

MECHANICAL TEST REPORT

According to the standard method:
IEC 60068-2-6 (2007)

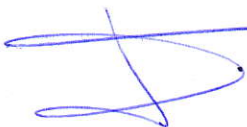
Equipments under test:
- 1 detector
- 1 power supply AL200HD
1 power supply AL175

Company:
LOREME SA

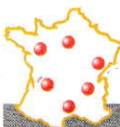
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Company: LOREME SA

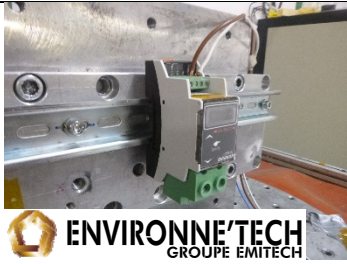
Number of pages: 64
Included 37 pages in appendix

Ed.	Date	Modified Pages	Written by	Technical Verification	Quality Approval
			Name, function and Visa	Name, function and Visa	Name, function and Visa
00	21/04/2023	Creation	Laura MARMONIER Mechanical Tests Technician 	Benjamin VUGIER Mechanical Tests Technician 	Renaud MOREAU Mechanical Tests Engineer 

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EQUIPMENT UNDER TEST:

Name :	One detector one cutoff	One power supply AL200HD	One power supply AL175
Ref :	DSL35LCC/R1	AL200HD-D-WD	AL175-D-WD
Serial :	11111/198	142741/2	142741/1
Date :	06/23	06/23	06/23
Photo :	 photo 1	 photo 2	 photo 3

MANUFACTURER: LOREME SA

CUSTOMER'S NAME AND ADDRESS:
Company: LOREME SA

Address: 12, rue des Potiers d'Etain Actipôle BORN
B.P.35014
57071 METZ CEDEX 3 – FRANCE

Contact: Mr REPPERT

PURCHASE ORDER: N° E230081-AVNT

TEST DATES: From 12th to 14th April, 2023

TEST LOCATION: Test Laboratory of Bourgoin-Jallieu

TESTER: Laura MARMONIER

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1. PURPOSE OF THE TESTS.

Purpose of 23C136 test run was to confirm the vibration resistance of three equipment.

2. EQUIPMENT SUBMITTED FOR TESTING.

The equipment to be tested was one detector / one power supply AL200HD / one power supply AL175:

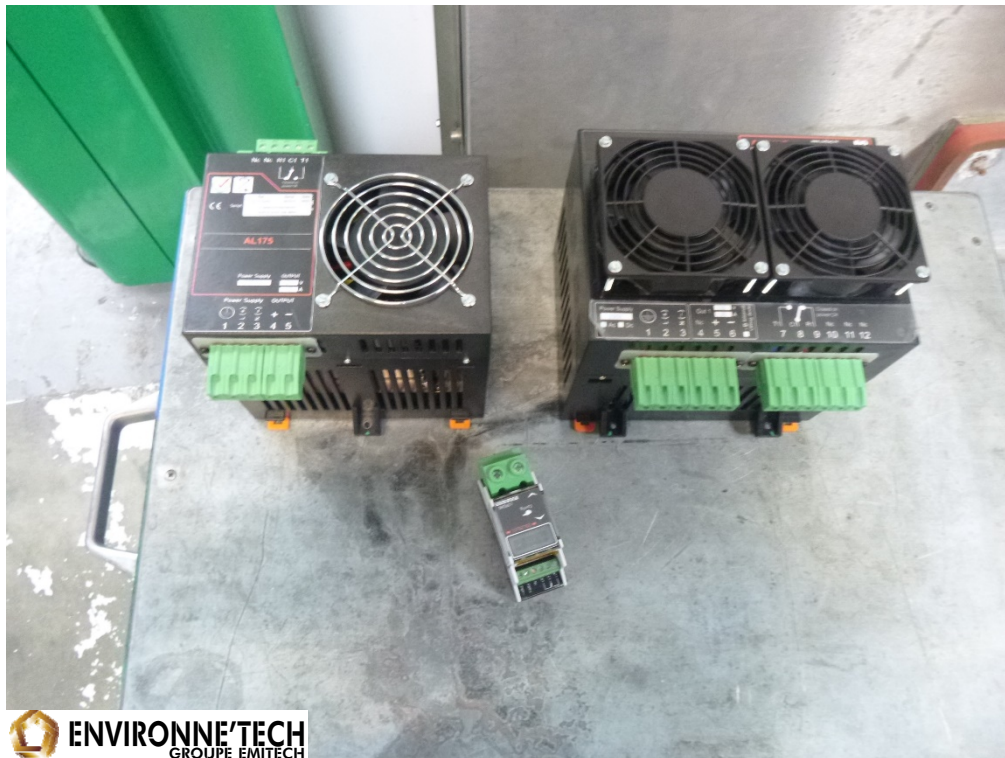


photo 4

The equipment carried the Environne'Tech test number: 23C136.

3. CUSTOMER SPECIFICATIONS SHEET.

The tests shall be conducted as per following document and as per *Environne'Tech Offer* ENVESS23C136LOR - 00V01.

3.1. *Reference document:*

Tests are to be carried out according to the following documents as included in the ENVESS23C136LOR - 00V01 Technical and Commercial Offer:

- According to the standard method:
 - o IEC 60068-2-6 (2007)

3.2. *Reminder of the main test criteria:*

3.2.1. *Vibration test RFS:*

Standard: IEC 60068-2-6 (2007)

Test:

- Test type: Sinusoidal vibrations
- Frequency range: 2* Hz to 100 Hz
- Number of axis: along 3 axes (Ox, Oy and Oz)
- Sweep rate: 1 oct/min
- Number of sweep: 1
- State of specimen: ON
- Level:
 - o 2 to 13.2 Hz: $\pm 1\text{mm}$
 - o 13.2 to 100 Hz: 0.7g

Measuring and recording all resonance frequencies ($Q \geq 2$) on each position.

**The 2-5Hz frequency range is not covered by COFRAC accreditation.*

3.2.2. *Vibration test Endurance:*

Standard: IEC 60068-2-6 (2007)

Test:

- Test type: Sinusoidal vibrations
- Frequency range: 2* Hz to 100 Hz
- Number of axis: along 3 axes (Ox, Oy and Oz)
- Time: 90 minutes on each resonance frequency (if there is no resonance frequencies, an endurance vibration test will be carried out at 30 Hz during 90 minutes)
- State of specimen: ON
- Level:
 - o 2 to 13.2 Hz: $\pm 1\text{mm}$
 - o 13.2 to 100 Hz: 0.7g

*The 2-5Hz frequency range is not covered by COFRAC accreditation.

3.3. *Functional control verification:*

Visual inspection and operating to be conducted before, during and after each test by Environne'Tech.

Functional check

- One detector: the display must remain on throughout the test.
- One power supply A1200HD: check the supply outlet voltage before and after each test. It should be approximately 110 V.
- One power supply A1175: check the supply outlet voltage before and after each test. It should be approximately 25 V.

4. EQUIPMENT USED.

4.1. Test facilities.

Identity	Designation	Brand and Model	Characteristics
MECA 76	Electrodynamic vibrator	LDS V875-640T	35kN; 5Hz to 2000Hz; resonance 2200Hz sine: 35kN; 25.4 mmPeak; 1.5m/sPeak; 50gPeak random: 33kNeff; 75geff / impact 1/2sine: 93kN
MECA 470	Electrodynamic vibrator	LDS V860	28kN; 5Hz to 2500Hz; resonance 2100Hz; sine: 28kN; 12,5mmPeak; 1.78m/sPeak ; 48gPeak random 28kNeff ; 48geff
MECA 32	Electrodynamic vibrator	LDS V805	13kN; 5Hz to 2400Hz; resonance; freq.: Reso: 2450Hz 117g max mass of the movable coil: 11.6kg; table Ø640mm.

4.2. Measurement Equipment.

Identity	Designation	Brand and Model	Characteristics	Last validity date	Metrological confirmation valid until
MECA 821	Accelerometer	PCB 353B33	sensitivity: 100.4 mV/g at 160Hz	24/08/2022	24/10/2023
MECA 655	Accelerometer	PCB 356B21	X: 9.98 mV/g, Y: 10.08 mV/g, Z: 9.98 mV/g at 160Hz	27/03/2023	27/05/2024
MECA 680	Accelerometer	PCB 356B21	X: 10.22 mV/g, Y: 10.42 mV/g, Z: 10.20 mV/g at 160Hz	18/07/2022	18/09/2023
MECA714	Accelerometer	PCB 353B34	sensitivity: 96.9 mV/g at 160Hz	19/07/2022	19/09/2023
MECA 815	Accelerometer	PCB 353B33	sensitivity: 100.7 mV/g at 160Hz	27/09/2022	27/11/2023
MECA 749	Accelerometer	PCB 356A02	X: 9.55 mV/g, Y: 9.55 mV/g, Z: 9.63 mV/g at 160Hz	01/06/2022	01/08/2023
MECA 683	Accelerometer	PCB 356B21	X: 10.35 mV/g, Y: 10.32 mV/g, Z: 10.33 mV/g at 160Hz	10/11/2022	10/01/2024
MECA 338	Control generator	LDS LASER	measurement 16 channels; sine, random, impact, level limitation; 1Hz to 5000Hz	14/06/2022	14/08/2024

4.3. Test tools:

The tools used are provided Environne'Tech.

5. TEST LOG.

5.1. *One Detector one cutoff:*

5.1.1. *Orientation of the equipment:*

Photo of the specimen with the associated mark given below:

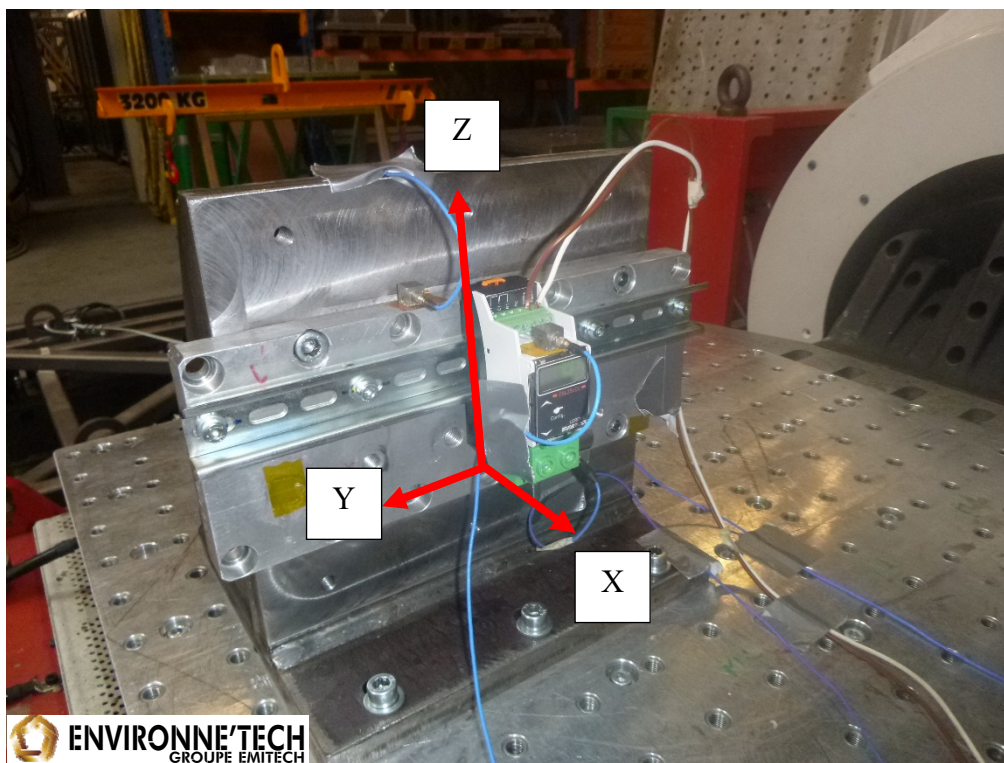


photo 5

5.1.2. *Instrumentation of the equipment:*

The pictures of the measurement and verification point below:

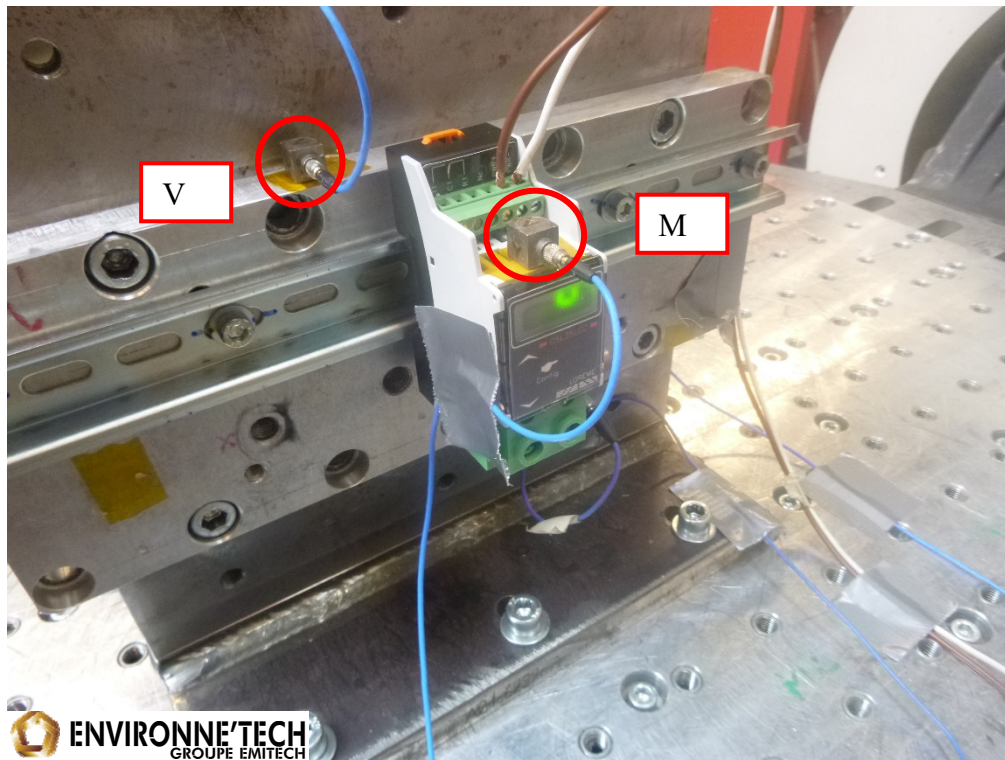


photo 6

5.1.3. Test setup:

5.1.3.1. Axis X:

Test setup is presented below:

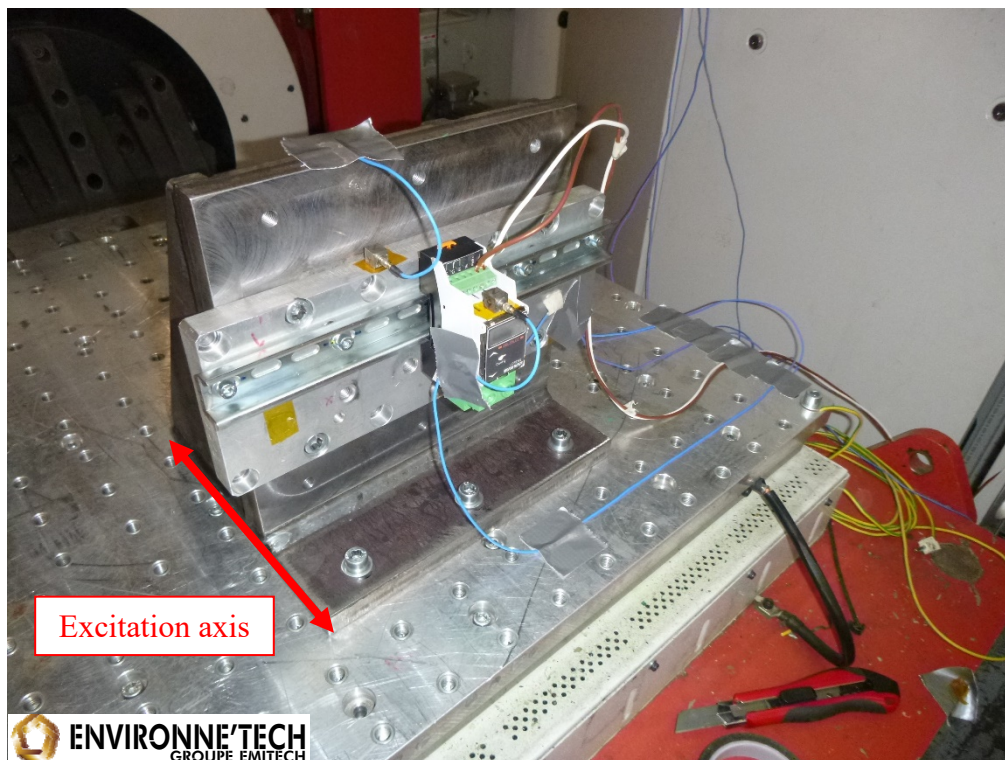


photo 7

One control accelerometer is located on the fixtures (P1).

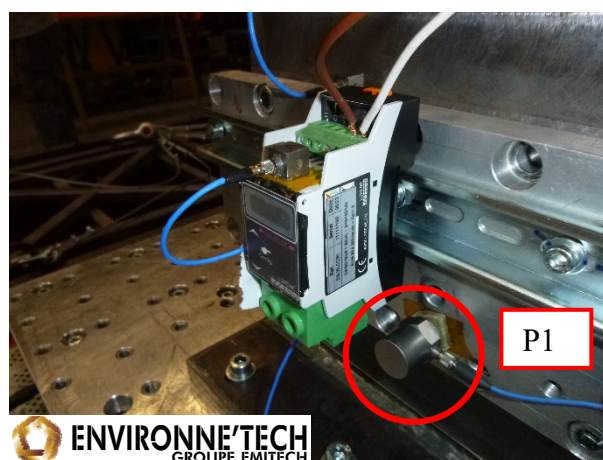


photo 8

5.1.3.2. Axis Y:

Test setup is presented below:

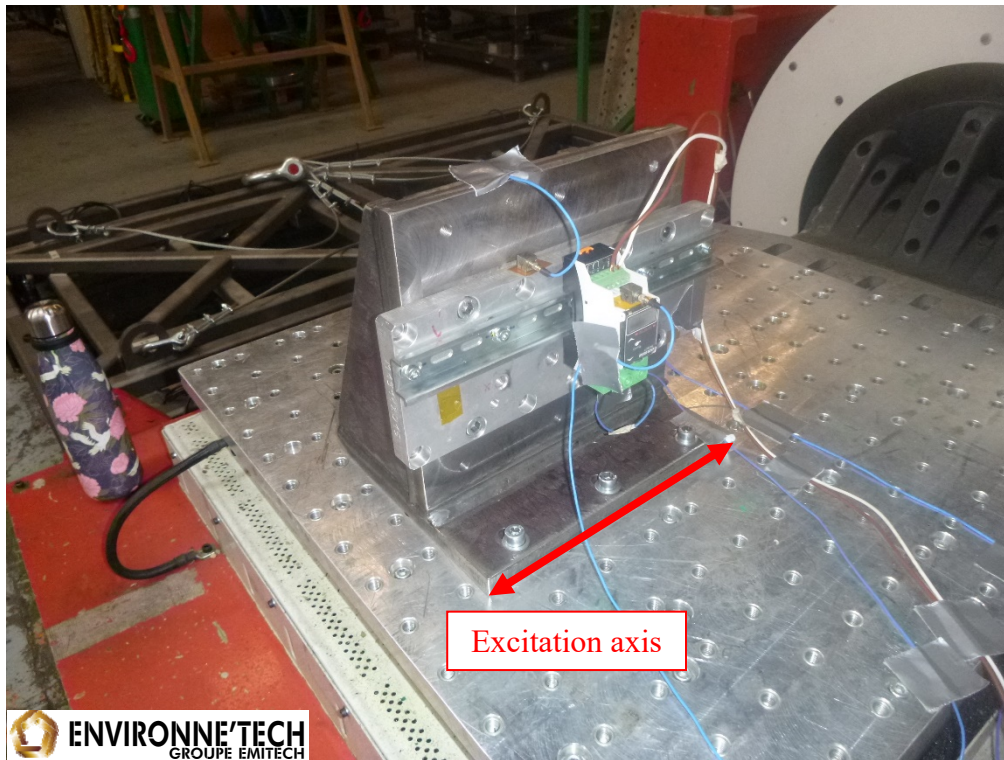


photo 9

One control accelerometer is located on the fixtures (P1).

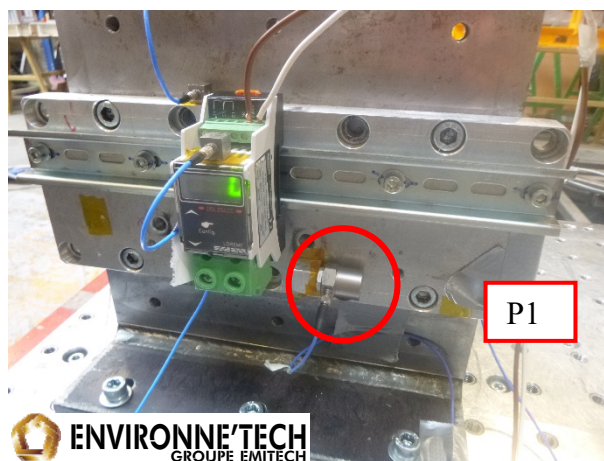


photo 10

5.1.3.3. Axis Z:

Test setup is presented below:

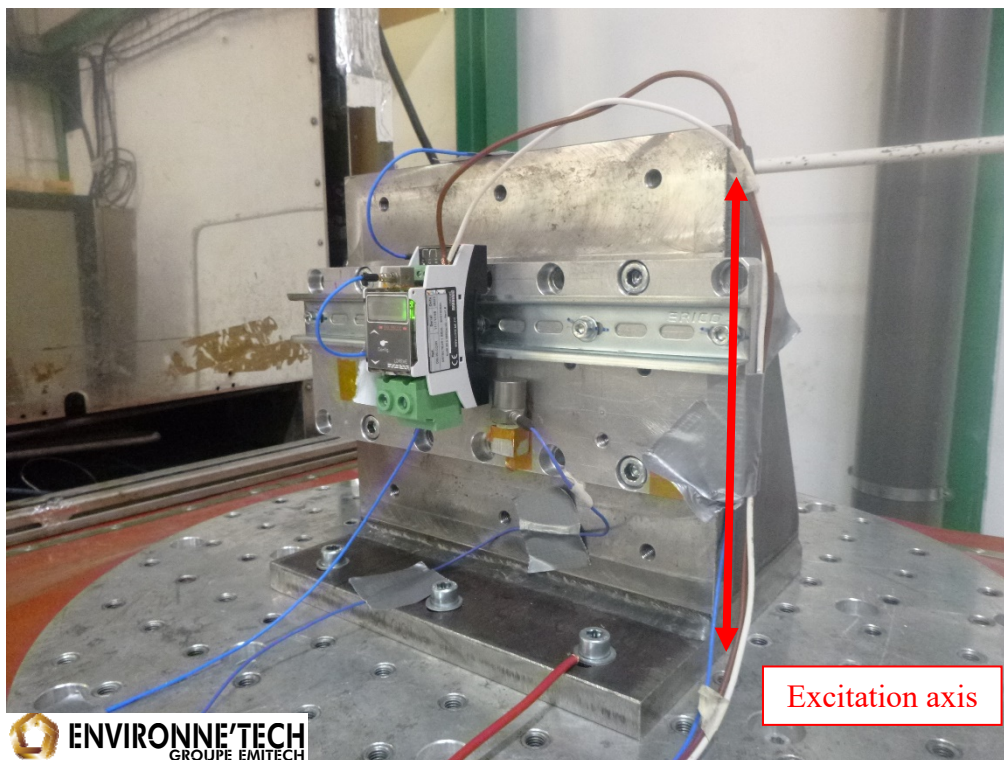


photo 11

One control accelerometer is located on the fixtures (P1).

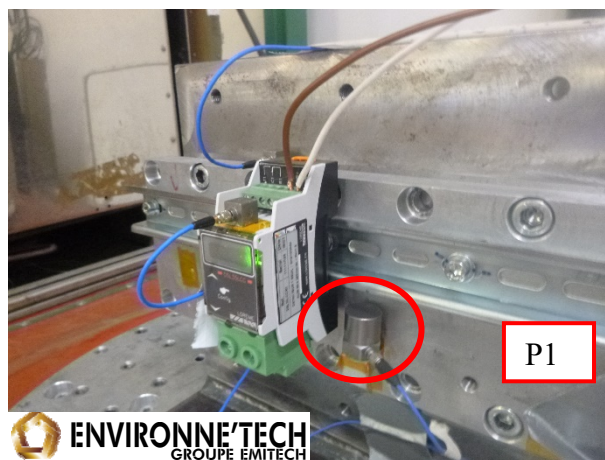


photo 12

5.1.4. Test sequence:

A summary table of the chronology of tests is given below:

Date	Axis	Type of test	Mechanical breakage	Display on
12/04/2023	X	Test: - IACS RFS => No resonance frequency - IACS Endurance at 30Hz		
			No	Yes
13/03/2023	Y	Test: - IACS RFS => No resonance frequency - IACS Endurance at 30Hz	No	Yes
			No	Yes
	Z	Test: - IACS RFS => No resonance frequency - IACS Endurance at 30Hz	No	Yes
			No	Yes

The curves, the detail of the results and the COFRAC conformity are presented in appendix.

5.2. *One power supply AL200HD:*

5.2.1. *Orientation of the equipment:*

Photo of the specimen with the associated mark given below:

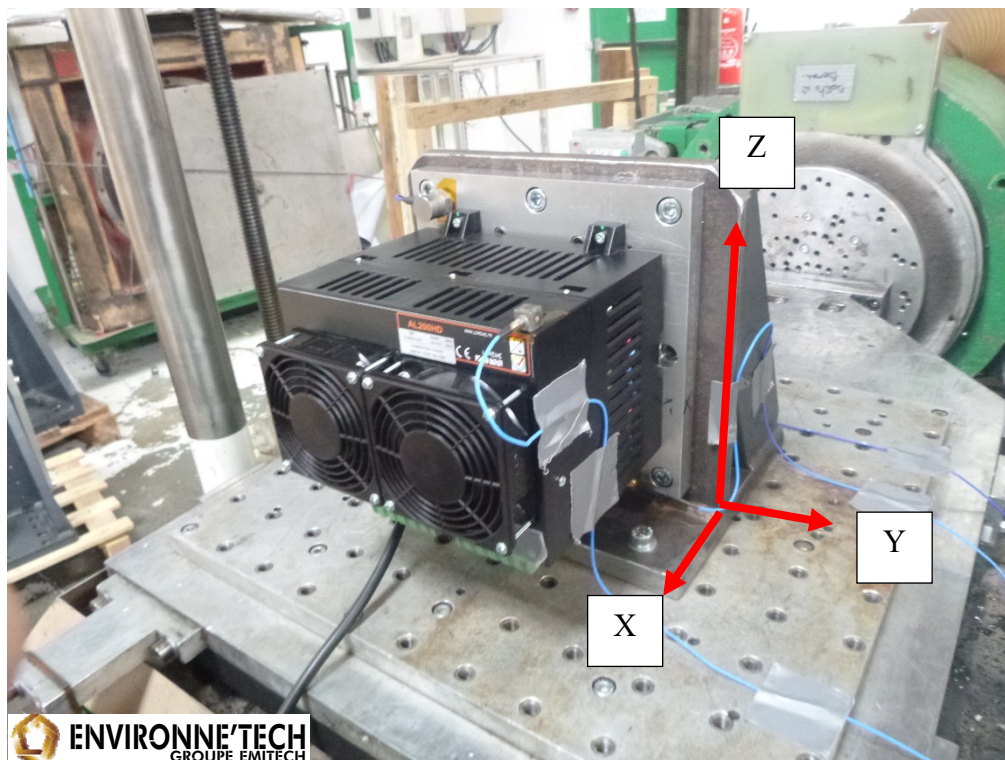


photo 13

5.2.2. Instrumentation of the equipment:

The pictures of the measurement and verification point below:

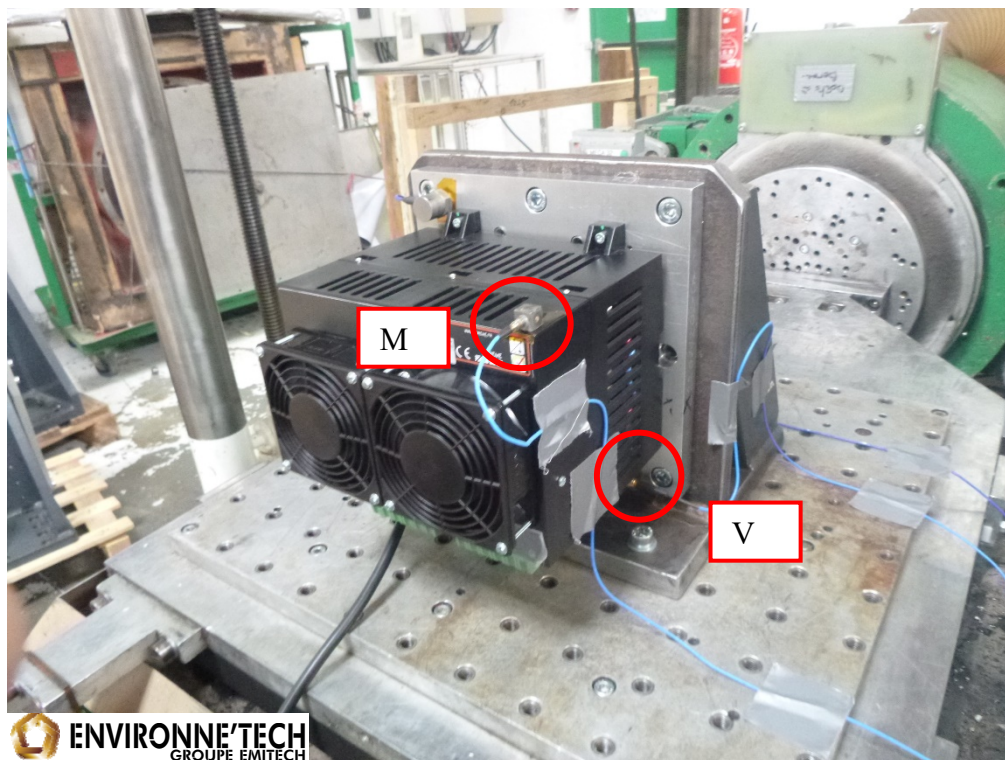


photo 14

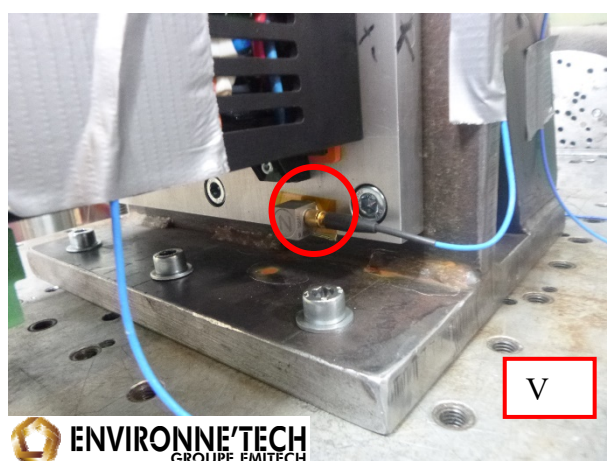


photo 15

5.2.3. Test setup:

5.2.3.1. Axis X:

Test setup is presented below:

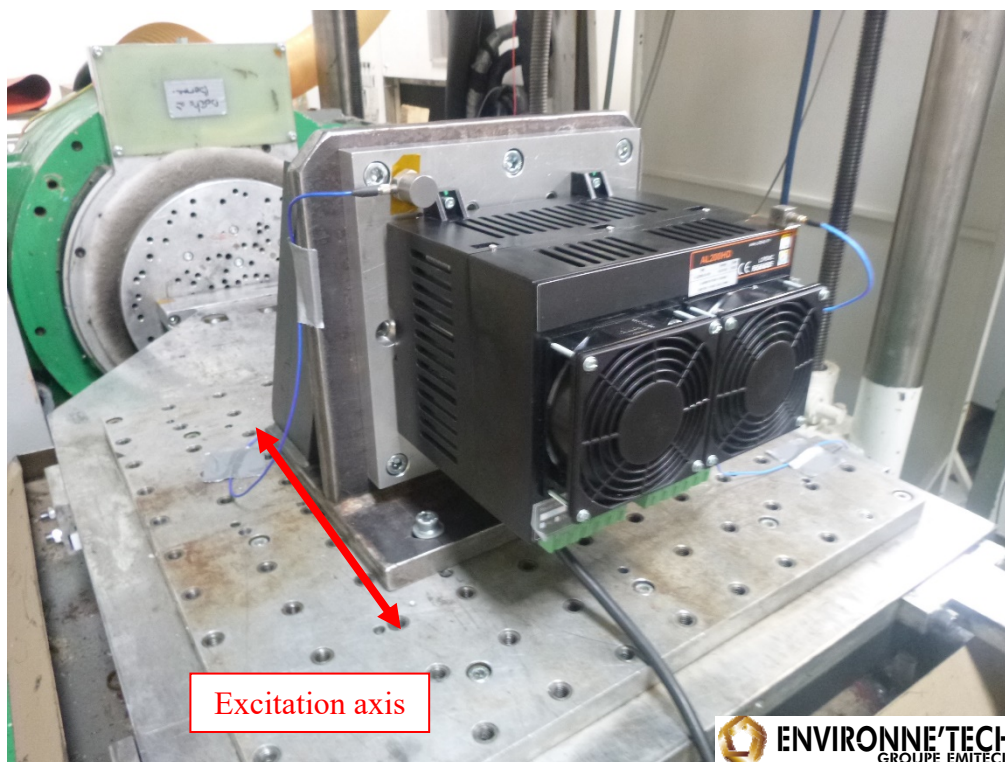


photo 16

One control accelerometer is located on the fixtures (P1).

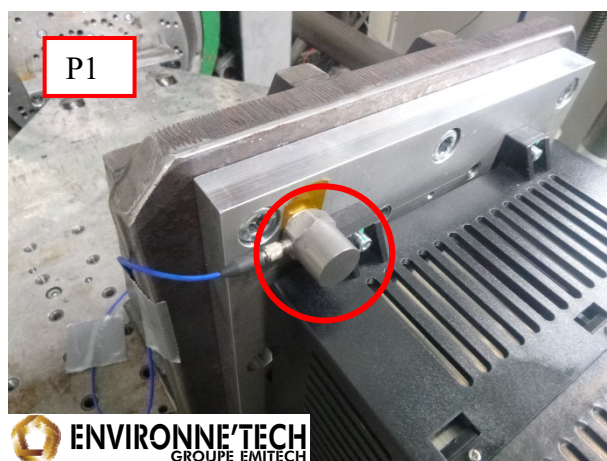


photo 17

5.2.3.2. Axis Y:

Test setup is presented below:

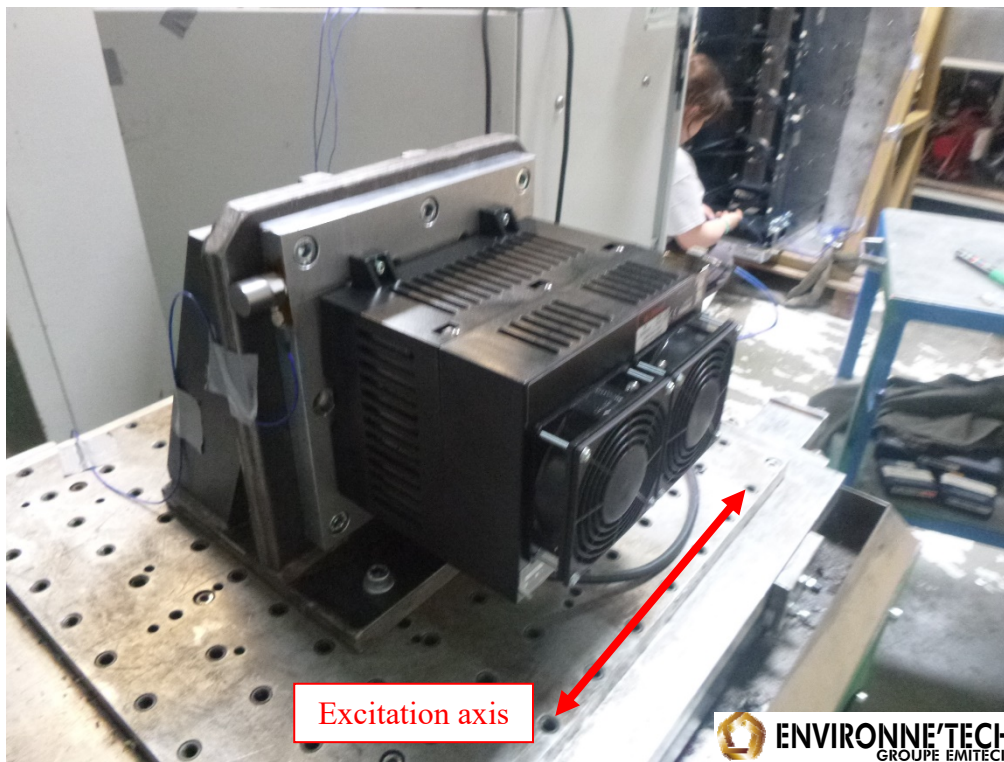


photo 18

One control accelerometer is located on the fixtures (P1).

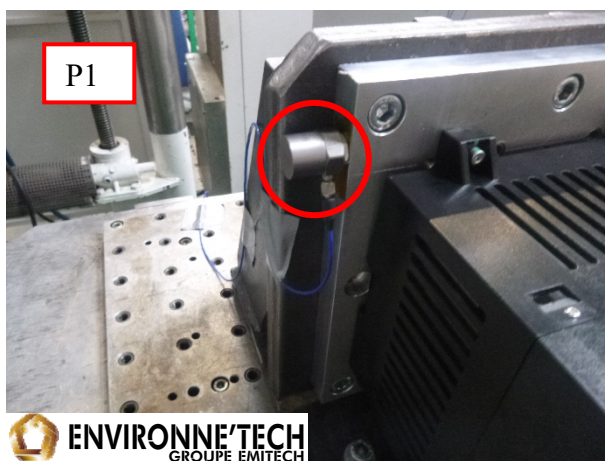


photo 19

5.2.3.3. Axis Z:

Test setup is presented below:

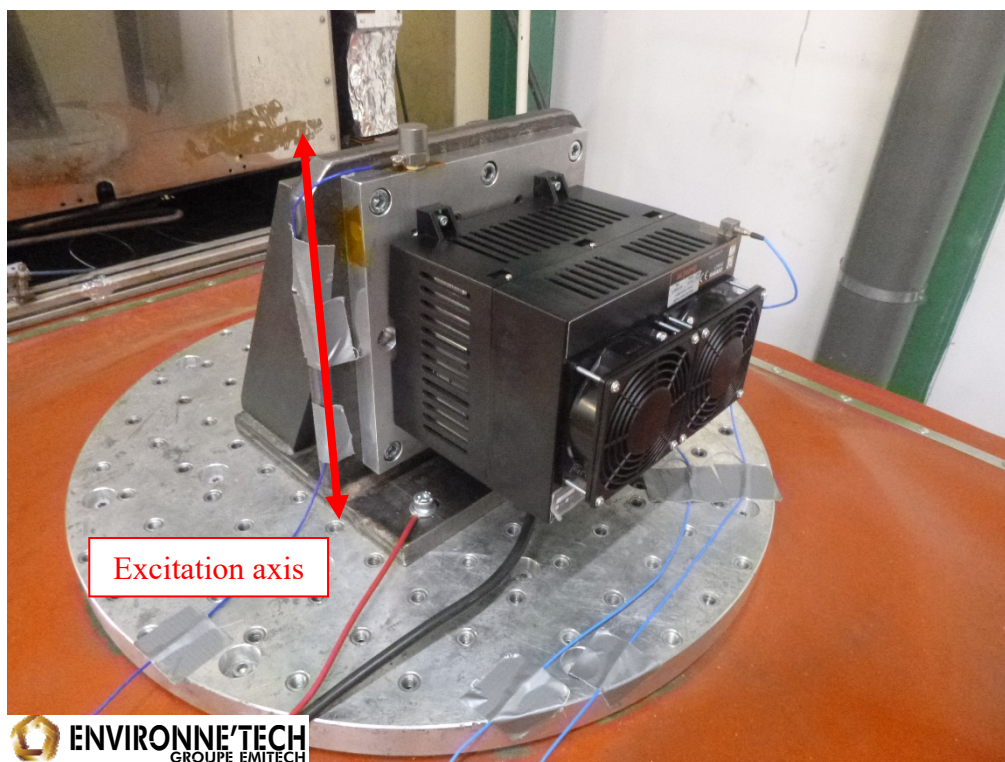


photo 20

One control accelerometer is located on the fixtures (P1).

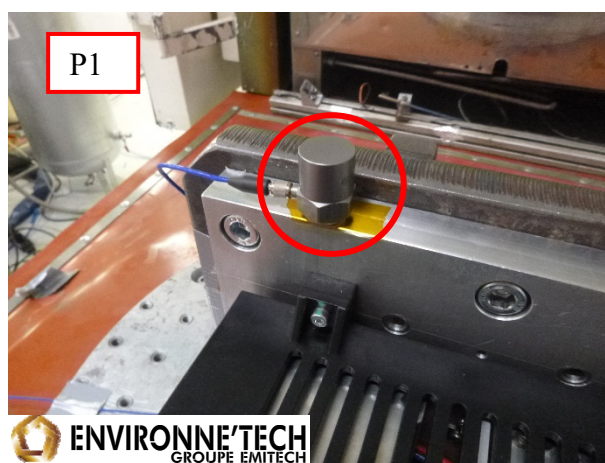


photo 21

5.2.4. Test sequence:

A summary table of the chronology of tests is given below:

Date	Axis	Type of test	Mechanical breakage	Display on
13/04/2023	X	<u>Test:</u> - RFS => No resonance frequency - Endurance at 30Hz		Before: 110.5V After: 110.4V
			No	
	Y	<u>Test:</u> - RFS => 1 resonance frequency - Endurance at 58.9Hz	No	After: 110.4V
			No	
	Z	<u>Test:</u> - RFS => 1 resonance frequency - Endurance at 59.8Hz	No	After: 110.3V
			No	

The curves, the detail of the results and the COFRAC conformity are presented in appendix.

5.3. *One power supply AL175:*

5.3.1. *Orientation of the equipment:*

Photo of the specimen with the associated mark given below:

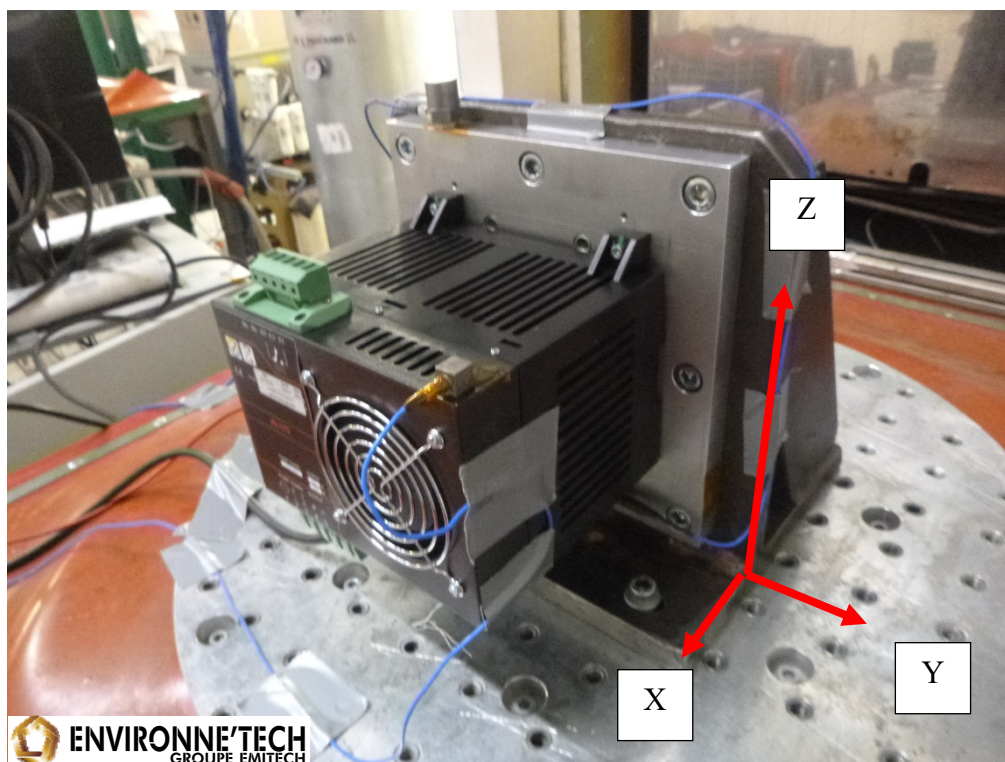


photo 22

5.3.2. Instrumentation of the equipment:

The pictures of the measurement and verification point below:

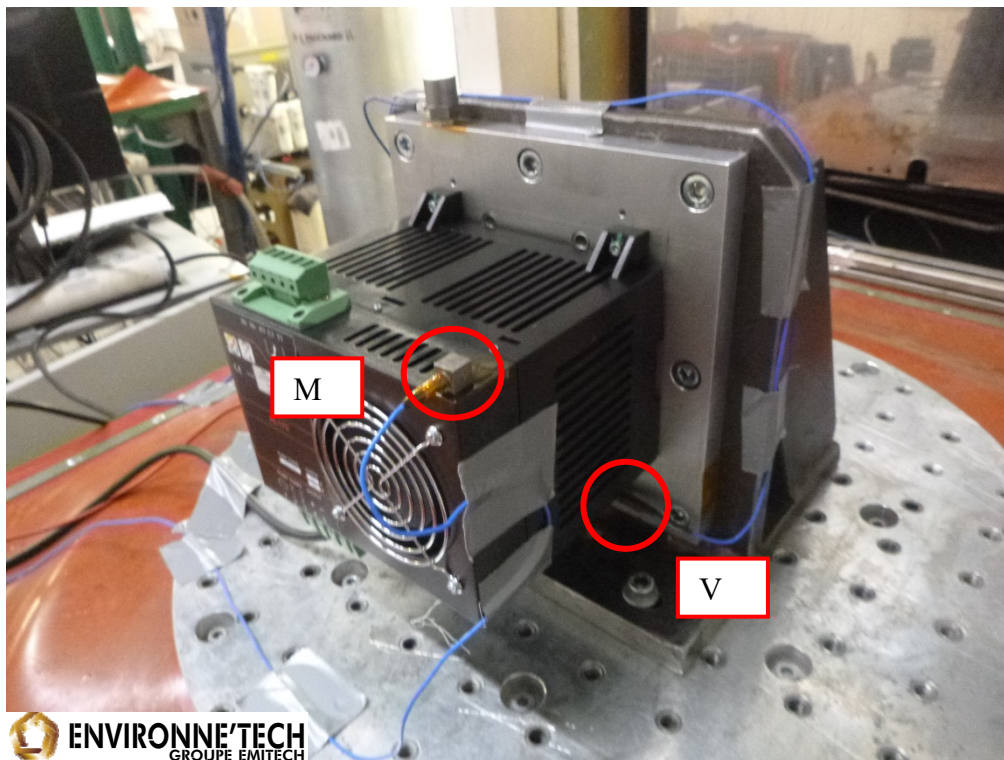


photo 23

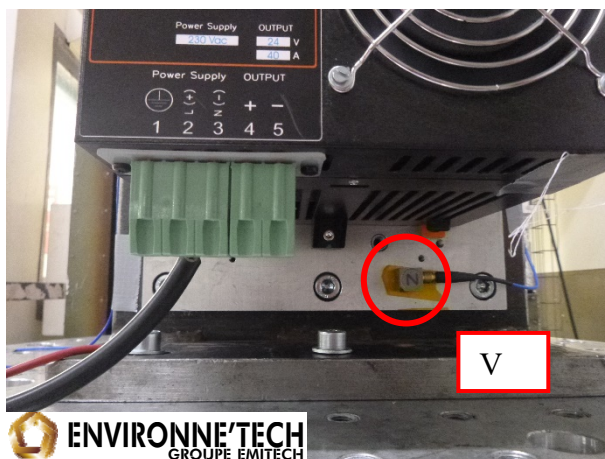


photo 24

5.3.3. Test setup:

5.3.3.1. Axis Z:

Test setup is presented below:



photo 25

One control accelerometer is located on the fixtures (P1).

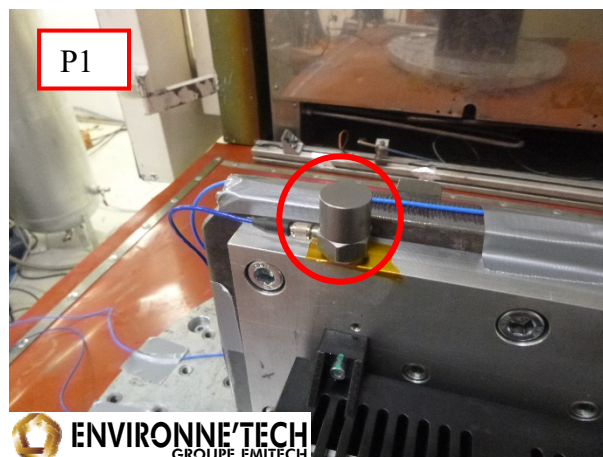


photo 26

5.3.3.2. Axis X:

Test setup is presented below:

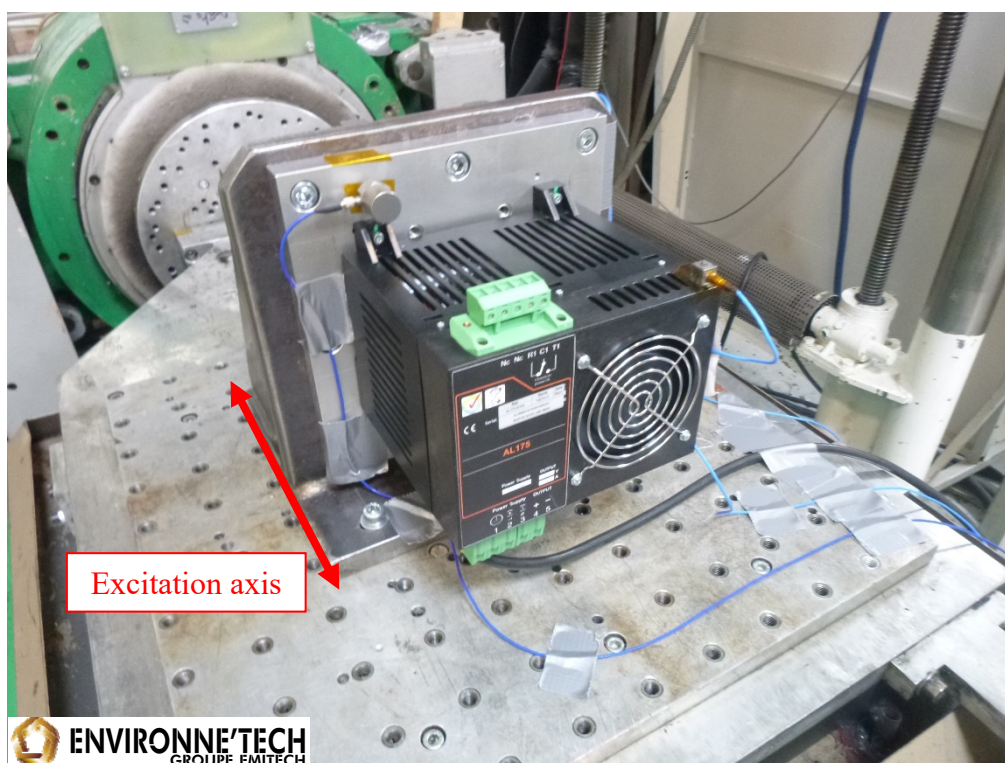


photo 27

One control accelerometer is located on the fixtures (P1).

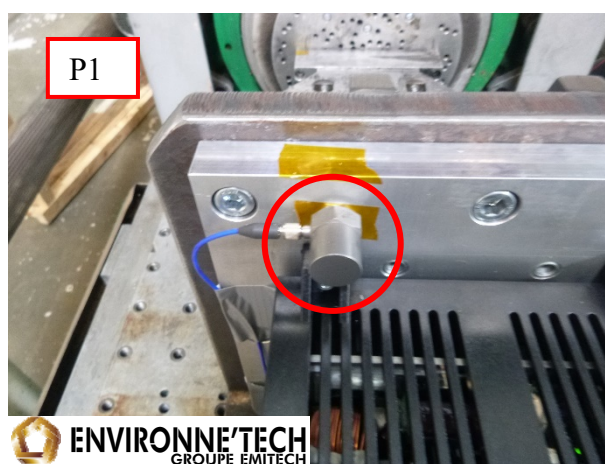


photo 28

5.3.3.3. Axis Y:

Test setup is presented below:

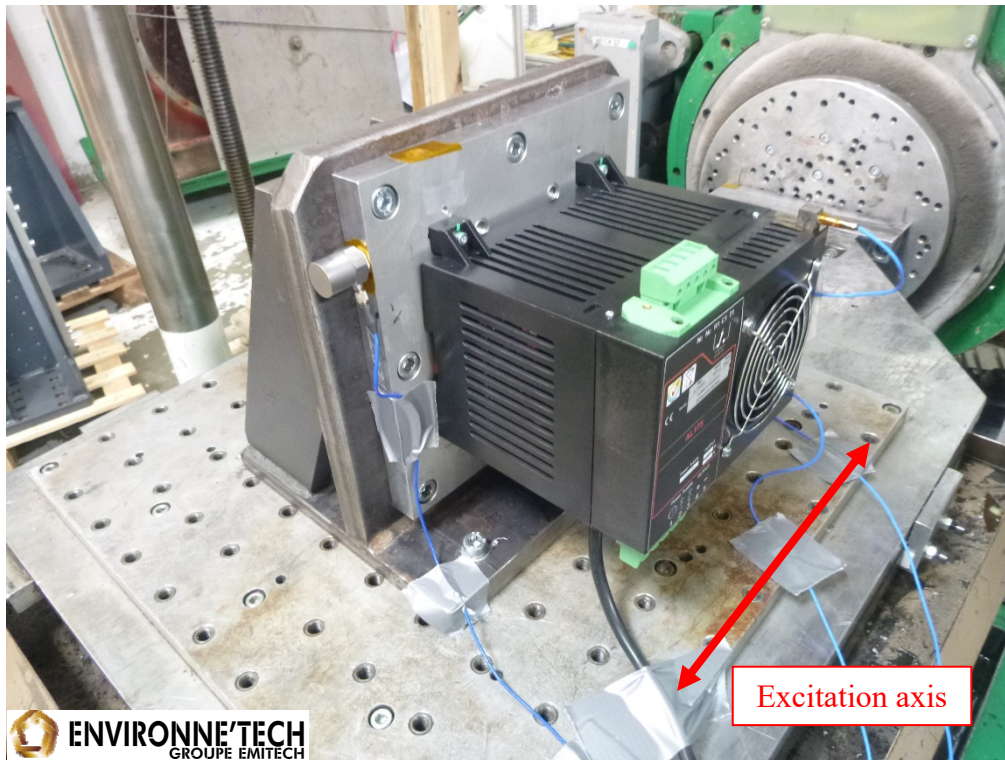


photo 29

One control accelerometer is located on the fixtures (P1).

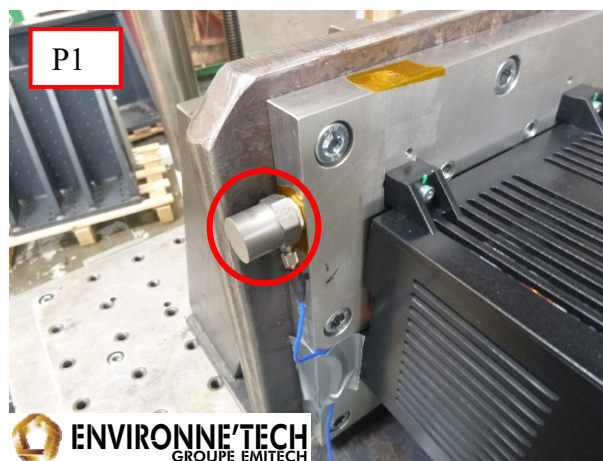


photo 30

5.3.4. Test sequence:

A summary table of the chronology of tests is given below:

Date	Axis	Type of test	Mechanical breakage	Output voltage
14/04/2023	Z	<u>Test:</u> - RFS => No resonance frequency - Endurance at 71.9Hz		
			No	Before: 25.61V
	X	<u>Test:</u> - RFS => No resonance frequency - Endurance at 30Hz	No	After: 25.62V
			No	
	Y	<u>Test:</u> - RFS => 1 resonance frequency - Endurance at 100Hz	No	After: 25.7V
			No	After: 25.7V

The curves, the detail of the results and the COFRAC conformity are presented in appendix.

6. CONCLUSION.

The equipment were tested in accordance with the test specification described in chapter 3 of this report.

At the end of the tests, the three equipment are functional and there are no degradation.

The equipment will continue their test campaign within the ENVIRONNE'TECH laboratory.

□□□ End of report, 37 pages in appendix to be forwarded □□□

7. APPENDIX

7.1. Appendix 1: Normative tolerances:

Normative specification limits are shown on the curves in this report according to the following table:

Test type	Curve plot	Lower limit name	Upper limit name
Sine vibrations		SpectrumLowAlarm	SpectrumUpAlarm

7.2. Appendix 2: One detector one cutoff:

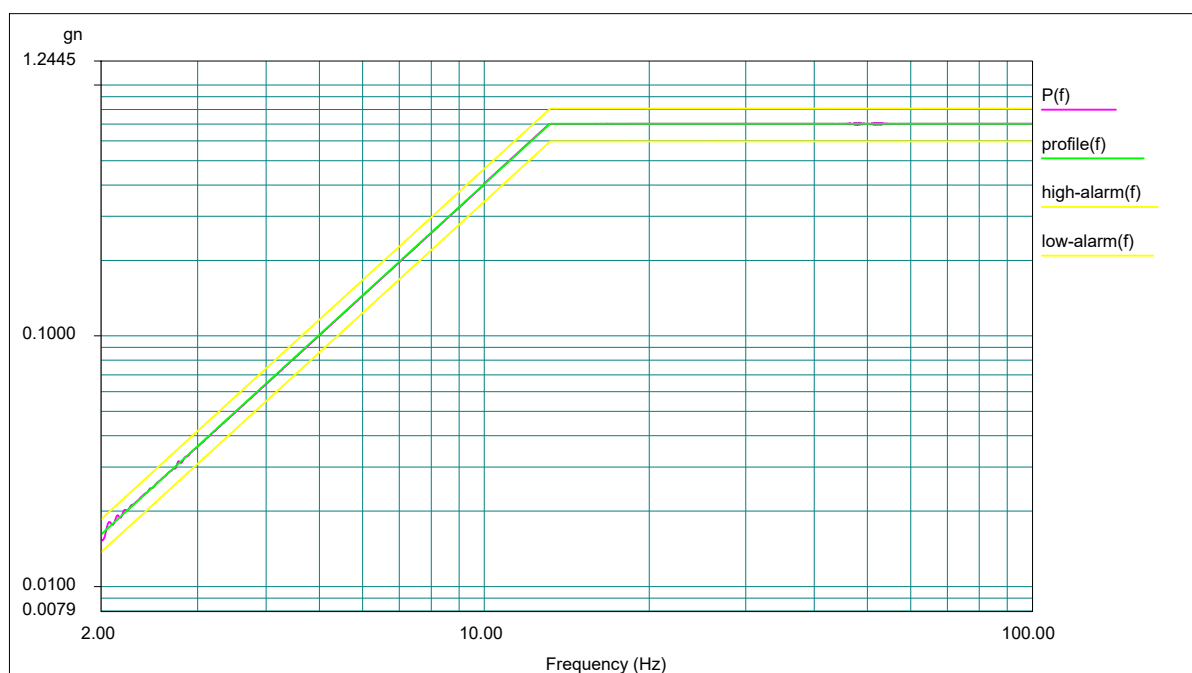
7.2.1. Axis X:

7.2.1.1. Vibration test/RFS:

For this test, control was conducted at P1.

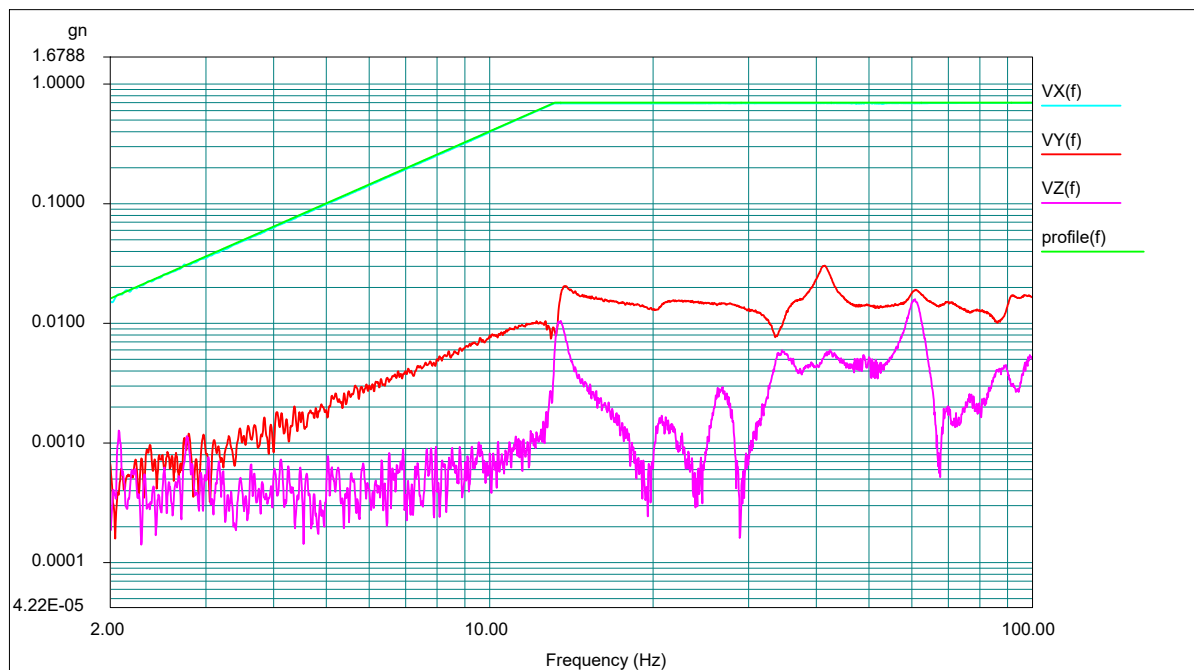
Curves recorded at the end of the test are presented here after.

Control curve is given below:



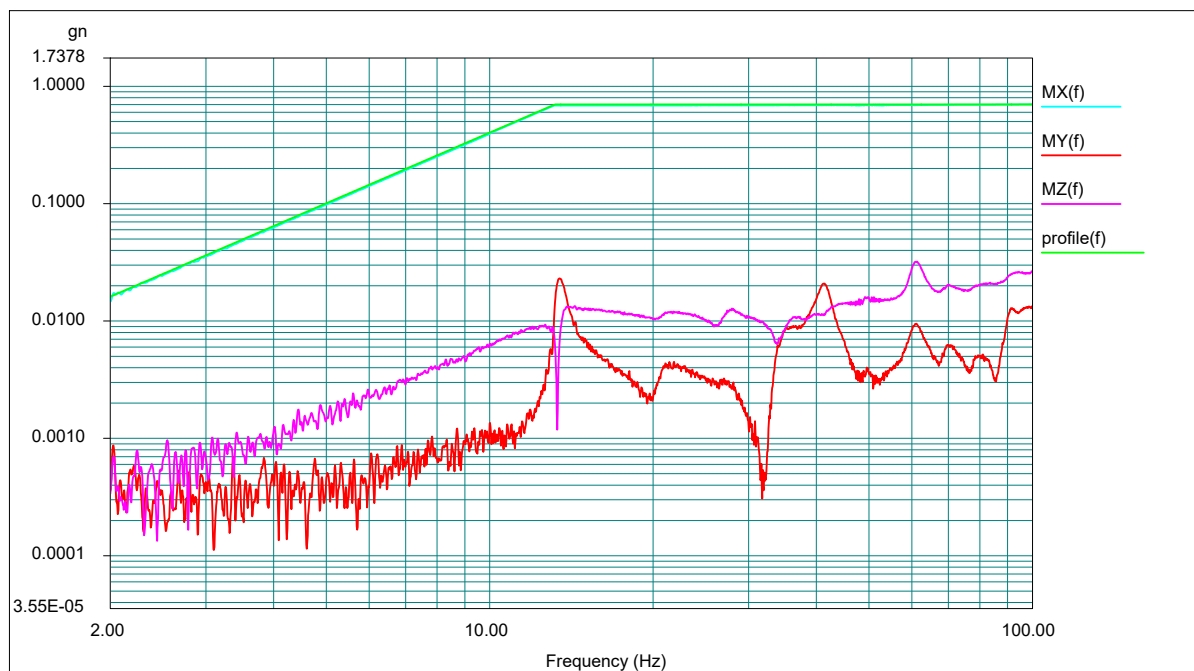
curve 1

Acceleration measurement of V point given below:



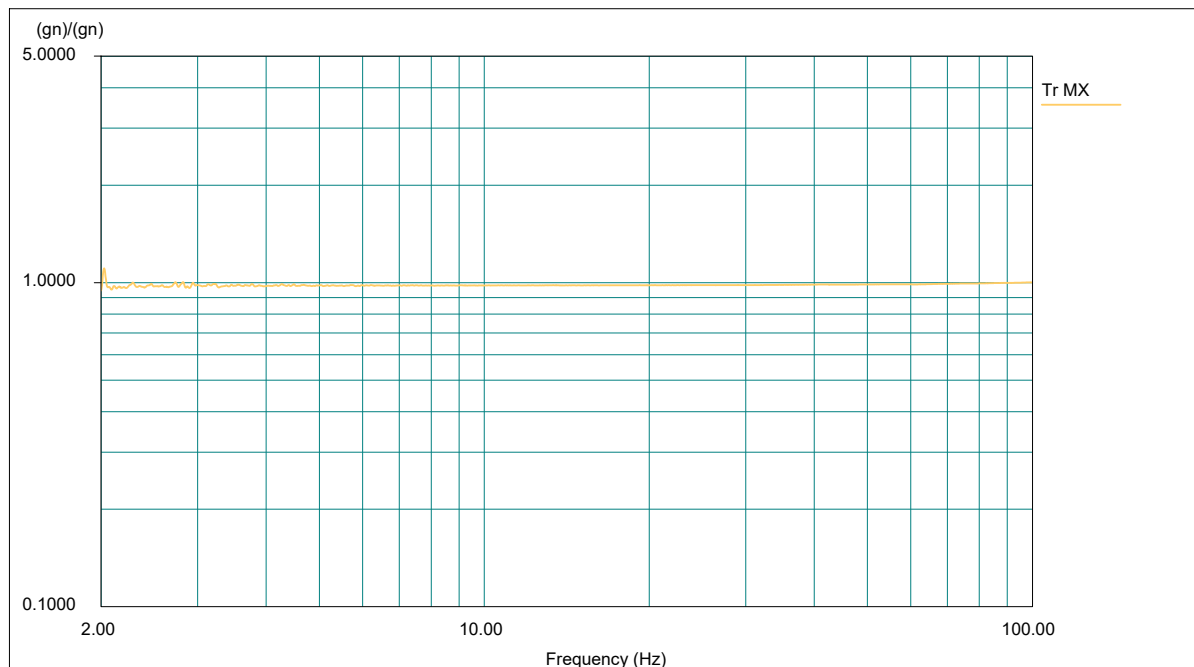
curve 2

Acceleration measurement of M point given below:



curve 3

Transfer function of measuring point M given below:



curve 4

Result: There is no resonance frequency. An endurance at the frequency of 30 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

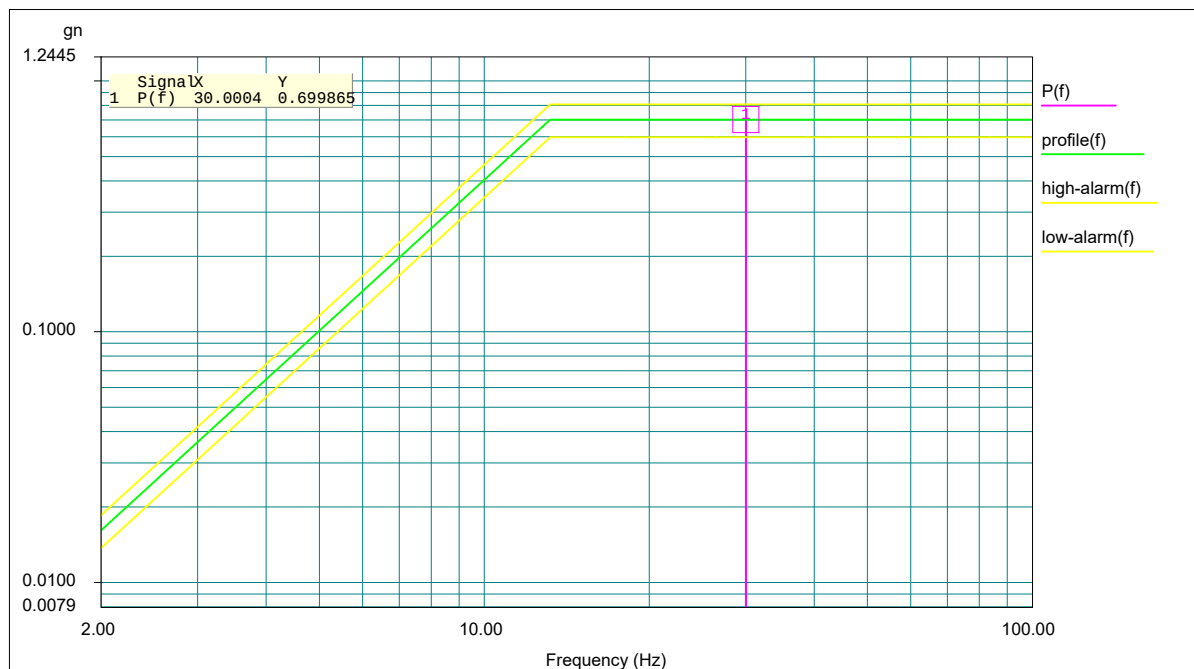
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Yes	/

7.2.1.2. Vibration test/Endurance:

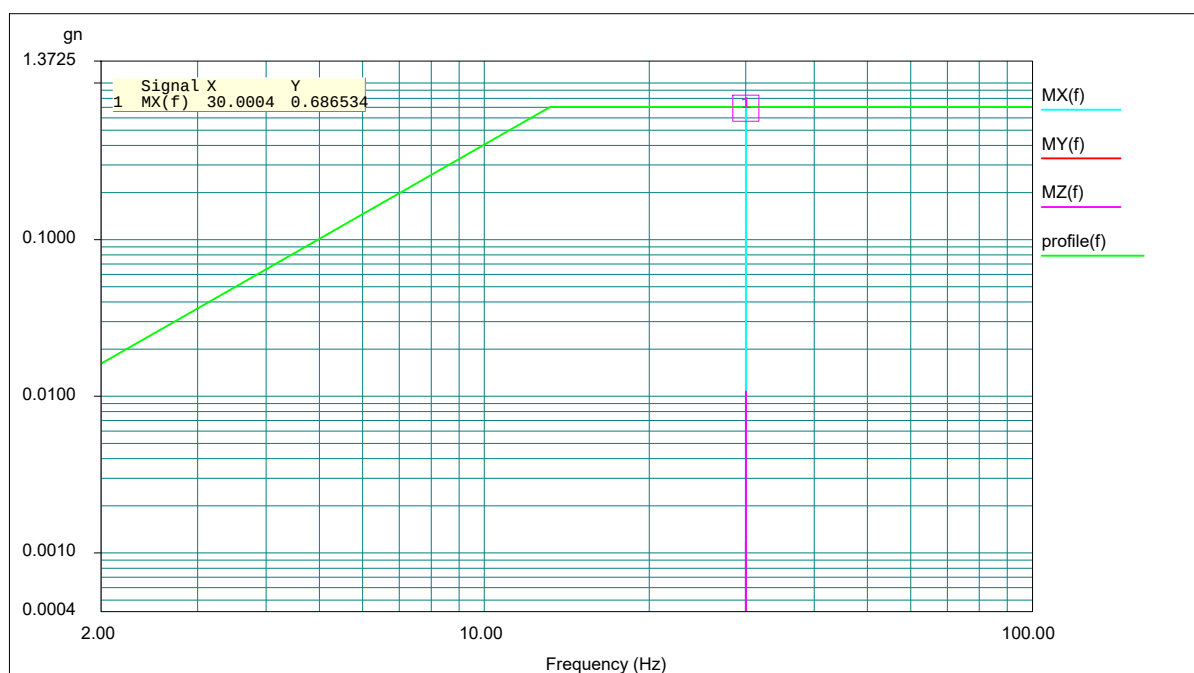
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 5

Acceleration measurement of M point given below:



curve 6

Result:

No visual degradation is observed.
Equipment was properly operating during and after test.

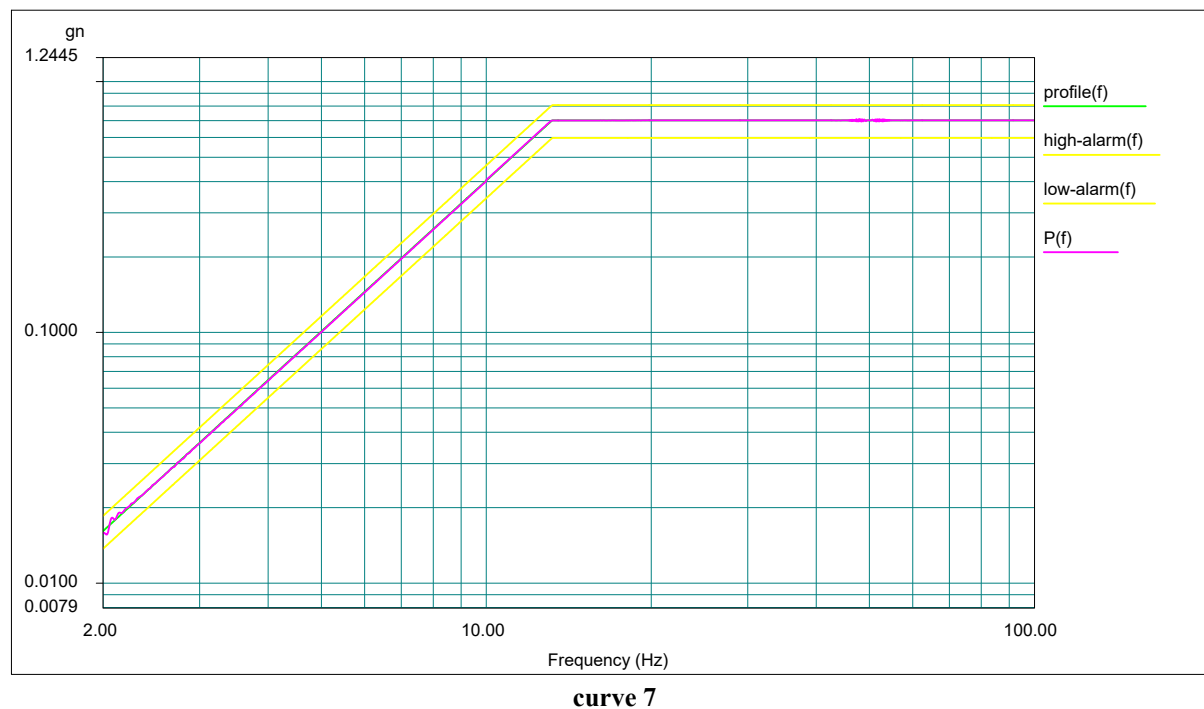
7.2.2. Axis Y:

7.2.2.1. Vibration test/RFS:

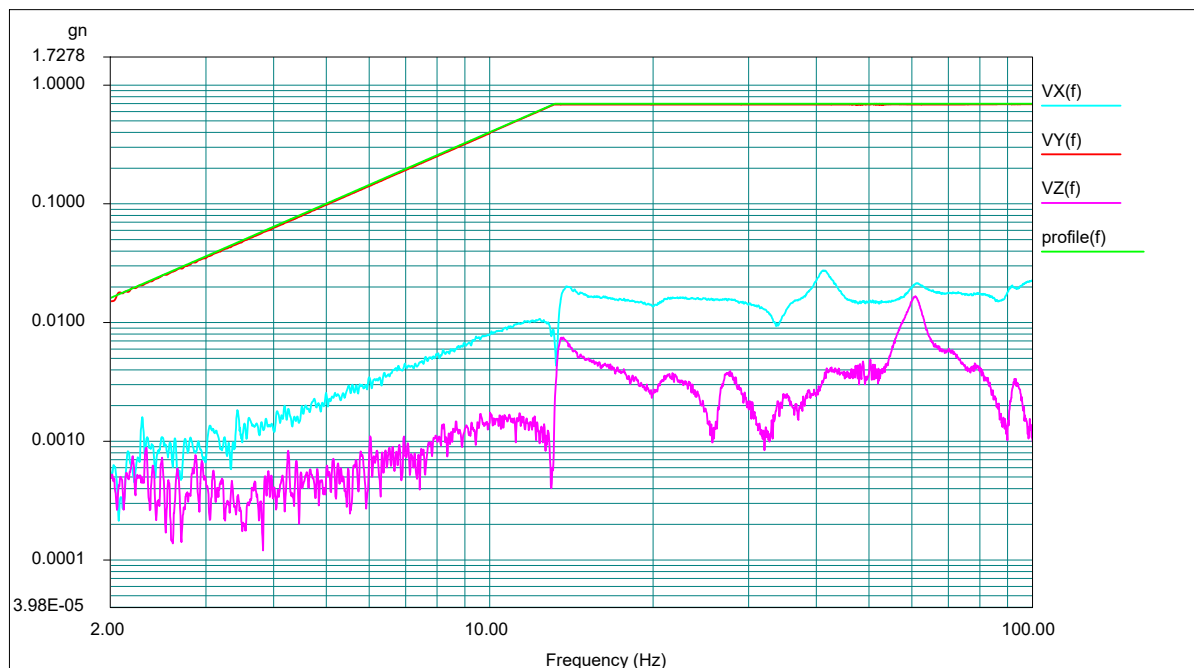
For this test, control was conducted at P1.

Curves recorded at the end of the test are presented here after.

Control curve is given below:

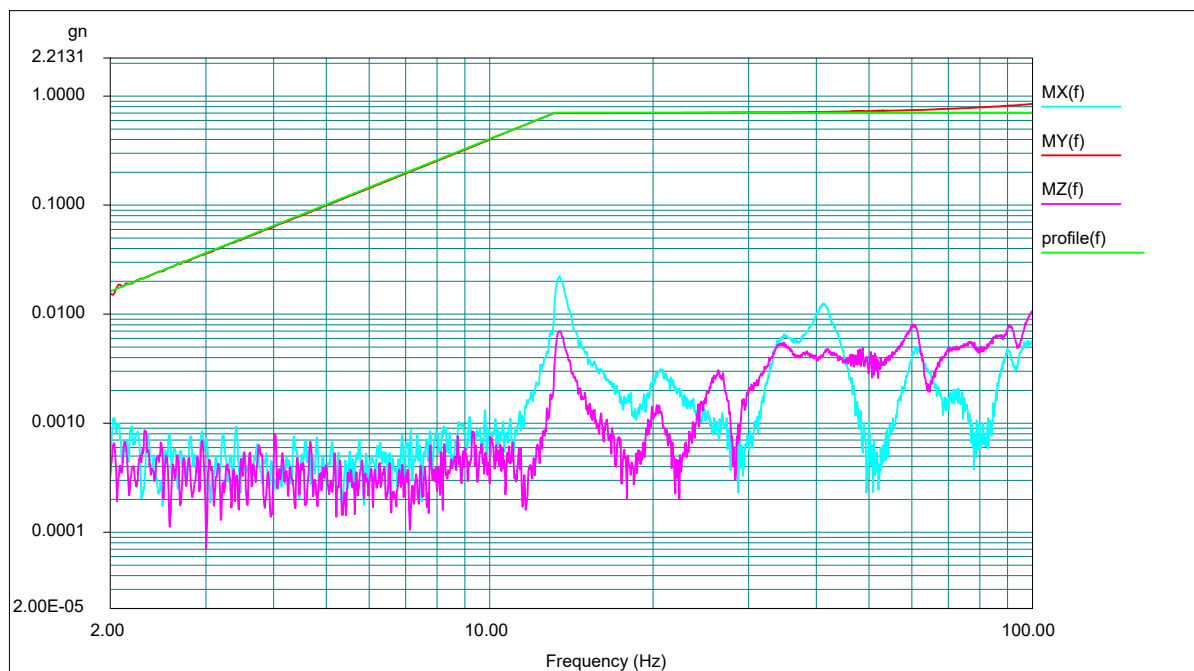


Acceleration measurement of V point given below:



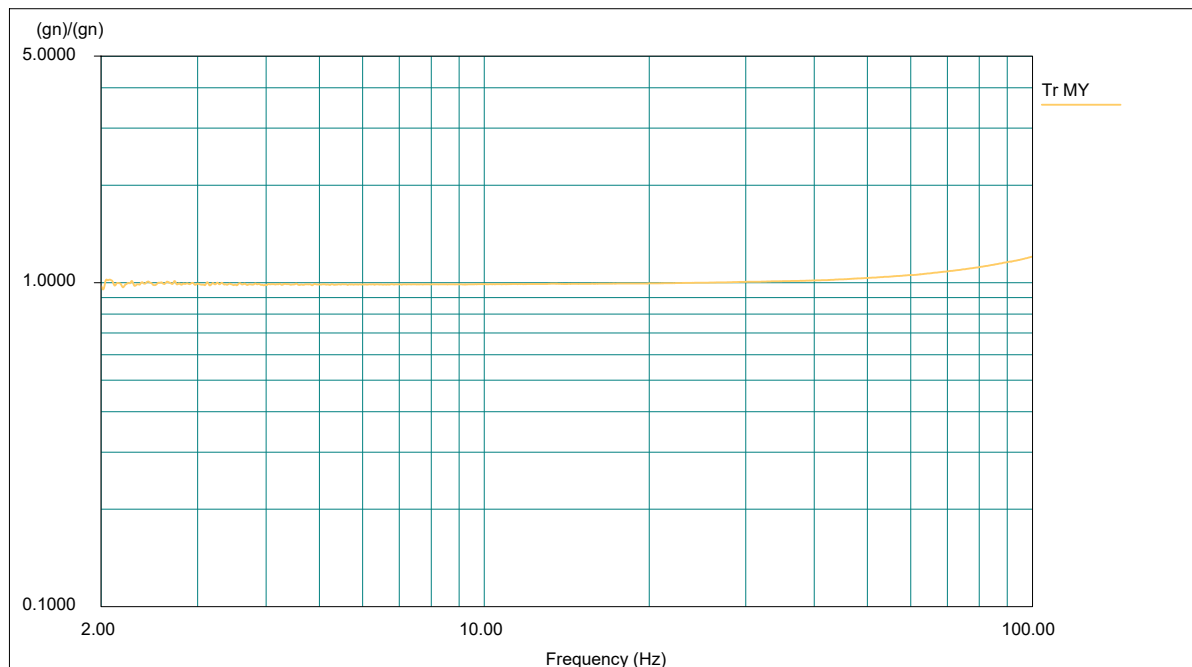
curve 8

Acceleration measurement of M point given below:



curve 9

Transfer function of measuring point M given below:



curve 10

Result: There is no resonance frequency. An endurance at the frequency of 30 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

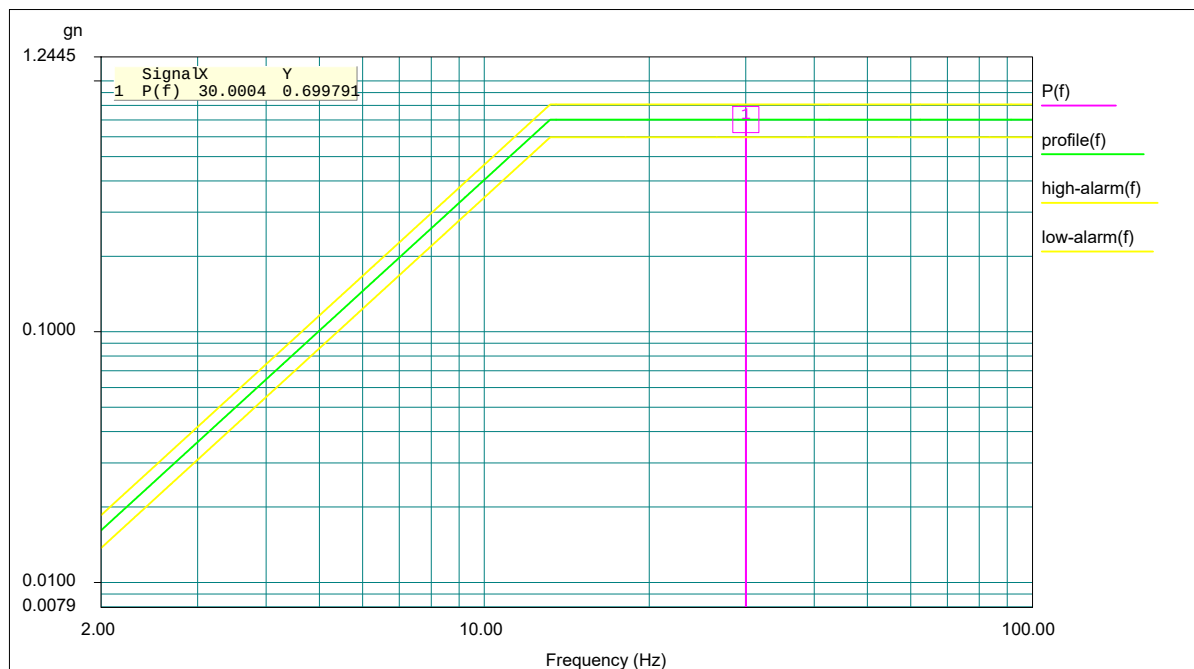
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Yes	/

7.2.2.2. Vibration test/Endurance:

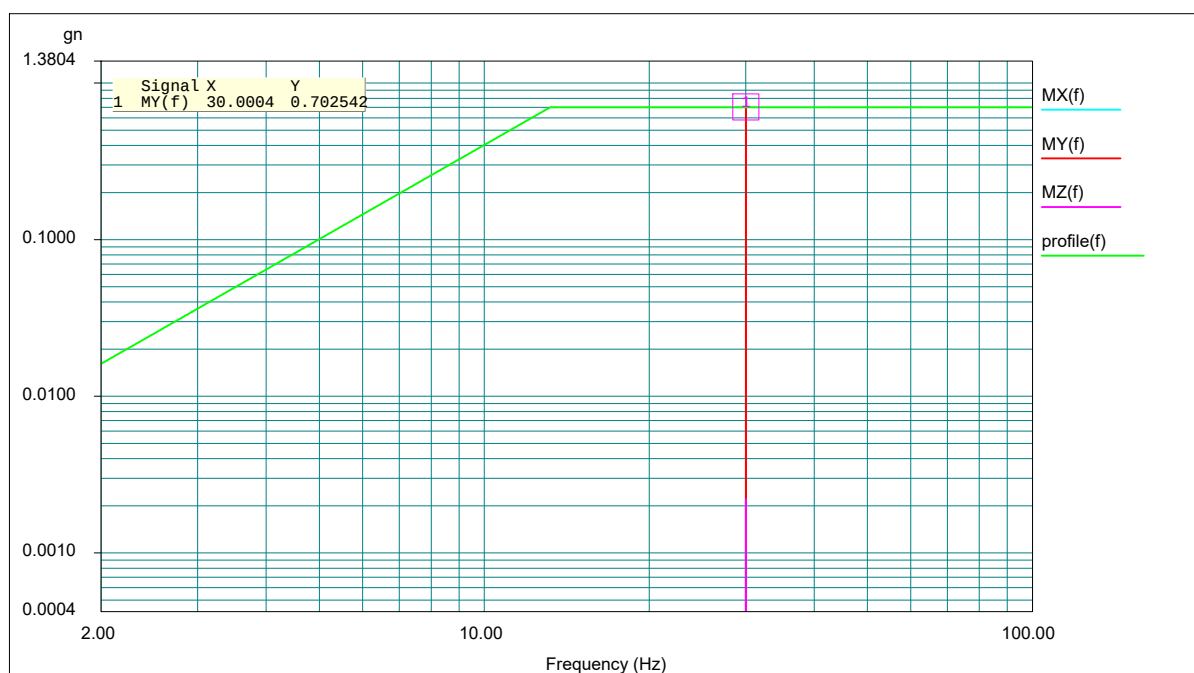
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 11

Acceleration measurement of M point given below:



curve 12

Result:

No visual degradation is observed.
Equipment was properly operating during and after test.

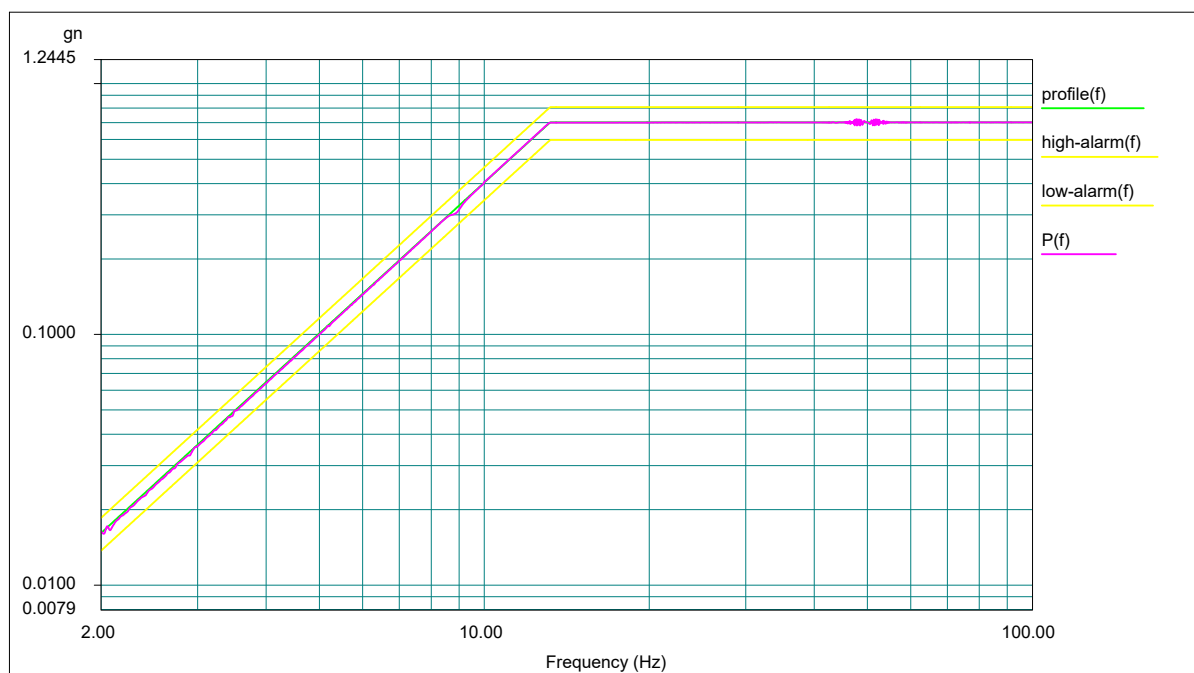
7.2.3. Axis Z:

7.2.3.1. Vibration test/RFS:

For this test, control was conducted at P1.

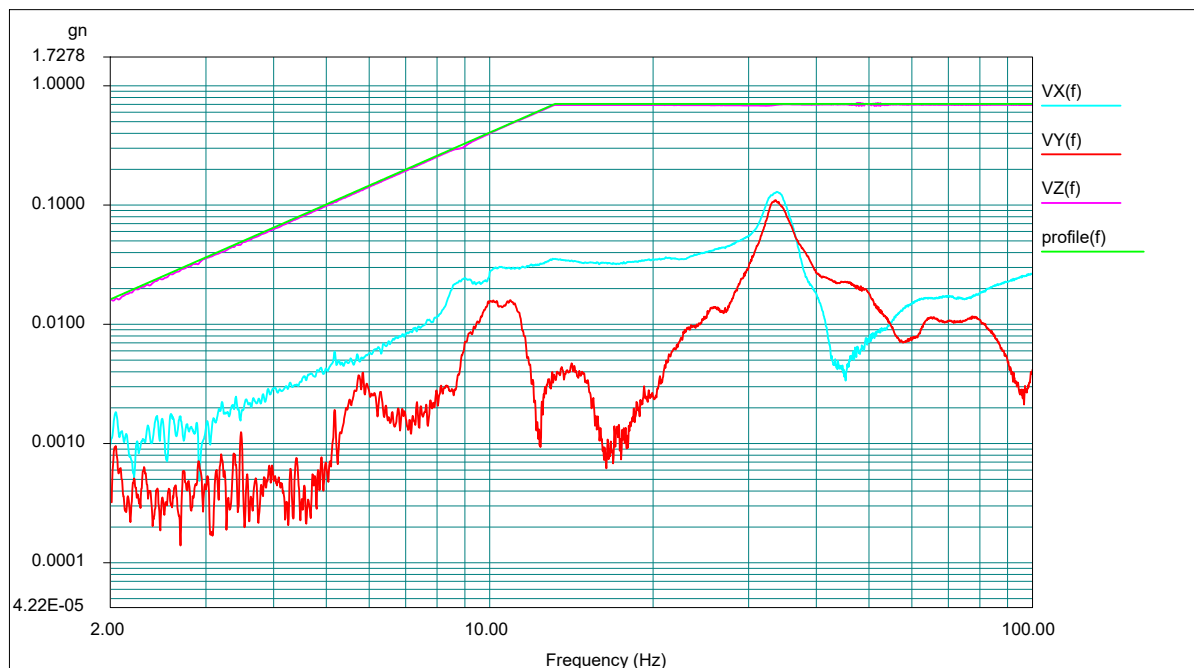
Curves recorded at the end of the test are presented here after.

Control curve is given below:



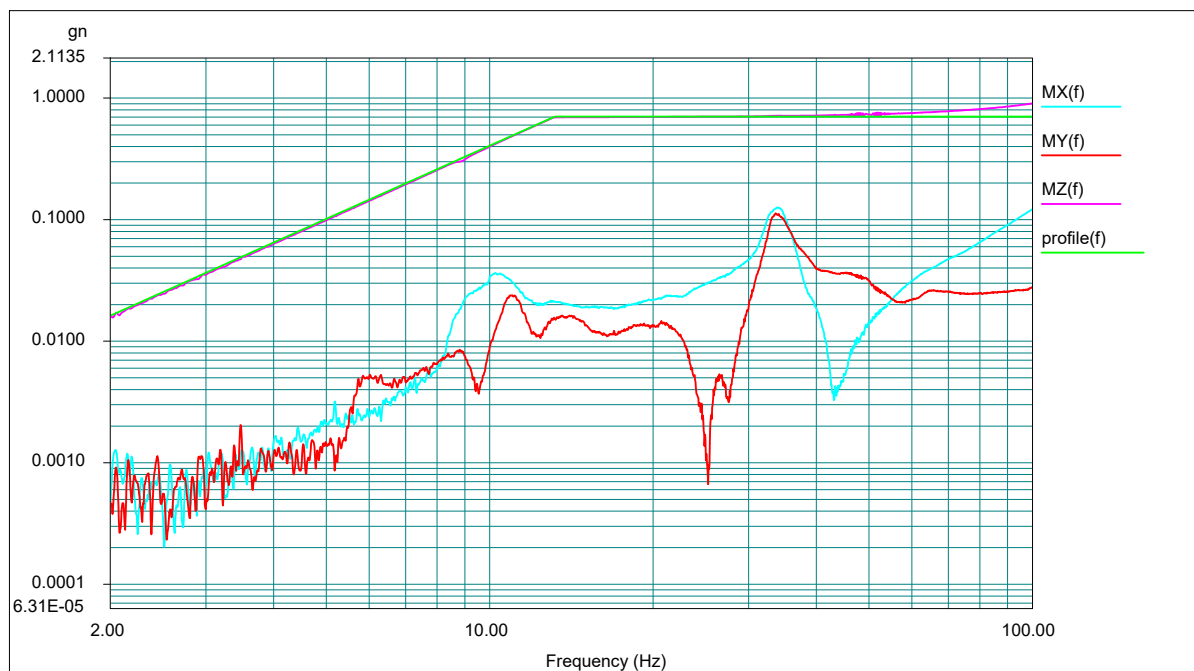
curve 13

Acceleration measurement of V point given below:



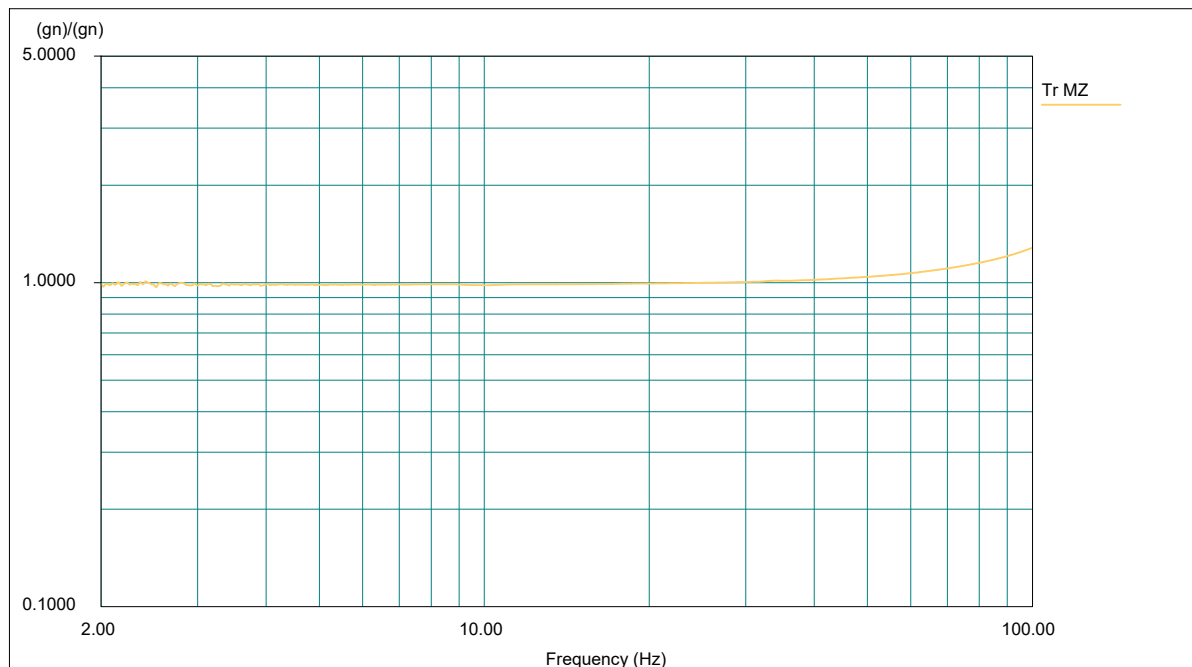
curve 14

Acceleration measurement of M point given below:



curve 15

Transfer function of measuring point M given below:



curve 16

Result: There is no resonance frequency. An endurance at the frequency of 30 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

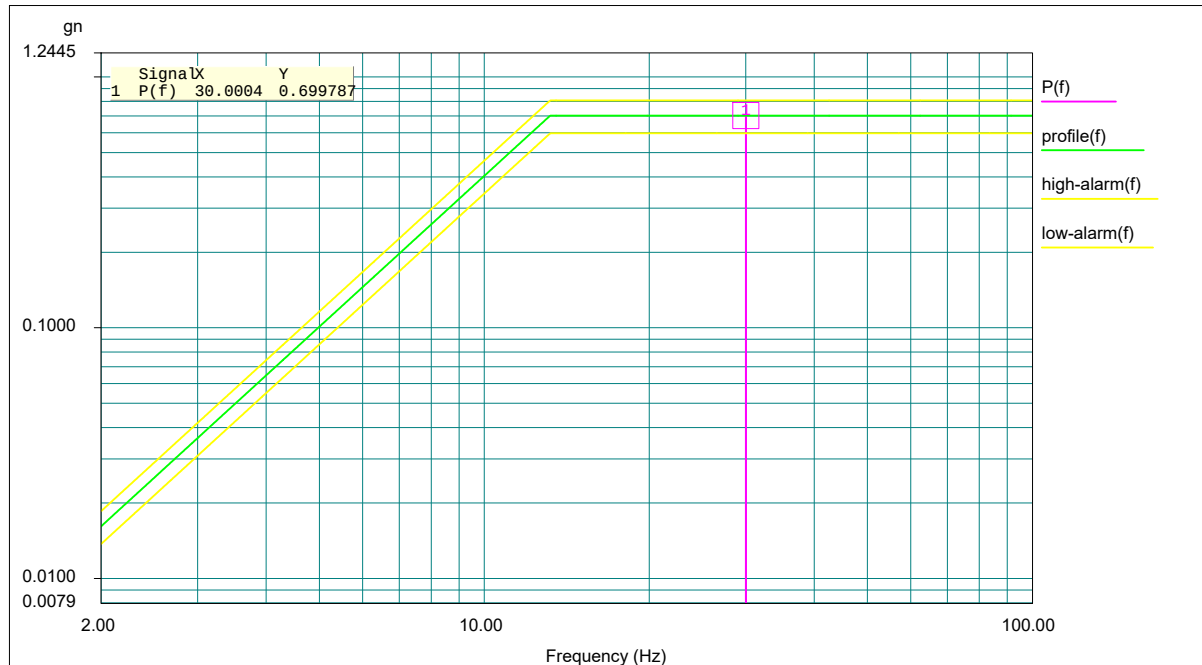
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Yes	/

7.2.3.2. Vibration test/Endurance:

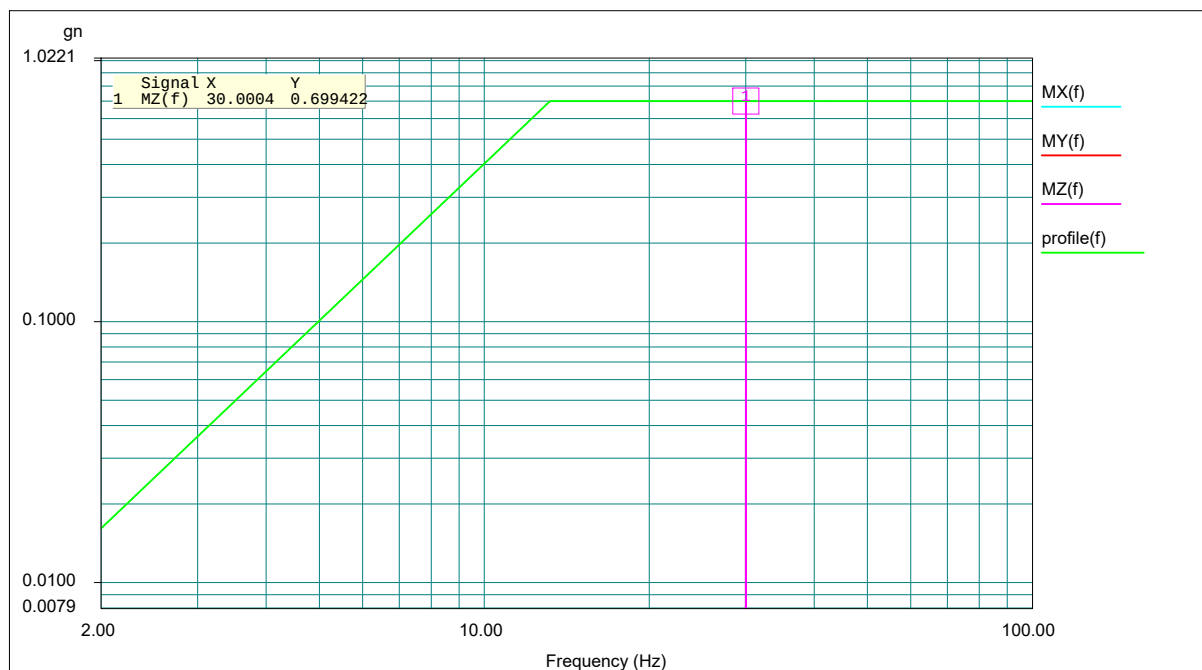
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 17

Acceleration measurement of M point given below:



curve 18

Result: No visual degradation is observed.
Equipment was properly operating during and after test.

7.3. Appendix 3: AL200HD:

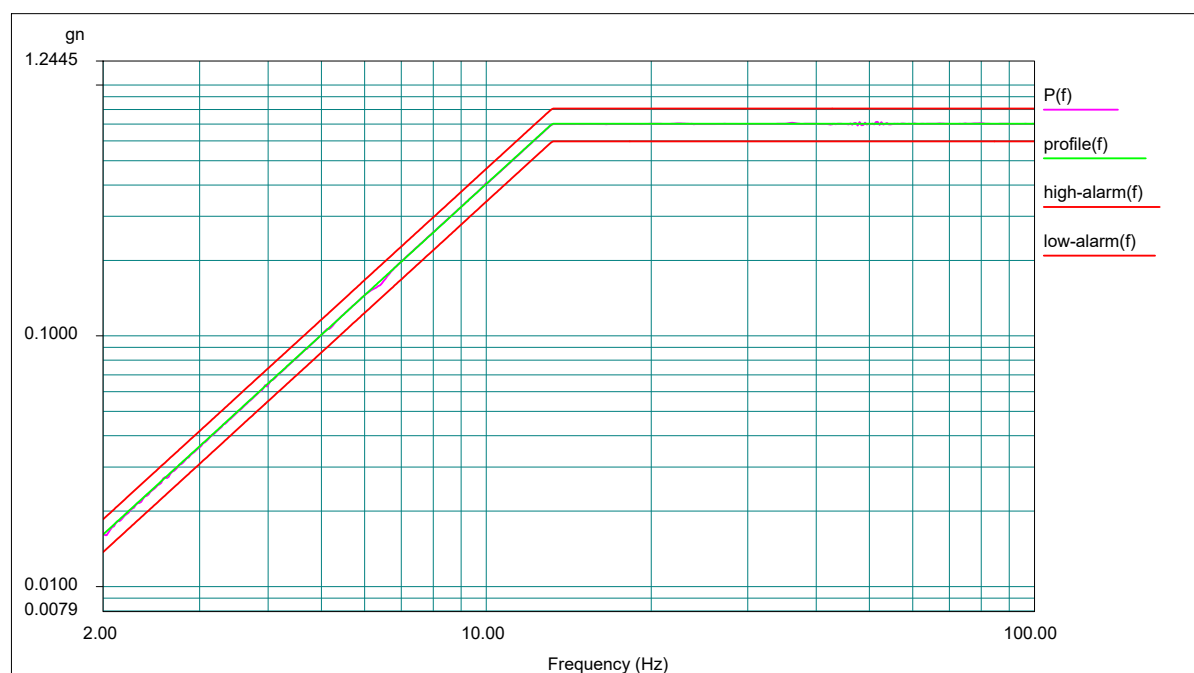
7.3.1. Axis X:

7.3.1.1. Vibration test/RFS:

For this test, control was conducted at P1.

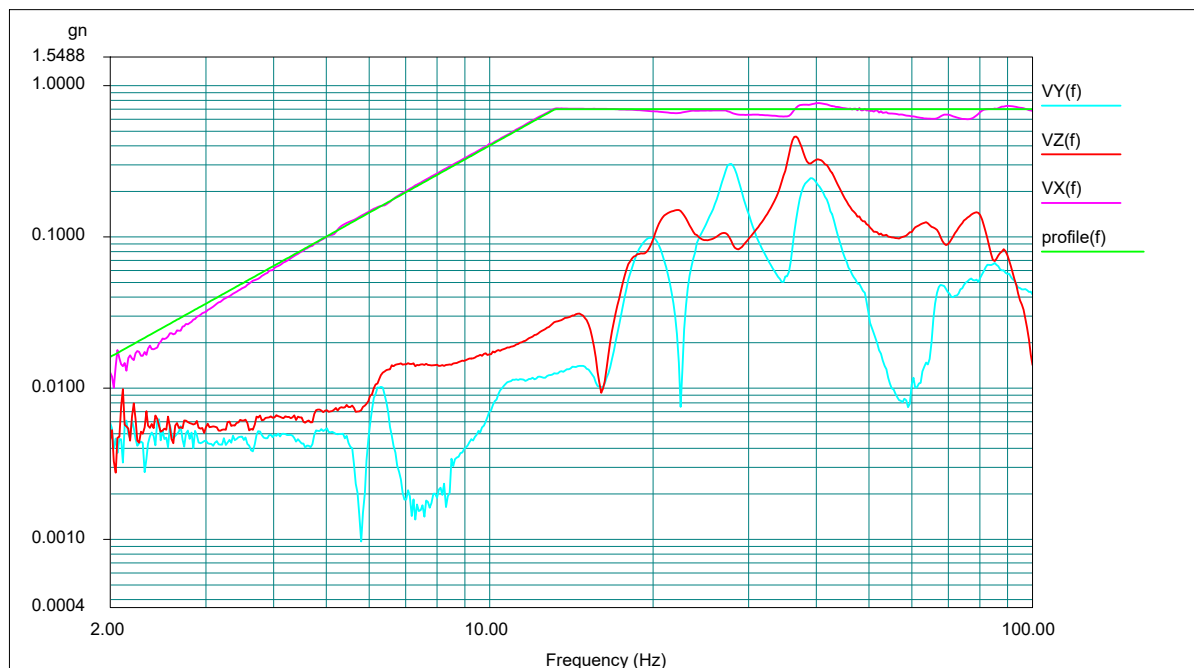
Curves recorded at the end of the test are presented here after.

Control curve is given below:



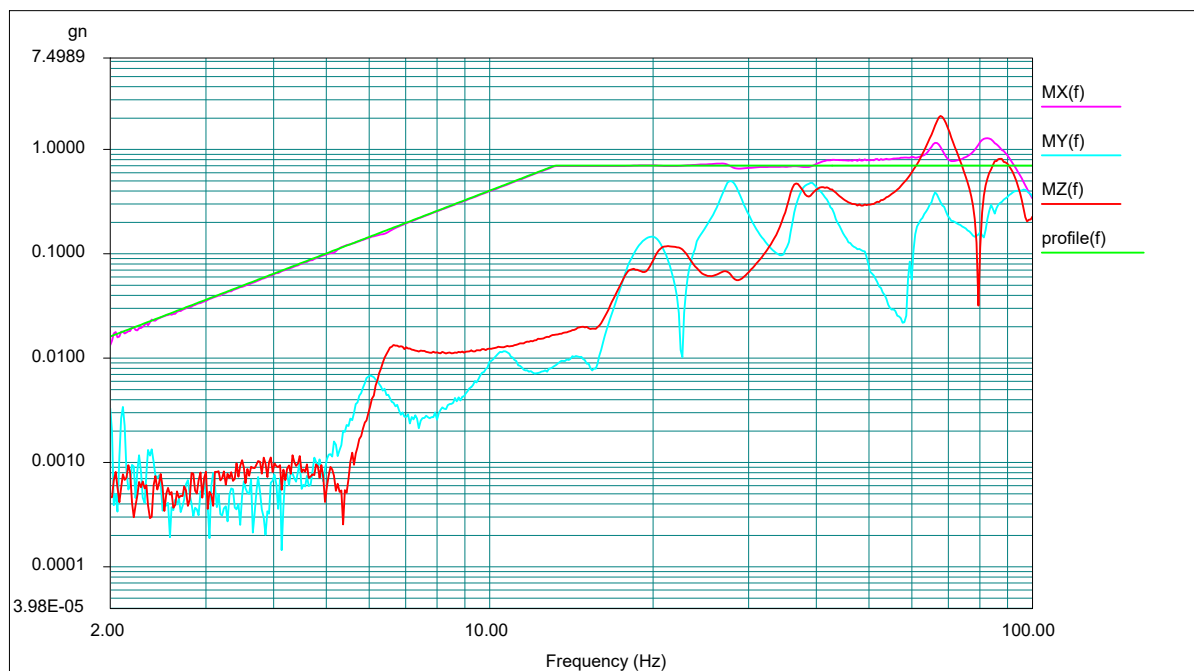
curve 19

Acceleration measurement of V point given below:



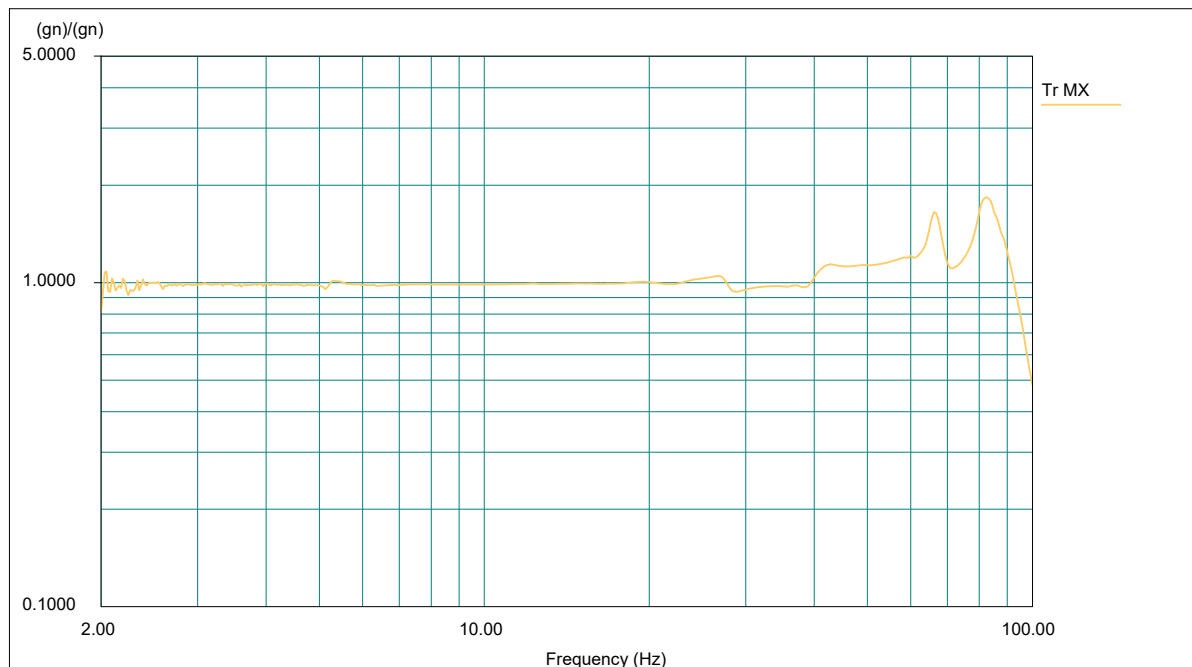
curve 20

Acceleration measurement of M point given below:



curve 21

Transfer function of measuring point M given below:



curve 22

Result: There is no resonance frequency. An endurance at the frequency of 30 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

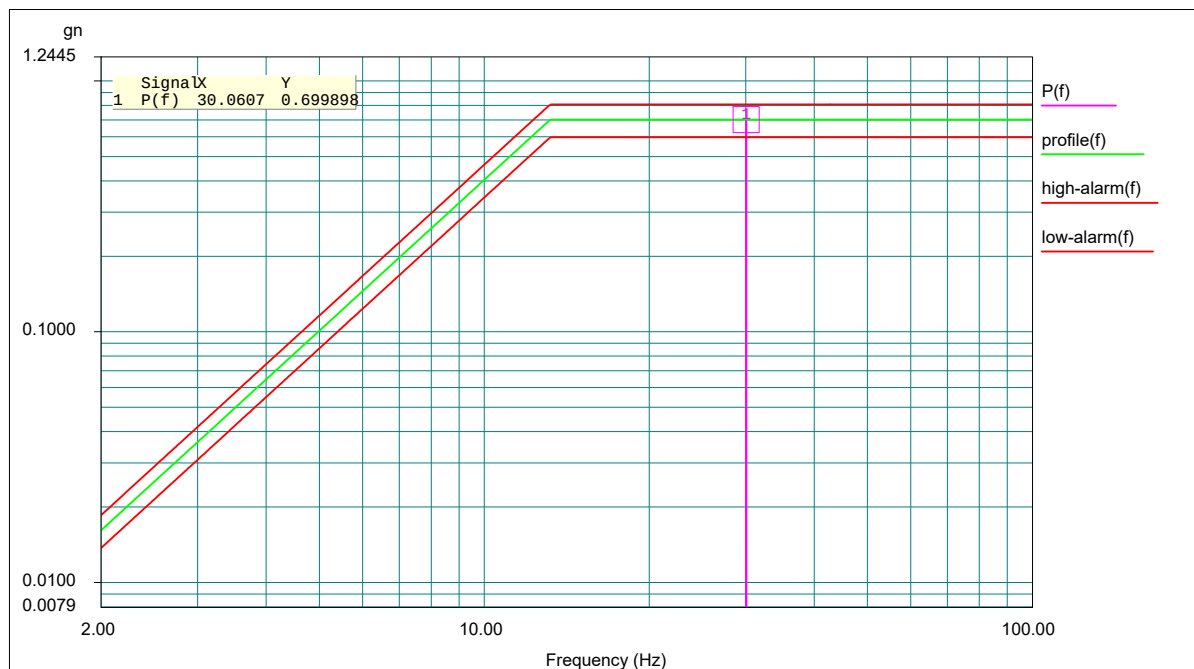
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Partial exceedance between 35 Hz and 45 Hz	/

7.3.1.2. Vibration test/Endurance:

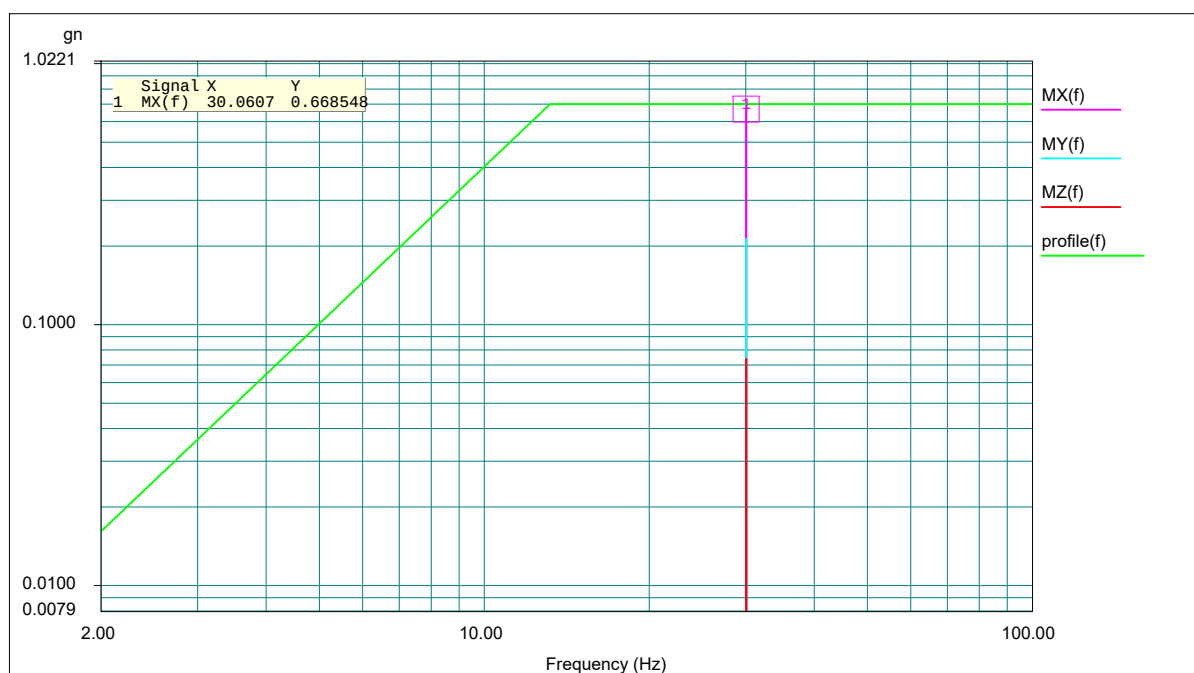
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 23

Acceleration measurement of M point given below:



curve 24

Result: No visual degradation is observed.
Equipment was properly operating during and after test.

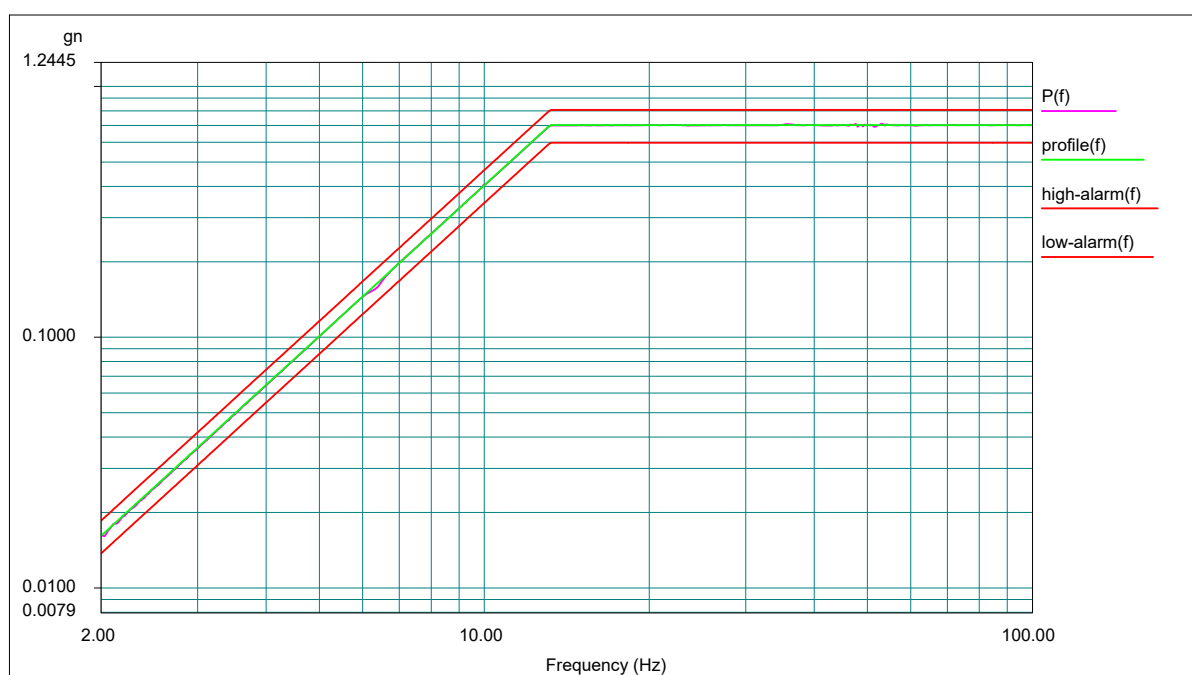
7.3.2. Axis Y:

7.3.2.1. Vibration test/RFS:

For this test, control was conducted at P1.

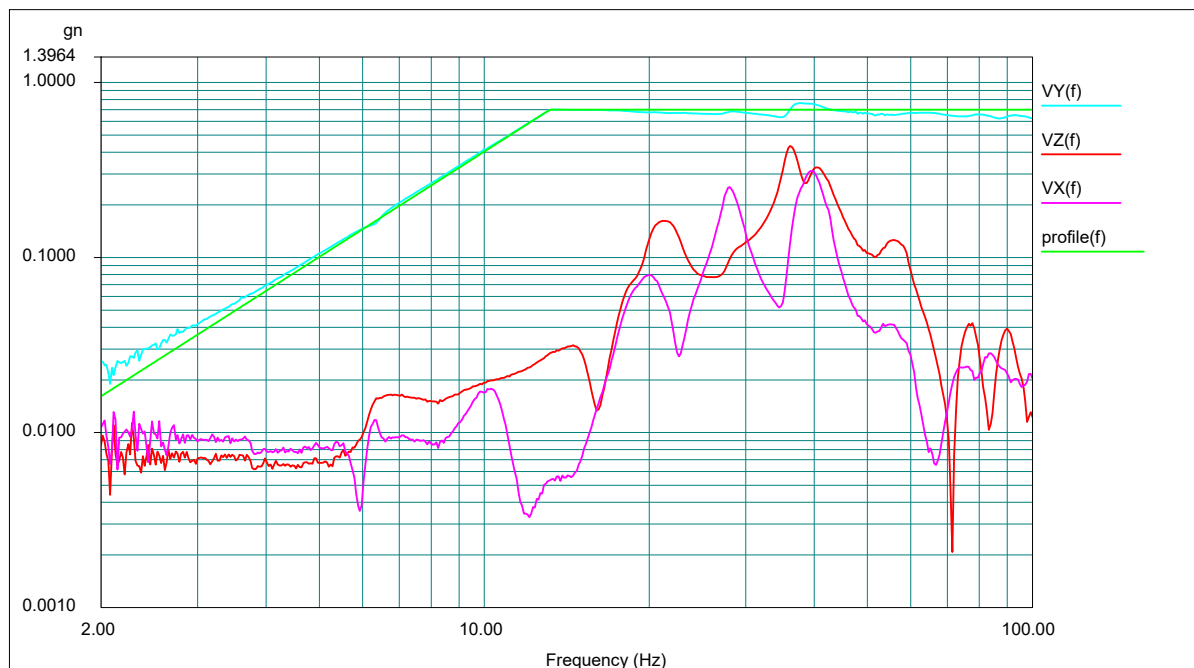
Curves recorded at the end of the test are presented here after.

Control curve is given below:



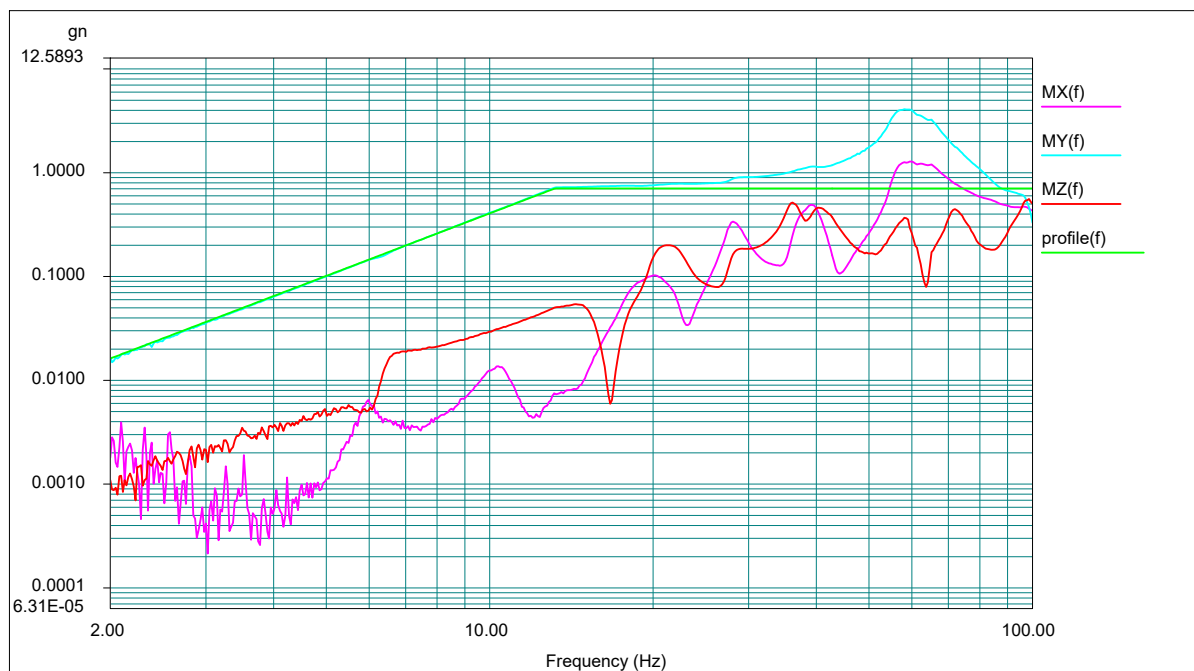
curve 25

Acceleration measurement of V point given below:



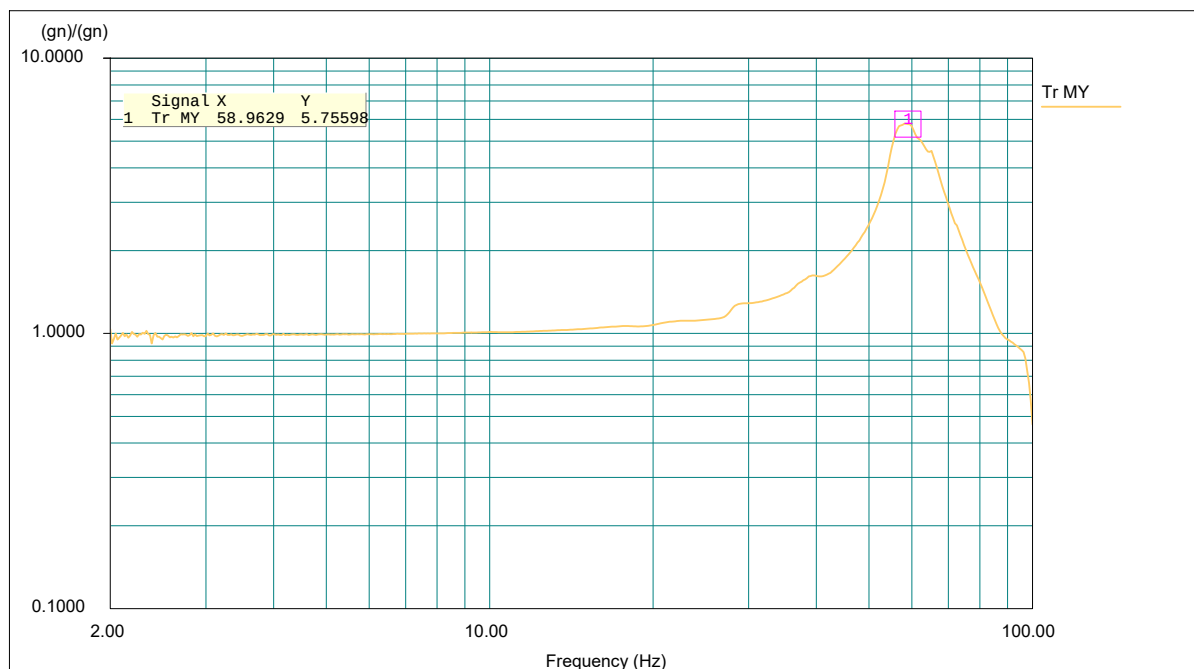
curve 26

Acceleration measurement of M point given below:



curve 27

Transfer function of measuring point M given below:



curve 28

Result: There is resonance frequency. An endurance at the frequency of 58.9 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

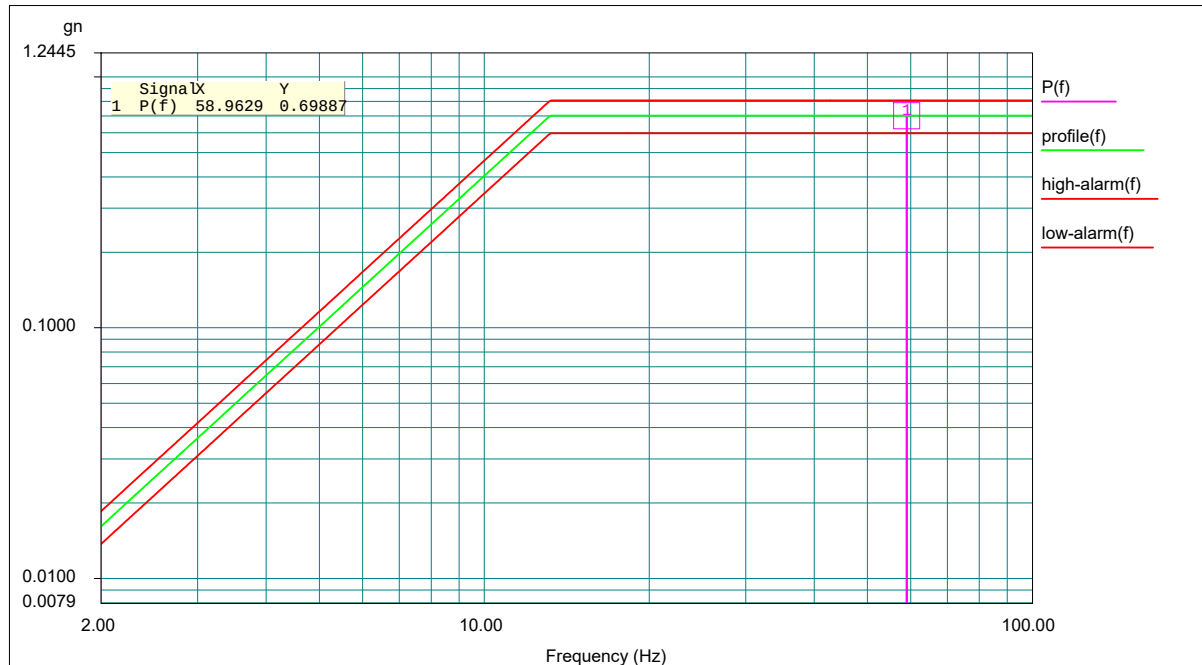
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Partial exceedance between 35 Hz and 45 Hz	/

7.3.2.2. Vibration test/Endurance:

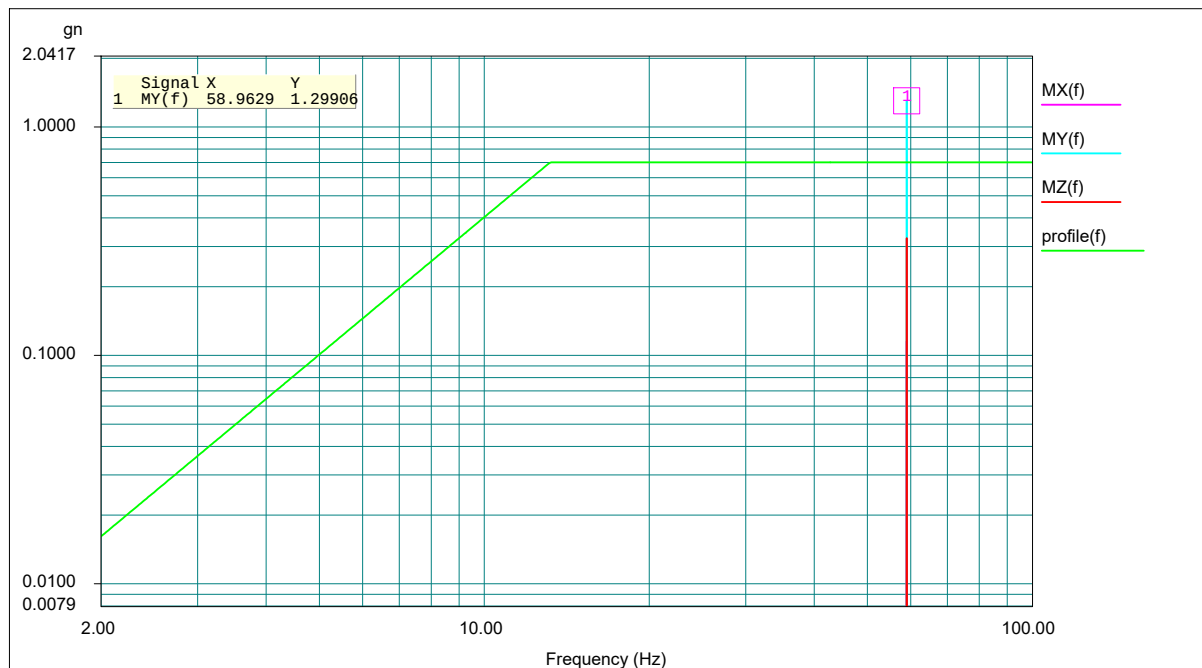
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 29

Acceleration measurement of M point given below:



curve 30

Result: No visual degradation is observed.
Equipment was properly operating during and after test.

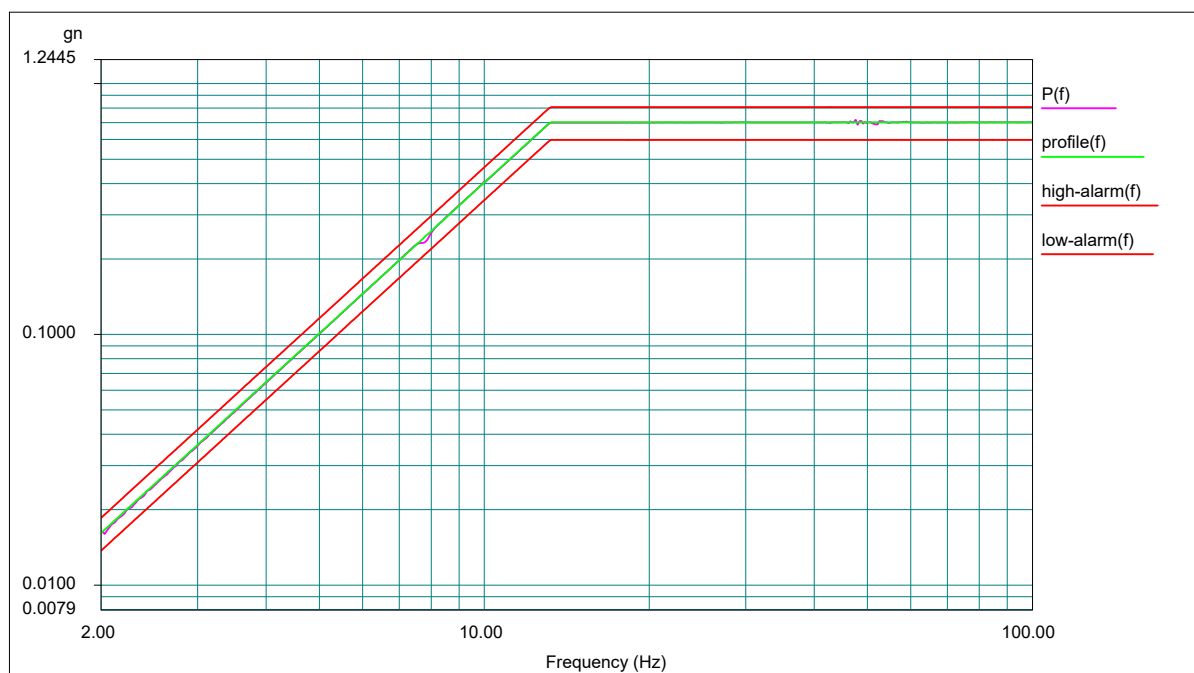
7.3.3. Axis Z:

7.3.3.1. Vibration test/RFS:

For this test, control was conducted at P1.

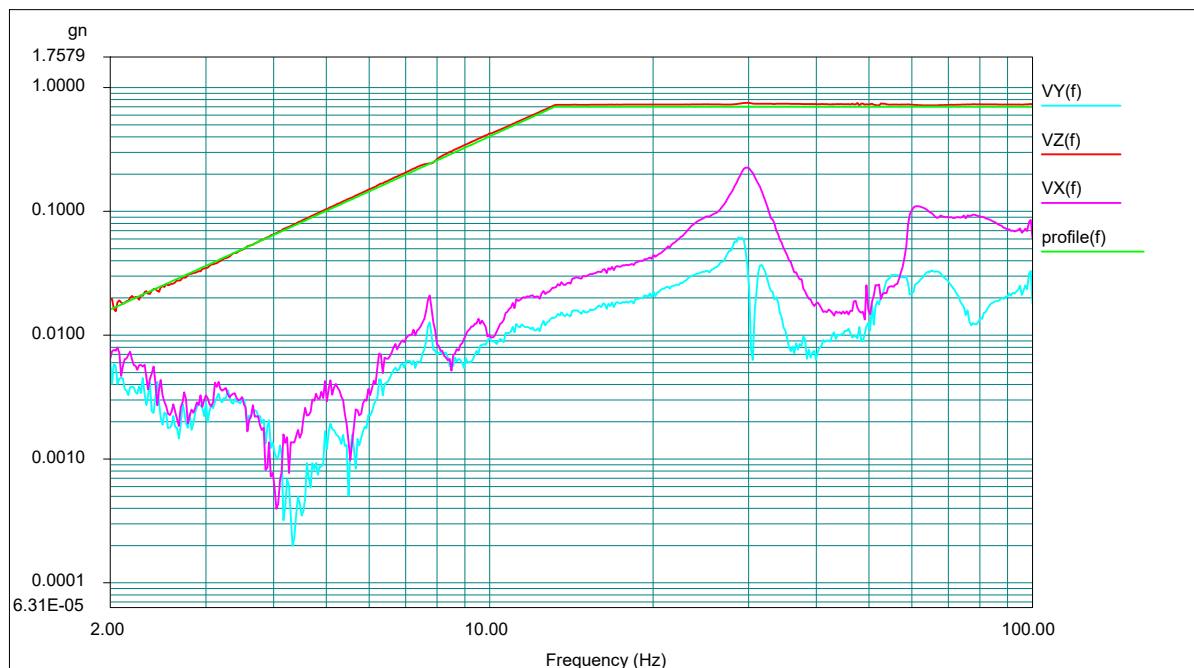
Curves recorded at the end of the test are presented here after.

Control curve is given below:



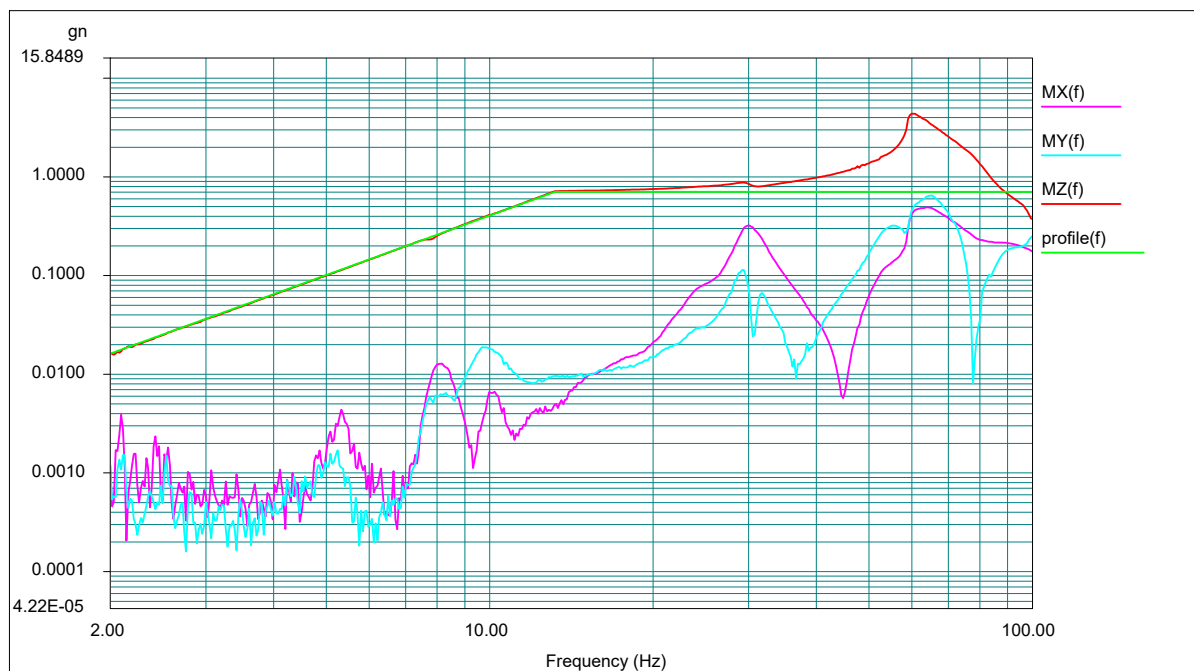
curve 31

Acceleration measurement of V point given below:



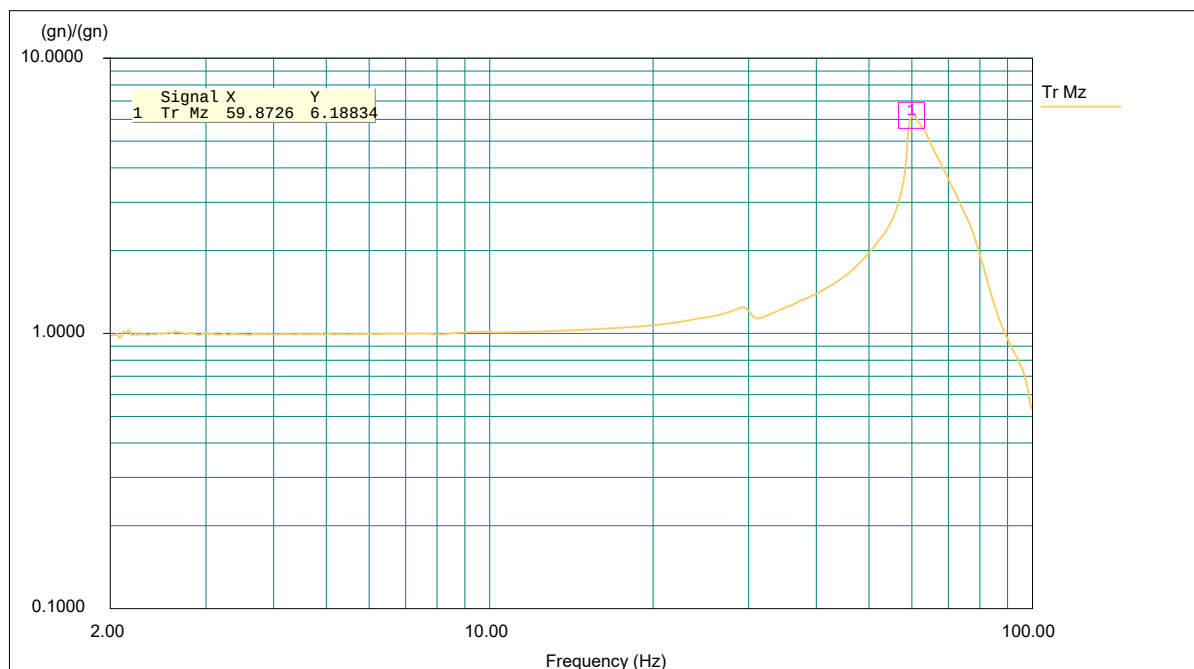
curve 32

Acceleration measurement of M point given below:



curve 33

Transfer function of measuring point M given below:



curve 34

Result: There is resonance frequency. An endurance at the frequency of 59.8 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

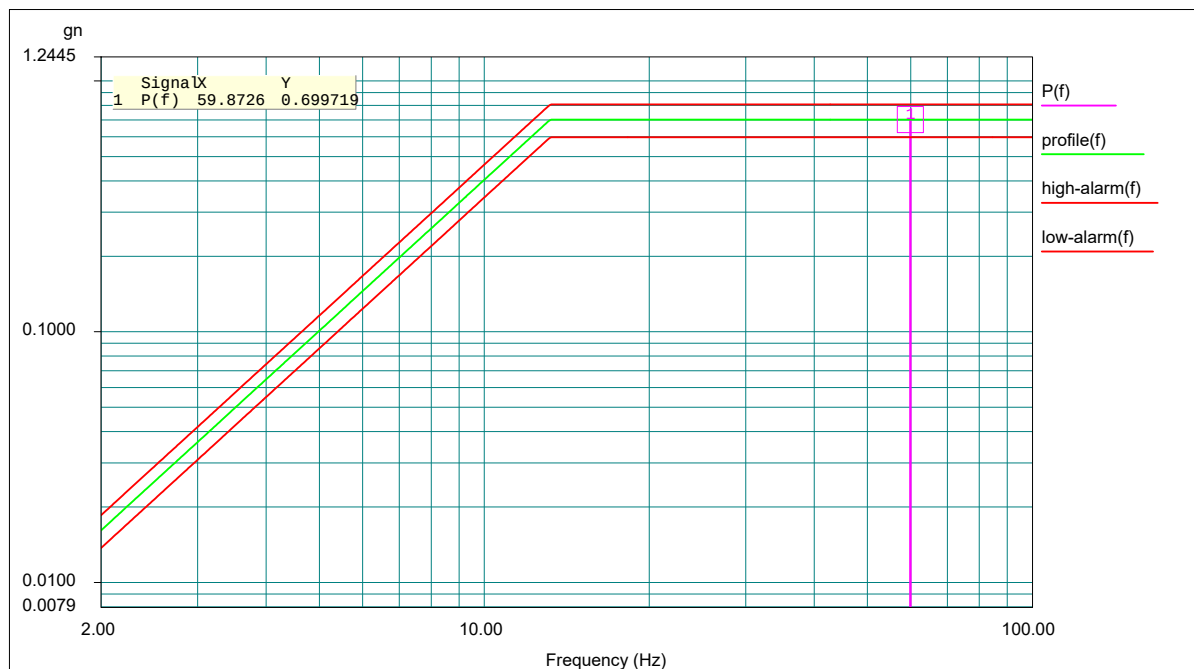
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Yes	/

7.3.3.2. Vibration test/Endurance:

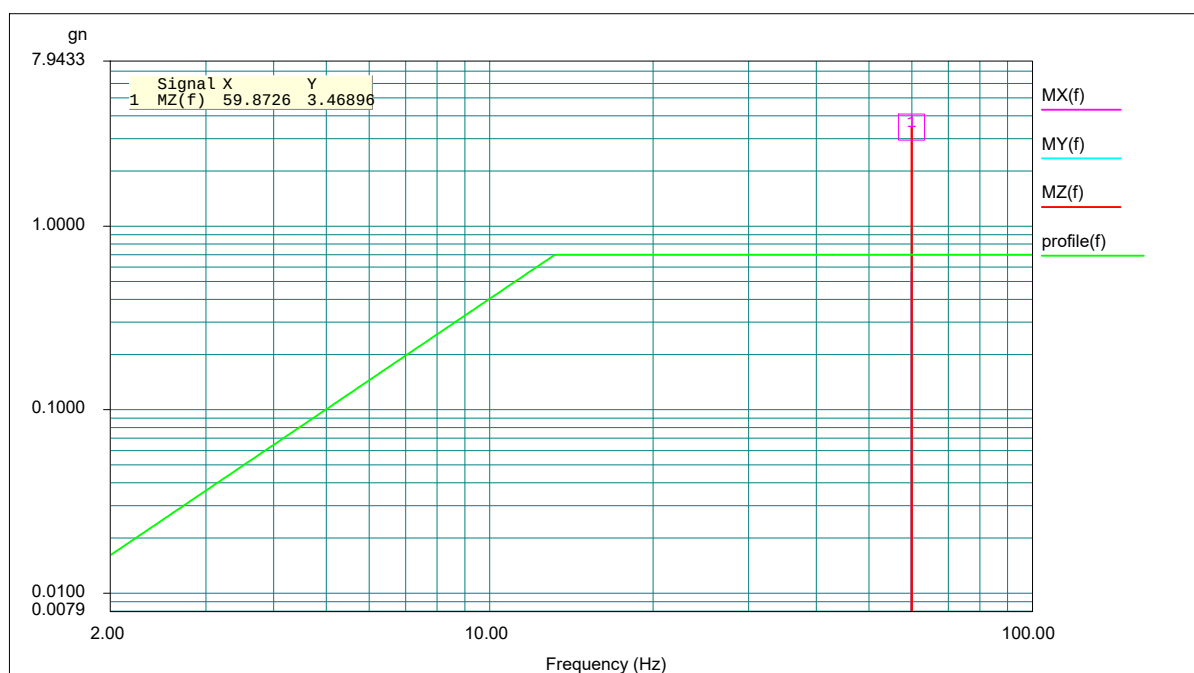
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 35

Acceleration measurement of M point given below:



curve 36

Result:

No visual degradation is observed.
Equipment was properly operating during and after test.

7.4. Appendix 4: AL175:

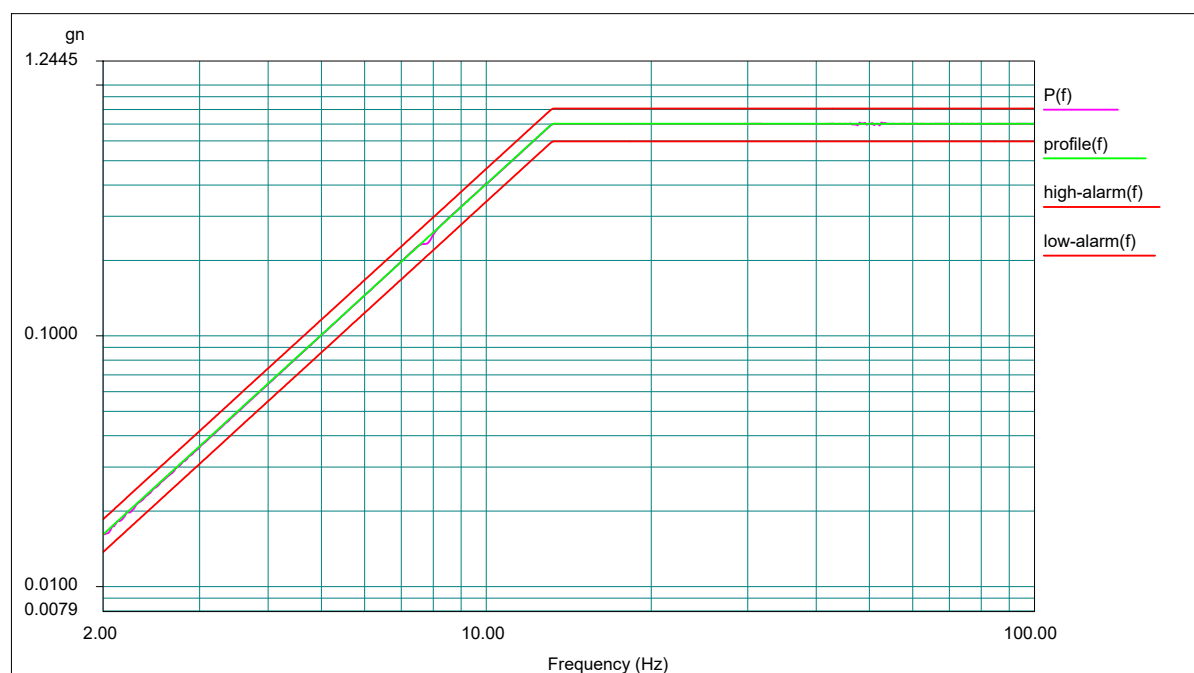
7.4.1. Axis Z:

7.4.1.1. Vibration test/RFS:

For this test, control was conducted at P1.

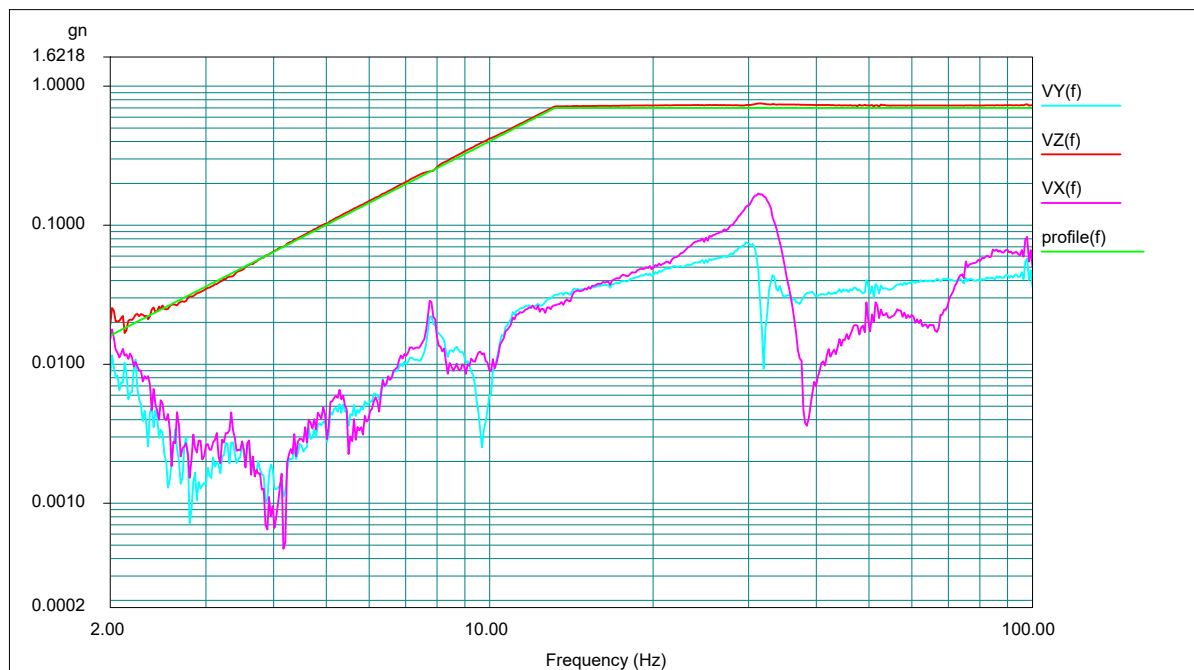
Curves recorded at the end of the test are presented here after.

Control curve is given below:



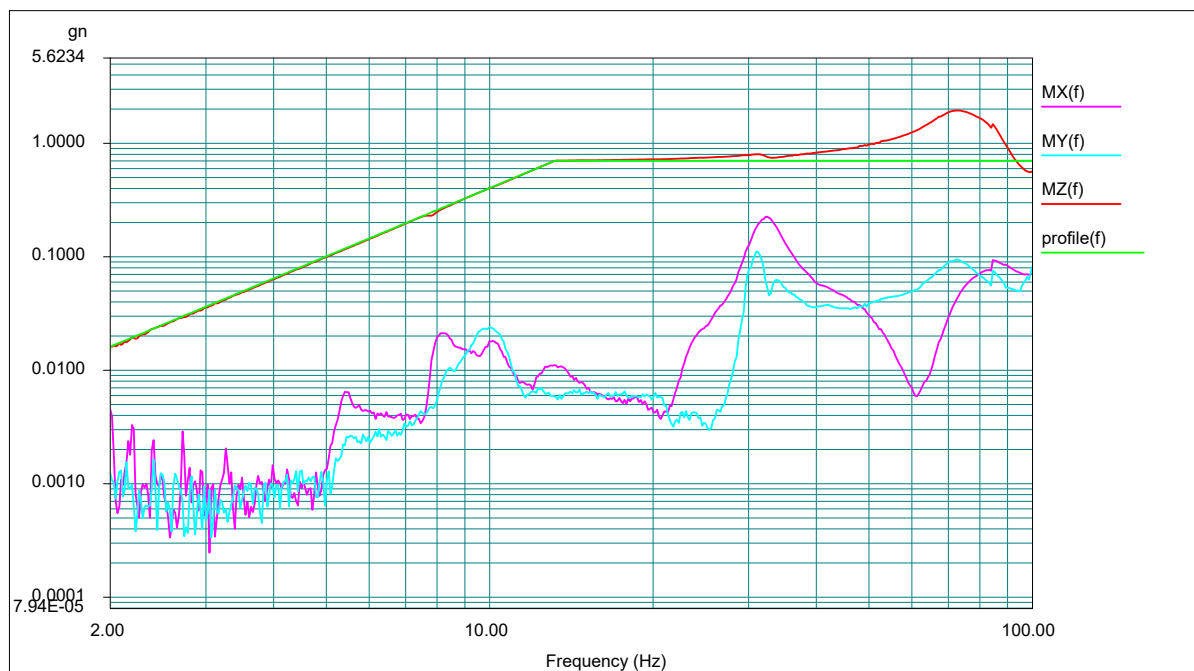
curve 37

Acceleration measurement of V point given below:



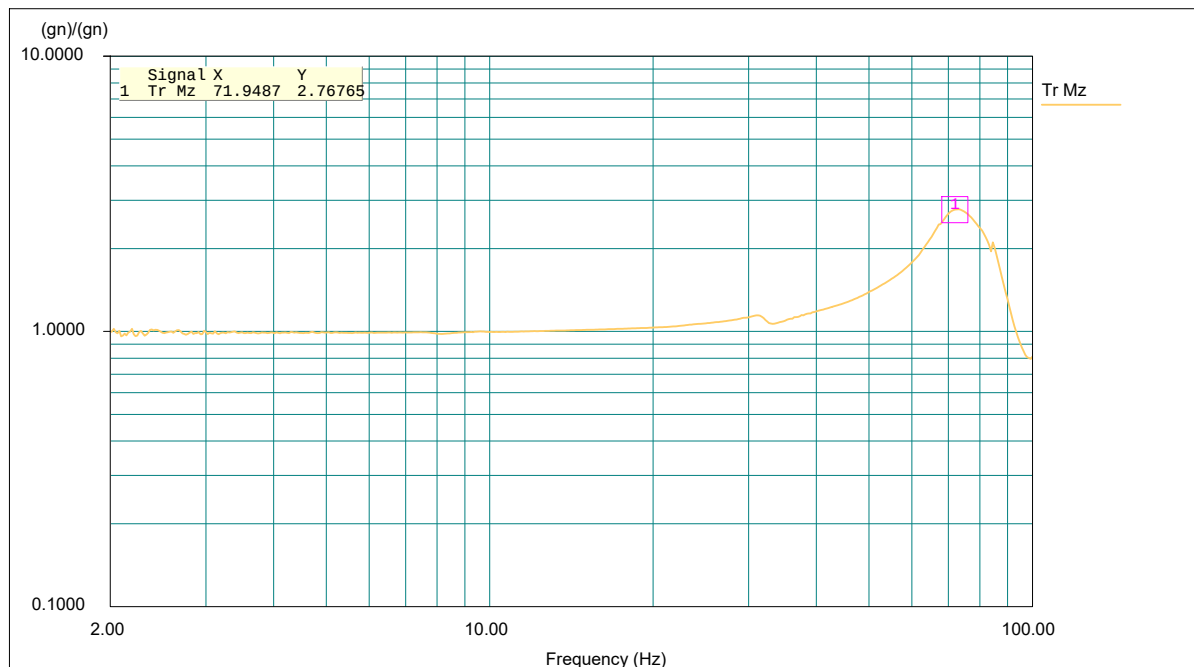
curve 38

Acceleration measurement of M point given below:



curve 39

Transfer function of measuring point M given below:



curve 40

Result: There is resonance frequency. An endurance at the frequency of 71.9 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

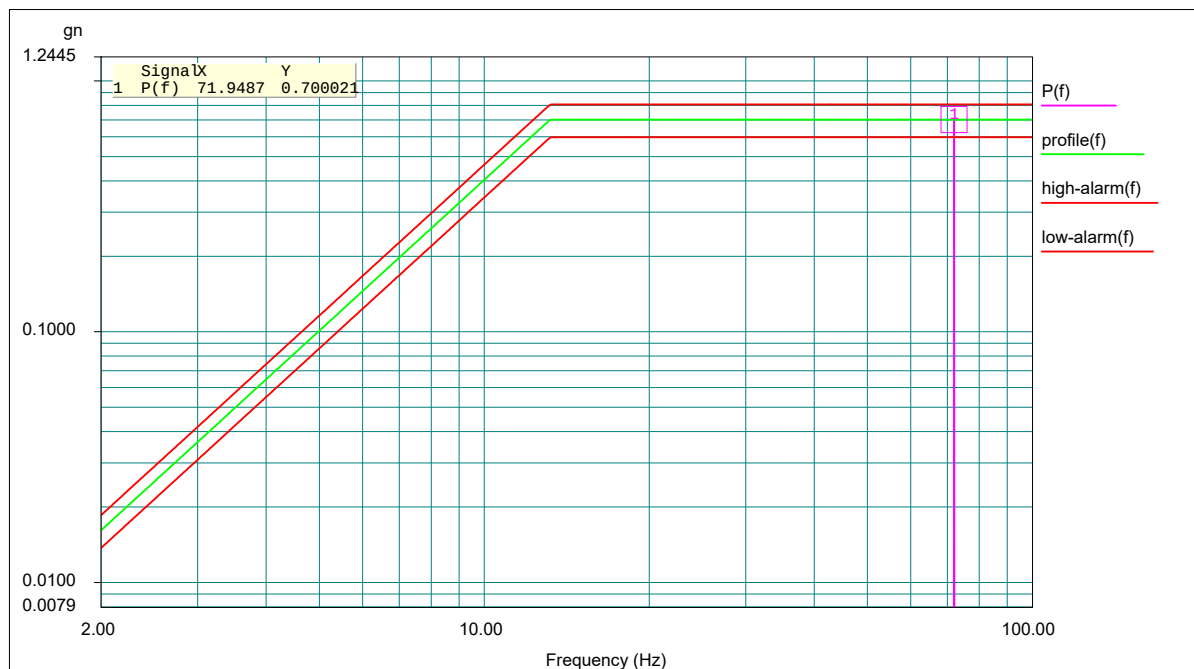
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Yes	/

7.4.1.2. Vibration test/Endurance:

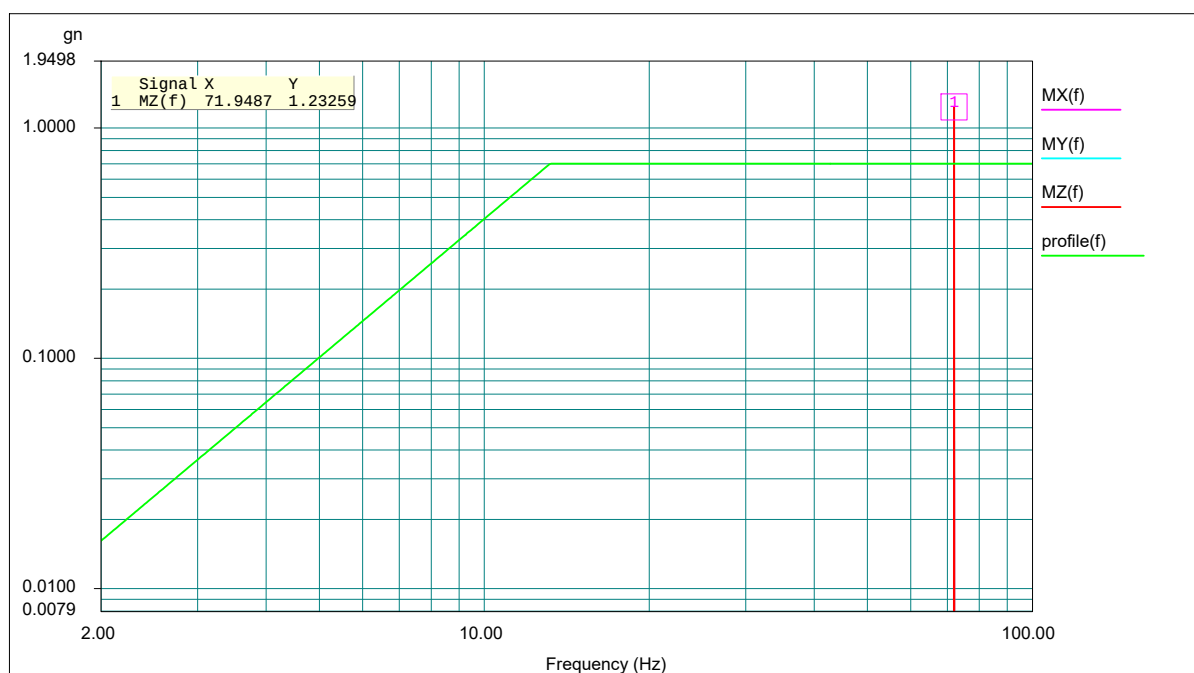
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 41

Acceleration measurement of M point given below:



curve 42

Result: No visual degradation is observed.
Equipment was properly operating during and after test.

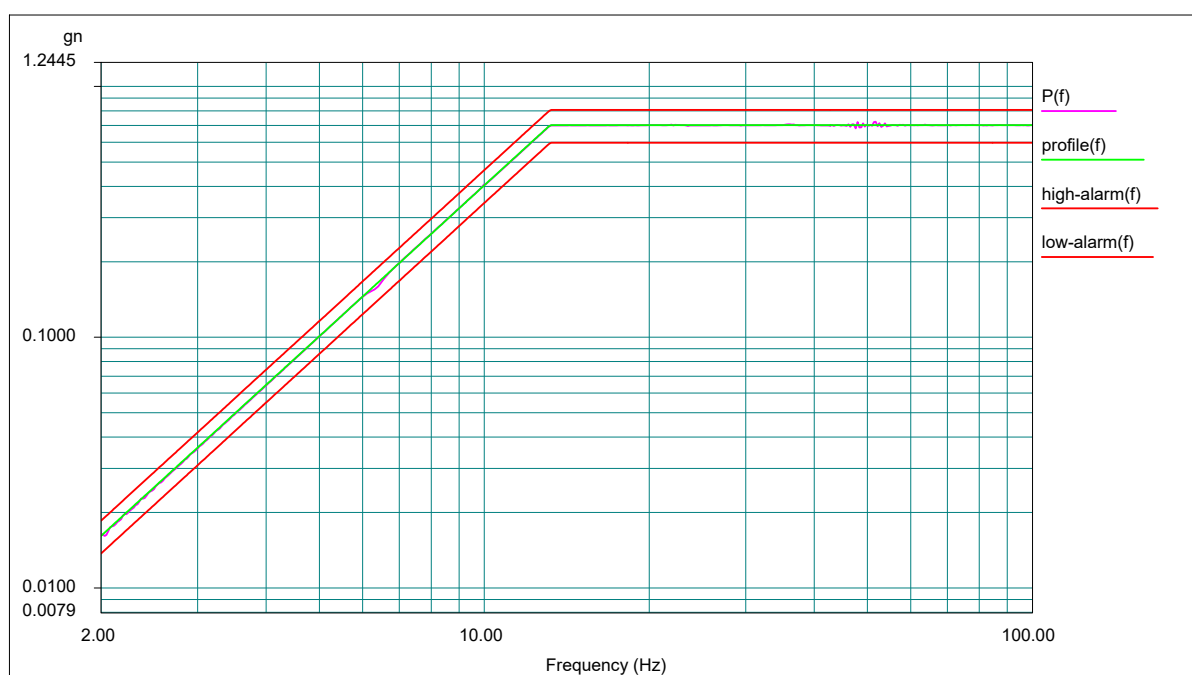
7.4.2. Axis X:

7.4.2.1. Vibration test/RFS:

For this test, control was conducted at P1.

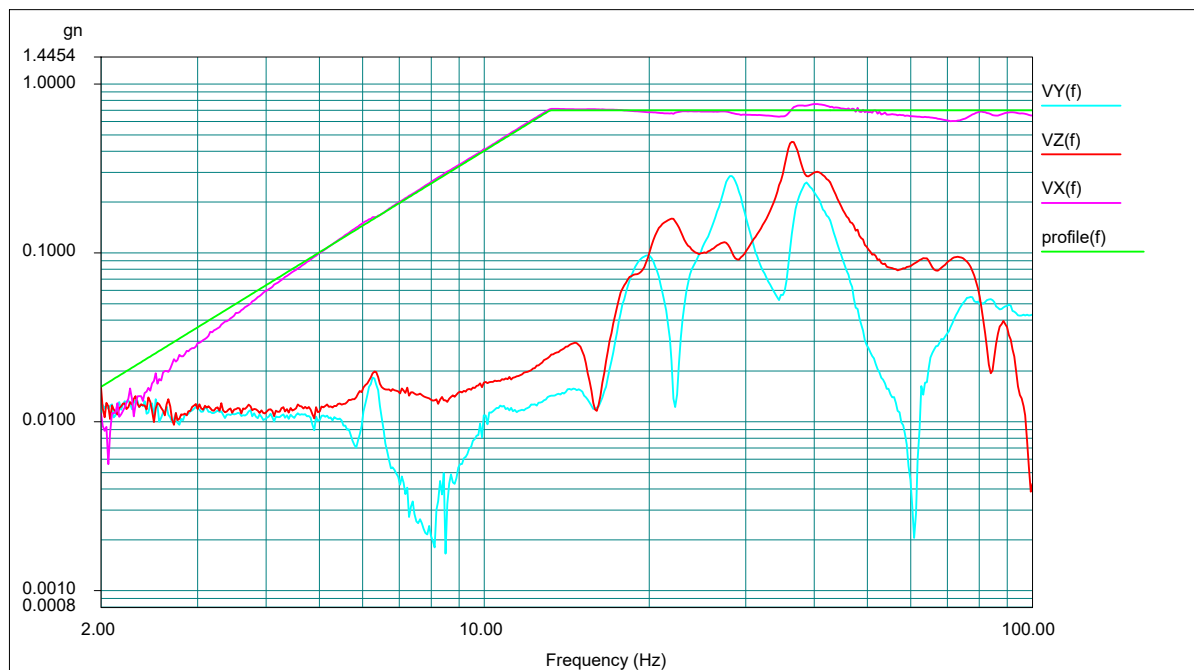
Curves recorded at the end of the test are presented here after.

Control curve is given below:



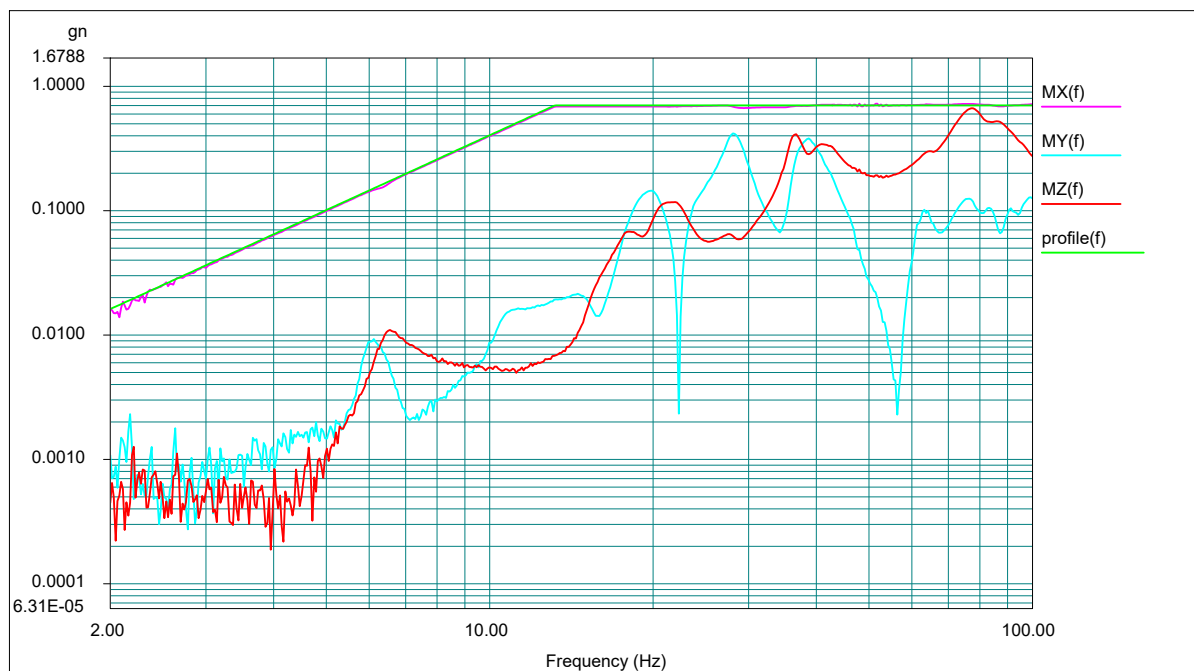
curve 43

Acceleration measurement of V point given below:



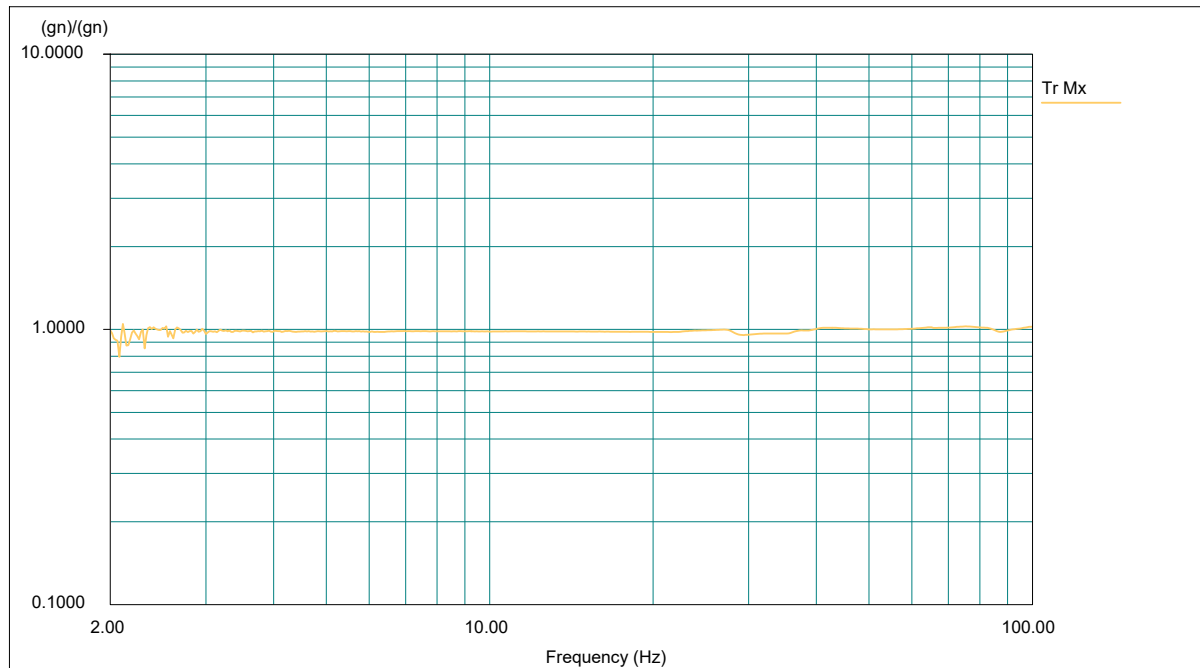
curve 44

Acceleration measurement of M point given below:



curve 45

Transfer function of measuring point M given below:



curve 46

Result: There is no resonance frequency. An endurance at the frequency of 30 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

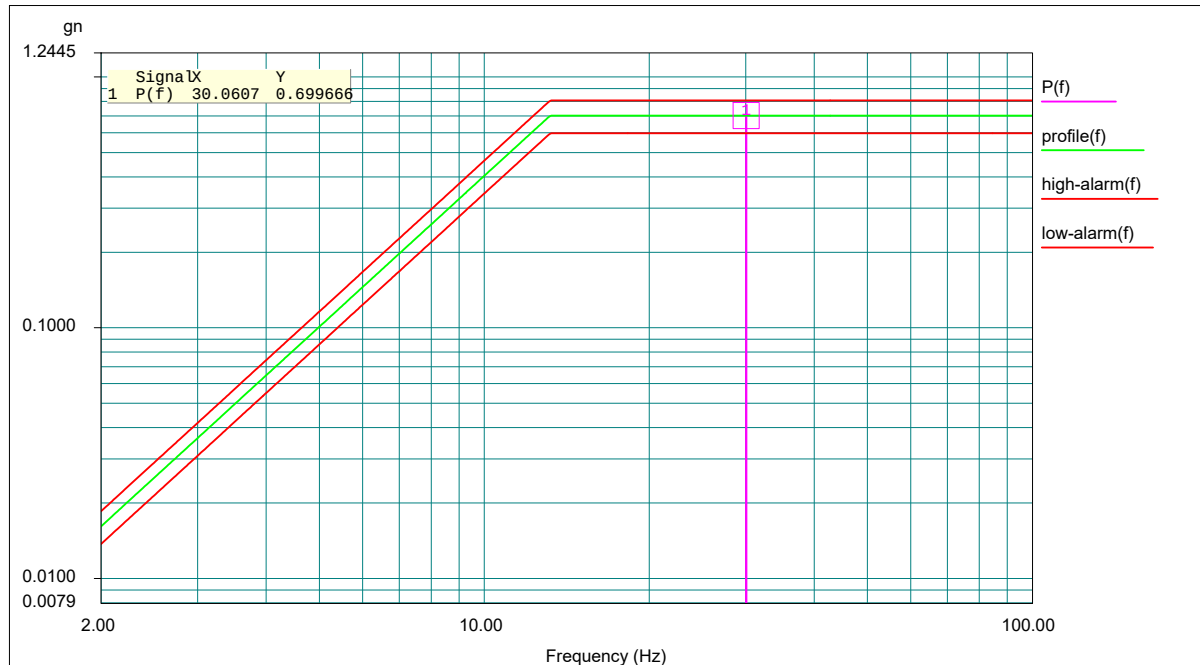
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Partial exceedance between 35 Hz and 45 Hz	/

7.4.2.2. Vibration test/Endurance:

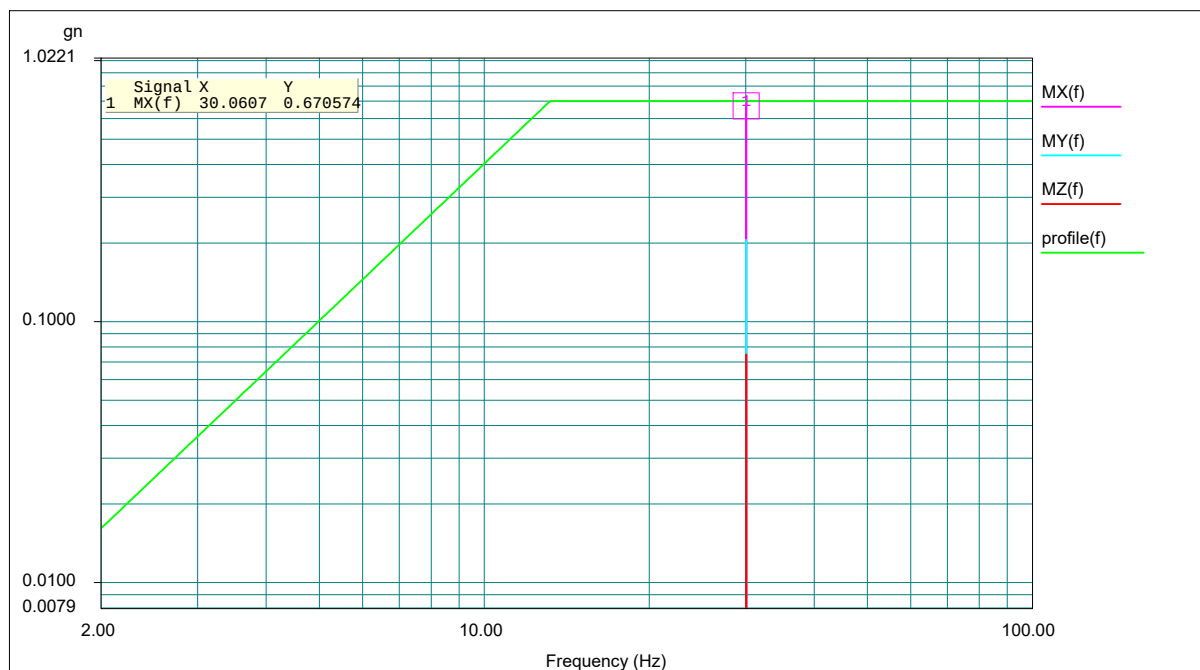
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 47

Acceleration measurement of M point given below:



curve 48

Result: No visual degradation is observed.
Equipment was properly operating during and after test.

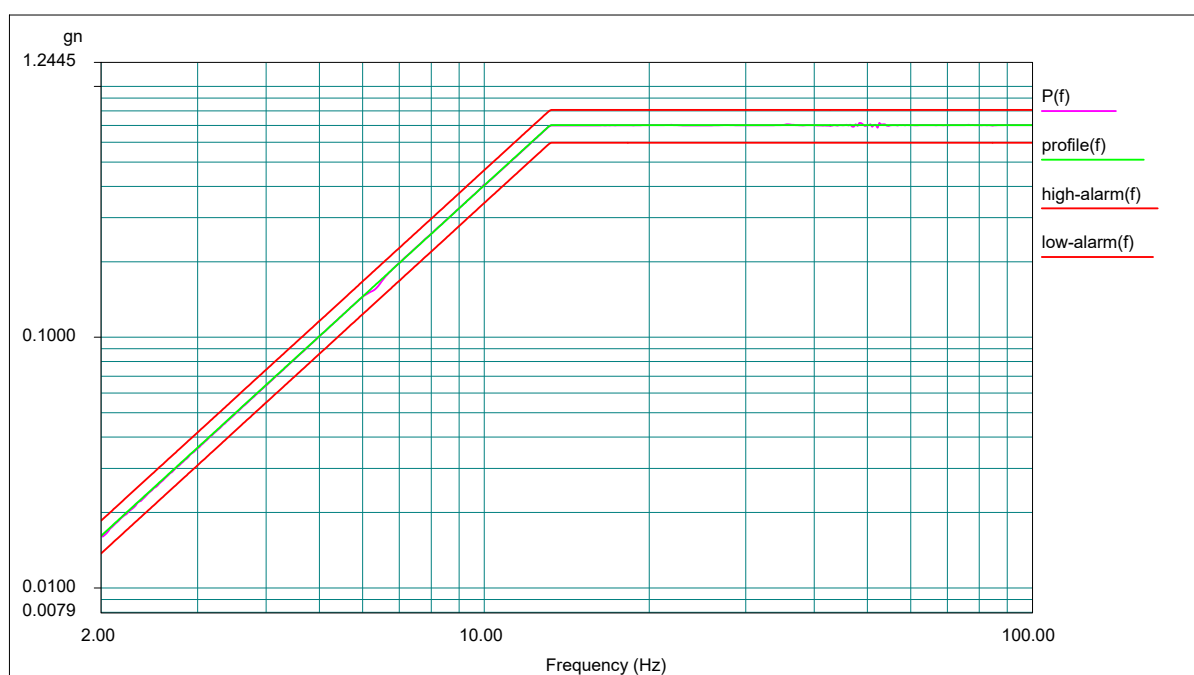
7.4.3. Axis Y:

7.4.3.1. Vibration test/RFS:

For this test, control was conducted at P1.

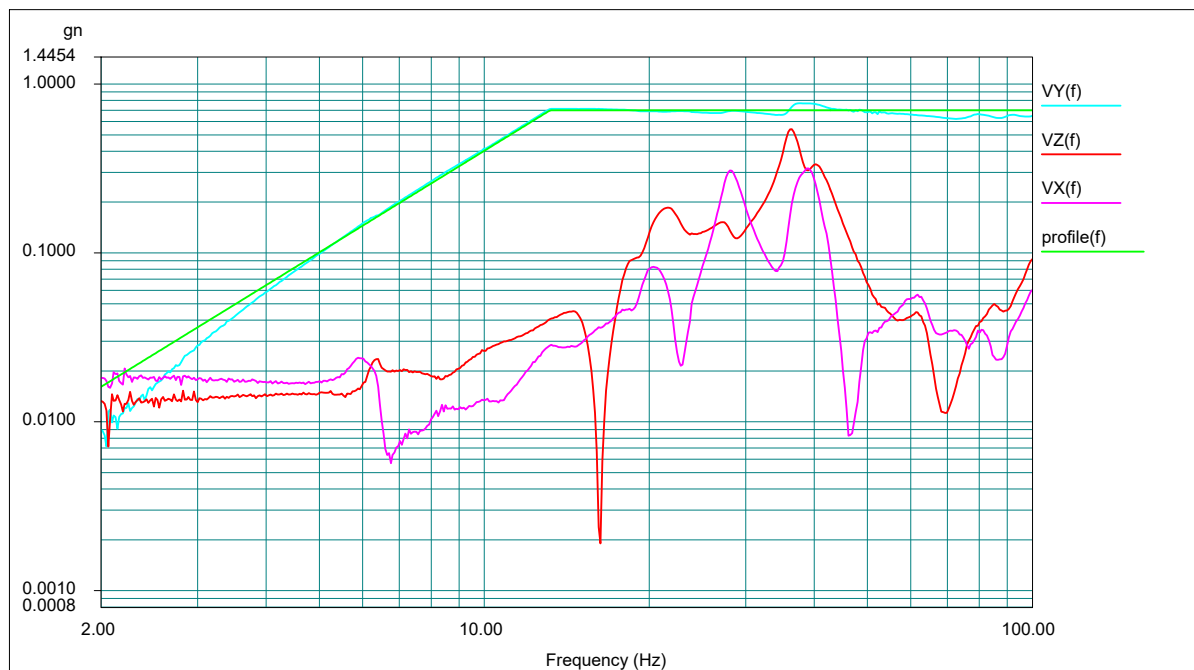
Curves recorded at the end of the test are presented here after.

Control curve is given below:



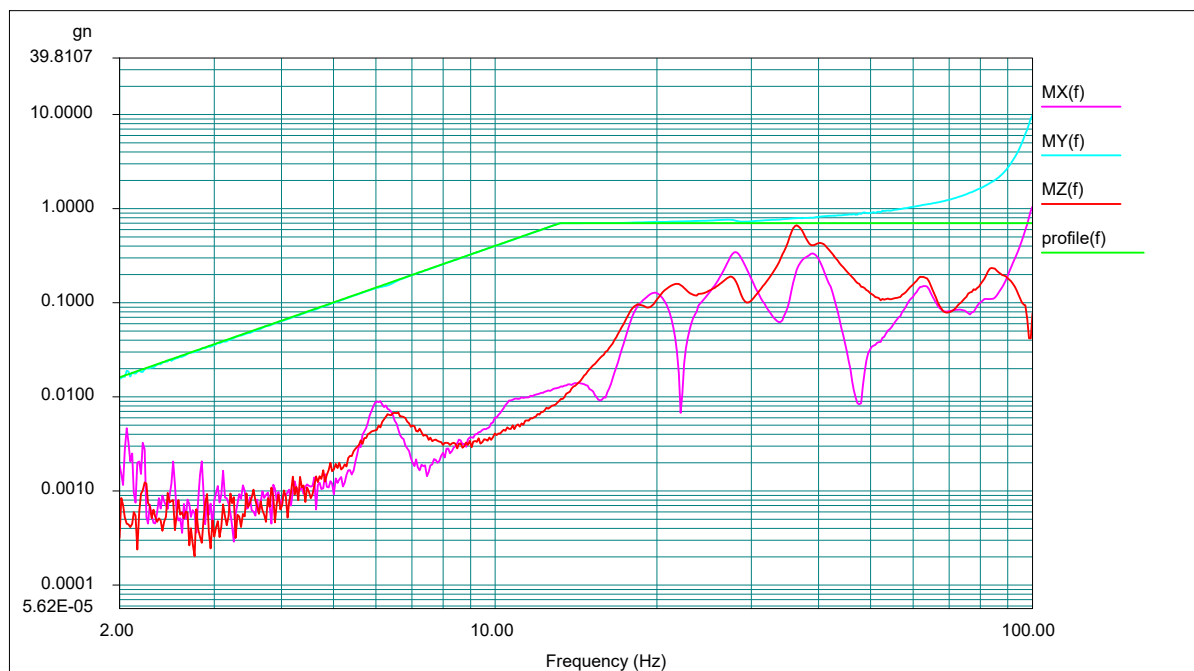
curve 49

Acceleration measurement of V point given below:



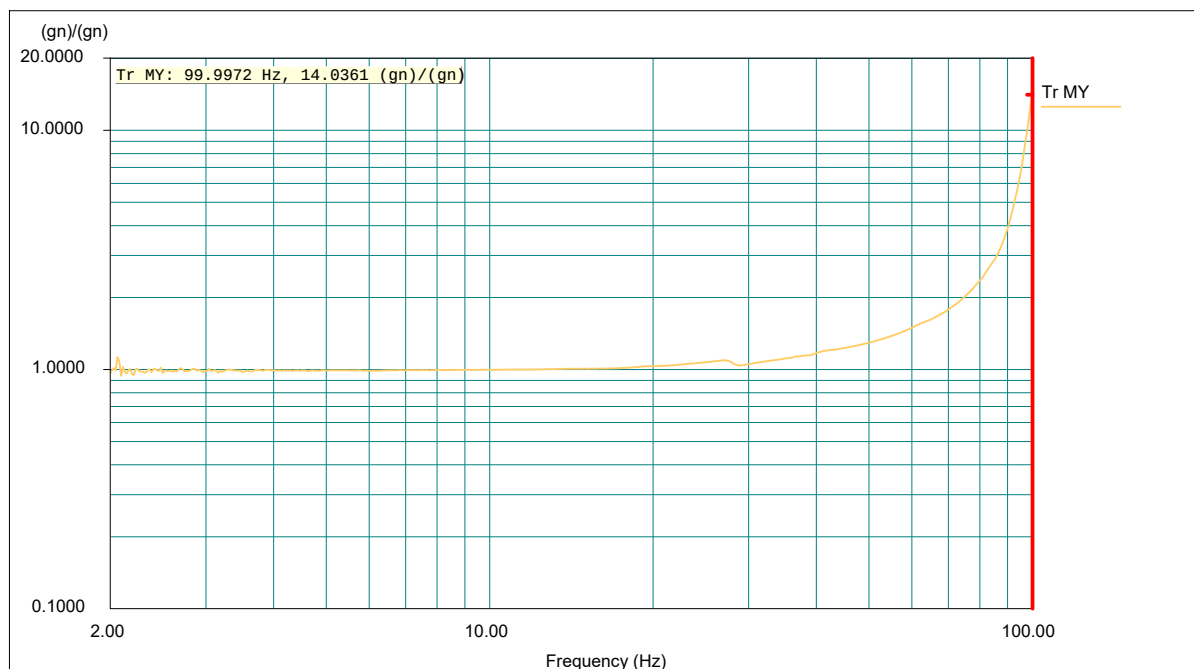
curve 50

Acceleration measurement of M point given below:



curve 51

Transfer function of measuring point M given below:



curve 52

Result: There is resonance frequency. An endurance at the frequency of 100 Hz is performed.
No visual degradation is observed.
Equipment was properly operating during and after test.

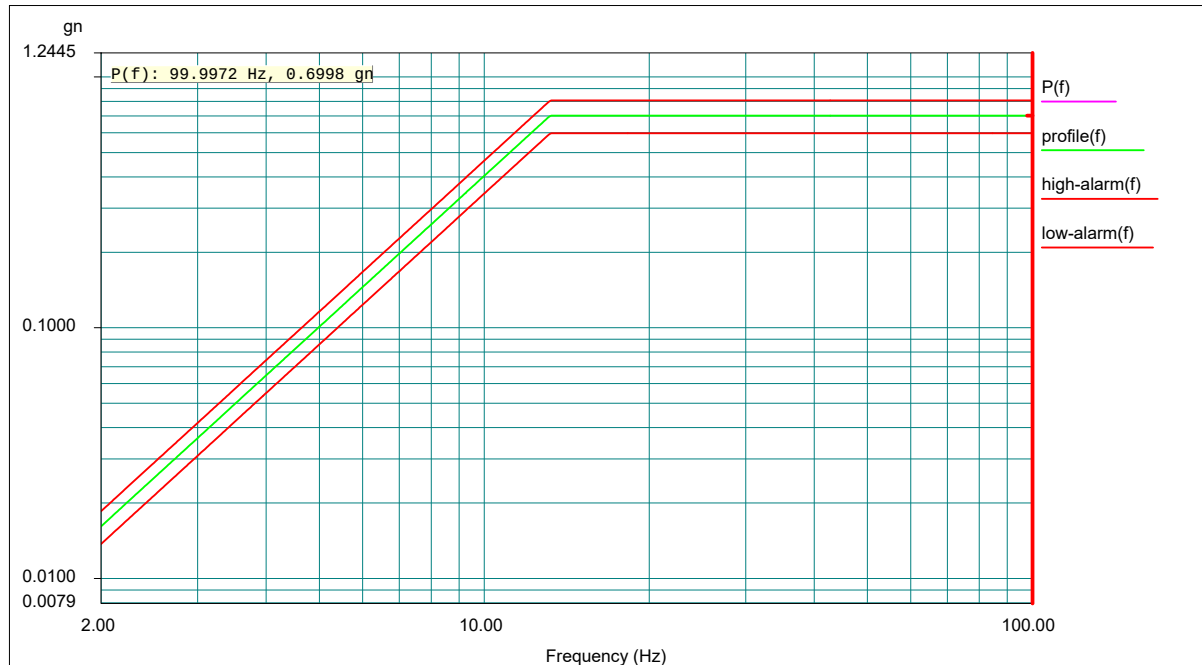
Below is a summary table of the conformities:

Tolerances	Criteria	conformities	Note
Tolerance on the control signal	+/-15%	Yes	/
Tolerance on the control points	+/-25% before 500Hz	Yes	/
Tolerance on transverse movements	< 50% before 500Hz	Partial exceedance between 35 Hz and 45 Hz	/

7.4.3.2. Vibration test/Endurance:

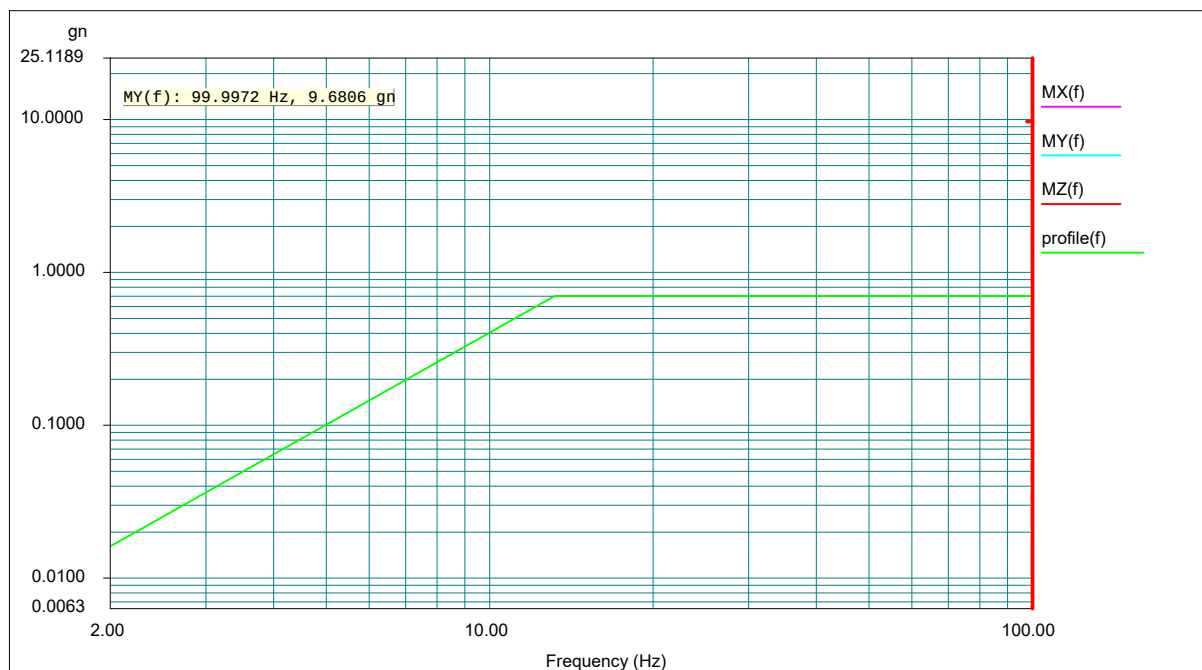
Curves recorded at the end of the test are presented here after.

Control curve is given below:



curve 53

Acceleration measurement of M point given below:



curve 54

Result: No visual degradation is observed.
Equipment was properly operating during and after test.