



AUTOMOTIVE MANUFACTURERS EQUIPMENT
COMPLIANCE AGENCY, INC.

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Notification Number: 231376

Test Report Date: June 16, 2023

Expiration Date: July 1, 2026

Applicant: Morimoto Lighting
2281 Defoor Hills Rd.
Atlanta GA 30318

Item: "LF-965M (Or LF-965C)" - Combination Headlamp and Parking Lamp - White In Color

Use: On 1989-1994~ Model Years Porsche 964/911 Motor Vehicles

Jurisdictional Compliance Standard(S)

Identical To: United States FMVSS 571.108

Markings	
Lens	Housing
Morimoto (Morimoto Logo) DOT SAE HI/HL P 23	LF-965M (Or LF-965C) 12V

Light Source: Parking Lamp: 4 LED's, 12.8V
Headlamp: 9 LED's, 12.8V

Test Lab: Zhejiang ATTC Automobile
Technology Service Co., Ltd.

Report Number: AT23XX1D79241


Executive Director



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Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

COMPLIANCE TEST REPORT

ACCORDING TO U.S. FMVSS 108

COVER PAGE



Subjects: Front Group Lamp(Headlamp, Parking Lamp)

Reference standard: FMVSS 571.108

Report number: AT23XX1D79241, Date: June 16, 2023

TEST DETAILS

APPLICANT'S NAME : Morimoto Lighting
ADDRESS : 2281 Defoor Hills Rd Atlanta GA 30318, United States

NO. OF DEVICES TESTED : -----
PART NUMBER : LF965M/LF965C
DESCRIPTION : GROUPED(Upper/Lower Beam, Parking Lamp)
LIGHT SOURCE : LED

TEST LABORATORY : Zhejiang ATTC Automobile Technology Service Co., Ltd.
TEST PLACE : Building 3, Essence Adream of Space, No.350, Jinghua Road,
Hi-tech Zone, Ningbo City, Zhejiang Province, P.R. China
TEST DATE: : May 16, 2023 – June 19, 2023



SUMMARY

TEST DESCRIPTION	TEST RESULTS		REMARKS
	NUMBER PASSED	NUMBER FAILED	
PHYSICAL INSPECTION	2	-	
PHOTOMETRIC TEST	2	-	
COLOR TEST	2	-	
CORROSION TEST	1	-	S10.14.7.1
TEMPERATURE CYCLE TEST	1	-	
VIBRATION TEST	1	-	
INWARD FORCE TEST	N/A	N/A	
HEADLAMP CONNECTOR TEST	1	-	
AIMING ADJUSTMENT TEST	N/A	N/A	
CORROSION CONNECTOR TEST	1	-	S10.14.7.2
DUST TEST	1	-	
HUMIDITY TEST	1	-	
ABRASION TEST	1	-	S10.14.7.3
CHEMICAL RESISTANCE TEST	5	-	S10.14.7.4
INTERNAL HEAT TEST	1	-	S10.14.7.5
CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST	N/A	N/A	S10.14.7.6
CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST	N/A	N/A	
TORQUE DEFLECTION TEST	N/A	N/A	S10.14.7.7
PLASTIC OPTICAL MATERIAL TEST	Not test*	-	S10.14.7.8

REMARKS:

*: Plastic optical material test is not carried out for this application because the applicant used the material already listed in "AMECA-List-of-Acceptable-Plastics-for-Optical-Lenses-and-Reflex-Reflectors-March-10-2023"

NAME AND SIGNATURE : Zhang Xiaoning

张小平

TITLE : Test Engineer

DATE : June 19, 2023



Subjects: Front Group Lamp(Headlamp, Parking Lamp)

Reference standard: FMVSS 571.108

Report number: AT23XX1D79241, Date: June 16, 2023

SECTION 1) PHYSICAL INSPECTION

TEST COMPONENT : LF965M/LF965C

MANUFACTURED BY : Zhejiang Hongguan Lighting Technology Co., Ltd.

MARKINGS

- LENS : MORIMOTO (logo), "DOT SAE HI/HL P 23 VOR",
Optical axis marking
- HOUSING : "LF965M or LF965C" , "LOW BEAM: 12V 45W",
"HIGH BEAM: 12V 55W", "PARKING: 12V 2.9W"

LENS

- MATERIAL : Bayer Material Science Makrolon 2407 Polycarbonate
Clear #
 - COATING : UVT610V2
 - METHOD OF : Glue
- MOUNTING TO HOUSING

HOUSING

- MATERIAL : PPT20
 - METHOD OF : Screw
- MOUNTING TO VEHICLE
- GASKET : None

LIGHT SOURCE USED:

FUNCTION	QTY	TRADE NO.	RATE VOLTAGE
LOWER/UPPER BEAM	9 PCS*	LED	12V
Parking Lamp	4 PCS	LED	12V

NOTES: Lower/Upper beam use the same light sources, the beam switch is controlled by solenoid valve.

INSPECTION PERFORMED BY: Cao Wei

DATE: May 16, 2023



SECTION 2) COLOR OF LIGHT

TEST COMPONENT : Upper/Lower beam

COLOR REQUIREMENT : WHITE (CIE 1931)

the color of light emitted must fall within the following boundaries:

$x = 0.31$ (blue boundary)

$y = 0.44$ (green boundary)

$x = 0.50$ (yellow boundary)

$y = 0.15 + 0.64x$ (green boundary)

$y = 0.38$ (red boundary)

$y = 0.05 + 0.75x$ (purple boundary)

TEST METHOD : TRISTIMULOUS

TEST PERFORMED BY : Cao Wei

DATE : May 16, 2023

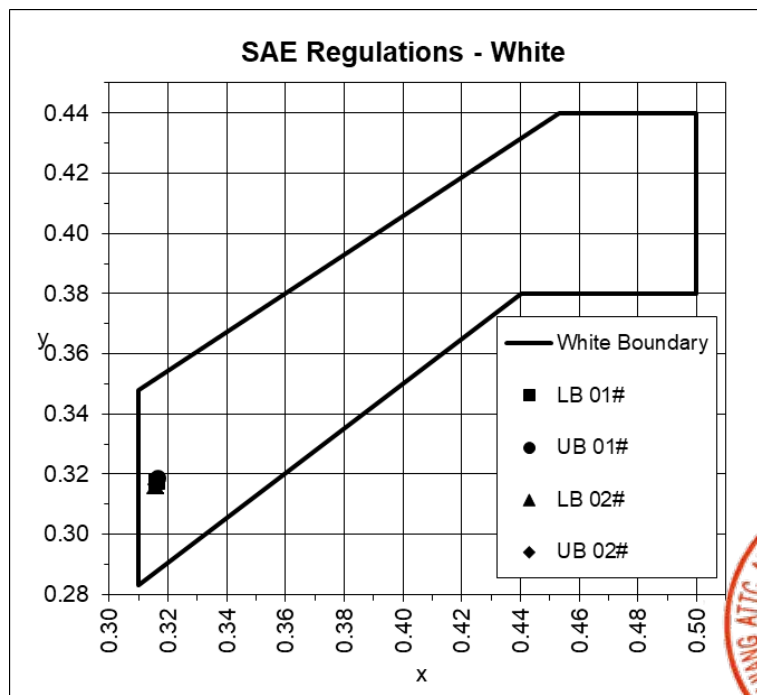
LAMP VOLTAGE/CURRENT : 12.8V

TEST DISTANCE : 3.236 m

LAMP POSITION : Lower Beam at 2D/V, Upper Beam at HV

RESULTS :

HV point	Coordinate x	Coordinate y
LB 01#	0.3162	0.3176
UB 01#	0.3167	0.3187
LB 02#	0.3158	0.3160
UB 02#	0.3162	0.3166



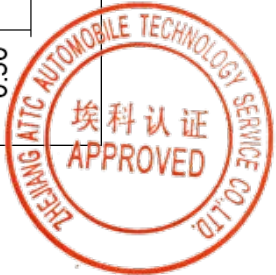
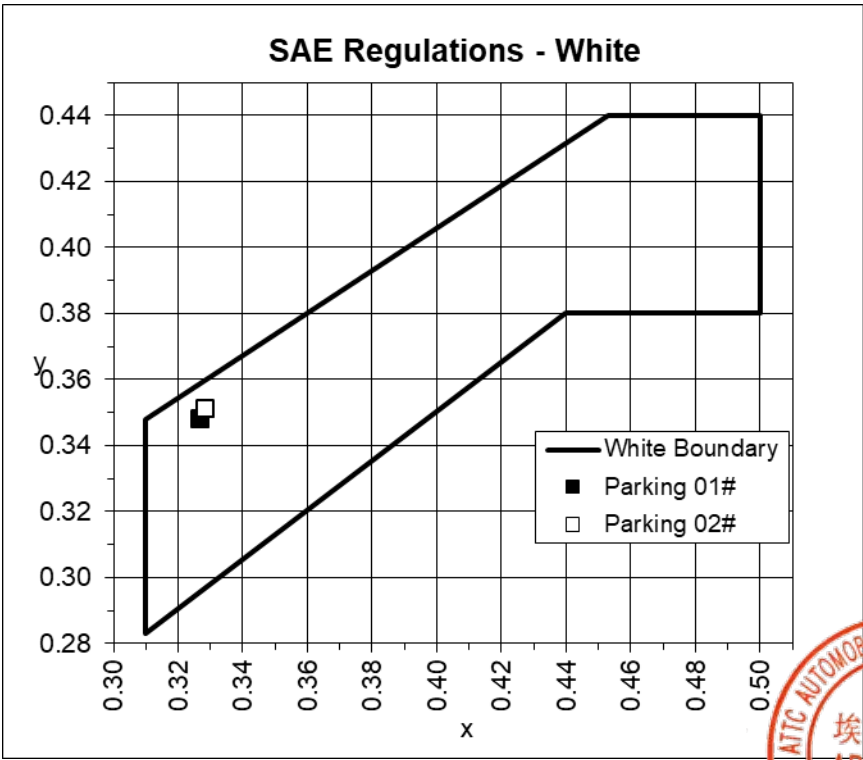
TEST COMPONENT : Parking lamp
 COLOR REQUIREMENT : WHITE (CIE 1931)
 the color of light emitted must fall within the following boundaries:
 $x = 0.31$ (blue boundary)
 $y = 0.44$ (green boundary)
 $x = 0.50$ (yellow boundary)
 $y = 0.15 + 0.64x$ (green boundary)
 $y = 0.38$ (red boundary)
 $y = 0.05 + 0.75x$ (purple boundary)

TEST METHOD : TRISTIMULOUS
 TEST PERFORMED BY : Cao Wei
 DATE : May 16, 2023

LAMP VOLTAGE : 12.8V
 TEST DISTANCE : 3.236m
 LAMP POSITION : HV

RESULTS :

HV point	Coordinate x	Coordinate y
Parking 01#	0.3267	0.3482
Parking 02#	0.3283	0.3513



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SECTION 3) MOUNTING LOCATION/HEIGHT

Vehicle check item, not measured during component testing.

SECTION 4) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirements

SECTION 5) VISIBILITY

No requirements



SECTION 6) MARKINGS

DOT marking

The lens of each original equipment and replacement headlamp, and of each original equipment and replacement beam contributor, and each replacement headlamp lens for an integral beam or replaceable bulb headlamp, must be marked with the symbol “**DOT**” either horizontally or vertically to indicate certification under 49 U.S.C. 30115.

Trademark

The lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor must be marked with **the name and/or trademark** registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

Voltage and trade number

Each original and replacement equipment headlamp, and each original and replacement equipment beam contributor must be marked with its **voltage and with its part or trade number**.

Light source(s)

The lens of each replaceable bulb headlamp must bear permanent marking in front of each replaceable light source with which it is equipped that states either: The HB Type, if the light source conforms to S11 of FMVSS No. 108 for filament light sources, or the bulb marking/designation provided in compliance with Section VIII of Appendix A of part 564 (if the light source conforms to S11 of FMVSS No. 108 for discharge light sources). No marking need be provided if the only replaceable light source in the headlamp is type HB1.

Beam(s)

A replaceable bulb headlamp in a four headlamp system providing lower beam must have its lens permanently marked with “L”. A replaceable bulb headlamp in a four headlamp system providing upper beam must have its lens permanently marked with “U”. No such markings are required if the light sources in the headlamp are any combination of dual filament light sources

Code(s)

Lighting codes (See FMVSS 108 S6.5.3.3.) & Headlamp Aim-Type Code (SAE J1383, para 4.3.)

Optical Axis

Light Center or Optical Axis(See FMVSS 108 S10.18.5.2. , S10.18.5.3.) shall be marked on the lens

RESULTS: PASS

REMARKS:---



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SECTION 7) SPACING TO OTHER LAMPS

Vehicle check item, not measured during component testing.

SECTION 8) MULTIPLE COMPARTMENT AND MULTIPLE LAMPS

No requirements

SECTION 9) RATIO

No requirements



SECTION 10) INATALLATION

Vehicle check item, not measured during component testing.

SECTION 11) AIMABILITY

S10.18.9 *Visual/optical aiming.* Each visually/optically aimable headlamp must be designed to conform to the following requirements:

S10.18.9.1 *Vertical aim, lower beam.* Each lower beam headlamp must have a cutoff in the beam pattern. It may be either on the left side or the right side of the optical axis, but once chosen for a particular headlamp system's design, the side chosen for the cutoff must not be changed for any headlamps intended to be used as replacements for those system's headlamps.

S10.18.9.1.1 *Vertical position of the cutoff.* The headlamp must be aimed vertically so that the **cutoff is on the left side, at 0.4° down from the H-H line, or on the right side, at the H-H line.**

S10.18.9.1.2 *Vertical gradient.* The gradient of the cutoff measured at **either 2.5° L or 2.0° R** must be not **less than 0.13** based on the procedure of S10.18.9.1.5.

S10.18.9.1.3 *Horizontal position of the cutoff.* **The width must be not less than 2°, with not less than 2° of its actual width centered at either 2.5° L, or 2.0° R.**

S10.18.9.1.4 *Maximum inclination of the cutoff.* The vertical location of the highest gradient at the ends of the minimum width must be **within ± 0.2° of the vertical location** of the maximum gradient measured at the appropriate vertical line (at either 2.5° L for a left side cutoff, or 2.0° R for a right side cutoff).

SECTION 12) REPLACEMENT EQUIPMENT

SECTION 13) ADDITIONAL LIGHT SOURCE

No requirements



SECTION 14) PHOTOMETRY

TEST COMPONENT : Upper/Lower beam
SAMPLE No : 01#, 02#
FMVSS No. 108 REQUIREMENT : Upper beam (UB3)
Lower beam (LB3V)
VEHICLE TYPE/SIZE : Porsche 964 (1989-1994)
- NUMBER OF COMPARTMENTS : ---
- NUMBER OF LAMPS : 1
- NUMBER OF LIGHTED SECTIONS : ---

TEST PERFORMED BY : Cao Wei
DATE : May 16, 2023

PHOTOMETRIC TEST DISTANCE : 25 meters
BULB TRADE NO. : ---
TEST VOLTAGE/CURRENT : 12.8V
AIM NOTES : VOR
OTHER NOTES : ---
RESULTS : PASS

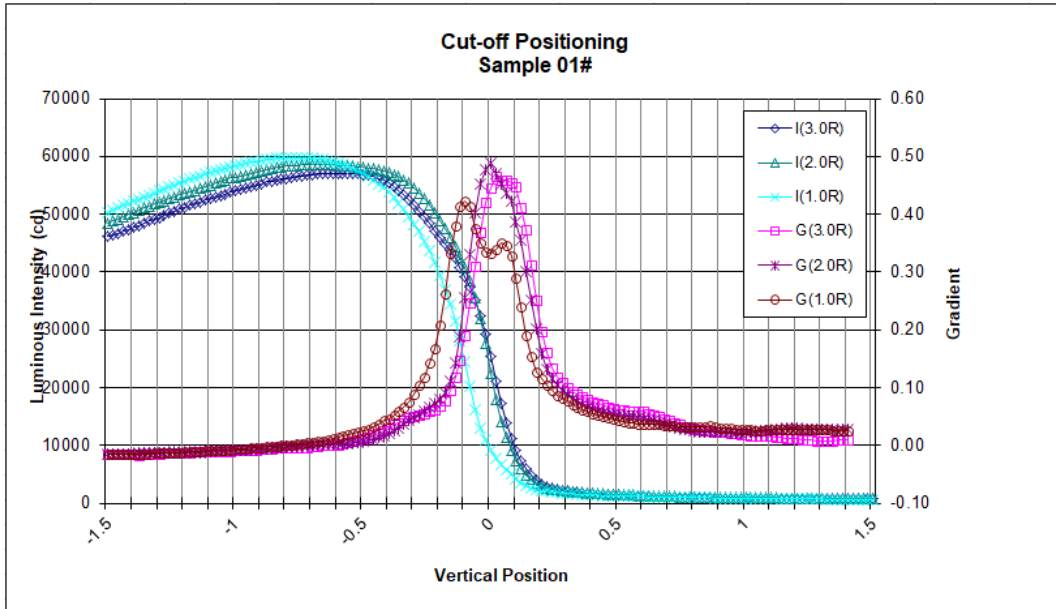


Subjects: Front Group Lamp(Headlamp, Parking Lamp)

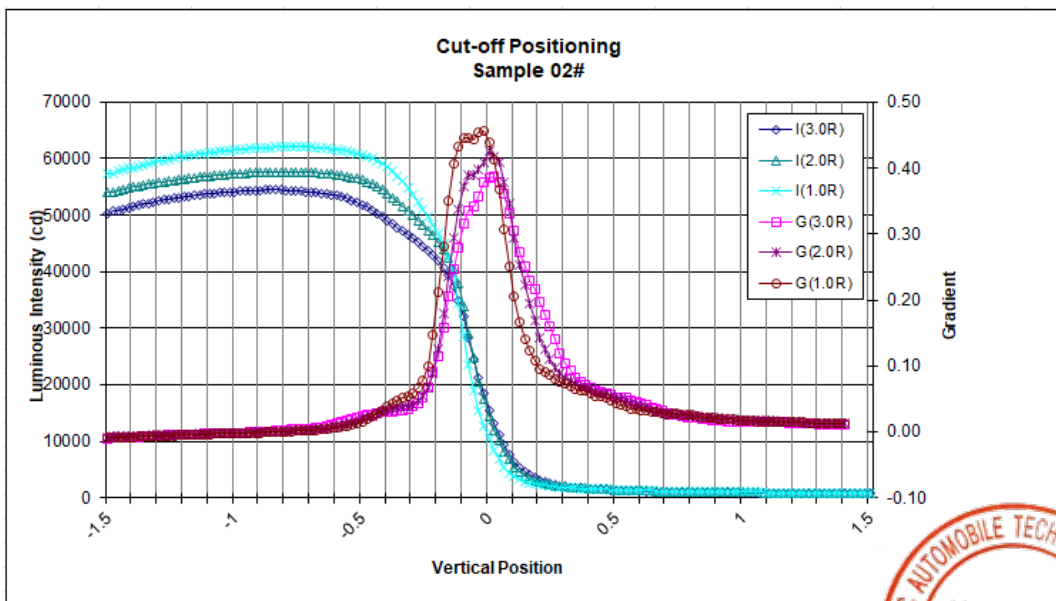
Reference standard: FMVSS 571.108

Report number: AT23XX1D79241, Date: June 16, 2023

Lower Beam Aim notes			Result
Location	Value	Required	Horizontal width of cutoff is greater than 2° centered at 2.0 R.
0.02U/3.0R	0.466	-	
0.00V/2.0R	0.489	> 0.13	
0.10D/1.0R	0.424	-	Maximum gradient G_{max} is positioned on the right side at H-H line. Maximum inclination of cutoff is within $\pm 0.2^\circ$.



Lower Beam Aim notes			Result
Location	Value	Required	Horizontal width of cutoff is greater than 2° centered at 2.0 R.
0.02U/3.0R	0.387	-	
0.00V/2.0R	0.426	> 0.13	
0.02D/1.0R	0.456	-	Maximum gradient G_{max} is positioned on the right side at H-H line. Maximum inclination of cutoff is within $\pm 0.2^\circ$.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
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HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		59350	
1U	3L & 3R	-	2,000		49550/57500	
H	V	75,000	20,000		70940	
H	3L & 3R	-	10,000		56540/62860	
H	6L & 6R	-	3,250		38790/42920	
H	9L & 9R	-	1,500		21420/23650	
H	12L & 12R	-	750		9620/10930	
1.5D	V	-	5,000		45770	
1.5D	9L & 9R	-	1,500		17490/19900	
2.5D	V	-	2,500		26510	
2.5D	12L & 12R	-	750		8010/8743	
4D	V	5,000	-	4.25D	6240	4713



HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		97.8	
4U	8L & 8R	-	64		113.3/140.1	
2U	4L	-	135		374.8	
1.5U	1R to 3R	-	200		619.4	
1.5U	1R to R	1,400	-		757.1	
1U	1.5L to L	700	-		532.6	
0.5U	1.5L to L	1,000	-		807.6	
0.5U	1R to 3R	2,700	500		1577/1923	
H	V	-	-		-	
H	4L	-	135		1502	
H	8L	-	64		1022	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		57680	
0.86D	V	-	4,500		50870	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	13860	11290
1D	6L	-	-		-	
1.5D	2R	-	15,000		43560	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		14230/16820	
2D	15L & 15R	-	1,000		4478/5646	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		9732	
4D	20L & 20R	-	300		1605/1908	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

Subjects: Front Group Lamp(Headlamp, Parking Lamp)
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HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 02#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		54620	
1U	3L & 3R	-	2,000		53700/50800	
H	V	75,000	20,000		69420	
H	3L & 3R	-	10,000		65920/62320	
H	6L & 6R	-	3,250		45990/39750	
H	9L & 9R	-	1,500		25340/22290	
H	12L & 12R	-	750		9844/10580	
1.5D	V	-	5,000		60980	
1.5D	9L & 9R	-	1,500		25840/21840	
2.5D	V	-	2,500		41560	
2.5D	12L & 12R	-	750		11210/9634	
4D	V	5,000	-	4.25D	6090	4710



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
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HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 02#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		93.8	
4U	8L & 8R	-	64		192.3/192.5	
2U	4L	-	135		671.7	
1.5U	1R to 3R	-	200		796.2	
1.5U	1R to R	1,400	-		809.2	
1U	1.5L to L	700	-		521.3	
0.5U	1.5L to L	1,000	-		967.4	
0.5U	1R to 3R	2,700	500		1497/1587	
H	V	-	-		-	
H	4L	-	135		1096	
H	8L	-	64		582.2	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		60040	
0.86D	V	-	4,500		56720	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	13240	10500
1D	6L	-	-		-	
1.5D	2R	-	15,000		52450	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		19500/18230	
2D	15L & 15R	-	1,000		6137/5392	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		9308	
4D	20L & 20R	-	300		1992/1864	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

SECTION 14) PHOTOMETRY(CONTINUED)

TEST COMPONENT : Parking Lamp
SAMPLE No : 01#, 02#
FMVSS No. 108 REQUIREMENT :
VEHICLE TYPE/SIZE :
- NUMBER OF COMPARTMENTS : ---
- NUMBER OF LAMPS : 1
- NUMBER OF LIGHTED SECTIONS : ---

TEST PERFORMED BY : Cao Wei
DATE : May 16, 2023

PHOTOMETRIC TEST DISTANCE : 3.16m
BULB TRADE NO. : ---
TEST VOLTAGE : 12.8V
AIM NOTES : Reference center refer to the drawing on last
page
OTHER NOTES : ---
RESULTS : Pass



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
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PARKING LAMP PHOTOMETRY TEST RESULT UPON TIME (AT H=0/V=0 POINT)				
SAMPLE NO.	TEST RESULT (unit: cd)		RATIO	REMARK
	1 MIN	30 MIN	1MIN/30MIN	
01#	54.13	51.84	1.044	
02#	55.51	52.72	1.053	

PARKING LAMP PHOTOMETRY RESULT AFTER 1 MINUTE OF OPERATION (TABLE XIV of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY (1)(2)(cd)	MAXIMUM PHOTOMETRIC INTENSITY (1)(2)(cd)	Measurements		GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
							Required Minimum	Measured	
					Sample 01#	Sample 02#		01#	02#
1	20L	5U	0.4	125	40.82	55.04	2.4	185.87	211.40
		5D	0.4	250	37.12	43.21			
	5L	10U	0.8	125	68.04	68.05			
		10D ⁽³⁾	0.8	250	39.89	45.10			
2	10L	5U	0.8	125	63.82	64.21	3.0	164.34	172.11
		H	1.4	125	56.04	58.11			
		5D	0.8	250	44.48	49.79			
3	V	5U	2.8	125	63.34	63.93	16.8	274.84	279.78
	5L		3.6	125	55.32	53.86			
	V	H	4.0	125	54.13	55.51			
	5R		3.6	125	57.06	59.14			
	V	5D	2.8	250	44.99	47.34			
4	10R	5U	0.8	125	68.64	67.99	3.0	184.83	186.88
		H	1.4	125	62.83	62.05			
		5D	0.8	250	53.36	56.84			
5	5R	10U	0.8	125	74.36	69.94	2.4	231.92	219.64
		10D ⁽³⁾	0.8	250	48.08	47.81			
	20R	5U	0.4	125	58.92	51.15			
		5D	0.4	250	50.56	50.74			



PARKING LAMP PHOTOMETRY RESULT AFTER 30 MINUTES OF OPERATION									
(TABLE XIV of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY (⁽¹⁾⁽²⁾ (cd)	MAXIMUM PHOTOMETRIC INTENSITY (⁽¹⁾⁽²⁾ (cd)	Measurements		GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
							Required	Measured	
					Sample 01#	Sample 02#	Minimum	01#	02#
1	20L	5U	0.4	125	39.09	52.27	2.4	178.00	200.77
		5D	0.4	250	35.55	41.04			
	5L	10U	0.8	125	65.16	64.63			
		10D ⁽³⁾	0.8	250	38.20	42.83			
2	10L	5U	0.8	125	61.12	60.98	3	157.39	163.46
		H	1.4	125	53.67	55.19			
		5D	0.8	250	42.60	47.29			
3	V	5U	2.8	125	60.66	60.72	16.8	263.22	265.72
	5L	H	3.6	125	52.98	51.15			
	V		4.0	125	51.84	52.72			
	5R		3.6	125	54.65	56.17			
	V	5D	2.8	250	43.09	44.96			
4	10R	5U	0.8	125	65.74	64.57	3	177.01	177.48
		H	1.4	125	60.17	58.93			
		5D	0.8	250	51.10	53.98			
5	5R	10U	0.8	125	71.21	66.42	2.4	222.11	208.60
		10D ⁽³⁾	0.8	250	46.05	45.41			
	20R	5U	0.4	125	56.43	48.58			
		5D	0.4	250	48.42	48.19			



(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5° down may be met at 5° down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0° radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

SECTION 15) PHYSICAL TESTS

ABRASION TEST

	PASS	FAIL
	✓	
<p>ABRADING PAD</p> <p>A new, unused abrading pad constructed of 0000 steel wool not less than 2.5±.1 cm. wide rubber cemented to a rigid base shaped to the same vertical contour of the lens is used for each test. The abrading pad support is equal in size to the pad and the center of the support surface is within ±2 mm. of parallel to the lens surface. The “grain” of the pad is oriented perpendicular to the direction of motion. The density of the pad is such that when the pad is resting unweighted on the lens, the base of the pad is no closer than 3.2 mm. to the lens at its closest point.</p> <p>ABRADING PAD ALIGNMENT</p> <p>A sample headlamp is mounted in the abrasion test fixture of Figure 5 of FMVSS No. 108 with the lens facing upward. When mounted on its support and resting on the lens of the test headlamp, the abrading pad is then weighted such that a pad pressure of 14±1 KPa. exists at the center and perpendicular to the face of the lens.</p> <p>ABRASION TEST PROCEDURE</p> <p>The pad is cycled back and forth (1 cycle) for 11 cycles at 4± 0.8 in. (10±2 cm.) per second over at least 80% of the lens surface, including all the area between the upper and lower aiming pads, but not including lens trim rings and edges. A pivot must be used if it is required to follow the contour of the lens.</p> <p>PERFORMANCE REQUIREMENTS</p> <p>After completion of the abrasion test the sample headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.</p>		



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

PHOTOMETRY AFTER ABRASION TEST

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		47970	
1U	3L & 3R	-	2,000		49720/45130	
H	V	75,000	20,000		72730	
H	3L & 3R	-	10,000		62060/57160	
H	6L & 6R	-	3,250		44010/35340	
H	9L & 9R	-	1,500		22720/18420	
H	12L & 12R	-	750		7774/8538	
1.5D	V	-	5,000		58730	
1.5D	9L & 9R	-	1,500		25560/20610	
2.5D	V	-	2,500		39950	
2.5D	12L & 12R	-	750		11110/9059	
4D	V	5,000	-	4.25D	6890	4920



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		93.2	
4U	8L & 8R	-	64		197.2/214.7	
2U	4L	-	135		698.4	
1.5U	1R to 3R	-	200		820.1	
1.5U	1R to R	1,400	-		843.8	
1U	1.5L to L	700	-		595.5	
0.5U	1.5L to L	1,000	-		941.1	
0.5U	1R to 3R	2,700	500		1333/1401	
H	V	-	-		-	
H	4L	-	135		993.6	
H	8L	-	64		533.1	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		58270	
0.86D	V	-	4,500		56270	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	14500	11310
1D	6L	-	-		-	
1.5D	2R	-	15,000		52040	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		19680/17800	
2D	15L & 15R	-	1,000		6147/5280	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		11580	
4D	20L & 20R	-	300		1946/1802	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

CHEMICAL RESISTANCE TEST

PASS	FAIL
✓	

TEST FLUIDS

The five test fluids used in the chemical resistance test include;

- (a) ASTM Reference Fuel C, which is composed of Isooctane 50% volume and Toluene 50% volume. Isooctane must conform to A2.7 in Annex 2 of the Motor Fuels Section of the 1985 Annual Book of ASTM Standards, Vol. 05.04, and Toluene must conform to ASTM specification D362-84, Standard Specification for Industrial Grade Toluene. ASTM Reference Fuel C must be used as specified in: Paragraph A2.3.2 and A2.3.3 of Annex 2 to Motor Fuels, Section 1 in the 1985 Annual Book of ASTM Standards; and OSHA Standard 29 CFR 1910.106—Handling Storage and Use of Flammable Combustible Liquids.
- (b) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits).
- (c) Power steering fluid (as specified by the vehicle manufacturer for use in the motor vehicle on which the headlamp is intended to be installed).
- (d) Windshield washer fluid consisting of 0.5% monoethanolamine with the remainder 50% concentration of methanol/distilled water by volume.
- (e) Antifreeze (50% concentration of ethylene glycol/distilled water by volume).

FLUID APPLICATION

The entire exterior lens surface of the sample headlamp mounted in the headlamp test fixture and top surface of the lens-reflector joint is wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of five different test fluids listed above. The lamp is wiped within 5 seconds after removal of the cloth from the test fluid. A new lamp sample may be used with each fluid.

TEST DURATION

After the headlamp sample has been wiped with the test fluid, it must be stored in its designed operating attitude for 48 hours at a temperature of 23°C±4°C and a relative humidity of 30% ± 10%. At the end of the 48-hour period, the headlamp is wiped clean with a soft dry cotton cloth and visually inspected.

PERFORMANCE REQUIREMENTS

After completion of the chemical resistance test, the sample headlamp must have no surface deterioration, coating delamination, fractures, deterioration of bonding or sealing materials, color bleeding, or color pickup visible without magnification and the headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
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PHOTOMETRY AFTER CHEMICAL RESISTANCE TEST

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		48300	
1U	3L & 3R	-	2,000		49940/45160	
H	V	75,000	20,000		72630	
H	3L & 3R	-	10,000		60890/56090	
H	6L & 6R	-	3,250		43470/34660	
H	9L & 9R	-	1,500		22750/18250	
H	12L & 12R	-	750		8060/8497	
1.5D	V	-	5,000		55100	
1.5D	9L & 9R	-	1,500		23930/19610	
2.5D	V	-	2,500		36410	
2.5D	12L & 12R	-	750		10710/8594	
4D	V	5,000	-	4.25D	6540	4850



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS
(TABLE XIX-b of FMVSS No. 108)

		LOWER BEAM (LB3V)		MEASUREMENTS		
				Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		86.8	
4U	8L & 8R	-	64		187.7/203.7	
2U	4L	-	135		650.2	
1.5U	1R to 3R	-	200		778.4	
1.5U	1R to R	1,400	-		803.7	
1U	1.5L to L	700	-		554.2	
0.5U	1.5L to L	1,000	-		973.7	
0.5U	1R to 3R	2,700	500		1545/1658	
H	V	-	-		-	
H	4L	-	135		1105	
H	8L	-	64		633.3	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		56450	
0.86D	V	-	4,500		55450	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	14690	11550
1D	6L	-	-		-	
1.5D	2R	-	15,000		48860	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		18710/16920	
2D	15L & 15R	-	1,000		5846/5026	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		11940	
4D	20L & 20R	-	300		1882/1748	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

CORROSION CONNECTOR TEST

	PASS	FAIL
	✓	

PROCEDURE

A headlamp connector test must be performed on each filament circuit of the sample headlamp prior to the test in S14.6.4.1.2 of FMVSS No. 108 according to Figure 4 and S14.6.15 of FMVSS No. 108. The power source is set to provide 12.8 volts and the resistance must be set to produce 10 amperes. The headlamp with connector attached to the terminals, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, is subjected to a salt spray (fog) test in accordance with ASTM B117-73, Method of Salt Spray (Fog) Testing, for 240 hours, consisting of ten successive 24-hour periods. During each period, the headlamp is mounted in the middle of the chamber and exposed for 23 hours to the salt spray. The spray is not activated during the 24th hour. The bulb is removed from the headlamp and from the test chamber during the one hour of salt spray deactivation and reinserted for the start of the next test period, at the end of the first and last three 23-hour periods of salt spray exposure, and at the end of any two of the fourth through seventh 23-hour periods of salt-spray exposure. The test chamber is closed at all times except for a maximum of 2 minutes which is allowed for removal or replacement of a bulb during each period. After the ten periods, the lens reflector unit without the bulb must be immersed in deionized water for 5 minutes, then secured and allowed to dry by natural convection only. Using the voltage, resistance and pretest set up of S14.6.4.1.1 of FMVSS No. 108 the current in each filament circuit must be measured after the test conducted in S14.6.4.1.2 of FMVSS No. 108.

PERFORMANCE REQUIREMENTS

After the completion of the corrosion-connector test, the sample headlamp must show no evidence of external or internal corrosion or rust visible without magnification. Loss of adhesion of any applied coating must not occur more than 3.2 mm from any sharp edge on the inside or out. Corrosion may occur on terminals only if the test current produced during the test of S14.6.4.1.6 of FMVSS No. 108 is not less than 9.7 amperes.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

CORROSION TEST

	PASS	FAIL
	✓	

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture in designed operating position and including all accessory equipment necessary to operate in its normal manner, is subjected to a salt spray (fog) test in accordance with ASTM B117-73, Method of Salt Spray (Fog) Testing, for 50 total hours, consisting of two periods of 24 hours exposure followed by a 1 hour drying period. If a portion of the device is completely protected in service, that portion is covered to prevent salt fog entry during exposure. After removal from the salt spray and the final 1 hour drying period the sample headlamp is examined for corrosion that affect any other applicable tests contained in Appendix J. If such corrosion is found, the affected test(s) must be performed on the corrosion sample and the results recorded.

PERFORMANCE REQUIREMENTS

After completion of the corrosion test, the sample headlamp must not have any observed corrosion which would result in the failure of any other applicable tests contained in Appendix J and no corrosion of the headlamp mounting and aiming mechanism that would result in the failure of the aiming adjustment tests, inward force test, or torque deflection test of Appendix J.



DUST TEST

	PASS	FAIL
	✓	

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture, with all drain holes, breathing devices or other designed openings in their normal operating positions, is positioned within a cubical box, with inside measurements of 900 mm. on each side or larger if required for adequate wall clearance (i.e., a distance of at least 150 mm between the headlamp and any wall of the box).
 The box contains 4.5 kg. of fine powdered cement which conforms to the ASTM C150-77 specification for Portland Cement. Every 15 minutes, the cement is agitated by compressed air or fan blower(s) by projecting blasts of air for a two second period in a downward direction so that the cement is diffused as uniformly as possible throughout the entire box. This test is continued for five hours after which the exterior surfaces of the headlamp are wiped clean.

PERFORMANCE REQUIREMENTS

After completion of the dust test, the sample headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

PHOTOMETRY AFTER DUST TEST

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		43000	
1U	3L & 3R	-	2,000		47600/41820	
H	V	75,000	20,000		70350	
H	3L & 3R	-	10,000		59270/52730	
H	6L & 6R	-	3,250		42480/31970	
H	9L & 9R	-	1,500		21600/15540	
H	12L & 12R	-	750		6845/7089	
1.5D	V	-	5,000		55010	
1.5D	9L & 9R	-	1,500		24260/19210	
2.5D	V	-	2,500		36690	
2.5D	12L & 12R	-	750		10880/8509	
4D	V	5,000	-	4.25D	6080	4360



HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		81.1	
4U	8L & 8R	-	64		178.9/189.6	
2U	4L	-	135		648.1	
1.5U	1R to 3R	-	200		711.7	
1.5U	1R to R	1,400	-		753.0	
1U	1.5L to L	700	-		537.6	
0.5U	1.5L to L	1,000	-		912.3	
0.5U	1R to 3R	2,700	500		1301/1359	
H	V	-	-		-	
H	4L	-	135		943.8	
H	8L	-	64		532.0	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		53470	
0.86D	V	-	4,500		53670	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	13850	10850
1D	6L	-	-		-	
1.5D	2R	-	15,000		48270	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		18760/16770	
2D	15L & 15R	-	1,000		5862/4879	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		12380	
4D	20L & 20R	-	300		1895/1681	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

TEMPERATURE CYCLE TEST

PASS	FAIL
✓	

SAMPLES

A sample headlamp with one or more replaceable light sources is tested according to the procedures of this section for a temperature cycle test and an internal heat test. The same sample headlamp is used in the temperature cycle test and then in the internal heat test.

GENERAL PROCEDURE

Tests are made with all filaments lighted at design voltage that are intended to be used simultaneously in the headlamp and which in combination draw the highest total wattage. These include but are not limited to filaments used for turn signal lamps, fog lamps, parking lamps, and headlamp lower beams lighted with upper beams when the wiring harness is so connected on the vehicle. If a turn signal is included in the headlamp assembly, it is operated at 90 flashes a minute with a 75%±2% current "on time." If the lamp produces both the upper and lower beam, it is tested in both the upper beam mode and the lower beam mode under the conditions above described, except for a headlamp with a single HB1 or HB2 replaceable light source.

TEMPERATURE CYCLE TEST

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture, is subjected to 10 complete consecutive cycles having the thermal cycle profile shown in Figure 6 of FMVSS No. 108. During the hot cycle, the lamp, is energized commencing at point "A" of Figure 6 of FMVSS No. 108 and de-energized at point "B." Separate or single test chambers may be used to generate the environment of Figure 6 of FMVSS No. 108. All drain holes, breathing devices or other openings or vents of the headlamps are set in their normal operating positions.

PERFORMANCE REQUIREMENTS

After completion of the temperature cycle test, the sample headlamp must;

- (a) show no evidence of delamination, fractures, entry of moisture, or deterioration of bonding material, color bleeding, warp or deformation visible without magnification
- (b) show no lens warpage greater than 3 mm when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens.
- (c) meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
Report number: AT23XX1D79241, Date: June 16, 2023

PHOTOMETRY AFTER TEMPERATURE CYCLE TEST

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		40010	
1U	3L & 3R	-	2,000		45720/40430	
H	V	75,000	20,000		69250	
H	3L & 3R	-	10,000		58090/51410	
H	6L & 6R	-	3,250		41030/30910	
H	9L & 9R	-	1,500		19750/14310	
H	12L & 12R	-	750		5567/6284	
1.5D	V	-	5,000		55290	
1.5D	9L & 9R	-	1,500		24220/19510	
2.5D	V	-	2,500		37620	
2.5D	12L & 12R	-	750		10850/8725	
4D	V	5,000	-	4.25D	5850	4620



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
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HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		77.9	
4U	8L & 8R	-	64		173.7/183.5	
2U	4L	-	135		633.3	
1.5U	1R to 3R	-	200		702.4	
1.5U	1R to R	1,400	-		735.1	
1U	1.5L to L	700	-		526.6	
0.5U	1.5L to L	1,000	-		884.0	
0.5U	1R to 3R	2,700	500		1190/1242	
H	V	-	-		-	
H	4L	-	135		873.8	
H	8L	-	64		485.8	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		52430	
0.86D	V	-	4,500		50510	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	13310	9385
1D	6L	-	-		-	
1.5D	2R	-	15,000		48340	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		18490/16860	
2D	15L & 15R	-	1,000		5857/4952	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		11110	
4D	20L & 20R	-	300		1884/1639	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

INTERNAL HEAT TEST

PASS	FAIL
✓	

PROCEDURE

A sample headlamp lens surface that would normally be exposed to road dirt is uniformly sprayed with any appropriate mixture of dust and water or other materials to reduce the photometric output at the H-V test point of the upper beam (or the 1/2D-1 1/2R test point of the lower beam as appropriate) to 25%±2% of the output originally measured in the appropriate photometric compliance test. A headlamp with a single HB1 or HB2 replaceable light source is tested on the upper beam only.

Such reduction is determined under the same conditions as that of the original photometric measurement. After the photometric output of the lamp has been reduced as specified above, the sample lamp and its mounting hardware must be mounted in an environmental chamber in a manner similar to that indicated in Figure 7`Dirt/Ambient Test Setup."

The headlamp is soaked for one hour at a temperature of 35° + 4° -0° C) and then the lamp is energized according to the procedure of this section for one hour in a still air condition, allowing the temperature to rise from the soak temperature.

At the end of one hour the sample lamp is returned to a room ambient temperature of 23° + 4° -0° C and a relative humidity of 30%±10% and allowed to stabilize to the room ambient temperature. The lens is then cleaned.

PERFORMANCE REQUIREMENTS

After completion of the temperature cycle test and meeting its requirements, and completion of the internal heat test, the sample headlamp must;

- (a) have no lens warpage greater than 3 mm when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens.
- (b) meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A 1/4° reaim is permitted in any direction at any test point.



Subjects: Front Group Lamp(Headlamp, Parking Lamp)
Reference standard: FMVSS 571.108
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PHOTOMETRY AFTER INTERNAL HEAT TEST

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (TABLE XVIII of FMVSS No. 108)						
		UPPER BEAM (UB3)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000		40840	
1U	3L & 3R	-	2,000		45420/40740	
H	V	75,000	20,000		68830	
H	3L & 3R	-	10,000		57490/51560	
H	6L & 6R	-	3,250		40200/31100	
H	9L & 9R	-	1,500		19740/14450	
H	12L & 12R	-	750		5638/6455	
1.5D	V	-	5,000		54550	
1.5D	9L & 9R	-	1,500		23530/19330	
2.5D	V	-	2,500		36560	
2.5D	12L & 12R	-	750		10570/8596	
4D	V	5,000	-	4.25D	5480	4440



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HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (TABLE XIX-b of FMVSS No. 108)						
		LOWER BEAM (LB3V)		MEASUREMENTS Sample no. 01#		
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
⁽¹⁾ 10U to 90U	⁽¹⁾ 90L to 90R	125	-		73.0	
4U	8L & 8R	-	64		170.6/181.4	
2U	4L	-	135		611.0	
1.5U	1R to 3R	-	200		695.2	
1.5U	1R to R	1,400	-		727.9	
1U	1.5L to L	700	-		513.5	
0.5U	1.5L to L	1,000	-		866.3	
0.5U	1R to 3R	2,700	500		1215/1285	
H	V	-	-		-	
H	4L	-	135		878.0	
H	8L	-	64		495.1	
0.5D	1.5L to L	-	-		-	
0.5D	1.5R	-	-		-	
0.6D	1.3R	-	10,000		52020	
0.86D	V	-	4,500		48810	
0.86D	3.5L	12,000	1,800	3.5L/0.61D	15750	9151
1D	6L	-	-		-	
1.5D	2R	-	15,000		48180	
1.5D	9L & 9R	-	-		-	
2D	9L & 9R	-	1,250		18170/16720	
2D	15L & 15R	-	1,000		5738/4926	
2.5D	V	-	-		-	
2.5D	12L & 12R	-	-		-	
4D	V	-	-		-	
4D	4R	12,500	-		11400	
4D	20L & 20R	-	300		1865/1647	



⁽¹⁾ These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

HUMIDITY TEST

PASS	FAIL
✓	

PROCEDURE

The test fixture consists of a horizontal steel plate to which three threaded steel or aluminum rods of ½ inch diameter are screwed vertically behind the headlamp.

The sample headlamp assembly is clamped to the vertical rods, which are behind the headlamp. All attachments to the headlamp assembly are made behind the lens and vents or openings, and are not within 2 inches laterally of a vent inlet or outlet.

The mounted headlamp assembly is oriented in its design operating position, and is placed in a controlled environment at a temperature of 100°+7°-0° F (38°+4°-0° C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other openings are set in their normal operation positions for all phases of the humidity test.

The headlamp is subjected to 24 consecutive 3-hour test cycles. In each cycle, the headlamp is energized for 1 hour at design voltage with the highest combination of filament wattages that are intended to be used, and then deenergized for 2 hours. If the headlamp incorporates a turn signal then the turn signal flashes at 90 flashes per minute with a 75% ± 2% current “on-time.” Within 3 minutes after the completion of the 24th cycle, the air flow test will begin. The following procedure is to occur:

The mounted assembly is removed, placed in an insulating box and covered with foam material so that there is no visible air space around the assembly;

The box is closed, taken to the air flow test chamber, and placed within it. Inside the chamber, the assembly with respect to the air flow, is oriented in its design operating position;

The assembly is positioned in the chamber so that the center of the lens is in the center of the opening of the air flow entry duct during the test;

The headlamp has at least 3 inches clearance on all sides, and at least 4 inches to the entry and exit ducts at the closest points;

If vent tubes are used which extend below the lamp body, the 3 inches are measured from the bottom of the vent tube or its protection;

The temperature of the chamber is 73°+7°-0° F (23°+4°-0° C) with a relative humidity of 30%+10%-0%;

The headlamp is not energized.

Before the test specified in paragraph S14.6.7.1.7 of FMVSS No. 108, the uniformity of the air flow in the empty test chamber at a plane 4 inches downstream of the air entry duct is measured over a 4-inch square grid. The uniformity of air flow at each grid point is ±10% of the average air flow specified in paragraph S14.6.7.1.7 of FMVSS No. 108.

The mounted assembly in the chamber is exposed, for one hour, to an average air flow of 330+0-30 ft/min. as measured with an air velocity measuring probe having an accuracy of ±3% in the 330 ft/min range. The average air flow is the average of the velocity recorded at six points around the



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perimeter of the lens. The six points are determined as follows: At the center of the lens, construct a horizontal plane. The first two points are located in the plane, 1 inch outward from the intersection of the plane and each edge of the lens. Then, trisect the distance between these two points and construct longitudinal vertical planes at the two intermediate locations formed by the trisection. The four remaining points are located in the vertical planes, one inch above the top edge of the lens, and one inch below the bottom edge of the lens. After one hour, the headlamp is removed and inspected for moisture.

PERFORMANCE REQUIREMENTS

After completion of the humidity test, the sample headlamp must show no evidence of interior delamination or moisture, fogging or condensation visible without magnification.

VIBRATION TEST

	PASS	FAIL
	✓	

SAMPLES

The mounting bracket with a sample headlamp installed must not have a resonant frequency in the 10-55 Hz. range.

PROCEDURE

The mounted sample headlamp is bolted to the anvil end of the table of the vibration test machine of Figure 21 and vibrated 750 cpm through a distance of 1/8 in. The table is spring mounted at one end and fitted with steel calks on the underside of the other end. The table is of sufficient size to completely contain the test fixture base with no overhang. The calks are to make contact with the steel anvil once during each cycle at the completion of the fall. The rack is operated under a spring tension of 60 to 70 lb. The vibration is applied in the vertical axis of the headlamp as mounted on the vehicle. Bulb filaments are not energized during the test. The test is continued for 1 hour.

PERFORMANCE REQUIREMENTS

After completion of the vibration test, there must be no evidence of loose or broken parts, other than filaments, visible without magnification.



INWARD FORCE TEST

	PASS	FAIL
	N/A	N/A
<p>PROCEDURE A sample headlamp mechanism, including the aiming adjusters, must be subjected to an inward force of 222 N directed normal to the headlamp aiming plane and symmetrically about the center of the headlamp lens face.</p> <p>PERFORMANCE REQUIREMENTS After the completion of the inward force test a sample headlamp must not permanently recede by more than 2.5 mm. The aim of the headlamp must not permanently deviate by more than 3.2 mm at a distance of 7.6 m. The aim of any headlamp that is capable of being mechanically aimed by externally applied aiming devices must not change by more than 0.30.</p> <p>JUSTIFICATION: The headlamp unit is aftermarket fitment use only. The lamp may fit into appropriate mounting mechanism on the already approved vehicle, and also the lamp manufacturer do not produce the mounting mechanism.</p>		

HEADLAMP CONNECTOR TEST

	PASS	FAIL
	✓	
<p>PROCEDURE A sample headlamp connected into the test circuit of Figure 4 of FMVSS No. 108 has the power supply adjusted until 10 amperes DC are flowing through the circuit. The test is repeated for each filament circuit of the headlamp.</p> <p>PERFORMANCE REQUIREMENTS The voltage drop, as measured in the test circuit of Figure 4 of FMVSS No. 108, must not exceed 40 mV DC in any applicable filament circuit of the sample</p>		



AIMING ADJUSTMENT TEST

	PASS	FAIL
	N/A	N/A
<p>PROCEDURE A sample headlamp is mounted in design position at nominal (H=0, V=0) aim with an accurate measuring device such as a spot projector or other equally accurate means attached. The headlamp is adjusted to the extremes of travel in each horizontal and vertical direction.</p>		

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PERFORMANCE REQUIREMENTS

Visually aimed lower beam headlamps without a VHAD are required not to have a horizontal adjustment mechanism and horizontal aim range requirements do not apply.

A sample sealed beam headlamp, other than a Type F, tested per the procedure must provide a minimum of $\pm 4.0^\circ$ adjustment range in both the vertical and horizontal planes and if equipped with independent vertical and horizontal aiming screws, the adjustment must be such that neither the vertical nor horizontal aim must deviate more than 100 mm from horizontal or vertical planes, respectively, at a distance of 7.6 m through an angle of $\pm 4.0^\circ$. A sample Type F sealed beam, integral beam, replaceable bulb, or combination headlamp tested per the procedure must provide a minimum of $\pm 4.0^\circ$ adjustment range in the vertical plane and $\pm 2.5^\circ$ in the horizontal plane and if equipped with independent vertical and horizontal aiming screws, the adjustment must be such that neither the vertical nor horizontal aim must deviate more than 100 mm from horizontal or vertical planes, respectively, at a distance of 7.6 m through an angle of $\pm 2.5^\circ$ and $\pm 4.0^\circ$ respectively. A sample headlamp that is aimed by moving the reflector relative to the lens and headlamp housing, and vice versa must provide a minimum adjustment range in the vertical plane not less than the full range of the pitch on the vehicle on which it is installed and $\pm 2.5^\circ$ in the horizontal plane.

JUSTIFICATION: The headlamp has no internal adjustment travel. It shall be aimed by external mechanism.



CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	PASS	FAIL
	N/A	N/A

PROCEDURE

TEST FLUIDS

The three test fluids used in the chemical resistance test include:

- (a) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits);
- (b) Mineral spirits;
- (c) Fluids other than water contained in the manufacturer’s instructions for cleaning the reflector.

FLUID APPLICATION

With a sample headlamp in the headlamp test fixture and the lens removed, the entire surface of the reflector that receives light from a headlamp light source is wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of one of the test fluids listed in S14.6.10.1.1 of FMVSS No. 108. The lamp is wiped within 5 seconds after removal of the cloth from the test fluid.

TEST DURATION

After the headlamp has been wiped with the test fluid, it is stored in its designed operating attitude for 48 hours at a temperature of 73° ± 7° F (23° ± 4° C) and a relative humidity of 30% ± 10%. At the end of the 48- hour period, the headlamp is wiped clean with a soft dry cotton cloth and visually inspected.

PERFORMANCE REQUIREMENTS

After completion of the chemical resistance test, the sample headlamp must have no surface deterioration, coating delamination, fractures, deterioration of bonding or sealing materials, color bleeding or color pickup visible without magnification and the headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.



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CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	PASS	FAIL
	N/A	N/A

PROCEDURE

A sample headlamp with the lens removed, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, must be subjected to a salt spray (fog) test in accordance with ASTM B117-73, Method of Salt Spray (Fog)

Testing, for 24 hours, while mounted in the middle of the chamber.

Afterwards, the headlamp must be stored in its designed operating attitude for 48 hours at a temperature of 73° ±7°F (23 ° ±4°C) and a relative humidity of 30% ±10% and allowed to dry by natural convection only. At the end of the 48- hour period, the reflector must be cleaned according to the instructions supplied with the headlamp manufacturer’s replacement lens, and inspected.

The lens and seal must then be attached according to these instructions and the headlamp tested for photometric performance.

PERFORMANCE REQUIREMENTS

After the completion of the corrosion test the sample headlamp must show no evidence of corrosion or rust visible without magnification on any part of the headlamp reflector that receives light from a headlamp light source, on any metal light or heat shield assembly, or on a metal reflector of any other lamp. The sample headlamp with the replacement lens installed must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.



TORQUE DEFLECTION TEST

	PASS	FAIL
	N/A	N/A

PROCEDURE

The sample headlamp assembly is mounted in designed vehicle position and set at nominal aim (H=0, V=0).

A sealed beam headlamp, except Type G and Type H, is removed from its mounting and replaced by the appropriate deflectometer. (Type C and Type D – see Figure 18 of FMVSS No. 108, Type A and Type E – see Figure 16 of FMVSS No. 108, Type B - Figure 17 of FMVSS No. 108, and Type F – Figure 14 of FMVSS No. 108)

Sealed beam headlamps of Type G and Type H have the adapter of Figure 15 of FMVSS No. 108 and the deflectometer of Figure 14 of FMVSS No. 108 attached to the headlamp.

A torque of 2.25 Nm must be applied to the headlamp assembly through the deflectometer and a reading on the thumbwheel is taken. The torque must be removed and a second reading on the thumbwheel is taken.

Headlamps other than sealed beam headlamps must have the downward force used to create the torque applied parallel to the aiming reference plane, through the aiming pads, and displaced forward using a lever arm such that the force is applied on an axis that is perpendicular to the aiming reference plane and originates at the center of the aiming pad pattern (see Figure 3 of FMVSS No. 108).

For headlamps using the aiming pad locations of Group I, the distance between the point of application of force and the aiming reference plane is not less than 168.3 mm plus the distance from the aiming reference plane to the secondary plane, if used.

For headlamps using the aiming pad locations of Group II, the distance between the point of application of force and the aiming reference plane is not less than 167.9 mm plus the distance to the secondary plane, if used.

For headlamps using the nonadjustable Headlamp Aiming Device Locating Plates for the 146 mm diameter, the 176 mm diameter, and the 92x150 mm sealed beam, the distance between the point of application of force and the aiming plane is not, respectively, less than 177.4 mm, 176.2 mm, and 193.7mm.

PERFORMANCE REQUIREMENTS

The aim of each sample headlamp must not deviate more than 0.30_ when the downward torque is removed.



JUSTIFICATION: The headlamp unit is aftermarket fitment use only. The lamp may fit into appropriate mounting mechanism on the already approved vehicle, and also the lamp manufacturer do not produce the mounting mechanism.

PLASTIC OPTICAL MATERIAL TEST

	PASS	FAIL
	N/A	N/A

Accelerated weathering procedures are not permitted.

SAMPLES

Samples of materials should be injection molded into polished metal molds to produce test specimens with two flat and parallel faces. Alternative techniques may be used to produce equivalent specimens. Test specimens shape may vary, but each exposed surface should contain a minimum uninterrupted area of 32 sq. cm. Samples must be furnished in thicknesses of; 1.6± 0.25 mm., 2.3 ±0.25 mm., 3.2 ± 0.25 mm., and 6.4± 0.25 mm. All samples must conform to the appropriate color test requirement of this standard prior to testing. A control sample, kept properly protected from influences which may change its appearance and properties of each thickness must be retained.

OUTDOOR EXPOSURE TEST

Outdoor exposure tests of 3 years in duration must be made on samples of all materials, including coated and uncoated versions, used for optical parts of devices covered by this standard. Tests are to be conducted in Florida and Arizona. Concentrations of polymer components and additives used in plastic materials may be changed without outdoor exposure testing provided the changes are within the limits of composition represented by higher and lower concentrations of these polymer components and additives previously tested to this section and found to meet its requirements.

PROCEDURE

One sample of each thickness of each material must be mounted at each exposure site so that at least a minimum uninterrupted area of 32 sq. cm. of the exposed upper surface of the sample is at an angle of 45° to the horizontal facing south. The sample must be mounted in the open no closer than 30 cm (11.8 in) to its background.

During the exposure time the samples must be cleaned once every three months by washing with mild soap or detergent and water, and then rinsing with distilled water. Rubbing must be avoided.

PERFORMANCE REQUIREMENTS

Plastic lenses, other than those incorporating reflex reflectors, used for inner lenses or those covered by another material and not exposed directly to sunlight must meet the optical material test requirements when covered by the outer lens or other material. After completion of the outdoor exposure test the haze and loss of surface luster as measured by ASTM 1003-92, Haze and Luminous Transmittance of Transparent Plastic, must not be greater than;

- (a) 30% for materials used for outer lenses, other than those incorporating reflex reflectors,
- (b) 7% for materials used for reflex reflectors and lenses used in front of reflex reflectors.



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After completion of the outdoor exposure test materials used for headlamp lenses must show no deterioration. After completion of the outdoor exposure test materials, when compared with the unexposed control samples, must not show physical changes affecting performance such as color bleeding, delamination, crazing, or cracking. Materials used for reflex reflectors and lenses used in front of reflex reflectors must not show surface deterioration or dimensional changes. After completion of the outdoor exposure test materials, when compared with the unexposed control samples, must not have their luminous transmittance changed by more than 25% when tested in accordance with ASTM E 308-66 (1973) using CIE Illuminant A (2856K). After completion of the outdoor exposure test materials must conform to the color test of this standard in the range of thickness stated by the material manufacturer.



SECTION 16) PHOTOGRAPHS OF TEST SAMPLE

FRONT VIEW



SIDE VIEW



REAR VIEW



SECTION 17) DRAWINGS

