UL 1447

STANDARD FOR SAFETY

Electric Lawn Mowers

UL Standard for Safety for Electric Lawn Mowers, UL 1447

Sixth Edition, Dated October 13, 2017

Summary of Topics

The revisions of ANSI/UL 1447 dated May 12, 2020 add references to UL 61800-5-1, Standard For Adjustable Speed Electric Power Drive Systems to replace all references to UL 508C, Standard for Power Conversion Equipment; 3.1, 5.6.4.1, and 5.15.4.4

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

The revised requirements are substantially in accordance with Proposal(s) on this subject dated February 14, 2020.

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Sixth Edition

October 13, 2017

This ANSI/UL Standard for Safety consists of the Sixth Edition including revisions through May 12, 2020.

The most recent designation of ANSI/UL 1447 as an American National Standard (ANSI) occurred on May 1, 2020. 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 UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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PART 1 – ALL LAWN MOWERS

INTRODUCTION

1 Scope

1.1 These requirements cover cord-connected electrically operated lawn mowers rated 250 volts or less to be employed in accordance with ANSI/NFPA 70.

1.2 These requirements also cover battery-powered lawn mowers as specified in Battery-Powered Lawn Mowers, Supplement SA in this Standard.

1.3 These requirements do not cover equipment for use in hazardous locations as defined in the , ANSI/NFPA 70.

1.4 These requirements do not cover sulky-type lawn mowers, garden tractors or their attachments, flail mowers, sickle-bar mowers, robotic lawn mowers, or lawn mowers intended for commercial use.

1.5 In addition to the requirements in this standard, a lawn mower shall comply with ANSI B71.1, and with the Safety Standard for Walk-Behind Power Lawn Mowers, 16 CFR 1205.

1.6 In the text, a requirement that applies only to a rotary or other type of lawn mower is identified by a specific reference in that requirement to the specific lawn mower involved. Absence of the specific reference, or use of the term lawn mower, indicates that the requirement applies to all of the lawn mowers covered in this standard.

2 Units of Measurement

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

3 References

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

ANSI Standards

ANSI/NFPA 70
National Electrical Code

ANSI B71.1
Safety Specification for Consumer Turf-Care Equipment – Walk-Behind Mowers and Ride-On Machines with Mowers

ANSI B71.1
Safety Specification for Consumer Turf-Care Equipment – Walk-Behind Mowers and Ride-On Machines with Mowers

ANSI Z21.21a/CSA 6.5a
Automatic Valves for Gas Appliances

ASTM Standards

ASTM E230/E230M
Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

IEC Standards

IEC 61000-4-5
Electromagnetic Compatibility (Emc) – Part 4-5: Testing And Measurement Techniques – Surge Immunity Test

IEC 61672-1
Electroacoustics – Sound Level Meters – Part 1: Specifications

IEC 61672-2
Electroacoustics – Sound Level Meters – Part 2: Pattern Evaluation Tests

NFPA Standards

ANSI/NFPA 70
National Electrical Code

UL Standards

UL 20
General-Use Snap Switches

UL 44
Thermoset-Insulated Wires and Cables

UL 62
Flexible Cords and Cables

UL 66
Fixture Wire

UL 83
Thermoplastic-Insulated Wires and Cables

UL 94
Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

UL 157
Gaskets and Seals

UL 224
Extruded Insulating Tubing

UL 244A
Solid-State Controls for Appliances

UL 248-1

Low-Voltage Fuses – Part 1: General Requirements

UL 248-5
Low-Voltage Fuses – Part 5: Class G Fuses

UL 310
Electrical Quick-Connect Terminals

UL 355
Cord Reels

UL 429
Electrically Operated Valves

UL 486A-486B
Wire Connectors

UL 486C
Splicing Wire Connectors

UL 486E
Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

UL 496
Lampholders

UL 489
Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

UL 498
Attachment Plugs and Receptacles

489A
Circuit Breakers For Use in Communications Equipment

UL 507
Electric Fans

UL 508
Industrial Control Equipment

UL 510
Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

UL 514A
Metallic Outlet Boxes

UL 514C
Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers

UL 514D
Cover Plates for Flush-Mounted Wiring Devices

UL 635
Insulating Bushings

UL 746A
Polymeric Materials – Short Term Property Evaluations

UL 746B
Polymeric Materials – Long Term Property Evaluations

UL 746C
Polymeric Materials – Use in Electrical Equipment Evaluations

UL 746D
Polymeric Materials – Fabricated Parts

UL 758
Appliance Wiring Material

UL 773A
Nonindustrial Photoelectric Switches for Lighting Control

UL 796
Printed-Wiring Boards

UL 810
Capacitors

UL 817
Cord Sets and Power-Supply Cords

UL 873
Temperature-Indicating and – Regulating Equipment

UL 917
Clock-Operated Switches

UL 935
Fluorescent-Lamp Ballasts

UL 943
Ground-Fault Circuit-Interrupters

UL 943B
Appliance Leakage-Current Interrupters

UL 969
Marking and Labeling Systems

UL 991
Tests for Safety-Related Controls Employing Solid-State Devices

UL 1004-1
Rotating Electrical Machines – General Requirements

UL 1004-2
Impedance Protected Motors

UL 1004-3
Standard for Thermally Protected Motors

UL 1004-7
Electronically Protected Motors

UL 1029
High-Intensity Discharge Lamp Ballasts

UL 1053
Ground-Fault Sensing and Relaying Equipment

UL 1059
Terminal Blocks

UL 1077
Supplementary Protectors for Use in Electrical Equipment

1090
Electric Snow Movers

UL 1283
Electromagnetic Interference Filters

1411
Transformer and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances

UL 1412
Fusing Resistors and Temperature-Limited Resistors for Radio- and Television-Type Appliances

UL 1434
Thermistor-Type Devices

UL 1441
Coated Electrical Sleeving

UL 1446
Systems of Insulating Materials – General

UL 1557
Electrically Isolated Semiconductor Devices

UL 1565
Positioning Devices

UL 1577
Optical Isolators

UL 1642
Lithium Batteries

UL 1699
Arc-Fault Circuit-Interrupters

UL 1977
Component Connectors for Data, Signal, Control and Power Applications

UL 1998
Software in Programmable Components

UL 2111
Protection for Motors

UL 2459
Insulated Multi-Pole Splicing Wire Connectors

UL 2595
General Requirements for Battery-Powered Appliances

4248-1
Fuseholders – Part 1: General Requirements

4248-9
Fuseholders – Part 9: Class K

UL 5085-1
Low Voltage Transformers – Part 1: General Requirements

UL 5085-2
Low Voltage Transformers – Part 2: General Purpose Transformers

UL 5085-3
Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers

UL 60691
Thermal-Links – Requirements and Application Guide

UL 8750
Light Emitting Diode (LED) Equipment For Use In Lighting Products

UL 60730-1
Electrical Controls for Household and Similar Use; Part 1: General Requirements

UL 60730-2-2
Standard for Automatic Electrical Controls for Household and Similar Use; Part 2 Particular Requirements for Thermal Motor Protectors

UL 60730-2-6
Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements

UL 60730-2-7
Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches

UL 60730-2-8
Electrically Operated Water Valves, Including Mechanical Requirements

UL 60730-2-9
Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls

UL 60730-2-15
Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Air Flow, Water Flow and Water Level Sensing Controls

UL 61800-5-1
Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal, and Energy

IEC 61000-4-5
Electromagnetic Compatibility (EMC) – Part 4-5: Testing and Measurement Techniques – Surge Immunity Test

4 Glossary

4.1 For the purpose of this Standard the following definitions apply.

4.2 ACCESSIBLE PART – A part located so that it can be contacted by a person, either directly or by means of a probe or tool, or so that it is not recessed the required distance behind an opening. See Section 7, Accessibility of Live Parts.

4.3 APPLIANCE – A single-outlet, female contact device for attachment to a flexible cord as part of a detachable power-supply cord to be connected to an appliance inlet (motor attachment plug).

4.4 APPLIANCE INLET (Motor Attachment Plug) – A male contact device mounted on an end product appliance to provide an integral blade configuration for the connection of an appliance coupler or cord connector.

4.5 APPLIANCE (FLATIRON) PLUG – An appliance coupler type of device having a cord guard and a slot configuration specified for use with heating or cooking appliances.

4.6 BASIC INSULATION – The insulation applied to live parts to provide basic protection against electric shock.

4.7 BLADE – Any rigid or semi-rigid device or means that is intended to cut grass during mowing operations and includes all blades of a multi-blade mower.

4.8 BLADE-TIP CIRCLE – The path described by the outermost point of the blade as it moves about its axis.

4.9 CATCHER ASSEMBLY – A part or combination of parts on a lawn mower that provides a means of collecting grass clippings and debris.

4.10 COMPONENT – A device or fabricated part of the appliance covered by the scope of a 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.

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

4.12 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 electric shock, fire, or injury to persons during normal or abnormal operation of the end product is considered an auxiliary control.

4.13 CORD CONNECTOR – A female contact device wired on flexible cord for use as an extension from an outlet to make a detachable electrical connection to an attachment plug or, as an appliance coupler, to an equipment inlet.

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

4.15 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 electric shock, fire, or injury to persons, is considered an operating control. Operating controls are also referred to as "regulating controls".

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

4.17 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 have not been declared and tested under this Standard.

4.18 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 Standard.

4.19 CUTTING HEIGHT – The vertical distance between the blade-tip circle and the supporting surface of a lawn mower.

4.20 CUTTING WIDTH – For a single-blade mower, the diameter of the blade-tip circle. For a multi-blade mower, the width of a composite of all blade-tip circles measured perpendicular to the forward direction of the mower.

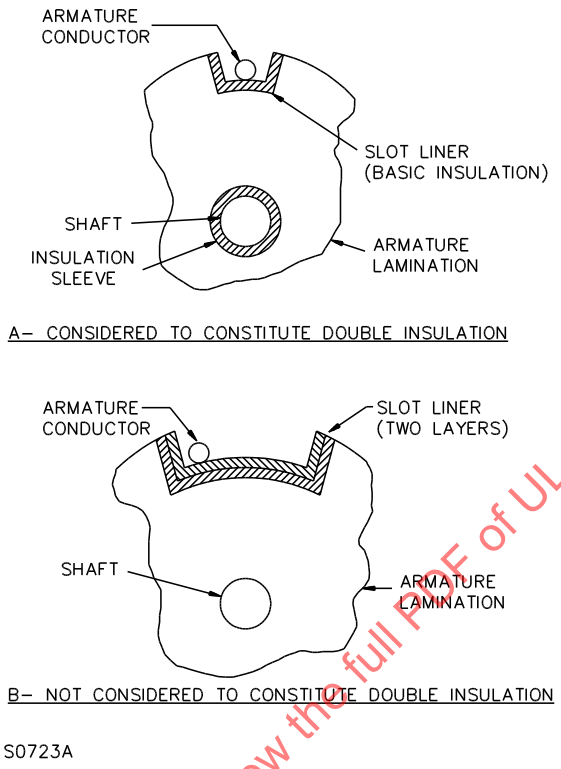
4.21 DEAD-MAN CONTROL – An operator control designed so that it will automatically interrupt power when the actuating force supplied by the operator is removed.

4.22 DEFORM – Any visible alteration of shape or dimension of a body caused by stresses induced by external forces.

4.23 DOUBLE INSULATION – An insulation system comprised of both basic insulation and supplementary insulation, with the two insulation systems physically separated and arranged so that they are not simultaneously subjected to the same deteriorating influences – temperature, contaminants, and the like – to the same degree. See Figure 4.1.

Figure 4.1

Examples illustrating 4.23



4.24 ENCLOSURE – That portion of the lawn mower that:

a) Renders inaccessible all or any part that may otherwise present a risk of electric shock or injury to persons; or

b) Reduces the propagation of flame that may be initiated by electrical disturbances occurring within.

4.25 GUARD – A part or an assembly provided for shielding an area that would otherwise introduce a risk of electric shock or injury to persons.

4.26 LEAKAGE CURRENT – All current or currents, including capacitively-coupled currents, that may be conveyed between exposed conductive surfaces of a lawn mower and ground or other exposed conductive surfaces of the lawn mower.

4.27 LIVE PART – A part electrically energized with respect to earth or energized with respect to some other part.

4.28 MAXIMUM OPERATING SPEED – The maximum revolutions per minute (rpm) obtainable by the motor under the conditions of the particular test where the term is used. For a cord-connected mower, it is the speed attained when the mower is energized from a 120V, (or 240V if applicable), 60Hz supply source with any blade speed controls set at maximum. For a battery-powered mower it is the speed attained after the battery has been fully charged in accordance with the mower manufacturer's instructions.

4.29 MINOR DIMENSION OF AN OPENING – The diameter of the largest cylindrical probe having a hemispherical tip that can be inserted through the opening with a force of 5 pounds (22.2 N).

4.30 MOTOR – A power-producing machine that converts electrical energy into mechanical energy.

4.31 NORMAL STARTING MEANS – The primary mechanism intended to be actuated by the operator to start a mower's motor.

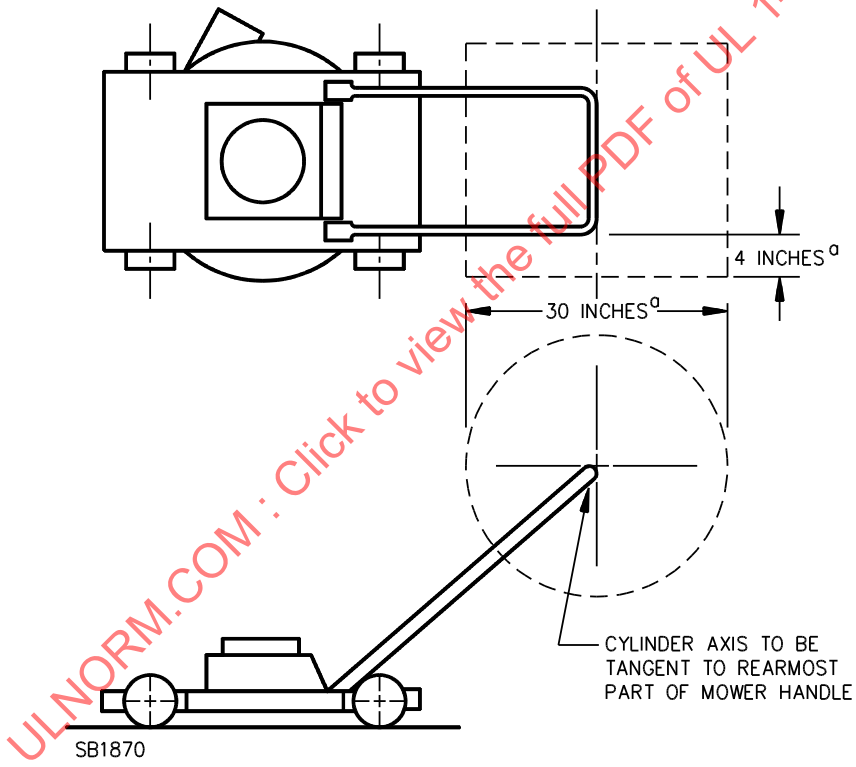
4.32 OPERATING CONTROL ZONE – The space enclosed by a cylinder with a radius of 15 inches (380 mm) having a horizontal axis that is:

a) Perpendicular to the fore-aft centerline of the mower; and

b) Tangent to the rearmost part of the mower handle, extending 4 inches (102 mm) beyond the outermost portion of each side of the handle. See Figure 4.2.

Figure 4.2

Operating control zone



4.33 OPERATOR CONTROL – Any device necessary for operating a lawn mower including a drive-engaging control, a movable-guide control, a drive-speed changing control, and a deflector control.

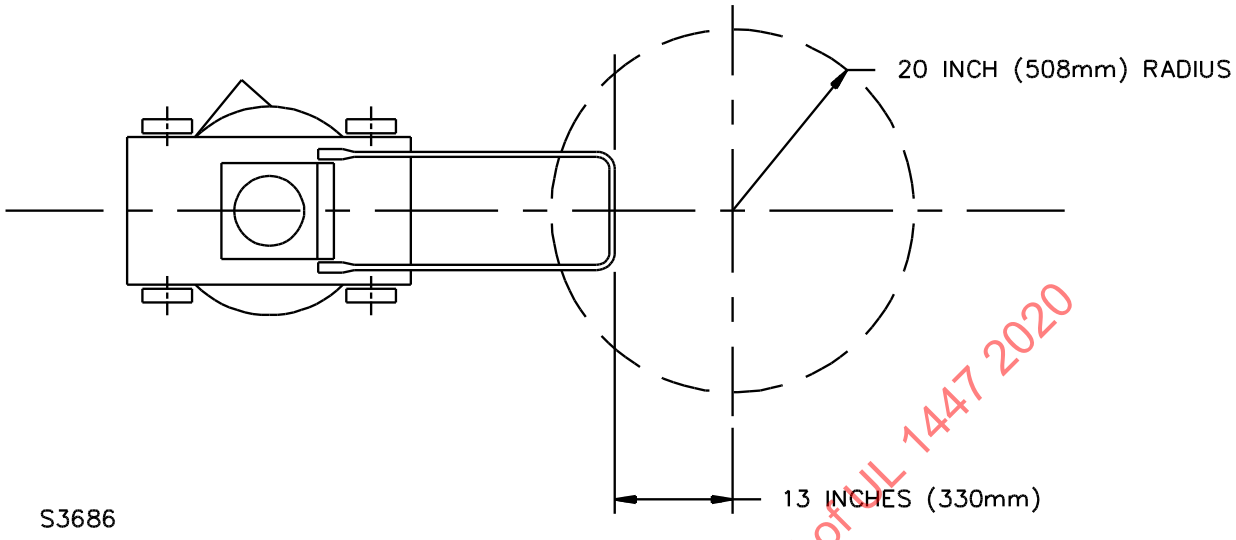
4.34 OPERATOR ZONE – The space enclosed by a cylinder, from ground to 6 feet (1.63 m) above ground, with a radius of 20 inches (508 mm), having a vertical axis that is:

a) Located 13 inches (330 mm) behind the handle assembly when adjusted to the most unfavorable position; and

b) Centered on the fore-aft centerline of the cutting width. See Figure 4.3.

Figure 4.3

Operator zone



4.35 REEL-TYPE MOWER – A lawn mower that cuts grass by rotating one or more helically formed blades about a horizontal axis to provide a shearing action with a stationary cutter bar or bed knife.

4.36 REINFORCED INSULATION – An improved basic insulation with such mechanical and electrical qualities that it, in itself, provides the same degree of protection against electric shock as double insulation. It may consist of one or more layers of insulating material. It is acceptable in place of double insulation only in accordance with the Exception to 70.1.

4.37 ROBOTIC LAWN MOWER – An unattended lawn mower that operates automatically.

4.38 ROTARY MOWER – A lawn mower in which one or more cutting blades rotate in essentially a horizontal plane about at least one vertical axis.

4.39 SUPPLEMENTARY INSULATION – An independent insulation provided in addition to the basic insulation to protect against electric shock in case of mechanical rupture or electrical breakdown of the basic insulation. An enclosure of insulating material may form a part or the whole of the supplementary insulation.

4.40 SWING-OVER HANDLE – A handle that pivots from one end of a lawn mower to the other about a horizontal axis to allow reversing the direction of travel of the lawn mower without turning the lawn mower around.

4.41 WALK-BEHIND LAWN MOWER – A grass-cutting machine that:

a) Is either pushed or self-propelled;