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tiv valves

Ball valve production

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Automation and Process Control Systems

HYTER NEW ENERGY ROUTES

Hydrogen production

FE LOW EMMISION REGULATORS

Design and Placement of Compact Service Regulators with Lower Emissions

DOT PHMSA recently did a study with an objective to provide natural gas utilities with data for additional options for the safe, outside installation of service regulators and meter sets. The objective of the project is to perform research on newer “vent limiting” gas service regulators to determine safe clearance allowances and installation practices that will provide a gas utility with more options for outside installation.

Current federal and local codes, industry standards, and utility procedures all very and require a minimum clearance distance from the service regulator vent to building openings (doors and windows), vents, and possible ignition sources by state and locality. Depending on old or even new installations these safety requirements limit the ability for utilities to install new or even relocate existing indoor meters and service regulators on the outside of buildings.

However, new vent limiting service regulators are now available on the market with an overall smaller footprint with less or no clearance requirements.

PHMSA states that Utilities have an obligation to comply with Section 114 of the PIPES Act by December 27, 2021.

The Act requires operators to update their inspection and maintenance plans to identify procedures to prevent and mitigate both vented (intentional) and fugitive (unintentional) pipeline emissions. Vented emissions can occur during repairs, maintenance, pressure relief systems, or other controlled activities.

Fugitive emissions include leaks from mains or service lines, natural gas meters, or excavation damage, as well as other accidental releases.

The big question is are utilities enforcing this act?????

3 FOOT ABNORMAL OPERATING CONDITIONS (AOC) REGULATOR INSTALLATION AND REQUIREMENTS

Where did they come from?

3 FOOT ABNORMAL OPERATING CONDITIONS (AOC) REGULATOR INSTALLATION AND REQUIREMENTS

DOT 192 §192.353 Customer meters and regulators: Location

- (c) Each meter installed within a building must be located in a ventilated place and not less than 3 feet (914 millimeters) from any source of ignition or any source of heat which might damage the meter.
- In 2009 the NFPA 54 changed Sec. 5.7.2.3, which now states, “there shall be a minimum of 3 feet of clearance from a door, window, or an ignition source” and a gas meter or gas regulator relief vent.

515.3 Class I Locations. Table 515.3 Outdoor equipment installed where flammable vapor–air mixtures can exist under normal operation

1 0 The entire area associated with such equipment where flammable gases or vapors are present continuously or for long periods of time
1.1 Area within 900 mm (3 ft) of any edge of such equipment, extending in all directions
1.2 Area between 900 mm (3 ft) and 2.5 m (8 ft) of any edge of such equipment
2.extending in all directions; also, space up to 900 mm (3 ft) above floor or grade level within 900 mm to 3.0 m (3 ft to 10 ft) horizontally from any edge of such equipment

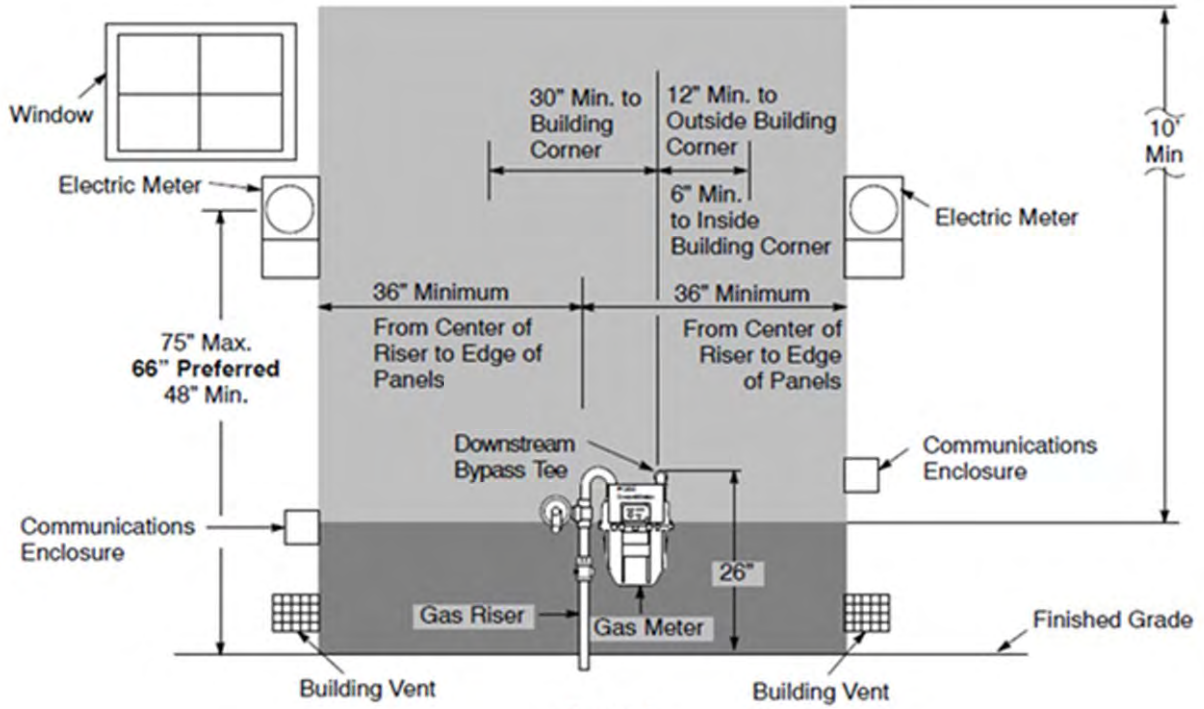
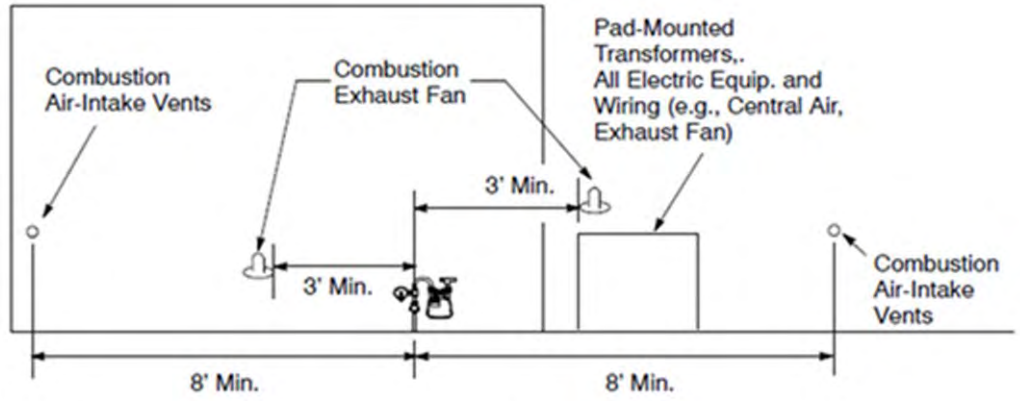


Figure 3
Gas Meter Set Separations



Gas Regulator Set Clearance Requirement from Sources of Ignition

Natural gas utilities prefer to install new Meter set assemblies (MSAs) outdoors, however, finding appropriate locations with sufficient clearances from building openings (doors and windows), vents, and potential ignition sources can create challenges. In addition, gas utilities are relocating existing inside MSAs (meters and/or regulators) to the outdoors.

This is not always feasible due to space constraints (especially in congested urban environments), local building codes restricting their outdoor placement, landmark / historic district restrictions, equipment security, and sensitive building designations.

You have 2 choices today when it comes to service regulators:

First is the standard Internal Relief Valve (IRV) regulators in mind. IRV regulators have an internal relief valve that is designed to relieve the downstream gas pressure at a set spring point. The internal relief valve is designed to open and vent the excess gas pressure to the atmosphere through the regulator vent line.

Second is installing these vent limiting regulators with slam-shut features and have demonstrated a reduction in methane emissions and decreased operations and maintenance costs, thus improving system safety and performance. Several manufacturers incorporate overpressure shut-off (OPSO) and under-pressure shut-off (UPSO) systems. These regulators may also incorporate excess flow valve shut-off abilities that could be effective to stop the flow in the event of large amounts of gas escaping into a structure. These regulators have been manufactured with a vent limiter that is compliant with ANSI Z21.80/CSA 6.22 to keep the vent flow to less than 2.5 SCFH in the event of diaphragm failure.

Clearance distance requirements can vary between gas utilities and some of the MSA requirements can vary by state. Most utilities procedures currently do not differentiate between “vent-limited” regulators and traditional IRV regulators. An example is the New Hampshire and the Maine PUC both state special exceptions for clearance distances in situations when vent-limited gas service regulators are used.

New Hampshire

Reference Standard / Code	Clearance Distance Measure Used	Definition of Ignition Source	Point of Measurement	Additional Vent Clearance Considerations
New Hampshire PUC 506.1 (n)				Utilities shall not install or operate a gas regulator that could release gas closer than 3 feet to a source of ignition, an opening into a building, an air intake into a building or any electrical source not intrinsically safe, as follows: (1) 3-foot clearance from a source of ignition shall be measured from the vent or source of release (discharge port), not from the physical location of the meter set assembly; and (2) For encroachment within the required 3-foot clearance caused by an action of the property owner or occupant after the initial installation, the encroachment shall be resolved by extending the regulator vent to meet this requirement within 90 days of discovery”

Maine PUC

Reference Standard / Code	Clearance Distance Measure Used	Definition of Ignition Source	Point of Measurement	Additional Vent Clearance Considerations
Maine PUC chapter 420	At least 5 feet away from any existing source of ignition. 3 feet horizontally or 8 feet vertically from building openings above vent.	Electrical meters, openings into direct-vent appliances, or mechanical ventilation air intakes.	Relief Vent Termination	Vents on pressure regulators installed after July 1, 2011, with over-pressure protection that vent gas to atmosphere must be at least three feet horizontally, or eight feet vertically, away from any existing building opening above the vent, and at least five feet away from any existing source of ignition (e.g., electrical meters, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes). Pressure regulators that utilize over-pressure shutoff (OPSO) technology or otherwise effectively eliminate venting gas to atmosphere need not abide by the above distance restrictions.

REASONS FOR THE CODE?

As Allowed by Local Codes, Regulations and Company Policies

THE FOLLOWING ARE EXAMPLES OF THE METER SET IN VIOLATION OF THE CODE !

The picture below shows inadequate clearances between the gas service and electric meter.

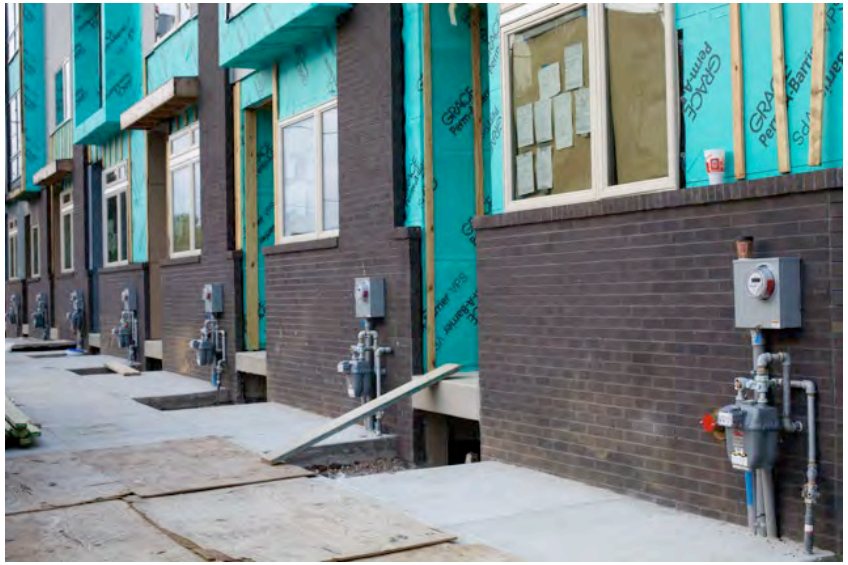
The electric meter is classified as an ignition source and there shall be a minimum of 3 feet of clearance between an ignition source and a gas regulator relief vent.

GENERATOR, WINDOW, & AC UNIT

Venting of Outdoor Installations

MULTIPLE PROBLEMS!

Historic Areas, Apartments & Condo



These types of installations have caused many problems for Utilities and cost thousands of dollars to fix including:

1. Relocating services.
2. Running expensive & unsightly vent lines.
3. Vent lines can affect the performance of the regulator.
4. Sometimes retrofitting buildings, such as condominiums and row houses provide no options for either of the above.

CASE STUDY TIMELINE

1. Met with Washington Gas & Virginia PSC July of 2013.

2. Did preliminary Field & Lab tests from August to October of 2013.

3. Other Utilities and PSC's were involved in the background, but we preferred to work with only 1 Utility company during this period.

4. First Field trial was installed in December of 2013.

5. To date, over 1,000,000 installed in the US.

DESIGN CRITERIA AGREED UPON BY ALL PARTIES TO SATISFY THE PSC AND EVERYONE INVOLVED

1. There is no US code to compare this standard to for zero clearance.
2. We decided the requirement needed to meet the CSA/ANSI Z21.80a-2019 / CSA 6.22a-2019 line regulator vent limited standard is < 2.5 cu. Ft./Hr.
3. We felt redundant safety was important and required.
4. Everyone had to agree it would meet the requirements.
5. MOST IMPORTANT: PF wanted to have a 3rd party (CSA) certification to ensure our product met the standards.

What is your choice of regulator to protect your customers?

NEW ANSI B109.4 10/2021

5.3.9 Internal Relief-Valve Performance Test

This section is only for regulators equipped with an internal relief valve. The internal relief-valve capacity for each orifice size available shall be tested as follows:

a) Cause the regulator to fail by disconnecting the linkage between the diaphragm and valve mechanism or the most severe failure condition that yields the highest build-up pressure.
b) Disconnect any vent piping to allow the regulator to vent the flow of gas freely and unrestricted to the atmosphere.
c) Close the valve downstream of the regulator so that there is no flow of gas through the regulator.
d) Note the outlet pressure while slowly increasing the inlet pressure from 0 psig to the maximum inlet pressure recommended by the manufacturer for the orifice installed. Record the outlet pressure at the maximum inlet pressure after the system reaches a steady-state condition. Refer to the Appendix A for how to display the result.

NEW ANSI B109.4 10/2021

BIG QUESTIONS?

1. With the new standard present IRV curves are not accurate and Internal monitoring orifices will not work.

2. These regulator will relieve more gas than previously thought and methane emissions will increase.

3. The big question is the IRV going to keep the downstream pressure going to be below the NFPA 54 requirement of 2 psig downstream to the customer?

4. You need to change the orifice depending on the inlet pressure and flow and this greatly effects the IRV and regulator capacity. You also need to keep track of the orifice size!

Traditional gas service regulators Natural gas service regulators are typically installed upstream of the gas meter and have an IRV that is designed to relieve (emit gas) at a set pressure through a vent as part of normal operation to maintain a target outlet pressure for the customer.

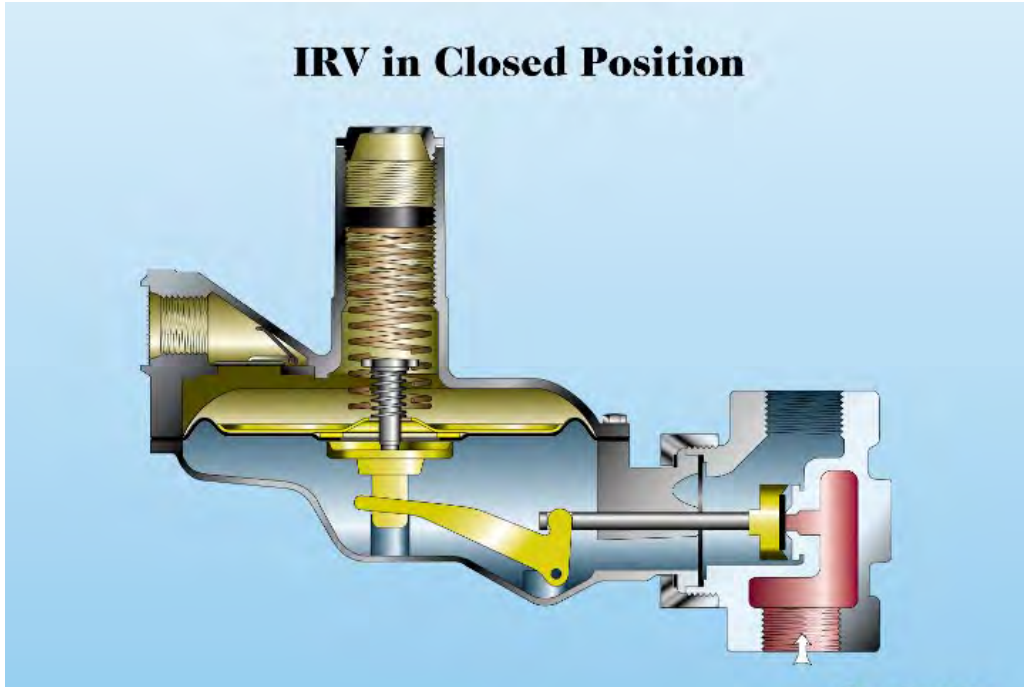
In and over pressurization event the IRV emits gas through the vent which is set by spring tension on the diaphragm. In a traditional single-stage IRV gas service regulator, excess gas pressure higher than the set points pushes past the diaphragms to be released through the outside vent.

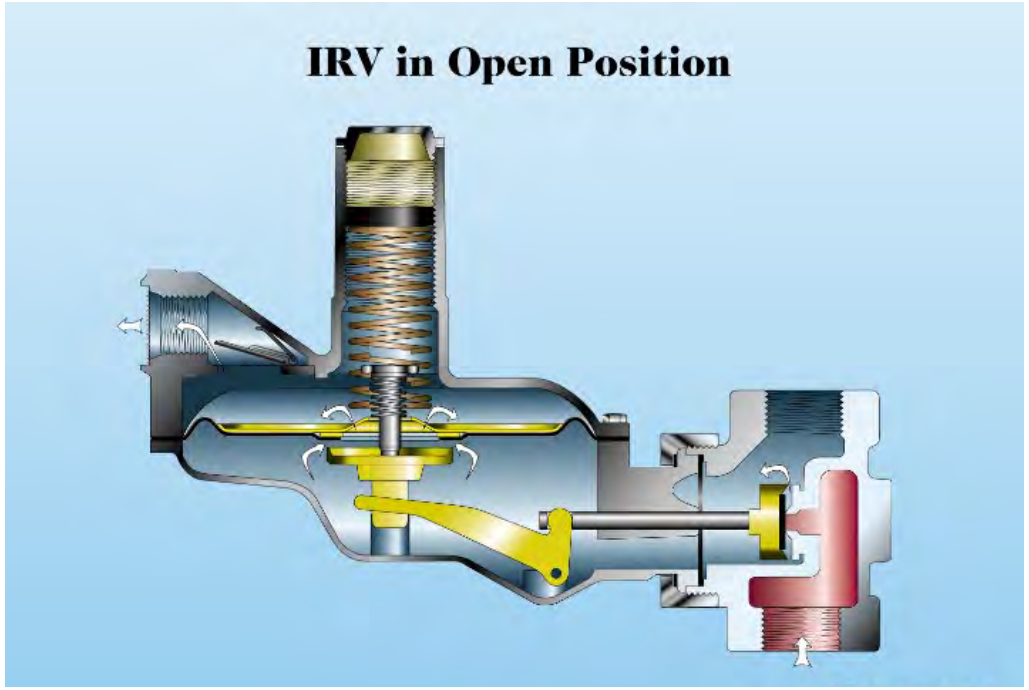
This excessive pressure can occur when gas appliances are suddenly turned off and the pressure allowed past the valve seat increases past the IRV's spring set point relieving the Gas. This then rests when the downstream pressure is satisfied below the IRV setpoint.

Tests we have done All IRV residential regulators can vent during lockup between .015 to .69 cubic feet depending on the manufacturer and model of the regulator.

Tests we have done and data from regulator manufacturers All IRV residential regulators can vent during Failure between 50 to 2,500 cubic feet depending on the manufacturer, orifice installed and model of the regulator.

Typical IRV Regulator

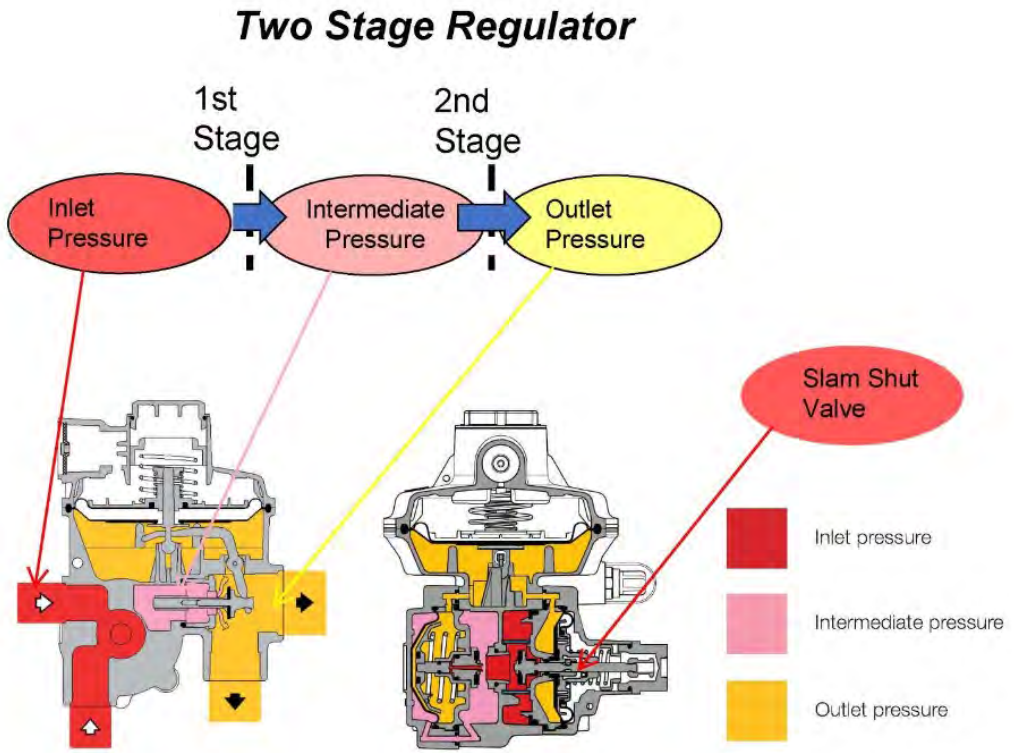




Vent Limited regulators are built with 2 different options

First Vent Limited Option

- **Two Stage Regulation**
  - The First Stage Regulation cuts the inlet pressure to the second stage which negates upstream pressure variation and its effect on downstream.
  - Token IRV
  - Dual safety diaphragmn case of main diaphragm failure, the double safety diaphragm with internal vent limiter ensures a controlled leak rate. Regulator may continue to operate and have the ability to control downstream pressure
  - Dual safety diaphragmn case of slam shut
  - Single Orifice Size
  - Standard Over pressure shut off switch (OPSO)
  - Optional Under pressure cut off switch (UPSO)
  - Models have a filter to protect the regulators inlet
  - Meets MAOP up to 125 psi


Two Stage Regulator
1st Stage
2nd Stage
Inlet Pressure
Intermediate Pressure
Outlet Pressure
Slam Shut Valve
Inlet pressure
Intermediate pressure
Outlet pressure

Second Vent Limited Option

- **Standard IRV Regulator with Slam Shut**
  - Regulator has standard IRV
  - Token IRV
  - Single diaphragm
  - Limited venting diaphragm
  - Multiple Orifice Sizes
  - Standard Over pressure shut off switch(OPSO)
  - Special limited Over pressure shut off switch(OPSO)
  - Optional under pressure cut off orifice valve (UPSO)
  - Meets MAOP depends on orifice installed

MADE IN THE USA!

Strategically based in **Weirton (WV)** the manufacturing area is covering 30,000 sq.ft. on 32 acres property suitable for further expansion happening this year.
The new plant, built from scratches to incorporate the **20 years' experience of Lean manufacturing** of the Group, operating since 2019.

FE REGULATOR – Main features

- **Two Stage Regulation and Balanced Valve**
  - Accuracy - The First Stage Regulation negates upstream pressure variation and its effect on downstream Pressure
  - Safety – if a stage should fail the remaining stage acts as a monitor and limits downstream pressure

- **Dual Diaphragm**
  - Safety – In case of main diaphragm failure, the double safety diaphragm with internal vent limiter ensures a controlled leak rate. Regulator may continue to operate and have the ability to control downstream pressure.

- **Single Orifice Size**
  - Meets MAOP up to 125 psi

FE REGULATOR Safety Shut-off

- **Over Pressure Safety Shut-off (OPSO)**
  - Meets the challenges presented by Codes and Regulations as they pertain to building openings and sources of ignition
  - Provides options for new installations and relocating existing sets vs. the use of regulators with full capacity internal relief.
  - Provides Enhanced Downstream safety
  - Eliminate or reduce the cost of Venting indoor installations
  - Eliminate or reduce the cost of Venting outdoor installations

FE REGULATOR FEATURES

- FE and FEX is ANSI B109.4 / CSA 6.18 certified
- Two Stage Pressure Reduction
- Fully Balanced Valve
- Internal Safety Diaphragm with Vent Limiter
- THE SAFETY DIAPHRAGM SERVES AS A VENT LIMITER, THEREFORE IN CASE OF WORKING DIAPHRGAM FAILURE IT WILL LIMIT THE VOLUME OF GAS VENTED TO LESS THAN 1 CFH. BY CONTRAST STANDARD IRV TYPE SERVICE REGULATORS MAY VENT, IN CASE OF CATASTROPHIC FAILURE, UP TO 500 TIMES MORE VOLUME OF GAS.
- Safety Shutoff Options
  - Over Pressure
  - Under Pressure
  - Excess Flow
  - Thermal shut off

FE REGULATOR ADVANTAGES

- Inlet Strainer
- Single Orifice
- Token Relief Valve
- Inlet and Outlet Pressure Tap Option
- One or Two Outlets
- External Vent Limiter
- Anti-Flooding
- H2 Ready (Hydrogen blend)

THE FE IS ANSI B109.4 / CSA 6.18 & ANSI Z21.80 -2019 APPROVED P IS A CSA-APPROVED & CERTIFIED TESTING LABORATORY & FACTORY

CSA Group

Supplement to Certificate of Compliance

Certificate: 2728532 Master Contract: 242437

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
2728532	Jun 26, 2014	Original Approval of FE and Dival 500 series to CSA 6.18 and ANSI B109.4 Add class 3331.04 & 3331.84

DQD 507 Rev 2012-05-22 Page 1

CSA INTERNATIONAL

Certificate of Qualification

This is to certify that

Fiorentini Minireg S.p.A
Costruzione Apparecchiature, Per Gas, Via Faustinella 11/13/15,
Desenzano del Garda, Brescia 25015 ITALY

has been qualified by CSA International as a Testing Facility for

WITNESSED MANUFACTURER'S TESTING FOR CERTIFICATION PROGRAM (WMTC)
Based on ISO/IEC 17025:2005

Certificate No. WMTC-021
Issue Date: July 29, 2008
Expiry Date: July 28, 2011

Susan McCarthy,
Technical Manager, Service Quality

FE REGULATOR
RELIEF VALVE VERSIONS

06/14/23

Pietro Fiorentini

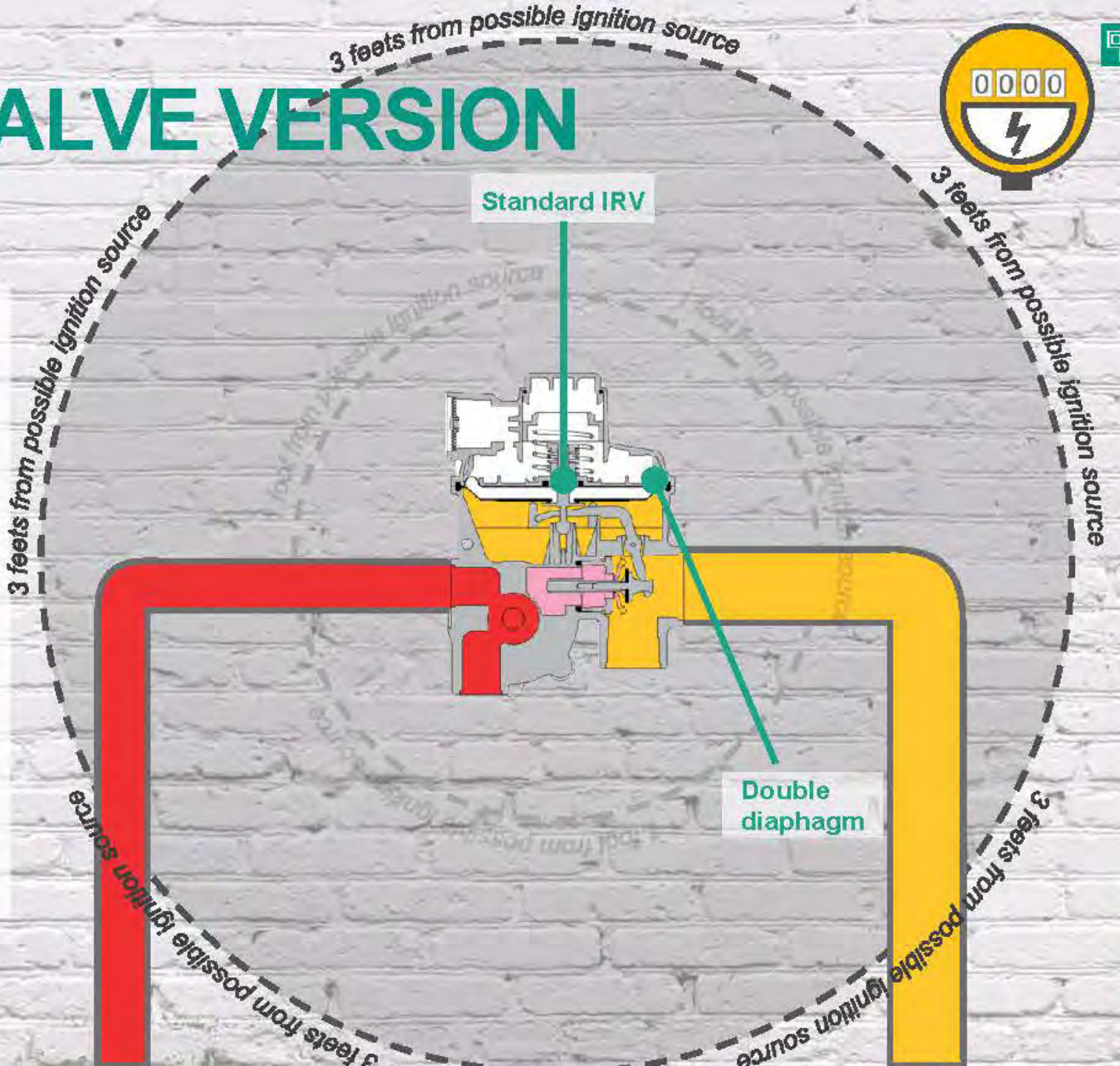
TOKEN RELIEF VALVE VERSION

Relief valve maximum flow rate (at the OPCO intervention value):

20 scfh @ regulator set point 7" wc
45 scfh @ regulator set point 2 psi

FE regulator token relief version is designed for outdoor intsallations with 3 foot distance from potential ingnition sources

The installation is permitted only if authorized and allowed by the local codes, standards and regulations in force.



CALIBRATED RELIEF VALVE VERSION

Relief valve maximum flow rate (at the OPCO intervention value):

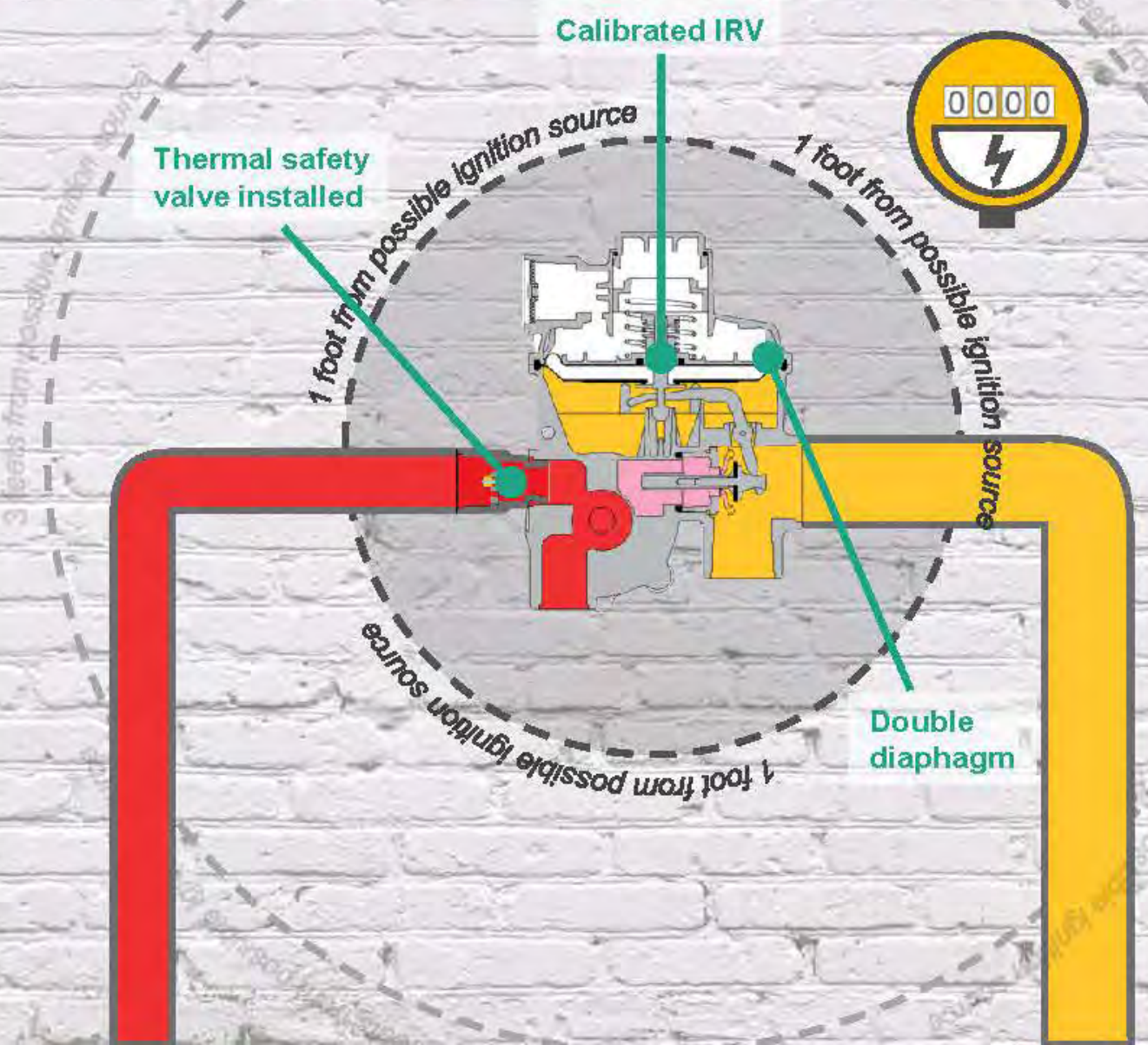
2,5 scfh @ regulator set point 7" wc
2,5 scfh @ regulator set point 2 psi

FE regulator calibrated version is designed for outdoor installations with 1 foot distance from potential ingnition sources

The distance of 1 foot must be approved by the authority.

Increased sensitivity to downstream raising pressure (OPCO tripping) in case of momentary unsecured lock-ups with leakage greater than 1.5-2.5 scfh

Filter installed in the reg to protect the 2nd stage lock-up area



NR (NO RELIEF) VERSION

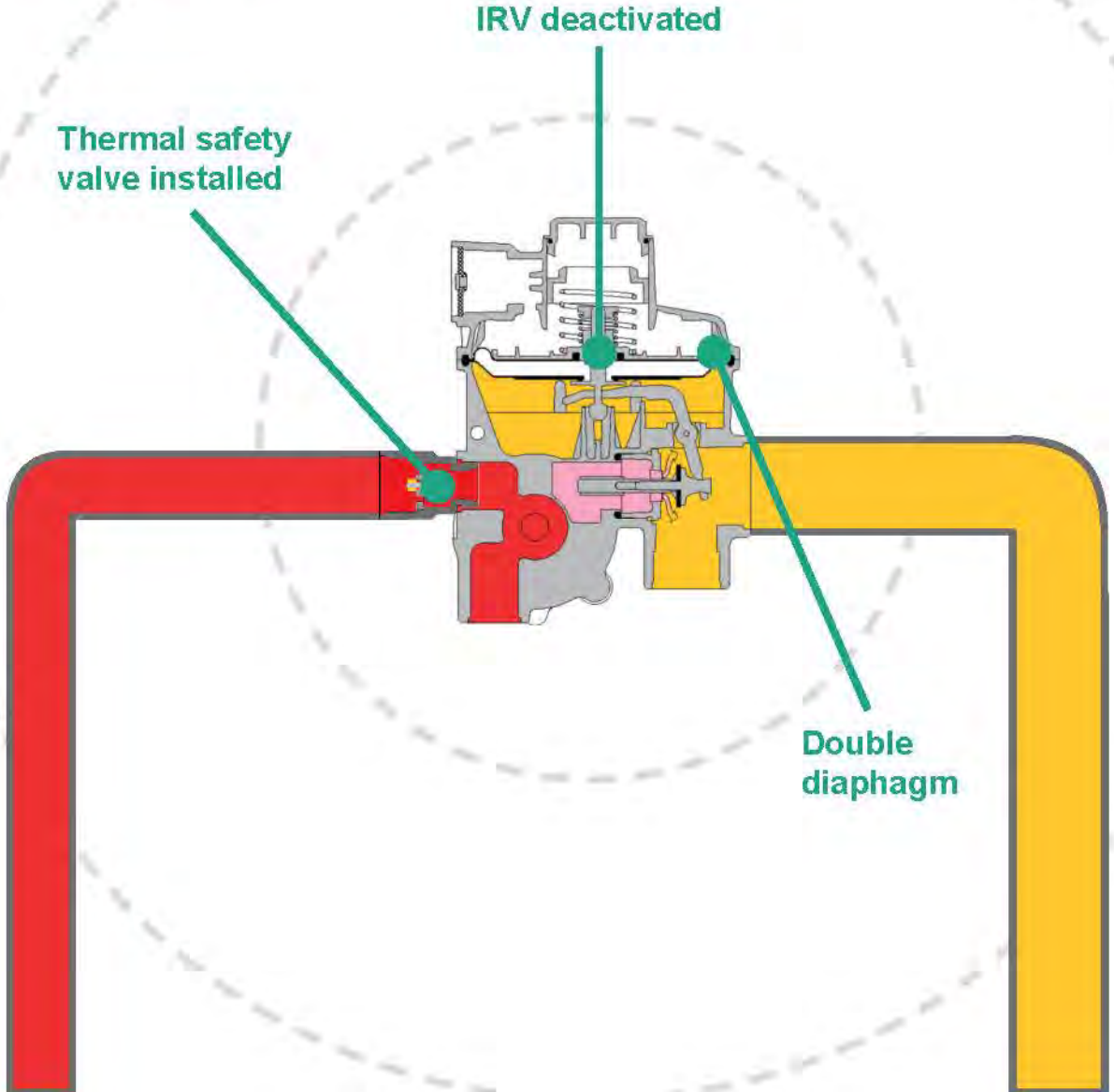
FE regulator NR version is designed for indoor installation.

Indoor installation without external vent connection is permitted only if authorized and allowed by the local codes, standards and regulations in force

This version performs the VENT LIMITING and has the following features:

- IRV is deactivated
- Thermal safety valve is installed in the inlet fitting

THIS VERSION IS NOT SUITABLE FOR OUTDOOR INSTALLATION



VENTING WITH FAILURE MODE

BREAKING WORKING DIAPHRAGMS. (WORK SAFETY DIAPHRAGMS)

NR (NO RELIEF) VERSION : **2.5 SCFH**

CALIBRATED RELIEF VALVE VERSION. : **2.5 SCFH**

TOKEN RELIEF VALVE VERSION : **2.5 SCFH**

LEVER DISCONNECTION.(TRIP OPSO)

NR (NO RELIEF) VERSION : **ZERO SCFH**

CALIBRATED RELIEF VALVE VERSION. : **0.0035 SCF or 0,007 SCF**

TOKEN RELIEF VALVE VERSION : **0.0035 SCF or 0.007 SCF**

INTERNAL LEAKAGE (BACK PRESSURE)

NR (NO RELIEF) VERSION : **ZERO SCFH (TRIP OPSO)**

CALIBRATED RELIEF VALVE VERSION. : **2.5 SCFH (OPEN CALIBRATED RELIEF VALVE)**

TOKEN RELIEF VALVE VERSION : **20 SCFH or 40 SCFH (OPEN TOKEN RELIEF VALVE)**

FE REGULATORS CAPACITIES

MODEL	NOMINAL CAPACITY SCFH	MINIMUM INLET PRESSURE PSIG
FE 10	353	4.0
FE 25	875	4.0
FES 50	1,500	10.0
FEXF 50	1,500	5.8
FEX 75	2,648	7.5
FEXS 100	3,5[illegible]	10.0
MAIN FEATURES		**Pipe Size**
INLET PRESSURE RANGE	2.2 – 125 psi	3/4 x 3/4
MAX ALLOWABLE PRESSURE	PS 125 psi	3/4 X 1
OUTLET PRESSURE RANGE	BP: 5.2” wc – 2.6 psi TR: 2.6 psi – 7.5 psi	1
OVER PRESSURE SHUT-OFF SETTING RANGE	BP: 14” wc - 4,3 psi TR: 4.3 psi- 11.6 psi	1 X 1-1/4 1 x 1-1/2
ACCURACY CLASS	up to AC5	1-1/4 X 2
LOCK UP PRESSURE CLASS	up to SG10	2 x 2
OPERATING TEMPERATURE	-4°F/140°F -40°F/140°F	

OLD FE MODELS

NEW FE MODELS NAMES & 4 MODELS

MODEL	SCFH L CAPACITY	PSIG PRESSURE
FE 25	875	4.0
FE 50	1,500	10.0
FE 75	2,648	7.5
FE 100	3,500	10.0

MAIN FEATURES		Pipe Size
INLET PRESSURE RANGE	2.2 – 125 psi	3/4" x 3/4"
MAX ALLOWABLE PRESSURE	PS 125 psi	3/4" X 1"
OUTLET PRESSURE RANGE	BP: 5.2” wc – 2.6 psi TR: 2.6 psi – 7.5 psi	1"
OVER PRESSURE SHUT-OFF SETTING RANGE	BP: 14” wc - 4,3 psi TR: 4.3 psi- 11.6 psi	1" X 1-1/4" 1" x 1-1/2"
ACCURACY CLASS	up to AC5 %	1-1/4" X 2"
LOCK UP PRESSURE CLASS	up to SG10 %	2" x 2"
OPERATING TEMPERATURE	-4°F/140°F -40°F/140°F	

CAPACITY

Nominal CAPACITY Low Inlet Pressure

White is in inches W.C. Red is in PSIG

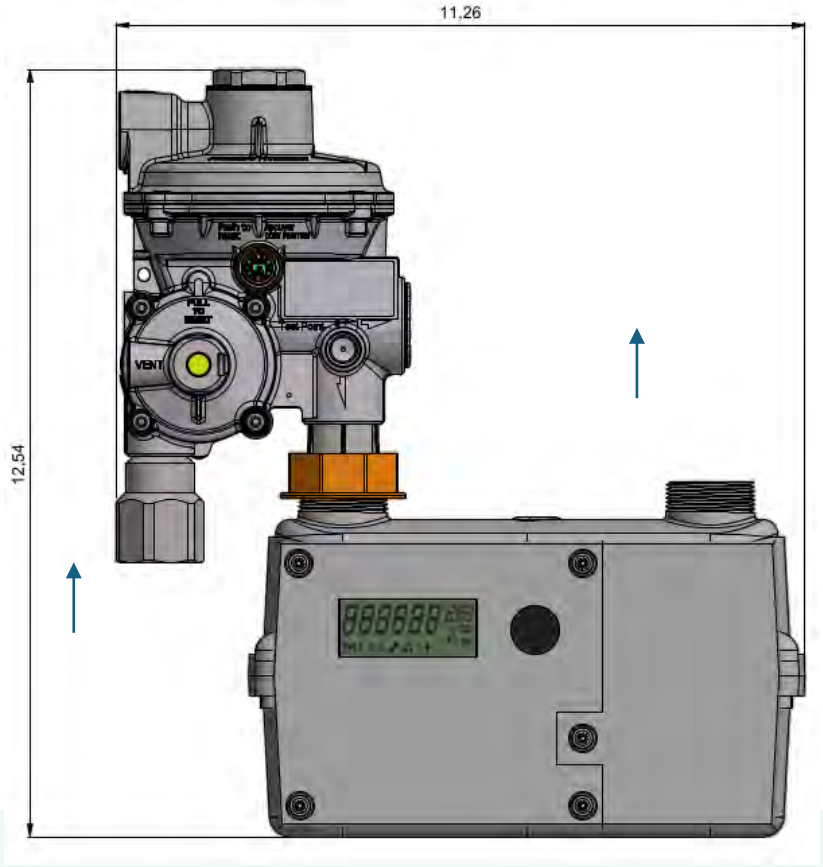
Set point 7"wc	FE	FEX
Pu ("w.c. PSI)	Q (SCFH)	Q (SCFH)
8.5	140	425
12	240	475
16	350	500
1.08	460	820
1.45	550	1,130
2.89	700	1,540
4.34	875	2,030
5.78	885	2,275
7.25	885	2,635

FE REGULATOR

Model FE 25-50

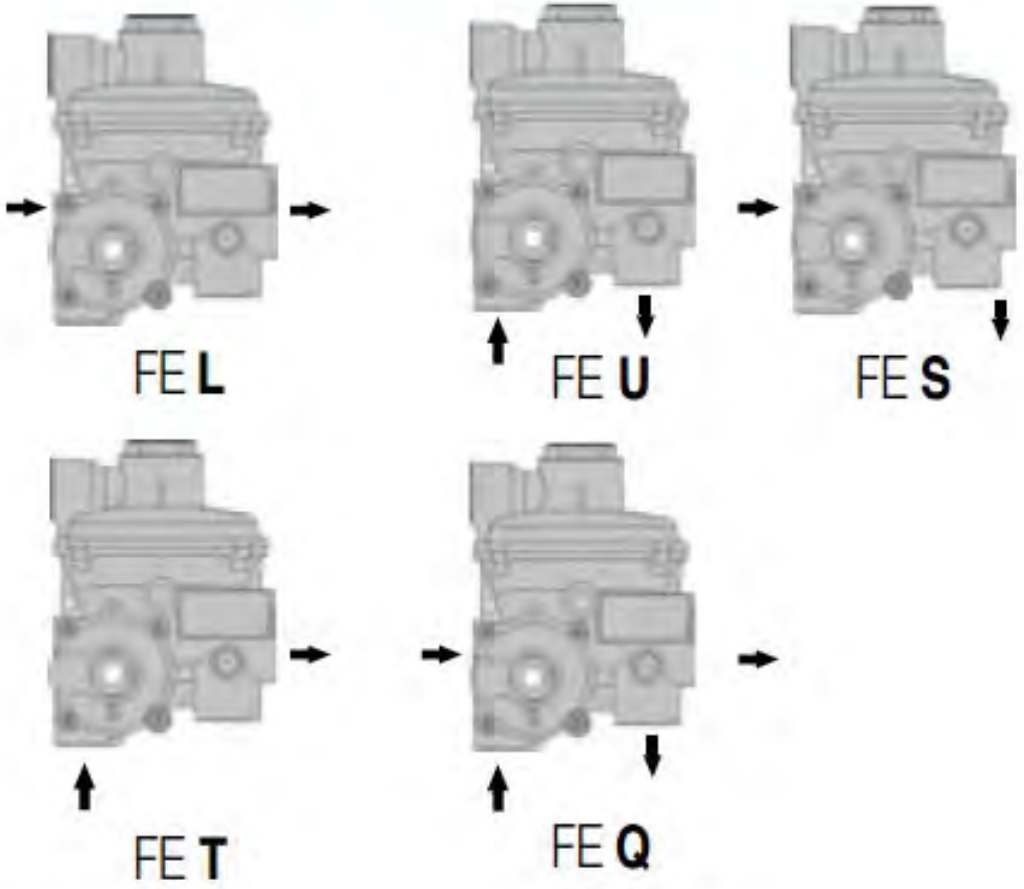
Model FE 75-100

Compact Meter Sets

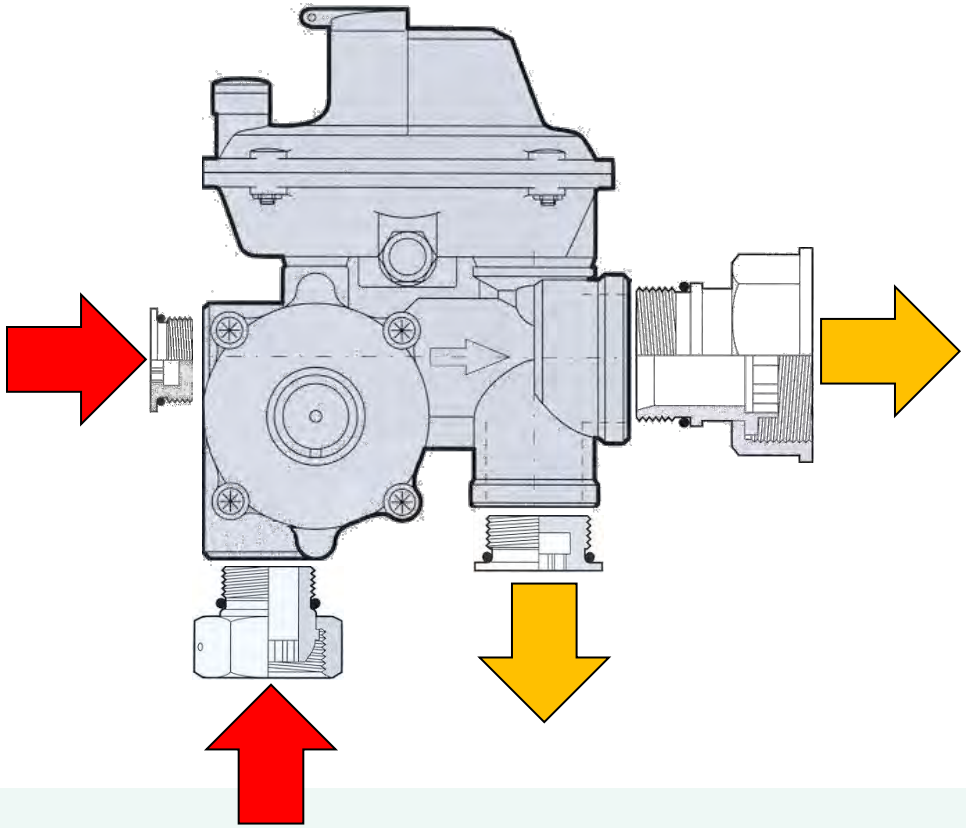


Compact Meter Sets

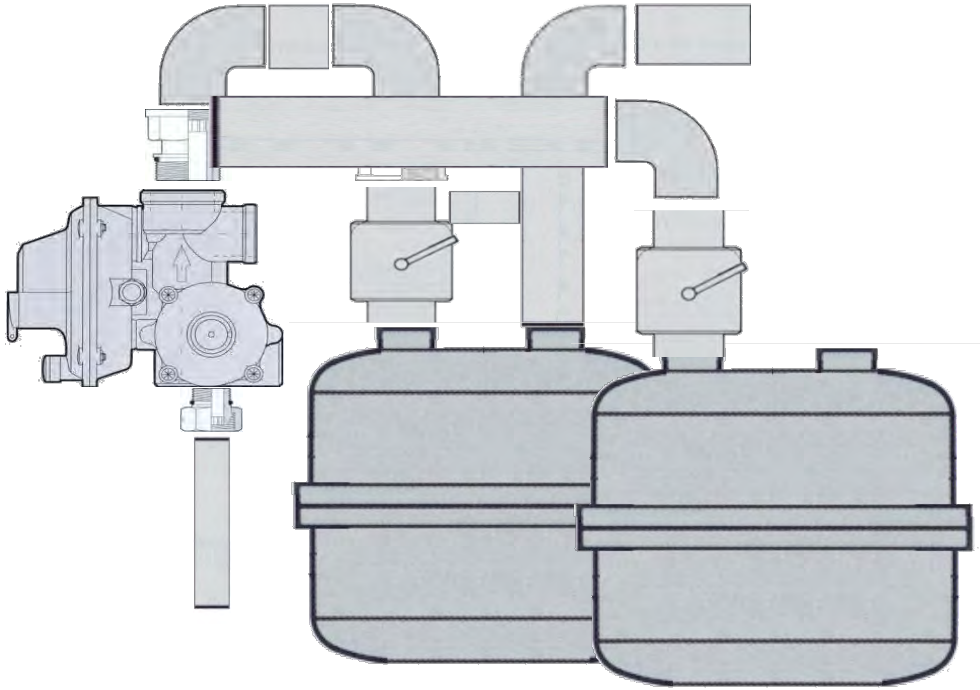
Connection configuration



INSTALLATION



Flexible Installation!

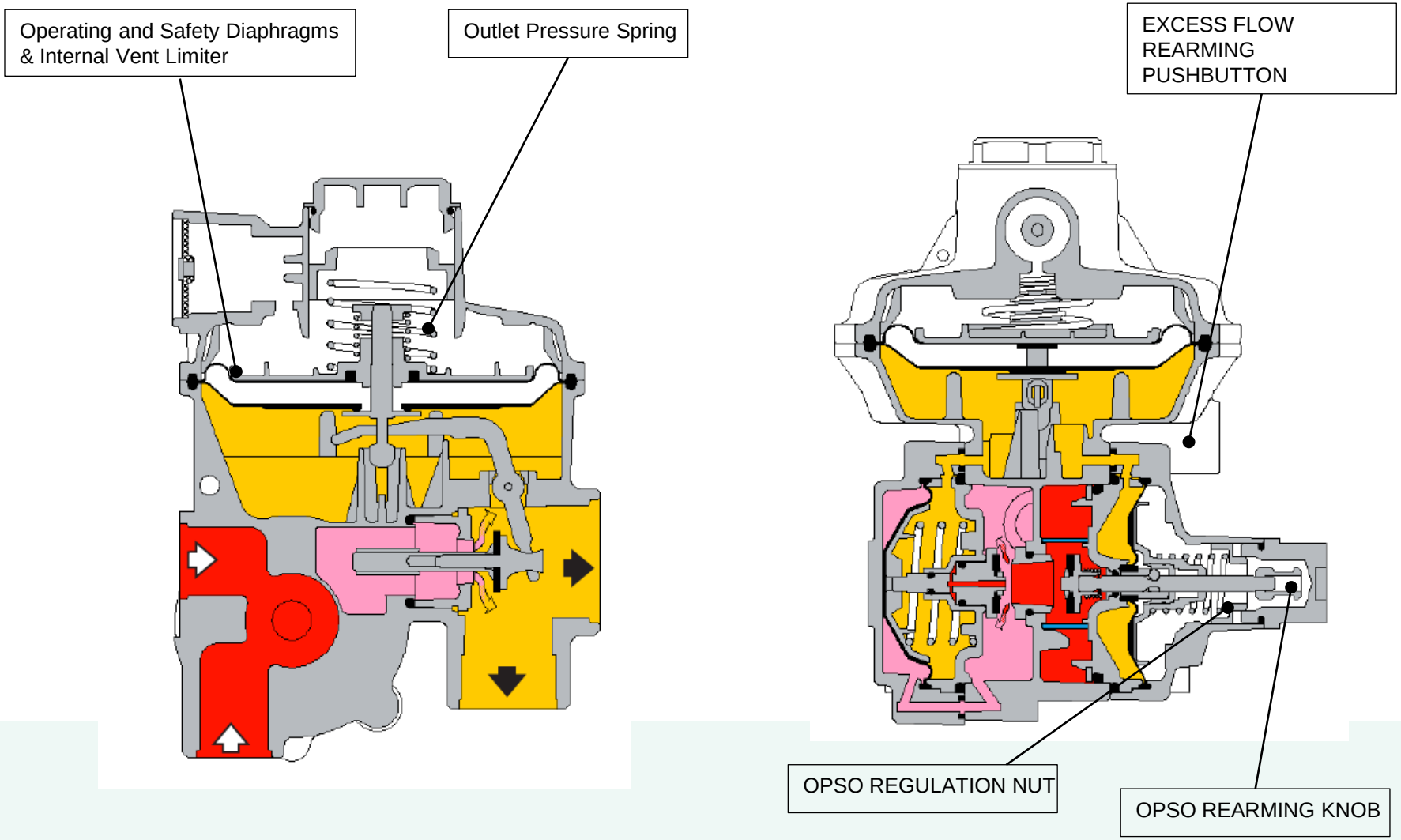


FE FEATURES

INLET FILTER

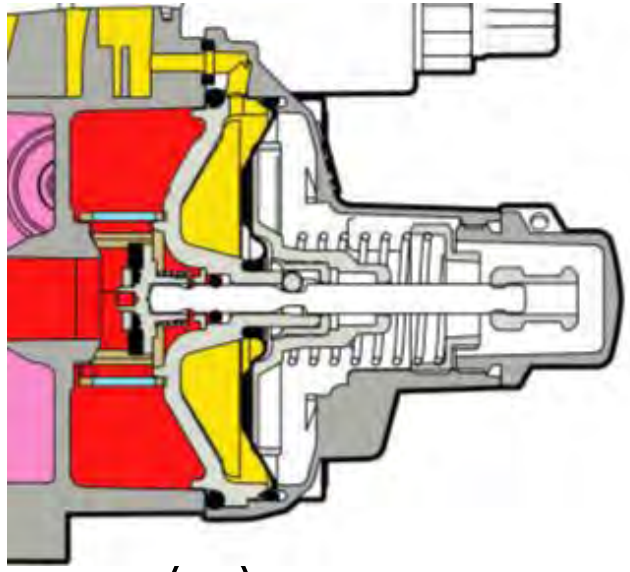
TO KEEP DEBRIS OUT OF THE REGULATOR

Inlet filter: area (0.775 inch^2) 100 µm efficiency


Operating and Safety Diaphragms & Internal Vent Limiter
Outlet Pressure Spring
EXCESS FLOW REARMING PUSHBUTTON
OPSO REGULATION NUT
OPSO REARMING KNOB

FE REGULATOR Safety Shut-off

1. Over Pressure Shut-Off device (OPSO)
2. Optional Under Pressure Shut-off (UPSO) OPTIONAL



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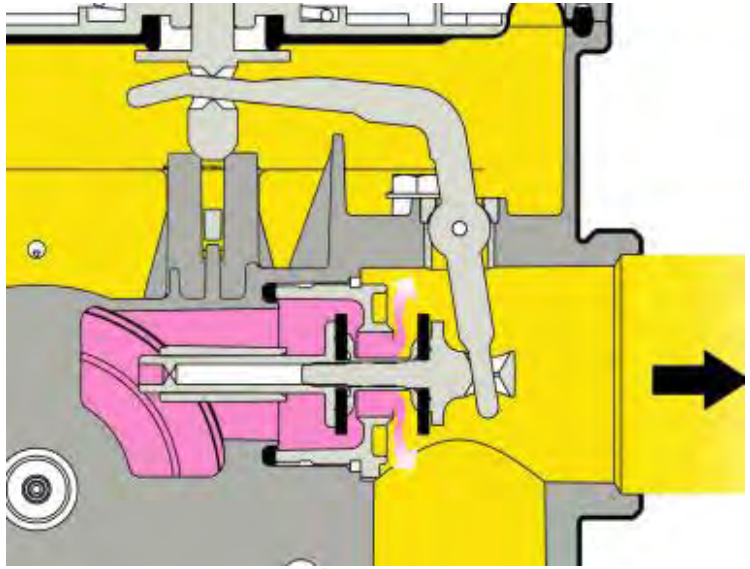
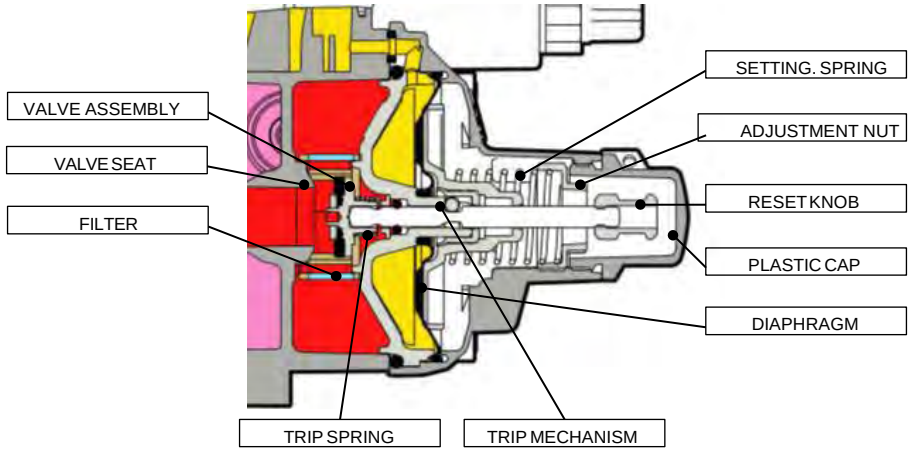


2

Overpressure slam-shut device (OPSO)



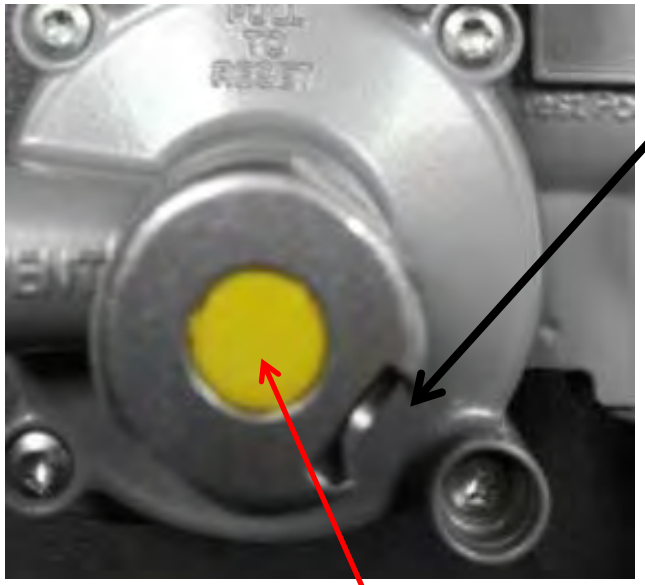
SLAM SHUT FOR ULTIMATE PROTECTION

Slam Shut device:
- OPSO
- UPSO (optional)
-Manual reset
- Shut off for lack of feeding
-Slam shut positions

ARMED

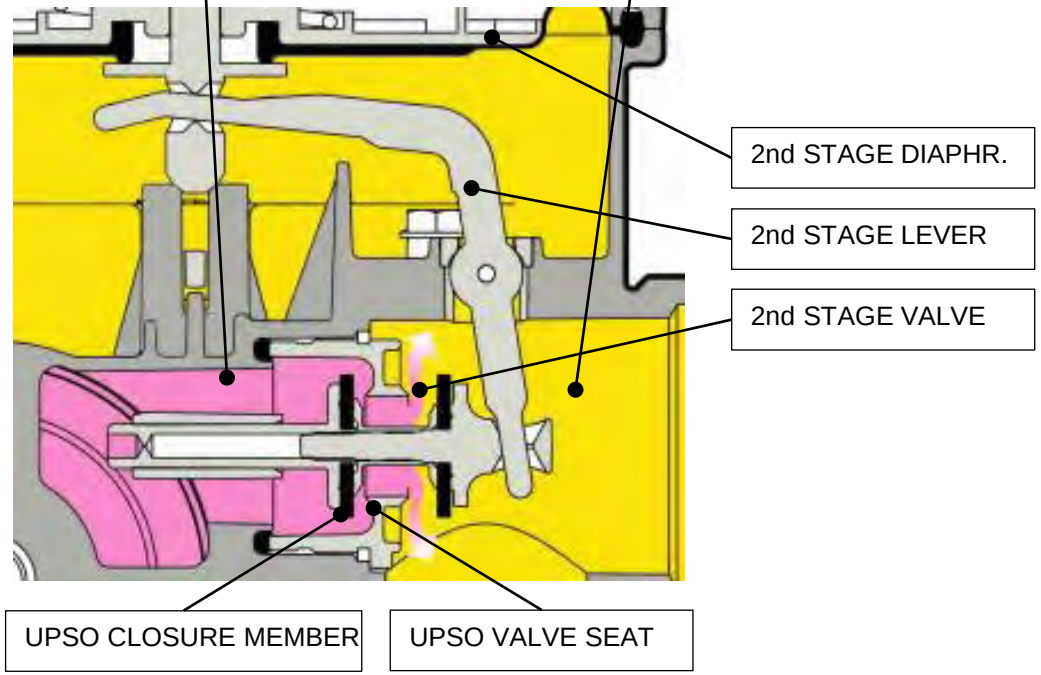
UNARMED

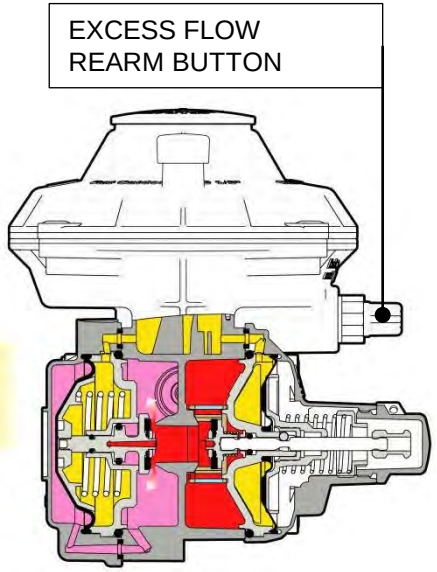
New cover has a slot to use as a tool to reset the slam shut!

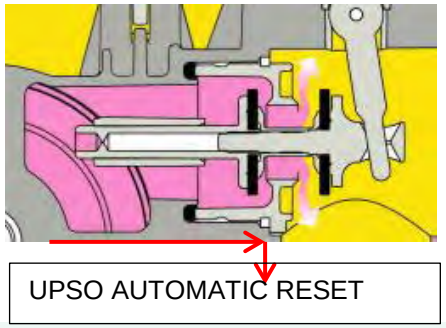


Yellow cover "w.c / Red cover psig

Excess flow valve / UPSO (optional)







SAFETY DIAPHRAGMS IMPROVEMENT NEW !

FE25-50
as

Introduction of safety diaphragm in OPCO valve

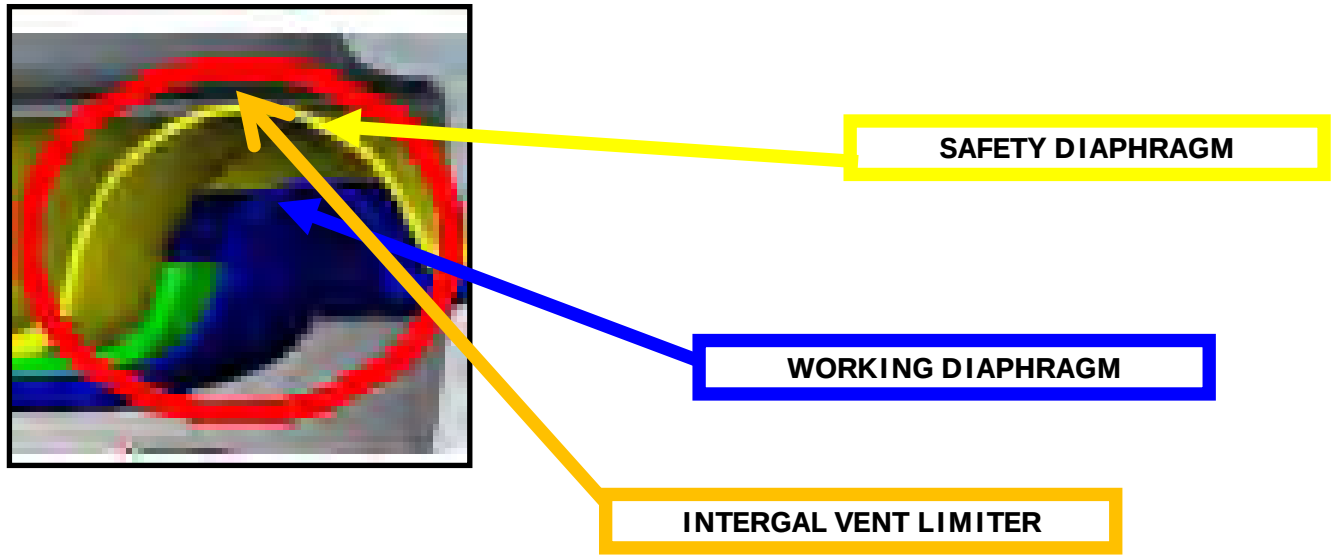
FE75-100

Introduction of safety diaphragm in 2 stage head

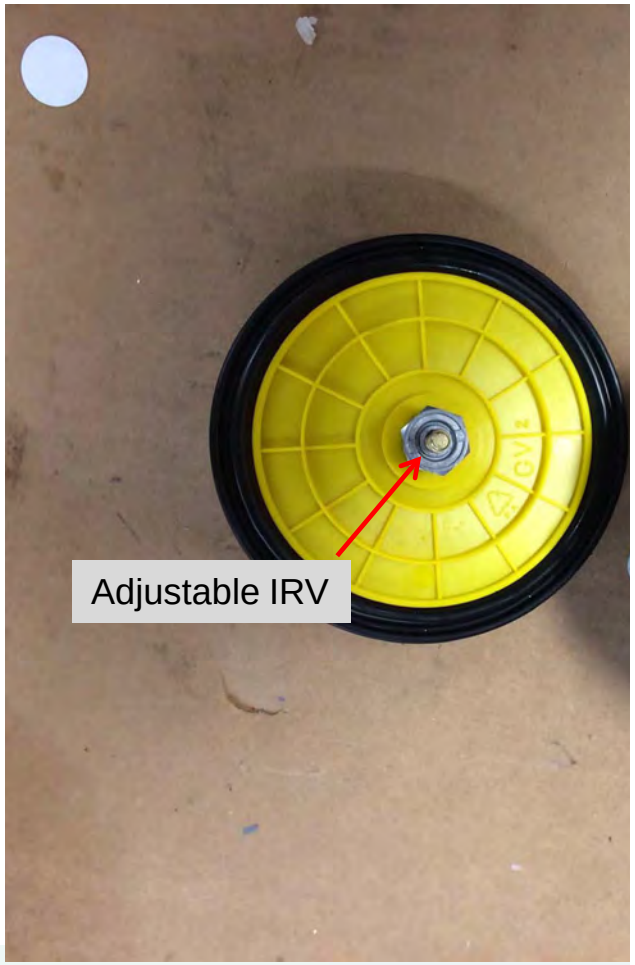
Introduction of safety diaphragm in OPCO-UPCO valve

The flow for all safety diaphragms versions is < 2.5 scfh

ADDED SAFETY WITH DUAL DIAPHRAGM ON REGULATOR AND SLAM SHUT



FE DIAPHRAGM ASSEMBLY



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Tel: 416 747 4000
www.csagroup.org

Advancing Today
Anticipating Tomorrow

Pietro Fiorentini
Armando Amadini
Research & Development Department
Via Faustinella, 13 • 25015 Desenzano D/G (BS)

October 17th 2014

Re: FE6, FE10 & FE25 – Vent Limiting Function of the Safety Diaphragm

CSA witnessed the following test at Pietro Fiorentini.

Background: The above regulators are currently certified to CSA 6.18-02(R2008) and ANSI B109.4-1998. The below tests were performed at the request of Pietro Fiorentini to measure the safety performance of the vent limiting function during a catastrophic rupture of the working diaphragm. There is no coverage for vent limiting devices in the above standards. This letter does not imply certification, it is only meant as a statement of test and results.

Test:

1. An FE25 was modified with an approximately 1.5 inch cut in the diaphragm. The body and diaphragm construction are identical to the FE06 and FE10. The cut was aligned with the limiting hole in the safety diaphragm to represent the worst possible case.
2. A Pressure of 4 PSIG was applied to the outlet of the regulator, to bypass the first stage and the pressure cut off device.
3. On application of the test pressure the flow through the safety diaphragm hole was initially measured at the equivalent of .66 cu.ft. / hr. of natural gas, this flow reduced within one second to .04 cu.Ft. / hr.

Conclusion: At an inlet pressure of 4 PSIG the maximum flow through the safety diaphragm bleed hole was initially the equivalent of .66 cu.ft. / hr. of natural gas and then reduced to .04 cu.Ft. / hr. after one second.

Regards,

Richard Clark

Richard Clark
Certification Engineer
CSA Group

178 Rexdale Blvd
Toronto, ON M9W 1R3 CANADA
T 416 747 2331
richard.clark@csagroup.org

CSA VENT LETTER WITNESS TEST

1. The FE was modified with an approximately 1.5 inch cut in the diaphragm. The cut was aligned with the limiting hole in the safety diaphragm to represent the worst possible case.

2. A Pressure of 4 PSIG was applied to the outlet of the regulator to bypass the first stage and the pressure cutoff device.

3. An application of the test pressure, the flow through the safety diaphragm hole was initially measured at the equivalent of .66 cu. ft./hr. of natural gas, this flow reduced within one second to .04 cu. ft./hr.

CSA VENT LETTER CONCLUSION

At an inlet pressure of 4 PSIG the maximum flow through the safety diaphragm bleed hole vent was initially the equivalent of .66 cu.ft. / hr. of natural gas and then reduced to .04 cu.ft. / hr. after one second.

Regards,

Richard Clark

Richard Clark Certification Engineer CSA Group

How does the FE WORK?

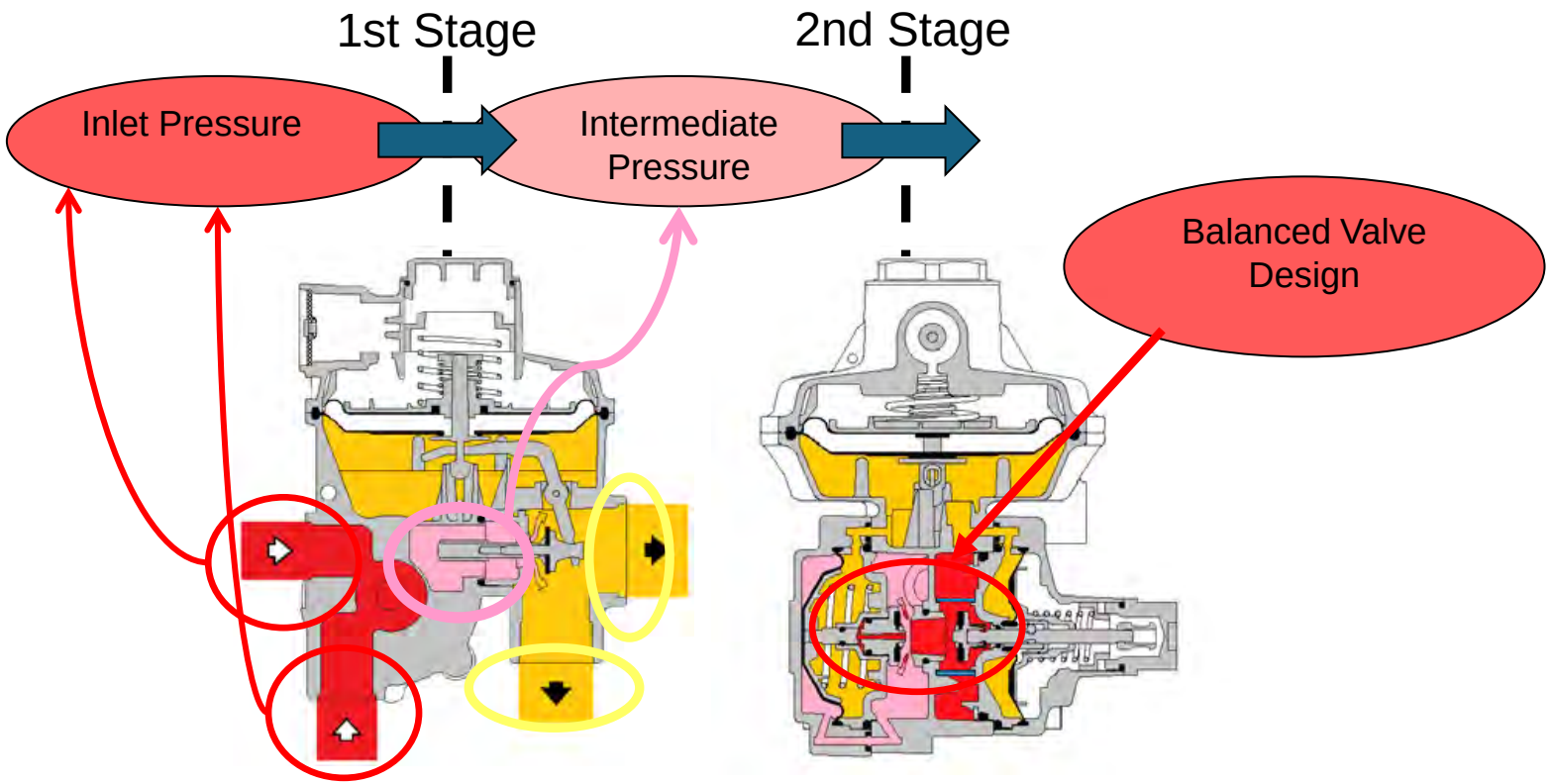
TWO STAGE REGULATOR

Two-stage gas pressure regulators have two main advantages compared to single-stage regulators:

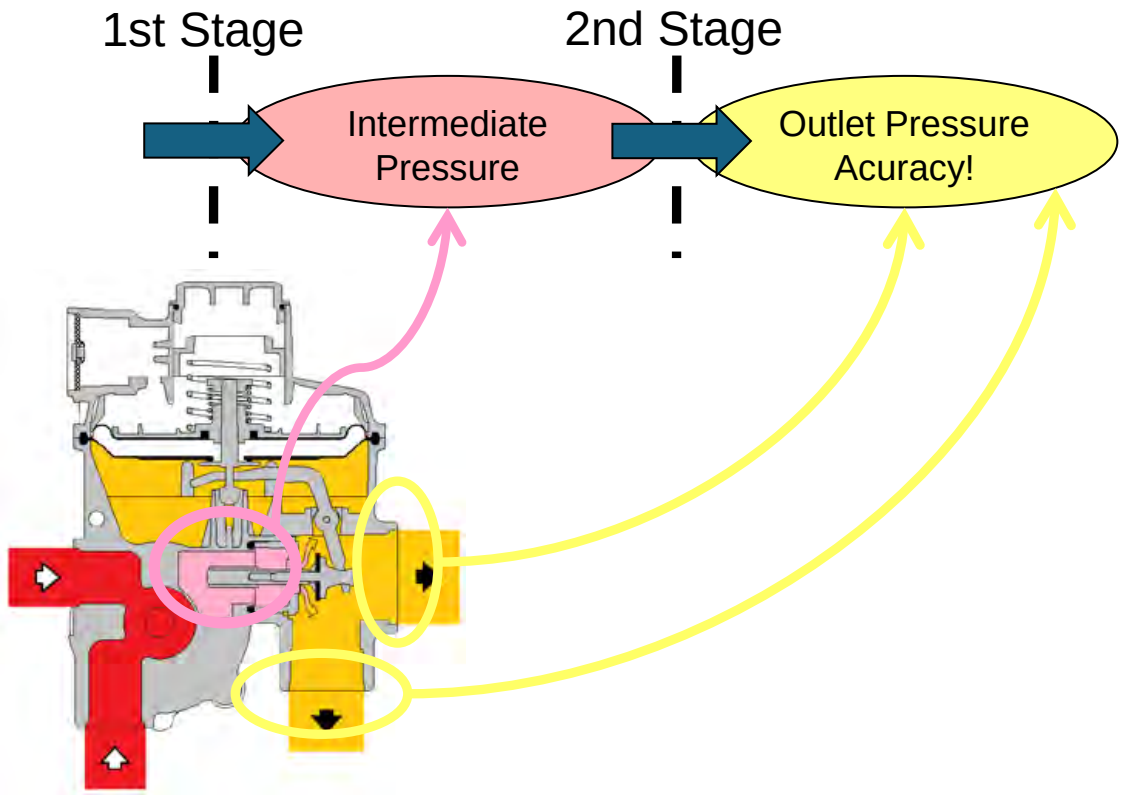
1. **Safety**: In case of failure of the 2nd stage, the 1st stage acts as a regulator to limit the pressure at the outlet; the over pressure shut-off device is a further safety feature.

2. **Accuracy**: The balanced 1st stage regulation limits the pressure variation to the 2nd stage, so it is possible to reach high accuracy of the regulated outlet pressure.

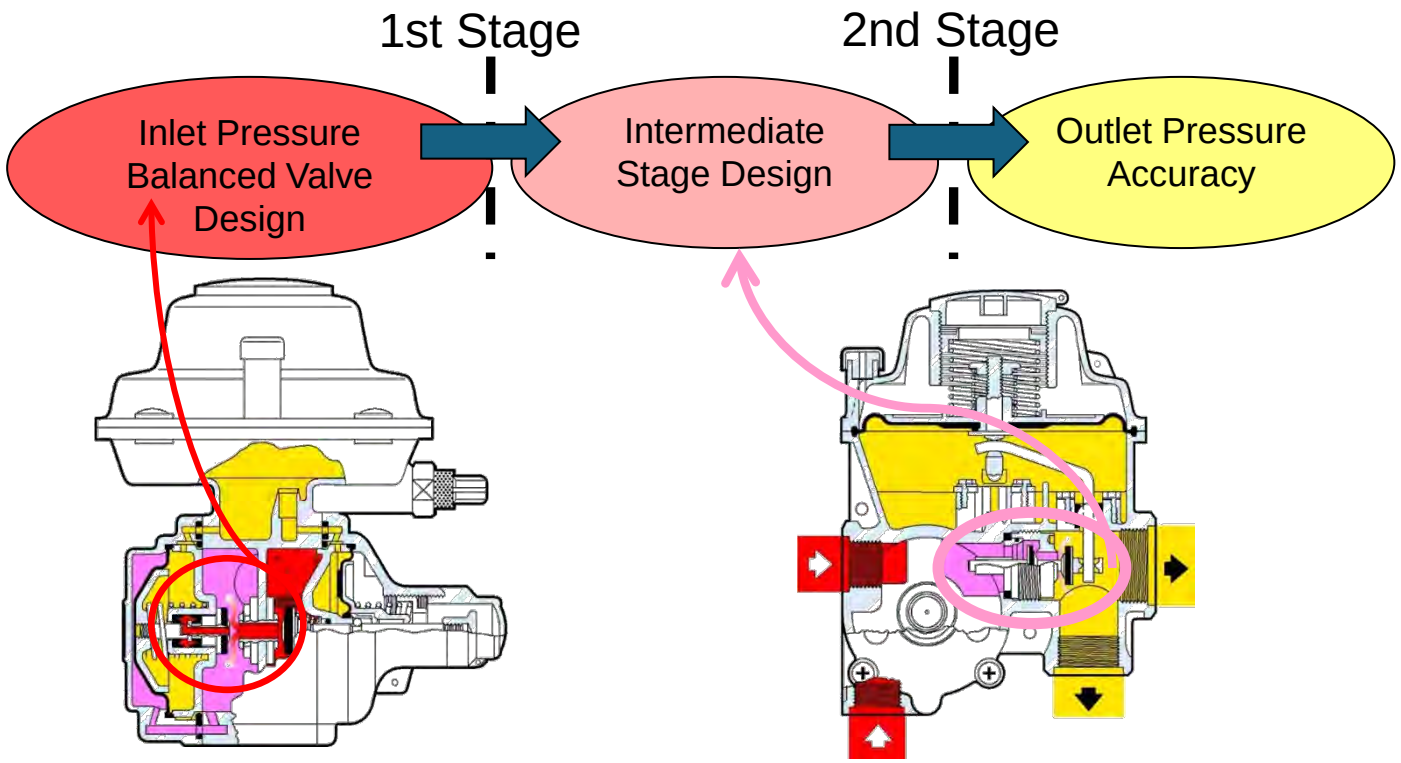
First Stage


1st Stage
2nd Stage
Inlet Pressure
Intermediate Pressure
Balanced Valve Design

2nd Stage

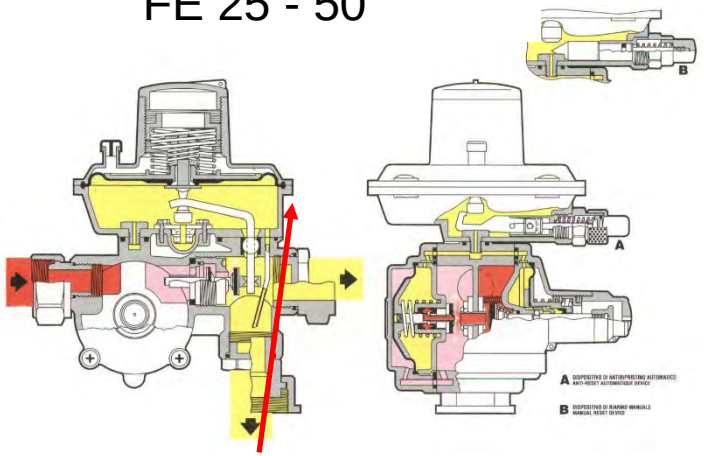

1st Stage
2nd Stage
Intermediate Pressure
Outlet Pressure Acuracy!

Equals Outlet pressure Accuracy!



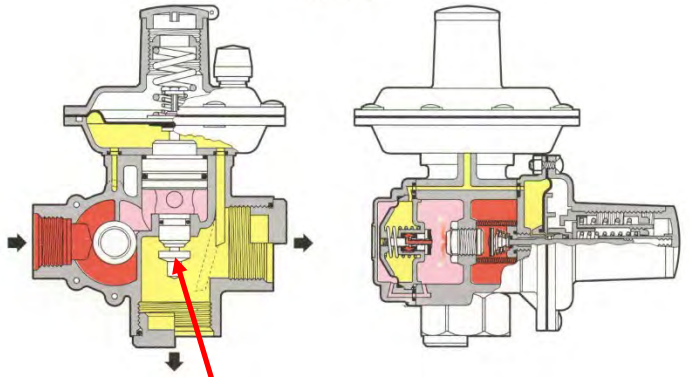
FE VS. FEX DIFFERENCES

FE 25 - 50



LEVER ACTING

FE 75 -100



DIRECT ACTING

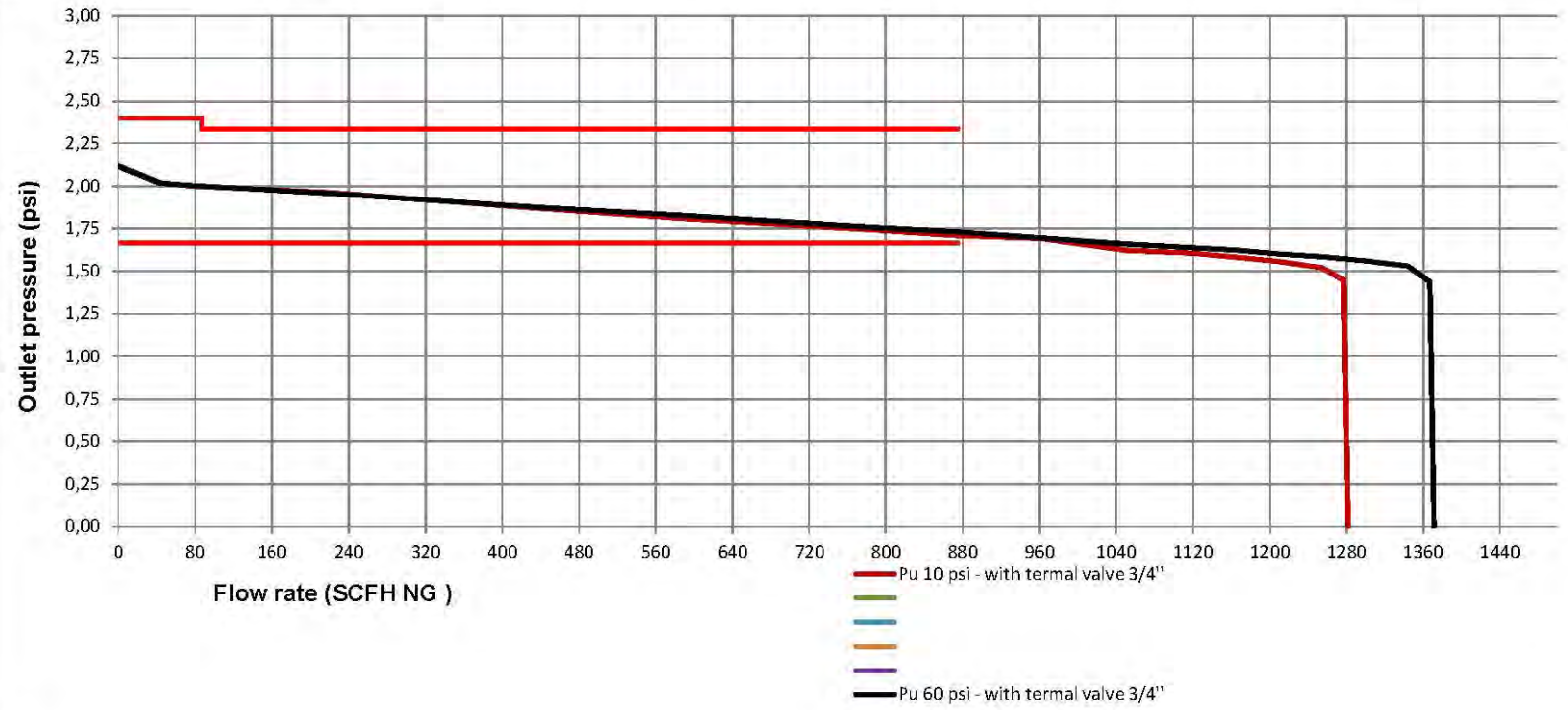
FE 25-50 Accuracy 2 PSIG setpoint!

Pietro Fiorentini®

REGULATOR	FE 25 - 50 sample 5 - 2PSI - inlet 3/4 NPT termal valve - outlet 3/4"NPT									
excess flow										
Pd	2,00	psi		AC	2	abs	SG	20		
RELIEF	2,70	psi								
OPSO	3,30	psi		UPSO	std					
Note:										

Issued by: Marco BRENA

Office	LABORATORY
Date	16/07/2019



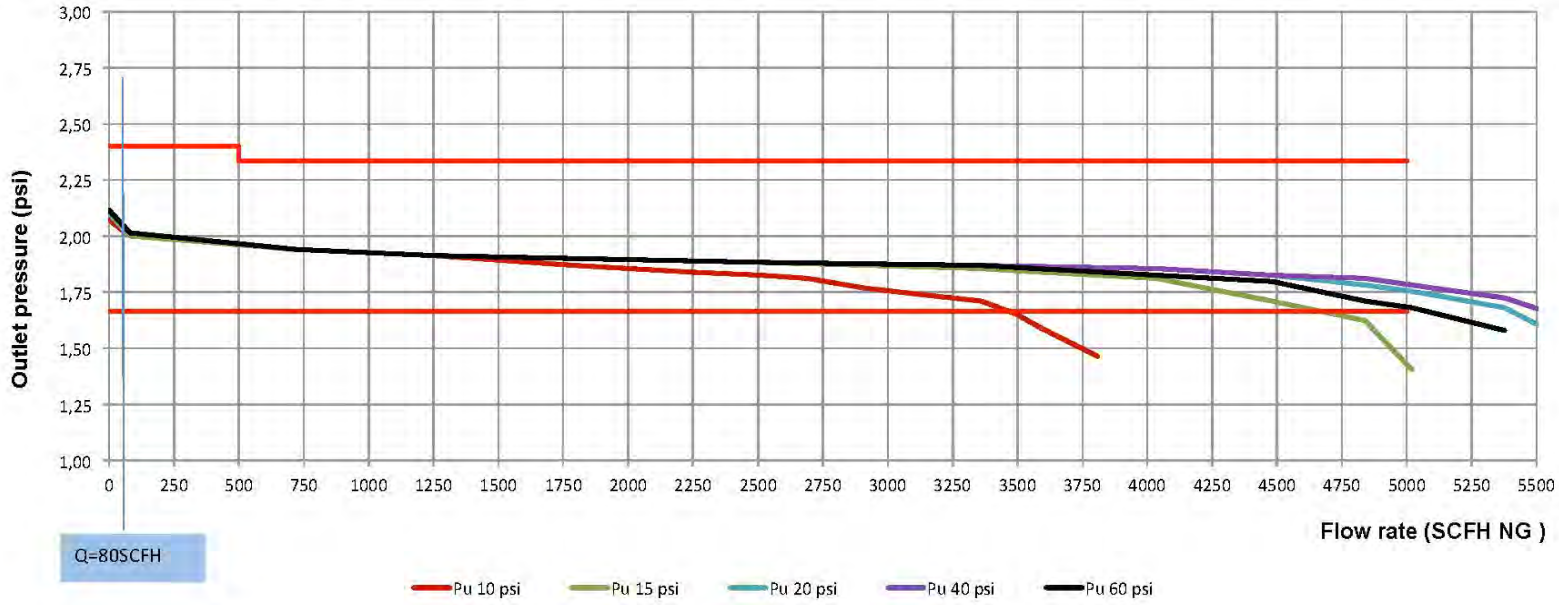
FE 75-100 Accuracy 2 PSIG setpoint!

Pietro Fiorentini®

REGULATOR	FE 75 - 100 - 2PSI - inlet 1"1/4 NPT termal valve - outlet 2"NPT										
Pd	2,00	psi		AC	2	abs	SG	20			
RELIEF		psi									
OPSO	8	psi		UPSO	1	psi					
Note:											

Issued by: Marco BRENA

Office	LABORATORY
Date	19/06/19



NEW MODEL NAMES & 4 MODELS

MODEL	SCFH L CAPACITY	PSIG PRESSURE
FE 25	875	4.0
FE 50	1,500	10.0
FE 75	2,648	7.5
FE 100	3,500	10.0

MAIN FEATURES		Pipe Size
INLET PRESSURE RANGE	2.2 – 125 psi	3/4" x 3/4"
MAX ALLOWABLE PRESSURE	PS 125 psi	3/4" X 1"
OUTLET PRESSURE RANGE	BP: 5.2” wc – 2.6 psi TR: 2.6 psi – 7.5 psi	1"
OVER PRESSURE SHUT-OFF SETTING RANGE	BP: 14” wc - 4,3 psi TR: 4.3 psi- 11.6 psi	1" X 1-1/4" 1" x 1-1/2"
ACCURACY CLASS	up to AC5 %	1-1/4" X 2"
LOCK UP PRESSURE CLASS	up to SG10 %	2" x 2"
OPERATING TEMPERATURE	-4°F/140°F -40°F/140°F	

The FE is Epoxy Painted

- Standard FE: Phosphate protective Coating
- All painted products
- PREPARATION: Shot blasting with 800 microns diameter micro sphere steel shot
- PRIMER: Phosphate Coating
- FINAL COAT: Epoxy polymeric powder paint 356° F final thickness 30-40 micron
- COLOR: Grey 9006
- Exceeds the 1,000 hour salt-spray test in accordance with ASTM Method B-117, "Salt Spray (Fog) Testing." After exposure, experts examine the sample for the presence of oxides and evaluate its corrosion-resistance performance!

OBSOLETE

NEW ANODIZED COLOR STD VERSION, ANODIZED NOT PAINTED!

Reference color : RAL7012

AS IS

TO BE

Aesthetics closer to the American regulators

NEW PROTECTION AND PAINTING COLOR UNDERGROUND VERSION

We have been adding an anodizing pre-treatment
To be able to distinguish this special version, we made the paint even darker color (anthracite)

as ANODIZATION

FINAL PAINTING

RESISTANCE SALT SPRAY TEST : UP 2000 HOURS

NEW MANUFACTURING PROCESS FOR SECOND STAGE CAPS

The caps will be made from die-cast mold.
Technology has allowed us to revise the plumbing system, making it more universal

as

AS IS

TO BE

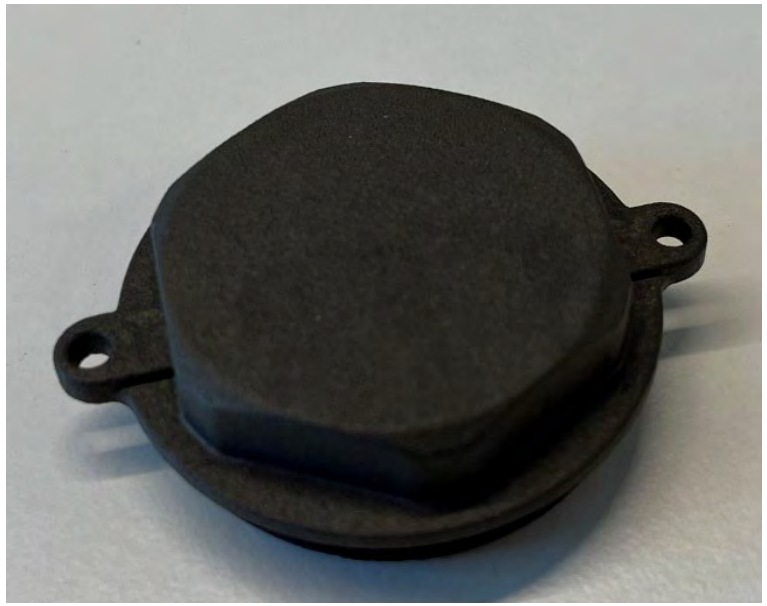
The same technology will be used to produce the FE25-50 OPCO cap

STANDARDIZATION OF CAPS TREATMENT

Introduction for all models of anodizing treatment.

AS IS

TO BE



Increased quality for all versions product

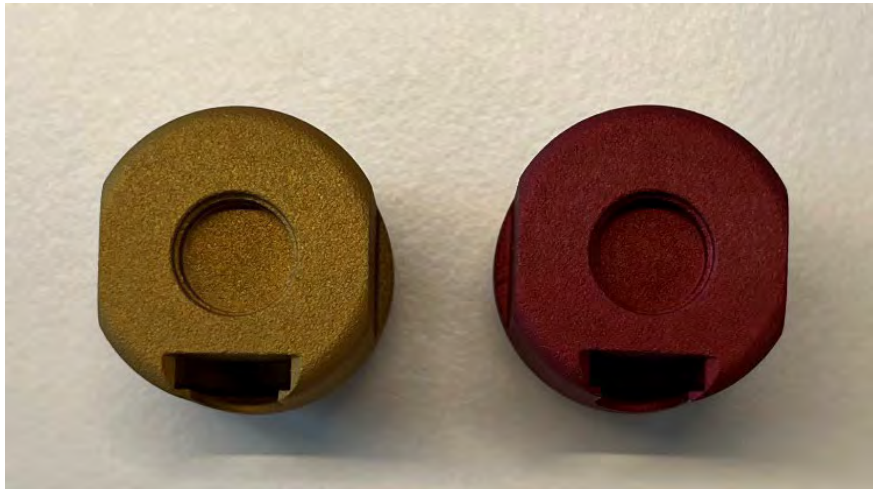
OPCO CAPS

Introduction for OPCO caps color anodizing treatment.

as

AS IS

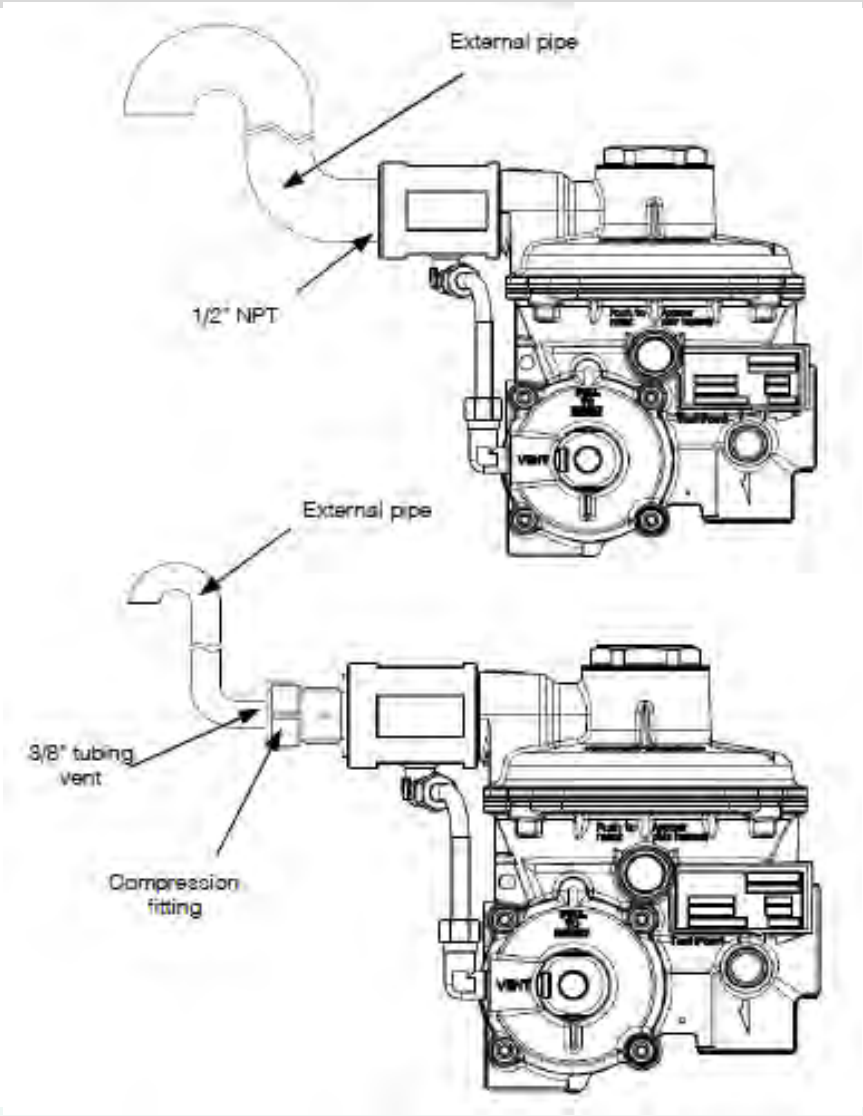
TO BE



Increased quality and better model identification

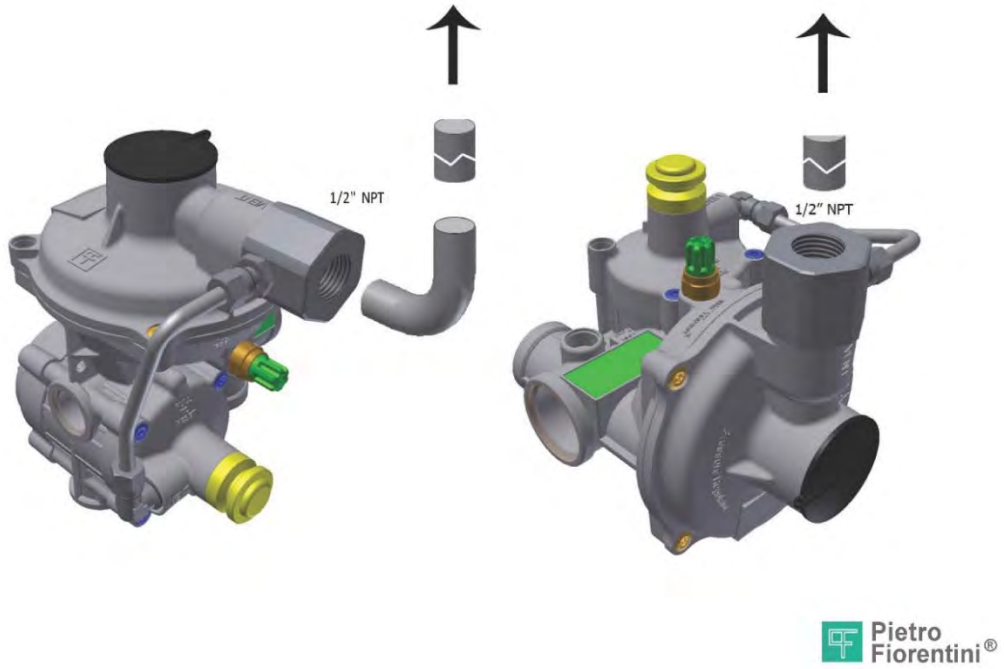
Indoor/Outdoor Vent Line Cost Reduction

- Use of the FE allows for a vent line of 3/8” O.D. tubing for up to 40 feet
- 100 feet with ½" pipe without any regulator performance detriment.
- Lower Material Cost
- Ease of Handling
- Ease of Mounting
- Aesthetics



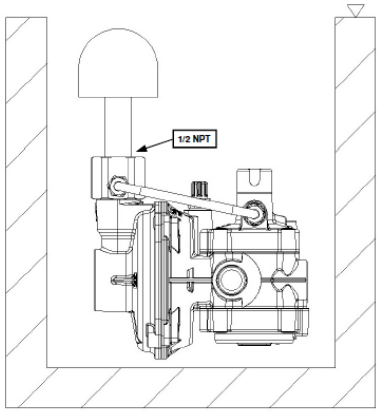
UNIVENT

Indoor & Underground / Underwater Version!



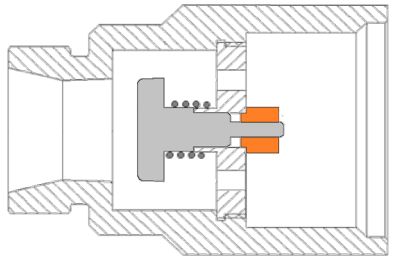
FE REGULATOR – Main accessories

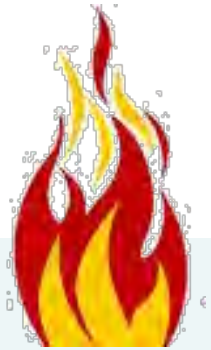
Underground version: regulator works properly even in case of complete flooding.



Thermal valve:

Optional. To increase operation safety in case of fire. Melting at a temperature comprised between 320 F based on the valve selection

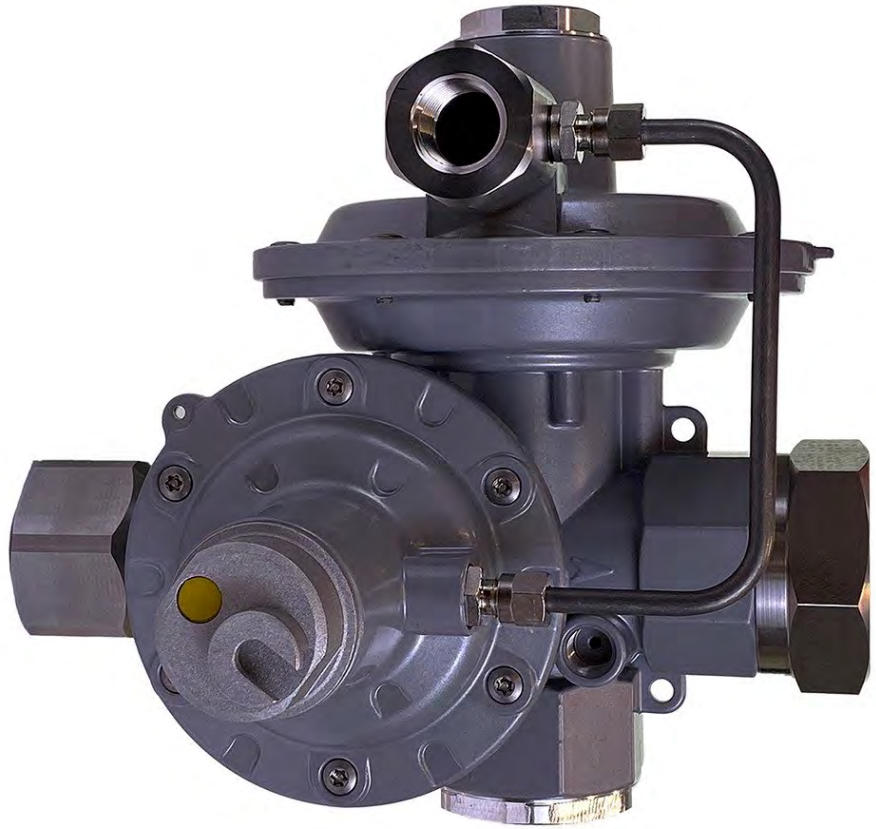


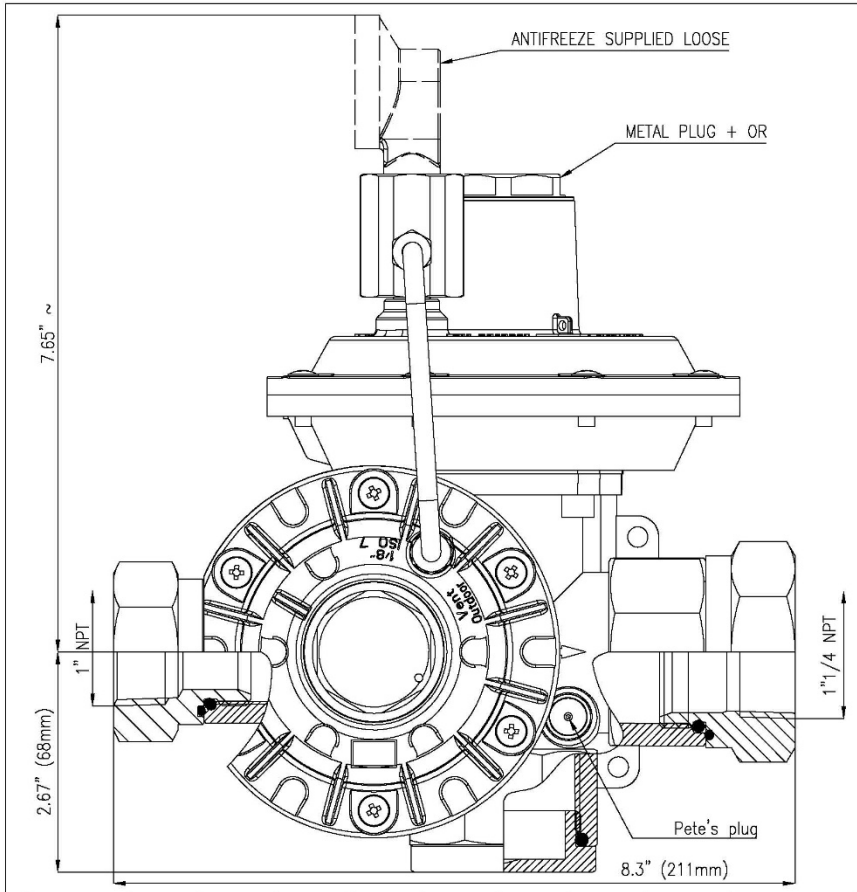


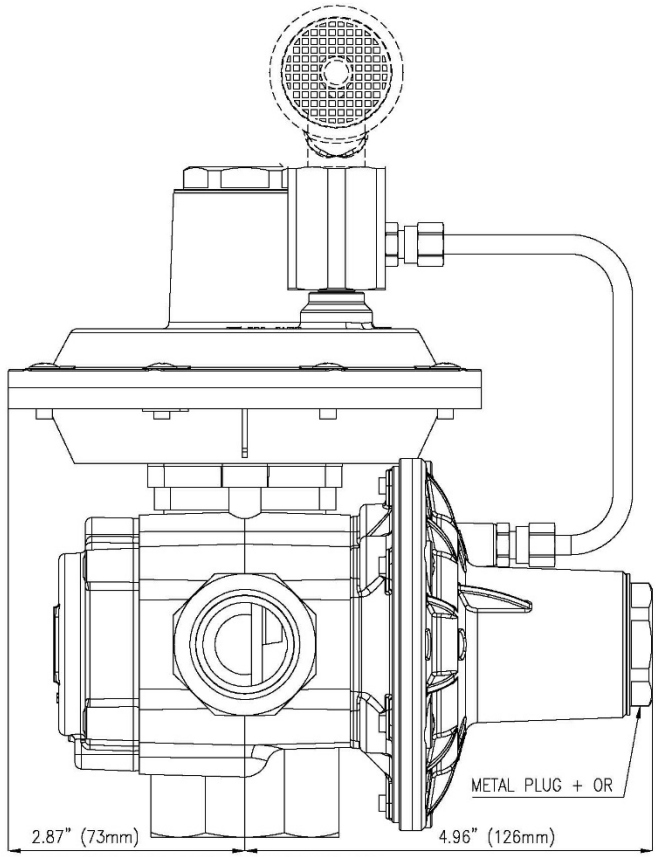
FE 75 -100

Standard

Univent







INSTALLATION WITH GAS FLOW FROM BOTTOM TO TOP

Inlet Pressure	8.5"wc	10"wc	12"wc	16" wc	1 psig	3 psig	7.2 psig	>8.7 psig
Flow SCFH	425	450	475	500	820	1540	3100	3500

Pietro Fiorentini FEX

SN: FEXXXXXXXXXX Ref. FE100
Inlet: 0,3 - 125 Psi
Delivery: 6.5" wc Wds: 6 - 8 "wc
OPSO: 20" wc Wdso: 17 - 20 "wc
UPSO: 2.4" wc Wdsu: 2.4 - 5.6 "wc

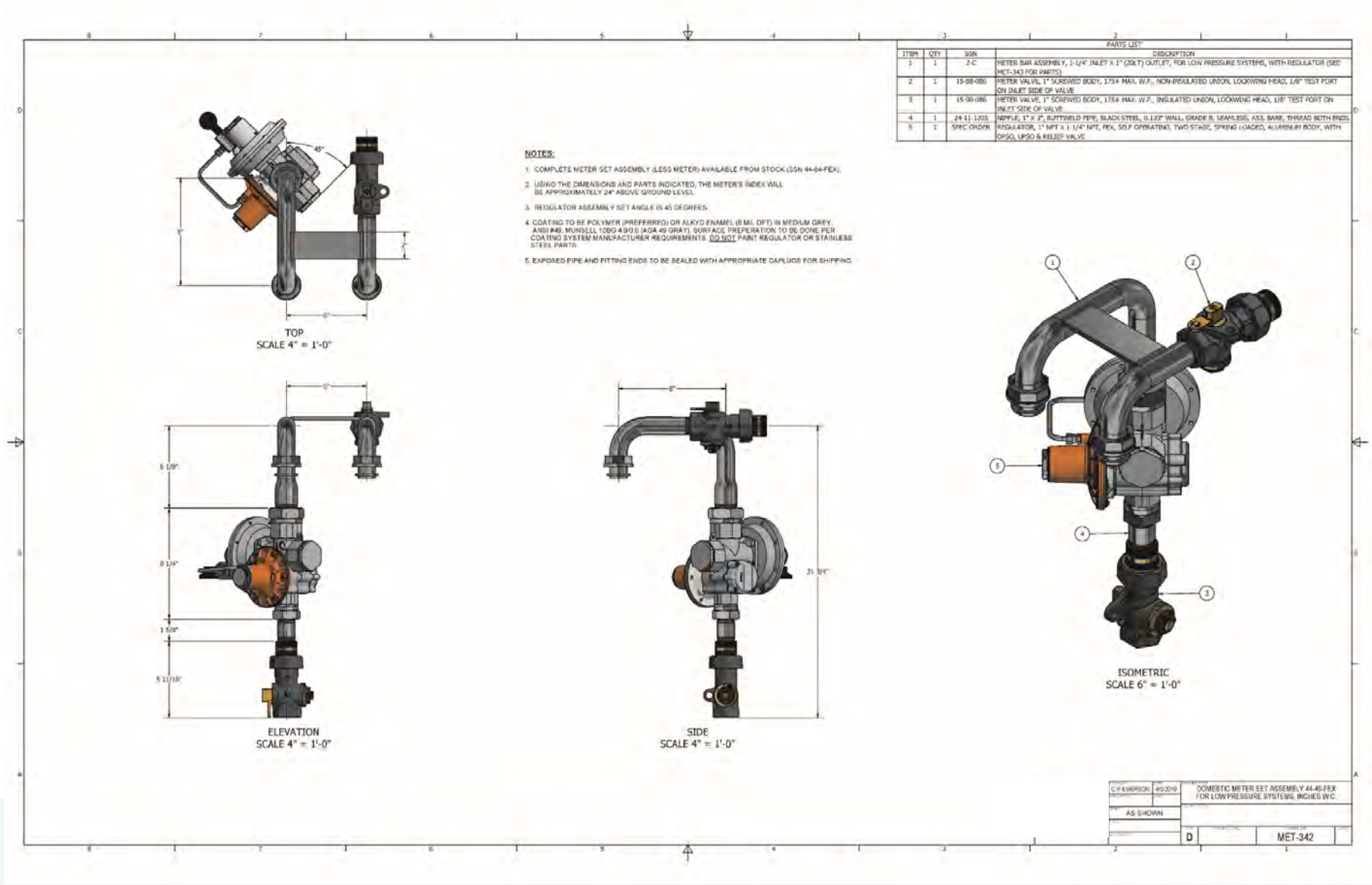
NOTE $: – Antifreezing version
– SPRING Pd CODE US64470171BI
– RELIEF SPRING CODE US64470027VER
– OPSO SPRING CODE US64470111VE
– UPSO SPRING CODE US64470308NE
– RELIFE VALVE 13" wc
– PETE'S PLUG 2950002000
– PF US P/N: USVAIBGZASTG$5178005

FMVAIBGZASTG$5178005	5346	PF USA
Codice PF - PF Code	Codice Cliente PF	Gara - Tender

Pietro Fiorentini — Descrizione / Description: REGULATOR FEX (FE100) ANTIFREEZING

Rev.	Data-Date	Modifiche (vedi simbolo ▲sul disegno)-Revision (see symbol ▲ on the drawing)	Dis.-Drawn	Approv.
C	11/04/19	Inserita presa di pressione Peterson	Co.S.	A.A.
B	03/04/19	Modificato tarature	Co.S	A.A.
A	15/03/019	EMISSIONE	Co.S.	A.A.

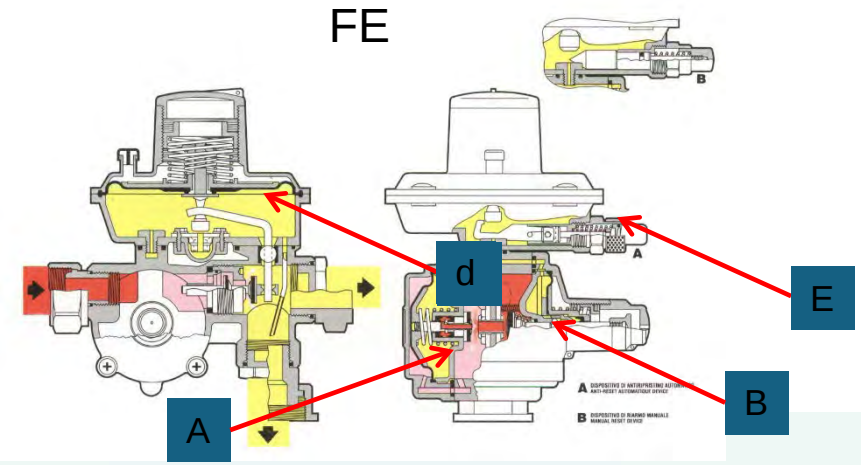
Peso-Weight:
Scala-Scale: 1:1.25
Size: A3
N° Disegno-Drawing N°: 0015178005 C
REV


PARTS LIST
ITEM | QTY | SSN | DESCRIPTION
1 | 1 | 2-C | METER BAR ASSEMBLY, 1-1/4" INLET X 1" (2QLT) OUTLET, FOR LOW PRESSURE SYSTEMS, WITH REGULATOR (SEE MET-343 FOR PARTS)
2 | 1 | 15-88-086 | METER VALVE, 1" SCREWED BODY, 175# MAX. W.P., NON-INSULATED UNION, LOCKWING HEAD, 1/8" TEST PORT ON INLET SIDE OF VALVE
3 | 1 | 15-90-086 | METER VALVE, 1" SCREWED BODY, 175# MAX. W.P., INSULATED UNION, LOCKWING HEAD, 1/8" TEST PORT ON INLET SIDE OF VALVE
4 | 1 | 24-11-1205 | NIPPLE, 1" X 3", BUTTWELD PIPE, BLACK STEEL, 0.133" WALL, GRADE B, SEAMLESS, A53, BARE, THREAD BOTH ENDS
5 | 1 | SPEC ORDER | REGULATOR, 1" NPT x 1 1/4" NPT, FBX, SELF OPERATING, TWO STAGE, SPRING LOADED, ALUMINUM BODY, WITH OPSO, UPSO & RELIEF VALVE
NOTES:
1. COMPLETE METER SET ASSEMBLY (LESS METER) AVAILABLE FROM STOCK (SSN 44-64-FBX).
2. USING THE DIMENSIONS AND PARTS INDICATED, THE METER'S INDEX WILL BE APPROXIMATELY 24" ABOVE GROUND LEVEL.
3. REGULATOR ASSEMBLY SET ANGLE IS 45 DEGREES.
4. COATING TO BE POLYMER (PREFERRED) OR ALKYD ENAMEL (8 MIL DFT) IN MEDIUM GREY, ANSI #49, MUNSELL 10BG 4.9/0.8 (AGA 49 GRAY). SURFACE PREPERATION TO BE DONE PER COATING SYSTEM MANUFACTURER REQUIREMENTS. DO NOT PAINT REGULATOR OR STAINLESS STEEL PARTS.
5. EXPOSED PIPE AND FITTING ENDS TO BE SEALED WITH APPROPRIATE CAPLUGS FOR SHIPPING.
TOP
SCALE 4" = 1'-0"
ELEVATION
SCALE 4" = 1'-0"
SIDE
SCALE 4" = 1'-0"
ISOMETRIC
SCALE 6" = 1'-0"
C-F EMERSON
AS SHOWN
DOMESTIC METER SET ASSEMBLY 44-48-FBX
FOR LOW PRESSURE SYSTEMS, INCHES W.C.
D
MET-342

Compact Installation

FE & FE Failure Matrix

A. Failure of 1st stage diaphragm	2nd stage takes overtakes over and regulator still operates!
B. Failure of slam shut diaphragm	Increase in outlet pressure & Slam Shut trips!
C. Failure of main diaphragm	Safety diaphragm takes over!
D. Failure of safety diaphragm	Slam shut will trip!
E. Line breaks downstream	Low pressure cut off engages shuts off!



FE Start Up

A. Make sure the meter nut is loose or test point is open to purge air from the system

B. Turn Gas on

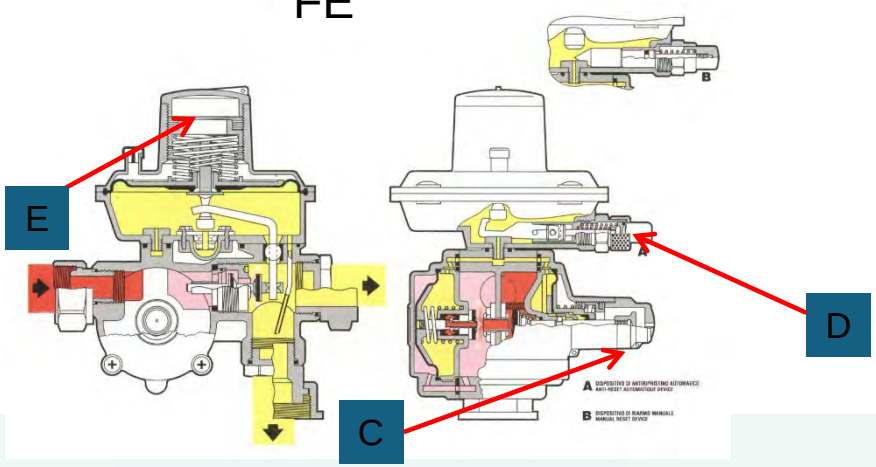
C. Pull out OPSO slam shut reset stem

D. Push in low pressure reset button (IF USED)

E. Adjust outlet pressure

F. Close the purge fitting

FE



NeoR

Low Pressure Gas Regulator for North American Market

NeoR – pressure regulators

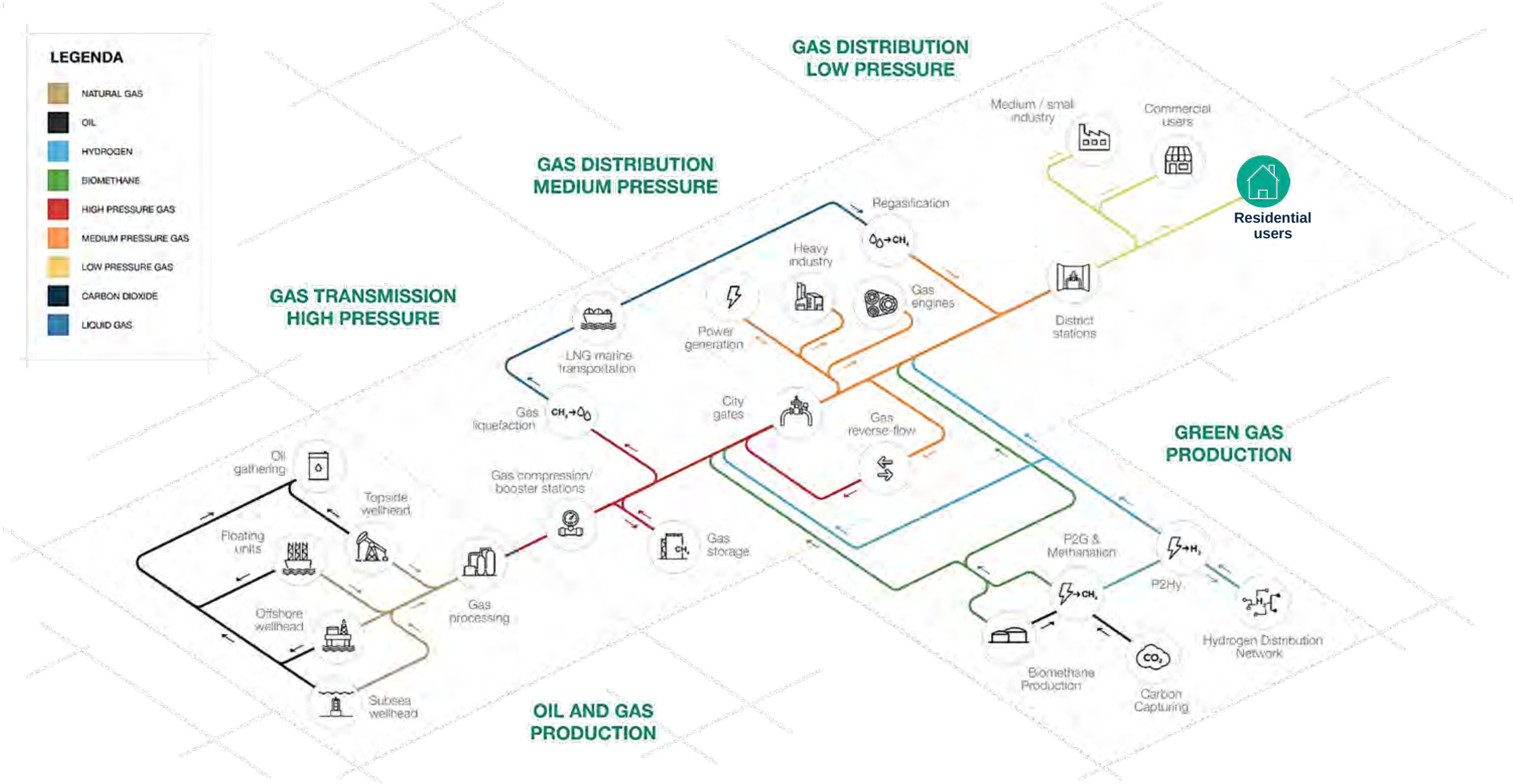
The NeoR is a double stage gas pressure regulator by Pietro Fiorentini.

Designed to **ensure continuous gas supply** while **maintaining a high level of safety with reduced emission**. The NeoR is a service regulator without slam-shut device, incorporating a double token relief valve (IRV) with partial relief capacity.

It is particularly suitable for low pressure natural gas distribution systems for residential users. It should be used with previously filtered non-corrosive gases including biomethane and RNG (Renewable Natural Gas).

The NeoR is Hydrogen Ready for NG-H2 blending.

NeoR applications



NeoR materials and approvals

Spring
Steel

Body
Aluminum

Orifice seat
Nitrile rubber

Diaphragms
Nitrile rubber

Cover
Aluminum

Sealing rings
Nitrile

Design Standards

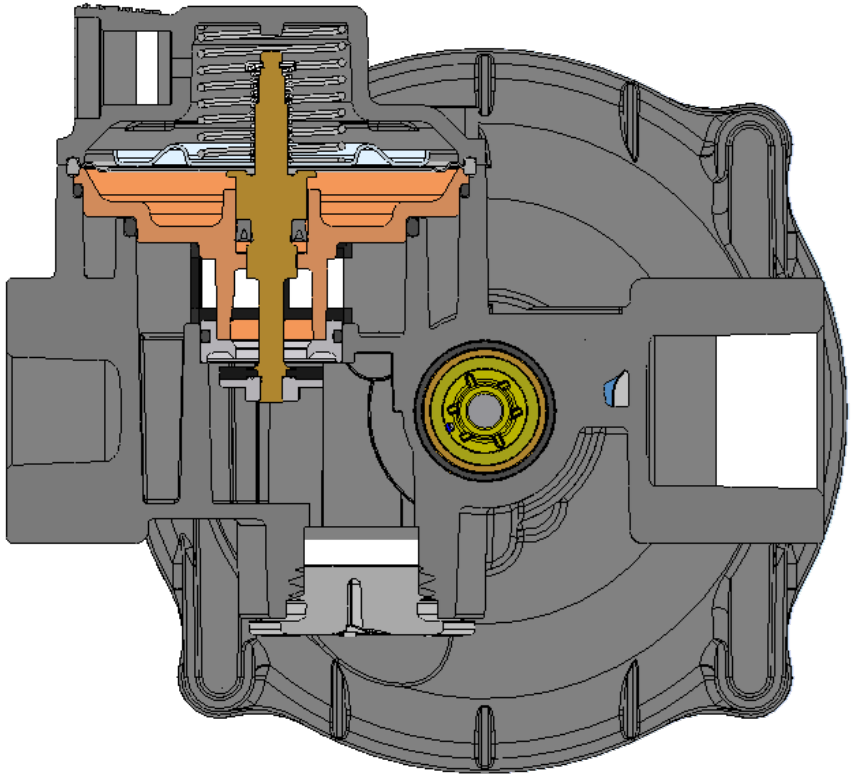
ANSI B109.4

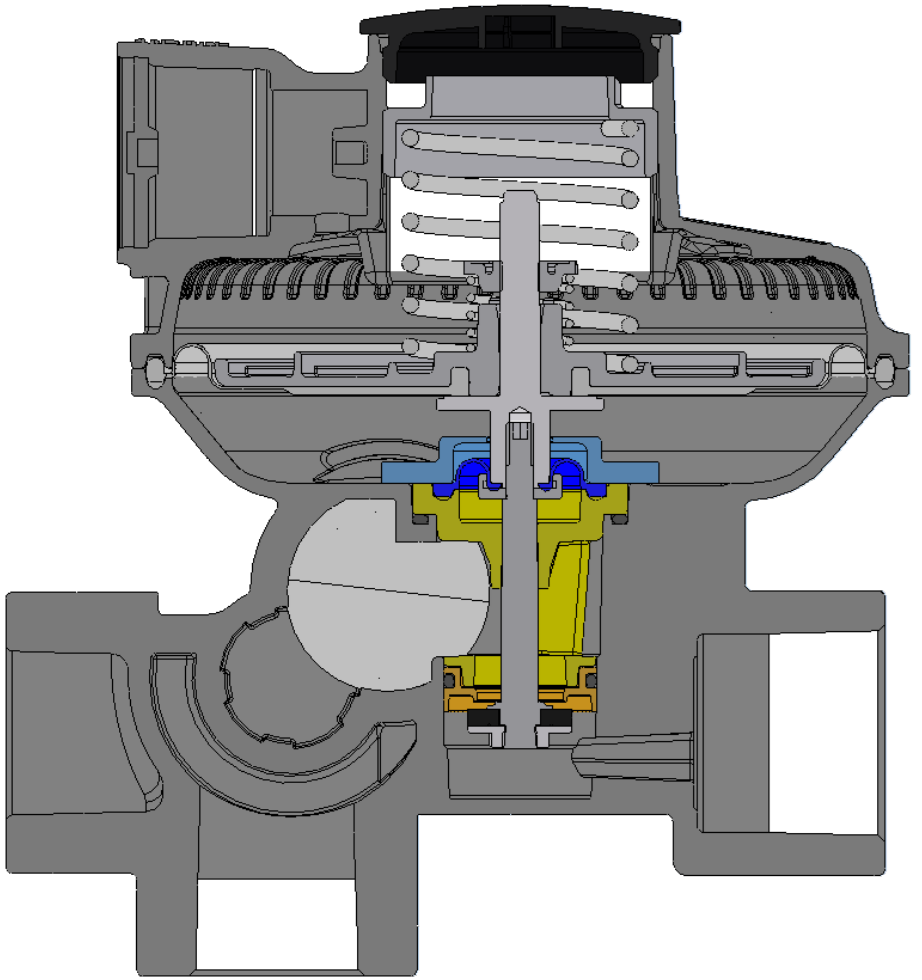
CSA 6.18

North America PF new concept

- Reduced emission, and **not full relief**
- **No slam-shut** as Over-pressure protection
- Designed to be more competitive
- For compliant installation (non-EOC)

Inside a NeoR : 1st and 2nd Stage





Competitive advantages

- Operates with low differential pressure
- Overpressure protection without slam-shut or full capacity IRV
- Two-stage single orifice regulator
- Suitable for 3 ft clearance installation
- Built-in thermal valve option
- Built-in strainer
- Suitable for outdoor installations
- Biomethane (RNG) compatible and 20% Hydrogen blending compatible. Higher blending available on request

NeoR vs FE25

Features	FE25	NeoR	Features	FE25	NeoR
MAOP Maximum Allowable Operating Pressure	up to 125 psig	Up to 100 psig	**Accuracy and Lock-up pressure**	ANSI B109.4 CSA 6.18	ANSI B109.4 CSA 6.18
Capacity	25 Sm3/h 875 scfh	up to 40 Sm3/h up to 1400 scfh	**Filter**	100-micron	100-micron
Design pressure	125 psig	125 psig	**Orientation Inlet / outlet**	Multiple In/Out with fittings	In-line / 90°
Outlet pressure range	6” w.c. – 2 psig	5” w.c. - 2 psig	**Body connections**	NPT	NPT
Ambient temperature standard version	-30°C to 65°C -20°F to 150°F	-30°C to 65°C -20°F to 150°F	**Dielectric union**	Optional	No
Gas temperature standard version	-20°C to 60°C -7°F to 140°F	-20°C to 60°C -7°F to 140°F	**Token relief capacity**	max 14 scfh max 400 l/h	max 14 scfh max 400 l/h
Ambient temperature Arctic version	-40°C to 65°C -40°F to 150°F	-40°C to 65°C -40°F to 150°F	**Over pressure protection**	SSV	IMD, up to 5 psig
Gas temperature Arctic version	-30°C to 60°C -20°F to 140°F	-30°C to 60°C -20°F to 140°F	**Venting during 2nd stage diaphragm failure**	max 2.5 cfh max 70 l/h	max 14 scfh max 400 l/h
Reference standards	ANSI B109.4 CSA 6.18	ANSI B109.4 CSA 6.18	**Spring holder cap**	Aluminum	Plastic
Body material	Aluminum	Aluminum	**Safety diaphragm**	SVV and second stage	None
Lockup class	ANSI B109.4 CSA 6.18	ANSI B109.4 CSA 6.18	**Pressure test point**	Optional, downstream	NO

QUESTIONS

Thank You!