UL 60730-2-9

STANDARD FOR SAFETY

Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls

UL Standard for Safety for Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9

Fourth Edition, Dated February 14, 2017

Summary of Topics

The revision of ANSI/UL 60730-2-9 dated August 5, 2021 includes the adoption of the second amendment to IEC 60730-2-9; Table 1, 11.4.11 and 11.4.12.

UL 60730-2-9 is an adoption of IEC 60730-2-9, Fourth Edition, issued by the IEC May 2015, and includes IEC Amendment 1 published January 2018 and Amendment 2 published April 2020. Please note that the National Difference document incorporates all of the U.S. national differences for UL 60730-2-9.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 28, 2021.

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UL 60730-2-9

Standard for Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls

Prior to the first edition of UL 60730-2-9, the requirements for the products covered by this Standard were included in UL 8730-2-9.

First Edition – January, 2003
Third Edition – October, 2010

Fourth Edition

February 14, 2017

This ANSI/UL Standard for Safety consists of the Fourth Edition including revisions through August 5, 2021.

The most recent designation of ANSI/UL 60730-2-9 as an American National Standard (ANSI) occurred on August 5, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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Annexes

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Preface (UL)

This UL Standard is based on IEC Publication IEC 60730-2-9: Fourth edition Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls, as revised by Amendments 1 and 2. IEC publication 60730-2-9 is copyrighted by the IEC.

This UL Standard 60730-2-9, Standard for Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls, is to be used in conjunction with the fifth edition of UL 60730-1. The requirements for temperature sensing controls are contained in this Part 2 Standard and UL 60730-1.

Requirements of this Part 2 Standard, where stated, amend the requirements of UL 60730-1.

Where a particular subclause of UL 60730-1 is not mentioned in UL 60730-2-9, the UL 60730-1 subclause applies.

Note – Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.

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NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60730-2-9 are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS – Part 2-9: Particular requirements for temperature sensing controls

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.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted 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 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 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.

101DV DE *Modification of Item (1) of the part 2:*

– Words in SMALL ROMAN CAPITALS in the text are defined in Clause 2.

102DV DE *Addition to the part 2:*

The numbering system in the Standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

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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 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

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 nonelectrical 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.

1.1.101DV D2 *Modify text of 1.1.101 with the following:*

This standard applies to single operation devices, thermostats for drip-type coffee makers, self-heating thermal protectors (SHTP) for recessed lighting fixtures, and Fan/Heat sequencers as defined in this standard.

1.2 Normative references

Addition:

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

IEC 60691, *Thermal links – Requirements and application guide*

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 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