

Reliability Test Report

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Prepared by Seo Bo Nam

Manager

Approved by Lee hyun Su *01/2018*

Director

R&D Quality Assurance Group
Quality Assurance Team
Security Business

HANWHA TECHWIN Co., LTD

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I. Purpose

It's an aim to ensure that product will satisfy customer requirements by strengthen reliability through the process of testing according with the terms of measuring, stress test to make sure about stability and reproducibility of the product till the period from the shipment, distribution, warehousing and until disposal.

II. Terms

1. Reliability Test

Test for evaluation or estimation of the fact on reliability (failure rate, tolerance, etc) of the customer requirement level.

Other detailed terms on product reliability and reliability test is followed by KSA 3004.

2. MTBF (Mean Time Between Failure)

The average between failure occurrences. The sum of the operating time of a machine divided by the total number of failures.

3. MTTF (Mean Time To Failure)

A basic measure of system reliability for non-repairable items: The total number of life units of an item divided by the total number of failures within that population, during a particular measurement interval under stated conditions.

4. Failure

An event when machinery/equipment is not available to produce parts at specified conditions when scheduled or is not capable of producing parts or perform scheduled operations to specification. For every failure, an action is required.

5. Failure Rate

Number of failures per unit of gross operating period in terms of time, events, cycles, or number of parts.

6. Reliability

The probability that machinery/equipment can perform continuously, without failure, for a specified interval of time when operating under stated conditions.

7. Availability

A measure of the degree to which machinery/equipment is in an operable and committable state at any point in time. Specifically, the percent of time that machinery/equipment will be operable when needed.

8. Maintainability

a characteristic of design, installation and operation, usually expressed as the probability that a machine can be retained in, or resorted to specified operable condition within a specified interval of time when a maintenance is performed in accordance with prescribed procedures.

9. Acceptance test Process

Procedures		DV	PV	PR
Certification	Function	-	100%	100%
	Performance	-	100%	100%

III. TEST MODEL

TNV-7010RC

(3M Corner Vandal Camera)

1. Features

Photo	Features
	- Sensor: 1/2.8"(3.2M CMOS) - Lens: 2.8mm, F2.0 (Fixed Lens) - Angular Field of view : H: 102°, V:75°, D: 129° - Max. Framerate: 30fps@H.265/H.264/MJPEG - Tilt Rotate : $\pm 15^\circ$ - IR viewable length : 10m with 940nm IR LED - Wide Dynamic Range : 120dB - Operating Temperature : $-10^\circ\text{C} \sim +55^\circ\text{C}$ - Power: DC12V, PoE(IEEE802.3af,Class3)

2. Accelerated Life Test

	1 year expectation failure rate	7 year expectation failure rate	Bx Information		MTBF
			B1 Life	B10 Life	
Result	—	—	—	—	—

3. STRESS

Life expectation result			
Set MTBF		Failure Rate	Remark
Time	Year		
295,767hrs	33.8Years	3.38ppm/hrs	8,760hr/Year 43,800hr/5Year

4. Power Consumption

Operating Mode(Max)	TNV-7010RC	PoE 11.1 W
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5. Reliability Test

Tester	H/W : Bonam Seo, Sijin Kim S/W : Henwoo Lee
Test Period	PV Stage : '18. 10. 16 ~ '18. 11. 07 PR Stage : '18. 11. 14 ~ '18. 11. 20

IV. Eco Declaration

1. Eco Mark Summary

Environment Characteristic	RoHS Satisfaction	Effective Date	2018. 11. 15
Indication Information	RoHS Compliant	Sales Area	W/W
Mark Type		Attachment Position	Package Box Side Lower Column

2. Eco Mark Compatibility

RESULT	APPROVAL
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Test Item	Evaluation Item	Result	Remark
Eco Design Evaluation	Eco Design Check	N/A	
Eco Friendly Proof	Evaluation of Material Hazardousness	PASS	
Eco Friendly Information	Eco-Declaration	PASS	

V. Software Evaluation Report

[DV / PV / PR Stage]

1. Software Evaluation (White Box Test)

	Test Item	Test Spec	Result
1	• S/W Static Test (Coverity Integrity Control)	◆ Critical Defect : 0	PASS
		◆ Total Defect : 150 ppm ↓	PASS

2. Software Evaluation (Black Box Test)

	Test Item	Test Spec	Result
1	• BF (Basic Function)	◆ STW SS Business Evaluation Standard - System Basic Function Test	PASS
2	• EF (Exception Function)	◆ STW SS Business Evaluation Standard - System Exception Function Test	PASS
3	• QR (Quality Requirement)	◆ STW SS Business Evaluation Standard - System Quality Requirement Test	PASS

VI. Hardware Reliability Test

[DV Stage]

1. Climatic Environment Test

	Test Item	Test Condition	Q'ty	Result
1	High temperature & High humidity Operating Cycle Test	- STW SS Business Evaluation Standard - 3 STEP : 3Cycle / 128 Hr - (65 °C/95 %/24 Hr → 25 °C/10 % / 12 Hr → 60 °C / 90 % / 12 Hr → -45 °C / 12 Hr → 60 °C / 90 % / 24 Hr → -45 °C / 24 Hr)	-	-
2	High temperature limit Operating	0 °C ~ Dead (5 ~ 10 °C Step / 4 Hrs Stay)	-	-
	Low temperature limit Operating	0 °C ~ Dead (-5 ~ -10 °C Step / 4 Hrs Stay)	-	-

2. Special Environment Test

1	ALT	STW SS Business Evaluation Standard (800 Hrs)	-	-
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VI. Hardware Reliability Test

[DV Stage]

3. Power Environment Test

	Test Item	Test Condition	Q'ty	Result
1	• Voltage Regulation	♦ AC : Up : 15 % , Down : -15 % ♦ DC : Up : 15 % , Down : -15 %	-	-
2	• Voltage Dip & Up	♦ Error : 100 % - 3 Cycle , 50 % - 5 Cycle ♦ Failure : 100 % - 10 Cycle ♦ Environment Coarse Area : 25 Cycle	-	-
3	• EFT/B Noise	♦ ± 2 KV	-	-
4	• Impulse Noise	♦ ± 1.2 KV / 1.5 KV	-	-
5	• ESD	♦ CD : ± 5 KV / 6 KV (Connector : 3 KV) ♦ AD : ± 8 KV / 10 KV	-	-
6	• Lighting Surge	♦ Indoor : ± 6 KV / 8 KV , Outdoor : ±13 KV	-	-
7	▪ Hipot and Insulation Resistance	♦ Voltage : 1,000 V / 1 Min 1,500 V / 1 Min 3,000 V / 1 Min ♦ Insulation Resistance : 7 MΩ / 4 MΩ / 1 MΩ (Cut-Off Current 5mA)	-	-
8	▪ Power On/Off	♦ ON / OFF 500 Cycle	-	-

VII. Hardware Reliability Test

[PV Stage]

1. Climatic Environment Test

	Test Item	Test Condition	Q'ty	Result
1	• High temperature & humidity Storage	♦ 60 °C / 95 % / 120 Hrs	2	PASS
2	• Low temperature Storage	♦ - 30 °C / 48 Hrs	2	PASS
3	• High temperature & High humidity Operating Life Cycle Test	♦ HTW SS Business Evaluation Standard - 10 STEP : 10 Cycle / 490 Hr 60°C/90%/16HR → 25°C/50%/10HR → 60°C/90%/10HR → -15°C/10HR → 60°C/90%/22HR → -15°C/22HR	8	PASS
4	• High temperature limit Operating Test	♦ 0 °C ~ Dead (5 ~ 10 °C Step / 4 Hrs Stay)	-	-
	• Low temperature limit Operating Test	♦ 0 °C ~ Dead (-5 ~ -10 °C Step / 4 Hrs Stay)	-	-
5	• Water Proof Test	♦ IP66 Standard	-	-

VII. Hardware Reliability Test

[PV Stage]

2. Power Environment Test

	Test Item	Test Condition	Q'ty	Result
1	• Voltage Regulation	♦ AC : Up : 15 % , Down : -15 % ♦ DC : Up : 15 % , Down : -15 %	2	PASS
2	• Voltage Dip & Up	♦ Error : 100 % - 3 Cycle , 50 % - 5 Cycle ♦ Failure : 100 % - 10 Cycle ♦ Environment Coarse Area : 25 Cycle	2	PASS
3	• EFT/B Noise	♦ ± 2 KV	2	PASS
4	• Impulse Noise	♦ ±1.2 KV / 1.5 KV	2	PASS
5	• ESD	♦ CD : ± 4 KV / 6 KV (Connector : ±2/3 KV) ♦ AD : ± 6KV / 8 KV	2	PASS
6	• Lighting Surge	♦ Power : ±6 KV / 6 KV ♦ BNC : ±6 KV / 10 KV	2	PASS
7	▪ Hipot and Insulation Resistance	♦ Voltage : 1,500 V / 1 Min, 3,000 V / 1 Min ♦ Insulation Resistance : 7 MΩ (Cut-Off Current 5mA)	-	-
8	▪ Power On/Off	♦ ON / OFF 500 Cycle	2	PASS
9	▪ Earth Continuity Test	♦ 25 A / 0.1 Ω ↓	-	-

VII. Hardware Reliability Test

[PV Stage]

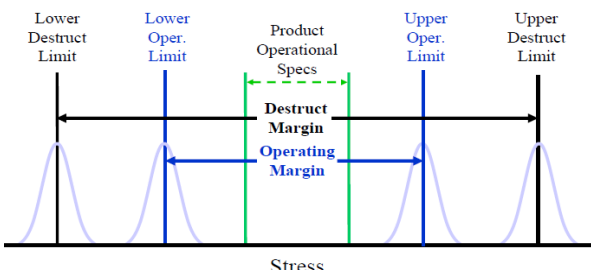
3. Distribution Environment Test

	Test Item	Test Condition	Q'ty	Result						
1	• Vibration Test	♦ Frequency : 5~200 Hz ♦ Acceleration : 1.047 Grms <table><tr><td rowspan="2">Reference</td><td>Frequency</td><td>PSD</td></tr><tr><td>5 Hz~100 100 Hz~200 Hz 200 Hz</td><td>0.015 g2/Hz -6 dB/oct 0.0038 g2/Hz</td></tr></table>	Reference	Frequency	PSD	5 Hz~100 100 Hz~200 Hz 200 Hz	0.015 g2/Hz -6 dB/oct 0.0038 g2/Hz	16	PASS	
Reference	Frequency	PSD								
	5 Hz~100 100 Hz~200 Hz 200 Hz	0.015 g2/Hz -6 dB/oct 0.0038 g2/Hz								
2	• Drop Test	♦ <table><tr><td>Weight</td><td>Height</td><td>Times</td></tr><tr><td>♦ 10 kg ↓ ♦ 20 kg ↓ ♦ 30 kg ↓ ♦ 40 kg ↓ ♦ 50 kg ↓</td><td>♦ 61 cm ♦ 53 cm ♦ 46 cm ♦ 38 cm ♦ 31 cm</td><td>1 Corner 3 Angle 6 Side</td></tr></table>	Weight	Height	Times	♦ 10 kg ↓ ♦ 20 kg ↓ ♦ 30 kg ↓ ♦ 40 kg ↓ ♦ 50 kg ↓	♦ 61 cm ♦ 53 cm ♦ 46 cm ♦ 38 cm ♦ 31 cm	1 Corner 3 Angle 6 Side	8	PASS
Weight	Height	Times								
♦ 10 kg ↓ ♦ 20 kg ↓ ♦ 30 kg ↓ ♦ 40 kg ↓ ♦ 50 kg ↓	♦ 61 cm ♦ 53 cm ♦ 46 cm ♦ 38 cm ♦ 31 cm	1 Corner 3 Angle 6 Side								
3	• Cold Proof Drop Test	• -30 °C 4 hrs Stay, 2.8 Kg : 61 Cm	2	PASS						
4	• Critical Drop Test	♦ 90 Cm	2	PASS						

VII. Hardware Reliability Test

[PV Stage]

4. Special Environment Test

	Test Item	Test Condition	Q'ty	Result
1	• HALT	♦ HTW SS Business Evaluation Standard 	-	-
2	• HASS	♦ HTW SS Business Evaluation Standard	-	-
3	• Stress Evaluation	♦ HTW SS Business Evaluation Standard - MTTF : 43,800 Hrs ↑ - Telcordia Issue 1 called SR-332	2	PASS
4	• ALT	♦ HTW SS Business Evaluation Standard (1,000 Hrs)	-	-
5	• Temperature Rising Test	♦ HTW SS Business Evaluation Standard	-	-
6	• Picture Quality & Precision Measurement	♦ HTW SS Business Evaluation Standard	-	-
7	• Compatibility	♦ HTW SS Business Evaluation Standard	-	-

※ Remarks

- HALT : Highly Accelerated Life Test
- HASS : Highly Accelerated Stress Screening
- ALT : Accelerated Life Test

VIII. Reliability Test Report

[PR Stage]

1. Climatic Environment Test

	Test Item	Test Condition	Q'ty	Result
1	• High Temperature & humidity Storage	♦ 60 °C / 95 % / 120 Hrs	2	PASS
2	• Low Temperature Storage	♦ - 30 °C / 48 Hrs	2	PASS
3	• High temperature & High Humidity Operating Cycle	♦ HTW SS Business Evaluation Standard • 10 STEP : 5Cycle / 120HR 60°C/90%/22HR → 25°C/10%/10HR → 60°C/90%/10HR → -15°C/10HR → 60°C/90%/22HR → -15°C/22HR	2	PASS

2. Distribution Environment Test

	Test Item	Test Condition			Q'ty	Result	
1	• Vibration Test	♦ Frequency : 5 ~ 200 Hz ♦ Acceleration : 1.047 Grms			10	PASS	
		Reference	Frequency	PSD			
			5 Hz~100 100 Hz~200 Hz 200 Hz	0.015 g2/Hz -6 dB/oct 0.0038 g2/Hz			
2	• Drop Test	♦	Weight	Height	Times	10	PASS
		♦ 10 kg ↓ ♦ 20 kg ↓ ♦ 30 kg ↓ ♦ 40 kg ↓	♦ 61 cm ♦ 53 cm ♦ 46 cm ♦ 38 cm	1 Corner 3 Angle 6 Side			

VIII. Reliability Test Report**[PR Stage]****3. Special Environment Test**

	Test Item	Test Condition	Q'ty	Result
1	• HASS	♦ STW SS Business Evaluation Standard	-	-
2	• Aging	♦ STW SS Business Evaluation Standard (120 Hrs)	6	PASS

IX. Precision Measurement

1. Precision Measurement Result

ITEM		SPEC.	TNV-7010RC #1
Resolution (Wide)	Center	1100 TVL	1500 TVL
	Left-Top	700 TVL	900 TVL
	Left-Bottom	700 TVL	850 TVL
	Right-Top	700 TVL	900 TVL
	Right-Bottom	700 TVL	900 TVL
Min. Illumination	50 IRE	-	0.7 Lux
	30 IRE	0.3 Lux	0.3 Lux