

Test Report

Report Number: F140898E1

Applicant:

Weatherdock AG

Manufacturer:

Weatherdock AG

Equipment under Test (EUT):

A109



Laboratory accredited by
Deutsche Akkreditierungsstelle (DAkkS) GmbH
in compliance with DIN EN ISO/IEC 17025

References

Family standards / generic standards:

- **ETSI EN 301 489-1 V1.9.2 (2011-09)**, Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
- **ETSI EN 301 489-3 V1.6.1 (2013-08)**, Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

Basic Standards:

- EN 55022:2010 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- EN 61000-4-2:2009 Electrostatic discharge immunity test
- EN 61000-4-3:2006 + A1:2008 + A2:2010 Radiated, radio-frequency, electromagnetic field immunity test

Test result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

Test engineer:	<u>Wolfgang KASALOWSKY</u> Name	<u></u> Signature	<u>04 April 2014</u> Date
Authorized reviewer:	<u>Thomas KÜHN</u> Name	<u></u> Signature	<u>04 April 2014</u> Date

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1 Identification

1.1 Applicant

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Manufacturer represented during the test by the following person:	Mr. Norman JÖRNS

1.2 Manufacturer

Name:	Weatherdock AG
Address:	Sigmundstraße 180 90431 Nürnberg
Country:	Germany
Name for contact purposes:	Mr. Norman JÖRNS
Phone:	+49 (0) 911 376638-30
Fax:	+49 (0) 911 376638-40
eMail Address:	njoerns@weatherdock.de
Manufacturer represented during the test by the following person:	Mr. Norman JÖRNS

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-01 and D-PL-17186-01-02.

1.4 EUT (Equipment Under Test)

Test object:	AIS-MOB (Man-over-board-Transmitter)
Type:	A109
Order number:	A109
Serial number:	888230001
PCB identifier:	A109-B-0001-02
Hardware version:	02
Software version:	7

1.5 Technical Data of Equipment

Receiver class: *	3 (GPS receiver)					
Rated RF output power: *	0.5 W					
Antenna gain: *	-4 dBi					
Antenna type: *	Lambda/4					
Frequency range: *	161.975 MHz, 162.025 MHz, 1575.42 MHz (RX only)					
Number of channels: *	2					
Channel spacing: *	25 kHz					
Modulation: *	GMSK					
Bit rate of transmitter: *	9600 bps					
Supply Voltage:	U _{Nom} =	6 V DC	U _{Min} =	3.4 V DC	U _{Max} =	6.5 V DC
Power Supply: *	Internal Lithium Battery					
Temperature range: *	-20°C to + 55°C					
Ancillaries to be tested with:	AIS Transceiver easy TRX2					

The following external I/O cables were used:

Identification	Connector		Shielded	Length during test
	EUT	Ancillary		
No external cables are connectable to the EUT.				

1.6 Dates

Date of receipt of test sample:	12 March 2014
Start of test:	12 March 2014
End of test:	12 March 2014

2 Operational States and Test Setup

Description of function of the EUT:

- The EUT is an AIS-MOB (Automatic Identification System - Man-over-board-Transmitter). With a built in GPS it transmits an emergency sentence, along with the Lat/Long of the position

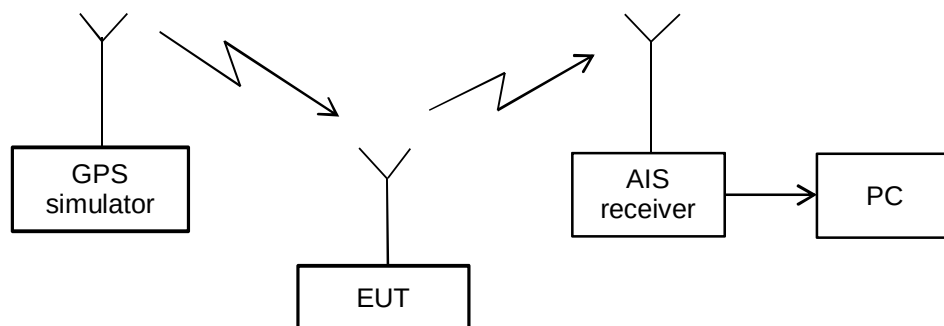
The following states were defined as the operating conditions:

- During the tests the EUT was powered by its internal battery.
- A test software was running which forces the AIS transmitter to transmit the actual position from internal GPS every 600 ms.

Definition of the functions to be monitored and corresponding tolerance limits:

- The transmitted signals of the EUT were received by an AIS receiver (easy TRX2) which was connected to a PC. The Software of the PC shows the difference of the position received and the expected position generated by a GPS simulator. The difference should be less than 15 meters and and at least every 600ms one message should be received.

The system was set up as follows:



3 Test Overview

3.1 Electromagnetic disturbance characteristics

Electromagnetic radiation disturbances characteristics – enclosure				
Frequency range	Limits	Basic standard	Remark	Test result
30 to 230 MHz 230 to 1000 MHz 1 to 3 GHz 3 to 6 GHz	30 dB μ V/m QP at 10 m 37 dB μ V/m QP at 10 m 70 dB μ V/m PK at 3 m 50 dB μ V/m AV at 3 m 74 dB μ V/m PK at 3 m 54 dB μ V/m AV at 3 m	EN 55022 Class B	Not applicable	--
30 to 230 MHz 230 to 1000 MHz 1 to 3 GHz 3 to 6 GHz	40 dB μ V/m QP at 10 m 47 dB μ V/m QP at 10 m 76 dB μ V/m PK at 3 m 56 dB μ V/m AV at 3 m 80 dB μ V/m PK at 3 m 60 dB μ V/m AV at 3 m	EN 55022 Class A	Not applicable	--

3.2 EMC Immunity

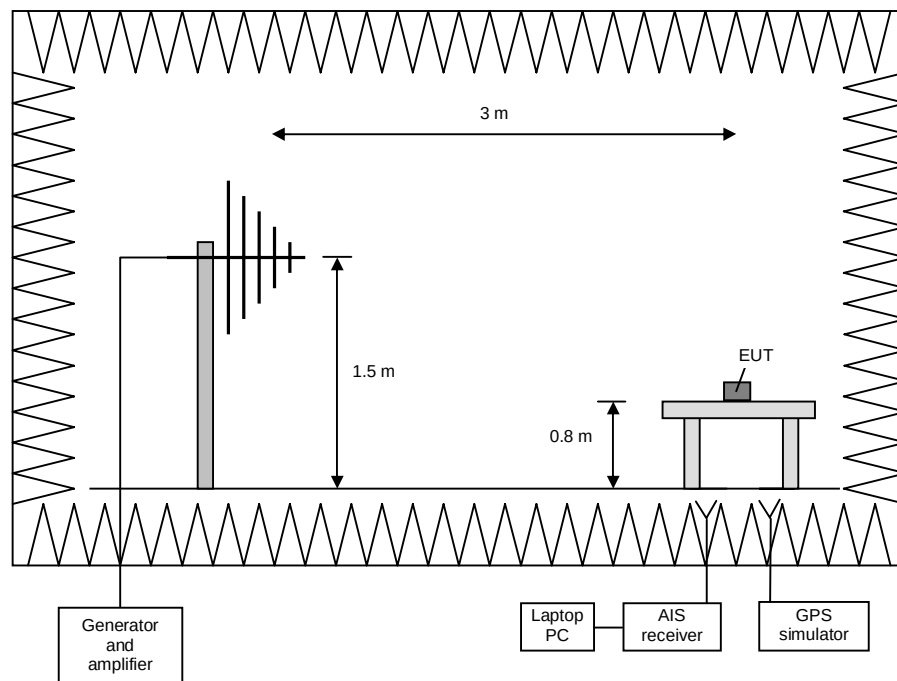
Immunity – Enclosure					
Environmental phenomena	Test specification and units	Basic standard	Remark	Performance criterion	Test result
Radio-frequency electromagnetic field	80 - 1000, 1400 - 2700 MHz; 3 V/m; 80% AM (1 kHz)	EN 61000-4-3		A	Passed
Electrostatic discharge	up to $\pm$ 4 kV charge voltage (contact discharge)	EN 61000-4-2		A	Passed
	up to $\pm$ 8 kV charge voltage (air discharge)			A	Passed

4 Results

4.1 Radio-frequency, electromagnetic fields

Test setup:

- Table setup according to EN 61000-4-3.
- The transmitting antenna is set at 1.5 m above the floor.
- Photos of the test setup were shown in annex A.



Monitoring of EUT:

The transmitted signals of the EUT were received by an AIS receiver which is connected to a PC. The Software of the PC shows the difference of the position received and the expected position generated by a GPS simulator. The difference should be less than 15 meters and at least every second one message should be received. Additionally the GPS LED of the EUT was monitored visually with the help of a camera system at the anechoic chamber.

Exclusion bands:

161.925 MHz – 162.025 MHz due to the AIS transmitter of EUT
1500.42 MHz – 1650.42 MHz due to the integrated GPS receiver of the EUT

Measuring records:

Date of test:	12 March 2014		
Ambient conditions:	21°C, 31% F _{rel} ; air pressure conforms to the requirements of the standard		
Modulation:	80% AM (1 kHz)		
Test level:	3 V/m		
Increment:	log 1%		
Dwell time:	3 s		
Distance antenna - EUT:	3 m		
Frequency range: 80 MHz - 161.925, 162.075 - 1000 MHz			
Polarisation	Radiation direction	EUT reaction	Result
Vertical	0°	No noticeable reaction, operates as intended during and after the test	A
	90°	No noticeable reaction, operates as intended during and after the test	A
	180°	No noticeable reaction, operates as intended during and after the test	A
	270°	No noticeable reaction, operates as intended during and after the test	A
Horizontal	0°	No noticeable reaction, operates as intended during and after the test	A
	90°	No noticeable reaction, operates as intended during and after the test	A
	180°	No noticeable reaction, operates as intended during and after the test	A
	270°	No noticeable reaction, operates as intended during and after the test	A
Frequency range: 1400 MHz - 1500.42, 1650,42 - 2700 MHz			
Polarisation	Radiation direction	EUT reaction	Result
Vertical	0°	No noticeable reaction, operates as intended during and after the test	A
	90°	No noticeable reaction, operates as intended during and after the test	A
	180°	No noticeable reaction, operates as intended during and after the test	A
	270°	No noticeable reaction, operates as intended during and after the test	A
Horizontal	0°	No noticeable reaction, operates as intended during and after the test	A
	90°	No noticeable reaction, operates as intended during and after the test	A
	180°	No noticeable reaction, operates as intended during and after the test	A
	270°	No noticeable reaction, operates as intended during and after the test	A

Test results: Test passed

Test equipment used (refer clause 6):
1 – 18, 21

4.2 Electrostatic discharge

Test setup: - Table setup according to EN 61000-4-2



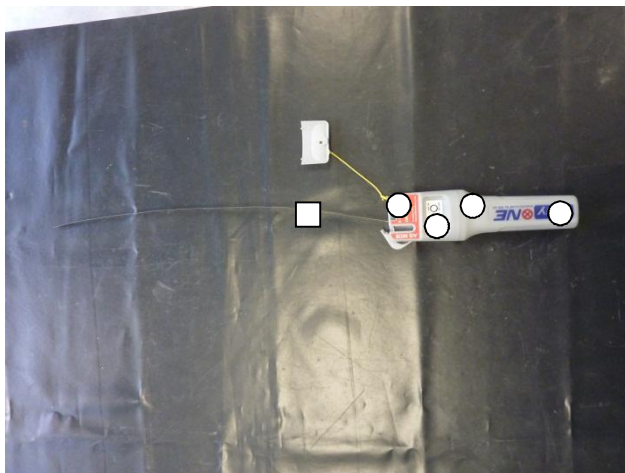
Test plan:

- Indirect discharge (ID) is carried out on the horizontal (HCP) and vertical (VCP) coupling plane, in case the housing of the EUT is made of insulating materials.
- Contact discharge (CD) is carried out on the conductive parts of the equipment under test and on the coupling plates for the indirect discharge.
- Air discharge (AD) is carried out on isolating parts of the equipment under test.
- The discharge locations can be seen on the following figure(s).

Points of air- and contact discharge:

Air discharge = ○

Contact discharge = □



Measuring records:

Date of test:		12 March 2014	
Ambient conditions:		21°C, 32% F _{rel} ; Air pressure conforms to the requirements of the standard	
Number of impulses:		10 per polarity, test voltage and discharge location	
Method of discharge	Discharge location	EUT reaction	Result
indirect coupling ± 2 kV	HCP / VCP	none detected	A
indirect coupling ± 4 kV	HCP / VCP	none detected	A
contact discharge ± 2 kV	CD	none detected	A
contact discharge ± 4 kV	CD	none detected	A
air discharge ± 2 kV	AD	none detected	A
air discharge ± 4 kV	AD	none detected	A
air discharge ± 8 kV	AD	none detected	A

Test results:

Test passed

Test equipment used (refer clause 6):

19 - 21

6 Test equipment used

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
1	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
2	Controller	MCU	Maturo	MCU/043/971107	480832
3	Turntable	DS420HE	Deisel	420/620/80	480315
4	Field sensor display	RadiSense	Dare Development	03D00370SN0-03	480461
5	Field sensor	RadiSense 03D00370	Dare Development	SN0-03	480460
6	AC-filter	B84299-D1630-E1	Siemens	00 01 95434	480305
7	Power amplifier	AR 60S1G3	Amplifier research	308365	480418
8	Power amplifier	AR 150W1000	Amplifier research	308331	480419
9	Signal generator	SML03	Rohde & Schwarz	101360	480421
10	Antenna support	AS615P	Deisel	615/310	480187
11	Power meter	NRVD	Rohde & Schwarz	844351/037	480177
12	Relay switch unit	RSU	Rohde & Schwarz	338221/011	480175
13	Power probe	NRV-Z2	Rohde & Schwarz	842848/021	480193
14	Power probe	NRV-Z2	Rohde & Schwarz	844854/003	480194
15	Antenna	HL046	Rohde & Schwarz	100013	480429
16	Relay switch unit	RSU	Rohde & Schwarz	338221/008	480182
17	EMS-software	EMS-K1	Rohde & Schwarz	-	480222
18	Horn antenna	BBHA 9120E	Schwarzbeck	131	480335
19	ESD simulator	NSG 435	Schaffner EMV GmbH	372	480027
20	Testing table	PTi	Numerik	-	480049
21	GPS Multi-Channel Simulator	STR 4500	Spirent	1517	480463

7 Report History

Report Number	Date of issue	Comment
F140898E1	04 April 2014	Initial test report

8 List of Annexes

ANNEX A: PHOTOGRAPHS

Set-up photographs:

- 140898_1.jpg: Test setup Electrostatic discharge
- 140898_2.jpg: Test setup RF electromagnetic field 80 MHz to 1000MHz
- 140898_3.jpg: Test setup RF electromagnetic field 80 MHz to 1000MHz
- 140898_4.jpg: Test setup RF electromagnetic field 1400 MHz to 2700MHz
- 140898_5.jpg: Test setup RF electromagnetic field 1400 MHz to 2700MHz

External photographs of the EUT:

- 140898_6.jpg: Front view
- 140898_7.jpg: Backside view
- 140898_8.jpg: Antenna

Internal photographs of the EUT:

- 140898_9.jpg: Top view of PCB
- 140898_10.jpg: Bottom view of PCB