UL 2044

STANDARD FOR SAFETY

Commercial Closed-Circuit Television Equipment

UL Standard for Safety for Commercial Closed-Circuit Television Equipment, UL 2044

Fourth Edition, Dated June 28, 2019

Summary of Topics

This revision of ANSI/UL 2044 dated August 28, 2024 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated June 28, 2024.

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UL 2044

Standard for Commercial Closed-Circuit Television Equipment

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This ANSI/UL Standard for Safety consists of the Fourth Edition including revisions through August 28, 2024.

The most recent designation of ANSI/UL 2044 as a Reaffirmed American National Standard (ANS) occurred on August 28, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover closed-circuit television equipment that:

a) Are intended for commercial use on supply circuits as defined in the National Electrical Code, NFPA 70; and

b) Receive their signals from a video-recorded medium or image-producing devices in a closed-circuit television system.

1.2 These requirements cover closed-circuit television equipment – such as video tape recorders; video-receiving, -processing, -recording, -producing, and -amplification equipment; video cameras; and the like.

1.3 These requirements also cover auxiliary equipment and accessories intended for use with closed-circuit television systems.

1.4 These requirements also cover portable closed-circuit television equipment of the types described in 1.2 that are intended for use with a vehicular, marine, or any other battery circuit as the power supply means.

1.5 These requirements do not cover video monitors, as these products are covered by the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1.

1.6 These requirements do not cover video cameras with integral electronic viewfinders.

1.7 These requirements do not cover tape-head demagnetizers or bulk tape erasers intended for use with video products and do not cover general-purpose tape-head demagnetizers or bulk tape erasers, as those products are covered by the requirements for household and commercial tape recorders in the Standard for Commercial Audio Equipment, UL 813.

1.8 Commercial video products provided with a means for receiving commercially broadcasted video signals and household video products are covered by the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1.

1.9 A cart or stand that is not intended to be used with a specific product is covered by the Standard for Household, Commercial, and Professional-Use Carts and Stands for Use with Audio/Video Equipment, UL 1678.

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. See Appendix A for a list of standards covering components used in the products covered by this standard.

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 Undated references

2.2.1 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.

2.3 Terminology

2.3.1 The term "product" as used in this standard refers to all types of closed-circuit television products.

3 Glossary

3.1 For the purpose of these requirements the following definitions apply:

3.2 ACCESSIBLE PART – A part located so that it can be contacted by means of a probe (see Figure 16.1) or that is not recessed the required distance behind an opening (see 16.9).

3.3 ADJUSTABLE CONTROL – A control provided for making adjustments necessary to render the product capable of performing its intended functions.

3.4 BRANCH CIRCUIT – A branch circuit is that portion of the building wiring system beyond the final overcurrent device on the power-distribution panel protecting the circuit to the field-wiring terminals in a permanently connected unit or to the receptacle outlet for cord-connected units.

3.5 CART – A stand (see 3.21) provided with casters, wheels, or rollers to make it mobile.

3.6 CASTER – Any roller or swiveled wheel attached to a cart, stand, or product that makes the cart, stand, or product mobile.

3.7 ELECTRONIC DEVICE – A part, or an assembly of parts, that employs electron or hole conduction in a vacuum, in a gaseous atmosphere, or in semiconductors.

3.8 ENCLOSURE – A material intended to limit access to uninsulated live parts, and live parts insulated with materials not intended to be subjected to user contact.

3.9 FIBER – The term "fiber" is used in place of "vulcanized fiber" to denote a material usually used as electrical insulation. Vulcanized fiber is made by combining layers of chemically gelled paper. The chemical compound used in gelling the paper is subsequently removed by leaching, and the resulting product, after being dried and finished by calendaring, is a dense material of partially regenerated cellulose in which the fibrous structure is retained in varying degrees, depending upon the grade of fiber. Cellulose fiberboard, pressboard, fullerboard, or cardboard are not accepted as the equivalent of fiber. Fishpaper is a designation commonly used in the trade to refer to thin sheets of electrical grade vulcanized fiber.

3.10 FIELD-WIRING TERMINAL – Any terminal to which a supply or other wire can be connected by an installer in the field is a field-wiring terminal unless the wire is provided as part of the unit and a connector, soldering lug, soldering loop, crimped eyelet, pressure terminal, or other means for making the connection is factory-assembled to the wire.

3.11 GROUND – Earth ground, unless otherwise specified.

3.12 HAZARDOUS CIRCUIT – A circuit that is not supplied by a low-voltage, limited-energy circuit as described in Low-Voltage, Limited-Energy Circuits, Section 14.

3.13 HOSPITAL PRODUCT – A product intended for use in a hospital, a nursing home, a medical-care center, or a similar health-care facility where installation is limited to a nonhazardous area in accordance with the National Electrical Code, NFPA 70. It is not intended for use in a critical-care area where a patient may be treated with an externalized electrical conductor, such as a probe, a catheter, or other electrode, connected to the heart.

3.14 HOUSING – A material intended to reduce the risk of unintentional contact with parts the user is expected to contact.

3.15 INTERLOCK – A mechanism that de-energizes parts involving risk of electric shock or that stops moving parts involving a risk of injury to persons before they become accessible to the user when the enclosure of the part is opened or a cover is removed.

3.16 MAJOR ENCLOSURE PART – A part of an enclosure that:

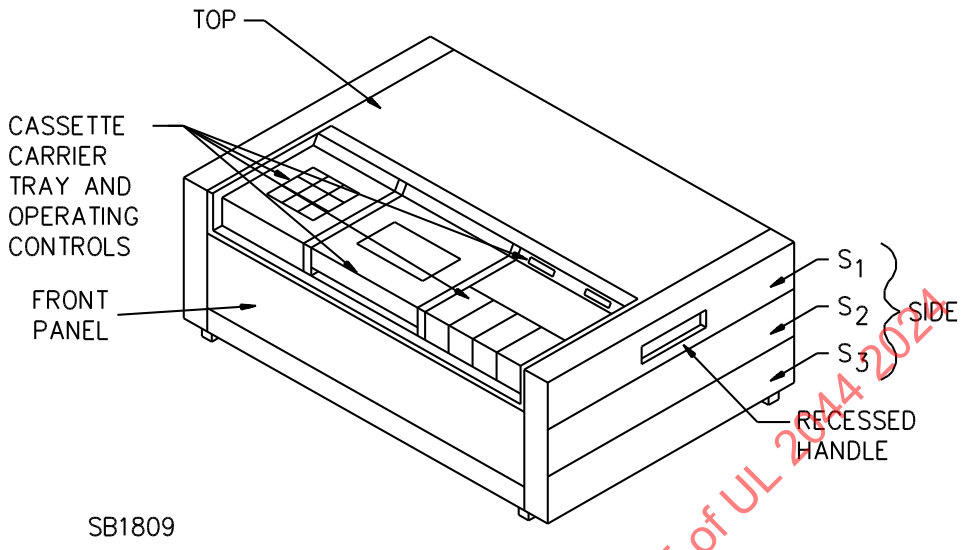
a) Forms more than 50 percent of the area of any surface, such as the front, back, top, bottom, or either side and

b) Is required to comply with the requirements for protection against risks of fire, electric shock, and injury to persons, or protection against mechanical damage to internal parts.

The surface area of a part is to be computed based on the surface area encompassed by the perimeter of the part, including the area composed of holes, perforations, and deletions within the boundaries of the part. If an enclosure surface is formed by separate sections, those sections that perform the same enclosure function are to be considered together; and both evaluation of the part and the computation of the surface area are to be based on the composite surface. See Figure 3.1.

Figure 3.1

Examples of some major enclosure parts



FRONT – The front surface is composed of a single panel of material plus the overlap from other surfaces. Since the panel comprises more than 100 percent of the surface and is considered to be a required part of the enclosure, it is a major enclosure part.

TOP – The top surface is composed of several parts and materials including the top panel, several dial windows, the cassette carrier tray, and operator controls. The dial windows, cassette carrier tray, and operator controls are not major enclosure parts, even though they are required parts of the enclosure, because they do not form more than 50 percent of the top surface. The top panel is a major enclosure part because when computing the surface area encompassed by the perimeter of the part – including the area composed of openings for the dial windows, cassette carrier tray, and operator controls – the resulting area comprises more than 50 percent of the surface.

SIDE – The side surface is composed of several parts and materials, including the recessed handle and three panels (S_1, S_2 and S_3). The recessed handle is not a major enclosure part, even though it is a required part of the enclosure, because it does not form more than 50 percent of the side surface. The panels S_1, S_2, and S_3 are major enclosure parts, even though each panel by itself does not form more than 50 percent of the side surface, because the three parts perform the same enclosure function, and when taken together, they form more than 50 percent of the side surface involved.

3.17 MINOR DIMENSION OF OPENING – The minor dimension of an opening is the diameter of the largest sphere that can pass through the opening.

3.18 ORDINARY TOOLS – Flat-bladed and cross-head screwdrivers, nut drivers, pliers, and the like.

3.19 POWER-SUPPLY CORD – The flexible cord and attachment plug provided to connect a product to the supply circuit.

3.20 RAIN SHIELD ENCLOSURE – A structural part of an outdoor-use wet location product relied upon to reduce the risk of contact with live parts, and the entrance of water into the product or onto current-carrying parts.

3.21 STAND – A structure intended to support a product.

3.22 STANDBY CONDITION – The ready-to-operate condition. The condition which exists prior to being tripped or operated by the manual actuation of an initiating device.

3.23 SUPPLY CIRCUIT – The branch circuit supplying electrical energy to the product.

3.24 UNINSULATED PART – A part that is bare (being without insulation) or has insulation that is not acceptable for the operating conditions (such as potential and temperature).

3.25 USER-SERVICING – The replacing, cleaning, adjusting, and similar maintenance operations intended to be accomplished by the user (see User-Servicing and Replacement of Parts, Section 17), for example:

a) Removing a cover,

b) Opening a door,

c) Adjusting a control,

d) Setting a supply-circuit voltage mechanism, and

e) Replacing a fuse.

CONSTRUCTION

4 General

4.1 The requirements in this section apply to all products within the scope of this standard. They are supplemented by requirements in separate sections that apply to a specific product.

4.2 The construction of the product shall be such that the product complies with each of the following:

a) The operation and user servicing of the product does not result in a risk of fire, electric shock, or injury to persons;

b) The materials and components are used within their electrical, mechanical, and temperature limits; and

c) The assembly protects the components and wiring from being displaced or damaged.

4.3 The materials, components, and wiring referred to in 4.2 and elsewhere in this standard, are to be those involving risk of fire, electric shock, or injury to persons.

Exception: Other materials, components, and wiring shall comply with 4.2 if specifically indicated.

5 Corrosion Protection

5.1 A metal part shall be protected against corrosion if corrosion of that part can increase the risk of fire, electric shock, or injury to persons.

Exception: Metals that are inherently corrosion resistant need not be additionally protected.

6 Outdoor-Use Products

6.1 A product intended for outdoor use shall be:

a) Provided with a Type SJ power-supply cord or the equivalent that is acceptable for outdoor-use;

b) Provided with an enclosure that complies with the applicable requirements in the Standard for Enclosures for Electrical Equipment, UL 50, and marked with an appropriate designation; and

c) Subjected to the Outdoor-Use Wetting Test, Section 64.

6.2 A product is considered to be intended for outdoor-use when it complies with one or more of the following:

a) It is provided with a means (handles, wheels, rollers, or similar manipulatory devices) making it portable;

b) It has a total mass of less than 35 kg;

c) It can be operated from a battery power-supply source; or

d) The product-manufacturer's literature (instruction manual, use-and-care information, advertising, or promotional material) indicates or implies outdoor-use of the product.

Exception: A product that is marked as specified in 72.11 need not be considered outdoor use.

7 Multiple-Supply-Circuit-Voltage Products

7.1 A product employing a supply-circuit-voltage selector shall be tested in accordance with the Multiple-Voltage Equipment Test, Section 57, without resulting in a risk of fire or electric shock. The product shall be provided with instructions and marked in accordance with 71.10 and 71.11.

7.2 A product that can be set to different rated supply-circuit voltages shall be so constructed that the indication of voltage to which the product is set is externally visible and preferably in the area adjacent to the rating information. See 71.11.

7.3 If the product is provided with more than one voltage-setting device or selector, it shall be indicated, either on the product or in the instructions that accompany the product from the factory, as to how all devices or selectors are to be set.

7.4 The construction of the supply-circuit-voltage selector shall be such that the supply-circuit-voltage setting cannot be unintentionally changed.

7.5 If the product is so constructed that the supply-circuit-voltage-selector setting can be changed by the user, the action of changing the voltage-selector setting shall also change the supply-circuit-voltage indication.

8 Material Flammability Classifications

8.1 A material shall have a minimum flammability rating as shown in Table 8.1. Cellulose nitrate or any comparably flammable material shall not be used for any part regardless of location, application, or function.

Table 8.1
Material flammability requirements

Material and application	Flammability classifications[a,b]
A. Enclosures:	
1. Polymeric	V-2, V-1, V-0
2. Pressed wood or similar materials[c]	None
B. Polymeric and fiber materials in contact with hazardous parts[d,e]	V-2, V-1, V-0, HF-2, HF-1, VTM-2, VTM-1, VTM-0
C. Sound-deadening and shock absorption material:	
1. In contact with live parts	
a) Specific gravity less than 0.6	HF-1, HF-0
b) Specific gravity equal to or more than 0.6	HB, V-2, V-1, V-0
2. Not in contact with live parts	
a) Specific gravity less than 0.6	HBF, HF-1, HF-0
b) Specific gravity equal to or more than 0.6	HB, V-2, V-1, V-0
D. Grille covering material, cloth, and reticulated foam	Tablet[f]
E. Materials used in applications other than those specified in A–D	HB, V-2, V-1, V-0, HBF, HF-2, HF-1, VTM-2, VTM-1, VTM-0

NOTE – Covers insulation properties and stability. Mechanical strength is investigated in the application. For enclosures see the Strength of Enclosure Tests, Section 60.

[a] Flammability Classification – Determined by tests described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. For testing a material, the samples are to be flat stock – bar samples – sized in accordance with UL 94; for an assembly, the samples can consist of the assembly. High voltage transformers, deflection yokes, printed-wiring boards, terminal strips, and the like can be tested as finished parts, or test samples can be cut from finished parts. In the case of small parts that might be consumed before the test is completed, larger samples of the same material can be tested when they represent the same or lesser thickness than the part in question. None of the larger samples is to be entirely consumed. Samples that consist of an assembly or a section of an assembly that are not flat stock samples are to be positioned in what is considered to be the worst position in the application. A material having a higher flammability classification than that specified in Table 8.1 is acceptable. See footnote b.

[b] The parts evaluated by Table 8.1 and classified using 1.6 mm thick bar specimens may be accepted in lesser thicknesses in the end product. For polymeric enclosures, a material classified using 3.2 mm thick bar specimens may be accepted in lesser thicknesses in the end product.

[c] Must be spaced at least 3.0 mm from uninsulated live parts.

[d] Does not apply to the internal insulating systems of components or where component requirements exist (see 2.1.1 – 2.1.4).

[e] See 3.12.

[f] The flammability test using a hexamethylene-tetramine tablet is described in Tablet Flammability Test, Section 66.

8.2 A recording or playback medium (for example tapes or discs) provided with or recommended for use with a recording or playback product shall not be formed of, nor coated with, cellulose nitrate or any comparably flammable material. The risk of fire for recording or playback media in storage shall not be greater than that of common newsprint in the same general form and quantity.

8.3 Accessory parts – such as lens caps, eyeshields, sunshades, shoulder pads, shoulder straps and separable lens systems, including lens, filters, and the like – that are external to a product are not required

to comply with the requirements in Table 8.1, and shall not be formed or coated with cellulose nitrate or any comparably flammable material.

8.4 The flammability requirements in Table 8.1 do not apply to small parts. For the purpose of these requirements, a small part is defined as one that complies with each of the following items:

a) Its volume does not exceed 2 cubic centimeters;

b) Its maximum dimension does not exceed 3 centimeters; and

c) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

9 Spacings

9.1 A minimum spacing of 3.0 mm over-surface and through-air shall be maintained between uninsulated live parts conductively connected to the supply circuit (for example, the primary circuit) and each of the following:

a) Uninsulated live parts of opposite polarity and

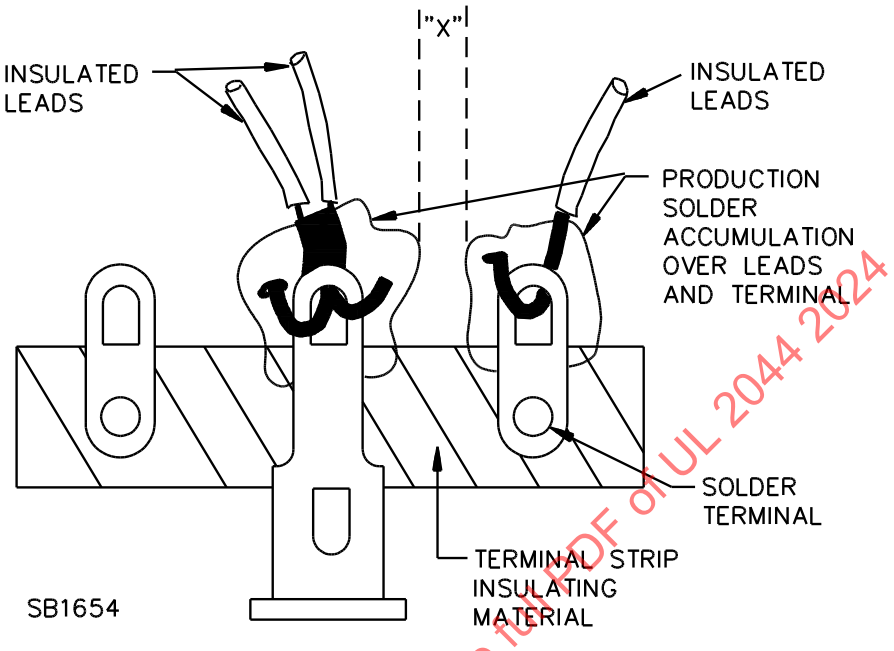
b) Accessible conductive parts.

Exception: The spacing requirements in 9.1 do not apply when the location and relative arrangement of parts are such that acceptable permanent separation is provided. See the Dielectric Voltage-Withstand Test, Section 44.

9.2 When measuring spacings through-air or over-surface between parts where hand-soldering is involved, the spacing may need to be measured assuming production accumulation of solder on parts and lead connections as illustrated in Figure 9.1.

Figure 9.1

Measurements of spacings between parts where hand-soldering is involved (example only to illustrate 9.2)



"X" is the spacing to be maintained between hand-soldered parts assuming production solder accumulation.

9.3 A barrier or liner of polymeric, fiber, or similar material (other than the enclosure), employed where spacings would otherwise be unacceptable between uninsulated live parts of opposite polarity or between such parts and accessible conductive parts, according to 9.1 and 9.2, shall comply with each of the following:

a) It shall be of a material complying with the requirements for insulating materials;

b) It shall be of a material as defined by Table 8.1;

c) It shall comply with the applicable tests specified in the Strength of Enclosure Tests, Section 60, when it is subject to handling during use or user-servicing of the product;

d) It shall be held in place by a means other than friction between surfaces;

e) It shall be located so that it is not damaged by operation of the product; and

f) It shall have a minimum thickness of 0.70 mm; 0.35 mm when used in conjunction with an air space.

Exception: Insulation that is built into a component is not required to comply with 9.3 (a) – (f).

9.4 A minimum spacing of 3.0 mm over-surface and through-air shall be maintained between the uninsulated live parts of a fuse and fuse clip that involve risk of electric shock and each of the following:

a) Uninsulated live parts of opposite polarity and

b) Accessible conductive parts.

The spacing shall be measured with the fuse in place.

Exception: When a barrier according to 9.3 is provided, the minimum spacing is not required to be maintained.

10 Product and Accessory Assembly

10.1 User-mechanical assembly (addition of legs, casters, decorative parts, and the like) of a product or accessory shall be such that all of the following requirements are met:

a) Assembly shall require one or more of the following:

1) No tools,

2) Only ordinary tools (see 3.18), or

3) Tools supplied with the assembly by the manufacturer;

b) All required parts shall be provided;

c) Assembly instructions shall be provided (see Installation, Operation, and Other Instructions, Section 74); and

d) Assembly instructions shall not cause the user to commit an act that in itself results in a risk of fire, electric shock, or injury to persons.

10.2 Products or accessories intended to be installed by qualified service personnel are not required to comply with 10.1 (a) and (d). Such products or accessories shall be provided with the installation instructions required in 74.1 and 74.4.

11 Adhesive-Backed Conductive Parts and Labels

11.1 A part or label of conductive material secured in place by an adhesive shall comply with the Adhesive-Backed Parts Peel Test, Section 63, when, dislodged, the part or label acts as a bridging agent and results in a risk of fire or electric shock.

12 Injury to Persons

12.1 The risk of injury to persons is considered to exist when one or more of the following conditions are present:

a) Power-operated moving parts, such as gears and linkages, are accessible during normal operation (see 12.2);

b) Sharp edges, burrs, or projections are present that can cause injury to persons during user-assembly, operation of the product, or user-servicing; or

c) The product, or the product on a cart or stand used with it, is unstable (see Injury to Persons Tests, Section 59).

12.2 In applying the requirement specified in 12.1(a), accessibility of power-operated moving parts such as gears and linkages shall be evaluated using the accessibility requirements specified in 16.8 and 16.9, and Table 16.2. Accessibility shall be determined after the installation or assembly of parts provided by the manufacturer has been completed according to the instructions packed with the product.

Exception: This requirement does not apply to tape-reel or tape-drive mechanisms that must be exposed for operation of the product. However, gears, linkages, and similar mechanisms shall be evaluated for accessibility if the construction is such that those parts can move with a tape reel, cartridge, or cassette removed from its operating position.

12.3 To determine compliance with the requirements specified in 12.1(b), the Standard for Tests for Sharpness of Edges on Equipment, UL 1439, shall be used.

13 Fire

13.1 For the purpose of evaluating the internal circuitry of products to the requirements of this standard, risk of fire is not considered to exist when the circuitry is determined to be low-voltage, limited-energy as described in Low-Voltage, Limited-Energy Circuits, Section 14, and as evaluated according to the Low-Voltage, Limited-Energy Circuit Test, Section 55.

14 Low-Voltage, Limited-Energy Circuits

14.1 There are no specifications for spacings in a low-voltage, limited-energy circuit, other than as may be required to reduce the risk of contact with an uninsulated live part of another circuit.

14.2 A low-voltage, limited-energy circuit is a circuit that is supplied from an isolated secondary winding of a transformer and that complies with the applicable values specified in Table 14.1. Power limitations of a low-voltage, limited-energy circuit may be obtained by the use of any of the following configurations:

a) An inherently-limited transformer;

b) A not-inherently-limited transformer coupled with an overcurrent protective device in the output circuit;

c) A combination transformer and fixed impedance; or

d) An arrangement equivalent to (a), (b) or (c).

Table 14.1
Low-voltage, limited-energy circuit values

Circuit voltage (volts)[a]	Inherently-limited transformer (overcurrent protection not required)			Not-inherently-limited transformer (overcurrent protection required)			
	0 – 20 volts AC or DC	Over 20 volts but not more than 30 volts AC or DC	Over 30 volts but not more than 60 volts DC	0 – 15 volts AC or DC	Over 15 volts but not more than 20 volts AC or DC	Over 20 volts but not more than 30 volts AC or DC	Over 30 volts but not more than 60 volts DC
Power limitation (volt-amperes)[b]	–	–	–	350	250	250	250
Current limitation (amperes)[c]	8	8	150/V[a]	1000/V[a]	1000/V[a]	1000/V[a]	1000/V[a]
Maximum overcurrent protection (amperes)	–	–	–	5	5	100/V[a]	100/V[a]
NOTE – In all cases the applied primary voltage shall be as indicated in Table 37.1.							

Table 14.1 Continued on Next Page