UL 60730-2-11

STANDARD FOR SAFETY

Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators

UL Standard for Safety for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators, UL 60730-2-11

Second Edition, Dated November 13, 2013

Summary of Topics

This revision of ANSI/UL 60730-2-11 is being issued to reaffirm approval as an American National Standard. No changes in requirements are involved.

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 requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the preface. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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November 13, 2013
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UL 60730-2-11

Standard for Automatic Electrical Controls for Household and Similar Use;

Part 2: Particular Requirements for Energy Regulators

Prior to the second edition of UL 60730-2-11, the requirements for the products covered by this Standard were included in UL 60730-2-11A.

First Edition – February, 2002

Second Edition

November 13, 2013

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through January 24, 2018.

The most recent designation of ANSI/UL 60730-2-11 as an American National Standard (ANSI) occurred on January 24, 2018. 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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Preface (UL)

This UL Standard, UL 60730-2-11, Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators, is to be used in conjunction with UL 60730-1. The requirements for electric actuators 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 60730-2-11, the UL 60730-1 subclause applies.

The text, figures and tables of the IEC Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators, 60730-2-11, copyright 2006, are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI). The IEC copyrighted material has been reproduced with permission from ANSI. ANSI should be contacted regarding the reproduction of any portion of the IEC material. The IEC Foreword and Introduction are not a part of the requirements of this Standard but are included for information purposes only. Copies of IEC Publication 60730-2-11 may be purchased from ANSI, 25 West 43rd Street, 4th Floor, New York, NY 10036, (212) 642-4900.

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.

UL effective date

The effective date for UL 60730-2-11, second edition, is October 19, 2018. A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

NATIONAL DIFFERENCES

GENERAL

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60730-2-11, Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators, copyright 2006, 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.

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.

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE – Part 2-11: Particular Requirements for Energy Regulators

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 nongovernmental 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.

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6) All users should ensure that they have the latest edition of this publication.

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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.

International Standard IEC 60730-2-11 has been prepared by IEC technical committee 72: Automatic controls for household use.

This second edition cancels and replaces the first edition published in 1993, Amendment 1 (1994) and Amendment 2 (1997). This second edition constitutes a technical revision, which incorporates amended requirements for electronic controls in Annex H.

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

FDIS	Report on voting
72/712/FDIS	72/725/RVD

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

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

This Part 2-11 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). Consideration may be given to future editions of, or amendments to, IEC 60730-1.

This Part 2-11 supplements or modifies the corresponding clauses in IEC 60730-1 so as to convert that publication into the IEC standard: Particular requirements for energy regulators.

Where this Part 2-11 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 2-11 indicates that the relevant clause or subclause applies.

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 or figures which are additional to those in Part 1 are numbered starting from 101.

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 this publication will remain unchanged until the maintenance result 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.

101DV 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.

102DV DE *Modification of the paragraph starting with, "In this publication"*

– words in SMALL ROMAN CAPITALS in the text are defined in clause 2.

103DV D2 *Modification of the of the 6th paragraph after item (9) by replacing it with the following paragraph:*

This Part 2-11 is intended to be used in conjunction with UL 60730-1, edition 4.

Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Energy Regulators

1 Scope and normative references

This clause of Part 1 is applicable except as follows:

1.1 Replacement:

In general, this part of IEC 60730 applies to energy regulators for use in, on, or in association with equipment for household and similar use, including energy regulators for heating, air conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc. or a combination thereof.

These energy regulators may be thermally, mechanically or electrically operated.

1.1.1 Replacement:

This standard applies to the inherent safety, to the operating values, operating times and operating sequence where such are associated with equipment safety, and to the testing of automatic electrical energy regulator devices used in, or in association with, household or similar equipment.

This standard is also applicable to energy regulators for appliances within the scope of IEC 60335-1.

Throughout this standard the word “equipment” means “appliance and equipment”.

This standard does not apply to automatic electrical energy regulators designed exclusively for industrial applications.

This standard is also applicable to individual energy regulators utilized as part of a control system or energy regulators which are mechanically integral with multi-functional controls having non-electrical outputs.

Energy regulators for equipment not intended for normal household use, but which nevertheless may be used by the public, such as equipment intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

See also Annex J.

1.1.2 Not applicable.

1.1.3 Not applicable.

1.1.4 Replacement:

This standard applies to manual energy regulators when such are electrically and/or mechanically integral with automatic controls.

Requirements for manual switches not forming part of an automatic energy regulator are contained in IEC 61058-1.

1.2 Replacement:

This standard applies to energy regulators with a rated voltage not exceeding 690 V and with a rated current not exceeding 63A.

1.3 Not applicable.

1.4 Replacement:

This standard applies also to energy regulators incorporating electronic devices, requirements for which are contained in Annex H.

This standard applies also to energy regulators using NTC or PTC thermistors, additional requirements for which are contained in Annex J.

2 Definitions

This clause of Part 1 is applicable except as follows:

2.2 Definitions of types of controls according to purpose

2.2.19 Addition:

In general, an energy regulator is an operating control.

2.2.20 *Addition:*

In general, energy regulators using software have functions classified as software class A.

2.5 Definitions of type of control according to construction

Addition:

2.5.101 **Push-and-turn actuation** Push-and-turn actuation denotes a two-step actuation accomplished by first pushing, and then rotating, the actuating member of the control.

2.5.102 **Pull-and-turn actuation** Pull-and-turn actuation denotes a two-step actuation accomplished by first pulling, and then rotating, the actuating member of the control.

3 General requirements

This clause of Part 1 is applicable.

4 General notes on tests

This clause of Part 1 is applicable.

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 Addition:

6.4.3.101 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 and 2.X).

6.4.3.102 An action which is initiated only after a push-and-turn or pull-and-turn actuation (Type 1.Z or 2.Z).

6.7 According to ambient temperature limits of the switch head

Addition:

6.7.101 Energy regulator for use in or on cooking appliances.

7 Information

This clause of Part 1 is applicable except as follows:

Table 7.2

Addition to Note 4):

For energy regulators, limits of the activating quantity are not declared (see 17.7 and 17.8).

8 Protection against electric shock

This clause of Part 1 is applicable.

9 Provision for protective earthing

This clause of Part 1 is applicable.

10 Terminals and terminations

This clause of Part 1 is applicable.

11 Constructional requirements

This clause of Part 1 is applicable except as follows:

11.3.9 Pull-cord actuated control

Addition:

The second explanatory paragraph is not applicable to energy regulators classified as Type 1.X or 2.X or Type 1.Z or 2.Z.

11.4 Actions

Addition:

11.4.101 **Type 1.X or 2.X**

A Type 1.X or 2.X action shall be so designed that a turn action can only be accomplished after the completion of a push action or a pull action. Only rotation shall be required to return the actuating member of the energy regulator to the off or rest position.

Compliance is checked by the tests of 18.101.

11.4.102 **Type 1.Z or 2.Z**

A Type 1.Z or 2.Z action shall be so designed that a turn action can only be accomplished after the completion of a push action or a pull action.

Compliance is checked by the tests of 18.101.

12 Moisture and dust resistance

This clause of Part 1 is applicable.

13 Electric strength and insulation resistance

This clause of Part 1 is applicable.

14 Heating

This clause of Part 1 is applicable except as follows:

Addition:

14.101 Energy regulators for use in or on cooking appliances

14.101.1 The following is applicable to energy regulators classified under 6.7.101.

14.101.2 As a means of complying with note 12), if the temperature of insulating parts exceeds that permitted in Table 14.1, then the test of 17.16.101 may be conducted after the conditioning of 14.102 and 14.102.1.

14.102 A previously untested sample of the energy regulator is conditioned for 1 000 h in an oven maintained at a temperature between 1,02 T_1 + 20 °C and 1,05 times that temperature, where T_1 is the maximum measured temperature on the insulating part during the test of Clause 14. The energy regulator shall not be energized during the test.

If the elevated temperature is localized, such as at or near a bimetal heater, the 1 000 h conditioning is conducted with the energy regulator between T_{max} and T_{max} + 5 % for normal conditions, but with the contacts closed and non-cycling. If necessary, the contacts may be forced closed to provide the most arduous temperature conditions. A bimetal heater across the mains is energized at 1,1 times rated voltage. A series bimetal heater shall conduct at 1,1 times rated current.

15 Manufacturing deviation and drift

This clause of Part 1 is applicable.

16 Environmental stress

This clause of Part 1 is applicable.

17 Endurance

This clause of Part 1 is applicable except as follows:

17.16 Tests for particular purpose controls

Replacement:

17.1 to 17.5 Applicable.

17.6 Applicable to actions classified as Type 1.M or 2.M.

17.6DV.1 D2 *Modification of 17.6 of the Part 2 by adding the following note:*

NOTE – In the USA, for ENERGY REGULATORS used in self-cleaning ovens, the aging period is 250 hrs, at the declared SWITCH HEAD temperature during self-cleaning OPERATION of the appliance.

17.6DV.2 D2 *Modification of 17.6 of the Part 2 by adding the following note:*

NOTE – In the USA, for controls intended for use with self-cleaning ovens, the overload test shall be conducted at the declared SWITCH HEAD temperature during self-cleaning OPERATION of the appliance and the endurance test shall be conducted at the declared SWITCH HEAD temperature during maximum cook OPERATION of the appliance.

17.7 and 17.8 are applicable, except that actuating members are placed in the position that produces the fastest natural cycling rate at the beginning of the test. The rate can be adjusted to the fastest natural cycling rate during the test.

17.9 Not applicable.

17.10 to 17.13 inclusive are applicable, except that for actuating members which have been tested during the automatic action tests of 17.7 and 17.8, the number of cycles of actuation is reduced in 17.13 by the number of cycles carried out during those tests.

17.14 Applicable.

17.15 Not applicable.

Addition:

17.16.101 Evaluation of materials

The following tests are conducted as indicated in 14.101.1.

The energy regulator is subjected to the tests of 17.7 for 50 operations and 17.8 for 1 000 operations. The tests of 17.7 and 17.8 are conducted at an ambient temperature of (20 ± 5) °C.

After these tests, the energy regulator shall comply with 17.5.

17.16.101DV D2 *Modification of 17.16.101 of the Part 2 by adding the following note:*

NOTE – In the USA, the number of required endurance cycles are specified in the following table:

Action Type	Endurance Cycles
AUTOMATIC	100,000[1)]
MANUAL	6,000
[1)] For controls intended to be used in conjunction with a temperature-limiting control, only 30,000 cycles of OPERATION are required.	

18 Mechanical strength

This clause of Part 1 is applicable except as follows:

Addition:

18.101 Push-and-turn or pull-and-turn actuation

Energy regulators with actions classified as Type 1.X or 2.X or Type 1.Z or 2.Z shall be subjected to the tests of 18.101.1 and 18.101.2.

One new sample is used for the tests. After these tests, the energy regulator shall comply with the requirements of 18.1.5.

18.101.1 Energy regulators with actions classified as Type 1.X or 2.X or Type 1.Z or 2.Z shall be subjected to the tests.

– The axial force required to push or pull the actuating member shall not be less than 10 N.

– An axial push or pull force of 140 N applied to the actuating member shall not effect compliance with 18.1.5.

– For an energy regulator intended for use with a knob having a grip diameter or length of 50 mm or less, the means preventing rotation of the shaft prior to the push or pull actuation shall withstand, without damage or effect on the energy regulator function, a torque of 4 Nm.

– Alternatively, if the means preventing the rotation of the shaft is defeated when a torque of at least 2 Nm is applied, the effect shall be such that either:

- the means is not damaged but overridden to close the contacts, in which case subsequent actuation at a torque less than 2 Nm shall require both push-and-turn or pull-and-turn to operate the contacts, or

- no operation of the contacts occurs nor can be made to occur.

– The torque required to reset the energy regulator to the initial contact condition, if necessary after the application of the push or pull, shall not be greater than 0,5 Nm.

– A torque of 6 Nm is applied to the setting means. Any breakage or damage to the means preventing rotation of the shaft shall not result in failure to comply with the requirements of Clauses 8, 13 and 20.

– For energy regulators intended for use with a knob having a grip diameter or length greater than 50 mm, the values of torque are increased proportionally.

18.101.2 Energy regulators with actions classified as Type 1.X or 2.X, or Type 1.Z or 2.Z shall be actuated for the declared number of manual cycles.

After this test, the energy regulator shall comply with the requirements of 18.101.1. For the case in which the means preventing rotation is not damaged but is overridden to operate the contacts, the first one-sixth of the declared manual cycles shall be performed without first pushing or pulling the actuating member.

19 Threaded parts and connections

This clause of Part 1 is applicable.

20 Creepage distances, clearances and distances through solid insulation

This clause of Part 1 is applicable.

21 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

22 Resistance to corrosion

This clause of Part 1 is applicable.

23 Electromagnetic compatibility (EMC) requirements – emission

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable.

25 Normal operation

See Annex H.

26 Electromagnetic compatibility (EMC) requirements – immunity

See Annex H.

27 Abnormal operation

This clause of Part 1 is applicable. See also Annex H.

28 Guidance on the use of electronic disconnection

See Annex H.

Figures

The figures of part 1 are applicable.

Annexes

The annexes of part 1 are applicable except as follows: