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ULC/ORD-C228-95

DOOR CLOSERS AND HOLDERS



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FOREWORD

Certification organizations are periodically called upon to respond promptly to a need to provide a certification service for devices, constructions, materials and systems for which no recognized standards of acceptance are available. Accordingly, the certification agency draws upon its experience, existing specifications and requirements in related areas, together with assistance from its advisory councils to develop and prepare an "Other Recognized Document" (ORD) for use in conducting the necessary tests and evaluation investigation.

Underwriters' Laboratories of Canada has over the years prepared many ORD's in response to requests from, and in conjunction with, industry, code writing bodies, regulatory agencies and others prior to inaugurating a certification programme. In many instances such documents have become published ULC Standards and subsequently National Standards of Canada. It is the intention of Underwriters' Laboratories of Canada to continue this practice, as appropriate.

Comments on the content of this ORD should be directed to the Head Office of Underwriters' Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario, CANADA, M1R 3A9.

NOTE: These Recognized Documents are accepted under the National Standards System of Canada. Reference may be made to the Document CAN-P-3, "Criteria and Procedures for Accreditation of Certification Organization" published by the Standards Council of Canada located at 45 O'Connor Street, Suite 1200, Ottawa, Ontario, CANADA, K1P 6N7.

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REQUIREMENTS FOR DOOR CLOSERS AND HOLDERS

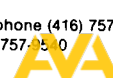
PREFACE

This is the Second Edition of the ULC/ORD-C228 (which was previously entitled Guide for the Investigation of Door Closers and Electromagnetic Door Holders).

A product which complies with these requirements will not necessarily be acceptable if, when examined and tested, it is found to have features not covered by the Standard which may impair the result contemplated by these requirements.

A product employing materials or having forms of construction differing from those detailed in these requirements may be examined and tested according to the intent of the requirements, and if found to be substantially equivalent, may be given recognition.

The SI units of measurement used throughout this Document are the primary units required to satisfy the requirements.



1. SCOPE

1.1 This Document establishes requirements for door holding-closing equipment in the following arrangements:

- A Closer with a separately installed holder-release unit actuated by a signal from a separately installed smoke detector or other source;
- B A single unit incorporating closing and holding-release functions actuated by a signal from a separately installed smoke detector or other source; or
- C A single unit incorporating closing, holding-release, and smoke detection functions.

1.2 The separately installed smoke detector of the arrangements detailed in Clause 1.1A and B, intended to initiate a door release and closure either directly or via a fire protective signalling system control unit shall comply with the requirements of the Standard for Smoke Detectors for Fire Alarm Systems, CAN/ULC-S529.

1.3 All functions of the unit detailed in Clause 1.1 C shall be in accordance with the requirements detailed in this Document.

1.4 The units covered by this Document are intended for installation in accordance with the Standard for Fire Doors and Windows, NFPA No. 80, and the Standard for the Installation of Fire Alarm Systems, CAN/ULC-S524.

1.5 The units covered by this Document are intended for installation in ordinary indoor locations.

NOTE: This Document does not include safety requirements that are covered by Federal or Provincial regulations.

2. GLOSSARY AND REFERENCE PUBLICATIONS

2.1 DEFINITIONS

2.1.1 FREE-SWINGING RELEASE - A feature of a closer-holder unit where the opening and closing control of the closer is disabled until receipt of a signal from a smoke detector or other source when the closer then performs its normal function and closes the door.

2.1.2 HOLD-OPEN - A feature of a closer-holder unit for holding the door in an open position against the closing force of the closer.

2.1.3 **HOLDER-RELEASE DEVICE** - An electromechanical or electromagnetic wall, floor or door mounted unit that releases doors from an open position upon receipt of a signal from a smoke detector or other source.

2.1.4 **MULTIPLE-POINT HOLD-OPEN** - A hold-open feature of a closer-holder unit for holding the door in more than one hold-open position.

2.1.5 **OPENING FORCE** - The force required to open a door measured perpendicular to the door face at a point 762 mm from the door's pivot centre during travel of the door from its closed position in the unlatched condition to 60° of door opening.

2.1.6 **RELEASE FORCE** - The force applied to the door required to overcome the holding force of a hold-open feature of a closer-holder unit or the holding force of a holder-release device.

2.1.7 **SINGLE-POINT HOLD-OPEN** - A hold-open feature of a closer-holder unit for holding the door open in one position.

2.2 REFERENCE PUBLICATIONS

2.2.1 Where reference is made to Standards, such reference shall be considered to refer to the latest edition and revision thereto, unless otherwise specified. This Document refers to the following such Standards:

- A CAN/ULC-S524, Standard for The Installation of Fire Alarm Systems;
- B CAN/ULC-S529, Standard for Smoke Detectors for Fire Alarm Systems;
- C CSA/C22.1, Canadian Electrical Code, Part I;
- D CSA/C22.2 No. 0, General Requirements - Canadian Electrical Code, Part II;
- E CSA/C22.2 No. 0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding);
- F CSA/C22.2 No. 0.6, Flammability Testing of Polymeric Materials;
- G CSA/C22.2 No. 66 (Reaffirmed 1969), Specialty Transformers;
- H CSA Standard B35.1-1972, Machine Screws and Associated Nuts;
- I CSA Standard B35.2-1963 (Reaffirmed 1969), Binding Head Screws;

J CGSB Standard 67-GP-7M, Standard for Cotton Absorbent, Sterile and Nonsterile;

K NFPA No. 80, Installation of Fire Doors and Windows.

3. GENERAL REQUIREMENTS

3.1 GENERAL

3.1.1 The term "product" or "unit" as used in this Document refers to all items of equipment covered by the Scope.

3.1.2 Unless otherwise indicated, all voltage and current values mentioned in this Document are rms.

3.1.3 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.

3.1.4 The requirements of this Document apply to units rated at not more than 120 V nominal (150 V maximum to ground).

3.1.5 All wiring to a unit intended for mounting within or on a door shall be Class 2 circuits as defined by the Canadian Electrical Code, Part I and shall not exceed 30 V (42.4 V peak or dc). The means for extending the wiring to the door such as a door cord or other flexible connector shall be provided with the unit and certified for the purpose.

3.2 FUNCTIONAL REQUIREMENTS

3.2.1 These products shall be used to make swinging doors close upon receipt of a signal of a fire or smoke emergency.

3.2.2 Upon release of the door by a hold-open device, free-swinging release device or holder-release device, the door shall become self-closing.

3.2.3 Door equipment which includes means for holding the door in an open position shall be arranged so that the door may be taken out of the hold-open state by a simple and obvious manual action following which the door shall become self-closing into the closed and latched state.

3.2.4 Closers incorporating the free-swinging release feature shall, while in the free-swinging mode prior to release, permit the door to be manually closed at any time.

3.2.5 The armature unit of an electromagnetic holder-release device shall be universal and self-adjusting.

4. INSTRUCTIONS AND DRAWINGS

4.1 Each unit shall be furnished with operating and maintenance instructions, installation instructions, and wiring drawings.

4.2 The operating instructions shall detail the following:

- A Identify all field adjustment controls and their function;
- B Identify all visual and audible indicators and their function; and
- C Describe the sequence of operation of the product.

4.3 The maintenance instructions shall detail the following:

- A Identify all overcurrent protective devices, their location and rating, and the circuit protected by each;
- B Identify equipment parts which require periodic replacement. The expected life or replacement frequency, ordering information, and procurement source of such parts shall be stated; and
- C Maintenance procedures for units and the frequency of such procedures.

4.4 The installation instructions shall cover the following items:

- A Raceway entry for the various circuits and circuit segregation where applicable;
- B Mounting and orientation; and
- C Location of units with respect to environmental conditions.

4.5 The installation wiring drawings shall cover the following:

- A Wiring material type designation;
- B Wire gauge related to power capacity requirements and circuit length, as applicable;
- C Wiring method which shall be in accordance with the Canadian Electrical Code, Part I;
- D Wire connections including equipment grounding by wire colour code or identified terminals as applicable.

- E Identify all connected system components by manufacturer and model designation, or by the parameters necessary to allow for the selection of compatible components by others; and
- F Electrical input rating of equipment and electrical rating of all extended circuits.

5. CONSTRUCTION

5.1 GENERAL

5.1.1 The integral smoke detector of a product described in Clause 1.1 C shall comply with the construction requirements of this Section and the relevant requirements of the Standard for Smoke Detectors for Fire Alarm Systems, CAN/ULC-S529.

5.2 PRODUCT ASSEMBLY

5.2.1 All parts of a product necessary for its intended function when installed (used) as intended shall be factory-built. The product may be shipped from the factory as a complete assembly or as two or more subassemblies.

5.2.2 If the product is shipped by the manufacturer as two or more subassemblies, assembly instructions with each subassembly positively identified shall be furnished. Each subassembly shall be capable of being incorporated into the final assembly without requiring alteration, cutting, drilling, threading, welding, soldering, critical alignment, or similar tasks by the installer.

5.3 PROTECTION OF SERVICE PERSONNEL (See also Subsection 5.4.3)

5.3.1 An uninsulated live part at a hazardous potential within the enclosure shall be located, guarded, or enclosed so as to minimize the likelihood of accidental contact by persons performing service functions which may be performed with the equipment energized.

5.3.2 An electrical component which may require examination, replacement, adjustment, servicing, or maintenance with the product energized shall be located and mounted with respect to other components and with respect to grounded metal so that it is accessible for such service without subjecting the serviceman to the likelihood of electric shock from adjacent uninsulated live parts at hazardous potential.

5.3.3 The following are not considered to be uninsulated live parts:

- A Coils of relays and solenoids, and transformer windings, if the coils and windings are provided with insulating overwraps rated for the potentials encountered;

B Terminals and splices with insulation rated for the potential encountered; and

C Insulated wire.

5.3.4 The means of access to a compartment containing live parts at hazardous potential not intended to be serviced with the equipment energized shall be marked in accordance with Clause 6.3.4. Any removable barrier or guard provided to shield a live part at hazardous potential shall be marked in accordance with Clause 6.3.5.

5.3.5 Provision shall be made for the automatic discharge of the energy stored in capacitors if the safety of an area to which service personnel have access is dependent upon de-energizing the equipment, unless the equipment is marked with a clear instruction specifying the time required for discharge to a potential less than 30 V (rms) or 42.4 V (peak) if the time for self-discharge to this value is greater than 5 s.

5.4 ENCLOSURES

5.4.1 General

5.4.1.1 The product shall be enclosed or inherently constructed and enclosed so that:

- A The product is protected from damage from forces and impacts applied to the enclosure;
- B The product is protected from damage by the entry of foreign objects;
- C Protection against electrical shock from enclosed live parts is provided; and
- D Ignition by the product of combustible material adjacent to the product is prevented.

5.4.1.2 Operating parts which may be affected by dust shall be enclosed to exclude entry of dust.

5.4.1.3 The enclosure of a product shall be provided with means for mounting of the product in its intended position.

5.4.1.4 The mounting means shall be accessible without disassembly of any components of the product. Removal of a complete assembly is not considered to be disassembly of a component. There shall be at least 12.5 mm of free space about a key hole opening intended for mounting, and no live parts shall be located less than 25 mm directly behind the opening.

5.4.1.5 Except for a product detailed in Clause 3.1.5, the enclosure of a product shall have provision for installation wiring entry by means of conduit openings in accordance with Subsections 5.4.6 through 5.4.8.

5.4.1.6 The outside edges, corners and projections of an enclosure which will be exposed after installation, or projecting operating parts, shall be smooth and rounded to 1.6 mm radius to minimize the possibility of a cut injury or injury by impact.

5.4.2 Enclosure Strength and Integrity

5.4.2.1 The frame and enclosure of a product shall be sufficiently strong and rigid to resist total or partial collapse with attendant reduction of spacings, loosening or displacement of parts and development of other conditions which could impair operation of the product and increase the risk of fire or electrical shock. The enclosure shall also provide the required degree of product protection from damage by the entry of foreign objects.

5.4.2.2 In determining compliance with Clause 5.4.2.1, all elements that contribute to the enclosing function, including enclosures of individual components, shall be considered.

5.4.2.3 An enclosure shall be considered to comply with Clause 5.4.2.1 if it complies with Subsection 7.18, Mechanical Strength Tests for Enclosures, and the applicable requirements of Subsection 5.4.5, Openings.

5.4.2.4 A product intended for floor mounting shall comply with the Water Resistance test of Subsection 7.23 and the Impact test of Subsection 7.24.

5.4.3 Protection from Electric Shock (See also Subsections 5.3 and 5.4.5)

5.4.3.1 Electrical parts of a product shall be enclosed to provide protection from unintentional contact with uninsulated live parts at hazardous potential. A shock hazard from such contact is considered to exist if the open-circuit potential is higher than 42.4 V (peak) and the available current or stored energy exceeds the values specified in Subsection 7.7, Electric Shock Current Test. The probe illustrated in Figure 1 is to be used to determine that an uninsulated live part cannot be contacted under the following conditions:

- A The probe may be articulated into any configuration and may be rotated or angled to any position before, during or after insertion into the area being investigated;

B Doors and covers not equipped with an interlock providing access to compartments containing components which may require servicing or adjustment with the equipment energized shall be opened or removed. Any removable barrier or guard provided to shield a live part and marked in accordance with Clause 6.3.5 shall remain in place while applying the probe for the purpose of this requirement;

EXCEPTION: This requirement does not apply to the screw shell of a lampholder or equivalently mounted components.

C Product parts such as covers, doors, panels and grilles used as part of the enclosure are to be removed unless a tool or key is required for their opening or removal, or an interlock is provided; and

D The product complies with the Mechanical Strength Test for Enclosures, Subsection 7.18.

5.4.3.2 An interlock that is relied on for protection from electric shock shall be designed so that:

A It cannot be reset inadvertently; and

B If it can be actuated intentionally so as to restore power to the de-energized parts, the reclosing or replacement of the cover, door, panel or grille will automatically restore the interlock to a position in which it will perform as intended when the cover, door panel or grille is next opened or removed.

5.4.3.3 A product incorporating exposed metal parts which could be energized to a hazardous potential level as a result of an abnormal condition within the product shall be provided with means for grounding. Provisions for grounding and bonding shall be in accordance with CSA Standard C22.2 No. 0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding). Notwithstanding the need for bonding and grounding, for protection against electrical shock reasons, metal enclosures and dead metal parts which are likely to become energized, a product detailed in Clause 5.3.1 shall be bonded and grounded for ground fault detection reasons.

5.4.3.4 The insertion in any socket of any component or its equivalent of like designation used in the product shall not result in a risk of electric shock.

5.4.3.5 A product incorporating separately energized control circuits at hazardous potential shall comply with Item A and Item B or C:

- A The separately energized control circuits shall not exceed 150 V to ground;
- B The installation wiring drawing for the product, required by Clause 4.5, shall detail grouping, identification and warning marking of the disconnecting means as required by the Canadian Electric Code, Part I;
- C The bare live parts associated with the separately energized control circuits are protected against inadvertent contact by means of barriers and the product or protecting barriers are marked with a warning sign complying with Subsection 6.3.

5.4.4 Confinement of Fire Hazard

5.4.4.1 The enclosure of a product not energized from a Class 2 supply or containing other than Class 2 circuits, shall be of a material and constructed so as to prevent the emission or propagation of flame, molten metal, flaming or glowing particles, or flaming drops originating from the product. The evaluation of fire hazard confinement shall include direct expulsion of material by explosion of a component based on the maximum energy available to the component. (See also Subsection 5.8.7, Capacitors.) The maximum energy available to a product shall include the energy from an integral or externally located emergency battery.

5.4.4.2 In determining compliance with Clause 5.4.4.1, all elements that contribute to confinement of fire hazard, including enclosures of individual components, shall be considered.

5.4.4.3 An enclosure shall be considered to comply with Clause 5.4.4.1 if it complies with the following, as applicable:

- A Abnormal Operation Test, Subsection 7.14;
- B Burnout Test, Subsection 7.15;
- C Flame Test for Polymeric Materials, Subsection 7.19; and
- D Requirements of Clauses 5.4.5.4 and 5.4.5.5.

5.4.5 Openings

5.4.5.1 An opening in an enclosure shall be sized and arranged so that the product complies with Subsection 5.4.3, Protection from Electric Shock.

5.4.5.2 An opening in an enclosure shall be sized and so arranged that a straight rod of circular cross section 6.4 mm in diameter, with a hemispherical end, cannot be made to contact any uninsulated live part and cannot damage any part of the product by a push force of 5 N so as to impair operation, reduce electrical spacings or otherwise reduce the reliability of the product.

5.4.5.3 An opening in an enclosure provided for adjustment of the product shall be sized and so arranged that a straight rod of circular cross section 3.2 mm in diameter, with a flat end, cannot be made to contact any uninsulated live part and cannot damage any part of the product by a push force of 5 N so as to impair operation, reduce electrical spacings, or otherwise reduce the reliability of the product.

5.4.5.4 Openings over uninsulated live parts, or operating parts the operation of which may be impaired by foreign objects, shall not exceed 4.75 mm in any dimension unless the configuration of the opening is such that direct entry by falling foreign objects is prevented. See Figure 2 for examples of top cover designs that are deemed to prevent direct entry. See also Figure 3 for side openings.

5.4.5.5 The bottom of an enclosure containing materials having a flammability rating of 0.6 V-1 or better as determined by the flammability classification tests of CSA Standard C22.2 No. 0.6, Flammability Testing of Polymeric Materials, may have openings not larger in area than 0.4 cm². Openings in the bottom of enclosures containing materials which do not have a flammability rating of at least 0.6 V-1 may be provided if constructed so that dropping through of material from the enclosure would be prevented either by baffles over the openings as illustrated by Figure 4, or by protective barriers as illustrated by Figure 5. An alternative acceptable construction is a 1.02 mm thick or greater sheet steel bottom panel in which 2 mm diameter round holes are spaced no closer than 1.5 times the hole diameter centre-to-centre. Other constructions are acceptable if the product complies with the Ignition Through Bottom Panel Openings Test, Subsection 7.20.

5.4.6 Cast Metal Enclosures

5.4.6.1 The minimum thickness of parts of an enclosure die-cast of zinc-alloy specified in ANSI/ASTM B86 shall be as indicated in Table 1. Enclosures of lesser thickness are acceptable if due to the shape and size equivalent mechanical strength is obtained and the product complies with the Mechanical Strength Tests for Enclosures, Subsection 7.18.

5.4.6.2 Enclosures of other alloys or cast by other methods are acceptable if the minimum thickness of metal is not less than indicated in Table 1 and the product complies with the Mechanical Strength Tests for Enclosures, Subsection 7.18.

5.4.6.3 If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, there shall be not less than 3-1/2 nor more than 5 threads in the metal, and the construction shall be such that a standard conduit bushing can be properly attached.

5.4.6.4 If threads for the connection of conduit are tapped only part of the way through a hole in an enclosure wall, there shall be not less than 3-1/2 full threads in the metal, and there shall be a smooth, rounded inlet hole which shall afford protection to the conductors equivalent to that provided by a standard conduit bushing.

TABLE 1
CAST METAL ENCLOSURES

Use or Dimensions of Area Involved	Minimum Thickness, mm	
	Die-Cast Metal	Cast Metal of Other Than the Die-Cast Type
Area of 155 cm ² or less and having no dimension greater than 150 mm.	1.6	3.2
Area greater than 155 cm ² or having any dimension greater than 150 mm	2.4	3.2
At a threaded conduit hole	6.4	6.4
At an unthreaded conduit hole	3.2	3.2

5.4.6.5 A product designed to be supported by rigid conduit shall be provided with conduit hubs, or the equivalent, having not less than 5 full threads.

5.4.7 Sheet Metal Enclosures

5.4.7.1 The thickness of sheet metal employed for the enclosure of a product shall be not less than that indicated in Table 2, except that sheet metal of two gauge sizes lesser 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 adequate mechanical strength is provided.

5.4.7.2 A plate or plug closure for an unused conduit opening or other hole in the enclosure shall have a thickness not less than:

A 0.36 mm for steel or 0.43 mm for nonferrous metal for a hole having a 6.4 mm maximum dimension;

B 0.69 mm for steel or 0.81 mm for nonferrous metal for a hole having a 35 mm maximum dimension.

TABLE 2

SHEET METAL ENCLOSURES

Maximum Enclosure Dimensions		Minimum Thickness of Sheet Metal, mm		
Any Linear Dimension	Area of Any Surface	Steel		Brass or Aluminum
mm	cm ²	Zinc Coated	Uncoated	
305	584	1.00	0.90	1.29
610	2322	1.31	1.20	1.63
1219	7742	1.61	1.50	2.05
1524	9678	1.99	1.90	2.59
Over 1524	Over 9678	2.74	2.65	3.26

5.4.7.3 A hole larger than 35 mm diameter shall have a closure whose thickness is no less than that required for the enclosure of the product or shall have a standard knockout seal. Such plates or plugs shall be securely mounted.

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

5.4.7.5 A knockout shall be provided with a surrounding surface area of sufficient size to permit seating of a conduit bushing, and shall be so located that a bushing employed at any knockout likely to be used during installation will not result in spacings between uninsulated live parts and the bushing of less than those indicated under Spacings, Subsection 5.9.

5.4.7.6 An enclosure intended for recessed mounting and whose front panel is to be flush with the surface of the wall, shall have no openings that vent into concealed spaces of a building structure, such as into hollow spaces in the wall, when the product is mounted as intended.

5.4.7.7 The requirement in Clause 5.4.7.6 does not apply to an opening for a mounting screw or nail or for a manufacturing operation (such as paint drainage) provided:

A No such opening has a dimension greater than 6.75 mm or an area greater than 0.35 cm^2 ; and

B There is no more than one mounting screw for each 300 mm of length of mounting surface.

5.4.7.8 A sheet metal member to which a wiring system is to be connected in the field shall have a thickness not less than 0.81 mm if of uncoated steel, of not less than 0.86 mm if of galvanized steel, and of not less than 1.14 mm if of nonferrous metal.

5.4.8 Nonmetallic Enclosures

5.4.8.1 Among the factors taken into consideration when judging the acceptability of a nonmetallic enclosure are the mechanical strength, resistance to impact, moisture-absorptive properties, flammability and resistance to ignition from electrical sources, dielectric strength, insulation resistance, resistance to arc tracking, and resistance to distortion and creeping at temperatures to which the material may be subjected. All these factors are considered with respect to aging. See also Mechanical Strength Tests for Enclosures, Subsection 7.18 and Flame Test for Polymeric Materials, Subsection 7.19.

5.4.9 Screens and Expanded Metal

5.4.9.1 Screens and expanded metal used as a guard, enclosure or part of an enclosure, shall comply with the applicable requirements of Subsections 5.4.2 through 5.4.4.