



**Underwriters Laboratories Inc.®**A not-for-profit organization dedicated to public safety  
and committed to quality service**May 16, 1994****Revision pages for****Standard for****Marine Combustible Gas Indicators****UL 1110, Second Edition**

Attached to this transmittal notice is a reprinted title page for the Second edition of UL 1110.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 1110-1994.

Revised and/or additional pages may be issued from time to time.

With the inclusion of the accompanying material, the standard consists of pages dated as shown in the following checklist:

| <b>Page</b>      | <b>Date</b>                                |
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| 1 . . . . .      | February 12, 1988 (Reprinted May 16, 1994) |
| 2 . . . . .      | —                                          |
| 3, 4 . . . . .   | February 12, 1988                          |
| 5, 6 . . . . .   | January 21, 1992                           |
| 7 . . . . .      | February 12, 1988                          |
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**FEBRUARY 12, 1988**  
(Title Page Reprinted: May 16, 1994)



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**UL 1110**  
**Standard for**  
**Marine Combustible Gas Indicators**

First Edition — September, 1976

**Second Edition**

**February 12, 1988**

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated February 12, 1988, and January 21, 1992. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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

Approved as ANSI/UL 1110-1987, October 5, 1987  
Approved as ANSI/UL 1110-1994, March 15, 1994

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 published set of revision pages.

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**Underwriters Laboratories Inc.®**

An independent, not-for-profit organization testing for public safety

**January 21, 1992**

**Revision pages for**

**STANDARD FOR**

**MARINE COMBUSTIBLE GAS INDICATORS**

**UL 1110, FIRST EDITION**

Attached to this transmittal notice is a revision of the first edition of UL 1110.

A CHANGE IN REQUIREMENTS IS INDICATED BY A VERTICAL LINE IN THE MARGIN ON PAGES DATED JANUARY 21, 1992. EDITORIAL CHANGES ARE NOT SO MARKED.

THESE NEW AND REVISED REQUIREMENTS ARE NOW IN EFFECT.

The new and revised requirements are substantially in accordance with UL's bulletin on this subject dated September 11, 1991. The bulletin is now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 1110-1987.

Revised and/or additional pages may be issued from time to time.

With the inclusion of the accompanying material, the standard consists of pages dated as shown in the following check list:

| <b>Page</b>  | <b>Date</b>       |
|--------------|-------------------|
| 1 .....      | February 12, 1988 |
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| 8 .....      | January 21, 1992  |
| 9 — 11 ..... | February 12, 1988 |

(4)

## GENERAL

### 1. Scope

1.1 These requirements cover electrically operated marine combustible gas indicating equipment for use in boats.

1.2 Marine combustible gas indicators are intended for permanent installation and for installation, maintenance, and use in accordance with the applicable requirements of the Standard for Fire Protection of Pleasure and Commercial Motor-Craft, NFPA 302, or the American Boat and Yacht Council, Inc.

1.3 These requirements cover ignition-protected equipment that may be used on boats under 65 feet (19.8 m) in length, but do not cover marine combustible gas detectors intended for use in hazardous locations aboard vessels subject to the U. S. Coast Guard electrical engineering regulations.

### 2. Glossary

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

2.2 LOWER EXPLOSIVE LIMIT — The lowest concentration of a flammable gas or vapor in air that will burn or explode.

2.3 MARINE COMBUSTIBLE GAS INDICATOR — One or more unit assemblies of electrical components that are constructed to detect and indicate the presence of a combustible gas or vapor aboard boats.

### 3. General

#### Components

3.1 Except as indicated in paragraph 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

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

A. Involves a feature or characteristic not needed in the application of the component in the product covered by this standard, or

B. Is superseded by a requirement in this standard.

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

3.4 Specific components are recognized as being 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 for which they have been recognized.

#### Units of Measurement

3.5 Unless otherwise indicated, all voltage and current values mentioned in this standard are rms.

3.6 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

### 4. Installation Instructions

4.1 A copy of the operating and installation instructions and related schematic wiring diagrams and installation drawings shall be furnished with, and is to be used as a guide in, the examination and test of the indicator. For this purpose the installation instructions need not be in final printed form. Also, see paragraph 16.3.

4.2 The instructions and drawings shall include such directions and information necessary for the intended installation, maintenance, and operation of the indicator including the specific gases and/or vapors which the indicator is intended to detect. The instructions shall clearly indicate the procedure for testing as required by paragraph 6.8.

Paragraph 4.2 revised January 21, 1992

*\*Replaces page 5 dated February 12, 1988*

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## CONSTRUCTION

### 5. Materials

5.1 A material used in an indicator shall be acceptable for use in a marine environment.

5.2 A metallic component of an indicator that is necessary for the indicator to perform its intended function and that may be exposed to corrosive conditions, such as a bilge combustible gas indicator, shall be fabricated of metals or metal alloys that are inherently resistant to corrosion in salt atmospheres (see Salt-Spray Corrosion Test, Section 14). Other metallic components shall be provided with a corrosion-resistant coating or equivalently protected against corrosion. Metal combinations shall be galvanically compatible.

### 6. Operation

6.1 An indicator shall be constructed to detect and indicate the presence of combustible vapors or gases for which it is intended. See Operational Tests, Section 13.

6.2 An indicator shall be provided with an indicating device. The indicating device may include either an audible or visual signal to show the presence of a combustible gas or vapor. Examples of audible signal devices are bells, horns, sirens, electronic horns, or buzzers. Visual indicators include lamps, light-emitting diodes, and meters.

6.3 An indicator that is marked for gasoline shall be provided with means to give visual and audible warning of the presence of a 20 percent or greater concentration (by volume) of the lower explosive limit of 87 — 93 octane gasoline vapor in air.

Paragraph 6.3 revised January 21, 1992

6.4 An indicator that requires a warm-up period to attain intended operation shall not indicate a satisfactory operating condition during the required warm-up period.

6.5 An indicator shall be provided with means that indicates the malfunction of a component due to immersion, burn-out of the filament, or other cause that affects the intended function of the indicator.

6.6 An indicator lamp shall be provided to indicate energized equipment.

6.7 A Wheatstone bridge or other circuit that may require balancing or adjustment shall be provided with an adjustment for the purpose. Such adjustments shall be recessed or so located that the adjustments cannot be unintentionally changed.

6.8 Provision shall be made for periodic testing (by the user) of the response of an indicator. A bilge or remotely-located component shall be removable for testing and recalibration. Also, see paragraph 4.2.

## 7. Assembly

### General

7.1 An indicator shall be constructed to withstand the stresses to which it may be subjected during intended use.

7.2 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.

7.3 A means shall be provided to securely mount all components of the indicator to appropriate members of the vessel's structure. Only common hand tools (such as standard American or metric wrenches, straight or cross-recessed screwdrivers, or hexagonal wrenches) shall be required for the installation and, if necessary, for the calibration of the indicator.

7.4 A replaceable part, such as an indicating component or lamp, shall be accessible for maintenance.

*\*Replaces page 6 dated February 12, 1988*

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7.5 An ignition source, such as a hot wire component, shall have flame arresting provisions, so that ignition of an explosive mixture will be contained and not propagate external to the component.

7.7 Barrier-type terminals or equivalent protection shall be provided to reduce the likelihood of ungrounded terminals, located outside a junction box or enclosure, short-circuiting with other terminals or ground.

7.8 A conductor shall not carry a current greater than the applicable value specified in Table 7.1. The current through a conductor connected between the control box and sensors located in machinery spaces shall not be greater than the derated value obtained by multiplying the applicable ampere value specified in Table 7.1 by the applicable correction factor specified in Table 7.2. The current through two or more current-carrying conductors that share the same duct or bundle and operate at potentials of 50 volts or more shall not be greater than the derated value obtained by multiplying the appropriate ampere values specified in Table 7.1 by the correction factor corresponding to the number of bundled conductors specified in Table 7.3.

## Wiring

7.6 The equipment frame shall not be used as a current-carrying part.

Exception: An instrument frame or electronically equipped frame intended to be mounted above the cockpit deck near the engine instruments may be internally grounded.

TABLE 7.1  
MAXIMUM AMPERAGE OF CONDUCTORS

| Conductor Size |                    | Temperature Rating of Conductor Insulation |                 |                 |                 |                  |                  |                  |
|----------------|--------------------|--------------------------------------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| AWG            | (mm <sup>2</sup> ) | 60°C<br>(140°F)                            | 75°C<br>(167°F) | 80°C<br>(176°F) | 90°C<br>(194°F) | 105°C<br>(221°F) | 125°C<br>(257°F) | 200°C<br>(392°F) |
| 18             | (0.82)             | 10                                         | 10              | 15              | 20              | 20               | 25               | 25               |
| 16             | (1.3)              | 15                                         | 15              | 20              | 25              | 25               | 30               | 35               |
| 14             | (2.1)              | 20                                         | 20              | 25              | 30              | 35               | 40               | 45               |
| 12             | (3.3)              | 25                                         | 25              | 35              | 40              | 45               | 50               | 55               |

TABLE 7.2  
DERATING OF CONDUCTORS IN 60°C (140°F) ENGINE SPACE

| Temperature Rating of Conductor Insulation | 60°C<br>(140°F) | 75°C<br>(167°F) | 80°C<br>(176°F) | 90°C<br>(194°F) | 105°C<br>(221°F) | 125°C<br>(257°F) | 200°C<br>(392°F) |
|--------------------------------------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Correction Factor for Current Derating     | 0.58            | 0.75            | 0.78            | 0.82            | 0.85             | 0.89             | 1.00             |