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Approvals



CSA Certified: ANSI Z21.18 / CSA 6.3
Gas Appliance Pressure Regulator / File # 1135455

UL Unlisted Component
File # MH 16727 (sp)

European Community
EN 88-1 for EN 746-2 applications only

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.

**Safety
first
O.K.**

On completion of work on the pressure regulator, perform a leakage and function test.



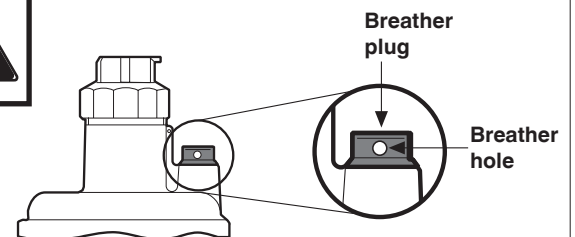
Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com. If these instructions are not heeded, the result may be personal injury or damage to property.

**IFGC
UL CSA
ANSI
NFPA**

This product is intended for installations covered by, but not limited to, the following codes and standards: NFPA 86, CSD-1, ANSI Z21.13, UL 795, NFPA 85, CSA B149.3, NFPA 37 or CSA B149.1.



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

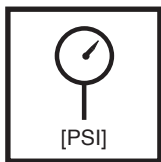


Explanation of symbols

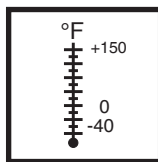
- 1, 2, 3 ... = Action
- = Instruction

Specification

FRI/6 Gas pressure regulator (lock-up type) with integrated gas filter in one housing. The FRI/6 series regulator mounts directly to the DMV 701, 702 and 703 series valves. Suitable as stand-alone when using two flanges.



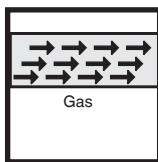
Max. Operating Pressure (MOP)
7 PSI (500 mbar) UL & CE
5 PSI (350 mbar) CSA
Max. Body Pressure (MOP)
15 PSI (1bar)



Ambient / Fluid Temperature
CSA Certified: -10 °F to +150 °F
CE Marking: -15 °C to +70 °C



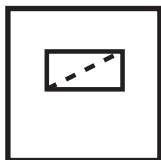
Maximum pressure drop and gas velocity
The maximum pressure drop is limited by the velocity of the gas. Do not exceed a gas velocity of 30 meters/s.



Gases
Dry, natural gas, propane, butane; other noncorrosive gases. Suitable for up to 0.1% by volume, dry H₂S. 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: Aluminum
Sealings on valve seats: NBR-based rubber



Strainer
23 Mesh, installed in the housing
Filter
Mesh <0.05 mm, installed in the housing

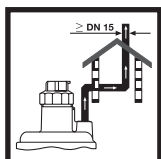


Hysteresis and Droop

Hysteresis/repeatability is less than 10 % for up to 7 PSI inlet. Average droop at 20:1 turndown is 10 % for up to 7 PSI

Lock-Up Rating

- The FRI meets the ANSI Z21.80/ CSA 6.22 as Class I, which allows lockup rating not more than 150 % or 5 in. W.C., whichever is greater.
- The FRI meets EN 88-1 as SG30, which allows lock-up as high as + 30 % of the outlet pressure.
- See lock-up Pressure Parameter on page 2 for more details



Vent Limiting Device and Vent Line Connection

The FRI/6 has an internal, factory installed vent limiter, which limits the escape of gas to less than 0.5 CFH @ 5 PSI in case atmospheric diaphragm ruptures. Vent limiting device also complies with EN 88-1 & ISO 23551-2. Venting required unless otherwise accepted by the authority having jurisdiction.

Body Size

Size

FRI 705/6 & 707/6

1/2" - 1" NPT

FRI 710/6 & 712/6

1" - 2" NPT

Lock-up Pressure Parameters

Per ANSI Z21.80, lock-up is defined as an outlet pressure not more than 150 % or 5 in. W.C, whichever is greater, above the setpoint after a downstream safety shutoff valve closes within 2 seconds, and the two following conditions exist:

1. outlet pressure is set to the highest set point of the spring, and
2. the regulator is set to maximum capacity or flow at which the regulator will control lockup pressure within the acceptable limits.

This means that in a given application, a lockup greater than 150% or 5 in. W.C could occur, depending out the inlet pressure, the outlet pressure of the regulator, the flow rate of the regulator, and the pipe volume downstream the regulator and upstream the safety shutoff valve.

Per DUNGS, lock-up is +30 % of the outlet pressure setting after downstream shutoff valve slowly closes within 30 seconds. Therefore, in a given application, a lockup greater than +30% or 5 in. W.C could occur, depending on the inlet pressure, the outlet pressure of the regulator, the flow rate of the regulator, and the pipe volume downstream the regulator and upstream the safety shutoff valve.

If in a given application the lock-up pressure is too high, employing one or more of the following should reduce the lock-up pressure:

1. Increase the size of the regulator.
2. Increase the pipe volume downstream the regulator and upstream the safety shutoff valve.
3. Decrease the inlet pressure.
4. Decrease the outlet pressure.
5. Reduce the flow rate.
6. Remove vent line, if installed.

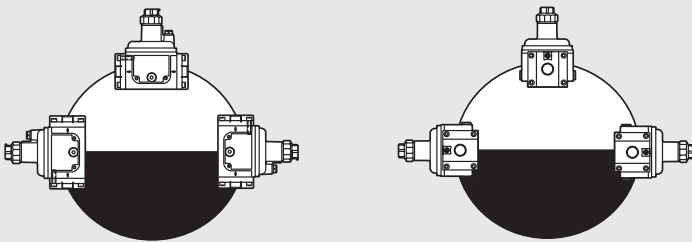
Regulator Orifice Diameters

Regulator Type	Orifice Diameter (mm)
FRI 705/6	17.0
FRI 707/6	24.0
FRI 710/6	29.0
FRI 712/6	37.5

Mounting

Recommended Mounting Procedure

Regulator dome from vertically upright to lying horizontally



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

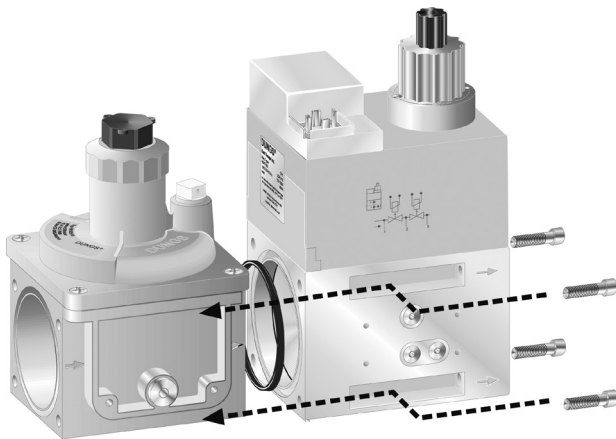
Mounting & Installation

- The regulator can be mounted either upstream or downstream of the DMV. It can also be mounted as a stand alone regulator using two flanges and the flange mounting kit.
- The main gas supply must be shut off before starting the installation.
- Examine the regulator for shipping damage.
- The inside of the regulator and piping must be clean and free of dirt.

Recommended Procedure to Mount the FRI/6 regulator to a DMV 701, 702, or 703 series safety shutoff valve.

1. Replace the o-ring in the groove on the side of the DMV body with the oval o-ring supplied with the mounting kit.
2. Make sure the oval o-ring and the groove are clean and in good condition.
3. Install the FRI/6 regulator and DMV series valve with the gas flow matching the direction indicated by the arrows on the body.
4. Attach the regulator to the DMV series valve body using the socket cap bolts supplied in the FRI/DMV mounting kit.
5. Use a 5mm Allen wrench for the FRI 705/6 & 707/6.
6. Use a 6mm Allen wrench for the FRI 710/6 & 712/6.
7. Tighten the bolts in crisscross pattern.
8. Do not overtighten the bolts. Follow the maximum torque values listed below.
9. After installation is complete, perform a leak test to verify that no leakage occurs.

Recommended Torque for Mounting Bolts		
M6	M8	Bolt Size
62	134	[lb-in]



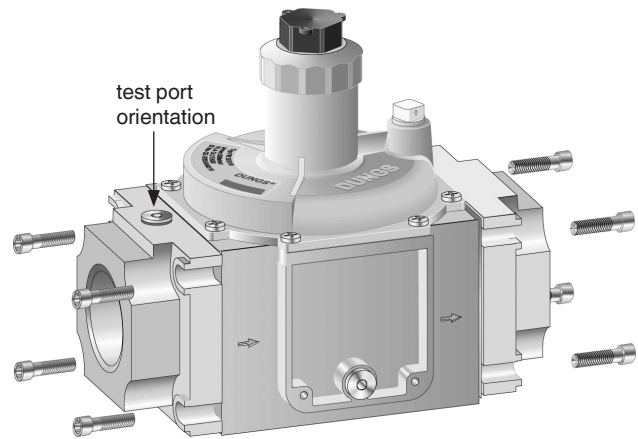
Recommended Procedure to Mount Flanges

1. Make sure the o-rings and the grooves are clean and in good condition.
2. Install the FRI/6 with the gas flow matching the direction indicated by the arrows on the casting.
3. Mount the FRI/6 vertical upright to horizontal.
4. Clean the mounting surface of the flanges. Make sure they are in good condition.
5. Attach the FRI/6 to the flanges using the appropriate M6 or M8 socket cap bolts supplied.

6. Use a 5 mm Allen wrench for the FRI 705/6 & 707/6.
7. For the FRI 710/6 & 712/6, there two options for bolts:
For 1" and 1 1/4" flanges, the M8 x 35 mm bolts must be used.
For 1 1/2" and 2" flanges, the M8 x 40 mm bolts must be used.
8. Tighten the bolts in a crisscross pattern.
9. Do not overtighten the bolts. Follow the maximum torque values below.
10. After installation is complete, perform a leak test.

Recommended Torque Bolts

M6	M8	Blot Size
62	134	[lb-in]



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

Recommended Piping Procedure & Applying Pressure

- 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 regulator 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 using 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.



When first applying pressure, open the inlet manual shutoff valve slowly. Quickly opening the inlet manual shutoff valve can permanently rupture the internal, balancing diaphragm.

- After installation is complete and pressure is applied, perform a leak test.

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]

Pressure Taps

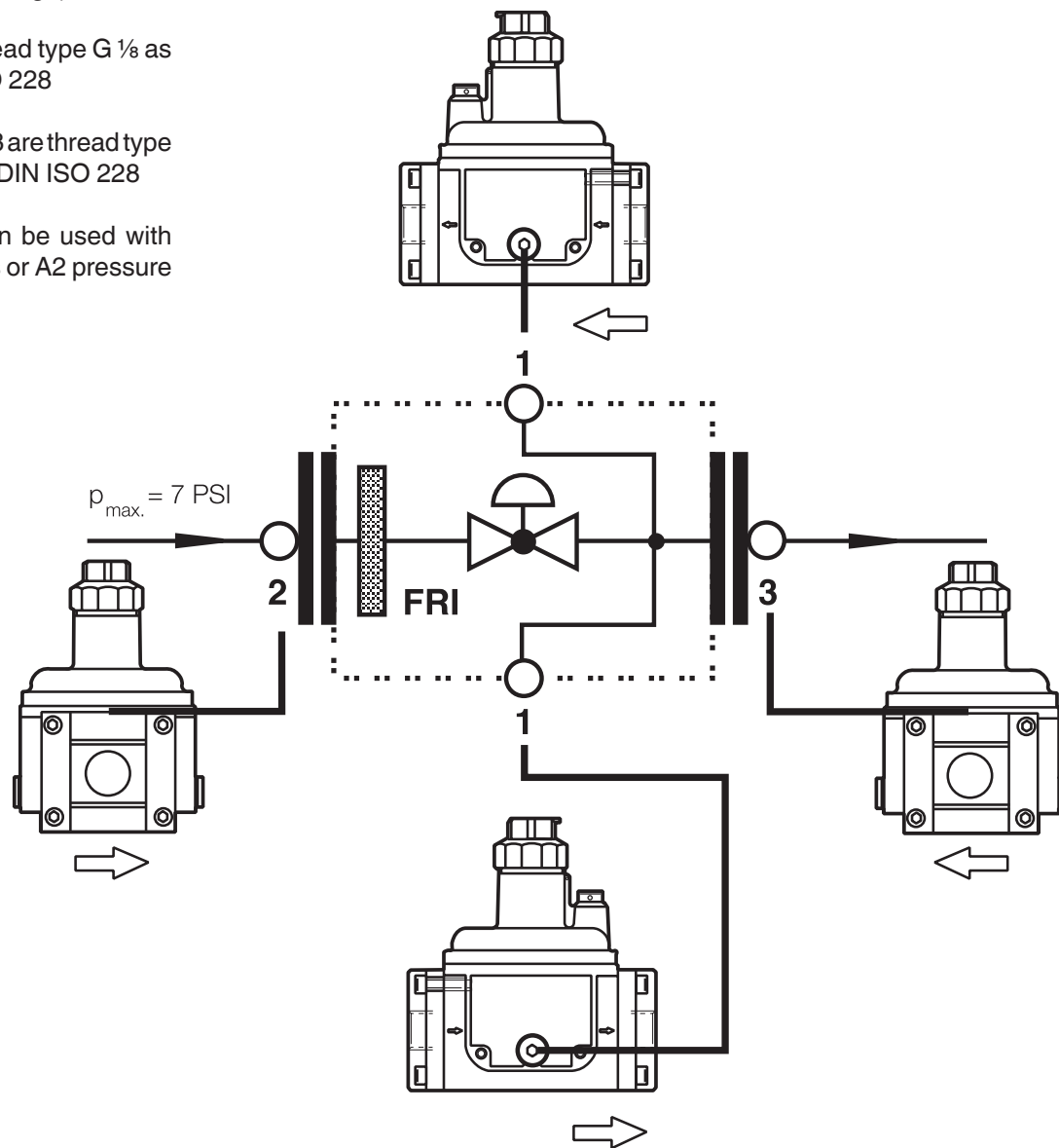
FRI pressure ports

1, 2, 3 (Ports 2 and 3 are located on flange)

Port 1 is thread type G $\frac{1}{8}$ as per DIN ISO 228

Ports 2 and 3 are thread type G $\frac{1}{8}$ as per DIN ISO 228

All ports can be used with accessories or A2 pressure switches.



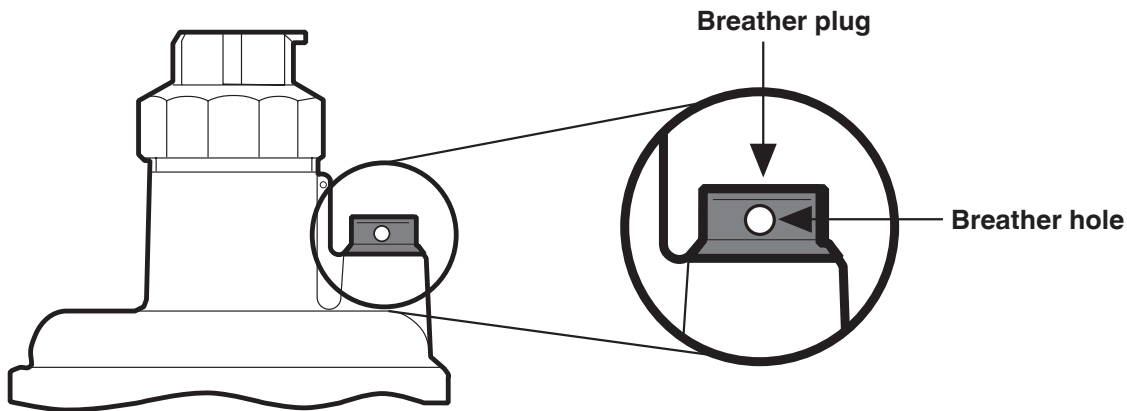
Breather Plug

- All FRI's have a breather plug that threads into the regulators's vent connection.

Do not removed plastic breather plug unless venting outdoors is required.

This plug is not the vent limiter, and it prevents debris from entering the upper chamber of the regulator. Debris in the upper chamber of the regulator will adversely affect regulator performance.

- The FRI regulator must also be able to exchange air through the breather hole in order to properly regulate. Do not plug the breather hole, and clean it out if necessary.



Vent Limiting Device & Vent Line Connection

Vent Limiting Device

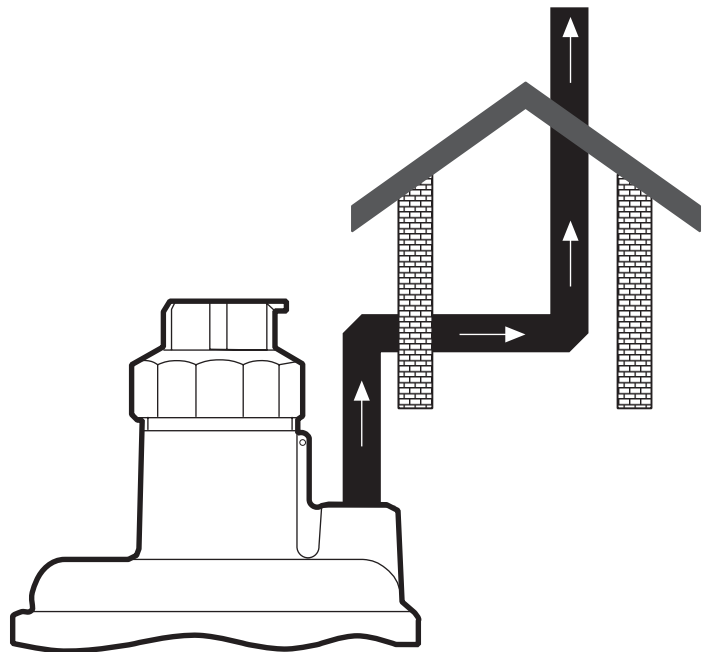
The FRI/6 series regulator contains an internal, factory installed vent limiting device, which limits the escape of gas to less than 0.5 CFH @ 5PSI in case atmospheric diaphragm ruptures. Venting required unless accepted by the authority having jurisdiction.

Vent Line Requirements

- Follow the local code for vent sizing and termination requirements. In the absence of local codes, follow National Fuel Gas Code NFPA 54, the International Fuel Gas Code or the CSA B149.1 installation code for venting requirements.
- Terminate the vent to an approved location.
- At the point of termination, the vent line must be protected from insects and water intrusion. It is highly recommend to install an insect screen and terminate the pipe with the exit facing downwards to prevent rain water from entering.

Installation Procedure

- If venting is required, the vent line is to be connected to the upper dome of the FRI regulator as illustrated.
- Remove the beather plug.
- On indoor installations requiring venting outdoors, run the piping as short and as direct as possible.
- The vent connection is G 1/4. G 1/4 to 1/4"NPT adapter is available: (P/N 231944) with replacable gasket(P/N 171260).



In the absence of venting codes and where venting is required, each regulator must be vented separately from all other vents.

Operation & Maintenance

Start-Up

- The inlet and outlet shut off valves should both be closed.



Quickly opening the inlet manual shutoff valve can permanently rupture the internal, balancing diaphragm.

- Slowly open the inlet manual shutoff valve just enough to allow inlet pressure to gradually build up to the inlet of the regulator until the system is fully pressurized.
- Slowly open the outlet shut off valve(s) to allow a small flow.

Set-Point Adjustment

1. Remove the black adjustment cover.
2. To increase the outlet pressure set point, turn the adjustment spindle clockwise with a screw driver.
3. To decrease the outlet pressure set point, turn the adjustment spindle counterclockwise with a screw driver.
4. Always use an accurate pressure gauge connected downstream from the regulator to measure the actual outlet pressure.
5. Re-install black adjustment cover.
6. After adjusting the set point for normal operation verify that the gas pressure regulator operates as intended.



During start-up, a pressure gauge must be used to read the setpoint of the regulator outlet pressure. After the safety shutoff valves are closed, the outlet pressure must not exceed the setpoint by more than 30 %. If the outlet pressure exceeds 30 % of the setpoint, see section on page 2 for lock-up pressure.



While adjusting the outlet pressure of the regulator, confirm that adjusting the outlet pressure does not create a hazard to the burner.

Outlet Pressure Spring Replacement



Head Injury Risk: Never have head above or near the aluminum cap when removing regulator spring. The spring tension can be high enough to rapidly eject the aluminum cap with a large force.

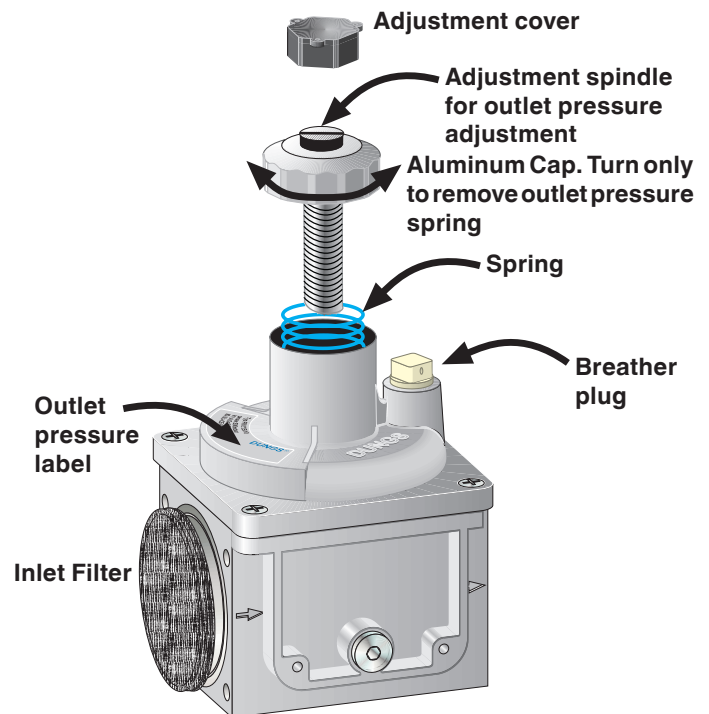
1. Remove the black adjustment cover.
2. Release spring tension by turning the adjustment spindle completely counterclockwise with a screwdriver.
3. Remove the aluminum cap.
4. Remove existing spring and insert new spring.
5. Re-install adjustment spindle (hand tighten only) and adjust to desired outlet pressure. Follow the setpoint adjustment instructions.
6. Re-install the adjustment cover, and apply the new outlet pressure label onto the name plate.

Filter

- Inspect the filter at least once a year.
- Replace the filter if the pressure drop across the filter is more than 4" W.C.
- Replace the filter if the pressure drop across the filter is more than twice as high as the first installation inspection.

Filter Change

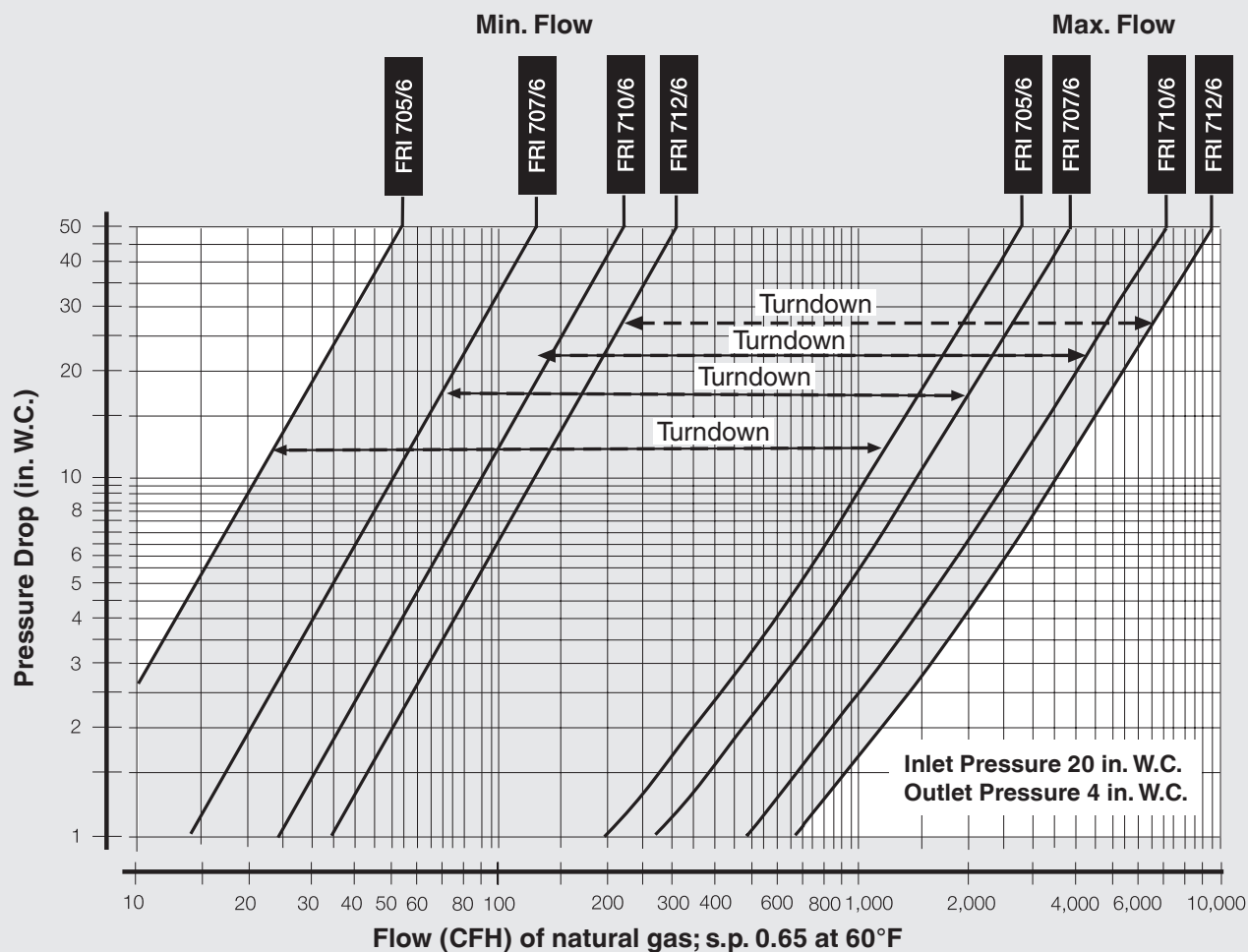
1. Remove the FRI/6 by following the mounting instructions in reverse order.
2. Remove the support ring.
3. Remove the filter insert.
4. Insert a new filter insert.
5. Press in the support ring.
6. Re-install the FRI/6 following the mounting instructions.
7. Perform a function and leak test.



Flow Curve

Regulator turndown characteristics
with gas filter / in regulated state.

Inlet pressure is 20 in. W.C. and outlet is set to 4 in. W.C.



Approximate flow increase in CFH (natural gas) when removing the integral filter from the FRI.

At a pressure drop of:	FRI 705/6	FRI 707/6	FRI 710/6	FRI 712/6
0.8 in. W.C.	25 CFH	50 CFH	390 CFH	765 CFH
2.0 in. W.C.	35 CFH	70 CFH	480 CFH	940 CFH
4.0 in. W.C.	35 CFH	75 CFH	575 CFH	1180 CFH
8.0 in. W.C.	35 CFH	80 CFH	700 CFH	1510 CFH

Determining equivalent flow through valves using another gas

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

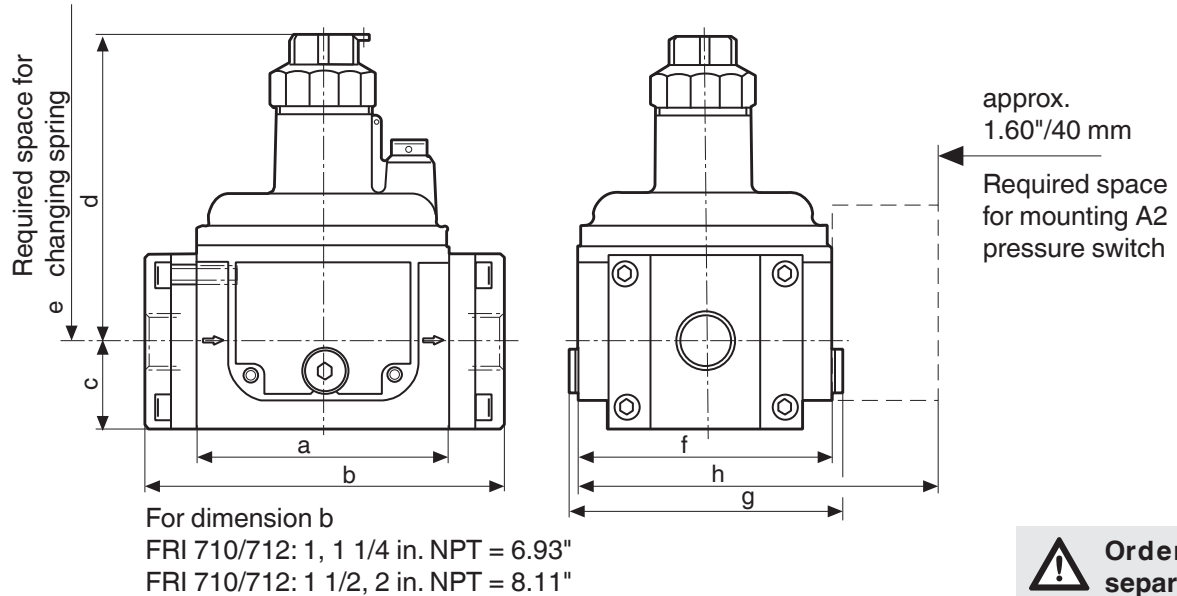
$$f = \sqrt{\frac{\text{Density of Natural gas}}{\text{Density of gas used}}}$$

Type of gas	Density [kg/m³]	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

Outlet pressure springs

Spring #	1	2	3	4	5	6	7	8	9
Spring Range (W.C.)	1 to 3.6	2 to 5	2.8 to 8	4 to 12	10 to 22	12 to 28	24 to 44	40 to 60	60 to 80
Spring color	brown Not CSA	white	orange	blue Standard	red	yellow	black	pink	grey Not CSA
FRI 705/6 - 707/6	229817	229818	229820	229821	229822	229823	229824	229825	229826
FRI 710/6 - 712/6	229842	229843	229844	229845	229846	229847	229848	229849	229850

Dimensions & Part Numbers



Order flanges separately.

Type	Mounts to DMV Type	NPT Flanges	Order No.	Dimensions [inch] Dimensions [mm]								Weight [lbs] [kg]
				a	b	c	d	e	f	g	h	
FRI 705/6	DMV 701	1/2" - 1"	230472	3.6 92	5.6 141	1.3 33	6.0 152	7.7 195	3.8 96	4.1 104	5.5 139	2.0 0,9
FRI 707/6	DMV 701	1/2" - 1"	230473	3.6 92	5.6 141	1.3 33	6.0 152	7.7 195	3.8 96	4.1 104	5.5 139	2.0 0,9
FRI 710/6	DMV 702/3	1" - 2"	230474	4.9 124	6.9/8.1 176/206	1.8 45	6.9 175	9.3 235	5.0 126	5.3 135	6.7 169	3.5 1,6
FRI 712/6	DMV 702/3	1" - 2"	230475	4.9 124	6.9/8.1 176/206	1.8 45	6.9 175	9.3 235	5.0 126	5.3 135	6.7 169	3.5 1,6

Accessories & Replacement

Flanges

Type	Mounts to DMV Type	Flange NPT	Order No.
FRI 705/6 -FRI 707/6	DMV 701	1/2"	222371
FRI 705/6 -FRI 707/6	DMV 701	3/4"	222368
FRI 705/6 -FRI 707/6	DMV 701	1"	221999
FRI 710/6 -FRI 712/6	DMV 702 or DMV 703	1"	222369
FRI 710/6 -FRI 712/6	DMV 702 or DMV 703	1 1/4"	222370
FRI 710/6 -FRI 712/6	DMV 702 or DMV 703	1 1/2"	222003
FRI 710/6 -FRI 712/6	DMV 702 or DMV 703	2"	221997

Stand alone mounting kit (one kit included in each FRI box)

Order No.	Includes
FRI 705/6 & FRI 707/6 224093	Consists of 8 bolts: M6 x 30; 2 x o-rings.
FRI 710/6 & FRI 712/6 224094	Consists of 8 bolts: M8 x 35 for 1" NPT and 1 1/4" NPT, and 8 bolts: M8 x 40 for 1 1/2" NPT and 2". 2 o-rings

DMV mounting kit (one kit included in each FRI box)

Order No.	Includes
FRI 705/707 on DMV 701 219967	4 bolts: M6 x 30 and 1 o-ring.
FRI 710/6 & FRI 712/6 219968	4 bolts: M8 x 45 and 1 o-ring

Filter & Strainer

Order No.	Includes
FRI 705/6 & FRI 707/6 230440	Strainer & Filter
FRI 710/6 & FRI 712/6 230441	Strainer & Filter

We reserve the right to make modifications in the course of technical development.

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