

UL 8730-2-8

ISBN 1-55989-848-8

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



**Underwriters Laboratories Inc.®**

Northbrook, Illinois • (708) 272-8800
Melville, New York • (516) 271-6200
Santa Clara, California • (408) 985-2400
Research Triangle Park,
North Carolina • (919) 549-1400
Camas, Washington • (360) 817-5500

Underwriters Laboratories Inc., founded in 1894, is chartered as a not-for-profit organization without capital stock, under the laws of the State of Delaware, to establish, maintain, and operate laboratories for the examination and testing of devices, systems and materials to determine their relation to hazards to life and property, and to ascertain, define and publish standards, classifications and specifications for materials, devices, products, equipment, constructions, methods, and systems affecting such hazards.

UL Standards for Safety are developed under a procedure which provides for participation and comment from the affected public as well as industry. The procedure takes into consideration a survey of known existing standards and the needs and opinions of a wide variety of interests concerned with the subject matter of the standard. Thus manufacturers, consumers, individuals associated with consumer-oriented organizations, academicians, government officials, industrial and commercial users, inspection authorities, insurance interests and others provide input to UL in the formulating of UL Standards for Safety, to keep them consonant with social and technological advances.



Underwriters Laboratories Inc.®

A not-for-profit organization dedicated to public safety
and committed to quality service

June 2, 1995

Standard for

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

UL 8730-2-8, First Edition

Accompanying this transmittal notice is a copy of the First edition of UL 8730-2-8.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT.

The requirements in this standard are substantially in accordance with UL's bulletin on this subject dated December 22, 1994. This bulletin is now obsolete and may be discarded.

Revised and/or additional pages may be issued from time to time.

JUNE 2, 1995

1

UL 8730-2-8

Standard for

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

First Edition

June 2, 1995

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest published set of revision pages.

ISBN 1-55989-848-8

COPYRIGHT © 1995 UNDERWRITERS LABORATORIES INC.

CONTENTS

	Page	
FOREWORD	4	D6
PROLOGUE	5	D6
Clause		
1 Scope	9	
2 Definitions	10	
3 General requirements	14	
4 General notes on tests	14	
5 Rating	14	
6 Classification	15	
7 Information	18	
8 Protection against electric shock	20	
9 Provision for protective earthing	21	
10 Terminals and terminations	21	
11 Constructional requirements	22	
12 Moisture and dust resistance	24	
13 Electric strength and insulation resistance	24	
14 Heating	24	
15 Manufacturing deviation and drift	25	
16 Environmental stress	25	
17 Endurance	25	
18 Mechanical strength	27	
19 Threaded parts and connections	30	
20 Creepage distances, clearances and distances through insulation	30	
21 Resistance to heat, fire and tracking	30	
22 Resistance to corrosion	31	
23 Radio interference suppression	31	
24 Components	31	
25 Normal operation	31	
26 Operation mains-borne perturbations, magnetic and electromagnetic disturbances	31	
27 Abnormal operation	31	
101A Manufacturing and production tests	31	D6
Figures	32	
Appendices	32	D6

FOREWORD

D6

- A. This Standard contains end product requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-up Service for this category within the limitations given below and in the Scope Section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable. D2
D2
D2
D2
D2
D2
D2
- B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product. D2
D2
- C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements. D2
D2
D2
- D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of these requirements and, if found to be substantially equivalent, may be judged to comply with the Standard. D2
D2
D2
D2
- E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgement given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard. D2
D2
D2
D2
D2
D2
- F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such test. D2
D2
- G. This standard applies only when used in conjunction with Part 1 for the general requirements. D2
D2

PROLOGUE

In this standard:

- requirements are printed in roman type.
- explanatory material regarding the requirements is printed in smaller roman type.
- *test specifications are printed in italic type.*
- subclauses, notes, item and figures which are additional to those in Part 1 are numbered starting from 101.

Deviations from IEC 730-2-8 text are indicated by the following margin notation:

D1 – Technical deviations to the IEC text to ensure compliance with U.S.A. installation codes such as the National Electrical Code, NFPA 70.

D2 – Technical deviations to the IEC text based on UL requirements. All D2 deviations will be reviewed to determine appropriated actions concerning retention, revision or deletion of the deviations.

D3 – Technical deviations which are considered to be alternatives to the IEC text. Either the IEC text or the deviation would be considered acceptable.

D4 – Indicates text taken from Central Office, Secretariat or National documents actively under consideration in IEC TC 72.

D5 – Technical deviations based on UL component requirements. In most cases, these have not been compared to their IEC equivalent, if any.

D6 – Explanations or editorial corrections.

D7 – IEC text that is under consideration and therefore subject to review in national standards bodies. U.S.A. practice has been indicated where the IEC text is under consideration.

D8 – Technical deviations to the IEC text based on other U.S.A. standards such as ASTM and ANSI. All D8 deviations will be reviewed to determine appropriate actions concerning retention, revision or deletion of the deviations.

D1 through D8 deviations have been incorporated into the body of UL 8730-1 and UL 8730-2-8.

The text, Figures, and Tables of International Electrotechnical Commission Publication 730-2-8, Automatic Controls for Household and Similar Use; Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements, copyright 1992, are used in this Standard with the consent of the International Electrotechnical Commission. Copies of IEC 730-2-8 may be purchased from the International Electrotechnical Commission, 3 rue de Varembe, Ch-1211 Geneva 20, Switzerland.

The International Electrotechnical Commission Foreword and Preface are not a part of the requirements of this Standard but are included for information purposes only.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD
AND SIMILAR USEPart 2: Particular requirements for electrically operated
water valves, including mechanical requirements

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

This part of International Standard IEC 730 has been prepared by IEC Technical Committee No. 72: Automatic controls for household use.

It forms the first edition of IEC 730-2-8 and incorporates its Amendment No. 1.

D6

The text of this part is based upon the following documents:

Six Months' Rule	Reports on Voting	Two Months' Procedure	Reports on Voting
72(CO)34	72(CO)47	72(CO)54	72(CO)62
72(CO)68	72(CO)78	72(CO)64	72(CO)67

DIS	Report on voting
72(CO)143	72/271/RVD

D6

Full information on the voting for the approval of this part can be found in the Voting Report on voting indicated in the above table.

This Part 2 is intended to be used in conjunction with IEC Publication 730-1. It was established on the basis of the first edition (1986) of that publication, as modified by its Amendments No. 1 (1990), No. 2 (1991) and No. 3 (1991). Consideration may be given to future editions of, or amendments to, IEC 730-1.

D6

D6

D6

D6

This Part 2 supplements or modifies the corresponding clauses in IEC 730-1 so as to convert that publication into the IEC standard: Safety requirements for electrically operated water valves, including mechanical requirements.

Where the first edition 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 the Part 2 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.

In this Part 2, the "in some countries" notes regarding differing national practices are contained in the Appendix DD, in the subclauses 10.1.101, 12.1.6, 16.2.1, in the tables DD.1.2.1 and DD.6 and in note 3 to the table 14.1:

In this publication:

- 1) The following print types are used:
 - Requirements proper: in roman type.
 - Test specifications: *in italic type*.
 - Explanatory matter: in smaller roman type.
- 2) Subclauses, notes, items and figures which are additional to those in Part 1 are numbered starting from 101.

Add the following to the list of Other Publications quoted:

ISO 7/1: 1982, *Pipe thread where pressure tight joints are made on the threads – Part 1: Designations, dimensions and tolerances.*

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

ISO 228/1: 1982, *Pipe threads where pressure-tight joints are not made on the threads – Part 1: Designations, dimensions and tolerances.*

ISO 630: 1980, *Structural steels.*

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: 1985, *Fluid power systems and components – Three-pin electrical plug connector – Characteristics and requirements.*

ISO/DIS 6952: 1989, *Fluid power systems and components – Two-pin electrical plug connector with earth contact – Characteristics and requirements.*

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE

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

1 Scope

This Clause of Part 1 is replaced by the following:

1.1 This Part 2 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 is also applicable to electrically operated water valves for appliances within the scope of IEC 335.

These requirements do not cover valves for marine use.

D2

1.1.1 This Part 2 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 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.

This Part 2 does not apply to electrically operated water valves designed exclusively for industrial applications.

Change "designed" to "intended".

D6

This Part 2 does not apply to:

- electrically operated water valves of nominal connections size above DN 50;
- electrically operated water valves for admissible nominal pressure rating above 1.6 MPa;
- food dispensers;
- detergent dispensers;
- steam valves.

Hereinafter, the term "valve" is used to denote an electrically operated water valve (including actuator and valve body assembly).

Throughout this Part 2, the word "actuator" means "electrically operated mechanism or prime mover".

Throughout this Part 2, the word "valve body" means "valve body assembly".

Throughout this Part 2, the word "equipment" includes "appliance" and "control system".

1.1.3 This Part 2 also applies to actuators and to valve bodies which are designed to be fitted to each other.

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

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.

2 Definitions

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

2.2.17 *Electrically operated valve*

Addition:

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*

Valve denotes a 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*

Water valve denotes a valve intended to be connected to a water supply and to control water flow.

A water valve is a Type 1 action. Switching devices incorporated in the water valves are Type 1 or Type 2 action.

D6

2.2.17.103 *Heating-water valve*

Heating-water valve denotes a valve intended to control the water circulation in heating systems.

2.2.17.104 *Actuator*

Actuator denotes an electrically operated mechanism or prime mover used to effect the opening or closing action of a valve.

An actuator may be integral with the valve, fixed to the valve body assembly or delivered as a separate component.

An actuator may also include the valve and closure member.

2.2.17.105 *Valve body assembly*

Valve body assembly denotes an assembly comprising the valve body, inlet and outlet end connections, valve seat, closure member and stem or shaft.

In some cases the stem and closure member may be a part of the actuator.

2.2.17.106 *Valve body*

Valve body denotes the 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*

Nominal size denotes a 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.

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

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*

Nominal pressure rating denotes a numerical designation of pressure rating.

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*

End connection denotes the valve body configuration provided to make a pressure-tight joint to the fluid-conducting system.

2.2.17.110 *Valve seat*

Valve seat denotes the surface of the orifice within the valve which makes full contact with the closure member.

2.2.17.111 *Closure member*

Closure member denotes a movable part of the valve which is positioned in the flow path to modify the rate of flow through the valve.

A closure member may be a plug, ball, disc, vane, gate, etc.

2.2.17.112 *Stem*

Stem denotes a component which connects the actuator to, and positions, the closure member.

For rotary valves the word "shaft" should be used in place of "stem".

In some controls the stem may be part of the actuator.

2.2.17.113 *Fitting*

Fitting denotes any device such as a reducer, expander, elbow, or T-piece which is attached directly to an end-connection of the valve body assembly.

2.3 *Definitions relating to the function of controls*

2.3.29 *Maximum working pressure*

Modification:

Delete "(maximum rated pressure)"

Additional definitions:

2.3.101 *On-off valve*

On-off valve denotes a valve which is open or closed, without any intermediate positions.

2.3.102 *Normally closed valve*

Normally closed valve denotes a valve which is closed when not electrically energized.

2.3.103 *Normally open valve*

Normally open valve denotes a valve which is open when not electrically energized.

2.3.104 *Modulating valve*

Modulating valve denotes a valve which has a variable flow rate between predetermined flow limits.

2.3.105 *Diverting valve*

Diverting valve denotes a valve with one or more inputs and outputs which may permit flow from any combination of inputs to outputs.

2.3.106 *Closed position*

Closed position denotes the position of the closure member when there is no water flow from the outlet side of the valve.

2.3.107 *Travel*

Travel denotes the displacement of the closure member from the closed position.

2.3.108 *Rated travel*

Rated travel denotes the displacement of the closure member from the closed position to the full open position.

2.3.109 *Open position*

Open position denotes the 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*

Fully open position denotes the 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*

Flow rate denotes the volume of water flowing through the valve in unit time.

2.3.112 *Rated flow rate*

Rated flow rate denotes the 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*

Flow factor denotes a factor specifying the amount of water which can pass through the valve at a specified pressure difference.

Flow factor may be referred to as flow coefficient.

The relationship between the different flow factors in use is indicated in Appendix AA.

2.3.114 *Maximum operating pressure differential*

Maximum operating pressure differential denotes the 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*

Minimum operating pressure differential denotes the declared minimum pressure difference at which the valve opens or closes.

2.3.116 *Deleted*

2.3.117 *Water hammer*

Water hammer denotes an 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*

Transient pressure denotes a 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 with anti-water-hammer characteristics denotes a 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.

2.13 *Miscellaneous definitions**Additional definitions:***2.13.101** *Drinking-water*

Drinking-water denotes a water supply which is intended to be suitable for human consumption.

2.13.102 *Non-drinking-water*

Non-drinking-water denotes a 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.

5 Rating

This clause of Part 1 is applicable.