

INTERNATIONAL STANDARD

This full version of IEC 60730-2-8:2025 includes the content of the references made to IEC 60730-1:2022

**Automatic electrical controls –
Part 2-8: Particular requirements for electrically operated water valves, including
mechanical requirements**

CONTENTS

FOREWORD	11
1 Scope	14
2 Normative references	15
3 Terms and definitions	20
3.1 Definitions relating to ratings, voltages, currents, frequencies, and wattages	20
3.2 Definitions of types of control according to purpose	22
3.3 Definitions relating to the function of controls	26
3.4 Definitions relating to disconnection and interruption	30
3.5 Definitions of types of control according to construction	32
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	39
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
4 General	48
4.1 General structure of the document	48
4.2 General requirements	49
4.3 General notes on tests	49
5 Required technical information	53
5.1 General requirements	53
5.2 Methods of providing technical information	53
5.3 Class II symbol	61
5.4 Additional requirements for marking	62
5.5 Warning or cautionary markings	63
6 Protection against electric shock	64
6.1 General requirements	64
6.2 Actuating members and actuating means	66
6.3 Capacitors	67
6.4 Covers and uninsulated live or hazardous parts	67
6.5 Battery operated controls provided with a user accessible mains supply input connector	67

7	Provision for protective earthing	67
7.1	Class 0I and Class I controls.....	67
7.2	Class II and class III controls	68
7.3	Adequacy of earth connections	68
7.4	Corrosion resistance	69
7.5	Other requirements	70
7.6	Protective equipotential bonding	70
8	Terminals and terminations.....	70
8.1	Terminals and terminations for external copper conductors	70
8.2	Terminals and terminations for internal conductors	75
8.3	Terminals and terminations for integrated conductors	77
9	Constructional requirements	77
9.1	Materials	77
9.2	Protection against electric shock.....	78
9.3	Actuation and operation	80
9.4	Actions	83
9.5	Openings in enclosures.....	85
9.6	Mounting of controls	86
9.7	Attachment of cords	87
9.8	Size of cords – non-detachable	88
9.9	Inlet openings	88
9.10	Equipment inlets and socket-outlets	89
9.11	Requirements during mounting, use, maintenance and servicing.....	90
9.12	Controls using software	92
9.13	Protective controls and components of protective control systems	95
9.101	Nominal size and thread size of end-connections.....	97
10	Threaded parts and connections	98
10.1	Threaded parts moved during mounting or servicing	98
10.2	Current-carrying connections and connections providing protective earthing continuity	99
11	Creepage distances, clearances and distances through solid insulation.....	100
11.1	General.....	100
11.2	Clearances	101
11.3	Creepage distances	105
11.4	Solid insulation	109
12	Components	110
12.1	Transformers	110
12.2	Switch mode power supplies and converters	110
12.3	Capacitors	111
12.4	Fuses.....	111
12.5	Varistors	111
12.6	Thermistors.....	111
12.7	Relays	112
12.8	Other components	112
13	Fault assessment on electronic circuits.....	112
13.1	Fault assessment for inherent safety.....	112
13.2	Fault assessment to ensure functional safety.....	118
14	Moisture and dust resistance	118

14.1	Protection against ingress of water and dust	118
14.2	Protection against humid conditions	119
14.3	Touch current test for in-line cord controls and free-standing controls	120
15	Electric strength and insulation resistance	121
15.1	Insulation resistance	121
15.2	Electric strength	121
15.3	Additional tests for in-line cord and free-standing controls	123
16	Heating	124
17	Manufacturing deviation and drift	129
18	Environmental stress	129
18.1	Transportation and storage	129
18.2	Environmental stress of temperature	129
19	Endurance	129
19.1	General requirements	129
19.2	Electrical conditions for the tests	131
19.3	Thermal conditions for the tests	136
19.4	Manual and mechanical conditions for the tests	136
19.5	Dielectric strength requirements	137
19.6	Ageing test	137
19.7	Overvoltage test or overload test in all countries using an overload test of automatic action at accelerated rate	137
19.8	Test of automatic action at accelerated rate	138
19.9	Test of automatic action at slow rate	138
19.10	Overvoltage test or overload test in all countries that use the overload test of manual action at accelerated speed	139
19.11	Test of manual action at slow speed	139
19.12	Test of manual action at high speed which has multiple poles, and where polarity reversal occurs during the action	139
19.13	Test of manual action at accelerated speed	139
19.14	Evaluation of compliance	140
19.15	Test for particular purpose controls	140
20	Mechanical strength	141
20.1	General requirements	141
20.2	Impact resistance	141
20.3	Free-standing controls	142
20.4	In-line cord controls	142
20.5	Pull-cord actuated controls	143
20.6	Foot actuated controls	143
20.7	Actuating member and actuating means	143
20.8	Flexing – test	144
20.9	Cord anchorages – test	144
20.101	Resistance to water pressure	145
20.102	Torque test	147
21	Resistance to heat, fire and tracking	148
21.1	General requirements	148
21.2	Integrated, incorporated and in-line cord controls	148
21.3	Independently mounted, free-standing controls	150
22	Resistance to corrosion	150

22.1	Resistance to rusting	150
23	Electromagnetic compatibility (EMC) requirements – Emission	151
23.1	General requirement	151
23.2	High frequency emission	151
23.3	Low frequency emission	154
24	Normal operation	154
25	Electromagnetic compatibility (EMC) requirements – Immunity	155
25.1	General	155
25.2	EMC test plan and report	155
25.3	Immunity requirements	157
25.4	Performance criteria	160
25.5	Surge immunity test	161
25.6	Electrical fast transient immunity test	161
25.7	Radio-frequency electromagnetic field immunity	162
25.8	Electrostatic discharge	162
25.9	Immunity to power-frequency magnetic fields	162
25.10	Test of the influence of voltage dips and voltage interruption in the power supply network	162
26	Abnormal operation tests	163
26.1	Abnormal temperature test	163
26.2	Overload tests	166
26.3	Battery short-circuit test	167
Annex A	(normative) Indelibility of markings	184
Annex B	(normative) Measurement of creepage distances and clearances in air	186
Annex C	(informative) Nominal voltages of supply systems for different modes of overvoltage control	190
Annex D	(normative) Overvoltage categories	192
Annex E	(informative) Typical usage of controls and related overvoltage categories	193
Annex F	(normative) Pollution degrees	194
F.1	Pollution	194
F.2	Degrees of pollution in the micro-environment	194
Annex G	(normative) Resistance to heat, fire and tracking tests	195
G.1	Glow-wire test	195
G.2	Proof tracking test	195
G.3	Ball pressure test	195
Annex H	(normative) Requirements related to functional safety	197
H.3	Terms and definitions	197
H.5	Information	208
H.9	Constructional requirements	209
H.13	Fault assessment on electronic circuits	226
H.17	Manufacturing deviation and drift	230
H.19	Endurance	231
H.25	Electromagnetic compatibility (EMC) requirements – Immunity	232
Annex I	(normative) Requirements for certain types of DC supplied controls	248
I.1	Scope	248
Annex J	(normative) Requirements for thermistor elements and controls using thermistors	250
J.1	Scope	250

Annex K (normative) Circuit for measuring touch current	267
Annex L (normative) Printed circuit board coating performance test	268
Annex M (normative) Printed circuit board protection	270
Annex N (informative) Explanatory notes for surge immunity test	273
N.1 Different source impedances	273
N.2 Application of the tests	273
N.3 Installation classification	274
Annex O (informative) Guidance for applying Clause 11	277
Annex P (normative) Requirements for SELV and PELV	280
P.1 Overview of the requirements for SELV and PELV	280
P.2 Protection against electric shock by SELV system or PELV system	280
P.3 Protective measures for SELV system and PELV system	281
Annex Q (informative) Regional differences relevant for the member countries of Cenelec	283
Annex R (informative) National differences relevant in the United States of America	287
R.2 Normative references	287
Annex S (informative) National differences relevant in Japan	288
S.2 Normative references	288
Annex T (informative) National differences relevant in Canada	289
T.2 Normative references	289
Annex AA (informative) Relation between different flow coefficients	290
AA.1 K_V value	290
AA.2 C_V value	290
Annex BB (informative) Arrangement for the measurement of transient pressures caused by water valves	291
Annex CC (normative) Long term pressure test for thermoplastic bodied valves	294
CC.1 Valves of thermoplastic material intended to be connected to the water supply mains	294
CC.2 Valves of thermoplastic material intended to be connected to the water supply mains for the control of water for tap and shower outlets	294
Annex DD (normative) Torque test	296
DD.1 Torque test for valves with internally threaded end-connections according to ISO 7-1	296
DD.2 Torque test for valves with internally threaded end-connections according to ISO 228-1	297
DD.3 Torque test for valves with internally threaded end-connections with ISO metric thread for compression fittings	298
DD.4 Torque test for valves with externally threaded end-connections according to ISO 7-1	298
DD.5 Torque test for valves with externally threaded end-connections according to ISO 228-1 or to ISO metric thread for compression fittings	298
DD.6 Torque test for valves with adaptors	298
DD.7 Torque test for valves with internally or externally threaded end-connections for NPT thread	299
DD.8 Torque test for valves with internally or externally threaded end-connections for SAE thread	299
Annex EE (informative) Arrangement for the measurement of transient pressures caused by water valves with a declared pressure of up to and including 1,0 MPa (10 bar)	300

EE.1 Description of test rig	300
EE.2 Measurement procedure	301
Bibliography	302
Figure 1 – Example of ports	46
Figure 2 – Structure of the document with respect to inherent safety and functional safety	49
Figure 3 – Example of an electronic circuit with low power points	113
Figure 4 – Test pin probe 13 of IEC 61032:1997	167
Figure 5 – Test finger probe B of IEC 61032:1997	168
Figure 6 – Test fingernail	169
Figure 7 – Impact test for free-standing controls	170
Figure 8 – Tumbling barrel	170
Figure 9 – Apparatus for testing durability of markings on rating labels	171
Figure 10 – Apparatus for flexing test	171
Figure 11 – Screw terminals and stud terminals	172
Figure 12 – Pillar terminals	173
Figure 13 – Mantle terminals	174
Figure 14 – Saddle and lug terminals	175
Figure 15 – Tabs	176
Figure 16 – Tabs for non-reversible connectors	177
Figure 17 – Receptacles	178
Figure 18 – Measurement of creepage distance and clearance	179
Figure 19 – Diagram for touch current measurement at operating temperature for single-phase connection of class II controls	180
Figure 20 – Diagram for touch current measurement at operating temperature for single-phase connection of controls other than class II	180
Figure 21 – Diagram for touch current measurement at operating temperature for three-phase connection of class II controls	181
Figure 22 – Diagram for touch current measurement at operating temperature for three-phase connection of controls other than class II	182
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	182
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	183
Figure B.1 – Narrow groove	187
Figure B.2 – Wide groove	187
Figure B.3 – V-shaped groove	187
Figure B.4 – Rib	187
Figure B.5 – Uncemented joint with narrow groove	188
Figure B.6 – Uncemented joint with wide groove	188
Figure B.7 – Uncemented joint with narrow and wide grooves	188
Figure B.8 – Diverging side walls	189
Figure B.9 – Narrow recess	189

Figure B.10 – Wide recess	189
Figure B.11 – Conductive floating part	189
Figure H.1 – V-Model for the software life cycle	217
Figure H.2 – Voltage variation test	236
Figure J.1 – Generic test circuit for inrush-current limiting thermistor endurance test	266
Figure K.1 – Circuit for measuring touch currents	267
Figure L.1 – Test sample	269
Figure M.1 – Example of type 1 protection	271
Figure M.2 – Example of type 2 protection	272
Figure N.1 – Example of surge protection by shielding in buildings with common earth reference systems	275
Figure N.2 – Example of secondary surge protection in buildings with separate common earth reference systems	276
Figure N.3 – Example of primary and secondary surge protection of indoor/outdoor equipment	276
Figure O.1 – Guidance flowchart for application of requirements of Clause 11	278
Figure BB.1 – Transient pressure measurement test rig schematic diagram	292
Figure DD.1 – Arrangements for carrying out the torque test	296
Figure EE.1 – Transient pressure measurement test rig for valves with a declared pressure of up to and including 1,0 MPa (10 bar) schematic diagram	300
Table 1 – Required technical information and methods of providing these information	56
Table 2 – Cross-sectional area of conductors	71
Table 3 – Terminal conductors	73
Table 4 – Conductor pull test values	73
Table 5 – Nominal cross-sectional areas of conductors	75
Table 6 – Axial force values for tab insertion and withdrawal	76
Table 7 – Minimum cord conductor sizes	88
Table 8 – Data exchange	93
Table 101 – Nominal size and thread size of end-connections	97
Table 9 – Threaded parts torque test values	99
Table 10 – Rated impulse voltage for equipment energized directly from the supply mains (from IEC 60664-1:2007, Table F.1)	102
Table 11 – Clearances for insulation co-ordination (from IEC 60664-1:2007, Table F.2)	103
Table 12 – Minimum creepage distances for basic insulation	107
Table 13 – Minimum creepage distances for functional insulation	108
Table 14 – Electrical/electronic component fault modes	114
Table 15 – Minimum insulation resistance	121
Table 16 – Insulation or disconnection test voltages	122
Table 17 – Maximum heating temperatures	126
Table 18 – Electrical conditions for the overvoltage and endurance tests	132
Table 19 – Electrical conditions for the overload tests of 19.7 and 19.10	134
Table 20 – Electrical conditions for the endurance tests of 19.8, 19.9, 19.11, 19.12 and 19.13	135
Table 21 – Pull-cord force test values	143

Table 22 – Pull and torque values	145
Table 102 – Torque test requirements for metal valves with internal threaded end-connections	147
Table 103 – Torque test requirements for metal valves with external threaded end-connections	148
Table 23 – Emission limit for residential electromagnetic environment	152
Table 24 – Emission limit for industrial electromagnetic environment	153
Table 25 – The applicable EMC test in relation to the class of control function and type of Action	155
Table 26 – Immunity test requirements for residential electromagnetic environments	157
Table 27 – Immunity test requirements for industrial electromagnetic environment	159
Table 28 – Performance criteria	161
Table 29 – Maximum winding temperature (for test of mechanical blocked output conditions)	164
Table B.1 – Value of X	186
Table C.1 – Inherent control or equivalent protective control	190
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	191
Table E.1 – Typical usage	193
Table H.1 – Additional items to Table 1	208
Table H.2 – Acceptable measures to address fault/errors ^a	211
Table H.3 – Examples of techniques/measures for semi-formal methods	218
Table H.4 – Examples of techniques/measures for software architecture specification	218
Table H.5 – Examples of techniques/measures for module design specification	219
Table H.6 – Examples of techniques/measures for design and coding standards	219
Table H.7 – Examples of techniques/measures for software module testing	220
Table H.8 – Examples of techniques/measures for software integration testing	221
Table H.9 – Examples of techniques/measures for software safety validation	221
Table H.10 – Combinations of analytical measures during hardware development	223
Table H.11 – Examples of defences against unauthorised access and transmission failure modes	224
Table H.12 – Applicable test levels in addition to Clause 25	233
Table H.13 – Voltage dips, short interruptions and voltage variations	234
Table H.14 – Test values for voltage variations	235
Table H.15 – Test voltages for test level 2 (depending on the installation class conditions)	238
Table H.16 – Test level for electrical fast transient burst test	240
Table H.17 – Test levels for conducted disturbances on mains and I/O lines	242
Table H.18 – Test level for immunity to radiated electromagnetic fields	243
Table H.19 – Increased test level for radiated immunity	244
Table H.20 – Test level for supply frequency variations	245
Table H.21 – Test level for continuous fields	246
Table I.1 – Electrical transient conduction immunity in accordance with ISO 7637-2	248
Table I.2 – Electrical transient conduction immunity in accordance with ISO 7637-3	249

Table J.1 – Maximum current.....	252
Table J.2 – Normal operating conditions	253
Table J.3 – Samples for the test (clause reference)	254
Table J.4 – Electrical and thermal ratings of a thermistor	255
Table J.5 – Additional items to Table 1	256
Table J.6 – Sequence of calibration and conditioning tests for PTC thermistors	258
Table J.7 – Classes for PTC sensing thermistors	259
Table J.8 – Sequence of calibration and conditioning tests for NTC thermistors	260
Table J.9 – Classes for NTC sensing thermistors	260
Table J.10 – Number of cycles for endurance test.....	264
Table J.11 – Ageing test temperature	264
Table J.12 – Number of cycles for endurance test.....	265
Table L.1 – Environmental cycling conditions	268
Table M.1 – IEC 60664-3 test levels or conditions.....	270
Table O.1 – Example A – Using Annex O guidance for applying Clause 11	279
Table O.2 – Example B – Using Annex O guidance for applying Clause 11	279
Table Q.1 – Additional aging parameters for windings.....	284
Table CC.1 – Test requirements for valves intended for uses other than the control of water for tap and shower outlets	294
Table CC.2 – Test requirements for valves intended for the control of water for tap and shower outlets	295
Table DD.1 – Required torque for the test.....	297
Table DD.2 – Tightening torque in newton metres (Nm) for bolts and screws for adaptors	299

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Part 2-8: Particular requirements for electrically operated water valves,
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 60730-2-8:2025 EXV includes the content of IEC 60730-2-8:2025, and the references made to IEC 60730-1:2022.

The specific content of IEC 60730-2-8:2025 is displayed on a blue background.

IEC 60730-2-8 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 2018 and Amendment 1:2021. This edition constitutes a technical revision.

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

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

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

Draft	Report on voting
72/1478/FDIS	72/1482/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 2-8 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 2-8 supplements or modifies the corresponding clauses in IEC 60730-1, so as to convert that publication into the IEC standard: Particular requirements for electrically operated water valves, including mechanical requirements.

Where this part 2-8 states "addition", "modification" or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

Where no change is necessary, part 2-8 indicates that the relevant clause or subclause applies.

In the development of a fully international standard it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variation in national electrical systems and wiring rules.

The reader's attention is drawn to the fact that [Annex R](#) to [Annex T](#) list all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

In this publication:

- 1) The following print types are used:
 - requirements proper: in roman type;
 - *test specifications: in italic type;*

- notes: in smaller roman type.
- Defined terms: **bold type**.

2) Subclauses, notes or items which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

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

- reconfirmed,
- withdrawn, or
- revised.

AUTOMATIC ELECTRICAL CONTROLS –

Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements

1 Scope

This document applies to **electrically operated water valves**

- 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 "control" means "**electrically operated water valve**".

EXAMPLE 1 **Electrically operated water valves** for appliances within the scope of IEC 60335.

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

EXAMPLE 2 Independently mounted **water valves**, 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 3 **Electrically operated water valves** for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled electrically operated water valves**;

EXAMPLE 4 Smart grid control, remote interfaces and controls of energy-consuming equipment including computer or smart phone.

- that are AC or DC powered **electrically operated water valves** with a **rated voltage** not exceeding 690 V AC or 600 V DC;
- used in, on, or in association with equipment that uses 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 of Part 1;
- 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;
- **in which actuators** and **valve** bodies are designed to be fitted to each other.
- as well as manual controls when such are electrically or mechanically integral with automatic controls.

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

This document applies to

- the inherent safety of **electrically operated water valves**, and
- functional safety of **electrically operated water valves** and safety related systems,
- 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 **electrically operated water valves** used in, on, or in association with an equipment.

This document contains requirements for electrical features of **water valves** and requirements for mechanical features of **valves** that affect their intended operation.

This document does not

- apply to **electrically operated water valves** 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.
- apply to
 - **electrically operated water valves** of nominal connection size above DN 50;
 - **electrically operated water valves** for admissible **nominal pressure rating** above 1,6 MPa;
 - food dispensers;
 - detergent dispensers;
 - steam **valves**;
- take into account the **response value** of an **automatic action** of a **electrically operated water valve**, 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.
- cover the prevention of contamination of drinking water as a result of contact with materials.

Throughout this document, where it can be used unambiguously, the term:

- "**valve**" is used to denote an **electrically operated water valve** (including **actuator** and **valve body assembly**);
- "**actuator**" means "electrically operated mechanism or prime mover";
- "**valve body**" means "**valve body assembly**";
- "equipment" includes "appliance" and "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 60068-2-75, *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 60730-1:2022, *Automatic electrical controls – Part 1: General requirements*

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*

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)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads – Part 1: Dimensions, tolerances and designation*

ISO 65:1981, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1³*

³ Withdrawn.

ISO 228-1:2000, *Pipe threads where pressure-tight joints are not made on the threads – Part 1: Dimensions, tolerances and designation*

ISO 630-2:2011, *Structural steels – Part 2: Technical delivery conditions for structural steels for general purposes*⁴

ISO 1179-1:2013, *Connections for general use and fluid power – Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing – Part 1: Threaded ports*

ISO 4144:2003, *Pipework – Stainless steel fittings threaded in accordance with ISO 7-1*

⁴ Withdrawn. A newer edition was published in 2021, but the listed edition applies.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Automatic electrical controls –

Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements

Dispositifs de commande électrique automatiques –

Partie 2-8: Exigences particulières pour les électrovannes hydrauliques, y compris les exigences mécaniques

CONTENTS

FOREWORD	4
1 Scope	7
2 Normative references	9
3 Terms and definitions	9
4 General	12
5 Required technical information	13
6 Protection against electric shock	15
7 Provision for protective earthing	16
8 Terminals and terminations.....	16
9 Constructional requirements	16
10 Threaded parts and connections.....	17
11 Creepage distances, clearances and distances through solid insulation.....	17
12 Components	18
13 Fault assessment on electronic circuits.....	18
14 Moisture and dust resistance	18
15 Electric strength and insulation resistance	18
16 Heating.....	18
17 Manufacturing deviation and drift.....	19
18 Environmental stress	20
19 Endurance	20
20 Mechanical strength	21
21 Resistance to heat, fire and tracking.....	24
22 Resistance to corrosion	24
23 Electromagnetic compatibility (EMC) requirements – Emission	24
24 Normal operation	25
25 Electromagnetic compatibility (EMC) requirements – Immunity	25
26 Abnormal operation tests.....	25
Annex H (normative) Requirements related to functional safety	29
Annex R (informative) National differences relevant in the United States of America.....	34
Annex S (informative) National differences relevant in Japan	35
Annex T (informative) National differences relevant in Canada	36
Annex AA (informative) Relation between different flow coefficients.....	37
Annex BB (informative) Arrangement for the measurement of transient pressures caused by water valves.....	38
Annex CC (normative) Long term pressure test for thermoplastic bodied valves.....	41
Annex DD (normative) Torque test.....	43
Annex EE (informative) Arrangement for the measurement of transient pressures caused by water valves with a declared pressure of up to and including 1,0 MPa (10 bar).....	47
Bibliography.....	49
Figure BB.1 – Transient pressure measurement test rig schematic diagram.....	39
Figure DD.1 – Arrangements for carrying out the torque test.....	43

Figure EE.1 – Transient pressure measurement test rig for valves with a declared pressure of up to and including 1,0 MPa (10 bar) schematic diagram	47
Table 1 – Required technical information and methods of providing these information	13
Table 101 – Nominal size and thread size of end-connections	17
Table 17 – Maximum heating temperatures	19
Table 102 – Torque test requirements for metal valves with internal threaded end-connections	23
Table 103 – Torque test requirements for metal valves with external threaded end-connections	24
Table CC.1 – Test requirements for valves intended for uses other than the control of water for tap and shower outlets	41
Table CC.2 – Test requirements for valves intended for the control of water for tap and shower outlets	42
Table DD.1 – Required torque for the test	44
Table DD.2 – Tightening torque in newton metres (Nm) for bolts and screws for adaptors	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS –**Part 2-8: Particular requirements for electrically operated water valves,
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 60730-2-8 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 2018 and Amendment 1:2021. This edition constitutes a technical revision.

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

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

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

Draft	Report on voting
72/1478/FDIS	72/1482/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 2-8 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 2-8 supplements or modifies the corresponding clauses in IEC 60730-1, so as to convert that publication into the IEC standard: Particular requirements for electrically operated water valves, including mechanical requirements.

Where this part 2-8 states "addition", "modification" or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

Where no change is necessary, part 2-8 indicates that the relevant clause or subclause applies.

In the development of a fully international standard it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variation in national electrical systems and wiring rules.

The reader's attention is drawn to the fact that Annex R to Annex T list all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

In this publication:

- 1) The following print types are used:
 - requirements proper: in roman type;
 - *test specifications: in italic type*;
 - notes: in smaller roman type.
 - Defined terms: **bold type**.
- 2) Subclauses, notes or items which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

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

- reconfirmed,
- withdrawn, or
- revised.

AUTOMATIC ELECTRICAL CONTROLS –

Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements

1 Scope

Replacement:

This document applies to **electrically operated water valves**

- 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 "control" means "**electrically operated water valve**".

EXAMPLE 1 **Electrically operated water valves** for appliances within the scope of IEC 60335.

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

EXAMPLE 2 Independently mounted **water valves**, 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 3 **Electrically operated water valves** for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled electrically operated water valves**;

EXAMPLE 4 Smart grid control, remote interfaces and controls of energy-consuming equipment including computer or smart phone.

- that are AC or DC powered **electrically operated water valves** with a **rated voltage** not exceeding 690 V AC or 600 V DC;
- used in, on, or in association with equipment that uses 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 of Part 1;
- 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;
- in which **actuators** and **valve** bodies are designed to be fitted to each other.
- as well as manual controls when such are electrically or mechanically integral with automatic controls.

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

This document applies to

- the inherent safety of **electrically operated water valves**, and
- functional safety of **electrically operated water valves** and safety related systems,
- 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 **electrically operated water valves** used in, on, or in association with an equipment.

This document contains requirements for electrical features of **water valves** and requirements for mechanical features of **valves** that affect their intended operation.

This document does not

- apply to **electrically operated water valves** 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.
- apply to
 - **electrically operated water valves** of nominal connection size above DN 50;
 - **electrically operated water valves** for admissible **nominal pressure rating** above 1,6 MPa;
 - food dispensers;
 - detergent dispensers;
 - steam **valves**;
- take into account the **response value** of an **automatic action** of a **electrically operated water valve**, 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.
- cover the prevention of contamination of drinking water as a result of contact with materials.

Throughout this document, where it can be used unambiguously, the term:

- "**valve**" is used to denote an **electrically operated water valve** (including **actuator** and **valve body assembly**);
- "**actuator**" means "electrically operated mechanism or prime mover";
- "**valve body**" means "**valve body assembly**";
- "equipment" includes "appliance" and "control system".

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60730-1:2022, *Automatic electrical controls – Part 1: General requirements*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads – Part 1: Dimensions, tolerances and designation*

ISO 65:1981, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*¹

ISO 228-1:2000, *Pipe threads where pressure-tight joints are not made on the threads – Part 1: Dimensions, tolerances and designation*

ISO 630-2:2011, *Structural steels – Part 2: Technical delivery conditions for structural steels for general purposes*²

ISO 1179-1:2013, *Connections for general use and fluid power – Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing – Part 1: Threaded ports*

ISO 4144:2003, *Pipework – Stainless steel fittings threaded in accordance with ISO 7-1*

¹ Withdrawn.

² Withdrawn. A newer edition was published in 2021, but the listed edition applies.

SOMMAIRE

AVANT-PROPOS	52
1 Domaine d'application	55
2 Références normatives	57
3 Termes et définitions	57
4 Généralités	61
5 Informations techniques exigées	61
6 Protection contre les chocs électriques	64
7 Dispositions en vue de la mise à la terre de protection	64
8 Bornes et connexions	65
9 Exigences de construction	65
10 Parties filettées et connexions	66
11 Lignes de fuite, distances dans l'air et distances à travers l'isolation solide	66
12 Éléments constitutifs	66
13 Évaluation des pannes sur les circuits électroniques	67
14 Résistance à l'humidité et à la poussière	67
15 Résistance d'isolement et rigidité diélectrique	67
16 Échauffements	67
17 Tolérances de fabrication et dérive	68
18 Contraintes climatiques	69
19 Endurance	69
20 Résistance mécanique	70
21 Résistance à la chaleur, au feu et aux courants de cheminement	73
22 Résistance à la corrosion	73
23 Exigences de compatibilité électromagnétique (CEM) – Émission	74
24 Fonctionnement normal	74
25 Exigences de compatibilité électromagnétique (CEM) – Immunité	74
26 Essais en fonctionnement anormal	74
Figures	78
Annexes	78
Annexe H (normative) Exigences relatives à la sécurité fonctionnelle	79
Annexe R (informative) Différences nationales applicables aux États-Unis	84
Annexe S (informative) Différences nationales applicables au Japon	85
Annexe T (informative) Différences nationales applicables au Canada	86
Annexe AA (informative) Relation entre coefficients de débit différents	87
Annexe BB (informative) Montage pour le mesurage des pressions transitoires engendrées par les vannes hydrauliques	88
Annexe CC (normative) Essai de pression longue durée pour les vannes thermoplastiques	91
Annexe DD (normative) Essai du couple de torsion	93
Annexe EE (informative) Montage pour le mesurage des pressions transitoires engendrées par les vannes hydrauliques dont la pression déclarée est inférieure ou égale à 1,0 MPa (10 bar)	98
Bibliographie	100

Figure BB.1 – Schéma du montage d'essai de mesure de la pression transitoire	89
Figure DD.1 – Montages pour la réalisation de l'essai du couple de torsion	93
Figure EE.1 – Schéma du montage d'essai de mesure de la pression transitoire pour les vannes dont la pression déclarée est inférieure ou égale à 1,0 MPa (10 bar)	98
Tableau 1 – Informations techniques exigées et méthodes pour fournir ces informations	61
Tableau 101 – Dimension nominale et dimension du filetage des raccords	66
Tableau 17 – Températures de chauffage maximales	68
Tableau 102 – Exigences d'essai du couple de torsion pour les vannes métalliques à raccords à filetage externe.....	72
Tableau 103 – Exigences d'essai du couple de torsion pour les vannes métalliques à raccords à filetage externe.....	73
Tableau CC.1 – Exigences d'essai pour les vannes destinées à d'autres applications que le contrôle du débit d'eau des robinets et des douches	91
Tableau CC.2 – Exigences d'essai pour les vannes destinées au contrôle du débit d'eau des robinets et des douches	92
Tableau DD.1 – Couple exigé pour l'essai.....	94
Tableau DD.2 – Couple de serrage en Newton mètres (Nm) des écrous et vis des adaptateurs	96

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

DISPOSITIFS DE COMMANDE ÉLECTRIQUE AUTOMATIQUES –

Partie 2-8: Exigences particulières pour les électrovannes hydrauliques, y compris les exigences mécaniques

AVANT-PROPOS

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'IEC attire l'attention sur le fait que la mise en application du présent document peut entraîner l'utilisation d'un ou de plusieurs brevets. L'IEC ne prend pas position quant à la preuve, à la validité et à l'applicabilité de tout droit de brevet revendiqué à cet égard. À la date de publication du présent document, l'IEC n'avait pas reçu notification qu'un ou plusieurs brevets pouvaient être nécessaires à sa mise en application. Toutefois, il y a lieu d'avertir les responsables de la mise en application du présent document que des informations plus récentes sont susceptibles de figurer dans la base de données de brevets, disponible à l'adresse <https://patents.iec.ch>. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 60730-2-8 a été établie par le comité d'études 72 de l'IEC: Commandes électriques automatiques. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2018 et l'Amendement 1:2021. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) adoption de l'IEC 60730-1:2022 avec toutes les modifications majeures par rapport à l'IEC 60730-1:2013, l'IEC 60730-1:2013/AMD1:2015 et l'IEC 60730-1:2013/AMD2:2020.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
72/1478/FDIS	72/1482/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Une liste de toutes les parties de la série IEC 60730, publiées sous le titre général: *Dispositifs de commande électrique automatiques*, se trouve sur le site web de l'IEC.

La présente partie 2-8 est destinée à être utilisée conjointement avec l'IEC 60730-1. Elle a été établie sur la base de la sixième édition de cette norme (2022). Les éditions futures de l'IEC 60730-1 ou ses amendements pourront être pris en considération.

La présente Partie 2-8 complète ou modifie les articles correspondants de l'IEC 60730-1, de façon à transformer cette publication en norme IEC: Exigences particulières pour les électrovannes hydrauliques, y compris les exigences mécaniques.

Lorsque la présente Partie 2-8 spécifie "addition", "modification" ou "remplacement", il convient d'adapter l'exigence, la modalité d'essai ou la note correspondante de la Partie 1 en conséquence.

Lorsqu'aucune modification n'est nécessaire, la partie 2-8 indique que l'article ou le paragraphe approprié s'applique.

Pour les besoins d'élaboration d'une Norme internationale, il a été nécessaire d'examiner les différentes exigences en s'appuyant sur l'expérience pratique acquise dans différentes régions du monde et d'identifier les variantes nationales au niveau des réseaux d'alimentation électrique et des règles d'installation

L'attention du lecteur est attirée sur le fait que les Annexes R à T donnent une liste de tous les articles qui traitent des différences de pratiques à caractère moins permanent qui existent dans certains pays dans le domaine couvert par le présent document.

Dans la présente publication:

- 1) Les caractères d'imprimerie suivants sont utilisés:
 - exigences proprement dites: caractères romains;
 - *modalités d'essais: caractères italiques;*
 - notes: petits caractères romains;
 - termes définis: **caractères gras.**

- 2) Les paragraphes, notes ou articles qui s'ajoutent à ceux de la Partie 1 sont numérotés à partir de 101 et les annexes qui sont ajoutées sont désignées AA, BB, etc.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

DISPOSITIFS DE COMMANDE ÉLECTRIQUE AUTOMATIQUES –

Partie 2-8: Exigences particulières pour les électrovannes hydrauliques, y compris les exigences mécaniques

1 Domaine d'application

Remplacement:

Le présent document s'applique aux **électrovannes hydrauliques**

- utilisées dans, sur ou avec des matériels pour appareil domestique et usage analogue;

NOTE 1 Dans le présent document, le terme "matériel" signifie "appareil et matériel" et "dispositif de commande" signifie "**électrovanne hydraulique**".

EXEMPLE 1 Les **électrovannes hydrauliques** pour appareils qui relèvent du domaine d'application de l'IEC 60335.

- pour l'automatisation des bâtiments qui relèvent du domaine d'application de la série ISO 16484 et de la série IEC 63044 (HBES/BACS);

EXEMPLE 2 Les **vannes hydrauliques** montées indépendamment, les dispositifs de commande des systèmes de réseau intelligent et les dispositifs de commande des systèmes d'automatisation des bâtiments qui relèvent du domaine d'application de l'ISO 16484-2.

- pour des matériels utilisés par le public, tels que les matériels destinés à être utilisés dans des magasins, des bureaux, des hôpitaux, des fermes et des applications commerciales et industrielles;

EXEMPLE 3 Les **électrovannes hydrauliques** pour les installations de restauration, de chauffage et d'air conditionné.

- qui sont des **électrovannes hydrauliques activées intelligentes**;

EXEMPLE 4 Les dispositifs de commande de réseau intelligent, les interfaces distantes et les dispositifs de commande de matériels utilisateurs d'énergie électrique, y compris les ordinateurs ou les mobiles multifonctions.

- qui sont des **électrovannes hydrauliques** à courant alternatif ou continu dont la **tension assignée** ne dépasse pas 690 V en courant alternatif ou 600 V en courant continu;
- qui sont utilisés dans, sur ou avec des matériels qui utilisent l'électricité, le gaz, le pétrole, des combustibles solides, l'énergie thermique solaire, etc. ou une combinaison de ces sources d'énergie;
- qui sont utilisées dans le cadre d'un **système de commande** ou de **dispositifs de commande** qui sont mécaniquement intégrés à des **dispositifs de commande multifonctions** comportant des sorties non électriques;
- qui utilisent des **thermistances CTN** ou CTP ainsi qu'aux dispositifs à **thermistances** discrètes, dont les exigences sont fournies à l'Annexe J de la Partie 1;
- qui réagissent à des caractéristiques telles que la température, la pression, le passage du temps, l'humidité, la lumière, les effets électrostatiques, le débit ou le niveau d'un liquide, le courant, la tension, l'accélération, ou une combinaison de ces caractéristiques, ou qui les régulent;
- dans lesquelles des **actionneurs** et des corps de **vannes** sont conçus pour être fixés l'un à l'autre;
- ainsi qu'aux dispositifs de commande manuels qui sont électriquement ou mécaniquement intégrés à des dispositifs de commande automatique.

NOTE 2 Les exigences relatives aux interrupteurs mécaniques à action manuelle qui ne font pas partie d'un dispositif de commande automatique sont contenues dans l'IEC 61058-1-1.

Le présent document s'applique:

- à la sécurité intrinsèque des **électrovannes hydrauliques**; et
- à la sécurité fonctionnelle des **électrovannes hydrauliques** et des systèmes de sécurité;
- aux dispositifs de commande pour lesquels les performances (par exemple, l'effet des phénomènes CEM) du produit peuvent compromettre la sécurité et les performances globales du système commandé;
- aux valeurs de fonctionnement, aux temps de fonctionnement et aux séquences de fonctionnement lorsque ces éléments interviennent dans la sécurité du matériel.

Le présent document spécifie les exigences relatives à la construction, au fonctionnement et aux essais des **électrovannes hydrauliques** utilisées dans, sur ou avec du matériel.

Le présent document établit les exigences relatives aux caractéristiques électriques des **vannes hydrauliques** et aux caractéristiques mécaniques des **vannes** qui ont une incidence sur leur fonctionnement prévu.

Le présent document:

- ne s'applique pas aux **électrovannes hydrauliques** destinées exclusivement à des applications de processus industriels, sauf mention particulière dans la Partie 2 applicable ou la norme du matériel. Toutefois, le présent document peut être utilisé pour évaluer les dispositifs de commande électriques automatiques destinés spécifiquement aux applications industrielles lorsqu'il n'existe aucune norme de sécurité pertinente;
- ne s'applique pas aux:
 - **électrovannes hydrauliques** dont la dimension nominale du raccord dépasse le DN 50;
 - **électrovannes hydrauliques** pour lesquelles la **pression nominale** admissible est supérieure à 1,6 MPa;
 - distributeurs de produits alimentaires;
 - distributeurs de détergents;
 - **soupapes** à vapeur;
- ne prend pas en compte la **valeur de réponse** d'une **action automatique** d'une **électrovanne hydraulique**, lorsque cette **valeur de réponse** dépend de la méthode de montage du dispositif de commande dans le matériel. Lorsqu'une **valeur de réponse** est importante du point de vue de la protection de l'**utilisateur** ou de l'environnement, la valeur définie dans la norme de matériel pertinente ou déterminée par le fabricant s'applique;
- ne traite pas de l'intégrité du signal de sortie transmis aux dispositifs de réseau, comme l'interopérabilité avec d'autres dispositifs, à moins qu'elle ait été évaluée comme partie intégrante du système de commande;
- ne couvre pas la prévention de la contamination de l'eau potable à la suite d'un contact avec les matériaux.

Dans l'ensemble du présent document, lorsqu'il peut être utilisé sans ambiguïté:

- le terme "**vanne**" est utilisé pour désigner une **électrovanne hydraulique** (y compris l'**actionneur** et l'**ensemble corps de vanne**);
- le terme "**actionneur**" signifie "mécanisme à commande électrique ou moteur primaire";
- le terme "**corps de vanne**" signifie "**ensemble corps de vanne**";
- le terme "matériel" signifie "appareil" et "système de commande".

2 Références normatives

L'article de la Partie 1 s'applique, avec l'exception suivante.

Addition:

IEC 60730-1:2022, *Dispositifs de commande électrique automatiques – Partie 1: Exigences générales*

ISO 7-1:1994, *Filetages de tuyauteries pour raccordement avec étanchéité dans le filet – Partie 1: Dimensions, tolérances et désignation*

ISO 65:1981, *Tubes en acier au carbone filetables selon ISO 7-1*¹

ISO 228-1:2000, *Filetages de tuyauterie pour raccordement sans étanchéité dans le filet – Partie 1: Dimensions, tolérances et désignation*

ISO 630-2:2011, *Aciers de construction – Partie 2: Conditions techniques de livraison pour aciers de construction métallique d'usage général*²

ISO 1179-1:2013, *Raccordements pour applications générales et transmissions hydrauliques et pneumatiques – Orifices et éléments mâles à filetage ISO 228-1 à joint en élastomère ou étanchéité métal sur métal – Partie 1: Orifices filetés*

ISO 4144:2003, *Tuyauteries – Raccords en acier inoxydable, filetés conformément à l'ISO 7-1*

¹ Supprimée.

² Supprimée. Une édition plus récente a été publiée en 2021, mais l'édition répertoriée s'applique.