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TESTING
CNAS L0095

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No GJW2019-3122-4

TEST REPORT

NAME OF SAMPLE : MF/HF Radio installation Equipment

CLIENT : SAMYUNG ENC CO., LTD.

CLASSIFICATION OF TEST : Commission Test

Vkan Certification & Testing Co., Ltd.



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Name of sample	MF/HF Radio installation Equipment	Trade mark	—
Client	SAMYUNG ENC CO., LTD.	Client address	69, Sangni-ro, Yeongdo-gu, Busan, Korea
Manufacturer	SAMYUNG ENC CO., LTD.	Manufacturer address	69, Sangni-ro, Yeongdo-gu, Busan, Korea
Means of receiving	Sending Sample	Receiving date	Jun. 18, 2019
Classification of test	Commission Test	Completing date	Jul. 25, 2019
Tested according to	IEC 60945: 2002 ed 4.0	Test items	1.Extreme power supply 2.Excessive conditions 3.Dry heat (functional test) 4.Damp heat (functional test) 5.Low temperature (functional test) 6.Salt mist(corrosion) 7.Acoustic noise and signals 8.Compass safe distance 9.Protection against accidental access to dangerous voltage 10.Electromagnetic radio frequency radiation

Test Conclusion:

The test items are performed according to respective relevant standards as required by the client.
The test results are detailed on page 4.



Approved by: Zhang Zhiyong
Zeng Bo

Title: Manager
Signature: *Z.Y. Zhang*
Zeng Bo

Reviewed by: Luo Hanying
Liu Yonghai

Signature: *Luo Hanying*
Liu Yonghai

Tested by: Wu Yuanwei
Ao Dan

Signature: *Wu Yuanwei*
Ao Dan

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Sample description	1 Basic information : Name of sample : MF/HF Radio installation Equipment Type/Model : SRG-150DN Quantity of sample: 3 2 Sample picture:  Fig. 1 Appearance of sample  Fig.2 Nameplate of sample
Remarks	—

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Tests Summary					
№	Name of sample	Test item	Test standard	Judgment	Test details
1	MF/HF Radio installation Equipment	Extreme power supply	IEC 60945: 2002 ed 4.0 Clause 7.1	P	Pages 5~6
2		Excessive conditions	IEC 60945: 2002 ed 4.0 Clause 7.2	P	Pages 7~8
3		Dry heat (functional test)	IEC 60945: 2002 ed 4.0 Clause 8.2	P	Page 9
4		Damp heat (functional test)	IEC 60945: 2002 ed 4.0 Clause 8.3	P	Pages 10~11
5		Low temperature (functional test)	IEC 60945: 2002 ed 4.0 Clause 8.4	P	Page 12
6		Corrosion (salt mist)	IEC 60945: 2002 ed 4.0 Clause 8.12	P	Pages 13~14
7		Acoustic noise and signals	IEC 60945: 2002 ed 4.0 Clause 11.2	P	Pages 15~16
8		Compass safe distance	IEC 60945: 2002 ed 4.0 Clause 11.2	—	Pages 17~18
9		Protection against accidental access to dangerous voltages	IEC 60945: 2002 ed 4.0 Clause 12.1	P	Pages 19~20
10		Electromagnetic radio frequency radiation	IEC 60945: 2002 ed 4.0 Clause 12.2	—	Page 21
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1 Extreme power supply

1.1 General description

The Extreme power supply is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 7.1;

Rated voltage: 24V 

Extreme power supply variations are tested in the following table:

Power supply	Voltage variation %	Frequency variation %
d.c.	+30 -10	Not applicable

Tests and performance checks at extreme power supply conditions shall be performed under the environmental conditions indicated in the following table:

Environment	Normal power supply	Extreme power supply
Dry heat	Performance test	Performance check
Damp heat	Performance check	—
Low temperature	Performance test	Performance check
Normal temperature	Performance test	Performance test

Dry heat: The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to and maintained at $+55^{\circ}\text{C} \pm 3^{\circ}\text{C}$, for a period of 10h to 16h.

Low temperature: The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be lowered to and maintained at $-20^{\circ}\text{C} \pm 3^{\circ}\text{C}$, for a period of 10h to 16h.

1.2 Technical requirements (Assessment criterion)

After dry heat and low temperature, the requirements of the performance check shall be met.

In normal temperature, the requirements of the performance test shall be met.

1.3 Test results

Sample identification	Test results	Judgment
3-1	After dry heat and low temperature, the requirements of the performance check were met. In normal temperature, the requirements of the performance test were met.	P

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1.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	VGDY-0156	289C	Multi-meter	2019.08.02
2	VGDR-0030	WTH360-40W5	Small step-in humidity and heat test chamber	2020.03.12

1.5 Test pictures



Fig. 3 Extreme power supply (+30%)



Fig. 4 Extreme power supply (-10%)

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2 Excessive conditions

2.1 General description

The Excessive conditions are performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 7.2;

These conditions exceed the extreme test conditions in which the EUT is required to operate, with or without performance degradation, as indicated in the equipment standard. Excessive current is defined as greater than normal working current.

Excessive voltage is greater than that specified in 5.2.2. Protection shall be provided against such excesses at an appropriate level chosen by the manufacturer and, when activated, may require the EUT to be reset, for example by fuse replacement. The power supply shall be adjusted to cause activation of the protection and after EUT reset, a performance check under normal test conditions shall be carried out.

Where appropriate, the EUT shall be subjected to an input from a power supply of reversed polarity or improper phase sequence for a period of 5 min. After completion of the test, and reset of the protection of the EUT, if required, the power supply shall be connected normally and a performance check shall be carried out.

2.2 Technical requirements (Assessment criterion)

The performance check shall meet the requirements.

2.3 Test results

Sample identification	Test results	Judgment
3-1	The performance check met the requirements.	P

2.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
2	VGDY-0156	289C	Multi-meter	2019.08.02

2.5 Test pictures



Fig. 5 Excessive voltage



Fig. 6 Excessive current

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Fig. 7 Power supply misconnections

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3 Dry heat (functional test)

3.1 General description

The Dry heat (functional test) is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 8.2;

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at $+55\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

At the end of a soak period of 16 h at $+55\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, the EUT shall be subjected to a performance test and check as specified in the relevant equipment standard.

The temperature of the chamber shall be maintained at $+55\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ during the whole performance test period.

At the end of the test, the EUT shall be returned to normal environmental conditions.

3.2 Technical requirements (Assessment criterion)

The performance test and check shall meet the requirements.

3.3 Test results

Sample identification	Test results	Judgment
3-1	The performance test and check met the requirements.	P

3.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	VGDF-0022	KXN-3030D	DC power supply	2019.10.29
2	VGDF-0023	KXN-3030D	DC power supply	2019.10.29
3	VGDR-0030	WTH360-40W5	Small step-in humidity and heat test chamber	2020.03.12

3.5 Test pictures

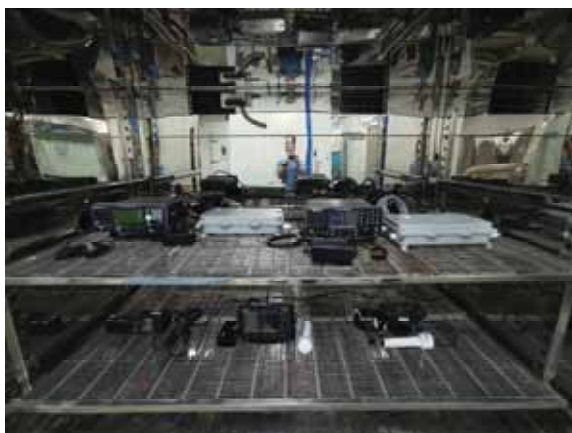


Fig. 8 Sample layout

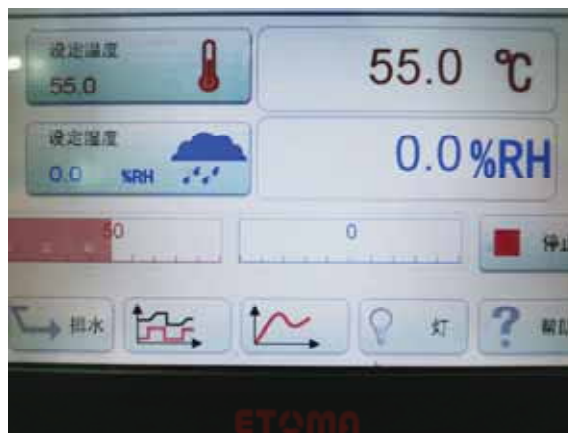


Fig.9 Equipment setting

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4 Damp heat (functional test)

4.1 General description

The Damp heat (functional test) is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 8.3;

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to $+40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, and the relative humidity raised to $93\% \pm 3\%$ over a period of $3\text{ h} \pm 0,5\text{ h}$. These conditions shall be maintained for a period of 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.

The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check as specified in the relevant equipment standard.

The temperature and relative humidity of the chamber shall be maintained as specified during the whole test period.

At the end of the test period and with the EUT still in the chamber, the chamber shall be brought to room temperature in not less than 1 h.

At the end of the test the EUT shall be returned to normal environmental conditions.

4.2 Technical requirements (Assessment criterion)

The performance check shall meet the requirements.

4.3 Test results

Sample identification	Test results	Judgment
3-1	The performance check met the requirements.	P

4.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	VGDF-0022	KXN-3030D	DC power supply	2019.10.29
2	VGDF-0023	KXN-3030D	DC power supply	2019.10.29
3	VGDR-0030	WTH360-40W5	Small step-in humidity and heat test chamber	2020.03.12

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4.5 Test pictures

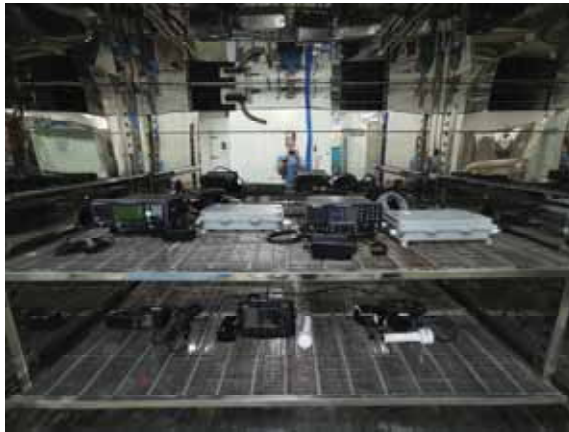


Fig. 10 Sample layout



Fig. 11 Equipment setting

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5 Low temperature (functional test)

5.1 General description

The Low temperature (functional test) is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 8.4;

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and maintained at $-20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, for a period of 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.

The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check test and check as specified in the relevant equipment standard.

The temperature of the chamber shall be maintained at $-20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ during the whole test period.

At the end of the test the EUT shall be returned to normal environmental conditions.

5.2 Technical requirements (Assessment criterion)

The performance test and check shall meet the requirements.

5.3 Test results

Sample identification	Test results	Judgment
3-1	The performance test and check met the requirements.	P

5.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	VGDF-0022	KXN-3030D	DC power supply	2019.10.29
2	VGDF-0023	KXN-3030D	DC power supply	2019.10.29
3	VGDR-0030	WTH360-40W5	Small step-in humidity and heat test chamber	2020.03.12

5.5 Test pictures



Fig. 12 Sample layout

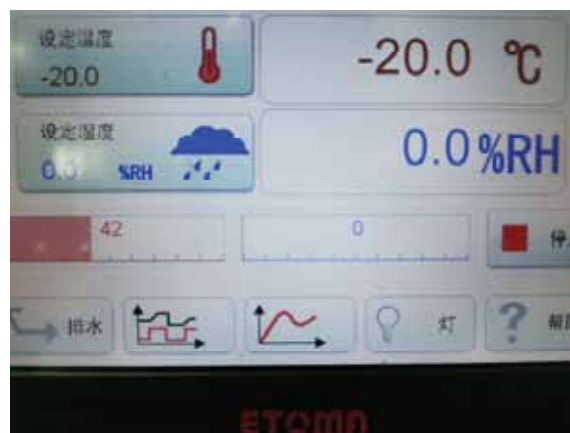


Fig. 13 Equipment setting

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6 Corrosion (salt mist)

6.1 General description

The Corrosion (salt mist) is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 8.12;

The EUT shall be placed in a chamber and sprayed a salt solution for 2 h at normal temperature. The salt solution shall be prepared by dissolving (5 ± 1) parts by weight of sodium chloride (NaCl) in 95 parts by weight of distilled or demineralized water.

At the end of the spraying period, the EUT shall be placed in a chamber which shall be maintained at a temperature of $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, and a relative humidity between 90% and 95% for a period of seven days.

The EUT shall be subjected to a test comprising four spraying periods, each of duration 2 h with a storage period of seven days after each.

At the conclusion of the test the EUT shall be inspected with the naked eye without magnification. The EUT shall then be subjected to a performance check.

6.2 Technical requirements (Assessment criterion)

The performance check shall meet the requirements. There shall be no undue deterioration or corrosion of metal parts.

6.3 Test results

Sample identification	Test results	Judgment
3-2	The performance check met the requirements. There was no undue deterioration or corrosion of metal parts.	P

6.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	WKNE-0109	YWX/Q-750	Salt spray test chamber	2020.04.20
2	IA-0023	JY601	Electronic balance	2019.08.20
3	VGIC-0011	PHS-3E	PH meter	2020.07.11
4	VGDR-0029	WTH3600-40W	Small step-in humidity and heat test chamber	2020.03.12

6.5 Test pictures



Fig. 14 Corrosion (salt mist)

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7 Acoustic noise and signals

7.1 General description

The Acoustic noise and signals are performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 11.1;

The EUT or parts thereof, intended for installation in wheelhouses or bridge wings, shall be examined for acoustic noise by means of a sound-level meter complying with IEC 60651. Audible alarms shall be switched off, and acoustic pressure radiated intentionally by any remote transducer of the EUT operating in its pass-band shall be discounted, unless it is likely to be detected in a noise-sensitive area. The EUT shall be mounted in a way which is identical to its installation on board and on a sound absorbing support in a sound absorbing environment.

The EUT shall be set to the operating condition that gives rise to the highest level of unwanted acoustic noise pressure.

The test shall be repeated with audible alarms switched on.

7.2 Technical requirements (Assessment criterion)

The acoustic pressure detected shall not exceed a level of 60 dB(A) at a distance of 1 m from any part of the EUT.

With audible alarms switched on, the acoustic noise pressure of an alarm shall be at least 75 dB(A) but not greater than 85 dB(A) at a distance of 1 m from any part of the EUT which is accessible for its operation.

7.3 Test results

Sample identification	Test results	Judgment
3-1	Operational noise (the main unit): 43.7 dB(A) Operational noise (the antenna): 17.1 dB(A) Operational noise (the speaker): 17.1 dB(A) Audible alarms (the speaker): 75.2 dB(A)	P

7.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	NC-036-2	5.2m×4.7m×4.6m	Hemi-anechoic room(A)	2023.10.07
2	VGDY-0184	3660C	PULSE system	2020.04.10
3	HJ-000095	4231	Calibrator	2020.06.11
4	HJ-000062	5m	Long steel tape	2019.09.02
5	HJ-000165	—	Atmospheric pressure meter	2019.11.06
6	KA-0008	8705B	Power meter	2020.01.28
7	NC-036-1	—	Temperature measurement system	2020.06.24

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7.5 Test pictures



Fig. 15 Acoustic noise and signals

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8 Compass safe distance

8.1 General description

The Compass safe distance is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 11.2;

The compass-safe distance of any unit of the EUT is defined as the distance between the nearest point of the unit and the centre of the compass or magnetometer at which it will not produce a deviation in the standard compass of more than $5.4^\circ/H$ where H is the horizontal component of the magnetic flux density in μT at the place of testing.

For the steering compass, the standby steering compass and the emergency compass, the permitted deviation is $18^\circ/H$.

Each unit of the EUT shall be tested:

- a) In the magnetic condition in which it is received with the EUT unpowered;
- b) After normalizing with the EUT unpowered;
- c) In the powered condition, if the unit is capable of being energized electrically.

In each of the above tests, the unit shall be rotated to determine the direction in which it produces the maximum deviation.

8.2 Technical requirements (Assessment criterion)

The greatest distance obtained under all these conditions is the safe distance. Distances are to be rounded up to the nearest 50 mm or 100 mm.

8.3 Test results

Sample identification	Test results	Judgment
3-1	Steering compass (the main unit): 1200 mm Standard compass (the main unit): 1650 mm Steering compass (the speaker): 1450 mm Standard compass (the speaker): 2000 mm	—

8.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	VGDY-0163	9200B	Magnetometer	2019.11.18
2	VGDY-0154	LZ-643	Gauss meter	2019.08.23
3	VGDY-0168	MF-1500	Helmholtz coils	2019.09.01
4	HJ-000062	5m	Long steel tape	2019.09.02
5	VGDY-0160	—	Constant current source	2019.09.10

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8.5 Test pictures



Fig. 16 Compass safe distance

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9 Protection against accidental access to dangerous voltages

9.1 General description

The Protection against accidental access to dangerous voltages is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 12.1;

The EUT shall be subjected to the test corresponding to IEC 60529, table I, first characteristic numeral 2: protected against access to hazardous parts with a finger.

The test shall be carried out by inserting the access probe through any openings of the enclosure of the EUT with the force specified in table VI of IEC 60529.

For the test, the jointed test finger may penetrate to its 80 mm length. Starting from the straight position, both joints of the finger shall be successively bent through an angle of up to 90° with respect to the adjoining section of the finger and shall be placed in every possible position.

For low-voltage equipment (rated voltages not exceeding 1000V a. c. and 1500V d. c) the test finger shall be connected to a low-voltage supply (of not less than 40V and not more than 50V) in series with a suitable lamp connected between the access probe and the hazardous parts inside the enclosure.

When an enclosure includes sections at different voltage levels, the appropriate acceptance conditions for adequate clearance shall be applied for each section.

Finally, it shall be verified that any further access to the interior of the EUT is only possible by means of a tool, such as a spanner or screwdriver, and warning labels, if appropriate, are displayed within the EUT and on protective covers.

9.2 Technical requirements (Assessment criterion)

Adequate clearance shall be found between the access probe and the hazardous parts.

For the low voltage test, the lamp shall not light.

9.3 Test results

Sample identification	Test results	Judgment
3-1	Adequate clearance had been found between the access probe and the hazardous parts. For the low voltage test, the lamp didn't light.	P

9.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	NE-0066	φ12mm	Jointed test finger	2020.02.24
2	VGDY-0210	HF-50	Push-pull force meter	2019.11.02

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9.5 Test pictures



Fig. 17 Protection against accidental access to dangerous voltages

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10 Electromagnetic radio frequency radiation

10.1 General description

The Electromagnetic radio frequency radiation is performed according to the standard: IEC 60945: 2002 ed 4.0 Clause 12.2;

Equipment which is designed to radiate electromagnetic radio frequency energy at frequencies above 30 MHz shall be subjected to measurements to determine the level of such radiated energy. The EUT shall be in the operational state and condition, which emits the maximum radiation. The method of measurement normally will be described in the relevant equipment standard.

10.2 Technical requirements (Assessment criterion)

Where appropriate, the maximum distance from the EUT at which the power density level of 100 W/m² and 10 W/m² of the radio frequency radiation has been measured shall be included in the equipment manual.

10.3 Test results

Sample identification	Test results	Judgment
3-3	The power density level of 100 W/m ² : 0.3m, 0.08 W/m ² The power density level of 30 W/m ² : 0.3m, 0.06 W/m ²	—

10.4 Test equipment

№	Equipment №	Type / Model	Equipment name	Calibration expiration date
1	KA-0101	ELT-400	NARDA ELT-400EMF Immunity Test System	2020.04.20

10.5 Test pictures



Fig. 18 Electromagnetic radio frequency radiation

Important

1. The test report is invalid without the official stamp of CVC;
2. Any photocopies or part photocopies of the test report are forbidden without the written permission from CVC;
3. The test report is invalid without the signatures of Author and Reviewer;
4. The test report is invalid if altered;
5. Objections to the test report must be submitted to CVC within 15 days;
6. Generally, commission test is responsible for the tested samples only;
7. As for the test result, “N” or “—” means “not applicable” , “/” means “not testing” , “P” means “pass” , and “F” means “fail” .

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