Report No. E09795.01

Test Report

Product	Navtex radio receiver
Name and address of the applicant	Polaris Electronics A/S Kærholt 1 P.O Box 7957 DK-9210 Aalborg SO, Denmark
Name and address of the manufacturer	Polaris Electronics A/S Kærholt 1 P.O Box 7957 DK-9210 Aalborg SO, Denmark
Model	Sirius-3 Navtex
Rating	12V/24V DC
Brand name	Polaris Sirius
Serial number	Frontend 2.2 000-005, Computer 1.2 000-008
Additional information	-
Tested according to	EN 60945 (2002) Climatic and vibration tests only
Order number	134363
Tested in period	2009-11-04 & 2010-02-18
Issue date	2010-03-12
Name and address of the testing laboratory	Nemko P.O. Box 73 Blindern, N-0314 Oslo, Norway Telephone (+47) 22 96 03 30 Fax (+47) 22 96 05 50

NORWEGIAN ACCREDITATION TEST 033
ACCREDITED REPORT REF. NA – TEST 033
An accredited technical test executed under the Norwegian accreditation scheme

Prepared by [Jarle Skogland]	Approved by [Roger Berget]

REVISIONS

Revision #	Date	Order #	Description
00	2009-12-08	134363	-
01	2010-02-18	134363	Test result updating.
02	2010-03-12	134363	Editorial. Corrected antenna port to PL connector female, page 3.

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the Competent Authorities in Europe for any modifications made to the product, which result in non-compliance to the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in an appendix to this report.

Further information about measurement uncertainties is provided on request.

EVALUATION OF RESULTS

If not explicitly stated otherwise in the standard, the test is passed if the measurement value is equal to or below the limit line, regardless of the uncertainty of the measurement. If the measurement value is above the limit line, the test is not passed - ref. IECEE/CTL (Sec) 056/94 (CTL = Committee of Testing Laboratories).

The instrumentation accuracy is within limits agreed by the IECEE/CTL (ref. Nemko proc. P227).

DESCRIPTION OF TESTED DEVICE (EUT)

SYSTEM DESCRIPTION

The EUT is a Navtex radio receiver for frequences 518 KHz, 490 KHz and 4.209 MHz.
The receiver contains radio modules for the 3 frequency bands and a computer with display and touch screen.
The receiver is intended for installation in pilothouses on ships.

Hardware identity and/or version: Frontend 2.2 000-005
Software identity and/or version: Computer 1.2 000-008

SYSTEM COMPONENTS

SC no.	Description	Manufacturer	Type	Serial no.
1	Frontend	Polaris Electronics	2.2 000-005	
2	Computer	Polaris Electronics	1.2 000-008	

PORTS AVAILABLE

This equipment is fitted with the following electrical ports.

PO no.	Port Name	Type	Count	Comment
1	PWR	D-Sub 9 pin male	1	Power supply
2	AUX	D-Sub 9 pin female	1	
3	USB	USB	1	Printer
4	ECDIS	D-Sub 9 pin female	1	
5	NMEA	D-Sub 9 pin female	1	GPS input connection
6	ANT	PL connector female	1	Antenna connection

CONFIGURATION OF CABLES (INCLUDING INTERCONNECTING ONES)

This equipment has been tested with the following cable types and cable configurations. Any changes to these parameters when installed may influence on the EMC properties of this equipment.

CA no.	Connection	Manufacturer	Type	Shielded	Leads	Length (m)
1	To Power Supply	-	D-Sub 9 pin female	No	2	0.7

AVAILABLE OPERATING MODES

The specimen has been tested without radio receiption. Performance has just been verified by visual obeservation of operation and displayed information.

ACCESSORIES APPLIED DURING TEST

No accessories were applied during test

EQUIPMENT MODIFICATIONS

No modifications required.

ADDITIONAL INFORMATION RELATED TO TESTING

No further information.

GENERAL TEST CONDITIONS

TEST LABORATORY

The following Nemko test sites have been utilized for the tests documented in this report:

	Site	
X	**GAUSTAD**	(Gaustadalleen 30, N-0314 Oslo, Norway)
	KJELLER	(Instituttveien 6, N-2027 Kjeller, Norway)
X	**SKAR**	(Maridalsveien 621, N-0890 Oslo, Norway)

Laboratory accreditation:
NORSK AKKREDITERING – TEST 033
P06 – EMC - Electromagnetic Compatibility
P17 – Environmental Tests

POWER SUPPLIED TO EUT

Filtered electrical power was available for operation of EuT in all the test sites.

Voltage type: 12V/24V DC
Grounding: Not grounded

AMBIENT CONDITIONS

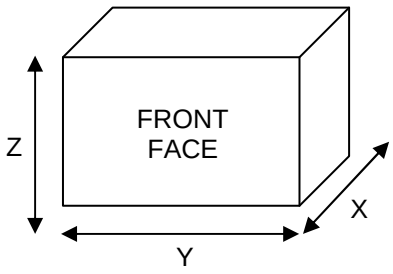
All EMC tests and measurements were performed in a shielded enclosure or in a controlled environment suitable for the tests conducted.

Normal ambient test conditions:

Ambient temperature:	20 - 23°C
Relative humidity:	20 - 50%RH
Atmospheric pressure:	98 - 102kPa

Note: The climatic conditions in the test areas are automatically controlled and recorded continuously.

DEFINITION OF AXIS CONVENTIONS



EVALUATION OF PERFORMANCE

FUNCTIONS MONITORED DURING TESTS

In order to verify acceptable performance by the EuT during the applied tests, the following functions were monitored:

#	Function	Monitoring method
1	No malfunction during conditioning	Visual

FUNCTIONAL CHECKS

A verification of correct function was performed before, during and after each test, by the following tests:

#	Functional tests
1	Touch screen functionality

PERFORMANCE CRITERIA

In order to pass each test, the specimen shall operate as intended without any obvious malfunction.

SUMMARY OF TESTING

APPLIED STANDARDS

» **EN 60945 (2002)** *Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results*

APPLIED TESTS

Test items	Test methods	Result
Mains Port Disturbance Voltage	EN 60945 (2002)	-
Radiated Disturbance (LF)	EN 60945 (2002)	-
Radiated Disturbance (RF)	EN 60945 (2002)	-
Electrostatic Discharges	EN 60945 (2002) EN 61000-4-2 (2001), Ed.1.2	-
Radiated RF Field	EN 60945 (2002) EN 61000-4-3 (2001), Ed.1.2	-
Electric Fast Transients	EN 60945 (2002) EN 61000-4-4 (2004), Ed.2.0	-
Surge	EN 60945 (2002) EN 61000-4-5 (2006), Ed.2.0	-
Conducted RF Disturbance	EN 60945 (2002) EN 61000-4-6 (2007), Ed.2.0	-
Dips/Interruptions	EN 60945 (2002) EN 61000-4-11 (2004), Ed.2.0	-
Voltage and Frequency Variations	EN 60945 (2002) EN 61000-4-11 (2004), Ed.2.0	-
Conducted LF Disturbance	EN 60945 (2002) EN 61000-4-16 (2001), Ed.1.1	-
Low Temperature	EN 60945 (2002) EN 60068-2-1 (2007), Ed.6.0	PASS
Dry Heat	EN 60945 (2002) EN 60068-2-2 (2007), Ed.5.0	PASS
Damp Heat	EN 60945 (2002) EN 60068-2-30 (2005), Ed.3.0	PASS
Corrosion	EN 60945 (2002) EN 60068-2-52 (1996), Ed.2.0	NA
Vibration	EN 60945 (2002) EN 60068-2-6 (2008), Ed.6.0	PASS
Drop	EN 60945 (2002)	NA
Ingress Protection (IP)	EN 60945 (2002) IEC 60529 (2001), Ed.2.1	-
Compass Safe	EN 60945 (2002) EN ISO 694 (2001)	PASS

Test items	Test methods	Result
Extreme Power Supply	EN 60945 (2002) IEC 60092-101 (1994)	PASS

PASS : Tested and complied with the requirements
FAIL : Tested and failed the requirements
NA : Test not relevant to this specimen (evaluated by the test laboratory)
– : Test not performed (instructed by the applicant)
* : An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
# : A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

DEVIATIONS AND EVALUATIONS

Product standards with dated references to basic standards may be modified by Nemko AS to test according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is considered to be adequate as long as the test is expected to confirm compliance to the intention of the product standard. The table above lists the edition of the basic standards used during testing.

Test Results

ENVIRONMENTAL – LOW TEMPERATURE

TEST DESCRIPTION

Method
EN 60068-2-1 (2007) (IEC 60068-2-1 (2007))
Test Ad: Cold for heat-dissipating specimen with gradual change of temperature.

Reference standard
IEC 60945 (2002) Ed.4; Maritime navigation and radiocommunication equipment and systems
Clause 8.4 Low temperature.

Procedure
The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and maintained at –15℃ ± 3℃, for a period of 10 to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period. The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check test and check as specified in the relevant equipment standard. The requirements of the performance test and check shall be met.

Instruments used during test

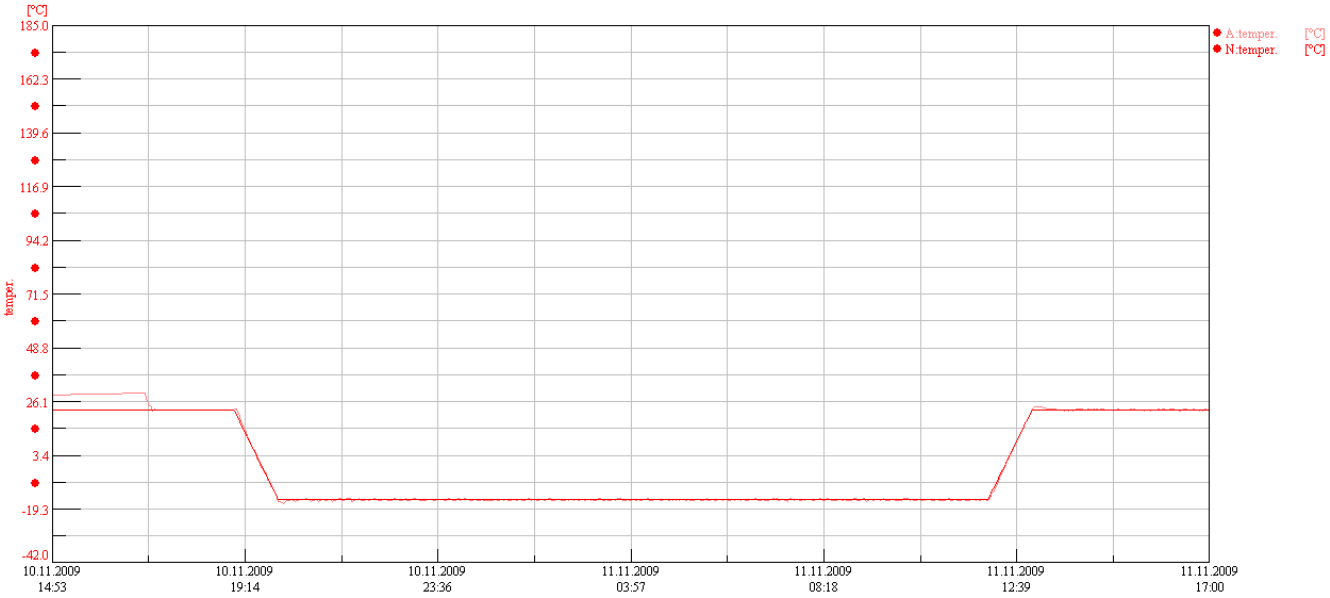
Instrument list:	Climatic Chamber : Vötsch / VC 4100 (N-4343) DC-Power Supply : Oltronix (N-1550) Digital Multimeter : Fluke / 27 (N-2310)

Comments
No recorded comments.

Test Severity		**Conformity**	
Temperature:	- 15℃	Verdict:	PASS
Duration:	16h	Test engineers:	Steinar Jensen Trond Petlund

DETAILED TEST LOG

DOFFEN [no6] prog.:68-2-1 -15C 16h arch.:134363 Polaris (Sirius-3) Low Temperatu~ start:Admin 10.11.2009 14:53 stop: ----
60945 Low Temperature



CONCLUSION

No operational errors were detected during or after the applied test(s).

ENVIRONMENTAL – DRY HEAT (FUNCTIONAL)

TEST DESCRIPTION

Method
EN 60068-2-2 (2007) (IEC 60068-2-2 (2007))
Tests Bd: Dry heat tests for heat-dissipating specimens with gradual change of temperature.

Reference standard
IEC 60945 (2002) Ed.4; Maritime navigation and radiocommunication equipment and systems
Clause 8.2 Dry Heat.

Procedure
The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at +55 ℃ ± 3 ℃. At the end of a soak period of 10 to 16 h at +55 ℃ ± 3 ℃, the EUT shall be subjected to a perf ormance test and check as specified in the relevant equipment standard. The temperature of the chamber shall be maintained at +55 ℃ ± 3 ℃ during the whole perform ance test period. At the end of the test, the EUT shall be returned to normal environmental conditions.
The requirements of the performance test and check shall be met.

Instruments used during measurement

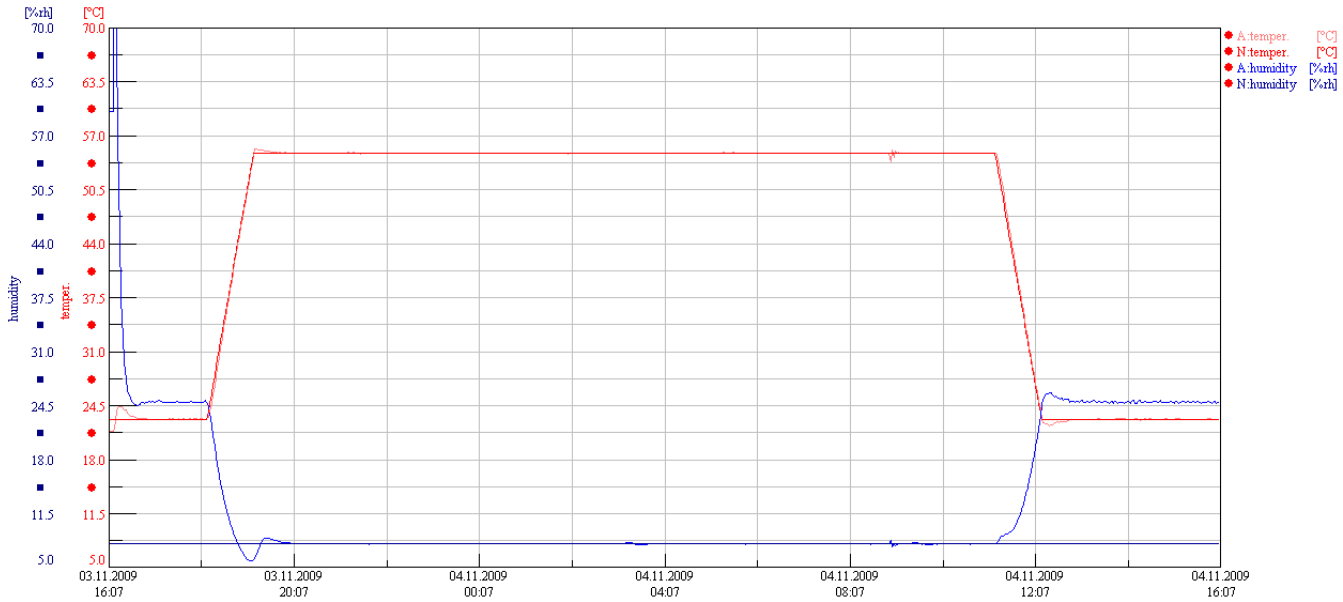
Instrument list:
Climatic Chamber : Vötsch / VC 4100 (N-4343)
DC-Power Supply : Oltronix (N-1550)
Digital Multimeter : Fluke / 27 (N-2310)

Comments
No recorded comments.

Severity		Conformity	
Temperature:	+55ºC	Verdict:	PASS
Duration:	16 hours	Test engineers:	Steinar Jensen Trond Petlund

DETAILED TEST LOG

DOFFEN [no6] prog.:68-2-2 55C 16h arch.:134363 Polaris (Sirius-3) start:Admin 3.11.2009 16:07 stop: ----
60945 Dry Heat



CONCLUSION

No operational errors were detected during or after the applied test(s).

ENVIRONMENTAL – DAMP HEAT

TEST DESCRIPTION

Method
EN 60068-2-30 (2007) (IEC 60068-2-30 (2007))
Test Db: Damp heat cyclic, 2 cycles (12H + 12H cycles).

Reference standard
IEC 60945 (2002) Ed.4; Maritime navigation and radiocommunication equipment and systems
Clause 8.3 Damp heat.

Procedure
The test chamber was pre-conditioned to 25 ºC and 95 %RH. The specimen was placed inside the test chamber, energized and in normal operating condition. The chamber conditions were raised to +55 ºC and 93 %RH over a period of 3 hours. From the time stable test conditions were obtained, the specimen was subject to the conditions for the duration specified under Severity. The test cycle was repeated as specified under Severity.
During the first 2 hours of the first cycle, the specimen was subjected to a functional test.
At the start of the second cycle, the specimen was de-energized. However, during the last 2 hours of the second cycle, the specimen was energized and subjected to a functional test.

Instruments used during measurement

Instrument list:
Climatic Chamber : Vötsch / VC 4100 (N-4343)
DC-Power Supply : Oltronix (N-1550)
Digital Multimeter : Fluke / 27 (N-2310)

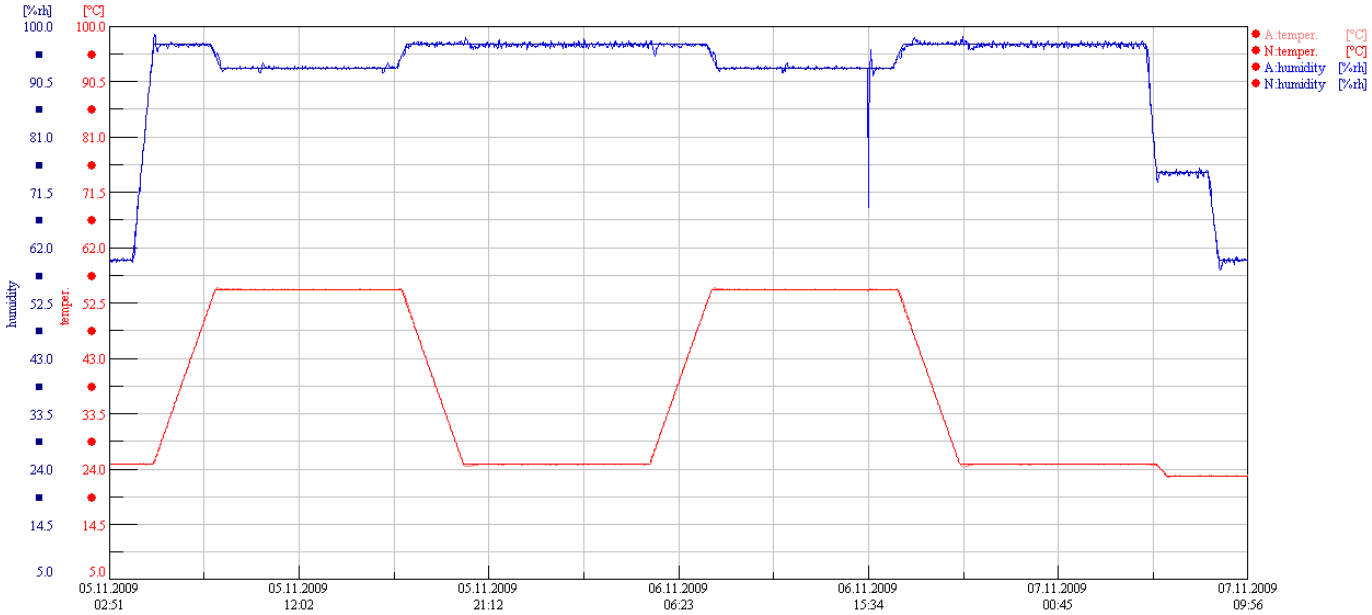
Comments
Eventhough this test is different in EN 60945, the performed test is consider superior and covers the reference standard.

Severity	
Temperature:	+55 ℃
Humidity:	95 %RH
Duration:	2 cycles (12H + 12H)

Conformity	
Verdict:	PASS
Test engineers:	Steinar Jensen Trond Petlund

DETAILED TEST LOG

DOFFEN [no6] prog.:68-2-2 55C 16h arch.:134363 Polaris (Sirius-3) start:Admin 3.11.2009 16:07 stop: Admin 4.11.2009 16:09
60945 Dry Heat



CONCLUSION

No operational errors were detected during or after the applied test(s).

ENVIRONMENTAL – VIBRATION

TEST DESCRIPTION

Method
EN 60068-2-06 (2008) (IEC 60068-2-06 (2007))
Test Fc: Vibration (sinusoidal)

Reference standard
IEC 60945 (2002) Ed.4; Maritime navigation and radiocommunication equipment and systems
Clause 8.7 Vibration.

Procedure
The EUT, complete with any shock and vibration absorbers with which it is provided, shall be fastened to the vibration table by its normal means of support and in its normal attitude. The EUT may be resiliently suspended to compensate for weight not capable of being withstood by the vibration table. Provision may be made to reduce or nullify any adverse effect on EUT performance which might be caused by the presence of an electromagnetic field due to the vibration unit. The EUT shall be subjected to sinusoidal vertical vibration at all frequencies between: – 2 Hz to 5 Hz and up to 13,2 Hz with an excursion of ±1 mm ± 10 % (7 m/s^2 maximum acceleration at 13,2 Hz); – above 13,2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s^2.
The frequency sweep rate shall be 0.5 octaves/min in order to allow the detection of resonances in any part of the EUT as mounted. A resonance search shall be carried out throughout the test. During the resonance search the EUT shall be externally observed, by unaided visual and aural means, for obvious signs of any resonances of components or sub-assemblies that may affect the integrity of the EUT. Such observations shall be recorded in the test report. If any resonance, as measured by a sensor fixed to the outside of the EUT at the location where obvious signs of resonance have been observed, has a magnitude ratio ≥5 measured relative to the surface where the EUT is fastened, the EUT shall be subjected to a vibration endurance test at each resonant frequency at the vibration level specified in the test with a duration of 2 h. When resonant frequencies with magnitude ratios ≥5 are harmonically related, only the fundamental frequency shall be tested. If no resonance with a magnitude ratio ≥5 occurs, the endurance test shall be carried out at one single observed frequency. If no resonance occurred, the endurance test shall be carried out at a frequency of 30 Hz. Performance check(s) shall be carried out at least once during each endurance test period, and once before the end of each endurance test period. The procedure shall be repeated with vibration in each of two mutually perpendicular directions in the horizontal plane. The requirements of the performance check shall be met.

Instruments used during measurement

Instrument list FFI:	Accelerometer: PCB 352C65 SN 78734 Accelerometer: PCB 352C65 SN 78735 Accelerometer: PCB 352C65 SN 78737 Accelerometer: PCB 352C65 SN 78738 Accelerometer: PCB 352C65 SN 74143 Shaker: LDS 824 Forsterker: Ling Electronic og LDS Software og controller: LDS Dactron type Laser USB

Comments
Witness testing at FFI, Kjeller, Norway.

Severity

Frequency range:	5 Hz – 100 Hz
Amplitude:	5 Hz – 13.2 Hz: 2mm (p-p) 13.2 Hz – 100 Hz: 7 m/s^2
Sweep rate:	0.5 octave/min
Amplification criteria:	-
Endurance criteria:	Endurance at each resonance ≥ 5:1, if none, one single observed frequency. if no observed freq., then 30 Hz.
Endurance Duration:	120 min. at each chosen frequency
Number of axes:	3 mutually perpendicular

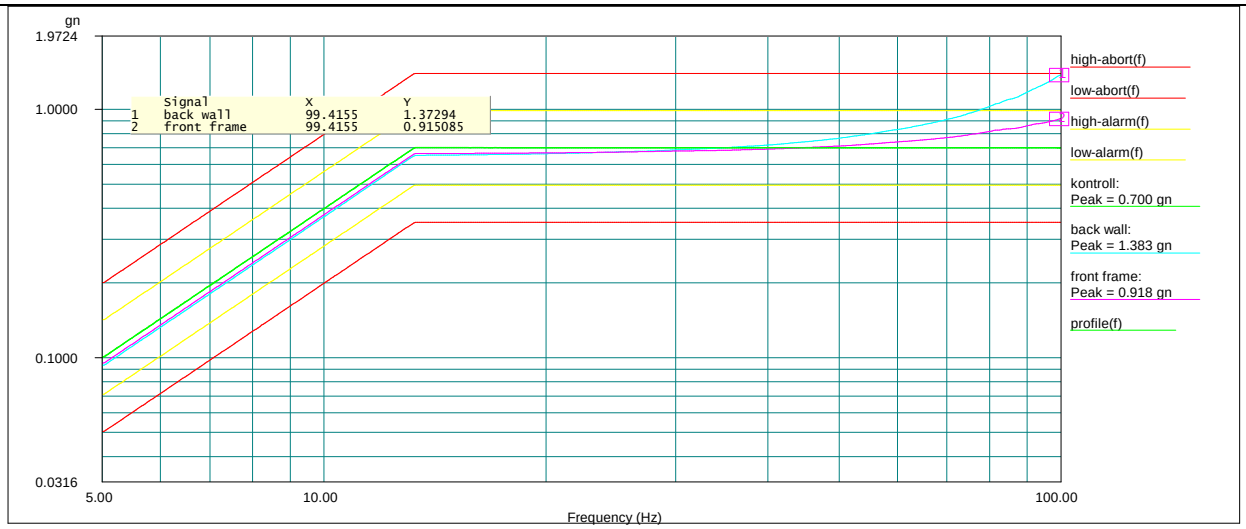
Conformity

Verdict:	PASS
Test engineers:	FFI : Øistein Lundberg Nemko: Steinar Jensen Trond Petlund

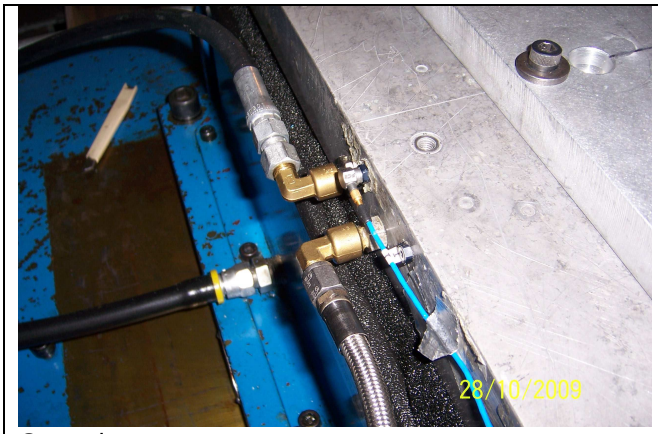
RESONANT POSITIONS

Axis	Position	Sweep number	Resonance Amplification Factor	Frequency
X	Back wall	1 (ch.2)	2 : 1	99.4 Hz
	Front frame	1 (ch.3)	1.3 : 1	99.4 Hz
Y	Side wall	2 (ch.2)	1.2 : 1	99.4 Hz
	Fixture/Bracket	2 (ch.3)	1.1 : 1	99.4 Hz
Z	Top wall	3 (ch.2)	1.1 : 1	99.4 Hz
	Bottom wall	3 (ch.3)	1.1 : 1	99.4 Hz

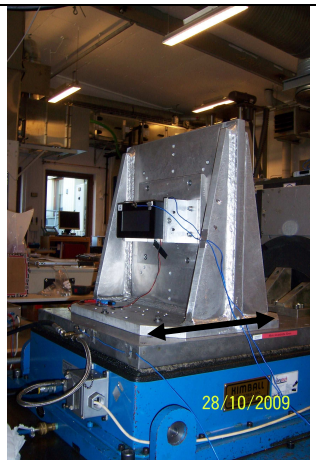
Sweep no.1



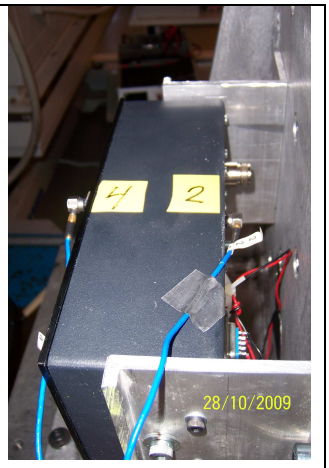
Sweep profile



Control

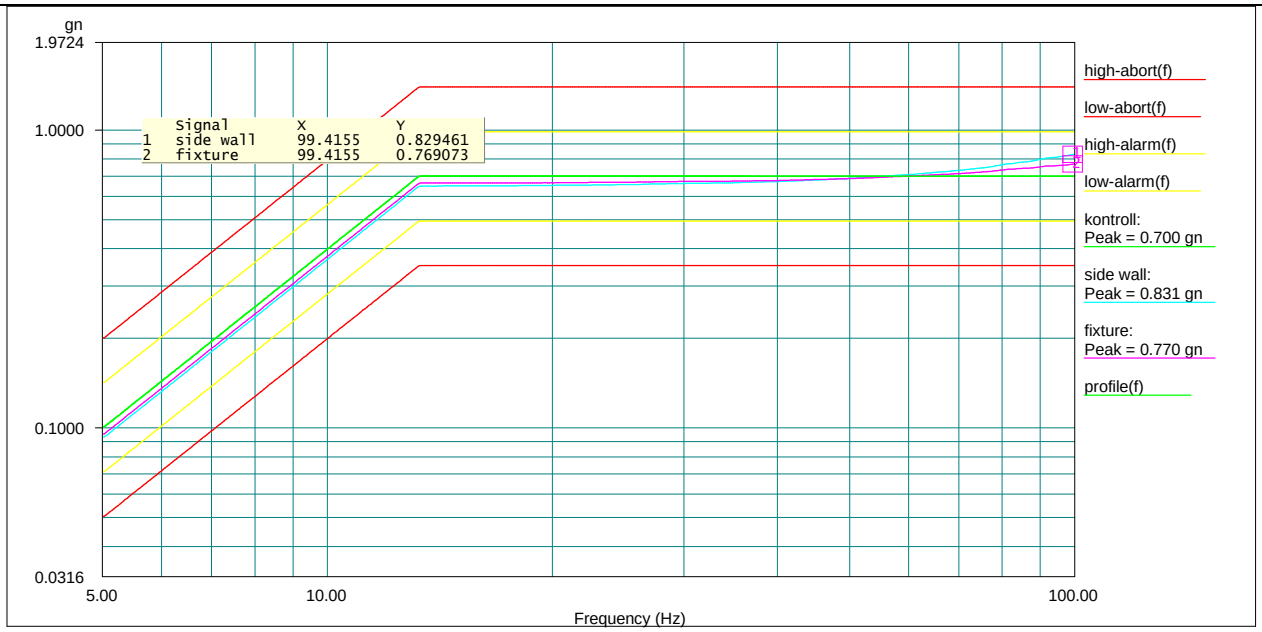


X-Axis

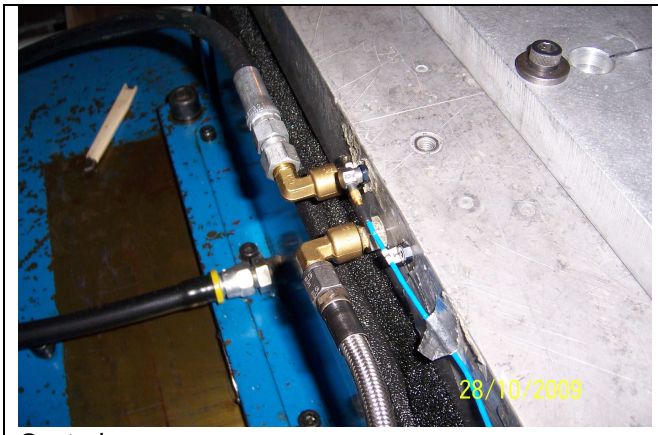


Accelerometer positions

Sweep no.2



Sweep profile



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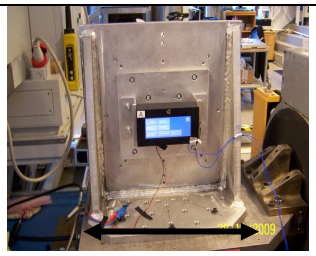
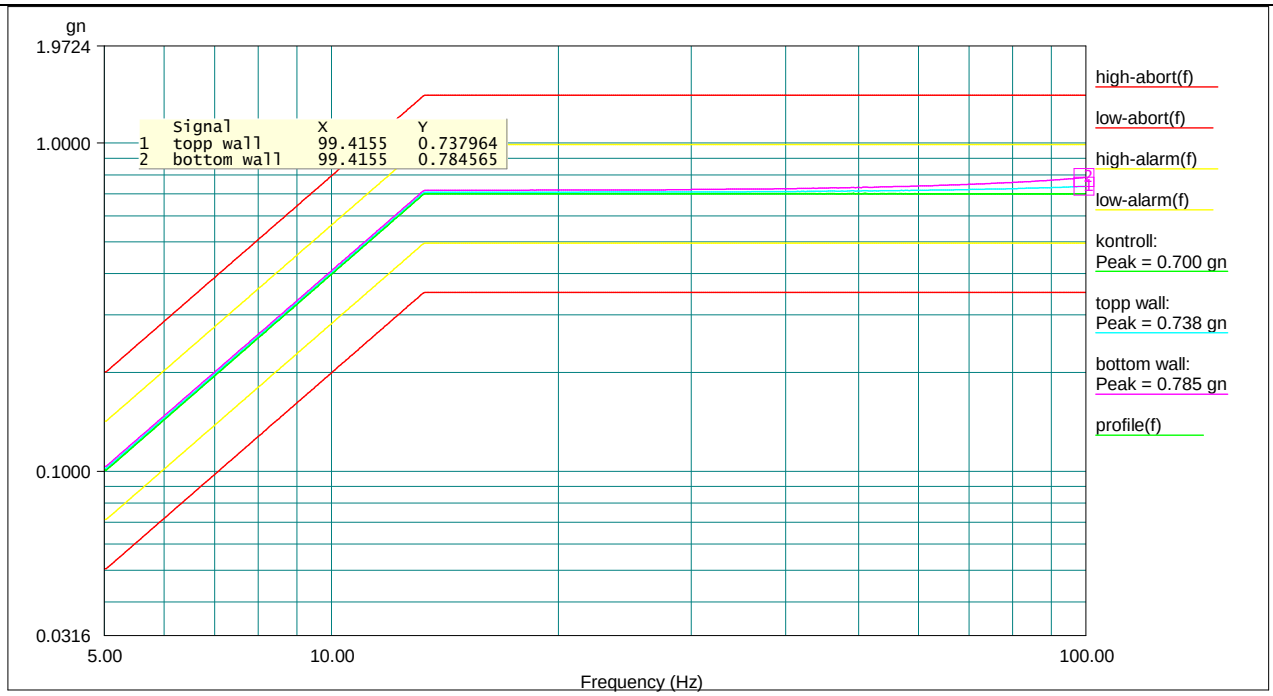


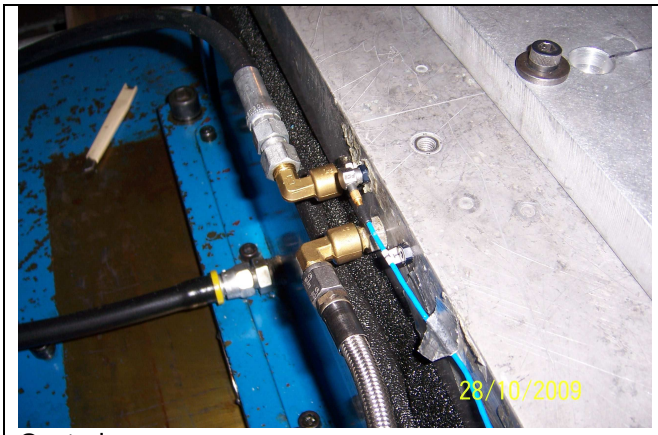
Y-Axis

Accelerometer positions

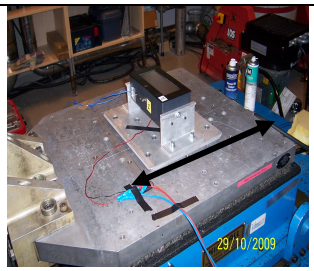
Sweep no.3



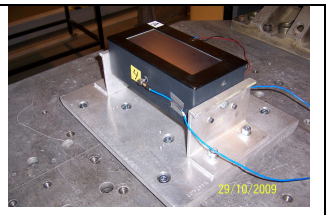
Sweep profile

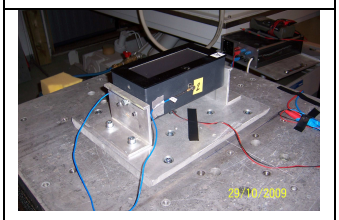


Control



Y-Axis





Accelerometer positions

ENDURANCE TEST LOG

Axis	Frequency	Duration	Functional test	Result
X	99.4Hz	120 min.	Before, during and after exposure	PASS
Y	99.4Hz	120 min.	Before, during and after exposure	PASS
Z	99.4Hz	120 min.	Before, during and after exposure	PASS

CONCLUSION

No operational errors or damages were detected during or after the applied test(s).

ELECTRICAL – COMPASS SAFE DISTANCE

TEST DESCRIPTION

Method
EN 60945 (2002), Section 11.2
EN ISO 694 (2001)
Ships and marine technology. Positioning of magnetic compasses in ships.

Procedure
Compass safe distance is the distance between the nearest point of the EuT and the subject compass, where an unacceptable compass deviation occur
For a standard compass, the horizontal magnetic flux shall be less than 0.942 mGauss (compass deviation of 5.4°H).
For a steering/standby/emergency compass, the horizontal magnetic flux shall be less than 3.142 mGauss (compass deviation of 18°H).

The compass safe distance is measured with a DC milligaussmeter. The EuT is first rotated to determine the worst case direction. Secondly the EuT is moved towards/away from the measurement probe until the required field is measured. The distance is then measured.

Measurements are made at 3 EuT conditions:
1) Non-energized (in the magnetic condition received from customer)
2) Non-energized after magnetisation in a 1 Gauss (80A/m) DC field, with a superimposed stabilising 50Hz AC field of 18 Gauss (1430A/m) *
3) Energized and in normal operating condition

* Test 2) may be omitted if the application of a strong magnetic field may damage the EuT

Instruments used during measurement

Instrument list: Magnetometer: Alphalab DC Milligauss (N-4046) (10/09)
Magnetization Coil: Nemko HC-1 (N-4216) (NA)
AC Magnetometer: Combinova MFM 10 (N-4286) (09/09)
DC Magnetometer: Alphalab DC Magnetometer (N-4258) (10/09)

Comments
No recorded comments.

Conformity
Test engineer: Nguyen Trung Cang

DETAILED TEST LOG

Condition	Standard Compass	Steering Compass
Non-energized	70 cm	40 cm
Non-energized after magnetisation	70 cm	40 cm
Energized and operating	70 cm	40 cm

CONCLUSION

Based on the above measurements the overall Compass Safe Distance is considered to be = **70 cm**

ELECTRICAL – EXTREME POWER SUPPLY

TEST DESCRIPTION

Method
IEC 60945 (2002) Ed.4; Maritime navigation and radiocommunication equipment and systems
Clause 7.1.

Procedure
Performance checks/tests has been performed at normal and at extreme power supply conditions prior to the environmental conditioning and then repeated after the Low Temperature test, the Dry Heat test and the Damp Heat test, as specified below.

The checks/tests were performed at extreme conditions as specified below:

Table 1 – Extreme power supply variation

Power supply	Voltage variation %	Frequency variation %
a.c.	±10	±5
d.c.	+30 −10	Not applicable

Instruments used during measurement

Instrument list: DC-Power Supply : Oltronix (N-1550)
Digital Multimeter : Fluke / 27 (N-2310)

Comments
No recorded comments.

Severity

Fnom:	DC
Vnom:	12 VDC 24 VDC

Conformity

Verdict:	PASS
Test engineers:	Steinar Jensen Trond Petlund

DETAILED TEST LOG

Condition	Voltage	Frequency	Action	Result
Dry heat	Vnom	NA	Performance test	PASS
Dry heat	Vnom + 30%	NA	Performance check	PASS
Dry heat	Vnom - 10%	NA	Performance check	PASS
Damp heat	Vnom	NA	Performance check	PASS
Cold	Vnom	NA	Performance test	PASS
Cold	Vnom + 30%	NA	Performance check	PASS
Cold	Vnom - 10%	NA	Performance check	PASS
Normal temperature	Vnom	NA	Performance test	PASS
Normal temperature	Vnom + 30%	NA	Performance test	PASS
Normal temperature	Vnom - 10%	NA	Performance test	PASS

CONCLUSION

Proper performance was verified during normal and extreme power supply conditions at all the required test points.

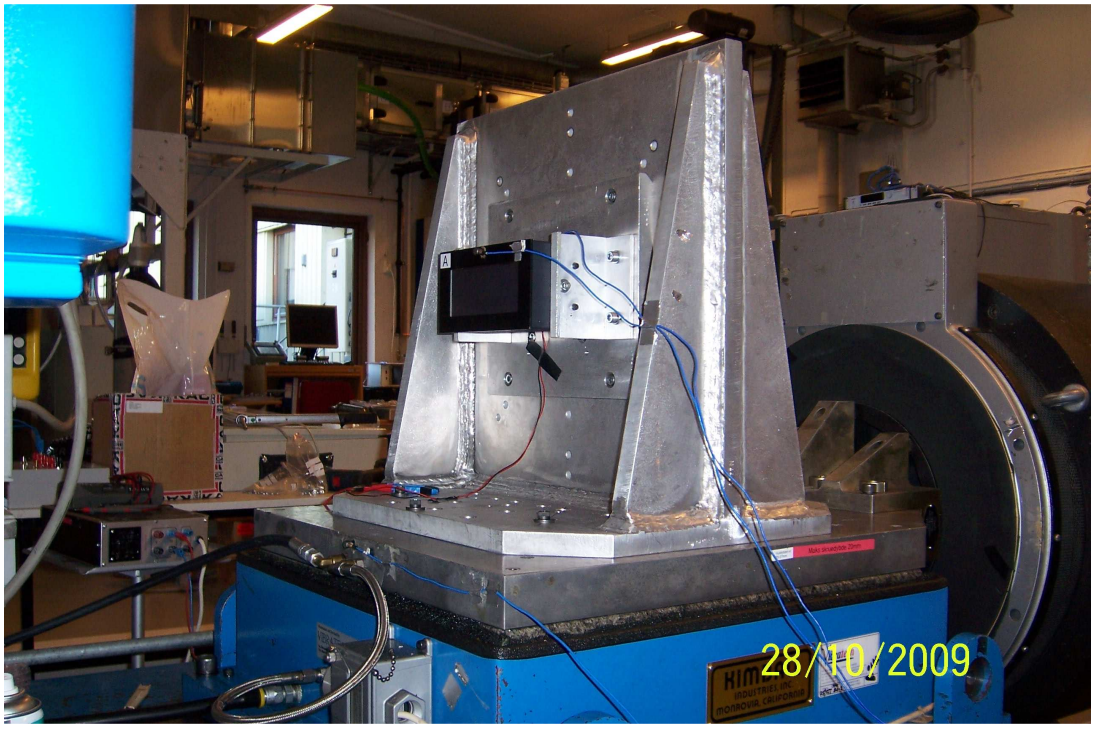
Annexes

UNCERTAINTY FIGURES

	Gaustad	Kjeller
Mains Port Disturbance Voltage	± 3.8 dB (9 kHz – 150 kHz) ± 3.5 dB (150 kHz – 30 MHz)	+ 2.9 dB / - 4.1 dB
Load Port Disturbance Voltage	± 2.7 dB (150 kHz – 30 MHz)	
Signal Port Disturbance Voltage	± 2.7 dB (150 kHz – 30 MHz)	
Discontinuous Disturbance Voltage	± 4.3 dB (150 kHz – 30 MHz)	
Insertion Loss	± 2.5 dB (150 kHz – 1.605 MHz)	
Disturbance Power	± 3.4 dB (30 MHz – 300 MHz)	
Radiated Electromagnetic Field	± 2.7 dB (9 kHz – 30 MHz)	
Radiated Disturbance (3 meter)		± 4.8 dB (150 kHz – 30 MHz) ± 4.7 dB (30 MHz – 200 MHz) ± 4.8 dB (200 MHz – 1000 MHz)
Radiated Disturbance (10 meter)		± 4.7 dB (30 MHz – 200 MHz) ± 4.8 dB (200 MHz – 1000 MHz)
Harmonic Current Emissions	± 2.1mA	
Flicker	± 0.64 V (Dc and Dmax) ± 5 % (Pst and Plt)	
Electrostatic Discharges	± 10 % (peak voltage) ± 30 % (pulse shape)	
Radiated RF Field		± 2.4 dB
Electric Fast Transients	± 10 % (peak voltage) ± 30 % (pulse shape)	
Surge	± 10 % (peak voltage) ± 30 % (rise time) ± 20 % (duration)	
Conducted RF Disturbance	± 2 dB	± 2.8 dB (150 kHz – 26 MHz) ± 3.7 dB (26 MHz – 80 MHz)
Power Frequency Magnetic Field	± 2 %	
Dips/Interruptions	± 5 % (voltage) ± 10% (zero crossing control) ± 10º (phase relationship)	
Compass Safe Distance	± 9 % (on measured level) ± 5 cm (on distance)	
Acoustic Noise	± 1 dB	
Vibration	± 5.6 % (acceleration) ± 0.01% (frequency)	
Temperature	± 2ºC	
Humidity	± 5 %Rh	
Voltage	± 1.5 %	
Frequency	± 0.2 %	

The instruments specified are subject to periodic calibration. Monthly controls ensure, with 95% confidence level, that the instruments remain within the calibrated levels

PHOTOS



Notes: Test set-up for Vibration in X axis

Notes: Test set-up for Vibration in Y axis

Notes: Test set-up for Vibration in Z axis

Notes: Test set-up for Compass Safe Distance

Notes: Test set-up for Compass Safe Distance