



UL 430

Underwriters Laboratories Inc. Standard for Safety

Waste Disposers



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UL Standard for Safety for Waste Disposers, UL 430

Seventh Edition, Dated December 16, 2009

Summary of Topics

The revision dated March 23, 2011 incorporates new and revised requirements as follows and reflects the March 23, 2011 ANSI approval date for UL 430:

- 1. Revisions To Paragraph 7.2.2 To Clarify The Specific Compliance Criteria Under Which Wiring May Be Exempt From Barrier Requirements***
- 2. Deletion of Paragraph 17.3 To Delete Obsolete References To Design E Motors***
- 3. Revision To Paragraph 35.8 And Addition Of Paragraph 35.9 To Differentiate Alternate Temperature Testing Methods For Commercial Disposers Having Continuous Duty Motors And Household Disposers Having Intermittent Duty Motors***
- 4. Revisions To Paragraphs 53.2.2 And 53.3.2 To Clarify Long Term Exposure Test Requirements For Complete Disposer Samples And Material Samples***
- 5. Addition And Revision Of Requirements To Relocate Component Standard References From Appendix A Into The Body Of The Standard As Component Requirements***

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated November 26, 2010.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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The most recent designation of ANSI/UL 430 as an American National Standard (ANSI) occurred on March 23, 2011. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

The Department of Defense (DoD) has adopted UL 430 on August 5, 1994. 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 motor operated household and commercial disposers rated 600 V or less and intended to be used in accordance with the National Electrical Code, ANSI/NFPA 70. These disposers are intended to convert organic types of waste material to a form that can be accommodated by plumbing systems. The requirements also cover field-installed control assemblies and accessories specifically intended for use with disposers covered by this standard.

1.2 These requirements do not cover an incinerator-type disposer or a disposer using a universal motor with a rating greater than 250 V.

2 Components

Section 2 deleted March 23, 2011

3 Units of Measurement

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

4 Undated References

4.1 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.

5 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 BARRIER – A part of a disposer that functions to reduce the risk of access to current-carrying parts or internal wiring through openings in the enclosure that involves a risk of electric shock or injury to persons, or reduces the risk of fire or injury to persons as a result of molten metal or burning insulation being expelled through openings in the enclosure under abnormal conditions.

5.2.1 COMPONENT – A device or fabricated part of the appliance covered by the scope of a safety standard dedicated to the purpose. When incorporated in an appliance, equipment otherwise typically field installed (e.g. luminaire) is considered to be a component. Unless otherwise specified, materials that compose a device or fabricated part, such as thermoplastic or copper, are not considered components.

5.2.1 added March 23, 2011

5.2.2 CONTROL, AUTOMATIC ACTION – A control in which at least one aspect is non-manual.

5.2.2 added March 23, 2011

5.2.3 CONTROL, AUXILIARY – A device or assembly of devices that provides a functional utility, is not relied upon as an operational or protective control, and therefore is not relied upon for safety. For example, an efficiency control not relied upon to reduce the risk of fire, electric shock, or injury to persons during normal or abnormal operation of the end product is considered an auxiliary control.

5.2.3 added March 23, 2011

5.2.4 CONTROL, MANUAL – A device that requires direct human interaction to activate or rest the control.

5.2.4 added March 23, 2011

5.2.5 CONTROL, OPERATING – A device or assembly of devices, the operation of which starts or regulates the end product during normal operation. For example, a thermostat, the failure of which a thermal cutout/limiter or another layer of protection would mitigate the risk of fire, electric shock, or injury to persons, is considered an operating control.

5.2.5 added March 23, 2011

5.2.6 CONTROL, PROTECTIVE A device or assembly of devices, the operation of which is intended to reduce the risk of fire, electric shock, or injury to persons during normal and reasonably anticipated abnormal operation of the appliance whereby during the evaluation of the protective control/circuit, the protective functions are verified under normal and single-fault conditions of the control. For example, a thermal cutout/limiter, or any other control/circuit relied upon for normal and abnormal conditions, is considered a protective control.

5.2.6 added March 23, 2011

5.2.7 CONTROL, TYPE 1 ACTION – The actuation of an automatic control for which the manufacturing deviation and the drift (tolerance before and after certain conditions) of its operating value, operating time, or operating sequence has not been declared and tested under this end product standard.

5.2.7 added March 23, 2011

5.2.8 CONTROL, TYPE 2 ACTION – The actuation of an automatic control for which the manufacturing deviation and the drift (tolerance before and after certain conditions) of its operating value, operating time, or operating sequence have been declared and tested under this end product standard.

5.2.8 added March 23, 2011

5.3 DECORATIVE PART – A part used for no function other than appearance.

5.4 ENCLOSURE – That portion of a disposer that:

- a) Renders inaccessible any part that presents a risk of electric shock or injury to persons;
- b) Reduces the risk of flame propagation initiated by electrical disturbances occurring within; or
- c) Both.

A grill, guard, panel, barrier, or similar part forms part of an enclosure if it reduces the risk of contact with an uninsulated current-carrying part or a part that presents a risk of injury to persons.

5.5 FUNCTIONAL PART – A part that is necessary for the intended operation of the disposer, the deterioration of which may result in a risk of fire, electric shock, or injury to persons.

5.6 HOPPER – A container that funnels material into the disposer prior to the reduction process.

CONSTRUCTION

5A Components

Section 5A added March 23, 2011

5A.1 General

5A.1.1 A component of a product covered by this standard shall:

- a) Comply with the requirements for that component as indicated in 5A.2 – 5A.21;
- b) Be used in accordance with its rating(s) established for the intended conditions of use;
- c) Be used within its established use limitations or conditions of acceptability;
- d) Additionally comply with the applicable requirements of this end product standard; and
- e) Not contain mercury.

Exception No. 1: A component of a product covered by this standard is not required to comply with a specific component requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product;*
- b) Is superseded by a requirement in this standard; or*
- c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.*

Exception No. 2: A component that complies with a UL component standard other than those specified in 5A.2 – 5A.21 is acceptable if:

- a) The component also complies with the applicable component standard specified in 5A.2 – 5A.21; or*
- b) The component standard:*
 - 1) Is compatible with the ampacity and overcurrent protection requirements in the National Electrical Code, ANSI/NFPA 70, where applicable;*
 - 2) Considers long-term thermal properties of polymeric insulating materials in accordance with the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B; and*
 - 3) Any use limitations of the other component standard are identified and appropriately accommodated in the end use application. For example, a component used in a household application, but intended for industrial use and complying with the relevant component standard may assume user expertise not common in household applications.*

5A.1.2 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.

5A.1.3 A component that is also intended to perform other functions, such as over current protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable UL standard(s) that cover devices that provide those functions.

Exception: Where these other functions are not required for the application and not identified as part of markings, instructions, or packaging for the appliance, the additional component standard(s) need not be applied.

5A.1.4 A component not anticipated by the requirements of this end product standard, not specifically covered by the component standards in 5A.2 – 5A.21, and that involves a risk of fire, electric shock, or injury to persons, shall be additionally investigated in accordance with the applicable UL standard, and shall comply with 5A.1.1(b) – (e).

5A.1.5 With regard to a component being additionally investigated, reference to construction and performance requirements in another UL end product standard is suitable where that standard anticipates normal and abnormal use conditions consistent with the application of this end product standard.

5A.2 Attachment plugs, receptacles, connectors, and terminals

5A.2.1 Attachment plugs and receptacles shall comply with the Standard for Attachment Plugs and Receptacles, UL 498. See 5A.2.9.

Exception No. 1: Attachment plugs and appliance couplers integral to cord sets or power supply cords that are investigated in accordance with the Standard for Cord Sets and Power Supply Cords, UL 817 are not required to comply with UL 498.

Exception No. 2: A fabricated pin terminal assembly need not comply with UL 498 if it complies with the requirements in Accessibility of Uninsulated Live Parts and Film Coated Wire, Section 7.3, Polymeric Materials, Section 8, Current Carrying Parts, Section 12, Electrical Insulation, Section 14, and Spacings, Section 21, of this end product standard, as well as the applicable performance requirements when tested in this end product standard.

5A.2.2 Quick-connect terminals, both connectors and tabs, for use with one or two 22 – 10 AWG copper conductors, having nominal widths of 2.8, 3.2, 4.8, 5.2, and 6.3 mm (0.110, 0.125, 0.187, 0.205, and 0.250 in), intended for internal wiring connections in appliances, or for the field termination of conductors to the appliance, shall comply with the Standard for Electrical Quick-Connect Terminals, UL 310.

Exception No. 1: Other sizes of quick-connect terminals shall be investigated with respect to crimp pull out, insertion-withdrawal, temperature rise, and all tests shall be conducted in accordance with UL 310.

Exception No. 2: A connector that complies with UL 310 may be used with an appropriately sized tab that complies with the material, configuration, and dimensional requirements for production tabs as specified in UL 310. The connector is the part of a quick-connect terminal that is pushed onto the male tab, and the tab is the part that receives the female connector.

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5A.2.3 Single and multipole connectors for use in data, signal, control and power applications within and between electrical equipment, and that are intended for factory assembly to copper or copper alloy conductors, or for factory assembly to printed wiring boards, shall comply with the Standard for Component Connectors for Data, Signal, Control and Power Applications, UL 1977. See 5A.2.9.

5A.2.4 Wire connectors shall comply with the Standard for Wiring Connectors, UL 486A-UL486B.

5A.2.5 Splicing wire connectors shall comply with the Standard for Splicing Wire Connectors, UL 486C.

5A.2.6 Multi-pole splicing wire connectors that are intended to facilitate the connection of hard-wired utilization equipment to the branch-circuit conductors of buildings shall comply with the Standard for Multi-Pole Splicing Wire Connectors, UL 2459. See 5A.2.9.

5A.2.7 Equipment wiring terminals for use with all alloys of copper, aluminum, or copper-clad aluminum conductors, shall comply with the Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors, UL 486E.

5A.2.8 Terminal blocks shall comply with the Standard for Terminal Blocks, UL 1059, and, if applicable, be suitably rated for field wiring.

Exception: A fabricated part performing the function of a terminal block need not comply with UL 1059 if the part complies with the requirements in Polymeric Materials, Section 8, Wiring Terminals and Leads, Section 11.2.4, Current-Carrying Parts, Section 12, Electrical Insulation, Section 14 and Spacings, Section 21, of this end product standard, as well as the applicable performance requirements when tested in the end-product. This exception does not apply to protective conductor terminal blocks.

5A.2.9 Female devices (such as receptacles, appliance couplers, and connectors) that are intended, or that may be used, to interrupt current in the end product, shall be suitably rated for current interruption of the specific type of load, when evaluated with its mating plug or connector. For example, an appliance coupler that can be used to interrupt the current of a motor load shall have a suitable horsepower rating when tested with its mating plug.

5A.3 Boxes, conduits, and raceways

5A.3.1 Electrical boxes and the associated bushings, conduits, fittings, and raceways of the types specified in Chapter 3, Wiring Methods and Materials, of the National Electrical Code, ANSI/NFPA 70, and that comply with the relevant UL standard (such as the Standard for Flexible Metal Conduit, UL 1, the Standard for Metallic Outlet Boxes, UL 514A, the Standard for Conduit, Tubing, and Cable Fittings, UL 514B, the Standard for Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers, UL 514C, the Standard for Cover Plates for Flush-Mounted Wiring Devices, UL 514D, and the Standard for Electrical Metallic Tubing – Steel, UL797) and 5A.1 are considered to comply with the requirements of this end product standard.

5A.4 Capacitors and filters

5A.4.1 The component requirements for capacitors and filters are specified in Section 19.

5A.5 Controls

5A.5.1 General

5A.5.1.1 Auxiliary controls shall be evaluated in accordance with the applicable requirements of this end product standard and the parameters in Controls – End Product Test Parameters, Section 17A.

5A.5.1.2 Operating (regulating) controls shall be evaluated in accordance with the applicable component standard requirements specified in 5A.5.2 – 5A.5.7, and if applicable, the parameters in Controls – End Product Test Parameters, Section 17A, unless otherwise specified in this end product standard.

5A.5.1.3 Operating controls that rely upon software for the normal operation of the end product where deviation or drift of the control may result in an increased risk of fire, electric shock, or injury to persons shall comply with one of the following:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991; and the Standard for Software in Programmable Components, UL 1998; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1.

5A.5.1.4 Electronic protective (limiting) controls that do not rely upon software as a protective component shall comply with the applicable component standard requirements specified in 5A.5.2 – 5A.5.7, and if applicable, the parameters in Controls – End Product Test Parameters, Section 17A, unless otherwise specified in this end product standard. See also 5A.5.1.5, 5A.15.4.4, and 38.5.

5A.5.1.5 Electronic protective controls that do not rely upon software as a protective component and that comply with one of the following standards are considered to comply with 5A.5.1.4:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1, except the Controls Using Software requirements, Clause H 11.12.

5A.5.1.6 Electronic protective controls that rely upon software as a protective component shall comply with one of the following:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991; and the Standard for Software in Programmable Components, UL 1998; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1.

5A.5.1.7 An electronic, auxiliary or operating control (e.g. a non-protective control), the failure of which would not increase the risk of electric shock, fire, or personal injury, need only be subjected to the applicable requirements of this end product standard. See Switches and Controls, Section 17 and Abnormal Operation Test, Section 54.

5A.5.2 Electromechanical and electronic controls

5A.5.2.1 A control, other than as specified in 5A.5.3 – 5A.5.7, shall comply with the applicable requirements of this end product standard, or comply with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A;
- b) The Standard for Temperature-Indicating and -Regulating Equipment, UL 873; or
- c) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1.

5A.5.3 Liquid level controls

5A.5.3.1 A liquid level control shall comply with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A;
- b) The Standard for Temperature-Indicating and -Regulating Equipment, UL 873;
- c) The Standard for Industrial Control Equipment, UL 508; or
- d) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1, and;
 - 1) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Water Level Controls of the Float Type for Household and Similar Applications, UL 60730-2-16A; or
 - 2) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Water and Air Flow Sensing Controls, Including Mechanical Requirements, UL 60730-2-18.

5A.5.3.2 A switch employed as part of a water level detection mechanism shall comply with one of the switch standards specified in Switches, Section 5A.22.

5A.5.4 Motor and speed controls

5A.5.4.1 A control used to start, stop, regulate or control the speed of a motor shall comply with the applicable requirements of this end product standard, or comply with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A;
- b) The Standard for Temperature-Indicating and -Regulating Equipment, UL 873;
- c) The Standard for Industrial Control Equipment, UL 508;
- d) The Standard for Power Conversion Equipment, UL 508C; or
- e) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1.

5A.5.5 Pressure controls

5A.5.5.1 A pressure control shall comply with one of the following:

- a) The Standard for Temperature-Indicating and -Regulating, UL 873;
- b) The Standard for Industrial Control Equipment, UL 508; or
- c) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements, UL 60730-2-6.

5A.5.6 Temperature controls

5A.5.6.1 A temperature control shall comply with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A;
- b) The Standard for Temperature-Indicating and -Regulating Equipment, UL 873;
- c) The Standard for Industrial Control Equipment, UL 508; or
- d) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9.

5A.5.6.2 A temperature sensing positive temperature coefficient (PTC) or a negative temperature coefficient (NTC) thermistor, that performs the same function as an operating or protective control shall comply with the one of the following:

- a) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, with Annex J; or

- b) The Standard for Thermistor-Type Devices, UL 1434.

5A.5.6.3 A thermal cutoff shall comply with the Standard for Thermal-Links (Thermal Cutoffs) for Use in Electrical Appliances and Components, UL 60691.

5A.5.7 Timer controls

5A.5.7.1 A timer control shall comply with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches, UL 60730-2-7.

5A.8 Cords, cables, and internal wiring

5A.8.1 A cord set or power supply cord shall comply with the Standard for Cord Sets and Power Supply Cords, UL 817.

5A.8.2 Flexible cords and cables shall comply with the Standard for Flexible Cords and Cables, UL 62. Flexible cord and cables are considered to comply with this requirement when pre-assembled in a cord set or power supply cord that complies with the Standard for Cord Sets and Power Supply Cords, UL 817.

5A.8.3 Internal wiring composed of insulated conductors shall comply with the Standard for Appliance Wiring Material, UL 758.

Exception No. 1: Insulated conductors need not comply with UL 758 if they comply with one of the following:

- a) The Standard for Thermoset-Insulated Wires and Cables, UL 44;*
- b) The Standard for Thermoplastic-Insulated Wires and Cables, UL 83;*
- c) The Standard for Fixture Wire, UL 66; or*
- d) The applicable UL standard(s) for other insulated conductor types specified in Chapter 3, Wiring Methods and Materials, of the National Electrical Code, ANSI/NFPA 70.*

Exception No. 2: Insulated conductors for specialty applications (e.g. data processing or communications) and located in a low-voltage circuit not involving the risk of fire, electric shock or injury to persons need not comply with UL 758.

5A.9 Film-coated wire (magnet wire)

5A.9.1 The component requirements for film coated wire and Class 105 (A) insulation systems are not specified.

5A.9.2 Film coated wire in intimate combination with one or more insulators, and incorporated in an insulation system rated Class 120 (E) or higher, shall comply with the magnet wire requirements in the Standard for Systems of Insulating Materials – General, UL 1446.

5A.10 Gaskets and seals

5A.10.1 Gaskets and seals that are relied upon to prevent water entrance into electrical compartments and flooding of electrically live parts shall comply with the requirements in Physical Properties of Gaskets and Seals Test, Section 40.

5A.11 Ground-fault, arc-fault, and leakage current detectors/interrupters

5A.11.1 Ground-fault circuit-interrupters (GFCI) for protection against electrical shock shall comply with the Standard for Ground-Fault Circuit-Interrupters, UL 943. The following statement, or equivalent, shall be included as a marking near the GFCI, or as an instruction in the manual: "Press the TEST button (then RESET button) every month to assure proper operation."

5A.11.2 Appliance-leakage-current interrupters (ALCI) for protection against electrical shock shall comply with the Standard for Appliance-Leakage-Current Interrupters, UL 943B.

5A.11.3 With respect to 5A.11.2, an ALCI is not considered an acceptable substitute for a GFCI when the National Electrical Code, ANSI/NFPA 70 requires a GFCI.

5A.11.4 Equipment ground-fault protective devices shall comply with the Standard for Ground-Fault Sensing and Relaying Equipment, UL 1053, and the applicable requirements in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

5A.11.5 Arc-fault circuit-interrupters (AFCI) shall comply with the Standard for Arc-Fault Circuit-Interrupters, UL 1699. See Arc-Fault and Leakage Current Detectors/Interrupters, Section 22A.

5A.11.6 Leakage-current detector-interrupters (LCDI) and any shielded cord between the LCDI and appliance shall comply with the Standard for Arc-Fault Circuit-Interrupters, UL 1699. See Section 22A.

5A.12 Heating elements and heaters

5A.12.1 Electric resistance heating elements shall comply with the construction requirements in:

- a) The Standard for Electric Heating Appliances, UL 499; or
- b) The Standard for Sheathed Heating Elements, UL 1030.

5A.12.2 Thermistor-type heaters (e.g. PTC and NTC heaters) shall comply with the Standard for Thermistor-Type Devices, UL 1434.

5A.13 Insulation systems

5A.13.1 Materials used in a Class 105 (A) insulation system shall comply with the requirements in Insulation Systems, Section 16A.

5A.13.2 Materials used in an insulation system that operates above Class 105 (A) temperatures shall comply with the Standard for Systems of Insulating Materials – General, UL 1446.

5A.13.3 All insulation systems employing integral ground insulation shall comply with the requirements specified in the Standard for Systems of Insulating Materials – General, UL 1446.

5A.14 Marking and labeling systems

5A.14.1 A marking and labeling system shall comply the requirements in Permanence of Marking Tests, Section 43.

5A.15 Motors and motor overload protection

5A.15.1 General

5A.15.1.1 General-purpose type motors having a NEMA frame size shall comply with the requirements specified in 5A.15.2. This includes fractional HP motors rated up to 1 HP (typically NEMA frame sizes 42, 48, or 56), and integral HP motors rated 1 HP and greater (typically NEMA frame sizes 140 – 449T).

5A.15.1.2 Motors not enclosed, or partially enclosed, by the end product enclosure shall comply with the requirements specified in 5A.15.2 or 5A.15.3.

5A.15.1.3 Component type motors completely enclosed within the end product enclosure shall comply with the requirements specified in 5A.15.2 or 5A.15.3.

5A.15.2 General-purpose type motors

5A.15.2.1 A general-purpose type motor shall comply with the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1.

5A.15.3 Component type motors

5A.15.3.1 Component type motors shall comply with either 5A.15.3.2 or 5A.15.3.3.

5A.15.3.2 The motor shall comply with the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1 except as noted in Table 5A.1.

Table 5A.1
Superseded requirements

UL 1004-1 exempted requirement	Superseded by UL 430 requirements
Current and Horsepower Relation	Paragraph 16.4
Cord-Connected Motors	Section 11.1
Factory Wiring Terminals and Leads	Section 13
Electrical Insulation	Sections 8 and 14
Non-Metallic Functional Parts	Sections 8, 14, and 16
Solid-State Controls, 7.2	Section 5A.5.2
Non-metallic enclosure thermal aging, 9.1.4	Section 8
Motor enclosure, 9.2 – 9.4	Sections 7 and 8
Grounding	Section 22
Ventilation Openings, only applicable where the openings are on surfaces considered to be the appliance enclosure.	Section 7
Accessibility of Uninsulated Live Parts, Film-Coated Wire, and Moving Parts	Section 7.3
Protection Against Corrosion	Section 10
Available fault current ratings for motor start and running capacitors, Paragraph 26.6: not applicable for cord and plug connected appliances.	Section 19
Switch, is not applicable to centrifugal starting switches	Section 17
With the exception of Resilient Elastomer Mounting and Electrolytic Capacitor Tests, the performance tests in the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1 are not applicable	All applicable performance tests
Only the following marking requirements in UL 1004-1 are applicable: manufacturer's name or identification; rated voltage; rated frequency; number of phases if greater than 1; and multi-speed motors, other than a shaded-pole or a permanent-split-capacitor motor, shall be marked with the amperes and horsepower at each speed	Paragraph 59.1

5A.15.3.3 The motor shall comply with the applicable component requirements for Components, Section 5A, the following construction requirements, and the applicable performance requirements (when tested in conjunction with the end product), of this end product standard:

- a) Polymeric Materials, Section 8;
- b) Corrosion Protection, Section 10;
- c) Terminal Compartment, Section 11 (11.2.1.1);

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- d) Current-Carrying Parts, Section 12;
- e) Internal Wiring, Section 13;
- f) Electrical Insulation, Section 14;
- g) Motors, Section 16;
- h) Capacitors, Section 19;
- i) Spacings, Section 21; and
- j) Grounding, Section 22.

5A.15.4 Motor overload protection

5A.15.4.1 Thermal protection devices integral with the motor shall comply with one of the following:

- a) The Standard for Overheating Protection for Motors, UL 2111;
- b) The Standard for Thermally Protected Motors, UL 1004-3; or
- c) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2 Particular Requirements for Thermal Motor Protectors, UL 60730-2-2, in conjunction with the Standard for Thermally Protected Motors, UL 1004-3 (to evaluate the motor-protector combination).

5A.15.4.2. Impedance protection shall comply with one of the following:

- a) The Standard for Overheating Protection for Motors, UL 2111; or
- b) The Standard for Impedance Protected Motors, UL 1004-2.

5A.15.4.3 Electronic protection integral to the motor shall comply with the Standard for Electronically Protected Motors, UL 1004-7.

5A.15.4.4 Except as indicated in 5A.15.4.3, electronically protected motor circuits shall comply with one of the following. See 5A.5.4 for basic control requirements:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991. When the protective electronic circuit is relying upon software as a protective component, it shall comply with the requirements in the Standard for Software in Programmable Components, UL 1998. If software is relied upon to perform a safety function, it shall be considered software Class 1;
- b) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1. If software is relied upon to perform a safety function, it shall be considered software Class B; or
- c) The Standard for Power Conversion Equipment, UL 508C.

Exception: Compliance with the above standards is not required for an electronically protected motor circuit if there is no risk of fire, electric shock, or injury to persons during abnormal testing with the motor electronic circuit rendered ineffective; compliance with the applicable requirements of this end product standard is then required.

5A.16 Overcurrent protection

5A.16.1 Fuses shall comply with the Standard for Low-Voltage Fuses – Part 1: General Requirements, UL 248-1; and the applicable UL 248 Part 2 (e.g. the Standard for Low-Voltage Fuses - Part 5: Class G Fuses, UL 248-5). Defined use fuses that comply with UL 248-1 and another applicable UL standards for fuses are considered to comply with this requirement.

5A.16.2 Fuseholders shall comply with The Standard for Fuseholders – Part 1: General Requirements, UL 4248-1, and the applicable Part 2 (e.g. the Standard for Fuseholders – Part 9: Class K, UL 4248-9).

5A.16.3 Circuit breakers shall comply with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489.

Exception: Circuit breakers used in telecommunications circuitry that comply with the Standard for Circuit Breakers For Use in Communications Equipment, UL 489A, need not comply with UL 489.

5A.16.4 Circuit breakers having integral ground fault circuit interrupter capability for protection against electrical shock shall additionally comply with the Standard for Ground-Fault Circuit-Interrupters, UL 943.

5A.16.5 Supplementary protectors shall comply with the Standard for Supplementary Protectors for Use in Electrical Equipment, UL 1077.

5A.17 Polymeric materials and enclosures

5A.17.1 Unless otherwise specified in this end product standard, polymeric electrical insulation shall comply with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C; see 44.3 of this end product standard. See Polymeric Materials, Section 8.

5A.17.2 Metallized or painted polymeric parts or enclosures shall comply with the applicable requirements of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C; see 44.3 of this end product standard. This requirement is not applicable to exterior surfaces of polymeric enclosure materials or parts provided that the metallized coating or paint does not offer a continuous path for an internal flame to propagate externally; see Polymeric Materials Test, Section 44, for applicable requirements.

5A.18 Power supplies

5A.18.1 A Class 2 power supply shall comply with one of the following:

- a) The Standard for Class 2 Power Units, UL 1310; or
- b) The Standard for Information Technology Equipment, Part 1: General Requirements, UL 60950-1, with an output marked "Class 2", or that complies with the limited power source (LPS) requirements and is marked "LPS".

5A.18.2 A non-Class 2 power supply shall comply with one of the following:

- a) The Standard Power Units Other Than Class 2, UL 1012; or
- b) The Standard for Information Technology Equipment, Part 1: General Requirements, UL 60950-1.

5A.19 Printed wiring boards

5A.19.1 Printed wiring boards, including the coatings, shall comply with the Standard for Printed Wiring Boards, UL 796.

Exception: A printed-wiring board in a Class 2 nonsafety circuit is not required to comply with the bonding requirements in UL 796 if the board is separated from parts of other circuits such that loosening of the bond between the foil conductor and the base material will not result in the foil conductors or components coming in contact with parts of other circuits of the control or of the end-use product.

5A.19.2 A printed-wiring board containing circuitry in a line-connected circuit or a safety circuit shall comply with the direct-support requirements for insulating materials in Insulating Material, Section 14 of this end product standard.

5A.19.3 Unless otherwise specified, the flammability class and temperature rating shall be that as specified for insulating materials in Polymeric Materials, Section 8 of this end product standard.

5A.20 Semiconductors and small electronic components

5A.20.1 A power switching semiconductor device that is relied upon to provide isolation to ground shall comply with the Standard for Safety for Electrically Isolated Semiconductor Devices, UL 1557. The Dielectric Voltage Withstand Tests required by UL 1557 shall be conducted applying the requirements of the Dielectric Voltage Withstand Test, Section 36, of this end product standard.

5A.20.2 An optical isolator that is relied upon to provide isolation between primary and secondary circuits or between other circuits as required by this end product standard shall comply with the Standard for Safety for Optical Isolators, UL 1577. The Dielectric Voltage Withstand Tests required by UL 1577 shall be conducted applying the requirements in Dielectric Voltage Withstand Test, Section 43 of this end product standard. The dielectric test voltage is to be applied between the input and output terminals of the optical isolator.

5A.20.3 Except as specified in 5A.20.4, component requirements are not specified for small electronic components on printed wiring boards, including diodes, transistors, resistors, inductors, integrated circuits, and capacitors not directly connected to the supply source.

5A.20.4 Where an electronic component is determined to be a critical component during the Abnormal Operation Test, Section 54, one of the following standards shall be applied. See 17A.4 of this end product standard for the test requirements to be used:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991, including its Follow-Up Program; and as applicable, the Standard for Software in Programmable Components, UL 1998 for controls that rely upon software as a protective component; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1.

5A.20.5 A critical component is a component that performs one or more safety-related functions whose failure results in a condition, such as the risk of fire, electric shock, or injury to persons, in the end product application.

5A.20.6 A critical component may also be identified using a failure-mode and effect analysis (FMEA) in accordance with the Failure-Mode and Effect Analysis (FMEA) requirements in the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

5A.20.7 Portions of a circuit comprised of a microcontroller or other programmable device that performs a back-up, limiting, or other safety function intended to reduce the risk of fire, electric shock, or injury to persons shall comply with the Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1, Annex H.

5A.21 Supplemental insulation, insulating bushings, and assembly aids

5A.21.1 The requirements for supplemental insulation (e.g. tape, sleeving or tubing) are not specified unless the insulation or device is required to comply with 13.13 or a performance requirement of this end product standard. In such cases, the insulation shall comply with the following applicable standards:

- a) Insulating tape shall comply with the Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, UL 510;
- b) Sleeving shall comply with the Standard for Coated Electrical Sleeving, UL 1441; or
- c) Tubing shall comply with the Standard for Extruded Insulating Tubing, UL 224.

5A.21.2 Wire positioning devices shall comply with the requirements in Polymeric Material, Section 8, and Electrical Insulation, Section 14. A device that complies with the Standard for Positioning Devices, UL 1565, is considered to comply with this requirement.

5A.21.3 Insulating bushings that comply with the requirements in General, Section 5A.1, of this end product standard, and the Standard for Insulating Bushings, UL 635 are considered to comply with the requirements of this end product standard. Tests specified in this end product standard (e.g. Strain Relief Test) may still need to be performed to confirm the combination of the insulating bushing and the supporting part comply with the intent of the requirements.

5A.22 Switches

5A.22.1 Switches shall comply with one of the following:

- a) The Standard for Special-Use Switches, UL 1054;
- b) The Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1;
- c) The Standard for General-Use Snap Switches, UL 20; or
- d) The Standard for Nonindustrial Photoelectric Switches for Lighting Control, UL 773A.

Exception: Switching devices that comply with the applicable UL standards for specialty applications (e.g. transfer switch equipment), industrial use (e.g. contactors, relays, auxiliary devices), or are integral to another component (e.g. switched lampholder), need not comply with this requirement.

5A.22.2 A clock-operated switch, in which the switching contacts are actuated by a clock-work, by a gear-train, by electrically-wound spring motors, by electric clock-type motors, or by equivalent arrangements shall comply with one of the following:

- a) The Standard for Clock-Operated Switches, UL 917; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches, UL 60730-2-7.

5A.22.3 A timer or time switch, incorporating electronic timing circuits or switching circuits, with or without separable contacts, shall comply with the requirements for an operating control with Type 1 action for 6000 cycles of operation, or as a manual control for 5000 cycles of operation, in accordance with one of the following:

- a) The Standard for Solid-State Controls for Appliances, UL 244A; or
- b) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches, UL 60730-2-7.

2.22.4 A timer or time switch, incorporating electronic timing circuits or switching circuits, with or without separable contacts, that functions as a protective control, shall comply with the requirements for a protective control; see 5A.5.1.4.

5A.23 Transformers

5A.23.1 General-purpose transformers shall comply with the Standard for Low Voltage Transformers: General Requirements, UL 5085-1; and the Standard for Low Voltage Transformers: General Purpose Transformers, UL 5085-2.

5A.23.2 Class 2 and Class 3 transformers shall comply with the Standard for Low Voltage Transformers: General Requirements, UL 5085-1; and the Standard for Low Voltage Transformers: Class 2 and Class 3 Transformers, UL 5085-3.

Exception: Transformers located in a Class 2 circuit, and that do not involve a risk of fire, electric shock or injury to persons need not comply with this requirement.

6 Field-Installed Accessories and Assemblies

6.1 The requirements in 6.2 – 6.8 apply to accessories intended for installation on or attachment to a disposer in the field for the purpose of modifying or supplementing the functions of the disposer. The combination of the basic disposer and control assembly or other field-installed accessory shall comply with the applicable requirements in this standard.

6.2 A disposer intended for use with a field-installed control assembly or accessory that is not shipped with the disposer shall be marked in accordance with 59.10.

6.3 A field-installed control assembly or accessory identified for use with a disposer as specified in 59.10 shall comply with 17.10.

6.4 A disposer having provision for an accessory to be attached in the field shall be constructed so that use of the accessory does not introduce a risk of fire, electric shock, or injury to persons.

6.5 The means provided for attachment of an accessory by the operator shall be receptacles and plug-in connectors.

6.6 The use of wire connectors and existing terminals as a means of attaching an accessory by qualified personnel is acceptable.

6.7 A disposer shall not require rearrangement of components or wires, cutting or splicing wires, or soldering connections in the field.

6.8 An accessory shall be trial-installed and tested to determine whether:

- a) The accessory can be installed according to the instructions;
- b) The instructions are detailed and correct; and
- c) Use of the accessory after installation according to the instructions does not result in a risk of fire, electric shock, or injury to persons.

7 Enclosure

7.1 General

7.1.1 A disposer shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it may be subjected, without resulting in a risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other defects.

7.1.2 For an unreinforced flat surface, cast metal shall not be less than 1/8 in (3.2 mm) thick, malleable iron shall not be less than 3/32 in (2.4 mm) thick, and die-cast metal shall not be less than 5/64 in (2.0 mm) thick.

Exception No. 1: The use of thinner metal complies if:

- a) The metal is curved, ribbed, or otherwise reinforced to provide equivalent or better mechanical strength; or*
- b) The metal is of a size or shape that provides equivalent or better mechanical strength.*

In any case, the metal shall not be less than 3/32 in (mm) for cast metal, 1/16 in (1.6 mm) for malleable iron, or 3/64 in (1.2 mm) for die-cast metal.

Exception No. 2: Thinner metal meets the intent of the requirement if found acceptable when investigated with respect to the factors specified in 7.1.6.

7.1.3 In addition to being investigated with respect to the factors specified in 7.1.6, the effects of the following factors shall be investigated to determine compliance of a sheet-metal enclosure with 7.1.1:

- a) The size and shape of the disposer with respect to the intended use of the disposer;
- b) The thickness of metal with respect to the intended use of the disposer; and
- c) The application of the metal with respect to the intended use of the disposer.

7.1.4 Sheet metal used for other than relatively small areas or for surfaces that are curved or otherwise reinforced shall not be thinner than:

- a) 0.026 in (0.66 mm) if uncoated steel;
- b) 0.029 in (0.74 mm) if galvanized steel; or
- c) 0.029 in (0.74 mm) if of nonferrous sheet metal having a thickness less than 0.036 in (0.91 mm).

7.1.5 Sheet metal to which a wiring system is to be connected in the field shall not be thinner than:

- a) 0.032 in (0.81 mm) if uncoated steel;
- b) 0.034 in (0.86 mm) if galvanized steel; or
- c) 0.045 in (1.14 mm) if nonferrous sheet metal.

7.1.6 The effects of the following factors shall be determined for compliance with 7.1.1:

- a) Mechanical strength;
- b) Resistance to impact;
- c) Moisture-absorption properties;
- d) Combustibility;
- e) Resistance to corrosion; and
- f) Resistance to distortion at temperatures to which the enclosure is subjected under conditions of intended or unintended use.

These factors shall be investigated with respect to thermal aging if a nonmetallic enclosure is being investigated.

7.1.7 The polymeric housing of a component is not considered to be an appliance enclosure unless this part is the sole insulation (excluding air) between a live part and an external surface of the appliance.

7.1.7 added March 23, 2011

7.2 Barriers

7.2.1 The enclosure of a disposer shall reduce the likelihood of molten metal, burning insulation, flaming particles, or the like from falling on combustible materials, including surfaces located beneath the disposer.

7.2.2 Compliance with 7.2.1 requires that a switch, a relay, a solenoid, or similar component be completely enclosed (no openings), unless it is shown that malfunction of the component does not result in a risk of fire; or there are no openings in the bottom of the disposer enclosure. Compliance with 7.2.1 also requires the use of a barrier:

- a) Under a motor, unless:
 - 1) The structural parts of the motor or of the disposer provide the equivalent of such a barrier;
 - 2) The protection provided with the motor is such that no burning insulation or molten material falls to surfaces located beneath the disposer when the motor is energized under each of the following fault conditions:
 - i) Open main winding;
 - ii) Open auxiliary winding;
 - iii) Starting switch short-circuited; and
 - iv) Capacitor of a permanent-split-capacitor motor short-circuited – the short-circuit is to be applied before the motor is energized and the rotor is to be locked;

3) The motor is provided with a thermal motor protector – a protective device that is sensitive to temperature and current – that reduces the risk of the temperature of the motor windings from becoming greater than 125°C (257°F) under the maximum load under which the motor runs without causing the protector to cycle, and from becoming greater than 150°C (302°F) with the rotor of the motor locked; or

4) The motor complies with the requirements for impedance-protected motors in the Standard for Overheating Protection for Motors, UL 2111 or the Standard for Impedance Protected Motors, UL 1004-2, and the temperature of the motor winding does not exceed 150°C (302°F) during the first 72 h of operation with the rotor of the motor locked.

b) Under wire, unless the wire complies with the vertical flame test requirements of the applicable UL Standard and is marked VW-1.

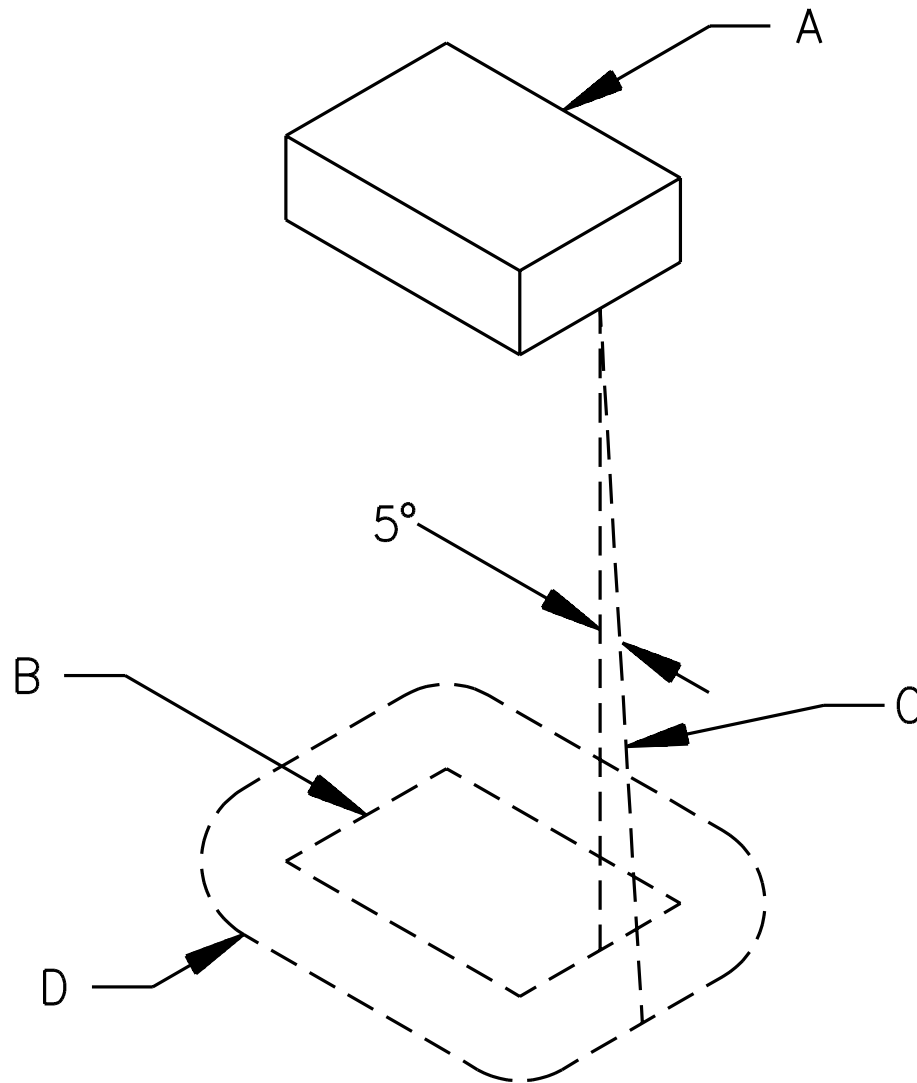
7.2.2 revised March 23, 2011. Note: UL 1004-2 will replace Part II of UL 2111 effective September 16, 2013.

7.2.3 The barrier specified in 7.2.2 shall:

a) Be located as illustrated in Figure 7.1; and

b) Have an area not less than that determined in accordance with Figure 7.1.

Figure 7.1
Location and extent of barrier



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A – Region to be shielded by barrier. This will consist of the entire component if it is not otherwise shielded, and will consist of the unshielded portion of a component that is partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line that traces out minimum area of barrier. When moving, the line is always tangent to the component, five degrees from the vertical, and oriented so that the area traced out on a horizontal plane is maximum.

D – Location – horizontal – and minimum area for barrier. The area is that included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

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7.2.4 With reference to 7.2.3, an opening that is intended for drainage or ventilation shall be such that molten metal, burning insulation, or similar material does not fall onto combustible material.

7.3 Accessibility of uninsulated live parts and film-coated wire

7.3.1 To reduce the risk of unintentional contact with an uninsulated live part or film-coated wire that involves a risk of electric shock, an opening in an enclosure shall comply with (a) or (b).

- a) For an opening that has a minor dimension (see 7.3.5) less than 1 in (25.4 mm), such a part or wire shall not be contacted by the probe illustrated in Figure 7.2.
- b) For an opening that has a minor dimension of 1 in or greater, such a part or wire shall be spaced from the opening as specified in Table 7.1.

Exception: An integral enclosure of a motor is not required to comply with these requirements if it complies with 7.3.2.