

**DMV-ZRD(LE) 7../602**  
**Dual Modular Safety Shutoff Valves with Two Stage Operation**  
**Installation Instructions**

**SPECIFICATIONS**

**DMV-ZRD/602** Two normally closed safety shutoff valves in one housing. V1 and V2 are fast opening, fast closing. Two stage and adjustable max. flow on V2.

**DMV-ZRDLE/602** Two normally closed safety shutoff valves in one housing. 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**  
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 /50-60 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)** is 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)**

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)**

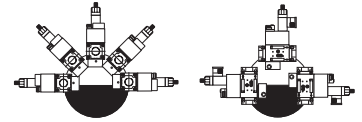
Adjustment on V2.  
Stage 1: 0 to 70 % of total flow; 0 to 35% of stroke.

**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

**Position Indication (optional)**

Visual Indicator  
CPI 400 with visual indication & interlock switch (SPDT)

**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"
<b>DMV ZRD(LE) 701</b>	345	429	457	-	-	-
<b>DMV ZRD(LE) 702</b>	-	-	1065	1277	1368	1430
<b>DMV ZRD(LE) 703</b>	-	-	1230	1532	1698	1795

## 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.
- The system must meet all applicable national and local code requirements such as but not limited to NFPA 70, NFPA 86, CSD-1, ANSI Z21.13, UL 795, NFPA 85. or CSA B149.3.
- 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.

## 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.

## 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.
- Verify that 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.



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

- 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 below.

### Recommended Torque Screws

M6	M8	Screw Size
62	134	[lb-in]

### Recommended Piping Procedure

- Use new, properly reamed and threaded pipe free of chips and visible 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 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]

- After installation is complete, perform a leak test.
- Use new, properly reamed and threaded pipe free of chips and visible 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.

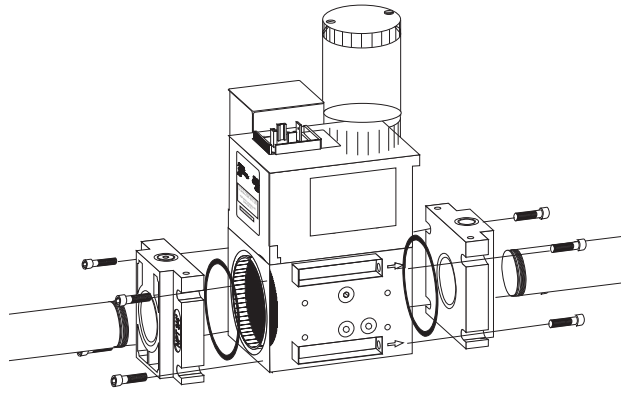
## MOUNTING (continued)

- 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]

- After installation is complete, perform a leak test.



## 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:

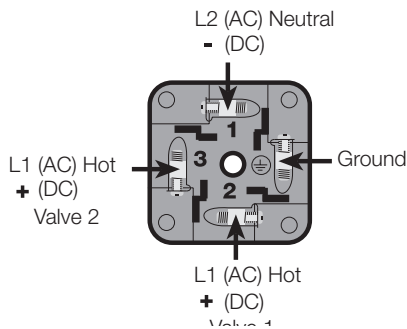
NOTE: Use 14 or 16 guage wire for at least 75°C (167°F).

- Attach a flexible 1/2" NPT conduit to the DIN connector.
- Route the wires through the conduit and the DIN connector.
- Connect the wiring to the appropriate screw terminals in the DIN connector using wiring for V1, V2 stage 1.
- 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



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

Figure 2

### For 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)

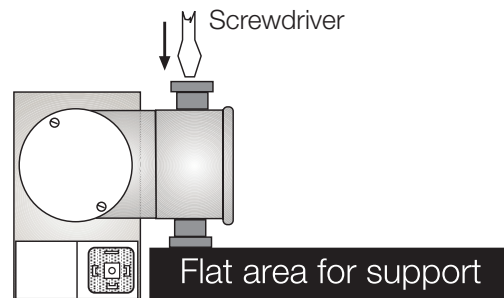


Figure 3

- Use appropriate 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

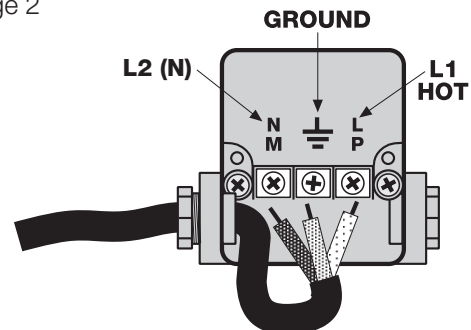


Figure 4

# 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:** Make sure 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.

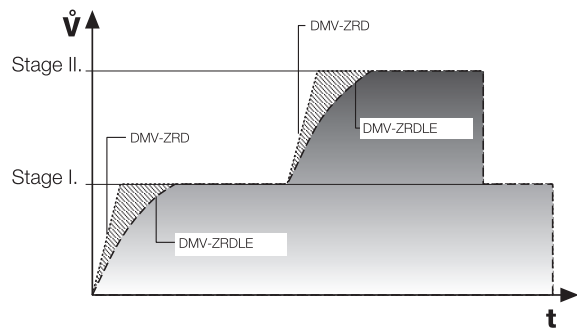


Figure 5

**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.

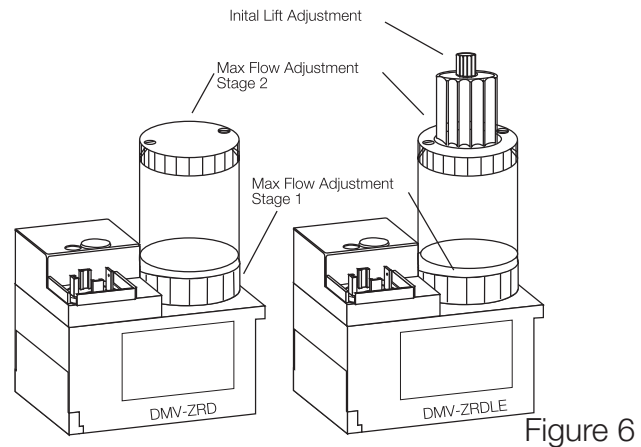


Figure 6

## 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.

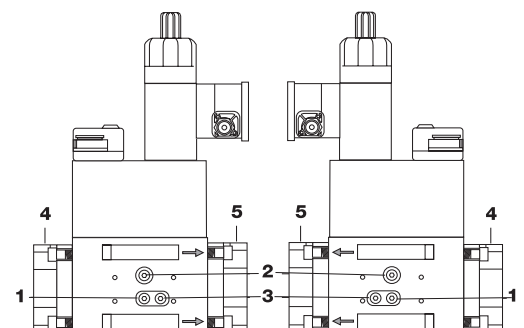
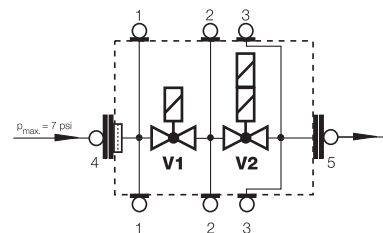


Figure 7

## 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

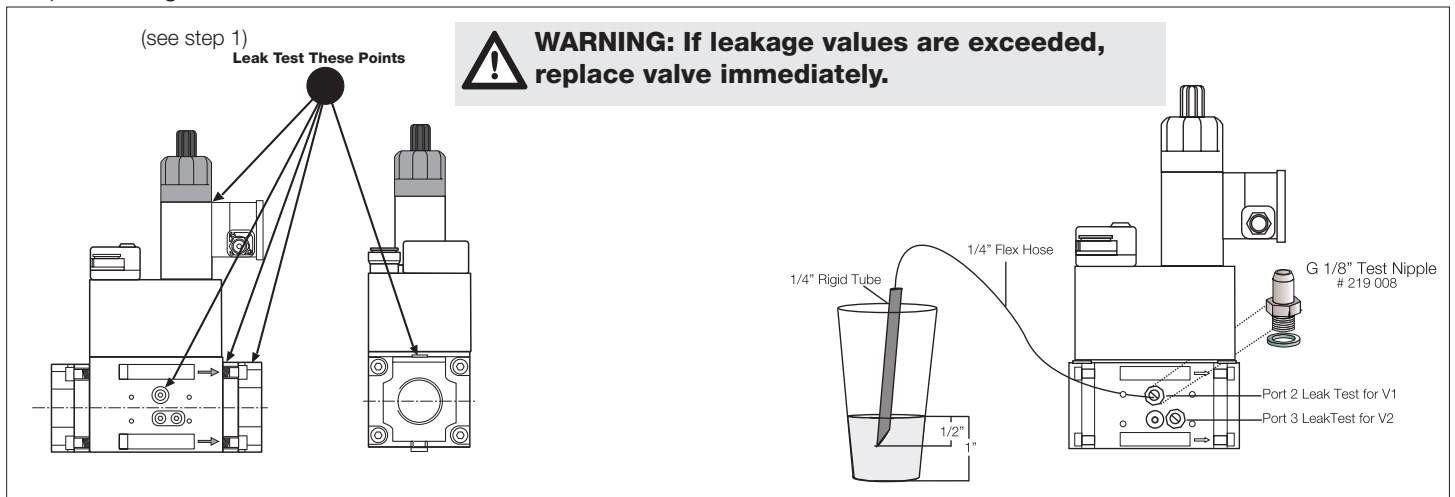
Use the illustration below as a reference.

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:

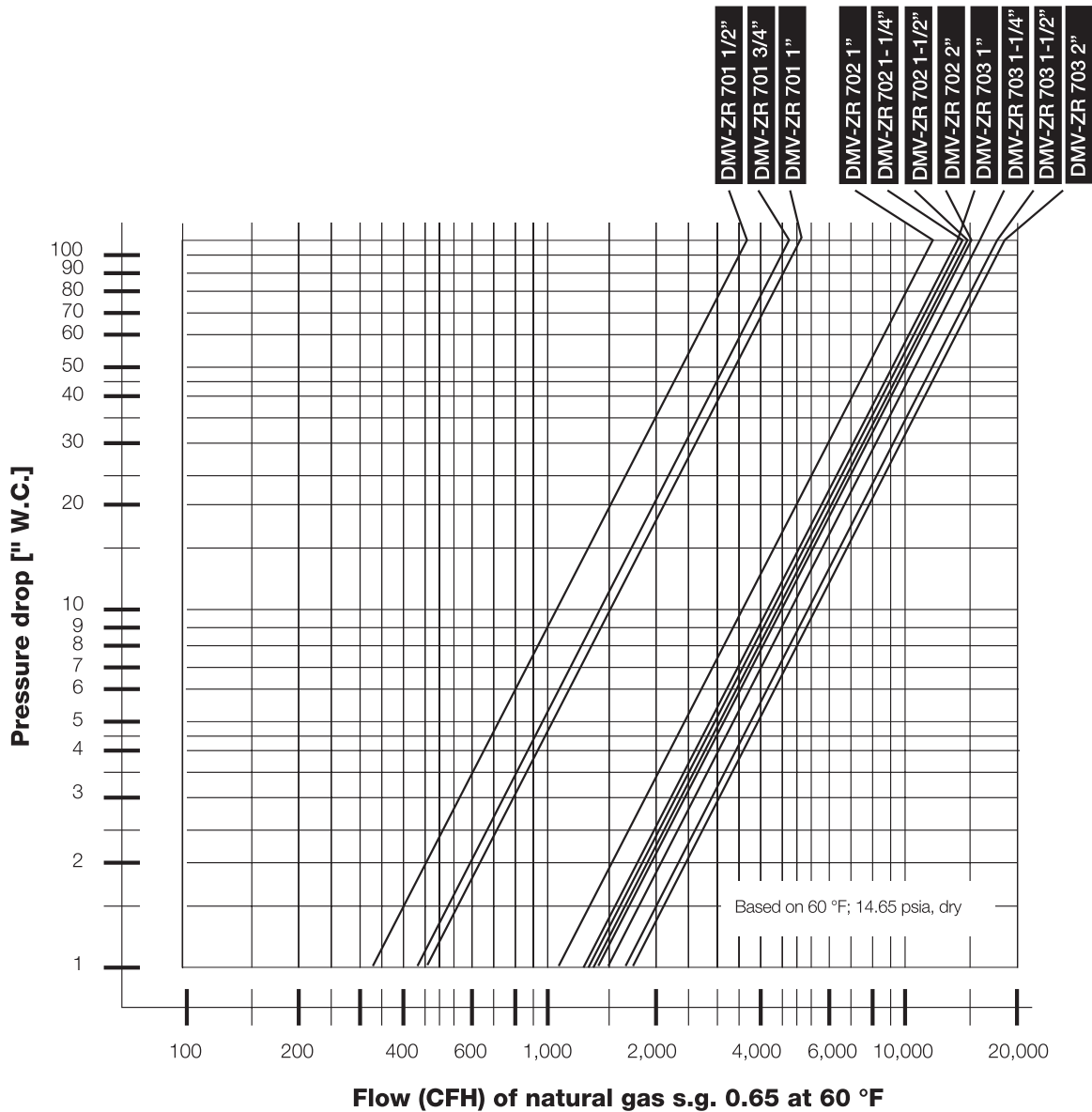
8. Verify that the downstream manual ball valve is closed, and both automatic safety shutoff valves are de-energized.
9. Remove the flexible hose, and close all test nipples.
10. With the upstream manual ball valve open, energize both automatic safety shutoff valves.
11. Use soapy water to leak test 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.



Valve Type	Allowable Valve Seat Leakage* for up to 7 PSI inlet	# of Bubbles in 10 sec		
		AIR	Natural Gas	LP
DMV ZRD(LE) 701/602	239 cc/hr	5	6	4
DMV ZRD(LE) 702/602	464 cc/hr	9	11	7
DMV ZRD(LE) 703/602	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 pressure in the application is 15 in. W.C. or less. Otherwise, the difference in flow rate between stage 1 and stage 2 will 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 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.

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

Use this formula to calculate 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 <sup>3</sup> ]	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
<b>DMV-ZRD(LE) 701/602</b>	1111	232-401
<b>DMV-ZRD(LE) 702/602</b>	1211	232-402
<b>DMV-ZRD(LE) 703/602</b>	1212	232-403

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

Type	Mag. Type	Part # for 120Vac	Part # for 24Vac
<b>DMV-ZRD(LE) 701/602</b>	1111	238-803	238-803
<b>DMV-ZRD(LE) 702/602</b>	1211	238-806	238-806
<b>DMV-ZRD(LE) 703/602</b>	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	<b>1/2"</b>	222-371	222-341	224-093	219-967	230-440
DMV-ZRD(LE) 701	<b>3/4"</b>	222-368	222-342	224-093	219-967	230-440
DMV-ZRD(LE) 701	<b>1"</b>	221-999	222-001	224-093	219-967	230-440
DMV-ZRD(LE) 702 & 703	<b>1"</b>	222-369	222-343	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	<b>1 1/4"</b>	222-370	222-344	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	<b>1 1/2"</b>	222-003	221-884	224-094	219-968	230-441
DMV-ZRD(LE) 702 & 703	<b>2"</b>	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.