# TEST REPORT

**CTK Co., Ltd.**
5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si,
Gyeonggi-do, Republic of Korea
Tel: 1551-9871
Fax: +82-31-624-9501

REPORT No.:
CTK-2026-02431


| | | |
|---|---|---|
| **1.** | **Applicant** | |
| | ◦ Name : | Hanwha Vision Co., Ltd |
| | ◦ Address : | 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488 KOREA |
| | ◦ Date of Receipt : | Aug. 05, 2026 |
| **2.** | **Manufacturer** | |
| | ◦ Name : | Hanwha Vision Co., Ltd |
| **3.** | **Use of Report :** | For submission to customer |
| **4.** | **Test sample / Model :** | NETWORK CAMERA / PNM-A20084RQZ |
| **5.** | **Date(s) of test :** | Aug. 11, 2026 ~ Aug. 28, 2026 |
| **6.** | **Test Standard (Method) used :** | NEMA TS-2:2021 2.2.7.3 Test C ~ 2.2.7.8 Test H, NEMA TS-2:2021 2.2.8, NEMA TS-2:2021 2.2.9 |
| **7.** | **Testing Environment :** | Temperature: (25 ± 10) ℃, 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.
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| | | |
|---|---|---|
| Approval | Tested by<br>Name: HongBeom Jeon (Signature) | Technical Manager<br>Name: HoHyun Lee (Signature) |

Remark. This report is not related to ISO/IEC 17025, KOLAS accreditation and relevant regulation.

Aug. 31, 2026

**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 | 5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea |
| Tel. | 1551-9871 |
| 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<br>NO. KT119 | |

※ CTK Co., Ltd. is an independent third-party testing laboratory and is not affiliated with the manufacturer (Hanwha Vision Co., Ltd.) or any of its parent or subsidiary companies.

# 2. Sample description and equipment information

## 2.1 Sample description

| Sample Name | Model Name | S/N | Date of Manufacture | Quantity | Comment |
|---|---|---|---|---|---|
| Network Camera | PNM-A20084RQZ | ZXLR6V4L70000CW | Jul. 2026 | 1 EA | - |
| PoE Injector | AMG155-1GBT-P90 | 2601080022 | Jan. 08, 2026 | 1 EA | - |

## 2.2 Equipment information

| Testing equipment | Model Name | Manufacturer | Manufacturing Number | Next Cal. Date |
|---|---|---|---|---|
| Temperature & Humidity Chamber | ARS-0390-AE | ESPEC | 4120200113 | Feb. 06, 2027 |
| Vibration Testing System | GT1000M | FAMTECH | D1803072 | N/A |
| Vibration Testing System | GT1000M | FAMTECH | D1803072-1 | N/A |
| Acceleration sensor | 8703A250M5 | KISTLER | 5833517 | Jun. 22, 2027 |
| Acceleration sensor | 8703A250M5 | KISTLER | 5833516 | Jun. 22, 2027 |

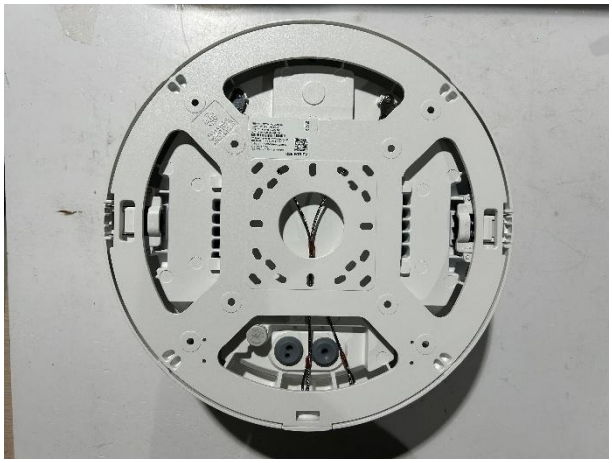
※ All test equipment used for this testing was calibrated in accordance with the manufacturer's requirements, and the calibration ranges cover the measurement values recorded in this report.

## 2.3 Pre-test sample images

### 2.3.1 Test sample



Top



Bottom



Front



Rear



Left side

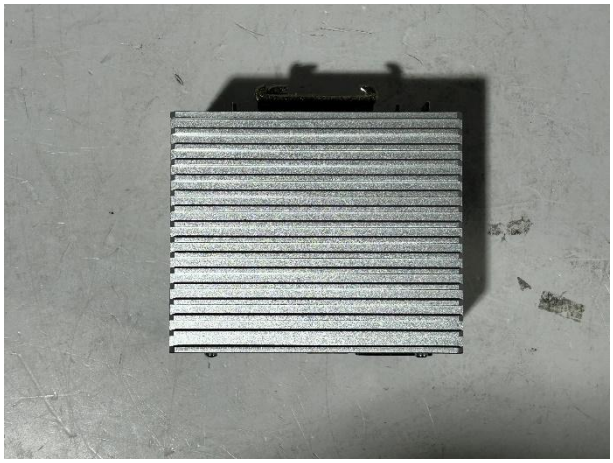


Right side

2.3.2 Test sample



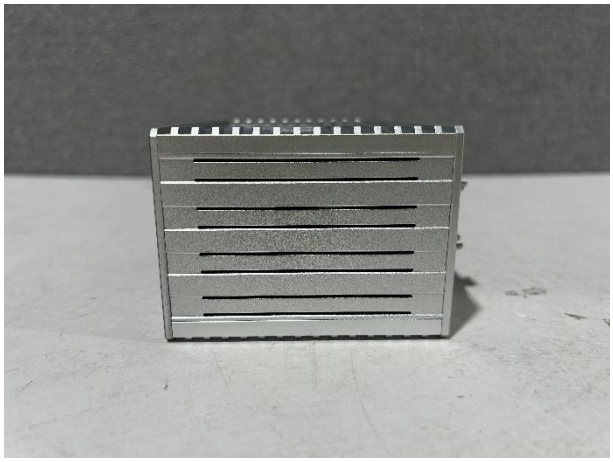

Top



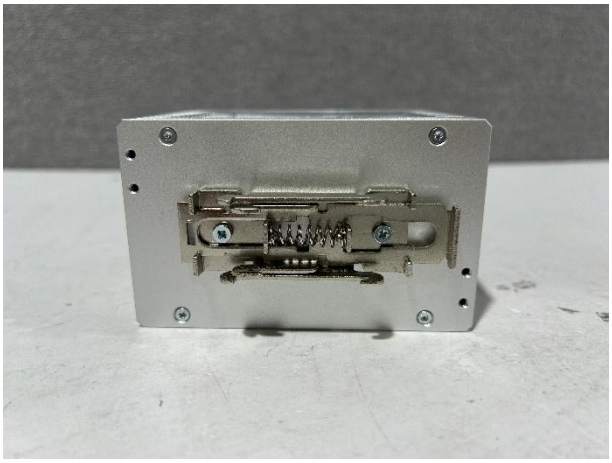
Bottom



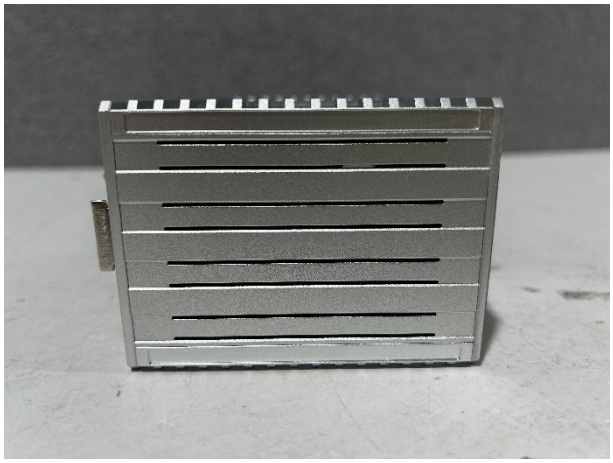

Front



Rear



Left side



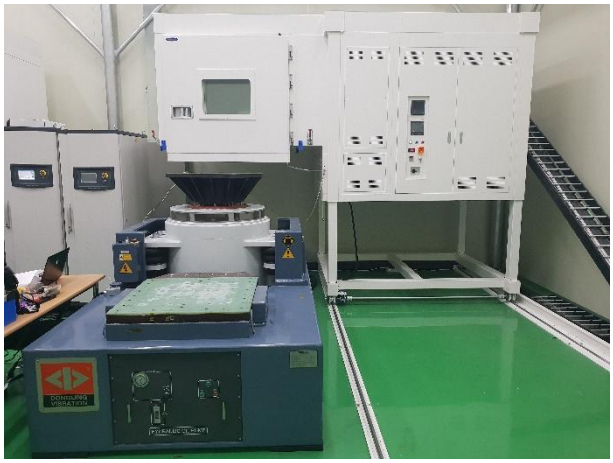
Right side

## 2.4 Testing equipment images

### 2.4.1 Test equipment



Temperature & Humidity Chamber



Vibration Testing System



Vibration Testing System



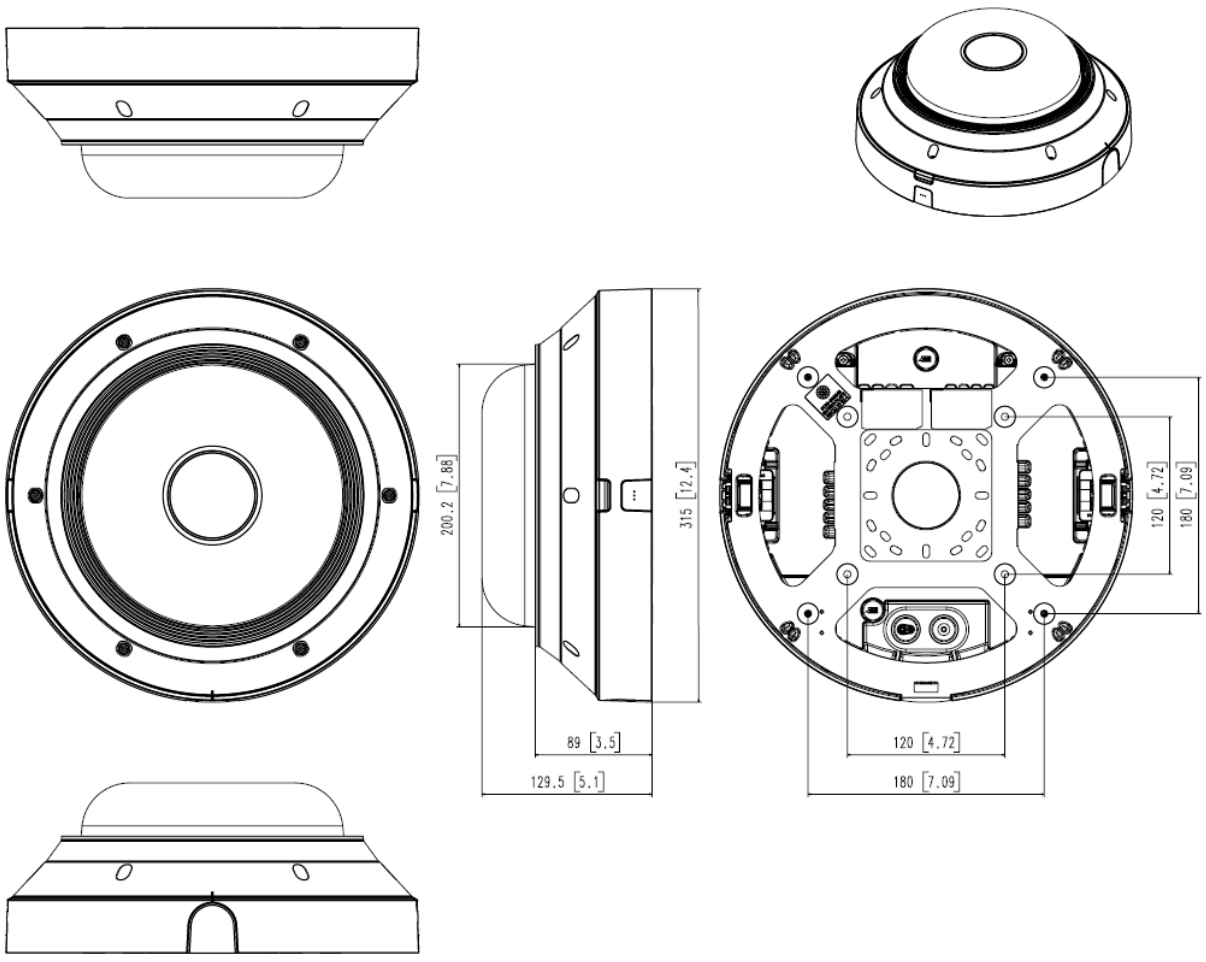

8703A250M5




8703A250M5

## 2.5 Sample appearance

Enclosure dimensions [unit: mm]



## 3. Test result summary

| No. | Test method | Clause | Evaluation Criteria | Test Result | Comment |
|---|---|---|---|---|---|
| 1 | Test C | 2.2.7.3 | Functional Check | **Pass** | - |
| 2 | Test D | 2.2.7.4 | Functional Check | **Pass** | - |
| 3 | Test E | 2.2.7.5 | Functional Check | **Pass** | - |
| 4 | Test F | 2.2.7.6 | Functional Check | **Pass** | - |
| 5 | Test G | 2.2.7.7 | Functional Check | **Pass** | - |
| 6 | Test H | 2.2.7.8 | Functional Check | **Pass** | - |
| | | | Mechanical Check | **Pass** | - |
| 7 | Resonant search | 2.2.8.3 | X Axis | **13.67 Hz** | - |
| | | | Y Axis | **12.64 Hz, 14.98 Hz** | - |
| | | | Z Axis | **7.266 Hz, 11.41 Hz, 14.92 Hz, 15.75 Hz** | - |
| 8 | Endurance Test | 2.2.8.4 | Functional Check | **Pass** | - |
| | | | Mechanical Check | **Pass** | - |
| 9 | Shock (impact) Test | 2.2.9 | Functional Check | **Pass** | - |
| | | | Mechanical Check | **Pass** | - |

# 4. NEMA TS-2:2021 2.2.7.3 Test C ~ 2.2.7.8 Test H

## 4.1 Test date and environmental conditions

4.1.1 Test date: Aug. 14, 2026 ~ Aug. 16, 2026

4.1.2 Measured Environmental Conditions

| Item | Temperature (℃) | Humidity (% R.H.) | Pressure (kPa) |
|---|---|---|---|
| Measurement | 25.1 | 52.3 | 98.6 |

## 4.2 Test C: Low-Temperature Low-Voltage Tests [2.2.7.3]

4.2.1 Definition of Test Conditions.

1) Environmental Chamber Door: Closed.
2) Temperature: -34 °C (-30 °F).
3) Low Voltage: 89 VAC.
4) Humidity Control: Off

4.2.2 While at room temperature, adjust the input voltage to 89 VAC and verify that the test sample is still operable.

4.2.3 With the test sample cycling, lower the test chamber to -34 °C (-30 °F) at a rate not exceeding 17 °C (30 °F) per hour. Allow the test sample to cycle for a minimum of 5 hours at -34 °C (-30 °F) with the humidity controls in the off position. Then operate the test switches as necessary to determine that all functions are operable.

4.2.4 Power shall then be removed from the test sample for a minimum period of 5 hours. Upon restoration of power, the test sample shall go through its prescribed start-up sequence and then resume cycling.

## 4.3 Test D: Low-Temperature High-Voltage Tests [2.2.7.4]

4.3.1 Definition of Test Conditions.

1) Environmental Chamber Door: Closed.
2) Temperature: -34 °C (-30 °F).
3) High Voltage: 135 VAC.
4) Humidity Control: Off

4.3.2 While at -34 °C (-30 °F) and with humidity controls off, adjust the input voltage to 135 VAC and allow the test sample to cycle for one hour. Then operate the test switches as necessary to determine that all functions are operable.

## 4.4 Test E: High-Temperature High-Voltage Tests [2.2.7.5]

4.4.1 Definition of Test Conditions.

1) Environmental Chamber Door: Closed.
2) Temperature: 74 °C (165 °F).
3) High Voltage: 135 VAC.

4) Humidity Control: In accordance with the humidities given in Table 2-1.

4.4.2 With the test sample cycling, raise the test chamber to 74 °C (165 °F) at a rate not to exceed 17 °C (30 °F) per hour. Verify the input voltage is 135 VAC.

4.4.3 Set the humidity controls to not exceed 95 % relative humidity over the temperature range of 4.4 °C (40 °F) to 43.3 °C (110 °F). When the temperature reaches 43 °C (109 °F), readjust the humidity control to maintain constant absolute humidity 43 °C (109 °F) wet bulb (see relative humidities shown in Table 2-1). Verify that the test sample continues to cycle satisfactorily during the period of temperature increase and at established levels of relative humidity.

4.4.4 Allow the test sample to cycle for a minimum of 15 hours at 74 °C (165 °F) and 18 % relative humidity. Then operate the test switches as necessary to determine that all functions are operable.

## 4.5 Test F: High-Temperature Low-Voltage Tests [2.2.7.6]

4.5.1 Definition of Test Conditions.

1) Environmental Chamber Door: Closed.
2) Temperature: 74 °C (165 °F).
3) Low Voltage: 89 VAC.
4) Humidity Control: 18 % relative humidity and 43 °C (109 °F) wet bulb.

4.5.2 Adjust the input voltage to 89 VAC and proceed to operate the test switches to determine that all functions are operable. With the test sample at 74 °C (165 °F) and 18 % relative humidity, 43 °C (109 °F) wet bulb.

## 4.6 Test G: Test Termination [2.2.7.7]

4.6.1 Program the test sample to cycle.

4.6.2 Adjust the input voltage to 120 VAC.

4.6.3 Set the controls on the environmental chamber to return to room temperature, 15 °C (60 °F) to 27 °C (80 °F), with the humidity controls in the off position. The rate of temperature change shall not exceed 17 °C (30 °F) per hour.

4.6.4 Verify the test sample continues to cycle properly.

4.6.5 Allow the test sample to stabilize at room temperature for one hour. Proceed to operate the test switches to determine that all functions are operable.

## 4.7 Test H: Appraisal of Equipment Under Test [2.2.7.8]

4.7.1 The test sample shall be checked to determine that it is functionally operable in all modes of its prescribed operation.

## 4.8 Test Profile

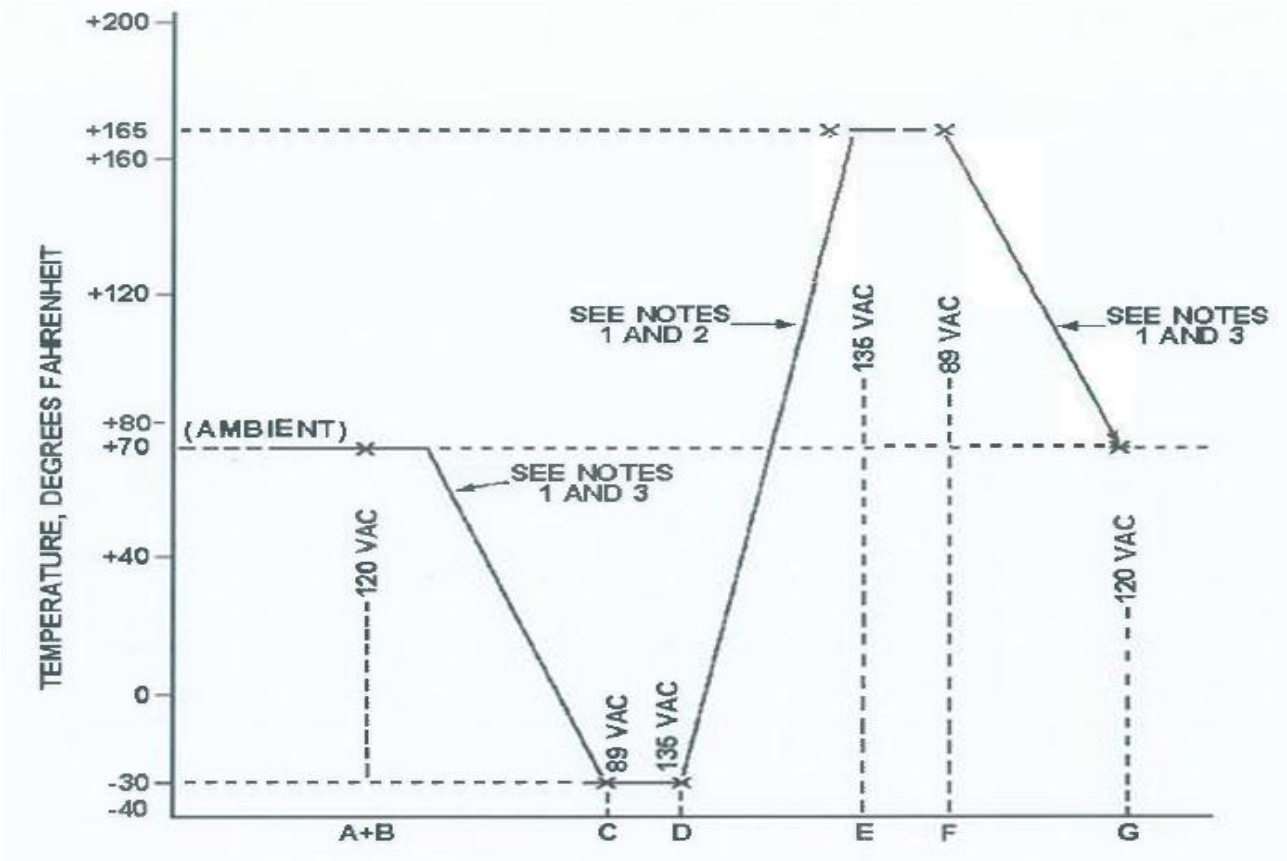



Table 2-1

## 4.9 Test Setup and During test sample images

4.9.1 Evidence of test setting



## 4.10 Test result

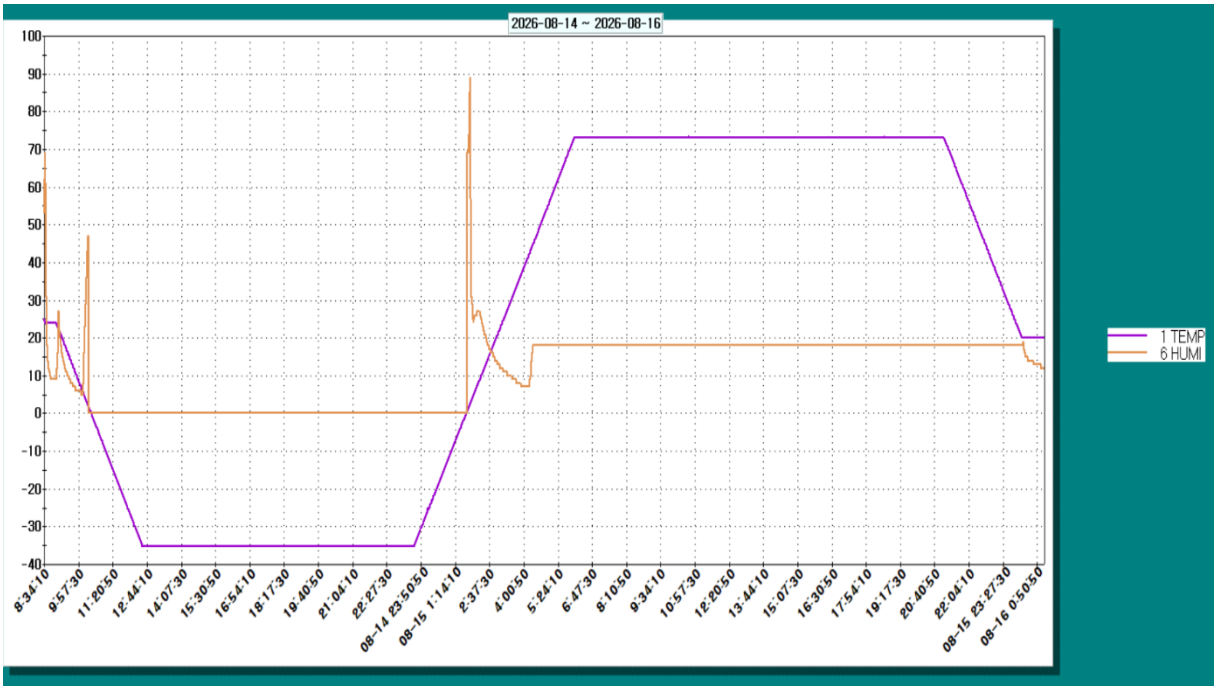
4.10.1 Test result table

| Test method | Evaluation Criteria | Test Results | Comment |
|---|---|---|---|
| Test C [2.2.7.3] | Functional operation | **Pass** | - |
| Test D [2.2.7.4] | Functional operation | **Pass** | - |
| Test E [2.2.7.5] | Functional operation | **Pass** | - |
| Test F [2.2.7.6] | Functional operation | **Pass** | - |
| Test G [2.2.7.7] | Functional operation | **Pass** | - |
| Test H [2.2.7.8] | Functional operation | **Pass** | - |
| | Mechanical inspection | **Pass** | - |

**※ Refer to the sample operation after the completion of testing in section 4.12.**

## 4.11 Test Data

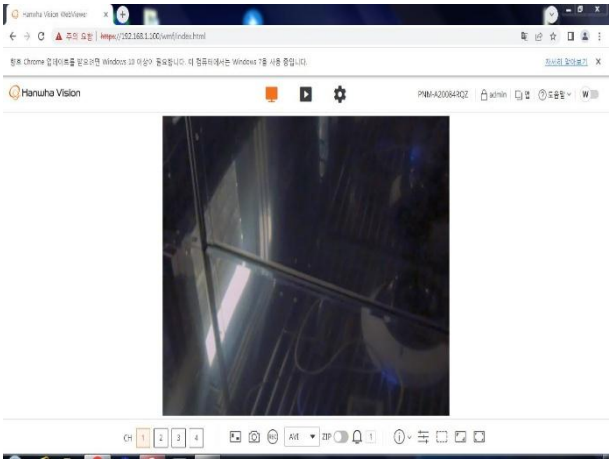
### 4.11.1 Test Data



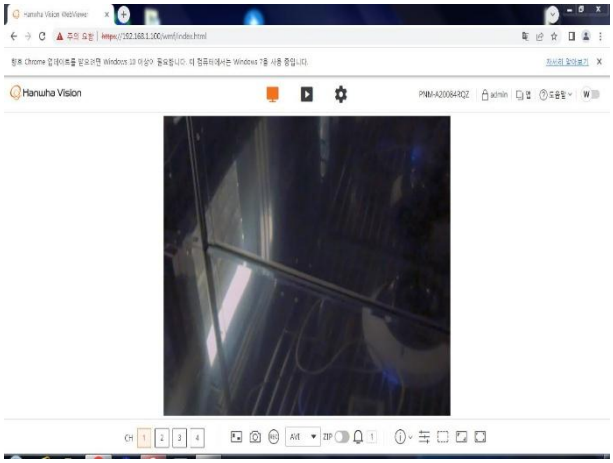

Temperature Data

## 4.12 Post-test operation and function

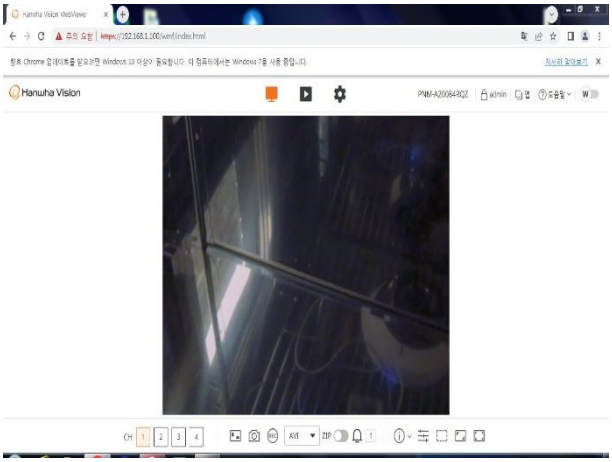
### 4.12.1 Test sample operation and function



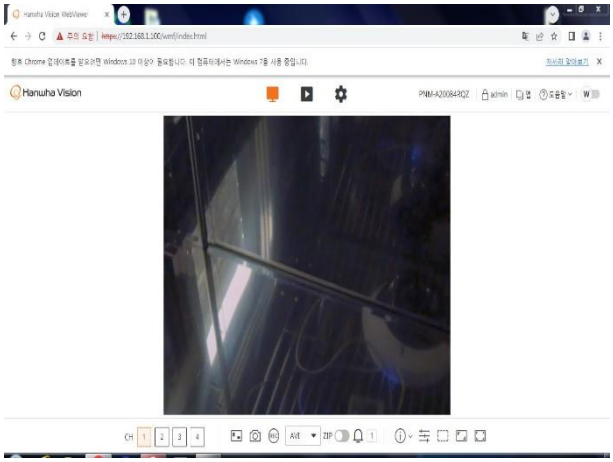
Test C [2.2.7.3] -34 °C, 89 VAC



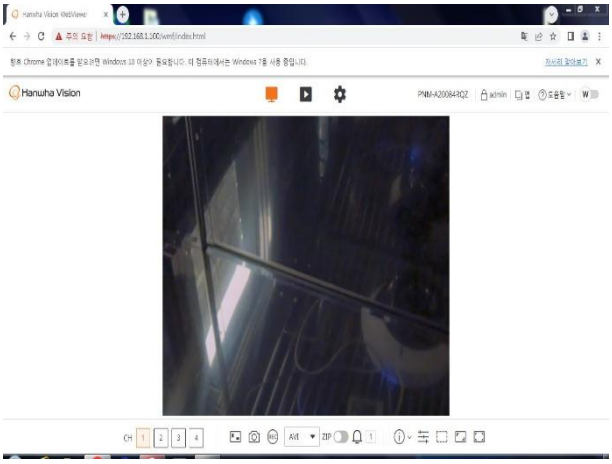
Test D [2.2.7.4] -34 °C, 135 VAC



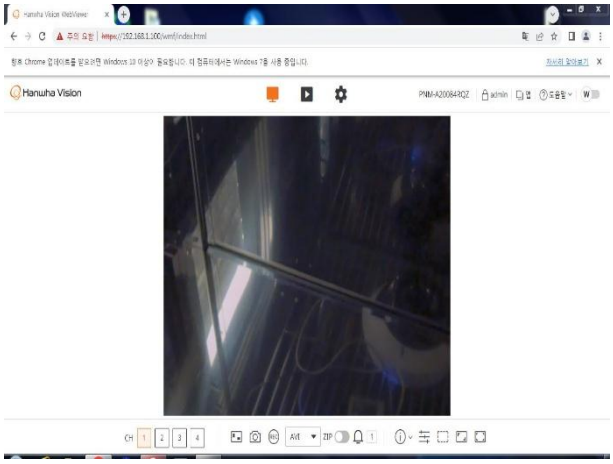
Test E [2.2.7.5] 74 °C, 135 VAC



Test F [2.2.7.6] 74 °C, 89 VAC



Test G [2.2.7.7] (21 ± 6) °C, 120 VAC



Test H [2.2.7.8] (21 ± 6) °C, 120 VAC

# 5. Resonant search, Endurance Test [NEMA TS-2:2021 2.2.8]

## 5.1 Test date and environmental conditions

5.1.1 Test date: Aug. 27, 2026 ~ Aug. 28, 2026

5.1.2 Measured Environmental Conditions

| Item | Temperature (℃) | Humidity (% R.H.) | Pressure (kPa) |
|---|---|---|---|
| Measurement | 25.1 | 52.3 | 98.6 |

## 5.2 Resonant search [NEMA TS-2:2021 2.2.8.3]

5.2.1 Sample status: unpackaged / operation

5.2.2 Applied waveform: Sine

5.2.3 Frequency (Hz): (5~30) Hz

5.2.4 Double amplitude displacement (inch): 0.015 inch

5.2.5 Sweep rate: 12.5 min

5.2.6 Applicable axis: X, Y, Z

5.2.7 Test methods

1) With the test sample securely fastened to the test table, set the test table for a double amplitude displacement of 0.015 inch.
2) Cycle the test table over a search range from 5 to 30 Hz and back within a period of 12.5 minutes.
3) Conduct the resonant frequency search in each of the three mutually perpendicular planes.
4) 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 resonance.

※ If resonant frequencies appear equally severe, record each resonant frequency.

※ If no resonant frequency occurs for a given plane within the prescribed range, 30 Hz shall be recorded.

5.2.8 Evaluation items

1) The test sample shall be checked to determine that it is functionally operable in all modes of its prescribed operation.

## 5.3 Endurance Test [NEMA TS-2:2021 2.2.8.4]

5.3.1 Sample status: operation
5.3.2 Applied waveform: Sine
5.3.3 Frequency (Hz): 30 Hz or 5.2 Test results
5.3.4 Acceleration(G): 0.5 G
5.3.5 Applicable axis: X, Y, Z
5.3.6 Test methods

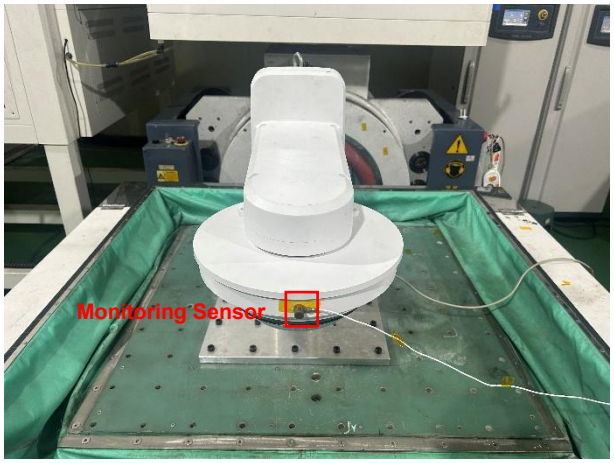
1) Vibrate the test sample in each plane at its resonant frequency for a period of 1 hour at an amplitude resulting in 0.5 g acceleration.
2) When more than one resonant frequency has been recorded in accordance with Section 3.2 Test method 4, the test period of 1 hour shall be divided equally between the resonant frequencies.
3) The total time of the endurance test shall be limited to 3 hours, 1 hour in each of three mutually perpendicular planes.

5.3.7 Evaluation items

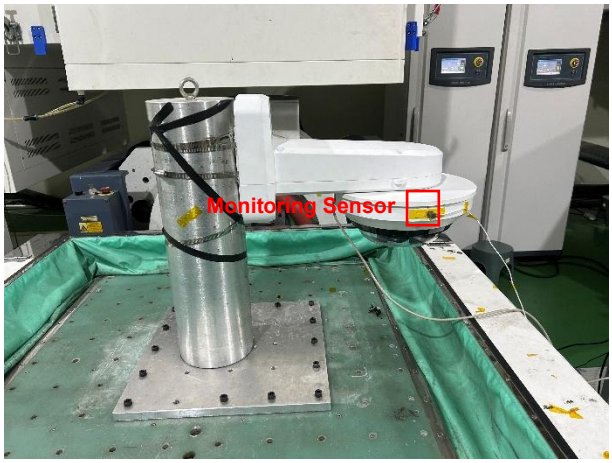
1) The test sample shall be checked to determine that it is functionally operable in all modes of its prescribed operation.

## 5.4 Test Setup and During test sample images

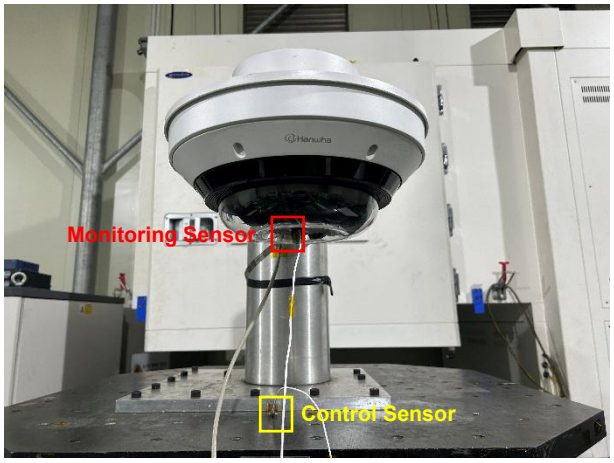
5.4.1 Evidence of test setting (NEMA TS-2:2021 2.2.8)




X axis




Y axis




Z axis

**※ The control sensors for the X and Y axes are mounted on the vibration plate.**

## 5.5 Test result [NEMA TS-2:2021 2.2.8.3]

5.5.1 Resonant search test result table

| Axis | Resonant Frequency (Hz) | Comment |
|---|---|---|
| X | **13.67 Hz** | **-** |
| Y | **12.64 Hz, 14.98 Hz** | **-** |
| Z | **7.266 Hz, 11.41 Hz, 14.92 Hz,15.75 Hz** | **-** |

## 5.6 Test result [NEMA TS-2:2021 2.2.8.4]

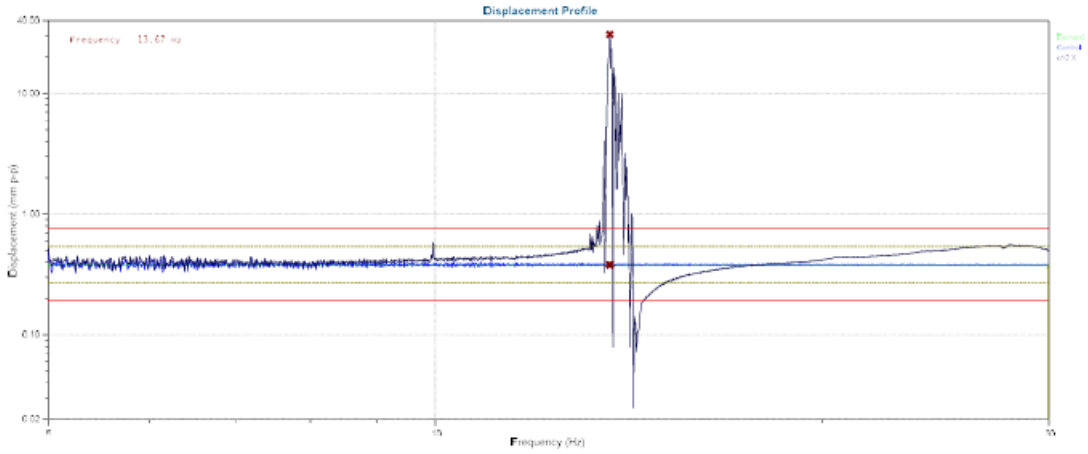
5.6.1 Test result table

| Evaluation Criteria | Test Results | Comment |
|---|---|---|
| Functional operation | **Pass** | - |
| Mechanical inspection | **Pass** | - |

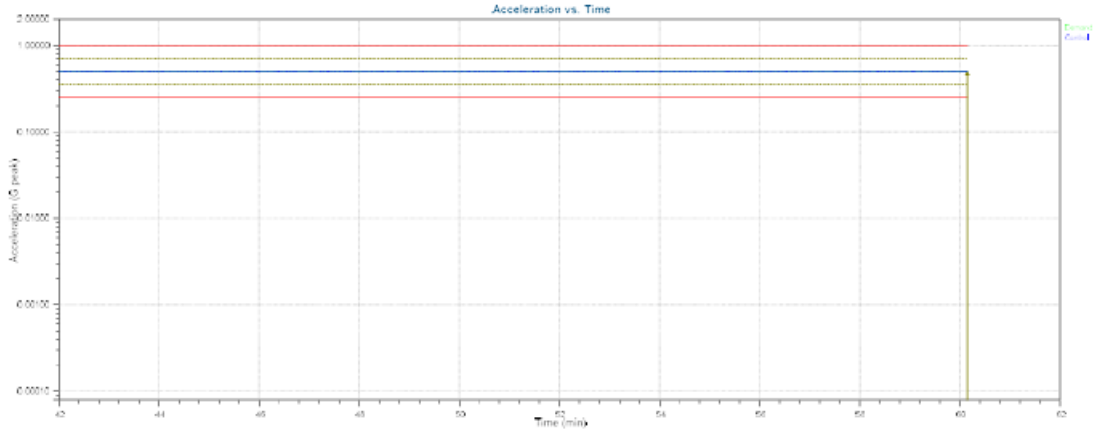
**※ Refer to the sample operation after the completion of testing in section 5.8.**

## 5.7 Test Data

### 5.7.1 Test Data (X Axis)

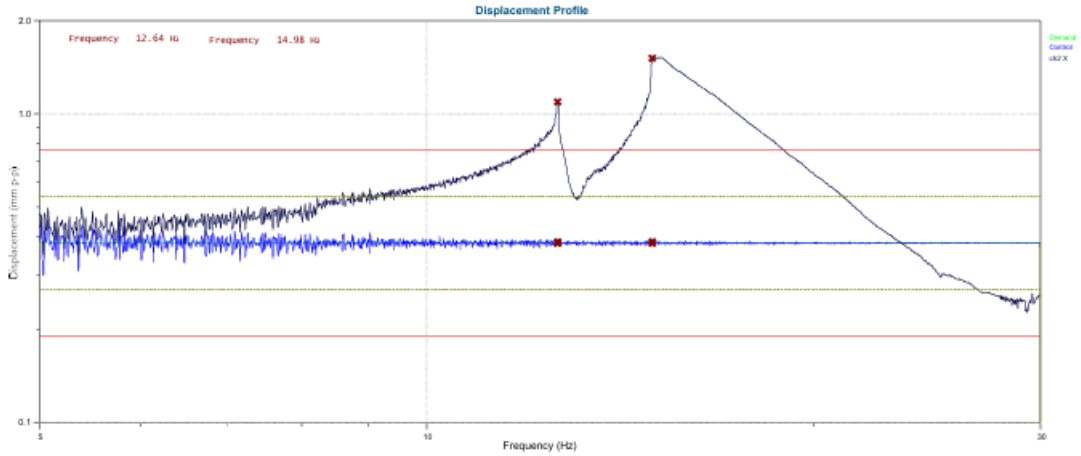



Resonant search Test (X Axis)

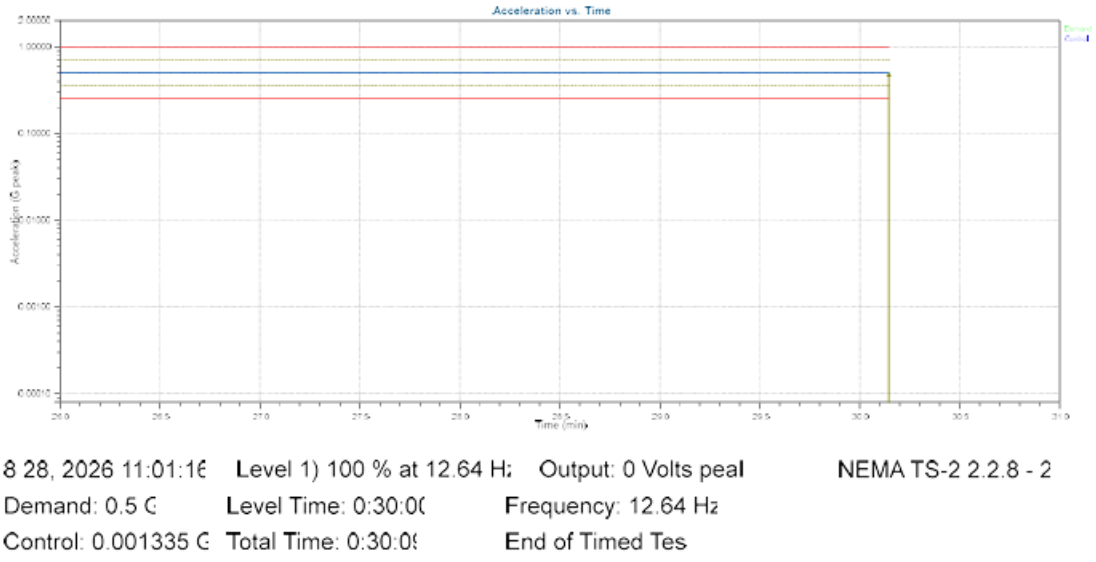



Endurance Test (X Axis)

5.7.2 Test Data (Y Axis)

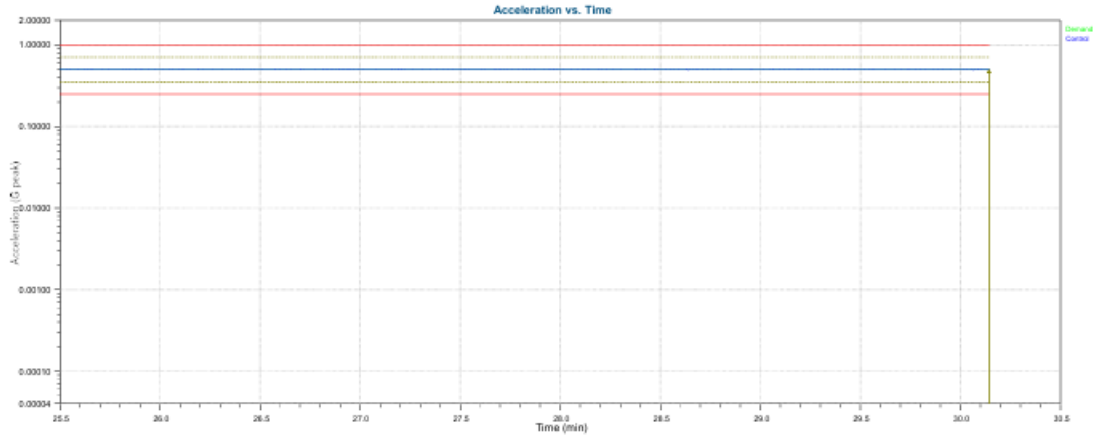



Resonant search Test (Y Axis)



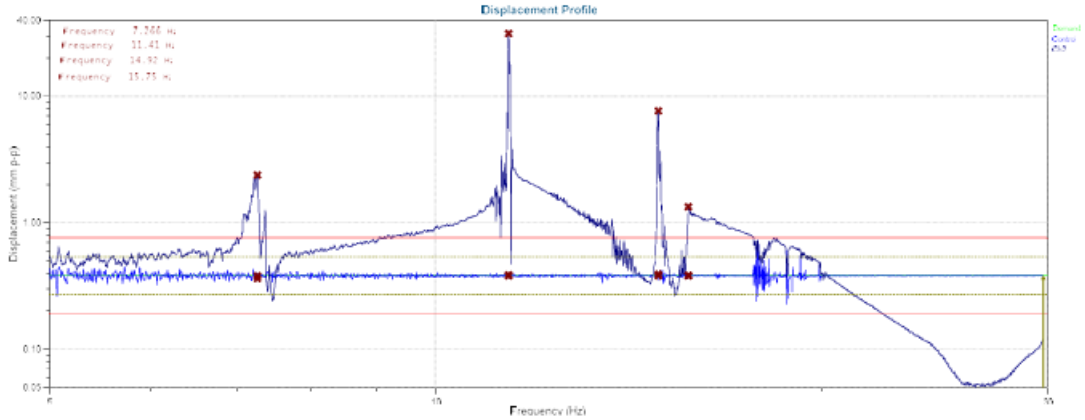

Endurance Test (Y Axis)

5.7.3 Test Data (Y, Z Axes)




8 28, 2026 11:32:57 Level 1) 100 % at 14.98 Hz Output: 0 Volts peal NEMA TS-2 2.2.8 - 2
Demand: 0.5 G Level Time: 0:30:0( Frequency: 14.98 Hz
Control: 0.002258 G Total Time: 0:30:0( End of Timed Tes

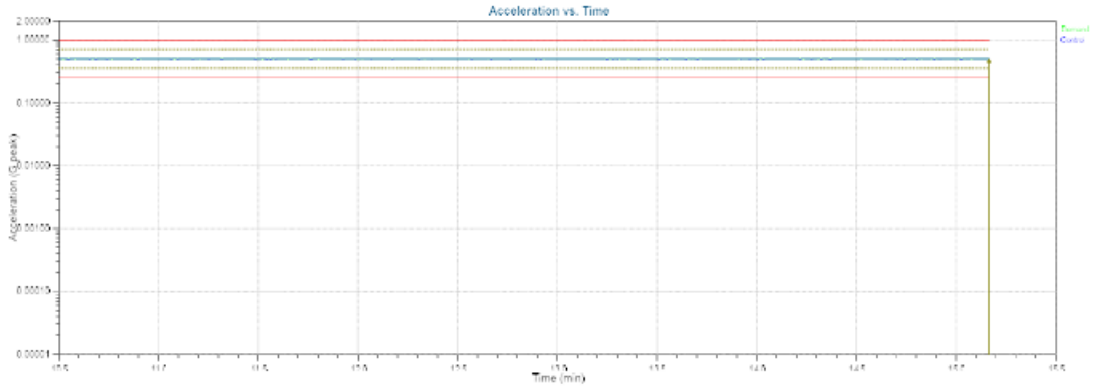
Endurance Test (Y Axis)




8 27, 2026 15:53:20 Level 1) 100 % Output: 0 Volts peak 한화비전 NEMA-TS 공진
Demand: 0.381 mm Level Time: 0:12:30 Frequency: 29.79 Hz
Control: 0.0001518 m Total Time: 0:13:14 End of Timed Test

Resonant search Test (Z Axis)

5.7.4 Test Data (Y, Z Axes)

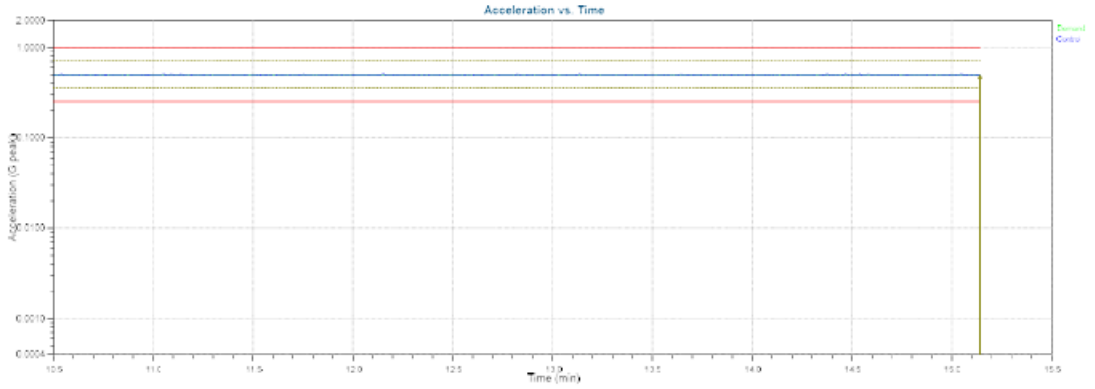



8 27, 2026 16:09:31 Level 1) 100 % Output: 0 Volts peak 20251021 한화비전 NEMA-TS 공진

Demand: 0.5 G Level Time: 0:15:00 Frequency: 7.266 Hz

Control: 0.001872 G Total Time: 0:15:10 End of Timed Test

Endurance Test (Y Axis)



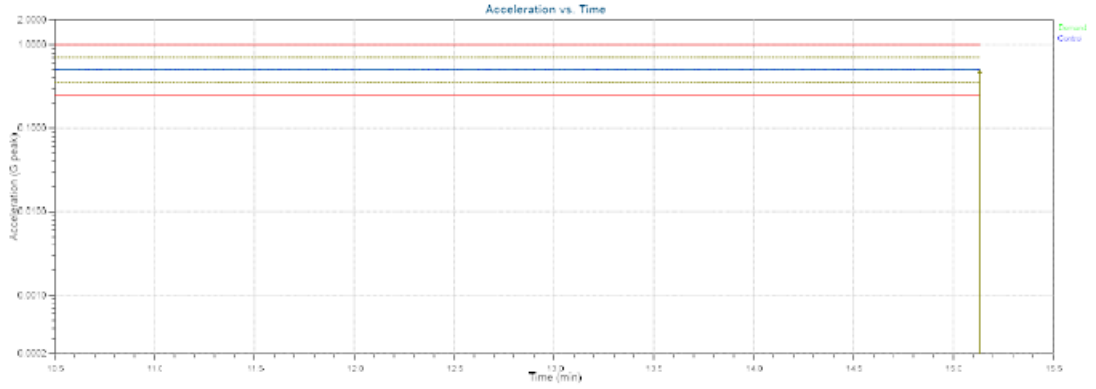

8 27, 2026 16:25:26 Level 1) 100 % Output: 0.0004287 Volts peak 20251021 한화비전 NEMA-TS 공진

Demand: 0.5 G Level Time: 0:15:00 Frequency: 11.41 Hz

Control: 0.003813 G Total Time: 0:15:08 End of Timed Test

Resonant search Test (Z Axis)

5.7.5 Test Data (Y Axis)

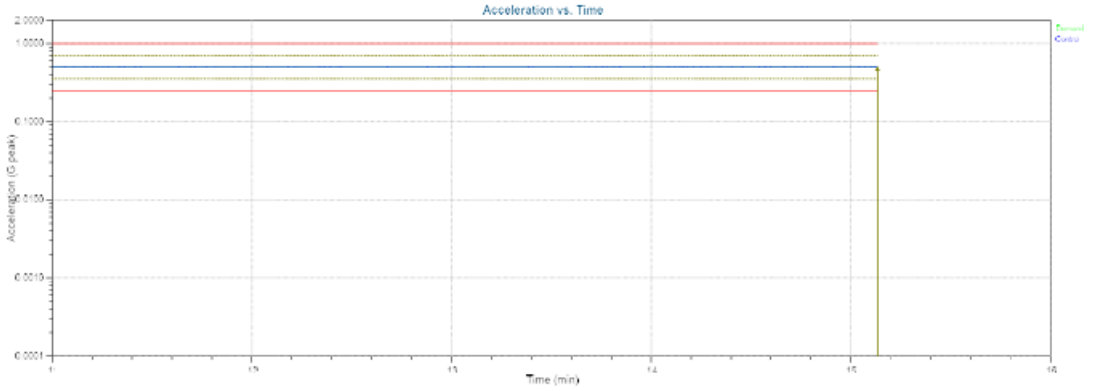



8 27, 2026 16:40:57 Level 1) 100 % Output: 0.005635 Volts peak 20251021 한화비전 NEMA-TS 공진

Demand: 0.5 G Level Time: 0:15:00 Frequency: 14.92 Hz

Control: 0.05738 G Total Time: 0:15:08 End of Timed Test

Endurance Test (Y Axis)




8 28, 2026 08:16:59 Level 1) 100 % Output: 0 Volts peak 20251021 한화비전 NEMA-TS 공진

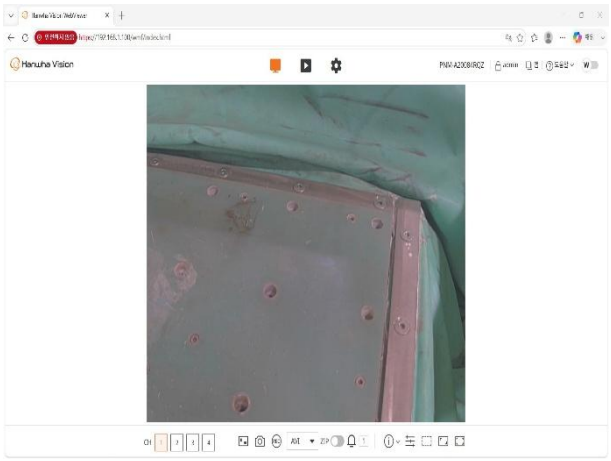
Demand: 0.5 G Level Time: 0:15:00 Frequency: 15.75 Hz

Control: 0.001996 G Total Time: 0:15:08 End of Timed Test

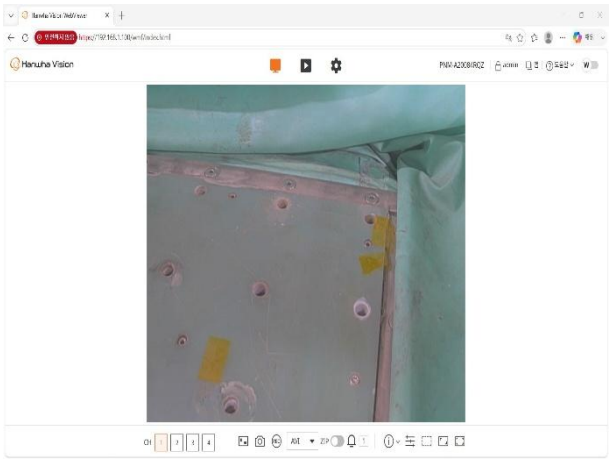
Endurance Test (Y Axis)

## 5.8 Post-test operation and function

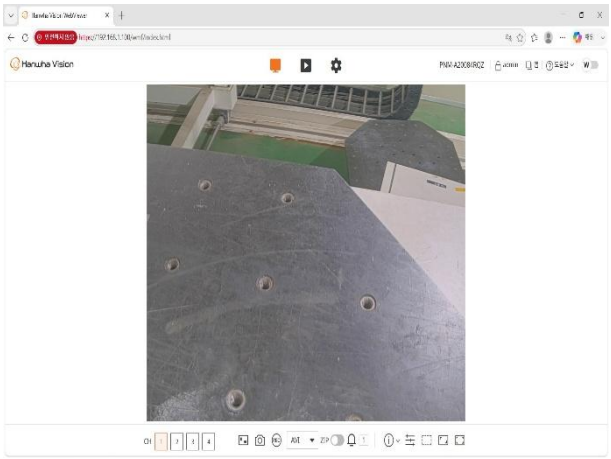
### 5.8.1 Test sample operation and function



X axis



Y axis



Z axis

# 6. Shock(impact) Test [NEMA TS-2:2021 2.2.9]

## 6.1 Test date and environmental conditions

6.1.1 Test date: Aug. 27, 2026 ~ Aug. 28, 2026

6.1.2 Measured Environmental Conditions

| Item | Temperature (℃) | Humidity (% R.H.) | Pressure (kPa) |
|---|---|---|---|
| Measurement | 24.8 | 45.2 | 95.8 |

## 6.2 Test conditions and methods

6.2.1 Sample status: operation

6.2.2 Applied waveform: Half sine

6.2.3 Acceleration(G): 10 G

6.2.4 Nominal duration (ms): 11

6.2.5 Applicable axis: X, Y, Z

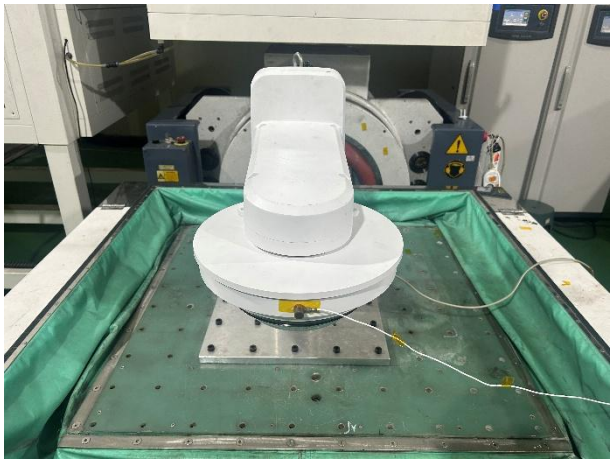
6.2.6 Number of impacts: 1 per direction (total 6)

6.2.7 Evaluation items

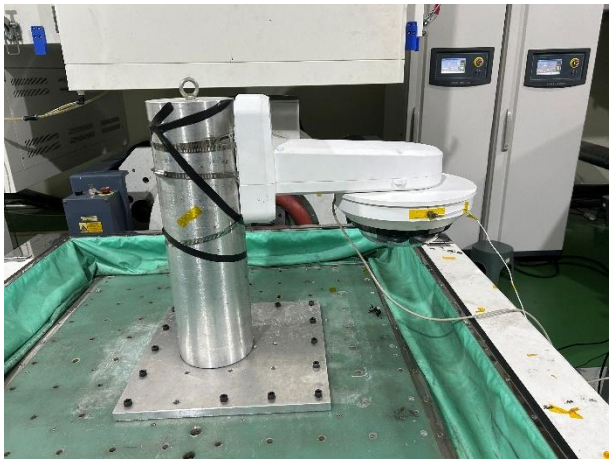
1) The test sample shall be checked to determine that it is functionally operable in all modes of its prescribed operation

## 6.3 Test Setup and During test sample images

6.3.1 Evidence of test setting (NEMA TS-2:2021 2.2.9)



X axis



Y axis




Z axis

**※ The control sensors for the X and Y axes are mounted on the vibration plate.**

## 6.4 Test result [NEMA TS-2:2021 2.2.9]

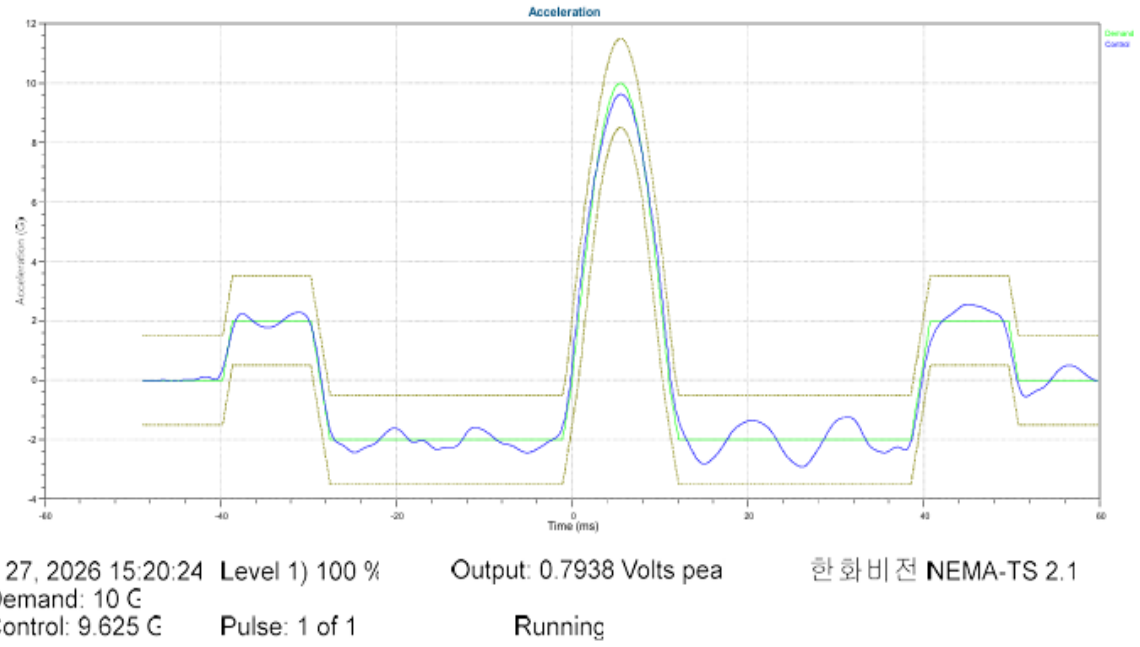
6.4.1 Test result table

| Evaluation Criteria | Test Results | Comment |
|---|---|---|
| Functional operation | **Pass** | - |
| Mechanical inspection | **Pass** | - |

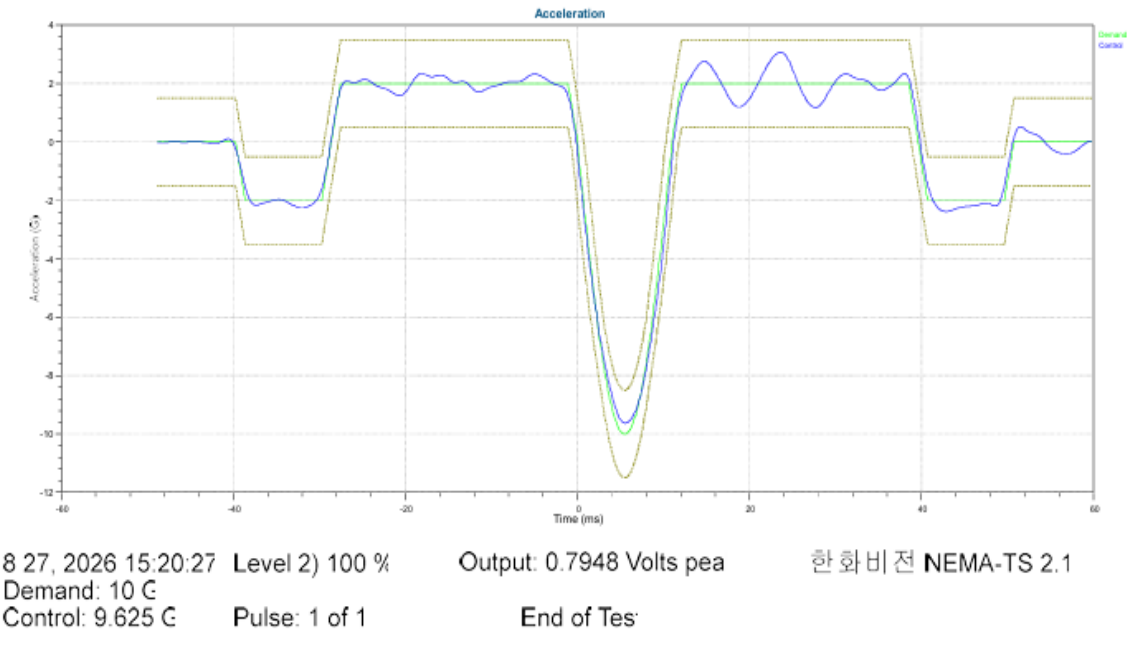
**※ Refer to the sample operation after the completion of testing in section 6.6.**

## 6.5 Test Data

### 6.5.1 Mechanical shock data (±X Axis)

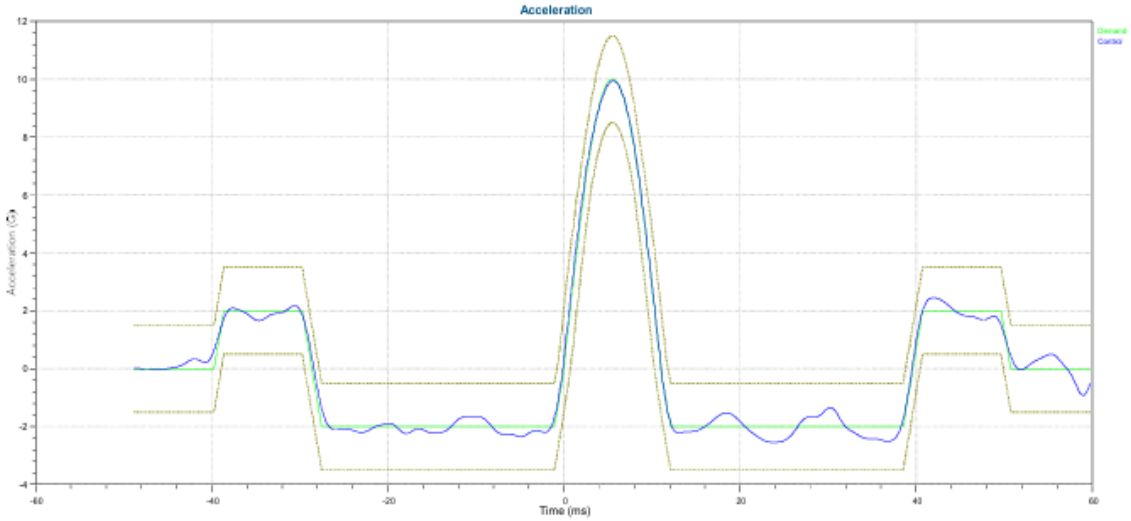



Mechanical Shock data +X Axis

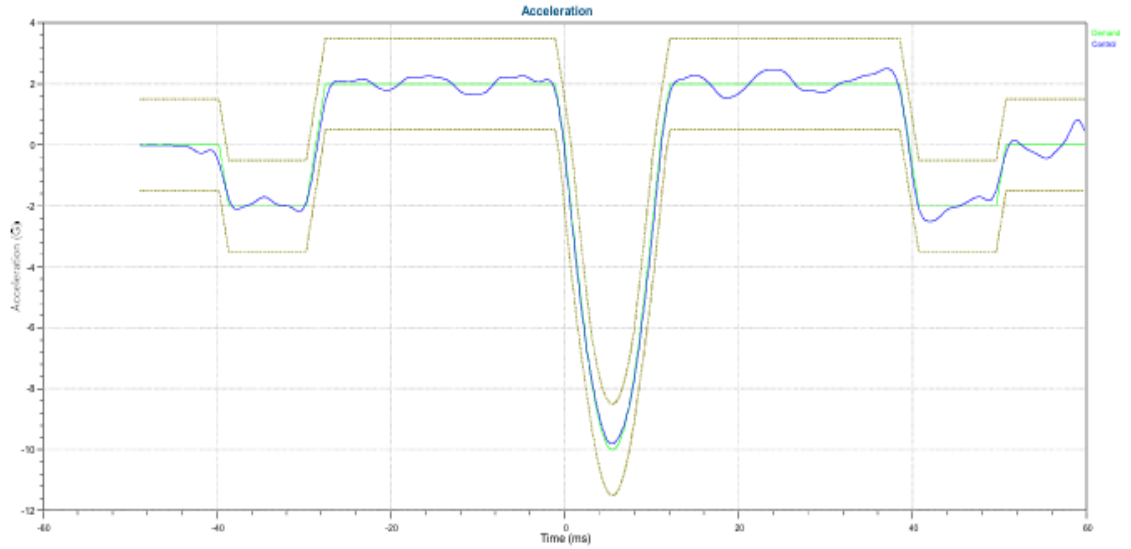



Mechanical Shock data -X Axis

6.5.2 Mechanical shock data (±Y Axis)

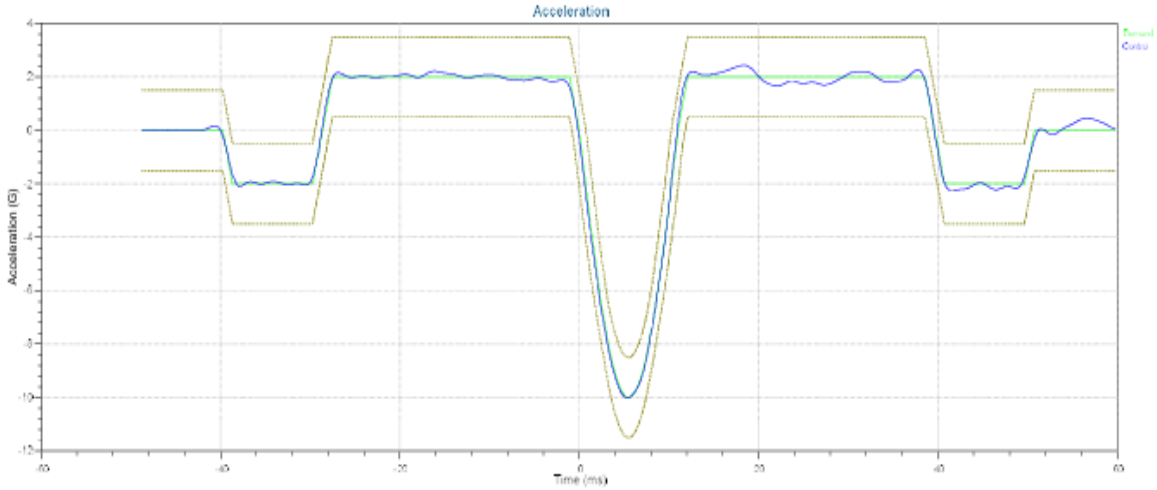



Mechanical Shock data +Y Axis



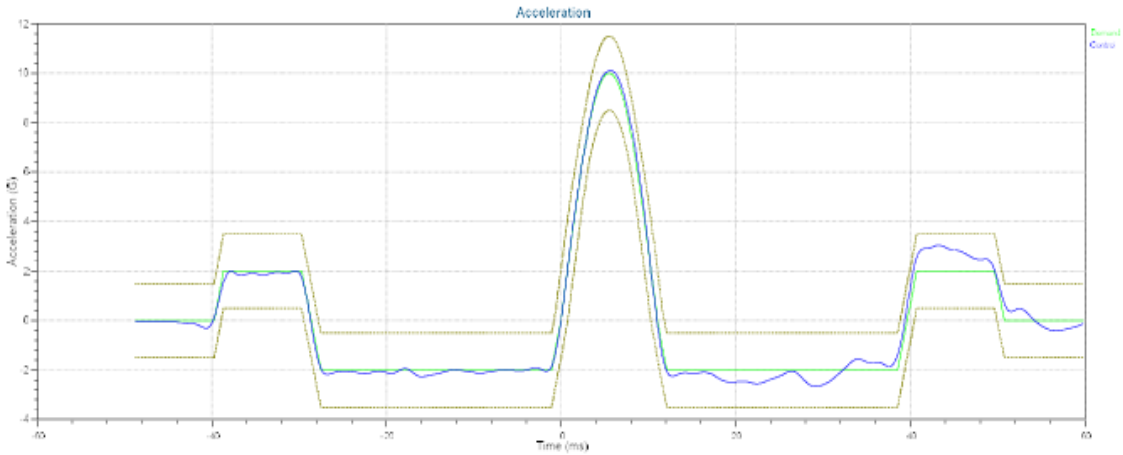

Mechanical Shock data -Y Axis

6.5.3 Mechanical shock data (±Z Axis)




8 28, 2026 08:18:11 Level 2) 100 % Output: 0.7261 Volts peak 251021 NEMA TS-2 2.2.9
Demand: 10 G
Control: 10 G Pulse: 1 of 1 End of Test

Mechanical Shock data +Z Axis

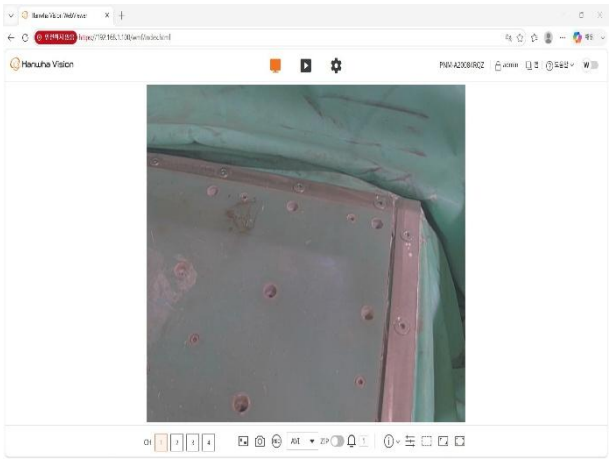



8 28, 2026 08:18:07 Level 1) 100 % Output: 0.7478 Volts peak 251021 NEMA TS-2 2.2.9
Demand: 10 G
Control: 10.11 G Pulse: 1 of 1 Running

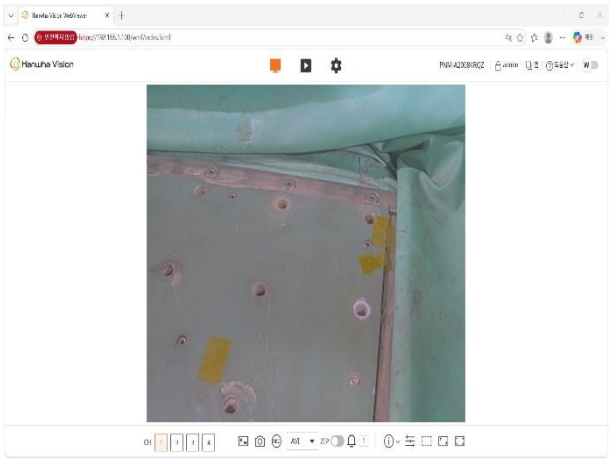
Mechanical Shock data -Z Axis

## 6.6 Post-test operation and function

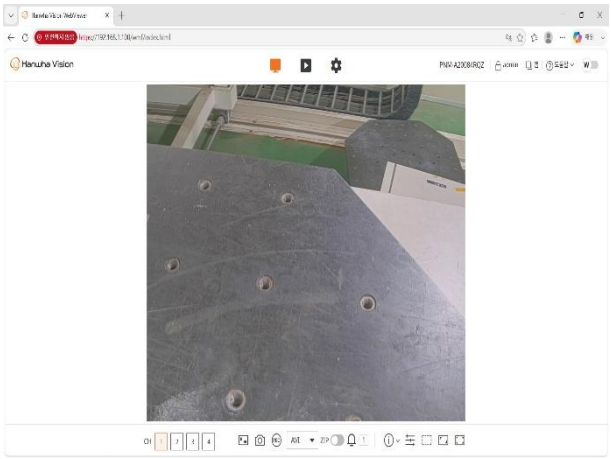
### 6.6.1 Test sample operation and function



X axis



Y axis



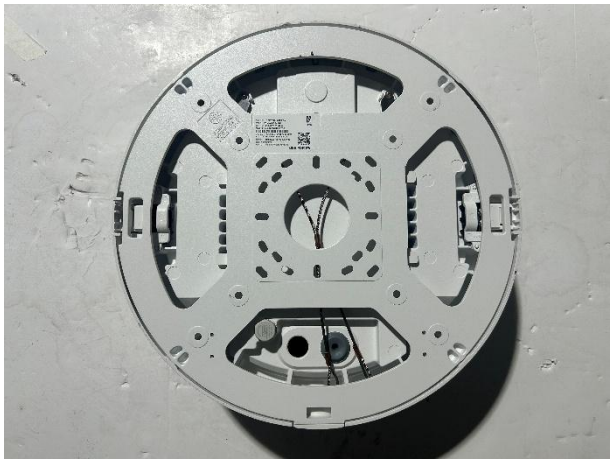
Z axis

## 6.7 Post-test sample images

6.7.1 Test sample(1)



Top



Bottom



Front



Rear



Left side

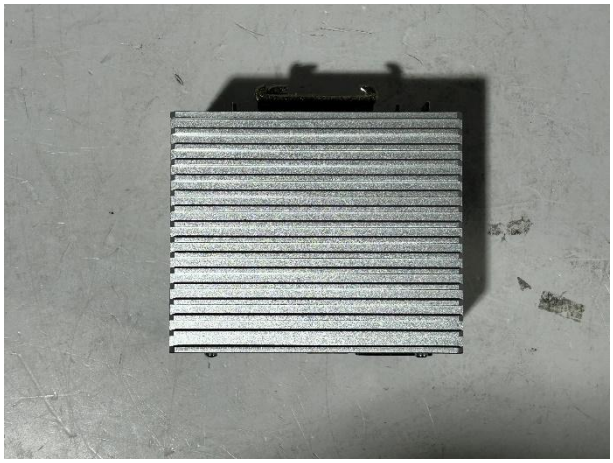


Right side

6.7.2 Test sample(2)



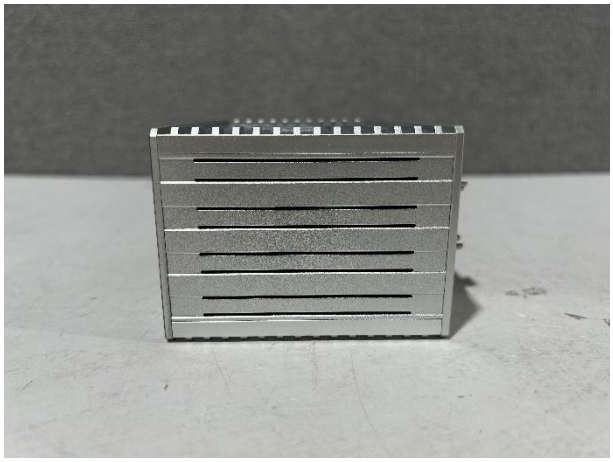

Top



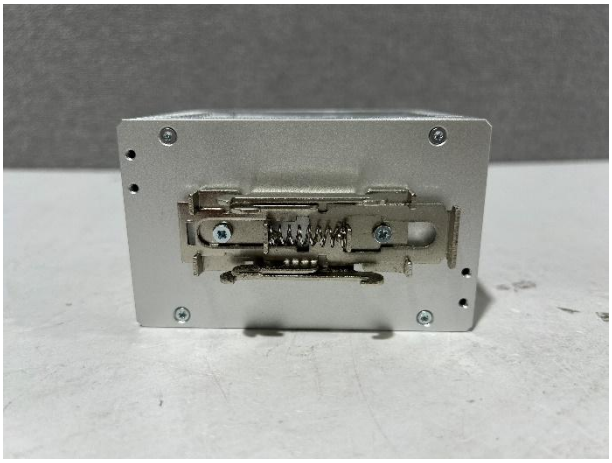
Bottom



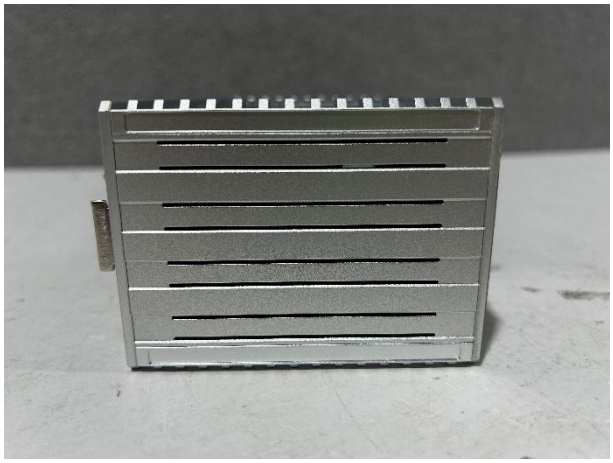

Front



Rear



Left side



Right side

- End-