)</td></tr> <tr> <td>2 Flashes</td><td>2 to 4hrs (Amber)</td><td>Frequency generation</td></tr> <tr> <td>3 Flashes</td><td>4 to 6hrs (Amber)</td><td>Transmit Power</td></tr> <tr> <td>4 Flashes</td><td>6 to 8hrs (Amber)</td><td>Battery failed</td></tr> <tr> <td>5 Flashes</td><td>8 to 10hrs (Amber)</td><td>No GPS Fix</td></tr> <tr> <td>6 Flashes</td><td>Over 10hrs (Amber)</td><td></td></tr> </tbody> </table> Table 1: Pass/Fail indication	Green / Amber Indicator. <i>Changes to Amber after 1 hour of use</i>		Red indicator status	No of Flashes	No of Hours Used	Type of Failure	1 Flash	0 to 1hr (Green)		1 to 2hrs (Amber)	2 Flashes	2 to 4hrs (Amber)	Frequency generation	3 Flashes	4 to 6hrs (Amber)	Transmit Power	4 Flashes	6 to 8hrs (Amber)	Battery failed	5 Flashes	8 to 10hrs (Amber)	No GPS Fix	6 Flashes	Over 10hrs (Amber)	
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4 Flashes	6 to 8hrs (Amber)	Battery failed																									
5 Flashes	8 to 10hrs (Amber)	No GPS Fix																									
6 Flashes	Over 10hrs (Amber)																										
4.1.5	Water activation function	The optional AU water-activation function should be protected against inadvertent activation from salt-water spray or rain. When installed on a life jacket as per the manufacturer's instructions the EUT will be activated by the expansion of the lifejacket. The EUT does not automatically activate in water via a water sensor.																									
4.2	Self-test function																										



Product Service

	The AU shall include a functional self-test designed to test as a minimum the following items under a full-load condition: • battery, and • RF output The self-test shall be functional throughout the operating temperature range. The manufacturer shall verify at the minimum: ambient and maximum operating temperatures, that the self-test pass/fail indicator(s) correctly identifies(y) any failure condition that has been detected by any of the self-test functions.	There are two self-test functions – see 4.1.4.2 above. The full function test, when a GPS fix is achieved, provides a MOB test transmission. See also section 2.17 for test of the Self Test Mode. The Manufacturer advised that “that the MOB1 correctly indicates any failure that has been detected by any of the self-test functions at minimum, ambient and maximum temperatures.”
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4.2.1	Battery self-test	
	The manufacturer shall verify during the battery self-test: ambient and maximum operating temperatures, that the AU battery experiences full-load current drain. The battery self-test shall indicate when the battery is no longer capable of providing the minimum operating time.	The Manufacturer advised that "that the battery self-test indicates when the battery is no longer capable of providing the minimum operating time and that the battery experiences full load current drain under minimum ambient and maximum temperature." For self-test functions – see 4.1.4.2 above.



4.2.2	RF self-test	
	The RF self-test shall include the connection of the transmitter to the antenna or an equivalent dummy load. During the self-test function, the AU shall transmit in such a way that it will not cause a distress alert. If the AU includes a 121.5 MHz radio-locating device, the signal transmitted during the self-test should not exceed 3 audio sweeps or 1 second, whichever is greater. The means of activating the self-test feature should prevent the test signal from being continuously activated.	The safety related message transmitted to the antenna during a self-test is MOB TEST. MOB TEST transmissions were received by a Class A AIS device. The EUT does not include a 121MHz transmitter. Continuous press of the test key does not result in continuous test transmissions
4.3	Buoyancy	
	Unless the AU is intended to be incorporated into a buoyant device, it should have sufficient positive buoyancy to float in fresh water and to operate while floating in fresh or salt water	Device is not buoyant but attaches to a lifejacket.
4.4	Environmental factors	
	The AU shall not be activated accidentally or damaged by: a) dry heat b) damp heat c) low temperature d) thermal shock e) drop onto hard surface f) drop into water g) vibration sweep h) water immersion (intrusion into the device) i) solar radiation j) oil contamination k) corrosion	See sections 2.2 through to 2.12 of this report.
	The electronic components should be protected to prevent malfunction under prolonged conditions of high humidity, including condensation.	Not tested.
5	Construction Requirements	
5.1	General	
	The AU shall be wearable, or arranged to be attached to the user's clothing or Personal Floatation Device (PFD) without interfering with the user's activities. The AU should be provided with adequate means of attachment to the user in its "operational" position.	The EUT is supplied with a clip to attach to the inflation tube of the PFD and a ribbon to activate the EUT on inflation, this is all housed within the PFD cover.



	The AU should be designed for "hands free" operation, so that the user is not required to hold the unit out of the water for operation after activation.	The EUT, when installed on a lifejacket as per the Automatic Activation conditions in the user manual would not require the user to hold it (implied). The position of the EUT with respect to the victim and water will be dependent on the type of PFD used. The user guide provides specific instructions for manual activation which include holding the beacon with the antenna standing vertically.
	The external design of the AU should avoid sharp edges or points to prevent injury or damage to equipment.	A sharp edge test finger was applied to the EUT and no sharp edges were observed.
5.2	Battery	
	The AU shall have its own battery or batteries and should not depend upon any external source of power for its operation when activated. The batteries shall be an integral part of the equipment.	The EUT is battery powered and the batteries are an integral part of the EUT.
5.2.1	Battery hazards	
	The AU shall not be hazardous to personnel handling it, operating it, or performing manufacturer-approved servicing of it nor shall it release toxic or corrosive products outside the AU case: a) during or subsequent to storage at temperatures between -55C and +75C; b) during a full or partial discharge at any rate up to and including an external short circuit; c) during a charge or forced discharge of a cell or cells by another cell or cells within the battery; and d) after a full or partial discharge.	The Manufacturer states the battery is a sealed unit and is replaced as per the date on the label or after any use, batteries should only be replaced by authorised dealer. See Annex A for Manufacturer supplied battery test data.
	All AUs should be safe with respect to reversal of polarity, shorting, and the effects of self-heating, cell-to-cell charging, and forced discharging.	The EUT battery pack is a shrink-wrapped component and the battery connector is keyed preventing incorrect connection to the EUT.



5.2.2	Battery life for primary battery	
	The AU manufacturer should establish a useful life and an expiration date for primary (non-rechargeable) batteries. The useful life is the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the MSLD system (as defined in the appropriate Annex), over the entire specified operating temperature range. The following losses must be included (at a temperature of +20 C $\pm$ 5 C): a) Testing, as recommended by the manufacturer or as required by the regulatory authority, whichever is the more demanding. b) Self-discharge of the battery pack. c) Standby loads, including any current drain in the READY mode of an AU. The battery replacement date marked on the AU should be the date of battery installation in the AU plus no more than 50% of the rated life of the battery, provided that the battery cells are no older than 25% of the rated life of the battery.	A field for the battery expiry date is provided on the side label of the EUT. Manufacturer provided report on useful battery life and cell / battery data – see Annex A.
5.2.3	Battery replacement	
	Replacement of the battery, if user-replaceable, should be possible with relative ease, and any interface connections required should be such as to prevent reversed polarity or incorrect installation. Provision should be made to ensure watertight integrity upon replacement of the battery.	The user documentation advises that the battery pack should only be replaced by an Ocean Signal authorised battery replacement centre.
5.3	Labelling	
5.3.1	Battery	
	The MSLD documentation should include instructions on AU battery replacement intervals.	The user documentation details the self-test function which shows battery usage, if over 1hrs usage then self-test function has been exceeded and batteries should be replaced
	All batteries in the AU and BU (if used) should use polarized connectors or wires to battery connectors uniquely color coded. The wire to the most positive (+) terminal should be RED; the wire to the most negative (-) terminal should be BLACK. YELLOW, GREEN, and/or BLUE color coding (if used) should be used for wires connecting intermediate voltage levels in multi-voltage battery packs.	The user documentation advises that the battery pack should only be replaced by manufacturer or a manufacturer authorised battery replacement centre. The battery pack connector is polarised, allowing fitting in one orientation only. The cables from the battery pack are red and black.



5.3.2	Identification and instructions	
	All labelling on the exterior of the AU shall be resistant to deterioration by prolonged exposure to sunlight, and shall not be unduly affected by seawater or oil, and shall be abrasion resistant. The outside of the AU shall be marked indelibly and legibly with the following: a) Concise markings for operating controls as specified in Sections 4.1.1 or 4.1.2, including how to turn the AU on and how to clear an alarm. b) Self-test instructions. c) The name and address of the manufacturer. d) The AU type number or model identification under which it was type tested. e) The serial number or identification number of the AU.	Abrasion resistance - See Manufacturer Materials Wavier and Declarations (Annex A). For point a) see points 4.1.1 and 4.1.2 above. There is a 'T' button with the word 'Off' adjacent to this. There are no self-test instructions on the EUT labelling. Apart from the 'T' (for test). The user manual details the test / off button which is identified on the EUT by the 'T'. The Manufacturer name (Ocean Signal) is identifiable on the EUT. The Manufacturer address is provided on the EUT (revised details as provided 07 March 2018). The AU type is identifiable on the EUT (Model: MOB1). Fields are provided on the EUT for the EUT serial number and MMSI.



	All labelling on the exterior of the AU shall be resistant to deterioration by prolonged exposure to sunlight, and shall not be unduly affected by seawater or oil, and shall be abrasion resistant. The outside of the AU shall be marked indelibly and legibly with the following: ... f) Battery safety warning and disposal statement, if applicable. g) Storage and operating temperature range of the AU. h) Regulatory authority markings, if required. i) Compass safe distance. j) Warning to only activate device in an emergency. k) If a GNSS receiver is included, a warning to not block the antenna.	Brief battery safety warnings are provided on the EUT (Do not recharge, incinerate or short circuit). The storage temperature range of the EUT is provided on the EUT. The operating temperature range of the EUT is provided on the EUT revised details as provided 07 March 2018). The following markings were visible of the EUT: FCC ID, IC ID CE number The compass safe distance value was provided on the EUT. The warning note was provided on the EUT (WARNING: USE ONLY IN EMERGENCY). The warning "Do not obstruct when armed" is provided in the location of the GNSS antenna. A photograph of a yellow and red electronic device, likely a GNSS receiver. It has a red top section and a yellow base. A black label is affixed to the front, featuring the text 'Do not obstruct when armed' in white. Below this text, the word 'ARM' is printed in red, flanked by two white arrows pointing downwards.
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7	Documentation	
	The manufacturer shall provide an operation manual including the following: a) Intended use of the MSLD system. b) Complete instructions for testing and operating the MSLD system. c) Information explaining the BU and LF system compatibility requirements. d) Cautions and recommendations to prevent false alarms. e) General battery information (e.g., battery replacement instructions, battery type, safety information regarding battery use and disposal). f) Information on when battery replacement is required.	The user documentation states the following: a) The MOB1 is intended to alert your vessel in the event that you fall overboard. Furthermore it is noted that the Man Over Board AIS transmitter is only intended for short range signalling to an AIS receiver installed onboard your own vessel. It will not directly alert the emergency services or any other vessels. b) Instructions for operation and self test are provided. c) Details of the display of MOB message reception via AIS enabled plotters are provided (user manual revised details as provided 07 March 2018). d) Cautions to prevent accidental activation are provided (user manual revised details as provided 07 March 2018). e) Battery information including replacement information, disposal, battery type and transportation information. f) Battery replacement information (based on use or prior to expiry date on EUT).



	The manufacturer shall provide an operation manual including the following ... g) Information related to the requirements of preventive maintenance. h) Minimum operating life time, operating, and stowage temperature ranges. i) Information explaining the requirement and procedure for licensing and registering MSLDs, as appropriate. j) Information relating to the shipment of the MSLD. k) Instructions on actions to be taken in the case of false alarms. NOTE: In the case of accidental activation involving transmission of a 121.5 MHz signal, the user should deactivate the MSLD and notify the appropriate search and rescue authorities (e.g., U.S. Coast Guard or Rescue Coordination Center serving the geographic area) at the earliest possible time. l) If a 121.5 MHz signal is transmitted during the self-test, information noting that the self-test should be performed only within the first 5 minutes of any hour and should not exceed 3 audio sweeps or 1 second, whichever is longer. m) A warning to the effect that the device should only be activated in an emergency. n) Instructions for fitting / attaching the AU to the user and for correct operation in the water in an emergency. o) Instructions for BU installation, testing, use, and maintenance.	The user documentation contains the following g) Preventative maintenance: "Your MOB1 will require little maintenance except periodic cleaning, if required" h) Operating life time, (user manual revised details as provided 07 March 2018) and operating and stowage temperatures i) Licencing information is provided (user manual revised details as provided 07 March 2018) j) Shipment information is detailed k) False alarm and steps to take if this occurs (user manual revised details as provided 07 March 2018) l) Not applicable – EUT does not support 121.5 MHz transmission m) Only to activate in emergency n) Installation on life jacket detailed o) Not applicable – EUT is an AU only (therefore no BU information is provided)
8.1.4.2	Controls durability	
	All manual controls should be operated for at least 500 cycles, without failure of the mechanism	Not tested



Product Service

Annex E	AIS Type MSLD Systems	
E.3.1	Operating time	
	The AU shall operate for a minimum of 12 hours.	The battery capacity test was run and the EUT operated for 24 hours. See section 2.19.
E.3.2	Interoperability	
	The AU should be capable of communicating with nearby vessels by transmitting an ITU-R M.1371-4 Annex 9 compliant Burst Transmission.	The Manufacturer advised the following "Compliance to ITU-R.1371-4 Annex 9 demonstrated by report already submitted to FCC as part of original approval." The intention of this report therefore is to demonstrate the EUT functional operation after each environmental test.



E.3.3	Operational functions	See sections 4.1.1 and 4.1.2 of this table. The User Guide provides the following information: 5.1 Automatic Activation When correctly packed in a lifejacket the MOB1 will automatically activate when the lifejacket inflates. Should the lifejacket fail to fully inflate, it may be necessary to assist the Activation Slide by pulling on the Activation Tape to fully release the Activation Slide. 5.2 Manual Activation  Only activate your MOB1 in situations requiring assistance ONLY in an emergency. Deliberate misuse of your MOB1 may result in a fine.  To manually activate your MOB1 in an emergency, slide the red Arming Slide down. Slide the grey Activation Slide to the Left or Right.  The antenna will be automatically released. Keep the MOB1 well away from your eyes when activating.  The strobe light will start flashing. The MOB1 will automatically start transmitting after 15seconds.  If the MOB1 fails to activate when the slide is removed, press the ON Key down until the green LED starts flashing. Release the key.  Upon activation, the indicator LED will show eight short flashes during AIS transmission and one long flash during DSC transmission. The colour of the flash will be Red during position acquisition and green when the GPS position is being received.  When operating the MOB1, tether the beacon to your body or the life jacket.  Hold your beacon with the antenna standing vertically. Keep the area marked 'Do not obstruct when armed' on the red arming slider free from obstruction, which would interfere with the GPS reception. Covering this area will interfere with the GPS reception. RF self-test burst requirements not tested.
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E.3.4	Unique identifier (user ID) The AIS MSLD AU shall have a unique identifier to ensure the integrity of the VHF data link. The user ID for an AIS MSLD AU is 972xyyyy, where xx = manufacturer ID 01 to 99;5 yyyy = the sequence number 0000 to 9999. This reverts to 0000 once 9999 has been reached. The manufacturer ID xx = 00 is reserved for test purposes. The unique identifier used for the purposes of type approval to this standard shall be in the format 97200yyyy. After being programmed by the manufacturer, it shall not be possible for the user to change the unique identifier of the AIS MSLD AU. The configuration method for the unique identifier shall be as defined by the manufacturer and shall be held in non-volatile memory.	 The Manufacturer has advised the following details regarding AIS user ID generation: Ocean Signal MSLD devices are programmed with the MMSI of the format 972 60 yyyy. The Manufacturer also stated that the user cannot change the MMSI via the supplied software. See also E3.5.
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E.3.5	AIS and DSC Combination MSLD Devices	
	If a manufacturer chooses to build an MSLD system that functions as both an AIS MSLD and a DSC MSLD (refer to Appendix A for detail), the AU transmitting both AIS and DSC messages shall transmit one common user ID. If a conflict occurs during AIS and DSC transmission time occurs, the AIS transmission shall be given priority and the DSC transmission shall be delayed.	The limited testing with this test report demonstrated that a common AIS and DSC user ID were transmitted (MMSI). See also E3.4. No checks were made to determine the schedule / priority transmission rules, see the Manufacturer advises the following: <i>"The MOB1 code is configured that if a conflict occurs between the AIS and DSC messages the AIS message will take priority and the DSC message will be delayed"</i>
E.3.6	Battery	
	For an AIS MSLD, the AU shall not use a rechargeable battery. Only primary batteries as defined in Section 5.2 of this standard are permitted	The EUT contains a lithium metal battery pack. The user manual indicates that this should be replaced by an authorised battery replacement centre only.
E.3.7	Output Power	
	The nominal radiated power (EIRP) of the AIS MSLD AU shall be 1 W.	Not tested
E.3.8	Transmission Performance	
E.3.9	Position Source and Data	



	A GNSS receiver shall be used as the source for AIS MSLD AU position reporting. The GNSS receiver shall meet the following requirements of IEC 61108: position accuracy, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, position update, effects of specific interfering signals but with a minimum update of once per minute, provide a resolution of one ten-thousandth of a minute of arc and use WGS 84 datum. The manufacturer shall provide evidence that an internal GNSS device cold start is forced at every AIS MSLD AU activation (cold start refers to the absence of time dependent or position dependent data in memory, which might affect the acquisition of the GNSS position). On activation, if the GNSS receiver is unable to provide a valid position fix, then the reported position shall be longitude = 181° = not available = default and latitude = 91° = not available = default, COG = not available = default, SOG = not available = default, and the time stamp field shall be set to a value of 63. If the GNSS data is lost then the AIS MSLD AU shall continue to transmit with the last known position, COG and SOG, and the time stamp field shall be set to a value of 63 "positioning system inoperative" and with the synchronization state set to 3.	See Annex A for Manufacturer supplied test data: PC TC Omega test report 14/509, IEC61108 test report for EPIRB1.
E.4	Technical Characteristics	Not tested
E.5	Documentation	
	The documentation requirements of Section 7 of this standard are replaced by the following: "General instructions advising the user of the AU what to expect to see on the BU in both the normal and test modes of operation."	The EUT is an AU (Annex E of RTCM 11901.1), and the user documentation provides brief details as to how the MSLD would be displayed on a BU in self-test mode and active mode (revised details as provided 07 March 2018).
E.6	Performance Tests	Not tested
E.7	Performance Radio Tests	Not tested
E.8	Link Layer	Not tested
Annex F	Internal Navigation Device	See section 2.18 of this report.



Product Service

2.17 TEST OF THE SELF-TEST MODE**2.17.1 Specification Reference**

RTCM 11901.1, Clause 8.1.6

2.17.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.17.3 Date of Test

29 January 2018

2.17.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.17.5 Environmental Conditions

Ambient Temperature 24.1°C - 24.9°C

Relative Humidity 40.8% - 41.5%

2.17.6 Test Results

Test Conditions	Self-test		
	Battery	GPS (with GPS available)	GPS (without GPS available)
T _{nom} (20.0°C)	Pass	Pass	Pass
T _{min} (-20.0°C)	Pass	Pass	Pass
T _{max} (+55.0°C)	Pass	Pass	Pass

Limit Clause 8.1.6

The self-test should be performed successfully at the minimum operating temperature (or colder), at the ambient temperature, and at the maximum operating temperature (or hotter).

Self-Test With Position Data (Ambient)

Parameter	Units	Result	Limit
EUT starts transmission after valid GPS data available	Y / N	Y	Y
Burst of 8 messages – AIS1/2 alternates	Y / N	Y	Y
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	Y	Y
User ID as configured	Y / N	Y	Y
Nav Status	-	15	15
SOG Error	kn	0	<0.2
Position accuracy flag	1 bit	0	RAIM result / 0
Position Error	m	0	< 30
COG	-	0	Not available
Timestamp (UTC)	s	37	0-59
Communication state time-out	1 bit	0	0
Communication state sub message	1 bit	0	0
Transmission stops after one burst of 8 messages	Y / N	Y	Y
Text message in Message 14	-	MOB TEST	MOB TEST
Correct indication as per manufacturer's documentation	Y / N	Y	Y

Self-Test Without Position Data (Ambient):

Parameter	Units	Result	Limit
EUT starts transmission within 5 mins	Y / N	N	No TX
Burst of 8 messages – AIS1/2 alternates	Y / N	N	N
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	N	N
User ID as configured	Y / N	N	Y
Nav Status	-	-	-
SOG Error	kn	-	-
Position accuracy	1 bit	-	-
Position	m	-	-
COG	-	-	-
Timestamp (UTC)	s	-	-
Communication state time-out	1 bit	-	-
Communication state sub message	1 bit	-	-
RAIM flag	1 bit	-	-
Transmission stops after one burst of 8 messages	Y / N	-	-
Text message in Message 14	-	-	-
Correct indication as per manufacturer's documentation	Y / N	-	-

Self-Test With Position Data (-20°C)

Parameter	Units	Result	Limit
EUT starts transmission after valid GPS data available	Y / N	Y	Y
Burst of 8 messages – AIS1/2 alternates	Y / N	Y	Y
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	Y	Y
User ID as configured	Y / N	Y	Y
Nav Status	-	15	15
SOG Error	kn	0	< 0.2
Position accuracy flag	1 bit	0	RAIM result / 0
Position Error	m	0	< 30
COG	-	-	Not available
Timestamp (UTC)	s	35	0-59
Communication state time-out	1 bit	0	0
Communication state sub message	1 bit	0	0
Transmission stops after one burst of 8 messages	Y / N	Y	Y
Text message in Message 14	-	MOB TEST	MOB TEST
Correct indication as per manufacturer's documentation	Y / N	Y	Y

Self-Test Without Position Data (-20°C)

Parameter	Units	Result	Limit
EUT starts transmission within 5 mins	Y / N	N	No TX
Burst of 8 messages – AIS1/2 alternates	Y / N	N	N
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	N	N
User ID as configured	Y / N	N	Y
Nav Status	-	-	-
SOG Error	kn	-	-
Position accuracy	1 bit	-	-
Position	m	-	-
COG	-	-	-
Timestamp (UTC)	s	-	-
Communication state time-out	1 bit	-	-
Communication state sub message	1 bit	-	-
RAIM flag	1 bit	-	-
Transmission stops after one burst of 8 messages	Y / N	-	-
Text message in Message 14	-	-	-
Correct indication as per manufacturer's documentation	Y / N	-	-

Self-Test With Position Data (+55°C)

Parameter	Units	Result	Limit
EUT starts transmission after valid GPS data available	Y / N	Y	Y
Burst of 8 messages – AIS1/2 alternates	Y / N	Y	Y
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	Y	Y
User ID as configured	Y / N	Y	Y
Nav Status	-	15	15
SOG Error	kn	0	< 0.2
Position accuracy flag	1 bit	0	RAIM result / 0
Position Error	m	1.35	< 3
COG	-	0	Not available
Timestamp (UTC)	s	5 - 15	0-59
Communication state time-out	1 bit	0	0
Communication state sub message	1 bit	0	0
Transmission stops after one burst of 8 messages	Y / N	Y	Y
Text message in Message 14	-	MOB TEST	MOB TEST
Correct indication as per manufacturer's documentation	Y / N	Y	Y

Self-Test Without Position Data (+55°C)

Parameter	Units	Result	Limit
EUT starts transmission within 5 mins	Y / N	N	No TX
Burst of 8 messages – AIS1/2 alternates	Y / N	N	N
Burst of 8 messages – Sequence 1x14, 6x1, 1x14	Y / N	N	N
User ID as configured	Y / N	N	Y
Nav Status	-	-	-
SOG Error	kn	-	-
Position accuracy	1 bit	-	-
Position	m	-	-
COG	-	-	-
Timestamp (UTC)	s	-	-
Communication state time-out	1 bit	-	-
Communication state sub message	1 bit	-	-
RAIM flag	1 bit	-	-
Transmission stops after one burst of 8 messages	Y / N	-	-
Text message in Message 14	-	-	-
Correct indication as per manufacturer's documentation	Y / N	-	-

Performance Check Results

Parameter	Units	Result	Limit
Successful reception of Message 1	Y / N	Y	Y
Successful reception of Message 14	Y / N	Y	Y

Parameter	Units	Result	Limit
Successful reception of DSC Message 972001071	Y / N	Y	Y



Product Service

2.18 INTERNAL NAVIGATION DEVICE SCENARIOS (ANNEX F)

2.18.1 Specification Reference

RTCM 11901.1, Clause F.2.2

2.18.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

2.18.3 Date of Test

17 December 2017

2.18.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.18.5 Environmental Conditions

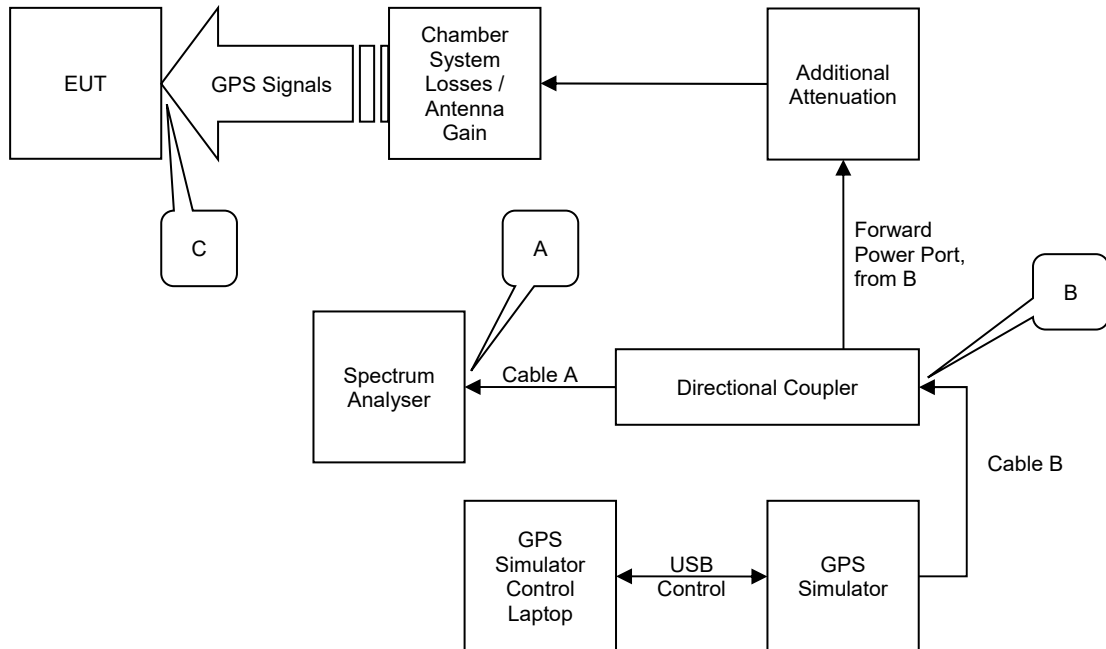
Ambient Temperature 22.7°C

Relative Humidity 35.1 %



2.18.6 Test Setup

Field Calibration



Field Calibration Schematic

The basic premise of the Field Calibration procedure is that Received Signal Strength (P_{RSS}) at C equals P_{RSS} at B minus the loss from B to C (calibrated), where the P_{RSS} at B equals the power measured at A plus the loss B to A.

Resultant P_{RSS} at C is recorded for each scenario at the test results section, below.



2.18.7 Test Results

Result Summary

Maritime Scenarios

General Note: The standard contains some contradictions, specifically regarding simulated positions (these contradictions are indicated in the table below with #). Testing was carried out in accordance with the Maritime Scenario Tables (D.6).

Scenario PRSS Summary Table:

Scenario #	Number of SVs	Required RSS [dBm]	Actual RSS [dBm]
1	7	-130.0	-130.10
2	7	-130.0	-130.20
6	7	-130.0	-130.30
7	7	-130.0	-131.00
8	7	-130.0	-130.30
9	7	-130.0	-131.00
12	7 [#]	-130.0	-130.35
13	7 [#]	-130.0	-130.37
14	7 [#]	-130.0	-130.61
16	7 [#]	-130.0	-130.32
17	7 [#]	-130.0	-130.42
18	7 [#]	-130.0	-130.90
20	7	-130.0	-130.46
22	7	-130.0	-130.77
24	7	-130.0	-130.42
26	7	-130.0	-130.42
28	7	-130.0	-130.38
30	7	-130.0	-130.56
32	7	-130.0	-130.43
33	7	-135.0	-135.80
34	7	-135.0	-135.65
35	7	-135.0	-135.75
36	7	-135.0	-135.53
37	7	-130.0	-130.55
38	7	-130.0	-130.54
39	7	-135.0	-130.72



Maritime Scenarios Test Results:

Scenario #	TTF (min: sec)	Simulator Location	Transmitted Location	Location Error (m)
1	01:45	0° 0' N, 0° 0' E	0° 0' 0.012" N 0° 0' 0.054" W	1.71
2	01:45	0° 0' N, 0° 0' E	0° 0' 0.0" N 0° 0' 0.012" W	0.37
6	01:44	80° 0' N, 0° 0' E*	79° 59' 59.94" N 0° 0' 0.162" E	1.93
7	01:46	0° 0' N, 0° 0' E	0° 0' 0.02" N 0° 0' 0.042" E	1.44
8	04:08	0° 0' N, 0° 0' E	0° 0' 0.006" S 0° 0' 0.03" W	0.95
9	04:44	0° 0' N, 0° 0' E	0° 0' 44.49" S 0° 2' 52.0" E	5498.67
12	04:44	80° 0' N, 0° 0' E	79° 59' 59.946" N 0° 0' 0.078" E	1.69
13	02:50	80° 0' N, 0° 0' E	80° 0' 0.072" N 0° 0' 0.36" E	2.54
14	01:44	80° 0' N, 0° 0' E	79° 59' 59.976" N 0° 0' 0.018" E	0.96
16	02:46	80° 0' N, 0° 0' E	79° 59' 59.998" N 0° 0' 0618" E	2.11
17	02:49	80° 0' N, 0° 0' E	80° 0' 0.0" N 0° 0' 0.09" W	0.31
18	02:38	80° 0' N, 0° 0' E	80° 0' 0.012" N 0° 0' 0.378" E	1.34
20	01:44	0° 0' N, 0° 0' E	0° 0' 0.012" S 0° 0' 0.006" W	0.41
22	11:58	0° 0' N, 0° 0' E	0° 0' 0.18" N 0° 0' 0.048" W	5.75
24	01:44	0° 0' N, 0° 0' E	0° 0' 0.012" N 0° 0' 0.042" E	1.35
26	01:44	0° 0' N, 0° 0' E	0° 0' 0.024" N 0° 0' 0.06" E	2.00
28	01:44	0° 0' N, 0° 0' E	0° 0' 0.0" N 0° 0' 0.024" E	0.74
30	01:43	0° 0' N, 0° 0' E	0° 0' 0.06" N 0° 0' 0.0" E	1.85
32	01:42	0° 0' N, 0° 0' E	0° 0' 0.012" S 0° 0' 0.018" W	0.67
33	02:47	0° 0' N, 0° 0' E	0° 0' 0.096" S 0° 0' 0.096" W	4.19
34	02:49	0° 0' N, 0° 0' E	0° 0' 0.03" S 0° 0' 0.024" E	1.19
35	02:44	0° 0' N, 0° 0' E	0° 0' 0.024" S 0° 0' 0.03" W	1.19
36	03:46	0° 0' N, 0° 0' E	0° 0' 0.06" N 0° 0' 0.0" E	1.85
37	01:48	44° 3' S, 174° 9' E*	44° 2' 59.99" S 174° 8' 59.97" E	0.98
38	01:48	47° 21' N, 8° 27' W*	47° 20' 59.97" N 8° 27' 0.0" W	0.93
39	02:48	0° 0' N, 0° 0' E	0° 0' 0.702" S 0° 0' 0.642" W	29.37

Note: * refer Table D1 to D6, Table D6 used.



Maritime Scenarios Results Analysis (D.4):

Criteria	Limit / Condition	Result
No. of Successful Tests	TTFF $\leq$ 5 minutes	25
Total No. of Maritime Scenarios	26	N/A
TTFF Percentage Success Rate	$(\text{No. Successful Tests} / 26) \times 100$	96.2
TTFF Pass / Fail Limit	$\geq 70\%$	N/A
No of Locations with Errors	≤ 30 m	25
No of Scenarios with Locations	Enter result	25
Location Accuracy Percentage Pass Rate	$(\text{No Locations Errors} \leq 30 \text{ m} / \text{No Scenarios with Location}) \times 100$	96.2
Location Accuracy Pass / Fail Limit	$\geq 70\%$	N/A

	Pass / Fail
Maritime TTFF Success Rate $\geq 70\%$	Pass
Maritime Location Accuracy Pass Rate $\geq 70\%$	Pass
Both results must be a "Pass" for the AU to pass, any one or more "Fails" indicated failure	

**2.19 BATTERY CAPACITY TEST****2.19.1 Specification Reference**

RTCM 11901.1, Clause E.6.5

2.19.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972606044 (TSR0007) and Mod State 1

2.19.3 Date of Test

15 May 2018 to 16 May 2018

2.19.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.19.5 Environmental Conditions

Ambient Temperature 20.7°C
Relative Humidity 34.1 %
Chamber -20°C

2.19.6 Test Method

As permitted by the standard, the Manufacturer provided a battery pack which was previously discharged in accordance with the clause 5.2 (see also Annex A for Manufacturers data).

The Standard requires that the AU shall be placed in a chamber at normal room temperature. Then the temperature shall be reduced to and maintained at $-20\text{ °C} \pm 3\text{ °C}$ for a period of 10 – 16 hours.

After this time EUT shall be activated in its mode of maximum current draw (declared by the Manufacturer as GPS search) 30 min after the end of the period and shall then be kept working continuously for a period of 12 hours. The temperature of the chamber shall be maintained as specified above for the whole of the period of 12 hours.

The operation of the AU during the test shall be verified. In addition, at the end of the 12-hour period, a performance test shall be performed.



2.19.7 Test Results

The EUT continued to operate at -20°C for a period of 24 hours. The AIS messages were confirmed via a Class A AIS throughout the 24 hours.

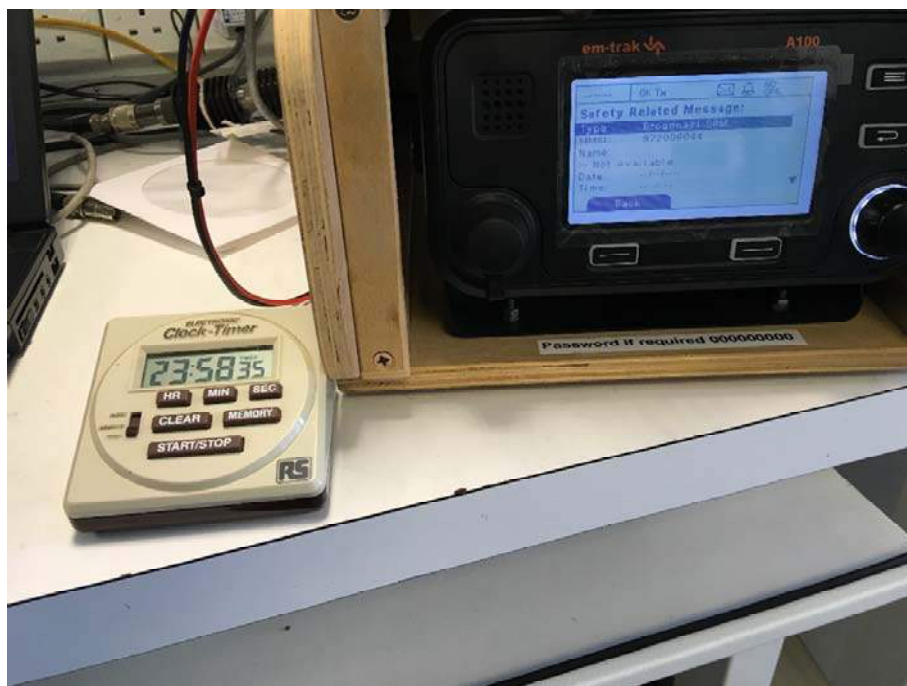
The DSC message reception was confirmed periodically via the Sailor RT5022 VHF with DSC radio.



EUT – Battery Capacity Test



Battery Capacity Test Monitoring Equipment



Start of 24-hour duration (AIS message received)



Start of 24-hour duration (DSC message received)



End of 24-hour duration (AIS message received)



End of 24-hour duration (DSC message received)

After the 24-hour period the AU was brought back to ambient, tested and found to be operational.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Section 2.2 Climatic – Dry Heat					
Montford F43	Montford	4FT CUBED	2126	12	24-Jan-2018
Section 2.3 Climatic – Damp Heat					
Montford F43	Montford	4FT CUBED	2126	12	24-Jan-2018
Section 2.5 Climatic - Thermal Shock					
Montford F43	Montford	4FT CUBED	2126	12	12-Jan-2019
Temperature Logger	Digitron	2098T	2479	12	6-Dec-2018
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	14-Mar-2018
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	12-Jun-2018
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	20-Jul-2018
Section 2.6 ENV – Drop onto Hard Surface					
Lansmont	Lansmont	PDT 56E	2291	-	TU
Hardwood Block	Unknown	ELM	2650	-	TU
10-meter Tape Measure	Stanley	Fatmax 10m/33'	4073	-	TU
Section 2.8 Vibration					
Charge Amplifier	Endevco	133	2503	12	21-Apr-2018
LDS 984	Ling	984LS/DPAK130	2513	6	7-Aug-2018
Accelerometer	Endevco	256-10	3440	6	6-Mar-2018
Vibration Controller	m + p International	Vibpilot 8	3772	12	7-Sep-2018
Isotron Accelerometer	Endevco	256-10	3785	6	6-Mar-2018
Isotron Accelerometer	Endevco	256-10	3789	6	7-Mar-2018
Section 2.9 and 2.10 Climatic – Rain and Spray and Immersion					
Hygrometer	Rotronic	A1	1388	12	4-May-2018
Montford F43	Montford	4FT CUBED	2126	12	12-Jan-2019
Balance	Geniweigher	GM-11K	2334	12	14-Mar-2018
Thermometer	Digitron	T208	2340	12	21-Nov-2018
Water Spray Head	Pipework & Eng Serv		2452	24	3-Nov-2018
940 litre Tank	Unknown	940 litre	3574	-	TU
Stop Watch	Radio Spares	Model 694 (974)	4025	0	27-Oct-2018
Stop Watch	Radio Spares	Model 694 (974)	4026	0	27-Oct-2018
12.5 Litre Container	TUV SUD Product Service	n/a	4027	-	TU
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	14-Mar-2018
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	20-Jul-2018
Tape Measure 8m	Stanley	FatMax	4878	-	TU
Section 2.14 – EMC – Compass Safe Distance					
Magnetometer	Bartington	MAG01	671	36	24-Mar-2018
Compass Verification Unit	TUV SUD Product Service	CVU	3579		TU
Marine Binnacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU
Section 2.18 Beacons - GNSS - RTCM Scenarios					
Antenna (Double Ridge Guide)	EMCO	3115	34	12	8-Dec-2018
Directional Coupler	Narda	3022	503	-	O/P Mon
Termination (50ohm)	Diamond Antenna	DL-30N	544	12	14-Feb-2018
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon



Section 2.18 Beacons - GNSS - RTCM Scenarios					
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	20-Oct-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Oct-2018
Multi-GNSS Simulator (GPS)	Spirent	GSS6700	4596	12	11-Aug-2018
Section 2.19 Battery Capacity Test					
3 dB attenuator	Narda	766F-3	3962	12	01-Nov-18
10 dB attenuator	Trilithic	HFP-50N	1377	12	20-Dec-18
10 dB attenuator	Texcan	HFP-50N	468	12	28-Jun-18
10 dB attenuator	Narda	766-10	480	12	18-Dec-18
RS TEMP Meter	RS Components	615-8206	3612	12	12-Sep-18
CHAMBER VMT 04/30	Heraeus Votsch	VMT 04/30	40	-	O/P MON
Section 2.16 Controls and Indicators (Sharp edge test)					
Sharp edge tester	TES TEC GmbH	SET-50	2792	-	TU

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are: -

Test Discipline	MU
Battery Capacity and Low Temperature Test	See Power and Frequency
Compass accuracy	$\pm 0.1^\circ$



Product Service

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Front View



Side View



Product Service



Antenna Deployed View

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

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TÜV SÜD Product Service

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Product Service

ANNEX A

MANUFACTURER SUPPLIED INFORMATION



Product Service

Manufacturer Materials Waiver and Declarations

23rd February 2018

Subject RescueME MOB1 Material waiver and Disclosure Information, including Waiver Statement for Label Legibility and Comprehensibility Tests

To Whom It May Concern:

Ocean Signal Limited hereby declares that the labelling on the RescueME product fully complies with the requirements of RTCM 11901.1 Section 5.3.2.

IEC 60945 stipulates that where a manufacture can produce evidence that the components, materials and finishes employed in the equipment would satisfy the following tests then the tests shall be waived:

- Corrosion (Salt Mist) IEC 60945 (8.12) & RTCM 11901.1 (8.1.2)
- Solar Radiation IEC 60945 (8.10) & RTCM 11901.1 (8.1.2)
- Oil resistance IEC 60945 (8.11) & RTCM 11901.1 (8.1.2)

In this instance Ocean Signal Limited claim, for one or more of the reasons listed below that these criteria are met and therefore make application that the tests be waived.

- 1 The materials have a proven history of service in a marine environment, either from use in Ocean Signal's existing approved product range, or by implication from a long established history of exposure without effect e.g. Stainless steel).
- 2 The material manufacturer has conducted equivalent testing and has declared the product as being immune to these effects in the relevant data sheet.
- 3 Ocean Signal Limited, in house testing has proven the materials to be immune to the cause of degradation (e.g. oil resistance)
- 4 Ocean Signal Limited has previously had the materials tested on other approved products which demonstrated the materials conformance to the test requirements.

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Technology Park,
Langstone Road,
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Product Service

Ocean Signal Limited hereby declares that the materials used in the construction of the RescueME MOB1 as here-in listed are not affected by the degrading agents listed above.

Signed on behalf of Ocean Signal Limited.

A handwritten signature in blue ink, appearing to read 'Simon Nolan'.

Simon Nolan
Chief technical Officer

The following is a list of components and materials used in the RescueMe MOB1 that are in direct contact with the marine environment.

Case Bottom	Xenoy
Case Top	Xenoy
Sealing Gasket	Silicone Rubber
Antenna Cover	Xenoy
Antenna Blade	Stainless Steel 301
Antenna Contact	Stainless Steel 304
Antenna Overmould	Polypropylene
Screw	Stainless Steel A2
Arming Slider	Acetal
Antenna retainer	Acetal
Mounting bracket	Xenoy
LED Lens	PMMA
Labels	Polycarbonate
Antenna cover	Polycarbonate
Lanyard	Polyester Cord



Product Service

Report 122014/1 Issue 1 Page 1 of 4



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Tel: +44 (0)1737 372670 Fax: +44 (0)1737 772795 Email: info@sartech.com Website: www.sartech.com

Report On

UN Transportation Safety Tests on
lithium primary batteries
Ocean Signal 901S-01509

COMMERCIAL IN CONFIDENCE

Issue 1 16 December 2014

A handwritten signature in black ink, appearing to read 'P. Forey'.

Peter Forey
Director



Registered in England No. 3328421





1 Summary and Conclusions

This report details tests carried out in accordance with Section 38.3 of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, fifth revised edition (ST/SG/AC.10/11/Rev.5)

Batteries tested were as follows:

Battery type	Description	Reference numbers of samples tested
9015-01509	Primary battery using 2 x Energizer CR123 cells	1,2,3,4 (Undischarged) 5,6,7,8 (Discharged)

All battery samples were found to meet the test requirements as defined in the standard.



Registered in England No. 3328421





Product Service

Report 122014/1 Issue 1 Page 3 of 4

2 Index

1. Summary and conclusions
2. Index
3. Test programme

Appendices

1. Test sheets – T.1
2. Test sheets – T.2
3. Test sheets – T.3
4. Test sheets – T.4
5. Test sheets – T.5 (Undischarged)
6. Test sheets – T.5 (Discharged)



Registered in England No. 3328421





3 Test programme

All battery samples were subjected to tests T.1 to T.5 in sequence. Test equipment calibration certificates and detailed logs for vibration and test runs are available on request.

3.1 Test T.1: Altitude test

Appendix 1 shows the data recorded before and after the test. No abnormal comments were recorded.

3.2 Test T.2: Thermal test

Appendix 2 shows the data recorded before and after the test. No abnormal comments were recorded.

3.3 Test T.3: Vibration test

Appendix 3 shows the data recorded before and after the test. No abnormal comments were recorded.

3.4 Test T.4: Shock test

Appendix 4 shows the data recorded before and after the test. No abnormal comments were recorded.

3.5 Test T.5: Short circuit test

Appendix 5 shows the data recorded during the test. No abnormal comments were recorded.



Registered in England No. 3328421





Product Service



UN- ST/SG/AC.10/11/Rev.5 CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.1 TEST 1 - ALTITUDE TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

FULLY UNDISCHARGED – TEST PRESSURE <11.6kPa for 6hrs

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial voltage	6.484	6.487	6.488	6.3483
Initial mass (g)	34.1779	34.1222	34.0277	33.932
TEST PRESSURE (max kPa abs)	11.0	11.0	11.0	11.0
Voltage after test	6.484	6.488	6.488	6.22
Mass after test (g)	34.1778	34.122	34.0276	33.9322
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

FULLY DISCHARGED – TEST PRESSURE <11.6kPa for 6hrs

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial mass (g)	33.9815	33.8401	34.0325	33.905
TEST PRESSURE (max kPa abs)	11.0	11.0	11.0	11.0
Mass after test (g)	33.9814	33.8403	34.0324	33.9046
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

TEST EQUIPMENT	SERIAL NUMBER
Island Scientific chamber 230x230	1101050
Keller LEO2 pressure gauge	49794
Thurlby Thandar DMM 1705	103851
Adam balance	AE437781

TEMPERATURE 20C +-5C: YES

COMMENTS:

All results within specification

SARTECH

SARTECH ENGINEERING LTD.

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Holmethorpe Industrial Estate,

Redhill, Surrey RH1 2LH, U.K.

Tel: 01737 373470 Fax: 01737 770271

START DATE: 17/10/14 TIME: 08:30 FINISH DATE: 17/10/14 TIME: 15:00

ENGINEER:
T. S. Compton

DATE: 26/11/14



Product Service



UN- ST/SG/AC.10/11/Rev.5 CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.2 TEST 2 – THERMAL TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

FULLY UNDISCHARGED – TEST TEMPERATURE -40C TO +75C 10 CYCLES
STORAGE FOR 24 HOURS AT 20C +/- 5C

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial voltage	6.484	6.488	6.488	6.22
Initial mass (g)	34.1778	34.122	34.0276	33.9322
Voltage after test	6.529	6.53	6.53	6.516
Mass after test (g)	34.1709	34.1137	34.0145	33.9253
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

FULLY DISCHARGED – TEST TEMPERATURE -40C TO +75C 10 CYCLES
STORAGE FOR 24 HOURS AT 20C +/- 5C

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial mass (g)	33.9814	33.8403	34.0324	33.9046
Mass after test (g)	33.9725	33.8305	34.025	33.8906
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

TEST EQUIPMENT	SERIAL NUMBER
Medical Supplies Assoc. Chamber	71/147
West 6400 Controller	unknown
Thurlby Thandar DMM 1705	103851
Adam balance	AE437781

COMMENTS:

All results within specification

SARTECH
SARTECH ENGINEERING LTD.
13 Trowers Way
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Tel: 01737 372670 Fax: 01737 77277

START DATE: 17/10/14 TIME: 15:00 FINISH DATE: 27/10/14 TIME: 0800

ENGINEER:

T. S. Constan

DATE: 26/11/14



Product Service



UN- ST/SG/AC.10/11/Rev.5 CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.3 TEST 3 - VIBRATION - TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

FULLY UNDISCHARGED – TEST 7Hz - 200Hz 12 CYCLES OVER 3 HOURS

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial voltage	6.529	6.53	6.53	6.516
Initial mass (g)	34.1709	34.1137	34.0145	33.9253
Voltage after test	6.527	6.527	6.527	6.514
Mass after test (g)	34.1716	34.1157	34.015	33.9259
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS
	PASS	PASS	PASS	PASS

FULLY DISCHARGED – TEST 7Hz - 200Hz 12 CYCLES OVER 3 HOURS

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial mass (g)	33.9725	33.8305	34.025	33.8906
Mass after test (g)	33.9727	33.8317	34.027	33.8993
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

TEST EQUIPMENT	SERIAL NUMBER
LDS Dactron SPAK Amplifier	96660/1
LDS Dactron Comet USB	12107947
PCB Transducer 353B34	108267
Thurlby Thandar DMM 1705	103851
Adam Balance	AE437781

COMMENTS:

All results within specification

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 Tel: 01737 372670 Fax: 01737 772701

START DATE: 27/10/14 TIME: 08:00 FINISH DATE: 31/10/14 TIME: 16:30

ENGINEER:

T. S. Compton

DATE: 26/11/14



Product Service



UN- ST/SG/AC.10/11/Rev.5

CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.3

TEST 4 SHOCK - TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK

OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

FULLY UNDISCHARGED – HALF SINE 6ms 150g

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial voltage	6.024	6.53	6.53	6.53
Initial mass (g)	34.1713	34.1159	34.0135	33.9257
Voltage after test	6.149	6.53	6.531	6.516
Mass after test (g)	34.1753	34.1176	34.0188	33.9291
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS
	PASS	PASS	PASS	PASS

FULLY DISCHARGED – HALF SINE 6ms 150g

SARTECH BATTERY REFERENCE:	1	2	3	4
Initial mass (g)	33.973	33.8322	34.0269	33.8999
Mass after test (g)	33.9762	33.835	34.0306	33.9029
OBSERVATIONS	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL
Leakage	PASS	PASS	PASS	PASS
Venting	PASS	PASS	PASS	PASS
Disassembly	PASS	PASS	PASS	PASS
Rupture	PASS	PASS	PASS	PASS
Fire	PASS	PASS	PASS	PASS

TEST EQUIPMENT	SERIAL NUMBER
LDS Dactron SPAK Amplifier	96660/1
LDS Dactron Comet USB	12107947
PCB Transducer 353B03	108361
Thurlby Thandar DMM 1705	103851
Adam balance	AE437781

START DATE: 7/11/14 TIME: 0800 FINISH DATE: 7/11/14 TIME: 16:30

COMMENTS:

All results within specification

ENGINEER:

T. S. Cooper

DATE: 26/11/14

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 SARTECH ENGINEERING LTD.
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 Redhill, Surrey RH1 2LH, U.K.
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Product Service



UN- ST/SG/AC.10/11/Rev.5

CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.5

TEST 5 – SHORT CIRCUIT TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK

OS REF: 901S-01509

CELLS: 2 X ENERGISER LITHIUM 123

FULLY UNDISCHARGED – < 0.1OHM SHORT @ +55C

BATTERY REF.	1	2	2	2	
TEMP CHECK	TEMP.	TEMP.	TEMP.	TEMP.	TIME OR DATE
START TIME @ 55C	08:00	08:00	08:00	08:00	25/11/14
2 hr STABILIZE	55	54	55	55	10:00
TEMP CHECK 1	57	56	58	68	10:05
TEMP CHECK 2	61	67	74	90	10:10
TEMP CHECK 3	64	66	74	87	10:15
TEMP CHECK 4	63	63	78	78	10:30
TEMP CHECK 5	65	61	75	71	10:50
TEMP CHECK 6	67	62	73	78	11:15
TEMP CHECK 7	70	65	76	80	12:15
TEMP CHECK 8	72	67	78	78	13:15
TEMP CHECK 9	66	85	76	82	14:15
TEMP CHECK 10	62	62	71	60	15:15
TEMP CHECK 11	65	60	60	57	16:15
NOT MONITORED OVERNIGHT					26/11/14
TEMP CHECK 12	56	56	55	55	07:30
OBSERVED UNTIL					13:30
OBSERVATION	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL	
Temp. =< 170C	PASS	PASS	PASS	PASS	
Disassembly	PASS	PASS	PASS	PASS	
Rupture	PASS	PASS	PASS	PASS	
Fire	PASS	PASS	PASS	PASS	

6 HOUR OBSERVATION COMPLETED:

TEST EQUIPMENT	SERIAL NUMBER
Medical Supplies Assoc. chamber	71/147
West 6400 Controller	Unknown
Fluke Foodpro	07070084

START DATE: 25/11/14 TIME: 08:00 FINISH DATE: 26/11/14 TIME: 13:30

COMMENTS:

All results within specification

ENGINEER:

T.S. Cooper

DATE: 26/11/14

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Product Service



UN- ST/SG/AC.10/11/Rev.5

CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.5

TEST 5 – SHORT CIRCUIT TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK

OS REF: 901S-01509

CELLS: 2 X ENERGISER LITHIUM 123

FULLY DISCHARGED – < 0.1OHM SHORT @ +55C

BATTERY REF.	1	2	2	2	
TEMP CHECK	TEMP.	TEMP.	TEMP.	TEMP.	TIME OR DATE
START TIME @ 55C	08:00	08:00	08:00	08:00	25/11/14
2 hr STABILIZE	54	55	54	54	10:00
TEMP CHECK 1	55	56	56	57	10:05
TEMP CHECK 2	58	59	60	60	10:10
TEMP CHECK 3	58	59	60	59	10:15
TEMP CHECK 4	59	60	59	59	10:30
TEMP CHECK 5	58	58	58	58	10:50
TEMP CHECK 6	58	57	58	58	11:15
TEMP CHECK 7	56	56	57	56	12:15
TEMP CHECK 8	56	56	57	56	13:15
TEMP CHECK 9	56	57	56	56	14:15
TEMP CHECK 10	55	56	55	56	15:15
TEMP CHECK 11	56	56	56	55	16:15
NOT MONITORED OVERNIGHT					26/11/14
TEMP CHECK 12	55	55	55	55	07:30
OBSERVED UNTIL					13:30
OBSERVATION	PASS/FAIL	PASS/FAIL	PASS/FAIL	PASS/FAIL	
Temp. =< 170C	PASS	PASS	PASS	PASS	
Disassembly	PASS	PASS	PASS	PASS	
Rupture	PASS	PASS	PASS	PASS	
Fire	PASS	PASS	PASS	PASS	

6 HOUR OBSERVATION COMPLETED:

TEST EQUIPMENT	SERIAL NUMBER
Medical Supplies Assoc. chamber	71/147
West 6400 Controller	Unknown
Fluke Foodpro	07070084

START DATE: 25/11/14 TIME: 08:00 FINISH DATE: 26/11/14 TIME: 13:30

COMMENTS:

All results within specification

ENGINEER:

DATE: 26/11/14

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Product Service

TÜV SÜD BABT
 Octagon House,
 Concorde Way, Sagenworth North,
 Fareham, PO15 5RL,
 United Kingdom



25 May 2018

Declaration of MOB1 Battery pre-discharge

The Ocean Signal rescueME MOB1 batteries supplied to TUV for operational life testing had been pre-discharged by 250mAh. This was achieved by drawing 100mA from each battery for 2.5 hours.

Signed on behalf of Ocean Signal Ltd.,

Simon Nolan
 Chief technical Officer

Registration No
 6627101
UK No
 938 4376 89
Registered Office
 27 New Dover Road
 Canterbury
 Kent
 CT1 3DN



Product Service

TÜV SÜD BABT
 Octagon House,
 Concorde Way, Sagenworth North,
 Fareham, PO15 5RL,
 United Kingdom



25 May 2018

Declaration of MOB1 Battery pre-discharge

The Ocean Signal rescueME MOB1 batteries supplied to TUV for operational life testing had been pre-discharged by 250mAh. This was achieved by drawing 100mA from each battery for 2.5 hours.

Signed on behalf of Ocean Signal Ltd.,

Simon Nolan
 Chief technical Officer

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IST No.
 938 4376 89
Registered Office
 27 New Dover Road
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 CT1 3DN



Document Type	Document No.	
	Issue	0A.00
Approved:	Date Last Amended	10/05/2019
	Last Amended by	S Nolan
Document Title	MOB1/ AIS-Link worst case current consumption	

The MOB1 / AIS-Link use the same PCB and same product firmware and therefore operate in exactly the same way.

The product transmits signals in the AIS Band channel A and B alternately as per the MSLD specification. A burst of eight transmissions are sent every minute separated by 75 AIS Slots (2 seconds). If enabled the device will also send a DSC relay message once turned on which will repeat every 5 minutes. If the unit has a GPS position it will insert an additional DSC message as soon as the product receives a position after being turned on. The five minute timing will then start from this point.

The GNSS receiver uses the GPS constellation and will keep the GPS receiver turned on for the first 790s after turn on irrespective of whether the GNSS receiver gets a position or not. This is required to ensure the GNSS receiver downloads a complete set of ephemeris data at turn on.

After the first 790 seconds the GNSS receiver will be turned on and off as required to the following schedules based upon a GPS signal being present or not.

Without a GPS signal being received the product will turn the receiver on and off for periods of 300s within the first hour of operation thereafter the unit will turn the GPS receiver on for 5 minutes every 20 minutes until the battery goes beyond its cut of voltage and the unit will turn off.

With a GPS signal present the product will turn on to sync the product timer to UTC every minute and then turn off. The average time taken to achieve a lock each minute is 12.05s with GPS on and 47.95s with GPS off.

Over a period of 24 hours operation this will mean the GPS will be on as shown below.

	With GNSS Signal present on time	With GNSS Signal present off time	Without GNSS Signal present on time	Without GNSS Signal present off time
	790s		790s	
	1427*12.05		1500	1500
			55*300	55*1200+110
Total	17985.4s	68414.6s	18790	67610

From these calculations it can be seen that the worst case test will be without a GNSS signal present.



Product Service

Document Type	Document No.	
	Issue	0A.00
	Date Last Amended	10/5/2018
	Last Amended by	Simon Nolan
Document Title	MOB1/ AIS-Link worst case current consumption	

Pre-discharge Current

Useful Battery Life 7 years so battery self-discharge equivalent to 14 years required.

Energizer 123 1.5Ah self-discharge 1% per year as per manufactures data

14 year self-discharge = 196.88mAh

GPS tests maximum 21 over life of product = $21 \times 0.672\text{mAh} = 14.11\text{mAh}$

DSC Tests 2 per year = $14 \times 2 \times 0.247\text{mAh} = 6.93\text{mAh}$

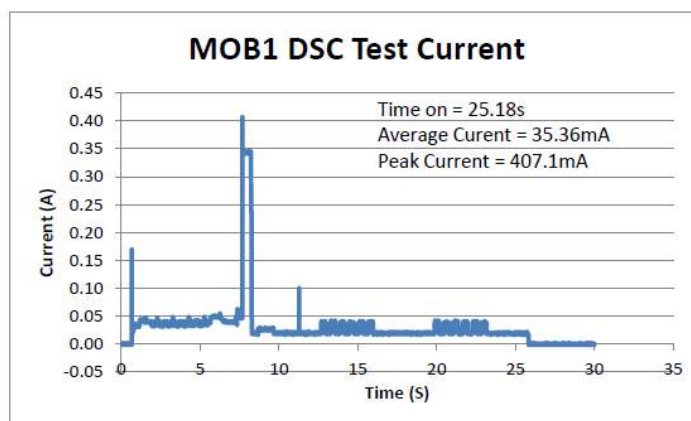
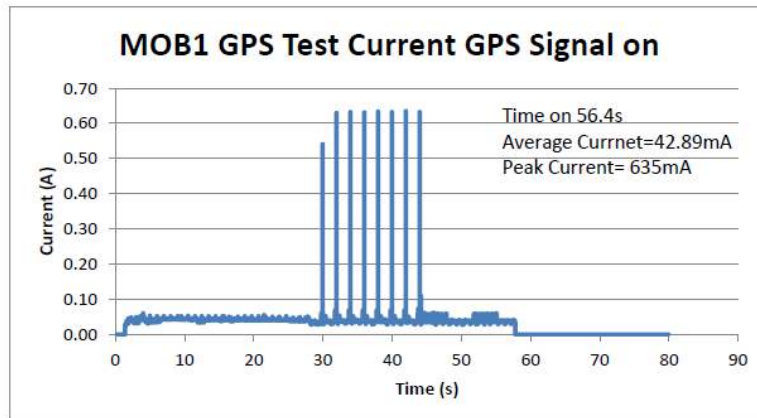
Self tests 1 per month = $168 \times 0.149\text{mAh} = 25.1\text{mAh}$

Total self-discharge = 243.0mAh



Product Service

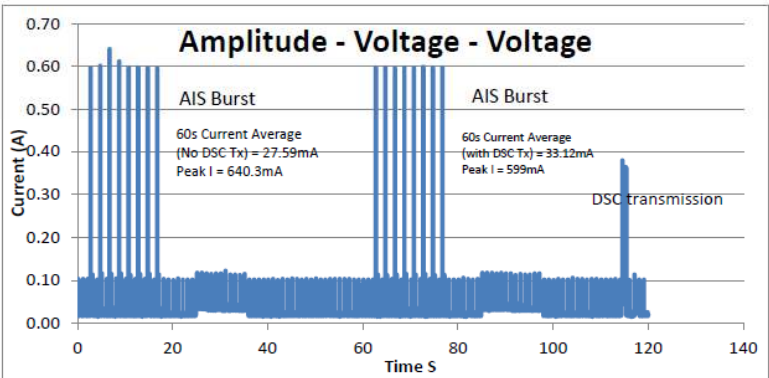
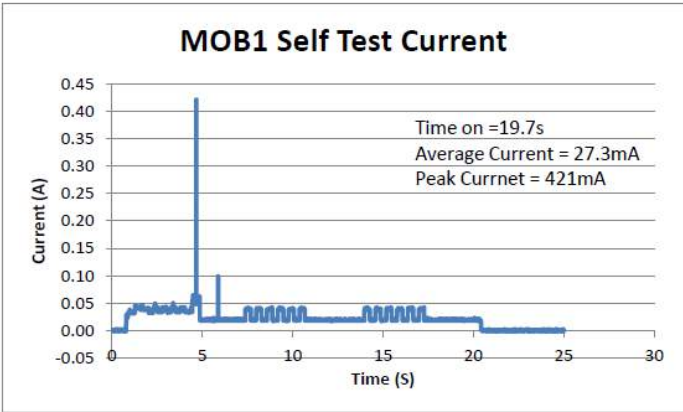
Document Type	Document No.	
	Issue	0A.00
	Date Last Amended	10/5/2018
	Last Amended by	Simon Nolan
Document Title	MOB1/ AIS-Link worst case current consumption	





Product Service

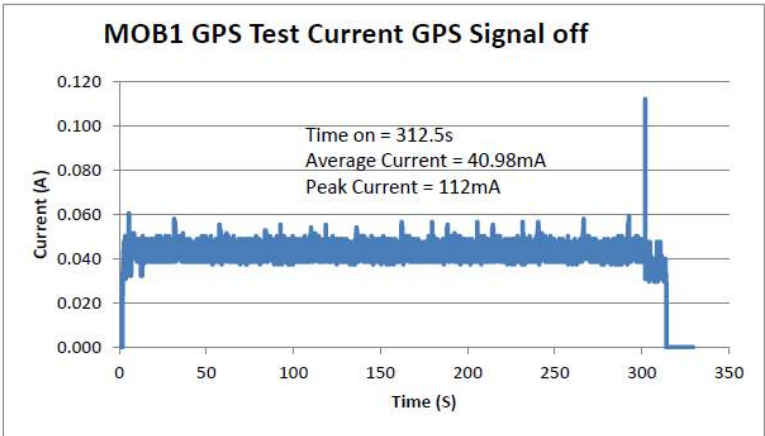
Document Type	Document No.	
	Issue	0A.00
	Date Last Amended	10/5/2018
	Last Amended by	Simon Nolan
Document Title	MOB1/ AIS-Link worst case current consumption	



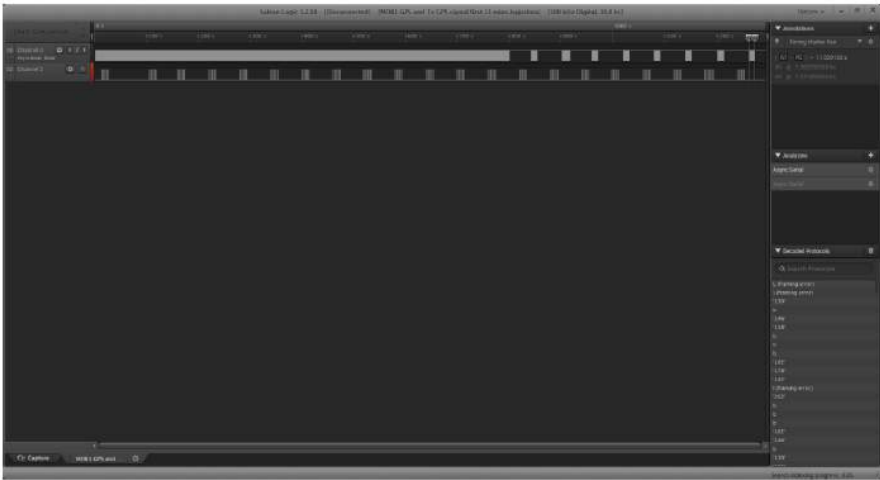


Product Service

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Pictures supporting GPS worst case current consumption calculations

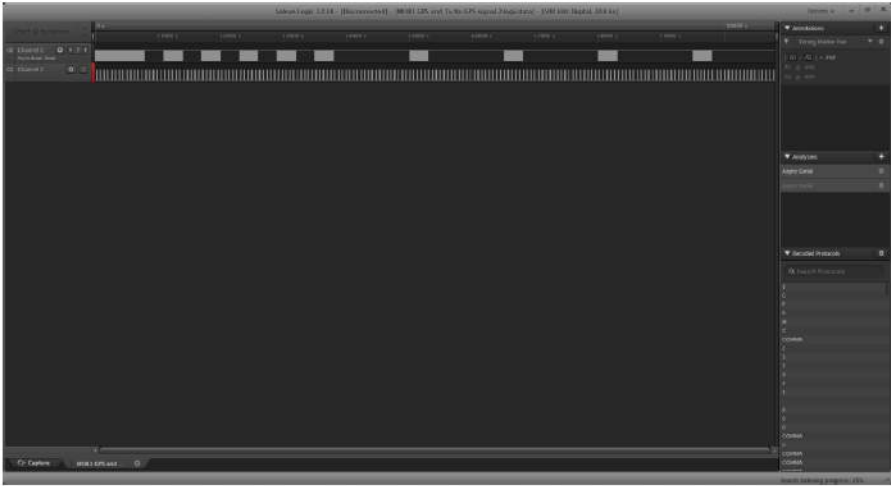


Trace 1 shows GPS output for unit with GPS signals present. On for first 13 minutes then on and off ~11.5s on each minute. Trace 2 shows the AIS transmissions every minute.



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Trace 1 shows the GPS output for unit without GPS signals present. On for 13 minutes then off/on for five minutes up to first hour then on for 5 minutes every 20 minutes. Trace 2 shows AIS transmissions every minute.