AUTOMOTIVE MANUFACTURERS EQUIPMENT COMPLIANCE AGENCY, INC.

# AMECA NOTICE OF EQUIPMENT COMPLIANCE™

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Notification Number: 231036

Test Report Date: May 10, 2023
Expiration Date: July 1, 2026

Applicant: Zhejiang Hongguan Lighting Technology Co., Ltd.
No. 185, Fengdu 2nd Road, Tangxia Town
Rui'an, Zhejiang 325200
P.R. China

Item: "YAA-WRX-0372A-08" - Combination Headlamp, Turn Signal, Parking, Side Marker And Daytime Running Lamp With Reflex Reflectors - White And Yellow In Colour

Use: On 2007 Model Years Subaru WRX Motor Vehicles

Jurisdictional Compliance Standard(S) Identical To: United States FMVSS 571.108

| Markings | |
|---|---|
| Lens | Housing |
| VLAND (logo) DOT SAE HI/HL AIPP2 DRL 23 VOR | YAA-WRX-0372A-08 12V |

| Light Source | |
|---|---|
| Upper Beam Headlamp: | 3 LED's, 12V |
| Lower Beam Headlamp: | 3 LED's, 12V |
| Turn Signal Lamp: | 12 LED's, 12V |
| Daytime Running/Parking Lamp: | 22 LED's, 12V |
| Side Marker Lamp: | 2 LED's, 12V |

Test Lab: Zhejiang ATTC Automobile Technology Service Co., Ltd.
Report Number: AT23XX1D61591

Executive Director

AUTOMOTIVE MANUFACTURERS EQUIPMENT COMPLIANCE AGENCY, INC. CORPORATE SEAL 1994 MARYLAND

**Subjects: Front Group Lamp(Headlamp, Front Turn Signal Lamp, Parking Lamp, Daytime Running Lamp, Side Marker Lamp, Side Retro-Reflector)**
**Reference standard: FMVSS 571.108**
**Report number: AT23XX1D61591, Date: May 10, 2023**

# COMPLIANCE TEST REPORT

## ACCORDING TO U.S. FMVSS 108

# COVER PAGE

## TEST DETAILS

| | | |
|---|---|---|
| APPLICANT'S NAME | : | Zhejiang Hongguan Lighting Technology Co., Ltd. |
| ADDRESS | : | No. 185, Fengdu 2nd Road, Tangxia Town, Rui'an City, Zhejiang Province 325200, China |
| NO. OF DEVICES TESTED | : | 2 PCS |
| PART NUMBER | : | YAA-WRX-0372A-08 |
| DESCRIPTION | : | GROUPED(Upper/Lower Beam, Front Turn Signal Lamp, Parking Lamp, Daytime Running Lamp,Side Marker Lamp, Side Retro-reflector) |
| 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: | : | April 13, 2023 – May 10, 2023 |

**Subjects: Front Group Lamp(Headlamp, Front Turn Signal Lamp, Parking Lamp, Daytime Running Lamp, Side Marker Lamp, Side Retro-Reflector)**
**Reference standard: FMVSS 571.108**
**Report number: AT23XX1D61591, Date: May 10, 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 | 1 | - | 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

TITLE : Test Engineer

DATE : May 10, 2023

ZHEJIANG ATTC AUTOMOBILE TECHNOLOGY SERVICE CO.,LTD. 埃科认证 APPROVED

## SECTION 1) PHYSICAL INSPECTION

TEST COMPONENT : YAA-WRX-0372A-08

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

MARKINGS

- LENS : VLAND (logo), “DOT SAE HI/HL AIPP2 DRL 23 VOR”, Optical axis marking
- HOUSING : “YAA-WRX-0372A-08” “Voltage: 12V”, “Low beam: 15.2W”, “Upper beam:16.2W”, “FTSL: 21.6W”, “DRL: 5.16W”, “PL: 2.1W”, “SML: 4W”

LENS

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

HOUSING

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

LIGHT SOURCE USED:

| FUNCTION | QTY | TRADE NO. | RATE VOLTAGE |
|---|---|---|---|
| LOWER BEAM | 3 PCS | LED | 12V |
| UPPER BEAM | 3 PCS | LED | 12V |
| Front Turn Signal Lamp | 12 PCS | LED | 12V |
| Parking Lamp/DRL | 22 PCS | LED | 12V |
| Side Marker Lamp | 2 PCS | LED | 12V |

NOTES: Lamps are > 10 hours at design voltage prior to photometry and color testing.

INSPECTION PERFORMED BY: Cao Wei

DATE: April 13, 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 : April 13, 2023

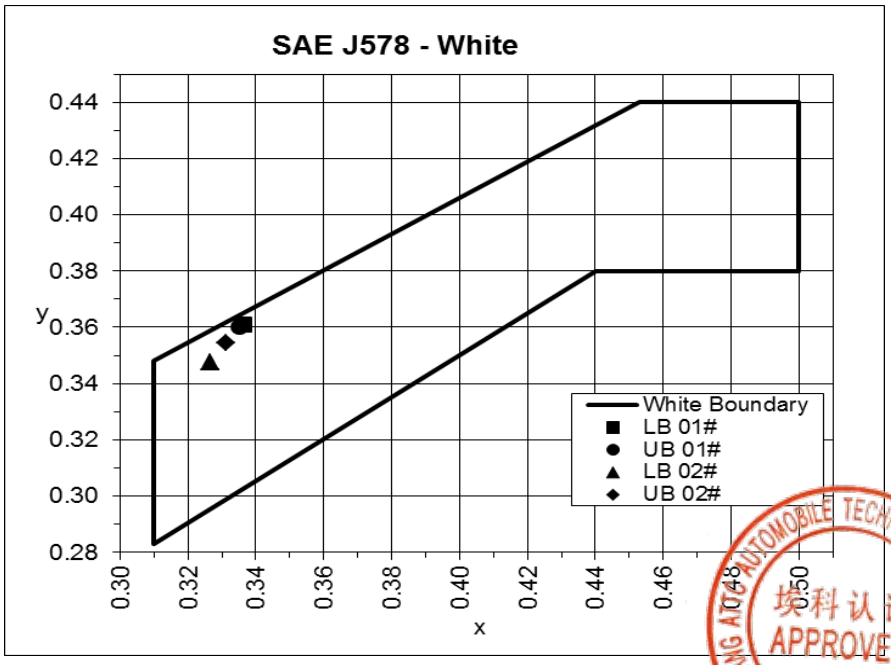
LAMP VOLTAGE/CURRENT : 12.8V

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# | 0.3364 | 0.3608 |
| UB 01# | 0.3353 | 0.3603 |
| LB 02# | 0.3265 | 0.3477 |
| UB 02# | 0.3313 | 0.3544 |

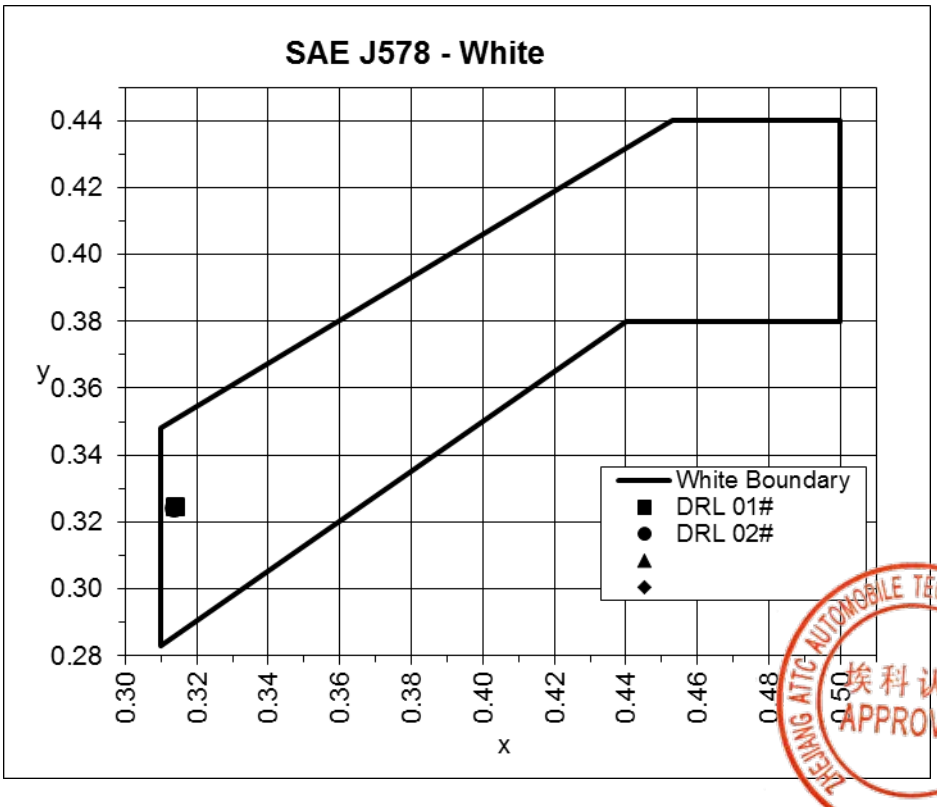


| | | |
|---|---|---|
| TEST COMPONENT | : | Daytime running lamp |
| COLOR REQUIREMENT | : | WHITE (CIE 1931)<br>the color of light emitted must fall within the following boundaries:<br>x = 0.31 (blue boundary)<br>y = 0.44 (green boundary)<br>x = 0.50 (yellow boundary)<br>y= 0.15 + 0.64x (green boundary)<br>y = 0.38 (red boundary)<br>y= 0.05 + 0.75x (purple boundary) |
| TEST METHOD | : | TRISTIMULOUS |
| TEST PERFORMED BY | : | Cao Wei |
| DATE | : | April 13, 2023 |

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

RESULTS :

| HV point | Coordinate x | Coordinate y |
|---|---|---|
| DRL 01# | 0.3140 | 0.3245 |
| DRL 02# | 0.3137 | 0.3241 |



TEST COMPONENT : Front turn signal lamp

COLOR REQUIREMENT : AMBER (CIE 1931)

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

y= 0.390 (red boundary)

y = 0.790 – 0.670x (white boundary)

y = x – 0.120 (green boundary)

TEST METHOD : TRISTIMULOUS

TEST PERFORMED BY : Cao Wei

DATE : April 13, 2023

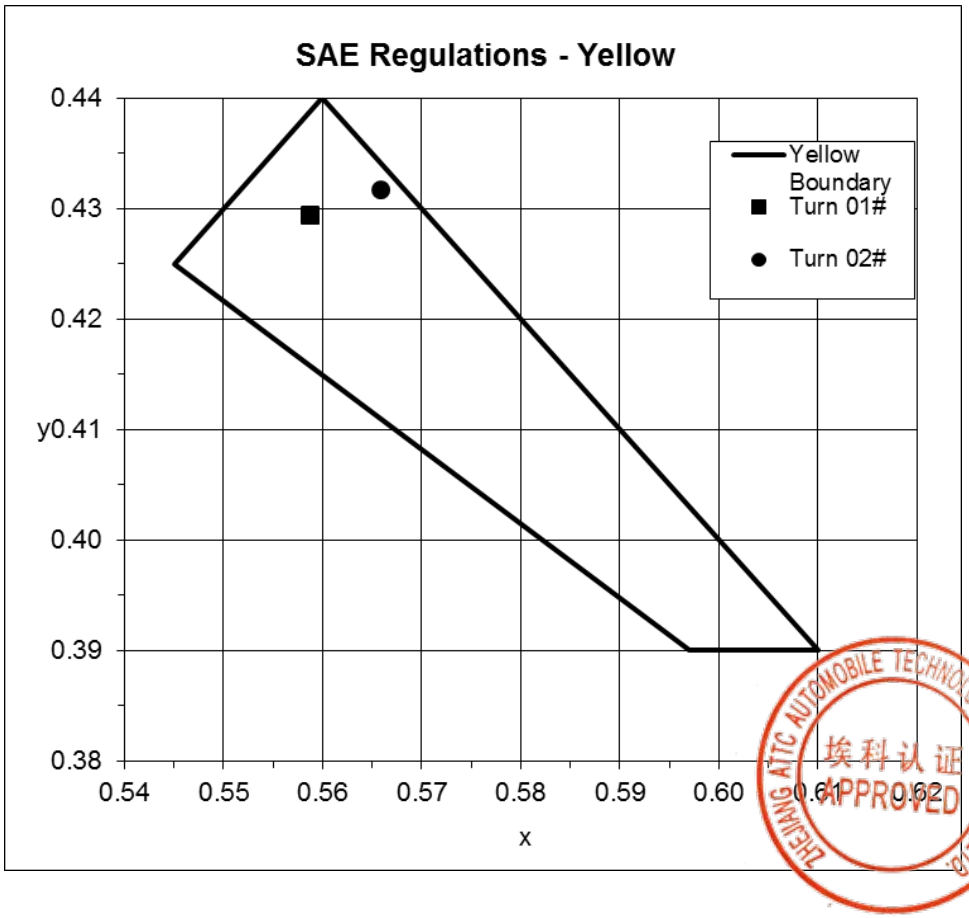
LAMP VOLTAGE/CURRENT : 12.8V

TEST DISTANCE : 3.236 m

LAMP POSITION : HV

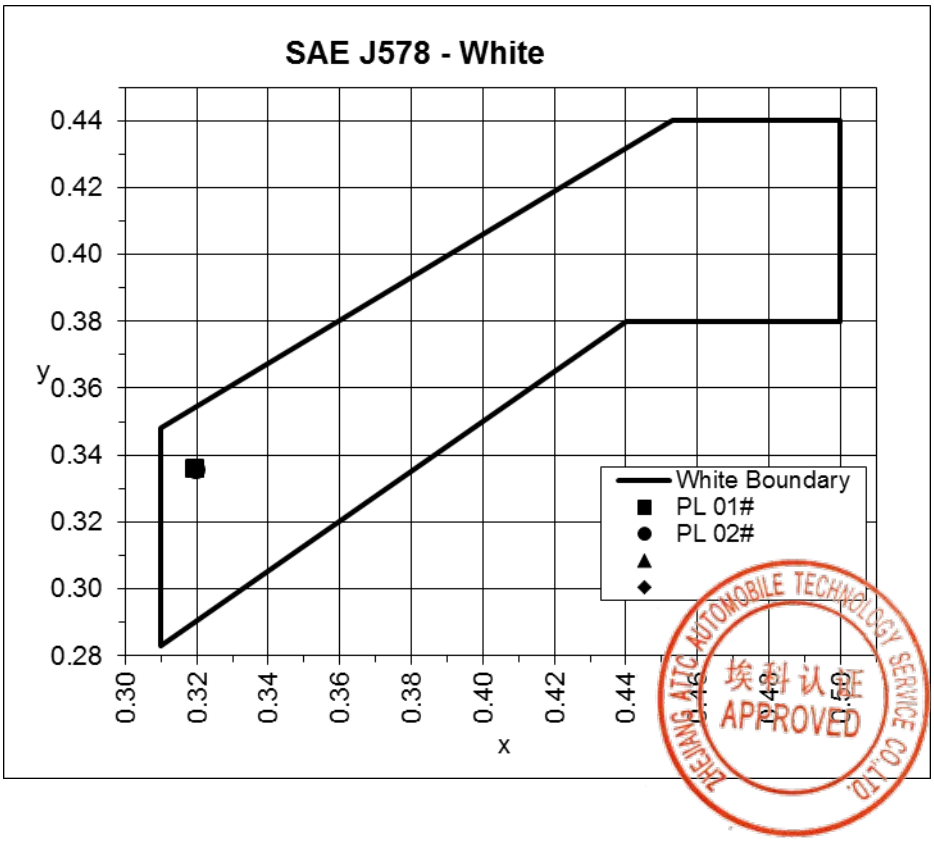
RESULTS :

| HV point | Coordinate x | Coordinate y |
|---|---|---|
| Turn 01# | 0.5588 | 0.4294 |
| Turn 02# | 0.5659 | 0.4317 |



| | | |
|---|---|---|
| TEST COMPONENT | : | Parking lamp |
| COLOR REQUIREMENT | : | WHITE (CIE 1931)<br>the color of light emitted must fall within the following boundaries:<br>x = 0.31 (blue boundary)<br>y = 0.44 (green boundary)<br>x = 0.50 (yellow boundary)<br>y= 0.15 + 0.64x (green boundary)<br>y = 0.38 (red boundary)<br>y= 0.05 + 0.75x (purple boundary) |
| TEST METHOD | : | TRISTIMULOUS |
| TEST PERFORMED BY | : | Cao Wei |
| DATE | : | April 13, 2023 |
| LAMP VOLTAGE | : | 12.8V |
| TEST DISTANCE | : | 3.236m |
| LAMP POSITION | : | HV |
| RESULTS | : | |

| HV point | Coordinate x | Coordinate y |
|---|---|---|
| Parking 01# | 0.3195 | 0.3359 |
| Parking 02# | 0.3197 | 0.3355 |



TEST COMPONENT : Side Marker Lamp

COLOR REQUIREMENT : AMBER (CIE 1931)

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

y= 0.390 (red boundary)

y = 0.790 – 0.670x (white boundary)

y = x – 0.120 (green boundary)

TEST METHOD : TRISTIMULOUS

TEST PERFORMED BY : Cao Wei

DATE : April 13, 2023

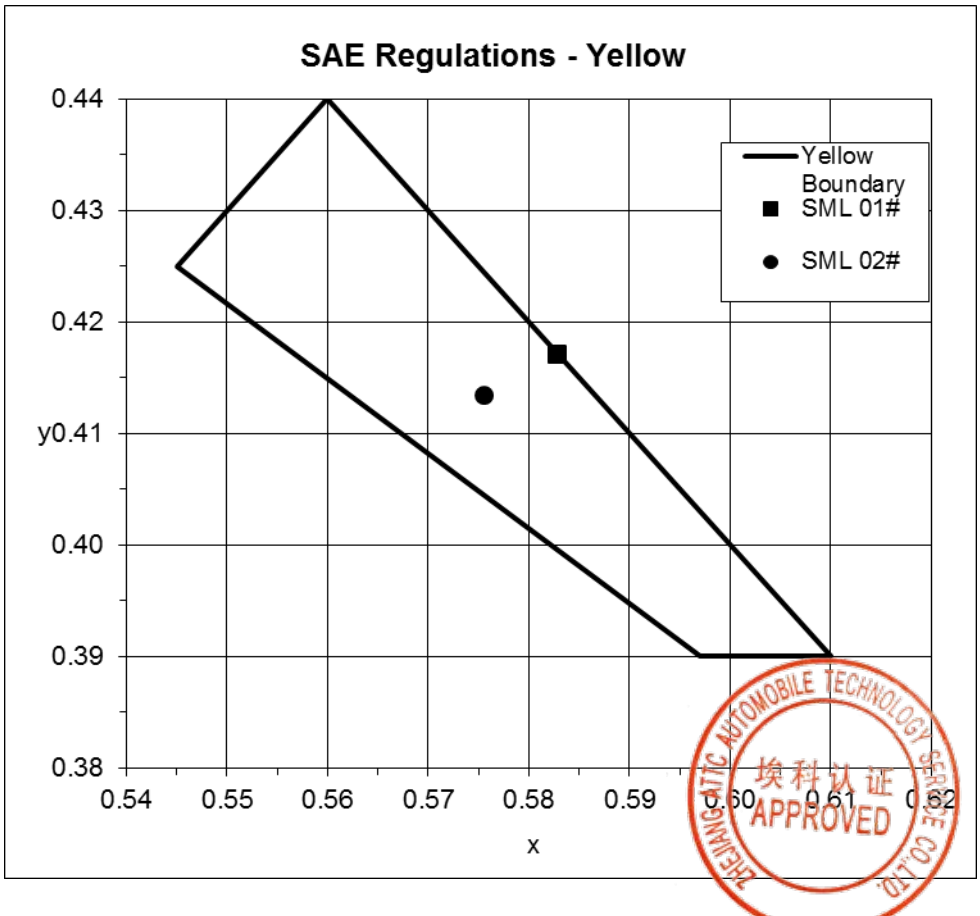
LAMP VOLTAGE : 12.8V

TEST DISTANCE : 3.236 m

LAMP POSITION : HV

RESULTS :

| HV point | Coordinate x | Coordinate y |
|---|---|---|
| Marker 1# | 0.5828 | 0.4171 |
| Marker 2# | 0.5755 | 0.4134 |



TEST COMPONENT : Side Reflex Reflectors

COLOR REQUIREMENT : AMBER (CIE 1931)

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

y= 0.390 (red boundary)

y = 0.790 – 0.670x (white boundary)

y = x – 0.120 (green boundary)

TEST METHOD : TRISTIMULOUS

TEST PERFORMED BY : Cao Wei

DATE : April 13, 2023

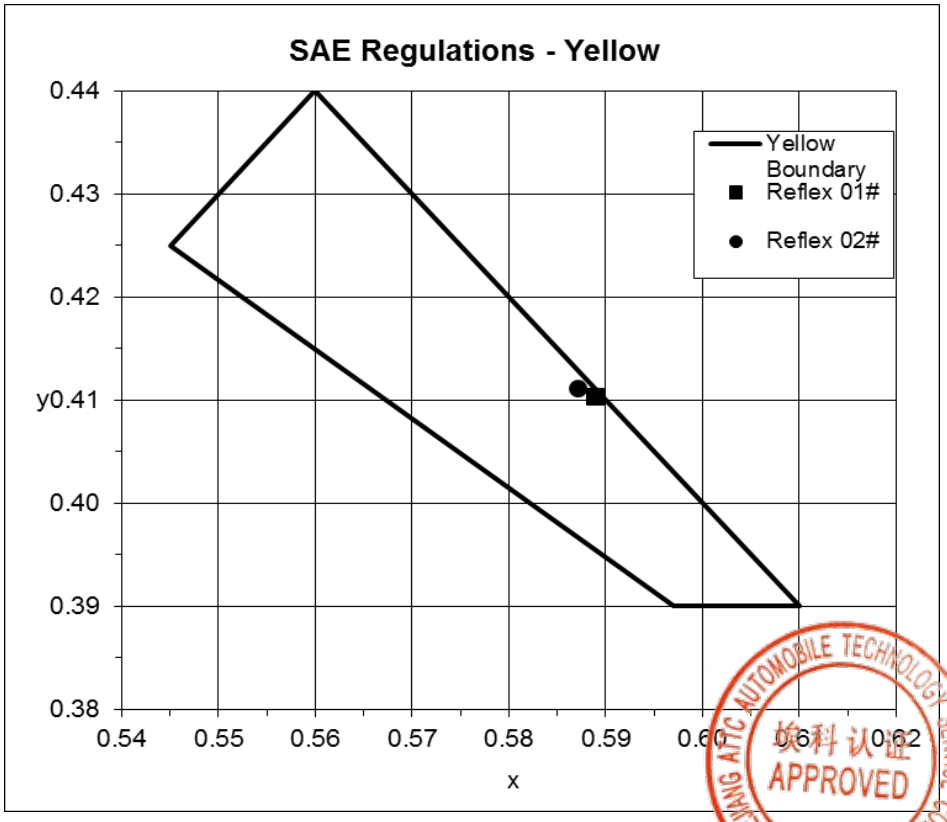
LAMP VOLTAGE : ---

TEST DISTANCE : 2 m

LAMP POSITION : ---

RESULTS :

| HV point | Coordinate x | Coordinate y |
|---|---|---|
| Reflex 01# | 0.5889 | 0.4103 |
| Reflex 02# | 0.5872 | 0.4111 |



## 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:---

## 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

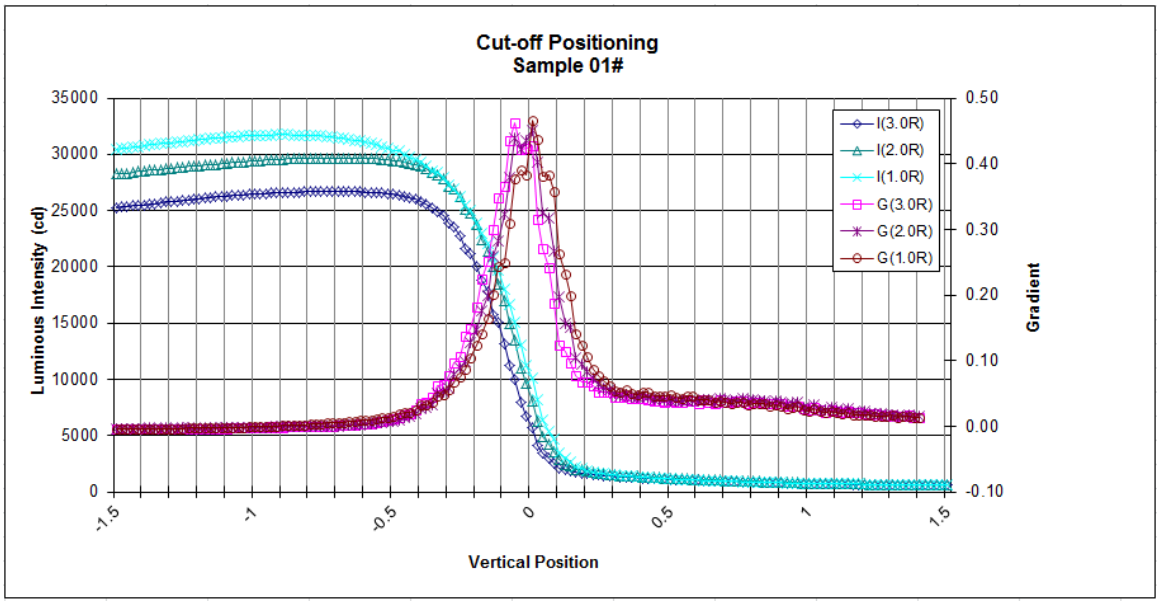
## SECTION 13) ADDITIONAL LIGHT SOURCE

No requirements

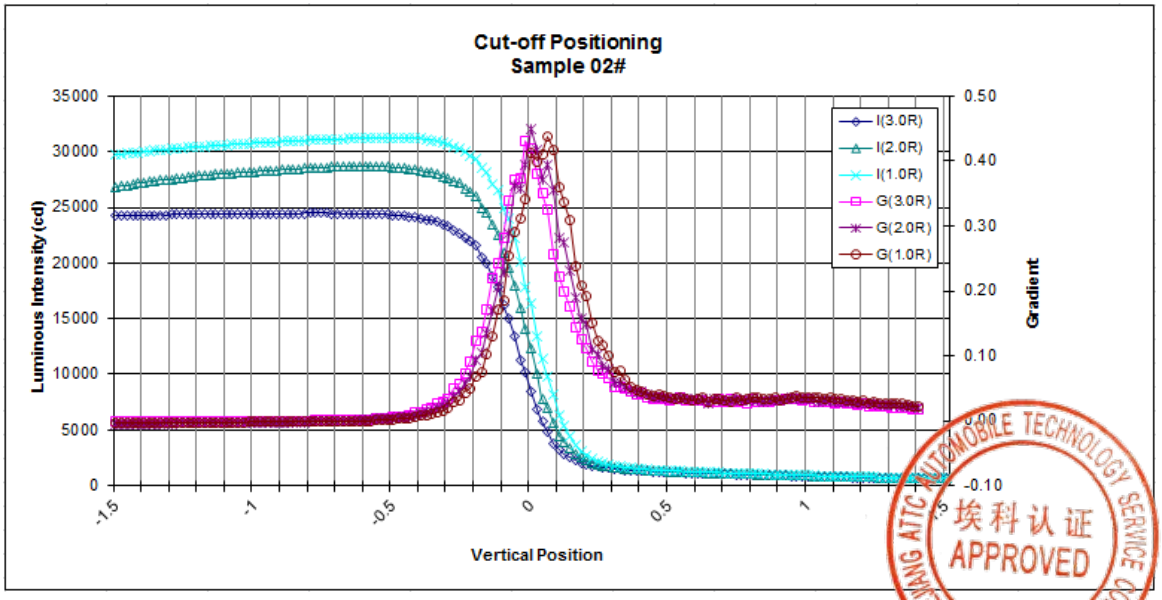
## SECTION 14) PHOTOMETRY

| | | |
|---|---|---|
| TEST COMPONENT | : | Upper/Lower beam |
| SAMPLE No | : | 01#, 02# |
| FMVSS No. 108 REQUIREMENT | : | Upper beam (UB3) |
| | | Lower beam (LB3V) |
| VEHICLE TYPE/SIZE | : | SUBARU WRX 2007 |
| - NUMBER OF COMPARTMENTS | : | --- |
| - NUMBER OF LAMPS | : | 1 |
| - NUMBER OF LIGHTED SECTIONS | : | --- |
| TEST PERFORMED BY | : | Cao Wei |
| DATE | : | April 13, 2023 |
| PHOTOMETRIC TEST DISTANCE | : | 25 meters |
| BULB TRADE NO. | : | --- |
| TEST VOLTAGE/CURRENT | : | 12.8V |
| AIM NOTES | : | VOR |
| OTHER NOTES | : | --- |
| RESULTS | : | PASS |

| **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 | 0.463 | - | |
| 0.00V/2.0R | 0.451 | > 0.13 | Maximum gradient $G_{max}$ is positioned on the right side at H-H line. Maximum inclination of cutoff is within ±0.2°. |
| 0.10D/1.0R | 0.466 | - | |




| **Lower Beam** Aim notes | | | Result |
|---|---|---|---|
| Location | Value | Required | Horizontal width of cutoff is greater than 2° centered at 2.0 R. |
| 0.04D/3.0R | 0.432 | - | |
| 0.02U/2.0R | 0.449 | > 0.13 | Maximum gradient $G_{max}$ is positioned on the right side at H-H line. Maximum inclination of cutoff is within ±0.2°. |
| 0.12D/1.0R | 0.438 | - | |



**Subjects: Front Group Lamp(Headlamp, Front Turn Signal Lamp, Parking Lamp, Daytime Running Lamp, Side Marker Lamp, Side Retro-Reflector)**
**Reference standard: FMVSS 571.108**
**Report number: AT23XX1D61591, Date: May 10, 2023**

| 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 | | 18340 | |
| 1U | 3L & 3R | - | 2,000 | | 20340/22320 | |
| H | V | 75,000 | 20,000 | | 29790 | |
| H | 3L & 3R | - | 10,000 | | 23020/25280 | |
| H | 6L & 6R | - | 3,200 | | 13410/14440 | |
| H | 9L & 9R | - | 1,500 | | 8065/8740 | |
| H | 12L & 12R | - | 750 | | 5814/5910 | |
| 1.5D | V | - | 5,000 | | 28900 | |
| 1.5D | 9L & 9R | - | 2,000 | | 9521/10110 | |
| 2.5D | V | - | 2,500 | | 25180 | |
| 2.5D | 12L & 12R | - | 750 | | 6792/7583 | |
| 4D | V | 5,000 | - | 4.25D | **6760** | 4550 |

| 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 | - | | 91.82 | |
| 4U | 8L & 8R | - | 64 | | 209.4/208.0 | |
| 2U | 4L | - | 135 | | 429.5 | |
| 1.5U | 1R to 3R | - | 200 | | 506.0 | |
| 1.5U | 1R to R | 1,400 | - | | 516.8 | |
| 1U | 1.5L to L | 700 | - | | 550.8 | |
| 0.5U | 1.5L to L | 1,000 | - | | 628.4 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 674.5/701.9 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 695.8 | |
| H | 8L | - | 64 | | 466.9 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | 1.3R/0.85D | **5729** | 23010 |
| 0.86D | V | - | 4,500 | | 5735 | |
| 0.86D | 3.5L | 12,000 | 1,800 | | 5840 | |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 29600 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 11200/11940 | |
| 2D | 15L & 15R | - | 1,000 | | 5458/6075 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 10970 | |
| 4D | 20L & 20R | - | 300 | | 1958/2074 | |

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

| 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 | | 27690 | |
| 1U | 3L & 3R | - | 2,000 | | 27680/23180 | |
| H | V | 75,000 | 20,000 | | 31070 | |
| H | 3L & 3R | - | 10,000 | | 27880/23810 | |
| H | 6L & 6R | - | 3,200 | | 16850/14780 | |
| H | 9L & 9R | - | 1,500 | | 10340/9240 | |
| H | 12L & 12R | - | 750 | | 7220/6548 | |
| 1.5D | V | - | 5,000 | | 28540 | |
| 1.5D | 9L & 9R | - | 2,000 | | 11230/10670 | |
| 2.5D | V | - | 2,500 | | 23640 | |
| 2.5D | 12L & 12R | - | 750 | | 6681/6970 | |
| 4D | V | 5,000 | - | 4.25D | **6520** | 4880 |

| 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 | - | | 96.71 | |
| 4U | 8L & 8R | - | 64 | | 244.8/218.1 | |
| 2U | 4L | - | 135 | | 460.1 | |
| 1.5U | 1R to 3R | - | 200 | | 682.6 | |
| 1.5U | 1R to R | 1,400 | - | | 713.6 | |
| 1U | 1.5L to L | 700 | - | | 639.7 | |
| 0.5U | 1.5L to L | 1,000 | - | | 872.0 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 1522/1808 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 1488 | |
| H | 8L | - | 64 | | 1093 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 29810 | |
| 0.86D | V | - | 4,500 | | 31870 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.5L/0.61D | **12390** | 5070 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 26000 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 12020/11670 | |
| 2D | 15L & 15R | - | 1,000 | | 5093/5383 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 10690 | |
| 4D | 20L & 20R | - | 300 | | 1843/1882 | |

[(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 | : | Daytime running lamp |
| SAMPLE No | : | 01#, 02# |
| SAE J2087 REQUIREMENT | : | |
| VEHICLE TYPE/SIZE | : | |
| - NUMBER OF COMPARTMENTS | : | --- |
| - NUMBER OF LAMPS | : | 1 |
| - NUMBER OF LIGHTED SECTIONS | : | --- |
| TEST PERFORMED BY | : | Cao Wei |
| DATE | : | April 13, 2023 |
| PHOTOMETRIC TEST DISTANCE | : | 3.16m |
| BULB TRADE NO. | : | --- |
| TEST VOLTAGE | : | 12.8V |
| AIM NOTES | : | Reference center refer to the drawing on last page |
| EFFECTIVE PROJECTED LUMINOUS LENS AREA | : | 7042mm$^2$ |
| OTHER NOTES | : | --- |
| RESULTS | : | Pass |

| DAYTIME RUNNING 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# | 531.5 | 515.4 | 1.031 | |
| 02# | 542.6 | 524.2 | 1.035 | |

DAYTIME RUNNING LAMP PHOTOMETRY RESULT AFTER 1 MINUTE OF OPERATION
(SAE J2087 FIGURE 1 - PHOTOMETRIC REQUIREMENTS FOR DRL OR DRL OPTICALLY COMBINED WITH FRONT POSITION LAMP)

| TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY (cd) | MAXIMUM PHOTOMETRIC INTENSITY (cd) | Measurements | |
|---|---|---|---|---|---|
| | | | | Sample 01# | Sample 02# |
| 20L | 5U | 40 | 2500 | 285.7 | 276.1 |
| | H | 100 | 2500 | 295.8 | 284.3 |
| | 5D | 40 | 2500 | 264.4 | 265.1 |
| 5L | 10U | 80 | 2500 | 271.1 | 241.2 |
| V | | 80 | 2500 | 298.6 | 310.0 |
| 5R | | 80 | 2500 | 248.4 | 269.6 |
| 10L | 5U | 80 | 2500 | 364.2 | 350.9 |
| | H | 280 | 2500 | 387.3 | 397.4 |
| | 5D | 80 | 2500 | 364.3 | 360.3 |
| V | 5U | 280 | 2500 | 501.4 | 513.3 |
| 5L | H | 360 | 2500 | 518.4 | 526.0 |
| V | | 500 | 2500 | 531.5 | 542.6 |
| 5R | | 360 | 2500 | 495.6 | 510.7 |
| V | 5D | 280 | 2500 | 493.6 | 468.8 |
| 10R | 5U | 80 | 2500 | 301.4 | 355.0 |
| | H | 280 | 2500 | 374.5 | 415.7 |
| | 5D | 80 | 2500 | 276.4 | 413.4 |
| 20R | 5U | 40 | 2500 | 138.9 | 245.3 |
| | H | 100 | 2500 | 167.3 | 283.0 |
| | 5D | 40 | 2500 | 110.3 | 268.9 |

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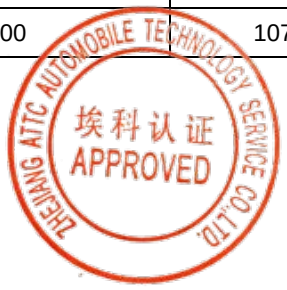
DAYTIME RUNNING LAMP PHOTOMETRY RESULT AFTER 30 MINUTES OF OPERATION

(SAE J2087 FIGURE 1 - PHOTOMETRIC REQUIREMENTS FOR DRL OR DRL OPTICALLY COMBINED WITH FRONT POSITION LAMP)

| TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY (cd) | MAXIMUM PHOTOMETRIC INTENSITY (cd) | Measurements | |
|---|---|---|---|---|---|
| | | | | Sample 01# | Sample 02# |
| 20L | 5U | 40 | 2500 | 277.0 | 266.7 |
| | H | 100 | 2500 | 286.8 | 274.7 |
| | 5D | 40 | 2500 | 256.4 | 256.1 |
| 5L | 10U | 80 | 2500 | 262.9 | 233.0 |
| V | | 80 | 2500 | 289.6 | 299.5 |
| 5R | | 80 | 2500 | 240.9 | 260.5 |
| 10L | 5U | 80 | 2500 | 353.2 | 339.0 |
| | H | 280 | 2500 | 375.6 | 383.9 |
| | 5D | 80 | 2500 | 353.3 | 348.1 |
| V | 5U | 280 | 2500 | 486.2 | 495.9 |
| 5L | H | 360 | 2500 | 502.7 | 508.2 |
| V | | 500 | 2500 | 515.4 | 524.2 |
| 5R | | 360 | 2500 | 480.6 | 493.4 |
| V | 5D | 280 | 2500 | 478.6 | 452.9 |
| 10R | 5U | 80 | 2500 | 292.3 | 343.0 |
| | H | 280 | 2500 | 363.2 | 401.6 |
| | 5D | 80 | 2500 | 268.0 | 399.4 |
| 20R | 5U | 40 | 2500 | 134.7 | 237.0 |
| | H | 100 | 2500 | 162.2 | 273.4 |
| | 5D | 40 | 2500 | 107.0 | 259.8 |



## SECTION 14) PHOTOMETRY(CONTINUED)

| | | |
|---|---|---|
| TEST COMPONENT | : | Front turn signal lamp |
| SAMPLE No | : | 01#, 02# |
| SAE J2087 REQUIREMENT | : | |
| VEHICLE TYPE/SIZE | : | |
| - NUMBER OF COMPARTMENTS | : | 1 |
| - NUMBER OF LAMPS | : | 1 |
| - NUMBER OF LIGHTED SECTIONS | : | 1 |
| TEST PERFORMED BY | : | Cao Wei |
| DATE | : | April 13, 2023 |
| PHOTOMETRIC TEST DISTANCE | : | 3.16m |
| BULB TRADE NO. | : | --- |
| TEST VOLTAGE | : | 12.8V |
| AIM NOTES | : | Reference center refer to the drawing on last page |
| EFFECTIVE PROJECTED LUMINOUS LENS AREA | : | 7824mm$^2$ |
| OTHER NOTES | : | --- |
| RESULTS | : | Pass |

| FRONT TURN SIGNAL 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# | 243.1 | 235.8 | 1.031 | |
| 02# | 250.1 | 241.2 | 1.037 | |

FRONT TURN SIGNAL LAMP PHOTOMETRY RESULT AFTER 1 MINUTE OF OPERATION
(TABLE IV-a of FMVSS No. 108)

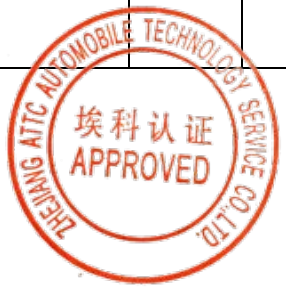
BASE REQUIREMENTS

| GROUP NUMBER | TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY(1)(2)(cd) | | | GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lighted Sections | Measurements | | | | |
| | | | 1 | Sample 01# | Sample 02# | Required Minimum | Measured | |
| | | | | | | | 01# | 02# |
| 1 | 20L | 5U | 25 | 48.61 | 45.96 | 130 | 252.1 | 235.4 |
| | | 5D | 25 | 43.82 | 41.62 | | | |
| | 5L | 10U | 40 | 75.78 | 69.33 | | | |
| | | 10D(3) | 40 | 83.90 | 78.46 | | | |
| 2 | 10L | 5U | 75 | 100.3 | 96.43 | 250 | 367.1 | 335.8 |
| | | H | 100 | 163.8 | 140.1 | | | |
| | | 5D | 75 | 103.0 | 99.29 | | | |
| 3 | V | 5U | 175 | 210.3 | 204.5 | 950 | 1099.9 | 1121.4 |
| | 5L | H | 200 | 225.3 | 233.9 | | | |
| | V | | 200 | 243.1 | 250.1 | | | |
| | 5R | | 200 | 223.6 | 237.4 | | | |
| | V | 5D | 175 | 197.6 | 195.5 | | | |
| 4 | 10R | 5U | 75 | 116.8 | 108.6 | 250 | 370.3 | 367.8 |
| | | H | 100 | 166.9 | 165.0 | | | |
| | | 5D | 75 | 86.62 | 94.18 | | | |
| 5 | 5R | 10U | 40 | 101.5 | 101.2 | 130 | 364.1 | 370.3 |
| | | 10D(3) | 40 | 96.38 | 96.48 | | | |
| | 20R | 5U | 25 | 82.97 | 87.42 | | | |
| | | 5D | 25 | 83.20 | 85.21 | | | |

FRONT TURN SIGNAL LAMP PHOTOMETRY RESULT AFTER 30 MINUTE OF OPERATION
(TABLE IV-a of FMVSS No. 108)

BASE REQUIREMENTS

| GROUP NUMBER | TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY[(1)(2)](cd) | | | GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lighted Sections | Measurements | | | | |
| | | | 1 | Sample 01# | Sample 02# | Required Minimum | Measured | |
| | | | | | | | 01# | 02# |
| 1 | 20L | 5U | 25 | 47.15 | 44.32 | 130 | 244.5 | 227.0 |
| | | 5D | 25 | 42.50 | 40.14 | | | |
| | 5L | 10U | 40 | 73.50 | 66.86 | | | |
| | | 10D[(3)] | 40 | 81.38 | 75.67 | | | |
| 2 | 10L | 5U | 75 | 97.24 | 93.00 | 250 | 356.0 | 324.0 |
| | | H | 100 | 158.9 | 135.1 | | | |
| | | 5D | 75 | 99.86 | 95.76 | | | |
| 3 | V | 5U | 175 | 204.0 | 197.2 | 950 | 1067.0 | 1081.4 |
| | 5L | H | 200 | 218.5 | 225.6 | | | |
| | V | | 200 | 235.8 | 241.2 | | | |
| | 5R | | 200 | 216.9 | 228.9 | | | |
| | V | 5D | 175 | 191.7 | 188.5 | | | |
| 4 | 10R | 5U | 75 | 113.3 | 104.7 | 250 | 359.2 | 354.6 |
| | | H | 100 | 161.9 | 159.1 | | | |
| | | 5D | 75 | 84.02 | 90.83 | | | |
| 5 | 5R | 10U | 40 | 98.45 | 97.60 | 130 | 353.1 | 357.1 |
| | | 10D[(3)] | 40 | 93.49 | 93.05 | | | |
| | 20R | 5U | 25 | 80.48 | 84.31 | | | |
| | | 5D | 25 | 80.70 | 82.18 | | | |



## 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 | : | April 13, 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 |

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# | 59.86 | 58.91 | 1.016 | |
| 02# | 68.28 | 65.77 | 1.038 | |

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 | Measured | |
| | | | | | Sample 01# | Sample 02# | Minimum | 01# | 02# |
| 1 | 20L | 5U | 0.4 | 125 | 39.28 | 23.91 | 2.4 | 153.7 | 128.3 |
| | | 5D | 0.4 | 250 | 36.60 | 22.64 | | | |
| | 5L | 10U | 0.8 | 125 | 37.50 | 33.54 | | | |
| | | 10D(3) | 0.8 | 250 | 40.36 | 48.24 | | | |
| 2 | 10L | 5U | 0.8 | 125 | 50.53 | 47.71 | 3.0 | 155.1 | 152.8 |
| | | H | 1.4 | 125 | 53.85 | 54.35 | | | |
| | | 5D | 0.8 | 250 | 50.74 | 50.71 | | | |
| 3 | V | 5U | 2.8 | 125 | 55.53 | 57.40 | 16.8 | 283.1 | 320.7 |
| | 5L | H | 3.6 | 125 | 57.92 | 65.52 | | | |
| | V | | 4.0 | 125 | 59.86 | 68.28 | | | |
| | 5R | | 3.6 | 125 | 55.02 | 63.69 | | | |
| | V | 5D | 2.8 | 250 | 54.75 | 65.85 | | | |
| 4 | 10R | 5U | 0.8 | 125 | 42.34 | 49.97 | 3.0 | 125.5 | 166.9 |
| | | H | 1.4 | 125 | 44.04 | 58.57 | | | |
| | | 5D | 0.8 | 250 | 39.08 | 58.34 | | | |
| 5 | 5R | 10U | 0.8 | 125 | 34.32 | 32.93 | 2.4 | 104.7 | 156.5 |
| | | 10D(3) | 0.8 | 250 | 35.49 | 50.94 | | | |
| | 20R | 5U | 0.4 | 125 | 19.46 | 34.59 | | | |
| | | 5D | 0.4 | 250 | 15.45 | 38.01 | | | |

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 | 38.66 | 23.03 | 2.4 | 151.3 | 123.6 |
| | | 5D | 0.4 | 250 | 36.02 | 21.81 | | | |
| | 5L | 10U | 0.8 | 125 | 36.90 | 32.31 | | | |
| | | 10D(3) | 0.8 | 250 | 39.72 | 46.47 | | | |
| 2 | 10L | 5U | 0.8 | 125 | 49.73 | 45.96 | 3 | 152.7 | 147.2 |
| | | H | 1.4 | 125 | 53.00 | 52.35 | | | |
| | | 5D | 0.8 | 250 | 49.93 | 48.85 | | | |
| 3 | V | 5U | 2.8 | 125 | 54.65 | 55.29 | 16.8 | 278.6 | 309.0 |
| | 5L | H | 3.6 | 125 | 57.00 | 63.11 | | | |
| | V | | 4.0 | 125 | 58.91 | 65.77 | | | |
| | 5R | | 3.6 | 125 | 54.15 | 61.35 | | | |
| | V | 5D | 2.8 | 250 | 53.88 | 63.43 | | | |
| 4 | 10R | 5U | 0.8 | 125 | 41.67 | 48.13 | 3 | 123.5 | 160.8 |
| | | H | 1.4 | 125 | 43.34 | 56.42 | | | |
| | | 5D | 0.8 | 250 | 38.46 | 56.20 | | | |
| 5 | 5R | 10U | 0.8 | 125 | 33.78 | 31.72 | 2.4 | 103.1 | 150.7 |
| | | 10D(3) | 0.8 | 250 | 34.93 | 49.07 | | | |
| | 20R | 5U | 0.4 | 125 | 19.15 | 33.32 | | | |
| | | 5D | 0.4 | 250 | 15.20 | 36.61 | | | |

(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 5º down may be met at 5º 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 1.0º 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 14) PHOTOMETRY(CONTINUED)

| | | |
|---|---|---|
| TEST COMPONENT | : | Side marker 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 | : | April 13, 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 |

| SIDE MARKER LAMPS 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# | 10.14 | 9.481 | 1.070 | |
| 02# | 11.19 | 10.66 | 1.050 | |

| SIDE MARKER LAMPS PHOTOMETRY RESULT AFTER 1 MINUTE OF OPERATION (TABLE X OF FMVSS No. 108) | | | | |
|---|---|---|---|---|
| TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY[2](cd) | Measurements | |
| | | AMBER LAMPS | Sample 01# | Sample 02# |
| 10U | 45L[1] | 0.62 | 3.786 | 6.555 |
| | V | 0.62 | 9.870 | 10.90 |
| | 45R[1] | 0.62 | 6.175 | 3.373 |
| H | 45L[1] | 0.62 | 3.799 | 7.009 |
| | V | 0.62 | 10.14 | 11.19 |
| | 45R[1] | 0.62 | 5.764 | 3.302 |
| 10D[3] | 45L[1] | 0.62 | 3.846 | 8.556 |
| | V | 0.62 | 9.933 | 11.35 |
| | 45R[1] | 0.62 | 5.982 | 3.402 |

| SIDE MARKER LAMPS PHOTOMETRY RESULT AFTER 30 MINUTES OF OPERATION (TABLE X OF FMVSS No. 108) | | | | |
|---|---|---|---|---|
| TEST POINT (degrees) | | MINIMUM PHOTOMETRIC INTENSITY(2)(cd) | Measurements | |
| | | AMBER LAMPS | Sample 01# | Sample 02# |
| 10U | 45L(1) | 0.62 | 3.540 | 6.245 |
| | V | 0.62 | 9.229 | 10.38 |
| | 45R(1) | 0.62 | 5.774 | 3.213 |
| H | 45L(1) | 0.62 | 3.552 | 6.677 |
| | V | 0.62 | 9.481 | 10.66 |
| | 45R(1) | 0.62 | 5.389 | 3.146 |
| 10D(3) | 45L(1) | 0.62 | 3.596 | 8.151 |
| | V | 0.62 | 9.287 | 10.81 |
| | 45R(1) | 0.62 | 5.593 | 3.241 |

(1) Where a side marker lamp installed on a motor vehicle less than 30 feet in overall length and less than 80 inches (2032 mm) in overall width has the lateral angle nearest the other required side marker lamp on the same side of the vehicle reduced from 45º by design as specified by paragraph ~~S5.1.1.8~~(S7.4.13.2) in FMVSS No.108, the photometric intensity measurement may be met at the lesser angle.

(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 side marker lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

## SECTION 14) PHOTOMETRY(CONTINUED)

| | | |
|---|---|---|
| TEST COMPONENT | : | Side Reflex Reflectors |
| 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 | : | April 13, 2023 |
| PHOTOMETRIC TEST DISTANCE | : | 30.5m |
| BULB TRADE NO. | : | --- |
| TEST VOLTAGE | : | --- |
| AIM NOTES | : | Reference center refer to the drawing on last page |
| OTHER NOTES | : | --- |
| RESULTS | : | Pass |

| REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS (TABLE XVI-a of FMVSS No. 108) | | | | |
|---|---|---|---|---|
| OBSERVATION ANGLE (degrees) | ENTRANCE ANGLE (degrees) | MINIMUM PHOTOMETRIC INTENSITY AMBER (mcd/lx) | Measurements | |
| | | | Sample 01# | Sample 02# |
| 0.2 | 0 | 1050 | 1218.1 | 1156.4 |
| | 10U | 700 | 936.8 | 962.8 |
| | 10D(1) | 700 | 956.3 | 875.8 |
| | 20L | 350 | 417.7 | 426.8 |
| | 20R | 350 | 468.2 | 464.3 |
| 1.5 | 0 | 15 | 51.4 | 47.8 |
| | 10U | 12.5 | 35.3 | 32.3 |
| | 10D(1) | 12.5 | 37.4 | 38.3 |
| | 20L | 7.5 | 25.3 | 21.3 |
| | 20R | 7.5 | 21.4 | 24.5 |

(1) Where reflex reflectors are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required specified downward angle.

# SECTION 15) PHYSICAL TESTS

## ABRASION TEST

| | PASS | FAIL |
|---|---|---|
| | ✓ | |

**ABRADING PAD**

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.

**ABRADING PAD ALIGNMENT**

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.

**ABRASION TEST PROCEDURE**

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.

**PERFORMANCE REQUIREMENTS**

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 ¼º reaim is permitted in any direction at any test point.

**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 | | 20210 | |
| 1U | 3L & 3R | - | 2,000 | | 18410/19250 | |
| H | V | 75,000 | 20,000 | | 23160 | |
| H | 3L & 3R | - | 10,000 | | 18590/19150 | |
| H | 6L & 6R | - | 3,200 | | 11770/12260 | |
| H | 9L & 9R | - | 1,500 | | 7402/7717 | |
| H | 12L & 12R | - | 750 | | 5518/5154 | |
| 1.5D | V | - | 5,000 | | 21140 | |
| 1.5D | 9L & 9R | - | 2,000 | | 8262/8092 | |
| 2.5D | V | - | 2,500 | | 17550 | |
| 2.5D | 12L & 12R | - | 750 | | 4999/5408 | |
| 4D | V | 5,000 | - | 4.25D | **7500** | 4200 |

| 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 | - | | 94.04 | |
| 4U | 8L & 8R | - | 64 | | 229.1/244.5 | |
| 2U | 4L | - | 135 | | 626.1 | |
| 1.5U | 1R to 3R | - | 200 | | 996.3 | |
| 1.5U | 1R to R | 1,400 | - | | 618.6 | |
| 1U | 1.5L to L | 700 | - | | 587.0 | |
| 0.5U | 1.5L to L | 1,000 | - | | 719.4 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 649.3/861.8 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 713.2 | |
| H | 8L | - | 64 | | 1391 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 22750 | |
| 0.86D | V | - | 4,500 | | 21840 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.5L/0.61D | **16370** | 10710 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 20580 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 8540/8765 | |
| 2D | 15L & 15R | - | 1,000 | | 3772/3985 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 11490 | |
| 4D | 20L & 20R | - | 300 | | 1552/1412 | |

(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 1in 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 23ºC±4ºC 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 ¼º reaim is permitted in any direction at any test point.

**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 | | 24670 | |
| 1U | 3L & 3R | - | 2,000 | | 22790/23710 | |
| H | V | 75,000 | 20,000 | | 28710 | |
| H | 3L & 3R | - | 10,000 | | 23210/23900 | |
| H | 6L & 6R | - | 3,200 | | 14180/14910 | |
| H | 9L & 9R | - | 1,500 | | 8525/9163 | |
| H | 12L & 12R | - | 750 | | 6378/6150 | |
| 1.5D | V | - | 5,000 | | 26540 | |
| 1.5D | 9L & 9R | - | 2,000 | | 9695/9913 | |
| 2.5D | V | - | 2,500 | | 21410 | |
| 2.5D | 12L & 12R | - | 750 | | 5756/6683 | |
| 4D | V | 5,000 | - | 4.25D | **7520** | 4417 |

| 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 | - | | 97.06 | |
| 4U | 8L & 8R | - | 64 | | 214.4/252.4 | |
| 2U | 4L | - | 135 | | 547.8 | |
| 1.5U | 1R to 3R | - | 200 | | 944.5 | |
| 1.5U | 1R to R | 1,400 | - | | 1017.6 | |
| 1U | 1.5L to L | 700 | - | | 626.7 | |
| 0.5U | 1.5L to L | 1,000 | - | | 726.7 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 762.8/919.2 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 1494 | |
| H | 8L | - | 64 | | 928.8 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 29430 | |
| 0.86D | V | - | 4,500 | | 26240 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.5L/0.61D | **20210** | 8062 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 26790 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 10610/11290 | |
| 2D | 15L & 15R | - | 1,000 | | 4628/5289 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 11560 | |
| 4D | 20L & 20R | - | 300 | | 1743/1879 | |

(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.

## 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 ASTMB117-73, 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 ¼º reaim is permitted in any direction at any test point.

**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 | | 13580 | |
| 1U | 3L & 3R | - | 2,000 | | 16360/17460 | |
| H | V | 75,000 | 20,000 | | 25330 | |
| H | 3L & 3R | - | 10,000 | | 19900/21510 | |
| H | 6L & 6R | - | 3,200 | | 11440/12060 | |
| H | 9L & 9R | - | 1,500 | | 7065/7446 | |
| H | 12L & 12R | - | 750 | | 5096/5082 | |
| 1.5D | V | - | 5,000 | | 25670 | |
| 1.5D | 9L & 9R | - | 2,000 | | 8308/8735 | |
| 2.5D | V | - | 2,500 | | 23810 | |
| 2.5D | 12L & 12R | - | 750 | | 6226/6537 | |
| 4D | V | 5,000 | - | 4.25D | **6736** | 4619 |

| 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 | - | | 91.92 | |
| 4U | 8L & 8R | - | 64 | | 363.7/532.3 | |
| 2U | 4L | - | 135 | | 846.9 | |
| 1.5U | 1R to 3R | - | 200 | | 1290.9 | |
| 1.5U | 1R to R | 1,400 | - | | 1146.9 | |
| 1U | 1.5L to L | 700 | - | | 526.3 | |
| 0.5U | 1.5L to L | 1,000 | - | | 817.3 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 667.0/840.3 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 1311 | |
| H | 8L | - | 64 | | 830.2 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 22390 | |
| 0.86D | V | - | 4,500 | | 22190 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.68L/1.04D | **14410** | 9828 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 17970 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 5314/9705 | |
| 2D | 15L & 15R | - | 1,000 | | 3242/3275 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 7844 | |
| 4D | 20L & 20R | - | 300 | | 1955/2165 | |

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

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## TEMPERATURE CYCLE TEST

| | PASS | FAIL |
|---|---|---|
| | ✓ | |

### SAMPLES

A sample headlamp with one or mo re 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 ¼º reaim is permitted in any direction at any test point.

**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 | | 12070 | |
| 1U | 3L & 3R | - | 2,000 | | 15840/16960 | |
| H | V | 75,000 | 20,000 | | 26040 | |
| H | 3L & 3R | - | 10,000 | | 20530/21890 | |
| H | 6L & 6R | - | 3,200 | | 11460/12140 | |
| H | 9L & 9R | - | 1,500 | | 7111/7461 | |
| H | 12L & 12R | - | 750 | | 5004/5118 | |
| 1.5D | V | - | 5,000 | | 26780 | |
| 1.5D | 9L & 9R | - | 2,000 | | 8403/8802 | |
| 2.5D | V | - | 2,500 | | 25170 | |
| 2.5D | 12L & 12R | - | 750 | | 6544/6639 | |
| 4D | V | 5,000 | - | 4.25D | **5878** | 4267 |

| 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 | - | | 85.98 | |
| 4U | 8L & 8R | - | 64 | | 377.8/537.8 | |
| 2U | 4L | - | 135 | | 890.6 | |
| 1.5U | 1R to 3R | - | 200 | | 1389 | |
| 1.5U | 1R to R | 1,400 | - | | 954.8 | |
| 1U | 1.5L to L | 700 | - | | 534.0 | |
| 0.5U | 1.5L to L | 1,000 | - | | 752.8 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 833.5/970.3 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 1433 | |
| H | 8L | - | 64 | | 897.5 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 22910 | |
| 0.86D | V | - | 4,500 | | 22577 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.5L/1D | **12737** | 9724 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 25470 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 9159/9908 | |
| 2D | 15L & 15R | - | 1,000 | | 4675/4836 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 7060 | |
| 4D | 20L & 20R | - | 300 | | 1952/1989 | |

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

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## 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 ½D-1½R 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 35º + 4° -0º 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° -0º 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.

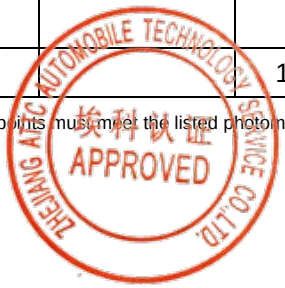
(b) meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

**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 | | 11320 | |
| 1U | 3L & 3R | - | 2,000 | | 19230/20530 | |
| H | V | 75,000 | 20,000 | | 24420 | |
| H | 3L & 3R | - | 10,000 | | 19380/20360 | |
| H | 6L & 6R | - | 3,200 | | 12010/12790 | |
| H | 9L & 9R | - | 1,500 | | 7504/8020 | |
| H | 12L & 12R | - | 750 | | 5609/5338 | |
| 1.5D | V | - | 5,000 | | 22310 | |
| 1.5D | 9L & 9R | - | 2,000 | | 8312/8547 | |
| 2.5D | V | - | 2,500 | | 18620 | |
| 2.5D | 12L & 12R | - | 750 | | 5115/5721 | |
| 4D | V | 5,000 | - | 4.25D | **5230** | 4139 |

| 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 | - | | 82.80 | |
| 4U | 8L & 8R | - | 64 | | 571.7/823.8 | |
| 2U | 4L | - | 135 | | 1259 | |
| 1.5U | 1R to 3R | - | 200 | | 1064 | |
| 1.5U | 1R to R | 1,400 | - | | 1179 | |
| 1U | 1.5L to L | 700 | - | | 489.0 | |
| 0.5U | 1.5L to L | 1,000 | - | | 825.8 | |
| 0.5U | 1R to 3R | 2,700 | 500 | | 847.1/963.9 | |
| H | V | - | - | | - | |
| H | 4L | - | 135 | | 2269 | |
| H | 8L | - | 64 | | 1445 | |
| 0.5D | 1.5L to L | - | - | | - | |
| 0.5D | 1.5R | - | - | | - | |
| 0.6D | 1.3R | - | 10,000 | | 24340 | |
| 0.86D | V | - | 4,500 | | 23190 | |
| 0.86D | 3.5L | 12,000 | 1,800 | 3.5L/0.61D | **17440** | 10700 |
| 1D | 6L | - | - | | - | |
| 1.5D | 2R | - | 15,000 | | 22070 | |
| 1.5D | 9L & 9R | - | - | | - | |
| 2D | 9L & 9R | - | 1,250 | | 9018/9297 | |
| 2D | 15L & 15R | - | 1,000 | | 4034/4270 | |
| 2.5D | V | - | - | | - | |
| 2.5D | 12L & 12R | - | - | | - | |
| 4D | V | - | - | | - | |
| 4D | 4R | 12,500 | - | | 10050 | |
| 4D | 20L & 20R | - | 300 | | 1587/1578 | |

[(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°-0º F (38º+4º-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 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 |

**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.

**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.

**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.

## HEADLAMP CONNECTOR TEST

| | PASS | FAIL |
|---|---|---|
| | ✓ | |

**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.

**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

## AIMING ADJUSTMENT TEST

| | PASS | FAIL |
|---|---|---|
| | N/A | N/A |

**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.

**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 ± 4.0º 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 ± 4.0º. A sample Type F sealed beam, integral beam, replaceable bulb, or combination headlamp tested per the procedure must provide a minimum of ± 4.0º adjustment range in the vertical plane and ± 2.5º 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 ± 2.5º and ± 4.0º 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 ±2.5º 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 ¼º reaim is permitted in any direction at any test point.

## 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 ¼º 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 down-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 45º 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.
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.

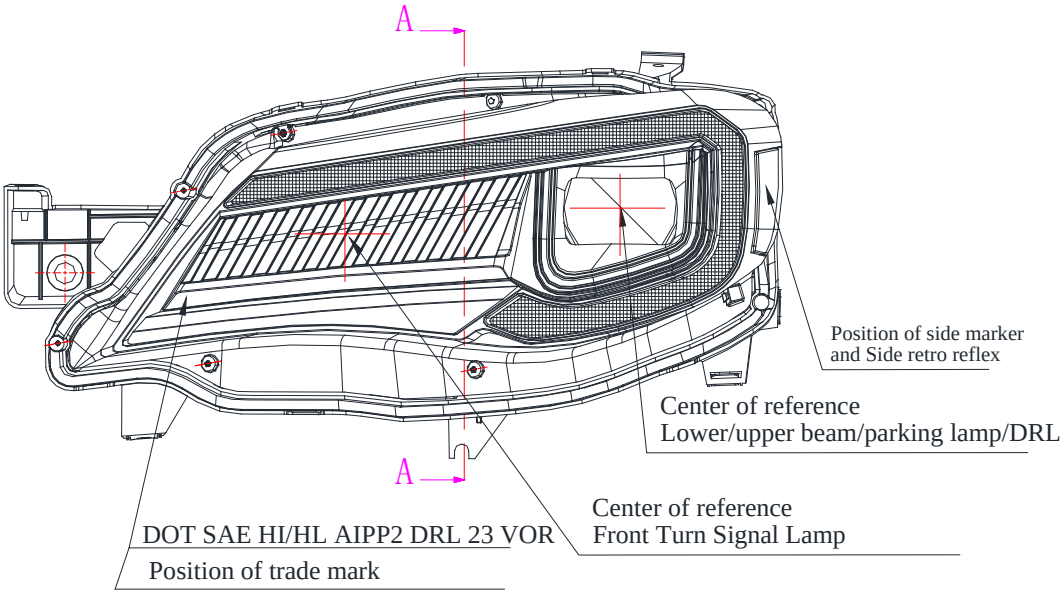
## SECTION 16) PHOTOGRAPHS OF TEST SAMPLE

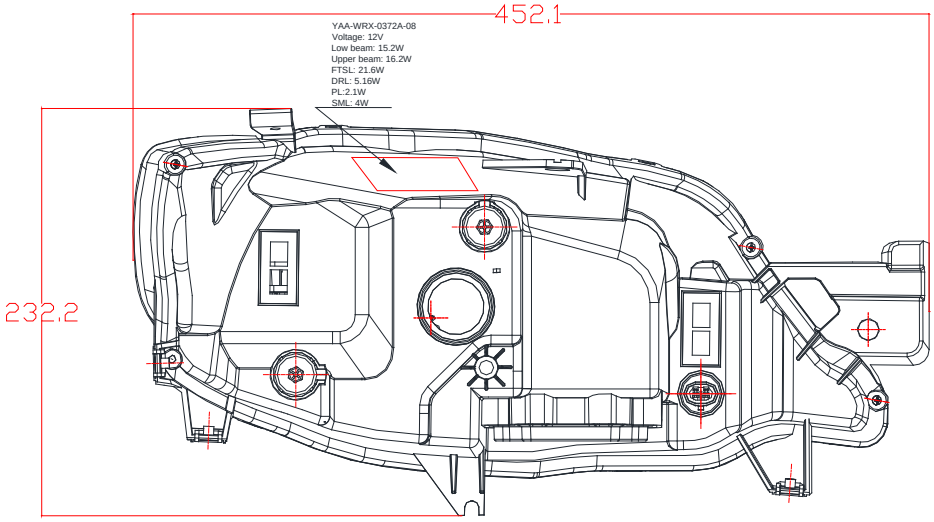
**FRONT VIEW**

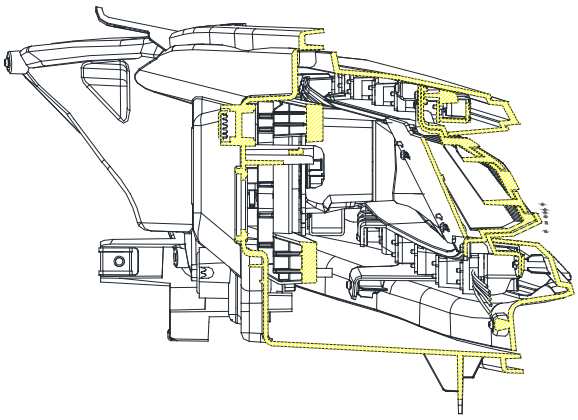
**SIDE VIEW**

**REAR VIEW**

## SECTION 17) DRAWINGS



SECTION A-A