



UL 773A

Underwriters Laboratories Inc. Standard for Safety

Nonindustrial Photoelectric Switches for Lighting Control



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UL Standard for Safety for Nonindustrial Photoelectric Switches for Lighting Control, UL 773A

Fifth Edition, Dated February 10, 2006

Summary of Topics

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The Department of Defense (DoD) has adopted UL 773A on June 13, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover indoor and outdoor light-sensitive, motion (passive infrared)- sensitive, or both light- and motion (passive infrared)- sensitive control units rated 300 Vac or less and 2000 W or less that are intended for controlling indoor or outdoor electric lighting fixtures, and that are intended to be employed in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements do not cover photoelectric switches, intended for industrial use, or controls of the plug-in, locking type, used for area or roadway lighting fixtures.

1.3 A solid-state device is investigated under these requirements and under such additional requirements as are applicable to the device under consideration.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.1.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

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

2.1.4 Specific components are 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.

2.2 Units of measurement

2.2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.3 References

2.3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

3 Enclosure

3.1 The enclosure of a unit shall be strong and rigid so as to resist the abuses likely to be encountered in the operation of the unit. The degree of resistance inherent in the unit shall preclude total or partial collapse with the attendant reduction of spacings, loosening or displacement of parts, and other serious defects which alone or in combination may increase the risk of fire, electric shock, or injury to persons.

3.2 A cast-metal enclosure shall be at least 1/8 in (3.2 mm) thick at every point, more than 1/8 in thick at reinforcing ribs and door edges, and not less than 1/4 in (6.4 mm) thick at tapped holes for conduit.

Exception: Other than at plain or threaded conduit holes, die-cast metal may be:

a) Not less than 3/32 in (2.4 mm) thick for an area greater than 24 in² (155 cm²) or having any dimensions more than 6 in (152 mm); and

b) Not less than 1/16 in (1.6 mm) thick for an area of 24 in² or less and having no dimensions more than 6 in. The area limitation may be obtained by the provision of reinforcing ribs subdividing a larger area.

3.3 The cast-metal enclosure described in 3.2 or an enclosure of sheet metal having the construction indicated in Table 3.1 or 3.2 will generally be considered to have an acceptable level of the factors indicated in 3.1.

Table 3.1
Minimum thickness of sheet metal for enclosures –
carbon steel or stainless steel, in

Without supporting frame ^a		With supporting frame or equivalent reinforcing ^a		Minimum thickness	
Maximum width ^b	Maximum length of supported edge ^{c,d}	Maximum width ^b	Maximum length ^d	Uncoated	Zinc coated
4.0	Not limited	6.25	Not limited	0.020 ^e	0.023 ^e
4.75	5.75	6.75	8.25	0.020 ^e	0.023 ^e
6.0	Not limited	9.5	Not limited	0.026 ^e	0.029 ^e
7.0	8.75	10.0	12.5	0.026 ^e	0.029 ^e
8.0	Not limited	12.0	Not limited	0.032	0.034
9.0	11.5	13.0	16.0	0.032	0.034
12.5	Not limited	19.5	Not limited	0.042	0.045
14.0	18.0	21.0	25.0	0.042	0.045
18.0	Not limited	27.0	Not limited	0.053	0.056
20.0	25.0	29.0	36.0	0.053	0.056

NOTE – SI equivalents of the dimensions in this table are:

in	mm	in	mm	in	mm	in	mm	in	mm
0.020	0.51	0.053	1.35	7.0	178	12.0	305	21.0	533
0.023	0.58	0.056	1.42	8.0	203	12.5	318	25.0	635
0.026	0.66	4.0	102	8.25	210	13.0	330	27.0	686
0.029	0.74	4.75	121	8.75	222	14.0	356	29.0	737
0.032	0.81	5.75	146	9.0	229	16.0	406	36.0	914
0.034	0.86	6.0	152	9.5	241	18.0	457		
0.042	1.07	6.25	159	10.0	254	19.5	495		
0.045	1.14	6.75	171	11.5	292	20.0	508		

^a See 3.5.

^b The width is the smaller dimension of a rectangular sheet metal piece that 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 that 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.

^d "Not limited" applies only if the edge of the surface is flanged at least 1/2 in (12.7 mm) or fastened to adjacent surfaces not normally removed in use.

^e Sheet steel for an enclosure intended for outdoor use – raintight or rainproof – shall not be less than 0.034 in thick if zinc coated and not less than 0.032 in thick if uncoated.

Table 3.2
Minimum thickness of sheet metal for enclosures –
aluminum, copper, or brass, in

Without supporting frame ^a		With supporting frame or equivalent reinforcing ^a		Minimum thickness
Maximum width ^b	Maximum length ^{c,d}	Maximum width ^b	Maximum length ^d	
3.0	Not limited	7.0	Not limited	0.023 ^e
3.5	4.0	8.5	9.5	0.023 ^e
4.0	Not limited	10.0	Not limited	0.029
5.0	6.0	10.5	13.5	0.029
6.0	Not limited	14.0	Not limited	0.036
6.5	8.0	15.0	18.0	0.036
8.0	Not limited	19.0	Not limited	0.045
9.5	11.5	21.0	25.0	0.045
12.0	Not limited	28.0	Not limited	0.058
14.0	16.0	30.0	37.0	0.058
18.0	Not limited	42.0	Not limited	0.075
20.0	25.0	45.0	55.0	0.075

NOTE – SI equivalents of the dimensions in this table are:

in	mm	in	mm	in	mm	in	mm	in	mm
0.023	0.58	3.5	89	8.5	216	14.0	356	25.0	635
0.029	0.74	4.0	102	9.5	241	15.0	381	28.0	711
0.036	0.91	5.0	127	10.0	254	16.0	406	30.0	762
0.045	1.14	6.0	152	10.5	267	18.0	457	37.0	940
0.058	1.47	6.5	166	11.5	292	19.0	483	42.0	1067
0.075	1.90	7.0	178	12.0	305	20.0	508	45.0	1143
3.0	76	8.0	203	13.5	343	21.0	533	55.0	1397

^a See 3.5.
^b The width is the smaller dimension of a rectangular sheet metal piece that 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.
^d "Not Limited" applies only if the edge of the surface is flanged at least 1/2 in (12.7 mm) or fastened to adjacent surfaces not normally removed in use.
^e Sheet copper, brass, or aluminum for an enclosure intended for outdoor use – raintight or rainproof – shall not be less than 0.029 in thick.

3.4 Tables 3.1 and 3.2 are based on a uniform deflection of the enclosure surface for any given load concentrated at the center of the surface regardless of metal thickness.

3.5 With reference to Tables 3.1 and 3.2, a supporting frame is a structure of angle or channel or folded rigid section of sheet metal that is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and that has sufficient torsional rigidity to resist the bending moments that may be applied by 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 that 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;
- b) A single sheet that is corrugated or ribbed;

- c) An enclosure surface loosely attached to a frame, for example, with spring clips; and
- d) An enclosure surface having an unsupported edge.

3.6 A polymeric enclosure shall comply with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Exception No. 1: For an indoor use unit or an outdoor use unit that complies with Rain Test, Section 27, with the lens removed, a polymeric lens that does not provide an enclosure for live parts as determined in accordance with Accessibility to Uninsulated Live Parts, Section 4, need not comply with the requirements in UL 746C.

Exception No. 2: For an outdoor use unit other than as described in Exception No. 1, a polymeric lens that does not provide an enclosure for live parts as determined in accordance with Accessibility to Uninsulated Live Parts, Section 4, need only comply with the requirements for exposure to ultraviolet light and water exposure and immersion as specified in UL 746C.

3.7 The enclosure shall have provision for the connection of a wiring system acceptable for the application.

4 Accessibility of Uninsulated Live Parts

4.1 An uninsulated live part that may involve a risk of electric shock shall be located, enclosed, or guarded so that the part can not be contacted by persons.

4.2 A live part is considered to involve a risk of electric shock unless it is in one of the following circuits:

a) A circuit supplied by one or more isolated secondary windings of a transformer in which the maximum possible open circuit voltage at the transformer is less than:

- 1) 30 V (42.4 V peak) where wet contact is not likely to occur, and
- 2) 15 V (21.2 V peak) where wet contact is likely to occur; or

b) A circuit derived from a source other than that described in (a) in which the available current is limited to 0.5 mA, regardless of supply polarity. The current is to be measured between accessible points and from these points to earth ground through a 1500- Ω resistor. If circuit impedance is used to limit the current, the circuitry shall comply with the requirements specified in 4.3 and 4.4.

4.3 The circuit impedance described in 4.2(b) shall be provided by two independent means. Either independent means shall limit the available leakage current to less than 0.5 mA.

4.4 With respect to 4.3, the following components can be used for the application:

- a) Metal film, carbon film, wire wound, and metal glazed resistors;
- b) Metallized polyester film capacitors;
- c) Antenna-coupling capacitors, and line-by-pass capacitors that comply with the Standard for Capacitors and Suppressors for Radio- and Television-Type Appliances, UL 1414; and

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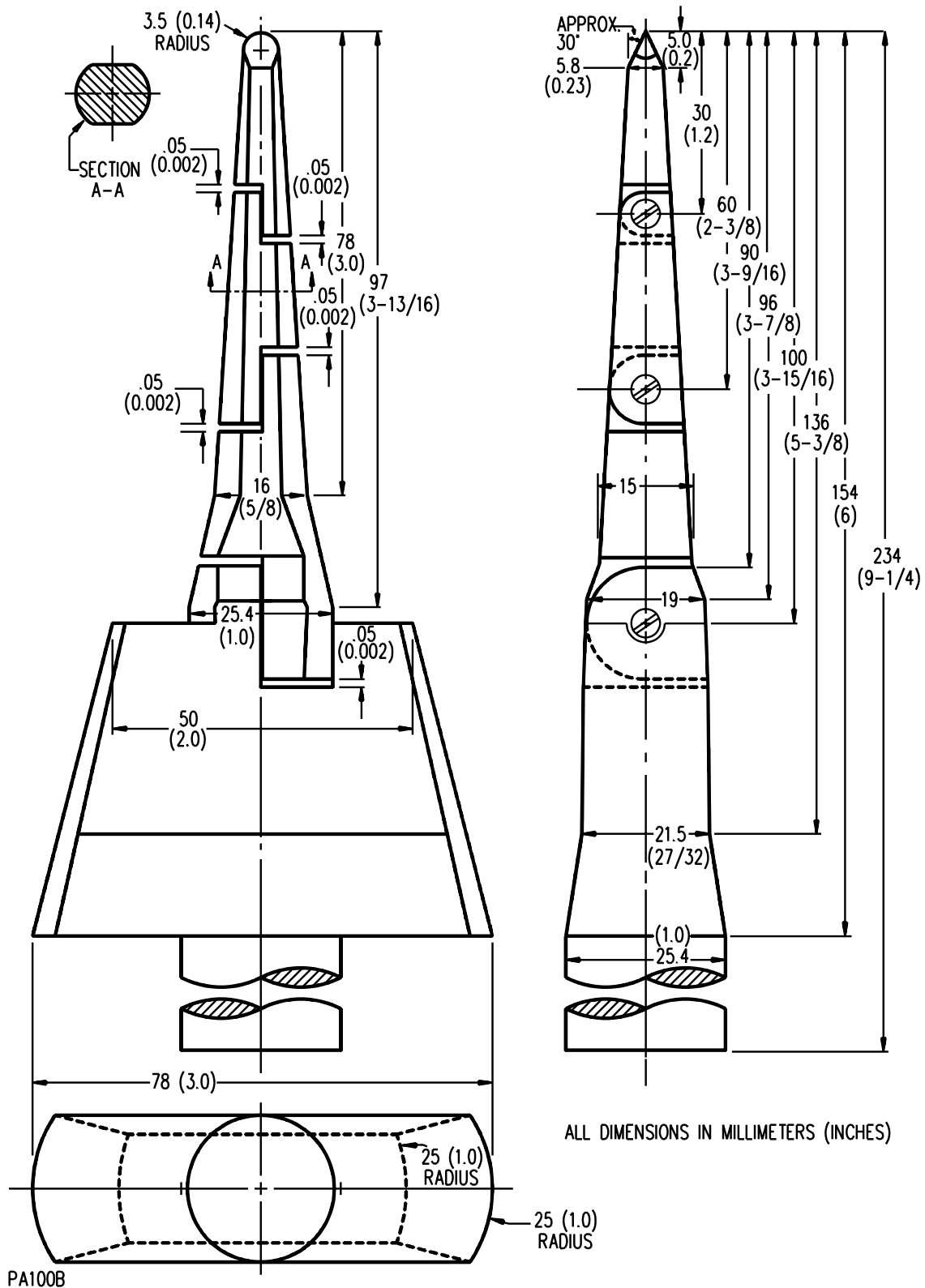
d) Other components, if investigated and found acceptable for the application.

4.4 revised June 23, 2010

4.5 For supplies of circuits of the types specified in 4.2(b), the minimum spacings shall be in accordance with Spacings, Section 12, or Alternate Spacings – Clearances and Creepage Distances, Section 13.

4.6 The probe illustrated in Figure 4.1, when inserted through an opening in an enclosure, guard, or operator accessible barrier, shall not touch any uninsulated live part that involves a risk of electric shock. See 4.7. The probe is to be rotated with the movable sections straight or in any possible position resulting from bending one or more sections in the same direction. See 5.1.

Figure 4.1
Articulate probe with web stop



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4.7 If any part of the enclosure must be opened or removed as part of normal operation, regular adjustment, or regular or required maintenance (set point adjustment, timer or time of day clock adjustment, battery replacement, or similar maintenance) with or without the use of tools, or can be opened or removed without the use of tools, the accessibility probe is to be applied without the part in place.

5 Openings in Enclosure

5.1 Openings in an enclosure shall not have any dimensions large enough to permit the entrance of a 1 in (25.4 mm) diameter rod, and shall comply with 5.2 – 5.6.

5.2 An opening shall not be provided in a compartment or part of an enclosure that contains field-wiring splices in a line-voltage circuit.

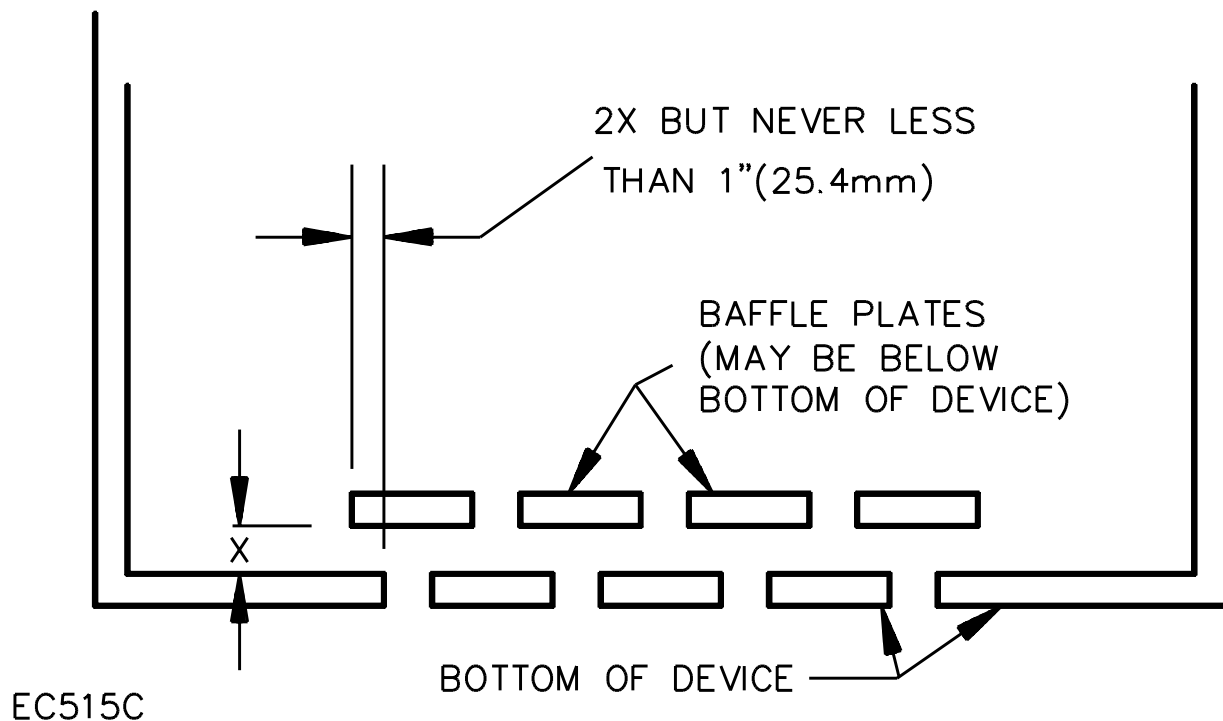
5.3 An opening shall not be located in a mounting surface of an enclosure.

Exception: The following openings may be located in the mounting surface of an enclosure:

- a) A mounting opening that complies with Provision for Mounting, Section 6.*
- b) A maximum of four openings provided for the escape of air or paint during a painting process. The maximum dimension of such an opening shall not exceed 1/8 in (3.2 mm).*
- c) A maximum of four unused holes provided for mounting of internal components. The maximum dimension of such an opening shall not exceed 3/16 in (4.8 mm).*

5.4 An opening may be provided in the bottom surface of an enclosure if the opening does not permit materials to fall directly out from the interior of the unit. Figure 5.1 illustrates a construction that meets this requirement.

Figure 5.1
Bottom surface opening of an enclosure



5.5 The shortest distance between an opening and the bottom of an enclosure or a wall-mounting surface shall be at least one-quarter of the enclosure height or depth, respectively, or 1 in (25.4 mm), whichever is less.

5.6 There shall be no emission of flame or molten material through an opening, or manifestation of risk of fire, during normal tests or during abnormal tests, such as transformer burnout.

6 Provision for Mounting

6.1 Provision shall be made for securely mounting a permanently connected unit in position. Bolts, screws, or other parts used for assembling the unit shall be independent of those used for securing component parts of the unit to the frame, base, or panel. There shall be no more than four holes for mounting.

6.2 A cord-connected unit shall not include means for permanent mounting. One or two keyhole slots for wall hanging may be provided if the hanging screws, nails, and similar means, are not accessible for tightening, and if long nails, hooks, or screws for hanging will not be likely to touch internal wiring, the operating mechanism, or live parts and will not result in spacings less than those required in 12.1.

6.3 A unit having attachment-plug blades for direct plug-in connection to a receptacle outlet rated 15 A, 125 V, and having the Standard for Wiring Devices, ANSI/NEMA WD6-1988, slot configuration shall have a mass of 28 oz (0.79 kg) or less. The moment, center of gravity, and dimensions shall not exceed the limits specified in 6.4.

6.4 The moment, center of gravity, and dimensions of a direct plug-in unit, see Figure 6.1, shall comply with each of the following:

- a) The quotient of WY/Z shall not exceed 48 oz (1.36 kg);
- b) The quotient of WY/S shall not exceed 48 oz;
- c) The product of WX shall not exceed 80 oz-in (0.56 N·m);
- d) The dimension Z3 shall not exceed 3-1/4 in (82.6 mm); and
- e) The dimensions S_1 , S_2 , Z_1 , and Z_2 shall not exceed 5 in (127 mm).

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