TEST REPORT

Test Report No.	: KES-RE-23T0291
Date of Issue	: September 19, 2023
Description of Product	: NETWORK CAMERA
Model No.	: QNV-C8011RMG
Variant Model	: -
Applicant	: Hanwha Vision Co., Ltd.
Address	: 6, Pangyo-ro, 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer 1	: D-TECH CO., LTD.
Address	: 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea (Suwon Industrial Complex)
Manufacturer 2	: HANWHA VISION VIETNAM COMPANY LIMITED
Address	: Lot O-2, Que Vo Industial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
Applicable Regulation	: EN 50155:2021 Railway applications – Rolling stock - Electronic equipment
Use of Report	: For quality control

Test Date : September 13, 2023 to September 17, 2023

Tested by:
Sungwoo, Lee
Test Engineer

Reviewed by:
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1. General information

1.1 Introduction

Company Name	KES Co., Ltd.
Name of President / CEO	Young, Kim
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1.2 Laboratory

Address	C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea
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2. Information of E.U.T.

1) Product : NETWORK CAMERA
2) Model : QNV-C8011RMG
3) Ratings : DC 48 V, 0.18 A
4) Serial No. : ZTCV6V4W600018K
5) Use of report : For quality management

3. Visual inspection : EN 50155:2021 (clause 13.4.1)

3.1 General

The Visual inspection test verifies the mechanical and appearance conformance of the Electronic Equipment.
The Visual inspection shall be carried out before and after tests to check whether any damage or deterioration has occurred resulting from the tests.

3.2 Mechanical and appearance

Test Items	Test standard	Test result	Remarks
Mechanical and appearance	No mechanical damage or deterioration has occurred resulting from the tests, loosening of screw, etc.	Positive results (refer to the results and/or remarks of each tests)	-

4. Performance test : EN 50155:2021 (clause 13.4.2)

4.1 General

The performance test is carried out according to the Performance test specification and Performance test procedure written by the supplier. (E.U.T. shall continue to operate as intended during and after the test.)

4.2 Test result

Test Items	Test standard	Test result	Remarks
Performance test	Boot and video output shall operating normally	Positive results (refer to the results and/or remarks of each tests)	-

5. Insulation test : EN 50155:2021 (clause 13.4.7)

5.1 General

The aim of this test (insulation resistance test and voltage withstand test) is to ensure that the mounted components, their metal connections and enclosures, and the routing of printed circuit board tracks and wires (if any), are not located too close to surrounding metal parts or fixings.

The test verifies that the design of circuits meets the requirements for galvanic isolation.
The test shall be carried out on fully assembled parts of equipment, and/or complete equipment dependent upon the scope of supply. For this test no alteration of the original equipment is permitted (e.g. component removal).

The insulation test consists of three parts:
- an insulation resistance test before the voltage withstand test;
- the voltage withstand test;
- an insulation resistance test after the voltage withstand test.

After the insulation test the equipment shall work as intended and within its specified limits. All measured values shall be recorded in the test report.
Where galvanic isolation is required, test voltages shall be applied between the two sides of the isolation barrier and the measured insulation resistance values shall be recorded.
Each equipotential area shall be defined and tested against functional earth and against all adjacent equipotential areas.
An equipotential area can be formed by ELV circuits that have internal electronic earth potential (0 V) electrically connected to the functional earth (see Annex K). In this case, insulation test against functional earth is not required.
The voltage withstand test procedure shall be arranged such that equipotential areas are subjected to the minimum number of applications of the dielectric test voltage.
The earth continuity shall be ensured for subracks and PBAs with exposed metal parts which can be touched.

5.2 Insulation measurement test

The insulation resistance test shall be carried out at DC 500 V and the resistance values shall be recorded for all the equipotential areas defined for the insulation test. During the test, the equipment shall not be powered on.

Test acceptance requirements:
For a single equipotential area on a fully assembled part of equipment (e.g. on a single PBA), the minimum value of the insulation resistance after the voltage withstand test shall be higher than 20 MΩ.
For assembled equipment (e.g. control electronics in traction converter), the minimum value of the insulation resistance of equipotential areas depends on the extent of the complete circuit. The insulation resistance at the interfaces to the vehicle shall be agreed between the involved parties.
In the case of high-impedance bleeder resistors between adjacent equipotential areas or between an equipotential area and functional earth, the effect of these resistors shall be deducted.

5.3 Voltage withstand test

The test shall be performed with AC test voltage (50 Hz or 60 Hz) according to Table 13. If not applicable (e.g. when EMC filter capacitors are mounted between active signals and functional earth) DC test voltage according to the same table shall be used.
Each equipotential area shall be defined and tested against functional earth and against all surrounding equipotential areas.

The test voltage shall be applied by gradually increasing the voltage amplitude to the test voltage (i.e. in more than 1 s), and maintained at the specified level for:
— Type test: 1 min;
— Routine test: 10 s.
For type test always the initial test voltage shall be applied.

An insulation resistance test shall be carried out before and after the voltage withstand test. Significant differences in the results shall be analysed and justified in the test report.

The nominal battery voltage and/or I/O voltage of each equipotential area define the test voltage according to Table 13.

For equipment powered by voltage not covered by this standard, see the applicable standards (e.g. EN 61287-1, EN 60077-1).

The test shall be applied to all insulated ports including power supply, I/O-ports and communication ports.

Table 13 — Test voltages of voltage withstand test

Nominal battery voltage and/or I/O voltage	Test voltage
< DC 72 V or AC 50 V_{RMS}	AC 500 V or DC 750 V
DC 72 V ≤ DC V < DC 125 V or from AC 50 to 90 V_{RMS}	AC 1 000 V or DC 1 500 V
DC 125 V ≤ DC V < DC 315 V or from AC 90 to 225 V_{RMS}	AC 1 500 V or DC 2 200 V

Where part of the electronic equipment is galvanically connected to a power circuit, then this part of the equipment shall be subject to the same dielectric tests as that circuit.

Attention is drawn to the fact that for battery referenced ports, a higher impulse withstand voltage is applicable, in respect of EN 50121-3-2:2016 surge requirements.

Test acceptance requirements:
Neither disruptive discharge nor flashover shall occur.

5.4 Insulation measurement test results

Test Items	Test standard	Test result	Remarks
Insulation measurement test	Carried out at 500 V d.c., There shall be no fundamental deterioration from the initial measurement.	Not applicable	ELV part (Input : DC 48 V)

5.5 Voltage withstand test results

Test Items	Test standard	Test result	Remarks
Voltage withstand test	AC 500 V, 60 Hz, 1 min, Neither disruptive discharge nor flashover shall occur.	Not applicable	ELV part (Input : DC 48 V)

6. Low temperature test : EN 50155:2021 (clause 13.4.4)

-. Carried out according to EN 60068-2-1:2007 (test Ad)

6.1 Test description and symbol

Standard	Symbol	Test description
EN 60068-2-1	Ab	Cold for non heat-dissipating specimens with gradual change of temperature
	Ad	Cold for heat-dissipating specimens with gradual change of temperature that are powered after initial temperature stabilization
	Ae	Cold for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test

6.2 Table 1 – Operating temperature classes

Class	Equipment operating temperature range	Class	Equipment operating temperature range
OT1	-25 ℃ to 55 ℃	OT4	-40 ℃ to 70 ℃
OT2	-40 ℃ to 55 ℃	OT5	-25 ℃ to 85 ℃
OT3	-25 ℃ to 70 ℃	OT6	-40 ℃ to 85 ℃

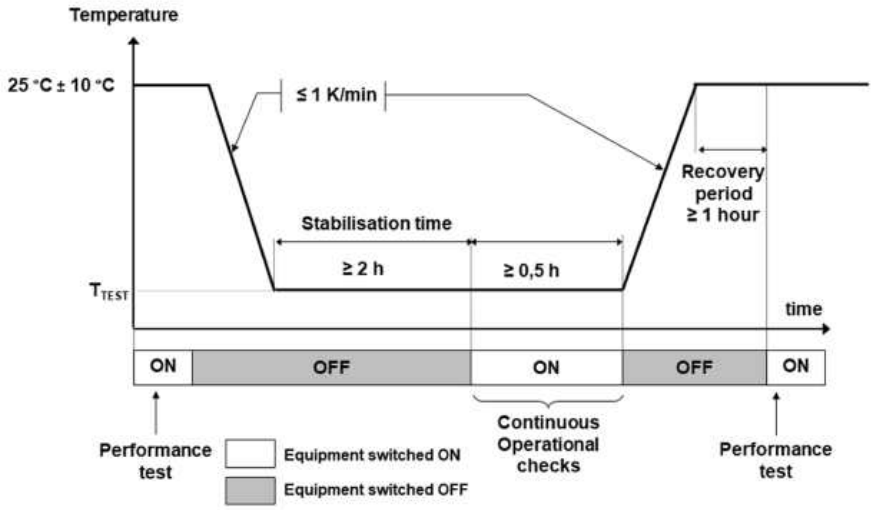
6.3 Test instrument performance

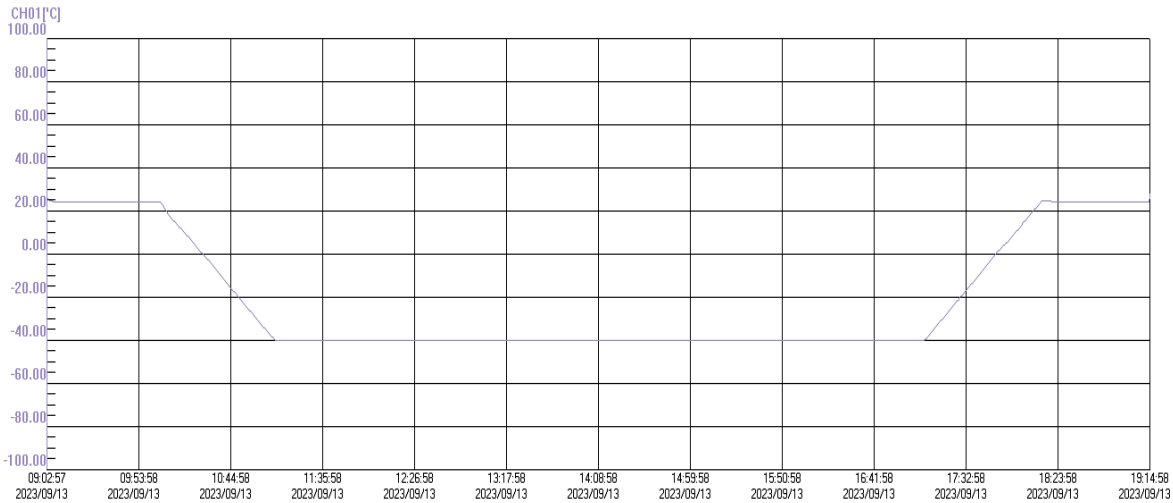
Set point temperature control method	Temperature sensor detection and control
Applied temperature change rate (slope)	Max. 1 K/min

6.4 Test conditions

Item		Detailed description	Remarks
Test date		September 13, 2023	-
Atmospheric conditions		(25.0 ± 10.0) ℃, (50 ± 25) % R.H.	-
Power conditions		☐ Store (Power OFF) ☑ Action (Power ON)	During measurements
Operating temperature classes		☐ OT1 ☑ OT2 ☐ OT3 ☐ OT4 ☐ OT5 ☐ OT6	-40 ℃
Specimen classification		☐ Non heat-dissipating specimens ☑ heat-dissipating specimens	-
Application testing		☐ Test Ab ☑ Test Ad ☐ Test Ae	EN 50155
Severity	Temperature	☐ -65 ℃ ☐ -55 ℃ ☐ -50 ℃ ☑ -40 ℃ ☐ -33 ℃ ☐ -25 ℃ ☐ -20 ℃ ☐ -10 ℃ ☐ -5 ℃ ☐ +5 ℃	Tolerance ± 2 K
	Duration	☑ 2 h ☐ 16 h ☐ 72 h ☐ 96 h ☐ Etc	EN 50155
Pre conditioning	Applicability	☑ No Regulations ☐ Regulations	-
	Contents	-	-
Initial measurements	Visual inspection	Mechanical damage, loosening of screw, etc.	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-
Intermediate measurements	Visual inspection	Not applicable	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-
Recovery	Applicability	☐ No Regulations ☑ Regulations	-
	Condition	☑ Recovery from standard atmospheric conditions ☐ Etc :	Minimum 1 h
Final measurements	Visual inspection	Mechanical damage, loosening of screw, etc.	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-

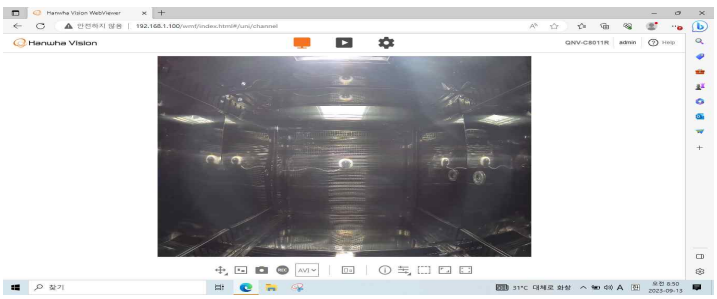
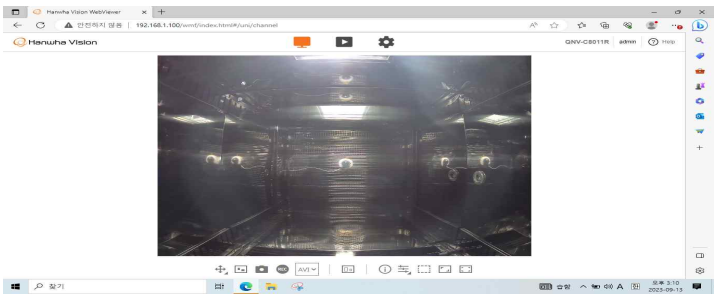
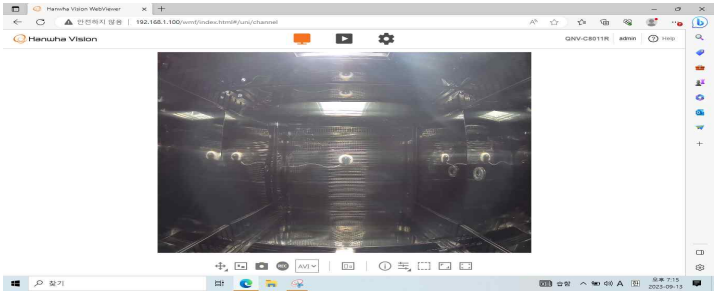
6.5 Low temperature test profile & graph





6.6 Test result

Test Items	Test standard	Test result	Remarks
Low temperature test	According to EN 60068-2-1 (test Ad), it is allowed to stand at −40 ℃, 2 h, no abnormalities and no mechanical defects when the function test is confirmed at the initial, intermediate and final of the test	No abnormalities and no mechanical defects when the visual inspection and performance test was confirmed at the initial, intermediate and final of the test	-

Photos of Low temperature test	Internal chamber		
	During the test		
	Normal operation check	Initial	
		Intermediate	
		Final	

7. Dry heat test : EN 50155:2021 (clause 13.4.5)

-. Carried out according to EN 60068-2-2:2007 (test Bd)

7.1 Test description and symbol

Standard	Symbol	Test description
EN 60068-2-2	Bb	Dry heat for non heat-dissipating specimens with gradual change of temperature
	Bd	Dry heat for heat-dissipating specimens with gradual change of temperature that are not powered during the conditioning period
	Be	Dry heat for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test

7.2 Table 1 – Operating temperature classes

Class	Equipment operating temperature range	Class	Equipment operating temperature range
OT1	-25 ℃ to 55 ℃	OT4	-40 ℃ to 70 ℃
OT2	-40 ℃ to 55 ℃	OT5	-25 ℃ to 85 ℃
OT3	-25 ℃ to 70 ℃	OT6	-40 ℃ to 85 ℃

7.3 Table 2 – Classes for increased operating temperature at switch-on

Class	Switch-on extended operating temperature	Thermal test cycle
ST0	OTx (no increased temperature)	Test cycle A
ST1	OTx + 15 ℃	Test cycle B
ST2	OTx + 15 ℃	Test cycle C

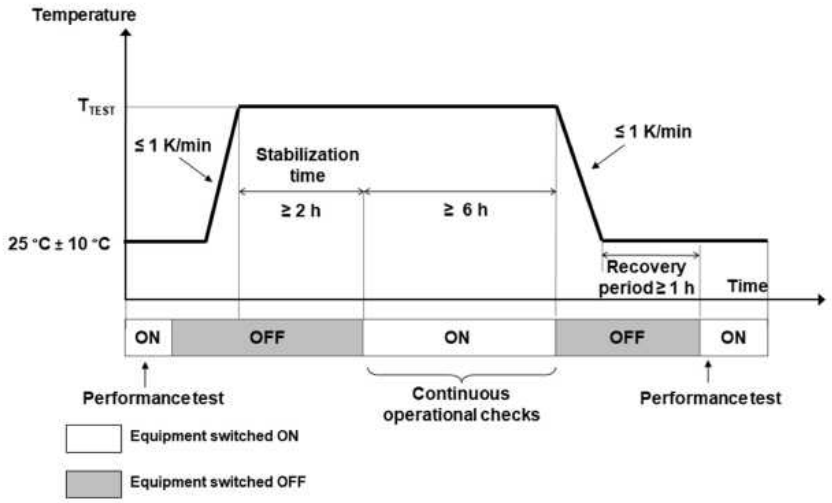
7.4 Test instrument performance

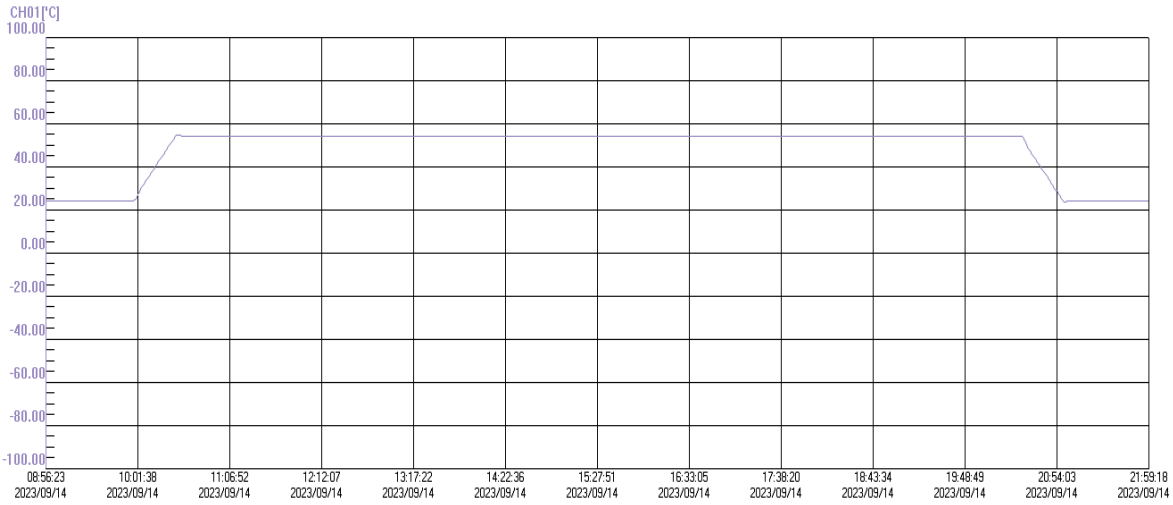
Set point temperature control method	Temperature sensor detection and control
Applied temperature change rate (slope)	Max. 1 K/min

7.5 Test conditions

Item		Detailed description	Remarks
Test date		September 14, 2023	-
Atmospheric conditions		(25.0 ± 10.0) ℃, (50 ± 25) % R.H.	-
Power conditions		☐ Store (Power OFF) ☑ Action (Power ON)	During measurements
Operating temperature classes		☐ OT1 ☑ OT2 ☐ OT3 ☐ OT4 ☐ OT5 ☐ OT6	55 ℃
Switch-on extended Operating temperature classes		☑ ST0 ☐ ST1 ☐ ST2	Test cycle A
Specimen classification		☐ Non heat-dissipating specimens ☑ heat-dissipating specimens	-
Application testing		☐ Test Bb ☑ Test Bd ☐ Test Be	EN 50155
Severity	Temperature	☐ 1 000 ℃ ☐ 800 ℃ ☐ 630 ℃ ☐ 500 ℃ ☐ 400 ℃ ☐ 315 ℃ ☐ 250 ℃ ☐ 175 ℃ ☐ 155 ℃ ☐ 125 ℃ ☐ 100 ℃ ☐ 85 ℃ ☐ 70 ℃ ☐ 65 ℃ ☐ 60 ℃ ☑ 55 ℃ ☐ 50 ℃ ☐ 45 ℃ ☐ 40 ℃ ☐ 35 ℃ ☐ 30 ℃	Tolerance ± 2 K
	Duration	☐ 2 h ☐ 16 h ☐ 72 h ☐ 96 h ☐ 168 h ☐ 240 h ☐ 336 h ☐ 1 000 h ☑ Etc : 6 h	EN 50155
Initial measurements	Visual inspection	Mechanical damage, loosening of screw, etc.	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-
Intermediate measurements	Visual inspection	Not applicable	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-
Recovery	Applicability	☐ No Regulations ☑ Regulations	-
	Condition	☑ Recovery from standard atmospheric conditions ☐ Etc :	Minimum 1 h
Final measurements	Visual inspection	Mechanical damage, loosening of screw, etc.	-
	Performance test	Normal operation check (Boot and video output shall operating normally)	-

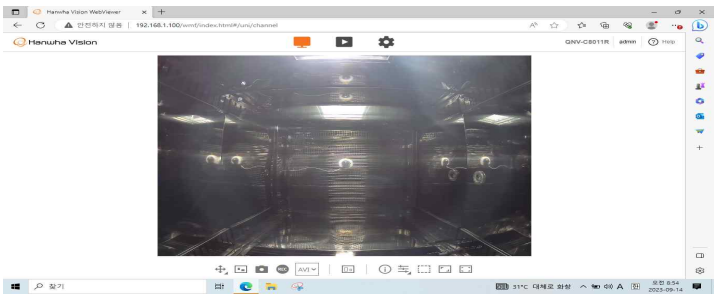
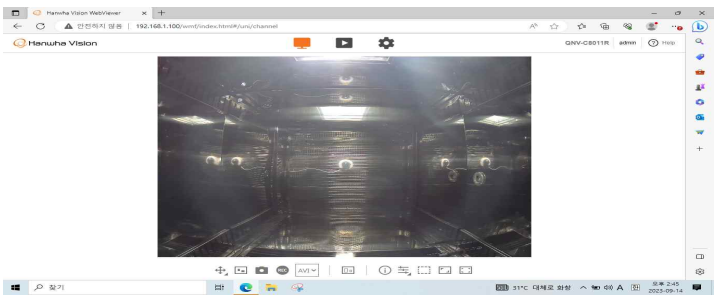
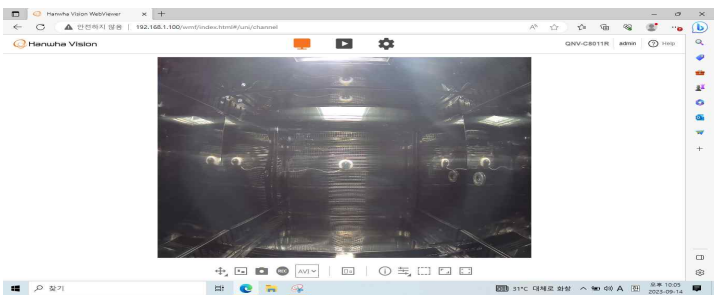
7.6 Dry heat test profile & graph (Test cycle A)





7.7 Test result

Test Items	Test standard	Test result	Remarks
Dry heat test	According to EN 60068-2-2 (test Bd), it is allowed to stand at 55 ℃, 6 h, no abnormalities and no mechanical defects when the function test is confirmed at the initial, intermediate and final stages of the test	No abnormalities and no mechanical defects when the visual inspection and performance test was confirmed at the initial, intermediate and final of the test	-

Dry heat test photos	Internal chamber		
	During the test		
	Normal operation check	Initial	
		Intermediate	
		Final	

8. Shock and vibration tests : EN 50155:2021 (clause 13.4.10)

-. Carried out according to EN 61373:2010

8.1 Scope

This International Standard specifies the requirements for testing items of equipment intended for use on railway vehicles which are subsequently subjected to vibrations and shock owing to the nature of railway operational environment. To gain assurance that the quality of the equipment is acceptable, it has to withstand tests of reasonable duration that simulate the service conditions seen throughout its expected life.

Simulated long-life testing can be achieved in a number of ways each having their associated advantages and disadvantages, the following being the most common:

a) amplification: where the amplitudes are increased and the time base decreased;

b) time compression: where the amplitude history is retained and the time base is decreased (increase of the frequency);

c) decimation: where time slices of the historical data are removed when the amplitudes are below a specified threshold value.

8.2 Purpose and choice of the tests

Symbol	Test description
Category 1 Body mounted	Class A Cubicles, subassemblies, equipment and components mounted directly on or under the car body.
	Class B Anything mounted inside an equipment case which is in turn mounted directly on or under the car body. NOTE 1 Class B should be used when it is not clear where the equipment is to be located.
Category 2 Bogie mounted	Cubicles, subassemblies, equipment and components which are to be mounted on the bogie of a railway vehicle
Category 3 Axle mounted	Subassemblies, equipment and components or assemblies which are to be mounted on the wheelset assembly of a railway vehicle.

8.3 General

This test shall be carried out in accordance with EN 61373:2010.

For the test the equipment shall be placed in conditions representative of its use and with the orientation and associated equipment parts recommended by the supplier for its operation (e.g. cabinet and / or complete chassis, auxiliary and mounting accessories, including its damping devices, if any, and with mated connectors as used in normal operation).

During testing (with the exception of simulated endurance tests), the equipment shall be functional, and its performance monitored.

8.4 Simulated long-life testing

8.4.1 Test conditions

<table>
<tr><th colspan="2">Item</th><th colspan="6">Detailed description</th><th>Remarks</th></tr>
<tr><td colspan="2">Test date</td><td colspan="6">September 16, 2023 to September 17, 2023</td><td>-</td></tr>
<tr><td colspan="2">Atmospheric conditions</td><td colspan="6">(25.0 ± 10.0) ℃, (50 ± 25) % R.H.</td><td>-</td></tr>
<tr><td colspan="2">Power conditions</td><td colspan="6">☑ Store (Power OFF) ☐ Action (Power ON)</td><td>-</td></tr>
<tr><td colspan="2">Categories</td><td colspan="6">☑ Category 1 (☐ Class A ☑ Class B)
☐ Category 2 ☐ Category 3</td><td>-</td></tr>
<tr><td colspan="2">When mass</td><td colspan="6">☑ ≦ 500 kg ☐ > 500 kg, ≦ 1 250 kg ☐ > 1 250 kg</td><td>-</td></tr>
<tr><td colspan="2" rowspan="6">Direction time and test level</td><td colspan="2">Vertical (5 h)</td><td colspan="2">Transverse (5 h)</td><td colspan="2">Longitudinal (5 h)</td><td rowspan="6"></td></tr>
<tr><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td></tr>
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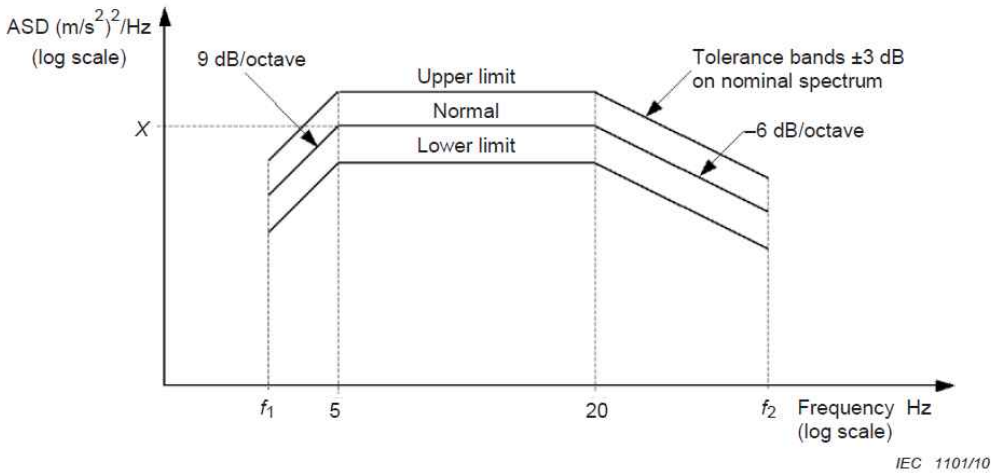
<tr><td>20</td><td>0.964</td><td>20</td><td>0.192</td><td>20</td><td>0.461</td></tr>
<tr><td>150</td><td>-6 dB/oct</td><td>150</td><td>-6 dB/oct</td><td>150</td><td>-6 dB/oct</td></tr>
<tr><td colspan="2">5.72 m/s^2 r.m.s</td><td colspan="2">2.55 m/s^2 r.m.s</td><td colspan="2">3.96 m/s^2 r.m.s</td></tr>
<tr><td colspan="2">ASD spectrum</td><td colspan="6">Category 1 (☐ Class A ☑ Class B)</td><td>Refer to 8.4.2</td></tr>
<tr><td rowspan="2">Initial measurements</td><td>Visual inspection</td><td colspan="6">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
<tr><td rowspan="2">Intermediate measurements</td><td>Visual inspection</td><td colspan="6">Not applicable</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Not applicable</td><td>-</td></tr>
<tr><td rowspan="2">Final measurements</td><td>Visual inspection</td><td colspan="6">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
</table>

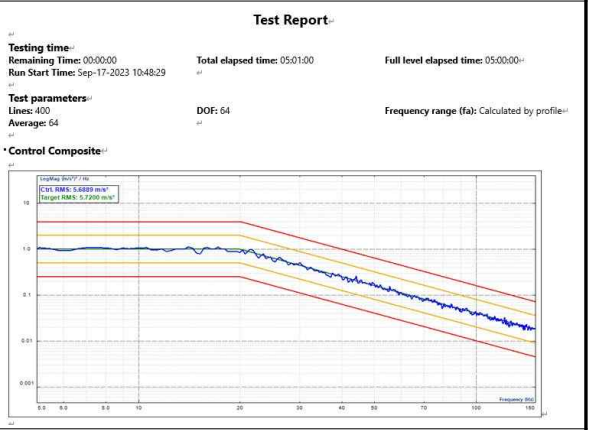
8.4.2 ASD spectrum (Category 1, Class B)



when mass	≤500 kg:	f_1 = 5 Hz	f_2 = 150 Hz
when mass	>500 kg≤1 250 kg:	$f_1 = \frac{1250}{\text{mass}} \times 2\,\text{Hz}$	$f_2 = \frac{1250}{\text{mass}} \times 60\,\text{Hz}$
when mass	>1 250 kg:	f_1 = 2 Hz	f_2 = 60 Hz

8.4.3 Test result

Test Items	Test standard	Test result	Remarks
Simulated long-life testing	According to EN 61373:2010, Clause 9 (Category 1, Class B). There should be no abnormalities and no mechanical defects when checking the performance test at the initial and final of the test.	No abnormalities and no mechanical defects when the visual inspection and performance test was confirmed at the initial and final of the test	-

Vertical		September 17, 2023 / 10:48:29 
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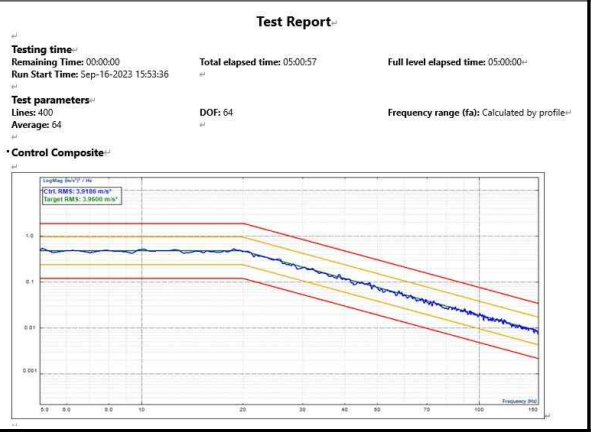
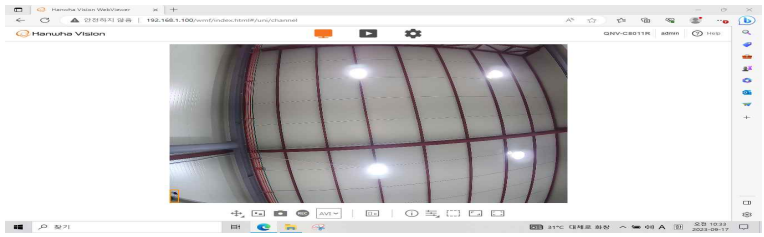
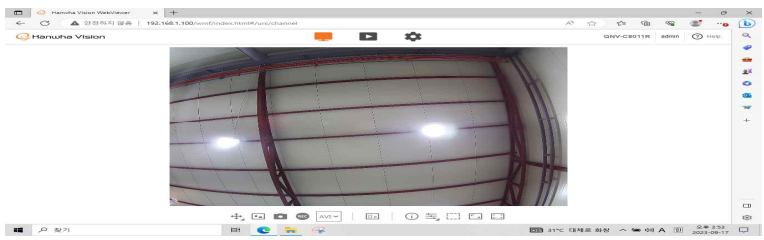
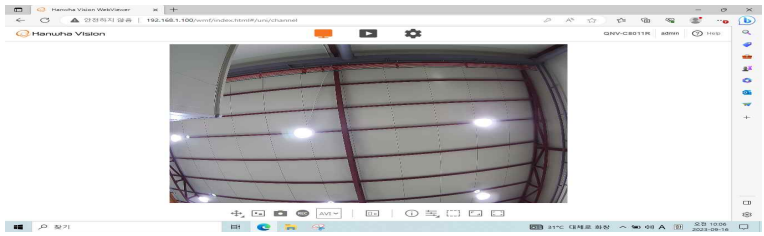
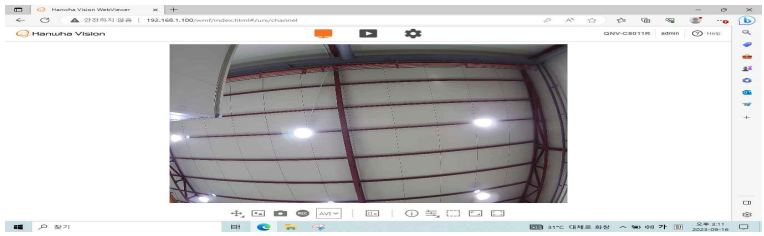
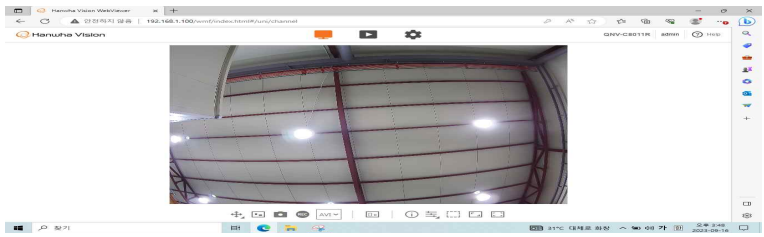
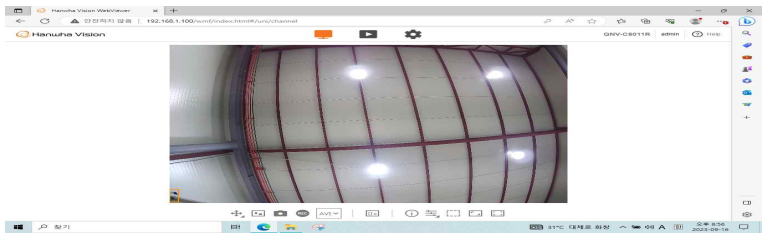
Longitu dinal		September 16, 2023 / 15:53:36 

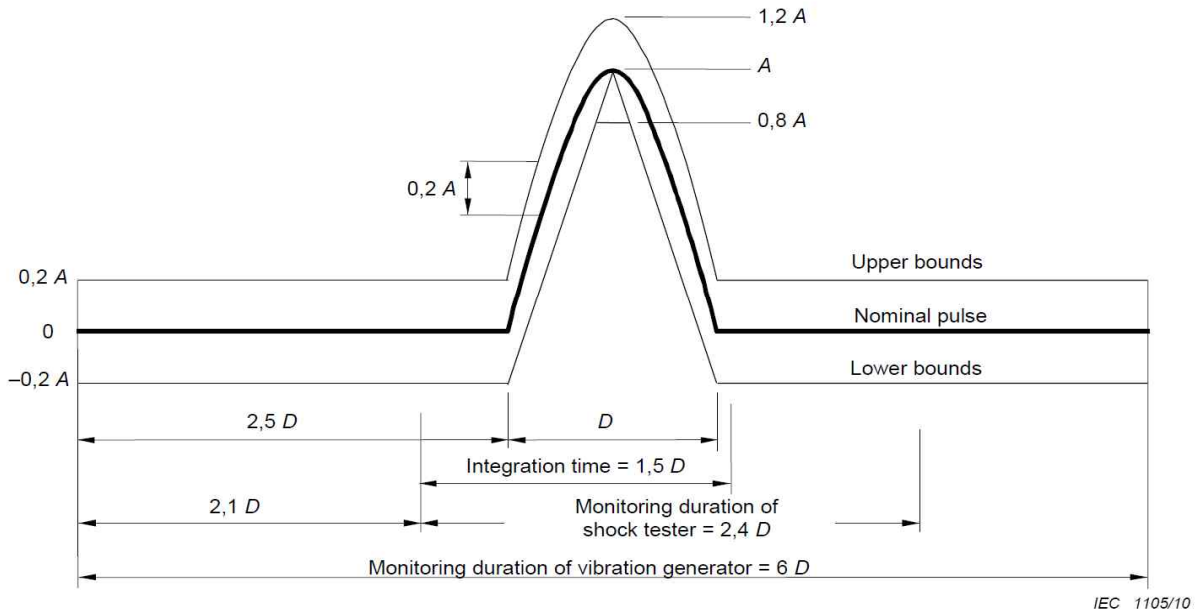
Simulated long-life testing - Normal operation check	Vertical	Initial	
		Final	
	Trans verse	Initial	
		Final	
	Longitu dinal	Initial	
		Final	

8.5 Shock testing

8.5.1 Test conditions

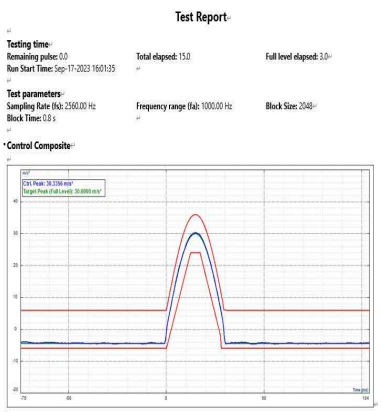
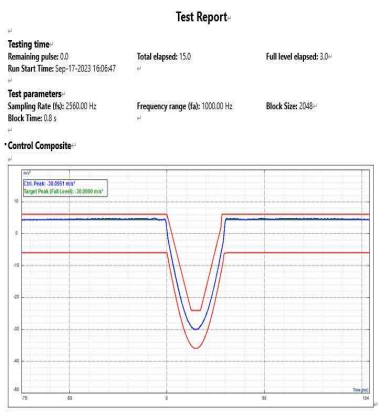
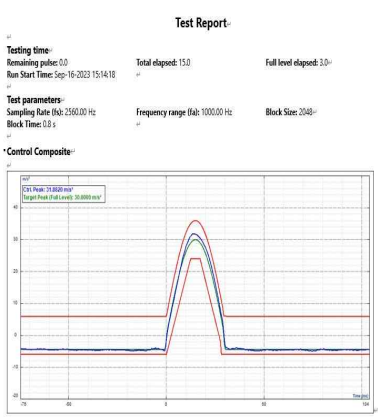
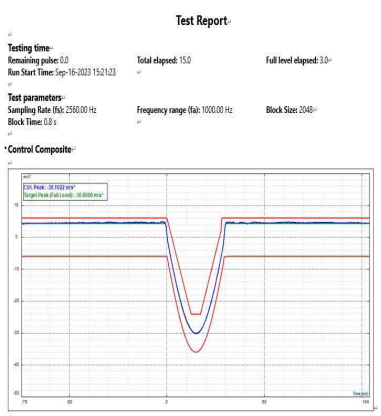
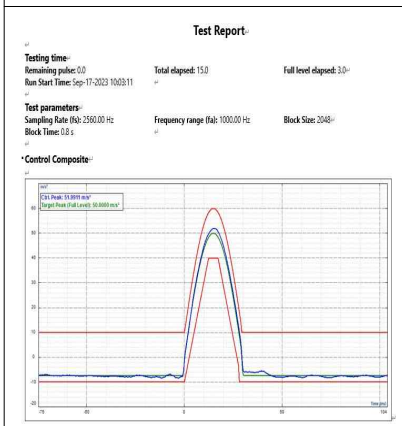
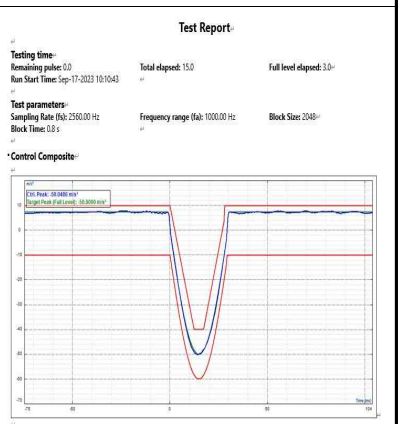
<table>
<tr><th colspan="2">Item</th><th colspan="4">Detailed description</th><th>Remarks</th></tr>
<tr><td colspan="2">Test date</td><td colspan="4">September 16, 2023 to September 17, 2023</td><td>-</td></tr>
<tr><td colspan="2">Atmospheric conditions</td><td colspan="4">(25.0 ± 10.0) ℃, (50 ± 25) % R.H.</td><td>-</td></tr>
<tr><td colspan="2">Power conditions</td><td colspan="4">☑ Store (Power OFF) ☐ Action (Power ON)</td><td>-</td></tr>
<tr><td colspan="2">Categories</td><td colspan="4">☑ Category 1 (☐ Class A ☑ Class B)
☐ Category 2 ☐ Category 3</td><td>-</td></tr>
<tr><td colspan="2" rowspan="4">Direction
time
and
test
level</td><td></td><td>Vertical</td><td>Transverse</td><td>Longitudinal</td><td rowspan="4"></td></tr>
<tr><td>Peak acceleration A (m/s^2)</td><td>30</td><td>30</td><td>50</td></tr>
<tr><td>Nominal duration D (ms)</td><td>30</td><td>30</td><td>30</td></tr>
<tr><td>Number of repetitions (+, -)</td><td>3 / 3</td><td>3 / 3</td><td>3 / 3</td></tr>
<tr><td colspan="2">Wave form</td><td>Half sine wave</td><td>Half sine wave</td><td>Half sine wave</td><td></td></tr>
<tr><td colspan="2">Allowable width of sine wave type</td><td colspan="3">Category 1 (☐ Class A ☑ Class B)</td><td>Refer to 8.5.2</td></tr>
<tr><td rowspan="2">Initial measurements</td><td>Visual inspection</td><td colspan="3">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="3">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
<tr><td rowspan="2">Intermediate measurements</td><td>Visual inspection</td><td colspan="3">Not applicable</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="3">Not applicable</td><td>-</td></tr>
<tr><td rowspan="2">Final measurements</td><td>Visual inspection</td><td colspan="3">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="3">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
</table>

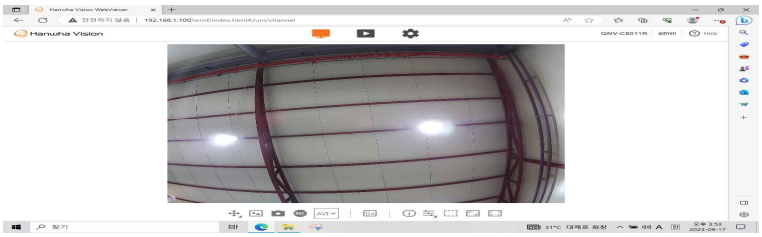
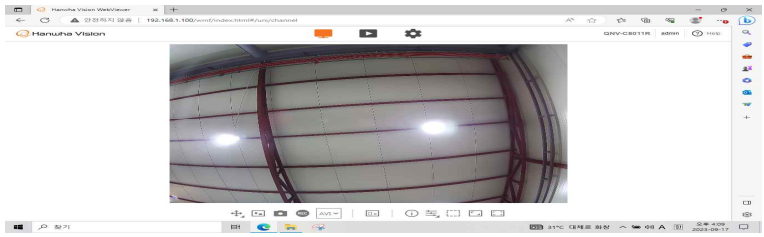
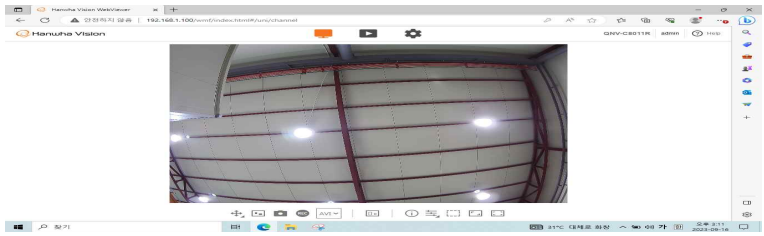
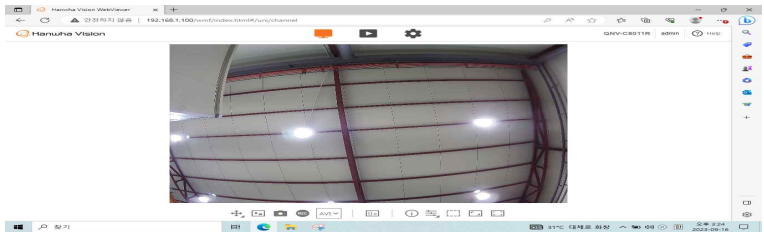
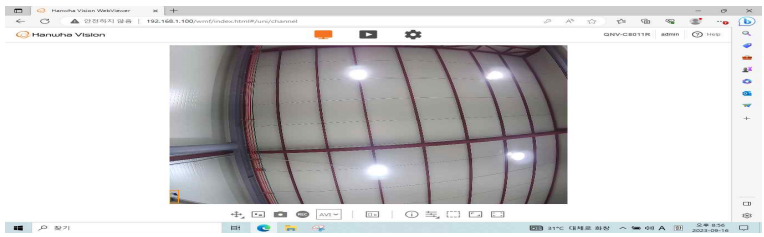
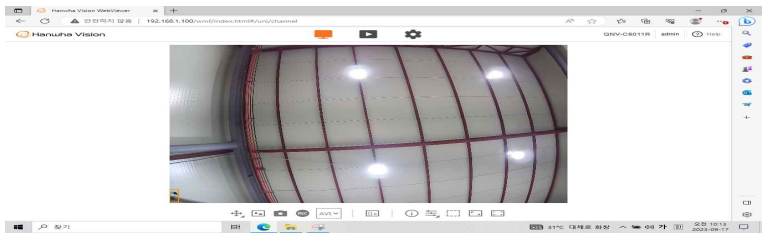
8.5.2 Allowable width of sine wave type



8.5.3 Test result

Test Items	Test standard	Test result	Remarks
Shock testing	According to EN 61373:2010, Clause 10 (Category 1, Class B). There should be no abnormalities and no mechanical defects when checking the performance test at the initial and final of the test.	No abnormalities and no mechanical defects when the visual inspection and performance test was confirmed at the initial and final of the test	-

Vertical		September 17, 2023 / 16:01:35 	September 17, 2023 / 16:06:47 
Trans verse		September 16, 2023 / 15:14:18 	September 16, 2023 / 15:21:23 
Longitu dinal		September 17, 2023 / 10:03:11 	September 17, 2023 / 10:10:43 

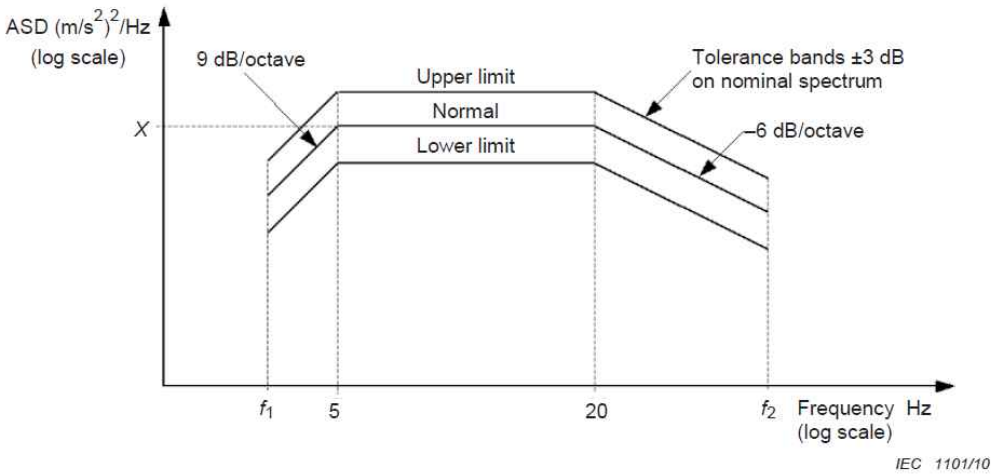
Shock testing - Normal operation check	Vertical	Initial	
		Final	
	Trans verse	Initial	
		Final	
	Longitu dinal	Initial	
		Final	

8.6 Functional random vibration test

8.6.1 Test conditions

<table>
<tr><th colspan="2">Item</th><th colspan="6">Detailed description</th><th>Remarks</th></tr>
<tr><td colspan="2">Test date</td><td colspan="6">September 16, 2023 to September 17, 2023</td><td>-</td></tr>
<tr><td colspan="2">Atmospheric conditions</td><td colspan="6">(25.0 ± 10.0)℃, (50 ± 25) % R.H.</td><td>-</td></tr>
<tr><td colspan="2">Power conditions</td><td colspan="6">☐ Store (Power OFF) ☑ Action (Power ON)</td><td>DC 48 V</td></tr>
<tr><td colspan="2">Categories</td><td colspan="6">☑ Category 1 (☐ Class A ☑ Class B)
☐ Category 2 ☐ Category 3</td><td>-</td></tr>
<tr><td colspan="2">When mass</td><td colspan="6">☑ ≦ 500 kg ☐ > 500 kg, ≦ 1 250 kg ☐ > 1 250 kg</td><td>-</td></tr>
<tr><td colspan="2" rowspan="5">Direction time and test level</td><td colspan="2">Vertical (15 min)</td><td colspan="2">Transverse (15 min)</td><td colspan="2">Longitudinal (15 min)</td><td rowspan="5"></td></tr>
<tr><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td><td>Frequency [Hz]</td><td>ASD Level [$(m/s^2)^2/Hz$]</td></tr>
<tr><td>5</td><td>0.030 1</td><td>5</td><td>0.006 0</td><td>5</td><td>0.014 4</td></tr>
<tr><td>20</td><td>0.030 1</td><td>20</td><td>0.006 0</td><td>20</td><td>0.014 4</td></tr>
<tr><td>150</td><td>-6 dB/oct</td><td>150</td><td>-6 dB/oct</td><td>150</td><td>-6 dB/oct</td></tr>
<tr><td colspan="2">1.010 m/s^2 r.m.s</td><td colspan="2">0.450 m/s^2 r.m.s</td><td colspan="2">0.700 m/s^2 r.m.s</td></tr>
<tr><td colspan="2">ASD spectrum</td><td colspan="6">Category 1 (☐ Class A ☑ Class B)</td><td>Refer to 8.6.2</td></tr>
<tr><td rowspan="2">Initial measurements</td><td>Visual inspection</td><td colspan="6">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
<tr><td rowspan="2">Intermediate measurements</td><td>Visual inspection</td><td colspan="6">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
<tr><td rowspan="2">Final measurements</td><td>Visual inspection</td><td colspan="6">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="6">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
</table>

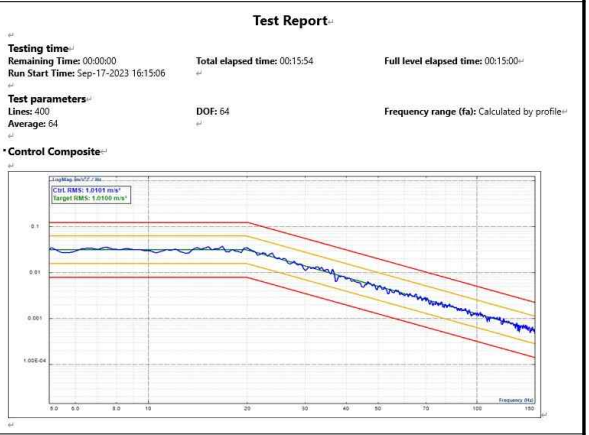
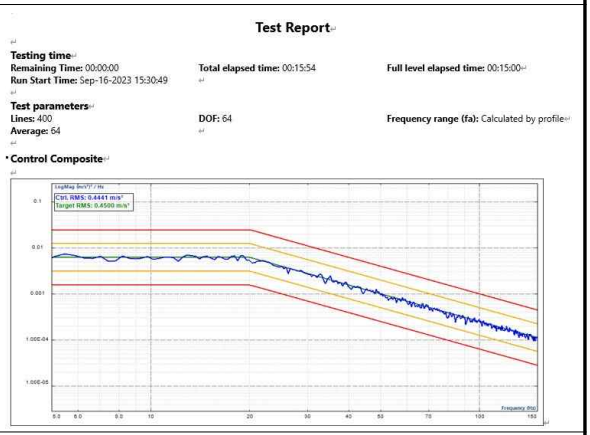
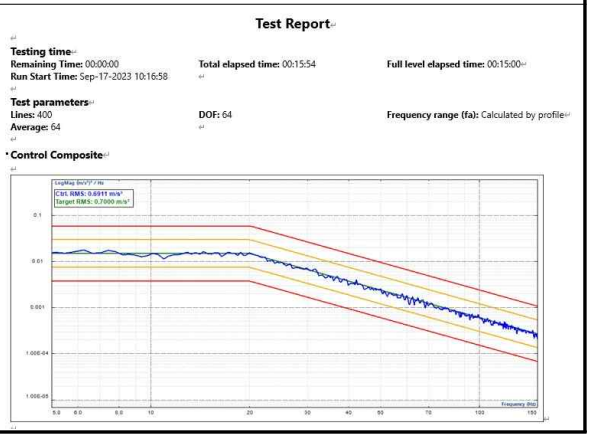
8.6.2 ASD spectrum (Category 1, Class B)

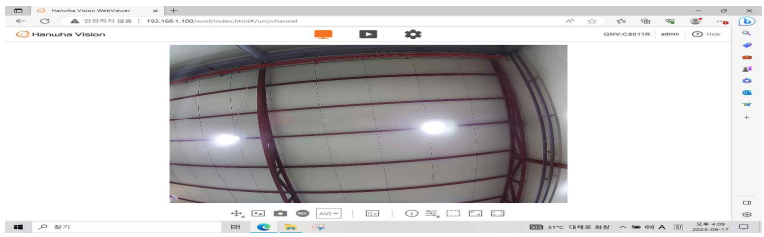
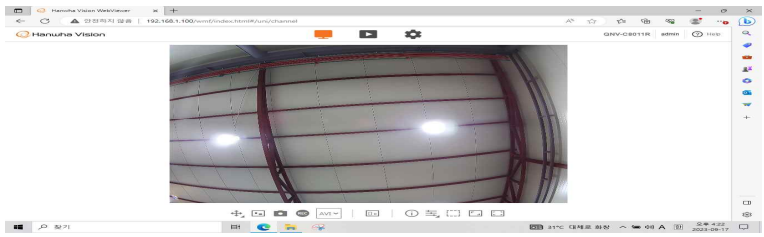
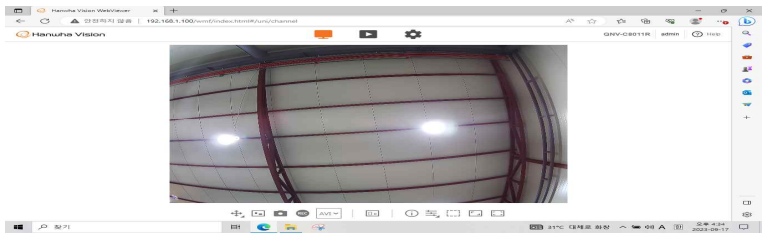
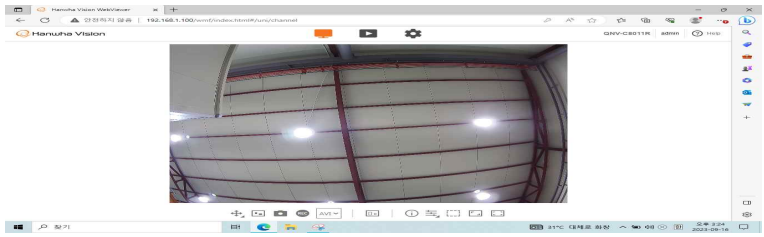
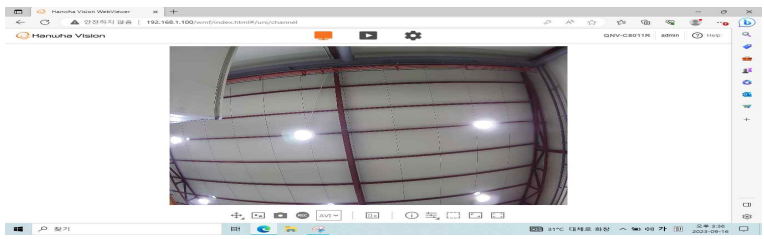
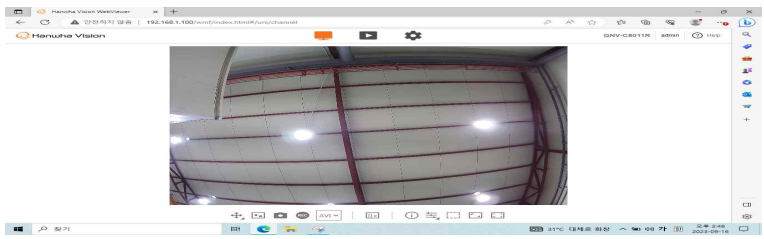


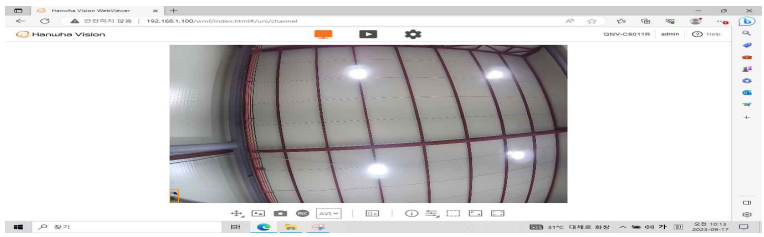
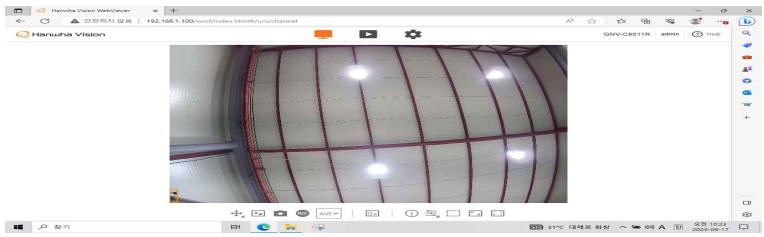
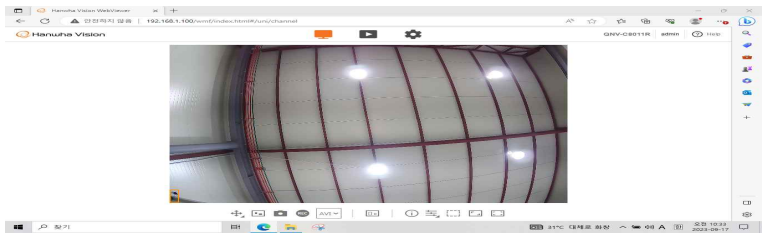
when mass	≤500 kg:	f_1 = 5 Hz	f_2 = 150 Hz
when mass	>500 kg≤1 250 kg:	$f_1 = \frac{1250}{\text{mass}} \times 2\,\text{Hz}$	$f_2 = \frac{1250}{\text{mass}} \times 60\,\text{Hz}$
when mass	>1 250 kg:	f_1 = 2 Hz	f_2 = 60 Hz

8.6.3 Test result

Test Items	Test standard	Test result	Remarks
Functional random vibration test	According to EN 61373:2010, Clause 8 (Category 1, Class B). There should be no abnormalities and no mechanical defects when checking the performance test at the initial and final of the test.	No abnormalities and no mechanical defects when the visual inspection and performance test was confirmed at the initial, intermediate and final of the test	-

Vertical		September 17, 2023 / 16:15:06 
Trans verse		September 16, 2023 / 15:30:49 
Longitu dinal		September 17, 2023 / 10:16:58 

Functional random vibration test - Normal operation check	Vertical	Initial	
		Intermediate	
		Final	
	Trans verse	Initial	
		Intermediate	
		Final	

Functional random vibration test - Normal operation check	Longitudinal	Initial	
		Intermediate	
		Final	

9. Used instrument list

No	KES Management Number	Instrument Name	Mfr.	Model	S/N	Date of Calibration	Next Calibration Date	Calibration Interval	Remark
1	KES-RE-107	Vibration Exciter	JINN Co., Ltd.	S701LS4-450M	20170523	2023.05.11	2024.05.11	1 year	-
		Accelero meter	PCB	J353B33	215333	2023.01.13	2024.01.13	1 year	-
2	KES-RE-110	Temp. & Humid. Chamber	SJ SCIENCE CO	SJ-TH-S100	SJ-TH-S100 -171205	2022.12.29	2023.12.29	1 year	-

- The end of test report -