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Report On

EMC Testing of the
SRT Marine Technology Ltd
em-trak I100 AIS Identifier

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Document 75920099 Report 05 Issue 2 April 2013

TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuv-sud.co.uk

REPORT ON

EMC Testing of the
SRT Marine Technology Ltd
em-trak I100 AIS Identifier

Document 75920099 Report 05 Issue 2

April 2013

PREPARED FOR

SRT Marine Technology Ltd
Wireless House
Westfield Industrial Estate
Midsomer Norton
Bath
BA3 4BS

PREPARED BY

P Joynson
EMC Engineer

APPROVED BY

J J Adams
Authorised Signatory

DATED 22 April 2013

This report was up-issued to Issue 2 to correct a page numbering error

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SECTION 1

REPORT SUMMARY

EMC Testing of the
SRT Marine Technology Ltd
em-trak I100 AIS Identifier

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the SRT Marine Technology Ltd, em-trak I100 AIS Identifier to the requirements of IEC 60945.

Objective	To perform Electromagnetic Compatibility (EMC) Qualification 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)	I100
Serial Number(s)	MMSI200000013 TUV Ref 75919391 TSR0029
Software Version	050200.01.00.25
Hardware Version	011-0041 v6.4
Number of Samples Tested	2
Test Specification/Issue/Date	IEC 60945: C1 2008
Incoming Release Date	Declaration of Build Status 29 October 2012
Order Number Date	PO003458 10 September 2012
Start of Test	01 October 2012
Finish of Test	08 February 2013
Name of Engineer(s)	P Joynson C McKean
Related Document(s)	IEC 61000-4-3 : 2006 IEC 61000-4-2 : 2001

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with IEC 60945 is shown below.

Configuration 1 - 1						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
	Table 5, 9.2	Conducted Emissions (AC Power Port)	CSTDMA		N/A	CISPR 16-1-2
			Emergency		N/A	
	Table 5, 9.2	Conducted Emissions (DC Power Port)	CSTDMA		N/A	CISPR 16-1-2
			Emergency		N/A	
	Table 5, 9.3	Enclosure Port Magnetic Emissions - Field Strength	CSTDMA		N/A	CISPR 16-1-2
			Emergency		N/A	
	Table 5, 9.3	Radiated Emissions (Enclosure Port)	CSTDMA		N/A	CISPR 16-1-4
			Emergency		N/A	
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (AC Power Port)	CSTDMA		N/A	IEC 61000-4-6
			Emergency		N/A	
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (DC Power Port)	CSTDMA		N/A	IEC 61000-4-6
			Emergency		N/A	
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (Signal, Control and Telecommunications Port)	CSTDMA		N/A	IEC 61000-4-6
			Emergency		N/A	
2.1	Table 6, 10.4	Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)	CSTDMA	0	Pass	IEC 61000-4-3
			Emergency	0	Pass	
	Table 6, 10.5	Immunity to Fast Transient Bursts Common Mode (AC Power Port)	CSTDMA		N/A	IEC 61000-4-4
			Emergency		N/A	
	Table 6, 10.5	Immunity to Fast Transient Bursts Common Mode (Signal, Control and Telecommunications Port)	CSTDMA		N/A	IEC 61000-4-4
			Emergency		N/A	
	Table 6, 10.6	Immunity to Surges (AC Power Port)	CSTDMA		N/A	IEC 61000-4-5
			Emergency		N/A	
	Table 6, 10.7	Immunity to Power Supply Short Term Variation (AC Power Ports)	CSTDMA		N/A	IEC 61000-4-11
			Emergency		N/A	
	Table 6, 10.8	Immunity to Interruptions (AC Power Port)	CSTDMA		N/A	IEC 61000-4-11
			Emergency		N/A	
	Table 6, 10.8	Immunity to Interruptions (DC Power Port)	CSTDMA		N/A	IEC 61000-4-11
			Emergency		N/A	
2.2	Table 6, 10.9	Immunity to Electrostatic Discharge (Enclosure Port)	CSTDMA	0	Pass	IEC 61000-4-2
			Emergency	0	Pass	

N/A – Not Applicable

1.3 DECLARATION OF BUILD STATUS

Manufacturer	SRT-Marine Technology Ltd (em-trak Ltd)
Country of origin	UK
Technical Description	AIS Identifier
Model No	I100
Part No	417-0002
Serial No	#5- 4170002282022
Drawing Number	417-0002
Build Status	EP6
Software Issue	050200.01.00.25
Hardware Issue	011-0041 v6.4
FCC ID	N/A
IC ID	N/A
Highest Operating Frequency	162.05Mhz

Signature 

Date 29.10.2012

D of B S Serial No

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a SRT Marine Technology Ltd, Em-trak I100 AIS Identifier as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Em-trak I100 AIS Identifier

1.4.2 Test Configuration

Configuration 1:

For testing Sample TRS00013 was amended to TX at 30 sec intervals and the Rx carrier sense threshold set to -78 dBm , VHF Rx LNA disabled by removing R137

The EUT was configured in accordance with IEC 60945.

1.4.3 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 – CSTDMA (Normal Operation)

Mode 2 - Emergency Mode (MayDay)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.4.4 Monitoring of Performance

The EUT was monitored via a CCTV camera and monitor; aditionally all transmission data was recorded.

1.4.5 Performance Criteria

Mode 1 - The EUT shall stay in Normal operation (Single Flash) and transmit every 30 sec as setup, there is to be no change of state of the EUT.

Mode 2 – The EUT shall stay operating in the Emergency operation and keep transmitting mayday throughout testing, there is to be no change of state of the EUT.

IEC 60945

Performance criterion A: the EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed.

Performance criterion B: the EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

Performance criterion C: temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from an rechargable internal battery supply.

Test Results

EN 60945, Clause 5.3 states:

The measured test results shall be compared with the corresponding acceptable performance limits and the EUT shall pass the test only if the measured performance margin is favourable and greater than the measurement uncertainty. The test report shall show, for each test measurement, the test result, its associated measurement uncertainty, the acceptable performance limits, and the acceptable performance margin, as applicable.

The tests detailed in this report met the above test requirements.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

SECTION 2

TEST DETAILS

EMC Testing of the
SRT Marine Technology Ltd
em-trak I100 AIS Identifier

2.1 IMMUNITY TO RADIO FREQUENCY ELECTROMAGNETIC FIELD (ENCLOSURE PORT)

2.1.1 Specification Reference

IEC 60945, Table 6, Clause 10.4

2.1.2 Equipment Under Test

em-trak I100 AIS Identifier, S/N: MMSI200000013

2.1.3 Date of Test and Modification State

06 to 22 November 2012 - Modification State 0

2.1.4 Test Equipment Used

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

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of IEC 61000-4-3.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2

2.1.6 Environmental Conditions

	06 November 2012	07 November 2012	22 November 2012
Ambient Temperature	21.6°C	24°C	21.8°C
Relative Humidity	52%	51%	51%
Atmospheric Pressure	1017mbar	1007mbar	1008mbar

2.1.7 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of IEC 60945 for Immunity to Radio Frequency Electromagnetic Field (Enclosure Port).

The applied test levels are shown below.

Configuration 1 - Mode 1

Amplitude Modulation	Frequency	400Hz	
	Depth	80%	
Stepped Frequency Increments		1% with respect to last momentary frequency	
Dwell Time		3 Seconds	
Frequency Range (MHz)		80 – 1000	
Field Strength (V/m)		12.6 (inc. MU)	
Dwell Time		9 Seconds	
Frequency Range (MHz)		1000 – 2000	
Field Strength (V/m)		12.6 (inc. MU)	
		Result	
Orientation of EUT		Vertical Polarisation	Horizontal Polarisation
Front		Pass	Pass
Right Side		Pass	Pass
Rear		Pass	Pass
Left Side		Pass	Pass

Configuration 1 - Mode 2

Amplitude Modulation	Frequency	400Hz	
	Depth	80%	
Stepped Frequency Increments		1% with respect to last momentary frequency	
Dwell Time		3 Seconds	
Frequency Range (MHz)		80 – 1000	
Field Strength (V/m)		12.6 (inc. MU)	
Dwell Time		9 Seconds	
Frequency Range (MHz)		1000 – 2000	
Field Strength (V/m)		12.6 (inc. MU)	
		Result	
Orientation of EUT		Vertical Polarisation	Horizontal Polarisation
Front		Pass	Pass
Right Side		Pass	Pass
Rear		Pass	Pass
Left Side		Pass	Pass

2.2 IMMUNITY TO ELECTROSTATIC DISCHARGE (ENCLOSURE PORT)

2.2.1 Specification Reference

IEC 60945, Table 6, Clause 10.9

2.2.2 Equipment Under Test

em-trak I100 AIS Identifier, S/N: MMSI2000000013
em-trak I100 AIS Identifier, TUV Ref:75919391 TSR0029 - for tests in mode 2 only

2.2.3 Date of Test and Modification State

12 November 2012 & 8 February 2013 - Modification State 0

2.2.4 Test Equipment Used

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

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of IEC 61000-4-2.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2

2.2.6 Environmental Conditions

	12 November 2012	8 February 2013
Ambient Temperature	24°C	22°C
Relative Humidity	32.5%	31%
Atmospheric Pressure	1017mbar	1004mbar

2.2.7 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of IEC 60945 for Immunity to Electrostatic Discharge (Enclosure Port).

The applied test levels are shown below.

Configuration 1 - Mode 1

		Contact Discharges (kV)								Air Discharge (kV)							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Case (top)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
B	Case (Bottom)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Activation button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	Stand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A

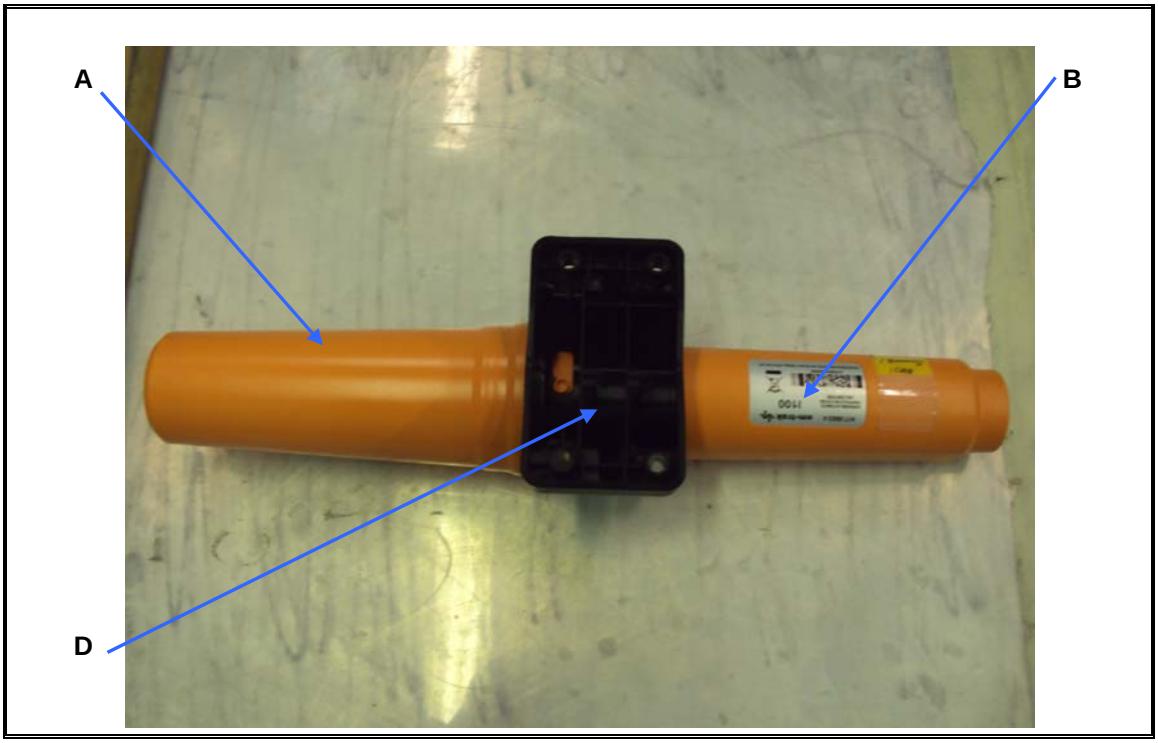
Configuration 1 - Mode 2

		Contact Discharges (kV)								Air Discharge (kV)							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Case (top)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
B	Case (Bottom)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Activation button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	Stand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A

Key to Results

✓ The EUT's performance was not impaired at this test point when the ESD pulse was applied.
✓* No discharge occurred at this test point when the ESD pulse was applied.
N/A Test not applicable as defined in the specification.

ESD TEST POINTS



SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 EMC - Electrostatic Discharges					
ESD Simulator	Schaffner	NSG 435+SL 171-504	552	12	22-Aug-2013
Section 2.2 EMC - Radiated Immunity					
Load (50ohm, 30W)	Weinschel	50T-054	275	-	TU
Directional Coupler	Amp Research	DC6180	283	-	TU
Antenna (Bilog)	Schaffner	CBL6143	316	-	TU
Antenna	Schaffner	CBL6143	322	-	TU
Attenuator (10dB/250W)	Weinschel	45-10-43	477	12	27-Jun-2013
Termination (50ohm)	Meca	405-1	718	12	13-Jun-2013
Power Meter	Rohde & Schwarz	NRVD	747	-	TU
Power Meter	Rohde & Schwarz	NRVD	748	-	TU
Screened Room (1)	Rainford	Rainford	1541	-	TU
Screened Room (2)	Rainford	Rainford	1542	-	TU
RF Power Amplifier	Amp Research	250W1000A	2844	-	TU
Amplifier (250W, 80MHz - 1GHz)	Amp Research	250W1000A	3029	-	TU
Signal Generator, 9kHz to 6GHz	Rohde & Schwarz	SMB 100A	3499	12	29-May-2013
Signal Generator, 9kHz to 6GHz	Rohde & Schwarz	SMB 100A	3500	12	6-Jun-2013
Microwave Amplifier 1GHz - 2.5GHz; 500W; CW	Thorn	PTC6440	3736	-	TU
Power Sensor; 100kHz - 6GHz/500pW - 20mW	Rohde & Schwarz	NRV-Z4	3815	-	TU
Power Sensor: 100kHz - 6GHz/100pW - 20mW	Rohde & Schwarz	NRV-Z4	3816	-	TU

TU – Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.2dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	10MHz to 6GHz Test Amplitude	2.0dB†
Conducted Susceptibility RF	50kHz to 1000MHz Amplitude EM Clamp Method of Test CDN Method of Test BCI Clamp Method of Test Direct Injection Method of Test	 3.1dB• 1.2dB• 1.1dB• 1.2dB•
Conducted Susceptibility LF	DC to 150kHz	1.0%†
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

* In accordance with CISPR 16-4-2
† In accordance with UKAS Lab 34
• I n accordance with EN 61000-4-6: 2009

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Em-trak I100 AIS Identifier

Em-trak I100 AIS Identifier

4.2 TEST SET UP PHOTOGRAPHS

Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)

Immunity to Electrostatic Discharge (Enclosure Port)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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