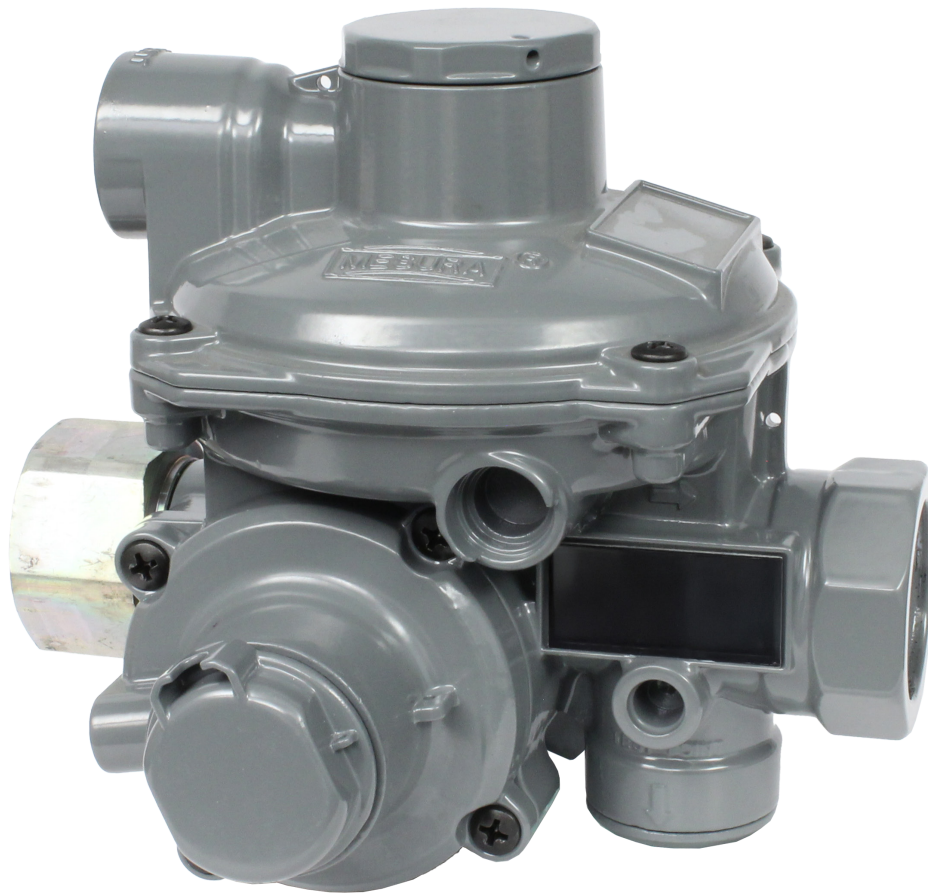




A Cavagna Group Company

S7 Dual Stage Regulator Product Bulletin



1 PRODUCT OVERVIEW

The S7 regulator is a direct acting, dual-stage pressure regulator with an integral slam-shut valve (SSV) and an optional token Internal Relief Valve (IRV). The S7 features a variety of body configurations, end connections, and integral overpressure protection options. The dual stage design provides improved accuracy and minimizes delivery pressure fluctuations as inlet pressures vary. The available over pressure protection options include a token IRV, Limited IRV, over pressure shut off (OPSO) device, under pressure shut off (UPS0) device and excess-flow shut off (EFV). Built on decades of experience and refined for North America, the S7 provides a level of safety and reliability for residential and light commercial applications that cannot be achieved with traditional lever-style regulators.

2 MATERIALS OF CONSTRUCTION

BODY & CASINGS: Die-cast aluminum
DIAPHRAGMS: Nitrile (NBR)
SPRINGS: Stainless steel
STEMS & LEVER ARM: Brass, Zinc alloy, or SST
ADJUSTING SCREW: Zinc alloy or plastic
VENT SCREEN: Stainless steel
VENTURI TUBE: Plastic

FITTINGS: Zinc Plated Steel
ORIFICE: Brass or aluminum
DISCS AND O-RINGS: Nitrile (NBR)
DIAPHRAGM PLATES: Plastic or aluminum
CLOSING CAP: Die-cast aluminum
FASTENERS: Plated steel
SSV CLOSING CAP: Aluminum or plastic

3 OPERATIONAL SCHEMATICS

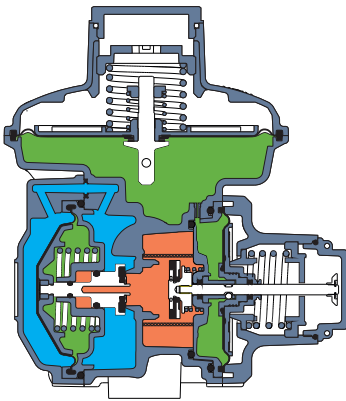


Figure 1: Front View Schematic

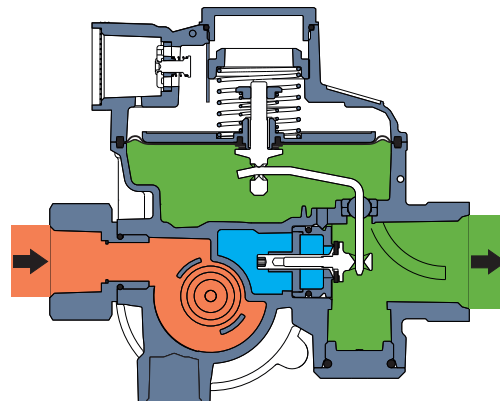


Figure 2: Side View Schematic

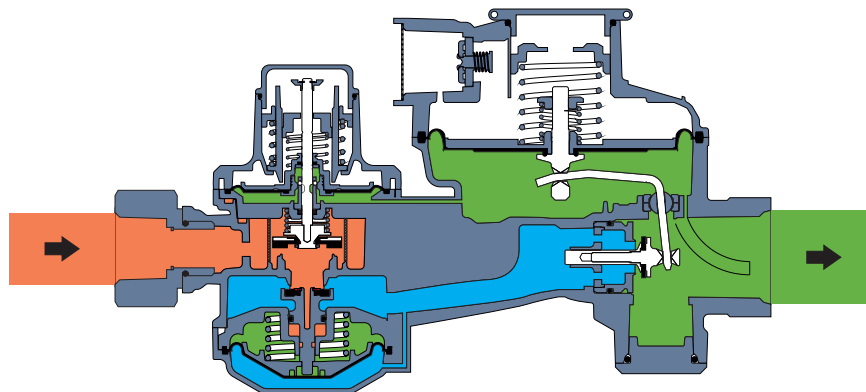


Figure 3: Operational Schematic

■ Inlet Pressure
■ Intermediate Pressure
■ Outlet Pressure

4 SPECIFICATIONS

Designed and tested to ANSI B109.4

Table 1: Regulator Specifications

Operating Inlet Pressure		125 psig	8.6 bar	Inlet Connections	3/4" NPT & 1" NPT	
Operating Outlet Pressure Range		See Table 6		Outlet Connections Angled or In-line Body	3/4" NPT & 1" NPT	
Maximum Outlet Pressure to avoid damage to internal parts	BP¹:	5.0 psig	345 mbar	Operating Temperature	-22 to 155 °F	-30 to 69 °C
	MP²:	7.5 psig	520 mbar	Weight	3.3 lbs	1.5 kg
Emergency Inlet Pressure (Body)		150 psig	10.3 bar	Over Pressure Shut Off Accuracy	BP ¹ : AG 10 MP ² : AG 5	
Emergency Outlet Pressure (Casing)		10.9 psig	750 mbar	Under Pressure Shut Off Accuracy	BP ¹ (≤10" w.c.): AG 20 ³ BP ¹ (>10" w.c.): AG 10 MP ² : AG 5	
Regulator Vent Connection		3/4" NPT		SSV Vent Connection	1/8" NPT	
Orifice Size (2nd Stage)		1/2"		Pressure Registration	Internal	

1: Base Pressure (BP), 2: Medium Pressure (MP), 3: UPSO accuracy at minimum temperature is AG35

5 AVAILABLE SAFETY FEATURES

OVERPRESSURE SHUT-OFF (OPSO)

If outlet pressure reaches the OPSO set point, the flow of gas is shut off at the inlet of the regulator. This requires a manual reset. OPSO is available standalone or with UPSO.

UNDERPRESSURE SHUT-OFF (UPSO)

If outlet pressure decreases to the UPSO set point, the flow of gas is shut off at the inlet of the regulator. This requires a manual reset.

EXCESS FLOW SHUT-OFF

When the outlet flow of gas exceeds between 110% - 150% of the maximum flow the excess flow device shuts off the downstream flow of gas. This would then activate the UPSO, requiring a manual reset.

VISUAL INDICATOR FOR OPSO/UPSO SHUT-OFF

If the OPSO/UPSO activate and shut-off the flow of gas for any reason, the visual indicator will change from green to red as shown in Figure 4. This optional indicator has no impact on operation, can be added after installation of the regulator, and requires no special tools for installation.

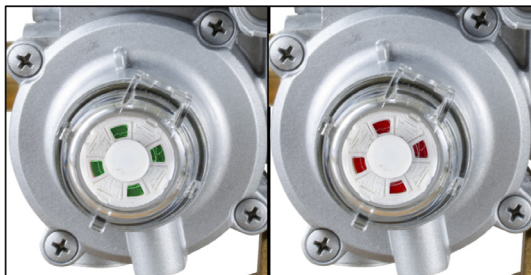


Figure 4: Visual Indicator

TOKEN INTERNAL RELIEF VALVE (IRV)

The internal relief valve will release a small amount of gas through the vent during an overpressure event. When the pressure decreases, the IRV re-seats, stopping the release of gas. This protects the regulator from brief pressure surges, such as thermal expansion.

LIMITED IRV (LIRV)

The Limited IRV functions the same as the standard IRV, but has been designed to minimize emissions. The Limited IRV is designed to limit the release of gas to < 2.5 SCFH until the OPSO activates.

SECOND STAGE SAFETY DIAPHRAGM

In the event of a second stage diaphragm failure, the Safety Diaphragm will contain the gas and keep the regulator in operation. The safety diaphragm does not impact normal operation and provides an alarm through a limited release of gas to atmosphere. This Micro-Vent will limit the release of gas to < 1.0 SCFH.

COMBINED VENTS

An optional system is available to combine the SSV vent with the regulator vent. This simplifies vent piping for installations that require vents to be piped away. Caution should be taken to prevent all vents from freezing or plugging.

OPSO/UPSO VENT LIMITER

For indoor installations, an alternative to combined vents is utilizing a vent limiter on the SSV vent. This vent limiter will keep emissions at or below 2.5 SCFH for inlet pressures up to 10 PSIG. This eliminates the need to combine vents.

6 CAPACITY TABLES

Additional capacity information is available upon request.
All capacity data was recorded per ANSI B109.4 unless otherwise noted.

Table 2: 7" w.c. Set Point (17.4 mbar)			
In-line and Angled Bodies. Capacities in 0.6 SG Natural Gas - (14.7 PSIA and 60° F)			
Inlet Pressure		3/4" NPT Outlet	1" NPT Outlet
		Accuracy: +2/-1" w.c.	
PSIG	Bar	SCFH (m3/h)	SCFH (m3/h)
0.5	0.034	244 (7)	285 (8)
1	0.069	407 (11.5)	427 (12)
2	0.138	610 (17)	672 (19)
3	0.207	733 (20.7)	855 (24)
5	0.345	936 (26.5)	1,099 (31)
10 - 125	0.7 - 8.6	1,220 (34.6)	1,425 (40)

Do not exceed these capacity values. Capacity values may be limited by droop or boost.
For inlet pressures outside ANSI B109.4, set point was established at the advertised inlet pressure with a flow rate of 50 SCFH NG.
Excess Flow Shut Off may impact the regulator capacity. All other safety options do not impact capacity. Contact Cavagna for more information.

Table 3: 2 PSIG Set Point (138 mbar)					
In-line and Angled Bodies. Capacities in 0.6 SG Natural Gas - (14.7 PSIA and 60° F)					
Inlet Pressure		3/4" NPT Outlet		1" NPT Outlet	
		+/- 1% ABS	+/- 2% ABS	+/- 1% ABS	+/- 2% ABS
PSIG	Bar	SCFH (m3/hr)	SCFH (m3/hr)	SCFH (m3/hr)	SCFH (m3/hr)
3	0.207	346 (9.8)	631 (18)	395 (11)	631 (18)
5	0.345	684 (19.4)	1,018 (29)	712 (20)	1,018 (28.8)
10	0.690	1,181 (33.5)	1,832 (52)	1,629 (46)	1,832 (52)
15 - 125	1 - 8.6	1,220 (34.6)	1,873 (53)	1,832 (52)	2,000 (57)

Do not exceed these capacity values. Capacity values may be limited by droop or boost.
Excess Flow Shut Off may impact the regulator capacity. All other safety options do not impact capacity. Contact Cavagna for more information.

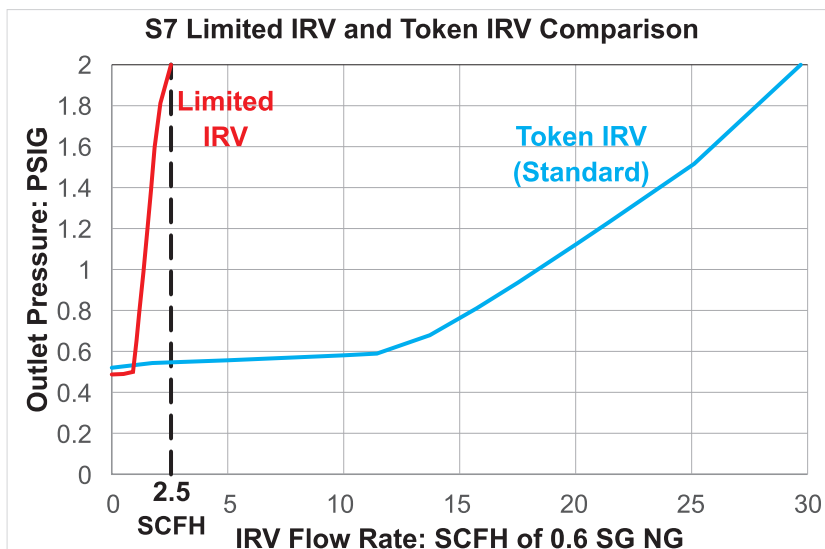


Figure 5: S7 LIRV and Token IRV Comparison - 7" w.c. Delivery

The S7 is available with an optional Token IRV or Limited IRV. These IRVs are designed to release limited amounts of gas during minor upset scenarios. **They do not provide over pressure protection** and have no impact on regulator operation.

The Limited IRV can be used to keep emissions at or below 2.5 SCFH until the OPSO activation point. The Limited IRV is available to minimize emissions for all delivery pressures.

7 PRODUCT CONFIGURATION

This table shows common set points for popular configurations in North America. Custom set points are available for the delivery pressure, IRV, OPSO and UPSO. Please specify all set points in Section 11.

Table 4: Common Configurations

Model	Regulator Delivery Pressure		IRV Setting (Standard or Limited)		OPSO		UPSO (Optional)	
	Set Point	Spring Color	Set Point	Spring Color	Set Point	Spring Color	Set Point	Spring Color
Base Pressure (BP)	7" w.c.	SST/Unpainted	No IRV		16" w.c.	SST/Unpainted	4" w.c.	SST
			15" w.c.	White	28" w.c.	Red		
	14" w.c.	Blue	No IRV		28" w.c.	Red	6" w.c.	Red
			23" w.c.	White	1.5 psig	Green		
	28" w.c.	Orange	No IRV		2 psig	Green	10" w.c.	Red
			1.5 psig	Red	2.5 psig	Blue		
	2 psig	Yellow	No IRV		3.5 psig	Orange	20" w.c.	Green
			3 psig	Red	4.5 psig	Brown		
Medium Pressure (MP)	5 psig	Pink	No IRV		7 psig	Yellow	3 psig	White
			6 psig	Green	7.25 psig	Yellow		

8 PRODUCT MARKING & IDENTIFICATION

The sample nameplate in Figure 6 on the right shows the information available on each regulator. These laser engraved nameplates are fixed to the S7 actuator diaphragm casing:

The most critical components of an S7 regulator construction can be easily identified by a three digit code following "Type: S7" in the upper left hand corner of the nameplate. The two numbers after the dash correlate to Table 5 below. This table indicates the set point, diaphragm configuration, and over pressure protection features. The letter (\$) following the two digits indicate the body configuration from table 5.1 below.

Type: S7- ## \$	MM/YY	SN: #####
Pout xxxx	Spring Range: xxxx	Orifice:
OPSO: xxxx	Spring Range: xxxx	1/2"
UPSO: xxxx	Spring Range: xxxx	Max Inlet:
IRV: xxxx	Type: xxxx	125 psig

Figure 6: S7 Nameplate

Table 5: Product Coding System

Over Pressure Protection Options		Regulator Set Point (inches w.c.)									
		7"	14"	28"	2 psig	Other	7"	14"	28"	2 psig	Other
OPSO Only	No IRV	11	12	13	14	15	16	17	18	19	10
	Token IRV	21	22	23	24	25	26	27	28	29	20
	Limited IRV	31	32	33	34	35	36	37	38	39	30
OPSO & UPSO	No IRV	41	42	43	44	45	46	47	48	49	40
	Token IRV	51	52	53	54	55	56	57	58	59	50
	Limited IRV	61	62	63	64	65	66	67	68	69	60
OPSO, UPSO & EFV	No IRV	71	72	73	74	75	76	77	78	79	70
	Token IRV	81	82	83	84	85	86	87	88	89	80
	Limited IRV	91	92	93	94	95	96	97	98	99	90
Single Diaphragm							Dual (Safety) Diaphragm				

Note that Table 5 only represents the most common constructions. More options are available; please see page 8 for more options or contact Cavagna Group.

Table 5.1: Body Configuration	3/4 x 3/4"	1 x 1"	3/4 x 1"
Linear	I	K	M
Angled	J	L	N

9 SPRING SPECIFICATIONS

For recommended/standard settings, refer to Table 4.
Additional spring ranges are available.

Table 6: Second Stage/Delivery Pressure Spring Data

Model	Spring Range		Standard Set Point	Color	Part Number
	In w.c.	mbar			
Base Pressure (BP)	6 - 7.6	15 - 19	7" w.c.	SST	32-R-190-0115
	7.6 - 9.6	19 - 24	9" w.c.	Red	32-R-190-0116
	9.6 - 12.1	24 - 30	11" w.c.	Green	32-R-190-0117
	12.1 - 16.8	30 - 42	14" w.c.	Blue	32-R-190-0118
	16.9 - 22.1	42 - 55	20" w.c.	White	32-R-190-0119
	22.1 - 32.1	55 - 80	28" w.c.	Orange	32-R-190-0120
	1.16 - 1.67 psig	80 - 115	1.5 psig	Brown	32-R-190-0121
	1.67 - 2.6 psig	115 - 180	2 psig	Yellow	32-R-190-0122
Medium Pressure (MP)	2.6 - 4.1 psig	180 - 280	3 psig	Grey	32-R-190-0123
	4.1 - 5.8 psig	280 - 400	5 psig	Pink	32-R-190-0124

Table 7: Internal Relief Valve Spring Data

Model	Regulator Set Point	IRV Set Point		Color	Part Number
		psig	mbar		
Base Pressure (BP)	7" w.c.	15" w.c.	37	White	32-R-190-0137
	14" w.c.	23" w.c.	55		
	28" w.c.	1.5	103	Red	32-R-190-0138
	2 psig	3	206		
Medium Pressure (MP)	3 psig	4	275	Green	32-R-190-0139
	5 psig	6.5	450		

IRV start-to-relieve point is +/- 10% of IRV Set Point.
Custom IRV set points are available. For more information contact Cavagna North America.

Table 8: Over Pressure Shut Off Spring Data

Model	Spring Range		Color	Part Number
	psig	mbar		
Base Pressure (BP)	11.6 - 20" w.c.	29 - 50	SST	32-R-190-0125
	20 - 34" w.c.	50 - 85	Red	32-R-190-0127
	1.25 - 2.0	85 - 140	Green	32-R-190-0128
	1.75 - 2.5	120 - 175	Blue	32-R-190-0129
	2.35 - 3.0	160 - 210	White	32-R-190-0130
Medium Pressure (MP)	3.0 - 4.0	210 - 280	Orange	32-R-190-0131
	3.65 - 5.0	250 - 350	Brown	32-R-190-0132
	5.1 - 6.5	350 - 450	Lt Blue	32-R-190-0133
	6.5 - 8.5	450 - 590	Yellow	32-R-190-0134

Table 9: Under Pressure Shut Off Spring Data

Model	Spring Range		Color	Part Number
	In w.c.	mbar		
Base Pressure (BP)	3.5 - 5	8 - 13	SST	07-1-110-1284
	5.6 - 10	14 - 25	Red	07-1-111-0635
	10 - 18	25 - 45	Yellow	07-1-111-1266
	18.1 - 22.9	45 - 57	Green	07-1-111-0678
Medium Pressure (MP)	1 - 1.6 psig	68 - 110	Blue	07-1-111-0679
	2.3 - 3.5 psig	160 - 240	White	07-1-111-0677
	4.3 - 5.1 psig	300 - 350	Orange	07-1-111-0826

10 CONFIGURATIONS & DIMENSIONS

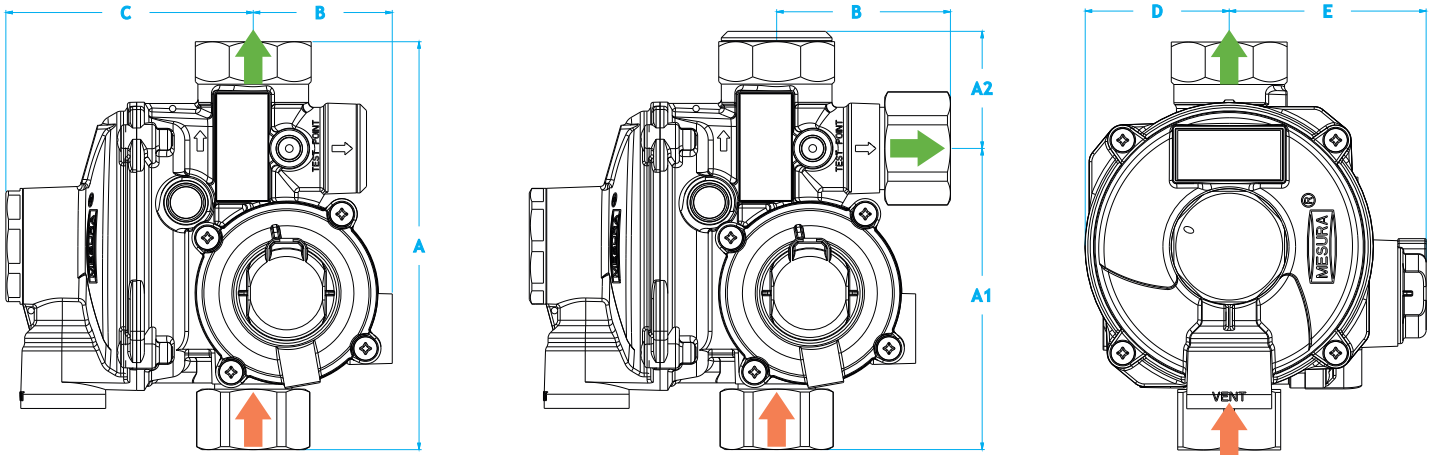


Figure 7: Regulator Dimensions

Table 10: Regulator Dimensions - See Figure 7 Above

Configuration	Inlet Connection	Outlet Connection	A		B	C	D	E
In-line	3/4" NPT	3/4" NPT	7" (178 mm)		2.13" (54 mm)	3.8" (96 mm)	2.2" (56 mm)	3.0" (76.5 mm)
	3/4" NPT	1" NPT	6.24" (158.5 mm)					
	1" NPT	1" NPT	6.32" (160.5 mm)					
Angled (Outlet on bottom)	3/4" NPT	3/4" NPT	A1: 4.53" (115 mm)	A2: 1.8" (45.5 mm)	2.58" (65.5 mm)	3.8" (96 mm)	2.2" (56 mm)	3.0" (76.5 mm)
	3/4" NPT	1" NPT			2.66" (67.5 mm)			
	1" NPT	1" NPT	A1: 4.61" (117 mm)					

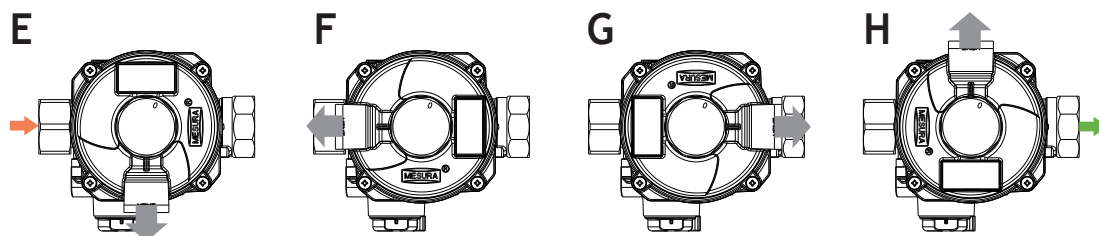


Figure 8: Regulator Vent Orientation (Regulator Inlet on Left)

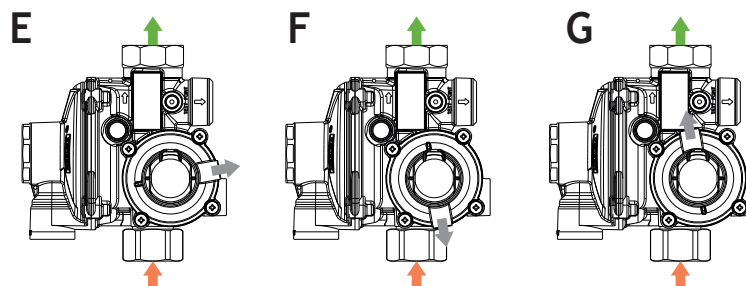


Figure 9: Slam-shut Valve Vent Orientation (Independent of Regulator Vent)

11 PRODUCT SELECTION

Choose one option or enter the specific request for each section below. Table 4 above offers common set points, but any set points can be provided upon request.

PRODUCT CONSTRUCTION CODE (See Table 5): **S7-**_____

BODY CONFIGURATION

3/4" Linear (I) _____
 3/4" Angled (J) _____
 1" Linear (K) _____
 1" Angled (L) _____
 3/4 x 1" Linear (M) _____
 3/4 x 1" Angled (N) _____

DELIVERY PRESSURE

Set Point _____

OVER PRESSURE SHUT OFF

Set Point _____

UNDER PRESSURE SHUT OFF

Set Point _____

REGULATOR VENT POSITION

E _____
 F _____
 G _____
 H _____

OPSO/UPSO VENT POSITION

E _____
 F _____
 G _____

ORIFICE DIAMETER

1/2" _____
 Custom _____

FILTER

Yes _____
 No _____

ADDITIONAL OPTIONS

None _____
 Closing Seal Wires _____
 SSV Vent Limiter _____
 Premium Paint _____
 Combined Vents _____
 Arctic Construction _____

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