UL 1769

STANDARD FOR SAFETY

Cylinder Valves

UL Standard for Safety for Cylinder Valves, UL 1769

Fifth Edition, Dated June 25, 2015

Summary of Topics

This revision of ANSI/UL 1769 dated January 8, 2025 includes the following changes in requirements:

– Remove MAPP References; 3.1, 4.5, 7.14, Table 22.1

– Editorial Updates; 1.2, 1.3, 2.3, Section 2A, 3.4, 5.7, 8.1 – 9.3, 12.1, 12.2, 17.6, 19.1 – 20.2, 21.2, 22.2, 23.2.1, 25.3, 29.3, 30.2, 30.8, Appendix A

– Alternate Connections 3.4, 30.4A

Text that has been changed in any manner or impacted by ULSE'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 18, 2024.

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UL 1769

Standard for Cylinder Valves

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Fifth Edition

June 25, 2015

This ANSI/UL Standard for Safety consists of the Fifth edition including revisions through January 8, 2025.

The most recent designation of ANSI/UL 1769 as an American National Standard (ANSI) occurred on January 8, 2025. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

No Text on This Page

CONTENTS

INTRODUCTION

CONSTRUCTION

PERFORMANCE

MANUFACTURING AND PRODUCTION TESTS

MARKING

Appendix A

INTRODUCTION

1 Scope

1.1 These requirements cover shut-off valves, with or without relief valve, that are for use on cylinders that comply with the specifications and charging and maintenance regulations of the U.S. Department of Transportation (DOT) or the corresponding specifications and regulations of Transport Canada (TC).

1.2 Valves covered by these requirements are for use on DOT or TC cylinders used for flow of gas into and out of the cylinder, in applications such as, but not limited to, automotive, medical, or industrial systems, vehicles, facilities, or providing fuel to buildings or appliances, and as covered in the following standards:

a) Liquefied Petroleum Gas Code, NFPA 58;

b) Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes, NFPA 51;

c) Safety Requirements for the Storage and Handling of Anhydrous Ammonia – See CGA G-2.1;

d) Safety in Welding, Cutting, and Allied Processes, AWS Z49.1; and

e) Health Care Facilities, NFPA 99.

1.3 Gas-line shut-off valves, other shutoff valves used on ASME containers, filler valves, excess flow check valves, for use with liquefied petroleum gases or anhydrous ammonia are covered by the requirements in the Standard for Flow Control Valves for Anhydrous Ammonia and LP-Gas, UL/ULC 125.

1.4 Gas-line shut-off valves for use with flammable gases are covered by the requirements in the Standard for Valves for Flammable Fluids, UL 842.

1.5 Gas-line shutoff valves for compressed gases, other than those described in 1.3 and 1.4, are covered by the requirements in Outline of Investigation for Compressed Gas Shutoff Valves, UL 1477.

1.6 The type of refrigerant used in the system shall comply with the Standard for Refrigerants, UL 2182.

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. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

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 cylinder valve is permitted to incorporate several different types of components such as, but not limited to, a back pressure check-valve, excess flow check-valve, quick-disconnect coupling, quick-closing coupling, fixed tube vent valve, liquid-level gauge, and/or high pressure gauge.

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 *Deleted*

2A Referenced Publications

2A.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.

2A.2 The following publications are referenced in this Standard:

ASME B1.5, *Acme Screw Threads*

ASME B16.26, *Cast Copper Alloy Fittings for Flared Copper Tubes*

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*

ASME B36.10M, *Welded and Seamless Wrong Steel Pipe*

ASTM B858, *Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*

ASTM D572, *Standard Test Method for Rubber – Deterioration by Heat and Oxygen*

AWS Z49.1, *Safety in Welding, Cutting and Allied Processes*

CGA C-12, *Qualification Procedure for Acetylene Cylinder Design*

CGA C-14, *Procedures for Fire Testing of DOT Cylinder Pressure Relief Device Systems*

CGA G-2.1, *Requirements for the Storage and Handling of Anhydrous Ammonia*

CGA S-1.1, *Pressure Relief Device Standards – Part 1 – Cylinders for Compressed Gases*

CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*

NFPA 58, *Liquified Petroleum Gas Code*

NFPA 99, *Healthcare Facilities Code*

SAE J512, *Automotive Tube Fittings*

UL 157, *Gaskets and Seals*

UL 565, *Liquid-Level Gauges for Anhydrous Ammonia and LP-Gas*

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 969, *Marking and Labeling Systems*

UL 1477, *Outline of Investigation for Compressed Gas Shutoff Valves*

UL 2061, *Adapters and Cylinder Connection Devices for Portable LP-Gas Cylinder Assemblies*

UL 2182, *Refrigerants*

UL 2227, *Overfilling Prevention Devices*

UL/ULC 125, *Flow Control Valves for Anhydrous Ammonia and LP-Gas*

UL/ULC 842, *Valves for Flammable and Combustible Liquids*

3 Service-Pressure and Temperature Ratings

3.1 The service-pressure rating of a cylinder valve intended for use with anhydrous ammonia, LP-Gas, or acetylene shall not be less than 250 psig (1.7 MPa).

3.2 The service-pressure rating of a cylinder valve intended for use with carbon dioxide shall not be less than 1800 psig (12.41 MPa).

3.3 The service-pressure rating of a cylinder valve intended for use with propylene shall not be less than 325 psig (2.2 MPa).

3.4 The service-pressure rating of a cylinder valve intended for all other liquefied or nonliquefied compressed gases or compressed gas in solution shall not be less than the maximum pressure defined for the connection that complies with CGA V-1.

Exception No. 1: For a valve that is provided with a pressure-relief device, the service- pressure rating of the valve shall not be less than the marked service pressure on the cylinder to which the valve is intended to be installed.

Exception No. 2: A valve that is marked in accordance with 30.4A.

3.5 Cylinder valves covered by these requirements are intended for use at ambient temperatures within the range of minus 40°F – 130°F (minus 40°C – 55°C).

4 Glossary

4.1 For the purpose of this standard, the following definitions apply:

4.2 COMPRESSED GAS IN SOLUTION (ACETYLENE) – A nonliquefied compressed gas that is dissolved in a solvent.

4.3 CYLINDER – A portable container that complies with the specification for cylinders constructed under Subpart C of Part 178 of the DOT Regulations and similar cylinder specifications of the TC Regulations.

4.4 DOT REGULATIONS – The U.S. Department of Transportation Regulations for the Transportation of Hazardous Materials, under Code of Federal Regulations Title 49, Parts 100 – 199.

4.5 FUEL GAS – Acetylene, hydrogen, natural gas, liquefied petroleum gas (LP-Gas), propylene, and other liquefied and nonliquefied flammable gases that are stable because of their composition, or because of the conditions of storage.

4.6 LIQUEFIED COMPRESSED GAS – A gas which, under the charged pressure, is partially liquid at a temperature of 70.0°F (21.1°C).

4.7 LIQUEFIED PETROLEUM GAS (LP-GAS OR LPG) – Any material having a vapor pressure not exceeding that allowed for commercial propane that is composed predominantly of the following hydrocarbons, either by themselves (excluding propylene) or as mixtures: propane, propylene, butane (normal butane or isobutane) and butylenes.

4.8 NONLIQUEFIED COMPRESSED GAS – A gas, other than a gas in solution, which under the charged pressure is entirely gaseous at a temperature of 70.0°F (21.1°C).

4.9 PRESSURE-RELIEF DEVICE – A device intended to prevent rupture of a normally charged cylinder, when exposed to abnormal or emergency conditions such as a fire condition.

4.10 TC REGULATIONS – The Transport Canada Regulations under the Transportation of Dangerous Goods Act.

CONSTRUCTION

5 General

5.1 A valve shall include all of the components required for its intended function and installation, and shall be furnished as a single unit or assembly.

5.2 A valve intended to be repaired shall be constructed so that parts are capable of being reassembled after being dismantled to the extent required for routine maintenance.

5.3 A seat disc shall be attached to its poppet or holder, or otherwise assembled to prevent it from becoming dislocated under service conditions. The means to secure the disc shall not rely on cement or adhesive.

5.4 A brazing material used for joining liquid-confining parts of a valve for LP-Gas shall have a melting point (solidus temperature) not less than 1000°F (538°C). Brazing shall not be used on a valve intended for use with anhydrous ammonia. See 7.7.

5.5 A valve shall not be equipped with a means to prevent it from closing completely.

5.6 A valve shall be constructed so that a pressure-relief device operates in its intended manner with the shut-off portion of the valve, and the overfilling prevention device if provided, in the closed position.

5.7 A valve for LP-Gas for use on nominal 4 – 40 pound nominal LP-Gas capacity (10.2 – 95.3 pound water capacity) shall be provided with all of the following:

a) A CGA 791, CGA 793, or CGA 810 (Type I or Type II) outlet connection complying with CGA V-1.

b) An overfilling prevention device complying with UL 2227.

c) A fixed maximum liquid level gauge including a dip tube. The vent valve portion of the gauge shall be of the type that incorporates a flat-bladed screwdriver slot for operation.

d) The fixed maximum liquid level gauge (vent valve) shall have the vent stem retained, such as by staking or crimping, so that it cannot be removed from the valve body by reverse rotation.

Exception No. 1: Valves intended for use on cylinders used in industrial truck service (including forklift truck cylinders) and cylinders identified and used in industrial welding and cutting gas applications, are not required to comply with the requirements noted in (a), (b), and (c) above.

Exception No. 2: A CGA 793 outlet connection complying with CGA V-1 shall be limited to use on composite cylinders between 2.2 and 19 lbs propane capacity.

5.8 The maximum venting flow from a fixed maximum liquid level gauge valve for LP-Gas shall not exceed that from a No. 54 drill orifice (0.055 inch diameter).

5.9 For valves provided with a threaded overfilling prevention device, the device shall be attached to the valve body with a sealing compound suitable for LP-Gas. Polytetrafluoroethylene (PTFE) tape shall not be used.

6 Handwheels

6.1 A valve for LP-Gas intended for use with an overfilling prevention device shall comply with the following:

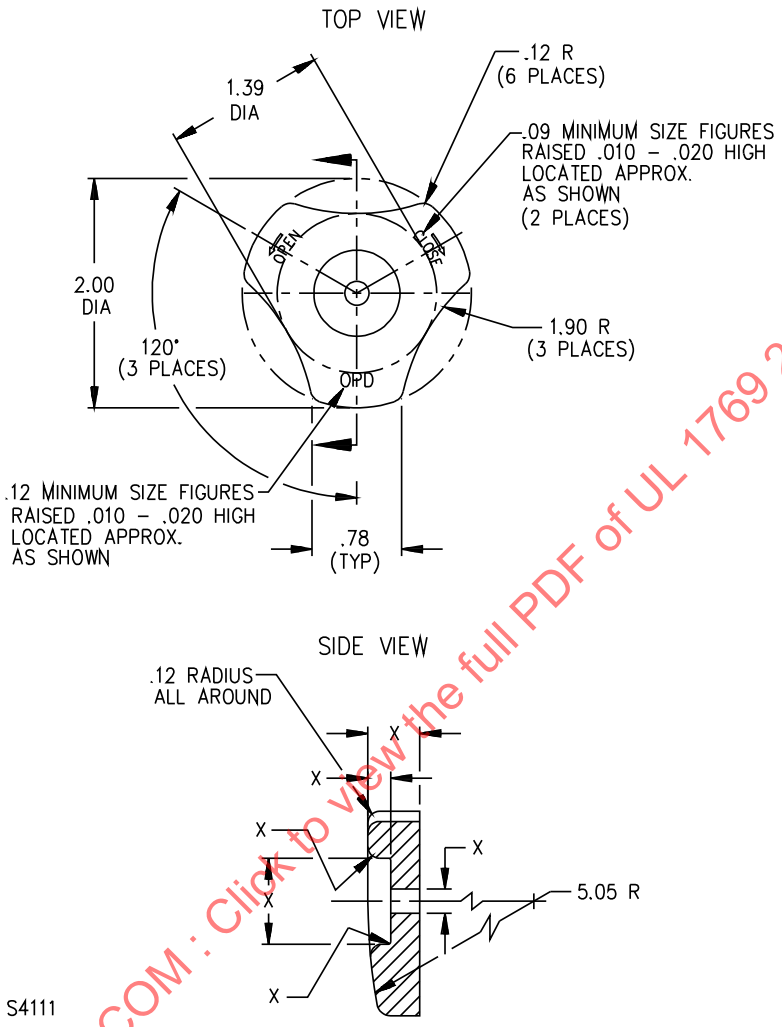
a) The handwheel design shall be tri-lobular as shown in Figure 6.1.

b) The handwheel shall be permanently attached and be integral to the valve stem or secured with a tamper resistant fastener. The handwheel shall be nonremovable with common hand tools such as screwdrivers, pliers, wrenches, etc.

6.2 The tri-lobular handwheel design shown in Figure 6.1 shall only be provided on valves intended for use with overfilling prevention devices.

Figure 6.1

Tri-lobular handwheel design



NOTES

1) X = Indicated characteristics per manufacturer's discretion.

2) Additional markings per manufacturer's discretion.

3) Lightening holes/perforations per manufacturer's discretion.

4) Handwheel shall be permanently attached to valve as required in 6.1(b).

5) Material – See 7.2.

6) Dimensional tolerances:

2 place decimal ±0.010

3 place decimal ±0.005

angles 2°

7 Materials

7.1 An operating or gas-confining part of a valve shall have the strength and durability to provide reliable service of the part and of the assembly.

7.2 To comply with the requirement of 7.1, a material for gas-confining parts of a valve intended for fuel gases shall have a minimum melting point (solidus temperature) of not less than 1500°F (816°C). A material for gas-confining parts of nonfuel gases and operating parts, including handwheels, of fuel gas valves shall have a melting point (solidus temperature) of not less than 950°F (510°C) and a tensile strength of not less than 10,000 psi (68.9 MPa) at 400°F (204°C).

Exception No. 1: A valve for use with an LP-Gas cylinder not exceeding 240-pound water capacity is permitted to have the safety relief poppet (discholder) made of a material having a melting point and a tensile strength less than that specified.

Exception No. 2: A valve disc, soft seat, seal ring, diaphragm, or gasket is not required to comply with this requirement.

7.3 A part in contact with the gas to be handled shall be resistant to the action of such gas.

7.4 With reference to 7.3 elastomeric materials shall be subjected to the tests noted in (a), (b), and (c). Polymeric materials shall be subjected to the Accelerated Aging Test, Section 20 and the Fluid Compatibility Test, Section 22.

a) Accelerated Aging Test, Section 20; For oxygen service, see 7.5.

b) Accelerated Hydrogen Pressure Aging Test, Section 21, if for use with hydrogen,

c) Fluid Compatibility Test, Section 22; and

d) Low Temperature Test, Section 24.

Exception: Acetal polymers, chlorotrifluorethylene polymers, tetrafluorethylene, fluorinated ethylene propylene polymers and polyamides of composition polyhexamethylene adipamide or polycaproamide polymers (nylon 6, 6/6 or 6/16) shall only be subjected to the Accelerated Aging Test, Section 20.

7.5 Organic materials utilized in the gas stream of a valve intended for use with oxygen shall be compatible with oxygen. Elastomeric materials shall be subjected to the test as shown by the Exception to 20.2.

7.6 With reference to the requirement in 7.5, chlorotrifluoroethylene polymers, tetrafluoroethylene, fluorinated ethylene propylene polymers and polyamides of composition polyhexamethylene adipamide or polycaproamide polymers (Nylon 6 or 6/16) are permitted without test.

7.7 Ammonia containing minute quantities of water will react rapidly with cadmium, copper, zinc, and many alloys, especially those of copper base. Only iron, steel, and certain nonferrous alloys, known to be resistant to ammonia service, shall be used in contact with anhydrous ammonia.

7.8 Nonductile cast iron (regular gray iron) shall not be used for bodies or enclosures for anhydrous ammonia or LP-Gas valves. This does not preclude the use of malleable or nodular iron.

7.9 When corrosion of a part interferes with the intended function of the valve, the part shall be of a corrosion-resistant material or be provided with a corrosion-resistant protective coating.

7.10 A protective coating shall provide resistance against corrosion to a degree not less than that provided by the protective coatings specified in 7.11.

7.11 Cadmium plating shall have a thickness of not less than 0.0003 inch (0.008 mm), and zinc plating shall have a thickness of not less than 0.0005 inch (0.013 mm).

Exception: When threads constitute the major portion of the area of a part, the thickness of the cadmium or zinc plating shall not be less than 0.00015 inch (0.0038 mm).

7.12 When warpage of a casting affects the tightness of gas-confining joints or the proper fit of parts, the casting shall be stress-relieved to reduce the risk of warpage.

7.13 A pressure confining brass part containing more than 15 percent zinc shall be subjected to the Moist Ammonia Air Stress Cracking Test, Section 25.

7.14 Copper or a copper alloy exceeding 67 percent copper shall not be used for a part in contact with acetylene.

8 Connections

8.1 The inlet of a valve shall comply with one of the following standards:

a) CGA V-1, for the gas involved; or

b) ASME B1.20.1;

c) A CGA 793 cylinder valve shall only be constructed with an inlet thread that has a M34 X 1.5 straight thread connection into cylinder and is only to be used on composite cylinders between 2.2 lbs and 19 lbs propane capacity.

Exception: Valves intended for use in installations where pipe fittings incorporate other than NPT type threads shall be permitted to be provided with pipe threads complying with a national pipe thread standard compatible with those fittings. The pipe thread type shall be identified in accordance with 30.10.

8.2 The outlet of a valve shall comply with CGA V-1, for the gas involved.

Exception No. 1: A valve that is marked in accordance with 30.4 is not prohibited from being used with an outlet that complies with one of the following:

a) ASME B1.20.1;

b) SAE J512; and

c) ASME B16.26.

Exception No. 2: A valve intended for use with LP-Gas is not prohibited from being used with an outlet that complies with ASME B1.5.

Exception No. 3: A valve is not prohibited from being used with an outlet connection other than those previously described, if it is marked in accordance with 30.3.

Exception No. 4: Composite cylinders using between 2.2 lbs and 19 lbs propane capacity shall only be equipped with a CGA 793 outlet connection and metallic cylinders are prohibited from being equipped with a CGA 793 connection regardless of the above exceptions.

8.3 A valve provided with a CGA 791, CGA 793, or CGA 810 (Type I or Type II) outlet connection shall also comply with UL 2061.

9 Pressure-Relief Devices

9.1 A valve that incorporates a pressure-relief device shall comply with the requirements in CGA S-1.1, for the various compressed gases with which it is intended to be used.

9.2 When a pressure-relief device is provided on a valve intended for use with acetylene, a fire test shall also be performed in accordance with CGA C-12, and CGA C-14.

9.3 A dust cap or cover, when provided on a pressure relief valve (Type CG-7 as defined in CGA S-1.1) shall not reduce the flow capacity of the relief device. See 19.3.

10 Bodies

10.1 A body shall be provided with a section to serve as a wrench grip.

10.2 Openings for bolts or screws used for assembly shall not extend through the outer walls of a body into the gas-handling section.

11 Shut-off Assemblies

11.1 A shut-off assembly shall include a stuffing box or other means for sealing to prevent leakage at the valve stem.

11.2 When packing is used to prevent leakage around the valve stem, and the design is such that the user must adjust or renew the packing during intended usage or as wear occurs, a stuffing box shall be:

a) Located so that it is subjected to discharge side pressure;

b) Provided with a removable, shouldered, unthreaded follower gland, made of corrosion-resistant material, and a nut or other means for adjusting the gland to maintain pressure on the packing; and

c) Fully packed prior to shipment of the valve.

11.3 A spring-loaded follower gland shall employ a spring made of corrosion-resistant material, or be of material provided with a corrosion-resistant protective coating.

11.4 When corrosion of the valve stem is capable of damaging a packing or seal material, and results in leakage or makes the valve inoperable, the stem shall be of corrosion-resistant material.

11.5 A valve stem shall be constructed so that it cannot be completely withdrawn from the valve by reverse rotation. Threads of the valve stem shall not enter the stuffing box recess.

11.6 The valve stem shall be so constructed so that it shall not fracture, break, crack or have threads stripped, in the open and closed position when subjected to the Valve Stem Torque Test, Section 26. For handwheel equipped valves, the handwheel shall not break or crack during this test.

12 Service Valves for LP-Gas for Use On Industrial Truck Type Containers

12.1 A service valve that is intended to be installed on industrial truck type containers (DOT or ASME) shall comply with 3.1 and the following:

a) Incorporate an internal excess flow check valve that shall comply with UL/ULC 125.

b) Incorporate NPT pipe threaded outlet connection that complies with 8.1(b) or NGT threaded outlet connection that complies with CGA V-1.

c) If a fixed maximum liquid level gauge is provided,

1) It shall comply with 5.8;

2) It shall indicate the maximum permitted filling level for all mounting positions of the container, in which the valve is to be used.

3) The valve stem is allowed to have a knurled handwheel or similar knob for operation.

4) The valve stem is allowed to be removable from the valve body for replacement purposes.

12.2 A service valve that is intended to be installed on single opening industrial truck type DOT cylinders shall comply with 3.1 and the following:

a) Incorporate a pressure relief valve that shall comply with Pressure-Relief Devices, Section 9, and shall have its spring and guiding mechanism not exposed to the atmosphere.

b) The relief valve shall be orientated so that its discharge is directed upward at a 45-degree (0.78 radians) angle from vertical.

c) The relief valve shall be provided with a protective cap or cover to minimize the possibility of the entry of water or any extraneous matter.

d) The relief valve shall have direct communication with the vapor space of the cylinder in all mounting positions for the cylinder.

e) Incorporate NPT pipe threaded outlet connection that complies with 8.1(b) or NGT threaded outlet connection that complies with CGA V-1.

f) Incorporate an internal excess flow check valve that shall comply with UL/ULC 125.

g) The internal excess flow check valve shall not restrict the flow of the pressure relief valve.

h) Incorporate a fixed maximum liquid level gauge that shall comply with 12.1(c)(1 – 4).

i) Include a tag, label or similar marking system that has installation instructions in accordance with 30.11.

j) Incorporate a variable liquid level gauge that shall comply with UL 565.

Exception: Service valves for LP-Gas for use on composite type single opening DOT cylinders are not required to incorporate a variable liquid level gauge.

PERFORMANCE

13 General

13.1 Representative samples of each size and type of valve are to be subjected to the tests described in Sections 14 – 26. The number of samples required for the tests in Sections 14 – 26 are specified in Table 13.1.

Table 13.1
Test samples required

Test	Test samples	
	Valve incorporates female NPT threads	Valve does not incorporate female NPT threads
Deformation Test, Section 14	Three samples with relief device blocked or plugged.	Test not conducted.
External Leakage Test, Section 15	Use same three samples from above.	Three samples with relief device blocked or plugged.
Seat Leakage Test, Section 16	Use same three samples from the External Leakage Test.	Use same three samples from above.
Endurance Test, Section 17	Use one sample from the Seat Leakage Test.	Use one sample from the Seat Leakage Test.
Seat Leakage Test, Section 16	Use same sample from the Endurance Test.	Use same sample from the Endurance Test.
Hydrostatic-Pressure Test, Section 18	Use the same two samples from the Seat Leakage Test and the one sample used for the Endurance Test.	Use the same two samples from the Seat Leakage and the one sample used for the Endurance Test.
Pressure-Relief Device Tests, Section 19	Three samples not subjected to any previous tests.	Three samples not subjected to any previous tests.
Volume-Change and Weight-Loss Tests – Elastomeric Parts, Section 22	Twenty-five samples of each elastomeric or polymeric part	
Moist Ammonia Air Stress Cracking Test, Section 25	Three samples of each part containing female threads with mating pieces.	
Valve Stem Torque Test, Section 26	Six samples* of each handwheel and stem design	Six samples* of each handwheel and stem design
* These six samples may be six new valve samples or the three samples from the hydrostatic strength test and the 3 samples from the pressure relief device tests may be used.		

13.2 Leakage tests at pressures of 1,000 psig (689 MPa) or less are to be conducted using a source of aerostatic pressure such as air or nitrogen. Leakage tests at pressures greater than 1,000 psig (689 MPa) are permitted to be conducted using a source of hydrostatic pressure such as water.

13.3 Hydrostatic-pressure tests are permitted to use water or other liquids of comparable or lighter viscosity to develop the required pressure.

13.4 All aerostatic leakage and hydrostatic-pressure tests are to be maintained for at least 1 minute. When liquid is used for the leakage test in accordance with 13.2, the duration of the test is not to be less than 5 minutes.

13.5 A relief device is to be capped or plugged for the leakage and hydrostatic pressure tests.

13.6 Pressure measuring device shall be calibrated over the range that it is used. The test pressure measured shall be not less than 20 percent nor more than 80 percent of the full-scale reading of the device.

Exception: The test pressure is allowed to be less than 20 percent or more than 80 percent of the full-scale reading of the measuring device, when calibration indicates that there is no loss of accuracy in the measured value.

14 Deformation Test

14.1 Three sample valves that incorporate female NPT threads are to be subjected to the test described in 14.2 – 14.4. The joints in a valve shall not leak, nor shall there be evidence of loosening of joints, distortion, or other damage resulting from the stress imposed on pipe-threaded sections.

14.2 Each sample valve is to be rigidly anchored or otherwise supported. A length of Schedule 80 pipe is to be connected to a female pipe-threaded section of the body, the male threads having first been lubricated with SAE No. 10 machine oil. Each pipe is then to be tightened to the torque specified in Table 14.1.

Table 14.1
Torque requirements for pipe connections

Pipe size,[a] inches	Torque, inch-pounds	N·m
1/8	150	17
1/4	250	28
3/8	450	51
1/2	800	90
3/4	1000	113
1	1200	136
1-1/4	1450	164
1-1/2	1550	175
2	1650	186
2-1/2	1750	198
3	1800	203
4	1900	214

[a] ASME B36.10M.

14.3 After the torque has been applied to each connected pipe, each test sample is to be subjected to the External Leakage Test, Section 15. If leakage is noted at the threaded joint between the pipe and the valve body, the joint is to be remade using a pipe joint sealing compound and the sample retested for external leakage.

14.4 Upon removal of the pipe from a test sample, the assembly is to be examined for loosening of body joints.

15 External Leakage Test

15.1 Three sample valves are to be subjected to a pressure of 1-1/2 times the maximum rated service pressure with the valves in the open position and the outlet plugged. There shall be no leakage.

15.2 Each sample is to be connected to a system of adequate pressure. A positive shut-off valve and a pressure measuring device in accordance with 13.6 are to be installed in the pressure supply piping.

16 Seat Leakage Test

16.1 Three sample valves are to be subjected to a pressure of 1-1/2 times the maximum rated service pressure, with the valve seats in the closed position and the outlet open. There shall be no leakage past the seat.

16.2 Each sample is to be connected to a system as described in 15.2.

17 Endurance Test

17.1 A valve is to be subjected to repeated cycles of opening and closing as specified in 17.2 – 17.4.

17.2 A valve with a handwheel, or quick coupling outlet connection, is to be subjected to 6,000 cycles of opening and closing.

17.3 A valve that is wrench-operated and does not have a handwheel, is to be subjected to 1,000 cycles of opening and closing.

17.4 A valve for use only with LP-Gas, or one for use with either LP-Gas or anhydrous ammonia, is to be tested with the valve outlet plugged, the valve body filled with n-hexane, and the valve inlet subjected to a pressure of 250 psig (1.7 MPa).

Exception: A valve with a quick coupling outlet connection is to be tested with air or nitrogen.

17.5 A valve for use only with anhydrous ammonia is to be tested without a liquid, and without pressure.

17.6 All other valves are to be tested with the valve outlet plugged, and the body subjected to air or nitrogen at 300 psig (2.0 MPa), or normal cylinder pressure at 70°F (21.1°C), whichever is less.

17.7 The endurance test is to be conducted at a rate not faster than 10 cycles per minute. A valve using a handwheel is to be subjected to a closing torque of 35 inch-pounds (4.0 N·m) on each cycle. A valve that is wrench-operated is to be subjected to a closing torque of 100 inch-pounds (11.3 N·m) on each cycle.

17.8 A valve provided with a fixed maximum liquid level gauge is to be subjected to 1500 cycles of opening and closing of the vent valve with the main handwheel or lever in the closed position and 100 psig aerostatic pressure applied to the valve inlet. The test is to be conducted manually and with a closing torque sufficient to stop air flow.

17.9 There shall be no sticking of the valve, nor shall the valve become otherwise inoperative, and the required corrosion protection shall not be impaired.

17.10 The sample is to be subjected to and comply with the requirements of the External Leakage Test, Section 15, and the Seat Leakage Test, Section 16, immediately following the endurance test.

18 Hydrostatic-Pressure Test

18.1 All parts of a valve, including the check modules on CGA 791, CGA 793, and CGA 810 connections, shall withstand, without rupture or permanent distortion, a hydrostatic pressure as specified in Table 18.1 for a minimum of one minute. The valve shall be pressurized from the inlet side of the valve. For valves having CGA 791, CGA 793, or CGA 810 connection outlets, the test is first conducted without an adapter connected to the outlet, which will keep the check valve in the closed position. The test is then repeated with an adapter connected to the outlet, which will keep the check valve in an open position. The outlet of the adapter shall be closed or plugged. "Without permanent distortion" is defined as compliance

with the requirements of the External Leakage Test, Section 15. Pressure relief device portions of the valve are exempt from this requirement.

18.2 The samples are to be connected to a source of hydrostatic pressure. A positive shut-off valve and a pressure measuring device in accordance with 13.6 are to be installed in the hydrostatic-pressure supply piping. The pressure gauge is to be installed in the piping between the shut-off valve and the sample under test.

Table 18.1
Hydrostatic test pressures

Rated service pressure, psig (as defined in Section 3)	Test pressures
Less than 1000	Five times the rated service pressure.
1000 – 3000	Five times the rated service pressure or 10,000 psig (whichever is lower).
Over 3000	Two times the rated service pressure but not less than 12,000 psig.

18.3 External leakage observed during this test is permitted when, following the hydrostatic-pressure test, the samples comply with the requirements of the External Leakage Test, Section 15.

19 Pressure-Relief Device Tests

19.1 A pressure-relief device incorporated in a valve is to be subjected to the applicable tests described in CGA S-1.1.

19.2 Three representative samples of each size and type are to be tested. The shut-off portion of the valve is to be in the closed position for the duration of the relief-device test.

19.3 The flow capacity test for pressure relief valves, (Type CG-7 as defined in CGA S-1.1) is to be conducted with the dust cap or cover, when provided, initially in place.

20 Accelerated Aging Test

20.1 An elastomeric or polymeric part is to be subjected to oven conditioning as described in 20.2. After conditioning, the part shall not crack or show visible deterioration.

Exception: If a composite gasket is used as a seal, Tensile Strength and Elongation shall be conducted before and after aging. The test and results shall be in accordance with UL 157.

20.2 Elastomeric parts are to be exposed for 70 hours at 212°F (100°C) in an air-circulating oven. A polymeric part is to be conditioned for 7 days in an air-circulating oven at a temperature of 87°C (189°F). After conditioning, there shall be no cracking or visible evidence of deterioration.

Exception: For elastomers used in oxygen service, the elastomers are to be exposed for 14 days to oxygen at a pressure of 300 ±15 psig (2068 ±103 kPa) and at a temperature of 168 ±1.8°F (80 ±1°C) in accordance with ASTM D572.

21 Accelerated Hydrogen-Pressure Aging Test

21.1 An elastomeric part is to be subjected to hydrogen gas as described in 21.2. After conditioning, the part shall not crack, blister, or show visible deterioration.

21.2 An elastomeric part is to be exposed for 14 days to hydrogen gas at a pressure of 300 ±15 psig (2068 ±103 kPa) and at a temperature of 168 ±1.8°F (80 ±1°C) in accordance with ASTM D572, except that hydrogen gas is substituted for oxygen gas in the description.

22 Fluid Compatibility Test

22.1 Nonmetallic parts in contact with one of the gases specified in Table 22.1 shall be subjected to the appropriate test for 70 hours. Elastomeric parts shall not show a volume change of more than 25 percent swelling or 1 percent shrinkage, or weight loss (extraction) of more than 10 percent. Weight loss test is not conducted after IRM 903 oil immersion. Polymeric parts shall show no evidence of shrinkage, warpage, cracking, a dimensional change exceeding 3 percent, or other signs of deterioration following the immersion test.

Table 22.1
Test liquids for non-metallic materials

Gas in contact with part	Test liquid
Anhydrous ammonia	Liquid anhydrous ammonia
Liquefied Petroleum Gas (LP-Gas)	n-Hexane
Manufactured, natural gas	IRM 903 Oil and n-Hexane
Propylene	Liquid propylene

22.2 Volume change and weight loss tests for elastomeric parts are conducted in accordance with the Immersion Test of UL 157. Dimensional stability tests for polymeric parts are conducted in accordance with the Method for Measuring Water Absorption of Polymeric Materials of UL 746A.

22.3 With reference to the requirement in 22.1, when the limits for volume-change or weight-loss are exceeded, a complete valve assembly is to be filled with the appropriate test liquid for 70 hours, following which the assembly shall comply with the requirements of the External Leakage Test, Section 15; the Seat Leakage Test, Section 16; and the Hydrostatic-Pressure Test, Section 18.

23 Tests of Gaskets and Seals Used in Refrigerant Systems

23.1 General

23.1.1 Gaskets and seals of neoprene, rubber, or polymeric material used to prevent refrigerant leaks shall comply with the requirements in 23.2.1 – 23.4.1.

23.2 Tensile strength and elongation test

23.2.1 Representative samples of each elastomeric material shall be subjected to this test in accordance with UL 157, in the as-received condition, after the refrigerant exposure and oil immersion tests noted below. No minimum values are established for as-received samples. After exposure in each refrigerant and immersion in oil, the tensile strength and elongation shall not be less than 60 percent of original.

23.3 Refrigerant exposure test

23.3.1 Representative samples of each elastomeric material shall be exposed to the liquid phase of each refrigerant intended to be handled for 30 days at 158°F (70°C). The test apparatus shall include a pressure vessel of sufficient strength to adequately handle the test pressure developed and means of transferring the test fluid to the vessel.