

**STANDARD FOR DEVICES AND ACCESSORIES FOR WATER
TYPE EXTINGUISHING SYSTEMS**



Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

The Standards Council of Canada (SCC) is the coordinating body of the Canadian standardization network, which is composed of people and organizations involved in the development, promotion and implementation of standards. Through the collaborative efforts of Canadian standardization network members, standardization is helping to advance the social and economic well-being of Canada and to safeguard the health and safety of Canadians. The network's efforts are overseen by SCC.

The principal objectives of SCC are to foster and promote voluntary standardization as a means of advancing the national economy, supporting sustainable development, benefiting the health, safety and welfare of workers and the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in relation to standardization.

An important facet of the Canadian standards development system is the use of the following principles: consensus; equal access and effective participation by concerned interests; respect for diverse interests and identification of those who should be afforded access to provide the needed balance of interests; mechanism for dispute resolution; openness and transparency; open access by interested parties to the procedures guiding the standards development process; clarity with respect to the processes; and Canadian interest consideration as the initial basis for the development of standards.

A National Standard of Canada (NSC) is a standard prepared or reviewed by an SCC-accredited SDO and approved by the SCC according to NSC approval requirements. Approval does not refer to the technical content of the standard, as this remains the responsibility of the SDO. An NSC reflects a consensus of a number of capable individuals whose collective interests provide, to the greatest practicable extent, a balance of representation of general interests, producers, regulators, users (including consumers) and others with relevant interests, as may be appropriate to the subject at hand. NSCs are intended to make a significant and timely contribution to the Canadian interest.

Those who have a need to apply standards are encouraged to use NSCs. These standards are subject to periodic review. Users of NSCs are cautioned to obtain the latest edition from the SDO that publishes the standard.

The responsibility for approving standards as NSCs rests with:

Standards Council of Canada
270 Albert Street
Suite 200
Ottawa, Ontario
K1P 6N7
Telephone: (613) 238-3222

E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

STANDARD FOR DEVICES AND ACCESSORIES FOR WATER TYPE
EXTINGUISHING SYSTEMS

ICS 13.220.20; 13.320

Prepared and Published by
ULC STANDARDS



Approved by
STANDARDS COUNCIL OF CANADA



First Edition June 1990
Second Edition.....August 2002
Third Edition.....July 2008
FOURTH EDITION.....SEPTEMBER 2015

Copyright © 2015

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission of ULC Standards.

Document ID: 123456789

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON FIRE ALARM AND LIFE SAFETY EQUIPMENT AND SYSTEMS	I
ULC STANDARDS SUBCOMMITTEE ON ACCESSORY DEVICES	II
ULC STANDARDS WORKING GROUP ON DEVICES AND ACCESSORIES FOR WATER TYPE EXTINGUISHING SYSTEMS	III
PREFACE	IV
1 SCOPE	1
2 REFERENCE PUBLICATIONS	2
3 GLOSSARY	5
4 GENERAL	5
4.1 COMPONENTS	5
4.2 UNITS OF MEASUREMENT	6
4.3 REQUIREMENTS FOR WATER TYPE EXTINGUISHING SYSTEMS	6
5 INSTRUCTIONS AND INSTALLATION WIRING DIAGRAM	6
5.1 GENERAL - ALL PRODUCTS	6
5.2 VANE AND PADDLE TYPE DEVICES	7
5.3 VALVE POSITION SWITCHES	7
6 CONSTRUCTION	8
6.1 GENERAL - ALL PRODUCTS	8
6.1.1 General	8
6.1.2 Sizes	8
6.1.3 Assembly	8
6.1.4 Working Pressures	8
6.1.5 Mounting Positions	8
6.2 ENCLOSURE — ALL PRODUCTS	9
6.2.1 General	9
6.2.2 Cast Metal Enclosures	9
6.2.3 Sheet Metal Enclosures	10
6.2.4 Nonmetallic Enclosures	10
6.3 OPERATING MECHANISMS	11
6.4 CORROSION PROTECTION - ALL PRODUCTS	11
6.5 FIELD WIRING CONNECTIONS	11
6.5.1 General	11
6.5.2 Field Wiring Compartment	12
6.5.3 Strain Relief	12
6.5.4 Field Wiring Terminals and Leads	13
6.6 BONDING FOR GROUNDING	13
6.7 INTERNAL WIRING	14

6.7.1	General	14
6.7.2	Wireways	14
6.7.3	Splices	14
6.7.4	Barriers	15
6.8	COMPONENTS	15
6.8.1	Bushings	15
6.8.2	Printed Wiring Boards	15
6.8.3	Coil Windings	16
6.8.4	Metallic Components	16
6.8.5	Nonmetallic Components	16
6.8.6	Insulating Material	16
6.8.7	Mounting of Parts	17
6.8.8	Switches	17
6.8.9	Operating Mechanisms	17
6.8.10	Mounting Bolts	18
6.8.11	Tamper Protection	18
6.8.12	Adjustments and Stops	18
6.9	ELECTRIC SHOCK - ALL PRODUCTS	19
6.10	SPACINGS	19
6.11	SERVICING AND MAINTENANCE PROTECTION - ALL PRODUCTS	20
6.12	ALARM INITIATING DEVICES	20
6.12.1	General	20
6.12.2	Vane and Paddle Type Devices	20
6.12.2.1	Retard Feature	20
6.12.2.2	Drain Holes	21
7	MARKING	21
7.1	GENERAL - ALL PRODUCTS	21
7.2	ALARM INITIATING DEVICES	22
7.3	ACCESSORIES FOR WATER-SUPPLY CONTROL VALVES	22
8	PERFORMANCE TESTS	22
8.1	GENERAL — ALL PRODUCTS	22
8.1.1	Test Samples	22
8.1.2	Test Voltages	23
8.1.3	Test Samples	23
8.2	NORMAL OPERATION	23
8.2.1	General - All Products	23
8.2.2	Alarm Initiating Devices	24
8.2.3	Pressure-Actuated Devices Sensitivity Test	24
8.2.4	Valve Position Device	24
8.2.5	Temperature Supervisory Device	24
8.2.6	Water Motors	24
8.2.7	Water-Motor and Gong Protection	25
8.2.8	Strainers	25
8.3	CALIBRATION TEST - RETARD FEATURE - VANE & PADDLE TYPE	25
8.4	ENDURANCE TEST	26
8.4.1	General	26
8.4.2	Retard Feature - Vane and Paddle Type	26
8.4.3	Water-Motor and Gong	26
8.4.4	Contact Endurance	26

8.5 OVERLOAD	27
8.6 TEMPERATURE	28
8.7 INTERFERENCE FROM RADIO FREQUENCY AND ELECTROMAGNETIC RADIATIONS	29
8.7.1 General	29
8.7.2 Extraneous Radio Frequency Transients	29
8.7.3 Supply Line (Low Voltage) Transients	29
8.7.4 Internally Induced Transients	30
8.7.5 Supply-Line (Extra-Low Voltage) Transients	30
8.8 DIELECTRIC VOLTAGE-WITHSTAND	30
8.9 POLARITY REVERSAL	31
8.10 ELECTRIC SHOCK CURRENT	31
8.11 CORROSION - INDOOR USE ONLY	33
8.11.1 General - All Products	33
8.11.2 Alarm Initiating Devices - Vane and Paddle	33
8.12 FLEXING TEST (VANE ASSEMBLY) - ALARM INITIATING DEVICES	33
8.13 ABNORMAL OPERATION	34
8.14 VARIABLE AMBIENT TEMPERATURE (INDOOR)	34
8.15 HUMIDITY (INDOOR)	34
8.16 TESTS OF PLASTIC MATERIALS	35
8.16.1 General	35
8.16.2 Air-Oven Aging Test	35
8.16.3 Flame Test	35
8.16.4 Immersion Test - Vane and Paddle and Float Type Devices	36
8.17 JARRING	37
8.18 VIBRATION	37
8.19 TESTS OF ELASTOMERIC MATERIALS	38
8.19.1 Oxygen Aging Test	38
8.19.2 Hardness Measurement - Vane and Paddle or Float Type Device	38
8.19.3 Immersion Test (Saddle Gasket) - Vane and Paddle Type	38
8.20 IMMERSION TEST (INDICATOR ASSEMBLY) - VANE AND PADDLE OR FLOAT TYPE	38
8.21 SENSITIVITY TEST - VANE AND PADDLE TYPE	39
8.22 HYDRAULIC FRICTION LOSS TEST - VANE AND PADDLE OR FLOAT DEVICE ..	39
8.23 SURGE TEST - VANE AND PADDLE TYPE	40
8.24 HYDROSTATIC STRENGTH TEST - VANE, PADDLE OR FLOAT TYPE	40
8.25 MARKING PERMANENCY TESTS	41
8.25.1 General	41
8.25.2 Environment Exposures	41
8.25.2.1 High Temperature	41
8.25.2.2 Humidity	41
8.25.2.3 Water Immersion	41
8.25.3 Permanence Tests	42
8.26 MECHANICAL STRENGTH TESTS FOR ENCLOSURES	42

9 OUTDOOR-USE PRODUCTS 44

9.1 GENERAL	44
9.2 CONSTRUCTION	44
9.3 PERFORMANCE TESTS	44
9.3.1 Water Spray (Rain Exposure)	44
9.3.2 Variable Temperature	45
9.3.3 Humidity	45

9.3.4 Corrosion	45
9.3.4.1 General	45
9.3.4.2 Salt Spray	45
9.3.4.3 Hydrogen Sulphide	46
9.3.4.4 Sulphur Dioxide – Carbon Dioxide	46
9.3.5 Ultraviolet Light and Water Exposure Test	46
9.3.6 Gasket Material Tests	46
9.4 DUST EXPOSURE	47
9.5 MARKING	47
10 MANUFACTURING AND PRODUCTION TESTS	48
10.1 GENERAL	48
10.2 SENSITIVITY AND RETARD CALIBRATION TEST	48
10.3 HYDROSTATIC STRENGTH TEST	48
10.4 PRODUCTION-LINE DIELECTRIC VOLTAGE-WITHSTAND TEST	48
TABLES	50
FIGURES	58
APPENDIX A (NORMATIVE) — STANDARDS FOR COMPONENTS	63

Copyright Underwriters' Laboratories of Canada
 Provided by IHS Markit under license with ULC
 No reproduction or networking permitted without license from IHS
 Full document details: ULC S548-15 2015

ULC STANDARDS COMMITTEE ON FIRE ALARM AND LIFE SAFETY EQUIPMENT AND SYSTEMS

NAME	AFFILIATION	REGION	CATEGORY
A.M. Leber (Chair)	LRI Engineering Inc.	Canada	General Interest
S. Ames	System Sensor Canada	Canada	Producer
D. Boynowski	Siemens Canada - Building Technologies, Ltd.	Canada	Producer
P. Clarke	Department of National Defence	Canada	User
S. Crosby	Randal Brown and Associates Engineering Ltd.	Canada	General Interest
D.N. Delen	Morrison Hershfield Limited	Canada	General Interest
D. Duggan	Fire Detection Devices Ltd.	Canada	Producer
L.E. Eisner	Mircom Technologies Ltd.	Canada	Producer
G. Fawcett	Society of Fire Protection Engineers, Southern Ontario Chapter	Ontario	General Interest
M. Fortin	National Research Council Canada	Canada	General Interest
B. Fremis	Defence Construction Canada	Canada	User
W.D. Goodyear	D. Goodyear Fire Consulting	Canada	General Interest
D. Hammoudi	Health Canada	Canada	Regulator
D. Hollingshead	Canadian Security Association	Canada	User
R. Jagmohan	Honeywell Security & Custom Electronics	Canada	Producer
K. Jess	Alberta Municipal Affairs	Alberta	Regulator
P. Jobin	Gouvernement du Québec, Ministère de la Sécurité publique	Quebec	Regulator
F. Kurz	Fire Protection Technicians Network	Canada	User
G. Landmesser	Canadian Fire Alarm Association	Canada	User
K. Lefebvre	Canadian Association of Fire Chiefs	Canada	Regulator
D. Morris	Canadian Fire Safety Association	Canada	General Interest
D. Nita	Digital Security Controls Ltd.	Canada	Producer
B. Paterson	Office of the Fire Marshal & Emergency Management	Ontario	Regulator
P. Patry	Ontario Municipal Fire Prevention Officers Association	Ontario	Regulator
M. Shea	City of Victoria	British Columbia	Regulator
S. Stroud	ADT Security Services Canada, Inc.	Canada	User
J. Van Keuren	Chubb Edwards - UTC Fire and Security Canada	Canada	Producer
L. Shudak (Associate Member)	UL LLC	U.S.A.	Non-Voting
A. Tsisserev (Associate Member)	EFS Engineering Solutions	British Columbia	Non-Voting
T. Zhong (Associate Member)	Underwriters Laboratories of Canada Inc.	Canada	Non-Voting
T. Espejo (Project Manager)	ULC Standards	Canada	Non-Voting

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS SUBCOMMITTEE ON ACCESSORY DEVICES

MEMBER

REPRESENTING

D. Boynowski (Chair)	Siemens Canada - Building Technologies, Ltd.
P. Adams	Society of Fire Protection Engineers, Ontario
A. Andrews	Tyco Fire Protection Products, U.S.A.
R. Barnes	Chubb Edwards, A UTC Fire and Security Co., Canada
D. Chan	Asterix Security Hardware Intl. Inc., Canada
R. Clark	Canadian Automatic Sprinkler Association, Canada
R. Coco	Potter Manufacturing Ltd., Canada
G. Duggan	Electronic Surveillance Corporation, Canada
M. Farley	FCS Fire Consulting, Canada
G. Fawcett	Society of Fire Protection Engineers, Southern Ontario, Ontario
D. Goodyear	D. Goodyear Fire Consulting, Canada
Z. Mi	Underwriters Laboratories of Canada Inc., Canada
R. Nagy	System Sensor Canada, Canada
B. Paterson	Office of the Fire Marshal and Emergency Management, Ontario
L. Shudak	UL LLC, U.S.A.
T. Espejo (Project Manager)	ULC Standards, Canada

ULC STANDARDS WORKING GROUP ON DEVICES AND ACCESSORIES FOR WATER TYPE EXTINGUISHING SYSTEMS

MEMBER

REPRESENTING

D. Boynowski (Chair)	Siemens Canada - Building Technologies, Ltd.
F. Butalla	System Sensor, Canada
D. Grosch	Underwriters Laboratories Inc., U.S.A.
B. Paterson	Office of the Fire Marshal and Emergency Management, Ontario
B. Serangeli	Potter Electric Signal Company, Canada

1

STANDARD FOR DEVICES AND ACCESSORIES FOR WATER TYPE EXTINGUISHING SYSTEMS

PREFACE

This is the Fourth Edition of the Standard for Devices and Accessories for Water Type Extinguishing Systems, CAN/ULC-S548-15. This Edition of the Standard was developed by the ULC Standards Working Group on Water Type Extinguishing Systems, reviewed by the ULC Standards Subcommittee on Accessory Devices and was formally approved by the ULC Standards Committee on Fire Alarm and Life Safety Equipment and Systems.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendix A, identified as Normative, indicates mandatory action or requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the fact that some Canadian authorities may require markings and/or installation instructions to be in both official languages.

This Fourth Edition National Standard of Canada is based on, and now supersedes, the Third Edition CAN/ULC-S548-08.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

The initiation of the review of this Standard will commence within 5 years of the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 This Standard contains requirements for *alarm initiating devices*, supervisory detecting devices and accessories for automatic water supply control valves for attachment to water type extinguishing systems (such as, but not limited to wet, dry, pre-action and deluge type sprinklers, residential sprinklers, water mist suppression systems, water spray fixed extinguishing systems, water motors, gongs and standpipe systems), as follows:

A *Alarm initiating devices*, including but not limited to:

- (i) Vane and paddle type waterflow switches; and
- (ii) Pressure actuated waterflow switches;

B *Supervisory indicating devices*, including but not limited to:

- (i) Pressure supervisory switches;
- (ii) Shut-off valve position supervisory switches;
- (iii) Water level supervisory switches; and
- (iv) Temperature supervisory switches.

C Accessories for automatic water supply control valves, including but not limited to:

- (i) Water motors and gongs; and
- (ii) Other electrical and non-electrical components or units commonly used.

1.2 Valve position supervisory devices may be of a design suitable for the supervision of gate, butterfly, ball or post-indicator type valves.

1.3 The requirements of this Standard cover devices suitable for installation in ordinary (non-hazardous) indoor and outdoor locations.

1.4 The products covered by this Standard are intended for installation in accordance with the following:

- A CAN/ULC-S524, Standard for Installation of Fire Alarm Systems;
- B CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations;
- C NFPA 13, Standard for the Installation of Sprinkler Systems;
- D NFPA 14, Standard for the Installation of Standpipe and Hose Systems;
- E NFPA 15, Standard for Water-Spray Fixed Systems for Fire Protection; and
- F NFPA 750, Standard on Water-Mist Fire Protection Systems.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard. All undated references shall be interpreted as referring to the latest edition of that document.

Document published by the Acoustical Society of America
35 Pinelawn Road, Suite 114E, Melville, NY 11747 U.S.A.
Telephone: (631) 390-0215
<http://asa.aip.org>

- ANSI/ASA S1.40-2014, American National Standard Electroacoustics 0 Sound Level Meters - Part 1: Specifications

Document published by the American Society of Mechanical Engineers
3 Park Avenue, New York NY 10016-5990 U.S.A.
Telephone: 800-843-2763
www.asme.org

- ANSI/ASME B1.20.1- 2013, Standard For Pipe Threads - General Purpose (Inch)

Documents Published by the American Society for Testing and Materials (ASTM) International
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM B117-11, Standard Practice for Operating Salt Spray (Fog) Apparatus
- ASTM D572-04 (R2010), Standard Test Method for Rubber-Deterioration by Heat and Oxygen
- ASTM D638-10, Standard Test Method for Tensile Properties of Plastics
- ASTM D1693-13, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
- ASTM D1708-13, Standard Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens
- ASTM D2240-05 (R2010), Standard Test Method for Rubber Property - Durometer Hardness

Documents Published by the CSA Group International
5060 Spectrum Way, Mississauga, ON L4W 5N6 Canada
Telephone: (416) 747-4000 or 1-800-469-6727
www.csa.ca

- CSA C22.1-15, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
- CAN/CSA C22.2 No.0.4-04 (R2013), Bonding of Electrical Equipment
- CAN/CSA C22.2 No.0.17-00 (R2009), Evaluation of Properties of Polymeric Materials

- CSA C22.2 No. 38-14, Thermoset-Insulated Wires and Cables
- CSA C22.2 No. 49-14, Flexible Cords and Cables
- CAN/CSA C22.2 No. 65-03 (R2008), Wire Connectors
- CSA C22.2 No. 66.1-06, Low Voltage Transformers — Part 1: General Requirements
- CSA C22.2 No. 66.2-06, Low Voltage Transformers — Part 2: General Purpose Transformers
- CSA C22.2 No. 66.3-06, Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
- CSA C22.2 No. 75-14, Thermoplastic-Insulated Wires and Cables
- CAN/CSA C22.2 No. 94.1-07, Enclosures for Electrical Equipment, Non-Environmental Conditions
- CSA C22.2 No. 94.2-07 (R2008), Enclosures for Electrical Equipment, Environmental Conditions
- CSA C22.2 No. 96-09 (R2011), Portable Power Cables
- CSA C22.2 No. 100-04 (R2009), Motors and Generators
- CSA C22.2 No. 111-10 (R2012), General-Use Snap Switches
- CSA C22.2 No. 127-09 (R2012), General-Use Snap Switches
- CSA C22.2 No. 142-M1987 (R2009), Process Control Equipment Industrial Products
- CSA C22.2 No. 153-09, Electric Quick Connect Terminals
- CSA C22.2 No. 156-M1987 (R2004), Solid State Controls
- CSA C22.2 No. 158-10, Terminal Blocks
- CSA C22.2 No. 190-M1985 (R2009), Capacitors for Power Factor Correction
- CSA C22.2 No. 197-M1983 (R2008), Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
- CSA C22.2 No. 198.1-06 (R2010), Extruded Insulating Tubing
- CSA C22.2 No. 4248.1-07, Fuseholders - Part 1: General Requirements
- CSA C22.2 No. 4248.4-07, Fuseholders - Part 4: Class CC
- CSA C22.2 No. 4248.5-07, Fuseholders - Part 5: Class G
- CSA C22.2 No. 4248.6-07, Fuseholders - Part 6: Class H
- CSA C22.2 No. 4248.8-07, Fuseholders - Part 8: Class J
- CSA C22.2 No. 4248.9-07, Fuseholders - Part 9: Class – K
- CSA C22.2 No. 4248.11-07, Fuseholders - Part 11: Type C (Edison Base) and Type S Plug Fuse

- CSA C22.2 No. 4248.12-07, Fuseholders - Part 12: Class R
 - CSA C22.2 No. 4248.15-07, Fuseholders - Part 15: Class T
 - CAN/CSA C22.2 No. 60065-03 (R2012), Audio, Video, and Similar Electronic Apparatus
-

Documents by the National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, MA 02169-7471 U.S.A.
Telephone: (617) 770-3000
www.nfpa.org

- NFPA 13-2013, Standard for the Installation of Sprinkler Systems
 - NFPA 14-2013, Standard for the Installation of Standpipe and Hose Systems
 - NFPA 15-2012, Standard for Water-Spray Fixed Systems for Fire Protection
 - NFPA 750-2015, Standard for the Installation of Sprinkler Systems
-

Documents published by ULC Standards
7 Underwriters Road, Toronto, ON M1R 3A9 Canada
Telephone: (416) 757-3611, ext. 61744 or 1-866-99373-ULC
E-mail: publications@ulc.ca
www.ulc.ca

- CAN/ULC-S511-07, Standard for Lined Fire Hose for Interior Standpipes and Municipal and Industrial Fire Protection Services
 - CAN/ULC-S513-11, Standard for Threaded Couplings for 38 mm and 65 mm Fire Hose
 - CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems Including Accessories
 - CAN/ULC-S527, Standard for Control Units for Fire Alarm Systems
-

Documents Published by Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062-2096 U.S.A.
Telephone: (847) 272-8800
www.ul.com

- ANSI/UL 746A-12, Polymeric Materials - Short Term Property Evaluations
 - ANSI/UL 746B-13, Polymeric Materials - Long Term Property Evaluations
 - ANSI/UL 746C-04 (R2012), Polymeric Materials - Use in Electrical Equipment Evaluations
 - ANSI/UL 746D-12, Polymeric Materials - Fabricated Parts
 - ANSI/UL 796-10 (R2013), Printed-Wiring Boards
-

3 GLOSSARY

NOTE: Terms used in this Standard that are in italic print are defined as follows:

ALARM INITIATING DEVICE - A product that provides an electrical signal to indicate the flow of water through a water-type extinguishing system:

- A Pressure Actuated Type - A device operated by an air or water pressure change; and
- B Vane or Paddle Type - A device operated by mechanical movement of a vane or paddle caused by the flow of water past the mechanism.

CONTROL UNIT - A component which provides the control and logic processing for a fire alarm system.

EXTRA-LOW VOLTAGE - Any voltage up to and including 30 V rms.

LOW VOLTAGE - Any voltage exceeding 30 V rms but not exceeding 750 V rms.

RETARD TIME - The elapsed time in seconds between the initial movement of the vane resulting from the flow of a discreet amount of water and the actual transmission of an alarm signal by the device.

SET POINT - The predetermined value to which a control or interlock is adjusted, and at which it performs its intended function.

SUPERVISORY INDICATING DEVICE - A product that provides an electrical signal to indicate an abnormal condition in the water type extinguishing system:

- A Pressure Type - A device operated by an air or water pressure change;
- B Temperature Type - A device operated by an air or water temperature change;
- C Valve Position Type - A device operated by mechanical linkage to the movable parts of a valve; and
- D Water Level Type - A device operated by movement of the water storage level.

4 GENERAL

4.1 COMPONENTS

4.1.1 Except as indicated in Clause 4.1.2, a component of a product covered by this Standard shall comply with the requirements for that component. See Appendix A (Normative) for a list of Standards that apply to components generally used in the products covered by this standard.

4.1.2 A component need not comply with a specific requirement that for such devices and also with respect to their suitability for the particular application:

- A Involves a feature or characteristic not needed in the application of the component in the product covered by this Standard; or
- B Is superseded by a requirement in this Standard.

4.1.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

4.1.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

4.1.5 A component of a product shall comply with the requirements for that component, and shall be used in accordance with its recognized rating and other limitation of use, except when superseded by a requirement in this Standard.

4.2 UNITS OF MEASUREMENT

4.2.1 Unless otherwise indicated, all voltage and current values mentioned in this Standard are root-mean-square (rms).

4.2.2 The metric unit shall be designated as the official unit for purposes of this standard. Where values of measurement are specified in both SI and English units, either unit is used. In cases of dispute, the metric unit shall be used.

4.2.3 Values stated without parentheses are the requirements. Values in parentheses are explanatory or approximate information.

4.2.4 Whenever the abbreviation “AWG” appears in these requirements, it refers to American Wire Gauge.

4.3 REQUIREMENTS FOR WATER TYPE EXTINGUISHING SYSTEMS

4.3.1 The term “product” as used in this Standard refers to all devices and/or accessories covered by Section 1, Scope.

4.3.2 The requirements of this Standard apply to products supplied from circuits whose power is limited to a maximum of 100 VA.

4.3.3 A product incorporating circuitry for functional interfacing with a *control unit* for purposes such as supervision, point addressing, multiplexing, etc., shall also comply with the applicable functional requirements of CAN/ULC-S527, Standard for Control Units for Fire Alarm Systems.

4.3.4 An electrically energized product when used as an input device of a fire protective signalling system shall be energized from the system *control unit* in accordance with CAN/ULC-S527, Standard for Control Units for Fire Alarm Systems.

5 INSTRUCTIONS AND INSTALLATION WIRING DIAGRAM

NOTE: In Canada, there are two official languages, French and English. Attention is drawn to the fact that some Canadian authorities may require installation wiring diagrams to be in both official languages.

5.1 GENERAL - ALL PRODUCTS

5.1.1 Each product shall include installation instructions and drawings as specified in Subsections 5.1, General – All Products, through 5.3, Valve Position Switches, as applicable.

5.1.2 An installation diagram(s) shall be provided with each product showing the electrical field connections to be made and the method of installation in the water type extinguishing system. The diagram(s) shall be attached to the indicator. A separate diagram, if provided, shall be referenced in the marking attached to the indicator with the diagram number and issue number or date or both.

5.1.3 The diagram shall show a pictorial view or equivalent of the installation terminals or leads to which field connections are made as they would appear when viewed from the front. The terminal designations on the indicator shall agree with the designations on the diagram. An unattached diagram shall be marked with the name or trademark of the manufacturer, drawing number and issue number or date or both.

5.1.4 The instructions for all products shall include information on the orientation of the product, method of attachment, special techniques for alignment, any necessary adjustments, intended installation, maintenance and use of the equipment as deemed by the manufacturer.

5.1.5 Installation wiring drawings shall include the following items:

- A Typical wiring material type designation;
- B Typical wire gauge related to circuit voltage and power rating and circuit length;
- C Typical wiring method which shall be in accordance with CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, Section 32; and CAN/ULC-S524, Standard for Installation of Fire Alarm Systems;
- D Wire connections to the device, including equipment grounding by wire colour code and identified terminals, as applicable; and
- E Compatible interface equipment, such as *control unit* and end-of-line devices or the applicable parameters of the interface equipment for voltage, power, and supervision compatibility specified.

5.2 VANE AND PADDLE TYPE DEVICES

5.2.1 The following additional information is required to appear on the installation diagram:

- A Instructions on the installation of the product in the sprinkler pipe, such as pipe size, hole sizes and locations, direction of waterflow for activation;
- B Recommended torque values for the mounting bolts;
- C Instructions on setting retard features; and
- D If the product is intended for installation in more than one schedule of pipe sizes, instructions on trimming the vane or any other necessary adjustments.

5.3 VALVE POSITION SWITCHES

5.3.1 The following additional information is required to appear on the installation diagram:

- A The switch shall be installed in a manner so that the closing of 20% of the valve or a maximum of 4 revolutions will cause the switch to change status; and
- B Recommended torque values for the mounting bolts.

6 CONSTRUCTION

6.1 GENERAL - ALL PRODUCTS

6.1.1 General

6.1.1.1 A product shall be so constructed that it will be suitable for connection to *control units*, electrically actuated transmitters, or similar units which will permit its application in conformity with the applicable Standards (Refer to Clause 1.4).

6.1.2 Sizes

6.1.2.1 Products covered by these requirements include sizes 19 mm and larger. The indicator sizes refer to the nominal inside diameter of the main sprinkler pipe or tubing on which they are installed.

6.1.3 Assembly

6.1.3.1 An alarm accessory assembly shall include all of the components necessary for its intended function and installation. The components shall be planned for assembly as a unit.

6.1.3.2 An alarm accessory shall be constructed so that it can be installed and connected in accordance with the manufacturer's instructions without damaging the accessory and/or the component to which it is being attached.

6.1.3.3 Two or more subassemblies intended to be assembled in the field as a unit shall be capable of being joined together without misalignment and without requiring any of the subassemblies to be drilled, welded, or otherwise altered, except for a part required to be cut to length, threaded or grooved.

6.1.3.4 For the purpose of these requirements, if two or more subassemblies are designed to be used together as one unit, the entire assembly shall be considered and tested as one unit.

6.1.3.5 The assembly shall be capable of being dismantled, without removing the product from supporting structures or piping or disconnecting the field wiring means to permit inspection, adjustment, or repairs. Any means for adjustment that could adversely affect the operation of the product shall be enclosed or shielded to discourage tampering.

6.1.3.6 A water motor and gong assembly shall be constructed to prevent loosening of the gong from its support as a result of operation of the assembly or setting of the supporting structure.

6.1.4 Working Pressures

6.1.4.1 A product shall be constructed for a maximum working pressure of 1200 kPa (gauge) unless specifically indicated otherwise on the product.

6.1.5 Mounting Positions

6.1.5.1 A product may be constructed to operate as intended when installed in the horizontal position only, or the vertical position only, or it may be constructed to operate in both of these positions. If the product is intended for mounting only in one position, it shall be marked to indicate that position.

6.2 ENCLOSURE — ALL PRODUCTS

6.2.1 General

6.2.1.1 The enclosure of a product shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it is likely to be subjected in service without impairing its operation due to total or partial collapse with resulting reduction of spacings, or loosening, or displacement of parts or development of other conditions which could impair operation of the device and increase the risk of fire or electrical shock. See Subsection 8.26, Mechanical Strength Tests for Enclosures.

6.2.1.2 All electrical parts of a product shall be enclosed to provide protection against contact with uninsulated live parts.

6.2.1.3 The enclosure of a product shall be provided with means for mounting in the intended manner. Any fittings, such as brackets, hangers, or the like, necessary for the intended mounting shall be furnished with the unit. The mounting means shall be accessible without disassembling any operating part of the product.

6.2.1.4 An enclosure shall have provision for the connection of metal-clad cable, conduit, or non-metallic sheathed cable. An enclosure without such provision may be acceptable if definite instructions are furnished with it indicating the sections of the product which are intended to be drilled in the field for the connection of raceways, or if the unit is intended for mounting on an outlet box.

6.2.1.5 An opening threaded for pipe connection shall be threaded in accordance with ASME/ANSI B1.20.1, Standard for Pipe Threads - General Purpose (Inch). An assembly for attachment to pipe by threaded connection shall have a substantial section to serve as a wrench grip.

6.2.1.6 A ferrule, bushing, or other functional part of a product having a threaded connection for attachment to pipe shall not become loosened or dislodged as the result of the turning effect of assembling or dismantling pipe.

6.2.1.7 Glass covering an observation opening that forms a part of the enclosure shall be secured in place so that it cannot be displaced in service, and shall provide mechanical protection for the enclosed parts and shall be:

- A Not less than 1.40 mm thick, nominal 1.6 mm, for an opening not more than 100 mm in any dimension; or
- B Not less than 2.92 mm thick, nominal 3.2 mm, for an opening having no dimension greater than 300 mm.

6.2.2 Cast Metal Enclosures

6.2.2.1 The thickness of cast metal for an enclosure shall be as indicated in Table 1, Cast Metal Enclosures, except that cast metal having a thickness 0.8 mm less than that indicated in Table 1, Cast Metal Enclosures, may be employed if the surface under consideration is curved, ribbed, or otherwise reinforced, or if the shape and/or size of the surface is such that equivalent mechanical strength is provided.

6.2.2.2 If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, or if an equivalent construction is employed, there shall be not less than three and one-half nor more than five threads in the metal, and the construction shall be such that a standard conduit bushing can be properly attached.

6.2.2.3 If threads for the connection of conduit are tapped part way through a hole in an enclosure wall, there shall be not less than five full threads in the metal, and there shall be a smooth, rounded conduit stop of inside diameter equal to that specified for a standard conduit bushing of the appropriate size for the protection of the conductors

6.2.3 Sheet Metal Enclosures

6.2.3.1 The thickness of sheet metal employed for the enclosure of a product shall be not less than that indicated in Table 2, Minimum Thickness of Sheet Metal for Enclosures and Barriers, Carbon Steel or Stainless Steel; or Table 3, Minimum Thickness of Sheet Metal for Enclosures and Barriers, Aluminum, Copper, or Brass, except that sheet metal 20% less in thickness may be employed if the surface under consideration is curved, ribbed, or otherwise reinforced, or if the shape and/or size of the surface is such that equivalent mechanical strength is provided.

6.2.3.2 At any point where conduit or metal-clad cable is to be attached, sheet metal shall be of such thickness or shall be so formed or reinforced that it will have stiffness at least equivalent to that of an uncoated flat sheet having a minimum thickness of 1.35 mm and the construction shall be such that a standard conduit bushing can be attached.

6.2.3.3 A plate or plug for an unused conduit opening or other hole in the enclosure shall have a thickness not less than 0.66 mm if of steel or 0.81 mm if of non-ferrous metal.

6.2.3.4 A closure for a larger hole shall have a thickness equal to that required for the enclosure of the product or a standard knockout seal shall be used. Such plates or plugs shall be securely mounted.

6.2.3.5 A knockout in a sheet metal enclosure shall be reliably secured but shall be capable of being removed without undue deformation of the enclosure.

6.2.3.6 A knockout shall be provided with a flat surrounding surface adequate for proper seating of a conduit bushing, and shall be so located that installation of a bushing at any knockout likely to be used during installation will not result in spacings between uninsulated live parts and the bushing of less than the requirements in this Standard. (Refer to Subsection 6.10, Spacings.)

6.2.4 Nonmetallic Enclosures

6.2.4.1 Among the factors taken into consideration when judging the acceptability of a nonmetallic enclosure shall be: aging; mechanical strength; resistance to impact; moisture absorptive properties; flammability and resistance to ignition from electrical sources; dielectric strength, insulation resistance, and resistance to arc tracking; and resistance to distortion and creeping at temperatures to which the material may be subjected under conditions of normal or abnormal usage. (Refer to Section 8, Performance Tests, as applicable.)

6.2.4.2 An enclosure or parts of an enclosure of nonmetallic material shall have the mechanical strength and durability and be so formed that operating parts will be protected against damage. The enclosure parts shall resist the abuses likely to be encountered during installation and normal use and service, but in any case, the mechanical strength shall be at least equivalent to a sheet metal enclosure. (Refer to Subsection 8.26, Mechanical Strength Tests for Enclosures.)

6.2.4.3 The continuity of the grounding system of the equipment shall not rely on the dimensional integrity of the nonmetallic material.

6.3 OPERATING MECHANISMS

6.3.1 Shafts or bearings and materials in contact with bearings for movable parts shall be of corrosion resistant materials and shall be either self-lubricated or provided with other means to accomplish lubrication for an extended period of time. Any lubricants employed shall be practical for use over a temperature range of -40 ° to 49 °C

6.3.2 Metal parts coming into contact with a diaphragm shall have no sharp edges, burrs, or projections that might chafe or abrade the diaphragm.

6.3.3 An operating spring shall be made of corrosion resistant materials, and shall be retained and arranged to prevent abrasion, binding, buckling, or other interference with its free movement

6.4 CORROSION PROTECTION - ALL PRODUCTS

6.4.1 Iron and steel parts shall be protected against corrosion by enamelling, galvanizing, sherardizing, plating, or other equivalent means.

6.4.2 The requirement of Clause 6.4.1 applies to all enclosures whether of sheet steel or cast iron, and to all springs and other parts upon which mechanical operation may depend.

6.4.3 The requirement of Clause 6.4.1 does not apply to minor parts, such as washers, screws, bolts, and the like, if the failure of such unprotected parts would not be likely to result in a risk of fire, electric shock, or unintentional contact with hazardous moving parts that involve a risk of injury to persons or impair the operation of the product

6.4.4 Parts made of stainless steel, having corrosion resistance at least equivalent to Type 416 Stainless Steel, do not require additional protection.

6.4.5 Bearing surfaces shall be of such materials so as to reduce the likelihood of binding due to corrosion.

6.4.6 Metal used in cabinets and enclosures shall be galvanically compatible.

6.4.7 Hinges and other attachments shall be resistant to corrosion.

6.4.8 Nonferrous parts do not need special corrosion protection.

6.5 FIELD WIRING CONNECTIONS

6.5.1 General

6.5.1.1 A product shall be provided with wiring terminals or leads for the connection of conductors of at least the size required by CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, corresponding to the rating of the product.

6.5.1.2 Wiring terminals shall be prevented from turning.

6.5.1.3 The terminals to which wiring connections are made shall consist of binding screws with terminal plates having upturned lugs or the equivalent to hold the wires in position. Other terminal connections may be provided if found to be equivalent.

6.5.1.4 Dual terminals or dual leads, or equivalent means to achieve electrical supervision, shall be provided for each incoming and each outgoing circuit connection.

6.5.1.5 To comply with the requirements of Clause 6.5.1.4, a common terminal may be used for connection of both incoming and outgoing wires, provided that the design and construction of the terminal does not permit an uninsulated section of a single conductor to be looped around the terminal and serve as two separate connections, thereby precluding supervision of the connection in the event that the wire becomes dislodged from under the terminal.

6.5.1.6 A notched clamping plate under a single securing screw, where separate conductors of an initiating circuit are intended to be inserted in each notch, is acceptable to meet the requirements of Clauses 6.5.1.4 and 6.5.1.5, but this arrangement shall be supplemented by additional marking in the wiring area or on the installation wiring diagram specifying the intended connections to the terminals.

6.5.2 Field Wiring Compartment

6.5.2.1 The field wiring compartment area shall be in accordance with CSA C22.1 Canadian Electrical Code Section 12, Wiring Methods.

6.5.2.2 The field wiring compartment area shall be of sufficient size for completing all field wiring connections as specified by the installation wiring diagram, without damage to wire insulation or to internal components. There shall be adequate space within the compartment to permit the use of a standard conduit bushing on conduit connected to the compartment if a bushing is required for installation.

6.5.2.3 Protection from sharp edges for internal components and wire insulation shall be provided by insulating barriers or metal barriers having smooth, rounded edges.

6.5.2.4 The location of an outlet box or compartment in which field wiring connections are to be made shall be such that the connections may be inspected after the product is installed as intended. The removal of not more than two mounting screws, or an equivalent arrangement, to view the field wiring connections is considered to comply with this requirement.

6.5.3 Strain Relief

6.5.3.1 Strain relief shall be provided so that a mechanical stress on a flexible cord or cable, or field wiring will not be transmitted to terminals, splices, or internal wiring.

6.5.3.2 If a knot in a flexible cord serves as strain relief, a surface against which the knot may bear or with which it may come in contact shall be free from projections, sharp edges, burrs, fins, and the like, that may cause abrasion of the insulation on the conductors

6.5.3.3 Means shall be provided to prevent the flexible cord from being pushed into the alarm accessory through the cord entry hole if such displacement is likely to reduce spacings, such as to a metal strain relief clamp, below minimum acceptable values.

6.5.3.4 Strain relief shall be provided for the field supply leads, and all internally connected wires that are subject to movement in conjunction with the installation, operation, or servicing of an alarm accessory to reduce the likelihood of mechanical stress being transmitted to terminals and internal connections. Inward movement of the leads provided with a ring type strain relief or equivalent means shall not damage internal connections or components, or result in a reduction of electrical spacings.

6.5.3.5 The strain relief means provided on the flexible cord shall withstand for 1 min a force of 156 N applied to the cord, with no evidence of stress being transmitted to the interior connections. A force of 156 N is to be applied to the cord and supported by the product so that the strain relief means will be stressed from any angle that the construction of the product permits.