



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

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents
Document Sharing Hub

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

Reaffirm the ANSI Approval of ANSI/UL 60730-2-8

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated March 9, 2012.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the preface. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

No Text on This Page

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

FEBRUARY 28, 2007
(Title Page Reprinted: May 25, 2012)



ANSI/UL 60730-2-8-2007

1

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 25, 2012.

The most recent designation of ANSI/UL 60730-2-8 as a Reaffirmed American National Standard (ANS) occurred on May 25, 2012. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface, or effective date information.

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 <http://csds.ul.com>.

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

COPYRIGHT © 2012 UNDERWRITERS LABORATORIES INC.

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents
Document Sharing Hub

No Text on This Page

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

CONTENTS

Preface (UL)	6
NATIONAL DIFFERENCES	7
FOREWORD	8
1 Scope and normative references	11
1.5 Normative references	12
2 Definitions	13
2.2 Definitions of types of control according to purpose	13
2.3 Definitions relating to the function of controls	14
2.13 Miscellaneous definitions	16
3 General requirements	16
4 General notes on tests	16
4.1 Conditions of test	16
4.2 Samples required	16
5 Rating	16
6 Classification	16
6.5.2 According to degree of protection provided by enclosures against harmful ingress of water (see IEC 60529)	16
6.7 According to ambient temperature limits of the SWITCH HEAD:	17
6.8 According to protection against electric shock:	17
6.101 According to type of end-connections	18
6.102 According to features of electrically operated WATER VALVES	18
6.103 According to temperature, pressure and type of the water controlled	19
6.104 According to NOMINAL SIZE and thread size of END CONNECTIONS	20
7 Information	20
7.4 Additional requirements for marking	22
8 Protection against electric shock	23
9 Provision for protective earthing	23
9.5.101DV.1 Swimming pool VALVE	23
10 Terminals and TERMINATIONS	24
10.1 Terminals and TERMINATIONS for external copper conductors	24
10.2 Terminals and TERMINATIONS for INTERNAL CONDUCTORS	24
11 Constructional requirements	24
11.3 Modification:	24
11.101 Separation of wetted parts from electrical parts	25
11.102DV.1 Springs	25
11.103DV.1 Metal parts	25
11.104DV.1 Threaded fasteners	26
12 Moisture and dust resistance	26
13 Electric strength and insulation resistance	26
14 Heating	26
15 MANUFACTURING DEVIATION and DRIFT	28
16 Environmental stress	28
16.2 Environmental stress of temperature	28
17 Endurance	28
17.7 Over-voltage (or in some countries, overload) test of AUTOMATIC ACTION at accelerated rate	29
17.16 Test for particular purpose controls	30

18	Mechanical strength	30
18.101.1	Test at 1,5 times maximum rated working pressure (test for external leakage) ..	30
18.101.2	Test at 5 times maximum rated working pressure (hydrostatic strength test)	31
18.101.3	Anti-WATER HAMMER characteristics	31
18.101.4	Test on VALVE BODIES of thermoplastic material	32
18.102	Wetted material specifications	33
18.103	Torque	33
19	Threaded parts and connections	34
20	CREEPAGE DISTANCES, CLEARANCES and distances through insulation	34
21	Resistance to heat, fire and tracking	35
22	Resistance to corrosion	35
23	Electromagnetic compatibility (EMC) requirements – emission	35
24	Components	35
25	Normal OPERATION	35
26	Electromagnetic compatibility (EMC) requirements – immunity	35
27	Abnormal OPERATION	35
27.2	Blocked mechanism test	35
27.3	Overvoltage and undervoltage test	37
27.101	Dry condition test	38
28	Guidance on the USE of ELECTRONIC DISCONNECTION	38

Figures

Annexes

Annex H (normative) Requirements for ELECTRONIC CONTROLS

H.6	Classification	39
H.6.18	According to software class	39
H.7	Information	39
H.11	Constructional requirements	39
H.11.12	Controls using software	39
H.26	Electromagnetic compatibility (EMC) requirements – immunity	39
H.26.9	Fast transient burst test	40
H.26.9	Electrical fast transient/burst immunity test	40
H.26.13	Evaluation of compliance	40

Annex AA (informative) Relation between different flow coefficients

AA.1	K_v value	40
AA.2	C_v value	40

Annex BB (normative) Arrangement for the measurement of TRANSIENT PRESSURES caused by WATER VALVES

Annex CC (normative) Test on VALVE BODIES of thermoplastic material intended to be connected to the water supply mains

Annex DD (normative) Torque

DD.1 Torque test for VALVES with internally threaded end-connections to ISO 7-1	45
DD.1.1 General	45
DD.1.2 Torque test	45
DD.2 Torque test for VALVES with internally threaded end-connections to ISO 228-1	47
DD.3 Torque test for VALVES with internally threaded end-connections with ISO metric thread for compression FITTINGS	48
DD.3.1 Olive type compression FITTINGS	48
DD.3.2 Flared compression FITTINGS	48
DD.4 Torque test for VALVES with externally threaded end-connections to ISO 7-1	48
DD.5 Torque test for VALVES with external threaded end-connections to ISO 228-1 or to ISO metric thread for compression FITTINGS	48
DD.6 Torque test for VALVES with adaptors	48
DD.7 Torque test for VALVES with internally or externally threaded end-connections for NPT thread ..	49
DD.8 Torque test for VALVES with internally or externally threaded end-connections for SAE thread ..	49

Annex EE (normative) 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)

Annex 8.DVA – Manufacturing and Production Tests (normative)

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 third edition of UL 60730-1A. The requirements for electrically operated water valves are contained in this part 2 Standard and UL 60730-1A.

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

Where a particular subclause of UL 60730-1A is not mentioned in UL 60730-2-8, the UL 60730-1A 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 2003, are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI). The IEC copyrighted material has been reproduced with permission from ANSI. ANSI should be contacted regarding the reproduction of any portion of the IEC material. The IEC Foreword and Introduction are not a part of the requirements of this Standard but are included for information purposes only. Copies of IEC Publication 60730-2-8 may be purchased from ANSI, 11 West 42nd Street, New York, New York, 10036, (212) 642-4900.

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.

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 2003 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.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

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

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 IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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

This consolidated version of IEC 60730-2-8 is based on the second edition (2000) [documents 72/428/FDIS and 72/439/RVD] and its amendment 1 (2002) [documents 72/553/FDIS and 72/557/RVD].

It bears the edition number 2.1.

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

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 third edition (1999) 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 7.2, items 113 and 114
- 14.7.4, note 101
- 16.2.1
- 27.2.101.1
- 27.101
- H.26.2.1
- 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.*
- 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 2005. At this date, the publication will be

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

- amended.

101DV DE Modification of the fourth paragraph following item (6) of the Foreword:

Due to formatting differences, marginal lines are not being used to identify where the base publication has been modified by amendment 1.

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.

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 replaced as follows:

Replacement:

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 that may use electricity, gas, oil, solid fuel, solar thermal energy, etc. or a combination thereof, including heating, air-conditioning and similar applications.

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

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 contains requirements for electrical features of WATER VALVES and requirements for mechanical features of VALVES that affect their intended OPERATION.

1.1.2 This part 2-8 applies to the inherent safety, to the OPERATING VALUES, OPERATING SEQUENCES where such are associated with equipment protection, and to the testing of automatic ELECTRICAL CONTROLS used in, on or in association with household and similar equipment.

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 designed exclusively for industrial applications.

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.

Throughout this part 2-8, 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”.

1.1.2DV DE Modification of 1.1.2 of the part 2:

In the third paragraph, replace the word “designed” with “intended”.

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:

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 228-1:1994,
Pipe threads where pressure-tight joints are not made on the threads – Part 1: Dimensions, tolerances and designation

ISO 630:1995,
Structural steels – Plates, wide flats, bars sections and profiles

ISO 1179:1981,
Pipe connections threaded to ISO 228-1 for plain end steel and other metal tubes in industrial applications

ISO 4144:1979,
Stainless steel fittings threaded to ISO 7-1

ISO 4400:1994,
Fluid power systems and components – Three-pin electrical plug connectors with earth contact – Characteristics and requirements

ISO 6952:1994,
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:

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

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM



Documents
Document Sharing Hub

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

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM  **Documents**
Document Sharing Hub