TEST REPORT

CTK Co., Ltd.	**CTK Co., Ltd.** 5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2023-01676 Page (1) / (34) pages	

1. Applicant

- ◦ Name : Hanwha Vision Co., Ltd
- ◦ Address : 6 Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488 KOREA
- ◦ Date of Receipt : 2023-03-14

2. Manufacturer

- ◦ Name : HANWHA VISION VIETNAM COMPANY LIMITED
- ◦ Address : Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam

3. Use of Report : Quality control

4. Test sample / Model : Network Camera / PNM-C32083RVQ

5. Date(s) of test : 2023-03-15 to 2023-03-22

6. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

Address: (5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea)

7. Test Standard (Method) used : NEMA 250-2014
Enclosures for Electrical Equipment (1000 Volts Maximum)

8. Testing Environment : Temperature: (25.0 ± 5.0) °C
Humidity: (40.0 ± 5.0) %.

9. Test Results : Refer to each test items

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

The test was conducted as one sample, and the test result does not depend on the number of samples

Affirmation	Tested by HyungUk Jeon (Signature)	Technical Manager SooChan Bae (Signature)

2023-08-02

CTK Co., Ltd

CTK Co., Ltd.
5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea
Tel: +82-31-339-9970
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Test item description.....:	NETWORK CAMERA
Trade Mark.....:	Hanwha Vision
Manufacturer .....:	Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
Model/Type reference.....:	PNM-C32083RVQ
Ratings.....:	Electrical PNM-C32083RVQ : PoE (55 V ⎓ 33.0 W),PoE (55 V ⎓ 0.6 A) PNM-C16083RVQ : PoE (55 V ⎓ 33.0 W),PoE (55 V ⎓ 0.6 A) Dimension: Ø 250 mm by 785 mm, Ø 210 mm by 659.4 mm, Ø 180 mm by 565.2 mm, Ø 165 mm by 518.1 mm, Ø 63 mm by 197.82 mm, Ø 8.2*6 mm by 154.488 mm, Ø 16 mm by 50.24 mm, Ø 25*2 mm by 157 mm

List of Attachments (including a total number of pages in each attachment):
Attachment 1: 11-15 pages (Construction Diagram including installation method)
Attachment 2: 16-30 pages (Parts List)
Attachment 3: 31-34 pages (photographs)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
Clause 5.7(Hose Down Test)	CTK Co., Ltd. 5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea

Copy of marking plate: The artwork above may be only a draft.

Test item particulars.....:	Network Camera
Classification of installation and use .....:	Outdoor (Watertight/Corrosion Resistant)
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
- test case does not evaluated to the test object :	N/E

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Clause numbers between brackets refer to clauses in NEMA 250-2014

Name and address of factory (ies):

1. HANWHA VISION VIETNAM COMPANY LIMITED
   Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam

2. D-TECH CO., LTD.
   173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea (Suwon Industrial Complex)

General product information:

Applied NEMA Rating : 4X

Model PNM-C32083RVQ is basic model which was tested.

Model description

Basic Model .....:	PNM-C32083RVQ
Series Model .....:	PNM-C16083RVQ
Model differences	Using the same appearance and material (case,finish,pcb cable etc), differences in electronic components inside the product

Type 4X Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); that provides an increased level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Table 2-1
Comparison of Specific Applications of Enclosures for Indoor Nonhazardous (Unclassified) Locations

Provides a Degree of Protection against the Following Conditions	Type of Enclosure									
	1	2	4	4X	5	6	6P	12	12K	13
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X
Ingress of solid foreign objects (falling dirt)	X	X	X	X	X	X	X	X	X	X
Ingress of water (dripping and light splashing)	...	X	X	X	X	X	X	X	X	X
Ingress of solid foreign objects (circulating dust, lint, fibers, and flyings **)	...	...	X	X	...	X	X	X	X	X
Ingress of solid foreign objects (settling airborne dust, lint, fibers, and flyings **)	...	...	X	X	X	X	X	X	X	X
Ingress of water (hosedown and splashing water)	...	...	X	X	...	X	X	...	...	...
Oil and coolant seepage	...	...	...	..	...	...	...	X	X	X
Oil or coolant spraying and splashing	...	...	...	...	...	...	...	...	...	X
Corrosive agents	...	...	...	X	...	...	X	...	...	...
Ingress of water (occasional temporary submersion)	...	...	...	...	...	X	X	...	...	...
Ingress of water (occasional prolonged submersion)	...	...	...	...	...	...	X	...	...	...

** These fibers and flyings are not considered Class III type ignitable fibers or combustible flyings. For Class III type ignitable fibers or flyings see the *National Electrical Code®*, Article 500.5(D).

Table 2-2
Comparison of Specific Applications of Enclosures for Indoor & Outdoor Nonhazardous (Unclassified) Locations

Provides a Degree of Protection Against the Following Conditions	Type of Enclosure									
	3	3X	3R	3RX	3S	3SX	4	4X	6	6P
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X
Ingress of solid foreign objects (falling dirt)	X	X	X	X	X	X	X	X	X	X
Ingress of water (dripping and light splashing)	X	X	X	X	X	X	X	X	X	X
Ingress of water (rain, snow, and sleet **)	X	X	X	X	X	X	X	X	X	X
Sleet ***	...	...	...	...	X	X	...	...	...	...
Ingress of solid foreign objects (windblown dust, lint, fibers, and flyings****)	X	X	...	...	X	X	X	X	X	X
Ingress of water (hosedown and splashing water)	...	...	...	...	...	...	X	X	X	X
Corrosive agents	...	X	...	X	...	X	...	X	...	X
Ingress of water (occasional temporary submersion)	...	...	...	...	...	...	...	...	X	X
Ingress of water (occasional prolonged submersion)	...	...	...	...	...	...	...	...	...	X

** External operating mechanisms are not required to be operable when the enclosure is ice covered.

*** External operating mechanisms are operable when the enclosure is ice covered. See subsection 5.6.

**** These fibers and flyings are not considered Class III type ignitable fibers or combustible flyings. For Class III type ignitable fibers or flyings see the *National Electrical Code®*, Article 500.5(D).

Table 5-1A
Degrees of Protection Against Access to Hazardous Parts

Enclosure Type	Test Conditions	Degree of Protection		Corresponding IP First Characteristic Numeral
		Brief Description	Definition	
4X	5.7	Protected against access to hazardous parts with a wire	An access probe of 1.0 mm shall not penetrate	6

Table 5-1B
Degrees of Protection Against Solid Foreign Objects

Enclosure Type	Test Conditions	Degree of Protection		Corresponding IP First Characteristic Numeral
		Brief Description	Definition	
4X	Non-vented 5.7 Vented 5.5.1 Dust Blast Method	Windblown dust protected	No ingress of dust	6

Table 5-1C
Degrees of Protection against Water

Enclosure Type	Test Conditions	Degree of Protection		Corresponding IP Second Characteristic Numeral
		Brief Description	Definition	
4X	5.7	Protected against hose directed water	Water projected against the enclosure in any direction shall not enter	6 No Ingress Allowed*

Table 5-1D
Additional Protection

Enclosure Type	Test Conditions	Additional Protection		Corresponding IP Second Characteristic Numeral
		Brief Description	Definition	
4X	5.6 5.9 5.10	Special corrosion protection and undamaged by the external formation of ice	Enclosure provides increased corrosion protection and is not damaged by ice that forms on the outside	None

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NEMA 250-2014			
Clause	Requirement + Test	Result - Remark	Verdict
3	**CONSTRUCTION**		
3.1	General		P
3.2	Units of Measurement		P
3.3	Materials-General	Enclosures are made of metal or polymeric materials	P
3.4	Materials-Polymeric	More than 650 mm^2 (1 in^2) in area Polymeric Materials used is declared as Min. V-2 Used to UL certified material. (See the attachment 2)	N/E
3.5	Corrosion Protection	Stainless steel and/or aluminium are declared as the materials used (See the attachment 2)	N/E
3.6	Openings	No openings in Product	N/A
3.7	Mounting	Mounting means are external to the equipment cavity (See the attachment 1)	P
3.8	Conduit Connection	No conduit connection (See the attachment 1)	N/A
3.9	Hubs and Fittings	No Hubs and Fittings	N/A
3.10	Knockouts	No Knockouts	N/A
3.11	External Operating Mechanisms	No External Operating Mechanisms	N/A
3.12	Access to Interior	Needs tool to open unit	P
3.13	Closing Hardware	No closing Hardware	N/A
3.14	Gaskets	Gaskets made of a silicone Sponge Rubber (no Elastomeric or Thermoplastic used) (See clause 5.14 and the attachment 2)	P
3.15	Observation Windows	No Observation Window	N/A
4	**MARKING**		

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NEMA 250-2014			
Clause	Requirement + Test	Result - Remark	Verdict
4.1	Type Designations	"Type 4X" Marking is declared to be on the product before on the market	P
4.2	Supplemental Markings	Supplemental Marking (watertight/ corrosion resistant) is declared to be used when it is on the market. The required marking shall be added on the product)	P
4.3	Location of Markings	See the Attachment 3	P
4.4	Enclosure Orientation	No Particular Mounting Orientation	N/A
4.5	Conduit Hubs and Closure Plates	No Conduit Hubs and Closure Plates	N/A
4.6	Equipment Openings	No Openings on Unit	N/A
4.7	Drainage Openings	No Drain Openings	N/A
5	**DESIGN TESTS**		
5.1	General	See Table 5-1A to 5-1D and 5.1.5 in the General product information	P
5.2	Tests For Protection Against Access to Hazardous Parts	Rated 4X	N/A
5.3	Tests for Protection Against Ingress of Water (Dripping and Light Splashing)	Rated 4X	N/A
5.4	Tests for Protection Against Ingress of Water (Rain)	Rated 4X	N/A
5.5	Tests for Protection Against Ingress of Solid Foreign Objects (Setting Airborne Dust, Lint, Fibers, And Flings)	Non-vented (See clause 5.7)	N/A
5.6	External Icing Test	No external cavities to trap water when mounted in the normal position.	N/A
5.7	Tests for Protection Against Ingress of Water (Hosedown)	No entry of water See the test information	P
5.8	Indoor Corrosion Protection (Rust-Resistance Test (24-Hour Salt Spray Test))	See clause 3.5	N/E
5.9	Outdoor Corrosion Protection	See clause 3.5	N/E
5.10	Corrosion Protection-Type 3X, 3RX, 3SX, 4X Or 6P Enclosures	See clause 3.5	N/E

NEMA 250-2014			
Clause	Requirement + Test	Result - Remark	Verdict
5.11	Test for Protection Against Ingress of Water (Temporary Submersion)	Rated 4X	N/A
5.12	Test for Protection Against Ingress of Water (Prolonged Submersion)	Rated 4X	N/A
5.13	Oil Exclusion Test	Rated 4X	N/A
5.14	GASKET MATERIAL TESTS	The product itself(including gaskets) was conditioned at 70 ℃ for 168 hrs according to 5.14.3(Alternate Evaluation) before performing relevant required tests.	P
5.15	Test for Sharpness of Edges	No sharp edges	P

NEMA 250-2014			
Clause	Requirement + Test	Result - Remark	Verdict

Test Information

	Hose Down Test: Clause 5.7	**P**

Description of Test

The enclosure and its external mechanisms were subjected to a stream of water from a hose that has a 25.4 mm (1 in) inside diameter nozzle and delivers at least 240 L (65 gal) per minute.

The nozzle was held from 3.0 to 3.5 m (10 to 12 feet) from the enclosure, and the spray of water was directed at all points of potential water entry such as seams, joints, external operating mechanisms, and such. The nozzle was moved along each test point one time at a uniform rate of 6 mm/sec(1/4 in/sec).

Sample Dimension

Ø 250 mm by 785 mm, Ø 210 mm by 659.4 mm,

Ø 180 mm by 565.2 mm, Ø 165 mm by 518.1 mm,

Ø 63 mm by 197.82 mm, Ø 8.2*6 mm by 154.488 mm,

Ø 16 mm by 50.24 mm, Ø 25*2 mm by 157 mm

Test Duration = 185.23 secs

Acceptance conditions:

The enclosure shall be considered to have met the requirements if at the conclusion of the test no water has entered the enclosure

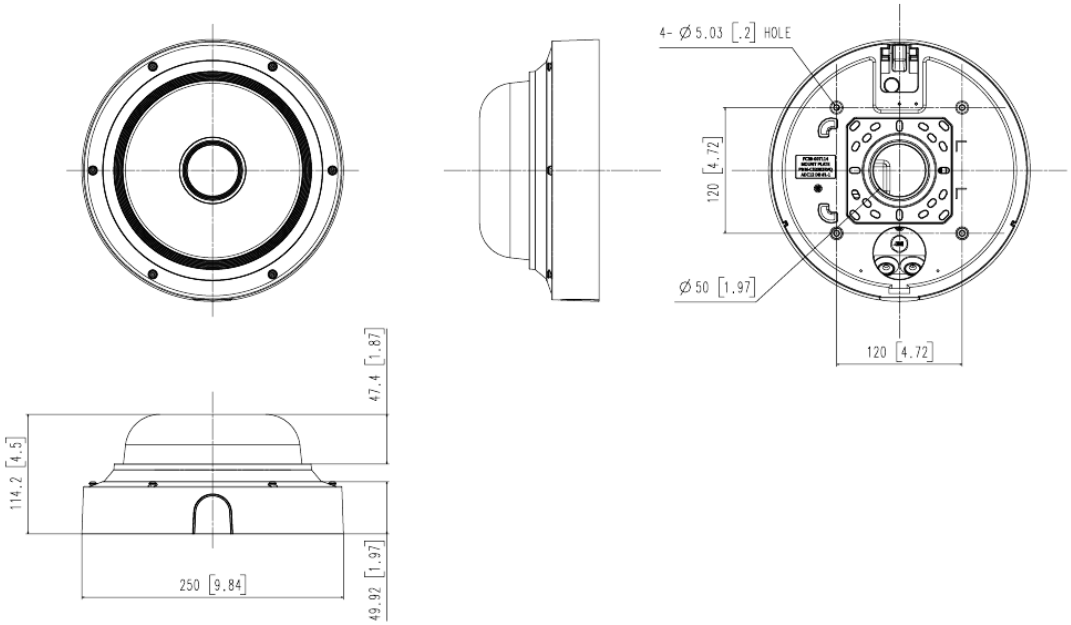
Test Results

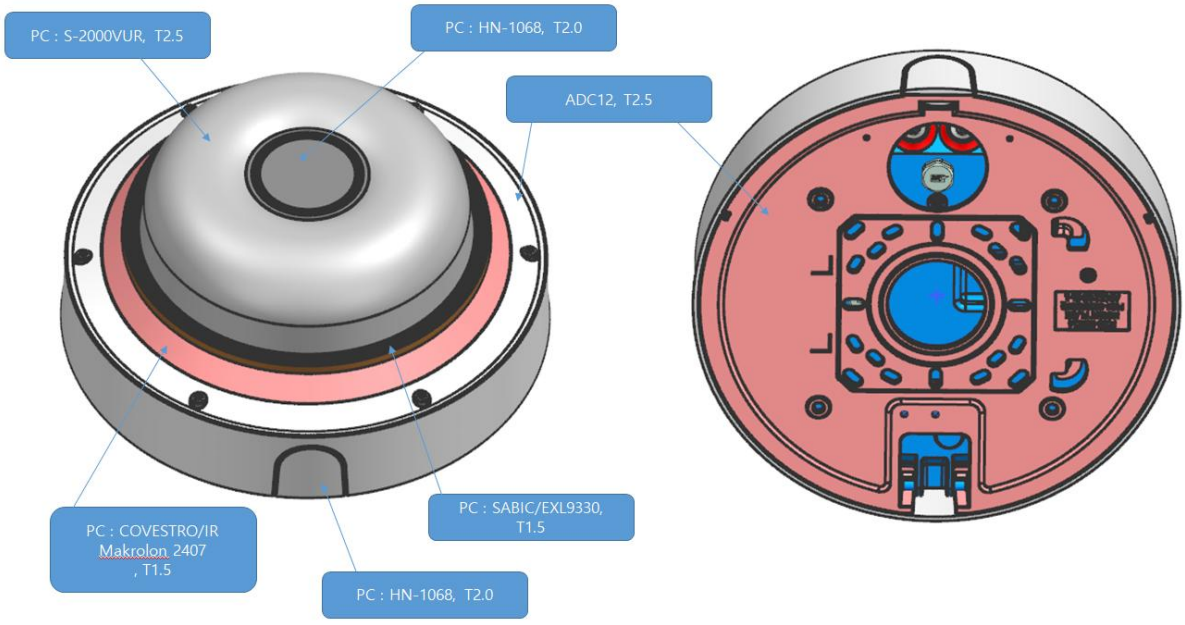
Sample No (Model)	Water Flow	Presence of water inside	Result
PNM-C32083RVQ	240 LPM	No	Pass

List of test equipment used:

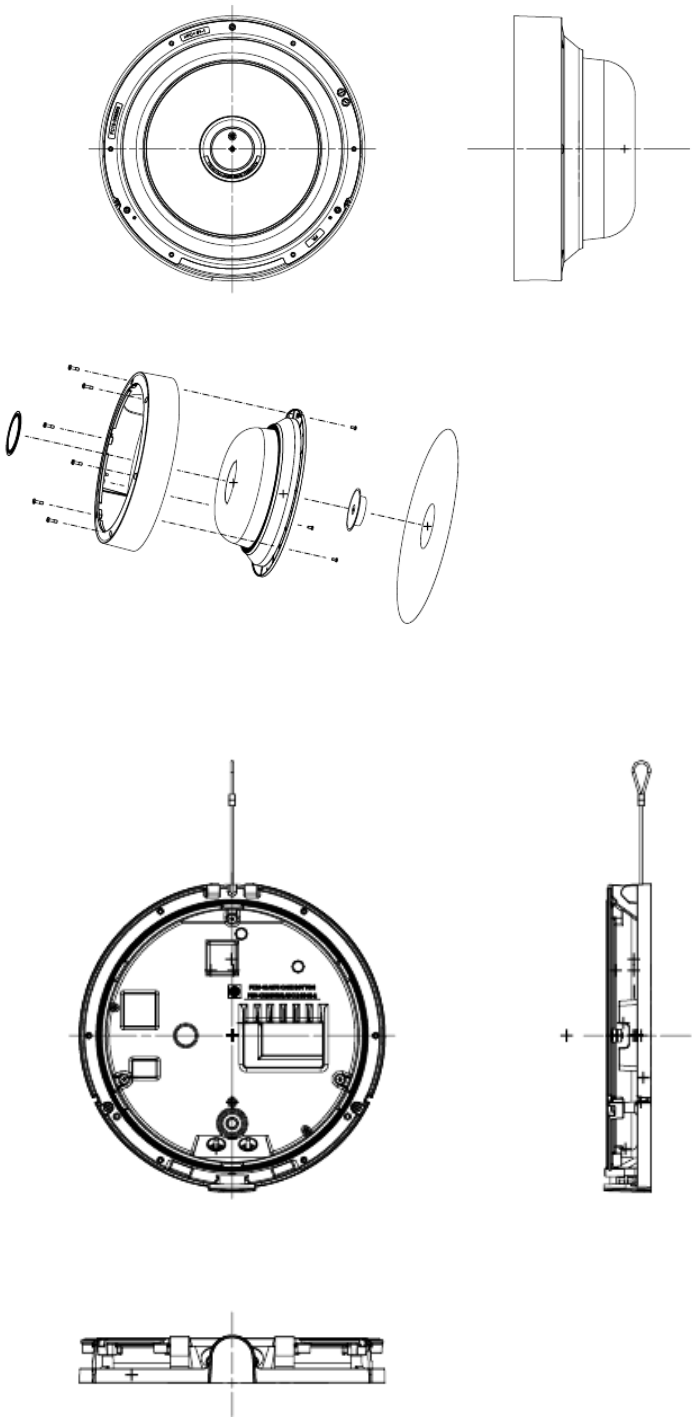
Instr. Code	Instrument Type	Range Used	Mfr./Model	Calibration Date	
				Last	Due
S3-IP18	25.4mm Nozzle	25.4 mm	CTK/S3-IP18	-	Checked by calliper below before using
S1-SW2	Stop Watch	0.01 s	CASIO/ NONE	2022-02-22	2024-02-21
C-S1-D09	Steel Measuring Tape	5 m	KOMELON/KMC-74N	2023-02-17	2024-11-14
S3-IP23	Water flow meter	250LPM	Nuri tech/ Z-6504	2024.01.19	2024.02.12
C-S1-D02	DIGITAL VERNIER CALIPER	150 mm	MITUTOYO/150 mm	2021-08-28	2023-08-09

Attachment 1 – Construction Diagram and installation method





Attachment 1 – Construction Diagram and installation method



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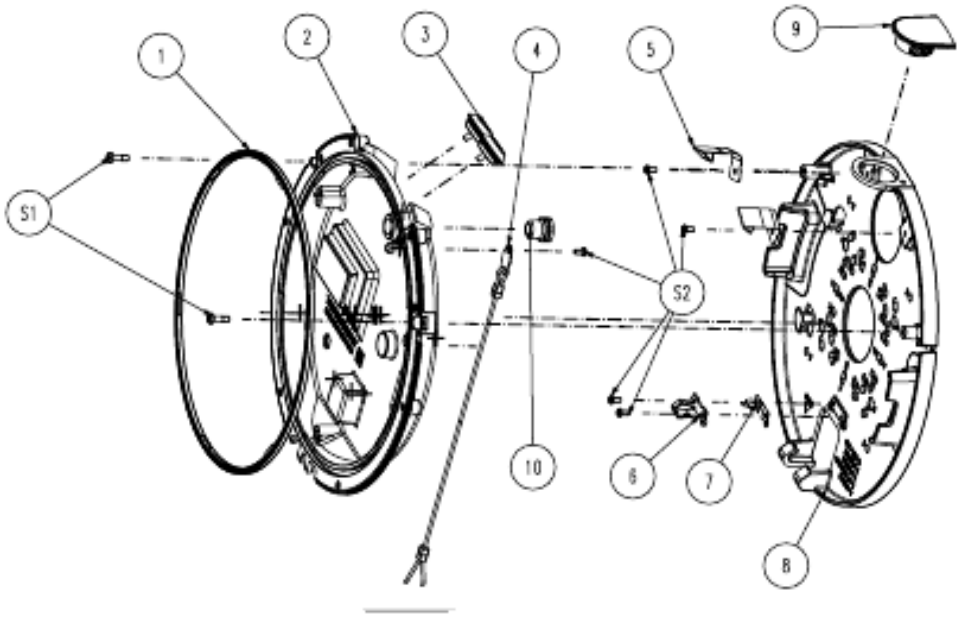

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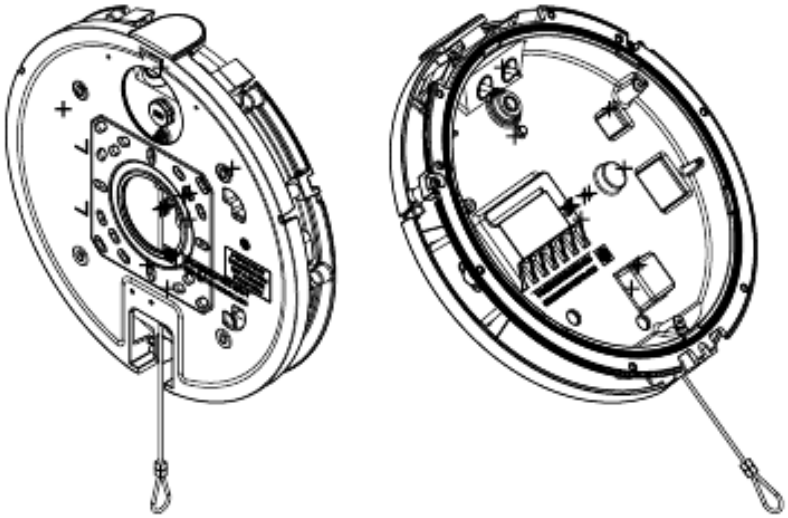

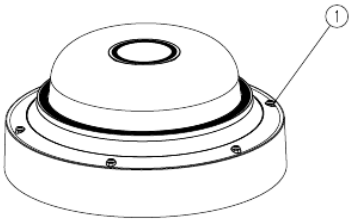

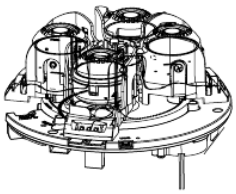

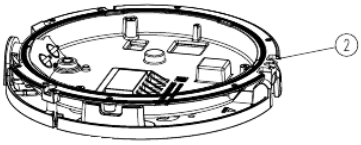

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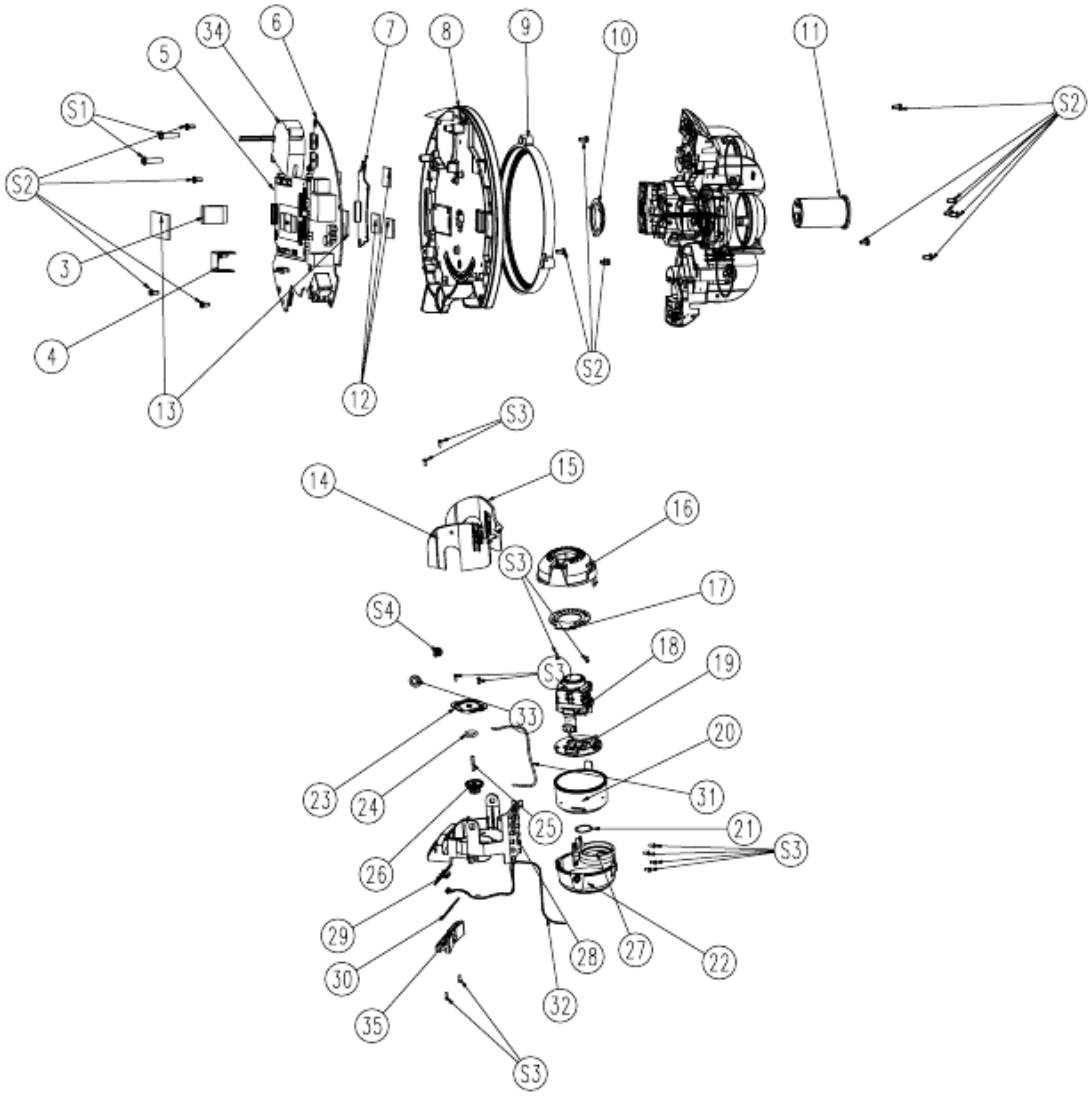


Attachment 2 – Parts List

PNM-C32083RVQ			
NO	품번	품명	수량
1	AM07-015435B	ASSY-CASE-TOP PNM32083RVQ_HANWHA	1
2	AM07-015437A	ASSY,CASE BOTTOM-32083RVQ	1
3	EP02-005207A	CABLE-PNM-C32083RVQ;MDI,15P,15P,80MM,0.4	1
4	EP02-005210A	CABLE-PNM-C32083RVQ;FFC,30-30P,55MM	1
5	AM06-010866B	ASSY,PCB-PNM-C32083RVQ_MAIN_8GNAND	1
6	AM06-010868A	ASSY,PCB-PNM-C32083RVQ_NETWORK	1
7	AM06-010871A	ASSY,PCB-PNM-C32083RVQ_USB_SD	1
8	FC39-006587A	FRAME-BODY 32083RVQ	1
9	MC11-006501A	GEAR PAN 32083RVQ	1
10	AM07-013341A	ASSY,COVER-SPRING-9084	1
11	MC19-003052A	SHAFT-PAN-9084	1
12	FC28-002488A	PAD_THERMAL_17*17*2	3
13	FC28-003406A	PAD_THERMAL_45*22*2_7.0	2
14	FC15-009821A	COVER_IR_RIGHT_PNM-C32083RVQ	4
15	FC15-009822A	COVER_IR_LEFT_PNM-C32083RVQ	4
16-1	FC15-008358A	COVER-FRONT-9083 CH1	1
16-2	FC15-008358B	COVER-FRONT-9083 CH2	1
16-3	FC15-008358C	COVER-FRONT-9083 CH3	1
16-4	FC15-008358D	COVER-FRONT-9083 CH4	1
17	AM06-010923A	ASSY,PCB-PNM-C34404RQPZ HEATER	4

Attachment 2 – Parts List

18	AM07-016518A	ASSY-LENS MODULE-SUB_CH1_PNM-C32083RVQ	4
19	AM06-010873A	ASSY,PCB-PNM-C32083RVQ_SENSOR	4
20	FC15-008360A	COVER-ROTATE-9083RVQ	4
21	Z6031007302A	WAVE WASHER M12(H3)	4
22	FC15-008359A	COVER-REAR-9083RVQ;MOLD	4
23	FC15-009357A	COVER GEAR 32083RVQ	4
24	FC18-005721A	O RING 11.7	4
25	FC18-000470A	PIN-ABF SENSOR GUIDE;SUS304BD,GUIDE PIN	4
26	MC11-004647A	GEAR,SPUR-COM-6085;MOLD	4
27	FC15-009355A	COVER-HOLDER-PAN-9083;MOLD	4
28	FC15-008361A	COVER-BASE-9083RVQ;MOLD	4
29	AM06-010879A	ASSY,PCB-PNM-C32083RVQ_IR	4
30	FC28-003613A	PAD THERMAL 32083RVQ	4
31	EP02-005228A	HARNESS-PNM_C32083RVQ;MCX,RED,40P-40P,18	4
32	EP02-005212A	HARNESS-PNM-C32083RVQ;IR,RED,2-2P,200MM,	4
33	FC18-005721A	O RING 11.7	1
34	EP07-000073A	FAN,ELECTRIC-BM4515-04W-B50-L02	1
35	FC30-007651A	PLATE-HEAT SINK	4
S1	FC18-005093A	SCREW-MACHINE:BH,+,M4,L16,WHT,FP	2
S2	Z9642306007	SCREW_MACHINE_M3, L6	12
S3	Z6003012201A	SCREW-TAPTITE:CH,+,M2,L5,WHT,B-TYPE	48
S4	FC18-004952A	SCREW,TAPTITE-M3;SPECIAL,0.5,8,N,3	4

Attachment 2 – Parts List

PNM-C16083RVQ			
NO	품번	품명	수량
1	AM07-015435B	ASSY-CASE-TOP PNM32083RVQ_HANWHA	1
2	AM07-015437A	ASSY,CASE BOTTOM-32083RVQ	1
3	EP02-005207A	CABLE-PNM-C32083RVQ;MDI,15P,15P,80MM,0.4	1
4	EP02-005210A	CABLE-PNM-C32083RVQ;FFC,30-30P,55MM	1
5	AM06-010866B	ASSY,PCB-PNM-C32083RVQ_MAIN_8GNAND	1
6	AM06-010868A	ASSY,PCB-PNM-C32083RVQ_NETWORK	1
7	AM06-010871A	ASSY,PCB-PNM-C32083RVQ_USB_SD	1
8	FC39-006587A	FRAME-BODY 32083RVQ	1
9	MC11-006501A	GEAR PAN 32083RVQ	1
10	AM07-013341A	ASSY,COVER-SPRING-9084	1
11	MC19-003052A	SHAFT-PAN-9084	1
12	FC28-002488A	PAD_THERMAL_17*17*2	3
13	FC28-003406A	PAD_THERMAL_45*22*2_7.0	2
14	FC15-009821A	COVER_IR_RIGHT_PNM-C32083RVQ	4
15	FC15-009822A	COVER_IR_LEFT_PNM-C32083RVQ	4
16-1	FC15-008358A	COVER-FRONT-9083 CH1	1
16-2	FC15-008358B	COVER-FRONT-9083 CH2	1
16-3	FC15-008358C	COVER-FRONT-9083 CH3	1
16-4	FC15-008358D	COVER-FRONT-9083 CH4	1
17	AM06-010923A	ASSY,PCB-PNM-C34404RQPZ HEATER	4
18	EP14-001214	LENS SET-YT0W1X55FB.ICR-8MP-V00;VF	4

Attachment 2 – Parts List

19	AM06-010875A	ASSY,PCB-PNM-C16083RVQ_SENSOR	4
20	FC15-008360A	COVER-ROTATE-9083RVQ	4
21	Z6031007302A	WAVE WASHER M12(H3)	4
22	FC15-008359A	COVER-REAR-9083RVQ;MOLD	4
23	FC15-009357A	COVER GEAR 32083RVQ	4
24	FC18-005721A	O RING 11.7	4
25	FC18-000470A	PIN-ABF SENSOR GUIDE;SUS304BD,GUIDE PIN	4
26	MC11-004647A	GEAR,SPUR-COM-6085;MOLD	4
27	FC15-009355A	COVER-HOLDER-PAN-9083;MOLD	4
28	FC15-008361A	COVER-BASE-9083RVQ;MOLD	4
29	AM06-010879A	ASSY,PCB-PNM-C32083RVQ_IR	4
30	FC28-003613A	PAD THERMAL 32083RVQ	4
31	EP02-005228A	HARNESS-PNM_C32083RVQ;MCX,RED,40P-40P,18	4
32	EP02-005212A	HARNESS-PNM-C32083RVQ;IR,RED,2-2P,200MM,	4
33	FC18-005721A	O RING 11.7	1
34	EP07-000073A	FAN,ELECTRIC-BM4515-04W-B50-L02	1
35	FC30-007651A	PLATE-HEAT SINK	4
S1	FC18-005093A	SCREW-MACHINE:BH,+,M4,L16,WHT,FP	2
S2	Z9642306007	SCREW_MACHINE_M3, L6	12
S3	Z6003012201A	SCREW-TAPTITE:CH,+,M2,L5,WHT,B-TYPE	48
S4	FC18-004952A	SCREW,TAPTITE-M3;SPECIAL,0.5,8,N,3	4

CTK Co., Ltd.
5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si,
Gyeonggi-do, Republic of Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Attachment 2 – Parts List

Component - Plastics

File Number: E207780

Electrical	Value	Test Method
Hot-wire Ignition (HWI)		UL 746
0.60 mm	PLC 3	
0.63 mm	PLC 3	
0.70 mm	PLC 3	
0.8 mm	PLC 3	
1.0 mm	PLC 3	
1.5 mm	PLC 2	
2.0 mm	PLC 2	
2.3 mm	PLC 2	
2.5 mm	PLC 2	
3.0 mm	PLC 1	
High Amp Arc Ignition (HAI)		UL 746
0.60 mm	PLC 1	
0.63 mm	PLC 1	
0.70 mm	PLC 1	
0.8 mm	PLC 1	
1.0 mm	PLC 1	
1.5 mm	PLC 1	
2.0 mm	PLC 1	
2.3 mm	PLC 0	
2.5 mm	PLC 0	
3.0 mm	PLC 0	
Comparative Tracking Index (CTI)	PLC 3	UL 746
Dielectric Strength	25 kV/mm	ASTM D149 IEC 60243-1
Inclined-Plane Tracking	1.5 kV	ASTM D2303
Volume Resistivity	1.0E+17 ohms·cm	ASTM D257 IEC 60093

Thermal	Value	Test Method
RTI Elec		UL 746
0.60 mm	80.0 °C	
0.63 mm	125 °C	
0.70 mm	125 °C	
0.8 mm	125 °C	
1.0 mm	125 °C	
1.5 mm	125 °C	
2.0 mm	125 °C	
2.3 mm	125 °C	
2.5 mm	125 °C	
3.0 mm	125 °C	
RTI Imp		UL 746
0.60 mm	80.0 °C	
0.63 mm	105 °C	
0.70 mm	105 °C	
0.8 mm	105 °C	
1.0 mm	105 °C	
1.5 mm	110 °C	
2.0 mm	110 °C	
2.3 mm	110 °C	
2.5 mm	110 °C	
3.0 mm	115 °C	

Form Number: E207780-228378

Report Date: 2002-08-15
Last Revised: 2018-06-26

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-

Attachment 2 – Parts List

Component - Plastics
File Number: E207780

Thermal	Value	Test Method
RTI Str		UL 746
0.60 mm	80.0 °C	
0.63 mm	115 °C	
0.70 mm	115 °C	
0.8 mm	115 °C	
1.0 mm	115 °C	
1.5 mm	120 °C	
2.0 mm	120 °C	
2.3 mm	120 °C	
2.5 mm	120 °C	
3.0 mm	125 °C	
Physical	**Value**	**Test Method**
Dimensional Stability	0.0 %	ASTM D1042 ISO 2796
Outdoor Suitability	f1	UL 746C

Page 3 of 3
Form Number: E207780-228378

Report Date: 2002-08-15
Last Revised: 2018-06-26

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Attachment 2 – Parts List

Component - Plastics
File Number: E115797

LOTTE CHEMICAL CORPORATION
56 GOSAN-RO
UIWANG-SI, GYEONGGI-DO 16073 Republic of Korea

INFINO: HN-1068(+)(f1)

Polycarbonate (PC), pellets

(+) - May be replaced by one, two, or three numbers and/or letter(s)
(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

Flammability	Value	Test Method
Flame Rating		UL 94 IEC 60695-11-10, -20
1.5 mm, ALL	V-0	
3.0 mm, ALL	V-0	
Glow Wire Flammability Index		IEC 60695-2-12
1.5 mm	960 °C	
3.0 mm	960 °C	
Glow Wire Ignition Temperature		IEC 60695-2-13
1.5 mm	825 °C	
3.0 mm	825 °C	
Electrical	**Value**	**Test Method**
Hot-wire Ignition (HWI) (1.5 mm)	PLC 3	UL 746
High Amp Arc Ignition (HAI) (1.5 mm)	PLC 3	UL 746
Comparative Tracking Index (CTI)	PLC 3	UL 746
Dielectric Strength	32 kV/mm	ASTM D149 IEC 60243-1
Volume Resistivity	1.0E+17 ohms·cm	ASTM D257 IEC 60093
Thermal	**Value**	**Test Method**
RTI Elec		UL 746
1.5 mm	130 °C	
3.0 mm	130 °C	
RTI Imp		UL 746
1.5 mm	130 °C	
3.0 mm	130 °C	
RTI Str		UL 746
1.5 mm	130 °C	
3.0 mm	130 °C	
Ball Pressure Test (130°C, 3.00 mm)	Pass	IEC 60695-10-2
Physical	**Value**	**Test Method**
Outdoor Suitability	f1	UL 746C

Page 1 of 1
Form Number: E115797-103587012

Report Date: 1998-08-24
Last Revised: 2019-08-27

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Attachment 2 – Parts List

组件 - 塑料

UL 档案号: E41613

Covestro Deutschland AG [PC Resins]
Chempark, Gebaeude B207, Leverkusen 51368 DE

Makrolon: 2405 + (z)

Polycarbonate (PC), pellets

(z) - Material designation and color code may be followed by up to three letters and/or three numbers (does not include grades which are separately recognized with above material designation and suffix)
+ - Material designations may be followed by a six digit numerical code denoting color.

可燃性	值	测试方法
UL 阻燃等级		
2.7 mm, ALL	HB	UL 94
3.0 mm, ALL	HB	UL 94
6.0 mm, ALL	HB	UL 94
0.36 mm, ALL	V-2	UL 94 IEC 60695-11-10, -20
0.75 mm, ALL	V-2	UL 94 IEC 60695-11-10, -20
1.5 到 2.6 mm, ALL	V-2	UL 94 IEC 60695-11-10, -20
3.0 mm, ALL	HB40	IEC 60695-11-10, -20
6.0 mm, ALL	HB40	IEC 60695-11-10, -20
2.7 mm, ALL	HB75	IEC 60695-11-10, -20
电气性能	**值**	**测试方法**
热丝引燃 (HWI)		UL 746
0.36 mm	PLC 4	
0.75 mm	PLC 3	
1.5 到 2.6 mm	PLC 2	
2.7 mm	PLC 2	
3.0 mm	PLC 2	
6.0 mm	PLC 0	
高电弧燃烧指数(HAI)		UL 746
0.36 mm	PLC 0	
0.75 mm	PLC 0	
1.5 到 2.6 mm	PLC 0	
2.7 mm	PLC 0	
3.0 mm	PLC 0	
6.0 mm	PLC 0	
相比耐漏电起痕指数(CTI)	PLC 2	UL 746
介电强度	25 kV/mm	ASTM D149 IEC 60243-1
高电压电弧起痕速率 (HVTR)	PLC 0	UL 746
体积电阻率	1.0E+15 ohms-cm	ASTM D257 IEC 60093
耐电弧性	PLC 5	ASTM D495

Page 1 / 2
Form Number: E41613-10044688

Report Date: 8/22/1969
Last Revised: 2015-09-21

ANSI/UL 94 小规模测试数据与建筑材料、家具和有关内容不相关。ANSI/UL 94 小规模测试数据仅用于确定成品设备和装置的组件和部件中所用塑料材料的易燃性，其中组合的可接受性由 UL 确定。

Attachment 2 – Parts List

组件 - 塑料
UL 档案号: E41613

热性能	值	测试方法
RTI Elec		UL 746
0.36 mm	125 °C	
0.75 mm	125 °C	
1.5 到 2.6 mm	125 °C	
2.7 mm	125 °C	
3.0 mm	125 °C	
6.0 mm	125 °C	
RTI Imp		UL 746
0.36 mm	115 °C	
0.75 mm	115 °C	
1.5 到 2.6 mm	115 °C	
2.7 mm	115 °C	
3.0 mm	115 °C	
6.0 mm	115 °C	
RTI		UL 746
0.36 mm	125 °C	
0.75 mm	125 °C	
1.5 到 2.6 mm	125 °C	
2.7 mm	125 °C	
3.0 mm	125 °C	
6.0 mm	125 °C	
物理性能	值	测试方法
Dimensional Stability	0.0 %	ASTM D1042 ISO 2796

ANSI/UL 94 小规模测试数据与建筑材料、家具和有关内容不相关。ANSI/UL 94 小规模测试数据仅用于确定成品设备和装置的组件和部件中所用塑料材料的易燃性，其中组合的可接受性由 UL 确定。

CTK Co., Ltd.
5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Attachment 2 – Parts List

Iupilon® S-2000

Polycarbonate

Mitsubishi Engineering-Plastics Corp

PROSPECTOR®
www.ulprospector.com

Technical Data

Product Description

Iupilon® S-2000 is a Polycarbonate (PC) material. It is available in Asia Pacific, Europe, or North America for injection molding. Primary attribute of Iupilon® S-2000: Medium Viscosity.

Typical application of Iupilon® S-2000: Automotive

General			
Material Status	• Commercial: Active		
Literature [1]	• Technical Datasheet (English)		
UL Yellow Card [2]	• E41179-231969		
Search for UL Yellow Card	• Mitsubishi Engineering-Plastics Corp • Iupilon®		
Availability	• Asia Pacific	• Europe	• North America
Features	• Medium Viscosity		
Forms	• Pellets		
Processing Method	• Injection Molding		

Physical	Nominal Value	Unit	Test Method
Density	1.20	g/cm³	ISO 1183
Melt Mass-Flow Rate (MFR) (300°C/1.2 kg)	10	g/10 min	ISO 1133
Melt Volume-Flow Rate (MVR) (300°C/1.2 kg)	9.00	cm³/10min	ISO 1133
Molding Shrinkage			
Across Flow : 3.20 mm	0.50 to 0.70	%	
Flow : 3.20 mm	0.50 to 0.70	%	
Water Absorption (Saturation, 23°C)	0.24	%	ISO 62
Mechanical	**Nominal Value**	**Unit**	**Test Method**
Tensile Modulus	2400	MPa	ISO 527-2
Tensile Stress (Yield)	61.0	MPa	ISO 527-2
Tensile Strain (Yield)	5.6	%	ISO 527-2
Nominal Tensile Strain at Break	110	%	ISO 527-2
Flexural Modulus	2300	MPa	ISO 178
Flexural Stress	93.0	MPa	ISO 178
Impact	**Nominal Value**	**Unit**	**Test Method**
Charpy Notched Impact Strength (23°C)	76	kJ/m²	ISO 179
Charpy Unnotched Impact Strength (23°C)	No Break		ISO 179
Thermal	**Nominal Value**	**Unit**	**Test Method**
Heat Deflection Temperature			
0.45 MPa, Unannealed	143	°C	ISO 75-2/B
1.8 MPa, Unannealed	129	°C	ISO 75-2/A
CLTE			ISO 11359-2
Flow	6.5E-5	cm/cm/°C	
Transverse	6.6E-5	cm/cm/°C	
Electrical	**Nominal Value**	**Unit**	**Test Method**
Surface Resistivity	6.0E+15	ohms	IEC 60093
Volume Resistivity	3.0E+16	ohms·cm	IEC 60093
Electric Strength			IEC 60243-1
1.00 mm	31	kV/mm	
3.00 mm	18	kV/mm	
Relative Permittivity			IEC 60250
100 Hz	3.10		
1 MHz	3.10		

Form No. TDS-10540-en
Document Created: Wednesday, September 28, 2016
Added to Prospector: November 2000
Last Updated: 4/1/2014

Attachment 2 – Parts List

Iupilon® S-2000
Polycarbonate
Mitsubishi Engineering-Plastics Corp

PROSPECTOR®
www.ulprospector.com

Electrical	Nominal Value	Unit	Test Method
Dissipation Factor			IEC 60250
100 Hz	6.0E-4		
1 MHz	9.0E-3		
Comparative Tracking Index (CTI)	PLC 2		UL 746

Additional Information

S-2000V(R): V-2
S-2000R: Mold Release
S-2000U(R): UV Stabilized
S-2001(R): FDA compliant

Injection	Nominal Value	Unit
Drying Temperature	120	°C
Drying Time	4.0 to 8.0	hr
Rear Temperature	260 to 280	°C
Middle Temperature	270 to 290	°C
Front Temperature	270 to 300	°C
Nozzle Temperature	270 to 300	°C
Mold Temperature	70 to 100	°C
Injection Pressure	50.0 to 150	MPa
Screw Speed	50 to 100	rpm

Notes

[1] These links provide you with access to supplier literature. We work hard to keep them up to date; however you may find the most current literature from the supplier.

[2] A UL Yellow Card contains UL-verified flammability and electrical characteristics. UL Prospector continually works to link Yellow Cards to individual plastic materials in Prospector, however this list may not include all of the appropriate links. It is important that you verify the association between these Yellow Cards and the plastic material found in Prospector. For a complete listing of Yellow Cards, visit the UL Yellow Card Search.

[3] Typical properties: these are not to be construed as specifications.

Attachment 2 – Parts List

Iupilon® S-2000
Polycarbonate
Mitsubishi Engineering-Plastics Corp

PROSPECTOR®
www.ulprospector.com

Where to Buy

Supplier

Mitsubishi Engineering-Plastics Corp
, Japan
Telephone: +81-463-21-8610
Web: http://www.m-ep.co.jp/

Distributor

Amco Polymers
Telephone: 800-262-6685
Web: http://www.amcopolymers.com/
Availability: North America

Chase Plastic Services, Inc.
Chase Plastics Services is a North American distributor with representatives throughout the region. Please find your rep here: http://www.chaseplastics.com/contact/locations
Telephone: 800-232-4273
Web: http://www.chaseplastics.com/
Availability: North America

EnCom, Inc.
Telephone: 866-481-7700
Web: http://www.encompolymers.com/
Availability: North America

M. Holland Canada Company
Telephone: 905-665-1168
Web: http://www.mholland.com/
Availability: Canada

M. Holland Company
Telephone: 855-497-1403
Web: http://www.mholland.com/
Availability: Mexico, United States

Plastribution
Telephone: +44-845-345-4560
Web: http://www.plastribution.co.uk/
Availability: United Kingdom

The Materials Group
Telephone: 616-863-6046
Web: http://thematerialsgroup.com/
Availability: North America

Form No. TDS-10540-en
Document Created: Wednesday, September 28, 2016
Added to Prospector: November 2000
Last Updated: 4/1/2014

CTK Co., Ltd.
5 Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si,
Gyeonggi-do, Republic of Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Attachment 2 – Parts List

Component - Plastics

File Number: E41613

COVESTRO DEUTSCHLAND AG [PC RESINS]
Chempark
Gebaeude B207
Leverkusen, 51368 Germany

Makrolon: 2407 + (z)(f1)

Polycarbonate (PC), pellets

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.
(z) - Material designation and color code may be followed by up to three letters and/or three numbers (does not include grades which are separately recognized with above material designation and suffix)
+ - Material designations may be followed by a six digit numerical code denoting color.

Flammability	Value	Test Method
Flame Rating		
2.7 mm, ALL	HB	UL 94
3.0 mm, ALL	HB	UL 94
6.0 mm, ALL	HB	UL 94
0.75 mm, ALL	V-2	UL 94 IEC 60695-11-10, -20
1.5 to 2.6 mm, ALL	V-2	UL 94 IEC 60695-11-10, -20
3.0 mm, ALL	HB40	IEC 60695-11-10, -20
6.0 mm, ALL	HB40	IEC 60695-11-10, -20
2.7 mm, ALL	HB75	IEC 60695-11-10, -20
Electrical	**Value**	**Test Method**
Hot-wire Ignition (HWI)		UL 746A
1.5 to 2.6 mm	PLC 3	
2.7 mm	PLC 3	
3.0 mm	PLC 2	
6.0 mm	PLC 0	
High Amp Arc Ignition (HAI)		UL 746A
1.5 to 2.6 mm	PLC 0	
2.7 mm	PLC 0	
3.0 mm	PLC 0	
6.0 mm	PLC 0	
Comparative Tracking Index (CTI)	PLC 2	UL 746A
Dielectric Strength	25 kV/mm	ASTM D149
High Voltage Arc Tracking Rate (HVTR)	PLC 0	UL 746A
Volume Resistivity	1.0E+15 ohms·cm	ASTM D257 IEC 60093
Arc Resistance	PLC 5	ASTM D495
Thermal	**Value**	**Test Method**
RTI Elec		UL 746B
0.75 mm	125 °C	
1.5 to 2.6 mm	125 °C	
2.7 mm	125 °C	
3.0 mm	125 °C	
6.0 mm	125 °C	

Form Number: E41613-103595616

Report Date: 8/22/1969
Last Revised: 1/30/2018 3:10:01 PM

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Attachment 2 – Parts List

Component - Plastics

File Number: E41613

Thermal	Value	Test Method
RTI Imp		UL 746B
0.75 mm	115 °C	
1.5 to 2.6 mm	115 °C	
2.7 mm	115 °C	
3.0 mm	115 °C	
6.0 mm	115 °C	
RTI Str		UL 746B
0.75 mm	125 °C	
1.5 to 2.6 mm	125 °C	
2.7 mm	125 °C	
3.0 mm	125 °C	
6.0 mm	125 °C	
Physical	**Value**	**Test Method**
Dimensional Stability	0.0 %	ASTM D1042 ISO 2796
Outdoor Suitability	f1	UL 746C

Form Number: E41613-103595616
Report Date: 8/22/1969
Last Revised: 1/30/2018 3:10:01 PM

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Attachment 2 – Parts List

Component - Plastics
File Number: E41179

MITSUBISHI ENGINEERING-PLASTICS CORP
ENVIRONMENT & QUALITY ASSURANCE DEPT
SHIODOME SUMITOMO-BLDG 25TH FL
1-9-2 HIGASHI-SHINBASHI
MINATO-KU, TOKYO 105-0021 Japan

S-2000V+(f1), S-2001V+(f1), S-2003V+(f1)

Polycarbonate (PC), pellets, unreinforced

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

+ - Suffix optional, exceptions: The following cannot be used as optional suffixes: "NF" for grade NXG5050, "N" for grade NXG5030, "N" for grade MB2112+, "S1" for grade F20-54, "V" for grades S-2000+(f1), S-2001+(f1), S-2003+(f1), the last letter "L" for grade CFH2520+, "W" for ELV2010 included in Grade ELV20(a5)+.

Flammability	Value	Test Method
Flame Rating		UL 94 IEC 60695-11-10, -20
0.38 mm, ALL	V-2	
1.5 mm, ALL	V-2	
3.0 mm, ALL	V-2	
Electrical	**Value**	**Test Method**
Hot-wire Ignition (HWI)		UL 746A
1.5 mm	PLC 3	
3.0 mm	PLC 3	
High Amp Arc Ignition (HAI)		UL 746A
1.5 mm	PLC 0	
3.0 mm	PLC 0	
Comparative Tracking Index (CTI)	PLC 2	UL 746A
Dielectric Strength	20 kV/mm	ASTM D149
High Voltage Arc Tracking Rate (HVTR)	PLC 0	UL 746A
Volume Resistivity	1.0E+7 ohms·cm	ASTM D257 IEC 60093
Arc Resistance	PLC 5	ASTM D495
Thermal	**Value**	**Test Method**
RTI Elec		UL 746B
0.38 mm	80.0 °C	
1.5 mm	125 °C	
3.0 mm	125 °C	
RTI Imp		UL 746B
0.38 mm	80.0 °C	
1.5 mm	115 °C	
3.0 mm	115 °C	
RTI Str		UL 746B
0.38 mm	80.0 °C	
1.5 mm	125 °C	
3.0 mm	125 °C	
Physical	**Value**	**Test Method**
Dimensional Stability	0.0 %	ASTM D1042 ISO 2796
Outdoor Suitability	f1	UL 746C

Page 1 of 1

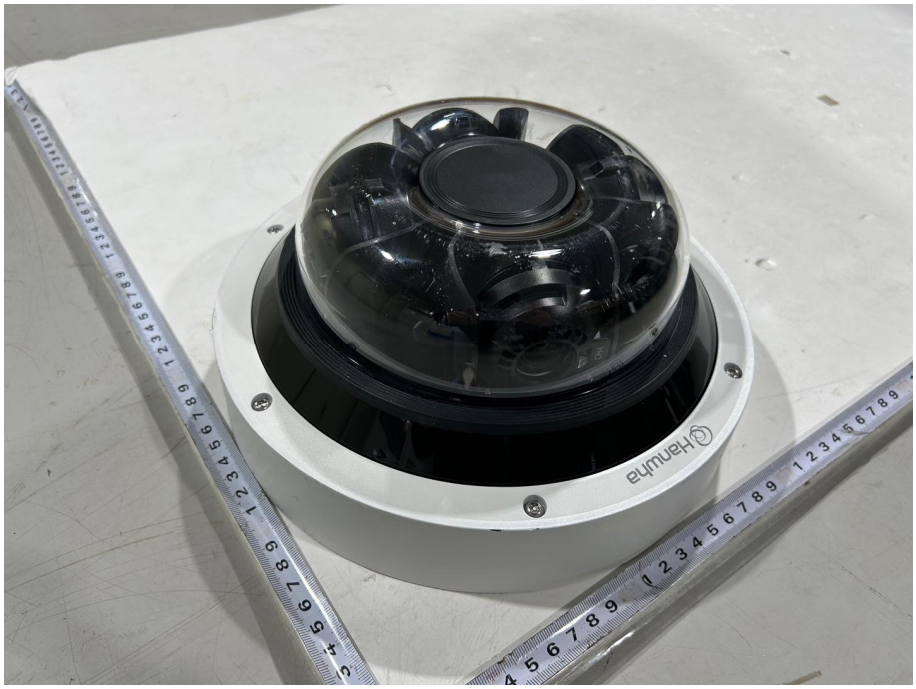
Form Number: E41179-231970

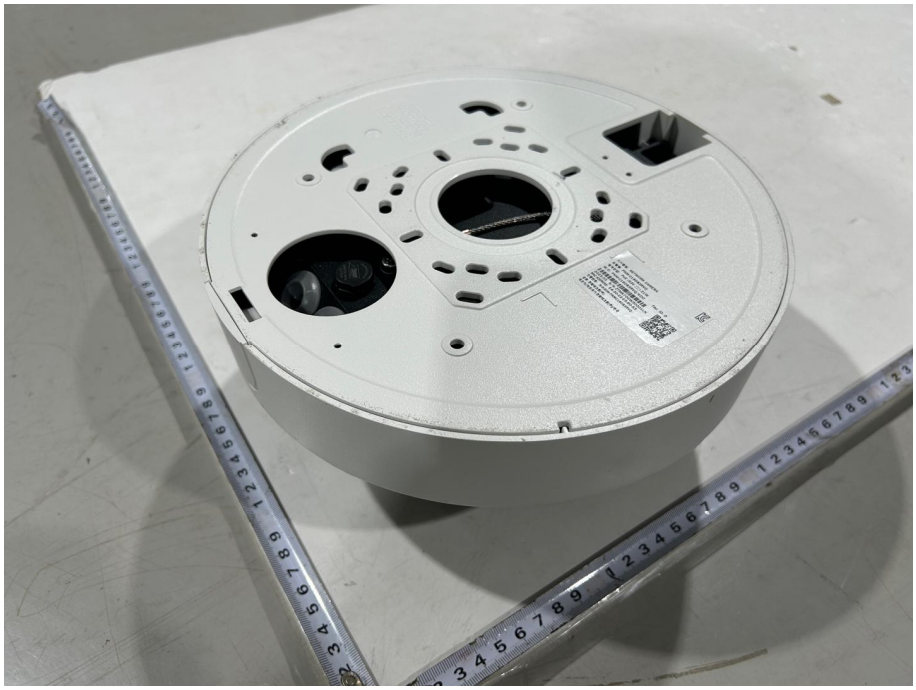
Report Date: 10/1/1992
Last Revised: 6/7/2021 1:56:30 AM

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Attachment 3 – Photographs

Test Unit



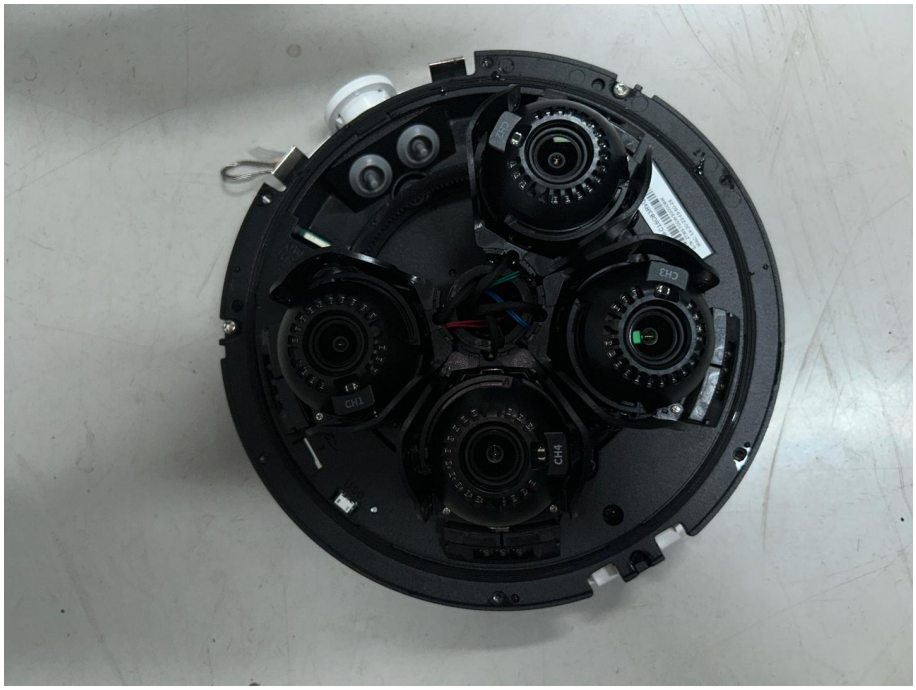


Attachment 3 – Photographs

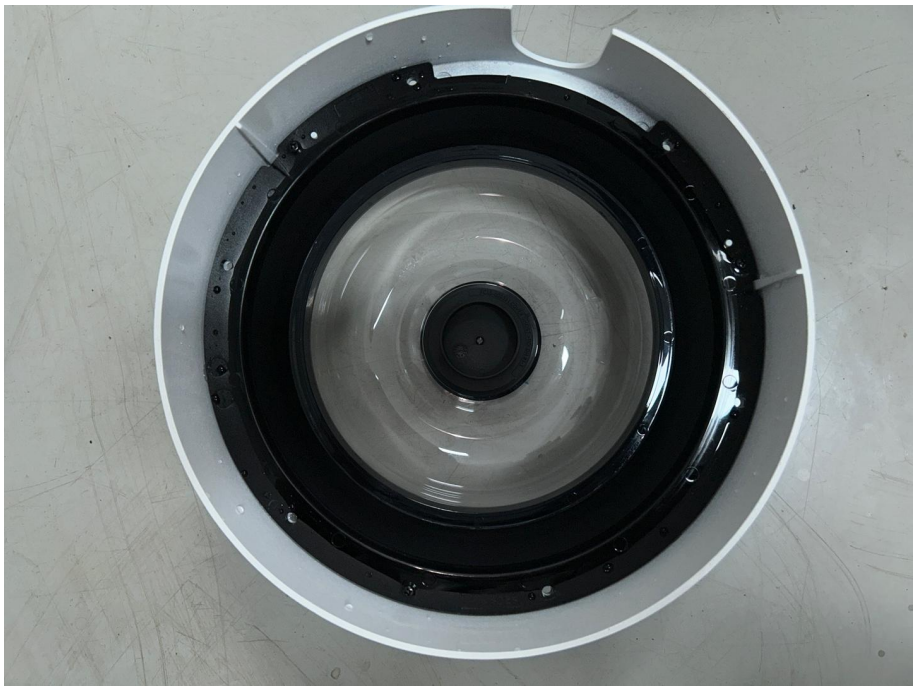
Hose down test

Attachment 3 – Photographs

Test Result



Attachment 3 – Photographs



-END-