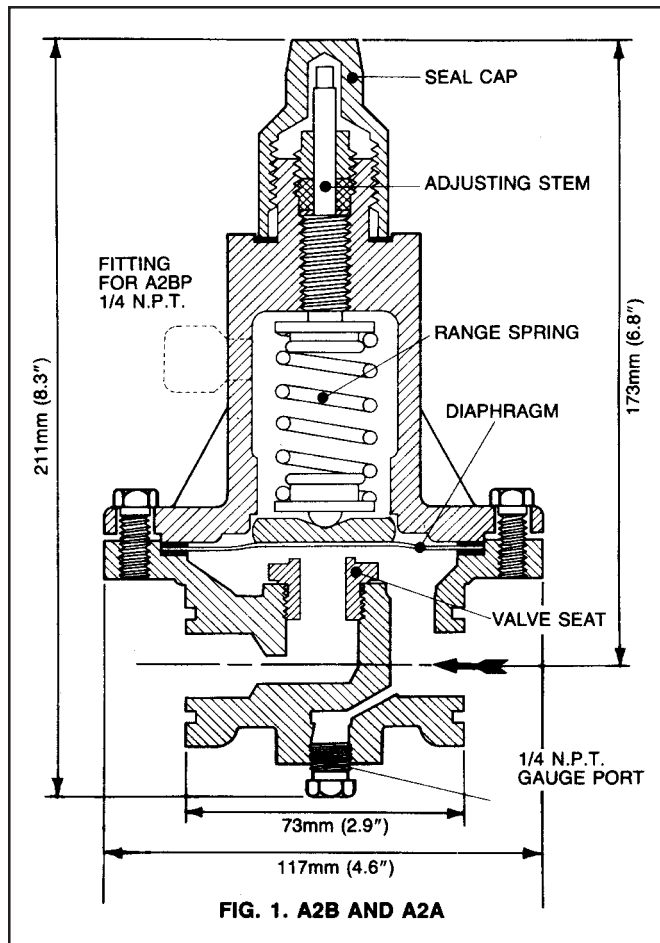


# COMPACT PRESSURE REGULATORS

Type A2B, A2A, A2BK, A2BOE  
FOR AMMONIA, R12, R22, R502  
AND OTHER COMMON REFRIGERANTS

## FEATURES

- Compact Direct Diaphragm Operated
- Design Pressure (MRP): 27.6 bar (400 PSIG)
- Flanged Connections: FPT, SW, WN or ODS
- Available with Close Coupled Strainer
- Stainless Steel Diaphragm



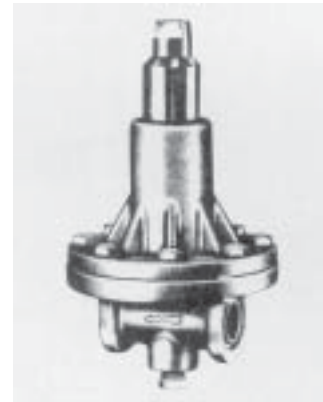
## Description

The A2 Type pressure regulators are compact, direct diaphragm operated, for use with refrigerant liquid or vapor. The regulators can be used with ammonia, R12, R-22, R-502, certain other refrigerants, oil and other approved fluids with similar pressure temperature and corrosion characteristics. The design pressure (MRP) is 21 bar (300 psig). The regulators are for use in systems where a small inlet or outlet pressure regulator is needed.

The regulators are furnished with flanges for FPT: Internal NPT (USA Standard Taper Pipe Thread), socket weld, weld neck or ODS (solders over copper tubing of given external diameter) connections. The regulator can be easily removed for service.

A strainer can be furnished to close couple to the inlet of the regulator.

## BULLETIN 21-02D Type A2B, A2A, A2BK, A2BOE



## January 2003 Installation, Service and Parts Information

### Purpose

The A2B, A2BK and A2A are Inlet Pressure Regulators that prevent inlet (or upstream) pressure from falling below set-point. They will tend to open on a rise in inlet pressure above set-point and will be closed below set-point.

The A2BO and A2BOE are Outlet Pressure Regulators. (The A2BOE senses outlet pressure through an external connection.) They prevent their outlet (or downstream) pressure from rising above set-point. They tend to open on a drop in outlet pressure below set-point and will be closed above set-point.

### Principles of Operation A2B, A2A

The inlet pressure acts on the diaphragm; when the force created by the pressure exceeds the force of the range spring, the diaphragm is lifted off of the valve seat and flow occurs between the diaphragm and the valve seat, from the regulator inlet to the outlet. Increased inlet pressure lifts the diaphragm further, allowing increased flow. Decrease in inlet pressure causes the diaphragm to move closer to the valve seat, thus reducing the flow. Thus, the regulator acts to maintain the inlet pressure approximately constant. If the inlet pressure drops below the regulator setting, the diaphragm closes off the flow to keep the inlet pressure from going below the set point, subject to limits of seat leakage tolerance, or leakage due to dirt particles on the seat surfaces.

### Adjustment A2B, A2A

An accurate pressure gauge should be installed at the gauge connection on the regulator or in the piping near the regulator inlet.

Carefully remove the seal cap by barely cracking it open to allow any confined refrigerant to escape gradually. Then turn the adjusting stem in (clockwise) to raise the set point, or out (counterclockwise) to lower the set point. Table 1 shows the set point pressure ranges for the regulators.

Do not attempt to exceed the rated maximum pressure setting adjustment because this could damage the regulator or make it inoperative. Severe overadjusting could also apply enough force to damage the diaphragm and valve seat or put the spring in solid position. So, if the maximum tightening adjustment has been reached, stop and back out the adjusting stem (counterclockwise) at least one half turn so the range spring can move.

After adjusting the regulator it is advisable to observe the maintained pressure while the system is operating normally and to make any minor adjustments required at that time. Replace the seal cap after the desired set point is reached.

**TABLE 1. INLET PRESSURE SETTING RANGES**

SET POINT RANGES	APPROX. CHANGE PER TURN OF ADJUSTING SCREW
A: 0 to 10.3 bar (0 to 150 psig)	1.7 bar (25 psi)
V: 500 mm Hg to 8 bar (20 in. Hg to 120 psig)	1.7 bar (25 psi)
D: 5 to 19 bar (75 to 280 psig)	3.6 bar (53 psi)

ITEMS 1 THROUGH 18  
USED ON A2BO AND  
A2BOE ALSO

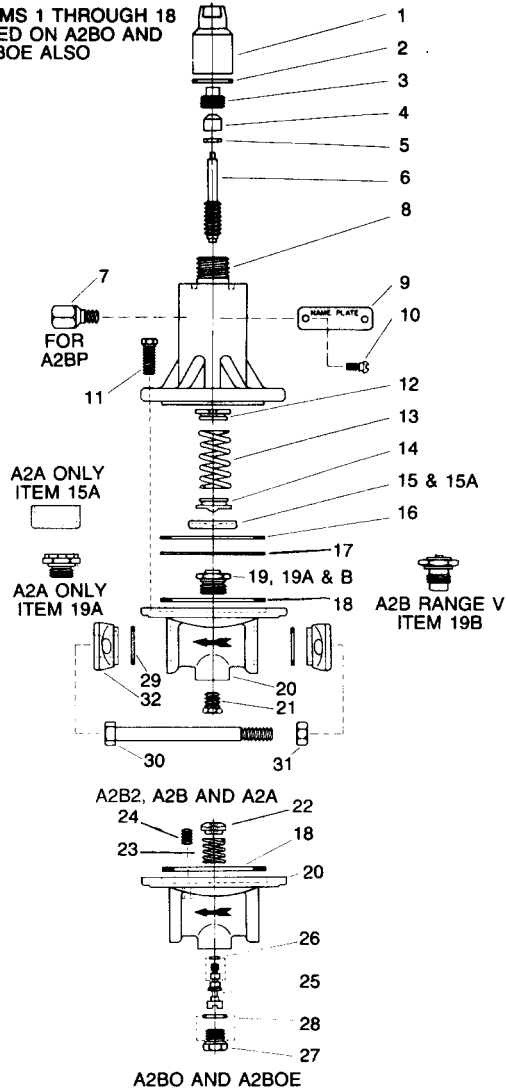


FIG. 2

**PARTS KITS LIST**

Valve Type	Item No.	Description	Oty.	Kit No.	
A2B		<b>Spring/Stem Kit</b>	Ranges A & Y	1	202006
	3	Nut, Packing	1		
	4	Packing, Stem	1		
	5	Washer, Flat	1		
	6	Stem, Adjusting	1		
	12	Plate, Spring, Upper	1		
	14	Plate, Spring, Lower	1		
	13	Spring, Range, Comp	1		
	15	Follower, Diaphragm	1		
A2B, A2BO		<b>Spring/Stem Kit</b>	Range D	1	202007
	3	Nut, Packing	1		
	4	Packing, Stem	1		
	5	Washer, Flat	1		
	6	Stem, Adjusting	1		
	12	Plate, Spring, Upper	1		
	14	Plate, Spring, Lower	1		
	13	Spring, Range, Comp	1		
	15	Follower, Diaphragm	1		
A2A		<b>Spring/Stem Kit</b>	Range A	1	202344
	3	Nut, Packing	1		
	4	Packing, Stem	1		
	5	Washer, Flat	1		
	6	Stem, Adjusting	1		
	12	Plate, Spring, Upper	1		
	14	Plate, Spring, Lower	1		
	13	Spring, Range, Comp	1		
	15A	Follower, Diaphragm	1		

Valve Type	Item No.	Description	Oty.	Kit No.	
A2A		<b>Spring/Stem Kit</b>	Range D	1	202345
	3	Nut, Packing	1		
	4	Packing, Stem	1		
	5	Washer, Flat	1		
	6	Stem, Adjusting	1		
	12	Plate, Spring, Upper	1		
	14	Plate, Spring, Lower	1		
	13	Spring, Range, Comp	1		
	15A	Follower, Diaphragm	1		
A2B		<b>Bonnet/Spring Kit</b>	Ranges A & V	1	202008
		Spring/Stem Kit (202006)	1		
	1	Seal Cap	1		
	2	Gasket	1		
	8	Bonnet	1		
	11	Screw, Hex Hd.	8		
	16	Gasket	1		
A2B, A2BO		<b>Bonnet/Spring Kit</b>	Range D	1	202009
		Spring/Stem Kit (202007)	1		
	1	Seal Cap	1		
	2	Gasket	1		
	8	Bonnet	1		
	11	Screw, Hex Hd.	8		
	16	Gasket	1		
A2A		<b>Bonnet/Spring Kit</b>		1	202359
		Spring/Stem Kit (202344)	1		
	1	Seal Cap	1		
	2	Gasket	1		
	8	Bonnet	1		
	11	Screw, Hex Hd.	8		
	16	Gasket	1		
A2B, A2BO		<b>Diaphragm Kit</b>	Ranges A & V	1	200770
	17	Diaphragm	1		
	16	Gasket	1		
	18	Gasket	1		
A2A		<b>Diaphragm Kit</b>	Ranges A & D	1	200771
	17	Diaphragm	2		
	16	Gasket	1		
	18	Gasket	1		
A2B, A2BO		<b>Diaphragm Kit</b>	Range D	1	200771
	17	Diaphragm	2		
	16	Gasket	1		
	18	Gasket	1		
A2B		<b>Seat Kit, Pilot</b>	Range A	1	202001
	19	Seat, Pilot	1		
		Diaphragm Kit (200770)	1		
A2B2		<b>Seat Kit, Pilot</b>	Range A	1	202000
	19	Seat, Pilot	1		
		Diaphragm Kit (200770)	1		
A2B		<b>Seat Kit, Pilot</b>	Range V	1	202004
	19B	Seat, Pilot	1		
		Diaphragm Kit (200770)	1		
A2B		<b>Seat Kit, Pilot</b>	Range D	1	202003
	19	Seat, Pilot	1		
		Diaphragm Kit (200771)	1		
A2B2		<b>Seat Kit, Pilot</b>	Range D	1	202002
	19	Seat, Pilot	1		
		Diaphragm Kit (200771)	1		
A2A		<b>Seat Kit, Pilot</b>	Ranges A & D	1	202005
	19A	Seat, Pilot	1		
		Diaphragm Kit	1		
A2BO		<b>Plug Kit, Pilot</b>		1	201394
	27	Plug, Seal	1		
A2BO1		<b>Plug Kit, Pilot</b>	Ranges V & D	1	200776
	25	Plug, Pilot	1		
	26	O-Ring (A2BO1 E Only)	1		
	28	O-Ring	1		
	22	Nut, Retainer	1		
	18	Gasket	1		
	23	Spring	1		
A2BO2		<b>Plug Kit, Pilot</b>	Ranges V & D	1	200777
	25	Plug, Pilot	1		
	26	O-Ring (A2BO2E Only)	1		
	28	O-Ring	1		
	22	Nut, Retainer	1		
	18	Gasket	1		
	23	Spring	1		
A2BO4		<b>Plug Kit, Pilot</b>	Ranges V & D	1	200778
	25	Pilot Plug	1		
	26	O-Ring (A2BO4E Only)	1		
	28	O-Ring	1		
	22	Nut, Retainer	1		
	18	Gasket	1		
	23	Spring	1		
A2B,A2A,A2BO		<b>Packing Kit, Stem</b>		1	202100
	5	Washer, Flat	1		
	3	Nut, Packing	1		
	4	Packing, Stem	1		
A2B,A2A,A2BO		<b>Cap Kit, Seal</b>		1	202110
	1	Seal Cap	1		
	2	Gasket	1		
A2B,A2A,A2BO		<b>Gaskets, Flange</b>		12	202078
	29				

## Disassembly and Assembly

Refer to the exploded views (Fig. 2) for the parts discussed in this section. Before disassembling or assembling an A2 regulator read the information in this bulletin and Bulletin RSB, Safety Procedures for R/S 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 regulator is isolated from the rest of the system in a safe manner.

### All A2 Regulators, General Procedure

**Disassembly** – Remove Seal Cap 1 and back out the Adjusting Stem 6 to remove all tension from the Range Spring 13. This is necessary to avoid possible damage to internal parts of the regulator. Remove Bonnet Screws 11 and disassemble parts 12 through 18 as shown in Fig. 2. Normally parts 3 through 6 do not require disassembly. Inspect parts for dirt, corrosion and wear and clean or replace as needed. Gaskets and “O” rings should be replaced whenever a regulator is re-assembled.

**Assembly** – When assembling the regulator, lightly oil the gaskets with refrigerant oil. Do not apply oil to the “O” rings because some oils may cause slight swelling and diameter increase. This does not affect the performance of the “O” rings, but it may make the assembly difficult. Make sure all parts are free of dirt and moisture condensate. Dry the parts if necessary and oil lightly.

All gaskets and “O” rings must be properly aligned. Arrange the parts as shown in Fig. 2 making sure that the Diaphragm Follower 15 is properly located in the Bonnet 8. The diaphragm must be installed with the raised center portion towards the bonnet. Make sure two diaphragms are used for A2B and A2BO Range D and A2A Ranges A and D. Tighten the Bonnet Screws 11 gradually and evenly. The screws should be tightened by turning opposing screws alternately rather than in a circular pattern. The ideal tightening torque is 1.5 kg-m (11 lbs.-ft.).

After the regulator is assembled and re-installed, check all external joints for leaks. Adjust the regulator spring to the proper set point by turning the adjusting stem while observing the proper pressure gauges during system operation.

### A2B and A2A

After above General Procedure for disassembly, inspect the Valve Seat 19 top seating surface for dirt, wear or damage. Remove 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.

### A2BO and A2BOE

After above General Procedure for disassembly, remove Bottom Cap 27. Disassemble the Valve Plug 25 and Spring 23 by inserting a screwdriver in the slot in the bottom of the valve plug and turning the hexagon Spring Nut 22 with a wrench. Inspect the valve plug and the matching seat surface in the Valve Body 20 for dirt, corrosion or damage. Clean, lap in place or replace as needed. Assemble new “O” ring 26 to the valve plug on A2BOE only (no “O” ring 26 required on A2BO), and carefully insert the assembly into the valve body. Place Spring 23 in place and tighten the Spring Nut 22 with a wrench while inserting a screwdriver into Valve Plug 25. Replace Bottom Plug “O” ring 28 and screw bottom cap in place.

## A2BP

For this regulator, which has an external connection to the bonnet, check the parts inside the bonnet for dirt, moisture or corrosion, especially on the outside diameter of diaphragm follower. If source of dirt, moisture or corrosion cannot be eliminated, it may be advisable to install and maintain a filter-drier in the sensing line to the bonnet.

### SERVICE POINTERS

#### SYMPTOM-Regulator does not shut off flow

PROBABLE REASON	CORRECTION
Incorrect setting .....	Adjust set point as needed. See appropriate adjustment procedure.
Wrong pressure range .....	Check pressure range, change range spring if necessary
Diaphragm or seat dirty, damaged or frozen .....	Clean or replace – clean strainer
Diaphragm follower stuck or damaged .....	Clean or replace. Install follower carefully
A2BO plug sticking .....	Check for dirt, corrosion or damage. Clean or replace. Check mating bore and seat in valve body.
A2BO plug and seat eroded due to flash gas .....	Replace as needed. Reduce flash gas by sub-cooling or by reducing pressure drop across valve by providing restriction at valve outlet.
A2BO diaphragm ruptured or badly deformed .....	Replace. Make sure Range “D” has 2 diaphragms.

#### SYMPTOM – Regulator does not open

Incorrect setting .....	Adjust set point as needed. See appropriate adjustment procedure.
Wrong pressure range .....	Check pressure range, change range spring if necessary
Diaphragm follower stuck, damaged or frozen .....	Clean or replace. Install follower carefully
A2B or A2A diaphragm ruptured or badly deformed .....	Replace. Make sure Range “D” has 2 diaphragms.
A2BO plug sticking .....	Check for dirt, corrosion or damage. Clean or replace. Check mating bore and seat in valve body.

#### SYMPTOM – Regulator operation erratic

Diaphragm or seat dirty or damaged .....	Clean or replace – clean strainer
A2BO plug sticking .....	Check for dirt, corrosion or damage. Clean or replace. Check mating bore and seat in valve body.
Diaphragm follower has burrs or dirt on outside diameter .....	Clean or replace.
Check other system components .....	Adjust or replace as needed.

#### SYMPTOM – Pressure drop across valve too high

Inlet or outlet restricted .....	Check for restriction. Clean strainer.
Valve too small .....	Replace with proper size valve.
Large amount of flash gas in a liquid line .....	Reduce flash gas by subcooling. Reduce line restriction by increasing pipe size, particularly at the valve outlet. Replace with larger valve.

## FLANGE TABLE

FPT FLANGES		WELDING FLANGES								O.D.S. FLANGES				
Nominal Pipe Size Inches	Flange Package No.	Fit Pipe Size		Socket Weld Socket I.D.		Weld Neck Neck O.D.		Flange Package No.		Tubing O.D.		Fitting I.D.		Flange Package No.
		Nominal Inches	O.D. mm	Inches	mm	Inches	mm	Socket Weld	Weld Neck	Inches	mm	Inches	mm	
1/4	200000	1/4	13.25	.560	14.22	.540	13.72	200004	200008	1/2	12.70	.502	12.75	200012
3/8	200001	3/8	16.75	.695	17.65	.675	17.15	200005	200009	5/8	15.87	.627	15.92	200013
1/2	200002	1/2	21.25	.860	21.84	.840	21.34	200006	200010	7/8	22.22	.877	22.27	200014
3/4	200003	3/4	26.75	1.070	27.18	1.050	26.67	200007	200011					

⌀ FPT – Internal NPT (USA Standard Taper Pipe Thread)

⌀ Metric steel tubing used for refrigeration

⌀ Metric copper tubing used for refrigeration

⌀ ODS Connections to fit copper tubing of given outside diameter

DEFINITIONS: O.D.S. – Outside Diameter Sweat; I.D. – Inside Diameter; O.D. – Outside Diameter

When ordering flanges, use the proper package number from Flange Table. A Flange Package consists of two flanges only.

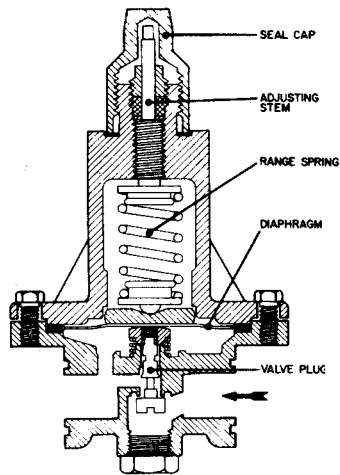


FIG. 3, A2BO

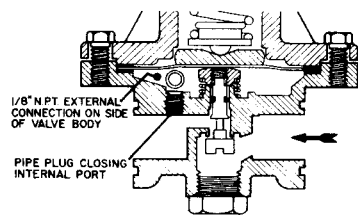


FIG. 4, A2BOE

Dimensions: See Fig. 1

### Principles of Operation A2BO, A2BOE

In the A2BO the outlet pressure is sensed under the diaphragm. As the outlet pressure decreases below the set point, the range spring pushes the diaphragm against the valve plug, moving the plug off the seat and allowing flow through the regulator (Fig. 3). As the outlet pressure increases it moves the diaphragm against the force of the range spring and allows the valve plug to move towards its seat, thus reducing the flow through the valve. When the outlet pressure exceeds the regulator set point, the regulator is closed.

The A2BOE externally equalized pressure regulator operates like the A2BO except the sensing pressure under the diaphragm is from a point downstream of the valve (Fig. 4).

### Adjustment A2BO, A2BOE

An accurate pressure gauge should be installed at the outlet of the regulator (or at the pressure sensing point for A2BOE). In case of a compensated pressure regulator, pressure gauges should be installed at the outlet of the regulator and also at the compensating pressure to the bonnet.

Carefully remove the seal cap and turn the adjusting stem in (clockwise) to raise the set point, tending to open the seat; or out (counterclockwise) to lower the set point, tending to close the seat. Table 2 shows the set point pressure ranges for the regulators. Do not attempt to exceed the rated maximum pressure setting adjustment because this could damage the regulator or make it inoperative. Severe over adjusting could also apply enough force to damage the diaphragm, or put the spring in solid position. So, if the maximum tightening adjustment has been reached, stop and back out the adjusting stem (counterclockwise) at least one half turn so the range spring can move.

After adjusting the regulator, it is advisable to observe the maintained pressure while the system is operating normally, and to make any minor adjustments desired at that time. Replace the seal cap after the desired set point is reached.

TABLE 2. A2BO OUTLET PRESSURE SETTING RANGES

SET POINT RANGES	APPROX. CHANGE PER TURN OF ADJUSTING SCREW
V: 500 mm hg to 8 bar (20 in. hg to 120 psig)	1.8 bar (25 psi)
D: 5 to 19 bar (75 to 280 psig)	3.6 bar (53 psi)

### Installation All A2 Regulators

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.

Tighten flange bolts and nuts evenly to provide proper seating of the flange gasket and to avoid damage to gasket or flanges. A close coupled companion strainer is available for installation at the inlet of the regulator to help to protect it from any foreign material in the system.

The regulator must be installed with the arrow on the valve body pointing in the direction of the flow for the regulator to function properly. Backwards flow through the regulator is uncontrolled and will vary with the valve model, its setting and the reverse pressure drop encountered. 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 pressure gauges should be installed to be easily visible to the operator adjusting the regulator.

### 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, 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 SET FORTH ABOVE CONSTITUTES THE ONLY WARRANTY APPLICABLE TO REFRIGERATING SPECIALTIES PRODUCTS, AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WRITTEN OR ORAL, INCLUDING ANY WARRANTY OR MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. 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.

### Safe Operation

#### (see also Bulletin RSBVCV)

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 shutoff, 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.**