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Approvals



UL Recognized Component:
File No. MH16727

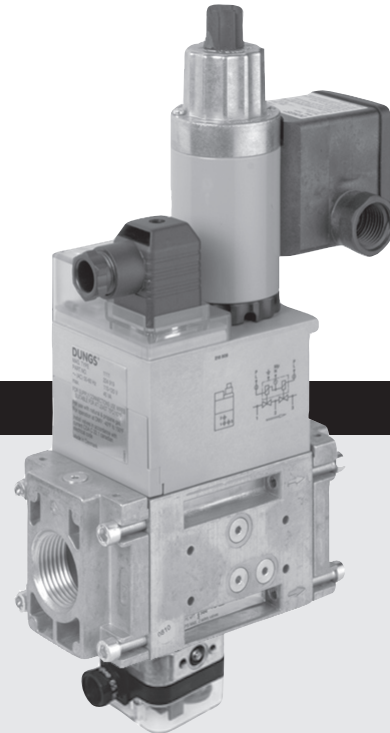


CSA:
Certified File No.157406



FM Approved:
Report J.I.1Z6A0.AF

Commonwealth of Massachusetts Approved Product Approval code G1-1107-35



Attention



The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.



Check the ratings in the specifications to make sure that they are suitable for your application.



Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com. If these instructions are not heeded, the result may be personal injury or damage to property.



On completion of work on the safety valve, perform a leakage and function test.



Any adjustment and application-specific adjustment values must be made in accordance with the appliance-/boiler manufacturers instructions.



This product is intended for installations covered by, but not limited to, the following fuel gas codes and standards: NFPA 54, IFGC (International Fuel Gas Code), or CSA B149.1 (for Canada) or the following equipment codes and standards: CSD-1, UL 795, NFPA 86, NFPA 37, ANSI Z83.4/CSA 3.7, ANSI Z83.18, ANSI Z21.13/CSA 4.9, or CSA B149.3 (for Canada).

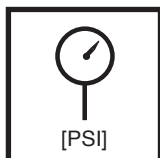
Explanation of symbols

- 1, 2, 3 ... = Action
- = Instruction

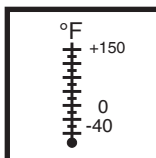
Specification

DMV-ZRD/612 Two normally closed safety shutoff valves in one housing. V1 with proof-of-closure. V1 and V2 are fast opening, fast closing. Two stage and adjustable max. flow on V2.

DMV-ZRDLE/612 Two normally closed safety shutoff valves in one housing. V1 with proof-of-closure. V1 fast opening, fast closing. V2 is a two stage, slow opening, fast closing valve. Adjustable max. flow and adjustable initial lift with V2.



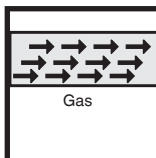
Max. Operating Pressure
MOP = 7 PSI (500 mbar) UL; FM
MOP = 5 PSI (360 mbar) CSA
Max. Close-off Pressure
10 PSI (750 mbar)



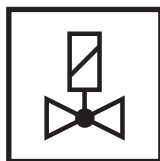
Ambient Temperature
-20 °F ... +150 °F
(-30 °C ... +65 °C)



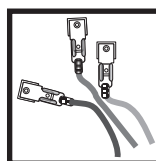
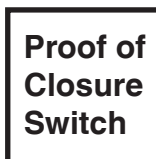
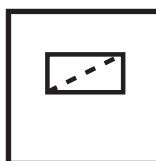
Electrical Ratings Available
110 - 120 VAC / 50 - 60 Hz
Operating time
100 % duty cycle
Power Consumption with all coils energized
DMV-ZRD(LE) 701: 70 VA
DMV-ZRD(LE) 702: 85 VA
DMV-ZRD(LE) 703: 115 VA



Gases
Dry, natural gas, propane, butane; other noncorrosive gases. A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60 %.
Materials in contact with Gas
Housing: Aluminium, Steel, free of nonferrous metals. Sealings on valve seats: NBR-based rubber.



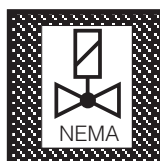
Classification of Valve V1 and V2 Safety Shutoff Valve: UL 429, FM 7400 & ANSI Z21.21 • CSA 6.5 C/I Valves
Closing Time (Valve 1 & Valve 2)
< 1 s
Opening Time
DMV-ZRD: V1 & V2 < 1 s
DMV-ZRDLE: V1 < 1 s;
V2 10 to 20 s at 70 °F
Max. Flow Setting (DMV-ZRD & DMV-ZRDLE)
Valve 2, Stage 1: <5 to 30 % of flow; <5 to 20 % of stroke.
Valve 2, Stage 2: <5 to 100 % of flow; <5 to 100 % of stroke.
Initial Lift Adjustment (DMV-ZRDLE only; V2 ONLY)
Adjustable on V2:
Stage 1: 0 to 70 % of total flow; 0 to 35 % of stroke.



Strainer
23 Mesh, installed in the housing upstream V1

Proof of Closure Switch with visual indication
SPDT mounted to valve 2, 10 A res, 8 FLA, 48 LRA @ 120 VAC

Electrical Connection
DIN-connector (Order No. 210319) required. M20 - 1/2 NPT Adapter (Order No. 240671) required for a conduit connection. Order parts separately.



Enclosure Rating
IP 65/NEMA Type 12

Alterations, Modifications or Repairs

For safety-related components, devices and systems, any liability of DUNGS, i.e. product liability for any kind of consequential damage as well as liability for defects, will cease to exist if alterations, modifications or repairs are made to these safety-related components, devices and systems by unauthorized specialist staff or with spare parts which have not been specially permitted for use in these safety-related components, devices and systems.

Additionally Required Electrical Parts

Description	Order No.
DIN Connector	210319
Conduit Adapter	240671

Mounting

Setup

1. Examine the DMV valve for shipping damage.
2. The main gas supply must be shutoff before starting the installation.
3. The inside of the DMV valve, the flanges, and piping must be clean and free of dirt. Remove all dirt and debris before installing the DMV valve. Failure to remove dirt / debris could result in valve damage or improper performance.

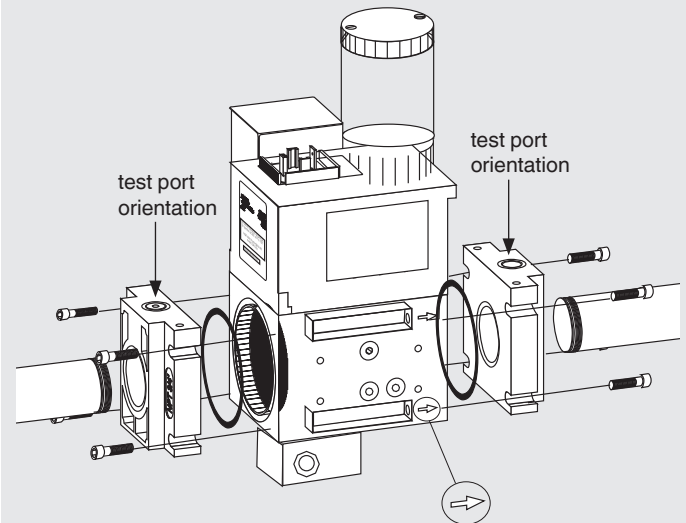
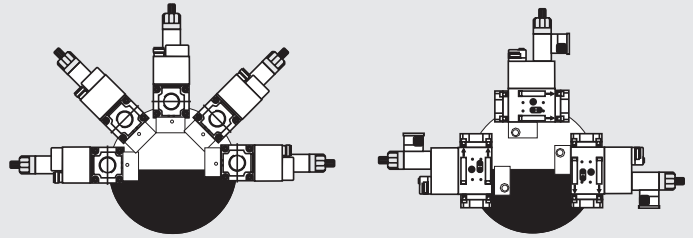
Recommended Procedure to Mount the Flanges

1. Unpack the DMV valve and remove the socket cap head screws.
For DMV 701: use 5 mm hex wrench for M6 screws
For DMV 702/703: use 6 mm hex wrench for M8 screws
2. Remove the two white protective plastic covers.
3. Verify the o-rings and the grooves are clean and in good condition.
4. Install the DMV valve with the gas flow matching the direction indicated by the arrows on the casting.
5. Mount the DMV solenoid from vertically upright to horizontal.
6. Clean the mounting surface of the flanges.
7. Mount the flanges with the test port in the position relative to the coil as shown in the figure. Failure to have the test port in the correct position may cause a gas leak.
8. Tighten the screws in a crisscross pattern. See table for recommended torque!

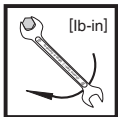


Do not overtighten the screws.
Follow the maximum torque values below.

Installation position



If the flow is not in the same direction of the arrows, the valves will not operate properly.



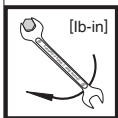
Recommended Torque System Accessories

M3	M6	M8	Screw Size
11 lb-in	62 lb-in	134 lb-in	[lb-in]

Recommended Piping Procedure

- Use new, properly reamed and threaded pipe free of chips.
- Apply good quality pipe sealant, putting a moderate amount on the male threads only. If pipe sealant lodges on the valve seat, it will prevent proper operation. If using LP gas, use pipe sealant rated for use with LP gas.

- Do not thread pipe too far. Valve distortion and/or malfunction may result from excess pipe in the valve body.
- Apply counter pressure only a parallel jaw wrench only to the flats on the flange when connecting to pipe.
- Do not overtighten the pipe. Follow the maximum torque values listed below.



Recommended Torque for Piping

1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	NPT pipe
375	560	750	875	940	1190	[lb-in]

- On completion of work on the DMV valve, perform a leakage test. (See "Valve Leakage Test")

Painting Valve

- It is not recommended that this valve be painted. Painting covers date codes and other labels that identify this valve.
- If the valve needs to be painted, a paint free of volatile organic components (VOC's) must be used. VOC's can damage valve o-rings, resulting in external gas leakage over time.
- During the painting process, use measures that will allow the valve's date code and other labeling information to be legible after the paint is dry.

Protection from Radiant Heat

- Radiant heat must be considered as a heat source that could result in an ambient temperature higher than the rating of this valve.
- Provide proper shielding to protect against radiant heat.

Wiring

Wiring Procedure for V1 and V2 stage 1

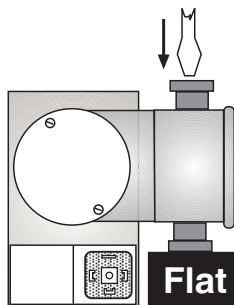
1. Disconnect all power to the valves before wiring to prevent electrical shock and equipment damage.
2. Attach flexible 1/2" NPT conduit to the DIN connector.
3. Route 14 or 16 gauge wire rated for at least 75 °C (167 °F) through the conduit and the DIN connector.
4. Connect the wiring to the appropriate screw terminals in the DIN connector.
5. Plug the DIN connector onto the terminals. Fasten the DIN connector with the screw supplied.



All wiring must comply with local electrical codes, ordinances and regulations.

Wiring Procedure for V2 stage 2

1. Remove the junction box cover to expose the three terminals
2. The coil can be rotated to accommodate a conduit connection in any position.
3. Use only one of the knock-outs for connecting conduit to the junction box. Support the opposite side of the junction box when removing the knock-out.
4. Run 14 or 16 gauge wire rated for 95 °C (200 °F) through the conduit and attach 1/2" NPT conduit to the junction box.
5. Use appropriate tools to connect the conduit fitting to the junction box.
6. Make electrical connections to the terminals using the wiring diagram.
7. Replace junction box cover.



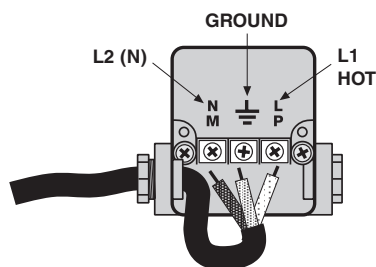
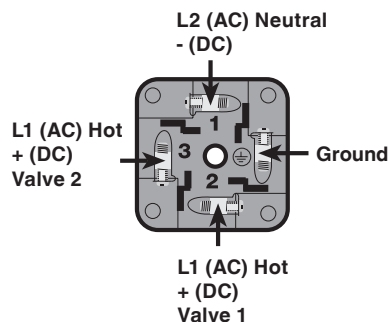
Flat area for support



The second stage coil must be integrated into the Flame Safeguard shutdown circuitry so that during any shutdown, voltage to ALL coils is removed; this will allow both valves to close.

DIN Connector

screw terminal connections



Proof of Closure Switch

Location

The proof of closure switch is factory installed on valve 1 of the DMV, it visually and electrically indicates valve position. When the valve is closed (NO position) an orange light is visible, when the valve is open (NC position) a green light is visible.

Conduit Connection

1. Before connecting conduit to the proof of closure switch, position the proof of closure switch so that there is no torque from the wiring or conduit. If the switch needs to be rotated, loosen the slotted set screw on the side. The switch may be removed from the brass adapter for wiring, however, **DO NOT** turn the proof of closure switch after tightening the slotted set screw.
2. Tighten the slotted set screw so that the proof of closure switch housing is secure. (16 lb-in torque)

Wiring

- Do not exceed the electrical ratings given in the proof of closure switch specifications.
- Use 14 or 16 gauge wire for at least 167 °F (75 °C).
- Connect wire to the appropriate terminal of the proof of closure switch (see the wiring diagram).
COM to the L1, Ground to ground, NO to the Proof of Closure terminal of the Flame Safeguard and N to L2.
- 3. The ORANGE light shall be on when the valve is closed, 4. The GREEN light shall be on when the valve is open (FM requirement).

⚠ Do not wire the valve switch to close a circuit that will directly power another safety shutoff valve. Doing so could result in a safety valve being energized and opened rather than remaining closed.

Annual Testing

- Perform a switch continuity test at least annually to verify that the proof of closure switch is working properly.
 1. Make sure that there is no power to the proof of closure switch.
 2. Shut the upstream ball valve to stop the flow of gas into the valve train.
 3. With the valve de-energized, use a multimeter and verify that there is continuity between the switch contacts 3 (COM) and 2 (NO). Then verify that there is no continuity between the switch contacts 3 (COM) and 1 (NC).
 4. Energize the valve that the proof of closure switch is mounted to. Use a multimeter and verify that there is continuity between the switch contacts 3 (COM) and 1 (NC). Then verify that there is no continuity between the switch contacts 3 (COM) and 2 (NO).

If you experience a problem, contact DUNGS.

5. De-energize the valve and replace the cover on the proof of closure switch.
6. Open the upstream ball valve.

Proof of Closure Switch Specifications

Switch

SPDT

Switch Action

Valve open: Switch in NC position, Green light on.

Valve closed: Switch in NO position, Orange light on.

Contact Rating

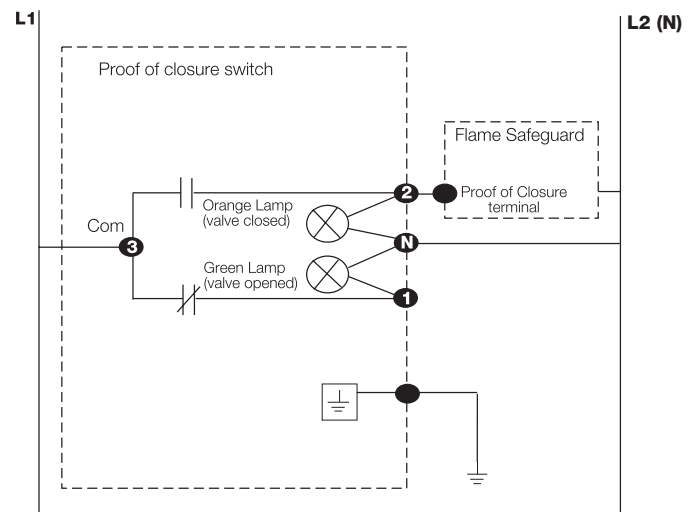
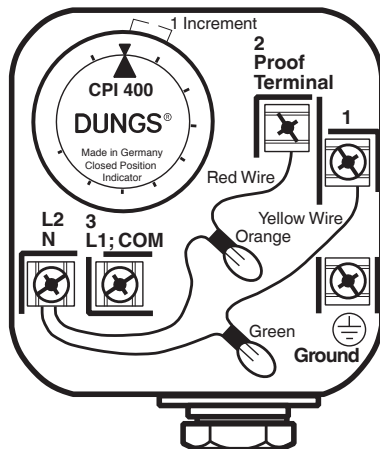
10 A res, 8 FLA, 48 LRA @120 VAC

Enclosure

NEMA Type 4

Ambient/Fluid Temperature

-40 °F to 150 °F



Valve Adjustment

Flow Setting Valve V2, Stage 1

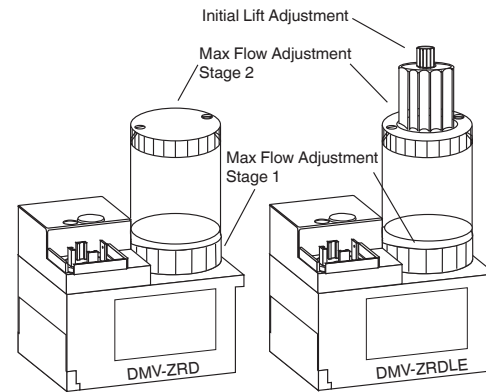
The valves are supplied with the max. flow adjustment fully open. To adjust the gas flow proceed as follows:

1. Locate the flow adjustment on top of valve 2 on the DMV-ZRD (black knob) DMV-ZRDLE (base of the hydraulic brake). There are two screws, the holding screw is recessed and has a blue sealing compound on it, while the pan head screw protrudes from the cap.
2. Loosen the pan head screw until you can manually rotate the flow adjustment dial.
3. Locate the max. flow adjustment dial between the top of the DMV-ZRD(LE) housing and the upper coil for the second stage.
4. Turn the dial clockwise for less gas or counterclockwise for more gas.
5. Check the flow at the burner with an orifice or flow meter until you have achieved the desired flow.

Flow Setting Valve V2, Stage 2

The valves are supplied with the flow adjustment fully open. To adjust the gas flow proceed as follows:

1. Locate the max. flow adjustment cap on top of valve
2. There are two screws in the cap. The holding screw is recessed and has a blue sealing compound on it, while the pan head screw protrudes from the cap.
3. Loosen the pan head screw until you can manually rotate the max. flow adjustment cap for 1-1/2 to 2 turns.
4. Turn the cap clockwise for less gas or counterclockwise for more gas.
5. Check the flow at the burner with an orifice or flow meter until you have achieved the desired flow.
6. Tighten the pan head screw on the adjustment cap.



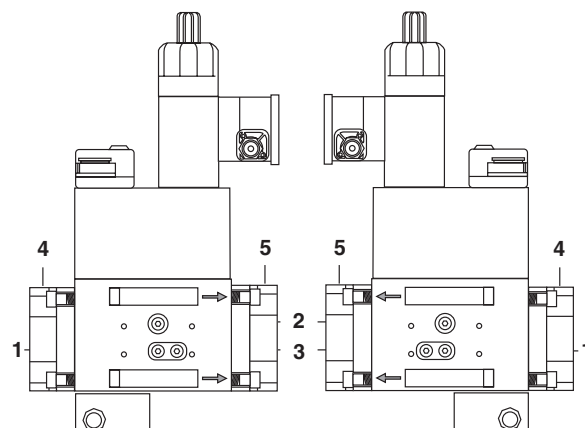
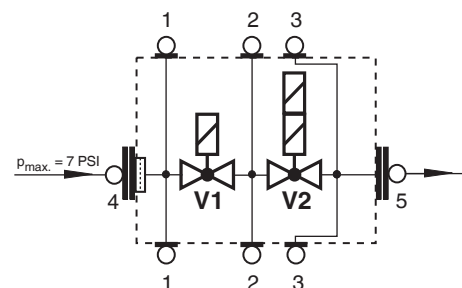
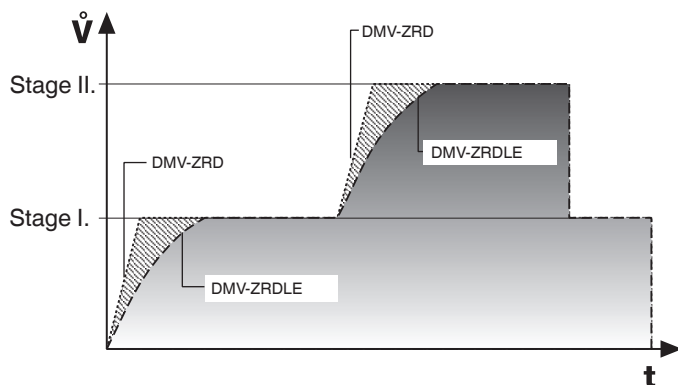
Initial Lift Adjustment (DMV-ZRDLE only)

The initial lift adjustment varies the initial gas flow through the valve as the valve seat begins to open. This adjustment can vary the initial flow between 0 % and 70 % of the total gas flow; 0 to 35 % of stroke. All DMV-ZRDLE valves are shipped from the factory with no initial lift. To adjust the lift proceed as follows:

1. Unscrew the small black cap on top of the flow adjustment cap to expose the initial lift adjustment knob.
2. The black cap also serves as tool; turn the cap over and insert it into the corresponding slot on the adjustment knob.
3. Turn the knob clockwise for a minimum initial lift or counterclockwise for a maximum initial lift.
4. Once the desired initial lift has been achieved, reinstall the black cap.

Test Ports

The G 1/8 ISO 228 taps are available on both sides upstream V1, between V1 and V2, downstream V2, and on both flanges. The G 1/8 test nipple (Ordering Number: 219008) can be screwed in any of these pressure tap ports.



Do not adjust or remove any screws or bolts which are sealed with a Red or Blue colored compound. Doing so will void all approvals and warranties.

Valve Leakage Test

This leak test procedure tests the external sealing and valve seat sealing capabilities of the DMV automatic safety shutoff valve. Only qualified personnel should perform this test.

It is required that this test be done on the initial system startup, and then repeated at least annually. Possibly more often depending on the application, environmental parameters, and the requirements of the authority having jurisdiction.

Setup

This test requires the following:

- Test nipples installed in the downstream pressure tap port of each automatic safety shutoff valve to make the required 1/4" hose connection in step 4.
- A transparent glass of water filled at least 1 inch from the bottom.
- A proper leak test tube. An aluminum or copper 1/4" rigid tube with a 45° cut at the end that is then connected to a 1/4" flexible hose of some convenient length provides for a more accurate leakage measurement.
However, a 45° cut at the end of the 1/4" flexible hose will suffice, but it will not likely be as accurate as the rigid tube.
- For detecting external leakages, an all purpose liquid leak detector solution is required.

Leak Test Procedure

Use the illustration below as a reference.

1. With the upstream ball valve open, the downstream ball valve closed and both valves energized, apply an all purpose liquid leak detector solution to the "External Leakage Test Areas" indicated in the illustration below, to any accessories mounted to the safety valve, and to all gas piping and gas components downstream the equipment isolation valve, and the inlet and outlet gas piping of the automatic safety shutoff valve. The presence of bubbles

indicates a leak, which needs to be rectified before proceeding.

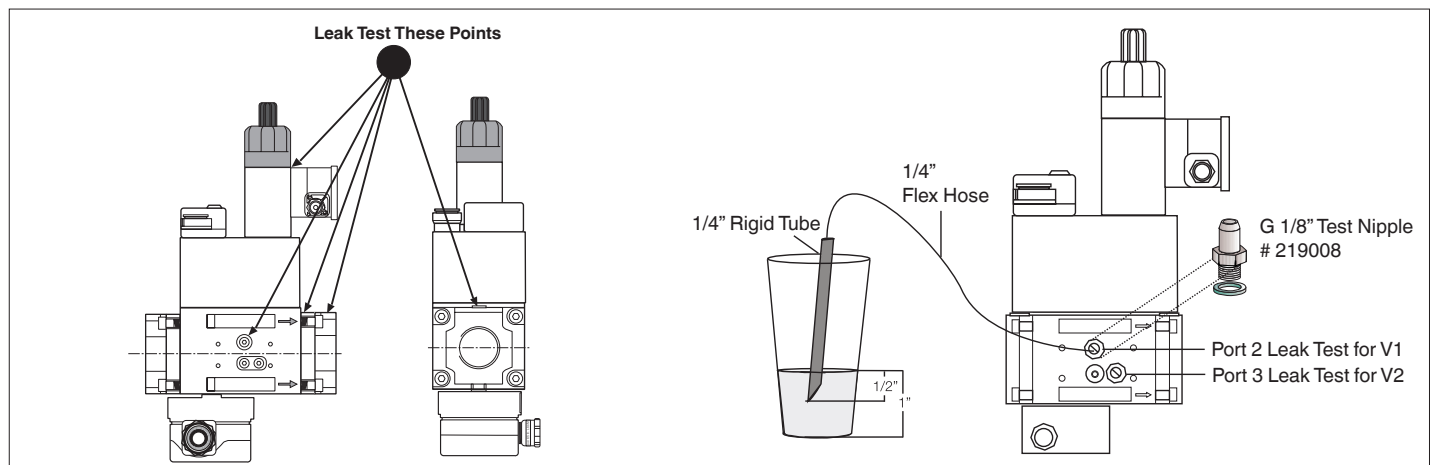
2. Then, de-energize the burner system and verify that both automatic safety shutoff valves are closed.
3. Close the upstream and downstream manual ball valve.
4. Using a screwdriver, slowly open the V1 test nipple (port 3) by turning it counter clockwise to depressurize the volume between the two valves, and connect the 1/4" flexible hose to the test nipple.
5. Slowly open the upstream manual ball valve, and then provide for some time to allow potential leakage to charge the test chamber before measuring the valve seat leakage.
6. Immerse the 1/4 in. tube vertically 1/2 in. (12.7 mm) below the water surface. If bubbles emerge from the 1/4" tube and after the leakage rate has stabilized, count the number of bubbles appearing during a 10 second period. (See chart below for allowable leakage rates.)
7. Repeat the same procedure for valve V2 (port 3).
(Energize terminal 2 on the DIN connector to open valve 1)

After completing the above tests proceed as follows:

8. Verify that the downstream manual ball valve is closed, and both automatic safety shutoff valves are de-energized.
9. Remove the flexible hose, and close all test nipples.
10. With the upstream manual ball valve open, energize both automatic safety shutoff valves.
11. Use soapy water to leak test all test nipples to ensure that there are no leaks.
12. If no leakage is detected, de-energize all automatic safety shutoff valves, and open the downstream manual ball valve.



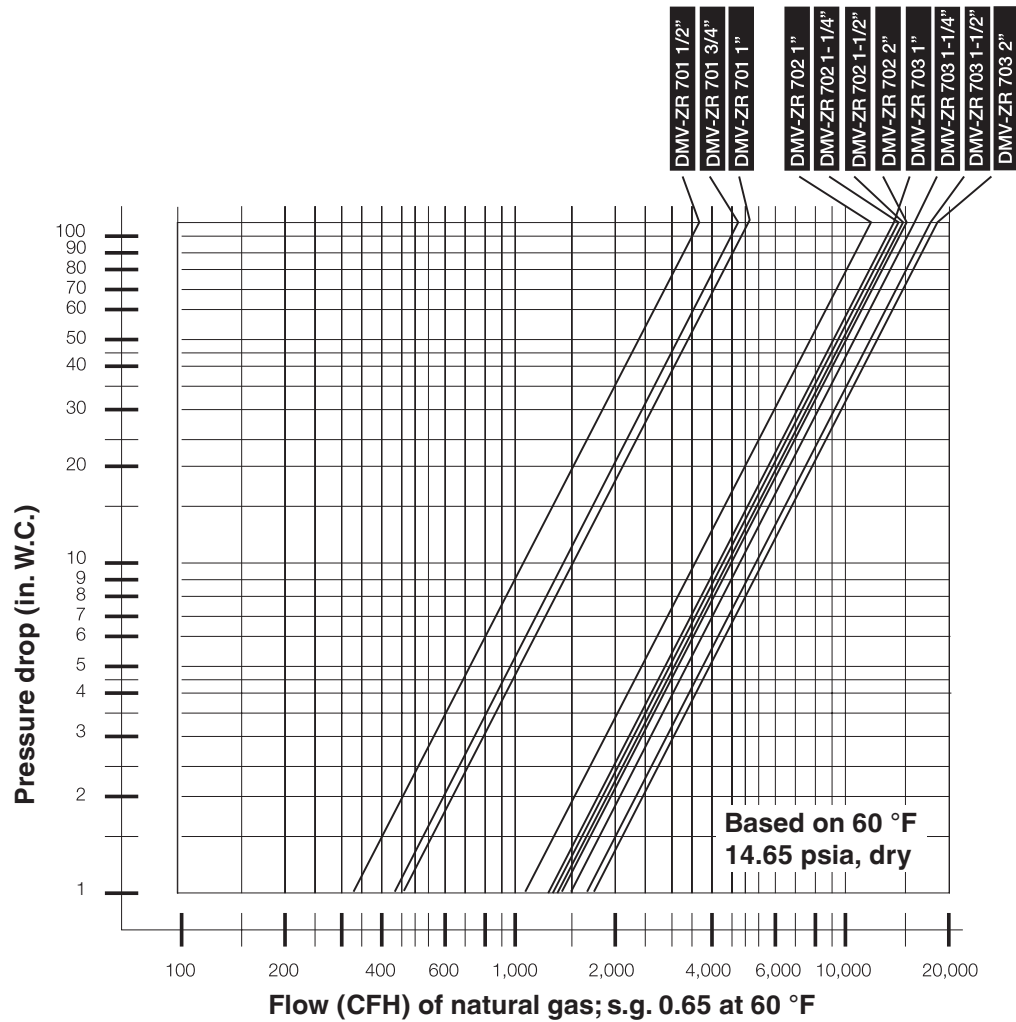
If leakage values are exceeded, replace valve immediately.



Type	Allowable Valve Seat Leakage* up to 7 PSI inlet	# of Bubbles in 10 s		
		Air	Natural Gas	LP
DMV-ZRD(LE) 701/612	239 cc/hr	5	6	4
DMV-ZRD(LE) 702/602	464 cc/hr	9	11	7
DMV-ZRD(LE) 703/612	464 cc/hr	9	11	7

*Based on air and test conditions per UL 429 Section 29. (Air or inert gas at a pressure of 1/4 psig and also at a pressure of one and one-half times maximum operating pressure differential, but not less than 1/2 psig. This test shall be applied with the valve installed in its intended position.)
Volume of bubble defined in Table 2 of FCI 70-2-1998.

Flow Curve



Size valve for at least 2 in. W.C. of pressure drop or more if the inlet pressure in the application is 15 in. W.C. or less. Otherwise, the difference in flow rate between stage 1 and 2 will be not be noticeable.

Pressure Drop for other Gases

To determine the pressure drop when using a gas other than natural gas, use the flow formula below and f value located in the table below to determine the “corrected” flow rate in CFH through the valve for the other gas used. For example,

when using propane, divide the volume (CFH) of propane required for the application by the calculated value f (f = 0.66 for propane). Use this “corrected” flow rate and the flow curve on the next page to determine pressure drop for propane.

Determining equivalent flow through valves using another gas

$$\dot{V}_{\text{gas used}} = \dot{V}_{\text{Natural gas}} \times f$$

$$f = \sqrt{\frac{\text{Density of Natural gas}}{\text{Density of gas used}}}$$

Type of gas	Density [kg/m ³]	s.g.	f
Natural gas	0.81	0.65	1.00
Butane	2.39	1.95	0.58
Propane	1.86	1.50	0.66
Air	1.24	1.00	0.80

Pulse Fired Application

When using these valves on pulse fired applications, the following apply:

- Before installing the valve, the inside of all gas piping upstream to the nearest filter shall be cleaned, and that filter shall have an insert with mesh no larger than 50 micron.
- The valve shall be installed in the upright position.
- The valve shall be applied within all of its ratings. The type of gas, the ambient temperature, and the cycle rate of the valve are critical.
- The valve shall be leak tested as least annually.
- After the cycle life has been exceeded, the valve shall be immediately replaced.

Multiple Burner Applications

On multiple burner applications, the following requirements apply:

- A manually operated shutoff valve shall be installed downstream of each individual burner safety shutoff valve.
- The backpressure on the individual burner safety shutoff valve shall be measured during the commissioning of the furnace to verify that while all other burners are firing and the individual burner safety shutoff valve shall is deenergized, the backpressure does not exceed 2 PSI. Measuring the backpressure shall also be repeated during purge and post purge. A pressure gauge can be used to measure the backpressure.

Accessories & Replacement

Coil for	Magnet Type for stage 1	Order No. for 120 VAC (stage 1)	Magnet Type for stage 2	Order No. for 120 VAC (stage 2)
DMV-ZRD(LE) 701/612	1111	232401	1150	251680
DMV-ZRD(LE) 702/612	1211	232402	1250	251681
DMV-ZRD(LE) 703/612	1212	232403	1350	251682
Printed Wiring Board				
DMV-ZRD(LE) 701/612	1111	238803	1150	not available
DMV-ZRD(LE) 702/612	1211	238806	1250	not available
DMV-ZRD(LE) 703/612	1212	238806	1350	not available
Accessories/Adapter	Order No.			
Electrical DIN Connector (DUNGS)	210319			
M20 - 1/2 NPT Adapter	240671			
Visual Indicator Valve 2 only	266949	The indicator mounts to the bottom of the valve and visually displays when the valve is open or closed.		
Valve Switch CPI 400 Valve 1 only	266968	Valve switch with visual indication.		
1/4" NPT port 1 or port 2 adapter (reduced port)	225047			
1/2" NPT port 2 pilot / vent adapter (reduced port)	225043			
G 1/8" Test nipple with gasket	219008			
Port 3 pressure switch mounting adapter	273777			
Hydraulic Brake	240458			
Max. Flow Adj. Knob	240457			

Valve Description	Flange	NPT Order No.	Rp Order No.	O-ring and bolt kit Order No.*	FRI mounting Kit Order No.**	Integral strainer and Filter replacement
DMV-ZRD(LE) 701	1/2"	222371	222341	224093	219967	230440
DMV-ZRD(LE) 701	3/4"	222368	222342	224093	219967	230440
DMV-ZRD(LE) 701	1"	221999	222001	224093	219967	230440
DMV-ZRD(LE) 702 & 703	1"	222369	222343	224094	219968	230441
DMV-ZRD(LE) 702 & 703	1 1/4"	222370	222344	224094	219968	230441
DMV-ZRD(LE) 702 & 703	1 1/2"	222003	221884	224094	219968	230441
DMV-ZRD(LE) 702 & 703	2"	221997	221926	224094	219968	230441

*Includes two o-rings and two sets of bolts (one set of four bolts for each flange).

**Includes four bolts and one o-ring.

Karl Dungs, Inc.
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