

TEST REPORT



CTK Co., Ltd.

5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si,
Gyeonggi-do, Republic of Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

REPORT No.:
CTK-2025-02238
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1. Applicant

- Name : Hanwha Vision Co., Ltd
- Address : 6 Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, 13488 KOREA
- Date of Receipt : Jul. 10, 2025

2. Manufacturer

- Name : Hanwha Vision Co., Ltd

3. Use of Report :

For submission to customer

4. Test sample / Model :

NETWORK CAMERA / PNM-A13022RV

5. Date(s) of test :

Aug. 21, 2025 ~ Aug. 24, 2025

6. Test Standard (Method) used :

NEMA TS 2-2013 2.2.7.3 Test C ~ 2.2.7.8 Test H,
NEMA TS 2.2.8, NEMA TS 2.2.9

7. Testing Environment :

Temperature: (25 ±10) °C, Humidity: (50 ±25) % R.H.
Pressure: (96 ±10) kPa

8. Test Results :

Refer to the test results

9. Location of Test :

☒ Permanent Testing Lab ☐ On Site Testing
(5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-
do, Republic of Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK.

Approval	Tested by	Technical Manager
	Name: HyungUk Jeon (Signature)	Name: HoHyun Lee (Signature)

Remark. This report is not related to KOLAS accreditation and relevant regulation.

Aug. 25, 2025

CTK Co., Ltd.



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1. Testing laboratory

1.1 Testing laboratory information

Lab. Name	CTK Co., Ltd.
Representative	Young Joseph Seungwon
Address	113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do Republic of Korea
Tel.	+82-31-339-9970
Fax.	+82-31-624-9501
E-Mail	all.youngin@element.com
Website	www.elementkorea.kr

1.2 Testing laboratory accreditation status

Country	Classification	Accreditation Number	Logo
International	KOLAS	TESTING NO. KT119	

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2. Product description and equipment information

2.1 Product description

Product Name	Model Name	Quantity	Comment
NETWORK CAMERA	PNM-A13022RV	1 EA	–

2.2 Equipment information

Testing equipment	Model Name	Manufacturer	Manufacturing Number	Calibration Date
Temperature & Humidity Chamber	ARS-1100-AE	ESPEC	1110024015	Oct 07, 2025
VIBRATION TESTING SYSTEM	LT1010	FAMTECH	D2012335	N/A
Acceleration sensor	8703A250M5	KISTLER	5830236	Jan. 16, 2026
Acceleration sensor	8703A250M5	KISTLER	5722241	Jan. 16, 2026

2.3 Pre-test product images

2.3.1 Test sample



Top



Bottom



Front



Rear



Left side



Right side



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2.4 Testing equipment images

2.4.1 Test equipment



Temperature & Humidity Chamber



VIBRATION TESTING SYSTEM



8703A250M5



8703A250M5



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3. NEMA TS 2-2013 2.2.7.3 Test C ~ 2.2.7.8 Test H

3.1 Test date and environmental conditions

3.1.1 Test date: Aug. 22, 2025 ~ Aug. 24, 2025

3.1.2 Measured Environmental Conditions

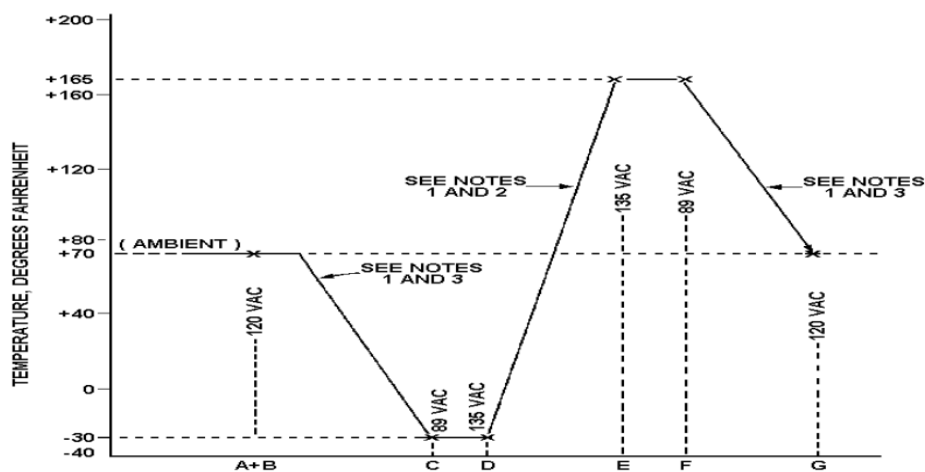
Item	Temperature (°C)	Humidity (% R.H.)	Pressure (kPa)
Measurement	24.2	46.2	96.3

3.2 Test conditions and methods

- 3.2.1 2.2.7.3 Test C: - 34 °C, 89 Vac, 10 h (Check interim operation after 5 h and operation check after 10h)
- 3.2.2 2.2.7.4 Test D: - 34 °C, 135 Vac, 1 h (Operating state)
- 3.2.3 2.2.7.5 Test E: 74 °C, 18 %, 135 Vac, 15 h (Operating state)
- 3.2.4 2.2.7.6 Test F: 74 °C, 18 %, 89 Vac (Operation check after 2.2.7.5 Test E)
- 3.2.5 2.2.7.7 Test G: (21 ±6) °C, 120 Vac (Operating state)
- 3.2.6 2.2.7.8 Test H: Check for mechanical damage

3.2.7 Test Methods

- Evaluations Criteria :
 - Check for mechanical damage before and after testing
- Test methods



3.3 Testing images

3.3.1 Evidence of test setting



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3.4 Test Result

3.4.1 Test result table

Evaluation Criteria		Test Results	Comment
2.2.7.3 Test C ~ 2.2.7.8 Test H	Before	Normal	-
	After	Normal	-



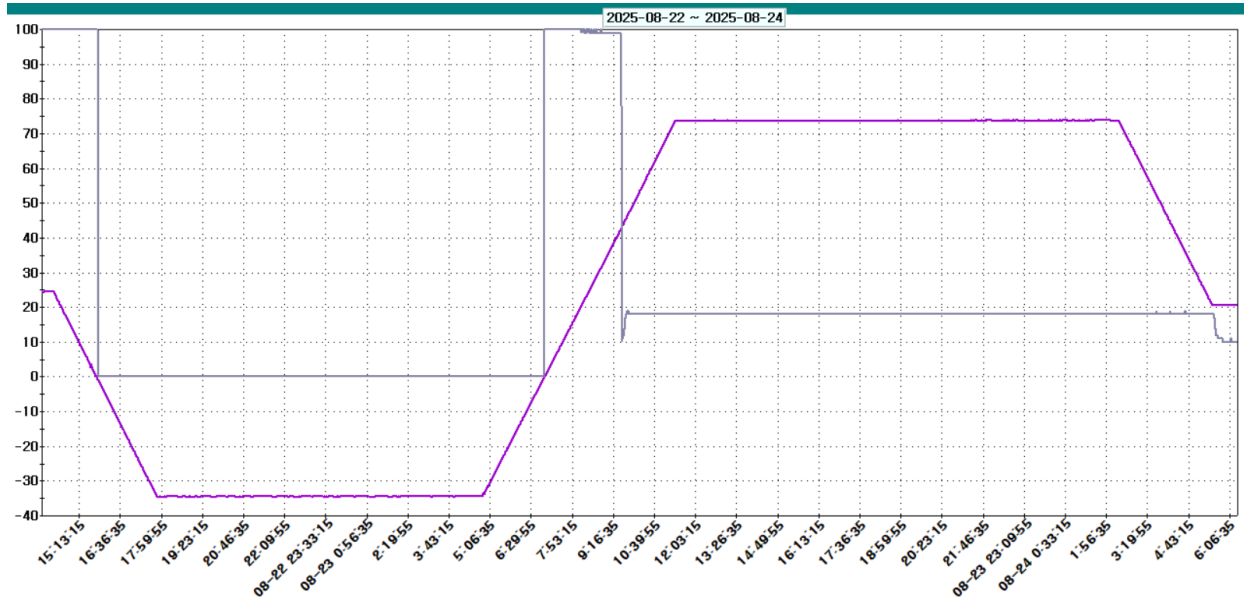
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3.5 Test Data

3.5.1 Test data and graph



Temperature Data



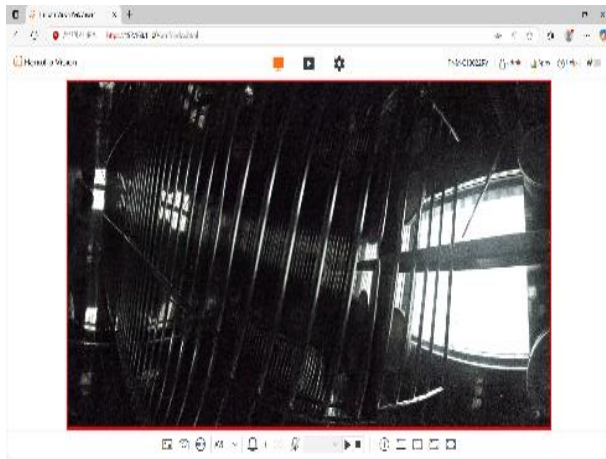
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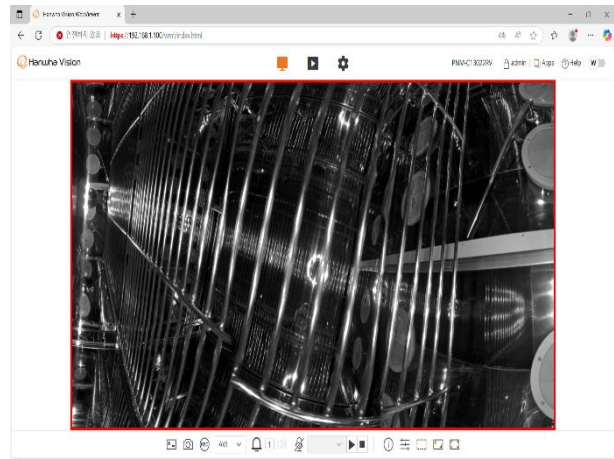
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3.6 Test sample operation images

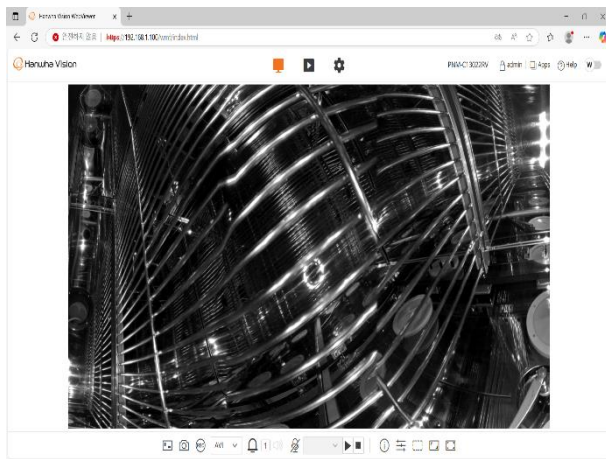
3.6.1 Test sample operation and function



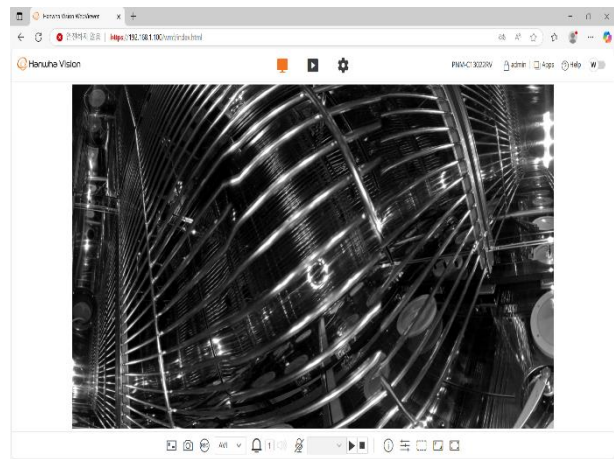
-34 °C 89 Vac



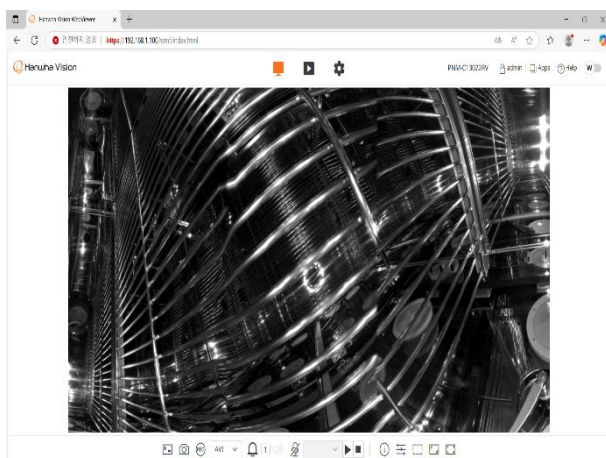
-34 °C 135 Vac



74 °C 135 Vac



74 °C 89 Vac



(21 ±6) °C 120 Vac

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4. Resonant search, Endurance Test [NEMA TS 2-2013 2.2.8]

4.1 Test date and environmental conditions

4.1.1 Test date: Aug. 21, 2025 ~ Aug. 22, 2025

4.1.2 Measured Environmental Conditions

Item	Temperature (°C)	Humidity (% R.H.)	Pressure (kPa)
Measurement	24.7	45.0	89.9

4.2 Test conditions and methods

4.2.1 Resonant search [NEMA TS 2-2013 2.2.8.3]

- Sample status : unpackaged / not in operation
- Applied waveform : Sine
- Frequency(Hz) : 5 ~ 30
- Double amplitude displacement (inch) : 0.015
- Sweep rate(Sweep/min) : 12.5
- Applicable axis : X, Y, Z
- Test time(h) : 12.5
- Evaluation items
 - Check for mechanical damage before and after testing
- Test methods
 - With the test unit securely fastened to the test table, set the test table for a double amplitude displacement of 0.015 inch.
 - Cycle the test table over a search range from 5 to 30 Hz and back within a period of 12.5 minutes.
 - Conduct the resonant frequency search in each of the three mutually perpendicular planes.
 - Note and record the resonant frequency determined from each plane.
 - ◆ In the event of more than one resonant frequency in a given plane, record the most severe a. resonance.
 - ◆ b. If resonant frequencies appear equally severe, record each resonant frequency.
 - ◆ c. If no resonant frequency occurs for a given plane within the prescribed range, 30 Hz shall be recorded.

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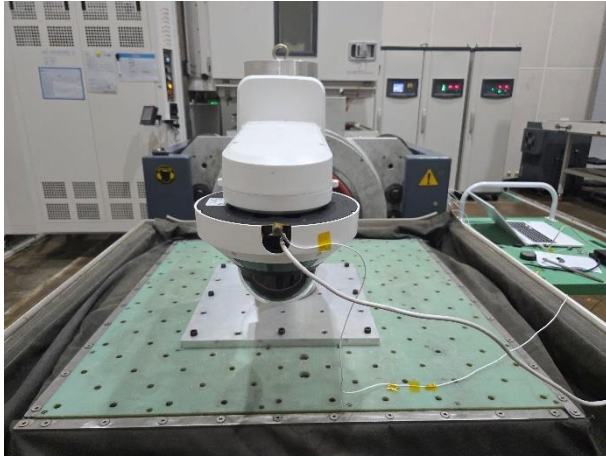
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4.2.2 Endurance Test[NEMA TS 2-2013 2.2.8.4]

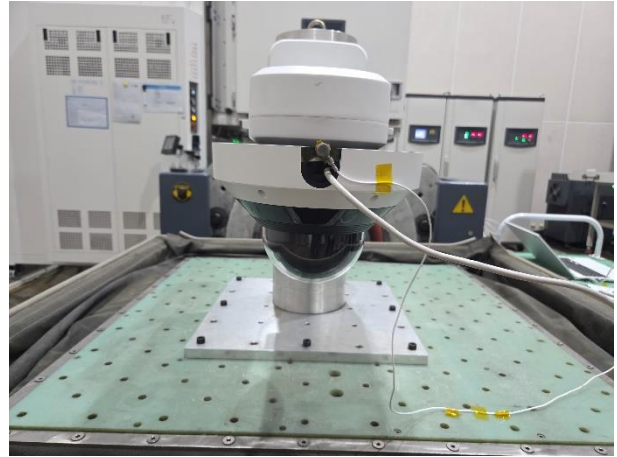
- Sample status : unpackaged / not in operation
- Applied waveform : Sine
- Frequency(Hz) : 30 or 3.2.2 Test results
- Acceleration(G) : 0.5
- Applicable axis : X, Y, Z
- Test time(h) : All 3(Each axis 1)
- Evaluation items
 - Check for mechanical damage before and after testing
- Test methods
 - Vibrate the test unit in each plane at its resonant frequency for a period of 1 hour at an amplitude resulting in 0.5 g acceleration. (test profile)
 - When more than one resonant frequency has been recorded in accordance with Section 1.2 Item 4, the test period of 1 hour shall be divided equally between the resonant frequencies.
 - The total time of the endurance test shall be limited to 3 hours, 1 hour in each of three mutually perpendicular planes.

4.3 Testing images

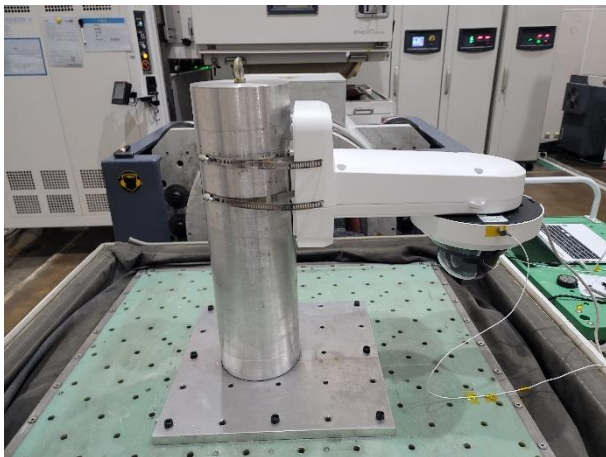
4.3.1 Evidence of test setting (NEMA TS 2-2013 2.2.8)



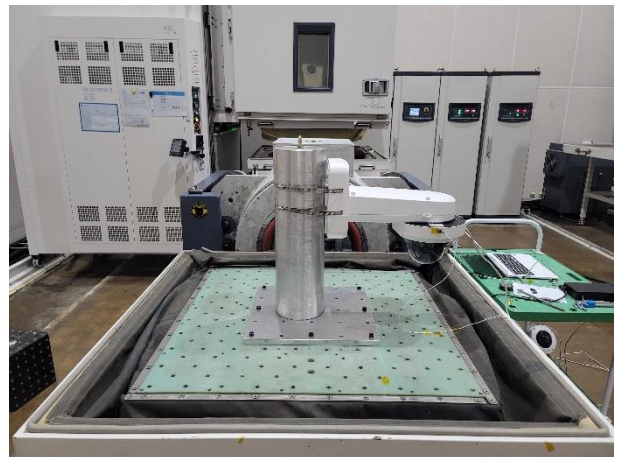
X axis_1



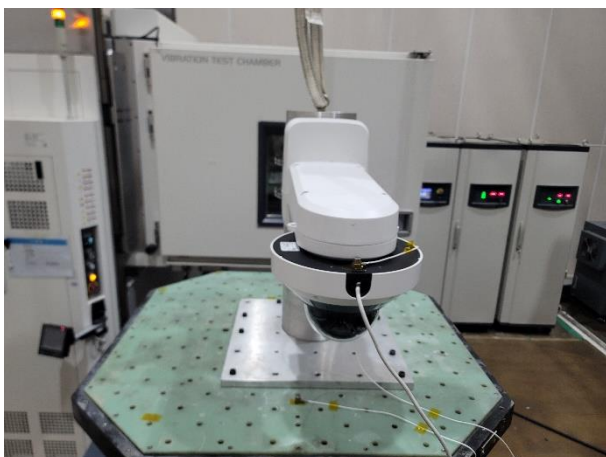
X axis_2



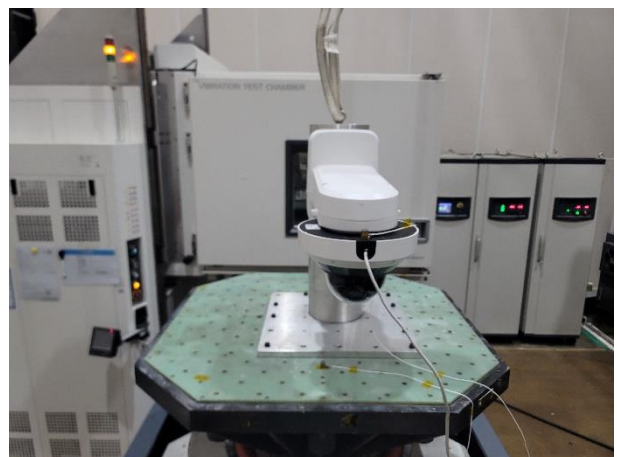
Y axis_1



Y axis_2



Z axis_1



Z axis_2

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4.4 Test Result

4.4.1 Test result table

Evaluation Criteria		Test Results	Comment
Resonant search Test	Before	Normal	
	After	Normal	
Endurance Test	Before	Normal	
	After	Normal	



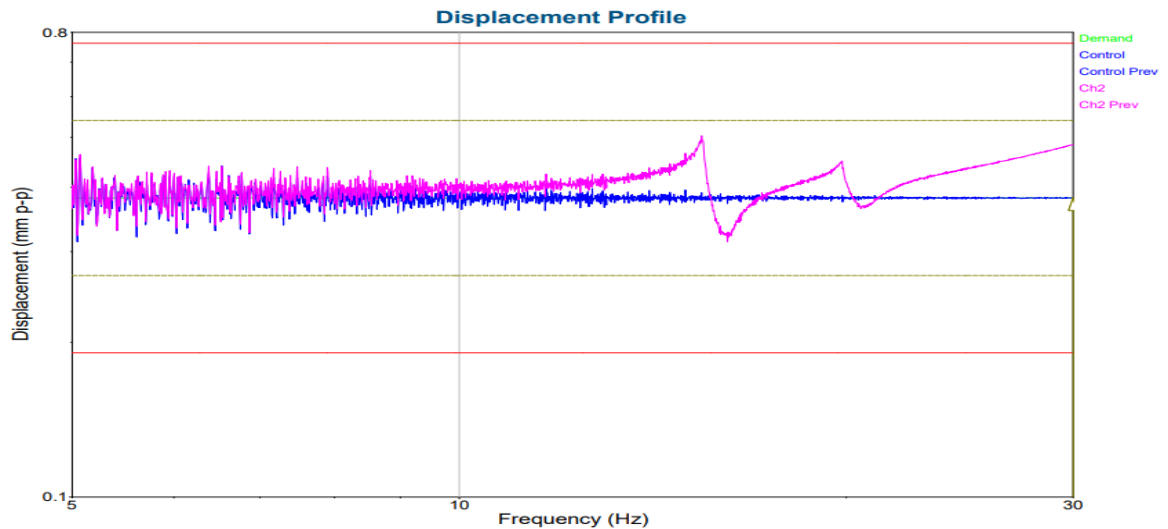
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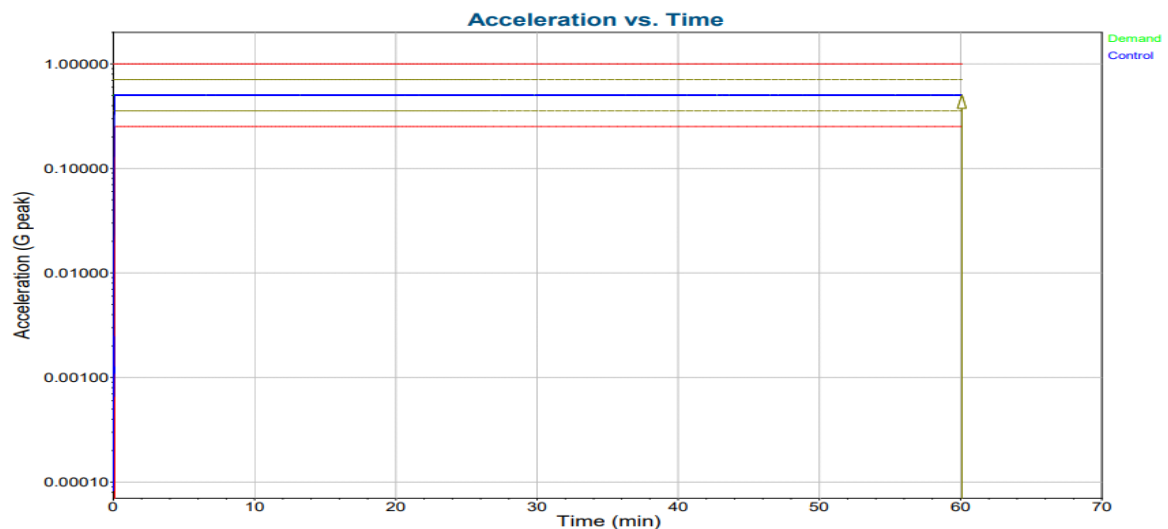
4.5 Test Data

4.5.1 Test Data X Axis



8 21, 2025 17:19:06	Level 1) 100 %	Output: 0.04784 Volts peak	NEMA TS-2 2.2.8
Demand: 0.381 mm	Level Time: 0:12:30	Frequency: 30 Hz	
Control: 0.3815 mm	Total Time: 0:12:36	End of Sweep Test	

Resonant search Test (X Axis)



8 21, 2025 18:20:14	Level 1) 100 %	Output: 0.03426 Volts peak	NEMA TS-2 2.2.8 내구
Demand: 0.5 G	Level Time: 1:00:00	Frequency: 30 Hz	
Control: 0.4996 G	Total Time: 1:00:08	End of Timed Test	

Endurance Test (X Axis)

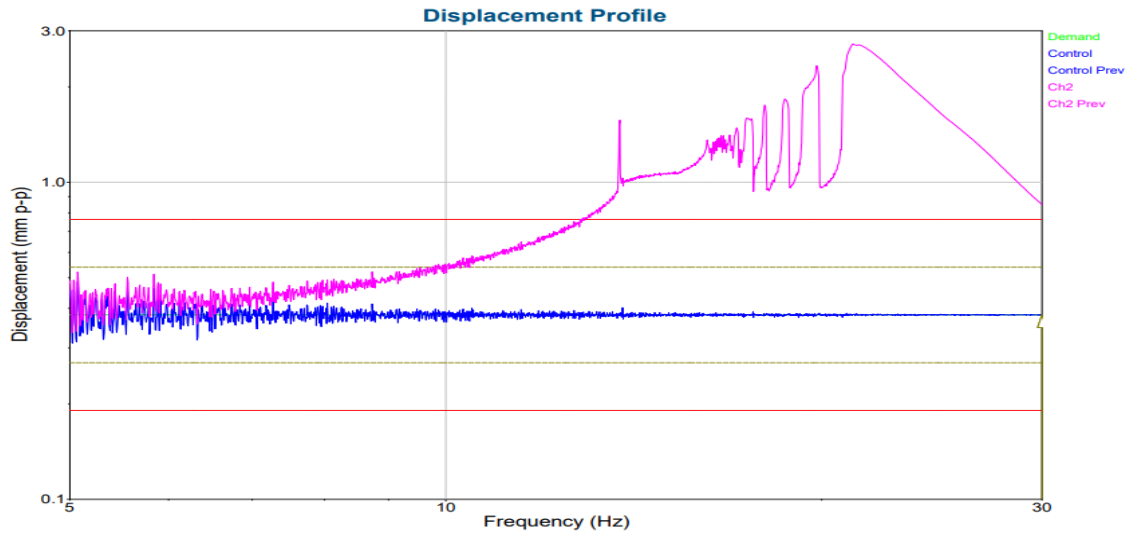


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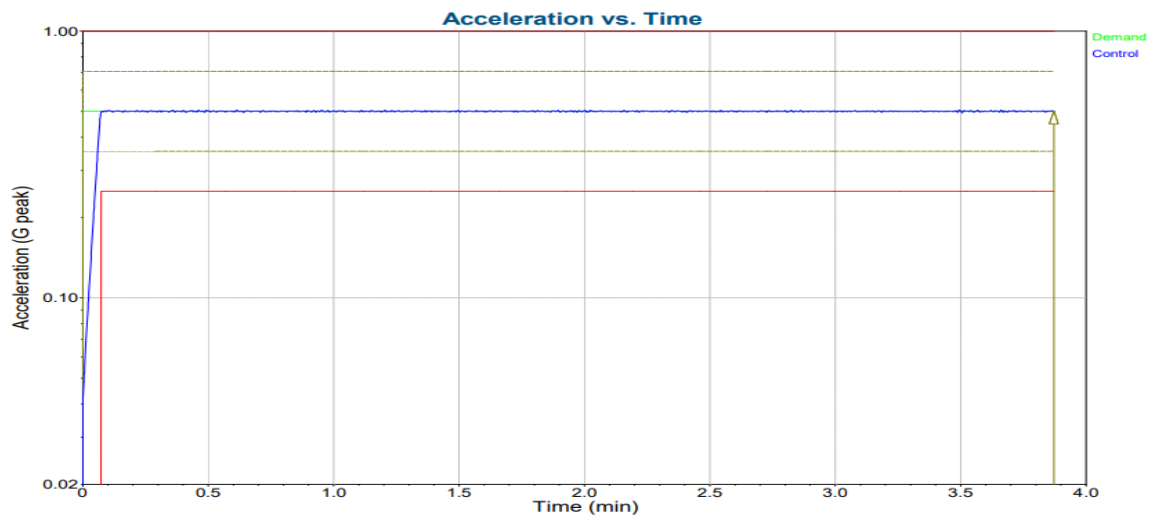
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4.5.2 Test Data Y Axis



8 21, 2025 18:31:28 Level 1) 100 % Output: 0.04802 Volts peak NEMA TS-2 2.2.8
Demand: 0.381 mm Level Time: 0:12:30 Frequency: 30 Hz
Control: 0.3814 mm Total Time: 0:12:36 End of Sweep Test

Resonant search Test (Y Axis)



8 22, 2025 09:30:42 Level 1) 100 % Output: 0.0741 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:03:45 Frequency: 13.78 Hz
Control: 0.5005 G Total Time: 0:03:52 End of Timed Test

Endurance Test (Y Axis)

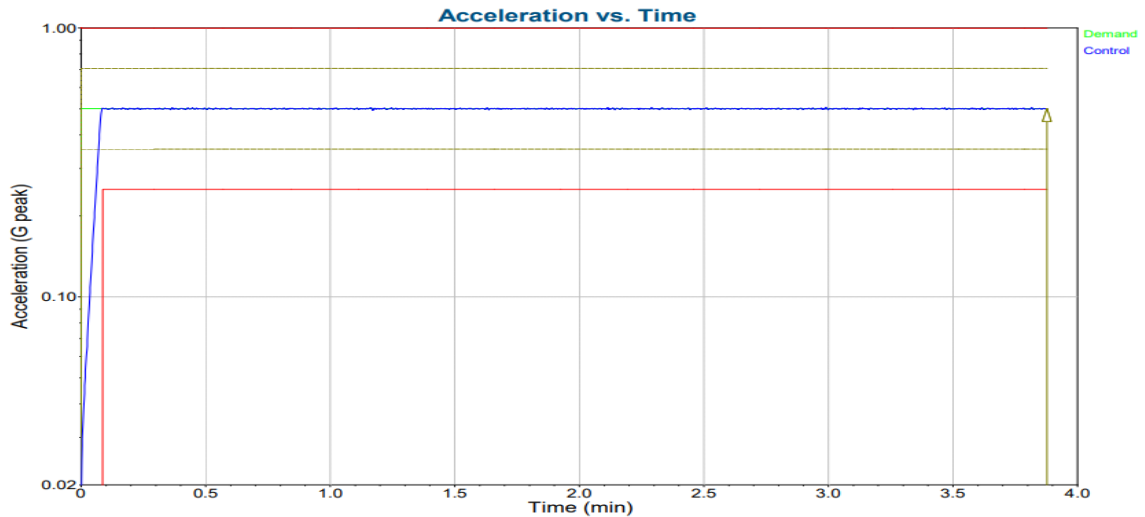


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4.5.3 Test Data Y Axis

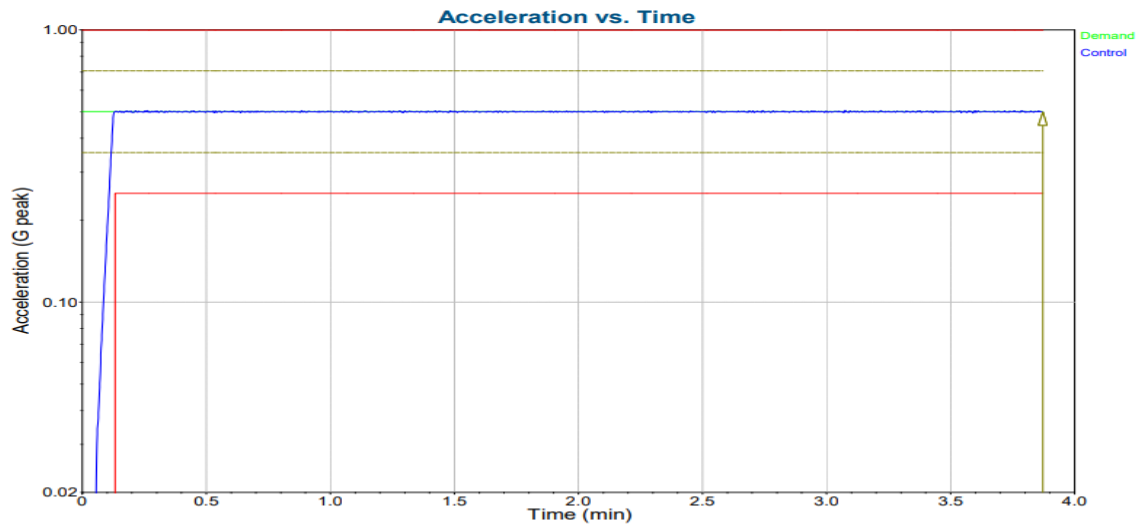


8 22, 2025 09:34:45 Level 1) 100 % Output: 0.06327 Volts peak NEMA TS-2 2.2.8 내구

Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.19 Hz

Control: 0.501 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 09:42:54 Level 1) 100 % Output: 0.06256 Volts peak NEMA TS-2 2.2.8 내구

Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.38 Hz

Control: 0.4974 G Total Time: 0:03:52 End of Timed Test

Endurance Test (Y Axis)

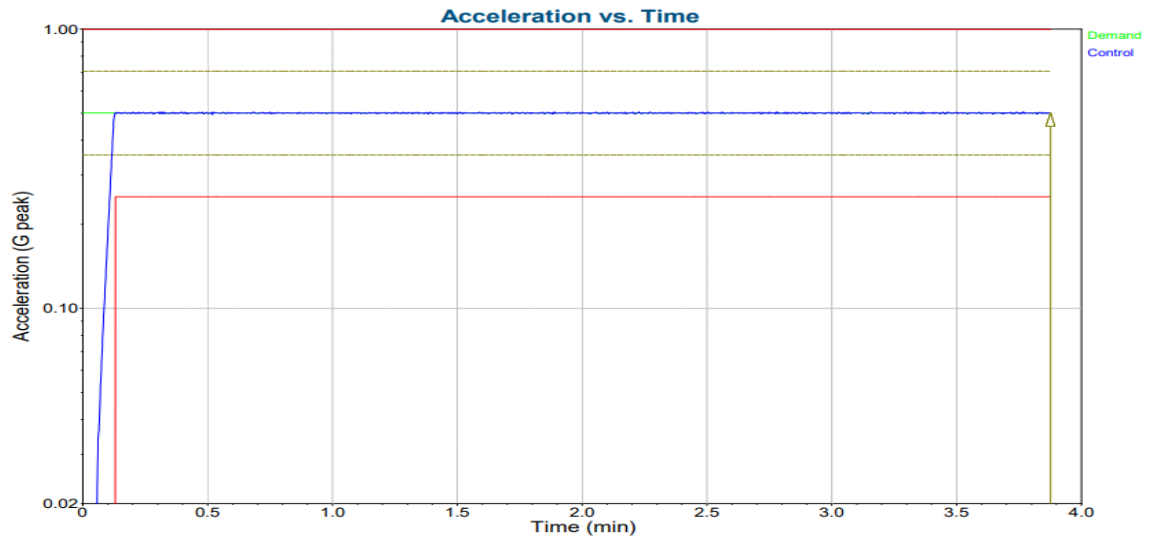


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4.5.4 Test Data Y Axis

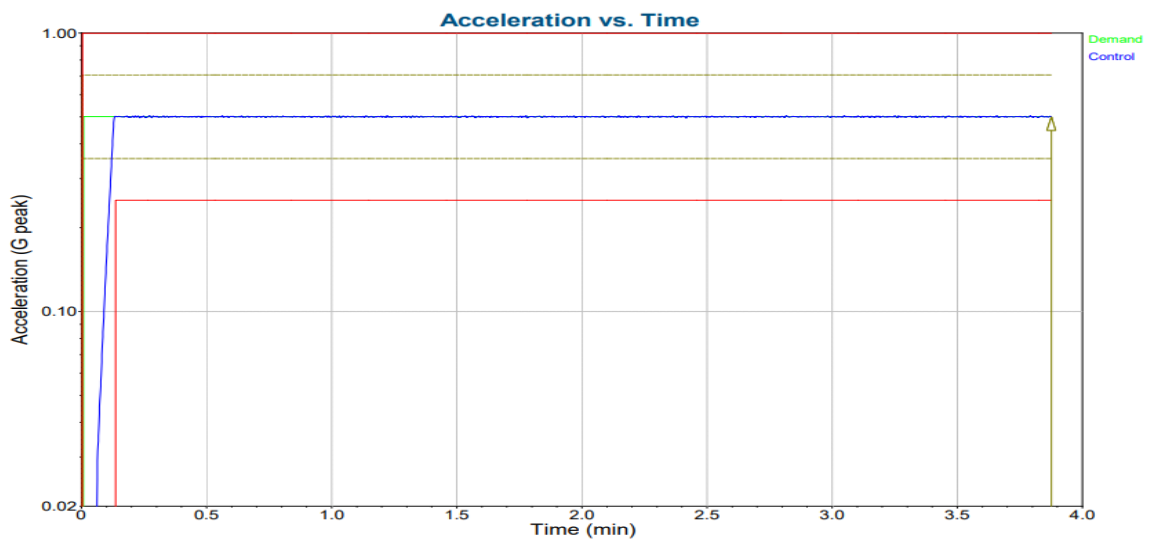


8 22, 2025 10:04:19 Level 1) 100 % Output: 0.06226 Volts peak NEMA TS-2 2.2.8 내구

Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.44 Hz

Control: 0.5001 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 10:08:23 Level 1) 100 % Output: 0.06197 Volts peak NEMA TS-2 2.2.8 내구

Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.5 Hz

Control: 0.499 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)

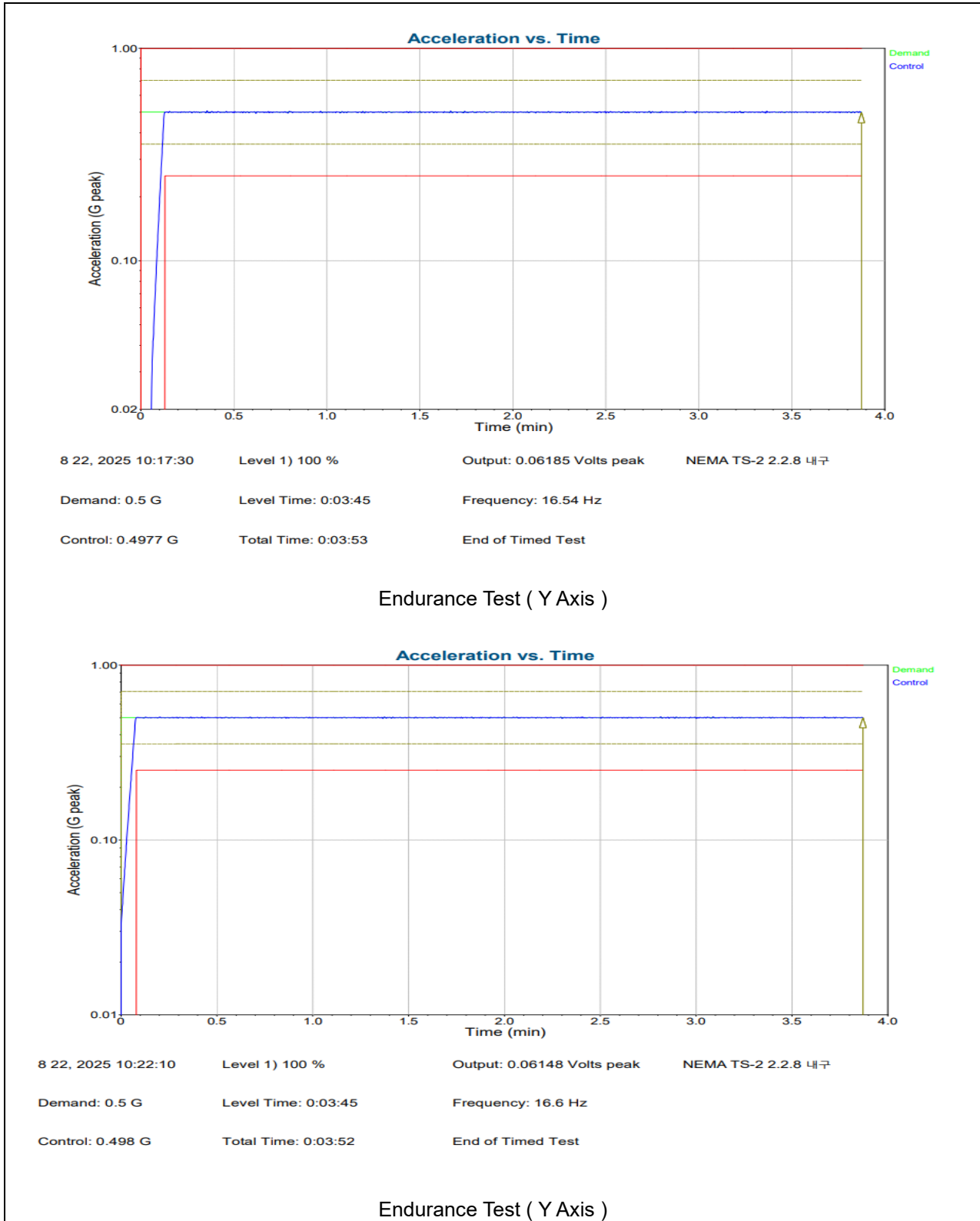


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4.5.5 Test Data Y Axis



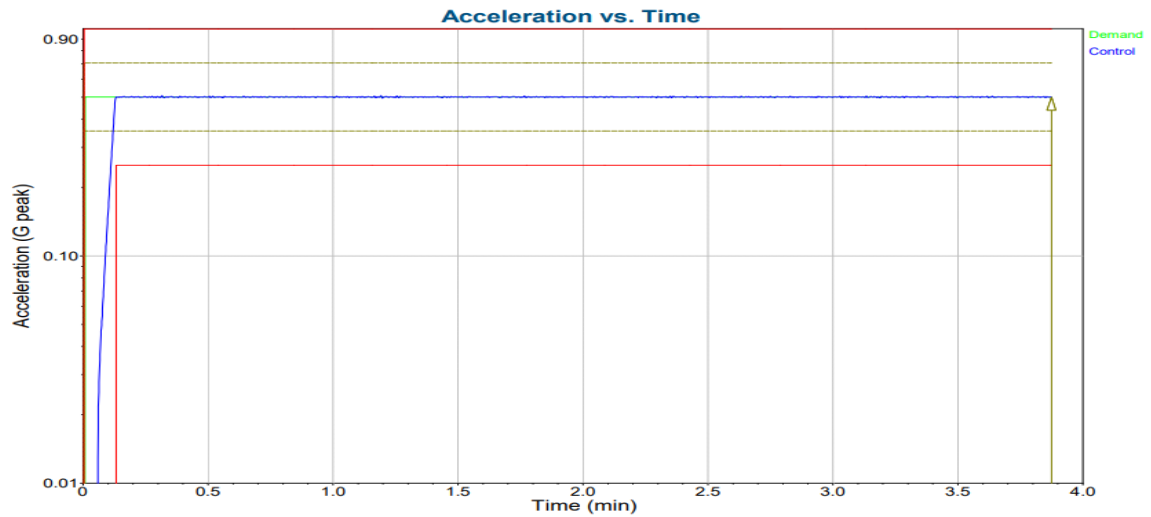


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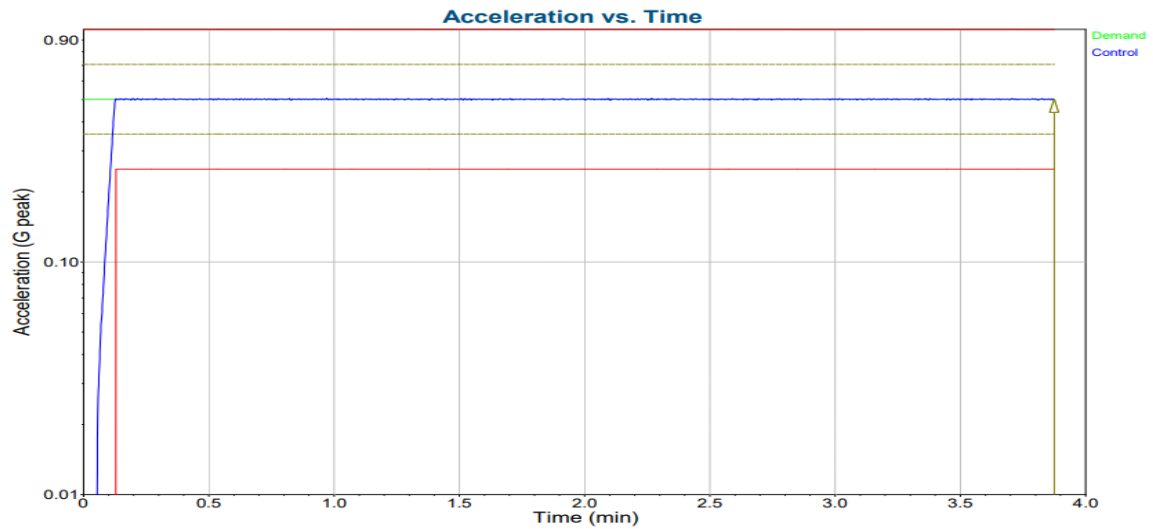
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4.5.6 Test Data Y Axis



8 22, 2025 10:26:41 Level 1) 100 % Output: 0.06147 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.68 Hz
Control: 0.4982 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 10:31:04 Level 1) 100 % Output: 0.0612 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.74 Hz
Control: 0.5006 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)

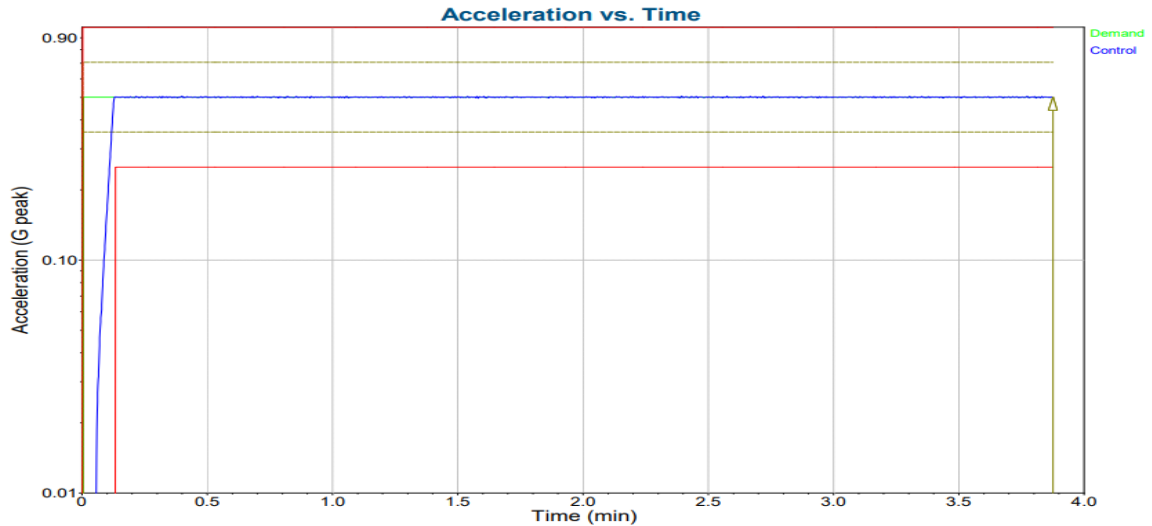


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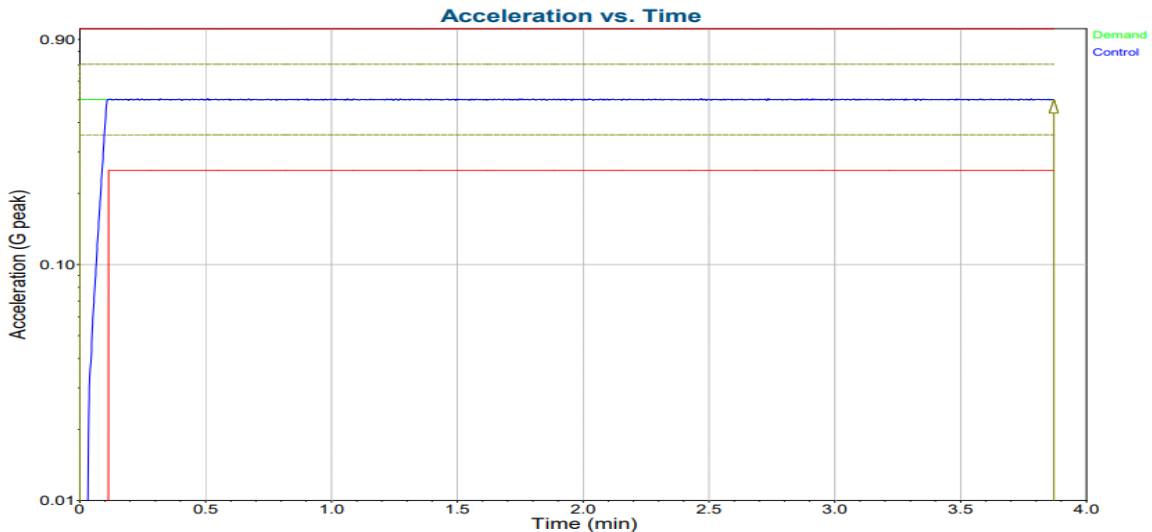
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4.5.7 Test Data Y Axis



8 22, 2025 10:35:25 Level 1) 100 % Output: 0.06077 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:03:45 Frequency: 16.87 Hz
Control: 0.4998 G Total Time: 0:03:53 End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 10:39:29 Level 1) 100 % Output: 0.06093 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:03:45 Frequency: 17.1 Hz
Control: 0.4992 G Total Time: 0:03:52 End of Timed Test

Endurance Test (Y Axis)

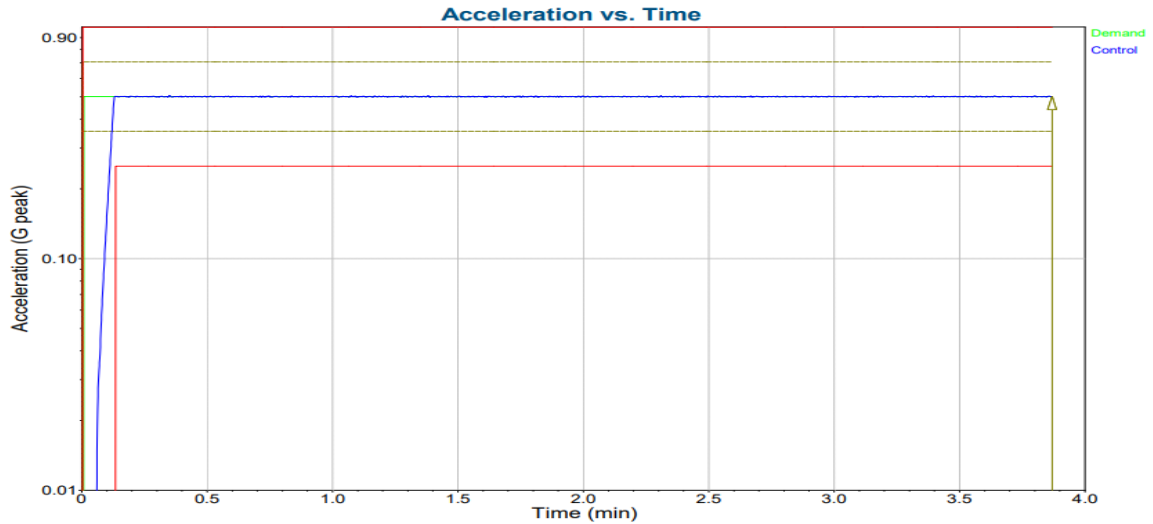


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4.5.8 Test Data Y Axis



8 22, 2025 10:43:34

Level 1) 100 %

Output: 0.05891 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:03:45

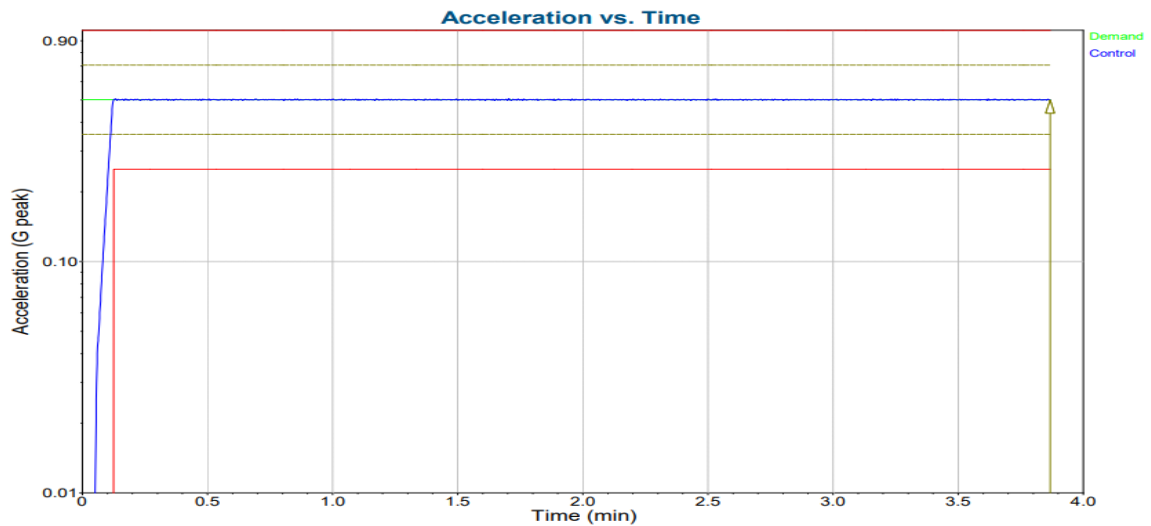
Frequency: 17.41 Hz

Control: 0.5006 G

Total Time: 0:03:52

End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 10:47:38

Level 1) 100 %

Output: 0.05659 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:03:45

Frequency: 18 Hz

Control: 0.498 G

Total Time: 0:03:52

End of Timed Test

Endurance Test (Y Axis)

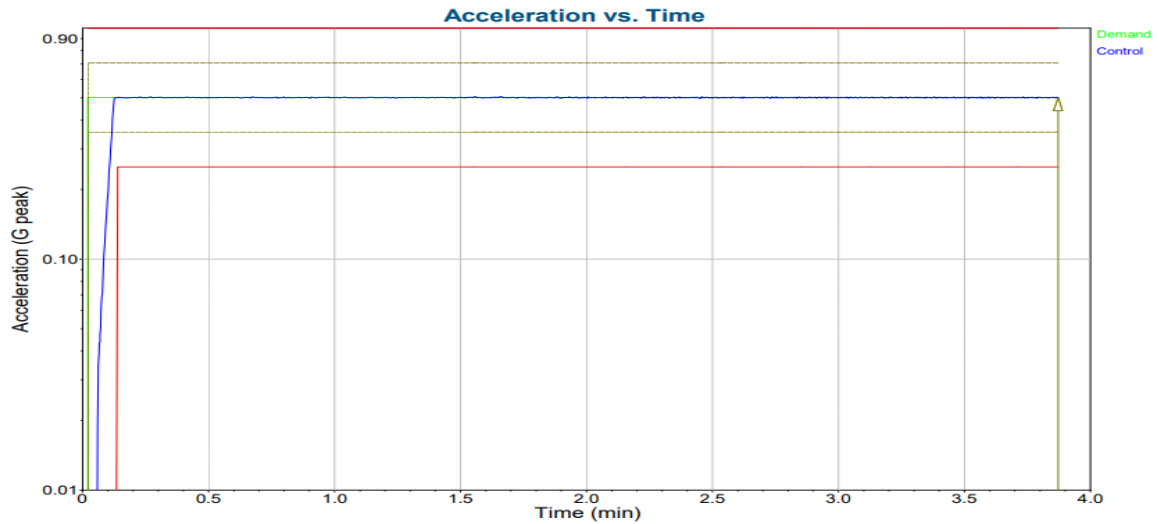


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4.5.9 Test Data Y Axis



8 22, 2025 10:51:48

Level 1) 100 %

Output: 0.05462 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:03:45

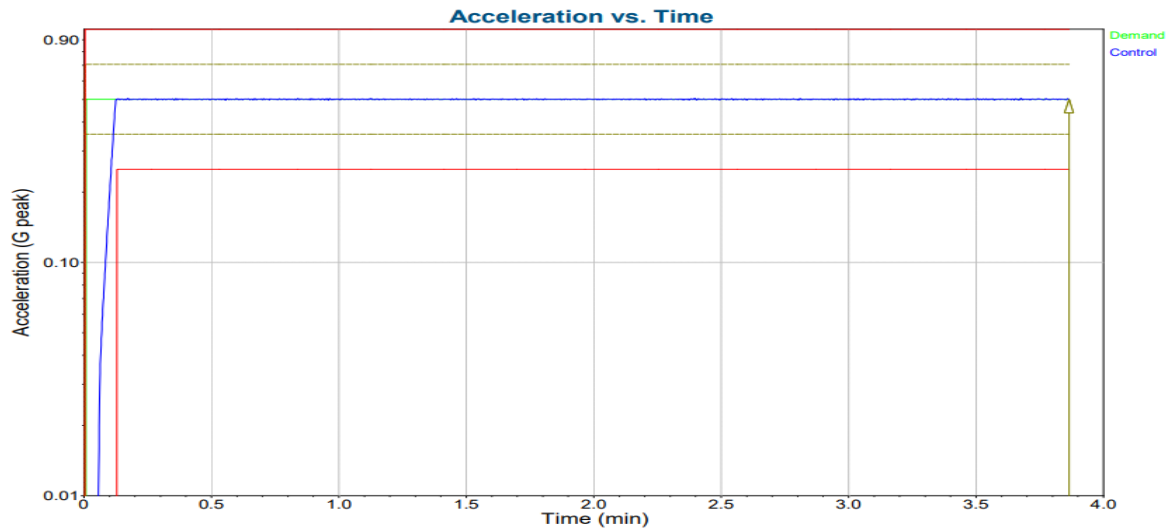
Frequency: 18.69 Hz

Control: 0.4987 G

Total Time: 0:03:52

End of Timed Test

Endurance Test (Y Axis)



8 22, 2025 10:56:11

Level 1) 100 %

Output: 0.0517 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:03:45

Frequency: 19.81 Hz

Control: 0.4982 G

Total Time: 0:03:52

End of Timed Test

Endurance Test (Y Axis)

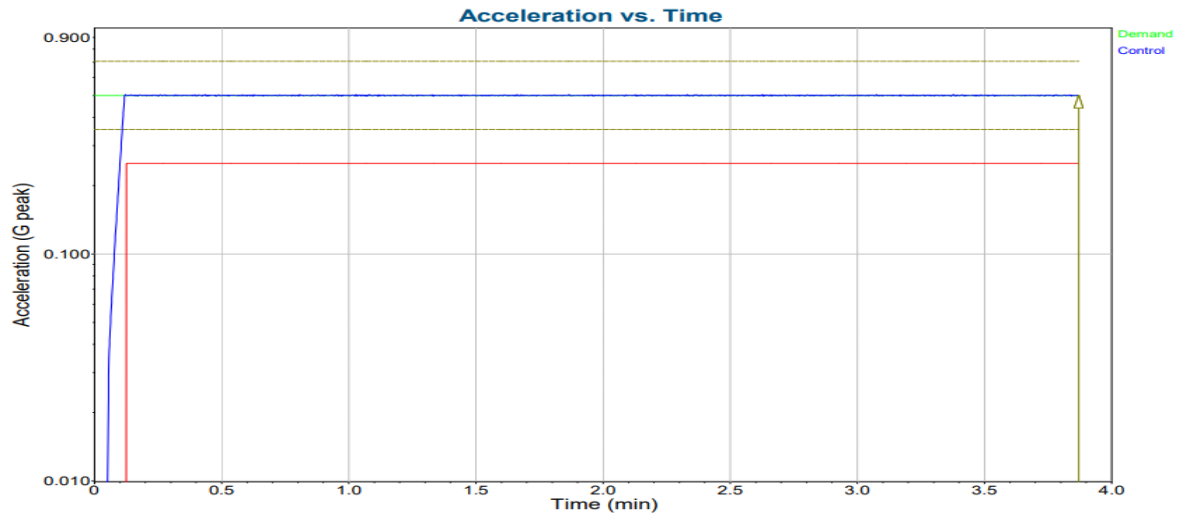


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4.5.10 Test Data Y Axis



8 22, 2025 11:00:14

Level 1) 100 %

Output: 0.0486 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:03:45

Frequency: 21.19 Hz

Control: 0.5012 G

Total Time: 0:03:52

End of Timed Test

Endurance Test (Y Axis)

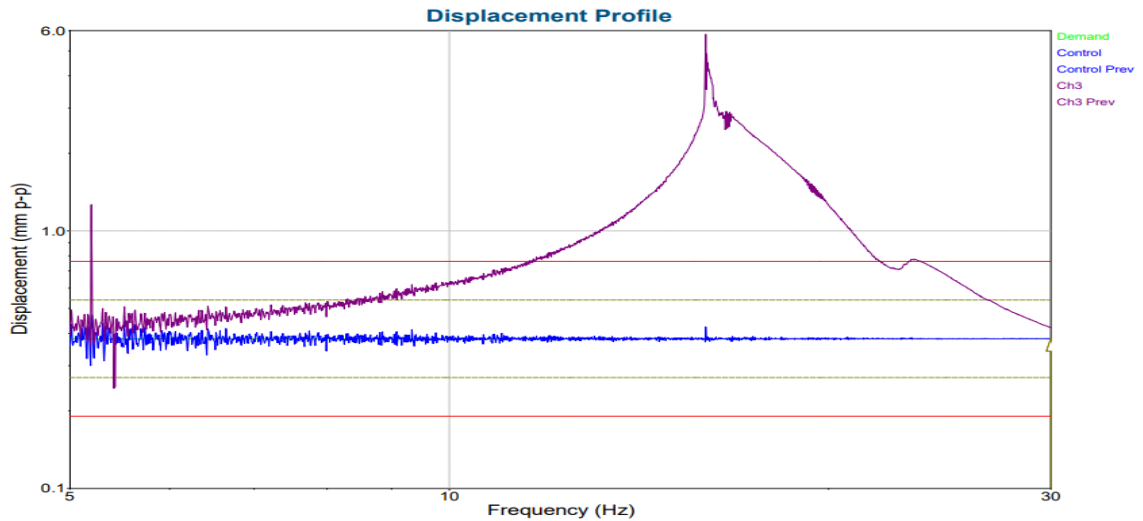


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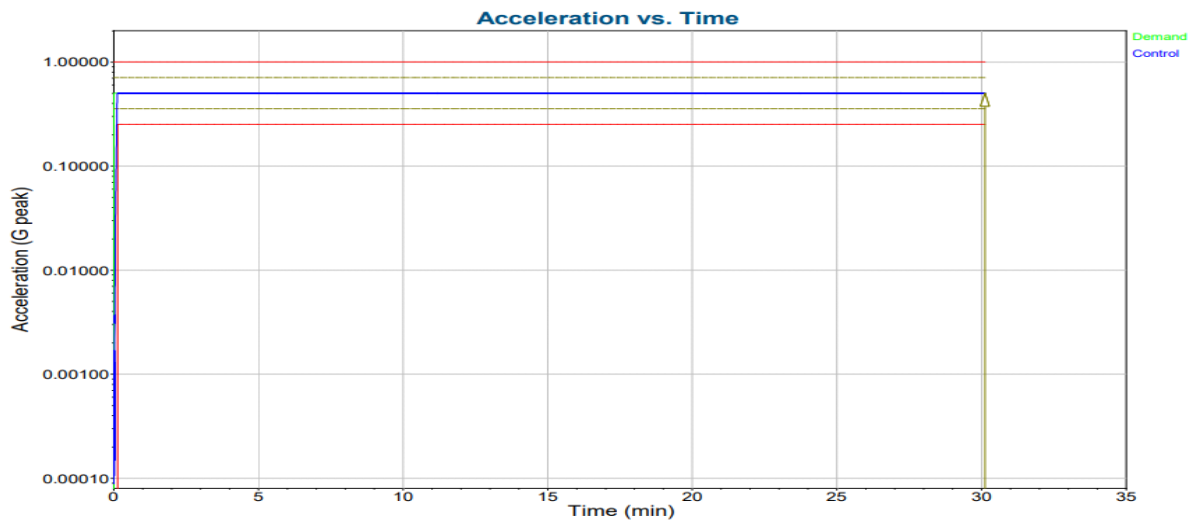
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4.5.11 Test Data Z Axis



8 21, 2025 12:18:35 Level 1) 100 % Output: 0.0477 Volts peak NEMA TS-2 2.2.8
Demand: 0.381 mm Level Time: 0:12:30 Frequency: 30 Hz
Control: 0.3817 mm Total Time: 0:12:40 End of Sweep Test

Resonant search Test (Z Axis)



8 21, 2025 13:03:06 Level 1) 100 % Output: 0.06211 Volts peak NEMA TS-2 2.2.8 내구
Demand: 0.5 G Level Time: 0:30:00 Frequency: 15.98 Hz
Control: 0.499 G Total Time: 0:30:08 End of Timed Test

Endurance Test (Z Axis)

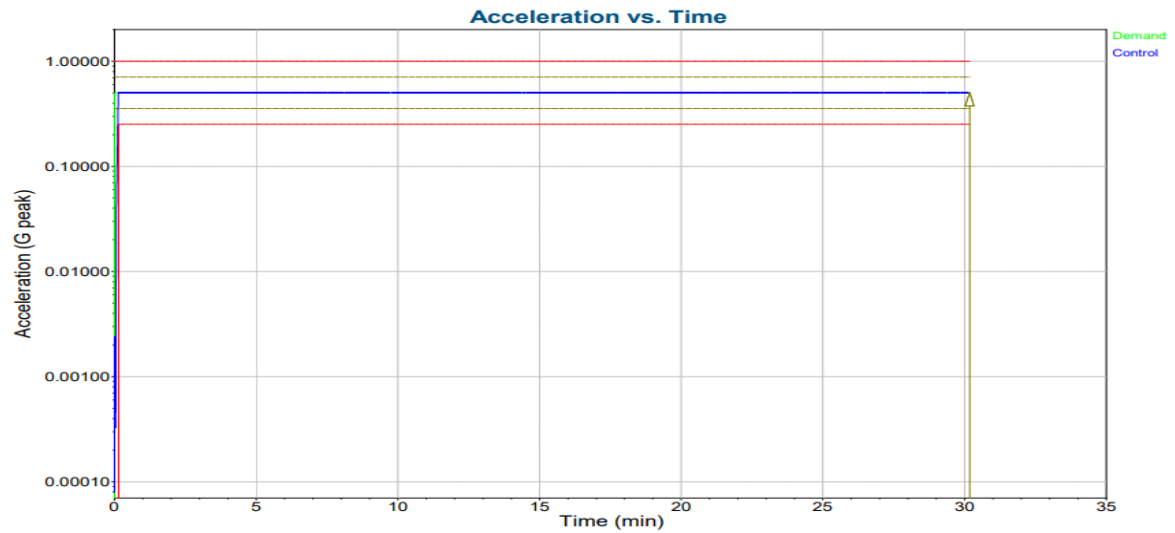


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4.5.12 Test Data Z Axis



8 21, 2025 13:34:18

Level 1) 100 %

Output: 0.04967 Volts peak

NEMA TS-2 2.2.8 내구

Demand: 0.5 G

Level Time: 0:30:00

Frequency: 20.34 Hz

Control: 0.4993 G

Total Time: 0:30:11

End of Timed Test

Endurance Test (Z Axis)

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5. Shock(impact) Test [NEMA TS 2-2013 2.2.9]

5.1 Test date and environmental conditions

5.1.1 Test date: Apr. 03, 2025 ~ Apr. 16, 2025

5.1.2 Measured Environmental Conditions

Item	Temperature (°C)	Humidity (% R.H.)	Pressure (kPa)
Measurement	24.8	45.2	89.9

5.2 Test conditions and methods

5.2.1 Sample status: unpackaged / not in operation

5.2.2 Applied waveform: Half sine

5.2.3 Acceleration(G): 10 G

5.2.4 Nominal duration (ms): 11

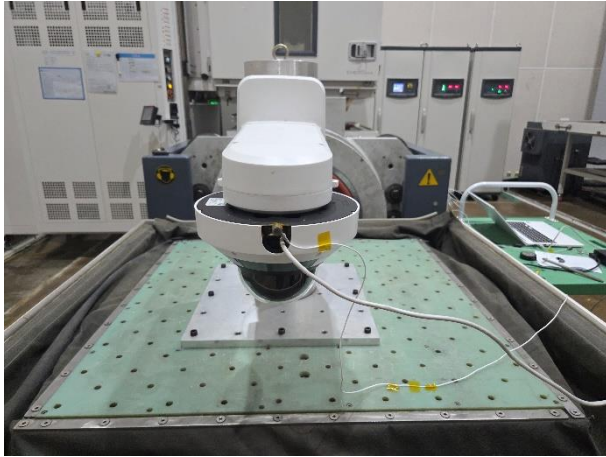
5.2.5 Applicable axis : X, Y, Z

5.2.6 Number of impacts: 1 per direction (total 6)

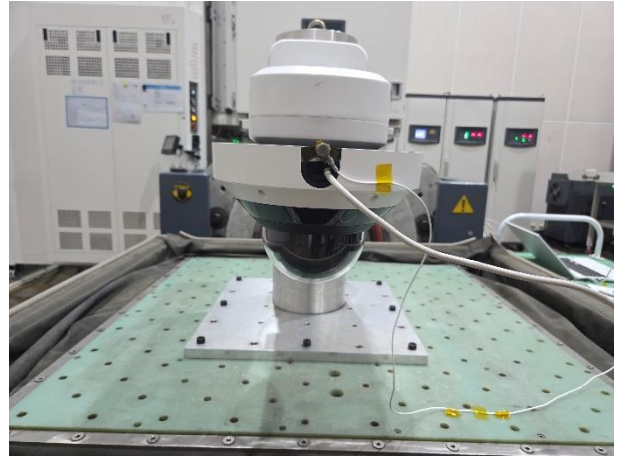
5.2.7 Evaluation items: Check for mechanical damage before and after testing

5.3 Testing images

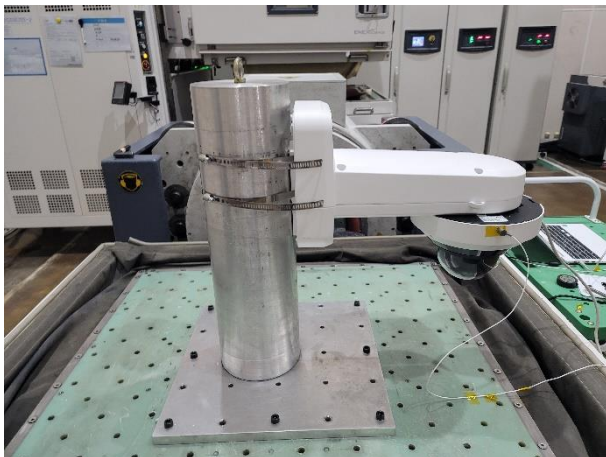
5.3.1 Evidence of test setting (NEMA TS 2-2013 2.2.9)



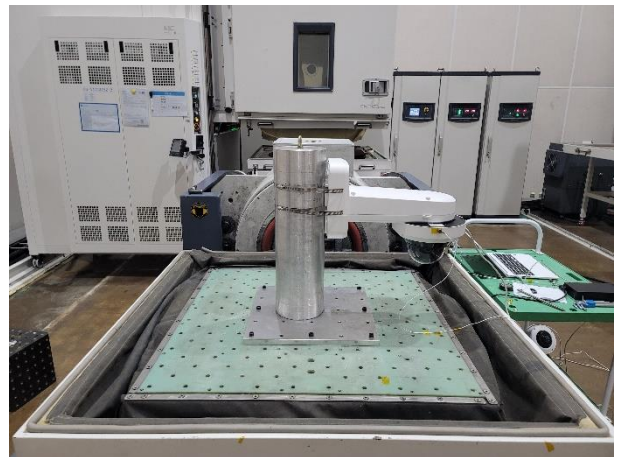
X axis_1



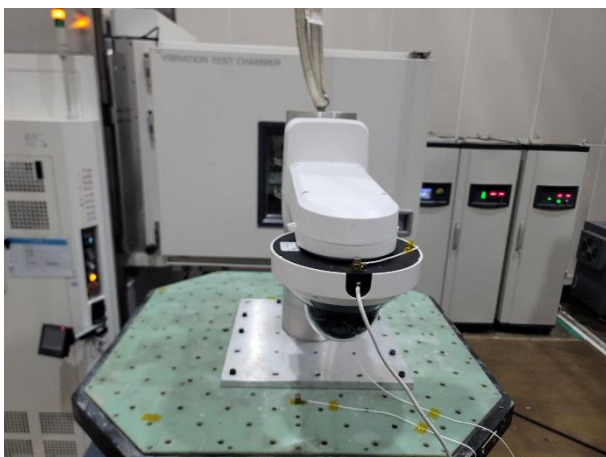
X axis_2



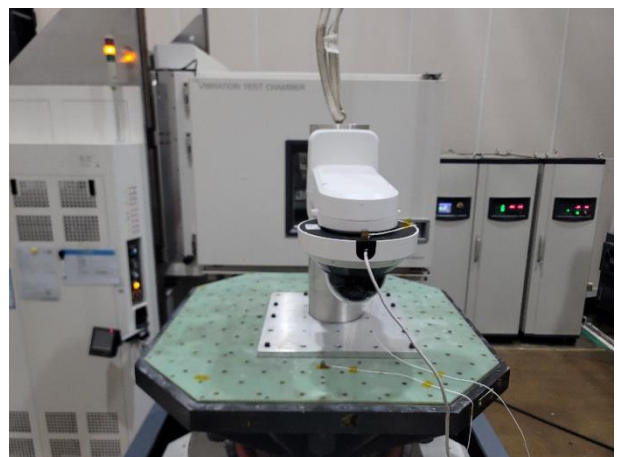
Y axis_1



Y axis_2



Z axis_1



Z axis_2

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5.4 Test Result

5.4.1 Test result table

Evaluation Criteria		Test Results	Comment
Shock(impact) Test	Before	Normal	
	After	Normal	



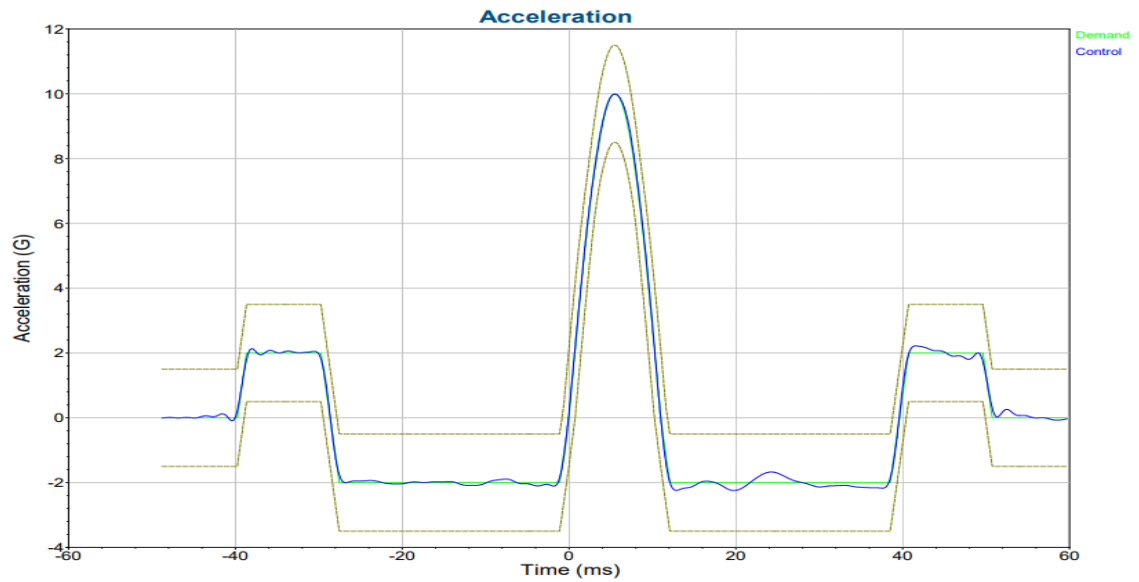
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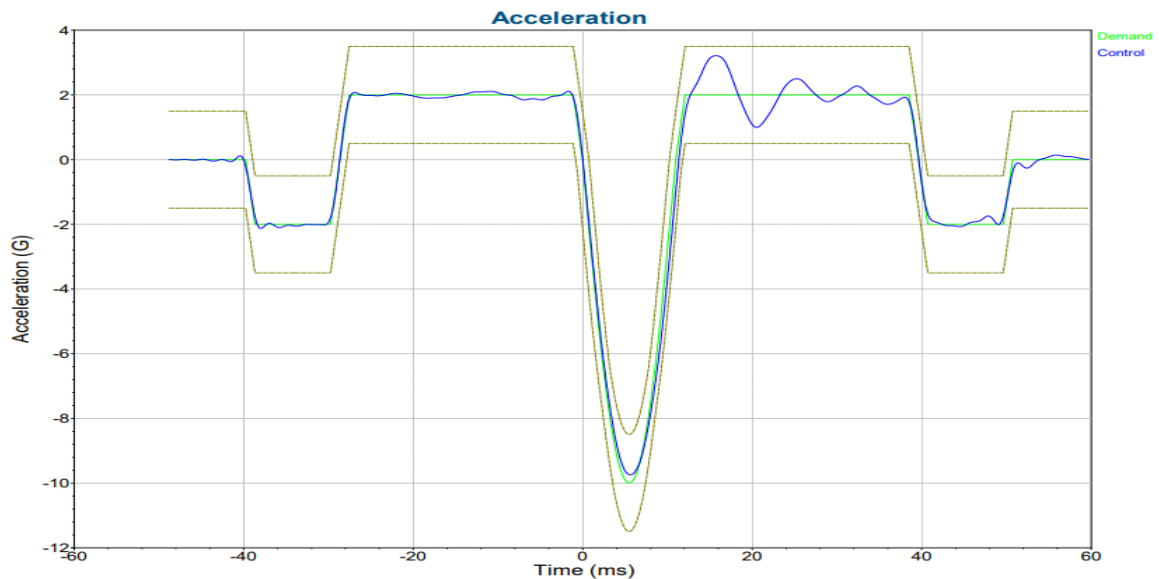
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5.5 Test Data

5.5.1 Test Data X Axis



X+



X-

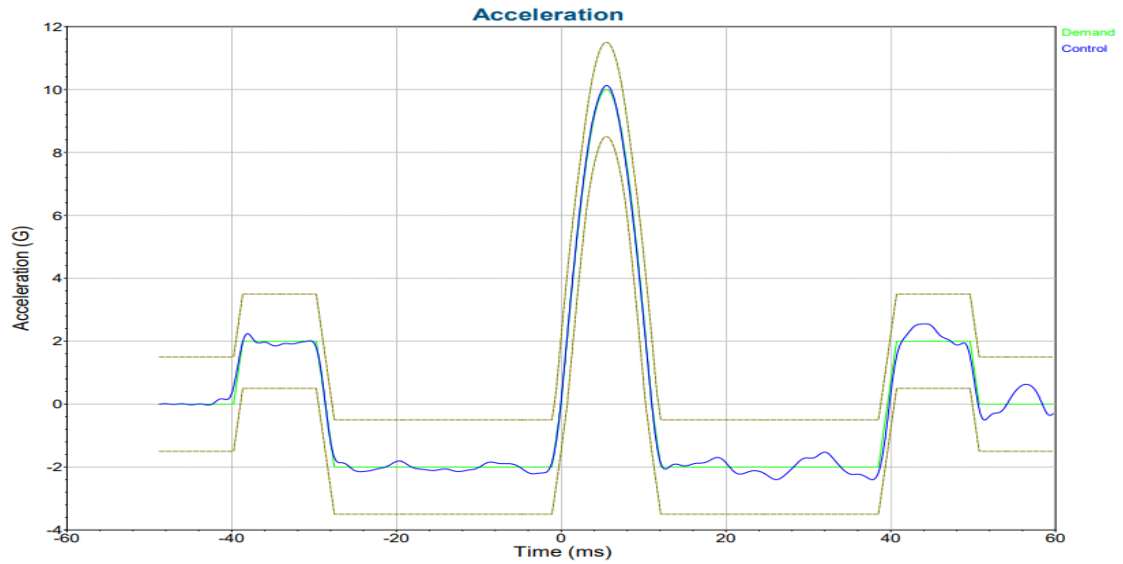


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5.5.2 Test Data Y Axis



8 22, 2025 11:11:28

Level 1) 100 %

Output: 0.5415 Volts peak

NEMA TS-2 2.2.9

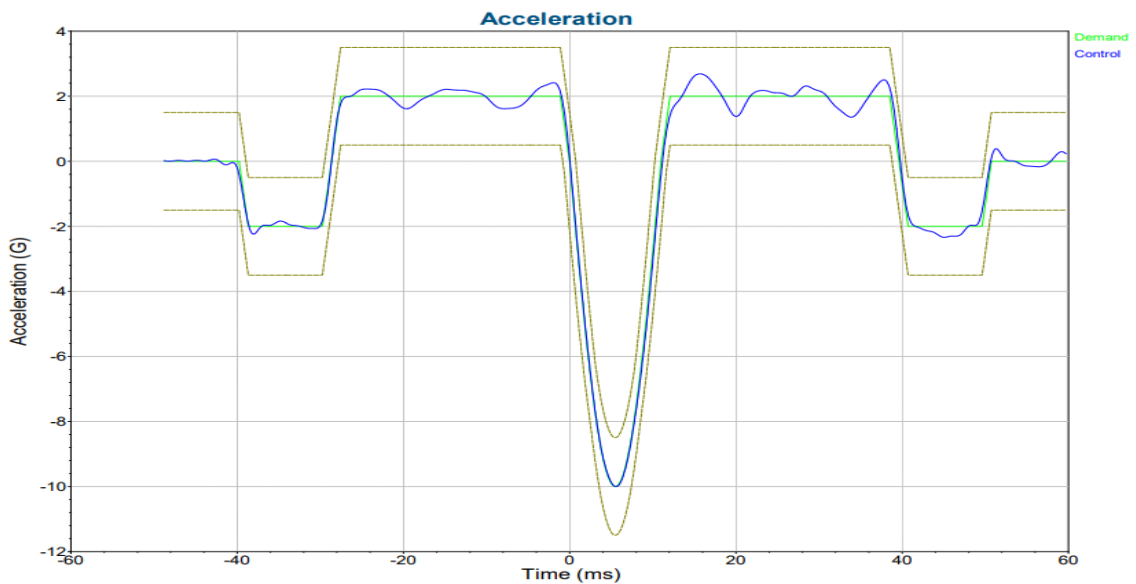
Demand: 10 G

Control: 10.12 G

Pulse: 1 of 1

Running

Y+



8 22, 2025 11:11:31

Level 2) 100 %

Output: 0.5404 Volts peak

NEMA TS-2 2.2.9

Demand: 10 G

Control: 10.01 G

Pulse: 1 of 1

End of Test

Y-

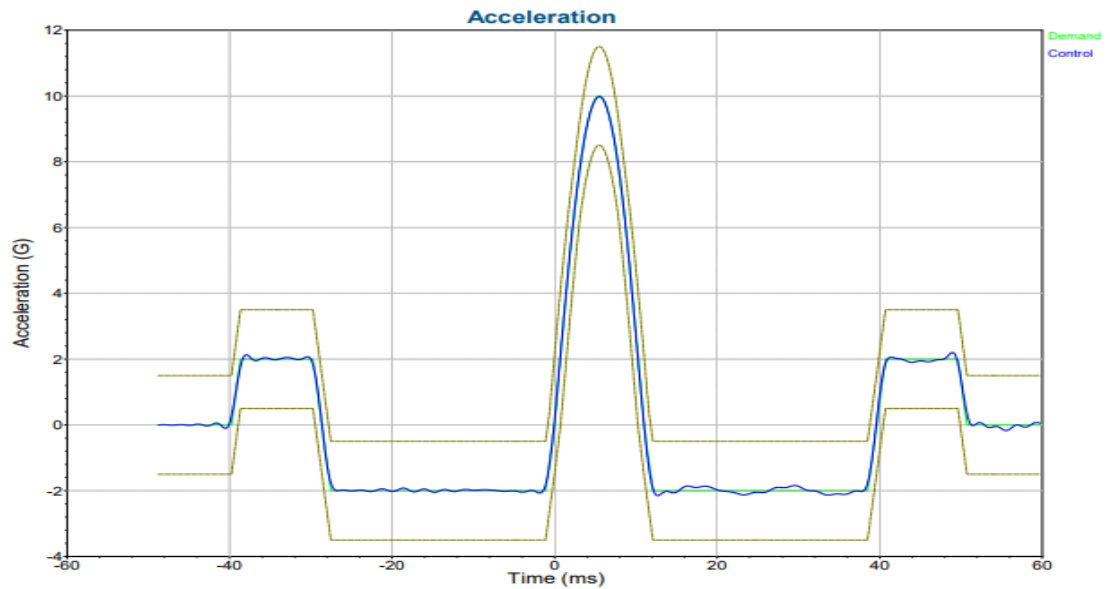


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5.5.3 Test Data Z Axis



8 21, 2025 11:28:07

Level 1) 100 %

Output: 0.4954 Volts peak

NEMA TS-2 2.2.9

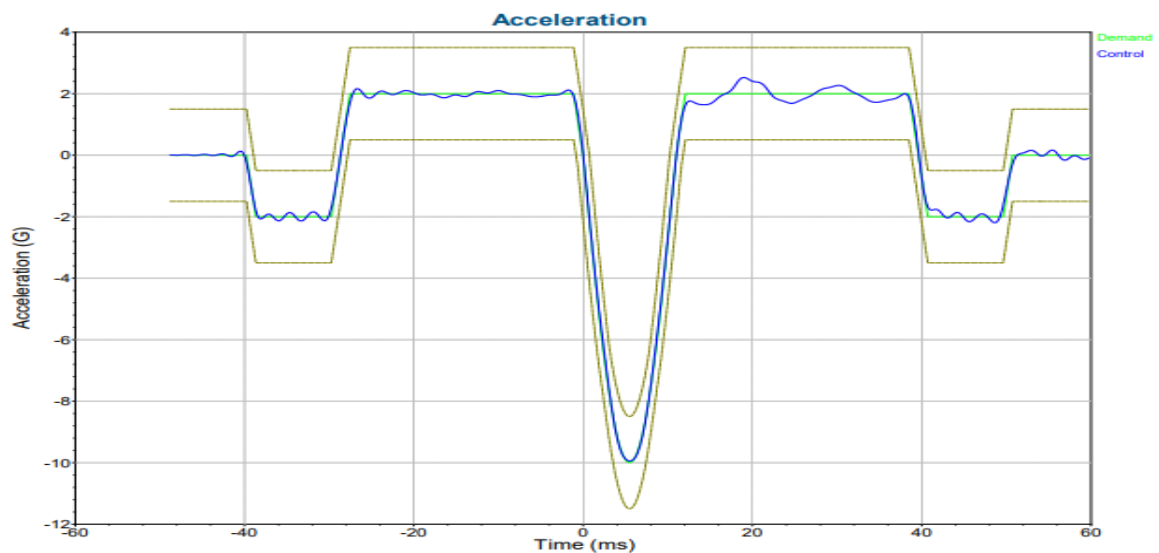
Demand: 10 G

Control: 9.98 G

Pulse: 1 of 1

Running

Z+



8 21, 2025 11:28:10

Level 2) 100 %

Output: 0.4939 Volts peak

NEMA TS-2 2.2.9

Demand: 10 G

Control: 9.948 G

Pulse: 1 of 1

End of Test

Z-

5.6 Post-test product images

5.6.1 Test sample



Top



Bottom



Front



Rear



Left side



Right side

- End -