UL 1120

ISBN 0-7629-0217-5

Marine Engine Ignition Systems and Components

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety
for
Marine Engine Ignition Systems and Components, UL 1120

Third Edition, Dated September 4, 1997

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

UL will attempt to answer support requests concerning WordPerfect, Envoy, and Standards-on-Diskette. However, this support service is offered on a reasonable efforts basis only, and UL may not be able to resolve every support request. UL supports a Standards-on-Diskette only if it is used under the conditions and operating systems for which it is intended. UL's support policies may change from time-to-time without notification.

UL reserves the right to change the format, presentation, file types and formats, delivery methods and formats, and the like of both its printed and electronic Standards without prior notice.

Standards-on-Diskette purchasers agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgement (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing a Standard-on-Diskette on the purchaser's computer system.

If a single-user version Standards-on-Diskette was purchased, one copy of this Standard may be stored on the hard disk of a single personal computer, or on a single LAN file-server or the permanent storage device of a multiple-user computer in such a manner that this Standard may only be accessed by one user at a time and for which there is no possibility of multiple concurrent access. The original distribution diskette should be stored in a safe place.

If a multiple-user version Standards-on-Diskette was purchased, one copy of the Standard may be stored on a single LAN file-server, or on the permanent storage device of a multiple-user computer. The number of concurrent users shall not exceed the number of users authorized for the Standards-on-Diskette version. The original distribution diskette should be stored in a safe place.

Standards-on-Diskette are intended for on-line use, such as for viewing the requirements of a Standard, conducting a word search, and the like. Only one copy of the Standard may be printed from each single-user version of a Standards-on-Diskette. Only one copy of the Standard may be printed for each authorized user of a multiple-user version of a Standards-on-Diskette. An employee of an organization purchasing a Standard-on-Diskette can make a copy of the page or pages being viewed for their own fair and/or practical internal use. Because of differences in the computer/software/printer setup used by UL and those of Standards-on-Diskette purchasers, the printed copy obtained by a purchaser may not look exactly like the on-line screen view or the printed Standard.

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.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

UL 1120

Standard for

Marine Engine Ignition Systems and Components

First Edition – September, 1977
Second Edition – 1988

Third Edition

September 4, 1997

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

ISBN 0-7629-0217-5

No Text on This Page

CONTENTS

FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover battery-supplied marine engine ignition systems and components operating with an input voltage of less than 50 volts. These requirements also cover magneto ignition systems.

1.2 The products covered by these requirements are those required to be ignition-protected by U. S. Coast Guard regulations as specified in 33 CFR 183.410.

1.3 The components and systems covered by these requirements are intended for installation and use in accordance with the applicable requirements of the U. S. Coast Guard, and the Fire Protection Standard for Pleasure and Commercial Motor Craft, ANSI/NFPA 302.

1.4 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as required to maintain the level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard is not judged to comply with this Standard. Where appropriate, revision of requirements are proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 Glossary

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

2.2 ENGINE IGNITION SYSTEM – A combination of components used on an internal combustion engine to supply a high voltage at each spark plug at a precise time in the operating cycle.

2.3 IGNITION-PROTECTED – Constructed so that:

a) A flammable hydrocarbon mixture surrounding a system or component is not ignited if a normally occurring electrical arc, spark, or heat source ignites a flammable hydrocarbon mixture inside the system or component;

b) The electrical arc, spark, or heat source has insufficient electrical or heat energy to ignite the flammable mixture; or

c) The source of ignition is hermetically sealed from the surrounding mixture.

An ignition-protected product does not necessarily comply with the requirements for an explosion-proof product as applied to U. S. Coast Guard inspected vessels or as defined by the National Electrical Code, ANSI/NFPA 70-1996, Errata Notice No. 1.

2.4 PRODUCT – A component of an ignition system other than high-voltage wire; for example, a distributor, coil, distributor cap, solid state device, or high-voltage wire bracket.

3 Units of Measurement

3.1 If a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

CONSTRUCTION

4 Distributors

4.1 A distributor and its attachments shall be of an ignition-protected construction that is not adversely affected when subjected to vibration and shock. See Vibration Test, Section 13; Shock Test, Section 14; and Ignition-Protection Test, Section 15.

4.2 A distributor in which moisture and ozone can accumulate shall be ventilated to reduce the likelihood of accumulation of condensation, and dissipate generated ozone. An exposed surface shall be sloped or otherwise constructed to be free of wells or crevices that may collect water.

4.3 A distributor and its electrical connections shall be constructed to reduce the likelihood of accumulation of moisture around high- and low-voltage parts. A high-voltage (and, if necessary, low-voltage) connection shall be covered with a tight fitting cap, boot, or nipple.

5 High-Voltage Connections

5.1 A high-voltage wire termination shall provide positive electrical contact with the high-voltage conductor under conditions of marine usage. See Vibration Test, Section 13; and Shock Test, Section 14.

6 Materials

6.1 A metallic component, including a mounting bracket, shall be galvanically compatible with other parts of the system, and shall have corrosion resistance at least equivalent to AISI Type 410 stainless steel alloy. If corrosion of a component can result in the loss of ignition-protection or cause the system to become inoperative, the component shall be protected against corrosion by galvanizing or other equivalent means. A product having parts formed of materials that are not known to provide acceptable corrosion resistance, dezincification resistance, and galvanic compatibility with other parts is to be subjected to the Salt-Spray Corrosion Test, Section 17.

6.2 An electrical terminal, nut, or contact shall be fabricated of copper alloy or other metal providing acceptable protection against corrosion.

6.3 A bracket intended to be mounted on an engine and a clamp intended to hold wires in a fixed position shall be fabricated of materials that withstand continuous exposure to temperatures up to 100EC (212EF). Edges of a bracket or clamp shall be free of burrs, fins, and the like, that may abrade or otherwise damage the insulation on wiring.

6.4 An exposed nonmetallic material shall be resistant to deterioration from exposure to oil, grease, and fuel in service. See Chemical Resistance Test, Section 16.

6.5 A nonmetallic part, including insulation, a protective boot, or an ignition wire bracket, shall withstand continuous operation within an ambient temperature range of minus 25 to plus 100EC (minus 13 to plus 212EF) without unacceptable deterioration of the material, or reduction in dielectric voltage-withstand capability to below the minimum acceptable value. See Low Ambient Temperature Test, Section 7; High Ambient Temperature Test, Section 8; and Dielectric Voltage-Withstand Test, Section 9.

7 Enclosures

7.1 An enclosure that contains a potential ignition source, such as a switch, distributor, or the like, shall withstand the abuses to which it is likely to be subjected in service. See Sections 10 – 17.

7.2 A removable cover that forms part of an ignition-protected enclosure shall be constructed to permit removal and replacement in the field with common tools, such as standard American or metric wrenches, screwdrivers (straight or cross point), and standard hexagonal wrenches, without loss of ignition-protection.

7.3 A gasket, oil ring, or similar part that is necessary for ignition-protection shall be cemented or otherwise secured in position if the product can be assembled in the field without such parts.

7.4 An enclosure, a frame, a guard, a handle, or the like, shall not be sufficiently sharp to constitute a risk of injury to persons in normal maintenance or use.

Exception: This requirement does not apply to a part or portion of a part needed to perform a working function.

8 Electrical

8.1 A component not integrally mounted on an engine shall be of the 2-conductor type and shall have all electrical circuits insulated from the housing and mounting provisions. An electrical component with one side of the circuit connected to the housing is acceptable if the component is intended to be integrally mounted on the engine. Insulation shall be acceptable for the temperature involved and for exposure to environmental conditions such as humidity, oil, water, vibration, and shock, as applicable.

8.2 The location of an external terminal shall permit the intended connections to be made in the field and reduce the likelihood of accumulation of water. A continuously energized ungrounded terminal shall be fitted with a boot or other equivalent insulation.

8.3 An external conductor provided by the manufacturer as part of an assembly shall be stranded copper wire. Wire insulation shall be acceptable for use in damp or wet locations, resistant to oil, and rated for a temperature of 75EC (167EF) or higher.

8.4 A conductor in a secondary circuit of an ignition system shall comply with applicable requirements in the Standard for High Tension Ignition Cable, September 1996, SAE No. J2031.

PERFORMANCE

9 General

9.1 One test sample shall be subjected to the tests described in Sections 10 – 15, in the order presented.

9.2 Two test samples shall be subjected to the Chemical Resistance Test, Section 16; and the Salt-Spray Corrosion Test, Section 17. Separate test samples may be used for these tests.

10 Low Ambient Temperature Test

10.1 A product, with all accessory components, including wiring provided by the manufacturer, shall be tested as described in 10.2 – 10.4. There shall be no evidence of cracking or development of other conditions that result in malfunction or loss of the ignition-protection.

10.2 The sample is to be mounted on a test fixture simulating the intended installation and is to be placed in a cold chamber maintained at minus 25 ±2EC (minus 13 ±4EF) for 24 hours. The sample need not be operational during the conditioning.

10.3 At the end of the 24 hours, wiring subject to flexing during intended operation of the product is to be wrapped for six turns of 360 degrees per turn around a mandrel of the size specified in Table 10.1, before being removed from the cold chamber. The wrapping is to be done at an approximately uniform rate of 10 seconds for each turn.

Table 10.1
Mandrel diameters

Conductor size		Diameter of mandrel,	
AWG	(mm^2)	Inch	(mm)
16	(1.3)	0.313	(7.95)
14	(2.1)	0.313	(7.95)
12	(3.3)	0.375	(9.53)
10	(5.3)	0.563	(14.30)

10.4 Immediately following the procedure specified in 10.3, the assembly (sample and fixture) is to be removed from the cold chamber and is to be clamped to a shock test table. The assembly then is to be subjected to 25 shock impacts, each having an acceleration of 10 g (98 m/s^2) and a duration of 20 to 25 milliseconds as measured at the base of the half-sine shock envelope. The assembly is to be subjected to the first impact within 30 seconds after removal from the cold chamber. If additional time is required, the assembly is to be wrapped with insulation at least 2 hours before removal from the cold chamber to maintain the temperature of the sample while the transfer is made.

11 High Ambient Temperature Test

11.1 A product shall be conditioned as described in 11.2 and 11.3. There shall be no evidence of displacement of gaskets of ignition-protection components, loss of tightness of enclosures, or evidence of softening, distortion, or other conditions that result in malfunction or loss of ignition-protection.

11.2 Following the Low Ambient Temperature Test, Section 10, the sample is to be placed in a circulating-air oven maintained at 100 ±2EC (212 ±4EF) for 50 hours. The sample need not be operational during the conditioning.

11.3 After removal from the oven, low-voltage wire is to be allowed to cool to room temperature and then is to be wrapped for six turns of 360 degrees per turn around a mandrel of the size specified in Table 10.1. The wrapping is to be done at an approximately uniform rate of 10 seconds for each turn.