UL 647

Underwriters Laboratories Inc.

Standard for Safety

# Unvented Kerosene-Fired Room Heaters and Portable Heaters

UL Standard for Safety for Unvented Kerosene-Fired Room Heaters and Portable Heaters, UL 647

Second Edition, Dated May 3, 1993

***Summary of Topics***

***These revisions to UL 647 are being issued to address universal upkeep of UL Standards for Safety. These revisions are considered to be non-substantive and not subject to UL's STP process.***

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. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

A reference to UL 60730-1 and/or a Part 2 standard from that series has been added to this standard. The addition of this reference provides an alternate standard for investigating components currently covered by UL 873 until October 19, 2016. This added reference will facilitate the use of components that have been investigated to the UL 60730 series. Such components have been determined to fulfill the requirements of the legacy standards.

UL 60730-1 (4th Edition) becomes effective on October 19, 2016. All components that were previously investigated to the requirements in UL 873 will have to comply with the requirements in either UL 60730-1 and/or a Part 2 standard from that series in order to maintain UL Listing or Recognition, as appropriate. UL 873 legacy control standard will be withdrawn on October 19, 2016.

This is intended to provide end product manufacturers with sufficient time to a) address the impact of the standards changes during normal design changes over the intervening years, b) submit any modified products for investigation, and c) implement any necessary changes in production.



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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

No Text on This Page

**MAY 3, 1993**
(Title Page Reprinted: April 16, 2010)

**1**

# UL 647

## Standard for Unvented Kerosene-Fired Room Heaters and Portable Heaters

First Edition – December, 1982

**Second Edition**

**May 3, 1993**

This UL Standard for Safety consists of the Second Edition including revisions through April 16, 2010.

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.

No Text on This Page

## CONTENTS

## INTRODUCTION



## CONSTRUCTION

GENERAL

ELECTRICAL COMPONENTS



SPACINGS



**PERFORMANCE**

**MANUFACTURING AND PRODUCTION TESTS**



**MARKING**



**APPENDIX A**

This page intentionally left blank.

## INTRODUCTION

### 1 Scope

1.1 These requirements apply to unvented kerosene-fired room heaters and portable heaters as defined herein. They are for use with Type 1-K Kerosene, and Synthetic Fuels complying with the Outline of Investigation for Synthetic Fuels for Listed Kerosene-Fired Portable Heaters and Kerosene-Fired Room Heaters, Subject 647A, in spaces that are well ventilated to provide the supply of air required for combustion and to reduce the risk of accumulation of carbon monoxide. These heaters are for attended or unattended use. These products are required to be equipped with automatic primary safety controls or to be inherently constructed to prevent abnormal discharge of fuel at the burner in case of ignition failure or premature flame extinguishment. They are not intended for use under the following conditions:

a) In spaces in which flammable vapors or gases may be present, or

b) As cooking appliances.

1.1 revised April 16, 2010

1.2 Requirements for the installation and use of kerosene-fired room heaters and portable heaters are included in the Standard for the Installation of Oil-Burning Equipment, NFPA 31 and in codes such as the BOCA National Mechanical Code, the SBCC Standard Mechanical Code, and the ICBO/IAPMO Uniform Mechanical Code.

1.3 The maximum fuel-input rating for kerosene-fired room heaters is 30,000 Btu per hour (31.65 MJ) and for kerosene-fired portable heaters is 25,000 Btu per hour (26.38 MJ).

1.4 These requirements cover kerosene-fired room heaters and portable heaters that may include electrical circuits rated 600 volts or less and are intended for installation as specified in the National Electrical Code, NFPA 70.

*1.5 Deleted July 27, 2001*

### 2 General

2.1 The term heater refers to all products covered by this standard unless specifically noted otherwise.

2.1.1 The term fuel refers to both Type 1-K Kerosene and Synthetic Fuels for all products covered by this standard, unless specifically noted otherwise.

2.1.1 added November 2, 1998

2.2 Except as indicated in 2.3, 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.

2.2 revised July 27, 2001

2.3 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.

2.3 revised July 27, 2007

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

2.4 revised July 27, 2001

2.5 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.

2.5 revised July 27, 2001

2.6 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.

2.6 revised July 27, 2001

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

2.7 revised July 27, 2001

## 3 Installation And Operating Instructions

3.1 A copy of the manufacturer's installation and operating instructions shall be furnished with each heater. These instructions are to be used as a guide in the examination and test of the heater. For this purpose a printed edition is not required.

3.2 The instructions shall include such directions and information as deemed by the manufacturer to be adequate for attaining intended installation, maintenance, and use of the heater. For those heaters that are not intended for use with Synthetic Fuels, the instructions shall indicate that Synthetic Fuels shall not be used with the heater. At least the following information shall be included:

a) Initial setup and operating instructions, including minimum clearances to adjacent flammable materials while the heater is in operation. When further actions are required by the user to:

1) Complete installation of a guard or grille that is folded or telescoped, or

2) Attach a guard or grille that is not attached to the heater at the factory,

they shall be completely described in the instructions.

b) Method of adjustment of the burner flame with detailed instructions for wick-type heaters specifying that the heater should be operated only at the manufacturer's recommended burner settings.

c) When the heater is intended only for use with No. 1-K kerosene, instructions to use only clear or red colored No. 1-K kerosene (see the Specification for Kerosene, ASTM D3699-96). When the heater is intended for use with either kerosene or synthetic fuel, instructions to use only clear or red colored No. 1-K kerosene (see the Specification for Kerosene, ASTM D3699-96) or synthetic fuels for use with kerosene-fired portable heaters. For all heaters, instructions on how to fill the reservoir.

c1) Information that the kerosene in the USA is sometimes dyed red due to tax laws and the red dyed kerosene should be translucent (able to be seen through) and not cloudy.

d) Lighting Instructions – The instructions for heaters equipped with burner mantles that may require manual adjustment shall include details on how to position the mantle as intended in the heater and how to seat the mantle after lighting heater.

e) Maintenance – When the burner is of the wick type, the following shall be included:

1) Identification of the manufacturer or private labeler and part number or equivalent of the recommended replacement wick or wicks.

2) Detailed instructions for wick replacement as follows:

a) Disassembly of the heater to remove old wick.

b) Installation of the replacement wick, including specification for the maximum wick height in millimeters and inches.

No Text on This Page

c) Reassembly of the heater.

d) Instructions for the operator to recheck wick height after reassembly and to check that the wick adjuster and extinguishing device are operating as intended before using the heater.

f) The following or equivalent cautionary statement preceded by the word WARNING:

1) Risk of Explosion –

a) Never use any fuel other than the fuels specifically identified for use in the heater. Never use gasoline.

b) Never refill heater fuel tank when heater is operating or still hot.

c) Never fill heater fuel tank in living space. Fill heater tank outdoors.

d) Never use heater in areas where flammable vapors or gas may be present.

e) Never store or transport the fuel in other than a metal or plastic container that is:

1) Acceptable for use with the specific fuel,

2) Nonred in color,

3) For 1-K Kerosene clearly marked, ″kerosene,″ or

4) Is in the original container for the Synthetic Fuel.

f) Never store fuel in the living space.

2) Due to high surface temperatures, keep children, clothing, and furniture away.

3) Risk of Indoor Air Pollution – Use heater only in well-ventilated areas. People with breathing problems should consult a physician before using the heater.

4) Do not use heater to heat or boil water or use as a cooking appliance.

g) The following or equivalent information for provision of combustion and ventilating air for unvented heaters: ″In a house of typical construction, that is, one that is not of unusually tight construction due to heavy insulation and tight seals against air infiltration, an adequate supply of air for combustion and ventilation is provided through infiltration. However, if the heater is used in a small room where less than 200 cubic feet (5.7 $m^3$) of air space is provided for each 1000 Btu per hour of heater rating (considering the maximum burner adjustment), the door(s) to adjacent room(s) should be kept open or a window to the outside should be opened at least 1 inch (25.4 mm) to guard against potential buildup of indoor air pollution. Do not use the heater in a bathroom or any other small room with the door closed.″

h) For a heater that requires further actions by the user to:

1) Attach a disassembled guard or grille, or

2) Complete installation of a guard or grille that is folded or telescoped and is not provided with an interlock that would prevent heater operation unless the guard or grille is attached to the heater in its final intended position,

the following or equivalent cautionary statement preceded by the word ″CAUTION″:

″Risk of burns. Do not operate the heater without the guard or grille completely attached.″

i) Periodic Service – Details on the items that require periodic service, recommended intervals for such service, and instructions for performing the service.

1) The information mentioned in subitems a – g shall be included for all heaters, as applicable.

a) Cleaning of heater combustion surfaces, including the burner glass chimney.

b) Replacement of burner glass chimney when cracked or broken.

c) Adjustment and replacement of ignition device.

d) Cleaning and/or replacement of air filter.

e) Checking operation of external manual shutoff device and tip-over device.

f) Replacement of battery.

g) Preparation of heater for storage.

2) The information mentioned in subitems a and b shall be included for heaters with a wick type burner.

a) Wick replacement.

b) Wick cleaning.

j) For a heater provided with a minimum wick stop in accordance with 14.3(a), the following or equivalent statement preceded by the word ″WARNING″:

″Risk of indoor air pollution and fire. Do not operate heater at wick setting lower than minimum wick-stop setting.″ [See 3.2(b)].″

Revised 3.2 effective July 27, 2002

## 4 Glossary

4.1 For the purpose of this standard, the following definitions apply.

4.2 ANTIFLOODING DEVICE – A primary safety control that causes the fuel flow to be shut off upon a rise in fuel level or upon receiving excess fuel, and that operates before the unintended discharge of fuel can occur. A wick, vacuum breaker, or other automatic device may be considered an antiflooding device.

No Text on This Page

4.3 APPLIANCE FLUE – The flue passages within the heater.

4.4 BAFFLE – An object placed in a heater to direct or to retard the flow of air of flue gases.

4.5 BASE – The main supporting frame or structure of an assembly.

4.6 BURNER – A device for the final conveyance of fuel or a mixture of fuel and air to the combustion zone.

4.7 BURNER, VAPORIZING TYPE – A burner consisting of an oil-vaporizing bowl or other receptacle to which liquid fuel may be fed in controllable quantities with provision for admitting air and mixing it with the fuel vapor in combustible proportions. The heat of combustion is used to vaporize the fuel.

4.8 BURNER, WICK TYPE – A burner consisting of a receptacle and wick to which liquid fuel may be fed in controllable quantities. The wick carries the fuel to the combustion zone where air is introduced for combustion.

4.9 CASING – An enclosure forming the outside of the heater, no parts of which are likely to be subjected to intense heat.

4.10 CATALYST – A material that speeds the oxidation of hydrocarbons and carbon monoxide into water vapor and carbon dioxide.

4.11 COMBUSTIBLE MATERIAL – As pertaining to materials adjacent to or in contact with heaters, a material made of or having surfaces of wood, compressed paper, plant fibers, or other material that will ignite and burn. Such material shall be considered as combustible even though flameproofed, fire-retardant treated, or plastered.

4.12 COMBUSTION – The rapid oxidation of fuel accompanied by the production of heat, or heat and light. Complete combustion of a fuel is possible only in the presence of an adequate oxygen supply.

4.13 COMBUSTION CHAMBER – The portion of the heater within which combustion occurs and that is usually part of the heat exchanger.

4.14 CONSTANT-LEVEL VALVE – A device for maintaining within a reservoir a constant level of fuel for delivery to the burner.

4.15 CONTROL – A device used to regulate the fuel, air, water or electrical supply to the controlled equipment. It may be automatic, semiautomatic, or manual.

4.16 CONTROL, LIMIT – An automatic safety control responsive to changes in liquid level, pressure, or temperature; for limiting the operation of the controlled equipment.

4.17 CONTROL, PRIMARY SAFETY – The automatic safety control intended to prevent abnormal discharge of fuel at the burner in case of ignition failure or premature flame extinguishment.

4.18 DAMPER – A valve or plate for regulating draft or flow of flue gases. A damper is generally considered as being located on the downstream side of the combustion chamber, usually in a flue passage of a heater or in the flue pipe.

4.19 DEVICE, SAFETY – Automatic controls and interlocks (including relays, switches, and other auxiliary equipment used in conjunction therewith to form a safety-control system) that are intended to prevent operation of the controlled equipment that could cause a risk of fire, electric shock, or injury to persons.

4.20 ELECTRICAL CIRCUITS:

a) High-Voltage Circuit – A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.

b) Low-Voltage Circuit – A circuit involving a potential of not more than 30 volts alternating-current rms (42.4 peak or direct current) and supplied by a primary battery or by a standard Class 2 transformer or other transforming device, or by a combination of transformer and fixed impedance having output characteristics in compliance with what is required for a Class 2 transformer. A circuit derived from a source of supply classified as a high-voltage circuit by connecting resistance in series with the supply circuit as a means of limiting the voltage and current is not considered to be a low-voltage circuit.

c) Isolated-Limited-Secondary Circuit – A circuit of limited energy derived from an isolated secondary winding of a transformer having a maximum capacity of 1000 volt-amperes and open-circuit secondary-voltage rating not exceeding 1000 volts.

d) Safety (Control) Circuit – A circuit involving one or more safety devices.

4.21 EXCESS AIR – Air that passes through the combustion area and the appliance flues in excess of that which is theoretically required for complete combustion.

4.22 FLUE GASES – Combustion products and excess air.

4.23 FULL DRAIN – As applied to tanks, a construction in which the tank is emptied through its normal feed outlet at the bottom of the tank.

4.24 HEATER, CIRCULATING – A room heater intended to convert energy in the fuel to convected heat by the circulation of air heated by contact with the heating surfaces.

4.25 HEATER, DIRECT-FIRED – A heater in which combustion products or flue gases are mixed with the air being heated.

4.26 HEATER, RADIANT – A heater intended primarily to convert energy in the fuel to radiant heat, such as with openings in the outer jacket to permit direct radiation from the heating surface.

4.27 HEATER, ROOM – A stationary, self-contained, freestanding, air-heating appliance intended for installation in the space being heated and not intended for duct connection.

4.28 HEATING SURFACES – All surfaces that transmit heat directly from flame or flue gases to the medium to be heated.

4.29 KEROSENE – A hydrocarbon oil defined by the Standard Specification for Kerosene, ASTM D3699-96. Kerosene is either clear or dyed translucent (i.e. not cloudy) red in color.

Revised 4.29 effective July 27, 2002

4.30 MANUALLY LIGHTED HEATER – A heater in which fuel to the main burner is turned on only by hand and ignited under supervision.

No Text on This Page

4.31 PORTABLE HEATER – A direct-fired heater that:

a) Is intended to burn kerosene,

b) Is not flue connected,

c) Can be carried from one location to another,

d) Is self-supporting and self-contained, and

e) Includes either an integral or a removable fuel tank.

4.32 RADIATION SHIELD – A separate panel or panels interposed between heating surfaces and adjacent objects to reduce heat transmission by radiation.

4.33 READILY ACCESSIBLE – Capable of being reached easily and quickly for operation, adjustment, and inspection.

4.34 SAFETY SHUT-DOWN – The action of shutting off all fuel and ignition energy to the burner by a safety control, or controls, such that restart cannot be accomplished without a manual restart.

4.35 SUMP (FOUNT) – The receptacle employed with a vacuum tank.

4.35.1 SYNTHETIC FUEL – A fuel that is the result of a process consisting of refining crude oil in combination with chemical reactions producing a specific liquid fuel meeting the requirements of No. 1-K Kerosene referenced in ASTM D3699-96, Standard Specification for Kerosene.

4.35.1 added November 2, 1998

4.36 TANK, GRAVITY – A fuel tank from which the fuel is delivered directly to the burner by gravity.

4.37 TANK, INTEGRAL – A fuel tank that is permanently attached to a heater.

4.38 TANK, REMOVABLE – A fuel tank that can be separated from a heater, without the use of a tool, for filling.

4.39 TANK VACUUM – A fuel tank that maintains a definite level of fuel in a sump or similar receptacle by barometric feed. Fuel is delivered from the sump to the burner by gravity.

4.40 TRACER FLAME – Small flickers or a trickle of flame at or above the wick of a wick-type burner that may continue to burn due to presence of kerosene vapors after the main burner flame has been extinguished.

4.41 VALVE, FUEL-CONTROL – An automatically or manually operated device consisting essentially of a fuel valve for controlling the fuel supply to a burner.

a) Metering (Regulating) Valve – A fuel-control valve for regulating burner input.

b) Safety Valve – A normally closed valve of the On and Off type (without any bypass to the burner) that is actuated by a primary safety control or by an emergency device.

4.42 VALVE, MANUAL FUEL-SHUTOFF – A manually operated valve in the fuel line for the purpose of completely turning on or shutting off the fuel supply to the burner.

## CONSTRUCTION

GENERAL

### 5 Assembly

5.1 Each heater shall include all the essential components necessary for its intended function when installed as intended.

5.2 The various parts of a heater shall be constructed and assembled in accordance with these requirements to provide the strength, rigidity, and durability required.

5.3 The various parts of a heater shall be assembled or jointed as intended. Soft solder shall not be used on any fuel-handling parts if melting of the solder may allow leakage of fuel, except as indicated in 20.14. Soft-soldered joints, where acceptable, shall be made mechanically secure before soldering.

5.4 The heater shall be completely assembled by the manufacturer before shipment from the factory.

*Exception No. 1: Subassemblies (such as a completely assembled burner or chimney section of a wick-type heater), minor parts, or accessories may be shipped unassembled with clear and precise instructions for their assembly in the field, provided that:*

*a) The heater cannot be operated without correctly installing the parts, subassemblies, or accessories; or*

*b) A risk of fire or injury to persons is not caused when the heater is operated without using the parts, subassemblies, or accessories.*

*Exception No. 2: A tray or subbase that complies with the requirements in 9.2 may be furnished without being assembled on the heater.*

*Exception No. 3: A heater that incorporates a guard or grille may be shipped with the guard or grille unassembled, provided the heater is marked in accordance with 3.2(h).*

5.5 If a functional part of a heater is rendered inoperative (nonfunctional) in the factory by packaging materials used for shipment purposes, the packing materials shall be arranged so that they have to be removed and so that all essential parts, the function of which is required to comply with the requirements in this standard, are functional before the heater can be operated.

5.6 A constant-level valve or sump assembly shall be secured in position and mounted independently of the fuel piping.

5.7 A hinge provided for the joining of the upper and lower sections of a portable heater, together with any latching device, the malfunctioning of which could cause a spillage of fuel or other risk of fire, shall be:

a) Of permanently attached and assembled parts, and

b) Resistant to distortion.

A latch shall engage as intended automatically from the weight of the upper section.