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The Netherlands
Chamber of Commerce
51565536
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telefication

Test report
20103677200

based on:
EN 60945, issue 4: 2002-10

AIS Class A and Inland Transponder
CNS Systems
VDL 6000

Contents

This report comprises of five modules. The total number of pages is: 73

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Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Ordering party:

Company name	:	C.N.S. Systems AB
Address	:	St. Larsgatan 32B
Zipcode	:	582 24
City/town	:	Linköping
Country	:	Sweden
Date of order	:	17 October 2011

2 Product

A sample of the following product was submitted for testing:

Product name	:	AIS Class A and Inland Transponder
Manufacturer	:	C.N.S. systems AB
Trade mark	:	CNS Systems
Type designation	:	VDL 6000
Software version	:	SW-6000-12-3.0.1
Hardware version	:	1.0
Serial number	:	1.44-6000-00010

The CNS VDL 6000 transponder is a category b (protected) equipment.

3 Test schedule

The tests are carried out at the following locations:

- Telefication, Zevenaar
- Thales, Hengelo (vibration tests only)

The sample of the product was received on:

- 8 November 2011

The tests are carried out between:

- 9 and 21 November 2011

4 Product documentation

For production of this report the following product documentation is used:

Description	Identification	Date
Installation, maintenance and repair manual, issue P1B	Doc. No. CNSS-11-1601	2012-01-10
Manual, part II user's guide, issue P3I	Doc. No. CNSS-03-2114	2011-11-07

The above mentioned documentation will be filed at Telefication for a period of 10 years following the issue of this report.

5 Observations and comments

An overview of tested ports is given below.

Port	Function of port	Emission	Immunity
Enclosure	--	x	x
X1	VHF antenna	Terminated	x
X2	GNSS antenna	Terminated	x
X3	Pilot	x	x
X6	Power supply and ground	x	x
X7	Maintenance	--	--
X8	Navigation sensors	x	x
X9	Pilot	--	--
X10	Blue sign, alarm and DGNSS	x	x

Port X9 has not been tested since it has same functionality as port X3 (Pilot).
Port X7 has not been tested since this a maintenance port, not intended for normal use.

6 Modifications to the sample

No modifications were made to the sample.

7 Summary

The product is intended for use in the following application area:

- MARINE COMMUNICATIONS EQUIPMENT

The sample is tested according to the following specification:

- EN 60945, issue 4: 2002-10

8 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report.

The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in section 7 "*Summary*".

All tests are performed by:

name : ing. P.A. Suringa

function : Senior Engineer Radio/EMC

signature :

Review of test methods and report by:

name : G.J. Gort

function : Senior Test Engineer

signature :

The above conclusions have been verified by the following signatory:

date : 15 May 2012

name : ing. A. van der Valk

function : Manager Laboratory

signature :

Test results module

1 Operational checks according to EN60945 clause 6

According to EN 60945:2002 edition four, the following checks are performed:

Summary table

EN 60945 sub clause		Minimum Performance requirement reference	Performance requirement
6.1 Ergonomics and HMI	6.1.1	--	General
	6.1.2	4.2.1.2	Arrangement
	6.1.3	4.2.1.3	Operation
	6.1.4	4.2.1.4	Identification
	6.1.5	4.2.1.5	Screen display and indicators
	6.1.6	4.2.1.6	Voice announcement
	6.1.7	4.2.1.7	Safety of operation
	6.1.8	4.2.1.8	Distress alert
6.2 Hardware	6.2.1	4.2.2.1	General
	6.2.2	4.2.2.2	Alarm and indicators
	6.2.3	4.2.2.3	Illumination
6.3 Software	6.3.1	4.2.3.1	General
	6.3.2	4.2.3.2	Safety of operation
	6.3.3	4.2.3.3	Monitoring
	6.3.4	4.2.3.4	Operation
6.4 Inter-unit connection	6.4	4.2.4	General

2 Ergonomics and HMI (6.1)

2.1 General

EN 60945 reference: 6.1.1

Observation of the operational check	Result
No controls are implemented	NA

2.2 Arrangement

EN 60945 reference: 6.1.2

Requirement	Observation of the operational check	Result
a) Check that the number of operational controls, their design and manner of function, location, arrangement and size provide for simple, quick and effective operation of the EUT. Check that the controls are logically grouped according to their function.	The number of operational controls, their design and manner of function, location, arrangement and size provide for simple, quick and effective operation of the EUT.	NA
b) Check that the shape and size of each control is appropriate to its mode of operation. In the case of trackballs, joysticks and mice check that the controller can produce any combination of x and y axis output values and that the controller does not drive the follower off the edge of the screen. In the case of joysticks, check that there is a “home position” with a capability for a return to that point.	The shape and size of each control is appropriate to its mode of operation.	NA
c) In the case of touch screens check that the dimension of the response area for a push to activate operation is a minimum of 15 mm height and width and the force required for operation is a maximum of 1,5 N where applicable.		NA

Requirement	Observation of the operational check	Result
e) Check that rotating controls and indicators turn clockwise for increased value or effect.	The display unit contains the following rotating control which turns clockwise for increased function: *AF-volume* The display unit contains the following rotating control which turns clockwise for increased function: *Backlight*	NA
f) Check that linear controls and indicators move upwards or to the right for increased value or effect.		NA
g) Check that where users must rapidly discern directional change, digital displays are provided with indications of directions of change.		NA
h) Check that equipment elements relating to control, and indicators associated with control, are readily distinguishable from elements provided for other functions, such as equipment set-up.		NA

2.3 Operation

EN 60945 reference: 6.1.3

Requirement	Observation of the operational check	Result
a) Check that all operational controls permit normal adjustments to be easily performed, and are arranged in a manner which minimizes the chance of inadvertent operation. Check that controls not required for normal operation and which may affect performance are not readily accessible.		NA
b) Check all operational controls and indications for ease of use and correctness, and for general suitability related to their function and environment, for example expected ambient illumination and sound.		NA
c) Check that the operation of a control does not cause obscuration of its related indicator where observation of the indicator is necessary for making the adjustment.		NA
d) Check that in all operations there is a clearly marked or consistent simple action to recover from a mistaken choice or to leave an unwanted state. Check that it is always possible for a user to start, interrupt, resume and end an operation.	This is achieved by CLR and/or ESC buttons	P

2.4 Identification

EN 60945 reference: 6.1.4

Requirement	Observation of the operational check	Result
1 Check that all operational controls and indicators are easy to identify and read from the position where the equipment is normally operated.		NA
b) Check that instrument and indicator character type is simple and clear. The character height (mm) shall be not less than 3,5 times the reading distance in metres, and the nominal character width shall be 0,7 times the character height. Check that instruments meant to be operated, or fitted in connection with controls are readable from a distance of at least 1 m, and that other instruments are readable from a distance of at least 2 m.	height is 3.5 mm; width is 2.0 mm	P*)
c) Check that the controls and indicators are identified in English, and that the identifications provided in the equipment standard are used.		NA
d) Check that indicators are satisfactorily positioned relative to the operator's line of sight, and are not obscured when operating associated controls under normal operating conditions.		NA

*) valid for a reading distance of 0.7 m.

2.5 Screen display and indicators

EN 60945 reference: 6.1.5

Requirement	Observation of the operational check	Result
a) Check that menus are grouped according to the task environment. Check that hierarchical menu structures have been designed to minimize the number of steps required and that the user has an indication of current position in the menu.	The menu is designed for minimum number of steps. The user knows the current position by cursor indication in the display.	P
b) If menu selections are made of keyed codes, check that each code is the first letter or letters of the displayed option label rather than an arbitrary letter.		NA
c) Check that a menu displays only those options currently available in the current context to the user. Check that menu items are highlighted when the cursor passes over them.	The cursor does not pass over menu items.	NA
d) Check that for menu items that can be in an “On” or “Off” state the “On” state should be indicated by making the item perceptually distinct and that selection of menu items with “On” and “Off” states change their state.		NA
e) Check that items which appear the same behave consistently by, for instance, – checking for consistent display format and selection logic in hierarchical menus, – checking that menus used in different displays are consistent, – checking that menus are displayed in consistent screen locations, – checking for consistent input prompts and checking that labels are consistent.		NA
f) Check that the user does not have to remember information from one part of a dialogue to another		NA
g) Check that the system employs marine terminology conforming with the SMCPs where appropriate.		NA
h) Check that displayed text is easy to understand wherever possible.		P
i) Check that where additional on-line help is available it is in task dependent form, easy to search and list the steps to be carried out.		NA

Requirement	Observation of the operational check	Result
j) Check that in all operations the system state is observable with essential data displayed.		P
k) Check that all information required by the user to perform an operation is available on the current display.	All necessary information is available.	P
l) Check that feedback timing is consistent with the task requirements. Check that there is a clear feedback from any action within a short time. Check that where a perceptible delay in response occurs, a visible indication is given.		NA
m) Check that it is possible at any step of a screen supported operation to return with one action to the original status before the operation was started.		NA
n) Check that any mode in use is distinctively identified by the display.	Each mode is indicated by indicator LED's.	NA
o) Check that displays present the simplest information consistent with their function, information irrelevant to the task is not displayed, and extraneous text and graphics are not present.		NA
p) Check that displayed text is clearly legible to the user. Check that the font and size of alphanumeric characters are consistent. For any font used, check that it is possible to clearly distinguish between the characters: X and K, T and Y, I and L, I and 1, 0, O and Q, S and 5 and U and V.		P
q) Check that the unit of measure is indicated for any data.	M, ° (meter, degree)	P
r) Check that all information is presented on a background of high contrast.		P
s) Check that highlighting is easily recognizable and is disabled when it is no longer applicable.		NA
t) Check that flashing is only used to signal an alarm and that only a small percentage of the screen is flashing at any one time. Check that if a user is required to read alarm text a marker symbol shall flash rather than the text. Check that no more than two flash rates are used and that they are then time synchronized.		NA

2.6 Voice announcement

EN 60945 reference: 6.1.6

Requirement	Observation of the operational check	Result
1 Check that voice announcements are in plain language, using marine terminology conforming with the SMCPs where appropriate, and in the English language.		NA
b) Check that it is possible to adjust the volume to extinction and that sudden changes in loudness do not occur.		NA
c) Check that voice announcements stop when their associated indication or alarm is acknowledged.		NA
d) Check that failure of the voice announcement system by disabling the loudspeaker, does not degrade the operation of the provided indicators and alarms.		NA

2.7 Safety of operation

EN 60945 reference: 6.1.7

Requirement	Observation of the operational check	Result
a) Check that the system attempts to prevent ascertainable user-action error from occurring.		P
b) Check that all actions that may be irreversible, require a confirmation before proceeding.		NA
c) Check that when an action causes a detectable error the system gives clear feedback such as by including UNDO and/or REDO options where possible.	By CLR and ESC keys	P
d) Check that the EUT makes use of any quality indication contained in the input from other systems or sources.		NA
e) Check that the user has available means to return to a known safe state with a single action.		NA

2.8 Distress alert

EN 60945 reference: 6.1.8

Requirement	Observation of the operational check	Result
a) Check that a distress alert is only activated by means of a dedicated distress button, and that it is not a key of an ITU-T digital input panel, or of an ISO keyboard on the equipment. Check that the button is physically separated from functional buttons/keys used for normal operation. Check that the button is a single button used for no other purpose than to initiate a distress alert.		NA
b) Check that the dedicated distress button is clearly identified by being red in colour and marked “DISTRESS”. Where a non-transparent protective lid or cover is used check that this is also marked “DISTRESS”.		NA
c) Check that the dedicated distress button is protected against inadvertent operation by means of a spring loaded lid or cover permanently attached to the equipment, for example by hinges. Check that it is not necessary for a user to remove additional seals or to break the lid or cover in order to operate the distress button.		NA
d) Check that the distress alert initiation requires at least two independent actions. Lifting the protective lid or cover is considered as the first action. Pressing the distress button is considered as the second independent action.		NA
e) Check that the equipment indicates the status of a distress alert transmission by checking that the distress button generates a visible and audible indication. Check that when the distress button is pressed a flashing light and intermittent acoustic signal start immediately. Check that after the distress button has been pressed for at least 3 s, the transmission of the distress alert is initiated and the indication becomes steady.		NA

f) Check that it is not possible to interrupt the transmission of a distress alert or distress message which is in progress, but that it is possible to interrupt repetitive transmissions of a distress message.		NA

3 Hardware (6.2)

3.1 General

EN 60945 reference: 6.2.1

Requirement	**Observation of the operational check**	**Result**
a) Check that provision has been made for the removal of, or for blocking off, the position of controls of any optional facilities which are not fitted.		NA
b) Check that operational controls, the inadvertent exercise of which could switch off the equipment, lead to performance degradation, or to false indications not obvious to the operator, are specially protected against unintentional operation.		NA
c) Check that the design of the EUT is such that misuse of the controls required for normal operation, and which are accessible to the operator, shall not cause damage to the equipment or injury to personnel.		NA
d) Check that where a digital input panel with the digits “0” to “9” is provided, the digits are arranged to conform with ITU-T Recommendation E.161 (4x3 array) or, alternatively, where an alpha-numeric keyboard layout, as used on office machinery and data processing equipment, is provided, the digits “0” to “9” are arranged to conform with ISO 3791.	MKD (minimum keyboard and display) is implemented.	NA

3.2 Alarms and indicators

EN 60945 reference: 6.2.2

Requirement	**Observation of the operational check**	**Result**
a) Check that the EUT is provided with facilities which permit the testing of all operational indicators (alarm, warning and routine), displays and audible devices. Check audible alarms as described in 11.1.		NA
b) Check that alarm indications are red, or if on displays, red or otherwise highlighted.	Alarm status by red indicator LED	P
c) Check that warning and alarm indications show no self-illumination, except to outline the alarm area on CRT or LCD displays, in the “safe” condition, and that any indirect illumination is low enough to avoid false indications.	No self-illumination except to outline the alarm area on the display.	P

3.3 Illumination

EN 60945 reference: 6.2.3

Requirement	Observation of the operational check	Result
a) Check that any illumination provided in the EUT is adequate for operation of the equipment under all expected conditions of ambient illumination. Check that it can be adjusted for night use so that the night vision of the officer of the watch is not harmed by it.	Backlight can be adjusted for night use.	P
b) Check that means are provided for dimming the output of any light source of the equipment which is capable of interfering with navigation.	Backlight can be dimmed in 15 steps.	P
c) Check that any external illumination required is clearly identified in the equipment manual.		NA
d) Check that warning and alarm indicator lamps cannot be dimmed below reading intensity.		NA
e) Check that the illumination is dazzle-free and adjustable to extinction, except for those warning and alarm indicators which are illuminated in the warning/alarm condition, and indicators required for equipment reactivation or distress alerting, which are to be clearly visible in all appropriate conditions of ambient illumination.	The backlight is adjustable to extinction.	P
f) Check that controls which are not illuminated, such as tracker balls, are locatable easily and unambiguously by tactile means.		NA
g) Check that all information is presented with high contrast on a low-reflectance background which emits negligible light at night.		P
h) Check that transparent covers to instruments cannot cause reflections which reduce readability to an unacceptable level.		NA
i) Check that adjustable dimming from full brightness is provided for all lamps which are to be used in conditions of varying ambient illumination.		NA

4 Software (6.3)

4.1 General

EN 60945 reference: 6.3.1 General

Requirement	Observation of the operational check	Result
Check documentation for demonstrating that the software is developed and tested according to the code of practice.	The following documentation specifies that the software of the equipment is developed and tested according to RTCA/DO-178B/ED-12B level D: CNSS_09_1830_F_Inland_ClassA_Dec_2011.pdf	P
The structure of the complex software shall support maintenance and up-dates by minimizing undetected problems and failures.	The software structure supports software updates by means of specific software intended for vendor use.	P

4.2 Safety of operation

EN 60945 reference: 6.3.2 Safety of operation

Requirement	Observation of the software	Result
a) Check documentation for compliance with 4.2.3.2.	The code of practice employed in the design of software is specified and subject to a quality control system audited by a competent authority.	P
b) Check that software defaults, where applicable, are inserted in all modes of operation and that the default value: – facilitates the preferred or expected operation of the equipment in accordance with the applicable equipment standards – does not lead to an unexpected or invalid operation, and – has the effect of minimizing the number of inputs or transmissions into the system under which it operates.	AID type is default set to not available (value "0"); Confirm LR reply is default set to yes (value "Y"); Default values for regional settings (channel no., Tx power, Tx/Rx mode); Default setting for backlight level (value "15"); Overall ship dimensions (for the purpose of position reference point) ser to default (value "0")	P
c) Check that the software prevents an operation or warns an operator when attempting an input that leads to an invalid operation of the equipment.	A warning is presented when regional setting is not successfully added or changed.	P
d) Check that the operator has the possibility to choose a value other than the default value.		P
e) Check that operations not required for normal operation, or which may adversely affect system performance, are not readily accessible.	Operations not required for normal operation are not readily accessible.	P

4.3 Monitoring

EN 60945 reference: 6.3.3

	Observation of the operational check	**Result**
Check documentation for compliance with 4.2.3.3 The manufacturer shall provide information on how to produce a non-recoverable error.		NA

4.4 Operation

EN 60945 reference: 6.3.4

	Observation of the operational check	**Result**
Check documentation for compliance with 4.2.3.4		NA

5 Inter- unit connection (6.4)

EN 60945 reference: 6.4

Observation of the software		**Result**
a)	NMEA interface is tested acc. to IEC 61162-1. *(BSH test report)* RS-485 interfaces are tested acc. to IEC 61162-2 *(Telefication report 20103677301)*	P
b)1)	Exchange of signals between units with minimum effect on the signal source.	P (ref. to test reports above)
2)	No loading of circuits or mismatch of transmission lines.	P (ref. to test reports above)
3)	Sustaining a 1 kV isolation between units of equipment (*).	P

(*)Remark:
RS-485 input circuits use ADM 2587 device;
RS 232 port uses ADM 3251E device;
Blue sign port uses FOD 817A opto coupler device;
Alarm input uses relay.

6 Test and measurement uncertainty considerations

In accordance with the requirements contained in EN 60945, section 5.3 *"Test results"*, all measurement results in this test report have been judged against their applicable limits, compensated for the relevant measurement uncertainty towards each measurement result.

It is noted that no such compensation have been applied to conditionings related to any reported immunity test.

7 Power supply – Methods of testing and required test results acc. to EN60945 clause 7

7.1 Extreme power supply

EN 60945 reference: 7.1

The tests are carried out according to IEC 61993-2, see Telefication report 20103677300.

7.2 Excessive conditions

EN 60945 reference: 7.2

	Observation of the operational check	**Result**
a)	The equipment is designed to withstand the following excessive voltage 36 Volt. During the test, the protection circuitry was activated at a test voltage of 39 Volt.	P
b)	The equipment was exposed to a power supply misconnection (reversed polarity) for the duration of 5 minutes with a voltage of 24 Volt. No resetting of protection components was necessary and a confidence check was carried out.	P

7.3 Power supply short-term variation

EN 60945 reference: 7.3

This test is not applicable to this product.

7.4 Power supply failure

EN 60945 reference: 7.4

See section 11.7 of this report.

8 Durability and resistance to environmental conditions according to EN60945 clause 8

EN 60945 sub clause	Cate-gory	Test	Phenomena	Result	Reference to remark
8.1	a b c d		Pre test and visual inspection	P	--
8.2	a c d a b c	Storage Functional	Dry heat 70°C Dry heat 55°C	NA P	-- --
8.3	a b c	Functional	Damp heat 40°C 95% rel. hum.	P	--
8.4	a a b c	Storage Functional Functional Functional	Low temperature -30°C Low temperature -20°C Low temperature -15°C Low temperature -25°C	NA NA P NA	
8.5	a		Thermal shock 70°C -> 25°C	NA	--
8.6	a a		Drop on hard surface 1.00 m Drop into water 20 m	NA NA	-- --
8.7	a b c d		Vibration 2 – 13.2 Hz 1mm, ≥ 13.2 – 100Hz 7m/s^2, resonance 2h	P	--
8.8	c		Rain 100 l/m, 30 minutes	NA	
8.9	c		Immersion 600kPa 12h Immersion 100kPa 5min. Temporary immersion 1m 5min.	NA NA NA	--
8.10	a		Solar radiation 1120W/m^2 80h	NA	--
8.11	a		Oil resistance immersion 3h	NA	--
8.12	a b c d	Corrosion	Salt mist 5% NaCl 2h -> 40°C 95% humidity 7 days	NP	1

Category:

a	=	portable	c	=	exposed
b	=	protected	d	=	submerged

Legend:

P	=	Pass	NA	=	Not applicable
NP	=	Not performed			

Remarks:

1 The applicant provided a waiver, see ‘Additional information module’ in this report.

9 Environmental Tests

9.2 Vibration Test

9.1.1 Resonance frequencies

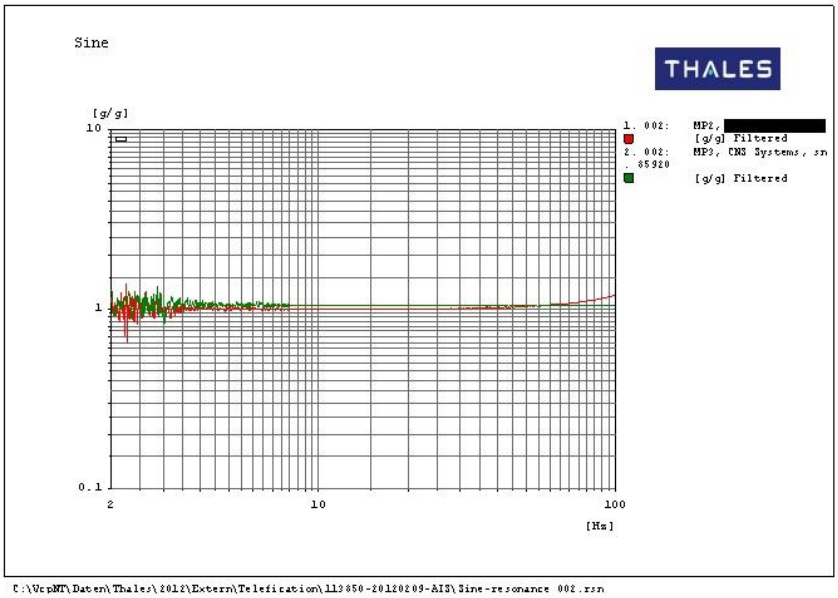
Date of test: 9/10-02-2012 Ambient temp: 22ºC R.H: 20%

Resonance reaction: Q = Acceleration (EUT) – Acceleration (Resonator platform)

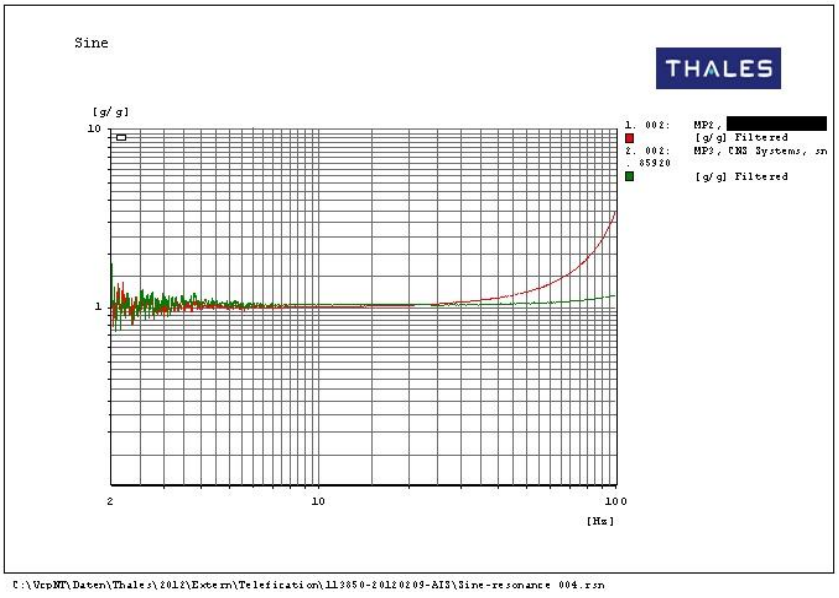
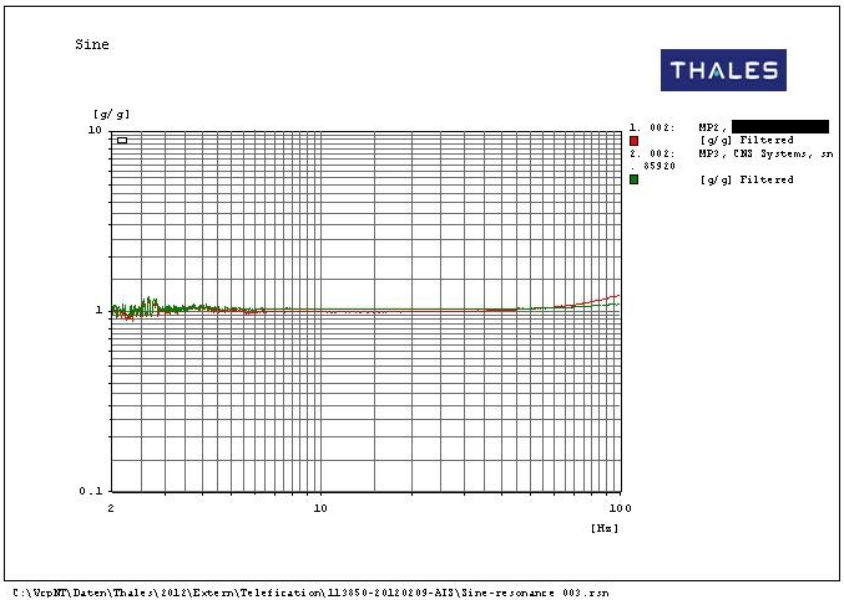
Vibration direction	Resonance frequency (Hz)	Resonance reaction (Q)
Vertical	--	--
1st horizontal	--	--
2nd horizontal	--	--

Graphs of response on vibration in vertical direction and two mutually perpendicular directions in the horizontal plane:

RESONANCE SEARCH

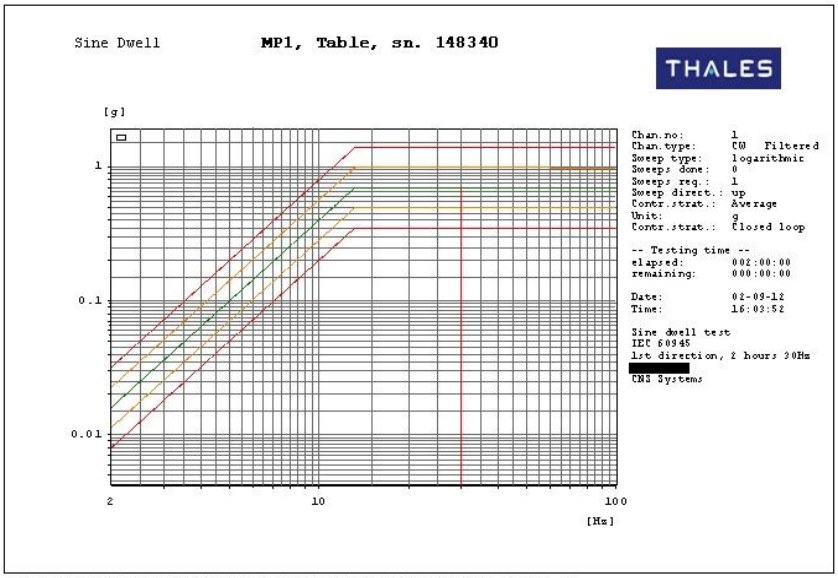
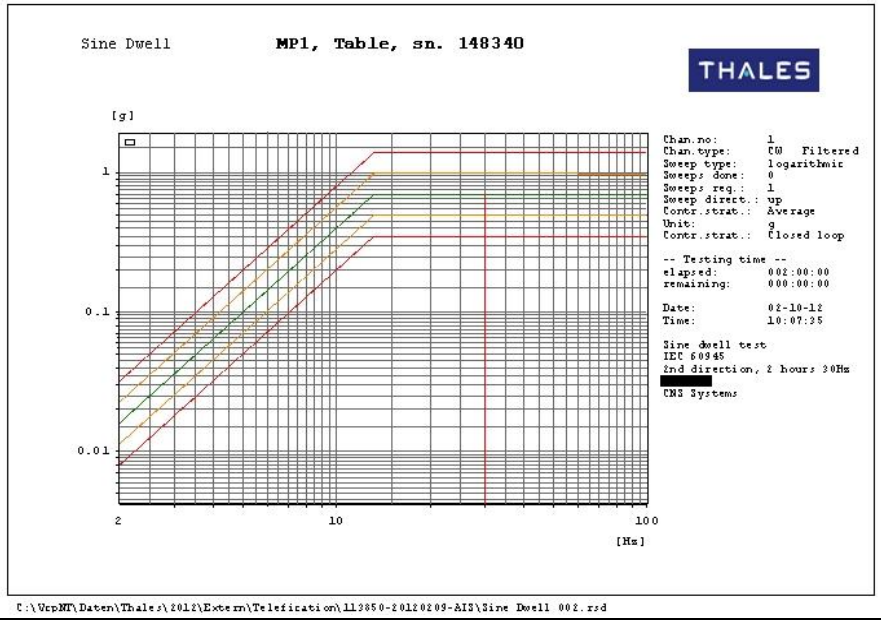
VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
1st horizontal	

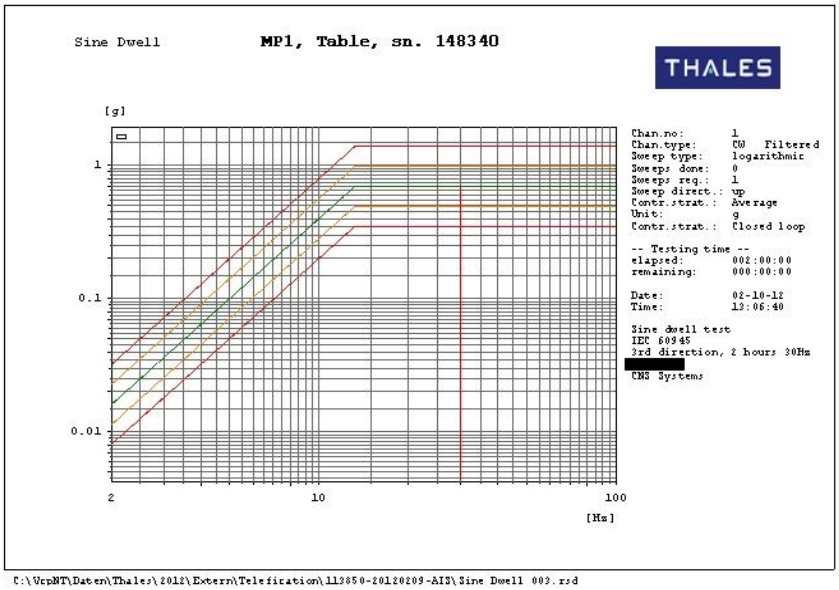
The black bar in the picture is placed over the name of a product not belonging in this report.

VIBRATION DIRECTION	RESONANCE FREQUENCIES (Hz)
Vertical	
2nd horizontal	

Black bars in the pictures are placed over the name of a product not belonging in this report.

ENDURANCE TESTS:

VIBRATION DIRECTION	
1st horizontal	
2nd horizontal	

Vertical	

Black bars in the pictures are placed over the name of a product not belonging in this report.

Test equipment used: (Item numbers)	92, 93, 94, 95, 96, 97

10.1.1 Performance checks during and at the end of the endurance test periods

Date of test: 9/1-2-2012 Ambient temp: 22ºC R.H: 20%

Result: Pass

Comments: During the performance checks the EUT operated in accordance with its equipment standard.

9.3 Dry heat functional test

EN 60945 reference	:	8.2
Basic standard	:	IEC 60068-2-2
Temperature	:	55°C
Duration	:	10-16h
EUT	:	VDL 6000
Power supply	:	DC 24 volt
Climatic control device provided	:	No

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
High voltage +30%	31.2	P
Low voltage -10%	21.6	P

Comments: The performance check was carried out with the EUT switched on and the EUT was kept operational for sixteen hours. During the performance check the EUT operated in accordance with its equipment standard.

9.4 Damp heat functional test

EN 60945 reference	:	8.3
Basic standard	:	IEC 60068-2-30
Temperature	:	40°C
Relative humidity	:	95%
Duration	:	10-16h
EUT	:	VDL 6000
Power supply	:	DC 24 volt
Climatic control device provided	:	No

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
High voltage +30%	31.2	P
Low voltage -10%	21.6	P

Comments: The performance check was carried out after the EUT was switched on and the EUT was kept operational for two hours. During the performance check the EUT operated in accordance with its equipment standard.

9.5 Low temperature functional test

EN 60945 reference	:	8.4
Basic standard	:	IEC 60068-2-1
Temperature	:	-15°C
Duration	:	10-16h
EUT	:	VDL 6000
Power supply	:	DC 24 Volt
Climatic control device provided	:	No

Power supply variation	**Voltage (V)**	**Result**
Normal Power supply	24	P
High voltage +30%	31.2	P
Low voltage -10%	21.6	P

Comments: The performance check was performed with the EUT switched on and the EUT was kept operational for two hours. During the performance test and checks the EUT operated in accordance with its equipment standard.

10 Electromagnetic emission clause 9

10.1 Summary

According to EN 60945: 2002 the following tests are performed:

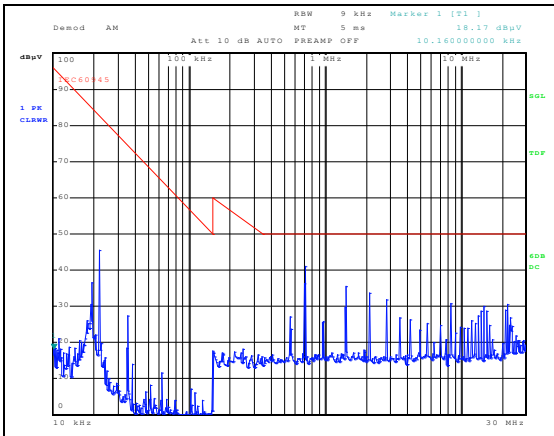
Port	Sub clause	Category	Phenomenon	Result
DC-input	9.2	b c d	Conducted emissions	P
AC-input	9.2	b c d	Conducted emissions	NA
Enclosure	9.3	a b c	Radiated emissions	P

Result:
P = pass NA = not applicable
F = fail NP = not performed

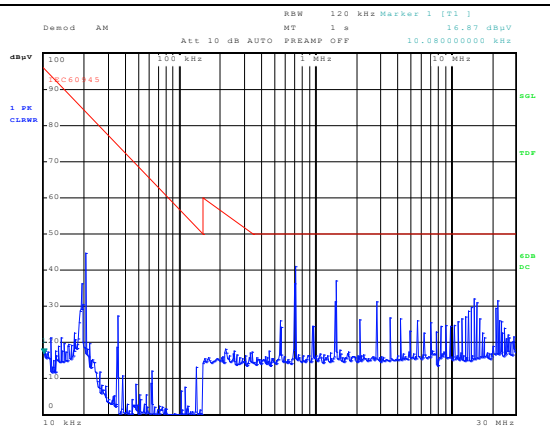
Category:
a = portable c = exposed
b = protected d = submerged

10.2 Conducted emissions 10 kHz – 30 MHz

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-2: 2006; CISPR 16-1-4: 2007
Length power cable	:	XX m
EUT operational mode	:	see below



-24 Vdc, operational (transmitting)



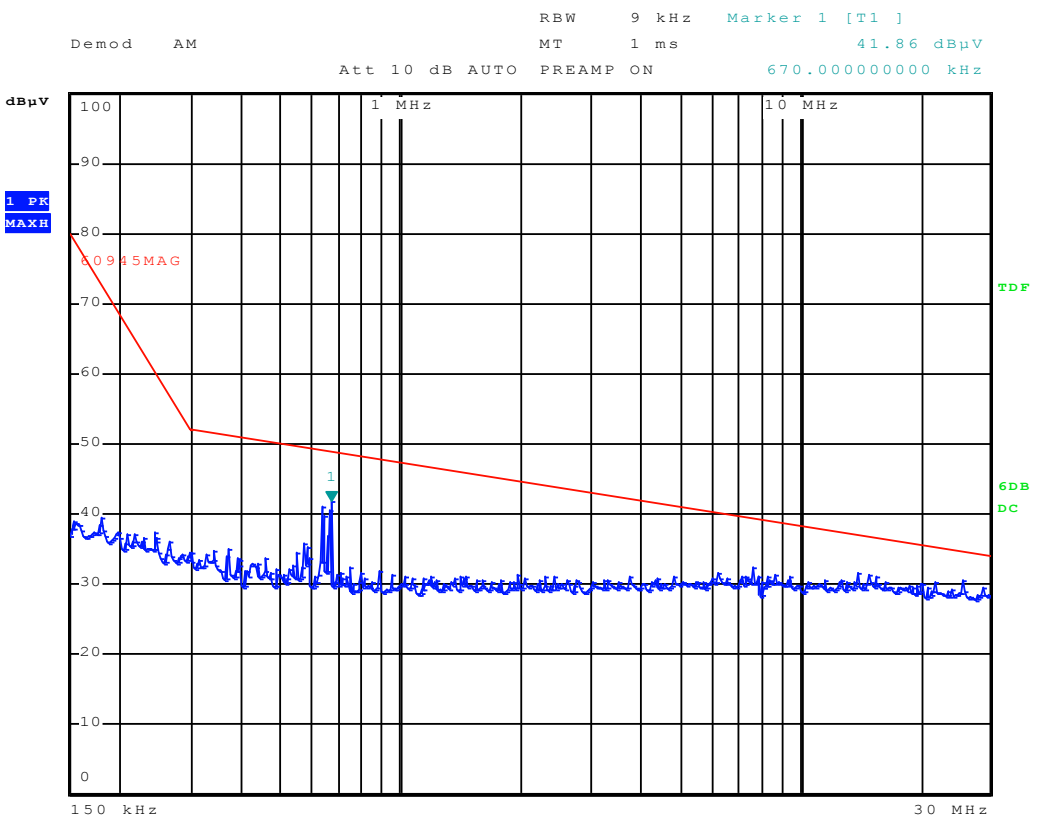
+24 Vdc, operational (transmitting)

Measurement uncertainty	+3.7/-3.7 dB
Limit: see plot	

Test equipment used: (Item numbers)	24, 26, 27

10.3 Radiated emissions 150 kHz – 30 MHz

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-2: 2006; CISPR 16-1-4: 2007
EUT operational mode	:	operational (not transmitting)

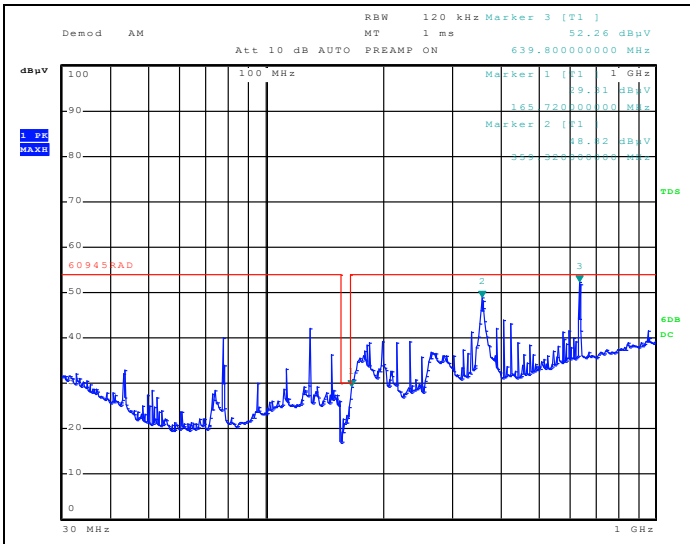


Measurement uncertainty	+1.9 / -2.1 dB
Limit: 80 dBµV/m @ 150 kHz descending to 52 dBµV/m @ 300 kHz 52 dBµV/m @ 300 kHz descending to 34 dBµV/m @ 30 MHz	

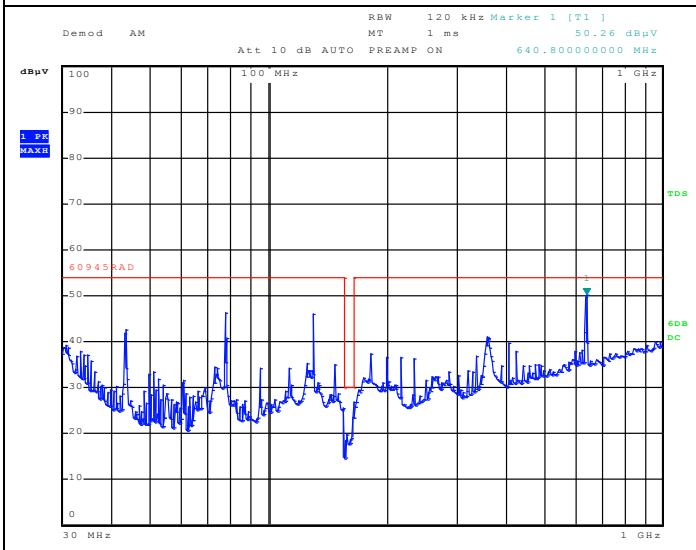
Test equipment used: (Item numbers)	81, 91

10.4 Radiated emissions 0.03 – 1 GHz

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-2: 2006; CISPR 16-1-4: 2007
Distance ant.↔ EUT	:	3m
EUT operational mode	:	operational (not transmitting)



Horizontal polarization



Vertical polarization

Measurement uncertainty:

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Test equipment used: (Item numbers)	55, 81, 87

Radiated emissions 30 MHz – 1 GHz (continued)

Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-2: 2006; CISPR 16-1-4: 2007
Port	:	Enclosure
Configuration	:	See photograph 17 in 'Photographs module'
EUT operational mode	:	operational (not transmitting)

Results:

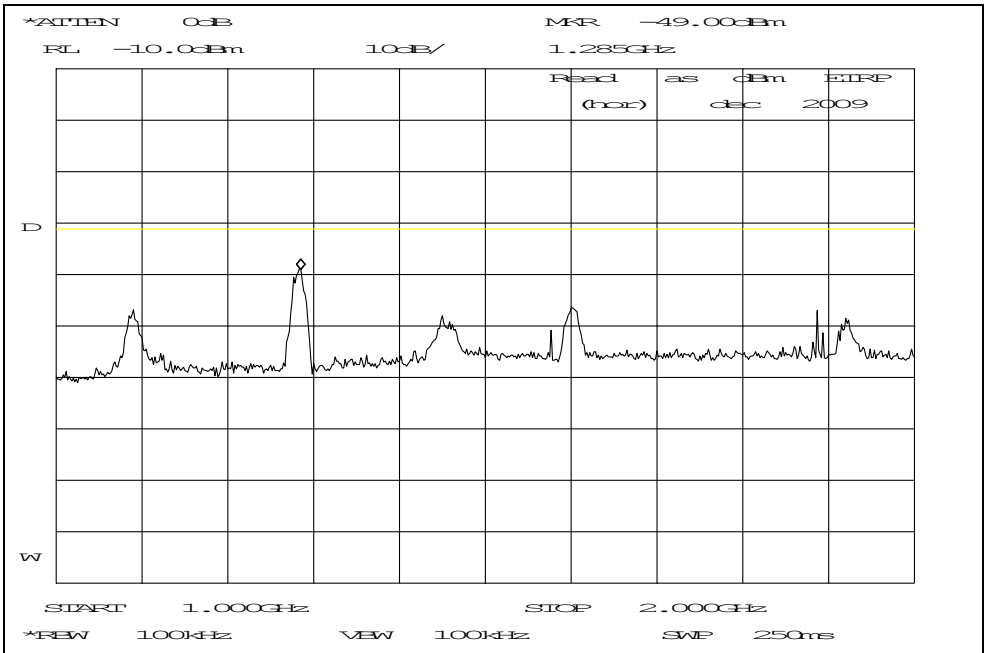
Frequency (MHz)	Polarization H/V	Level (dBµV/m PK) (from plot)	Level (dBµV/m QPK)	Limit (dBµV/m)
359.52	H	48.8	--	54
639.8	H	52.3	48	54
640.8	V	50.3	45	54

Measurement uncertainty	
Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

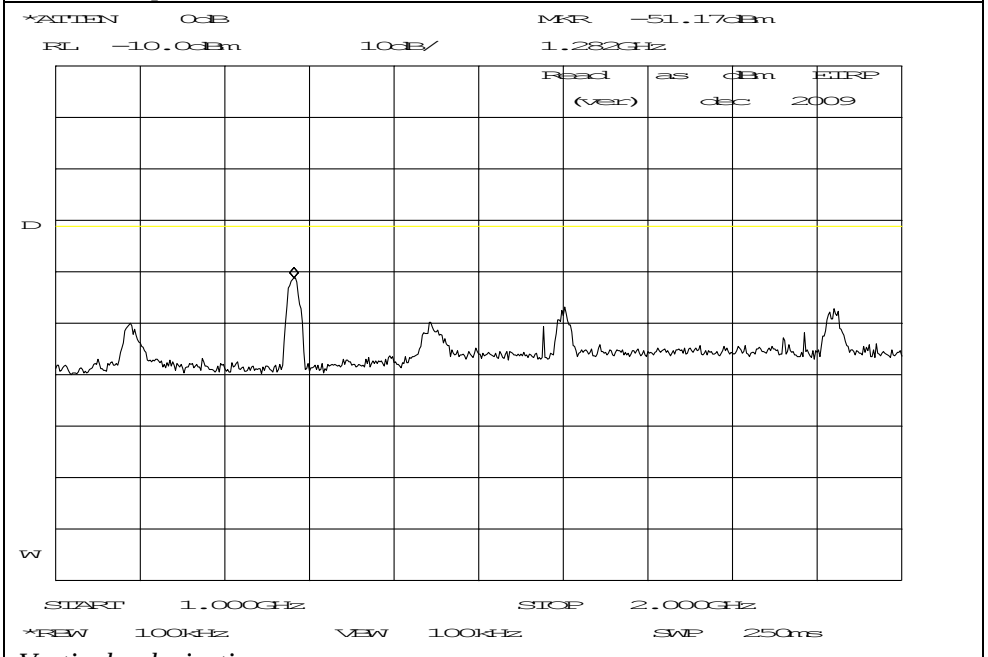
Test equipment used: (Item numbers)	55, 81, 87

10.5 Radiated emissions 1 – 2 GHz

EN 60945 ref.	:	9.3
Basic standard	:	CISPR 16-1-1: 2006; CISPR 16-1-2: 2006; CISPR 16-1-4: 2007
Distance ant.↔ EUT	:	3m
EUT operational mode	:	operational (not transmitting)



Horizontal polarization



Vertical polarization

Measurement uncertainty: +4.5 dB / -6.1 dB

Test equipment used: (Item numbers)	22, 25, 56, 90

Remark
As the units in the plots shown above are in dBm e.i.r.p., the limit shown is derived by subtracting 95.2 dB from the limit in dBµV/m as stated in section 9.1, table 5 of EN 60945.

11 Immunity to electromagnetic environment clause 10

11.1 Summary

According to EN 60945:2002 the following tests are performed:

Port	Sub clause Category	Phenomena	Performance criterion (ref. IEC 61993-2, clause 13)	Result
AC-input	10.3 b c d	Conducted RF CM 0.15 – 80.00 MHz, 3 V*), AM80% 400Hz	A	NA
DC-input	10.3 b c d	Conducted RF CM 0.15 – 80.00 MHz, 3 V*), AM80% 400Hz	A	P
Signal/control line(s)	10.3 b c d	Conducted RF CM 0.15-80.00 MHz, 3 V*), AM80% 400Hz	A	P
Enclosure	10.4 a b c	RF-field 10 V/m, AM80% 400Hz 80 – 2000 MHz	A	P
AC-input	10.5 b c d	EFT +/- 2 kV common mode	B	NA
DC-input	10.5 b c d	EFT +/- 1 kV common mode	B	NA
Signal/control line(s)	10.5 b c d	EFT +/- 1 kV common mode	B	P
AC-input	10.6 b c d	Surges 1 kV line-earth 0.5 kV line-line	B	NA
AC-input	10.7 b c d	Power supply short-term variation volt. +/-20%, freq. +/-10%	B	NA
AC-input	10.8 b c d	Power supply failure, 60sec common mode	C	NA
DC-input	10.8 b c d	Power supply failure, 60sec common mode	C	P
Enclosure	10.9 a b c	ESD, 6 kV contact 8 kV air	B	P

*) 10 V level applies to spot frequencies 2, 3, 4, 6.2, 8.2, 12.2, 16.5, 18.8, 22 & 25 MHz

Result:
P = pass NA = not applicable
F = fail NP = not performed

Category:
a = portable c = exposed
b = protected d = submerged

Performance criterion A/B

The EUT shall be set into autonomous mode using channels AIS1 and AIS2 with a reporting interval of 2 s in the standard test environment. The contents of the reports and the reporting intervals shall not be degraded during or after the test, as appropriate for the considered criterion.

Performance criterion C

Performance criterion C is to be taken to mean that the functions of the EUT are self-recoverable i.e. without operation of controls (automatically restart of the unit without any help).

11.2 Immunity to conducted radio frequency disturbance

EN 60945 ref. : 10.5
Basic standard : IEC 61000-4-6: 2006
Modulation : 400Hz 80% AM
Dwell time : 2 seconds
Performance criterion : A, ref. IEC 61993-2, clause 13
EUT operational mode : Powered on

Port **Mode of operation**	**Frequency (MHz)** Note 1	**Coupl. Dev.**	**Test Level (V_{rms})** Note 2	**Comments**	**Result**
24 Vdc autonomous	0.15 – 80.00 range 1 % step size	64	3	1	P
X1 autonomous	0.15 – 80.00 range 1 % step size	64	3	1	P
X2 autonomous	0.15 – 80.00 range 1 % step size	64	3	1	P
X3 (Tx) autonomous	0.15 - 80.00 range 1 % step size	70	3	1	P
X3 (Rx) autonomous	0.15 - 80.00 range 1 % step size	70	3	1	P
X7 autonomous	0.15 - 80.00 range 1 % step size	89	3	1	P
X8 autonomous	0.15 - 80.00 range 1 % step size	33	3	1	P
X10 (bluesign) autonomous	0.15 - 80.00 range 1 % step size	70	3	1	P
X10 (alarm relay) autonomous	0.15 - 80.00 range 1 % step size	70	3	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.

Measurement uncertainty: +/- 1.3 dB
The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approx. 95%, but excluding the effect of measurement system repeatability.

Note 1: includes spot frequencies 2, 3, 4, 6.2, 8.2, 12.2, 16.5, 18.8, 22, 25 MHz
Note 2: test level 10 V_{rms} at spot frequencies

Test equipment used: (Item numbers)	23, 43, 44, 45, 46, 49, 56

11.3 Immunity to radiated radio frequency disturbance

EN 60945 ref. : 10.5
Basic standard : IEC 61000-4-3: 2006
Modulation : 400Hz 80% AM
Dwell time : 2 seconds
Performance criterion : A, ref. IEC 61993-2, clause 13

Mode of operation	Position of EUT	Frequency (MHz)	Test Level (V/m)	Polarisation H/V	Comments	Result
Autonomous	Front of EUT illuminated	Range 80 - 2000 1 % frequency steps	10	H & V	1	P
Autonomous	Rear of EUT illuminated	Range 80 - 2000 1 % frequency steps	10	H & V	1, 3	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.
3. There is no degradation in the good reception of targets.

Field uniformity uncertainty : +2.66/-2.66 dB

Test equipment used: (Item numbers)	21, 31, 32, 33, 35, 56, 73, 75

11.4 Immunity to Fast Transients

EN 60945 ref. : 10.5
Basic standard : IEC 61000-4-4: 2004
Atmospheric pressure : between 86 kPa and 106 kPa
Temperature : 26 °C
Relative humidity : 41 %
Performance criterion : B, ref. IEC 61993-2, clause 13

Port Mode of operation	Test duration for each polarity	Coupl. dev.	Test Volt. (kV)	Polarity +/-	Comments	Result
X1 Autonomous	3 min.	3	1	+ & -	1	P
X2 Autonomous	3 min.	3	1	+ & -	1	P
X3 Autonomous	3 min.	3	1	+ & -	1	P
X7 Autonomous	3 min.	3	1	+ & -	1	P
X8 Autonomous	3 min.	3	1	+ & -	1	P
X10 Autonomous	3 min.	3	1	+ & -	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.

Measurement uncertainty: It has been demonstrated that EFT generator and its coupling networks meet the specified requirements in the standard with at least a 95% confidence.

Test equipment used: (Item numbers)	40, 71

11.5 Immunity to electrostatic discharge, air

EN 60945 ref. : 10.9
Basic standard : IEC 61000-4-2: 2001
Atmospheric pressure : between 86 kPa and 106 kPa
Temperature : 21 °C
Relative humidity : 28 %
Performance criterion : B, ref. IEC 61993-2, clause 13

Position	Mode of operation	Test Volt. (kV)	Number of Discharges	Polarity +/-	Comments	Result
Black rim around display	Autonomous	8	10	+	1	P
		8	10	-	1	P
Gap between grey and black part of front	Autonomous	8	10	+	1	P
		8	10	-	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.

Measurement uncertainty : It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence.

Test equipment used: (Item numbers)	38, 67

11.6 Immunity to electrostatic discharge, indirect contact

EN 60945 ref. : 10.9
Basic standard : IEC 61000-4-2: 2001
Atmospheric pressure : between 86 kPa and 106 kPa
Temperature : 21 °C
Relative humidity : 28 %
Performance criterion : B, ref. IEC 61993-2, clause 13

Position	Mode of operation	Test Volt. (kV)	Number of Discharges	Polarity +/-	Comments	Result
Left side of EUT illuminated by VCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Right side of EUT illuminated by VCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Front of EUT illuminated by VCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Rear of EUT illuminated by VCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Left side of EUT illuminated by HCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Right side of EUT illuminated by HCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Front of EUT illuminated by HCP	Autonomous	6	10	+	1	P
		6	10	-	1	P
Rear of EUT illuminated by HCP	Autonomous	6	10	+	1	P
		6	10	-	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.

Measurement uncertainty: It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95 % confidence.

Test equipment used: (Item numbers)	67, 68

11.7 Immunity to electrostatic discharge, direct contact

EN 60945 ref. : 10.9
Basic standard : IEC 61000-4-2: 2001
Atmospheric pressure : between 86 kPa and 106 kPa
Temperature : 21 °C
Relative humidity : 28 %
Performance criterion : B, ref. IEC 61993-2, clause 13

Position	Mode of operation	Test Volt. (kV)	Number of Discharges	Polarity +/-	Comments	Result
Top of housing; screw in lower left corner	Autonomous	6	10	+	1	P
		6	10	-	1	P
Top of housing; screw in upper right corner	Autonomous	6	10	+	1	P
		6	10	-	1	P
Front of EUT; screw in upper left corner	Autonomous	6	10	+	1	P
		6	10	-	1	P
Front of EUT; screw in lower right corner	Autonomous	6	10	+	1	P
		6	10	-	1	P

Comments:
1. There is no degradation of performance or loss of function of the EUT during and after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.

Measurement uncertainty: It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95 % confidence.

Test equipment used: (Item numbers)	67. 68

11.8 Immunity to power supply failure.

EN 60945 ref. : 10.8
Basic standard : IEC 61000-4-11: 2004
Performance criterion : C, ref. IEC 61993-2, clause 13

Test			Performance criterion	Comments	Result
nr.	Supply	time			
1	break	60 s	C	3	P
2	break	60 s	C	3	P
3	break	60 s	C	3	P
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--

Comments:
1. There is no change of actual operating state or stored data after the test.
2. There is no degradation of performance or loss of function of the EUT after the test.
3. Functions can be restored at the end of the test by operation of the keyboard.

Measurement uncertainty: Not applicable

Test equipment used: (Item numbers)	--

12 Special purpose tests according to EN 60945 clause 11

12.1 Summary

According to EN 60945: 2002 fourth edition the following special purpose tests are performed:

Sub clause	Performance requirement	Result
11.1	Acoustic noise and signals	NA
11.2	Compass safe distance	*)

*) see BSH report No. 744

Results:
P : = pass
F : = fail
NA : = not applicable
NP : = not performed

12.2 Acoustic noise and signals

EN 60945 reference : 11.1

Acoustic parameter	Observation	Result
Acoustic noise power	The product is not capable of generating any acoustic noise, which contributes to the background noise.	NA
Acoustic noise power of an alarm	Between 75 dB(A) and 85 dB(A) at a distance of 1 m.	NA

Results:
P : = pass
F : = fail
NA : = not applicable
NP : = not performed

13 Safety precautions according to EN 60945 clause 12

Summary

Subclause	Performance requirement	Result
12.1	Protection against accidental access to dangerous voltages	NA
12.2	Electromagnetic radio frequency radiation	NA
12.3	Emission from visual display	NA
12.4	X-radiation	NA

Results:
P : = pass
F : = fail
NA : = not applicable
NP : = not performed

14 Maintenance according to EN 60945 clause 13

EN 60945 reference : 4.7

Observation	Result
The transceiver unit is so designed that the main units can be replaced readily; on-board repair is possible without elaborate recalibration or readjustment.	NA
The transceiver unit is so constructed that it is readily accessible for inspection and maintenance purposes.	NA
Equipment shall be so designed that maintenance of software can be readily carried out on board.	P (by special trained personnel only)
Maintenance shall be supported by labelling in accordance with 4.9.	P (in display)
No user retraining shall be necessary after maintenance.	P

Results:
P : = pass
F : = fail
NA : = not applicable

15 Equipment manuals according to EN 60945 clause 14

Observation	Result
The equipment manual is checked (ref. clause 4.8) *a) the manual is written in English* *b) the category of equipment is identifiable* *c) fault diagnosis only; no repair* *d) n.a.*	P

Results:
P : = pass
F : = fail
NA : = not applicable
NP : = not performed

16 Marking and identification according to EN 60945 clause 15

Observation	Result
The equipment shall be marked with the following identification: 1) Identification of the manufacturer *(yes)* 2) Equipment type identification *(yes)* 3) Serial number of the unit *(yes)*	P
Marking of compass safe distance *(in installation, maintenance and repair manual).*	P

Results:
P : = pass
F : = fail
NA : = not applicable
NP : = not performed

Used test equipment module

Item	Description	Manufacturer	Type	ID
1	RF probe	R & S	URV5-Z2	TE 00009
2	T-network	R & S	ESH3-Z4	TE 00026
3	Signal generator	Marconi	2042	TE 00030
4	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00097
5	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00098
6	Spectrum analyser	HP	8562^{E}	TE 00099
7	Artificial mains network	R & S	ESH2-Z5	TE 00130
8	Arbitrary waveform generator	HP	33120A	TE 00144
9	Artificial mains network	R & S	ESH3-Z5	TE 00208
10	Digital multimeter	HP	3438A	TE 00215
11	Pulse generator	HP	8012 B	TE 00225
12	Pulse limiter	R & S	ESH3-Z2	TE 00227
13	Digital multimeter	Fluke	87	TE 00329
14	Spectrum analyser	HP	8563^{E}	TE 00359
15	Digital thermometer	Fluke	51	TE 00388
16	Modulation analyzer	R & S	FAM	TE 00412
17	Power meter	R & S	NRVS	TE 00414
18	Measurement probe	R & S	URV5-Z4	TE 00415
19	Distortion meter	HP	8903 B	TE 00416
20	Signal generator	HP	8642B	TE 00424
21	Signal generator	Marconi	2042	TE 00427
22	Spectrum analyser	HP	8563^{E}	TE 00481
23	RF amplifier	Amplifier Research	25A250A	TE 00515
24	Audio amplifier	Solar Electronics	6552-1A	TE 00517
25	Horn antenna	EMCO	3115	TE 00531
26	Biconilog antenna	EMCO	3143	TE 00700
27	RF voltmeter/power meter	Boonton	5232	--
28	Pulse modulator	Schaffner	CPM9830	TE 00708

Item	Description	Manufacturer	Type	ID
29	---	--	--	--
30	Log periodic antenna	EMCO	3147	TE 00744
31	Field probe	Holaday	HI-4422	TE 00748
32	System readout	Holaday	HI-4416	TE 00749
33	RF power amplifier	Kalmus	737FC	TE 00750
34	Attenuator 3 dB, 100 W	Tenuline	8343-030	TE 00751
35	40 dB coupler	Kalmus	DC100HHR	TE 00752
36	RF probe	Boonton	5175	--
37	RF probe	Boonton	5175	--
38	ESD air discharge tip	Keytek	TPA-2	TE 00755
39	Pulse limiter	R & S	ESH3-Z2	TE 00756
40	Capacitive clamp	Keytek	CCL-4/S	TE 00761
41	AC power simulator	Kikusui	PCR4000L	TE 00762
42	Power analyzer	Xitron Technologies	2501AH	TE 00763
43	EM clamp	Lüthi	EM101	TE 00764
44	Ferrite tube	Lüthi	FTC101	TE 00765
45	Coaxial coupl./dec. Network	Telefication	CDN-S1	TE 00766
46	Mains coupl./dec. Network	Telefication	CDN-M2/M3	TE 00767
47	Mains coupl./dec. Network	Telefication	9403S1	TE 00768
48	100 µF decoupling capacitor	Telefication	JOZ	TE 00769
49	Coupl./dec. device for screened cables	MEB	CDN-S25	TE 00771
50	Audio isolation transformer	Solar	6220-2	TE 00772
51	Current probe	Eaton	93686-2	TE 00773
52	Acoustic pipe coupler	Telefication	JOZ110395	TE 00775
53	Absorbing clamp	R & S	MDS 21	TE 00777
54	Power supply	Delta Elektronika	E030-1	TE 00851
55	Biconilog antenna	Chase	CBL6112A	TE 00967
56	Full anechoic chamber	Euroshield	RFD-F-100	TE 01064
57	Triple loop antenna	Telefication	--	TE 01066
58	Coupling Decoupling Network	Schaffner	USB/p	TE 01068
59	Coupling Decoupling Network	Schaffner	A401	TE 01069

Item	Description	Manufacturer	Type	ID
60	Multifunction synthesizer	HP	8904A	TE 01070
61	Coupling Decoupling Network	Schaffner	A201	TE 01074
62	Isotropic field sensor	Holaday	HI-6005	TE 01075
63	Fibre optic RS232 interface	Holaday	HI-4460	TE 01094
64	Antistatic brush	Precision brush	55320	TE 01107
65	Signal line CDN	Keytek	CM-I/OCD	TE 01108
66	Telecom line CDN	Keytek	CM-TELCD	TE 01109
67	ESD simulator	Keytek	MiniZap	TE 01110
68	ESD contact discharge tip	Keytek	TPC-2a	TE 01111
69	ESD air discharge tip	Keytek	TPA-2	TE 01112
70	Temp / RH logger	MicroLog	EC 650	TE 01114
71	Ultra Compact Simulator	EM Test AG	UCS 500N	TE 01170
72	CDN for data/signal lines	EM Test AG	CNV 504N	TE 01170
73	Stacked double LogPer antenna	Schwarzbeck	STLP 9128D	TE 01171
74	Isotropic electric field probe	Holaday	HI-440	TE 01172
75	RF power amplifier	Teseq	CBA 3G-050	TE 01173
76	Directional 30 dB coupler	Bird	100-CC-FFN-30	TE 01175
77	Current generator	Fischer	F-1000-1000-4-8-G-125A	TE 01181
78	Loop antenna	Fischer	F-1000-4-8/9/10-1M	TE 01182
79	Antenna cable	Belden	H2000-flex	TE 01192
80	Spectrum analyser	R & S	FSP40	TE 11125
81	EMI test receiver	R & S	ESCI	TE 11128
82	Antenna tower	Heinrich Deisel	AS 620P	ANEC
83	Turntable	Heinrich Deisel	DS-412	ANEC
84	Turntable controller	Heinrich Deisel	HD-050	ANEC
85	Antenna mast	EMCO	1070	SAR
86	Turn table	EMCO	1060-2M	SAR
87	Semi Anechoic Room	Comtest	--	SAR
88	Adjustable transformer	KSL	RU8	--
89	800 mm strip line	Telefication	--	--
90	Preamplifier 1 – 26.5 GHz	HP	8449B	TE 00092

Item	Description	Manufacturer	Type	ID
91	Active loop antenna	R & S	HFH2-Z2	TE 00746

Test equipment used for vibration testing.

This equipment is the property of Thales BV, Environmental Competence Centre, Hengelo

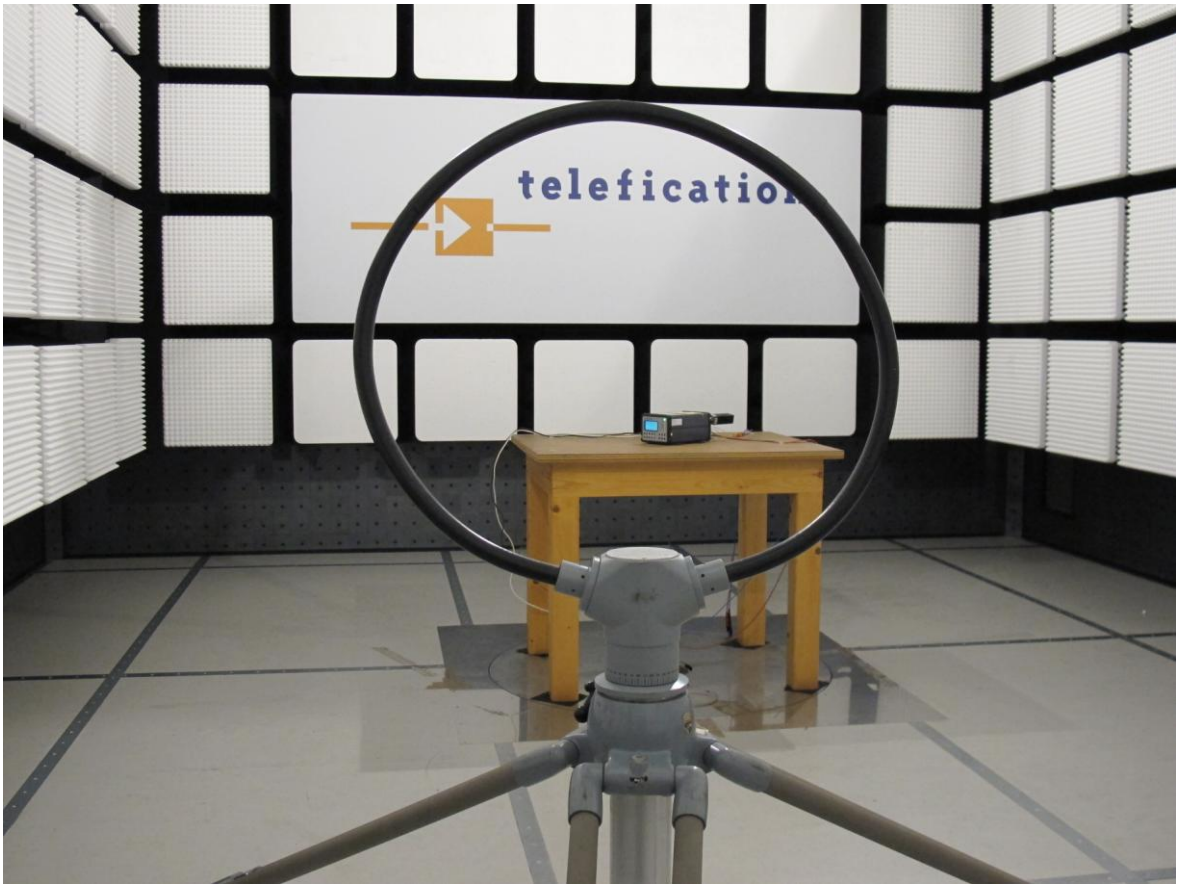
Ref	Description	Manufacturer	Model
92	Conditioning amplifier	Ling Dynamics	SPAK 24
93	Accelerometer	PCB Piezotronics	33353B
94	Controller	M+P International	VibPilot Oros
95	Shaker	Ling Dynamics	2860
96	Acceleration sensor	Brüel & Kjaer	4384
97	Amplifier	Kistler	5011

Photographs module

Photograph 1: *Product front view*

Photograph 2: *Product rear view*

Photograph 3: *Radiated emission test set up (0.15 – 30 MHz)*

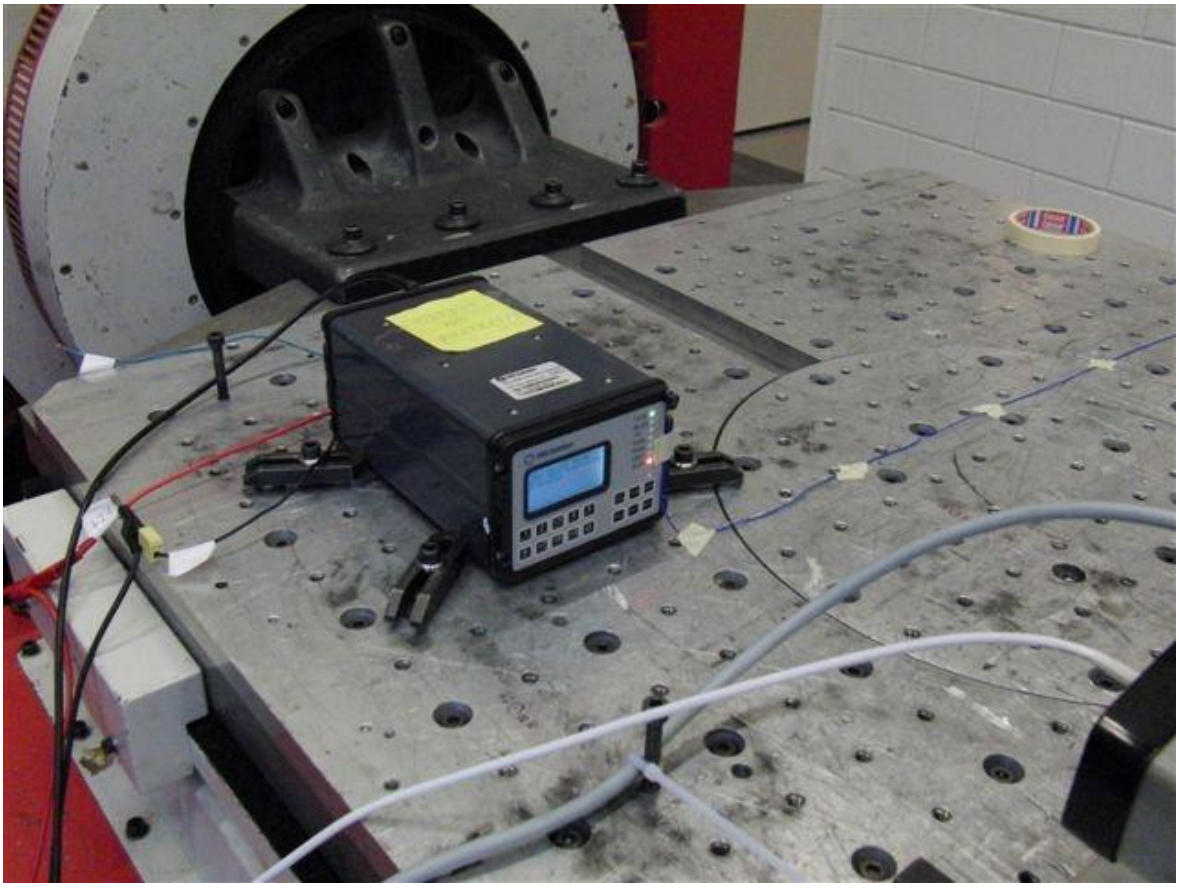


Photograph 4: *Emission test set up (0.03 – 1 GHz)*

Photograph 5: *Radiated emission test set up (1 – 2 GHz)*

Photograph 6: *Radiated immunity test set up (0.03 – 2 GHz)*

Photograph 7: *EUT on the vibration table*



Additional information module

This module contains one page of information provided by the applicant.

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Handled by	Date	Classification	Page
Jan-Erik Wiss	2012-04-12	Unclassified	1 (1)
	Document No.	Issue	
	CNSS-12-1375	A	

Corrosion Waiver

Transponder VDL 6000-4x

Summary:

According to drawings and bills of material there is no external material that is sensitive to oxidation or combined in a way that should cause galvanic corrosion.

Motivation:

The transponder is designed with low corrosive aluminum housing with front and rear covers of ABS-plastic.

The aluminum housing is chemically passivated and its external surface is painted with a polyester powder lacquer.

All screws are stainless steel and connectors are plastic or plated with nickel or zinc.

Connector pins are gold plated and surrounded with plastic isolation and thus not directly exposed to other galvanic metals.

All connectors are mounted in the plastic covers and thus not exposed to other galvanic metals.

The external surfaces of this transponder are very well protected against corrosion.

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Lars Gustafsson
Project Manager
CNS Systems AB

Revision history

REVISION	DATE	REMARKS	REVISED BY