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# Report On

Radio Approval Testing of the  
SRT Marine Technology Ltd. Cobalt Class B AIS Transceiver  
In accordance with IEC 62287-1

Document 75912008 Report 04 Issue 1

March 2011



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**REPORT ON**

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**DATED**

10 March 2011



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## CONTENTS

Section	Page No
<b>1</b>	<b>REPORT SUMMARY ..... 3</b>
1.1	Introduction ..... 4
1.2	Brief Summary of Results ..... 5
1.3	Application Form ..... 6
1.4	Product Information ..... 11
1.5	Deviations from the Standard ..... 12
1.6	Modification Record ..... 12
1.7	Alternative Test Site ..... 12
<b>2</b>	<b>TEST DETAILS ..... 13</b>
2.1	Manuals ..... 14
2.2	Marking and Identification ..... 15
2.3	Modes of Operation ..... 16
2.4	Messages Extending One Time Period ..... 27
2.5	Channel Selection ..... 28
2.6	AIS Information ..... 30
2.7	Initialisation Period ..... 38
2.8	Alarms and Indications, Fall-Back Arrangements ..... 40
2.9	User Interface ..... 43
2.10	TDMA Synchronisation ..... 47
2.11	Carrier-Sense Tests ..... 50
2.12	VDL state/reservations ..... 52
2.13	Data Encoding (BIT Stuffing) ..... 53
2.14	Frame Check Sequence ..... 54
2.15	Slot Allocation (Channel Access Protocol) ..... 55
2.16	Assigned Operation ..... 57
2.17	Message Formats ..... 61
2.18	Regional Area Designation by VDL Message ..... 64
2.19	Regional Area Designation by Serial Message or Manually ..... 66
2.20	Management of Received Regional Operating Settings ..... 67
2.21	DSC Functionality Tests ..... 73
<b>3</b>	<b>TEST EQUIPMENT USED ..... 79</b>
3.1	Test Equipment Used ..... 80
<b>4</b>	<b>PHOTOGRAPHS ..... 81</b>
4.1	Photographs of Equipment Under Test (EUT) ..... 82
<b>5</b>	<b>ACCREDITATION, DISCLAIMERS AND COPYRIGHT ..... 83</b>
5.1	Accreditation, Disclaimers and Copyright ..... 84



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Approval Testing of the  
SRT Marine Technology Ltd. Cobalt Class B AIS Transceiver  
In accordance with IEC 62287-1



Product Service

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Radio Approval Testing of the SRT Marine Technology Ltd. Cobalt Class B AIS Transceiver to the requirements of IEC 62287-1.

Objective	To perform Radio Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	SRT Marine Technology Ltd.
Model Number(s)	408-0002
Serial Number(s)	11
Number of Samples Tested	1
Test Specification/Issue/Date	IEC 62287-1: 2010
Start of Test	14 December 2010
Finish of Test	23 February 2011
Name of Engineer(s)	N Forsyth



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## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with IEC 62287-1 is shown below.

Section	Clause	Test Description	Result	Mod State	Comments
2.1	4.2	Manuals	-	-	Declaration
2.2	4.3	Marking and Identification	-	-	Declaration
2.3	10.2	Modes of Operation	Pass	0, 2, 3, 4 and 7	
2.4	10.3	Messages Extending One Time Period	Pass	3	
2.5	10.4	Channel Selection	Pass	2	
2.6	10.6	AIS Information	Pass	2, 3 and 5	
2.7	10.7	Initialisation Period	Pass	3	
2.8	10.8	Alarms and Indications, Fall-Back Arrangements	Pass	3 and 5	
2.9	10.9	User Interface	Pass	3	
2.10	12.1	TDMA Synchronisation	Pass	6	
2.11	12.2	Carrier-Sense Tests	Pass	6 and 7	
2.12	12.3	VDL state/reservations	Pass	6	
2.13	12.4	Data Encoding (BIT Stuffing)	Pass	2	
2.14	12.5	Frame Check Sequence	Pass	4	
2.15	12.6	Slot Allocation (Channel Access Protocol)	Pass	5 and 7	
2.16	12.7	Assigned Operation	Pass	2 and 5	
2.17	12.8	Message Formats	Pass	4 and 6	
2.18	13.1	Regional Area Designation by VDL Message	Pass	4	
2.19	13.2	Regional Area Designation by Serial Message or Manually	Pass	3	
2.20	13.3	Management of Received Regional Operating Settings	Pass	4 and 5	
2.21	C.3	DSC Functionality Tests	Pass	8	



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### 1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	COBALT
Part Number	011-0014
Technical Description (Please provide a brief description of the intended use of the equipment)	Marine AIS SOTDMA Class B Transceiver to IEC62287-1

TYPE OF EQUIPMENT	
<input type="checkbox"/> Base Station	(Equipment fitted with an antenna socket for use with an external antenna, and intended for use in a fixed location).
<input checked="" type="checkbox"/> Mobile Station	(Mobile equipment fitted with an antenna socket, for use with an external antenna, normally used in a vehicle or as a transportable station).
<input type="checkbox"/> Hand Portable	(fitted with an antenna socket)
<input type="checkbox"/> Hand Portable	(without an external antenna socket integral antenna equipment, but fitted with a permanent internal or a temporary internal 50 ohm R.F. connector which allows access to the transmitter output and the receiver input)
<input type="checkbox"/> Other	

TYPE OF EQUIPMENT					
Base Station	<input type="checkbox"/>	Mobile Station	<input checked="" type="checkbox"/>	Hand Portable	<input type="checkbox"/>
<input type="checkbox"/> Transmitter		<input type="checkbox"/> Simplex			
<input type="checkbox"/> Receiver		<input checked="" type="checkbox"/> Duplex			
<input checked="" type="checkbox"/> Transceiver		<input type="checkbox"/> Communal Site use (70dB limit)			

TRANSMITTER TECHNICAL CHARACTERISTICS		
FREQUENCY CHARACTERISTICS		
Transmitter channel switching frequency range:	156.025 to 162.025	MHz (MHz Range)
Transmitter frequency alignment range:	156.025 to 162.025	MHz (MHz Range)



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TRANSMITTER POWER CHARACTERISTICS			
Is transmitter intended for :			
Continuous duty	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/> No
Intermittent duty only	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
If intermittent duty state DUTY CYCLE			
Transmitter ON 0.0267 Seconds	Transmitter OFF 5 Seconds		
Is transmitter output power variable?	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
If yes			
RF output power (watts)	12.5	Maximum	1 Minimum
Is the RF power			
continuously variable	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/> No
Or			
stepped	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/> No
If stepped	dB per step		

TRANSMITTER - MODULATION			
Amplitude	<input type="checkbox"/>	Other	<input type="checkbox"/>
Frequency	<input type="checkbox"/>	Details :	
Phase	<input checked="" type="checkbox"/>		
Can the transmitter be operated without modulation (See Note 1)	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No





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RECEIVER TECHNICAL CHARACTERISTICS		
Intermediate Frequencies		
<input checked="" type="checkbox"/> 1 <sup>st</sup>	<input checked="" type="checkbox"/> 2 <sup>nd</sup>	
<input type="checkbox"/> 3 <sup>rd</sup>		
Is local oscillator injection frequency higher or lower than the receiver nominal frequency?		
<input type="checkbox"/> Higher	<input checked="" type="checkbox"/> Lower	
RECEIVER CHANNEL SWITCHING FREQUENCY RANGE	156.025 to 156.025	MHz (MHz Range)
RECEIVER FREQUENCY ALIGNMENT RANGE	156.025 to 162.025	MHz (MHz Range)

RECEIVER AUDIO (AF) CHARACTERISTICS			
MAXIMUM RATED AUDIO (AF) FREQUENCY OUTPUT POWER			
Into Loudspeaker	N/A	Watts	
Into Line	N/A	Watts	
Into Earpiece	N/A	Watts	
Balanced		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Unbalanced		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does connection carry DC voltage?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
If Yes, please state value:	N/A		
Normal Audio load impedance:			
At Loudspeaker	N/A	Ohms	
At Line	N/A	Ohms	
At Earpiece	N/A	Ohms	
At audio accessory connection or facility socket (if fitted):			
Output	N/A	Watts	
Impedance	N/A	Ohms	
Max input level at audio accessory socket:			
Output	N/A	mV	
Impedance	N/A	Ohms	

TRANSMITTER AND RECEIVER CHARACTERISTICS			
Channel Separation:	25	kHz	
State the maximum number of channels over which the equipment can operate			240



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**EXTREME TEMPERATURE RANGE** over which equipment is to be type tested

- ☐ -25°C to +55°C  
☒ -15°C to +55°C  
☐ -10°C to +55°C

**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 12V V Max Current 6 A  
Extreme upper voltage 31.2 V  
Extreme lower voltage 9.6 V

**Battery**

- ☐ Nickel Cadmium ☐ Lead acid (Vehicle regulated)  
☐ Alkaline ☐ Leclanche  
☐ Lithium ☐ Other Details :

Volts nominal.

End point voltage as quoted by equipment manufacturer V

**AUTOMATIC EQUIPMENT SWITCH OFF**

If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.

- ☐ Applies V cut-off voltage  
☒ Does not apply



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ALIGNMENT RANGE		
The definition of the alignment range AR1 and AR2 are given in Sub Clauses 3.1.2 and 3.1.3 of the Standard. The applicant should ensure that the sample equipment(s) submitted are operational on the appropriate channel(s) as given in Sub Clauses 3.1.5 through to 3.1.11 and tick the appropriate box.		
	3.1.5	One sample single channel equipment of category AR1 <input type="checkbox"/>
Or	3.1.6	Three samples of single channel equipments of category AR2 <input type="checkbox"/>
Or	3.1.7	One sample two channel equipment of category AR1 <input type="checkbox"/>
Or	3.1.8	Three samples of two channel equipment of category AR2 <input type="checkbox"/>
Or	3.1.9	One sample multichannel equipment of category AR1 <input type="checkbox"/>
Or	3.1.10	Three samples of multichannel equipment of category AR2 <input type="checkbox"/>
Or	3.1.11	One sample of multichannel equipment of category AR2 where the switching range equals the alignment range <input type="checkbox"/>

CHANNEL IDENTIFICATION			
Each equipment, whether one or more submitted for tests shall carry clear identification (such as a serial number), together with the frequencies associated with the channel identification displayed on the equipment.			
Equipment Identification eg Serial Number	Channel Number	Transmit Nominal Freq MHz	Receive Nominal Freq MHz
TLA3-RF11-BB12-UI13	AIS 1 and AIS	161.975MHz and 162.025MHz	161.975MHz and 162.025MHz
TLA16-RF29-BB25-UI2	AIS 1 and AIS	161.975MHz and 162.025MHz	161.975MHz and 162.025MHz

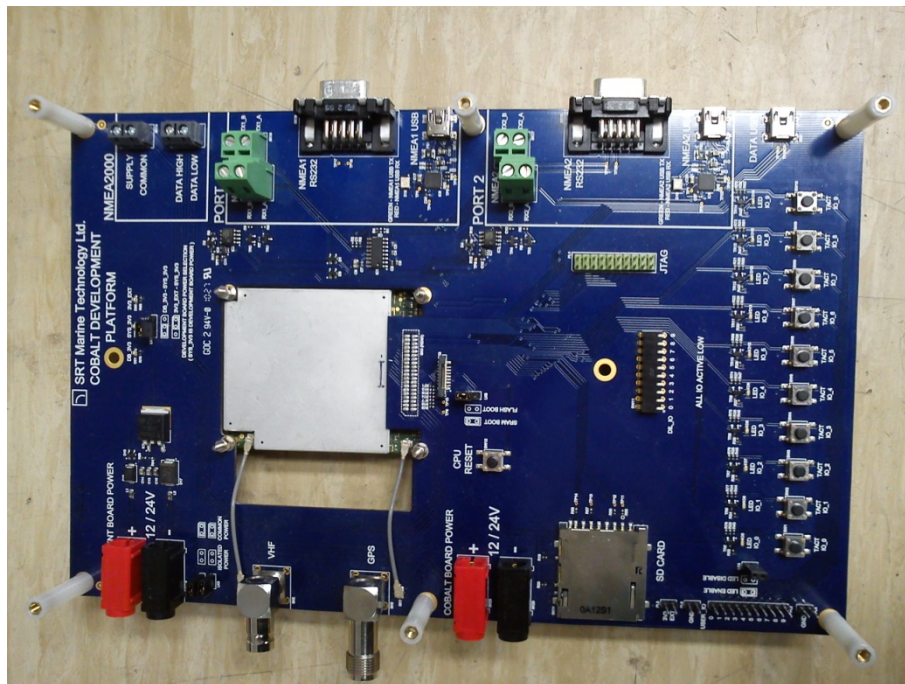
I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature:  Name: Nathan Emery  
Position held: Test & Quality Manager Date: 15<sup>th</sup> February 2011

## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a SRT Marine Technology Ltd. Cobalt Class B AIS Transceiver 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

The EUT is a complete Class B AIS transceiver module designed to be integrated into a host enclosure to provide a full AIS solution. Therefore the requirements of section 4.2, manuals and 4.3, marking and identification cannot be checked for compliance. These will be provided by the system integrator of the module.

## 1.6 MODIFICATION RECORD

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

Modification State	Description of Modification still fitted to EUT	Hardware	Software	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	11	1269	Not Applicable	Not Applicable
1	Software Update	11	1271	Tim Last	17-Dec-2010
2	Software Update	11	1278	Tim Last	22-Dec-2010
3	Software Update	11	1285	Tim Last	07-Jan-2011
4	Software Update	11	1290	Tim Last	24-Jan-2011
5	Software Update	11	1336	Tim Last	14-Feb-2011
6	Software Update	11	1346	Tim Last	17-Feb-2011
7	Software Update	11	1347	Tim Last	18-Feb-2011
8	Software Update	11	1373	Tim Last	23-Feb-2011

## 1.7 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV SÜD Product Service Ltd conducted the following tests at SRT in Midsummer Norton, UK.



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## **SECTION 2**

### **TEST DETAILS**

Radio Approval Testing of the  
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## **2.1 MANUALS**

### **2.1.1 Specification Reference**

IEC 62287-1, Clause 4.2

### **2.1.2 Equipment Under Test**

408-0002

### **2.1.3 Comments**

The EUT is a complete Class B AIS transceiver module designed to be integrated into a host enclosure to provide a full AIS solution. Therefore manuals are not available at the time of test and will be provided by the system integrator.



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## **2.2 MARKING AND IDENTIFICATION**

### **2.2.1 Specification Reference**

IEC 62287-1, Clause 4.3

### **2.2.2 Equipment Under Test**

408-0002

### **2.2.3 Comments**

The EUT is a complete Class B AIS transceiver module designed to be integrated into a host enclosure to provide a full AIS solution. Therefore marking and identification are not available at the time of test and will be provided by the system integrator.





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## 2.3 MODES OF OPERATION

### 2.3.1 Specification Reference

IEC 62287-1, Clause 10.2

### 2.3.2 Equipment Under Test

408-0002, Serial No. 11

### 2.3.3 Date of Test and Modification State

14 and 15 December 2010 - Modification State 0

04 January 2011 - Modification State 2

07 and 18 January 2011 - Modification State 3

24 January 2011 - Modification State 4

18 February 2011 - Modification State 7

### 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 Test Results and Methods of Measurement

Autonomous Mode – Clause 10.2.1

Transmit Position Reports – Clause 10.2.1.1 (Modification State 0)

#### **Method of Measurement**

Set up standard test environment. Record the VDL communication and check for messages transmitted by the EUT.

#### **Required Results**

Confirm that the EUT transmits Messages 18 and 24 following the nominal schedule and alternates between channel A and channel B.

#### **Test Results**

<b>Message 18</b>	
Requirement	Verdict
Message 18 is transmitted according to the current reporting rate of 3 minutes.	✓
Transmissions occur on channel A and B alternately.	✓

<b>Message 24</b>	
Requirement	Verdict
Message 24 is transmitted every 6 minutes.	✓
Message 24 is comprised of two parts and the second part is transmitted within 1 minute of the first.	✓
Transmissions occur on channel A and B alternately.	✓



Product Service

Receive Class A position reports – Clause 10.2.1.2(Modification State 0)

**Method of Measurement**

Set up standard test environment.

- a) Switch on test targets, then start operation of the EUT.
- b) Start operation of the EUT, then switch on test targets.
- c) Transmit test targets using the same time periods on channel A and channel B.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

**Required Results**

Confirm that EUT receives continuously under conditions 10.2.1.2.1 a), b) and c) and, where provided, outputs the received messages on the external interface or display.

**Test Results**

Part a)	
Requirement	Verdict
Class A position reports are continuously output on the RS232 serial interface.	✓
Messages are continuously received on channel A and B.	✓

Part b)	
Requirement	Verdict
Class A position reports are continuously output on the RS232 serial interface.	✓
Messages are continuously received on channel A and B.	✓

Part c)	
Requirement	Verdict
Class A position reports are received on both channel A and B using the same slot.	✓



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Receive Class B "CS" position reports – Clause 10.2.1.3(Modification State 3)

**Method of Measurement**

Set up standard test environment. Simulate at least one additional Class B "CS" test target (bit stuffing shall not increase 4 bit).

Check the VDL communication, test output, and display or external interface of the EUT.

**Required Results**

Confirm that EUT receives the Class B "CS" test target continuously and, where provided, outputs the received Messages 18 and 24 on the external interface.

**Test Results**

Requirement	Verdict
Class B position reports are continuously output on the RS232 serial interface.	✓
Class B static data reports are continuously output on the RS232 serial interface.	✓
Messages are continuously received on channel A and B.	✓
Comments	
EUT only has a serial interface, no display is implemented.	

Receive in adjacent time periods – Clause 10.2.1.4 (Modification State 7)

**Method of Measurement**

Set up standard test environment. Simulate additional targets so that the first 4 of each 5 time periods are used. The reporting rate may be increased for the purpose of this test.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

**Required Results**

Confirm that EUT continuously receives messages in the time periods adjacent to own transmission period with an acceptable loss of 5 %.

**Test Results**

Part a)	
Requirement	Verdict
EUT continuously receives messages in the adjacent time periods.	✓
EUT continuously receives with a loss of < 5%	✓



Product Service

Rx performance test – Clause 10.2.1.5 (Modification State 7)

**Method of Measurement**

Set up standard test environment. Simulate additional targets so that 9 of 10 time periods are used.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

**Required Results**

Confirm that EUT continuously receives messages and, where provided, outputs the received messages on the external interface with a loss of not more than 5 %.

**Test Results**

Part a)	
Requirement	Verdict
EUT continuously receives messages with a loss of not more than 5 %	✓
Comments	
100% of messages received.	



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#### Assigned mode – Clause 10.2.2

#### Group assignment – Clause 10.2.2.1 (Modification State 2)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Transmit a group assignment command Message 23 to the EUT addressing stations by

region,  
station type and  
type of ship,  
and commanding for  
Tx/Rx mode,  
reporting rate,  
quiet time.

Record transmitted messages.

#### **Required Results**

Confirm that the EUT transmits position reports Message 18 according to the defined parameters and reverts to standard reporting rate after 4 min to 8 min.

Confirm that the operation of the EUT is not affected when not addressed.

#### **Test Results**

<b>EUT at 1 knot.</b> <b>Message 23 parameters:</b> <b>Station Type = 0</b> <b>Ship Type = 0</b> <b>Tx/Rx Mode = 0</b> <b>Reporting Rate = 8</b> <b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate changes to 5 seconds after receiving message 23.	✓
Transmissions occur on channel A and B.	✓
The standard reporting rate of 3 minutes is returned to after 4 to 8 minutes.	✓
The time taken to revert back to the standard reporting rate is random.	✓

<b>EUT at 10 knots, ship type set to engaged in diving operations.</b> <b>Message 23 parameters:</b> <b>Station Type = 2</b> <b>Ship Type = 34</b> <b>Tx/Rx Mode = 0</b> <b>Reporting Rate = 9</b> <b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate changes from 30 seconds to 15 seconds after receiving message 23.	✓
Transmissions occur on channel A and B.	✓
The standard reporting rate of 3 minutes is returned to after 4 to 8 minutes.	✓
The time taken to revert back to the standard reporting rate is random.	✓



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<b>EUT at 10 knots, ship type set to pleasure craft.</b>	
<b>Message 23 parameters:</b>	
<b>Station Type = 2</b>	
<b>Ship Type = 37</b>	
<b>Tx/Rx Mode = 0</b>	
<b>Reporting Rate = 7</b>	
<b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate changes from 30 seconds to 10 seconds after receiving message 23.	✓
Transmissions occur on channel A and B.	✓
<b>A second Message 23 was sent after 1 minute with the Reporting Rate = 10 (next longest)</b>	
Reporting rate changes from 10 seconds to 15 seconds.	✓
Reporting rate of 30 seconds is returned to after 4 to 8 minutes from the second message 23.	✓

<b>EUT at 1 knot.</b>	
<b>Message 23 parameters:</b>	
<b>Station Type = 0</b>	
<b>Ship Type = 0</b>	
<b>Tx/Rx Mode = 1</b>	
<b>Reporting Rate = 7</b>	
<b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate changes to 10 seconds after receiving message 23.	✓
Transmissions only occur on channel A.	✓
The standard reporting rate of 3 minutes is returned to after 4 to 8 minutes.	✓
Transmissions revert back to both channel A and B.	✓

<b>EUT at 1 knot.</b>	
<b>Message 23 parameters:</b>	
<b>Station Type = 0</b>	
<b>Ship Type = 0</b>	
<b>Tx/Rx Mode = 2</b>	
<b>Reporting Rate = 7</b>	
<b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate changes to 10 seconds after receiving message 23.	✓
Transmissions only occur on channel B.	✓
The standard reporting rate of 3 minutes is returned to after 4 to 8 minutes.	✓
Transmissions revert back to both channel A and B.	✓

<b>EUT at 10 knots.</b>	
<b>Message 23 parameters:</b>	
<b>Station Type = 0</b>	
<b>Ship Type = 0</b>	
<b>Tx/Rx Mode = 0</b>	
<b>Reporting Rate = 0</b>	
<b>Quiet Time = 8</b>	
Requirement	Verdict
Transmissions stop for 8 minutes	✓
The standard reporting rate of 30 seconds is returned to after 8 minutes.	✓



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<b>EUT at 10 knots.</b> <b>Message 23 parameters:</b> <b>Region = Outside of EUT position</b> <b>Station Type = 0</b> <b>Ship Type = 0</b> <b>Tx/Rx Mode =0</b> <b>Reporting Rate = 8</b> <b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate remains at 30 seconds.	✓

<b>EUT at 10 knots.</b> <b>Message 23 parameters:</b> <b>Region = Including EUT position</b> <b>Station Type = 1 (Class A)</b> <b>Ship Type = 0</b> <b>Tx/Rx Mode =0</b> <b>Reporting Rate = 8</b> <b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate remains at 30 seconds.	✓

<b>EUT at 10 knots, ship type set to pleasure craft.</b> <b>Message 23 parameters:</b> <b>Region = Including EUT position</b> <b>Station Type = 0</b> <b>Ship Type = 34</b> <b>Tx/Rx Mode =0</b> <b>Reporting Rate = 8</b> <b>Quiet Time = 0</b>	
Requirement	Verdict
Reporting rate remains at 30 seconds.	✓



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Base station reservations – Clause 10.2.2.2 (Modification State 4)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Transmit a reservation Message 20 to the EUT specifying reserved time periods.

Record transmitted messages.

**Required Results**

Confirm that the EUT transmits position reports Message 18 without using reserved time periods.

**Test Results**

<b>Message 20 sent reserving all but slots xxx2 and xxx7 on channel 1.</b>	
Requirement	Verdict
EUT only uses slots xxx2 and xxx7 on channel 1.	✓
EUT uses any time periods after timeout of message 20.	✓
<b>Message 20 sent reserving all but slots xxx2 and xxx7 on channel 2.</b>	
Requirement	Verdict
EUT only uses slots xxx2 and xxx7 on channel 2.	✓
EUT uses any time periods after timeout of message 20.	✓





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### Polled mode/interrogation response – Clause 10.2.3

#### Interrogation for Messages 18 and 24 – Clause 10.2.3.1 (Modification State 3)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (Message 15; EUT as destination) to the VDL according to message table (ITU-R M.1371-4 Table 43) for responses with Message 18, Message 24:

- a) with transmission offset = 0;
- b) with transmission offset = defined value;
- c) with a Message 23 “quiet time” command transmitted before the interrogation.

Record transmitted messages and frame structure.

#### **Required Results**

Check that the EUT transmits the appropriate interrogation response message as requested after defined transmission offset. Confirm that the EUT transmits the response to the interrogation on the same channel as that received.

#### **Test Results**

<b>Part a)</b>	
<b>Request for message 18 only, offset = 0, Channel A</b>	
Requirement	Verdict
EUT sends message 18 within 30 seconds.	✓
Message 18 sent on channel A.	✓
<b>Request for message 18 and 24, offset = 0, Channel A</b>	
EUT sends message 18 within 30 seconds.	✓
Message 18 sent on channel A.	✓
EUT sends message 24A and 24B within 30 seconds.	✓
Message 24A and 24B sent on channel A.	✓
<b>Request for message 24 and 24, offset = 0, Channel B</b>	
EUT sends message 24A and 24B within 30 seconds.	✓
EUT only sends message 24A and 24B once.	✓
Message 24A and 24B sent on channel B.	✓

<b>Part b)</b>	
<b>Request for message 18, destination 2, offset = 50, Channel B</b>	
Requirement	Verdict
EUT sends message 18, 50 slots after message 15.	✓
Message 18 sent on channel B.	✓
<b>Request for message 24, destination 2, offset = 20, Channel B</b>	
Requirement	Verdict
EUT sends message 24A only, 20 slots after message 15.	✓
Message 24A sent on channel B.	✓



Product Service

Part c) – EUT sent message 23 with quiet time = 8.	
Request for message 18 and 24, offset = 0, Channel A	
Requirement	Verdict
EUT ceases transmission after quiet mode command.	
EUT sends message 18 within 30 seconds of interrogation.	✓
Message 18 sent on channel A.	✓
EUT sends message 24A and 24B within 30 seconds of interrogation.	✓
Message 24A and 24B sent on channel A.	✓



Product Service

Interrogation for Message 19 – Clause 10.2.3.2 (Modification State 2)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (Message 15; EUT as destination) by a Base station to the VDL according to message table (M.1371-4, Table 43) for responses with Message 19:

- a) with transmission offset = 0;
- b) with transmission offset = defined value.

Record transmitted messages and frame structure.

**Required Results**

- a) the EUT does not respond,
- b) the EUT transmits the appropriate interrogation response message as requested after defined transmission offset.

Confirm that the EUT transmits the response on the same channel as that received and the data content is identical with that in Message 24.

**Test Results**

<b>Part a)</b>	
Requirement	Verdict
Check that the EUT does not respond.	✓

<b>Part b) Transmission offset = 15</b>	
Requirement	Verdict
Check that the EUT transmits message 19, 15 slots after message 15.	✓
Confirm that the contents in message 19 are the same as message 24.	✓



Product Service

## 2.4 MESSAGES EXTENDING ONE TIME PERIOD

### 2.4.1 Specification Reference

IEC 62287-1, Clause 10.3

### 2.4.2 Equipment Under Test

408-0002, Serial No. 11

### 2.4.3 Date of Test and Modification State

18 January 2011 - Modification State 3

### 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 Test Results and Methods of Measurement

(Modification State 3)

#### **Method of Measurement**

Check the documentation for a possibility to initiate transmission of messages longer than one time period.

#### **Required Results**

It shall not be possible for the user to initiate the transmission of messages longer than one time period.

#### **Test Results**

Requirement	Verdict
It is not possible to initiate messages longer than one time period. This is stated in the manufacturer documentation in section 13.1.	✓



Product Service

## 2.5 CHANNEL SELECTION

### 2.5.1 Specification Reference

IEC 62287-1, Clause 10.4

### 2.5.2 Equipment Under Test

408-0002, Serial No. 11

### 2.5.3 Date of Test and Modification State

05 January 2011 – Modification State 2

### 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 Test Results and Methods of Measurement

Valid Channels – Clause 10.4.1 (Modification State 2)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Switch the EUT to different channels within the operating band as specified in 6.2 by transmission of channel management message (Message 22) broadcast and addressed to EUT.

Record the VDL messages on the designated channels and check “band flag” and “Message 22 flag” in Message 18 (note that DSC command is covered in Annex C).

#### **Required Results**

Confirm that the EUT switches to the required channel accordingly.

#### **Test Results**

<b>Message 22 sent as broadcast with Channels set to 2060 and 2064</b>	
Requirement	Verdict
The EUT changes to channels 2060 and 2064	✓
Band flag = 1	✓
Message 22 flag = 1	✓

<b>Message 22 sent addressed with Channels set to 2080 and 2082</b>	
Requirement	Verdict
The EUT changes to channels 2080 and 2082	✓



Product Service

Invalid Channels – Clause 10.4.2 (Modification State 2)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Check units capability on the “band flag” and “Message 22 flag” in Message 18. Switch the EUT to channels outside the operating band as specified in 6.2.

Record the VDL messages on the designated channels.

**Required Results**

Confirm that the EUT does not switch to the respective channels and stops transmissions.

**Test Results**

Requirement	Verdict
EUT stops transmissions.	✓
The EUT receives on default channels.	✓



Product Service

## 2.6 AIS INFORMATION

### 2.6.1 Specification Reference

IEC 62287-1, Clause 10.6

### 2.6.2 Equipment Under Test

408-0002, Serial No. 11

### 2.6.3 Date of Test and Modification State

22 December 2010 and 05 January 2011 - Modification State 2

18 January 2011 - Modification State 3

14 and 15 February 2011 - Modification State 5

### 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 Test Results and Methods of Measurement

Information Content – Clause 10.6.1

Defaults – Clause 10.6.1.1 (Modification State 3)

#### **Method of Measurement**

Set up the standard test environment and reset the equipment to enable the manufacturers static data delivery defaults. Attempt to set the equipment to operate in autonomous mode.

#### **Required Results**

Confirm that the default MMSI is set at 000000000 and that other static data defaults unambiguously identify that the equipment has been properly initialised. Confirm that the transmissions are inhibited and that an indication is given that transmissions are inhibited.

#### **Test Results**

Requirement	Verdict
When the MMSI is set to 000000000, the EUT does not transmit.	✓
Tx timeout is indicated by a yellow LED.	✓



Product Service

Required information – Clause 10.6.1.2 (Modification State 5)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Apply all static data to the EUT.

Record all messages on VDL and check the contents of position report Message 18 and static data report Messages 24 A and B.

**Required Results**

Confirm that data transmitted by the EUT complies with static data and position sensor data.

**Test Results**

Message 18 – The following parameters were checked		
Parameter	Requirement	Verdict
MMSI	According to MMSI setting	✓
SOG	According to sensor data	✓
Position Accuracy	According to sensor data	✓
Longitude	According to sensor data	✓
Latitude	According to sensor data	✓
COG	According to sensor data	✓
True Heading	According to sensor data	✓
Time Stamp	According to current time	✓
Reserved for regional applications	0	✓
Class B unit flag	1	✓
Class B display flag	0	✓
Class B DSC flag	1	✓
Class B band flag	1	✓
Class B message 22 flag	1	✓
Mode flag	0	✓
RAIM flag	1	✓
Communication state selector flag	1	✓
Communication state	1100000000000000110	✓

Message 24A – The following parameters were checked		
Parameter	Requirement	Verdict
MMSI	According to MMSI setting	✓
Part Number	0	✓
Name	According to ship name	✓

Message 24N – The following parameters were checked		
Parameter	Requirement	Verdict
MMSI	According to MMSI setting	✓
Part Number	0	✓
Type of ship and cargo	According to ship type setting	✓
Vendor ID	According to vendor setting	✓
Call sign	According to call sign setting	✓
Dimensions	According to dimA, dimB, dimC and dimD setting.	✓
Spare	000000	✓





Product Service

External sensor information – Clause 10.6.1.3

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode.

- a) Apply external position data with expected error <10 m (from GBS sentence) and within 26 m of internal position.
- b) Simulate unavailable/invalid external sensor data and missing/incorrect checksum.
- c) Apply a non-WGS-84 or unspecified (no DTM) position input.
- d) Apply a low accuracy position input with expected error >10 m or without RAIM information (no GBS).
- e) Apply position data with more than 26 m apart from internal position

Record all messages on VDL and check the contents of position report Message 18 for position and COG/SOG.

**Required Results**

- a) Data transmitted by the EUT complies with external sensor inputs.
- b), c), d), e) External data is not used.

Confirm that accuracy and RAIM flags are set accordingly; confirm that position and COG/SOG are of the same source.

**Test Results**

Requirement	Verdict
Test not performed as EUT does not support external sensor data.	✓



Product Service

#### Information update rates – Clause 10.6.2

#### Nominal reporting interval – Clause 10.6.2.1 (Modification State 2)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode.

a) Start with own SOG of 1 kn; record all messages on VDL for 10 min and evaluate reporting rate for position report of EUT by calculating average transmission offset over test period.

b) Increase speed to 10 kn.

c) Reduce speed to 1 kn.

Record all messages on VDL and check transmission offset between two consecutive transmissions.

#### **Required Results**

The following results are required.

a) Reporting interval shall be 3 min ( $\pm 10$  s).

b) Confirm that the reporting interval of 30 s ( $\pm 5$  s) has been established after the next transmission in the old schedule at the latest. The average reporting interval calculated over at least 25 transmissions shall be 30 s ( $\pm 2$  s).

c) Confirm that the reporting rate is reduced after 3 min (speed reduction).

#### **Test Results**

<b>Part a)</b>	
Requirement	Verdict
Reporting interval is 3 minutes $\pm 10$ seconds.	✓

<b>Part b)</b>	
Requirement	Verdict
Reporting interval is 30 seconds $\pm 5$ seconds.	✓
The reporting interval is established after the next transmission.	✓
The average reporting interval over 25 transmissions is 30 seconds $\pm 2$ seconds.	✓

<b>Part c)</b>	
Requirement	Verdict
The reporting interval is reduced after 3 minutes.	✓
Reporting interval is 3 minutes $\pm 10$ seconds.	✓



Product Service

Assigned reporting interval – Clause 10.6.2.2 (Modification State 5)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode.

- a) Transmit an assigned mode command Message 23 to the EUT with designated reporting intervals of 5 s to 3 min according to Table 17.
- b) Transmit an assigned mode command Message 23 to the EUT with designated reporting interval of 10 min.
- c) Transmit Messages 23 with a refresh rate of 1 min with designated reporting intervals of 6 min and 10 min.
- d) Transmit Messages 23 designated reporting interval field settings of 11 to 15.
- e) Change course, speed. Record transmitted messages.

**Required Results**

The following results are required.

- a) Confirm that the EUT transmits position reports Message 18 according to the parameters defined by Message 23. The EUT shall revert to autonomous mode with nominal reporting interval after 4 min to 8 min.
- b) Confirm that the EUT reverts to autonomous mode with nominal reporting interval after 4 min to 8 min.
- c) Confirm that the EUT transmits position reports Message 18 according to the parameters defined by Message 23.
- d) Confirm that the EUT does not change its nominal behaviour.
- e) The reporting interval shall not be affected by course or speed.



Product Service

## Test Results

<b>Part a) Message 23 sent with reporting rate = 5 seconds</b>	
Requirement	Verdict
The EUT transmits with an interval of 5 seconds.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 10 seconds</b>	
Requirement	Verdict
The EUT transmits with an interval of 10 seconds.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 15 seconds</b>	
Requirement	Verdict
The EUT transmits with an interval of 15 seconds.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 30 seconds</b>	
Requirement	Verdict
The EUT transmits with an interval of 30 seconds.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 30 seconds</b>	
Requirement	Verdict
The EUT transmits with an interval of 30 seconds.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 1 minute</b>	
Requirement	Verdict
The EUT transmits with an interval of 1 minute.	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓
<b>Message 23 sent with reporting rate = 3 minutes</b>	
Requirement	Verdict
The EUT transmits with an interval of 3 minutes	✓
The EUT returns to autonomous mode after 4 to 8 minutes.	✓

<b>Part b) Message 23 sent with reporting rate = 10 minutes</b>	
Requirement	Verdict
The EUT returns to autonomous mode after 4 to 8 minutes.	✓

<b>Part c) Message 23 sent with reporting rate = 6 minutes every minute</b>	
Requirement	Verdict
The EUT transmits with an interval of 6 minutes	✓
The EUT returns to autonomous mode after 4 to 8 minutes when message 23 is no longer transmitted.	✓
<b>Message 23 sent with reporting rate = 10 minutes every minute</b>	
Requirement	Verdict
The EUT transmits with an interval of 10 minutes	✓
The EUT returns to autonomous mode after 4 to 8 minutes when message 23 is no longer transmitted.	✓

<b>Part d) Message 23 sent with reporting interval field = 11</b>	
Requirement	Verdict
The EUT does not change its reporting interval.	✓
<b>Message 23 sent with reporting interval field = 11</b>	
Requirement	Verdict
The EUT does not change its reporting interval.	✓



Product Service

Message 23 sent with reporting interval field = 12	
Requirement	Verdict
The EUT does not change its reporting interval.	✓
Message 23 sent with reporting interval field = 13	
Requirement	Verdict
The EUT does not change its reporting interval.	✓
Message 23 sent with reporting interval field = 14	
Requirement	Verdict
The EUT does not change its reporting interval.	✓
Message 23 sent with reporting interval field = 15	
Requirement	Verdict
The EUT does not change its reporting interval.	✓

Part e) Message 23 sent with reporting rate = 1 minute. Speed is set to 1 kn.	
Requirement	Verdict
The EUT transmits with an interval of 1 minute.	✓
Speed is set to 10 kn.	
Requirement	Verdict
The EUT transmits with an interval of 1 minute.	✓
COG changed 10 degrees every 5 seconds.	
Requirement	Verdict
The EUT transmits with an interval of 1 minute.	✓

*Static data reporting interval – Clause 10.6.2.3 (Modification State 2)*

### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Record the transmitted messages and check for static data (Message 24).

Repeat the test at an assigned reporting interval of 5 s.

### **Required Results**

Confirm that the EUT transmits submessages 24A and 24B every 6 min (24B following 24A within 1 min). Transmission shall alternate between channel A and channel B and be independent of the Message 18 reporting interval.

### **Test Results**

Part 1) EUT at 1 knots	
Requirement	Verdict
Message 18 is transmitted at 3 minute intervals.	✓
Message 24A and 24B are transmitted every 6 minutes.	✓
The time between 24A and 24B is less than a minute.	✓
Message 24A and 24B alternate between channel A and B.	✓

Part 2) EUT at 10 knots	
Requirement	Verdict
Message 18 is transmitted at 30 second intervals.	✓
Message 24A and 24B are transmitted every 6 minutes.	✓
The time between 24A and 24B is less than a minute.	✓
Message 24A and 24B alternate between channel A and B.	✓



Product Service

<b>Part 3) EUT sent Message 23 with reporting interval set to 5 seconds</b>	
Requirement	Verdict
Message 18 is transmitted at 5 second intervals.	✓
Message 24A and 24B are transmitted every 6 minutes.	✓
The time between 24A and 24B is less than a minute.	✓
Message 24A and 24B alternate between channel A and B.	✓



Product Service

## 2.7 INITIALISATION PERIOD

### 2.7.1 Specification Reference

IEC 62287-1, Clause 10.7

### 2.7.2 Equipment Under Test

408-0002, Serial No. 11

### 2.7.3 Date of Test and Modification State

17 January 2011 - Modification State 3

### 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 Test Results and Methods of Measurement

(Modification State 3)

#### **Method of Measurement**

Set up standard test environment with SOG > 2 kn as follows.

- a) Switch on the EUT from cold (off-time minimum 1 h) with EUT operating in autonomous mode.
- b) Switch off the EUT for a period of time between 15 min to 60 min and switch on again.
- c) Make the GNSS sensor unavailable for a period of time between 1 min to 5 min.

Record transmitted messages.

#### **Required Results**

- a) within 30 min after switch on;
- b) within 5 min;
- c) stops transmitting after the next transmission and resumes within 1 min after enabling the position source.

#### **Test Results**

<b>Part a) – EUT switched on after off time greater than 24 hours.</b>	
Requirement	Verdict
EUT starts transmissions within 30 minutes.	✓

<b>Part b) – EUT switched off for 30 minutes and back on again.</b>	
Requirement	Verdict
EUT starts transmissions within 5 minutes.	✓



Product Service

<b>Part c) – GNSS sensor input removed.</b>	
Requirement	Verdict
EUT stops transmitting.	✓
<b>GNSS sensor input reconnected.</b>	
EUT starts transmissions within 1 minute.	✓





Product Service

## 2.8 ALARMS AND INDICATIONS, FALL-BACK ARRANGEMENTS

### 2.8.1 Specification Reference

IEC 62287-1, Clause 10.8

### 2.8.2 Equipment Under Test

408-0002, Serial No. 11

### 2.8.3 Date of Test and Modification State

18 January 2011 - Modification State 3

14 February 2011 - Modification State 5

### 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 Test Results and Methods of Measurement

Built-in integrity test – Clause 10.8.1 (Modification State 5)

#### **Method of Measurement**

Check manufacturer's documentation on built-in integrity test.

#### **Required Results**

Verify that an indication is provided if a malfunction is detected.

#### **Test Results**

Documentation states that the built in integrity test, consists of the following.	
Requirement	Verdict
Test for receiver background noise level > 77dBm	✓
Test for VHF antenna high VSWR	✓



Product Service

#### Transceiver protection – Clause 10.8.2 (Modification State 5)

##### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Open-circuit and short-circuit VHF antenna terminals of the EUT for at least 5 min each.

##### **Required Results**

The EUT shall be operative again within 2 min after refitting the antenna without damage to the transceiver.

##### **Test Results**

Requirement	Verdict
After refitting the antenna, the EUT shall resume normal operation within 2 minutes.	✓
Error light activated when antenna terminals are open circuit or short circuit, behaviour as stated in EUT documentation.	✓

#### Transmitter shutdown procedure – Clause 10.8.3 (Modification State 3)

##### **Method of Measurement**

Check manufacturer's documentation on transmitter shutdown procedure.

##### **Required Results**

Verify that a transmitter shutdown procedure independent of the operating software is provided.

##### **Test Results**

Requirement	Verdict
The documentation provides a description of the transmitter shutdown procedure.	✓
The procedure is independent of software.	✓

#### Position sensor fallback conditions – Clause 10.8.4 (Modification State 5)

##### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Where an option for an external GNSS sensor is not provided, the respective tests shall be omitted.

Apply position sensor data in a way that the EUT operates in the states defined below:

- a) external DGNSS in use if implemented;
- b) internal DGNSS in use (corrected by Message 17) if implemented;
- c) internal DGNSS in use (corrected by a beacon) if implemented;
- d) external GNSS in use if implemented;
- e) internal GNSS in use;
- f) no sensor position in use.

Check the position accuracy and RAIM flag in the VDL Message 18 and, where provided, the ALR sentence.



Product Service

### Required Results

Verify that the use of position source, position accuracy flag, RAIM flag and position information complies with Table 1.

Verify that the position sensor status is maintained for the next scheduled report and changed after that.

### Test Results

From e) internal GNSS in use to f) no sensor position in use.	
Requirement	Verdict
Next scheduled report is transmitted.	✓
Transmissions are ceased after the next scheduled report.	✓
Comments	
A message is displayed on the serial interface when a position report should be transmitted, "TX attempt failed (msg 18 no pos'n)".	

From f) no sensor position in use to e) internal GNSS in use	
Requirement	Verdict
Transmissions are resumed.	✓
Check PA Flag = 1	✓
Check RAIM = 1	✓

### Speed sensors – Clause 10.8.5

#### Method of Measurement

Set up standard test environment and operate EUT in autonomous mode. Where an option for an external GNSS sensor is not provided, this test shall be omitted.

- a) Apply valid external DGNSS position and speed data.
- b) Make external DGNSS position invalid (for example by wrong checksum, "valid/invalid" flag).

### Required Results

Check the following.

- a) The external data for SOG/COG is transmitted in Message 18.
- b) The internal data for SOG/COG is transmitted in Message 18.

### Test Results

Requirement	Verdict
External GNSS sensor is not provided.	✓



Product Service

## 2.9 USER INTERFACE

### 2.9.1 Specification Reference

IEC 62287-1, Clause 10.9

### 2.9.2 Equipment Under Test

408-0002, Serial No. 11

### 2.9.3 Date of Test and Modification State

20 January 2011 - Modification State 3

### 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 Test Results and Methods of Measurement

Display – Clause 10.9.1 (Modification State 3)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode.

- a) Check status indications for power, Tx timeout, Error.
- b) Apply Message 23 “quiet time” of >7 min.
- c) Simulate VDL load in order to make it impossible for the EUT to find free candidate periods.

#### **Required Results**

Check the following.

- a) Indicators are available and working correctly according to manufacturer’s documentation.
- b) The Tx timeout indication is activated.
- c) The Tx timeout indication is activated.

#### **Test Results**

<b>Part a)</b>	
<b>Requirement</b>	<b>Verdict</b>
Check that a power indicator is present.	✓
Verify that the power LED is activated when EUT is switched on.	✓
Check that a tx timeout indicator is present.	✓
Check that an error indicator is present.	✓
When background noise level is greater than -77 dBm, according to the documentation, the error LED shall be activated. Verify the error LED activates under these conditions.	✓



Product Service

<b>Part b) – Message 23 sent with quiet time = 8</b>	
Requirement	Verdict
Verify that the tx timeout LED is activated after the message is received.	✓
After 8 minutes, when normal transmissions resume, check that the tx timeout LED is deactivated.	✓
Comments	
The Tx timeout LED activates after the first failed transmission.	
The Tx timeout LED is deactivated after the next successful transmission.	

<b>Part c) – 100 % channel loading.</b>	
Requirement	Verdict
Verify that the tx timeout LED is activated.	✓
Check that the tx timeout LED is deactivated when channel loading ceases.	✓
Comments	
The Tx timeout LED activates after the first failed transmission.	
The Tx timeout LED is deactivated after the next successful transmission.	



Product Service

Message display – Clause 10.9.2 (Modification State 3)

**Method of Measurement**

This test is only applicable if a message display is provided.

Set up standard test environment and operate EUT in autonomous mode.

Transmit a Message 14.

**Required Results**

Verify that the EUT displays the message.

**Test Results**

Requirement	Verdict
A message display is not provided.	✓

Static data input – Clause 10.9.3 (Modification State 3)

**Method of Measurement**

Verify that static data can be input to the unit according to the manufacturer's documentation.

Set up standard test environment and operate EUT in autonomous mode.

**Required Results**

Check that static data are transmitted correctly by the EUT and that the MMSI cannot be altered by the user.

**Test Results**

Requirement	Verdict
MMSI cannot be altered by the user, without a password.	✓
Static data can be input via the serial interface as defined in the documentation.	✓



Product Service

#### External interfaces – Clause 10.9.4

##### Display interface – Clause 10.9.4.1

This test only applies if a display interface is provided.

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Apply a safety related broadcast Message 14 through the VDL to the EUT.

#### **Required Results**

The interface shall be compliant with IEC 61162 series protocol and the manufacturer's documentation of interface hardware.

#### **Test Results**

Requirement	Verdict
Display interface is not provided.	✓



Product Service

## **2.10 TDMA SYNCHRONISATION**

### **2.10.1 Specification Reference**

IEC 62287-1, Clause 12.1

### **2.10.2 Equipment Under Test**

408-0002, Serial No. 11

### **2.10.3 Date of Test and Modification State**

17 February 2011 - Modification State 6

### **2.10.4 Test Equipment Used**

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

### **2.10.5 Test Results and Methods of Measurement**

Synchronisation test sync mode 1 – Clause 12.1.1 (Modification State 6)

#### ***Method of Measurement***

Set up standard test environment and set the EUT to assigned mode for a reporting rate of 5 s. Enable test conditions for the following:

- a) station transmitting Message 1 or 2, 3, 4 not subject to a CS-delay, with repeat indicator = 0, with no propagation delay and with position available is received by the EUT;
- b) no sync source (switched off);
- c) with the internal clock of the EUT out of sync (sync jitter > 1 000 ms), transmit messages not to be used as sync source (see 7.3.2.2) to the EUT;
- d) repeat test a) using a sync source transmitting Message 4; simulate the position of the station providing the sync source (for instance a base station 60 NM = 416 ms away from EUT position) in order to simulate a propagation delay;
- e) repeat test d) with an additional source transmitting Message 1 or 2, 3, 4, 18 not subject to a CS-delay, with repeat indicator = 0, with no propagation delay and with position available is received by the EUT.

Record VDL messages and measure the time between T0 ref of the synchronisation source and the initiation of the "transmitter on" function TA and calculate back to T0 EUT (a sync output may be used for the purpose of this test). Alternative methods, for example by evaluating the start flag are allowed.





Product Service

### Required Results

- a) The EUT shall synchronise on the received source and the synchronisation jitter shall not exceed  $\pm 312 \mu\text{s}$  (sync mode 1).
- b) The synchronisation jitter shall not exceed  $\pm 312 \mu\text{s}$  during a 30 s period from the time a proper sync source was last received.
- c) The EUT shall not synchronise on these received messages.
- d) The synchronisation jitter of the EUT shall be within  $-416 \mu\text{s} \pm 312 \mu\text{s}$ .
- e) The synchronisation jitter of the EUT shall be  $-208 \mu\text{s} \pm 312 \mu\text{s}$  within 60 s.

### Test Results

Part a)	
Requirement	Verdict
Jitter shall not exceed $\pm 312 \mu\text{s}$ .	✓
Comments	
Jitter measured at $-47 \mu\text{s}$	

Part b)	
Requirement	Verdict
Jitter shall not exceed $\pm 312 \mu\text{s}$ during a 30 s period from the time a proper sync source was last received.	✓

Part c)	
Requirement	Verdict
EUT does not synchronise to messages with repeat indicator = 1.	✓

Part d)	
Requirement	Verdict
Jitter of the EUT shall be within $-416 \mu\text{s} \pm 312 \mu\text{s}$	✓
Comments	
Jitter measured at $-324 \mu\text{s}$	

Part e)	
Requirement	Verdict
Jitter of the EUT shall be within $-208 \mu\text{s} \pm 312 \mu\text{s}$ within 60 seconds.	✓
Comments	
Jitter measured at $-145 \mu\text{s}$	



Product Service

#### Synchronisation test sync mode 2 – Clause 12.1.2 (Modification State 6)

##### **Method of Measurement**

Set up standard test environment and enable test conditions for the following:

- a) Operate EUT in sync mode 2 for more than 5 min.
- b) Switch on sync source immediately after scheduled transmission of EUT. Sync source shall be a station transmitting Message 1 or 2, 3, 4 not subject to a CS-delay, with repeat indicator = 0 and with position available with a reporting rate of 10 s.

Record VDL messages and measure the time between T0 ref of the synchronisation source and the initiation of the "transmitter on" function TA and calculate back to T0 EUT (a sync output may be used for the purpose of this test). Alternative methods, for example by evaluating the start flag are allowed.

##### **Required Results**

Verify that the EUT synchronises its next scheduled transmission on the sync source. The synchronisation jitter shall not exceed  $\pm 312 \mu\text{s}$ .

##### **Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT synchronises its next scheduled transmission.	✓
Jitter shall not exceed $\pm 312 \mu\text{s}$ .	✓

#### Synchronisation test with UTC – Clause 12.1.3

##### **Method of Measurement**

Set up standard test environment and enable test conditions in a way that EUT operates in UTC synchronised mode.

##### **Required Results**

The synchronisation jitter shall not exceed  $\pm 312 \text{ ms}$ .

##### **Test Results**

Requirement	Verdict
The EUT does not provide the means to synchronise from other sources.	✓



Product Service

## 2.11 CARRIER-SENSE TESTS

### 2.11.1 Specification Reference

IEC 62287-1, Clause 12.2

### 2.11.2 Equipment Under Test

408-0002, Serial No. 11

### 2.11.3 Date of Test and Modification State

17 February 2011 - Modification State 6

18 February 2011 - Modification State 7

### 2.11.4 Test Equipment Used

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

### 2.11.5 Test Results and Methods of Measurement

Threshold Level - Clause 12.2.1 (Modification State 7)

#### **Method of Measurement**

The test shall be set-up and tested according to clause 12.2.1

#### **Required Results**

Step	Description	Signal A (dBm)	Signal B (dBm)	EUT Transmission
1	Time period free	OFF	OFF	Yes
2	Time period free	-104	OFF	Ceased
3	Recovery	OFF	OFF	Yes
4	Raised background	OFF	-87	Yes
5	Time period used	-74	-87	Ceased
6	Recovery	OFF	-87	Yes

#### **Test Results**

Step	Description	Signal A (dBm)	Signal B (dBm)	Result
1	Time period free	OFF	OFF	Pass
2	Time period free	-104	OFF	Pass
3	Recovery	OFF	OFF	Pass
4	Raised background	OFF	-87	Pass
5	Time period used	-74	-87	Pass
6	Recovery	OFF	-87	Pass



Product Service

Carrier-sense timing - Clause 12.2.2 (Modification State 6)

**Method of Measurement**

Use the test configuration and signals of test 12.2.1.

Signal B is switched off, signal A can be manually set to -74 dBm, -104 dBm and OFF.

The SYNC signal of the EUT indicating the start of each time period that it intends to transmit into is used to trigger the pulse generator to generate a 0,7 ms (7 bits) pulse for switch 2 starting at the SYNC signal (this pulse ends 1 bit before start of the CS detection window of the EUT).

Levels shall be adjusted as per the steps given in Table 25 and the EUT monitored for 10 min (or at least 20 reporting attempts) to confirm if EUT transmits.

**Required Results**

Step	Description	Signal A (dBm)	Signal B (dBm)	EUT Transmission
1	Time period free	OFF	OFF	Yes
2	Time period free	-104	OFF	Yes
3	Time period free	-74	OFF	Yes

**Test Results**

Step	Description	Signal A (dBm)	Signal B (dBm)	Result
1	Time period free	OFF	OFF	Pass
2	Time period free	-104	OFF	Pass
3	Recovery	OFF	OFF	Pass



Product Service

## 2.12 VDL STATE/RESERVATIONS

### 2.12.1 Specification Reference

IEC 62287-1, Clause 12.3

### 2.12.2 Equipment Under Test

408-0002, Serial No. 11

### 2.12.3 Date of Test and Modification State

17 February 2011 - Modification State 6

### 2.12.4 Test Equipment Used

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

### 2.12.5 Test Results and Methods of Measurement

(Modification State 6)

#### **Method of Measurement**

Set up standard test environment and operate EUT with assigned reporting interval of 10 s. Record transmitted scheduled position reports Message 18 and check time periods used for transmission.

- a) Transmit a Message 20 to the EUT reserving a block of time periods including timeout.
- b) Transmit a Message 20 to the EUT reserving a block of time periods without timeout.

#### **Required Results**

Verify that

- a) the reserved block is not used and used again after the timeout specified in Message 20;
- b) the reserved block is not used and used again after a timeout of 3 min.

#### **Test Results**

<b>Part a) Message 20 sent reserving all but slots xxx2 and xxx7, timeout = 5.</b>	
Requirement	Verdict
EUT does not use slots xxx2 or xxx7.	✓
EUT uses any slot after timeout of 5 minutes.	✓

<b>Part a) Message 20 sent reserving all but slots xxx2 and xxx7, timeout = 0.</b>	
Requirement	Verdict
EUT does not use slots xxx2 or xxx7.	✓
EUT uses any slot after 3 minutes.	✓



Product Service

## 2.13 DATA ENCODING (BIT STUFFING)

### 2.13.1 Specification Reference

IEC 62287-1, Clause 12.4

### 2.13.2 Equipment Under Test

408-0002, Serial No. 11

### 2.13.3 Date of Test and Modification State

23 December 2010 - Modification State 2

### 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 Test Results and Methods of Measurement

(Modification State 2)

#### **Method of Measurement**

Set up standard test environment.

Set ships name to a value that requires bit-stuffing for instance "wwwwww" and check the VDL (note that this might require that the manufacturer provides means to input this data).

#### **Required Results**

Confirm that transmitted VDL Message 24 conforms to data input.

#### **Test Results**

Requirement	Verdict
Message 24 contains the correct data.	✓



Product Service

## 2.14 FRAME CHECK SEQUENCE

### 2.14.1 Specification Reference

IEC 62287-1, Clause 12.5

### 2.14.2 Equipment Under Test

408-0002, Serial No. 11

### 2.14.3 Date of Test and Modification State

27 January 2011 - Modification State 4

### 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 Test Results and Methods of Measurement

(Modification State 5)

#### **Method of Measurement**

Apply simulated position report messages with wrong CRC bit sequence to the VDL as follows.

- Check test output; if a display interface is provided, check this.
- Repeat test 12.1.1 and check that a station transmitting messages with wrong CRC are not used for synchronisation.

#### **Required Results**

Confirm that messages with invalid CRC are not accepted by the EUT in cases a) and b).

#### **Test Results**

<b>Part a) Position report sent to EUT with valid CRC.</b>	
Requirement	Verdict
EUT outputs the message on the serial interface.	✓
<b>Position report sent to EUT with invalid CRC.</b>	
Requirement	Verdict
EUT does not output the message on the serial interface.	✓

<b>Part b) Position reports sent to EUT with invalid CRC.</b>	
Requirement	Verdict
EUT does not synchronise to the source transmitting the position reports.	✓
<b>Position reports sent to EUT with valid CRC.</b>	
Requirement	Verdict
EUT synchronises to the source transmitting the position reports.	✓



Product Service

## **2.15 SLOT ALLOCATION (CHANNEL ACCESS PROTOCOL)**

### **2.15.1 Specification Reference**

IEC 62287-1, Clause 12.6

### **2.15.2 Equipment Under Test**

408-0002, Serial No. 11

### **2.15.3 Date of Test and Modification State**

15 February 2011 - Modification State 5

18 February 2011 - Modification State 7

### **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 Test Results and Methods of Measurement**

Autonomous mode allocation – Clause 12.6.1 (Modification State 5)

#### ***Method of Measurement***

Set up standard test environment and operate EUT with assigned reporting interval of 10 s.

Record transmitted scheduled position reports Message 18 and check time periods used for transmission. Check the communication state of transmitted messages.

Repeat the test with additional simulated channel load of 80 % (4 time periods used, 1 time period unused).

#### ***Required Results***

The time periods used for transmission shall in both tests

- not exceed the transmission interval TI,
- not always use the same time period,
- not always use the first unused time period.

Check that the communication state of Message 18 is the default value as defined in 7.3.4.6.





Product Service

### Test Results

<b>Message 23 sent with reporting interval = 10 seconds. No channel loading.</b>	
Requirement	Verdict
EUT does not exceed the transmission interval TI.	✓
EUT does not always use the same time period.	✓
EUT does not always use the first unused time period.	✓
Check that the communication state of Message 18 is the default value.	✓

<b>Message 23 sent with reporting interval = 10 seconds. 80% channel loading.</b>	
Requirement	Verdict
EUT does not exceed the transmission interval TI.	✓
EUT does not always use the same time period.	✓
EUT does not always use the first unused time period.	✓
Check that the communication state of Message 18 is the default value.	✓

DSC listening periods – Clause 12.6.2 (Modification State 7)

### Method of Measurement

This test is applicable only if DSC functionality is implemented.

Set up standard test environment and operate EUT with assigned reporting interval of 10 s. Enable DSC functionality. Record transmitted scheduled position reports Message 18 and check time periods used for transmission.

### Required Results

During the DSC monitoring times, scheduled transmissions of Message 18 shall continue.

### Test Results

Requirement	Verdict
Message 18 transmissions are unaffected during DSC monitoring times.	✓



Product Service

## **2.16 ASSIGNED OPERATION**

### **2.16.1 Specification Reference**

IEC 62287-1, Clause 12.7

### **2.16.2 Equipment Under Test**

408-0002, Serial No. 11

### **2.16.3 Date of Test and Modification State**

06 January 2011 - Modification State 2

14 February 2011 - Modification State 5

### **2.16.4 Test Equipment Used**

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

### **2.16.5 Test Results and Methods of Measurement**

Assignment priority – Clause 12.7.1 (Modification State 2)

#### ***Method of Measurement***

Set up standard test environment and operate EUT in autonomous mode. Transmit an assigned mode command (Message 23) to the EUT with Tx/Rx mode 1.

a) Transmit a Message 22 defining a region with the EUT inside that region. Transmit a Message 22 to the EUT individually addressed and specifying Tx/Rx mode 2.

b) Repeat the test, clear the region defined by Message 22 under a). Transmit Message 22 to the EUT with regional settings specifying Tx/Rx mode 2.

NOTE This can be carried out using the method used in 13.3.1 b) step 2 or by assigning a new simulated position to the EUT.

Record transmitted messages.

#### ***Required Results***

a) The Tx/Rx mode field setting of Message 22 shall take precedence over the Tx/Rx mode field setting of Message 23.

b) The Tx/Rx mode field setting of Message 23 shall take precedence over the Tx/Rx mode field setting of Message 22. The receiving station shall revert to its previous Tx/Rx mode after a timeout value randomly chosen between 240 s and 480 s.



Product Service

### Test Results

<b>Part a) - Message 23 sent to EUT with Tx/Rx mode = 1.</b>	
Requirement	Verdict
Check that the EUT is using Channel A.	✓
EUT uses channel B when an addressed Message 22 with Tx/Rx mode = 2 is sent.	✓

<b>Part b) - Message 22 sent to EUT with Tx/Rx mode = 2.</b>	
Requirement	Verdict
Check that the EUT is using Channel B.	✓
EUT uses channel A when Message 23 with Tx/Rx mode = 1 is sent.	✓
Check that the EUT reverts to using Channel B after 4 – 8 minutes.	✓

Entering rate assignment – Clause 12.7.2 (*Modification State 2*)

### Method of Measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a Group Assignment command (Message 23) to the EUT with a reporting interval of 10 s assigned, monitor the VDL, reset by assigning 30 s rate; repeat 10 times.

### Required Results

Verify that the first transmission after receiving the Message 23 is within a time randomly selected between the time the Message 23 has been received and the assigned interval.

### Test Results

<b>Part a) - Message 23 sent to EUT with a reporting interval of 10 seconds.</b>	
Requirement	Verdict
The first transmission shall be random over 10 assignments between 0 and 10 seconds.	✓

<b>Part b) - Message 22 sent to EUT with a reporting interval of 30 seconds.</b>	
Requirement	Verdict
The first transmission shall be random over 10 assignments between 0 and 30 seconds.	✓



Product Service

#### Reverting from rate assignment – Clause 12.7.3 (Modification State 2)

##### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Transmit a group assignment command (Message 23) to the EUT with a reporting interval of 10 s assigned, monitor the VDL until at least 1 min after timeout occurred; repeat 10 times (transmissions of Message 23 shall not be synchronised to the initial transmission schedule of the EUT).

Measure the time  $T_{rev}$  between the reception of Message 23 and first transmission after timeout.

##### **Required Results**

$T_{rev}$  shall be randomly distributed between 240 s and 480 s.

##### **Test Results**

Requirement	Verdict
$T_{rev}$ is randomly distributed between 240 seconds and 480 seconds.	✓

#### Reverting from quiet mode – Clause 12.7.4 (Modification State 2)

##### **Method of Measurement**

Set up standard test environment and operate EUT with a reporting interval of 10 s assigned. Transmit a group assignment command (Message 23) to the EUT with quiet time = 1 min.

##### **Required Results**

Verify that the first transmission after the quiet period is within the schedule that was in place before the quiet period.

##### **Test Results**

Requirement	Verdict
EUT enters assigned mode with 10 second reporting interval.	✓
EUT does not transmit after message 23 with quiet time of 1 minute is received.	✓
EUT starts transmitting after quiet time has elapsed, in the same schedule as before.	✓



Product Service

Retry of interrogation response – Clause 12.7.5 (Modification State 5)

**Method of Measurement**

Set up standard test environment. Interrogate the EUT by Message 15 for a response with Message 18.

Measure under the following conditions.

- a) Simulate full VDL load for the following 30 s.
- b) Simulate full VDL load for the following 60 s.

**Required Results**

Verify that

- a) A response is transmitted between 30 s and 60 s after the transmission of Message 15;
- b) Verify no response is transmitted.

**Test Results**

Part a)	
Requirement	Verdict
EUT responds with message 18 within 30 to 60 seconds.	✓

Part b)	
Requirement	Verdict
EUT does not respond.	✓



Product Service

## **2.17 MESSAGE FORMATS**

### **2.17.1 Specification Reference**

IEC 62287-1, Clause 12.8

### **2.17.2 Equipment Under Test**

408-0002, Serial No. 11

### **2.17.3 Date of Test and Modification State**

25 January 2011 - Modification State 4  
17 February 2011 - Modification State 6

### **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 Test Results and Methods of Measurement**

Received messages – Clause 12.8.1 (*Modification State 4*)

#### ***Method of Measurement***

Set up standard test environment and operate EUT in autonomous mode. Apply messages according to Table 11 to the VDL. Record messages output by the PI of EUT where provided.

#### ***Required Results***

Confirm that EUT responds as appropriate. Check that EUT outputs the corresponding sentences with correct field contents and format via the PI where provided.

Verify that the EUT does not process addressed messages.



Product Service

### Test Results

Msg No.	Support	Requirement	Verdict
1	Optional	Message is output on the serial interface correctly.	✓
2	Optional	Message is output on the serial interface correctly.	✓
3	Optional	Message is output on the serial interface correctly.	✓
4	Optional	Message is output on the serial interface correctly.	✓
5	Optional	Message is output on the serial interface correctly.	✓
6	No	Message is not output on the serial interface.	✓
7	No	Message is not output on the serial interface.	✓
8	Optional	Message is output on the serial interface correctly.	✓
9	Optional	Message is output on the serial interface correctly.	✓
10	No	Message is not output on the serial interface.	✓
11	Optional	Message is output on the serial interface correctly.	✓
12	Optional	Message is not output on the serial interface.	✓
13	No	Message is not output on the serial interface.	✓
14	Optional	Message is output on the serial interface correctly.	✓
15	Yes	Message is output on the serial interface correctly.	✓
16	No	Message is not output on the serial interface.	✓
17	Optional	Message is output on the serial interface correctly.	✓
18	Optional	Message is output on the serial interface correctly.	✓
19	Optional	Message is output on the serial interface correctly.	✓
20	Yes	Message is output on the serial interface correctly.	✓
21	Optional	Message is output on the serial interface correctly.	✓
22	Yes	Message is output on the serial interface correctly.	✓
23	Yes	Message is output on the serial interface correctly.	✓
24	Optional	Message is output on the serial interface correctly.	✓
25	Optional	Message is output on the serial interface correctly.	✓
26	No	Message is not output on the serial interface.	✓
27	No	Message is not output on the serial interface.	✓



Product Service

#### Transmitted messages – Clause 12.8.2 (Modification State 6)

##### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Initiate the transmission of messages relevant for a Class B mobile station according to Table 11 by the EUT. Record transmitted messages.

##### **Required Results**

Confirm that only messages as allowed by Table 11 are transmitted by the EUT.

##### **Test Results**

Msg No.	Support	Requirement	Verdict
1	No	The EUT does not transmit the message.	✓
2	No	The EUT does not transmit the message.	✓
3	No	The EUT does not transmit the message.	✓
4	No	The EUT does not transmit the message.	✓
5	No	The EUT does not transmit the message.	✓
6	No	The EUT does not transmit the message.	✓
7	No	The EUT does not transmit the message.	✓
8	No	The EUT does not transmit the message.	✓
9	No	The EUT does not transmit the message.	✓
10	No	The EUT does not transmit the message.	✓
11	No	The EUT does not transmit the message.	✓
12	No	The EUT does not transmit the message.	✓
13	Optional	The EUT does not transmit the message.	✓
14	No	The EUT does not transmit the message.	✓
15	No	The EUT does not transmit the message.	✓
16	No	The EUT does not transmit the message.	✓
17	No	The EUT does not transmit the message.	✓
18	Yes	The EUT transmits the message.	✓
19	Yes	The EUT transmits the message.	✓
20	No	The EUT does not transmit the message.	✓
21	No	The EUT does not transmit the message.	✓
22	No	The EUT does not transmit the message.	✓
23	No	The EUT does not transmit the message.	✓
24	Yes	The EUT transmits both parts of the message.	✓
25	No	The EUT does not transmit the message.	✓
26	No	The EUT does not transmit the message.	✓
27	No	The EUT does not transmit the message.	✓





Product Service

## 2.18 REGIONAL AREA DESIGNATION BY VDL MESSAGE

### 2.18.1 Specification Reference

IEC 62287-1, Clause 13.1

### 2.18.2 Equipment Under Test

408-0002, Serial No. 11

### 2.18.3 Date of Test and Modification State

27 January 2011 - Modification State 4

### 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 Test Results and Methods of Measurement

(Modification State 4)

#### **Method of Measurement**

Set up standard test environment. Apply channel management messages (Message 22) to the VDL defining two adjacent regional areas 1 and 2 with different channel assignments for both regions and a transitional zone extending 4 NM either side of the regional boundary

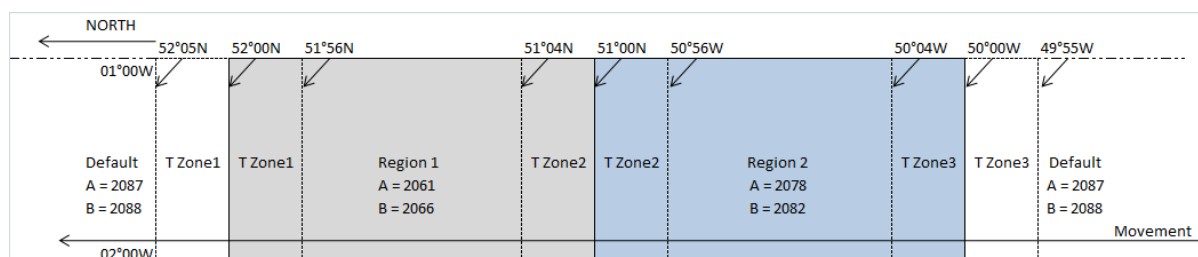
Let the EUT approach region 1 (see Figure 17) from outside region 2 more than 5 NM away from region boundary transmitting on default channels. Record transmitted messages on all 6 channels. This can be accomplished by either using a dedicated test input for simulated position information or a GNSS simulator.

#### **Required Results**

Check that the EUT transmits and receives on the primary channels assigned for each region alternating channels and doubling reporting rate when passing through the transitional zones (see Table 26). EUT shall revert to default autonomous operation on the regional channels after leaving the transitional zones.

#### **Test Results**

The following regions were setup and the EUT moved through them.





Product Service

This test was divided up into 6 sections to test for behaviour when crossing between regions and transition zones.

Test	Zone	Start Position	Stop Position	Boundary Position
1	RD-TZ3	49°53	49°58	49°55
2	TZ3-R2	50°02	50°06	50°04
3	R2-TZ2	50°54	50°58	50°56
4	TZ2-R1	51°02	51°06	51°04
5	R1-TZ1	51°54	51°58	51°56
6	TZ1-RD	52°02	52°07	52°05

RD = Region default

TZ = Transition Zone

R = Region

Region Settings by message 22	
Requirement	Verdict
Check that message 22 for region 1 is received.	✓
Check that message 22 for region 2 is received.	✓

Test 1 – Region default to transition zone 3	
Requirement	Verdict
Verify that channels 2087 and 2078 are used.	✓
Check that the reporting rate is doubled.	✓

Test 2 – Transition zone 3 to region 2	
Requirement	Verdict
Verify that channels 2078 and 2082 are used.	✓
Check that the reporting rate returns to normal.	✓

Test 3 – Region 2 to transition zone 2	
Requirement	Verdict
Verify that channels 2087 and 2061 are used.	✓
Check that the reporting rate is doubled.	✓

Test 4 – Transition zone 2 to region 1	
Requirement	Verdict
Verify that channels 2061 and 2066 are used.	✓
Check that the reporting rate returns to normal.	✓

Test 5 – Region1 to transition zone 1	
Requirement	Verdict
Verify that channels 2061 and 2087 are used.	✓
Check that the reporting rate is doubled.	✓

Test 6 – Transition zone 1 to region default	
Requirement	Verdict
Verify that channels 2087 and 2088 are used.	✓
Check that the reporting rate returns to normal.	✓



Product Service

## 2.19 REGIONAL AREA DESIGNATION BY SERIAL MESSAGE OR MANUALLY

### 2.19.1 Specification Reference

IEC 62287-1, Clause 13.2

### 2.19.2 Equipment Under Test

408-0002, Serial No. 11

### 2.19.3 Date of Test and Modification State

18 January 2011 - Modification State 3

### 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 Test Results and Methods of Measurement

(Modification State 3)

#### **Method of Measurement**

Check documentation.

#### **Required Results**

Verify that the user cannot allocate channels (directly or by ACA sentence).

#### **Test Results**

Requirement	Verdict
The documentation states that the user cannot allocate channels in section 13.6.	✓



Product Service

## **2.20 MANAGEMENT OF RECEIVED REGIONAL OPERATING SETTINGS**

### **2.20.1 Specification Reference**

IEC 62287-1, Clause 13.3

### **2.20.2 Equipment Under Test**

408-0002, Serial No. 11

### **2.20.3 Date of Test and Modification State**

25 January 2011 - Modification State 4

15 February 2011 - Modification State 5

### **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 Test Results and Methods of Measurement**

Replacement or erasure of dated or remote regional operating settings – Clause 13.3.1  
(Modification State 4)

#### ***Method of Measurement***

Set up standard test environment. Send a valid regional operating setting to the EUT by Message 22 with the regional operating area including the own position of the EUT. Consecutively send a total of seven valid regional operating settings to EUT, using Message 22, with regional operating areas not overlapping to the first and to each other. Perform the following in the order shown:

a) Send a ninth Message 22 to the EUT with valid regional operating areas not overlapping with the previous eight regional operating areas.

b) Step 1: set own position of EUT into any of the regional operating areas defined by the second to the ninth Message 22 sent to the EUT previously.

Step 2: send a tenth Message 22 to the EUT, with a regional operating area which partly overlaps the regional operating area to which the EUT was set by step 1 but which does not include the own position of the EUT.

c) Step 3: move own position of EUT to a distance of more than 500 miles from all regions defined by previous commands.

Step 4: consecutively set own position of EUT to within all regions defined by the previous Message 22.

This test can be accomplished by either using the test input for simulated position information or a GNSS simulator (see also Annex D).



Product Service

### **Required Results**

After the initialisation, the EUT shall operate according to the regional operating settings defined by the first Message 22 sent.

Check that

a) The EUT returns to the default operating settings.

b) Step 1: the EUT changes its operating settings to those of that region which includes own position of the EUT.

Step 2: the EUT reverts to the default operating settings.

NOTE: Since the regional operating settings to which the EUT was set in Step 1 are erased due to Step 2, and since there is no other regional operating setting due to their non-overlapping definition, the EUT returns to default.

c) Step 3: the EUT operates with the default settings.

Step 4: the EUT operates with the default settings.

### **Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT returns to default operating settings.	✓

<b>Part b) Step 1</b>	
Requirement	Verdict
EUT uses region 2 settings when positioned in region 2.	✓
EUT uses region 3 settings when positioned in region 3.	✓
EUT uses region 4 settings when positioned in region 4.	✓
EUT uses region 5 settings when positioned in region 5.	✓
EUT uses region 6 settings when positioned in region 6.	✓
EUT uses region 7 settings when positioned in region 7.	✓
EUT uses region 8 settings when positioned in region 8.	✓
EUT uses region 9 settings when positioned in region 9.	✓
<b>Step 2</b>	
Requirement	Verdict
EUT returns to default operating settings.	✓



Product Service

<b>Part c) Step 3</b>	
Requirement	Verdict
EUT uses default operating settings.	✓
<b>Step 4</b>	
Requirement	Verdict
EUT uses default settings when positioned in previous region 2.	✓
EUT uses default settings when positioned in previous region 3.	✓
EUT uses default settings when positioned in previous region 4.	✓
EUT uses default settings when positioned in previous region 5.	✓
EUT uses default settings when positioned in previous region 6.	✓
EUT uses default settings when positioned in previous region 7.	✓
EUT uses default settings when positioned in previous region 8.	✓
EUT uses default settings when positioned in previous region 10.	✓



Replacement or erasure of dated or remote regional operating settings – Clause 13.3.2  
(Modification State 5)

**Method of Measurement**

Set up a standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order:

- a) Send Message 22 with valid regional operating settings that are different from the default operating settings to the EUT with a regional operating area, which contains the current position of own station;
- b) Send an addressed Message 22 to the EUT with different regional operating settings from the previous command;
- c) Send a Message 22 to the same area as a) every minute for 15 min after the addressed Message 22;
- d) Move the EUT out of the regional operating area defined by the previous addressed command into an area without regional operating settings;
- e) Send an addressed Message 22 to the EUT with different channels than default.

**Required Results**

- a) The EUT uses the regional operating settings commanded to it in 13.3.2.1 a),
- b) The EUT uses the regional operating settings commanded to it in 13.3.2.1 b),
- c) The EUT ignores the settings of Message 22 to the area for the first 10 min. Check that the EUT uses the settings of Message 22 to the area after 10 min,
- d) The EUT reverts to default,
- e) The EUT continues using the default channels.

**Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT uses the settings in message 22.	✓

<b>Part b)</b>	
Requirement	Verdict
EUT uses the settings in the addressed message 22.	✓

<b>Part c)</b>	
Requirement	Verdict
EUT ignores the settings in message 22 for 10 minutes.	✓
EUT uses the settings in message 22 after 10 minutes.	✓

<b>Part d)</b>	
Requirement	Verdict
EUT uses default settings when moved outside the area used by the previous commands.	✓



Product Service

Part e)	
Requirement	Verdict
EUT ignores the settings in the addressed message 22 and continues to use default settings.	✓

Invalid regional operating areas – Clause 13.3.3 (*Modification State 5*)

#### **Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order after completion of all other tests related to change of regional operating settings:

- a) Send three different valid regional operating settings with adjacent regional operating areas, their corners within eight miles of each other, to the EUT by Message 22. The current own position of the EUT shall be within the regional operating area of the third regional operating setting;
- b) Move current own position of the EUT consecutively to the regional operating areas of the first two valid regional operating settings.

#### **Required Results**

- a) The EUT uses the operating settings that were in use prior to receiving the third regional operating settings,
- b) The EUT consecutively uses the regional operating settings of the first two received regional operating areas.

#### **Test Results**

Part a)	
Requirement	Verdict
EUT uses the default settings.	✓

Part b)	
Requirement	Verdict
When moved to the first region, the EUT uses region 1 settings.	✓
When moved to the second region, the EUT uses region 2 settings.	✓





Product Service

Continuation of autonomous mode reporting rate – Clause 13.3.4 (Modification State 4)

**Method of Measurement**

When in the presence of an assigned mode command and in a transition zone, check that the EUT continues to report at the autonomous mode reporting interval.

**Required Results**

Ensure that the autonomous reporting interval is maintained.

**Test Results**

<b>EUT positioned in transition zone of area. Message 23 with reporting rate of 5 seconds sent to EUT.</b>	
Requirement	Verdict
EUT does not change its reporting rate.	✓
<b>EUT positioned outside of transition zone. Message 23 with reporting rate of 10 seconds sent to EUT.</b>	
Requirement	Verdict
EUT changes it's reporting rate to 10 seconds.	✓



Product Service

## 2.21 DSC FUNCTIONALITY TESTS

### 2.21.1 Specification Reference

IEC 62287-1, Clause C.3

### 2.21.2 Equipment Under Test

408-0002, Serial No. 11

### 2.21.3 Date of Test and Modification State

18 and 23 February 2011 - Modification State 8

### 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 Test Results and Methods of Measurement

General – Clause C.3.1 (Modification State 8)

#### **Method of Measurement**

For the tests in this subclause set the EUT into assigned mode using channels AIS 1 and AIS 2 with a reporting interval of 10 s.

Check with a sequence of valid calls consisting of a DSC channel management standard test call, a geographic call from ITU-R M.493-13, a standard test call, an individual call from ITU-R M.493-13 and a standard test call that the EUT's AIS operation is not affected by the interleaved calls.

#### **Test Results**

Requirement	Verdict
The EUT's AIS operation is not affected by the interleaved calls.	✓



Product Service

Regional area designation – Clause C.3.2 (Modification State 8)

**Method of Measurement**

Perform the following tests using the DSC channel management standard test call.

Send to the EUT a standard test call but with symbol numbers appropriate to the geographical regions and channels specified in the test. Note the transition boundary is 5 NM in this test.

**Test Results**

Requirement	Verdict
The EUT's stores the settings in the standard test call.	✓

Scheduling – Clause C.3.3 (Modification State 8)

**Method of Measurement**

Check that the EUT's AIS reporting is not affected during the DSC monitoring times.

Send a valid geographical call to the EUT. Check that a response is not transmitted.

**Test Results**

Requirement	Verdict
The EUT's AIS operation is not affected during DSC monitoring times.	✓
No response is transmitted.	✓

DSC flag in Message 18 – Clause C.3.4 (Modification State 8)

**Method of Measurement**

Check that the DSC flag is set properly when DSC functionality is available.

**Test Results**

Requirement	Verdict
When DSC functionality is disabled by configuration setting, the DSC flag = 0.	✓
When DSC functionality is enabled by configuration setting, the DSC flag = 1.	✓



Product Service

#### DSC monitoring time plan – Clause C.3.5 (Modification State 8)

##### **Method of Measurement**

Check that DSC commands are received during DSC monitoring times and, if time-sharing is used, are not received outside those times.

##### **Test Results**

Requirement	Verdict
DSC commands are received during DSC monitoring times.	✓
DSC commands are not received outside DSC monitoring times.	✓

Time Period	Result
05:30 – 05:59	DSC commands received.
06:30 – 06:59	DSC commands received.
20:30 – 20:59	DSC commands received.
21:30 – 21:59	DSC commands received.
35:30 – 35:59	DSC commands received.
36:30 – 36:59	DSC commands received.
50:30 – 50:59	DSC commands received.
51:30 – 51:59	DSC commands received.

#### Replacement or erasure of dated or remote regional operating settings – Clause C.3.6 (Modification State 8)

##### **Method of Measurement**

Set up standard test environment. Send a valid regional operating setting to the EUT by Message 22 with the regional operating area including the own position of the EUT. Consecutively send a total of seven valid regional operating settings to EUT, using Message 22, with regional operating areas not overlapping to the first and to each other. Perform the following in the order shown:

a) Send a ninth Message 22 to the EUT with valid regional operating areas not overlapping with the previous eight regional operating areas.

b) Step 1: set own position of EUT into any of the regional operating areas defined by the second to the ninth Message 22 sent to the EUT previously.

Step 2: send a tenth Message 22 to the EUT, with a regional operating area which partly overlaps the regional operating area to which the EUT was set by step 1 but which does not include the own position of the EUT.

c) Step 3: move own position of EUT to a distance of more than 500 miles from all regions defined by previous commands.

Step 4: consecutively set own position of EUT to within all regions defined by the previous Message 22.

This test can be accomplished by either using the test input for simulated position information or a GNSS simulator (see also Annex D).



Product Service

### **Required Results**

After the initialisation, the EUT shall operate according to the regional operating settings defined by the first Message 22 sent.

Check that

a) The EUT returns to the default operating settings.

b) Step 1: the EUT changes its operating settings to those of that region which includes own position of the EUT.

Step 2: the EUT reverts to the default operating settings.

NOTE: Since the regional operating settings to which the EUT was set in Step 1 are erased due to Step 2, and since there is no other regional operating setting due to their non-overlapping definition, the EUT returns to default.

c) Step 3: the EUT operates with the default settings.

Step 4: the EUT operates with the default settings.

### **Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT returns to default operating settings.	✓

<b>Part b) Step 1</b>	
Requirement	Verdict
EUT uses region 2 settings when positioned in region 2.	✓
EUT uses region 3 settings when positioned in region 3.	✓
EUT uses region 4 settings when positioned in region 4.	✓
EUT uses region 5 settings when positioned in region 5.	✓
EUT uses region 6 settings when positioned in region 6.	✓
EUT uses region 7 settings when positioned in region 7.	✓
EUT uses region 8 settings when positioned in region 8.	✓
EUT uses region 9 settings when positioned in region 9.	✓
<b>Step 2</b>	
Requirement	Verdict
EUT returns to default operating settings.	✓



Product Service

<b>Part c) Step 3</b>	
Requirement	Verdict
EUT uses default operating settings.	✓
<b>Step 4</b>	
Requirement	Verdict
EUT uses default settings when positioned in previous region 2.	✓
EUT uses default settings when positioned in previous region 3.	✓
EUT uses default settings when positioned in previous region 4.	✓
EUT uses default settings when positioned in previous region 5.	✓
EUT uses default settings when positioned in previous region 6.	✓
EUT uses default settings when positioned in previous region 7.	✓
EUT uses default settings when positioned in previous region 8.	✓
EUT uses default settings when positioned in previous region 10.	✓

Test of addressed telecommand – Clause C.3.7 (Modification State 8)

#### **Method of Measurement**

Set up a standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order:

- send a DSC telecommand with valid regional operating settings that are different from the default operating settings, to the EUT with a regional operating area, which contains the current position of own station;
- send an addressed DSC telecommand to the EUT with different regional operating settings than the previous command;
- move the EUT out of the regional operating area defined by the previous addressed telecommand into an area without regional operating settings.

#### **Required Results**

- the EUT uses the regional operating settings commanded to it in a),
- the EUT uses the regional operating settings commanded to it in b),
- the EUT reverts to default.

#### **Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT uses the settings in message 22.	✓

<b>Part b)</b>	
Requirement	Verdict
EUT uses the settings in the addressed message 22.	✓

<b>Part c)</b>	
Requirement	Verdict
EUT uses default settings.	✓



Product Service

Invalid regional operating areas – Clause C.3.8 (Modification State 8)

**Method of Measurement**

Set up standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order after completion of all other tests related to change of regional operating settings:

- a) send three different valid regional operating settings with adjacent regional operating areas, their corners within eight miles of each other, to the EUT by DSC telecommand, presentation interface input and manual input via MKD. The current own position of the EUT shall be within the regional operating area of the third regional operating setting;
- b) move current own position of the EUT consecutively to the regional operating areas of the first two valid regional operating settings.

**Required Results**

- a) the EUT uses the operating settings that were in use prior to receiving the third regional operating setting,
- b) the EUT consecutively uses the regional operating settings of the first two received regional operating areas.

**Test Results**

<b>Part a)</b>	
Requirement	Verdict
EUT does not use the settings of the third region.	✓

<b>Part b)</b>	
Requirement	Verdict
EUT uses the settings of the first two regions when moved into these regions.	✓



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 Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
<b>Section 2.3 to 2.10 and 2.12 to 2.21</b>					
VDL Analyser/Generator	Attingimus	AIS Tester	380	12	13-Jan-2012
Power Supply Unit	Iso-Tech	IP2302A	-	-	TU
Digital Volt Meter	Fluke	79 Series III	TE411	12	26-Aug-2011
DSC Modem	ICS	PLT02249	120	-	TU
Pre-emphasis Filter	TUV	RAB 200701	3314	-	TU
Signal Generator	Rohde & Schwarz	SMY	TE1109	12	23-Dec-2011
Modulation Analyser	Hewlett Packard	8901B	TE45	12	13-Aug-2011
<b>Section 2.11</b>					
Function Generator	Hewlett Packard	3314A	TE755	-	TU
Function Generator	Hewlett Packard	3314A	TE1332	-	TU
Oscilloscope	Lecroy	9370M	TE612	12	19-Oct-2011
Signal Generator	Rohde & Schwarz	SMY	TE1109	12	23-Dec-2011
Signal Generator	Hewlett Packard	E4431B	GB39340285	-	OP Mon
Signal Generator	Marconi	2050	119606/008	-	OP Mon
Switch	Mini Circuits	ZMSW-1211	N/A	-	TU
Switch	Mini Circuits	ZMSW-1211	N/A	-	TU
Switch	Mini Circuits	ZMSW-1211	N/A	-	TU
Switch	Mini Circuits	ZMSW-1211	N/A	-	TU
Oscilloscope	Lecroy	9370M	TE612	12	19-Oct-2011

TU – Traceability Unscheduled

OP MON – Output monitored using calibrated equipment

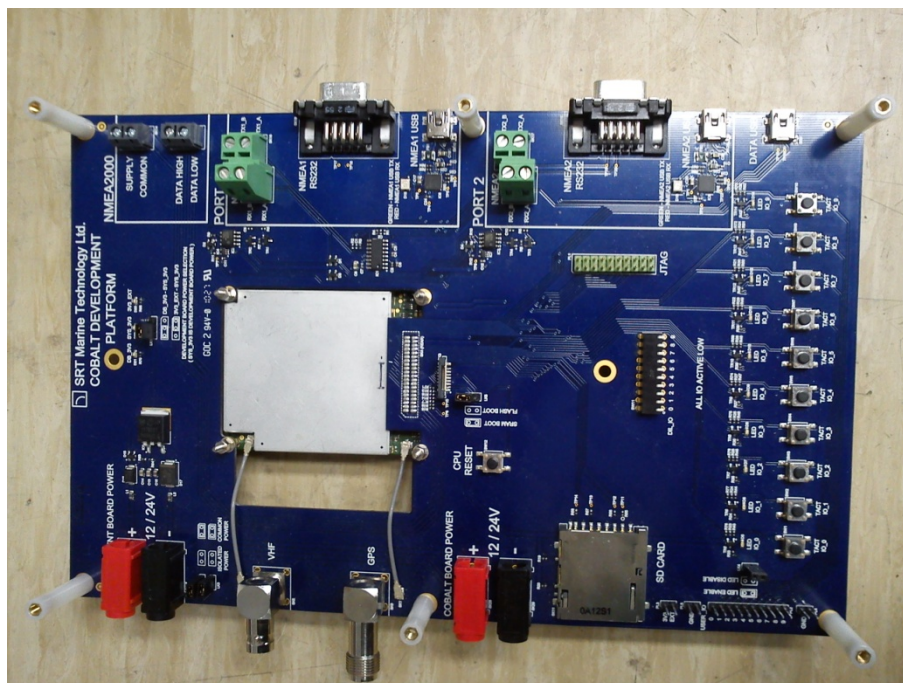


Product Service

## **SECTION 4**

### **PHOTOGRAPHS**

#### 4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Top View



Product Service

## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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