

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Automatic electrical controls for household and similar use –
Part 2-9: Particular requirements for temperature sensing controls**

**Dispositifs de commande électrique automatiques à usage domestique
et analogue –
Partie 2-9: Règles particulières pour les dispositifs de commande
thermosensibles**

IEC 60730-2-9:2008

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**AUTOMATIC ELECTRICAL CONTROLS
FOR HOUSEHOLD AND SIMILAR USE –****Part 2-9: Particular requirements
for temperature sensing controls**

FOREWORD

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This consolidated version of IEC 60730-2-9 consists of the third edition (2008) [documents 72/763/FDIS and 72/767/RVD] and its amendment 1 (2011) [documents 72/815/FDIS and 72/827/RVD]. It bears the edition number 3.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 60730-2-9 has been prepared by IEC technical committee 72: Automatic controls for household use.

This edition of IEC 60730-2-9 contains a new Annex EE, which is an informative guide to the application of temperature sensing controls. Additionally, a new requirement to 17.3.1 (there is an error in the FDIS document - 17.7.3 should be 17.3.1) was added to address the endurance requirement for temperature sensing devices where the whole control is declared as the sensing element for ambient temperatures below 0° C. This document contains also some editorial changes due to new editions of referenced standards.

This publication has been drafted in accordance with 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 third edition of that standard (1999) and its Amendment 1 (2003) and Amendment 2 (2007). 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 2-9 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 practice are contained in the following subclauses:

- 4.1.101
- Table 7.2, note 102
- 11.4.3.101
- 11.4.101
- 11.101
- 12.101.3
- 13.2
- 17.8.4.101
- 17.15.1.3
- 17.15.1.3.1
- 17.16.101
- 17.16.105
- 18.102.3
- 23.101
- Annex AA
- CC.2
- DD.9.2
- EE.3.6

In this publication, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

Subclauses, notes or items 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, under the general title *Automatic electrical controls for household and similar use*, 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

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- withdrawn,
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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 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.

1.1.1 Replace the explanatory matter with the following new explanatory matter:

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".

1.1.2 Replacement:

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.

Additional subclause:

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

1.5 Normative references

Addition:

IEC 60216-1:2001, *Electrical insulating materials – Properties of thermal endurance – Part 1: Ageing procedures and evaluation of test results*

IEC 60335 (all parts), *Household and similar electrical appliances – Safety*

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 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 explanatory paragraph:

In general, a thermostat is an operating control.

2.2.20 protective control

Add, to the definition, the following explanatory paragraph:

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 having a bimetallic temperature sensing element

NOTE 1 A bimetallic single operation device does not reset above a declared temperature (see 11.4.103).

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

2.2.101.2 non-bimetallic single operation device

~~part of a control the operation of which cannot be separated from other functions of the control and having a non-bimetallic sensing element that operates only once and then requires complete or partial replacement~~

single operation device 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 thermal element that operates only once and then requires complete or partial replacement

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

NOTE 2 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 should be representative of the application conditions for which the protective control is intended (see 7.2).

NOTE 3 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_e

~~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

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

a 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.*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.

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);

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 or pull-and-turn actuation and in which only rotation is required to return the actuating member to the off or rest position (Type 1.X or 2.X);

6.4.3.104 – an action which is initiated only after a push-and-turn 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:

7.2 Methods of providing information

Table 7.2

Addition:

| | Information | Clause or subclause | Method |
|-----|--|--|--------|
| 101 | Maximum sensing element temperature (other than relevant to Item 105) ¹⁰¹⁾ | 6.7 6.15 14.101 | X |
| 102 | Time factor with or without sheath ref. | 2.3.14.101 11.101 BB.1.2 | X |
| 103 | SOD reset temperature (either -35 °C or 0 °C) | 2.2.101 11.4.103 17.15.2.3 | X |
| 104 | Number of cycles for bimetallic single-operation devices with 0 °C reset | 17.15.1.3.1 | X |
| 105 | Maximum sensing element temperature for the test of 17.16.107 (T_e) | 6.7.102 17.16.107 | D |
| 106 | Controls having parts containing liquid metal ¹⁰²⁾ | 6.15.101 11.1.101 18.102 | D |
| 107 | Tensile yield strength | 11.1.101 | X |
| 108 | Minimum current for the purpose of the test of 23.101 ¹⁰³⁾ | 23.101 | D |
| 109 | $T_{max,1}$ is the maximum ambient temperature in which the control may remain continuously in the operated condition so that Table 14.1 temperatures are not exceeded ¹⁰⁵⁾ | 14.4.3.1 | D |
| 110 | Time period, t_1 , is the maximum time during which the ambient temperature can be higher than $T_{max,1}$ after the control has operated ¹⁰⁵⁾ | 14.4.3.1 | D |
| 111 | Temperature limit above which automatic reset of a manual reset thermal cut-out or a voltage maintained thermal cut-out shall not occur (not higher than -20 °C) | 2.2.105 11.4.106 17.16.104.1 17.16.108 | X |
| 112 | For Type 2.P controls, the method of test | 17.101 | X |
| 113 | The click rate N or switching operations per minute for the purposes of testing to CISPR 14-1 | 23 | X |
| 114 | Rated functioning temperature (T_f) | 2.2.101.2.1 17.15.2 | C |
| 115 | Holding temperature (T_c) Ageing temperature for non-bimetallic SOD ¹⁰⁶⁾ | 2.2.101.2.2 17.15.2.2 17.15.2.3 | D |
| 116 | Maximum temperature limit (T_m) Rate of rise of temperature for testing non-bimetallic SOD ¹⁰⁷⁾ | 2.2.101.2.3 17.15.2.2 17.15.2.3 | D |
| 117 | Agricultural thermostat | 2.2.107 6.4.3.106 11.4.107 11.6.3.101 Annex DD | D |