

INTERNATIONAL STANDARD



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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS –

Part 2-9: Particular requirements for temperature sensing controls

FOREWORD

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

The text of this standard is based on the following documents:

FDIS	Report on voting
72/990/FDIS	72/998/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This fourth edition cancels and replaces the third edition published in 2008, and its Amendment 1:2011. This 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 variation 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 this publication 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.

A bilingual version of this publication may be issued at a later date.

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AUTOMATIC ELECTRICAL CONTROLS – FOR HOUSEHOLD AND SIMILAR USE –

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 ~~for household and similar use~~, 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 ISO 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 ~~Replace the explanatory matter with the following new explanatory matter:~~

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**.

~~Throughout This standard, the word "equipment" includes "appliance" and "control system".~~

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

1.1.2 *Replacement:*

Addition:

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

1.1.3 Not applicable.

1.1.4

Replacement:

This standard applies to **manual controls** when such are electrically and/or mechanically integral with automatic temperature **sensing controls**.

NOTE Requirements for manual switches not forming part of an **automatic control** are contained in IEC 61058-1.

1.1.5

Replacement:

This standard applies to a.c. or d.c. powered temperature **sensing controls** with a rated voltage not exceeding 690 V a.c. or 600 V d.c.

1.1.6

Replacement:

This standard does not take into account the **response value** of an **automatic action** of a temperature **sensing control**, if such a **response value** is dependent upon the method of mounting it in the equipment. Where a **response value** is of significant purpose for the protection of the **user**, or surroundings, the value defined in the appropriate equipment standard or as determined by the manufacturer shall apply.

1.1.7

Replacement:

This standard applies also to temperature **sensing controls** incorporating **electronic devices**, requirements for which are contained in Annex H and to temperature **sensing controls** using **NTC thermistors** or **PTC thermistors**, requirements for which are contained in Annex J.

Additional subclause:

1.1.101 This standard applies to **single operation devices** as defined in this standard.

1.1 Normative references

Addition:

~~IEC 60335 (all parts), Household and similar electrical appliances — Safety~~

IEC 60216-1:2013, *Electrical insulating materials – Thermal endurance properties – Part 1: Ageing procedures and evaluation of test results*

IEC 60691:2002, *Thermal links – Requirements and application guide*
~~Amendment 1 (2006)~~

IEC 60730-2-4, *Automatic electrical controls for household and similar use – Part 2-4: Particular requirements for thermal motor protectors for motor-compressors of hermetic and semi-hermetic type*

2 Terms and definitions

This clause of Part 1 is applicable except as follows:

2.2 Definitions of types of control according to purpose

2.2.19 operating control

Add, to the definition, the following note:

Note 1 to entry: In general, a **thermostat** is an **operating control**.

2.2.20 protective control

Add, to the definition, the following note:

Note 1 to entry: In general, a **thermal cut-out** is a **protective control**.

Additional definitions:

2.2.101 single-operation device SOD

control having a temperature **sensing element** which is intended to operate only once and then requires complete replacement

2.2.101.1 bimetallic single-operation device single operation device (SOD) having a bimetallic temperature sensing element

Note 1 to entry: A **bimetallic single operation device (SOD)** does not reset above a declared temperature (see 11.4.103).

Note 2 to entry: Requirements for thermal links (which are not allowed to reset) are contained in IEC 60691.

2.2.101.2 non-bimetallic single-operation device

single operation device (SOD) having a temperature **sensing element** which is part of a **combination action control**, the **operation** of which cannot be separated from other functions of the **control** and having a non-bimetallic **sensing thermal** element that operates only once and then requires complete or partial replacement

Note 1 to entry: When such parts can be tested separately, they are considered to be thermal links within the scope of IEC 60691.

Note 2 to entry: The ageing period and thermal response of the device is dependent on the intended use of the device. As a result, the nature of the testing applicable to the device is representative of the application conditions for which the **protective control** is intended (see 7.2).

Note 3 to entry: **Non-bimetallic SODs** provide the equivalent of **micro-disconnection**.

2.2.101.2.1 rated functioning temperature

T_f

temperature of the **sensing element** of a **non-bimetallic SOD** which causes it to change the state of conductivity of the **control** when measured under specified conditions as declared by the manufacturer

2.2.101.2.2**holding temperature** T_c

~~maximum temperature of the sensing element of a non-bimetallic SOD at which it will not cause the control to change its state of conductivity during a specified time under specified conditions as declared by the manufacturer~~

2.2.101.2.3**maximum temperature limit** T_m

~~temperature of the sensing element of a non-bimetallic SOD, stated by the manufacturer, up to which the mechanical and electrical properties of the control having changed its state of conductivity will not be impaired for a given time~~

2.2.102**room thermostat**

independently mounted or incorporated **thermostat** intended to control the temperature of habitable space

2.2.103**fan control**

automatic temperature **sensing control** intended to control the **operation** of a fan or blower

2.2.104**boiler thermostat**

thermostat intended to control boiler/liquid temperature

2.2.105**modulating thermostat**

thermostat which controls the temperature between two limits by continuously controlling the input to the load

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2.2.106**voltage maintained thermal cut-out**

thermal cut-out which is maintained in its operated condition by the voltage which appears across it in that condition

2.2.107**agricultural thermostat**

thermostat intended for use in agricultural confinement buildings

2.3 Definitions relating to the function of controls**2.3.14 Additional definition:****2.3.14.101****time factor**

transient response of temperature **sensing controls** by defined change of the **activating quantity**

2.5 Definitions of types of control according to construction

Additional definitions:

2.5.101

push-and-turn actuation

two-step actuation accomplished by first pushing, then rotating the **actuating member** of the control

2.5.102

pull-and-turn actuation

two-step actuation accomplished by first pulling, then rotating the **actuating member** of the control

3 General requirements

This clause of Part 1 is applicable.

4 General notes on tests

4.1 Conditions of test

This clause of Part 1 is applicable except as follows:

~~4.1.7 Not applicable.~~

4.1 Conditions of test

Additional subclauses:

4.1.101 For the purposes of the tests of this standard and unless otherwise indicated, ambient temperature excursions beyond T_{\max} during abnormal **operation** as a precursor to the **operation** of a manual reset **thermal cut-out** or a **bimetallic SOD** are ignored.

NOTE In Canada and the USA, the preceding applies only to **bimetallic SODs**.

4.1.102 For manual reset **thermal cut-outs** and **bimetallic SODs** which have an **operating value** above T_{\max} , the temperature at the **sensing element** is raised, as necessary, to achieve any cycling required during the tests.

4.2 Samples required

4.2.1 Addition:

Six samples of **bimetallic SODs** are used for the test of Clause 15 **and a further six for the test of Clause 17.**

~~Additional samples are required for the tests of Clause 17.~~

5 Rating

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable except as follows:

6.4 According to features of automatic action

6.4.3 Additional subclauses:

6.4.3.101 – for sensing actions, no increase in the **operating value** as a result of any leakage from the **sensing element**, or from parts connecting the **sensing element** to the **switch head** (type 2.N);

6.4.3.102 – an action which operates after a declared thermal cycling test as specified in 17.101 (type 2.P);

NOTE In general, **thermal cut-outs** for specific applications, such as pressurized water heating systems, may be classified as having Type 2.P action.

6.4.3.103 – an action which is initiated only after a **push-and-turn actuation** or **pull-and-turn actuation** and in which only rotation is required to return the **actuating member** to the **OFF position** or rest position (type 1.X or 2.X);

6.4.3.104 – an action which is initiated only after a **push-and-turn actuation** or **pull-and-turn actuation** (type 1.Z or 2.Z);

6.4.3.105 – an action which cannot be reset under electrically loaded conditions (type 1.AK or 2.AK);

6.4.3.106 – an action which operates after declared agricultural environmental exposures (type 1.AM or 2.AM).

6.7 According to ambient temperature limits of the switch head

Additional subclauses:

6.7.101 Controls for use in or on cooking appliances.

6.7.102 Controls for use in or on ovens of the self-cleaning type.

6.7.103 Controls for use in or on food-handling appliances.

6.7.104 The **non-bimetallic SODs** are limited for use in appliances for heating or employing liquids or steam. It is not suitable for instantaneous water heaters and storage water heaters.

6.8.3 Modification:

Replace the first paragraph by:

For an **in-line cord control**, a free standing control, an **independently mounted control** or a **control** integrated or incorporated in an assembly utilizing a non-electrical energy source:

6.15 According to construction

Additional subclause:

6.15.101 – **controls** having parts containing liquid metal.

7 Information

This clause of Part 1 is applicable except as follows: