UL 60730-2-3

STANDARD FOR SAFETY

Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps

UL Standard for Safety for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps, UL 60730-2-3

Second Edition, Dated June 28, 2013

Summary of Topics

This revision of ANSI/UL 60730-2-3 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.

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JUNE 28, 2013
(Title Page Reprinted: August 16, 2017)

UL 60730-2-3

Standard for Automatic Electrical Controls for Household and Similar Use;

Part 2: Particular Requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps

Prior to the first edition of UL 60730-2-3, the requirements for the products covered by this Standard were included in UL 8730-2-3.

First Edition – February, 2002

Second Edition

June 28, 2013

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through August 16, 2017.

The most recent designation of ANSI/UL 60730-2-3 as a Reaffirmed American National Standard (ANS) occurred on August 16, 2017. 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 60730-2-3, Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps, is to be used in conjunction with UL 60730-1. The requirements for thermal protectors for ballasts for tubular fluorescent lamps 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 60730-2-3, 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 Thermal Protectors for Ballasts for Tubular Fluorescent Lamps, 60730-2-3, 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 60730-2-3 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 60730-2-3, 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 60730-2-3, Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps, 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 2-3: Particular requirements for thermal protectors for ballasts for tubular fluorescent lamps

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) IEC Publications have the form of recommendation for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

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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 60730-2-3 has been prepared by IEC Technical Committee 72: Automatic controls for household use.

This second edition cancels and replaces the first edition published in 1990, Amendment 1 (1995) and Amendment 2 (2001). This second edition constitutes a technical revision. This new edition updates the standard to IEC 60730-1, Edition 3 (1999) and its Amendment 1 (2003).

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

FDIS	Report on Voting
72/709/FDIS	72/722/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 2-3 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the third edition of that publication (1999) and its amendment 1 (2003). Consideration may be given to future editions of, or amendments to IEC 60730-1.

This Part 2 supplements or modifies the corresponding clauses in IEC Publication 60730-1 so as to convert that publication into the IEC standard: Particular requirements for thermal protectors for ballasts for tubular fluorescent lamps.

Where this Part 2-3 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 the 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.

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The ″in some countries″ notes regarding differing national practice are contained in the following subclauses:

– Table 7.2, item 101

– 12.2

– 17.4

– Annex C

– Annex D

In this publication:

1) The following print types are used:

– Requirements proper: in roman type.

– *Test specifications: in italic type.*

– Explanatory matter: in smaller roman type.

2) Subclauses, notes, items or 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, 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 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 of the following after the second note in 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 Item (1) 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 part 2 by adding the following:*

The following UL Standard is referenced in this standard:

UL 935 – Fluorescent-Lamp Ballasts

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE – Part 2: Particular requirements for Thermal Protectors for Ballasts for Tubular Fluorescent Lamps

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 the evaluation of thermal protectors for ballasts for tubular fluorescent lamps.

This standard applies to thermal protectors using NTC or PTC THERMISTORS, additional requirements for which are contained in Annex J.

Requirements concerning the testing of the combination of ballast and thermal protector are given in IEC 61347-1.

1.1DV D2 *Modification to the third paragraph of the part 2:*

Add ″and UL 935.″ to the end of the sentence.

1.1.1 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 thermal protectors used to protect ballasts for tubular lamps from overheating.

This standard applies to thermal protectors for ballasts within the scope of IEC 61347-2-8.

Thermal protectors covered by this standard may be suitable for ballasts for other discharge lamps such as ballasts under the scope of IEC 61347-2-9.

Throughout this standard the word ″protector″ means ″self-resetting THERMAL BALLAST PROTECTOR.″

1.1.1DV D2 *Modification to the second paragraph of the part 2:*

Add ″and UL 935.″ to the end of the sentence.

1.1.2 This standard is not applicable to other means used to protect ballasts.

1.1.3 This standard does not apply to a manual device for opening the circuit.

1.2 *Replacement:*

This standard applies to protectors for use with ballasts for use on a.c. supplies up to 690 V at 50 Hz or 60 Hz.

1.3 *Replacement:*

This standard does not take into account the RESPONSE VALUE of an AUTOMATIC ACTION of a control, if such a RESPONSE VALUE is dependent upon the method of mounting the control 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 household equipment standard or as determined by the manufacturer applies.

1.101DV DE *Addition of the following to the part 2:*

In IEC terminology, "safety" is defined as an acceptable level of risk. This is consistent with the intentions of UL requirements to reduce the risk of fire, shock, or injury to persons.

1.5 Normative references

Addition:

IEC 61347-1,
Lamp controlgear – Part 1: General and safety requirements

IEC 61347-2-8,
Lamp controlgear – Part 2-8: Particular requirements for ballasts for fluorescent lamps

IEC 61347-2-9,
Lamp controlgear – Part 2-9: Particular requirements for discharge lamps (excluding fluorescent lamps)

1.5DV D1 *Add the following UL reference:*

UL 935
Fluorescent-Lamp Ballasts

2 Definitions

This clause of Part 1 is applicable except as follows:

2.2.16 THERMAL MOTOR PROTECTOR

Additional definition:

2.2.16.101 THERMAL BALLAST PROTECTOR: self-resetting AUTOMATIC CONTROL integrated or incorporated with a ballast for tubular fluorescent lamps and is specifically designed to protect the ballast against overheating under any condition of use.

The control carries ballast current and is sensitive to ballast temperature and current.

3 General requirements

This clause of Part 1 is applicable.

4 General notes on tests

This clause of Part 1 is applicable except as follows:

4.2 *Samples required*

Replacement:

4.2.1 One sample is used for the tests in this standard except a separate sample is used for the test of 17.1.2 and three separate samples are used for the test of 17.4.

5 Rating

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable except as follows:

6.3 According to their purpose

Additional subclause:

6.3.101 – THERMAL BALLAST PROTECTOR.

6.4 According to features of AUTOMATIC ACTION

6.4.1 – not applicable.

Additional subclause:

6.4.101 Protectors are further classified as providing MICRO-INTERRUPTION on OPERATION as follows:

– self-resetting (Type 2.C).

6.4.101DV D2 ***Add the following:***

Protectors are further classified as providing MICRO-DISCONNECTION on OPERATION as follows:

– self-resetting (Type 2.B).

6.6 Not applicable.

6.7 Not applicable.

6.10 Not applicable.

6.11 Not applicable.

6.11DV D2 ***Replace "Not applicable" with "This clause of Part 1 is applicable."***

6.12 Not applicable.

6.14 Not applicable.

6.16 Not applicable.

7 Information

This clause of Part 1 is applicable except as follows:

Replacement:

Table 7.2

	Information	Clause or subclause	Method
1	Manufacturer's name or trade mark [2)]	7.2.6	C
2	UNIQUE TYPE REFERENCE [1) 2)]	2.11.1, 2.13.1	C
3	RATED VOLTAGE or RATED VOLTAGE RANGE (V)	2.1.2, 4.3.2	C
4	Nature of supply, unless the control is for both a.c. and d.c., or unless the rating is the same for a.c. and d.c.	4.3.2, 6.1	D
6	Purpose of control	4.3.5, 6.3	D
6a	Construction of control	6.15	D
20	Details of any special conductors which are intended to be connected to terminals for INTERNAL CONDUCTORS	10.2	D
31	Method of mounting control [5)]	11.6	D
37	Minimum and/or maximum rates of change of ACTIVATING QUANTITY, or minimum and/or maximum cycling rates for a SENSING CONTROL [4)]	4, 15, 17	X
38	Values of overshoot of ACTIVATING QUANTITY for SENSING CONTROLS which are either necessary for correction action, or which can be used for test purposes	17	X
48	OPERATING VALUE (or values)	15	D
101	Limited short-circuit capability [101)]	17.4	X
102	RATED CURRENT [102)]	6.101, 17	D

Modification to the notes of Table 7.2:

Note 4

α_2 = maximum rising rate (for TYPE 2 ACTIONS only)

β_2 = maximum falling rate (for TYPE 2 ACTIONS only)

The values α_2 and β_2 are for test purposes only, and may alternatively be declared as a maximum cycling rate.

For the purpose of this standard, the rate of change of temperature shall be expressed in K/h.

Additional notes:

Note 101

The test of 17.4 applies in Canada and the USA.

Note 102

The RATED CURRENT of the THERMAL BALLAST PROTECTOR is chosen in accordance with the RATED CURRENT of the ballast.

Table 7.2DV D2 *Modification of Table 7.2 with the following two national differences:*

DV.1 Insert row 1A, with the first column being "1A", the second column being "Date code of manufacturing 103A ", the third column being "blank" and the fourth column being "C".

DV.2 Add: "Note 103A The date code shall be the date or other dating period of manufacture not exceeding any three consecutive months. The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code:

a) Does not repeat in less than 20 years, and

b) Does not require reference to the product records of the manufacturer to determine when the product was manufactured."

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 except as follows:

10.1 Not applicable.

10.2 Addition:

For the purpose of this standard, internal conductors are considered INTEGRATED CONDUCTORS.

11 Constructional requirements

This clause of Part 1 is applicable except as follows:

11.3.4 SETTING by the manufacturer

Addition:

Sealing compounds, lock nuts and the like are deemed adequate for this purpose.

12 Moisture and dust resistance

This clause of Part 1 is applicable except as follows:

12.2 Protection against humid conditions

Addition:

In Canada and the United States, the tests of Annex D determine proof against humid conditions. In Japan, this evaluation is done in the ballast.

12.2DV D2 *Replace the above statement with "This clause of Part 1 is applicable in the United States."*

13 Electric strength and insulation resistance

This clause of Part 1 is applicable except as follows:

Addition:

The suitability of the test in clause 13 may depend upon the method of mounting the protector in the equipment. If the results of the tests in clause 13 are not likely to be representative of the results obtained when the protector is used with a ballast, then these tests would normally be carried out on the assembled thermally protected ballast.

14 Heating

This clause of Part 1 is not applicable.

Successful completion of the tests of clause 17 of this standard are deemed to be sufficient.

15 MANUFACTURING DEVIATION and DRIFT

This clause of Part 1 is replaced as follows:

15.1 The allowable deviation in opening temperature shall not exceed ±5 K from the declared opening temperature.

15.2 The allowable DRIFT from initial opening temperature following the endurance test of 17.1.3 shall not exceed +5 K from the opening temperature recorded on the sample which had been previously tested for deviation.

15.3 Compliance is checked by the appropriate tests of this clause.

15.4 The consistency shall be determined as follows:

15.4.1 One sample of the protector is tested for initial opening temperature in accordance with 15.4.2 and 15.4.3. Opening is indicated by the interruption of a current through the protector which does not exceed:

- *3% of the protector RATED CURRENT, or*
- *0,01 A,*

whichever is less.

15.4.2 The protector is mounted in an air oven in which the air flow is at least 30 m/min (100 ft/min). Temperature is measured by means of 0,25 mm diameter thermocouple wire attached to the SENSING ELEMENT *either of the sample or of an identical sample located in air adjacent to the element.*

Other test apparatus may be used upon agreement between manufacturer and test house.

15.4.3 The temperature of the air oven may be rapidly increased to 10 K below the expected opening temperature of the test sample and maintained until conditions of equilibrium have been reached. The oven temperature is then increased at a rate of not more than 0,5 K/min until the sample operates.

For the repeat tests required in 17.1.3.5, it is important that the thermocouple be placed in the same position relative to the test sample as in the initial test.

16 Environmental stress

This clause of Part 1 is applicable.

17 Endurance This clause of Part 1 is replaced as follows:17 Overload, endurance and limited short-circuit

17.1 General requirements

17.1.1 A protector shall withstand the mechanical, electrical and thermal stresses that occur in NORMAL USE.

Separate samples shall be used for the overload, endurance and limited short-circuit tests.

17.1.2 *Overload test*

17.1.2.1 An untested protector shall be used for the overload test. The protector shall make and break a test current having a 40% to 50% power factor at the rated test voltage specified in 17.2, for 1 000 cycles of OPERATION. The test current shall be four times the RATED CURRENT. When the test voltage is 120 V, the test current shall not be less than 20 A.

17.1.2.2 For the test, the protector shall be mounted and connected as declared.

17.1.2.3 The protector shall be operated thermally in a manner consistent with its normal OPERATION*. If a heat source is used, it shall be cycled by the protector under test.*

17.1.2.4 The cycling rate shall be (6 ±1) cycles/min unless other values, required by the characteristics of the protector, are declared in requirements 37 and 38 of table 7.2.

17.1.2.5 The protector shall be deemed to comply with the requirements of 17.1.2 if there has been no malfunction, resulting in non-compliance with clauses 8, 13 and 20.

17.1.3 Endurance test

17.1.3.1 A protector shall operate such that its DRIFT, specified in 15.2, is not exceeded after making and breaking a test current of twice RATED CURRENT for 10 000 cycles of OPERATION, at a 40% to 50% power factor and a test voltage as specified in 17.2.

17.1.3.2 For the test, the protector shall be mounted and connected as declared.

17.1.3.3 The protector shall be operated thermally in a manner consistent with its normal OPERATION. If a heat source is used, it shall be cycled by the protector under test.

17.1.3.4 The cycling rate shall be (6 ±1) cycles/min unless other values, required by the characteristics of the protector, are declared in requirements 37 and 38 of table 7.2.

17.1.3.5 At the conclusion of the endurance test, the protector shall be subjected to a repeated calibration verification test using the test procedure specified in 15.4.1.

17.1.3.6 The protector shall be deemed to comply with the requirements of 17.1.3 if the opening temperature recorded in the repeat test of 17.1.3.5 does not exceed ±5 K from the initial opening temperature recorded in the test of 15.1. In addition, there shall have been no malfunction or welding of contacts.

17.2 Test voltage

Voltages used for the tests of 17.1.2 and 17.1.3 shall be equal to RATED VOLTAGE or the maximum voltage of the RATED VOLTAGE RANGE.

17.3 Electrical strength requirements

After all the tests of 17.1.3, the requirements of 13.2 shall apply to protectors for which the applicability of 13.2 has been previously determined; however the protector shall not be subjected to the humidity treatment.

17.4 Limited short-circuit

A protector shall not cause a risk of fire when subjected to the limited short-circuit test.

In Canada and the United States, compliance is checked by the following test.

The test shall be carried out on three new samples which have not been subjected to any other tests.

At the option of the manufacturer, the limited short-circuit test shall be performed on the protector alone, as declared by the manufacturer, or on the protector installed as intended.

The test circuit shall include a 20 A series fuse having a design characteristic such that it will not open in less than 12 s when carrying 40 A. The circuit shall be adjusted such that a limited short-circuit current of 200 A is obtained at a voltage of ±5% of RATED VOLTAGE of the protector and without the protector connected in the circuit.

The protector is connected in the circuit, without further circuit adjustment, by two 0,91 m (3 ft) lengths of 1,6 mm diameter (No. 14 AWG copper wire).

Surgical grade cotton shall be wrapped around the protector, if tested alone, during the test.

Each protector shall be subjected to one test in which the short-circuit is closed on the protector.

If the protector cycles during the test and if the cotton is not ignited, the test shall be continued until the protector permanently opens the circuit or the series fuse opens.

The protector shall be deemed to comply with the requirements of 17.4 provided there is no ignition of the cotton indicator or other evidence of risk of fire such as emission of flame or molten metal during or after the test.

18 Mechanical strength

This clause of Part 1 is applicable.

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, except as follows:

20.101 Additional subclause:

Requirements for creepage distances and clearances do not apply

– between live parts having the same polarity (including their heater(s), if used);

– across the contact gap;

– between terminals and terminations.

NOTE – This exclusion does not apply to CLEARANCE and CREEPAGE DISTANCES from LIVE PARTS to earth or to ACCESSIBLE LIVE PARTS.

20.101DV D2 *Replace clause 20 with "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.