



UL 877

Underwriters Laboratories Inc. Standard for Safety

Circuit Breakers and
Circuit-Breaker Enclosures for
Use in Hazardous (Classified)
Locations



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UL Standard for Safety for Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations, UL 877

Fourth Edition, Dated June 28, 1993

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UL 877

**Standard for Circuit Breakers and Circuit-Breaker Enclosures for Use in
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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 circuit breakers specifically designed to provide service-entrance, meter-service, or branch-circuit protection for installation and use in hazardous (classified) locations, Class I, Division 1, Groups A, B, C, and D, and Class II, Division 1, Groups E, F, and G, in accordance with the National Electrical Code, NFPA 70.

1.1.1 These requirements also cover explosion-proof electrical equipment for installation and use in Class I, Zone 1, Groups IIA, IIB, IIB plus Hydrogen, and IIC hazardous (classified) locations.

1.1.1 added July 26, 1996

1.2 These requirements cover circuit breakers rated 600 volts, or less.

1.3 These requirements also cover enclosures intended to house a single circuit-breaker mechanism – single or multiple pole, or two single-pole circuit-breaker mechanisms. The mechanisms are not provided with the enclosures.

1.4 These requirements apply to circuit breakers and circuit breaker enclosures for use in hazardous locations under the following atmospheric conditions:

- a) A minimum ambient temperature of minus 25°C (minus 13°F),
- b) An oxygen concentration not greater than 21 percent by volume, and
- c) A nominal barometric pressure of one atmosphere.

1.5 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements to determine that the level of safety as originally anticipated by the intent of this Standard is maintained. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard shall not be judged to comply with this Standard. Where appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

1.5 revised November 18, 1999

2 General

2.1 Terminology

2.1.1 For the purpose of these requirements, the term circuit breaker covers the electrical mechanism together with an enclosure and the term circuit-breaker mechanism covers the electrical mechanisms, only.

2.2 Units of measurement

2.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.3 Undated references

2.3.1 Deleted November 18, 1999

2.4 Components

2.4.1 Except as indicated in 2.4.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.4.2 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 standard, or
- b) Is superseded by a requirement in this standard.

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

2.4.4 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.

2A Class I, Zone, and Group Equivalency

2A.1 Class I, Zone 1, Group IIA

2A.1.1 Explosion-proof electrical equipment intended to be marked in accordance with 24.1.1 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group D hazardous (classified) locations.

2A.1.1 added July 26, 1996

2A.2 Class I, Zone 1, Group IIB

2A.2.1 Explosion-proof electrical equipment intended to be marked in accordance with 24.1.2 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group C hazardous (classified) locations.

2A.2.1 added July 26, 1996

2A.3 Class I, Zone 1, Group IIB plus Hydrogen

2A.3.1 Explosion-proof electrical equipment intended to be marked in accordance with 24.1.3 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group B hazardous (classified) locations.

2A.3.1 added July 26, 1996

2A.4 Class I, Zone 1, Group IIC

2A.4.1 Explosion-proof electrical equipment intended to be marked in accordance with 24.1.4 shall comply with all the requirements for explosion-proof electrical equipment for use in both Class I, Group A and Class I, Group B hazardous (classified) locations.

2A.4.1 added July 26, 1996

CONSTRUCTION

3 General

3.1 These requirements cover both circuit breakers and circuit-breaker enclosures other than as indicated in 24.24.

3.2 Circuit breakers for use in hazardous locations shall also comply with the applicable requirements in the Standard for Molded-Case Circuit Breakers Molded-Case Switches, and Circuit-Breaker Enclosures, UL 489.

3.2 revised May 27, 1997

4 Enclosure Material

4.1 The enclosure of a circuit breaker shall be made of ferrous alloys, copper, brass, bronze, or aluminum or its alloys containing not less than 80 percent aluminum or shall be made of acceptable nonmetallic material. A metal such as zinc or magnesium, or their alloys, is not acceptable.

4.2 Copper shall not be used for the enclosure of a circuit breaker for use in Class I, Group A locations. A copper alloy may be used for an enclosure if:

- a) It is coated with tin, nickel, or other acceptable coating, or
- b) The copper content of the alloy is not more than 30 percent.

4.3 Among the factors that are taken into consideration when determining the acceptability of a nonmetallic material are:

- a) Mechanical strength,
- b) Resistance to impact,
- c) Moisture-absorptive properties,

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- d) Resistance to fungus,
- e) Combustibility,
- f) Resistance to repeated explosions,
- g) Resistance to solvents as covered by the hazardous location group or groups under consideration,
- h) Resistance to accumulation of electrostatic charges, and
- i) Resistance to distortion and creep at temperatures to which the material may be subjected under all conditions of use.

All of these factors are to be considered with respect to thermal aging.

5 Enclosure Thickness

5.1 The thickness of a metal enclosure wall shall not be less than specified in Table 5.1.

Exception: An enclosure of die-cast or permanent-mold aluminum may have a wall thickness of not less than 3/32 inch (2.4 mm), provided that:

- a) The free internal volume of the enclosure is less than 30 cubic inches (0.5 dm³);*
- b) Insulated conductors are clamped or routed so that they cannot contact the enclosure; and*
- c) All uninsulated live parts are separated from the enclosure by an insulating barrier at least 0.028 inch (0.70 mm) thick secured in place. In determining the acceptability of the insulating material, consideration is to be given to:*
 - 1) Moisture absorptive properties,*
 - 2) Combustibility,*
 - 3) Resistance to distortion at temperatures to which it may be subjected, and*
 - 4) Thermal aging.*

Table 5.1
Thickness of metal for enclosure

Maximum enclosure dimension		Minimum acceptable thickness, inch ^a		
Length or diameter in inches ^a	Area of any one surface in square inches ^b	Cast brass, bronze, copper, or malleable iron	Cast iron or aluminum	Sheet steel
22	480	0.093	0.125	0.067
30	620	0.093	0.125	0.093
60	1500	0.125	0.187	0.125
Over 60	Over 1500	0.187	0.250	0.187

^a 1 inch = 25.4 mm.
^b 1 square inch = 645 mm².

5.2 A machined or a threaded joint in the walls of a cast-metal enclosure shall have at least the thickness specified in Table 5.1 through the overlap.

6 Joints in Enclosures

6.1 General

6.1.1 A joint in an enclosure shall be of the metal-to-metal, metal-to-polymeric, or polymeric-to-polymeric type. The joint surface shall have an arithmetical average roughness of not more than 250 microinches (0.0064 mm) in accordance with the Standard for Surface Texture, ANSI/ASME B46.1-1985.

6.1.2 A polymeric-to-polymeric joint shall be a labyrinth or threaded type.

6.1.3 The free-internal volume is considered to be the total internal volume of an electrical enclosure minus the volume of internal components. Potting compounds are not considered in the determination of the free-internal volume.

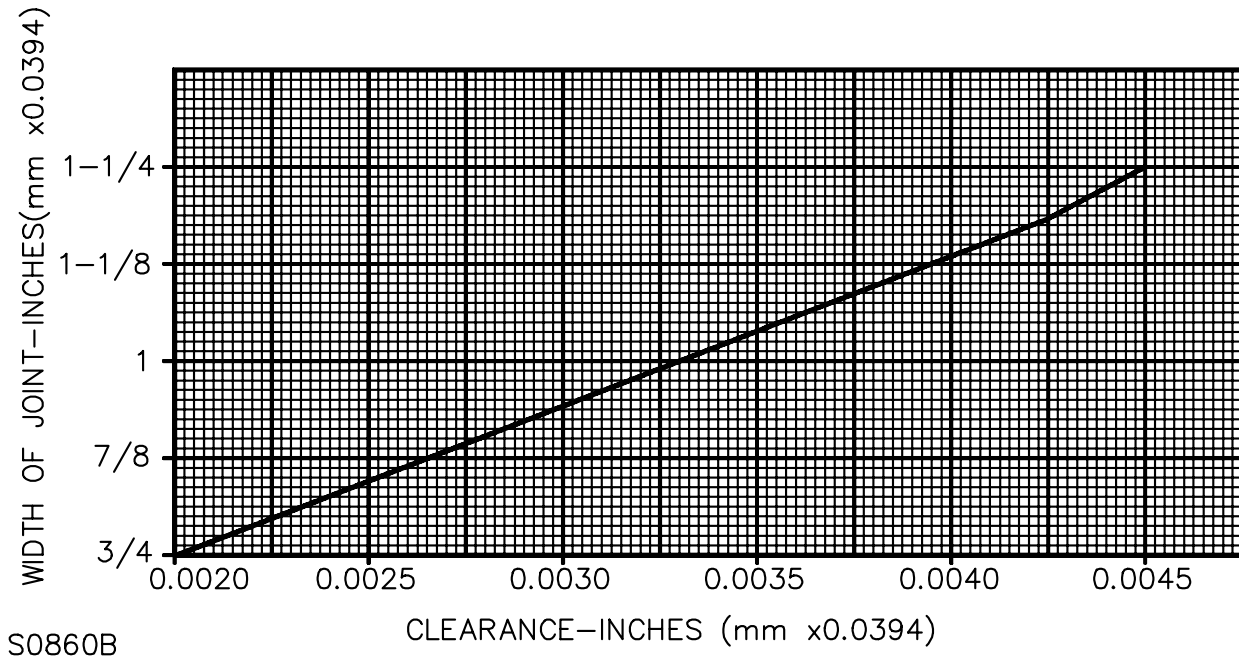
6.1.4 A feeler gauge utilized to measure the clearances specified in these requirements is to be 1/8 to 1/2 inch (3.2 to 12.7 mm) wide, with a 1/2-inch-wide gauge used, if possible. The width of a joint is to be measured with the cover in the most unfavorable position.

6.2 Class I, Groups C and D locations

6.2.1 Flat and rabbet joints

6.2.1.1 Except as indicated in 6.2.1.2, 6.2.1.3, and 6.2.3.1, the width of a joint and the clearance, when assembled, shall be as specified in Figure 6.1 and the width of joint shall not be less than 3/4 inch (19.1 mm).

Figure 6.1
Relation between clearance and width of joint



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6.2.1.2 A rabbet joint may have a diametrical clearance at the axial section of not more than twice the clearance specified in Figure 6.1 if neither the axial nor the radial section of the joint is less than 1/16 inch (1.6 mm) wide.

6.2.1.3 An enclosure having a free internal volume of not more than 300 cubic inches (4.92 dm³) may have a 1/2-inch (12.7-mm) wide rabbet joint or a 3/8-inch (9.5-mm) wide flat joint if details comply with (a) or (b), respectively.

a) One-half-inch wide rabbet joint (see Figure 6.2):

- 1) Neither the axial nor the radial section of the joint is less than 3/64 inch (1.2 mm) wide,
- 2) The diametrical clearance of the axial section and the clearance of the radial section of the joint is not more than 0.002 inch (0.05 mm), and
- 3) The joint width measured from the inside of the enclosure to the nearest edge of each bolt clearance hole and elsewhere is not less than 1/2 inch.

b) Three-eighths-inch wide flat joint (see Figure 6.3):

- 1) The clearance between the joint surfaces is less than 0.0015 inch (0.038 mm) or such that an 0.0015-inch feeler gauge will not enter the joint more than 1/8 inch (3.2 mm) at any point,

- 2) The thickness of the cover at the joint width is not less than 3/8 inch unless stiffened or reinforced metal of a lesser thickness has been found to be acceptable when judged with respect to opening of the joint clearance under internal pressures, and
- 3) The joint width measured from the inside of the enclosure to the nearest edge of each bolt clearance hole is not less than 3/8 inch.