Test Report

Test Report No.	: KES-RE-20T0340
Date of Issue	: July 30, 2020
Description of Product	: NETWORK CAMERA
Model No.	: XNF-9010RVM
Variant Model	: -
Applicant	: Hanwha Techwin Co., Ltd.
Address	: 6, Pangyo-ro, 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer 1	: HANWHA TECHWIN SECURITY VIETNAM CO., LTD.
Address	: Lot O-2, Que Vo Industial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
Manufacturer 2	: D-TECH CO., LTD.
Address	: 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea (Suwon Industrial Complex)
Applicable Regulation	: EN 50155:2017 Railway applications – Rolling stock - Electronic equipment

Test Date : July 15, 2020 – July 27, 2020

Tested by: Sungwoo, Lee
Test Engineer

Reviewed by: Kang sun, Lee
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1. General information

1.1 Introduction

Company Name	KES Co., Ltd.
Name of President / CEO	Young, Kim
Address	C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
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E-mail	kes@kes.co.kr

1.2 Laboratory

Address	C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea
Tel	+82-31-425-6200
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2. Information of E.U.T.



1) Product : NETWORK CAMERA
2) Model : XNF-9010RVM
3) Ratings : 48V DC
4) Serial No. : XNF9010RVM
5) Use of report : For quality management

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3. Visual inspection : EN 50155:2017 (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 50155:2017 (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)	-

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5. Insulation test : EN 50155:2017 (clause 13.4.9)

5.1 General

The aim of this test is to ensure that the mounting of components, their metal connections and casings, and the routing of wiring and printed board tracks, are not located too close to surrounding metal parts or fixings.
In addition the test will verify the design clearances of circuits with requirements for galvanic isolation.
The test shall be carried out on fully assembled parts of equipment, and/or complete equipments dependent upon the scope of supply.
Insulation test against mechanical earth is not required for equipotential area formed by ELV circuits that have internal electronic 0 V potential electrically connected to the mechanical earth.
For subracks and printed board assemblies with exposed metal parts, frames or front panels, or metal fixings, which can either be touched or require galvanic isolation; then, the test shall be carried out between all the connections shorted together and these metal parts.

5.2 Insulation measurement test

The insulation resistance measurement test shall be carried out at 500 V DC and the values shall be recorded for all the equipotential areas defined for the insulation test. During the test, the equipment shall not be powered on.
The test shall then be repeated after the voltage withstand test.
The insulation of each equipotential area shall be tested and measured against mechanical earth and against all surrounding equipotential areas.
The insulation measurement shall be carried out after the voltage withstand test.
Significant difference shall be analysed and justified in the test report.
Test acceptance requirements:
The minimum value of the insulation resistance after the withstand test shall be higher than 20 MΩ.
The equipment shall work as intended and within its specified limits after the insulation test.

5.3 Voltage withstand test

The test shall be performed with AC (50 Hz or 60 Hz) or DC test voltage according to Table 1.
The test voltage shall be applied by gradually increasing the voltage amplitude to the test voltage, and maintained at the specified level for:
a) Type test: 1 min;
b) Routine test: 10 s.
Each equipotential area shall be defined and tested against mechanical earth and against all surrounding equipotential areas.
An insulation test is not required for internal electronic 0 V potential electrically connected to the mechanical earth.
Test acceptance requirements:
Neither disruptive discharge nor flashover shall occur.
After the withstand test, the equipment shall work as intended and within its specified limits.

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

Table 1 — Test voltages of voltage withstand test

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 : PoE or Max. 48 V DC)

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 : PoE or Max. 48 V DC)

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6. Low temperature start-up test : EN 50155:2017 (clause 13.4.4)

-. Carried out according to EN 60068-2-1:2007

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 ℃ ~ 55 ℃	OT4	-40 ℃ ~ 70 ℃
OT2	-40 ℃ ~ 55 ℃	OT5	-25 ℃ ~ 85 ℃
OT3	-25 ℃ ~ 70 ℃	OT6	-40 ℃ ~ 85 ℃

6.3 Test instrument performance

Set point temperature control method	Temperature sensor detection and control
Air flow	High wind speed circulation
Air velocity and direction	7.38 m/s, north wind
Applied temperature change rate (slope)	Max. 1 K/min

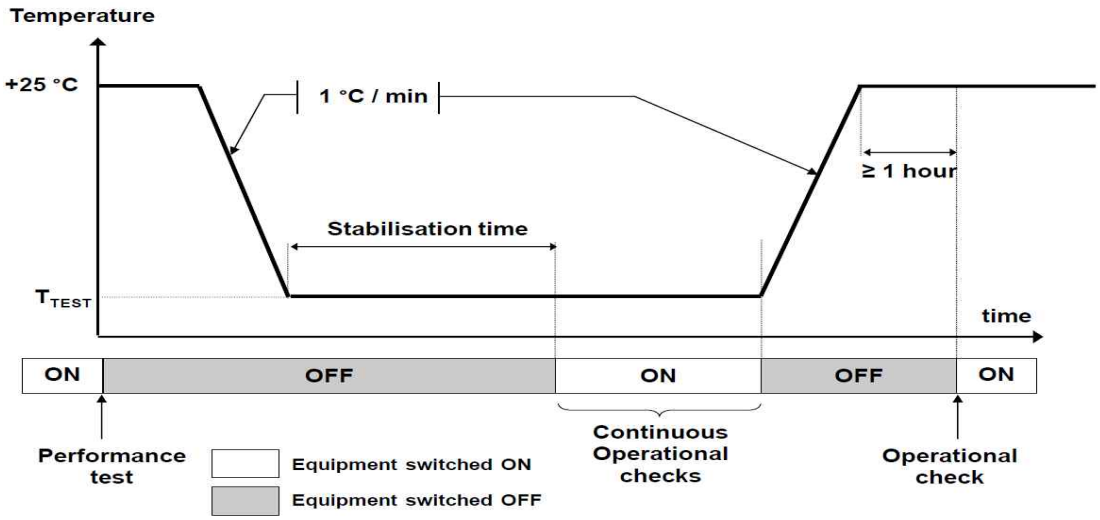
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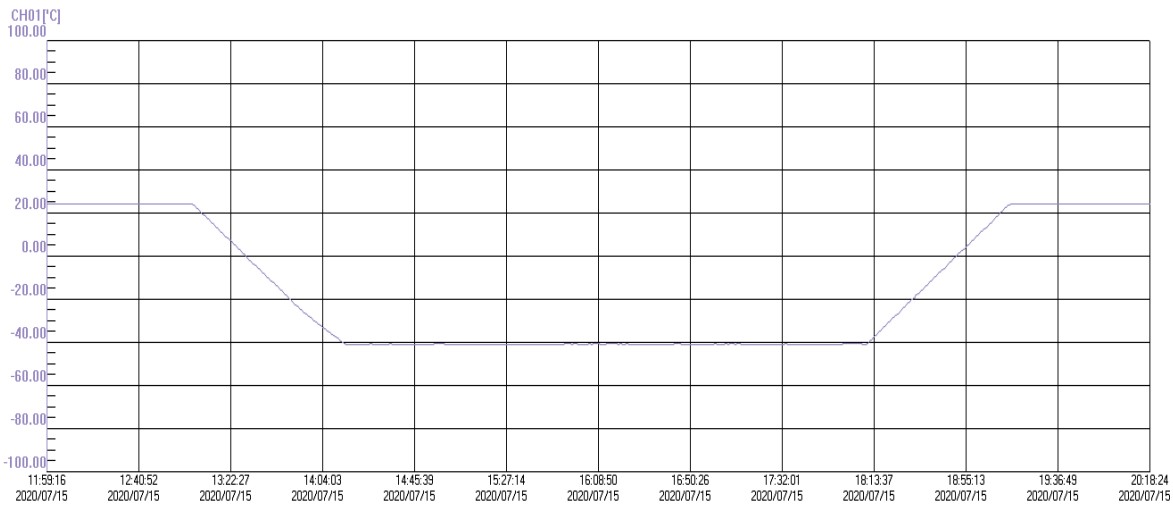
6.4 Test conditions

Item		Detailed description	Remarks
Test date		July 15, 2020	-
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)	-

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6.5 Low temperature start-up test graph





6.6 Test result

Test Items	Test standard	Test result	Remarks
Low temperature start-up 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	–

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Low temperature start-up test photos	Internal chamber		
	During the test		
	Normal operation check	Initial	
		Intermediate	
		Final	

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7. Dry heat test : EN 50155:2017 (clause 13.4.5)

-. Carried out according to EN 60068-2-2:2007

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 ℃ ~ 55 ℃	OT4	-40 ℃ ~ 70 ℃
OT2	-40 ℃ ~ 55 ℃	OT5	-25 ℃ ~ 85 ℃
OT3	-25 ℃ ~ 70 ℃	OT6	-40 ℃ ~ 85 ℃

7.3 Table 2 – Switch-on extended Operating temperature classes

Class	Switch-on extended operating temperature	Thermal test cycle
ST0	No switch-on extended operating 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
Air flow	High wind speed circulation
Air velocity and direction	7.40 m/s, north wind
Applied temperature change rate (slope)	Max. 1 K/min

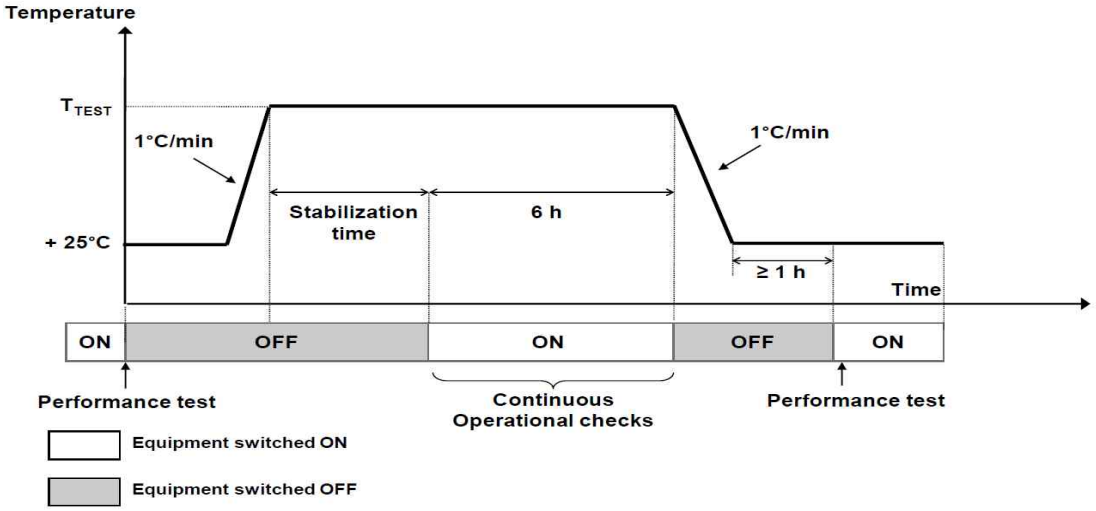
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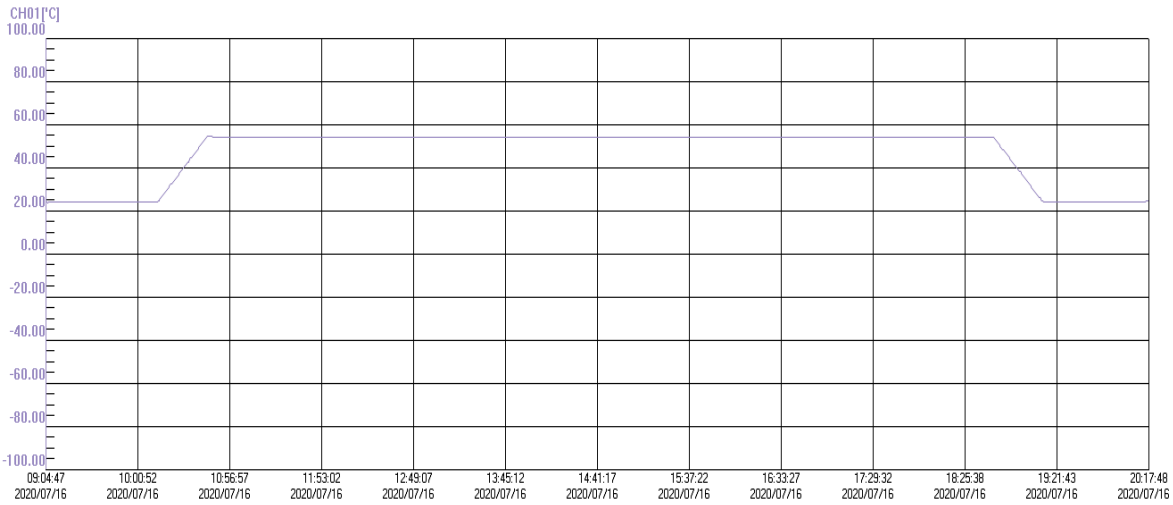
7.5 Test conditions

Item		Detailed description	Remarks
Test date		July 16, 2020	-
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)	-

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7.6 Dry heat test 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 Be), 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	–

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

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8. Vibration and shock tests : EN 50155:2017 (clause 13.4.11)

-. 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 standard is intended to highlight any weakness/error which may result in problems as a consequence of operation under environments where vibration and shock are known to occur in service on a railway vehicle. This is not intended to represent a full life test. However, the test conditions are sufficient to provide some reasonable degree of confidence that the equipment will survive the specified life under service conditions.

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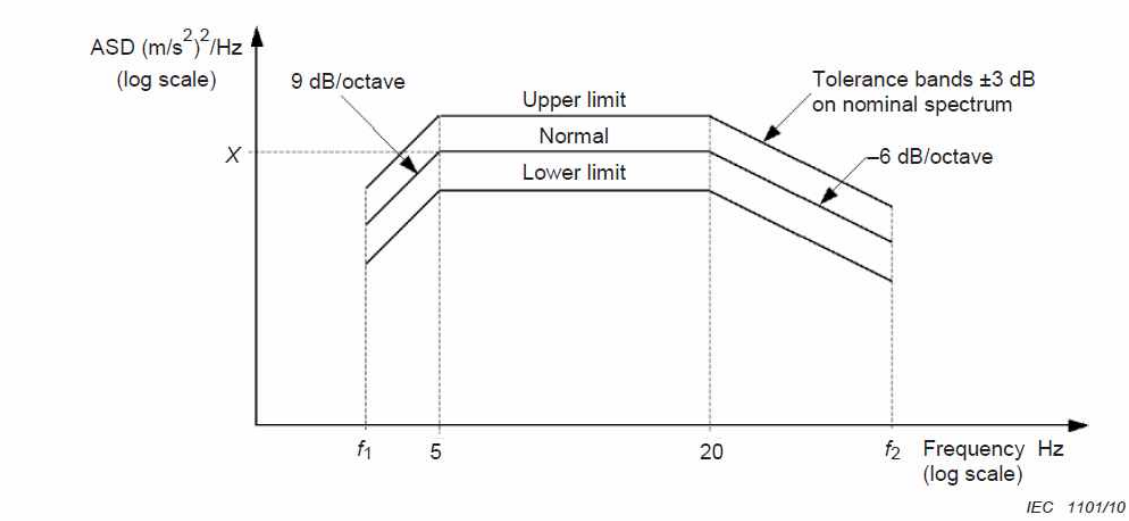
8.4 Simulated long-life testing

8.4.1 Test conditions

<table>
<tr><th colspan="2">Item</th><th colspan="3">Detailed description</th><th>Remarks</th></tr>
<tr><td colspan="2">Test date</td><td colspan="3">July 23, 2020 - July 24, 2020</td><td>–</td></tr>
<tr><td colspan="2">Atmospheric conditions</td><td colspan="3">(25.0 ± 10.0) ℃, (50 ± 25) % R.H.</td><td>–</td></tr>
<tr><td colspan="2">Power conditions</td><td colspan="3">☑ Store (Power OFF) ☐ Action (Power ON)</td><td>–</td></tr>
<tr><td colspan="2">Categories</td><td colspan="3">☑ Category 1 (☐ Class A ☑ Class B)
☐ Category 2 ☐ Category 3</td><td>–</td></tr>
<tr><td colspan="2">When mass</td><td colspan="3">☑ ≦ 500 kg ☐ > 500 kg, ≦ 1 250 kg ☐ > 1 250 kg</td><td>-</td></tr>
<tr><td colspan="2">Direction time and test level</td><td colspan="3">
<table>
<tr><th colspan="2">Vertical (5 h)</th><th colspan="2">Transverse (5 h)</th><th colspan="2">Longitudinal (5 h)</th></tr>
<tr><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th></tr>
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<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>
</table>
</td><td></td></tr>
<tr><td colspan="2">ASD spectrum</td><td colspan="3">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="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>

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8.4.2 ASD spectrum (Category 1, Class B)

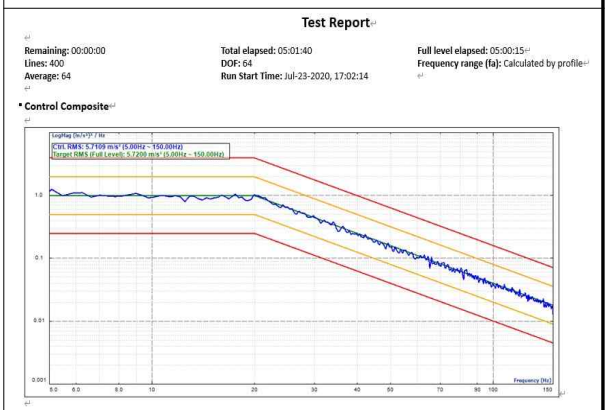
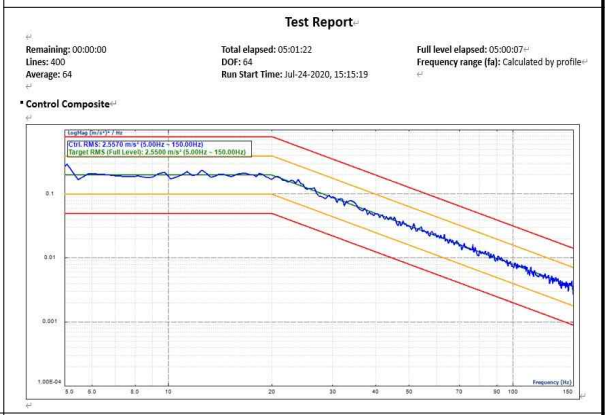
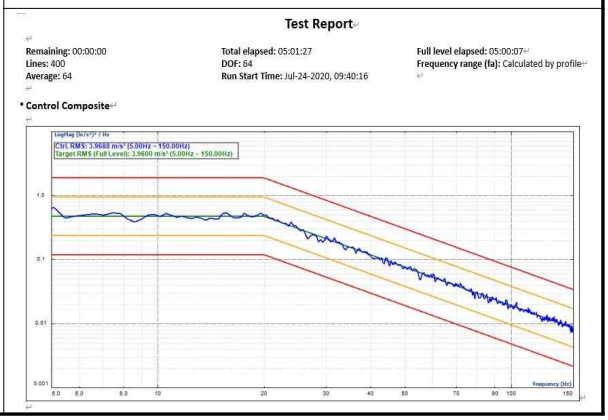


when mass	≤500 kg:	f_1 = 5 Hz	f_2 = 150 Hz
when mass	>500 kg≤1 250 kg:	$f_1 = \frac{1250}{\text{mass}} \times 2\,\text{Hz}$	$f_2 = \frac{1250}{\text{mass}} \times 60\,\text{Hz}$
when mass	>1 250 kg:	f_1 = 2 Hz	f_2 = 60 Hz

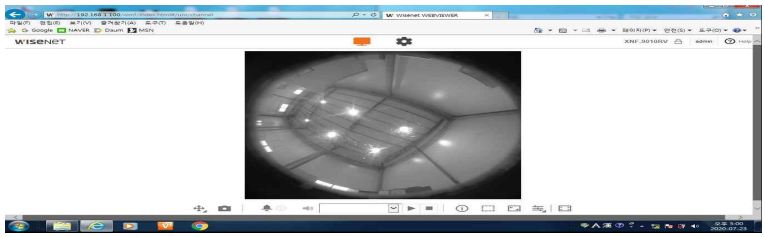
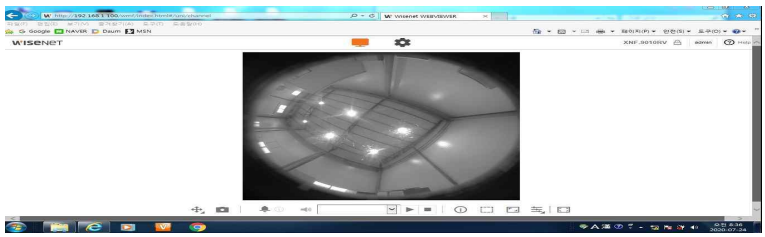
8.4.3 Test result

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	–

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Vertical		July 23, 2020 / 17:02:14 
Trans verse		July 24, 2020 / 15:15:19 
Longitu dinal		July 24, 2020 / 09:40:16 

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

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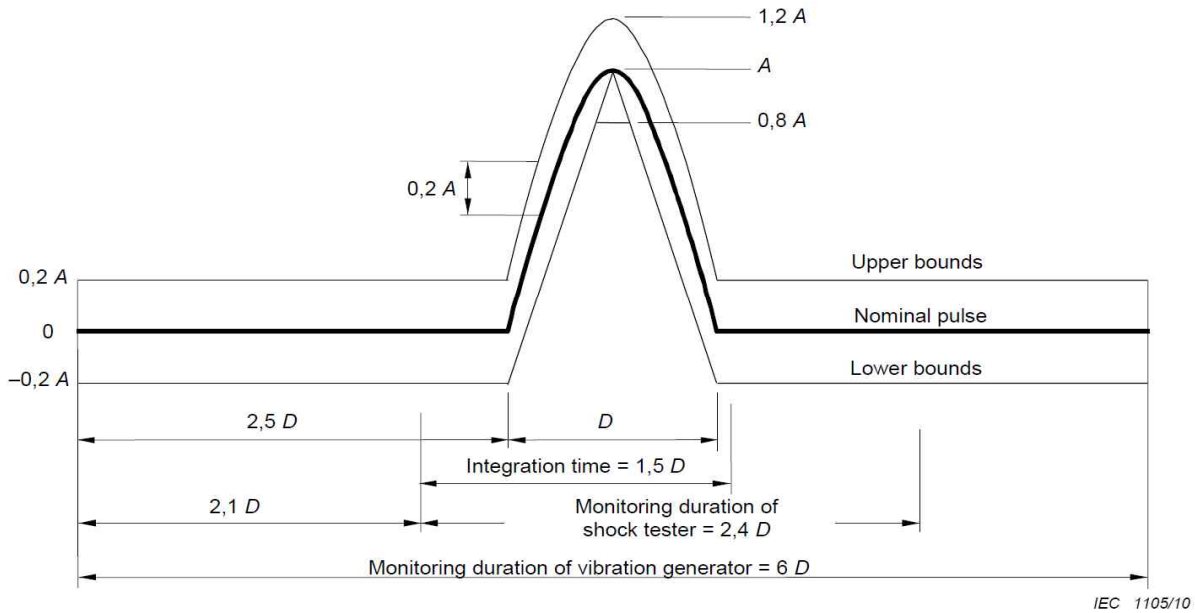
8.5 Shock testing

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">July 24, 2020 - July 27, 2020</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 rowspan="5">Direction time and test level</td><td></td><td colspan="2">Vertical</td><td>Transverse</td><td>Longitudinal</td><td></td></tr>
<tr><td colspan="2">Peak acceleration A (m/s^2)</td><td colspan="2">30</td><td>30</td><td>50</td><td></td></tr>
<tr><td colspan="2">Nominal duration D (ms)</td><td colspan="2">30</td><td>30</td><td>30</td><td></td></tr>
<tr><td colspan="2">Number of repetitions (+, -)</td><td colspan="2">3 / 3</td><td>3 / 3</td><td>3 / 3</td><td></td></tr>
<tr><td colspan="2">Wave form</td><td colspan="2">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="4">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="4">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">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="4">Not applicable</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">Not applicable</td><td>-</td></tr>
<tr><td rowspan="2">Final measurements</td><td>Visual inspection</td><td colspan="4">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
</table>

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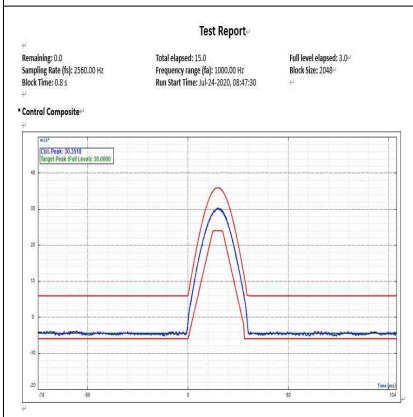
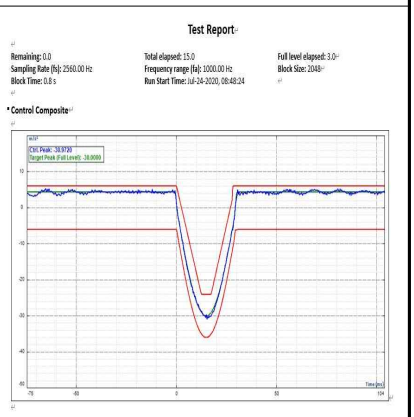
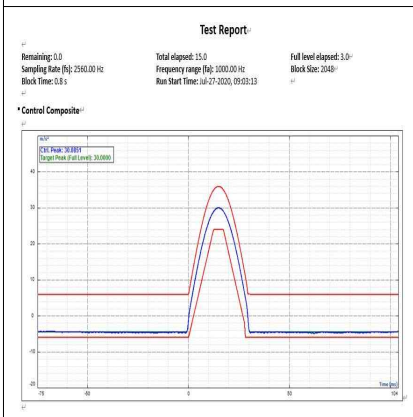
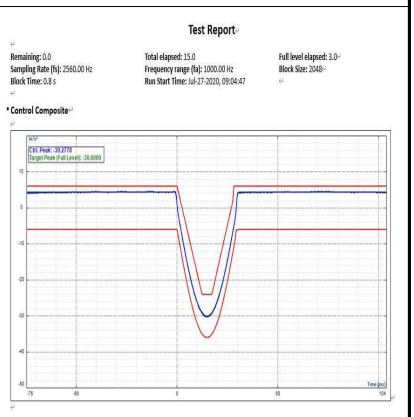
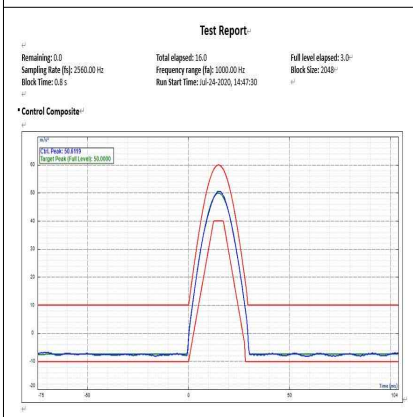
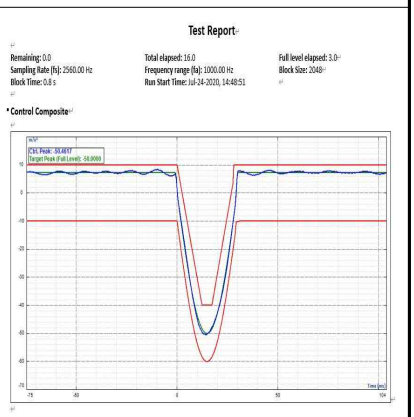
8.5.2 Allowable width of sine wave type



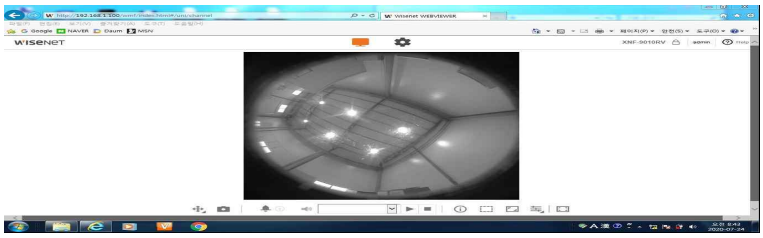
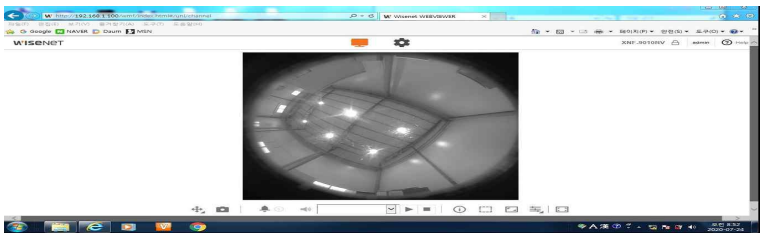
8.5.3 Test result

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	–

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Vertical		July 24, 2020 / 08:47:30 	July 24, 2020 / 08:48:24 
Transverse		July 27, 2020 / 09:03:13 	July 27, 2020 / 09:04:47 
Longitudinal		July 24, 2020 / 14:47:30 	July 24, 2020 / 14:48:51 

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

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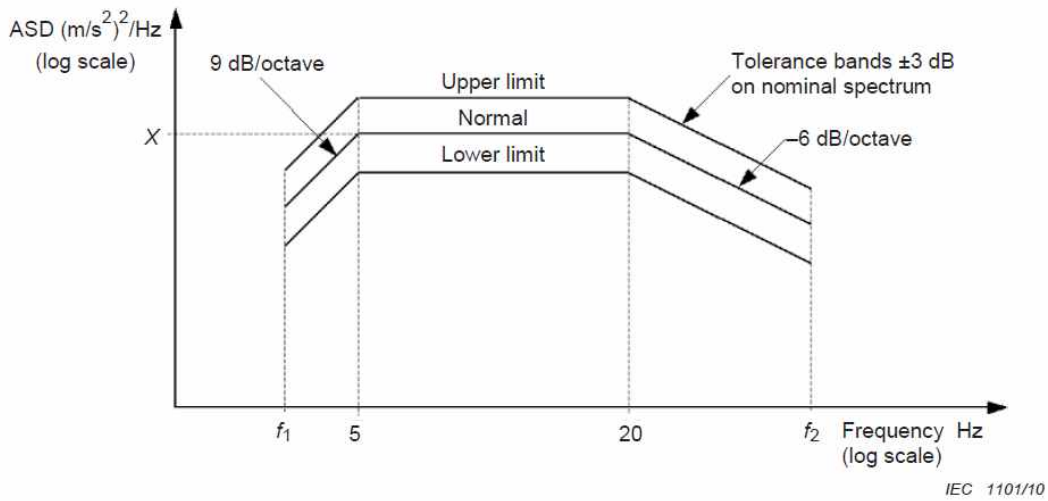
8.6 Functional random vibration test

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">July 24, 2020 - July 27, 2020</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>48 V DC</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 rowspan="6">Direction time and test level</td><td colspan="7"><table>
<tr><th colspan="2">Vertical (10 min)</th><th colspan="2">Transverse (10 min)</th><th colspan="2">Longitudinal (10 min)</th></tr>
<tr><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th><th>Frequency [Hz]</th><th>ASD Level [$(m/s^2)^2/Hz$]</th></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>
</table></td></tr>
<tr><td colspan="2">ASD spectrum</td><td colspan="4">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="4">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">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="4">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">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="4">Mechanical damage, loosening of screw, etc.</td><td>-</td></tr>
<tr><td>Performance test</td><td colspan="4">Normal operation check
(Boot and video output shall operating normally)</td><td>-</td></tr>
</table>

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8.6.2 ASD spectrum (Category 1, Class B)

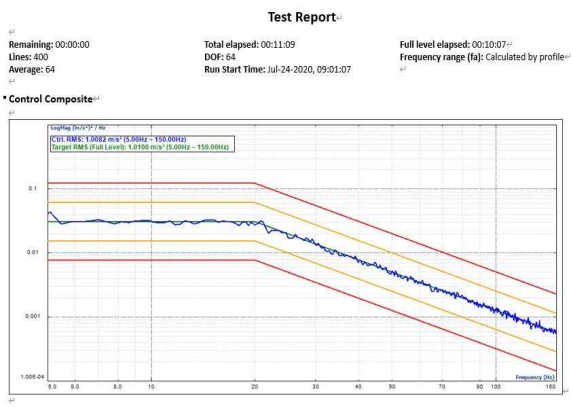
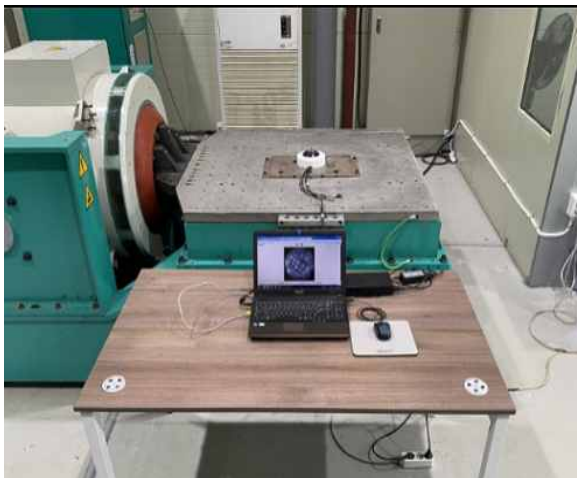
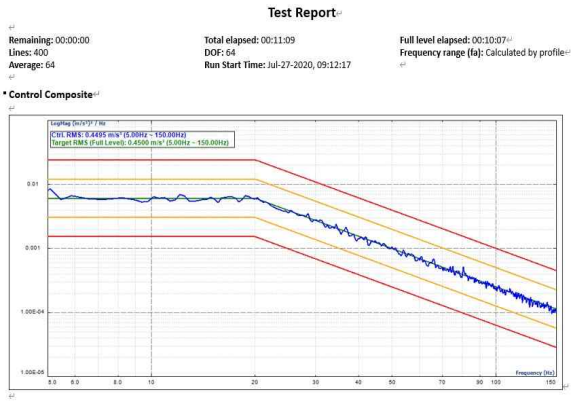
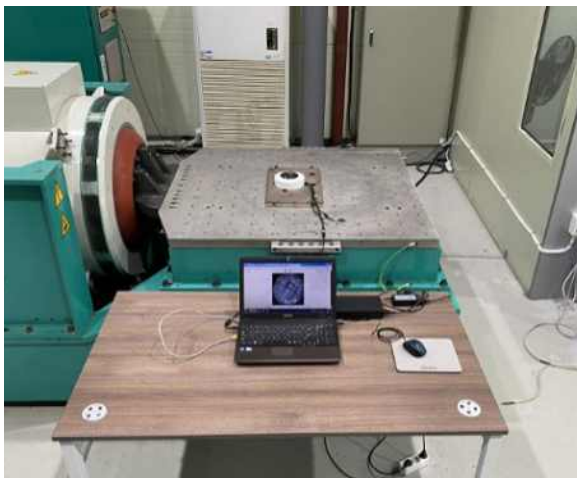
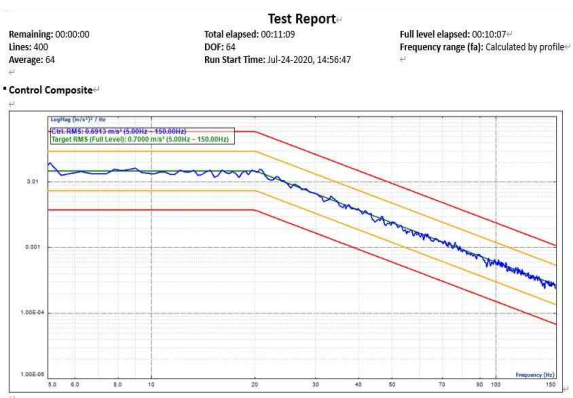


when mass	≤500 kg:	f_1 = 5 Hz	f_2 = 150 Hz
when mass	>500 kg≤1 250 kg:	$f_1 = \frac{1250}{\text{mass}} \times 2\,\text{Hz}$	$f_2 = \frac{1250}{\text{mass}} \times 60\,\text{Hz}$
when mass	>1 250 kg:	f_1 = 2 Hz	f_2 = 60 Hz

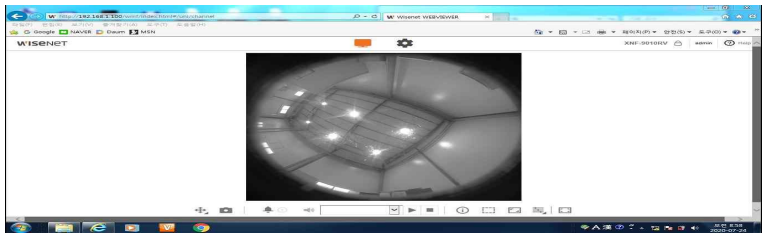
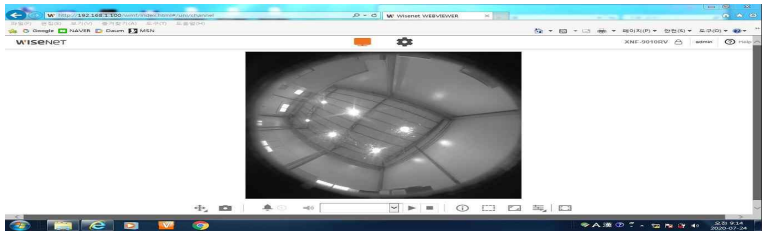
8.6.3 Test result

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	–

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Vertical		July 24, 2020 / 09:01:07 
Trans verse		July 27, 2020 / 09:12:17 
Longitu dinal		July 24, 2020 / 14:56:47 

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

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9. Used instrument list

No.	KES Management Number	Instrument Name	Mfr.	Model	Serial #	Date of Calibration	Next calibration date	Calibration Cycle	Remark
1	KES-RE-107	Vibration Exciter	JINN Co., Ltd.	S701LS4-450M	20170523	2020.05.14	2021.05.14	1 year	-
		Accelerometer	PCB	J353B33	215333	2020.02.24	2021.02.24	1 year	-
2	KES-RE-118	Temp. & Humid. Chamber	ESPEC CORP.	EFL-4	15016362	2020.05.14	2021.05.14	1 year	-

- The end of test report -

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