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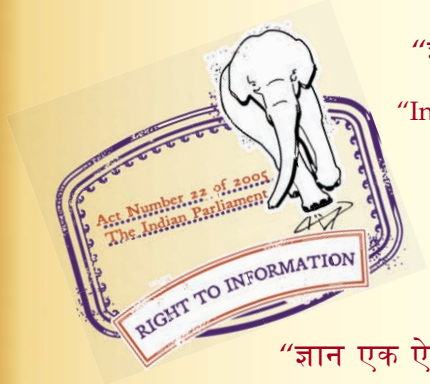
IS 11086 (1984): Speedometer/Odometer Systems for Automotive Applications [TED 11: Automotive Electrical Equipment]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 11086 - 1984

(Reaffirmed 2006)

Indian Standard

SPECIFICATION FOR SPEEDOMETER/ODOMETER SYSTEMS FOR AUTOMOTIVE APPLICATIONS

UDC 629·113·053·2+629·113·056·2

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

February 1985

Indian Standard

SPECIFICATION FOR SPEEDOMETER/ODOMETER SYSTEMS FOR AUTOMOTIVE APPLICATIONS

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Indian Standard

SPECIFICATION FOR SPEEDOMETER/ODOMETER SYSTEMS FOR AUTOMOTIVE APPLICATIONS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 6 February 1984, after the draft finalized by the Automotive Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Speedometers in automobiles are used as instruments to indicate the rate of distances travelled per unit time. This standard is intented to cover the mechanical type of speedometers using a rotating magnet.

0.3 Work on the formulation of this standard has been undertaken with a view to establish an acceptable level of quality and performance and to bring about a degree of interchangeability in these units.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers the general design and performance characteristics and tests for mechanical type of speedometers using rotating magnet. The instrument is suitable for all types of automotive applications.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

2.1 Speedometer — A device for the measurement of the rate of distance travelled per unit time.

*Rules for rounding off numerical values (*revised*).

2.2 Odometer (Distance Indicator) — A counter which gives the distance travelled by the vehicle.

2.3 Speed Indicator — A device for the measurement of the rate of distance travelled per unit time.

2.4 Effective Range — That portion of the scale over which the instrument purports to comply with specified limits of accuracy.

2.5 Sweep — The included angle between the minimum and maximum of the scale.

2.6 Ratio — The rev/min of the drive shaft of the instrument divided by 1 000 to indicate 60 km/h.

It is also equal to 1/1 000th of the revolutions of the input shaft of the instrument to read 1 km on the odometer.

The range and ratio of the instruments shall be as required by the purchaser.

2.7 Index — The pointer or other means by which the measured speed is indicated relative to the scale.

2.8 Scale Mark — One of the marks constituting a scale.

2.9 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of speedometer.

2.10 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

2.11 Routine Tests — Tests carried out on each speedometer to check requirements which are likely to vary during production.

3. DESIGN AND CONSTRUCTION

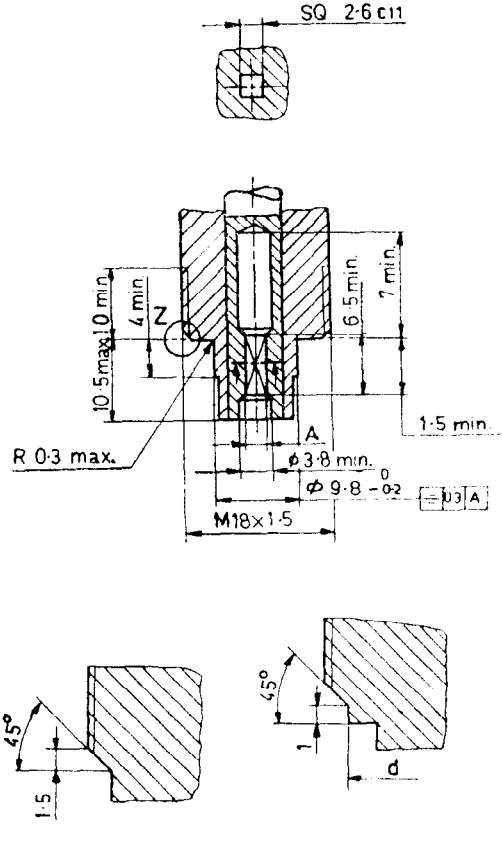
3.1 The instrument consists of an odometer and a speed indicator. The instrument is driven by a flexible shaft. The maximum reading of the odometer shall be 99 999 km. After completing the maximum reading the odometer shall automatically set back to zero.

3.2 Graduations — Graduations shall be according to the requirements of the purchaser. The preferred number of graduations shall be in the increasing steps of 5 km/h.

3.3 Dial Facia — The printing details on the dial such as style of lettering printing, thickness of graduation, customer's monogram, symbol or writing and colour of printing shall be according to the requirements of the purchaser. Manufacturers monogram in suitable size shall appear on the dial.

3.4 Bearing block threading for input shaft connection shall be M 10 × 1 or M 18 × 1·5 or as specified (*see* Fig. 1).

The drive shaft shall have 2·6 C11 or 3 C11.



DETAIL Z

All dimensions in millimetres.

FIG. 1 INPUT SHAFT CONNECTION

3.5 The movement of the pointer of the speed indicator shall be clockwise or anti-clockwise.

3.6 Illumination — The instrument shall be supplied with or without illumination as required by the purchaser.

3.7 Mounting — The mounting arrangement shall be such as to facilitate its fixing on the panel.

4. DIMENSIONS

4.1 The preferred outside diameter of the case or housing shall be 48, 60, 73, 80, 85, 100 or 140 mm. All other dimensions including that of the mounting accessories shall be as specified. The preferred mounting dimensions are given in Fig. 2.

4.2 The dimensions of non-circular type of speedometers shall also be as specified.

5. MARKING

5.1 The speedometer shall be marked with the following:

a) Manufacturer's name or trade-mark or both,

b) Month and year of manufacture,

c) Country of manufacture,

d) The symbol for the quantity measured, and

e) Ratio of marking.

5.2 The speedometer may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. TESTS

6.1 Classification of Tests

6.1.1 *Type Tests* — The following shall constitute type tests:

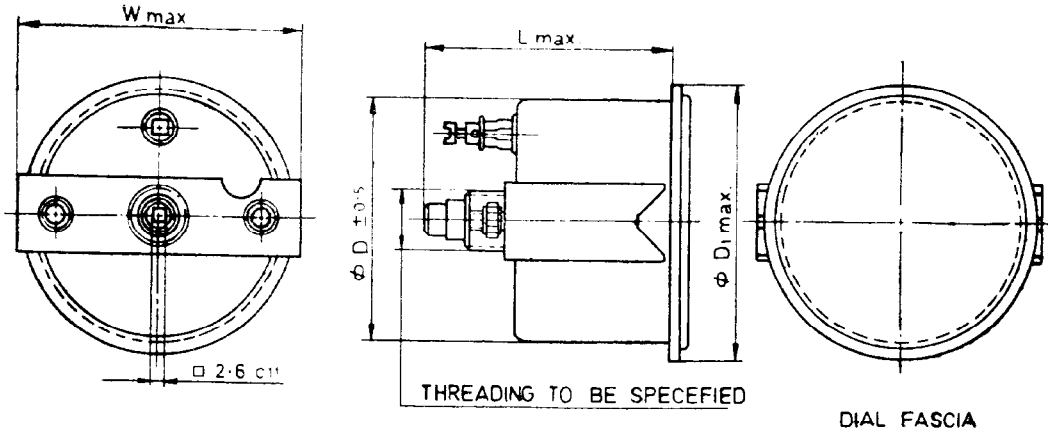
a) Visual examination (*see* **6.2**),

b) Accuracy test (*see* **6.3**),

c) Hysteresis test (*see* **6.4**),

d) Endurance test (*see* **6.5**),

e) Vibration test (*see* **6.6**),



All dimensions in millimetres.

FIG. 2 FITMENT DIMENSION OF A SPEEDOMETER rpm METER WITH HOUR COUNTER

f) Dry heat test (*see* **6.7**),

g) Damp heat cycling test (*see* **6.8**),

h) Cold test (*see* **6.9**),

j) Rapid change of temperature test (*see* **6.10**), and

k) Water spray test (*see* **6.11**).

6.1.1.1 *Criteria for approval* — Eight samples shall be submitted for testing together with the relevant data. These shall be tested according to the test schedule given in Appendix A. The testing authority shall issue a type approval certificate if the speedometers are found to comply with the requirements of tests given in **6.1.1.**

6.1.1.2 In case of failure in one or more type tests, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to the test(s) in which failure occurred. If in repeat test(s) no failure occurs, the tests may be considered to have been satisfied.

6.1.2 *Acceptance Tests* — The following shall constitute acceptance tests:

a) Visual examination (*see* **6.2**), and

b) Accuracy test (*see* **6.3**).

6.1.2.1 The number of samples for acceptance tests shall be as specified. However, a recommended plan of sampling is given in Appendix B.

6.1.3 *Routine Tests* — The following shall constitute routine tests:

a) Visual examination (*see* **6.2**), and

b) Accuracy test (*see* **6.3**).

6.2 Visual Examination — The external components and the dial shall be visually examined for surface defects. The dial characteristics shall be as specified.

6.3 Accuracy Test

6.3.1 *Tolerance on Indication* — The permissible tolerance on the observed value on speed indicater at 25 $\pm$ 5°C shall be 0 to + 4 percent of the full scale value for the effective range.

6.3.1.1 Under standard conditions the tolerance on the observed value of the odometer reading shall be $\pm$2 percent.

6.3.2 *Pointer Resting* — When the drive shaft of the instrument is not rotating the pointer shall rest on the stop pin or at zero position.

6.3.3 *Pointer Stability* — The oscillation of the pointer shall be not more than ±2 percent of the full scale value on either side of any particular indication within the effective range. However, for an instrument having the pointer sweep less than 180°, the permissible oscillation of the pointer shall be not more than ±3 percent of the full scale value within the effective range. When there is a change in the input rpm above 500 rev/min, the oscillation of the pointer shall be permissible for a maximum period of 3 seconds before indicating the final reading.

6.3.4 *Sensitivity* — The pointer shall return to zero position when moved from that position by an impact or when the drive stops rotating.

6.3.5 *Damping* — The pointer shall respond to any change in input rpm within three seconds.

6.3.6 *Counter Alignment* — The alignment of the counter numerals while at rest, shall be within 0·75 mm of the true alignment. Misalignment of adjacent numerals shall not exceed 0·75 mm except when they are moving. The numerals shall not be obscured by the window aperture and no part of the preceding or succeeding numerals shall be visible when viewed from an average driver's eye line, except when the numerals are moving.

6.4 Hysteresis Test — When the speedometer is tested for increasing and decreasing rev/min, the indication of the pointer for any particular values on decreasing rev/min may be different from that of the corresponding indication on increasing rev/min. The two readings shall be within the tolerance specified in **6.3.1**.

6.5 Endurance Test — The speedometer shall be operated continuously at 70 percent of its full range speed till the odometer reads 100 000 km. The instrument shall be checked for accuracy as specified in **6.3.1** at regular intervals of every 10 000 km indicated by the odometer.

6.5.1 After this test, the speedometer shall satisfy the requirements specified in **6.3.1**, and the variation in the observed value from the initial value shall not exceed ±4 km/h.

6.6 Vibration Test — The speedometer after being rigidly mounted on a suitable vibrating machine constructed to produce a simple harmonic motion shall be subjected to vibration (a total lift of 0·7 mm) through a frequency range of 10-55-10 Hz in a period of one minute. With continuously varying frequencies the vibration shall be applied for not less than one hour in each of the 3 major areas of the speedometer. At the end of the vibration test the speedometer shall be examined for any evidence of damage and shall be subjected to accuracy test (**6.3.1**). The permissible variation in the observed value from the initial value shall not exceed ± 4 km/h.

6.7 Dry Heat Test — The dry heat test shall be carried out according to IS : 9000 (Part 3/Sec 3)-1977* with a gradual change of temperature under the following conditions:

Temperature	70 ± 3°C
Duration of exposure	4 hours

6.7.1 After this test, while the speedometer is still at the high temperature, the speedometer shall satisfy the requirements specified in **6.3.1** and the variation in the observed value from the initial value shall not exceed ±4 km/h.

6.8 Damp Heat (Cycling) Test — The damp heat (cycling) test shall be carried out according to IS : 9000 (Part 5/Sec 2)-1981* not followed by exposure to cold. The number of conditioning cycles shall be 2.

6.8.1 After this test, the speedometer shall satisfy the requirements specified in **6.3.1** and the variation in the observed value from the initial value shall not exceed ±4 km/h.

6.9 Cold Test — The cold test shall be carried out as in IS : 9000 (Part 2/Sec 3)-1977* with a gradual change in temperature under the following conditions:

Temperature	— 10°C ± 3°C
Duration of exposure	2 hours

6.9.1 After this test, while the speedometer is still at the low temperature, the speedometer shall satisfy the requirements specified in **6.3.1** and the variation in the observed value from the initial value shall not exceed ±4 km/h.

6.10 Rapid Change of Temperature Test — Rapid change of temperature test shall be carried out as per IS : 9000 (Part 14)-1978*. The speedometer shall be exposed to the following conditions:

Cold (*Min*) temperature	— 10 ± 3°C
Hot (*Max*) temperature	+ 70 ± 3°C
Number of cycles	2
Duration (t_1)	30 *Min*

*Specification for basic environmental testing procedures for electronic and electrical items:

Part 3 Dry heat test, Section 3 Dry heat test for non-heat dissipating items with gradual change of temperature.

Part 5 Damp heat (cyclic) test, Section 2 12 + 12 h cycle.

Part 2 Cold test, Section 3 Cold test for non-heat dissipating items with gradual change of temperature.

Part 14 Change of temperature.

6.10.1 After this test, the speedometer shall satisfy the requirements specified in **6.3.1** and the variation in the observed value from the initial value shall not exceed ±4 km/h.

6.11 Water Spray Test — The speedometer shall be subjected to water spary test as per IS : 2106 (Part 11)-1965* exposing only the front parts for 30 minutes.

6.11.1 After this test, the speedometer shall satisfy the requirements specified in **6.3.1** and variation in the observed value from the initial value shall not exceed ± 4 km/h.

APPENDIX A

(*Clause* 6.1.1.1)

Clause No.	*Test*	*Sequence*							
		1	2	3	4	5	6	7	8
6.2	Visual examination	×	×	×	×	×	×	×	×
6.3	Accuracy test	×	×	×	×	×	×	×	×
6.4	Hysteresis test	×	×	×	×	×	×	×	×
6.5	Endurance test	×	×						
6.6	Vibration test			×					
6.7	Dry heat test				×				
6.8	Damp heat (cycling) test					×			
6.9	Cold test						×		
6.10	Rapid change of temperature test							×	
6.11	Water spray test								×

× Sample to be tested.

*Specification for environmental tests for electronic and electrical equipment: Part 11 Water spray test.

APPENDIX B

(*Clause* 6.1.2.1)

SAMPLING PROCEDURE FOR ACCEPTANCE TEST

B-1. LOT

B-1.1 In a consignment, all the speedometer and odometer systems of the same size, manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 The number of speedometer and odometer systems to be selected from each lot shall depend upon the size of the lot and shall be as follows:

Lot Size	*Sample Size*	*Acceptance Number*
Up to 150	20	1
151 to 300	32	2
301 to 500	50	3
501 to 1 000	80	5
1 001 to 3 000	125	7
3 001 and above	200	10

B-1.2.1 The speedometer and odometer systems shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS : 4905-1968*, may be followed.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 All the speedometer and odometer systems shall be selected at random in accordance with lot size and sample size in **B-1.2** shall be subjected to the acceptance tests. A system failing to satisfy either of the requirements of acceptance tests shall be termed as ' defective '. The lot shall be considered as conforming to the requirements of acceptance tests if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in acceptance number in **B-1.2**, otherwise the lot shall be rejected.

*Methods for random sampling.