UL 60730-2-8

STANDARD FOR SAFETY

Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements

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UL Standard for Safety for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements, UL 60730-2-8

Second Edition, Dated February 28, 2007

Summary of Topics

These revisions to ANSI/UL 60730-2-8 are based on the second amendment to edition No. 2 of IEC 60730-2-8.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated February 3, 2017.

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UL 60730-2-8

Standard for Automatic Electrical Controls for Household and Similar Use;

Part 2: Particular Requirements for Electrically Operated Water Valves,

Including Mechanical Requirements

The first edition was titled Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements and numbered UL 8730-2-8.

First Edition – June, 1995

Second Edition

February 28, 2007

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through May 10, 2017.

The most recent designation of ANSI/UL 60730-2-8 as an American National Standard (ANSI) occurred on May 10, 2017. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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Preface (UL)

This UL Standard 60730-2-8, Standard for Safety for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements, is to be used in conjunction with the fourth edition of UL 60730-1. Consideration may be given to future editions of UL 60730-1. The requirements for electrically operated water valves are contained in this part 2 Standard and UL 60730-1.

This edition has been issued to satisfy UL Standards policy.

Requirements of this part 2 Standard, where stated, amend the requirements of UL 60730-1.

Where a particular subclause of UL 60730-1 is not mentioned in UL 60730-2-8, the UL 60730-1 subclause applies.

The text, figures and tables of IEC Publication Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements, IEC 60730-2-8 copyright 2000, its amendment 1 (2002), and its amendment 2 (2015), are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI).

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Note – Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.

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NATIONAL DIFFERENCES

GENERAL

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60730-2-8, Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements copyright 2000, its amendment 1 (2002), and its amendment 2 (2015), are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are national differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

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Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE – 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.

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This Consolidated version of IEC 60730-2-8 bears the edition number 2.2. It consists of the second edition (2000-02) [documents 72/428/FDIS and 72/439/RVD], its amendment 1 (2002-11) [documents 72/553/FDIS and 72/557/RVD] and its amendment 2 (2015-11) [documents 72/1011A/FDIS and 72/1025/RVD]. The technical content is identical to the base edition and its amendments.

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 60730-2-8 has been prepared by IEC technical committee 72: Automatic controls for household use.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

This part 2-8 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the fourth edition (2010) of that publication. 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: *Safety 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 ″in some countries″ notes regarding differing national practices are contained in the following elements:

– Table 1, items 113 and 114

– 14.7.4, note 101

– 16.2.1

– 27.2.3.1

– annex CC

– table DD.1.2.1, note 1

– table DD.6, note 1

In this publication:

1) The following print types are used:

– Requirements proper: in roman type.

– *Test specifications: in italic type.*

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– Notes: in smaller roman type.

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under ″http://webstore.iec.ch″ in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

101DV DE *National Difference Deleted.*

102DV DE *Modification of the print types used in the part 2:*

– Words in SMALL ROMAN CAPITALS in the text are defined in clause 2.

103DV DE *Addition to the part 2:*

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

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AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE – Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements

1 Scope and normative references

This clause of part 1 is applicable as follows:

1.1 This part 2-8 applies to electrically operated water valves for use in, on or in association with equipment for household and similar use, including heating, air-conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof.

1.1DV D2 ***Modification of 1.1 of the part 2 by adding the following:***

These requirements do not cover VALVES for marine use.

1.1.1 This part 2-8 applies to the inherent safety, to the operating values, operating times and operating sequences where such are associated with equipment safety, and to the testing of automatic electrical control devices used in, on or in association with, household and similar equipment.

This part 2-8 contains requirements for electrical features of water valves and requirements for mechanical features of valves that affect their intended operation.

This part 2-8 is also applicable to electrically operated water valves for appliances within the scope of IEC 60335.

Electrically operated valves for equipment not intended for normal household use but which may nevertheless be used by the public, such as equipment intended to be used by laymen in shops, in light industry and on farms, are within the scope of this part 2-8.

This part 2-8 does not 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;

– electrically operated water valves designed exclusively for industrial applications.

1.1.1DV DE ***Modification of 1.1.1 of the part 2:***

In the fifth paragraph, sixth dashed item, replace the word “designed” with “intended”.

1.1.2 Throughout this part 2-8, where it can be used unambiguously, the term:

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– “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”.

1.1.3 This part 2-8 also applies to ACTUATORS and to VALVE BODIES which are designed to be fitted to each other.

1.1.4 This part 2-8 applies to individual VALVES, VALVES utilized as part of a system and valves mechanically integral with multi-functional controls having non-electrical outputs.

NOTE Attention is drawn to the fact that, in many countries, additional test requirements and by-laws have been established by the water authorities or companies.

1.5 Normative references

This clause of part 1 is applicable except as follows:

Addition:

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

IEC 60730-1:2010, *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*

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

ISO 630, *Structural steels – Plates, wide flats, bars sections and profiles*

ISO 1179-1, *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, *Pipework – Stainless steel fittings threaded in accordance with ISO 7-1*

ISO 4400, *Fluid power systems and components – Three-pin electrical plug connectors with earth contact – Characteristics and requirements*

ISO 6952, *Fluid power systems and components – Two-pin electrical plug connectors with earth contact – Characteristics and requirements*

2 Definitions

This clause of part 1 is applicable, except as follows:

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2.2 Definitions of types of control according to purpose

2.2.17 ELECTRICALLY OPERATED VALVE

Addition:

NOTE A semi-automatic VALVE that is opened manually and closes automatically or vice versa is also covered by this definition.

Additional definitions:

2.2.17.101 VALVE: device consisting of an ACTUATOR connected to a VALVE BODY ASSEMBLY and used to stop or regulate flow of fluid by the closure or partial closure of an orifice

2.2.17.102 WATER VALVE: VALVE intended to be connected to a water supply and to control water flow

NOTE A WATER VALVE is a TYPE 1 ACTION. Switching devices incorporated in WATER VALVES are TYPE 1 OR 2 ACTIONS.

2.2.17.103 HEATING-WATER VALVE: VALVE intended to control the water circulation in heating systems

2.2.17.104 ACTUATOR: ELECTRICALLY OPERATED MECHANISM or PRIME MOVER used to effect the opening or closing action of a VALVE

NOTE 1 An ACTUATOR may be integral with the VALVE, fixed to the VALVE BODY ASSEMBLY or delivered as a separate component.

NOTE 2 An ACTUATOR may also include the VALVE and CLOSURE MEMBER.

2.2.17.105 VALVE BODY ASSEMBLY: assembly comprising the VALVE BODY, inlet and outlet END CONNECTIONS, the VALVE SEAT, CLOSURE MEMBER and STEM or shaft

NOTE In some cases, the STEM and CLOSURE MEMBER may be part of the ACTUATOR.

2.2.17.106 VALVE BODY: part of the VALVE BODY ASSEMBLY which is the main pressure boundary. It provides the water flow passage-ways with END CONNECTIONS

2.2.17.107 NOMINAL SIZE: numerical designation of size which is common to all components in a fluid-conducting system other than components designated by outside diameter or by thread size

NOTE 1 It may be designated by "DN" followed by a convenient round number, for reference purposes only.

NOTE 2 Some older international standards refer to NOMINAL SIZE as nominal diameter but, for the purpose of this standard, the two terms are synonymous.

2.2.17.108 NOMINAL PRESSURE RATING: numerical designation of pressure rating

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NOTE It may be designated by the letters "PN" (also referred to as the pressure number) followed by a convenient round number, for reference purposes only.

2.2.17.109 END CONNECTION: VALVE BODY configuration provided to make a pressure-tight joint to the fluid-conducting system

2.2.17.110 VALVE SEAT: surface of the orifice within the VALVE which makes full contact with the CLOSURE MEMBER

2.2.17.111 CLOSURE MEMBER: movable part of the VALVE which is positioned in the flow path to modify the rate of flow through the VALVE

NOTE A CLOSURE MEMBER may be a plug, ball, disc, vane, gate, etc.

2.2.17.112 STEM: component which connects the ACTUATOR to, and positions, the CLOSURE MEMBER

NOTE 1 For rotary VALVES the word "shaft" should be used in place of "STEM".

NOTE 2 In some controls the STEM may be part of the ACTUATOR.

2.2.17.113 FITTING: any device such as a reducer, expander, elbow, or T-piece which is attached directly to an end-connection of the VALVE BODY ASSEMBLY

2.2.17.114DV D2 *Addition to the UL part 2:*

SAFETY VALVE: A normally closed valve intended to be actuated by a safety control or by an emergency device to prevent the delivery of a fluid that can result in risk of fire.

2.3 Definitions relating to the function of controls

2.3.29

Amend the existing definition as follows:

Delete "(MAXIMUM RATED PRESSURE)".

Additional definitions:

2.3.101 ON-OFF VALVE: VALVE which is open or closed, without any INTERMEDIATE POSITIONS

2.3.102 NORMALLY CLOSED VALVE: VALVE which is closed when not electrically energized

2.3.103 NORMALLY OPEN VALVE: VALVE which is open when not electrically energized

2.3.104 MODULATING VALVE: VALVE which has a variable FLOW RATE between predetermined flow limits

2.3.105 DIVERTING VALVE: VALVE with one or more inputs and outputs which may permit flow from any combination of inputs to outputs

2.3.106 CLOSED POSITION: position of the CLOSURE MEMBER when there is no water flow from the outlet side of the VALVE

2.3.107 TRAVEL: displacement of the CLOSURE MEMBER from the CLOSED POSITION

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2.3.108 RATED TRAVEL: displacement of the CLOSURE MEMBER from the CLOSED POSITION to the FULL OPEN POSITION

2.3.109 OPEN POSITION: position of the CLOSURE MEMBER when there is a flow of water from the outlet side of the VALVE

2.3.110 FULLY OPEN POSITION: position of the CLOSURE MEMBER so that the amount of water flowing through the VALVE is in accordance with the RATED FLOW RATE

2.3.111 FLOW RATE: volume of water flowing through the VALVE in unit time

2.3.112 RATED FLOW RATE: FLOW RATE at the RATED TRAVEL under standard reference conditions of temperature and pressure declared at a given pressure difference

2.3.113 FLOW FACTOR: factor specifying the amount of water which can pass through the VALVE at a specified pressure difference

NOTE 1 The FLOW FACTOR may be referred to as flow coefficient.

NOTE 2 The relationship between the different FLOW FACTORS in use is indicated in annex AA.

2.3.114 MAXIMUM OPERATING PRESSURE DIFFERENTIAL: declared maximum difference in pressure between inlet and outlet ports of the VALVE against which the ACTUATOR can operate the CLOSURE MEMBER

2.3.115 MINIMUM OPERATING PRESSURE DIFFERENTIAL: declared minimum pressure difference at which the VALVE opens or closes

2.3.116 Void

2.3.117 WATER HAMMER: excessive TRANSIENT PRESSURE which can occur in some water supply systems as a result of closing a VALVE as intended

2.3.118 TRANSIENT PRESSURE: short-time pressure surge exceeding the normal stable supply pressure in the closed condition of the VALVE

2.3.119 VALVE WITH ANTI-WATER-HAMMER CHARACTERISTICS: VALVE that does not cause an excessive pressure drop when opening and no excessive TRANSIENT PRESSURE when closing if connected directly, without special precautions to water supply mains applications where WATER-HAMMER may occur

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2.13 Miscellaneous definitions

Additional definitions:

2.13.101 DRINKING-WATER: water supply which is intended to be suitable for human consumption

NOTE In some standards, "DRINKING-WATER" is referred to as "potable water".

2.13.102 NON-DRINKING-WATER: water supply which is not intended for human consumption

3 General requirements

This clause of part 1 is applicable.

4 General notes on tests

This clause of part 1 is applicable, except as follows:

4.1 Conditions of test

4.1.2 Addition:

Unless otherwise specified in this standard, water temperature for the tests shall be maintained at a temperature of (20 ±5)°C.

4.2 Samples required

4.2.1 Addition:

One sample is required for each test of clause 27.

NOTE By agreement between manufacturer and testing authority, one sample may be submitted to more than one test.

5 Rating

This clause of part 1 is applicable.

6 Classification

This clause of part 1 is applicable, except as follows:

6.3.12 – ELECTRICALLY OPERATED VALVE

Addition:

6.3.12.101 – WATER VALVE

6.5.2 According to degree of protection provided by enclosures against harmful ingress of water (see IEC 60529)

Replacement of the second explanatory paragraph as follows:

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NOTE Preferred degrees of protection provided by enclosures are:

IP20, IP30, IP40, IP54, IP65.

Values differing from these preferred values are allowed.

6.7 According to ambient temperature limits of the switch head:

Modification:

Read "VALVE" for "control" and "ACTUATOR" for "SWITCH HEAD".

6.8 According to protection against electric shock:

6.8.3 *Replacement:*

For an INDEPENDENTLY mounted VALVE or a VALVE integrated or incorporated in an assembly utilizing a non-electrical source:

6.10 Not applicable.

6.11 *Addition:*

WATER VALVES shall be subjected to a minimum of 6 000 automatic cycles.

6.12DV D2 *Deletion of 6.12 of the part 1:*

This clause is not applicable.

6.16DV D2 *Deletion of 6.16 of the part 1:*

This clause is not applicable.

Additional subclauses:

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6.101 According to type of end-connections

6.101.1 VALVES provided with internally threaded end-connections with either:

ISO 7-1 or NPT thread when pressure-tight joints are made on the thread, or

ISO 228-1 thread when pressure-tight joints are not made on the thread, but via an additional sealing washer.

6.101.2 VALVES provided with externally threaded end-connections for:

a) compression FITTINGS, or

b) washered union connection, or

c) cone seated union connection, or

d) threaded pipe connections either according to ISO 7-1, ISO 228-1 or NPT thread.

6.101.3 VALVES provided with flanged end-connections suitable for connection to flanges with or without adaptors.

6.101.4 VALVES provided with end-connections with neck-end for soldered or welded connections.

6.101.5 VALVES provided with end-connections with hose tails for use with flexible tubing.

6.102 According to features of electrically operated WATER VALVES

6.102.1 According to the size and capacity:

Size and capacity to be specified in dimension of inlet and outlet connections and FLOW FACTOR.

6.102.2 According to the type of OPERATION:

Direct or pilot controlled with or without minimum pressure differential limit.

6.102.3 According to function:

Description of function regarding the number of water connections and the VALVE position when de-energized.

6.102.4 According to material of wetted parts:

Includes the material identification of all internal parts in contact with water such as the body and the sealing material.

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6.102.5 According to construction of the CLOSURE MEMBER*:*

The VALVE may be a direct operated or pilot VALVE controlled diaphragm or piston-operated poppet type or spool type closing member.

6.102.6 According to construction of the ACTUATOR*:*

Examples are: electromagnetic; electric motor; electrically heated wax or bi-metal controlled ACTUATOR with ACTUATOR STEM in contact with or shielded from the water.

6.103 According to temperature, pressure and type of the water controlled

VALVES for controlling:

6.103.1 Cold DRINKING-WATER supply with a maximum temperature of 25°C;

6.103.2 Hot DRINKING-WATER supply with a maximum temperature of 90°C;

6.103.3 Cold NON-DRINKING-WATER supply with a maximum temperature of 25°C;

6.103.4 Hot NON-DRINKING-WATER supply with a maximum temperature of 90°C;

6.103.5 Circulation heating water with a maximum temperature of between 50°C and 120°C;

Replacement:

6.103.6 Water with a maximum rated temperature other than indicated above;

6.103.7 Water flow in systems with a maximum pressure of 0,1 MPa;

6.103.8 Water flow in systems with a maximum pressure of 0,6 MPa;

6.103.9 Water flow in systems with a maximum pressure of 0,86 MPa;

6.103.10 Water flow in systems with a maximum pressure of 1,0 MPa;

6.103.11 Water flow in systems with a maximum pressure of 1,6 MPa;

Additional subclause:

6.103.12 Water flow in systems with a maximum system pressure other than indicated above.

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6.104 According to NOMINAL SIZE and thread size of END CONNECTIONS

Designation of thread	NOMINAL SIZE
1/8	DN 6
1/4	DN 8
3/8	DN 10
1/2	DN 15
3/4	DN 20
1	DN 25
1 1/4	DN 32
1 1/2	DN 40
2	DN 50
NOTE The designation “DN” followed by the appropriate convenient round number is normally only loosely related to manufacturing dimensions and corresponds for reference purposes only approximately to the internal diameter, expressed in millimetres of the water system.	

7 Information

This clause of part 1 is applicable, except as follows:

Modification:

Replace the following items by:

Table 1

Requirement	Information	Clause or subclause	Method
7	The type of load controlled by each circuit (for VALVES with switching devices) 7)	6.2, 14, 17, 23.1.1	C
22	Temperature limits of the ACTUATOR, if T_{min} lower than 0°C, or T_{MAX} other than 55°C	6.7, 14.5, 14.7, 17.3	D
26	Not applicable		
28	Not applicable		
29	Type of disconnection or interruption provided by each circuit (for VALVES with switching devices)	6.9, 2.4	X
36 to 38	Not applicable		
39	TYPE 1 OR TYPE 2 ACTION(for VALVES with switching devices) 101)	6.4	D
40	Additional features of TYPE 1 OR TYPE 2 ACTIONS(for VALVES with switching devices) 101)	6.4.3, 11.4	D
41	MANUFACTURING DEVIATION and condition of test appropriate to deviation (for VALVES with switching devices)	11.4.3, 15, 17.14, 2.11.1	X
42	DRIFT(for VALVES with switching devices)	11.4.3, 15, 2.11.2	X
43 to 44	Not applicable		
47	Not applicable		
49	Control POLLUTION situation of ACTUATOR	6.5.3	D
Add the following additional items:			
101	Power consumption in watts or in VA or current rating		C
102	MAXIMUM OPERATING PRESSURE DIFFERENTIAL in MPa (or in bar)	2.3.114	D

Table 1 Continued on Next Page

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Table 1 Continued

Requirement	Information	Clause or subclause	Method
103	MINIMUM OPERATING PRESSURE DIFFERENTIAL in MPa (or in bar)	2.3.115	D
104	MAXIMUM WORKING PRESSURE in MPa (or in bar)	2.3.29, 6.103	D
105	Flow direction indicated by an arrow (on VALVE BODY)		C
106	Maximum water temperature in °C	6.103	D
107	Suitable for DRINKING-WATER or NON-DRINKING-WATER	6.103, 18.102	D
108	For VALVES intended to be cleaned in NORMAL USE, the method of disassembling, cleaning, reassembling and maintenance	18.1.101	D
109	If VALVE is intended to be used in water supply installations where WATER HAMMER may occur and test method per Annex BB or EE	18.101.3	X
110	Material identification of wetted parts	6.102.4	X
111	VALVE features	6.101, 6.102	D
112	Plastic VALVES intended to be hand-tightened	18.103.5	D
113	VALVES incorporated in those household appliances covered by the IEC 60335 series where the loss of water supply or dry VALVE is considered as an abnormal use condition.[102)]	14.5.107, 27.101	D
114	For VALVES identified under item 113, details of any limitation of OPERATING TIME(DUTY CYCLE).[103)]	27.101.2	D
115	Water valve intended to be used in accordance with IEC 60335	18.101.3	D

[101)] The WATER VALVE itself is TYPE 1 ACTION.

[102)] Not applicable in Canada, Japan and the USA.

[103)] Not applicable in Canada, Japan and the USA.

Table 1DV D2 *Modification of table 1 of the part 2 by replacing it with the following:*

Table 1DV

Requirement	Information	Clause or subclause	Method
Modification:			
Replace the following items by:			
7	**The type of load controlled by each circuit (for VALVES with switching devices) [7)]**	**6.2, 14, 17, 23.1.1**	**C**
22	**Temperature limits of the ACTUATOR, if T_{min} lower than 0°C, or T_{MAX} other than 55°C**	**6.7, 14.5, 14.7, 17.3**	**D**
26	**Not applicable**		
28	**Not applicable**		
29	**Type of disconnection or interruption provided by each circuit (for VALVES with switching devices)**	**6.9, 2.4**	**X**
34	**Details of any limitation of OPERATING TIME**	**14, 17**	**C**
36 to 38	**Not applicable**		
39	**TYPE 1 OR TYPE 2 ACTION(for VALVES with switching devices) [101)]**	**6.4**	**D**
40	**Additional features of TYPE 1 OR TYPE 2 ACTIONS (for VALVES with switching devices) [101)]**	**6.4.3, 11.4**	**D**

Table 1DV Continued on Next Page

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Table 1DV Continued

Requirement	Information	Clause or subclause	Method
41	MANUFACTURING DEVIATION and condition of test appropriate to deviation (for VALVES with switching devices)	11.4.3, 15, 17.14, 2.11.1	X
42	DRIFT (for VALVES with switching devices)	11.4.3, 15, 2.11.2	X
43 to 44	Not applicable		
47	Not applicable		
49	Control POLLUTION situation of ACTUATOR	6.5.3	D
Add the following additional items:			
101	Power consumption in watts or in VA or current rating		C
102	MAXIMUM OPERATING PRESSURE DIFFERENTIAL in Psi	2.3.114	D
103	MINIMUM OPERATING PRESSURE DIFFERENTIAL in Psi	2.3.115	D
104	MAXIMUM WORKING PRESSURE in Psi	2.3.29, 6.103	D
105	Flow direction indicated by an arrow		C
106	Maximum water temperature in °C	6.103	D
107	Suitable for DRINKING-WATER or NON-DRINKING-WATER	6.103, 18.102	D
108	For VALVES intended to be cleaned in NORMAL USE, the method of disassembling, cleaning, reassembling and maintenance	18.101.1	D
109	If a VALVE is intended to be used in water supply installations where WATER HAMMER may occur and test method per annex BB or EE	18.101.3	X
110	Material identification of wetted parts	6.102.4	X
111	VALVE features	6.101, 6.102	D
112	Plastic VALVES intended to be hand-tightened	18.103.5	D
113	VALVES incorporated in those household appliances covered by the IEC 60335 series where the loss of water supply or dry VALVE is considered as an abnormal use condition. [102)]	14.5.107, 27.101	D
114	For VALVES identified under item 113, details of any limitation of OPERATING TIME(DUTY CYCLE). [103)]	27.101.2	D
115	A VALVE intended for a water circulating system of a swimming pool	9.5.101DV.1	C

NOTES

[3)] Not applicable

[4)] Not applicable

[101)] The WATER VALVE itself is TYPE 1 ACTION.

[102)] Not applicable in Canada, Japan and the USA.

[103)] Not applicable in Canada, Japan and the USA.

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7.4 Additional requirements for marking

This clause of part 1 is applicable except as follows:

7.4.3DV D2 *Deletion of 7.4.3 of the part 1:*

This clause is not applicable.

7.4.4 is not applicable

7.4.4DV D2 *National Difference deleted*

8 Protection against electric shock

This clause of part 1 is applicable, except as follows:

8.1.4 Addition:

For class II WATER VALVES, REINFORCED INSULATION shall not be in direct contact with the water.

Additional subclause:

8.1.101 VALVES which are declared capable of being cleaned in NORMAL USE shall be so constructed that there is adequate protection against accidental contact with LIVE PARTS during cleaning.

Compliance is checked by INSPECTION and by a simulated cleaning OPERATION as described below:

If the ACTUATOR can be removed from the VALVE BODY ASSEMBLY without disconnecting the electrical wiring the removed ACTUATOR shall still meet the requirements for its class of construction. Removal shall not affect electrical characteristics.

If the ACTUATOR can only be removed from the VALVE BODY ASSEMBLY after removing the electrical wiring:

a) the INSPECTION and simulated cleaning OPERATION shall be made in accordance with the manufacturer's instructions in the documentation.

b) if a plug connector is used this removal shall be impossible before the plug connector is disconnected. Plug connectors for ACTUATORS with earth connection shall be so designed that the disconnection of the electrical supply takes place prior to the disconnection of the earthed wire.

NOTE For plug connectors, reference is made to ISO 4400 and ISO 6952.

9 Provision for protective earthing

This clause of part 1 is applicable.

9.2.101DV D2 *Addition of 9.2.101DV.1 and 9.2.101DV.2 to the part 2:*

9.2.101DV.1 A single point reference ground may be employed in a low-voltage circuit if current is not carried through the equipment grounding means, metallic raceway, power supply grounding means, or the earth ground.

9.2.101DV.2 Compliance is checked by INSPECTION.

9.5.101DV D2 *Addition of 9.5.101DV.1 to the part 2:*

9.5.101DV.1 Swimming pool VALVE

9.5.101DV.1.1 VALVES marked "swimming pool VALVE" (Table 1 item 113) shall be provided with a wire connector securely mounted to the outside of the VALVE housing for the connection of a minimum No. 8 AWG solid copper wire.

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9.5.101DV.1.2 Compliance is checked by INSPECTION.

10 Terminals and TERMINATIONS

This clause of part 1 is applicable, except as follows:

10.1 Terminals and TERMINATIONS for external copper conductors

10.1.1.1 Delete the last explanatory paragraph.

10.1.16 Replace the first sentence by:

Where FLYING LEAD (PIG TAIL) connections are used, the lead or leads shall be no smaller than 0,75 mm^2 with insulation having a nominal thickness not less than 0,6 mm and shall be a minimum of 450 mm long as measured from the coil to the end of the lead, except if the FLYING LEAD is intended to be connected to the wiring within the VALVE enclosure, the FLYING LEAD shall be at least 150 mm long.

10.1.16.1 Replace the first sentence by:

FLYING LEADS shall be provided with strain relief for attachment method Z to prevent mechanical stress from being transmitted to terminals for internal wiring.

Compliance is checked by INSPECTION and by applying a pull of 44 N for 1 min. During the pull the lead shall not be damaged and shall not have been displaced longitudinally by more than 2 mm after the test. CREEPAGE DISTANCES and CLEARANCES shall not have been reduced to less than the value specified in clause 20.

10.2 Terminals and TERMINATIONS for INTERNAL CONDUCTORS

Addition:

NOTE 1 The requirements of 10.2 also apply to terminals and TERMINATIONS of controls which are intended to be used for internal wiring which is external to the equipment.

NOTE 2 The requirements of 10.2 apply to terminals and TERMINATIONS deliberately designed to accept special connectors such as the plug connectors described in ISO 4400 and ISO 6952.

NOTE 3 The requirements of 10.2 apply to terminals and TERMINATIONS deliberately designed for connection of PILOT DUTY loads.

11 Constructional requirements

This clause of part 1 is applicable, except as follows:

11.3 *Modification:*

For “controls” read “VALVES with auxiliary switches” throughout the whole of this subclause.

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11.3.9 *Replacement:*

11.3.9.1 OPERATION of a manually actuated mechanism of a VALVE shall not subject parts to distortion or damage to the extent that their intended function is impaired.

Compliance is checked by OPERATION and INSPECTION.

11.3.9.2 Operating parts shall be separated from conductors to be connected to the VALVE by barriers or by their physical location so that such operating parts are not obstructed by stowed wiring.

Compliance is checked by OPERATION and INSPECTION.

11.4.15DV D2 *Deletion of 11.4.15 of the part 1:*

This clause is not applicable.

11.9.3.101DV D2 *Addition to the part 2:*

An inlet bushing may be used for a low-voltage VALVE connected to a non-safety control circuit or for a VALVE intended for use only within other equipment and where the VALVE is provided with leads of flexible cord not smaller than Type P-1 or with insulated conductors having not less than 1,2 mm thick insulation. The surface against which such leads may bear shall be rounded.

Additional subclause:

11.101 Separation of wetted parts from electrical parts

There shall be no leakage of water to the electrical parts.

Compliance is checked by INSPECTION after the pressure test of 18.101.1.

11.102DV D2 *Addition to the part 2:*

11.102DV.1 Springs

11.102DV.1.1 A spring shall be protected against abrasion and shall be guided or arranged to reduce the likelihood of binding, buckling, or other interference with its free movement.

11.102DV.1.2 Compliance is checked by OPERATION, INSPECTION and the requirements of Clause 17.

11.103DV D2 *Addition to the part 2:*

11.103DV.1 Metal parts

11.103DV.1.1 A metal part coming in contact with a diaphragm shall have no sharp edges, burrs, projections, and the like that may chafe or abrade the diaphragm.

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11.103DV.1.2 Compliance is checked by INSPECTION.

11.104DV D2 *Addition to the part 2:*

11.104DV.1 Threaded fasteners

11.104DV.1.1 If threaded fasteners attach operating parts to movable members, they shall be locked or otherwise prevented from loosening.

***11.104DV.1.2 Compliance is checked by OPERATION*, INSPECTION and the requirements of Clause 17.**

12 Moisture and dust resistance

This clause of part 1 is applicable.

12.2DV D2 *Deletion of 12.2 of the part 1:*

This clause is not applicable.

13 Electric strength and insulation resistance

This clause of part 1 is applicable.

14 Heating

This clause of part 1 is applicable, except as follows:

Replacement:

14.4.3.1 Not applicable.

Additional subclauses:

14.4.101 If stalling of the motorized electric ACTUATOR drive shaft is part of normal OPERATION, then the drive shaft of motorized ACTUATORS shall be stalled and temperatures measured after steady-state conditions are reached. The temperatures shall comply with the values of Table 13. In addition, if any protective device provided does not cycle under stalled conditions, then the electric ACTUATOR is also considered to comply with the requirements of 27.2.3 and 27.2.101 if applicable.

14.4.102 If stalling of the motorized electric ACTUATOR drive shaft is not part of normal OPERATION, then the values of Table 13 do not apply during stalling. The electric ACTUATOR shall comply with the requirements of 27.2.3 and 27.2.101 if applicable.

14.5 Replacement:

ACTUATORS of VALVES are tested at room temperature or in appropriate heating and/or refrigerating apparatus and fitted such that the conditions in 14.5.1, 14.5.2, 14.5.101 to 14.5.104, and 14.5.107 are obtained.

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14.5.1 For the test of 14.5.7 the ambient temperature of the ACTUATOR is maintained in the range of 15°C to 30°C, the resulting measured temperature being corrected to a 25°C reference.

14.5.2 For the test of 14.5.8 the ambient temperature of the ACTUATOR is maintained at T_{MAX}.

14.5.101 If the VALVE includes switching devices or other auxiliary circuits, all such circuits shall be loaded to carry rated current during the temperature test.

14.5.102 A MODULATING VALVE shall be caused to execute successive complete cycles of the modulating action for which it is designed until constant temperatures are reached. The time between successive cycles is chosen in accordance with the manufacturer's specifications.

14.5.103 A VALVE intended for rapid repeated OPERATION shall be energized and de-energized at the maximum rate of OPERATION for which it is intended until constant temperatures are reached.

14.5.104 The temperature rise of the motor of a motor-operated VALVE when stalled shall not exceed the values specified in Table 13 if stalling is part of normal OPERATION.

14.5.104DV D2 *Modification of 14.5.104 by adding the following:*

If stalling of the motor is not part of the normal OPERATION, the limits in Table 13 do not apply. The motor, when stalled or otherwise operated with a blocked VALVE STEM, shall comply with the test of Clause 27.2.

14.5.105 For VALVES intended for use at room temperature and for VALVES handling cold water up to 25°C, a 30 cm length of iron or copper pipe of the correct size shall be fitted in the inlet and outlet openings of the VALVE under test. The pipe shall be arranged as a framework so that the VALVE will be mounted or suspended away from other heat-conduction bodies. The end of the pipes need not be plugged.

NOTE This test does not apply to VALVES identified under requirement 113 of Table 1.

14.5.105DV D2 *Modification of 14.5.105 by adding the following:*

In addition, openings for the connection of metal-clad cable or rigid conduit shall be provided with at least 1-foot length of conduit or metal-clad cable through which leads of the VALVE are to be carried.

14.5.106 VALVES intended for handling hot water shall be tested with the hot water connected and with and without the hot water flowing through the VALVE at the highest declared temperature.

NOTE This test does not apply to VALVES identified under requirement 113 of Table 1.

14.5.107 VALVES identified under requirement 113 of Table 1 are tested at their declared operating conditions (for instance: T_{MAX}, MAXIMUM WORKING PRESSURE, considering any declared limitation of the OPERATING TIME) with the water connected and flowing through the VALVE at its highest declared temperature.

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14.7.4 Addition to Table 13:

Add:

"[101)]" *to the third value of "85" in the last column of Table 13 against:* "All accessible surfaces except those of ACTUATING MEMBERS, handles, knob grips and the like".

Addition to the notes of Table 13:

[101)] This value is increased to 110°C (120°C in some countries) for the surface of VALVES and the like to be mounted on the pipes of central heating systems.

15 MANUFACTURING DEVIATION and DRIFT

This clause of part 1 is applicable to VALVES with type 2 switching devices.

16 Environmental stress

This clause of part 1 is applicable, except as follows:

16.2 Environmental stress of temperature

16.2.1 Replacement:

The effect of temperature is tested as follows:

The VALVE BODY and ACTUATOR being repacked for dispatching as delivered by the VALVE manufacturer shall be maintained at a temperature of (-10 ±2)°C for a period of 24 h, and then at a temperature of (50 ±5)°C for a period of 4 h.

NOTE In some countries, a temperature of (-40 ±2)°C is used instead of (-10 ±2)°C.

During the environmental stress the VALVE or ACTUATOR is not energized.

16.2.2 Replacement:

The VALVE or ACTUATOR is considered to withstand the environmental stress if it functions in the intended and declared manner after this test.

17 Endurance

This clause of part 1 is applicable, except as follows:

17.1.1 Addition:

Compliance is checked by the tests of 17.16.

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17.1.2 Not applicable.

17.1.2.1 Not applicable.

17.3.2DV D2 *Modification of 17.3.2 of the part 1 by adding the following:*

***If T_{min} is less than 0°C, 50% of the tests shall be run at T_{MAX}* and 50% shall be run at T_{min}, using the same sample.**

17.4.3DV D2 *Deletion of 17.4.3 of the part 1:*

This clause is not applicable.

17.7 Over-voltage (or in some countries, overload) test of AUTOMATIC ACTION at accelerated rate

Replacement:

The automatic OPERATION of the VALVE shall be tested by causing the VALVES to operate for the number of automatic OPERATIONS as declared in Table 1, requirement 27. The number of automatic OPERATIONS shall be a minimum of 6 000 or any higher number as required by the application and declared by the manufacturer.

The rate of OPERATION and the method of OPERATION shall be agreed between the testing authority and the manufacturer.

A cycle rate of about 6 cycles/min for a WATER VALVE can be used as guidance. During the test, VALVES are loaded with 1,06 times rated voltage or 1,06 times the upper limit of the rated voltage range or loaded as indicated in 17.2.3.1.

The VALVE shall be tested at

a) the maximum declared ambient temperature. During the test, the heating or cooling effect of the water flow temperature shall not be allowed to cause the ambient temperature to exceed the maximum declared ambient temperature or fall below the minimum declared ambient temperature;

b) the highest declared water flow temperature;

c) the declared MAXIMUM OPERATING PRESSURE DIFFERENTIAL.

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17.16 Test for particular purpose controls

Replacement:

The tests for ELECTRICALLY OPERATED VALVES *are as follows:*

– 17.1 is applicable.

– 17.2 to 17.4 inclusive are applicable to auxiliary switching devices integrated or incorporated in a VALVE*.*

– 17.5 is applicable.

– 17.6 is not applicable.

– 17.7 is applicable as modified in this part 2-8.

– 17.8 to 17.13 inclusive are applicable to auxiliary switching devices integrated or incorporated in the VALVE*.*

– 17.14 is applicable.

– 17.15 is not applicable.

17.16DV D2 *Modification of 17.16 of the part 2 by adding the following:*

If the VALVE includes an auxiliary switching device, the endurance test shall be conducted for 6 000 cycles.

18 Mechanical strength

This clause of part 1 is applicable, except as follows:

18.2DV D2 *Deletion of 18.2 of the part 1:*

This clause is not applicable. See 18.4.

18.9.4DV.1 D2 *Deletion of 18.9.4DV.1 of the UL part 1:*

This clause is not applicable.

Additional subclauses:

18.101 VALVES *shall withstand the water pressure occurring in* NORMAL USE*.*

Compliance is checked by the following tests

18.101.1 Test at 1,5 times maximum rated working pressure (test for external leakage)

After the endurance test of 17.7, the VALVE *in* OPEN POSITION *with outlet sealed is subjected on the inlet side during 1 h to a static water pressure equal to 1,5 times the declared* MAXIMUM WORKING PRESSURE*.*

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In the case of diaphragm elements that, in normal usage are subjected to water pressure on both sides of the diaphragm, the pressure shall be applied slowly and without shock to avoid excessively stressing the diaphragm. After the test, INSPECTION shall show that no leakage of water of more than 5 cm^3/h has occurred and that the VALVE is still operating as intended.

18.101.2 Test at 5 times maximum rated working pressure (hydrostatic strength test)

After the torque test of 18.103 which is conducted on a separate sample, this sample is subjected for 1 min to a water pressure 5 times the declared MAXIMUM WORKING PRESSURE under the same conditions as indicated in 18.101.1. External water leakage observed during this test is acceptable if, following this hydrostatic test, the VALVE complies with the external leakage requirements of 18.101.1.

18.101.3 Anti-WATER HAMMER characteristics

WATER VALVES with declared anti-WATER HAMMER characteristics intended to be connected directly to water supply mains shall not cause an excessive pressure drop when opening, or an excessive TRANSIENT PRESSURE when closing.

Compliance is checked by carrying out the tests of 18.101.3.1 to 18.101.3.3, inclusive according to the arrangement of annex BB. Annex EE can be used as an alternative method of test for WATER HAMMER for WATER VALVES connected to water supply mains with MAXIMUM WORKING PRESSURE up to and including 1,0 MPa (10 bar) for WATER VALVES intended for use in appliances within the scope of IEC 60335-1, if declared, in Table 1, requirement 115.

NOTE 1 In most countries, WATER HAMMER does not usually occur due to water installation requirements and special precautions based on plumbing practices.

NOTE 2 In general, WATER VALVES with end-connection sizes up to DN 15 used in equipment connected via a hose to the water supply mains piping will not cause a WATER HAMMER that can damage water conducting systems or equipment.

18.101.3.1 Pressure drop at low supply pressure

For determining the pressure drop at low supply pressure, the pressure at the VALVE inlet with the WATER VALVE(see annex BB, item 15 or annex EE, VALVE 10) under test in OPEN POSITION, is adjusted to 0,1 MPa (1 bar) by regulating VALVE 3 (see annex BB) or pump 2 (see annex EE). The WATER VALVE is then closed and after 20 s opened again. The pressure shall at no time become negative.

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18.101.3.2 **Pressure drop at rated inlet pressure**

For determining the pressure drop at rated inlet pressure, the pressure at the VALVE inlet, with the WATER VALVE (see annex BB, item 15 or annex EE, VALVE 10) under test in the OPEN POSITION is adjusted to 0,6 MPa (6 bar) by regulating VALVE 3 (see annex BB) or pump 2 (see annex EE). The WATER VALVE is then closed and after 20 s opened again. When the WATER VALVE is opened, the pressure shall at no time become negative.

18.101.3.3 **TRANSIENT PRESSURE at high pressure**

VALVES intended to be connected to the water supply mains shall not cause an excessive TRANSIENT PRESSURE.

Compliance is checked by the following:

The pressure, with the WATER VALVE 15 (see annex BB) or VALVE 10 (see annex EE) in CLOSED POSITION, is adjusted to 0,6 MPa (6 bar) by regulating VALVE 3 or pump 2. The WATER VALVE is then opened and after the flow has become constant closed again. When the WATER VALVE is closed, the pressure shall at no time exceed 0,9 MPa (9 bar).

NOTE This is to reflect increasing usage of smaller pipe sizes in the household water installation system.

18.101.4 Test on VALVE BODIES of thermoplastic material

VALVE BODIES of thermoplastic material shall withstand the thermal conditions to which they may be subjected when used as intended.

Compliance is checked by the following tests:

18.101.4.1 VALVE BODIES of thermoplastic material intended to be connected to the water supply mains shall be checked by carrying out the test as indicated in annex CC.

18.101.4.2 A test is under consideration for VALVE BODIES of thermoplastic material not intended to be connected to the water supply mains. See annex CC.

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18.102 Wetted material specifications

18.102DV D2 *National Difference Deleted*

18.102.1 Wetted materials shall withstand the chemical conditions to which they may be subjected when used as intended.

Compliance is checked by the following tests:

18.102.1.1 **Test for corrosion resistance of materials wetted by DRINKING-WATER**

NOTE Because this test is in general under the control of the water authorities or companies (in most countries part of the local, federal or state government) reference is made to the specifications issued by these national authorities.

18.102.1.2 **Test for corrosion resistance of materials wetted by NON-DRINKING-WATER**

NOTE The method of test is under consideration.

18.102.1.3 **Tests for the effect on DRINKING-WATER quality by wetted materials**

NOTE This test in under the control of the water authorities responsible for the quality of the DRINKING-WATER. Reference in this respect is made to the specifications issued by these authorities.

18.103 Torque

18.103.1 VALVES and their joints shall withstand the stresses to which they may be subjected during installation and SERVICING.

Compliance is checked by the applicable torque tested, as indicated in the following subclauses and in annex DD. After the tests of annex DD, the hydrostatic strength test of 18.101.2 is carried out. There shall be no evidence of loosening of joints, distortion, external leakage beyond the limits of 18.101.2, or other damage.

18.103.2 **VALVES with internal threaded end-connections**

18.103.2.1 Metal VALVES with internal threaded end-connections shall be subjected to the appropriate torque test as indicated in annex DD.

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Thread type	Clause
ISO 7-1	DD.1
ISO 228-1	DD.2
ISO metric for compression FITTINGS	DD.3
NPT	DD.7
SAE	DD.8

NOTE Torque values for plastic VALVES with internal threaded end-connections are under consideration.

18.103.3 **VALVES with external threaded end-connections**

18.103.3.1 Metal VALVES with external threaded end-connections shall be subjected to the appropriate torque test as indicated in annex DD.

Thread type	Clause
ISO 7-1	DD.4
ISO 228-1	DD.5
ISO metric for compression FITTINGS	DD.5
NPT	DD.7
SAE	DD.8

NOTE Torque values for plastic VALVES with internal threaded end-connections are under consideration.

18.103.3.1DV DE *Modification of 18.103.3.1 of the part 2:*

In the note, replace "internal" with "external."

18.103.4 **VALVES with end-connections for adaptors**

Metal VALVES with end-connections for use with adaptors are subjected to the torque test specified in clause DD.6.

18.103.5 The following VALVES are not subjected to a torque test:

Plastic VALVES with internal or external threaded end-connections intended to be hand-tightened (see Table 1, requirement 112);

Metal VALVES with flanged end-connections;

VALVES with end-connections for hose tail or slip-fit connections and for use with flexible tubing;

Metal VALVES with end-connections for soldered or brazed connections.

19 Threaded parts and connections

This clause of part 1 is applicable.

20 CREEPAGE DISTANCES, CLEARANCES and distances through insulation

This clause of part 1 is applicable.

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21 Resistance to heat, fire and tracking

This clause of part 1 is applicable.

22 Resistance to corrosion

This clause of part 1 is applicable.

23 Electromagnetic compatibility (EMC) requirements – emission

This clause of part 1 is applicable.

23DV D2 *Modification of the part 2:*

This clause is not applicable for valves in general-use applications. It is only applicable for safety valves.

24 Components

This clause of part 1 is applicable.

25 Normal OPERATION

See annex H.

26 Electromagnetic compatibility (EMC) requirements – immunity

See annex H.

26DV D2 *Modification of the part 2:*

This clause is not applicable for valves in general-use applications. It is only applicable for safety valves.

27 Abnormal OPERATION

This clause of part 1 is applicable, except as follows:

27.1 See annex H.

27.2 Burnout test

Replacement:

VALVES incorporating solenoids and valves incorporating motors shall withstand the effects of blocking of the VALVE mechanism.

For valves where an external mechanical blockage will not cause an internal overload of the valve due to decoupling of the external blockage to the internal mechanical structure, e.g. a clutch, a blockage of the mechanical parts between the motor and the decoupling means shall be tested.

Compliance is checked by the tests of 27.2.1 and 27.2.2

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27.2.1 The VALVE mechanism is blocked in the position assumed when the VALVE is de-energized. If more than one position is possible, the position which produces the most onerous effects shall be chosen. The VALVE is then energized at rated frequency, rated voltage, room temperature of (20 ±5)°C without water and with no consideration of any limitation of the OPERATING TIME(see Table 1, requirement 34).

The duration of the test is either 7 h; or until an internal protective device, if any, operates; or until burnout, whichever occurs first.

27.2.1DV D2 *Modification of 27.2.1 of the part 1:*

Replace the second sentence with: "The test shall be conducted at rated voltage and with the control grounded. If the VALVE BODY is non-metallic, three samples shall be tested and each shall comply with the requirements of 18.101."

27.2.2

Replacement:

After this test, the VALVE shall comply with items a) to g) of H.27.1.1.3, where applicable.

NOTE The VALVE need not be operative following the test.

27.2.3 Blocked mechanical output test (abnormal temperature test)

Replacement:

Valves with motorized electrical actuators shall withstand the effects of blocked output without exceeding the temperatures indicated in Table 101. Temperatures are measured by the method specified in 14.7.1.

NOTE This test is not conducted on valves which meet the requirements of 14.4.101.

27.2.3.1

Modification:

Replace the first and second paragraph by the following:

Valves are tested for 24 h or until thermal equilibrium has been reached with the output blocked in the most unfavorable position at rated voltage and in a room temperature in the range of 15 °C to 30 °C, the resulting measured temperature being corrected to a 25 °C reference value.

NOTE 1 In Canada and the USA, the test is conducted at the voltages indicated in 17.2.3.1 and 17.2.3.2.

NOTE 2 This test is not applicable to valves identified under requirement 113 of Table 1.

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Table 101 – Maximum winding temperature (for test of blocked output conditions and valves declared under Table 1, item 113)

Condition	Temperature of insulation by class[d] °C							
	A	E	B	F	H	200	220	250
If impedance protected:	150	165	175	190	210	230	250	280
If protected by protective devices:								
during first hour								
– maximum value [a] [b]	200	215	225	240	260	280	300	330
after first hour								
– maximum value [a]	175	190	200	215	235	255	275	305
– arithmetic average [a] [c]	150	165	175	190	210	230	250	280

[a] Applicable to actuators with thermal motor protection.
[b] Applicable to actuators protected by incorporated fuses or thermal cut-outs.
[c] Applicable to actuators with no protection.
[d] These classifications correspond to the thermal classes specified in IEC 60085.

Addition:

27.2.101 **Test on three phase valve**

27.2.101.1 With any one phase disconnected, the valve is operated under normal operation and supplied at rated voltage until thermal equilibrium has been reached.

The temperature of the winding shall not exceed the temperatures indicated in Table 101. Temperatures are measured by the method specified in 14.7.1.

Replacement:

27.3 Overvoltage and undervoltage test

A VALVE shall operate as intended at any voltage within the range of 85% of the minimum rated voltage and 110% of the maximum rated voltage, inclusive.

Compliance is checked by subjecting the VALVE to the following tests at T_{MAX}, maximum water temperature (see Table 1, requirement 106) and MAXIMUM OPERATING PRESSURE DIFFERENTIAL (see Table 1, requirement 102). For this test, any declared limitation of OPERATING TIME (see Table 1, requirement 34) is considered.

The VALVE is subjected to 0,85 V_{Rmin} until equilibrium temperature is reached and then tested immediately for OPERATION at 0,85 V_{Rmin}.

The VALVE is also subjected to 1,1 V_{Rmax} until equilibrium temperature is reached and then tested immediately for OPERATION at 1,1 V_{Rmax} and at rated voltage.

After each test, the VALVE shall operate once as intended.

27.4 See annex H.

Additional subclauses:

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27.101 Dry condition test

VALVES identified under requirement 113 of Table 1 are subjected to the test of 27.101.1.

NOTE This clause is not applicable in Canada, Japan, and the USA.

27.101.1 VALVES shall withstand the abnormal condition occurring in case of loss of the water supply

Compliance is verified by the test of 27.101.2

27.101.2 The WATER VALVE, connected but without water, is energized at rated frequency and rated voltage,

- *at the ambient temperature, and*
- *considering any limitation of the operating time (duty cycle).*

The duration of the test is either 4 h or until the steady temperature state is reached, whichever occurs first.

The temperature measured shall comply with the temperatures indicated in Table 101.

27.102 Running overload

27.102.1 The running overload test is carried out on valves that are intended to be remotely or automatically controlled or liable to be operated continuously in unattended mode if overload protective devices relying on electronic circuits to protect the motor windings, other than those that sense winding temperatures directly, are also subjected to the running overload test.

27.102.2 The valve is operated under normal operation conditions and supplied at rated voltage until steady conditions are established. The load is then increased so that the current through the motor windings is raised by 10 % increments and the valve is operated again until steady conditions are established, the supply voltage being maintained at its original value.

27.102.3 During the test, the winding temperature shall not exceed

– 140 °C, for class 105 (A) winding insulation;

– 155 °C, for class 120 (E) winding insulation;

– 165 °C, for class 130 (B) winding insulation;

– 180 °C, for class 155 (F) winding insulation;

– 200 °C, for class 180 (H) winding insulation;

– 220 °C, for class 200 (N) winding insulation;

– 240 °C, for class 220 (R) winding insulation;

– 270 °C, for class 250 winding insulation.

NOTE If the load cannot be increased in appropriate steps, the motor may be removed from the appliance and tested separately.

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27.102.4 For valves which are used in a continuously operation for longer than 24 h without interruption, the load is again increased and the test is repeated until the protective device operates or the motor stalls.

27.102.5 For valves which are used in operation mode which will not exceed for longer than 24 h without interruption, the test is repeated after the winding temperature has reached environmental temperature conditions. The test will be performed with an increased load so that the current through the motor windings is raised by 10 % increments. The valve is operated again until steady conditions are established, the supply voltage being maintained at its original value. This procedure will be repeated until the protective device operates or the motor stalls.

28 Guidance on the use of ELECTRONIC DISCONNECTION

This clause of part 1 is not applicable.

Figures

The figures of part 1 are applicable.

Annexes

The annexes of part 1 are applicable, except as follows:

Annex H

(normative)

Requirements for ELECTRONIC CONTROLS

This annex of the part 1 is applicable except as follows:

Annex HDV D2 *Modification of Annex H:*

This annex is not applicable for valves in general-use applications. It is only applicable for safety valves.

H.6 Classification

H.6.18 According to software class

H.6.18.1 Not applicable.

H.6.18.2 Not applicable.

H.6.18.3 Not applicable.

H.7 Information

Additional requirements to Table 1:

Requirements 66 to 72, inclusive, are not applicable.

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H.26 Electromagnetic compatibility (EMC) requirements – immunity

This clause of part 1 is applicable, except as follows.

H.26.2.1

H.26.5 Voltage dips and voltage interruptions in the power supply network

H.26.5.3 Test procedure

Addition:

Each test is performed three times.

H.26.5.3.101 Compliance

After the test according to H.26.5.3 of all the voltage dips and the voltage interruption of more than one cycle of the supply waveform, the electric actuator shall provide normal operation.

During the test according to H.26.5.3 of an interruption of one cycle of the supply waveform, the control shall continue to operate after restoration of the supply voltage from the position the electric actuator was in right before the interruption.

H.26.6 Not applicable.

H.26.8 Surge immunity test

H.26.8.3 Test procedure

Addition:

The five pulses in each polarity shall be distributed in the following operating modes:

– 1 pulse in the closed position;

– 3 pulses during energized movement in the most surge sensitive position;

– 1 pulse in the open position.

H.26.8.3.101 Compliance

The valve shall tolerate voltage surges on the mains supply and signal lines, so that, when tested in accordance with H.26.8.3,

a) for the value of severity level 2: it shall continue to function in accordance with the requirements of this standard. No influence to the actual position of the valve is recognized;

b) for the value of severity level 3: for a valve as a protective actuator used as a component of a protective multi-purpose control or system, it shall either perform as in a) or it may stop operating and shall indicate that it has done so to the protective multi-purpose control or system.

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NOTE The acceptability of the indication to the protective multi-purpose control or system is dependent on the application.

H.26.9 Electrical fast transient/burst immunity test

H.26.9.3 Test procedure

Addition:

Operating modes are as follows:

– being in the closed position;

– during energized movement in the most surge sensitive position;

– being in the open position.

H.26.9.3.101 Compliance

The valve shall tolerate electrical fast/transient bursts on the mains supply and signal lines, so that, when tested in accordance with H.26.9.3,

a) for the value of severity level 2: it shall continue to function in accordance with the requirements of this standard. No influence to the actual position of the valve is recognized;

b) for the value of severity level 3: for a valve as a protective actuator used as a component of a protective multi-purpose control or system, it shall either perform as in a) or it may stop operating and shall indicate that it has done so to the protective multi-purpose control or system.

NOTE The acceptability of the indication to the protective multi-purpose control or system is dependent on the application.

Add the following subclause:

H.26.9.101 **Test procedure**

The VALVE is subjected to five tests.

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H.26.11 Electrostatic discharge test

Additional subclauses:

H.26.11.101 Test procedure

The test shall be performed during the following operating modes:

– being in the closed position;

– during energized movement in the most surge sensitive position;

– being in the open position.

H.26.11.102 Compliance

The valve shall tolerate electrostatic discharges on the mains supply and signal lines, so that, when tested in accordance with H.26.11.101,

a) for the value of severity level 3: it shall continue to function in accordance with the requirements of this standard. No influence to the actual position of the valve is recognized;

b) for the value of severity level 4: for a valve as a protective actuator used as a component of a protective multi-purpose control or system, it shall either perform as in a) or it may stop operating and shall indicate that it has done so to the protective multi-purpose control or system.

NOTE The acceptability of the indication to the protective multi-purpose control or system is dependent on the application.

H.26.12 Radio-frequency electromagnetic field immunity

Additional subclauses:

H.26.12.1.101

The test procedure and compliance criteria for H.26.12.2 and H.26.12.3 shall be according H.26.12.1.102 and H.26.12.1.103.

H.26.12.1.102 Test procedure

The test shall be performed during the following operating modes:

– whilst in the closed position;

– during energized movement in the most surge sensitive position;

– whilst in the open position.

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H.26.12.1.103 Compliance

The valve shall tolerate high frequency signals and fields on the mains supply, signal terminals and the enclosure, so that, when tested in accordance with H.26.12.1.102,

a) for the value of severity level 2: it shall continue to function in accordance with the requirements of this standard. No influence to the actual position of the valve is recognized;

b) for the value of severity level 3: for a valve as a protective actuator used as a component of a protective multi-purpose control or system, it shall either perform as in a) or it may stop operating and shall indicate that it has done so to the protective multi-purpose control or system.

NOTE The acceptability of the indication to the protective multi-purpose control or system is dependent on the application.

H.26.13 Test of influence of supply frequency variations

Addition:

This subclause is applicable for a valve as a protective actuator used as a component of a protective multi-purpose control or system where the protective function depends on the supply frequency.

H.26.13.3 Test procedure

Addition:

The travel time to move the electric actuator from the closed position to the open position as well as in the other direction as well as to remain in the final position shall be verified for each of the frequencies of Table H.19.

H.26.13.3.101 Compliance

The percentage of the travel time deviation shall not be higher than the percentage of the frequency variation. A final position shall be maintained.

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H.26.14 Power frequency magnetic field immunity test

Modification:

Replace the second paragraph with the following new paragraph:

Compliance is checked by H.26.14.3.101 after the test of H.26.14.2.

H.26.14.3 Test procedure

Addition:

Operating modes are as follows:

– being in the closed position;

– moving between the closed and open position and vice-a-versa (being in operation);

– being in the open position.

The test shall be performed in all three operating modes.

H.26.14.3.101 Compliance

The electric actuator shall tolerate power frequency magnetic field, so that, when tested in accordance with H.26.14.3,

a) for the value of severity level 2: it shall continue to function in accordance with the requirements of this standard. No influence to the actual position of the electric actuator shall be recognized;

b) for the value of severity level 3: for a valve as a protective actuator used as a component of a protective multi-purpose control or system, it shall either perform as in a) or it may stop operating and shall indicate that is has done so to the protective multi-purpose control or system.

NOTE The acceptability of the indication to the protective multi-purpose control or system is dependent on the application.

Additional annexes:

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Annex AA

(informative)

Relation between different flow coefficients

AA.1 K_v value

The FLOW FACTOR indicated by the symbol K_v, represents the number of cubic metres per hour of water, at a temperature between 5°C and 40°C, that will flow through a VALVE in the FULLY OPEN POSITION at a pressure differential across the VALVE of 100 kPa (1 bar).

AA.2 C_v value

The FLOW FACTOR indicated by the symbol C_v, generally referred to as the flow coefficient represents the number of US gallons (3,785 dm^3) per minute of water, at a temperature between 4,5°C and 37,8°C (40°F and 100°F) that will flow through a VALVE in the FULL OPEN POSITION at a pressure differential across the VALVE of 6,89 kPa (1 lb/in^2).

$$K_v = 0{,}865\ C_v$$

$$C_v = 1{,}16\ K_v$$

If the FLOW FACTOR is indicated in litres per minute, the relation is

K_v = 16,7 times FLOW FACTOR in l/min

C_v = 14,4 times FLOW FACTOR in l/min

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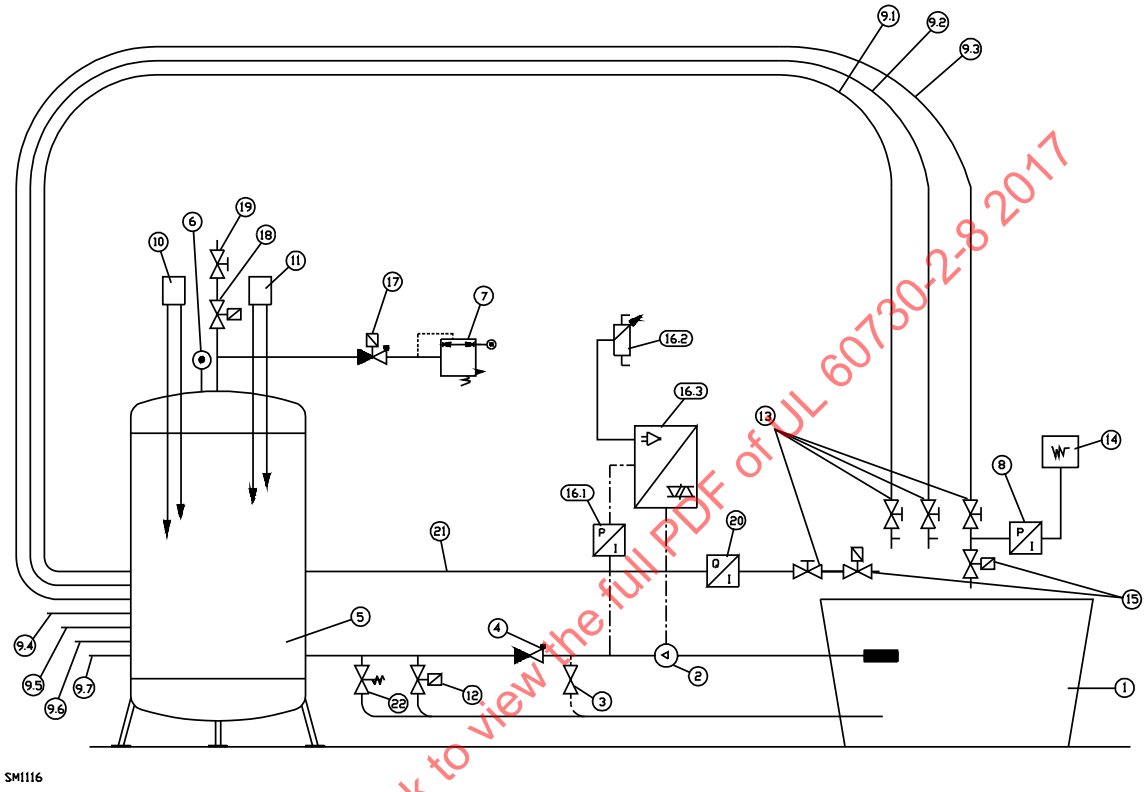
Annex BB

(normative)

Arrangement for the measurement of TRANSIENT PRESSURES caused by WATER VALVES



1 Container of appropriate size filled with water.

2 Pump having a capacity of at least 100 l/min at a dynamic pressure of 1 MPa (10 bar).

3 By-pass VALVE; this VALVE is not necessary if the pump is adjustable.

4 Non-return VALVE 1 1/4 in.

5 Compensating tank having a capacity of at least 350 l.

6 Pressure gauge.

7 Pressure reducer 3/8 in.

8 Pressure transducer having a pressure range between atmospheric pressure and 1,6 MPa (16 bar) and a natural frequency of more than 200 Hz.

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9 Steel pipe or copper pipe with a lining having a wall thickness of 1,0 mm to 2,0 mm and a length of approximately 9 m and as well as an internal diameter which should be such that the velocity of the water flow does not exceed 2 m/s with the sample VALVE fully open and a static pressure of 0,6 MPa.

The pipe 9.4 is bent at a radius of not less than 300 mm and the other pipes are adjusted at a respectively appropriate radius.

9.1	pipe 3/8 in	15 mm × 1 mm
9.2	pipe 1/2 in	18 mm × 1 mm
9.3	pipe 3/4 in	22 mm × 1 mm
9.4	pipe 1 in	28 mm × 1,5 mm
9.5	pipe 1 1/4 in	35 mm × 1,5 mm
9.6	pipe 1 1/2 in	42 mm × 1,5 mm
9.7	pipe 2 in	54 mm × 2 mm

10 Level controller which controls the minimum water level; the level-controller is adjusted according to the size of the container.

11 Level controller which controls the maximum water level; the level-controller is adjusted according to the size of the container.

12 Magnetic VALVE having a capacity 25% that of the pump capacity at 0,6 MPa or with flow regulator 25 l/min.

13 Ball VALVE or clap VALVE having a nominal diameter of the same size as the pipe (see 9.1 to 9.7).

14 Recorder with which the march of pressure at the pressure transducer can be graphically demonstrated.

15 Sample VALVE.

16.1 Pressure indicator for pump control system (actual value).

16.2 Adjusting potentiometer for pump control system (desired value).

16.3 Frequency converter at rotary current ACTUATION or thyristor control system instrument at direct current ACTUATION. Items 16.1 to 16.3 do not apply if the testing stand is controlled by a by-pass VALVE 3.

17 Air pressure VALVE 1/2 in having a non-return VALVE.

18 Bleeder VALVE 3/8 in.

19 Reducing VALVE.

20 Instrument for flow measurements of respective size to measure the flow of the sample VALVE at 0,6 MPa.

21 Supply pipe to the instrument for flow measurements of minimum size 3/4 in (22 mm × 1 mm).

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