



UL 299

STANDARD FOR SAFETY

Dry Chemical Fire Extinguishers

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UL Standard for Safety for Dry Chemical Fire Extinguishers, UL 299

Eleventh Edition, Dated April 13, 2012

Summary of Topics

This New Edition of ANSI/UL 299 is issued to clarify cylinder requirements with DOT and TDGR specifications.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated October 21, 2011.

Due to the issuance of this new edition, a margin line will not indicate text that has been changed from the previous edition. Note that the following paragraphs are new or revised: 40.1.1, 40.1.2, 40.1.3, 40.1.5, 41.1.3, 42.2.1, 65.1.1 and 65.1.2.

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ULC Standards
CAN/ULC-S504
Third Edition



Underwriters Laboratories Inc.
ANSI/UL 299
Eleventh Edition

Dry Chemical Fire Extinguishers

April 13, 2012

This common standard has been jointly revised on April 13, 2012 to clarify cylinder requirements with DOT and TDGR specifications. For this purpose, ULC and UL have issued new editions dated April 13, 2012.



ANSI/UL 299-2012

Approved
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This ANSI/UL Standard for Safety consists of the Eleventh Edition.

The most recent designation of ANSI/UL 299 as an American National Standard (ANSI) occurred on April 13, 2012. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

The Department of Defense (DoD) has adopted UL 299 on August 6, 1990. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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Preface

This is the common UL and ULC Standard for Dry Chemical Fire Extinguishers. It is the third edition of CAN/ULC-S504, and the eleventh edition of UL 299.

This common Standard was prepared by Underwriters Laboratories Inc., ULC Standards and the dry chemical fire extinguisher manufacturing industry. (The efforts and support of the Extinguisher Technical Harmonization Committee are gratefully acknowledged.)

This Standard was formally approved by the ULC Committee on Portable Fire Extinguishers.

The Annexes in this Standard are for information purposes only.

Note: Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.

Level of harmonization

This standard used an ISO format, but is not based on, nor shall it be considered equivalent to, an ISO standard. This standard is published as an identical standard.

An identical standard is a standard that is the same in technical content except for conflicts in Codes and Governmental Regulations. Presentation shall be word for word except for editorial changes.

Interpretations

The interpretation by the SDO of an identical or equivalent standard shall be based on the literal text to determine compliance with the standard in accordance with the procedural rules of the SDO. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the SDOs to more accurately reflect the intent.

UL Effective Date

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved Standard.

INTRODUCTION

1 Scope

1.1 These requirements cover the construction and performance, exclusive of performance during fire tests, of portable dry chemical and dry powder (Class D) fire extinguishers. Dry chemical and dry powder fire extinguishers are intended to be utilized in accordance with the Standard for Portable Fire Extinguishers, ANSI/NFPA 10 and with the National Fire Code of Canada.

1.2 The requirements for performance during fire testing of dry chemical fire extinguishers are specified in the Binational Standard for Rating and Fire Testing of Fire Extinguishers, ANSI/UL 711/CAN/ULC-S508.

1.3 As used in these requirements, the term "extinguisher" refers to all extinguishers or any part thereof covered by these requirements, unless specifically noted otherwise.

2 Units of measurement

2.1 The metric unit shall be designated as the official unit for purposes of this standard. Where values of measurement are specified in both SI and English units, either unit is used. In cases of dispute, the metric unit shall be used.

3 Reference publications

3.1 See Annex A for a list of publications referenced in this standard. 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. When the latest edition of a standard is not applicable, the appropriate edition is indicated accordingly in Annex A.

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for that component. A component shall comply with both the Underwriters Laboratories Inc. and the Underwriters' Laboratories of Canada standards for the component.

4.2 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.

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

4.4 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.

5 Glossary

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

5.2 DISPOSABLE (NONRECHARGEABLE) FIRE EXTINGUISHER – A fire extinguisher not capable of nor intended to undergo complete maintenance including internal inspection of cylinder, replacement of parts and seals and hydrostatic testing.

5.3 EFFECTIVE DISCHARGE – The time of discharge of extinguishing agent from the extinguisher until gas point.

5.4 EXPELLANT GAS – A compressed or pressurized gas used to propel the dry chemical extinguishing agent from a single cylinder.

5.5 GALVANIC COMPATIBILITY – Fire extinguisher cylinder and component parts which are not susceptible to 10-day stress corrosion cracking nor corrosion from combination of dissimilar materials.

5.6 GAS POINT – The point in time when the discharge changes from extinguishing agent to a gas and dry chemical combination.

5.6.1 HIGH FLOW EXTINGUISHER – A dry chemical extinguisher with a minimum 4.54 kg (10.0 lb) of extinguishing agent, an agent flow rate of at least 0.454 kg/s (1.0 lb./s), and having attained a Class B rating, suitable for Class B specific hazard applications specified in the National Fire Protection Association Standard for Portable Fire Extinguishers, NFPA 10.

5.7 PORTABLE FIRE EXTINGUISHER – A fire extinguisher carried or on wheels and operated by hand.

5.8 PRESSURE GAUGE – A gauge that shows the pressure in the cylinder and the operating range of the extinguisher based upon the operating temperature-pressure relationship in appropriate pressure units.

5.9 PRESSURE INDICATOR – An indicator that shows that the extinguisher is pressurized with its rated expellant gas pressure.

5.10 RECHARGEABLE (REFILLABLE) FIRE EXTINGUISHER – A fire extinguisher capable of undergoing complete maintenance including internal inspection of cylinder, replacement of parts and seals and hydrostatic testing.

5.11 STORED PRESSURE TYPE FIRE EXTINGUISHER – A fire extinguisher in which both the extinguishing agent and expellant gas are in a single cylinder.

CONSTRUCTION

6 General

6.1 The construction of an extinguisher shall be such that the method of operation is obvious after observing the operating instructions.

6.2 The construction of an extinguisher shall be such that after discharge of the agent is initiated, the operator of the extinguisher is not required to take further manual actions to maintain the maximum possible flow of agent, other than holding the operating device in the fully opened position. The extinguisher shall be usable by one operator, without assistance from a second individual.

6.3 A disposable extinguisher shall not be rechargeable.

6.4 An extinguisher having a volume in excess of 2.3 L (140 in³) shall stand in the upright position without support.

6.5 A material for an extinguisher part, the deterioration of which causes the extinguisher to become inoperable or results in the risk of injury to persons, shall not be susceptible to stress corrosion.

6.6 A polymeric or other nonmetallic part, other than an "O" ring or gasket, shall be evaluated on the basis of:

- a) Mechanical strength, including resistance to impact, see Vibration tests, Clause 41; Roadability and rough usage tests, Clause 42; Handle and mounting device test, Clause 26; Hydrostatic pressure test, Clause 40; Burst strength test – gauges and indicators, Clause 52; and Nameplate exposure tests, Clause 60;
- b) Moisture absorption, see 44.3.1 and 44.3.2, Salt spray corrosion test, Clause 46; One-year time leakage test, Clause 50; Nameplate exposure tests, Clause 60;
- c) Flammability, see 6.7;
- d) Resistance to deterioration due to aging, see Aging tests – polymeric materials, Clause 44; One-year time leakage test, Clause 50; and Nameplate exposure tests, Clause 60;
- e) Exposure to light, see 44.3.2, Nameplate exposure tests, Clause 60; and
- f) Exposure to the extinguishing agent, see 44.2.1.

6.7 With reference to flammability, see 6.6(c), polymeric materials shall be classified as HB, V-0, V-1, V-2, 5VA, or 5VB, when tested in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. Other nonmetallic materials shall have equivalent characteristics.

6.8 An extinguisher shall operate as intended from the minimum storage temperature to 49°C (120°F), inclusive. Currently recognized minimum storage temperatures are minus 40°C (minus 40°F) and minus 54°C (minus 65°F). See Operating temperature limits test, Clause 32.

6.9 The edges and surfaces of a valve, cap, closure, hose, cylinder, handle, mounting device, and similar items, shall not be sufficiently sharp to constitute a risk of injury to persons in intended maintenance and use.

6.10 Whenever reference measurements are necessary to determine that a part as described in 6.9 is not sufficiently sharp to constitute a risk of injury to persons, the method described in the Standard for Test for Sharpness of Edges on Equipment, UL 1439, is to be employed.

6.11 A hand portable extinguisher shall have a gross weight not exceeding 27 kg (60 lb).

6.12 A pressurizing adaptor for a rechargeable stored pressure type extinguisher shall have threads or other mechanical means for securement to the valve assembly.

7 Cylinders

7.1 The requirements in this clause do not apply to a rechargeable cylinder marked as complying with U.S. Department of Transportation (DOT), or Canadian Transportation of Dangerous Goods Regulations (TDGR), or ASME specifications, unless otherwise specifically indicated.

7.2 An extinguisher cylinder under the jurisdiction of the DOT or TDGR shall comply with the appropriate DOT or TDGR specifications for shipping containers.

7.3 An extinguisher cylinder shall be fabricated of a material having rigidity, durability, and resistance to corrosion at least equivalent to:

- a) An aluminum alloy such as 6661-T6 or 6351-T6, see the Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, ASTM B209, having a minimum thickness of 0.71 mm (0.028 in);
- b) An aluminum alloy, such as 1100, 1170, or 3003 having a minimum thickness of 0.71 mm (0.028 in);
- c) A mild steel alloy, such as SAE 1010, having a minimum thickness of 0.71 mm (0.028 in); or
- d) An austenitic stainless steel having a maximum of 0.03 percent carbon content and having a wall thickness of at least 0.71 mm (0.028 in).

7.4 A cylinder assembled complete with permanently attached fittings shall be resistant to any corrosive influence of the extinguishing agent.

7.5 The material of the dome and bottom of a metal cylinder shall be of the same material as the cylinder.

7.6 All joints in metal cylinders shall be threaded, brazed, or welded.

Exception: Brazed joints shall not be used on stainless steel cylinders.

7.7 For the purpose of these requirements, thickness measurements of the sidewall are to be measured on uncoated metal. The thickness of the dome and of the bottom is to be measured at several points after forming and before coating.

8 Joints

8.1 The minimum width of a brazed joint on the cylinder wall shall be at least four times the design thickness of the sidewall.

9 Caps, valves, closures, and pressure relief

9.1 The inside diameter of a fill opening of a rechargeable-type extinguisher shall be:

- a) A minimum 19 mm (3/4 in) for an extinguisher having a capacity of 13.6 kg (30 lb) or less;
- b) A minimum 25 mm (1 in) for an extinguisher having a capacity above 13.6 to 34.0 kg (30 to 75 lb);
- c) A minimum 38 mm (1-1/2 in) for an extinguisher having a capacity above 34.0 to 68.0 kg (75 to 150 lb); and
- d) A minimum 64 mm (2-1/2 in) for an extinguisher having a capacity above 68.0 kg (150 lb) or greater.

Exception: The fill opening is able to be 19 mm (3/4 in) or more when the extinguisher has at least one other opening.

9.2 A collar with external threads shall be constructed so that the cap does not contact the dome or the bottom when the gasket is removed.

9.3 A threaded cap, closure, or valve shall engage the collar or the threaded opening by a minimum four full threads with the gasket in place.

9.4 A cap, plug, or other component, except a pressure gauge or indicator, shall be provided with a means of relieving pressure when it is removed while the dry-chemical chamber is still under pressure. The pressure shall be relieved with a minimum two threads engaged.

9.5 Closures of rechargeable extinguishers shall resist, without evidence of damage to the threads, a closing torque of 35 N·m (25 lbf-ft).

9.6 When pressure relief is required under the jurisdiction of the U.S. Department of Transportation (DOT) or Canadian Transportation of Dangerous Goods Regulations (TDGR), it shall be in accordance with the Compressed Gas Association pamphlet CGA S-1.1 Pressure Relief Standards.

10 Gaskets and "O" rings

10.1 A gasket or an "O" ring shall be retained in a recess or the equivalent, in the cap, collar, or valve. A gasket or an "O" ring of a rubber-like material shall be of thickness to provide a compression-type seal and shall fit snugly against the cap or head. See Elastomeric parts test, Clause 45.

11 Gas cartridges, cylinders, and regulators

11.1 A gas cartridge and a cylinder under the jurisdiction of the U.S. Department of Transportation (DOT) or Canadian Transportation of Dangerous Goods Regulations (TDGR) shall be constructed, tested, marked, and charged in accordance with the applicable shipping container specifications of the DOT or TDGR. See 40.4.1.

11.2 A gas cylinder assembly shall be provided with a pressure-relief device as required by applicable DOT or TDGR regulations. A gas cylinder assembly not under the jurisdiction of the DOT or the TDGR shall be provided with a pressure relief appropriate for the cylinder used.

11.3 Gas cartridges shall be provided with an antirecoil cap for use in storage and transit.

11.4 Gas cartridges or cylinder assemblies shall be securely attached to the extinguisher.

11.5 Gas cylinders of the seated-valve type shall be provided with a pressure-relief disc held in place by a nut which vents and prevents recoil.

11.6 A seated-valve type gas cylinder assembly shall be provided with a corrosion-resistant locking device to reduce the risk of unintentional discharge. An appropriate sealing device that is breakable with a force not exceeding 65 N (15 lb-f), as installed with no external load on the locking device, shall be provided to retain the locking device and to indicate tampering with or use of the gas cylinder assembly.

11.7 A valve of the handwheel-type shall be constructed so that not more than 1-1/2 turns are required to achieve the maximum flow of agent.

11.8 The regulator used on a wheeled extinguisher shall be factory preset and pinned or otherwise locked to reduce the risk of tampering or field adjustment. The regulator shall comply with the Standard for Compressed Gas Regulators, UL 252.

12 Pressure gauges and indicators

12.1 A rechargeable extinguisher, including a wheeled extinguisher, of the stored pressure type employing a single chamber for both the dry chemical and the expellant gas shall be equipped with a pressure gauge to show the amount of pressure in the chamber whether the valve is open or closed, except as provided in 12.2. The operating range of the gauge shall reflect the operating temperature-pressure relationship of the extinguisher, except that the minimum operating pressure line is able to be higher than the pressure that corresponds to the minimum operating temperature.

12.2 An extinguisher having a disposable, nonrefillable, sealed chamber is not required to be equipped with a pressure gauge when a pressure indicator is used to verify that the extinguisher is charged with the correct expellant gas pressure.

12.3 The pressure gauge face shall indicate the appropriate units for which the gauge is calibrated, such as psig, or kPa, or bar, or any combination of pressure units.

12.4 The maximum indicated gauge pressure shall be between 150 and 250 percent of the indicated charging pressure at 21°C (70°F). The gauge dial shall indicate, in green, the operable pressure range of the extinguisher. The zero, charging, and maximum indicated gauge pressures shall be shown in numerals and with marks. The background of the gauge face outside of the operable pressure range shall be red. The arc of the dial from the zero pressure point to the lower end of the operable range shall read "Recharge." The arc of the dial from the higher end of the operable range to the maximum indicated pressure shall read "Overcharged." All numerals, letters, and characters in the recharge, operable, and overcharge portions of the dial shall be white. Pointers shall be yellow, and the tip of the pointer shall end in the arc of the pressure indicating dots, and shall have a maximum tip radius of 0.25 mm (0.010 in). The minimum length of the pointer, from the centerpoint of the dial to the tip, shall be 9.53 mm (0.375 in) measured at the zero pressure point. The minimum length of the arc from zero pressure to the indicated charging pressure shall be 12.7 mm (0.50 in) measured along the outer edge of the gauge dial face, from the centerline of the zero pressure mark to the centerline of the indicated charging pressure mark.

12.5 The mark used to indicate the charging pressure at 21°C (70°F) shall be a minimum 0.6 mm (0.025 in) and not more than 1.0 mm (0.040 in) wide.

12.6 The pressure gauge face shall be marked, "Use With Dry Chemical Only."

12.7 The pressure gauge shall be marked with the gauge manufacturer's identifying mark. The pressure gauge shall also be marked according to the following, as applicable, using a line extending as wide as, and of the same stroke thickness as, the manufacturer's identifying mark:

- a) To indicate galvanic compatibility with aluminum valve bodies – a horizontal line above the manufacturer's identifying mark.
- b) To indicate galvanic compatibility with brass valve bodies – a horizontal line below the manufacturer's identifying mark.
- c) To indicate galvanic compatibility with aluminum and brass valve bodies – a line above and a line below the manufacturer's identifying mark, or the manufacturer's identifying mark by itself without additional lines.

12.8 A cartridge-operated wheeled extinguisher provided with a nitrogen cylinder shall be provided with a gauge capable of indicating cylinder pressure whether the valve is open or closed. The gauge shall comply with the Standard for Gauges, Indicating Pressure for Compressed Gas Service, UL 404.

13 Puncturing mechanisms

13.1 The parts of a puncturing mechanism, with the exception of unexposed springs and pins, shall be made of nonferrous metal or corrosion-resistant stainless steel.

14 Locking devices and seals

14.1 The operating mechanism(s) of an extinguisher shall be provided with a locking pin or other device to reduce the risk of unintentional discharge. A locking device shall be made of corrosion-resistant material. See Salt spray corrosion test, Clause 46.

14.2 The locking pin or other device shall be visible from the front of the extinguisher when the extinguisher is mounted on a wall in its bracket or on its mounting hook. However, the locking pin is able to be on the back side when pictographic operating instructions on the front illustrate the intended means of operation.

14.3 When the locking device is attached to the valve with a chain or similar device, the chain shall be attached so that it does not interfere with the discharge stream.

14.4 A tamper indicator such as a seal or the equivalent shall be made of a corrosion resistant material and shall be provided to retain the locking device and to indicate tampering with or use of the extinguisher. The tamper indicator shall break when subjected to a force of 65 N (15 lb-f) or less.

Exception: The 65 N (15 lb-f) does not apply when the tamper indicator is broken by the action required to start discharge of the extinguisher, or when an internal load is continuously applied to the release mechanism, the force, applied as intended and required to accomplish discharge or release of the internal load. In this case, the force shall not exceed 133 N (30 lb-f). See 25.3.

14.5 The tamper indicator shall be constructed so that it is required to be broken to operate the extinguisher.

15 Hose

15.1 A hose to direct the discharge shall be provided on an extinguisher having:

- a) A gross weight of more than 5.4 kg (12 lb); or
- b) A rating of 2-A or higher, 20-B or higher, or both.

The length of the hose shall be such that the dry chemical discharge is not restricted by kinking of the hose or by other means when the extinguisher is operated in any position in which it is capable of being held in service.

15.2 An extinguisher having a gross weight of 5.4 kg (12 lb) or less is not prohibited from being provided with a hose.

15.3 A hose shall have a nominal internal diameter of a minimum 9.5 mm (3/8 in) and shall comply with the Standard for Fire Extinguisher and Booster Hose, UL 92 and the Standard for Fire Extinguisher and Booster Hose, CAN/ULC-S522.

15.4 A hose shall be attached so that it is removable and replaceable as intended.

15.5 For a hand-portable extinguisher, a holding device shall maintain a hose in a position within 25 mm (1 in) of the cylinder when the hose is not in use, or the hose shall be preformed and have rigidity to provide an equivalent function. The distance is to be measured from the cylinder to the nearest edge of the hose.

16 Couplings

16.1 A hose coupling shall be made of corrosion-resistant material. See Salt spray corrosion test, Clause 46. The coupling shall be threaded or provided with equivalent means for its attachment to the outlet of the discharge valve. When the hose coupling incorporates a nozzle orifice, the threads or attachment means shall prevent the outlet end of the hose from being connected to the outlet of the discharge valve.