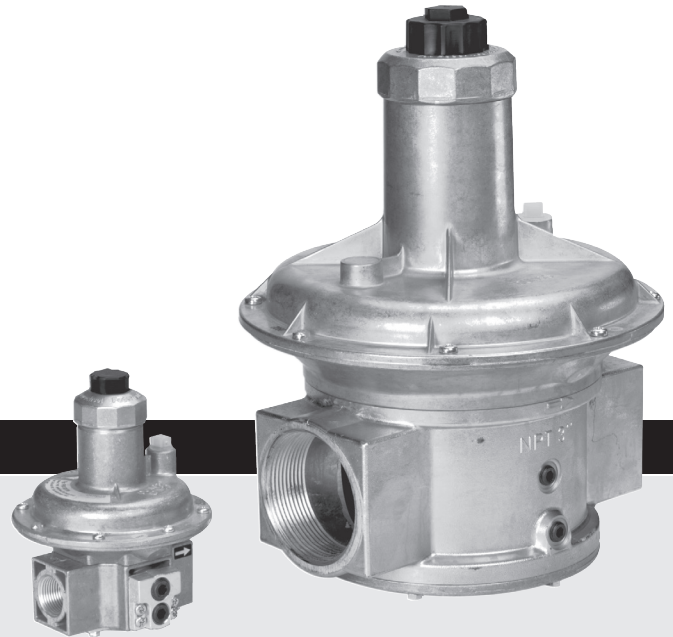



**Table of Contents**

Table of Contents ..... Page 1  
 Approvals ..... Page 1  
 Attention ..... Page 1  
 Specification ..... Page 2  
 Mounting ..... Page 3  
 Pressure Taps/Air Impulse Line/Vent Connection. . Page 3  
 Zero Governor Application ..... Page 4  
 Ratio Regulator Application ..... Page 5  
 Ratio Regulator Biasing Curve ..... Page 6  
 Ratio Regulator Biasing Curve ..... Page 6  
 Low Fire Bypass ..... Page 6  
 Outlet Pressure Adjustment ..... Page 7  
 FRG/6 Flow Curve ..... Page 8  
 Pressure Drop for other Gases ..... Page 8  
 Accessories & Replacement ..... Page 9



**Approvals**

 **CSA Certified: ANSI Z21.18 / CSA 6.3**  
File No. 1135455

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.



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



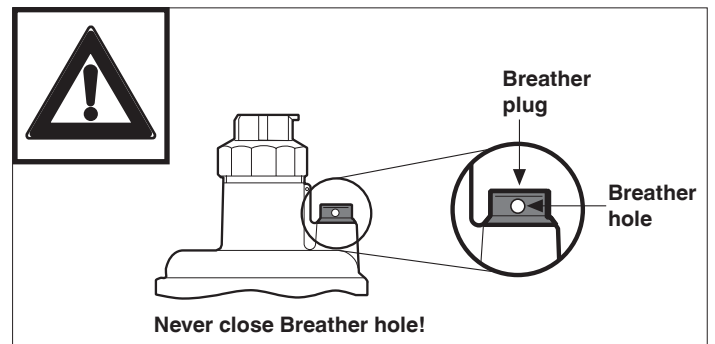
Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at [www.dungs.com](http://www.dungs.com) If these instructions are not heeded, the result may be personal injury or damage to property.



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 or CSA B149.1.



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



**Explanation of symbols**

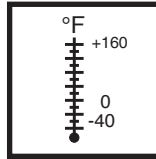
- 1, 2, 3 ... = Action
- = Instruction

## Specification

**FRG/6** Spring-loaded ratio regulator / zero governor with adjustable setpoint spring and defined counterspring. Internal sensing of output pressure; air impulse line connection is standard.



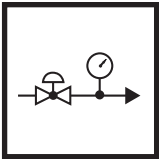
**Max. Operating Pressure (MOP)**  
7 PSI (500 mbar)  
5 PSI (350 mbar) applies to the CSA Certification.



### Ambient / Fluid Temperature

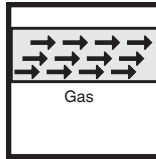
FRG 7../6 series:

- +5 °F to +160 °F for up to 7 PSI for regulating behavior (+/- 10 % of setpoint)
- CSA Certified for -40°F to +160 °F for up to 5 PSI: Diaphragms are suitable for the low temperature, but there may be out of range regulating behavior.



### Optimal Inlet Pressure Range

Ratio Regulator: 3 to 82 in. W.C.  
(7 to 200 mbar)  
Zero Governor: 3 to 20 in. W.C.  
(7 to 50 mbar) with 10:1 turndown.  
Zero Governor: 3 to 82 in. W.C.  
(7 to 200 mbar) with 3:1 turndown.



### Output Pressure Range

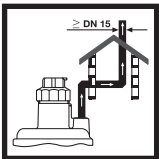
Ratio Regulator: -4 to 60 in. W.C.  
(-10 to 150 mbar)  
Zero Governor: -2 to 1 in. W.C.  
(-5 to 3 mbar)

### Gases

Dry, natural gas, propane, butane; other noncorrosive gases. Suitable for up to 0.1 % by volume, dry H<sub>2</sub>S. 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  
Seals & Diaphragm: NBR-based rubber



### Vent Limiting Device and Vent Line Connection


The FRG/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 & ISO 2355-1. Venting required unless otherwise accepted by the authority having jurisdiction.

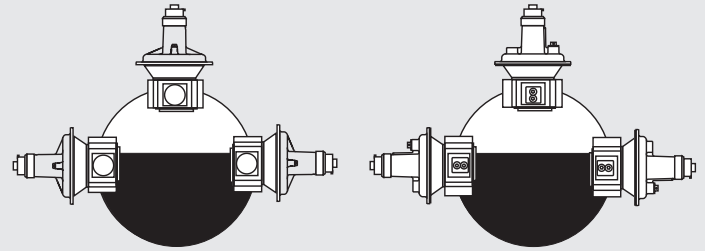
Body Size	Order No.	Size
FRG 705/6	226458	1/2" NPT
FRG 707/6	226459	3/4" NPT
FRG 710/6	226460	1" NPT
FRG 712/6	226461	1 1/4" NPT
FRG 715/6	226462	1 1/2" NPT
FRG 720/6	226463	2" NPT
FRG 725/6	226464	2 1/2" NPT
FRG 730/6	226465	3" NPT

## 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.**




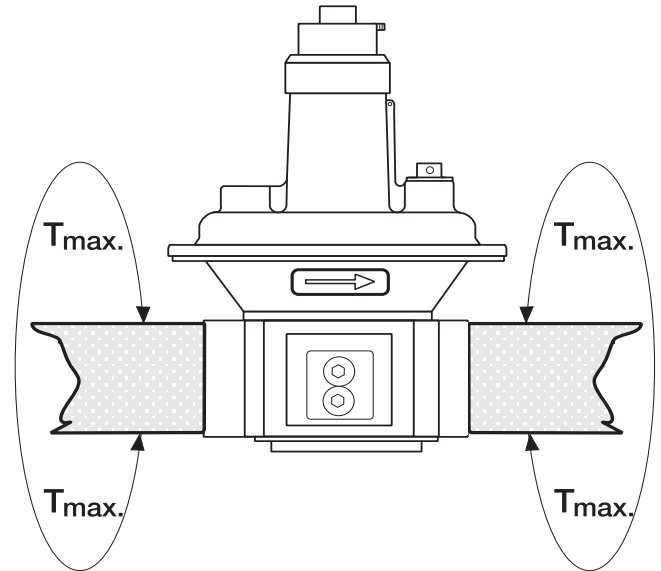
### Recommended Preparation

- The main gas supply must be shut off before starting the installation.
- Read these installation instructions carefully.
- Carefully examine the FRG/6 for shipping damage.
- Remove the two red plastic covers from the FRG/6 body.
- Remove all dirt and debris before installing the FRG/6. Failure to remove dirt/debris could result in damage or improper performance.

### Recommended Procedure to Mount the FRG/6

- Install the FRG/6 with the gas flow matching the direction indicated by the arrows on the casting.
- Mount the FRG/6 with the regulator vertical or horizontal.
- 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 using LP gas, use pipe sealant rated for use with LP gas.
- Do not thread pipe too far. FRG/6 distortion and/or malfunction may result from excess pipe in the valve body. Apply counter pressure with a parallel jaw wrench only to the flats of the FRG/6 when installing pipe.
- Do not overtighten the pipe. Follow the maximum torque values listed.
- After installation is complete, perform a leak test.

 **If the flow is not in the same direction as the arrows, the FRG/6 will not operate properly.**



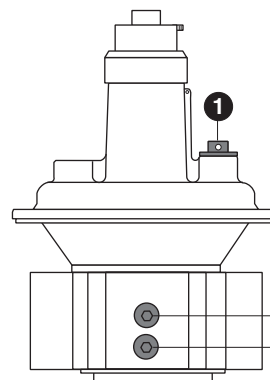
NPT pipe	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
T <sub>max</sub> [lb-in]	443	752	1106	1770	1991	2213	2876	3540

## Pressure Taps/Air Impulse Line/Vent Connection

- As a proportionator, this is an air impulse line connection. As a zero governor, this is a breathing plug or a vent connection.

**NOTE:** All FRGs have a factory installed vent limiting device under the regulator housing. Connection is G 1/4 for FRG 705/6 to FRG 710/6 and G 1/2 for FRG 712/6 to FRG 730/6. G thread to NPT thread adapters are available. G 1/4 to 1/4" NPT adapter (Order No. 231944) and G 1/2 to 1/2" NPT adapter (Order No. 231945).

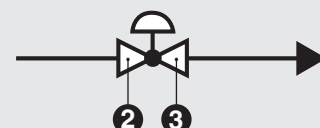
- Pressure tap connection in inlet section, both sides 1/4" NPT.
- Pressure tap connection in outlet section, both sides 1/4" NPT.



### Test Port

When low fire bypass is used, only test ports on one side can be used.

Low fire bypass option for FRG 705/6 - 720/6  
Order No. 225256



## Zero Governor Application

### Application - Zero governor

For use with gas engines or premix burners, the FRG controls flow by reducing upstream gas pressure to zero or adjustable to slightly above or below atmospheric pressure.

The outlet pressure is adjustable with the setpoint spring.

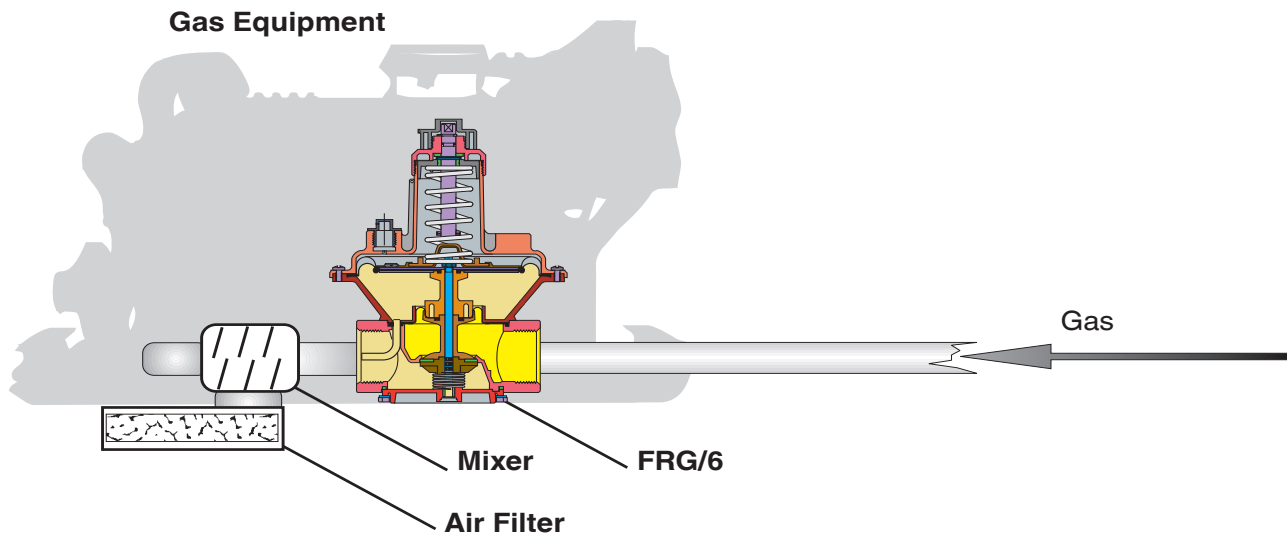
For  $\dot{V}_{\max}$  see flow diagram on page 6.

### Adjusting the FRG/6

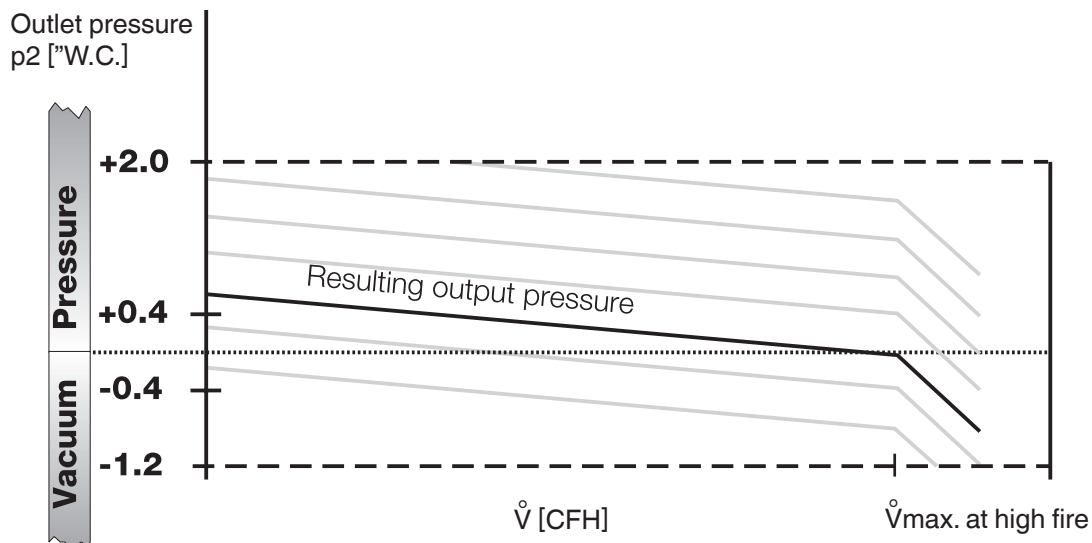
1. For zero governor applications, the FRG should be adjusted at low fire only.
2. If the FRG is not flowing enough gas at the maximum air flow rate, the gas flow can be increased by any of the following:
  - a.) Increase the negative signal to the FRG.
  - b.) Install a larger FRG.



**Do not mount the zero governor upside down.**



### Zero governor outlet pressure



The above illustration shows adjustability (fuel biasing) of the FRG/6 when used as a zero governor. Refer to page 6 for sizing FRG/6 at maximum flow rate.

# Ratio Regulator Application

## Application - Ratio Regulator

The FRG holds a constant gas/air ratio during turndown by varying gas flow to the burner in proportion to the combustion air flow. Adjustable for excess air or gas.

## Setup Procedure

When setting up the FRG/6 and burner for proper ratio at all firing rates, follow the burner manufacturer's instructions. The following procedure contains recommended guidelines only, and they do not supersede the burner manufacturer's procedures for setting up and adjusting the FRG/6 to the burner.

## Low Fire Adjustment

The adjustable top loading spring on the FRG/6 is a low fire adjustment (see outlet pressure adjustment on page 2). If the tension on this spring is at a minimum and there is still too much gas flow at low fire, achieving a lower flow rate is possible by reducing the air impulse line pressure to 2"WC or less. If the air impulse line pressure cannot be reduced, a lower flow rate can be achieved by installing a smaller FRG/6.

In order to achieve a low fire flow rate in the range of 20-100 CFH, a field mountable low fire bypass restrictor (225256) is recommended. See "Flow curve for Low fire bypass" on page 5 for more details. When using the low fire bypass restrictor, it is recommended that the top loading

spring be adjusted so that the FRG/6 regulating disc opens just as the impulse line increases during the ramp-up cycle. If the loading spring tension is too small, there will be a delayed increase of fuel flow as the air flow increase until the loading line pressure is greater than the counterspring force, and the result can be a lean burner over a small range of inputs near low fire.

**CAUTION:** Multiple burners and low fire adjustment. It is not recommended to use a control scheme or gas piping scheme that does not equally distribute the gas pressure to each burner at low fire. Examples of such schemes could include using one FRG/6 to control the gas flow to more than one burner, or using one air control valve to feed two FRG's and a second air control valve to feed three FRG's. Such a control scheme will likely not allow for optimal low fire adjustment at each burner.

**CAUTION:** Purge and low fire start. A burner (or set of burners) that light immediately after a purge that is longer than 60 seconds can cause a 5-20 second (depending on the purge pressure) slightly fuel rich condition at the low fire start. If such a case occurs, it is recommended that the loading line pressure during the purge be vented, or that lighthoff be delayed just long enough to eliminate the slightly fuel rich condition at the low fire start.

## High Fire Adjustment

Additional adjustments might be needed at high fire, depending on the type of burner, piping arrangement, flow, air impulse line pressure, and the model of FRG/6 installed on the burner. **NOTE:** The burner might have an integrated gas limiting valve or an air balancing valve (see illustration below). If these are not provided on the burner, installing them might be needed in order to achieve the correct ratio at high fire.

In cases where the high fire rate is fuel rich, partially close the gas limiting valve located downstream of the FRG/6 in order to achieve proper ratio. This adjustment reduces the gas pressure in the burner without affecting the air pressure. Re-adjust the low fire ratio if needed.

In cases where the high firing rate is fuel lean, first verify that the inlet gas pressure to the FRG/6 is and remains at least 2"WC higher than the air impulse line pressure at high fire. If there is suitable inlet gas pressure to the FRG/6, then more fuel to the burner can be accomplished by either installing a larger FRG/6 or by partially closing the air balancing valve located downstream of the control valve to achieve proper ratio; this adjustment reduces the air pressure in the burner and increases the impulse line pressure on the FRG/6. Re-adjust the low fire ratio if needed.

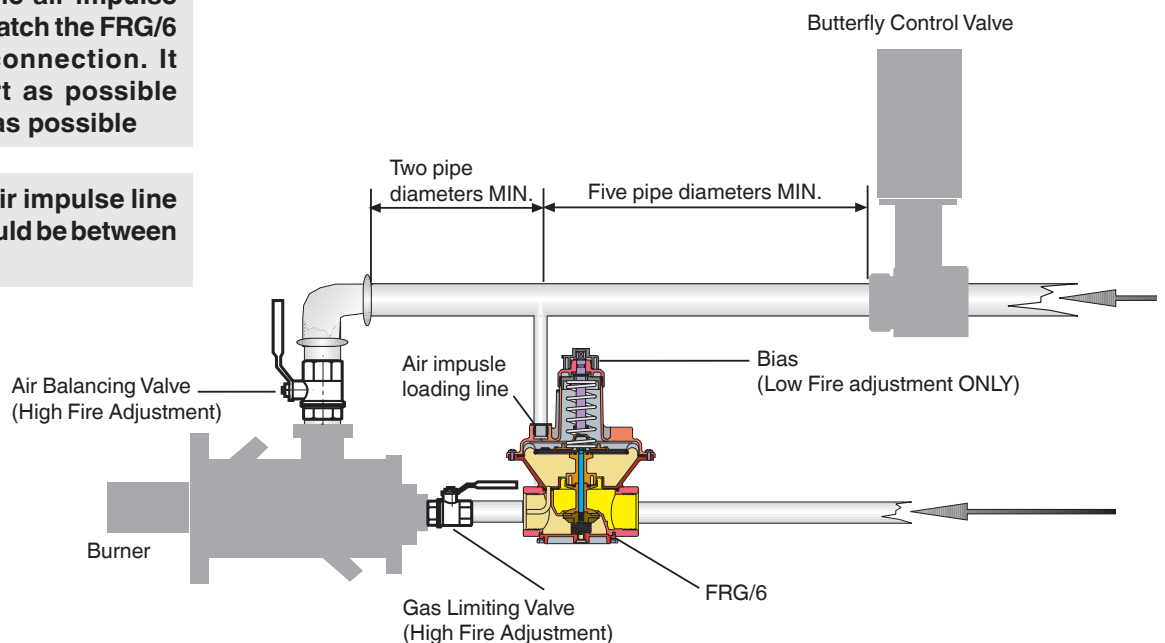
## Adjusting the FRG/6

See outlet pressure adjustment on page 2.

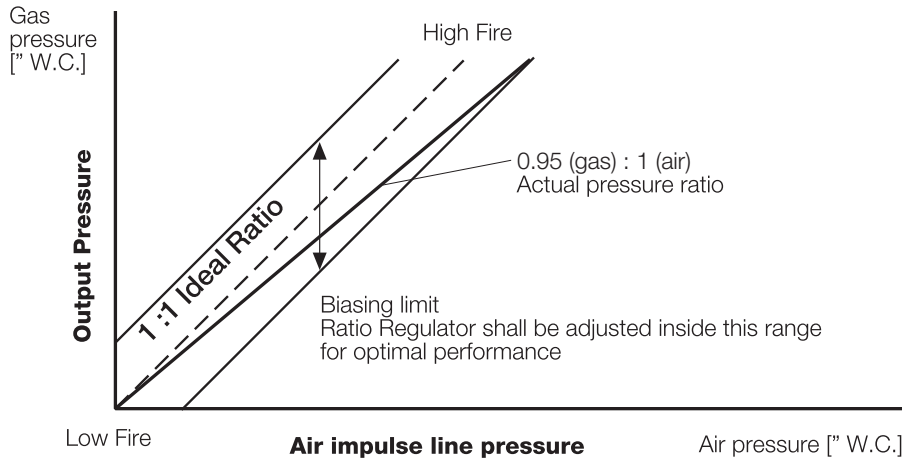
**⚠ The size of the air impulse line should match the FRG/6 air impulse line connection. It should be as short as possible with as few bends as possible**

**⚠ The low fire air impulse line pressure should be between 0.2 and 1.0 In. W.C.**

**⚠ Do not mount the FRG upsidedown.**



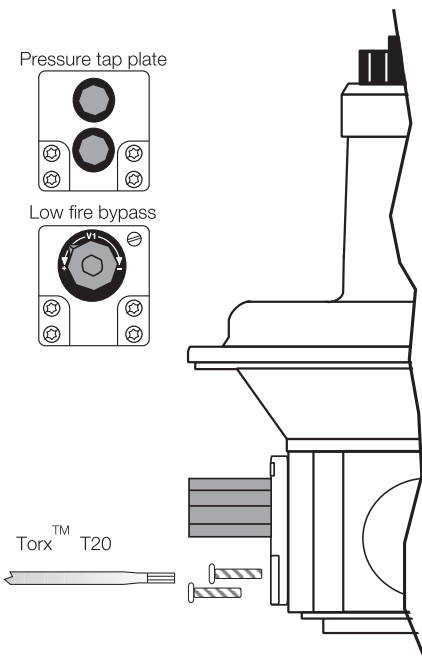
# Ratio Regulator Biasing Curve



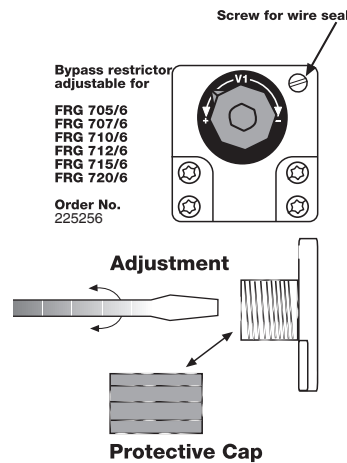
The above illustration shows that the air impulse line can be adjusted to achieve excess air, excess gas, or on ratio at low fire. However, the air impulse line slightly exceeds the gas outlet pressure at high fire rate.

## Low Fire Bypass, Please note: only FRG 705/6 - 720/6

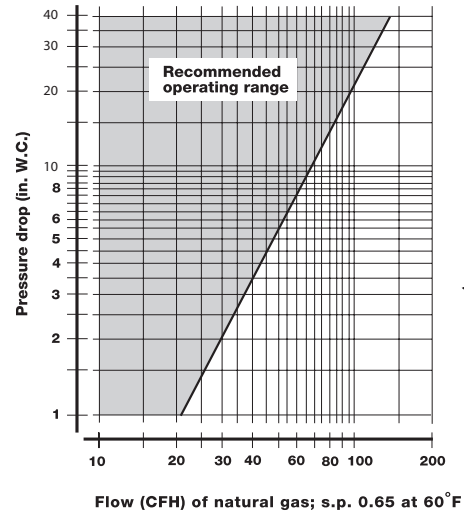
### Mounting of low fire bypass



### Low fire bypass Flow adjustment



### Flow Curve for Low fire bypass



**Low fire bypass max. Torque 1.85 Lb-in.**

**The low fire bypass is factory set for maximum flow.**

### Mounting the Low Fire Bypass

1. Remove the pressure tap plate with a Torx™ driver size T20.
2. Line up the low fire bypass making sure that the O-ring is seated correctly. Reinstall with the screws from the pressure tap mounting plate.
3. Perform a leak test after torquing the low fire bypass.


### Adjusting the Low Fire Bypass

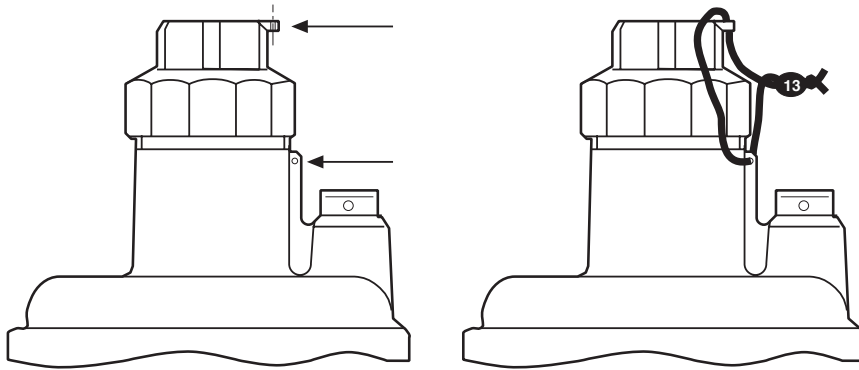
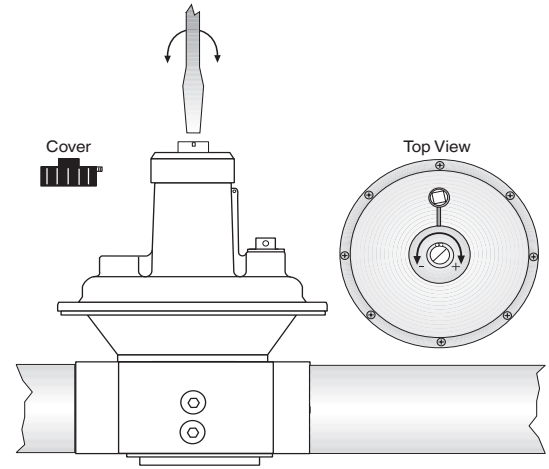
1. Remove the black cover
2. With a slotted screwdriver turn the adjustment screw clockwise for LESS gas and counter clockwise for MORE gas flow.
3. Secure cap with a wire seal.

## Outlet Pressure Adjustment

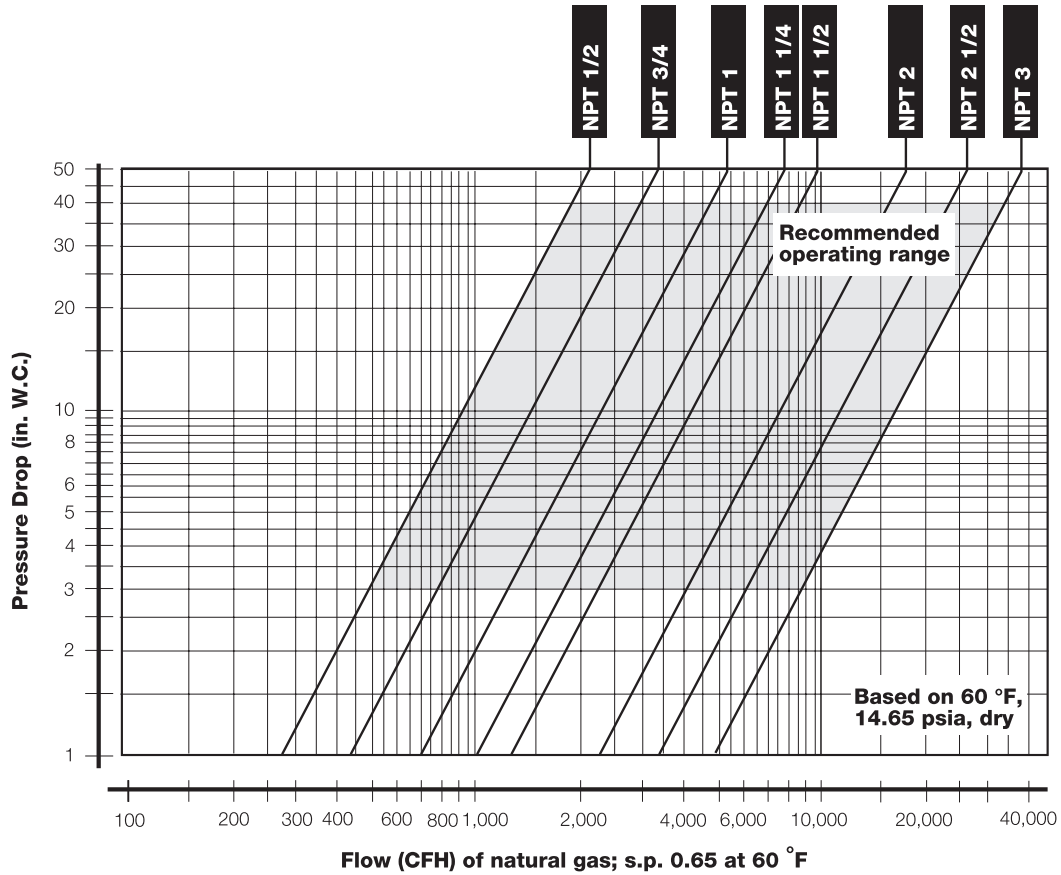
### Adjusting the FRG/6

1. Remove the black cover.
2. To increase outlet pressure turn the adjustment spindle clockwise, to decrease the outlet pressure turn the adjustment spindle counterclockwise.
3. Always use an accurate pressure gauge connected downstream from the regulator to measure the actual outlet pressure.
4. Reinstall the black cover.
5. After adjusting the set point for normal operation check to see that the gas pressure regulator operates as intended.
6. Use holes in the black cover and the side of the regulator to secure a lead seal to prevent unauthorized adjustment.

 **An internal adjustment limits (but does not prevent) the risk of a gas rich flame.**



# FRG/6 Flow Curve



A minimum of 3 in. W.C.  $\Delta p$  is required when sizing at maximum flow capacity for optimal control on high turndown applications (40:1). A 2 in. W.C.  $\Delta p$  can be applied for sizing if a lower turndown (in the range of 10:1) is required. Sizing the FRG/6 using a 1 in. W.C.  $\Delta p$  or less is not recommended for most applications.

## 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 <sup>3</sup> ]	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



**Accessories & Replacement**

**FRG & FRNG Repair Kits**

Description	Diaphragm / Repair Kit Order No.
FRG 705/6	Not available
FRG 707/6	Not available
FRG 710/6	Not available
FRG 712/6 & 715/6	Not available
FRG 720/6	229658
FRG 725/6	229659
FRG 730/6	229660

**Replacement Bias Spring / Loading Springs**

Description	Order No.	
FRG 705/6	229817 (Bias Spring / Loading Spring)	
FRG 707/6	229833 (Bias Spring / Loading Spring)	
FRG 710/6	229842 (Bias Spring / Loading Spring)	
FRG 712/6 & 715/6	229851 (Bias Spring / Loading Spring)	
FRG 720/6	229874 (Bias Spring / Loading Spring)	
FRG 725/6	229883 (Bias Spring / Loading Spring)	
FRG 730/6	229883 (Bias Spring / Loading Spring)	

**Replacement Parts**

Description	Order No.	
Bypass Adapter (Restrictor)	225256 (Bypass Adapter for FRG up to 2")	
Side plate (with two 1/4" NPT taps)	225132 (Includes gasket but not mounting screws)	

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



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