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DAT-P-002/91-02

Center for Quality Engineering

Test Report No.: U0ES0003

Order No.: U0ES	**Pages:** 29	**Munich,** Nov 29, 2006

Client:	Schroff GmbH
Equipment Under Test:	Micro TCA-shelf 14 slot completed with 12 AMC Modules with weights and two filler panels
Manufacturer:	Schroff GmbH
Task:	Conformance test according to the below mentioned test specifications Vibration, Shock, Earthquake
Test Specification(s): [covered by accreditation]	IEC 60068-2-6, Test Fc: Vibration (sinusoidal) IEC 60068-2-27, Test Ea and guidance: Shock IEC 60068-2-57, Test Ff: Vibration –Time-history method
Test Specification(s): [not covered by accreditation]	IEC 61587-1 IEC 61587-2
Result:	The EUT was subject to the tests listed in detail in ch. 6 of this report and complies with the corresponding requirements.

The results relate only to the items tested as described in this test report.

approved by:	**Date**	**Signature**
Alt Director 'Environmental Engineering'	Nov 30, 2006	

This document was signed electronically.

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Address: Siemens Networks GmbH & Co. KG, SN CTO CQE, Hofmannstr. 51, D-81359 München, Phone +49 89-722-48793, Fax +49 89-722-22648, Internet www.pruefinstitut.de

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1 Summary

Testing was performed to determine if the MicroTCA shelf 14 slot meets the requirements of

IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-57
IEC 61587-1: 1999-06
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part1: Climatic, mechanical tests and safty aspects for cabinets, racks, subracks and chassis
IEC 61587-2: 2000-12
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part2: Seismic tests for cabinets and racks

The performed Earthquake tests are also covered in the specifications of

GR 63 CORE , Issue 3: March 2006
NEBS Requirements : Physical Protection
Part 5.4.1 Earthquake Test Methods
ETSI EN 300 019-2-3 V2.2.2 (2003-04)
Environmental Engineering (EE);
Environmental conditions and environmental tests for telecommunications equipment;
Part 2-3: Specification of environmental tests; Stationary use at weatherprotected locations
Part 4 Earthquake test specification

The EUT shows no physical damage during and after the tests.

The table below contains a detailed list of tests performed.

Tested Requirement(s)	Test Passed	Remark
IEC 60068-2-6, Test Fc: Vibration (sinusoidal)	yes	
IEC 60068-2-27, Test Ea and guidance: Shock	yes	
IEC 60068-2-57, Test Ff Vibration –Time-history method	yes	

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2 References

2.1 Specifications

[1] **IEC 61587-1: 1999-06**
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part1: Climatic, mechanical tests and safty aspects for cabinets, racks, subracks and chassis

[2] **IEC 61587-2: 2000-12**
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part2: Seismic tests for cabinets and racks

[3] **IEC 60068-2-6: 1995-03**
Environmental testing
Part 2: Tests, Test Fc: Vibration (sinusoidal)

[4] **IEC 60068-2-27: 1987**
Basic environmental testing procedures
Part 2: Tests, Test Ea and guidance: Shock

[5] **IEC 60068-2-57 : 1999-11**
Environmental testing
Part 2-57: Tests , Test Ff: Vibration –Time-history method

[6] **GR 63 CORE , Issue 3: March 2006**
NEBS Requirements : Physical Protection
Part 5.4.1 Earthquake Test Methods

[7] **ETSI EN 300 019-2-3 V2.2.2 (2003-04)**
Environmental Engineering (EE);
Environmental conditions and environmental tests for telecommunications equipment;
Part 2-3: Specification of environmental tests; Stationary use at weatherprotected locations
Part 4 Earthquake test specification

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3 General Information

3.1 Identification of Client

Schroff GmbH
R&D Subracks and Systems
Langenalber Str. 96-100
75334 Straubenhardt

3.2 Test Laboratory

Center for Quality Engineering
Siemens Networks GmbH & Co. KG
SN CTO CQE CoC31
Hofmannstraße 51
81359 München

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3.3 Time Schedule

Delivery of EUT:	Oct 20, 2006
Start of test:	Oct 23, 2006
End of test:	Oct 25, 2006

3.4 Participants

Name	Function	Phone	E-Mail
Alfred Knier	Accredited testing, Editor	+49 89 722-48726	alfred.knier@siemens.com
Paul Rutherford	Client	+49 7082794 561	paul_rutherford@schroff.de

4 Equipment Under Test

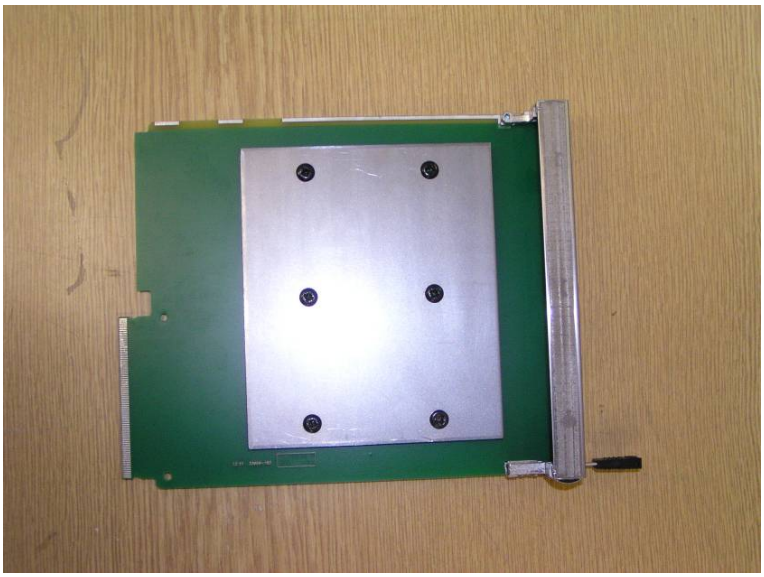
Micro TCA – shelf Part No.: 20849-095 total weight with boards 11,5Kg

mounted in a special frame for Vibration-, Shock- and Earthquake testing.

Pic. 1 EUT front side

The MicroTCA shelf 14 slot was completed with:

12x AMC Module FS-D – Dummyboards weight: 0,712 Kg
2x filler panels on left and right side without additional weights.



Pic. 2 AMC Module FS-D - Dummyboard

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4.1 Failure Criteria

No mechanical deviations.

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5 Test Equipment

5.1 Test Facility

The measurements were carried out in the Center for Quality Engineering: Siemens Networks GmbH & Co. KG, Department SN CTO CQE CoC3, Hofmannstraße 50, 81359 München, Germany.

5.2 Measuring Equipment

Vibration- and Shock test

	Equipment	Type	Manufacturer	Status	Last Cal.	Next Cal.
	Vibration Test System 80A					
S0795	Frequency Counter	P6101,FP2	Newport	ind		
S0854	Frequency Display	L4S4RA8W	Newport	ind		
S1406	Charge Amplifier (VIB9000)	D22PMG	Unholtz Dickie	cal	Feb 23, 2006	Feb 2007
S1407	Charge Amplifier (VIB9000)	D22PMG	Unholtz Dickie	cal	Feb 23, 2006	Feb 2007
S1408	Charge Amplifier (VIB9000)	D22PMG	Unholtz Dickie	cal	Feb 23, 2006	Feb 2007
S1409	Charge Amplifier (VIB9000)	D22PMG	Unholtz Dickie	cal	Feb 23, 2006	Feb 2007
S1419	80A Vibration Exciter VIB9000	SW9100	RMS	cal	Feb 23, 2006	Feb 2007
S5004	Oscilloscope	D1011	Siemens	ind		
S5528	Personal Computer (VIB9000)	Scenic-W600	Fujitsu Siemens	cnn		
S5452	Software Version 2.9.0	Vib Control/NT f. VIB 9000	M&P	cnn		
S5662	Vibration Control and Analysis System (VIB9000)	Vibrunner	Agilent	cal	Feb 23, 2006	Feb 2007
S5050	Accelerometer	226C	Endevco	cal	Jul 24, 2006	Jul 2008
S5064	Accelerometer	226C	Endevco	cal	Jul 24, 2006	Jul 2008
S5066	Accelerometer	226C	Endevco	cal	Jul 24, 2006	Jul 2008
S5067	Accelerometer	226C	Endevco	cal	Jul 24, 2006	Jul 2008

cal = Calibration, car = Calibration restricted use, chk = Check, chr = Check restricted use, cpu = Check prior to use, cnn = Calibration not necessary, ind = for indication only

Earthquake test

ID No.	Equipment	Type	Manufacturer	Status	Last Cal.	Next Cal.
	Earthquake Test System 84A					
S0353	Earthquake Test System	921.67	MTS	cnn		
S0896	Control System for Earthquake	TESTSTAR IIS		cnn		
S0919	Amplifier	106	Endevco	cal	Jan 25, 2006	Jan 2007
S0922	Power Supply	109V	Endevco	cnn		
S5398	Accelerometer	2262A-25	Endevco	cal	Jan 24, 2006	Jan 2007
S5453	Software Version 3.3A	Teststar Iis	MTS	cnn		
S5453	Software Version 2.2	Component RPC III	MTS	cnn		
S5453	Software Version 2000 Prof	Mathcad.	MTS	cnn		
S5482	Netzgerät	ARGOS	TET Electronic	cnn		
S5544	Position Transducer	1850-125	National Oilwell	chk	Apr 17, 2006	Apr 2007

cal = Calibration, car = Calibration restricted use, chk = Check, chr = Check restricted use, cpu = Check prior to use, cnn = Calibration not necessary, ind = for indication only

5.3 Measurement Uncertainty

The measurement uncertainity is given by the used equipment. Detailed information can be seen in the technical descriptions of the used equipment and in the calibration data sheet. It is available on request.

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6 Test Specifications and Results

The test results in the report refer exclusively to the test object described in section 4 and the test period in section 3.3.

6.1 Test Specification

6.1.1 Vibration and shock test:

IEC 61587-1: 1999-06
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part1: Climatic, mechanical tests and safty aspects for cabinets, racks, subracks and chassis

Table 11: Performance Level DL1

6.1.1.1 Resonance search - Vibration (sinusoidal)

Test	Parameter	Test Severity	Reference	Method
Vibration sinusoidal	Acceleration Frequency range Axes of vibration Duration	2 m/s² 10-150 Hz 3 3 x 1 sweep cycles	IEC 60068-2-6	Fc: Vibration (sinusoidal)

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Test Performance

For the tests the EUT was screwed with 8x M6 screws into a special mounting frame and were fixed to the shaker table (see pic 7-9).

The test was performed in 3 mutually perpendicular axes.

horizontal longitudinal front to back = Y-axis
horizontal lateral = X-axis
vertical = Z-axis

The tests were performed in normal use attitude.

Pic. 3 Mounting of EUT at vibrator table, Z-Axis

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Pic. 4 Mounting of EUT at vibrator table, Y-Axis

For vibration in direction X-axis the EUT was rotated by 90º at the shaker table.

For Resonance search three accelerometers are positioned at the upper rear side of the shelf.

Pic. 5 Position of accelerometers

Test Result

No visible mechanical deviations were identified.

Diagrams of the recorded accelerations:

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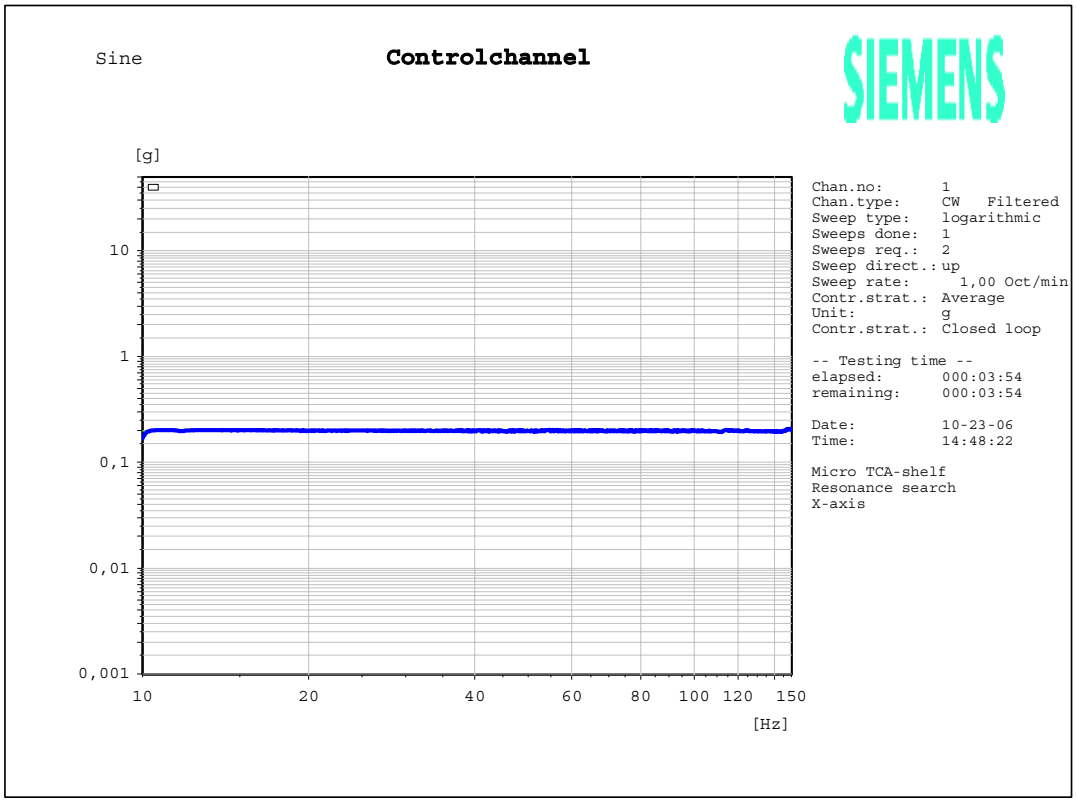
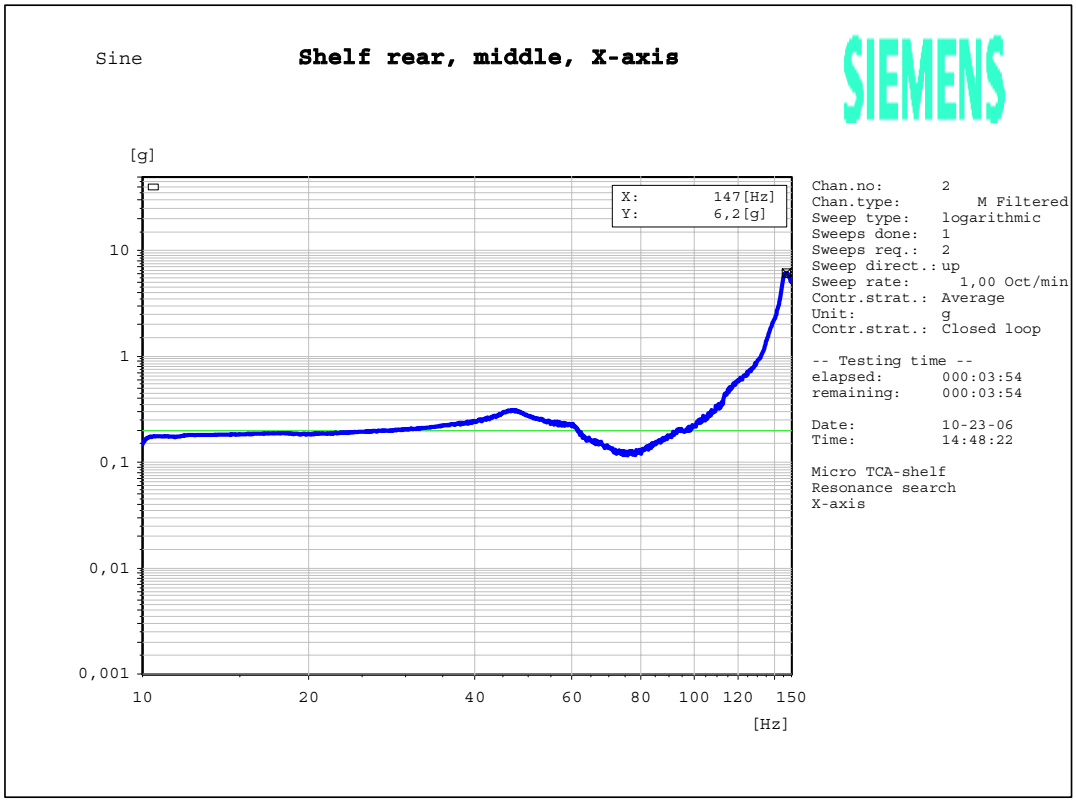
Resonance search X-axis





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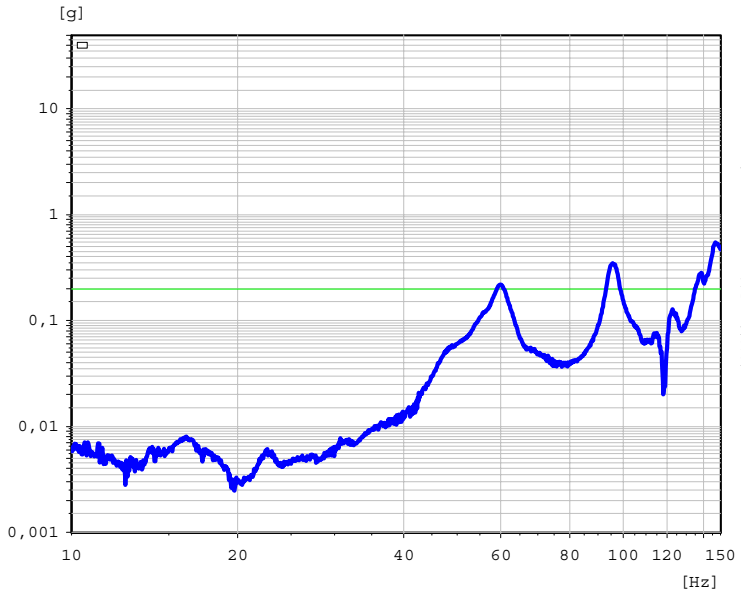
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Sine **Shelf rear, middle, Y-axis**

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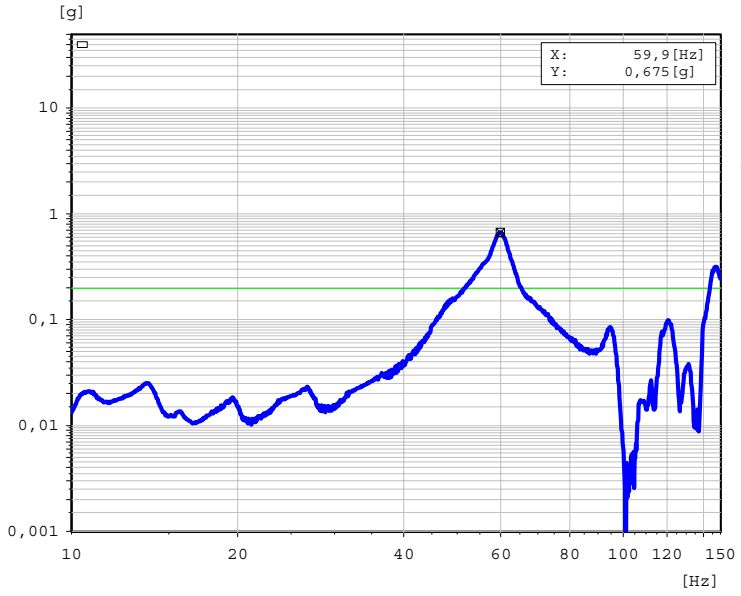
Sweep type:     logarithmic
Sweeps done:    1
Sweeps req.:    2
Sweep direct.:  up
Sweep rate:       1,00 Oct/min
Contr.strat.:   Average
Unit:           g
Contr.strat.:   Closed loop

-- Testing time --
elapsed:        000:03:54
remaining:      000:03:54

Date:           10-23-06
Time:           14:48:22

Micro TCA-shelf
Resonance search
X-axis
```

Sine **Shelf rear, middle, Z-axis**

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Sweeps req.:    2
Sweep direct.:  up
Sweep rate:       1,00 Oct/min
Contr.strat.:   Average
Unit:           g
Contr.strat.:   Closed loop

-- Testing time --
elapsed:        000:03:54
remaining:      000:03:54

Date:           10-23-06
Time:           14:48:22

Micro TCA-shelf
Resonance search
X-axis
```
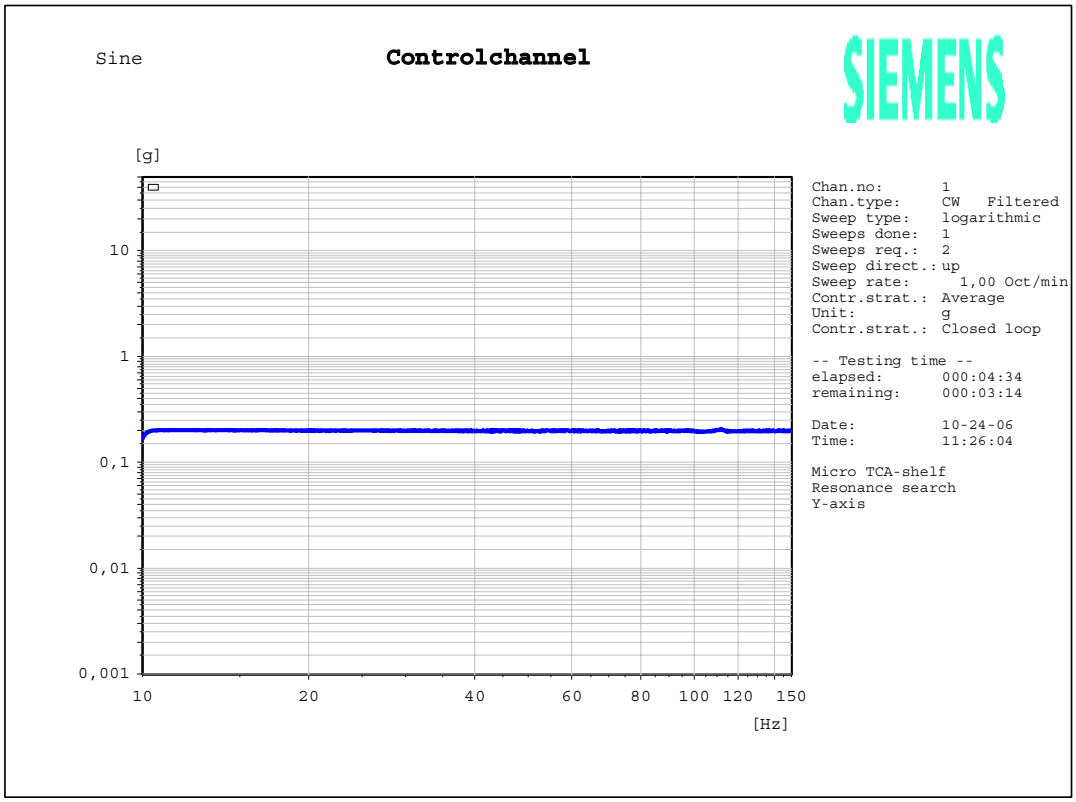
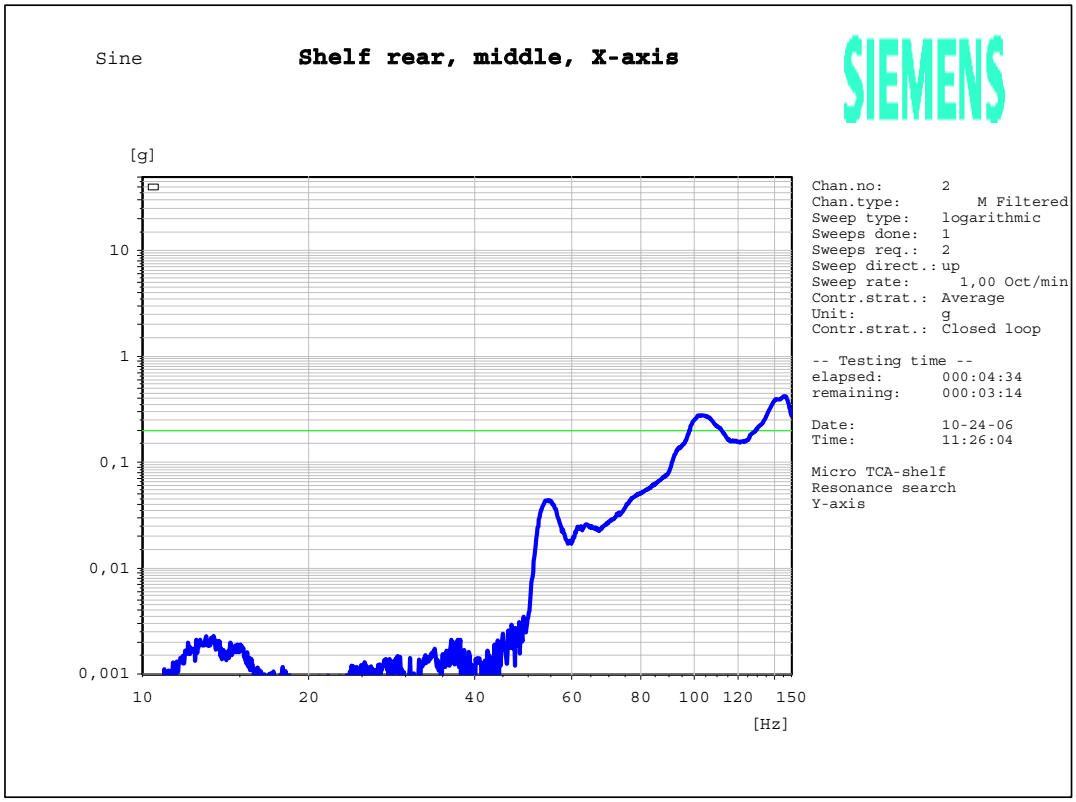

Resonance search Y-axis





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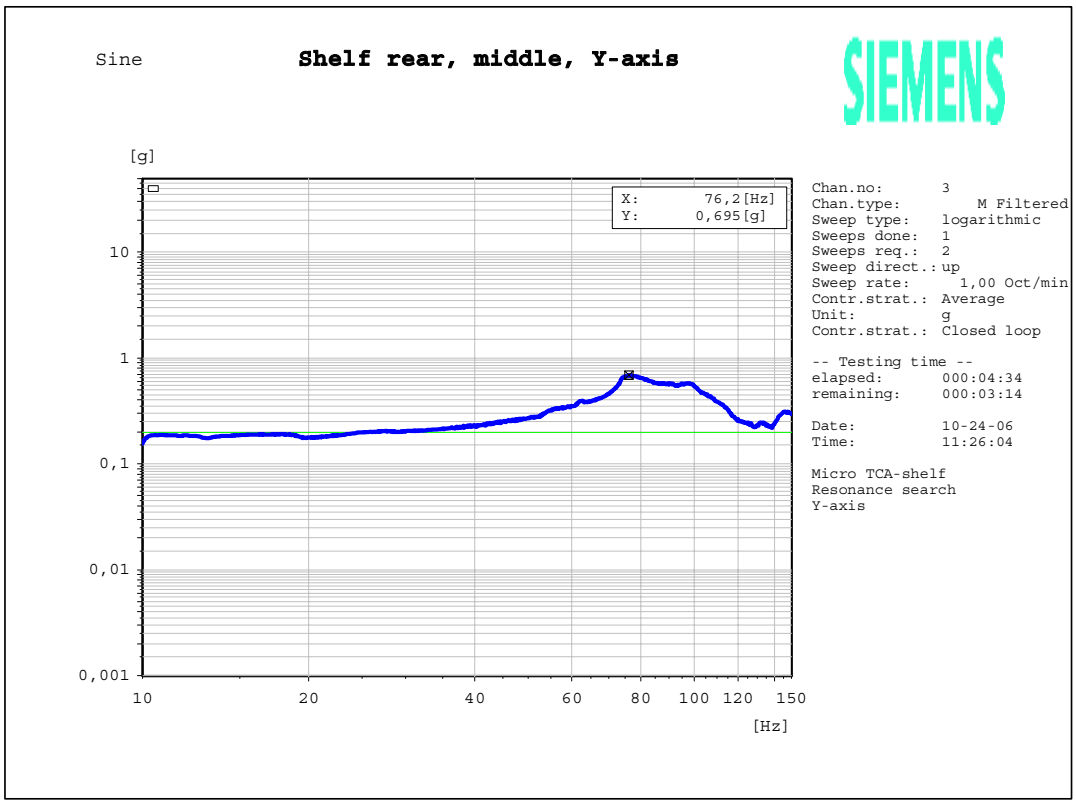

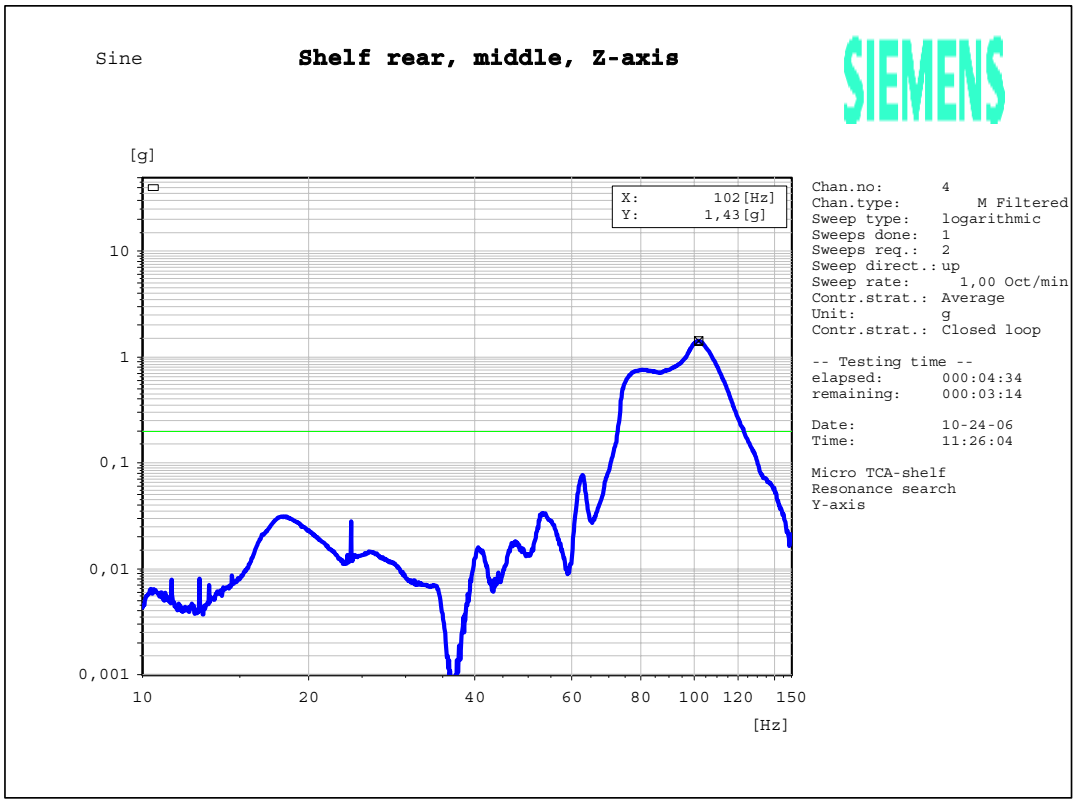

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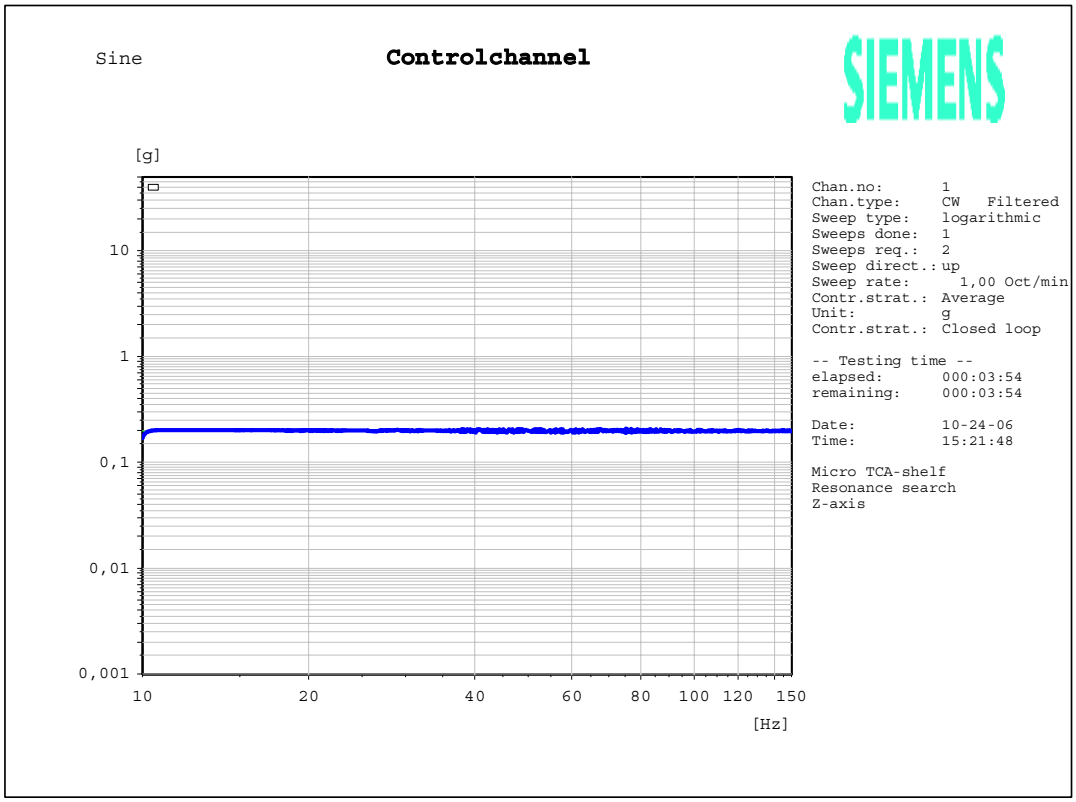
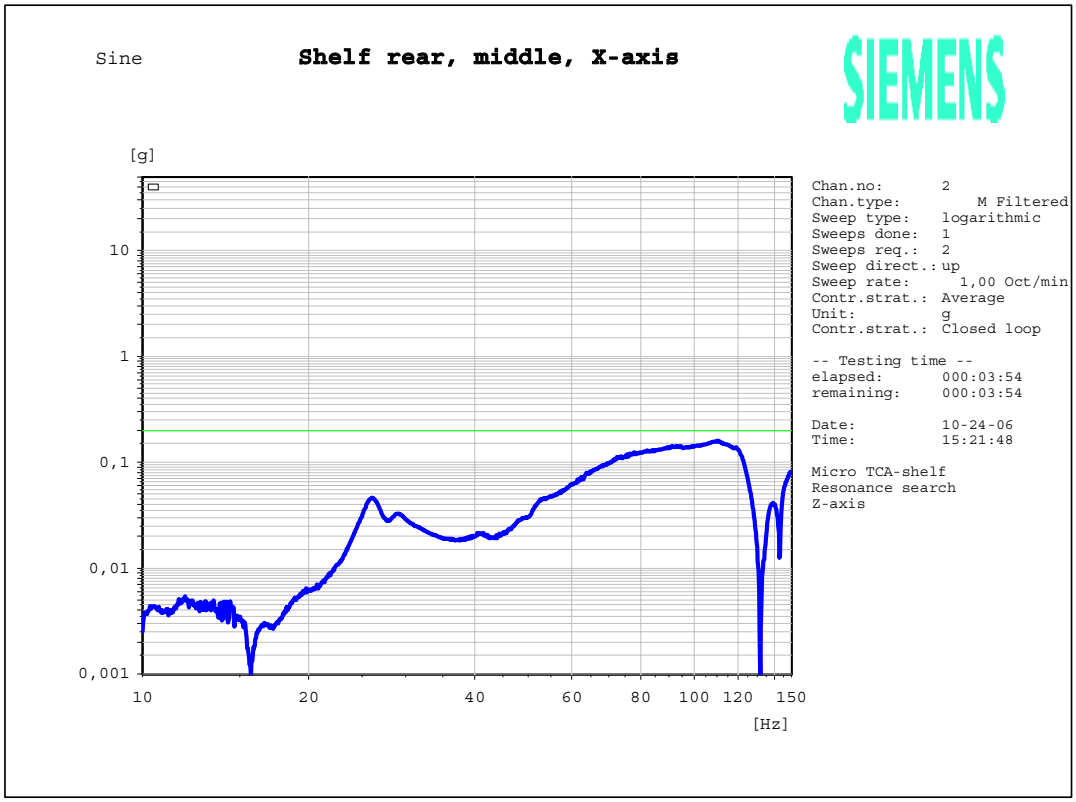
Resonance search Z-axis





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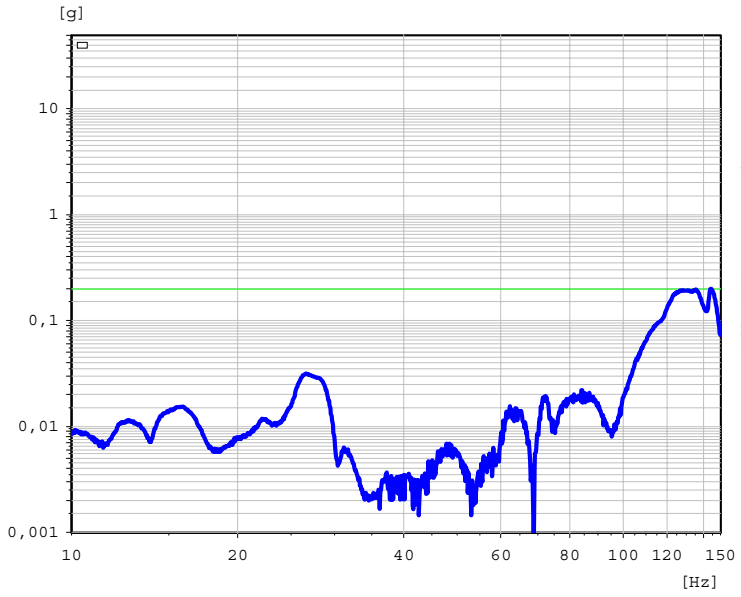
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Sine **Shelf rear, middle, Y-axis**

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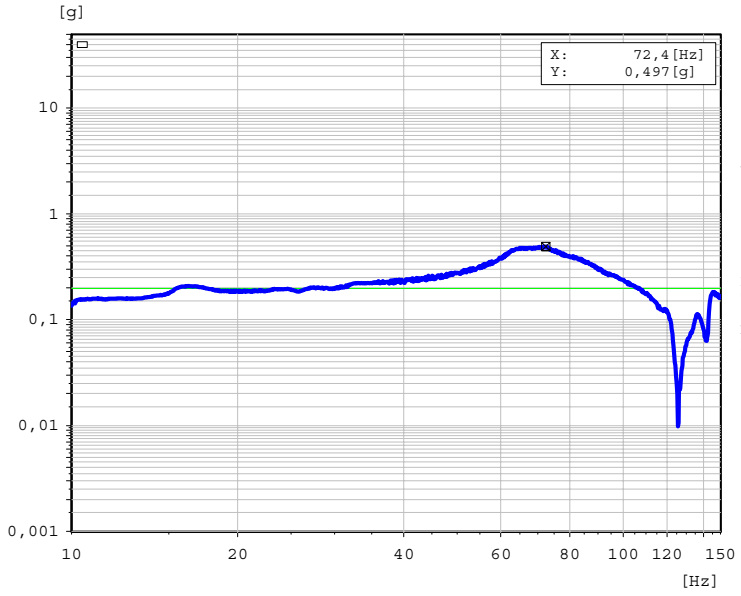
Sweep type:     logarithmic
Sweeps done:    1
Sweeps req.:    2
Sweep direct.:  up
Sweep rate:       1,00 Oct/min
Contr.strat.:   Average
Unit:           g
Contr.strat.:   Closed loop

-- Testing time --
elapsed:        000:03:54
remaining:      000:03:54

Date:           10-24-06
Time:           15:21:48

Micro TCA-shelf
Resonance search
Z-axis
```

Sine **Shelf rear, middle, Z-axis**

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Chan.no:        4
Chan.type:          M Filtered
Sweep type:     logarithmic
Sweeps done:    1
Sweeps req.:    2
Sweep direct.:  up
Sweep rate:       1,00 Oct/min
Contr.strat.:   Average
Unit:           g
Contr.strat.:   Closed loop

-- Testing time --
elapsed:        000:03:54
remaining:      000:03:54

Date:           10-24-06
Time:           15:21:48

Micro TCA-shelf
Resonance search
Z-axis
```

6.1.1.2 Vibration (sinusoidal)

Test	Parameter	Test Severity	Reference	Method
Vibration sinusoidal	Displacement Acceleration Frequency range Axes of vibration Duration	0,075 mm 9,8 m/s² 10-62 Hz 62-200 Hz 3 3 x 20 sweep cycles	IEC 60068-2-6	Fc: Vibration (sinusoidal)

Test Performance

Mounting of EUT the same as for Resonance search (see 6.1.1.1)

The test was performed in 3 mutually perpendicular axes.

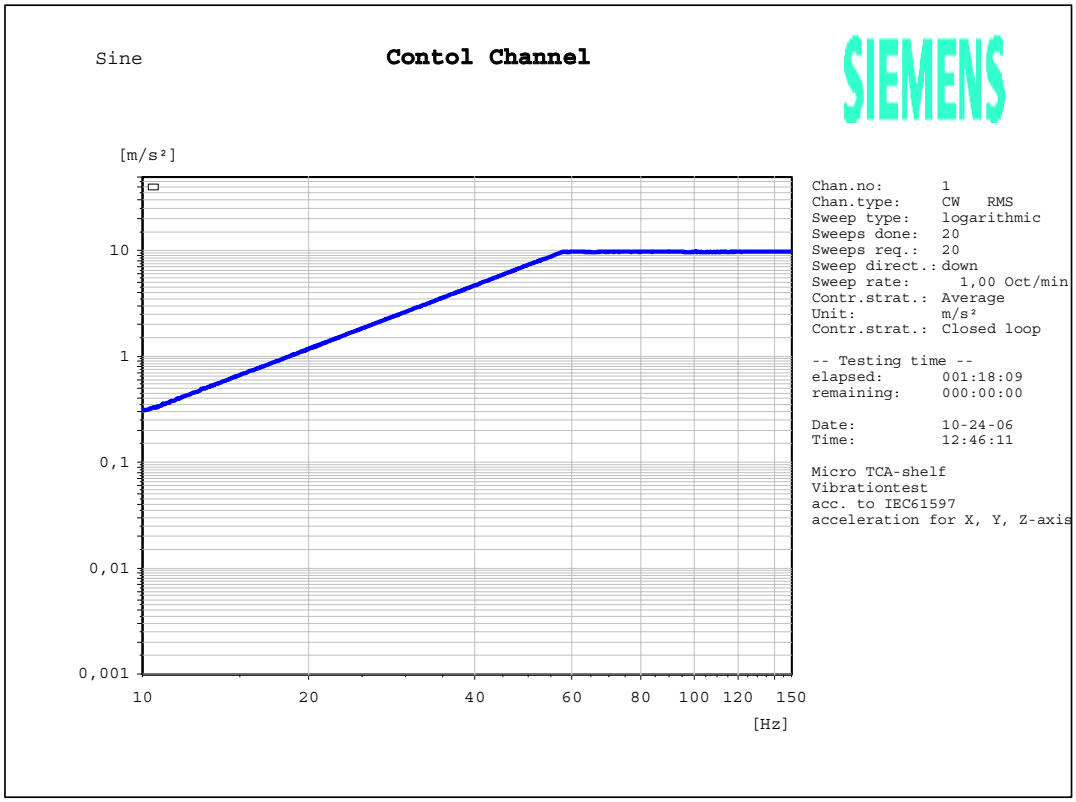
horizontal longitudinal front to back = Y-axis
horizontal lateral = X-axis
vertical = Z-axis

The tests were performed in normal use attitude.

Test Result

No visible mechanical deviations were identified.

Diagram of the recorded acceleration at vibrator table:



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6.1.1.3 Shock

Test	Parameter	Test Severity	Reference	Method
Shocks	Shock spectrum Shock duration Acceleration Number of Shocks Directions of Shocks	half sine 11 ms 30 m/s² 3 in each dir. 6	IEC 60068-2-27	Ea: Shock

Test Performance

Mounting of EUT the same as for Resonance search (see 6.1.1.1)

The test was performed in 3 mutually perpendicular axes.

horizontal longitudinal front to back = Y-axis
horizontal lateral = X-axis
vertical = Z-axis

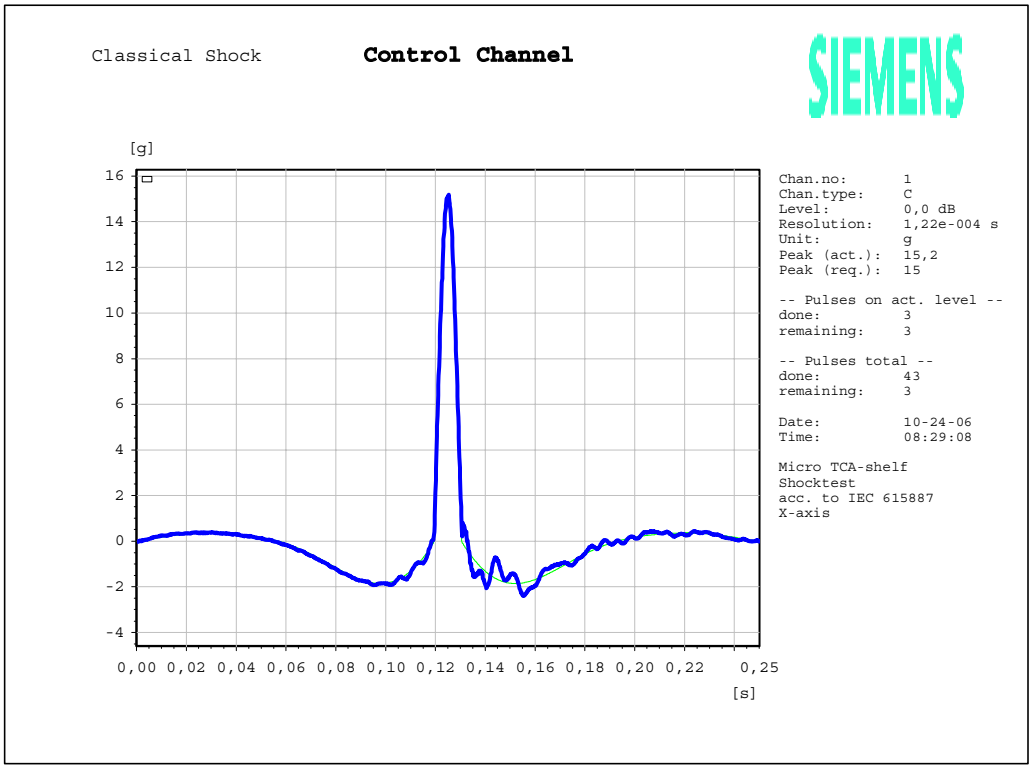
The tests were performed in normal use attitude.

Test Result

No visible mechanical deviations were identified.

Diagrams of the recorded acceleration at vibrator table:

X-axis



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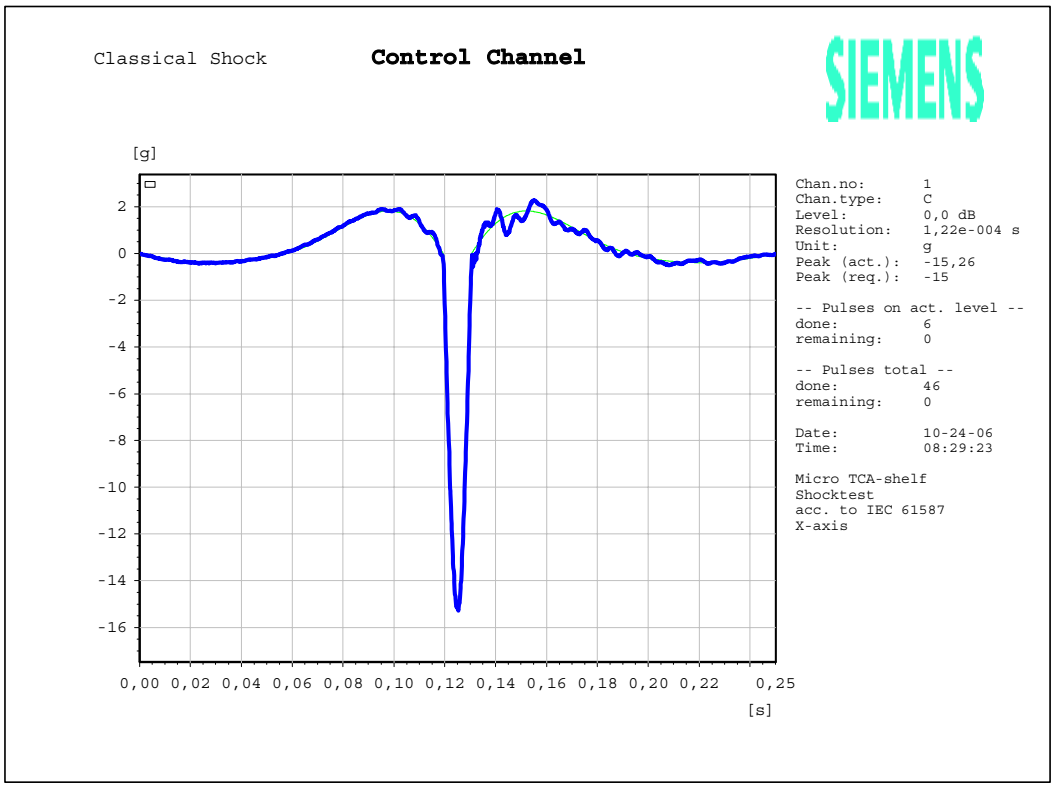
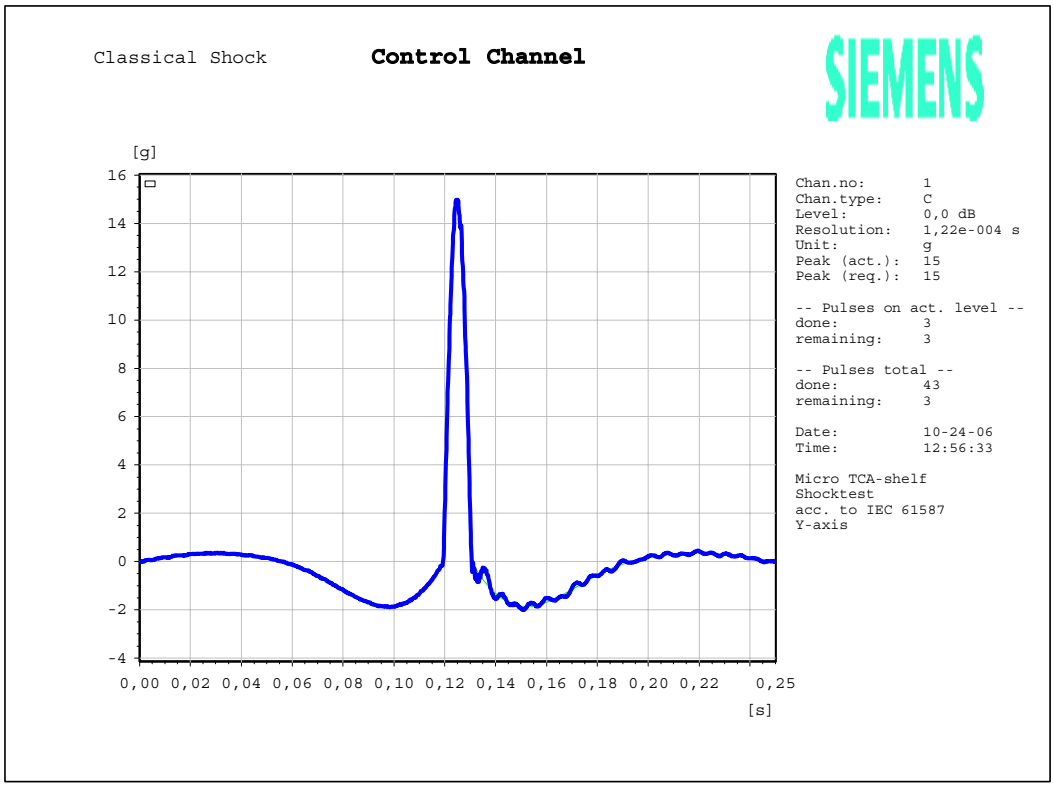


Y-axis



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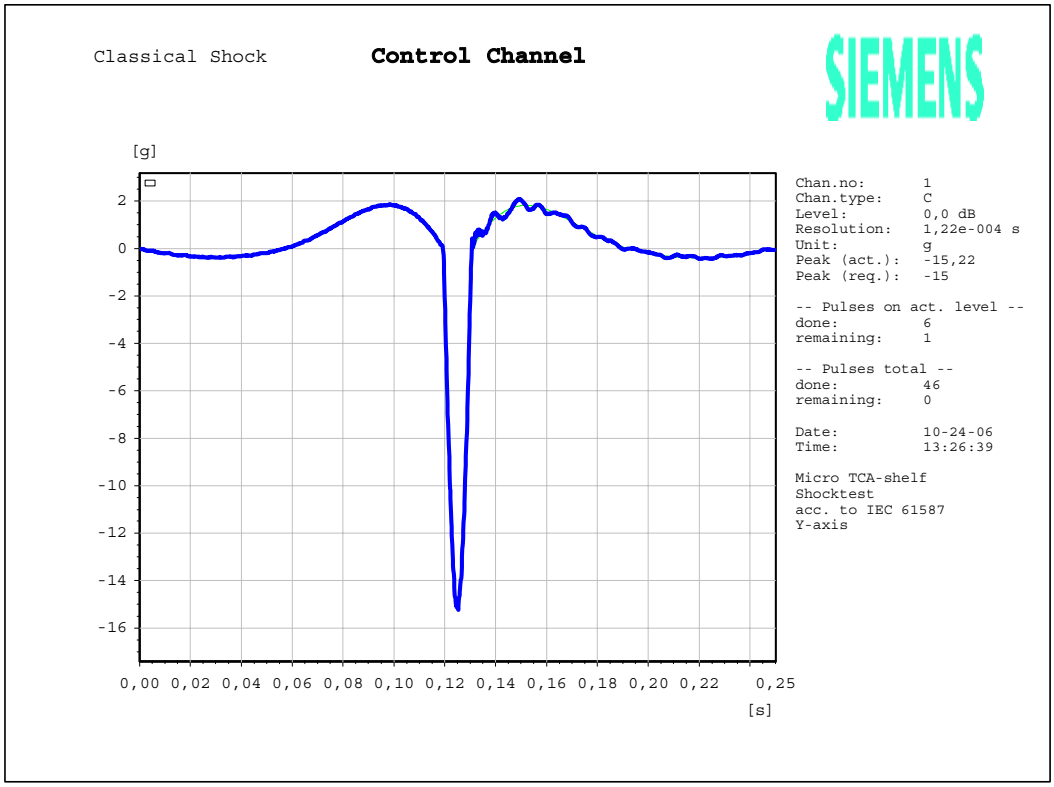
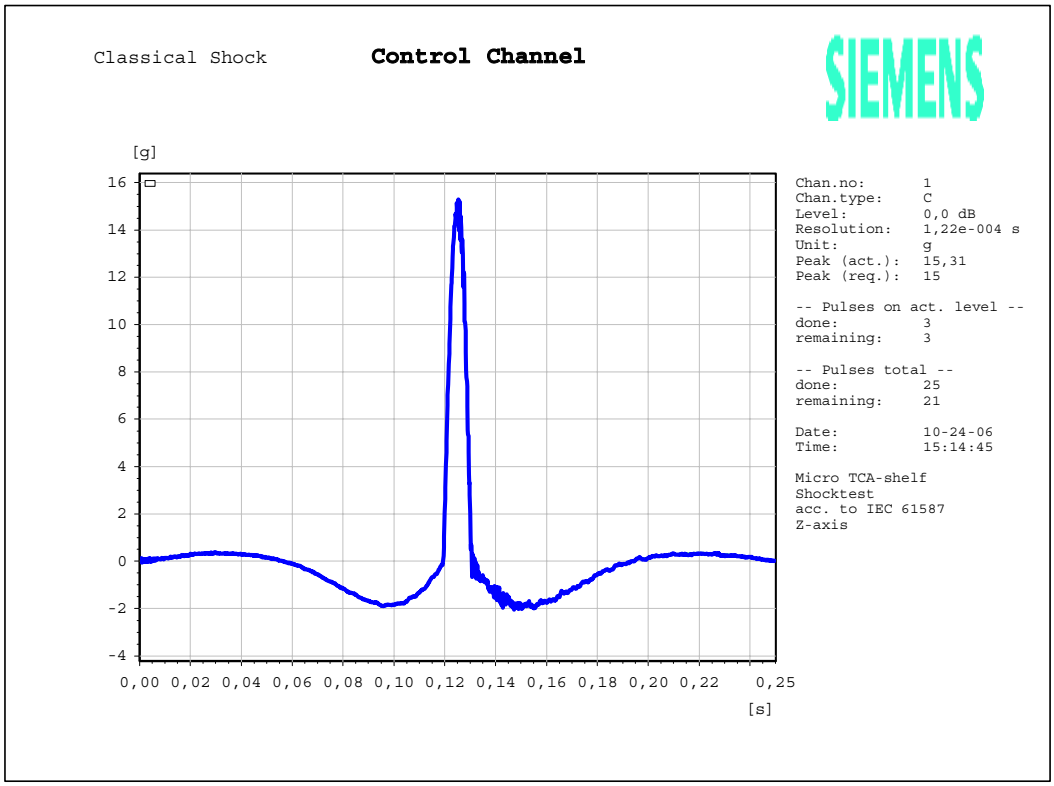


Z-axis



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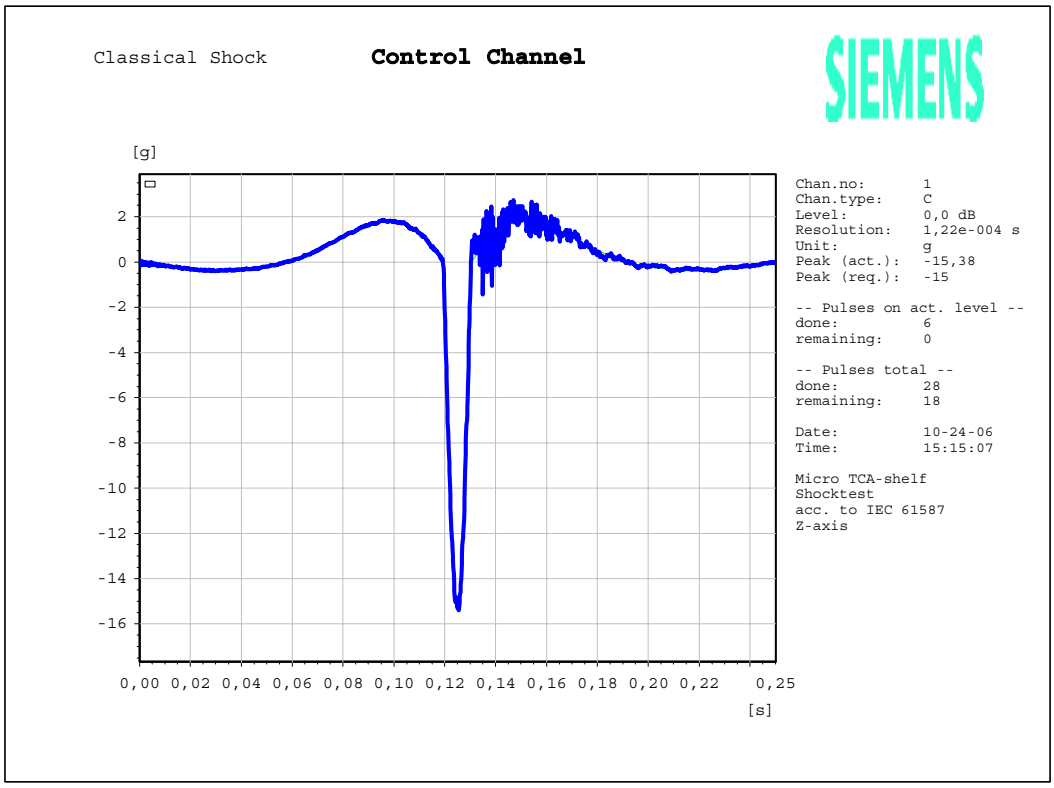

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6.2 Earthquake test:

IEC 61587-2: 2000-12
Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297;
Part2: Seismic tests for cabinets and racks

Waveform A

6.2.1.1 Earthquake Waveform and Required Response Spectrum

Test	Parameter	Dim	Test severity	Duration	Reference	Method
Earthquake Time History	RRS		Table 5	30 sec	IEC 68-2-57	Ff: Time History Method
	Frequency Range	Hz	1 – 15			
	ZPA	m/s^2	16			
	Axes		3			
	Damping ratio	%	2			

Table 5 Acceleration Coordinates for the RRS

Co-ordinate Point	Frequency (Hz)	Ground Acceleration (m/s^2)
1	1,0	30
2	2,0	50
3	5,0	50
4	15,0	16
5	50,0	16

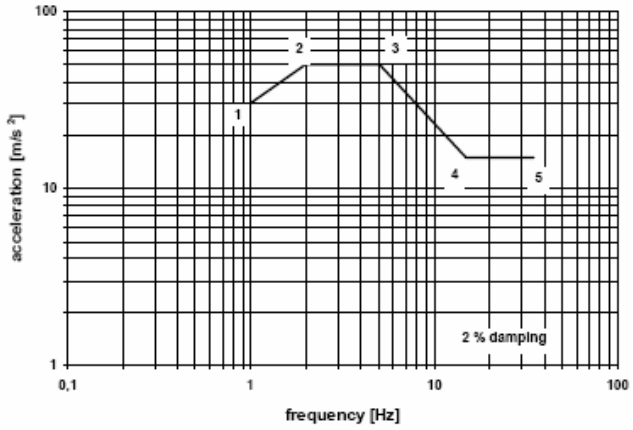

Fig. 6.1: Earthquake Requiered Response Spectrum

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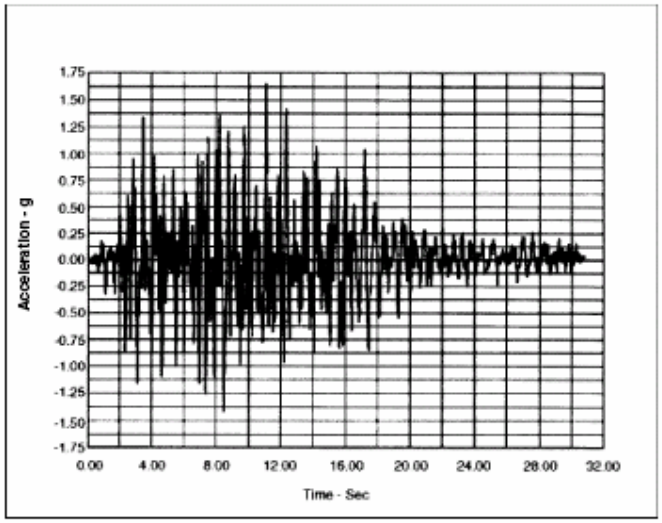

Fig. 6.2: Earthquake Synthesized Waveform VERTEQ II Zone4

Test Performance

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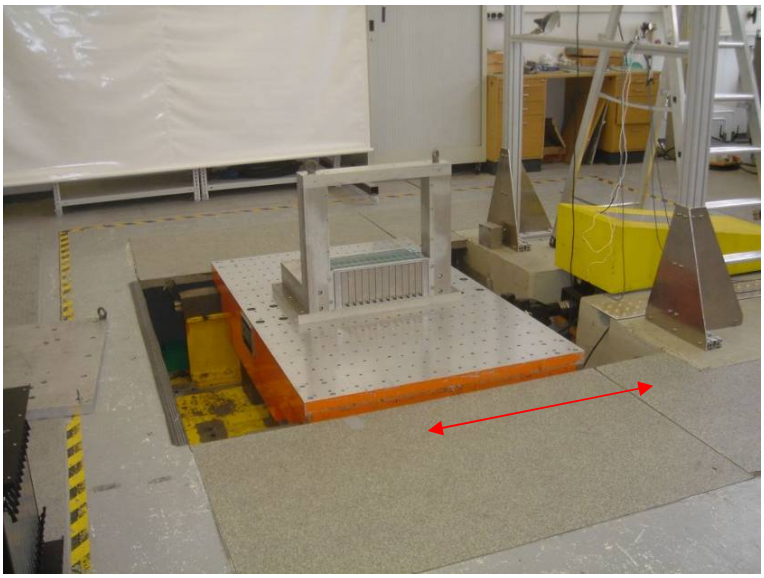
For the tests the EUT was screwed with 8x M6 screws into a special mounting frame and were fixed to the earthquake table (see pic 11-13).

The test was performed in 3 mutually perpendicular axes.

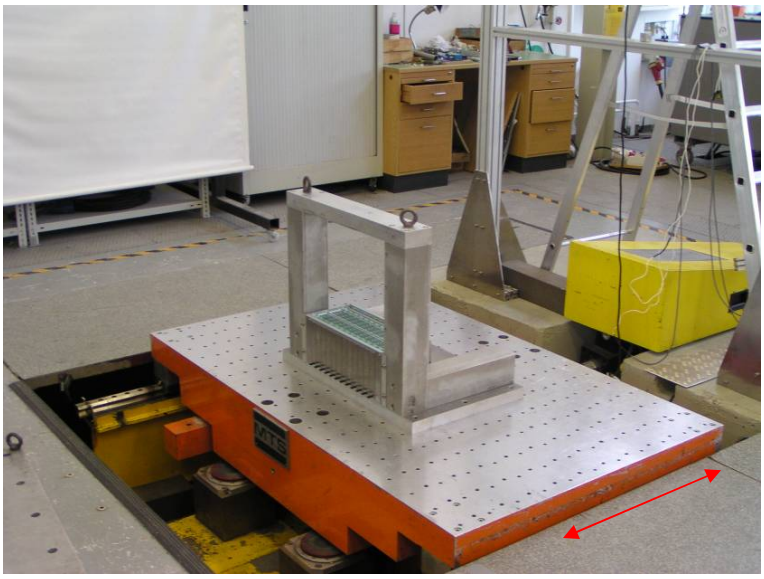
horizontal longitudinal front to back = Y-axis
horizontal lateral = X-axis
vertical = Z-axis

The tests were performed in normal use attitude.

A video taken from tests in all three axes is part of the documentation.



Pic. 6 Mounting of EUT X-Axis (horizontal lateral)



Pic. 7 Mounting of EUT Y-Axis (horizontal longitudinal)

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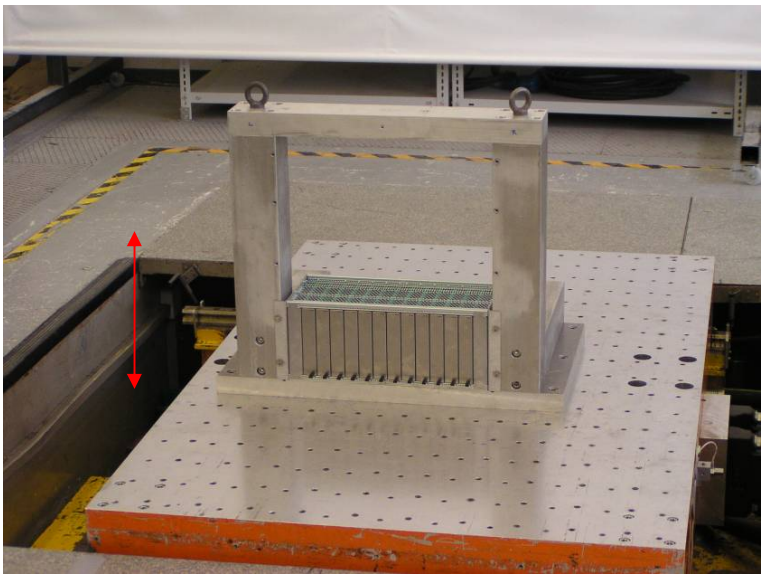
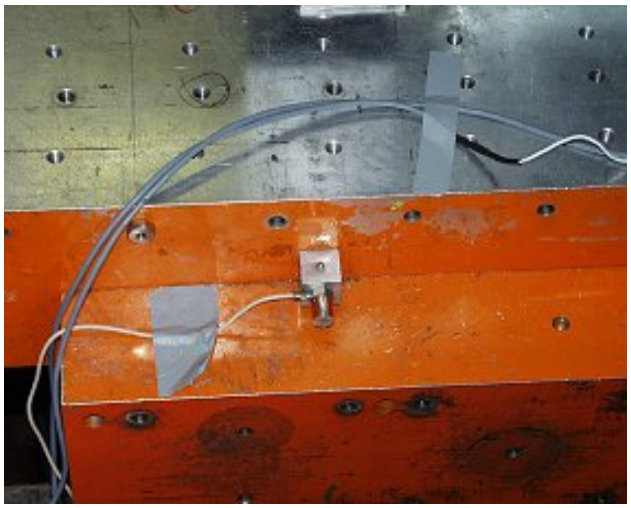


Pic. 8 Mounting of EUT Z-Axis (vertikal)

For Z-axis test (vertical), a vertically oriented piston underneath the table is used.

Control point in direction of excitation and recording the time history over a time of 35 sec



Pic. 9 Measuring point – earthquake table

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6.3 Test Result

No visible mechanical deviations were identified.

Earthquake TRS vs. RRS and Acceleration at EUT

The shaker table's analysed acceleration, known as Test Response Spectrum (TRS, red line), must meet or exceed the Required Response Spectrum (RRS, blue line) for the Earthquake Risk Zone 4 in the range from 1.0 to 35 Hz.

The following diagrams show the recorded plots for each axis.

Excitation in direction of x-axis

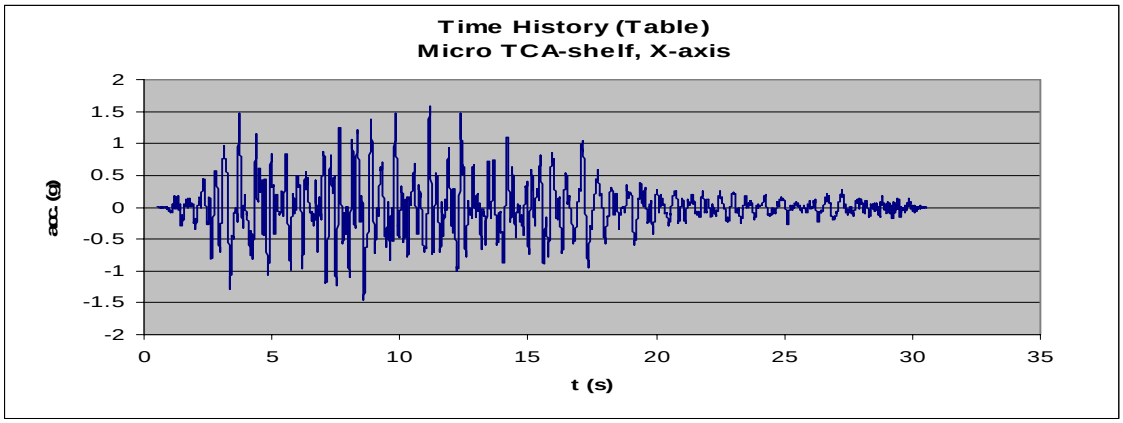

Fig. 6.3: Time history signal at the table

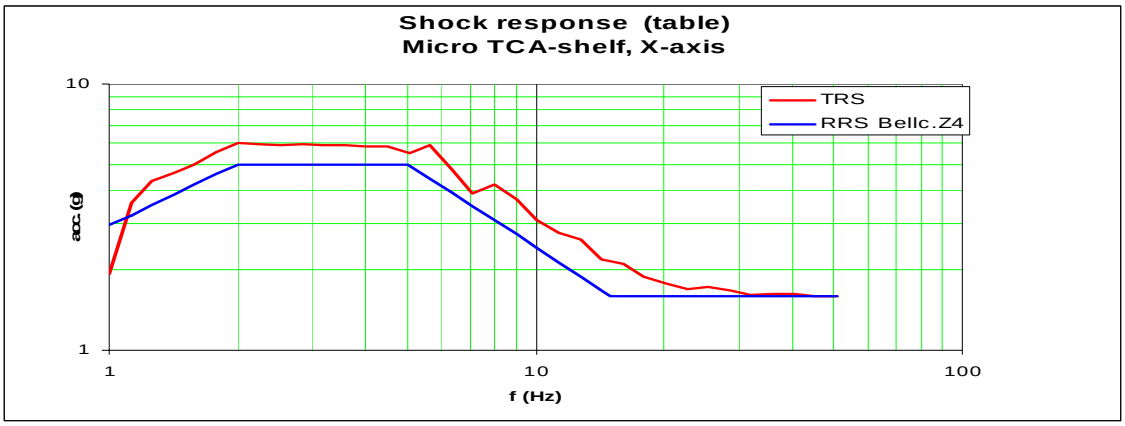

Fig. 6.4: RRS and TRS at the table

Excitation in direction of y-axis

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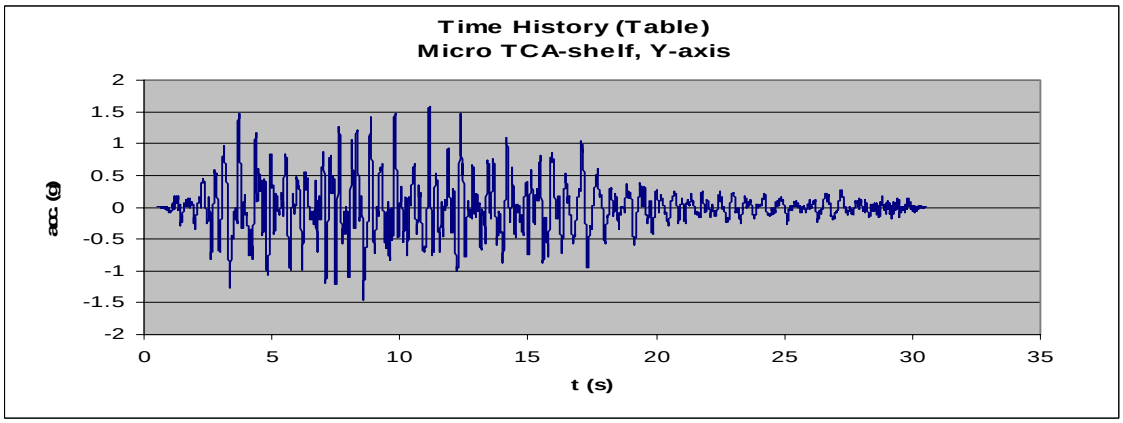

Fig. 6.5: Time history signal at the table

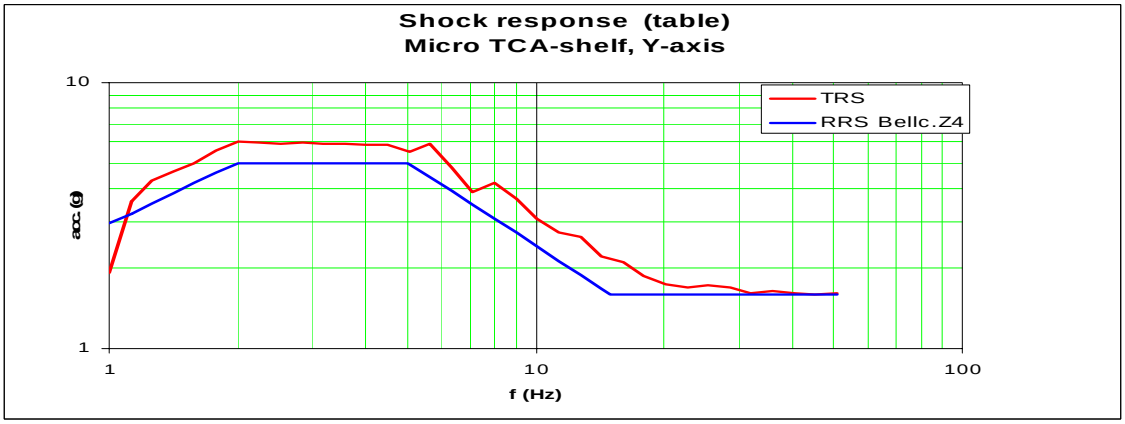

Fig. 6.6: RRS and TRS at the table

Excitation in direction of z-axis

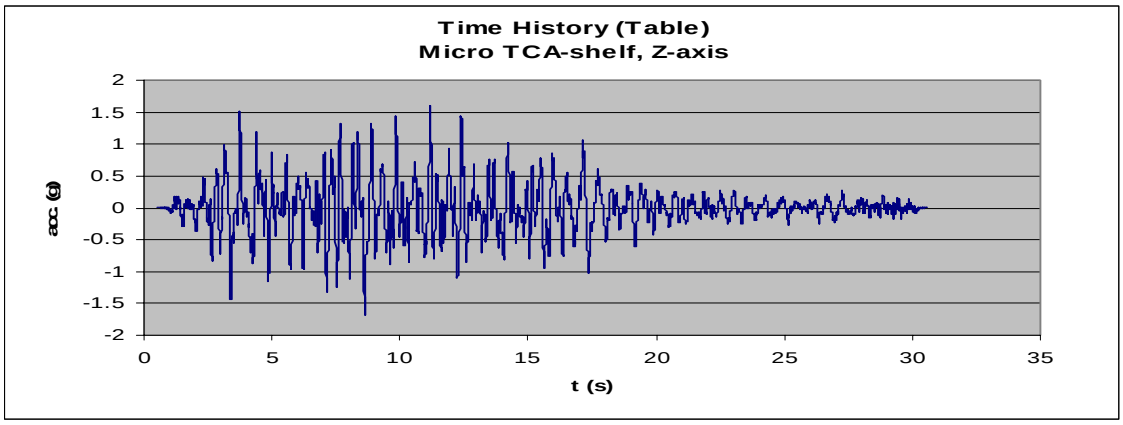

Fig. 6.7: Time history signal at the table

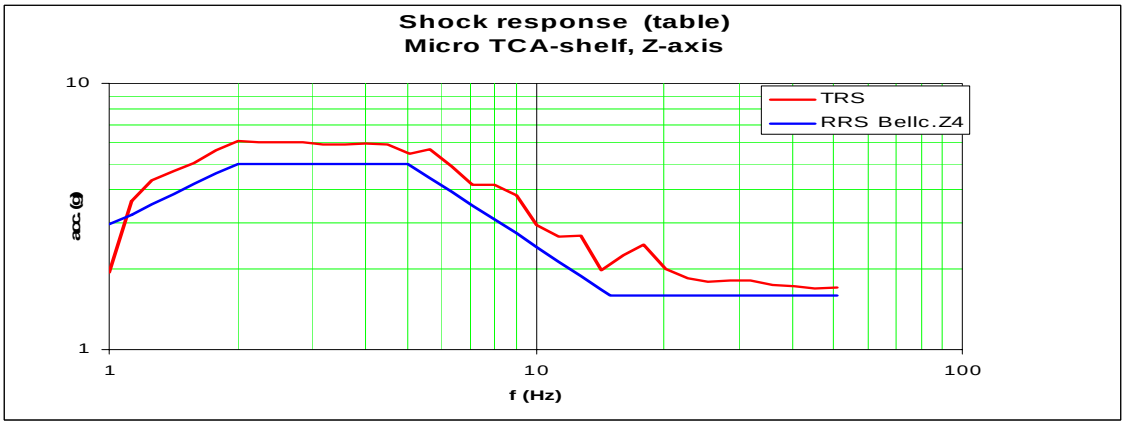

Fig. 6.8: RRS and TRS at the table

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