DMV-ZRD(LE) 7../612 Dual Modular Safety Shutoff Valves with Proof of Closure and Two Stage Operation Installation Instructions

DUNGS®
Combustion Controls

SPECIFICATIONS

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.

Body size

	Flange Size
DMV-ZRD(LE) 701	1/2" - 1" NPT
DMV-ZRD(LE) 702	1" - 2" NPT
DMV-ZRD(LE) 703	1" - 2" NPT

Gases
Natural gas, propane, butane; & noncorrosive gases.

Maximum Operating Pressure
7 PSI (500 mbar) UL; FM 5PSI (360 mbar) CSA

Maximum Close-off Pressure
10 PSI (750 mbar)

Ambient / Fluid Temperature
-20°F to +150°F; (-30°C to +65°C)

Electrical Ratings Available
110 to 120 Vac /50 to 60 Hz

Power Consumption with all coils energized
DMV-ZRD(LE) 701: 70 VA
DMV-ZRD(LE) 702: 85 VA
DMV-ZRD(LE) 703: 115 VA

Electrical Connection
DIN-Connector with 1/2" NPT conduit adapter V1, V2 stage 1; V2 stage 2 Terminal box with NPT 1/2" conduit connection

Operating Time
100 % duty cycle

Classification of Valve V1 and V2
Safety Shut Off Valve:
UL 429
ANSI Z21.21 • CSA 6.5 C/I Valves
FM 7400

Closing Time (Valve 1 & Valve 2) Less than 1 second.

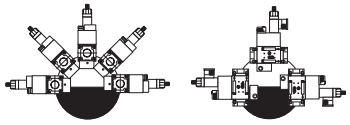
Opening Time
DMV-ZRD: V1 & V2 < 1 sec.
DMV-ZRDLE: V1 < 1 sec.; V2 10 to 20 sec. (70 °F)

Max. Flow Setting (DMV-ZRD & DMV-ZRDLE): V2 ONLY
Stage 1: <5 to 30 % of flow & <5 to 20% of stroke.
Stage 2: <5 to 100 % of flow; <5 to 100 % of stroke.

Initial Lift Adjustment (DMV-ZRDLE only; V2 ONLY)
Adjustment on V2.
Stage 1: 0 to 70 % of total flow; 0 to 35% of stroke.

Materials in contact with Gas
Housing: Aluminum, Steel
Sealings on valve seats: NBR-based rubber

Mounting Position
Solenoid upright vertical
to solenoid horizontal



Strainer
23 Mesh, installed in the housing upstream V1

Test Port
G 1/8 ISO 228 taps available on both sides upstream of V1, between V1 and V2 and downstream of V2, and on both flanges

Proof of Closure Switch with visual indication and a SPDT valve switch mounted to V1, 10 A res, 8 FLA, 48 LRA @120V

Position Indication-Mechanical (optional for valve 2 only)

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

CAPACITY

Capacity in CFH at pressure drop of 1 inch water column; natural gas, sp.gr.=0.64

	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
DMV ZRD(LE) 701	345	429	457	-	-	-
DMV ZRD(LE) 702	-	-	1065	1277	1368	1430
DMV ZRD(LE) 703	-	-	1230	1532	1698	1795

Power Equipment Company
2011 Williamsburg Road Richmond, VA 23231 USA
Phone: 804.236.3800 Fax: 804.236.3882 E-Mail: sales@peconet.com

ATTENTION

- Read these instructions carefully.
- Failure to follow them and/or improper installation may cause explosion, property damage and injuries.
- Installation must be done with the supervision of a licensed burner technician.
- Check the ratings in the specifications to make sure that they are suitable for your application.
- Never perform work if gas pressure or power is applied, or in the presence of an open flame.
- Once installed, perform a complete checkout including leak testing.
- Verify proper operation after servicing.
- The system must meet all applicable national and local code requirements such as but not limited to the following fuel gas codes: NFPA 54, IFGC (International Fuel Gas Code), or CSA B149.1 (for Canada) or the following equipment codes and standards: CSD-1, NFPA 86, NFPA 37, UL 795, ANSI Z83.4/CSA 3.7, ANSI Z83.18, ANSI Z21.13/ CSA 4.9, or CSA B149.3 (for Canada).

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 volitile organic componants (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 propor shielding to protect against radiant heat.

MOUNTING

- Examine the DMV-ZRD(LE) for shipping damage
- The main gas supply must be shut off before starting the installation.
- The inside of the DMV-ZRD(LE), the flanges, and piping must be clean and free of dirt, remove all dirt and debris before installing the DMV-ZRD(LE).Failure to remove dirt/debris could result in valve damage or improper performance.

Recommended Procedure to Mount the Flanges

- Unpack the DMV-ZRD(LE) 701 (702/703) and remove the 8 M6 (M8) socket cap head screws using a 5 mm (6 mm) Allen wrench.
- Remove the two white protective plastic covers from the DMV-ZRD(LE) body.
- Make sure the O-rings and the grooves are clean and in good condition.
- Install the DMV-ZRD(LE) with the gas flow matching the direction indicated by the arrows on the casting.
- Mount the DMV-ZRD(LE) only with the solenoid vertical upright to horizontal.
- Clean the mounting surface of the flanges. Make sure they are in good condition.
- Attach the DMV-ZRD(LE) to the flanges using the M6 (M8) socket cap screws supplied.
- Use a 5mm Allen wrench for the DMV-ZRD(LE) 701.
- Use a 6mm Allen wrench for the DMV-ZRD(LE) 702 & 703.
- Tighten the screws in a crisscross pattern.
- Do not overtighten the screws. Follow the maximum-torque values listed.

Recommended Torque Screw

M6	M8	Screw Size
62	134	[lb-in]

Recommended Piping Procedure

- Use new, properly reamed and threaded pipe free of chips and visable defects.
- 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 screwing the pipe into the flanges.
- Do not overtighten the pipe. Follow the maximum torque values listed on the next page.

MOUNTING (continued)

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]

- After installation is complete, perform a leak test.

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

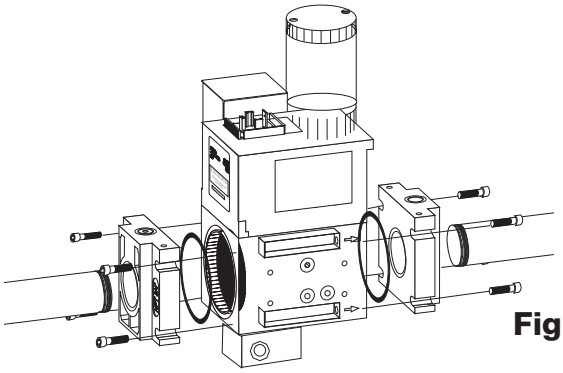


Figure 1

WIRING

Review the specifications on the valve and for each coil, and wiring accordingly.

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.

For wiring V1 and Stage 1 of V2:

NOTE: Use 14 or 16 guage wire for at least 75˚C (167˚F).

- Attach a flexible 1/2" NPT conduit to the DIN connector.
- Route the wires through the conduit and the DIN connnector.
- Connect the wiring to the appropriate screw terminals in the DIN connector using wiring for V1, V2 stage 1. (see figure #2).
- Plug the DIN connector into the male terminals. Fasten the DIN connector with the screw supplied.

Valve Wiring for
- V1 and
- V2-Stage 1

DIN Connector screw terminal connections

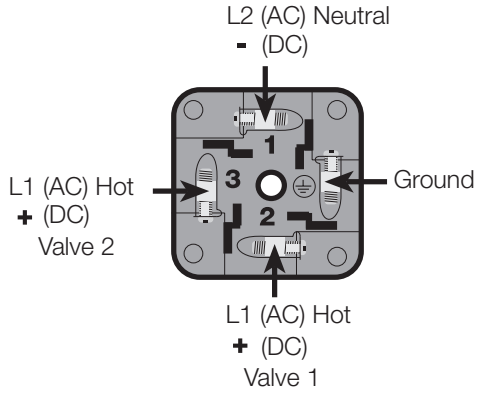


Figure 2

Wiring Stage 2 of V2:

NOTE: Use 14 or 16 guage wire rated for 95˚C(200˚F).

- Remove the wiring box cover to expose the three terminals.
- The wiring box can be rotated to accommodate the conduit connection.
- Knock out only one of the conduit connections on the side of the terminal box you wish to make your conduit connection to. Support the opposite side of the electrical box when knocking out the conduit connection. (see figure #3 below)

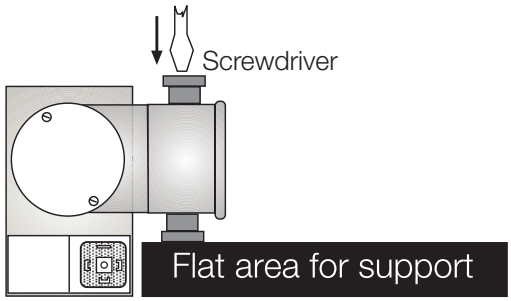


Figure 3

- Use approprate tools to connect the conduit to the electrical box.
- Make electrical connections to the valve using the wiring diagram for V2 Stage 2. (see figure #4).
- Replace wiring box cover.

Valve Wiring for
- V2-Stage 2

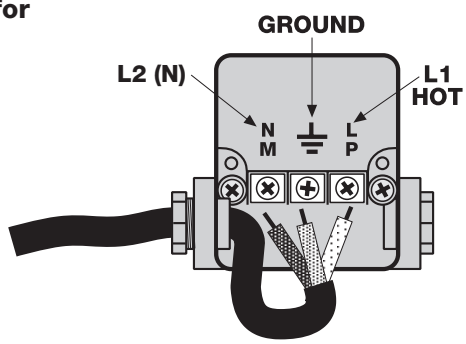


Figure 4

PROOF OF CLOSURE SWITCH

Description

The proof of closure switch is factory set and sealed. The switch 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

- 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.
- 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 rated for at least 75˚C (167˚F).
- 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 to the flame safeguard, and N to L2. The ORANGE light shall be on when the valve is closed, The GREEN light shall be on when the valve is open (FM and NFPA 86 requirement).

Testing at Initial Startup

- Perform an operational test at initial startup to verify that the proof of closure switch is wired properly to the flame safeguard by disconnecting the wire at terminal 2 of the proof of closure switch and starting the burner sequence.
- Verify that the flame safety goes into a FAULT condition without lighting the burner.

Annual Testing

- Perform a switch continuity test at least annually to verify that the proof of closure switch is working properly.
- Make sure that there is no power to the proof of closure switch.
- 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).
- Shut the upstream ball valve to stop the flow of gas into the valve train.
- 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 for help.
- De-energize the valve and replace the cover on the proof of closure switch.
- Open the upstream ball valve.

Proof of Closure Switch Specifications

Switch

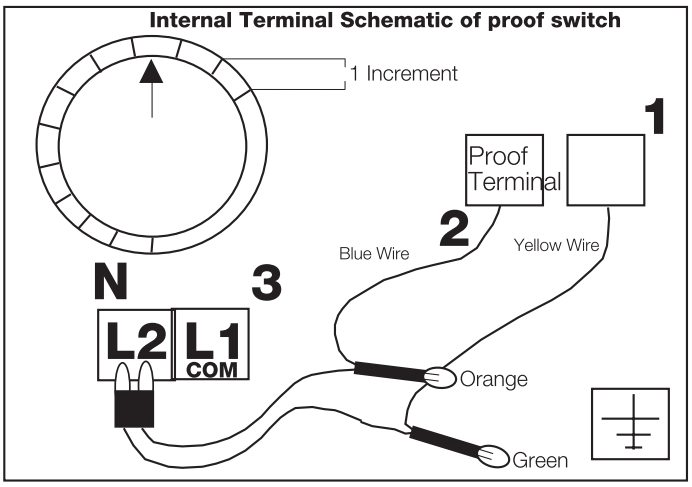
SPDT

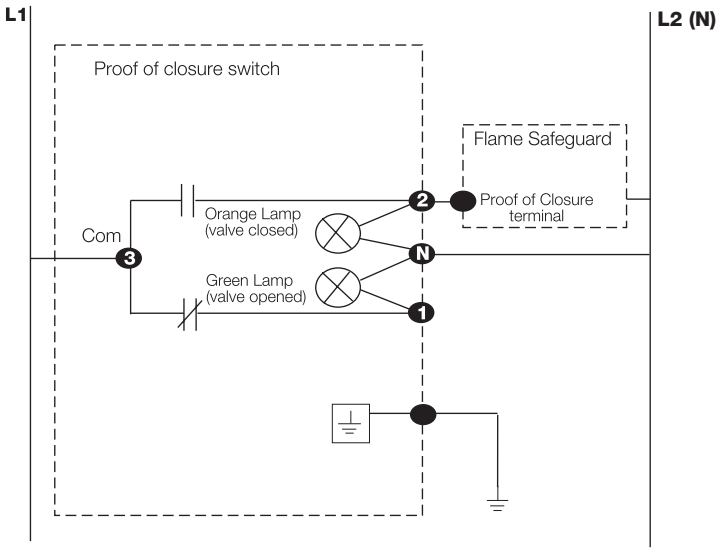
Switch Action

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





⚠ 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.

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

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:

CAUTION: Verify that changing the flow of gas does not create a hazard.

- 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.
- Loosen the pan head screw until you can manually rotate the flow adjustment dial.
- Locate the max. flow adjustment dial between the top of the DMV-ZRD(LE) housing and the upper coil for the second stage.
- Turn the dial clockwise for less gas or counterclockwise for more gas.
- 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:

- CAUTION: Make sure the flow of gas does not create a hazard.
- 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.
- Loosen the pan head screw until you can manually rotate the max. flow adjustment cap for 1-1/2 to 2 turns.
  Turn the cap clockwise for less gas or counterclockwise for more gas.
- Check the flow at the burner with an orifice or flow meter until you have achieved the desired flow.
- Tighten the pan head screw on the adjustment cap.

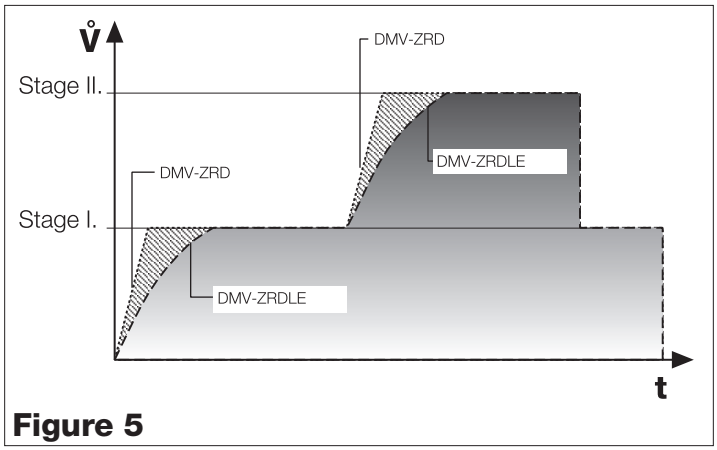


Figure 5

CAUTION: 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.

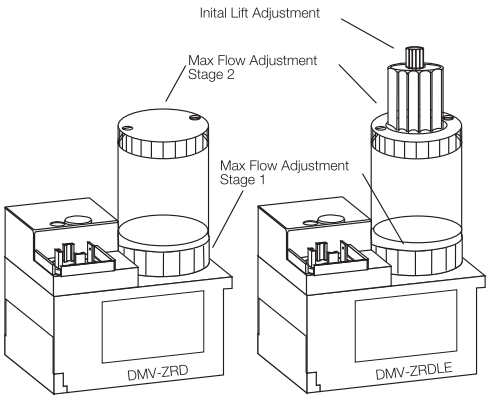


Figure 6

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:

- Unscrew the small black cap on top of the flow adjustment cap to expose the initial lift adjustment knob.
- The black cap also serves as tool; turn the cap over and insert it into the corresponding slot on the adjustment knob.
- Turn the knob clockwise for a min. initial lift or counterclockwise for a max. initial lift.
- 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: 219-008) can be screwed in any of these pressure tap ports.

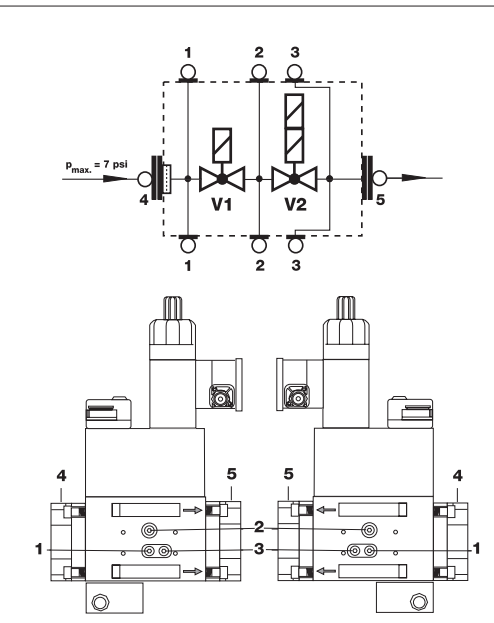


Figure 7

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 start-up, 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:

A) 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.

B) A transparent glass of water filled at least 1 inch from the bottom.

C) 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.

D) For detecting external leakages, an all purpose liquid leak detector solution or a soapy water 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.

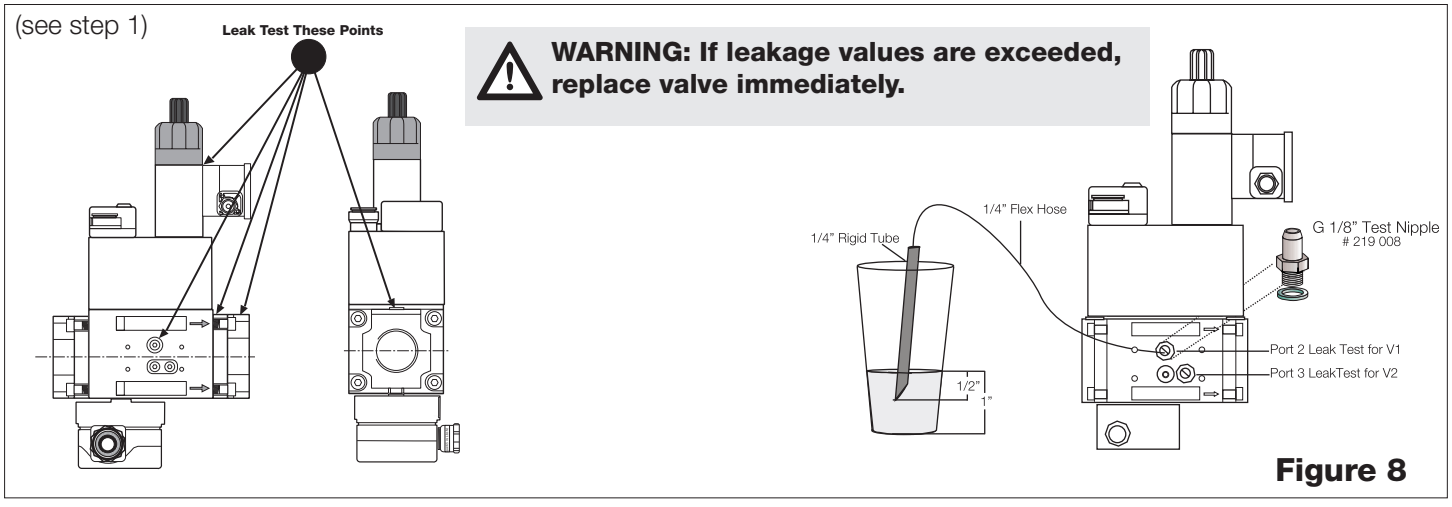
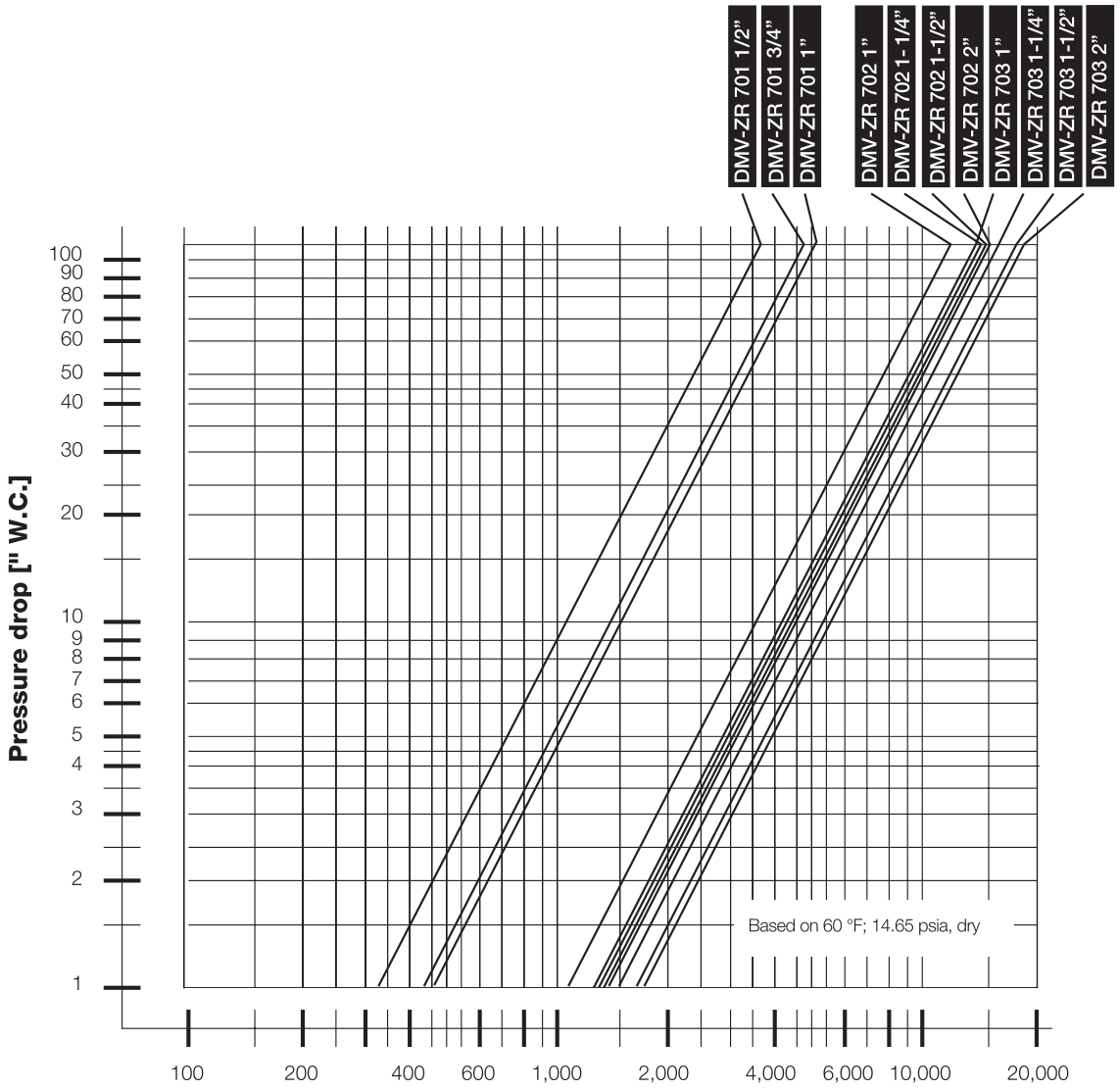


Figure 8

Valve Type	Allowable Valve Seat Leakage* for up to 7 PSI inlet	# of Bubbles in 10 sec AIR	Natural Gas	LP
DMV ZRD(LE) 701/612	239 cc/hr	5	6	4
DMV ZRD(LE) 702/612	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



NOTE: Size valve for at least 2 in. W.C. of pressure drop or more if the inlet presure in the application is 15 in. W.C. or less. Otherwise, the difference in flow rate between stage 1 and stage 2 will be note be noticable.

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 chart 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 above to determine pressure drop for propane.

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

Use this formula to calculator the f factor for other gases not listed on the table.

$$f = \sqrt{\frac{\text{Spec. gravity of Natural Gas}}{\text{Spec. gravity of gas used}}}$$

Type of gas used	Density [kg/m^3]	sg	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

Replacement Coils

Type	Mag. Type	Part # for 120Vac Stage 1, valves 1 and 2
DMV-ZRD(LE) 701/612	1111	232-401
DMV-ZRD(LE) 702/612	1211	232-402
DMV-ZRD(LE) 703/612	1212	232-403

Replacement Printed Wiring Board (First Stage, Valves One and Two)

Type	Mag. Type	Part # for 120Vac	Part # for 24Vac
DMV-ZRD(LE) 701/612	1111	238-803	238-803
DMV-ZRD(LE) 702/612	1211	238-806	238-806
DMV-ZRD(LE) 703/612	1212	238-806	238-806

Other Replacement Parts and Accessories

Accessories/Adapters	P/N	Accessories/Adapters	P/N
DIN-Electrical Connector (Hirschmann)	210-319	Hydraulic Brake	240-458
M20 - 1/2" NPT Conduit Adapter	240-671	Main Flow Adj. Knob	240-457
Visual indicator	217-665		
1/4" NPT port 1 or port 2 adapter (reduced port)	225-047		
1/2" NPT port 2 pilot gas adapter (reduced port)	225-043		
G 1/8" Test nipple	219-008		
Port 3 pressure switch mounting adapter	214-975		
Valve switch CPI 400	224-253A		

Valve Description	Flange	NPT P/N	Rp P/N	Oring and bolt kit P/N*	FRI mounting Kit P/N**	Integral filter and strainer replacement
DMV-ZRD(LE) 701	**1/2"**	222-371	222-341	224-093	219-967	230-440
DMV-ZRD(LE) 701	**3/4"**	222-368	222-342	224-093	219-967	230-440
DMV-ZRD(LE) 701	**1"**	221-999	222-001	224-093	219-967	230-440
DMV-ZRD(LE) 702 & 703	**1"**	222-369	222-343	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	**1 1/4"**	222-370	222-344	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	**1 1/2"**	222-003	221-884	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	**2"**	221-997	221-926	224-094	219-968	230-441

* Includes two orings for flanges and two sets of bolts (one set of four bolts for each flange).

** Includes four bolts and one oring.