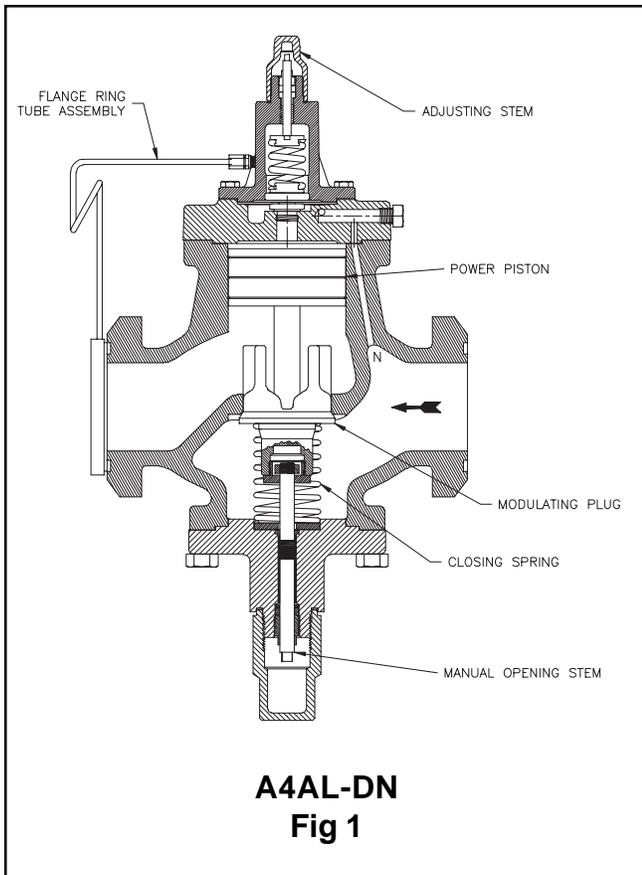


**DIFFERENTIAL PRESSURE
RELIEF REGULATOR
TYPE A4AL-DN**
Port Size 3/4" - 4" (20-100mm)
For Ammonia, R-22, R134a, R404a, R507
and other common refrigerants.

FEATURES

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



**BULLETIN DN23-10B
Type A4AL-DN**

**January 2007
Installation and Service Information**

Description:
These compact, heavy duty, pilot operated, Differential Pressure Regulators are suitable for Ammonia, R22, R134a, R404a, R507 and other common refrigerants and fluids approved for use in refrigeration systems.

All A4AL Regulators are pilot operated using upstream pressure for the opening force and require a minimum 2 psi (0.14 bar) 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.

Purpose:
Modulates flow of refrigerant liquid or gas to maintain a constant set-for pressure differential between regulator inlet and regulator outlet.

Regulator applications are as follows: As a relief valve from pump outlet to accumulator of a liquid recirculating pump system to prevent pump overload or dry pumping when evaporator liquid solenoid valves are closed. Differential pressure will not vary despite fluctuating accumulator pressures. As a gas or liquid pressure regulator whenever it is desired to maintain a set-for pressure difference between regulator inlet and outlet. The fluid temperature range for the A4AL Series of Regulators is -50°F to 220°F (-45°C to 105°C).

Principles of Operation

This is a pilot operated regulator whose main valve is opened by a power piston in response to the inlet fluid pressure received from below the regulator diaphragm. The outlet pressure is introduced through a sensing tube, which is part of the Flange Ring-tube Assembly (20), from the outlet of the regulator into the bonnet and to the top of the diaphragm, thus allowing the regulator to maintain a differential pressure between the inlet and outlet equivalent to the spring pressure.

After the regulator is set for the desired pressure differential, the pressure at the inlet of the regulator will rise and fall, pound for pound, with the rise and fall of pressure at the regulator outlet, always maintaining the set-for differential pressure across the regulator. If the difference between inlet pressure and outlet pressure of the regulator is less than the set-for pressure, the regulator will remain tightly closed.

Manual Opening Stem:

All Type A4AL 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.

Adjustment

For adjustment, pressure gauges should be connected to the gauge port at the regulator inlet and also downstream of the regulator. With the system operating, back the adjusting stem all the way out to stop (counterclockwise) to give minimum differential, which is about 2 psi. Gradually turn the adjusting stem in (clockwise) until the desired differential pressure is reached, assuming the system is capable of achieving such a differential. Check the differential setting after the system has been in operation for a while and make any minor corrections necessary.

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 A4AL 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 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 Bolt Torque Table). Avoid using the regulator flange bolts to stretch or align pipe. Even the heavy duty 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. Do not insulate the solenoid coil and coil housing. Proper indicating gauges should be installed to be easily visible to the operating engineer for system checking and adjusting purposes.

Disassembly and Assembly

Before disassembling any A4A type regulator, read the information in this bulletin and Bulletin RSB, 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 instruction 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, 3/4" through 1-1/4" (20mm through 32mm). 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. Items which require several bolts to fasten must be tightened uniformly to provide proper alignment and seating. (See Bolt Torque Table). 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 the 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. Tighten Cap Screws (11) evenly. The

ideal tightening torque is 11 ft. lbs. (1.5 kg-m). 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.

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.

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 instruction 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.

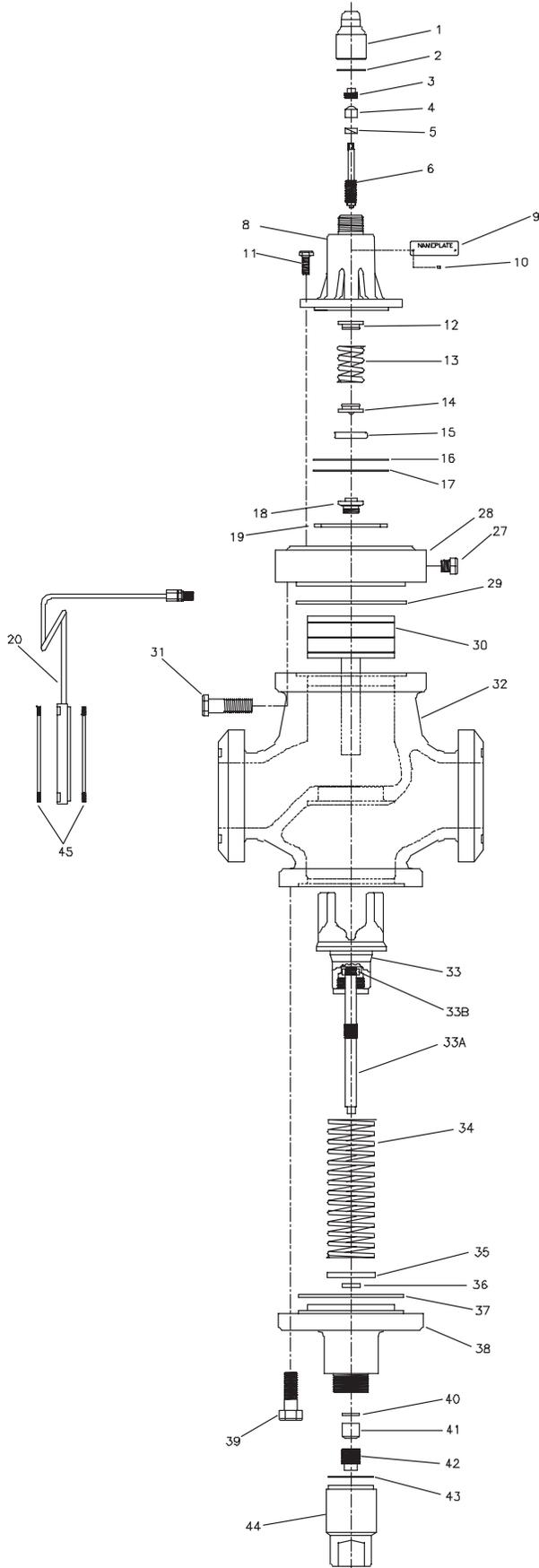
Check other system components for proper operation. Check hand valves in the system to make sure they are open or closed as required and the system is receiving liquid or gas as the case may be.

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 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 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 valve 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.



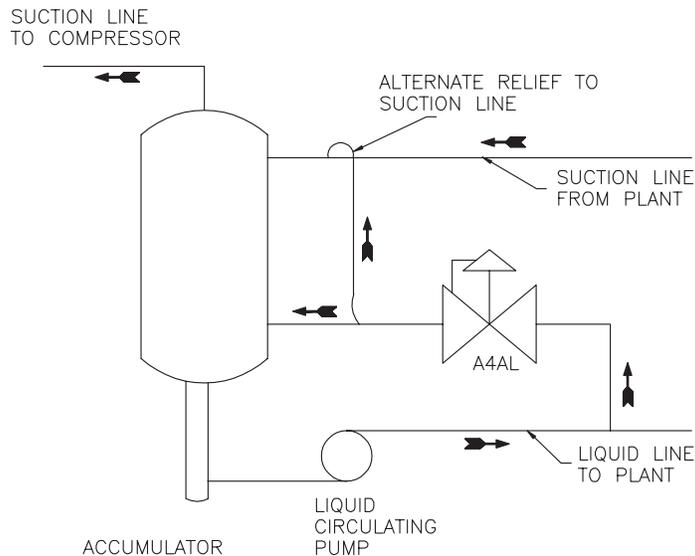
Item	Description
1	Seal Cap
2	Gasket, Seal Cap
3	Nut, Stuffing Box
4	Packing Ring
5	Packing Washer
6	Adjusting Stem
8	Bonnet
9	Nameplate
10	Screw, Name Plate
11	Screw, Bonnet
12	Spring Rest, Upper
13	Spring, Range
14	Spring Rest, Lower
15	Diaphragm Follower
16	Gasket, Bonnet
17	Diaphragm
18	Seat, Pilot
19	Gasket, Adapter
20	Flg Ring-tube Asm
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

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		

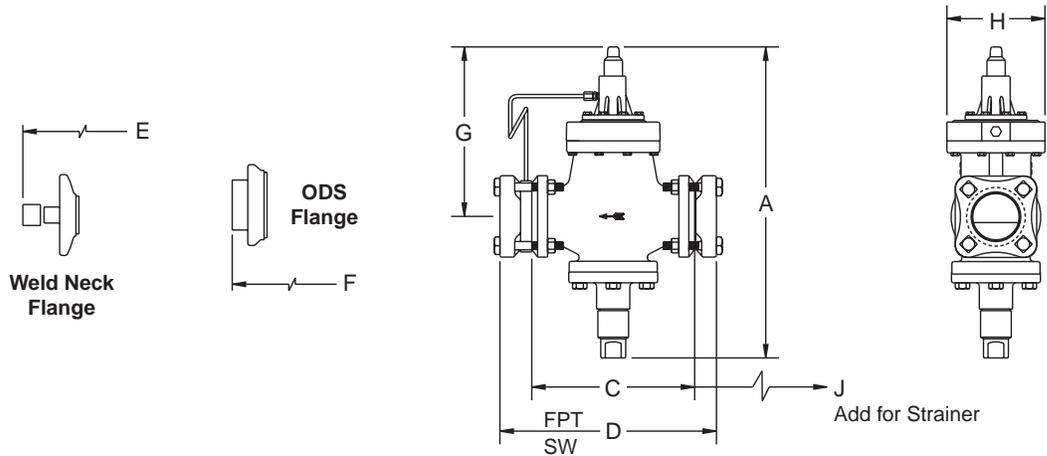
PRESSURE CONTAINING COMPONENTS A4A DN LINE: 1-1/4 TO 4

	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		
32 MM	COVER BOTTOM, A4A/S4A	BARSTOCK ASTM 1213 CRS		
	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		
40 MM	COVER BOTTOM, A4A/S4A 1-5/8 to 2-1/2	DUCTILE IRON GGG 40.3		
	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		
50 MM	COVER BOTTOM, A4A/S4A 1-5/8 to 2-1/2	DUCTILE IRON GGG 40.3		
	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		
65 MM	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.3		
	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		
75 MM	COVER BOTTOM, 3 A4A/S4A	DUCTILE IRON GGG 40.4		
	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		
100 MM	COVER BOTTOM, 4 A4A/S4A	DUCTILE IRON GGG 40.4		
	BONNET A4W	DUCTILE IRON GGG 40.3		



Dimensions

A4AL



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						
A	A4P, A4L	392	15.4	410	15.6	464	16.2	483	19.0	597	23.5	653	25.7						
	A43P	414	16.3	432	17.0	485	19.1	505	19.9	620	24.4	676	26.6						
C		164	6.2	203	8.0	251	9.9	252	9.9	311	12.2	359	14.1						
G	A4P, A4L	244	9.6	248	9.8	287	11.3	302	11.9	324	12.8	361	14.2						
	A43P	266	10.5	270	10.7	308	12.2	324	12.8	347	13.7	384	15.1						
H		117	4.6	117	4.6	140	5.5	159	6.2	176	7.0	222	8.8						
J		98	3.9	178	7.0	251	9.9	314	12.4	314	12.4	363	14.3						
OVERALL LENGTH DIMENSIONS WITH FLANGES																			
*Add 13mm (0.5") to D, E & F Dimensions for A4L Variation																			
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															

BOLT TORQUE TABLE		
ITEM	PORT SIZE	TORQUE
7/16" Flange Bolt	1/2"	28 ft lb
5/8" Flange Bolt	3/4" - 2"	85 ft lb
3/4" Flange Bolt	2-1/2" - 3"	105 ft lb
7/8" Flange Bolt	4"	150 ft lb
5/16"-18 Bonnet Bolt	3/4" - 4"	15 ft lb
5/16"-18 Adapter Bolt	3/4" - 2"	15 ft lb
5/8"-11 Adapter Bolt	3" - 4"	75 ft lb
Bottom Cap	3/4" - 1-1/4"	150 ft lb
1/2"-13 Bottom Cap Bolt	1-5/8" - 2-1/2"	50 ft lb
5/8"-11 Bottom Cap Bolt	3" - 4"	75 ft lb

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
	Modulating plug leaking due to excess dirt or damaged	Clean or replace. If used on liquid, check for erosion due to excessive flash gas by subcooling or by reducing pressure drop across valve by providing restriction at valve outlet.
Regulator does not open	Pressure Regulator Diaphragm ruptured or badly deformed	Replace. Make sure 2 diaphragms are installed.
	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, damaged.	Clean or replace. Clean strainer
	Diaphragm follower has dirt on the outside diameter or outside diameter is damaged.	Clean 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 subcooling. 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.

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 Company. 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, 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.