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Automatic electrical controls – Part 2-11: Particular requirements for energy regulators

Dispositifs de commande électrique automatiques – Partie 2-11: Exigences particulières pour les régulateurs d'énergie

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Automatic electrical controls - Part 2-11: Particular requirements for energy regulators

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

This fourth edition cancels and replaces the third edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) adoption to IEC 60730-1:2022 with all of its significant changes to IEC 60730-1:2013 IEC 60730-1:2013/AMD1:2015 and IEC 60730-1:2013/AMD2:2020.

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

Draft	Report on voting
72/1485/FDIS	72/1501/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 60730 series, under the general title: *Automatic electrical controls,* can be found on the IEC website.

This part 2-11 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the sixth edition of that standard (2022). 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.

When a particular subclause of Part 1 is not mentioned in this Part 2, that 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 reader's attention is drawn to the fact that Annex Q, Annex R, Annex S and Annex T list all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

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;
   - Defined terms: **bold type**.
2) Subclauses, notes or items which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

1 Scope

This clause of Part 1 is replaced by the following:

This document applies to **energy regulators**

- for use in, on, or in association with equipment for household appliance and similar use;

NOTE 1 Throughout this document, the word "equipment" means "appliance and equipment" and "controls" means "energy regulators".

- for equipment that is used by the public, such as equipment intended to be used in shops, offices, hospitals, farms and commercial and industrial applications;

EXAMPLE 1 **Energy regulators** for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled energy regulators**;

EXAMPLE 2 Smart grid control, remote interfaces/control of energy-consuming equipment including computer or smart phone.

- that are AC or DC powered controls with a rated voltage not exceeding 690 V AC or 600 V DC;
- used in, on, or in association with equipment that use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof;
- utilized as part of a control system or controls which are mechanically integral with multifunctional controls having non-electrical outputs;
- using NTC or **PTC thermistors** and to discrete **thermistors**, requirements for which are contained in Annex J;
- that are mechanically or electrically operated, responsive to or controlling such characteristics as temperature, pressure, passage of time, humidity, light, electrostatic effects, flow, or liquid level, current, voltage, acceleration, or combinations thereof;
- as well as manual controls when such are electrically and/or mechanically integral with automatic controls.

NOTE 2 Requirements for manually actuated mechanical switches not forming part of an automatic control are contained in IEC 61058-1-1.

This document applies to

– the inherent safety of **energy regulators**, and
– **functional safety** of **energy regulators** of low complexity safety related systems and controls,
– controls where the performance (for example the effect of EMC phenomena) of the product can impair the overall safety and performance of the controlled system,
– the operating values, operating times, and operating sequences where such are associated with equipment safety.
– manual energy regulators which are electrically and/or mechanically integral with automatic controls.
– energy regulators incorporating electronic devices, requirements for which are contained in Annex H.
– 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 can 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.

This document specifies the requirements for construction, operation and testing of automatic **energy regulators** used in, on, or in association with an equipment.

This document does not

- apply to automatic **energy regulators** intended exclusively for industrial process applications unless explicitly mentioned in the relevant part 2 or the equipment standard. However, this document can be applied to evaluate automatic **energy regulators** intended specifically for industrial applications in cases where no relevant safety standard exists.
- take into account the **response value** of an **automatic action** of an **energy regulator**, if such a **response value** is dependent upon the method of mounting the **energy regulator** 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 will apply.
- 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 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

3.5 Definitions of types of control according to construction

Additional definitions:

3.5.101
push-and-turn actuation
two-step **actuation** accomplished by first pushing, and then turning, the actuating member of the control

3.5.102
pull-and-turn actuation
two-step **actuation** accomplished by first pulling, and then rotating, the actuating member of the control

4 General

This clause of Part 1 is applicable.

5 Required technical information

This clause of Part 1 is applicable except as follows:

5.2 Methods of providing technical information

This clause of Part 1 is applicable except as follows:

Table 1 – Required technical information and methods of providing these information

	Information	Clause or subclause	Method
Replacement:			
7	Type of **control** according to construction and whether the **control** is electronic Energy regulators can be **push-and-turn actuation** and **pull-and-turn actuation**	3.5.101, 3.5.102	X
Replacement:			
15	Temperature limits of the **energy regulators**, if the minimum value (T_{min}) lower than 0 °C or the maximum value (T_{max}) other than 55 °C Preferred values of $\boldsymbol{T_{max}}$ are 30 °C, 55 °C, 70 °C, 85 °C, 105 °C, 125 °C, 150 °C. Preferred values of T_{min} are 0 °C, −10 °C, −20 °C, −30 °C, and −40 °C Automatic action at slow rate is not applicable	16.5 16.7 16.101	C
Addition to note i: For energy regulators, limits of the activating quantity are not declared (see 19.7 and 19.8).			

6 Protection against electric shock

This clause of Part 1 is applicable.

7 Provision for protective earthing

This clause of Part 1 is applicable.

8 Terminals and terminations

This clause of Part 1 is applicable.

9 Constructional requirements

This clause of Part 1 is applicable except as follows:

9.3 Actuation and operation

9.3.9 Pull-cord actuated control

Addition:

This subclause is not applicable to energy regulators classified as type 1.X or 2.X or type 1.Z or 2.Z.

9.4 Actions

Additional subclauses:

9.4.101 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 20.101.

9.4.102 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 20.101.

10 Threaded parts and connections

This clause of Part 1 is applicable.

11 Creepage distances, clearances and distances through solid insulation

This clause of Part 1 is applicable.

12 Components

This clause of Part 1 is applicable.

13 Fault assessment on electronic circuits

This clause of Part 1 is applicable except as follows.

13.1 Fault assessment for inherent safety

13.1.3 Component fault assessment

13.1.3.2 Test procedure

Modifications:

Replace the first line with:

The energy regulator shall be operated under the following conditions. In addition, the energy regulator shall be tested at the high, low and OFF settings.

Add the following sentence to the end of item h):

*A further option for integrated and **incorporated controls** is to require, for example, further shielding, in the appliance or equipment.*

13.1.3.8 Compliance criteria

Modification:

Item c) is not applicable.

14 Moisture and dust resistance

This clause of Part 1 is applicable.

15 Electric strength and insulation resistance

This clause of Part 1 is applicable.

16 Heating

This clause of Part 1 is applicable except as follows:

Additional subclause:

16.101 Energy regulators for use in or on cooking appliances

16.101.1 The following is applicable to energy regulators Type 1.X or 2.X.

16.101.2 As a means of complying with Footnote l) of Table 17, if the temperature of insulating parts exceeds that permitted in Table 17, then the test of 19.15.101 may be conducted after the conditioning of 16.101.3.

16.101.3 An unenergized previously untested sample of the control is conditioned for 1 000 h in an oven maintained at a temperature between T_1 and T_2 where: T_1 = 102 % of T_m + 20 K, T_2 = 105 % of T_1 and T_m = the maximum measured temperature on the insulating part during the test of Clause 16.

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.

17 Manufacturing deviation and drift

This clause of Part 1 is applicable.

18 Environmental stress

This clause of Part 1 is applicable.

19 Endurance

This clause of Part 1 is applicable except as follows:

19.7 Overvoltage test or overload test in all countries using an overload test of automatic action at accelerated rate

19.7.3

Addition of the following as fourth dashed item:

– *the 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.*

19.8 Test of automatic action at accelerated rate

19.8.3 *Addition:*

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.

19.9 Test of automatic action at slow rate

Not applicable.

19.13 Test of manual action at accelerated speed

19.13.4 *Modification:*

For actuating members which have been tested during the automatic action tests of 19.7 and 19.8, the number of cycles of **actuation** is reduced in 19.13 by the number of cycles carried out during those tests.

19.15 Test for particular purpose controls

Additional subclause:

19.15.101 Evaluation of materials

The following tests are conducted as indicated in 16.101.2.

The energy regulator is subjected to the tests of 19.7 for 50 operations and 19.8 for 1 000 operations. The tests of 19.7 and 19.8 are conducted at an ambient temperature of (20 ± 5) °C.

After these tests, the energy regulator shall comply with 19.5.