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Indian Standard

SPECIFICATION FOR
SEVERITIES FOR ENVIRONMENTAL TESTS FOR
AUTOMOTIVE ELECTRICAL EQUIPMENT

(First Reprint APRIL 1998)

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

January 1983
Indian Standard

SPECIFICATION FOR
SEVERITIES FOR ENVIRONMENTAL TESTS FOR
AUTOMOTIVE ELECTRICAL EQUIPMENT

Automotive Electrical Equipment Sectional Committee, ETDC 14

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(Continued on page 2)

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0. **FOREWORD**

0.1 This Indian Standard was adopted by the Indian Standards Institution on 11 May 1982, after the draft finalized by the Automotive Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 The object of this standard is to specify the environmental severities encountered in actual service by automotive electrical equipment.

0.3 This standard covers the anticipated severities for the various environmental tests required to be done on automotive electrical equipment. Information regarding electrical and mechanical checks to be made and performance requirements to be complied with after the test are not part of this standard. Details of the same are covered in individual specifications.

0.4 The environmental tests contained in this standard may in themselves consist of a series of operations such as preconditioning, initial measurements, conditioning, intermediate measurements (wherever applicable) and recovery. In view of the variety of products covered by this standard, it is not possible to give details of these operations. It is essential, therefore, that guidance shall be obtained from individual specifications in this regard to enable the tests to be done in a proper manner.

0.5 All the possible tests that may be required to be done are listed in this standard, along with their applicability in respect of the broad groupings into which the automotive electrical equipment are divided. However, each equipment is to be examined in detail taking into account the actual service conditions, technical and economic aspects, etc. The applicability or otherwise of a test would therefore be ultimately governed by the individual specification. In the event of a conflict between this standard and the relevant equipment specification, the requirements specified in the latter shall prevail.
0.6 It is not intended that the environmental severities, specified in this standard are to be uniformly adopted for all automotive electrical equipment. However, this standard would enable the individual equipment specification to adopt a common terminology and make departures only where absolutely necessary and unavoidable. It is recommended that the reasons for departures, when made, shall be indicated in the individual specifications to enable the peculiarities of the equipment and the conditions of its use to be better understood.

0.7 Equipment covered by this standard are broadly classified into 3 groups (see 3). This classification is being made keeping in view the environmental severities encountered depending on the location of mounting of the equipment.

0.8 The methods of environmental tests are covered in the IS : 9000* series. The requirements of this standard shall, therefore, be read in conjunction with IS : 9000*, wherever applicable.

0.9 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.

1. SCOPE

1.1 This standard specifies the basic information on degrees of severities for various environmental tests required to be conducted on automotive electrical equipment.

1.2 This standard deals only with the severities of test conditions and gives no information on electrical and mechanical checks to be made or performance requirements during or after the test, or about the expected life of the equipment. For these requirements, relevant equipment specification shall be referred.

1.3 The applicability of an environmental test and the sequence of tests shall be as given in the individual specifications.

2. TERMINOLOGY

2.1 For the purpose of this standard, the explanations of terms as given in 2 of IS: 9000 (Part I)-1977‡ shall apply.

* Specification for basic environmental testing procedures for electronic and electrical items.
† Rules for rounding off numerical values (revised).
‡ Specification for basic environmental testing procedures for electronic and electrical items: Part I General.
3. CLASSIFICATION

3.0 For the purposes of environmental severities, automotive electrical equipment are classified into the following three groups:

**Group 1** Engine mounted equipment, such as starter motors, dynamos, transducers, etc.

**Group 2** Chassis or cowl mounted/exposed electrical equipment, such as batteries, tail lights, stoplights, light assemblies including headlight assembly, horn, instruments, switches, gauges, etc.

**Group 3** Cab mounted/protected/semi-protected electrical equipment, such as instruments, gauges, switches, wiper motor, flashers, fuse box, terminal strips, etc.

3.1 The examples of typical equipment in each group mentioned above are illustrative in nature and each equipment depending on the vehicle in which it is mounted, is to be considered in detail.

4. TESTS

4.0 **General** — When a test is included in the relevant equipment specification, the following details shall be given as far as they are applicable:

a) Preconditioning;
b) Initial measurements;
c) Details of mounting;
d) State of item during conditioning;
e) Severity;
f) Intermediate measurements;
g) Recovery, if non-standard;
h) Final measurement;
j) Acceptance criteria; and
k) Sampling plan and sequence of tests.

4.1 Vibration Test

4.1.0 This test is intended to determine the ability of equipment to withstand specified severities of vibration when mounted on a vehicle.

4.1.1 The test shall be conducted as specified in IS : 2106 (Part XVI)-1971*.

4.1.2 Endurance testing by sweeping shall be conducted according to 9.2.1 of IS: 2106 (Part XVI)-1971* with the following severities:

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
<th>Group 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Petrol Engine Mounted Equipment</td>
<td>Diesel Engine Mounted Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency range, Hz</td>
<td>10-250</td>
<td>10-250</td>
<td>10-55</td>
<td>10-55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement amplitude (up to a frequency of 57 to 62 Hz), mm</td>
<td>0.75</td>
<td>0.75</td>
<td>0.35</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceleration amplitude (above a frequency of 57 to 62 Hz), g</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total duration, hours</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note — Below a certain frequency known as the cross-over frequency (basically between 57 and 62 Hz) all amplitudes are specified as constant displacement, whilst above this frequency amplitudes are given as constant acceleration.

4.1.3 Endurance testing at resonant frequency, if exist, shall also be conducted according to 9.2.2 of IS: 2106 (Part XVI)-1971* with the following severities for all groups:

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
<th>Group 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Petrol Engine Mounted Equipment</td>
<td>Diesel Engine Mounted Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency range for resonance search, Hz</td>
<td>10-250</td>
<td>10-250</td>
<td>10-55</td>
<td>10-55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement amplitude (up to a frequency of 57 to 62 Hz), mm</td>
<td>0.75</td>
<td>0.75</td>
<td>0.35</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceleration amplitude (above a frequency of 57 to 62 Hz), g</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total duration at each frequency, hours</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AMENDMENT NO. 2 OCTOBER 1996
TO
IS 10250 :1982 SPECIFICATION FOR SEVERITIES FOR ENVIRONMENTAL TESTS FOR AUTOMOTIVE ELECTRICAL EQUIPMENT


(Page 5, foot-note with ‘**’ mark) — Substitute the following for the existing foot-note:

‘Basic environmental testing procedures for electronic and electrical items: Part 8 Vibration (sinusoidal) test.’


(Page 6, foot-note with ‘**’ mark) — Substitute the following for the existing foot-note:

‘Basic environmental testing procedures for electronic and electrical items: Part 8 Vibration (sinusoidal) test.’

(Page 7, clause 4.1.3, Note 1) — Substitute ‘19 of IS 9000 (Part 8) : 1981 *’ for ‘6.1 of IS: 2106 (Part XVI) - 1971 *’.

(Page 7, foot-note with ‘**’ mark) — Substitute the following for the existing foot-note:

‘Basic environmental testing procedures for electronic and electrical items: Part 8 Vibration (sinusoidal) test.’

(Page 9, clause 4.6.1) — Substitute ‘IS 269 : 1989 *’ for ‘IS: 269 - 1976 *’.

(Page 9, foot-note with ‘**’ mark) — Substitute the following the existing foot-note:

‘Ordinary Portland cement, 33 grade — Specification (fourth revision).’
Amndt No. 2 to IS 10250 : 1982

(Page 9, clause 4.8.1) — Substitute the following for the existing clause:

4.8.1 The test shall be conducted as specified in IS 9000 (Part XI) : 1983 for all the three groups.'

(Page 11, clause 4.13.1) — Substitute 'IS 9000 (Part 16) : 1983† for IS : 2106 (Part XI) - 1965†.'

(Page 11, foot-note with † mark) — Substitute the following for the existing foot-note:

'†Basic environmental testing procedures for electronic and electrical items: Part 16 Driving rain test.'

(Page 11, clause 4.13.2.1) — Substitute 'IS 9000 (Part 15/Sec 9) : 1982‡ for IS:2106 (Part X) -1965‡.'

(Page 11, foot-note with ‡ mark) — Substitute the following for the existing foot-note:

'‡Basic environmental testing procedures for electronic and electrical items: Part 15 Sealing test, Section 9 Sealing for equipment.'

(Page 12, Appendix A) — Delete.

(TED 11)
4.2 Dry Heat Test

4.2.0 This test is intended to determine suitability of equipment to withstand high temperature severities which are likely to be encountered when mounted on a vehicle.

4.2.1 The test shall be conducted as specified in IS : 9000 (Part III/Sec 1 to Sec 5)-1977†.

4.2.2 The equipment shall be tested for high temperature use at the following conditions:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature, ºC</td>
<td>100</td>
<td>70/55</td>
</tr>
<tr>
<td>Duration of exposure, hours</td>
<td>16</td>
<td>4/16</td>
</tr>
</tbody>
</table>

4.3 Damp Heat (Cycling) Test

4.3.0 This test is intended to check the satisfactory performance level that can be maintained before and after exposure to varying conditions of humidity and temperature.

4.3.1 The test shall be conducted as specified in IS : 9000 (Part V/Sec 1 and 2)-1981‡.

---

†Specification for basic environmental testing procedures for electronic and electrical items: Part III Dry heat test,
  Section 1 General
  Section 2 Dry heat test for non-heat dissipating items with sudden change of temperature
  Section 3 Dry heat test for non-heat dissipating items with gradual change of temperature
  Section 4 Dry heat test for heat dissipating items with sudden change of temperature
  Section 5 Dry heat test for heat dissipating items with gradual change of temperature.
‡Specification for basic environmental testing procedures for electronic and electrical items: Part V Damp heat (cyclic) test,
  Section 1 16 + 8 h cycle
  Section 2 12 + 12 cycle.
4.3.2 Number of conditioning cycles and recovery period shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cycles</td>
<td>21</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Recovery period, hours</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

4.4 Cold Test

4.4.0 This test is intended to determine the suitability of the equipment at the specified low temperature likely to be encountered when mounted on a vehicle.

4.4.1 The test shall be conducted as specified in IS: 9000†(Part II/Sec 1 to 4)-1977*.

4.4.2 The equipment shall be tested for low temperature use at the following conditions for all the 3 groups:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-10°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of exposure</td>
<td>2 hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.5 Rapid Change of Temperature Test

4.5.0 This test is intended to determine the suitability of the equipment when mounted on vehicle and subjected to quick changes in temperature.

4.5.1 The test shall be conducted as specified in IS : 9000 (Part XIV)-1978†.

4.5.2 The equipment shall be exposed to the following cyclic conditions:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold (Min) temperature, °C</td>
<td>-10</td>
<td>-10</td>
<td>-10</td>
</tr>
<tr>
<td>Hot (Max) temperature, °C</td>
<td>100</td>
<td>70/55</td>
<td>70/55</td>
</tr>
<tr>
<td>Number of cycles</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Duration (t1)</td>
<td>1 hour</td>
<td>1 hour</td>
<td>30 min</td>
</tr>
</tbody>
</table>

*Specification for basic environmental testing procedures for electronic and electrical items: Part II Cold test,
  Section 1 General
  Section 2 Cold test for non-heat dissipating items with sudden change of temperature
  Section 3 Cold test for non-heat dissipating items with gradual change of temperature
  Section 4 Cold test for heat dissipating items with gradual change of temperature.

†Specification for basic environmental testing procedures for electronic and electrical items: Part XIV Change of temperature.
4.6 Dust Test

4.6.0 This test is intended to determine satisfactory performance of the equipment when operated in fine dusty atmosphere.

4.6.1 The equipment, with drain hole, if any, closed shall be mounted in its normal operating position, 150 mm from the wall in a box measuring 900 mm in all directions, containing 5 kg of fine powdered cement conforming to IS: 269-1976*. At intervals of 15 minutes, this dust shall be agitated by compressed air or fan blower by projecting blasts of air for a two-second period in a downward direction into the dust in such a way that the dust shall be completely and uniformly diffused throughout the entire cube. The dust shall then be allowed to settle. This test shall be continued for 5 hours.

4.6.2 The test shall be conducted for all the groups.

4.7 Mould Growth Test

4.7.0 This test is intended to assess the extent of mould growth on the equipment when exposed to different cultures present at various atmospheric conditions.

4.7.1 The test shall be conducted for 84 days for all 3 groups as specified in IS: 9000 (Part X)-1979† with cultures specified in 6.1 of the same standard. After the test, the extent of mould growth permissible shall be as specified in the relevant equipment specification.

4.8 Corrosion Resistance Test

4.8.0 This test is intended to determine the suitability of the equipment to withstand corrosion due to atmospheric conditions. The appearance of the product shall not prejudice the assessment of results.

4.8.1 The test shall be conducted for all 3 groups as specified in Appendix A.

4.9 Contamination Test

4.9.0 This test is intended to determine the suitability of the equipment to withstand contamination from fuels, oils and such other substances which it may encounter during service.

4.9.1 The following test procedure shall be common for all the 3 groups.

4.9.1.1 Conditioning

a) A sprayer capable of spraying paraffin oil, petrol diesel oil and lubricating oil shall be used for this test.

*Specification for ordinary and low heat Portland cement (third revision).

†Specification for basic environmental testing procedures for electronic and electrical items : Part X Mould growth test.
b) A chamber capable of maintaining a temperature of 50 ± 3°C shall be used.

4.9.1.2 Procedure

a) The equipment, with drain holes or openings if any, closed shall be uniformly sprayed with contaminant fluids mentioned in 3.9.1.1(a) at the rate of 100 ml per minute for about one minute.

b) After each material has been sprayed, the equipment shall be stored in the dry heat chamber maintained at 50 ± 3°C for one hour.

c) At the end of the above period, the chamber shall be switched off and the chamber temperature shall be allowed to attain the laboratory temperature.

4.9.1.3 Recovery — The equipment shall then be removed from the chamber and allowed to remain under the following standard atmospheric conditions until a temperature equilibrium is reached:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>15 to 35°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>45 to 75 percent</td>
</tr>
<tr>
<td>Air pressure</td>
<td>86 to 106 kPa</td>
</tr>
</tbody>
</table>

4.10 Drop and Topple Test

4.10.0 This test is intended to determine the suitability of the equipment for such applications where it is likely to be dropped, or toppled, or otherwise roughly handled.

4.10.1 The test shall be conducted as specified in IS : 9000 (Part VII/Sec 3) - 1979*.

4.10.2 Test conditions for all the 3 groups shall be as follows:

a) Number of drops : 6

b) Drop height : 25, 50, 100 or 200 mm

c) Attitude of dropping that is, drop on corner, edge or plane shall be as specified in the relevant equipment specification.

d) The equipment shall be made to topple over on to the face or edge and in the manner specified in the relevant equipment specification. The number of topples shall be 6.

4.11 Bump Test

4.11.0 This test is intended to determine the suitability of equipment to withstand repeated shocks such as those encountered on motor vehicles.

*Specification for basic environmental testing procedures for electronic and electrical items: Part VII Impact test, Section 3 Drop and topple.
Alterations

(Page 11, clause 4.12) - Substitute the following for the existing clause:

"4.12 Impact or Shock Test

4.12.0 This test is intended to determine the suitability of the equipment when mounted on vehicle and subjected to shocks as a result of suddenly applied forces or abrupt changes in motion.

4.12.1 The test shall be conducted for all the three groups as specified in IS:9000(Part 7/Sec 1)-1979 'Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Section 1 Shock.'

4.12.2 Any one of the following severities shall be selected for the test depending on the location of the equipment and the vehicle to which it is intended:

  5 g, 10 g, 15 g and 20 g.

4.12.3 Method of mounting, and other details shall be as specified in relevant equipment specification. Components mounted on mounting brackets during normal operation shall be tested along with them."

(Page 11, clause 4.14) - Substitute the following for the existing clause:

"4.14 Simulated Solar Radiation Test"
4.14.0 This test is intended to determine the effects (thermal mechanical, chemical, electrical, etc) produced on equipment as a result of exposure to solar radiation under conditions experienced on the surface of earth.

4.14.1 Any one of the following methods shall be selected for the test:

4.14.1.1 The equipment shall be mounted in the manner in which it is mounted on the vehicle exposing only parts which are normally exposed under actual working conditions and subjected to an exposure to direct sun light for a period of 90 days.

4.14.1.2 The equipment shall be exposed to the action of ultra violet light in a fadeometer as specified in IS:101-1964 'Methods of test for ready mixed paints and enamels (second revision)'. The period of exposure shall be 24 hours.

4.14.2 The test shall be applicable to group 2 and 3 equipment only."

(ETDC 14)
4.11.1 The test shall be conducted as specified in IS : 9000 (Part VII/Sec 2)-1979*.

4.11.2 Test conditions for all the 3 groups shall be as follows:
   a) Number of bumps  1 000
   b) Bump severity  40 g ± 10 percent

4.11.3 Unless otherwise specified in the relevant equipment specification, the equipment shall be kept in operation during the test.

4.12 Impact or Shock Test — Under consideration.

4.13 Water Spray Test

4.13.0 This test is intended to determine the suitability of the equipment to withstand conditions of water spray.

4.13.1 The test shall be conducted as specified in IS : 2106 (Part XI)-1965†, and test duration shall be 2 hours for Groups 1 and 3 and 25 hours for group 2 equipment.

4.13.1.1 Mounting details and direction of water spray shall be as specified in equipment specification.

4.13.2 Water Seal Test — This test shall be applicable to waterproof equipment in addition to the water spray test specified in 4.13.1.

4.13.2.1 The test shall be conducted as specified in IS : 2106 (Part X)-1965‡.

4.13.2.2 Test condition for Groups 1 and 2 shall be as given below:
   Depth of water or pressure to be used for the test  15 cm of water
   Duration of the test  2 hours

4.13.2.3 This test shall not be applicable to Group 3 equipment.

4.14 Simulated Solar Radiation at Ground Level Test — Under consideration.

---

*Specification for basic environmental testing procedures for electronic and electrical items: Part VII Impact test, Section 2 Bump.
†Specification for environmental tests for electronic and electrical equipment: Part XI Water spray test.
‡Specification for environmental tests for electronic and electrical equipment: Part X Water immersion test.
IS : 10250 - 1982

5. SEQUENCE OF TESTS

5.1 The sequence of tests shall be as given in the relevant equipment standard.

APPENDIX A

(Clause 4.8.1)

TEST FOR CORROSION RESISTANCE

A-1. APPARATUS

A-1.1 Salt Spray Chamber — The chamber for this test shall be so constructed that the salt spray is produced in the lower part of the chamber, in the upper part of which the parts to be exposed are suspended. The construction of the ceiling, walls and other parts of the chamber shall be such that no condensate can drip on the test specimen. The spray shall be produced by an atomizer employing compressed air free from all impurities.

A-1.1.1 In general, a salt spray chamber shown in Fig. 1 with a spraying arrangement as shown in Fig. 2 and complying with the following requirements would be suitable:

a) The cabinet shall approximately be of the dimensions shown, and the cabinet and its internal fittings shall be made of monel metal or other suitable material. A shelf capable of being fitted in the upper or lower part of the cabinet shall be provided.

b) The air used for atomizing the salt solution shall be clean. It shall be possible to adjust the pressure by a relief valve or by the pressure outlet of the blower.

c) It shall be possible to control the amount of spray by adjusting the position of the lower nozzle C by unscrewing the bottom locknut B. The diameter of nozzle shall be 1.5 mm. A tap and second branch in the air-line shall be available for agitating the salt solution as required.

d) The spraying apparatus shall be capable of atomizing not less than 1450 ml of salt solution per hour. The quantity of solution sprayed per cubic metre capacity of the chamber shall be approximately 175 ml per minute.
e) A container filled with cotton wool shall be provided as shown in Fig. 1. It acts as a breather and provides an outlet for the air which is constantly being pumped into the chamber, the cotton wool acting as a filter and preventing salt mist from being discharged into the atmosphere.

All dimensions in centimetres.

Fig. 1 Salt Spray Chamber

A-2. Procedure

A-2.1 The nozzle for atomizing the salt solution shall be adjusted for maximum amount of spray.

A-2.2 The pressure of the solution shall be maintained between 29 and 35 kPa.

A-2.3 The test piece shall be sprayed in the chamber with 5 percent solution of sodium chloride in water at the standard temperature of
27 ± 2°C for 50 hours consisting of two periods, each period being of 24 hours of spraying and one hour of draining.

**Fig. 2 Details of Spraying Arrangement**
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