

# FINAL VERSION



---

## Automatic electrical controls – Part 2-9: Particular requirements for temperature sensing controls

## CONTENTS

FOREWORD .....	4
1 Scope and normative references .....	7
2 Terms and definitions .....	8
3 General requirements .....	10
4 General notes on tests .....	10
5 Rating.....	11
6 Classification .....	11
7 Information .....	12
8 Protection against electric shock .....	14
9 Provision for protective earthing .....	14
10 Terminals and terminations.....	14
11 Constructional requirements .....	14
12 Moisture and dust resistance .....	19
13 Electric strength and insulation resistance .....	20
14 Heating.....	20
15 Manufacturing deviation and drift.....	21
16 Environmental stress .....	22
17 Endurance .....	22
18 Mechanical strength .....	28
19 Threaded parts and connections.....	29
20 Creepage distances, clearances and distances through solid insulation.....	29
21 Resistance to heat, fire and tracking .....	29
22 Resistance to corrosion .....	29
23 Electromagnetic compatibility (EMC) requirements – Emission .....	29
24 Components .....	30
25 Normal operation.....	30
26 Electromagnetic compatibility (EMC) requirements – Immunity .....	30
27 Abnormal operation .....	30
28 Guidance on the use of electronic disconnection .....	31
Annexes .....	32
Annex G (normative) Heat and fire resistance tests .....	32
Annex H (normative) Requirements for electronic controls .....	33
Annex J (normative) Requirements for thermistor elements and controls using thermistors.....	40
Annex AA (informative) Maximum manufacturing deviation and drift <sup>a, b</sup> .....	41
Annex BB (informative) Time factor .....	42
Annex CC (informative) Number of cycles .....	45
Annex DD (normative) Controls for use in agricultural confinement buildings .....	46
Annex EE (informative) Guide to the application of temperature sensing controls within the scope of IEC 60730-2-9 .....	49
Bibliography.....	74

Figure 101 – Impact tool .....	17
Figure 102 – Aluminium cylinder for temperature change method .....	27
Figure BB.1 – Determination of time factor in the case of a sudden temperature change .....	43
Figure BB.2 – Determination of time factor in the case of a linear rise of test-bath temperature .....	44
Figure EE.1 – Thermostat .....	60
Figure EE.2 – Self-resetting temperature limiter .....	61
Figure EE.3 – Non-self-resetting temperature limiter .....	61
Figure EE.4 – Self-resetting thermal cut-out .....	63
Figure EE.5 – Manual reset thermal cut-out .....	63
Figure EE.6 – Single operation device .....	65
Figure EE.7 – Three-stage control system .....	66
Figure EE.8 – Schematic diagram showing usage of various controls approved to IEC 60730-2-9 .....	69
Table 1 – Required information and methods of providing information .....	13
Table H.101 – Compliance criteria .....	35
Table BB.1 – Method to determine and verify time factor values (see 11.101) .....	44
Table EE.1 – Typical examples of the classification of temperature sensing controls in accordance with IEC 60730-2-9 .....	67
Table EE.2 – Examples of controls expected to operate during Clauses 11 and 19 of IEC 60335 (all parts) .....	70
Table EE.3 – Guidance on the common usage of types of control .....	71

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## AUTOMATIC ELECTRICAL CONTROLS –

## Part 2-9: Particular requirements for temperature sensing controls

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**DISCLAIMER**

**This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.**

This Consolidated version of IEC 60730-2-9 bears the edition number 4.2. It consists of the fourth edition (2015-05) [documents 72/990/FDIS and 72/998/RVD], its amendment 1 (2018-01) [documents 72/1112A/FDIS and 72/1118/RVD] and its amendment 2 (2020-04) [documents 72/1225/FDIS and 72/1236/RVD]. The technical content is identical to the base edition and its amendments.

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 60730-2-9 has been prepared by technical committee TC 72: Automatic electrical controls.

This fourth edition constitutes a technical revision.

This edition includes alignment with the text of 60730-1 fifth edition and the following significant technical changes with respect to the previous edition:

- a) modification of heating-freezing tests in Clause 12;
- b) alignment of the EMC requirements in H.26 to those in other part 2 standards;
- c) addition of requirements in Clause H.27 to cover class B and C control functions of temperature sensing controls;

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 2-9 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the fifth edition (2013) of that publication. Consideration may be given to future editions of, or amendments to, IEC 60730-1.

This Part 2-9 supplements or modifies the corresponding clauses in IEC 60730-1 so as to convert that publication into the IEC standard: Particular requirements for temperature sensing controls.

Where this Part 2-9 states "addition", "modification" or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

Where no change is necessary, this part 2 indicates that the relevant clause or subclause applies.

In the development of a fully international standard, it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variations in national electrical systems and wiring rules.

The "in some countries" notes regarding differing national practices are contained in the following subclauses:

4.1.101	17.8.4.101	Annex AA
7.2, Table 1	17.16.101	Clause CC.2
11.4.101	17.16.102	DD.9.2
11.101	17.16.105	EE.3.6
12.101.3	18.102.3	
13.2	23.101	

In this publication:

- 1) The following print types are used:
  - Requirements proper: in roman type;
  - *Test specifications: in italic type;*
  - Notes; in small roman type;
  - Words defined in Clause 2: **bold**.
- 2) Subclauses, notes, tables and figures which are additional to those in part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 60730 series, published under the title *Automatic electrical controls* can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## AUTOMATIC ELECTRICAL CONTROLS –

### Part 2-9: Particular requirements for temperature sensing controls

#### 1 Scope and normative references

This clause of Part 1 is applicable except as follows:

##### 1.1 Scope

*Replacement:*

This part of IEC 60730 applies to automatic electrical temperature **sensing controls** for use in, on or in association with equipment, including **electrical controls** for heating, air-conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof.

NOTE Throughout this standard, the word "equipment" includes "appliance" and "control system".

This standard is applicable to automatic electrical temperature **sensing controls** forming part of a building automation **control system** within the scope of IS 16484.

This standard also applies to automatic electrical temperature **sensing controls** for equipment that may be used by the public, such as equipment intended to be used in shops, offices, hospitals, farms and commercial and industrial applications.

This standard does not apply to automatic electrical temperature **sensing controls** intended exclusively for industrial process applications, unless explicitly mentioned in the relevant equipment standard.

##### 1.1.1

*Replacement:*

This standard applies to the inherent safety, to the **operating values, operating times, and operating sequences**, where such are associated with equipment safety, and to the testing of automatic electrical temperature **sensing control** devices used in, or in association with, equipment.

NOTE Examples of such **controls** include **boiler thermostats, fan controls, temperature limiters and thermal cut-outs**.

This standard is also applicable to the functional safety of low complexity safety-related temperature **sensing controls** and **systems**.

##### 1.1.2

*Addition:*

This standard also applies to the electrical safety of temperature sensing controls with non-electrical outputs such as refrigerant flow and gas **controls**.