

Test Report

Performance test for
Multi Repeater Compact CD 401 MR
according to
EU Directive 96/98EC on Marine Equipment
at
SKIPPER Electronics AS, Enebakkveien 150, 0612 OSLO
26 of March 2010

1. **Scope**
2. **Equipment under the test (EUT)**
3. **Auxiliary equipment (AUX)**
4. **Display Performance tests (IEC 62288:2008)**
5. **Digital Interface Performance test (IEC 61162:2007)**
6. **Annex A:**
Functional Test CD 401 Compact Multi Repeater



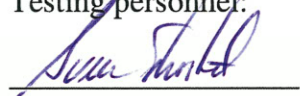
1. Scope.

The operator unit, referred as Compact Display CD401 contains a dot-matrix led display and four buttons. The display is presently approved to be used in two different modes. The first mode is as a main display in an EML224 log system. The other mode is as an NMEA repeater in a log system. This test extends the use of the display to include numerous NMEA (IEC 61162-1) formats.

During this performance tests project, SKIPPER have based their preparation on the following available documents:

- DNV document: Standard for Certification no. 2.9, Type Examination Programme A.1/4.6
"Echo Sounding Equipment" November 2008
- IEC 62288 ed.1.0, 2008 "Maritime navigation and radiocommunication equipment and systems Presentation of navigation-related information on shipborne navigational displays General requirements, methods of testing and required test results"
- IEC 61162-1 (2007) Serial Interface tests

Testing personnel:

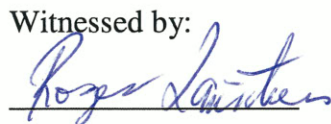


Ryan 26/3-10
Place and date

pr. SKIPPER Electronics AS

Skipper Electronics A/S

Witnessed by:



Ryan 26/3-10
Place and date

Det Norske Veritas



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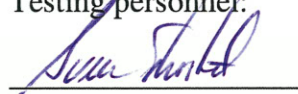
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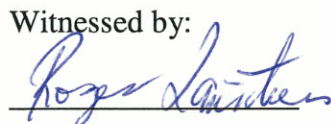


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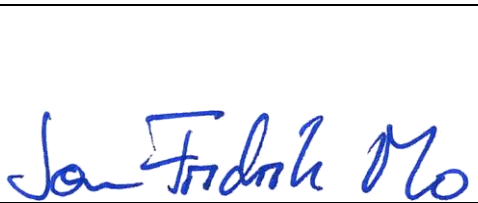


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Test Report

Product	Compact Display		
Name and address of the applicant	SKIPPER Electronics A/S Ryensvingen 5, P.O Box 151, Manglerud 0612 Oslo, NORWAY		
Name and address of the manufacturer	SKIPPER Electronics A/S Ryensvingen 5, P.O Box 151, Manglerud 0612 Oslo, NORWAY		
Model	CD401		
Rating	24VDC		
Brand name	Skipper		
Serial number	Pre-production		
Additional information	-		
Tested according to	EN 60945 (2002)		
Order number	187841		
Tested in period	2007-11-15 to 2008-03-04 / 2011-09-13 to 2011-09-30		
Issue date	2011-10-06		
Name and address of the testing laboratory	 P.O. Box 73 Blindern, N-0314 Oslo, Norway	Telephone (+47) 22 96 03 30 Fax (+47) 22 96 05 50	 ACCREDITED REPORT REF. NA - TEST 033 An accredited technical test executed under the Norwegian accreditation scheme
 Prepared by [Jon Fredrik Mo]  Approved by [Nguyen Trung Cang]			
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REVISIONS

Revision #	Date	Order #	Description
00	2008-03-14	96269	-
01	2011-10-06	187841	Added testing for vibration and shock
02	2011-10-06	187841	Edited the summary of testing due to typo.

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.

The instruments specified in immunity testing are subject to periodic calibration. Monthly controls 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).

EQUIPMENT UNDER TEST (EUT)

SYSTEM DESCRIPTION

The equipment under test is a display, receiving information and displays it.

MODEL VARIATIONS

No model variations are considered covered by this report

PORTS AVAILABLE

This equipment is fitted with the following electrical ports.

PO no.	Port Name	Type	Count	Comment
1	Input		1	Both power and signal in same connector
Notes:				

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	Signal / power					2 meter
Notes:						

AVAILABLE OPERATING MODES

The following functional operating modes are available and are considered applicable under intended use.

FU no.	Operating mode	Comment	Investigated
1	Displaying incoming signals		Yes
Notes:			

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	Address
X	GAUSTAD	Gaustadalleen 30, N-0314 Oslo, Norway
X	SKAR	Maridalsveien 621, N-0890 Oslo, Norway
	KJELLER	Gåsevikveien 8, N-1300 Kjeller, 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: [24V DC](#)

Grounding: [Grounded through external connection.](#)

AMBIENT CONDITIONS

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

The climatic conditions in the laboratory environment were according to EN 60068-1 (1988) + A1 (1992):

Ambient temperature	23°C (EN 60068-1: 15 - 35°C)
Relative humidity	45%RH (EN 60068-1: 25 - 75%RH)
Atmospheric pressure	100kPa (EN 60068-1: 86 – 106kPa)

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

EVALUATION OF PERFORMANCE

FUNCTIONS MONITORED DURING IMMUNITY TESTS

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

#	Function	Monitoring method
1	Correct cyclic displaying of information	Visual
Notes:		

FUNCTIONAL CHECKS

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

#	Functional tests
1	The ability to change display information
Notes:	

PERFORMANCE CRITERIA

In order to pass each test, the EuT shall meet the following criteria:

Criteria	General description	Criteria modified by manufacturer
A	The device shall continue to operate as intended both during and after the test. No degradation of performance or loss of function is allowed below the expected performance level of the device	
B	The device shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below the expected performance level of the device	
C	Temporary loss of function during test is allowed, provided the function is self-recoverable or can be restored by the operation of the controls	
Notes:		

SUMMARY OF TESTING

APPLIED STANDARDS

» **EN 60945 (2002)**

Maritime navigation and radio communication 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)	PASS
Radiated Disturbance (9kHz-30MHz)	EN 60945 (2002)	PASS
Radiated Disturbance (30-2000MHz)	EN 60945 (2002)	PASS
Electrostatic Discharges	EN 60945 (2002) EN 61000-4-2 (2001), Ed.1.2	PASS
Radiated RF Field	EN 60945 (2002) EN 61000-4-3 (2001), Ed.2.0	PASS
Electric Fast Transients	EN 60945 (2002) EN 61000-4-4 (2001), Ed.1.1	PASS
Surge	EN 60945 (2002) EN 61000-4-5 (2001), Ed.1.1	NA
Conducted RF Disturbance	EN 60945 (2002) EN 61000-4-6 (2003), Ed.2.0	PASS
Dips/Interruptions	EN 60945 (2002) EN 61000-4-11 (2001), Ed.1.1	PASS
Voltage and Frequency Variations	EN 60945 (2002) EN 61000-4-11 (2001), Ed.1.1	NA
Conducted LF Disturbance	EN 60945 (2002) EN 61000-4-16 (2001), Ed.1.1	NA
Low Temperature (Cold)	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
Shock	ETSI EN 300 019-2-4 V2.1.2 (1999) EN 60068-2-27 (2009)	PASS
Vibration	EN 60945 (2002) EN 60068-2-06 (2008)	PASS
Drop	EN 60945 (2002)	NA

Ingress Protection (IP)	EN 60945 (2002) IEC 60529 (2001), Ed.2.1	NA
Compass Safe	EN 60945 (2002) EN ISO 694 (2001)	PASS
Extreme power supply	EN 60945 (2002)	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

Nemko has not recorded any deviations to the applied standards, but an additional shock test has been performed by customer request.
Nemko has made no general evaluations.

ENVIRONMENTAL – RAIN AND SPRAY

TEST DESCRIPTION

Method

IEC 60945 Ed.4 (2002-08), Cl. 8.8 Rain and spray (Exposed equipment)
IEC 60529 Ed.2.1 (2001) Degrees of protection provided by enclosures (IP Code), table 3, second characteristic numeral 6:protected by powerful water jets.

Purpose

This test simulates the effects of rain, sea spray and light breaking seas on equipment. It is applicable to exposed equipment mounted above deck level such as antennas. It is not applicable to portable equipment, as these are required to meet a more stringent immersion test.

Procedure

The test shall be carried out by spraying the EUT from all practicable directions with a stream of water from a standard test nozzle (hose) as shown in figure 6 of IEC 60529. The EUT shall operate throughout the test. The conditions to be observed are as follows:

- internal diameter of nozzle: 12,5 mm;
- delivery rate: 100 l/min $\pm$ 5 % ;
- water pressure: to be adjusted to achieve the specified delivery rate;
- core of substantial stream: circle of approximately 120 mm diameter at distance 2,5 m from nozzle;
- test duration: approximately 30 min;
- distance from nozzle to the equipment surface: approximately 3 m.

At the end of the test the EUT shall be subjected to a performance check, and shall then be examined for damage and for unwanted ingress of water. Following examination, the EUT shall be resealed in accordance with the manufacturer's instructions.

Alternatively, if there are no external signs of unwanted ingress of water, an internal examination which involves disturbance to seals may be carried out after all environmental tests have been completed.

Further guidance is given in IEC 60529, table 3, second characteristic numeral 6: protected against powerful water jets.

Instruments used during measurement

Instrument list:	IP facility:	Nemko AS
	Water flow meter:	ABB Kent – Taylor / MagMaster (N4012)

Comments

No recorded comments.

Severity

IP numeral:	IPX6
Flow rate:	100 l/min.
Test duration:	30 min

Conformity

Verdict:	PASS
Test engineer:	Jarle Skogland

CONCLUSION

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