UL 407

STANDARD FOR SAFETY

Manifolds for Compressed Gases

UL Standard for Safety for Manifolds for Compressed Gases, UL 407

Seventh Edition, Dated June 18, 2004

Summary of Topics

This revision of ANSI/UL 407 is being issued to reaffirm approval as an American National Standard. No changes in requirements are involved.

Text that has been changed in any manner or impacted by UL's electronic publishing system 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 revised requirements are substantially in accordance with Proposal(s) on this subject dated October 20, 2017.

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Standard for Manifolds for Compressed Gases

The first, second and third editions were titled High-Pressure Gas Manifolds.

First Edition – December, 1952
Second Edition – October, 1967
Third Edition – October, 1972
Fourth Edition – April, 1978
Fifth Edition – July, 1993
Sixth Edition – October, 1997

Seventh Edition

June 18, 2004

This ANSI/UL Standard for Safety consists of the Seventh Edition including revisions through December 13, 2017.

The most recent designation of ANSI/UL 407 as a Reaffirmed American National Standard (ANS) occurred on December 12, 2017. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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 https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover equipment for manifolding high-pressure gas cylinders to supply gas for various industrial and commercial applications. Cylinders are manifolded for the purpose of centralizing the gas supply, to provide a continuous supply of gas, or to provide gas at a rate in excess of that which may be obtained from a single cylinder.

1.2 Manifolds for services other than for nonflammable medical gases are intended to be installed and used in accordance with the Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes, NFPA 51. Those for nonflammable medical gases are intended to be installed and used in accordance with the Standard for Healthcare Facilities, NFPA 99.

1.2 revised June 18, 2004

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.1.2 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.

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

2.1.4 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.

2.1.5 A component, as assembled as part of a manifold, shall comply with the requirements for the construction, performance, and use for that component.

2.2 Units of measurement

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

2.3 Undated references

2.3.1 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.

3 Types

3.1 Five types of service are covered by these requirements:

a) Acetylene;

b) Oxygen;

c) Fuel gases other than acetylene;

d) Nitrogen, carbon dioxide, air, and inert gases; and

e) Nonflammable medical gases.

Manifolds and parts are to be used only for the gas or gases for which they are designed.

3.2 Stationary manifolds are those which consist essentially of a wall- or floor-supported header provided with fittings for connection of cylinders by means of leads. One or more permanently mounted regulators serve to reduce and regulate the pressure of the gas from the cylinders to the point of consumption.

3.3 Portable manifolds contemplated by these requirements are of two types:

a) In one type the gas passes from the connected cylinders through individual leads to a single common coupler block, and from there through a single pressure-reducing regulator to the consuming device.

b) In a second type the cylinders are connected by means of coupler tees attached to the shutoff valve of each cylinder. Gas from each cylinder passes through the coupler tee and joins the main stream flowing through a common line composed of leads joining coupler tee to successive coupler tee. From there the gas passes through a single pressure-reducing regulator to the consuming device.

4 Installation and Operating Instructions

4.1 Printed instructions covering all essential items commonly requiring attention in the installation, operation, and maintenance of the manifold shall be furnished with each manifold when shipped.

CONSTRUCTION

5 General

5.1 Cast iron and other castings having low tensile strength or low ductile characteristics shall not be used in the construction of manifold parts handling gas at cylinder pressure.

5.2 Joints in manifolds shall be made up using unions or shall be threaded, welded, brazed, or of the socket type using a brazing alloy having a melting point exceeding 1000°F (538°C).

5.3 Gaskets shall not be used for making up joints in the manifold.

5.4 Each manifold shall be designed for attachment of one or more compressed-gas regulators for controlling the pressure of the delivered gas.

5.5 Manifolds designed for acetylene, fuel gases other than acetylene, and those designed for nonflammable medical gases, shall be provided with a back-flow check valve between each cylinder and the header, coupler block, or coupler tee. This check valve shall be located in the cylinder lead connecting fitting on the header or coupler block, or in the manifold end of the lead. Where portable manifolds are provided with coupler tees, the check valve shall be located in that portion of the tee connected to the shutoff valve of the cylinder.

5.6 The purpose of these check valves is to prevent the loss of gas from a bank of connected cylinders if for any reason the pressure-relief device of an individual cylinder should function or a lead is severed.

5.7 Headers of stationary manifolds may be provided with a manual shutoff valve at each point where a single or a pair of cylinders can be connected.

5.8 Each section of multiple-header type stationary manifolds shall be provided with section shutoff valves to segregate from each other those sections designed to be operated alternately.

5.9 Headers of stationary manifolds shall be mounted on a supporting member, or the necessary mounting plates or brackets for making an installation shall be furnished with each manifold.

5.10 Leads for making connections between cylinders and the manifold shall withstand the specified design rupture strength of the manifold with which they are to be used and shall also withstand manipulation under normal service conditions without kinking, splitting, or cracking.

5.11 Caps or blind plugs provided to close unused cylinder-connecting openings in the manifold and intended for occasional use shall be attached by lengths of chain.

5.12 All manifolds and parts exposed to gas shall be free from grease, oil, dirt, or other foreign substances.

6 Manifolds for Acetylene

6.1 General

6.1.1 Manifolds for acetylene shall conform to the requirements of Construction – General, Section 5, and to the following additional requirements.

6.1.2 Manifolds, cylinder leads, and other parts handling acetylene at cylinder pressure shall withstand, without rupture, a hydrostatically applied test pressure of 10,000 pounds per square inch (psi) (69 MPa).

6.1.3 Copper or copper-bearing alloys exceeding 65 percent copper shall not be used in the construction of acetylene-handling parts.

6.1.3 revised June 18, 2004

6.1.4 Piping or tubing used in the construction of stationary manifold headers shall have an internal diameter not greater than that of a nominal 1-1/4-inch double extra strong steel pipe.

6.1.5 Passages in manifolds handling high-pressure acetylene shall be maintained as small as practicable, and all unnecessary voids or spaces shall be eliminated.

6.2 Back-pressure seal assembly

6.2.1 Each stationary acetylene manifold shall be provided with one or more back-pressure seal assemblies for installation in the piping system on the discharge side of pressure-reducing regulators. These seal assemblies may be of either the hydraulic or the dry-seal type.

6.2.2 Hydraulic back-pressure seal assemblies shall withstand, without rupture, a hydrostatically applied test pressure of 500 psi (3.4 MPa). Sheet steel used in the construction shall have a thickness of not less than 0.053 inch (1.35 mm) (No. 16 MSG).

6.2.3 Each hydraulic back-pressure seal assembly shall incorporate a mechanical back-flow check valve to prevent water from the hydraulic chamber being forced into the manifold piping under a back-pressure condition.

6.2.4 Each hydraulic chamber shall be provided with a water-fill opening and a drain opening. Such openings shall be closed by threaded caps or plugs.

6.2.5 The effective depth of the water seal in the hydraulic chamber, and the volume of water in the chamber, shall provide an effective seal.

6.2.6 A back-pressure seal assembly shall be designed to provide flash-back protection.

6.2.7 A mechanical relief valve set to start to discharge at a pressure of not more than 20 psi (137.9 kPa), shall be provided on each back-pressure seal assembly. This relief shall be designed for manual opening and for connection of vent piping at the installation.

6.3 Flash arrester

6.3.1 A flash arrester designed for use with high-pressure acetylene shall be installed between each cylinder and the manifold.

7 Manifolds for Oxygen

7.1 Manifolds for oxygen, for other than medical use, shall conform to the requirements of Construction – General, Section 5, and to the following additional requirements.

7.2 Manifolds, cylinder leads, and other parts handling oxygen at cylinder pressure shall withstand, without rupture, a hydrostatically applied test pressure of 10,000 psi (69 MPa).

7.3 Metal parts in contact with oxygen shall be stainless steel or nonferrous metal.

8 Manifolds for Fuel Gases Other Than Acetylene

8.1 Manifolds for fuel gases other than acetylene shall conform to the requirements of Construction – General, Section 5, and to the following additional requirements.

8.2 Manifolds, cylinder leads, and other parts handling fuel gases other than acetylene at cylinder pressure shall withstand, without rupture, a hydrostatically applied test pressure of 10,000 psi (69 MPa) or five times the maximum cylinder gas pressure at 70°F (21.1°C), whichever is the lesser, but in no case less than 1,000 psi (6.9 MPa).

9 Manifolds for Nitrogen, Carbon Dioxide, Air, and Inert Gases

9.1 Manifolds for nitrogen, carbon dioxide, air, or inert gases shall conform to the requirements of Construction – General, Section 5, and to the following additional requirements.

9.2 Manifolds, cylinder leads, and other parts handling gas at cylinder pressure shall withstand, without rupture, a hydrostatically applied test pressure of 10,000 psi (69 MPa) or five times the maximum cylinder gas pressure at 70°F (21.1°C), whichever is the lesser.

10 Manifolds for Nonflammable Medical Gases

10.1 General

10.1.1 Manifolds for nonflammable medical gases shall conform to the requirements of Construction – General, Section 5, and to the following additional requirements.

10.1.2 Manifolds for this service shall be of the stationary multiple header type designed for connection of at least two primary supply cylinders and an equal number of secondary supply cylinders.

10.1.3 Manifolds, cylinder leads, and other parts handling gas at cylinder pressure shall withstand, without rupture, a hydrostatically applied test pressure of 10,000 psi (69 MPa) or five times the maximum cylinder gas pressure at 70°F (21.1°C), whichever is the lesser.