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Report On

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

COMMERCIAL-IN-CONFIDENCE

Document 75920099 Report 05 Issue 2

April 2013



Product Service

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22 April 2013

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





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Product Service

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 |




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; additionally 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 rechargeable 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 |

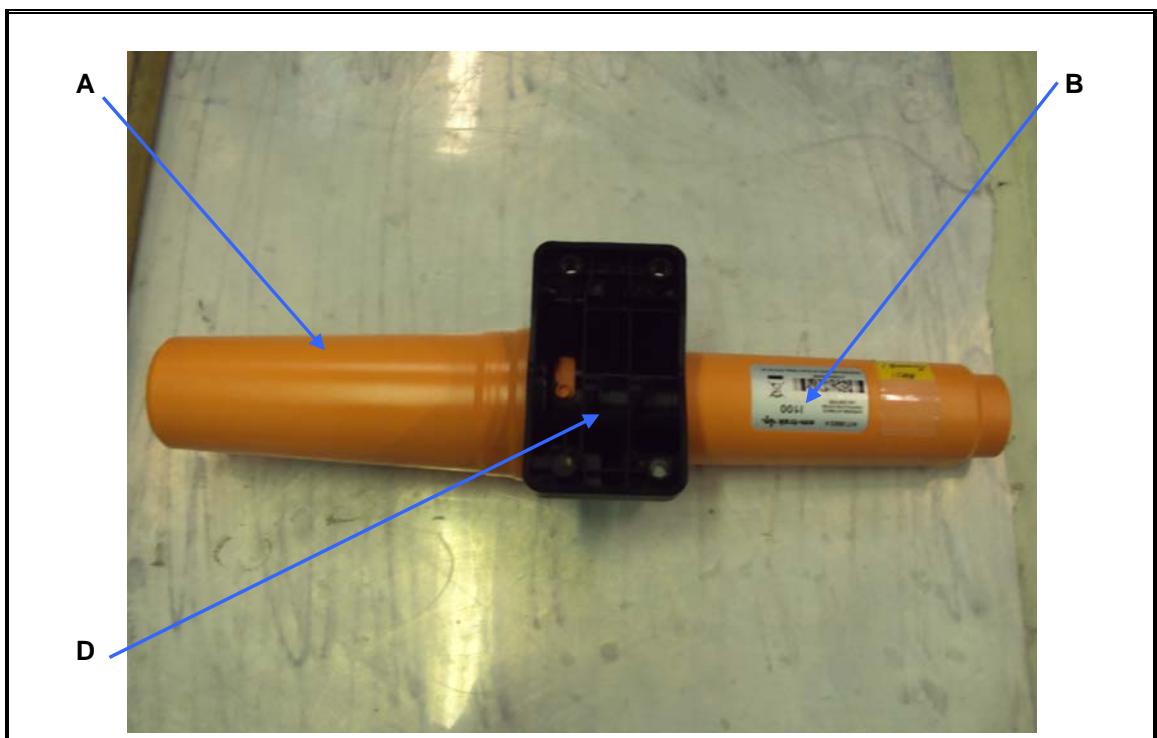
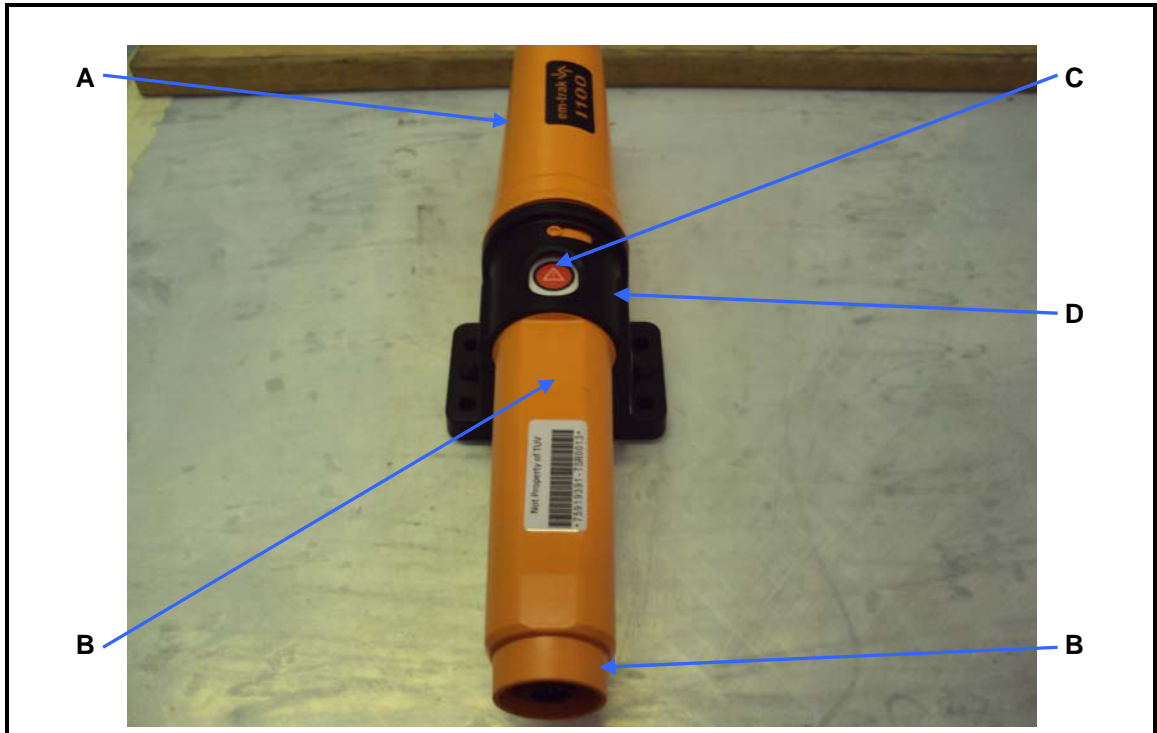
Configuration 1 - Mode 2

| | | 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 | 3.1dB• |
| | EM Clamp Method of Test | 1.2dB• |
| | CDN Method of Test | 1.1dB• |
| | BCI Clamp Method of Test | 1.2dB• |
| | Direct Injection Method of Test | 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
- In 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



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

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

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
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