MESURA®

Natural Gas Solutions

S7 Dual Stage Regulator

USER GUIDE

cavagna group®

Wherever gas is used, we are there

S7 DUAL STAGE PRESSURE REGULATOR, HEREAFTER PRODUCT

This product is intended for installation and use in accordance with the Code of Federal Regulations CFR 49 Part 192 and all applicable federal, state, local and building codes. This product is manufactured in compliance with ANSI B109.4.

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⚠ WARNINGS & CAUTIONS ▲

All images are included for illustrative purposes. Products are subject to change.

- **Gas leaks can cause flames, bursts, fires or fatal explosions, damages to people or things and pollution.**
- **If the Product has been exposed to fire, it must be removed and scrapped.**
- **The product must be kept away from heat sources (fire, cigarettes, open flames, etc.) and easily flammable materials.**
- **Gas leaks can cause corrosion and, in closed areas, also asphyxiation.**
- **Only qualified personnel who are trained and competent should work on the Product.**
- **Inspect the Product at regular intervals.**
- **Non-observance of these Instructions may cause serious risks for your health and may result in an explosion and/or fire, causing property damage and personal injury or death.**
- **In case the Product has been exposed to a hurricane, a flood, a storm or other extreme weather conditions, it is likely that it has been damaged, made unusable or unsafe for use for having been wholly immersed or exposed to various debris (for instance: mud, foliage, sea water or other debris caused by the hurricane). In such events, the Product must be therefore promptly removed, scrapped and replaced.**
- **Do not use the Product for applications other than those specified in these Instructions. The Manufacturer is not liable for breakages and/or malfunctions caused by improper use not in accordance with these Instructions.**
- **Repair and maintain the Product as prescribed in par. "Maintenance"**
- **The Product must be reasonably protected throughout its use from snow/ice accumulation, flooding and other unfavorable environmental conditions, which could adversely affect its quality, reliability and safety.**
- **Always read and follow the manufacturer's instructions for the Device (e.g. boiler, burner, water heater, dryer, etc.) before connecting the gas supply or using any Device. If you have any doubt, DO NOT USE THE DEVICE OR THE PRODUCT. Contact the supplier or manufacturer of the Device.**
- **This Product may expose the user to chemicals, including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, please visit www.p65warnings.ca.gov.**
- **Install regulators outdoors whenever possible. If a regulator is installed indoors, ensure all vents are piped outside and do not impact Product operation. See the Vent Line Installation section for more details.**

List of Tools for Maintenance

Tool	Use
Flat Head Screw Driver	Regulator set point adjustment, Removing SSV retaining clip
3/8" (10 mm) allen key or 1-1/8" (28 mm) socket	Regulator set point adjustment
Drill/Driver or phillips head screw driver	Removing cover/casing screws
7/8" (21 mm) socket	Adjusting OPSO set point (OPSO Only Constructions)
Needle Nose Pliers	OPSO/UPSO adjustment (OPSO/UPSO Constructions)
Snap Ring Pliers	Replacing the SSV disk
T10 Torx Bit	Removing 2nd stage lever arm
Adjustable Wrench	Removing closing caps

PRODUCT DESCRIPTION AND INTENDED USE:

The S7 is intended for use as a pressure reducing regulator in natural gas distribution systems with gas consisting of primarily methane. The presence of substances other than methane may, in certain situations, impair the service life and performance of the Product. The Product should only be used with Pipeline Quality Natural Gas or Renewable Natural Gas. This product is not intended for use with biogas. For compatibility with hydrogen blended into the gas, please contact the Manufacturer for the latest approvals.

The Product is equipped with an Over Pressure Shut Off (OPSO) and is available with optional Token Internal Relief Valve (IRV), Under Pressure Shut Off (UPSO), Second Stage Safety Diaphragm, and Excess Flow Valve (EFV).

- **SSV:** Slam-Shut valve consisting of an OPSO or an OPSO and UPSO.
- **OPSO** provides over pressure protection for the system by stopping the gas flow if outlet pressure reaches the OPSO set point.
- **Token IRV** is not a form of over pressure protection and is only used for minor upset conditions and to provide a form of alarm.
- **Limited IRV** is a Token IRV that is desigend to limit the venting of gas to ≤2.5 SCFH until the OPSO activates. This feature is only available for delivery pressures up to 2 psig.
- **UPSO** provides under pressure protection for the system by stopping the gas flow if outlet pressure drops below the UPSO set point.
- **Safety Diaphragm** is a secondary diaphragm that will contain the gas in the event of a primary diaphragm failure. The safety diaphragm features a small vent that allows ≤ 1 SCFH of gas to vent as an alarm.
- **EFV** will shut off the flow of gas if gas flow exceeds 150% of the specified nominal flow.

Note that OPSO, UPSO and Token IRV are all user configurable. The user must ensure that all settings are appropriate to provide adequate over pressure protection for the system.

Additional options like combined vents and vent-limiters are discussed in the Vent Line Installation Section.

GENERAL SPECIFICATIONS

For full product specifications, please refer to the product nameplate, specification sheet or drawing.

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 3		**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**	**Std Version**	-22 to 155 °F	-30 to 69 °C
					CSA Version	-40 to 155 °F	-40 to 69 °C
	MP2:	8.7 psig	600 mbar	**Weight**		3.3 lbs	1.5 kg
Emergency Inlet Pressure (Body)		150 psig	10.3 bar	**Over Pressure Shut Off Accuracy**		BP1: AG 10 MP2: AG 5	
Emergency Outlet Pressure (Casing)		10.9 psig	750 mbar	**Under Pressure Shut Off Accuracy**		BP1 (≤10” w.c.): AG 203 BP1 (>10“ w.c.): AG 10 **MP: 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

MATERIALS OF CONSTRUCTION

BODY & CASINGS:	Die-cast aluminum	**FITTINGS:**	Zinc Plated Steel
DIAPHRAGMS:	Nitrile (NBR)	**ORIFICE:**	Brass or aluminum
SPRINGS:	Stainless steel	**DISCS AND O-RINGS:**	Nitrile (NBR)
STEMS & LEVER ARM:	Brass, Zinc alloy, or SST	**DIAPHRAGM PLATES:**	Plastic or aluminum
ADJUSTING SCREW:	Zinc alloy or plastic	**CLOSING CAP:**	Die-cast aluminum
VENT SCREEN:	Stainless steel	**FASTENERS:**	Plated Steel
VENTURI UBE:	Plastic	**SSV CLOSING CAP:**	Aluminum or plastic

PRODUCT SCHEMATICS:

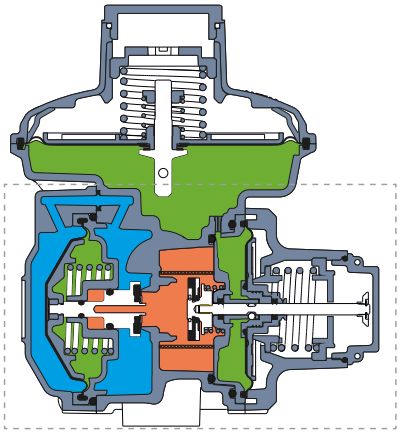


Figure 1: Front View Schematic

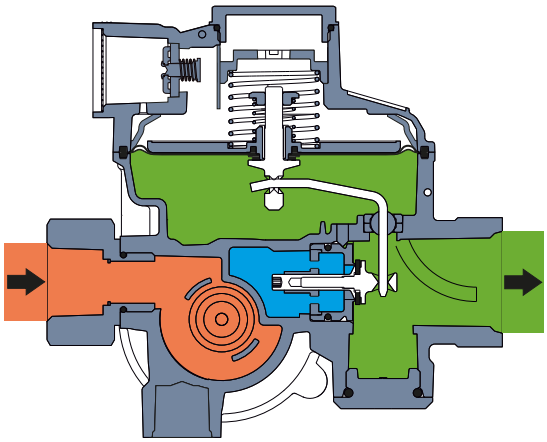


Figure 2: Side View Schematic

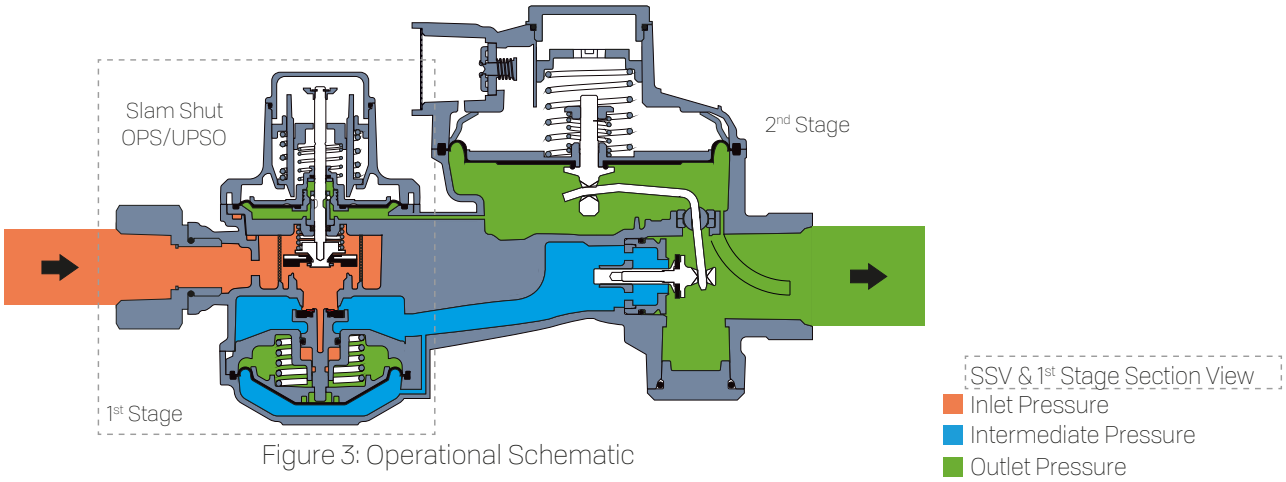


Figure 3: Operational Schematic

SPRING TABLES AND TECHNICAL DATA:

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

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

Figure 4: S7 Nameplate

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 2. This table indicates the set point, diaphragm configuration, and over pressure protection features. The letter ($) following the two digits indicate the body configuration and can be found in Table 2.1.

Table 2: Product Coding System											
Over Pressure Protection Options		Regulator Set Point									
		7" w.c.	14" w.c.	28" w.c.	2 psig	Other	7" w.c.	14" w.c.	28" w.c.	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 2 only represents the most common constructions. More options are available; please contact Cavagna North America.

Table 2.1: Body Configuration	3/4 x 3/4"	1 x 1"	3/4 x 1"
Linear	I	K	M
Angled	J	L	N

Table 3: 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 - 2.1 psig	115 - 145	2 psig	Light Blue	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 4: 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	SST (LIRV)	32-R-190-0136
				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	Red	32-R-190-0138
	5 psig	6.5	430	Green	32-R-190-0139

- 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 5: 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 6: 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	32-R-190-0300
	5.6 - 10	14 - 25	Red	32-R-190-0037
	10 - 18	25 – 45	Yellow	32-R-190-0271
	18.1 - 22.9	45 - 57	Green	32-R-190-0161
Medium Pressure (MP)	1 - 1.6 psig	68 - 110	Blue	32-R-190-0162
	2.3 - 3.5 psig	160 - 240	White	32-R-190-0217
	4.3 - 5.1psig	300 - 350	Orange	32-R-190-0218

VERIFICATION BEFORE INSTALLATION:

Prior to installation, the Product must be stored in a clean, dry environment. Product must be sealed and protected against weather, impacts, debris or other damage. It is not permitted to install a Product that is deformed or damaged.

Surrounding Area

- Verify the presence of inlet and outlet shut off valves
- Service lines must be cleared of any shavings, welding slag, dirt, liquids, or other debris. These can damage the internal components of the product.
- Piping shall be properly braced and designed to minimize load or stress on the regulator through any seasonal changes.
- The installation should be reasonably protected from external forces such as vehicles, falling debris or other impacts.
- Do not install directly below a gutter, roofline or other location where excessive water, ice or snow accumulation is possible.

Product Notes

▲ **CAUTION:** All units with an UPSO device will be shipped with a spacer around the SSV stem (807) that will hold the SSV in the open position. The installer must remove the SSV cap (23) and remove the spacer from below the reset knob (821). Once this is removed, the start up procedure can begin as normal.

- Verify that the information on the nameplate corresponds to the requirements of the system.
- Several safety options are available to protect the system, equipment and personnel. If the Product does not have sufficient integral safeties, an external device may be required to provide over pressure protection.
- Confirm the Product is not damaged and that no dirt has accumulated on or inside of the Product.
- Ensure the filter is in place and free of debris, if equipped.
- Check that the threads on the Product are not damaged and correspond to the mating parts.
- The Product can be mounted in any position such that flow is in the direction of the flow arrow. Ensure that all vents are oriented down to prevent moisture from accumulating. If a vent cannot be oriented down then a hood, cover or vent line is necessary. See Vent Line Installation in the next section for additional details.
  - **WARNING: If the system pressures or temperatures can exceed the design limits of the regulator or the downstream system, then over pressure protection is required to prevent damage, leakage or bursting of the regulator, fittings and piping. All pressure limiting or relieving devices used for over pressure protection must be selected and installed in accordance with all applicable regulations, codes and standards.**

OVER PRESSURE PROTECTION:

- The internal relief valve will not provide sufficient over pressure protection alone.
- Under Pressure Shut Off can only protect against under pressure conditions that are close enough to the regulator sensing point to register on the UPSO diaphragm. For example, if a line break is too small or too far downstream from the regulator, the UPSO may not sense the drop in pressure. Many factors can impact the pressure in the downstream pipe, so additional safety devices may need to be considered.
- Combining the vents of the 2nd stage regulator and the SSV can simplify venting requirements and reduce the number of vent lines. However if the combined vent line becomes plugged or restricted the regulator and the OPSO may create a back pressure on one another that could impact set point or even prevent operation. Caution should be used when installing combined vents to prevent any plugging or restriction.

INSTALLATION:

Installers shall wear sufficient personal protective equipment in accordance with the company policy and industry standards.

- The Product shall be installed with the proper tools in order to prevent damage.
- The installation shall be performed in accordance with federal, state and local regulations, the user's company procedures, and industry best practices.
- When installing the Product, the maximum torque applied on the body shall not exceed 100 ft-lbs. Excessive torque may damage the Product and cause leaks. This torque should only be applied at the inlet (27) and outlet (26) of the regulator with properly sized wrenches. Ensure that inlet and outlet piping is properly secured and does not rotate during installation of the Product.
- The installer shall take caution to prevent chipping the paint of the Product. Chipping the paint will increase the susceptibility to corrosion.
- Fittings, gaskets, lubricants and sealants used must meet or exceed the application requirements and be compatible with the Product.
- Take caution when applying thread sealant. Only apply sealing compounds to external/male threads. Excessive sealant may damage the threads or enter the system and damage equipment.
- Avoid sealing compounds with lubricating effects, otherwise reduce the maximum tightening torque.
- Once installed, the Product and all connection areas must be tested by the installer within the range of the service pressures to detect any leakage before being placed into service. The inspection procedures must ensure the detection of any leakage. Use only non-corrosive, non-toxic leak detection liquids.
- After installation, ensure that no damages to the product have occurred that would impact operation.
  - **WARNING: NEVER have any open flames present during installation of the Product, or have near you any device which can create a spark or electric charge.**

VENT LINE INSTALLATION:

- If a Limited IRV is used, refer to local, state, federal or company codes and standards to determine vent piping requirements.
- The Product may be equipped with a token internal relief valve that releases a small amount of gas to the atmosphere. Therefore, the Product must be installed in an area with good ventilation, away from ignition sources, windows or building intakes. If this is not possible, or if the Product is installed indoors, then the vent must be piped away to a safe, outdoor area meeting the distance requirements of any applicable standards.
- If the vent must be piped away then the vent piping should be sized to minimize back pressure for regulator operation and Token IRV venting. Vent piping should be as short as possible with the minimum amount of elbows.
- Vent piping should never interfere with the vent stabilizer or be smaller than the vent connection on the regulator casing.
- Inspect vents regularly. Vents must be clear and fully open at all times. An obstructed vent may prevent the Product from operating properly and can cause an abnormal pressure condition, which may result in property damage and personal injury.
- Do not remove the vent screen (193) unless vent piping is necessary.
- Vents should be oriented down to prevent moisture build up inside the Product. Moisture in the Product can impact operation.
- Protect all vent openings from intrusion of rain, snow, freezing rain, ice formation, sleet, insects, mud, paint or any other foreign objects or debris, that could obstruct or plug the vent or vent line.
- The Product may be equipped with a vent-limiting device on the SSV module. The vent-limiter is intended for indoor use only and must be oriented upright to ensure proper operation.
- If the Product is equipped with a combined vent system, meaning the SSV and 2nd Stage vents are tubed together, extra caution should be taken to ensure the combined vent line does not become plugged or frozen. Restricting a combined vent can introduce new risks to the regulator and SSV operation. Otherwise, normal venting guidelines should be used.

START UP PROCEDURE: Refer to Figures 5 & 6

Ensure that the valves upstream and downstream of the Product are in the closed position and that the system is free of leaks. Inlet and outlet pressure gauges should be used during start up.

⚠ WARNING: If you suspect a malfunction or another problem, call the manufacturer or an authorized distributor. DO NOT TAKE ANY RISKS! IN THE EVENT OF GAS LEAKS OR A FIRE, IMMEDIATELY LEAVE THE AREA AND CALL 911 OR THE LOCAL FIRE DEPARTMENT.

Note that all units with an UPSO device will be shipped with a spacer around the SSV stem (807) that will hold the SSV in the open position. The installer must remove the SSV cap (23) and remove the spacer from below the reset knob (821). Once this is removed, the start up procedure can begin as normal.

1. Slowly open the shut-off valve located upstream of the regulator and verify inlet pressure to the regulator. Establishing a small amount of flow downstream of the regulator prior to opening the inlet valve can help prevent surges in outlet pressure, which may trip the OPSO.
2. Confirm the outlet pressure matches the desired set point. If there is no flow through the regulator, then you may need to reset the SSV (Step 4).
3. If the SSV stem (807) is in the open position (See Figure 5) proceed to step 7. If the SSV stem is in the closed position, proceed to step 4.
4. Unscrew the cap of the SSV (23) and slide the cap around the green knob (821) on the end of the stem (807) (Figure 5). A needle nose pliers can also be used in place of the cap.
5. Slowly pull on the stem/reset knob as shown in Figure 5, taking care not to bend the stem (807). The force required to reset the SSV will increase as inlet pressure to the regulator increases.
6. Once outlet pressure begins to increase, hold the stem in that position. When outlet pressure is below the OPSO set point and above the UPSO set point (if equipped), the reset can occur. Pull the stem so the SSV is wide open and the stem should remain in that open position when you remove the cap from the green knob, as shown in Figure 5.
7. With the SSV in the open position, completely open the valve downstream of the regulator. Verify that the downstream system has proper gas supply. If the gas supply is not restored, repeat the procedure described above.
8. Replace the cap (23) and tighten to avoid any moisture ingress into the safety device.

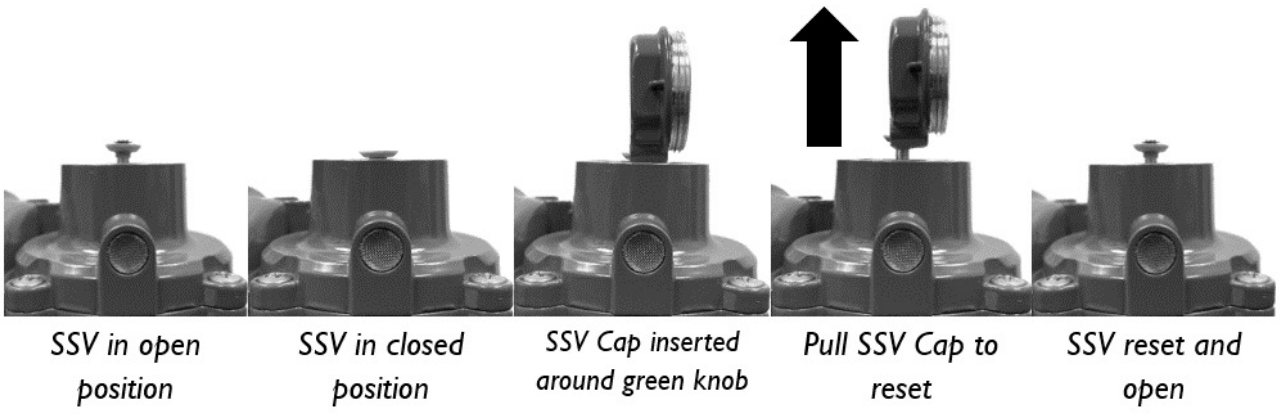


Figure 5: SSV Reset Procedure

SET POINT ADJUSTMENT:

The Product has an adjustable delivery pressure, OPSO set point and UPSO set point. These pressures are determined by the springs assembled with the Product. These pressures are set at the time of manufacturing according to the customer request or the manufacturer's standard offering. If the delivery pressure is changed, the user must ensure that the OPSO, UPSO and IRV set points can still provide adequate over pressure protection.

Adjusting Delivery Pressure: Refer to Figure 7

1. Remove the 2nd stage spring case cap (24) with an adjustable wrench. Take care to protect the paint.
2. When adjusting the delivery set point, the Product should be flowing approximately 50 SCFH of natural gas.
3. Turn the adjusting screw (21) clockwise to increase the delivery pressure or counter-clockwise to reduce the delivery pressure. Use a flat head screwdriver, 3/8" (10 mm) allen, or 1-1/8" (21 mm) socket.
4. Ensure that the desired delivery pressure is within the published spring range that is installed. If a new spring is needed, the user must verify that the Product is suited for the application prior to changing the spring.
5. Once the desired pressure is achieved, close the outlet shut-off valve, verify lock up, and replace the regulator cap (24). Secure the cap into place to prevent any moisture ingress. The cap (24) can be secured with a lock-wire to prevent tampering.

Note that the regulator may vibrate when the cap (24) is removed. This is normal and should stabilize when the cap is reinstalled.

Adjusting the OPSO: Refer to Figure 9

1. Remove the cap (23) from the SSV with an adjustable wrench. Take care to protect the paint.
2. Turn the adjusting screw (816) clockwise to increase the set point and counter-clockwise to decrease it.
   a. For OPSO Only, use a 7/8" (21 mm) socket.
   b. For OPSO/UPSO, use a needle nose pliers.
3. To verify this set pressure, you will need to increase the outlet pressure of the regulator until the OPSO triggers.
4. Reset the OPSO device as described in the Start Up Procedure section.
5. Replace the cap (23) and ensure it is tight to avoid any moisture ingress into the SSV. Note that the cap can be secured with a lock-wire to prevent tampering.

▲ **CAUTION:** The SSV will not reset if the pressure downstream of the regulator remains at or above the OPSO set point. Note that the SSV will only have one adjusting screw if it is an OPSO only construction.

Adjusting the UPSO: Refer to Figure 9

1. Remove the cap (23) from the SSV with an adjustable wrench. Take care to protect the paint.
2. Using a needle nose pliers, turn the adjusting screw (819) clockwise to increase the set point and counterclockwise to decrease it.
3. To verify this set pressure, you will need to decrease the outlet pressure of the regulator until the UPSO triggers.
4. Reset the UPSO device as described in the Start Up Procedure section.
5. Replace the cap (23) and ensure it is tight to avoid any moisture ingress into the SSV. Note that the cap can be secured with a lock-wire to prevent tampering.

▲ **CAUTION:** The SSV will not reset if the pressure downstream of the regulator remains remains below the UPSO set point or above the OPSO set point.

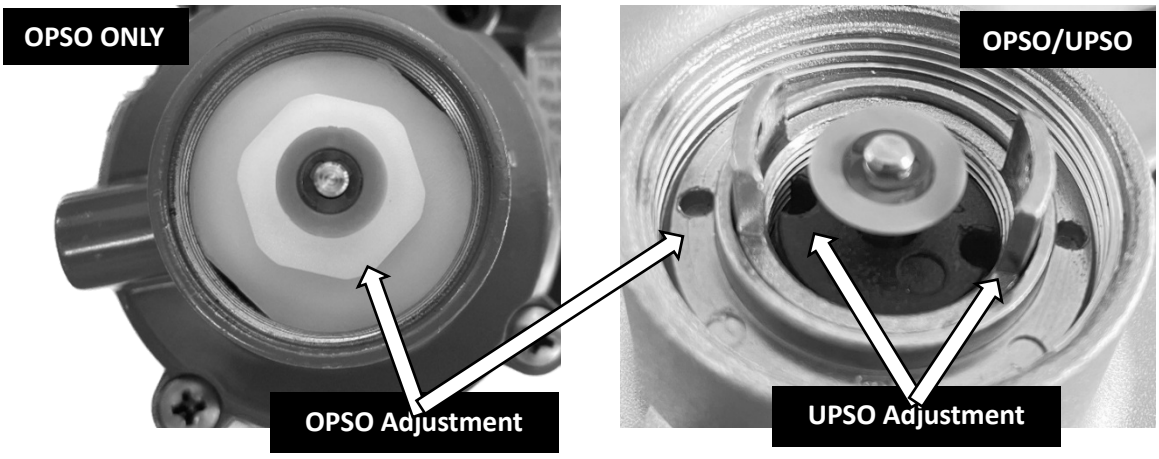


Figure 6: OPSO and UPSO Adjustment Screws

INSPECTIONS & MAINTENANCE:

Periodic inspections should be completed by the installer/operator, at intervals of time defined by the company policy or applicable regulations and standards. Extreme weather or excessive wear may require an increased frequency of these inspections. The inspections must be done by a trained and qualified technician. It is recommended that the regulator be inspected every 12 months, and repairs be made as needed.

▲ **CAUTION:** If any evidence of a pressure excursion exceeding the limits of the regulator exists, the regulator shall be removed from service.
- To avoid personal injury or damage to equipment, never attempt any maintenance or disassembly without isolating the regulator from system pressure and slowly relieving all internal pressure.
- Regulators that have been disassembled must be tested for leaks and proper operation before being returned to service.
- Use only parts manufactured and distributed by Cavagna Group for repairing Cavagna or Mesura branded regulators.

System Shutdown

1. Slowly and completely close the upstream valve. This should reduce pressure in the regulator to outlet pressure. Once the pressures are equal, close the downstream valve.
2. Slowly remove any remaining pressure from the outlet of the regulator until the inlet pressure and outlet pressure gauge show zero pressure.
3. If the SSV activates during this process and pressure remains on the upstream side of the regulator, use the cap (23) or a pair of needle nose pliers to hold the SSV in the open position until all pressure is removed from the system. See Figure 5 for more information.

Inspecting or Replacing the Filter: Refer to Figure 8

Most S7 regulators feature an inlet filter (9) upstream of the SSV that may become plugged by debris. To clean or replace the filter:

1. Shutdown the system as described in the System Shutdown section.
2. Remove the 4 screws (5) holding the SSV module (8) to the body. A drill is recommended, but take care not to strip the screws.
3. Remove the SSV module (8). Protect the o-rings (6 & 7) as they may need to be reused.
4. Remove the filter (9) and clean any debris using a soft brush. If you use any liquid, ensure the filter is completely clean and dry before replacing it in the regulator.
5. Reinstall the filter so it is centered around the SSV orifice.
6. Reinstall the SSV module (8) and ensure the o-rings (6 & 7) are in place. The O-rings should be undamaged and lightly lubricated.
7. Tighten the 4 screws (5) evenly to secure the SSV module. Use torque values in Table 7.
8. When ready, follow the procedure under Start Up.

Verify Functionality of SSV (OPSO/UPSO Constructions Only): Refer to Figure 9

1. Close the regulator outlet valve and wait for the regulator to achieve lock up.
2. Pull up (away from the body) on the 2 handles protruding from (815). This will trigger the SSV to close.
3. If outlet pressure is removed or reduced to a value below regulator set point, the SSV will prevent the flow of gas and outlet pressure will not increase back to regulator set point.
4. Refer to “Start Up Procedure” to reset the SSV.

Changing 2nd Stage Regulation Spring: Refer to Figure 7

Note that changing the set point of the S7 regulator may require use of a different venturi tube. Contact the manufacturer for confirmation.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the spring case cap (24) using an adjustable wrench.
3. Remove the spring adjusting screw (21) using a 3/8" (10 mm) allen or 1-1/8" (28 mm) socket.
4. Remove the spring (22) and replace with the new spring.
5. Replace the spring adjusting screw (21).
6. To establish set point, follow the procedures in Start Up and Set Point Adjustment.

Changing OPSO Spring (OPSO Only Construction): Refer to Figure 6 & 9

Ensure that the new OPSO set point will still meet the safety and design requirements of the system and the regulator. Contact the manufacturer for more information.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the spring case cap (23).
3. Remove the retainer clip (822) using a flat head screw driver. Then remove the reset knob (821). Take care not to lose or damage these.
4. Remove the OPSO spring adjusting screw (816) using a 7/8" (21 mm) socket.
5. Remove the OPSO spring (817) and replace with the new spring.
6. Replace the spring adjusting screw (816), reset knob (821), and the retainer clip (822).
7. To establish set point, follow the procedures in Start Up and Set Point Adjustment.

Changing OPSO Spring (OPSO/UPSO Constructions only): Refer to Figure 6 & 9

Ensure that the new OPSO set point will still meet the safety and design requirements of the system and the regulator. Contact the manufacturer for more information.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the spring case cap (23).
3. Remove the OPSO spring adjusting screw (816) using a needle nose pliers.
4. Remove the OPSO spring (817) and replace with the new spring.
5. Replace the spring adjusting screw (816).
6. To establish set point, follow the procedures in Start Up and Set Point Adjustment.

Changing UPSO Spring: Refer to Figure 6 & 9

Ensure that the new UPSO set point will still meet the safety and design requirements of the system and the regulator. Contact the manufacturer for more information.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the spring case cap (23).
3. Remove the retainer clip (822) using a flat head screw driver. Then remove the reset knob (821). Take care not to lose or damage these.
4. Remove the UPSO spring adjusting screw (819) using a needle nose pliers.
5. Remove the UPSO spring (820) and replace with the new spring.
6. Replace the spring adjusting screw (819).
7. To establish set point, follow the procedures in Start Up and Set Point Adjustment.

Note that the SSV (OPSO or OPSO/UPSO) can be replaced as a module

Inspecting or Replacing the SSV Module: Refer to Figure 9

The compact design of the SSV module on the S7 requires several small components that can be difficult to assemble. Because of this, it is only recommended to inspect the SSV module or replace the SSV disk. It is not advisable to rebuild the entire SSV module. The SSV is available as a pre-assembled module under the Parts Kits in Table 8. Specify spring ranges when ordering.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the 4 screws (5) holding the SSV module (8) to the body. A drill is recommended, but take care not to strip the screws.
3. Clean or replace the SSV Module (8). Emory cloth can be used to smooth any imperfections in the orifice.
4. Install the o-rings (6 and 7) and SSV module (8) with the new components provided. Light lubricate the o-rings.
5. Evenly tighten the 4 screws (5) to mount the SSV module (8) back to the body. Use torque values in Table 7.
6. Follow the procedures under Start Up and, if necessary, Set Point Adjustment to return the regulator to service.

To Replace the SSV Disk (810): Refer to Figures 7 & 8

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the 4 screws (5) holding the SSV module (8) to the body. A drill is recommended, but take care not to strip the screws.
3. Using a snap ring pliers, remove the Disk Retainer Clip (811). The Disk (810) can now be easily removed.
4. Install the new Disk (810) and reinstall the Disk Retainer Clip (811).
5. Inspect the SSV orifice in the body. Emory cloth can be used to smooth any imperfections in the orifice.
6. Replace the o-rings (6 and 7) and SSV module (8). The o-rings should be lightly lubricated.
7. Evenly tighten the 4 screws (5) to mount the SSV module (8) back to the body. Use torque values in Table 7.
8. Follow the procedures under Start Up and, if necessary, Set Point Adjustment to return the regulator to service.

Inspecting or Replacing the First Stage Regulator: Refer to Figure 8

The compact design of the first stage regulator on the S7 requires several small components that can be difficult to assemble. Because of this, it is recommended to only clean or replace the first stage regulator. It is not recommended to rebuild the first stage regulator. The first stage is available as a pre-assembled module under the Parts Kits in Table 8.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the 4 screws (5) holding the first stage regulator module (4) to the body (1).
3. Clean or replace the first stage module (4). Take care not to lose the 2 o-rings (2).
4. Inspect the 1st stage orifice in the body. Emory cloth can be used to smooth any imperfections in the orifice.
5. 3 total o-rings provide sealing between the 1st stage and the body. Two of o-ring (2) fit into groves on the regulator Body (1) and o-ring (3) fits into a grove on the first stage device. Ensure each of these three o-rings are in good condition and properly installed. Lightly lubricate all o-rings and place the first stage assembly back on the body (1) in the same orientation.
6. Evenly tighten the 4 screws to mount the first stage module back to the body. Use torque values in Table 7.
7. Follow the procedures under Start Up and, if necessary, Set Point Adjustment to return the regulator to service.

Replacing 2nd Stage diaphragm: Refer to Figures 7, 11 & 12

The 2nd stage diaphragm is available as a pre-assembled module under the Parts Kits in Table 8. Specify IRV and diaphragm options when ordering.

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Loosen the spring adjuster (2) to remove spring tension using a 3/8” (10 mm) allen key or flat screw driver.
3. Remove the four screws (5) holding the upper diaphragm casing (191) to the body (1).
4. Remove the existing diaphragm assembly (18) by sliding it toward the regulator inlet.
5. When installing the new diaphragm assembly first slide the lever arm (15) into the slot on the lower end of the stem (181). Then align the outer edge of the diaphragm (182) with the machined groove in the body (1).
6. If a dual diaphragm assembly is being installed, ensure the flow reduction plate (20) is snapped into place in the upper diaphragm casing (191).

7. Now, place the upper diaphragm casing (191) so the machined groove aligns with the outer edge of the diaphragm. Confirm proper orientation of the vent. 15
8. Tighten the four screws (5) holding the upper diaphragm casing (191) to the body (1). Use torque values in Table 7.
9. Follow the procedures under Start Up and, if necessary, Set Point Adjustment to return the regulator to service.

▲ **CAUTION:** If a new diaphragm subassembly with IRV (Token or Limited) is installed, the IRV will be set at the factory to an approximate setting. This value can be specified at the time of order, or default settings from Table 4 will be used. The accuracy of the IRV on the replacement diaphragm assembly **will not meet +/- 10%**. If a precise setting or improved accuracy is needed, contact Cavagna or your distributor for further instructions.

Inspecting or Replacing the 2nd Stage Regulator Disk: Refer to Figures 7 & 10

The standard S7 construction features an inlet filter that is designed prevent debris from damaging these internal components. This should mitigate any reason to inspect or replace the disk or orifice.

1. Shutdown and isolate the system as described in the System Shutdown section.
   a. For linear body constructions, any outlet piping will need to be removed to access the trim components.
   b. For angled body constructions, use a 9 mm Allen to remove (25) to gain access to the trim components.
2. Follow steps 1-4 above to remove the 2nd stage diaphragm.
3. Remove the 2 screws (16) holding the lever arm (15) in place using a T10 Torx bit. The upper and lower lever arm support (14) should remain with the lever arm when removed. Ensure they are not lost.
4. Once the lever arm is removed, the piston/disk (11) can be removed through the regulator outlet. Protect the venturi tube (17) during this removal.
5. Inspect the 2nd stage orifice in the body. Emory cloth can be used to smooth any imperfections in the orifice.
6. Replace all the components in the opposite order. Lubricate all o-rings and confirm all components are properly positioned to eliminate internal leaks. Use torque values in Table 7 during reassembly.

SSV Vent Limiter Installation

⚠ **WARNING: The SSV Vent Limiter is only intended for indoor use. DO NOT USE OUTDOORS.**

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the SSV vent screen (824).
3. The SSV vent limiter must be ordered as a kit/sub-assembly. Apply thread sealant to the SSV vent limiter and install the vent limiter in the SSV vent. The vent limiter must be oriented up. An Elbow fitting can be used, or the SSV cover can be rotated.

Combined Vent Installation: Refer to Figure 13

⚠ **WARNING: Ensure the combined vent or vent piping outlet is protected from intrusion of water or build up of ice, snow or debris. Combining vents can impact regulator and slam shut valve operation.**

1. Shutdown and isolate the system as described in the System Shutdown section.
2. Remove the 2nd Stage vent screen (193) and the SSV vent screen (824).
3. Apply thread sealant to fittings (161), (162), and (163). Install fitting (161) into the 2nd stage vent. Install fitting (163) into the opening in the side of fitting (161). Support fitting (during this installation to minimize force applied to the diaphragm casing (191). Install fitting (162) into the SSV vent. Use torque values in Table 7 for all fittings and tubing.
4. Now install the piece of tubing (164) to connect fitting (16)2 to fitting (163).
5. A light back pressure (2 psig or less) can be applied to the combined vent to check for leaks in the new tubing system. Only do this while the regulator is out of service. This may cause the SSV to activate.
6. Ensure the new combined vent outlet is oriented down and protected from debris, snow, ice and rain.
7. See Start Up Procedure to reset the SSV and place the regulator back into service.

TRACEABILITY & DOCUMENTATION

- The Product's purchaser accepts responsibility to ensure traceability after purchase, even if the Product is sold to further purchaser, so that the manufacturer is able to locate Products if necessary.
- Any changes made to the product should be identified on a new tag or stamped into the existing product nameplate. Any out of date information shall be stamped over so it is no longer visible.
- Any Product that has been removed from service or has reached its end of life shall be deformed so that it is inoperable.

TORQUE VALUES FOR REASSEMBLY

The values below should be used when reassembling components on the regulator. Refer to the figures listed for additional information.

	Table 7: Torque Values			
Item	**Description**	**Value**	**Value (Nm)**	**Figure**
5	Cover Screws	3.32 Lb-ft	4.5	All
16	Lever Arm Screws	8 – 8.85 Lb-in	0.9 - 1	9

PARTS, SUB-ASSEMBLIES AND KITS:

Table 8: Sub-Assemblies Available for Purchase				
Sub-Assembly	**Description**	**Part Number**	**Details**	**Additional Parts Included**
Filter (9)	Replacement Filter	Contact Cavagna North America	No additional information required	1 of (6), 1 of (7), 4 of (5)
Slam Shut Valve (8)	BP OPSO, with o-rings and screws		Specify Springs from Table 5	1 of (6), 1 of (7), 4 of (5), 1 of (9)
	MP OPSO, with o-rings and screws			
	BP OPSO/UPSO, with o-rings and screws		Specify Springs from Table 5 & 6	
	MP OPSO/UPSO, with o-rings and screws			
Second Stage Diaphragm Assembly (18)	DOUBLE DIAPHRAGM / NON-RELIEVING		No additional Information required	4 of (5) and 1 of (20) for Double Diaphragm Assemblies
	SINGLE DIAPHRAGM / TOKEN IRV		Specify the IRV spring from Table 4	
	DOUBLE DIAPHRAGM / TOKEN IRV			
	DOUBLE DIAPHRAGM / LIMITED IRV			
First Stage (6)	First Stage Regulator (4.35 PSID)		No additional information required	1 of (2), 1 of (3), 4 of (5)
Second Stage Cover	Second Stage Diaphragm Casing Cover Assembly		No additional information required	4 of (5)
Combined Vent System	Combined Vent Kit		No additional information required	1 each of (161), (162), (163), (164)
SSV Vent Limiter	Vent Limiter		No additional information required	Vent Limiter Only

TABLE 9: PARTS LIST

If a Part Number is not provided for an item, refer to Table 8 to see if it is available as a sub-assembly. If it is not included in Table 8 or Table 9, contact Cavagna North America.

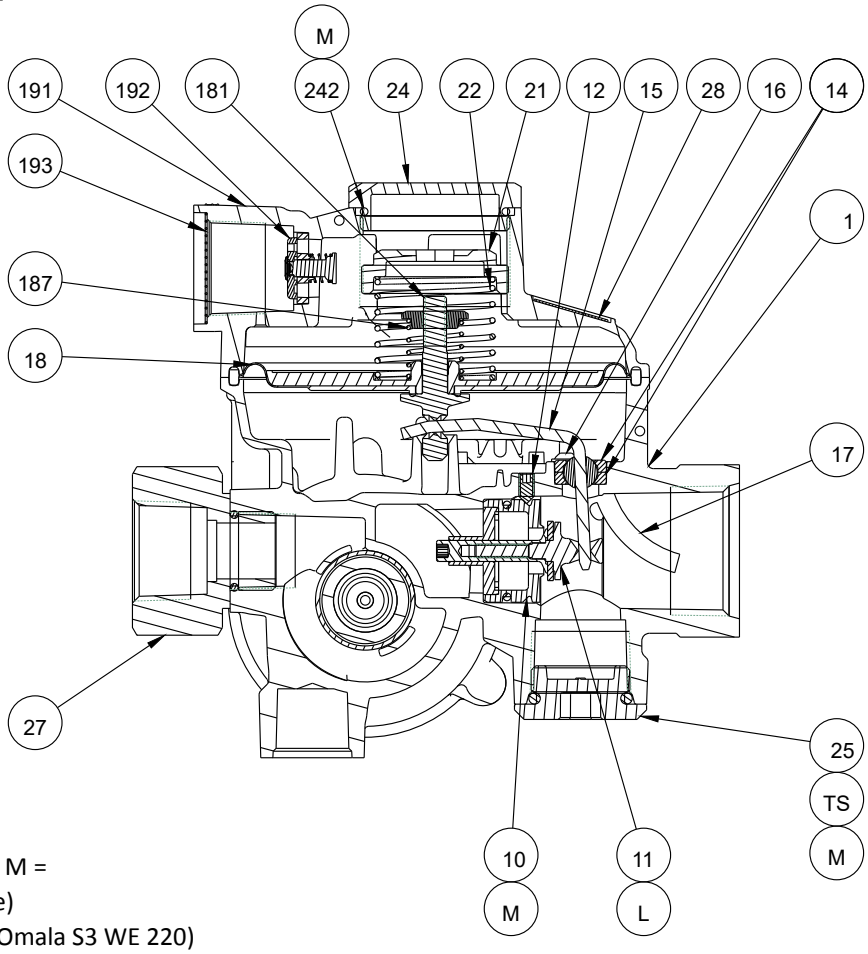
3 digit Item Numbers are components for a subassembly. These components may only be orderable as a subassembly.

Item	DESCRIPTION	PART NUMBER	QTY
1	MESURA S7 BODY - PRODUCTION	-	1
2	O-RING	04-1-110-0116	2
3	O-RING	04-1-110-0170	1
4	FIRST STAGE REGULATION SUB-ASSEMBLY (4.25 mbar)	40-1-950-0545	1
5	COVER SCREWS (ALL COVERS) BLACK	14-1-110-0226	12
6	O-RING	04-1-110-0113	1
7	O-RING	04-1-110-0172	1
8	SLAM SHUT VALVE SUB-ASSEMBLY	SEE TABLE 8	1
807	SLAM SHUT VALVE STEM	-	1
810	SLAM SHUT VALVE DISK	06-1-950-0117	1
811	DISK RETAINER CLIP	15-1-110-0121	1
816	OPSO ADJUSTING SCREW	580_020_002	1
817	OPSO SETTING SPRING	SEE TABLE 5	1
819	UPSO SPRING ADJUSTER	580_021_002	1
820	UPSO SETTING SPRING	SEE TABLE 6	1
821	RESET KNOB	21-1-110-0291	1
822	RETAINER CLIP	15-1-110-0122	1
824	SSV VENT SCREEN	17-1- 110-0185	1
9	S7 INLET FILTER	17-1-110-0125	1
10	ORIFICE/PISTON GUIDE	-	1
11	PISTON/DISK ASSEMBLY	06-1-950-0120	1
12	SCREW, ORIFICE	-	1
14	LEVER ARM SUPPORT	-	2
15	LEVER ARM	-	1
16	SCREW, LEVER ARM	14-1-110-0164	2
17	VENTURI	-	1
18	DIAPHRAGM SUB-ASSEMBLY	SEE TABLE 8	1
181	DIAPHRAGM ASSEMBLY STEM		
182	S7 REGULATION DIAPHRAGM		
183	S7 SAFETY DIAPHRAGM		
184	DIAPHRAGM RETAINER		
185	BUSHING		
186	ADJUSTING NUT		
187	IRV SETTING SPRING	SEE TABLE 4	
188	Limited IRV Q-ring	SEE TABLE 8	

TABLE 9 CONTINUED: PARTS LIST

Item	DESCRIPTION	PART NUMBER	QTY
19	SECOND STAGE DIAPHRAGM CASING COVER ASSEMBLY	01-1-950-0283	1
191	DIAPHRAGM CASING COVER - 2ND STAGE		
192	DIAPHRAGM CASING STABILIZER		
193	VENT SCREEN		
20	SAFETY DIAPHRAGM FLOW REDUCTION PLATE	21-1-110-0515	1
21	DELIVERY PRESSURE SPRING ADJUSTER	08-1-110-0140	1
22	DELIVERY PRESSURE SETTING SPRING	SEE TABLE 3	1
23	SLAM SHUT VALVE CASING CAP (METAL) WITH O-RING	19-1-950-0192	1
	SLAM SHUT VALVE CASING CAP (CLEAR PLASTIC) WITH O-RING	19-1-950-0153	
	SLAM SHUT VALVE CASING CAP (VISIUAL INDICATOR) WITH O-RING	Contact CNA	
232	O-RING	04-1-110-0132	
24	2ND STAGE CASING CAP WITH O-RING	19-1-950-0194	1
242	O-RING	04-1-110-0153	1
25	OUTLET CAP & O-RING	-	1
26	OUTLET FITTING	-	1
27	INLET FITTING	-	1
28	REGULATOR NAMEPLATE	-	1
161	2ND STAGE VENT FITTING (1/2" FNPT X 7/16" - 20 UNF)	SEE TABLE 7	1
162	SSV VENT FITTING (1/8" NPT X 1/4" NPT)	SEE TABLE 7	1
163	COMBINATION FITTING (1/8" NPT X 7/16" - 20 UNF)	SEE TABLE 7	1
164	1/4" FLEX TUBING	SEE TABLE 7	1

Product Drawings



TS = Thread Sealant M = Lubricate (Molykote)
L = Lubricate (Shell Omala S3 WE 220)

Figure 7: S7 Regulator Assembly

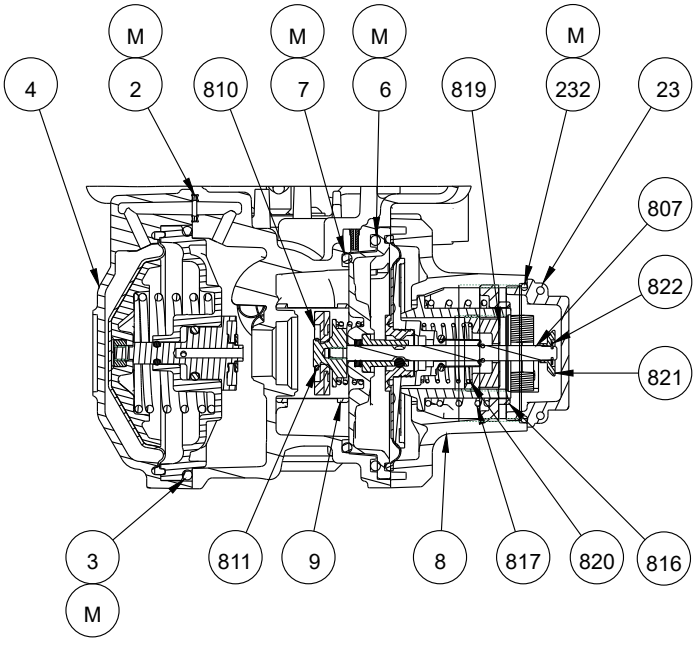


Figure 8: S7 First Stage and SSV Assembly (OPSO & UPSO)

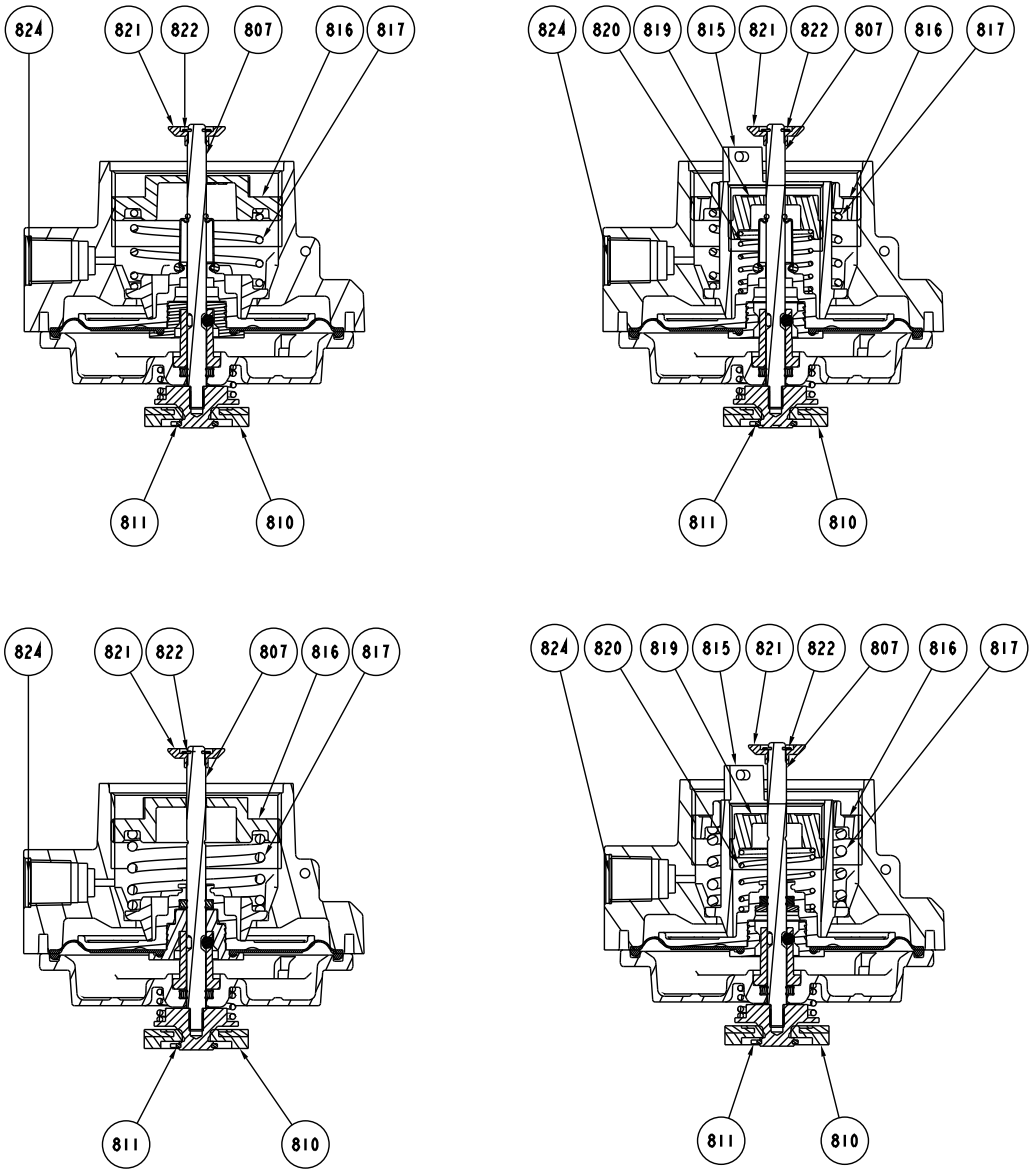


Figure 9: SSV Assemblies. BP Assemblies in Top Row, MP Assemblies on Bottom Row. OPSO Only on Left, OPSO/UPSO on Right.

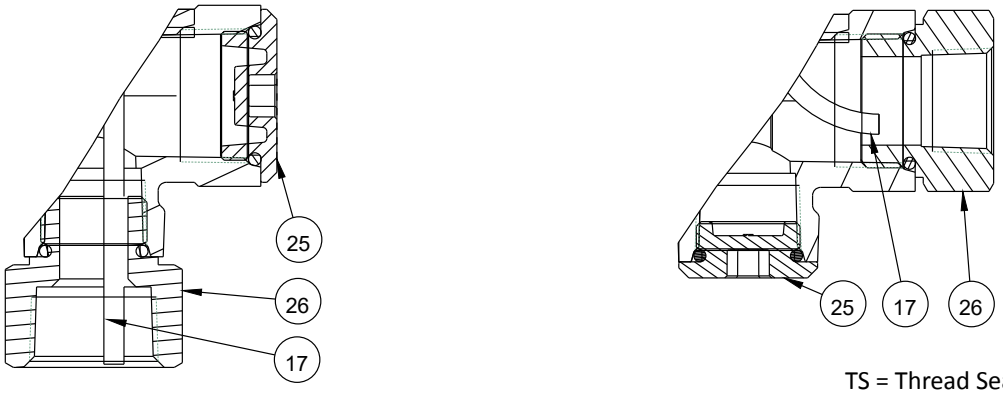
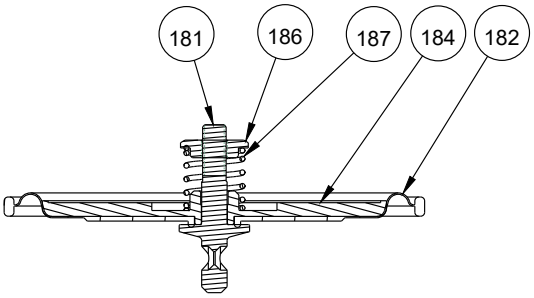
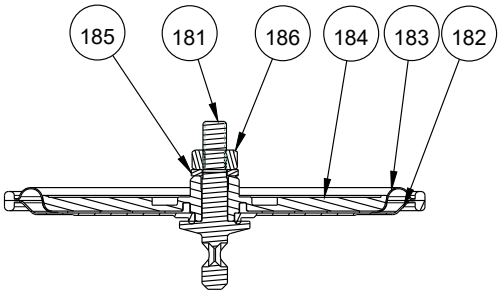


Figure 10: Angled Outlet (Left) and Linear Outlet (Right)

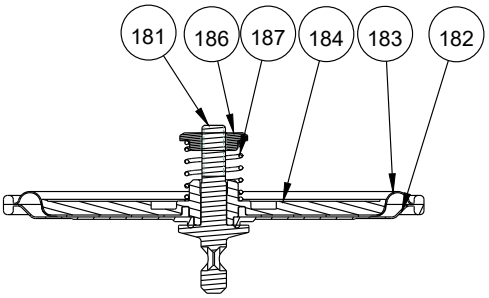
TS = Thread Sealant
M = Lubricate (Molykote)
L = Lubricate (Shell Omala S3 WE 220)



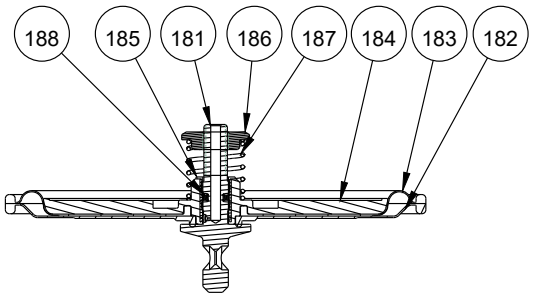
Single Diaphragm - Token IRV



Dual Diaphragm - Non-Relieving



Dual Diaphragm - Token IRV



Dual Diaphragm - Low Flow IRV

Figure 11: 2nd Stage Diaphragm Assemblies

TS = Thread Sealant
M = Lubricate (Molykote)
L = Lubricate (Shell Omala S3 WE 220)

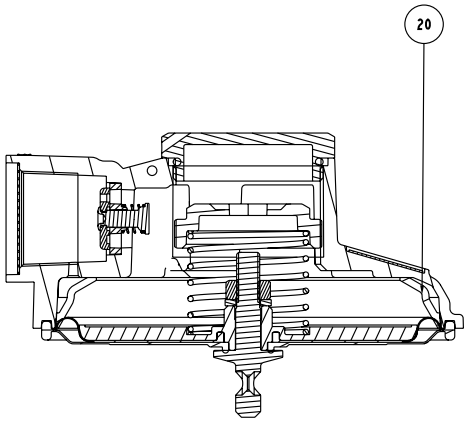


Figure 12: Dual Diaphragm Restriction Plate

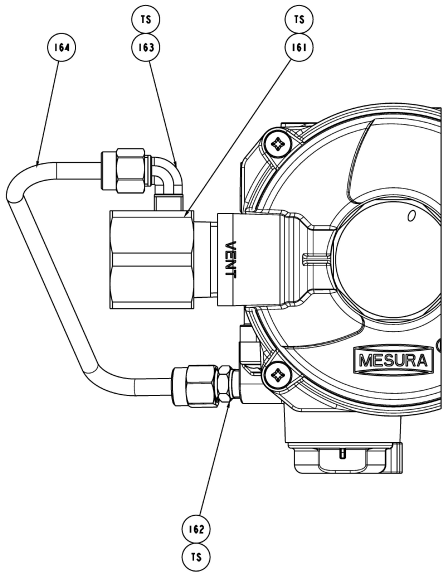


Figure 13: Combined Vent System

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