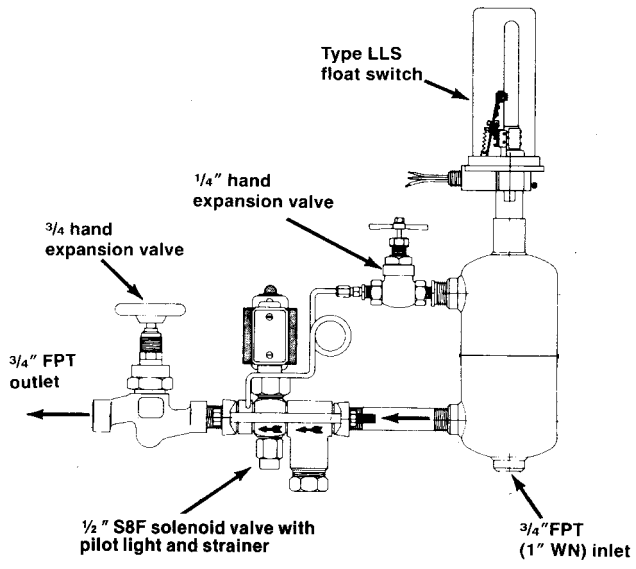
AUTOMATIC LIQUID DRAINER

Type ALD

FOR AMMONIA, R-12, R-22, R-502
AND OTHER COMMON REFRIGERANTS

FEATURES

- Drains Liquid Only.
- Stops Flow of Vapor.
- Prevents Vapor Lockup.
- Built-in Strainer.
- No Small Orifices.
- Resists Wire Drawing.
- Includes Pilot Light.
- Manual Opening Stem.
- Design Pressure (MRP): 26.7 bar (400 psig).



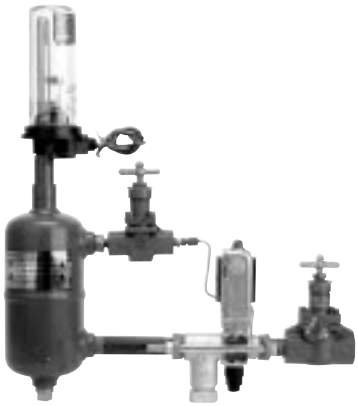
Type ALD Automatic Liquid Drainer
Fig. 1

Description

The Type ALD Automatic Liquid Drainer is a combination of a Type LLS Float Switch, a 13mm (1/2") Port Size Type S8F Solenoid Valve with Pilot Light Assembly, a 3/4" and a 1/4" Hand Expansion Valve, as well as necessary pipe and fittings, complete for field assembly as shown on Figure 1. All are heavy duty devices intended for use with Ammonia, R-12, R-22, R-502 and other common refrigerants.

For more information see also Bul. 61-10E (LLS), Bul. 30-91E (S8F), Bul. 80-01 (Hand Valves), Bul. 00-10E (Strainer) and Bul. 60-10C (Pilot Light Assembly).

BULLETIN 62-01A
TYPE ALD



March 2002
Installation, Service and Parts Information

Purpose

It is the purpose of the Type ALD Automatic Liquid Drainer to permit flow of liquid refrigerant only and to prevent the flow of vapor refrigerant. It is intended for use in draining liquid from defrosting evaporators, or heat recovery condensers, into a lower pressure portion of the system.

Principles of Operation

Liquid refrigerant, which drains by gravity from a defrosting evaporator, or a heat recovery condenser, enters the Type LLS Float Switch at the bottom connection, which is 3/4" FPT or 1" WN. When the amount of liquid is sufficient to raise the ball in the float chamber to its high level point, the electrical circuit to the Type S8F Solenoid Valve coil is closed, the coil is energized and the valve opens. The liquid flow now is out of the chamber, through the solenoid valve, the 3/4" Hand Expansion Valve and into a lower pressure portion of the refrigeration system, usually the suction line.

When the liquid level in the float chamber has dropped by 50mm (2"), the solenoid valve is de-energized and closes, stopping flow of liquid.

The float chamber is continuously vented to the lower pressure section of the refrigeration system. The flow is through the 1/4" Hand Expansion Valve and the Flange Ring Tube Assembly which is connected to the outlet of the solenoid valve. This venting prevents vapor pressure from building up in the float chamber and causing a vapor lockup, which would stop the draining of liquid. (The venting process is especially important if the float chamber is in an ambient temperature warmer than the temperature of the liquid being drained.)

The rate of flow of refrigerant vapor (or liquid) through the 1/4" vent valve is dependent upon the pressure difference between the float chamber and the Type ALD outlet pressure. When the ALD is functioning as a liquid drainer and venting is important, the pressure difference is higher than when it is not draining and the pressure difference is small, allowing almost no flow.

It also is possible for the ALD to maintain a constant flow if the rate of liquid flow into the float chamber is equal to that leaving it.

Manual Opening

The ALD liquid drainer can be manually opened to drain, by manually opening the Type S8F Solenoid Valve. This is done by cautiously removing the seal cap on the bottom of the S8F and then turning the manual opening stem in (clockwise when viewed from beneath). To resume automatic operation, turn the manual opening stem out (counterclockwise when viewed from beneath) until it stops, and replace the seal cap.

AUTOMATIC LIQUID DRAINER CAPACITIES

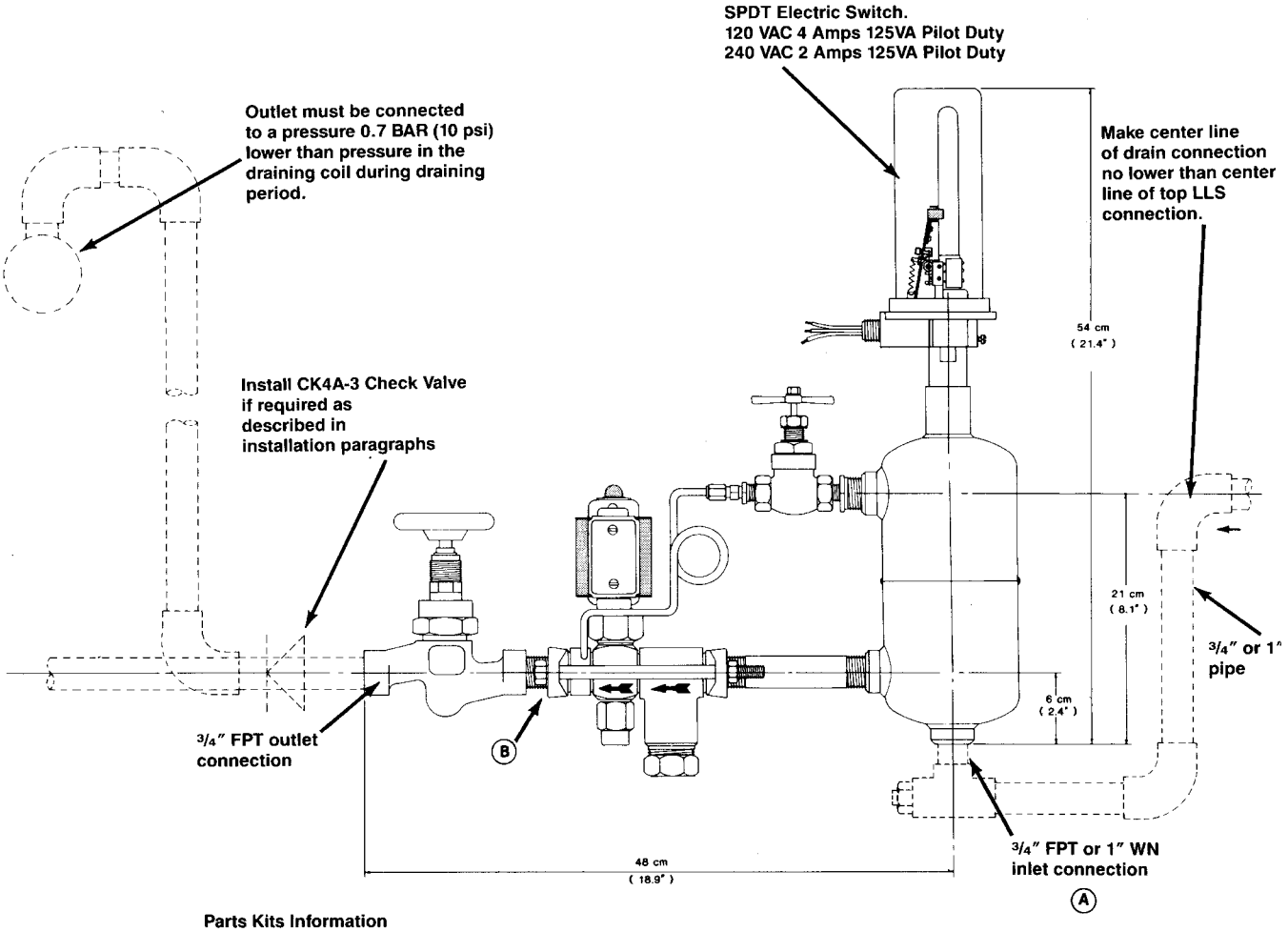
Use: Hot Gas Defrost Liquid Drainer
(Evaporator capacities at temperatures listed)

	KW Evaporator Size			
Ref't	-7°C	-18°C	-29°C	-40°C
R-12	37	30	26	23
R-22	48	39	34	30
R-502	36	30	26	23
R-717	206	167	145	125
	Tons Evaporator Size			
Ref't	**20°F**	**0°F**	**-20°F**	**-40°F**
R-12	10	8	7	6
R-22	14	11	10	9
R-502	10	8	7	6
R-717	59	48	41	35

Use: Heat Reclaim Condenser Liquid Drainer
(Condenser flow rate at liquid temperatures listed)

	Kg/Min. Flow Rate			
Ref't	38°C	24°C	10°C	-4°C
R-12	28.8	29.2	29.6	29.8
R-22	25.7	26.3	26.8	27.3
R-502	26.1	26.8	27.4	0
R-717	18.3	187	19.0	19.3
	Lbs./Min. Flow Rate			
Ref't	**100°F**	**75°F**	**50°F**	**25°F**
R-12	63.6	64.4	65.1	65.8
R-22	56.6	57.9	59.2	60.3
R-502	57.6	59.1	60.5	61.7
R-717	40.4	41.2	41.8	42.5

NOTE: All above capacities are nominal based on 3/4" Hand Expansion Valve set for 0.7 Bar (10 psi) pressure drop from inlet of LLS (Point "A") to outlet of Solenoid Valve (Point "B") and a continuous flow rate.



Parts Kits Information
- S8F Solenoid Valve—Bulletin 30-91E
- RSF Strainer—Bulletin 00-10E
- LLS Float Switch—Bulletin 61-10E
- Pilot Light Assembly—Bulletin 60-10C
- Hand Valves—Bulletin 80-01

Fig. 2

Installation

The ALD Automatic Liquid Drainer must be installed in a position that will insure adequate, gravity draining of liquid from the bottom of the defrosting evaporator or heat recovery condenser. The lowest desired level of liquid in the coil being drained should be at, or above the high level mark indicated on the side of the float chamber. If the refrigerant drain connection from the bottom of the coil is no lower than the top connection on the float chamber, complete draining of the coil will be achieved.

The ALD should be installed in a position that will allow for adequate maintenance and where it cannot be damaged by material handling or other equipment.

The outlet connection must go to a part of the refrigeration system that will be at least 0.7 Bar (10 psi) lower than the pressure in the draining coil during the time in which draining is to take place. If at anytime during the system operation, either during the draining or the refrigeration mode, the pressure at the ALD outlet will be higher than that in the float chamber, a Type CK4A-3 In-line Check Valve should be installed in the outlet line to prevent reverse flow.

The outlet connection to the lower pressure part of the refrigeration system will usually be to suction pressure. This suction connection can be higher in elevation than the ALD. Usually, a solid column of liquid in a riser from the ALD to the suction line will not reverse flow when the ALD's solenoid valve is closed, because, during this period of time, the float chamber is filling and at a higher pressure than the suction pressure plus the pressure caused by the column of liquid. If the outlet riser exceeds 6m (20 ft.) for ammonia, or 3m (10 ft.) for R-12, R-22 or R-502, a Type CK4A-3 should be installed at the ALD outlet.

The Refrigerant Float Switch is shipped from the factory with a plastic plug in the bottom connections and a metal clip in the upper side equalizing connection covered by a plastic plug. The forked portion of the clip slips over the float rod and supports the float ball and float rod in the upper position. This keeps the float ball from bouncing and possibly being damaged if dropped or otherwise mishandled in shipment. Also with float rod in the upper position, the attraction sleeve is held in the magnetic field and the magnet is held securely against the enclosing tube protecting the switch mechanism.

Remove the plastic plugs from the chamber connections and the metal clip from the upper connection before installing.

Caution: Do not twist the metal clips as this may damage the float stem. Grasp the tab on the metal clip securely and pull straight out.

The Refrigerant Float Switch must always be mounted in a near vertical position. The side of the float chamber can be used as a leveling surface and, with the use of a simple level, proper position can be obtained.

If the ALD will be exposed to ambient temperatures above that of the liquid refrigerant being drained, it should be insulated. Otherwise, performance will be improved if exposed to temperatures lower than the liquid being drained.

Protect inside of the S8F Solenoid 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.

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. If reversal of pressure occurs in the system so the outlet pressure exceeds the inlet pressure by more than 0.07 kg/cm^2 (1 psi) the piston will be blown upward from its seat and reverse flow will occur. If a system has this type of pressure reversal, a check valve such as Refrigerating Specialties Division Type CK4A-3, in series with the solenoid valve, will prevent flow reversal. (CK4A must be installed downstream to avoid trapping liquid.)

Hand Expansion Valve Adjustment

The 3/4" Hand Expansion Valve must be adjusted so that the pressure drop across the S8F solenoid valve does not exceed approximately 0.7 Bar (10 psi). This is particularly important for an ammonia system to prevent the erosive action caused by liquid flashing into vapor as it passes through the opening that causes the pressure drop. This erosive action is sometimes called "wire drawing".

The actual pressure drop across the solenoid valve is not always easy to measure, but it is directly related to the corresponding temperature drop. For most defrosting or heat recovery conditions using R-22, R-502, or R-717, a temperature drop of 20 to 30°C (40 to 60°F) will be equivalent to a pressure drop of less than 0.7 bar (10 psi). For R-12 the equivalent temperature drop is 31 to 50°C (60 to 100°F).

The 1/4" Hand Expansion Valve must be adjusted so that, ideally, the pressure in the float switch chamber during the filling process is slightly less than the pressure in the coil from which the liquid is draining. This can be judged without the use of pressure gauges by setting the expansion valve so that the temperature of the filling chamber is one or two degrees colder than the liquid entering it.

Electrical

The solenoid coil and float switch 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 Volts/Hertz	Inrush Current (Amps)	Running Current (Amps)	Fuse Size (Amps)
120/60 (Blue leads)	1.18	0.46	1
208/60 (Blue & Red leads)	0.63	0.26	1
240/60 (Red leads)	0.60	0.23	1
440/60 (Yellow & Red leads)	0.39	0.13	1
115/50 (Yellow & Blue leads)	1.22	0.21	1
230/50 (Yellow leads)	0.65	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 **after purging refrigerant** 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 Kg/cm^2 (300 psi). (e) Solenoid Coil is burned-out. See “Electrical,” and replace with proper coil. (f) 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 Solenoid Coil, remove Tube Assembly, lift out Plunger Needle Assembly, then remove 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 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 Plunger Piston Kit. (d) Piston Plug is sticking. See (1f) above. (e) Manual Opening Stem is turned all or partly in, holding Piston Plug Assembly open and permitting flow through in valve. (f) Coil Housing Screw (made of non-magnetic stainless steel) has been replaced with a screw made of magnetic material and residual magnetism is holding 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.

5. Replacement of Switch Assembly: The Hermetic Float Switch Assembly, can be replaced without pumping down the float chamber. It is necessary only to disconnect the electrical leads in the junction box at or near the float switch, loosen the base set screw and slide the Switch Assembly up from the Float Rod Enclosing Tube. The new Switch Assembly can then be replaced in a similar manner.

6. Failure to Open or to Close: The Hermetic Float Switch Assembly is a sealed unit which cannot be field serviced. Before replacing the assembly as described in paragraph No. 5 above, external wiring should be checked to be sure that the trouble is not somewhere other than the float switch. If the switch can be determined to be defective then the Switch Assembly must be replaced.

7. Switch Current Limitations: The electrical capacities of the switch are listed in page 2. Continual switching of overload contacts will, of course, eventually burn or pit them to a point where they will no longer perform their function. Grossly overloading can weld the contacts together so that they will not open. Errors in field wiring which place a dead short across the contacts will destroy the electrical switch. Good wiring practice will dictate using a properly sized fuse in the control circuit to protect the switch as well as the load.

8. Low Temperature Ambients: If it is necessary to install a Switch Assembly in an ambient temperature below -20°C (0°F), caution should be used when flexing the plastic insulated wire leads. At very low temperatures -40°C (-40°F) the leads are stiff and undue bending may crack the insulation.

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 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 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. A 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.