



TECHNICAL REPORT

J197

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ELECTRIC TACHOMETER SPECIFICATION—
OFF ROAD—SAE J197

SAE Recommended Practice

Report of Speedometer and Tachometer Committee approved April 1973.

1. Scope—To specify minimum requirements for electric tachometers for general off-road applications and to provide dimensional envelopes for determining space allowances. Two general classes are provided to correspond with different applications, Class 1 being less severe than Class 2.

2. Identification

2.1 To be legibly stamped on outside of case:

2.1.1 Manufacturer's part number.

2.1.2 Manufacturer's serial number and/or date of manufacture.

2.2 To be printed on dial and/or stamped on case: manufacturer's name or trademark.

2.3 Electrical connections shall be clearly identified for proper wiring of instrument into circuit.

3. Calibration—For instruments mounted with dials in any plane from vertical to 35 deg back from vertical, calibration accuracy shall be $\pm 3\%$ of full-scale reading at 75°F (24°C) (instrument to be tapped lightly when checking calibration). For other instrument mounting angles, effect on calibration should be determined by contact with manufacturer. Recommended calibration points shall be at 20 and 80% of full-scale dial reading.

4. Environmental Conditions**4.1 Temperature**

4.1.1 Instrument indication shall not vary in excess of $\pm 2\%$ of the full-scale reading of the values determined at a temperature of 75°F (24°C) while operating through a range of +20-130°F (-7 to +54°C). No permanent damage shall result from operating in a range of -40 to +160°F (-40 to +71°C).

4.1.2 STORAGE—Varying the temperature of the instrument from -40°F (-40°C) for 2 h; allow to recover to room temperature before checking then for 2 h at +180°F (+82°C) exposure. Again allow to recover to room temperature. The check shall result in not more than $\pm 1\%$ of full-scale permanent calibration change from readings determined at 75°F (24°C) before exposure (paragraph 3) when checked at 75°F (24°C) after exposure.

4.2 Humidity—Instrument shall not have its function impaired by exposure to 95% relative humidity at 100°F (38°C) for 48 h.

4.3 Vibration Test—The electric tachometer and/or tachometer and electric sender shall be capable of withstanding without mechanical or electrical failure 6 h of vibration, 2 h in each direction along the three mutually perpendicular axes. One of said axes shall be parallel to the

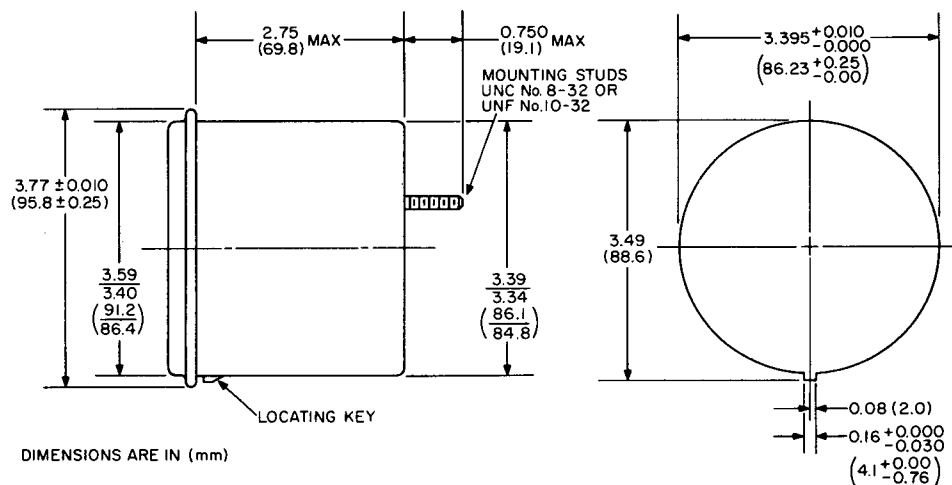


FIG. 1—ENVELOPE AND MOUNTING STUDS

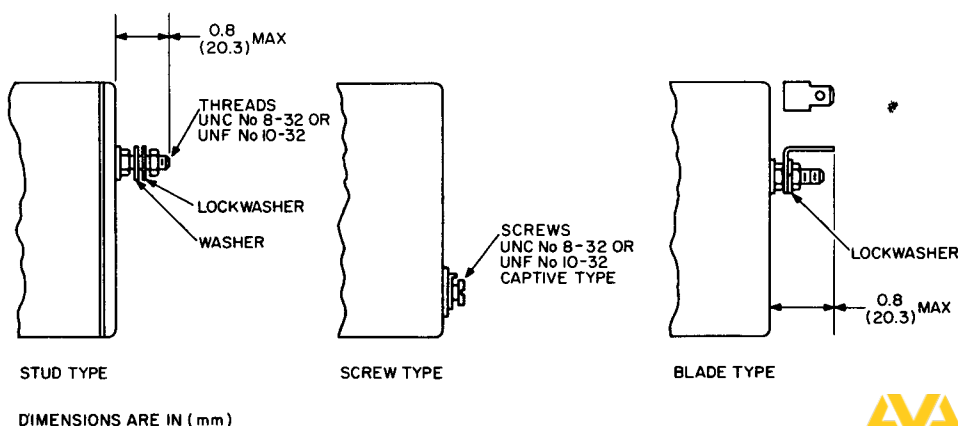


FIG. 2—TERMINALS

indicator shaft. The vibration test shall be run at a double amplitude of 0.060 in (1.52 mm) with the frequency variation of 10-55-10 Hz for Class 1 and 10-80-10 Hz for Class 2 at intervals of 1 min. After test, the calibration shall remain within the tolerances specified in paragraph 3. The sample shall be mounted in accordance with the manufacturer's recommendations.

4.4 Shock Test—The electric tachometer and/or tachometer and electric sender shall be capable of withstanding without mechanical or electrical failure the following series of shocks and still maintain the calibration tolerances specified in paragraph 3.

The instrument shall be mounted in a vertical mounted position and subjected to 25 shocks with a vertical acceleration of 23-27 *g* for Class 1, 44-55 *g* for Class 2, half sine characteristic of 9-13 ms duration. The instrument shall then be rotated 90 deg counterclockwise in the plane of mounting and subjected to 25 shocks of the same magnitude and direction as previously. The instrument shall then be mounted face upward and subjected to 25 shocks of the same magnitude and direction as previously. The sample shall be mounted in accordance with the manufacturer's recommendations.

4.5 Voltage Variations—The electric tachometer calibration shall not change more than $\pm 1\%$ of full-scale rpm at a half-scale dial graduation due to a voltage change of a nominal 12 V system from 12 to 16 V d-c and a nominal 24 V system from 24 to 32 V d-c.

4.6 Transient Protection—The instrument shall be capable of withstanding supply voltage transients without permanent damage and shall remain within the calibration specification of paragraph 3 at the conclusion of this test.

The instrument shall be connected and operated for a total of 1 h with a means provided to impress upon the nominal battery voltage a single or repetitive rectangular voltage pulse as follows, limiting current flow to 0.5-1 A:

- (a) Plus six times nominal battery voltage of 300 μ s duration and 1% duty cycle.
- (b) Minus four times nominal battery voltage of 300 μ s duration and 1% duty cycle.

Any transient voltage that has a magnitude, duration, or duty cycle exceeding the above requirement shall be considered destructive and paragraph 5.8 shall be followed.

4.7 Secondary Losses—The effect of the tachometer on the ignition system should not reduce the available secondary voltage by more than 4%. Testing is to be done with the exact ignition system to be used in actual practice. The distributor is to be run with the coil input voltage held constant at 14.0 V and the coil secondary open circuited. The exact test procedure for measurements shall be established by the supplier and consumer.

5. Detail Recommendations

5.1 Indication shall be accomplished by a pointer traversing in a clockwise or left-to-right direction as applicable to register increasing rpm over a suitable scale on the instrument dial.

5.2 Graduations shall be designed for the best practical legibility and accuracy of reading.

5.3 Unless otherwise specified, pointers and dial printing shall be white, dial background shall be low gloss black, and visible portions of the instrument should exhibit low reflectivity.

5.4 All exposed surfaces shall be corrosion resistant for limited exposure. (NOTE: If instruments are required for extreme exposure installations, contact manufacturer for recommendations.)

5.5 Instruments shall be moisture and dust resistant. (See note in paragraph 5.4.)

5.6 Sending units shall be corrosion resistant to withstand external exposure. Engine mounted signal source sending units shall be excluded from this specification until clarification of the mounting environment is investigated.

5.7 Tachometer mounting—The tachometer case shall be provided with studs for mounting by suitable U-clamp or similar means.

5.8 For instrument requirements not covered by this specification, contact the manufacturer for recommendations.

5.9 Typical envelope, mounting studs, and terminal designations are displayed in Figs. 1 and 2.

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