UL 1331

STANDARD FOR SAFETY

Station Inlets and Outlets

UL Standard for Safety for Station Inlets and Outlets, UL 1331

First Edition, Dated September 30, 2005

SUMMARY OF TOPICS

This revision of UL 1331 dated February 5, 2020 includes the following changes in requirements:

– Revisions to exclude vacuum assemblies from burst strength test and for samples subject to the external leakage test; 6.3, 13.1

– Revisions to clarify conducting of tests with respect to cleansing agents and antiseptics; 15.2, 15.3, 16.2, 16.3

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.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated October 25, 2019.

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SEPTEMBER 30, 2005
(Title Page Reprinted: February 5, 2020)

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Standard for Station Inlets and Outlets

First Edition

September 30, 2005

This UL Standard for Safety consists of the First Edition including revisions through February 5, 2020.

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 station inlets and outlets intended for use in hospitals for distribution of nonflammable medical gas in rigid piping systems in accordance with the Standard for Health Care Facilities, NFPA 99.

1.2 These requirements do not cover station inlets and outlets designed to operate at non-standard operating pressures as defined in the Standard for Health Care Facilities, NFPA 99.

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b) Is superseded by a requirement in this standard.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.

2.2 Units of measurement

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

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 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 ABBREVIATIONS – For the purpose of this standard the following abbreviations apply:

SCFM – Standard Cubic Feet Per Minute

SLPM – Standard Liters Per Minute

3.3 CONDUCTIVE – Electrically conductive.

3.4 ELECTRICALLY CONDUCTIVE MATERIAL – A material electrically conductive to a degree that the product will discharge or prevent the accumulation of static electricity, or both, in accordance with these requirements.

3.5 GAS-SPECIFIC – Having characteristics that prevent interchangeability and thereby allow assignment to one gas or vacuum service only.

3.6 MANUFACTURED ASSEMBLIES – A factory-assembled product designed for aesthetics or convenience that contains medical gas or vacuum outlets, piping, or other devices related to medical gases.[a] Examples of manufactured assemblies include headwalls, columns, ceiling columns, ceiling hung pendants, and movable track systems.

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3.7 NONCONDUCTIVE – Electrically nonconductive.

3.8 QUICK CONNECTOR – A pair of non-threaded gas-specific components, which can be easily and rapidly joined together by a single action of one or both hands without the use of tools.

3.9 STATION INLET – An inlet point in a piped medical, surgical vacuum distribution system at which the user makes connections and disconnections.

3.10 STATION OUTLET – An outlet point in a piped medical gas distribution system at which the user makes connections and disconnections.

3.11 WASTE ANESTHETIC GAS DISPOSAL (WAGD) – A station inlet that captures and carries away gases vented from the patient during the operation of gas anesthesia or analgesia equipment.

CONSTRUCTION

4 Assembly

4.1 Each station outlet/inlet for medical gases or vacuum shall be gas specific, whether the outlet/inlet is threaded, or is a non-interchangeable quick-coupler.[a]

4.2 Each station outlet shall consist of a primary and a secondary valve (or assembly).[a]

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4.3 Each station inlet shall consist of a primary valve (or assembly) and shall be permitted to include a secondary valve (or assembly).[a]

4.4 The secondary valve (or assembly) shall close automatically to stop the flow of gas (or vacuum, if provided) when the primary valve (or assembly) is removed.[a]

4.5 Threaded outlets/inlets shall be non-interchangeable connections complying with the Diameter Index Safety System (Non-Interchangeable Low Pressure Connections for Medical Gas Applications), CGA V-5.[a]

4.6 Each station outlet/inlet, including those mounted in columns, hose reels, ceiling tracks, or other special installations, shall be designed so that parts or components that are required to be gas-specific cannot be interchanged between station outlet/inlet for different gases.[a]

4.7 The use of common parts in outlets/inlets, such as springs, O-rings, fasteners, seals, and shutoff poppets, are permitted.[a]

4.8 Recessed outlets shall be provided with mounting brackets and a cover plate.

4.9 Factory installed copper inlet tubes on station outlets extending no further than 8 in. (205 mm) from the body of the terminal shall be not less than 3/8 in. OD [DN8 (NPS 1/4)] size, with 0.3 in. (8 mm) minimum inside diameter.[a]

4.10 Factory installed copper inlet tubes on station inlets extending no further than 8 in. (205 mm) from the body of the terminal shall be not less than 1/2 in. OD [DN10 (NPS 3/8)] size, with 0.4 in. (10 mm) minimum inside diameter.[a]

4.11 Flared and compresssion-type connections to station outlets are prohibited.

4.12 Seamless copper tube shall meet the requirements of Standard Specification for Seamless Copper Tube for Medical Gas Systems, ASTM B 819.

PERFORMANCE

5 General

5.1 Representative samples each basic design shall comply with the applicable performance requirements indicated in Table 5.1.

5.2 Additional samples of parts constructed of nonmetallic materials, such as valve seats and “O” rings are required for the tests specified in the Accelerated Aging Test for Elastomers, Section 10.

Table 5.1
Required tests

Test	Station inlet	Station outlet	Station inlet for manufactured assemblies	Station outlet for manufactured assemblies
External and Seat Leakage Test, Section 6		X		X
Endurance Test for Station Outlets and Inlets, Section 7	X	X	X	X
Endurance Test for Shutoff-Valves, Section 7A	X	X	X	X
Operational Pressure Test, Section 8	X	X	X	X
Hydrostatic Strength Test, Section 9	X	X	X	X
Accelerated Aging Test, Section 10	X	X	X	X
10-Day Moist Ammonia-Air Stress Cracking Test, Section 11	X	X	X	X
Hose for station inlets and outlets for manufactured assemblies				
Burst Strength Test, Section 13				X

Table 5.1 Continued on Next Page

Table 5.1 Continued

Test	Station inlet	Station outlet	Station inlet for manufactured assemblies	Station outlet for manufactured assemblies
Flame Spread Test, Section 14			X	X
Cleansing Agents, Section 15			X	X
Antiseptics Test, Section 16			X	X
Accelerated Aging Thermoplastic Materials Test, Section 17 –			X	X
(external leakage)				(X)
Usage Test, Section 18 –			X	X
(external leakage)				(X)
Electrical Resistance Test, Section 19			X	X

6 External and Seat Leakage Test

6.1 A station outlet shall not leak across operating seats when tested as described in 6.3.

6.2 To determine compliance with 6.1, two samples of each basic design are to be tested.

6.3 The test is to be conducted using oil-free air or nitrogen at twice the maximum rated pressure but not less than 200 psig. The test is conducted with the adapter connected to the sample and the outlet of the adapter plugged and with the adapter removed. Station inlets, when provided with a secondary valve, and station outlets are also conducted with the primary valve removed. The test pressure is to be maintained for at least 1 minute. The tests are repeated after the Endurance Test, Section 7. This test does not apply to vacuum assemblies.

7 Endurance Test for Station Outlets and Inlets

7.1 A station outlet and inlet shall operate as intended following the endurance test when tested as described in 7.3.

7.2 To determine compliance with 7.1, one sample of each basic design is to be tested.

7.3 For station outlets the test is to be conducted using oil-free air or nitrogen at 100 psig or at the rated pressure whichever is greater.

7.4 For station inlets that do not use common station outlet parts, the test is to be conducted at rated vacuum pressure.

7.5 The sample shall be subjected to 25,000 cycles on the primary valve and 100,000 cycles on the secondary valve. One cycle consists of opening and closing the valves.

7.6 Station inlets with only a primary valve are subjected to 100,000 cycles. One cycle consists of opening and closing the valves.

7.7 After the conclusion of the 100,000 cycles the station outlet and inlet shall operate as intended.

7.8 After the conclusion of the 100,000 cycles the station outlet samples are reassembled and the leakage tests are repeated.

7A Endurance Test for Shut-Off Valves

7A.1 A station outlet or inlet provided with an additional shut-off valve shall also comply with the requirements for seat and external leakage before and after being subjected to this test.

7A.2 The shut-off valve shall perform in its intended manner for 6,000 cycles of operation while handling the gas the valve is intended to be used with and with maximum rated operating pressure across the valve seat. One cycle consists of rotation to and from the closed position.

Exception: Station outlet or inlets for vacuum or waste anesthetic gas disposal (WAGD) service shall have no pressure applied to the valve seat.

7A.3 For shut-off valves having a rotating stem, the stem is to be rotated from closed to open, or from closed to 360 degrees of rotation. For a hand-operated valve, the stem is to be closed with a torque as indicated in Table 7A.1. If a hand wheel is not provided measure the maximum diameter of the stem to determine the closing torque.

Table 7A.1
Hand-operated valve torque requirements

Diameter of hand wheel, inches	Closing torque, inch-pounds
1.0 or less	10
1.1 to 1.5	15
1.6 to 2.0	20
2.1 to 2.4	30
2.5 or greater	35

7A.4 The endurance test is to be conducted with clean air or nitrogen.

7A.5 This test is to be conducted at a rate not faster than ten cycles per minute.

8 Operational Pressure Test

8.1 Operational pressure tests shall be performed at each station outlet where the user makes connections and disconnections.[a]

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8.2 Tests shall be performed with oil-free, dry Nitrogen, the gas of system designation, or the operating vacuum.[a]

8.3 All gas outlets with a gauge pressure of 345 kPa (50 psi), including but not limited to oxygen, nitrous oxide, medical air, and carbon dioxide, shall deliver 100 SLPM (3.5 SCFM) with a pressure drop of no more than 35 kPa (5 psig) and static pressure of 345 – 380 kPa (50 – 55 psig).[a]

8.4 Support gas outlets shall deliver 140 SLPM (5.0 SCFM) with a pressure drop of no more than 35 kPa (5 psig) gauge and static pressure of 1100 – 1275 kPa (160 – 185 psig) gauge.[a]

9 Hydrostatic Strength Test

9.1 Three samples of each different outlet design shall be capable of withstanding, without rupture or permanent distortion, a hydrostatic pressure of 5 times the maximum rated pressure but not less than 500 psig. The test is conducted with the adapter connected to the station outlet and the outlet of the adapter plugged.

9.2 The pressure is to be raised slowly to the required test pressure and held for at least 1 minute.

10 Accelerated-Aging Test

10.1 A part made of an elastomer that is only exposed to oxygen service shall not crack or show visible evidence of deterioration following exposure for 96 hours to oxygen at a pressure of 300 ±10 psig (2.07 ±0.07 MPa) and at a temperature of 70.0 ±1.0° C (158.0 ±1.8° F) when tested in accordance with the Standard Test Method for Rubber-Deterioration by Heat and Oxygen, ASTM D572.

10.2 A part made of an elastomer that is not exposed to oxygen service shall not crack or show visible evidence of deterioration following exposure for 70 hours at 100°C (212°F) in Type IIA oven as specified in the Standard Specification for Gravity-Convection and Forced-Ventilation Ovens, ASTM E145.

10.3 A part made of an elastomer that is exposed to oxygen and other gases only needs to meet the requirement in 10.1.

10A Accelerated Aging Test for Nonmetallic Tubes of Flow Meters

10A.1 Samples of a flow meter having nonmetallic-type pressure confining tubes are to be subjected to conditioning for 30, 60, and 90 days in an air conditioning oven maintained at a temperature of 90°C (194° F). Two samples are to be subjected to each time period.

10A.2 Following the conditioning, both samples are to be subjected to and shall comply with the Hydrostatic Strength Test, Section 9.

10A.3 When synthetic rubber materials deteriorate under this conditioning, they are to be replaced prior to conducting the tests described in 10A.2.

11 Moist Ammonia-Air Stress Cracking Test

11.1 After being subjected to the conditions described in 11.2 – 11.3, a pressure confining brass part containing more than 15 percent zinc shall show no evidence of cracking when examined using 25X magnification.

11.2 One test sample of each size is to be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Such stresses are to be applied to the sample prior to and maintained during the test.

11.3 The samples are then to be tested in accordance with Apparatus, Section 6, Reagents and Materials, Section 7, Test Media, Section 8, Test Sample Preparation (9.3 - 9.4), Test Procedure (10.1 - 10.4) of the Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys, ASTM B858-06, except the pH level of the test solution shall be High 10.5 ±0.1 and the exposure temperature shall be 25 ±1°C.

11.4 *Deleted*