INTERNATIONAL STANDARD

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Edition 3.1
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Edition 3:1999 consolidated with amendment 1:2003

Automatic electrical controls for household and similar use –

Part 1: General requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE –

Part 1: General requirements

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, 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 60730-1 has been prepared by IEC technical committee 72: Automatic controls for household use.

This consolidated version of IEC 60730-1 is based on the third edition (1999) [documents 72/416/FDIS and 72/417/RVD] and its amendment 1 (2003) [documents 72/577/FDIS and 72/580/RVD].

It bears the edition number 3.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

In the development of a fully international standard to cover automatic controls for household and similar use, 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.

Annexes A, B, C, E, G, H, J, L, N, P, and Q form an integral part of this standard.

Annexes D, F, K, M, R and S are for information only.

An alphabetical key-word index is added for information only.

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

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It is envisaged that in the next edition of this standard it will be found possible to remove those differences that are covered by new IEC standards now being prepared by other technical committees.

This standard is in two parts:

Part 1: General requirements, comprising clauses of a general character for automatic electrical controls for use in, on, or with household and similar electrical appliances.

This part 1 is to be used in conjunction with the appropriate part 2 for a particular type of control, or for controls for particular applications. This part 1 may also be applied, so far as reasonable, to controls not mentioned in a part 2, and to controls designed on new principles, in which cases additional requirements may be considered to be necessary.

See also 4.3.5.2 and 4.3.5.3.

Part 2: Particular requirements, dealing with particular types of controls. The clauses of these particular requirements supplement or modify the corresponding clauses of part 1.

Where, for a particular clause or subclause, the text of part 2 indicates:

Addition	–	the part 1 text applies with the additional requirement indicated in a part 2;
Modification	–	the part 1 text applies with a minor change as indicated in a part 2;
Replacement	–	the part 2 text contains a change which replaces the part 1 text in its entirety.

Where no change is necessary, the part 2 indicates that the relevant clause or subclause applies.

NOTE – In this standard the following print types are used:

– Requirements proper: in roman type.

– *Test specifications: in italic type.*

– Explanatory matter: in smaller roman type.

The committee has decided that the contents of the base publication and its amendment 1 will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE –

Part 1: General requirements

1 Scope and normative references

1.1 In general, this standard applies to automatic electrical controls for use in, on, or in association with equipment for household and similar use, including controls for heating, air-conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof.

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 automatic electrical control devices used in, or in association with, household or similar equipment.

This standard is also applicable to controls 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 controls intended exclusively for industrial applications unless explicitly mentioned in the relevant part 2.

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

Automatic electrical controls 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 This standard applies to automatic electrical controls, 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.

1.1.3 This standard applies to starting relays, which are a specific type of automatic electrical control, intended to switch the starting winding of a motor. Such controls may be built into, or be separate from, the motor.

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

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

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

1.3 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 shall apply.

1.4 This standard applies also to controls incorporating electronic devices, requirements for which are contained in annex H.

This standard applies also to controls using NTC or PTC thermistors, requirements for which are contained in annex J.

1.5 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60038:1983, *IEC standard voltages*

IEC 60050(604):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation*

IEC 60065:1998, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-75:1997, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*

IEC 60099-1:1991, *Surge arresters – Part 1: Non-linear resistor type gapped arresters for a.c. systems*

IEC 60112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60127, *Miniature fuses*

IEC 60216-1:1990, *Guide for the determination of thermal endurance properties of electrical insulating materials – Part 1: General guidelines for ageing procedures and evaluation of test results*

IEC 60227, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60245, *Rubber insulated cables – Rated voltages up to and including 450/750* V

IEC 60249, *Base materials for printed circuits*

IEC 60269, *Low-voltage fuses*

IEC 60326, *Printed boards*

IEC 60326-3:1991, *Printed boards – Part 3: Design and use of printed boards*

IEC 60335-1:1991, *Safety of household and similar electrical appliances – Part 1: General requirements*

IEC 60384-14:1993, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference and connection to the supply mains*

IEC 60384-16:1982, *Fixed capacitors for use in electronic equipment – Part 16: Sectional specification – Fixed metallized polypropylene film dielectric d.c. capacitors*

IEC 60384-17:1987, *Fixed capacitors for use in electronic equipment – Part 17: Sectional specification – Fixed metallized polypropylene film dielectric a.c. and pulse capacitors*

IEC 60423:1993, *Conduits for electrical purposes – Outside diameters of conduits for electrical installations and threads for conduits and fittings*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

IEC 60536:1976, *Classification of electrical and electronic equipment with regard to protection against electric shock*

IEC 60539:1976, *Directly heated negative temperature coefficient thermistors*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:1992, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coatings to achieve insulation coordination of printed board assemblies*

IEC 60695-2-1/1:1994, *Fire hazard testing – Part 2: Test methods – Section 1/Sheet 1: Glow-wire end-product test and guidance*

IEC 60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*

IEC 60707:1981, *Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source*

IEC 60738-1:1998, *Thermistors – Directly heated positive step-function temperature coefficient – Part 1: Generic specification*

IEC 60738-1-1:1998, *Thermistors – Directly heated positive step-function temperature coefficient – Part 1-1: Blank detail specification – Current limiting application – Assessment level EZ*

IEC 60998-2-2:1991, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units*

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61000-3-2:1998, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3:1994, *Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test. Basic EMC Publication*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test. Basic EMC Publication*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test*

IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test.* Basic EMC publication

IEC 61000-4-11:1994, *Electromagnetic compatibility (EMC) – Part 4: Testing and measuring techniques – Section 11: Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-28:2002, *Electromagnetic compatibility (EMC) – Part 4-28: Testing and measurement techniques – Variation of power frequency, immunity test.* Basic EMC publication

IEC 61058-1:1996, *Switches for appliances – Part 1: General requirements*

IEC 61210:1993, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61558-2-6:1997, *Safety of power transformers, power supply units and similar – Part 2: Particular requirements for safety isolating transformers for general use.* Group safety publication

CISPR 14-1:1993, *Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus*

CISPR 22:1997, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

2 Definitions

For the purpose of this Standard the following definitions apply. Where the terms "voltage" and "current" are used, they imply the r.m.s. values, unless otherwise specified.

2.1 Definitions relating to ratings, voltages, currents, frequencies, and wattages

2.1.1
rated voltage, current, frequency or wattage
voltage, current, frequency or wattage assigned to a control by the manufacturer. For three phase supply, the rated voltage is the line voltage

2.1.2
rated voltage, current, frequency or wattage range
voltage, current, frequency or wattage ranges assigned to the control by the manufacturer and expressed by lower and upper values

2.1.3
working voltage
the highest r.m.s. value of the a.c. or d.c. voltage across any particular insulation which can occur when the equipment is supplied at rated voltage

NOTE 1 – Transient overvoltages are disregarded.

NOTE 2 – Open-circuit conditions and normal operating conditions are taken into account.

2.1.4
extra-low voltage
nominal voltage not exceeding 42 V between conductors and between conductors and earth, or for three-phase connection not exceeding 42 V between line conductors and 24 V between line conductors and neutral

2.1.5
safety extra-low voltage (SELV)
nominal voltage between conductors and between conductors and earth, not exceeding 42 V between conductors, or in the case of three-phase circuits, not exceeding 24 V between conductors and neutral, the no-load voltage of the circuit not exceeding 50 V and 29 V, respectively

When safety extra-low voltage is obtained from supply mains of higher voltages, it shall be through a safety isolating transformer or a converter with separate windings providing equivalent insulation

The voltage limits are based on the assumption that the safety isolating transformer is supplied at its rated voltage.

In Canada and the USA, the limit for safety extra-low voltage is 30 V.

2.1.6
safety isolating transformer
transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double or reinforced insulation, and which is intended to supply safety extra-low voltage circuits

2.1.7
same polarity
relationship between live parts such that an interconnection between them allows a flow of current through a load, and which current is thus limited by the load

2.1.8
opposite polarity
relationship between two live parts such that an interconnection between them allows a flow of current which is limited by the impedance of the electrical supply circuit

2.1.9
isolated limited secondary circuit
circuit from an isolated secondary winding of a transformer having a maximum capacity of 100 VA and an open-circuit secondary voltage rating not exceeding 1 000 V

2.1.10
pilot duty
class of operation in which the ultimate electrical load is controlled by an auxiliary means such as a relay or contactor

2.1.11
transient overvoltage
a short duration overvoltage of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped [IEV 604-03-13]

2.1.12
rated impulse voltage
an impulse withstand voltage assigned by the manufacturer to the equipment or to a part of it, characterizing the specified withstand capability of its insulation against overvoltages

2.1.13
overvoltage category
a numeral characterizing a transient overvoltage condition

NOTE – Overvoltage categories I, II, III, and IV are used. See annex L.

2.2 Definitions of types of control according to purpose

2.2.1
electrical control (hereinafter referred to as "control")
device used in, on or in association with an equipment for the purpose of varying or modifying the output from such equipment, and which embodies the aspects of initiation, transmission and operation. At least one of these aspects shall be electrical or electronic

2.2.2
manual control
control in which the initiation is by actuation and in which the transmission and the operation are both direct and without any intentional time delay

2.2.3
automatic control
control in which at least one aspect is non-manual

2.2.4
sensing control
automatic control in which initiation is by an element sensitive to the particular activating quantity declared; for example, temperature, current, humidity, light, liquid level, position, pressure or velocity

2.2.5
thermally operated control
automatic control in which the transmission is by a thermal prime mover

2.2.6
thermostat
cycling temperature sensing control, which is intended to keep a temperature between two particular values under normal operating conditions and which may have provision for setting by the user

2.2.7
temperature limiter
temperature sensing control which is intended to keep a temperature below or above one particular value during normal operating conditions and which may have provision for setting by the user

A temperature limiter may be of the automatic or of the manual reset type. It does not make the reverse operation during the normal duty cycle of the appliance.