Declaration of Compliance with NFPA 130 and BSS 7239 for Model “XNF-9010RVM”

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Reported by

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1. Objective

To declare the compliance with EN 45545-2 for a product designed by **Hanwha Vision Co., Ltd**.

2. Reference Standard

NFPA 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems
ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
BSS 7239 – Test Method for Toxic Gas Generation by Materials on Combustion
IEEE 1202 – IEEE Standard for Flame-Propagation Testing of Wire & Cable
ANSI/UL 1685 – Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

3. Product Information

The product under assessment is a network camera designated **"XNF-9010RVM"**. This product is made by **Hanwha Vision Co., Ltd.**

The product is developed and designed for application in rolling stock. The enclosure (top and bottom cover) is made of aluminum parts. The dome cover consists of a transparent polycarbonate with coating. The product contains the functional components including printed circuit boards, and other miscellaneous materials inside the enclosure. They also have one outer cable assembly for communication.

The overall dimension of the products is **160mm diameter with 72mm height**. The total mass of "**XNF-9010RVM**" is **1052.6g** excluding the outer cable assembly.
The product will be installed inside rolling stocks. The outer face will be exposed to a passenger area. While multiple number of the products can be used in one vehicle, each product will be installed separately.
The diagram of "**XNF-9010RVM**" is shown in **Figure 1**. The breakdown structure of the product with the part list is shown in **Figure 2**. The part list with the information of each mass (excluding the outer cable assembly) is shown in **Table 1**.

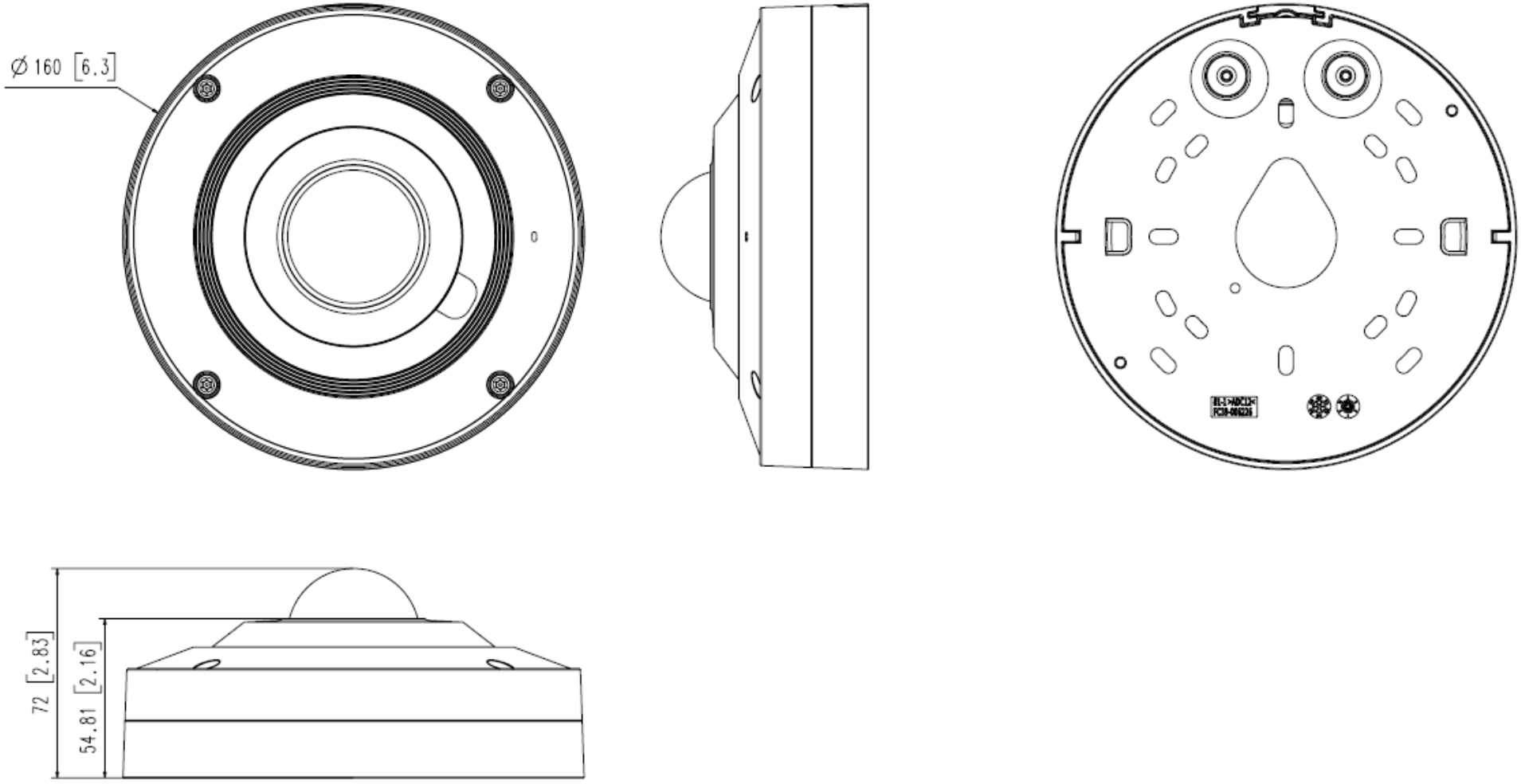
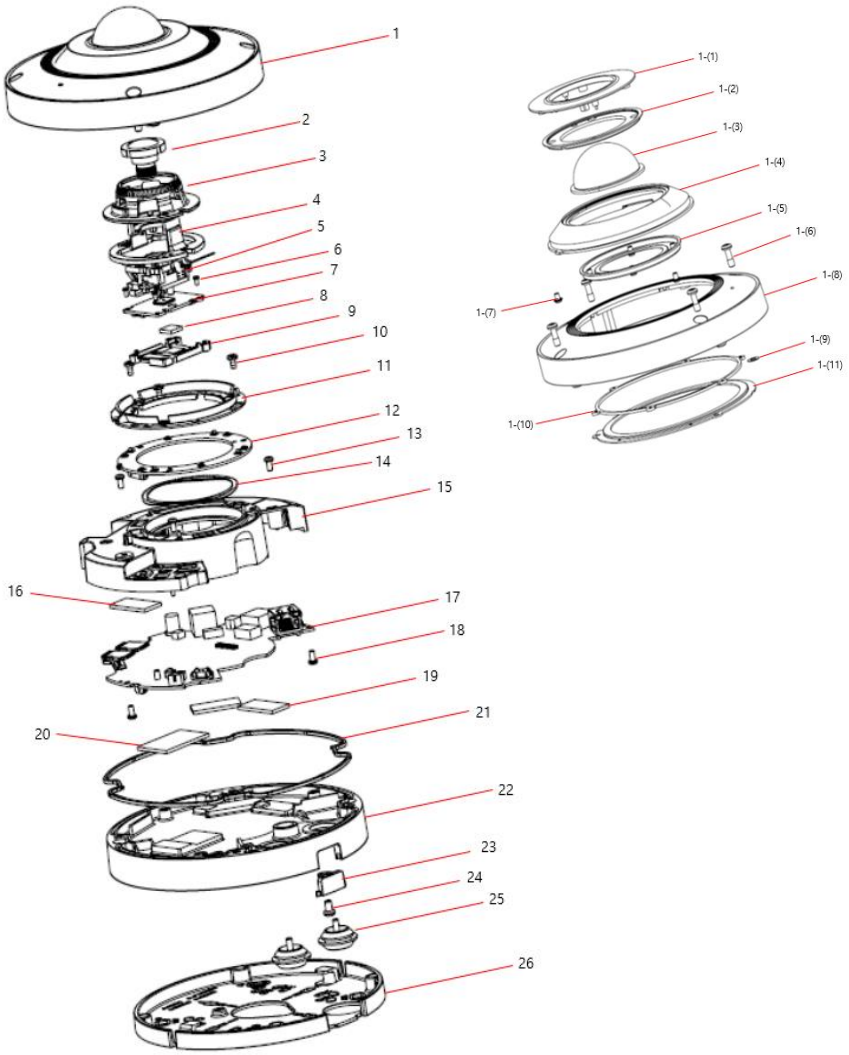


Figure 1: Diagram of "XNF-9010RVM"



No	Part Number	Part Name	ea	Material Type
1	AM07-014448A	ASSY,CASE-TOP-XNF-9010RV_WISENET	1	
1-(1)	FC29-013189A	CASE-DOME_XNF-9010RV	1	ALDC
1-(2)	HP07-001566A	GASKET-DOME_XNF-9010RV	1	SILICON RUBBER
1-(3)	FC15-007583B	COVER-DOME_FISHEYE_HC;PC,COATING	1	PC
1-(4)	FC15-005078A	COVER-GLASS_IR_PNF-9010RVM;COVER	1	PC
1-(5)	FC09-011730A	BRACKET-DOME_XNF-9010RV	1	SECC
1-(6)	FC18-004000A	SCREW-BUILT-IN_TORX20;0.7,15,NO,4	4	SUS
1-(7)	Z6001055901A	SCREW-MACHINE;6001-001785,PWH,+,M3,L4,Z	7	SWRCH18A
1-(8)	FC29-013164A	CASE-TOP_XNF-9010RV_WISENET	1	ALDC
1-(9)	FC36-001015	SHEET-GORE-ACOUSTIC-GAW3250408P	1	
1-(10)	HP07-001567A	GASKET-CASE_TOP_XNF-9010RV	1	SILICON RUBBER
1-(11)	FC09-011731A	BRACKET-CASE_TOP_XNF-9010RV	1	SECC
2	AM07-013218B	ASSY-LENS-TOTAL_CL1-ABF	1	
3	FC15-007736A	COVER-LENS_XNF-9010RV;-	1	PC
4	FC09-011728A	BRACKET-LENS_XNF-9010RV	1	ALDC
5	AM08-006603A	ASSY-AF_MODULE_XNF-9010RV	1	
6	Z6001055101A	SCREW-MACHINE;6001-001707,BH,+,M2,L4,ZP	6	SWCH18A
7	AM06-009541A	ASSY,PCB-XNF-9010RV,SENSOR	1	
8	FC28-003056A	PAD-THERMAL-10X10XT2,K=7W/M-K	1	SILICONE
9	FC29-013190A	HOLDER-SENSOR_XNF-9010RV	1	ALDC
10	Z6001053501A	SCREW-MACHINE;6001-001476,BH,+,M3,L6,Ni	3	SWCH18A
11	FC28-003187A	REFLECTOR-IR_XNF-9010RV;-	1	PC
12	AM06-009537A	ASSY,PCB-XNF-9010RV,IR	1	
13	Z9642306007	MACHINE SCREW(M3xL6,Zn-B,냄비머리)	3	SWCH16A
14	FC18-005707A	WASHER,WAVE-XNF-9010RV;-,59	1	SUS
15	FC39-006215A	FRAME-MAIN_XNF-9010RV	1	ALDC
16	FC28-002822A	PAD-THERMAL-30X15XT2,K=7W/M-K	1	SILICONE
17	AM06-009536A	ASSY,PCB-XNF-9010RV,NETWORK	1	
18	Z9642306007	MACHINE SCREW(M3xL6,Zn-B,냄비머리)	2	SWCH16A
19	FC28-002822A	PAD-THERMAL-30X15XT2,K=7W/M-K	2	SILICONE
20	FC28-002821A	PAD-THERMAL-38X25XT2,K=7W/M-K	1	SILICONE
21	HP07-001568A	GASKET-BOTTOM_XNF-9010RV	1	SILICON RUBBER
22	FC29-013191A	CASE-BOTTOM_XNF-9010RV	1	ALDC
23	FC15-007735A	COVER-CABLE_XNF-9010RV;-	1	ALDC
24	FC18-001116A	SCREW-MACHINE;TORX T20,BH,M4,0.7,L6,SUS	1	SUS
25	MC06-001082A	BUSHING-CABLE FLEXIBLE;SILICON,GRAY	2	SILICON RUBBER
26	FC39-006226A	MOUNT-PLATE_XNF-9010RV	1	ALDC

Figure 2: Breakdown Structure of "XNF9010RVM" with Part List

No.	Level						Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Meterial type	
	1	2	3	4	5	6						Type	Details
1	O						AM08-006575A	ASSY-TOTAL-XNF-9010RV_WISENET	1	0	0.0	ASSY	ASSY
2		O					AM07-014639A	ASSY-HALF-XNF-9010RV	1	0	0.0	ASSY	ASSY
3			O				AM08-006574A	ASSY-FRAME_MAIN-XNF-9010RV	1	0.0	0.0	ASSY	ASSY
4				O			FC39-006215A	FRAME-MAIN_XNF-9010RV	1	188.0	188.0	METAL	ALUMINUM
5				O			FC10-001204A	RUBBER-MIC_XNF-9010RV;-	1	0.1	0.1	RUBBER	RUBBER
6				O			FC29-011939A	STOPPER-ROTATE_QNF-8010;PC	1	0.1	0.1	PLASTIC	PC
7				O			Z6001045901A	4748_M3_L6_SCREW	1	0.1	0.1	METAL	SCREW
8				O			FC36-001393A	SHEET-LABEL_XNF-9010RV	1	0.1	0.1	PLASTIC	PC
9				O			EP10-001257A	MODULE,ELECTRONIC-UGHO6035CW-50-A28J-510	1	1.0	1.0	complex	
10			O				AM08-006604A	ASSY-MODULE_XNF-9010RV_EXPORT	1	0.0	0.0	ASSY	ASSY
11				O			AM08-006603A	ASSY-AF_MODULE_XNF-9010RV	1	0.0	0.0	ASSY	ASSY
					O		AM07-008203A	ASSY-HALF-LENS_9011	1	1.0	1.0	ASSY	ASSY
					O		Z6003021901A	35_VF_FIXED_SCREW	2	0.1	0.2	METAL	SCREW
					O		AM07-008625A	ASSY,FPC-9010	1	2.0	2.0	ASSY	ASSY
					O		AM07-008201A	ASSY-HALF-GEAR_AF_9011	1	10.0	10.0	ASSY	ASSY
					O		FC15-004871A	COVER-GUIDE_LS_9010;MOLD	1	0.7	0.7	PLASTIC	PC
					O		FC38-001076A	SPRING,COM-AF_9010;SUS	1	0.1	0.1	METAL	SUS
					O		Z6003020401A	SCREW-TAPTYPE;6003-001453,BH,+,B,M1.7,L	3	0.1	0.3	METAL	SCREW
					O		FC09-011728A	BRACKET-LENS_XNF-9010RV	1	16.0	16.0	METAL	ALUMINUM
					O		AM07-013218B	ASSY-LENS-TOTAL_CL1-ABF	1	0.0	0.0	ASSY	ASSY
						O		Lens	1	7.5	7.5	Glass	Glass
						O		Lens holder	1	5.9	5.9	METAL	ALUMINUM
						O		lens cap	1	1.0	1.0	PLASTIC	PC
12				O			AM06-009541A	ASSY,PCB-XNF-9010RV,SENSOR	1	6.0	6.0	PCB	PCB
13				O			EP02-004260A	HARNESS-XNV-6011;MCX,30P,80MM	1	1.0	1.0	CABLE	CABLE
14				O			FC29-013190A	HOLDER-SENSOR_XNF-9010RV	1	6.0	6.0	METAL	ALUMINUM
15				O			Z6001055101A	SCREW-MACHINE;6001-001707,BH,+,M2,L4,ZP	6	0.1	0.6	METAL	SCREW
16				O			FC28-003056A	PAD-THERMAL-10X10XT2,K=7W/M-K	1	0.1	0.1	Silicon	
17				O			FC15-007736A	COVER-LENS_XNF-9010RV;-	1	5.0	5.0	PLASTIC	PC
18			O				FC28-003187A	REFLECTOR-IR_XNF-9010RV;-	1	7.0	7.0	PLASTIC	PC
19			O				Z6001053501A	SCREW-MACHINE;6001-001476,BH,+,M3,L6,Ni	3	0.1	0.3	METAL	SCREW
20			O				FC18-005707A	WASHER,WAVE-XNF-9010RV;-,59	1	1.0	1.0	METAL	SUS
21			O				Z9642306007	MACHINE SCREW(M3xL6,Zn-B,냄비머리)	2	0.1	0.2	METAL	SCREW
22			O				FC28-002822A	PAD-THERMAL-30X15XT2,K=7W/M-K	1	0.1	0.1	Silicon	
23			O				Z6001055101A	SCREW-MACHINE;6001-001707,BH,+,M2,L4,ZP	6	0.1	0.6	METAL	SCREW
24			O				AM06-009537A	ASSY,PCB-XNF-9010RV,IR	1	12.0	12.0	PCB	PCB
25			O				Z3900030201A	WIRE HARNESS-CCD TO POWER;AB39-00162A,S	1	1.0	1.0	CABLE	CABLE
26		O					AM07-014448A	ASSY,CASE-TOP-XNF-9010RV_WISENET	1	0.0	0.0	ASSY	ASSY
27			O				FC15-007583B	COVER-DOME_FISHEYE_HC;PC,COATING	1	8.0	8.0	PLASTIC	PC
28			O				FC29-013189A	CASE-DOME_XNF-9010RV	1	18.0	18.0	METAL	ALUMINUM
29			O				FC15-005078A	COVER-GLASS_IR_PNF-9010RVM;COVER	1	18.0	18.0	PLASTIC	PC
30			O				FC09-011730A	BRACKET-DOME_XNF-9010RV	1	20.0	20.0	METAL	Steel
31			O				HP07-001566A	GASKET-DOME_XNF-9010RV	1	4.0	4.0	RUBBER	RUBBER
32			O				FC09-011731A	BRACKET-CASE_TOP_XNF-9010RV	1	25.0	25.0	METAL	Steel
33			O				HP07-001567A	GASKET-CASE_TOP_XNF-9010RV	1	1.0	1.0	RUBBER	RUBBER
34			O				FC29-013164A	CASE-TOP_XNF-9010RV_WISENET	1	224.0	224.0	METAL	ALUMINUM
35			O				FC36-001015	SHEET-GORE-ACOUSTIC-GAW3250408P	1	0.1	0.1	ETC	TAPE
36			O				Z6001055901A	SCREW-MACHINE;6001-001785,PWH,+,M3,L4,Z	7	0.1	0.7	METAL	SCREW
37			O				FC18-004000A	SCREW-BUILT-IN_TORX20;0.7,15,NO,4	4	1.0	4.0	METAL	SCREW
38			O				FC36-001108A	SHEET-PROTECT_PNF-9010RV	1	0.1	0.1	ETC	TAPE
39		O					AM08-006573A	ASSY-CASE BOTTOM XNF-9010RV	1	0.0	0.0	ASSY	ASSY
40			O				FC29-013191A	CASE-BOTTOM_XNF-9010RV	1	237.0	237.0	METAL	ALUMINUM
41			O				MC06-001082A	BUSHING-CABLE FLEXIBLE;SILICON,GRAY	2	1.0	2.0	RUBBER	RUBBER
42			O				HP07-001568A	GASKET-BOTTOM_XNF-9010RV	1	3.0	3.0	RUBBER	RUBBER
43			O				FC18-004000A	SCREW-BUILT-IN_TORX20;0.7,15,NO,4	2	1.0	2.0	METAL	SCREW
44			O				FC18-001116A	SCREW-MACHINE;TORX T20,BH,M4,0.7,L6,SUS	1	1.0	1.0	METAL	SCREW
45			O				FC15-007735A	COVER-CABLE_XNF-9010RV;-	1	1.0	1.0	METAL	ALUMINUM
46		O					Z9642306007	MACHINE SCREW(M3xL6,Zn-B,냄비머리)	3	0.1	0.3	METAL	SCREW
47		O					FC39-006226A	MOUNT-PLATE_XNF-9010RV	1	123.0	123.0	METAL	ALUMINUM
48		O					FC28-002822A	PAD-THERMAL-30X15XT2,K=7W/M-K	2	0.1	0.2	Silicon	
49		O					FC28-002821A	PAD-THERMAL-38X25XT2,K=7W/M-K	1	0.1	0.1	Silicon	
50		O					AM06-009536A	ASSY,PCB-XNF-9010RV,NETWORK	1	85.0	85.0	PCB	PCB
51	O						PT03-002454B	LABEL-RATING-CAMERA-EXPORT-BASIC	1	0.1	0.1	ETC	LABEL
										TOTAL	1052.6		

Table 1: Part List of "XNF-9010RVM" with Information of Each Mass

The product establishes a network connection through the outer cable assembly shown in **Figure 3**.

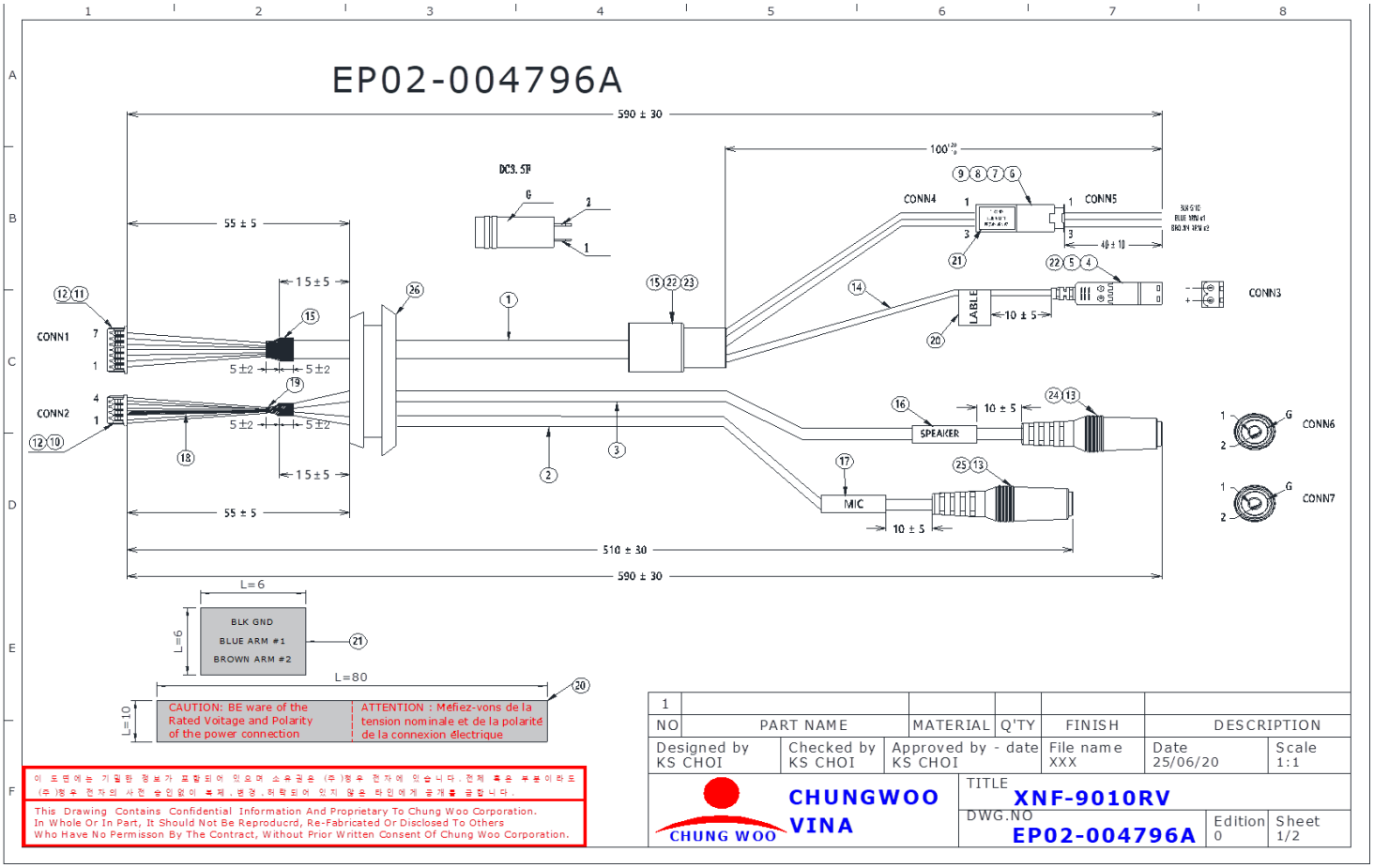


Figure 3: Detail of Outer Cable Assembly for "XNF-9010RVM"

Table 2 shows the non-metallic material list used in the outer cable assembly. The total mass of the non-metallic materials is **30.254g**.

Remark	Description	SPECIFICATION	Q'TY	g	MAKER
1	CABLE	UL2464 #28X7CXAL OD:4.9 (BRN,BLU,BLK,RED,RED,BLK/WHT,BLK/WHT)	0.61	12.12	MYUNGBO
2	CABLE	UL2725 #26X1P+S OD:3.0 (ORG,OGR/WHT)	0.59	4.638	MYUNGBO
3	CABLE	UL2725 #26X1P+S OD:3.0 (GRN,GRN/WHT)	0.53	4.046	MYUNGBO
4	HOUSING	KF2EDGK-5.08-02-4	1	0.45	KEFA
5	HOUSING	KF2EDGV-5.08-02-4	1	1.1	KEFA
6	HOUSING	PHS-3R	1	0.32	JINDA
7	HOUSING	PHS-3Y	1	0.14	JINDA
8	TERMINAL	RHS-TE male	3	-	JINDA
9	TERMINAL	PHS-TE female	3	-	JINDA
10	HOUSING	1.25T-1-7Y	1	0.06	JINDA
11	HOUSING	1.25T-1-4Y	1	0.04	JINDA
12	TERMINAL	1.25T-1-TE	11	-	JINDA
13	DC JACK	DC3.5 JACK 350308	2	1.1	ZHOGGUAN
14	PVC TUBE	Φ2.5 PVC BLK L=90mm	1	0.4	
15	본딩형 SR TUBE	Φ5.0 BLK L=10mm	2	0.46	
16	SR MARKING TUBE	Φ3 WHT (SPEAKER) L=30mm	1	0.9	
17	SR MARKING TUBE	Φ3 WHT (MIC) L=30mm	1	0.9	
18	SR TUBE	Φ1.0 BLK L=40mm	1	0.02	
19	본딩형 SR TUBE	Φ6.0 BLK L=10mm	1	0.23	
20	LABEL	80*10 LABEL	1	0.03	AGC
21	LABEL	L6XW6mm LABEL	1	-	AGC
22	MOLDING	PVC : 45P BLK	40	-	
23	EPOXY	ITW 116FR BLK	10	1	
24	MOLDING	PVC : 45P GRN	20	-	
25	MOLDING	PVC : 45P PINK	20	-	
26	BUSHING	MC06-000040A	1	2.3	

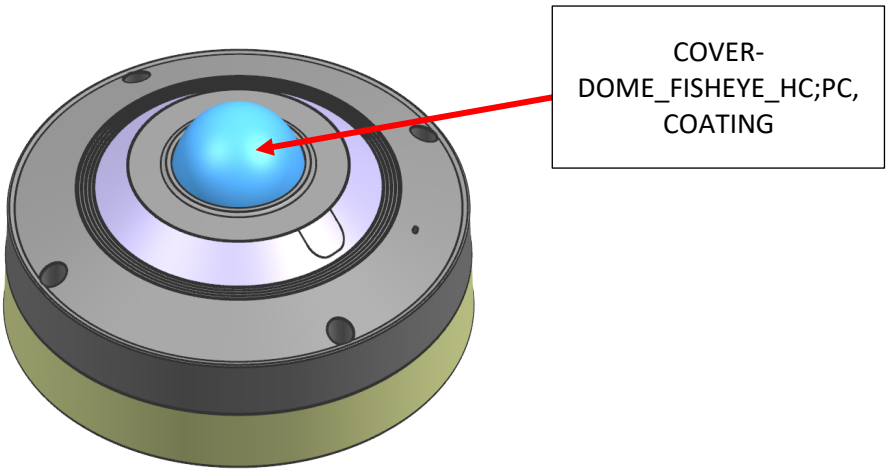
Table 2: Detail of Non-Metallic Materials Used in Outer Cable Assembly for "XNF-9010RVM"

4. Assessment

In accordance with Chapter 8 of NFPA 130 ("Vehicles"), assessment was conducted to determine which parts/materials should be subject to flammability testing, what kind of testing should be done for each part/material, and whether the test results pass the criteria stipulated by the standard.

1) Dome Cover:

Part name of Dome cover is "COVER-DOME_FISHEYE_HC;PC,COATING". See the following figure for the relevant part in the complete product.



It is made of polycarbonate (S2000VUR) with hard coating, which is combustible, and therefore should be assessed.

Although NFPA 130 does not specify any requirement for this kind of part, the application can be considered as equivalent to “Light diffuser”, because the product will be installed on the ceiling, and the dome cover part is made of transparent plastic. According to Table 8.4.1 of NFPA 130, ASTM E162 (Surface flammability testing) and ASTM E662 (smoke emission testing) were selected to demonstrate the compliance with the standard requirement. Refer to the following extract from the standard;

Light diffusers, windows, and transparent plastic windscreens[b,i]	ASTM E162	$I_s = 100$
	ASTM E662	$D_s\,(1.5) = 100$ $D_s\,(4.0) = 200$

Also, based on the general practice in the North-American railway industry, toxicity testing was conducted in accordance with **BSS 7239** in addition to the surface flammability (ASTM E162) and smoke emission (ASTM E662) testing. The typical practice in the aircraft industry was used as the criteria of toxicity. Refer to the following **Table 3**;

Table 3: Measured gas types and typical acceptance criteria

Gas Type	Acceptance Criteria
CO	≤ 3500 ppm
HCN	≤ 150 ppm
HF	≤ 200 ppm
HCl	≤ 500 ppm
SO2	≤ 100 ppm
NO2	≤ 100 ppm

The test results are summarized in **Table 4**. For more detail, refer to the test reports issued by Chemitox, which is ISO 17025 accredited for the relevant testing (**Appendix 1**).

Table 4: Test results for Painting

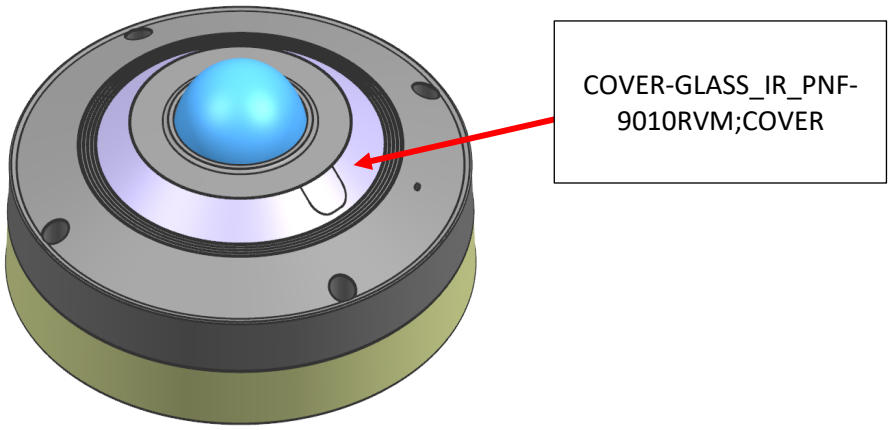
Test Parameter	Test Results	Evaluation	Report Number
Is	60*	Compliant**	210693-RP (Chemitox)
Ds (1.5)	3.50 in flaming mode 0.67 in non-flaming mode	Compliant	210693-SD (Chemitox)
Ds (4.0)	116.60 in flaming mode 2.78 in non-flaming mode	Compliant	
Toxicity	Emission of all gases within acceptance criteria in both flaming and non-flaming mode	Compliant	210693-TX (Chemitox)

*: Per the client's request, in each testing four sheets were lined up to make the dimension required by the standard.
**: Since the specimens exhibited dripping of flaming material due to melting, no formal radiant panel index shall be reported per ASTM E162 Clause 11.11, and the Is value is only for reference purpose. However, according to the footnotes relevant to the product category of light diffuser, such a behavior is considered acceptable only for this category.

Therefore, the material used for the dome cover is considered as complying with the requirements of NFPA 130.

2) IR LED Cover

Part name of IR LED cover is "COVER-GLASS_IR_PNF-9010RVM;COVER". See the following figure for the relevant part in the complete product. This part serves as covering of IR LED which can make the product shoot footage of surrounding area under a low illumination condition (such as at night).



It is made of polycarbonate (SC-1220UR), which is combustible, and therefore should be assessed.

Although NFPA 130 does not specify any requirement for this kind of part, the application can be considered as equivalent to "Light diffuser", because the product will be installed on the ceiling, and this part can transmit IR light. According to Table 8.4.1 of NFPA 130, ASTM E162 (Surface flammability testing) and ASTM E662 (smoke emission testing) were selected to demonstrate the compliance with the standard requirement. Refer to the following extract from the standard;

Also, based on the general practice in the North-American railway industry, toxicity testing was conducted in accordance with **BSS 7239** in addition to the surface flammability (ASTM E162) and smoke emission (ASTM E662) testing. The typical practice in the aircraft industry was used as the criteria of toxicity. Refer to **Table 3**.

The test results are summarized in **Table 5**. For more detail, refer to the test reports issued by Chemitox, which is ISO 17025 accredited for the relevant testing (**Appendix 2**).

Table 5: Test results for Painting

Test Parameter	Test Results	Evaluation	Report Number
Is	5*	Compliant**	210744-RP (Chemitox)
Ds (1.5)	5.70 in flaming mode 1.02 in non-flaming mode	Compliant	210744-SD (Chemitox)
Ds (4.0)	99.21 in flaming mode 6.57 in non-flaming mode	Compliant	
Toxicity	Emission of all gases within acceptance criteria in both flaming and non-flaming mode	Compliant	210744-TX (Chemitox)

*: Per the client's request, in each testing four sheets were lined up to make the dimension required by the standard.

**: Since the specimens exhibited dripping of flaming material due to melting, no formal radiant panel index shall be reported per ASTM E162 Clause 11.11, and the Is value is only for reference purpose. However, according to the footnotes relevant to the product category of light diffuser, such a behavior is considered acceptable only for this category.

Therefore, the material used for the IR LED cover is considered as complying with the requirements of NFPA 130.

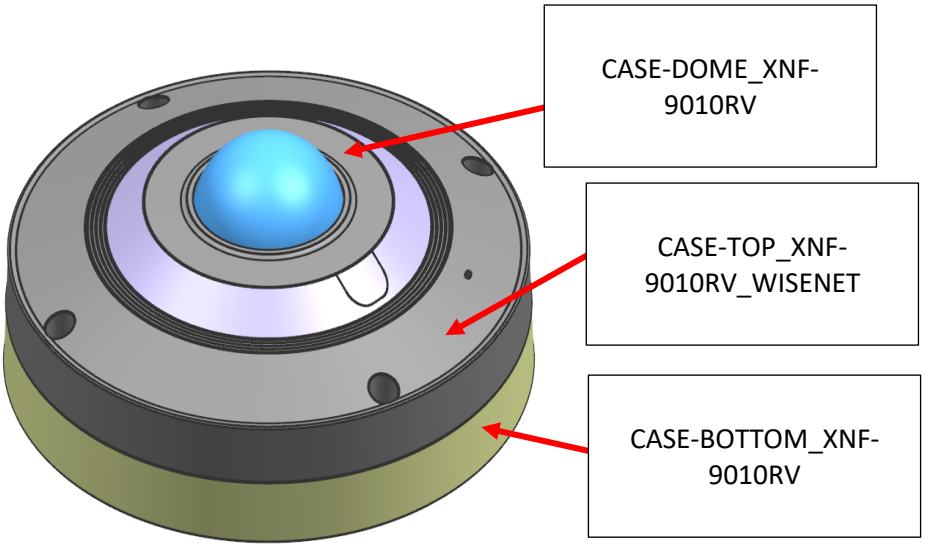
3) Coating of aluminum enclosure:

The outer cover and cabinet are coated by certain organic painting. See **Table 6** for more detail;

Table 6: Detail of Painting

Part Name	**CASE-DOME_XNF-9010RV**	**CASE-BOTTOM_XNF-9010RV**	**CASE-TOP_XNF-9010RV_WISENET**
Specification of Aluminum Plate	Thickness: 1mm Density: 2.70g/cm^3	Thickness: 2mm Density: 2.70g/cm^3	Same as "**CASE-BOTTOM_XNF-9010RV**"
Specification of Coating	PX4332(S)-TX-RAL9005(HTW) Color: Black Thickness: 70 um	PX4332(S)-TX-WH086(HTW) Color: White Thickness: 70 um	Same as "**CASE-BOTTOM_XNF-9010RV**"

See the following figure for the relevant part in the complete product.



These parts can be considered as “component box”. According to Table 8.4.1 of NFPA 130, ASTM E162 (Surface flammability testing) and ASTM E662 (smoke emission testing) were selected to demonstrate the compliance with the standard requirement. Refer to the following extract from the standard;

Δ Table 8.4.1 Fire Test Procedures and Performance Criteria for Materials and Assemblies

Category	Function of Material	Test Method	Performance Criteria
Cushioning	All individual flexible cushioning materials used in seat cushions, mattresses, mattress pads, armrests, crash pads, and grab rail padding[a–e]	ASTM D3675	$I_s = 25$
		ASTM E662	D_s (1.5) = 100 D_s (4.0) = 175
Fabrics	Seat upholstery, mattress ticking and covers, curtains, draperies, window shades, and woven seat cushion suspensions[a–c,f–h]	14 CFR 25, Appendix F, Part I (vertical test)	Flame time = 10 sec Burn length = 6 in.
		ASTM E662	D_s (4.0) = 200
Other vehicle components	Seat and mattress frames, wall and ceiling lining and panels, seat and toilet shrouds, toilet seats, trays and other tables, partitions, shelves, opaque windscreens, combustible signage, end caps, roof housings, articulation bellows, exterior shells, nonmetallic skirts, battery case material, and component boxes and covers[a,b,i–k]	ASTM E162	$I_s = 35$
		ASTM E662	D_s (1.5) = 100 D_s (4.0) = 200

Also, based on the general practice in the North-American railway industry, toxicity testing was conducted in accordance with **BSS 7239** in addition to the surface flammability (ASTM E162) and smoke emission (ASTM E662) testing. The typical practice in the aircraft industry was used as the criteria of toxicity. Refer to **Table 3**.

The test results are summarized in **Table 7** and **8**. For more detail, refer to the test reports issued by Chemitox, which is ISO 17025 accredited for the relevant testing (**Appendix 3** and **4**).

Table 7: Test results for Coating of “CASE-DOME_XNF-9010RV”

Test Parameter	Test Results	Evaluation	Report Number
Is	0	Compliant	210695-RP (Chemitox)
Ds (1.5)	0.74 in flaming mode 0.41 in non-flaming mode	Compliant	210695-SD (Chemitox)
Ds (4.0)	10.66 in flaming mode 2.80 in non-flaming mode	Compliant	
Toxicity	Emission of all gases within acceptance criteria in both flaming and non-flaming mode	Compliant	210695-TX (Chemitox)

Table 8: Test results for Coating of "CASE-BOTTOM_XNF-9010RV"

Test Parameter	Test Results	Evaluation	Report Number
Is	0	Compliant	210694-RP (Chemitox)
Ds (1.5)	0.68 in flaming mode 0.63 in non-flaming mode	Compliant	210694-SD (Chemitox)
Ds (4.0)	2.50 in flaming mode 1.06 in non-flaming mode	Compliant	
Toxicity	Emission of all gases within acceptance criteria in both flaming and non-flaming mode	Compliant	210694-TX (Chemitox)

*: These results can represent the compliance for coating of "**CASE-TOP_XNF-9010RV_WISENET**" because of exactly the same coating specification.

Therefore, the coating materials are considered as complying with the requirements of NFPA 130.

4) Outer Cable Assembly:

NFPA 130 requires all cables to be compliant with the following requirements;

> **8.6.7.1.1.1** All wires and cables shall comply with the FT4/ IEEE 1202 exposure requirements for cable char height and with ANSI/UL 1685 for total smoke released and peak smoke release rate.

In this project, the cable assembly was not tested because the client stated that they cannot prepare the required length of cable for both FT4/IEEE 1202 and ANSI/UL 1685. Therefore, **the compliance of the cable has NOT been demonstrated in this assessment report**.
However, there would still be a possibility that this cable can be used in railway vehicles by referring to **Clause 8.4.2 of NFPA 130**. See also the following extract from the standard;

> **8.4.2*** Materials intended for use in a limited area of the vehicle and not meeting the requirements of Table 8.4.1 shall be permitted only after an appropriate fire hazard analysis establishes, within the limits of precision, that the material produces a contribution to fire hazard equal to or less than a material meeting the appropriate criteria of Table 8.4.1, where the alternative material is used in the same location to fulfill a function similar to the candidate material.

For the product under assessment, the cable can be considered as producing very low contribution to fire hazard based on the following assumptions;

- While multiple number of the products can be used in one vehicle, each product will be installed separately.
- The total number of the products installed in a vehicle will be quite limited according to the purpose of the product's application (i.e. a specific area within railway vehicles is surveilled by one product).
- The non-metallic material mass of the cable assembly is very small (30.254g per the information in **Table 2**).
- The cable assembly itself will not be exposed to passenger area (i.e. it will be hidden behind ceiling

panel).

With those taken into consideration, it is thought that there would be cases where users of the product accept the use of this cable assembly not demonstrating the compliance.

5) Other miscellaneous combustible materials:

There are other miscellaneous materials which are combustible. However, all those materials are very small (i.e. surface area less than 100cm^2), and except for the labels, are covered by the already assessed compliant parts. This means that they are considered as not critical and not likely to contributing to development of fire. For the labels, although they are exposed, the testing can be omitted by applying the following exception stated in NFPA 130;

> **8.4.1.9** Combustible operational and safety signage shall not be required to meet flame spread or smoke emission requirements if the combustible mass of a single sign does not exceed 500 g (1.1 lb) and the aggregate area of combustible signage does not exceed 1 ft^2 per foot of car length.

Therefore, those materials can be considered as complying with the requirement of NFPA 130 without any additional testing and evaluation, assuming an appropriate fire hazard analysis demonstrates that they will not contribute materially to fire growth in end use configuration.

5. Verification of compliance with NFPA 130 and BSS 7239

According to the assessment described in Item 5, the compliance with NFPA 130 for the relevant product has been verified **only in case where a fire hazard analysis based on actual end use application allows the cable assembly not to be evaluated**.

With regards to BSS 7239, it has been verified that the concentration of all emitted gases are within the acceptance criteria shown in **Table 3** in both flaming and non-flaming mode.

IMPORTANT NOTE: the acceptance criteria can vary depending on customers' specifications. In this report, verification for BSS 7239 toxicity testing has been conducted only based on the criteria typically used in the aerospace industry.

6. Revision History

Revised date	Detail
2023-03-01	Company name was updated from "HANWHA TECHWIN CO., LTD" to "Hanwha Vision Co., Ltd"

Appendix 1
Test Report of Dome Cover Material

Appendix 2
Test Report of IR LED Cover Material

Appendix 3
Test Report of Coating for “CASE-DOME_XNF-9010RV”

Appendix 4
Test Report of Coating for “CASE-BOTTOM_XNF-9010RV”