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SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1383

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Submitted for recognition as an American National Standard

(R) PERFORMANCE REQUIREMENTS FOR MOTOR VEHICLE HEADLAMPS

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 Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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 J576—Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices
SAE J578—Color Specification
SAE J599—Lighting Inspection Code
SAE J600—Headlamp Testing Machines
SAE J602—Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units
SAE J759—Lighting Identification Code

2.2 Related Publications—The following publication is provided for information purposes only and is not a required part of this document.

2.2.1 FEDERAL PUBLICATION—Available from the Superintendent of Documents, U. S. Printing Office, Washington, DC

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3. *Definitions*

3.1 Headlamp—A lighting device providing an upper and/or a lower beam designed to provide illumination forward of the vehicle.

3.2 Sealed Beam Headlamp Assembly—A headlamp assembly which includes one or more sealed beam headlamps.

3.3 Replaceable Bulb (Bulb)—A light source with related envelope and mounting base which is removable from the headlamp for the purpose of replacement.

3.4 Mechanically Aimable Headlamp—A headlamp having three pads on the lens, forming an aiming plane or an aiming ring, the aiming plane or aiming ring being used for laboratory photometric testing and for inspecting the aim of the headlamp when installed on the vehicle.

3.5 Aiming Plane—A plane defined by the surface of the three aiming pads on the headlamp lens or by the forward surface of an aiming ring.

3.6 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.

3.7 H-V Axis—A line from the center of the principal filament (low beam filament of two filament bulbs) formed by the intersection of the horizontal (H) and vertical (V) planes which intersect the filament and are perpendicular to the test screen (see Figure 1).

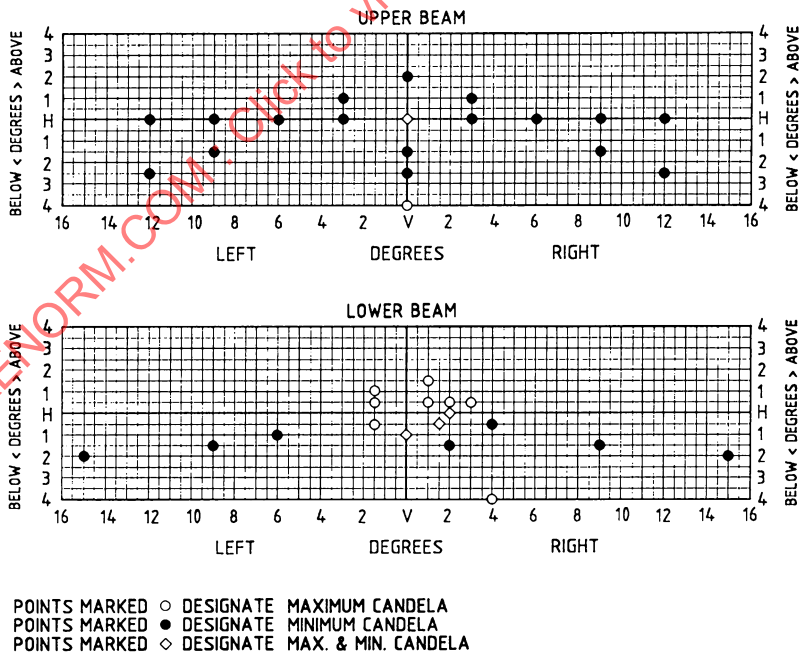


FIGURE 1—PHOTOMETRIC TABLES

3.8 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.

3.9 Design Voltage—The voltage used for design purposes.

3.10 Test Voltage—The specified voltage and tolerance to be used when conducting a test.

3.11 Rated Voltage—The nominal circuit or vehicle electrical system voltage classification. (Example: 12 V headlamp.)

3.12 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.

3.13 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 or retaining ring when assembled into a sealed beam headlamp assembly.

3.14 Retaining Ring—The clamping ring that holds the sealed beam bulb against the mounting ring.

3.15 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.

3.16 Aiming Screws—Screws with self-locking features used for adjusting horizontal and vertical aim and to retain the headlamp unit in the proper position.

3.17 Vehicle Headlamp Aiming Device (VHAD)—An aiming device incorporated in the headlamp system which allows for inspection and adjustment of headlamp aim in both vertical and horizontal axes without the use of aim measuring equipment external to the vehicle.

3.18 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 the Figures specified in Table 2. Separate bulbs may be used for high and low beam tests.

TABLE 1—REPLACEABLE HEADLAMP BULBS

Design Designation	Number of Filaments	Wattage (Watts) at 12.8 V U.B./L.B.	Luminous Flux (Lumens) at 12.8 V U.B./L.B.	Design Life (Hours) at 14 V U.B./L.B.(1)	Filament Type
9004 (ANSI)	2	65/45	1200/700(2)	150/320	C6/C6
9005 (ANSI)	1	65	1700	150	C8
9006 (ANSI)	1	55	1000(2)	320	C8
9007 (ANSI)	2	65/55	1350/1000(2)	150/320	C8/C8
H1	1	60.5	1410	320	C8
H3/9200 (ANSI)	1	60.5	1310	320	C6
H4/9003(ANSI)	2	67/60.5	1500/910(2)	150/320	C8/C8
H7	1	53.5	1360	320	C8

1. Guideline
2. With opaque coating.

TABLE 2—REPLACEABLE HEADLAMP 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 8.1, 8.1.3, 8.1.4	38
9005	Figures 39 to 43	44	Sections 8.2, 8.2.3, 8.2.4, 8.2.5	Sections 8.2, 8.2.3, 8.2.4, 8.2.5, and Figure 46
9006	Figure 47 to 51	52	53	Sections 8.2, 8.2.3, 8.2.4, 8.2.5 and Figure 53
9007	Figures 54 to 57	58	Sections 8.3, 8.3.3, 8.3.4	59
H1	Figures 60 to 61	62	63	64
H3	Figures 65 to 66	67	68	69
H4	Figures 70 to 72	73	Sections 8.4, 8.4.2, and Figure 74	71
HB2	Figures 70 to 72	73	Sections 8.4, 8.4.2, and Figure 74	71
H7	Figures 77 to 82	81, 82	77	78

3.19 High Beam—A beam intended primarily for distant illumination and for use when not meeting or following other vehicles.

3.20 Low Beam—A beam intended to illuminate the road ahead of the vehicle when meeting or following another vehicle.

3.21 High Beam Filament—Filament coil designed to provide high beam function.

3.22 Low Beam Filament—Filament coil designed to provide low beam function.

3.23 Filament Rotation—Any non-parallelism 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.

3.24 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.

3.25 Design Life—An operational time objective in hours of a headlamp filament at the test voltage.

3.26 Gaging Standard—A gage to calibrate filament location measuring equipment produced for each bulb type with all critical tolerances affecting filament location one-tenth the stated tolerances in the design requirements.

3.27 Aiming Reference Plane—A plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forwardmost aiming pad on the headlamp or, where such a plane would intersect the surface of the lens between the aiming pads, a plane which is perpendicular to the longitudinal axis of the vehicle and is located forward of and as close to the lens as possible without causing interference.

4. Identification Code Designation

4.1 SAE J759 Lighting Identification Code

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

a. Manufacturer's name and/or trademark shall appear on the lens.
b. Voltage and part number or trade number shall appear on the headlamp.
c. 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).

4.3 Headlamp Type Identification Code

4.3.1 Headlamp lenses shall be marked with a two or three character code.

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

4.3.3 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.

4.3.4 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
*—55 x 135 mm rectangular, four lamp system

NOTE— * Unspecified

4.3.5 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 3A—PHOTOMETRY—LOW BEAM

Low Beam	Min.	Max.
10U to 90U, 45°R to 45°L		125 cd
8L to 8R, H to 4U	64 cd	
4L to 4R, H to 2U	125	
1U to 1-1/2L to L		700
1/2U to 1-1/2L to L		1000
1/2D to 1-1/2L to L		3000
1-1/2U to 1R to R		1400
1/2U to 1R, 2R, 3R		2700
1/2D to 1-1/2R	8000	20000
1D to 6L	750	
1-1/2D to 2R	15000	
1-1/2D to 9L and 9R	750	
2D to 15L and 15R	700	
4D to 4R		8000

TABLE 3B—PHOTOMETRY—HIGH BEAM

High Beam	Min.	Max.
2U to V	1500 cd	
1U to 3R and 3L	5000	
H to V	20000	75000 cd
H to 3R and 3L	10000	
H to 6R and 6L	3250	
H to 9R and 9L	2000	
H to 12R and 12L	500	
1-1/2D to V	5000	
1-1/2D to 9R and 9L	1500	
2-1/2D to V	2000	
2-1/2D to 12R and 12L	750	
4D to V		12500
Maximum Beam Candela(1)	30000	

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

4.3.6 The lens markings of headlamps designed to UF and LF specifications shall meet the following criteria.

a. The first character indicates the upper (high) or low beam function.
b. The second character indicates the size and number of headlamps used on the vehicle.

4.3.7 HEADLAMP TYPE IDENTIFICATION—See Table 4.

TABLE 4—HEADLAMP TYPE IDENTIFICATION

Size	Type	Number of Headlamps
100 x 165 mm	1A1	2
(4 x 6.5 in)	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)	2E1	2
(4 x 6.5 in)	2H1	2
92 x 150 mm	UF	2
	LF	2
56 x 75 mm	UJ	4
	LJ	4
55 x 135 mm	—	2
	—	2

4.4 Replaceable Bulb Marking Requirements—Bulbs shall be marked with the following information:

a. Manufacturer's name and/or trademark
b. Trade number (ANSI)
c. Date Code

4.5 Beam Pattern Location Marking

4.5.1 Headlamps designed to be aimed by fractional balance means shall be marked with the letter "B".

4.5.2 Following the letter designation will be two, two-digit numbers indicating first, the "H-2 degree right," and second, the "V-1 degree down" fractional balance percentage values chosen to represent the design aim of the headlamp.

4.5.3 The two numbers may be separated by a space, dash (-), or slash mark (/), (e.g., B25-35 or B25/35).

4.5.4 Lens marking will be no less than 3 mm in height and imprinted indelibly on the lens.

4.6 Mechanical Axis Mark—If the mechanical axis of the headlamp is not at the geometric center of the lens, then the location shall be indicated by the manufacturer on the headlamp lens. This mark is also recommended for headlamps which are to be optically aimed.

5. 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. Unless otherwise indicated, all drain holes, breathing devices or other openings or vents of headlamp units under test shall be in their normal operating condition.

a. 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.

5.1 SAE J575, Tests for Motor Vehicle Lighting Devices and Components—The following tests are applicable with the modifications as indicated.

5.1.1 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 5.1.4.)

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

5.1.3 CORROSION TEST

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

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

5.1.4 PHOTOMETRY

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

5.1.4.2 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.

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

5.1.4.4 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 coincident with the photometer axis.

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

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

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

5.4 Beam Pattern Location Test—This test applies only to headlamps designed to be aimed by the fractional balance method. (Headlamps do not have VHADs.)

5.4.1 Headlamps designed to be aimed on high beam shall be seasoned and photometered to find the location of maximum intensity. (See 5.1.4.)

5.4.2 Headlamps designed to be aimed on low beam shall be seasoned and photometered at the test points H-2R and 1D-V (see 5.1.4). The highest intensity within the beam pattern shall also be measured and recorded.

5.5 Wattage Test

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

5.5.2 Filaments shall be seasoned prior to wattage measurement.

5.6 Luminous Flux Test

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

5.6.2 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.

5.7 Luminous Flux Maintenance Test

5.7.1 The luminous flux for each filament shall be determined in accordance with 5.6.

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

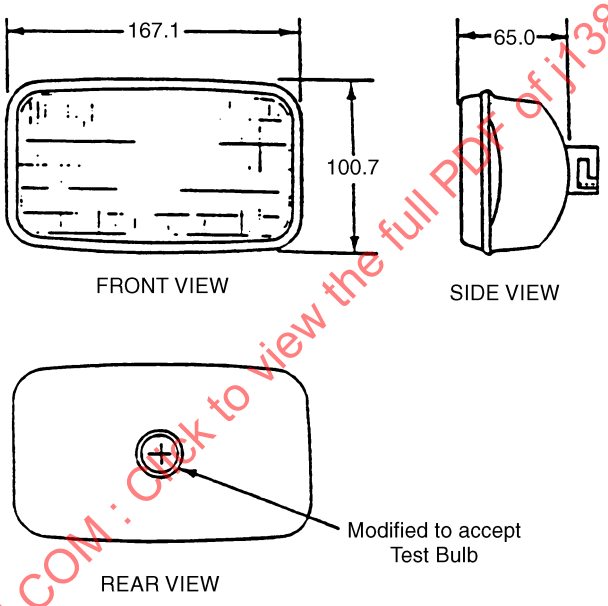


FIGURE 2—TEST ENCLOSURE DIMENSIONS

5.7.3 The test voltage shall be 14.0 V ± 0.1 V DC. Two-filament bulbs shall be tested by cycle tested by operating the low beam filament for 48 min followed by the high beam filament for 12 min in each hour of testing.

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

5.7.5 The luminous flux of each filament of two-filament bulbs shall be measured in accordance with 5.6 after the low beam filament on-time equals 70% of the design life when tested according to 5.7.3.

5.8 Out-of-Focus Test

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

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

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

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

5.8.5 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.

5.9 Impact Test—This test applies to headlamps with plastic lenses or outer covers.

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

5.9.2 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.

5.9.3 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.

5.10 Aiming Adjustment Test

5.10.1 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

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

5.10.3 The vertical aiming screw shall be turned to the upper and lower extremes of its range and the vertical angle between the mechanical and H-V axes shall be measured in each position. Any change in vertical angle throughout the horizontal aim range shall also be recorded.

5.10.4 The horizontal aiming screw shall be turned to the left and right extremes of its range and the horizontal angle between the mechanical and H-V axes shall be measured in each position. Any change in vertical angle throughout the horizontal aim range shall also be recorded.

5.11 Inward Force Test—The headlamp assembly, 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 headlamp assembly face. (See Figure 3.)

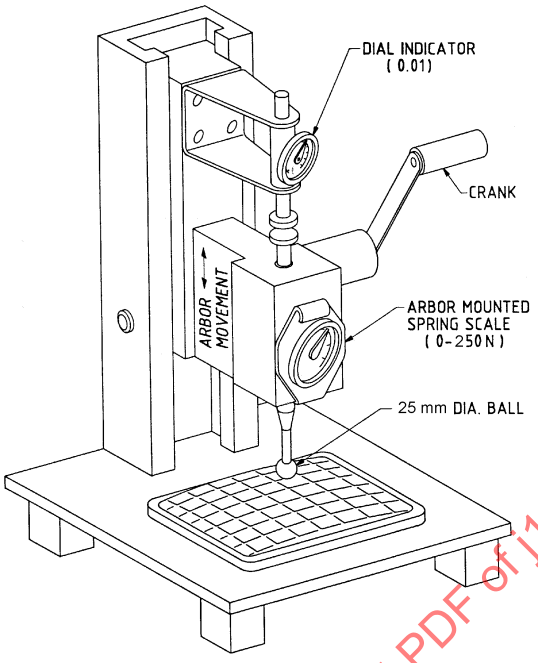


FIGURE 3—INWARD FORCE TESTER

5.12 Torque Deflection Test—Applies to headlamps which do not incorporate on-board headlamp aiming system and are not aimed solely by the fractional balance photometry method.

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

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

5.12.3 Replaceable bulb headlamps shall be equipped with an appropriate fixture which mates to one of the deflectors shown in Figures 4 to 8 on the face of the lens with an applied torque of 222 N acting parallel to the aiming reference plane and in a downward direction. The force shall be applied through the aiming pads.

5.12.4 The torque 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.

5.13 Deflection Test—Applies to Replaceable Headlamp Bulbs.

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

5.13.2 A force of 18.0 N ± 0.4 N 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.

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

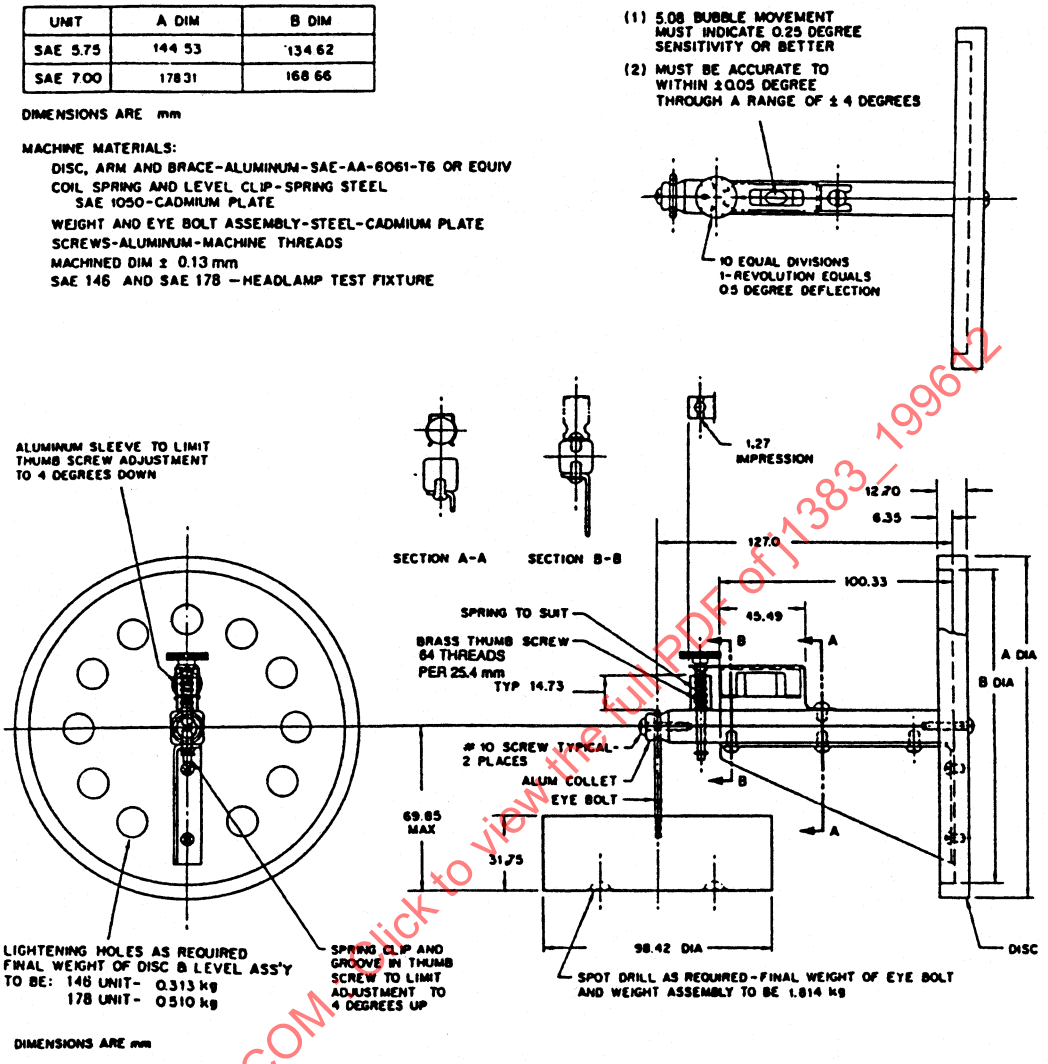


FIGURE 4—DEFLECTOMETER

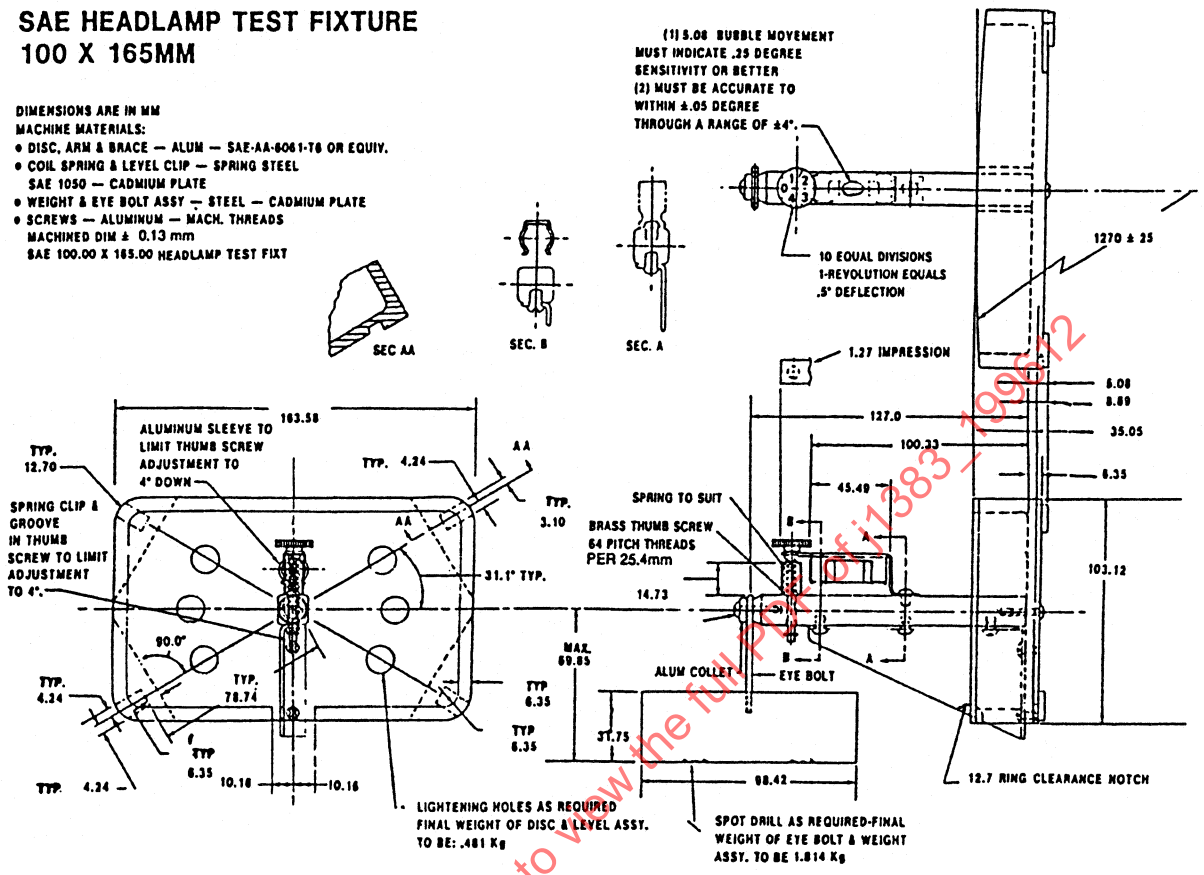


FIGURE 5—DEFLECTOMETER

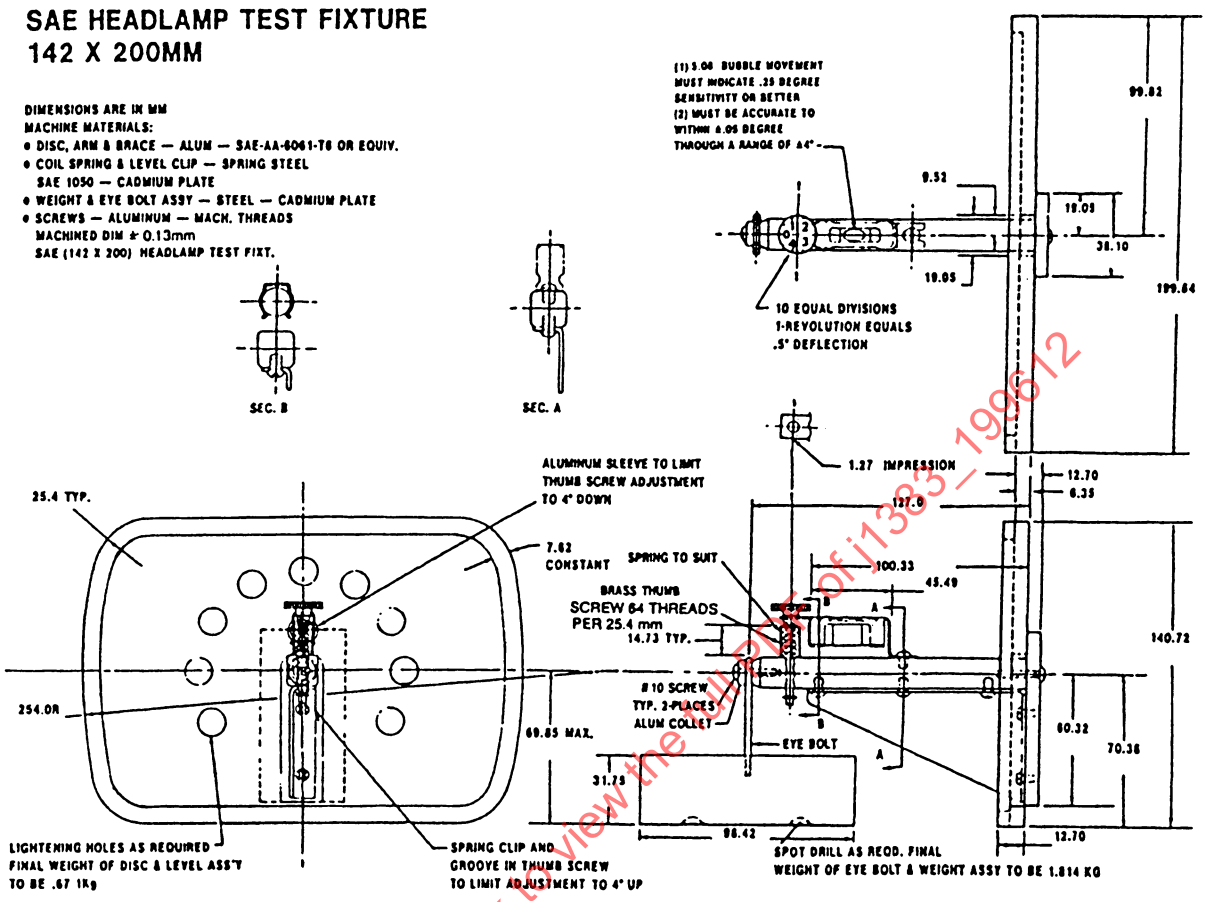


FIGURE 6—DEFLECTOMETER

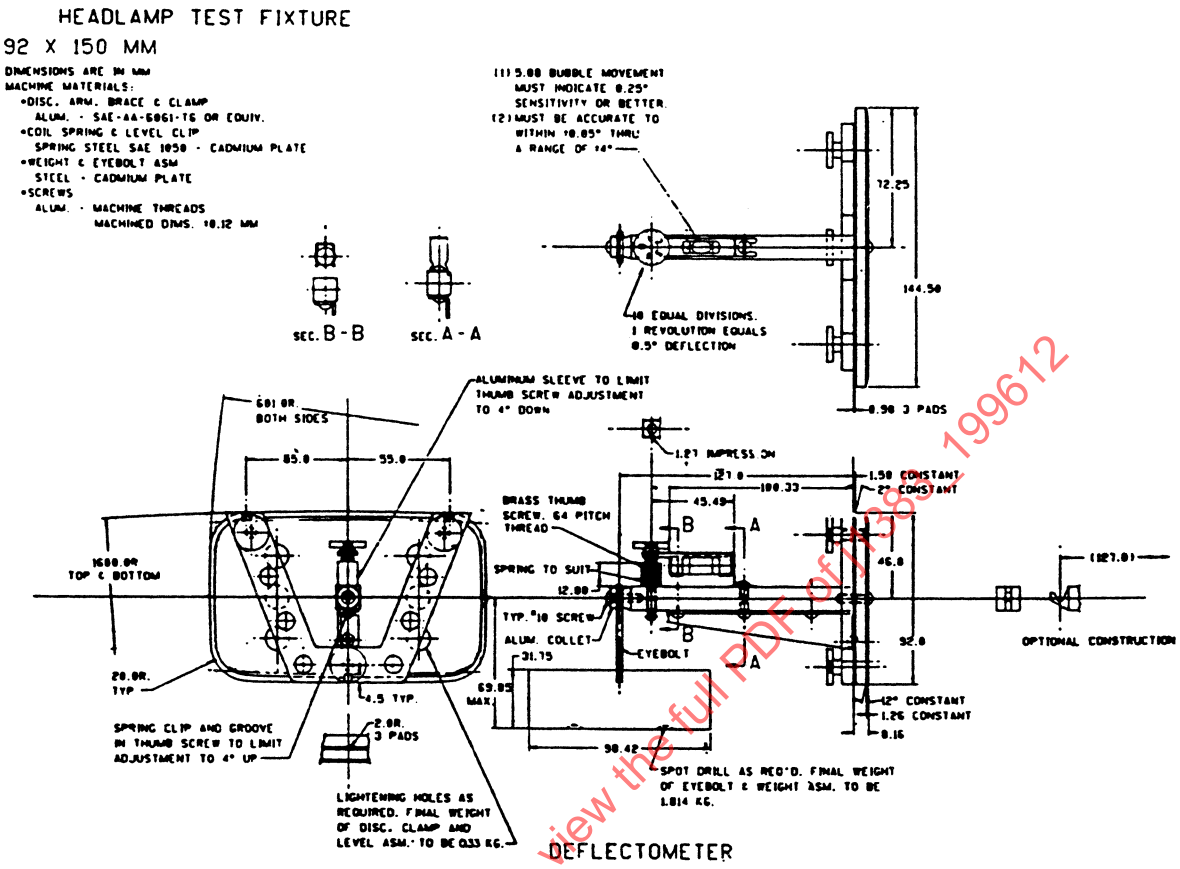


FIGURE 7—DEFLECTOMETER

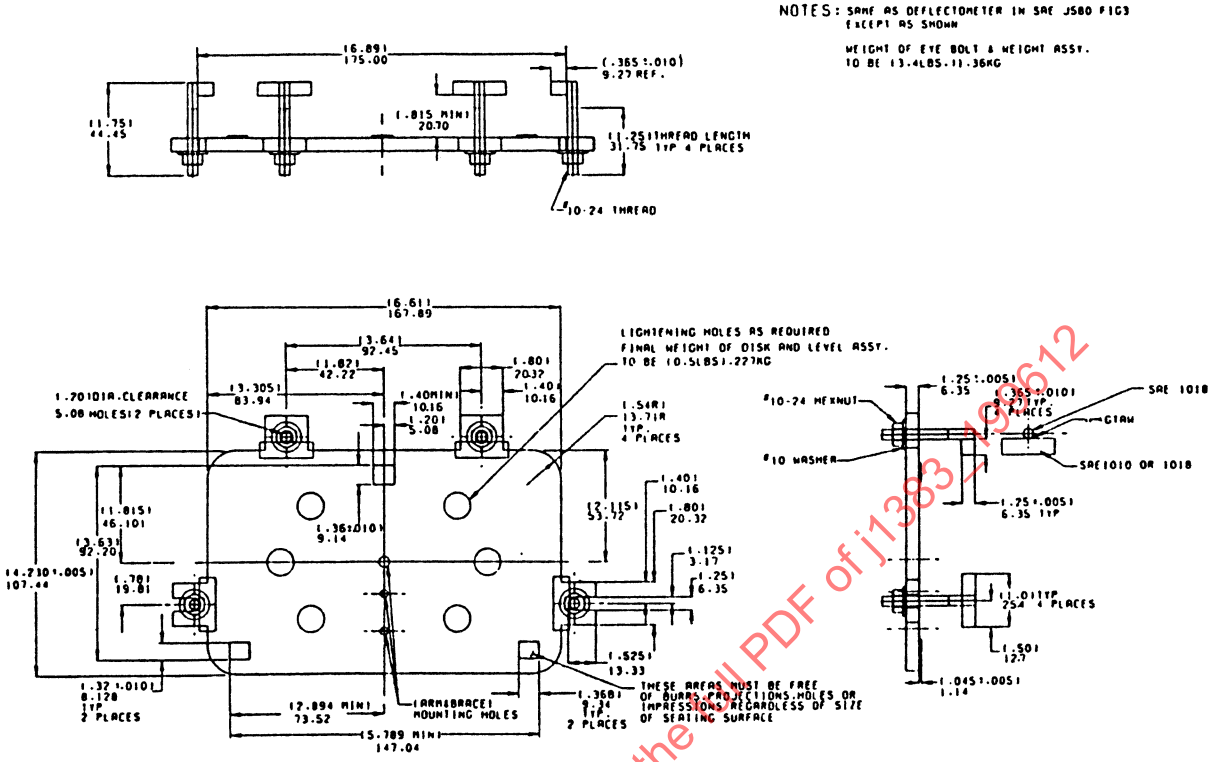


FIGURE 8—DEFLECTOMETER

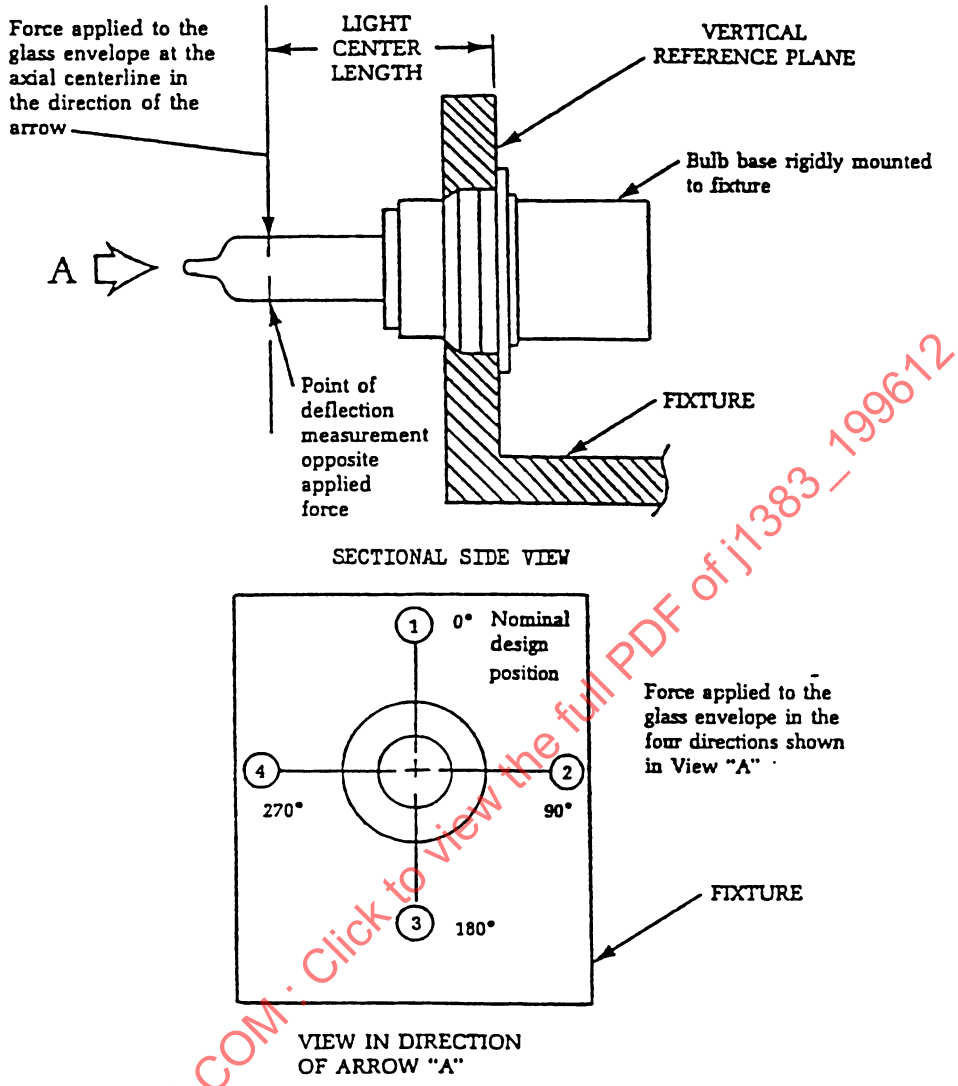


FIGURE 9—BULB DEFLECTION TEST

5.14 Sealing Test—Applies to bulbs designed for an air tight fit to the headlamp.

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

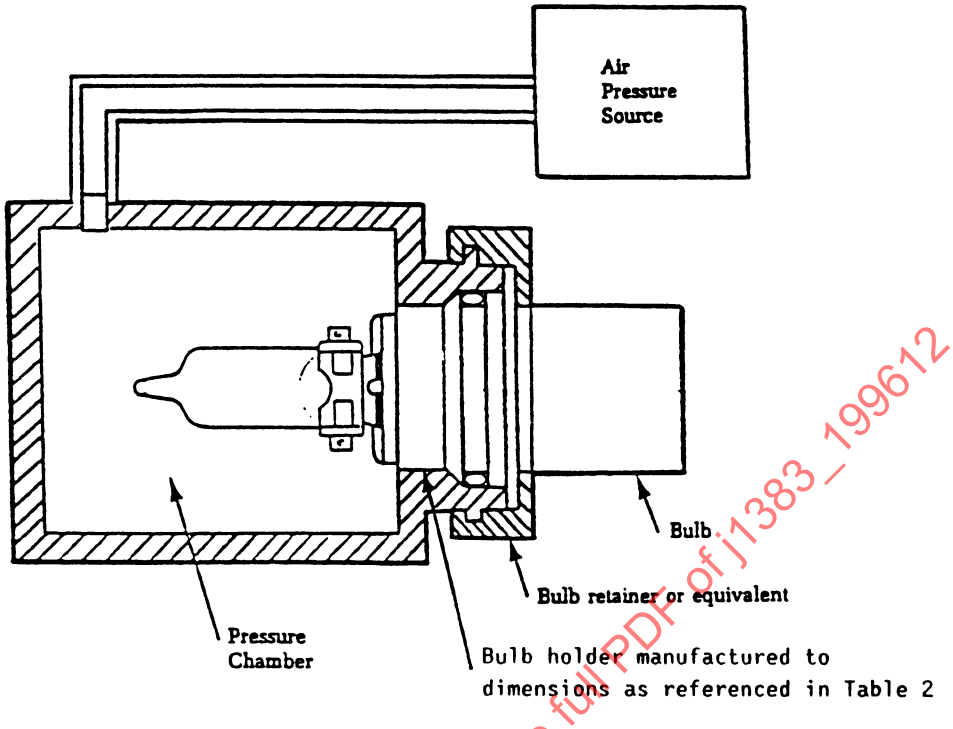


FIGURE 10—TEST FOR AIRTIGHT SEAL

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

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

5.15 Chemical Resistance Test—This test applies only to headlamps with plastic lenses or outer covers.

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

5.15.2 The test headlamps shall be seasoned and photometered to the test points in Table 3 before and after the chemical resistance test (see 5.2.4).

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

5.15.4 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”)

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

5.15.6 A 15 cm square cotton cloth shall be folded twice to form a 7.5 cm square and placed at the bottom of a beaker.

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

5.15.8 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).

5.15.9 Within 5 s after removal of the cloth from the beaker, wipe the lens and the top surface of the lens-lamp housing joint with that cloth surface which was uppermost in the beaker. The entire exterior optical surface of the lens and top surface of the lens-lamp housing joint 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 and the joint, the second cycle shall apply it to the center segment of the lens and the third cycle shall apply it to the lower segment of the lens.

5.15.10 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.

5.16 Abrasion Test of Plastic Headlamp Lens Material

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

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

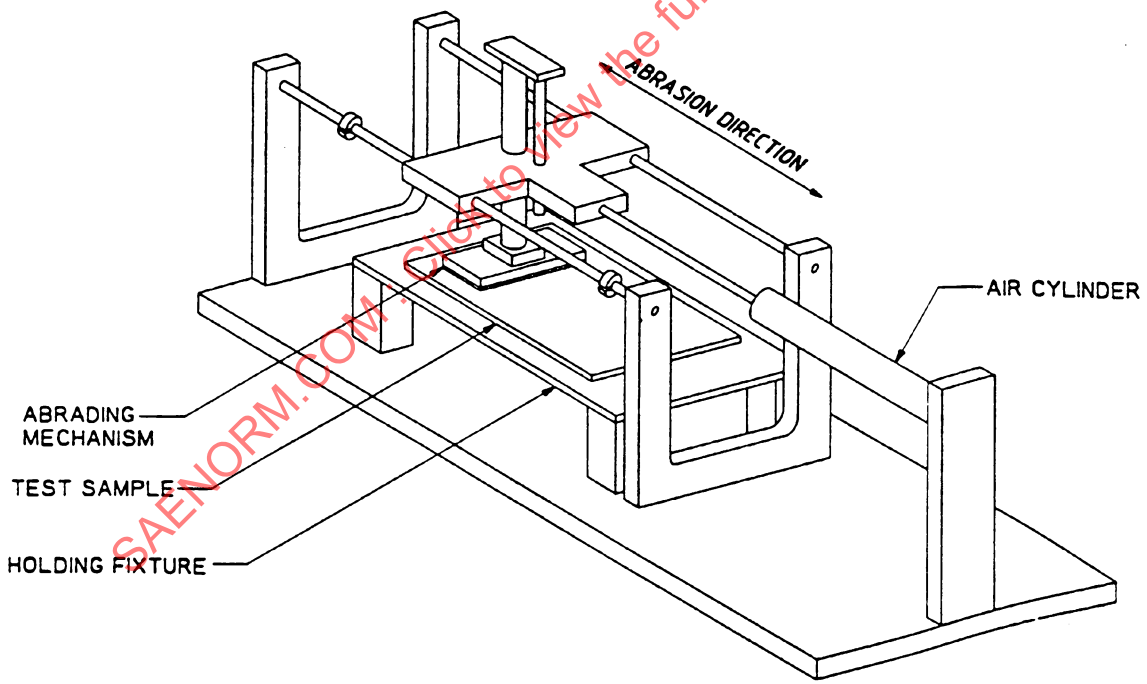


FIGURE 11—ABRASION TEST MACHINE

5.16.3 The size of the abrading pad shall be 25 x 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.

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

5.16.5 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.

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

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

5.17 Thermal Cycle Test—This test applies only to headlamps that have a plastic lens, a plastic reflector, or both.

5.17.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the thermal cycle test (see 5.2.4).

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

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

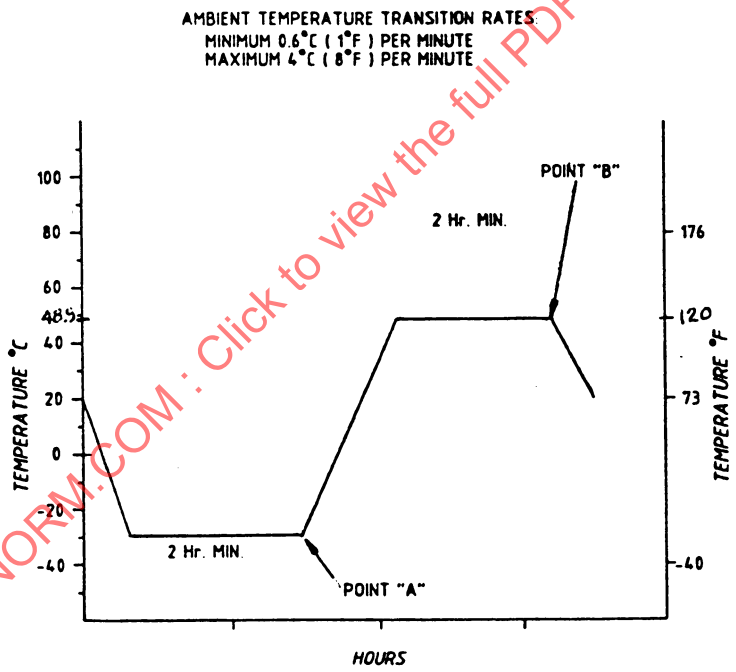


FIGURE 12—THERMAL CYCLE PROFILE

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

5.17.5 The headlamp shall be energized at 12.8 V ± 20 mV, in its highest wattage mode commencing at point "A" of Figure 11 and de-energized at point "B" of each cycle.

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

5.18 Internal Heat Test

5.18.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the internal heat test (see 5.2.4).

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

5.18.3 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.

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

5.18.5 The test cycle shall be 30 min.

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

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

5.19 Humidity Test

5.19.1 The headlamp shall be seasoned and photometered to the test points in Table 3 before and after the humidity test (see 5.2.4).

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

5.19.3 The headlamp shall be placed in a controlled environment of 95% ± 5% relative humidity at 38 °C.

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

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

5.19.6 Test Duration-24 complete cycles. The test shall end in the “off” cycle mode.

5.19.7 After completion of the 24th 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.

5.19.8 Within 3 min after the completion of the 24th cycle, the mounted assembly shall be removed, wrapped in a thermal blanket, and placed in an axial air flow chamber. The thermal blanket shall be removed when the assembly is placed in the chamber. The orientation of the assembly with respect to the air flow shall be identical to that of its position on any vehicle for which the headlamp is intended. The assembly shall be positioned in the chamber so that the center of the lens is in the center of the opening of the air flow entry duct during the test. The headlamp shall have at least 76 mm clearance on all sides, and at least 102 mm to the entry and exit ducts at the closest points. If vent tubes are used which extend below the lamp body, the clearance shall be measured from the bottom of the vent tube or its protection. The temperature of the chamber shall be 23 +4/–0 °C with a relative humidity of 30 +20/–0%. The headlamp shall not be energized.

5.19.9 Before the test specified previously, the uniformity of the air flow in the empty test chamber at a plane 102 mm downstream of the air entry duct shall have been measured over a 102 mm square grid. The uniformity of air flow at each grid point shall be +7/–10% of the average air flow specified in the following paragraph.

5.19.10 The mounted assembly in the chamber shall be exposed for 1 h, to a flow having an average air speed of 1.68 +0/–0.1 m/s as measured with an air velocity measuring probe having an accuracy of ±3% in the 1.68 m/s range. The average air speed is the average of the speed recorded at six points around the perimeter of the lens. The six points are determined as follows: Construct a horizontal plane at the center of the lens. The first two points are located in the plane, 25 mm outward from the intersection of the plane and each edge of the lens. Then, the distance between these two points are trisected, creating two new intermediate points. A vertical plane is constructed though each new point, parallel to the longitudinal axis of the vehicle. For each of the two planes, create two points, one 25 mm above the top edge of the lens and one 25 mm below the bottom edge of the lens.

5.19.11 After 1 h, the headlamp shall be removed and inspected for moisture. The headlamp shall then be tested immediately for photometrics. The photometric testing of the headlamp shall begin within 10 min ± 1 min of its removal from the chamber.

5.20 Filament Rated Average Lab Life Test

5.20.1 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.

5.20.2 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.

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

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

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

6.1 SAE J575, Test Requirements for Motor Vehicle Lighting Devices and Components

6.1.1 VIBRATION REQUIREMENT (SAE J575)

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

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

6.1.2 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.

6.1.3 CORROSION REQUIREMENT (SAE J575)

6.1.3.1 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.

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

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

6.2 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 to 90U, 45R to 45L	438 cd max permissible within 2 degrees conical angle
1/2U to 1-1/2 L	1100 max
1/2U to 1R	3240 max
1/2D to 1-1/2R	6400 min/24 000 max
1D to 6L	600 min
HIGH BEAM	
Type 1A1 and 1C1, or Equivalent	
2U to V	800 min
H-3R and 3L	9600 min
H-V	16 000 min
2-1/2D-V	1600 min

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

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

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

6.5 Beam Pattern Location Requirement

6.5.1 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).

6.5.2 HEADLAMPS DESIGNED TO BE AIMED ON LOW BEAM—The beam pattern is properly oriented to the aiming plane if the fractional values, designated by the manufacturer, are met at H - 2R and 1D - V. These fractional values are designated as percentages of the maximum intensity point in the beam pattern. Unless otherwise designated, the fractional value for H - 2R is 0.20 (20%) and the fractional value for 1D- V is 0.30 (30%).

6.5.2.1 Headlamps designed to be aimed by fractional balance means shall be marked with the letter “B.”

6.5.2.2 Following the letter designation will be two, two-digit numbers indicating first, the “2 degree right: and second, the “1 degree down” fractional balance percentage values chosen to represent the design aim of the headlamp.

6.5.2.3 The two numbers may be separated by a space, dash (-), or slash mark (/), (e.g., B25-35 or B25/35).

6.5.2.4 Lens marking will be no less than 3 mm in height and imprinted indelibly on the lens.

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

6.7 Luminous Flux Requirement—Applies to Replaceable Headlamp Bulbs.

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

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

6.8 Maintenance of Luminous Flux Requirement—When tested in accordance with 5.7. 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.

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

6.10 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.

6.11 Aiming Adjustment Requirement—When tested in accordance with 5.11, the headlamp shall meet the following requirements:

6.11.1 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.

6.11.2 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.

6.11.3 On headlamps with a VHAD 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.

6.11.4 On headlamps with VHAD, 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.

6.11.5 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— Paragraphs 6.11.2 and 6.11.3 are not applicable to headlamps with ball and socket or equivalent adjusting means.

6.12 Inward Force Requirements—When subjected to the tests in 5.12, the headlamp shall meet the following requirements:

a. The headlamp shall not permanently recede by more than 2.5 mm
b. The aim of the headlamp shall not permanently deviate by more than 32 mm at a distance of 7.6 m

6.13 Torque Deflection Requirement—When subjected to the tests in 5.11, the difference between the two readings shall not exceed 0.30 degree.

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

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

6.16 Chemical Resistance Requirement

6.16.1 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.

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

6.17 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.

6.18 Thermal Cycle Requirement

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

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

6.19 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.

6.20 Humidity Requirement

6.20.1 At the end of the 10 min test period (see 5.20), the headlamp shall be inspected immediately and show no evidence of condensed moisture or droplets inside the headlamp.

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

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

6.21 Retaining Ring Requirements

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

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

6.21.3 When a headlamp having a flange thickness (see Table 6) is secured between the retaining ring and mounting ring, there shall be no evidence of looseness:

TABLE 6—FLANGE THICKNESS DIMENSIONS FOR SEALED BEAM HEADLAMPS

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

6.22 Design Requirements

6.22.1 DIMENSIONS OF MOUNTING AND RETAINING RINGS—Sealed beam headlamp mounting rings and retaining rings shall meet the dimensions marked "l" in the following figures to assure compatibility with the corresponding types of units. See Table 7.

TABLE 7—DIMENSIONS OF MOUNTING AND RETAINING RINGS

Type	Figure
Type 1A1	13
Type 2A1	13
Type 2B1	14
Type 1C1	15
Type 2C1	15
Type 2D1	16
Type 2E1	13
Type UF	17
Type LF	17
Type 55x135	18
Type 55x135	18

6.22.2 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. See Table 8.

TABLE 8—DIMENSIONS OF SEALED BEAM HEADLAMPS

Type	Figure
Type 1A1	20
Type 2A1	21
Type 2B1	22
Type 1C1	23
Type 2C1	24
Type 2D1	25
Type 2E1	26
Type UF	27
Type LF	27
Type 1G1	28
Type 2G1	28
Type 2H1	28
Type UJ	29
Type LJ	30
Type 55x135 (U)	31
Type 55x135 (L)	32

6.22.3 DIMENSIONS FOR MECHANICAL AIMING OF HEADLAMPS—Headlamps shall meet the following requirements to assure compatibility with mechanical aimers.

6.22.3.1 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.

6.22.3.2 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.

6.22.3.3 Aiming pad design may vary but shall meet the limiting dimensions as shown on the figures specified in 6.22.1 and 6.22.2.

6.22.3.4 Except as provided in 6.22.3.7, a whole number, which represents the distance in tenths of an inch (i.e., 0.3 in = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens.

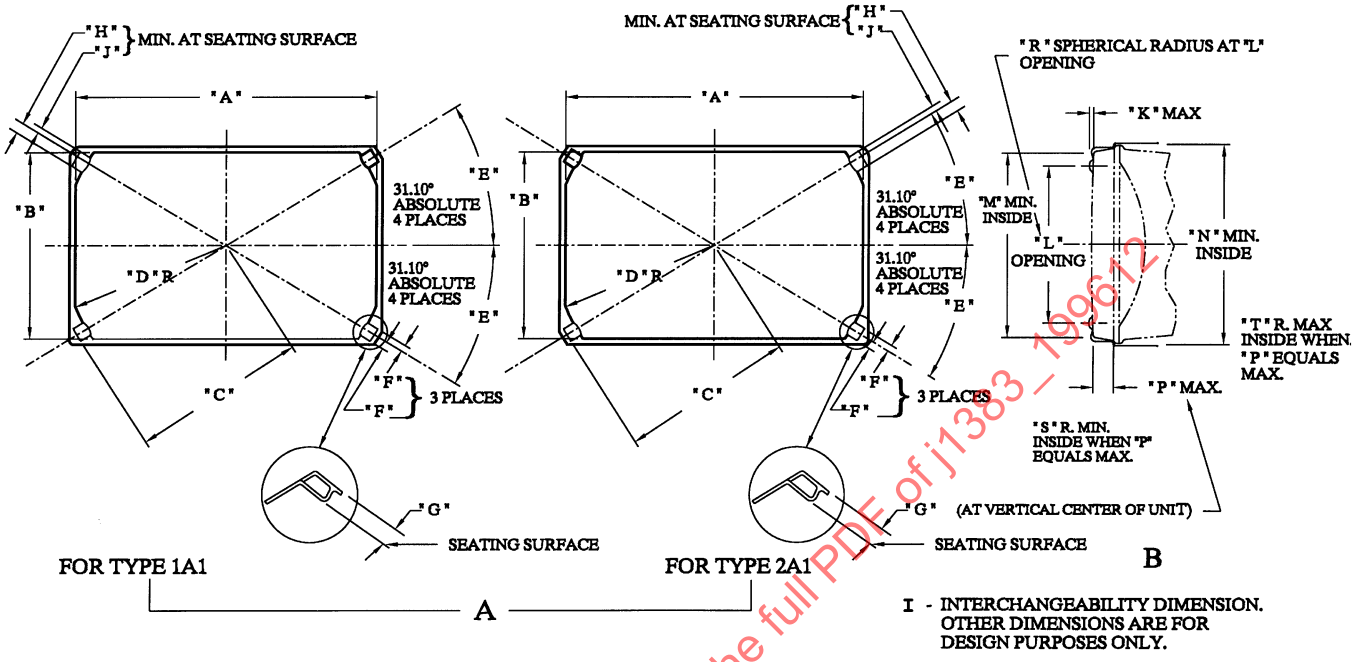
6.22.3.5 The height of these numbers shall not be less than 4 mm.

6.22.3.6 If the most forward aiming pad is the lower inboard aiming pad, then the numbers may be placed anywhere on the lens.

6.22.3.7 The number for the outboard aiming pad shall be followed by the letter "H" and the number for the center aiming pad shall be followed by the letter "V."

6.22.3.8 Each headlamp may be designed to use the nonadjustable Headlamp AIming Device Locating Plates specified in SAE J602 for the 100x165 mm headlamp, the 142x200 mm headlamp, the 146 mm diameter headlamp, or the 178 mm diameter headlamp, or the 92x150 mm Type F headlamp, and incorporate lens mounted aiming pads as referenced in Figures 26 to 32.

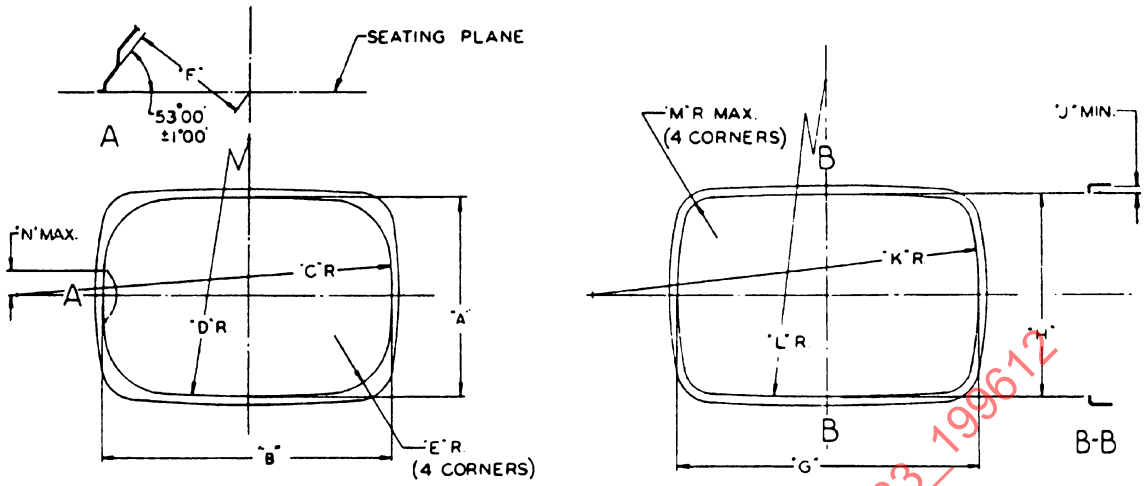
6.22.4 HEADLAMP MOUNTING ASSEMBLY—The headlamp mounting assembly shall meet the requirements of Figures 13 to 18, Dimensions of Sealed Beam Headlamp Mounting.



	Letter	In	mm
	A	6.518 ±0.020	165.56 ±0.50
	B	4.140 ±0.020	105.16 ±0.50
I	C	3.670 +0.015 −0.000	93.22 +0.38 −0.00
	D	3.408 ±0.020	86.56 ±0.50
	E	31.10° ±0.08°	
I	F	0.178 +0.020 −0.000	4.52 +0.50 −0.00
I	G	.170 +0.000 −0.030	4.32 +0.00 −0.76
I	H	0.334	8.48
I	J	0.120	3.05
	K	0.060	1.52

	Letter	In	mm
	L	3.660 ±0.059 x 6.040 ±0.059	92.96 ±1.50 x 153.42 ±1.50
I	M	4.080 x 6.460	103.63 x 164.08
I	N	4.250 x 6.630	107.95 x 168.40
	P	0.418	10.62
	R	50.0 +0.50 −2.00	1270.0 +12.7 −50.8
	S	0.075	1.91
	T	0.060	1.52

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



DIMENSIONS APPLY AT SEATING PLANE SURFACE

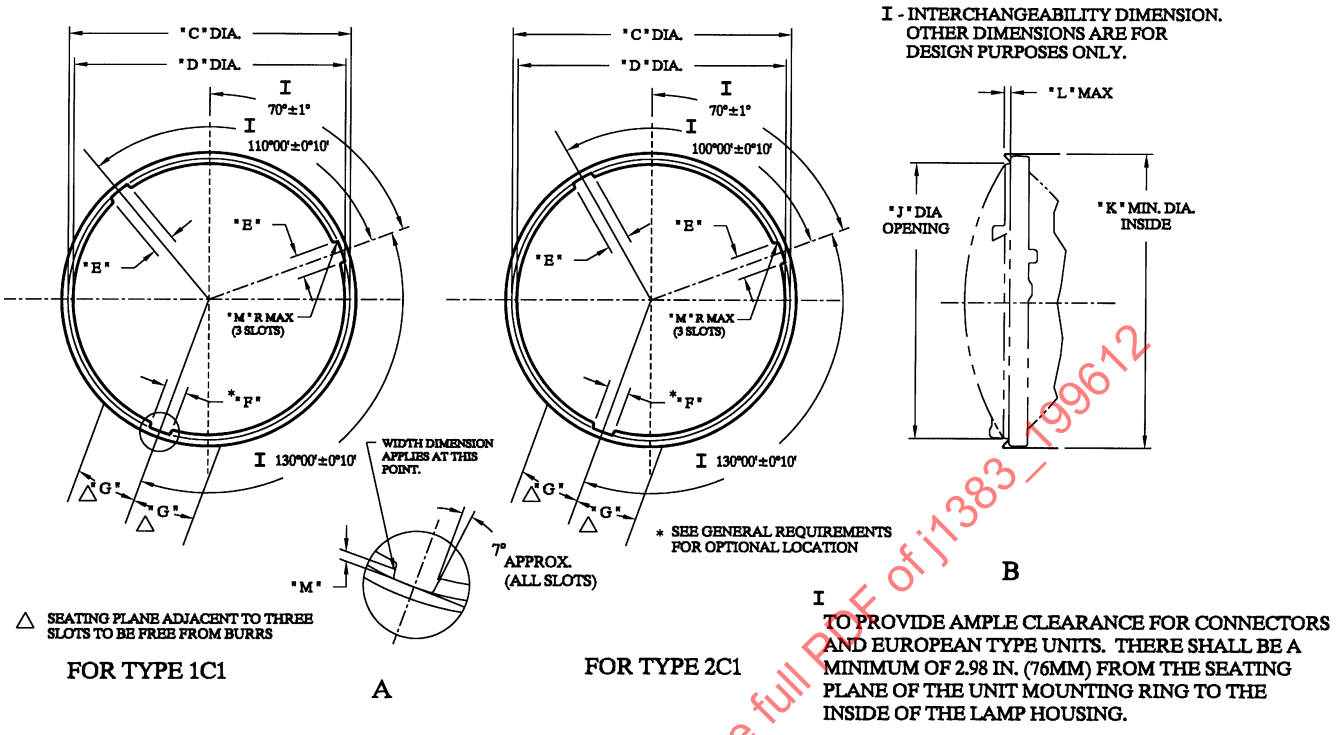
MOUNTING RING (A) RETAINING RING (B)

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 $^{+225.00}_{-0}$	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 x 200 mm RECTANGULAR HEADLAMP; (B) RETAINING RING



DIMENSIONS

Letter	In	mm	Letter	In	mm
I C	5.450 $^{+0.010}_{-0.000}$	138.43 $^{+0.25}_{-0.00}$	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 $^{+0.25}_{-0.00}$	I K	5.710	145.03
I F	0.330 $^{+0.005}_{-0.000}$	8.38 $^{+0.12}_{-0.00}$	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

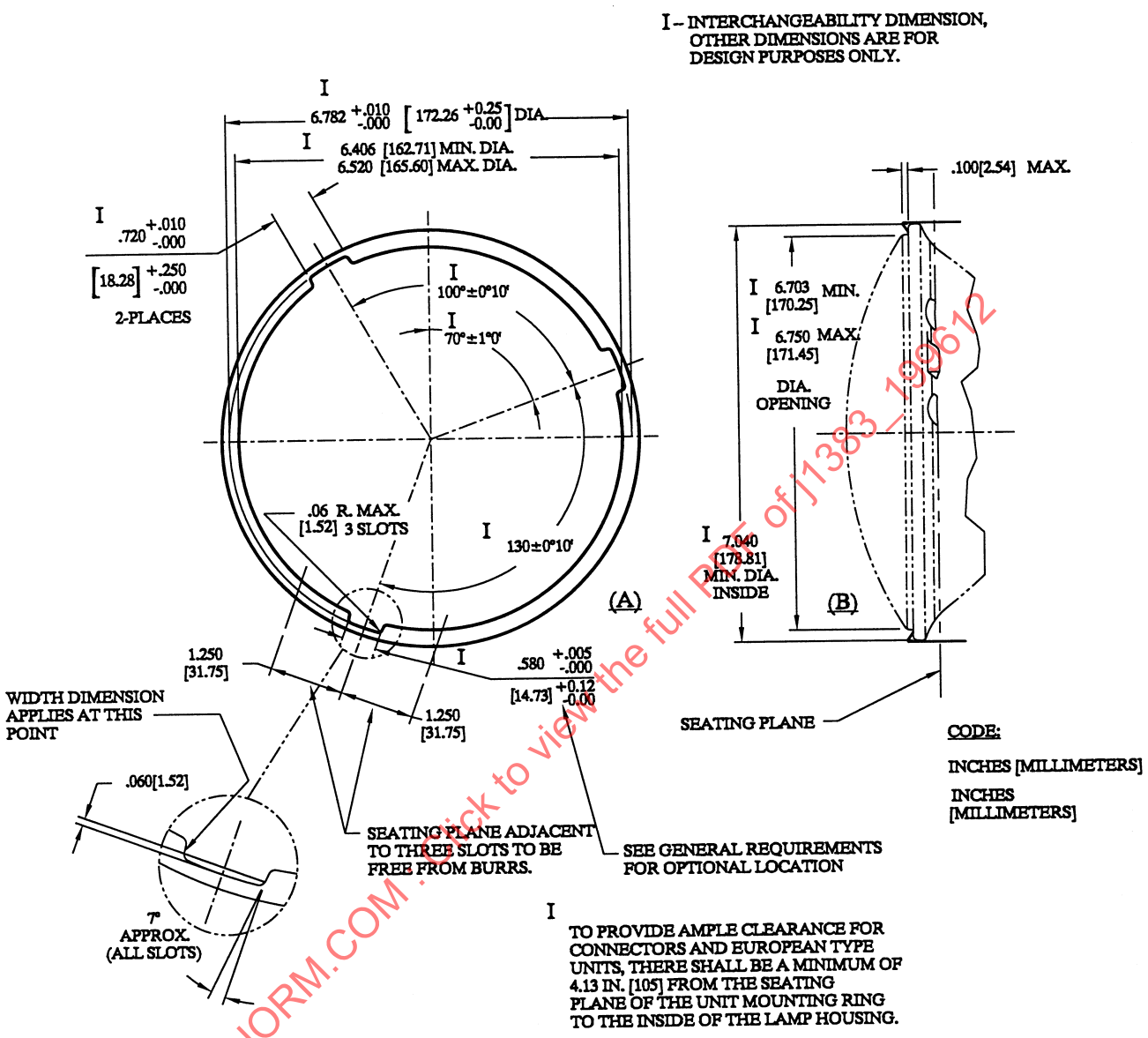
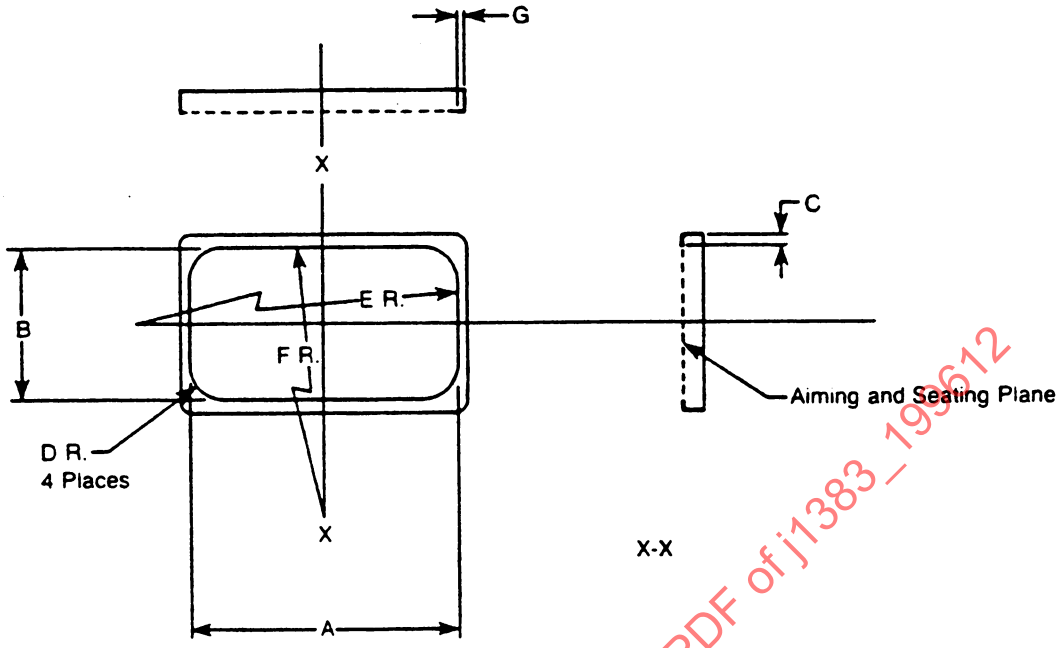


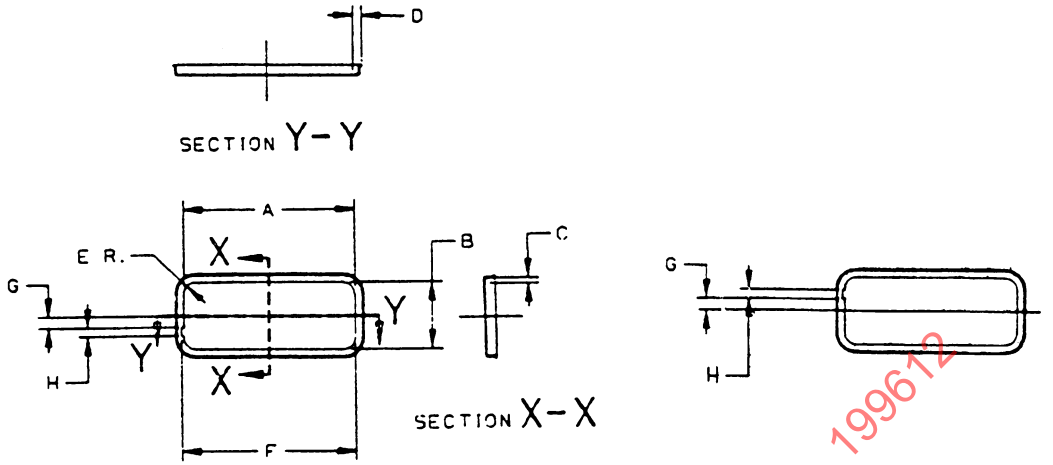
FIGURE 16—(A) FRONT VIEW OF SLOT OR NOTCHES FOR 178 mm DIAMETER HEADLAMP MOUNTING RING OR LAMP BODY; (B) 178 mm HEADLAMP RETAINING RING



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 x 135 UK/LK

6.22.5 Headlamps when mounted on a vehicle shall meet the aimer compatibility requirements described in 6.22.6 or shall meet the Vehicle Headlamp Aiming Device (VHAD) requirements described in 6.22.7.

6.22.6 AIMER COMPATIBILITY—Headlamps which do not incorporate VHAD 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.

6.22.7 A Vehicle Headlamp Aim Device (VHAD) shall meet the requirements specified as follows:

6.22.7.1 Aim—The VHAD shall provide for headlamp aim inspection and adjustment in both the vertical and horizontal directions.

6.22.7.2 Vertical Aim—The VHAD shall include the necessary references and scales relative to the horizontal plane to assure correct vertical aim for photometry and aiming purposes. An off-vehicle measurement of the angle of the plane of the ground is permitted. In addition, an equal number of graduations from the “0” position representing angular changes in the axis in the upward and downward directions shall be provided. The “0” position shall be marked “0” and shall be accurate to within ±0.1 degree.

6.22.7.2.1 Each graduation shall represent a change in the vertical angle not larger than 0.19 degree (25 mm at 6.8 m). Graduations shall provide for variations in aim at least 1.2 degrees above and below the horizontal axis. For each graduation, the angle indicated by the mark or number shall be accurate to within ±0.1 degree of the actual angle between the mark and the horizontal axis.

6.22.7.2.2 Graduations on the VHAD scale shall be spaced a minimum of 1.27 mm (0.05 in) apart. If a direct reading analog indicator is provided, it shall represent the actual aim movement in a clear, understandable format.

6.22.7.2.3 The graduations shall be legible at a distance of 0.3 m under an illumination of 30 fc maximum, measured at the top of the radiator, by an observer having 20/20 vision (Snellen).

6.22.7.3 Horizontal Aim—The VHAD shall include references and scales relative to the longitudinal axis of the vehicle necessary to assure correct horizontal aim for photometry and aiming purposes. A mark shall be used to indicate alignment of the headlamps relative to the longitudinal axis of the vehicle. The mark shall consist of the symbol '0' and shall be accurate to within ±0.2 degree. In addition, an equal number of graduations representing equal angular changes in the leftward and rightward directions relative to the vehicle longitudinal axis shall be provided.

6.22.7.3.1 Each graduation shall represent a change in the horizontal angle not greater than 0.38 degree to the left and right of the longitudinal axis of the vehicle, and shall have an accuracy relative to the zero mark of equal to or better than 0.1 degree.

6.22.7.3.2 The graduations shall be legible at a distance of 0.3 m under an illumination of 30 fc maximum, measured at the top of the radiator, by an observer having 20/20 vision (Snellen).

6.22.7.3.3 The horizontal indicator shall perform through a minimum range of 0.76 degrees left and right (101.6 mm at 6.8 m); however, the indicator itself shall be capable of recalibration over an angular range of ±2.5 degrees relative to the longitudinal axis of the vehicle to accommodate any adjustment necessary for recalibrating the indicator.

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

6.22.9 Accurate rated bulbs shall meet the dimensional requirements shown in each applicable Figure referenced in Table 2.

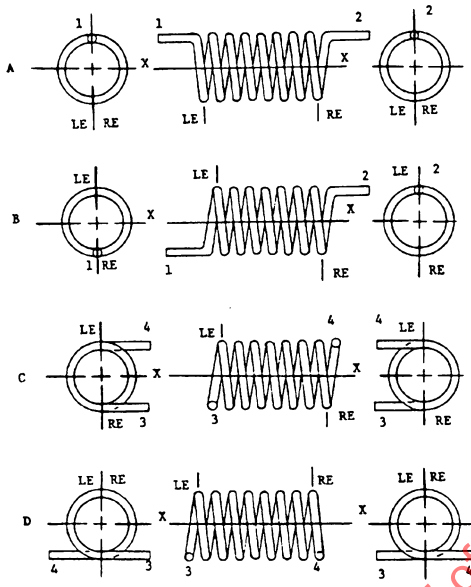
6.22.10 Typical replaceable headlamp bulbs are listed in Table 1.

7. Guidelines

7.1 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.

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

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



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 DEFINTION

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

a. Mounting and Retaining Rings—See Figures 13 to 18.
b. Sealed Beam Headlamps—See Table 4 and Figures 20 to 32.
c. Replaceable Bulbs—See Table 2 and Figures 33 to 82.
d. Reflector Bulb Mounting Hole for Replaceable Bulbs—See Table 2.

7.5 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 6.

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

TABLE 9—TEST CLASSIFICATION

	Report Section	Requirements Performance	Requirements Design	Requirements Material	Requirements Guidelines
4	Identification Code Designation				X
5.1.1	Vibration	X			
5.1.2	Dust	X			
5.1.3	Corrosion	X			
5.1.4	Photometry	X			
5.2	Color	X			
5.3	Plastic Materials	X			
5.4	Beam Pattern Location	X			
5.5	Wattage	X			
5.6	Luminous Flux	X			
5.7	Maintenance of Luminous Flux	X			
5.8	Out-of-Focus Test	X			
5.9	Impact	X			
5.10	Aiming Adjustment	X			
5.11	Lens Inward Force	X			
5.12	Torque Deflection	X			
5.13	Deflection Test-Replaceable Headlamp Bulbs	X			
5.14	Sealing	X			
5.15	Chemical Resistance	X			
5.16	Abrasion	X		X	
5.17	Thermal Cycle	X			
5.18	Internal Heat	X			
5.19	Humidity	X			
5.20	Filament Rated Average Lab Life	X			
6.23	Retaining Ring Requirements		X		X
6.24	Dimensions		X		X
7.2	Photometric Design		X		X
7.4	Filament Life				X

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

8. Replaceable Bulb Filament Dimensions and Location Tests

8.1 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 in the following paragraphs. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

8.1.1 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

8.1.2 HIGH BEAM FILAMENT LOCATION TEST—The location shall be determined as indicated in 8.1.1.

8.1.3 LOW BEAM FILAMENT LOCATION—Production bulbs (refer to Figure 38).

8.1.3.1 *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.

8.1.3.2 *Vertical*—The low beam filament vertical or up/down location shall be measured in the side view from a horizontal plane through the base centerline to the center of the smallest rectangle which encloses the low beam filament image.

8.1.3.3 *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.

8.1.4 HIGH BEAM FILAMENT LOCATION—Production bulbs (refer to Figure 38).

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

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

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

8.2 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 in the following paragraphs. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

8.2.1 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

8.2.2 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

8.2.3 HIGH BEAM FILAMENT LOCATION

8.2.3.1 Production Bulbs

a. 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.
b. Vertical—Same as 8.2.3.1.a.
c. Transverse—Same as 8.2.3.1.a.

8.2.3.2 Accurate Rated Bulbs

a. 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.
b. Vertical

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.
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.

c. Transverse

1. End Coils—Same as 8.2.3.2.b
2. Center Section—Same as 8.2.3.2.b

8.2.4 LOW BEAM FILAMENT LOCATION

8.2.4.1 Production Bulbs

a. Axial—Same as 8.2.3.1.a, except Figure 51
b. Vertical—Same as 8.2.4.1.a
c. Transverse—Same as 8.2.4.1.a

8.2.4.2 Accurate Rated Bulbs

a. Axial—Same as 7.2.3.1.a, except Figure 53
b. Vertical

1. End Coils—Same as 7.2.3.2.b, except Figure 53
2. Center Section—Same as 7.2.3.2.b, except Figure 53

c. Transverse

1. End Coils—Same as 7.2.3.2.c
2. Center Section—Same as 7.2.3.2.c

8.2.5 VIEWING DIRECTION FOR HB3 (9005) AND HB4 (9006)—The recommended perpendicular viewing directions are listed as follows. 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 in Figures 43, 46, 51, and 53 are to be rotated to the perpendicular viewing directions specified by the manufacturer.

8.3 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 as follows. For the actual conduct of these measurements, gaging standards shall be used for equipment calibration purposes.

8.3.1 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

8.3.2 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

8.3.3 LOW BEAM FILAMENT LOCATION—Production bulbs (refer to Figure 59).

8.3.3.1 *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."

8.3.3.2 *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.

8.3.3.3 *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.

8.3.4 HIGH BEAM FILAMENT LOCATION—Production bulbs (refer to Figure 59).

8.3.4.1 *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.

8.3.4.2 *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 8.3.3.2. This location shall not exceed 1.6X the diameter of the high beam filament coil.

8.3.4.3 *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 7.3.3.3. 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.

8.4 Methods of Measuring Internal Elements of H4/HB2 Bulbs—These paragraphs specify the methods of measuring internal elements of H4 and HB2 bulbs.

8.4.1 GENERAL TEST CONDITIONS

8.4.1.1 The bulb shall be measured in a horizontal operating position.

8.4.1.2 Each filament shall be aged for approximately 1 h at test voltage. Immediately prior to a measurement, the filament shall be operated for a minimum of 2 min at test voltage.

8.4.1.3 Measurements of filaments are carried out at test voltage.

8.4.2 REFERENCE PLANE, REFERENCE AXIS, AND PLANES FOR MEASUREMENTS

8.4.2.1 *Reference Plane*—The reference plane is the plane formed by the seating points of the three lugs.

8.4.2.2 *Reference Axis*—The reference axis is perpendicular to the reference plane and passed through the center of the outer circle with diameter M of the base-ring.

8.4.2.3 *Plane V-V*—Plane V-V is the plane perpendicular to the reference plane and contains the reference axis and the centerline of the reference lug.

8.4.2.4 *Plane H-H*—Plane H-H is the plane perpendicular to the reference plane and plane V-V and contains the reference axis.

8.4.2.5 *Plane X-X*—Plane X-X is the plane perpendicular to the reference plane, contains the reference axis, and has an angle of 15 degrees to plane H-H turned clockwise away from the reference lug.

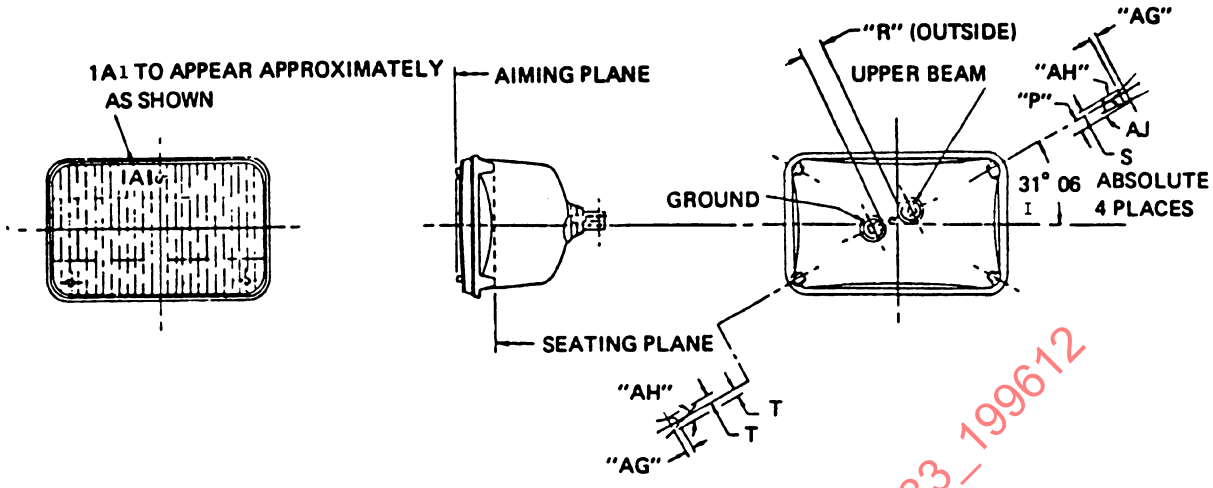
8.4.2.6 *Plane Y_1-Y_1*—Plane Y_1-Y_1 is a plane parallel to the reference plane at a distance of 29.5 mm from it.

8.4.2.7 *Plane Y_2-Y_2*—Plane Y_2-Y_2 is a plane parallel to the reference plane at a distance of 33.0 mm from it.

8.4.2.8 *Plane Y_3-Y_3*—Plane Y_3-Y_3 is a plane parallel to the reference plane at a distance of 23.5 mm from it.

8.4.2.9 *Plane Y_4-Y_4*—Plane Y_4-Y_4 is a plane parallel to the reference plane at a distance of 26.0 mm from it.

8.4.2.10 *Plane Y_5-Y_5*—Plane Y_5-Y_5 is a plane parallel to the reference plane at a distance of 28.95 mm from it.



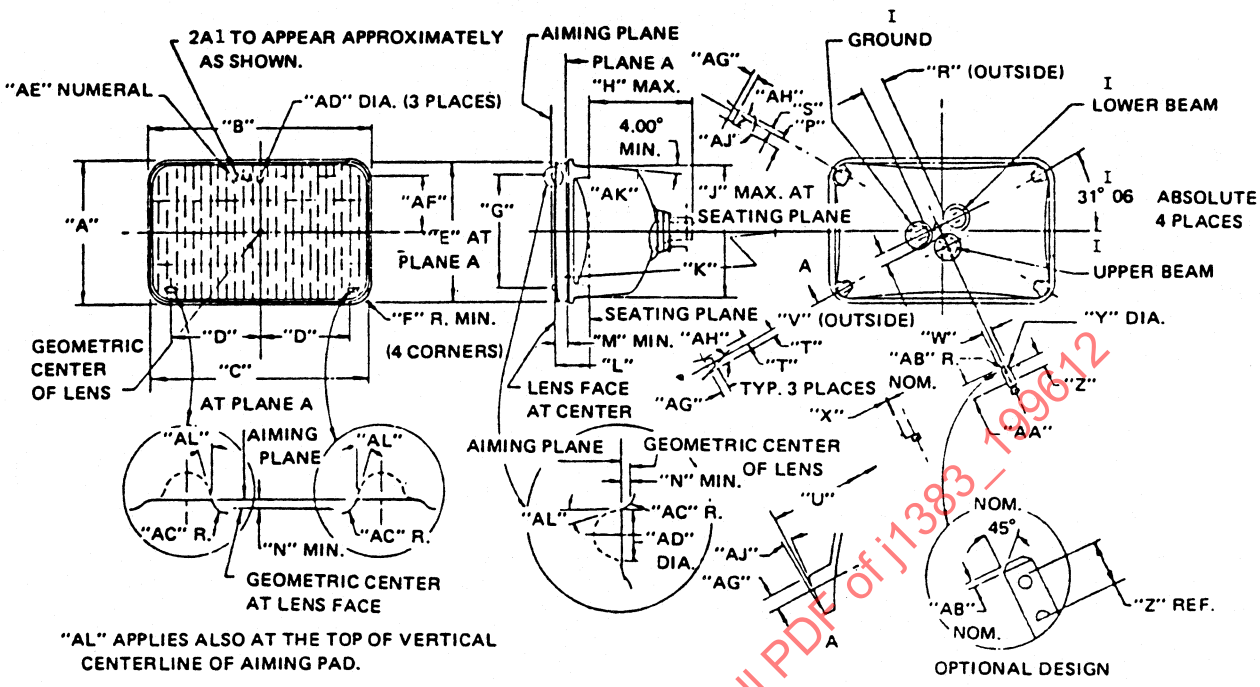
I - INTERCHANGEABILITY DIMENSION. OTHER DIMENSIONS ARE FOR DESIGN PURPOSES ONLY.

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	$0.122^{+0.015}_{-0.010}$	$3.10^{+0.38}_{-0.25}$

TYPE 1A1 HEADLAMP 100 × 165 mm RECTANGULAR

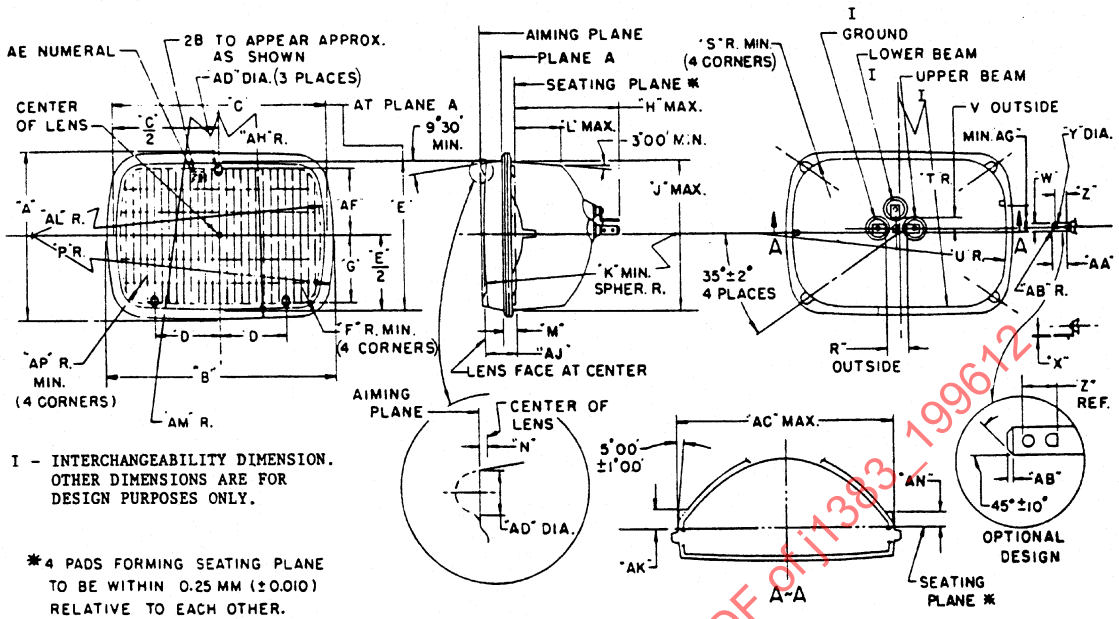
FIGURE 20—TYPE 1A1 HEADLAMP 100 x 165 mm RECTANGULAR



	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



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

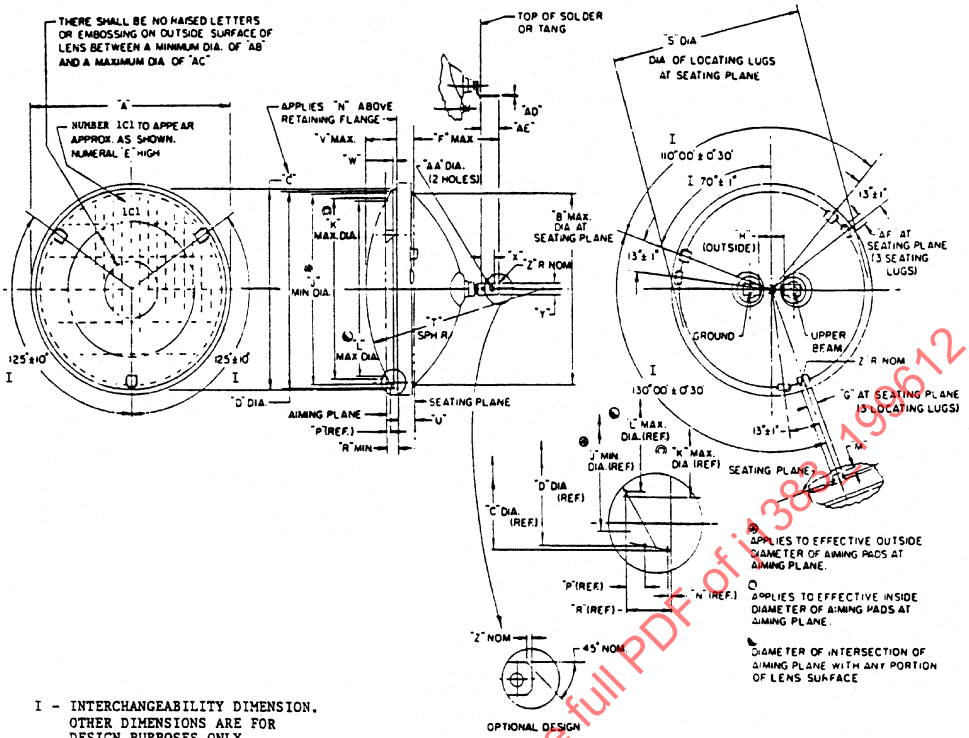
*4 PADS FORMING SEATING PLANE TO BE WITHIN 0.25 MM (±0.010) RELATIVE TO EACH OTHER.

	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 −0.3	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	2401.5 ± 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	13.58 +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 x 200 mm RECTANGULAR



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

DIMENSIONS

Letter	in	mm	Letter	in	mm
I A	$5.700^{+0.000}_{-0.100}$	$144.78^{+0}_{-2.54}$	Y	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 M	$0.670^{+0.035}_{-0.000}$	$17.01^{+0.88}_{-0}$	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

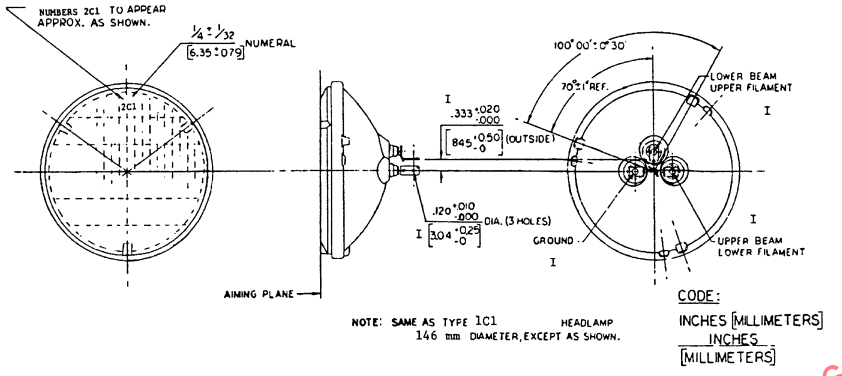
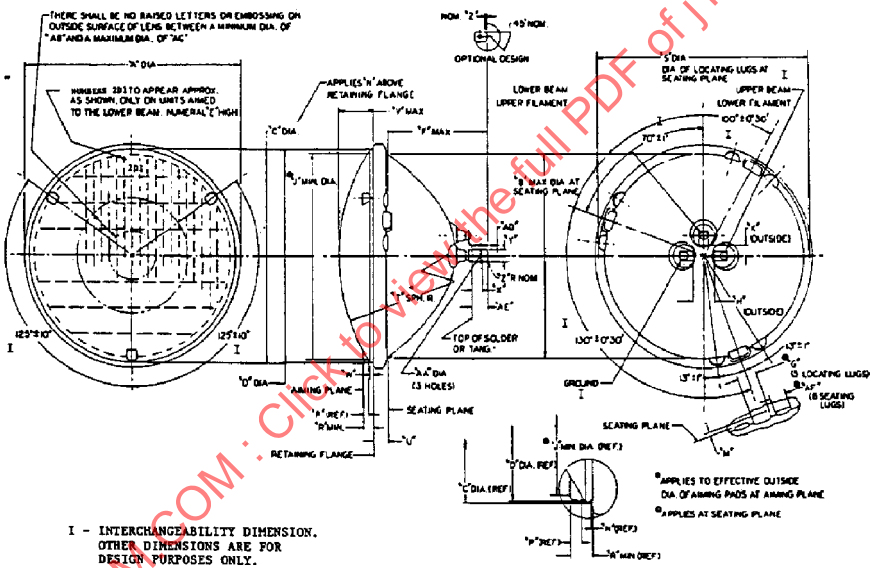


FIGURE 24—TYPE 2C1 HEADLAMP



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 – 6.673	167.52 – 169.54		V	1.150	29.21
	E	3/16 ±1/32	9.52 ±0.79		W	0.075 +0.062 −0.000	1.98 +1.57 −0
I	P	3.500	88.90				
I	G	0.575 +0.000 −0.025	14.60 +0 −0.63	I	X	0.345 +0.060 −0.000	8.76 +1.52 −0
I	H	0.670 +0.035 −0.000	17.01 +0.88 −0	I	Y	0.304 +0.016 −0.000	7.72 +0.40 −0
I	J	6.450	163.83		Z	0.06	1.52
I	K	0.333 +0.020 −0.000	8.45 +0.50 −0	I	AA	0.120 +0.010 −0.000	3.04 +0.25 −0
					AB	1.50	38.10
I	M	0.104 +0.100 −0.000	2.69 +2.54 −0		AC	3.60	91.44
	N	0.030	0.76	I	AD	0.030 ±0.002	0.76 ±0.05
	P	0.180	4.57		AE	0.535 +0.000 −0.079	13.58 +0 −1.77
I	R	0.350	8.89		AF	0.50 ±0.25	12.70 ±6.35

FIGURE 25—TYPE 2D1 HEADLAMP 178 mm DIAMETER

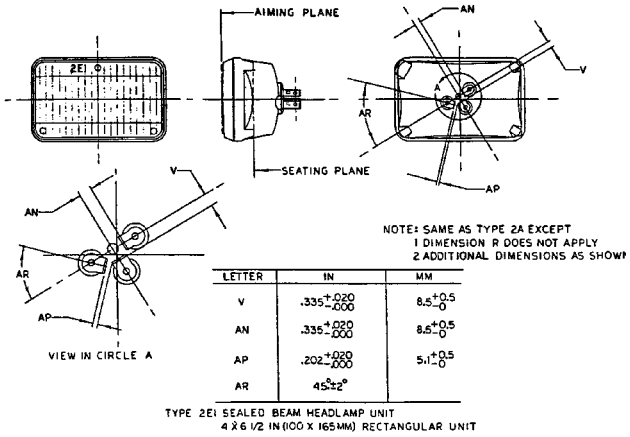


FIGURE 26—TYPE 2E1 HEADLAMP 100 x 165 mm RECTANGULAR

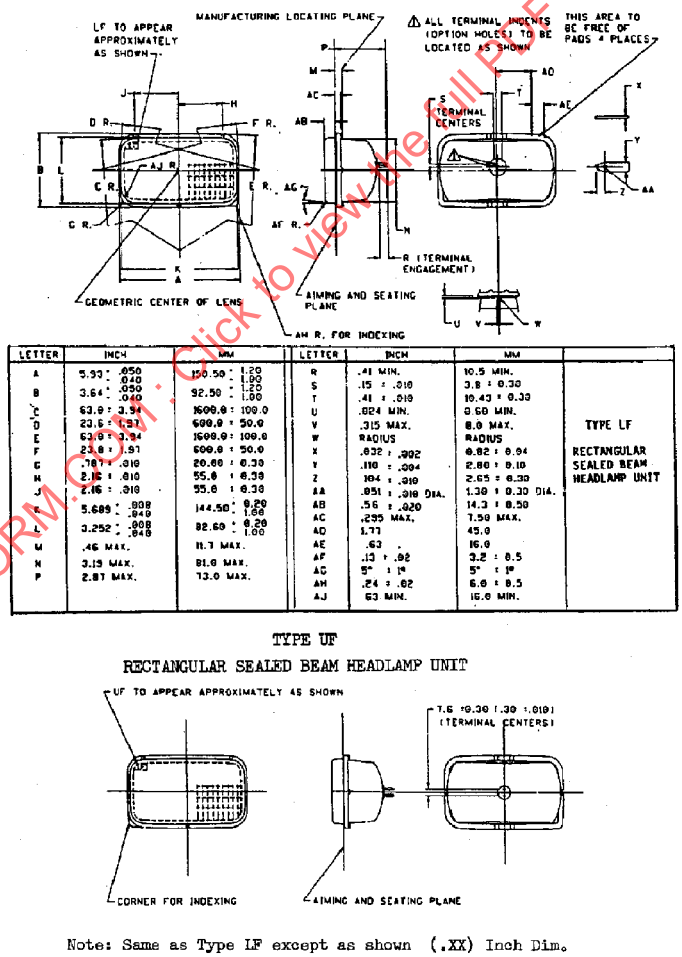
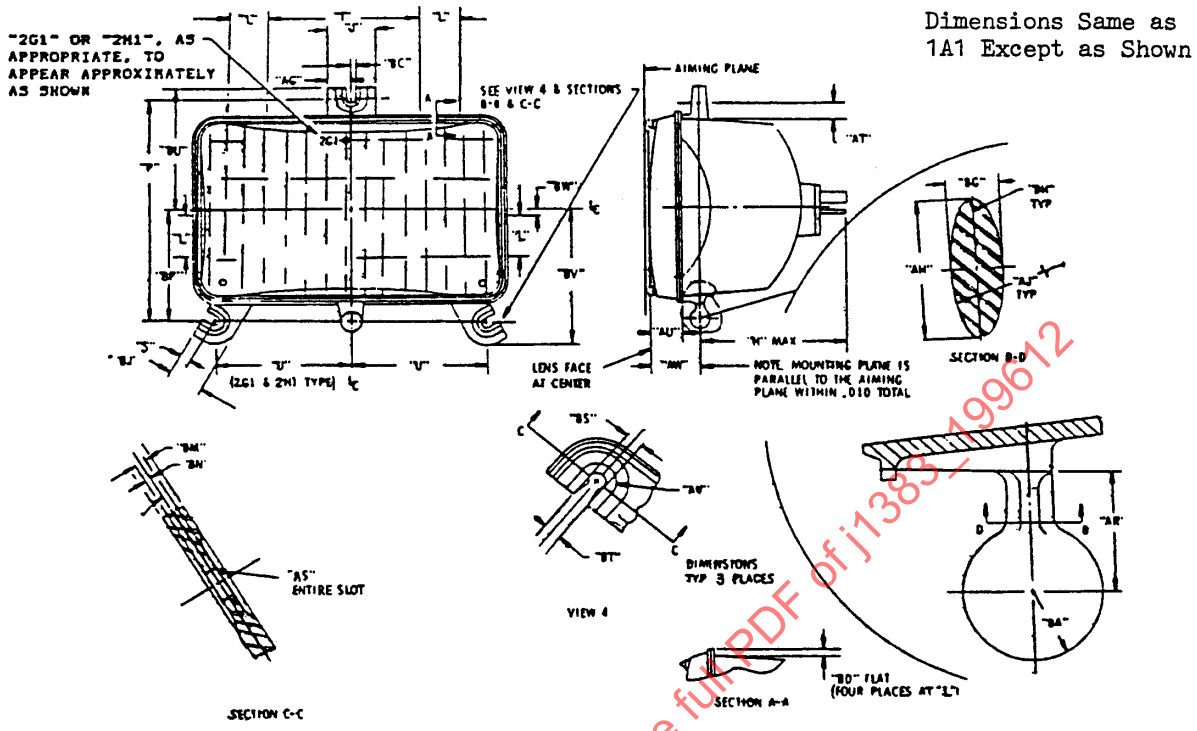
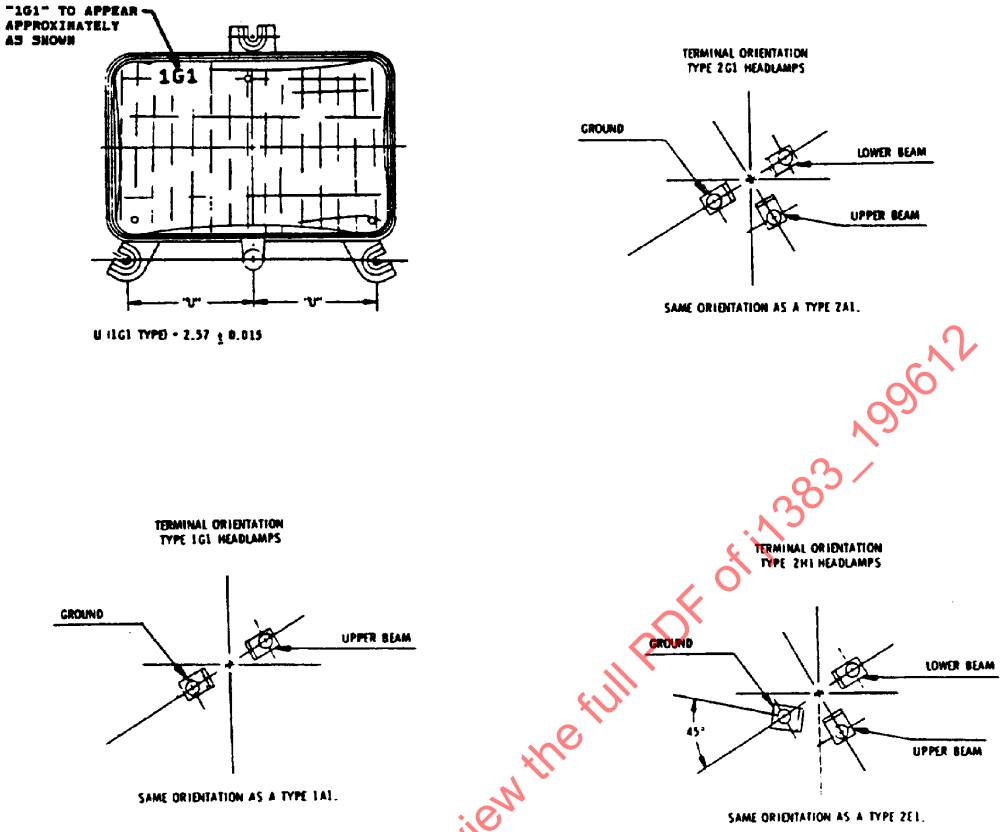


FIGURE 27—TYPE “UF” AND “LF” HEADLAMPS 92 x 150 mm RECTANGULAR



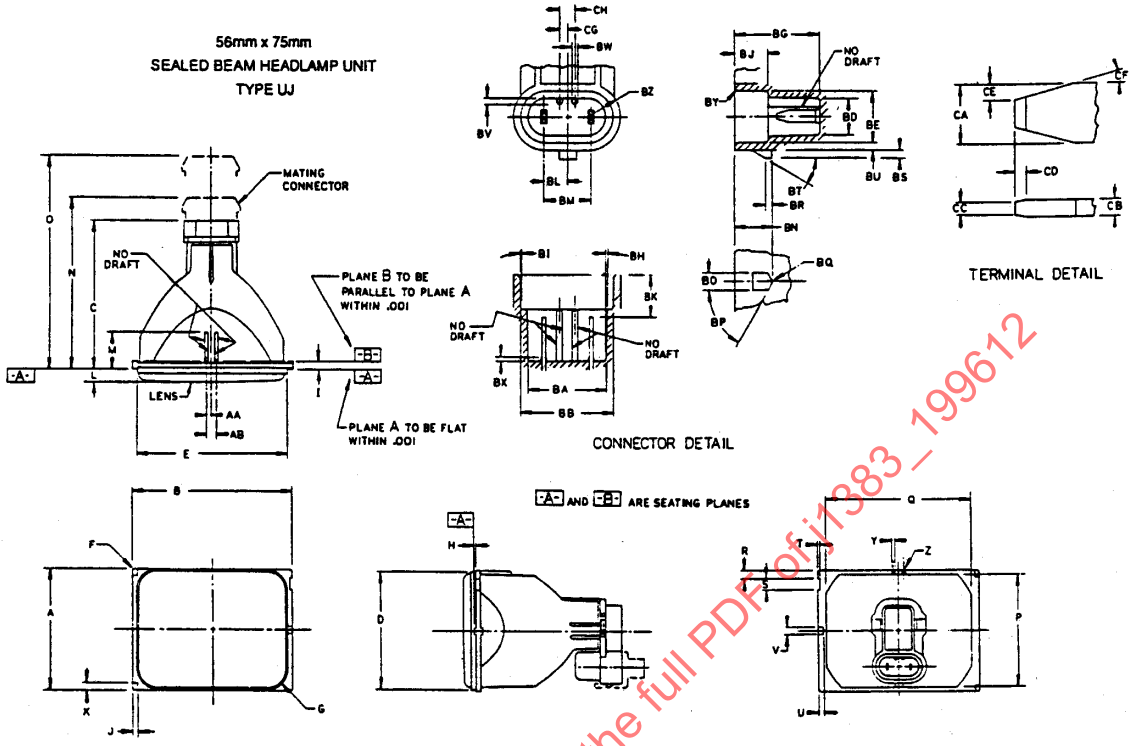
Letter	mm	Letter	mm.
H MAX	88.87 ± 0.38 I	BA	5.59 SPHER.R I
J	25.40 ± 0.38	BC	5.00 ± 0.13 I
L	31.75 MIN.	BD	1.02 MIN. I
P	121.92 ± 0.66 I	BG	3.81 ± 0.25 I
S	6.35± 0.13 I	BH	0.81R
T	97.40 ± 0.25	BJ	18.29 ± 0.38
U	71.63 ± 0.38 I	BM	1.62 ± 0.10 I
AG	12.70 ± 0.25	BN	0.81 ± 0.10 I
AH	10.41 ± 0.25 I	BP	62.23 ± 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 28A—TYPES 1G1, 2G1, AND 2H1 HEADLAMPS 100 x 165 mm RECTANGULAR



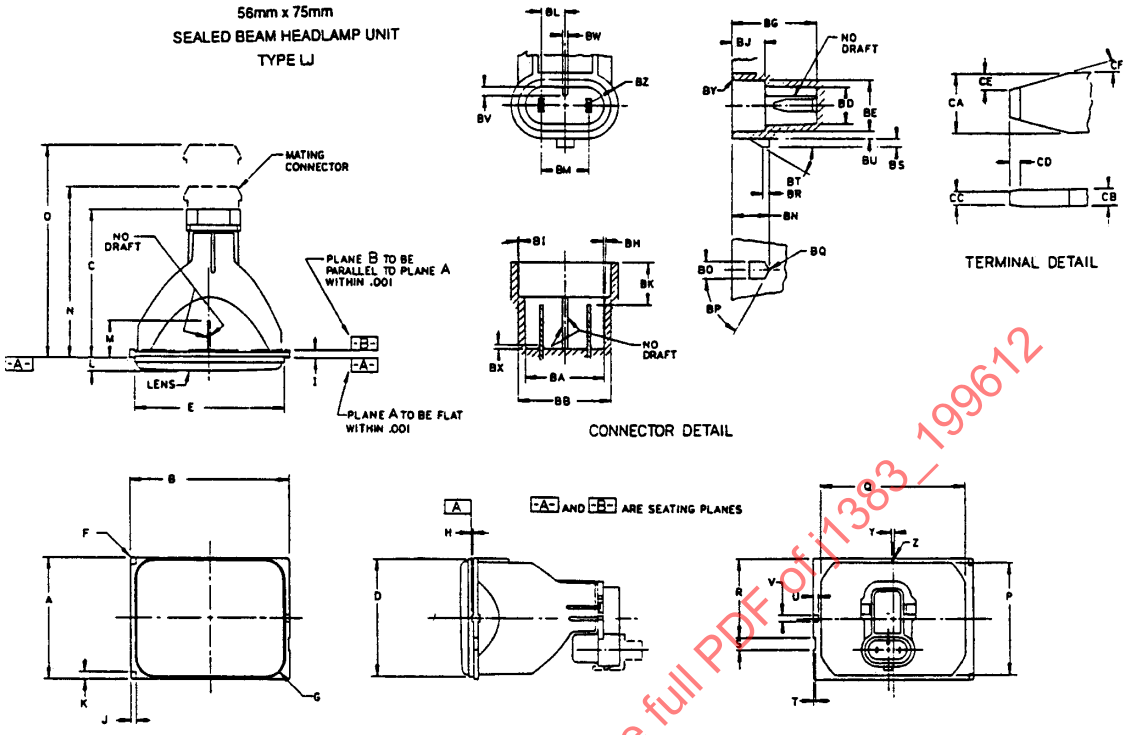
Noninterchangeability Configurations for Integral Mount Sealed Beam Headlamps, Type G and H

FIGURE 28B—TYPES 1G1, 2G1, AND 2H1 HEADLAMPS 100 x 165 mm RECTANGULAR (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	TOLERANCES UNLESS OTHERWISE SPECIFIED (INCHES):		
Q	2.656 MAX	67.46	BM	.434	11.02			
R	.140	3.560	BN	.346	8.79	2 PLACE DECIMAL ±.01		
S	.200	5.08	BO	.158	4.01	3 PLACE DECIMAL ±.005		
T	.040	1.02	BP	60°	60°	ANGULAR ±1°		
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			

FIGURE 29—SEALED BEAM HEADLAMP UNIT TYPE UJ

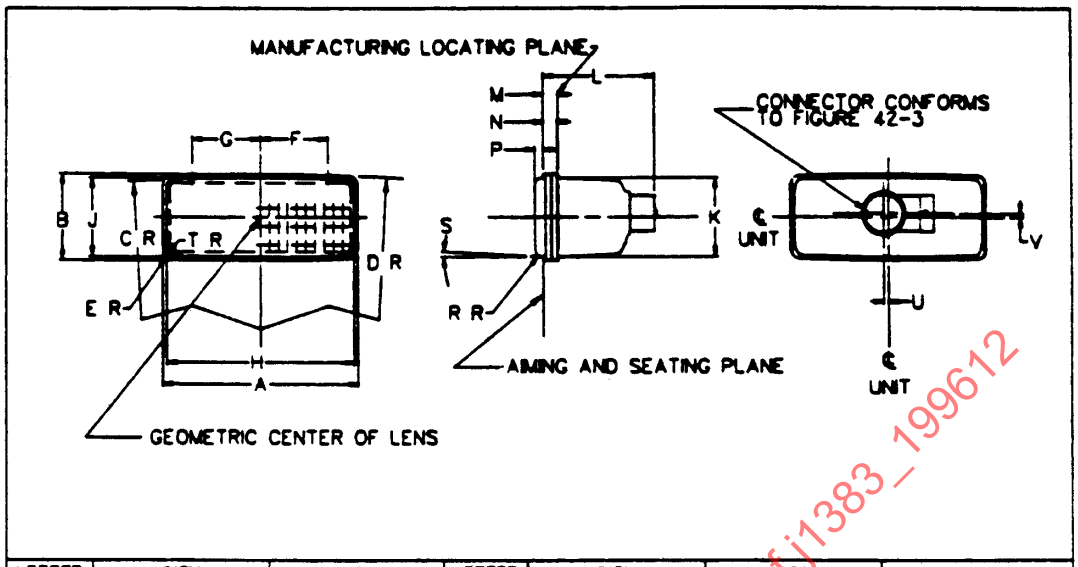


LETTER	INCH	MM	LETTER	INCH	MM	LETTER	INCH	MM
A	2.220	56.39				BW	.055	1.40
B	2.950	74.93				BX	.04X15° CON	1.0X15°
C	2.781	70.64				BY	.032 R	0.81
D	2.175	55.25				BZ	R TYP	R TYP
E	2.775	70.49	BA	.736	18.69	CA	.106-.114	2.69-2.90
F	.032 R	0.81	BB	.872	22.15	CB	.031-.034	0.79-0.86
G	.375 R	9.53				CC	.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			
L	.250 MAX	6.40	BH	1° CONSTANT	1°			
M	.73	18.50	BI	$^1/_2$° CONSTANT	$^1/_2$°			
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	1.475	37.47	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	.079	2.00			

TOLERANCES UNLESS OTHERWISE SPECIFIED (INCHES):

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

FIGURE 30—SEALED BEAM HEADLAMP UNIT LJ

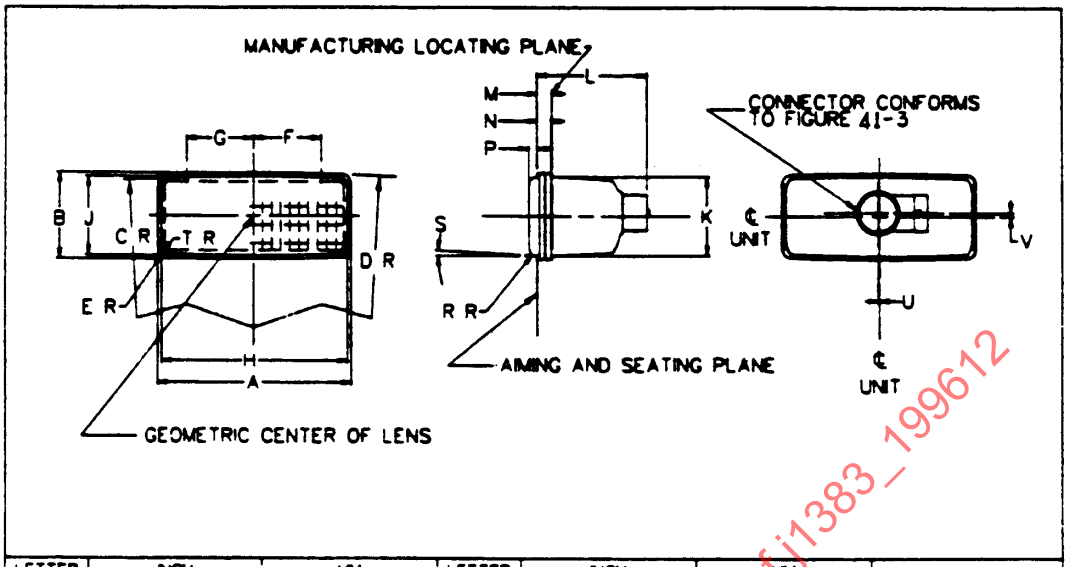


LETTER	INCH	MM	LETTER	INCH	MM
A	5.315 ± .060	135.0 ± 1.5	R	.188 ± .020	4.7 ± 0.5
B	2.362 ± .060	60.0 ± 1.5	S	3° ± 1°	3° ± 1°
C	62.4 ± 3.94	1585.0 ± 100.0	T	.19 MIN	3.2 MIN
D	62.5 ± 3.94	1587.5 ± 100.0	U	.131 ± .010	3.32 ± 0.30
E	.24 ± .010	6.4 ± 0.30	V	.104 ± .010	2.64 ± 0.30
F	1.85 ± .010	47.0 ± 0.30			
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

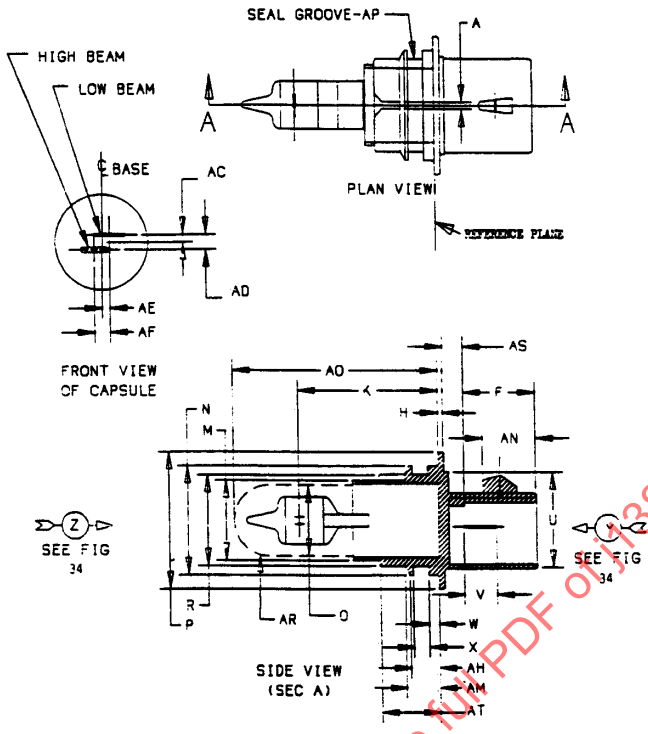


LETTER	INCH	MM	LETTER	INCH	MM
A	5.315 ± .060	135.0 ± 1.5	R	.188 ± .020	4.7 ± 0.5
B	2.362 ± .060	60.0 ± 1.5	S	3° ± 1°	3° ± 1°
C	62.4 ± 3.94	1585.0 ± 100.0	T	.19 MIN	3.2 MIN
D	62.5 ± 3.94	1587.5 ± 100.0	U	.039 ± .010	1.00 ± 0.30
E	.24 ± .010	6.4 ± 0.30	V	.104 ± .010	2.64 ± 0.30
F	1.85 ± .010	47.0 ± 0.30			
G	1.85 ± .010	47.0 ± 0.30			
H	5.106 ± .060	129.7 ± 1.5			
J	2.146 ± .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	5.8 MAX			

TYPE LK

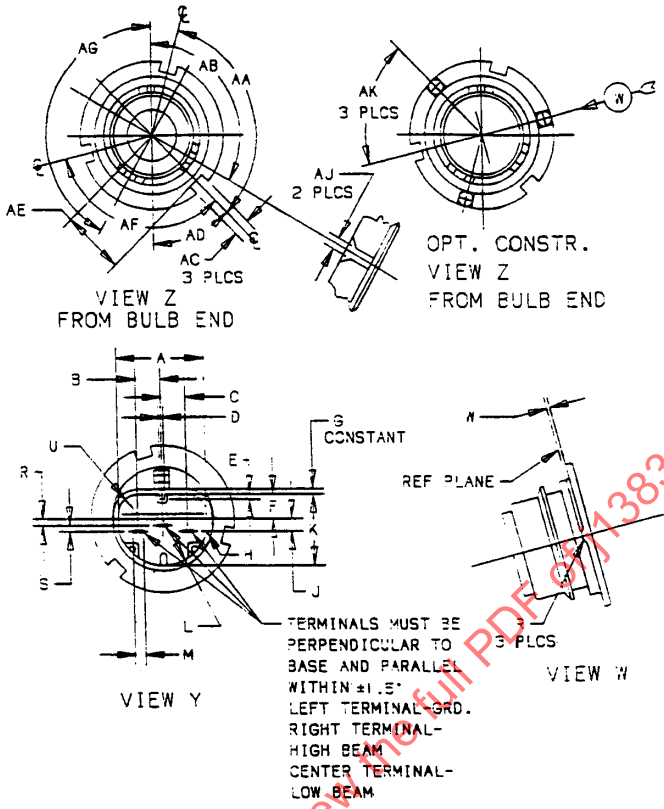
RECTANGULAR SEALDED BEAM HEADLAMP UNIT

FIGURE 32—TYPE LK RECTANGULAR SEALED BEAM HEADLAMP UNIT



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

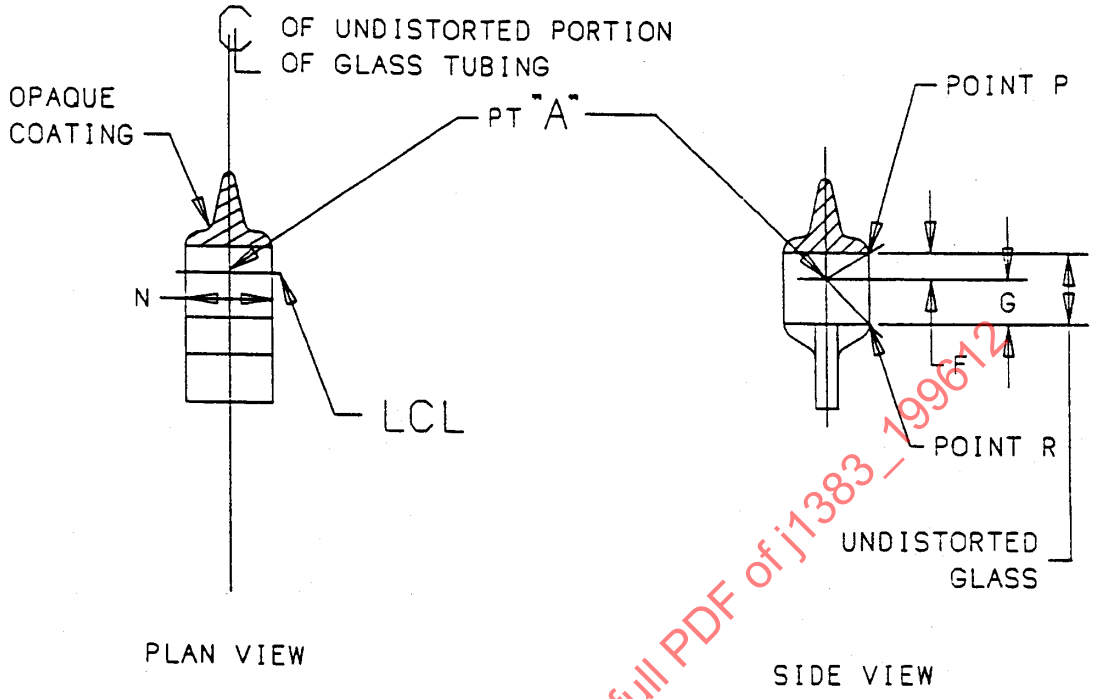
FIGURE 33—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



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°

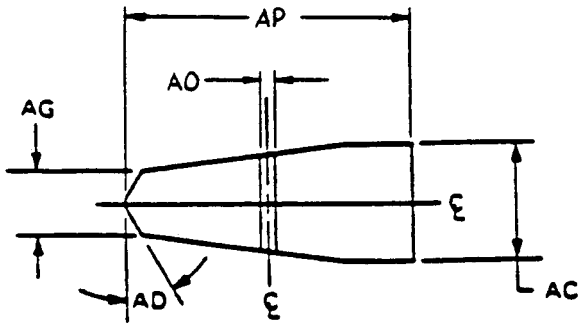
FIGURE 34—SPECIFICATION FOR THE 9004 REPLACEABLE BULB



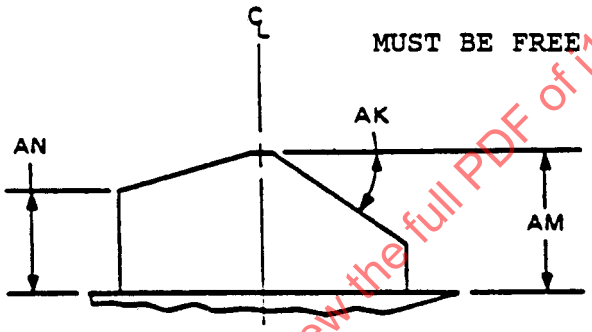
Dimensional Specifications
Figure 35

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



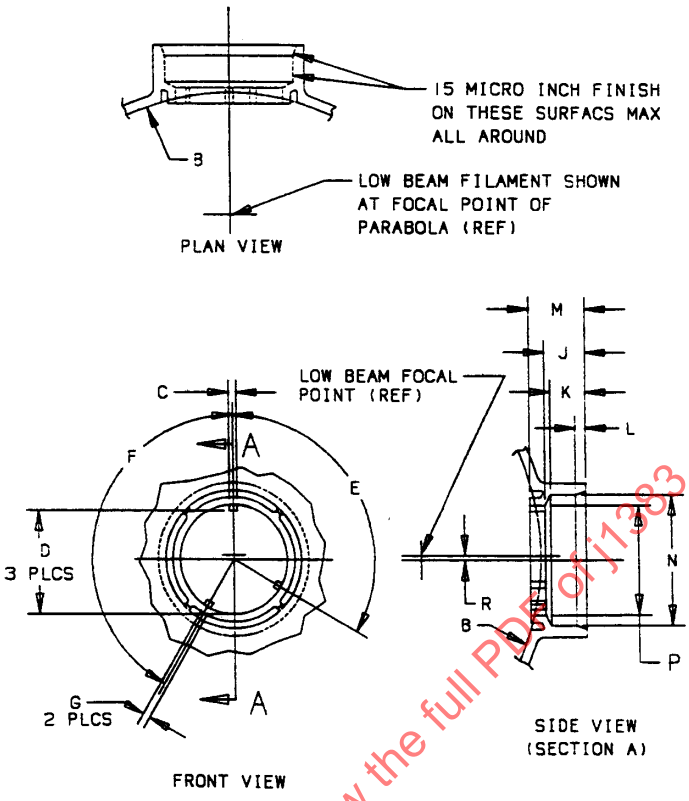
EXPLODED PLAN VIEW



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

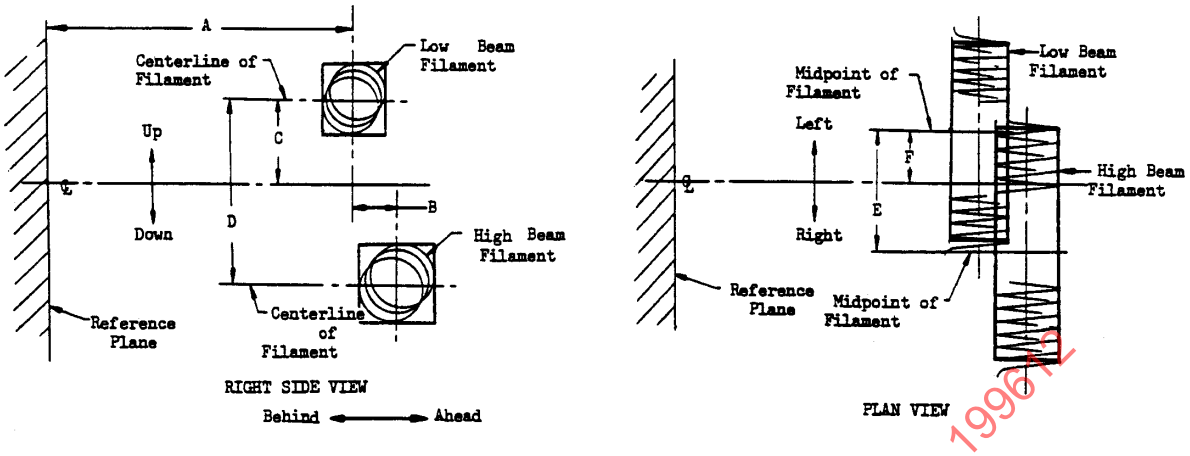
FIGURE 36—SPECIFICATION FOR THE 9004 REPLACEABLE BULB—LOCKING FEATURE



Dimension	Millimeters
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	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

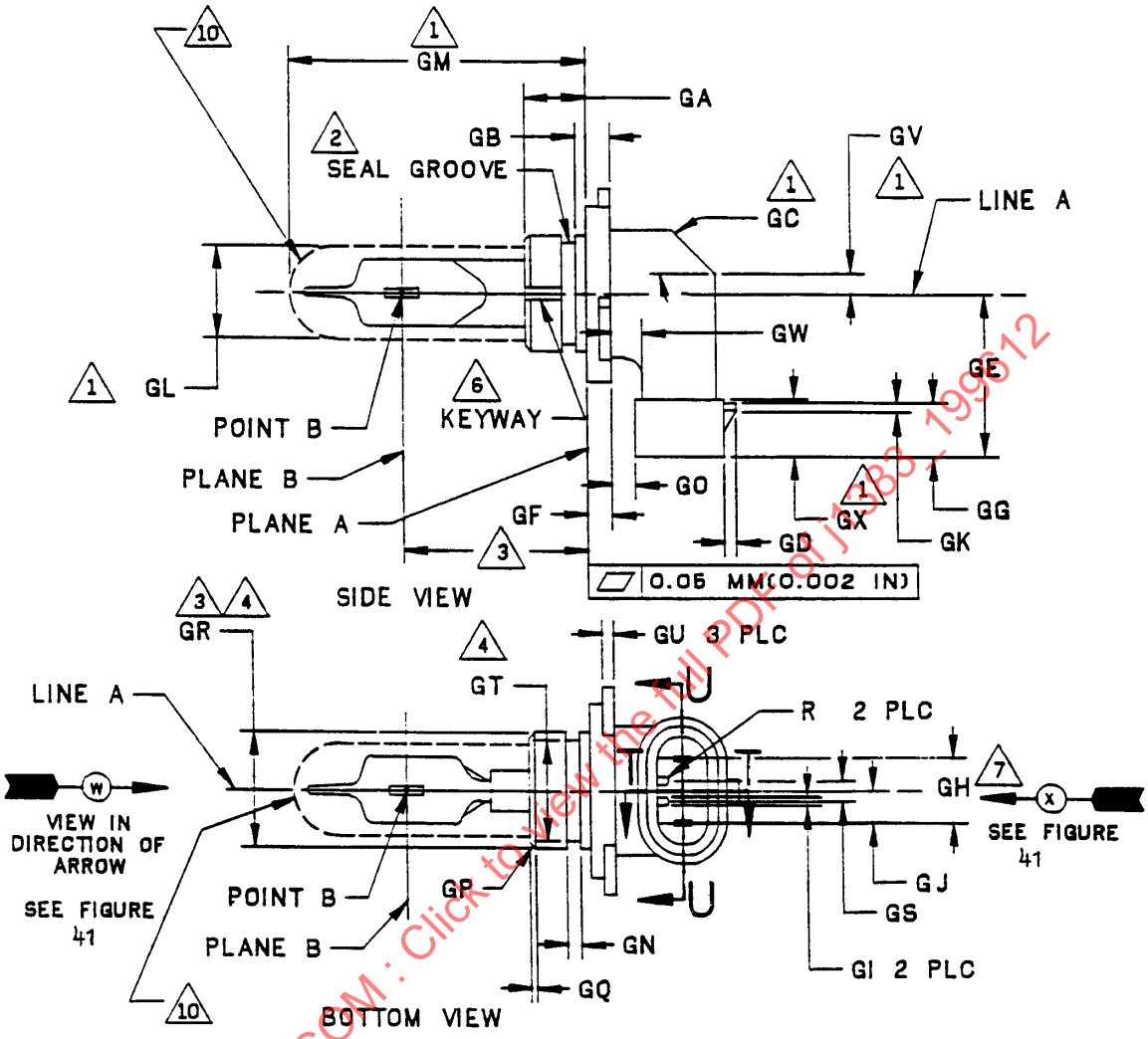


FIGURE 39A—SPECIFICAITON FOR THE 9005 REPLACEABLE BULB

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 2 PLACE DECIMALS ± .02 3 PLACE DECIMALS ± .010 ANGULAR ± 1°	millimeters 1 PLACE DECIMALS ± 0.5 2 PLACE DECIMALS ± 0.30 ANGULAR ± 1°

FIGURE 39B—SPECIFICATION FOR THE 9005 REPLACEABLE BULB (CONTINUED)

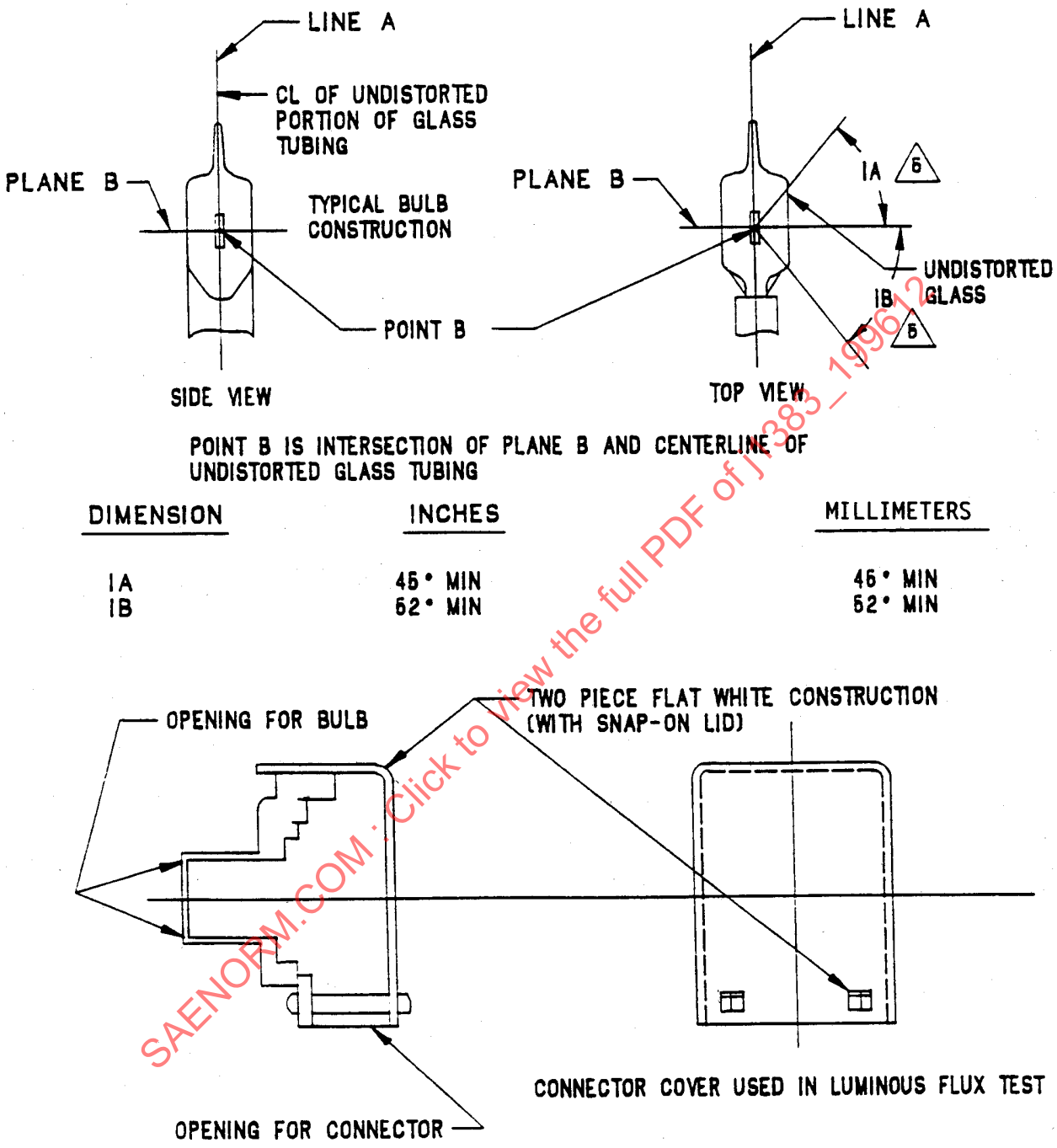
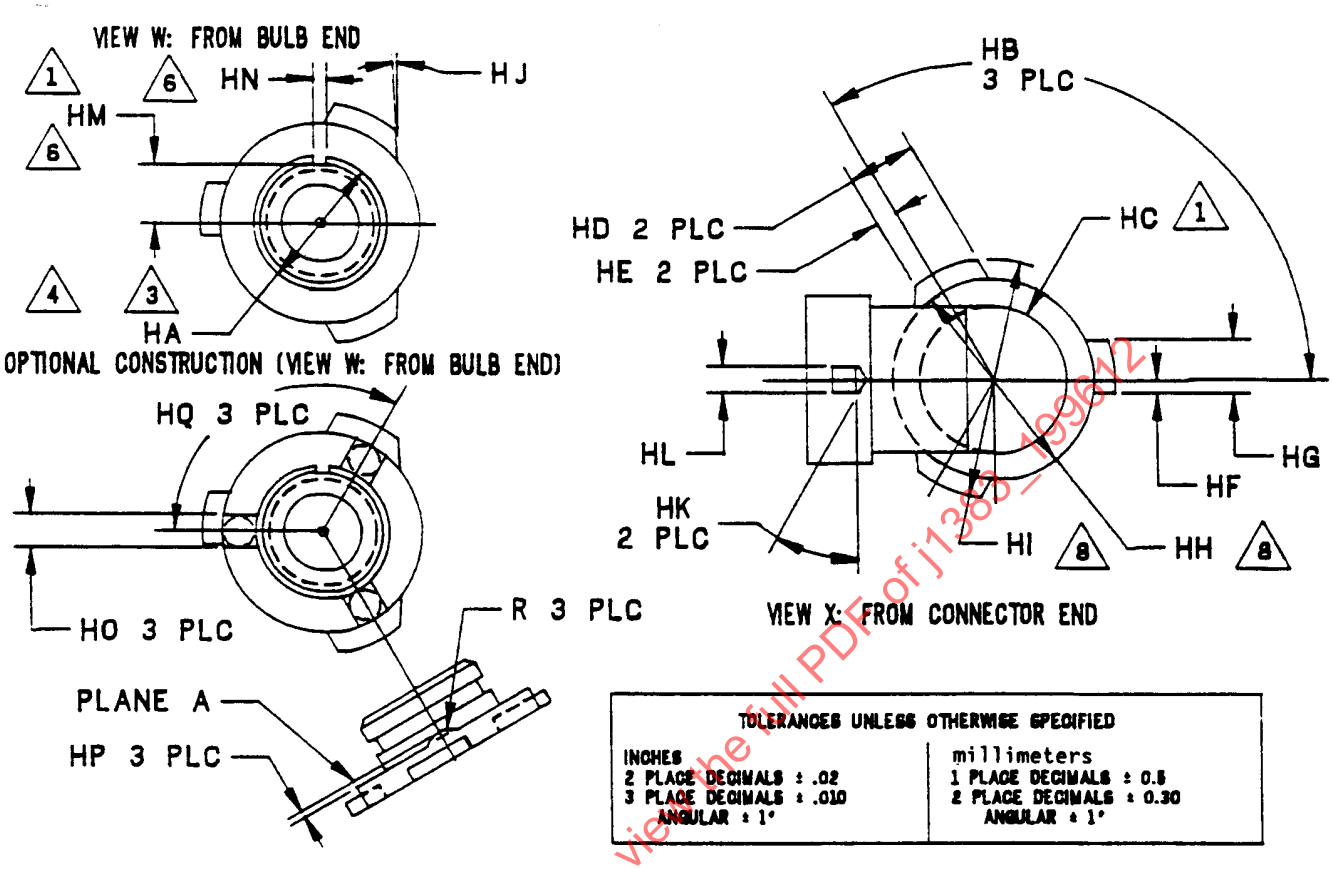


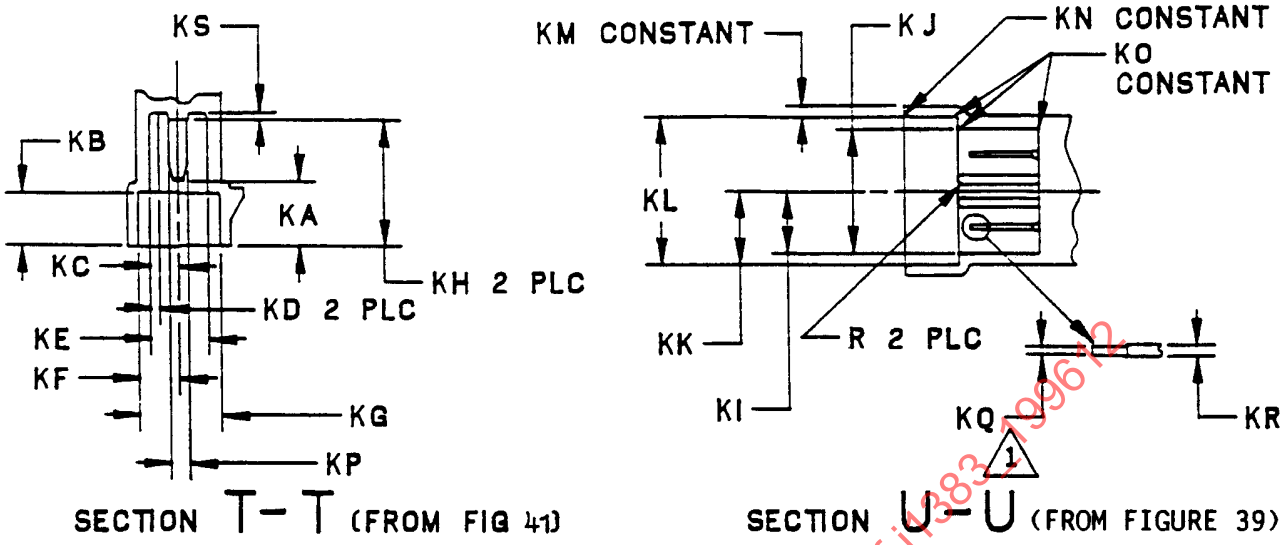
FIGURE 40—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



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



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

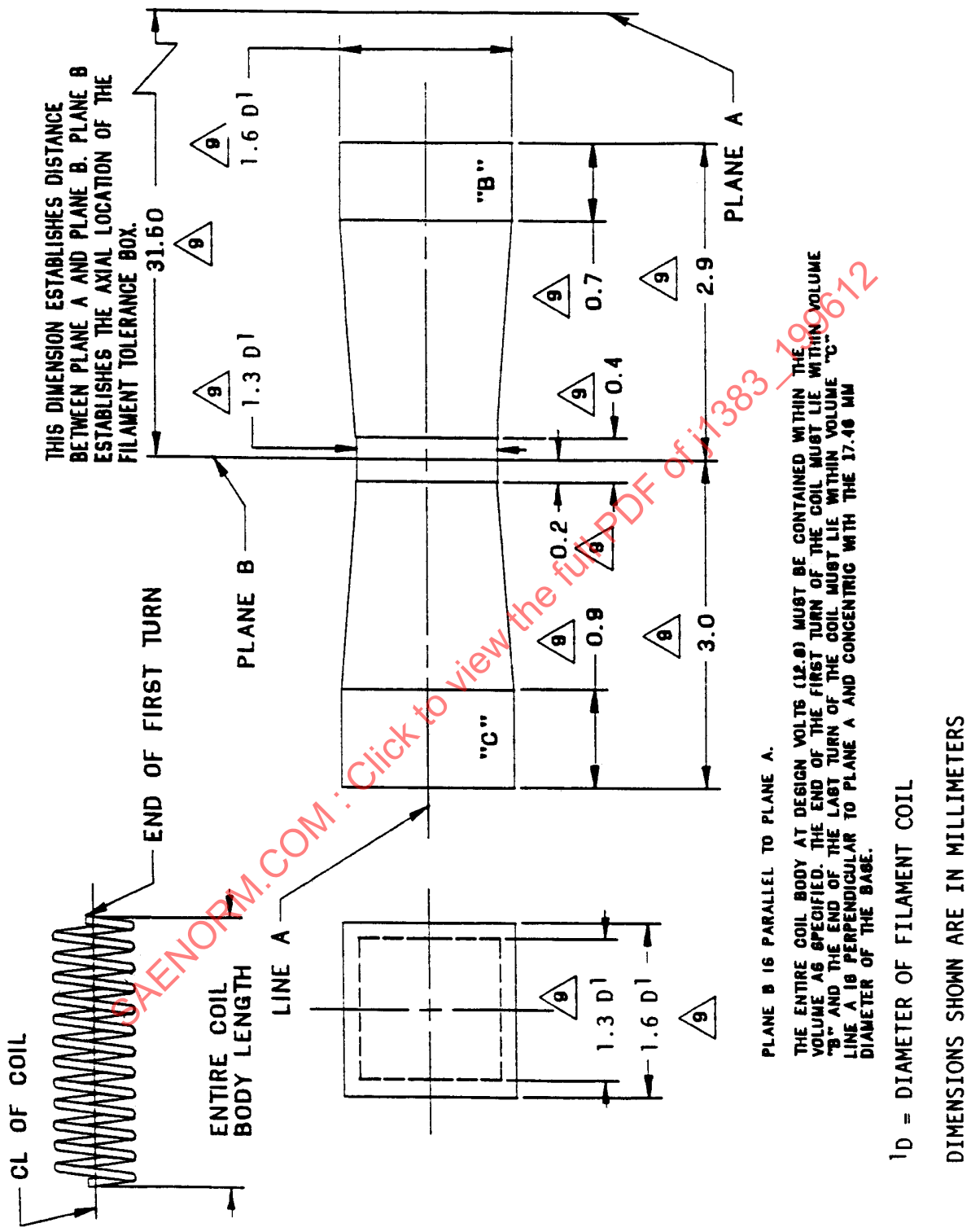
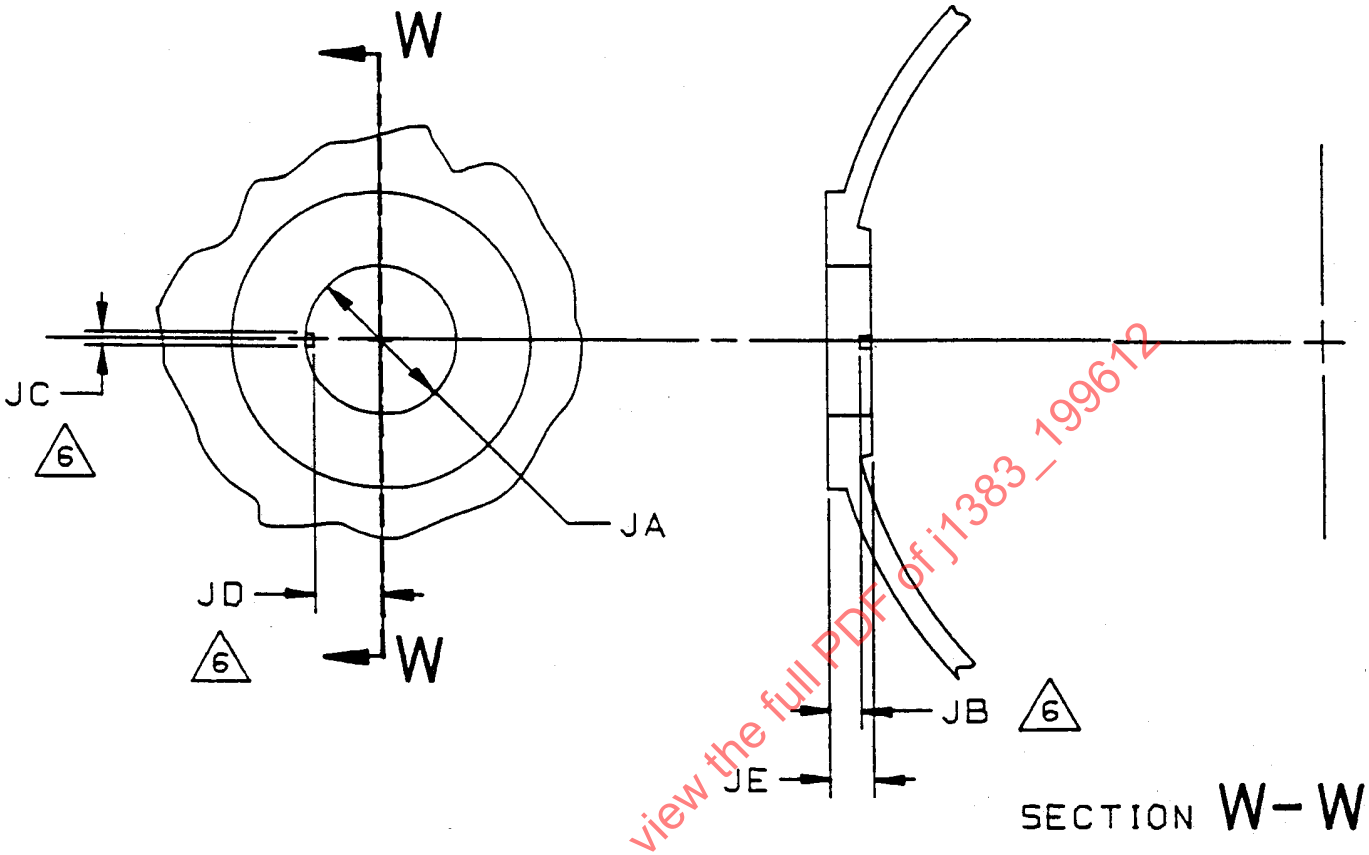


FIGURE 43—SPECIFICATION FOR THE 9005 REPLACEABLE BULB



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

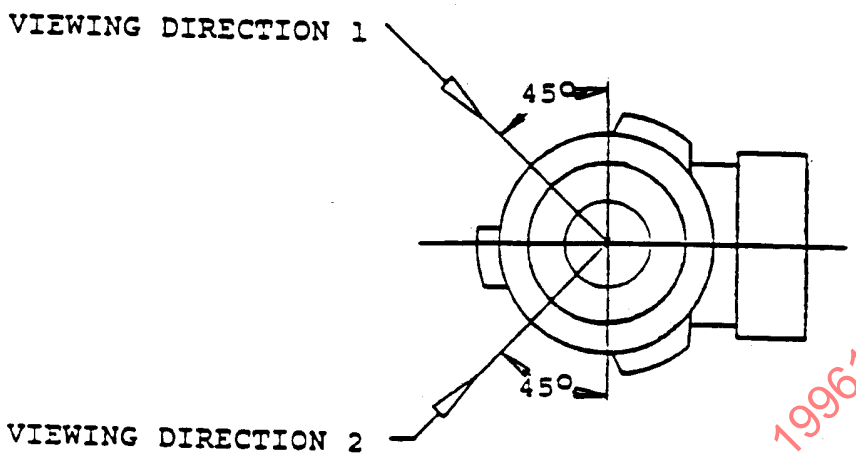


FIGURE 45—MODIFIED VIEW W FROM FIGURE 41, SIMILAR FOR 49

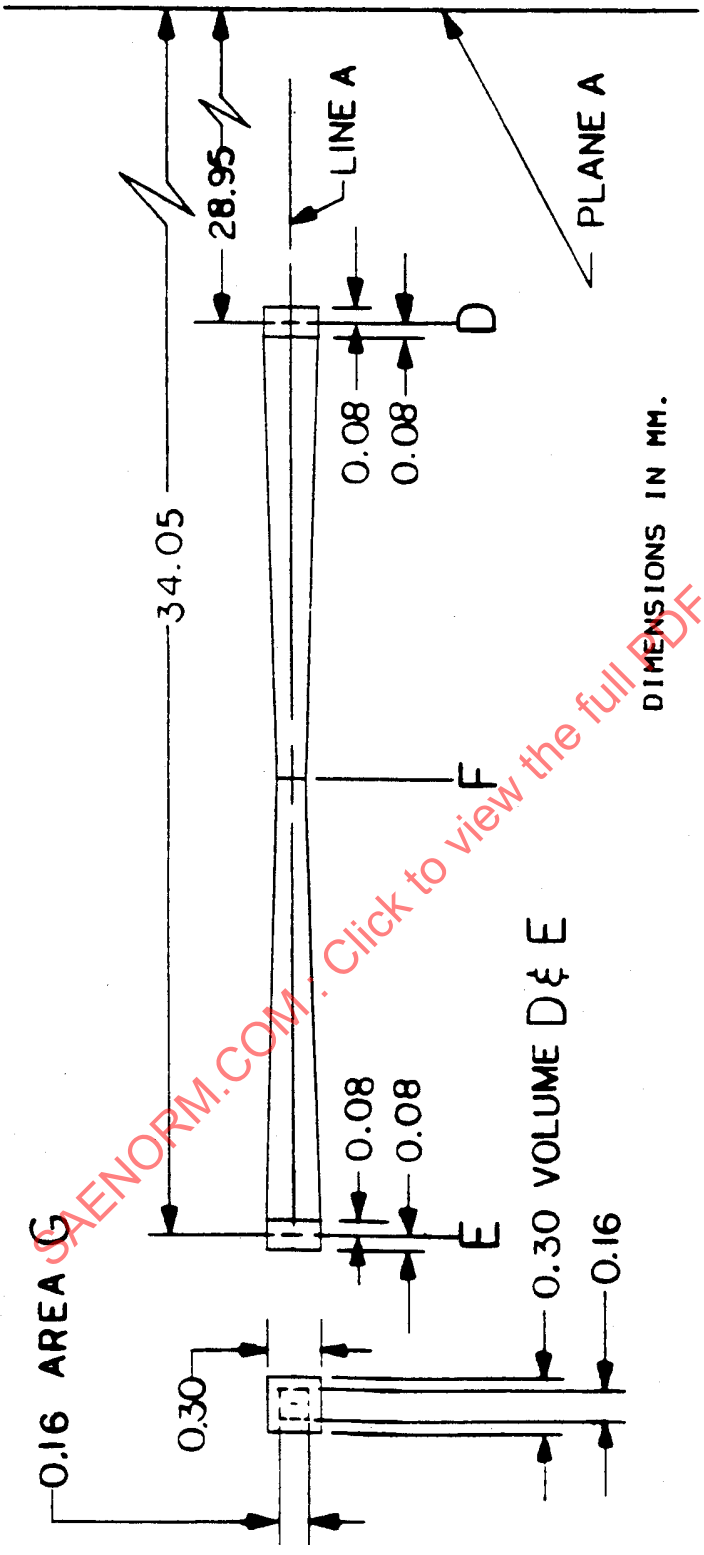


FIGURE 46—SPECIFICATION FOR THE 9005 REPLACEABLE BULB—ACCURATE RATED BULB

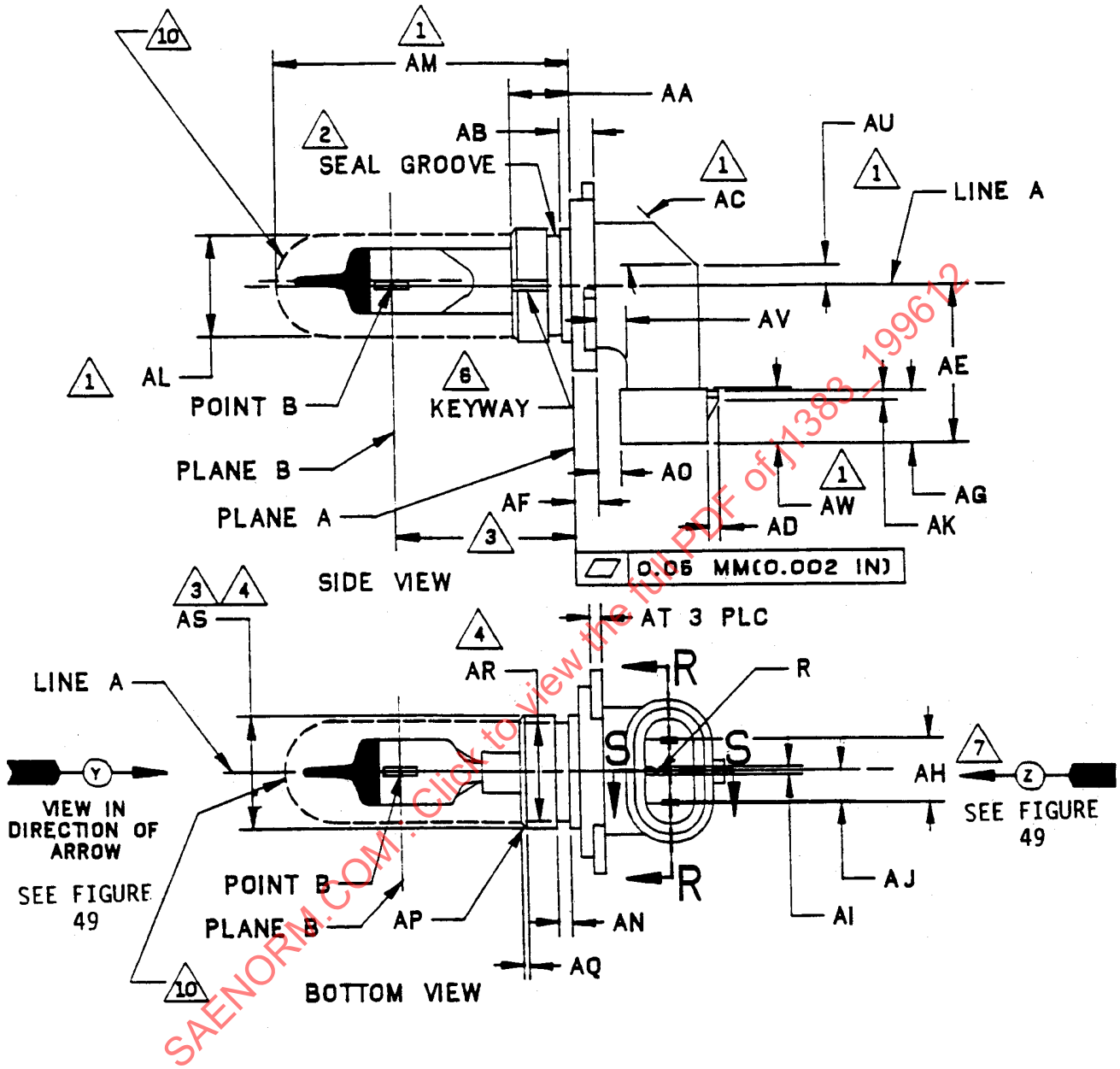


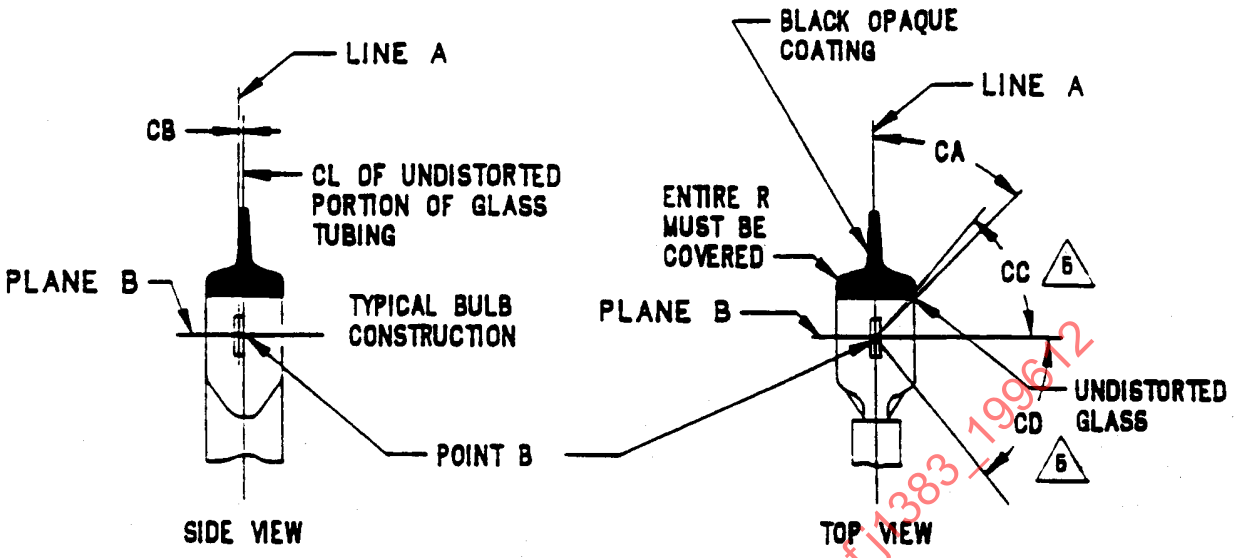
FIGURE 47A—SPECIFICATION FOR THE 9006 REPLACEABLE BULB

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 47B—SPECIFICATION FOR THE 9006 REPLACEABLE BULB (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

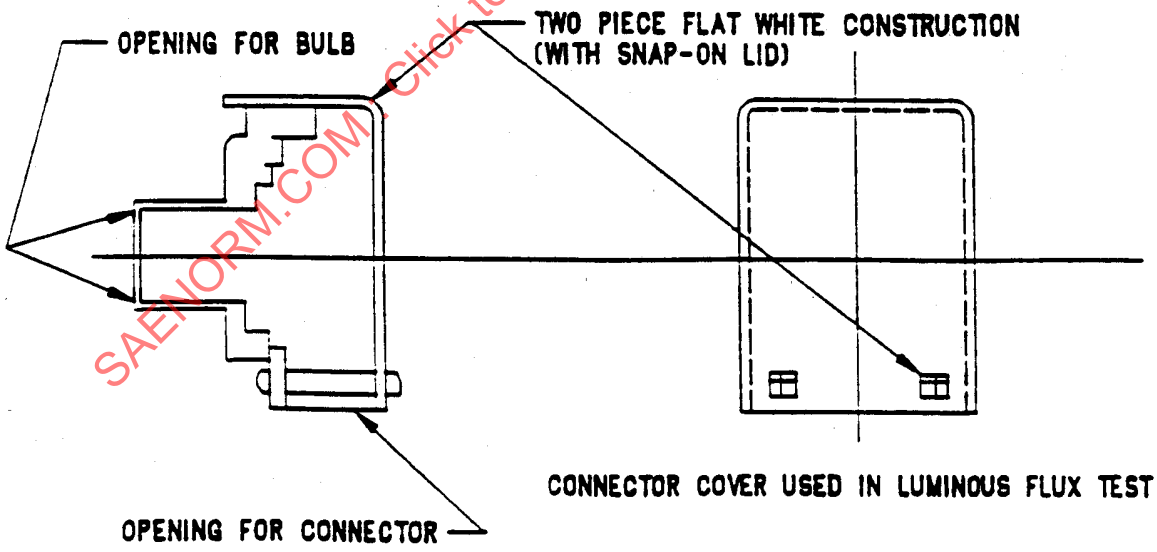
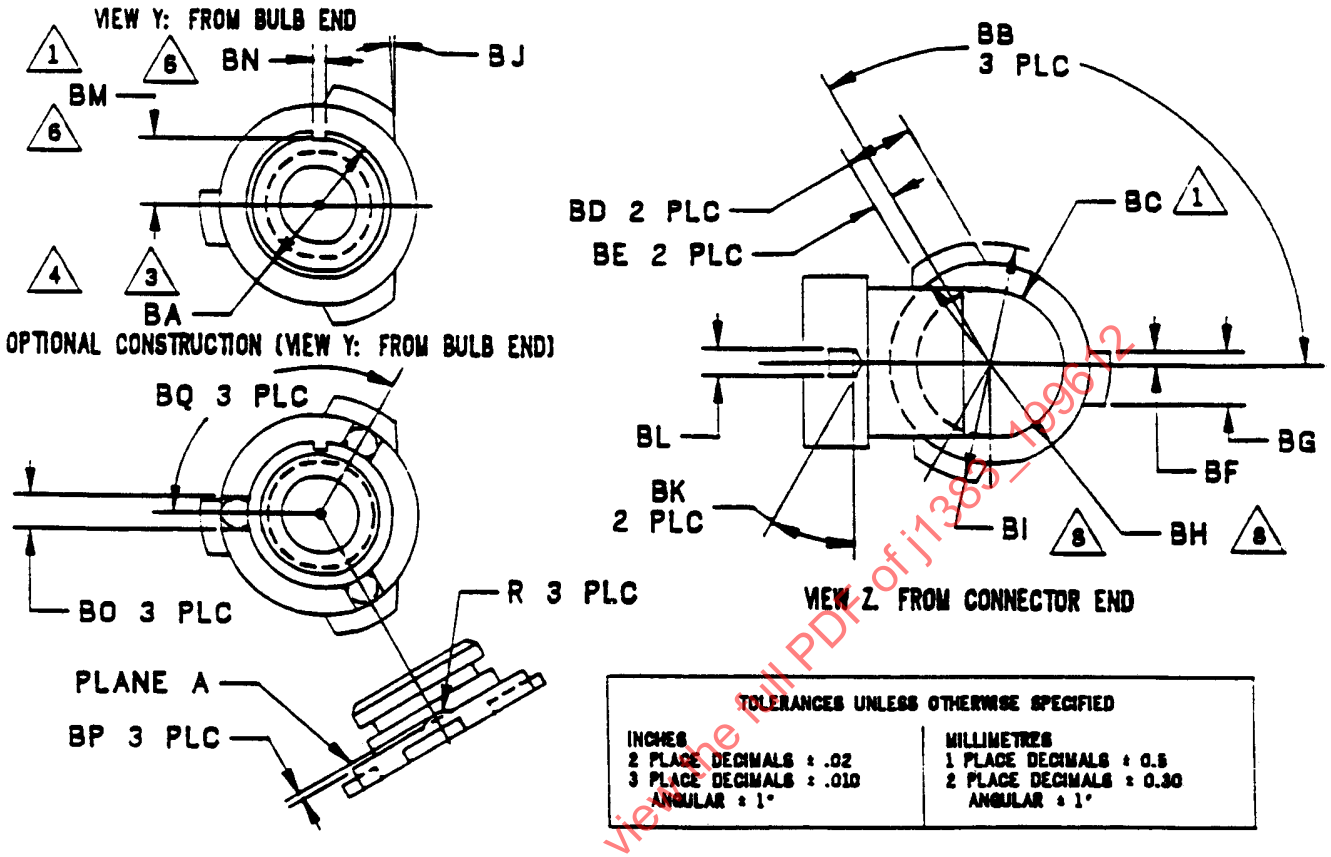


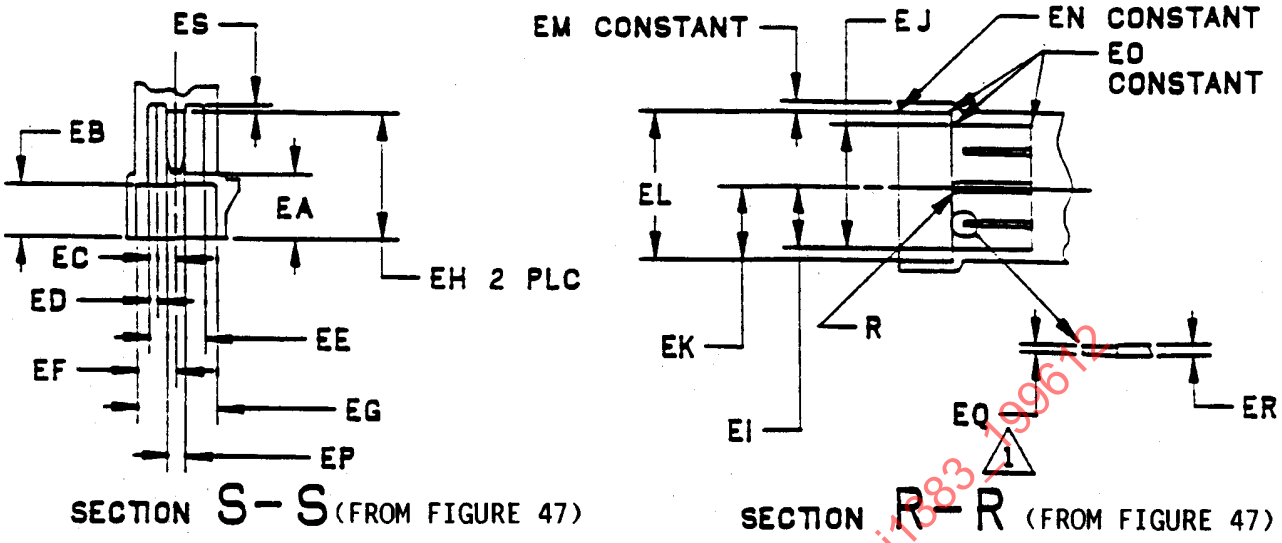
FIGURE 48—SPECIFICATION FOR THE 9006 REPLACEABLE BULB



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



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	millimeters
2 PLACE DECIMALS ± .02	1 PLACE DECIMALS ± 0.5
3 PLACE DECIMALS ± .010	2 PLACE DECIMALS ± 0.30
ANGULAR ± 1°	ANGULAR ± 1°

FIGURE 50—SPECIFICATION FOR THE 9006 REPLACEABLE BULB

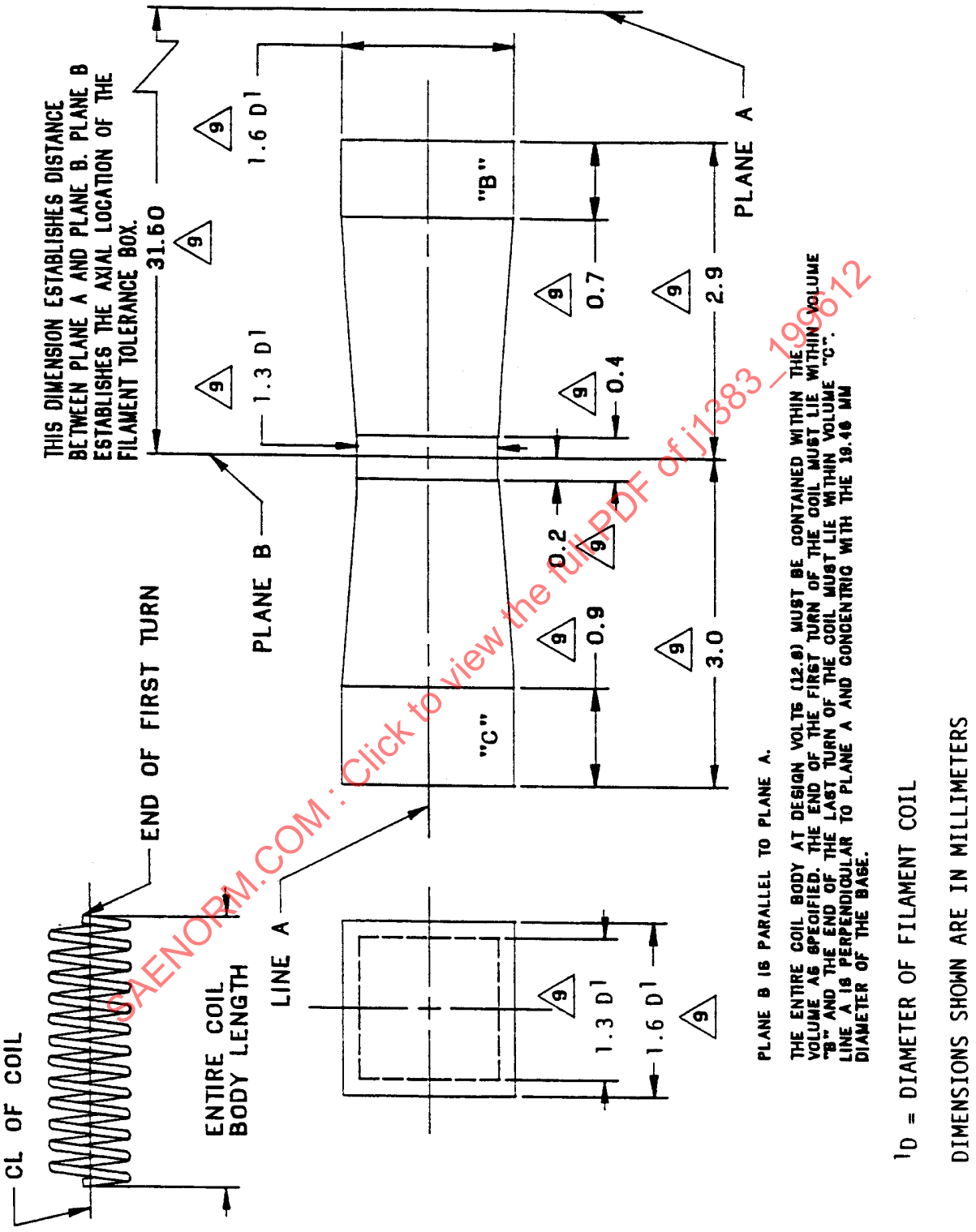
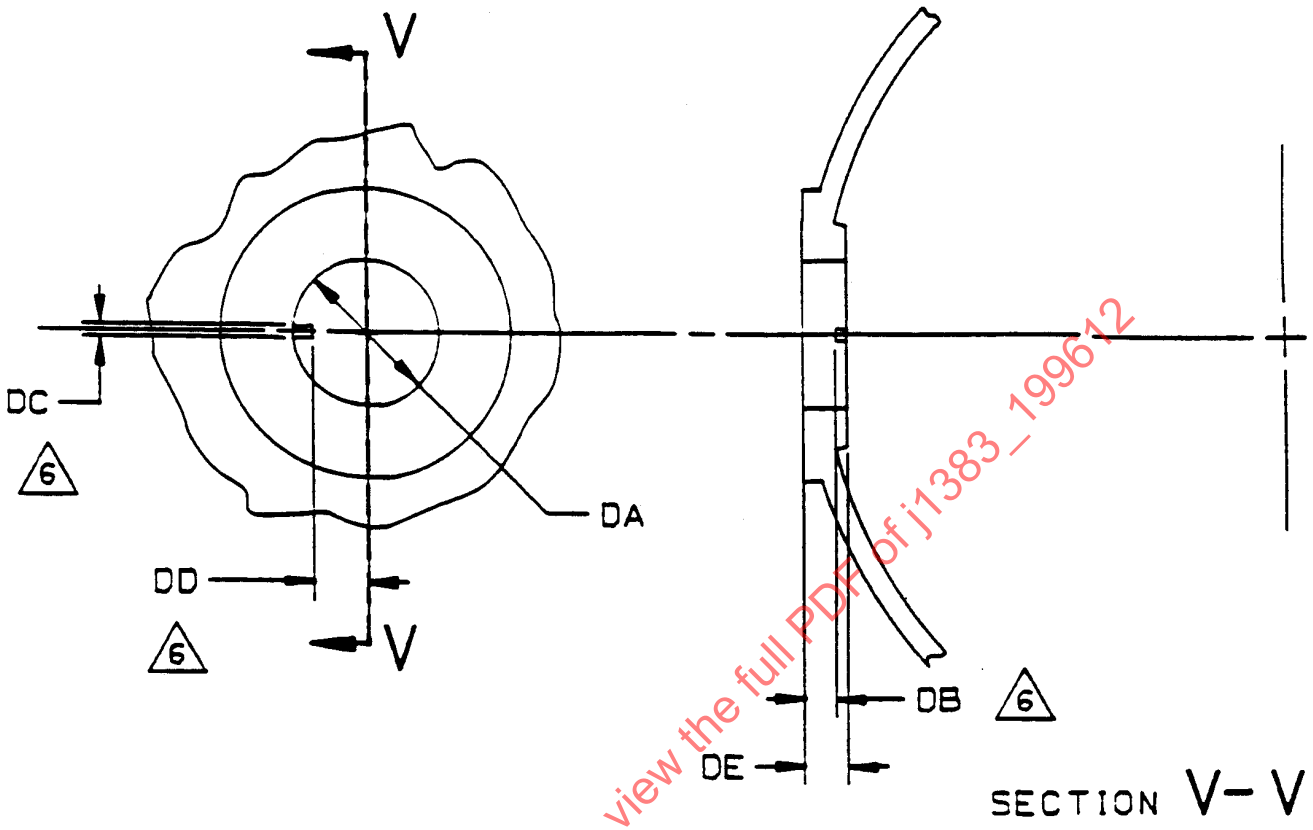


FIGURE 51—SPECIFICATION FOR THE 9006 REPLACEABLE BULB



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

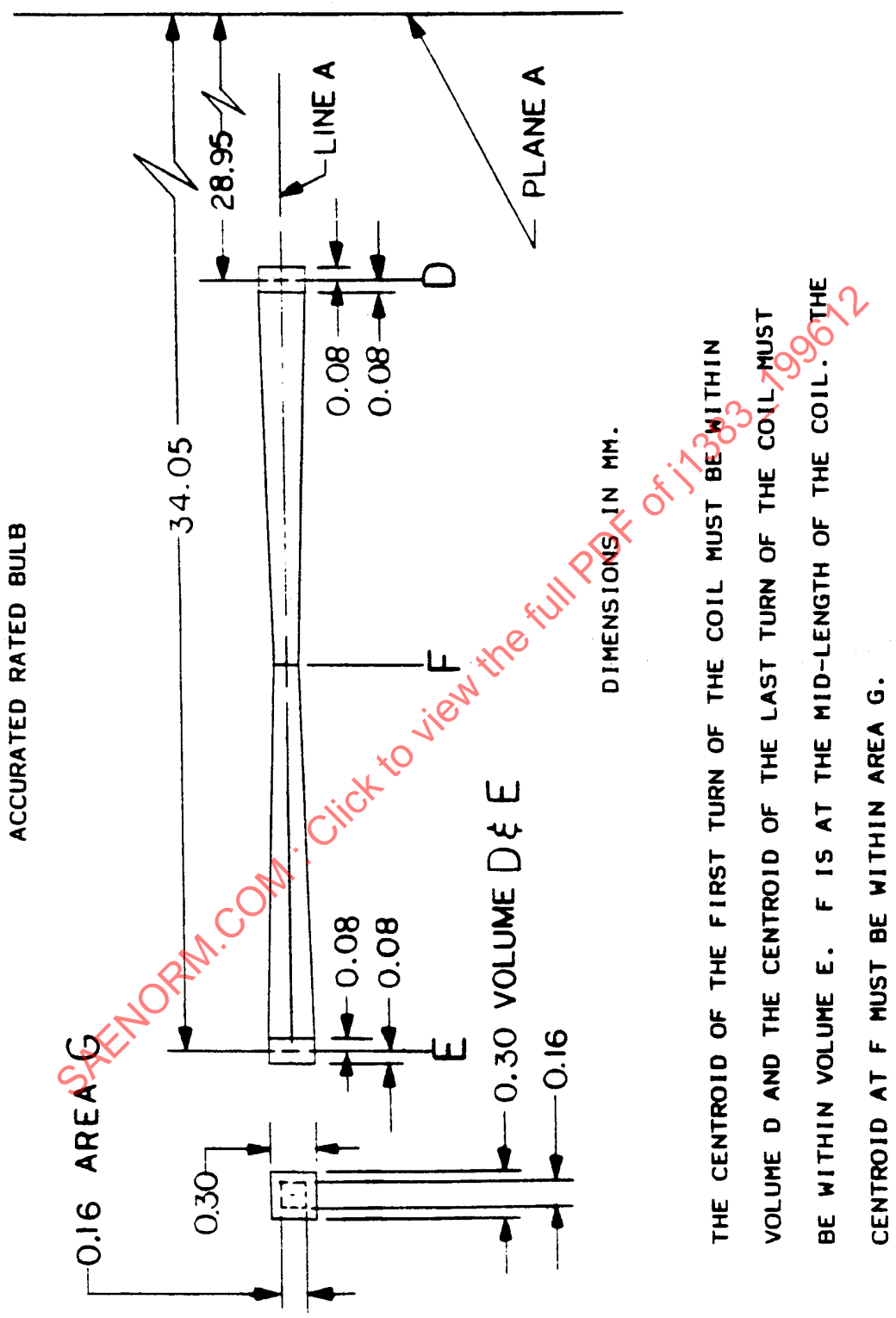
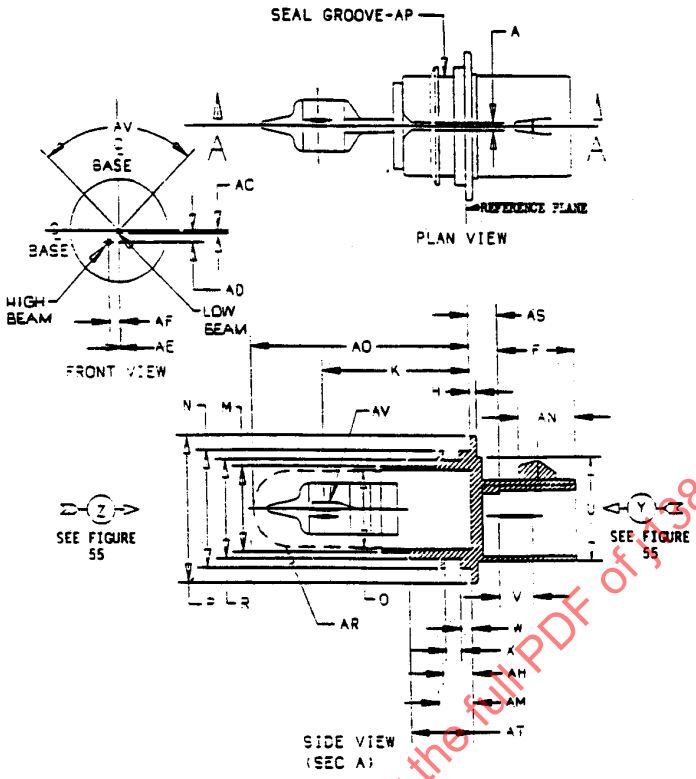
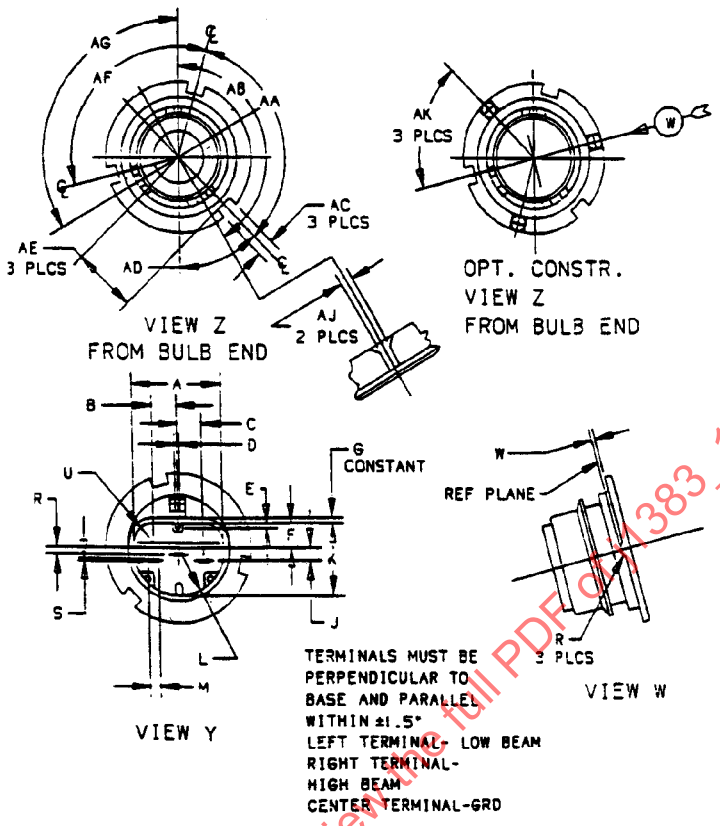


FIGURE 53—SPECIFICATION FORTHE 9006 REPLACEABLE BULB—ACCURATE RATED BULB



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.

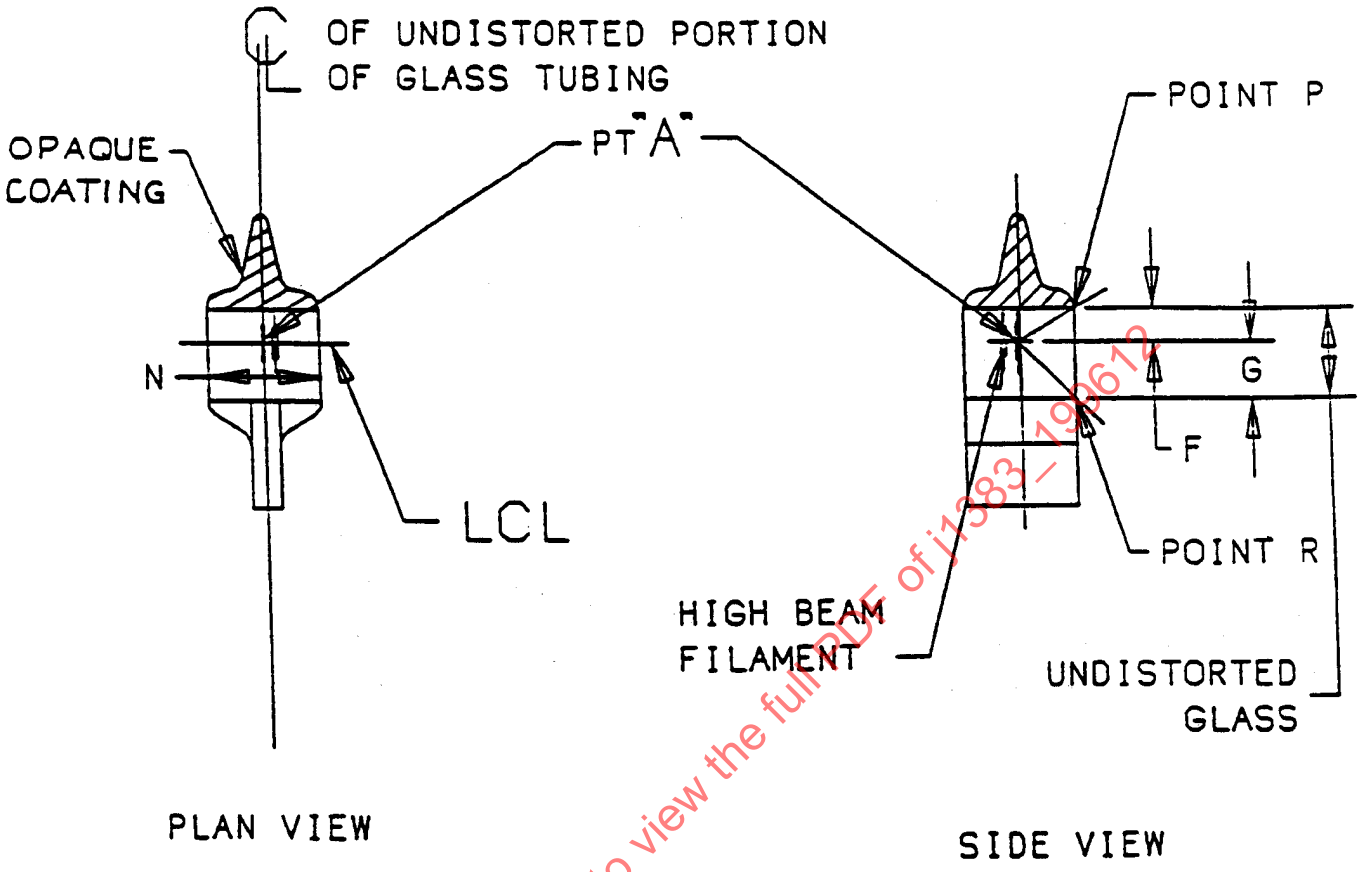
FIGURE 54—SPECIFICATION FOR THE 9007 REPLACEABLE BULB



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°

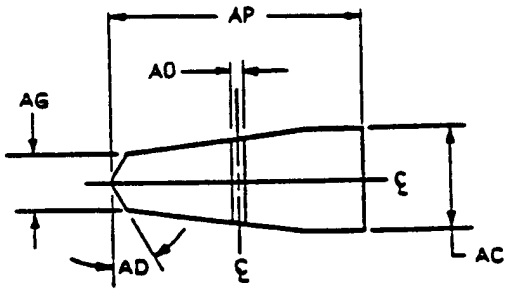
FIGURE 55—SPECIFICATION FOR THE 9007 REPLACEABLE BULB



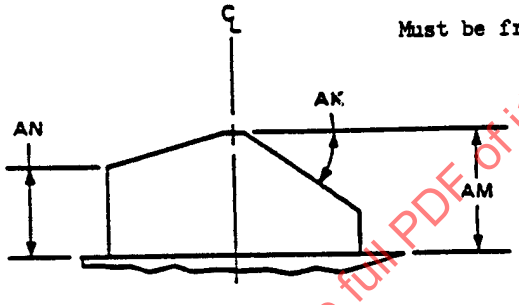
Dimensional Specifications
Figure 56

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



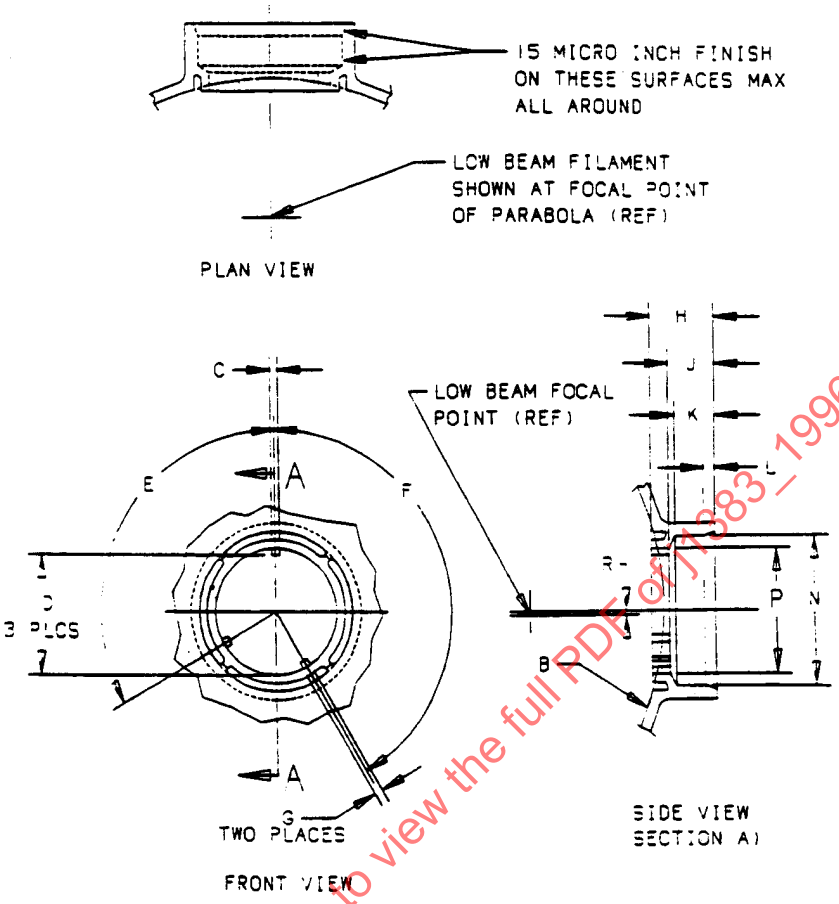
EXPLODED PLAN VIEW



EXPLODED SIDE VIEW

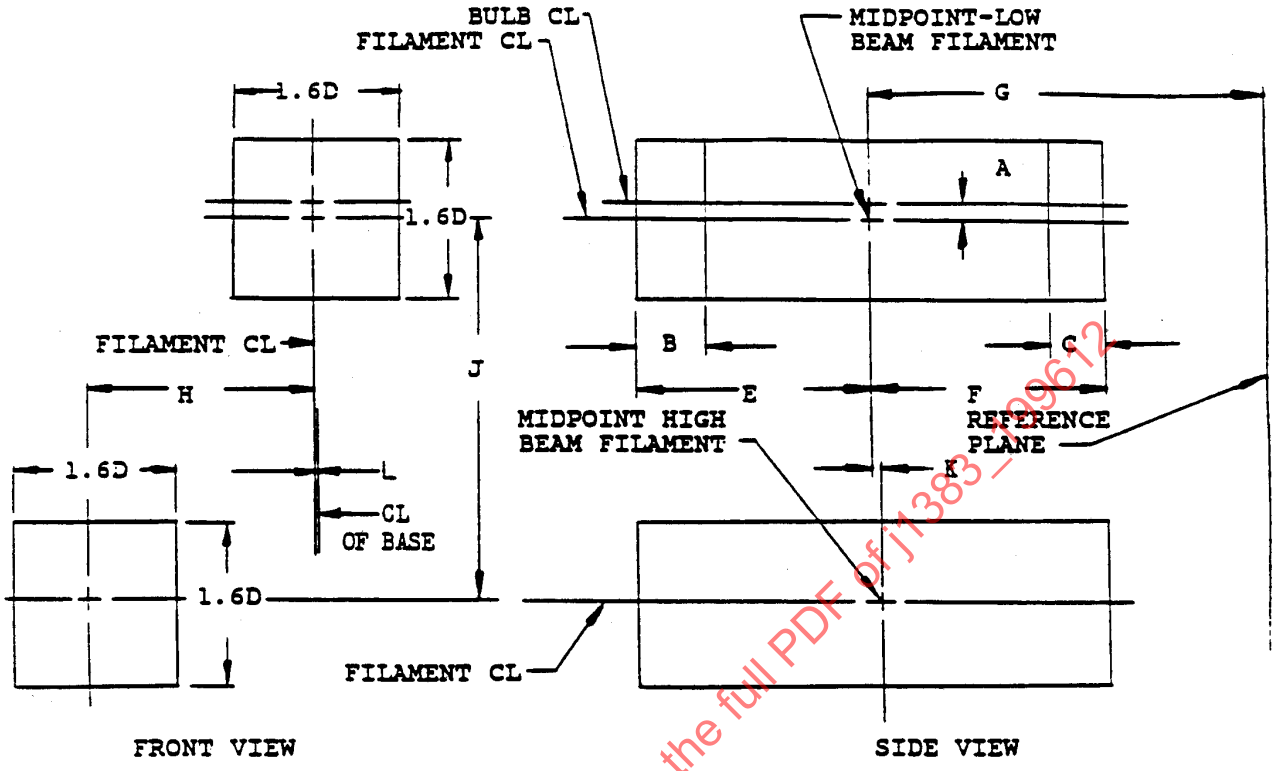
Dimension	Millimeters
AC	4.55 ± .20
AD	30° ± 3°
AG	2.50 ± .20
AK	35° ± 3°
AM	5.50 ± .20
AN	4.00 ± .20
AO	.5 ± .20
AP	11.4 ± .20

FIGURE 57—SPECIFICATION FOR THE 9007 REPLACEABLE BULB—LOCKING FEATURE



Dimension	Millimeters
B	Ref Line 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	0.38 ± 0.10
	TOLERANCE FOR ALL ANGULAR DIMENSIONS ± 1°

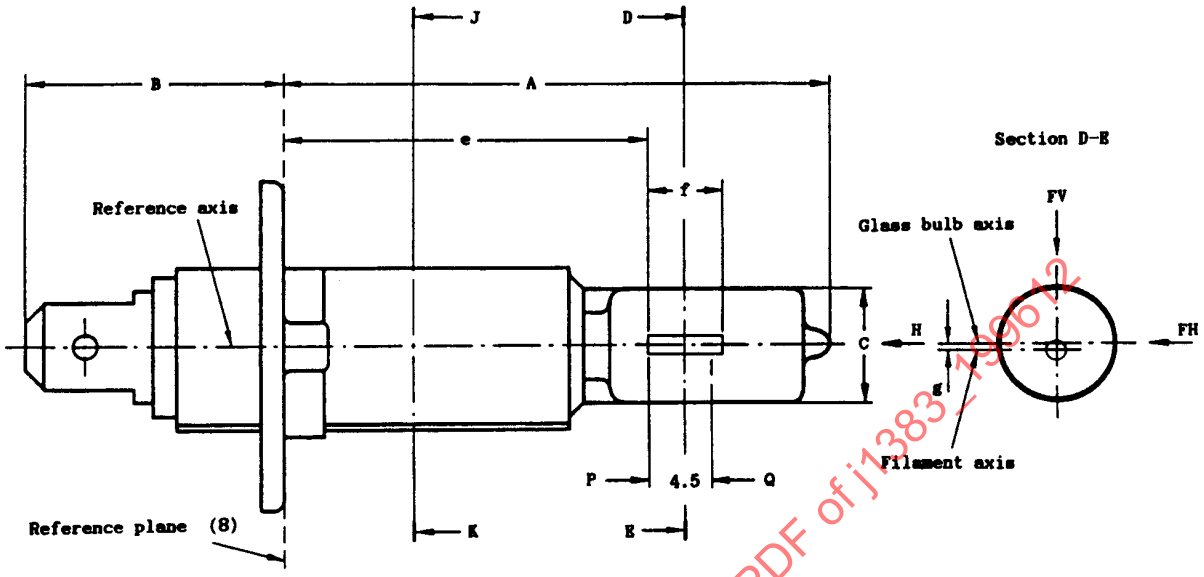
FIGURE 58—SPECIFICATION FOR THE 9007 REPLACEABLE BULB—BULB HOLDER



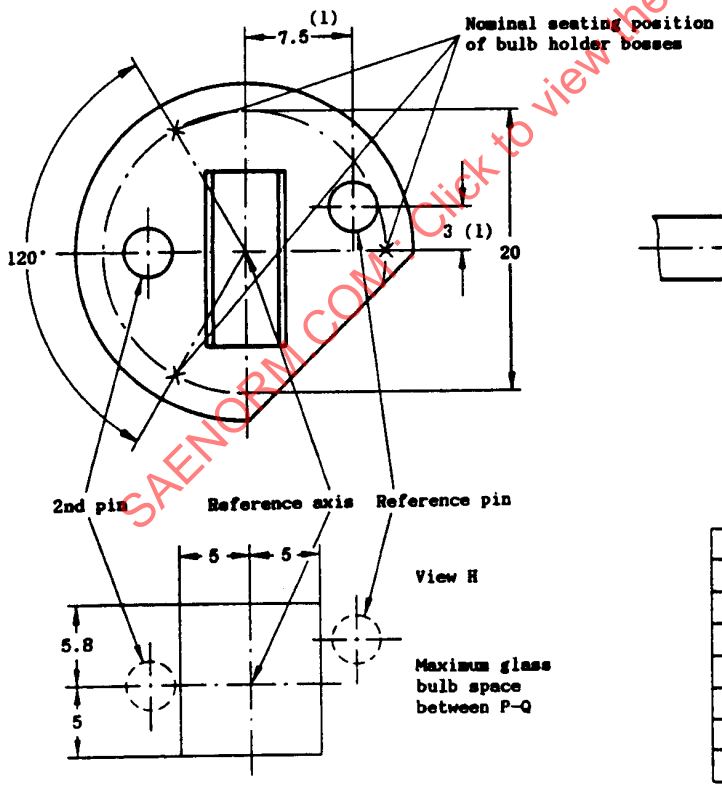
LETTER	STANDARD DIMENSION	ACCURATE RATED BULB
A	0.38 ± 0.38 mm	0.38 ± 0.20 mm
B	0.9 Basic	---
C	0.7 Basic	---
D	Actual Filament Diameter	---
E	3.0 Basic	---
F	2.9 Basic	---
G	44.50 ± 0.25	44.50 ± 0.15
H	1.60 ± 0.81	1.60 ± 0.25
J	1.60 ± 0.64	1.60 ± 0.25
K	000 ± 0.64	000 ± 0.40
L	000 ± 0.38	000 ± 0.25

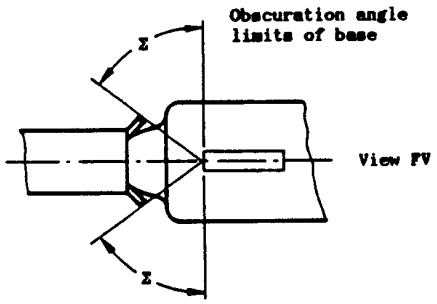
FIGURE 59—DIMENSIONAL SPECIFICATIONS FOR THE 9006 REPLACEABLE BULB FILAMENT DIMENSION AND LOCATION—MEASUREMENT METHOD

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.

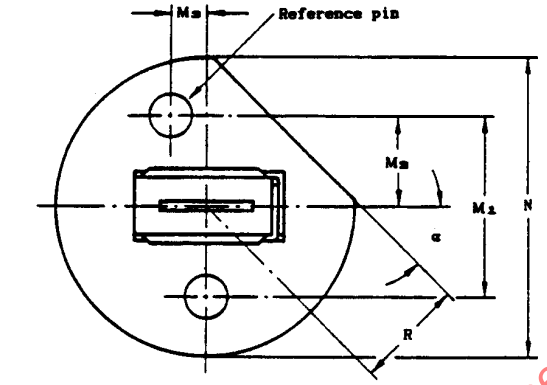
(1) The reference plane is defined by the points on the surface of the ring on which, taking into account all adverse tolerances on pages Figure 8-1 and 8-2, the bosses "e" of the bulb holder will rest. These points shall all lie on the flat surface of the ring.

(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.
A_1 (2)	5.2	5.8
A_2 (3)	-	12.0
B_1 (3)	3.75	4.25
B_2 (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	-
M_1	14.3	14.5
M_2	7.4	7.6
M_3	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
r_1	-	0.6
r_2	-	0.5 S
α	40°	50°
β	Nom. 45°	
γ	Nom. 11°	



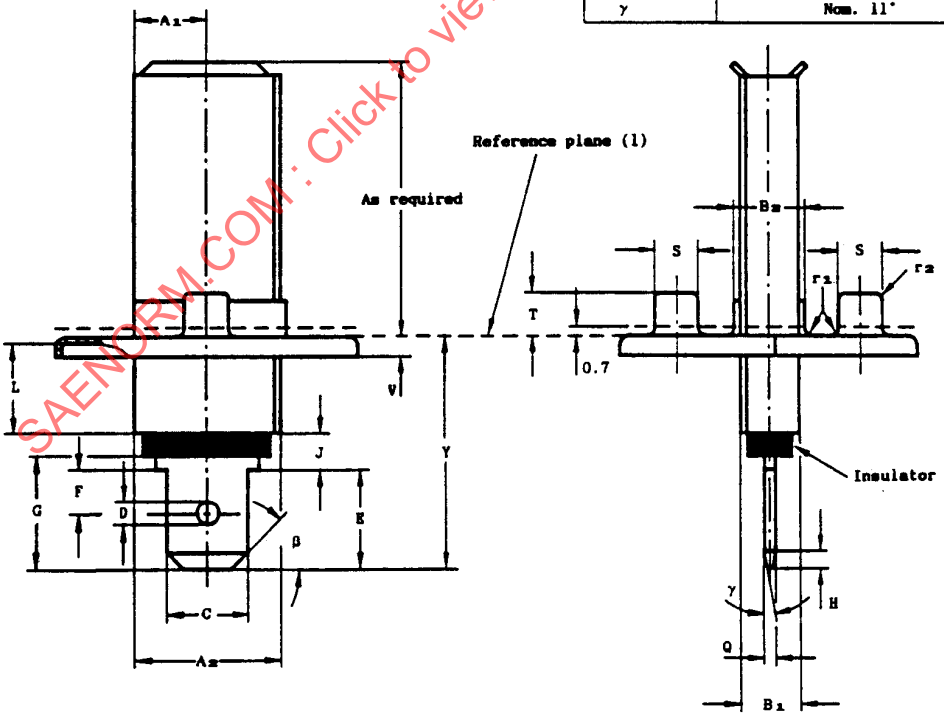
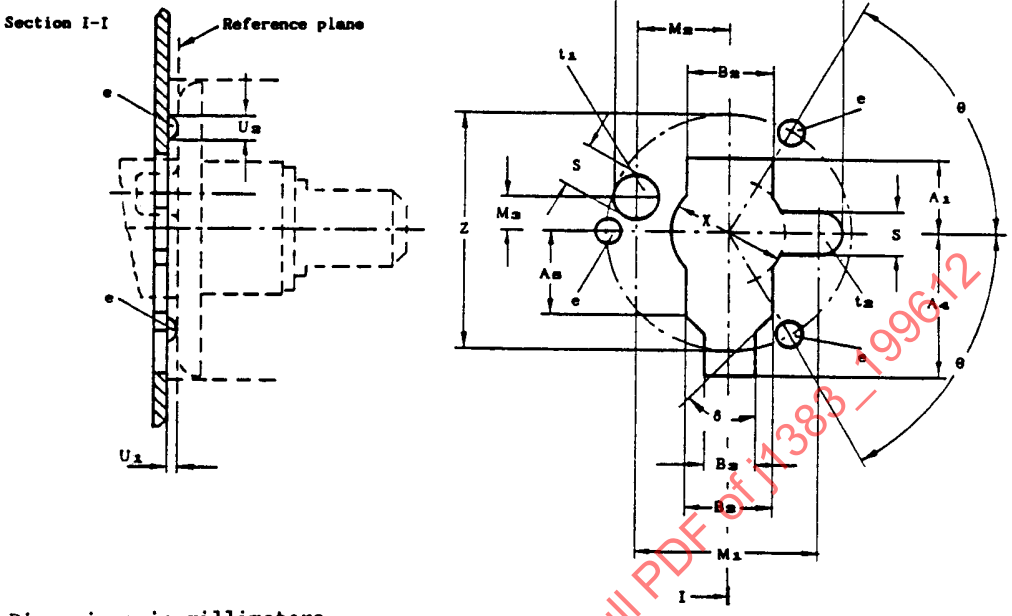


FIGURE 61—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB BASE P 14.5S

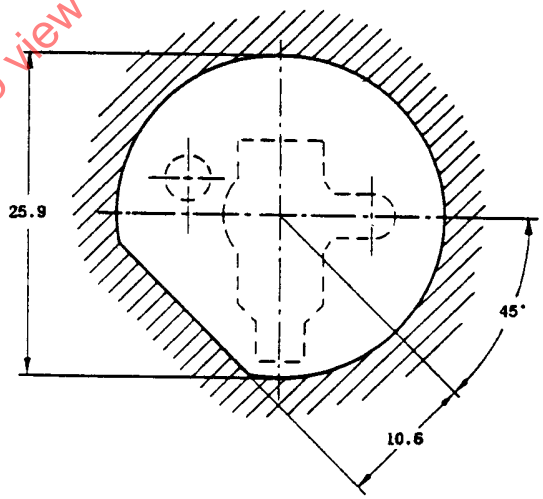
The drawings are intended only to indicate the dimensions essential for interchangeability.



Dimensions in millimeters

Dimension	Min.	Max.
A1	6.1	6.3
A4	11.7	-
A3	7.0	7.5
B2	7.0	7.5
B3	4.0	4.2
M1	Nom. 14.5	
M2	7.4	7.6
M3	2.9	3.1
M4	18.1	18.3
S	3.6	3.7
U1	0.8	1.0
U2	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 "t1" and "t2". 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.

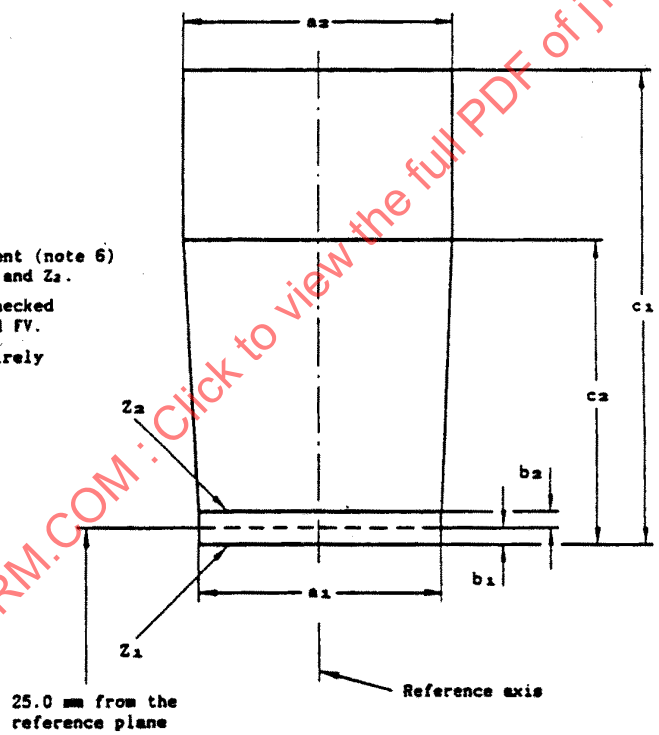
(8) The reference plane is the plane formed by the seating points of the three bosses of the bulb holder on the base ring.

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.

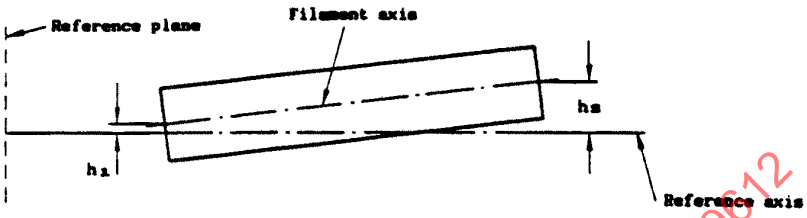


Dimensions in millimeters

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

Additional requirements for accurate rated bulbs

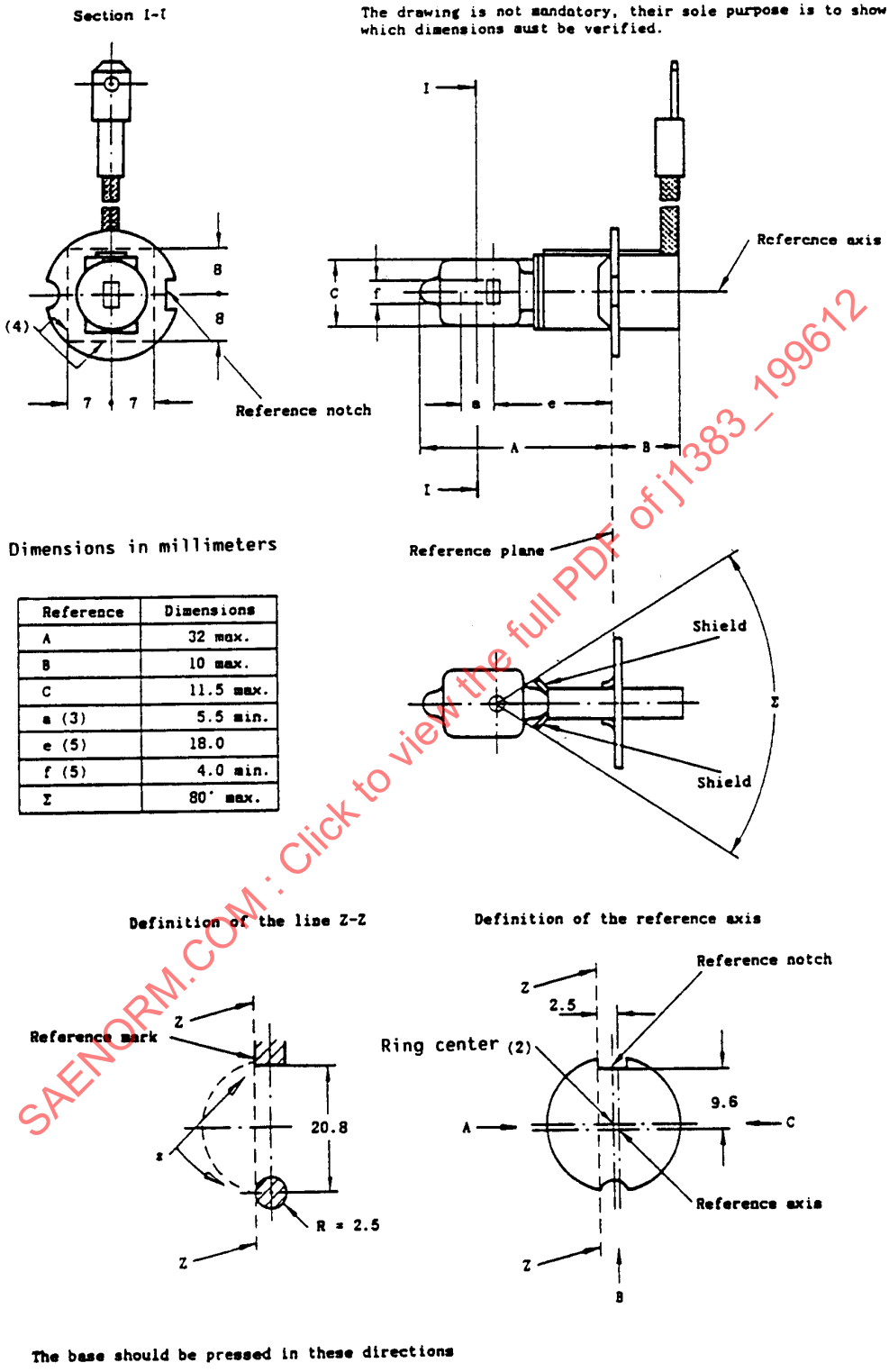


Dimensions in millimeters

Reference	Dimension	Tolerance
e (1)	25	± 0.15
f (1)	5.0	+ 0.5
g (1)	0.5d (2)	± 0.25d
Σ (1)	45°	± 3°
h1	0	± 0.20
h2	0	± 0.25

(1) See Figure 60
(2) d = actual filament diameter

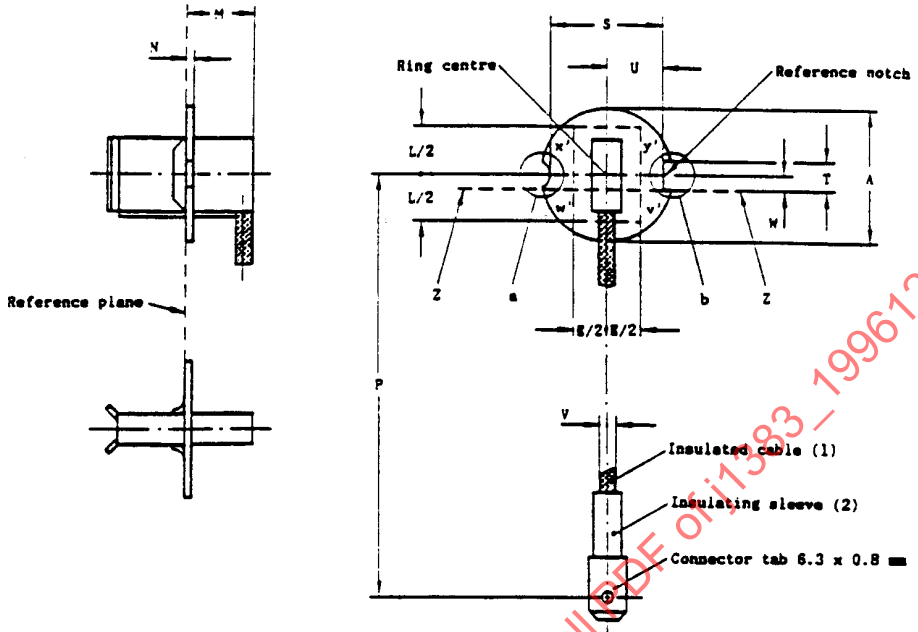
FIGURE 64—SPECIFICATION FOR THE TYPE H1 REPLACEABLE BULB



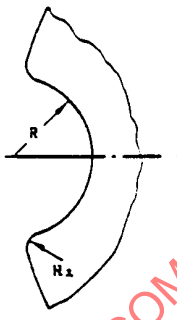
Reference	Dimensions
A	32 max.
B	10 max.
C	11.5 max.
a (3)	5.5 min.
e (5)	18.0
f (5)	4.0 min.
Σ	80° max.

FIGURE 65—SPECIFICATION FOR THE TYPE H3 REPLACEABLE BULB

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



Detail a



Detail b

(1) It shall be possible to bend the cable within a cylinder of 22.2 mm diameter co-axial with the axis of the ring.

(2) The insulating sleeve shall be securely fastened, shall adequately overlap the wire insulation and shall cover all metal parts up to the shoulders of the tab.

(3) The space to be reserved for the parts of the base below the ring-with the exception of the cable outlet, is bounded by a rectangular box of x', y', v', w'.

(4) A reduction of the minimum value is under consideration.

(5) This dimension is not to be gauged.

(6) Outside the area defined by x', y', v' and w', the flatness of the ring, on the reference plane side, shall be within 0.25 mm (0.01 in).

Dimensions in millimeters

Dimension	Min.	Max.
A	22.15	22.25
E (3)(6)	11.0	
L (3)(6)	16.0	
M	-	10.0
N (4)	0.7	1.1
P	95	105
R	2.5	2.6
R1	-	0.4
R2	-	0.5
S	18.1	18.3
T	5.0	5.1
U	9.55	9.65
V (5)	1.75	2.75
W	2.0	3.0

FIGURE 66—SPECIFICATION FOR THE TYPE H3 REPLACEABLE BULB BASE PK22S