UL 393

Underwriters Laboratories Inc.

Standard for Safety

Indicating Pressure Gauges for Fire-Protection Service

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UL Standard for Safety for Indicating Pressure Gauges for Fire-Protection Service, UL 393

Eighth Edition, Dated March 17, 2005

Revisions: This Standard contains revisions through and including March 31, 2009.

SUMMARY OF TOPICS

The following changes in requirements to the Standard for Indicating Pressure Gauges for Fire-Protection Service, UL 393, are included in these revisions:

1. Additional dial pressure range for Table 7.1

Text that has been changed in any manner 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.

The new and revised requirements are substantially in accordance with UL's Proposal(s) on this subject dated February 13, 2009.

The revisions dated March 31, 2009 include a reprinted title page (page1) for this Standard.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: http://ulstandardsinfonet.ul.com/ulforeword.html

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.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.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, Recognized, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

This Standard consists of pages dated as shown in the following checklist:

Page	Date
1	March 31, 2009
2-5	March 17, 2005
6-6B	March 31, 2009
7-14	March 17, 2005

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MARCH 17, 2005
(Title Page Reprinted: March 31, 2009)

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UL 393

Standard for Indicating Pressure Gauges for Fire-Protection Service

First Edition – October, 1921
Second Edition – March, 1967
Third Edition – March, 1973
Fourth Edition – June, 1979
Fifth Edition – July, 1985
Sixth Edition – January, 1991
Seventh Edition – June, 1996

Eighth Edition

March 17, 2005

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.

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INTRODUCTION

1 Scope

1.1 These requirements cover indicating pressure gauges of the elastic element type intended for use with sprinkler or standpipe equipment for fire-protection service.

1.2 These requirements cover gauges of trade sizes 3-1/2 to 4-1/2 inches (90 to 115 mm), inclusive.

1.3 The gauges covered by these requirements are intended for installation and use according to the following Standards of the National Fire Protection Association:

a) Standard for Installation of Sprinkler Systems, NFPA 13;

b) Standard for Installation of Standpipe and Hose Systems, NFPA 14;

c) Standard for Installation of Private Fire Service Mains and Their Appurtenances, NFPA 24; and

d) Standard for Installation of Stationary Fire Pumps for Fire Protection, NFPA 20.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 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 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 Units of Measurement

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

4 Undated References

4.1 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.

CONSTRUCTION

5 General

5.1 Pressure connections shall be tapered pipe threads in the 1/4 inch-18 size conforming with the Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1.

6 Sizes

6.1 The size of a gauge enclosed in a cylindrical case is to be the inside diameter of the case, in inches, measured at the face of the dial.

6.2 The dimensions of a flush or surface mounted pressure gauge shall be as specified in Table 6.1.

Table 6.1
Flush and surface mounted gauge dimensions

Gauge size,	Mounting bolt circle diameter		Case bolt hole diameter		Outside diameter of flush mounted case, maximum	
inches	inches	(mm)	inches	(mm)	inches	(mm)
3-1/2	4.25	(108)	0.22	(5.6)	3.75	(95.3)
4-1/2	5.38	(137)	0.22	(5.6)	4.88	(124)

7 Dials

7.1 The range of a gauge dial shall be as specified in Table 7.1.

Table 7.1
Dial ranges

Table 7.1 revised March 31, 2009

Psi[a]	(kPa)
-30 Inches Hg – 150 (Compound type)	(-100 (vacuum) – 1000)
0 – 45 to 150 (Retard Type)	(0 – 300 to 1000)
0 – 80 to 250 or 300 (Retard Type)	(0 – 600 to 1800 or 2000)
0 – 100	(0 – 600)
0 – 150	(0 – 1000)
0 – 250	(0 – 1600)
0 – 300	(0 – 2500)
0 – 400	(0 –- 2800)
0 – 600	(0 – 4000)
[a] Unless otherwise noted	

7.2 The values of the minor, or smallest, graduations on the dial shall be those specified in Table 7.2.

Table 7.2
Value of smallest graduations

Table 7.2 revised March 31, 2009

Range			Graduations		
Hg, inch	psi	(kPa)	psi	(kPa)	Hg, inch
-30 to 0	0 to 150 (Compound Type)	(-100 – 0 – 1000)	5	(25)	1/2
–	0 to 45 (Retard Type)	(0 – 300)	1	(5)	–
–	0 to 80 (Retard Type)	(0 – 600)	2	(10)	–
–	0 to 100	(0 – 600)	2	(10)	–
–	0 to 150	(0 – 1000)	2	(10)	–
–	0 to 250	(0 – 1600)	5	(25)	–
–	0 to 300	(0 – 2500)	5	(25)	–
–	0 to 400	(0 – 2800)	10	(50)	–
–	0 to 600	(0 – 4000)	10	(50)	–

7.3 Graduations and numerals on the dial shall be sharp and legible, as produced by silvering and lacquering, etching and filling, photographic, lithographic, and other equivalent processes.

7.4 Graduation lines shall be radial to the center of rotation of the pointer and shall project beyond the arc described by the end of the pointer. Major and intermediate graduation lines shall be emphasized. Graduations shall not extend beyond the calibrated portion of the scale.

Exception: Graduation lines on a mirror dial are not required to project beyond the arc described by the end of the pointer.

7.5 Numerals provided shall enable the operator to accurately and quickly identify any pressure on the scale. Numerals shall not obscure or crowd graduations or markings. Numerals shall not extend beyond the calibrated portion of the scale.

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7.6 The graduated scale shall be 270 degrees.

7.7 See General, Section 22 for additional marking requirements for gauges.

8 Pointers

8.1 A pointer shall be mounted on its staff so that it is capable of being reset without damage to the staff or pointer.

8.2 The tip of the pointer shall pass within one minor graduation line width of the inner end of the minor graduations.

9 Windows

9.1 A window shall be clear, free from blemishes, and of:

a) Double strength glass no less than 0.115 inch (2.9 mm) thick, or the equivalent; or

b) Nonmetallic material that complies with 9.3.

The window shall be assembled into the gauge so that, in case of breakage, a new window is capable of being easily inserted.

9.2 Nonmetallic windows shall comply with the requirements of Nonmetallic Components, Section 14, and with the Window Impact Strength Test, Section 21.

9.3 When laminated or heat-treated glass is used, it shall comply with the Standard for Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways – Safety Code, Standard, ANSI/SAE Z26.1.

10 Elastic Elements

10.1 An elastic element shall be seasoned or otherwise processed to reduce or eliminate internal stresses resulting from the manufacturing process. See Operation, Vibration, and Excess Pressure Tests, Sections 16 – 18.

11 Materials

11.1 Metallic materials shall have the strength, rigidity, and resistance to corrosion equivalent to yellow brass, or to bronze containing 15 percent or less of zinc.

11.2 Nonmetallic materials used for internal operating parts shall comply with the requirements of Nonmetallic Components, Section 14.

11.3 Nonmetallic materials used for external parts shall comply with the requirements of Nonmetallic Components, Section 14; Falling Ball Impact Test, Section 20; and with the Window Impact Strength Test, Section 21.

12 Pointers

12.1 A stop shall prevent pointer motion beyond a point between the last and the first dial graduation and shall prevent the pointer from striking an obstruction.

12.2 Pointer motion shall not be restrained at less than 105 percent of full-scale pressure.

PERFORMANCE

13 General

13.1 Representative samples of each size and pressure range of pressure gauges are to be subjected to these tests. For the purpose of these requirements:

a) The normal pressure range for a retard-type gauge is the expanded scale range; and

b) The full scale range of a retard-type gauge is the maximum pressure indicated on the dial.

14 Nonmetallic Components

14.1 General

14.1.1 Nonmetallic materials are to be investigated for compliance with the requirements of 14.2.1 – 14.4.2 while assembled as intended into a complete gauge assembly.

14.2 Light and water test

14.2.1 Following a 720-hour continuous exposure to ultraviolet light and water:

a) There shall be no cracking, warping, creeping, or other signs of deterioration of any internal or external nonmetallic part that impairs the intended operation or protection of the gauge; and

b) There shall be no visual reduction in transparency or other signs of deterioration of any nonmetallic window that impairs legibility of the gauge dial.

14.2.2 The light and water exposure is to be conducted in accordance with the Standard Practice for Operating Xenon-Arc Light Apparatus for Exposure of Nonmetallic Materials, ASTM G155, using a Type D or DH apparatus, as described therein.

14.2.3 Following the light and water exposure, samples of the gauge then shall comply with the requirements of the Accuracy Test, Section 15.

14.3 Air-oven aging test

14.3.1 There shall be no cracking, warping, creeping, or other signs of deterioration of internal nonmetallic parts that prevents intended operation of the gauge following 180 days of exposure of air at a temperature of 250 ±3.6°F (121 ±2°C).

14.3.2 There shall be no cracking, warping, creeping, reduction in transparency or other signs of deterioration of external nonmetallic parts that prevents intended operation of the gauge following 90 days of exposure to air at a temperature of 212 ±3°F (100 ±2°C).

14.3.3 Samples are to be supported so that they are prevented from touching each other or touching the sides of a full-draft, circulating air oven that has been preheated to 250 ±3.6°F (121 ±2°C) for internal nonmetallic parts and 212 ±3°F (100 ±2°C) for external nonmetallic parts. The samples are to be aged for 180 days for internal parts and 90 days for external parts and then allowed to cool in air at a temperature of 73.4 ±3.6°F (23 ±2°C) for at least 24 hours before conducting any further tests or dimensional checks.

14.3.4 When a material exhibits excessive softening, distortion, or deterioration during the exposure at 250 ±3.6°F (121 ±2°C), or at 212 ±3.6°F (100 ±2°C), as applicable, the air-oven aging test is permitted to be conducted at a lower temperature for a longer period of time. The duration of exposure at the lower temperature is to be calculated from the following formula:

$$D = 788795\ (e^{x})$$

in which:

D is test duration in days;

e is 2.718;

x is minus 0.0693t; and

t is test temperature, degrees C.