

# Electric Pilot Regulator Type A4AJ-DN

**PORT SIZE 3/4" - 4" (25MM - 100 MM)  
FOR AMMONIA, R22, R134A, R507, R404A,  
AND OTHER COMMON REFRIGERANTS**

## FEATURES

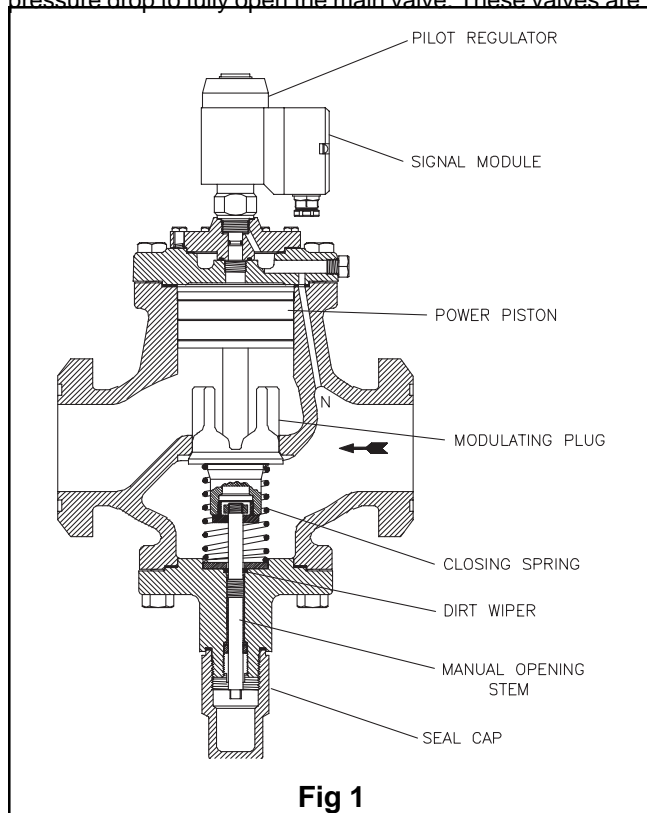
- Pilot operated for close control
- Two interchangeable control (I/O) signal modules available
- Positioning of pilot actuator proportional to input signal
- Wide temperature/pressure range
- Close coupled strainers, optional
- Manual Opening Stem
- Meets NEMA 3R requirements
- Complies with Pressure Equipment Directive 97/23/EC

## Specifications:

Input control signal : 0-10 VDC, 4-20 mA  
 Fluid temperature: -40°F to 248°F (-40°C to 120°C)  
 Ambient temperature: -40°F to 122°F (-40°C to 50°C)  
 Design pressure (PS): 406 psig (28 bar)  
 Maximum pressure differential (MOPD) 261 psig (18 bar)

## Description:

These compact, heavy duty, electronically controlled pilot operated regulators are suitable for Ammonia, R22, R134A and other common refrigerants. All A4AJ regulators are electronically pilot operated using upstream pressure for the opening force and require a minimum 2 psi (0.14 bar) pressure drop to fully open the main valve. These valves are



## BULLETIN 23-12B Type A4AJ-DN



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## Installation, Service and Parts Information

generally ordered with close coupled upstream strainers to prevent entrance of foreign material into the valve and the rest of the system. (See current Bul DN00-10 for strainer information.)

The A4AJ electronic pilot regulator utilizes a Landis & Staefa M2FP03GX direct operated linear-proportional solenoid as a pilot valve to modulate the flow of pilot pressure to the top of the regulator's piston. The positioning of the electronic pilot actuator is proportional to the input signal supplied to the electronic valve. For example, considering a 4-20 mA input signal from a suitable controller, a 4 mA signal results in the pilot valve being in a closed position, a 12 mA signal results in the pilot being 50% opened, and a 20 mA input signal results in the pilot valve being fully opened. The only moving part of the electronic pilot valve, the plunger (or core), is virtually frictionless and changes its position against a counter spring with each change in current.

Two separate control modules are available which respond to the supply signal from an external controller which senses the medium being cooled. Modules are mounted on a base attached to the solenoid housing with two phillips head screws, and can be easily changed in the field, if required. A 0-10 VDC module (P.N. 308229), or a 4-20 mA module (P.N. 308231) are available, which respond to the designated input signal. These control modules are an integral part of the valve and should be part of the description when ordering.

See Fig. 4 for wiring details . The 0-10 VDC and 4-20 mA modules require a 24 VAC power source, and should be wired as shown.

The A4AJ electronic pilot operated valve is available with many standard variations (dual, electric shut-off, electric wide opening) common to the R/S regulator line. The regulator carries an IP 54 protection class (dust-proof/ splash-proof), and meets NEMA 3R requirements

**Purpose:**

The electric pilot regulators are excellent for controlling evaporator pressure/temperature where load fluctuations are great, such as hot carcass chilling, warm fruit and wine chilling and cooling tunnels. They also control accurately where product load is fairly constant but very close temperature or humidity control is desired. They also can be used to control condensing pressures; for example, as part of a Heat Reclaim system.

**Principles of Operation:**

The inlet pressure enters the space to the pilot regulator through passage N (See Fig. 1). As the control signal voltage increases to the pilot regulator, the pilot regulator opens allowing more pilot flow to the top of the main valve piston. This causes the piston to move downward forcing the modulating plug to open. An increase in voltage to the pilot regulator opens the pilot regulator farther, allowing more pilot flow to the top of the piston and opening the valve wider. As the control signal voltage decreases to the pilot regulator, the pilot regulator closes allowing less pilot flow to the top of the main valve piston. This causes the closing spring to reduce the valve opening. The pressure on top of the piston is controlled by the flow through the pilot regulator and bleeds off through the clearance between the piston and the cylinder, in addition to the piston bleed hole.

**Control Signal Modules:**

The I/O signal modules provide signal interface and wiring termination point for the pilot regulator. I/O signal modules are selected by control signal type.

0-10 VDC I/O signal modules interface standard 0-10 VDC control signals to the pilot regulator. The signal load resistance is 10 k ohm. A circuit board is fitted into the control signal housing. The circuit board includes the required phase-cut driver, a 0-10 VDC signal conditioner, and termination for field wiring. A 24 VAC power source must be connected to the I/O signal module.

4-20 mA I/O signal modules interface standard 4- mA control signals to the pilot regulator. The dropping resistance is 500 ohms. A circuit board is fitted in the control signal housing. The circuit board includes the required phase-cut driver, a 4-20 mA signal conditioner, and termination for field wiring. A 24 VAC power source must be connected to the signal module.

**Control Package Requirements**

The control package wiring schematic is shown in Fig. 4. The control package consists of a 24 VAC transformer, a control signal I/O module and controller.

## Option #1

- A4AJ valve
- 0-10 VDC I/O Module (P.N. 308229)
- 0-18 VDC Controller (P.N. 105625)
- 24 VAC transformer

## Option #2

- A4AJ Valve
- 4-20 mA I/O Module (P. N. 308231)
- 4-20 mA Controller (P. N. 105624)
- 24 VAC transformer.

**Manual Opening Stem:**

All Type A4 Regulators are provided with a manual opening stem. To open the regulator manually, back the stem out (turn counterclockwise) 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.

**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 (type RSF) at the inlet of the regulator to help protect it from any foreign material in the system.

The A4AJ regulator will give optimum performance if mounted in a horizontal line in a vertical position with the manual opening stem on bottom. To function properly, the regulator must be installed with the arrow on the valve body pointing in the direction of the fluid flow. Backward flow through the regulator is uncontrolled and will vary with valve model and the reverse pressure drop encountered.

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), Avoid using the regulator flange bolts to stretch or align pipe. Even the heavy body of an A4 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. Do not insulate the electronic pilot and control module. Proper indicating gauges should be installed to be easily visible to the operating engineer for system checking and adjusting purposes.

**MAINTENANCE AND SERVICE**

## General Procedure:

Dirt in the system is the greatest single cause of regulator malfunction. All screens or filters should 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 strainer is used, maintain according to instruction in Bulletin DN00-10.

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

Item	Description
11	Bolt, Bonnet
19	Gasket, Adapter
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
48	Bonnet Adapter
49	Gasket, Bonnet
50	O-Ring
52	O-Ring
53	Signal module

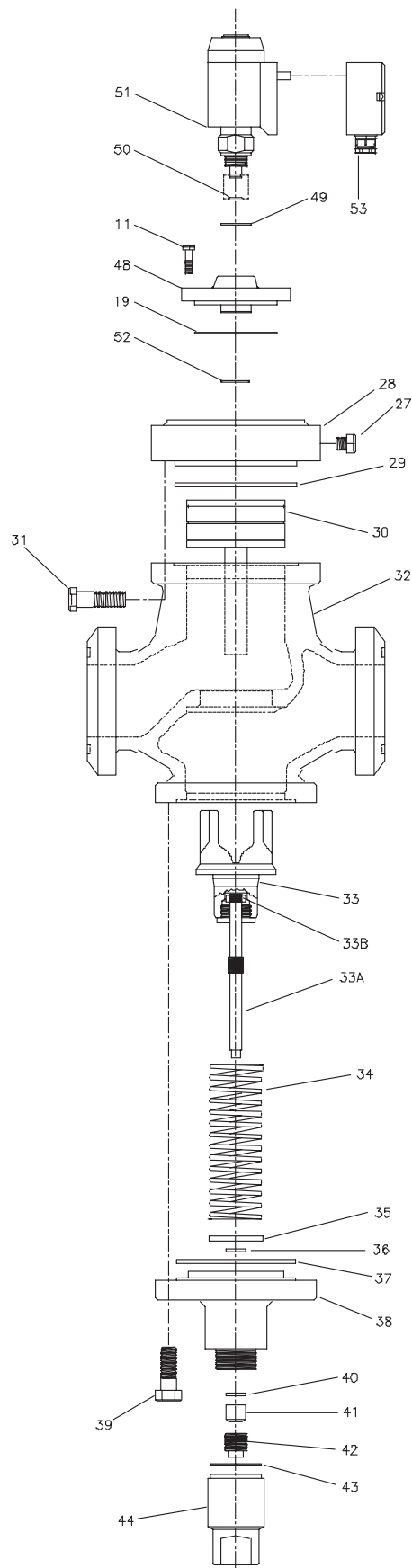


Fig 2.

Check the manual opening stem; it should be turned in for automatic operation.

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 RSBCV.

### 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 RSBCV prior to installation or servicing work.**

Where cold refrigerant liquid lines are used, it is necessary that certain precautions be taken to avoid damage that could result from liquid expansion. Temperature increase in a piping section full of solid liquid will cause high pressure due to the expanding liquid that 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 valve upstream of solenoid valves or downstream of check valves be close 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 that 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 warranted against defects in workmanship and materials for a period of one year from date of shipment from originating 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 that have been altered, or repaired in the field; damaged in transit, 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.

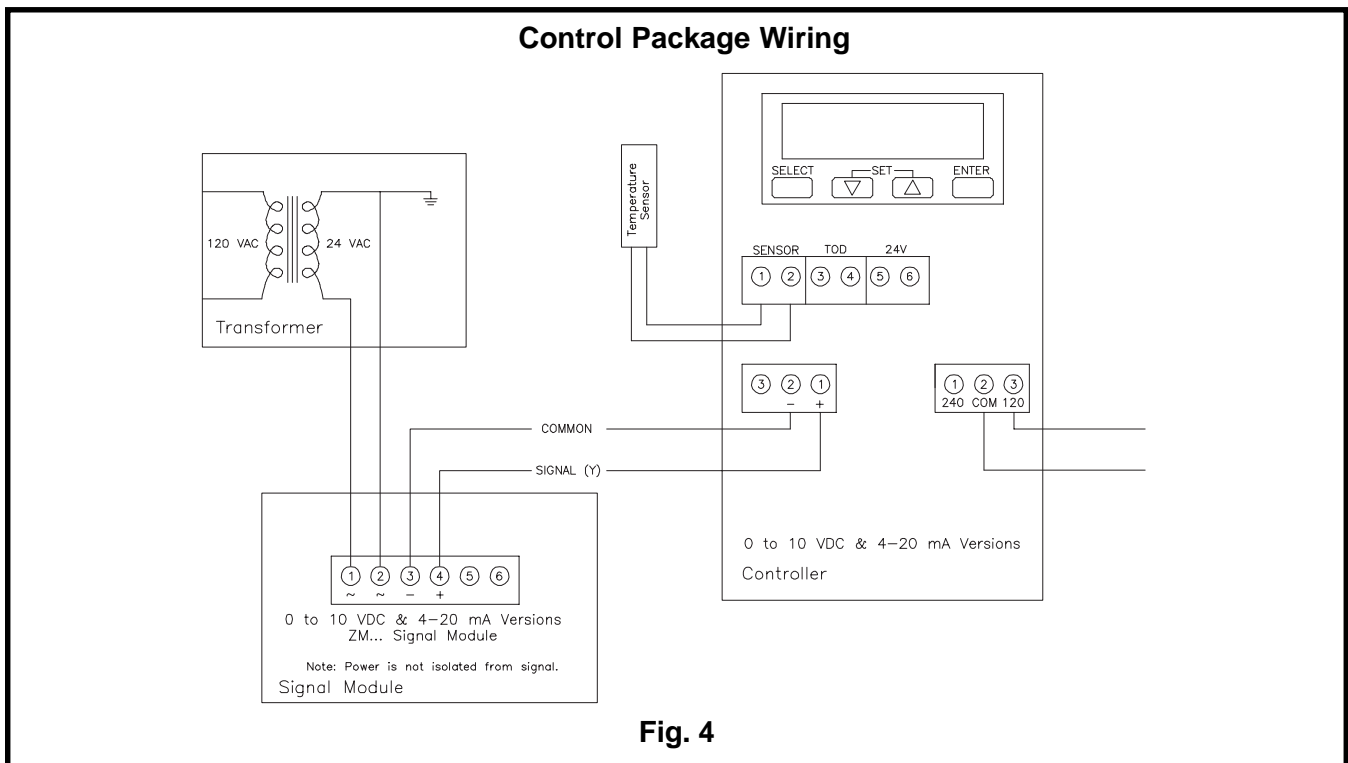


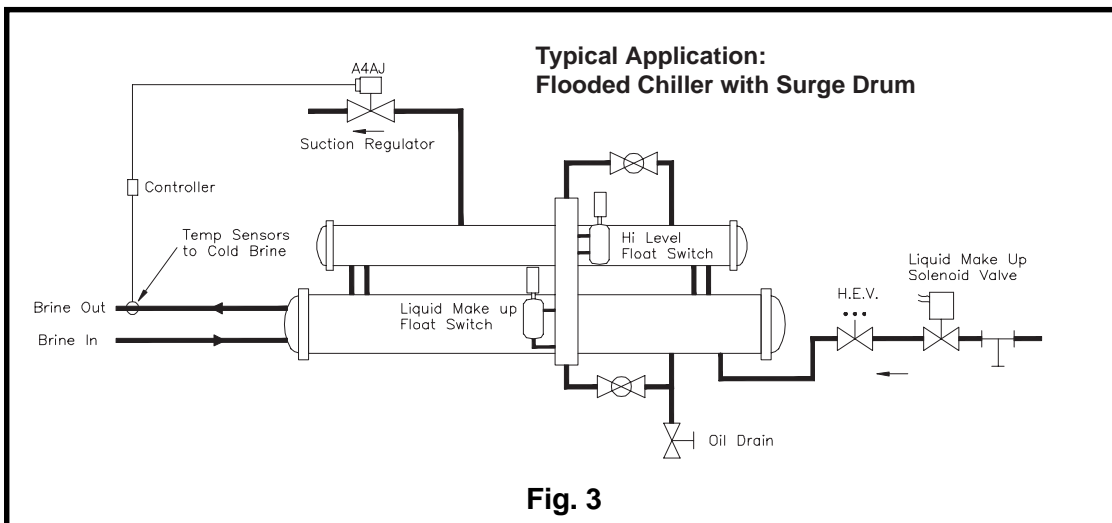
Fig. 4

**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	&	
	COVER BOTTOM, A4A/S4A	BARSTOCK ASTM 1213 CR	8.6	
20 & 25 MM	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		
	COVER BOTTOM, A4A/S4A	BARSTOCK ASTM 1213 CRS		
32 MM	BONNET A4W	DUCTILE IRON GGG 40.6		
1-5/8 IN	BODY, 2 A4A DN	DUCTILE IRON GGG 40.3	28.6	1.61 L
	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		
40 MM	BONNET A4W	DUCTILE IRON GGG 40.3		
2 IN	BODY, 2 A4A DN	DUCTILE IRON GGG 40.3	42.4	1.61 L
	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		
50 MM	BONNET A4W	DUCTILE IRON GGG 40.3		
2-1/2 IN	BODY, 2-1/2 A4A DN	DUCTILE IRON GGG 40.3	60	3.19 L
	ADAPTER, 3 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.3		
65 MM	BONNET A4W	DUCTILE IRON GGG 40.3		
3 IN	BODY, 3 A4A DN	DUCTILE IRON GGG 40.3	86	3.91 L
	ADAPTER, 3 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.4		
75 MM	BONNET A4W	DUCTILE IRON GGG 40.3		
4 IN	BODY, 4 A4A DN	DUCTILE IRON GGG 40.3	116	6.5 L
	ADAPTER, 4 A4A DN	DUCTILE IRON GGG 40.3		
	COVER BOTTOM, 4 A4A/S4A	DUCTILE IRON GGG 40.4		
100 MM	BONNET A4W	DUCTILE IRON GGG 40.3		



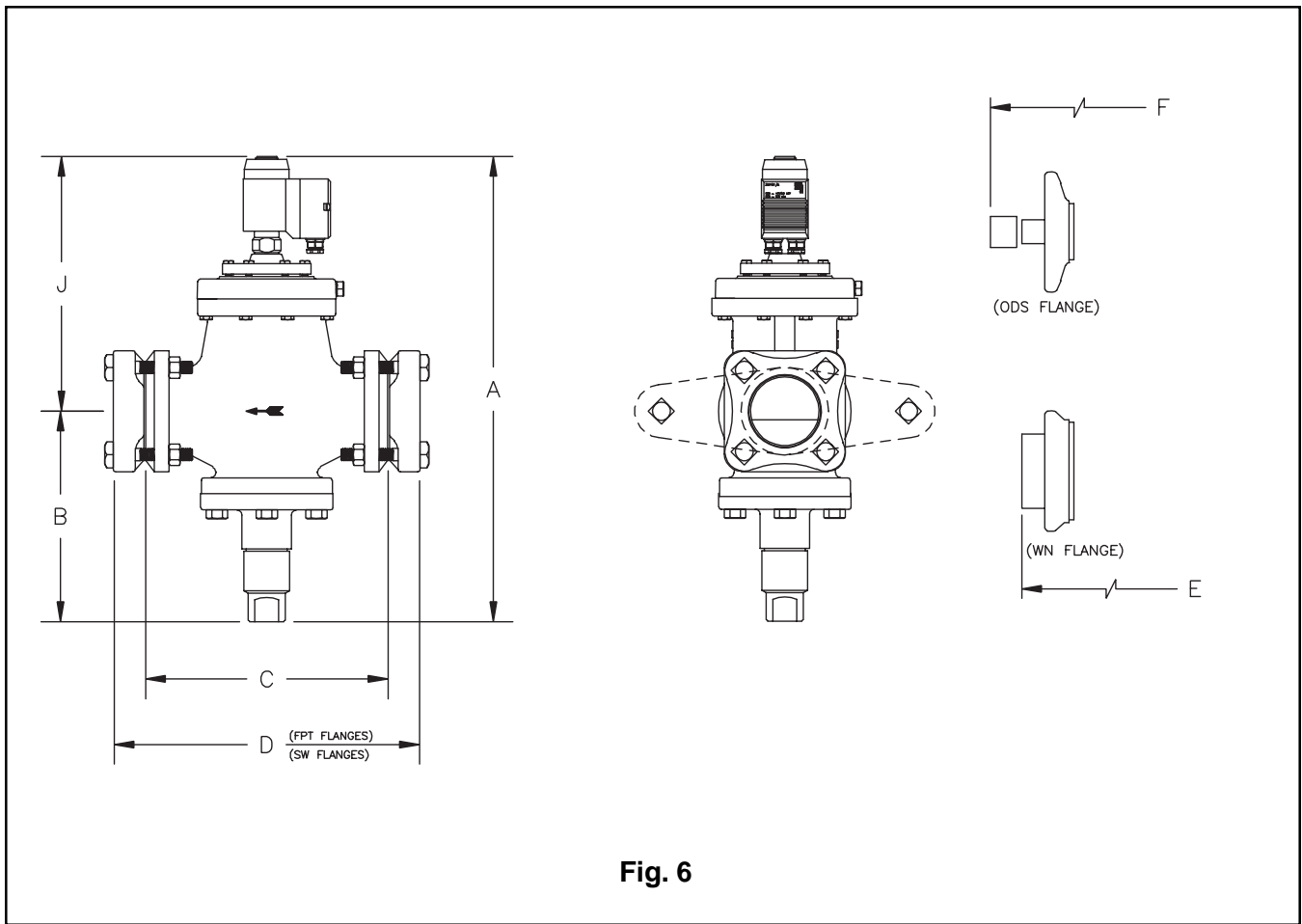


Fig. 6

		OVERALL VALVE DIMENSIONS											
PORT SIZE		3/4" & 1" (20 & 25 MM)		1-1/4" (32 MM)		1-5/8" & 2" (40 & 50 MM)		2-1/2" 65 MM		3" 75 MM		4" 100 MM	
DIMENSION		MM	NCH	MM	NCH	MM	NCH	MM	NCH	MM	NCH	MM	NCH
A	A4AJ	432	17.0	450	17.7	503	19.8	523	20.6	635	25.0	693	27.3
B	(ALL TYPES)	148	5.8	162	6.3	177	6.9	181	7.1	273	10.7	292	11.5
C	(ALL TYPES)	164	6.2	203	8.0	251	9.9	252	9.9	311	12.2	359	14.1
G	(ALL TYPES)	98	3.9	178	7.0	251	9.9	314	12.4	314	12.4	363	14.3
H	(ALL TYPES)	117	4.6	117	4.6	140	5.5	159	6.2	176	7.0	222	8.8
J	A4AJ	259	10.2	284	11.2	325	12.8	343	13.5	366	14.4	401	15.8

		OVERALL LENGTH DIMENSIONS WITH FLANGES																				
PORT SIZE		3/4" & 1" (20 & 25 MM)		1-1/4" (32 MM)		1-5/8" & 2" (40 & 50 MM)				2-1/2" 65 MM		3" 75 MM		4" 100 MM								
DIMENSION	PIPE SIZE	MM	NCH	PIPE SIZE	MM	NCH	PIPE SIZE	MM	NCH	PIPE SIZE	MM	NCH	PIPE SIZE	MM	NCH	PIPE SIZE	MM	NCH				
D	FPT & SW FOR PIPE SIZES	1/2"	216	8.5	1-1/4"	256	10.1	1-1/2"	256	10.1	2"	256	12.1	2-1/2"	331	13.0	3"	389	15.3	3-1/2"	450	17.7
	SHOWN	1-1/4"	216	8.5																		
E	WN FOR PIPE SIZES	3/4"	254	10.0	1-1/4"	300	11.8	1-1/2"	364	14.3	2"	371	14.6	2-1/2"	401	15.8	3"	478	18.8	4"	571	22.5
	SHOWN	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	3-5/8"	432	17.0	4-1/8"	503	19.8
	SHOWN	1-3/8"	231	9.1	2-1/8"	305	12.0	2-5/8"	358	14.1												
		1-5/8"	239	9.4																		
N	ODS TUBE ENGAGEMENT	7/8"	19	0.8	1-3/8"	25	1.0	1-5/8"	28	1.1	2-5/8"	38	1.5	3-1/8"	43	1.7	3-5/8"	48	1.9	4-1/8"	55	2.2
		1-1/8"	23	0.9	1-5/8"	28	1.1	2-1/8"	33	1.3	3-1/8"	43	1.7	3-5/8"	48	1.9						
		1-3/8"	25	1.0	2-1/8"	33	1.3	2-5/8"	38	1.5												
		1-5/8"	28	1.1																		
P	SW PIPE ENGAGEMENT	1/2"	13	0.5	1-1/4"	15	0.6	1-1/2"	15	0.6	2-1/2"	25	1.0	3"	29	1.1	3-1/2"	32	1.3	4"	32	1.3
		3/4"	13	0.5	1-1/2"	15	0.6	2"	15	0.6												