

3-Way Valves

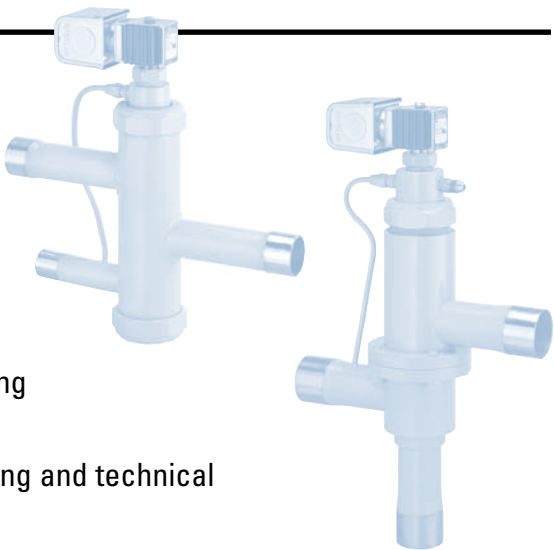
The right solenoid valve for any job.



Sporlan 3-Way Valves

Advantages

- 3-Way Pilot eliminates costly high- to low-side leaks.
- “B” Type reduces total installed cost by eliminating need for normally open solenoid valve on systems requiring reclaim condenser pump out.
- High capacity at minimum pressure drop.
- Tight synthetic main port seating.
- Easily mounted in vertical or horizontal line to simplify piping requirements.
- Proven performance backed by Sporlan service, engineering and technical support.
- Standard solenoid coil available at ANY Sporlan wholesaler.
- UL Listed file #MH4576, CSA Listed file #LR19953, CE Approved



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NOT FOR USE WITH HAZARDOUS OR CORROSIVE FLUIDS

3-Way Heat Reclaim Valves

22, 134a, 401A, 402A, 404A, 407C, 502, 507



Type B5D



Type 8D



Type 12D



Type 16D

UL and SR Listed
CE Approved

General

Today more and more applications are utilizing “heat reclaim” as a means of providing a supplementary or even a primary heat source. Heat reclaim can significantly lower energy costs. Heat reclaim is best described as the process of reclaiming heat that would normally be rejected by an outdoor condenser. Typically, the refrigerant is diverted to an air handler in an area that requires heat. One of the older applications of heat reclaim is in a supermarket, since a supermarket has a constant supply of heat removed from the many refrigerated display fixtures and coolers. Today there are many cost-effective applications of heat reclaim in refrigeration, air conditioning, dehumidification and heat pump systems.

While the most popular application of heat reclaim is air, water heating is popular in supermarkets, convenience stores and restaurants, which all use considerable amounts of hot water. Essentially any application that requires heat can recover the heat from a refrigeration or air conditioning system. The energy efficiency of recovered heat will almost always be more efficient than any other purchased heat source. The common sense question is “Why reject heat to the outdoors when additional heat is required in any other moderate temperature application within the system or building?” 3-Way refrigerant heat reclaim valves make it convenient to recover rejected or waste heat.

Application

Valves may be installed in either a horizontal or vertical position. However, it should not be mounted with the coil housing below the valve body.

Series versus Parallel Piping Schematics

Figures 2 & 3, Pages 3 & 4 show typical piping schematics for the two basic types of piping arrangements, series and parallel condensers. The selection of the piping arrangement will depend on the sizing of the reclaim coil and the control scheme of the system.

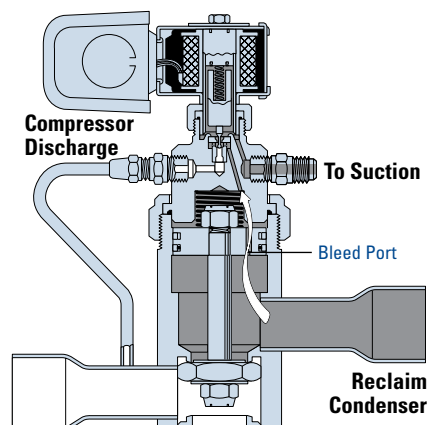
If the parallel piping arrangement is used, the reclaim condenser must be sized to handle 100% of the rejected heat at the conditions and time at which the reclaim coil is being utilized.

If the series piping arrangement is used, care and safety measures should be taken to prevent the mixing of subcooled refrigerant with hot gas vapors. These safety measures could include pressure or temperature lockout controls and time delay relays.

For both parallel and series piping, when the idle condenser is pumped down to suction pressure, a small solenoid valve can be used to pressurize the idle condenser prior to the 3-way valve shifting. This may reduce the potential for stress and fatigue failure of the refrigerant piping.

Heat Reclaim with or without a Bleed Port

3-Way Heat Reclaim Valves with 3-way pilot valves are available in a variety of different sizes. These



TYPE B RECLAIM CONDENSER PUMP OUT
Figure 1

valves are available with an optional “bleed” port, see Figure 1. The bleed port allows the refrigerant to be removed from the heat reclaim coil or heat exchanger when it is not being used. There are two reasons why the refrigerant is removed from the heat reclaim coil. One is to maintain a proper balance of refrigerant in the system (i.e., refrigerant left in the reclaim coil could result in the remainder of the system operating short of charge). A second reason is to eliminate the potential of having condensed refrigerant in an idle coil. When an idle reclaim coil has condensed or even subcooled liquid refrigerant sitting in the tubes there is a potential for a problem. When refrigerant liquid, either saturated or subcooled, is mixed with hot gas refrigerant, the reaction of the mixing can cause severe liquid hammer. Hot gas mixed with liquid can create thousands of pounds of force and has the potential of breaking refrigerant lines and valves.

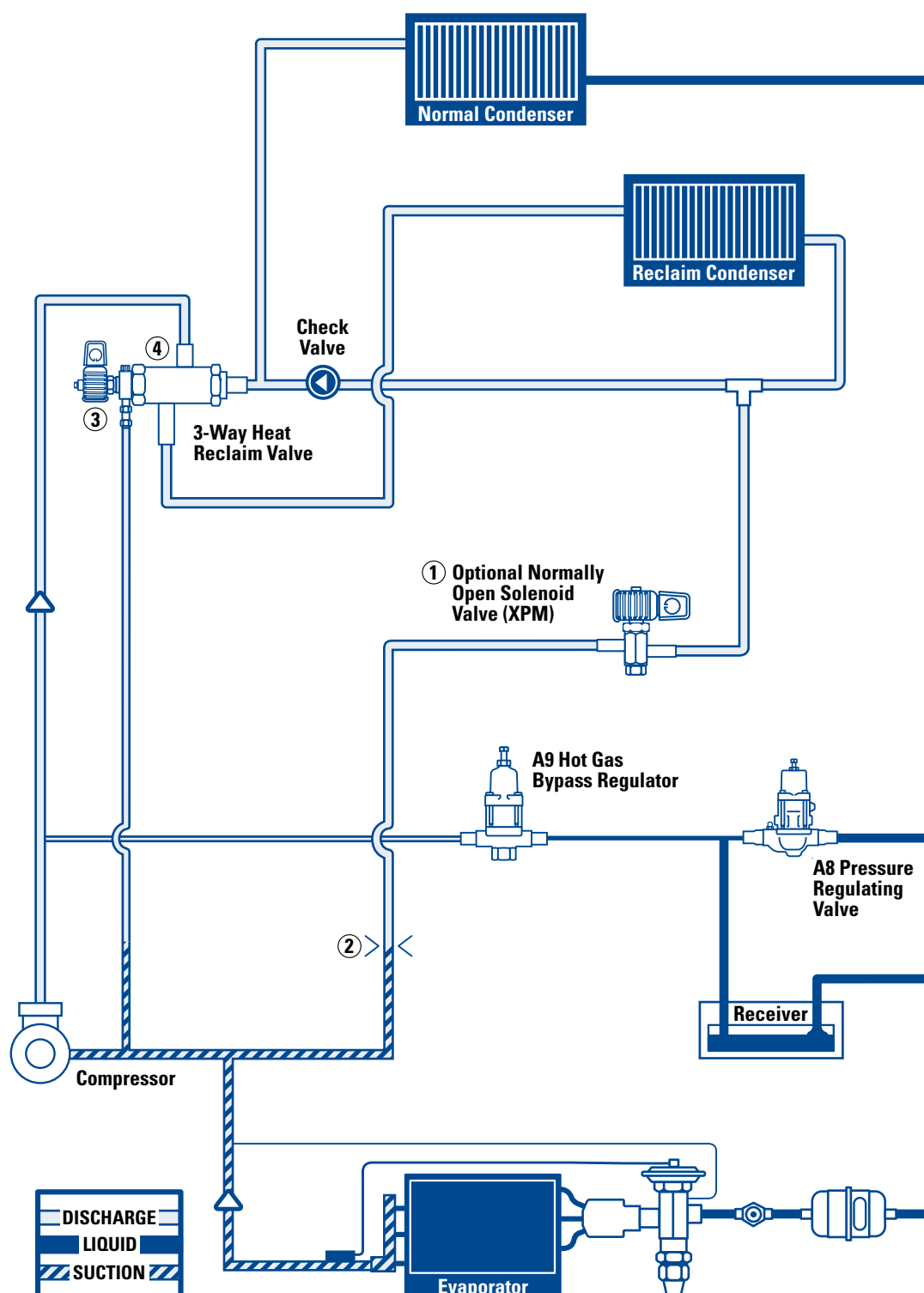
An alternate method of removing the refrigerant from a heat reclaim coil is to use a separate normally open solenoid valve and an optional fixed metering device, see Figures 2 & 3, Pages 3 & 4. The separate solenoid valve allows the flexibility of pumping out the reclaim heat exchanger as a liquid instead of a vapor. There are two benefits to pumping out the reclaim coil as a liquid: (1) Removal of any oil that may be present in the reclaim heat exchanger. (2) The refrigerating effect of the liquid can be used to lower the superheat of vapor entering the compressor, instead of cooling the heat reclaim heat exchanger.

Sporlan recommends that recognized piping references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage resulting from system design, or for misapplication of its products.

Note: A check valve should be installed in the heat reclaim pump out or bleed line whenever the reclaim heat exchanger is exposed to temperatures lower than the saturated suction temperature of the system. This will prevent migration of refrigerant to the coldest location in the system.

22, 134a, 401A, 402A, 404A, 407C, 502, 507

3-Way Heat Reclaim Valves



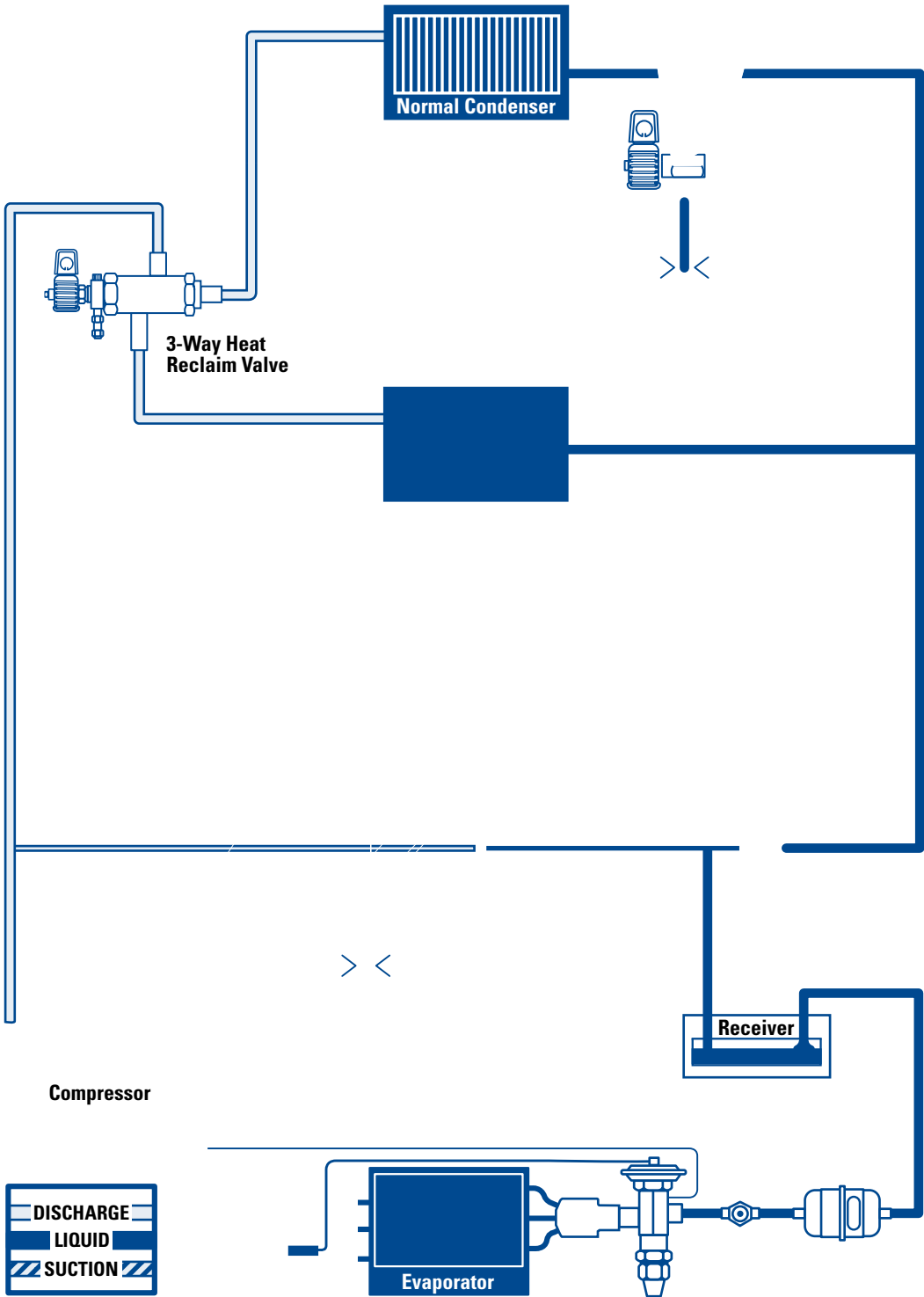
Series Condenser
Typical Piping
Schematic

Figure 2

- ① Use optional solenoid valve and piping if pump out is required and "C" model Heat Reclaim Valve is used, see Note 4. It is optional to omit this solenoid valve and piping on systems using "B" model Heat Reclaim Valve.
- ② Restrictor, Part #2449-004, may be required to control pump out rate on inactive condenser.
- ③ Pilot suction line must be open to common suction whether or not Heat Reclaim Coil is installed at time of installation and regardless of Heat Reclaim Valve model/type.
- ④ Proper support of heat reclaim valves is essential. Concentrated stresses resulting from thermal expansion or compressor vibrations can cause fatigue failure of tubing, elbows and valve fittings. Fatigue failures can also result from vapor propelled liquid slugging, and condensation induced shock. The use of piping brackets close to each of the 3-Way valve fittings is recommended.

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3-Way Heat Reclaim Valves

Operation

All Sporlan's 3-Way Heat Reclaim Valves have a pilot operated design that shifts the refrigerant flow to either the normal condenser or the reclaim condenser based on the heating requirements of the application.

"B" Type**Normal (Outdoor) Condenser – De-energized**

See Figure 4. With the pilot valve de-energized, high side pressure ① is prevented from entering the cavity above the piston-seat assembly ②. At the same time the upper pilot port is opened to suction pressure ③. The resulting pressure differential across the piston moves the piston-seat assembly to close the reclaim condenser port (upper main port). In this mode the system refrigerant flows to the normal condenser.

The pilot valve opens the cavity above the piston ②, to suction ③. This allows the reclaim condenser to be pumped out through a small bleed hole in the piston. The pump out process reduces the reclaim condenser to suction pressure. Once the suction pressure is reached, the flow through the bleed hole in the piston stops. There is no remaining high to low side bleed, with continued operation in the normal condenser mode. For a more efficient pump out of the reclaim

condenser, a normally open solenoid valve can be added to the lowest physical location of the heat reclaim coil to remove liquid.

"C" Type**Normal (Outdoor) Condenser – De-energized**

See Figure 4. With the pilot valve de-energized, high side pressure ① is prevented from entering cavity above the piston-seat assembly ②. At the same time the upper pilot port is opened to suction pressure ③. The resulting pressure differential across the piston moves the piston-seat assembly to close the reclaim (upper) main port. We use a solid piston ring on the piston thereby eliminating high to low side bleed, and the resulting capacity loss with the system in the normal condenser mode.

Note: When the heat reclaim condenser is used for heating hot water, some form of bleed is required. Type C valves with no method of bleed in the heat reclaim condenser may result in isolated reclaim condenser pressures higher than the saturated discharge pressure of the system. In this condition, the higher reclaim condenser pressure could prevent the valve from shifting into the reclaim mode. Or,

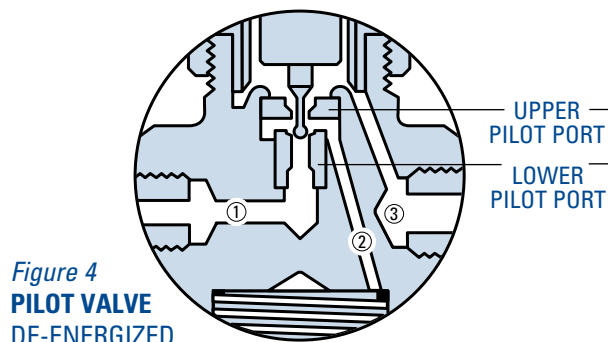


Figure 4
PILOT VALVE
DE-ENERGIZED

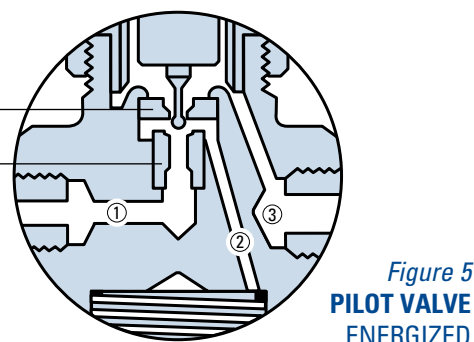


Figure 5
PILOT VALVE
ENERGIZED

Specifications

VALVE SERIES	TYPE	STANDARD CONNECTIONS Inches	PORT SIZE Inches	MOPD psi*	MRP psi**	STANDARD COIL RATINGS		
						VOLTS/CYCLES	WATTS	COIL
B5D	B5D5B	5/8	0.625	400	650	24/50-60 120/50-60 208-240/50-60 120-208-240/50-60	10	MKC-1
	B5D5C							
8D	8D7B	7/8	3/4	300	450			
	8D7C							
	8D9B	1-1/8						
	8D9C							
12D	12D11B	1-3/8	1-1/4					
	12D11C							
	12D13B	1-5/8						
	12D13C							
	12D17B	2-1/8						
16D	16D17B	2-1/8	2					
	16D17C							

* MOPD stands for Maximum Operating Pressure Differential.

** MRP stands for Maximum Rated Pressure.

■ Available with conduit boss or junction box at no extra charge.

■ Dual voltage 4-wire coils, 120-208-240/50-60 are available at slight additional cost. For other voltages and cycles, consult Sporlan, Washington, MO 63090.

3-Way Heat Reclaim Valves
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the balance of pressures and spring forces could result in flow to both the reclaim and normal condenser connections. One solution is to install a check valve in the reclaim condenser line and either use a Type B valve or provide a pump out solenoid connected to the tubing between the reclaim connection of the 3-way valve and the check valve.

“B” and “C” Type
Reclaim (Reheat) Condenser – Energized

See Figure 5. When the pilot valve is energized, high side pressure ① is permitted to flow through the lower pilot port. At the same time, the upper pilot port is closed to suction ③. High side pressure ①, builds up on top of the piston ②, moves the piston-seat assembly to close the normal condenser port, and opens the reclaim (upper) main port. With the upper pilot port closed, there is no high to low side bleed with the system in the reclaim mode.

Selection

- For a given refrigerant, select a valve having a port size with capacity most closely matching the evaporator maximum load requirements in tons at the design evaporator temperature. Refer to the tables on Page 7. Take into account the allowable pressure drop across the valve port.
- Select the proper coil assembly for the valve type and match the voltage requirements. All standard AC voltage options are available. For voltages

not listed in coil specification, consult Sporlan, Washington, MO.

Ordering Instructions

When ordering complete valves, specify Valve Type, Voltage and Cycles.

When ordering Valve Body ONLY, specify Valve Type.

When ordering Coil Assembly ONLY, specify Coil Type, Voltage and Cycles.

Example: MKC-1 120/50-60; MKC-2 120/50-60.

Dimensions – Inches

TYPE	A	B	C	D	E	F	G	H	J
B5D5B	5.00	4.36	3.22	3.22	0.80	3.84	0.50	2.92	1.64
B5D5C									
8D7B	4.94	5.06	3.44	3.44	1.12	2.62	0.75	2.92	1.64
8D7C									
8D9B		5.12					0.91		
8D9C									
12D11B	6.63	6.94	4.19	4.19	2.37	4.37	0.97	2.92	1.64
12D11C									
12D13B							1.09		
12D13C									
12D17B							1.25		
16D17B	7.94	9.53	5.47	5.47	3.50	5.44	1.25	3.17	1.89
16D17C									

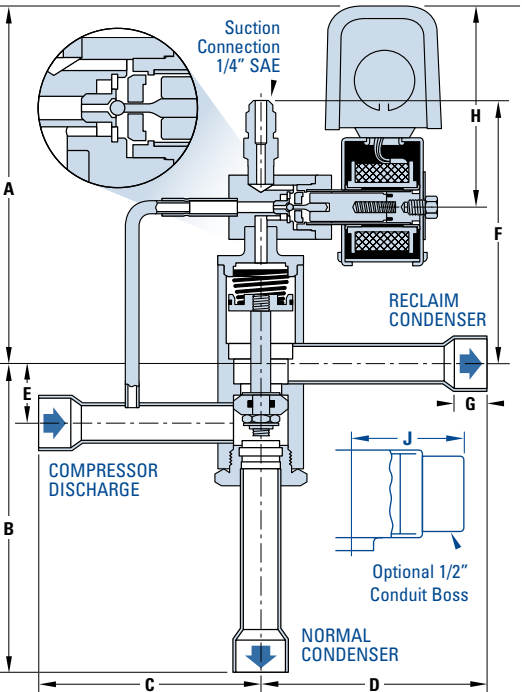
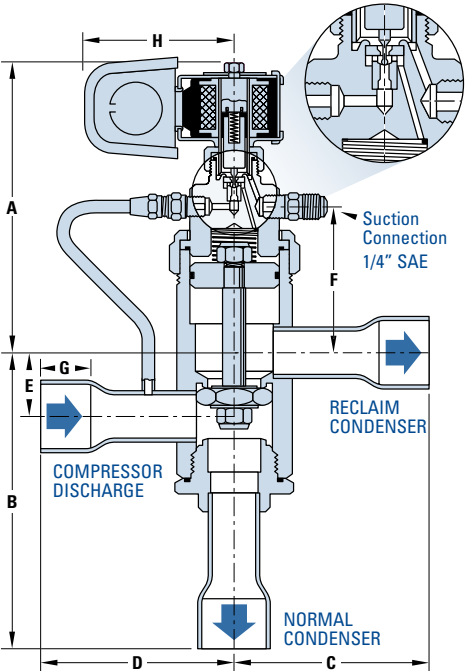


Figure 6



TYPE 8D - 12D - 16D

22, 134a, 401A, 402A, 404A, 407C, 502, 507

3-Way Heat Reclaim Valves

Evaporator Capacities — Tons

Capacities are based on 100°F condensing temperature isentropic compression plus 50°F, evaporator temperature as shown plus 25°F superheat suction gas. For capacities at other conditions, use the Sporlan Selection Program or the multipliers in the correction table below. All capacity ratings are in accordance with ARI Standard No. 760-80.

EVAPORATOR TEMP. °F	R-22								R-134a							
	PSI – Pressure Drop								PSI – Pressure Drop							
	2				4				2				4			
	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D
40	4.7	10.1	29.1	70.0	6.6	14.2	41.8	100	4.0	8.4	24.0	57.9	5.5	11.8	34.5	83.0
30	4.7	9.9	28.6	68.7	6.5	13.9	41.0	98.7	3.9	8.2	23.5	56.5	5.4	11.5	33.7	81.0
20	4.6	9.7	28.0	67.4	6.3	13.7	40.2	96.8	3.8	8.0	22.9	55.1	5.2	11.2	32.9	79.0
10	4.5	9.5	27.4	66.0	6.2	13.4	39.4	94.5	3.7	7.8	22.3	53.6	5.1	10.9	32.0	77.0
0	4.4	9.3	26.8	64.5	6.1	13.1	38.5	92.5	3.6	7.6	21.7	52.2	5.0	10.7	31.1	74.8
-10	4.3	9.1	26.2	63.0	5.9	12.8	37.6	90.5	3.5	7.4	21.0	50.7	4.8	10.3	30.2	72.6
-20	4.2	8.9	25.5	61.5	5.8	12.5	36.7	88.1	---	---	---	---	---	---	---	---
-30	4.1	8.7	24.9	59.9	5.7	12.2	35.8	85.8	---	---	---	---	---	---	---	---
-40	4.0	8.4	24.2	58.2	5.5	11.8	34.7	83.5	---	---	---	---	---	---	---	---

EVAPORATOR TEMP. °F	R-401A								R-402A							
	PSI – Pressure Drop								PSI – Pressure Drop							
	2				4				2				4			
	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D
40	4.3	9.2	26.2	63.2	6.0	12.9	37.7	91.0	4.1	8.8	25.9	62.3	5.7	12.4	37.3	89.0
30	4.2	9.0	25.6	61.7	5.9	12.6	36.8	88.5	4.0	8.6	25.3	60.7	5.6	12.1	36.3	87.0
20	4.1	8.8	25.0	60.3	5.7	12.3	36.0	86.4	3.9	8.4	24.6	59.0	5.4	11.7	35.3	84.6
10	4.0	8.6	24.4	58.8	5.6	12.0	35.1	84.3	3.8	8.1	23.8	57.3	5.3	11.4	34.2	82.1
0	3.9	8.3	23.8	57.3	5.4	11.7	34.1	82.1	3.7	7.9	23.1	55.4	5.1	11.0	33.1	79.5
-10	3.8	8.1	23.1	55.7	5.3	11.4	33.2	79.9	3.6	7.6	22.3	53.6	4.9	10.7	32.0	76.8
-20	---	---	---	---	---	---	---	---	3.4	7.3	21.5	51.7	4.7	10.3	30.9	74.0
-30	---	---	---	---	---	---	---	---	3.3	7.1	20.7	49.7	4.6	9.9	29.7	71.3
-40	---	---	---	---	---	---	---	---	3.2	6.8	19.9	47.7	4.4	9.5	28.6	68.4

EVAPORATOR TEMP. °F	R-404A								R-407C							
	PSI – Pressure Drop								PSI – Pressure Drop							
	2				4				2				4			
	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D
40	4.2	9.0	26.4	63.5	5.9	12.7	38.0	91.0	5.0	10.6	30.8	74.0	6.9	14.9	44.2	105.9
30	4.1	8.8	25.7	61.8	5.7	12.3	37.0	88.7	4.9	10.4	30.0	72.2	6.7	14.5	43.1	103.4
20	4.0	8.6	25.0	60.1	5.5	12.0	35.9	86.1	4.7	10.1	29.3	70.4	6.6	14.2	42.1	100.8
10	3.9	8.3	24.2	58.2	5.4	11.6	34.9	83.5	4.6	9.9	28.5	68.5	6.4	13.8	40.9	98.1
0	3.7	8.0	23.4	56.3	5.2	11.2	33.7	80.7	4.5	9.6	27.7	66.6	6.2	13.5	39.8	95.4
-10	3.6	7.7	22.6	54.3	5.0	10.8	32.5	77.9	4.4	9.3	26.9	64.7	6.1	13.0	38.7	92.6
-20	3.5	7.5	21.8	52.3	4.8	10.4	31.3	75.0	4.2	9.0	26.1	62.7	5.9	12.7	37.4	89.9
-30	3.3	7.2	20.9	50.3	4.6	10.0	30.1	72.1	4.1	8.7	25.2	60.7	5.7	12.2	36.3	87.0
-40	3.2	6.9	20.0	48.2	4.4	9.6	28.8	69.1	---	---	---	---	---	---	---	---

EVAPORATOR TEMP. °F	R-502								R-507							
	PSI – Pressure Drop								PSI – Pressure Drop							
	2				4				2				4			
	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D	B5D	8D	12D	16D
40	3.7	8.0	23.4	56.2	5.2	11.2	33.6	81.0	4.1	8.8	25.7	61.6	5.7	12.3	36.9	88.3
30	3.6	7.8	22.8	54.9	5.1	10.9	32.8	78.7	4.0	8.5	25.0	60.0	5.5	12.0	35.9	86.0
20	3.6	7.6	22.2	53.4	4.9	10.7	31.9	76.6	3.9	8.3	24.3	58.3	5.4	11.6	34.9	83.6
10	3.5	7.4	21.6	52.0	4.8	10.3	31.0	74.5	3.8	8.0	23.5	56.5	5.2	11.2	33.8	81.0
0	3.4	7.2	21.0	50.4	4.7	10.1	30.2	72.3	3.6	7.8	22.8	54.7	5.0	10.9	32.7	78.4
-10	3.3	7.0	20.3	48.9	4.5	9.8	29.3	70.1	3.5	7.5	22.0	52.8	4.9	10.5	31.6	75.8
-20	3.1	6.7	19.7	47.3	4.4	9.4	28.3	67.8	3.4	7.3	21.2	50.9	4.7	10.1	30.5	73.0
-30	3.0	6.5	19.0	45.6	4.2	9.1	27.3	65.4	3.3	7.0	20.4	49.0	4.5	9.8	29.3	70.3
-40	2.9	6.3	18.3	44.0	4.1	8.8	26.3	63.0	3.1	6.7	19.6	47.0	4.3	9.4	28.1	67.4

Evaporator Temperature Correction Factors

Evaporator Temperature °F	40	30	20	10	0	-10	-20	-30	-40
Multiplier	1.00	0.96	0.93	0.90	0.87	0.84	0.81	0.78	0.75

3-Way Heat Reclaim Valves

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Head Pressure Control for Reclaim Systems

When employing heat reclaim on a refrigeration system, the addition of head pressure controls is important not only to maintain liquid pressure at the expansion valve inlet, but also to assure the availability of quality hot gas at the reclaim heat exchanger. Typically, the additional energy required to maintain a higher head pressure, is not enough to pay for an alternate method of heating.

Split condenser controls are also important to minimize the required refrigerant charge for winter time operation. See Page 10.

See Sporlan Bulletin 90-30, Head Pressure Control Valves for high and low ambient stability. When low ambient conditions are encountered during fall-winter-spring operation, the Sporlan head pressure controls hold back liquid refrigerant so a portion of the condenser surface is inactive. This results in a rise in condensing pressure.

Calculating Refrigerant Charge

To calculate additional charge required for head pressure control, the following procedure is suggested:

Series Systems

- Obtain from condensing unit manufacturer or calculate the amount of charge required to totally flood the outdoor condenser (see table on Page 9).

- Calculate the amount of refrigerant required to totally flood the connecting piping from the reclaim condenser outlet to the outdoor condenser inlet.

- Care must be taken not to oversize the heat reclaim coil. Low head pressure will result in poor quality heat rejected, reflected by a drop in leaving air temperature. Consult equipment manufacturer or coil manufacturer for suggested sizing.

Also, subcooled liquid at the outlet of a series piped reclaim condenser can result in dangerous hydraulic pressures when mixed with compressor discharge gas upon termination of a heating cycle.

- Calculate the amount of refrigerant required to totally flood the piping from the outdoor condenser to the head pressure control valve. If the head pressure control valve is located at the outdoor condenser outlet, Step d. is not required.

Parallel Systems

Obtain the required refrigerant charge from the condenser manufacturer or calculate the amount of charge required to flood both condensers, at the ambient condition the system is expected to operate (see Bulletin 90-30-1). If the inactive condenser will be pumped out, reduce the amount of liquid required by the charge needed for the inactive condenser.

NOTE: Receiver must be capable of holding this added charge without exceeding 80% of its volume.

22, 134a, 401A, 402A, 404A, 407C, 502, 507

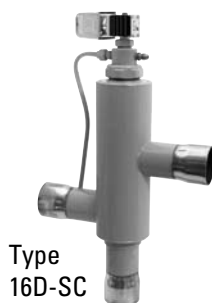
3-Way Heat Reclaim Valves

Data to Calculate Refrigerant to Flood Condenser and Associated Piping* — lbs.

REFRIGERANT	MINIMUM AMBIENT °F	EQUIVALENT LENGTH of TUBING for EACH RETURN BEND – Feet			DENSITY FACTOR – Pounds per Foot of Tubing					
					TUBING OD and WALL THICKNESS – Inches					
		3/8"	1/2"	5/8"	3/8 (.016)	1/2 (.017)	5/8 (.018)	7/8 (.045)	1-1/8 (.050)	1-3/8 (.055)
22	-40	.200	.250	.300	.056	.104	.167	.296	.505	.769
	-20				.055	.102	.163	.289	.493	.750
	0				.054	.100	.159	.282	.481	.732
	20				.052	.097	.154	.274	.468	.712
	40				.051	.094	.150	.267	.454	.692
	60				.049	.091	.145	.258	.440	.670
	70				.048	.089	.143	.254	.433	.659
134a	-40	.200	.250	.300	.057	.105	.167	.297	.507	.772
	-20				.055	.102	.164	.291	.496	.755
	0				.054	.100	.160	.284	.484	.736
	20				.053	.097	.156	.276	.471	.718
	40				.051	.095	.151	.269	.458	.698
	60				.050	.092	.147	.261	.444	.677
	70				.049	.090	.144	.256	.437	.666
401A	-40	.200	.250	.300	.056	.103	.164	.292	.497	.758
	-20				.055	.101	.161	.286	.487	.742
	0				.053	.098	.157	.279	.475	.724
	20				.052	.096	.153	.272	.463	.705
	40				.050	.093	.149	.264	.450	.685
	60				.049	.090	.144	.255	.435	.663
	70				.048	.088	.141	.251	.428	.651
402A	-40	.200	.250	.300	.056	.104	.166	.295	.504	.767
	-20				.055	.101	.162	.288	.490	.747
	0				.053	.098	.157	.279	.476	.725
	20				.052	.095	.152	.270	.460	.701
	40				.050	.092	.146	.260	.443	.675
	60				.047	.088	.140	.249	.424	.646
	70				.046	.086	.137	.243	.414	.630
404A	-40	.200	.250	.300	.052	.095	.152	.271	.462	.703
	-20				.050	.093	.149	.264	.450	.686
	0				.049	.090	.145	.257	.438	.667
	20				.047	.088	.140	.249	.424	.646
	40				.046	.084	.135	.240	.409	.622
	60				.044	.081	.129	.230	.392	.596
	70				.043	.079	.126	.224	.382	.582
407C	-40	.200	.250	.300	.053	.098	.156	.277	.472	.719
	-20				.052	.095	.152	.270	.460	.701
	0				.050	.092	.148	.262	.447	.682
	20				.049	.090	.143	.254	.433	.660
	40				.047	.086	.138	.245	.418	.636
	60				.045	.083	.132	.235	.400	.610
	70				.044	.081	.129	.229	.391	.595
502	-40	.200	.250	.300	.059	.108	.173	.307	.524	.798
	-20				.057	.106	.169	.300	.511	.778
	0				.056	.103	.164	.292	.497	.757
	20				.054	.100	.159	.283	.483	.735
	40				.052	.097	.154	.274	.467	.711
	60				.050	.093	.149	.264	.451	.686
	70				.049	.091	.146	.259	.443	.673
507	-40	.200	.250	.300	.051	.095	.151	.269	.458	.697
	-20				.050	.092	.147	.261	.445	.678
	0				.048	.089	.142	.253	.431	.657
	20				.047	.086	.138	.245	.417	.635
	40				.045	.083	.133	.236	.402	.612
	60				.043	.080	.127	.226	.385	.587
	70				.042	.078	.124	.221	.376	.573

* Example calculations can be found in Bulletin 90-30-1.

3-Way Split Condenser Valves 22, 134a, 401A, 402A, 404A, 407C, 502, 507



UL and SP Listed
CE Approved

Application

The split condenser valve is a relatively simple modification of the standard heat reclaim valve. Figure 7 below shows a split condenser valve. The upper seat and port of the split condenser valve opens and closes. The lower port is always open. During the normal full condenser mode, the refrigerant flow is split evenly between the two halves of the condenser.

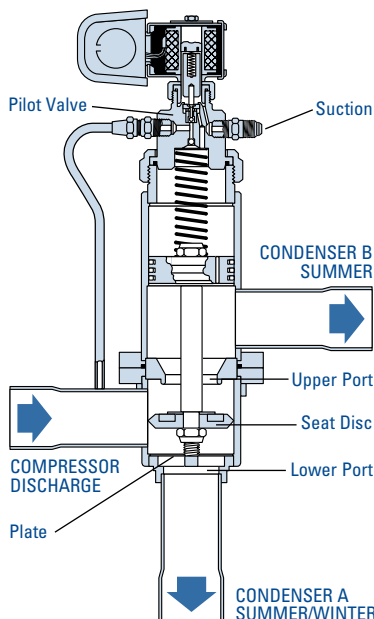


Figure 7
TYPE 12D13B-SC

When employing heat reclaim in series with the outdoor condenser of a refrigeration system, the required refrigerant charge may be a potential problem. If a majority or all of the heat is removed from the

refrigerant in the heat reclaim coil, some or all of the refrigerant may be in the form of liquid when it enters the outdoor condenser coil. During this condition, the liquid charge in the system would have to be large enough to completely fill the condenser with liquid. The requirement for this charge may be reduced by splitting and using only half of the outdoor condenser. During the winter the effectiveness of the condenser surface area is much greater than it is during the summer. Typically, split condenser valves are controlled by an ambient temperature control set for a specific outdoor temperature. This usually coincides with the requirement for heat reclaim in the building. In some applications, the control system will also split the condenser anytime the heat reclaim coil is active.

Operation

The pilot valve is different from the standard heat reclaim valve. It is normally open to high pressure.

"B" and "C" Type

Two Condenser Mode - De-energized

See Figure 8. With the pilot valve de-energized, high side pressure ① is permitted to flow through the lower pilot port at the same time the upper pilot port is closed to suction ②. High side pressure ① built up on top of the piston moves the piston-seat assembly down to evenly split the flow between the two condensers. The piston-seat assembly is held in place by a plate located in the Condenser A connection. This plate is designed to limit restriction through that port. With the upper pilot port closed, there is no high to low side bleed and no resulting capacity loss with the system in the two condenser mode.

Note: If the pressure in your idle Condenser B is less than the suction pressure at the suction connection, you may have charge

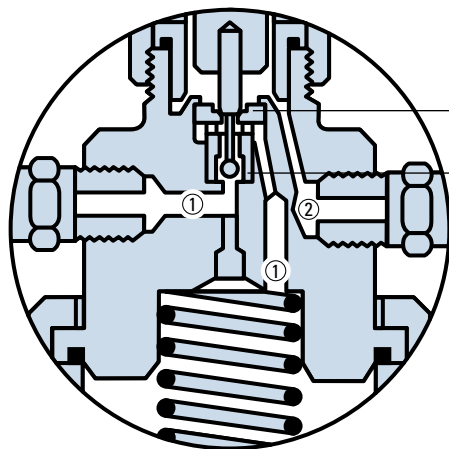


Figure 8
PILOT VALVE DE-ENERGIZED

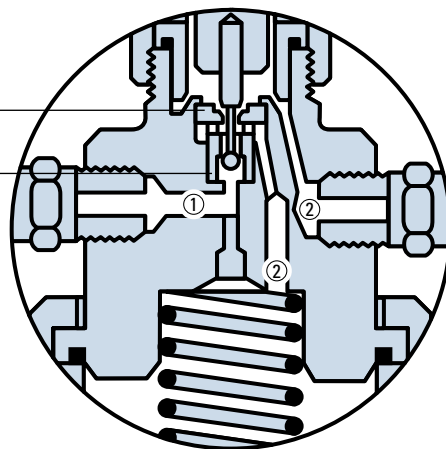


Figure 9
PILOT VALVE ENERGIZED

22, 134a, 401A, 402A, 404A, 407C, 502, 507

3-Way Split Condenser Valves

migration back into your idle Condenser B. Install a small check valve in the suction pilot line to prevent this.

"B" (Bleed) Type

Single Condenser Mode - Energized

See Figure 9. With the pilot valve energized, high side pressure ① is prevented from entering the cavity above the piston-seat assembly. At the same time the upper pilot port is opened to suction pressure ②. This opens the cavity above the piston-seat assembly to suction pressure ②. The cavity below the piston is exposed to high pressure. The resulting pressure differential across the piston moves the piston-seat assembly up to close the upper (Condenser B) port. When the upper pilot port opens, Condenser B is pumped out through a small bleed hole in the piston. When Condenser B has been pumped out and reduced to suction pressure, all flow ceases, thus eliminating high to low side bleed and the resulting capacity loss that may occur with the system in the single condenser mode.

"C" (No Bleed) Type

Single Condenser Mode - Energized

See Figure 9. With the pilot valve energized, high side pressure ① is prevented from entering the cavity above the piston-seat assembly. At the same time the upper pilot port is opened to suction pressure ②. This opens the cavity above the piston-seat assembly to suction pressure ②. The cavity below the piston is exposed to high pressure. The resulting pressure differential across the piston moves the piston-seat assembly up to close the upper (Condenser B) port. We use a solid piston ring on the piston thereby eliminating high to low side bleed, around the piston and the resulting capacity loss that may occur, with the system in the single condenser mode.

Selection

1. For a given refrigerant, select a valve having a port size with capacity most closely matching the evaporator maximum load requirements in tons at the design evaporator temperature. Refer to the tables on Page 14. Take into account the allowable pressure drop across the valve port.
2. Select the proper coil assembly for the valve type and match the voltage requirements. All standard AC voltage options are available. For voltages not listed in coil specification, consult Sporlan, Washington, MO.

Piping Selection

Valves may be installed in either a horizontal or vertical position. However, it should not be mounted with the coil housing below the valve body. Install Split Condenser Valves so the connections are in the proper flow direction as shown in Figure 7 on Page 10.

Figure 11 shows a piping schematic to illustrate the general installation of the Split Condenser Valves. Figure 12 shows a piping schematic to illustrate the general installation of both the heat reclaim valve and the split condenser valve. Sporlan recommends that recognized piping references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage resulting from system design, or for misapplication of its products.

Nomenclature

16D	17	C	-	SC
Valve Type	Connections in 1/8"	Non-Bleed Version		Split Condenser

Specifications

VALVE SERIES	TYPE	CONNECTION ODF SOLDER Inches	PORT SIZE Inches	MOPD psi*	MRP psi**	STANDARD COIL RATINGS		
						VOLTS/CYCLES	WATTS	COIL
8D	8D9B-SC	1-1/8	3/4	300	450	24/50-60 120/50-60 208-240/50-60 120-208-240/50-60	10	MKC-1
12D	12D11B-SC	1-3/8	1-1/4					
	12D13B-SC	1-5/8						
	12D17B-SC	2-1/8						
16D	16D17B-SC	2-1/8	2					
	16D17C-SC							

* MOPD stands for Maximum Operating Pressure Differential.

** MRP stands for Maximum Rated Pressure.

■ Available with conduit boss or junction box at no extra charge.

■ Dual voltage 4-wire coils, 120-208-240/50-60 are available at slight additional cost. For other voltages and cycles, consult Sporlan, Washington, MO 63090.

3-Way Split Condenser Valves

22, 134a, 401A, 402A, 404A, 407C, 502, 507

Ordering Instructions

When ordering complete valves, specify Valve Type, Voltage and Cycles.

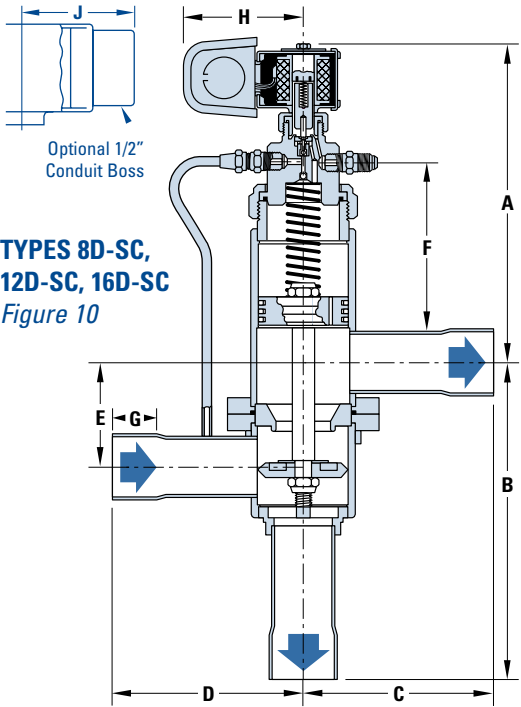
When ordering Valve Body ONLY, specify Valve Type.

When ordering Coil Assembly ONLY, specify Coil Type, Voltage and Cycles.

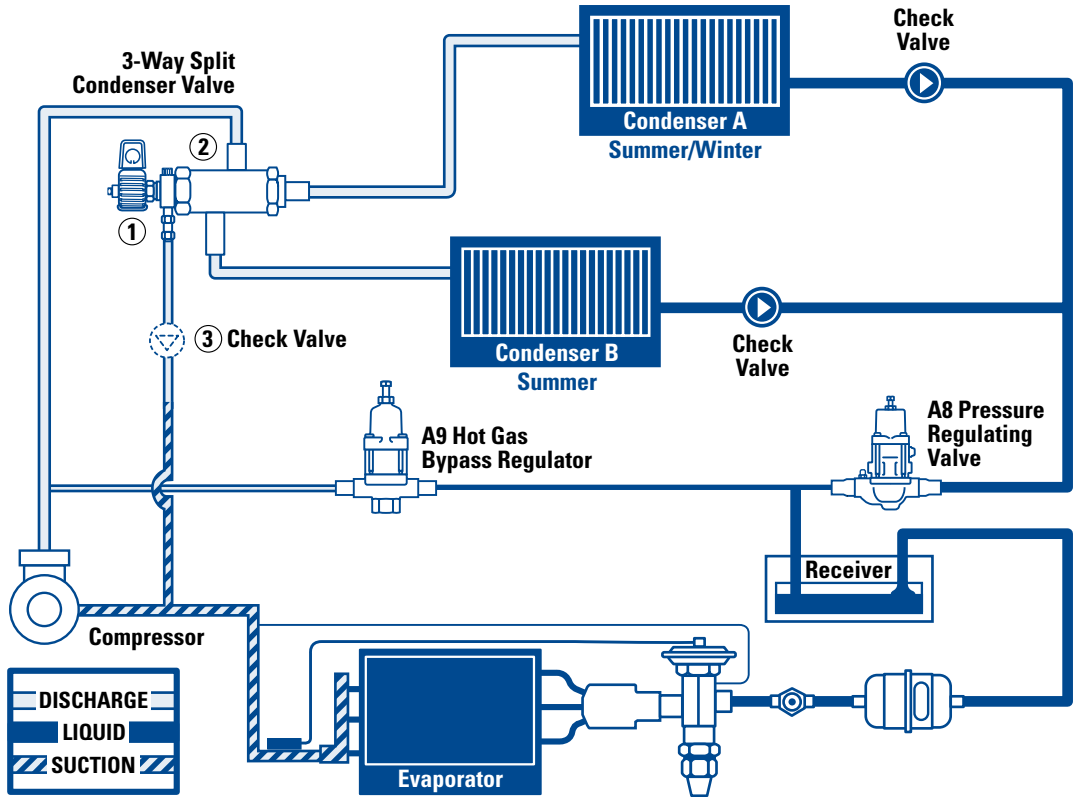
Example: MKC-1 120/50-60; MKC-2 120/50-60.

Dimensions

TYPE	A	B	C	D	E	F	G	H	J
8D9B-SC	5.18	5.13	3.44	3.44	1.13	2.63	0.91	2.94	1.64
12D11B-SC	6.87	6.94	4.19	4.19	2.38	4.25	0.97	2.94	1.64
12D13B-SC							1.09		
16D17B-SC	8.18	9.53	5.47	5.47	3.50	5.44	1.25	3.17	1.89
16D17C-SC									



TYPES 8D-SC, 12D-SC, 16D-SC
Figure 10

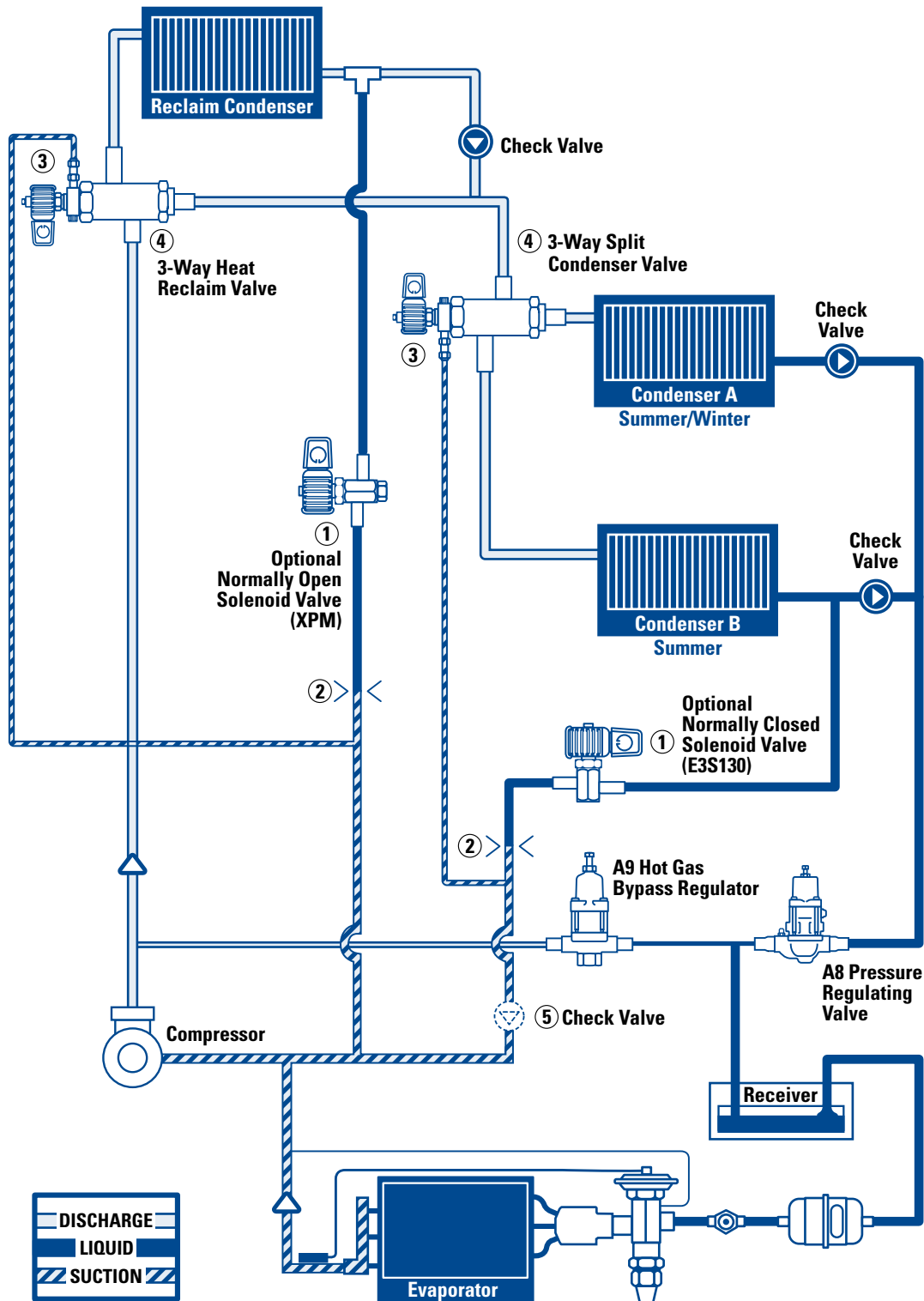


Typical Piping Schematic
Figure 11

- Pilot suction line must be open to common suction whether or not Split Condenser Valve is installed at time of installation and regardless of Split Condenser model/type.
- Proper support of split condenser valve is essential. Concentrated stresses resulting from thermal expansion or compressor vibrations can cause fatigue failure of tubing, elbows and valve fittings. Fatigue failures can also result from vapor propelled liquid slugging, and condensation induced shock. The use of piping brackets close to each of the 3-Way valve fittings is recommended.
- This check valve is required if lowest operating ambient temperature is lower than evaporator temperature.

22, 134a, 401A, 402A, 404A, 407C, 502, 507

3-Way Split Condenser Valves



Typical Piping
Schematic
Figure 12

- ① Use optional solenoid valve and piping if pump out is required. See Note 3.
- ② Restrictor, Part #2449-004, may be required to control pump out rate on inactive condenser.
- ③ Pilot suction line must be open to common suction whether or not Split Condenser Valve is installed at time of installation and regardless of Split Condenser model/type.
- ④ Proper support of split condenser valve is essential. Concentrated stresses resulting from thermal expansion or compressor vibrations can cause fatigue failure of tubing, elbows and valve fittings. Fatigue failures can also result from vapor propelled liquid slugging, and condensation induced shock. The use of piping brackets close to each of the 3-Way valve fittings is recommended.
- ⑤ This check valve is required if lowest operating ambient temperature is lower than evaporator temperature.

3-Way Split Condenser Valves

22, 134a, 401A, 402A, 404A, 407C, 502, 507

Evaporator Capacities – Tons

Capacities are based on 100°F condensing temperature isentropic compression plus 50°F, evaporator temperature as shown plus 25°F superheat suction gas. All capacity ratings are in accordance with ARI Standard No. 760-80.

EVAPORATOR TEMP. °F	R-22						R-134a					
	PSI – Pressure Drop						PSI – Pressure Drop					
	2			4			2			4		
	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC
40	15.7	33.9	94.7	22.8	51.3	139	13.0	27.6	77.7	18.8	41.7	114
30	15.4	33.3	92.9	22.3	50.3	137	12.7	26.9	75.8	18.3	40.7	112
20	15.1	32.6	91.0	21.9	49.2	134	12.3	26.2	73.9	17.9	39.7	109
10	14.8	31.9	89.1	21.4	48.1	131	12.0	25.5	71.9	17.4	38.6	106
0	14.5	31.1	87.1	21.0	47.0	128	11.7	24.8	69.9	16.9	37.5	103
-10	14.1	30.4	85.0	20.5	45.9	125	11.3	24.1	67.9	16.4	36.4	99.9
-20	13.8	29.6	82.8	20.0	44.7	122	11.0	23.4	65.8	15.9	35.3	96.9
-30	13.4	28.8	80.6	19.4	43.5	119	10.6	22.6	63.7	15.4	34.1	93.8
-40	13.1	28.0	78.4	18.9	42.2	115	10.3	21.8	61.6	14.9	33.0	90.7

EVAPORATOR TEMP. °F	R-401A						R-402A					
	PSI – Pressure Drop						PSI – Pressure Drop					
	2			4			2			4		
	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC
40	13.3	28.1	79.3	19.2	42.4	117	13.9	31.0	84.9	20.2	46.8	125
30	13.0	27.4	77.5	18.8	41.4	114	13.6	30.1	82.7	19.7	45.5	122
20	12.7	26.7	75.6	18.3	40.4	111	13.2	29.3	80.4	19.1	44.3	118
10	12.4	26.1	73.7	17.9	39.4	109	12.8	28.4	78.0	18.5	42.9	115
0	12.0	25.4	71.8	17.4	38.3	106	12.4	27.5	75.5	18.0	41.5	111
-10	11.7	24.7	69.9	17.0	37.3	103	12.0	26.6	72.9	17.4	40.1	107
-20	11.4	24.0	67.9	16.5	36.2	99.9	11.6	25.6	70.3	16.7	38.7	104
-30	11.0	23.2	65.9	16.0	35.1	97.0	11.1	24.6	67.6	16.1	37.2	99.6
-40	10.7	22.5	63.8	15.5	34.0	94.0	10.7	23.6	64.9	15.4	35.7	95.6

EVAPORATOR TEMP. °F	R-404A						R-407C					
	PSI – Pressure Drop						PSI – Pressure Drop					
	2			4			2			4		
	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC
40	14.3	31.6	86.9	20.7	47.7	128	15.6	33.6	93.7	22.5	50.8	138
30	13.9	30.7	84.5	20.1	46.4	124	15.2	32.8	91.5	22.0	49.5	135
20	13.5	29.9	82.1	19.6	45.1	121	14.8	32.0	89.2	21.4	48.3	131
10	13.1	28.9	79.6	19.0	43.7	117	14.4	31.1	86.8	20.9	47.0	128
0	12.7	28.0	77.0	18.3	42.3	113	14.0	30.2	84.4	20.3	45.6	124
-10	12.2	27.0	74.3	17.7	40.8	109	13.6	29.3	81.9	19.7	44.3	121
-20	11.8	26.0	71.5	17.0	39.3	105	13.2	28.4	79.3	19.1	42.9	117
-30	11.3	24.9	68.7	16.4	37.7	101	12.8	27.4	76.8	18.5	41.5	113
-40	10.8	23.9	65.8	15.7	36.1	96.8	12.3	26.5	74.1	17.9	40.0	109

EVAPORATOR TEMP. °F	R-502						R-507					
	PSI – Pressure Drop						PSI – Pressure Drop					
	2			4			2			4		
	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC	8D-SC	12D-SC	16D-SC
40	12.7	28.1	77.3	18.4	42.5	114	13.9	30.9	84.8	20.2	46.6	125
30	12.4	27.4	75.4	17.9	41.4	111	13.6	30.0	82.5	19.6	45.4	121
20	12.1	26.7	73.4	17.5	40.3	108	13.2	29.2	80.1	19.1	44.1	118
10	11.7	25.9	71.3	17.0	39.2	105	12.8	28.3	77.7	18.5	42.7	114
0	11.4	25.2	69.2	16.5	38.0	102	12.4	27.4	75.2	17.9	41.4	111
-10	11.0	24.4	67.1	16.0	36.8	98.8	11.9	26.4	72.6	17.3	39.9	107
-20	10.7	23.6	64.9	15.4	35.6	95.5	11.5	25.5	70.0	16.7	38.5	103
-30	10.3	22.7	62.6	14.9	34.4	92.2	11.1	24.5	67.3	16.0	37.0	99.1
-40	9.9	21.9	60.3	14.4	33.1	88.8	10.6	23.5	64.6	15.4	35.5	95.1

22, 134a, 401A, 402A, 404A, 407C, 502, 507

3-Way Hot Gas Defrost Valves

Application

3-Way Hot Gas Defrost valves are used for gas defrost only. One or more compressors are used to provide refrigeration for multiple evaporators, both medium and low temperature. The 3-Way valves are used to control either the flow of gas off a discharge header to the various evaporators, or suction gas from the evaporators to the suction header. The direction of flow is dependent upon whether the pilot valve is energized or de-energized.

The same pilot is used on both the 10G79B and 10G711B. As a result of reversing the suction and discharge connections, the 10G711C requires a different pilot assembly. It is **NOT** interchangeable with the “B” series pilot assembly. The 3-Way valve body is take-apart construction, as is the pilot valve and both may be completely serviced in the field.

The 10G79B, 10G711B and 10G711C may be installed either upright or on its side. However, it should not be mounted with the coil housing below the valve body.

Ordering Instructions

When ordering complete valves, specify Valve Type, Voltage and Cycles.

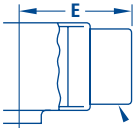
When ordering Valve Body ONLY, specify Valve Type.

When ordering Coil Assembly ONLY, specify Coil Type, Voltage and Cycles.

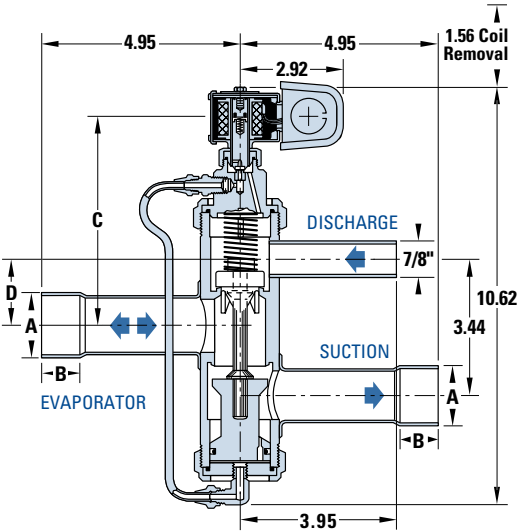
Example: MKC-1 120/50-60.

Dimensions

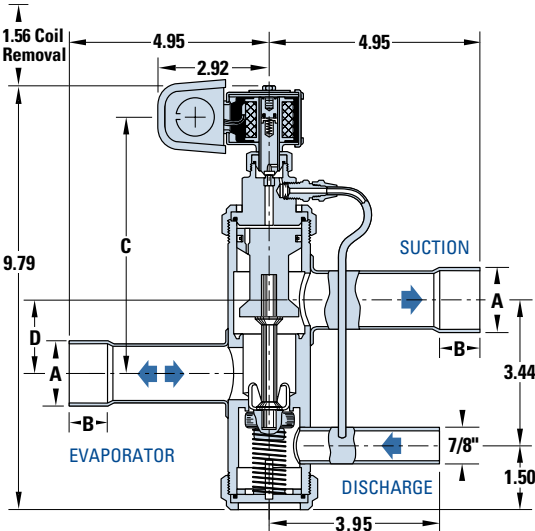
TYPE	A	B	C	D	E
10G79B	1-1/8	.91	6.00	1.81	1.64
10G711B	1-3/8	.97	5.87	1.74	
10G711C			5.16	1.72	



Optional 1/2" Conduit Boss



TYPE 10G711C



TYPE 10G79B and 10G711B



Type
10G711C



Type
10G79B
and 10G711B

UL and NSF Listed
CE Approved

Figure 13

Specifications

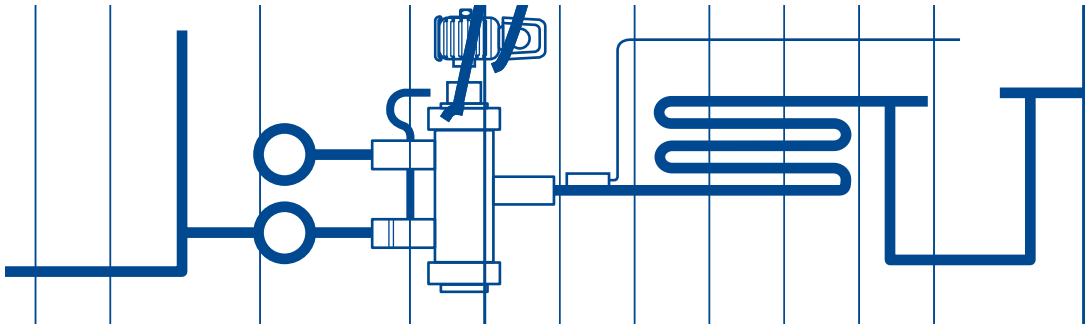
VALVE SERIES	TYPE	CONNECTION ODF SOLDER – Inches			MOPD psi*	MRP psi**	STANDARD COIL RATINGS		
		DISCHARGE	SUCTION	EVAPORATOR			VOLTS/CYCLES	WATTS	COIL
10G	10G79B	7/8	1-1/8	1-1/8	300	500	24/50-60	10	MKC-1
	10G711B		1-3/8	1-3/8			120/50-60		
	10G711C		1-3/8	1-3/8			208-240/50-60 120-208-240/50-60		

* MOPD stands for Maximum Operating Pressure Differential.
** MRP stands for Maximum Rated Pressure.

■ Available with conduit boss or junction box at no extra charge.
■ Dual voltage 4-wire coils, 120-208-240/50-60 are available at slight additional cost. For other voltages and cycles, consult Sporlan, Washington, MO 63090.

3-Way Hot Gas Defrost Valves

22, 134a, 401A, 402A, 404A, 407C, 502, 507



Suction Line Capacities — Tons

Capacities are based on 100°F condensing temperature – 60°F Suction Gas Entering Valve.

22, 134a, 401A, 402A, 404A, 407C, 502, 507

Type 180 Solenoid Pilot Control

The **180 Solenoid Pilot Control** is applicable as a supplementary device to Sporlan Thermostatic Expansion Valves. It is used in place of large capacity solenoid valves for positive shut-off of liquid lines. Since only one size is necessary it costs less and is more economical to install.

The Solenoid Pilot Control does not directly close the liquid line, but acts on the thermostatic expansion valve causing the expansion valve to close. The 180 is installed in the external equalizer line of the thermostatic expansion valve and has a third 1/4" connection from the liquid line.

Principles of Operation

The principle upon which the 180 Solenoid Pilot Control influences the expansion valve action is by the creation of a pressure under the valve diaphragm which is higher than the bulb pressure.

The Type 180 has two ports, both in the valve body - one high pressure and one low pressure. When the solenoid coil is energized, the plunger moves upward sealing off the high pressure port. See Figure 16, Page 18. With the high pressure excluded from the pilot control, true suction pressure acts on the underside of the expansion valve diaphragm through the equalizer line and the low pressure port. This is illustrated in Figure 15. When the solenoid coil is de-energized, the low pressure port is closed, thereby closing the equalizer line from the valve to the suction line. The high pressure port is open and liquid line pressure is applied to the underside of the thermostatic expansion valve diaphragm. This high side pressure instantly overcomes the bulb pressure and supplements the valve spring, immediately closing the port of the expansion valve.

Application

The Type 180 Solenoid Pilot Control may be connected to any number of thermostatic expansion valves as large as those nominally rated at 180 tons on Refrigerant 22. Thus one Solenoid Pilot Control simultaneously controls the action of all expansion valves on one evaporator or system of evaporators.

NOTE: Since thermostatic expansion valve Types V and W have an extended neck between the thermostatic element and the valve body, a relatively large quantity of liquid refrigerant resides at this point during the off-cycle (Type 180 de-energized). Upon re-energizing the Type 180 control, this liquid must boil off if the TEV is installed so that the "neck" volume is NOT free draining. The consequence of such an arrangement is chilling of the thermostatic element and possible gas charge condensation or migration.

Therefore, we recommend that Types V or W thermostatic expansion valves (with Types VGA, gas or P thermostatic charges), when installed with the Type 180 solenoid pilot control, be placed in an upright position and at a point above the suction line so that the volume under the diaphragm is free draining.

The Solenoid Pilot Control is actuated in the same manner as a liquid line solenoid valve, e.g. with a thermostat, a pressure switch or by manual control. Since the Type 180 design requires that the liquid line pressure during the off-cycle be slightly higher than the expansion valve bulb pressure, certain types of applications require special precautions.

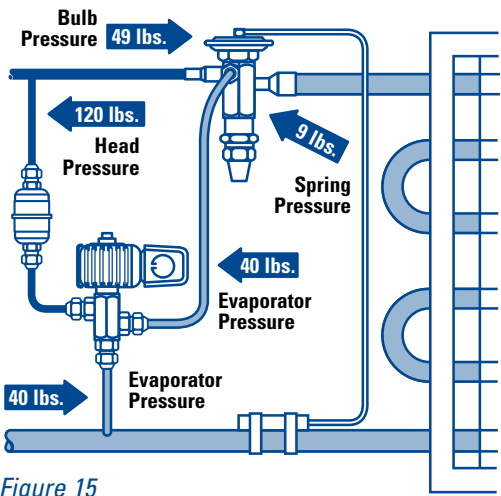


Figure 15



UL and SF Listed
CE Approved

Specifications — MKC-2 Coil

TYPE	STANDARD CONNECTIONS Inches	MOPD – psi		COIL RATINGS		
		AC	DC	STANDARD VOLTS/CYCLES	WATTS AC	DC
180	1/4" SAE Flare	275	225	24/50-60 120/50-60 208-240/50-60 120-208-240/50-60	15	18

- Maximum rated pressure 500 psi.
- Available with conduit boss or junction box at no extra charge.

- Dual voltage 4-wire coils, 120-208-240/50-60 are available at slight additional cost. For other voltages and cycles, consult Sporlan, Washington, MO 63090.

Type 180 Solenoid Pilot Control

22, 134a, 401A, 402A, 404A, 407C, 502, 507

Comfort Cooling Applications

Sporlan thermostatic expansion valves for comfort cooling applications are generally supplied with pressure limiting charges in the thermostatic elements. These charges limit the maximum operating or opening pressure during the off-cycle, as well as during the running cycle. The table below lists these standard maximum operating pressures at an approximate 60°F saturated evaporator temperature.

REFRIGERANTS	STANDARD MAXIMUM OPERATING PRESSURE 60°F
134a, 401A	60 psig
22, 407C	100 psig
404A, 502	115 psig

Therefore, during the off-cycle the receiver ambient temperature needs to be only slightly higher, 65°F or more, to maintain a higher liquid line pressure and to insure satisfactory Solenoid Pilot Control operation.

Commercial or Low Temperature Refrigeration Applications

This type of application requires that the expansion valve and sensing bulb be installed within the refrigerated space so the bulb temperature will be the same as the evaporator during the off-cycle. Not only will this prevent compressor flood-back on start-up, but it will help ensure a liquid line pressure higher than the bulb pressure to keep the expansion valve closed tight during the off-cycle.

Comfort Cooling Application (Intermittent Operation)

In certain locales during mild weather, wide variations between night and day temperatures can create unusual system pressure conditions. This occurs when the receiver, hence the liquid line pressure, falls below the maximum thermostatic expansion valve operating

pressures listed above. This is liable to occur when the receiver is located on the outside of the building or is subjected to unusually low ambient temperatures. Proper attention to receiver location can minimize the possibility.

Other Applications

On other applications where the Solenoid Pilot Control may be applied, care must be exercised to maintain the correct liquid line - expansion bulb pressure relationship. If the expansion valve bulb is located near heating coils or any other location warmer than the receiver location, trouble may occur. During the off-cycle, the bulb pressure for expansion valves with thermostatic charges other than the Type P air conditioning charge will rise and open the valve. This will tend to flood the evaporator; and, if the compressor is on pressure control, cause it to run for a short period of time when cooling is not required. Therefore, proper attention to component location is important to insure correct operation of the Type 180 Solenoid Pilot Control.

Recommendations

Where the unusual conditions exist as previously described, and where normal location precautions are not feasible, Sporlan recommends that a conventional liquid line solenoid valve be installed instead of the Type 180 Solenoid Pilot Control.

The Type 180 Solenoid Pilot Control is not recommended for application with other makes of thermostatic expansion valves. The reason is that Sporlan diaphragm assemblies are specially designed to withstand the admission of high side pressure through the external equalizer connection.

The Type 180 may be installed either upright or on its side. However, it should not be mounted with the coil housing below the valve body.

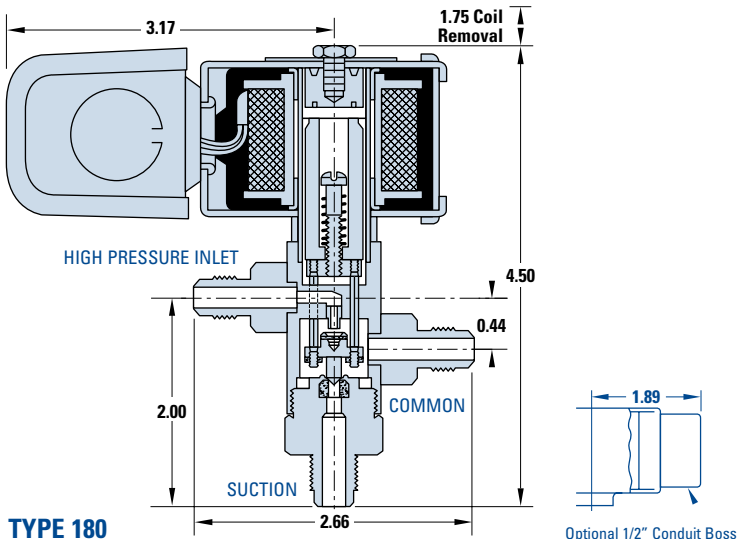


Figure 16

TYPE 180

Sporlan Solenoid Valves

Electrical

Transformer Selection for Low-Voltage Control Systems

Many systems utilize low voltage controls, requiring the use of a transformer for voltage reduction, normally to 24 volts. The selection of a transformer is not accomplished by merely selecting one that has the proper voltage requirements. The volt-ampere (VA) rating is equally important. To determine the VA requirement for a specific 3-way valve, refer to the chart below. It should be noted, that insufficient transformer capacity will result in reduced operating power or lowering of the MOPD value.

If more than one 3-way valve and/or other accessories are operated from the same transformer, then the transformer VA rating must be determined by adding the individual accessories' VA requirements.

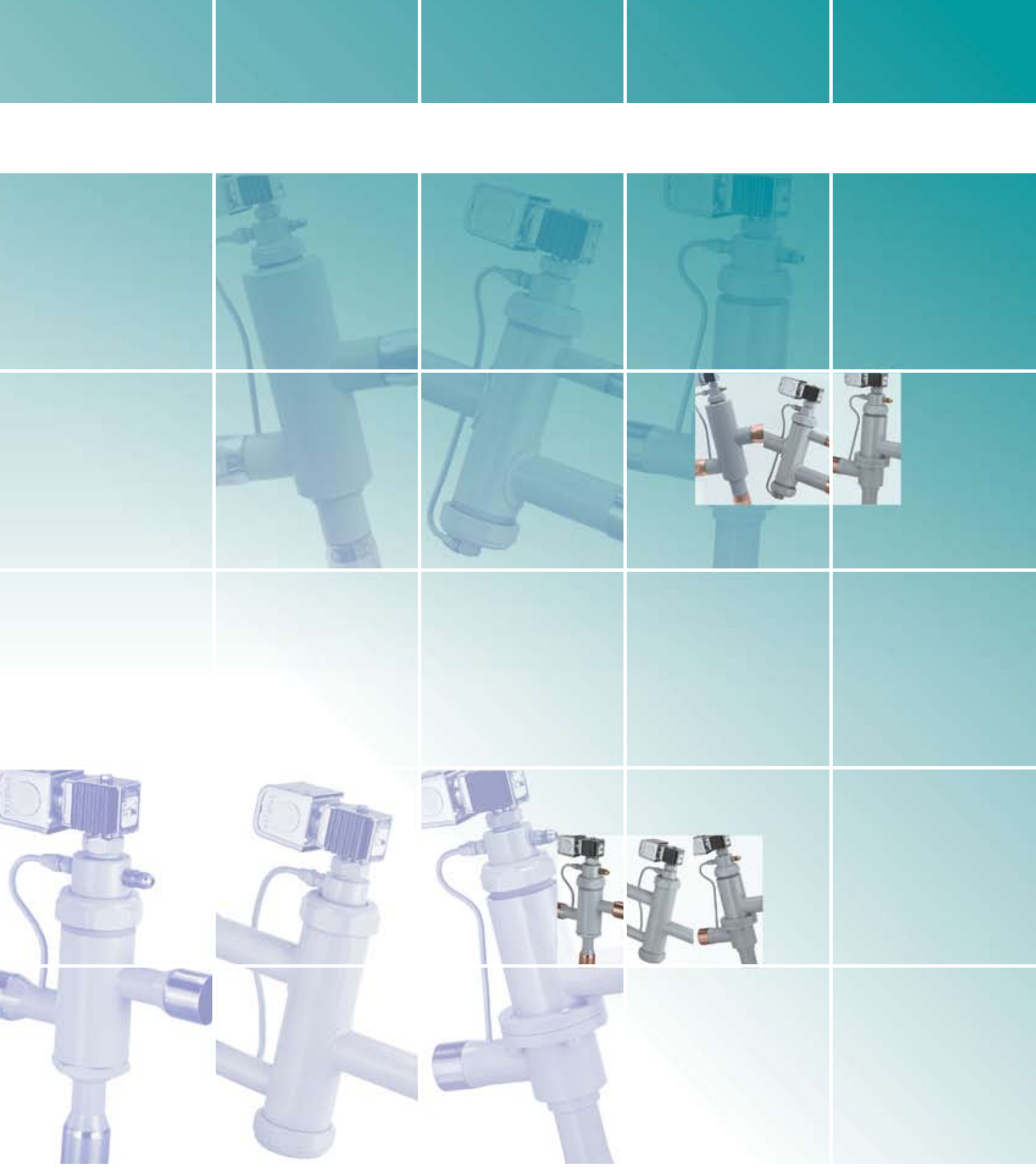
Fusing

Sporlan 3-Way Valves are not supplied with fuses. Fusing should be according to local codes. We recommend fusing the hot leg of the valve wiring with fast acting fuses and the valve should be grounded either through the fluid piping or the electrical conduit.

COIL KIT	24 VOLTS/ 50-60 CYCLES		120 VOLTS/ 50-60 CYCLES		240 VOLTS/ 50-60 CYCLES		TRANSFORMER RATING VOLTS-AMPERES
	CURRENT-AMPERES		CURRENT-AMPERES		CURRENT-AMPERES		FOR 100% OF RATED MOPD OF VALVE
	INRUSH	HOLDING	INRUSH	HOLDING	INRUSH	HOLDING	
MKC-1	1.9	.63	.39	.14	.19	.09	60
MKC-2	3.1	1.4	.60	.26	.31	.13	100

- All current values are based on 60 cycles.
- Volt-ampere ratings are based on inrush currents.
- Above values are based on the most severe conditions. — Consult Sporlan for coil characteristics on specific valve types.





Sporlan Division
Parker Hannifin Corporation
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