PHOENIX TESTLAB

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Test Report

No.: U62607

Designation of equipment under test: AIS-Transponder AIS-300

Test Laboratory

for
"Safety of Electrical Equipment and Industrial Low-Voltage Devices as well as Environmental Tests"

accredited by
DATech GmbH
in compliance with DIN EN ISO/IEC 17025
under
Reg. No. DAT-P-105/00-11

Testing body:	PHOENIX TESTLAB GmbH Königswinkel 10 D-32825 Blomberg
Applicant:	ACR Electronics Europe GmbH Handelskai 388 / Top 632 1020 Wien Österreich
Order number:	62607
Type of test:	Environmental simulation: - Vibration - Shock
Method of measure-ment according to:	IEC 62287-1:2006 maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier sense time division multiple access (CSTDMA) techniques EN 60945:2002 Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results IEC 68-2-6:1995 Test Fc: Vibration (sinusoidal) IEC 60068-2-27:1987 Test Ea and guidance: shock

Equipment under test (EUT):	AIS-Transponder AIS-300

EUT	Type	S/N
1	Nauticast B AIS-300	203888357
2	Nauticast B AIS-300	203888151

Manufacturer:	See applicant
Date equipment was received:	January 15, 2007
Test specifications:	IEC 62287-1:2006 maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier sense time division multiple access (CSTDMA) techniques EN 60945:2002 Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results IEC 68-2-6:1995 Test Fc: Vibration (sinusoidal) IEC 60068-2-27:1987 Test Ea and guidance: shock
Applicant/Client represented during the test by following person(s):	---
Place of test:	PHOENIX TESTLAB GmbH, Blomberg
Date of test:	January 26, 2007 to January 30, 2007

Test result: The complete test results are present in the following.

The test requirements are **conformed** by the EUT.

The final valuation of the test will be carried out by the applicant and not by the testing body, PHOENIX TESTLAB GmbH.

Blomberg, January 31, 2007

Examiner: Matthias Zelt

Reviewed by: Michael Jonca

Contents: **Page**

1 Test specifications and test conditions

1.1 Vibration, sinusoidal

Test Fc: Vibration, sinusoidal / EN 60068-2-6

This part of EN 60068 gives a method of test applicable to components, equipment and other articles which, during transportation or in service, may be subjected to conditions involving vibration of harmonic pattern, generated primarily by rotating, pulsating or oscillating forces, such as occur in ships, aircraft, land vehicles, rotorcraft and space applications or are caused by machinery and seismic phenomena.

The basic motion shall be a sinusoidal function of time. Below a certain frequency known as the cross-over frequency, all amplitudes are specified as constant displacement, whilst above this frequency, amplitudes are given as constant acceleration. The vibration profile is shown in Diagram 1.

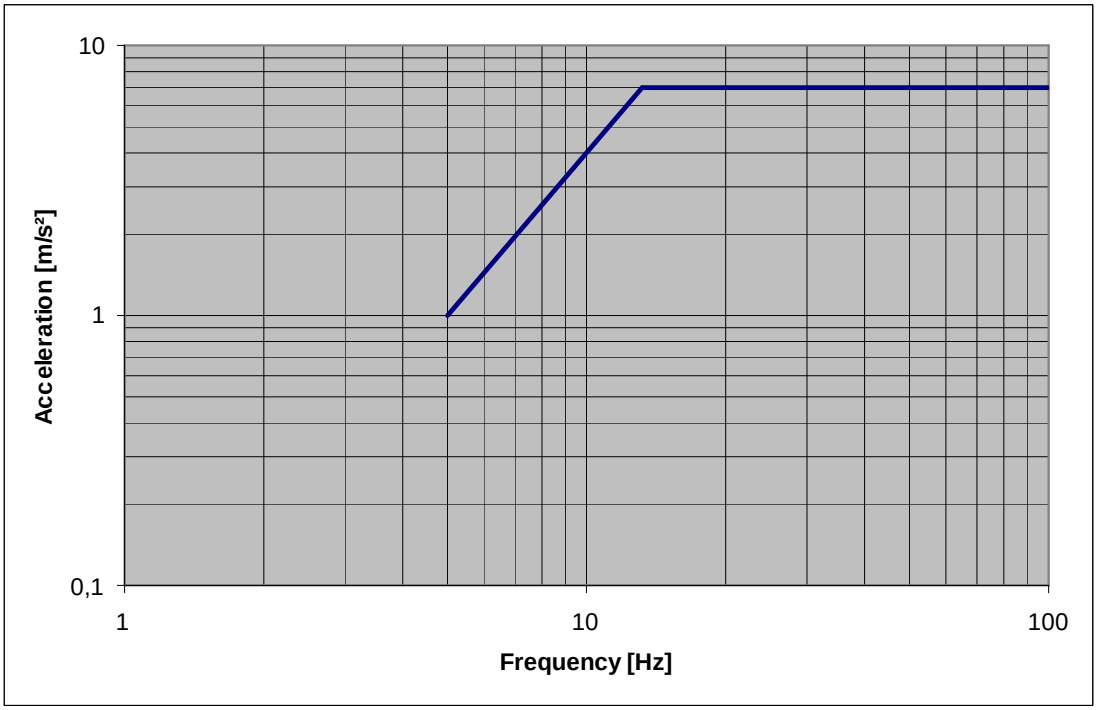
The equipment under test is fastened by means of its fastening devises in its normal mounting position in accordance with the manufacturer's instructions.

Severity of the tests according to EN 60945:2002:

Frequency range:	2 – 5 Hz to 100 Hz
Cross-over frequency:	13.2 Hz
Amplitude below the cross-over frequency:	+/- 1.00 mm +/- 10 %
Acceleration amplitude above the cross-over frequency:	7 m/s²
Sweep rate	0.2 oct/min [1)]
Test duration:	1 sweep up and 1 sweep down each axis
Axis:	x, y, z

Note: [1)] *The test is carried out with the more severe sweep rate of 0.2 oct/min according to IEC 62287-1:2006*

Diagram 1: Vibration profile according to EN 60945:2002



The equipment under test is fastened by means of its fastening devises in its normal mounting position.

During the tests functions shall be demonstrated on the EUT. At the end of each test period a successful performance check shall be carried out.

At start of the test points of resonance are determined in each axis. If points of resonance are determined on the outside of the EUT which have an amplification factor $Q \geq 5$, the test duration is 120 minutes per resonance frequency.

If no points of resonance are determined on the EUT, the test duration is 120 minutes per axis at a frequency of 30 Hz.

Definition of the functions to monitor those and the associated tolerance limits:

- Search for resonance frequencies on the outside of the EUT
- Performance check during and after each test

1.2 Shock test

Test Ea: Shock / EN 60068-2-27

The test is a generally valid testing method for elements, devices and other technical products to determine the durability of the test specimens in relation to relatively infrequent non-repetitive shocks with a given degree of sharpness

The testing serves to reveal mechanical weakness and/or degradation in specified performance. It may also be used to determine the structural integrity of the EUT.

The purpose of this test is to determine if the EUT is able to meet specification requirements when subjected to the mechanical stresses defined below.

Severity of the tests according to IEC 62287-1:2006:

Acceleration:	100 m/s^2
Nominal shock duration:	25 ms
Nominal shock shape:	half sine
Number of shocks in each direction:	3
Directions:	+x, + y, + z [1)]

Note: [1)] *The test is carried out in each axis of the EUT, because in use it may be mounted in every orientation.*

The EUT is mounted by its normal fixing points in the normal operating orientation on the shaker and is kept operational during the shocks.

The test is carried out as follows:

- Caring out a performance test
- Apply three successive upward shocks with the EUT operating
- Check for any mechanical damages
- Caring out a second performance test

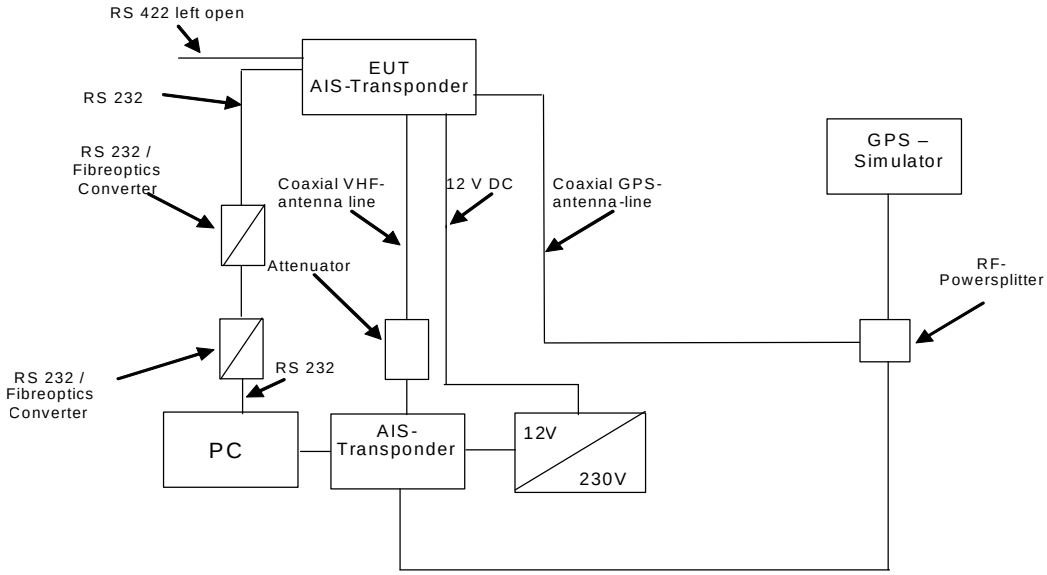
1.3 Operating states and test set-up

For the vibration tests the EUT is mounted on an electrodynamic shaker by its normal mounting points. The signal control of the electrodynamic shaker is carried out as an average value control of two equal weighted accelerometers mounted near the EUT. For resonance search a additional accelerometer is mounted on the EUT housing. During the vibration and shock tests the EUT is connected and operating.

For operation and function testing during the vibration and shock tests two AIS transponders were connected coaxial via a 100 dB rf-attenuator. During all vibration and shock tests EUT 1 is mounted on the electrodynamic shaker and EUT 2 only is used for data transmission.

Both transponders were operating in normal operation mode, data exchange every 2 seconds. The receive- and transmit-data of each transponder and GPS Status were monitored via the RS 232 Serial port with the help of software tool LINK2AISB V112 at an external PC and printed in a log file to check the numbers and the context of data during the whole test-time. Furthermore the status LEDs on the transponder were monitored manually by the test engineer. A block diagram of the monitoring set-up is shown in Diagram 1.

Diagram 2: Test set-up of the monitoring system



During and after the tests there shall be no damages or malfunctions.

Definition of the functions of the monitoring and their tolerances:

- Visual check for mechanical damages
- Control of the function

2 Test performance and test results

2.1 Test performance

The tests were carried out as follows:

Date:	Axis:	Test:
January 26,2007	Z	Resonance search
January 26,2007	Z	Vibration sinusoidal
January 26,2007	Z	Shock
January 30,2007	Y	Resonance search
January 30,2007	Y	Vibration sinusoidal
January 30,2007	Y	Shock
January 30,2007	X	Resonance search
January 30,2007	X	Vibration sinusoidal
January 30,2007	X	Shock

2.2 Test results

2.2.1 Vibration sinusoidal

EUT	Axis	Frequency	Test duration	Pass
1	Z	30 Hz	2.0 h	Yes [1)]
1	Y	30 Hz	2.0 h	Yes [1)]
1	X	30 Hz	2.0 h	Yes [1)]

Note: Diagrams of resonance search see chapter 4, page 19, 22 and 25.

[1)] According to EN 60945:2002 no resonance frequency is found on the EUT. Thus a fatigue test at 30 Hz is carried out.

2.2.2 Shock test

EUT	Direction	Shock	Number of shocks	Pass
1	+ Z	100 m/s^2 / 25 ms	3 upwards	Yes
1	+ Y	100 m/s^2 / 25 ms	3 upwards	Yes
1	+ Z	100 m/s^2 / 25 ms	3 upwards	Yes

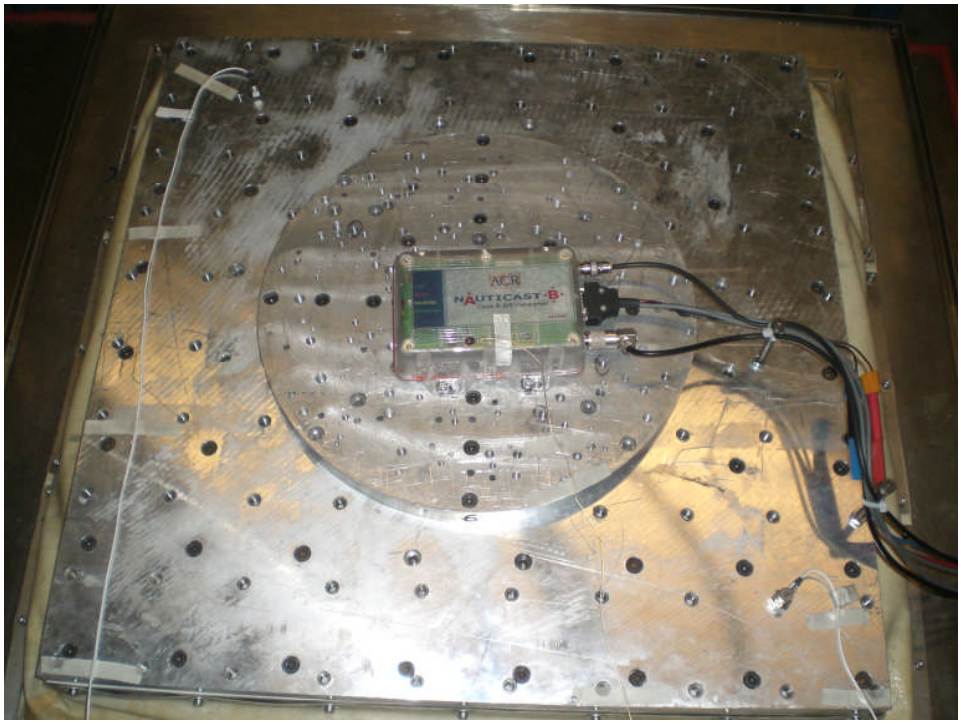
Note: Diagrams of shock test see chapter 4, page 21, 24 and 27.

3 List of measurement equipment

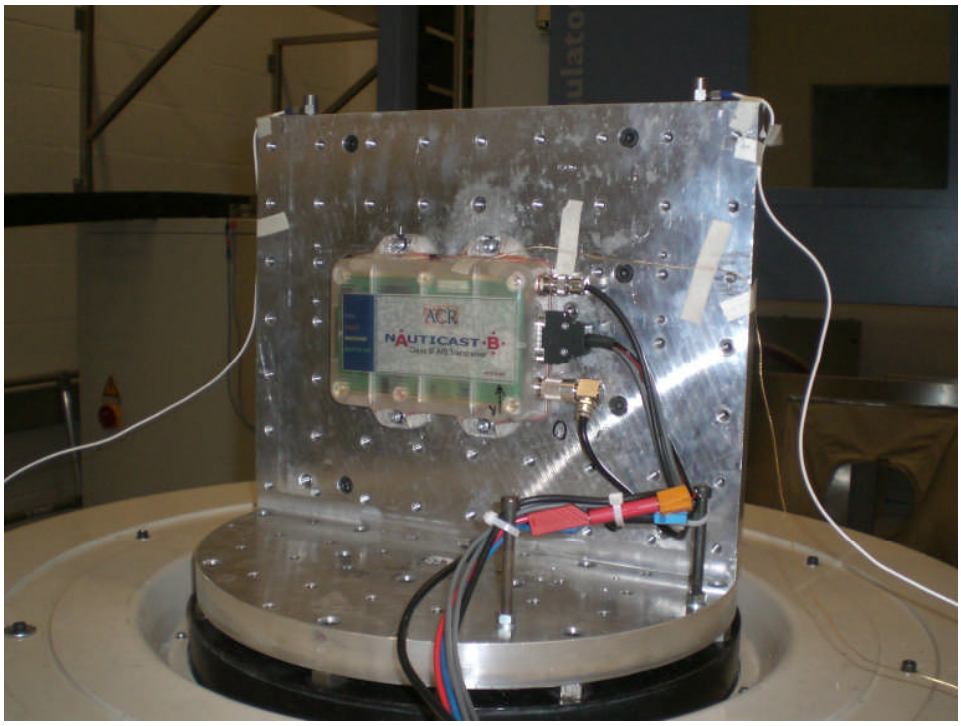
Measurement equipment	PM No.
Shaker LDS V9-440 SPA176K HBT 600	490100
Accelerometer 1.08 mV/m/s^2	480612
Accelerometer 1.09 mV/ m/s^2	480570
Accelerometer 1.10 mV/ m/s^2	490126
GPS Multi-Channel Simulator STR 4500	480463

4 Pictures and Diagrams

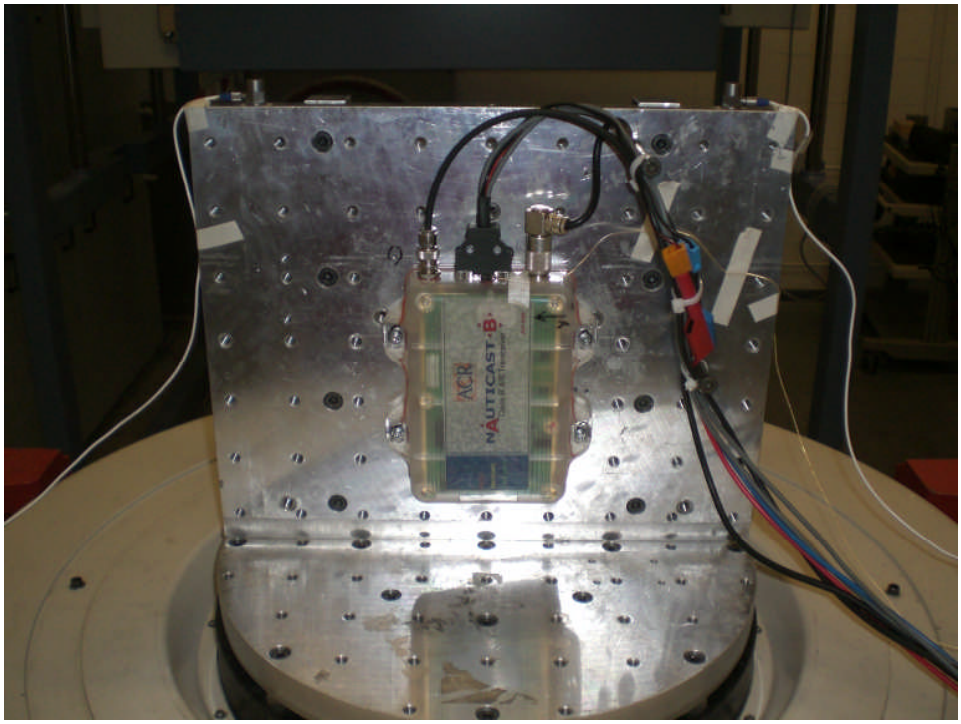
Picture 1: Vibration and Shock Test set-up Z-axis



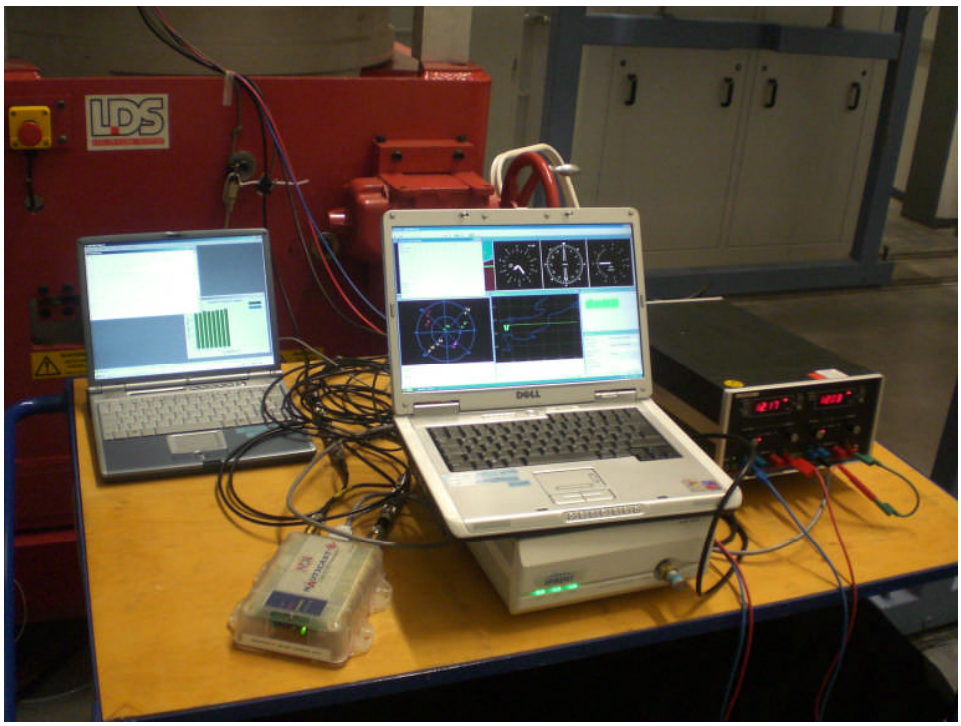
Picture 2: Vibration and Shock Test set-up Y-axis



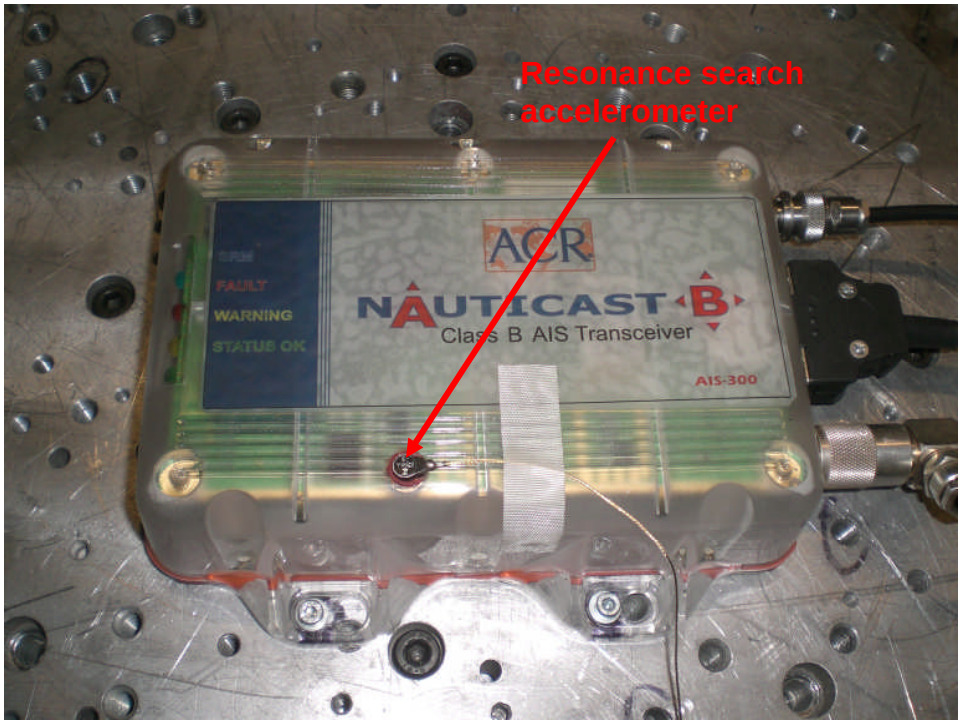
Picture 3: Vibration and Shock Test set-up X-axis



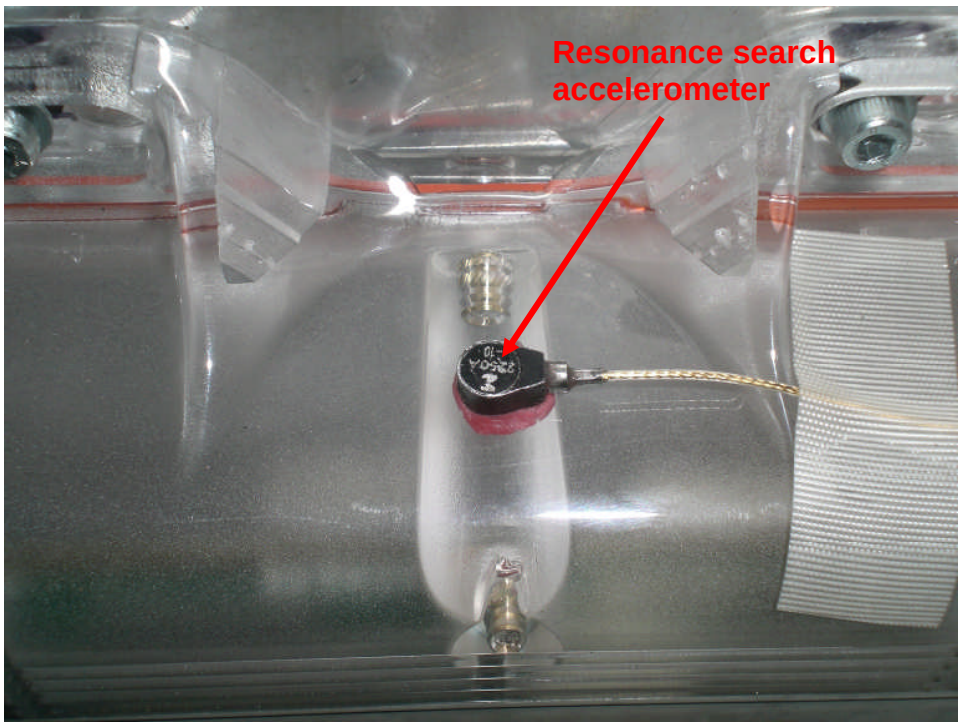
Picture 4: Monitoring set-up for operation and function testing



Picture 5: Resonance search accelerometer position Z-Axis



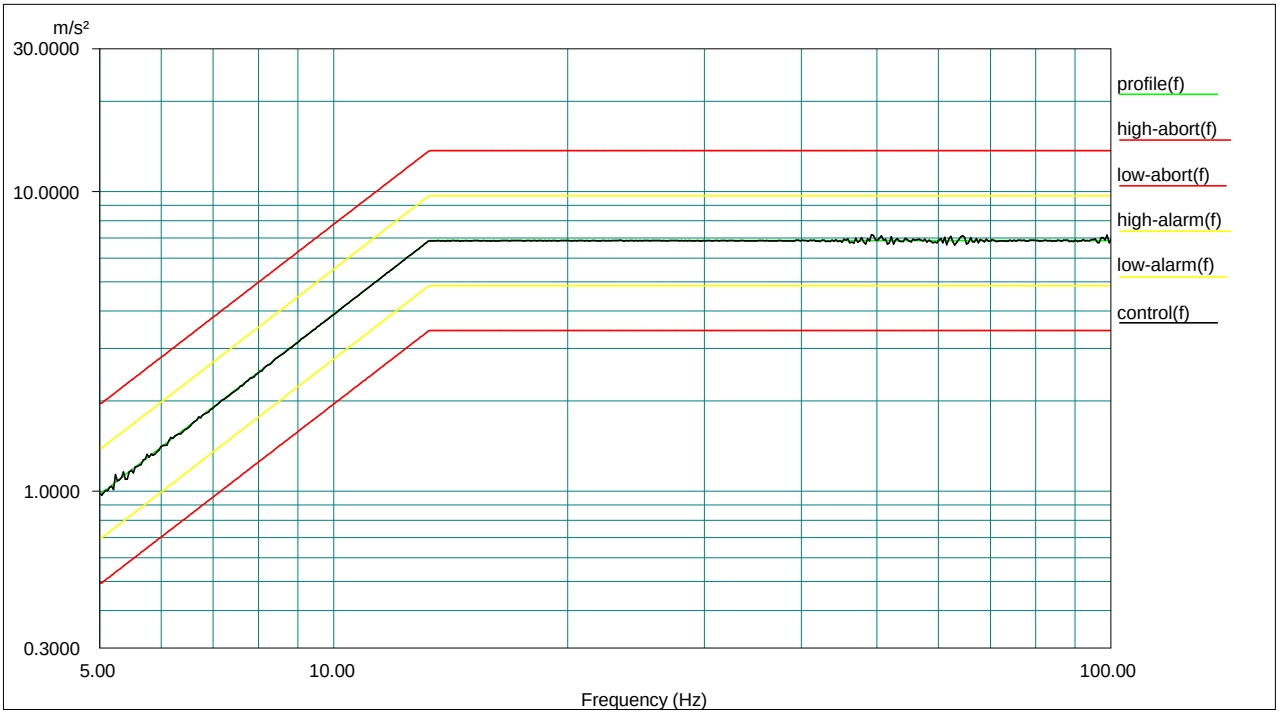
Picture 6: Resonance search accelerometer position Y-Axis



Picture 7: Resonance search accelerometer position X-Axis

Diagram 3: Vibration test sinusoidal resonance search (Excitation exemplary)

Nauticast AIS-B 300
Z-Achse
Project File Name: Resosuche.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 26,2007 11-27-27

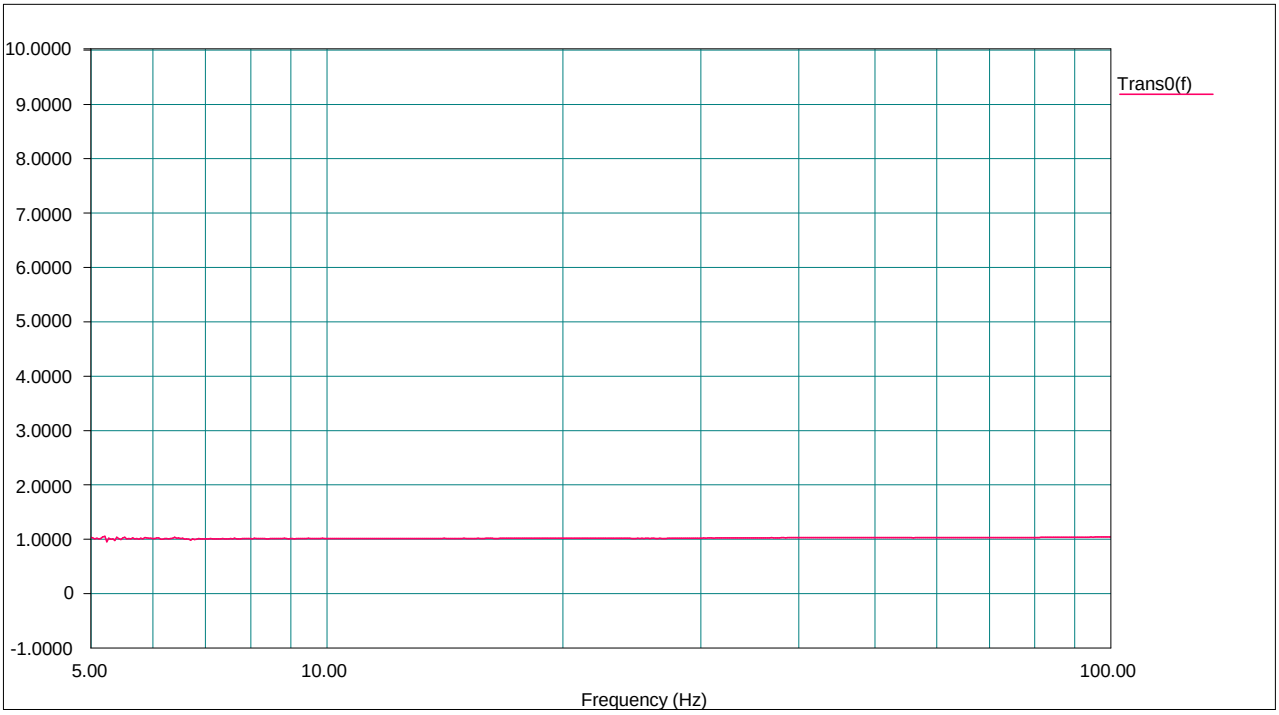


Level:	100 %	Control Peak:	0.986978 m/s²	Full Level Time:	00:43:16	Sweep Type:	Logarithmic
Frequency:	5.001286 Hz	Demand Peak:	0.986960 m/s²	Time Remaining:	00:00:00	Sweep Rate:	0.2 Oct/Min

Data saved at 12:10:52 PM, Friday, January 26, 2007 Report created at 12:10:59 , Freitag, Januar 26, 2007

Diagram 4: Resonance search, Z-axis

Nauticast AIS-B 300
Z-Achse
Project File Name: Resosuche.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 26,2007 11-27-27



Level:	100 %	Control Peak:	0.972920 m/s²	Full Level Time:	00:43:16	Sweep Type:	Logarithmic
Frequency:	5.000051 Hz	Demand Peak:	0.986960 m/s²	Time Remaining:	00:00:00	Sweep Rate:	0.2 Oct/Min

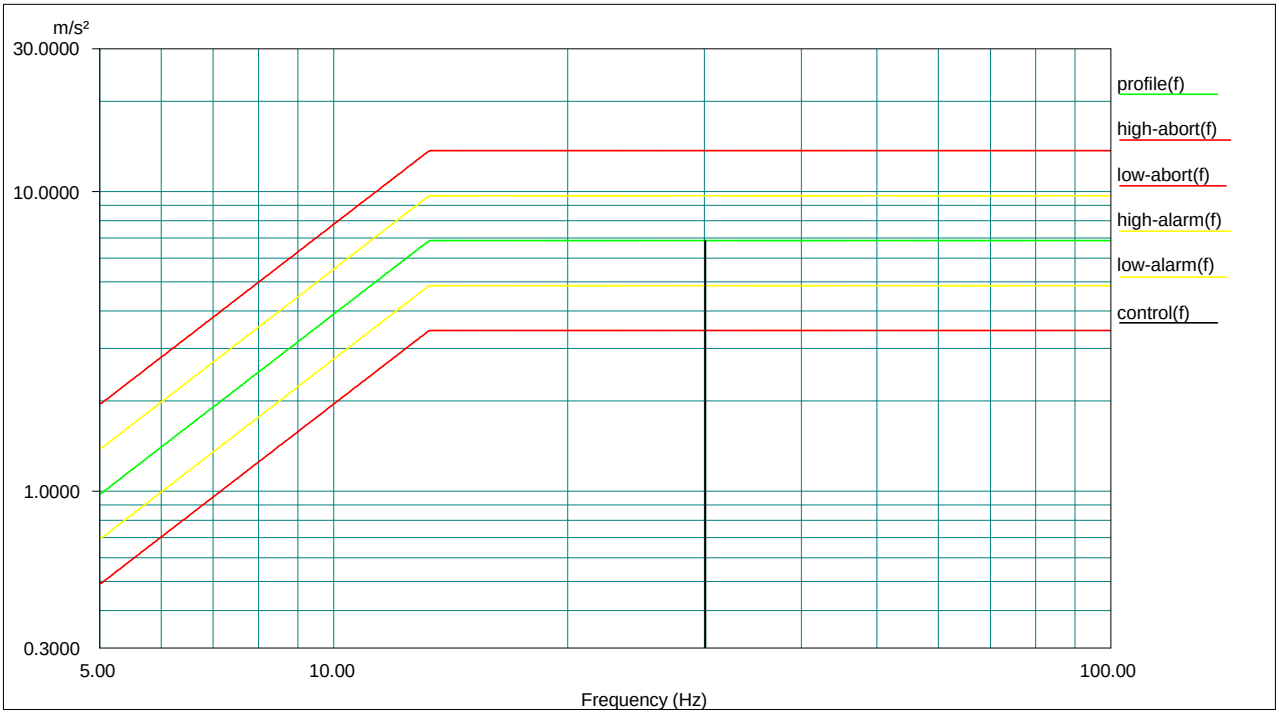
Data saved at 12:13:22 PM, Friday, January 26, 2007 Report created at 12:13:23 , Freitag, Januar 26, 2007

Note: *The transmission function shown in the diagram is the amplification factor of the resonant search accelerometers signal in relation to the control signal of the shaker.*

The position of the resonant search accelerometer is shown in Picture 5.

Diagram 5: Vibration sinusoidal fatigue test, Z-axis

Nauticast AIS-B 300
Z-Achse
Project File Name: Verweilen_30Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 26,2007 12-28-49

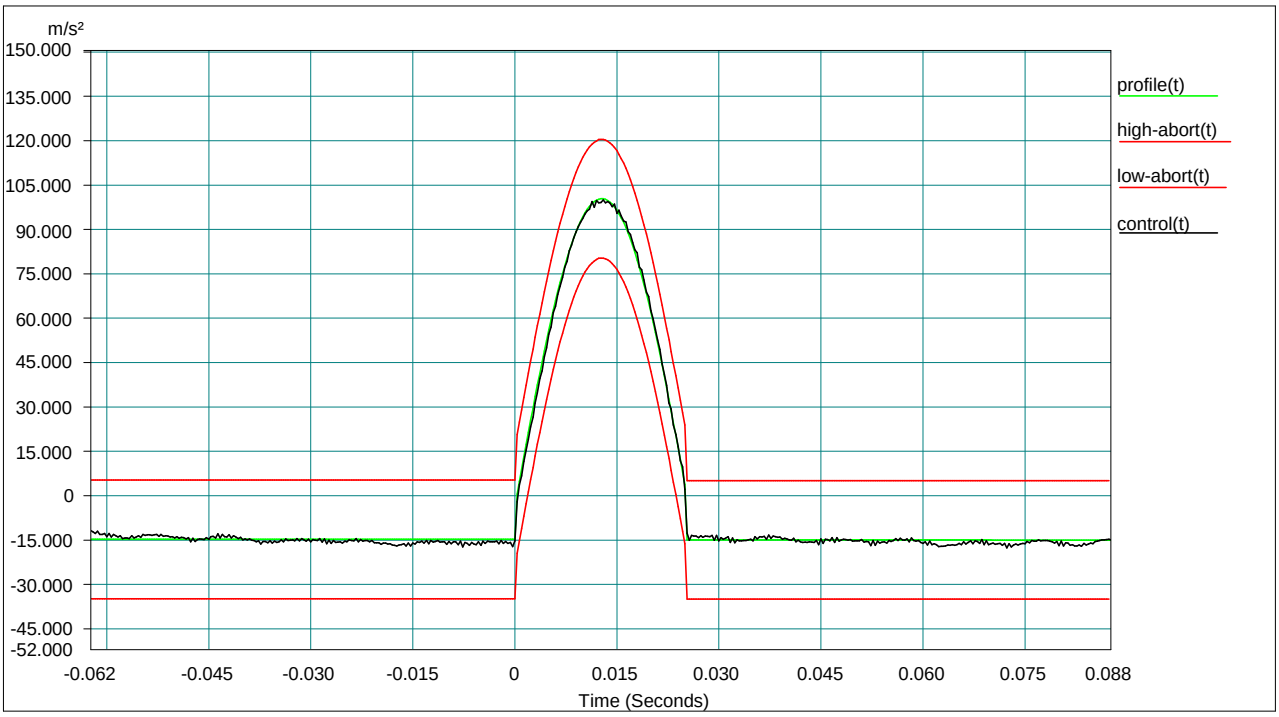


Level:	100 %	Control Peak:	6.862723 m/s²	Full Level Time:	02:00:00	Sweep Type:	Logarithmic
Frequency:	30.000000 Hz	Demand Peak:	6.864655 m/s²	Time Remaining:	00:00:00	Sweep Rate:	1 Oct/Min

Data saved at 02:50:11 PM, Friday, January 26, 2007 Report created at 02:50:12 , Freitag, Januar 26, 2007

Diagram 6: Shock test, Z-axis

Nauticast AIS-B 300
Z-Achse
Project File Name: 100ms2_25ms.prj
Profile Name: 100m/s² 25mSec Test Type: Classical Shock Run Folder:
.\RunDefault Jan 26,2007 14-57-55

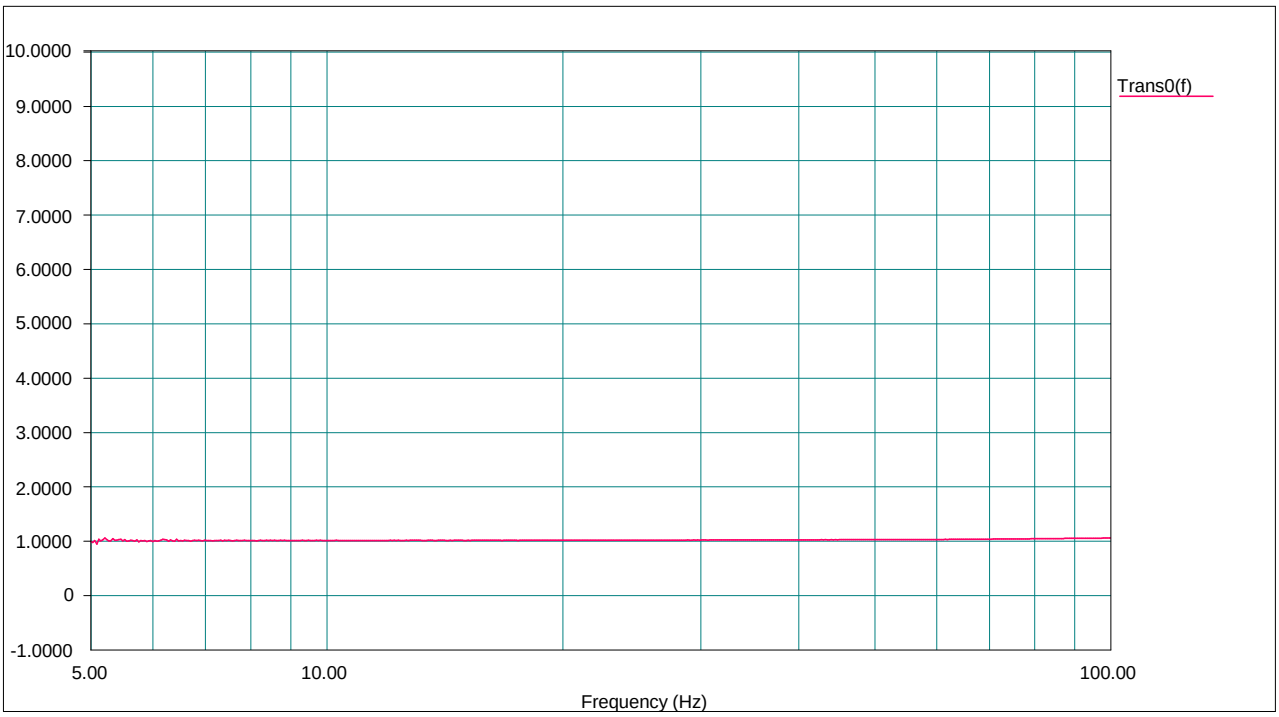


Level:	100 %		Block Size:	2048		Elapsed Pulses:	11
Frame Time:	0.682667 Seconds	Control Peak:	99.537193 m/s²	Control RMS:	16.171436 m/s²	Full Level Elapsed Pulses:	3
dT:	0.000333 Seconds	Demand Peak:	100.000000 m/s²	Demand RMS:	16.083145 m/s²	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	100.000000 m/s²				

Data saved at 02:58:50 PM, Friday, January 26, 2007 Report created at 02:58:50 , Freitag, Januar 26, 2007

Diagram 7: Resonance search, Y-axis

Nauticast AIS-B 300
Y-Achse
Project File Name: Resosuche.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 30,2007 09-09-38



Level:	100 %	Control Peak:	0.950409 m/s²	Full Level Time:	00:43:16	Sweep Type:	Logarithmic
Frequency:	5.000051 Hz	Demand Peak:	0.986960 m/s²	Time Remaining:	00:00:00	Sweep Rate:	0.2 Oct/Min

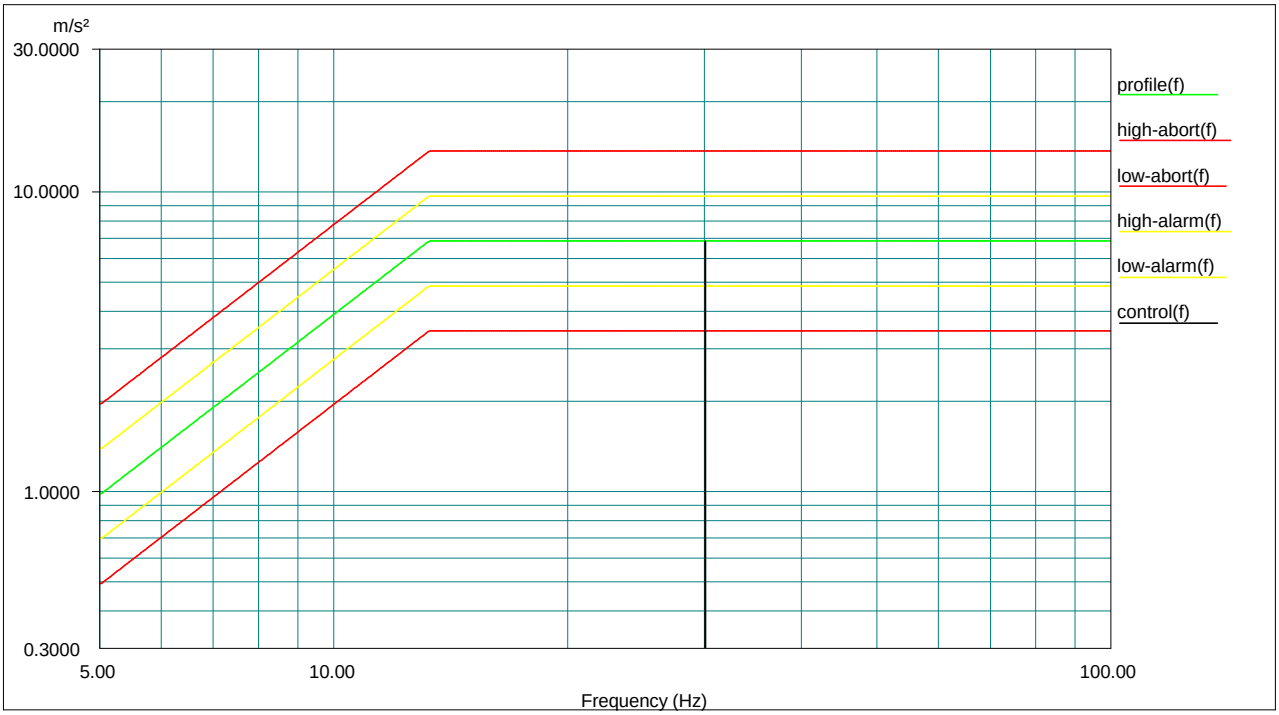
Data saved at 09:53:53 AM, Tuesday, January 30, 2007 Report created at 09:53:54 , Dienstag, Januar 30, 2007

Note: *The transmission function shown in the diagram is the amplification factor of the resonant search accelerometers signal in relation to the control signal of the shaker.*

The position of the resonant search accelerometer is shown in Picture 6.

Diagram 8: Vibration sinusoidal fatigue test, Y-axis

Y-Achse
Project File Name: Verweilen_30Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 30,2007 09-56-07

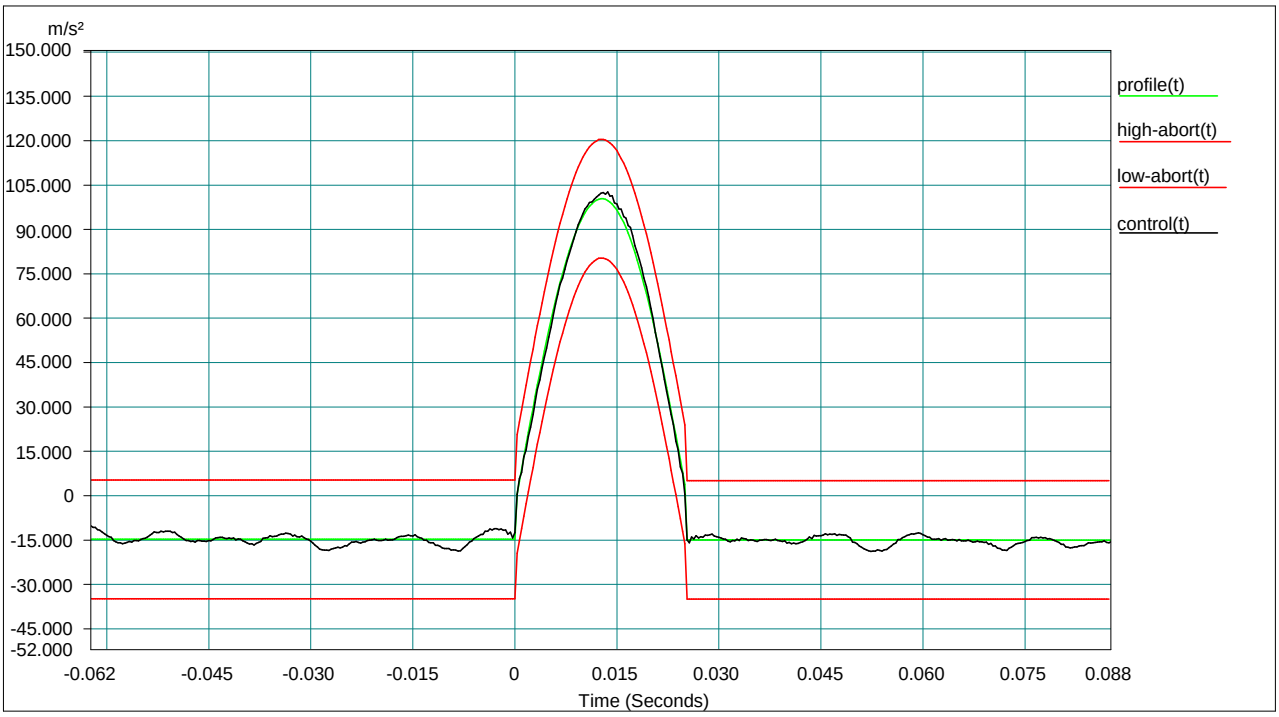


Level:	100 %	Control Peak:	6.859457 m/s²	Full Level Time:	02:00:00	Sweep Type:	Logarithmic
Frequency:	30.000000 Hz	Demand Peak:	6.864655 m/s²	Time Remaining:	00:00:00	Sweep Rate:	1 Oct/Min

Data saved at 12:03:43 PM, Tuesday, January 30, 2007 Report created at 12:03:44 , Dienstag, Januar 30, 2007

Diagram 9: Shock test, Y-axis

Nauticast AIS-B 300
Y-Achse
Project File Name: 100ms2_25ms.prj
Profile Name: 100m/s² 25mSec Test Type: Classical Shock Run Folder:
.\RunDefault Jan 30,2007 12-10-01

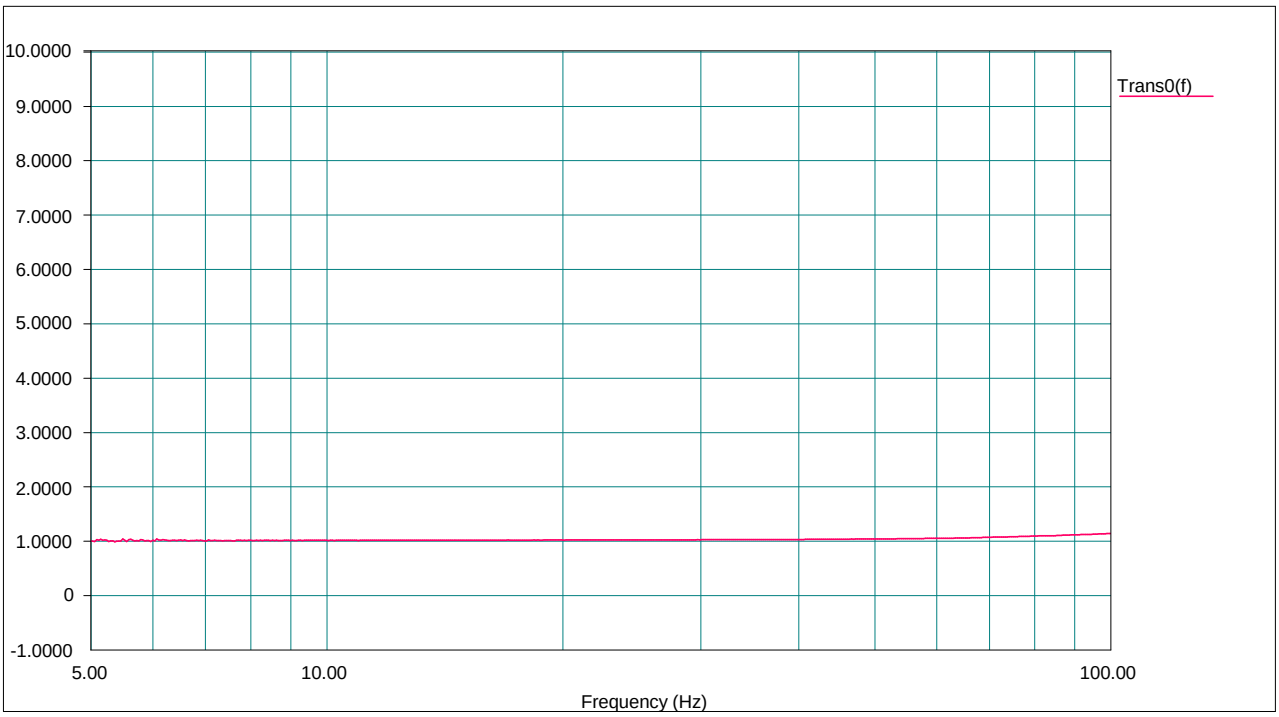


Level:	100 %		Block Size:	2048		Elapsed Pulses:	11
Frame Time:	0.682667 Seconds	Control Peak:	102.264397 m/s²	Control RMS:	16.292028 m/s²	Full Level Elapsed Pulses:	3
dT:	0.000333 Seconds	Demand Peak:	100.000000 m/s²	Demand RMS:	16.083145 m/s²	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	100.000000 m/s²				

Data saved at 12:10:27 PM, Tuesday, January 30, 2007 Report created at 12:10:27 , Dienstag, Januar 30, 2007

Diagram 10: Resonance search, X-axis

Nauticast AIS-B 300
X-Achse
Project File Name: Resosuche.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 30,2007 12-22-24



Level:	100 %	Control Peak:	0.975583 m/s²	Full Level Time:	00:43:16	Sweep Type:	Logarithmic
Frequency:	5.000051 Hz	Demand Peak:	0.986960 m/s²	Time Remaining:	00:00:00	Sweep Rate:	0.2 Oct/Min

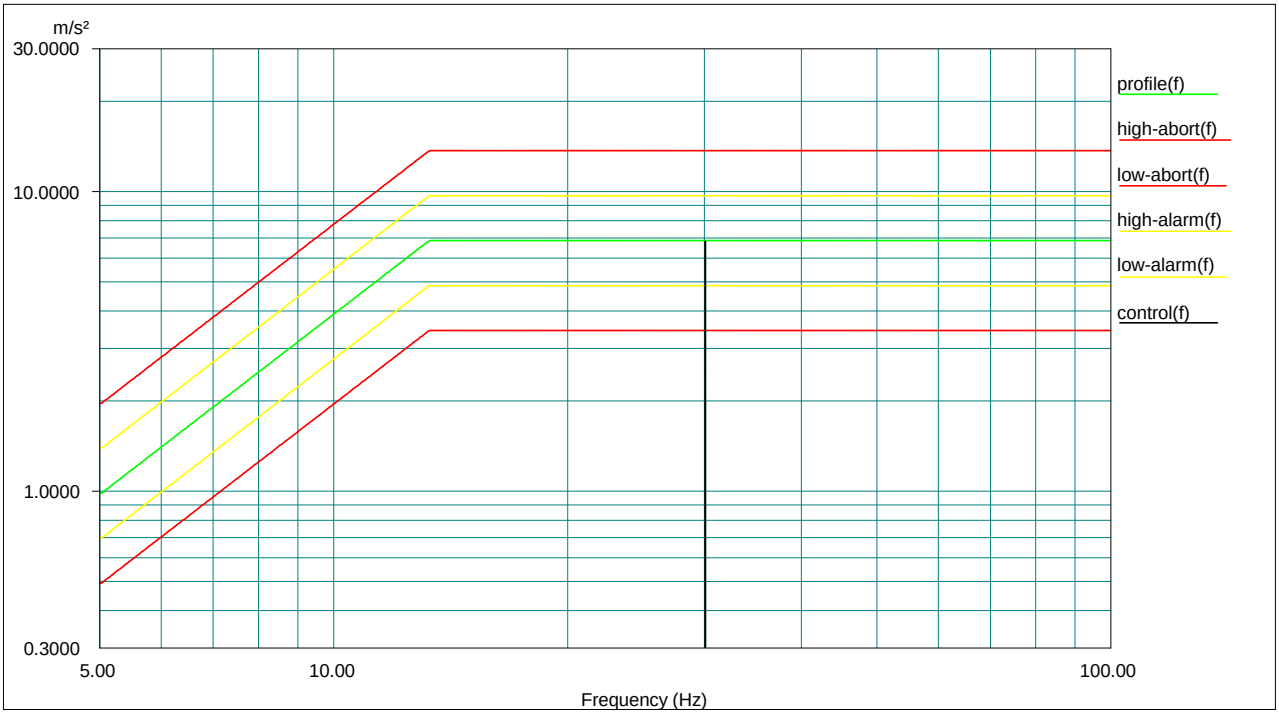
Data saved at 01:20:21 PM, Tuesday, January 30, 2007 Report created at 01:20:22 , Dienstag, Januar 30, 2007

Note: *The transmission function shown in the diagram is the amplification factor of the resonant search accelerometers signal in relation to the control signal of the shaker.*

The position of the resonant search accelerometer is shown in Picture 7.

Diagram 11: Vibration sinusoidal fatigue test, X-axis

Nauticast AIS-B 300
X-Achse
Project File Name: Verweilen_30Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Jan 30,2007 13-24-45

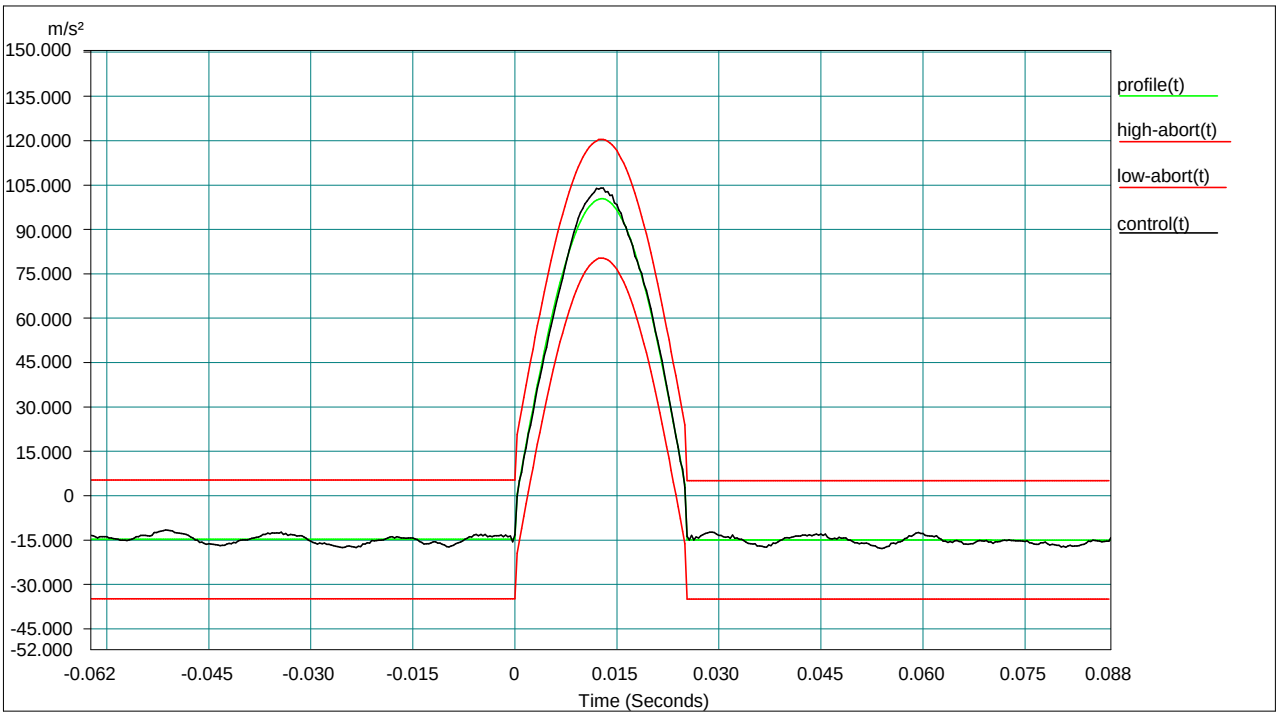


Level:	100 %	Control Peak:	6.847176 m/s²	Full Level Time:	02:00:00	Sweep Type:	Logarithmic
Frequency:	30.000000 Hz	Demand Peak:	6.864655 m/s²	Time Remaining:	00:00:00	Sweep Rate:	1 Oct/Min

Data saved at 03:26:30 PM, Tuesday, January 30, 2007 Report created at 03:26:30 , Dienstag, Januar 30, 2007

Diagram 12: Shock test, X-axis

Nauticast AIS-B 300
X-Achse
Project File Name: 100ms2_25ms.prj
Profile Name: 100m/s² 25mSec Test Type: Classical Shock Run Folder:
.\RunDefault Jan 30,2007 15-26-56



Level:	100 %		Block Size:	2048		Elapsed Pulses:	11
Frame Time:	0.682667 Seconds	Control Peak:	103.579369 m/s²	Control RMS:	16.306673 m/s²	Full Level Elapsed Pulses:	3
dT:	0.000333 Seconds	Demand Peak:	100.000000 m/s²	Demand RMS:	16.083145 m/s²	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	100.000000 m/s²				

Data saved at 03:27:31 PM, Tuesday, January 30, 2007 Report created at 03:27:32 , Dienstag, Januar 30, 2007

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