

JULY 18, 2012

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UL 7700-1

OUTLINE OF INVESTIGATION
FOR
PORTABLE PNEUMATIC TOOLS

Issue Number: 3

July 18, 2012

Summary of Topics

The third issue of the Outline of Investigation for Portable Pneumatic Tools, UL 7700-1, has been published to revise 8.1(f) – (h), 8.5, and 9.1.5(a), (b), and (f) to clarify that equivalent wording is acceptable for these markings as the required wording does not provide any specialized clarity or content.

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APPENDIX A

Standards for Components.....	A1
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1 Scope

1.1 This outline of investigation applies to portable, pneumatic-powered tools. These tools are intended for connection to a compressed air power source with a maximum pressure of 200 psi and a regulator to reduce the pressure to the rated pressure of the tool.

1.2 These requirements apply to: buffers, drills, grinders, hammers, impact wrenches, nailers, nibblers, nut runners, polishers, ratchets, routers, sanders, saws, screwdrivers, shears, staplers, tappers, valve seat grinders and similar pneumatic tools.

1.3 These requirements apply to portable pneumatically powered tools that contain electrical and electronic components.

1.4 These requirements apply to accessories and attachments for use with portable pneumatic tools.

1.5 These requirements do not apply to fixed or stationary pneumatic tools, powder-actuated tools, rescue equipment, or tools powered by oxygen, combustible gas, combustible fuel or bottled gas including air.

1.6 These requirements do not apply to tools intended for use in a hazardous location as defined in the National Electrical Code, NFPA 70.

2 Components

2.1 Except as indicated in 2.2, a component of a tool covered by this outline shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the tools covered by this outline.

2.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component covered by this outline, or
- b) Is superseded by a requirement in this outline.

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

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Undated References

3.1 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.

4 Units of Measurement

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

5 Glossary

5.1 Where the expressions "with the aid of a tool," "without the aid of a tool," or "requires the use of a tool" occur in this outline, the word "tool" means a screwdriver, a coin or any other object used to operate a screw or similar securing means, not including a wrench, key, screwdriver or similar item packaged with the tool.

5.2 For the purpose of this outline, the following definitions apply.

5.3 ACCESSORY – A device that is attached only to the spindle of the tool.

5.4 ATTACHMENT – A device secured to the housing or other component of a tool. Securement of the attachment to the spindle is optional. Attachments include tables to convert hand held tools to bench mounted types; for example, a router table.

5.5 CLASS 2 CIRCUIT – A circuit involving a potential of not more than 42.4 V peak and has output characteristics not greater than those of an inherently-limited Class 2 transformer.

5.6 CONTINUOUS OPERATION – Operation under normal load for an unlimited period.

5.7 CONTROL DEVICE – The main component that actuates or whose actuation results in movement of the output of the tool. The On-Off type is either in the fully open or closed position at all times. The variable pressure type is able to vary the air flow from closed to fully open.

5.8 COMPRESSED AIR – Air compressed to any pressure greater than atmospheric pressure.

5.9 GUARD – A mechanical barrier provided for protection against unintentional contact with a part that involves a risk of electrical shock, fire, or injury to persons.

5.10 INTERMITTENT OPERATION – Operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load followed by a rest period with the tool running idle or switched off.

5.11 MAXIMUM RATED AIR PRESSURE – The rated air pressure or maximum pressure of the rated air pressure range.

5.12 NORMAL LOAD – The load to be applied to a tool so that the stress imposed corresponds to that occurring under normal conditions of use, any marking of short-time or intermittent operation being observed. The normal load is based on the rated air pressure or on the upper limit of the rated air pressure range.

5.13 PORTABLE PNEUMATIC TOOL – A hand-held or transportable pneumatic tool.

a) **HAND-HELD TOOL** – A tool which can easily be brought to the place of operation and which is held by hand or suspended during operation. Hand-held tools include tools having a flexible shaft, tools having provisions for mounting on a support; and hand-supported tools such as paving breakers.

b) **TRANSPORTABLE TOOL** – A tool that is not hand supported during use and which is intended to be taken to the workpiece to perform its intended function.

5.14 QUICK CONNECT/DISCONNECT FITTING – A fitting used to connect and disconnect with a female air hose fitting without the use of a tool.

5.15 RATED AIR PRESSURE – The air pressure, in psi, that is required at an air tool inlet port in order to provide rated performance of the tool.

5.16 RATED AIR PRESSURE RANGE – The air pressure range, expressed by its lower and upper limits, in psi, that is required at an air tool inlet port in order to provide rated performance of the tool.

5.17 RATED NO-LOAD SPEED – The nominal speed, in rpm, of the tool at no load with rated air pressure at the tool inlet port.

5.18 REGULATING DEVICE – A device other than the control device that regulates speed and similar operating characteristics.

5.19 SHORT-TIME OPERATION – Operation under normal load for a specified period, starting from cold, the intervals between each period of operation being sufficient to allow the tool to cool down approximately to ambient temperature.

5.20 TOOL – Portable pneumatic tool.

5.21 TOOL WEIGHT – The weight of a tool including the accessories and attachments, but not including the air hose.

5.22 WORKPIECE – The object on which a tool performs its intended function.

6 General Requirements

6.1 A tool shall be formed and assembled so that the tool will have the strength and rigidity necessary to resist the abuses to which the tool is subjected during normal use, without resulting in a risk of fire, electric shock, or injury to persons due to damage that results in loosening or displacement of parts, or other serious defects.

7 General Notes on Tests

7.1 Unless otherwise specified:

- a) Each test shall be performed on a new sample, and
- b) Each test shall be performed only once.

7.2 The tests are to be performed with the tool, or any movable part of the tool, placed in the most unfavorable position which occurs in normal use.

7.3 If the test results are influenced by the temperature of the ambient air, the room ambient temperature is to be maintained at $25 \pm 5^\circ\text{C}$.

7.4 Unless otherwise specified, a tool marked with a rated air pressure range is to be tested at the most unfavorable pressure within the applicable range. If the most unfavorable pressure is not evident, tests are to be performed at the minimum, the mean, and the maximum values of the rated air pressure range in order to establish the most unfavorable pressure.

7.5 A tool for which alternate accessories are available is to be tested in accordance with the applicable section with those accessories which give the most unfavorable results, provided that the accessories used for the test are used within the tool manufacturer's specifications.

7.6 Unless otherwise specified, a tool provided with regulating devices or similar controls with a user adjustable setting is to be tested with the controls adjusted to their most unfavorable setting.

If the adjusting means of the control is accessible without the aid of a tool, this requirement applies whether the setting is adjustable by hand or requires the aid of a tool to adjust.

If the adjusting means is not accessible without the aid of a tool, this requirement applies only if the setting is adjustable by hand.

An adjusting means that is sealed is evaluated as not accessible without the aid of a tool.

7.7 When the conditions of normal load are specified in a Part 2, the tool is to be loaded according to those conditions, irrespective of any marking of short-time or intermittent operation, unless it is evident from the construction of the tool that those conditions will not occur in normal use.

When the conditions of normal load are not specified in a Part 2, the tool is to be loaded according to the manufacturer's instructions. In the absence of such instructions, the tool is to be operated continuously at no load.

For an accessory performing a function which is within the scope of a Part 2, the tests are to be performed in accordance with the Part 2.

7.8 If torque is to be applied, the method of loading is to be chosen so as to reduce the risk of additional stresses, such as those caused by side thrust. However, additional loads necessary for the correct operation of the tool are to be taken into account.

8 Marking

8.1 A tool shall be legibly and permanently marked with:

a) The manufacturer's name, trade name, or trademark or other descriptive marking by which the organization responsible for the tool is able to be identified;

Exception: The manufacturer's identification is able to be in a traceable code if the tool is identified by the brand or trademark owned by a private labeler.

b) A distinctive catalog, model or type reference number or the equivalent;

c) The date or other dating period of manufacture not exceeding any one month.

Exception: The date of manufacture is able to be abbreviated; or is able to be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code:

a) Does not repeat in less than 10 years for a household tool and less than 20 years for a commercial tool, and

b) Does not require reference to the tool in records of the manufacturer to determine when the tool was manufactured.

d) The rated air-pressure or rated air-pressure range and stated as psi.

e) Rated no-load speed for a tool with a rotating output means. A tool provided with a rated air-pressure range or more than one speed shall be marked with the no-load speed obtainable with the tool at the highest speed setting.

Exception: This does not apply to impact wrenches, nailers, nut setters, screwdrivers, drain cleaners, belt sanders, band saws, and tools with predominately linear work function motion.

f) The following wording or the equivalent: "WARNING" "Risk of Injury to Persons. Read and understand instruction manual before use."

g) The following wording or the equivalent: "WARNING" "Risk of Eye Injury. Wear eye protection."

h) For a tool that the sound level exceeds 85 dBA at a distance of 1 m (3.28 ft) from the tool, the following wording or the equivalent: "WARNING" "Risk of Hearing Loss. Wear ear protection." See 16.1.

i) For a tool employing an electrical connection as indicated in Section 10, the following wording or the equivalent: "CAUTION" "Risk of Electric Shock. Connect to a Class 2 source rated ____ V maximum, ____ A maximum." The blanks shall be replaced with the maximum voltage rating and the maximum current rating respectively. The term "maximum" is optional.

Exception: A tool provided with the mating supply meeting Class 2 limits as indicated in 10.1 need not employ this marking.

j) The following wording or the equivalent: "WARNING" "Risk of Electric Shock. This tool is not provided with an insulated gripping surface."

Exception: A tool meeting the dielectric requirements in 15.14 need not employ this marking.

8.2 When a manufacturer produces tools at more than one factory, each tool shall have a distinctive marking to identify it as the tool of a particular factory.

8.3 If a nameplate contains a required marking and is on a part that must be removed for servicing of the tool, the construction shall be such that the nameplate must be returned to its proper location for the tool to be operable.

8.4 A cautionary marking shall be permanent and shall be located on a part permanently attached to the tool or located on a part that cannot be removed without impairing the operation or the appearance of the tool.

8.5 Additional cautionary statements, as deemed necessary by the manufacturer, are optional. Combining cautionary statements having the same signal word into one paragraph under one signal word is acceptable. The order of statements shall be markings required by Part 1, followed by markings required by the applicable Part 2, followed by any optional markings.

8.6 In a case where DANGER, WARNING, and CAUTION appear together, the cautionary markings shall be in the order of severity, that is, DANGER, WARNING, and CAUTION.

8.7 A marking intended to inform the user of a risk of electric shock, fire, or injury to persons shall be prefixed by a signal word "CAUTION," "WARNING," or "DANGER." The signal word shall be in capital letters and more prominent than any other required marking on the tool.

8.8 The upper case letters of a cautionary marking shall be in letters not less than 2.4-mm (0.1-in) high. The lower case letters of a cautionary marking shall be in letters not less than 1.7-mm (0.07-in) high.

8.9 If a symbol is used due to the small amount of available space on a tool, a symbol specified in Table 8.1 is able to be used as an option. The symbol shall be defined in the operator's instruction manual.

Table 8.1
Marking Symbols

Symbol	Property or statement
V	Volts
A	Amperes
l	Liters
kg	Kilograms
h	Hours
min	Minutes
s	Seconds
n_o	No-load speed
.../min	Revolutions or reciprocation per minute
psi	Pounds per square inch
See Figure 1	WARNING marking concerning Risk of Eye Injury, see 8.1(g)
See Figure 2	WARNING marking concerning Risk of Hearing Loss, see 8.1(h)

8.10 Unless it is obvious, a regulating device shall be marked or located so as to indicate clearly which part of the tool the device controls. Indications used for this purpose shall, wherever practicable, be comprehensible without a knowledge of languages, national standards, or similar information.

8.11 A regulating device intended to be adjusted during operation and a control device shall be provided with a marking to indicate the direction of adjustment to increase or to decrease the value of the characteristic being adjusted. A marking of "+" and "-" complies.

Exception: An indication is not required for a regulating device provided with an adjusting means, if the "fully-on" position is opposite to the "off" position.

8.12 With reference to 8.11, if numbers are used to indicate the different positions, the "off" position shall be indicated by the number 0, and the position for a greater output, speed, or similar characteristic shall be indicated by a higher number. The marking for the different positions need not be placed on the device itself.

8.13 A required marking shall be visible, legible, and permanent. The marking shall be:

- a) Etched, molded, die-stamped, paint-stenciled; permanently secured, stamped, or etched metal; or
- b) A pressure-sensitive label or a label secured by cement or adhesive complying with the applicable requirements, including exposure to oil, in the Standard for Marking and Labeling Systems, UL 969.

8.14 The markings specified in this Section shall be on a main part of the tool, unless otherwise indicated, in such way that the marking is clearly discernible when the tool is ready for use.

8.15 A marking for a regulating device or a control device shall be placed in the vicinity of the component. The marking shall not be placed on a removable part if such part is replaceable in such a way that the marking is misleading.

9 Instruction Manual

9.1 General

9.1.1 A tool shall be provided with instructions containing the items specified in 9.1.5. The instructions shall be legible and contrast with the background.

9.1.2 The instructions shall be:

- a) In separate manuals, or
- b) Combined in one or more manuals, if the instructions pertaining to a risk of fire, electric shock, or injury to persons are separated in format and emphasized to distinguish them from the rest of the text.

9.1.3 An instruction manual shall be provided with the tool and packaged such that it is obvious when the tool is removed from the carton. This requirement does not preclude supplying the instructions printed on a blister pack backing card, if the tool can be removed without damaging the instructions.

9.1.4 The instruction manual shall include the manufacturer's or private labeler's name and address, street, city, state, and postal code as applicable.

9.1.5 The instruction manual shall include the following items in the sequence given. The wording shall be as shown or the equivalent:

a) **Instructions pertaining to a risk of fire, electric shock, or injury to persons.** The items as presented in 9.2.3.

Supplemental instructions following the mandatory instructions are acceptable if the instructions are related to the topic.

b) **Specific safety instructions, symbols, or both** – Instructions and symbols specific to the applicable tool shall be provided.

The instructions in this item shall include a definition of all symbols used on the tool. Definitions for symbols are shown in Table 8.1.

Additional specific safety instructions determined to be applicable to the tool are acceptable. These additional safety instructions shall be located after the mandatory specific safety instructions.

Repeating any of the safety instructions is acceptable within the instruction manual at the manufacturer's discretion.

c) **Functional description** – The functional item shall describe the essential components or controls of the tool.

d) **Tool assembly** – A tool assembly item shall be provided, if applicable.

e) **Operating instructions** – This item shall contain all the information needed to operate the tool as intended. The instructions shall be preceded by the heading "OPERATING INSTRUCTIONS" or the equivalent.

Exception: Instructions and warnings provided in accordance with the requirements for instructions pertaining to a risk of fire, electric shock, or injury to persons are not required to be repeated in the operating instructions if there is a reference to the applicable instructions and warnings in the operating instructions.

The operating instructions shall explain and describe the location, function, and operation of each user-operated control of the tool, and warn against tampering with such devices.

f) **User maintenance** – Instructions and cautionary statements for any user-maintenance operations specified by the manufacturer shall be provided. The instructions shall be preceded by the heading "USER-MAINTENANCE INSTRUCTIONS" or the equivalent.

g) **Accessories** – The accessories item shall specify accessories and attachments intended for use with the tool. The Accessories item or the Operating Instructions item shall include instructions for correct use of such accessories or attachments.