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SURFACE VEHICLE STANDARD

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(R) HEADLAMP AIMING DEVICE FOR MECHANICALLY AIMABLE HEADLAMP UNITS

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. Scope—This document applies to the requirements of a device used in the field and inspection stations to aim and check aim of mechanically aimable headlamp units.

The purpose of this document is to provide a laboratory test procedure to determine whether the devices under test are capable of accurately positioning headlamp units from their aiming pads and maintaining their accuracy in service within the tolerances designated in this document.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

SAE J599 MAY81—Lighting Inspection Code

SAE J1383 APR85—Performance Requirements for Motor Vehicle Headlamps

3. Definitions

3.1 Headlamp Aiming Device—A device used to adjust and inspect the aim of mechanically aimable headlamp units consisting of one or more fixtures designed to seat against the three aiming pads (aiming plane) on mechanically aimable headlamp units installed on a vehicle to facilitate accurate aiming of such units, vertically and laterally.

3.2 Mechanically Aimable Headlamp Units—A unit having three pads on the face of the lens forming a mechanical aiming plane used to adjust and inspect the aim of the unit when installed on a vehicle.

3.3 Aiming Plane—A plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forward most aiming pad on the headlamp.

4. Samples For Test—Sample devices submitted for laboratory tests shall be representative of the devices as regularly manufactured and marketed. Each sample shall include all accessory equipment peculiar to the device. Full assembly and operating instructions shall be provided, including information on how to check accuracy and maintain the device in calibration.

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5. Laboratory Facilities—The laboratory shall be equipped with all facilities necessary to make the tests in this document.

NOTE 1—All tests are to be made in air ambient temperature of 24 °C ± 3 (75 °F ± 5).

NOTE 2—If a vertical indication means other than a spirit level is used, equivalent accuracy shall be maintained.

6. Requirements

6.1 Design Requirements

6.1.1 The device shall be of such design that the seating portion will register only on the three aiming pads on the headlamp units as covered by SAE J1383.

6.1.2 No part of the device, except those parts (strings, sighting devices, scales, etc.) required for referencing lateral alignment between devices, shall extend beyond the dimensional limits of the headlamp aiming device locating plate (Figure 1, dimension C and Figures 2, 3, and 4, dimension 4.05 in (102.9 mm) maximum diameter).

6.1.3 A device that uses adapters to fit more than one size headlamp unit shall meet all the requirements of this document with and without adapters.

6.1.4 The seating plane of the device shall meet the dimensions shown in Figures 1, 2, 3, and 4.

6.1.5 When aiming headlamp units spaced 90 in (2300 mm) apart, the torque exerted by the device at the aiming plane shall not exceed 18 lbf in (2.0 N·m) vertically and 12 lbf in (1.4 N·m) laterally.

6.1.6 The means of securing the device to the headlamp unit shall retain the device against the three aiming pads when an axially centered tensile force of 4.0 lb/ft (17.8 N·m) minimum is applied to the device.

6.1.7 The device shall be capable of being calibrated and shall have available for immediate use an independent calibration fixture and/or instructions to immediately recalibrate the device.

6.1.8 If a suction cup is used to retain the device to the headlamp unit, the effective diameter for 5-3/4 in (146 mm) and 7 in (178 mm) headlamps shall not exceed 3.5 in (90 mm) and the effective diameter for 4 x 6-1/2 in (100 x 165 mm) and 5 x 8 in (142 x 200 mm) headlamps shall not exceed 2.8 in (71 mm) when installed.

6.1.9 Means shall be provided in the device for compensating within ±0.1 deg through a slope range of ±1.5 deg from horizontal. The method for device compensation shall be clearly explained in the operating instructions.

6.1.10 If the horizontal aim is to be accomplished by reference between devices on opposite sides of the vehicle, the means provided for referencing lateral alignment between devices (sight line, string, or equivalent) shall be located as shown in Figures 1, 2, 3, and 4.

6.1.11 The spirit level or other means provided for indicating vertical aim shall be capable of showing at least a 0.1 in (2.5 mm) deviation with a 1 in (25 mm)[1] change in level.

6.1.12 A horizontal aim scale shall be provided with graduations in steps of not more than 2 in (51 mm) from straight ahead to at least 8 in (203 mm) left and right.

6.1.13 The instructions covering the use of the device shall include those items shown in Section 3 of SAE J599.

1. Represents inches (millimeters) at 25 ft (7.6 m).

6.1.14 The vertical aim scale shall be marked 0 with the aiming plane vertical.

6.1.15 The vertical aim scale shall be provided with numerical graduations in steps, each of which represents 1 in (25 mm) to provide for variations in vertical aim from at least 8 in (203 mm) below 0.

6.2 Test Procedure—Assuming that the devices comply with the general requirements, they shall be considered acceptable if they comply with additional test requirements as follows:

6.2.1 With the aiming plane vertical and with the vertical scale on the device set at 0, the angle through which the aiming plane must be rotated vertically to center the bubble in the spirit level, or equivalent, shall not exceed 0.5 in (13 mm).

6.2.2 With the aiming planes in the same vertical plane and with the means provided for adjusting lateral aim in use, the angle through which the aiming plane must be rotated laterally to indicate straight ahead shall not exceed ±1 in (25 mm)[2] with the lamps 24 and 90 in (610 and 2300 mm) apart.

6.2.3 With the aiming planes initially in the same vertical plane and subsequently toed inward and outward 6 in (152 mm) and with the means provided for checking lateral aim in use, the error in reading shall not exceed ±1 in (25 mm) with the lamps 60 in (1520 mm) apart.

6.2.4 With the aiming plane vertical and with the vertical scale on the device set at 0, the level on the aimer shall be adjusted prior to each of the following tests to center the bubble in the spirit level or equivalent.

6.2.4.1 Each step on the vertical aim scale shall be checked and in no case shall the variation from the correct aim exceed ±0.5 in (13 mm).

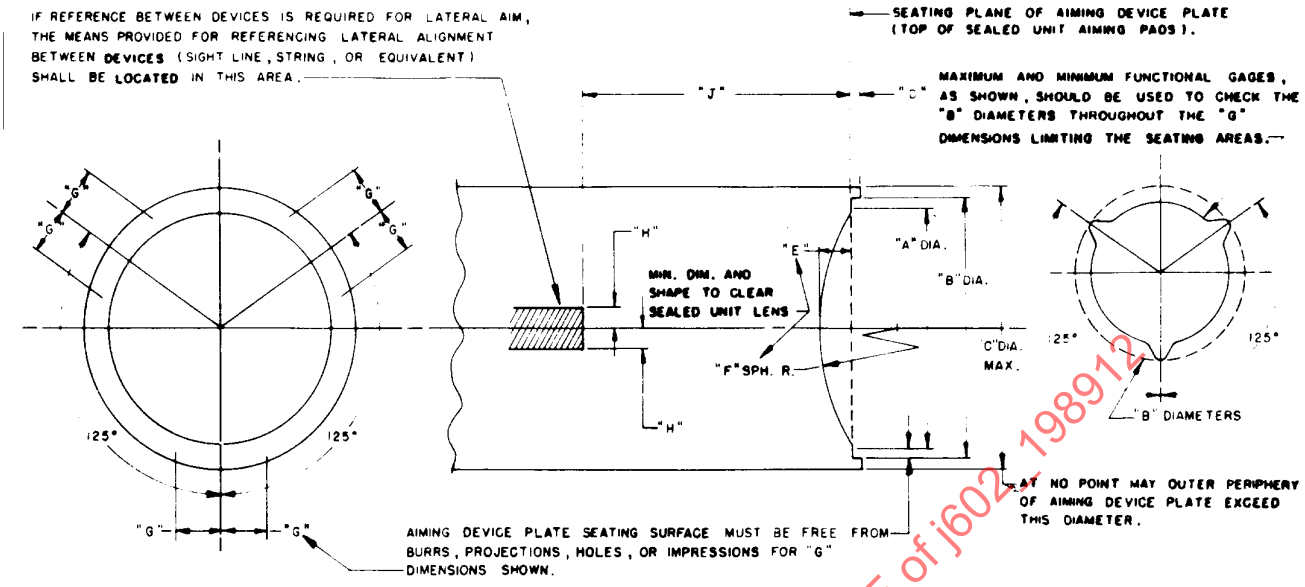
6.2.4.2 A pair of devices shall be stabilized at −7 °C ± 3 (20 °F ± 5) and then installed on a pair of unlighted headlamp units spaced 60 in (1520 mm) apart at the −7°C (20 °F) ambient temperature. After a period of 30 min, the seating portion of the device shall continue to register against the three headlamp unit aiming pads, and the variation from correct vertical aim shall not exceed ±0.5 in (13 mm) and the variation from correct lateral aim shall not exceed ±1 in (25 mm)[3].

6.2.4.3 They shall then be installed on the pair of unlighted headlamp units spaced 60 in (1520 mm) apart and the variation from correct vertical aim shall not exceed ±0.5 in (13 mm) and the variation from correct lateral aim shall not exceed ±1 in (25 mm).[4]

6.2.4.4 A sample device shall be exposed to 1.7 °C ± 3 (35 °F ± 5) for 1 h and then immediately allowed to free fall onto a concrete floor three times from its normal operating position on a headlamp unit at a height of 40 in (1020 mm), after which it shall show no damage that would interfere with the proper calibration of the device. It shall then be installed in combination with its companion device on a pair of unlighted headlamp units spaced 60 in (1520 mm) apart and the variation from correct vertical aim shall not exceed 1 in (25 mm)[5] and the variation from the correct lateral aim shall not exceed 1 in (25 mm)[6]. (This test applies only to devices that are supported by the headlamp unit.)

6.2.4.5 Using the calibration fixture and/or instructions required by 5.1.7, the device shall be calibrated and checked for compliance with 5.2.1 and 5.2.2.

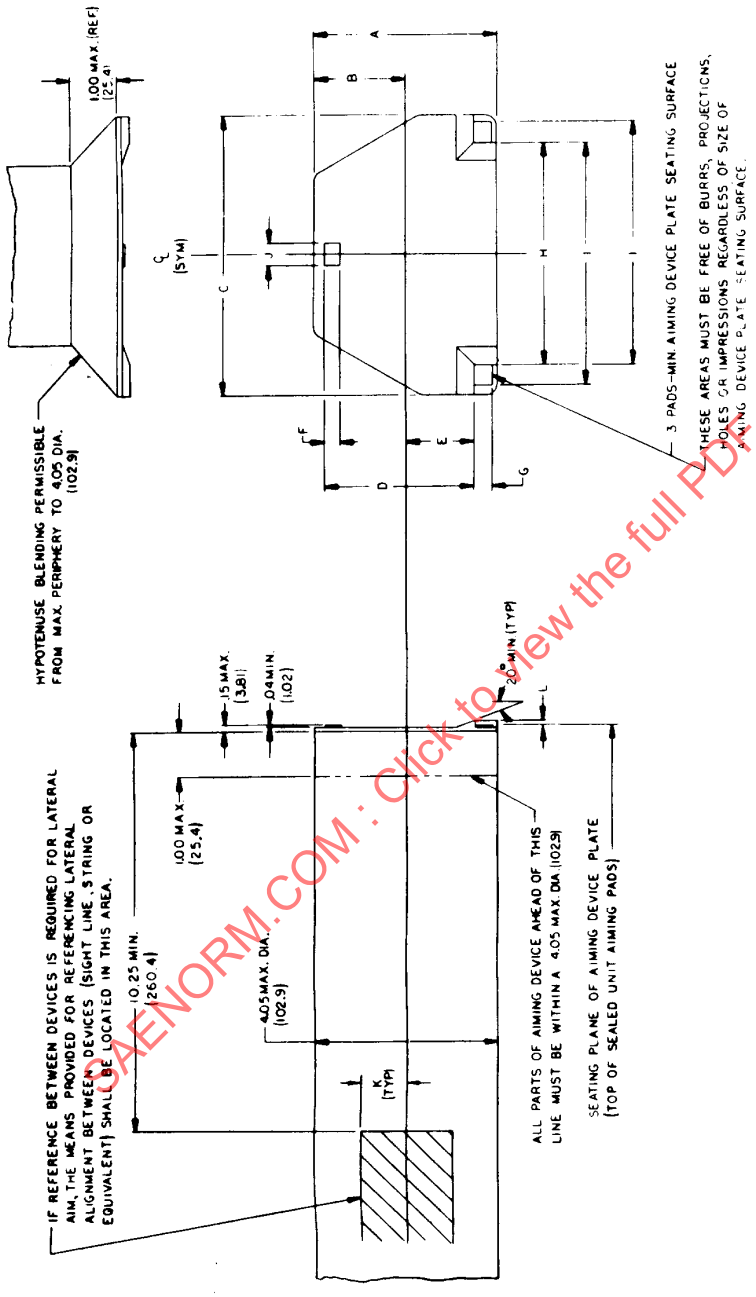
2. Represents inches (millimeters) at 25 ft (7.6 m).
3. Represents inches (millimeters) at 25 ft (7.6 m).
4. Represents inches (millimeters) at 25 ft (7.6 m).
5. Represents inches (millimeters) at 25 ft (7.6 m).
6. Represents inches (millimeters) at 25 ft (7.6 m).



NOTE: There shall be no projections, tangs, lugs, etc. on this locating plate, which will permit locating the aiming device on any part of the headlamp other than the aiming pads on the mechanical headlamp unit.

Locating Plate	Unit of Measure	Dimensions												
		A		B		C	D		E	F	G	H	J	
		Max	Min	Max	Min	Max	Max	Min	Ref	Ref	Min	Max	Min	
5-3/4 in	in	4.830	4.770	5.375	5.345	5.700	0.165	0.145	0.70	4.40	0.70	1.00	9.50	
(146 mm)	mm	122.7	121.2	136.5	135.8	144.8	4.19	3.68	17.8	111.8	17.8	25.4	241.3	
7 in	in	6.140	6.080	6.710	6.680	7.031	0.180	0.160	0.96	5.60	0.70	1.00	10.25	
(178 mm)	mm	156.0	154.4	170.4	169.7	178.6	4.57	4.06	24.4	142.2	17.8	25.4	260.4	

FIGURE 1—DIMENSIONAL SPECIFICATIONS FOR HEADLAMP AIMING DEVICE LOCATING PLATE

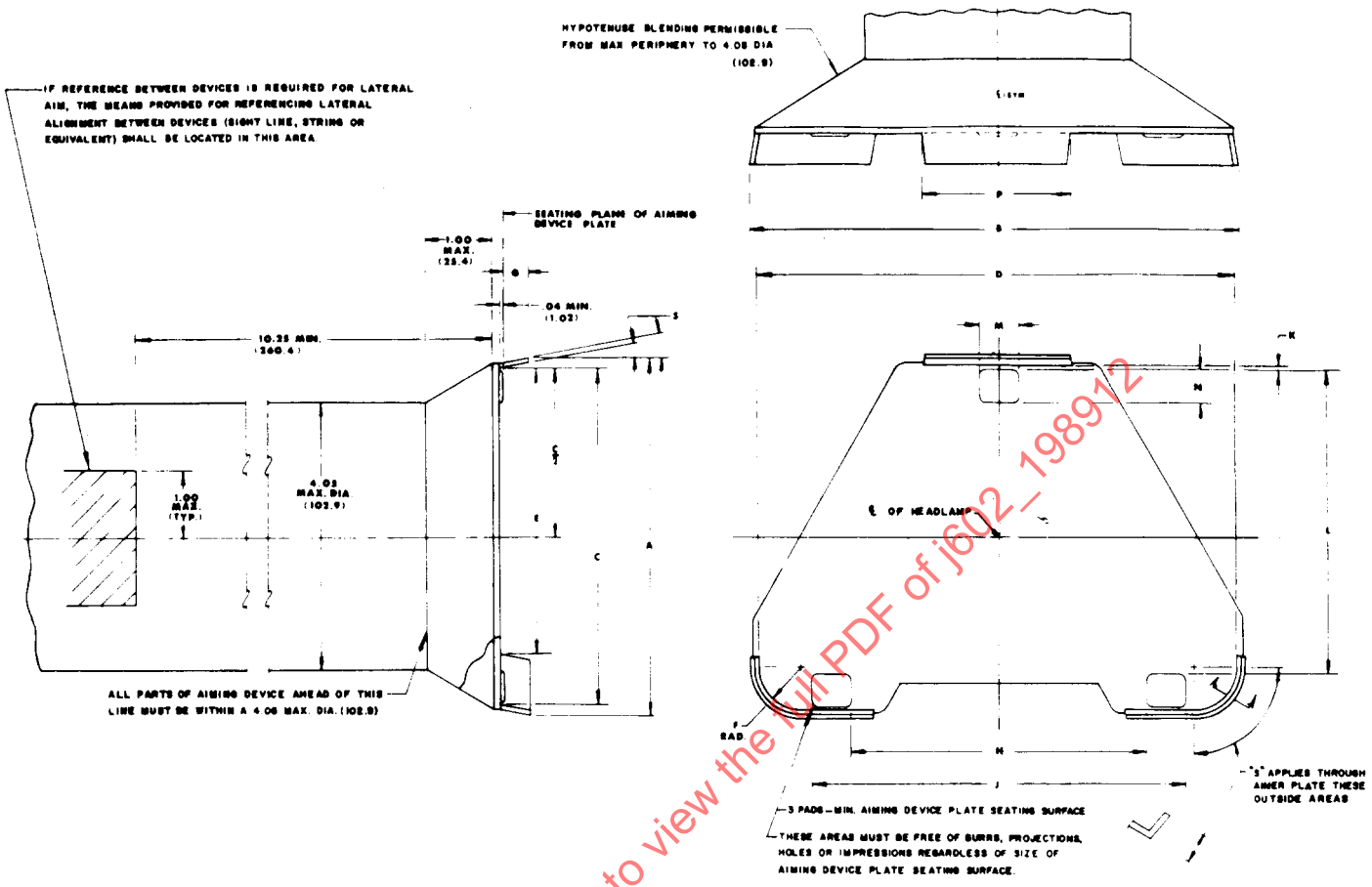


NOTE: There shall be no projections, tangs, lugs, etc. on this locating plate, which will permit locating the aiming device on any part of the headlamp other than the aiming pads on the mechanical headlamp unit.

ALL DIMENSIONS ENCLOSED (X.XX) ARE IN MM.

Locating Plate	Unit of Measure	Dimensions																					
		A		B		C		D		E		F		G		H		J		K		L	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4 x 61	in	3.935	3.925	1.975	1.953	6.001	5.991	3.320	3.300	1.550	1.540	0.370	0.350	0.330	0.310	5.088	5.018	—	5.421	—	0.400	1.000	—	0.080	0.060
100 x 165	mm	99.95	99.60	50.17	49.66	152.42	152.17	84.33	83.82	39.37	39.12	9.40	8.89	8.38	7.87	129.24	128.98	—	137.20	—	10.16	25.40	—	2.03	1.52

FIGURE 2—DIMENSIONAL SPECIFICATIONS FOR HEADLAMP AIMING DEVICE LOCATING PLATE (100 X 165)



NOTE: There shall be no projections, tangs, lugs, etc. on this locating plate, which will permit locating the aiming device on any part of the headlamp other than the aiming pads on the mechanical headlamp unit.

ALL DIMENSIONS ENCLOSED (X.XX) ARE IN MM.

Unit of Measure	Dimensions															
	A ±0.010	B ±0.010	C ±0.005	D ±0.005	E ±0.010	F ±0.010	G ±0.010	H ±0.005	J ±0.005	K ±0.005	L ±0.005	M ±0.010	N ±0.010	P ±0.010	S ±0°	S 30 ft
in	5.275	7.340	4.995	7.030	4.285	0.625	0.395	4.450	5.663	0.005	4.487	0.610	0.485	2.125	10°	0 ft
mm	133.98	186.43	126.87	179.07	108.83	15.87	10.03	113.03	143.84	0.12	113.97	15.49	12.31	53.97		

FIGURE 3—DIMENSIONAL SPECIFICATIONS FOR HEADLAMP AIMING DEVICE LOCATING PLATE (142 X 200)