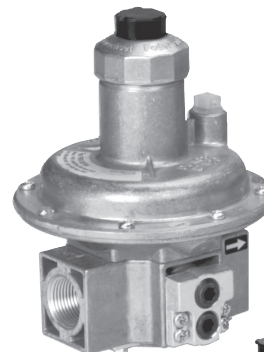
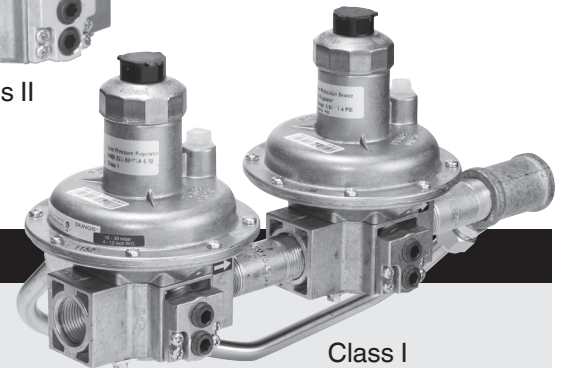


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Class II



Class I

Approvals



FRS 7../6 series are CSA Certified: ANSI Z21.80 / CSA 6.22

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.



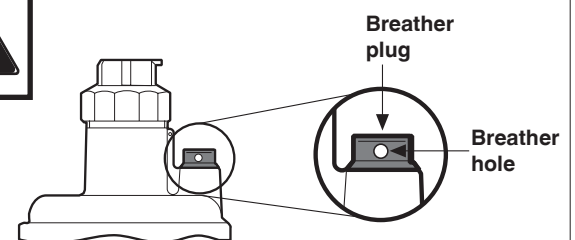
Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com. If these instructions are not heeded, the result may be personal injury or damage to property.

**IFGC
UL CSA
ANSI
NFPA**

This product is intended for installations covered by, but not limited to, the following codes and standards: NFPA 54, International Fuel Gas Code, and CSA B149.1



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

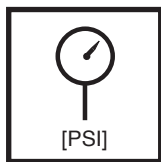


Explanation of symbols

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

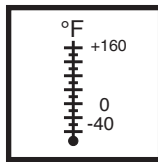
Specification

FRS The FRS series balance type, pressure regulator is a spring-loaded pressure regulator with adjustable setpoint spring and an internal sensor for regulating output pressure.



Max. Operating Pressure (MOP)
5 PSI (350 mbar)

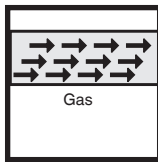
Output pressure range
Adjustable with different springs
1 - 15" W.C. as Class I
16" W.C. - 2 PSI as Class II



Ambient / Fluid Temperature
FRS 7.../6 series:
CSA Certified: -20 °F to +160 °F



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.

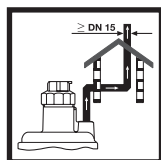


Gases

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 & Steel
Seals & Diaphragm: NBR-based rubber.



Vent Limiting Device and Vent Line Connection

The FRS/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.



Droop and Hysteresis

Hysteresis 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 FRS meets the ANSI Z.21.80/ CSA 6.22 as Class I, which allows lockup rating not more than 150 % or 5 in. W.C, whichever is greater.
- The FRS meets EN 88-1 as SG30, which allows lock-up as high as +30 % of the outlet pressure.
- See Lock-up Pressure Parameters on page 3 for more details.

Body Size	Size	Order No. Class I	Order No. Class II
FRS 705/6	1/2" NPT	267002	269319
FRS 707/6	3/4" NPT	269320	267004
FRS 710/6	1" NPT	269321	267006
FRS 712/6	1 1/4" NPT	269322	267008
FRS 715/6	1 1/2" NPT	267010	269323
FRS 720/6	2" NPT	267012	267013
FRS 725/6	2 1/2" NPT	269325	269326
FRS 730/6	3" NPT	269328	269329

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 with 2 seconds, and the two following conditions exists:

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 lock-up 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, closing time of safety shutoff valves, and the pipe volume downstream the regulator and upstream the safety shutoff valve.

Per DUNGS & EN 88, 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 out the inlet pressure, the outlet pressure of the regulator, the flow rate of the regulator, closing time of safety shutoff valves, and the pipe volume downstream the regulator and upstream the safety shutoff valve.

Lock-up Pressure Spike

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

1. Increase the size of the regulator.
2. For standard applications, increase the pipe volume downstream the regulator and upstream the safety shutoff valve. For a commercial appliance using a combination valve with a zero governor, installing the FRS within 1-2 feet of the appliance will help minimize the lock-up pressure.
3. Decrease the inlet pressure.
4. Decrease the outlet pressure.
5. Reduce the flow rate.
6. Disconnect vent line, if installed.
7. Use the external impulse option (see page 7). This will typically reduce the lock-up pressure by 10 %.
8. Install a token relief valve.

Lock-up Pressure Creep

If the lock-up pressure slowly increases over time, the regulating disc is dirty or damaged or the regulator is defective. In most cases to correct this condition, the regulator must be replaced.

Mounting Preparation

Mounting Preparation FRS 7.../6 & FRS 5... Flanged

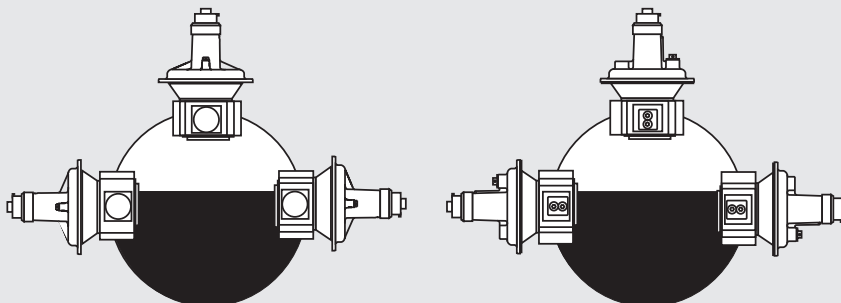
- The main gas supply must be shut off before starting the installation.
- Carefully examine the unit for shipping damage.
- Before installing the FRS in a new or in an extension of an existing gas piping system or if the pressure of an existing gas piping system has been increased, verify one of the following:
 1. The upstream gas piping system has been cleaned per NFPA 54, Section 8.1.1 under Inspection, Testing, and Purging or per NFPA 86, Section 6.2.4.2 under Piping and Fittings.

2. A gas filter with maximum 0.05 mm mesh is install upstream of the FRS using as few pipe fittings as possible. A smaller mesh may be required depending on the debris.

- Failure to remove dirt/debris could result in damage or improper performance.

Recommended Mounting Procedure

Regulator dome from vertically upright to horizontal



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

Mounting & Installation

Procedure to mount the FRS 7../6 using internal impulse or external impulse

For best performance, install a 50-60 micron mesh gas filter upstream of FRS using only one pipe nipple. The shorter the nipple the better. This protects the lockup feature from damage due to debris.

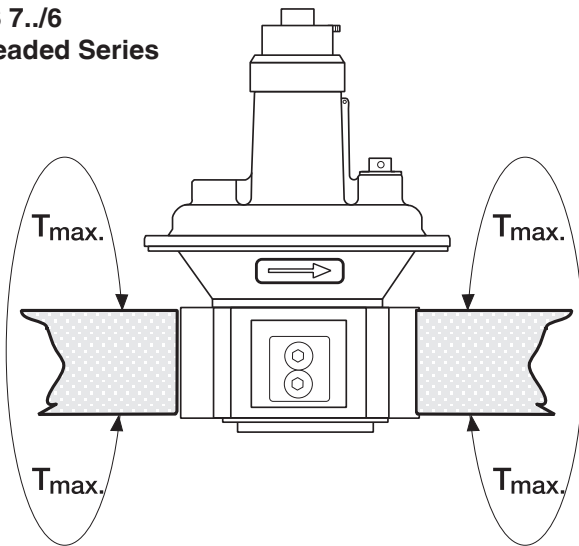
If using the internal impulse line, then proceed with steps 1-8. If using the external impulse line, read instructions in **Additional requirements to Mount the FRS 7../6 using external impulse** before proceeding with steps 1-8.

1. Install the FRS.../6 with the gas flow matching the direction indicated by the arrows on the casting.
2. Mount the FRS.../6 with the regulator dome vertical or horizontal.
3. Use new, properly reamed and NPT threaded pipe free of chips.
4. 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.
5. Do not thread pipe too far. FRS.../6 distortion and/or malfunction may result from excess pipe in the valve body.
6. Apply counterpressure with a parallel jaw wrench only to the flats of the FRS.../6 when installing pipe.
7. Do not overtighten the pipe. Follow the maximum torque values listed
8. After installation is complete, perform a leak test using a soapy water solution.



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

FRS 7../6 Threaded Series



NPT pipe	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
T _{max} [lb-in]	443	560	750	875	940	1190	1310	1310



Do not overtorque threaded connection or bolts. Permanent damage will occur.

Additional requirements to mount the FRS 7../6 using external impulse

If using the external impulse, the internal impulse must be sealed. See page 7 "External Impulse" before mounting the FRS.

2. **If mounting in a gas piping system:** Mount the FRS upstream the manual isolation valve for the appliance, and terminate the external impulse line at a 1/4" side tap of the manual isolation valve, or terminate the external impulse line into pipe T as close as possible to the upstream side of the manual isolation valve. Best to use a manual isolation valve with one 1/4" side tap.
3. **If mounting in a gas train:** Terminate the external impulse line into pipe T as close as possible to the upstream side of the first safety shutoff valve for the appliance.

Recommended materials for external impulse line

- a. **Tubing/Piping:** Use 1/2" copper tubing [port needs to be at least 7mm (9/32")]. Do not reduce the internal port of the 1/4" external line. Reducing the line diameter reduces lockup pressure performance. Sched 40 is acceptable, but do not use Sched 80.
- b. **Fittings:** Use
 - i. 1/2" Tube OD x 1/4" Male ISO tapered (Rc) thread (Male ISO tapered) to connect tubing to FRS (p/n 267783).
 - ii. 1/2" Tube OD x 1/4" NPT to connect tubing to 1/4" NPT fitting (p/n 267784).

NOTE: There are no limits for required pipe lengths immediately downstream of the FRS, except no changes in pipe size within 5 pipe diameters downstream of the FRS.

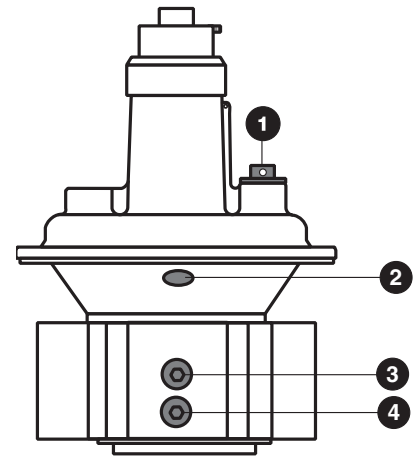


If the flow is not in the same direction as the arrows, the FRS will not operate properly.

Pressure Tap Connections

Pressure Taps - FRS 7../6 Threaded Version

- 1 Vent/breather connection
FRS 705/6 - FRS 710/6, G 1/4 in.
FRS 712/6 - FRS 730/6, G 1/2 in.
- 2 External feedback pressure connection
FRS 705/6 - FRS 710/6, G 1/8 in. - one side.
FRS 712/6 - FRS 730/6, G 1/4 in. - both sides.
- 3 Upstream pressure connection
FRS 705/6 - FRS 710/6, 1/4 in. NPT - one side.
FRS 705/6 - FRS 710/6, G 1/4 in. - one side.
FRS 712/6 - FRS 730/6, 1/4 in. NPT - both sides.
- 4 Downstream pressure connection
FRS 705/6 - FRS 710/6, 1/4 in. NPT - one side.
FRS 712/6 - FRS 730/6 1/4 in. NPT - both sides.



When using external impulse line, the internal impulse line must be sealed with RTV.

Outlet Pressure Spring Selection

Outlet Pressure Spring Selection (outlet pressure values are for horizontal pipe mounting)

The output pressure is controlled by the force of the adjustable spring. The pressure regulator is supplied with the blue spring No. 4. By exchanging springs, other output pressures can be attained. Subtract 1"W.C. when mounted vertically.

FRS 7../6 Type	Order No. as Class I	Regulator Outlet pressure range as Class I	Monitoring Regulator as Over- pressure Protection device. Outlet Pressure Protection Range
FRS 705/6	267002	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 707/6	269320	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 710/6	269321	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 712/6	269322	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 715/6	267010	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 720/6	267012	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 725/6	269325	4 - 12 in. W.C.	10 - 22 in. W.C.
FRS 730/6	269328	4 - 12 in. W.C.	10 - 22 in. W.C.

FRS 7../6 Type	Order No. as Class II	Regulator Outlet pressure range as Class II
FRS 705/6	269319	24 - 40 in. W.C.
FRS 707/6	267004	24 - 40 in. W.C.
FRS 710/6	267006	24 - 40 in. W.C.
FRS 712/6	267008	24 - 40 in. W.C.
FRS 715/6	269323	24 - 40 in. W.C.
FRS 720/6	267013	24 - 40 in. W.C.
FRS 725/6	269326	24 - 40 in. W.C.
FRS 730/6	269329	24 - 40 in. W.C.

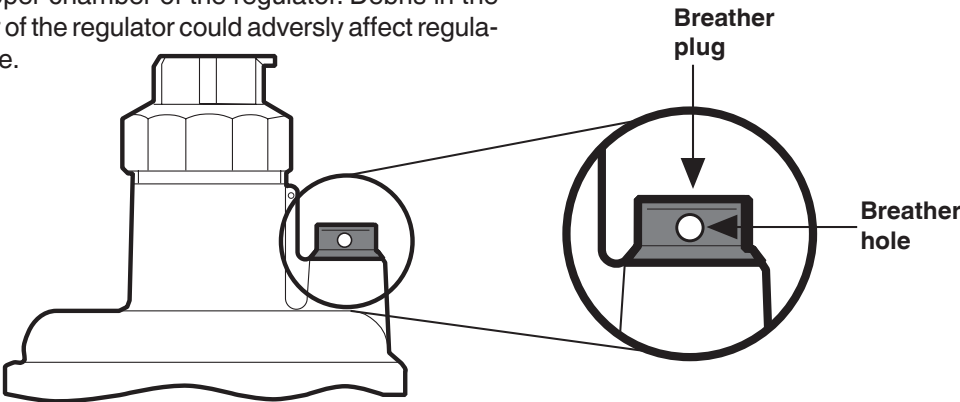
Breather Plug

- All FRS's have a breather plug that threads into the regulator's vent connection.
- The FRS regulator must also be able to exchange air through the breather hole in order to properly regulate. Do not plug the breather hole. Clear out if necessary.



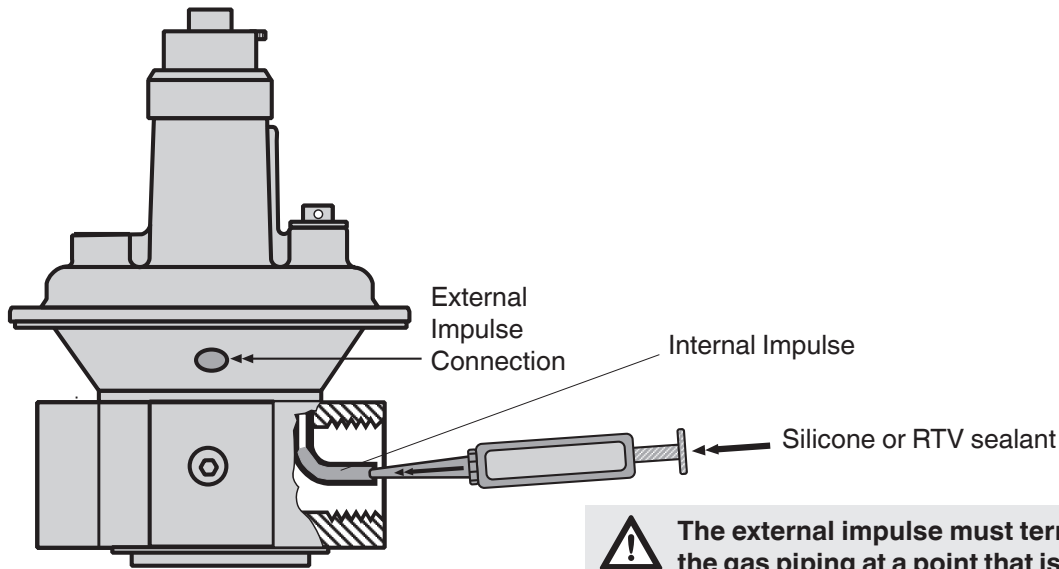
Do not removed plastic breather plug unless venting outdoors is required.

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 could adversely affect regulator performance.



External Impulse

- When it is desirable to use the external impulse as the feed-back for the regulator, the internal impulse must be plugged. Seal the internal impulse connection with a silicone or RTV sealant suitable for exposure to natural gas, propane, or butane.
- The external impulse must be properly terminated and made of a durable, metal material that is suitable for gas service.



⚠ The external impulse must terminate back into the gas piping at a point that is upstream of the two safety shutoff valves in series.

Vent Limiting Device, Backloading & Venting

Vent Limiting Device

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

Backloading Requirements

If the vent line connection is backloaded with an air pressure, the air pressure may be 7 PSI/500 mbar maximum without damaging the FRS or causing adverse outlet pressure conditions.

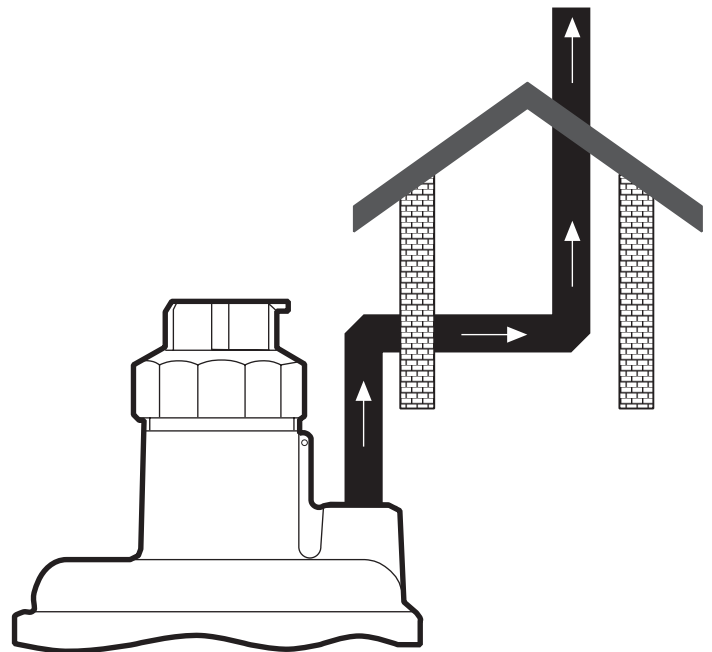
Vent Line Requirements

It is highly recommended that the internal vent limiter of the FRS be relied upon rather than venting the FRS, especially if the vent line is greater than 15 ft. An atmospheric vent line (aka 'vent line') from a regulator can adversely affecting the performance (lockup, response time, repeatability, hysteresis, etc) of the regulator, which can result in damage to the downstream appliance (e.g. combustion chamber), excessive CO, hard light-offs, or nuisance shutdowns. If venting is required regardless of these issues, then the vent line from a regulator should be installed in accordance with 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 in combination with the requirements in section Vent Line Installation.

Connecting the vent line to the FRS

- If venting the regulator, the vent line is to be connected to the upper dome of the FRS regulator as illustrated.
- Remove the beather plug.

- The vent connect is G 1/4 for FRS 705/6 to FRS 710/6 and G 1/2 for FRS 712/6 to FRS 730/6 and for all ISO flanged regulators. G 1/4 to 1/4"NPT adapters are available: (Order No. 231944) and G 1/2 to 1/2 NPT (Order No. 231945).



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

Vent Line Installation

Requirements for Vent Line Installation

1. Do not use excessive fittings or long pipe runs. With runs longer than 15 ft, increasing the pipe size can increase stack effect (movement of air through the vent line) and can reduce air friction to improve breathability of the regulator.
2. Elbows significantly reduce stack effect. Keep elbows to an absolute minimum, and when a 90 deg needs to be made, do as follows:
 - If using rigid pipe, use long radius elbows (not short). Long radius elbows have a bending radius of 1.5 times the pipe diameter. Short elbows have a bending radius of 1 times the pipe diameter.
 - If using tubing and permitted by code, use a minimum bending radius of 2 x the vent line outside diameter.
3. Do not reduce along the entire run of the vent line the pipe size that is established at the regulator's threaded vent connection.
4. Do not apply a bending moment on the vent line, if rigid pipe is used. This can apply a large bending force (a severe stress) to the vent connection of the regulator and damage the housing, which will bypass of the vent line.
5. Apply proper pipe hangers and supports so that the vent line does not load or strain due to the regulator vent line connection.
6. Do not combine or connect other vents from other devices.

Requirements for Vent Line Length and Size for a maximum 15ft run

For ¼ vent line connection

- Use schedule 40, ¼" pipe or minimum 9mm OD tubing.

For regulator main inlet pipe connections up to 1" and with ½" vent line connection

- Use schedule 40, 3/8" pipe or minimum 12mm OD tubing

For regulator main inlet pipe connections greater than 1" and with ½" vent line connection

- Use schedule 40, ½" pipe or minimum 15mm OD tubing

Additional Requirements for Vent Line Length and Pipe Size for runs beyond 15ft

For regulator main inlet pipe connections up to 1" and with ¼ vent line connection

- The same as above applies, and then after a length of 15 ft: schedule 40, 3/8" pipe or minimum 12mm OD tubing.
- After additional 10ft, increase pipe to schedule 40, ½" pipe or minimum 15mm OD tubing.

For regulator main inlet pipe connections up to 1" and with ½" vent line connection

- The same as above applies, and then after a length of 15 ft: ½" pipe or minimum 15mm OD tubing
- After additional 10ft, increase pipe to schedule 40, 3/4" pipe or minimum 20mm OD tubing.

For regulator main inlet pipe connections greater than 1" and with ½" vent line connection

- The same as above applies, and then after a length of 15 ft: schedule 40, 3/4" pipe or minimum 20mm OD tubing.
- After additional 10ft, increase pipe to schedule 40, 1" pipe or minimum 26mm OD tubing

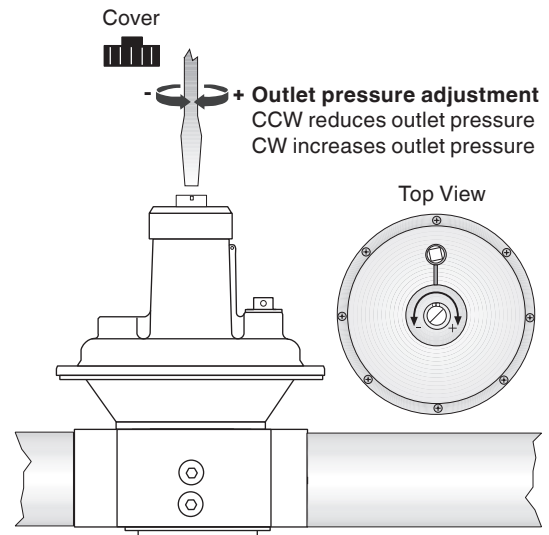
Requirements for the Vent Line's Point of Termination

1. If a vent line runs through a roof, verify that the vent line terminates above the point where water due to heavy rains and snow accumulate on the roof do not cover or isolate the termination point from the atmosphere.
2. To limit the consequences of rain or debris getting into the vent, always turn the outlet of the vent down towards the ground (goose necked).
3. Bugs Screen
 - Bugs are attracted to the smell of the natural/LP gas odorant and will nest in the vent line, which will further reduce stack effect or will completely seal the termination point. Install a bug screen on the termination point to deter insects from nesting in the line.
 - Do not paint the bug screen.
4. Points of Discharge
 - The vent line must discharge away from where people might walk or work, such as pedestrians, roofers and other maintenance professionals.
 - The vent line must discharge away from fresh air intakes and from windows. See applicable fuel gas installation codes (e.g. CSA B149.1, NFPA 54, or the International Fuel Gas Code) for acceptable clearances.

Outlet Pressure and Monitor Regulator Adjustment

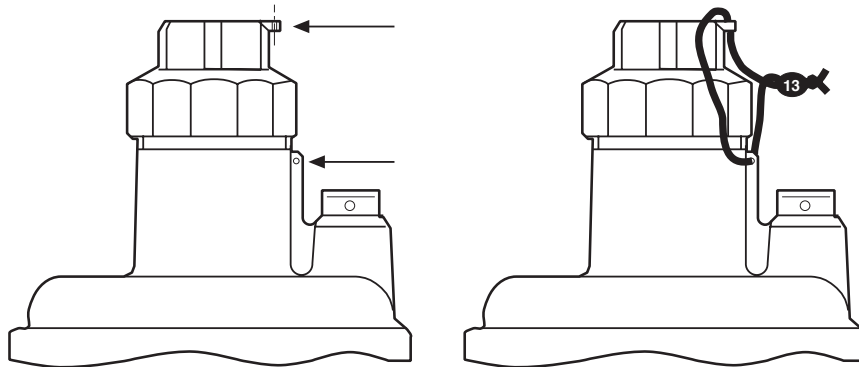
Adjusting the FRS outlet pressure

1. Verify that the intended output pressure is within the spring range that is installed in the regulator by comparing the colored outlet pressure label with the table on page 6.
2. Remove the black cover.
3. To increase outlet pressure, turn the adjustment spindle clockwise. To decrease the outlet pressure, turn the adjustment spindle counterclockwise.
4. Always use an accurate pressure gauge connected downstream of the regulator to measure the actual outlet pressure as the FRS is mounted in the operating position.
5. Reinstall the black adjustment cover.
6. To prevent unauthorized adjustment, holes in the black cover and the side of the regulator can be used to secure a lead seal.



Monitor Regulator Adjustment

The monitor regulator has a setting range of 10 - 22" W.C. If needed, adjust the setting using steps 2 – 6 above. The setting shall be according to the requirement of the downstream appliance and applicable codes (e.g. NFPA 54, CSA B149.1, NFPA 86, etc.).



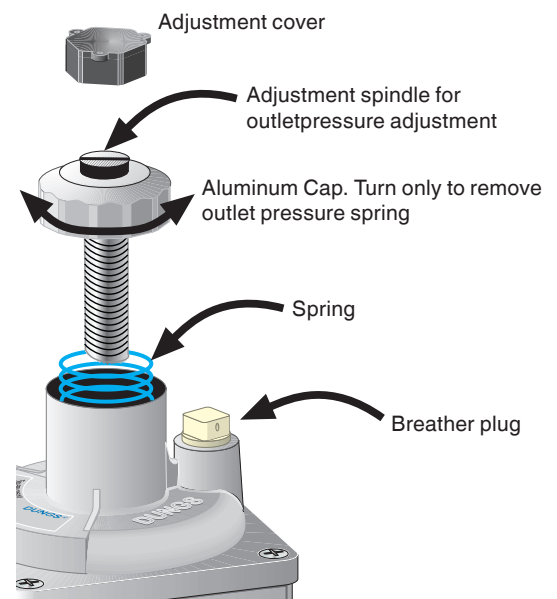
Spring Replacement

Spring Replacement

- Remove the adjustment cover.
- Completely release the spring tension by turning the adjustment spindle completely counterclockwise with a screwdriver, and remove the aluminum cap.
- Remove existing spring and insert new spring.
- Re-install the adjustment cover, and apply the new outlet pressure label provided with new outlet pressure range onto the name plate.
- Reinstall the adjustment cover.

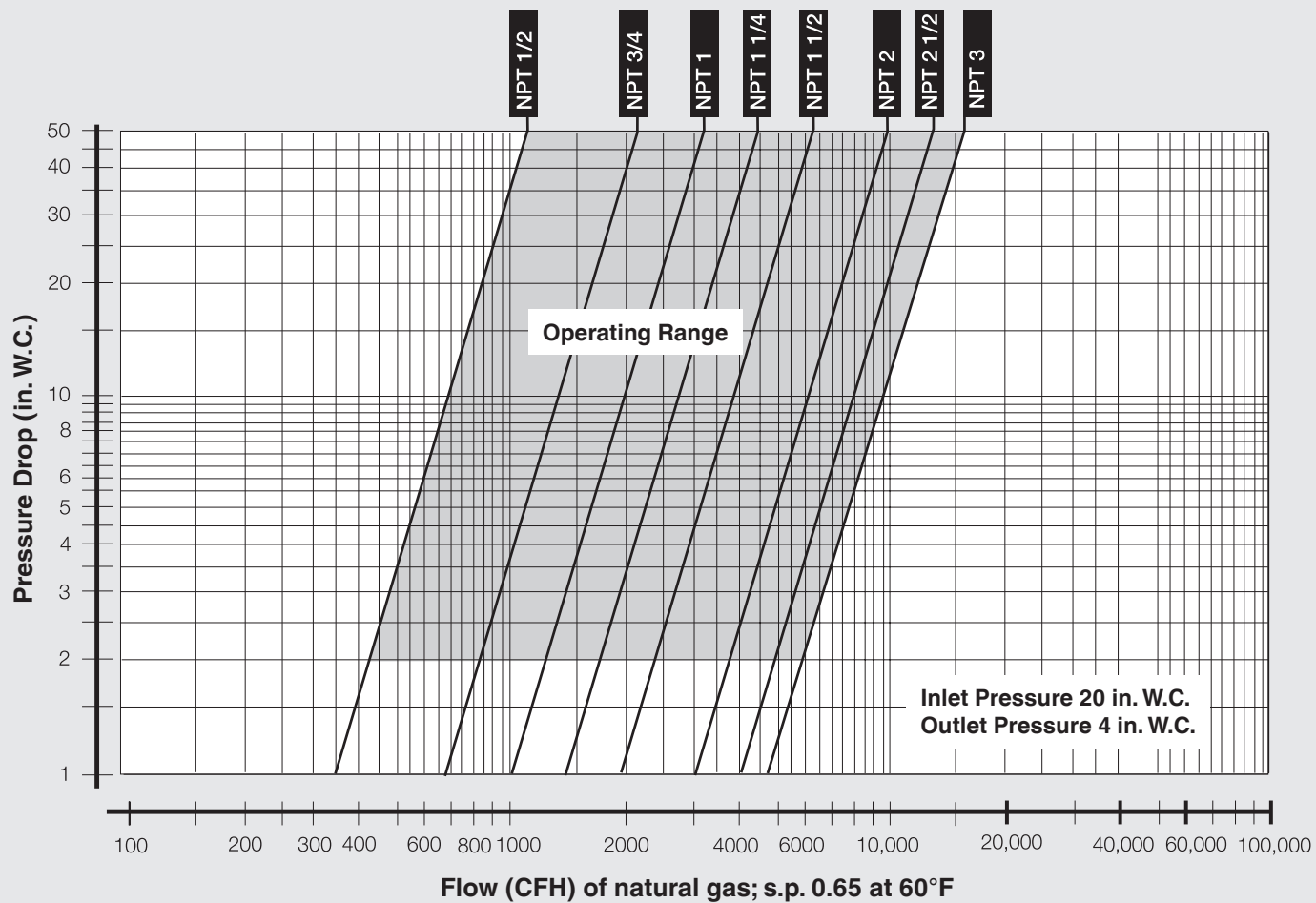


Never have your head above or near the aluminum cap when removing regulator spring. The spring tension can be high enough to rapidly eject the aluminum cap with a large force.



Flow Curve

Flow Curve Using Natural Gas for class II regulator.
Use as a quick reference for sizing a regulator in the regulated state at:
Outlet pressure = 8 in. W.C.
Inlet pressure = 20 in. W.C.
 $V_{min} = 0.05 \times V_{max}$
Flow tables for other outlet pressures are available
Pressure drop for a Class I regulator is in worst case twice the value of the Class II regulator.



Repair Kits

Repair Kit (contains all internal hardware to rebuild regulator)	Part #
FRS 705/6	Not available
FRS 707/6	Not available
FRS 710/6	Not available
FRS 712/6, 715/6	068924
FRS 720/6	068932

Repair Kit (contains all internal hardware to rebuild regulator)	Part #
FRS 725/6	068940
FRS 730/6	091868

We reserve the right to make any changes in the interest of technical progress.

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