

ULC SUBJECT C634-M1986



**GUIDE
FOR
THE INVESTIGATION
OF
CONNECTORS AND SWITCHES
FOR USE WITH
BURGLAR ALARM SYSTEMS**

UNDERWRITERS' LABORATORIES OF CANADA

ULC SUBJECT C634-M1986

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Please Refer to ULC Subject C634-M1986

GUIDE FOR THE INVESTIGATION OF CONNECTORS AND SWITCHES FOR USE WITH BURGLAR ALARM SYSTEMS

FOREWORD

This is the First Edition of ULC Subject C634, entitled "Guide for the Investigation of Connectors and Switches for Use with Burglar Alarm Systems".

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 Guide 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.

These requirements are written in SI Units and have been prepared to accommodate metric conversion in Canada. Although this Edition is generally in soft-converted and rounded metric units, where new metric sizes of products have been established, such sizes are included in the Guide. An Appendix of equivalent Imperial Units is included for information purposes only.

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GENERAL

1. Scope

1.1 These requirements cover connectors and switches for use with burglar-alarm systems in mercantile premises, mercantile safes and vaults, bank safes and vaults, and residences. They are intended to be used in circuits of limited energy, for these applications, in accordance with the Canadian Electrical Code.

1.2 The connectors and switches covered by these requirements include insulated contact springs and mating brackets; magnetically actuated and mercury switches; heat, smoke, and vibration detectors; floor mats; floor traps, special contacts for safes and vaults; flexible connectors; foil connectors; and shunting devices.

1.3 Switches covered by these requirements are intended for use in protective circuits to supervise doors, windows, hatches, vents, trap doors, and the like, to initiate an alarm signal when actuated.

1.4 Connectors covered by these requirements are intended to join various parts of protective circuit components and wiring.

1.5 The products covered by these requirements are intended to be installed in accordance with the Standard for Installation and Classification of Mercantile and Bank Burglar Alarm Systems, ULC-S302, or the Guide for Installation and Classification of Residential Burglar Alarm Systems, ULC Subject C1641.

2. Glossary

2.1 For the purpose of this Guide, the following definitions apply:

2.2 CIRCUITS, ELECTRICAL -

- A HIGH-VOLTAGE - A circuit involving a potential of not more than 300 Vrms and having circuit characteristics in excess of those of a low-voltage power limited circuit.
- B LOW-VOLTAGE (POWER LIMITED) - A circuit involving a potential of not more than 30 Vrms (42.4 Vpeak) or 30 Vdc and providing not more than 100 VA rated output. The 100 VA limit shall be provided by the construction of the transformer; a fixed impedance; a noninterchangeable fuse; a nonadjustable manual reset circuit protective device; or a regulating network.

2.3 SUPPLEMENTARY DEVICE - An assembly of parts intended to provide a supplementary service or function as opposed to primary, required service.

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3. General

3.1 The term "product" as used in this Guide refers to all types of connectors and switches.

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

3.3 A component of a product covered by this Guide shall comply with the requirements for that component and shall be used in accordance with its recognized rating and other limitations of use. A component need not comply with a specific requirement that:

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

CONSTRUCTION

ASSEMBLY

4. General

4.1 Unless specifically indicated otherwise, the construction requirements specified for a product shall apply also for any accessories or supplementary devices with which it is to be employed.

5. Frame and Enclosure

5.1 The frame and enclosure of a product shall have strength and rigidity to resist total or partial collapse that may result in reduction of mechanical protection or electrical spacings (see Spacings, Section 15), loosening or displacement of parts, or other serious defects.

5.2 Electrical parts of a product shall be located or enclosed so that protection is provided against unintentional contact with uninsulated high-voltage live parts.

5.3 Operating parts, such as gear mechanisms, light-duty relays, and similar devices, shall be enclosed to protect against malfunction from dust or other material that may impair their intended operation.

5.4 An enclosure shall have means for mounting that shall be accessible without disassembling any operating part of the product. Removal of a completely assembled panel to mount the enclosure is not considered to be disassembly of an operating part.

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Cast Metal

5.5 The minimum thickness of cast metal for an enclosure shall be as indicated in Table 1.

Exception: Cast metal of lesser thickness may be employed if, upon investigation, the shape, size, and function of the enclosure provides equivalent mechanical strength. See Impact Test, Section 32.

Sheet Metal

TABLE 1

CAST-METAL ENCLOSURES

Use, or Dimensions of Area Involved ^a ,	Minimum Thickness	
	Die-Cast Metal, Millimetres	Cast Metal of Other Than the Die-Cast Type, Millimetres
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	2.5	3.2
At a threaded conduit hole	7.0	7.0
At an unthreaded conduit hole	3.2	3.2
^a The area limitation for metal 1.6 mm in thickness may be obtained by the provision of reinforcing ribs subdividing a larger area.		

5.6 The thickness of sheet metal employed for the enclosure of a product shall be not less than that indicated in Table 2 or 3, whichever applies.

Exception: Sheet metal of lesser thickness may be employed if, upon investigation, the shape, size, and function of the enclosure provides equivalent mechanical strength. See Impact Test, Section 32.

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TABLE 2
MINIMUM THICKNESS OF SHEET METAL FOR ENCLOSURES
CARBON STEEL OR STAINLESS STEEL

Without Supporting Frame ^a		With Supporting Frame or Equivalent Reinforcing ^a		Minimum Thickness	
Maximum Width ^b , Millimetres	Maximum Length ^c , Millimetres	Maximum width ^b , Millimetres	Maximum Length, Millimetres	Uncoated, Millimetres	Metal Coated Millimetres
102 121	Not limited 146	159 172	Not Limited 210	0.52	0.59
152 178	Not limited 222	241 254	Not limited 318	0.68	0.75
203 229	Not limited 292	305 330	Not limited 406	0.78	0.88
318 356	Not limited 457	495 533	Not limited 635	1.02	1.16
457 508	Not limited 635	686 737	Not limited 914	1.34	1.43
559 635	Not limited 787	838 889	Not limited 1092	1.52*	1.62
635 737	Not limited 914	990 1041	Not limited 1295	1.69	1.79
838 889	Not limited 1194	1295 1372	Not limited 1676	2.00	2.14
1067 1194	Not limited 1500	1626 1727	Not limited 2134	2.30	2.47
1321 1524	Not limited 1880	2032 2134	Not limited 2616	2.73	2.85
1600 1854	Not limited 2286	2464 2616	Not limited 3226	3.11	3.23

*soft converted

TABLE 2 Continued...

- a. A supporting frame is a structure of angle or channel or a folded rigid section of sheet metal which is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and which has sufficient torsional rigidity to resist the bending moments which may be applied via the enclosure surface when it is deflected. Construction that is considered to have equivalent reinforcing may be accomplished by designs that will produce a structure which is as rigid as one built with a frame of angles or channels. Construction considered to be without supporting frame includes a single sheet with single formed flanges (formed edges), or a single sheet which is corrugated or ribbed, or an enclosure surface loosely attached to a frame, for example, with spring clips.
- b. The width is the smaller dimension of a rectangular sheet metal piece which is part of an enclosure. Adjacent surfaces of an enclosure may have supports in common and be made of a single sheet.
- c. For panels which are not supported along one side, for example, side panels of boxes, the length of the unsupported side shall be limited to the dimensions specified unless the side in question is provided with a flange at least 12.5 mm wide.

5.7 A sheet metal member to which a wiring system is to be connected in the field shall be not less than 0.81 mm thick if of uncoated steel, 0.86 mm if of galvanized steel, and 1.41 mm if of nonferrous metal.

Nonmetallic

5.8 Nonmetallic material used for an enclosure shall have a wall thickness of not less than 1.6 mm.

5.9 Among the factors taken into consideration when determining 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, and resistance to arc tracking; resistance to distortion and creeping at temperatures to which the material may be subjected under any conditions of use; and the effect of exposure to weathering if for outdoor use. All these factors are to be considered with respect to aging in accordance with the Tests on Polymeric Materials, Section 38, and the Impact Test, Section 32.

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TABLE 3

MINIMUM THICKNESS OF SHEET METAL FOR ENCLOSURES
ALUMINUM, COPPER OR BRASS

Without Supporting Frame ^a		With Supporting Frame or Equivalent Reinforcing ^a		
Maximum Width ^b , Millimetres	Maximum Length ^c , Millimetres	Maximum Width ^b , Millimetres	Maximum Length, Millimetres	Minimum Thickness, Millimetres
76 89	Not limited 102	178 216	Not limited 241	0.58
102 127	Not limited 152	254 267	Not limited 343	0.74
152 165	Not limited 203	356 381	Not limited 457	0.91
203 241	Not limited 292	483 533	Not limited 635	1.14
305 356	Not limited 406	711 762	Not limited 940	1.47
457 508	Not limited 635	1067 1143	Not limited 1397	1.91
635 737	Not limited 914	1524 1627	Not limited 1981	2.41
940 1067	Not limited 1346	2210 2362	Not limited 2896	3.10
1321 1524	Not limited 1880	3124 3302	Not limited 4064	3.89

TABLE 3 Continued ...

- a A supporting frame is a structure of angle or channel or a folded rigid section of sheet metal which is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and which has sufficient torsional rigidity to resist the bending moments which may be applied via the enclosure surface when it is deflected. Construction that is considered to have equivalent reinforcing may be accomplished by designs that will produce a structure which is as rigid as one built with a frame of angles or channels. Construction considered to be without supporting frame includes a single sheet with single formed flanges (formed edges), or a single sheet which is corrugated or ribbed, or an enclosure surface loosely attached to a frame, for example, with spring clips.
- b The width is the smaller dimension of a rectangular sheet metal piece which is part of an enclosure. Adjacent surfaces of an enclosure may have supports in common and be made of a single sheet.
- c For panels which are not supported along one side, for example, side panels of boxes, the length of the unsupported side shall be limited to the dimensions specified unless the side in question is provided with a flange at least 12.5 mm wide.

5.10 Assembly screws that hold essential working parts and that must be loosened or removed in order to wire or install a connector or switch shall not thread into material other than metal.

6. Corrosion Protection

6.1 Iron and steel parts, other than bearings, and the like, where such protection is impracticable, shall be protected against corrosion by enameling, galvanizing, sherardizing, plating, or other equivalent means, as determined by the requirements of the Corrosion Tests - Indoor Use, Section 26.

6.2 The requirement of Clause 6.1 applies to all enclosures of sheet steel or cast iron, and to all springs and other parts upon which intended mechanical operation may depend.

Exception No.1: This requirement does not apply to parts, such as washers, screws, bolts, and the like, if corrosion of such unprotected parts would not result in risk of electric shock or fire, or impair the operation of the product.

Exception No.2: Parts made of stainless steel, polished or treated, if necessary, do not require additional protection against corrosion.

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6.3 Bearing surfaces shall be of such materials and construction as to resist binding due to corrosion.

6.4 Metals used in combination shall be galvanically compatible.

6.5 Enclosures of corrosion-resistant material may be employed without special corrosion protection.

FIELD WIRING CONNECTIONS

7. General

7.1 Wiring terminals or leads shall be provided for connection of conductors of at least the size required by the Canadian Electrical Code, Part 1.

7.2 A field wiring terminal shall be prevented from turning or shifting in position. This may be accomplished by means such as two screws or rivets; by square shoulders or mortises; by a dowel pin, lug, or offset; or by a connecting strap or clip fitted into an adjacent part. Friction between surfaces is not acceptable for preventing movement of the terminals.

7.3 Field wiring terminals intended for connection of No. 10 AWG and smaller wires may consist of terminal plates with wire binding screws.

7.4 A terminal plate tapped for a wire binding screw shall have not less than two full threads in the metal (the terminal plate metal may be extruded to provide the two full threads) and shall have upturned lugs, clamps, or the equivalent, to hold the wires in position. Other constructions may be employed if they provide equivalent thread security of the wire binding screw.

Exception No.1: Two full threads are not required if wire binding screws, which do not pass entirely through the threaded hole, engage clean-cut full threads for a distance not less than the major diameter of the screw.

Exception No.2: Other construction may be employed if they provide equivalent ruggedness of the terminal plate and thread security of the wire binding screw.

7.5 A wire binding screw shall be not smaller than No. 8 size.

Exception: A No. 6 screw may be used for the connection of one No. 14 AWG or smaller conductor and a No. 4 screw may be used for the connection of one No. 19 AWG or smaller conductor.

7.6 A terminal plate tapped for a wire binding screw shall be of nonferrous metal not less than 1.3 mm thick if used with a No. 8 or larger screw, and not less than 0.76 mm thick if used with a No. 6 or smaller screw.

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7.7 If two or more conductors are intended to be connected by wrapping under the same screw, a nonferrous intervening metal washer shall be used for each additional conductor. If the wires protrude above terminal barriers, the nonferrous separator shall include means, such as upturned tabs or sides, to retain the wire.

Exception: A separator washer is not required if two conductors are separated and intended to be secured under a common clamping plate.

Terminals - Qualified Application

7.8 Any of the following terminal configurations may be employed for connection of field wiring provided that they comply with all of the requirements of Clause 7.9, and with the applicable requirements in Tests on Special Terminal Assemblies, Section 39:

- A Telephone Type Terminals - Nonferrous terminal plates using a narrow V-shaped slot for securing of a conductor in a special post design, and requiring a special tool for wire connection;
- B Solderless Wrapped Terminals - Nonferrous terminals requiring a special tool and terminal post design;
- C Quick-Connect Terminals - Nonferrous quick-connect (push-type) terminals consisting of male posts permanently secured to the device and provided with compatible female connectors for connection to field wiring. Requires special tool for crimping of field wires. Mating terminals shall be shipped with the product, with instructions for their installation;
- D Push-In Terminals - Nonferrous (screwless) push-in terminals of the type used on some switches and receptacles wherein solid conductors may be pushed into slots containing spring-type retaining contacts. The leads can be removed by means of a tool inserted to relieve the spring tension on the conductor. Push-in terminals are not acceptable for use with aluminum conductors. The marking adjacent to the terminal shall indicate that only copper conductors are to be used;
- E Solder Terminals - Conventional nonferrous solder terminals; and
- F Other Terminals - Other terminal connections may be employed if found to be equivalent to those described in items A through E.

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7.9 Any of the terminal configurations listed in Clause 7.8 may be employed for connection of field wiring provided that they comply with all of the following:

- A If a special tool is required for connection, its use shall be indicated on the installation wiring diagram and the name of the manufacturer and the model number, or equivalent shall also be indicated, along with information as to where the tool may be obtained;
- B The range of wire sizes shall be indicated in the installation wiring diagram. The minimum permissible wire size to be employed shall be no smaller than No. 22 AWG;
- C The terminal shall permit the use of a conductor having sufficient ampacity for the circuit application; and
- D A lead intended to be disconnected for testing or routine servicing shall comply with the requirements of Clause 39.2.

Leads

7.10 A lead provided in lieu of wiring terminals shall be not less than 150 mm long, and not smaller than No. 22 AWG.

Exception No.1: A lead may be less than 150 mm long if it is evident that the use of a longer lead may result in damage to the lead insulation or impair the operation of the product.

Exception No.2: A lead intended for connection of a line-voltage source shall be not smaller than No. 18 AWG.

Strain Relief

7.11 A strain relief means shall be provided so that a mechanical stress on a flexible cord or cable will not be transmitted to terminals, splices, or interior wiring, as determined by the Strain Relief Pull Test, Section 37.

7.12 If a knot in a flexible cord serves as a 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, which may cause abrasion of the insulation on the conductors.