

INTERNATIONAL STANDARD



Automatic electrical controls ~~for household and similar use~~ –
Part 2-11: Particular requirements for energy regulators



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HOUSEHOLD AND SIMILAR USE~~****Part 2-11: Particular requirements for energy regulators****FOREWORD**

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

This third edition cancels and replaces the second edition published in 2006. This edition constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

- a) revision to the title to remove “for household and similar use”;
- b) changes to the scope and related modifications;
- c) changes to definitions in Annex H.

The text of this International Standard is based upon the following documents:

CDV	Report on voting
72/1137/CDV	72/1167/RVC

Full information on the voting for the approval of this International Standard 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 fifth edition of that standard (2013) including Amendment 1 (2015). 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,
- defined terms: **bold type**.

Subclauses, notes, tables and 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*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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

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- withdrawn;
- replaced by a revised edition, or
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AUTOMATIC ELECTRICAL CONTROLS ~~FOR~~ ~~HOUSEHOLD AND SIMILAR USE~~

Part 2-11: Particular requirements for energy regulators

1 Scope and normative references

This clause of Part 1 is applicable except as follows:

1.1 Scope

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.

NOTE These energy regulators ~~may~~ can 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~~ these 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 also applies to automatic electrical energy regulators 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 energy regulators designed exclusively for industrial process applications unless explicitly mentioned in the equipment standard.

This standard does not apply to equipment that are specifically within the scope of building automation equipment.

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.~~

This standard applies to **controls** powered by primary or secondary batteries, requirements for which are contained within the standard, including Annex V.

1.1.1 This International 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 control** devices used in, or in association with, equipment.

This standard applies to **controls** using **thermistors**, see also Annex J.

This standard is also applicable to the **functional safety** of **low complexity safety related systems and controls**.

1.1.2 ~~Not applicable.~~

This standard applies to energy regulators as defined in 2.2.10 of Part 1.

1.1.3 Not applicable.

1.1.4 *Replacement:*

This standard applies to manual energy regulators ~~when such~~ which 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.

~~4.2~~**1.1.5** *Replacement:*

This standard applies to energy regulators with a rated voltage not exceeding 690 V ~~and with a rated current not exceeding 63A~~ AC or 600 V DC.

~~4.3~~**1.1.6** Not applicable.

~~4.4~~**1.1.7** *Replacement:*

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

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

1.1.9 This standard applies to the electrical and **functional safety** of **controls** capable of receiving and responding to communications signals, including signals for power billing rate and demand response.

The signals may be transmitted to or received from external units being part of the **control** (wired), or to and from external units which are not part of the **control** (wireless) under test.

1.1.10 This standard does not address the integrity of the output signal to the network devices, such as interoperability with other devices unless it has been evaluated as part of the **control system**.

2 Terms and 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 protective control

Addition:

Note 1 to entry: 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~~ turning, 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

Table 1 – Required information and methods of providing information

Addition to ~~Note 4~~ item i):

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~~ Note 2 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)~~ I) of Table 13, if the temperature of insulating parts exceeds that permitted in Table ~~14.1~~ 13, 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 $1,02 T_1 + 20\text{ °C}$ 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.~~

Modification:

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. *Limits of the activating quantity are not declared.*

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

17.16 Test for particular purpose controls

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 $(20 \pm 5) ^\circ\text{C}$.

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

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.~~

This clause of Part 1 is applicable.

26 Electromagnetic compatibility (EMC) requirements – Immunity

~~See Annex H.~~

This clause of Part 1 is applicable.

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.~~

This clause of Part 1 is applicable.

Figures

The figures of Part 1 are applicable.

Annexes

The annexes of Part 1 are applicable except as follows:

Annex H (normative)

Requirements for electronic controls

This annex of Part 1 is applicable except as follows:

H.6 Classification

H.6.18 According to ~~software~~ classes of control functions

H.6.18.1 – Control of class A control functions

Addition:

NOTE In general, energy regulators ~~using software have functions classified as software~~ perform class A control function.

H.11.12 Controls using software

Modification:

After the second paragraph, add the following note:

NOTE The value(s) given in Table 1, item 71 can be taken from the equipment standard.

H.23.1.2 Radio frequency emission

Addition:

Integrated and incorporated energy regulators are not subjected to the tests of this subclause, as the results of these tests are influenced by the incorporation of the energy regulator into the equipment and the use of measures to control emissions used therein. ~~They~~ The tests of this subclause may, however, be carried out under declared conditions if so requested by the manufacturer.

H.26 Electromagnetic compatibility (EMC) requirements – Immunity

H.26.2 *Addition:*

The tests of H.26.4 to H.26.14 are performed with the energy regulator at its highest setting, its lowest and at the OFF setting, if provided.

H.26.5 Voltage dips, voltage interruptions and voltage variations in the power supply network

Modification:

~~H.26.5.3 Test procedure~~

~~Delete the paragraph beginning "In the case of three-phase equipment...".~~