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IS 11037 (1984): Electronic type fan regulators [ETD 5: Electric Fans]

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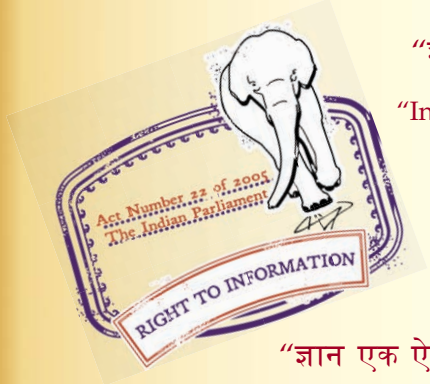

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"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

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Indian Standard

SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

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Indian Standard

SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 February 1984, after the draft finalized by the Electric Fans Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard deals with safety and performance requirements of electronic type fan regulators. The manufacture and use of such regulators is on the increase in this country and the need for formulation of an Indian Standard has been realized.

0.3 Though the use of electronic type fan regulators results in some saving in the overall energy consumed by the fan as compared to conventional regulators when the fans run at speeds lower than the full speed, the use of such regulators is reported to have caused radio and television interference. In addition, the presence of hormonics in the supply to the fan motor may cause over-heating of the fan motor. It is felt that this standard would create awareness in consumers regarding the advantages and the possible deficiencies of electronic type fan regulators and highlight the necessity to pay adequate attention in design as well as production to limit these parameters to acceptable levels by the manufacturers.

0.4 Due to non-availability of adequate information, subjective tests for assessing the radio and television interference have been included in this standard. As and when details about more precise test methods are available, they will be included.

0.5 Inclusion of tests for power losses and ripple contents is under consideration.

0.6 For the purpose of deciding whether a particular requirement of the standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, 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.

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

1. SCOPE

1.1 This standard deals with safety and performance requirements of electronic type fan regulators for use with single-phase ac fans up to 250 V.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 1885 (Part 55)-1981* shall apply.

2.1 Electronic Type Fan Regulator — Fan regulator which incorporates electronic devices and components, such as resistors and capacitors, intended to regulate the speed of the fan.

2.2 Electric Fan — A propeller-bladed fan, having two or more blades, driven by ac electric motor and provided with a suitable mounting arrangement.

3. RATED VOLTAGES

3.1 The preferred rated voltages for the regulator are 230 V and 240 V single-phase ac.

NOTE — Nevertheless, regulators made for other voltages shall be considered to comply with the specification provided they do so in all other aspects.

4. RATED FREQUENCY

4.1 The rated frequency shall be the standard frequency of 50 Hz.

NOTE — Nevertheless, regulator made for other frequencies shall be considered to comply with the specification, provided they do so in all other aspects.

5. DESIGN AND GENERAL CONSTRUCTION

5.1 The regulators may be either of ventilated or totally enclosed type. The enclosures, if metallic shall be reliably and permanently connected to earthing terminal or termination within the regulator, which shall be indelibly marked with the symbol ' ⏚ '.

5.2 The regulators shall match in rating with the fans for which they are intended.

5.3 The regulators shall have an ' off ' position, preferably next to lowest speed contact.

*Electrotechnical vocabulary : Part 55 Electric fans.

5.4 The speed regulator shall be capable of withstanding the moisture resistance test spocified in **9.3.7.**

5.5 In the assembled fan regulator, live parts shall not be accessible to the standard test finger (*see* IS : 1401-1970*).

5.6 Precautions shall be taken in the manufacture of regulators to ensure a reasonable degree of silence (absence of humming noise) in operation of the fan at all speeds.

6. GENERAL AND SAFETY REQUIREMENTS

6.1 Insulation Resistance — When measured according to **9.3.4,** the insulation resistance shall be not less than 2 MΩ.

6.2 Leakage Current — The leakage current which may flow from live parts to accessible metal parts and metal foil on external insulating material connected together shall not exceed 300μA (peak), that is 210μA (rms).

6.3 Temperature Rise — The regulator when tested at any ambient temperature not exceeding 40°C, the temperature-rise shall not exceed the following values:

a) Frame enclosing the regulator	45°C
b) Knob:	
i) Metal	20°C
ii) Moulded materials and rubber	15°C
iii) Porcelain or vitreous material	20°C

6.4 Mechanical Strength — Fan regulators shall have adequate mechanical strength and be so constructed as to withstand such rough handling as may be expected in normal use.

6.5 Creepage Distances and Clearances — Creepage distances and clearances shall not be less than the values given below:

Sl No.	*Parts*	*Creepage Distance* mm
i)	Between live parts and accessible metal parts:	
	a) If protected against deposition of dirt	3·0
	b) If not protected against deposition of dirt	4·0

*Specification for accessibility test probes (*first revision*).

Sl No.	*Parts*	*Creepage Distance* mm
ii)	Between live parts of different polarity:	
	a) If protected against deposition of dirt	2·0
	b) If not protected against deposition of dirt	3·0
iii)	Between live parts and accessible metal parts:	
	a) If protected against deposition of dirt	2·5
	b) If not protected against deposition of dirt	3·0
iv)	Between live parts of different polarity;	
	a) If protected against deposition of dirt	2·0
	b) If not protected against deposition of dirt	2·5

6.6 The regulators shall be provided with radio and television interference suppression devices so as to ensure that there is no noise/disturbance on radio/television when operated beyond a distance of 1 m from the regulator.

6.7 The voltage drop across the regulator at maximum speed position shall not exceed 2 percent of the rated voltage of the fan for which the regulator is intended.

7. PERFORMANCE

7.1 The regulator shall be capable of starting up from rest, the fan, with the regulator set at minimum speed setting, when 85 percent of the rated voltage is applied.

7.2 The regulator shall be capable of reducing the speed of the fan by at least 50 percent of the full speed at the rated voltage.

8. MARKING

8.1 Each regulator shall be clearly and indelibly marked with the following information:

a) Manufacturers' name and trade-mark if any;
b) Type, namely electronic type;
c) Rated voltage(s) or rated voltage range;
d) Maximum wattage; and
e) Frequency or frequency range.

8.2 The regulators 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.

9. TESTS

9.1 Classification Tests

9.1.1 *Type Tests* — The tests specified below shall constitute type tests and shall be carried out on three samples of the same type and rating; selected preferably at random from a regular production lot:

a) Temperature-rise (**9.3.1**),

b) Leakage current (**9.3.2**),

c) High voltage (**9.3.3**),

d) Insulation resistance (**9.3.4**),

e) Earthing connection (**9.3.5**),

f) Protection against electric shock (**9.3.6**),

g) Voltage drop (**6.7**),

h) Performance (**7**),

j) Moisture resistance (**9.3.7**),

k) Mechanical strength (**9.3.8**),

m) Creepage distances and clearances (**9.3.9**),

n) Mechanical endurance (**9.3.10**),

p) Power losses (**9.3.11**),

q) Ripple contents (**9.3.12**), and

r) Environmental tests (**9.3.13**).

9.1.1.1 *Criteria for acceptance* — All samples shall successfully pass all the type tests for proving conformity with the requirements of this standard. If any of the samples fails in any of the type tests, the testing

authority, at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all the tests or to the tests in which failure(s) had occurred. No failure shall be permitted in the repeat test(s).

9.1.2 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Leakage current (**9.3.2**),

b) High voltage (**9.3.3**),

c) Insulation resistance (**9.3.4**),

d) Earthing connection (**9.3.5**),

e) Protection against electric shock (**9.3.6**),

f) Moisture resistance (**9.3.7**),

g) Performance (**7**),

h) Mechanical endurance (**9.3.10**), and

j) Power losses (**9.3.11**).

9.1.2.1 A recommended sampling plan for acceptance tests is given in Appendix A.

9.1.3 *Routine Tests* — The following shall constitute the routine tests:

a) Flash test (**9.3.3.4**),

b) Insulation resistance (**9.3.4.2**), and

c) Earthing connection (**9.3.5**).

9.2 General Conditions of Test

9.2.1 *Test Voltage* — When rated voltage is indicated on the name-plate, the test shall be conducted at the rated voltage. When a voltage range is specified, the tests are carried out at the highest value of the range.

9.2.2 *Limits of Error of Electrical Instruments* — The error in the indicated values of ammeter, voltmeters and wattmeters shall not exceed 0·5 percent of full scale value for instruments used for type tests. For routine and acceptance tests, instruments of accuracy class 2 may be used.

9.3 Schedule of Tests

9.3.1 *Temperature-Rise*

9.3.1.1 *Measurement of cooling air temperature during tests* — The cooling air temperature shall be measured by means of several thermometers placed at different points around the regulators at a distance of 1 to 2 metres and protected from all heat rediations and extraneous draughts. The thermometers used for this test shall be accurate to $\pm$ 0·5°C.

The value to be adopted for the temperature of the cooling air during a test shall be the mean of the readings of the thermometers taken at equal intervals of time during the last quarter of the duration of the test.

9.3.1.2 Load shall consist of fan of equivalent rated power for which regulator is suitable. The regulator shall be set at a position where maximum current is taken by this load.

9.3.1.3 *Measurement of temperature-rise* — The temperature-rise measurements shall be carried out by the method by thermometers or thermocouples, immediately after the regulator has reached steady state conditions.

9.3.2 *Leakage Current Test* — The test shall be carried out according to **13.2** of IS : 302-1979*.

9.3.3 *High Voltage Test (Type and Acceptance Test)*

9.3.3.1 The source of supply for high voltage test shall be not less then 500 VA.

9.3.3.2 The high voltage test shall be applied to regulators in normal working conditions.

9.3.3.3 An ac test voltage of 1 500 volts at a frequency of approximately 50 Hz and sine wave-form shall be applied between and terminal and the body and maintained for 1 minute without showing any kind of breakdown or flashover. Electronic circuit of the regulator shall be short-circuited during this test.

9.3.3.4 *Flash test (routine test)* — The test shall be carried out as specified in **9.3.3.3** except that the test voltage shall be applied instantaneously for 1 second.

*General and safety requirements for household and similar electrical appliances (*fifth revision*).

9.3.4 *Insulation Resistance*

9.3.4.1 *Type and acceptance test* — When conducted as a type or acceptance test, this test shall follow the moisture resistance test (**9.3.7**). The insulation resistance of the regulator shall be measured with dc voltage of approximately 500 V, the measurement being made 1 minute after the application of the voltage. Electronic circuit of the regulator shall be short-circuited during this test.

9.3.4.2 *Routine test* — The insulation resistance test shall be carried out on regulator immediately after conducting the flash test.

9.3.5 *Earthing Connection* — This test is applicable to regulators with metal enclosure only. A current derived from an ac source having a no-load voltage not exceeding 12 V, and equal to 1·5 times the rated current of the regulator or 25 A, whichever is greater, is passed between the earthing terminal or earthing contact and each of the accessible metal parts in turn. The voltage drop between the earthing terminal of the regulator and the accessible metal part is measured and the resistance is calculated from the voltage drop and the current. The resistance value shall not exceed 0·1Ω. Care is taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test results.

9.3.6 *Protection Against Electric Shock* — The test shall be conducted according to **8** of IS : 302-1979*.

9.3.7 *Moisture Resistance* — The humidity treatment is carried out in a humidity cabinet containing air with a relative humidity of not less than 95 percent. The temperature of the air at all places where samples can be located is maintained at any convenient temperature in the range 40 $\pm$ 5°C for a period of 48 hours. Then it is subjected to test indicated in **9.3.4.1**.

9.3.8 *Mechanical Strength* — The test shall be carried out either by spring hummer or by the impact test apparatus and in accordance with **21** of IS : 302-1979*.

9.3.9 *Creepage Distances and Clearances* — The test shall be conducted according to the relevant provisions of **29** of IS : 302-1979*.

9.3.10 *Mechanical Endurance Test* — The regulator shall continue to function satisfactorily after being subjected to a test of 5 000 operations of the regulator when connected to a fan with locked rotor or an electrical load of an equivalent impedance supplied at the maximum rated voltage.

*General and safety requirements for household and similar electrical appliances (*fifth revision*).

One operation includes a full cycle of movement from the 'lowest (off)' position to the 'Full Speed' position (or to the other extreme position) and back to the original position. The test shall be made approximately at the rate of 10 operations per minute.

9.3.11 *Power Losses* — (Under consideration).

9.3.12 *Ripple Contents* — (Under consideration).

9.3.13 *Environmental Tests*

9.3.13.1 The regulator shall continue to function satisfactorily after being subjected to environmental tests of **9.3.13.2** to **9.3.13.4.**

9.3.13.2 *Cold test* — This test shall be carried out in accordance with IS : 9000 (Part 2/Sec 3)-1977*. The degree of severity shall be −10°C for a duration of 4 hours.

9.3.13.3 *Dry heat test* — This test shall be carried out in accordance with IS : 9000 (Part 3/Sec 3)-1977†. The degree of severity shall be 55°C for a duration of 4 hours.

9.3.13.4 *Vibration test* — This test shall be carried out in accordance with IS : 9000 (Part 8)-1981‡, with the details given below:

a) Sweep frequency range	10 to 150 Hz
b) Displacement amplitude	0·15 mm
c) Number of sweep cycles	5

The direction of vibration is vertical; the regulator is fastened in its normal position of use.

APPENDIX A

(*Clause* 9.1.2.1)

SAMPLING OF ELECTRONIC TYPE FAN REGULATORS

A-1. SCALE OF SAMPLING

A-1.1 Lot — In a consignment, all the electronic type fan regulators of the same rating manufactured in the same factory under similar conditions of production, shall be grouped together to constitute a lot.

*Basic environmental testing procedures for electronic and electrical items: Part 2 Cold test.

†Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test.

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

A-1.2 The number of regulators to be selected from each lot, shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

TABLE 1 SAMPLING SIZE AND ACCEPTANCE NUMBER

(*Clauses* A-1.2, A-2.1 *and* A-2.2)

Lot Size	For Leakage Current, High Voltage Insulation Resistance, Earthing Connection, Protection Against Electric Shock, Performance and Power Losses Tests		For Moisture Resistance Test Sample Size
	Sample Size	Acceptance Number	
(1)	(2)	(3)	(4)
Up to 50	8	0	2
51 to 100	13	0	2
101 to 300	20	1	3
301 to 500	32	2	3
501 and above	50	3	5

A-1.2.1 These regulators 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.

A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 The electronic type fan regulators, selected according to col 1 and 2 of Table 1, shall be subjected to leakage current, high voltage insulation resistance, earthing connection, protection against electric shock, performance and power losses tests. A regulator failing to satisfy any of these requirements shall be termed as 'defective'. The lot shall be considered as conforming to these requirements if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 1; otherwise the lot shall be rejected.

A-2.2 The lot which has been found as conforming to the above requirements, shall then be tested for moisture resistance. For this purpose, the number of regulators to be selected from the lot shall be in

*Methods for random sampling.

accordance with col 1 and 4 of Table 1. The lot shall be considered as conforming to these requirements if no defective is found in the sample.

A-2.3 The lot which has been found as conforming to the above requirements shall then be subjected to mechanical endurance test. For this purpose, three regulators shall be selected from the lot at random. The lot shall be considered as conforming to this requirement if no defective is found in the sample.

A-2.4 The lot shall be considered as conforming to the requirements of acceptance tests if **A-2.1, A-2.2** and **A-2.3** are satisfied.

AMENDMENT NO. 1 OCTOBER 1987

TO

IS:11037-1984 SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

(Page 8, clause 9.3.3.2) - Substitute the following for the existing clause:

'9.3.3.2 The high voltage test shall be applied to the regulators installed as in normal working conditions except that these shall not be connected to the power supply.'

(ETDC 5)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 AUGUST 2000
TO
IS 11037 : 1984 SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

(*Page* 5, *clause* **6.7**) — Substitute the following for the existing matter:

'The input RMS voltage from the regulator into the fan shall be not less than 98 percent of the RMS supply voltage.'

(ETD 05)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 OCTOBER 2002
TO
IS 11037 : 1984 SPECIFICATION FOR ELECTRONIC TYPE FAN REGULATORS

(*Page* 5, *clause* **6.7** (*see also Amendment No.* 2) — Substitute the following for the existing matter:

'**6.7** The input RMS voltage from the regulator into the fan shall be not less than 98 percent of the supply voltage at the maximum speed position.'

(ET 05)

Reprography Unit, BIS, New Delhi, India