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American National Standard/ CSA Standard for Manually Operated Gas Valves For Appliances, Appliance Connector Valves And Hose End Valves



AMERICAN NATIONAL STANDARD
ANSI Z21.15-2009

CSA STANDARD
CSA 9.1-2009

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Appliance Connector Valves and Hose End Valves
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Note

This standard contains SI (Metric) equivalents to the yard/pound quantities, the purpose being to allow the standard to be used in SI (Metric) units. (IEEE/ASTM-SI-10 or CAN/CSA Z234.1 are used as a guide in making metric conversion from yard/pound quantities.) If a value for a measurement and an equivalent value in other units, the first stated is to be regarded as the requirement. The given equivalent value may be approximate. If a value for a measurement and an equivalent value in other units, are both specified as a quoted marking requirement, the first stated unit, or both shall be provided.

American National Standard/CSA Standard For Manually Operated Gas Valves For Appliances, Appliance Connector Valves And Hose End Valves

Part I: Construction

1.1 Scope

1.1.1

This standard applies to manually-operated gas valves (see Part IV, Definitions), hereinafter referred to as valves, not exceeding 4 in (102 mm) pipe size, and pilot shut-off devices (see Part IV, Definitions), hereinafter referred to as devices. Except for hose end valves not intended for permanent connection to a hose, and appliance connector valves, these valves and devices are intended to be used as part of a gas-fired appliance.

This standard does not apply to valves intended for use in building piping systems.

1.1.2

Valves and devices shall be constructed entirely of new unused parts and materials.

1.1.3

This standard applies to valves and devices for use with natural, manufactured and mixed gas, liquefied petroleum (LP) gases and LP gas-air mixtures at pressures not in excess of $\frac{1}{2}$ psi (3.45 kPa).

1.1.4

Valves and devices covered by this standard shall be capable of operation at ambient temperatures of 32°F (0°C) to 125°F (51.5°C). They shall also be capable of operation at a higher temperature, a lower temperature, or both when so specified by the manufacturer (see 2.1.2).

1.1.5

A valve may be an individual valve or may be incorporated as part of a device which includes other means to control main burner gas. A component(s) of such a device performing a function other than that covered by this standard shall comply with the applicable American National Standard(s) or Canadian Standard(s).

1.1.6

Compliance with this standard does not imply that such valve or device is acceptable for use on gas appliances without supplemental tests with the valve or device applied to the particular appliance design.

1.1.7

If a valve for measurement as given in this standard is followed by an equivalent value in other units, the first stated value is to be regarded as the specification.

1.1.8

All references to psi throughout this standard are to be considered gauge pressures, unless otherwise specified.

1.2 General

1.2.1

The construction of parts not covered by this Standard shall be in accordance with reasonable concepts of safety, substantiality and durability.

All specifications as to construction set forth herein may be satisfied by the construction actually prescribed or such other construction as will provide at least equivalent performance.

General assembly shall be of a neat and workmanlike character with all parts well fitted.

1.2.2

The manufacturer shall specify the following information:

- a. Type of valve or device (see Part IV, Definitions);
- b. Maximum and minimum ambient temperature;
- c. Capacity;
- d. Low-setting throughput, if applicable; and
- e. Whether or not the valve has a non-displaceable member.

1.3 Dimensions

1.3.1

For a plug-type valve finished by lapping:

- a. The body shall be bored out at the small end of the taper to a diameter of at least 0.003 in (0.076 mm) larger than the small diameter of the plug taper for a minimum distance of 0.047 in (1.19 mm). This does not apply to pilot shut-off and pilot adjustment values.
- b. The largest diameter of the plug taper shall be at least 0.003 in (0.76 mm) smaller than the large end of the body taper.

1.3.2

A valve or device threaded for connection to piping shall have taper pipe threads conforming to the Standard for *Pipe Threads, General Purpose (Inch)*, ANSI/ASME B1.20.1.

A valve or device threaded for connection to a manifold shall have either:

- a. Standard taper pipe threads as specified above; or
- b. A threaded connection in accordance with Figure 1, Acceptable Dimensions For Special Threads And Working Gauges For Their Measurements.

1.3.3

Threads specified in 1.3.2 shall have a chamfer at the beginning of the thread and shall fit the respective gauges within ± 1 turn.

1.3.4

Threads shall have no shoulder within the distance given in Table I, Minimum Distance From Inlet To Any Shoulder At End Of Thread, from the inlet end of the threaded portion including any chamfer.

1.3.5

When for connection to semi-rigid tubing, the connection together with the fittings used thereon shall be in accordance with or be interchangeable with the fittings described in the Standard for *Automotive Tube Fittings*, ANSI/SAE J512, or the Standard for *Hydraulic Tube Fittings*, ANSI/SAE J514, as applicable.

Appliance connector valves need not comply with this provision.

1.3.6

Hose end valves with nozzles, not intended for permanent connection to a hose, shall either comply with the dimensions given in Figure 2, Standard Hose-End Nozzle, or shall have a minimum effective length of 1 in (25.4 mm) with the peak of the corrugation nearest the valve member at least $\frac{13}{16}$ in (20.6 mm) from the outlet end. Nozzles which differ from Figure 2 shall comply with 2.9, Gripping Properties Of Nozzles On Hose End Valves Not Intended For Permanent Connection.

1.3.7

For hose end valves with nozzles intended for permanent connection to a hose, the connection means shall comply with one or more of the following hose assembly standards, as appropriate:

UL 569 *Pigtails and Flexible Hose Connectors for LP-Gas*

UL 21 *LP-Gas Hose*

CSA 8.1 *Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas*

CSA 8.3 *Thermoplastic Hose and Hose Couplings for Conducting Propane and Natural Gas*

1.4 Seating Means

Valves shall be provided with a means, other than gravity, to maintain a continuous seating force to compensate for manufacturing tolerances, operational variations or displacement of lubricant(s) (see also 2.7, Adequacy Of Seating Means).

1.5 Valve Stems And Handles

1.5.1

Stems of valves and devices provided with slots for operation by a screwdriver shall have such slots at least $\frac{1}{32}$ in (0.8 mm) wide, $\frac{3}{64}$ in (1.2 mm) deep, and $\frac{1}{8}$ in (3.2 mm) long.

1.5.2

Straight through valves with integral or permanently attached lever or "T" handles, which are actuated by rotation, shall have the plane of the handle at right angles to the direction of gas flow when the valve is in the "off" position.

1.5.3

A separable handle, removable without further disassembly of the valve, shall be attached by tamper-resistant means unless removal of the handle does not affect the leak tightness of the valve or the retention of the valve member. (See Part IV, Definitions).

1.6 Valve Stops And Latches

Valves, except pilot adjustment valves, shall have stops to limit both extremes of movement of the valve member.

1.6.1

Valves, except pilot adjustment valves, shall have stops to limit both extremes of rotation.

1.6.2

Latching-type valves shall be positive in their actions, shall permit ready operation with one hand and shall necessitate not less than two actions to turn on.

1.6.3

A valve having an intermediate "off" position between two "on" positions shall be so constructed that it will become latched in the "off" position.

1.6.4

Latching type valves shall be capable of withstanding the following torques applied against the latching means without damage which could result in the unseating of the valve member.

	Torque, Inch-Pounds	(N•m)
Valves of pipe sizes less than $\frac{3}{8}$ in (9.53 mm), and valves having unthreaded inlets	50	(5.65)
Valves of pipe sizes $\frac{3}{8}$ in (9.53 mm) and larger having threaded inlets	100	(11.30)

1.7 Appliance Connector Valves

1.7.1

Appliance connector valves shall have inlet and outlet connections in accordance with Table II, Inlet And Outlet Connections Of Appliance Connector Valves, and shall have a capacity in accordance with that shown in Table VIII, Minimum Capacities For Appliance Connector Valves.

1.7.2

An appliance connector valve shall have a non-displaceable valve member (see Part IV, Definitions, and Figure 3, Appliance Connector Valve With Non-Displaceable Valve Member). If the small end of the plug is exposed, it shall be recessed in the body a minimum of $\frac{1}{16}$ in (1.6 mm).

1.8 Strength

1.8.1

Bending Moment.

A valve shall be capable of operation without cracking, breaking, or leaking while being subjected to a bending moment using the weight specified in Table III, Load For Bending Moment Test, in accordance with the following Method of Test.

This test shall not apply to valves which have outlets threaded for orifice fittings.

Method of Test

This test shall be conducted at room temperature. A new sample shall be subjected to the specified test.

- a. The inlet and outlet connections of the valve shall be assembled leak tight to the appropriate fittings as described below. The length of the inlet fitting shall be such that, after assembly, the dimension from the valve inlet to the end of the inlet fitting will be 13 in (330 mm) $\pm 1/2$ in (12.7 mm). The tightening torque for threaded pipe or tubing connections shall be one-half that shown in Table IV, Torques For Turning Effort Test.
 1. Pipe threaded connections shall be assembled to Schedule 40 iron pipe, or pipe fitting, using non-Teflon type joint compound.
 2. Tubing connections shall be assembled to steel tubing which conforms to the Standard for *Welded and Cold Drawn Low Carbon Steel Tubing Annealed for Bending and Flaring, ANSI/SAE J525*, and has a minimum wall thickness of 0.028 in (0.71 mm), using the attachment means specified by the manufacturer.
 3. Connections designed for other than threaded pipe or tubing shall be assembled to test fixture(s) representative of the intended connection means.
- b. The valve outlet fitting shall be rigidly supported 1 in (25.4 mm) from the valve outlet, unless the following exceptions apply. When the valve has an integral mounting means independent of the inlet and outlet connections, the valve shall be mounted using the integral mounting means as specified by the manufacturer. When the valve is intended to be mounted by either the integral mounting means or the valve outlet, the mounting means which produces the most severe test condition shall be used.

The valve inlet shall be in the horizontal position.
- c. A flow-measuring device, capable of accurately indicating the allowable leakage rate, shall be connected to the valve inlet fitting. A system, capable of supplying air or gas at the test pressures specified, shall be connected to the inlet of the flow-measuring device. The valve assembly shall then be tested for leakage as specified in 2.2, Leakage, and shall comply.
- d. With the valve in the closed position, the system shall be pressurized at 21 in wc (5.23 kPa) and the appropriate weight as specified in Table III, Load For Bending Moment Test, shall then be suspended on the inlet fitting, without shock, 12 in (305 mm) from the inlet of the valve for 15 minutes. Without removing the weight, the valve shall then be tested for leakage as specified in 2.2, Leakage, except at a maximum pressure of 21 in wc (5.23 kPa).

- e. The test in “-d” shall be repeated 3 times with the valve being rotated 90 degrees (1.57 rad) around the horizontal inlet axis between each test. If the application of any bending moment is in a direction that would tend to rotate the valve with respect to the outlet, that bending moment need not be applied. Between tests, the valve shall be cycled on and off 3 times with the weight removed.

At the completion of the above tests, the valve shall be removed and examined for deformation and breakage and then subjected to the leakage test as specified in 2.2.

1.8.2

Turning Effort.

A valve or device shall be capable of withstanding, without deformation, breakage or leakage, stresses resulting from installation of the valve or device.

Method of Test

These tests shall be conducted at room temperature. A new sample shall be used for each test.

- a. A valve with both the inlet and outlet threaded for connection to iron pipe with standard taper pipe threads shall be subjected to the following test.
 - 1. A length of new, clean and properly threaded Schedule 40 iron pipe or pipe fitting, as applicable, whose threads have not been lubricated, shall be threaded to the inlet of the closed test valve with the turning effort specified in Table IV, Torques For Turning Effort Test, by gripping the wrench flats on the valve or any suitable area of the valve if wrench flats are not provided. If wrench flats are provided on both ends of the valve, the inlet end wrench flats shall be used. If wrench flats are not provided, a special tool provided by the valve manufacturer may be used for this test. With the valve in the closed position, the turning effort shall be applied for 15 minutes and then released.
 - 2. The procedure outlined in “-a1” shall be repeated for the outlet of the valve using the outlet wrench flats, if provided.
 - 3. The valve, with the inlet and outlet pipes in place, shall be tested for leakage as specified in 2.2, Leakage, and shall comply. (NOTE: Any leakage due to dry threads shall be disregarded). The inlet and outlet pipes shall then be removed and the valve examined for deformation and breakage.
- b. A valve with both the inlet and outlet designed for connection to tubing shall be subjected to the following test.
 - 1. A length of the proper size of aluminum tubing with the end squared and deburred shall be assembled to the inlet end of the closed test valve with the turning effort specified in Table IV, Torques For Turning Effort Test, using the attachment means specified by the manufacturer.

When applying the turning effort, the valve shall be rigidly supported by the wrench flats, or any suitable area on the valve if wrench flats are not provided. If wrench flats are provided on both ends of the valve, the inlet end wrench flats shall be used. With the valve in the closed position, the turning effort shall be applied to the tubing fitting for 15 minutes and then released.

- 2. The procedure outlined in “-b1” shall be repeated for the outlet of the valve using the outlet wrench flats, if provided.

3. The valve, with the inlet and outlet tubing in place, shall be tested for leakage as specified in 2.2, Leakage, and shall comply. The inlet and outlet tubing shall then be removed and the valve examined for deformation and breakage.
- c. For a valve having only one threaded connection for iron pipe, the pipe thread end shall be tested as in "-a" above, as appropriate.
- d. For a valve having only one tubing connection, the tubing connection shall be tested as in -b above, as appropriate.
- e. A hose-end valve with nozzle terminating in standard pipe thread shall withstand, without deformation, breakage or leakage, a turning effort of 135 in/lb (15.3 N•m) applied through the valve body when subjected to the following test.

The inlet end of a completely assembled hose-end valve shall be attached to a rigidly supported pipe so that it will be in a position similar to that prevailing in service. The turning effort specified above shall be applied to an extra heavy-duty pipe fitting on the hose-end outlet of the valve so that it acts to turn the valve onto the inlet pipe. After this turning effort has been applied for 15 minutes and then released, the valve shall be subjected to the leakage test specified in 2.2, Leakage. The valve shall then be removed and examined for deformation and breakage.

1.8.3

Impact.

This test applies only to individual manual valves not incorporated in devices that include other means to control main burner gas.

- a. All valves, except those listed in 1.8.3-b, shall be capable of withstanding the applicable impact specified in Table V, Impact, Foot Pounds (J), without cracking or breaking.

Method of Test

This test shall be conducted at room temperature.

A new sample shall be subjected to the specified test.

A valve whose inlet is designed for connection to threaded pipe shall be supported by securing its inlet to a close pipe nipple of Schedule 80 iron pipe or a standard-weight pipe coupling mounted on a rigid surface so the free length of the nipple or coupling is not greater than 1 in (25.4 mm). The valve shall be tightened to the support with a turning effort as specified in Table IV, Torques For Turning Effort Test.

A valve whose inlet is designed for connection to semi-rigid tubing shall be mounted on a straight length of steel tubing conforming to the *Standard for Welded and Cold Drawn Low Carbon Steel Tubing Annealed for Bending and Flairing, ANSI/SAE J525*, and having a wall thickness of 0.035 in (0.889 mm). The tube fittings supplied with the valve or specified by the manufacturer shall be used, and the free length of the support tubing shall not exceed 1 in (25.4 mm).

The outlet end of the valve shall have assembled to it a fitting of the type for which designed. The test device shall be arranged so the center line of contact between the striking weight and the valve will be $\frac{1}{4}$ in (6.4 mm) from the extreme outlet end of the valve.

The valve shall then be struck four successive times at right angles to the longitudinal center line of the outlet gas way, with the valve being turned 90 degrees (1.57 rad) between each impact. After each impact, the valve shall be examined visually for cracks or breakage.

A pendulum-type impact machine is shown in Figure 4, Pendulum-Type Impact Machine Used For Testing Gas Valves.

- b. The following shall withstand the applicable impact specified in Table VI without cracking or breaking:
 - 1. Pilot adjustment and pilot shut-off valves and pilot shut-off devices;
 - 2. Valves with an outlet designed for an orifice fitting;
 - 3. Valves with an inlet designed for connection to other than threaded pipe or tubing; and
 - 4. Hose end valves.

Method of Test

This test shall be conducted at room temperature.

A new sample shall be subjected to the specified test.

The inlet of a completely assembled valve shall be suitably mounted on a rigid support. If the valve inlet is threaded for connection to iron pipe, it shall be mounted with a close pipe nipple of Schedule 80 pipe or a standard weight pipe coupling so the free length of the nipple or coupling is not greater than 1 in (25.4 mm). The valve shall be tightened to the support with the turning effort specified in Table IV, Torques For Turning Effort Test.

A valve whose inlet is designed for connection to semi-rigid tubing shall be mounted on a straight length of steel tubing conforming to the *Standard for Welded and Cold Drawn Low Carbon Steel Tubing Annealed for Bending and Flairing, ANSI/SAE J525*, and having a wall thickness of 0.035 in (.889 mm). The tube fittings supplied with the valve or specified by the manufacturer shall be used, and the free length of the support tubing shall not exceed 1 in (25.4 mm).

A valve whose inlet is designed for connection other than to threaded pipe or tubing shall be rigidly mounted in a manner consistent with its intended usage.

A valve with an outlet for connection to semi-rigid tubing shall have the fitting in place and drawn up tightly. A valve designed to use an orifice hood shall be equipped with a hood screwed down tightly. A valve designed to use an orifice spud shall be equipped with a suitable spud.

The valve shall be subjected to one impact as shown in Table VI applied perpendicularly to the outlet connection and in the plane of the inlet connection. The center line of contact between the striking weight and the valve shall be $\frac{1}{4}$ in (6.4 mm) from the extreme outlet end of the valve. The valve shall then be examined for cracking or breakage.

A valve with an outlet designated for an orifice [see “-b2”] shall then be subjected to the leakage test specified in 2.2, Leakage, and shall comply.