NOTICE OF ADOPTION

ADOPTION NOTICE 1
28 September, 1992 for
SAE J1383
21 June 1990

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Society of Automotive Engineers, Inc. (SAE)
400 Commonwealth Drive
Warrendale, PA 15096

Title of Document: Performance Requirements for Motor Vehicle Headlamps

Date of Specific Issue Adopted: 21 June 1990

Releasing Non-Government Standards Body: Society of Automotive Engineers

NOTE: Certain provisions of this standard are the subject of International Standardization Agreements which are specified in the commercial item description (CID) A-A-52400.

Custodians:
Army - AT

Review activities:
Air Force - 82
DLA - GS

Military coordination activity:
Army - AT

(Project 6240-1245)

AMSC N/A

FSC 6240

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(R) PERFORMANCE REQUIREMENTS FOR MOTOR VEHICLE HEADLAMPS—SAE J1383 JUN90

SAE Recommended Practice

Report of the Lighting Committee, approved April 1985. Rationale statement available. Completely revised by the Road Illumination Devices Standards Committee June 1990. Rationale statement available.

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LIST OF FIGURES AND TABLES

1. Scope—This SAE Recommended Practice is intended as a guide toward standard practice and is subject to change to keep pace with experience and technical advances. This document establishes performance requirements, material requirements, design requirements, and design guidelines for headlamps and replaceable bulbs for headlamps.

2. References

2.1 Applicable Documents

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J575—Tests for Motor Vehicle Lighting Devices and Components

SAE J759—Lighting Identification Code

2.2 Definitions

2.2.1 HEADLAMP—A lighting device providing an upper and/or a lower beam used for providing illumination forward of the vehicle.

2.2.2 SEALED BEAM HEADLAMP ASSEMBLY—A major lighting assembly which includes one or more indivisible optical assemblies used to provide general illumination ahead of the vehicle.

2.2.3 REPLACEABLE BULB (BULB)—A light source with related envelope and mounting base which is removable from the headlamp for the purpose of replacement.

2.2.4 MECHANICALLY AIMABLE HEADLAMP—A headlamp having three pads on the lens, forming an aiming plane used for laboratory photometric testing and for adjusting and inspecting the aim of the headlamp when installed on the vehicle.

2.2.5 AIMING PLANE—A plane defined by the surface of the three aiming pads on the lens.

2.2.6 HEADLAMP MECHANICAL AXIS—The line formed by the intersection of a horizontal and a vertical plane through the light source parallel to the longitudinal axis of the vehicle. If the mechanical axis of the headlamp is not at the geometric center of the lens, then the location will be indicated by the manufacturer on the headlamp.

2.2.7 H-V AXIS—A line from the center of the principal filament (low beam filament of two filament bulbs) to the intersection of the horizontal (H) and vertical (V) lines on the screen (see Figure 1).

2.2.8 SEASONING—Process of energizing the filament of a bulb at design voltage for a period of time equal to 1% of design life or 10 h maximum, whichever is shorter.

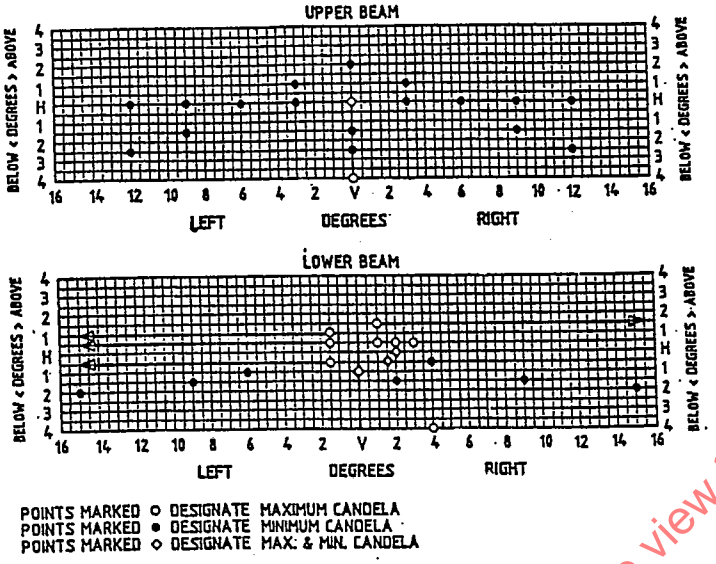


FIGURE 1—PHOTOMETRIC TABLES

TABLE 1—REPLACEABLE HEADLAMP BULBS

Design Designation	Number of Filaments	Luminous Wattage (Watts) at 12.8 V U.B./L.B.	Flux (Lumens) at 12.8 V U.B./L.B.	Design Life (Hours) Æ 14 V U.B./L.B.[2]	Filament Type
9004 (ANSI)	2	65/45	1200/700[1]	150/320	C6/C6
9005 (ANSI)	1	65	1700	150	C8
9006 (ANSI)	1	55	1000[1]	320	C8
9007 (ANSI)	2	65/55	1350/1000[1]	150/320	C8/C8
H1	1	60.5	1410	320	C8
H3	1	60.5	1310	320	C6
H4	2	67/60.5	1500/910[1]	150/320	C8/C8

[1] With opaque coating
[2] Guideline

TABLE 2—REPLACEABLE BULBS AND RELATED DIMENSIONAL FIGURES

Bulb Identification	Figures Relative To: Dimensional Specifications Standard Bulb	Figures Relative To: Specifications For Bulb Holders	Figures Relative To: Measurement Method — Bulb Filament Dimension and Tolerance	Figures Relative To: Dimensional Specifications for Accurate Rated Bulb
9004	Figures 33 to 36	37	Sections 7, 8, 9	38
9005	Figures 39 to 43	44	Sections 10, 11, 12, 13	Sections 10, 11, 12, 13, and Figure 46
9006	Figures 47 to 51	52	53	Sections 10, 11, 12, 13, and Figure 53
9007	Figures 54 to 57	58	Sections 14, 15, 16	59
H1	Figures 60 to 61	62	63	64
H3	Figures 65 to 66	67	68	69
H4	Figures 70 to 72	73	Sections 17, 18, 19, 20, 21 and Figure 74	71
HB2	Figures 70 to 72	73	Sections 17, 18, 19, 20, 21 and Figure 74	71

2.2.9 DESIGN VOLTAGE—The voltage used for design purposes.

2.2.10 TEST VOLTAGE—The specified voltage and tolerance to be used when conducting a test.

2.2.11 RATED VOLTAGE—The nominal circuit or vehicle electrical system voltage classification. (Example: 12 V Headlamp)

2.2.12 HEADLAMP TEST FIXTURE—Device specifically designed to support a headlamp in the test position during laboratory testing. Mounting hardware and components shall be representative of those necessary to operate the headlamp in its normal manner.

2.2.13 MOUNTING RING—The adjustable ring upon which the sealed beam bulb is mounted and which forces the sealed beam bulb to seat against the aiming ring when assembled into a sealed beam headlamp assembly.

2.2.14 RETAINING RING—The clamping ring that holds the sealed beam bulb against the mounting ring.

2.2.15 AIMING RING—The clamping ring that retains the sealed beam bulb against the mounting ring, and that provides an interface between the bulb's aiming/seating pads and the headlamp aimer adapter (locating plate). It also describes and is coincident with the aiming plane.

2.2.16 AIMING SCREWS—Horizontal and vertical adjusting screws with self-locking features used to aim and retain the headlamp unit in the proper position.

2.2.17 INTEGRAL AIM—A vertical aiming system which is mounted to the headlamp and does not require a separate vertical mechanical aiming device.

2.2.18 ACCURATE RATED BULB—A seasoned bulb operated at design luminous flux shown in Table 1 and having its filaments located within the tolerances indicated in figures specified in Table 2. Separate bulbs may be used for high and low beams.

2.2.19 HIGH BEAM—A beam intended primarily for distant illumination and for use when not meeting or following other vehicles.

2.2.20 LOW BEAM—A beam intended to illuminate the road ahead of the vehicle when meeting or following another vehicle.

2.2.21 HIGH BEAM FILAMENT—Filament coil designed to provide high beam function.

2.2.22 LOW BEAM FILAMENT—Filament coil designed to provide low beam function.

2.2.23 FILAMENT ROTATION—Any nonparallelism of either coil with respect to the centerline of the design nominal filament location or any additional width of the end view of the filament in excess of the outside diameter of the first full turn.

2.2.24 RATED AVERAGE LAB LIFE—An average life in hours which is obtained by laboratory life testing of bulbs at the specified test voltage over a long period of production time. It is meant to partially describe a manufactured product recognizing that individual lifetimes vary greatly. It is not the same as service life which is generally shorter due to environmental conditions such as vibration, voltage fluctuations, and temperature.

2.2.25 DESIGN LIFE—An operational time objective in hours of a headlamp filament at the test voltage.

2.2.26 GAGING STANDARD—A gage produced for each bulb type with all critical tolerances affecting filament location one-tenth the stated tolerances in the design requirements.

3. Identification Code Designation

3.1 SAE J759 Lighting Identification Code

3.2 Headlamp Marking Requirements—Headlamps shall be marked with the following markings:

3.2.1 Manufacturer's name and/or trademark shall appear on the lens.

3.2.2 Voltage and part number or trade number shall appear on the headlamp.

3.2.3 The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.5 mm (0.020 in).

3.2.4 HEADLAMP TYPE IDENTIFICATION CODE

3.2.4.1 Headlamp lenses shall be marked with a two or three char-

3.2.4.2 The marking shall be molded in the lens and shall be 6.35 mm (0.25 in) or greater in size.

3.2.4.3 The first character (a number) of the three character identification code indicates the number of beams in the headlamp. All headlamps marked with a "1" are aimed on the high beam and all headlamps marked with a "2" are aimed on the low beam.

3.2.4.4 The second character (a letter) stands for the size and number of headlamps used on the vehicle.

A — 100 X 165 mm rectangular, four lamp system
B — 142 X 200 mm rectangular, two lamp system
C — 146 mm round, four lamp system
D — 178 mm round, two lamp system
E — 100 X 165 mm rectangular, two lamp system
F — 92 X 150 mm rectangular, four lamp system
G — 100 X 165 mm rectangular, four lamp system
H — 100 X 165 mm rectangular, two lamp system
J — 56 X 75 mm rectangular, eight lamp system
K — 55 X 135 mm rectangular, four lamp system

3.2.4.5 The third character (a number) indicates the photometric specification which applies to the headlamp. Headlamps designed to Table 3 have "1" as the third character.

TABLE 3—PHOTOMETRY

	Low Beam Min	Low Beam Max
10U to 90U, 45R to 45L		125 cd
8L to 8R, H to 4U	64 cd	
4L to 4R, H to 2U	135	
1U—1-1/2L to L		700
1/2U—1-1/2L to L		1 000
1/2D—1-1/2L to L		3 000
1-1/2U—1R to R		1 400
1/2U—1R, 2R, 3R		2 700
1/2D—1-1/2R	8 000	20 000
1D—6L	750	
1-1/2D—2R	15 000	
1-1/2D—9L & 9R	750	
2D—15L & 15R	700	
4D—4R		8 000
H—2R	4 000	10 000
1D—V	6 000	15 000

TABLE 3—PHOTOMETRY (CONTINUED)

	High Beam Min	High Beam Max
2U—V	1 500 cd	
1U—3R & 3L	5 000	
H—V	20 000	75 000 cd
H—3R & 3L	10 000	
H—6R & 6L	3 250	
H—9R & 9L	2 000	
H—12R & 12L	500	
1-1/2D—V	5 000	
1-1/2D—9R & 9L	1 500	
2-1/2D—V	2 000	
2-1/2D—12R & 12L	750	
4D—V		12 500
Maximum Beam Candela [1]—30 000 cd Min		

[1] The highest candela reading found in the beam pattern.

3.2.4.6 Headlamps designed to UF, UK, LF, and LK specifications shall meet the following criteria:

3.2.4.6.1 The first character indicates the upper (high) or low beam function.

3.2.4.6.2 The second character indicates the size and number of headlamps used on the vehicle.

3.2.4.7 *Headlamp Type Identification*—See Table 4.

TABLE 4—HEADLAMP TYPE IDENTIFICATION

Size	Type	Number of Headlamps
100 X 165 mm (4 X 6.5 in)	1A1	2
	2A1	2
	1G1	2
	2G1	2
142 X 200 mm	2B1	2
146 mm (5.75 in)	1C1	2
	2C1	2
178 mm (7.0 in)	2D1	2
100 X 165 mm (4 X 6.5 in)	2E1	2
	2H1	2
92 X 150 mm	UF	2
	LF	2
56 X 75 mm	UJ	4
	LJ	4
55 X 135 mm	UK	2
	LK	2

3.3 Replaceable Bulb Marking Requirements—Bulbs shall be marked with the following information.

3.3.1 Manufacturer's name and/or trademark

3.3.2 Trade number (ANSI)

3.3.3 Date Code

4. Tests—The test procedures and test requirements specified in this document were developed emphasizing extreme conditions in the headlamp environment. Separate headlamps shall be used for each test.

4.1 Bulbs—Unless otherwise specified, bulbs used in the tests shall be representative of bulbs in regular production. Testing shall be conducted on lot sizes established by the manufacturer. The manufacturer shall obtain and be able to supply the data.

4.2 SAE J575 is a part of this report. The following tests are applicable with the modifications as indicated.

4.2.1 VIBRATION TEST—The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the vibration test. The filament shall not be operated during the test (see 4.2.4).

4.2.2 DUST TEST—The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the dust test.

4.2.3 CORROSION TEST

4.2.3.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the corrosion test.

4.2.3.2 The test period shall be 240 h consisting of 10 cycles of 23 h exposure followed by 1 h drying.

4.2.4 PHOTOMETRY

4.2.4.1 Test samples shall be new, unused headlamps manufactured from production tooling and assembled by production processes.

4.2.4.2 The headlamp shall be seasoned and photometered at the appropriate test points as listed in Table 3. The headlamp shall be in operation a minimum of 5 min prior to photometry.

4.2.4.3 Photometric test shall be made with the photometer sensor at a distance of at least 18.3 m from the headlamp.

4.2.4.4 The headlamp shall be aimed mechanically with the aiming plane at the design angle(s) to the photometer axis and the mechanical axis of the headlamp on the photometer axis.

4.2.4.5 *Test Voltage*—The voltage for the photometric test shall be 12.8 V ± 20 mV, DC as measured at the terminals of the headlamp.

4.3 Color Test—SAE J578 is a part of this report.

4.4 Plastic Materials—SAE J576 is a part of this report except 4.2.1, Luminous Transmittance.

4.5 Beam Pattern Location Test

4.5.1 Headlamps designed to be aimed on high beam, shall be seasoned and photometered to find the location of maximum intensity (see 4.2.4).

4.5.2 Headlamps designed to be aimed on low beam, shall be seasoned and photometered (see 4.2.4) at the test points H-2R and 1D-V.

4.6 Wattage Test

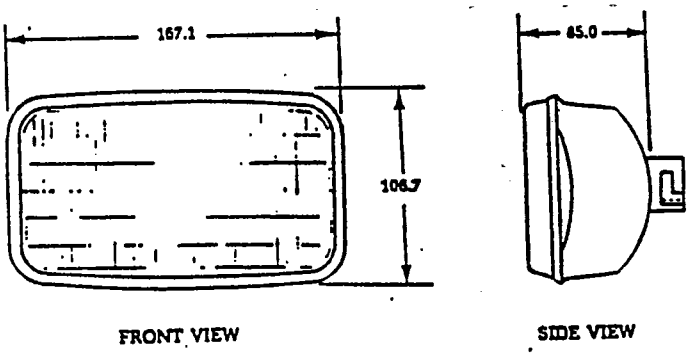
4.6.1 The wattage of each filament shall be determined at 12.8 V ± 20 mV DC.

4.6.2 Filaments shall be seasoned prior to wattage measurement.

4.7 Luminous Flux Test

4.7.1 Each filament shall be seasoned and photometered at 12.8 V ± 20 mV DC to determine luminous flux.

4.7.2 The tests shall be conducted in accordance with IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps, IES Lighting Handbook, Reference Volume, Illuminating Engineering Society, New York, NY, Procedure LM-45.



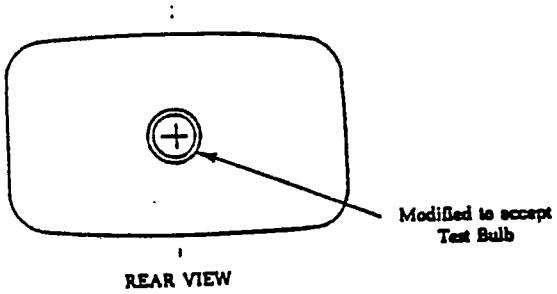


FIGURE 2—TEST ENCLOSURE DIMENSIONS

4.8 Luminous Flux Maintenance Test

4.8.1 The luminous flux for each filament shall be determined in accordance with 4.7.

4.8.2 The bulb shall then be energized in a horizontal or its normal burning position in the test enclosure shown in Figure 2.

4.8.3 The test voltage shall be 14.0 V ± 0.1 V DC. Two-filament bulbs shall be tested by cycle burning the high beam filament 12 min for each hour of testing.

4.8.4 The luminous flux of a single filament bulb shall be measured after burning for 70% of the design life.

4.8.5 The luminous flux of each filament of two-filament bulbs shall be measured in accordance with 4.7 after the low beam filament on-time equals 70% of the design life when tested according to 4.8.3.

4.9 Out-of-Focus Test

4.9.1 This test shall be conducted on headlamps with replaceable bulbs.

4.9.2 The headlamp shall be mounted in the goniometer with the mechanical axis coincident with the photometer axis.

4.9.3 The test voltage for the headlamp shall be 12.8 V ± 20 mV DC.

4.9.4 The headlamp shall be photometered at the appropriate test points as listed in Table 3.

4.9.5 Intensity measurements shall be made at six out-of-focus positions with the filament located at 2/3 of the tolerance value specified for the filament tolerance specifications referenced in Table 2.

4.10 Impact Test

4.10.1 The headlamp shall be rigidly mounted in a test fixture on the seating plane with the lens facing up.

4.10.2 The seating plane of the test fixture shall consist of 13 mm thick oak wood. The test fixture shall rest on an oak wood base.

4.10.3 One impact shall be delivered to the headlamp lens along the mechanical axis using a 23 mm diameter steel sphere (approximately 50 g) dropped freely, without side forces, from a distance of 40 cm above the lens.

4.11 Aiming Adjustment Test

4.11.1 When making the aiming adjustment test, an accurate measurement technique shall be used. This may consist of: (a) Attaching a device such as a spot projector to the headlamp, or (b) replacing the headlamp with a mirror along with a separate light source, or (c) other equally accurate means.

4.11.2 When conducting the test, the headlamp shall be mounted in the design position with the unit at nominal aim (0,0).

4.12 Inward Force Test—The mechanism, including the aiming adjusters, shall be subjected to an inward force of 222 N directed normal to the headlamp aiming plane and symmetrically about the center of the sealed beam unit face (see Figure 3).

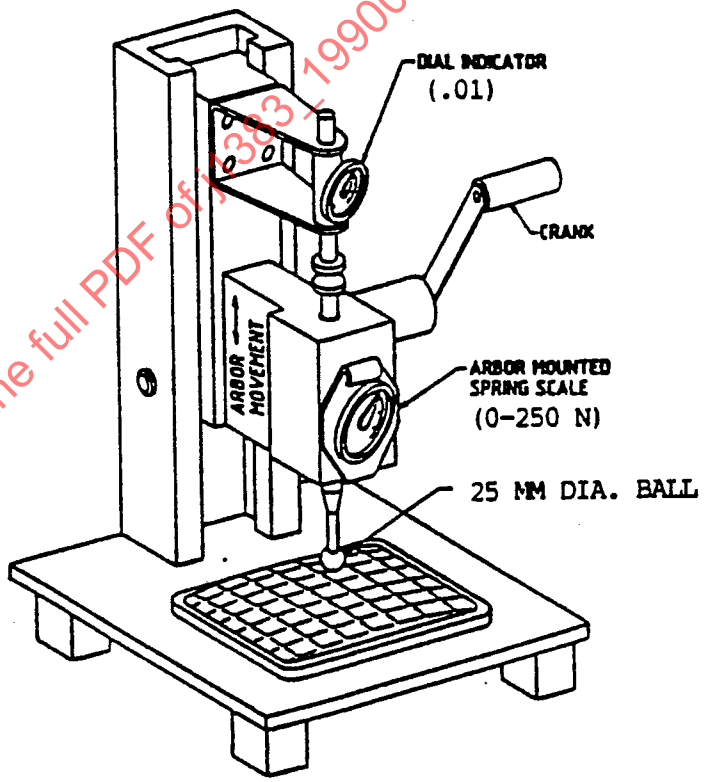


FIGURE 3—INWARD FORCE TESTER

4.13 Torque Deflection Test—Applies to headlamps which do not incorporate on-board headlamp aiming system.

4.13.1 The headlamp assembly to be tested shall be mounted in design vehicle position and set at nominal aim (0,0).

4.13.2 Sealed beam headlamps shall be replaced by the appropriate deflectometer (Figures 4 to 8).

4.13.3 Replaceable bulb headlamps shall be equipped with an appropriate fixture on the face of the lens with the applied load acting parallel to the aiming reference plane and in a downward direction. The force shall be applied through the aiming pads.

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

4.14 Deflection Test—Applies to replaceable headlamp bulbs.

4.14.1 The bulb shall be rigidly mounted in a fixture in a manner indicated in Figure 9.

UNIT	A DIM	B DIM
SAE 5.75	144 53	134.62
SAE 7.00	178 31	168 66

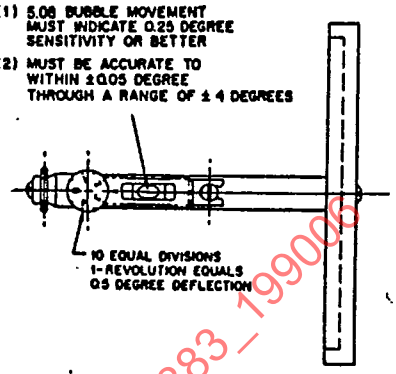
DIMENSIONS ARE mm

MACHINE MATERIALS:

DISC, ARM AND BRACE-ALUMINUM-SAE-AA-6061-T6 OR EQUIV
COIL SPRING AND LEVEL CLIP-SPRING STEEL
SAE 1050-CADMIUM PLATE
WEIGHT AND EYE BOLT ASSEMBLY-STEEL-CADMIUM PLATE
SCREWS-ALUMINUM-MACHINE THREADS
MACHINED DIM ± 0.13 mm
SAE 146 AND SAE 178 —HEADLAMP TEST FIXTURE

(1) 5.08 BUBBLE MOVEMENT MUST INDICATE 0.25 DEGREE SENSITIVITY OR BETTER

(2) MUST BE ACCURATE TO WITHIN ±0.05 DEGREE THROUGH A RANGE OF ± 4 DEGREES



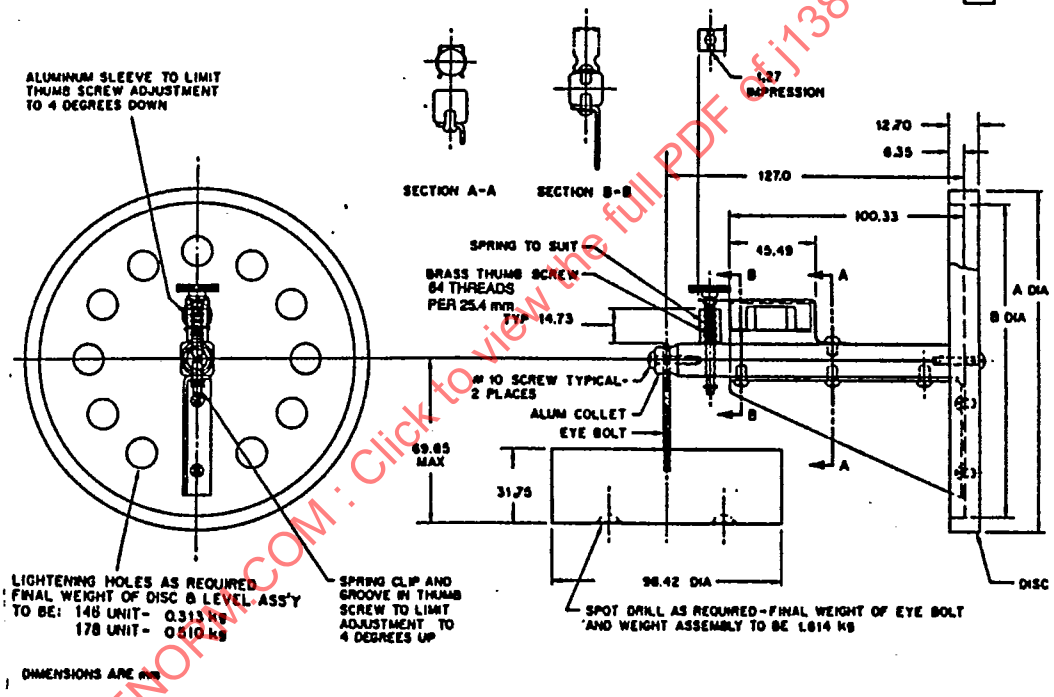


FIGURE 4—DEFLECTOMETER

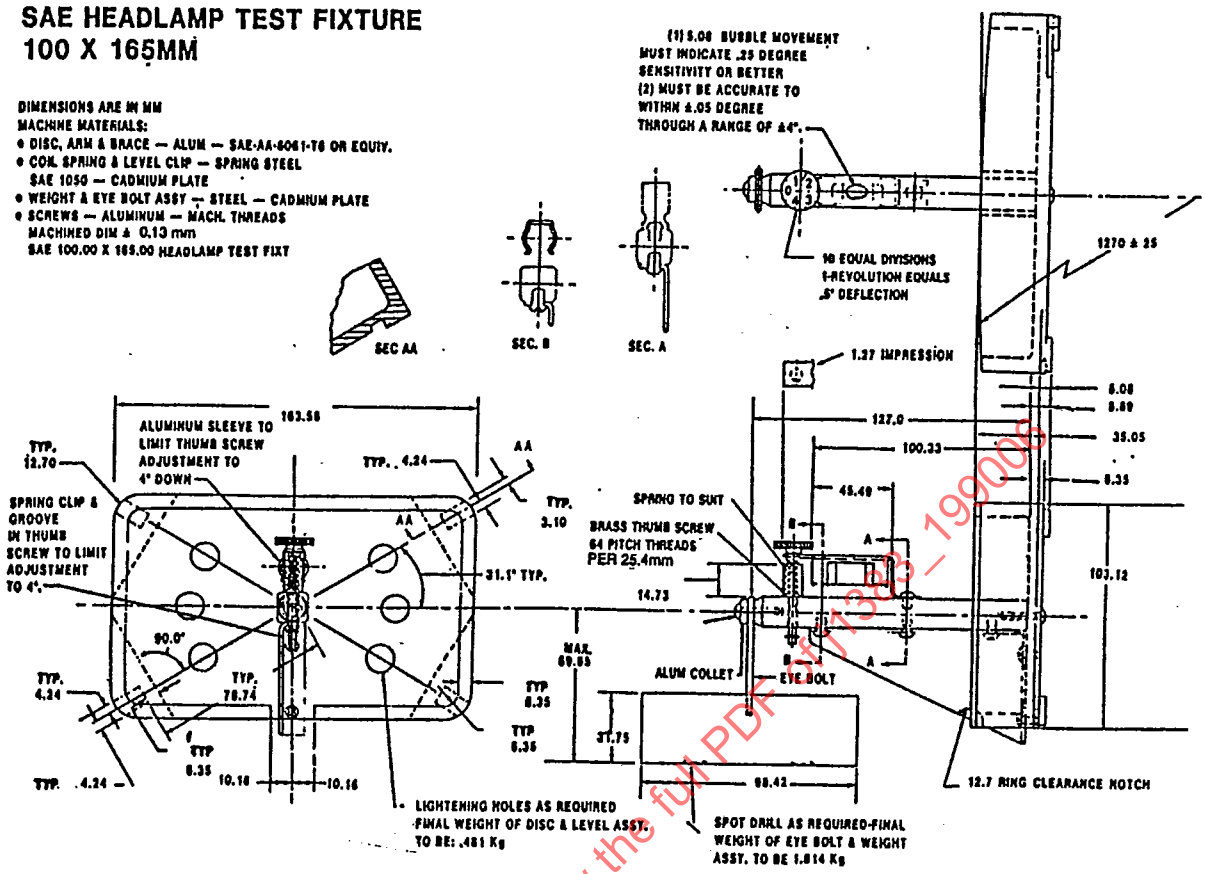


FIGURE 5—DEFLECTOMETER

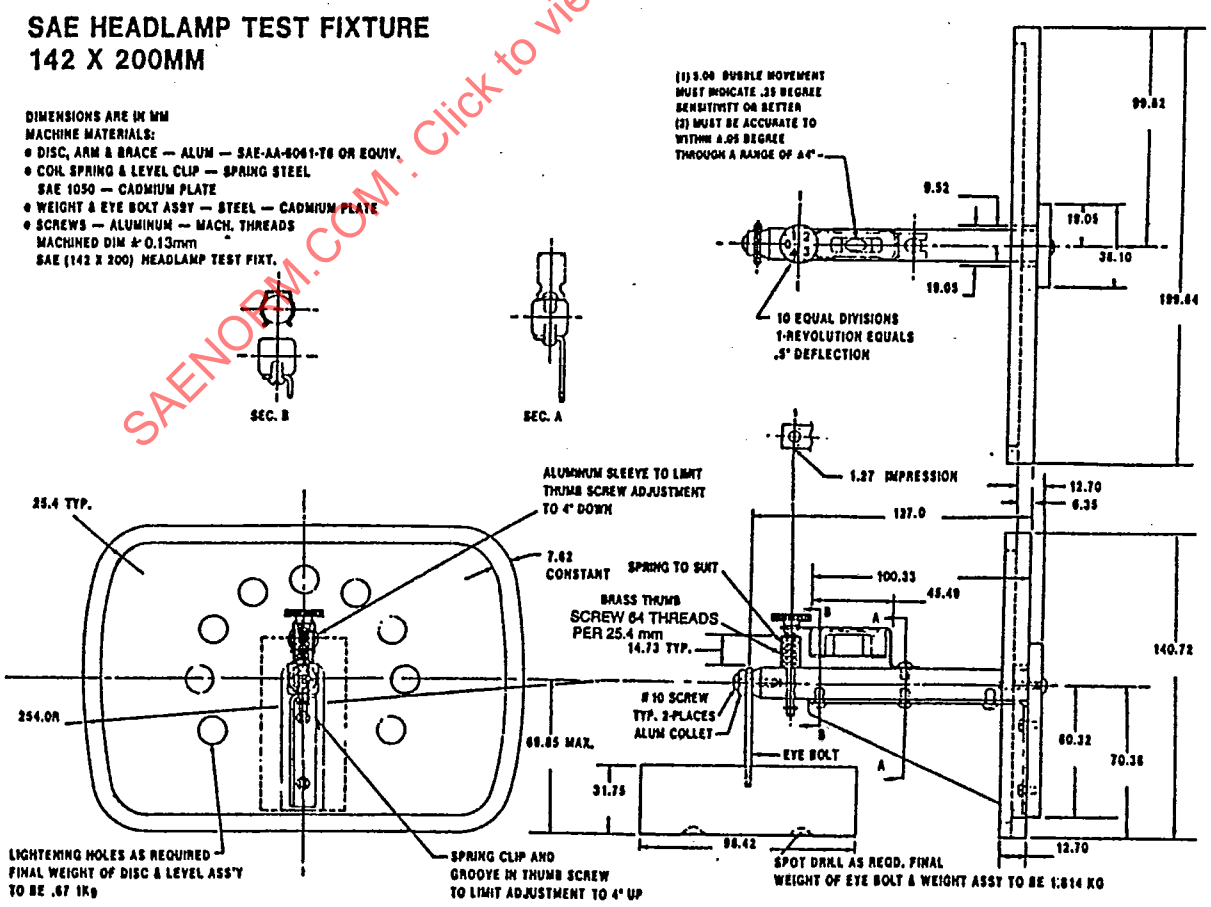


FIGURE 6—DEFLECTOMETER

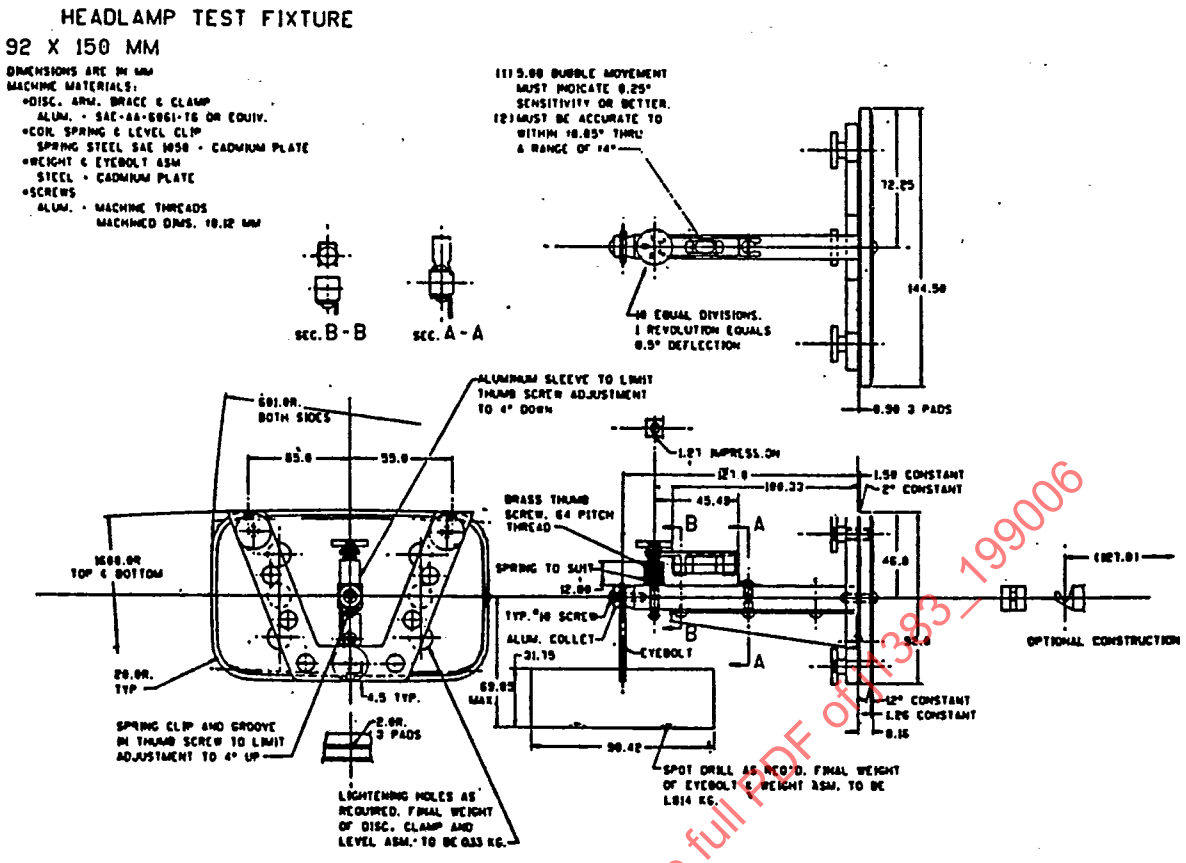


FIGURE 7—DEFLECTOMETER

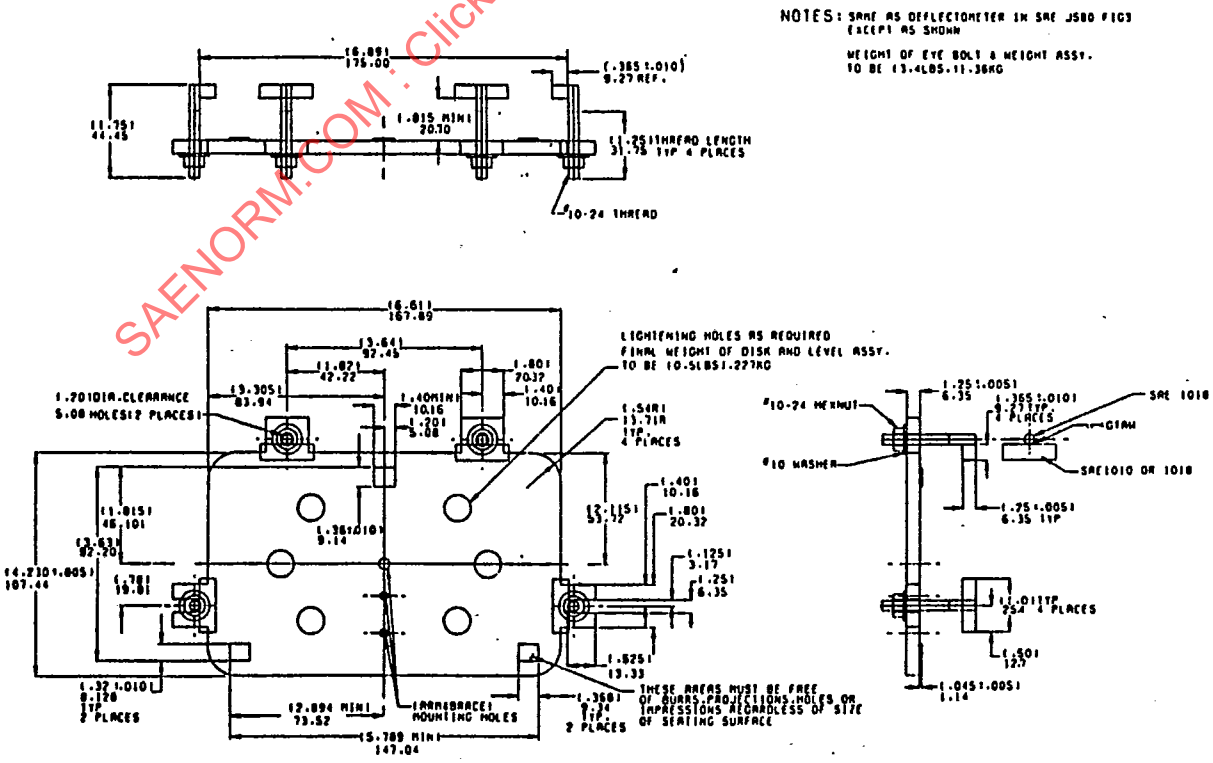


FIGURE 8—DEFLECTOMETER

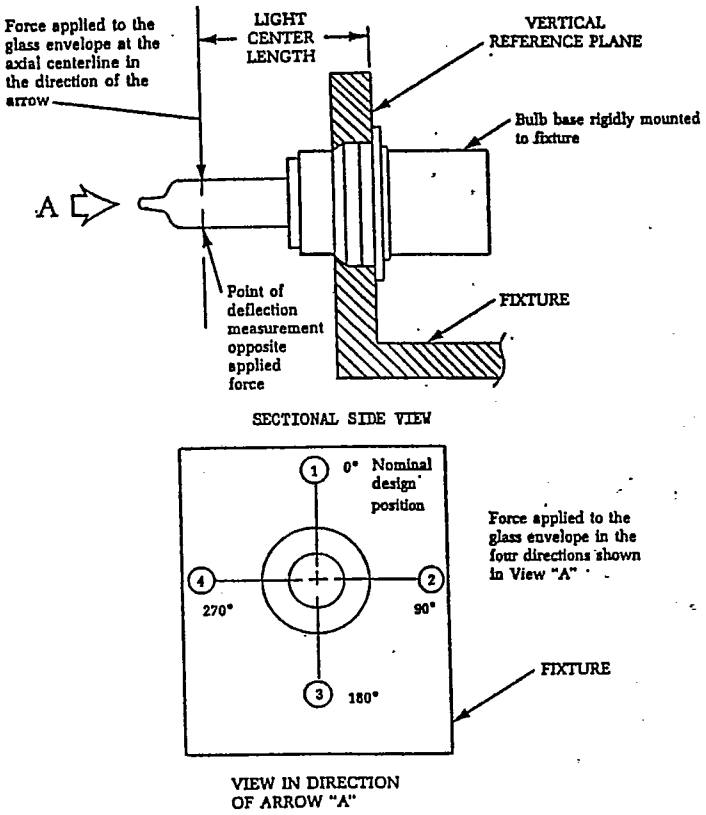


FIGURE 9—BULB DEFLECTION TEST

4.14.2 A force of 18.0 N ± 0.4 shall be applied for a maximum of 5.0 s at the locations shown in Figure 9 using a rod with a hard rubber tip with a minimum radius of 1.0 mm.

4.14.3 A separated bulb shall be used for each load application at 0, 90, 180, and 270 degrees.

4.15 Sealing Test—Applies to bulbs designed for an airtight fit to the headlamp.

4.15.1 The bulb shall be inserted into a fixture as shown in Figure 10 and retained by the same method intended for application, or equivalent.

4.15.2 The chamber shall be gradually pressurized to 70.0 kPa ± 1.0 gage while the fixture and terminal end of the bulb is completely submerged in water. The 70 kPa gage pressure shall be held for 60 s.

4.15.3 The bulb shall be observed for the presence of air bubbles during the 60 s time period.

4.16 Chemical Resistance Test

4.16.1 The test shall be conducted with the headlamps and the test fluids at an ambient temperature of 23 °C ± 4.

4.16.2 The test headlamps shall be seasoned and photometered to the test points in Table 3 before and after the chemical resistance test (see 4.2.4).

4.16.3 A separated headlamp shall be used for each of the test fluids.

4.16.4 The test fluids are:

a. Windshield washer fluid (50% concentration by volume of methanol/ detergent base, 0.16% ethanolamine)
b. Antifreeze (50% concentration by volume of ethylene glycol in water)
c. Simulated unleaded gasoline (test fluid ASTM D 471-79 Reference fuel "D")

4.16.5 An unfixtured headlamp in its design operating position and condition shall be used for the test.

4.16.6 A 6 in square cotton cloth shall be folded twice to form a 3 in square and placed onto the bottom of a beaker.

4.16.7 Meter 3 mL of the test fluid onto the folded cloth.

4.16.8 Remove the cloth from the beaker (5 s after completion of test fluid metering for Reference Fuel D and windshield washer fluid, and 60 s after completion of test fluid metering for antifreeze).

4.16.9 Within 5 s after removal of the cloth from the beaker, wipe the lens with that cloth surface which was uppermost in the beaker. The entire exterior optical surface of the lens of the fixtured headlamp shall be wiped in three horizontal cycles (one cycle consists of one back and forth motion). The first cycle shall apply the test fluid to the upper segment of the lens, the second cycle shall apply it to the center segment, and the third cycle shall apply it to the lower segment.

4.16.10 After applying the test fluid, the test headlamp shall be set aside for a period of 48 h where upon the headlamp shall be wiped clean with a soft, dry, cotton cloth.

4.17 Abrasion Test of Plastic Headlamp Lens Material

4.17.1 A 100 × 165 mm flat test specimen shall be measured for luminous transmittance before and after wiping clean after the abrasion test.

4.17.2 The test specimen shall be mounted in the abrasion test machine as indicated in Figure 11.

4.17.3 The size of the abrading pad shall be 25 × 100 mm constructed of 0000 steel wool and firmly attached to a pad support of equal size such that the "grain" of the pad is perpendicular to the direction of motion.

4.17.4 The abrading pad shall be loaded such that an average pad pressure of 14 kPa ± 1 exists normal to the surface of the test specimen.

4.17.5 The density of the abrading pad shall be such that when the abrading pad mounted to the pad support is resting unloaded on the test specimen, the pad support shall be no closer than 3.1 mm to the surface of the test specimen.

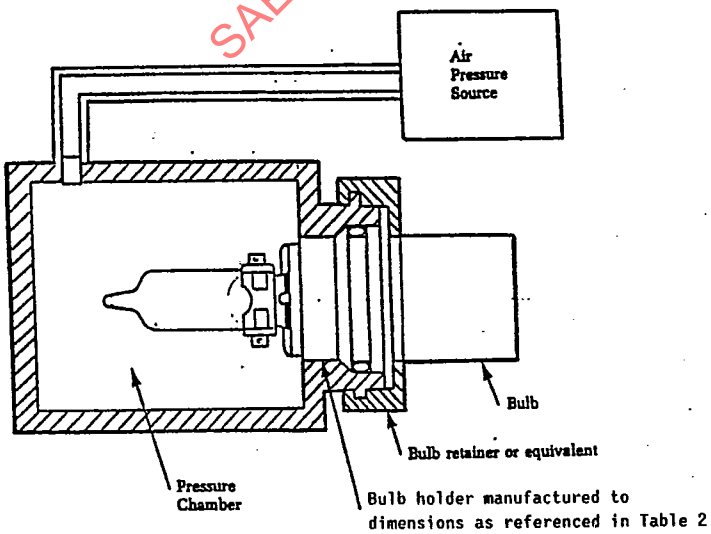


FIGURE 10—TEST FOR AIRTIGHT SEAL

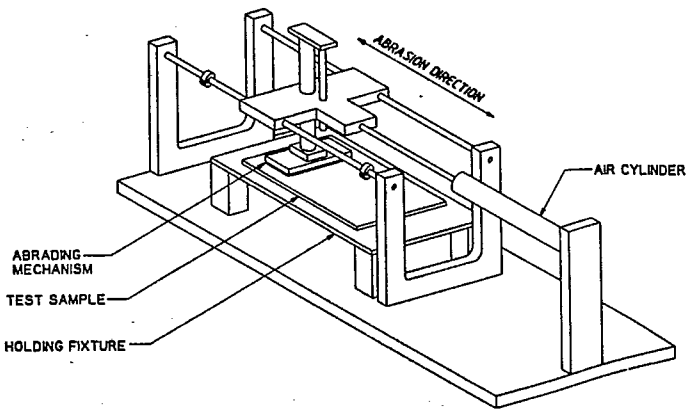


FIGURE 11—ABRASION TEST MACHINE

4.17.6 An abrasion cycle is one forward stroke 10 cm ± 2 and one rearward stroke of the same distance. The velocity of the abrading pad shall be 10 cm/s ± 2.

4.17.7 The test specimen shall be subjected to 20 abrasion cycles.

4.18 Thermal Cycle Test

4.18.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the thermal cycle test (see 4.2.4).

4.18.2 The headlamp shall be rigidly mounted in a test fixture on its seating plane in its design operating condition and design mounting position.

4.18.3 The headlamp shall be exposed to the thermal cycle profile shown in Figure 12.

4.18.4 Separate or single test chambers may be used to generate the temperature environment described by the thermal cycle.

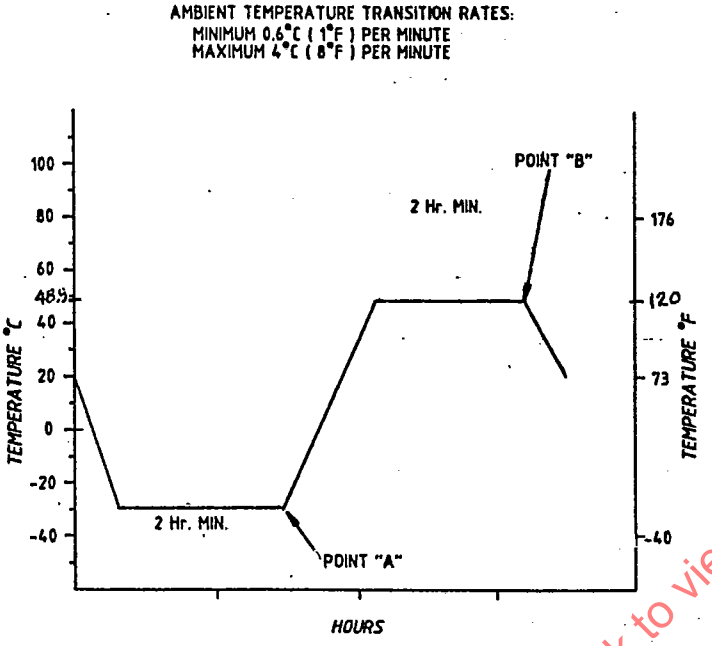


FIGURE 12—THERMAL CYCLE PROFILE

4.18.5 The headlamp shall be energized at 12.8 V ± 20 mV, its highest wattage mode commencing at point "A" of Figure 12 and de-energized at point "B" of each cycle.

4.18.6 The test period shall be 10 cycles of 8 h per cycle.

4.19 Internal Heat Test

4.19.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the internal heat test (see 4.2.4).

4.19.2 The headlamp shall be rigidly mounted in a test fixture on its seating plane in its design operating condition and design mounting position.

4.19.3 A dirt mixture, soluble in water, shall be sprayed uniformly on the face of the lens and allowed to dry until the light intensity at H-V is reduced by 50% of its original value.

4.19.4 The headlamp shall be energized in its highest wattage mode and placed in a chamber at 35 °C ± 3.

4.19.5 The test cycle shall be 30 min.

4.19.6 The test voltage for the headlamp shall be 12.8 V ± 0.1.

4.19.7 After the internal heat test, the lens face shall be wiped clean.

4.20 Humidity Test

4.20.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the humidity test (see 4.2.4).

4.20.2 The headlamp shall be rigidly mounted in a test fixture on its seating plane, in its design operating condition and design mounting position.

4.20.3 The headlamp shall be placed in a controlled environment of 95% ± 5 relative humidity at 38 °C (100 °F). There may be airflow within the test chamber not to exceed 16.5 km/h.

4.20.4 The headlamp shall be energized in its highest wattage mode for a test cycle of 1 h "on" and 5 h "off".

4.20.5 The test voltage for the headlamp shall be 12.8 V ± 0.1.

4.20.6 TEST DURATION—EIGHT COMPLETE CYCLES—The test is to end in the "off" cycle mode.

4.20.7 After completion of the eighth test cycle, the humidity shall be reduced in the test chamber to 30% ± 10 for 1 h. The headlamp shall be turned off during this period. During this period there may be a maximum air flow within the test chamber of 16.5 km/h when measured at the center of the chamber.

4.20.8 After a 1 h soak period, the headlamp shall be removed from the humidity chamber and photometered within 10 min ± 1.

4.21 Filament Rated Average Lab Life Test

4.21.1 The filament shall be energized at 14 V ± 0.1 V DC in a horizontal burning position in the standard enclosure shown in Figure 2.

4.21.2 The filament shall be unenergized 15 min for each 24 h of testing. The off time is not part of the test time of the filament being tested.

4.21.3 Each filament shall be tested separately and a different bulb shall be used for each filament.

4.21.4 The test may be terminated at 150% of design life.

5. Performance Requirements—A headlamp, when tested in accordance with the test procedures specified in Section 4, shall meet the following requirements.

5.1 Vibration Requirement (SAE J575)

5.1.1 The photometric values measured after the vibration test shall not vary more than ±10% from the values measured before the test.

5.1.2 There shall be no evidence of loose or broken parts, or intermittent electrical circuit.

5.2 Dust Requirement (SAE J575)—The photometric values measured after the dust test shall not vary by more than ±10% from the values measured before the test.

5.3 Corrosion Requirement (SAE J575)

5.3.1 The test headlamp shall show no evidence of exterior or internal corrosion or edge corrosion beyond 2 mm (0.08 in) from a sheared or cut edge.

5.3.2 The headlamp shall show no evidence of surface deterioration, fractures, color bleeding, or deterioration of bonding materials.

5.3.3 The photometric values measured after the corrosion test shall not vary more than ±10% from the values measured before the test.

5.4 Photometric Performance Requirement—Headlamps designed to meet the specifications of Table 3 shall meet the photometric requirements of Table 5.

TABLE 5—HEADLAMP PHOTOMETRIC PERFORMANCE REQUIREMENTS

Test Point[1]	Requirement, cd
Low Beam	
Type 2A1, 2B1, 2C1, 2D1, 2E1, or Equivalent	
10U-90U, 45 R-45 L	438 cd max permissible within 2 degree conical angle
1/2U—1-1/2L	1 100 max
1/2U—1R	3 240 max
1/2D—1-1/2R	6 400 min/24 000 max
1D—6L	600 min
High Beam	
Type 1A1 and 1C1, or Equivalent	
2U-V	800 min
H-3R and 3L	9 600 min
H-V	16 000 min
2-1/2D-V	1 600 min

[1] A tolerance of ±1/2 degree in location may be allowed at any test point.

5.5 Color—The color of the emanating light produced by a headlamp shall be white as specified in SAE J578.

5.6 Material Requirements—Headlamps shall meet the material requirements of SAE J576, except 4.2.1 Luminous Transmittance.

5.7 Beam Pattern Location Requirement

5.7.1 HEADLAMPS DESIGNED TO BE AIMED ON HIGH BEAM—The beam pattern is properly oriented to the aiming plane if the location of the maximum beam intensity point does not deviate from the H-V axis more than ±0.5 degree vertically and ±0.8 degree horizontally (rectangular box).

5.7.2 HEADLAMPS DESIGNED TO BE AIMED ON LOW BEAM—The beam pattern is properly oriented to the aiming plane if the intensity requirements listed in Table 3 for the test points H-2R and 1D-V are met.

5.8 Wattage Requirement—Measured wattage for each filament shall not exceed the design wattage listed in Tables 1 and 6 by more than 7.5%.

5.9 Luminous Flux Requirement—Applies to replaceable headlamp bulbs.

TABLE 6—TYPICAL HEADLAMPS

Headlamp Type and Identification Code[1]	Trade No.[2]	Design Watts at 12.8 V U.B.	Design Watts at 12.8 V L.B.	Design Life at 14 V[3] U.B.	Design Life at 14 V[3] L.B.	Max. Amps at 12.8 V U.B.	Max. Amps at 12.8 V L.B.	Size, mm	Dimensional Specs	Terminals No.
2C1	4000	37.5	60	200	320	3.14	5.02	146 Dia	Figure 24	3
2C1	4040[2]	37.5	60	200	320	3.14	5.02	146 Dia	Figure 24	3
2C1	H5006	35	35	200	320	2.94	2.94	146 Dia	Figure 24	3
1C1	4001	37.5		200		3.14		146 Dia	Figure 23	3
1C1	H4001	37.5		200		3.14		146 Dia	Figure 23	2
1C1	5001	50		200		4.20		146 Dia	Figure 23	2
1C1	H5001	50		200		4.20		146 Dia	Figure 23	2
2D1	6014	50	50	200	320	5.02	4.20	178 Dia	Figure 25	3
2D1	H6014	60	50	200	320	5.02	4.20	178 Dia	Figure 25	3
2D1	6015[2]	60	50	320	320	5.02	4.20	178 Dia	Figure 25	3
2D1	6016[2]	60	50	300	500	5.02	4.20	178 Dia	Figure 25	3
2D1	H6017	60	35	200	320	5.02	2.94	178 Dia	Figure 25	3
1A1	4651	50		200		4.20		100 X 165	Figure 20	2
1A1	H4651	50		200		4.20		100 X 165	Figure 20	2
2A1	4652	40	60	200	320	3.36	5.02	100 X 165	Figure 21	3
2A1	H4656	35	35	200	320	2.94	2.94	100 X 165	Figure 21	3
2A1	H4662	40	45	200	320	3.36	3.78	100 X 165	Figure 21	3
2A1	H4739	40	50	500	2000	3.36	4.20	100 X 165	Figure 21	3
2B1	6052	65	55	150	320	5.46	4.62	142 X 200	Figure 22	3
2B1	H6052	65	55	150	320	5.46	4.62	142 X 200	Figure 22	3
2B1	H6054	65	35	150	320	5.46	2.94	142 X 200	Figure 22	3
2E1	H4666	65	45	150	320	5.46	3.78	100 X 165	Figure 26	3
UF	H4701	65		150		5.46		92 X 150	Figure 27	2
LF	H4703		55		320		4.62	92 X 150	Figure 27	2
1G1		50		200		4.20		100 X 165	Figure 28	2
2G1		35	35	200	320	2.94	2.94	100 X 165	Figure 28	3
2H1		65	45	150	320	5.46	3.78	100 X 165	Figure 28	3
UJ		25		150		2.10		56 X 75	Figure 29	2
LJ			20		500		1.68	56 X 75	Figure 30	2
UK[4]	H4352	65		150		5.46		55 X 135	Figure 31	2
LK	H4351		55		500		4.62	55 X 135	Figure 32	2

[1]Headlamp identification codes are explained in 5.25.
[2]Heavy duty headlamps.
[3]All headlamps designs for 12.8 V usage are life tested at 14 V. In general, the life at vehicle voltage is longer.
[4]UK and LK photometric beam patterns are combined for high beam.

5.9.1 For bulbs with no opaque coating, the measured luminous flux shall be within ±12% of the design luminous flux listed in Table 1.

5.9.2 For bulbs with opaque coating, the measured luminous flux shall be within ±15% of the design luminous flux listed in Table 1.

5.10 Maintenance of Luminous Flux Requirement—When tested in accordance with 4.7—For samples from each lot tested, the average luminous flux value for single filament bulbs for each filament of two-filament bulbs after burning for 70% of design life shall be no less than 90% of the initial average luminous flux value.

5.11 Out-of-Focus Requirement—The headlamp shall meet the requirements of Table 5 for each of the out-of-focus test positions.

5.12 Impact Requirement—The headlamp shall show no evidence of broken, cracked, or chipped pieces of the headlamp, coating adhesion failure, or delamination of material, or visible loosening or breaking apart of headlamp parts.

5.13 Aiming Adjustment Requirement—When tested in accordance with 4.11, the headlamp shall meet the following requirements:

5.13.1 For headlamps with individual horizontal and vertical aim adjustments, tested in the laboratory, a minimum aiming adjustment of ±4.0 degrees shall be provided in the vertical plane and ±2.5 degrees in the horizontal plane.

5.13.2 On headlamp assemblies with independent vertical and horizontal aiming provision, the adjustments shall be such that when tested in the laboratory, neither the vertical nor horizontal aim shall deviate more than 100 mm from horizontal or vertical planes, respectively, at a distance of 7.6 m through an angle of ±4.0 degrees vertically and ±2.5 degrees horizontally.

5.13.3 On headlamps with integral aim tested in the laboratory, the headlamp shall be able to indicate variations in vertical aim within a range extending from 1.2 degrees above to at least 1.2 degrees below a longitudinal horizontal plane through the center of the headlamp system.

5.13.4 On headlamps with integral aim, photometric tests shall be performed with the vertical aiming system set to its specified design vertical aim, and with the headlamp assembly mounted to the test fixture in the same attitude as its design mounting position in the vehicle.

5.13.5 The self-locking devices used to hold aiming screws in position shall continue to operate satisfactorily for a minimum of 20 adjustments on each screw, over a length of screw thread of not less than 3 mm.

NOTE: 5.13.2 and 5.13.3 are not applicable to headlamps with ball and socket or equivalent adjusting means.

5.14 Inward Force Requirements—When subjected to the tests in 4.12, the headlamp shall meet the following requirements:

5.14.1 The headlamp shall not permanently recede by more than 2.5 mm.

5.14.2 The aim of the headlamp shall not permanently deviate by more than 3.2 mm at a distance of 7.6 m.

5.15 Torque Deflection Requirement—When subjected to the tests in 4.13, the difference between the two readings shall not exceed 0.30 degree.

5.16 Deflection Requirement—After the load application, the permanent deflection of the glass envelope of the bulb shall not exceed 0.13 mm.

5.17 Sealing Requirement—While the fixture and terminal end is submerged, no bubble(s) shall develop outside the test fixture.

5.18 Chemical Resistance Requirement

5.18.1 The exposed headlamp, when compared to an unexposed headlamp, shall not show surface deterioration, delamination, fractures, deterioration of bonding materials, color bleeding, or color pickup as a result of exposure to the test fluids.

5.18.2 The photometric values measured after the chemical resistance test shall not vary more than ±10% from the values measured before the test.

5.19 Abrasion of Plastic Headlamp Lens Material Requirements—The luminous transmittance of the abraded test specimen using CIE Illuminant A (2856D), shall show a maximum of 3% deterioration from the luminous transmittance of the unabraded control sample.

5.20 Thermal Cycle Requirement

5.20.1 The headlamp shall show no evidence of delamination, fractures, seal fractures, deterioration of bonding material, color bleeding, warp, or deforming.

5.20.2 The photometric values measured after the temperature cycle test shall not vary by more than ±10% from values measured before the test.

5.21 Internal Heat Requirement—The photometric values measured after the internal heat test shall not vary by more than ±10% from the values measured before the test.

5.22 Humidity Requirement

5.22.1 At the end of the 10 min test period (see 4.22), the headlamp shall be inspected immediately and show no evidence of condensed moisture or droplets inside the headlamp.

5.22.2 The headlamp shall show no evidence of delamination, bonding, material deterioration, or seal failure.

5.22.3 The photometric values measured after the humidity test shall not vary by more than ±10% from the values measured before the test.

5.23 Retaining Ring Requirements

5.23.1 Positive means shall be provided for holding the headlamp to the mounting ring.

5.23.2 The fastening means shall be capable of holding the headlamp securely in its proper position at the end of 20 replacements.

5.23.3 When a headlamp having a flange thickness (as shown in Table 7) is secured between the retaining ring and mounting ring, there shall be no evidence of looseness:

TABLE 7—FLANGE THICKNESS

Headlamp Type	Flange Thickness
146 mm	11.7 mm
178 mm	11.7 mm
100 × 165 mm	33.9 mm
142 × 200 mm	10.1 mm
92 × 150 mm	9.6 mm
55 × 135 mm	9.6 mm
56 × 75	3.6 mm

5.24 Design Requirements

5.24.1 Dimensions of sealed beam headlamp mounting-sealed beam headlamp mounting rings and retaining rings shall meet the dimensions marked "I" in the following figures to assure compatibility with the corresponding types of units.

Type 1A1—Figure 13
Type 2A1—Figure 13
Type 2B1—Figure 14
Type 1C1—Figure 15
Type 2C1—Figure 15
Type 2D1—Figure 16
Type 2E1—Figure 13
Type UF —Figure 17
Type LF —Figure 17
Type UK —Figure 18
Type LK —Figure 18

5.24.2 DIMENSIONS OF SEALED BEAM HEADLAMPS—Sealed beam headlamps shall meet the dimensions marked "I" in the following figures to assure interchangeability with other sealed beam headlamps of the same type.

Type 1A1—Figure 20
Type 2A1—Figure 21
Type 2B1—Figure 22
Type 1C1—Figure 23
Type 2C1—Figure 24
Type 2D1—Figure 25
Type 2E1—Figure 26
Type UF —Figure 27
Type LF —Figure 27
Type 1G1—Figure 28
Type 2G1—Figure 28
Type 2H1—Figure 28
Type UJ—Figure 29
Type UK—Figure 31
Type LK—Figure 32

5.24.3 Dimensions for Mechanical Aiming of Headlamps—Headlamps shall meet the following requirements to assure compatibility with mechanical aimers.

5.24.3.1 Type 1C1, 2C1, and 2D1 headlamps shall have no raised letters or embossing on the outside surface of the lens between the diameters of 40 and 90 mm about the lens center.

5.24.3.2 Type 1A1, 2A1, 2B1, 2E1, UF, LF, 1G1, 2G1, and 2H1 headlamps shall have no raised letters or embossing on the outside surface of the lens within a diameter of 70 mm about the lens center.

5.24.3.3 Aiming pad design may vary, but shall meet limiting dimensions as shown on the figures specified in 5.24.1 and 5.24.2.

5.24.4 Headlamp Mounting Assembly—The headlamp mounting assembly shall meet the requirements of Figure 13, Dimensions of Sealed Beam Headlamp Mounting.

5.24.5 Aimer Compatibility—Headlamps which do not incorporate integral headlamp aim shall be designed and installed so that they may be inspected and aimed by mechanical aimers as specified in SAE J602 without the removal of any ornamental trim rings or other parts.

5.24.6 Bulbs and bulb holders shall meet the requirements referenced in Table 2 to ensure interchangeability.

5.24.7 Accurate rated bulbs shall meet the dimensional requirements shown in each applicable figure of Table 2.

5.24.8 Typical replaceable headlamp bulbs are listed in Table 1.

6. Guidelines

6.1 When in use, a headlamp shall not have any styling ornament or other feature, such as a glass cover or grille, in front of the lens.

6.2 Photometric Design Guidelines—Guidelines for the photometric design of headlamps are shown in Table 3.

6.3 Dimensional Guidelines—Guidelines for dimensions are shown in the following figures:

6.3.1 Mounting and Retaining Rings—Figures 13 to 18

6.3.2 Sealed Beam Headlamps—See Table 6 and Figures 20 to 32

6.3.3 Replaceable Bulbs—See Table 2 and Figures 33 to 70

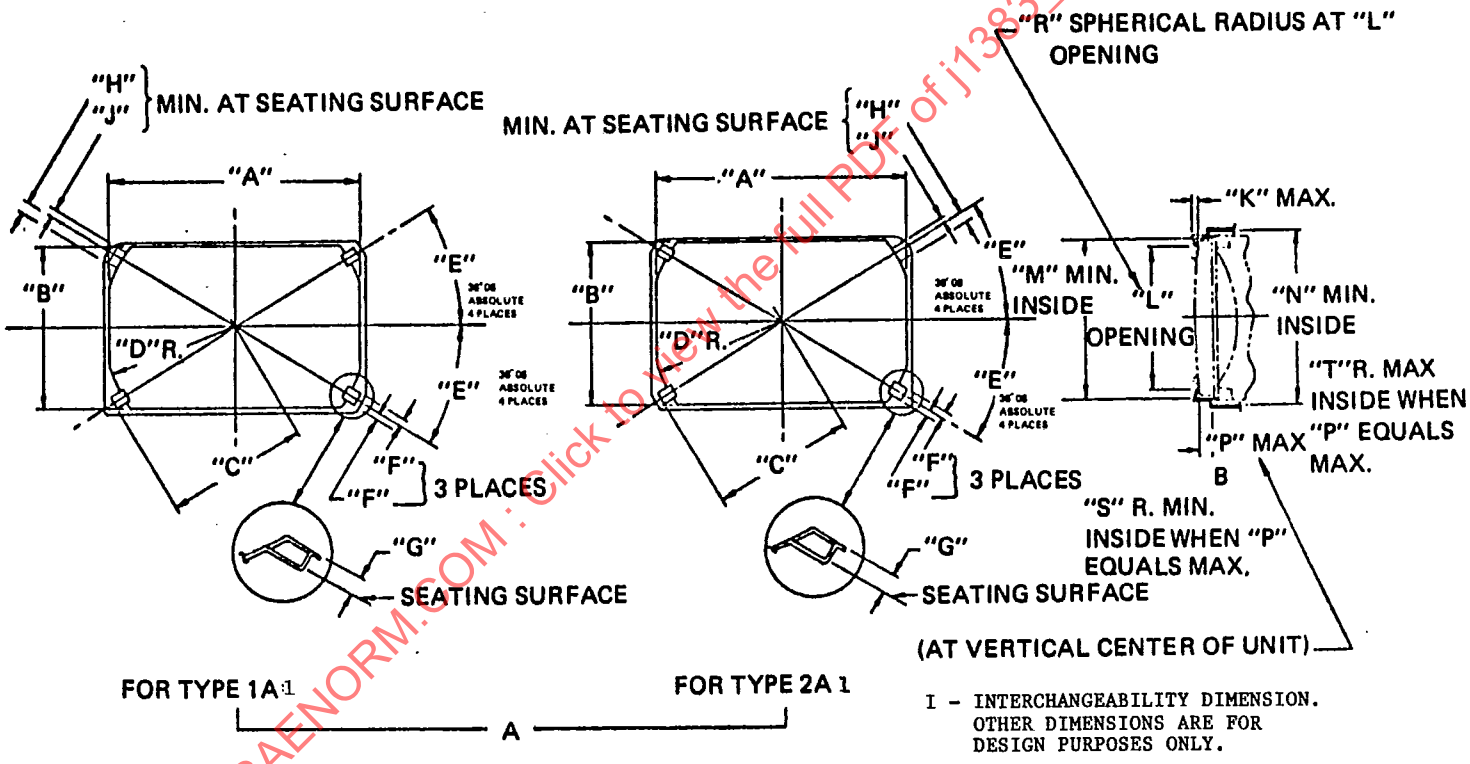
6.3.4 Reflector Bulb Mounting Hole for Replaceable Bulbs—See Table 2.

6.4 Filament Rated Average Lab Life Guideline—Rated average lab life shall approximate design life. The design life for the filament(s) of each bulb type is shown in Table 1 or 5.

6.5 Replaceable Bulb Filament End Coil Definition—Shown in Figure 19.

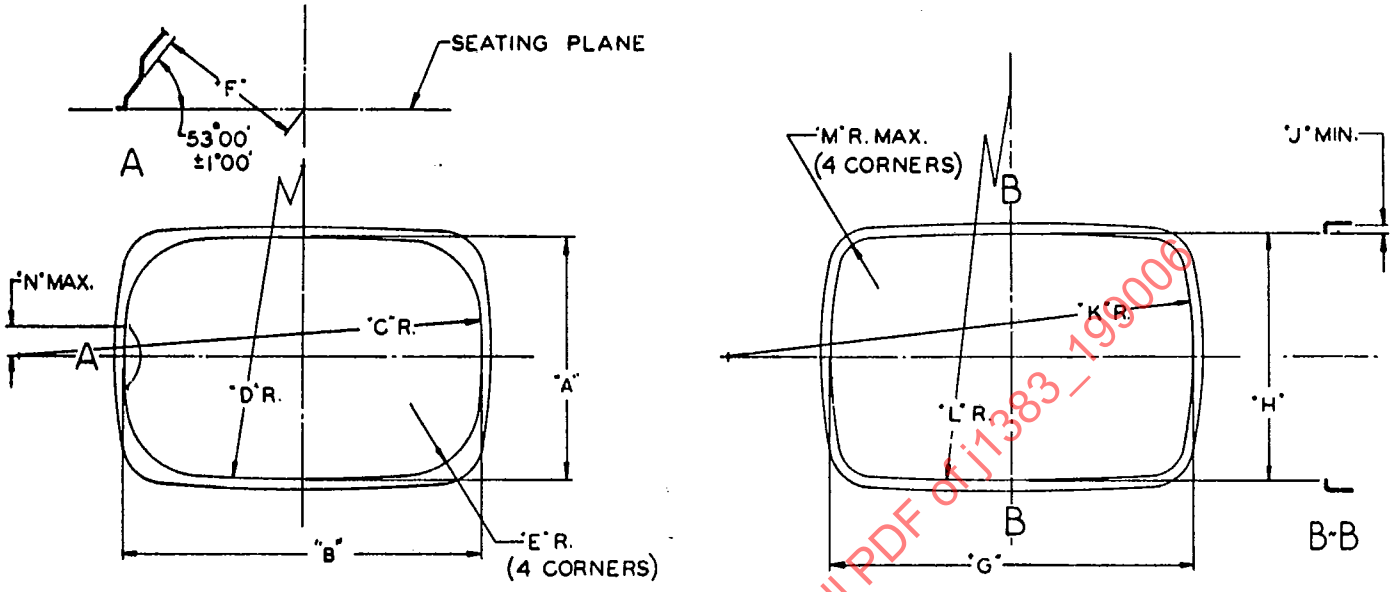
6.6 Summary of Requirements and Guidelines—Table 8 summarizes the classification of the various sections of this report into requirements and guidelines.

6.7 Fixed Horizontal Aim Guideline—When horizontal aim adjusting screws are provided on fixed horizontal aim headlamps, they shall be of a tamperproof design or shall be difficult to access.



	Letter	in	mm	Letter	in	mm
	A	6.518 ± 0.020	165.56 ± 0.50	L	3.660 ± 0.059 × 6.040 ± 0.059	92.96 ± 1.50 × 153.42 ± 1.50
	B	4.140 ± 0.020	105.16 ± 0.50			
I	C	3.670 + 0.015 − 0.000	93.218 + 0.37 0.00	I M	4.080 × 0.46	103.64 × 164.10
	D	3.408 ± 0.020	87.00 ± 0.50	I N	4.25 × 6.63	107.95 × 168.40
	E	31.10° ± 0.08°		P	0.418	10.62
I	F	0.178 + 0.020 − 0.000	4.52 + 0.51 − 0.00	R	50.0 + 0.50 − 2.00	1270.0 + 13.0 − 50.8
I	G	0.170 + 0.000 − 0.030	4.318 + 0.00 − 0.76	S	0.075	1.91
I	H	0.334	8.48	T	0.060	1.52
I	J	0.120	3.05			
	K	0.060	1.52			

FIGURE 13—(A) FRONT VIEW OF SLOTS OR NOTCHES FOR 100 × 165 mm RECTANGULAR HEADLAMP MOUNTING RING OR LAMP BODY; (B) RECTANGULAR HEADLAMP RETAINING RING



DIMENSIONS APPLY AT
SEATING PLANE SURFACE

MOUNTING RING (A)

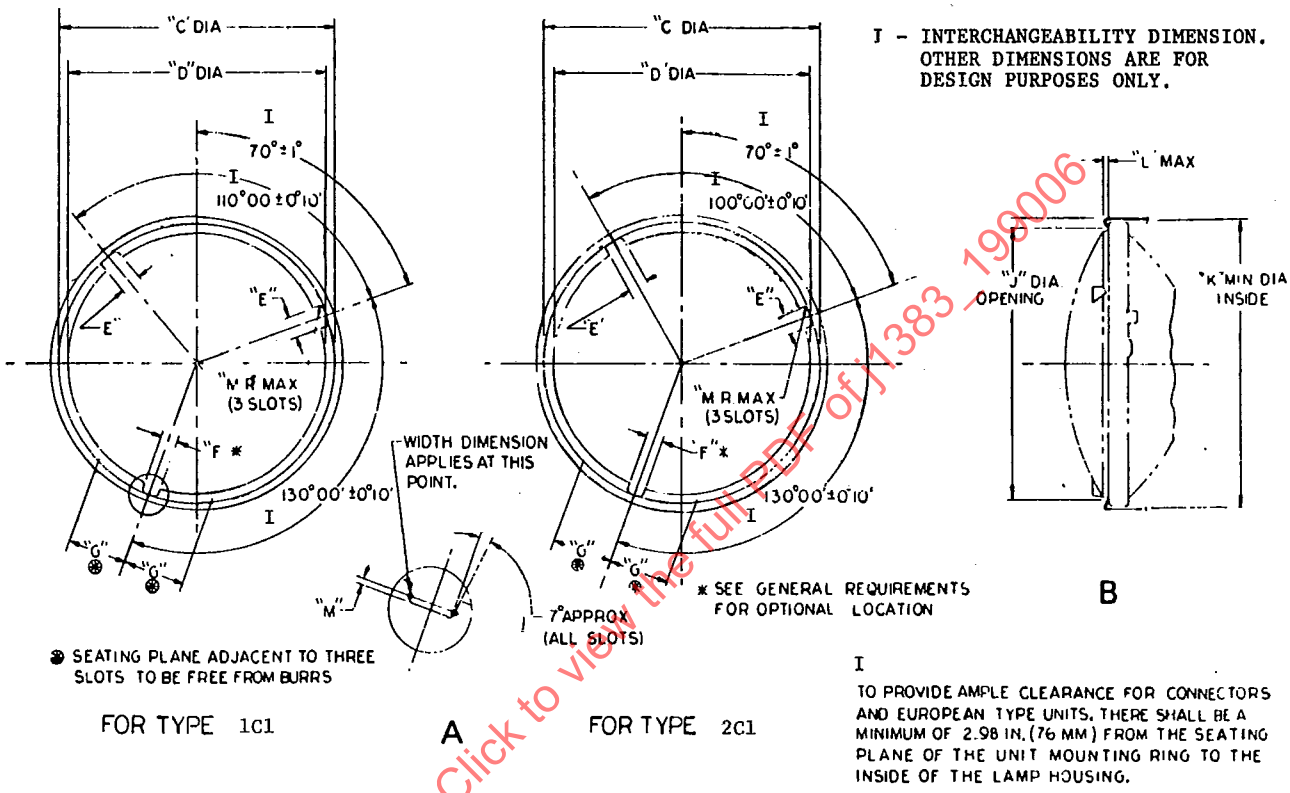
RETAINING RING (B)

I - INTERCHANGEABILITY DIMENSION.
OTHER DIMENSIONS ARE FOR
DESIGN PURPOSES ONLY.

LETTER	MM	INCH
A	132.9 ± 0.5	5.232 ± 0.020
B	191.0 ± 0.5	7.520 ± 0.020
C	250.0 ± 5.0	9.843 ± 0.197
D	2400.0 ± 50.0	94.488 ± 1.969
E	41.0 ± 2.0	1.614 ± 0.079
F	79.90 ± 0.40	3.146 ± 0.016

LETTER	MM	INCH
I G	190.42 ± 0.30	7.497 ± 0.012
I H	132.42 ± 0.30	5.213 ± 0.012
I J	5.34	0.210
I K	$250.0\ ^{+30.0}_{-0}$	$9.843\ ^{+1.181}_{-0.000}$
I L	$2402.0\ ^{+2250.0}_{-0}$	$94.567\ ^{+88.583}_{-0.000}$
I M	20.4	0.803
N	19.0	0.748

FIGURE 14—(A) FRONT VIEW OF MOUNTING RING OR LAMP BODY FOR 142 × 200 mm RECTANGULAR HEADLAMP; (B) RETAINING RING



DIMENSIONS

Letter	in	mm	Letter	in	mm
I C	5.450 $^{+0.010}_{-0.000}$	138.43 $^{+0.25}_{-0}$	G	1.20	30.48
I D	5.250 – 5.140	133.35 – 130.55	I J	5.400 – 5.360	137.16 – 136.14
I E	0.410 $^{+0.010}_{-0.000}$	10.41 $^{+0.25}_{-0}$	I K	5.710	145.03
I F	0.330 $^{+0.005}_{-0.000}$	8.38 $^{+0.12}_{-0}$	L	0.100	2.54
			M	0.06	1.52

FIGURE 15—(A) FRONT VIEW OF SLOTS OR NOTCHES FOR 146 mm DIAMETER HEADLAMP MOUNTING RING OR LAMP BODY; (B) 146 mm HEADLAMP RETAINING RING

I - INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

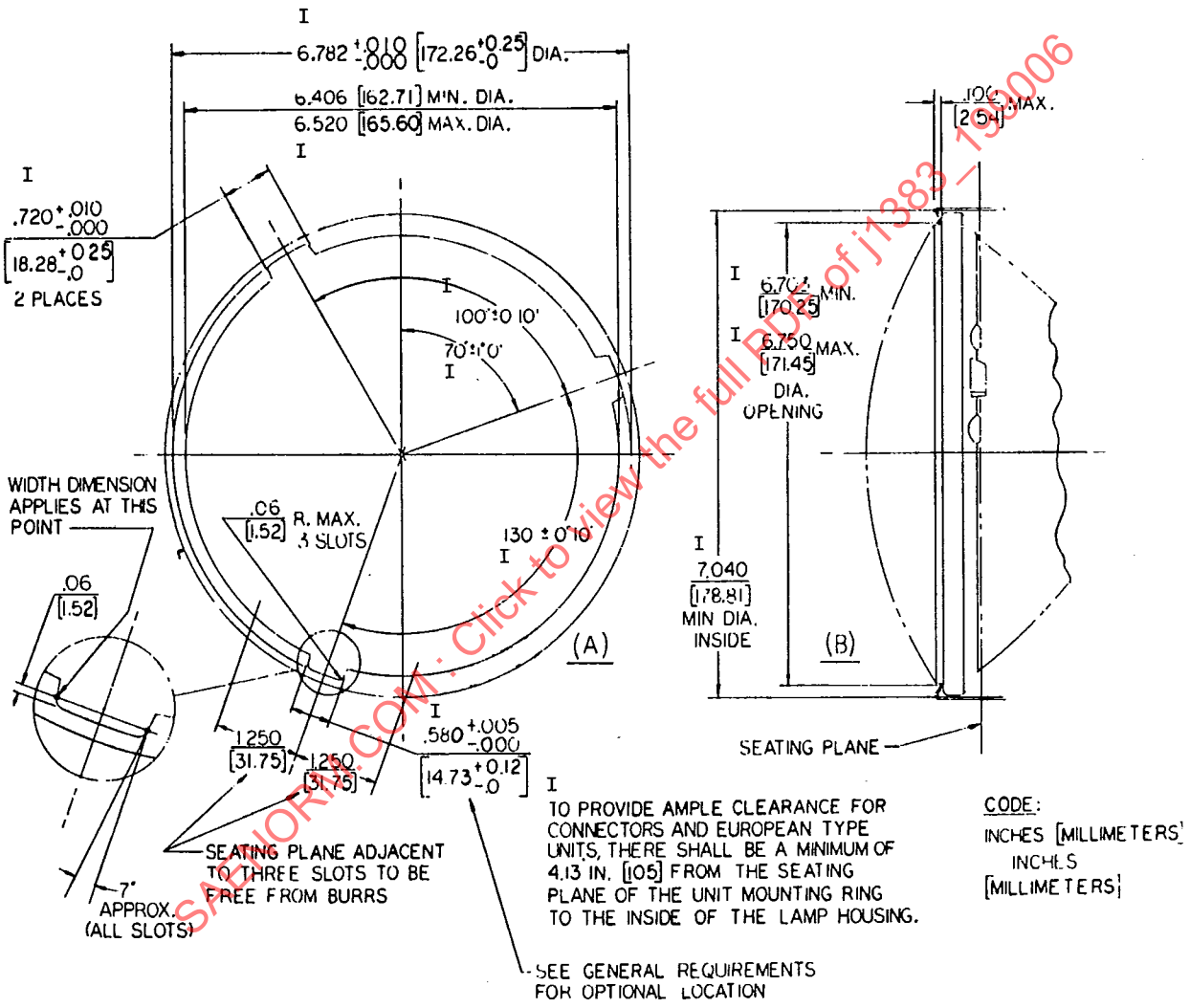
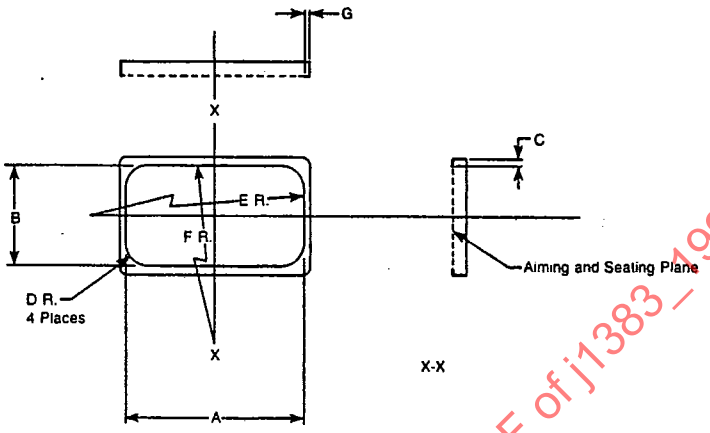


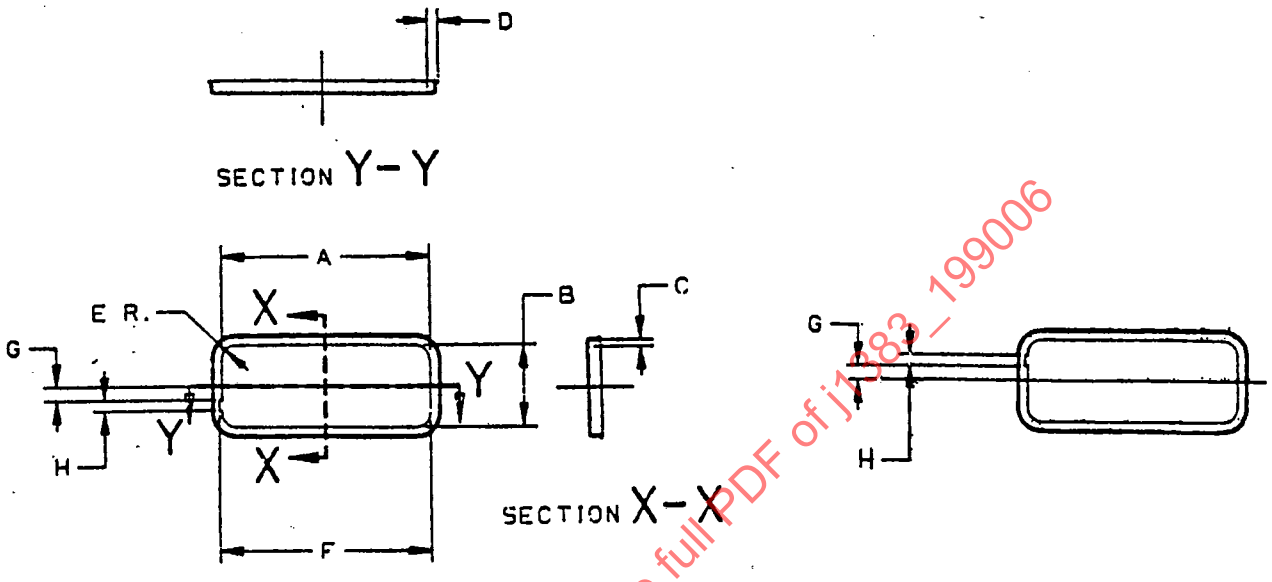
FIGURE 16—(A) FRONT VIEW OF SLOT OR NOTCHES FOR 178 mm DIAMETER HEADLAMP MOUNTING RING OR LAMP BODY; (B) 178 mm HEADLAMP RETAINING RING



Aiming Ring

LETTER	INCH	MM
A	5.721 ± .006	145.30 ± 0.30
B	3.284 ± .006	83 40 ± 0.30
C	.213 MIN.	5.40 MIN.
D	.670 MAX.	17.00 MAX.
E	23.7 ± 2.0	602.2 ± 50.0
F	63 0 ± 3.93	1600.0 ± 100.5
G	134 MIN.	3.40 MIN.

FIGURE 17—AIMING/SEATING RING FOR TYPE LF AND UF RECTANGULAR SEALED BEAM HEADLAMP UNITS



HIGH BEAM

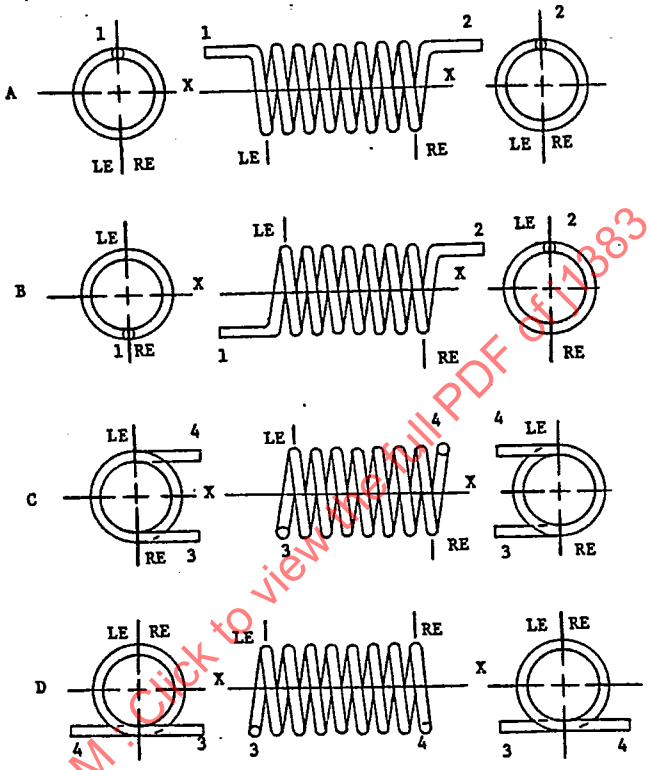
LETTER	INCH	MM
A	5.38 ±.010	136.7 ±0.30
B	2.25 ±.010	57.0 ±0.30
C	.154 MIN	3.9 MIN
D	.197 MIN	5.0 MIN
E	.26 ±.010	6.5 ±0.30
F	5.47 ±.02	139.0 ±0.30
G	.33 ±.02	8.5 ±0.5
H	.39 ±.02	10.0 ±0.5

LOW BEAM

LETTER	INCH	MM
	NOTE: SAME AS HIGH BEAM EXCEPT AS SHOWN	
G	.33 ±.02	8.5 ±0.5
H	.39 ±.02	10.0 ±0.5

FIGURE 18—AIMING RING—55 × 135 UK/LK

The following guideline is intended to depict the current methods which are being used by the lighting industry for identifying the end of filaments. It is not possible to predict every filament leg configuration. When the filament legs are in some other configuration than those shown below, a guideline is: The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are substantially at the correct helix angle. The ends of the filament would then be the beginning of the first turn and conclusion of the last turn that are substantially at the correct helix angle.



X-X axis of the filament
LE - Left end of filament
RE - Right end of filament

Filament configuration A and B:
LE - is 180 degrees around circumference on the first turn from (1) leg of the filament, when looking parallel to X-X

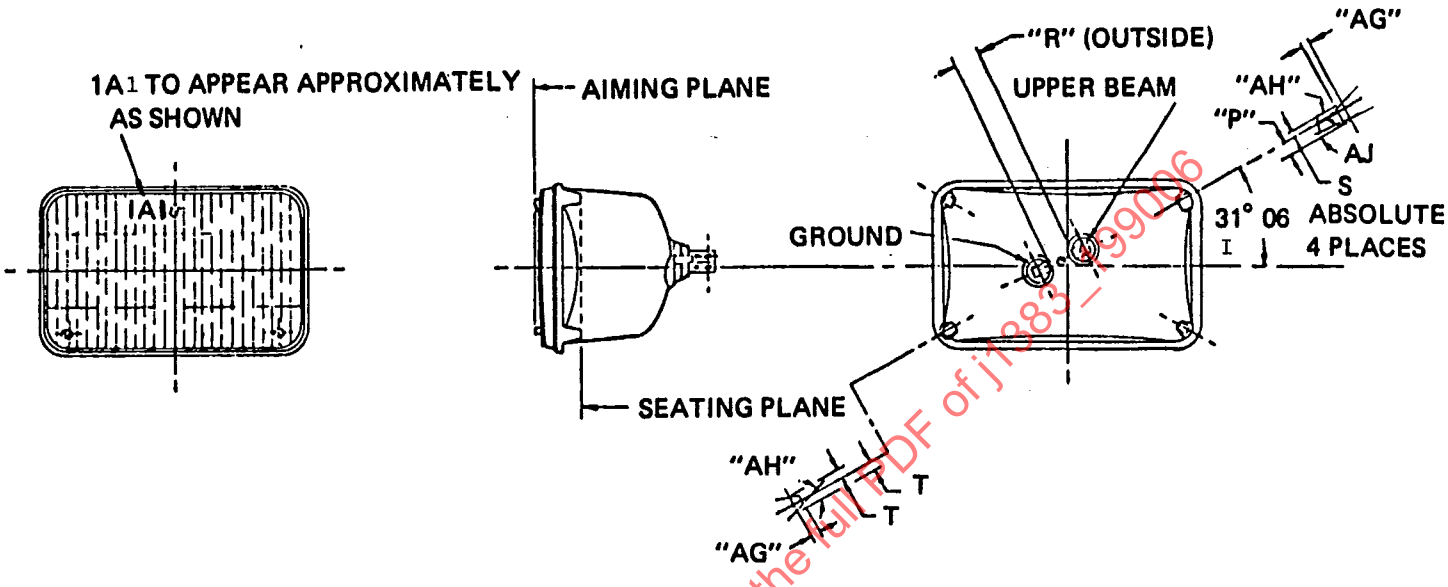
RE - is 180 degrees around circumference on the first turn from (2) leg of the filament, when looking parallel to X-X

Filament configuration C and D:

LE - is 180 degrees around circumference on the first turn from (3) centerline of filament leg, when looking parallel to X-X

RE - is 180 degrees around circumference on the first turn from (4) centerline of filament leg, when looking parallel to X-X

FIGURE 19—GUIDELINE REPLACEABLE BULB FILAMENT END COIL DEFINITION

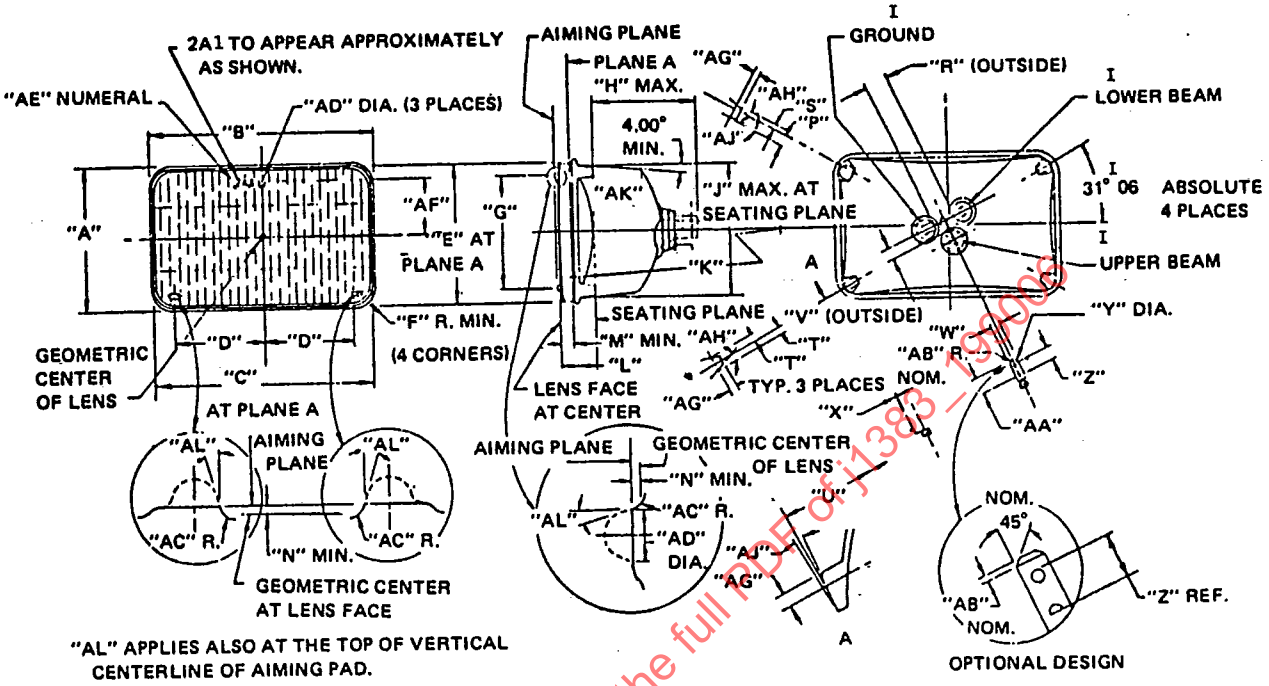


I - INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

NOTE: SAME AS TYPE 2A1 EXCEPT AS SHOWN

	Letter	in	mm
	AG	0.160 ± 0.010	4.064 ± 0.25
I	R	0.669 $^{+0.035}_{-0.000}$	17.0 $^{+0.9}_{-0}$
	AH	15°00′ ± 3°00′	
I	T	0.167 ± 0.0100	4.24 ± 0.25
	AJ	4°20′ ± 1°00′	
I	P	0.313 $^{+0.015}_{-0.010}$	7.95 $^{+0.38}_{-0.25}$
I	S	0.122 $^{+0.015}_{-0.010}$	3.10 $^{+0.38}_{-0.25}$

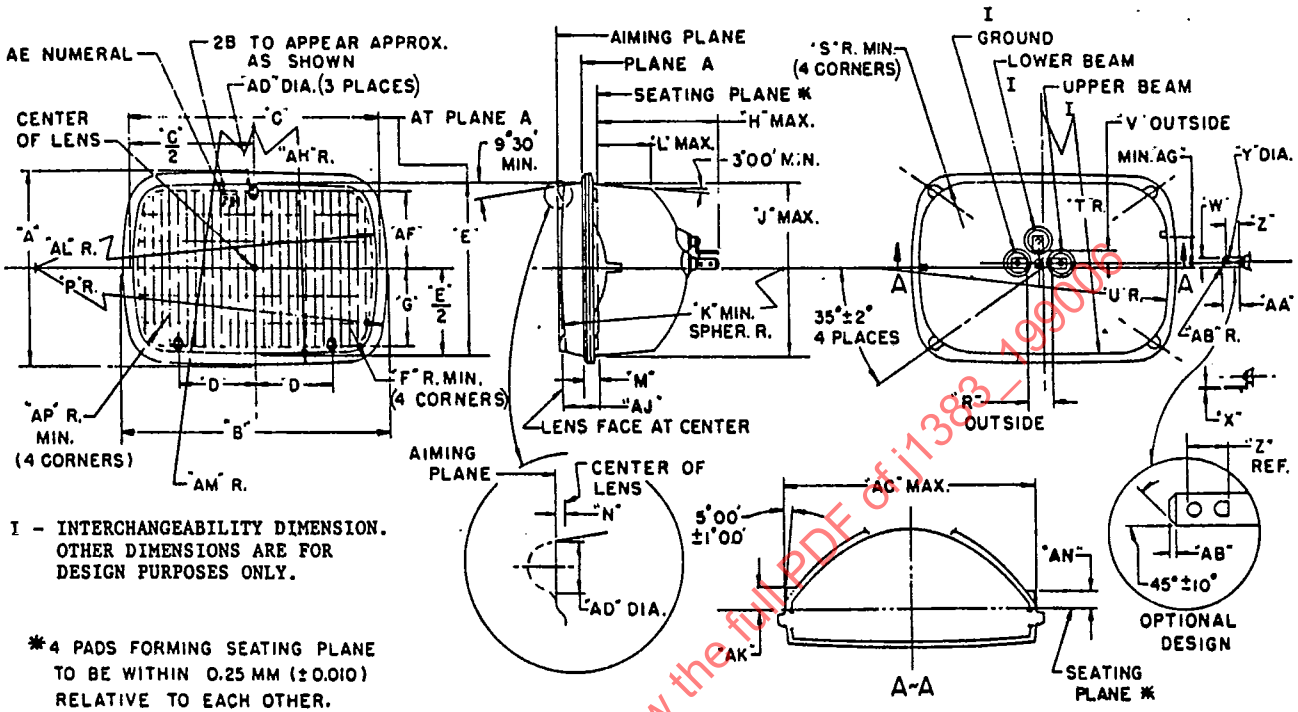
FIGURE 20—TYPE 1A1 HEADLAMP 100 × 165 mm RECTANGULAR



Letter	in	mm	Letter	in	mm	Letter	in	mm
I A	4.200 $^{+0.030}_{-0.170}$	106.68 $^{+0.76}_{-4.32}$	I P	0.313 $^{+0.015}_{-0.010}$	7.95 $^{+0.38}_{-0.25}$	AA	0.535 $^{+0.000}_{-0.071}$	13.58 $^{+0}_{-1.80}$
I B	6.580 $^{+0.030}_{-0.170}$	167.13 $^{+0.76}_{-4.32}$	I R	0.669 $^{+0.035}_{-0.000}$	17.02 $^{+0.88}_{-0.00}$	AB	0.060 ± 0.020	1.5 ± 0.5
I C	6.440 ± 0.030	163.58 ± 0.76	I S	0.122 ± 0.015	3.10 $^{+0.38}_{-0.25}$	AC	0.060 ± 0.020	1.5 ± 0.5
D	2.700 ± 0.020	68.58 ± 0.51	I T	0.167 ± 0.010	4.24 ± 0.25	AD	0.200 ± 0.010	5.08 ± 0.25
I E	4.060 ± 0.030	103.12 ± 0.76	I U	3.640 ± 0.010	92.47 ± 0.25	AE	0.250 ± 0.030	6.35 ± 0.76
I F	0.540	13.71	I V	0.335 $^{+0.020}_{-0.000}$	8.5 $^{+0.5}_{-0}$	AF	1.660 ± 0.010	42.16 ± 0.25
G	3.320 ± 0.030	84.33 ± 0.76	I W	0.304 $^{+0.016}_{-0.000}$	7.72 $^{+0.40}_{-0.00}$	AG	0.160 ± 0.010	4.06 ± 0.25
I H	3.350	85.09	I X	0.030 ± 0.002	0.76 ± 0.05	AH	15° max	
I J	4.01	101.85	Y	0.120 $^{+0.010}_{-0.000}$	3.05 $^{+0.25}_{-0}$	AJ	3.33° min	
K	50.000 $^{+0.500}_{-2.00}$	1270.0 $^{+13.0}_{-50.8}$	Z	0.345 $^{+0.059}_{-0.000}$	8.76 $^{+1.50}_{-0}$	AK	1.56° max	39.6 max
I L	1.375 ± 0.040	34.93 ± 1.02				AL	16° max	
I M	0.420	10.68						
N	0.020	0.51						

I – INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

FIGURE 21—TYPE 2A1 HEADLAMP 100 × 165 mm RECTANGULAR



I – INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

*4 PADS FORMING SEATING PLANE TO BE WITHIN 0.25 MM (±0.010) RELATIVE TO EACH OTHER.

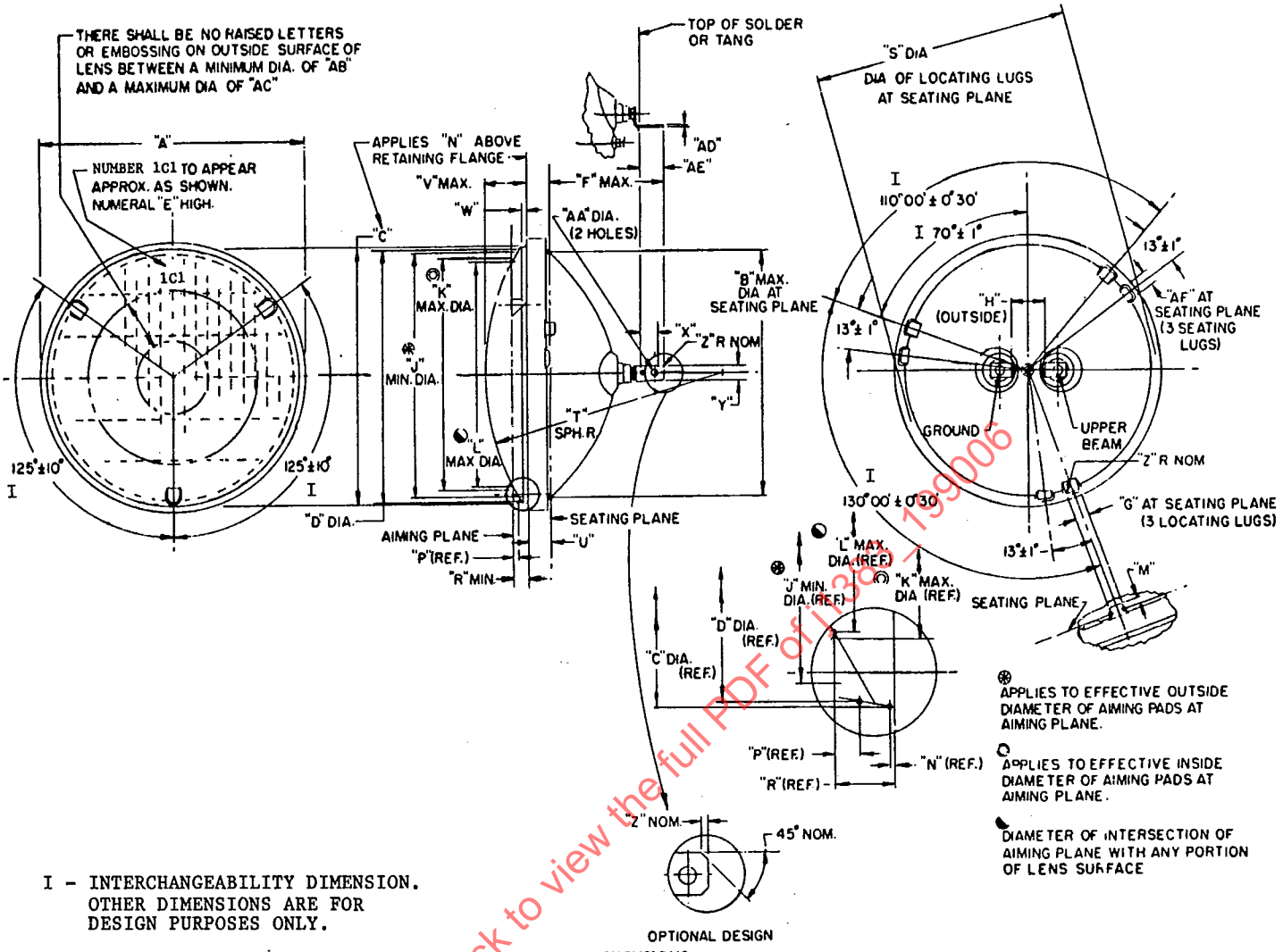
	LETTER	MM	INCH
I	A	142.0 $^{+0.8}_{-4.2}$	5.591 $^{+0.032}_{-0.165}$
I	B	200.0 $^{+0.8}_{-4.2}$	7.874 $^{+0.032}_{-0.165}$
I	C	189.73 $^{+0.30}_{-0.80}$	7.470 $^{+0.012}_{-0.032}$
	D	64.0 ± 1.0	2.520±0.039
I	E	131.73 $^{+0.30}_{-0.80}$	5.186 $^{+0.012}_{-0.032}$
I	F	25.5	1.004
	G	59.6 ± 1.0	2.346±0.039
I	H	107.0	4.213
I	J	132.23	5.206
	K	1200.0	47.244
	L	49.0	1.929
I	M	11.1 ± 1.0	0.437 ±0.039
	N	0.5 $^{+4.0}_{-0.5}$	0.020 $^{+0.157}_{-0.020}$

	LETTER	MM	INCH
I	P	254.0± 5.0	10.000±0.197
I	R	17.0 $^{+0.9}_{-0}$	0.669 $^{+0.035}_{-0.000}$
	S	42.7	1.681
	T	240.5 ± 13.0	94.547 ±0.512
	U	249.0 ± 5.0	9.803 ±0.197
I	V	8.5 $^{+0.5}_{-0}$	0.335 $^{+0.020}_{-0.000}$
I	W	7.72 $^{+0.40}_{-0}$	0.304 $^{+0.016}_{-0.000}$
I	X	0.76 ± 0.05	0.030±0.002
I	Y	3.05 $^{+0.25}_{-0}$	0.120 $^{+0.010}_{-0.000}$
	Z	8.76 $^{+1.50}_{-0}$	0.345 $^{+0.059}_{-0.000}$
	AA	13.56 $^{+0}_{-1.80}$	0.535 $^{+0.000}_{-0.071}$

	LETTER	MM	INCH
	AB	1.52 ±0.50	0.060 ±0.020
I	AC	190.23	7.489
	AD	5.0 ± 1.0	0.197 ± 0.039
	AE	6.35 ± 0.80	0.250±0.032
	AF	60.5 ± 1.0	2.382 ±0.039
I	AG	19.7	0.776
I	AH	2406.5 ± 13.0	94.744±0.512
	AJ	26.7 $^{+4.0}_{-1.0}$	1.051 $^{+0.157}_{-0.039}$
	AK	16.0 $^{+2.0}_{-1.0}$	0.630 $^{+0.079}_{-0.039}$
	AL	250.0 $^{+0}_{-25.0}$	9.843 $^{+0.000}_{-0.984}$
	AM	2402.0 $^{+0}_{-775.0}$	94.567 $^{+0.000}_{-30.512}$
	AN	12.0 $^{+2.0}_{-1.0}$	0.472 $^{+0.079}_{-0.039}$
	AP	20.4	0.803

FIGURE 22—TYPE 2B1 HEADLAMP 142 × 200 mm RECTANGULAR

21.100

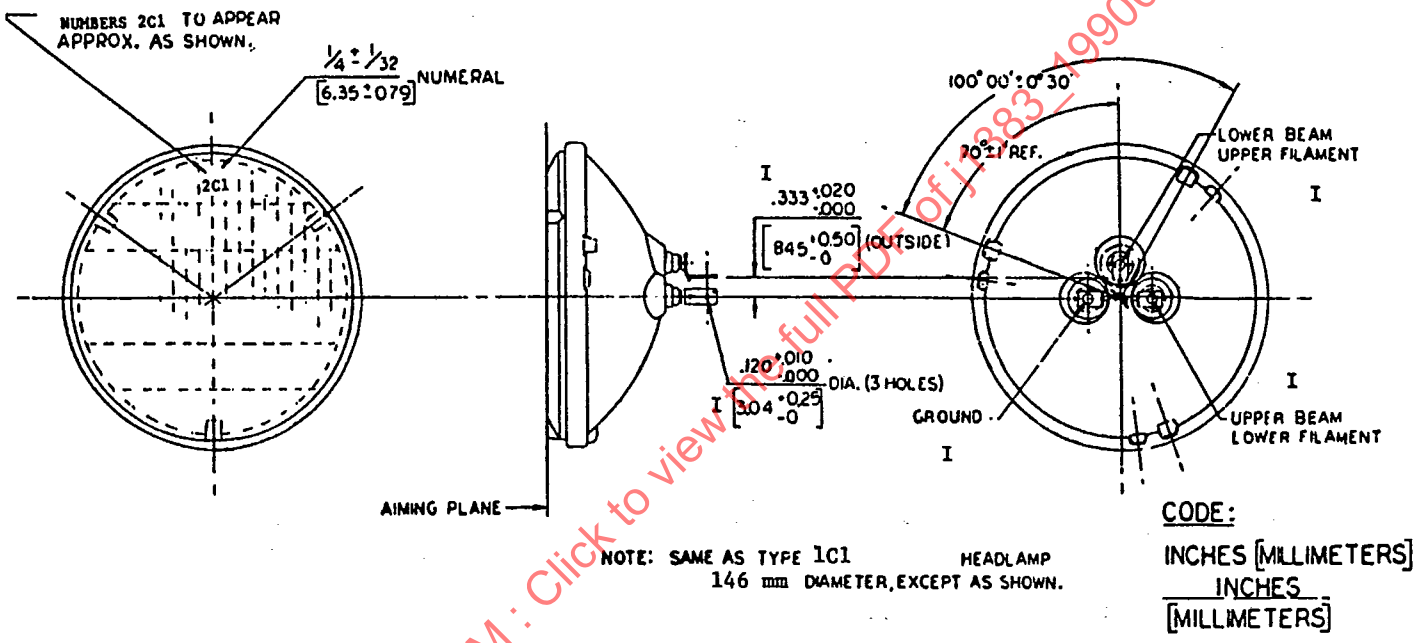


I - INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

DIMENSIONS

Letter	in	mm	Letter	in	mm
I A	$5.700^{+0.000}_{-0.100}$	$144.78^{+0}_{-2.54}$	T	5.06 ±0.12	128.52 ±3.04
I B	5.120	130.04	I U	0.500 ±0.040	12.70 ±1.01
I C	$5.355^{+0.000}_{-0.030}$	$136.01^{+0}_{-0.76}$	V	0.92	23.36
D	5.280 – 5.340	134.11 – 135.63	W	$0.078^{+0.062}_{-0.000}$	$1.98^{+1.57}_{-0}$
E	1/4 ±1/32	6.35 ±0.79	I X	$0.345^{+0.060}_{-0.000}$	$8.76^{+1.52}_{-0}$
I F	2.60	66.04	I Y	$0.304^{+0.016}_{-0.000}$	$7.72^{+0.40}_{-0}$
I G	0.312 ±0.010	7.92 ±0.25	Z	0.06	1.52
I H	$0.670^{+0.035}_{-0.000}$	$17.01^{+0.88}_{-0}$	I AA	$0.120^{+0.010}_{-0.000}$	$3.04^{+0.25}_{-0}$
I J	5.060	128.52	AB	1.50	38.10
K	4.57	116.07	AC	3.60	91.44
L	4.53	115.06	I AD	0.030 ±0.002	0.76 ±0.05
I M	$0.100^{+0.050}_{-0.000}$	$2.54^{+1.27}_{-0}$	AE	$0.535^{+0.000}_{-0.070}$	$13.58^{+0}_{-1.77}$
N	0.030	0.76	AF	0.31 ±0.12	7.87 ±3.04
P	0.165	4.19			
I R	0.320	8.12			
I S	$5.440^{+0.000}_{-0.040}$	$138.17^{+0}_{-1.01}$			

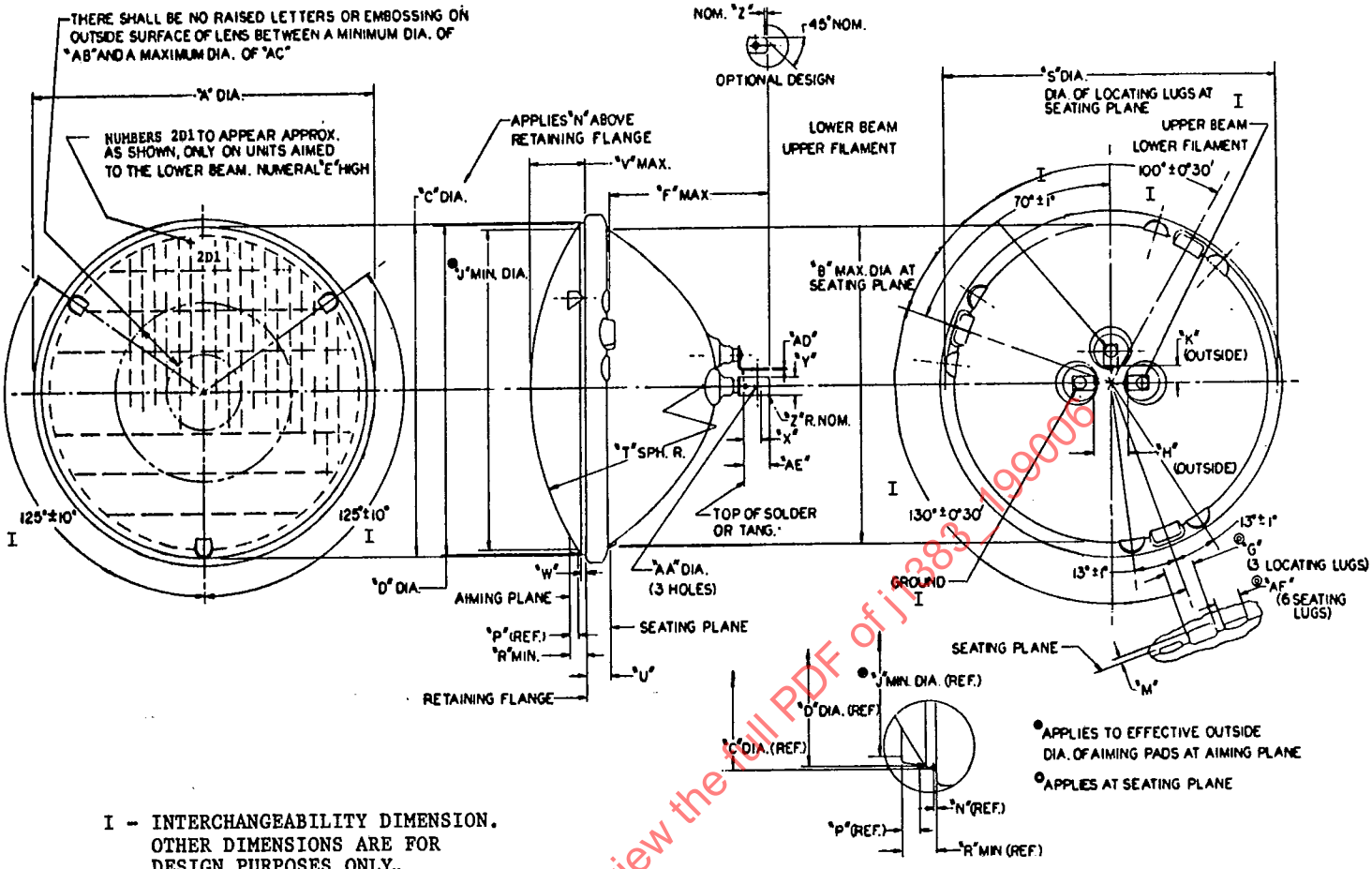
FIGURE 23—TYPE 1C1 HEADLAMP 146 mm DIAMETER



NOTE: SAME AS TYPE 1C1 HEADLAMP 146 mm DIAMETER, EXCEPT AS SHOWN.

FIGURE 24—TYPE 2C1 HEADLAMP 146 mm DIAMETER

21.102

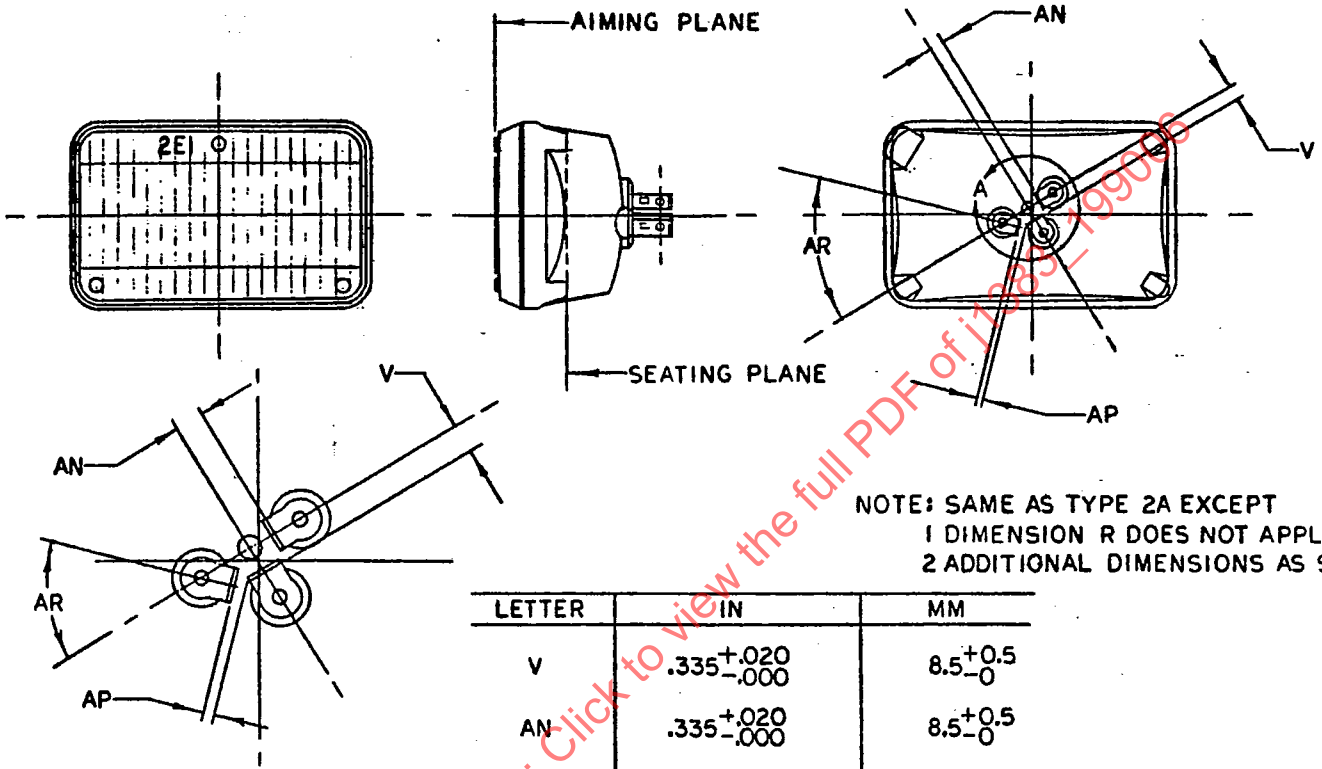


I - INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

DIMENSIONS

	Letter	In	mm		Letter	In	mm
I	A	$7.031^{+0.000}_{-0.109}$	$178.58^{+0}_{-2.76}$	I	S	$6.770^{+0.000}_{-0.040}$	$171.95^{+0}_{-1.01}$
I	B	6.380	162.05		T	$6.000^{+0.250}_{-0.000}$	$152.40^{+6.35}_{-0}$
I	C	$6.687^{+0.000}_{-0.030}$	$169.84^{+0}_{-0.76}$	I	U	0.500 ± 0.040	12.70 ± 1.01
	D	6.595 – 6.675	167.52 – 169.54		V	1.150	29.21
	E	3/8 ± 1/32	9.52 ± 0.79		W	$0.078^{+0.062}_{-0.000}$	$1.98^{+1.57}_{-0}$
I	F	3.500	88.90	I	X	$0.345^{+0.060}_{-0.000}$	$8.76^{+1.52}_{-0}$
I	G	$0.575^{+0.000}_{-0.025}$	$14.60^{+0}_{-0.63}$	I	Y	$0.304^{+0.016}_{-0.000}$	$7.72^{+0.40}_{-0}$
I	H	$0.670^{+0.035}_{-0.000}$	$17.01^{+0.88}_{-0}$		Z	0.06	1.52
I	J	6.450	163.83	I	AA	$0.120^{+0.010}_{-0.000}$	$3.04^{+0.25}_{-0}$
I	K	$0.333^{+0.020}_{-0.000}$	$8.45^{+0.50}_{-0}$		AB	1.50	38.10
					AC	3.60	91.44
I	M	$0.106^{+0.100}_{-0.000}$	$2.69^{+2.54}_{-0}$	I	AD	0.030 ± 0.002	0.76 ± 0.05
	N	0.030	0.76		AE	$0.535^{+0.000}_{-0.070}$	$13.58^{+0}_{-1.77}$
	P	0.180	4.57		AF	0.50 ± 0.25	12.70 ± 6.35
I	R	0.350	8.89				

FIGURE 25—TYPE 2D1 HEADLAMP 178 mm DIAMETER

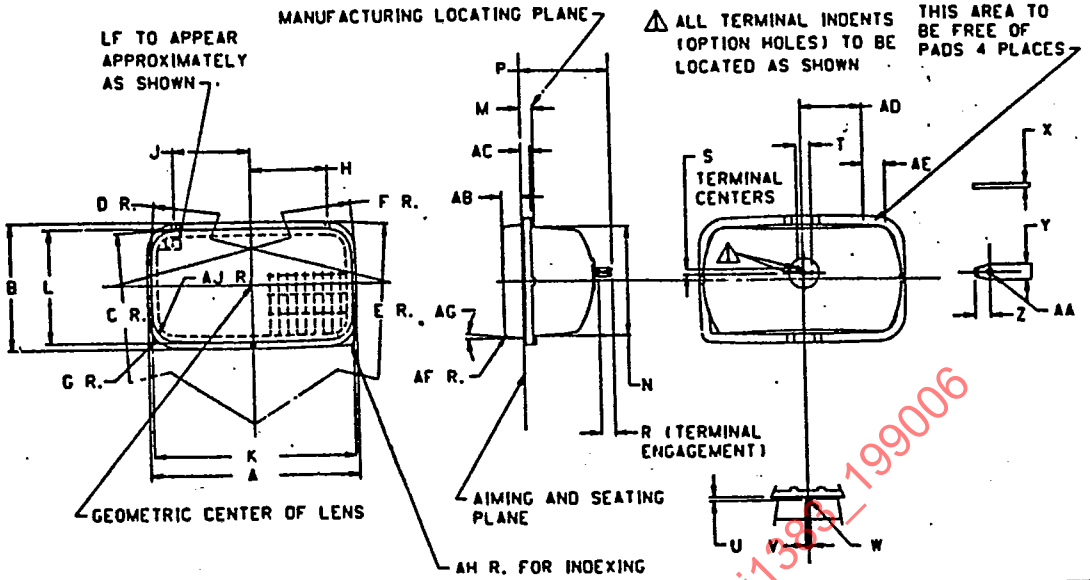


NOTE: SAME AS TYPE 2A EXCEPT
1 DIMENSION R DOES NOT APPLY
2 ADDITIONAL DIMENSIONS AS SHOWN

LETTER	IN	MM
V	$.335^{+.020}_{-.000}$	$8.5^{+0.5}_{-0}$
AN	$.335^{+.020}_{-.000}$	$8.5^{+0.5}_{-0}$
AP	$.202^{+.020}_{-.000}$	$5.1^{+0.5}_{-0}$
AR	$45^{\circ}\pm2^{\circ}$	

TYPE 2E1 SEALED BEAM HEADLAMP UNIT
4 X 6 1/2 IN (100 X 165 MM) RECTANGULAR UNIT

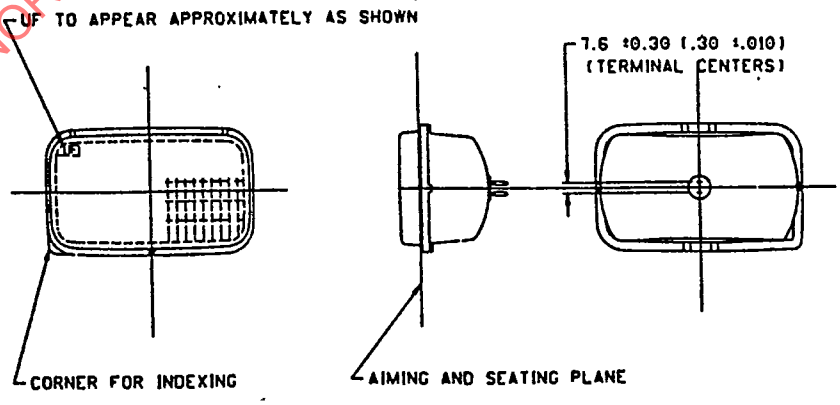
FIGURE 26—TYPE 2E1 HEADLAMP 100 × 165 mm RECTANGULAR



LETTER	INCH	MM	LETTER	INCH	MM	
A	5.93 +.050 −.040	150.50 +1.20 −1.00	R	.41 MIN.	10.5 MIN.	TYPE LF RECTANGULAR SEALED BEAM HEADLAMP UNIT
B	3.64 +.050 −.040	92.50 +1.20 −1.00	S	.15 ± .010	3.8 ± 0.30	
C	63.0 ± 3.94	1600.0 ± 100.0	T	.41 ± .010	10.43 ± 0.30	
D	23.6 ± 1.97	600.0 ± 50.0	U	.024 MIN.	0.60 MIN.	
E	63.0 ± 3.94	1600.0 ± 100.0	V	.315 MAX.	8.0 MAX.	
F	23.8 ± 1.97	600.0 ± 50.0	W	RADIUS	RADIUS	
G	.781 ± .010	20.00 ± 0.30	X	.032 ± .002	0.82 ± 0.04	
H	2.16 ± .010	55.0 ± 0.30	Y	.110 ± .004	2.80 ± 0.10	
J	2.16 ± .010	55.0 ± 0.30	Z	104 ± .010	2.65 ± 0.30	
K	5.689 +.008 −.040	144.50 +0.20 −1.00	AA	.051 ± .010 DIA.	1.30 ± 0.30 DIA.	
L	3.252 +.008 −.040	82.60 +0.20 −1.00	AB	.56 ± .020	14.3 ± 0.50	
M	.46 MAX.	11.7 MAX.	AC	.295 MAX.	7.50 MAX.	
N	3.19 MAX.	81.0 MAX.	AD	1.77	45.0	
P	2.87 MAX.	73.0 MAX.	AE	.63	16.0	
			AF	.13 ± .02	3.2 ± 0.5	
			AG	5° ± 1°	5° ± 1°	
			AH	.24 ± .02	6.0 ± 0.5	
			AJ	63 MIN.	16.0 MIN.	

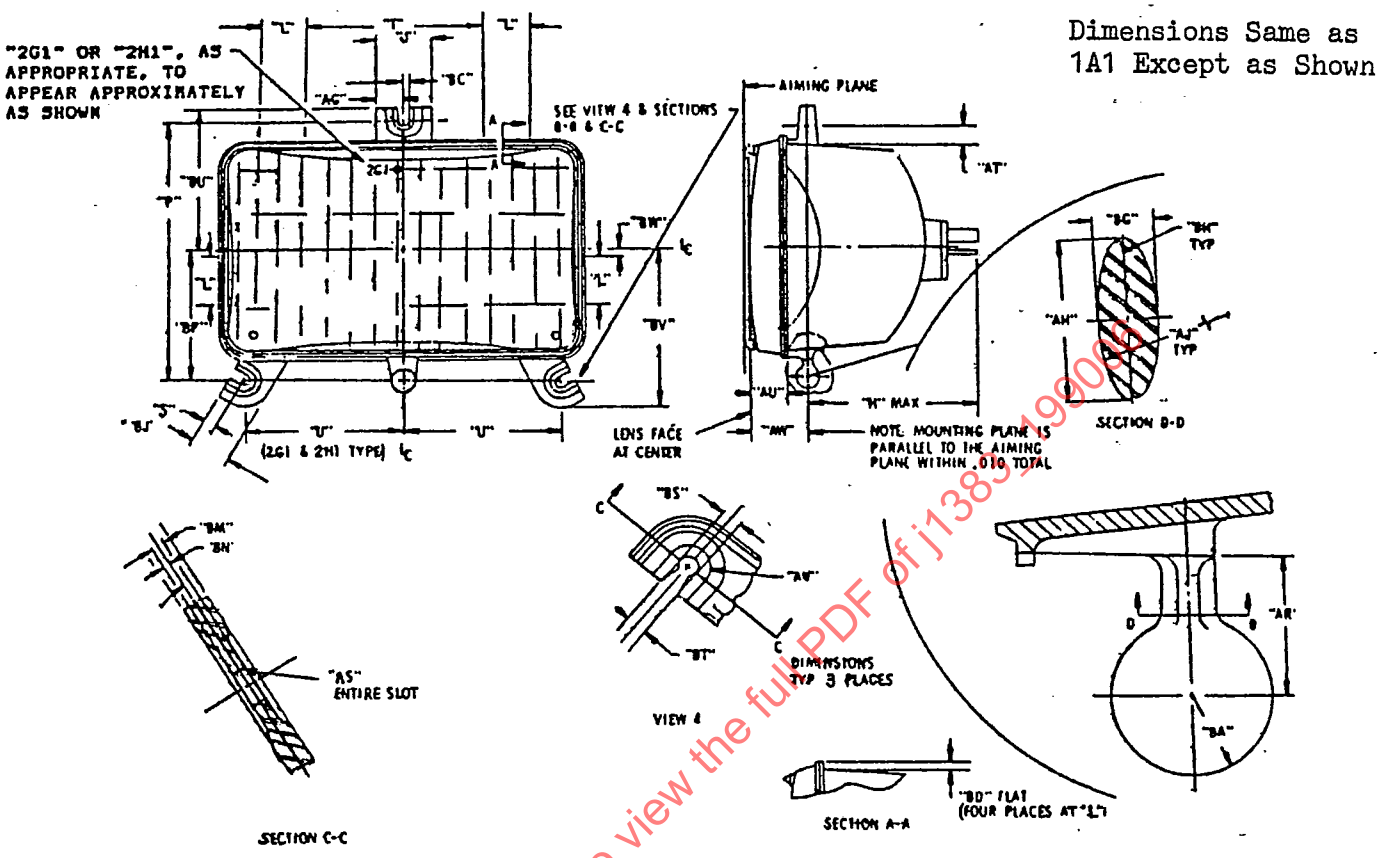
TYPE UF

RECTANGULAR SEALED BEAM HEADLAMP UNIT



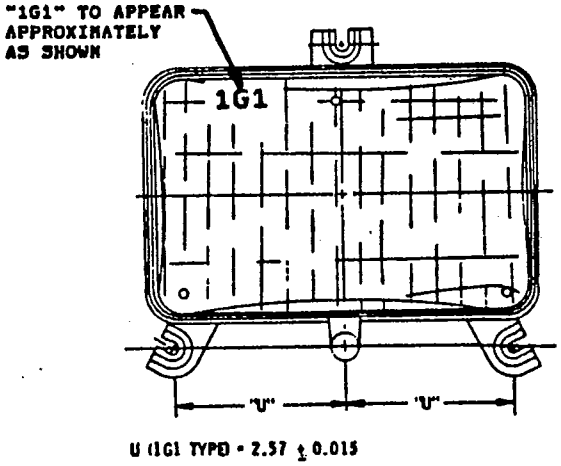
Note: Same as Type LF except as shown (.XX) Inch Dim.

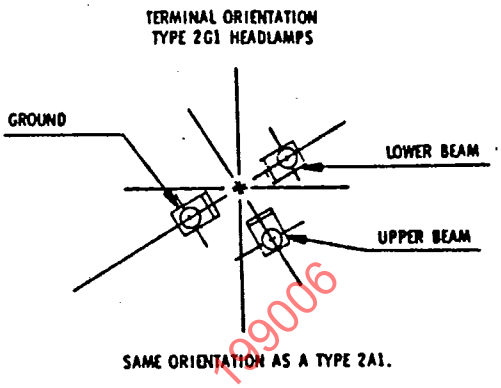
FIGURE 27—TYPE "UF" AND "LF" HEADLAMPS 92 × 150 mm RECTANGULAR

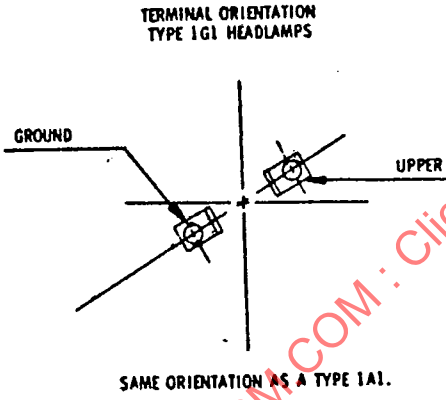


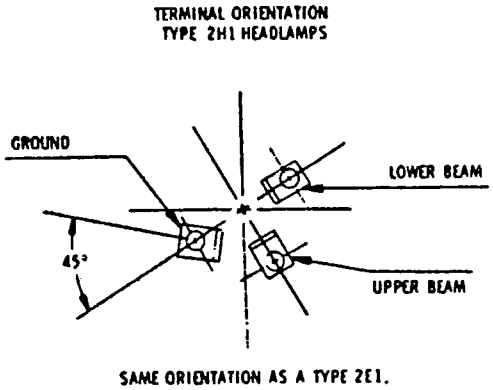
Letter	mm	Letter	mm.
H MAX	88.87 ± 0.38 I	BA	5.59 SPHER.R I
J	25.40 ± 0.38	BC	5.00 ± 0.13 I
L	31.75 MIN.	BD	1.02 MIN. I
P	121.92 ± 0.66 I	BG	3.81 ± 0.25 I
S	6.35± 0.13 I	BH	0.81R
T	97.40 ± 0.25	BJ	18.29 ± 0.38
U	71.63 ± 0.38 I	BM	1.62 ± 0.10 I
AG	12.70 ± 0.25	BN	0.81 ± 0.10 I
AH	10.41 ± 0.25 I	BP	62.23 ± 0.38
AJ	10.67 ± 0.25	BS	4.52/4.60 DIA I
AR	9.40 MIN. I	BT	4.42/4.47 I
AS	0.76R + 0.0.- 0.76 I	BU	69.34 ± 0.38
AT	5.84 MIN. I	BV	75.69 ± 0.38
AU	16.76 ± 1.02 I	BW	4.06 ± 0.25
AV	5.08R ± 0.25 I		
AW	27.94 ± 1.02 I		

FIGURE 28—TYPES 1G1, 2G1, AND 2H1 HEADLAMPS 100 × 165 mm RECTANGULAR



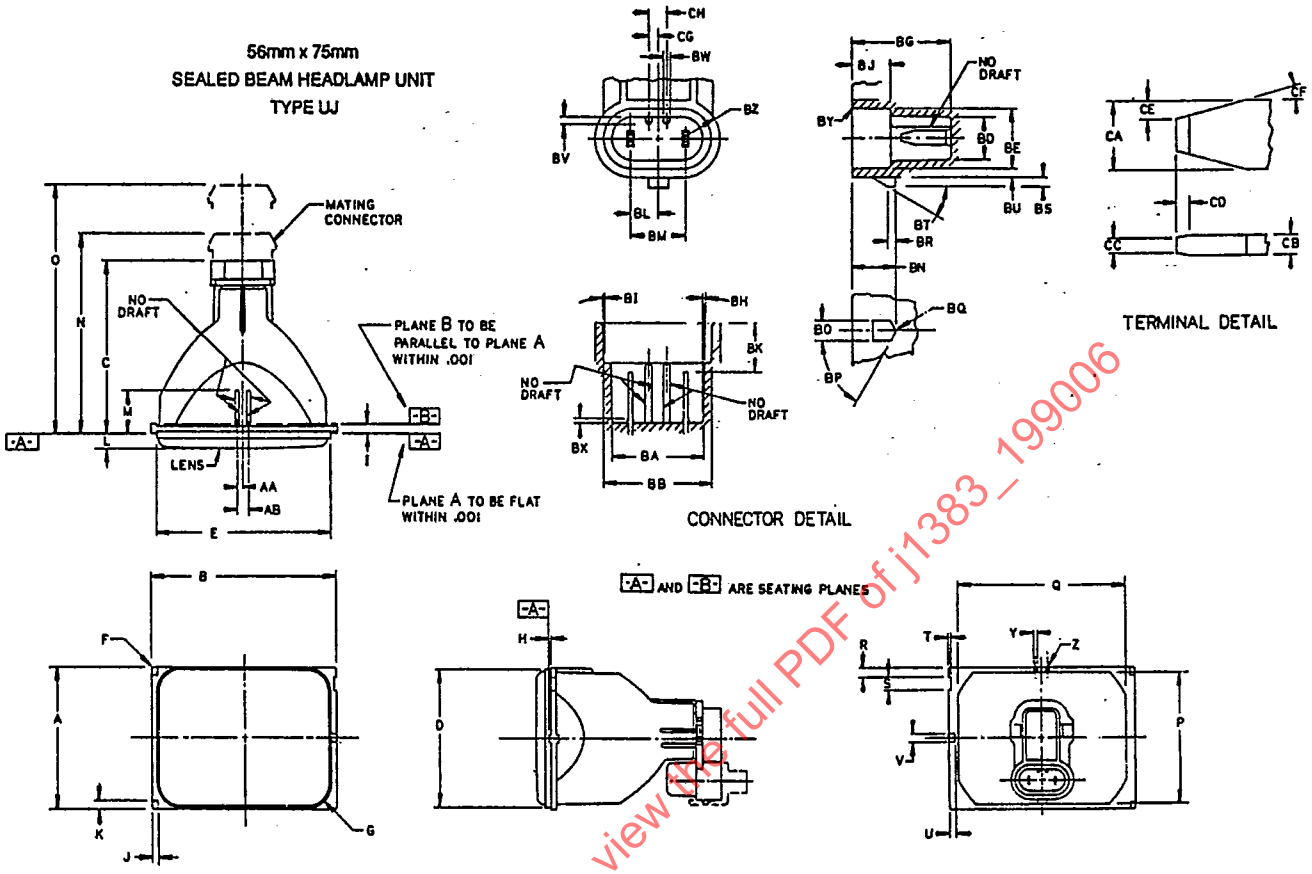






Noninterchangeability Configurations for Integral Mount Sealed Beam Headlamps, Type G and H

FIGURE 28 (CONTINUED)

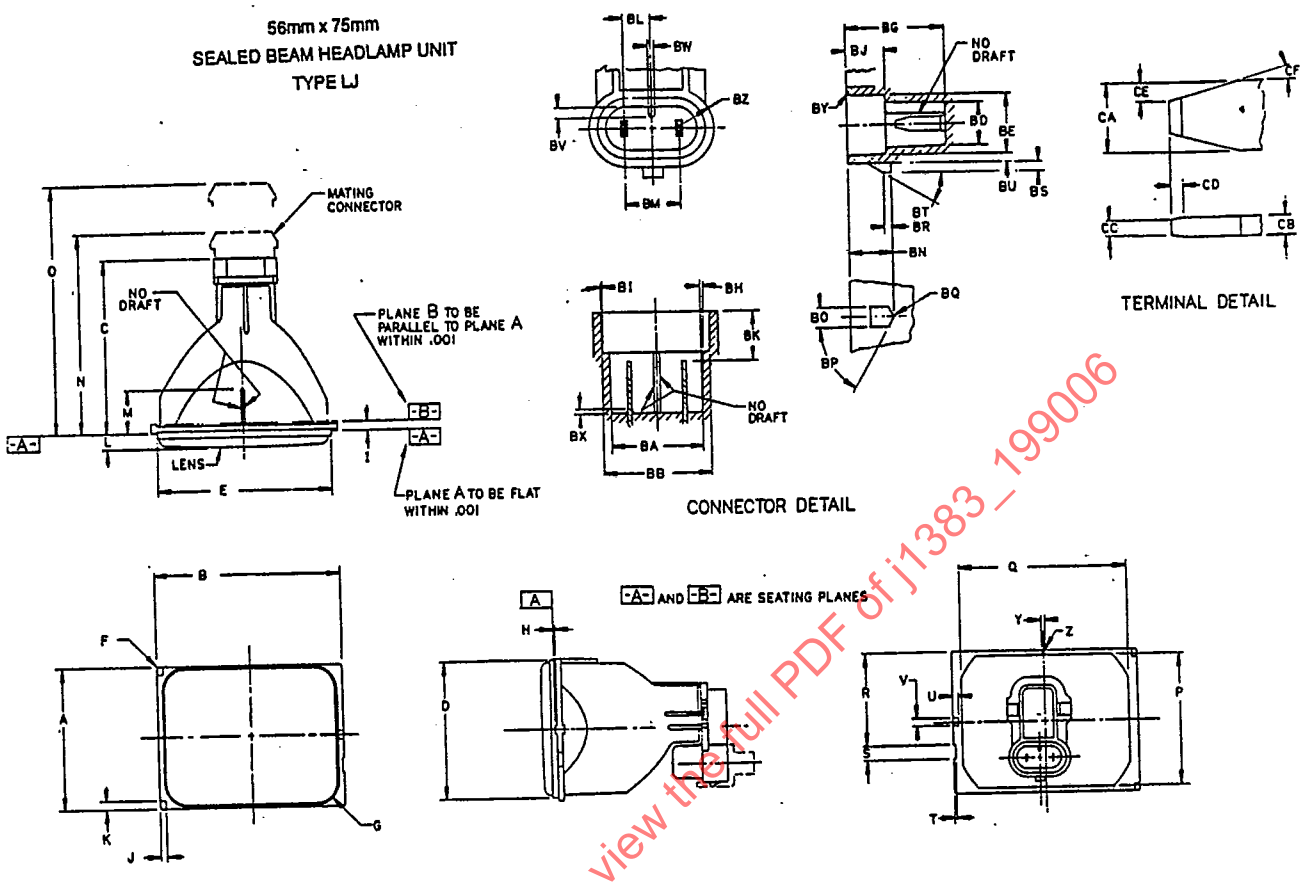


LETTER	INCH	MM	LETTER	INCH	MM	LETTER	INCH	MM
A	2.220	56.39	AA	.094	2.39	BW	.055	1.40
B	2.950	74.93	AB	.188	4.78	BX	.04X15° CON	1.0X15°
C	2.781	70.64				BY	.032 R	0.81
D	2.175	55.25				BZ	R TYP	R TYP
E	2.775	70.49	BA	.736	18.69	CA	.106-.114	2.69-2.90
F	.032 R	0.81	BB	.872	22.15	CB	.031-.034	0.79-0.86
G	.375 R	9.53				CC	.024 MAX	0.61
H	.030	0.76	BD	.343	8.71	CD	.020	0.50
I	.141	3.58	BE	.478	12.14	CE	.020-.043	.50-1.09
J	.09	2.30				CF	15°	15°
K	.13	3.30	BG	.787	20.00	CG	.069	1.75
L	.250 MAX	6.40	BH	1° CONSTANT	1°	CH	.138	3.50
M	.73	18.50	BI	½° CONSTANT	½°			
N	3.190 REF	81.00	BJ	.315	8.00			
O	3.960 REF	100.60	BK	.364-.404	9.25-10.25			
P	2.056 MAX	52.22	BL	.217	5.51			
Q	2.656 MAX	67.46	BM	.434	11.02			
R	.140	3.560	BN	.346	8.79			
S	.200	5.08	BO	.158	4.01			
T	.040	1.02	BP	60°	60°			
U	.09	2.30	BQ	.020 R	0.50			
V	.13	3.30	BR	.06	1.50			
			BS	.079	2.00			
			BT	30°	30°			
Y	.060	1.52	BU	.059 MIN	1.50			
Z	.03 R	0.80	BV	.055	1.40			

TOLERANCES UNLESS OTHERWISE SPECIFIED (INCHES):

2 PLACE DECIMAL ±.01
3 PLACE DECIMAL ±.005
ANGULAR ±1°

FIGURE 29—SEALED BEAM HEADLAMP UNIT TYPE UJ



LETTER	INCH	MM
A	2.220	56.39
B	2.950	74.93
C	2.781	70.64
D	2.175	55.25
E	2.775	70.49
F	.032 R	0.81
G	.375 R	9.53
H	.030	0.76
I	.141	3.58
J	.09	2.30
K	.13	3.30
L	.250 MAX	6.40
M	.73	18.50
N	3.190 REF	81.00
O	3.960 REF	100.60
P	2.056 MAX	52.22
Q	2.656 MAX	67.46
R	1.475	37.47
S	.200	5.08
T	.040	1.02
U	.09	2.30
V	.13	3.30
Y	.060	1.52
Z	.03 R	0.80

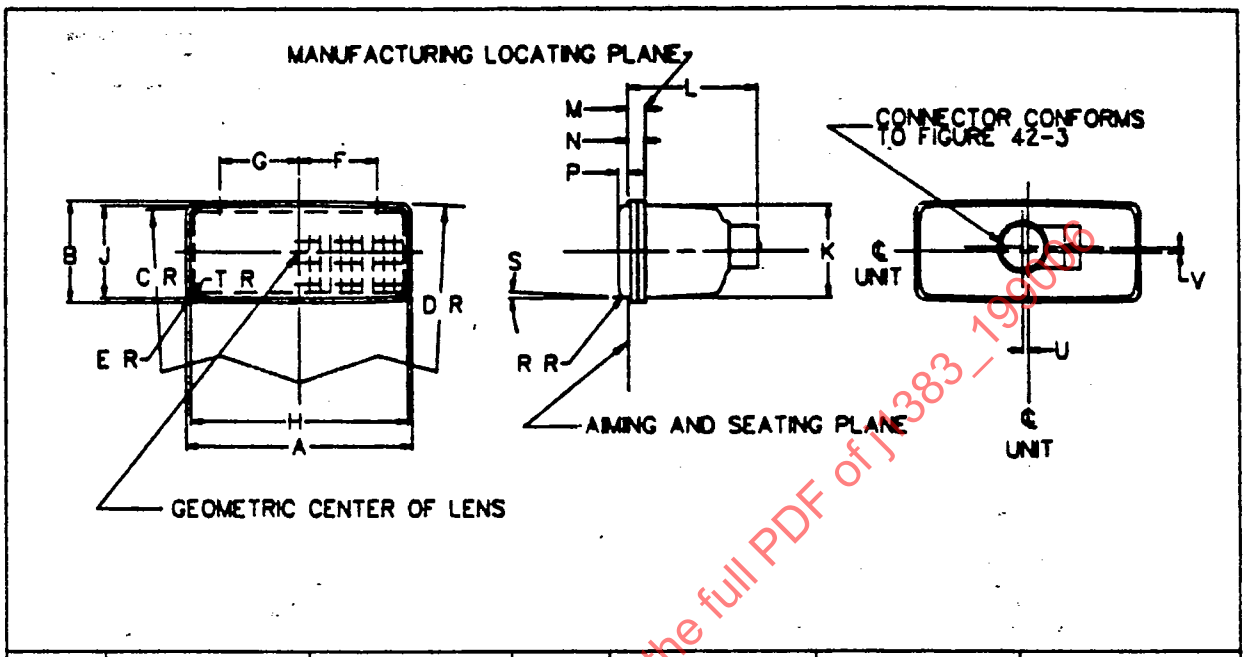
LETTER	INCH	MM
BA	.736	18.69
BB	.872	22.15
BD	.343	8.71
BE	.478	12.14
BG	.787	20.00
BH	1° CONSTANT	1°
BI	½° CONSTANT	½°
BJ	.315	8.00
BK	.364-.404	9.25-10.25
BL	.217	5.51
BM	.434	11.02
BN	.346	8.79
BO	.158	4.01
BP	60°	60°
BQ	.020 R	0.50
BR	.06	1.50
BS	.079	2.00
BT	30°	30°
BU	.059 MIN	1.50
BV	.079	2.00

LETTER	INCH	MM
BW	.055	1.40
BX	.04X15° CON	1.0X15°
BY	.032 R	0.81
BZ	R TYP	R TYP
CA	.106-.114	2.69-2.90
CB	.031-.034	0.79-0.86
CC	.024 MAX	0.61
CD	.020	0.50
CE	.020-.043	.50-1.09
CF	15°	15°

TOLERANCES UNLESS OTHERWISE SPECIFIED (INCHES):

2 PLACE DECIMAL ±.01
3 PLACE DECIMAL ±.005
ANGULAR ±1°

FIGURE 30—SEALED BEAM HEADLAMP UNIT
TYPE LJ

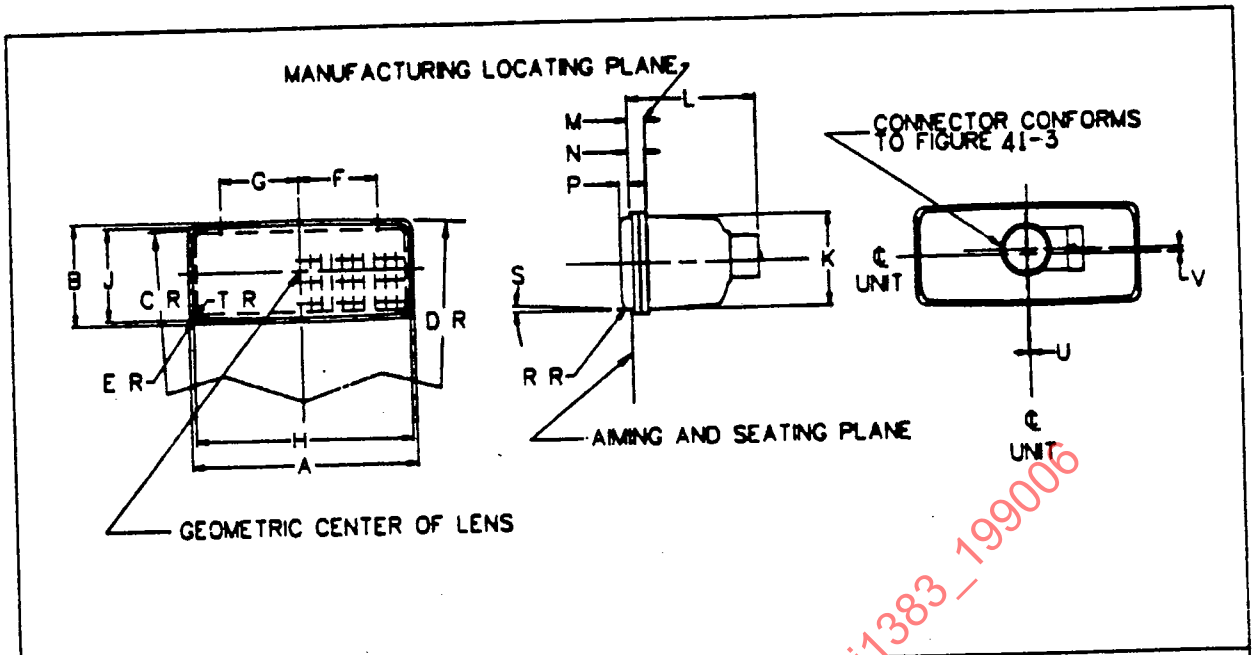


LETTER	INCH	MM	LETTER	INCH	MM
A	5.315 ± .060	135.0 ± 1.5	R	.188 ± .020	4.7 ± 0.5
B	2.362 ± .060	60.0 ± 1.5	S	3° ± 1°	3° ± 1°
C	62.4 ± 3.94	1585.0 ± 100.0	T	.19 MIN	3.2 MIN
D	62.5 ± 3.94	1587.5 ± 100.0	U	.131 ± .010	3.32 ± 0.30
E	.24 ± .010	6.4 ± 0.30	V	.104 ± .010	2.64 ± 0.30
F	1.85 ± .010	47.0 ± 0.30			
G	1.85 ± .010	47.0 ± 0.30			
H	5.106 ± .060	129.7 ± 1.5			
J	2.146 ± .060	54.7 ± 1.5			
K	2.152 ± .060	54.8 ± 1.5			
L	2.99 MAX	75.9 MAX			
M	.41 MAX	10.4 MAX			
N	.35 MAX	8.9 MAX			
P	.41 MAX	5.6 MAX			

TYPE UK

RECTANGULAR SEALED BEAM HEADLAMP UNIT

FIGURE 31—TYPE UK RECTANGULAR SEALED BEAM HEADLAMP UNIT



LETTER	INCH	MM	LETTER	INCH	MM
A	5.315 ± .060	135.0 ± 1.5	R	.188 ± .020	4.7 ± 0.5
B	2.362 ± .060	60.0 ± 1.5	S	3° ± 1°	3° ± 1°
C	62.4 ± 3.94	1585.0 ± 100.0	T	.13 MIN	3.2 MIN
D	62.5 ± 3.94	1587.5 ± 100.0	U	.039 ± .010	1.00 ± 0.30
E	.24 ± .010	6.4 ± 0.30	V	.104 ± .010	2.64 ± 0.30
F	1.85 ± .010	47.0 ± 0.30			
G	1.85 ± .010	47.0 ± 0.30			
H	5.106 ± .060	129.7 ± 1.5			
J	2.148 ± .060	54.7 ± 1.5			
K	2.152 ± .060	54.6 ± 1.5			
L	2.99 MAX	75.9 MAX			
M	.41 MAX	10.4 MAX			
N	.35 MAX	8.9 MAX			
P	.41 MAX	5.6 MAX			

TYPE LK

RECTANGULAR SEALDED BEAM HEADLAMP UNIT

FIGURE 32—TYPE LK RECTANGULAR SEALED BEAM HEADLAMP UNIT

7. Bulb Filament Dimension and Location Test for the 9004 Replaceable Bulb—Filament locations relative to the bulb base (with O-ring removed) shall be determined for both production and accurate rated bulbs, as outlined below. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

7.1 Low Beam Filament Location Test—The location shall be determined by measuring from the midpoint of the smallest rectangle which encloses the filament image to the axial centerline of the base (see Figure 38):

a. Axially—in the right side view
b. Vertically—in the right side view
c. Transversely—in the plan view

7.2 High Beam Filament Location Test—The location shall be determined as indicated in 7.1.

8. Low Beam Filament Location—Production bulbs (refer to Figure 38).

8.1 Axial—The low beam filament axial or fore/aft location shall be measured in the right side view from the reference plane of the base to the center of the smallest rectangle which encloses the low beam filament image.

8.2 Vertical—The low beam filament vertical or side view from a horizontal plane through the base centerline to the center of the smallest rectangle which encloses the low beam filament image.

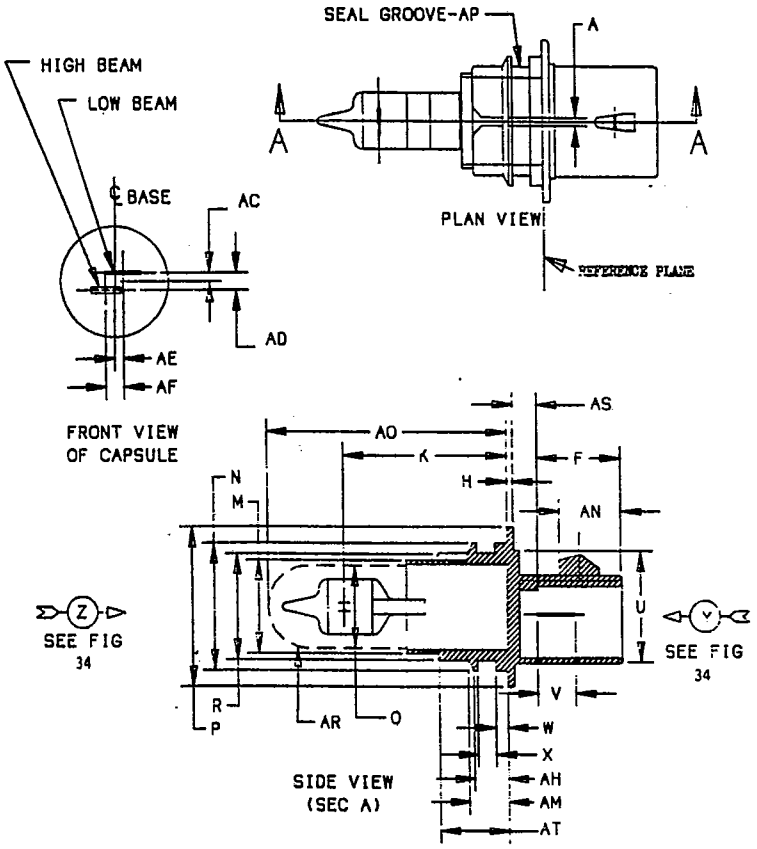
8.3 Transverse—The low beam filament transverse or left/right location shall be measured in the plan view from the vertical plane through the center of the base to the midpoint of the smallest rectangle which encloses the low beam filament image.

9. High Beam Filament Location—Production bulbs (refer to Figure 38).

9.1 Axial—The high beam filament axial location shall be measured in the right side view of the high beam filament from the centerline of the low beam filament to the centerline of the smallest rectangle which encloses the high beam filament image.

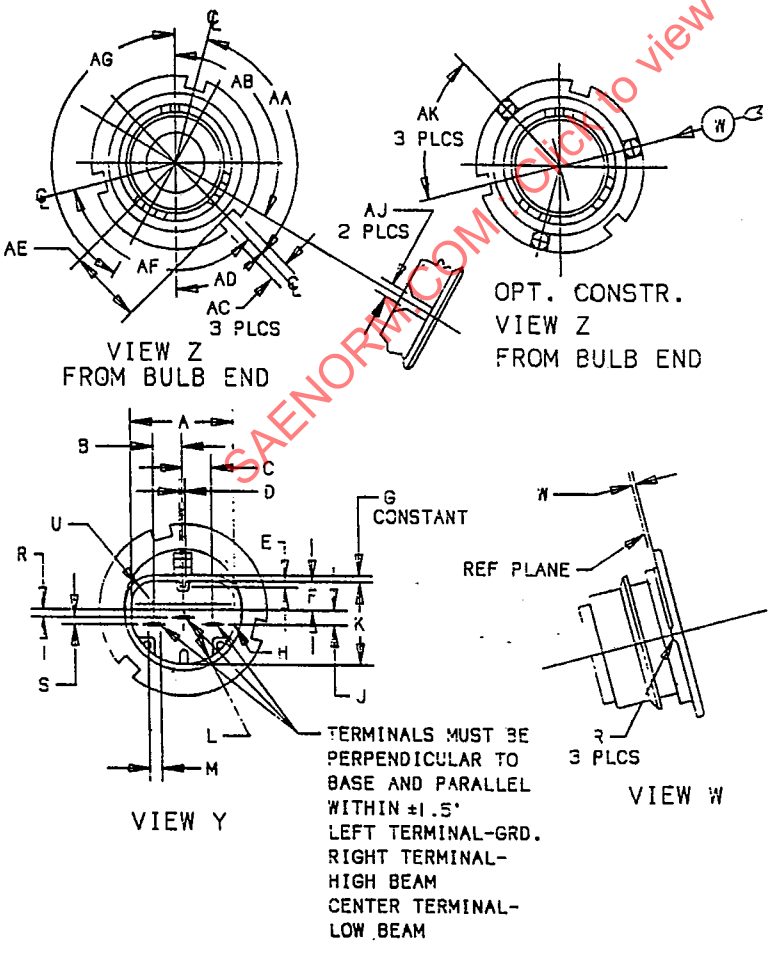
9.2 Vertical—The high beam filament vertical location shall be measured in the right side view of the high beam filament from the centerline of the low beam filament to the centerline of the smallest rectangle which encloses the high beam filament image.

9.3 Transverse—The high beam filament horizontal location shall be measured in the plan view of the high beam filament from the midpoint of the low beam filament to the midpoint of the smallest rectangle which encloses the high beam filament image.



Dimension	Millimeters
A	(2.15/2.10).05 Either Side CL
F	23.00 ± .20
H	2.00 ± .20
K Low Beam	44.50 ± .25
High Beam	CL High Beam to be within ± .64 of CL of low beam
M	24.85 Max.
N	(33.90/33.80).05 Either Side CL
O	24.5 Max.
P	42.50 ± .20
R	(28.60/28.50).05 Either Side CL
U	30.00 ± .20
V	10.50 ± .50
W	3.25 ± .20
X	4.80 ± .20
AC	1.15 ± .38
AD	2.30 ± .64
AE	1.20 ± .38
AF	2.40 ± .80
AH	9.05 ± .20
AM	10.54 ± .20
AN	17.10 ± .20
AO	70.0 Max.
AP	Seal must withstand a minimum of 70 kPa (10 PSIG) when bulb-seal assembly is inserted into a cylindrical aperture of 34.3/34.2 mm (1.350/1.346 in).
AR	Glass capsule and supports shall not exceed this envelope.
AS	8.5 ± 2.0
AT	16.0 Min

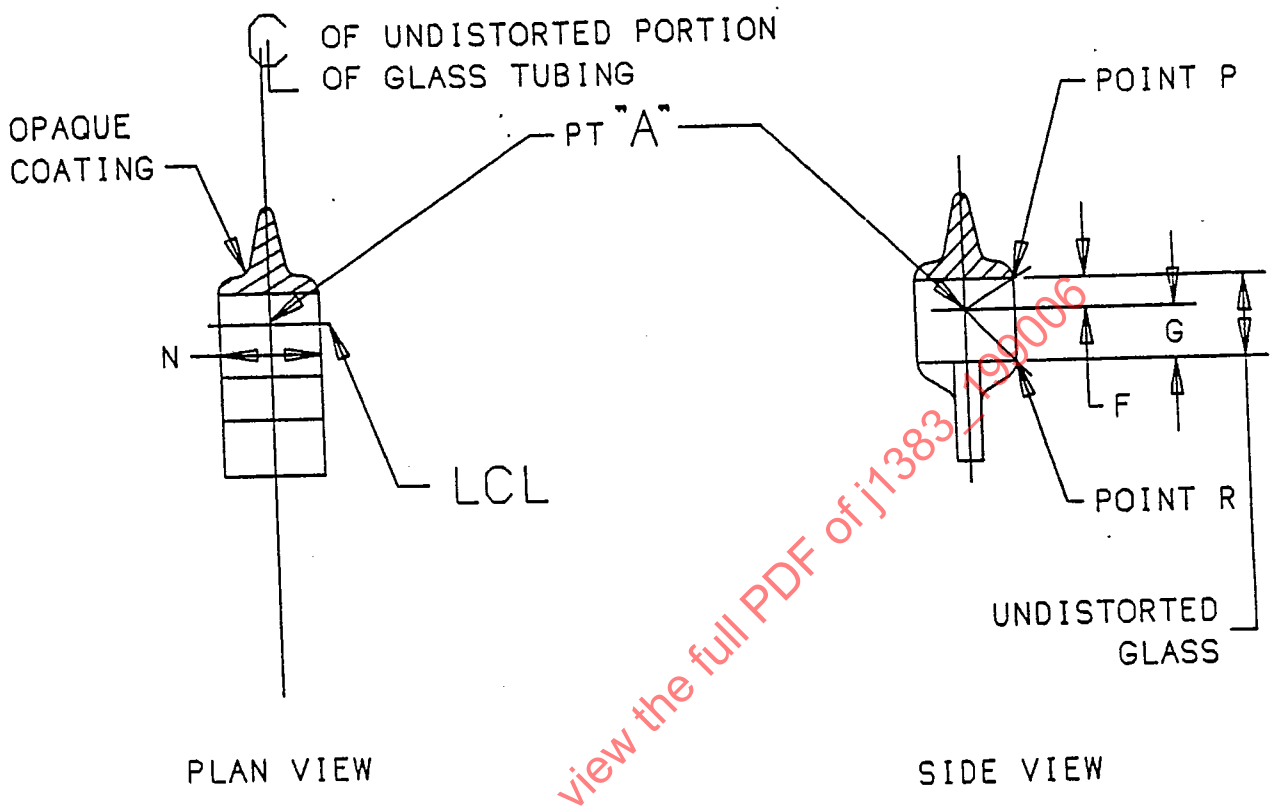
FIGURE 33—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



Dimension	Millimeters
AA	120°
AB	120°
AC	4.9 Min.
AD	44° 30'
AE	18.35 ± 0.20
AF	120°
AG	150°
AJ	3.6 ± .20
AK	60°
A	26.10 ± .20
B	7.35 ± .25
C	7.35 ± .25
D	1.30 ± .20
E	1.40 ± .20
F	7.05 ± .15
G	1.50 ± .20
J	3.60 ± .25
K	20.60 ± .20
L	13.60 ± .20R
M	3.00 ± .10
R	1.90 ± .25
S	.63 ± .05
U	5.65 ± .20R
W	.25 ± .15

TOLERANCE FOR ALL ANGULAR DIMENSIONS ± 1°

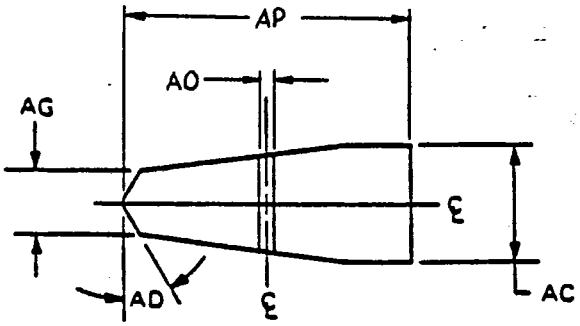
FIGURE 34—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



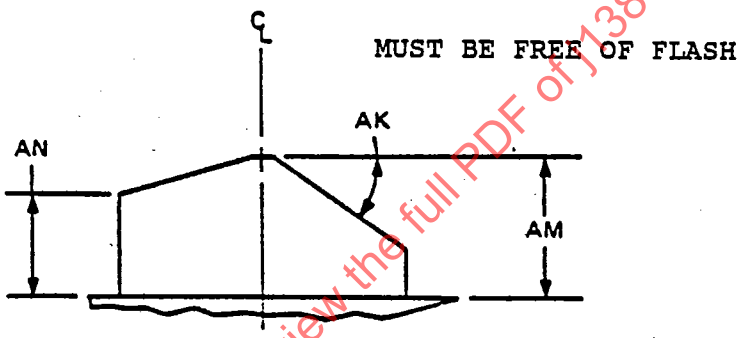
Dimensional Specifications
Figure 35

Dimension	Specification
F	(N/2)tan 38° ± 1.0mm
G	(N/2)tan 43° MIN
N	Actual Capsule Dia. (To Be Established By Manufacturer)
P	Entire Radius and Distorted Glass Shall Be Covered to the Plane Passing Through Point "P", Perpendicular to the Glass Capsule Centerline.

FIGURE 35—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



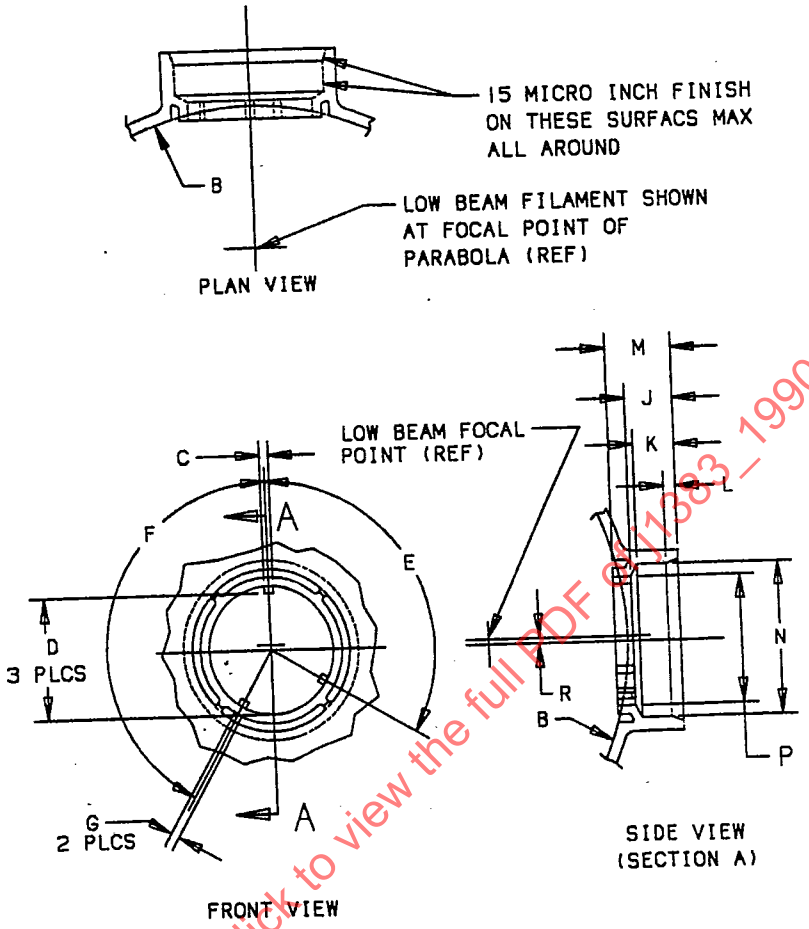
EXPLODED PLAN VIEW



EXPLODED SIDE VIEW

Dimension	Millimeters
AC	4.55 ± .20
AD	30° ± 3°
AG	2.50 ± .20
AK	35° ± 3°
AM	5.50 ± .20
AN	4.00 ± .20
AO	.5 ± .20
AP	11.4 ± .20

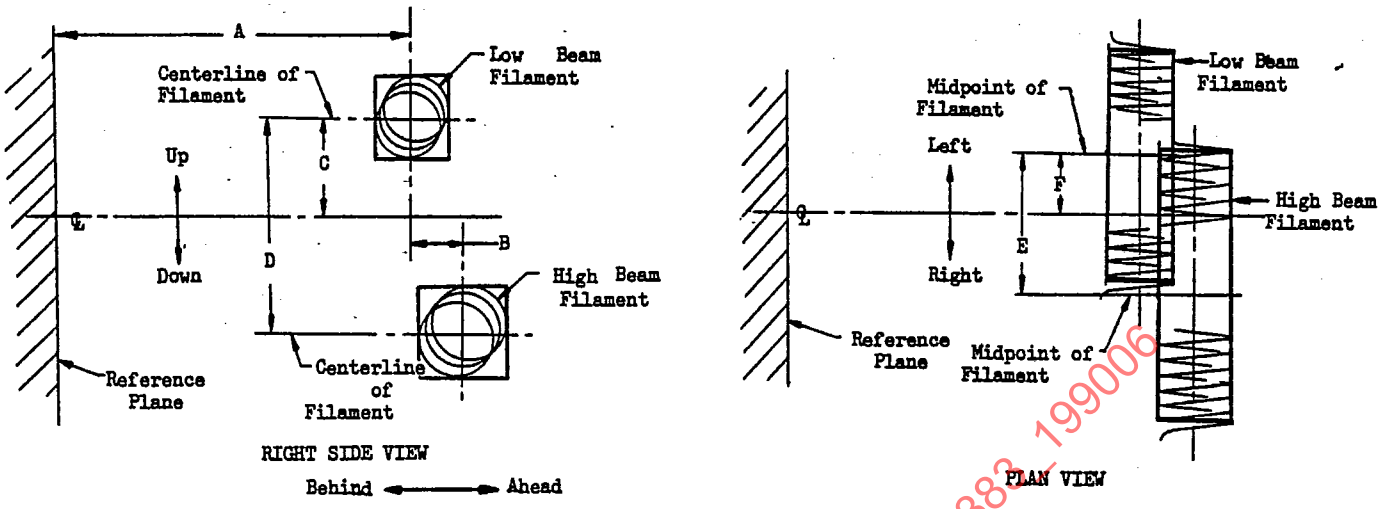
FIGURE 36—SPECIFICATION FOR THE 9004 REPLACEABLE BULB LOCKING FEATURE



Dimension	Millimeters
	Ref Line
B	Lamp Parabola
C	2.00 ± .05
	.05 Either Side of CL
D	27.10 ± .20
E	120°
F	150°
G	2.00 ± .20
H	15.15 ± .20
J	11.10 ± .20
K	9.50 ± .20
L	2.75 ± .20
N	34.24 +.08/-.05
P	28.70 +.10/-.05
	Diameter P shall be concentric to diameter N within ± .05
R	1.15 ± .10

TOLERANCE FOR ALL ANGULAR DIMENSIONS ± 1°

FIGURE 37—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



Letter	Accurate Rated Bulb Dimension (mm)
A	44.50 ± .15
B	0.00 ± .25
C	1.15 ± .20
D	2.30 ± .25
E	2.40 ± .40
F	1.20 ± .20
Low Beam Filament Length 1/3/	4.80 ± .40
High Beam Filament Length 2/3/	4.80 ± .40

1/ Low beam filament rotation shall not exceed 0.3 diameters of the coil.

2/ High beam filament rotation shall not exceed 0.4 diameters of the coil.

3/ Filament Length - The length of any filament shall be considered to be the length of the smallest rectangle which encloses the filament image in the plan view or right side view, as appropriate.

FIGURE 38—DIMENSIONAL SPECIFICATIONS FOR THE 9004 REPLACEABLE BULB FILAMENT DIMENSION AND LOCATION—MEASUREMENT METHOD

21.116

10. Bulb Filament Dimension and Location Test for the 9005 and 9006 Replaceable Bulb—Filament locations relative to the bulb base (with O-ring removed) shall be determined for both production and accurate rated bulbs, as outlined below. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

10.1 High Beam Filament Location Test (see Figure 39)—The high beam filament location shall be determined by measuring:

a. Axially—in the side view
b. Vertically—in the side view
c. Transversely—in the bottom view

10.2 Low Beam Filament Location Test (see Figure 47)—The low beam filament location shall be determined by measuring:

a. Axially—in the side view
b. Vertically—in the side view
c. Transversely—in the bottom view

11. High Beam Filament Location

11.1 Production Bulbs

11.1.1 AXIAL—The end coil nearest to Plane A shall be within the volume "B" and the end coil farthest from Plane A shall be within the volume "C" as shown in Figure 43.

11.1.2 VERTICAL—Same as 11.1.1.

11.1.3 TRANSVERSE—Same as 11.1.1.

11.2 Accurate Rated Bulbs

11.2.1 AXIAL—The axial or fore/aft location shall be measured from Plane A to the beginning of the end coil nearest to Plane A and to the finish of the end coil farthest from Plane A. See Figure 46, Volume D and E.

11.2.2 VERTICAL

11.2.2.1 *End Coils*—The vertical or up/down location shall be measured from line A to the center of the smallest rectangle which encloses the end coil. See Figure 46, Volume D and E.

11.2.2.2 *Center Section*—The vertical or up/down location shall be measured from line A to the center of the smallest rectangle which encloses the center coil. See Figure 46, Section F, Area G.

11.2.3 TRANSVERSE

11.2.3.1 *End Coils*—Same as 11.2.2.1.

11.2.3.2 *Center Section*—Same as 11.2.2.2.

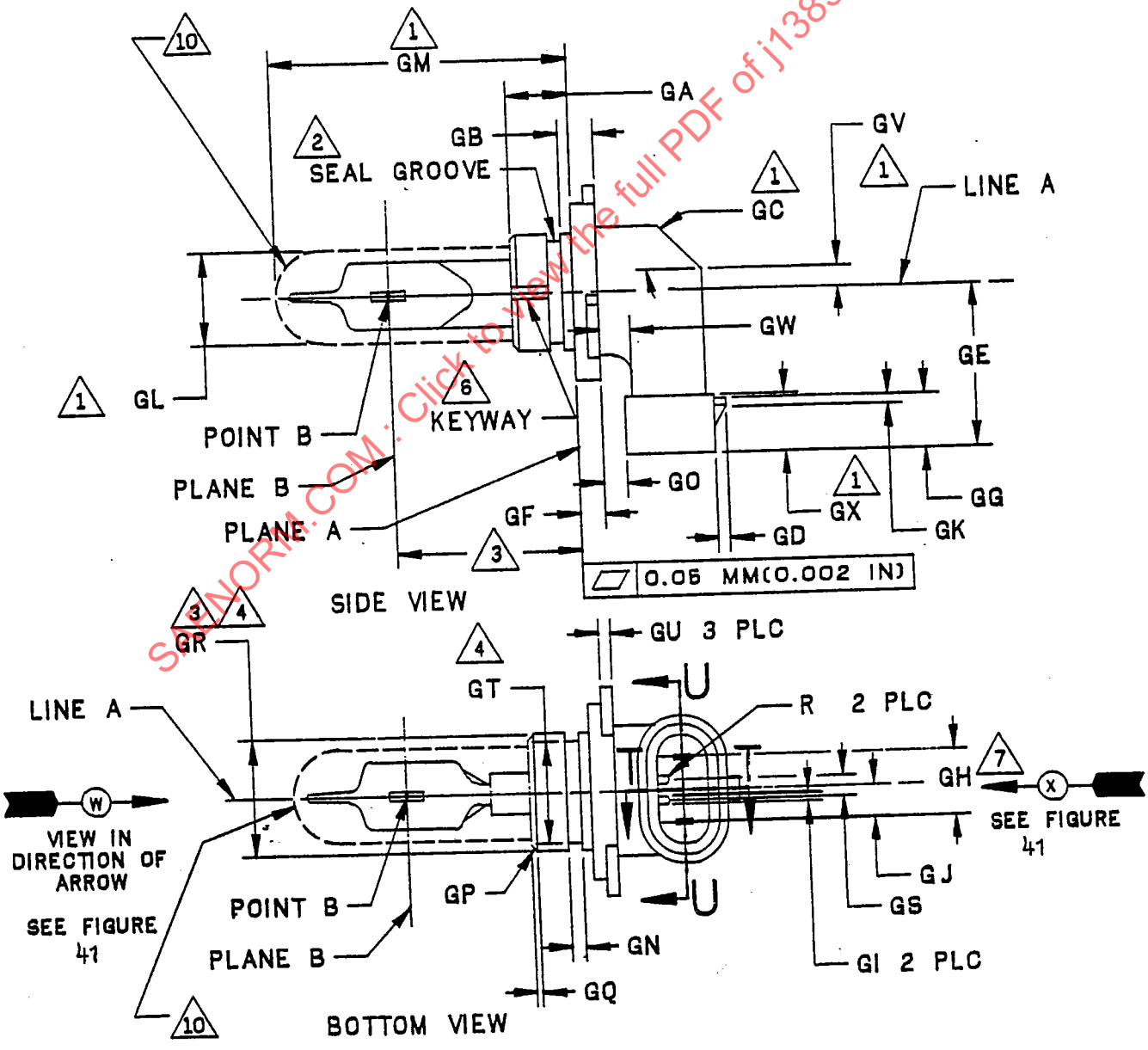


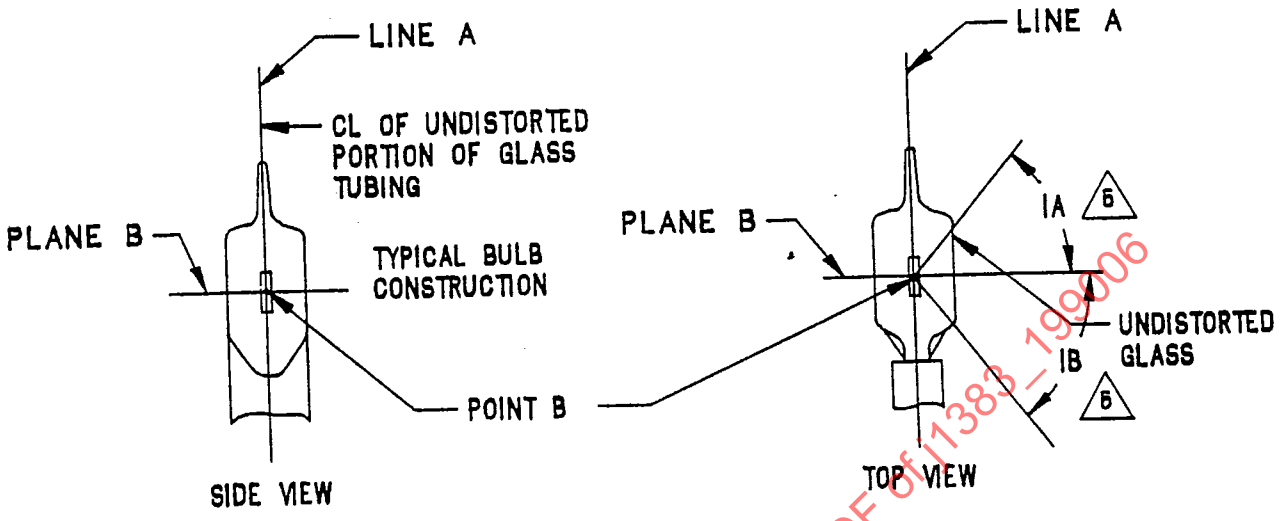
FIGURE 39—SPECIFICATION FOR THE 9005 REPLACEABLE BULB

DIMENSION	INCHES	MILLIMETERS
GA	0.591 MAX/0.217 MIN	15.00 MAX/5.50 MIN
GB	0.236	6.00
GC	45°	45°
GD	0.079	2.00
GE	1.09	27.8
GF	0.165	4.20
GG	0.346	8.80
GH	0.433	11.00
GI	0.055	1.40
GJ	0.217 ± 0.006	5.50 ± 0.15
GK	0.06	1.5
GL	0.775 DIA	19.68 DIA
GM	2.165	55.00
GN	0.093	2.36
GO	0.157	4.00
GP	45° CHAMFER	45° CHAMFER
GQ	0.039	1.00
GR	0.787 ± 0.002 DIA	20.00 ± 0.05 DIA
GS	0.138	3.50
GT	0.687 $^{+0.004}_{-0.000}$ DIA	17.46 $^{+0.10}_{-0.00}$ DIA
GU	0.079	2.00
GV	0.138	3.5
GW	0.209 MIN	5.30 MIN
GX	0.378	9.60

1. DIMENSIONS SHOWN ARE MAXIMUM-MAY BE SMALLER.
2. BULBS MUST BE EQUIPPED WITH A SEAL. THE BULB-SEAL ASSEMBLY MUST WITHSTAND A MINIMUM OF 70kPA. (10 P.S.I.G.) WHEN THE ASSEMBLY IS INSERTED INTO A CYLINDRICAL APERTURE OF 20.22±0.10 MM (0.796±0.004 IN).
3. SEE FIGURE 43
4. DIAMETERS MUST BE CONCENTRIC WITHIN 0.20 MM (0.008 IN).
5. GLASS BULB PERIPHERY MUST BE OPTICALLY DISTORTION FREE AXIALLY WITHIN THE INCLUDED ANGLES ABOUT POINT B.
6. KEY AND KEYWAY ARE OPTIONAL CONSTRUCTION. KEYWAY REQUIRED FOR AFTERMARKET ONLY.
7. MEASURED AT TERMINAL BASE. TERMINALS MUST BE PERPENDICULAR TO BASE AND PARALLEL WITHIN ±1.5°
8. DIAMETERS MUST BE CONCENTRIC WITHIN 0.20 MM (0.008 IN).
9. ABSOLUTE DIMENSION, NO TOLERANCE.
10. GLASS CAPSULE AND SUPPORTS SHALL NOT EXCEED THIS ENVELOPE AND SHALL NOT INTERFERE WITH INSERTION PAST THE LAMP'S KEY.

TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES	millimeters
2 PLACE DECIMALS ± .02	1 PLACE DECIMALS ± 0.5
3 PLACE DECIMALS ± .013	2 PLACE DECIMALS ± 0.30
ANGULAR ± 1°	ANGULAR ± 1°

FIGURE 39 (CONTINUED)



POINT B IS INTERSECTION OF PLANE B AND CENTERLINE OF UNDISTORTED GLASS TUBING

DIMENSION	INCHES	MILLIMETERS
1A	45° MIN	45° MIN
1B	62° MIN	62° MIN

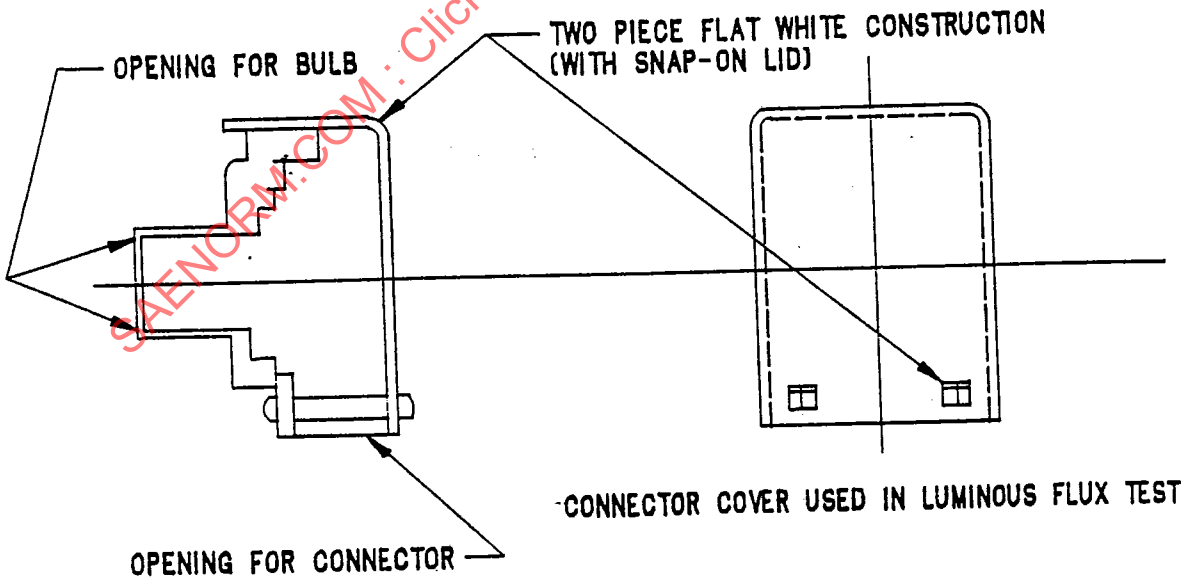
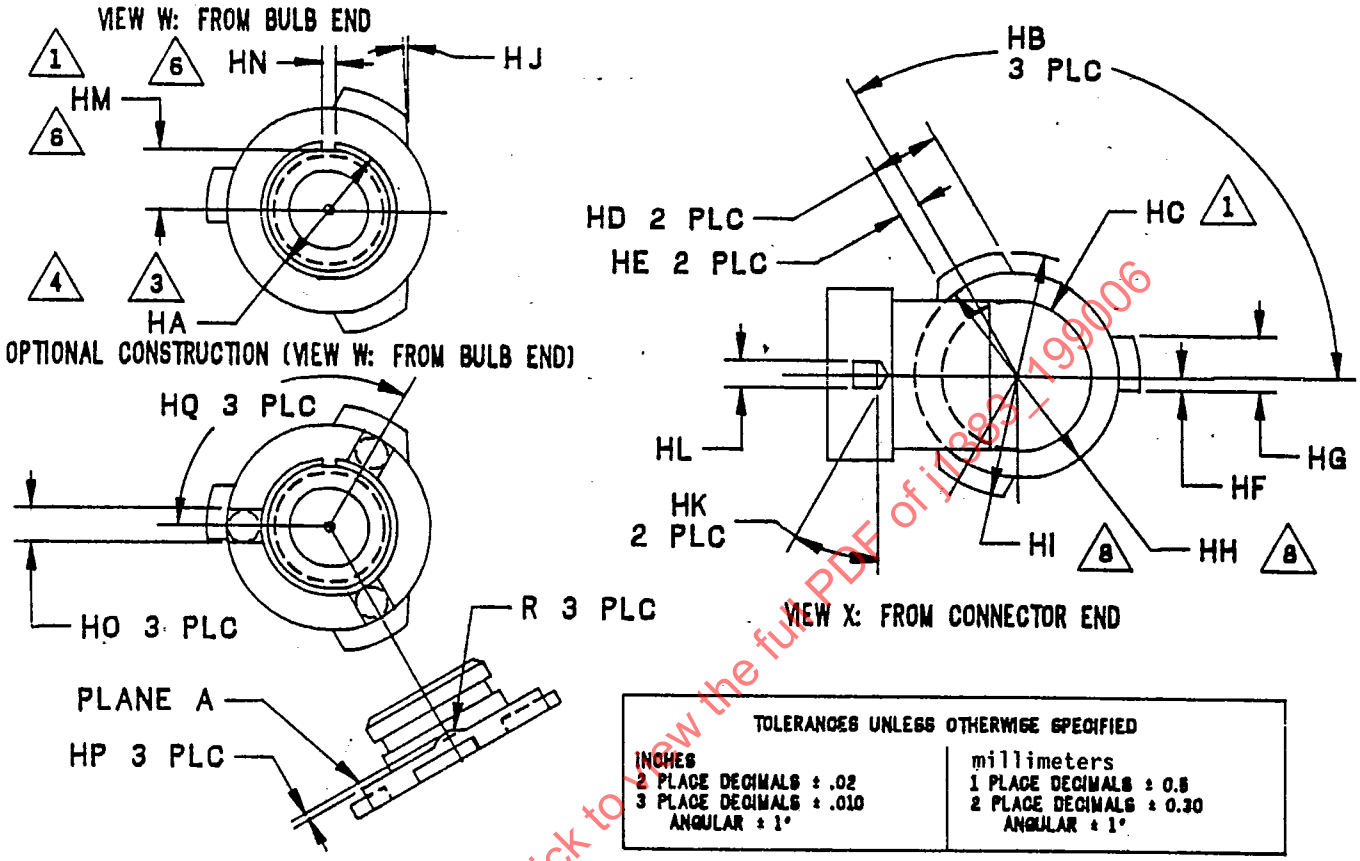


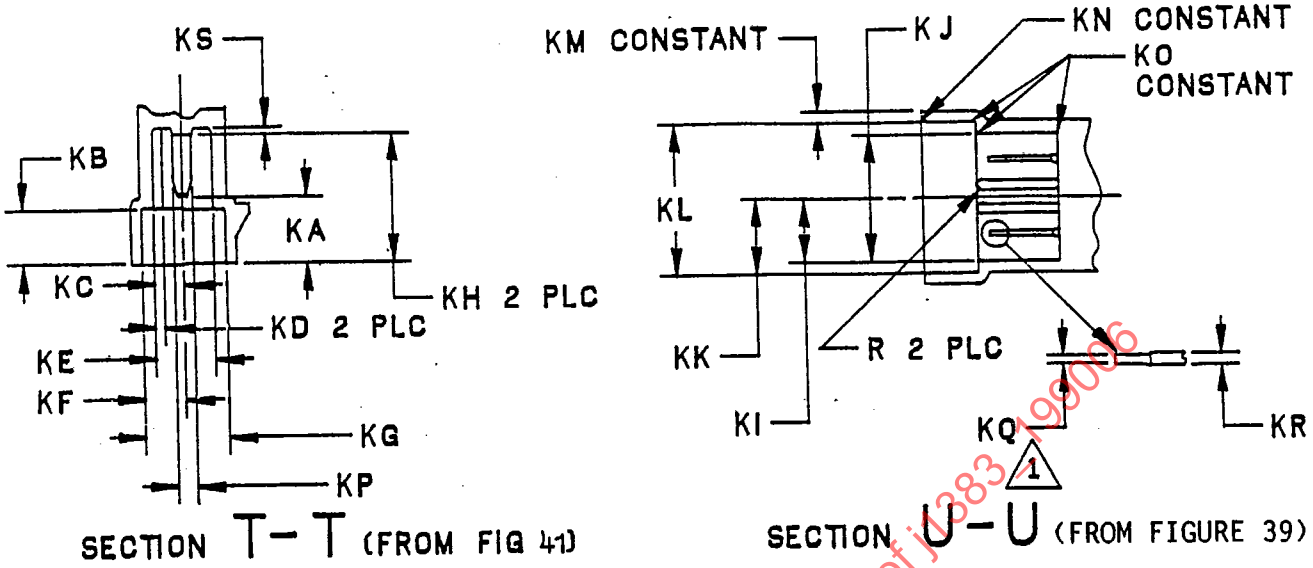
FIGURE 40—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES	millimeters
2 PLACE DECIMALS ± .02	1 PLACE DECIMALS ± 0.5
3 PLACE DECIMALS ± .010	2 PLACE DECIMALS ± 0.30
ANGULAR ± 1°	ANGULAR ± 1°

DIMENSIONS	INCHES	MILLIMETERS
HA	0.787±0.002 DIA	20.00±0.05 DIA
HB	120°±0°30	120°±0°30
HC	0.866 DIA	22.00 DIA
HD	0.394	10.00
HE	0.118	3.00
HF	0.079	2.00
HG	0.315	8.00
HH	1.181 DIA	30.00 DIA
HI	1.417 DIA	36.00 DIA
HJ	3°	3°
HK	30°	30°
HL	0.157	4.00
HM	0.35	8.9
HN	0.079±0.004	2.00±0.10
HO	0.20	5.0
HP	0.030	0.75
HQ	120° TYP	120° TYP

FIGURE 41—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



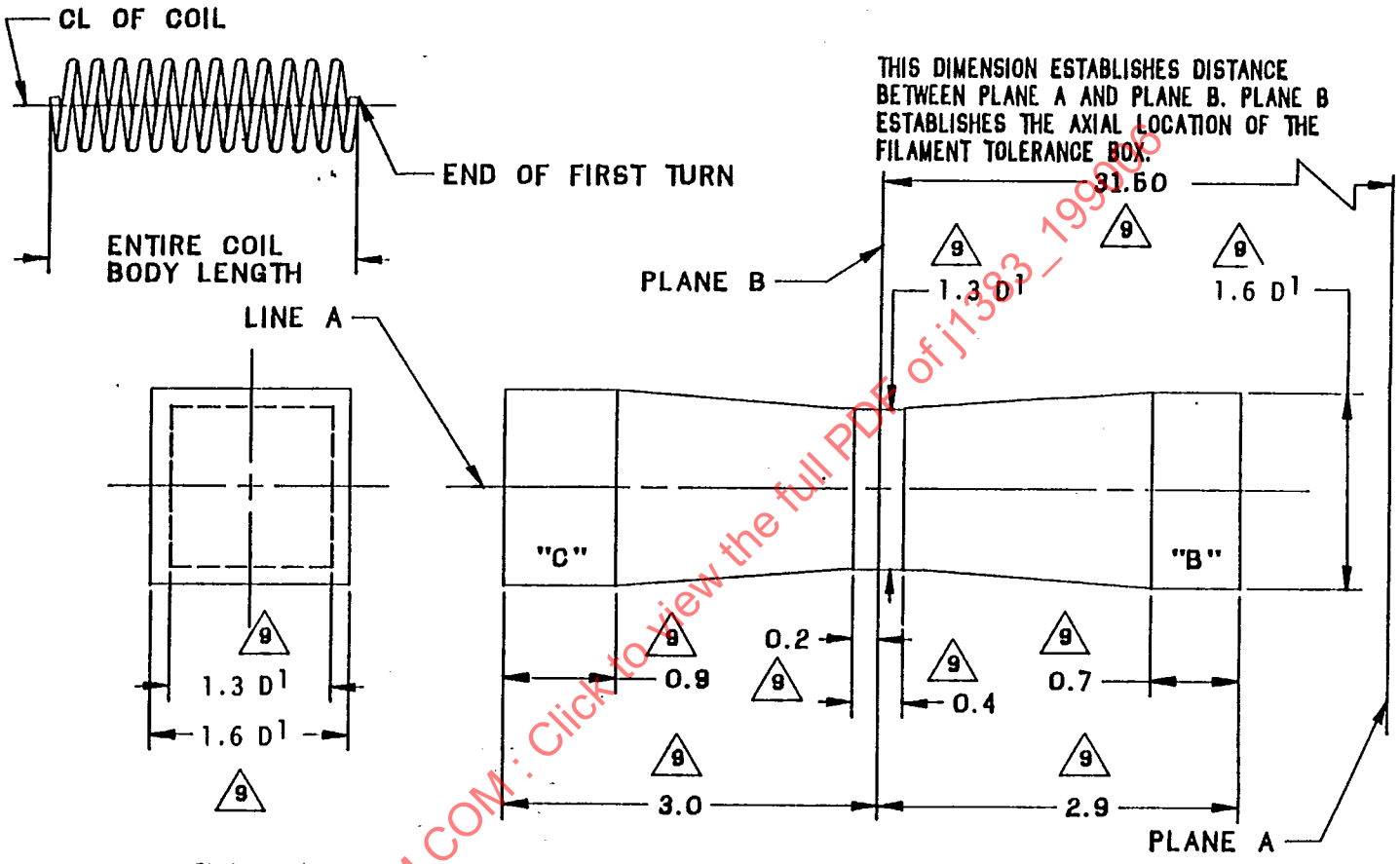
SECTION T-T (FROM FIG 41)

SECTION U-U (FROM FIGURE 39)

DIMENSIONS	INCHES	MILLIMETERS
KA	0.384	9.75
KB	0.315	8.00
KC	0.171	4.35
KD	0.055	1.40
KE	0.343	8.70
KF	0.242 ±0.006	6.15 ±0.15
KG	0.484	12.30
KH	0.748	19.00
KI	0.368 ±0.006	9.35 ±0.15
KJ	0.736	18.70
KK	0.439 ±0.006	11.15 ±0.15
KL	0.878	22.30
KM	0.059	1.50
KN	0.03 R	0.8 R
KO	0.016 R	0.40 R
KP	0.110 ±0.004	2.8 ±0.10
KQ	0.024	0.60
KR	0.033 ±0.001	0.83 ±0.03
KS	0.039 MIN	1.00 MIN

TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES 2 PLACE DECIMALS ± .02 3 PLACE DECIMALS ± .010 ANGULAR ± 1°	millimeters 1 PLACE DECIMALS ± 0.5 2 PLACE DECIMALS ± 0.30 ANGULAR ± 1°

FIGURE 42—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



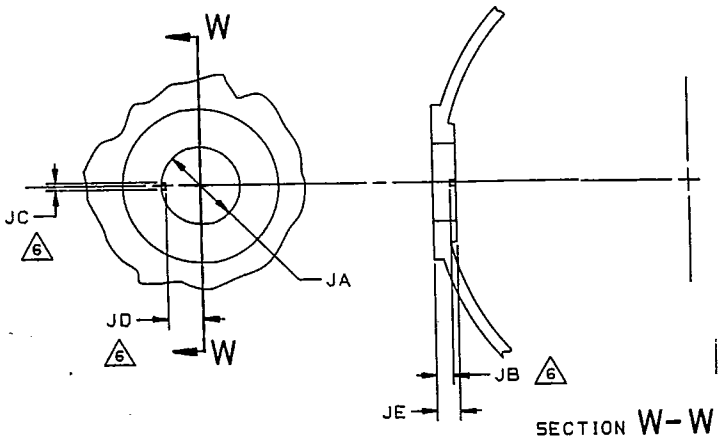
PLANE B IS PARALLEL TO PLANE A.

THE ENTIRE COIL BODY AT DESIGN VOLTS (12.8) MUST BE CONTAINED WITHIN THE VOLUME AS SPECIFIED. THE END OF THE FIRST TURN OF THE COIL MUST LIE WITHIN VOLUME "B" AND THE END OF THE LAST TURN OF THE COIL MUST LIE WITHIN VOLUME "C" LINE A IS PERPENDICULAR TO PLANE A AND CONCENTRIC WITH THE 17.46 MM DIAMETER OF THE BASE.

[1]D = DIAMETER OF FILAMENT COIL

DIMENSIONS SHOWN ARE IN MILLIMETERS

FIGURE 43—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



DIMENSIONS	INCHES	MILLIMETERS
JA	0.796±0.004 DIA	20.22±0.10 DIA
JB	$0.172^{+0.010}_{-0.000}$	$4.36^{+0.30}_{-0.00}$
JC	0.067±0.004	1.70±0.10
JD	$0.352^{+0.004}_{-0.000}$	$8.95^{+0.10}_{-0.00}$
JE	0.236 MIN	6.00 MIN

FIGURE 44—SPECIFICATION FOR THE 9005 REPLACEABLE BULB BULB HOLDER

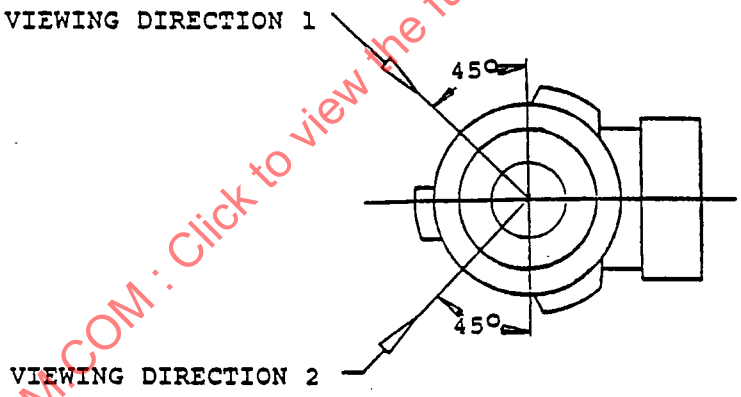
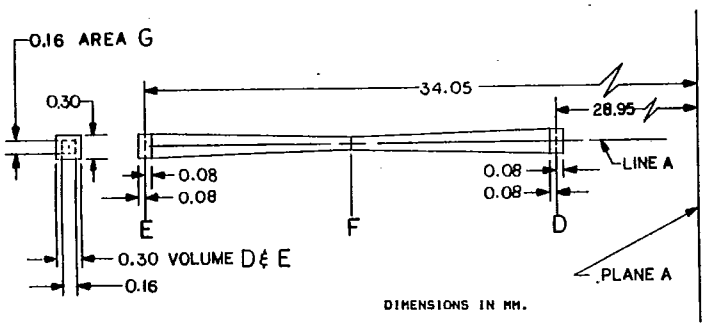


FIGURE 45—MODIFIED VIEW W FROM FIGURE 41, SIMILAR FOR 49



THE CENTROID OF THE FIRST TURN OF THE COIL MUST BE WITHIN VOLUME D AND THE CENTROID OF THE LAST TURN OF THE COIL MUST BE WITHIN VOLUME E. F IS AT THE MID-LENGTH OF THE COIL. THE CENTROID AT F MUST BE WITHIN AREA G.

FIGURE 46—SPECIFICATION FOR THE 9005 REPLACEABLE BULB ACCURATE RATED BULB

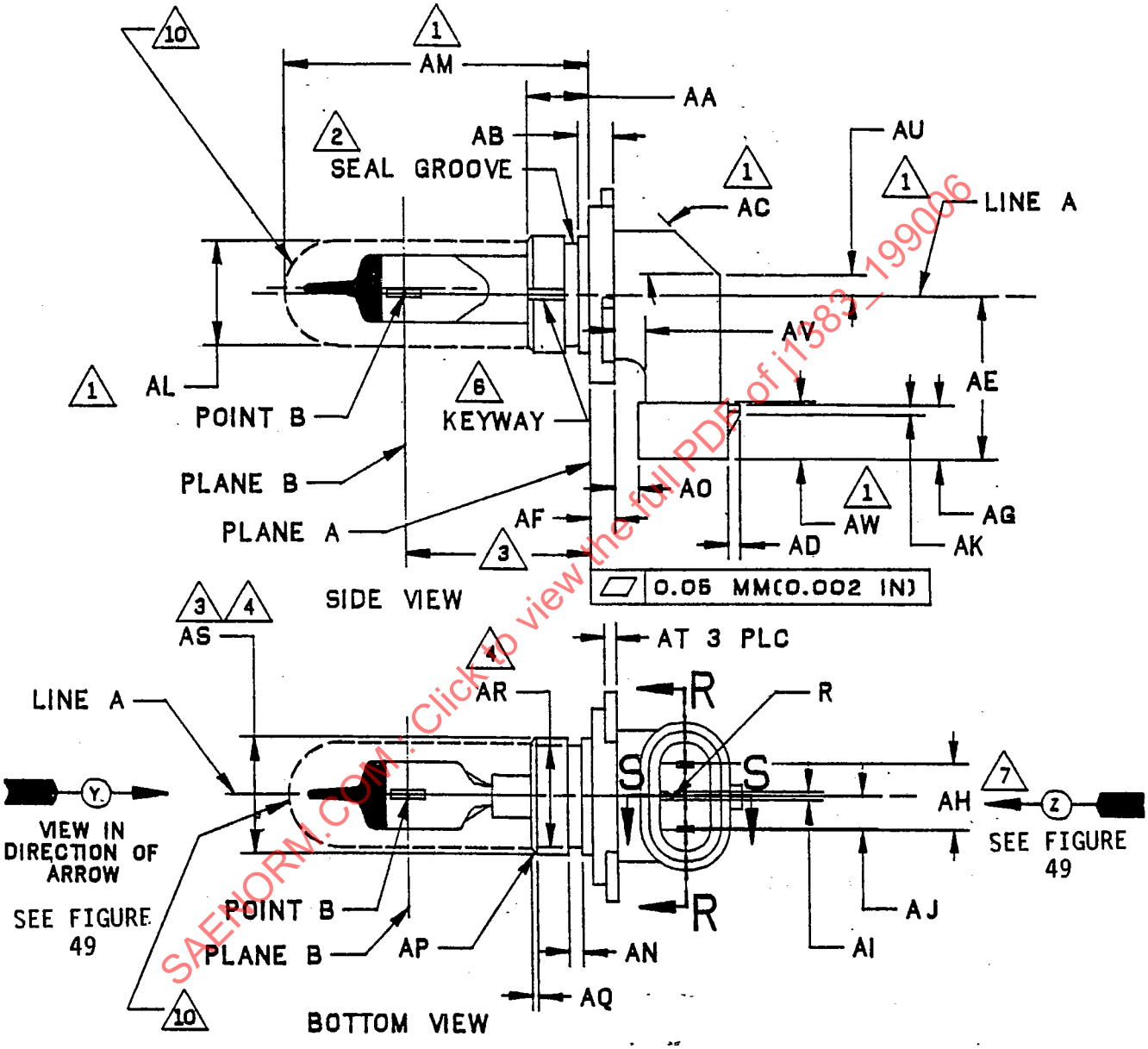


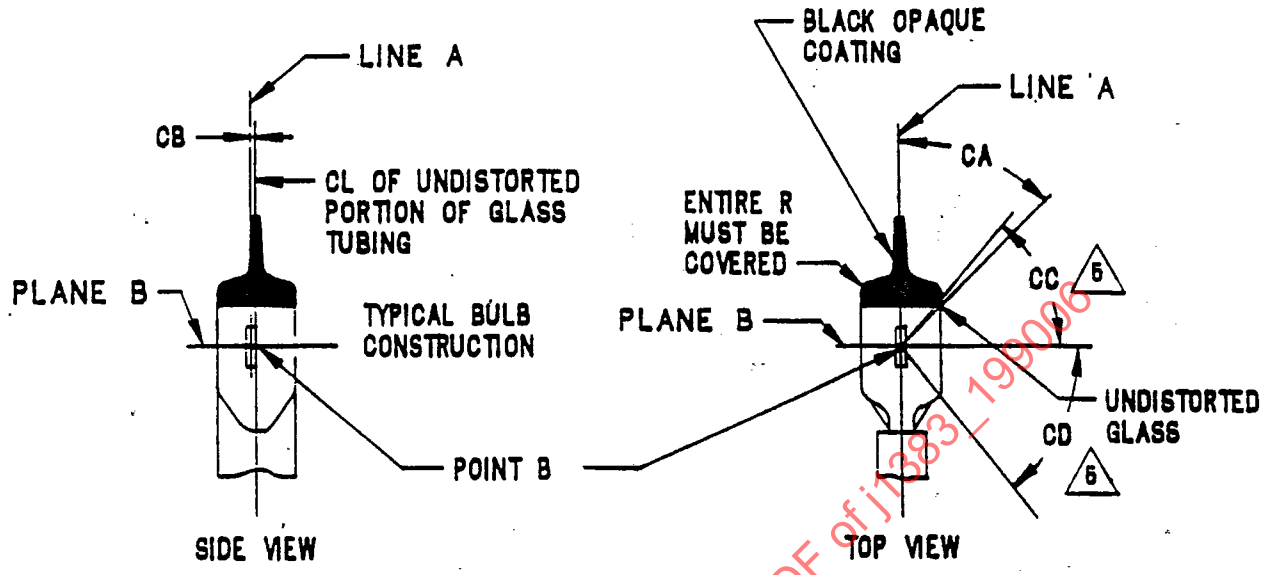
FIGURE 47—SPECIFICATION FOR THE 9006 REPLACEABLE BULB

DIMENSION	INCHES	MILLIMETERS
AA	0.591 MAX/0.217 MIN	15.00 MAX/5.50 MIN
AB	0.236	6.00
AC	45°	45°
AD	0.079	2.00
AE	1.09	27.8
AF	0.165	4.20
AG	0.346	8.80
AH	0.433	11.00
AI	0.055	1.40
AJ	0.217 ± 0.006	5.50 ± 0.15
AK	0.06	1.5
AL	0.780 DIA	19.81 DIA
AM	2.165	55.00
AN	0.093	2.36
AO	0.157	4.00
AP	45° CHAMFER	45° CHAMFER
AQ	0.039	1.00
AR	0.766 $^{+0.004}_{-0.000}$ DIA	19.46 $^{+0.10}_{-0.00}$ DIA
AS	0.866 ± 0.002 DIA	22.00 ± 0.05 DIA
AT	0.079	2.00
AU	0.138	3.5
AV	0.209 MIN	5.30 MIN
AW	0.378	9.60

1. DIMENSIONS SHOWN ARE MAXIMUM-MAY BE SMALLER.
2. BULBS MUST BE EQUIPPED WITH A SEAL. THE BULB-SEAL ASSEMBLY MUST WITHSTAND A MINIMUM OF 70kPA. (10 P.S.I.G.) WHEN THE ASSEMBLY IS INSERTED INTO A CYLINDRICAL APERTURE OF 22.22±0.10 MM (0.875±0.004 IN).
3. SEE FIGURE 51
4. DIAMETERS MUST BE CONCENTRIC WITHIN 0.20 MM (0.008 IN).
5. GLASS BULB PERIPHERY MUST BE OPTICALLY DISTORTION FREE AXIALLY WITHIN THE INCLUDED ANGLES ABOUT POINT B.
6. KEY AND KEYWAY ARE OPTIONAL CONSTRUCTION. KEYWAY REQUIRED FOR AFTERMARKET ONLY.
7. MEASURED AT TERMINAL BASE. TERMINALS MUST BE PERPENDICULAR TO BASE AND PARALLEL WITHIN ±1.5°
8. DIAMETERS MUST BE CONCENTRIC WITHIN 0.20 MM (0.008 IN).
9. ABSOLUTE DIMENSION. NO TOLERANCE.
10. GLASS CAPSULE AND SUPPORTS SHALL NOT EXCEED THIS ENVELOPE.

TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES	millimeters
2 PLACE DECIMALS ± .02	1 PLACE DECIMALS ± 0.5
3 PLACE DECIMALS ± .010	2 PLACE DECIMALS ± 0.30
ANGULAR ± 1°	ANGULAR ± 1°

FIGURE 47 (CONTINUED)



POINT B IS INTERSECTION OF PLANE B AND CENTERLINE OF UNDISTORTED GLASS TUBING

DIMENSION	INCHES	MILLIMETERS
CA	45°±5°	45°±5°
CB	0.030±0.020	0.75±0.50
CC	50° MIN	50° MIN
CD	52° MIN	52° MIN

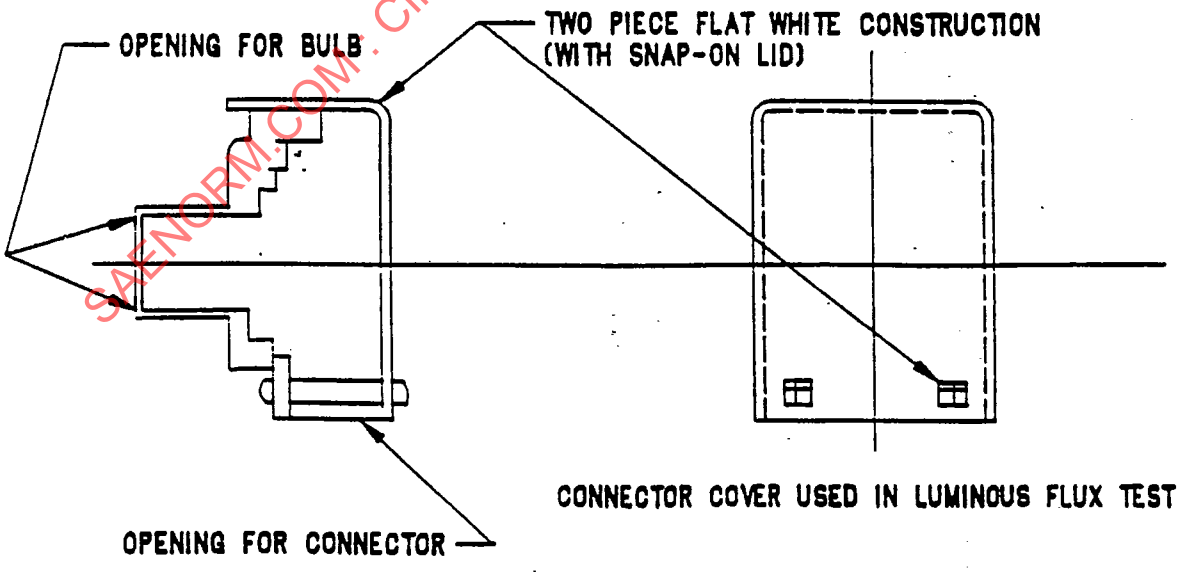
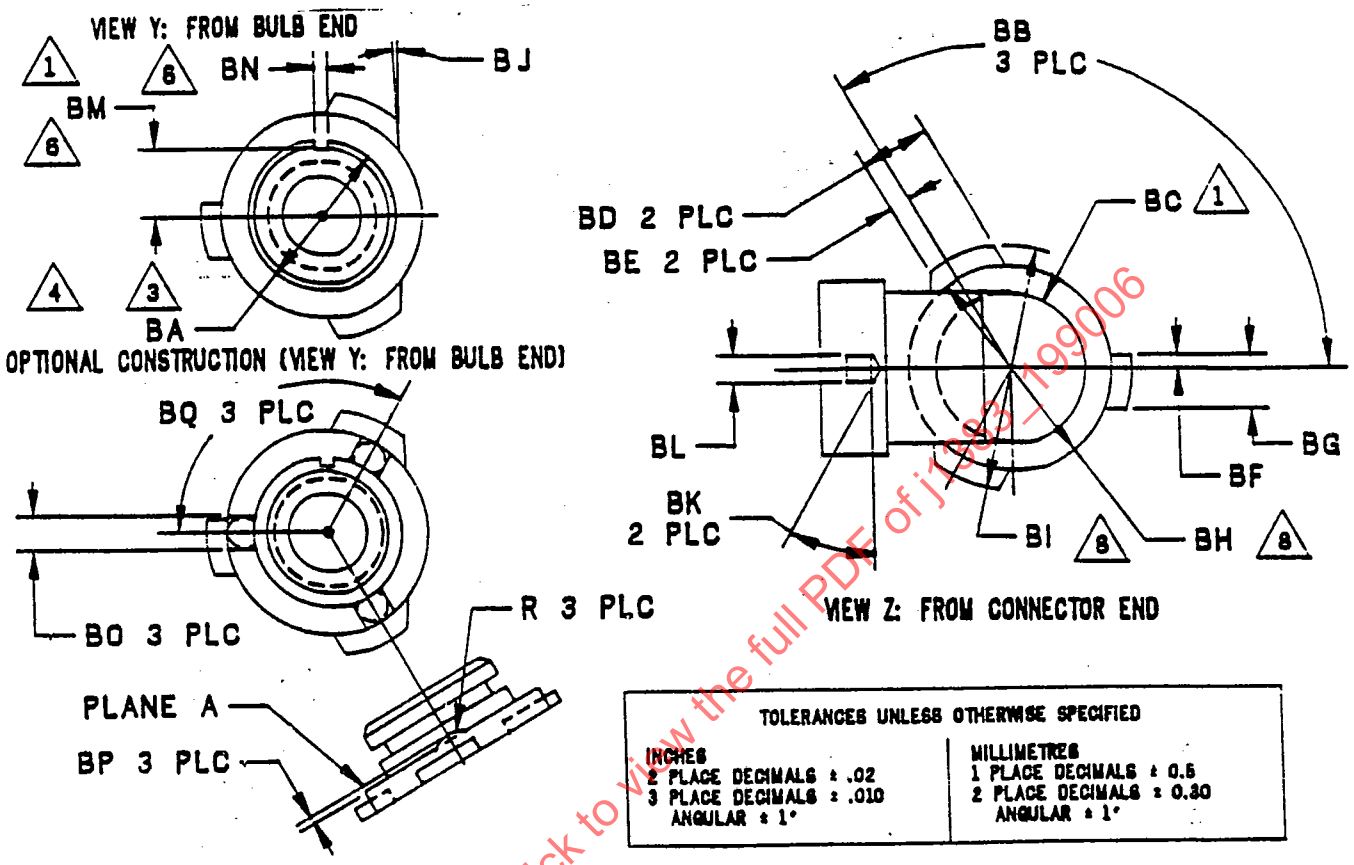


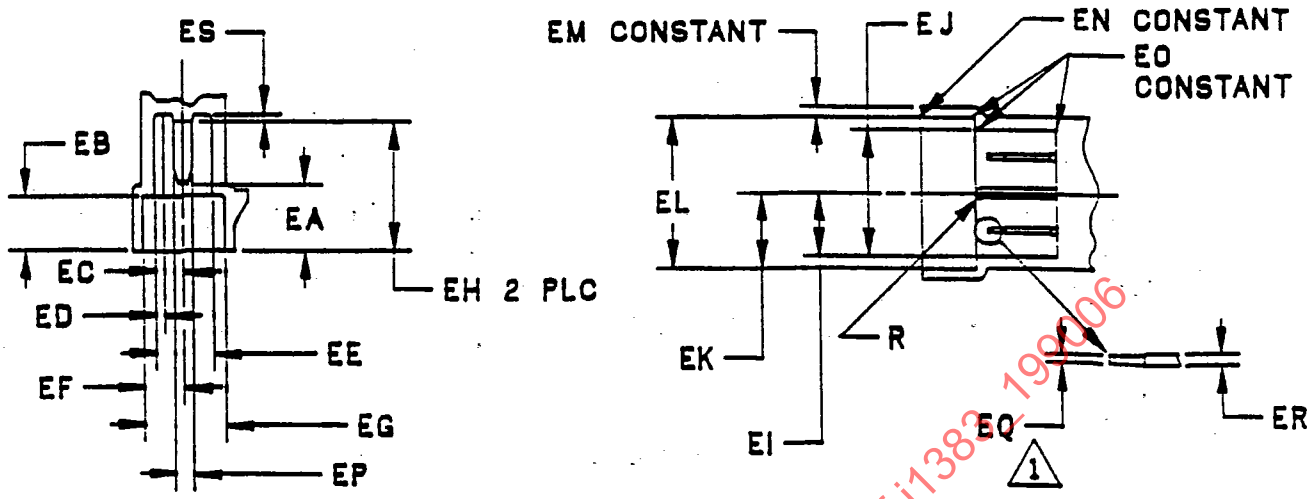
FIGURE 48—SPECIFICATION FOR THE 9006 REPLACEABLE BULB



TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES 2 PLACE DECIMALS ± .02 3 PLACE DECIMALS ± .010 ANGULAR ± 1°	MILLIMETRES 1 PLACE DECIMALS ± 0.5 2 PLACE DECIMALS ± 0.30 ANGULAR ± 1°

DIMENSIONS	INCHES	MILLIMETERS
BA	0.866±0.002 DIA	22.00±0.05 DIA
BB	120°±0°30	120°±0°30
BC	0.866 DIA	22.00 DIA
BD	0.394	10.00
BE	0.118	3.00
BF	0.079	2.00
BG	0.315	8.00
BH	1.181 DIA	30.00 DIA
BI	1.417 DIA	36.00 DIA
BJ	3°	3°
BK	30°	30°
BL	0.157	4.00
BM	0.39	9.9
BN	0.079±0.004	2.00±0.10
BO	0.20	5.0
BP	0.030	0.75
BQ	120° TYP	120° TYP

FIGURE 49—SPECIFICATION FOR THE 9006 REPLACEABLE BULB



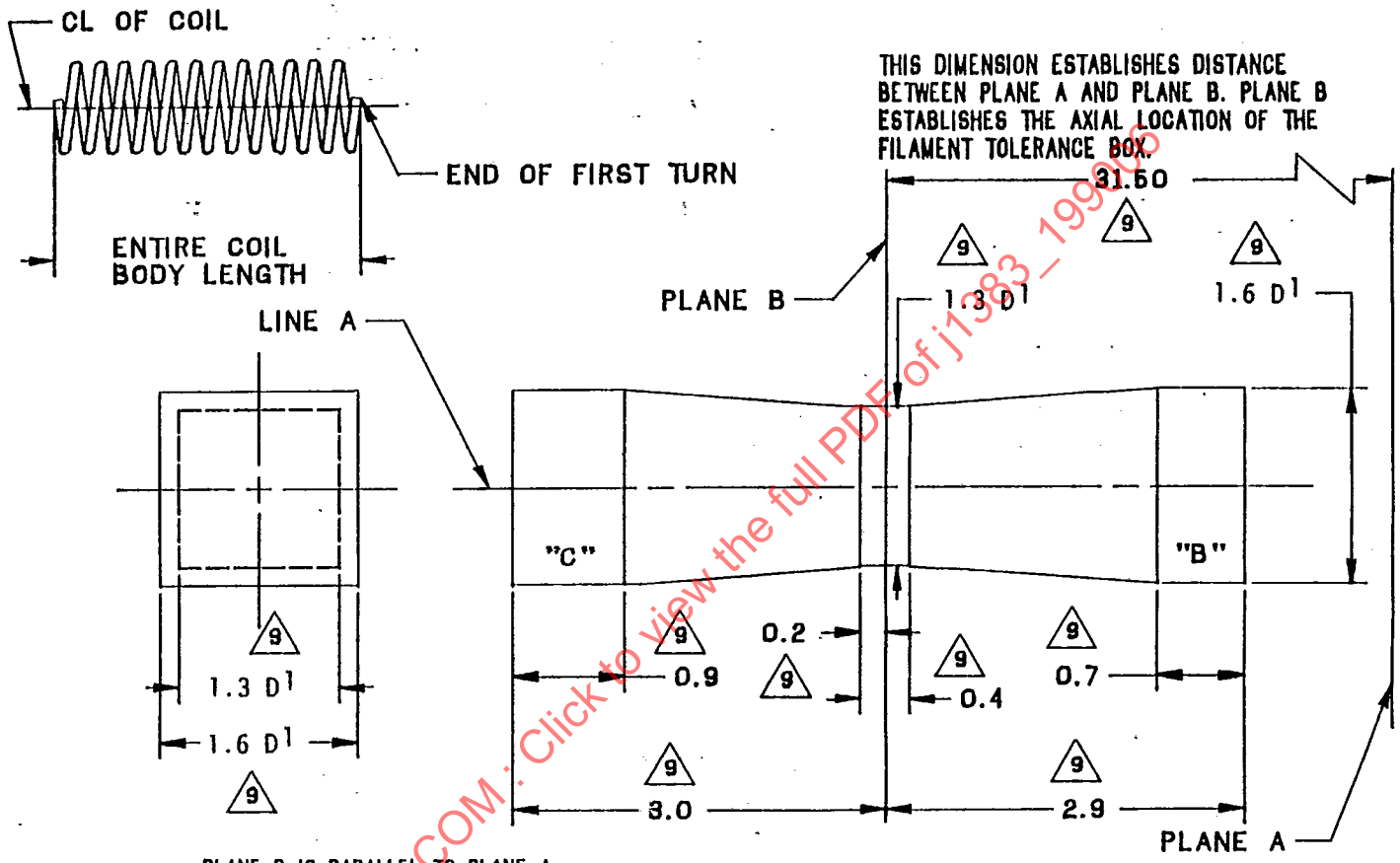
SECTION S-S (FROM FIGURE 47)

SECTION R-R (FROM FIGURE 47)

DIMENSIONS	INCHES	MILLIMETERS
EA	0.384	9.75
EB	0.315	8.00
EC	0.171	4.35
ED	0.079	2.00
EE	0.343	8.70
EF	0.242 ±0.006	6.15 ±0.15
EG	0.484	12.30
EH	0.748	19.00
EI	0.368 ±0.006	9.35 ±0.15
EJ	0.736	18.70
EK	0.439 ±0.006	11.15 ±0.15
EL	0.878	22.30
EM	0.059	1.50
EN	0.03 R	0.8 R
EO	0.016 R	0.40 R
EP	0.110 ±0.004	2.8 ±0.10
EQ	0.024	0.60
ER	0.033 ±0.001	0.83 ±0.03
ES	0.039 MIN	1.00 MIN

TOLERANCES UNLESS OTHERWISE SPECIFIED	
INCHES 2 PLACE DECIMALS ± .02 3 PLACE DECIMALS ± .010 ANGULAR ± 1°	millimeters 1 PLACE DECIMALS ± 0.5 2 PLACE DECIMALS ± 0.30 ANGULAR ± 1°

FIGURE 50—SPECIFICATION FOR THE 9006 REPLACEABLE BULB



PLANE B IS PARALLEL TO PLANE A.

THE ENTIRE COIL BODY AT DESIGN VOLTS (12.8) MUST BE CONTAINED WITHIN THE VOLUME AS SPECIFIED. THE END OF THE FIRST TURN OF THE COIL MUST LIE WITHIN VOLUME "B" AND THE END OF THE LAST TURN OF THE COIL MUST LIE WITHIN VOLUME "C". LINE A IS PERPENDICULAR TO PLANE A AND CONCENTRIC WITH THE 19.46 MM DIAMETER OF THE BASE.

[1]D = DIAMETER OF FILAMENT COIL

DIMENSIONS SHOWN ARE IN MILLIMETERS

FIGURE 51—SPECIFICATION FOR THE 9006 REPLACEABLE BULB

12. Low Beam Filament Location

12.1 Production Bulbs

12.1.1 AXIAL—Same as 11.1.1 except Figure 51.

12.1.2 VERTICAL—Same as 12.1.1.

12.1.3 TRANSVERSE—Same as 12.1.1.

12.2 Accurate Rated Bulbs

12.2.1 AXIAL—Same as 11.2.1 except Figure 53.

12.2.2 VERTICAL

12.2.2.1 *End Coils*—Same as 11.2.2.1 except Figure 53.

12.2.2.2 *Center Section*—Same as 11.2.2.2 except Figure 53.

12.2.3 TRANSVERSE

12.2.3.1 *End Coils*—Same as 12.2.2.1.

12.2.3.2 *Center Section*—Same as 12.2.2.2.

13. Viewing Direction for HB3 (9005) and HB4 (9006) Bulbs—The recommended perpendicular viewing directions are listed below. Because bulb construction and bulb manufacturing procedures can differ, the actual perpendicular viewing directions used may vary between manufacturers. Manufacturers may choose their perpendicular viewing directions. The perpendicular viewing directions specified by the manufacturers are to be used by a laboratory or testing agency when checking for filament tolerances. The filament tolerance boxes included if Figures 43, 46, 51, and 53 are to be rotated to the perpendicular viewing directions specified by the manufacturer.

14. Bulb Filament Dimension and Location Test for the 9007 Replaceable Bulb—Filament locations relative to the bulb base (with O-ring removed) shall be determined for both production and accurate rated bulb, as outlined below. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

14.1 Low Beam Filament Location Test—The location shall be determined by measuring (refer to Figure 54):

a. Axially—in the side view
b. Vertically—in the side view
c. Transversely—in the plan view

14.2 High Beam Filament Location Test—The location shall be determined by measuring (refer to Figure 54):

a. Axially—in the side view
b. Vertically—in the side view
c. Transversely—in the plan view

15. Low Beam Filament Location—Production bulbs (refer to Figure 59).

15.1 Axial—After locating the midpoint of the low beam filament to meet "G", the end coil of the filament nearest to the reference plane shall be within the volume bounded by the dimension "C", and the end coil farthest from the reference plane shall be within the volume bounded by the dimension "B".

15.2 Vertical—The vertical location shall be measured in the side view from a horizontal plane through the base centerline to the centerline of the smallest rectangle which encloses the low beam filament and is parallel to that horizontal plane. This location shall meet dimension "A". The width of this rectangle shall not exceed 1.6X the diameter of the low beam coil.

15.3 Transverse—The transverse location shall be measured in the plan view from a vertical plane through the center of the base to the centerline of the smallest rectangle which encloses the low beam filament and is parallel to that plane. This location shall meet the dimension "L". The width of this rectangle shall not exceed 1.6X the diameter of the low beam coil.

16. High Beam Filament Location—Production bulbs (refer to Figure 59).

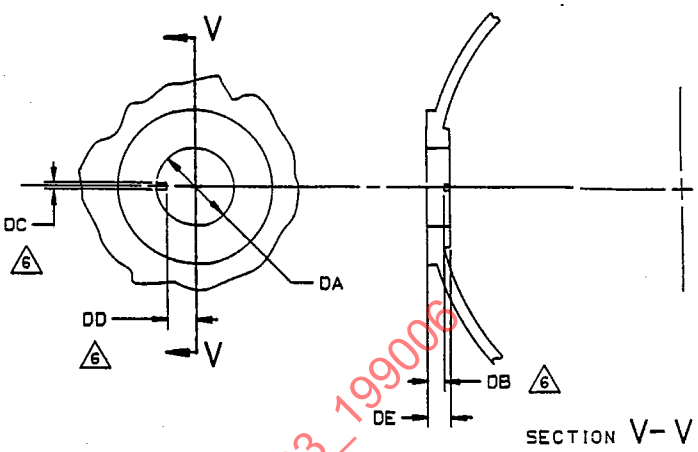
16.1 Axial—The filament location shall be measured from the midpoint of the low beam filament to the midpoint of the smallest rectangle which encloses the high beam filament image.

16.2 Vertical—The location shall be measured from the centerline of the low beam filament to the centerline of the smallest rectangle which encloses the high beam filament image and is parallel to the horizontal plane referenced in 15.2. This location shall not exceed dimension "J" and the width of the rectangle shall not exceed 1.6X the diameter of the high beam filament coil.

16.3 Transverse—The location shall be measured from the centerline of the low beam filament to the centerline of the smallest rectangle which encloses the high beam filament image and is parallel to that plane referenced in 15.3. This location shall not exceed dimension "H" and the width of the rectangle shall not exceed 1.6X the diameter of the high beam filament coil.

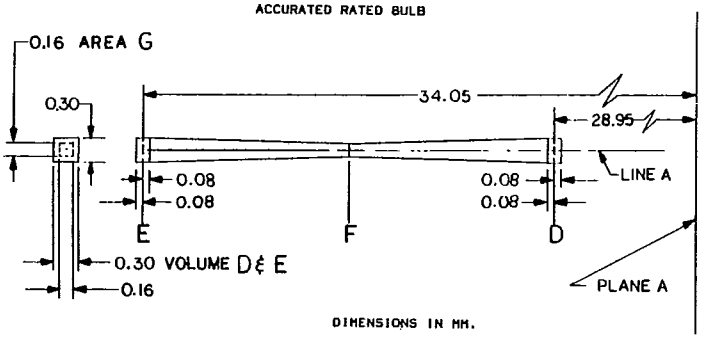
17. Methods of Measuring Internal Elements of H4/HB2 Bulbs

17.1 These paragraphs specify the methods of measuring internal elements of H4 and HB2 bulbs.



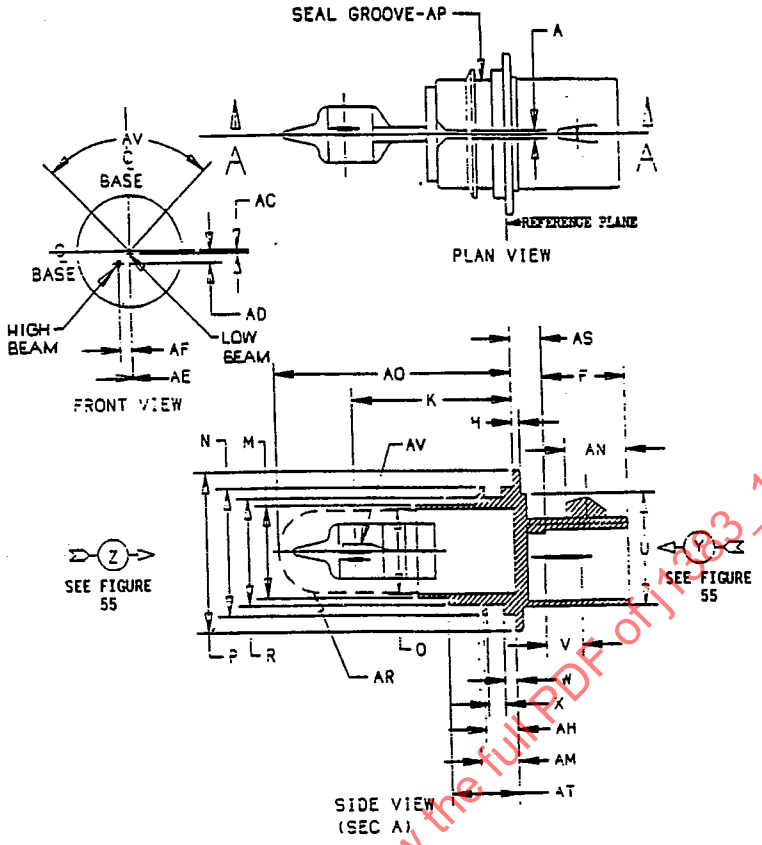
DIMENSIONS	INCHES	MILLIMETERS
DA	0.875±0.004 DIA	22.22±0.10 DIA
DB	0.172 +0.010 -0.000	4.36 +0.30 -0.00
DC	0.067±0.004	1.70±0.10
DD	0.392 +0.004 -0.000	9.95 +0.10 -0.00
DE	0.236 MIN	6.00 MIN

FIGURE 52—SPECIFICATION FOR THE 9006 REPLACEABLE BULB BULB HOLDER



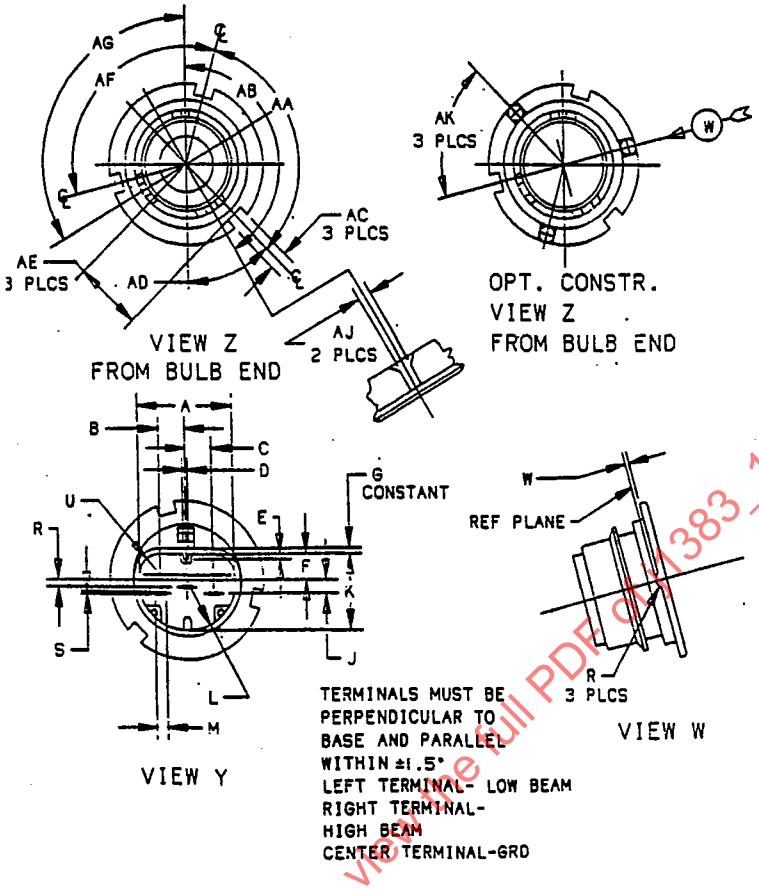
THE CENTROID OF THE FIRST TURN OF THE COIL MUST BE WITHIN VOLUME D AND THE CENTROID OF THE LAST TURN OF THE COIL MUST BE WITHIN VOLUME E. F IS AT THE MID-LENGTH OF THE COIL. THE CENTROID AT F MUST BE WITHIN AREA G.

FIGURE 53—SPECIFICATION FOR THE 9006 REPLACEABLE BULB ACCURATE RATED BULB



Dimension	Millimeters
A	(2.15/2.10) .05 Either Side CL
F	23.00 ± .20
H	2.00 ± .20
K Low Beam	44.50 ± .25
High Beam	CL High Beam to be within ± .64 of CL of low beam
M	24.85 Max.
N	(33.90/33.80) .05 Either Side CL
O	24.5 Max.
P	42.50 ± .20
R	(28.60/28.50).05 Either Side CL
U	30.00 ± .20
V	10.50 ± .50
W	3.25 ± .20
X	4.80 ± .20
AC	0.38 ± .38
AD	1.60 ± .64
AE	.000 ± .38
AF	1.60 ± .81
AH	9.05 ± .20
AM	10.54 ± .20
AN	17.10 ± .20
AO	70.0 Max.
AP	Seal must withstand a minimum of 70 kPa (10 PSIG) when bulb-seal assembly is inserted into a cylindrical aperture of 34.3/34.2 mm (1.350/1.346 in).
AR	Glass capsule and supports shall not exceed this envelope.
AS	8.5 ± 2.0
AT	16.00 Min.
AV	Support wires extending forward of the filaments shall be within ± 45° of vertical.

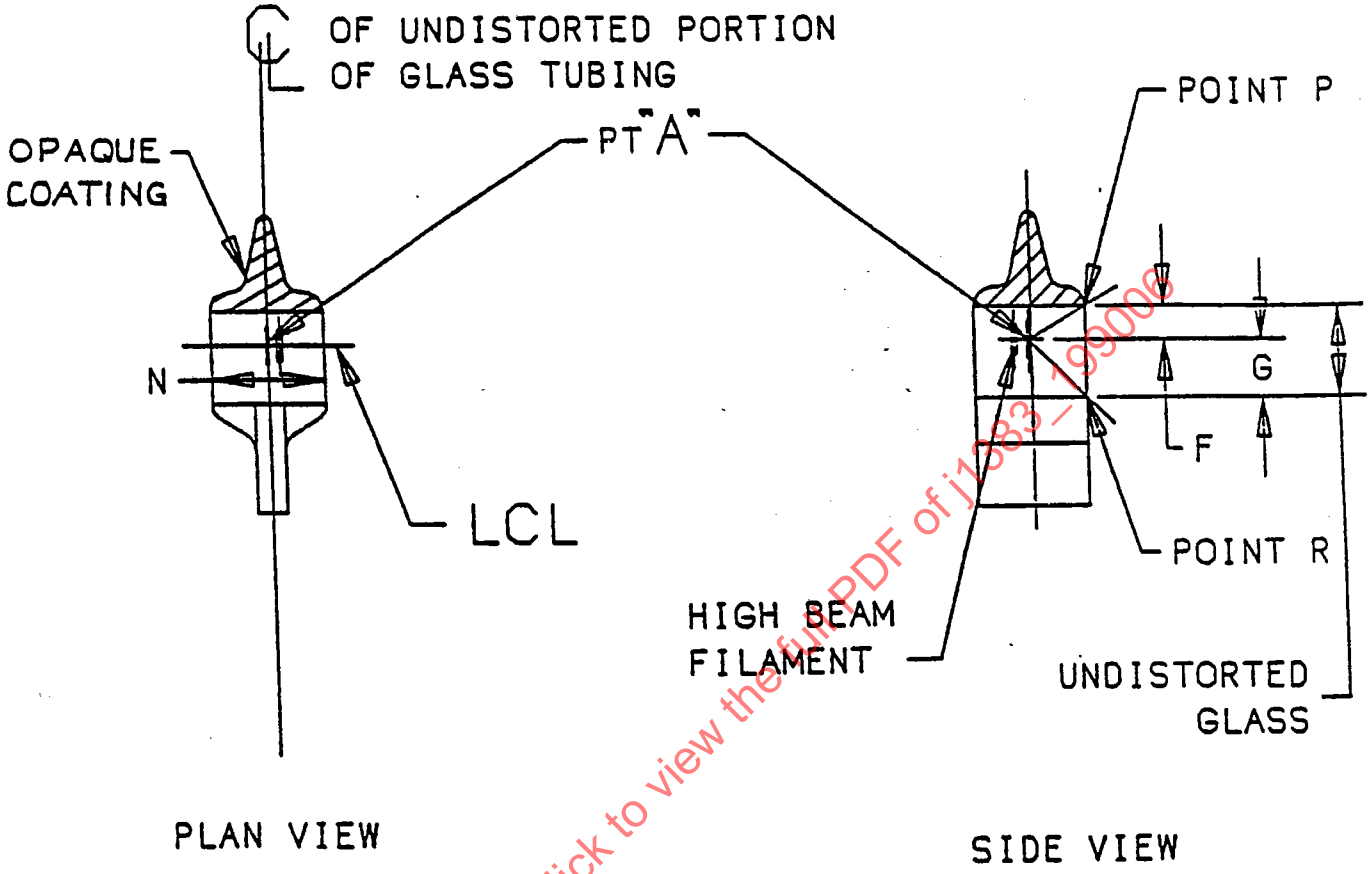
FIGURE 54—SPECIFICATION FOR THE 9007 REPLACEABLE BULB



Dimension	Millimeters
AA	120°
AB	150°
AC	4.9 Min.
AD	44° 30'
AE	18.35 ± 0.20
AF	120°
AG	120°
AJ	3.6 ± .20
AK	60°
A	26.10 ± .20
B	7.35 ± .25
C	7.35 ± .25
D	1.30 ± .20
E	1.40 ± .20
F	7.05 ± .15
G	1.50 ± .20
J	3.60 ± .25
K	20.60 ± .20
L	13.60 ± .20R
M	3.00 ± .10
R	1.90 ± .25
S	.63 ± .05
U	5.65 ± .20R
W	.25 ± .15

TOLERANCE FOR ALL ANGULAR DIMENSIONS ± 1°

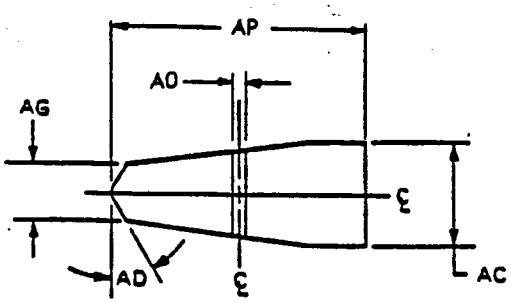
FIGURE 55—SPECIFICATION FOR THE 9007 REPLACEABLE BULB



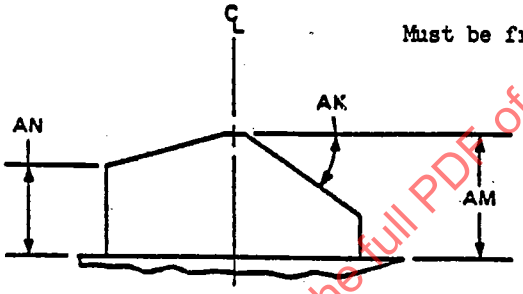
Dimensional Specifications
Figure 56

Dimension	
F	(N/2)tan 38° ± 1.0mm
G	(N/2)tan 43° MIN
N	Actual Capsule Dia. (To Be Established By Manufacturer)
P	Entire Radius and Distorted Glass Shall Be Covered to the Plane Passing Through Point "P", Perpendicular to the Glass Capsule Centerline.

FIGURE 56—SPECIFICATION FOR THE 9007 REPLACEABLE BULB



EXPLODED PLAN VIEW



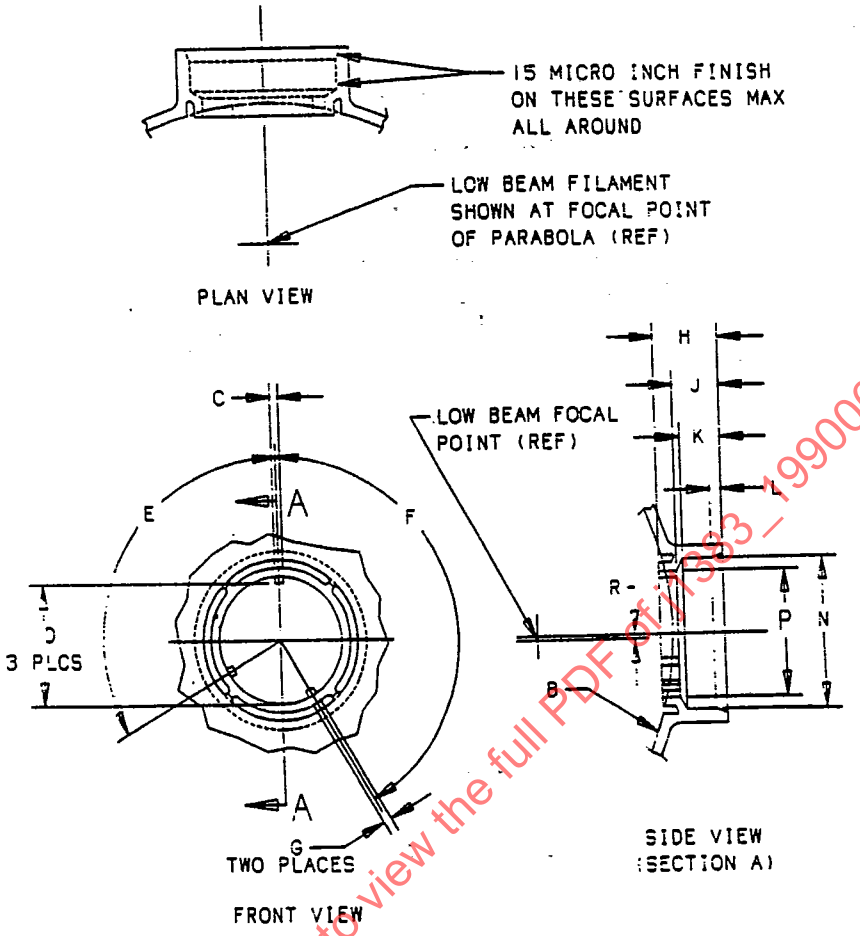
Must be free of flash.

EXPLODED SIDE VIEW

Dimension	Millimeters
AC	4.55 ± .20
AD	30° ± 3°
AG	2.50 ± .20
AK	35° ± 3°
AM	5.50 ± .20
AN	4.00 ± .20
AO	.5 ± .20
AP	11.4 ± .20

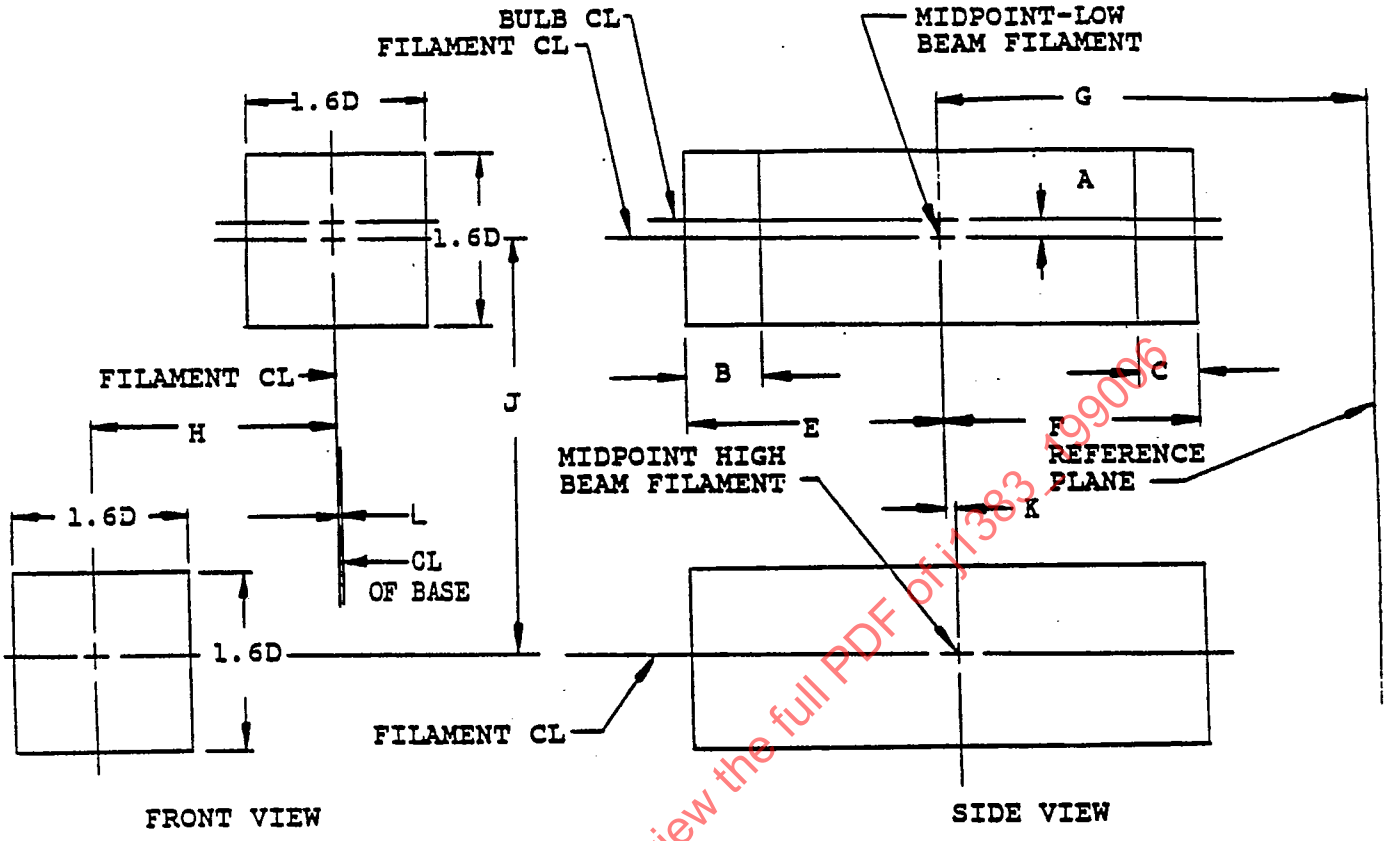
FIGURE 57—SPECIFICATION FOR THE 9007 REPLACEABLE BULB LOCKING FEATURE

21.134



Dimension	Millimeters
B	Ref Line Lamp Parabola
C	2.00 ± .05
D	.05 Either Side of CL
E	27.10 ± .20
F	120°
G	150°
H	2.00 ± .20
J	15.15 ± .20
K	11.10 ± .20
L	9.50 ± .20
N	2.75 ± .20
P	34.24 +.08/-.05
	28.70 +.10/-.05
	Diameter P shall be concentric to diameter N within ± .05
R	0.38 ± 0.10
	TOLERANCE FOR ALL ANGULAR DIMENSIONS ± 1°

FIGURE 58—SPECIFICATION FOR THE 9007 REPLACEABLE BULB
BULB HOLDER

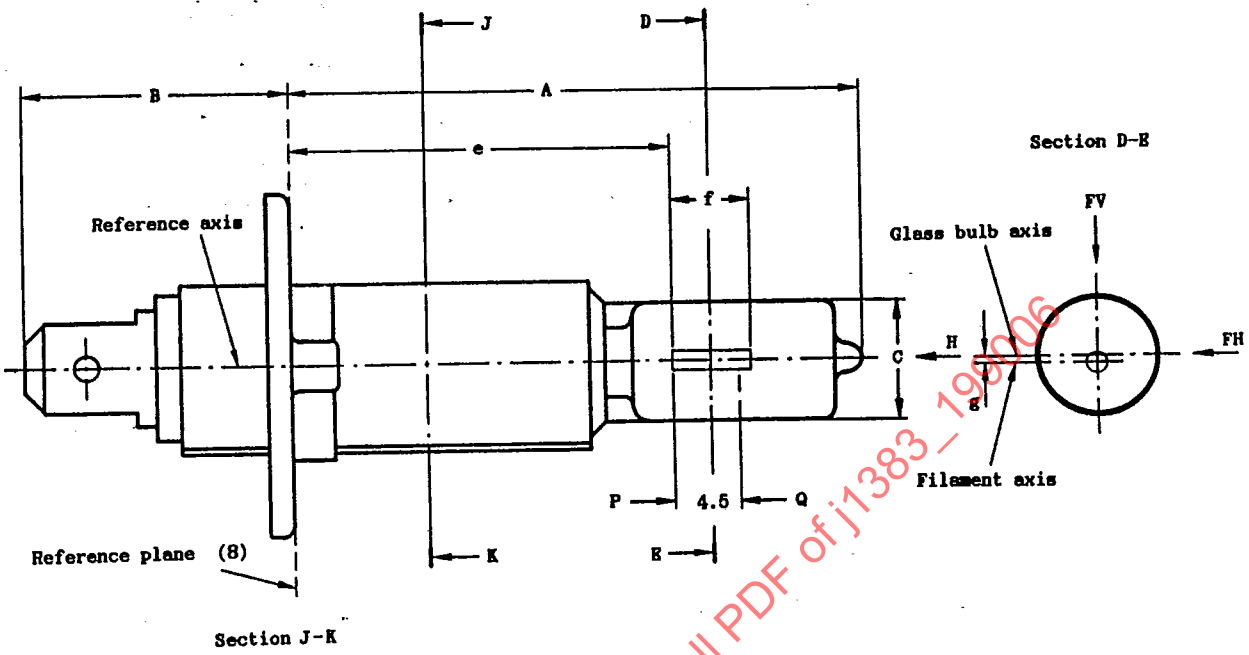


LETTER	STANDARD DIMENSION	ACCURATE RATED BULB
A	0.38 ± 0.38 mm	0.38 ± 0.20 mm
B	0.9 Basic	---
C	0.7 Basic	---
D	Actual Filament Diameter	---
E	3.0 Basic	---
F	2.9 Basic	---
G	44.50 ± 0.25	44.50 ± 0.15
H	1.60 ± 0.81	1.60 ± 0.25
J	1.60 ± 0.64	1.60 ± 0.25
K	000 ± 0.64	000 ± 0.40
L	000 ± 0.38	000 ± 0.25

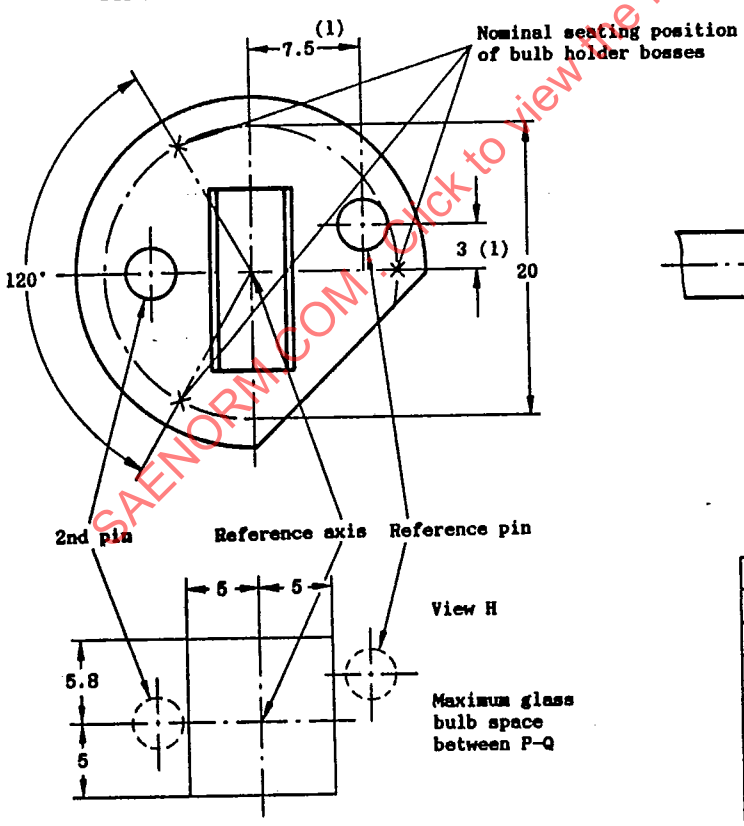
FIGURE 59—DIMENSIONAL SPECIFICATIONS FOR THE 9006 REPLACEABLE BULB FILAMENT DIMENSION AND LOCATION—MEASUREMENT METHOD

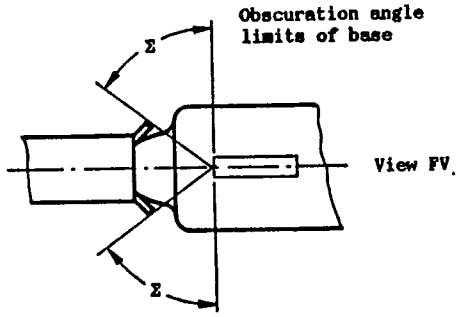
21.136

The drawing is not mandatory, their sole purpose is to show which dimensions must be verified.



Definition of reference axis





Dimensions in millimeters

Reference	Dimension	Tolerance
A	44 max.	-
B	18.5 max.	-
C	8.5 max.	-
e (6)	25	-
f (2)(3)(6)	5.0	± 0.5
g (4)(5)	0.5d	± 0.5d
Σ	45°	± 12°

FIGURE 60—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB

The drawing is intended only to indicate the dimensions essential for interchangeability.

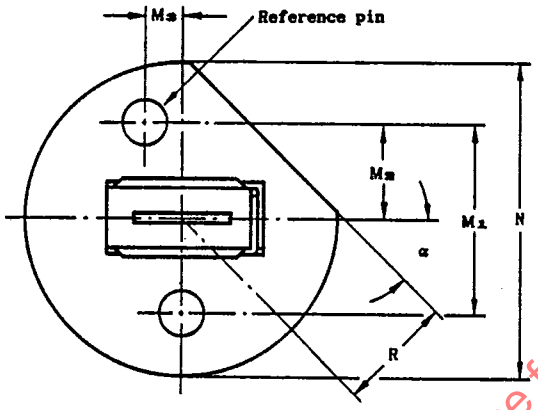
(1) The reference plane is defined by the points on the surface of the ring on which, taking into account all adverse tolerances on pages Figure 8-1 and 8-2, the bosses "e" of the bulb holder will rest. These points shall all lie on the flat surface of the ring.

(2) These dimensions are applicable above a plane situated 0.7 mm above the reference plane.

(3) These dimensions are applicable over a length of 4 mm from the insulator part.

Dimensions in millimeters

Dimension	Min.	Max.
A1 (2)	5.2	5.8
A2 (3)	-	12.0
B1 (3)	3.75	4.25
B2 (2)	-	6.0
C	6.2	6.4
D	1.7	2.0
E	7.8	8.1
F	3.3	3.5
G	9.0	-
H	0.5	1.0
J	-	3.0
L	5.0	-
M1	14.3	14.5
M2	7.4	7.6
M3	2.9	3.1
N	23.0	25.0
Q	0.77	0.84
R	8.5	9.5
S (2)	3.4	3.5
T	2.8	3.2
V	Nom. 1.6	
Y	-	18.5
r1	-	0.6
r2	-	0.5 S
α	40°	50°
β	Nom. 45°	
γ	Nom. 11°	



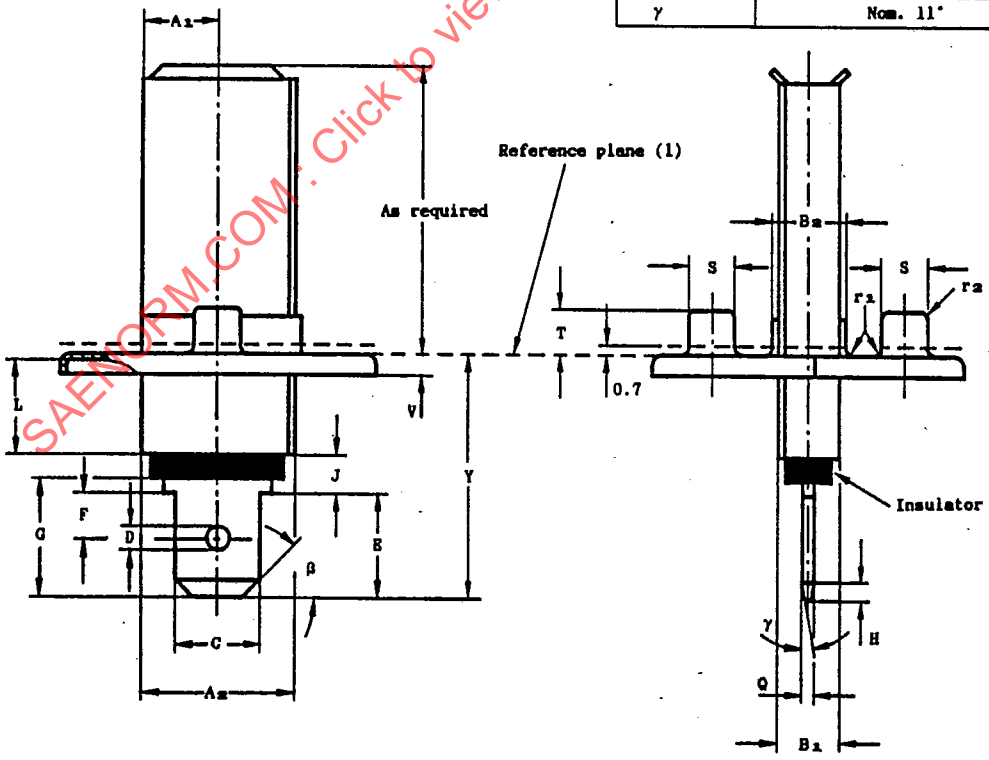
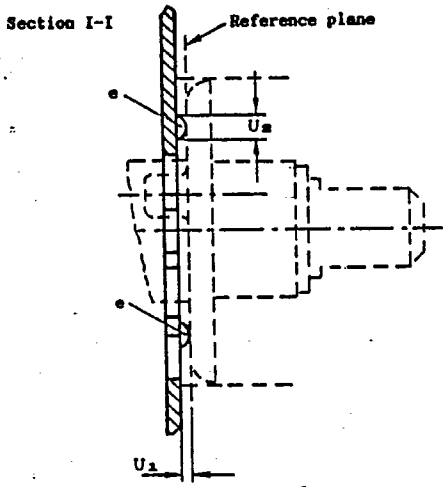
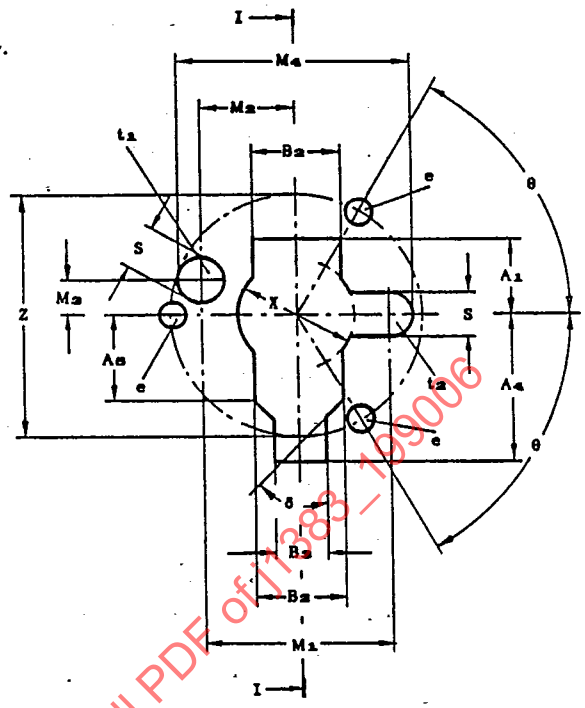


FIGURE 61—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB BASE P14.5s

The drawings are intended only to indicate the dimensions essential for interchangeability.

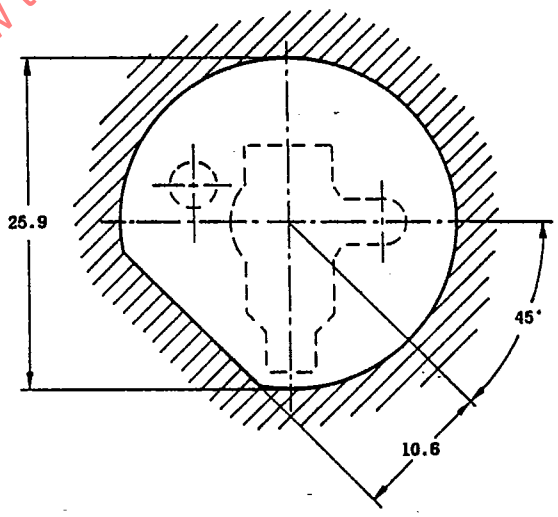




Dimensions in millimeters

Dimension	Min.	Max.
A_1	6.1	6.3
A_4	11.7	-
A_5	7.0	7.5
B_2	7.0	7.6
B_3	4.0	4.2
M_1	Nom. 14.6	
M_2	7.4	7.6
M_3	2.9	3.1
M_4	18.1	18.3
S	3.6	3.7
U_1	0.8	1.0
U_2	1.8	2.2
X	9.0	9.2
Z	19.5	20.5
δ	40°	45°
θ	59°	61°

Minimum free space for the base ring



The correct orientation of the bulb is made by the apertures "t_1" and "t_2". The three bosses "e" determine the reference plane.

The holder shall be so designed that the means of retention can be applied only when the bulb is in the correct position.

The means of retention shall make contact only with the prefocus ring of the base, and the total force exerted when the bulb is in position, shall be not less than 10 N and not greater than 60 N.

FIGURE 62—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB
BULB HOLDER P14.5s

(1) These dimensions define the reference axis.

(2) The longer lead wire should be positioned above the filament (the bulb being viewed as shown in the figure).
The internal design of the bulb should then be such that stray light images and reflections are reduced to the minimum e.g. by fitting cooling jackets over the non-coiled parts of the filament.

(3) The cylindrical portion of the glass bulb over length "f" shall be such as not to deform the projected image of the filament to such an extend as appreciable to affect the optical results.

(4) Offset of filament in relation to glass bulb axis measured at 27.5 mm from the reference plane in direction FV.

(5) d = actual diameter of filament.

(6) The ends of the filament are defined as the points where, when the viewing direction as defined in foot-note 7, the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the reference axis.

(7) The viewing direction is the perpendicular to the reference axis contained in the plane defined by the reference axis and the centre of the second pin of the base.

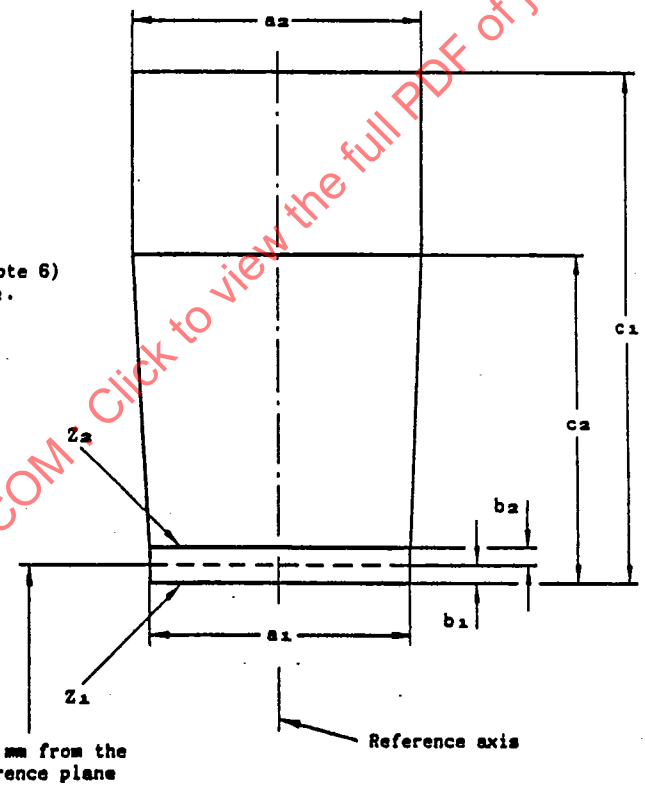
(8) The reference plane is the plane formed by the seating points of the three bosses of the bulb holder on the base ring.

Filament position requirements

The beginning of the filament (note 6) shall lie between lines Z_1 and Z_2.

The filament position is checked solely in directions FH and FV.

The filament shall lie entirely within the limits shown.



Dimensions in millimeters

Reference	Dimensions
a_1 (5)	1.4d
a_2 (5)	1.9d
b_1, b_2	0.25
c_1	7
c_2	4.5

FIGURE 63—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB