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Report On

Radio Testing of the
Jotron AS Tron TR30 GMDSS and Maritime VHF Radio
In accordance with IEC 61097-12

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Document 75933035 Report 07 Issue 2 **September 2016**

Product Service

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REPORT ON

Radio Testing of the
Jotron AS Tron TR30 GMDSS and Maritime VHF Radio
In accordance with IEC 61097-12

Document 75933035 Report 07 Issue 2

September 2016

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DATED

4 October 2016

4 October 2016

This report has been revised to Issue 2 to remove the Oil Resistance test results, include Performance Requirements, Corrosion and Battery life results and to correct other typographical / formatting errors.

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CONTENTS

Section		Page No
1	**REPORT SUMMARY**	**4**
1.1	Introduction	5
1.2	Brief Summary of Results	6
1.3	Application Form	8
1.4	Product Information	11
1.5	Deviations from the Standard	12
1.6	Modification Record	12
2	**TEST DETAILS**	**13**
2.1	Performance Requirements (NUA)	14
2.2	Battery	23
2.3	Drop Test	28
2.4	Thermal Shock	31
2.5	Immersion	34
2.6	Dry Heat	37
2.7	Damp Heat	40
2.8	Low Temperature	42
2.9	Vibration	44
2.10	Oil Resistance Test	55
2.11	Solar Radiation	56
2.12	Mould Growth	57
2.13	Corrosion	58
2.14	Frequency Error	67
2.15	Effective Radiated Power	68
2.16	Carrier Power	69
2.17	Maximum Permissible Frequency Deviation	71
2.18	Reduction of Frequency Deviation at Modulation Frequencies above 3 kHz	72
2.19	Limitation Characteristics of the Modulator	74
2.20	Sensitivity of the Modulator, including Microphone	75
2.21	Audio Frequency Response	76
2.22	Audio Frequency Harmonic Distortion of the Emission	77
2.23	Residual Modulation of the Transmitter	78
2.24	Adjacent Channel Power	79
2.25	Conducted Spurious Emissions Conveyed to the Antenna	80
2.26	Transient Frequency Behaviour of the Transmitter	81
2.27	Harmonic Distortion and Rated Audio Frequency Output Power	84
2.28	Audio Frequency Response Rx	88
2.29	Maximum Usable Sensitivity	90
2.30	Co-Channel Rejection	91
2.31	Adjacent Channel Selectivity	92
2.32	Spurious Response Rejection	93
2.33	Intermodulation Response	94
2.34	Blocking	95
2.35	Conducted Spurious Emissions Conveyed to the Antenna Rx	96
2.36	Amplitude Response of the Receiver Limiter	97
2.37	Receiver Hum and Noise Level	98
2.38	Squelch Operation	99
2.39	Squelch Hysteresis	100
3	**TEST EQUIPMENT USED**	**101**
3.1	Test Equipment Used	102

3.2 Measurement Uncertainty 113

4 PHOTOGRAPHS 115

4.1 Photographs of Equipment Under Test (EUT) 116

5 ACCREDITATION, DISCLAIMERS AND COPYRIGHT 118

5.1 Accreditation, Disclaimers and Copyright 119

ANNEX A Solar Radiation Report – 6P05223 ..... A.2
ANNEX B Additional ERP Position Measurements B.2

Product Service

SECTION 1

REPORT SUMMARY

Radio Testing of the
Jotron AS Tron TR30 GMDSS and Maritime VHF Radio
In accordance with IEC 61097-12

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of Radio Testing of the Jotron AS Tron TR30 GMDSS and Maritime VHF Radio to the requirements of IEC 61097-12.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Jotron AS
Model Number(s)	Tron TR30 GMDSS and Maritime VHF Radio
Serial Number(s)	810 1204 1322
Number of Samples Tested	3
Test Specification/Issue/Date	IEC 61097-12: 1996-11
Incoming Release Date	Application Form 30 March 2016
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	SP1551001 14 December 2015
Start of Test	9 March 2016
Finish of Test	27 September 2016
Name of Engineer(s)	M Russell G Lawler K Bryant N Rousell R Hampton

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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with IEC 61097-12 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
VHF				
2.1	Various	Performance Requirements	-	See section 2.1
2.2	3.3.8.4	Battery Test		
2.3	5.1.5.1	Drop Test	Satisfactory	
2.4	5.1.5.2	Thermal Shock	Satisfactory	
2.5	5.1.5.3	Immersion	Satisfactory	
2.6	5.1.5.4	Dry Heat	Satisfactory	
2.7	5.1.5.5	Damp Heat	Satisfactory	
2.8	5.1.5.6	Low Temperature	Satisfactory	
2.9	5.1.5.7	Vibration	Satisfactory	
2.10	5.1.5.8	Oil Resistance Test	Not Tested	
2.11	5.1.5.9	Solar Radiation	-	Sub-contracted
2.12	5.5.10	Mould Growth	-	Sub-contracted
2.13	5.5.10	Corrosion	-	See section 2.11
2.14	5.4.1	Frequency Error	Pass	
2.15	5.4.2	Effective Radiated Power	Pass	
2.16	5.4.3	Carrier Power	Pass	
2.17	5.4.4.2	Maximum Permissible Frequency Deviation	Pass	
2.18	5.4.4.3	Reduction of Frequency Deviation at Modulation Frequencies above 3 kHz	Pass	
2.19	5.4.5	Limitation Characteristics of the Modulator	Pass	

Product Service

Section	Specification Clause	Test Description	Result	Comments/Base Standard
VHF				
2.20	5.4.6	Sensitivity of the Modulator, including Microphone	Pass	
2.21	5.4.7	Audio Frequency Response	Pass	
2.22	5.4.8	Audio Frequency Harmonic Distortion of the Emission	Pass	
2.23	5.4.11	Residual Modulation of the Transmitter	Pass	
2.24	5.4.9	Adjacent Channel Power	Pass	
2.25	5.4.10	Conducted Spurious Emissions Conveyed to the Antenna	Pass	
2.26	5.4.12	Transient Frequency Behaviour of the Transmitter	Pass	
2.27	5.5.1	Harmonic Distortion and Rated Audio Frequency Output Power	Pass	
2.28	5.5.2	Audio Frequency Response Rx	Pass	
2.29	5.5.3	Maximum Usable Sensitivity	Pass	
2.30	5.5.4	Co-Channel Rejection	Pass	
2.31	5.5.5	Adjacent Channel Selectivity	Pass	
2.32	5.5.6	Spurious Response Rejection	Pass	
2.33	5.5.7	Intermodulation Response	Pass	
2.34	5.5.8	Blocking	Pass	
2.35	5.5.9	Conducted Spurious Emissions Conveyed to the Antenna Rx	Pass	
2.36	5.5.10	Amplitude Response of the Receiver Limiter	Pass	
2.37	5.5.11	Receiver Hum and Noise Level	Pass	
2.38	5.5.12	Squelch Operation	Pass	
2.39	5.5.13	Squelch Hysteresis	Pass	

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	Tron TR30 GMDSS and Maritime VHF radio
Part Number	87950
Hardware Version	R1610
Software Version	2.0.2
FCC ID (if applicable)	VRVTRONTR30
Industry Canada ID (if applicable)	2131A-TRONTR30
Technical Description (Please provide a brief description of the intended use of the equipment)	"Tron TR30 GMDSS and Maritime VHF radio" has the ultimate functional design, both in an emergency situation and in general on board communications. The radio switches automatically between standard simplex and duplex maritime channels and 21 emergency simplex channels depending on which battery, rechargeable or sealed lithium, is connected

POWER SOURCE

☐ AC mains State voltage

AC supply frequency (Hz)

VAC

Max Current

Hz

☐ Single phase ☐ Three phase

And / Or

☐ External DC supply

Nominal voltage V Max Current A

Extreme upper voltage V

Extreme lower voltage V

Battery

☐ Nickel Cadmium ☐ Lead acid (Vehicle regulated)

☐ Alkaline ☐ Leclanche

☒ Lithium ☐ Other Details :

NON GMDSS 7,4 Volts nominal.

GMDSS 6,0 V

End point voltage as quoted by equipment manufacturer NON GMDSS 6,0 V

GMDSS 4,1 V

FREQUENCY INFORMATION					
Frequency Range	154 to161,875	MHz			
Channel Spacing (where applicable)	25 KHz				
Receiver Frequency Range (if different)	154 to163	MHz			
Channel Spacing (if different)					
Test Frequencies*	Bottom	154.050	MHz	Channel Number (if applicable)	T1
	Middle	156.050	MHz	Channel Number (if applicable)	T2
	Top	161,875	MHz	Channel Number (if applicable)	T3
Intermediate Frequencies	45MHz, 0,455 MHz				

Highest Internally Generated Frequency : 161,875X2=323,750 MHz

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POWER CHARACTERISTICS				
Maximum TX power	GMDSS 2W	W		
	NON GMDSS 5W			
Minimum TX power	GMDSS 1	W (if variable)		
	NON GMDSS 1W			
Is transmitter intended for :				
Continuous duty			☐ Yes	☒ No
Intermittent duty			☒ Yes	☐ No
If intermittent state DUTY CYCLE				
Transmitter ON	50%@ 1W seconds			
Transmitter OFF	50%@ 1W seconds			

ANTENNA CHARACTERISTICS						
☒	Antenna connector			State impedance	50	Ohm
☐	Temporary antenna connector			State impedance		Ohm
☐	Integral antenna	Type		State impedance		dBi
☒	External antenna	Type	Helical	State impedance	-4	dBi

MODULATION CHARACTERISTICS					
☐	Amplitude		☐	Frequency	
☒	Phase		☐	Other (please provide details):	
Can the transmitter operate un-modulated?				☐ Yes	☒ No

CLASS OF EMISSION USED	
ITU designation or Class of Emission:	
1	G3E
(if applicable) 2	
(if applicable) 3	
If more than three classes of emission, list separately:	

BATTERY POWER SUPPLY			
Model name/number	Battery Emergency Lithium / Battery Chargeable Li Polymer	Identification/Part number	87086 /87087
Manufacturer	Jotron	Country of Origin	Norwa

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	AS		y

ANCILLARIES (If applicable)			
Model name/number	RCH-30 Battery charger	Identification/Part number	87685
Manufacturer	Jotron As	Country of Origin	Norway

EXTREME CONDITIONS					
Extreme test voltages (Max)	NON GMDSS 8,4V GMDSS 8,4V	V	Extreme test voltages (Min)	8,4	V
Nominal DC Voltage	NON GMDSS 7,4V GMDSS 6,0V	V	DC Maximum Current	2	A
Maximum temperature	+55	°C	Minimum temperature	-20	°C

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Name: Frank Løke

Position held: Certification Manager M&E Date: 19.08.2016

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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Jotron AS Tron TR30 GMDSS and Maritime VHF Radio as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test

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1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.6 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: 810			
0	As supplied by manufacturer.	N/A	N/A
1	Modification of audio amplifier. Updated with circuit which secure below 1W in working radio mode. Modification of TX release, modified audio transient when turn off transmitter with monophone. Squelch open level in max position, changed to opens at sensitivity limit.	Arnt Løke	01/06/2016
2	Adjusted audio response receiver	Arnt Løke	14/07/2016
Serial Number: 1204			
0	As supplied by manufacturer.	N/A	N/A
Serial Number: 1322			
0	As supplied by manufactuer.	N/A	N/A
1	SW version 1.1.3	Jotron	12 August 2016
2	SW version 2.0.2b	TUV	22 August 2016

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

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SECTION 2

TEST DETAILS

Radio Testing of the
Jotron AS Tron TR30 GMDSS and Maritime VHF Radio
In accordance with IEC 61097-12

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2.1 PERFORMANCE REQUIREMENTS (NUA)

2.1.1 Specification Reference

IEC 61097-12, Clause 3, sub clauses as per Test Results below

2.1.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 1322 – Modification State 1 (SW Version 2.0.2b)
Fist Mic: Not serialised (TUV Ref.: 75933035-TSR0007) – Modification State 0

2.1.3 Date of Test

20 - 23 September 2016

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 Test Setup

The EUT was connected to the Fist Mic and tested on a bench under nominal office conditions.

2.1.6 Test Method

The test method used is identified in the “Method” column for each test; definitions are as follows:

Obs.: Observation
Meas.: Measurement

2.1.7 Environmental Conditions

	20 August	21 August	23 August
Ambient Temperature:	20.8 °C	20.5 °C	19.5 °C
Relative Humidity:	70.1 %	68.1 %	46.5 %

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2.1.8 Test Results

Note: The EUT was configurable either as a GMDSS radio or as a Non-GMDSS radio. The configuration was driven by the selection of battery.

Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3	Performance Requirements	-	-	-	-	
3.1	Introduction	In addition to meeting performance requirements in this clause, the equipment shall comply with the technical characteristics contained in clause 4 of this standard.	-	It is intended that compliance with all clauses can be demonstrated within the present document.	N/T	
3.2	General	-	-	-	-	
3.2.1	(A.809(19) 1/2.1)	The equipment shall be portable and capable of being used for on-scene communication between survival craft, between survival craft and ship and between survival craft and rescue unit. It may also be used for on-board communications when capable of operating on appropriate frequencies.	Obs.	The requirement was met.	Y	

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Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3.2.2	(A.809(19) 1/2.3)	The equipment shall: 1) be capable of being operated by unskilled personnel; 2) be capable of being operated by personnel wearing gloves as specified for immersion suits in regulation 33 of chapter III of the SOLAS 1974 Convention; 3) be capable of single-handed operation except for channel selection; 9) be of small size and light weight; 10) be capable of operating in the ambient noise level likely to be encountered on board ships or survival craft; 11) have provisions for its attachment to the clothing of the user, including the immersion suit; and 12) be resistant to deterioration by prolonged exposure to sunlight.	Obs.	1) The EUT was simple to use and its controls were laid out in an intuitive manner 2) See also TUV SUD document 75933035 Report 8 3) All controls were usable single-handedly 9) The requirement was considered to be met 10) The requirement was considered to be met 11) The EUT incorporated a belt clip 12) See Annex A (Solar Radiation report).	Y (L/T)	
3.2.3	(A.809(19) 1/2.3.13)	The equipment shall be either of a highly visible yellow/orange colour or marked with a surrounding yellow/orange marking strip.	Obs.	The EUT was predominantly a bright orange colour.	Y	
3.3	General requirements	-	-	-	-	
3.3.1	Composition (A.809(19) 1/2.2)	The equipment shall comprise at least: 1) an integral transmitter/receiver including antenna and battery; 2) an integral control unit including a press-to-transmit switch; 3) an internal microphone and loudspeaker.	Obs.	The requirement was met.	Y	
3.3.2	Controls and indicators	-	-	-	-	

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Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3.3.2.1	(A.809(19) 1/4.1)	An on/off switch shall be provided with positive visual indication that the radiotelephone is switched on.	Obs.	The requirement was met. The positive indication was the activation of the LCD screen (and backlight, if active); when the EUT was off the screen was blank.	Y	
3.3.2.2	(A.809(19) 1/4.2)	The receiver shall be provided with a manual volume control by which the audio output may be varied.	Obs.	The requirement was met.	Y	
3.3.2.3	(A.809(19) 1/4.3)	A squelch (mute) control and channel selection switch shall be provided.	Obs.	The requirement was met.	Y	
3.3.2.4	(A.809(19) 1/4.4)	Channel selection shall be easily performed and the channels shall be clearly discernible.	Obs.	The requirement was met.	Y	
3.3.2.5	(A.809(19) 1/4.5)	Channel indication shall be in accordance with appendix 18 of the Radio Regulations.	Obs.	The selectable channels were checked against the Radio Regulations Appendices Edition of 2012 (Appendix 18); they were as follows: 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 67, 68, 69, 71, 72, 73, 74, 77. N.B.: Six additional channels outside of Appendix 18 were available; they were L1, L2, L3, F1, F2 & F3. The channels were not editable by the user, the user manual stated "*Your sales representative can program required custom channels, if allowed by local authorities*".	Y (N.B.)	N.B.: See Results
3.3.2.6	(A.809(19) 1/4.6)	It shall be possible to determine that channel 16 has been selected in all ambient light conditions.	Obs.	The requirement was met visually with backlighting enabled in the menu, without backlighting enabled it was not possible to determine visibly however pressing the "16 c" button resulted in audible feedback that the channel had been selected. Even with the key volume set to zero there was still an audible 'pop' upon selecting Channel 16.	Y	
3.3.3	Antenna	-	-	-	-	
3.3.3	(A.809(19) 1/9)	The antenna shall be vertically polarized and, as far as practicable, be omnidirectional in the horizontal plane. The antenna shall be suitable for efficient radiation and reception of signals at the operating frequency.	-	See section 2.15 of the present document. In addition, further ERP measurements can be found in Annex B.	N/T	

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Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3.3.4	Safety precautions	-	-	-	-	
3.3.4.1	(A.809(19) 1/6)	The equipment shall not be damaged by the effect of open-circuiting or short-circuiting the antenna.	Meas.	The EUT was subjected to the following sequence: • Set to Channel 16 on high power • Transmit into a short circuit for 130 s* • Transmit into open circuit for 130 s* *Note that the EUT 'timed out' after 130 s of continuous transmission whereupon it stopped transmitting and the user was instructed to "release transmit key" The EUT was then subjected to a Performance Check, results can be found beneath this table.	Y	
3.3.4.2	(A.809(19) 1/2.3.8)	The equipment shall have no sharp projections which could damage survival craft.	Obs.	The requirement was met.	Y	
3.3.5	Frequency bands and channels	-	-	-	-	
3.3.5.1	(A.809(19) 1/3.1)	The two-way radiotelephone shall be capable of operation on the frequency 156,800 MHz (VHF CH 16) and on at least one additional channel.	Obs.	The requirement was met.	Y	
3.3.5.2	(A.809(19) 1/3.2)	All channels fitted shall be for single-frequency voice communication only.	Obs.	The available frequency list (above) was checked against Appendix 18, all stated channels were single frequency. N.B. The custom channels were all set as single frequency however with both Transmit and Receive frequencies listed it would indicated that the setting of two-frequency channels was supported.	Y (N.B.)	N.B.: See Results
3.3.5.3	(A.809(19) 1/3.3)	The class of emission shall be G3E to comply with appendix 19 of the Radio Regulations.	-	See Application Form declaration in section 1.3.	N/T	
3.3.6	Marking and identification	-	-	-	-	

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Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3.3.6	(A.809(19) 1/13)	In addition to the items specified in resolution A.694(17) on general requirements, as detailed in IEC 945, the following shall be clearly indicated on the exterior of the equipment: 1) brief operating instructions; 2) expiry date for the primary batteries.	Obs.	See TUV SUD document 75933035 Report 01 (Limited IEC 60945).	Y (L/T)	
3.3.7	Warming-up period	-	-	-	-	
3.3.7	(A.809(19) 1/5)	The equipment shall be operational within 5 s of switching on.	Meas.	A stop watch was used and the time to activate (holding the power button) was 2.0 s and the EUT was usable 1.2 s later for a total time of 3.2 s.	Y	
3.3.8	Power supply	-	-	-	-	
3.3.8.1	(A.809(19) 1/12.1)	The source of energy shall be integrated in the equipment and may be replaceable by the user. In addition, provision may be made to operate the equipment using an external source of electrical energy.	Obs.	The battery was user-replaceable and the system was supplied with two batteries; one primary (GMDSS, non-rechargeable) and one secondary (non-GMDSS, rechargeable). No external power supply was provided but a charging dock was and the EUT was operable with the secondary battery whilst charging.	Y	
3.3.8.2	(A.809(19) 1/12.2)	Equipment intended for the source of energy to be user replaceable shall be provided with a dedicated primary battery for use in the event of a distress situation. This battery shall be equipped with a non-replaceable seal to indicate that it has not been used.	Obs.	As per the above, the requirement was met. The user manual and battery labelling indicated that a seal was normally fitted to the GMDSS battery although one was not present on the tested sample.	Y	
3.3.8.3	(A.809(19) 1/12.3)	Equipment intended for the source of energy to be non-user-replaceable shall be provided with a primary battery. The portable two-way radiotelephone equipment shall be equipped with a non-replaceable seal to indicate that it has not been used.	Obs.	As per the above, the requirement was not applicable.	N/A	

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Clause	Requirement - Title Note 1	Requirement - Main extract	Method	Results	Compliance indicated (Y/N)	Comments
3.3.8.4	(A.809(19) 1/12.4)	The primary battery shall have sufficient capacity to ensure 8 h operation at its highest rated power with a duty cycle of 1: 9. The duty cycle is defined as 6 s transmission, 6 s reception above squelch opening level and 48 s reception below squelch opening level.	-	See section 2.2 of the present document.	N/T	
3.3.8.5	(A.809(19) 1/12.5)	Primary batteries shall have a shelf life of at least 2 years and if intended to be user replaceable shall be of a colour or marking as defined in 3.2.3.	-	See Annex C. Colour/marking: The GMDSS battery was predominantly a bright orange colour.	Y (L/T)	
3.3.8.6	(A.809(19) 1/12.6)	Primary or secondary batteries not intended for the use in the event of a distress situation shall be of a colour or marking so that they cannot be confused with batteries intended for such use.	Obs.	The non-GMDSS battery was predominantly black.	Y	
3.4	Environmental requirements	[*Various*]	-	See sections 2.3 – 2.13 of the present document.	-	
3.5	Electromagnetic compatibility	[*Various*]	-	See TUV SUD document 75933035 Report 1 (Limited IEC 60945).	-	

Note 1: Requirement title in brackets, e.g. “(A.809(19) 1/2.1)”, indicates a reference to IMO Resolutions and ITU Recommendations
L/T: Limited Test
N/A: Not Applicable
N/T: Not Tested
N.B.: Nota Bene - Special notes where qualitative requirements may not have been considered met but alternative interpretations or exceptional circumstances may have precluded declaring the result as non-compliant

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Performance Check (Ref Clause 3.3.4.1)

Requirement	Result	Limit
ERP at Max Power setting (dBm)*	27.53 dBm	Between 0.25 W and 25 W (24.0 to 44.0 dBm)
Frequency Error (Hz)	-103 Hz	± 1.5 kHz
Maximum Usable Sensitivity on CH16	- 5.1 dBµV (e.m.f)	< 6 dBµV (emf) Normal Conditions

Exhibits

Exhibit 1

Product Service

Exhibit 2

2.2 BATTERY

2.2.1 Specification Reference

IEC 61097-12, Clause 3.3.8.4

2.2.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.2.3 Date of Test

13 July 2016, 23 September 2016, 26 September 2016

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	20.6 - 23.6°C
Relative Humidity	51.2 – 69.2%

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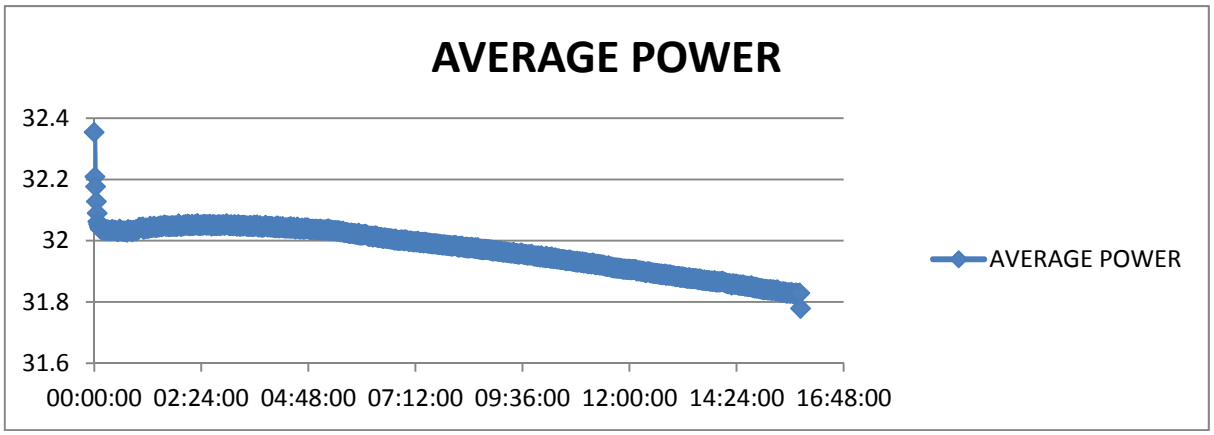
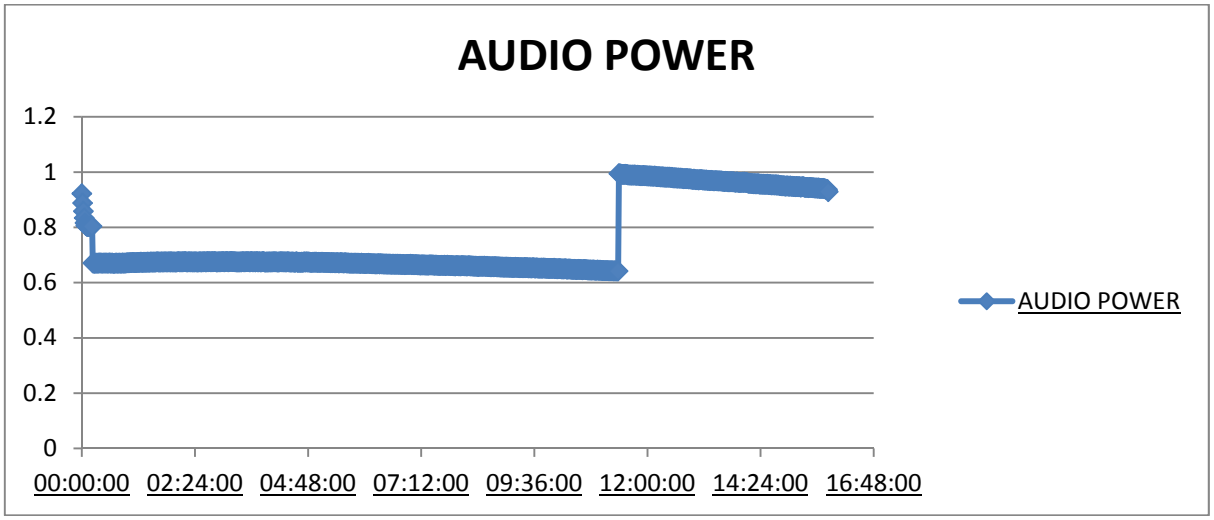
2.2.6 Test Results

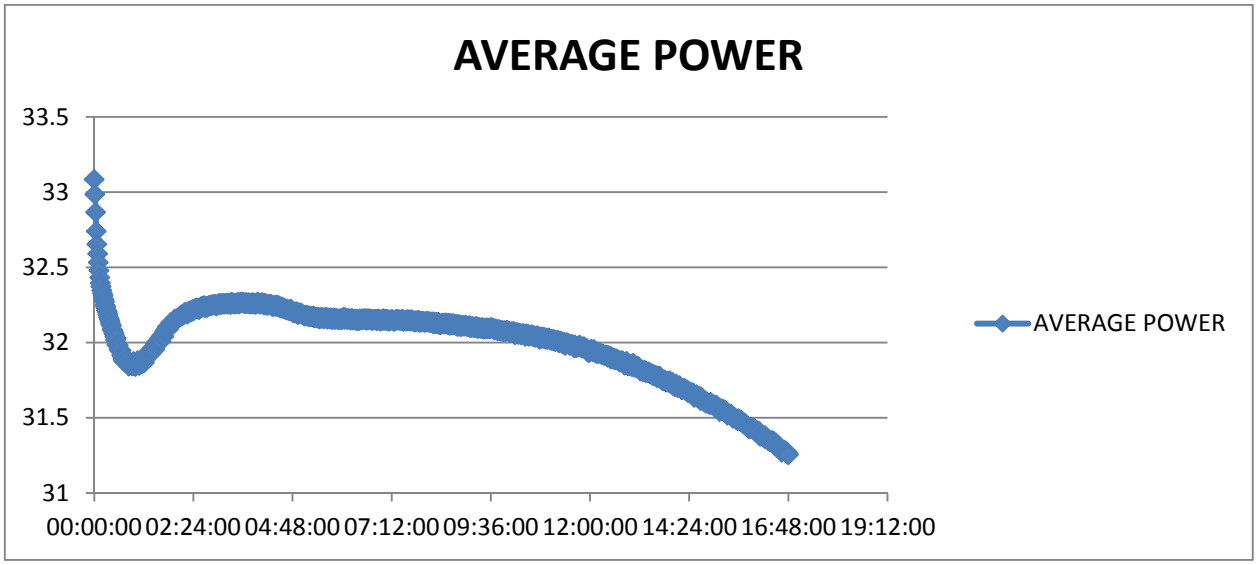
Ambient Temperature

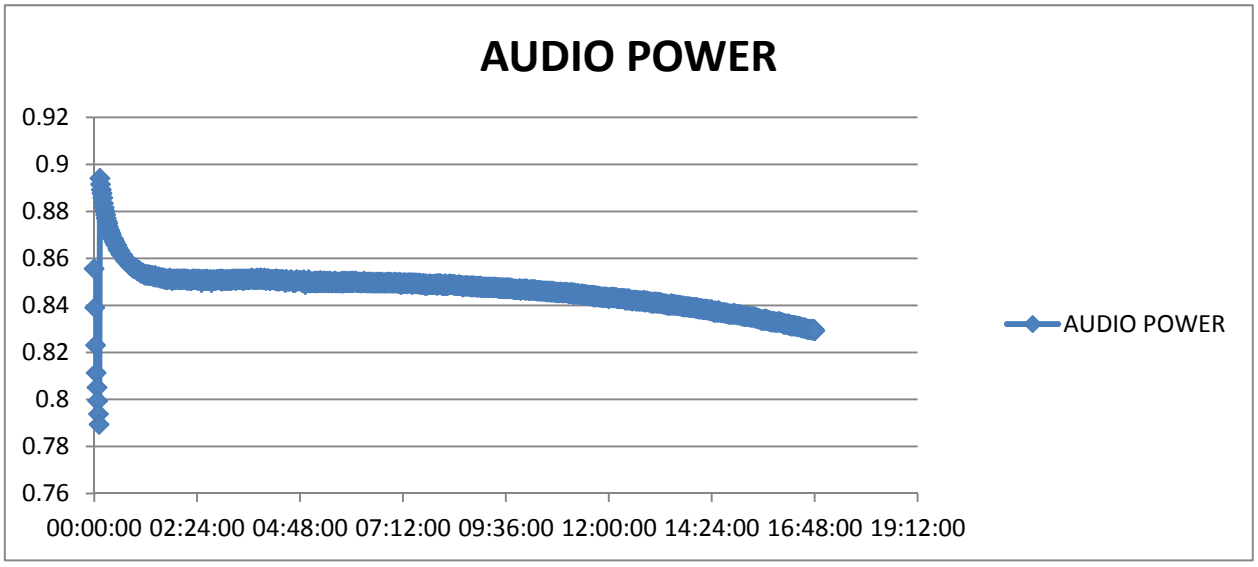




Product Service

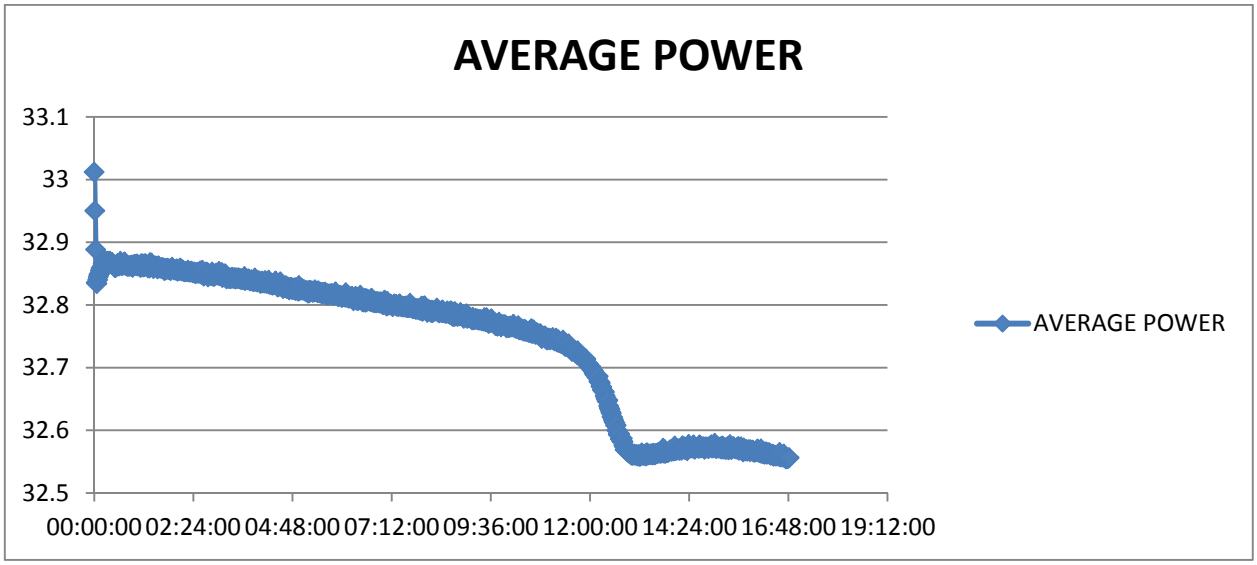
Low Temperature

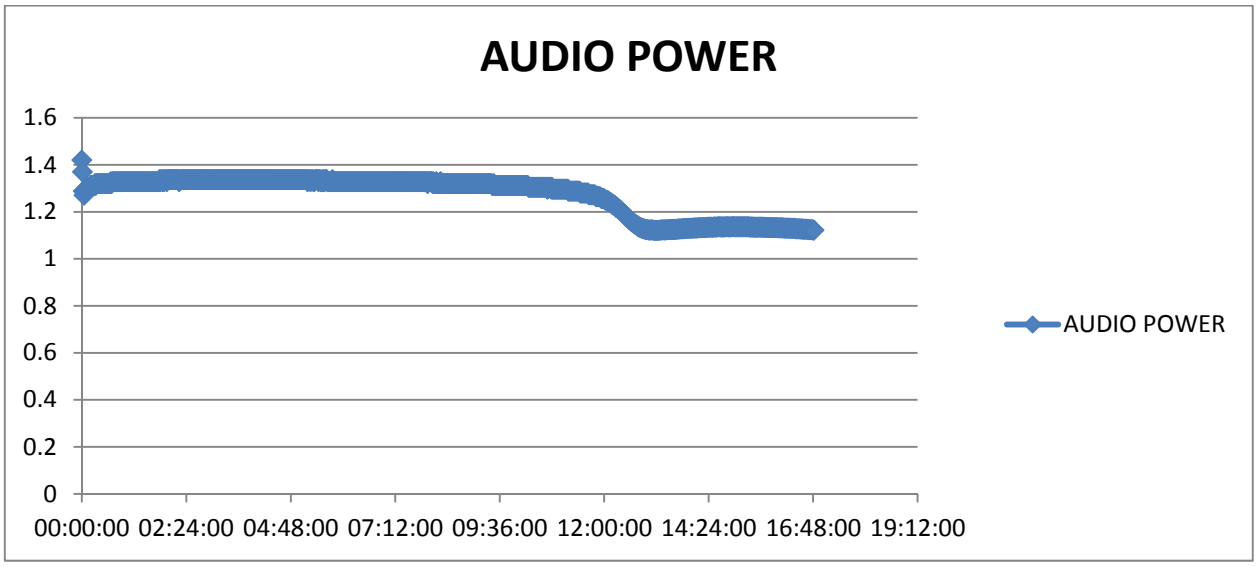




Product Service

High Temperature





Remarks

The battery test was terminated after approximately 16 hours and 45 minutes. At this point the EUT was still compliant with the minimum ERP requirement of 0.25W for all temperature conditions.

After 8 hours the RF power was recorded as 31.98 dBm for ambient conditions. A battery eliminator was then used and the voltage reduced until the same power was measured. This voltage was recorded as 5.97 V DC.

Product Service

Limit Clause 3.3.8.4

The primary battery shall have sufficient capacity to ensure 8 h operation at its highest rated power with a duty cycle of 1: 9. The duty cycle is defined as 6 s transmission, 6 s reception above squelch opening level and 48 s reception below squelch opening level.

2.3 DROP TEST

2.3.1 Specification Reference

IEC 61097-12, Clause 5.1.5.1

2.3.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.3.3 Date of Test

9 March 2016

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	22.3°C
Relative Humidity	31.8%

Product Service

2.3.6 Test Method

The EUT was dropped 6 times, once on each face of the EUT, from a height of 1 metre onto the test surface. The test surface consisted of a solid piece of hardwood with a minimum thickness of at least 15 cm, and a mass of at least 30 kg.

At the conclusion of the test, the EUT was subjected to a visual inspection and Performance Check.

Setup Photograph

Product Service

2.3.7 Test Results

The test was carried out satisfactorily.

Post Test Performance Check Results

Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
63	0.817	-5.5
Visual Inspection: Is there any visible damage or deterioration?		N

ERP was measured on channel 16 as the power on channel 17 is limited.

2.4 THERMAL SHOCK

2.4.1 Specification Reference

IEC 61097-12, Clause 5.1.5.2

2.4.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.4.3 Date of Test

9 March 2016

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	22.3°C
Relative Humidity	31.8%

Product Service

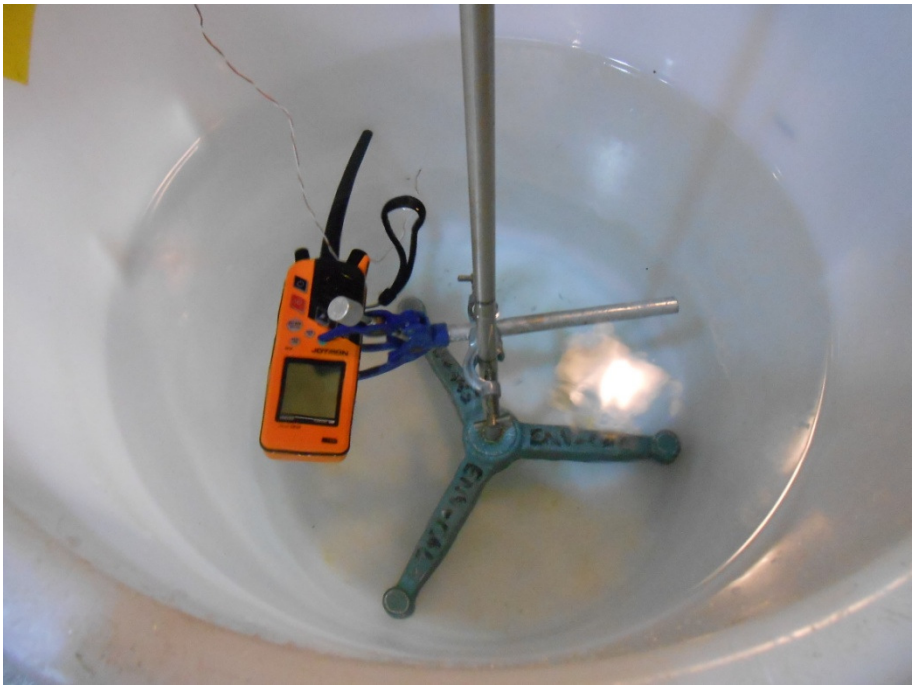
2.4.6 Test Method

The EUT was placed in the pre-conditioning climatic chamber at a temperature of +65°C for 1 hour.

The EUT was then immersed in water at a temperature of 20°C, at a level of 100mm below the surface of the water (measured to the highest point of the EUT), for a period of 1 hour.

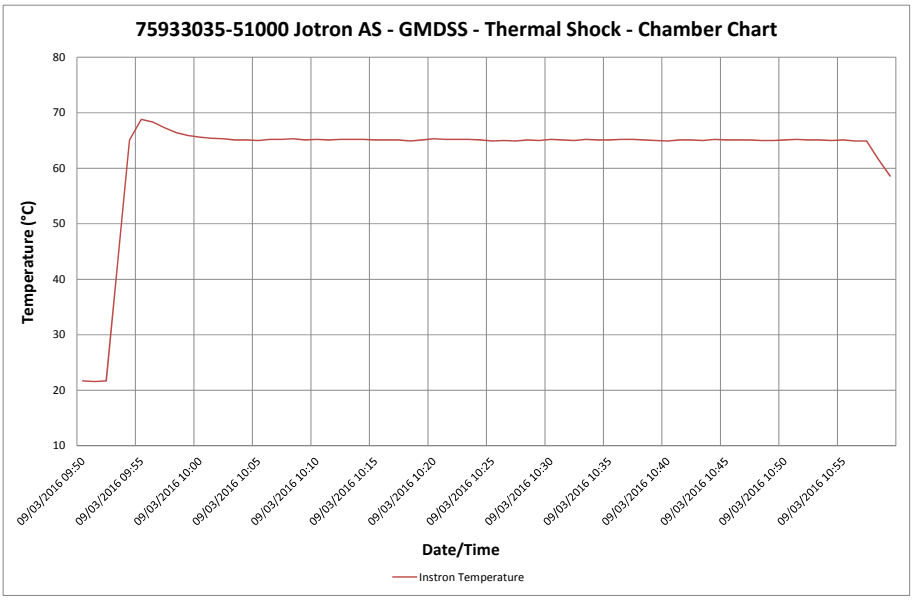
At the conclusion of the test, the EUT was subjected to a visual inspection and Performance Check.

Setup Photograph



Product Service

Preconditioning Temperature Plot



2.4.7 Test Results

Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Post Test Performance Check Results

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
65	0.867	-5.1
Visual Inspection: Is there any visible damage or deterioration?		N

ERP was measured on channel 16 as the power on channel 17 is limited.

2.5 IMMERSION

2.5.1 Specification Reference

IEC 61097-12, Clause 5.1.5.3

2.5.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.5.3 Date of Test

9 March 2016

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	22.3°C
Relative Humidity	31.8%

2.5.6 Test Method

The EUT was placed in a vessel as shown in the setup photograph(s). The unit was immersed to a depth of 1m of water for a period of 30 minutes.

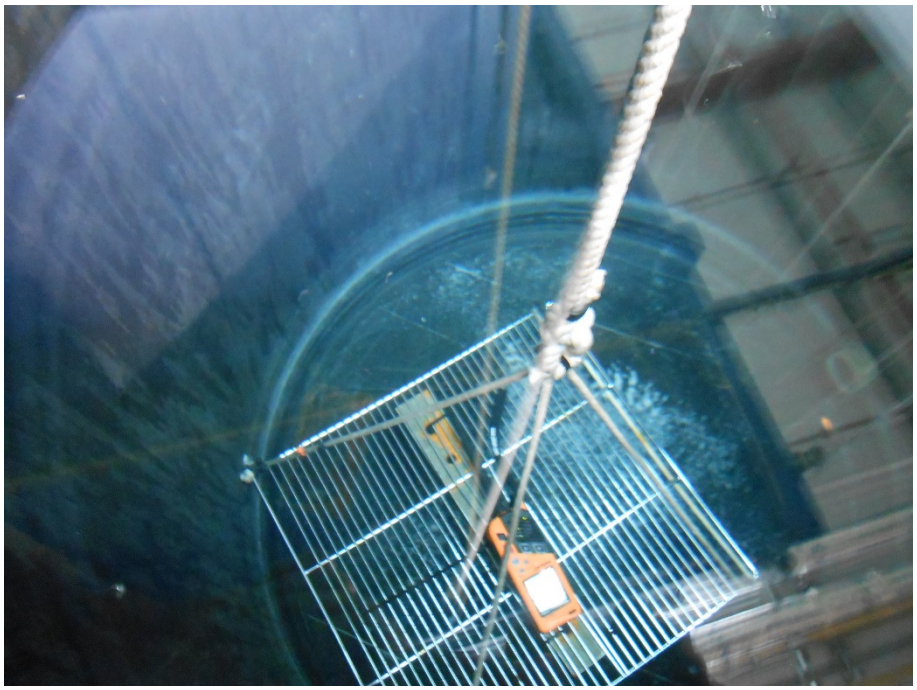
The EUT was weighed before and after the test to indicate if any ingress occurred.

Weight Before (kg)	0.31105
Weight After (kg)	0.31385

The difference in weight was attributed to absorption in the lanyards and trapped in seals and crevices on the EUT.

At the conclusion of the test, the EUT was subjected to a visual inspection and Performance Check.

Setup Photograph



Product Service

2.5.7 Test Results

The test was carried out satisfactorily.

Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Post Test Performance Check Results

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
63	0.817	-5.5
Visual Inspection: Is there any visible damage or deterioration?		N

ERP was measured on channel 16 as the power on channel 17 is limited.

Product Service

2.6 DRY HEAT

2.6.1 Specification Reference

IEC 61097-12, Clause 5.1.5.4

2.6.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.6.3 Date of Test

11 March 2016

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	21.8°C
Relative Humidity	37.1%

2.6.6 Test Method

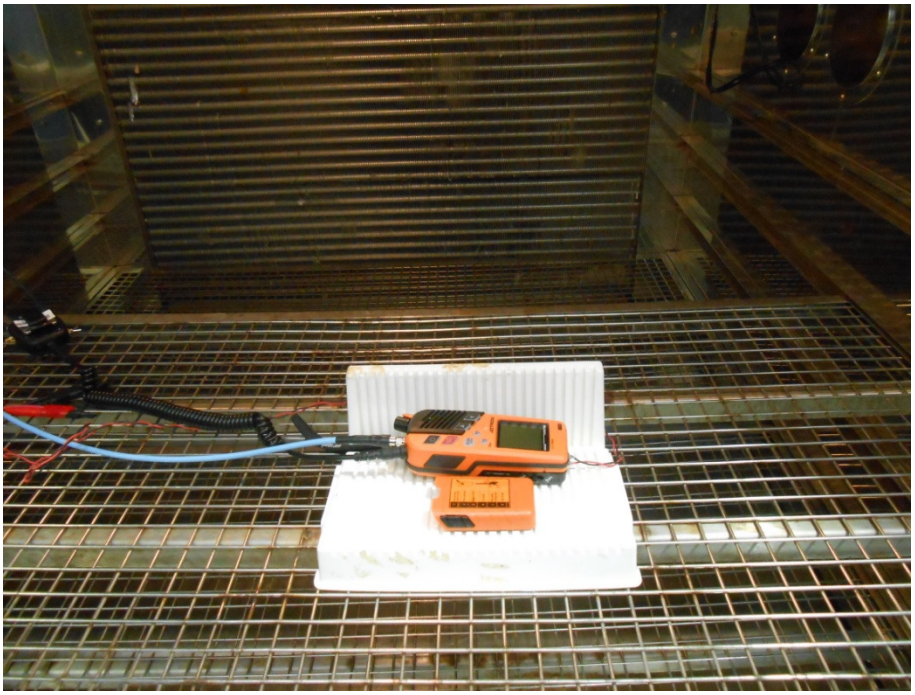
The EUT was placed in a climatic chamber at laboratory ambient conditions. With the EUT powered off the chamber was raised to and maintained at +70 °C for a period of approximately 12 hours. The temperature of the chamber was then lowered to +55 °C (within 20 minutes) and when this temperature was reached the EUT was powered on. The lower temperature of +55 °C was maintained for 3 hours, during this time the EUT transmitter was keyed with a duty cycle of 5 minutes transmission and 5 minutes reception for a period of two hours and subjected to a performance test; on completion, the chamber was reduced to laboratory ambient conditions.

Product Service

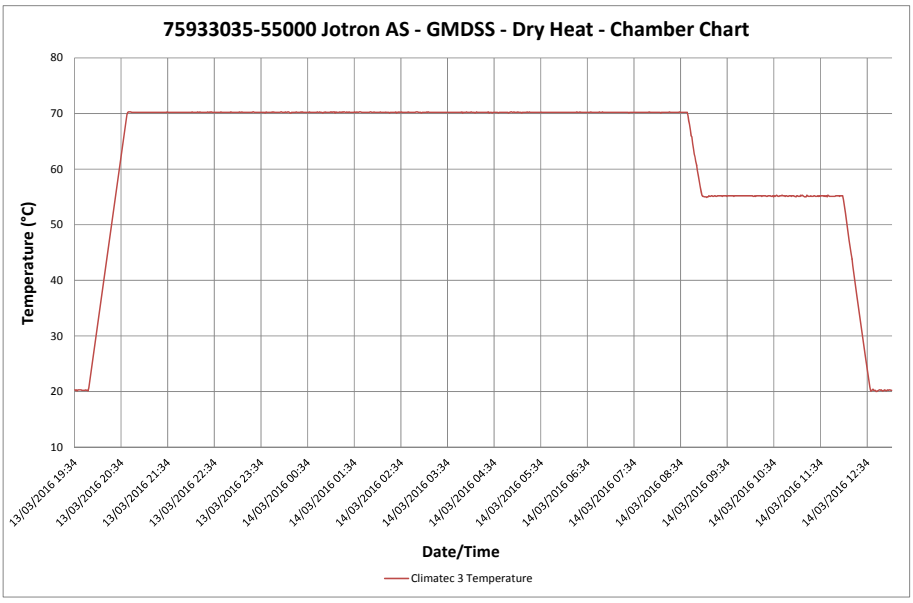
2.6.7 Test Results

The test was carried out satisfactorily.

Setup Photograph – Low temperature, Damp Heat, Dry Heat



Temperature Plot



Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Performance Check Results

	Frequency Error (Hz) Limit: ≤± 1.5 kHz		Output Power (W) Limit: Between 0.25 - 25 W		MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)	
Storage	4.2 V DC	108	4.2 V DC	0.423	4.2 V DC	-5.0
	7.2 V DC	135	7.2 V DC	0.929	7.2 V DC	-5.1
Functional	4.2 V DC	71	4.2 V DC	0.433	4.2 V DC	-4.1
	7.2 V DC	86	7.2 V DC	0.955	7.2 V DC	-4.2
Visual Inspection: Is there any visible damage or deterioration?				N		

ERP was measured on channel 16 as the power on channel 17 is limited.

Product Service

2.7 DAMP HEAT

2.7.1 Specification Reference

IEC 61097-12, Clause 5.1.5.5

2.7.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.7.3 Date of Test

15 March 2016

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	21.8°C
Relative Humidity	32.5%

2.7.6 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 a period of 3 hours. After 15 hours, the EUT was switched on and kept active for 2 hours with a keyed duty cycle of 5 minutes transmission and 5 minutes reception. A performance check was carried out during the 2 hour period.

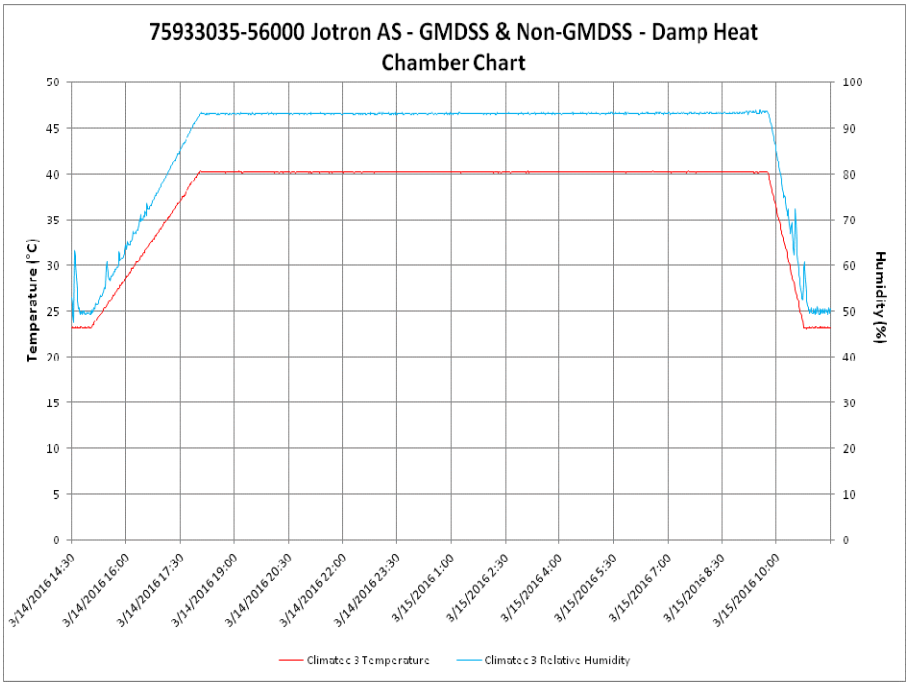
Product Service

2.7.7 Test Results

The test was carried out satisfactorily.

For setup photograph see Dry Heat Cycle.

Temperature Plot



Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Performance Check Results

Frequency Error (Hz) Limit: ≤± 1.5 kHz		Output Power (W) Limit: Between 0.25 - 25 W		MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)	
4.2 V DC	56	4.2 V DC	0.411	4.2 V DC	-4.5
7.2 V DC	72	7.2 V DC	0.979	7.2 V DC	-4.6
Visual Inspection: Is there any visible damage or deterioration?				N	

ERP was measured on channel 16 as the power on channel 17 is limited.

Product Service

2.8 LOW TEMPERATURE

2.8.1 Specification Reference

IEC 61097-12, Clause 5.1.5.6

2.8.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.8.3 Date of Test

17 March 2016

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	21.8°C
Relative Humidity	32.5%

2.8.6 Test Method

The EUT was placed in a climatic chamber at laboratory ambient conditions. With the EUT powered off the chamber was reduced to -30 °C for a period of approximately 12 hours. The temperature of the chamber was then raised to -20 °C (within 30 minutes). After 1 hour the EUT was powered on and subjected to a performance check. This higher temperature of -20 °C was maintained for a further hour.

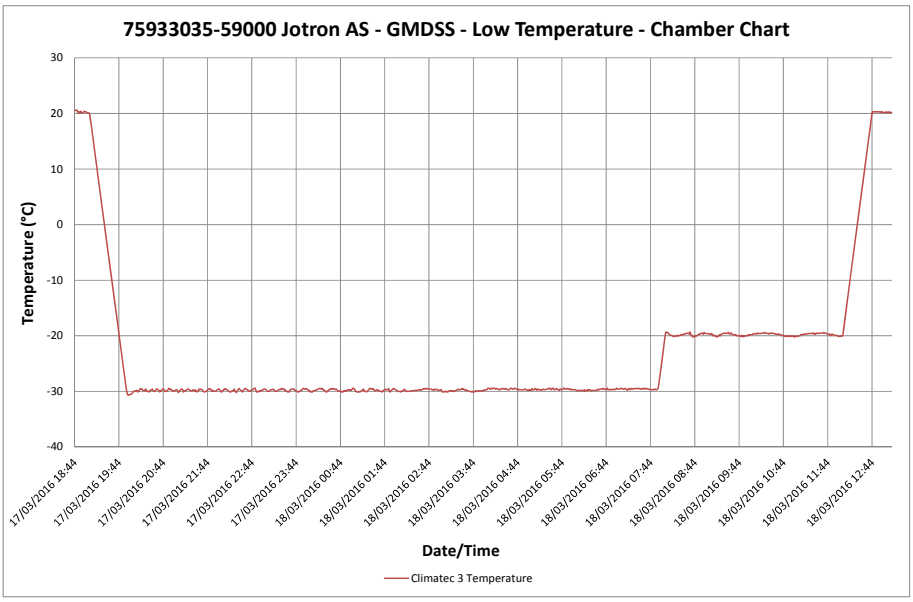
Product Service

2.8.7 Test Results

The test was carried out satisfactorily.

For setup photograph see Dry Heat Cycle.

Temperature Plot



Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Performance Check Results

	Frequency Error (Hz) Limit: ≤± 1.5 kHz		Output Power (W) Limit: Between 0.25 - 25 W		MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)	
Storage	4.2 V DC	44	4.2 V DC	0.430	4.2 V DC	-5.1
	7.2 V DC	-25	7.2 V DC	0.995	7.2 V DC	-5.2
Functional	4.2 V DC	-25	4.2 V DC	0.406	4.2 V DC	-6.6
	7.2 V DC	3	7.2 V DC	1.002	7.2 V DC	-6.4
Visual Inspection: Is there any visible damage or deterioration?				N		

ERP was measured on channel 16 as the power on channel 17 is limited.

Product Service

2.9 VIBRATION

2.9.1 Specification Reference

IEC 61097-12, Clause 5.1.5.7

2.9.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.9.3 Date of Test

21 March 2016

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	21.8°C
Relative Humidity	34.6%

2.9.6 Test Method

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

<u>Resonance Sweep</u>

– 5 Hz and up to 13.2 Hz with an excursion of ±1 mm (7 m/s² maximum acceleration at 13.2 Hz);
– above 13.2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s².

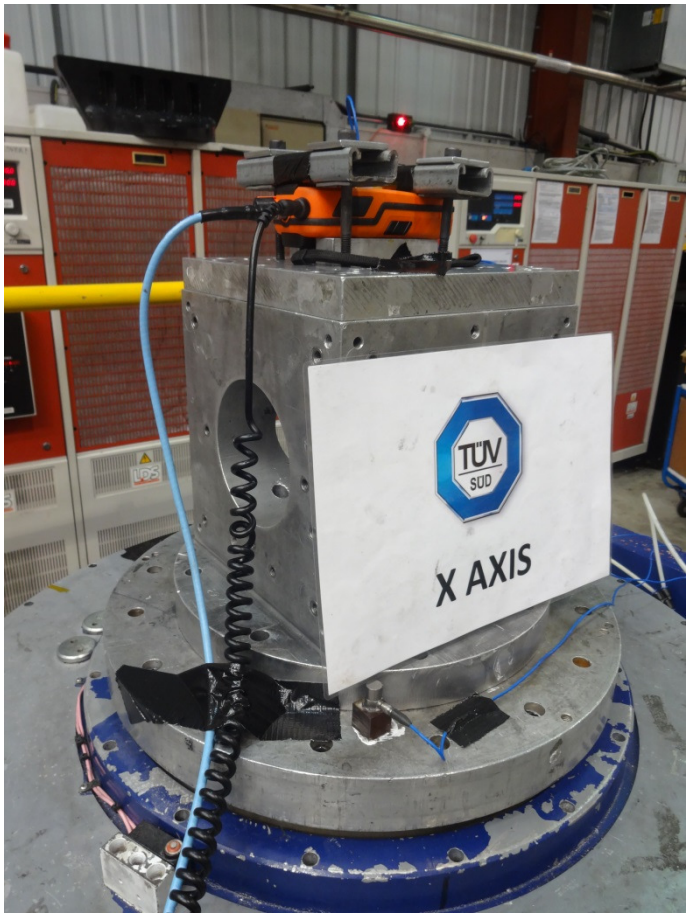
One sweep was performed at a rate of 0.5 octaves / minute.

The EUT was subjected to a 2 hour endurance run at 30Hz for each axis as no resonances were detected.

The EUT was subjected to a performance check in each axis. At the conclusion of the test the EUT was inspected for any mechanical degradation.

Product Service

Setup Photograph (X axis)



Product Service

Setup Photograph (Y axis)

Setup Photograph (Y axis)

Product Service

2.9.7 Test Results

The test was carried out satisfactorily.

Performance Check: Transmitter frequency error, carrier power and receiver maximum usable sensitivity on Channel 17. The limits are taken from IEC 61097-12, clause 5.1.4.

Transmitter tests are performed with the EUT set to maximum power.

Performance Check Results

Vibration Axis: X

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
PC1 = 110, PC2 = 113	PC1 0.826, PC2 = 0.817	PC1= -5.1, PC2 = -5.2
Visual Inspection: Is there any visible damage or deterioration?		N

Vibration Axis: Y

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
PC1 = 106, PC2 = 110	PC1 0.813, PC2 = 0.805	PC1= -5.1, PC2 = -5.3
Visual Inspection: Is there any visible damage or deterioration?		N

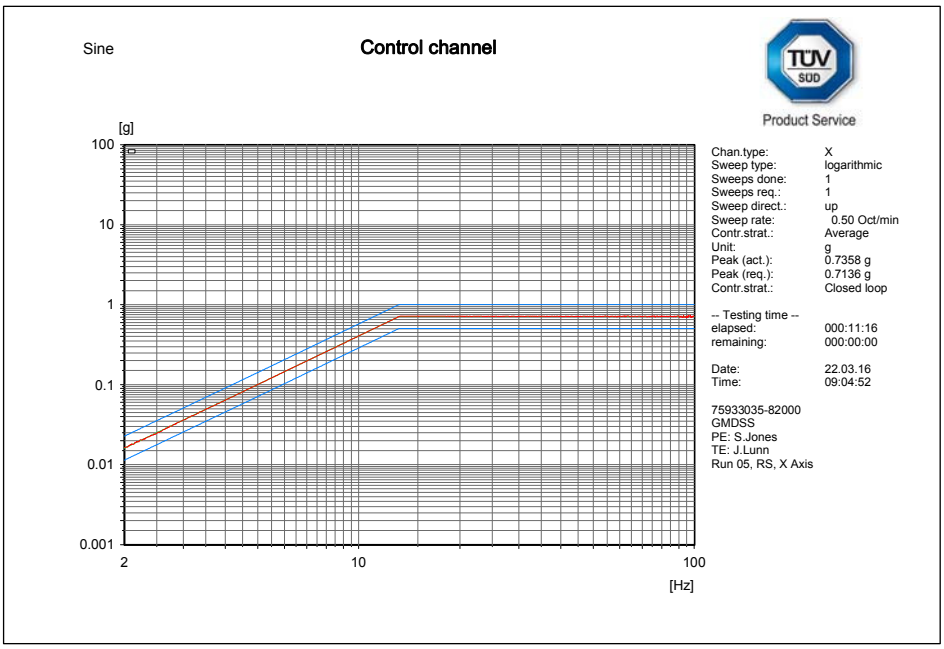
Vibration Axis: Z

Frequency Error (Hz) Limit: ≤± 1.5 kHz	Output Power (W) Limit: Between 0.25 - 25 W	MUS(dBµV(emf)) Limit: ≤+6dBµV(emf)
PC1 = 123, PC2 = 113	PC1 0.847, PC2 = 0.838	PC1= -5.3, PC2 = -5.2
Visual Inspection: Is there any visible damage or deterioration?		N

ERP was measured on channel 16 as the power on channel 17 is limited.

Two performance checks are required during vibration testing as described in EN 60945: PC1 = Performance check carried out during the vibration test. PC2 = Performance check carried out towards the end of the vibration test.

Product Service



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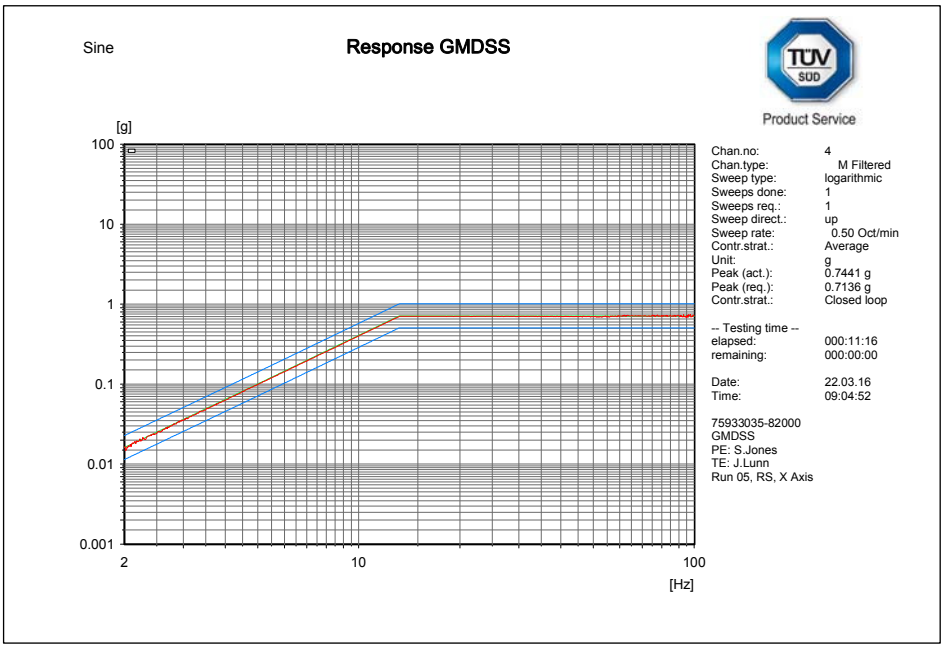
X axis resonance search (control plot)



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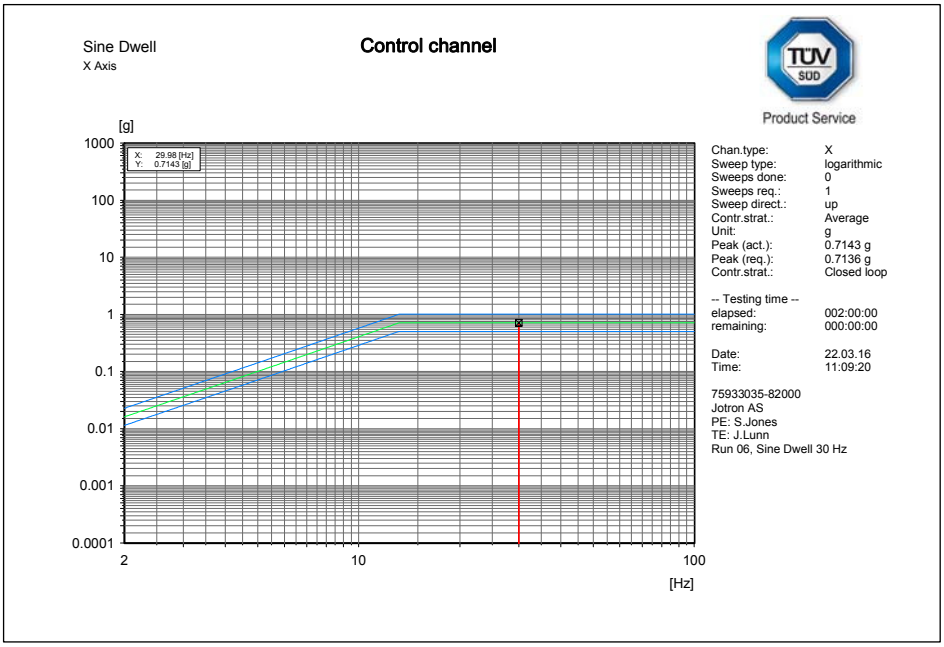
X axis resonance search (EUT plot)

Product Service



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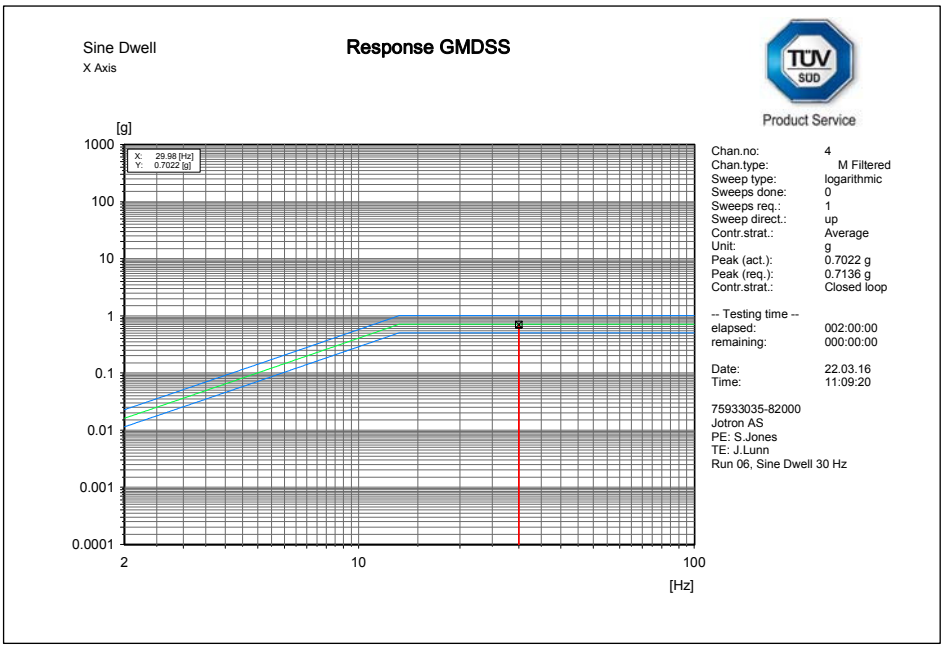
X axis endurance run (control plot)



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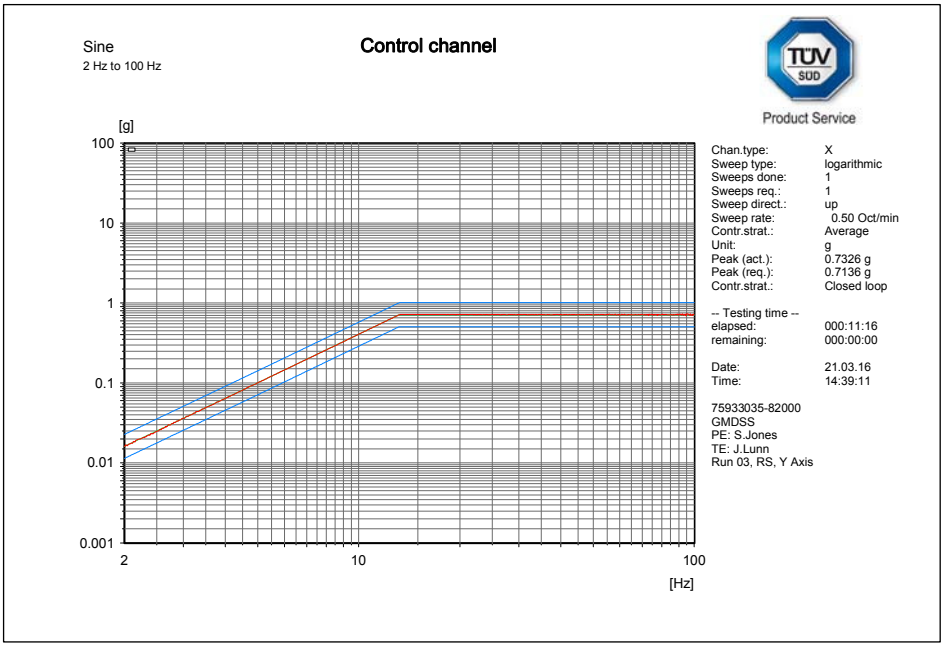
X axis endurance run (EUT plot)

Product Service



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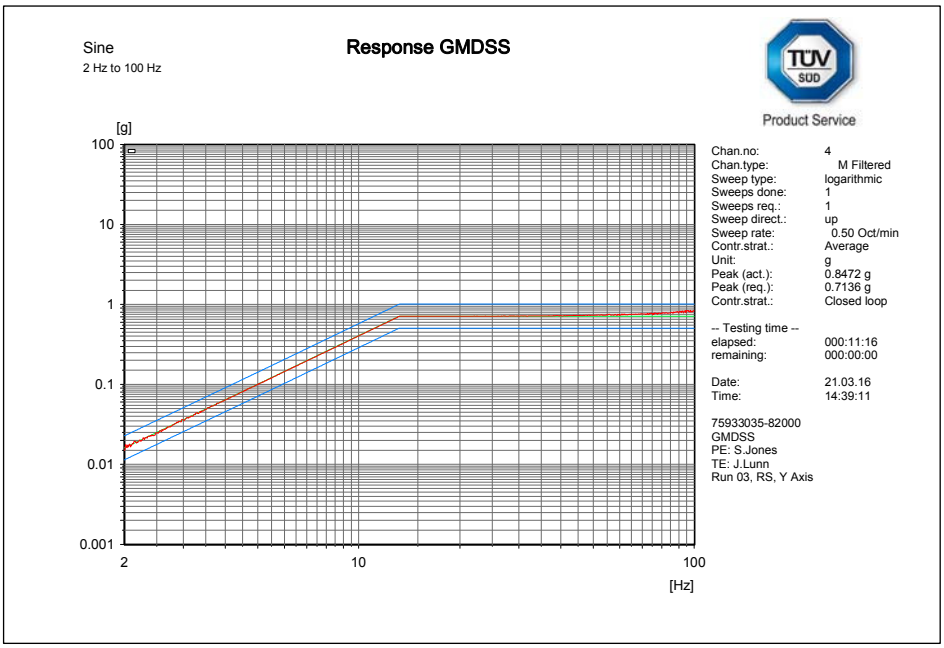
Y axis resonance search (control plot)



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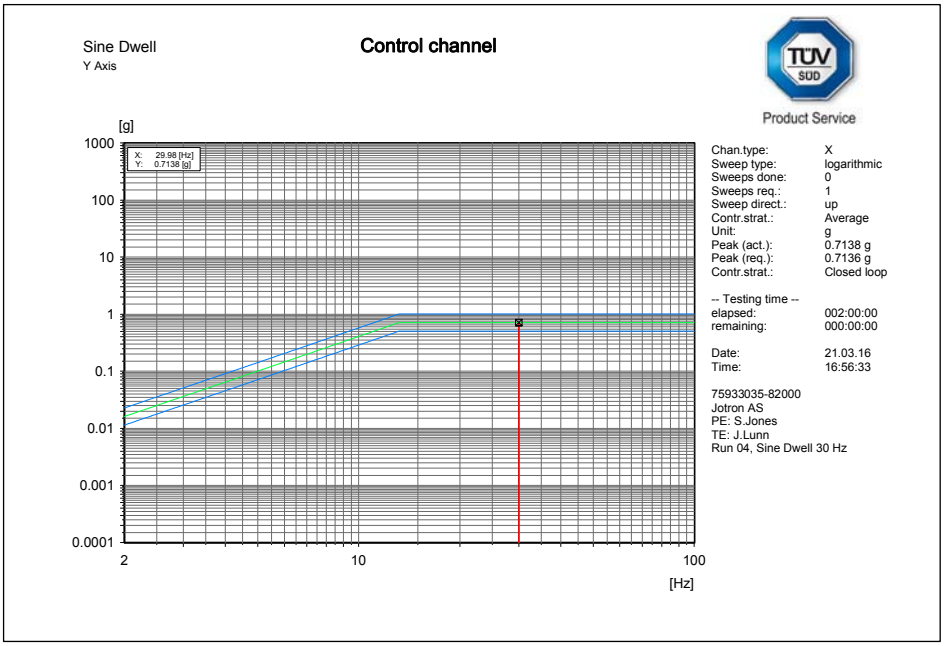
Y axis resonance search (EUT plot)



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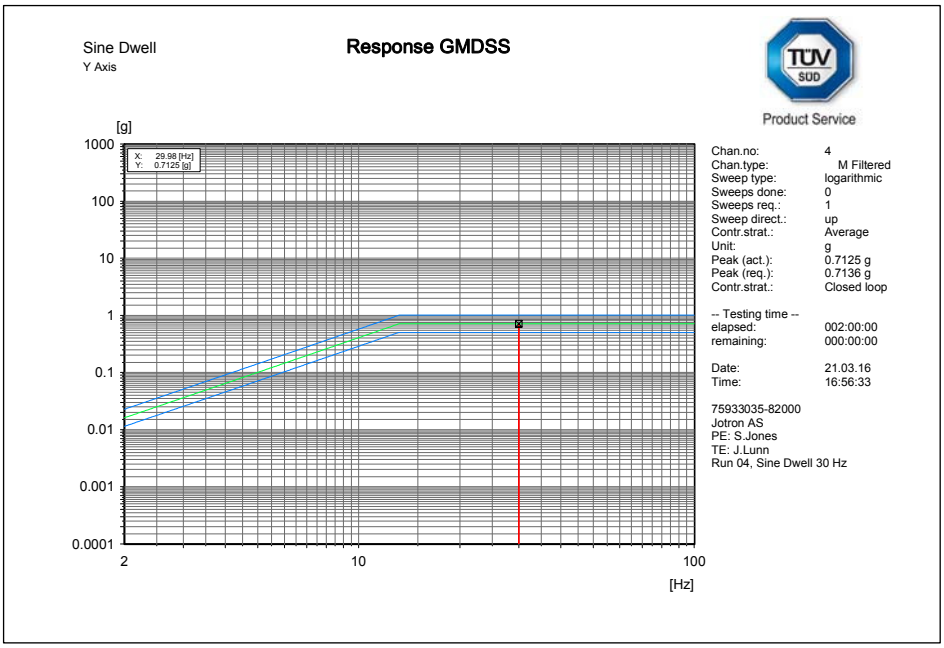
Y axis endurance run (control plot)



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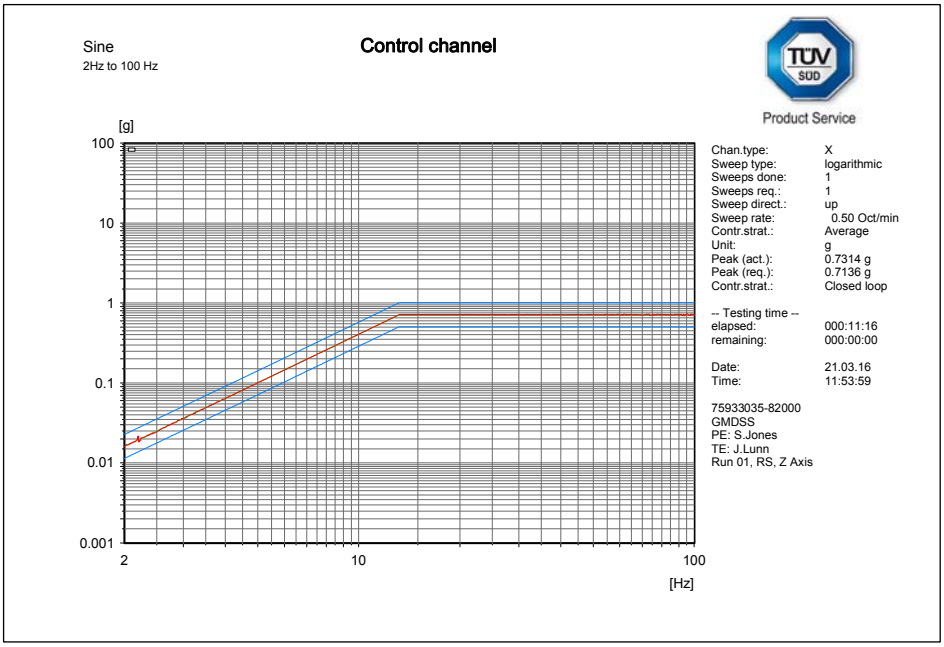
Y axis endurance run (EUT plot)

Product Service



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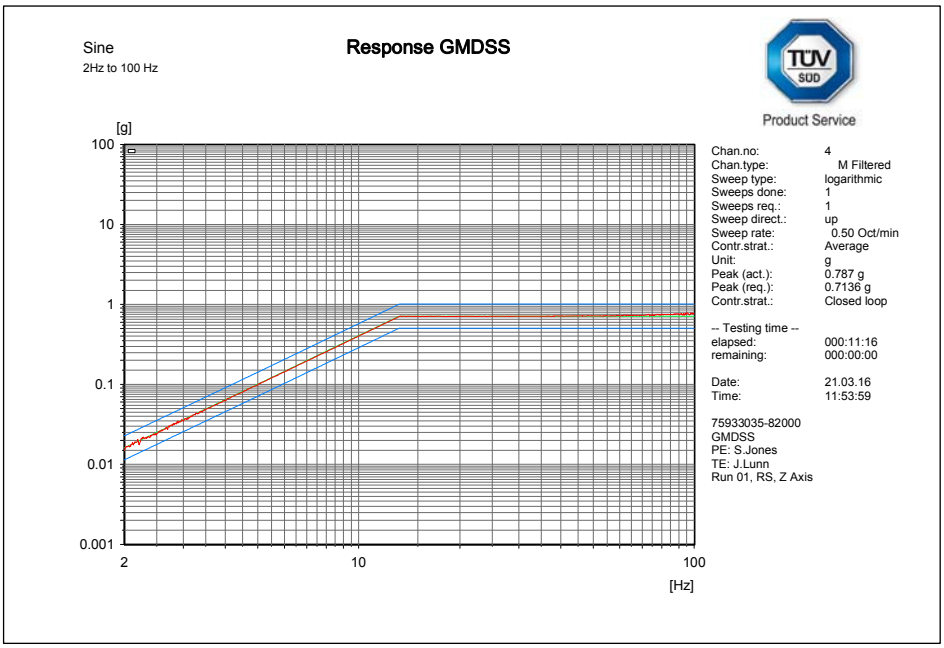
Z axis resonance search (control plot)



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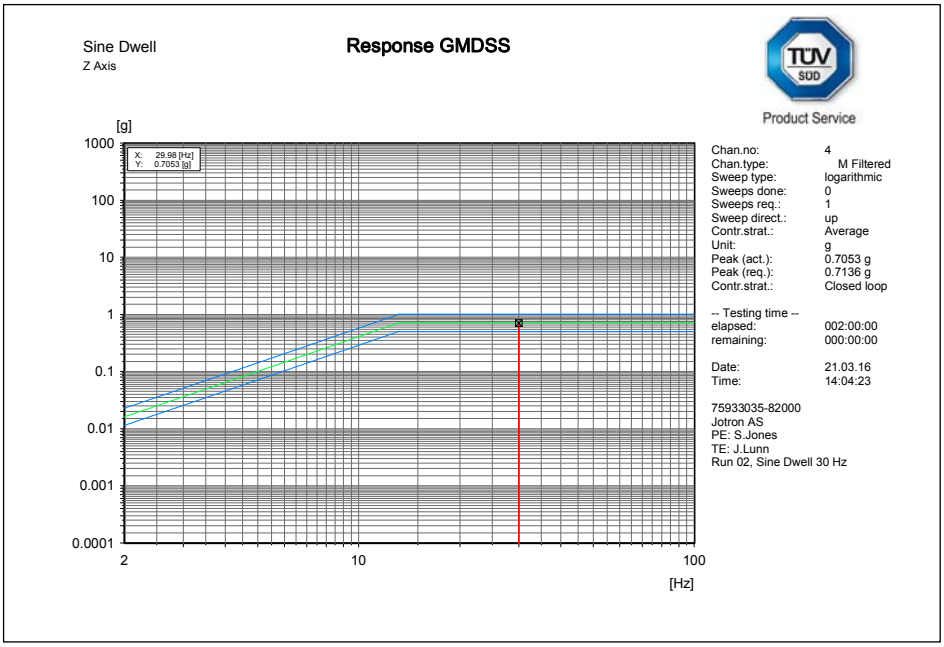
Z axis resonance search (EUT plot)

Product Service



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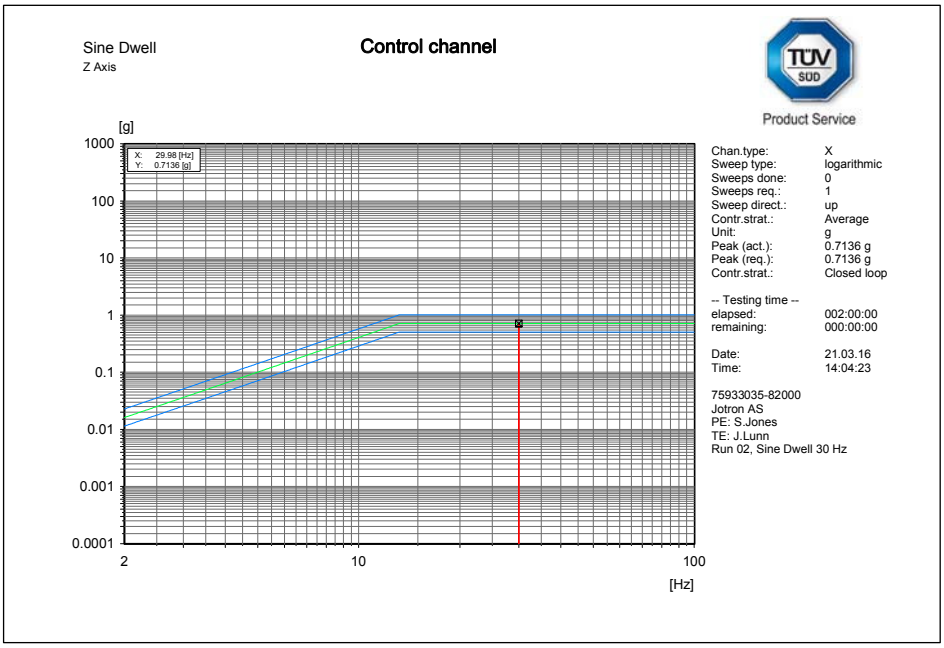
Z axis endurance run (control plot)



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Z axis endurance run (EUT plot)

2.10 OIL RESISTANCE TEST

2.10.1 Specification Reference

IEC 61097-12, Clause 5.1.5.8

Not Tested

2.11 SOLAR RADIATION

2.11.1 Specification Reference

IEC 61097-12, Clause 5.1.5.9

2.11.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio

2.11.3 Test Results

This test was sub-contracted, details of the test and its results can be found in Test Report Ref: 6P05223 Jotron.pdf.

2.12 MOULD GROWTH

2.12.1 Specification Reference

IEC 61097-12, Clause 5.1.5.10

2.12.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio

2.12.3 Test Results

This test was sub-contracted, details of the test and its results can be found in Test Report Ref: 15533.

Product Service

2.13 CORROSION

2.13.1 Specification Reference

IEC 61097-12, Clause 5.1.5.10

2.13.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 1001 - Modification State 0

2.13.3 Date of Test

5 May 2016

2.13.4 Test Equipment Used

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

2.13.5 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	25.2%

2.13.6 Test Method

The EUT was placed in a chamber and sprayed with a salt solution for 1 h at normal temperature. The salt solution was prepared by dissolving (5 ± 1) parts by weight of sodium chloride (NaCl) in 95 parts by weight of distilled or demineralised water. pH value was confirmed to be between 6.57 and 6.98 at 20 °C ± 2 °C throughout the test.

At the end of the spraying period, the EUT was placed in a chamber which was maintained at a temperature of 40 °C ± 2 °C, and a relative humidity between 90 % and 95 % for a period of seven days.

The EUT was subjected to a test comprising four spraying periods, each of duration 1 h, with a storage period of seven days after each.

At the conclusion of the test, the EUT was subjected to a visual inspection and Performance Check.

2.13.7 Test Results

The test was carried out satisfactorily.

Sample composition check data for salt solution:

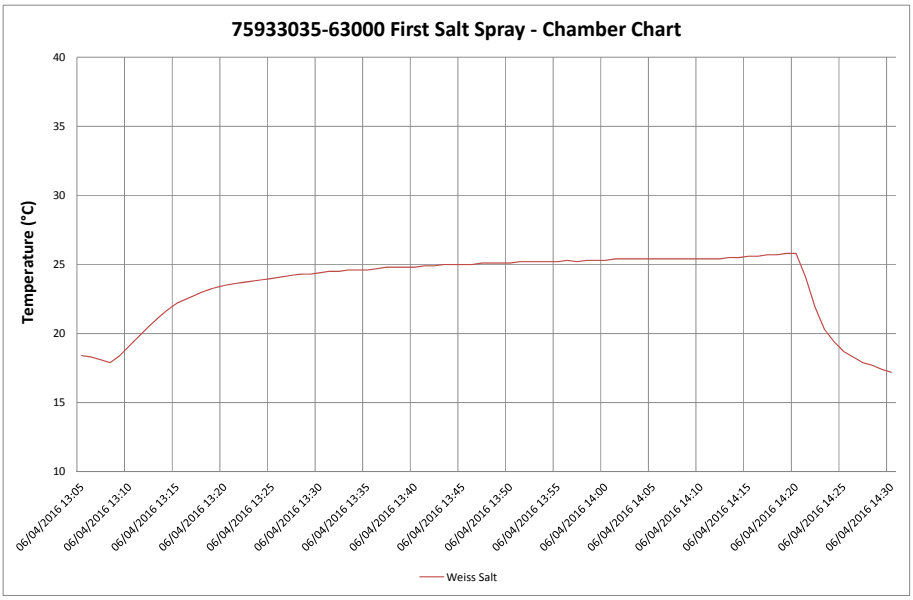
Check Ref	Salt Solution Concentration (%)	Salt Solution Depositions	Salt Solution pH
1	5.1	1.2ml / 80cm^2 / hr	6.57 (at 21.2°C)
4	5.2	1.2ml / 80cm^2 / hr	6.98 (at 21.8°C)

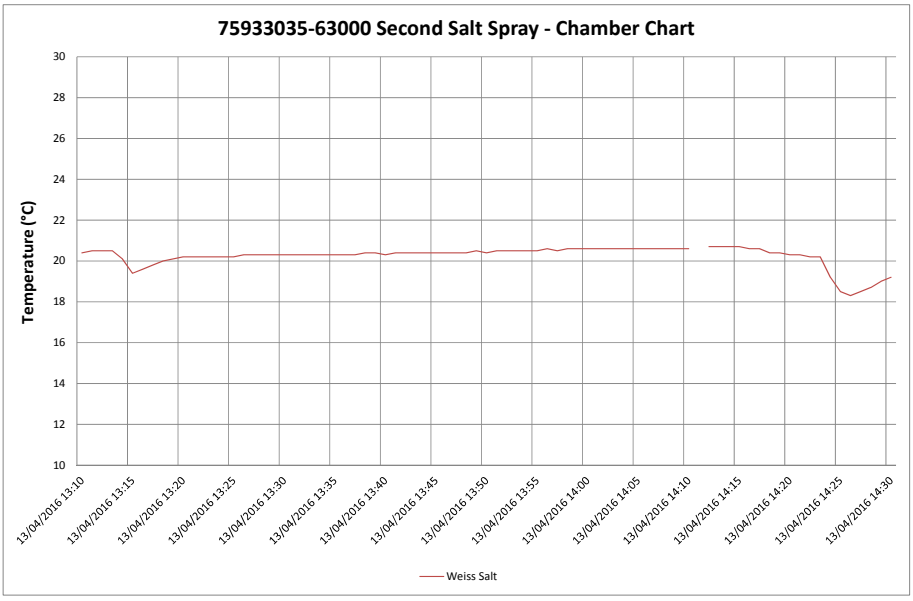
Test Setup Photo – Salt Spray Chamber

Test Setup Photo for Storage Period not available.

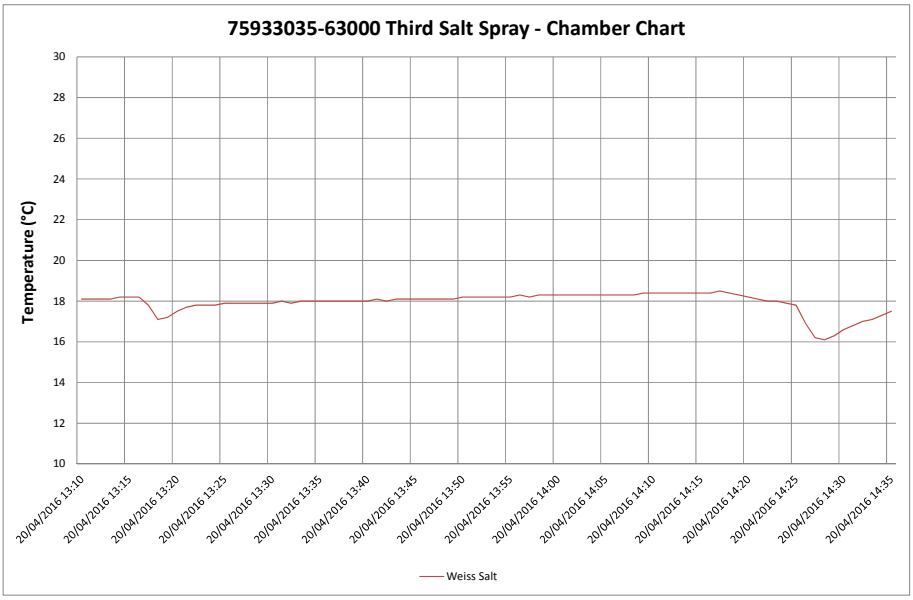
Product Service

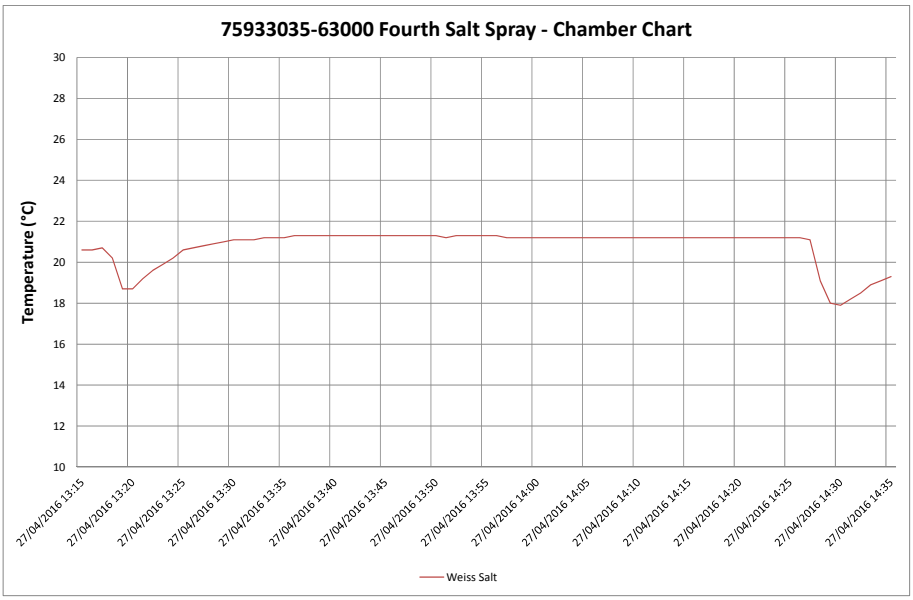
Salt Spray Chamber Plots





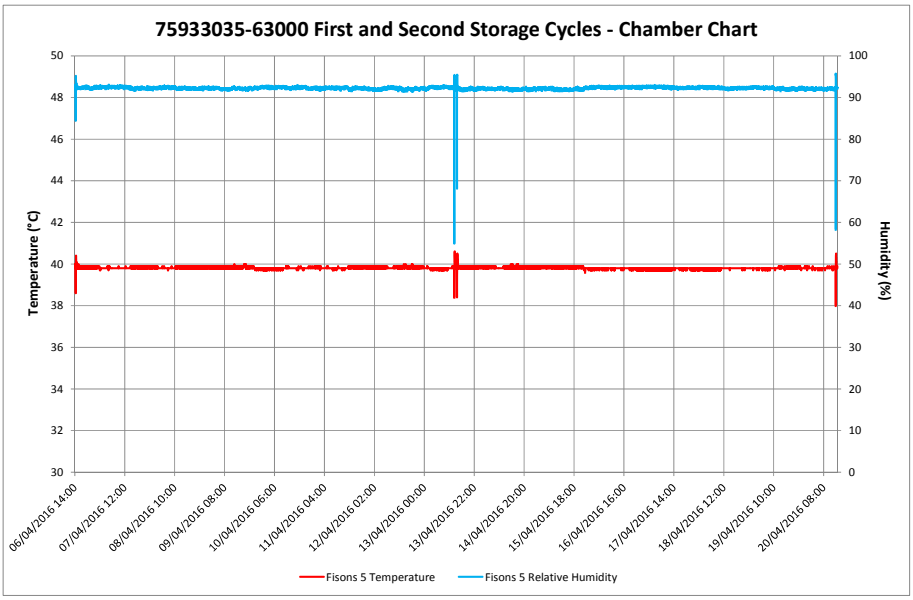
Product Service

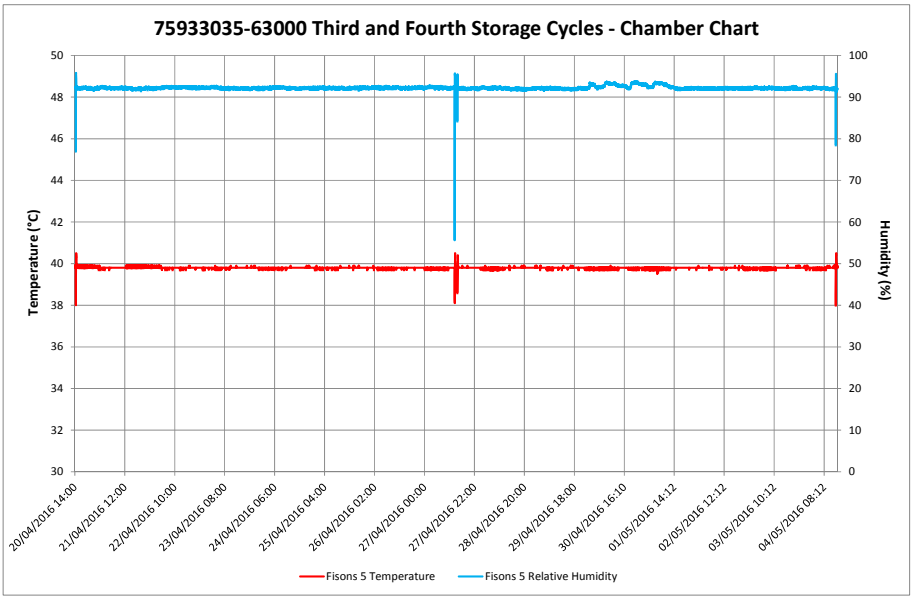




Product Service

Storage Chamber Plots





Product Service

Post Test Performance Check Results

Parameter	Result
Visible deterioration or corrosion	See *Inspection and Observations* below
Evidence of moisture penetration	None Observed
Transmitter Output Power (W)	0.752
Transmitter Frequency Error (kHz)	0.394
Receiver Sensitivity (dBuV emf)	-5.4

Product Service

Inspection and Observations

On completion of the test the EUT was subjected to an inspection. There were signs of some corrosion on some fixings and salt deposits, as shown in the photos below. Additionally, at the end of the performance check the antenna and mic cover was re-attached but whilst tightening the mic cover, the plastic split and became stuck in the mic input.

The manufacturer declared that this deterioration was not an effect of the corrosion test and has supplied a justification letter to support the test report (Annex B).

Product Service

Product Service

Product Service

2.14 FREQUENCY ERROR

2.14.1 Specification Reference

IEC 61097-12, Clause 5.4.1

2.14.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.14.3 Date of Test

6 April 2016

2.14.4 Test Equipment Used

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

2.14.5 Environmental Conditions

Ambient Temperature 23.2°C
Relative Humidity 26.4%

2.14.6 Test Results

Maximum Rated output power – 2.0 W

Test Conditions		Frequency Error (kHz)
		156.800 MHz
T_{nom}(+23.2°C)	V_{nom}(6.0 V DC)	0.012
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	0.091
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	0.012
Maximum freq. error (Hz)		0.091

Limit Clause 5.4.1.3

Normal and extreme conditions	± 1.5 kHz

2.15 EFFECTIVE RADIATED POWER

2.15.1 Specification Reference

IEC 61097-12, Clause 5.4.2

2.15.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.15.3 Date of Test

10 May 2016 & 6 July 2016

2.15.4 Test Equipment Used

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

2.15.5 Environmental Conditions

Ambient Temperature 17.4 - 21.8°C
Relative Humidity 36.9 - 56.2%

2.15.6 Test Results

6.0 V DC Supply

Test Frequency	Transmitter Power (W)	Antenna Polarisation
156.850 MHz	0.51	Vertical

The EUT has a power reduction switch	Yes

Limit Clause 5.4.2.3

Under normal test conditions	With the output power switch set at maximum, shall remain between 0.25W and 25W.
	When the e.r.p exceeds 1 W the EUT shall have a power reduction switch.

Product Service

2.16 CARRIER POWER

2.16.1 Specification Reference

IEC 61097-12, Clause 5.4.3

2.16.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 2

2.16.3 Date of Test

15 July 2016

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 Environmental Conditions

Ambient Temperature 23.9°C
Relative Humidity 53.6%

2.16.6 Test Results

Maximum Rated output power – 2.0 W

Test Conditions		Transmitter Power (W)		e.r.p (Power + Antenna Gain) (W)
		156.800 MHz	156.850 MHz	
T_{nom}(+21.8 °C)	V_{nom}(6.0 V DC)		1.84	0.51
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	1.82		0.51
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	1.91		0.53

e.r.p measured under clause 5.4.2 (W)	Conducted Transmitter Power measured under clause 5.4.3 (W)	Calculated Antenna Gain (dBi)
0.51	1.84	-5.54

Limit Clause 5.4.3.3

Under normal test conditions	With the output power switch set at maximum, shall remain between 0.25W and 25W.

Minimum Rated output power – 1.0 W

Test Conditions		Transmitter Power (W)		e.r.p (Power + Antenna Gain) (W)
		156.800 MHz	>156.850 MHz	
T_{nom}(+21.8 °C)	V_{nom}(6.0 V DC)		1.44	0.40
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	1.43		0.40
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	1.32		0.37

Limit Clause 5.4.3.3

Under normal test conditions	With the output switch set at minimum, shall remain between 0.25W and 1W.

A lower supply voltage of 5.97 V DC was used as this was the voltage equivalent to that of the battery at the end of the 8 hour battery test as defined in ETSI EN 300 225.

Product Service

2.17 MAXIMUM PERMISSIBLE FREQUENCY DEVIATION

2.17.1 Specification Reference

IEC 61097-12, Clause 5.4.4.2

2.17.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.17.3 Date of Test

29 March 2016

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 21.8°C
Relative Humidity 30.1%

2.17.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Modulation Frequency (Hz)	Maximum Deviation (kHz)
	156.800 MHz
100	1.98
200	2.79
300	3.15
400	3.36
500	3.49
1000	4.00
1500	4.26
2000	4.40
2500	4.54
3000	4.25
Maximum Deviation (kHz)	4.54

Limit Clause 5.4.4.2.2

Maximum Permissible Frequency Deviation	± 5.0 kHz

Product Service

2.18 REDUCTION OF FREQUENCY DEVIATION AT MODULATION FREQUENCIES ABOVE 3 kHz

2.18.1 Specification Reference

IEC 61097-12, Clause 5.4.4.3

2.18.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.18.3 Date of Test

29 March 2016

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 21.8°C
Relative Humidity 30.1%

2.18.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Modulation Frequency(Hz)	Frequency Deviation
	156.800 MHz
	(kHz)
3000	4.00
4000	3.03
5000	2.05
6000	1.20
8000	0.53
10000	0.33
12000	0.26
15000	0.04
20000	0.04
25000	0.04
Maximum Deviation (kHz)	4.00

Product Service

Limit Clause 5.4.4.3.2

For modulation frequencies between 3 kHz and 6 kHz the frequency deviation shall not exceed the frequency deviation with a modulation frequency of 3 kHz. For a modulation frequency of 6 kHz, the frequency deviation shall not exceed ± 1.5 kHz. For modulation frequencies between 6 kHz and 25 kHz, the frequency deviation shall not exceed that given by a linear response of frequency deviation (in dB) against modulation frequency, starting at the point where the modulation frequency is 6 kHz and the frequency deviation is ± 1.5 kHz and inclined at 14 dB per octave , with the frequency deviation diminishing as the modulation frequency increases.

For frequencies above 6.0 kHz the following table applies:

kHz	6.0	8.0	10.0	12.0	15.0	20.0	25.0
Limit	≤ 1.50	≤ 0.77	≤ 0.46	≤ 0.30	≤ 0.18	≤ 0.09	≤ 0.05

Product Service

2.19 LIMITATION CHARACTERISTICS OF THE MODULATOR

2.19.1 Specification Reference

IEC 61097-12, Clause 5.4.5

2.19.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.19.3 Date of Test

11 May 2016 & 25 May 2016

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	22.3 - 22.5°C
Relative Humidity	32.8 - 65.2%

2.19.6 Test Results

Test Conditions		Frequency Deviation (kHz)
		156.800 MHz
T_{nom}(+22.3°C)	V_{nom}(6.0 V DC)	3.63
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	4.07
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	4.33

Limit Clause 5.4.5.3

The Frequency Deviation shall be between ± 3.5 kHz and ± 5.0 kHz

Product Service

2.20 SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE

2.20.1 Specification Reference

IEC 61097-12, Clause 5.4.6

2.20.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.20.3 Date of Test

18 May 2016

2.20.4 Test Equipment Used

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

2.20.5 Environmental Conditions

Ambient Temperature	23.2°C
Relative Humidity	36.8%

2.20.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Internal Microphone

Frequency Deviation Given By Acoustic I/P Signal at 1kHz at a Level of 94 dBa relative to 2 x 10^{-5} Pa (kHz)	156.800 MHz
	1.967

External Microphone (Monophone)

Frequency Deviation Given By Acoustic I/P Signal at 1kHz at a Level of 94 dBa relative to 2 x 10^{-5} Pa (kHz)	156.800 MHz
	2.603

Limit Clause 5.4.6.3

Limit	Between ±1.5 kHz and ±3 kHz

Product Service

2.21 AUDIO FREQUENCY RESPONSE

2.21.1 Specification Reference

IEC 61097-12, Clause 5.4.7

2.21.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.21.3 Date of Test

11 May 2016

2.21.4 Test Equipment Used

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

2.21.5 Environmental Conditions

Ambient Temperature 22.3°C
Relative Humidity 65.1%

2.21.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Modulation Frequency (Hz)	Deviation (relative to 1 kHz) dB
	156.800 MHz
300	-1.34
400	-1.88
500	-1.41
600	-0.38
800	0.18
1000	0 (ref)
1500	-0.14
2000	-0.62
2500	-1.33
3000	-2.32

Limit Clause 5.4.7.3

Limit	+ 1 dB, -3 dB

Product Service

2.22 AUDIO FREQUENCY HARMONIC DISTORTION OF THE EMISSION

2.22.1 Specification Reference

IEC 61097-12, Clause 5.4.8

2.22.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.22.3 Date of Test

20 May 2016

2.22.4 Test Equipment Used

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

2.22.5 Environmental Conditions

Ambient Temperature 21.3°C
Relative Humidity 51.3%

2.22.6 Test Results

Maximum Rated output power – 2.0 W

Test Conditions		Modulation Frequencies (Hz)	Audio Frequency Harmonic Distortion (%)
			156.800 MHz
T_{nom}(21.3°C)	V_{nom}(6.0 V DC)	300	7.26
		1000	2.49
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	1000	4.95
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	1000	2.61

Limit Clause 5.4.8.3

Audio Frequency Harmonic Distortion	≤ 10 %

Product Service

2.23 RESIDUAL MODULATION OF THE TRANSMITTER

2.23.1 Specification Reference

IEC 61097-12, Clause 5.4.11

2.23.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.23.3 Date of Test

11 May 2016

2.23.4 Test Equipment Used

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

2.23.5 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	65.2%

2.23.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Residual Modulation (dB)	156.800 MHz
	-45.56

Limit Clause 5.4.11.3

Limit	≤ -40 dB

Product Service

2.24 ADJACENT CHANNEL POWER

2.24.1 Specification Reference

IEC 61097-12, Clause 5.4.9

2.24.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.24.3 Date of Test

30 March 2016

2.24.4 Test Equipment Used

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

2.24.5 Environmental Conditions

Ambient Temperature 22.7°C
Relative Humidity 30.7%

2.24.6 Test Results

Maximum Rated output power – 2.0 W

6.0 V DC Supply

Measurement Offset	Adjacent Channel Power (dBc)
	156.800 MHz
+25 kHz	-73.4
-25 kHz	-74.7

Limit Clause 5.4.9.3

The adjacent channel power shall not exceed a value of 70 dB below the carrier power of the transmitter or 0.2 μW

2.25 CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA

2.25.1 Specification Reference

IEC 61097-12, Clause 5.4.10

2.25.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.25.3 Date of Test

13 May 2016

2.25.4 Test Equipment Used

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

2.25.5 Environmental Conditions

Ambient Temperature 23.7°C
Relative Humidity 45.7%

2.25.6 Test Results

Maximum Rated output power – 2.0 W

Transmitter operating

6.0 V DC Supply

156.800 MHz

Frequency (MHz)	Emission result (dBm)
*	

*No emissions found were detected within a 6 dB margin of the limit.

Limit Clause 5.4.10.3

Frequency range	150 kHz to 1 GHz	1 GHz to 2 GHz
Transmitter operating	≤ 0.25 μW (-36.0 dBm)	≤ 1 μW (-30.0 dBm)

Product Service

2.26 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER

2.26.1 Specification Reference

IEC 61097-12, Clause 5.4.12

2.26.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 1

2.26.3 Date of Test

5 July 2016

2.26.4 Test Equipment Used

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

2.26.5 Environmental Conditions

Ambient Temperature 22.0°C
Relative Humidity 56.9%

2.26.6 Test Results

Maximum Rated output power – 2.0 W

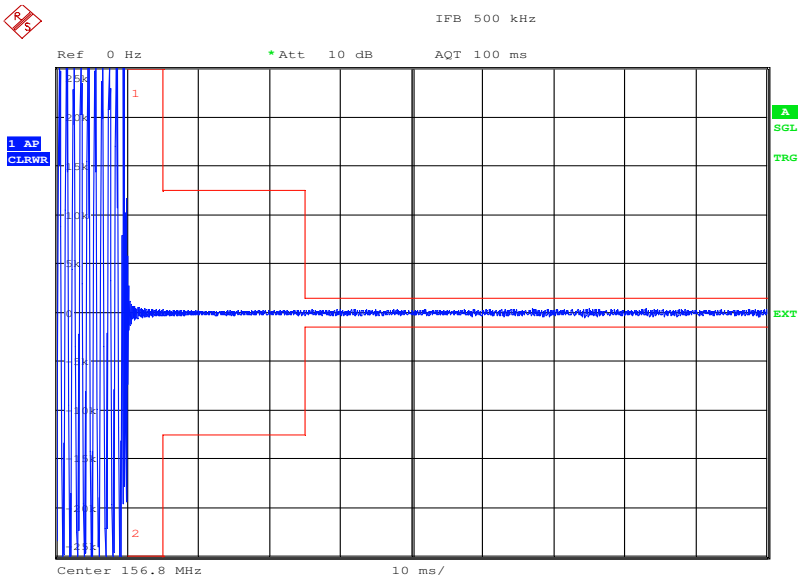
6.0 V DC Supply

Transient Periods	Frequency Difference (kHz)
	156.800 MHz
t1	7.64
t2	0.20
t3	15.27

Confirm that during the periods t1 and t3 the frequency difference does not exceed 25 kHz	Y
Confirm that during the period t2 the frequency difference does not exceed 12.5 kHz	Y
Confirm that after the period t2 and before the start of t3 the frequency difference is within ±1.5 kHz.	Y

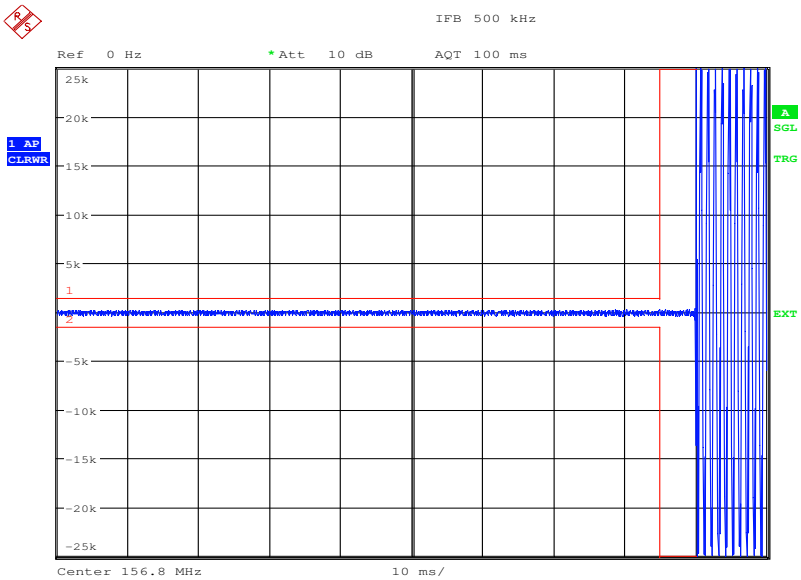
Product Service

Switch On



Date: 5.JUL.2016 16:15:33

Switch Off



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Limit Clause 5.4.12.3

Transient Periods	
t1 (ms)	5.0
t2 (ms)	20.0
t3 (ms)	5.0

Product Service

2.27 HARMONIC DISTORTION AND RATED AUDIO FREQUENCY OUTPUT POWER

2.27.1 Specification Reference

IEC 61097-12, Clause 5.5.1

2.27.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.27.3 Date of Test

20 May 2016 & 5 July 2016

2.27.4 Test Equipment Used

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

2.27.5 Environmental Conditions

Ambient Temperature	20.7 - 23.3°C
Relative Humidity	36.8 - 57.1%

2.27.6 Test Results

Measurement performed at handset earphone

Test Conditions		Test Signal Level (dBµV)	F_{mod} (Hz)	Harmonic Distortion (%)
F_n = 156.800 MHz				
T_{nom}(+21.1°C)	V_{nom}(6.0 V DC)	100	300	8.47
			1000	4.07
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	3.38
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	4.05
F_n = 156.800 MHz + 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	3.55
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	2.77
F_n = 156.800 MHz - 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	3.49
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	3.73

Limit Clause 5.5.1.3

Normal and extreme conditions	≤10 %

Product Service

Measurement performed at handset earphone

Test Conditions		Test Signal Level (dBµV)	F_{mod} (Hz)	Audio Frequency Output Power (mW)
F_n = 156.800 MHz				
T_{nom}(+21.1°C)	V_{nom}(6.0 V DC)	100	300	4.4
			1000	19.4
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	20.7
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	23.5
F_n = 156.800 MHz + 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	22.6
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	25.5
F_n = 156.800 MHz - 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	19.9
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	20.2

Limit Clause 5.5.1.3

Normal and extreme conditions	≥1 mW

Product Service

Measurement performed at loudspeaker

Test Conditions		Test Signal Level (dBµV)	F_{mod} (Hz)	Harmonic Distortion (%)
F_n = 156.800 MHz				
T_{nom}(+20.7°C)	V_{nom}(6.0 V DC)	100	300	8.77
			1000	2.24
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	3.98
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	6.26
F_n = 156.800 MHz + 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	3.56
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	6.06
F_n = 156.800 MHz - 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	4.64
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	6.70

Limit Clause 5.5.1.3

Normal and extreme conditions	≤10 %

Product Service

Measurement performed at loudspeaker

Test Conditions		Test Signal Level (dBµV)	F_{mod} (Hz)	Harmonic Distortion (%)
F_n = 156.800 MHz				
T_{nom}(+20.7°C)	V_{nom}(6.0 V DC)	100	300	221.9
			1000	278.8
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	216.8
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	236.3
F_n = 156.800 MHz + 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	245.4
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	251.3
F_n = 156.800 MHz 1 1.5 kHz				
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	100	1000	206.1
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	100	1000	202.9

Limit Clause 5.5.1.3

Normal and extreme conditions	≥200 mW

Product Service

2.28 AUDIO FREQUENCY RESPONSE RX

2.28.1 Specification Reference

IEC 61097-12, Clause 5.5.2

2.28.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 2

2.28.3 Date of Test

6 July 2016 & 14 July 2016

2.28.4 Test Equipment Used

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

2.28.5 Environmental Conditions

Ambient Temperature 23.6 - 23.7°C
Relative Humidity 41.8 - 47.8%

2.28.6 Test Results

6.0 V DC Supply

Internal Loudspeaker

Modulating Frequency (Hz)	Relative Audio Power (dB)		
	-1.5 kHz	156.800 MHz	+1.5 kHz
300	7.61	7.64	7.60
400	6.49	6.52	6.48
500	5.22	5.24	5.21
600	4.00	4.03	4.00
800	1.81	1.85	1.83
1000 (ref)	0 (ref)	0 (ref)	0 (ref)
1200	-1.61	-1.57	-1.59
1500	-3.66	-3.62	-3.69
2000	-6.66	-6.43	-6.67
2500	-9.40	-8.98	-9.22
3000	-12.27	-11.43	-11.84

External Loudspeaker

Modulating Frequency (Hz)	Relative Audio Power (dB)		
	-1.5 kHz	156.800 MHz	+1.5 kHz
300	7.99	8.01	8.12
400	7.00	7.03	7.13
500	5.44	5.47	5.52
600	3.86	3.86	3.91
800	1.64	1.66	1.69
1000 (ref)	0 (ref)	0 (ref)	0 (ref)
1200	-1.74	-1.72	-1.72
1500	-3.88	-3.78	-3.86
2000	-6.80	-6.60	-6.76
2500	-9.53	-9.02	-9.24
3000	-12.10	-11.18	-11.61

Limit Clause 5.5.2.3

The response shall not deviate by more than +1 dB or -3 dB from a characteristic giving the output level as a function of the audio frequency, decreasing by 6 dB per octave and passing through the measured point at 1 kHz.

Product Service

2.29 MAXIMUM USABLE SENSITIVITY

2.29.1 Specification Reference

IEC 61097-12, Clause 5.5.3

2.29.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.29.3 Date of Test

29 April 2016

2.29.4 Test Equipment Used

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

2.29.5 Environmental Conditions

Ambient Temperature 24.4°C
Relative Humidity 23.6%

2.29.6 Test Results

Test Conditions		Receiver Sensitivity (dBµV)
		156.800 MHz
T_{nom}(24.4°C)	V_{nom}(6.0 V DC)	-6.1
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	-7.4
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	-5.0

Limit Clause 5.5.3.3

Under normal test conditions	≤+6.0dBµV
Under extreme test conditions	≤+12.0dBµV

Product Service

2.30 CO-CHANNEL REJECTION

2.30.1 Specification Reference

IEC 61097-12, Clause 5.5.4

2.30.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.30.3 Date of Test

29 April 2016

2.30.4 Test Equipment Used

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

2.30.5 Environmental Conditions

Ambient Temperature 23.0°C
Relative Humidity 24.1%

2.30.6 Test Results

6.0 V DC Supply

Frequency of Unwanted Signal	Rejection Ratio (dB)
	156.800 MHz
f+3000 Hz	-7.1
f (nom)	-7.3
f-3000 Hz	-8.0

Limit Clause 5.5.4.3

Co-channel rejection shall be between -10.0dB and 0.0dB

Product Service

2.31 ADJACENT CHANNEL SELECTIVITY

2.31.1 Specification Reference

IEC 61097-12, Clause 5.5.5

2.31.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.31.3 Date of Test

28 April 2016

2.31.4 Test Equipment Used

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

2.31.5 Environmental Conditions

Ambient Temperature 24.4°C
Relative Humidity 23.6%

2.31.6 Test Results

Test Conditions		Unwanted Signal Relative To Wanted Signal Ratio (dB)	
		156.800 MHz	
		+ 25 kHz	- 25 kHz
T_{nom}(+24.4°C)	V_{nom}(6.0 V DC)	75.2	74.3
T_{min}(-20.0°C)	V_{min}(4.2 V DC)	76.1	76.8
T_{max}(+55.0°C)	V_{max}(7.2 V DC)	75.1	73.5

Limit Clause 5.5.5.3

Under normal conditions	≥ 70.0dB
Under extreme conditions	≥ 60.0dB

Product Service

2.32 SPURIOUS RESPONSE REJECTION

2.32.1 Specification Reference

IEC 61097-12, Clause 5.5.6

2.32.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.32.3 Date of Test

9 May 2016

2.32.4 Test Equipment Used

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

2.32.5 Environmental Conditions

Ambient Temperature 24.0°C
Relative Humidity 24.5%

2.32.6 Test Results

6.0 V DC Supply

156.800 MHz

Spurious Response Frequency (MHz)	Ratio (dB)
156.750	76.5
156.845	76.3
156.850	77.5
157.705	70.2

No other responses were detected with a rejection ratio ≤80.0dB.

Limit Clause 5.5.6.3

Limit	≥ 70.0dB

Product Service

2.33 INTERMODULATION RESPONSE

2.33.1 Specification Reference

IEC 61097-12, Clause 5.5.7

2.33.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.33.3 Date of Test

6 May 2016

2.33.4 Test Equipment Used

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

2.33.5 Environmental Conditions

Ambient Temperature 21.8°C
Relative Humidity 38.0%

2.33.6 Test Results

6.0 V DC Supply

Frequency Increments of Unwanted Signals	Ratio (dB)
	156.800 MHz
+50/100 kHz	71.8
-50/100 kHz	72.1

Limit Clause 5.5.7.3

Limit	≥ 65.0dB

Product Service

2.34 BLOCKING

2.34.1 Specification Reference

IEC 61097-12, Clause 5.5.8

2.34.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.34.3 Date of Test

5 May 2016

2.34.4 Test Equipment Used

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

2.34.5 Environmental Conditions

Ambient Temperature 23.6°C
Relative Humidity 25.2%

2.34.6 Test Results

6.0 V DC Supply

Frequency of Unwanted Signal	Blocking Level (dBµV)
	156.800 MHz
Nominal +10MHz	103.0
+5MHz	98.9
+2MHz	98.2
+1MHz	96.7
-1MHz	97.3
-2MHz	99.8
-5MHz	101.0
-10MHz	103.5

Limit Clause 5.5.8.3

Limit	≥ 90 dBµV

Product Service

2.35 CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA RX

2.35.1 Specification Reference

IEC 61097-12, Clause 5.5.9

2.35.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.35.3 Date of Test

13 May 2016

2.35.4 Test Equipment Used

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

2.35.5 Environmental Conditions

Ambient Temperature 23.7°C
Relative Humidity 45.7%

2.35.6 Test Results

6.0 V DC Supply

156.800 MHz

Frequency (MHz)	Emission Result (nW)
*	

*No emissions were detected within a 6 dB margin of the limit.

Limit Clause 5.5.9.3

Frequency range	150 kHz to 1 GHz	1 GHz to 2 GHz
Limit	≤ 2.0 nW (-57.0 dBm)	≤ 20 nW (-47.0 dBm)

Product Service

2.36 AMPLITUDE RESPONSE OF THE RECEIVER LIMITER

2.36.1 Specification Reference

IEC 61097-12, Clause 5.5.10

2.36.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.36.3 Date of Test

13 May 2016

2.36.4 Test Equipment Used

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

2.36.5 Environmental Conditions

Ambient Temperature 20.7°C
Relative Humidity 50.4%

2.36.6 Test Results

6.0 V DC Supply

Channel	Input Level (dBµV)	Audiofrequency Output Power Level (dB)
156.800 MHz	+6	-12.06
	+100	-12.03
Variation in Audiofrequency Output Power (dB)	0.03	

Limit Clause 5.5.10.3

The variation in Audio frequency Output Power level shall not exceed 3 dB.

2.37 RECEIVER HUM AND NOISE LEVEL

2.37.1 Specification Reference

IEC 61097-12, Clause 5.5.11

2.37.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 0

2.37.3 Date of Test

13 May 2016

2.37.4 Test Equipment Used

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

2.37.5 Environmental Conditions

Ambient Temperature	20.7°C
Relative Humidity	50.4%

2.37.6 Test Results

6.0 V DC Supply

Channel	Residual Noise Level (dB)
156.800 MHz	-56.48

Limit Clause 5.5.11.3

Limit	≤ -40 dB

Product Service

2.38 SQUELCH OPERATION

2.38.1 Specification Reference

IEC 61097-12, Clause 5.5.12

2.38.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 1

2.38.3 Date of Test

5 July 2016

2.38.4 Test Equipment Used

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

2.38.5 Environmental Conditions

Ambient Temperature 20.9°C
Relative Humidity 55.7%

2.38.6 Test Results

6.0 V DC Supply

Channel	Clause 5.5.12.2 a)	Clause 5.5.12.2 b)		Clause 5.5.12.2 c)
	Relative Output Power(dB)	Input Level (dBµV) emf	SINAD (dB)	Input Level (dBµV) emf
156.800 MHz	-100.1	-7.5	27.5	-1.4

Limit Clause 5.5.12.3

Limit	Clause 5.5.12.2 a)	Clause 5.5.12.2 b)	Clause 5.5.12.2 b)	Clause 5.5.12.2 c)
	≤ - 40 dB	≤ +6 dBµV emf	≥ 20dB	≤ +6 dBµV emf

Product Service

2.39 SQUELCH HYSTERESIS

2.39.1 Specification Reference

IEC 61097-12, Clause 5.5.13

2.39.2 Equipment Under Test and Modification State

Tron TR30 GMDSS and Maritime VHF Radio S/N: 810 - Modification State 1

2.39.3 Date of Test

5 July 2016

2.39.4 Test Equipment Used

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

2.39.5 Environmental Conditions

Ambient Temperature 20.9°C
Relative Humidity 55.7%

2.39.6 Test Results

6.0 V DC Supply

Channel	Input Level (dBµV)		Difference (dB)
	Squelch Open	Squelch Closed	
156.800 MHz	-108.5	-113.4	4.9

Limit Clause 5.5.13.3

Limit	Squelch hysteresis shall be between 3 dB and 6 dB

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Battery					
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
Signal Generator	Rohde & Schwarz	SMX	115	12	11-Jul-2017
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
AF Load (16ohm)	ASL (TUV)	16ohm	427	12	8-Feb-2017
AF Load (16ohm)	ASL (TUV)	SJ2	432	12	8-Feb-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Broadband Resistive Power Divider	Weinschel	1506A	605	12	9-Dec-2016
Power Splitter	Weinschel	1506A	607	12	31-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2017
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Power Supply	Iso-tech	IPS 2010	2440	-	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	23-Aug-2017
Attenuator (20dB, 150W)	Narda	769-20	3367	12	31-May-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	26-Sep-2017
P-Series Power Meter	Agilent Technologies	N1911A	3981	12	25-Sep-2016
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	25-Sep-2017
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3983	12	25-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2017
Section 2.1 - Drop Test					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Lansmont	Lansmont	PDT 56E	2291	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Tape Measure	Stanley	Powerlock 33-443	4305	-	TU
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016
Section 2.2 - Thermal Shock					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Data Logging Thermometer	Digitron	2098T	2348	12	22-Oct-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Stop Watch	Radio Spares	Model 694 (974)	4025	0	7-Sep-2016
Type T PFA Insulated Thermocouple	TC Limited	Type T	4229	12	2-Feb-2017
Tape Measure	Stanley	Powerlock 33-443	4305	-	TU

Product Service

2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	2-Oct-2016
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016
Section 2.3 - Immersion Test					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Lansmont	Lansmont	PDT 56E	2291	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Tape Measure	Stanley	Powerlock 33-443	4305	-	TU
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 – Dry Heat					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	1-Jun-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016
Section 2.5 – Damp Heat					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	1-Jun-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016
Section 2.6 - Low Temperature					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	1-Jun-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7 - Vibration					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Charge Amplifier	Endevco	133	2499	12	30-Nov-2016
Charge Amplifier	Endevco	133	2506	12	30-Nov-2016
Vibration System	Ling Dynamic Systems	LDS V964	2515	6	11-Jul-2016
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Isotron Accelerometer	Endevco	256-10	3394	6	28-Apr-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
Vibration Controller (8 Ch)	m + p International	VibPilot 8	3777	12	23-Jun-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
resistor/capacitor	TUV SUD Product Service	AHRC01-r1	3968	-	TU
Accelerometer	PCB Piezotronic	352C03	4336	6	9-Jun-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	16-Feb-2017
Isotron Accelerometer	PCB Piezotronic	352C03	4597	12	6-Jul-2016
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4662	12	6-Nov-2016
Section 2.8 - Oil Resistance					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	31-May-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Section 2.11 - Frequency Error					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Attenuator 10dB 75W	Bird	8308-100	386	12	28-Jan-2017
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Sensor Module	Hewlett Packard	11722A	3293	12	3-Dec-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.12 - Effective Radiated Power					
Signal Generator	Rohde & Schwarz	SMX	115	12	9-Jul-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Screened Room (8)	Rainford	Rainford	1548	-	TU
Hygrometer	Rotronic	I-1000	2882	12	4-Nov-2016
Antenna (Biconnical)	Schaffner	VBA6106A	3106	12	11-Sep-2016
Antenna (Biconnical)	Schaffner	VBA6106A	3107	12	11-Sep-2016
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	26-Feb-2017
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4100	0	9-Jun-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016
Section 2.13 - Carrier Power					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Attenuator 10dB 75W	Bird	8308-100	386	12	28-Jan-2017
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Digital Temperature Indicator	Fluke	51	2267	12	9-Dec-2016
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Sensor Module	Hewlett Packard	11722A	3293	12	3-Dec-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	23-Oct-2016
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	23-Oct-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.14 - Maximum Permissible Frequency Deviation					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Load (50ohm, 30W)	Weinschel	50T-054	350	12	16-Dec-2016
Transformer (Audio Isolating)	TUV SUD Product Service	600 OHM 1:1	416	-	TU
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.15 - Reduction of Frequency Deviation at Modulation Frequencies above 3 kHz					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Load (50ohm, 30W)	Weinschel	50T-054	350	12	16-Dec-2016
Transformer (Audio Isolating)	TUV SUD Product Service	600 OHM 1:1	416	-	TU
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Section 2.16 - Limitation Characteristics of the Modulator					
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Modulation Analyser	Hewlett Packard	8901B	555	12	1-Dec-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Sensor Module	Hewlett Packard	11722A	3293	12	3-Dec-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Section 2.17 - Sensitivity of the Modulator, including Microphone					
Sound Level Calibrator	Bruel & Kjaer	4231	243	12	13-Jan-2017
Amplifier (Measuring)	Bruel & Kjaer	T2609	247	-	TU
Amplifier (Acoustic Power)	Bruel & Kjaer	2706	249	-	TU
Mouth Simulator	Bruel & Kjaer	4227	255	-	TU
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Audio Analyser	Hewlett Packard	8903B	576	12	8-Jun-2016
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Section 2.18 - Audio Frequency Response					
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Section 2.19 - Audio Frequency Harmonic Distortion of the Emission					
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Section 2.20 - Residual Modulation of the Transmitter					
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.21 - Adjacent Channel Power					
Modulation Analyser	Hewlett Packard	8901B	45	12	1-Sep-2016
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
Load (50ohm, 30W)	Weinschel	50T-054	350	12	16-Dec-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	23-Oct-2016
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	23-Oct-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.22 - Conducted Spurious Emissions Conveyed to the Antenna					
Antenna (Double Ridge Guide)	EMCO	3115	34	12	27-Nov-2016
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Screened Room (8)	Rainford	Rainford	1548	-	TU
High Pass Filter	Mini-Circuits	NHP-300	1640	12	17-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	2882	12	4-Nov-2016
Antenna (Biconnical)	Schaffner	VBA6106A	3107	12	11-Sep-2016
Antenna (Log Periodic)	Schaffner	UPA6108	3109	12	29-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Broadband Amplifier	Mini-Circuits	ZHL-1042J	4050	12	27-May-2016
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4100	0	9-Jun-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016
Weight	Kern-Sohn	20kg	4656	-	TU

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.23 - Transient Frequency Behaviour of the Transmitter					
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	19-Aug-2016
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.24 - Harmonic Distortion and Rated Audio Frequency Output Power					
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
AF Load (16ohm)	ASL (TUV)	16ohm	427	12	8-Feb-2017
AF Load (16ohm)	ASL (TUV)	SJ2	432	12	8-Feb-2017
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016 31-May-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.25 - Audio Frequency Response					
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Modulation Analyser	Hewlett Packard	8901B	773	12	11-Jun-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	31-May-2017
Section 2.26 - Maximum Usable Sensitivity					
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Signal Generator	Rohde & Schwarz	SML01	1593	12	2-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.27 - Co-channel Rejection					
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Signal Generator	Hewlett Packard	8664A	1183	12	15-Apr-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Signal Generator	Rohde & Schwarz	SML01	1593	12	2-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Section 2.28 - Adjacent Channel Selectivity					
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Signal Generator	Hewlett Packard	8664A	1183	12	15-Apr-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Signal Generator	Rohde & Schwarz	SML01	1593	12	2-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Section 2.29 - Spurious Response Rejection					
Audio Analyser	Hewlett Packard	8903B	44	12	7-Oct-2016
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
Multimeter	White Gold	WG022	190	12	24-Nov-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Tunable Notch Filter	Wainwright	WRCD 130.0/170.0-0.05/50-5EEK	3412	-	TU
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Section 2.30 - Intermodulation Response					
Audio Analyser	Hewlett Packard	8903B	44	12	7-Oct-2016
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Signal Generator	Hewlett Packard	8664A	1183	12	15-Apr-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.31 - Blocking					
Audio Analyser	Hewlett Packard	8903B	44	12	7-Oct-2016
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
Section 2.32 - Conducted Spurious Emissions Conveyed to the Antenna					
Antenna (Double Ridge Guide)	EMCO	3115	34	12	27-Nov-2016
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Screened Room (8)	Rainford	Rainford	1548	-	TU
High Pass Filter	Mini-Circuits	NHP-300	1640	12	17-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Sensor	Hewlett Packard	11722A	2787	12	2-Sep-2016
Hygrometer	Rotronic	I-1000	2882	12	4-Nov-2016
Antenna (Biconnical)	Schaffner	VBA6106A	3107	12	11-Sep-2016
Antenna (Log Periodic)	Schaffner	UPA6108	3109	12	29-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Attenuator (10dB, 150W)	Narda	769-10	3368	12	29-May-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	29-Jun-2016
Broadband Amplifier	Mini-Circuits	ZHL-1042J	4050	12	27-May-2016
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4100	0	9-Jun-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016
Weight	Kern-Sohn	20kg	4656	-	TU
Section 2.33 - Amplitude Response of the Receiver Limiter					
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Section 2.34 - Receiver Hum and Noise Level					
Signal Generator	Rohde & Schwarz	SMY 01	118	12	23-Oct-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.35 - Squelch Operation					
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
AF Load (16ohm)	ASL (TUV)	16ohm	427	12	8-Feb-2017
AF Load (16ohm)	ASL (TUV)	SJ2	432	12	8-Feb-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Audio Analyser	Hewlett Packard	8903B	1881	12	16-Nov-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	29-May-2016
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	18-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.36 - Squelch Hysteresis					
Signal Generator	Rohde & Schwarz	SMY 01	49	12	23-Oct-2016
AF Load (16ohm)	ASL (TUV)	16ohm	427	12	8-Feb-2017
AF Load (16ohm)	ASL (TUV)	SJ2	432	12	8-Feb-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.1 Marine - General Requirements					
Stop Clock	R.S Components	RS328 061	2674	12	4-Jul-2017
Hygromer	Rotronic	I-1000	2829	12	4-Nov-2016
Short Circuit	TUV SUD Product Service	Short Cicuit	3272	-	TU
Transient Limiter	Hewlett Packard	11947A	15	12	7-Jan-2017
Modulation Analyser	Hewlett Packard	8901B	773	12	27-Jun-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	5-Mar-2017
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2016
Stop Clock	R.S Components	RS328 061	2674	12	4-Jul-2017
Hygromer	Rotronic	I-1000	2829	12	4-Nov-2016
Hygrometer	Rotronic	I-1000	2891	12	23-Aug-2017
Sensor Module	Hewlett Packard	11722A	3293	12	3-Dec-2016
Attenuator (20dB, 150W)	Narda	769-20	3367	12	31-May-2017
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	5-Mar-2017
Vernier Calipers	Linear Tools		4746	12	5-Jul-2017

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Damp Heat	-
Frequency Error	± 11 Hz
Maximum Permissible Frequency Deviation	-
Reduction of Frequency Deviation at Modulation Frequencies above 3 kHz	-
Sensitivity of the Modulator, including Microphone	± 1.0 dB
Audio Frequency Harmonic Distortion of the Emission	± 1.0 dB
Residual Modulation of the Transmitter	±1.0 dB
Harmonic Distortion and Rated Audio Frequency Output Power	Distortion: ± 14.12 % / -12.62% Audio Power: ± 2.84 %
Adjacent Channel Selectivity	±2.6 dB
Spurious Response Rejection	± 2.6 dB
Intermodulation Response	± 1.7 dB
Blocking	± 2.6 dB
Squelch Operation	± 0.4 dB
Low Temperature	-
Conducted Spurious Emissions Conveyed to the Antenna	± 2.0 dB
Maximum Usable Sensitivity	±1.8 dB
Audio Frequency Response Rx	±2.0 dB
Vibration	-
Audio Frequency Response	± 27.2 Hz
Dry Heat	-
Carrier Power	± 0.45 dB
Adjacent Channel Power	± 3.0 dB
Transient Frequency Behaviour of the Transmitter	±0.2 kHz
Co-Channel Rejection	±2.6 dB
Conducted Spurious Emissions Conveyed to the Antenna Rx	± 2.0 dB
Receiver Hum and Noise Level	± 1.8 dB
Squelch Hysteresis	± 1.8 dB
Effective Radiated Power	± 2.92 dB
Limitation Characteristics of the Modulator	± 0.5 dB
Amplitude Response of the Receiver Limiter	± 0.5 dB

Product Service

Test Discipline	MU
Oil Resistance Test	-
Mould Growth and Corrosion	-
Drop Test	-
Thermal Shock	-
Immersion	-
Solar Radiation	-

Product Service

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Front View

Rear View

Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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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Product Service

ANNEX A

SOLAR RADIATION REPORT – 6P05223

Product Service

REPORT

Contact person
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Date 2016-07-05 References 6P05223 Page 1 (3)

Jotron AS
Frank Löke
Innlaget 230
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Norge

Solar radiation test

Assignment

Simulated solar radiation test according to EN 300225 clause 7.10 / IEC 61097-12 clause 5.1.5.9, for 80 hours. Visual assessment after exposure.

Test specimen

Name	Description	Quantity
87087	Tron TR30 Rechargeable LiPo 1550 mAh	1
870860	Tron TR30 Emergency GMDSS battery	1
87101	Tron TR30 GMDSS Assembly	1
	Piece of cable with connector and clip	1

The test specimens were delivered to SP on June 7, 2016.

Test procedure

The test specimens were exposed in an *Atlas Suntest XXL+*. The xenon light source in the Weather-Ometer was filtered to correspond to daylight; this means that the light reaches a lower limit at 290 nm. The light intensity was 60 ± 6 W/m^2 within the band pass 290-400 nm, 550 ± 55 W/m^2 within the band pass 290-800 nm and 1300 ± 130 W/m^2 within the band pass 290-3000 nm.

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Product Service

REPORT

Date	Reference	Page
2016-07-05	6P05223	2 (3)

The air temperature was 55 ±2 °C and the black standard temperature (BST) was about 80 ±2 °C. The relative humidity was 50 ±5 %.

The exposure was carried out between June 28 and July 1, 2016.

Test results

Visual assessment
The visual assessment after the exposure showed no changes such as deformation, cracking, stratification, buckling, ungluing of plastic pieces, degradation of readability of inscriptions and signs on the instrument scale.

Functionality test after the exposure
The Tron TR30 was checked after 72 hours (weekend), the display was readable and the sound of the radio was ok.

Photos

Tron TR30 GMDSS Assembly

0 hours

80 hours

Tron TR30 Rechargeable LiPo 1550 mAh

0 hours

80 hours

ANNEX B

ADDITIONAL ERP POSITION MEASUREMENTS

Product Service

Additional ERP Position Measurements

The following measurements were made by TUV SUD during the ERP Test (Section 2.15 of the present document):

Radiated ERP Result using CH17 at Max Power							
Test Scenerio	Polarisation	Raw Result (dBm)	Sig Gen Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	Final Result (dBm)	Final ERP (W)
A - Talking into front	H	23.97	26.90	1.70	-0.50	24.70	0.30
	V	26.36	30.80	1.70	-2.00	27.10	0.51
B - Holding Like a Phone (LHS)	H	19.62	22.60	1.70	-0.50	20.40	0.11
	V	22.73	29.10	1.70	-2.00	25.40	0.35
B - Holding Like a Phone (RHS)	H	16.54	19.30	1.70	-0.50	17.10	0.05
	V	22.15	28.40	1.70	-2.00	24.70	0.30

Product Service

ANNEX C

MANUFACTURERS DECLARATION

Product Service

Jotron AS
Jotron UK Ltd.
Jotron Phontech AS
Jotron Consultos AS
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron

Skoppum: 21.09.2016

Declaration IEC 61097-12 Clause 3.2

Jotron AS hereby declare according to the international standard IEC 61097-12, that or Tron TR30 GMDSS and Maritime VHF Radio meets the requirements of 3.2 general performance requirements.

Our Tron TR30 GMDSS and Maritime VHF Radio comes with a belt clip and a hand strap making the radio compliant to:

Clause 3.2.2 The equipment shall:

- Be capable of being operated by unskilled personnel.
- Be capable of being operated by personnel wearing gloves as specified for immersion suits in regulation 33 of chapter III of the SOLAS 1974 Convention.
- Be capable of single-handed operation except for channel selection.
- Be of small size and light weight.
- Be capable of being operated in the ambient noise level likely to be encountered on board ships or survival craft.
- Have provisions for its attachment to the clothing of the user, including the immersion suit.
- Be resistant to deterioration by prolonged exposure to sunlight.

Frank Løke
Certification Manager M&E
Jotron AS

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