

INTERNATIONAL STANDARD

EXTENDED VERSION

This full version of IEC 60730-2-5:2026 includes the content of the references made to IEC 60730-1:2022

**Automatic electrical controls -
Part 2-5: Particular requirements for automatic electrical burner control systems**

CONTENTS

FOREWORD	9
1 Scope	12
2 Normative references	13
3 Terms and definitions	17
3.1 Definitions relating to ratings, voltages, currents, frequencies, and wattages	18
3.2 Definitions of types of control according to purpose	20
3.3 Definitions relating to the function of controls	23
3.4 Definitions relating to disconnection and interruption	30
3.5 Definitions of types of control according to construction	31
3.6 Definitions of type of automatic action of a control	33
3.7 Definitions relating to protection against electric shock and type of insulation	33
3.8 Definitions relating to component parts of controls	37
3.9 Definitions of types of terminals and terminations of controls	38
3.10 Definitions relating to the connections to controls	40
3.11 Definitions relating to the performance of type 2 actions	42
3.12 Definitions relating to the requirements for creepage distances and clearances	42
3.13 Miscellaneous definitions	43
3.14 Definitions relating to manufacturer and user	44
3.15 Definitions pertaining to thermistors	45
3.16 Definitions relating to the structure of controls using software	45
3.17 Definitions relating to error avoidance in controls using software	45
3.18 Definitions relating to fault/error control techniques for controls using software	45
3.19 Definitions relating to memory tests for controls using software	45
3.20 Definitions of software terminology – General	45
3.21 Definitions relating to classes of control functions	45
3.22 Definitions relating to functional safety	45
3.23 Definitions related to access to data exchange	45
3.24 Definitions related to EMC performance	45
3.101 Definitions relating to the type of burner	48
4 General	49
4.1 General structure of the document	49
4.2 General requirements	50
4.3 General notes on tests	50
5 Required technical information	54
5.1 General requirements	54
5.2 Methods of providing technical information	54
5.3 Class II symbol	63
5.4 Additional requirements for marking	63
5.5 Warning or cautionary markings	65
6 Protection against electric shock	65
6.1 General requirements	65
6.2 Actuating members and actuating means	68
6.3 Capacitors	69
6.4 Covers and uninsulated live or hazardous parts	69

6.5	Battery operated controls provided with a user accessible mains supply input connector.....	69
7	Provision for protective earthing.....	69
7.1	Class 0I and Class I controls.....	69
7.2	Class II and class III controls.....	70
7.3	Adequacy of earth connections.....	70
7.4	Corrosion resistance.....	71
7.5	Other requirements.....	71
7.6	Protective equipotential bonding.....	72
8	Terminals and terminations.....	72
8.1	Terminals and terminations for external copper conductors.....	72
8.2	Terminals and terminations for internal conductors.....	77
8.3	Terminals and terminations for integrated conductors.....	79
9	Constructional requirements.....	79
9.1	Materials.....	79
9.2	Protection against electric shock.....	80
9.3	Actuation and operation.....	82
9.4	Actions.....	88
9.5	Openings in enclosures.....	92
9.6	Mounting of controls.....	92
9.7	Attachment of cords.....	93
9.8	Size of cords – non-detachable.....	94
9.9	Inlet openings.....	95
9.10	Equipment inlets and socket-outlets.....	95
9.11	Requirements during mounting, use, maintenance and servicing.....	96
9.12	Controls using software.....	98
9.13	Protective controls and components of protective control systems.....	100
9.101	Flame detector constructional requirements.....	103
9.102	Reset from lock-out function.....	103
9.103	Application requirements for the use of Type 2.AL burner control systems in warm air heating appliances (furnaces).....	104
10	Threaded parts and connections.....	106
10.1	Threaded parts moved during mounting or servicing.....	106
10.2	Current-carrying connections and connections providing protective earthing continuity.....	107
11	Creepage distances, clearances and distances through solid insulation.....	108
11.1	General.....	108
11.2	Clearances.....	109
11.3	Creepage distances.....	113
11.4	Solid insulation.....	117
12	Components.....	118
12.1	Transformers.....	118
12.2	Switch mode power supplies and converters.....	118
12.3	Capacitors.....	119
12.4	Fuses.....	119
12.5	Varistors.....	119
12.6	Thermistors.....	119
12.7	Relays.....	120
12.8	Other components.....	120

13	Fault assessment on electronic circuits	120
13.1	Fault assessment for inherent safety	120
13.2	Fault assessment to ensure functional safety	126
14	Moisture and dust resistance	127
14.1	Protection against ingress of water and dust	127
14.2	Protection against humid conditions	127
14.3	Touch current test for in-line cord controls and free-standing controls	128
15	Electric strength and insulation resistance	129
15.1	Insulation resistance	129
15.2	Electric strength	129
15.3	Additional tests for in-line cord and free-standing controls	131
16	Heating	132
17	Manufacturing deviation and drift	137
18	Environmental stress	137
18.1	Transportation and storage	137
18.2	Environmental stress of temperature	137
19	Endurance	137
19.1	General requirements	137
19.2	Electrical conditions for the tests	139
19.3	Thermal conditions for the tests	144
19.4	Manual and mechanical conditions for the tests	144
19.5	Dielectric strength requirements	144
19.6	Ageing test	144
19.7	Overvoltage test or overload test in all countries using an overload test of automatic action at accelerated rate	144
19.8	Test of automatic action at accelerated rate	144
19.9	Test of automatic action at slow rate	144
19.10	Overvoltage test or overload test in all countries that use the overload test of manual action at accelerated speed	144
19.11	Test of manual action at slow speed	144
19.12	Test of manual action at high speed which has multiple poles, and where polarity reversal occurs during the action	144
19.13	Test of manual action at accelerated speed	144
19.14	Evaluation of compliance	145
19.15	Test for particular purpose controls	145
20	Mechanical strength	147
20.1	General requirements	147
20.2	Impact resistance	147
20.3	Free-standing controls	148
20.4	In-line cord controls	148
20.5	Pull-cord actuated controls	148
20.6	Foot actuated controls	148
20.7	Actuating member and actuating means	148
20.8	Flexing – test	148
20.9	Cord anchorages – test	149
21	Resistance to heat, fire and tracking	149
21.1	General requirements	149
21.2	Integrated, incorporated and in-line cord controls	150

21.3	Independently mounted, free-standing controls	151
22	Resistance to corrosion	151
22.1	Resistance to rusting	151
23	Electromagnetic compatibility (EMC) requirements – Emission	152
23.1	General requirement	152
23.2	High frequency emission	152
23.3	Low frequency emission	155
24	Normal operation	155
25	Electromagnetic compatibility (EMC) requirements – Immunity	156
25.1	General	156
25.2	EMC test plan and report	156
25.3	Immunity requirements	158
25.4	Performance criteria	161
25.5	Surge immunity test	162
25.6	Electrical fast transient immunity test	162
25.7	Radio-frequency electromagnetic field immunity	163
25.8	Electrostatic discharge	163
25.9	Immunity to power-frequency magnetic fields	163
25.10	Test of the influence of voltage dips and voltage interruption in the power supply network	163
26	Abnormal operation tests	164
26.1	Abnormal temperature test	164
26.2	Overload tests	165
26.3	Battery short-circuit test	166
Annex A (normative) Indelibility of markings		183
Annex B (normative) Measurement of creepage distances and clearances in air		185
Annex C (informative) Nominal voltages of supply systems for different modes of overvoltage control		189
Annex D (normative) Overvoltage categories		191
Annex E (informative) Typical usage of controls and related overvoltage categories		192
Annex F (normative) Pollution degrees		193
F.1	Pollution	193
F.2	Degrees of pollution in the micro-environment	193
Annex G (normative) Resistance to heat, fire and tracking tests		194
G.1	Glow-wire test	194
G.2	Proof tracking test	194
G.3	Ball pressure test	194
Annex H (normative) Requirements related to functional safety		196
H.3	Terms and definitions	196
H.5	Information	207
H.9	Constructional requirements	208
H.13	Fault assessment on electronic circuits	225
H.17	Manufacturing deviation and drift	230
H.19	Endurance	232
H.25	Electromagnetic compatibility (EMC) requirements – Immunity	233
Annex I (normative) Requirements for certain types of DC supplied controls		249
I.1	Scope	249

Annex J (normative) Requirements for thermistor elements and controls using thermistors.....	251
J.1 Scope	251
Annex K (normative) Circuit for measuring touch current	268
Annex L (normative) Printed circuit board coating performance test.....	269
Annex M (normative) Printed circuit board protection	271
Annex N (informative) Explanatory notes for surge immunity test.....	274
N.1 Different source impedances.....	274
N.2 Application of the tests.....	274
N.3 Installation classification	275
Annex O (informative) Guidance for applying Clause 11	278
Annex P (normative) Requirements for SELV and PELV	281
P.1 Overview of the requirements for SELV and PELV	281
P.2 Protection against electric shock by SELV system or PELV system.....	281
P.3 Protective measures for SELV system and PELV system	282
Annex Q (informative) Regional differences relevant for the member countries of Cenelec	284
Annex R (informative) National differences relevant in the United States of America.....	289
R.2 Normative references.....	289
Annex S (informative) National differences relevant in Japan	290
S.2 Normative references.....	290
Annex T (informative) National differences relevant in Canada	291
T.2 Normative references.....	291
Annex AA (informative) Functional characteristics of burner control systems to be specified by the relevant appliance standards, as applicable	292
Bibliography.....	293
Figure 1 – Example of ports	46
Figure 2 – Structure of the document with respect to inherent safety and functional safety	50
Figure 101 – Pulse spark generation.....	68
Figure 102 – Typical installation of the independent combustion air supply for room independent operation	105
Figure 3 – Example of an electronic circuit with low power points	121
Figure 4 – Test pin probe 13 of IEC 61032:1997	166
Figure 5 – Test finger probe B of IEC 61032:1997	167
Figure 6 – Test fingernail	168
Figure 7 – Impact test for free-standing controls	169
Figure 8 – Tumbling barrel.....	169
Figure 9 – Apparatus for testing durability of markings on rating labels.....	170
Figure 10 – Apparatus for flexing test	170
Figure 11 – Screw terminals and stud terminals	171
Figure 12 – Pillar terminals	172
Figure 13 – Mantle terminals.....	173
Figure 14 – Saddle and lug terminals.....	174
Figure 15 – Tabs.....	175

Figure 16 – Tabs for non-reversible connectors	176
Figure 17 – Receptacles	177
Figure 18 – Measurement of creepage distance and clearance	178
Figure 19 – Diagram for touch current measurement at operating temperature for single-phase connection of class II controls	179
Figure 20 – Diagram for touch current measurement at operating temperature for single-phase connection of controls other than class II	179
Figure 21 – Diagram for touch current measurement at operating temperature for three-phase connection of class II controls	180
Figure 22 – Diagram for touch current measurement at operating temperature for three-phase connection of controls other than class II	181
Figure 23 – Diagram for touch current measurement at operating temperature for single-phase connection of controls to three-wire, ground neutral supply other than class II	181
Figure 24 – Diagram for touch current measurement at operating temperature for two-phase connection of controls to three-wire, ground neutral supply other than class II	182
Figure B.1 – Narrow groove	186
Figure B.2 – Wide groove	186
Figure B.3 – V-shaped groove	186
Figure B.4 – Rib	186
Figure B.5 – Uncemented joint with narrow groove	187
Figure B.6 – Uncemented joint with wide groove	187
Figure B.7 – Uncemented joint with narrow and wide grooves	187
Figure B.8 – Diverging side walls	188
Figure B.9 – Narrow recess	188
Figure B.10 – Wide recess	188
Figure B.11 – Conductive floating part	188
Figure H.1 – V-Model for the software life cycle	216
Figure H.101 – Voltage variation test	237
Figure J.1 – Generic test circuit for inrush-current limiting thermistor endurance test	267
Figure K.1 – Circuit for measuring touch currents	268
Figure L.1 – Test sample	270
Figure M.1 – Example of type 1 protection	272
Figure M.2 – Example of type 2 protection	273
Figure N.1 – Example of surge protection by shielding in buildings with common earth reference systems	276
Figure N.2 – Example of secondary surge protection in buildings with separate common earth reference systems	277
Figure N.3 – Example of primary and secondary surge protection of indoor/outdoor equipment	277
Figure O.1 – Guidance flowchart for application of requirements of Clause 11	279
Table 1 – Required technical information and methods of providing these information	57
Table 2 – Cross-sectional area of conductors	73
Table 3 – Terminal conductors	75

Table 4 – Conductor pull test values	75
Table 5 – Nominal cross-sectional areas of conductors.....	77
Table 6 – Axial force values for tab insertion and withdrawal	78
Table 7 – Minimum cord conductor sizes	94
Table 8 – Data exchange	99
Table 9 – Threaded parts torque test values	107
Table 10 – Rated impulse voltage for equipment energized directly from the supply mains (from IEC 60664-1:2007, Table F.1)	110
Table 11 – Clearances for insulation co-ordination (from IEC 60664-1:2007, Table F.2).....	111
Table 12 – Minimum creepage distances for basic insulation	115
Table 13 – Minimum creepage distances for functional insulation	116
Table 14 – Electrical/electronic component fault modes	122
Table 16 – Insulation or disconnection test voltages	130
Table 17 – Maximum heating temperatures.....	134
Table 18 – Electrical conditions for the overvoltage and endurance tests.....	140
Table 19 – Electrical conditions for the overload tests of 19.7 and 19.10	142
Table 20 – Electrical conditions for the endurance tests of 19.8, 19.9, 19.11, 19.12 and 19.13	143
Table 22 – Pull and torque values.....	149
Table 23 – Emission limit for residential electromagnetic environment	153
Table 24 – Emission limit for industrial electromagnetic environment	154
Table 25 – The applicable EMC test in relation to the class of control function and type of Action	156
Table 26 – Immunity test requirements for residential electromagnetic environments.....	158
Table 27 – Immunity test requirements for industrial electromagnetic environment	160
Table 28 – Performance criteria	162
Table 29 – Maximum winding temperature (for test of mechanical blocked output conditions).....	165
Table B.1 – Value of X	185
Table C.1 – Inherent control or equivalent protective control.....	189
Table C.2 – Cases where protective control is necessary and control is provided by surge arresters having a ratio of clamping voltage to rated voltage not smaller than that specified by IEC 60099-1	190
Table E.1 – Typical usage.....	192
Table H.1 – Additional items to Table 1.....	207
Table H.2 – Acceptable measures to address fault/errors ^a	210
Table H.3 – Examples of techniques/measures for semi-formal methods	217
Table H.4 – Examples of techniques/measures for software architecture specification	217
Table H.5 – Examples of techniques/measures for module design specification.....	218
Table H.6 – Examples of techniques/measures for design and coding standards	218
Table H.7 – Examples of techniques/measures for software module testing.....	219
Table H.8 – Examples of techniques/measures for software integration testing.....	220
Table H.9 – Examples of techniques/measures for software safety validation	220
Table H.10 – Combinations of analytical measures during hardware development	222

Table H.11 – Examples of defences against unauthorised access and transmission failure modes	223
Table H.12 – Applicable test levels in addition to Clause 25.....	233
Table H.13 – Voltage dips, short interruptions and voltage variations.....	235
Table H.101 – Timing of short-term supply voltage variations	236
Table H.15 – Test voltages for test level 2 (depending on the installation class conditions).....	239
Table H.16 – Test level for electrical fast transient burst test	241
Table H.102 – Test levels for electrostatic discharge	242
Table H.17 – Test levels for conducted disturbances on mains and I/O lines.....	243
Table H.18 – Test level for immunity to radiated electromagnetic fields	244
Table H.19 – Increased test level for radiated immunity	245
Table H.20 – Test level for supply frequency variations	246
Table H.21 – Test level for continuous fields.....	247
Table I.1 – Electrical transient conduction immunity in accordance with ISO 7637-2	249
Table I.2 – Electrical transient conduction immunity in accordance with ISO 7637-3	250
Table J.1 – Maximum current.....	253
Table J.2 – Normal operating conditions	254
Table J.3 – Samples for the test (clause reference)	255
Table J.4 – Electrical and thermal ratings of a thermistor	256
Table J.5 – Additional items to Table 1	257
Table J.6 – Sequence of calibration and conditioning tests for PTC thermistors	259
Table J.7 – Classes for PTC sensing thermistors	260
Table J.8 – Sequence of calibration and conditioning tests for NTC thermistors.....	261
Table J.9 – Classes for NTC sensing thermistors	261
Table J.10 – Number of cycles for endurance test.....	265
Table J.11 – Ageing test temperature	265
Table J.12 – Number of cycles for endurance test.....	266
Table L.1 – Environmental cycling conditions.....	269
Table M.1 – IEC 60664-3 test levels or conditions	271
Table O.1 – Example A – Using Annex O guidance for applying Clause 11	280
Table O.2 – Example B – Using Annex O guidance for applying Clause 11	280
Table Q.1 – Additional aging parameters for windings.....	285
Table AA.1 – Functional characteristics of burner control systems to be specified by the relevant appliance standards, as applicable	292

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Automatic electrical controls -
Part 2-5: Particular requirements for automatic
electrical burner control systems**

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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This extended version (EXV) of the official IEC Standard provides the user with the full content of the Standard.

IEC 60730-2-5:2026 EXV includes the content of IEC 60730-2-5:2026 and the references made to IEC 60730-1:2022.

The specific content of IEC 60730-2-5:2026 is displayed on a [blue background](#).

IEC 60730-2-5 has been prepared by IEC technical committee 72: Automatic electrical controls. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2013, Amendment 1:2017 and Amendment 2:2021. This edition constitutes a technical revision.

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

Adoption of IEC 60730-1:2022 with all of its significant changes to IEC 60730-1:2013, including Amendment 1:2015 and Amendment 2:2020.

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

Draft	Report on voting
72/1530/FDIS	72/1539/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.

This part 2-5 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the sixth edition of that standard. Consideration may be given to future editions of, or amendments to, IEC 60730-1.

This part 2-5 supplements or modifies the corresponding clauses in IEC 60730-1, so as to convert that publication into the IEC standard: Particular requirements for automatic electrical burner control systems.

Where this part 2-5 states "addition", "modification" or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

When a particular clause or subclause of Part 1 is not mentioned in this part 2, that 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 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, 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 or items 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*, can be found on the IEC website.

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 part of IEC 60730 applies to automatic electrical **burner control systems** for the **automatic control** of burners for oil, gas, coal or other combustibles intended to be used

- for household and similar use;
- in shops, offices, hospitals, farms and commercial and industrial applications;

NOTE 1 Throughout this document, where it can be used unambiguously, the word "system" means "**burner control system**" and "systems" means "**burner control systems**".

- 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;

NOTE 2 Throughout this document, the word "equipment" means "appliance and equipment."

EXAMPLE 1 Controls for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled controls**;

EXAMPLE 2 Remote interfaces/control of burner operations.

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

This document is applicable

- to a complete **burner control system**;
- to a separate **programming unit**;
- to a separate electronic high-voltage **ignition source**;
- to a separate **flame detector**, and
- to a separate **high-temperature operation (HTO) detector**.
- to a **burner control system** intended to be used in warm air heating appliances (furnaces) where the appliance is equipped with an electromechanical differential pressure control to monitor the difference of the combustion air pressure (Type 2.AL). This pressure control provides a switch as an alternative to one of the two switching elements to directly de-energize the safety relevant terminals.

This document does not apply to thermoelectric flame supervision controls; thermoelectric flame supervision controls are covered by ISO 23551-6:2021.

This document also applies to electrical **burner control systems** intended exclusively for industrial process applications e.g. those applications covered by ISO TC 244 (ISO 13577 series).

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

This document applies to

- the inherent safety of automatic electrical **burner control systems**, and
- functional safety of automatic electrical **burner control systems**,
- automatic electrical **burner control systems** 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 burner safety and to the testing of automatic electrical **burner control systems** used in, on, or in association with, burners.

NOTE 4 Requirements for specific **operating values**, **operating times** and **operating sequences** are given in the standards for appliances and equipment.

This document specifies the requirements for construction, operation and testing of automatic electrical **burner control systems** used in, on, or in association with an equipment.

This document applies also to systems

- incorporating electronic devices,
- using **NTC** or **PTC thermistors**, additional requirements for which are contained in Annex J,
- to the electrical and functional safety of controls capable of receiving and responding to communications signals. The signals can be transmitted to or received from external units, connected wired or wireless, that can or can not be part of the **burner control system**.

This document 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 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

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *IEC standard voltages*

IEC 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-6, *Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)*

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

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

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

IEC 60112:2020, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60227-1, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60245-1, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60335-1:2020, *Household and similar electrical appliances – Safety – Part 1: General requirements*

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

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

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

IEC 60417, *Graphical symbols for use on equipment*

IEC 60423, *Conduit systems for cable management – 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 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013

IEC 60539 (all parts), *Directly heated negative temperature coefficient thermistors*

IEC 60664-1:2007², *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC TR 60664-2 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

¹ Withdrawn.

² Withdrawn.

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60738 (all parts), *Thermistors – Directly heated positive temperature coefficient*

IEC 60747-5-5, *Semiconductor devices – Part 5-5: Optoelectronic devices – Photocouplers*

IEC 60884-1, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

IEC 60884-2-5:2017, *Plugs and socket-outlets for household and similar purposes – Part 2-5: Particular requirements for adaptors*

IEC 60998-2-2, *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 60998-2-3, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*

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

IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC 61000-3-11, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

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

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

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

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

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

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with current up to 16 A per phase*

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-13:2002 /AMD1:2009

IEC 61000-4-13:2002 /AMD2:2015

IEC 61000-4-20, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

IEC 61000-4-21, *Electromagnetic compatibility (EMC) – Part 4-21: Testing and measurement techniques – Reverberation chamber test methods*

IEC 61000-4-22, *Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques – Radiated emissions and immunity measurements in fully anechoic rooms (FARs)*

IEC 61000-4-28, *Electromagnetic compatibility (EMC) – Part 4-28: Testing and measurement techniques – Variation of power frequency, immunity test for equipment with input current not exceeding 16A per phase*

IEC 61000-6-1:2016, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial and light-industrial environments*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-3:2020, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for equipment in residential environments*

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61051-1, *Varistors for use in electronic equipment – Part 1: Generic specification*

IEC 61051-2, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*

IEC 61051-2-2, *Varistors for use in electronic equipment – Part 2: Blank detail specification for zinc oxide surge suppression varistors. Assessment level E*

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

Bibliography

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at <http://www.electropedia.org/>)

IEC 60335 (all parts), *Household and similar electrical appliances – Safety*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 60243-1, *Electrical strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60669-1, *Switches for household and similar fixed-electrical installations – Part 1: General requirements*

IEC 60730-2-5, *Automatic electrical controls – Part 2-5: Particular requirements for automatic electrical burner control systems*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60998-2-1, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units*

IEC TR 61000-2-5, *Electromagnetic compatibility (EMC) – Part 2-5: Environment – Description and classification of electromagnetic environments*

IEC 61000-6-7:2014, *Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61058-1-1, *Switches for appliances – Part 1-1: Requirements for mechanical switches*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements*

IEC 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 7: Overview of techniques and measures*

IEC 61810-1, *Electromechanical elementary relays – Part 1: General and safety requirements*

IEC 62280:2014, *Railway applications – Communication, signalling and processing systems – Safety related communication in transmission systems*

IEC 63044-3, *Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 3: Electrical safety requirements*

IEC 63044-5-1:2017, *Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 5-1: EMC requirements, conditions and test set-up*

ISO/IEC 9796 (all parts), *Information technology – Security techniques – Digital signature schemes giving message recovery*

ISO/IEC 9797 (all parts), *Information technology – Security techniques – Message Authentication Codes (MACs)*

ISO/IEC 9798 (all parts), *Information technology – Security techniques – Entity authentication*

ISO/IEC 10118 (all parts), *Information technology – Security techniques – Hash-functions*

ISO/IEC 11770 (all parts), *Information technology – Security techniques – Key Management*

ISO/IEC 14888 (all parts), *Information technology – Security techniques – Digital signatures with appendix*

ISO/IEC 15946 (all parts), *Information security – Cryptographic techniques based on elliptic curves*

ISO/IEC 18033 (all parts), *Information technology – Security techniques – Encryption algorithms*

ISO/IEC 19772 *Information security – Authenticated encryption*

ISO/IEC 29192 (all parts), *Information technology – Security techniques – Lightweight cryptography*

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

ISO 62:2008, *Plastics – Determination of water absorption*

ISO 75-1, *Plastics – Determination of temperature of deflection under load – Part 1: General test method*

ISO 178:2019, *Plastics – Determination of flexural properties*

ISO 180:2019, *Plastics – Determination of Izod impact strength*

ISO 527-1:2019, *Plastics – Determination of tensile properties – Part 1: General principles*

ISO 8256:2004, *Plastics – Determination of tensile-impact strength*

ISO 16484-2, *Building automation and control systems (BACS) – Part 2: Hardware*

EN 50159, *Railway applications – Communication, signalling and processing systems – Safety-related communication in transmission systems*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

HOLSCHER, H. and RADER, J; "Microcomputers in safety techniques." Verlag TUV Bayern. TUV Rheinland. (ISBN 3-88585-315-9)

ABRAHAM, J.A.; THATTE, S.M.; "Fault coverage of test programs for a microprocessor",
Proceedings of the IEEE Test Conference 1979, pp 18-22

IECQ programme <http://www.iecq.org>

IECEE OD-5014 Instruments accuracy limits
