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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 vary 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.



Service Regulators with Lower Emissions

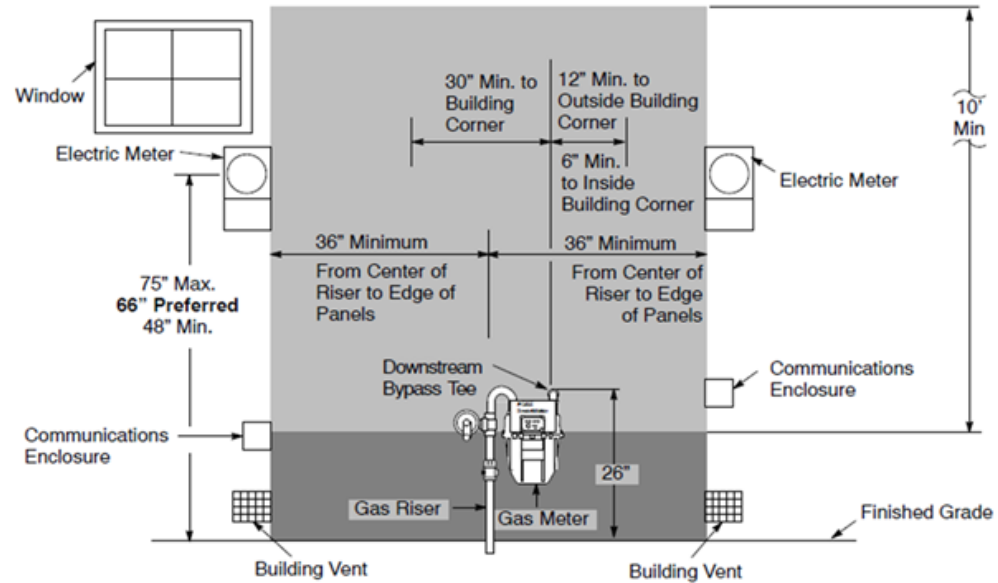
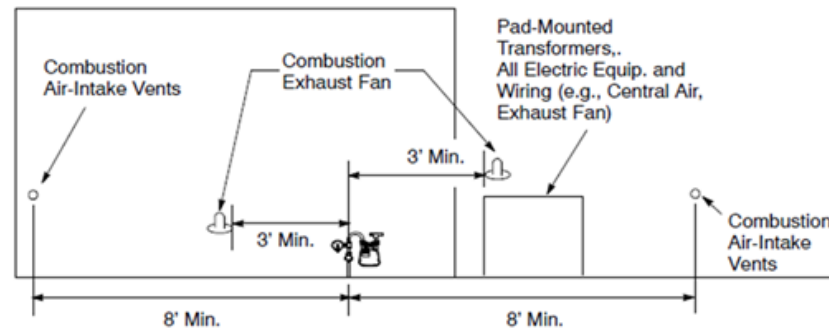


Figure 3
Gas Meter Set Separations



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 (UPS0) 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.



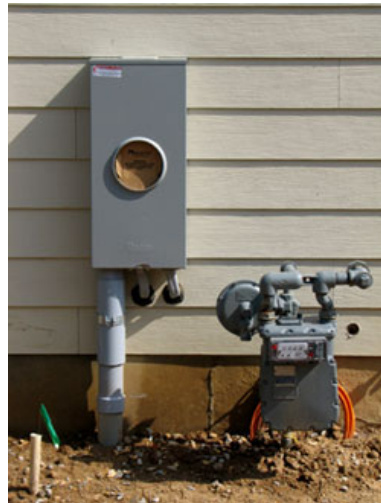
REASONS FOR THE CODE?

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



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Venting of Outdoor Installations





MULTIPLE PROBLEMS!



www.fiorentini.com



Service Regulators with Lower Emissions



Historic Areas, Apartments & Condo



www.fiorentini.com



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.

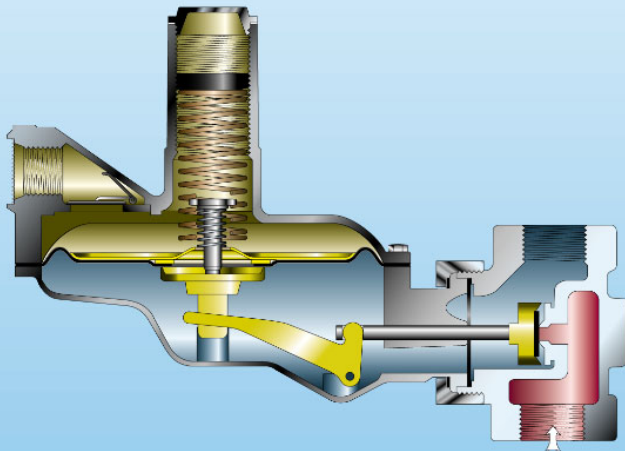
Tests we have done All IRV residential regulators can **vent during lockup** between .015 to .69 cubic feet depending on the manufacturer and model of the regulator.

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.

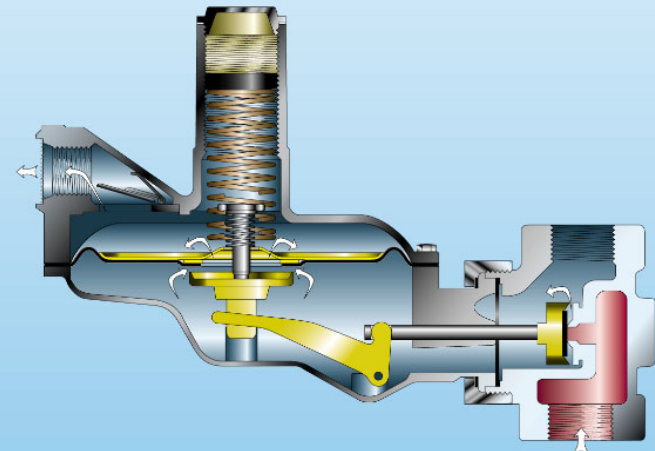


Typical IRV Regulator

IRV in Closed Position



IRV in Open Position





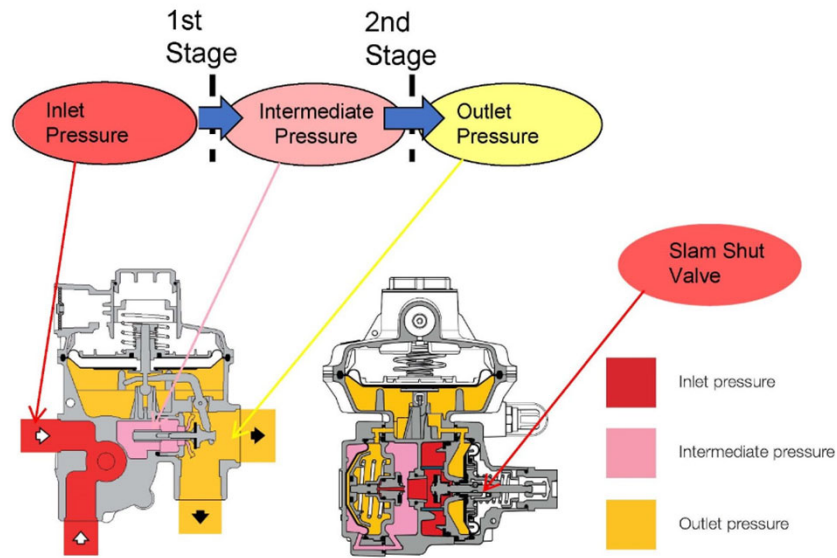
Vent Limited regulators are built with 2 different options

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 diaphragm 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
 - Standard Over pressure shut off switch (OPSO)
 - Optional Under pressure cut off switch (UPS0)
 - Some models have a filter to protect the regulators inlet
 - Meets MAOP up to 125 psi



Two Stage Regulator





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 DIAPHRAGM 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



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	Jan 26, 2014	Original Approval of FE and Dival 500 series to CSA 6.18 and ANSI B109.4 Add class 3331.04 & 3331.04

DCP 507 Rev. 2010-05-20 Page 1



FE REGULATOR RELIEF VALVE VERSIONS

06/14/23

TOKEN RELIEF VALVE VERSION

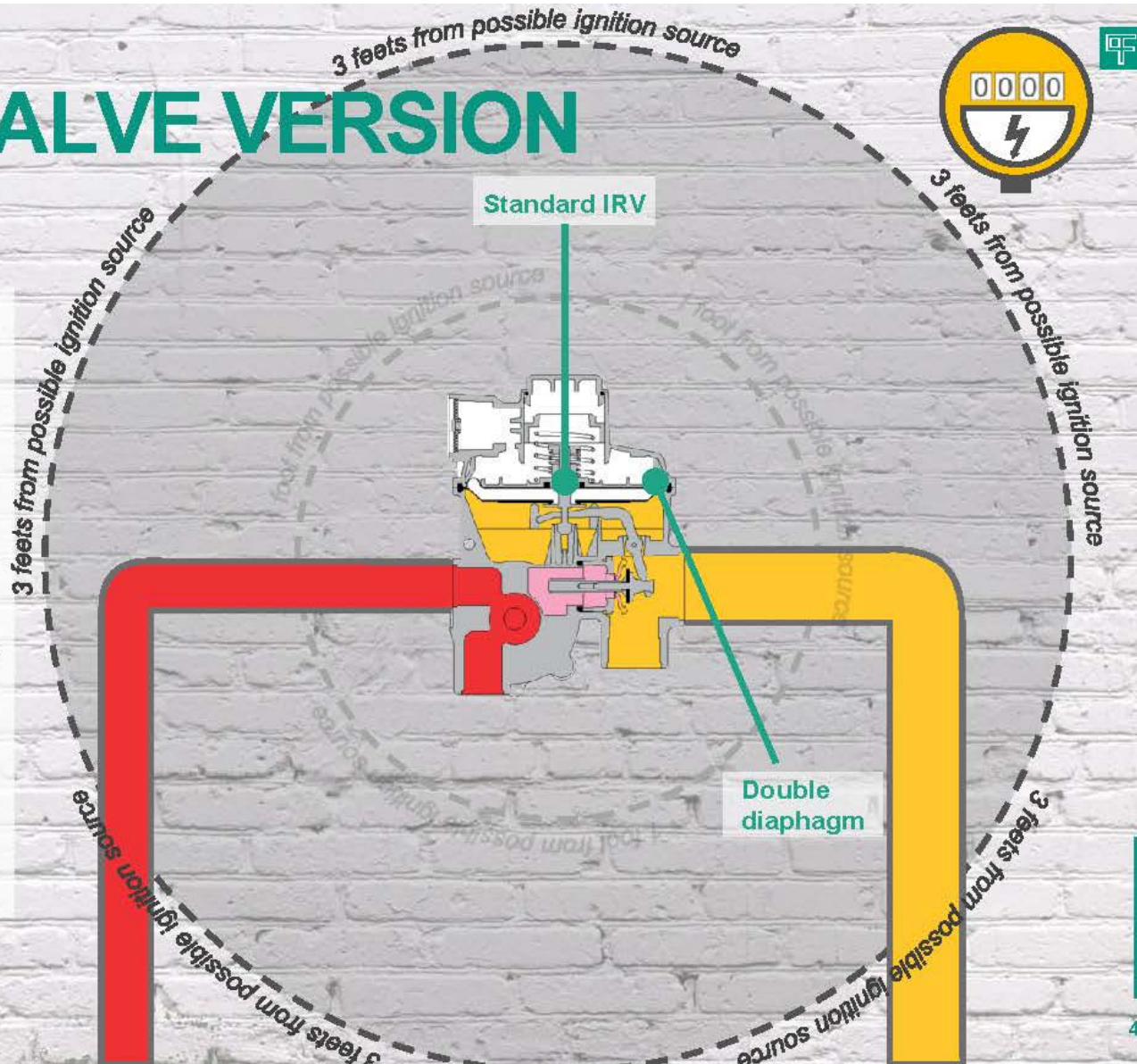
Relief valve maximum flow rate (at the OPCO intervention value):

20 scfh @ regulator set point 7" wc

45 scfh @ regulator set point 2 psi

FE regulator token relief version is designed for outdoor installations with 3 foot distance from potential ignition 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

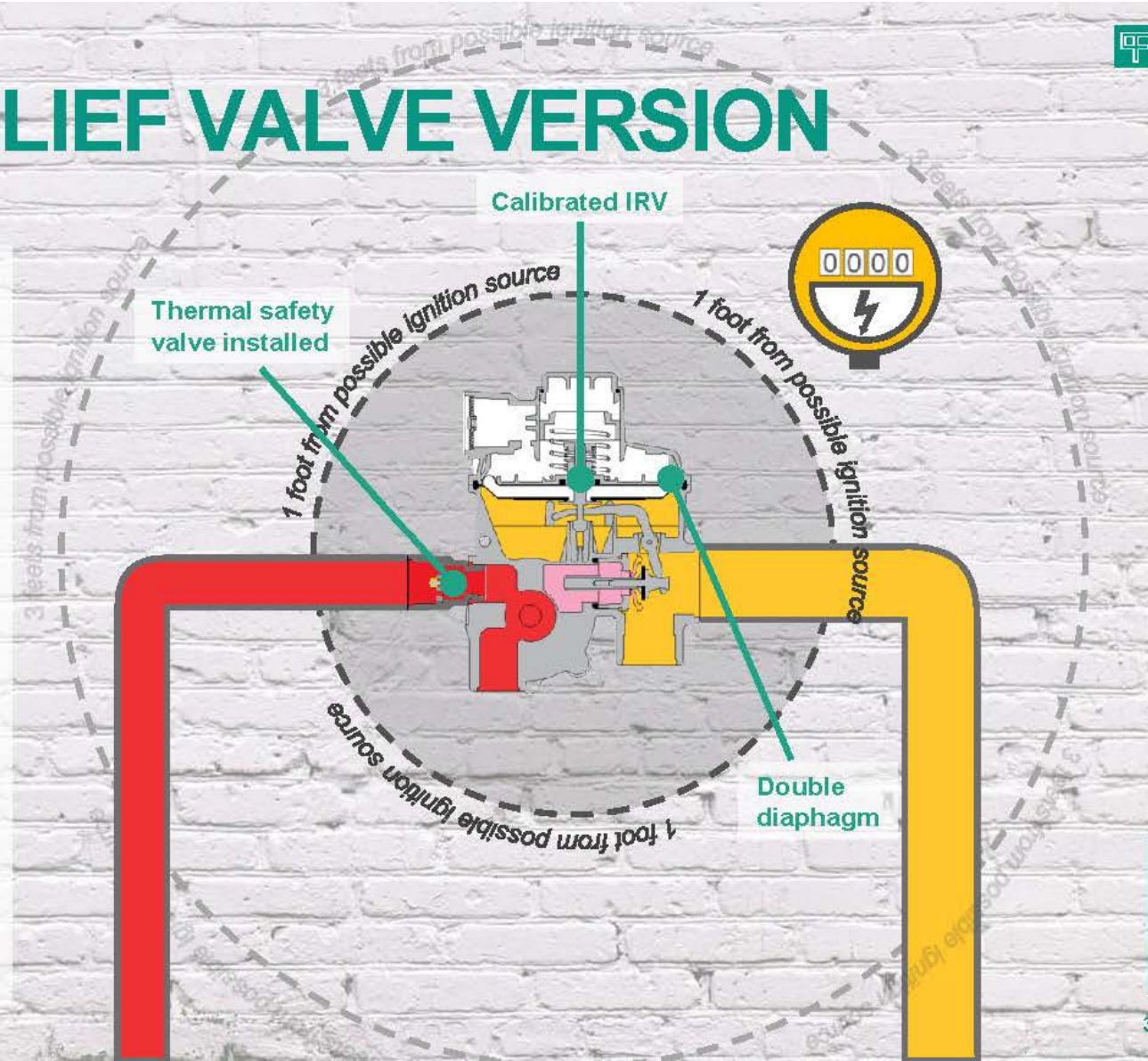
2,5 scfh @ regulator set point 2 psi

FE regulator calibrated version is designed for outdoor installations with 1 foot distance from potential ignition 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.

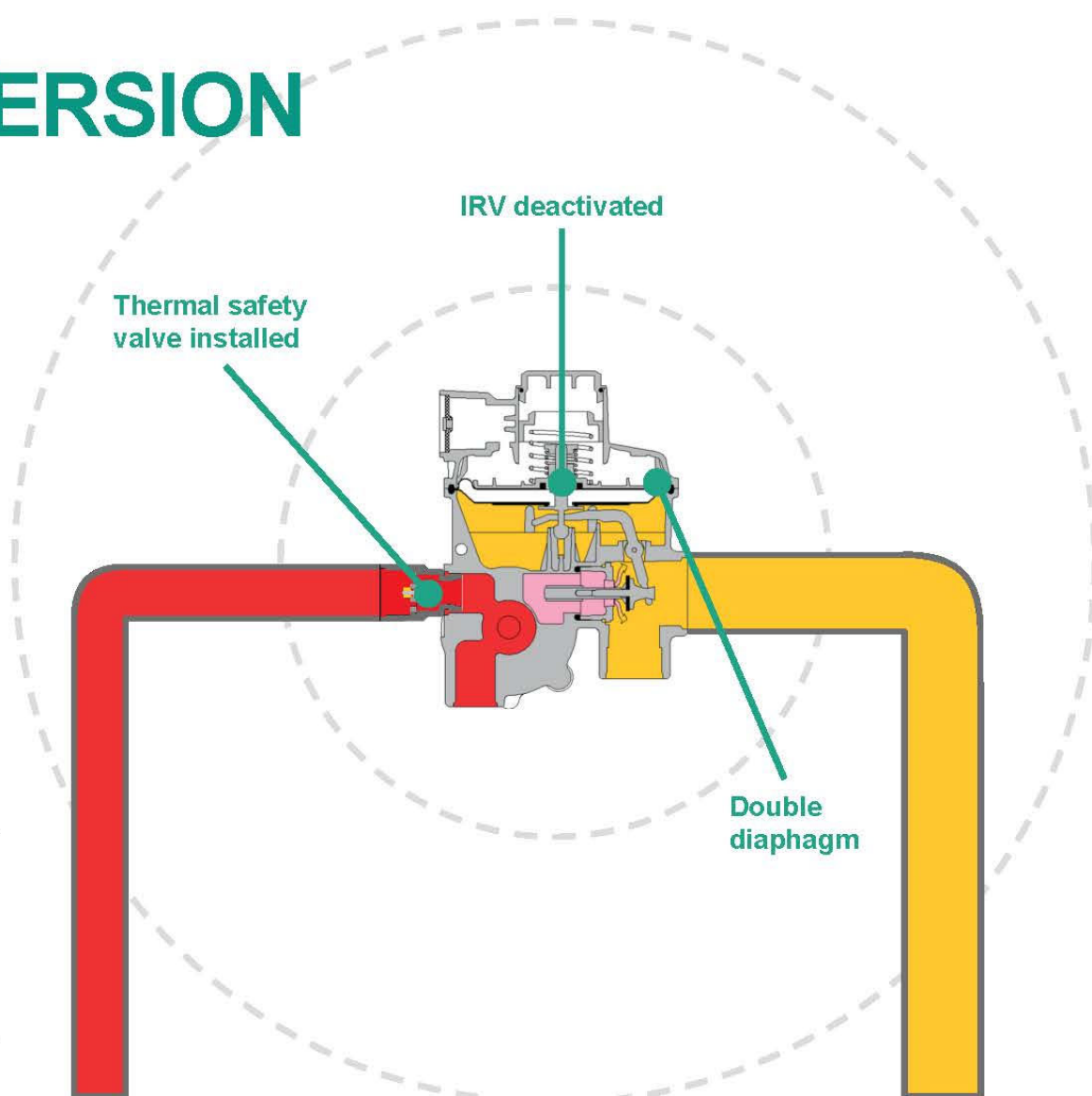
Indoor installation without external vent connection is permitted only if authorized and allowed by the local codes, standards and regulations in force

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	3,500	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	



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	

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CAPACITY

Nominal CAPACITY Low Inlet Pressure

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

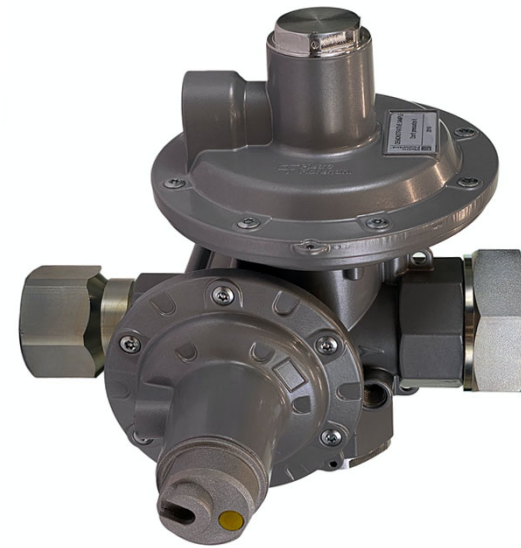
Set point 7"wc	FE	FEX
Pu ("w.c. PSI)	Q (SCFH)	Q (SCFH)
8.5	140	425
12	240	475
16	350	500
1.08	460	820
1.45	550	1,130
2.89	700	1,540
4.34	875	2,030
5.78	885	2,275
7.25	885	2,635



FE REGULATOR



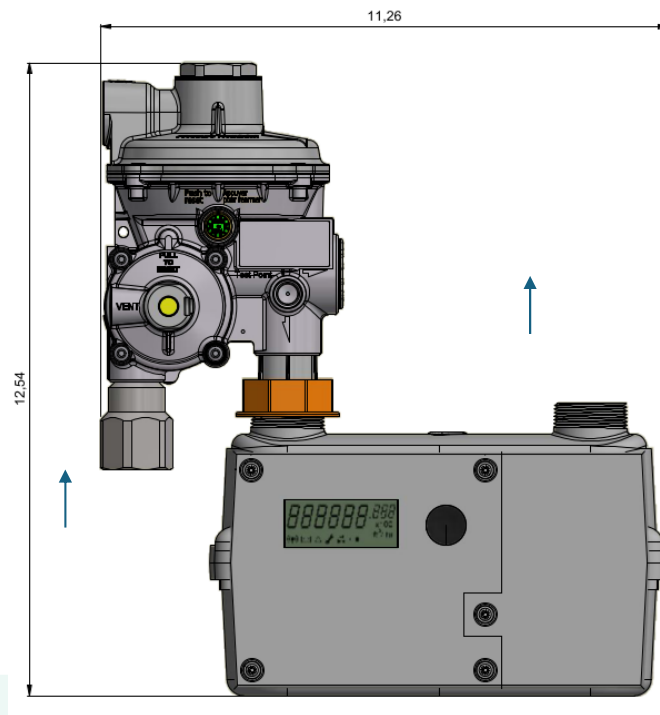
Model FE 25-50



Model FE 75-100



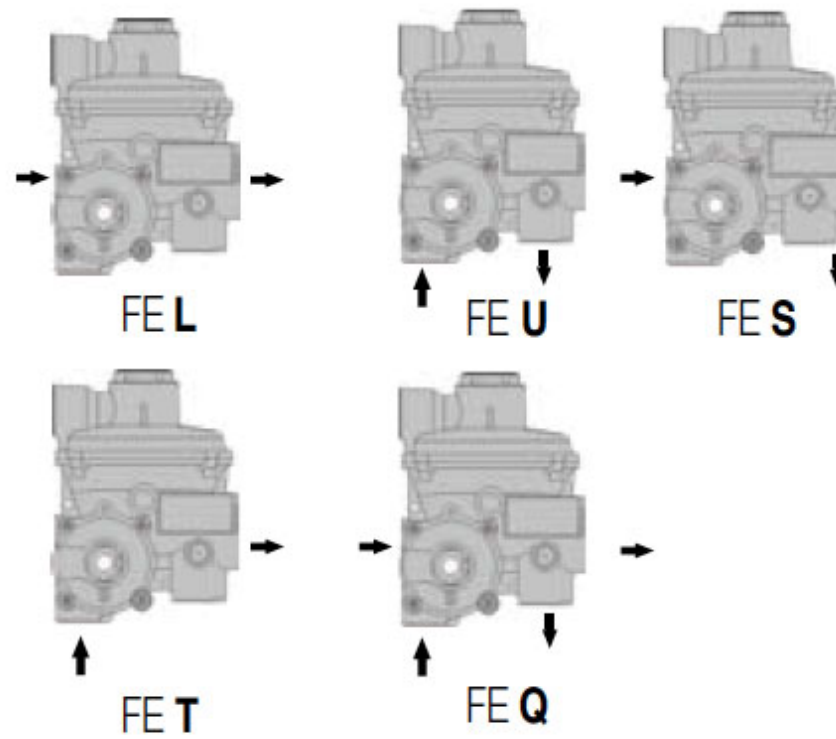
Compact Meter Sets





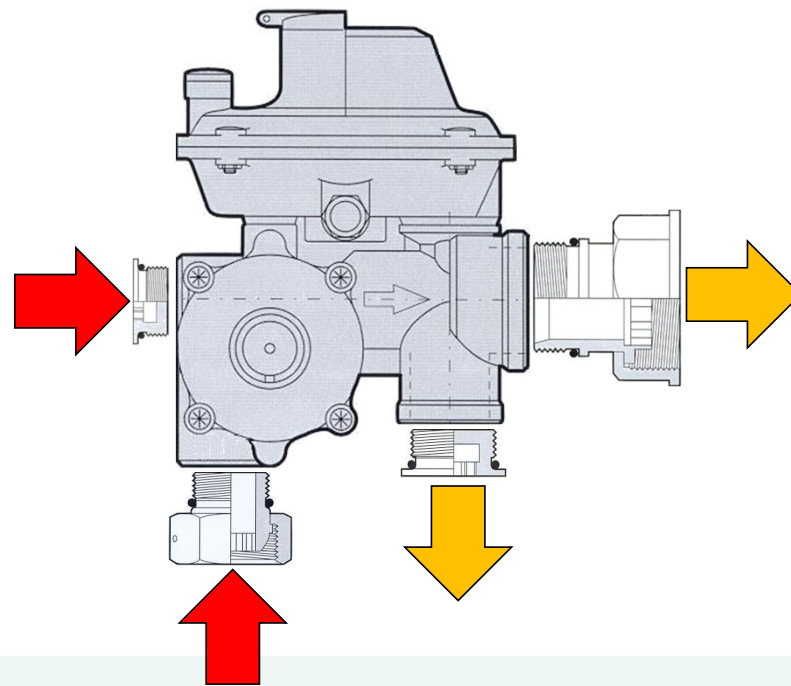
Compact Meter Sets

Connection configuration



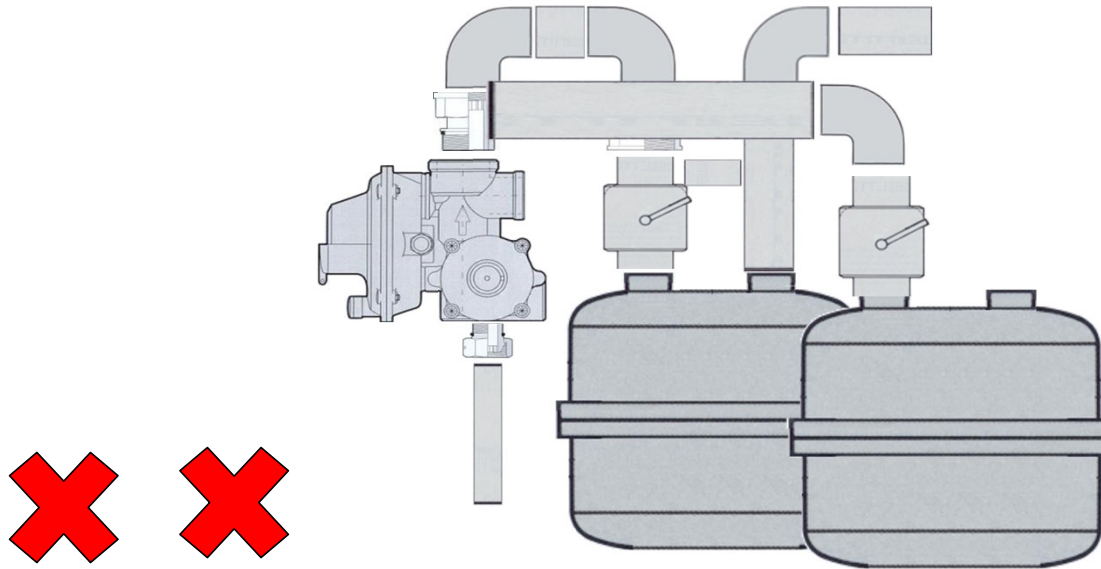


INSTALLATION





Flexible Installation!





FE FEATURES



INLET FILTER

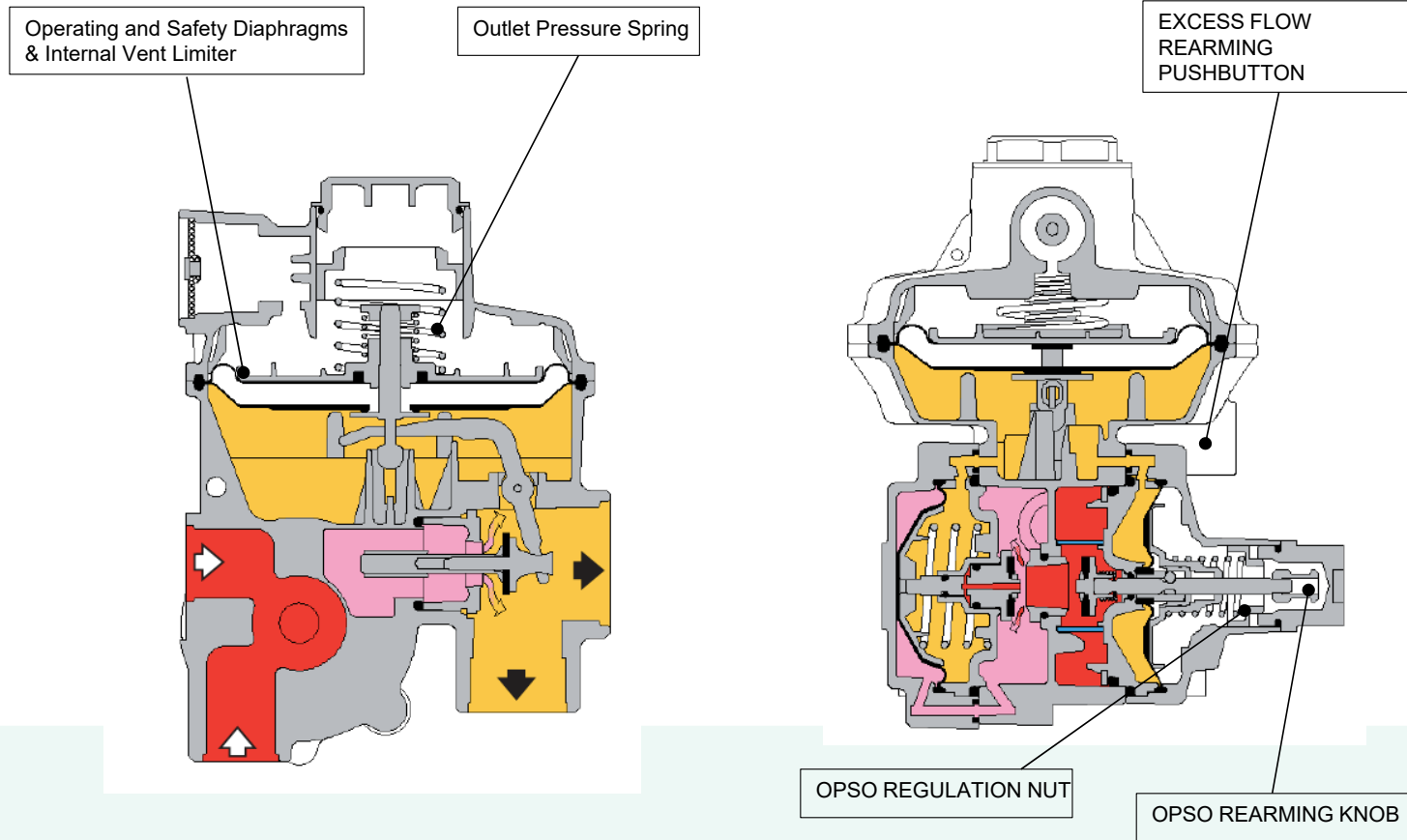
TO KEEP DEBRIS OUT OF THE REGULATOR



Inlet filter: area (0.775 inch²) 100 μm efficiency



Service Regulators with Lower Emissions



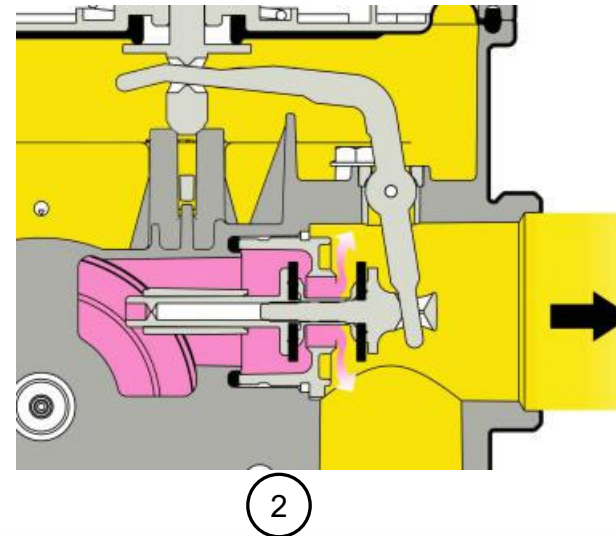
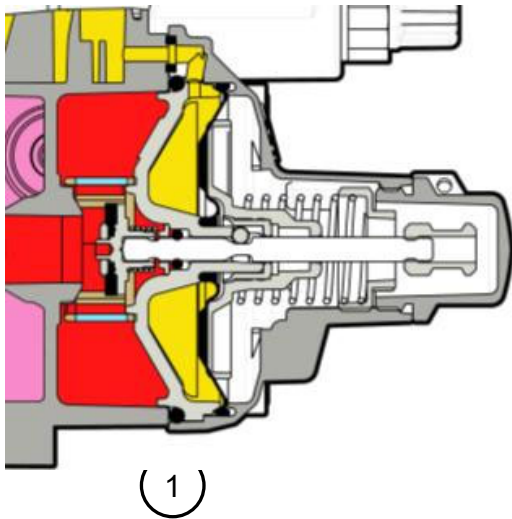
www.fiorentini.com



Service Regulators with Lower Emissions

FE REGULATOR Safety Shut-off

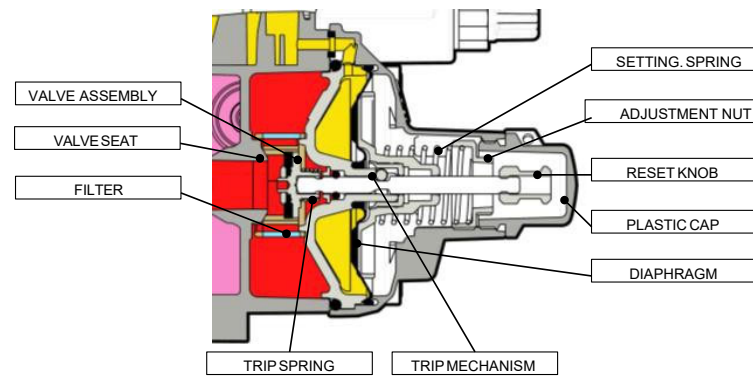
1. Over Pressure Shut-Off device (OPSO)
2. Optional Under Pressure Shut-off (UPSU) OPTIONAL



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Overpressure slam-shut device (OPSO)

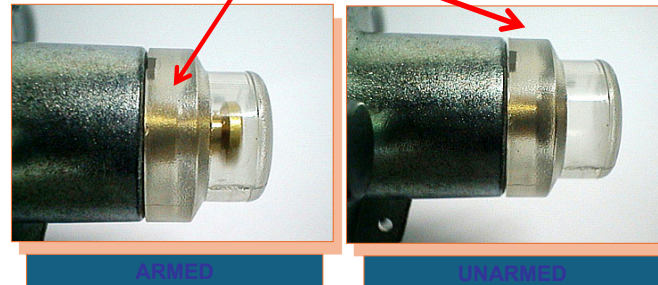




SLAM SHUT FOR ULTIMATE PROTECTION

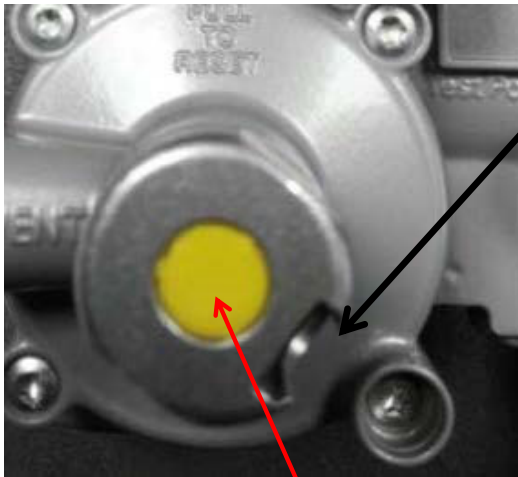


- Slam Shut device:
- OPSO
 - UPSO (optional)
 - Manual reset
 - Shut off for lack of feeding
 - Slam shut positions





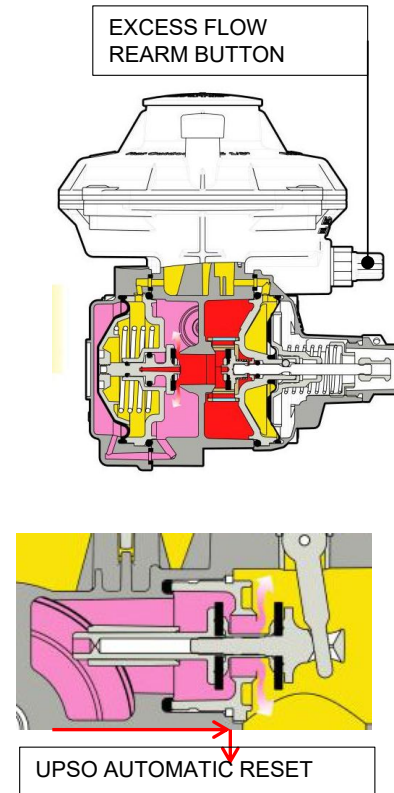
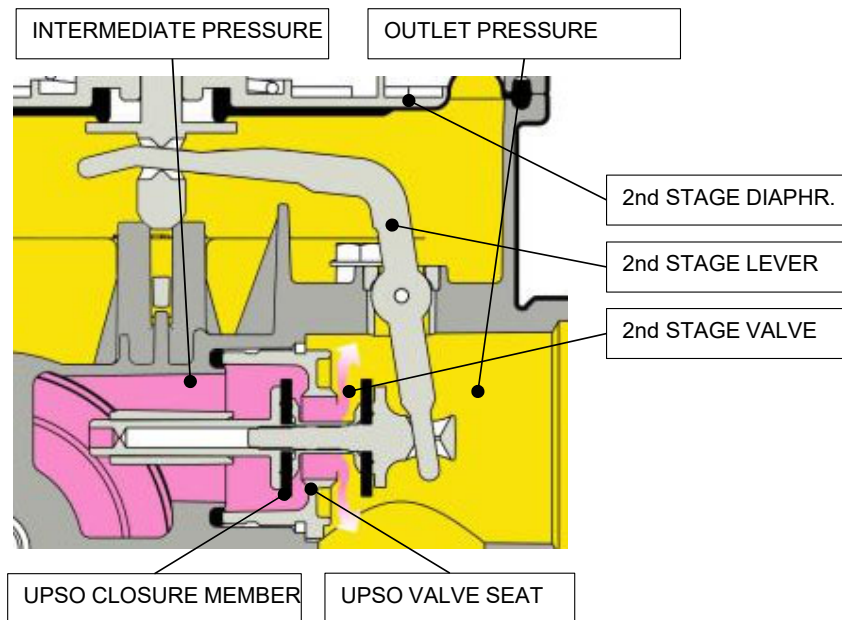
New cover has a slot to use as a tool to reset the slam shut!



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

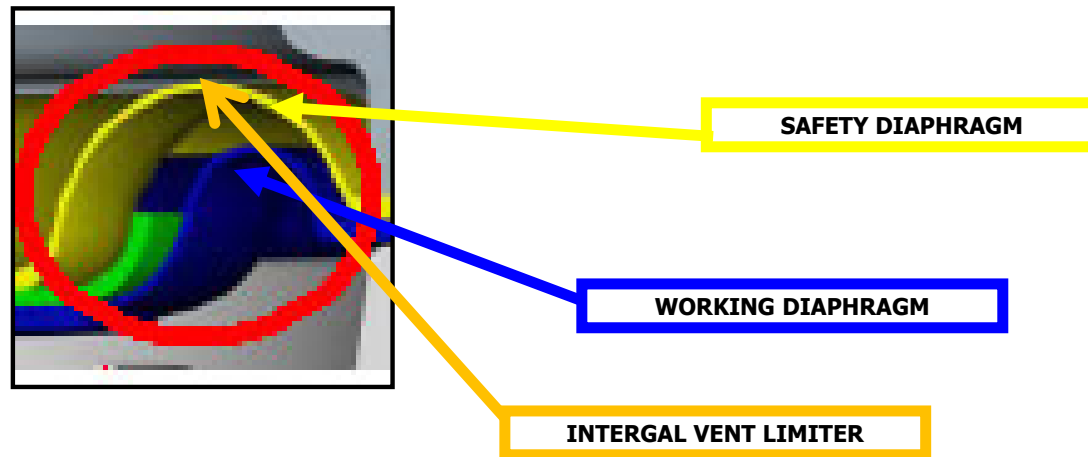
FE75-100

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

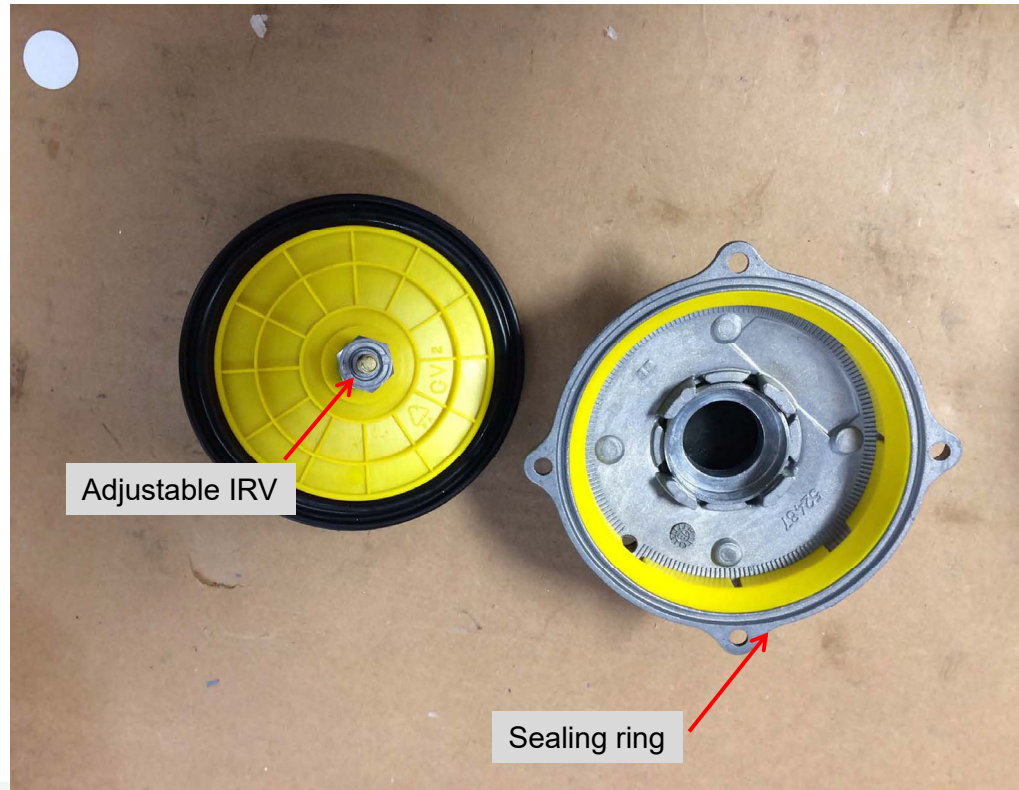


ADDED SAFETY WITH DUAL DIAPHRAGM ON REGULATOR AND SLAM SHUT





FE DIAPHRAGM ASSEMBLY





178 Rexdale Blvd
Toronto, ON M9W 1R3 CANADA
Tel: 416 747 4000
www.csagroup.org



Pietro Fiorentini
Armando Amadini
Research & Development Department
Via Faustiniella, 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 6.19-02(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

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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?

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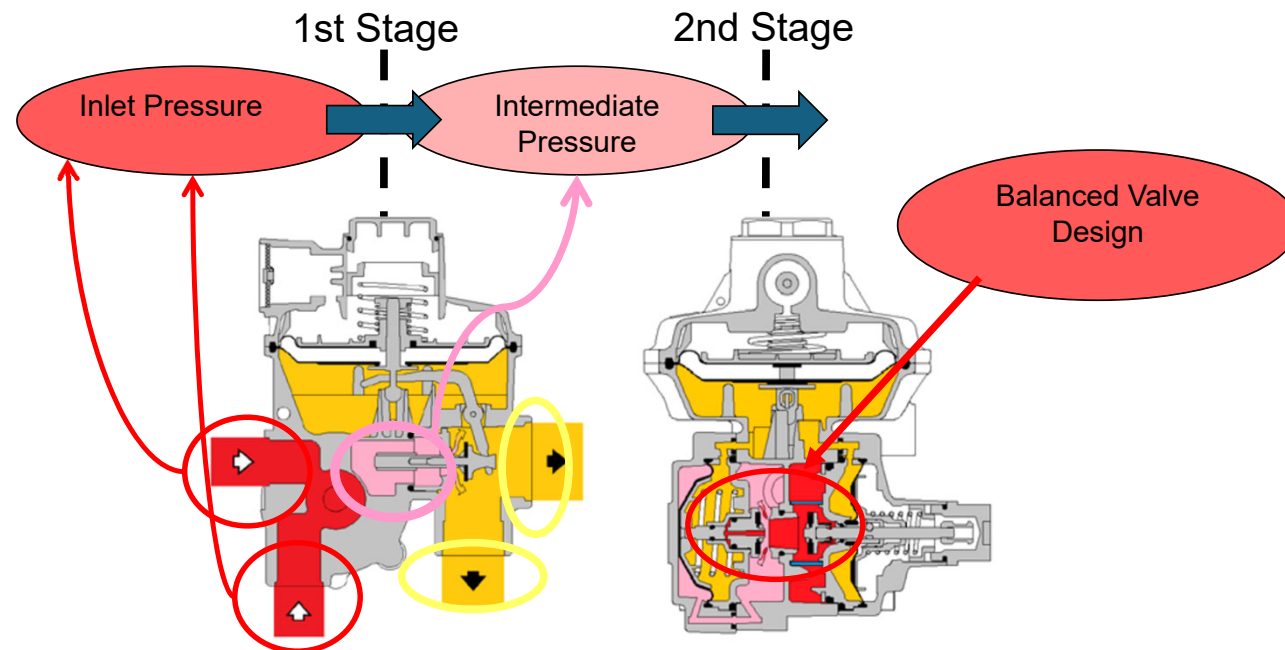
TWO STAGE REGULATOR

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.

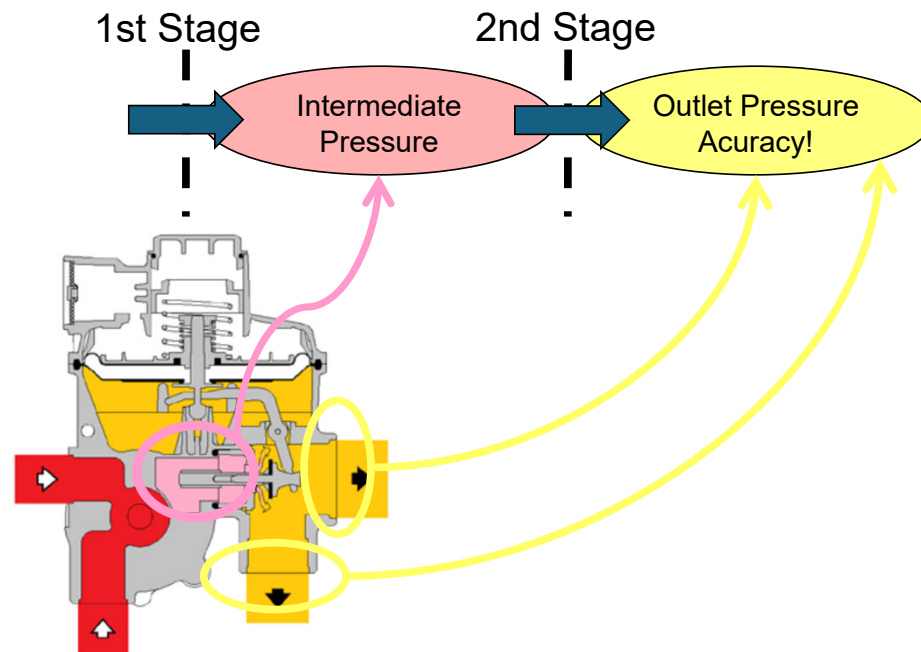


First Stage



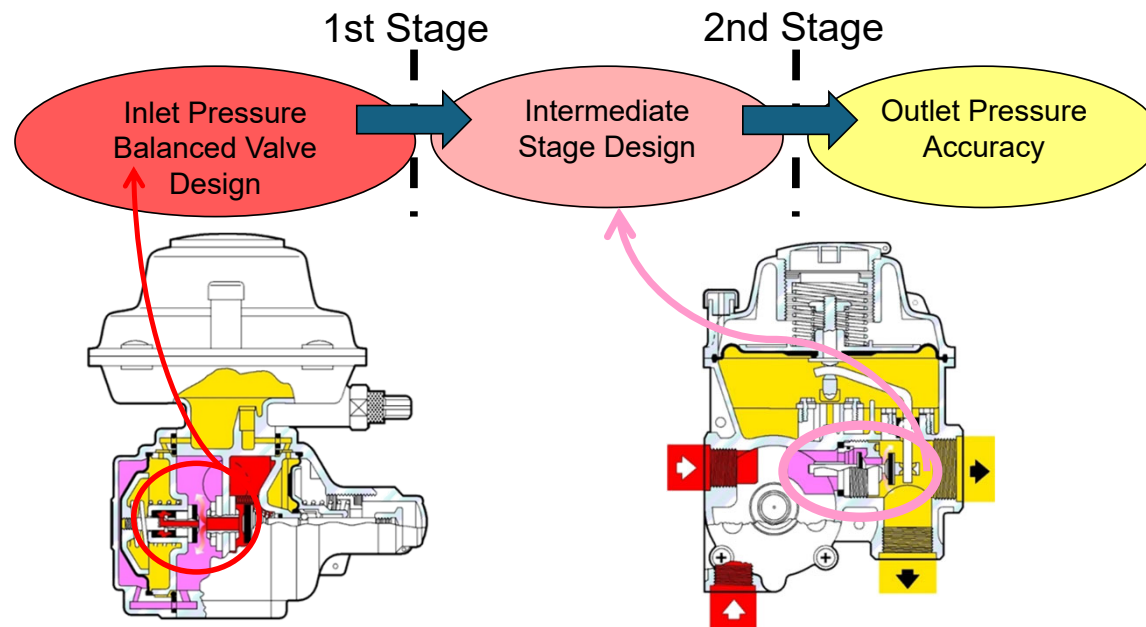


2nd Stage





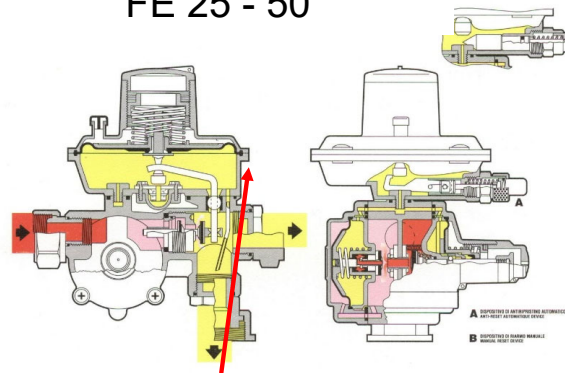
Equals Outlet pressure Accuracy!





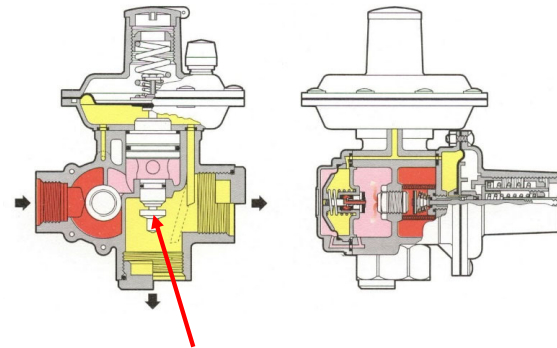
FE VS. FEX DIFFERENCES

FE 25 - 50



LEVER ACTING

FE 75 - 100

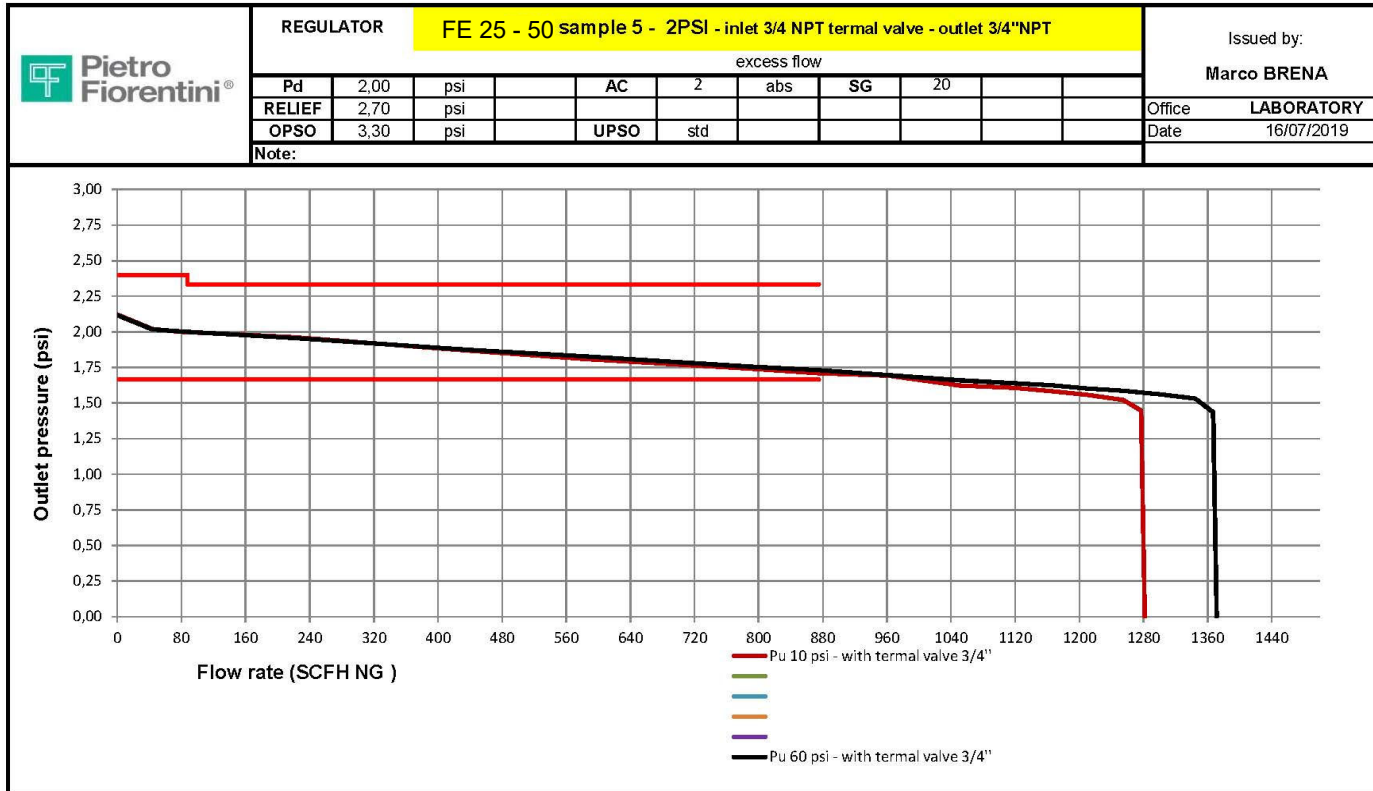


DIRECT ACTING



FE 25-50 Accuracy 2 PSIG setpoint!

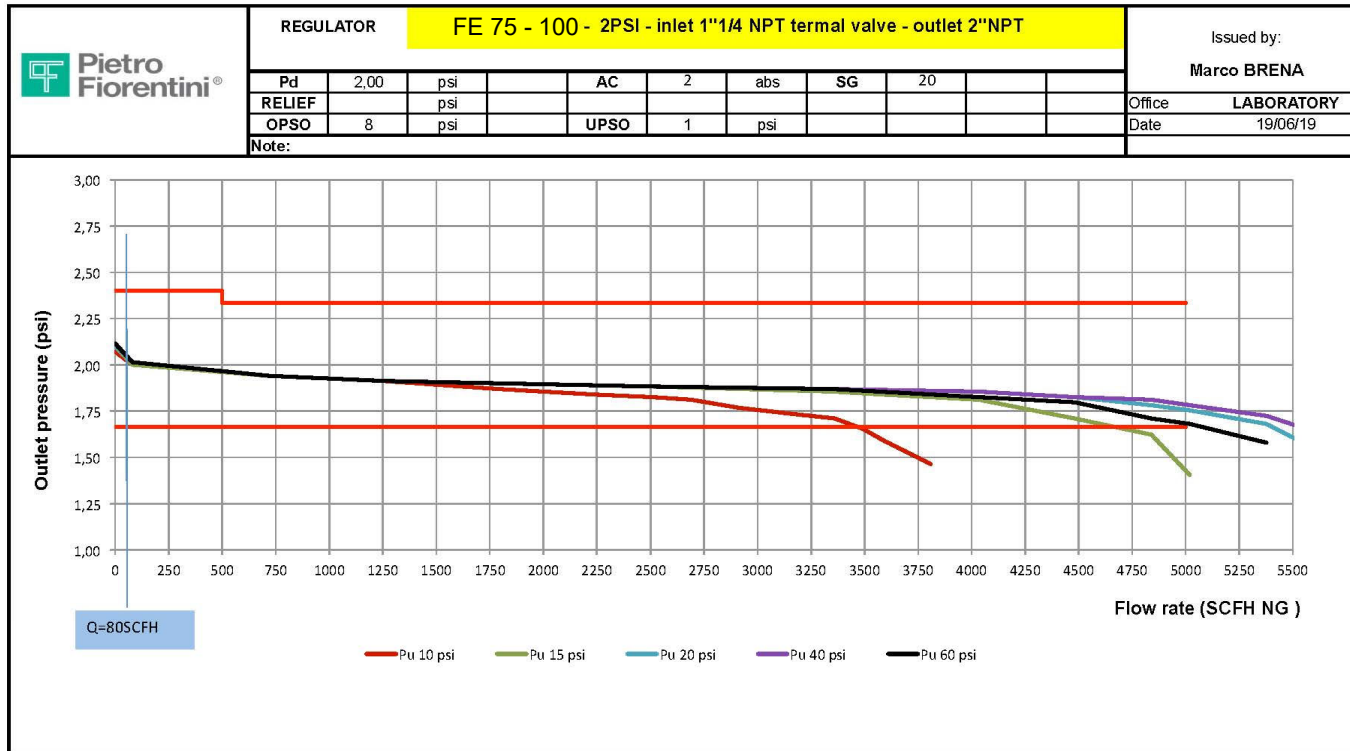
Document classified as: 2 - Company Confidential





FE 75-100 Accuracy 2 PSIG setpoint!

Document classified as: 2 - Company Confidential





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!**

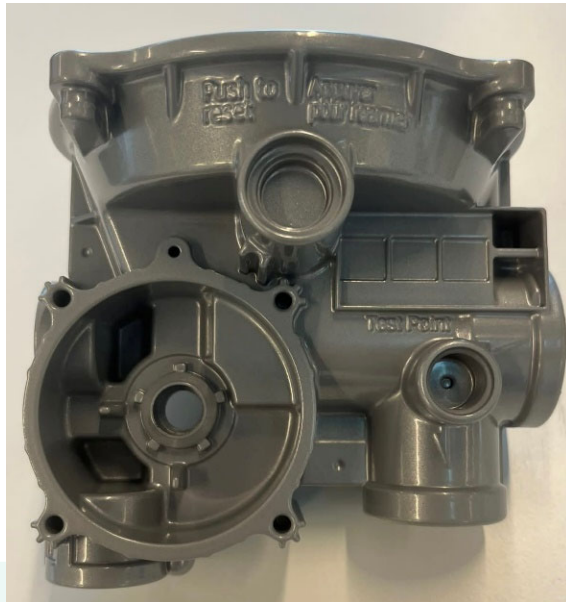
•



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



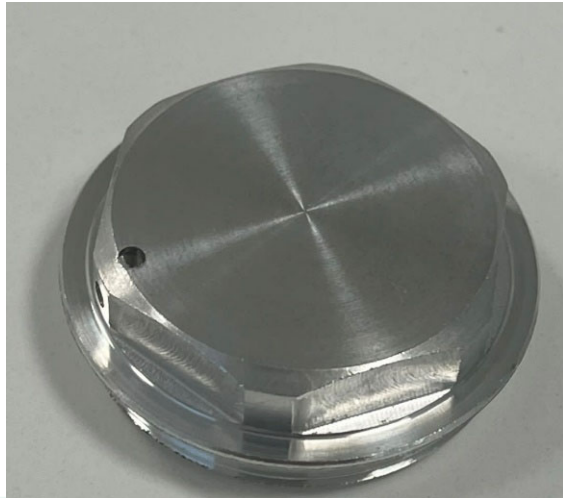
The same technology will be used to produce the FE25-50 OPCO cap
www.fiorentini.com



STANDARDIZATION OF CAPS TREATMENT

Introduction for all models of anodizing treatment.

AS IS



TO BE



Increased quality for all versions product
www.fiorentini.com

OPCO CAPS

Introduction for OPCO caps color anodizing treatment.

as

AS IS



TO BE

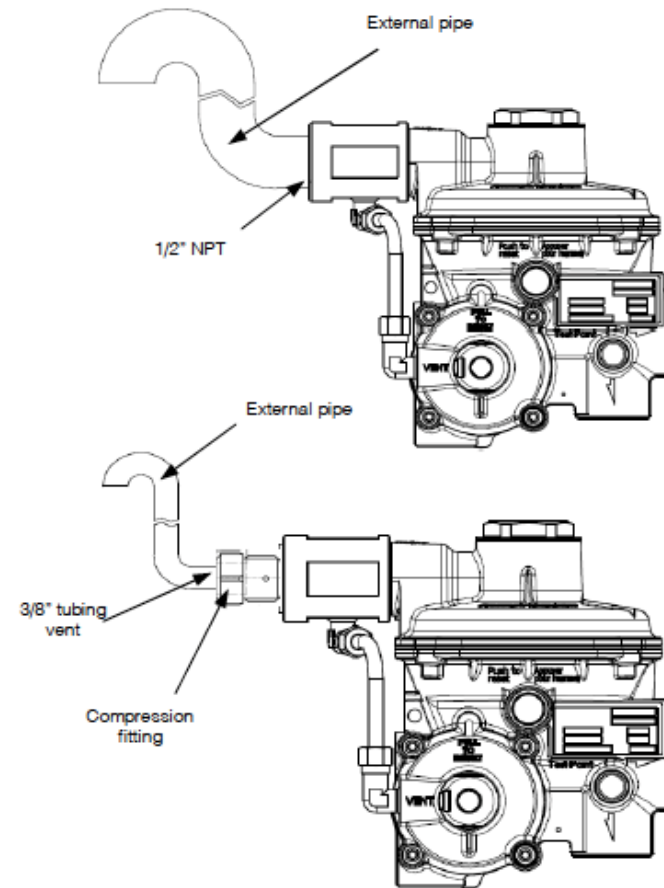


Increased quality and better model identification



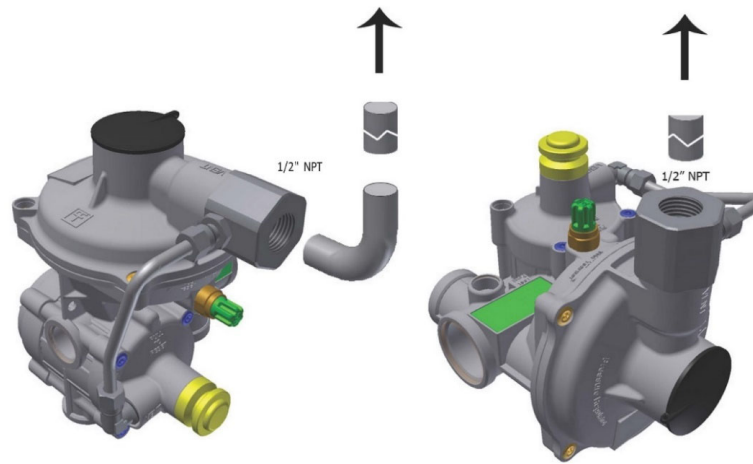
Indoor/Outdoor Vent Line Cost Reduction

- Use of the FE allows for a vent line of 3/8" O.D. tubing for up to 40 feet
- 100 feet with 1/2" pipe without any regulator performance detriment.
- Lower Material Cost
- Ease of Handling
- Ease of Mounting
- Aesthetics





UNIVENT *Indoor & Underground / Underwater Version!*



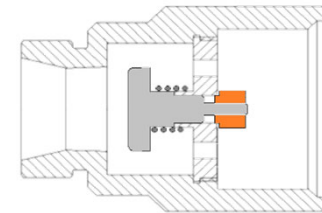
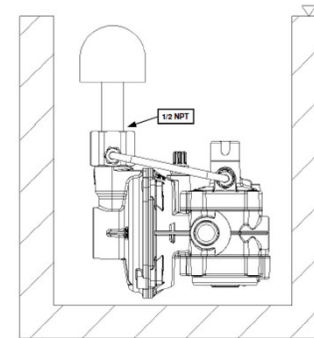


FE REGULATOR – Main accessories

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



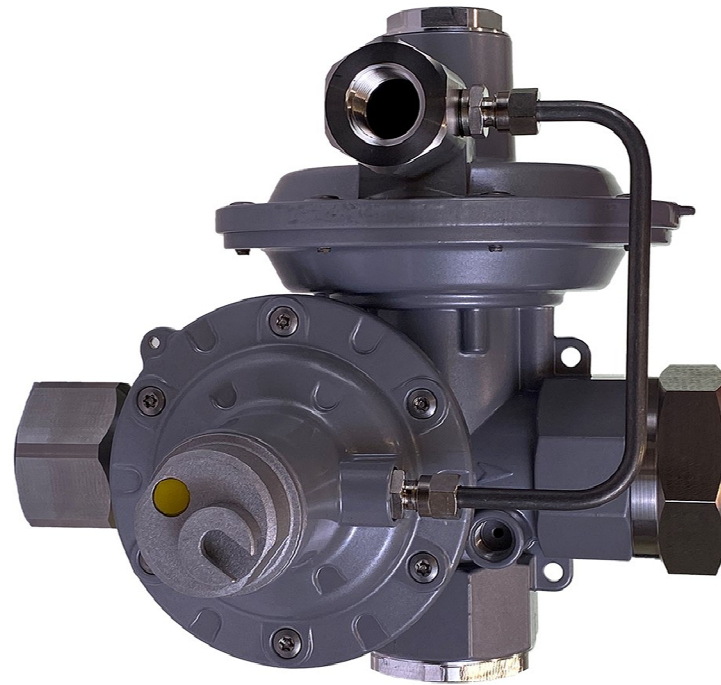


FE 75 -100

Standard



Univent





Service Regulators with Lower Emissions

ANTIFREEZE SUPPLIED LOOSE
METAL PLUG + OR
Pete's plug

METAL PLUG + OR

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
OPSO: 20" wc
UPSO: 2.4" wc

Wds: 6 - 8" wc
WdsO: 17 - 20" wc
Wdsu: 2.4 - 5.6" wc

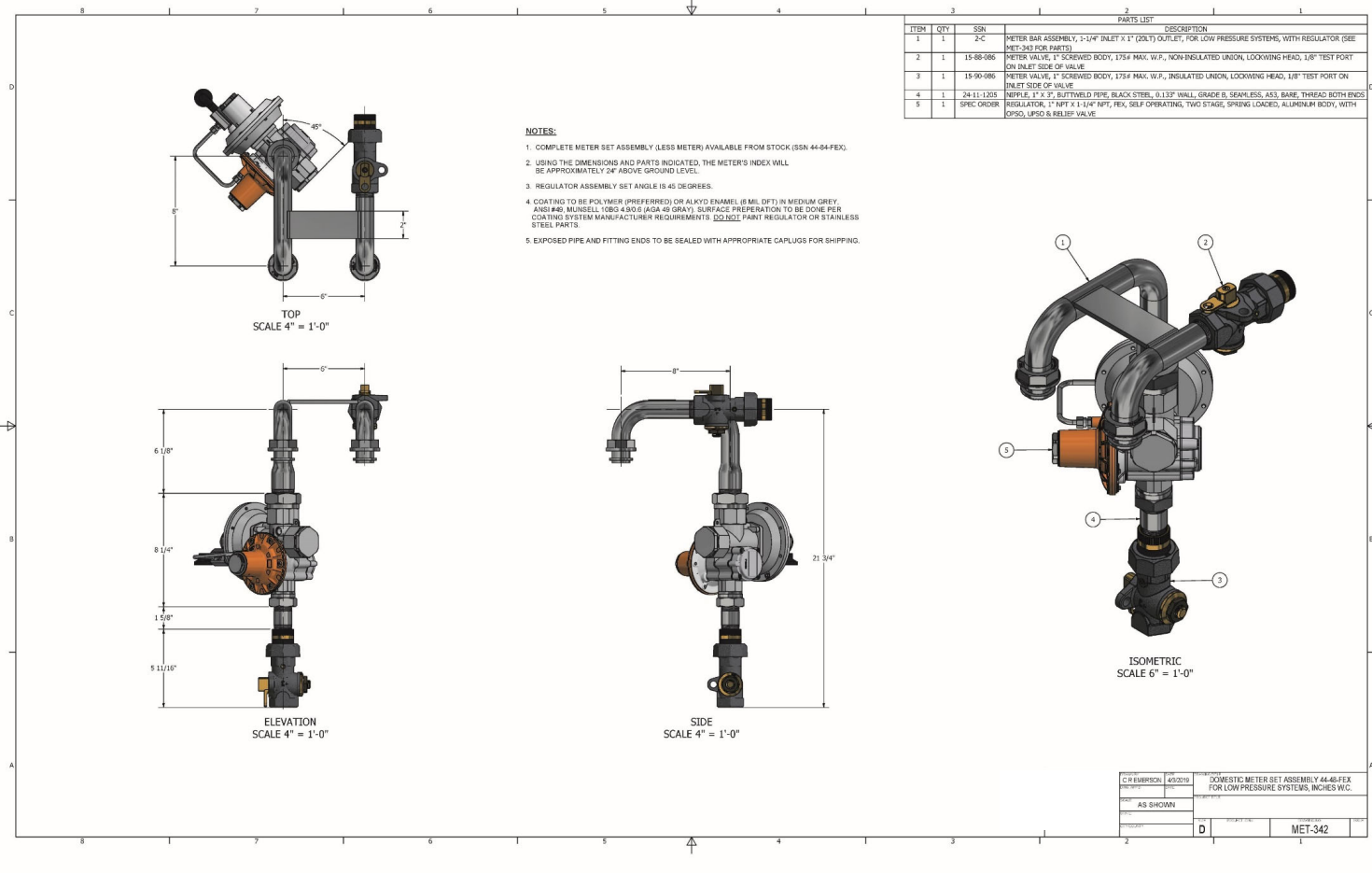
NOTE \$: - Antifreezing version

- SPRING Pd CODE US64470171BI
- RELIEF SPRING CODE US64470027VER
- OPSP SPRING CODE US64470111VE
- UPSO SPRING CODE US64470308NE
- RELIEF VALVE 1.3" 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: REGULATOR FEX (FE100) ANTIFREEZING			
QUESTO DOCUMENTO NON PUO' ESSERE COPiato, RIPRODOTTO, MOSTRATO A TERZI, SENZA CONSENSO SCRITTO DI PIETRO FIORENTINI S.p.A. THIS DRAWING MAY NOT BE COPIED, STORED, COMMUNICATED TO THIRD PARTIES WITHOUT THE WRITTEN AGREEMENT OF PIETRO FIORENTINI S.p.A.			
		Peso-Weight:	
		Scale-Scale: 1:1.25	
		Size: A3	
C	11/04/19	Inserito preso di pressione Peterson	Co.S. A.A.
B	03/04/19	Modificato tarature	Co.S. A.A.
A	15/03/09	EMISSIONE	Co.S. A.A.
Rev.	Data-Data	Modifiche (vedi simbolo ▲ sul disegno)-Revision (see symbol ▲ on the drawing)	Dis-Drawing Approv. N° Disegno-Drawing N° REV



Service Regulators with Lower Emissions





Service Regulators with Lower Emissions

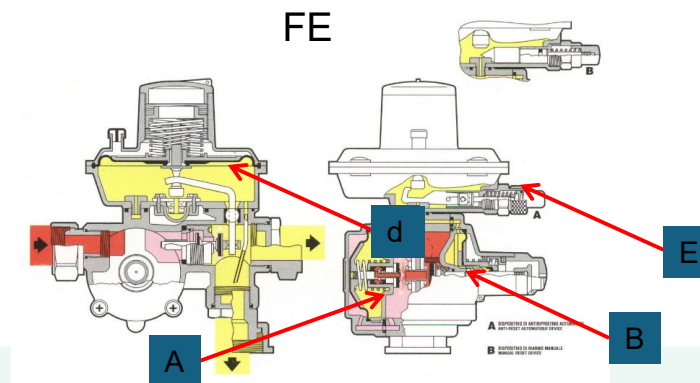
Compact Installation





FE & FE Failure Matrix

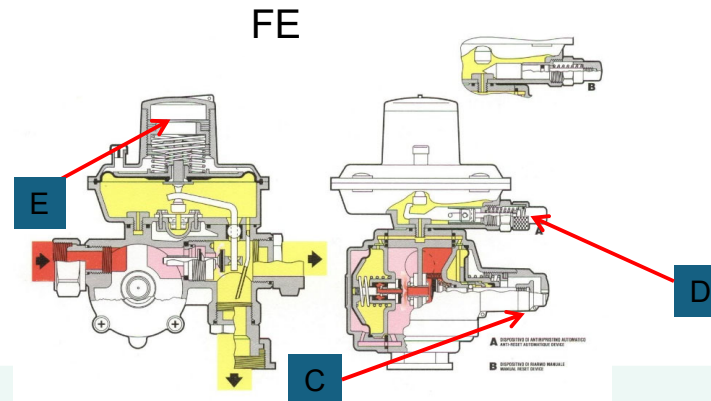
- | | |
|-----------------------------------|--|
| A. Failure of 1st stage diaphragm | 2 nd stage takes over and regulator still operates! |
| B. Failure of slam shut diaphragm | Increase in outlet pressure & Slam Shut trips! |
| C. Failure of main diaphragm | Safety diaphragm takes over! |
| D. Failure 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





QUESTIONS





Thank You!



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