

INLET PRESSURE REGULATORS

Type A4A-DN, A4AK-DN, A4AE-DN, A4AR-DN

Port Size 20 - 100 mm (3/4" - 4")
FOR AMMONIA, R-12, R-22, R-502
OTHER REFRIGERANTS AND OIL

FEATURES

- Pilot operated characterized Modulating Plug for precise control
- Suitable for all common refrigerants and oil
- 28 bar (406 psig) design pressure (PS)
- Flanges for threaded or welded steel pipe and copper tube (copper not for ammonia)
- Interchangeable parts
- Easy to service
- Close coupled strainers, optional
- Stainless Steel Diaphragm
- Stainless Steel Pilot Seat
- Manual Opening Stem
- Complies with Pressure Equipment Directive 97/23/EC

A4A-DN INLET PRESSURE REGULATOR

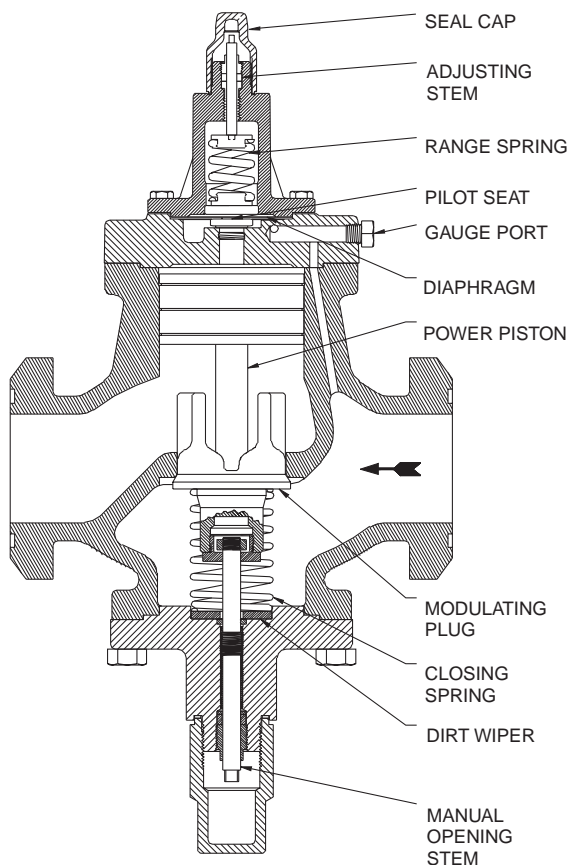
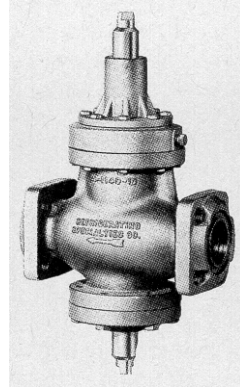


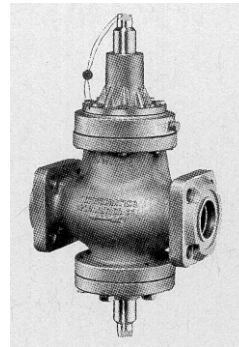
Fig. 1

BULLETIN DN23-05B

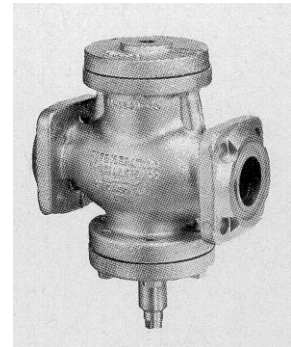
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A4A-DN, A4AE-DN



A4AK-DN



A4AR-DN

January 2007

Installation and Service Information

Description

These compact, heavy duty, pilot operated, ductile iron Inlet Pressure Regulators are suitable for Ammonia, R-12, R-22, R-502 and other common refrigerants and fluids approved for use in refrigeration systems.

All A4 Regulators are pilot operated using upstream pressure for the opening force and requires a minimum 0.14 bar (2 psig) pressure drop to fully open.

These valves are generally ordered with close coupled upstream strainer to prevent entrance of foreign material into the valve and the rest of the system. (See current Bul 00-10 for strainer information.)

Purpose

Modulates flow of refrigerant gas or liquid to maintain constant upstream (or inlet) pressure as set-for, despite load fluctuations. The A4AR is a main valve only and will control pressures as determined by the remote pilot(s) piped to it.

The fluid temperature range for the A4 Series of Regulators is -45°C to 105°C (-50°F to 220°F).

Principles of Operation (See Fig. 1)

The inlet pressure enters the space under the diaphragm through passage N. When the force created by the pressure exceeds the force of the range spring, the diaphragm is lifted off the pilot seat allowing pressure to enter on top of the power piston. This causes the power piston to move downward forcing the modulating plug to open and modulate to maintain constant inlet pressure. An increase in inlet pressure lifts the diaphragm further, allowing more pressure on top of the power piston and opening the valve wider. A decrease in inlet pressure causes the diaphragm to move closer to the pilot seat reducing the pressure on the top of the power piston and causing the closing spring to reduce the valve opening. The pressure on top of the power piston is controlled by the flow through the pilot seat and the bleed off through the bleed hole in the power piston and through the clearance between the piston and cylinder. A minimum of 0.14 bar (2 psig) pressure drop across the valve is required to open it fully.

The A4A Inlet Pressure Regulator therefore opens on a rise in the inlet pressure above its set point and closes on a drop in inlet pressure below its set point. The inlet pressure set point is not appreciably affected by variations in the outlet pressure.

Manual Opening Stem

All Type A4A Regulators are provided with a manual opening stem. To open the regulator manually, back the stem out (turn counter-clockwise) until it stops. To put the regulator into automatic operation, turn the stem in (clockwise) until only the flats on the stem protrude from the packing nut. Always retighten packing nut after changing position of the manual opening stem.

Installation

All regulators are packed for maximum protection. Unpack carefully. Check the carton to make sure all flanges and other items are unpacked. Save the enclosed instructions 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 moisture, dirt and chips before and during installation. When welded or brazed flange connections are used, all slag, scale and loose particles should be removed from the flange interior before the regulator is installed between the flanges. It is advisable to install a close-coupled companion strainer (RSF) at the inlet of the regulator to help protect it from any foreign material in the system.

The A4A Series of Regulators will give optimum performance if mounted in a horizontal line in a vertical position with the manual opening stem on bottom. Where other positions are desired, the factory should be consulted; please give application and piping details. The regulator must be installed with the arrow on the valve body pointing in the direction of the fluid flow for the regulator to function properly. Backward flow through the regulator is uncontrolled and will vary with the valve model and the reverse pressure drop encountered. The regulator is not a check valve.

Tighten the flange bolts and nuts evenly to provide proper seating of the flange gasket and to avoid damage to gaskets or flanges. (See Flange Bolt Torque Table, p. 8) Avoid using the regulator flange bolts to stretch or align pipe. Even the heavy-duty iron alloy body of an A4A can be distorted, causing the precision parts to bind.

The regulator should be installed in a location where it is easily accessible for adjustment and maintenance. The location should be such that the regulator can not be easily damaged by material handling equipment. When it is necessary to insulate the regulator (and companion strainer), the insulation should be installed to provide access to the regulator (and companion strainer) for adjustment and maintenance. Proper indicating gauges should be installed to be easily visible to the operating engineer for system checking and adjusting purposes.

Disassembly and Assembly

Refer to the exploded view (Fig. 2) for parts discussed in this section.

Before disassembling any A4A type regulator, read the information in this bulletin and Bulletin RSBCV, Safety Procedures for Refrigerating Specialties Division Refrigeration Control Valves.

Before a regulator is removed from the line or disassembled in the line, make sure that all refrigerant has been removed from the regulator, including the bonnet, where applicable, and the close coupled strainer. The regulator must be isolated from the rest of the system in a safe manner. When pumping down to remove the refrigerant, the manual opening stem 33A must be turned out (counter clockwise) to make sure the valve is open.

All A4A Regulators

General Procedure

The construction of the regulator and the method of disassembly are relatively simple, but some procedures must be followed to avoid damage. The following describes the procedure for the basic A4A; special instructions for other styles will be included in other appropriate sections.

Disassembly - Take care when removing Seal Caps 1 and 44 in case some refrigerant may be trapped inside. Back the Adjusting Stem 6 all the way out to remove any pressure from Range Spring 13 otherwise damage to Diaphragm 17 or Pilot Seat 18 may occur. Remove Bonnet 8 by carefully removing Cap Screws 11. Take care not to damage Diaphragm Follower 15. Remove Adapter 28 by removing Cap Screws 31. Turn the Manual Opening Stem 33A all the way in until the flats on the stem barely protrude from the stuffing box nut. Push Piston 30 down against the spring force. The piston should move freely down and be returned by the spring force. If the piston is jammed or sticky, remove Bottom Cap Assembly, which includes Items 33 through 42, by removing Cap Screws 39 or unscrewing Bottom Cap, 20mm through 32mm (3/4" through 1-1/4"). Using a hard wood dowel rod inserted through the bottom of the valve, tap the piston upward and out. Thoroughly clean all parts. If jamming has taken place and the piston and bore are scored, remove all burrs by polishing the piston, bore and modulating plug with fine crocus cloth. Inspect the seating area of the Modulating Plug 33 for damage or erosion. If damaged it should be replaced. It would be advisable to replace the entire bottom cap assembly. Inspect all gaskets and "O" rings for damage and replace where necessary.

Assembly - When reassembling the valve, all internal parts should be clean, dry and lightly oiled with refrigerant oil, except "O" rings. Apply silicone grease to the "O" rings. Care must be taken especially when the parts are cold since moisture can condense on parts and cause rapid rusting. When replacing gaskets, they should be oiled very lightly with refrigerant oil before assembly. Install bottom cap assembly first and tighten in place. Carefully replace the piston; never try to force it in place. Align the Adapter Gasket 29 carefully with the proper holes in the adapter and valve body and fasten adapter in place. Before assembling the bonnet be sure the Adjusting Stem 6 is turned all the way out. Place Gasket 19, Diaphragm 17 and Gasket 16 in Adapter 28. The raised center of the diaphragm must be towards the bonnet. Stack Diaphragm Follower 15, Lower Spring Rest 14, Spring 13 and Upper Spring Rest 12 on top of diaphragm and carefully lower bonnet in place and tighten Screws 11 in place. For range "D" use two diaphragms. Tighten Cap Screws 11 evenly. The ideal tightening torque is 1.5 Kg-m (11 ft. lbs.). Valve is now ready to be adjusted for normal operation.

If close coupled strainer is used, it may be cleaned before putting the valve back in operation. The regulator must be tested for leaks with refrigerant gas or other appropriate gas before the system is put into operation.

A4A

After the General Procedure for disassembly, inspect the Pilot Seat 18 top seating surface for dirt, wear or damage.

Remove seat from valve body and clean, lap on a flat plate or replace as necessary. Examine the diaphragm region which contacts the seat surface, look for dirt, heavy scratches or corrosion. If the diaphragm cannot be easily wiped clean, it should be replaced. Reassemble the regulator following the General Procedure.

A4AK

For disassembly and assembly follow the General Procedure and the procedure for A4A. 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. Please Note: Removal of the seal voids any Refrigerating Specialties Division factory responsibility for the regulator pressure set-point.

Adjustment

Install an accurate pressure gauge in the gauge port. Back the adjusting stem all the way out to stop. This will reduce the set point to its lowest level and cause the valve to open wide. Start the system, and when suction pressure is about the desired pressure, turn the adjusting stem in until the pressure gauge shows a slight rise in the inlet pressure. At this point the adjusting stem may be turned in (clockwise) to raise the pressure further, or backed out (counterclockwise) to lower it; but the final adjustment should be made after the system has been operating for a period of time.

INLET PRESSURE SETTING RANGES

Set Point Ranges	Approx. Pressure Change per Turn of Adjusting Screw	Factory Set Point (unless otherwise specified)
A: 0 to 10.3 bar (0 to 150 psig)	1 .7 bar (25 psi)	2.8 bar (40 psig)
V: 500mm hg to 8.3 bar (20in hg to 120 psig)	1 .7 bar (25 psi)	1 .0 bar (15 psig)
D: 5.2 to 19.3 bar (75 to 280 psig)	3.7 bar (53 psi)	9.7 bar (140 psig)

A4AE Inlet Pressure Regulator, Remote Sensing Connection

This regulator allows control of upstream pressure at a point remote from the regulator inlet. Gasket 19 has no hole, thus blocking flow of upstream pressure to under the diaphragm. The sensing pressure from the desired control point, upstream of the regulator, is connected to the gauge port leading to under the diaphragm. Thus the regulator will control the pressure at this point. The regulator operation and adjustment is the same as for A4A.

A4AK Reseating Relief Regulator

This regulator is adjusted at the factory for a given inlet pressure. The seal cap is wired to a bonnet cap screw and the wires are sealed with a lead seal. The relief pressure setting is stamped on the seal. Breaking or removal of the seal voids the factory responsibility for the relief setting of the regulator. Normal set-point is 4.8 bar (70 psig)

The operation and other construction features are similar to A4A, except that sizes 20mm (3/4") through 32mm (1-1/4") use a PTFE seat in the modulating plug.

Because of slight leakage tolerance, this regulator is not intended for use as a safety relief valve to the atmosphere, but rather to a lower pressure section of that system. Because of large diaphragm to seat area ratio, setting is affected only slightly by outlet pressure.

The A4AK Regulator is often used as a defrost pressure relief regulator.

For atmospheric relief, use Type H high capacity safety relief valve. (See Bul. 70-01 for information and selection).

A4AR Main Regulator for Remote Pilot

The A4AR is the main regulator only, without the pressure pilot being an integral part thereof. Instead, the main valve has a valve cover tapped 3/8" NPT. With this arrangement, external pressure pilot and solenoid, if positive electric shut-off is required, may be connected to control the main valve. These items can be remotely located from the main valve where they may be more convenient to adjust, service or perhaps be in a non-corrosive or non-explosive area.

Remote pilot piping should not exceed 6m (20 ft.) in total length and should be 3/8" pipe or equivalent tube size. The remote piping must originate in the upstream pipe, not at the A4AR valve itself.

See current issue of Bul. 21-02 for details of A2B Inlet Pressure Pilot. Use A2B2 with 20-50mm (3/4" - 2") A4AR. Use A2B Inlet Pressure Pilot with 65-100mm (2-1/2" - 4") A4AR.

If main valve is to perform as an Outlet Pressure Regulator, use Outlet Pressure Pilots A2BO2E for 20-50mm (3/4" - 2") A4AR, or A2BO4E for 65-100mm (2-1/2" - 4") A4AR.

For positive electric shut-off, for all sizes A4AR Main Valve, use direct operated pilot solenoid Type S6N. See Bul. 30-90C for details.

Maintenance and Service

GENERAL PROCEDURE:

Dirt in the system is the greatest single cause of regulator malfunction. All screens or filters must be cleaned or replaced when they become dirty. At start up it is especially important that these items are cleaned or changed frequently. When the RSF close-coupled companion

strainers are used, maintain according to instructions in Bulletin 00-10. Moisture in halocarbon systems in particular can cause corrosion or form ice, causing the piston to freeze in position. Filter-driers should be used and maintained for halocarbon systems.

Before deciding to disassemble a regulator for servicing, the following investigations should be made:

- Check the manual opening stem; it should be turned in for automatic operation.
- Check the regulator setting to make sure it is properly adjusted. Turn adjusting screw slowly to see if regulator responds. Check regulator pressure range; if wrong, range spring must be replaced.
- Check other system components for proper operation.
- Check hand valves in the system to make sure they are open or closed as required and the system is receiving liquid or gas as the case may be.

Before disassembly of regulator, make certain that all refrigerant has been removed (pumped out) from the regulator and its companion strainer where one is used. Read Safety Bulletin RSB.

Safe Operation (See also 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.

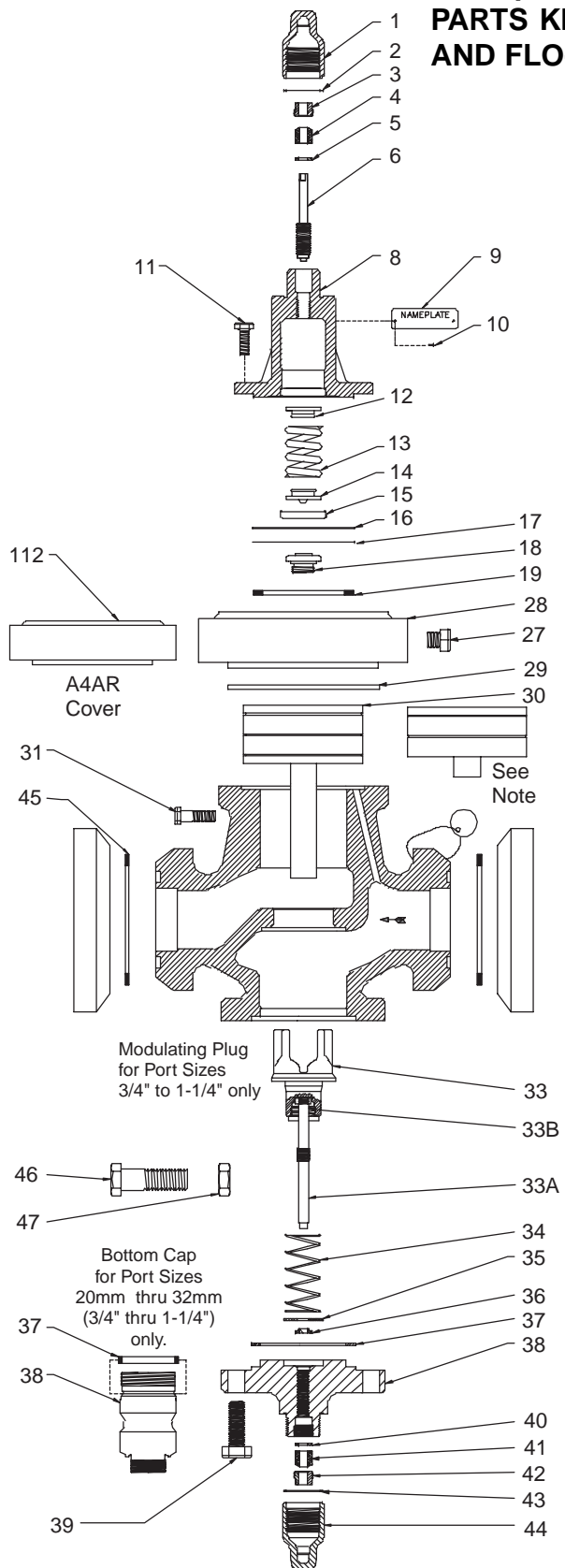
For the protection of people and products, all refrigerant must be removed from the section to be worked on before a valve, strainer, or other device is opened or removed.

Flanges with ODS connections are not suitable for ammonia service.

SERVICE POINTERS (Check General Procedure)

SYMPTOM	PROBABLE REASON	CORRECTION
Regulator does not shut off flow.	Diaphragm or seat dirty, damaged or frozen.	Clean or replace. Clean strainer.
	Diaphragm follower stuck or damaged.	Clean or replace. Install follower carefully.
	Piston jammed with excess dirt.	Remove and polish piston and bore with crocus cloth. Clean valve and strainer.
	Throttling plug leaking due to excess dirt or damage.	Clean or replace. If used on liquid, check for erosion due to excessive flash gas. Reduce flash gas by sub-cooling or by reducing pressure drop across valve by providing restriction at valve outlet.
	Diaphragm and seat eroded due to flash gas.	Replace. Reduce flash gas by sub-cooling or by reducing pressure drop across regulator by providing restriction at valve outlet.
Regulator does not open.	A4A (inlet) Pressure Regulator Diaphragm ruptured or badly deformed.	Replace. If Range D make sure has 2 diaphragms.
	Diaphragm follower stuck, damaged or frozen.	Clean or replace. Install follower carefully.
	Piston worn, too much clearance.	Replace piston. Check for reason. If used on liquid, check for flash gas.
Regulator Operation erratic.	Diaphragm or seat dirty or damaged.	Clean or replace. Clean strainer.
	Diaphragm follower has dirt on the outside diameter or outside diameter is damaged.	Clean or replace.
	Other system components, line controllers, thermostats, etc. , erratic.	Adjust, repair or replace.
	Regulator too far oversized.	Check load. Replace with smaller regulator or investigate use of Reduced Capacity Plug Kit.
Pressure drop across regulator too high.	Inlet or outlet restricted.	Check for restriction. Clean strainer.
	Regulator too small.	Replace with proper size regulator.
	Large amount of flash gas in liquid line.	Reduce flash gas by sub-cooling. Reduce line restriction by increasing line size, particularly at the regulator outlet. Replace with larger regulator.
	High pressure drop causes high rate of expansion of gas at regulator outlet.	Increase pipe size at the outlet of the regulator.
	Regulator does not open all the way.	Check piston for wear. Replace, if needed.

**For replacement parts and prices, consult
PARTS KITS LIST PRICE SCHEDULE INDUSTRIAL
AND FLO-CON (PK)**



Item	Description
1	Seal Cap
2	Gasket, Seal Cap
3	Nut, Stuffing Box
4	Packing Ring
5	Packing Washer
6	Adjusting Stem
8	Bonnet
9	Nameplate
10	Screw, Name Plate
11	Screw, Bonnet
12	Spring Rest, Upper
13	Spring, Range
14	Spring Rest, Lower
15	Diaphragm Follower
16	Gasket, Bonnet
17	Diaphragm
18	Seat, Pilot
19	Gasket, Adapter
27	Gauge Port Pipe Plug
28	Adapter, Body
29	Gasket, Body
30	Piston-Stem
31	Screw, Body
32	Body
33	Throttling Plug Asm
34	Spring, Closing
35	Dirt Wiper Retainer
36	Dirt Wiper
37	Seal, Bottom Cap
38	Bottom Cap
39	Screw, Bottom Cap
40	Packing Washer
41	Packing Ring
42	Stuffing Box Nut
43	Gasket, Seal Cap
44	Seal Cap
45	Gasket, Flange
46	Bolt, Flange
47	Nut, Flange

Note: Piston for port sizes 3/4" thru 1-1/4" only.

A4A-DN, A4AK-DN A4AE-DN, A4AR-DN

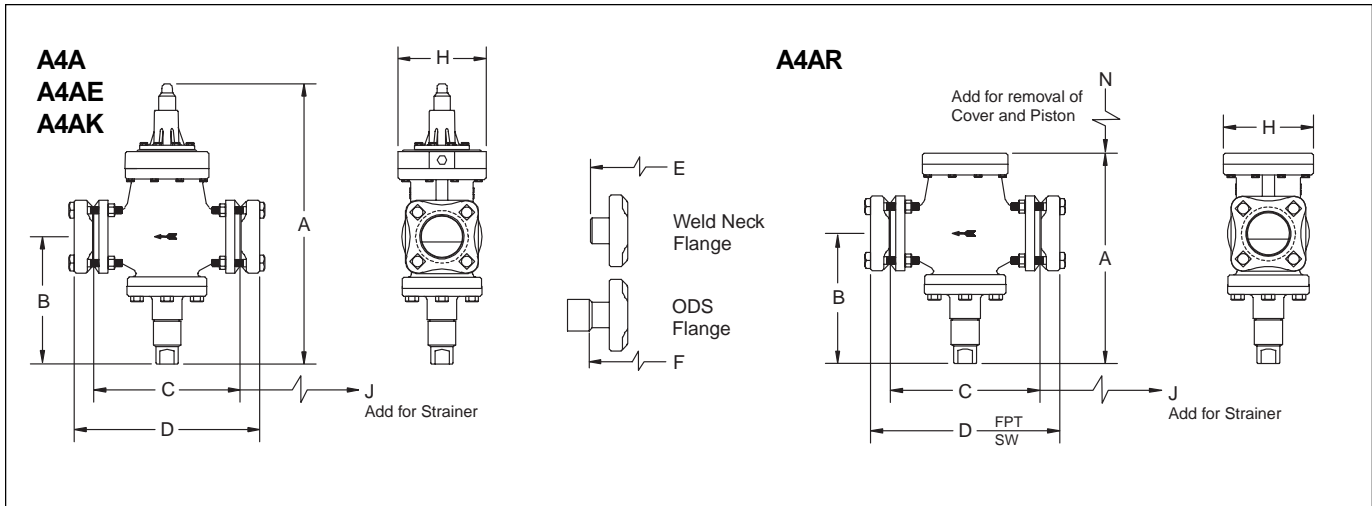
Fig. 2

PRESSURE CONTAINING COMPONENTS A4A DN LINE: 3/4" & 1"

	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
3/4 & 1IN	BODY, A4A DN	ASTM A-126 CLASS B	6.2	
	ADAPTER, A4A DN	ASTM A-126 CLASS B	&	
20 & 25 MM	COVER BOTTOM, A4A/S4A	BARSTOCK ASTM 1213 CR	8.6	
	BONNET A4W	ASTM A-126 CLASS B		
	BODY, S6A (REGULAR MATL)	DUCTILE IRON ASTM A536		
	TUBE SOLENOID, S6	SS TUBING 304		
	SLEEVE, SOLENOID TUBE	AISI 1117 CRS BARSTOCK		
	BODY, A2D DN	ASTM A-126 CLASS B		

PRESSURE CONTAINING COMPONENTS A4A DN LINE: 1-1/4 TO 4

	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
1-1/4 IN	BODY, A4A DN	DUCTILE IRON GGG 40.3	15	0.57 L
	ADAPTER, A4A DN	DUCTILE IRON GGG 40.3		
32 MM	COVER BOTTOM, A4A/S4A	BARSTOCK ASTM 1213 CRS		
	BONNET A4W	DUCTILE IRON GGG 40.6		
1-5/8 IN	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
	BODY, 2 A4A DN	DUCTILE IRON GGG 40.3	28.6	1.61 L
40 MM	ADAPTER, 2 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, A4A/S4A 1-5/8 to 2-1/2	DUCTILE IRON GGG 40.3		
2 IN	BONNET A4W	DUCTILE IRON GGG 40.3		
	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
50 MM	BODY, 2 A4A DN	DUCTILE IRON GGG 40.3	42.4	1.61 L
	ADAPTER, 2 A4A DN	DUCTILE IRON GGG 40.3		
2-1/2 IN	COVER BOTTOM, A4A/S4A 1-5/8 to 2-1/2	DUCTILE IRON GGG 40.3		
	BONNET A4W	DUCTILE IRON GGG 40.3		
65 MM	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
	BODY, 2-1/2 A4A DN	DUCTILE IRON GGG 40.3	60	3.19 L
3 IN	ADAPTER, 3 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.3		
75 MM	BONNET A4W	DUCTILE IRON GGG 40.3		
	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
4 IN	BODY, 3 A4A DN	DUCTILE IRON GGG 40.3	86	3.91 L
	ADAPTER, 3 A4A DN	DUCTILE IRON GGG 40.3		
100 MM	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.4		
	BONNET A4W	DUCTILE IRON GGG 40.3		
4 IN	COMPONENT DESCRIPTION	MATERIAL	Kv	VOLUME
	BODY, 4 A4A DN	DUCTILE IRON GGG 40.3	116	6.5 L
100 MM	ADAPTER, 4 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, 4 A4A/S4A	DUCTILE IRON GGG 40.4		
	BONNET A4W	DUCTILE IRON GGG 40.3		



OVERALL VALVE DIMENSIONS																			
Port Size		20mm & 25mm (3/4 & 1")		32mm (1-1/4")		40mm & 50mm (1-5/8 & 2")		65mm (2-1/2")		75mm (3")		100mm (4")							
DIMENSION		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches				
A	A4 Basic	392	15.4	410	16.1	464	18.2	483	19.0	597	23.5	653	25.7	653	25.7				
	A4R	241	9.5	254	10.0	307	12.1	325	12.8	432	17.0	478	18.8	478	18.8				
	A4S, B, Z	392	15.4	410	16.6	484	16.2	483	19.0	597	23.5	653	25.7	653	25.7				
	A4D	429	16.9	447	17.6	500	19.7	513	20.2	632	24.9	685	27.0	685	27.0				
B		148	5.8	162	6.3	177	6.9	181	7.1	273	10.7	292	11.5	292	11.5				
C		164	6.2	203	8.0	251	9.9	252	9.9	311	12.2	359	14.1	359	14.1				
H		117	4.6	117	4.6	140	5.5	159	6.2	176	7.0	222	8.8	222	8.8				
J		98	3.9	178	7.0	251	9.9	314	12.4	314	12.4	363	14.3	363	14.3				
K		112	4.4	112	4.4	117	4.6	124	4.9	142	5.6	157	6.2	157	6.2				
L		122	4.8	122	4.8	135	5.3	133	5.2	122	4.8	152	6.0	152	6.0				
M		138	5.4	138	5.4	140	5.5	150	5.9	170	6.6	190	7.7	190	7.7				
OVERALL LENGTH DIMENSIONS WITH FLANGE																			
D*	FPT & SW FOR PIPE SIZES	3/4"	216	8.5	1-1/4"	256	10.1	1-1/2"	307	12.1	2-1/2"	331	13.0	3"	389	15.3	4"	450	17.7
		1"	216	8.5	1-1/2"	256	10.1	2"	307	12.1									
		1-1/4"	216	8.5															
E*	WN FOR FOR PIPE SIZES	3/4"	254	10.0	1-1/4"	300	11.8	1-1/2"	364	14.3	2-1/2"	401	15.8	3"	478	18.8	4"	571	22.5
		1"	261	10.3	1-1/2"	304	12.0	2"	371	14.6									
		1-1/4"	261	10.3															
F*	ODS FOR TUBE SIZES	7/8"	239	9.4	1-3/8"	269	10.6	1-5/8"	358	14.1	2-5/8"	348	13.7	3-1/8"	414	16.3	4-1/8"	503	19.8
		1-1/8"	239	9.4	1-5/8"	279	11.0	2-1/8"	338	13.3									
		1-3/8"	231	9.1	2-1/8"	305	12.0	2-5/8"	358	14.1									
		1-5/8"	239	9.4															

Flange Bolt Torque Requirements

Bolt Diameter	Valve Port Size	Torque
11 mm (7/16")	13mm (1/2")	3.9 mkg (28 ft lb)
16mm (5/8")	20-50mm (3/4" - 2")	11.8 mkg (85 ft lb)
19mm (3/4")	65-75mm (2-1/2" - 3")	14.5 mkg (105 ft lb)
22mm (7/8")	100mm (4")	22.1 mkg (150 ft lb)

Warranty

All Refrigerating Specialties Products are warranted against defect 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 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 above constitutes the only warranty of Refrigerating Specialties products, and is in lieu of all other warranties, expressed or implied, written or oral, **including any warranty of merchantability or warranty of fitness for a particular purpose and 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.