



**PRODUCT MANUAL FOR
AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD
AND SIMILAR USE PART 2 PARTICULAR REQUIREMENTS -
SECTION 9 TEMPERATURE SENSING CONTROLS
ACCORDING TO IS/IEC 60730-2-9:2011**

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	Product	:	IS/IEC 60730-2-9:2011
	Title	:	Automatic electrical controls for household and similar use part 2 particular requirements - section 9 Temperature sensing controls
	No. of Amendments	:	One
2.	Sampling Guidelines:		
a)	Raw material	:	-
b)	Grouping guidelines	:	Please refer ANNEX –A
c)	Sample Size	:	10 numbers (additional samples may be required depending on the type of control)
3.	List of Test Equipment	:	Please refer ANNEX –B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX –C
5.	Possible tests in a day :		Please refer ANNEX-D
6.	Scope of the Licence :		Please refer ANNEX-E

ANNEX A

1. IS/IEC 60730-2-9 covers different varieties of automatic temperature sensing electrical controls, each having a number of classifications as given in clauses 5 & 6. The following aspects of an automatic temperature sensing electrical control shall be taken into consideration for the purpose of GoL/ CSoL:

Rated voltage (V) :	If one voltage is tested, lower voltages may be included without testing
Rated current (A) :	To cover a range of current ratings, highest and lowest rating may be tested
Nature of supply (Cl 6.1) :	ac only/ dc only/ac & dc/specific supplies or multiple supplies - if “ac & dc” is tested, “ac only” and “dc only” may be covered without testing
Type of load and power factor (Cl 6.2):	If “control suitable for resistive & inductive load with p.f. not less than 0.6” is tested, control suitable for resistive load only or inductive load only with p.f. not less than 0.6 may be covered without testing.
Purpose (Cl 6.3):	At least one of each variety as per 6.3.1 to 6.3.15 shall be tested to cover all the varieties in the scope.
Method of operation	At least one of each variety Bimetallic / bimetallic SOD / electronic / thermistor / capillary pressure type – each variety shall be tested to cover all the varieties in the scope.
Use	For water heater / refrigeration /oven / cooking appliance / room heater / air conditioner etc... – At least one of each variety shall be tested to cover all the varieties in the scope.
Features of automatic action, Type 1 or Type 2 (Cl 6.4) :	Type 1.X / Type 2.X (X – alphabet as per 6.4.3) – At least one of each variety as per 6.4.3.1 to 6.4.3.106 shall be tested to cover all the varieties in the scope.
Degree of protection provided and control pollution degree (Cl 6.5):	If higher IP is tested, lower ones may be covered without testing. If higher pollution degree is tested, lower ones may be covered without testing.
Protection against electric shock (Cl 6.8) :	At least one each of Class 0, 0I, I, II, III shall be tested to cover all the varieties in the scope
Circuit disconnection or interruption (Cl 6.9):	Full-disconnection / micro-disconnection / micro-interruption / all- pole disconnection / electronic disconnection – At least one of each variety shall be tested to cover all the varieties in the scope.
According to Construction (Cl 6.15):	Integrated / incorporated / in-line cord / etc – At least one of each variety shall be tested to cover all the varieties in the scope.

2. The firm shall submit a declaration as per Table 1 for the varieties to be covered in the scope:

Table 1

RATING, CLASSIFICATION AND INFORMATION TO BE MARKED		
5	RATINGS	
5.1	Rated voltage (V) :	
5.2	Rated current (A) :	
6	CLASSIFICATION	
6.1	Nature of supply :	ac only/dc only/ac & dc
6.2	Type of load and power factor :	Resistive load/resistive & inductive load/specific load/current less than 20mA/ac motor load/pilot load
6.3	Purpose :	Thermostat / temperature limiter/..... as per 6.3.1 to 6.3.15
	Method of operation	Bimetallic / bimetallic SOD / electronic / thermistor / capillary pressure type
	Use	For water heater / refrigeration /oven / cooking appliance / room heater / etc...
6.4	Features of automatic action, Type 1 or Type 2 :	Type 1.X / Type 2.X (x – alphabet as per 6.4.3)
	Manufacturing deviation and drift (for type 2) if different from annex AA	
6.5	Degree of protection provided by enclosure per IEC 60529 and control pollution situation :	
6.6	Method of connection :	For fixed wiring / for flexible / for integrated or internal conductors
6.7	Ambient temperature limits of the switch ahead: T_{\min} (if different from 0°C); T_{\max} (if different from 55°C) :	
6.8	Protection against electric shock :	Class 0/0I/I/II/III
6.9	Circuit disconnection or interruption :	Full-disconnection / micro-disconnection / micro-interruption / all- pole disconnection / electronic disconnection

6.10	Number of cycles of actuation (M) of each manual action :	
6.11	Number of cycles of actuation (A) of each automatic action :	
6.12	Temperature limits of the mounting surface of the control (°C or K) :	Suitable for mounting on a surface more than 20K above Tmax / not more than 20K above Tmax
6.13	proof tracking index (PTI) for the insulation material used :	Group I / II / IIIa / IIIb
6.14	Period of the electrical stress across insulating parts supporting live parts, and between live parts and earthed metal (short or long period) :	Not applicable
6.15	According to Construction	Integrated / incorporated / in-line cord / etc
6.16	Ageing requirements (type Y) of end-product equipment :	
6.17	According to use of thermistor (Annex J) :	
6.18	Software Class (for electronic controls Annex H) :	
7	INFORMATION	
7.2	Methods of providing information	
7.2.1	Methods of providing information (Addition to table 1)	
	1 – Manufacturer's name / trademark (Method C) :	
	2 – Unique type reference (Method C) :	
	3 – Rated voltage or rated voltage range in volts (Method C) :	
	4 – Nature of supply (Method C) :	
	5 – Frequency, if other than for range 50 Hz to 60 Hz inclusive (Method C) :	
	6 – Purpose of control (Method D) :	
	6a – Construction of control (Method D) :	
	7 – The type of load controlled by each circuit (Method C) :	
	15 – Degree of protection by enclosure (Method C) :	
	17 – Terminals for external conductors (Method C) :	
	18 – Terminals for external conductors accepting a wider range of conductor sizes, (Method D) :	

	19 – Method of connection and disconnection for screwless terminals (Method D) :	
	20 – Details of any special conductors which are intended to be connected to terminals for internal conductors (Method D) :	
	21 – Maximum temperature of terminals for internal conductors, if higher than 85°C (Method X) :	
	22 – Temperature limits of the switch head, if T_{\min} is lower than 0°C, or T_{\max} is other than 55°C (Method C) :	
	23 – Temperature limits of mounting surfaces (T_s) if more than 20 K above T_{\max} (Method C) :	
	24 – Classification of control according to protection against electric shock (Method X) :	
	25 – For Class II controls, the symbol for Class II construction (Method C) :	
	26 – Number of cycles of actuation (M) for each manual action (Method X) :	
	27 – Number of automatic cycles (A) for each automatic action (Method X) :	
	28 – Ageing period (Y) for controls with Type 1M or 2M action (Method X) :	
	29 – Type of disconnection or interruption provided by each circuit (Method X) :	
	30 – PTI of materials used for insulation (Method X) :	
	31 – Method of mounting controls (Method D) :	
	31a – Method of providing earthing of control (Method D) :	
	32 – Method of attachment for non-detachable cords (Method D) :	
	33 – Intended transportation condition of control (Method X) :	
	34 – Details of any limitation of operating time (Method D) :	
	35 – Period of electric stress across insulating parts (Method X) :	
	36 – Limits of activating quality for any sensing element over which micro-disconnection is secure (Method X) :	

	37 – Minimum and/or maximum rates of change of activating quantity, or minimum and/or maximum cycling rates for a sensing control (Method X) :	
	38 – Values of overshoot of activating quantity for sensing controls (Method X) :	
	39 – Type 1 or Type 2 action (Method D) :	
	40 – Additional features of Type 1 or Type 2 actions (Method D) :	
	41 – Manufacturing deviation and condition of test appropriate to deviation (Method X) :	
	42 – Drift (Method X) :	
	43 - Reset characteristics for cut-out action (Method D) :	
	44 - Hand-held control or control intended for hand-held equipment (Method X) :	
	45 - Limitation to the number or distribution of flat push-on receptacles (Method D) :	
	46 - Operating sequence for controls with more than one circuit (Method D) :	
	47 - Extent of any sensing element (Method D) :	
	48 - Operating value(s) or operating time (Method D) :	
	49 - Control pollution degree (Method D) :	
	50 - Control intended to be delivered exclusively to the equipment manufacturer (Method X) :	
	51 – Glow wire test temperatures (Method X) :	
	52 to 60 See Annex H	
	61 to 65 See Annex J	
	66 to 74 See Annex H	
	75 - Rated impulse voltage (Method D) :	
	76 - Type of printed wiring board coating, (Method X) :	
	77 – Temperature for ball pressure test (Method D) :	
	78 – Maximum declared torque on single brush mounting using thermoplastic material (Method D) :	

	79 – Pollution situation in the micro-environment of the creepage or clearance if cleaner than that of the control (Method D) :	
	80 – Rated impulse voltage for the creepage or clearance if different from that of the control (Method D) :	
	81 – Values designed for tolerances of distances for which the exclusion from fault mode “short” is claimed (Method D) :	
	82 to 84 See Annex J :	
	85 – For Class III controls, the symbol for Class III construction (Method C) :	
	86 – For SELV or PELV circuits, the ELV limits realized (Method D) :	
	87 – Accessible voltage of SELV/PELV circuit, if different from 8.1.1, product standard referred to for the application of the control, in which standard(s) the accessible SELV/PELV level(s) are (Method D) :	
	And product standard referred to for application, in which standard(s) the accessible SELV/PELV level(s) is (are) (Method D) :	
	88 – See Annex U :	
	89 – Emission tests and groups as declared according to CISPR 11 (Method X) :	
	90 – Immunity tests for protective controls for use according to IEC 60335 appliances (Method X) :	
	91 to 94 See Annex H :	
	95 – Maximum declared short-circuit current (Method D) :	
	101 – Max. sensing element temperature (other than relevant to requirement 105); (Method: X) :	
	102 - time factor; method; (Method: X) :	
	103 - bi-metallic SOD reset temperature (either - 35°C or 0°C; (Method: X) :	
	104 - number of cycles for bi-metallic single-operation devices with 0°C reset; (Method: X)	
	105 - maximum temperature for the sensing element for the test of 17.16.107; (Method: D) :	
	106 - controls having parts containing liquid metal; (Method: D) :	

	107 - tensile yield strength; (Method: X) :	
	108 - min. current for the test according to clause 23.101; (Method: D) :	
	109 - T_{Max1} max. ambient temp. in which control may continuously remain in operated condition so that Table 14.1 temperatures are not exceeded (Method: D) :	
	110 - Time period, t_1 : max. time during which ambient temp. can be higher than T_{Max1} after the control has operated; (Method: D) :	
	111 - Temp. limit above which automatic reset of a manual reset thermal cut-out or a voltage maintained thermal cut-out does not occur (not higher than $-20\text{ }^{\circ}\text{C}$); (Method: X) :	
	112 - For Type 2.P controls, the method of test; (Method: X) :	
	113 - The click rate N or switching operations per minute for the purposes of testing to CISPR 14-1; (Method: X) :	
	114 - Rated functioning temperature (T_f); (Method: C) :	
	115 - Ageing temperature for non-bimetallic SOD; (Method: D) :	
	116 - Rate of rise of temperature for testing non-bimetallic SOD ; (Method: D) :	
	117 - Agricultural thermostat; (Method: D) :	

3. The Scope of Licence may be restricted based on the Manufacturing capabilities and Testing facilities of the Manufacturer.

4. During the operation of the Licence, BO shall ensure that all the varieties covered in the Licence are tested in rotation, to the extent possible.

ANNEX B**List of Test Equipment***Major test equipment required to test as per the Indian Standard*

Sl No	Tests Used with clause reference	Test Equipment
1	Protection against electric shock (Cl 8)	Test finger (Fig. 2), force gauge, test pin (Fig. 1), milliammeter, voltmeter, ruler, micrometer
2	Provision of protective earthing (Cl 9)	Ammeter, Earth resistance tester, milliohm meter
3	Terminals and terminations (Cl 10)	Torque tester, force gauge tester, screwdriver, Terminal pull test setup, Axial pull and push test setup, micrometer, ruler
4	Construction requirements (Cl 11)	Electric strength tester, HV test supply, isolation transformer, insulation tester, DC voltage supply, voltmeter, ammeter, freezer chamber, temperature recorder, impact tester, flexing tester, Facility to apply pull and push force, Pull and Torque test facility, time clock, Vernier, test fingernail
5	Moisture and dust resistance (Cl 12)	IP test equipment as per IS/IEC 60529, electric strength tester, conditioning chambers: heating cabinet, humidity chamber, leakage current tester Hot water bath, Freezer, IR tester, AC source
6	Electric strength and insulation resistance (Cl 13)	Insulation resistance tester, electric strength tester, leakage current tester
7	Heating (Cl 14)	Temperature indicator/recorder, fine wire thermocouples, environmental chambers (heating, refrigerating), loading arrangement, voltmeter, ammeter, dull black plywood, blackened copper/ brass disc
8	Manufacturing deviation and drift (Cl 15)	Equipment as per sl. , Circulating air oven, .25mm thermocouple, Sensing device for operation of the control
9	Environmental stress (Cl 16)	Environmental Chamber for 10°C & 60°C

10	Endurance (CI 17)	Facility to maintain Tmax and Tmin, Mechanism for movement of actuating member (manual control), Loading arrangement for suitable current and power factor and fixture for endurance, Environmental chambers – heating, freezing. Voltmeter, ammeter, power factor meter
11	Mechanical strength (CI 18)	Impact test apparatus (Fig. 4), tumbling barrel (Fig. 5), Cord pull test setup, force tester, torque tester, Circular steel pressure plate, pump for applying hydraulic pressure, sharp, pointed metal rod,
12	Threaded parts and connections (CI 19)	Screwdrivers, torque tester
13	Creepage distances, clearances and distances through solid insulation (CI 20)	Vernier, force tester, test finger (Fig. 2), impulse voltage tester, electric voltage tester, insulation resistance meter, oscilloscope, electric strength tester, micrometer
14	Fire hazard testing (CI 21)	Ball pressure test apparatus, glow wire test apparatus, environmental chamber or heating cabinet, tracking test apparatus, Needle flame test apparatus for Category B, voltmeter, ammeter
15	Resistance to corrosion (CI 22)	Humidity chamber, heating cabinet
16	EMC requirements – emission (CI 23)	Apparatus in accordance with CISPR 14-1. Equipment in accordance with Clause 17, oscilloscope
17	Components (CI 24)	Test apparatus in accordance with component standards
18	Normal operation (CI 25)	Oscilloscope, ammeter, voltmeter
19	EMC requirements – immunity (CI 26)	Environmental chamber, voltage dips and short voltage interruption apparatus, variable voltage supply, 3-phase auto-transformer, surge test apparatus, fast transient/burst test apparatus, ring wave surge test apparatus, conducted radiofrequency test apparatus radiated EM field test apparatus
20	Abnormal operation (CI 27)	Voltmeter, ammeter, electric strength tester

The above list is indicative only and may not be treated as exhaustive.

ANNEX C

Scheme of Inspection and Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipment.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING – As per the requirements of Cl. 7 of IS/IEC 60730-1 & IS/IEC 60730-2-9. Each automatic temperature sensing electrical control may also be marked with the BIS Standard Mark.

4. CONTROL UNIT – Automatic temperature sensing electrical controls of the same type and design manufactured in a day shall constitute a control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of [Table 1](#) and the levels of control in column 3 of [Table 1](#), shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

6. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

(1)				(2)	(3)		
TEST DETAILS				TEST EQUIPMENT REQUIREMENT	LEVELS OF CONTROL		
Clause	Requirement	TEST METHODS		R: required (or) S: Sub-contracting permitted	No. of Samples	Frequency	Remarks
		Clause	Reference				
8	Protection against electric shock	8	IS/IEC 60730-2-9 IS/IEC 60730-0	R	Each unit		
9	Provision for protective earthing	9	-do-	R	Each unit		
10	Terminals & terminations	10	-do-	R	Each unit		
11	Constructional Requirements	11	-do-	R	Each unit		
11.1.2	Current-carrying parts	11.1.2	-do-	S	Each consignment		No further tests required if accompanied with Test Certificate or ISI marked.
12	Moisture and Dust Resistance	12	-do-	S	#	Once in 6 months	
13	Electric Strength and Insulation Resistance	13	-do-	R	Three	Each control unit	
14	Heating	14	-do-	S	#	Once in 6 months	
15	Manufacturing Deviation and Drift	15	-do-	S	#	Once in 6 months	
16	Environmental Stress	16	-do-	S	#	Once in a year	

17	Endurance	17	-do-	S	#	Once in a year	
18	Mechanical Strength	18	-do-	S	#	Once in 6 months	
19	Threaded Parts and connections	19	-do-	S	#	Once in a year	
20	Creepage distances, Clearances, and distances through solid insulation	20	-do-	S	#		
21	Fire hazard testing	21	-do-	S	#	Once in 5 years	
22	Resistance to corrosion	22	-do-	S	#		
23	Electromagnetic Compatibility (EMC) requirements - emission	23	-do-	S	#		
24	Components	24	-do-	S	#		No further tests required if accompanied with Test Certificate or ISI marked.
25	Normal Operation	25	-do-	R	Each unit		
26	Electromagnetic Compatibility (EMC) requirements - immunity	26	-do-	S	#	Once in 5 years	
27	Abnormal Operation	27	-do-	S	#	Once in 6 months	

Number of samples shall be in accordance with Cl. 4.2 of IS/IEC 60730-2-9 & IS/IEC 60730-0

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head.

ANNEX E**Scope of Licence**

“Licence is granted to use Standard Mark as per IS/IEC 60730-2-9:2011 with the following scope:

1	Rated voltage (V) :	
2	Rated current (A) :	
3	Nature of supply :	ac only/dc only/ac & dc
4	Type of load and power factor :	Resistive load/resistive & inductive load/specific load/current less than 20mA/ac motor load/pilot load
5	Purpose :	Thermostat / temperature limiter/..... as per 6.3.1 to 6.3.15
6	Method of operation	Bimetallic / bimetallic SOD / electronic / thermistor / capillary pressure type
7	Use	For water heater / refrigeration /oven / cooking appliance / room heater / air conditioner etc...
8	Features of automatic action, Type 1 or Type 2 :	Type 1.X / Type 2.X (x – alphabet as per 6.4.3)
9	Degree of protection provided by enclosure per IS/IEC 60529 :	
10	Method of connection :	For fixed wiring / for flexible / for integrated or internal conductors
11	Protection against electric shock :	Class 0/0I/I/II/III
12	Circuit disconnection or interruption :	Full-disconnection / micro-disconnection / micro-interruption / all- pole disconnection / electronic disconnection
13	According to Construction	Integrated / incorporated / in-line cord / etc