IEC 60730-2-7

Edition 3.0 2015-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Automatic electrical controls –
Part 2-7: Particular requirements for timers and time switches

Dispositifs de commande électrique automatiques –
Partie 2-7: Exigences particulières pour les minuteries et les minuteries cycliques

IEC 60730-2-7:2015-03(en-fr)

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AUTOMATIC ELECTRICAL CONTROLS –

Part 2-7: Particular requirements for timers and time switches

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 non-governmental 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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International Standard IEC 60730-2-7 has been prepared by IEC technical committee 72: Automatic electrical controls.

This third edition cancels and replaces the second edition published in 2008. This third edition constitutes a technical revision. This new edition revises the compliance criteria of type 1.S and 2.S action, revises the requirements for filament lamp loads, adds requirements for abnormal operation in Annex H, removes some special requirements for single countries as well as updates the standard to IEC 60730-1:2010, fourth edition.

This Part 2-7 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the fourth edition (2010) of that publication. IEC 60730-1 Ed. 5 is available, and this part 2-7 will be aligned with that edition in the future. Consideration may be given to future editions of, or amendments to, IEC 60730-1.

The title of IEC 60730-2-7 Ed.3 has been updated to the title of IEC 60730-1 Ed.5.0. However, IEC 60730-2-7 Ed.3.0 has not been updated in accordance with the technical requirements in IEC 60730-1 Ed. 5.0.

This Part 2-7 supplements or modifies the corresponding clauses in IEC 60730-1 so as to convert that publication into the IEC standard: Particular requirements for timers and time switches.

Where this Part 2-7 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 2-7 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.

The “in some countries” notes regarding differing national practice are contained in the following clauses and subclauses:

– 6.3.6.101
– Table 1, Notes 101 and 103
– 7.2.9
– 11.4.104
– 17.16.101.1
– 17.16.101.3
– 17.16.103.1
– Table 15, Notes 101 and 102
– Table 16, Notes 101 and 102
– 21.101
– Annex D
– H.26.11

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, tables or figures which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

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

CDV	Report on voting
72/926/CDV	72/959/RVC

Full information on the voting for the approval of this 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.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

AUTOMATIC ELECTRICAL CONTROLS –

Part 2-7: Particular requirements for timers and time switches

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 timers and time switches that may use electricity, gas, oil, solid fuel, solar thermal energy, etc. or a combination thereof, including heating, air conditioning and similar applications.

This standard is also applicable to individual timers utilized as part of a control system or timers which are mechanically integral with multifunctional controls having non-electrical outputs. This standard does not apply to time-delay switches (TDS) within the scope of IEC 60669-2-3.

NOTE 1 Throughout this standard, the word "timers" means timers and time switches, unless the type is specifically mentioned.

NOTE 2 Devices which only indicate time or passage of time are not included.

NOTE 3 This standard does not apply to multi-functional controls having an integrated timing function which is not capable of being tested as a separate timing device.

1.1.1 *Replacement:*

This standard applies to the inherent safety, to the operating characteristics where such are associated with equipment protection and to the testing of timers used in appliances and other apparatus, electrical and non-electrical, for household and similar purposes, but also extended to industrial purposes when no dedicated product standards exist, such as that for central heating, air conditioning, process heating, etc.

Timers 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 is also applicable to timers for appliances within the scope of IEC 60335-1.

1.1.2 *Replacement:*

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

1.4 *Replacement:*

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

This standard applies also to timers using NTC or PTC thermistors, requirements for which are contained in Part 1, Annex J.

1.5 Normative references

This subclause of Part 1 applies except as follows:

Addition:

IEC 60669-1:1998, *Switches for household and similar fixed-electrical installations – Part 1: General requirements*[1]
IEC 60669-1:1998/AMD1:1999
IEC 60669-1:1998/AMD2:2006

IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

2 Definitions

This clause of Part 1 is applicable except as follows:

2.3 Definitions relating to the function of controls

Additional definition:

2.3.101
timing cycle
program including all the switching activities involved in a start-to-finish operation of a controlled appliance

2.5 Definitions of types of control according to construction

Additional definitions:

2.5.101
plug-in timer
timer or time switch designed for direct plug-in to a socket-outlet

Note 1 to entry: The plug-in timer is equipped with conductor blades, pins or other means, protruding from the enclosure of the control or the control body itself, to match the dimensional parameters of the socket-outlet to which the control will be connected.

2.5.102
TV timer
control for television equipment that can be set by the user, switching very high inrush currents of a very short duration generated by electrical power supply components and associated electronic component parts with various electrical characteristics

Note 1 to entry: Examples are power transformers, electronic tube filaments, large electric capacitors and others in television receivers, radio and video products.

2.5.103
synchronous timer
timer or a time switch in which the transmission is effected by a device that is time-based on the frequency of the power supply for the prime mover or the load

2.5.104
hand-wound timer
timer or time switch in which the transmission is provided by actuation

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[1] There exists a consolidated edition 3.2 (2007) that includes IEC 60669-1:2008 and its Amendments 1 and 2.

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:

6.3 According to their purpose

6.3.6 *Additional subclause:*

6.3.6.101 – TV timer;

NOTE In Canada and the USA, timers for use on televisions have to be declared and tested as indicated in this standard.

6.4 According to features of automatic action

6.4.3 *Additional subclauses:*

6.4.3.101 – a timing action which automatically resets upon loss of the electrical supply (Type 1.Q or 2.Q);

6.4.3.102 – a timing action which is interrupted upon loss of the electrical supply and resumes at the point of interruption upon restoration of the electrical supply (Type 1.R or 2.R);

6.4.3.103 – a timing action of a time switch which, after interruption of the electrical supply for any interval up to the declared period of power reserve, resumes its intended operating sequence as if no interruption of the supply has occurred (Type 1.S or 2.S);

6.4.3.104 – a timing action with a declared running accuracy in an ambient temperature of 20 °C to 25 °C (Type 1.T or 2.T);

6.4.3.105 – a timing action in which the difference between set time and actual switching time does not exceed the declared amount (Type 1.U or 2.U).

6.10 According to number of cycles of actuation (M) of each manual actuation

Additional subclauses:

6.10.101 – 500 cycles;

6.10.102 – 2 500 cycles;

6.10.103 – 5 000 cycles.

6.15 According to construction

Additional subclause:

6.15.101 – plug-in timer.

7 Information

This clause of Part 1 is applicable except as follows:

7.2 Methods of providing information

7.2.9 *Addition:*

NOTE In Germany, for Type 1.S or 2.S actions, the power reserve is to be marked on the timer by the letter "R", followed by the duration of the power reserve, followed by the symbol indicating the time unit as follows:

minutes	min
hours	h
days	d
years	a

Table 1

Modification:

Replace the lines corresponding to items 7, 26, 27 and 28 by the following:

Information	Clause or subclause	Method
7 The type of load controlled by each circuit [7) 101)]	6.2 14 17	C
26 Number of cycles of actuation (M) for each manual action [102)]	6.10	X
27 Number of automatic cycles (A) for each automatic action [102)]	6.11	X
28 Ageing period (Y) for Type 1.M or 2.M action [102)]	6.16	X

Add the following additional items:

Information	Clause or subclause	Method
101 TV timer [103)]	2.5.102	C
102 Power reserve duration	6.4.3.103	D
103 Running time for manually wound switches	11.4.103	D
104 Running accuracy and setting accuracy	6.4.3.104 6.4.3.105 11.4.104	X

Add the following additional notes:

101)	In Canada and the USA, timers with a tungsten-filament lamp load rating or direct current as well as alternating current, in addition to the regular electrical information shall be marked to indicate the type of load, type of current and rated voltage. The marking shall be "T" for controls used with direct as well as alternating current and "L" for controls used on alternating current only. The marking shall follow the unique type reference or the electrical rating of the control.
102)	Values for in-line cord, free-standing and independently mounted controls are given in Annex AA (see also 17.1.3.101).
103)	In Canada and the USA, a timer with a TV rating shall be marked with the manufacturer's name or trademark, load type designation and electrical rating. The marking shall consist of "TV" followed by the ampere rating. This rating shall follow any other electrical rating the control may have or can be a single, stand-alone marking if the control has no additional ratings.

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:

11.4 Actions

Additional subclauses:

11.4.101 Type 1.Q or 2.Q action

A Type 1.Q or 2.Q action shall be so designed that it resets automatically upon loss of the electrical supply.

Compliance is checked by inspection and by test.

11.4.102 Type 1.R or 2.R action

A Type 1.R or 2.R action shall be so designed that it is interrupted upon loss of the electrical supply and resumes at the point of interruption upon restoration of the electrical supply.

Compliance is checked by inspection and by test.

11.4.103 Type 1.S or 2.S action

A Type 1.S or 2.S action shall be so designed that, after interruption of the electrical supply for any interval up to the declared period of power reserve, it resumes its intended operating sequence as if no interruption of the supply has occurred.

If the energy store is charged by the supply voltage, then compliance is checked by a functional test, carried out immediately after the operation of the timer switches into power reserve. The previous operation in power reserve shall be the declared period of power reserve. Charging is carried out at rated voltage for 48 h, if no other charging period is declared.

If the running reserve is provided by a primary battery, compliance shall be verified by calculation of the power reserve by means of the battery capacity and the measured discharge current.

11.4.104 Type 1.T or 2.T action

A Type 1.T or 2.T action shall be so designed that its running accuracy in an ambient temperature of 20 °C to 25 °C is as declared.

NOTE 1 In Germany, the running accuracy for time switches shall be within ±60 s per day. For the power reserve period of synchronous time switches (Type S.T), the running accuracy shall be within ±500 s per day.

NOTE 2 In Germany, the deviation from the calculated elapsed time shall be less than 30 min per year, relative to actual elapsed time under fluctuations of 0,85 times to 1,1 times rated voltage and ±2 % rated frequency.

Compliance is checked by inspection and by test.

11.4.105 Type 1.U or 2.U action

A Type 1.U or 2.U action shall be so designed that its setting means, dial assembly, indicating devices and switch operating means function so that the difference between set time and actual time shall not be more than the declared amount.

This deviation shall not be more than:

±1 min for time switches with "hour" dial;

±30 min for time switches with "24 hour" dial;

±3,5 h for time switches with "7 day" dial;

±14 h for time switches with "month" dial;

±7 days for time switches with "12 month" dial.

Compliance is checked only on time switches with hour, 24 hour and 7 day dial by three consecutive measurements.

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.

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:

17.1.3 Test sequence and conditions

17.1.3.3 *Addition:*

For manual actions which have been tested during the tests of 17.7 and 17.8, the number of cycles of actuation is reduced by the number of cycles carried out during those tests.

If a clutch is used during the tests of 17.10 to 17.13 inclusive, care should be taken to ensure that it does not fail due to the acceleration. If it fails or is considered liable to fail, the speeds of actuation shall be as specified, but rest periods shall be introduced between cycles to allow the heat dissipation which would occur during normal use.

Additional subclause:

17.1.3.101 At the end of each cycle, for timers only, an appropriate actuation shall be performed to initiate the next cycle.

If a timer or time switch has different programs, that program which utilizes the maximum number of contact operations shall be chosen, unless a timer with a special test program has been submitted by the manufacturer.

If the program does not cause all the contacts to be operated, the test shall be repeated on a new set or sets of samples operating on other programs to ensure that all contacts are tested. These extra samples need not be tested where the design is such that the results can be reasonably predicted from the result of the first set of samples, as could be done if the design of all contacts were identical.

If a timer with a special test program is used, it shall be so designed that it is possible, by carrying out the special program, to reasonably predict the test results for all specific application programs of the timer.

In-line cord, free-standing and independently mounted controls shall be tested as follows:

– For timers declared for resistive load, the number of cycles of contact operation for each contact of the time switch shall be A = 5 000.

  The number of cycles of actuation (M) for each manual action of the time switch shall be M = 500 (inducing 500 cycles of contact operation).

– For timers declared for resistive or inductive load, the number of cycles of contact operation for each contact so rated shall be 5 000, consisting of a first number of cycles A = 2 500, to be tested with a substantially resistive load as specified in Tables 14, 15 or 16 followed by a second number of cycles, A = 2 500, which shall be conducted at the conditions specified in Tables 14, 15 or 16 for resistive or inductive load.

  The number of cycles of actuation (M) for each manual action of these timers shall be M = 500 (inducing 500 cycles of contact operation, tested under resistive load conditions).

– If the timer requires an external electrical or mechanical signal to move it from a rest position this shall be simulated, if necessary in the manner declared by the manufacturer.

– For timers and time switches with Type 2 actions, any electrically driven prime mover shall for at least 50 % of the test, be connected to a supply of 0,9 V_R, all other loads and connections remaining as in 17.7.
– For timers and time switches with Type 1 actions, if there is any failure attributable to the acceleration (such as the excessive use of a clutch), then the test is held to be invalid and should be repeated in another manner.

17.2 Electrical conditions for the tests

Table 14 – Electrical conditions for the overvoltage test

Modification:

In the line "Declared specific load (classified 6.2.3)", *in the column* "Type of circuit as classified in 6.2", *add a reference to note* 101).

Additional footnote to Table 14:

101) For the tests of filament lamp load, the load and test of 18.2 of IEC 60669-1:1998, and for fluorescent lamp load, the load of 19.2 of IEC 60669-1:1998 and IEC 60669-1:1998/AMD2:2006, shall be used, under the conditions as specified in 17.6.

Table 15 – Electrical conditions for the overload tests of 17.7 and 17.10

Table 16 – Electrical conditions for the overload tests of 17.8, 17.9, 17.11, 17.12 and 17.13

Addition to the existing text of the notes to Tables 15 and 16:

For integrated and incorporated timers, except timers for filament lamp loads (17.16.101) with declared ratings of more than 10 A, the test current for a.c. circuits and d.c. circuits shall be 1,25 I_R or 1,25 I_x for substantially resistive and inductive (non-motor) type circuits, respectively.

The substantially resistive load may consist of any convenient combination of carbon-filament lamps or resistors or both that will cause the required current to flow through the test circuit with a power factor of 0,98 to 1,0 on a.c.

For a timer classified for substantially resistive load and tested under Tables 15 and 16, the tests of Table 16 may be waived for an additional motor load classification if I_R is not less than twice I_m. However, the tests under Table 15 for declared motor load shall be performed.

Additional subclause:

17.2.101 A two- or more pole timer shall be tested on a single-phase or d.c. circuit according to switch rating. In a more than two-pole timer intended to control a two-phase circuit, adjacent poles shall be used, one pole being that nearest metal that may be grounded in service. If the pole spacing varies, an additional test shall be made between the poles with the smallest spacing to cover use on two-phase interconnected systems.

17.15 Not applicable.

17.16 Test for particular purpose controls

Additional subclauses:

17.16.101 Filament lamp loads

17.16.101.1 Timers classified by the manufacturer under 6.2.3, declared specific load, for a halogen or tungsten-filament lamp load with a rating as declared according to Table 1, requirement 7, are subjected to the test tungsten-filament lamp test of 18.2 of IEC 60669-1:1998, with the number of contact cycles as declared by the manufacturer.