

# SOLENOID VALVE

## Type S8F

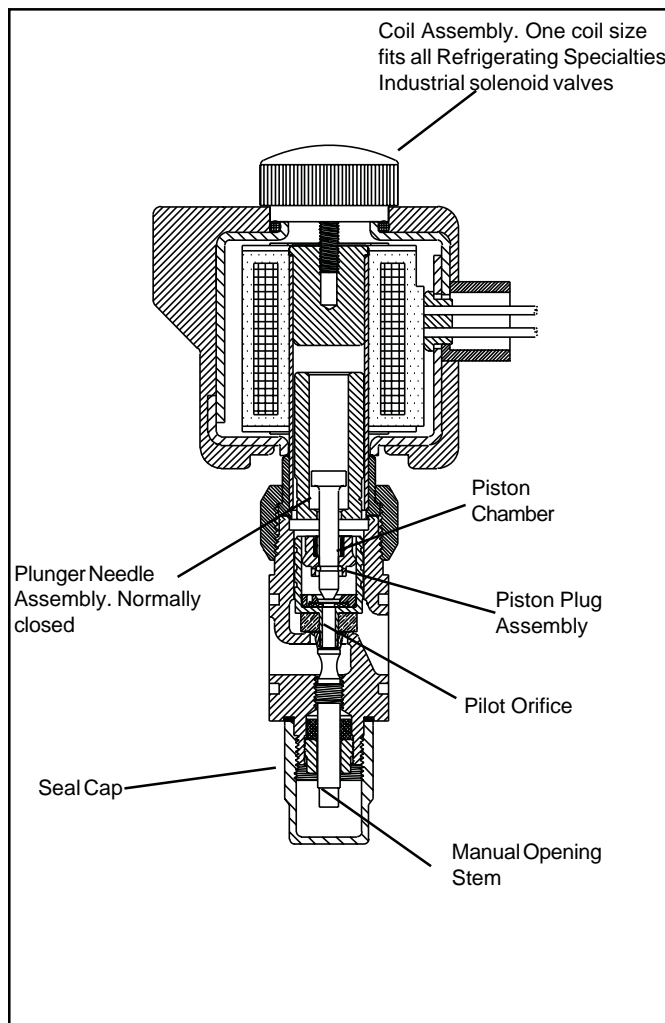
Port Size 13mm (1/2")

FOR AMMONIA, R12, R22, R502

AND OTHER COMMON REFRIGERANTS

### FEATURES

- Standard Coil Housing Meets NEMA 3R and NEMA 4 - Rain Tight
- Coil Housing Surpasses NEMA Salt Spray Test
- Plunger-Needle Assembly Same for S4A, S5A, S6N, S6A
- Replaceable Piston Plug Assembly
- Molded Class "B" Coil Construction
- Same Coil Fits All Refrigerating Specialties Solenoid Valves
- Pilot Light Available
- Stainless Steel Needle, PTFE Seats
- Manual Opening Stem
- MOPD and MRP 27.6 bar (400 PSIG)



### BULLETIN 30-91F

#### Type S8F



March 2002

### Installation, Service and Parts Information

### Description

This compact, heavy duty, pilot-operated, plated ductile iron bodied solenoid valve is suitable for Ammonia, R-12, R-22, R-502 and other common refrigerants for liquid, suction and hot gas lines, and refrigerant oil lines. The plunger-needle assembly is also used with most other Refrigerating Specialties Industrial Solenoid Valves. This valve is usually ordered with a close-coupled stainless steel screen strainer. (See current Bulletin 00-10 for strainer information.)

### Purpose

A solenoid valve is an electrically operated device used to control the flow of liquids or gases in a fully open or fully closed configuration. The S8F is a normally closed solenoid valve to control the flow of refrigerant. Like all Refrigerating Specialties Solenoid Valves, this valve does not modulate. When electrically energized a slight fluid pressure difference across the Valve causes it to promptly open wide; when de-energized, the Main Valve promptly closes to stop all flow in the normal direction.

### Principles of Operation

This is a pilot operated Solenoid Valve. A small Pilot Port is opened by a magnetically lifted Plunger-Needle Assembly; the consequent relief of pressure from the top of a Main Valve and Piston Assembly allows the Assembly to be lifted by the pressure difference between valve inlet and valve outlet. A minimum pressure difference of approximately 1 psi is required for operation.

Operation is as follows, starting with a closed valve: When energized, #6 Solenoid Coil forms a magnetic field which pulls #9 Solenoid Plunger upward, striking Valve Needle and pulling it up from its Pilot Seat to permit fluid travel from Chamber A (in and above #10 Piston Plug Assembly) through Orifice B in #10 Piston Plug Assembly to the downstream side of the Valve. When the pressure in Chamber A has dropped almost to the downstream pressure, the higher upstream pressure, acting on the annular portion of #10 Piston Plug Assembly outside of the Seat Bead, will lift the Main Valve to open position.

When the electrical circuit to the S8F Valve is broken, #6 Solenoid Coil is de-energized, allowing #9 Solenoid Plunger to drop and Valve Needle to close the Pilot Port in #10 Piston Plug. Liquid and/or gas leakage through the clearance area around #10 Piston Plug causes a rapid pressure build up in Chamber A which combines with the downward force of the Spring which is part of #9 Solenoid Plunger and the weight of #10 Piston Plug Assembly to force the Main Valve Disc tight against the Seat Bead to stop all flow.

### Manual Opening

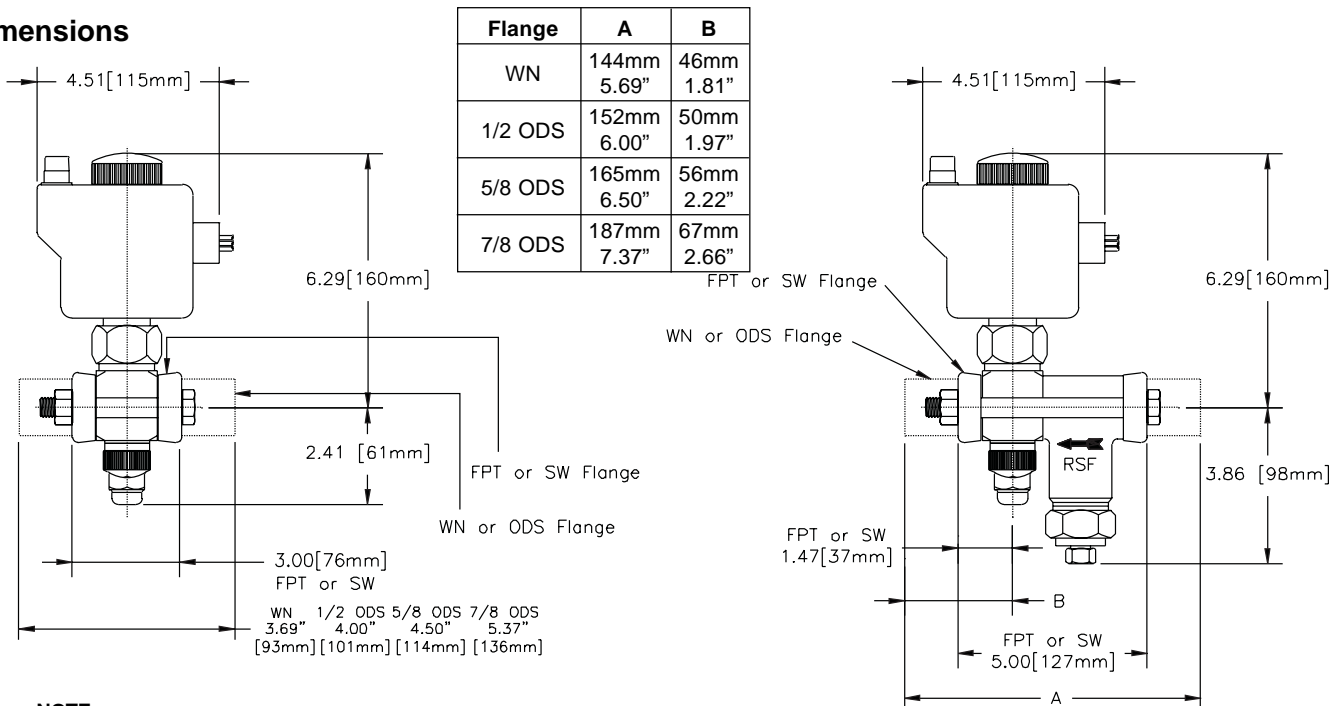
To manually open the S8F Solenoid Valve, cautiously remove #17 Seal Cap and turn #12 Manual Opening Stem in (clockwise viewed from beneath). The rising Stem will lift #10 Piston Plug Assembly from its seat and permit flow. To resume automatic operation, turn #12 Manual Opening Stem out (counterclockwise viewed from beneath) until it stops and replace #17 Seal Cap.

## Repair Kits For Type S8F Solenoid Valve

| Item    | Description  | Qty. | Kit Number  |
|---------|--|------|---|
| 1       | Knob   | 1    | Only Available With Kit                           |
| 2       | Gasket   | 1    | Only Available With Kit                           |
| 1, 2    | Knob Kit   | 1    |   |
| 3       | Encapsulated Coil  | 1    | See Part No. Page 4                               |
| 4       | Lens   | 1    | Only Available With Kit                           |
| 5       | Bulb   | 1    | Only Available With Kit                           |
| 6       | Gasket   | 1    | Only Available With Kit                           |
| 7       | Tube Assembly  | 1    | Only Available With Kit                           |
| 8       | Gasket   | 1    | Only Available With Kit                           |
| 7-8     | Tube Kit   | 1    | 201036  |
| 9       | Plunger Needle Assembly**  | 1    | Only Available With Kit                           |
| 10      | Piston Plug Assembly   | 1    | Only Available With Kit                           |
| 8-10    | Plunger Piston Kit**   | 1    | 202072  |
| 11      | Body, S8F  | 1    | Not Available Separately                          |
| 12      | Stem, Manual Opening   | 1    | Only Available With Kit                           |
| 13      | Washer   | 1    | Only Available With Kit                           |
| 14      | Packing, Stem  | 1    | Only Available With Kit                           |
| 15      | Nut, Packing   | 1    | Only Available With Kit                           |
| 12-15   | Stem Kit, Opening  | 1    | 202238  |
| 16      | O-Ring   | 1    | Only Available With Kit                           |
| 17      | Seal Cap   | 1    | Only Available With Kit                           |
| 16-17   | Cap Kit  | 1    | 202713  |
| 18      | Flange Kit (Specify Flange Style & Connection Size) Includes 2 Flanges Only. Sold Separately | 1    | FK-13. Also Specify Size and Style of Connection. |
| 19      | Bolt   | 2    | Only Available With Kit                           |
| 20      | Nut  | 2    | Only Available With Kit                           |
| 21      | Gasket (★2 if Without Strainer, 3 if With Strainer)  | ★    | Only Available With Kit                           |
| 19-21   | Bolt Kit (S8F Without Strainer)  | —    | 201290  |
| 19-21   | Bolt Kit (S8F With Strainer)   | —    | 201287  |
| 8,16,21 | Gasket Kit (Includes 2 Flange Gaskets)   | —    | 201632  |
| 7-17,21 | Complete Valve Body Assembly   | 1    | 100997  |

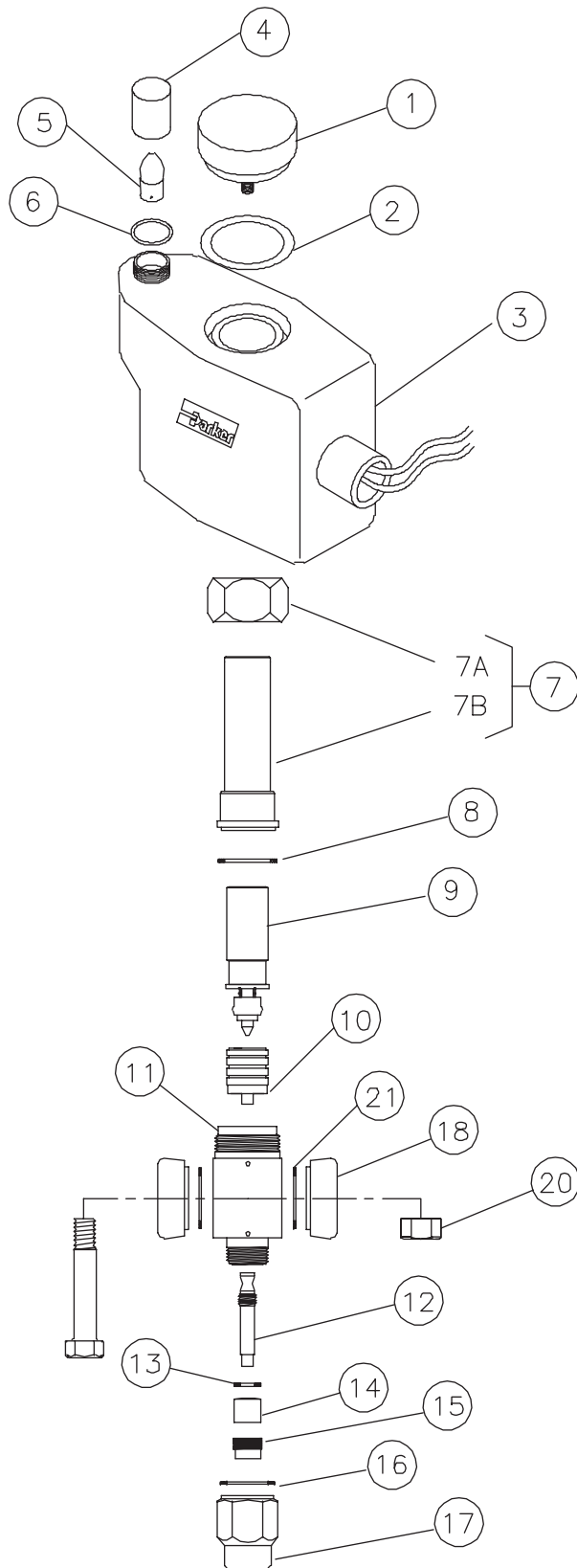
\*\* Not for D.C. Consult factory for correct parts.

### Dimensions



**NOTE:**

Allow 100mm (4.0") above valve for removal of coil housing and coil.  
Allow 25mm (1.0") below valve to operate manual opening stem.



**S8F**

## Installation

Protect inside of valve from dirt, chips and moisture during installation. Mount only in horizontal pipe line with solenoid coil at the top; this valve will work properly only in this position. In a liquid line the Solenoid Valve should be near the expansion valve inlet. It is advisable to install the S8F's close coupled companion strainer ahead of the valve for protection against dirt and chips.

The S8F solenoid valve must be installed with the arrow on the valve body in the direction of flow through the valve. If the valve is backwards, the flow will not be stopped when the valve is electrically de-energized. Like all Solenoid Valves, the S8F can stop flow only in the direction from normal inlet to normal outlet (as shown by the arrow on the body). If reversal of pressure occurs in the system so the outlet pressure exceeds the inlet pressure by more than 0.07 bar (11 psi) the piston will be blown upward from its seat and reverse flow will occur. If a system has this type of pressure reversal (as encountered during hot gas defrost with liquid recirculation systems), a check valve such as Refrigerating Specialties Division Type CK4A in series with the solenoid valve will prevent flow reversal. (CK4A must be installed downstream to avoid trapping liquid.)

## Electrical

The Refrigerating Specialties Division molded water resistant Class "B" 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. The coil housing far exceeds the requirements of NEMA Standard ICS, 1 - 110.57 salt spray test for rust resistance.

By definition, Class "B" coil construction will permit coil temperatures, as measured by resistance method, as high as 130°C (266°F). Final coil temperatures are a function of both fluid and ambient temperatures. The higher fluid temperatures require lower ambient temperatures so the maximum coil temperature is not exceeded. Conversely, low fluid temperatures permit higher ambient temperatures.

The molded Class "B" coil is available from stock with most standard voltages. However, coils are available for other voltages and frequencies, as well as for direct current. Coils are also available as transformer type with a 6 volt secondary winding for use with the Refrigerating Specialties Division Pilot Light Assembly (see current copy of Bulletin 60-10, "Pilot Light Assembly and Solenoid Transformer Coil").

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 burnout. Also, operating with line voltage below the limit will definitely result in lowering the valve opening pressure differential. Power consumption during normal operation will be 33 watts or less.

Inrush and running current is listed below:

| Standard Coil<br>Volts/Hertz | Part<br>Number | Inrush<br>Current<br>(Amps) | Running<br>Current<br>(Amps) | Fuse<br>Size<br>(Amps) |
|------------------------------|----------------|-----------------------------|------------------------------|------------------------|
| 120/60 (Blue leads)          | 205184         | 1.60                        | 0.52                         | 1                      |
| 208/60 (Blue & Red leads)    | 205189         | 0.88                        | 0.28                         | 1                      |
| 240/60 (Red leads)           | 205188         | 0.86                        | 0.26                         | 1                      |
| 440/60 (Yellow & Red leads)  |                | 0.39                        | 0.13                         | 1                      |
| 115/50 (Yellow & Blue leads) | 205184         | 1.50                        | 0.46                         | 1                      |
| 230/50 (Yellow leads)        | 205185         | 0.92                        | 0.26                         | 1                      |
| Other                        |                |                             | (Contact Factory)            |                        |

On transformer coil the 6 volt leads are always black.

## Service Pointers

The S8F Solenoid Valve and Strainer are easily removable for cleaning or repairing. To remove valve and strainer, merely unscrew the flange bolts and spread the flanges slightly apart.

**1. Failure to Open:** (a) Coil is of incorrectly high voltage. See "Electrical" Check Voltage printed on the coil. (b) Line voltage is abnormally low. See "Electrical." Check line voltage at coil leads with a voltmeter. (c) Failure to electrically energize. Check control circuit. (d) Pressure difference across valve is too high. The S8F will open against a maximum pressure difference across the valve of 21 bar (300 psig). (e) Solenoid Coil is burned out. See "Electrical," and replace with proper coil. (f) #10 Piston Plug Assembly is sticking. To disassemble the S8F for inspection of internal parts (after pumping out the system as required): disconnect power source to #6 Solenoid Coil, remove #7 Tube Assembly, lift out #9 Plunger Needle

Assembly, then remove #10 Plug Assembly. Remove every trace of dirt from the piston and cylinder using fine emery cloth to remove burrs if necessary. Thoroughly clean all parts and reassemble using a light film of refrigeration oil on the Piston.

**2. Failure to Close:** (a) Electrical control circuit is not opening properly. Check wiring and controls. (b) There are chips or dirt on the Pilot Seat or the Main Valve Disc (both in #10 Piston Plug Assembly), preventing proper seating. Disassemble and clean Valve as outlined in (1f) above. (c) Main Valve Disc, Pilot Seat, or Valve Needle may be worn or damaged and therefore leaking. Disassemble and clean Valve as outlined in (1f) above. If any of these parts need replacing, it is advisable to replace using #8-10 Plunger Piston Kit. (d) #10 Piston Plug is sticking. See (1f) above. (e) #12 Manual Opening Stem is turned all or partly in, holding #10 Piston Plug Assembly open and permitting flow through the valve. (f) #1 Coil Housing Screw (made of non-magnetic stainless steel) has been replaced with a screw made of magnetic material and residual magnetism is holding #9 Plunger Needle Assembly in the open position. Consequently, the Main Valve is not closing. Replace with screw of correct material.

**3. Leakage Through Valve:** See (2) above.

**4. Overheating:** The Solenoid Coil is designed to operate hot and is constructed of high temperature materials accordingly. Unless troubled with actual Coil burnouts, high coil temperature should be ignored. Persistent burnouts indicate improper line or coil voltage. See (1e) above.

## 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 SET FORTH ABOVE CONSTITUTES THE ONLY WARRANTY APPLICABLE TO REFRIGERATING SPECIALTIES PRODUCTS, AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, INCLUDING ANY WARRANTY OF 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 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 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.