



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.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

FEBRUARY 14, 2017
(Title Page Reprinted: August 5, 2021)



ANSI/UL 60730-2-9-2021

1

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>.

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

COPYRIGHT © 2021 UNDERWRITERS LABORATORIES INC.

This is a preview. Click here to purchase the full publication.

No Text on This Page

CONTENTS

Preface (UL)	7
NATIONAL DIFFERENCES	9
FOREWORD	11
1 Scope and normative references	15
1.1 Scope	15
1.1.101DV Modify text of 1.1.101 with the following:.....	16
1.2 Normative references.....	16
2 Terms and definitions.....	17
2.2 Definitions of types of control according to purpose	17
2.2.107ADV Add the following definitions to Clause 2.2:	18
2.2.107BDV Add the following definition to Clause 2.2:.....	19
2.2.107CDV Add the following definition to Clause 2.2:	19
2.3 Definitions relating to the function of controls	19
2.5 Definitions of types of control according to construction	19
3 General requirements.....	19
4 General notes on tests.....	20
4.1 Conditions of test.....	20
4.2 Samples required	20
4.2.1DV Modify Clause 4.2.1 by adding the following:	20
4.3.5.101DV Add Clause 4.3.5.101DV.1 to the Part 2:	20
5 Rating	20
6 Classification	20
6.4 According to features of automatic action	20
6.7 According to ambient temperature limits of the switch head	21
6.7.103ADV Add Clause 6.7.103ADV.1 to Clause 6.7.103:	21
6.7.103BDV Add Clause 6.7.103BDV.1 to Clause 6.7.103:	21
6.15 According to construction	21
7 Information	22
7.2 Methods of providing information	22
Table 7.2DV Addition of the following to Table 7.2:	23
8 Protection against electric shock	23
9 Provision for protective earthing	23
10 Terminals and terminations	24
11 Constructional requirements.....	24
11.1 Materials	24
11.3 Actuation and operation.....	24
11.4 Actions.....	24
11.6 Mounting of controls.....	28
11.11.101DV Addition of 11.11.101DV.1 – 11.11.101DV.3 to 11.11 to the Part 1:	29
11.101 Time factor	29
12 Moisture and dust resistance.....	29
12.101 Refrigeration controls	29
13 Electric strength and insulation resistance	30
13.2 Electric strength.....	30
14 Heating.....	30
14.102ADV Addition of the following Clauses to the Part 2:.....	31
15 Manufacturing deviation and drift.....	33
15.1DV Modification of 15.1 of the Part 2:	33
15.5.6DV Modification of 15.5.6 of the Part 2:	34
15.5.6ADV Addition of the following to Clause 15.5.6 :	34

15.5.6BDV Addition of the following to Clause 15.5.6 :	34
15.5.6CDV Addition of the following to Clause 15.5.6 :	34
15.5.6DDV Addition of the following to Clause 15.5.6 :	35
15.5.6EDV Addition of the following to Clause 15.5.6 :	35
16 Environmental stress	36
17 Endurance	37
17.15 Single operation devices	37
17.16 Test for particular purpose controls	38
17.16.102ADV Addition of the following to Clause 17.16:	39
17.16.102BDV Addition of the following to Clause 17.16:	40
17.16.102CDV Addition of the following to Clause 17.16 :	41
17.101 Type 2.P cycling test	43
18 Mechanical strength	45
18.101 Push-and-turn or pull-and-turn actuation	45
18.102 Parts containing liquid metal	46
19 Threaded parts and connections	46
20 Creepage distances, clearances and distances through solid insulation	46
21 Resistance to heat, fire and tracking	46
22 Resistance to corrosion	46
23 Electromagnetic compatibility (EMC) requirements – Emission	47
23.101.1 Test conditions	47
23.101.2 Test procedure	47
24 Components	47
25 Normal operation	47
26 Electromagnetic compatibility (EMC) requirements – Immunity	47
27 Abnormal operation	48
27.101DV Addition of the following clauses:	48
27.102DV Addition of the following clauses:	48
27.103DV Addition of the following clauses:	48
28 Guidance on the use of electronic disconnection	50

Annexes

Annex G (normative) Heat and fire resistance tests

G.5.1 Ball pressure test 1	52
G.5.2 Ball pressure test 2	52

Annex H (normative) Requirements for electronic controls

H.2 Terms and definitions	53
H.6 Classification	53
H.6.18 According to classes of control functions	53
H.6.18.3DV Add the following explanatory paragraph:	53
H.7 Information	54
H.11 Constructional requirements	54
H.11.12 Controls using software	54
H.23 Electromagnetic compatibility (EMC) requirements – Emission	54
H.23.1.2 Radio frequency emission	54
H.26 Electromagnetic compatibility (EMC) requirements – Immunity	54
H.26.5 Voltage dips, voltage interruptions and voltage variations in the power supply network	55
H.26.8 Surge immunity test	55
H.26.9 Electrical fast transient/burst immunity test	56

H.26.9.3.101DV National Difference Deleted.....	56
H.26.10 Ring wave immunity test	56
H.26.10DV Deletion of the explanatory paragraph, "In the USA..." from the Part 1.....	56
H.26.12 Radio-frequency electromagnetic field immunity	56
H.26.13 Test of influence of supply frequency variations.....	57
H.26.14 Power frequency magnetic field immunity test.....	57
H.26.15 Evaluation of compliance	57
H.27 Abnormal operation.....	57
H.27.1.2.2.3DV Clause H.27.1.2.2.3 is applicable.....	58
H.27.1.2.4DV Clause H.27.1.2.4 is applicable.	59

Annex J (normative) Requirements for thermistor elements and controls using thermistors

J.4 General notes on tests	60
J.7 Information.....	60

Annex AA (informative) Maximum manufacturing deviation and drift^{a, b}

Table AADV.1 Replacement of the text in Annex AA with the following:.....	62
---	----

Annex BB (informative) Time factor

BB.0 General.....	63
BB.2 Two-bath method.....	63
BB.3 Gradient method.....	63

Annex CC (informative) Number of cycles

CC.1 Number of cycles for independently mounted and in-line cord controls.....	67
CC.2 Minimum number of cycles for independently mounted and in-line cord controls (Canada and the USA).....	67
CCDV Modification of the table in CC.2 in Annex CC of the part 2-9:	67

Annex DD (normative) Controls for use in agricultural confinement buildings

DD.1 Object.....	68
DD.2 Terms and definitions.....	68
DD.3 Test apparatus	68
DD.4 Severities.....	68
DD.5 Pre-conditioning	68
DD.6 Initial measurements	68
DD.7 Testing.....	68
DD.7.1 General.....	68
DD.7.2 Moist carbon dioxide – sulfur dioxide – air mixture	68
DD.7.3 Moist hydrogen sulfide – air mixture	69
DD.7.4 Moist ammonia – air mixture	69
DD.7.5 Urea – water vapour.....	69
DD.7.6 Warm humid air	69
DD.7.7 Disinfectant – germicide – water mixture exposure	69
DD.7.8 Dust exposure	70
DD.8 Recovery	70
DD.9 Evaluation.....	70

Annex EE (informative) Guide to the application of temperature sensing controls within the scope of IEC 60730-2-9

EE.1	General.....	71
EE.1.2	Overview	71
EE.2	Selection of temperature sensing controls within the scope of IEC 60730-2-9	71
EE.3	Classifications common to temperature sensing controls	71
EE.3.1	Nature of supply	71
EE.3.2	Type of load	72
EE.3.3	Types of temperature sensing controls according to their purpose.....	72
EE.3.4	Features of automatic action	75
EE.3.5	Control pollution situation.....	77
EE.3.6	Method of connection	77
EE.3.7	Ambient temperature limits of the switch head	77
EE.3.8	Protection against electric shock	78
EE.3.9	Circuit disconnection or interruption	78
EE.3.10	Number of cycles of actuation (M) of each manual action.....	79
EE.3.11	Number of automatic cycles (A) of each automatic action	79
EE.3.12	Temperature limits of the mounting surface of the control.....	80
EE.3.13	Value of proof tracking index (PTI) for the insulation material used	80
EE.3.14	Period of electrical stress across insulating parts supporting live parts and between live parts and earthed metal	81
EE.3.15	Construction	81
EE.3.16	Ageing requirements of the equipment in which the control is intended to be used...	81
EE.3.17	Definitions of type of control according to construction.....	82
EE.3.18	Definitions relating to classes of control functions.....	82
EE.4	Specific types of temperature sensing control	82
EE.4.1	Thermostats	82
EE.4.2	Temperature limiter	84
EE.4.3	Thermal cut-out.....	87
EE.4.4	Single operation device	90
EE.5	Examples of controls used with domestic appliances	94
EE.5.1	General usage of controls in appliances.....	94
EE.5.2	Examples of which device is expected to operate during the tests of Clauses 11 and 19 of IEC 60335 (all parts)	96

Bibliography