Outlet Pressure Regulator

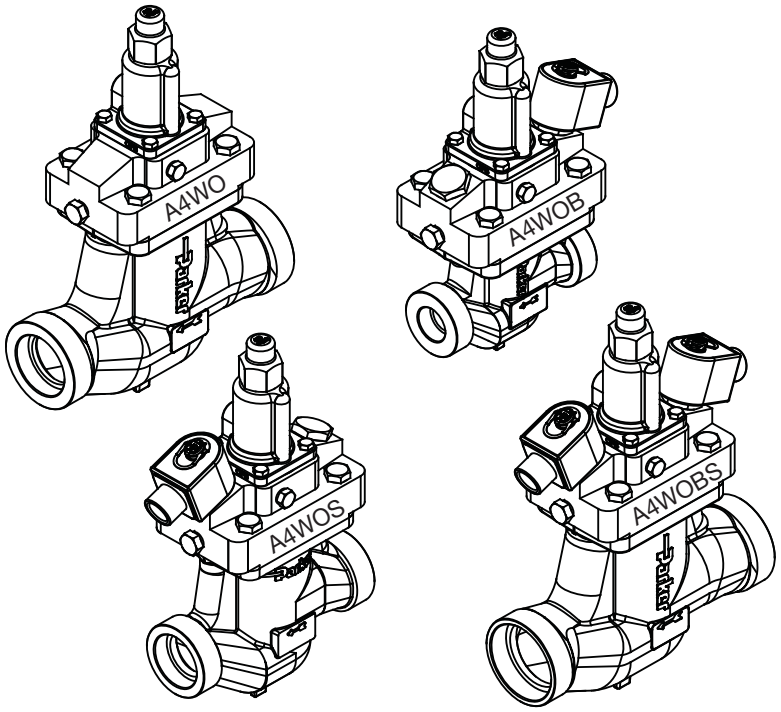
Product Bulletin 22-05 A

Type: A4WO, A4WOB, A4WOS, A4WOBS, A4WOK, A4WOBK, A4WOE, A4WOES
Size: 20 - 50 mm (¾" to 2")
Design Pressure Rating: 32 bar (464 psig)

A4WOB

Purpose:

The A4WO outlet pressure regulators modulate the flow of refrigerant gas or liquid to maintain a constant downstream pressure. This improved design has a higher working pressure, greater working temperature range than competitive products, and minimizes the effects of system impurities for a more durable operation. The A4WOs most beneficial features are its stainless steel and aluminum construction, which allows it to withstand corrosive environments and its overall light weight minimizes installation costs.



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Product Features:

- Suitable for Ammonia, CO_2, R-22, R-404a, and other common refrigerants
- Designed with corrosion resistant material – 304 stainless steel and aluminum
- No body wearing surfaces
- Stainless steel components are resistant to wiredrawing
- Improved performance at low loads with a turn down ratio of 10% of capacity
- Design drastically reduces foreign material to flow from inlet to diaphragm/seat and piston cavity
- Light weight
- Can be mounted in a horizontal and vertical position
- Several control options available
- Fluid temperature rating: -60°C to 116°C (-76°F to 240°F)
- Ambient temperature rating: -40°C to 60°C (-40°F to 140°F)
- Complies with Pressure Equipment Directive 97/23/EC

Patent Pending

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Description
All A4WO outlet pressure regulators are pilot operated and require a minimum of 0.14 bar (2 psig) pressure drop across the valve to fully open. The valves are an integrated assembly of three modules:

1. A body, which contains the modulating plug, but is ordered to suit a particular connection size. The port size defines the size of the body;

2. A port plate, which defines the valve function. Control features can be added by incorporating pilot solenoids: either an Electric Shut-Off (S) or a Electric Wide Open Bypass (B);

3. The bonnet, which contains the range set spring and adjustment stem.

The A4WO is a normally closed valve furnished with socket weld and weld neck options only. This unique design allows the regulator to be welded into the line without disassembly, yet provides full access for cleaning and servicing from the top only.

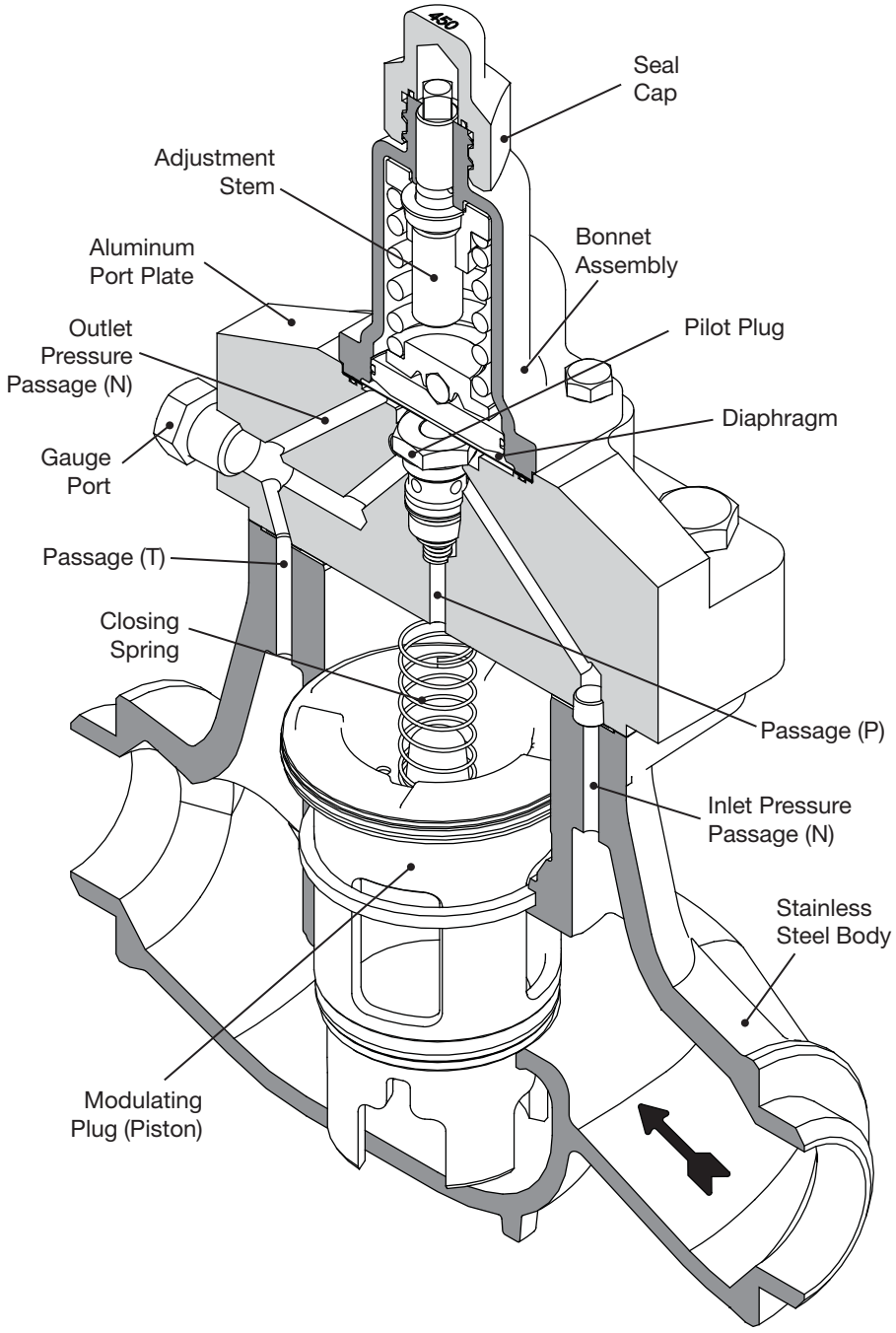
These valves will modulate to maintain a pressure as set for in the field, in spite of fluctuations in load, changes in ambient, changes in available refrigerant flow paths, and other operating variances. Appropriately sized, these valves will modulate the flow of liquid or vapor, high side or low side in a wide variety of system arrangements. Each port size will have a specific maximum capacity at full opening corresponding to the available or sensible-pressure.

The throttle range on this new design is greatly enhanced, resulting in optimal performance at low load conditions. Current regulator designs can regulate down to 20% of a valves maximum rating. The A4W series or regulators can regulate down to 10% of the valves maximum capacity.

These valves are generally ordered with close upstream strainer to prevent entrance of foreign material into the valve and the rest of the

Port Size	Connection Size (SW, BW)	Body Size	Kv	Cv
20 mm (3/4")	3/4", 1"	1"	10.8	12.6
25 mm (1")	3/4", 1", 1-1/4"	1", 1-1/4"	12.5	14.6
32 mm (1-1/4")	1-1/4", 1-1/2"	1-1/4", 2"	22.3	26
40 mm (1-1/2")	1-1/2", 2"	2"	30	35
50 mm (2")	1-1/2", 2"	2"	41.1	48

A4W Port, Connection, and Flow Coefficient Table



A4WO Outlet Pressure Regulator Cross Section (1-1/2" Valve Body Shown)

system. (See Bulletin 00-20 for more information)

A4WO Principle of Operation
The outlet pressure enters the space under the diaphragm through passage (T), shown in the A4WO principle of operation cross-section diagram, filling the chamber underneath the diaphragm. When force created by this pressure acting on the underside of the diaphragm exceeds the force of the range spring acting on top of the diaphragm, the diaphragm moves upward. This also results in an upward movement of the spring loaded pilot plug installed directly underneath the diaphragm. The upward movement of the pilot plug forces the pilot plug piston to close, preventing any pressure above the piston to escape through passage (P) and into passage (T). The pressure on top of the piston is equalized to the pressure below, inlet pressure, through the piston bleed hole and the piston moves downward, closing the valve due to the weight of the piston and the spring closing force. A piston seal ring ensures that this bleed hole is the sole source of equalization.

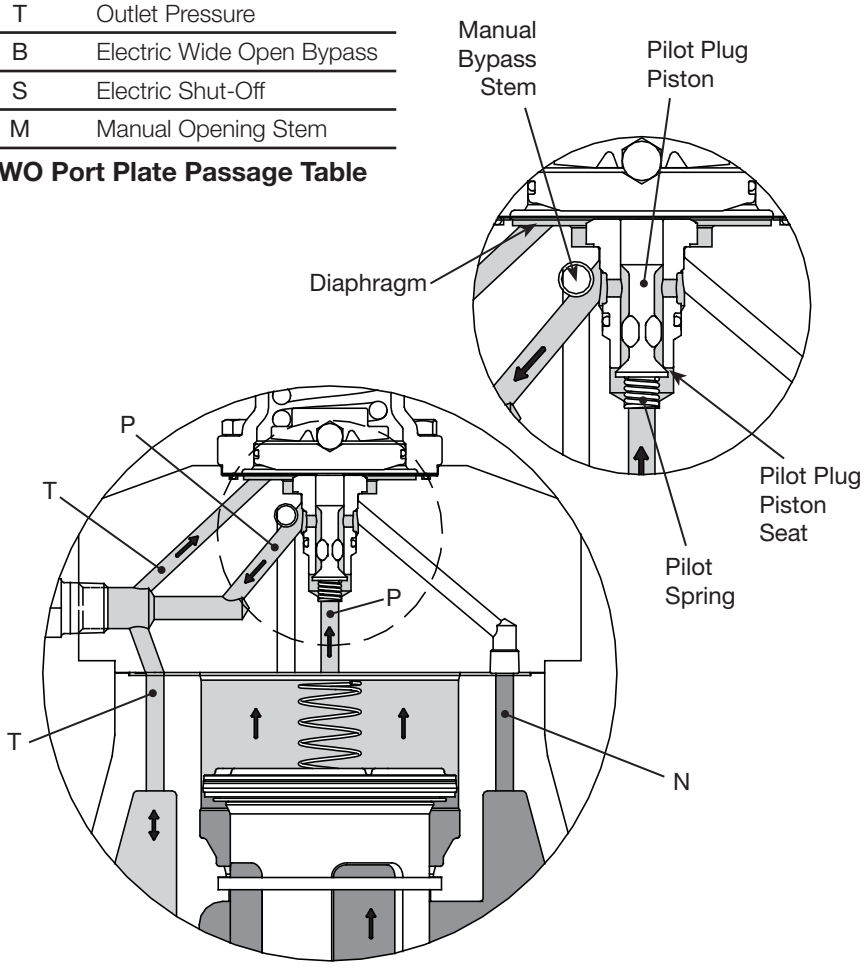
Note: the inlet passage (N), shown in the A4WO principle of operation cross-section diagram, is blocked off at the port plate. This passage (N) is used for the A4W inlet regulator variation and is not required for a standard A4WO outlet regulator. A plug is installed at the factory to prevent any pilot flow through this passage.

When the outlet pressure decreases, such that the range spring overcomes the pressure force underneath the diaphragm, the diaphragm moves downward forcing the pilot plug to move downward opening passage (P), releasing the pressure above the piston through the pilot plug and into passage (T). This lowers the pressure on top of the piston and the inlet pressure underside the piston forces the piston to open.

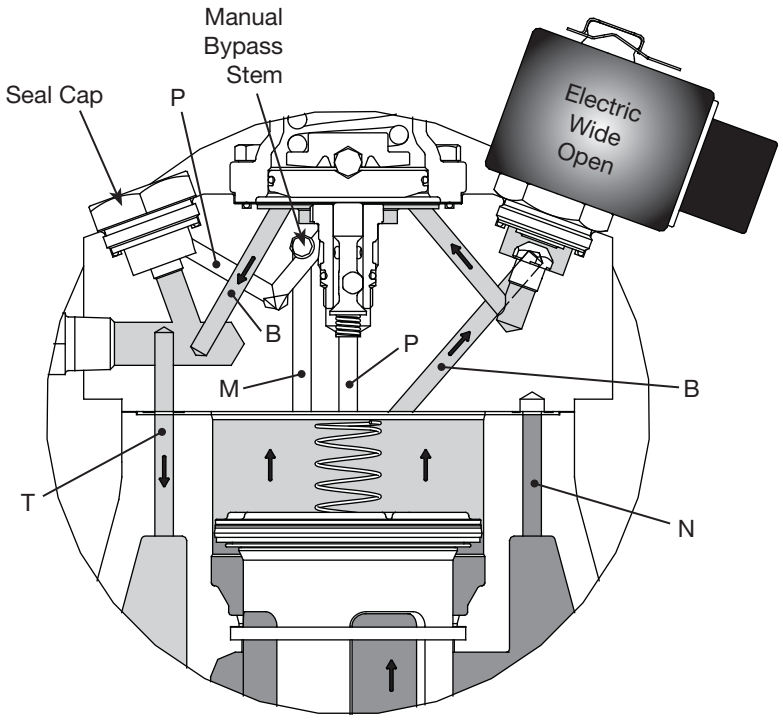
Note: passage (P) and passage (T) in the port plate use the same piping system. The pilot plug prevents both passages from being utilized at the same time.

Passage	Description
N	Inlet Pressure
P	Piston Pressure, Top
T	Outlet Pressure
B	Electric Wide Open Bypass
S	Electric Shut-Off
M	Manual Opening Stem

A4WO Port Plate Passage Table



A4WO Principle of Operation Cross Section



A4WOB Principle of Operation Cross Section ('B' Coil Energized)

A4WOB Principle of Operation
The port plate for the A4WOB is a slightly different construction, shown in the A4WOB principle of operation cross-section diagram, than the standard A4WO, but the regulating portion of the valve works in the same manner as described in the A4WO principles of operation.

Note: the passages in the A4WOB port plate are not in the same cross-section as shown in the diagram. The upper half of passage (B), passage (M), and the piston pressure release passage (P) are all located on different cross-sections of the port plate. The cross-section shown is to better illustrate how the valve operates.

The 'B' feature, electric wide open, when energized will cause the solenoid plug to lift and the valve will fully open. The pressure on top of the piston is released through passage (B) and into passage (T), lowering the pressure. The inlet pressure acting on the bottom side of the piston overcomes the outlet pressure, therefore forcing the piston upward and fully opening the valve. This pressure does not feed back through the pilot plug, because the pilot plug piston is fully seated.

Simply de-energize the 'B' feature on the valve to regulate.

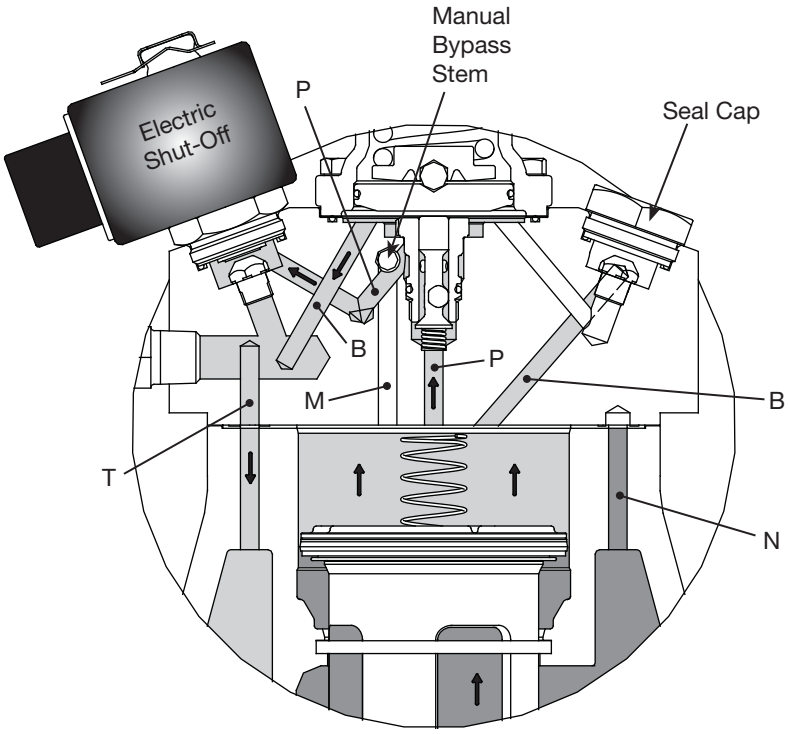
A4WOS Principle of Operation
The port plate for the A4WOS is the same port plate used for the A4WOB. The only difference is that the seal cap and coil assembly are located in the opposite location, as shown in the A4WOS principle of operation cross-section.

The 'S' feature, electric shut off, when energized will cause the solenoid plug to lift and allow the valve to regulate. The regulating portion of the valve works in the same manner as described in the A4WO principles of operation.

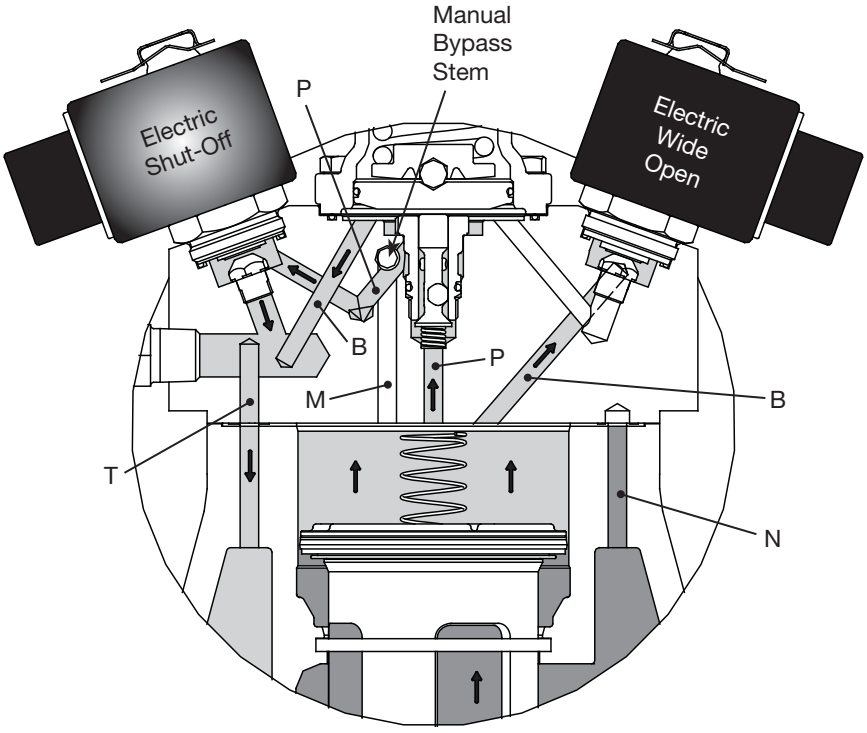
When the 'S' feature is de-energized passage (P) is blocked off and the inlet pressure bleeds through the bleed hole in the piston allowing for continuous equalization of inlet pressure to the

Passage	Description
N	Inlet Pressure
P	Piston Pressure, Top
T	Outlet Pressure
B	Electric Wide Open Bypass
S	Electric Shut-Off
M	Manual Opening Stem

A4WO Port Plate Passage Table



A4WOS Principle of Operation Cross Section ('S' Coil Energized)



A4WOBS Principle of Operation Cross Section ('S' Coil Energized & and 'B' Coil De-Energized)

top of the piston. The top and bottom pressure on the piston equalizes and the weight of the piston along with the closing spring force prevents the valve from regulating.

Note: when the 'S' feature solenoid is de-energized the piston remains closed regardless of the outlet pressure. Simply energize the 'S' feature on the valve to regulate.

A4WOBS Principle of Operation
The port plate for the A4WOBS is the same port plate used for the A4WOB and A4WOS. The regulating portion of the valve works in the same manner as the A4WOS described earlier. The A4WOBS principle of operation cross-section shows the 'B' and 'S' solenoid features. When both solenoids are de-energized, there is no flow from the top of the piston and therefore the pressure on top of the piston is equalized to that on the bottom, inlet pressure, through the bleed hole and the valve is closed due to the weight of the piston in combination with the closing spring. When the 'S' solenoid is energized it allows the valve to regulate. When the 'B' solenoid is energized it overrides the 'S' feature and the valve will is fully open.

Note: for more details on the principles of operation for the 'B' and 'S' features see the previous single operations.

A4WOK and A4WOBK Principle of Operation
The A4WOK and A4WOBK operate in the same manner as the A4WO and A4WOB. These regulators are factory set for a given set pressure. The seal cap is wired to the bonnet cap screw and the wires are sealed with a lead seal. The relief pressure setting is stamped on the seal.

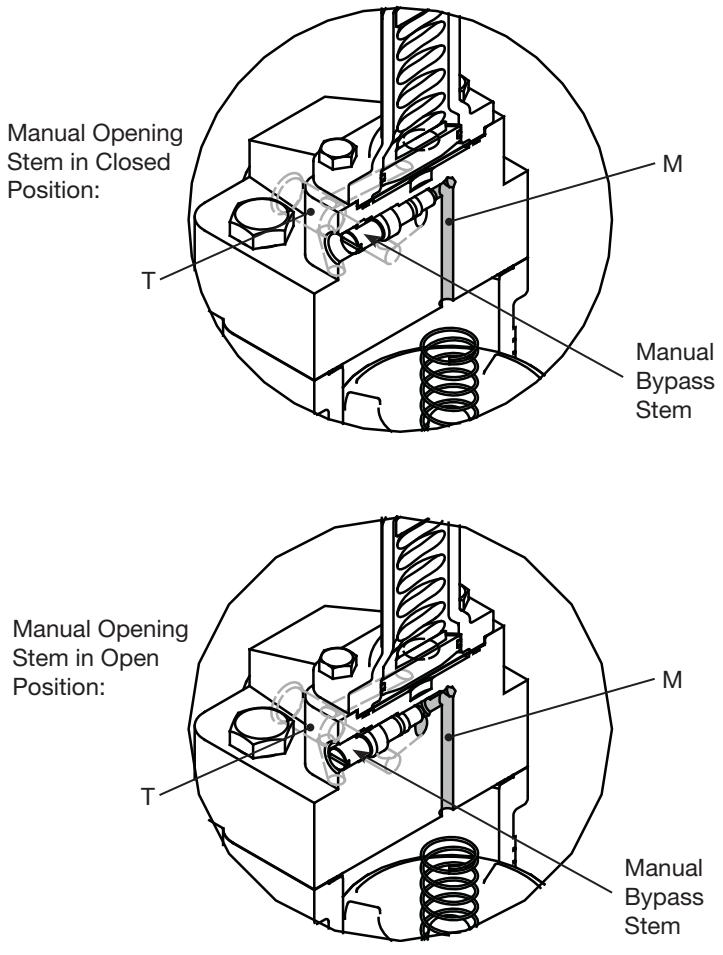
Note: if the lead seal is removed from the 'K' featured valves prior to one year of installation the warranty is voided.

A4WOE and A4WOES Principles of Operation
The A4WOE and A4WOES version of the outlet regulator has a remote sensing connection, which allows control of downstream pressure at a point remote from the regulator outlet. The port plate gasket (#35) has no hole, thus blocking flow of upstream pressure to the under side of the diaphragm. The sensing pressure from the desired control point, downstream of the regulator, is connected to the gauge port (#26). Thus the regulator will control the pressure at the sensing point. The regulator operation and adjustment is the same as the A4WO and A4WOS.

Manual Opening Stem
These valves are equipped with a pressure driven manual opening system versus the mechanical screw thread mechanism. A small valve is opened that allows the inlet pressure trapped above the piston to escape via passage (M), through the port plug and into passage (T), the valve outlet. The small valve stem is located on the side of the port plate as shown in the A4WO manual opening stem cross-section diagram. Using a screw driver, turn the CCW to manually open the valve. Turn the stem CW to put the valve back into automatic operation. There must be at least a 2 psi pressure drop across the valve to completely open the valve. If there is less than a 2 psi pressure difference available the valve will be partially open and at some point less than 2 psi will close. There is still a leak path between the valve inlet and outlet through the manual opening valve for pump down purposes.

Installation
All regulators are packed for a maximum protection. Unpack carefully. Check the carton to make sure all items are unpacked. Save the

Passage	Description
T	Outlet Pressure
M	Manual Opening Stem



A4WO Manual Opening Stem Cross Section

	Set Point Range	Approx. Pressure Change per Turn of Adjusting Screw	Factory Set Point (unless otherwise specified)
V:	500mm hg to 8.3 bar (20" hg to 120 psig)	0.7 bar (10 psi)	2.8 bar (40 psig)
D:	5.2 to 19.3 bar (75 to 280 psig)	4.1 bar (60 psi)	9.7 bar (140 psig)

A4WO Pressure Setting Ranges

Suffix	Description	Typical Application
A4WOB	Outlet Pressure Regulator Electric Wide Open	Crankcase Pressure Regulator Receiver Pressure Control Heat Reclaim
A4WOS	Outlet Pressure Regulator Electric Shut-Off	

Suffix Table

enclosed instruction for the installer and eventual user.

Do not remove the protective coverings from the inlet and outlet of the regulator until the regulator is ready to be installed. Protect the inside of the regulator from dirt and chips before and during installation.

The valves should not be disassembled before welding. This grade of stainless steel is a poor conductor of heat and conventional weld processes (stick, MIG, and TIG) do not create enough heat that transfers to the valve's internal parts that could be affected.

Contractors need to follow a WPS (Welding Procedure Specification) for all welding. The procedure must be qualified and welder doing the weld qualified to perform that procedure. For welding the stainless steel 304L body to carbon steel pipe, E309L and ER309L-15,-16, or -17 filler metal is a common choice. Contractors can develop their own standards and have them qualified based on the equipment they use and the environment they may encounter.

The codes applicable to the welding of socket weld valves require that the pipe be inserted into the socket until bottomed against the stop. The pipe is then to be backed out approximately 1/16 of an inch before welding. Use of welding rings is optional, but recommended for butt weld valves. They help alignment, control gap for full penetration welding, and reduce welding debris entry.

Note: When welding carbon steel and stainless steel the welded joint should be painted to prevent galvanic corrosion.

Socket welding where allowed is the preferred connection. This connection does help to reduce the amount of welding debris in the piping system.

Welded valves may be installed in horizontal or vertical pipelines. In a horizontal pipeline the valve can be mounted 90 degrees to either side from the upright position. These valves can not exceed below the 3-O'clock and 9-O'clock positions. It is important that the valves are installed in the correct direction of flow, because these regulators can control flow in one only direction.

Before putting valves into service, all pipe connections, valve seats, bonnet seals, and stem seals should be tested for leaks at pressure levels called for in appropriate codes.

Adjustment
Adjustment of a regulator's set point requires that the pressure being controlled be monitored by an accurate pressure gauge. Before making any adjustments, the seal cap must be removed. In all cases where the regulator is administering a pressure condition and a solenoid feature is not overriding that function, and the flow is in the normal direction, turning the adjusting stem in the (i.e. clockwise) direction will raise the set point, and turning it (i.e. counterclockwise) direction will lower the set point. One complete turn of the adjusting screw will change the set point 0.69 bar (10 psig).

Depending on system responses, the gauge may reflect some delay before change in set point actually results in a change in the pressure being maintained. This can also sometimes be observed following the energization or de-energization of the solenoid features.

The pressure gauge can be connected to the gauge port on the inlet side of the regulator.

Always re-tighten the seal cap once adjustments are complete.

⚠ Caution

Regulators with 'B' features can only be adjusted with the pilot solenoid de-energized. Regulators with the 'S' feature can only be adjusted with the solenoid energized.

A4WO Disassembly
(See also Bulletin RSBCV)
All A4WO series regulators can be disassembled and all serviceable and moving parts replaced without disturbing the piping, but of course, disassembly will cause exposure of some section of piping to atmosphere, which should be addressed before disassembly by evacuation and re-claim of the refrigerant.

For the A4WO series outlet regulators, the seal cap (#1) should be loosened and the adjustment stem (#7) backed out until no further spring compression is felt. If it is known that access to the range spring (#9) and diaphragm (#14) is not required, the sub-assembly from the port plate up can remain intact and the regulator set point can thus be preserved, avoiding the need for gross adjustments when the valve is put back in service. If

access to the pilot assembly (#17 – 21) on an A4WO is required, then the compression must be taken off the range spring as described above, and the bonnet bolts (#4) removed. If a solenoid feature is incorporated, the solenoid coil (#45) should now be removed by removing the coil clip (#44). Never energize a solenoid coil that is not mounted and secured on its solenoid actuator (#46).

After removing the bonnet assembly bolts, the bonnet can be easily lifted off, and will usually leave the diaphragm resting on top of the gasket (#15) and o-ring (#16). The bolts (#25) retaining the lower sub-assembly can now be removed. The wear aspects of the port plate (#34) are the diaphragm and the pilot assembly, which is pressed into the top of the port plate. Remove the diaphragm and inspect carefully for cracks, or scarring around the pilot seat area. This is most easily done by looking down a piece of large tubing, through the diaphragm, at a safety lamp or similar light source. Inspect the pilot seat area of inlet regulators for erosion or other damage; it should be dead smooth to maintain a good metal-to-metal seat.

Removal of the port plate may require a sharp tap on their sides to unseat the parts from their sealed position, for which a rubber or rawhide hammer is recommended so as to avoid damage to the sealing surfaces. Removal of the port plate will expose the top of the piston. The piston spring (#39) and piston (#40) should be removed and inspected. Continue to inspect the wear ring (#42), metal rings, and gaskets.

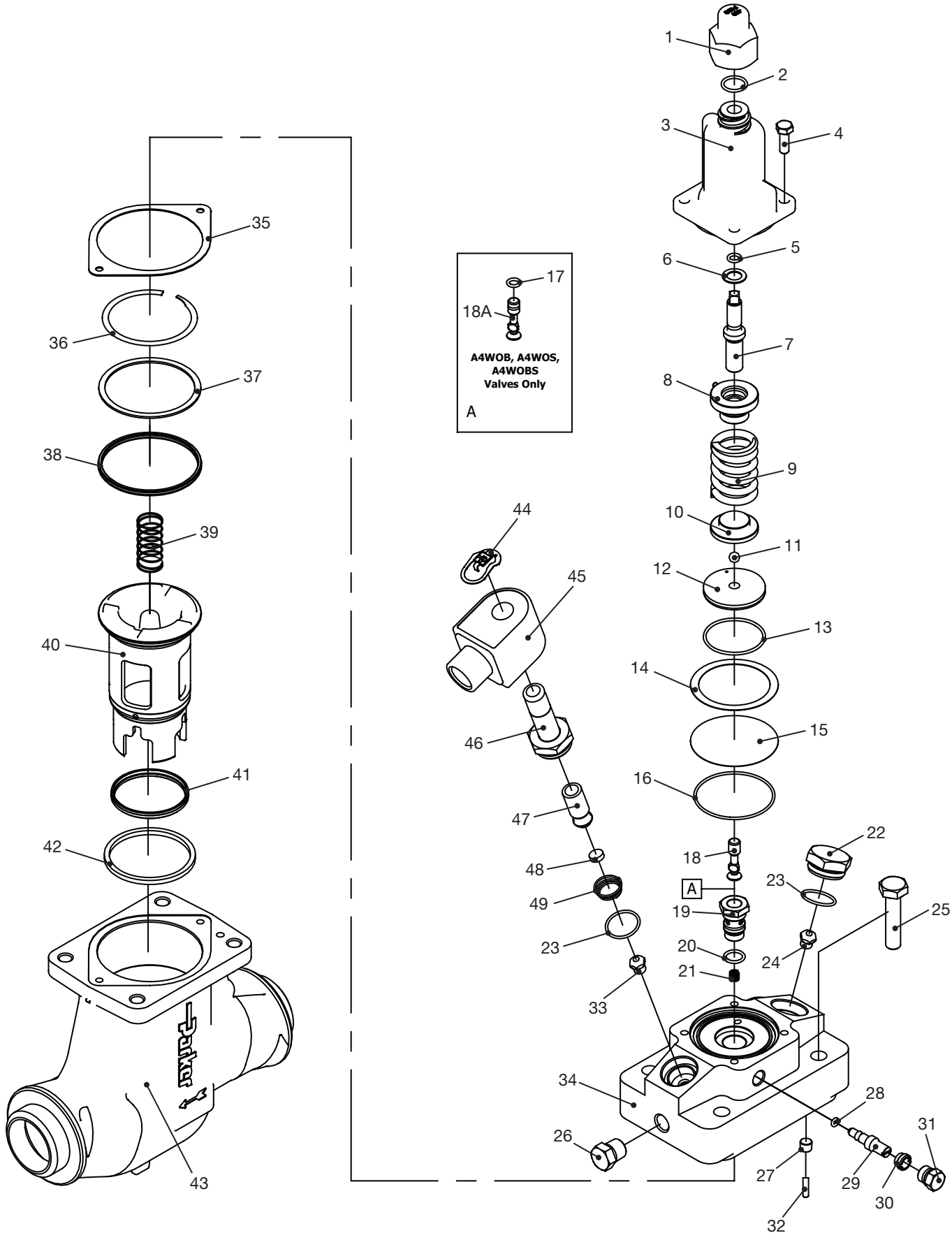
Before re-assembly, all parts must be cleaned with a suitable solvent, permitted to dry, and lubricated with a light film of refrigerant oil, simply wiped on with the fingers, All gaskets and o-rings should be renewed, and insertion and sealing will be facilitated if a similar film of oil is applied to them as well.

Re-assembly is exactly the reverse of disassembly, with the precaution that the reliefs cut into each module of the valve assembly and the

Item No.	Description	Material	Qty
1	Seal Cap	6061 Al	1
2	O-Ring, 0.551 ID x 0.691 OD x 0.07	Neoprene	1
3	Bonnet	304L S.S.	4
4	M6 x 18MM Bolt	DIN-ISO Standard 3506-1	1
5	O-Ring, 0.25 ID x 0.35 OD x 0.062	Neoprene	1
6	Washer, 0.39 ID x 0.625 OD x 0.031	Acetal	1
7	Stem	303 S.S.	1
8	Top Plate, Spring with Roll Pin	1215 Steel	1
9	Spring, Bonnet	Music Wire ASTM -228	1
10	Bottom Plate, Spring	1215 Steel	1
11	Ball, 0.281 DIA	440C S.S.	1
12	Follower, Diaphragm	1215 Steel	1
13	O-Ring, 1.5 ID x 1.625 OD x 0.062	Neoprene	1
14	Gasket, 1.875 ID x 2.3 OD x 0.015	Klingersil C-4401	1
15	Diaphragm	301/302 S.S.	1
16	O-Ring, 2.0 ID x 2.125 OD x 0.062	Neoprene	1
17	O-Ring, 0.25 ID x 0.375 OD x0.062	Neoprene	1
18	Plug, Pilot (A4WO Only)	303 S.S.	1
18A	Plug, Pilot (A4WB, A4WS, & A4WBS Only)	303 S.S.	1
19	Seat, Pilot	1215 Steel	1
20	O-Ring, 0.437 ID x 0.563 OD x 0.062	Neoprene	1
21	Spring, Pilot	S.S. ASTM A-313	1
22	Seal Cap	6061-T6 Al	1
23	O-Ring, 0.813 ID x 0.938 OD x 0.062	Neoprene	1
24	Seat, Pilot Plug (“S” Only)	303 S.S.	1
25	Bolt, M10 x 45MM	DIN-ISO Standard 3506-1	4
26	Plug, Gauge 1/4” NPT	PTFE Coated Steel	1
27	Plug, Pipe 1/16” NPT (A4WO Only)	Black Oxide Finish Steel	1
28	O-Ring, 0.125 ID x 0.25 OD x 0.062	Neoprene	1
29	Stem, Manual Opening	303 S.S.	1
30	Nut, Retainer	416 S.S.	1
31	Plug Cap, Manual Opening 7/16-20	6061-T6 Al	1
32	Pin, Roll	420 S.S.	1
33	Seat, Solenoid	303 S.S.	1
34	Port Plate	6061-T6 Al	1
35	Gasket, Port Plate 0.031	MP 15	1
36	Ring, Retaining 2.174 Internal	302 S.S.	1
37	Ring, Backing	302/304 S.S.	1
38	Ring, Seal 2.528 ID x 2.706 OD	PTFE S.S.	1
39	Spring, Piston	Music Wire ASTM A-228	1
40	Piston	303 S.S.	1
41	Ring, Seal	Teflon (PTFE)	1
42	Ring, Wear	PTFE EMS-103	1
43	Body	304L S.S.	1

A4WO, A4WOB, A4WOS, A4WOBS Parts List

Note: The port plate for a A4WO and A4WOE outlet pressure regulator does not contain coil options and is a separate port plate as shown.



A4WO Exploded Parts View (A4WOS shown)

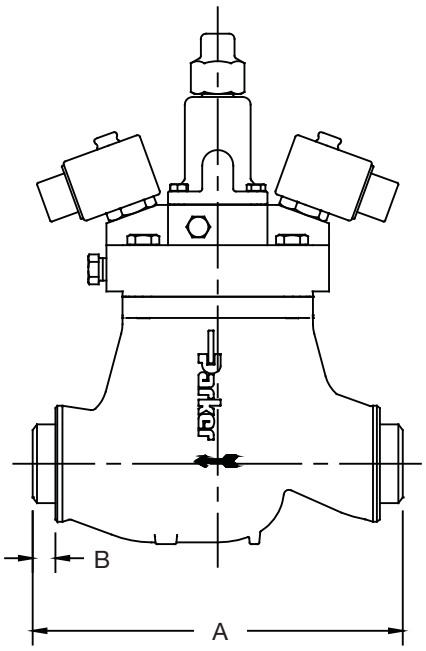
Item No.	Description	Material	Qty
44	Coil Clip	S.S.	1
45	Coil (“S” & “B” Only)	-------	1
46	Solenoid Pseudo Assembly (“S” & “B” Only)	S.S.	1
47	Armature, Coil (“S” & “B” Only)	S.S.	1
48	Ring, Seal	Teflon (PTFE)	1
49	Spring, Coil (“S” & “B” Only)	S.S.	1

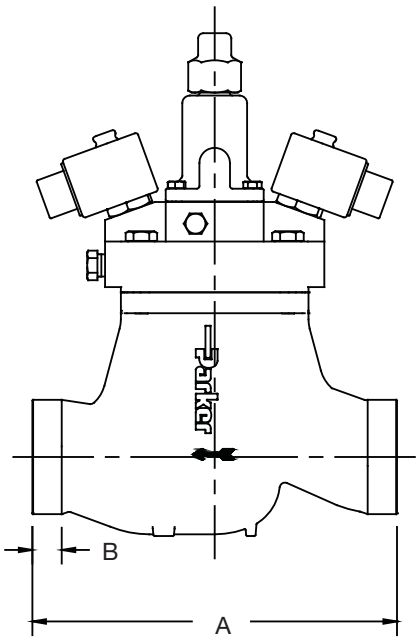
A4WO, A4WOB, A4WOS, & A4WOBS Parts List (continued)

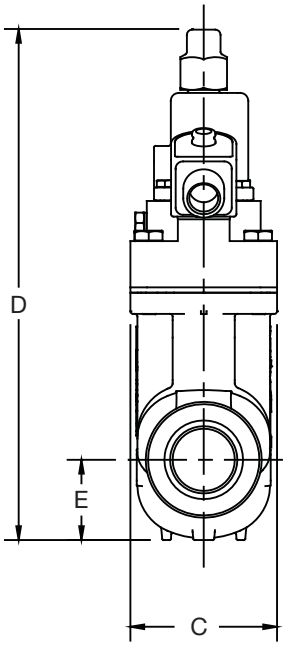
Item No.	Kit Description	Port Size				
		20 mm (3/4”)	25 mm (1”)	32 mm (1-1/4””)	40 mm (1-1/2”)	50 mm (2”)
1, 2	Seal Cap	208757	208757	208757	208757	208757
2, 3 , 5 - 13	Bonnet	208759	208759	208759	208759	208759
2, 5 - 13	Spring, Bonnet (Range V)	208760	208760	208760	208760	208760
2, 5 - 13	Spring, Bonnet (Range D)	208818	208818	208818	208818	208818
14 - 16	Diaphragm	208802	208802	208802	208802	208802
18 - 21	Pilot Plug (A4WO, A4WOK Only)	208765	208765	208765	208765	208765
17, 18A - 21	Pilot Plug (A4WOB, A4WOS, A4WOBS Only)	208766	208766	208766	208766	208766
22 - 24	Seal Cap	208758	208758	208758	208758	208758
26 -27	Gage Plug (A4WO Only)	208808	208808	208808	208808	208808
28 - 31	Manual Opening Stem	208809	208809	208809	208809	208809
18 - 21, 26 - 34	Port Plate (A4WO, A4WOK Only)	208761	208761	208761	208761	208761
17, 18A - 23, 26, 28 - 35, 46 - 49	Port Plate (A4WOB, A4WOBK Only)	208762	208762	208762	208762	208762
17, 18A - 24, 26, 28 - 35, 46 - 49	Port Plate (A4WOS Only)	208763	208763	208763	208763	208763
17, 18A - 21, 26, 28 - 32, 33 - 35, 46 - 49	Port Plate (A4WOBS Only)	208764	208764	208764	208764	208764
18 - 21, 27 - 34	Port Plate (A4WOE Only)	208943	208943	208943	208943	208943
17, 18A - 24, 28 - 35, 46 - 49	Port Plate (A4WOES Only)	208944	208944	208944	208944	208944
35 - 42	Piston	208778	208779	208780	208781	208782
35 - 39	Spring, Piston	208795	208796	208797	208798	208799
35 - 39, 41 - 42	Wear Seal, Piston	208819	208819	208820	208821	208821
2, 5 - 6, 13, 15 - 16, 20 35 - 38, 41-42	Gasket / O-Ring (A4WO, A4WOK Only)	208838	208839	208840	208841	208842
2, 5 - 6, 13, 15 - 16, 20, 23, 28, 35 - 38, 41-42	Gasket / O-Ring (A4WOB, A4WOS, A4WOBS, A4WOBK Only)	208843	208844	208845	208846	208847
4	Bolt, Bonnet	208800	208800	208800	208800	208800
25	Bolt, Port Plate	208801	208801	208801	208801	208801
23, 33, 46 - 48	* Solenoid Pseudo (“S” or “B” Only)	208940	208940	208940	208940	208940
44 - 45	Coil, 120/60 or 110/50 18.5 Watt Leaded	204843	204843	204843	204843	204843
44 - 45	Coil, 240/60 or 220/50 18.5 Watt Leaded	204844	204844	204844	204844	204844
44 - 45	Coil, 208/60 18.5 Watt Leaded	204845	204845	204845	204845	204845
44 - 45	Coil, 240/50 18.5 Watt Leaded	204846	204846	204846	204846	204846
44 - 45	Coil, 24/60 18.5 Watt Leaded	206244	206244	206244	206244	206244

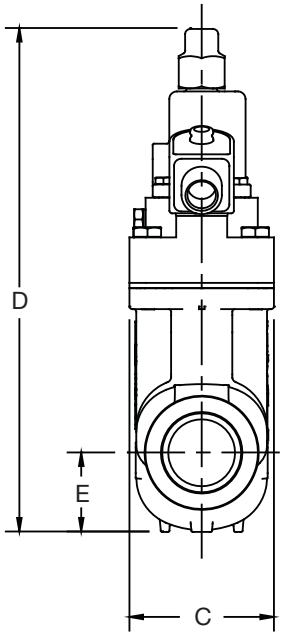
* If repairing a A4WOBS valve two kits must be ordered.

A4WO, A4WOB, A4WOS, & A4WOBS Repair Kits









Dimension	Port Size		
	20 - 25 mm (3/4” - 1”)	32 mm (1-1/4”)	40 - 50 mm (1-1/2” - 2”)
A	144.5 mm (5.69”)	176.3 mm (6.94”)	227.1 mm (8.94”)
B	11.2 mm (0.44”)	13.7 mm (0.54”)	14.0 mm (0.55”)
C	90.0 mm (3.54”)	90.0 mm (3.54”)	90.0 mm (3.54”)
D	266.7 mm (10.5”)	299.5 mm (11.79”)	312.7 mm (12.31”)
E	41.4 mm (1.63”)	53.1 mm (2.09”)	49.3 mm (1.94”)

A4WO Butt Weld (BW) Dimensions

Dimension	Port Size		
	20 - 25 mm (3/4” - 1”)	32 mm (1-1/4”)	40 - 50 mm (1-1/2” - 2”)
A	144.5 mm (5.69”)	176.3 mm (6.94”)	227.1 mm (8.94”)
B	12.7 mm (0.50”)	12.7 mm (0.50”)	16.0 mm (0.63”)
C	90.0 mm (3.54”)	90.0 mm (3.54”)	90.0 mm (3.54”)
D	266.7 mm (10.5”)	299.5 mm (11.79”)	312.7 mm (12.31”)
E	41.4 mm (1.63”)	53.1 mm (2.09”)	49.3 mm (1.94”)

A4WO Socket Weld (SW) Dimensions

corresponding gaskets be aligned with the appropriate location. Ensure that all access fittings, solenoid features, and bypass plug are sealed when re-installing the corresponding parts. Prior to installing the port plate inspect the piston, using your hand, by pulling up and pushing down. The piston should move freely, without dragging or hesitation. Adjust all torques to the values indicated by torque requirement table.

Tighten all bolts equally to draw the assembly together evenly, to ensure properly sealing of all joints. Replace all seal caps as applicable. When re-adjusting following servicing, prevent excessive pressures by starting with the adjustment stem at low spring compression until the system approaches the desired operating pressures, then re-set as per "ADJUSTMENT", above.

A4WOK and A4WOBK Disassembly
For disassembly and assembly follow the general procedure and the procedure for the A4WO. This regulator has a sealed wire connection to keep the seal cap from being removed. This wire must be removed before the regulator can be disassembled.

Note: breaking or removal of the seal voids any Refrigerating Specialties Division factory responsibility for the regulator pressure set-point.

⚠ Caution

All personnel working on valves must be qualified to work on refrigeration systems. If there are any question, contact Refrigerating Specialties before proceeding with the work.

Before doing any service work, always be sure to disconnect the power and isolate the valve. Failure to do so will result in venting of ammonia.

Electrical
The Refrigerating Specialties Division molded water resistant Class "H" solenoid coil is designed for long life and powerful opening force. The standard coil housing meets NEMA 3R and 4 requirements. This sealed construction can withstand direct contact with moisture and ice. By definition, Class "H" coil construction will permit coil temperatures, as measured by resistance method, as high as 185°C. (366°F.) Final coil temperatures are a function of both fluid and ambient temperatures. The higher fluid temperatures require lower ambient temperatures for the maximum coil temperature not to be exceeded. Conversely, low fluid temperatures permit higher ambient temperatures.

A solenoid coil should never be energized except when mounted on its corresponding solenoid tube.
The molded Class "H" coil is available from stock with most standard voltages. However, coils are available for other voltages and frequencies, as well as for direct current.

The solenoid coil must be connected to electrical lines with volts and Hertz same as stamped on coil. The supply circuits must be properly sized to give adequate voltage at the coil leads even when other electrical equipment is operating. The coil is designed to operate with line voltage from 85% to 110% of rated coil voltage. Operating with a line voltage above or below these limits may result in coil burn-out. Also, operating with line voltage below the limit will definitely result in lowering the valve's maximum opening pressure differential. Power consumption during normal operation will be 18.2 watts or less.

Valve	Port Size				
	20 mm (3/4")	25 mm (1")	32 mm (1-1/4"")	40 mm (1-1/2")	50 mm (2")
A4WO, A4AWOE, A4WOK	5.0 kg (11 lbs)	5.0 kg (11 lbs)	6.1 kg (13.3 lbs)	6.1 kg (13.3 lbs)	6.8 kg (15.1 lbs)
A4WOB, A4WOBK	5.4 kg (11.8 lbs)	5.4 kg (11.8 lbs)	6.4 kg (14.2 lbs)	6.4 kg (14.2 lbs)	7.4 kg (16.2 lbs)
A4WOS, A4WOES	5.4 kg (11.8 lbs)	5.4 kg (11.8 lbs)	6.4 kg (14.2 lbs)	6.4 kg (14.2 lbs)	7.4 kg (16.2 lbs)
A4WOBS	5.7 kg (12.5 lbs)	5.7 kg (12.5 lbs)	6.8 kg (15.0 lbs)	6.8 kg (15.0 lbs)	7.8 kg (17.2 lbs)

Socket Weld (SW) and Butt Weld (BW) Valve Weights

Symptom	Probable Cause	Correction
Failure to open, close, or regulate	Piston jammed due to excessive dirt	Flush clearance space between piston and cartridge bore with refrigeration oil solvent
	Valve Manually Open	Close manual bypass stem by tuning clockwise
	Adjusting stem improperly positioned: a. Turned in too far. Does not open (inlet regulator) b. Not turned far enough. Does not close (inlet regulator). Does not open (outlet regulator)	Position adjusting stem properly
	Passage “N” clogged	Clean passage “N”
	Pilot seat dirty or eroded	Clean and smooth pilot seat. If diaphragm is removed, replace with new gasket and O-Ring
	Regulator installed backwards	Re-install regulator in proper position
System Control cannot be maintained - unstable valve operation	Improper regulator selection: a. Actual load is mush lower than regulator capacity b. Actual pressure drop across valve higher than originally intended c. Combination of a and b	Replace cartridge with one of suitable size

A4WO Service Pointers

Location	Description (SAE)	Torque mkg (Ft-Lbs)
Bonnet Screws	M6 x 18 MM	(7)
Port Plate Screws	M10 x 45 MM	(35)
Bonnet Seal Cap	—	Snug
Solenoid Pseudo Assembly	—	Snug
Gages Port Plug	1/4” NPT	1.4 (10)
Pilot Plug	—	Snug

A4WO Torque Requirement Table

Safe Operation (See Bulletin RSBCV)
People doing any work on a refrigeration system must be qualified and completely familiar with the system and the Refrigerating Specialties Division valves involved, or all other precautions will be meaningless. This includes reading and understanding pertinent Refrigerating Specialties Division Product Bulletins and Safety Bulletin RSB prior to installation or servicing work.

Where cold refrigerant liquid lines are used, it is necessary that certain precautions be taken to avoid damage which could result from liquid expansion. Temperature increase in a piping section full of solid liquid will cause high pressure due to the expanding liquid which can possibly rupture a gasket, pipe or valve. All hand valves isolating such sections should be marked, warning against accidental closing, and must not be closed until the liquid is removed. Check valves must never be installed upstream of solenoid valves, or regulators with electric shut-off, nor should hand valves upstream of solenoid valves or downstream of check valves be closed until the liquid has been removed.

It is advisable to properly install relief devices in any section where liquid expansion could take place. Avoid all piping or control arrangements which might produce thermal or pressure shock.

For the protection of people and products, all refrigerant must be removed from the section to be worked on before a valve, strainer, or other device is opened or removed. Flanges with ODS connections are not suitable for ammonia service.

Warranty
All Refrigerating Specialties products are under warranty against defects in workmanship and materials for a period of one year from date of shipment from factory. This warranty is in force only when products are properly installed, field assembled, maintained, and operated in use and service as specifically stated in Refrigerating Specialties Catalogs or Bulletins for normal refrigeration applications, unless otherwise approved in writing by the Refrigerating Specialties Division. Defective products, or parts thereof returned to the factory with transportation charges prepaid and found to be defective by factory inspection, will be replaced or repaired at Refrigerating Specialties option, free of charge, F.O.B. factory. Warranty does not cover products which have been altered, or repaired in the field, damaged in transit, or have suffered accidents, misuse, or abuse. Products disabled by dirt or other foreign substances will not be considered defective.

The express warranty set forth above constitutes the only warranty applicable to Refrigerating Specialties products, and is in lieu of all other warranties, expressed or implied, written including any warranty of merchantability, or fitness for a particular purpose. In no event is Refrigerating Specialties responsible for any consequential damages of any nature whatsoever. No employee, agent, dealer or other person is authorized to give any warranties on behalf of Refrigerating Specialties, nor to assume, for Refrigerating Specialties, any other liability in connection with any of its products.

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