

INTERNATIONAL STANDARD

EXTENDED VERSION

This full version of IEC 60730-2-6:2025 includes the content of the references made to IEC 60730-1:2022

**Automatic electrical controls -
Part 2-6: Particular requirements for automatic electrical pressure sensing
controls including mechanical requirements**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

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	17
3.2 Definitions of types of control according to purpose	20
3.3 Definitions relating to the function of controls	22
3.4 Definitions relating to disconnection and interruption	26
3.5 Definitions of types of control according to construction	27
3.6 Definitions of type of automatic action of a control	28
3.7 Definitions relating to protection against electric shock and type of insulation	28
3.8 Definitions relating to component parts of controls	32
3.9 Definitions of types of terminals and terminations of controls	34
3.10 Definitions relating to the connections to controls	36
3.11 Definitions relating to the performance of type 2 actions	37
3.12 Definitions relating to the requirements for creepage distances and clearances	37
3.13 Miscellaneous definitions	38
3.14 Definitions relating to manufacturer and user	40
3.15 Definitions pertaining to thermistors	40
3.16 Definitions relating to the structure of controls using software	40
3.17 Definitions relating to error avoidance in controls using software	40
3.18 Definitions relating to fault/error control techniques for controls using software	40
3.19 Definitions relating to memory tests for controls using software	40
3.20 Definitions of software terminology – General	40
3.21 Definitions relating to classes of control functions	40
3.22 Definitions relating to functional safety	40
3.23 Definitions related to access to data exchange	40
3.24 Definitions related to EMC performance	41
4 General	43
4.1 General structure of the document	43
4.2 General requirements	44
4.3 General notes on tests	44
5 Required technical information	48
5.1 General requirements	48
5.2 Methods of providing technical information	48
5.3 Class II symbol	56
5.4 Additional requirements for marking	56
5.5 Warning or cautionary markings	58
6 Protection against electric shock	58
6.1 General requirements	58
6.2 Actuating members and actuating means	60
6.3 Capacitors	61
6.4 Covers and uninsulated live or hazardous parts	61
6.5 Battery operated controls provided with a user accessible mains supply input connector	61

7	Provision for protective earthing	62
7.1	Class 0I and Class I controls.....	62
7.2	Class II and class III controls	62
7.3	Adequacy of earth connections	62
7.4	Corrosion resistance	63
7.5	Other requirements	64
7.6	Protective equipotential bonding	64
8	Terminals and terminations.....	64
8.1	Terminals and terminations for external copper conductors.....	64
8.2	Terminals and terminations for internal conductors	69
8.3	Terminals and terminations for integrated conductors	71
9	Constructional requirements	71
9.1	Materials.....	71
9.2	Protection against electric shock.....	71
9.3	Actuation and operation	74
9.4	Actions	77
9.5	Openings in enclosures.....	80
9.6	Mounting of controls	80
9.7	Attachment of cords	81
9.8	Size of cords – non-detachable	82
9.9	Inlet openings	83
9.10	Equipment inlets and socket-outlets	83
9.11	Requirements during mounting, use, maintenance and servicing	84
9.12	Controls using software	87
9.13	Protective controls and components of protective control systems	90
9.101	Construction requirements relating to operating mechanism	92
9.102	A pressure cut-out shall not reset or be resettable manually or otherwise at a value above the maximum or below the minimum operating pressure, whichever is declared.	93
9.103	A pressure cut-out with a manually operated reset device shall be trip-free.	93
10	Threaded parts and connections.....	93
10.1	Threaded parts moved during mounting or servicing	93
10.2	Current-carrying connections and connections providing protective earthing continuity	95
11	Creepage distances, clearances and distances through solid insulation.....	96
11.1	General.....	96
11.2	Clearances	97
11.3	Creepage distances	101
11.4	Solid insulation	105
12	Components	106
12.1	Transformers	106
12.2	Switch mode power supplies and converters	106
12.3	Capacitors	107
12.4	Fuses	107
12.5	Varistors	107
12.6	Thermistors.....	107
12.7	Relays	108
12.8	Other components	108
13	Fault assessment on electronic circuits	108

13.1	Fault assessment for inherent safety	108
13.2	Fault assessment to ensure functional safety	114
14	Moisture and dust resistance	114
14.1	Protection against ingress of water and dust	114
14.2	Protection against humid conditions	115
14.3	Touch current test for in-line cord controls and free-standing controls	116
15	Electric strength and insulation resistance	117
15.1	Insulation resistance	117
15.2	Electric strength	117
15.3	Additional tests for in-line cord and free-standing controls	119
16	Heating	120
17	Manufacturing deviation and drift	124
18	Environmental stress	124
18.1	Transportation and storage	124
18.2	Environmental stress of temperature	124
19	Endurance	125
19.1	General requirements	125
19.2	Electrical conditions for the tests	126
19.3	Thermal conditions for the tests	132
19.4	Manual and mechanical conditions for the tests	132
19.5	Dielectric strength requirements	133
19.6	Ageing test	133
19.7	Overvoltage test or overload test in all countries using an overload test of automatic action at accelerated rate	133
19.8	Test of automatic action at accelerated rate	134
19.9	Test of automatic action at slow rate	134
19.10	Overvoltage test or overload test in all countries that use the overload test of manual action at accelerated speed	135
19.11	Test of manual action at slow speed	135
19.12	Test of manual action at high speed which has multiple poles, and where polarity reversal occurs during the action	135
19.13	Test of manual action at accelerated speed	135
19.14	Evaluation of compliance	136
19.15	Test for particular purpose controls	136
20	Mechanical strength	137
20.1	General requirements	137
20.2	Impact resistance	138
20.3	Free-standing controls	138
20.4	In-line cord controls	139
20.5	Pull-cord actuated controls	139
20.6	Foot actuated controls	139
20.7	Actuating member and actuating means	140
20.8	Flexing – test	140
20.9	Cord anchorages – test	141
20.101	Medium leakage	141
20.102	Strength of parts (hydrostatic)	142
21	Resistance to heat, fire and tracking	143
21.1	General requirements	143

21.2	Integrated, incorporated and in-line cord controls.....	143
21.3	Independently mounted, free-standing controls	144
22	Resistance to corrosion	145
22.1	Resistance to rusting	145
23	Electromagnetic compatibility (EMC) requirements – Emission	145
23.1	General requirement	145
23.2	High frequency emission	145
23.3	Low frequency emission	149
24	Normal operation	149
25	Electromagnetic compatibility (EMC) requirements – Immunity	149
25.1	General.....	149
25.2	EMC test plan and report	150
25.3	Immunity requirements.....	152
25.4	Performance criteria	155
25.5	Surge immunity test	156
25.6	Electrical fast transient immunity test.....	156
25.7	Radio-frequency electromagnetic field immunity	157
25.8	Electrostatic discharge.....	157
25.9	Immunity to power-frequency magnetic fields.....	157
25.10	Test of the influence of voltage dips and voltage interruption in the power supply network.....	157
26	Abnormal operation tests	158
26.1	Abnormal temperature test.....	158
26.2	Overload tests	159
26.3	Battery short-circuit test.....	160
Annex A	(normative) Indelibility of markings	177
Annex B	(normative) Measurement of creepage distances and clearances in air.....	179
Annex C	(informative) Nominal voltages of supply systems for different modes of overvoltage control	183
Annex D	(normative) Overvoltage categories	185
Annex E	(informative) Typical usage of controls and related overvoltage categories	186
Annex F	(normative) Pollution degrees	187
F.1	Pollution	187
F.2	Degrees of pollution in the micro-environment	187
Annex G	(normative) Resistance to heat, fire and tracking tests	188
G.1	Glow-wire test.....	188
G.2	Proof tracking test.....	188
G.3	Ball pressure test.....	188
Annex H	(normative) Requirements related to functional safety	190
H.3	Terms and definitions.....	190
H.5	Information	201
H.9	Constructional requirements	203
H.13	Fault assessment on electronic circuits.....	219
H.17	Manufacturing deviation and drift	223
H.19	Endurance	225
H.25	Electromagnetic compatibility (EMC) requirements – Immunity.....	226
Annex I	(normative) Requirements for certain types of DC supplied controls	244

I.1	Scope	244
Annex J (normative) Requirements for thermistor elements and controls using thermistors.....		246
J.1	Scope	246
Annex K (normative) Circuit for measuring touch current		263
Annex L (normative) Printed circuit board coating performance test.....		264
Annex M (normative) Printed circuit board protection		266
Annex N (informative) Explanatory notes for surge immunity test.....		269
N.1	Different source impedances.....	269
N.2	Application of the tests.....	269
N.3	Installation classification	270
Annex O (informative) Guidance for applying Clause 11		273
Annex P (normative) Requirements for SELV and PELV		276
P.1	Overview of the requirements for SELV and PELV	276
P.2	Protection against electric shock by SELV system or PELV system.....	276
P.3	Protective measures for SELV system and PELV system	277
Annex Q (informative) Regional differences relevant for the member countries of Cenelec		279
Annex R (informative) National differences relevant in the United States of America.....		283
R.2	Normative references.....	283
Annex S (informative) National differences relevant in Japan		284
S.2	Normative references.....	284
Annex T (informative) National differences relevant in Canada		285
T.2	Normative references.....	285
Annex AA (normative) Number of cycles		286
AA.1	Number of cycles for independently mounted controls.....	286
AA.2	Cycling rate for independently mounted controls	286
Annex BB (informative) Stainless steel for bellows, bourdon tubes or similar elements		287
Bibliography.....		290
Figure 1 – Example of ports		41
Figure 2 – Structure of the document with respect to inherent safety and functional safety		44
Figure 3 – Example of an electronic circuit with low power points		109
Figure 4 – Test pin probe 13 of IEC 61032:1997		160
Figure 5 – Test finger probe B of IEC 61032:1997		161
Figure 6 – Test fingernail		162
Figure 7 – Impact test for free-standing controls		163
Figure 8 – Tumbling barrel.....		163
Figure 9 – Apparatus for testing durability of markings on rating labels.....		164
Figure 10 – Apparatus for flexing test		164
Figure 11 – Screw terminals and stud terminals		165
Figure 12 – Pillar terminals		166
Figure 13 – Mantle terminals.....		167
Figure 14 – Saddle and lug terminals.....		168
Figure 15 – Tabs.....		169

Figure 16 – Tabs for non-reversible connectors	170
Figure 17 – Receptacles	171
Figure 18 – Measurement of creepage distance and clearance	172
Figure 19 – Diagram for touch current measurement at operating temperature for single-phase connection of class II controls	173
Figure 20 – Diagram for touch current measurement at operating temperature for single-phase connection of controls other than class II	173
Figure 21 – Diagram for touch current measurement at operating temperature for three-phase connection of class II controls	174
Figure 22 – Diagram for touch current measurement at operating temperature for three-phase connection of controls other than class II	175
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	175
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	176
Figure B.1 – Narrow groove	180
Figure B.2 – Wide groove	180
Figure B.3 – V-shaped groove	180
Figure B.4 – Rib	180
Figure B.5 – Uncemented joint with narrow groove	181
Figure B.6 – Uncemented joint with wide groove	181
Figure B.7 – Uncemented joint with narrow and wide grooves	181
Figure B.8 – Diverging side walls	182
Figure B.9 – Narrow recess	182
Figure B.10 – Wide recess	182
Figure B.11 – Conductive floating part	182
Figure H.1 – V-Model for the software life cycle	211
Figure H.2 – Voltage variation test	230
Figure J.1 – Generic test circuit for inrush-current limiting thermistor endurance test	262
Figure K.1 – Circuit for measuring touch currents	263
Figure L.1 – Test sample	265
Figure M.1 – Example of type 1 protection	267
Figure M.2 – Example of type 2 protection	268
Figure N.1 – Example of surge protection by shielding in buildings with common earth reference systems	271
Figure N.2 – Example of secondary surge protection in buildings with separate common earth reference systems	272
Figure N.3 – Example of primary and secondary surge protection of indoor/outdoor equipment	272
Figure O.1 – Guidance flowchart for application of requirements of Clause 11	274
Table 1 – Required technical information and methods of providing these information	51
Table 2 – Cross-sectional area of conductors	65
Table 3 – Terminal conductors	67

Table 4 – Conductor pull test values	67
Table 5 – Nominal cross-sectional areas of conductors	69
Table 6 – Axial force values for tab insertion and withdrawal	70
Table 7 – Minimum cord conductor sizes	82
Table 8 – Data exchange	89
Table 9 – Threaded parts torque test values	95
Table 10 – Rated impulse voltage for equipment energized directly from the supply mains (from IEC 60664-1:2007, Table F.1)	98
Table 11 – Clearances for insulation co-ordination (from IEC 60664-1:2007, Table F.2).....	99
Table 12 – Minimum creepage distances for basic insulation	103
Table 13 – Minimum creepage distances for functional insulation	104
Table 14 – Electrical/electronic component fault modes	110
Table 15 – Minimum insulation resistance.....	117
Table 16 – Insulation or disconnection test voltages	118
Table 17 – Maximum heating temperatures.....	122
Table 18 – Electrical conditions for the overvoltage and endurance tests.....	128
Table 19 – Electrical conditions for the overload tests of 19.7 and 19.10	130
Table 20 – Electrical conditions for the endurance tests of 19.8, 19.9, 19.11, 19.12 and 19.13	131
Table 21 – Pull-cord force test values	139
Table 22 – Pull and torque values	141
Table 23 – Emission limit for residential electromagnetic environment	147
Table 24 – Emission limit for industrial electromagnetic environment	148
Table 25 – The applicable EMC test in relation to the class of control function and type of Action	150
Table 26 – Immunity test requirements for residential electromagnetic environments.....	152
Table 27 – Immunity test requirements for industrial electromagnetic environment	154
Table 28 – Performance criteria	156
Table 29 – Maximum winding temperature (for test of mechanical blocked output conditions).....	159
Table B.1 – Value of X	179
Table C.1 – Inherent control or equivalent protective control.....	183
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	184
Table E.1 – Typical usage.....	186
Table H.1 – Additional items to Table 1.....	201
Table H.2 – Acceptable measures to address fault/errors ^a	204
Table H.3 – Examples of techniques/measures for semi-formal methods	211
Table H.4 – Examples of techniques/measures for software architecture specification	212
Table H.5 – Examples of techniques/measures for module design specification.....	213
Table H.6 – Examples of techniques/measures for design and coding standards	213
Table H.7 – Examples of techniques/measures for software module testing	214
Table H.8 – Examples of techniques/measures for software integration testing.....	215
Table H.9 – Examples of techniques/measures for software safety validation	215

Table H.10 – Combinations of analytical measures during hardware development	216
Table H.11 – Examples of defences against unauthorised access and transmission failure modes	218
Table H.12 – Applicable test levels in addition to Clause 25	227
Table H.13 – Voltage dips, short interruptions and voltage variations	229
Table H.14 – Test values for voltage variations	230
Table H.15 – Test voltages for test level 2 (depending on the installation class conditions)	233
Table H.16 – Test level for electrical fast transient burst test	235
Table H.17 – Test levels for conducted disturbances on mains and I/O lines	237
Table H.18 – Test level for immunity to radiated electromagnetic fields	238
Table H.19 – Increased test level for radiated immunity	239
Table H.20 – Test level for supply frequency variations	240
Table H.21 – Test level for continuous fields	242
Table I.1 – Electrical transient conduction immunity in accordance with ISO 7637-2	244
Table I.2 – Electrical transient conduction immunity in accordance with ISO 7637-3	245
Table J.1 – Maximum current	248
Table J.2 – Normal operating conditions	249
Table J.3 – Samples for the test (clause reference)	250
Table J.4 – Electrical and thermal ratings of a thermistor	251
Table J.5 – Additional items to Table 1	252
Table J.6 – Sequence of calibration and conditioning tests for PTC thermistors	254
Table J.7 – Classes for PTC sensing thermistors	255
Table J.8 – Sequence of calibration and conditioning tests for NTC thermistors	256
Table J.9 – Classes for NTC sensing thermistors	256
Table J.10 – Number of cycles for endurance test	260
Table J.11 – Ageing test temperature	260
Table J.12 – Number of cycles for endurance test	261
Table L.1 – Environmental cycling conditions	264
Table M.1 – IEC 60664-3 test levels or conditions	266
Table O.1 – Example A – Using Annex O guidance for applying Clause 11	275
Table O.2 – Example B – Using Annex O guidance for applying Clause 11	275
Table Q.1 – Additional aging parameters for windings	280
Table AA.1 – Number of cycles for independently mounted controls	286
Table AA.2 – Cycling rate for independently mounted controls	286
Table BB.1 – Stainless steel for bellows, bourdon tubes or similar elements	287

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Automatic electrical controls -
Part 2-6: Particular requirements for automatic electrical pressure
sensing controls including mechanical 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, 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 60730-2-6:2025 EXV includes the content of IEC 60730-2-6:2025, and the references made to IEC 60730-1:2022.

The specific content of IEC 60730-2-6:2025 is displayed on a blue background.

IEC 60730-2-6 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 2015 and its Amendment 1:2019. 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, IEC 60730-1:2013/AMD 1:2015 and IEC 60730-1:2013/AMD2:2020.

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

Draft	Report on voting
72/1486/FDIS	72/1504/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 2-6 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 2-6 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 pressure sensing controls including mechanical requirements.

Where this part 2-6 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:

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.

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 document applies to **automatic electrical pressure sensing controls**

- 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 "pressure **sensing controls**".

- for building automation within the scope of ISO 16484 series and IEC 63044 series (HBES/BACS);

EXAMPLE 1 Independently mounted **automatic electrical pressure sensing controls**, controls in smart grid systems and controls for building automation systems within the scope of ISO 16484-2.

- 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 2 **Automatic electrical pressure sensing controls** for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled automatic electrical pressure sensing controls**;

EXAMPLE 3 Smart grid **automatic electrical pressure sensing controls**, 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 a pressure or vacuum;
- 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 is also applicable to individual pressure **sensing controls** utilized as part of a **control system** or pressure **sensing controls** which are mechanically integral with multifunctional controls having non-electrical outputs.

This document is also applicable to pressure **sensing controls** for appliances within the scope of IEC 60335-1.

This document applies to

- the inherent safety of pressure **sensing controls**, and
- functional safety of pressure **sensing controls** and safety related systems,
- pressure **sensing 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.

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

This document does not

- apply to pressure **sensing controls** 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 electrical controls intended specifically for industrial applications in cases where no relevant safety standard exists;
- take into account the response value of an automatic action of a pressure **sensing 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.

This document contains requirements for electrical features of pressure **sensing controls** and requirements for mechanical features that affect their intended **operation**.

NOTE Subclause 20.101, as it pertains to gas and/or oil **controls**, is under consideration pending review or revision of ISO 22967, ISO 22968 and ISO 23550, if applicable.

In general, these pressure **sensing controls** are integrated or incorporated with the equipment or are intended to be integrated in, or on the equipment. This document also covers these **controls** when they are independently mounted. **In-line cord controls** are not covered by this document.

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 60068-2-75, *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*

¹ Withdrawn.

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*

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*

² Withdrawn.

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*

IEC 61249 (all parts), *Materials for printed boards and other interconnecting structures*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

IEC 61558-2-16, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units for general applications*

IEC 61810-3, *Electromechanical elementary relays – Part 3: Relays with forcibly guided (mechanically linked) contacts*

IEC 62151, *Safety of equipment electrically connected to a telecommunication network*

IEC 62319 (all parts), *Polymeric thermistors – Directly heated positive step function temperature coefficient*

IEC 62326 (all parts), *Printed boards*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 63044 (all parts), *Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)*

CISPR 11, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 14-1:2020, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

CISPR 32:2015/AMD1:2019

ISO 4046-4:2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

ISO 7637-2:2011, *Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only*

ISO 7637-3:2016, *Road vehicles – Electrical disturbances from conduction and coupling – Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines*

ISO 16484 (all parts), *Building automation and control systems (BACS)*

INTERNATIONAL STANDARD

**Automatic electrical controls -
Part 2-6: Particular requirements for automatic electrical pressure sensing
controls including mechanical requirements**

CONTENTS

FOREWORD	3
1 Scope	6
2 Normative references	7
3 Terms and definitions	7
4 General	8
5 Required technical information	9
6 Protection against electric shock	10
7 Provision for protective earthing	10
8 Terminals and terminations.....	10
9 Constructional requirements	10
10 Threaded parts and connections.....	12
11 Creepage distances, clearances and distances through solid insulation.....	12
12 Components	12
13 Fault assessment on electronic circuits	12
14 Moisture and dust resistance	12
15 Electric strength and insulation resistance	12
16 Heating.....	12
17 Manufacturing deviation and drift.....	13
18 Environmental stress	13
19 Endurance	13
20 Mechanical strength	14
21 Resistance to heat, fire and tracking.....	15
22 Resistance to corrosion	15
23 Electromagnetic compatibility (EMC) requirements - Emission	15
24 Normal operation	15
25 Electromagnetic compatibility (EMC) requirements - Immunity	16
26 Abnormal operation tests	16
Annex H (normative) Requirements related to functional safety	17
Annex Q (informative) Regional differences relevant for the member countries of Cenelec	28
Annex R (informative) National differences relevant in the United States of America.....	29
Annex S (informative) National differences relevant in Japan	30
Annex T (informative) National differences relevant in Canada	31
Annex AA (normative) Number of cycles	32
Annex BB (informative) Stainless steel for bellows, bourdon tubes or similar elements	33
Bibliography.....	36

Table 1 – Required technical information and methods of providing these information	9
Table H.1 – Additional items to Table 1.....	17
Table AA.1 – Number of cycles for independently mounted controls	32
Table AA.2 – Cycling rate for independently mounted controls	32
Table BB.1 - Stainless steel for bellows, bourdon tubes or similar elements.....	33

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Automatic electrical controls -
Part 2-6: Particular requirements for automatic electrical pressure
sensing controls including mechanical 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, 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.

IEC 60730-2-6 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 2015 and its Amendment 1:2019. 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, IEC 60730-1:2013/AMD 1:2015 and IEC 60730-1:2013/AMD2:2020.

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

Draft	Report on voting
72/1486/FDIS	72/1504/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 2-6 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 2-6 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 pressure sensing controls including mechanical requirements.

Where this part 2-6 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:

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.

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 **automatic electrical pressure sensing controls**

- 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 "pressure **sensing controls**".

- for building automation within the scope of ISO 16484 series and IEC 63044 series (HBES/BACS);

EXAMPLE 1 Independently mounted **automatic electrical pressure sensing controls**, controls in smart grid systems and controls for building automation systems within the scope of ISO 16484-2.

- 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 2 **Automatic electrical pressure sensing controls** for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled automatic electrical pressure sensing controls**;

EXAMPLE 3 Smart grid **automatic electrical pressure sensing controls**, 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 a pressure or vacuum;
- 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 is also applicable to individual pressure **sensing controls** utilized as part of a **control system** or pressure **sensing controls** which are mechanically integral with multifunctional controls having non-electrical outputs.

This document is also applicable to pressure **sensing controls** for appliances within the scope of IEC 60335-1.

This document applies to

- the inherent safety of pressure **sensing controls**, and
- functional safety of pressure **sensing controls** and safety related systems,
- pressure **sensing 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.

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

This document does not

- apply to pressure **sensing controls** 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 electrical controls intended specifically for industrial applications in cases where no relevant safety standard exists;
- take into account the response value of an automatic action of a pressure **sensing 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.

This document contains requirements for electrical features of pressure **sensing controls** and requirements for mechanical features that affect their intended **operation**.

NOTE Subclause 20.101, as it pertains to gas and/or oil controls, is under consideration pending review or revision of ISO 22967, ISO 22968 and ISO 23550, if applicable.

In general, these pressure **sensing controls** are integrated or incorporated with the equipment or are intended to be integrated in, or on the equipment. This document also covers these controls when they are independently mounted. **In-line cord controls** are not covered by this document.

2 Normative references

This clause of Part 1 is applicable.