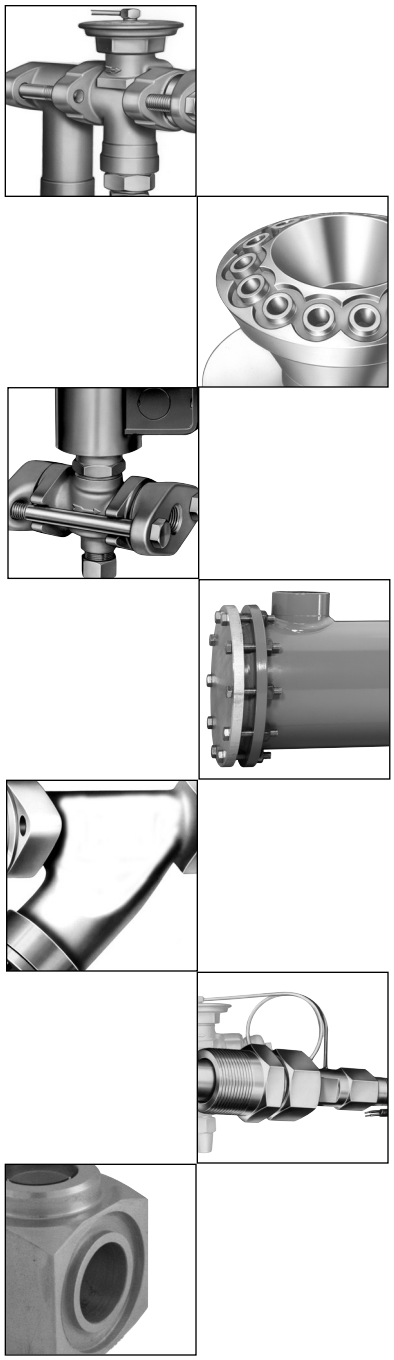
Refrigerant 717 Ammonia Products

Catalog R/S 717

Transitional Reference Guide from Sporlan to R/S Valves



- Thermostatic Expansion Valves
- Refrigerant Distributors
- Solenoid Valves
- Replaceable Core Filter Dryers
- Strainers
- Level Master Controls
- Sight Glasses

R/S

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Note: Since Parker's acquisition of Sporlan Valve Company in 2004, All Sporlan brand ammonia products are now marketed under the Parker R/S name.

Thermostatic Expansion Valves

The same features and design principles found in thermostatic expansion valves (TXVs) for Refrigerants – 12, 22, 134a, and 502 are also incorporated in Parker Refrigerating Specialties (R/S) thermostatic expansion valves for ammonia. They have proven their value and acceptance in the industry for more than 65 years.

Refrigerant 717 (Ammonia) Applications
Thermostatic expansion valves for ammonia applications require special design considerations due to the erosive effects of ammonia vapor. For this type of application, R/S has developed the Types D and A thermostatic expansion valves. Like other components of ammonia systems, the Types D and A valves are made from steel and steel alloys. The materials used in the manufacture of these valves are listed on pages 4-5.

With ammonia systems, the formation of flash vapor at the expansion valve port causes valve seat erosion or wire drawing to occur. This effect is further aggravated by high velocity ammonia mixed with dirt or scale passing through the port of the expansion valve. Fortunately, seat erosion can be minimized and valve life extended if the following steps are taken:

1. Maintain vapor-free liquid at the TXV inlet at all times

2. Maintain clean ammonia through effective filtration

3. Reduce the velocity of the ammonia through the TXV port by reducing the pressure drop across the port

Step 1 can be accomplished through proper system design. Liquid line vapor is prevented by adequately sizing liquid lines and providing sufficient subcooling.

Step 2 can be assured with the use of a Parker Replaceable Core Dryer. This filter dryer is an effective scale trap when used on ammonia systems. For further information on the use of this dryer with ammonia systems, refer to page 15 of this bulletin.

Step 3 can be accomplished with the use of a removable discharge tube or the nozzle of a refrigerant distributor. These components reduce the velocity and pressure drop at the expansion valve port by introducing a restriction or added pressure drop in the valve outlet passage.

The removable discharge tube is threaded into the outlet of the Type D valves, and the nominal 20, 30, and 50 ton Type A valves. The discharge tube is the principle difference between ammonia TXVs and TXVs used with other refrigerants. Discharge tube sizes are listed in the Type D and A valve specifications on pages 4-5.

The discharge tube in the outlet passage must be removed when the TXV is combined with a R/S Ammonia Distributor and Nozzle. If the discharge tube is not removed from the valve, the combination of the discharge tube and distributor nozzle may create an excessive pressure drop resulting in a substantial loss of TXV capacity. Refer to page 8 for further information on ammonia distributors.

The nominal 75 and 100 ton Type A valves do not employ a discharge tube since their valve outlets are designed to serve as a secondary orifice to reduce pressure drop across the valve port.

Thermostatic Charges for Ammonia Valves
Thermostatic charges C, Z, and L are available for the Type D thermostatic expansion valve. The Type L thermostatic charge is the only charge available for the Type A valve.

The Types C and Z thermostatic charges provide operating advantages for systems that cycle in response to a suction pressure switch or thermostat. These charges are also recommended for systems using a small capacity compressor. The table below lists the recommended temperature range for each charge.

THERMOSTATIC CHARGE	EVAPORATOR TEMPERATURE °F
C	40° to 0°
Z	0° to -20°

For applications at evaporator temperature below -20°F, consult R/S.

Cold storage plants often have large centralized ammonia systems consisting of many evaporators connected to one or more large compressors. This makes for fairly stable suction pressures. The R/S type L charge responds more quickly to changes in bulb temperature, allowing for a quicker pull-down of the conditioned space temperature. Therefore, for large ammonia systems consisting of multiple evaporators, the Type L charge is recommended.

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Type D – FPT Flange Connections

The R/S Type D valve is an externally adjustable valve with a gray cast iron body. It is supplied with FPT connections (1/2" SW available). The thermostatic element is replaceable, and all internal parts are serviceable. An optional XD-074 (1/2" FPT) external inlet strainer may be ordered with this valve. The nominal 1 and 2 ton Type D valves are identical, with the exception of their discharge tubes, as are the nominal 10 and 15 ton valves. One of these valves can be converted to the other by exchanging the discharge tubes.

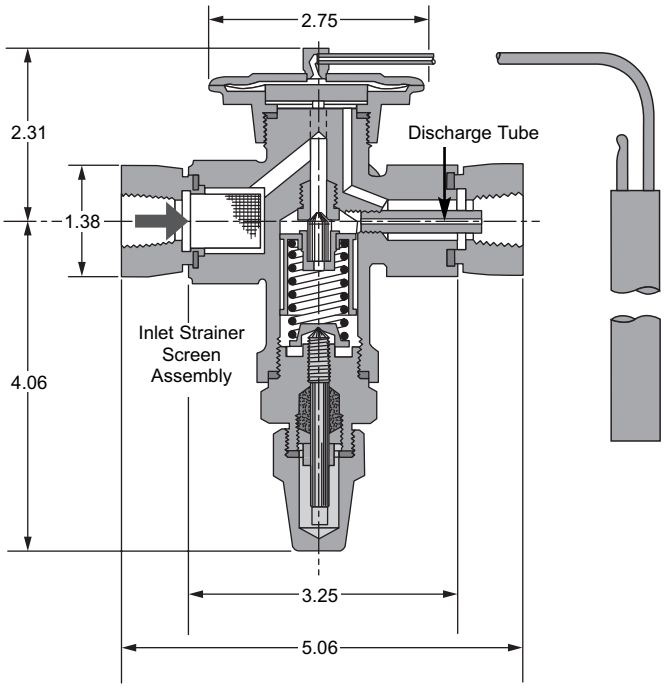
Refrigerant distributors that will mate directly to this valve are listed below.

Note: The discharge tube must be removed when a refrigerant distributor is applied to the valve.

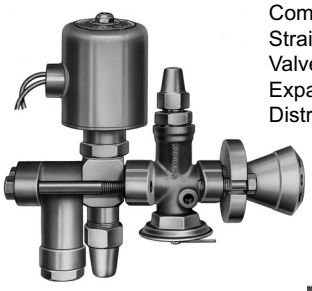
Outlet Connections
"D" flange

Distributors
1130, 1132, 1133, 1180 (aluminum)
1182 (aluminum)

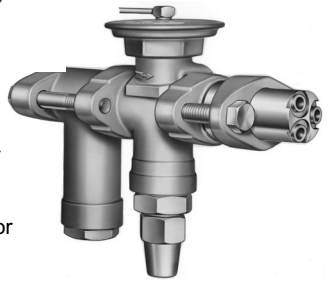
SPECIFICATIONS – ELEMENT SIZE NO. 23, GASKET JOINT										
TYPE		NOMINAL CAPACITY Tons of Refrigeration	Port Size Inches	Discharge Tube Orifice Inches	Thermostatic Charges Available	Bold figures are standard and will be furnished unless otherwise specified.			Flange Ring Size OD X ID Inches	**Net Weight** – Lbs.	**Shipping Weight** – Lbs.
Internal Equalizer	External Equalizer 1/8" FPT					**Std. Tubing Length – Ft.**	CONNECTIONS – Inches FPT				
							INLET	OUTLET			
DA-1	DAE-1	1	1/16	1/32	C-Z-L	5	1/4, 3/8, or 1/2		1.12 x 0.75	8	9
DA-2	DAE-2	2	1/16	1/16							
DA-5	DAE-5	5	7/64	5/64		10					
DA-10	DAE-10	10	3/16	7/64		15					
DA-15	DAE-15	15	3/16	5/32							



BULB SIZES – Inches	
CHARGES	REFRIGERANT
	717 – Ammonia
C - Z - L	0.75 x 4.00



Compact combination of XD Strainer – MA5A3 Solenoid Valve – DA Thermostatic Expansion Valve & 1130 Steel Distributor



Types XD Strainer – DA Thermostatic Expansion Valve & 1132 Steel Distributor

MATERIALS & DETAILS OF CONSTRUCTION								
VALVE TYPE	BODY	SEAT	PIN	PIN CARRIER	PUSHROD(S)	TYPE of JOINTS	CONNECTIONS	INLET STRAINER
D	Gray Iron Casting	Stainless Steel or Steel Alloy	Tungsten Carbide	Stainless Steel	Stainless Steel	Gasket	FPT (1/2" SW Only)	Removable Strainer Screen

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Type A – FPT Flange Connections

The R/S Type A valve is an externally adjustable valve with a gray cast iron body and either FPT or socket weld flange connections. The thermostatic element is replaceable. An optional 8004 (1/2" FPT) or 8006 (3/4" FPT) strainer may be ordered with this valve.

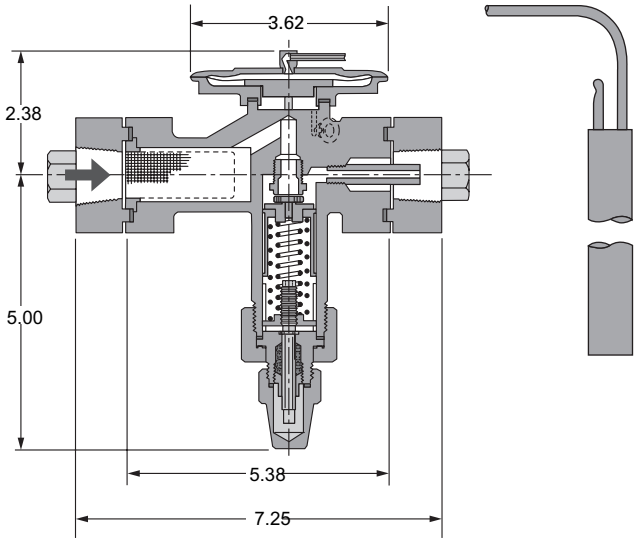
The nominal 20 and 30 ton Type A valves are identical with the exception of their discharge tubes. One of these valves can be converted to the other by exchanging their discharge tubes. The nominal 75 and 100 ton Type A valves do not employ a discharge tube, nor are their outlets tapped to receive one.

Refrigerant distributors that will mate directly to this valve are listed below. Note: The discharge tube must be removed from the nominal 20, 30, and 50 ton Type A valves when a refrigerant distributor is applied.

Outlet Connections
"A" flange

Distributors
1138, 1185 (aluminum)

SPECIFICATIONS – ELEMENT SIZE NO. 12, GASKET JOINT											
TYPE		NOMINAL CAPACITY Tons of Refrigeration	Port Size Inches	Discharge Tube Orifice Inches	Thermostatic Charges Available	Bold figures are standard and will be furnished unless otherwise specified.			Flange Ring Size OD x ID Inches	Net Weight – Lbs.	Shipping Weight – Lbs.
Internal Equalizer	External Equalizer 1/8" FPT					Std. Tubing Length – Ft.	CONNECTIONS – Inches FPT or SW				
							INLET	OUTLET			
AA-20	AAE-20	20	5/16	1/8	L Only	10 15	1/2, 3/4, or 1		1.75 x 1.25	10	11
AA-30	AAE-30	30	5/16	5/32							
AA-50	AAE-50	50	3/8	3/16							
AA-75	AAE-75	75	3/8	–			3/4 or 1				
AA-100	AAE-100	100	7/16	–							



BULB SIZES – Inches	
CHARGE	REFRIGERANT 717 – Ammonia
L - Only	0.88 OD x 6.00

8004 Strainer – AA Thermostatic Expansion Valve & 1185 Aluminum Distributor

MATERIALS & DETAILS OF CONSTRUCTION								
VALVE TYPE	BODY	SEAT	PIN	PIN CARRIER	PUSHROD(S)	TYPE of JOINTS	CONNECTIONS	INLET STRAINER
A	Gray Iron Casting	Stainless Steel	20 & 30 Ton: Tungsten Carbide 50, 75, & 100 Ton: Stainless Steel	Stainless Steel	Stainless Steel	Gasket	FPT or SW	Removable Strainer Screen

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Thermostatic Expansion Valve Capacities – Tons of Refrigeration

These ratings are based on vapor free 86°F liquid refrigerant entering the TXV, a maximum opening superheat of 7°F, and a standard factory air test setting.

AC and AL THERMOSTATIC CHARGES													
VALVE TYPE	NOMINAL CAPACITY	PORT SIZE	DISCHARGE TUBE SIZE	EVAPORATOR TEMPERATURE °F											
				40°				20°				5°			
				PRESSURE DROP ACROSS VALVE – psi											
				80	100	120	140	100	120	140	160	100	120	140	160
D	1	1/16	1/32	1.08	1.21	1.32	1.43	1.02	1.12	1.21	1.29	0.85	0.93	1.00	1.07
D	2	1/16	1/16	2.16	2.41	2.64	2.86	2.05	2.24	2.42	2.59	1.69	1.85	2.00	2.14
D	5	7/64	5/64	5.40	6.03	6.61	7.14	5.12	5.61	6.05	6.47	4.23	4.63	5.00	5.35
D	10	3/16	7/64	10.8	12.1	13.2	14.3	10.2	11.2	12.1	12.9	8.45	9.26	10.0	10.7
D	15	3/16	5/32	16.2	18.1	19.8	21.4	15.4	16.8	18.2	19.4	12.7	13.9	15.0	16.0
A	20	5/16	1/8	19.3	21.6	23.6	25.5	18.8	20.6	22.2	23.7	16.9	18.5	20.0	21.4
A	30	5/16	5/32	28.9	32.3	35.4	38.2	28.1	30.8	33.3	35.6	25.4	27.8	30.0	32.1
A	50	3/8	3/16	48.2	53.9	59.0	63.7	46.9	51.4	55.5	59.3	42.3	46.3	50.0	53.5
A	75	3/8	–	72.3	80.8	88.5	95.6	70.4	77.1	83.3	89.0	63.4	69.4	75.0	80.2
A	100	7/16	–	96.4	108	118	127	93.8	103	111	119	84.5	92.6	100	107

AZ and AL THERMOSTATIC CHARGES											
VALVE TYPE	NOMINAL CAPACITY	PORT SIZE	DISCHARGE TUBE SIZE	EVAPORATOR TEMPERATURE °F							
				-10°				-20°			
				PRESSURE DROP ACROSS VALVE – psi							
				120	140	160	180	120	140	160	180
D	1	1/16	1/32	0.61	0.66	0.71	0.75	0.52	0.56	0.60	0.63
D	2	1/16	1/16	1.06	1.14	1.22	1.29	0.89	0.96	1.03	1.09
D	5	7/64	5/64	2.48	2.68	2.87	3.04	2.09	2.26	2.42	2.56
D	10	3/16	7/64	5.24	5.66	6.05	6.42	4.42	4.78	5.11	5.42
D	15	3/16	5/32	7.27	7.85	8.39	8.90	6.13	6.62	7.08	7.51
A	20	5/16	1/8	15.9	17.2	18.4	19.5	13.6	14.7	15.8	16.7
A	30	5/16	5/32	23.9	25.8	27.6	29.3	20.5	22.1	23.6	25.1
A	50	3/8	3/16	39.9	43.1	46.0	48.8	34.1	36.9	39.4	41.8
A	75	3/8	–	59.8	64.6	69.1	73.2	51.2	55.3	59.1	62.7
A	100	7/16	–	79.7	86.1	92.1	97.7	68.2	73.7	78.8	83.6

REFRIGERANT	LIQUID TEMPERATURE ENTERING TXV °F											
	0°	10°	20°	30°	40°	50°	60°	70°	80°	86°	90°	100°
	CORRECTION FACTOR, CF LIQUID TEMPERATURE											
717	1.27	1.24	1.20	1.17	1.14	1.11	1.08	1.05	1.02	1.00	0.99	0.96

EXAMPLE: Actual capacity of nominal 10 ton valve at -10°F evaporator, 160 psi pressure drop and 60°F liquid temperature = 6.05 tons x 1.08 = 6.53 tons.

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an average evaporator temperature of 0°F. However, they may be used for any evaporator temperature from -20°F to 40°F since the variation in the actual factors across this range is insignificant.

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Broadview, IL 60155

Selection Procedure

The following procedure should be used when selecting a R717 Ammonia TXV:

1. Determine the pressure drop across the valve

Subtract the evaporating pressure from the condensing pressure. The condensing pressure used in this calculation should be the minimum operating condensing pressure of the system. From this value, subtract all other pressure losses to obtain the net pressure drop across the valve. Be sure to consider all of the following possible sources of pressure drop: (1) friction losses through refrigeration lines including the evaporator and condenser; (2) pressure drop across liquid line accessories such as a solenoid valve and filter-drier; and (3) static pressure loss (gain) due to the vertical lift (drop) of the liquid line, see Table 1.

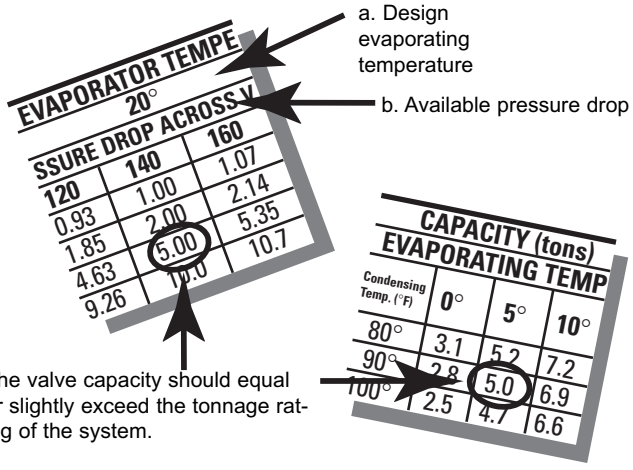
Table 1

REFRIGERANT	VERTICAL LIFT – FEET				
	20	40	60	80	100
	STATIC PRESSURE LOSS – psi				
717 Ammonia	5	10	15	20	25

It is not necessary to subtract the pressure drop across the refrigerant distributor when determining the pressure drop across a R/S Type D or Type A valve with a nominal rating of 50 tons or less. These valves employ a discharge tube in the valve outlet passageway, and it should be removed when a distributor is connected to the valve. R/S distributors are normally selected to provide a 40 psi pressure drop at design load conditions for ammonia applications. Removing the discharge tube from the valve will compensate for this pressure drop.

2. Determine the liquid temperature of the refrigerant entering the valve

The R-717 Ammonia TXV rating tables on page six are based on a liquid temperature of 86°F. For other liquid temperatures, apply the correction factor given in the table.



3. Select valve from the rating tables

Select a valve based on the design evaporating temperature and the available pressure drop across the valve. If possible, the valve rating should equal or slightly exceed the design rating of the system. Be sure to apply the appropriate liquid temperature correction factor to the valve ratings shown in the tables.

Once the desired valve rating has been located, determine the nominal capacity of the valve from the second column of the table. On multiple evaporator systems, select each valve on the basis of individual evaporator capacity.

4. Determine if an external equalizer is required

The amount of pressure drop between the valve outlet and bulb location will determine if an external equalizer is required. The recommendations given in Table 1 are suitable for most field installed systems. Use an externally equalized valve when pressure drop between the valve outlet and bulb location exceeds values shown in Table 2. An externally equalized valve must be used on evaporators, which employ a refrigerant distributor.

Table 2

REFRIGERANT	EVAPORATOR TEMPERATURE °F			
	40	20	0	-20
	PRESSURE DROP – psi			
717 Ammonia	3	2	1.5	1.0

When the thermostatic expansion valve is equipped with an external equalizer, it must be connected. Do not cap off the equalizer connection, as it will prevent the valve from operating properly.

5. Select the R/S Selective Thermostatic Charge

Select the charge according to the design evaporator temperature and the valve application. The subject of R-717 thermostatic charges is discussed on page 3.

Selection Example:
Refrigerant 717
Application: Refrigeration, single evaporator system

Design evaporator temperature	5°F
Design condenser temperature	90°F
Refrigerant liquid temperature	80°F
Design evaporator capacity	5 tons
Available pressure drop across TXV	
Condensing pressure (psig)	166
Evaporator pressure (psig)	-19
	147
Liquid line and accessories loss (psi)	-7
Distributor and tubes loss (psi) ①	0
	140
Refrigerant liquid correction factor	1.02

The DAE-5 has a valve capacity of: 5.00 x 1.02 = 5.10 tons at 5°F evaporator temperature, 140 psi pressure drop, and 80°F liquid temperature.

Thermostatic charge, see page 3: C

Selection: DAE-5-C

① An externally equalized valve must be used on evaporators employing a refrigerant distributor due to the pressure drop created by the distributor. Pressure drop due to the distributor is not used in the calculation to determine pressure drop across the TXV since the valve's discharge tube will be removed. Refer to step 1 of the selection procedure.

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Refrigerant Distributors

Direct Expansion – Steel & Aluminum Models – Flange Connections

R/S refrigerant distributors for R-717 function like our conventional brass models.

Steel models – The distributor body is Type 8620 vacuum degassed steel. The nozzle is Type 303 stainless steel, and the dispersion cone in the distributor is made of Stellite.

Distributor tube connections are available for 3/16", 1/4", and 5/16" OD steel tubing. The ODF connections are trepanned to facilitate welding the joint. A 1/8" NPT connection is also available with Types 1130, 1133, and 1138 distributors.

Aluminum models – These distributors are designed for R-717 aluminum coils, and they are 6061-T6 aluminum. As with the steel distributors, the dispersion cone is Stellite, and the nozzle is stainless steel.

Distributor tube connections are available for 3/16", 1/4", and 5/16" OD aluminum tubing. Aluminum brazing techniques require more space between circuits than copper to brass brazing. As a result, the maximum number of circuits is less than for comparable brass models.

Applying Distributors to Thermostatic Expansion Valves

All Type D and Type A TXVs up to and including 50 tons, employ a discharge tube. The discharge tube reduces refrigerant velocity across the valve port, preventing premature pin and seat erosion. When a distributor is used with these valves, the distributor nozzle performs the discharge tube's function. The discharge tube **must** then be removed from the valve to avoid excessive pressure drop.

Distributor performance is best obtained if the distributor is bolted directly to the TXV outlet. When it is not possible to bolt the TXV to the distributor, or if a shut off valve is installed between them, use a short, straight piece of pipe to connect the two. The pipe should not exceed two feet. It should be sized to maintain high refrigerant velocities. Elbows between the TXV and distributor are not recommended since they hinder proper distribution.

Ratings for Refrigerant 717 Distributors
Full load ratings are based on 30 psi nozzle, 10 psi tube pressure drop and 86° liquid temperature entering thermostatic expansion valve.

Distributor Tube Circuit Capacities
Tons of Refrigeration – Tube Length 30"
Distributor Nozzle Orifice Capacities for Ammonia at Various Evaporator Temperatures

Tons of Refrigeration

DISTRIBUTOR TUBE OD – Inches	REFRIGERANT 717 Ammonia EVAPORATOR TEMPERATURE °F					
	40°	20°	5°	-10°	-20°	-30°
3/16	1.79	1.27	1.01	0.82	0.72	0.64
1/4	4.52	3.20	2.55	2.07	1.82	1.62
5/16	9.73	6.90	5.50	4.46	3.93	3.49
1/8" Pipe*	12.0	8.50	6.77	5.50	4.84	4.30

* Schedule 40

REFRIGERANT	LIQUID TEMPERATURE ENTERING TXV °F						
	35°	45°	55°	65°	75°	86°	95°
	CORRECTION FACTOR, CF LIQUID TEMPERATURE						
717	2.95	2.15	1.58	1.33	1.17	1.00	0.85

To use the table below, knowing the total load in tons and evaporator temperature, find nearest capacity in the table. On same horizontal line in extreme left column is the Distributor Nozzle Orifice Number to order. For example: 5.3 ton load at minus 10°F would require Nozzle Orifice Number 12A.

DISTRIBUTOR NOZZLE NUMBER	REFRIGERANT 717 Ammonia EVAPORATOR TEMPERATURE °F					
	40°	20°	5°	-10°	-20°	-30°
1A	0.65	0.48	0.41	0.35	0.32	0.30
1-1/2A	1.07	0.79	0.66	0.58	0.53	0.50
2A	1.42	1.05	0.88	0.76	0.70	0.65
2-1/2A	2.03	1.50	1.26	1.09	1.00	0.94
3A	2.62	1.93	1.62	1.40	1.30	1.21
4A	3.01	2.22	1.86	1.61	1.49	1.39
5A	4.07	3.01	2.52	2.19	2.02	1.88
6A	4.95	3.66	3.07	2.66	2.45	2.29
8A	6.83	5.05	4.23	3.67	3.38	3.15
10A	8.10	5.98	5.02	4.35	4.01	3.74
12A	9.64	7.12	5.98	5.17	4.77	4.45
15A	13.1	9.69	8.13	7.04	6.50	6.06
18A	16.3	12.1	10.1	8.77	8.09	7.55
20A	17.4	12.8	10.8	9.31	8.59	8.01
25A	22.2	16.4	13.7	11.9	11.0	10.2
30A	29.2	21.6	18.1	15.7	14.5	13.5
35A	34.8	25.7	21.6	18.7	17.2	16.1
40A	39.2	29.0	24.3	21.0	19.4	18.1
50A	49.5	36.6	30.7	26.6	24.5	22.9

Ratings based on 86°F liquid entering TXV, 30 psi △P across nozzle, 10 psi △P across distributor tubes, 30" tube length.

For information on applications and capacities at evaporator temperatures below -30°F consult R/S.

NOTE: For direct expansion application with liquid temperatures lower than tabulated values or for flooded liquid recirculation systems – contact R/S, Broadview, IL 60155.

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Specifications

The Types 1132 and 1180 ammonia distributors have a male flange ring and bolt directly to the outlet of the Type D valve. These distributors come with a steel companion flange, P/N 207650. When specified, an aluminum companion flange, P/N 207651 is available for the Type 1180 distributor.

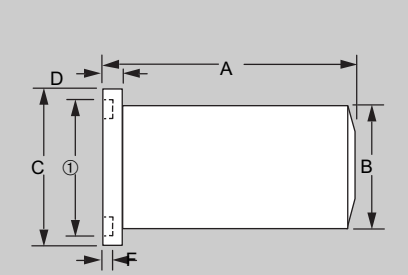
Two 7/16" – 14 THD 2" long bolts connect these distributors to the Type D valve.

The Types 1130 and 1182 distributors do not require a companion flange. These distributors bolt directly to the Type D valve using two 7/16" – 14 THD 1-1/2" bolts.

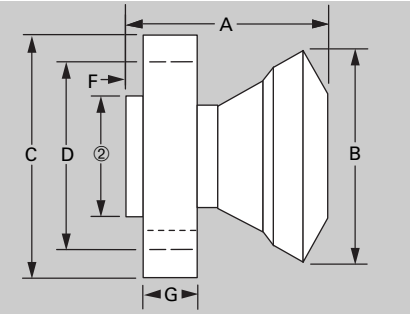
All distributors used with the Type D valve require flange gasket P/N 207658.

The Type 1138 and 1185 distributors have a male flange ring that bolts directly to the Type A valve.

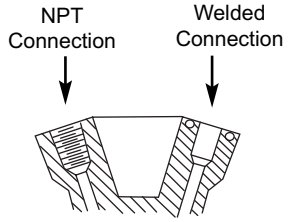
Two 1/2" – 13 THD 1-3/4" long bolts connect these distributors to the Type A valve.
All distributors used with Type A valve require flange gasket P/N 207657.



① Male Flange
1.099 OD x .776 ID

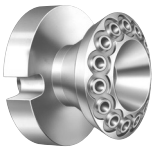


② 1130-1182 Male Flange 1.099 OD x .776 ID
1138-1185 Male Flange 1.718 OD x 1.281 ID



Either NPT connection or welded connections of steel body distributors

SPECIFICATIONS

NO. CIRCUITS & TUBING SIZES AVAILABLE	NOZZLE ORIFICE NUMBERS AVAILABLE	NOZZLE & RETAINER RING SIZE	DISTRIBUTOR	DIMENSIONS Inches						
				A	B	C	D	E	F	G
TYPE 1132 Steel	Net Weight - Approximately 9 oz.	G Used in combination with R/S Valve Type DAE and XD Strainer or DAE, XD Strainer and MA5A3 Solenoid Valve, or XD Strainer, Steel Flange No. 207650 and Spacer Part No. 207652.		2.44	1.12	1.37	0.25	①	–	–
2 to 5 - 3/16" - ODF Welded	1A thru 30A									
2 to 4 - 1/4" - ODF Welded										
2 to 3 - 5/16" - ODF Welded										
TYPE 1180 Aluminum	Net Weight - Approximately 4 oz.									
2 to 8 - 3/16" - ODF Brazing	1A thru 30A									
2 to 6 - 1/4" - ODF Brazing										
TYPE 1130 Steel	Net Weight - Approximately 1 lb., 10 oz.	G Used in combination with R/S Valve Type DAE and XD Strainer or DAE, XD Strainer and MA5A3 Solenoid Valve, or XD Strainer with Spacer Part No. 207652.		2.50	2.25	2.75	2.00	②	0.25	0.50
2 to 10 - 3/16" - ODF Welded	1A thru 30A									
4 to 10 - 1/4" - ODF Welded										
2 to 6 - 5/16" - ODF Welded										
2 to 6 - 1/8" - NPT										
TYPE 1182 Aluminum	Net Weight - Approximately 10 oz.								0.12	0.62
8 to 12 - 3/16" - ODF Brazing	1A thru 30A									
7 to 10 - 1/4" - ODF Brazing										
TYPE 1138 Steel	Net Weight - Approximately 3 lb., 6 oz.	C Used in combination with R/S Valve Type AAE and 8004 Strainer or AAE, 8004 Strainer and MA17A3 Solenoid Valve, or 8004 Strainer with Spacer Part No. 207653.		2.87	3.19 / 3.06	3.48 / 3.50	2.69	②	0.25	0.75
11 to 19 - 3/16" - ODF Welded	5A thru 50A									
6 to 14 - 1/4" - ODF Welded										
7 to 12 - 5/16" - ODF Welded										
2 to 10 - 1/8" - NPT										
TYPE 1185 Aluminum	Net Weight - Approximately 1 lb., 4 oz.									
8 to 20 - 3/16" - ODF Brazing	5A thru 50A									
6 to 16 - 1/4" - ODF Brazing										
2 to 11 - 5/16" - ODF Brazing										

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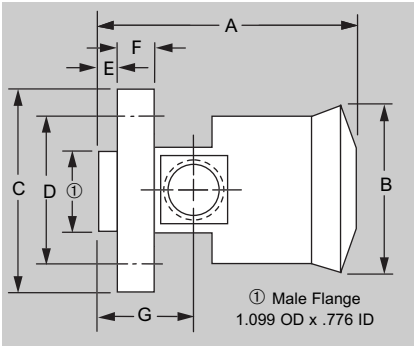
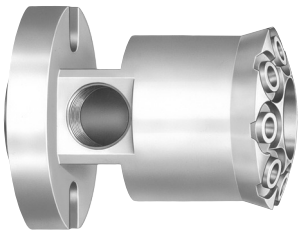
Specifications

Refrigerant Distributor with Auxiliary Side Connection

The Type 1133 distributor bolts directly to the Type D valve. This distributor features a side connection for hot gas bypass, hot gas defrost, or reverse cycle defrost applications.

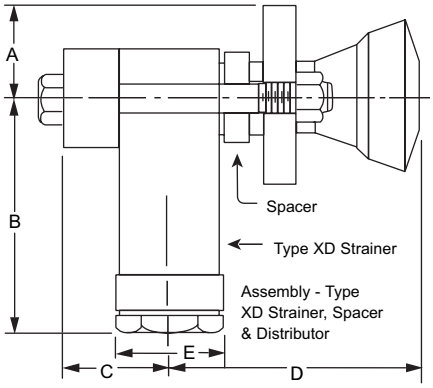
Two 7/16" – 13 THD 2" long bolts connect these distributors to the Type D valve.



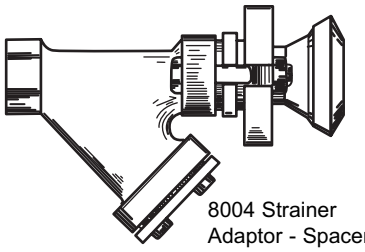


NO. CIRCUITS & TUBING SIZES AVAILABLE	NOZZLE ORIFICE NUMBERS AVAILABLE	SIDE CONNECTIONS		NOZZLE & RETAINER RING SIZE	DIMENSIONS Inches						
		NUMBER	SIZE Inches		A	B	C	D	E	F	G
TYPE 1133 Steel	Net Weight - Approximately 2 lb.,10 oz.			G Used in combination with R/S Valve Type DAE and XD Strainer or DAE, XD Strainer and MA5A3 Solenoid Valve, or XD Strainer with Spacer Part No. 207652.	3.44	2.25	2.75	2.00	0.25	0.50	1.25
2 to 10 - 3/16" - ODF Welded	1A thru 30A	1	3/8 or 1/2 FPT								
2 to 8 - 1/4" - ODF Welded											
2 to 6 - 5/16" - ODF Welded											
2 to 6 - 1/8" - NPT											

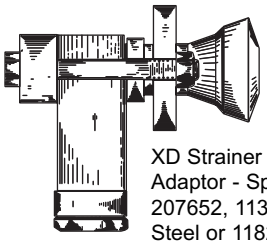
TYPE	DIMENSIONS – Inches				
	A	B	C	D	E
1132	0.19	3.50	1.19	3.44	1.56
1180					
1130	1.38				
1133				4.38	
1182				3.44	
1138	1.75	4.00	4.75	4.12	2.75
1185					
FLANGE					
207651	0.62	3.00	2.00	–	–
207650	0.94				



Aluminum Flange No. 207651 for Type 1180 Distributor

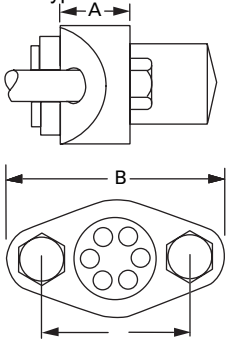


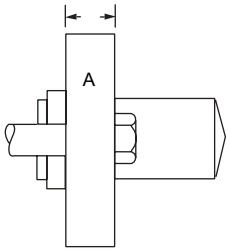
8004 Strainer Adaptor - Spacer 207653, 1138 Steel or 1185 Aluminum Distributor

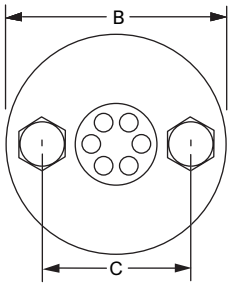


XD Strainer Adaptor - Spacer 207652, 1130 & 1133 Steel or 1182 Aluminum Distributor

Steel Flange No. 207560 for Type 1132 and 1180 Distributors







XD Strainer Adaptor - Spacer 207652, Steel Flange No. 207650, 1132 Steel or 1180 Aluminum Distributor

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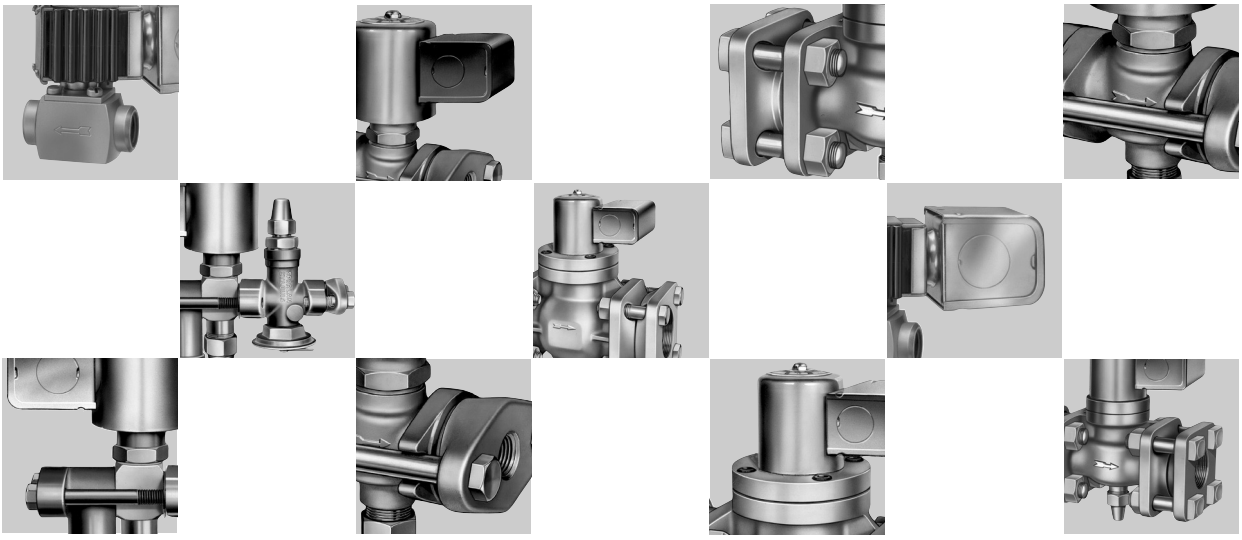
Solenoid Valves



Selection – Capacity Ratings

The following information is required when selecting a R/S Solenoid Valve:

- Refrigerant or fluid to be controlled.
- Capacity required.
- MOPD – Maximum Operating Pressure Differential required.
- Electrical specifications – volts and cycles.

With this information, the correct valve can be selected from the Selection Tables.

For Liquid Line capacity data, see below and individual specification pages.

SPECIFICATIONS							
TYPE NUMBER	CONNECTION Inches	PORT SIZE Inches	TONS OF REFRIGERATION PRESSURE DROP – psi				
			1	2	3	4	5
XJH	1/4 NPT Female	.109	3.91	5.54	6.79	7.85	8.78
XOF	3/8 NPT Female	.109					
MA5A3	1/4, 3/8, 1/2 NPT Female	.140	8.0	11.3	13.7	16	17.8
MA17A3	1/2, 3/4, or 1 NPT Female	17/32	73	95	120	143	160
MA32P3	1 or 1-1/4 NPT Female	1	125	176	225	250	280
MA42P3	1-1/2 NPT Female	1-5/16	275	390	500	550	625
MA50P3	2 NPT Female	1-9/16	500	725	875	1000	1110

Refrigerant 717 capacities are based on 5°F evaporating and 86°F liquid.

REFRIGERANT	LIQUID TEMPERATURE ENTERING TXV °F											
	0°	10°	20°	30°	40°	50°	60°	70°	80°	86°	90°	100°
	CORRECTION FACTOR, CF LIQUID TEMPERATURE											
717	1.27	1.24	1.20	1.17	1.14	1.11	1.08	1.05	1.02	1.00	0.99	0.96

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an average evaporator temperature of 0°F. However, they may be used for any evaporator temperature from -20°F to 40°F since the variation in the actual factors across this range is insignificant.

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Types XJH and XOF

Application

Type XJH and XOF solenoid valves are of the direct acting type and are designed for small capacity ammonia/oil service. Both of these valves may be mounted horizontally, on their side or in a vertical line.

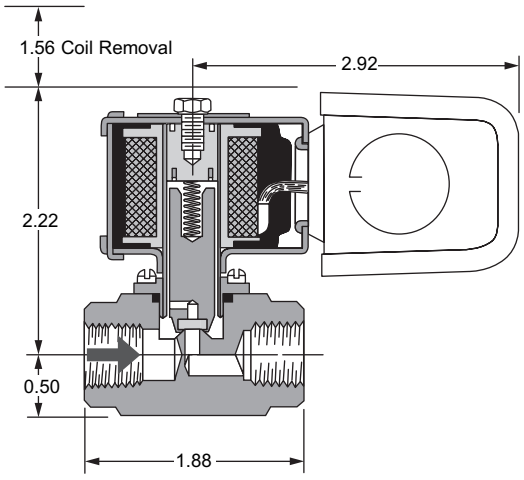
Types XJH and XOF

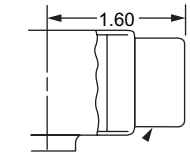
Ordering Instructions

Be sure to specify Valve Type, Connections, Voltage, and Cycles.

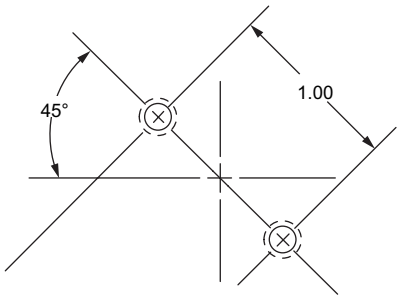
SPECIFICATIONS – MKC-1 COIL										
TYPE	STANDARD CONNECTIONS Inches	PORT SIZE Inches	MOPD psi	NOMINAL LIQUID CAPACITIES Tons of Refrigeration AMMONIA PRESSURE DROP – psi					STANDARD COIL RATINGS	
			AC	1	2	3	4	5	VOLTS/CYCLES	WATTS
XJH	1/4 NPT Female	.109	250	3.91	5.54	6.79	7.85	8.78	24/50-60 120/50-60 208/50-60 240/50-60 Dual 120-240/60	10
XOF	3/8 NPT Female									

▼ Safe working pressure 300 psi.
▼ Dual voltage 4-wire coils, 120-240/60 are available at slight additional cost. For other voltages and cycles, consult R/S.
▼ Available with conduit boss or junction box at no extra charge.





Optional 1/2" Conduit Boss



Mounting Hole Pattern
#8-32 x .31 Deep

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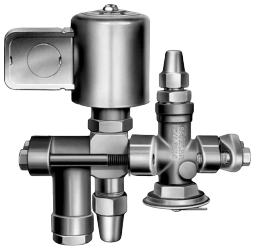
Types MA5A3 and MA17A3



Type MA5A3 shown with XD Strainer and DA Thermostatic Expansion Valve

Application:
Type MA5A3 solenoid valve is of the direct acting type and designed specifically for ammonia service. The type MA17A3 is a pilot operated solenoid valve for ammonia service. It is also available with a direct connected stem, plunger, and piston assembly for suction line applications. To specify, add prefix D to the type number. Example: DMA17A3. MOPD for direct connected valves is 200 psi.

For hot gas application, add prefix H to type number. Example: HMA17A3.

Both of these valves **must** be mounted in a horizontal line with the coil at the top.

Ordering Instructions:
Be sure to specify Valve Type, Connections, Voltage, and Cycles.

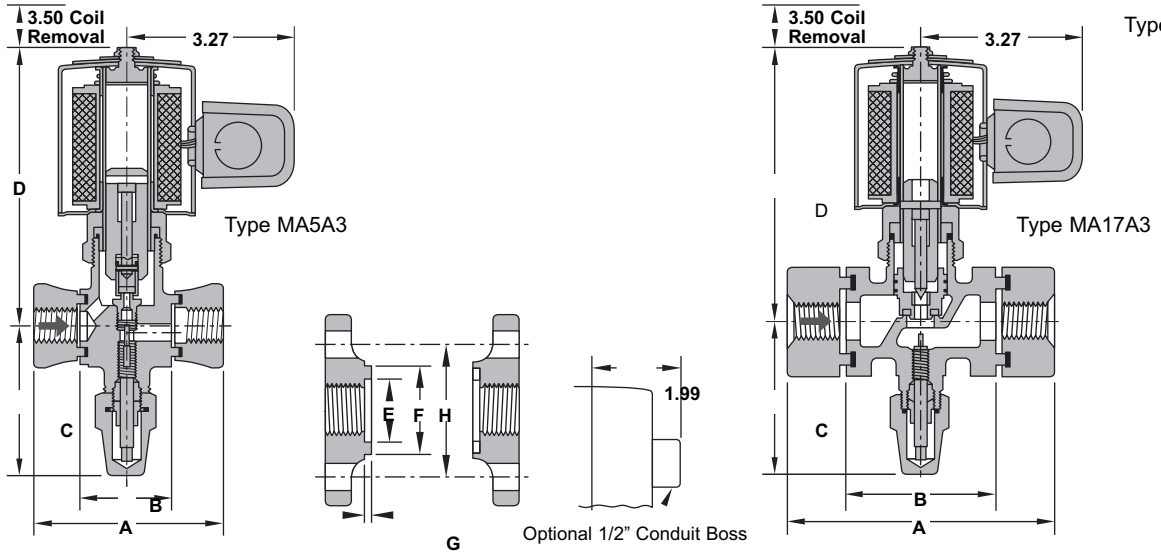
Dimensions – Inches

TYPE	A	B	C	D
MA5A3	3.25	1.69	2.75	5.00
MA17A3	5.12	3.25	2.94	5.12

2-Bolt Flanges

TYPE	E	F	G	H	BOLT SIZE
MA5A3	0.75	1.12	0.12	2.00	7/16
MA17A3	1.25	1.75	0.16	2.69	1/2

Type MA17A3



SPECIFICATIONS – KC-3 COIL												
TYPE	FLANGE CONNECTIONS Inches Sizes shown in BOLD will be furnished unless otherwise specified.	PORT SIZE Inches	MOPD psi		NOMINAL LIQUID CAPACITIES Tons of Refrigeration AMMONIA Pressure Drop – psi					COIL RATINGS		
			AC	DC	1	2	3	4	5	STANDARD VOLTS/CYCLES	WATTS AC	WATTS DC
MA5A3	1/4, 3/8, or 1/2 NPT Female	.140	250	200	8.0	11.3	13.8	16.0	17.8	24/50-60 120/50-60 208/50-60 240/50-60 Dual 120-240/60	18	25
MA17A3	1/2, 3/4, or 1 NPT Female	17/32	275	225	70.9	100	122	141	157			

▼ Maximum rated pressure 300 psi.
▼ Dual voltage 4-wire coils, 120-240/60 are available at slight additional cost. For other voltages and cycles, consult R/S.
▼ Available with conduit boss or junction box at no extra charge.
▼ Available with strainer inlet and one flange, with two flanges or without flanges.

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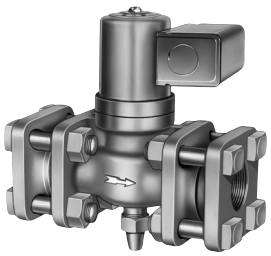
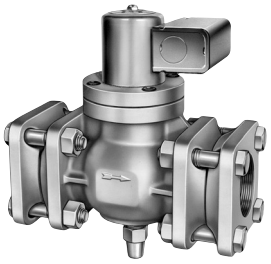
Types MA32, MA42, and MA50

Application:
Types MA32, MA42, and MA50 are large capacity, pilot operated solenoid valves for refrigeration and air conditioning applications. They are suitable for suction service because very low pressure differential, 1 psi, is required for full operation.

For hot gas application, add prefix H to the type number.
Example: HMA42P3, HMA32P3, etc.

Both of these valves **must** be mounted in a horizontal line with the coil at the top.


Type MA32P3


Type MA42P3

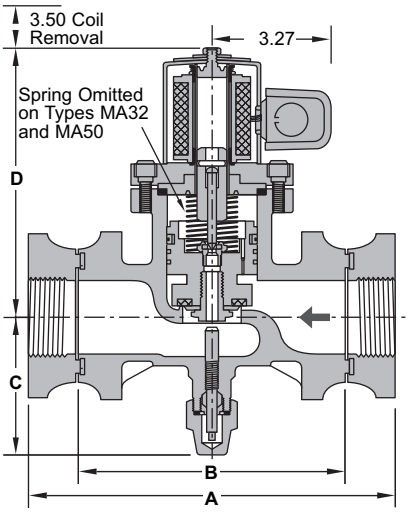
Ordering Instructions:
Be sure to specify Valve Type, Connections, Voltage, and Cycles.

Dimensions – Inches

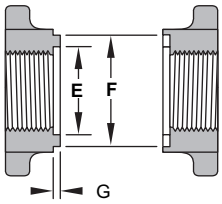
TYPE	A	B	C	D
MA32P3	8.25	5.88	3.06	5.94
MA42P3	8.75	6.62	3.06	6.69
MA50P3	9.88	7.38	3.88	7.12

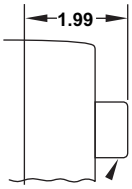
4-Bolt Flanges

TYPE	E	F	G	BOLT CIRCLE Diameter	BOLT SIZE
MA32P3	1.81	2.31	0.12	3.50	5/8
MA42P3	2.12	2.75	0.16	3.81	5/8
MA50P3	2.50	3.25	0.16	4.50	5/8



Type MA32P3, MA42P3, and MA50P3





Optional 1/2" Conduit Boss

SPECIFICATIONS – KC-3 COIL

TYPE	FLANGE CONNECTIONS Inches Sizes shown in BOLD will be furnished unless otherwise specified.	PORT SIZE Inches	MOPD psi		NOMINAL LIQUID CAPACITIES Tons of Refrigeration AMMONIA Pressure Drop – psi					COIL RATINGS		
			AC	DC	1	2	3	4	5	STANDARD VOLTS/CYCLES	WATTS AC	WATTS DC
MA32P3	1 or 1-1/4 NPT Female	1	250	175	126	178	219	253	283	24/50-60 120/50-60 208/50-60 240/50-60 Dual 120-240/60	18	25
MA42P3	1-1/2 NPT Female	1-5/16	300	175	317	429	511	582	639			
MA50P3	2 NPT Female	1-9/16	300	175	566	765	913	1039	1140			

▼ Maximum rated pressure 300 psi.
▼ Dual voltage 4-wire coils, 120-240/60 are available at slight additional cost. For other voltages and cycles, consult R/S.
▼ Available with conduit boss or junction box at no extra charge.

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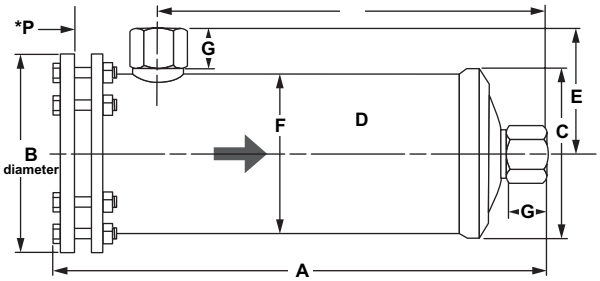
Parker Replaceable Core Filter Dryers

Maximum Rated Pressure of 500 psi



SPECIFICATIONS															
TYPE	CONNECTIONS Inches FPT	NO. OF CORES	CORE PART NO.	VOLUME OF DESICCANT Cu. In.	MOUNTING BRACKETS	SHELL DIMENSIONS Inches								NET WEIGHT Lbs.	SHIPPING WEIGHT Lbs.
						A	B	C	D	E	F	G	*P		
C-484-P	1/2	1	RC-4864	48	A-685	9.08	6.00	5.00	5.85	3.41	4.75	–	7.50	10	12
C-966-P	3/4	2		96		14.67			11.44	3.48			13.00	14	16
C-1448-P	1	3		144		20.42			17.19	3.66			18.62	17	20
C-19212-P	1-1/2	4		192		25.85			22.62	3.76			24.25	20	23
C-40016-P	2	4	RC-1009-8	400	A-175-2	34.44	7.50	6.25	30.38	4.38	6.00	–	32.12	46	51

* “P” Dimension is the pull space required to change core.

Ammonia Parker Replaceable Core Filter Dryers

The molded porous Replaceable Core Filter Dryer effectively removes scale and other fine particles – keeping the system clean – and prolonging the life of all moving parts.

Small amounts of water are not considered a problem in ammonia systems. Therefore, the “drier” function of the desiccant core is not normally required.

The Type C-413-P is a sealed model filter-drier. All of the other models shown at the right are replaceable core types. Use the RC-4864 or RC-10098 replaceable cores for excellent filtration ability.

Note: Do not use RPE-48-BD and RPE-100 Filter Elements on ammonia systems.

FILTER DRYER TYPE	FITTING SIZE FPT	SELECTION RECOMMENDATIONS Tons	REFRIGERANT FLOW CAPACITY Tons at 1 psi Δ P	REPLACEABLE CORE TYPE AND QUANTITY REQUIRED
C-413-P	3/8	20	58	–
C-484-P	1/2	40	72	RC-4864 (1)
C-966-P	3/4	100	189	RC-4864 (2)
C-1448-P	1	150	289	RC-4864 (3)
C-19212-P	1-1/2	300	476	RC-4864 (4)
C-40016-P	2	450	696	RC-10098 (4)

Replaceable Cores – Order Separately

Cores for replacement core type filter-driers are molded of exactly the same desiccants that are used in the popular sealed model filter-driers.

Cores are individually packed in metal cans, fully activated, and hermetically sealed against moisture and dirt.

The method of mounting the cores on the end plate by means of tie rods makes them very easy to install and remove.

Parker Replaceable Core Filter Dryers with pipe connections are supplied with an envelope containing 5 endplate gaskets. When replacement of endplate gasket is required, use one gasket from the envelope.

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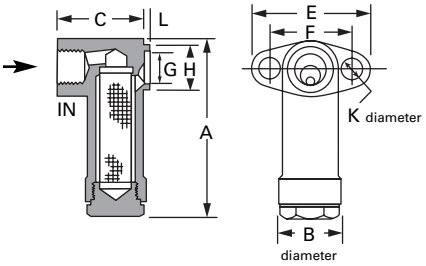
Strainers



Special Purpose Strainer

Type XD Strainer is for use with Ammonia and other liquids where a steel construction is suitable. May be used with companion flange or can be bolted directly to Type D thermostatic expansion valves and Type MA5A3 solenoid valves.

Semi-cast steel body with FPT inlet and flanged outlet connections. Strainer screen is stainless steel with a seal plug for screen removal. Complete unit is zinc plated and painted. The maximum safe working pressure is 500 psig.

SPECIFICATIONS																
TYPE NO.	CONNECTIONS Inches		SCREEN		MESH SIZE	WEIGHT – Lbs.		DIMENSIONS – Inches								
	INLET	OUTLET	AREA Sq. In.	PART NO.		NET	SHIP-PING	A	B	C	E	F	G	H	K	L
XD 074	1/2 FPT	Flange	6.6	635-3	100	1-3/4	3	4.19	1.50	2.25	2.88	2.00	0.78	1.09	0.50	0.13

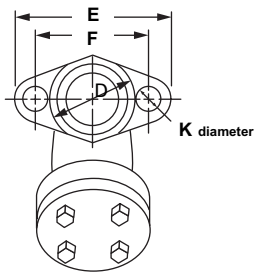
Strainers are supplied with female companion flange. Strainers can be ordered without the flange.

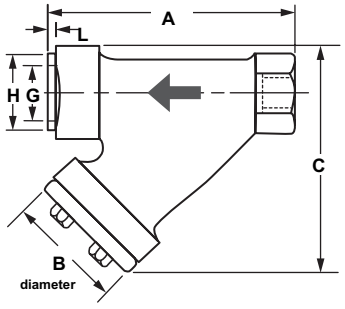
"Y" Type Cast Semi-Steel Strainers

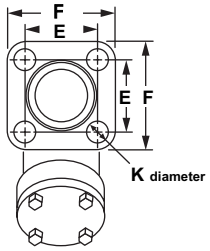
Type 8000 Strainer is used primarily for Refrigerant 717 Ammonia, but can also be used for halocarbon refrigerants (R-22, R-134a, and R-404A) and other liquids where a steel construction is applicable. FPT inlet, standard two bolt York flange outlet connections. Types 8004 and 8006 strainers can be bolted direct to the inlet of Type A thermostatic expansion valves or Type MA17A3 solenoid valves on Ammonia applications. The unit is zinc plated. The maximum safe working pressure is 500 psig.

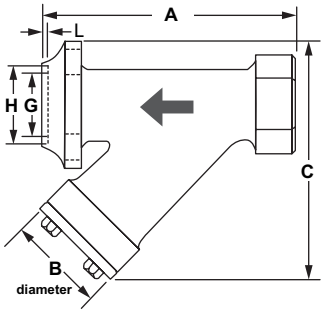
Type 9000 Strainers for large Refrigerant 717 Ammonia installations are also adaptable to halocarbon refrigerant (R-22, R-134a, and R-404A) applications, and other liquids where steel construction is suitable. The strainer is zinc plated. The maximum safe working pressure is 400 psig.

FPT inlet, standard four bolt York flange outlet connections. The Type 9008 and 9010 strainers bolt directly to inlet of Types MA32P3 and DMA32P3 solenoid valves.









SPECIFICATIONS																
TYPE NO.	CONNECTION Inches	SCREEN		MES-H SIZE	WEIGHT Lbs.		DIMENSIONS – Inches									
		AREA Sq. In.	PART NO.		NET	SHIP-PING	A	B	C	D	E	F	G	H	K	L
8004	1/2 FPT*	15	4097-3	80	5	7	5.69	2.75	5.06	2.06	3.81	2.69	1.28	1.75	0.56	0.13
8006	3/4 FPT*															
9008	1 FPT**	23	4110-3	60	11	13	7.56	3.13	7.50	–	2.44	3.75	1.81	2.31	0.75	
9010	1-1/4 FPT**				10-1/2											

* Strainers are supplied without companion flange. Female companion flange, bolts, and gasket can be supplied when ordered.
** Strainers are supplied without companion flange. Male companion flange, bolts, and gasket can be supplied when ordered.

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Refrigerating Specialties (R/S)
Broadview, IL 60155

The Level Master Control

Application and Installation

The R/S Level-Master Control is a positive liquid level control device suitable for application to all flooded evaporators.

Description and Operation

The LMC is a standard thermostatic expansion valve equipped with a Level-Master Element. The combination provides a simple, economical, and highly effective liquid level control. The bulb of the conventional thermostatic element has been modified to an insert type of bulb that incorporates a low wattage heater. A 15-watt heater is supplied as standard. For applications below -60°F evaporating temperature, specify a special 25-watt heater.

The insert bulb is installed in the accumulator or surge drum at the point of the desired liquid level. As the level at the insert bulb drops, the electrically added heat increases the pressure within the thermostatic element and opens the valve. As the liquid level at the bulb rises, the electrical input is balanced by the heat transfer from the bulb to the liquid refrigerant and the LMC either modulates or eventually shuts off. The evaporator pressure and spring assist in providing a positive closure.

Installation – General

The Level-Master Control is applicable to any system that has been specifically designed for flooded operation.

R/S is not responsible for system design and, therefore, is not liable for any damage arising from faulty design or improper piping, or for misapplication of its products. Figures 2 through 4 are piping schematics only to illustrate possible methods of applying the LMC valves.

If these valves are applied in any manner other than as described in this bulletin, the R/S warranty is void. Actual system piping must be done to protect the compressor at all times. This includes protection against overheating, slugging with liquid refrigerant, and trapping of oil in various locations. R/S recommends that recognized piping references, such as equipment manufacturers' literature and the ASHRAE Guide and Data Book, be consulted for assistance with this subject.

The valve is usually connected to feed into the surge drum above the liquid level. It can also feed into the liquid leg or coil header.

The insert bulb can be installed directly into the shell, surge drum or liquid leg on new or existing installations. Existing float systems can be easily converted by installing the LMC insert bulb in the float chamber.

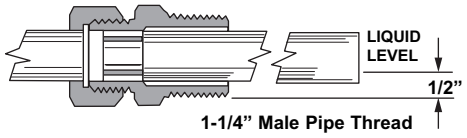
The Level-Master Control may be installed at any ambient temperature. The element is protected against excessive temperature, created by the heater, by a thermostatic switch that is an integral part of the heater assembly.

Installation – Insert Bulb

The insert bulb should be installed at the point where the desired liquid level is to be maintained. The bulb must be in contact with the refrigerant, i.e., **NOT** installed in a well. If the insert bulb is projected directly into the surge drum, it should be shielded to prevent the possibility of splash from either the valve feed or the return from the coil. While generally installed in a horizontal position, see Figure 1, it will operate effectively at any angle or vertical position.

Minor adjustments in liquid level can be made with the adjusting stem provided on the expansion valve. The insert bulb assembly is provided with a lock ring and gasket joint so that the bulb may be removed without breaking the pipe joint.

Figure 1

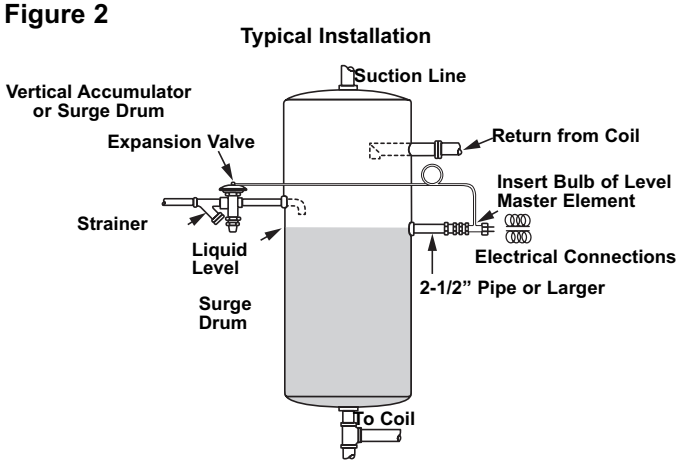


Installation – Electrical Connections

The heater is provided with a two-wire neoprene covered cord two feet in length. It runs through a moisture-proof grommet and a 1/2" male conduit connection affixed to the insert bulb assembly, see Figure 2.

The heater circuit must be interrupted when refrigeration is not required and the compressor is cycled off. This will prevent shortening the life of the heater thermostat. To accomplish this, the heater is wired in parallel (on the compressor side) with the control or power relay, the holding coil of the compressor magnetic starter, or the liquid line solenoid valve.

Figure 2



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Design Precautions

Hand Valves

On installations where the valve is isolated from the surge drum by a hand valve, and a two to three pound pressure drop from the valve outlet to the bulb location is likely, we recommend that an externally equalized valve be used. (See ordering instructions.)

Oil Return

General – All reciprocating compressors will allow some oil to pass into the discharge line along with the discharge gas. Mechanical oil separators are used extensively; however, they are never completely effective. The untrapped oil passes through the condenser, liquid line, expansion device and finally into the evaporator.

In a properly designed direct expansion system, the refrigerant velocity in the evaporator tubes and in the suction line is sufficiently high to ensure a continuous return of oil to the compressor crankcase. But, this is not characteristic of flooded systems. Here, we purposely design the surge drum for a relatively low vapor velocity to prevent entrainment of liquid refrigerant droplets and consequent carryover into the suction line. This design criterion also prevents the return of any oil from the low side in the normal manner.

And if oil is allowed to concentrate at the insert bulb location of the R/S Level-Master Control, overfeeding with possible floodback can occur. The tendency to overfeed is due to the fact that the oil does not convey the heat from the low wattage heater element away from the bulb as rapidly as does pure liquid refrigerant. The bulb pressure is higher than normal and the valve remains in the open or partially open position.

Oil and Ammonia Systems

Liquid ammonia and oil are immiscible for all practical purposes. And since the density of oil is greater than that of ammonia, it will fall to the bottom of any vessel containing such a mixture, if the mixture is relatively placid. Therefore, the removal of oil from an ammonia system is a comparatively simple task. Generally, on systems equipped with a surge drum, the liquid leg is extended downward below the point where the liquid is fed off to the evaporator and a drain valve is provided to allow periodic manual draining as shown in Figure 3.

For flooded chillers that do not use a surge drum, a sump with a drain valve is usually provided at the bottom of the chiller shell.

The above methods are quite satisfactory, except possibly on some low temperature systems. Here, the drain leg or sump generally has to be warmed prior to attempting to draw off the oil since the trapped oil becomes quite viscous at lower temperatures. If oil is not drained from a flooded ammonia system, a reduction in the evaporator heat transfer rate can occur due to an increase in the refrigerant film resistance. Difficulty in maintaining the proper liquid level with any type of flooded control can also be expected.

With a float valve, you can expect the liquid level in the evaporator to increase with high concentration of oil in a remote float chamber.

If a R/S Level-Master Control is used with the insert bulb installed in a remote chamber, oil concentration at the bulb can cause overfeeding with possible floodback. The lower or liquid balance line must be free of traps and be free draining into the surge drum or chiller as shown in Figure 4. The oil drain leg or sump must be located at the lowest point in the low side.

Figure 3

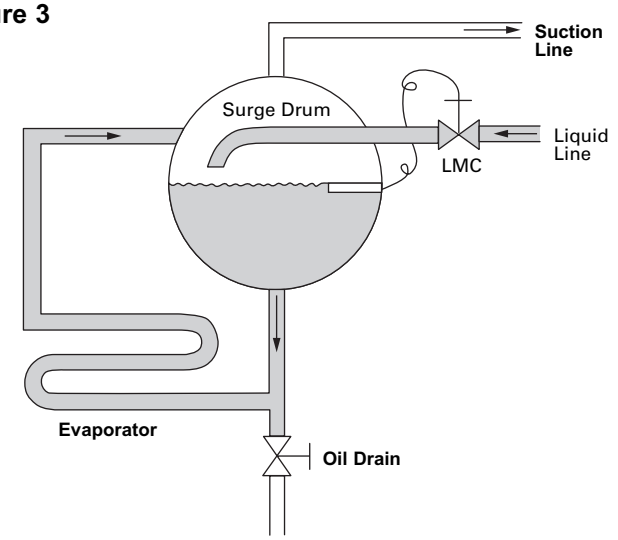
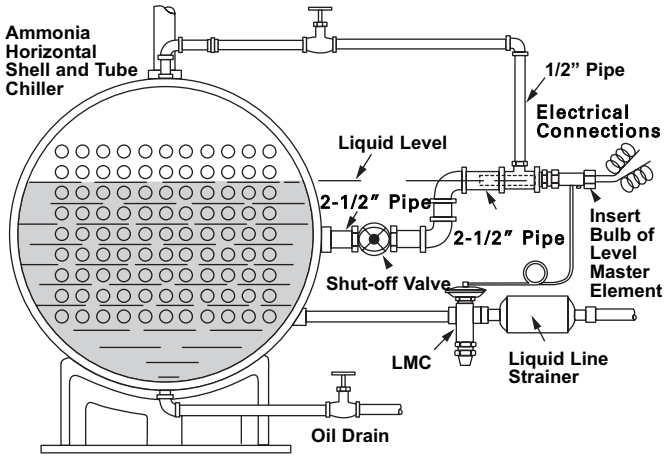


Figure 4

Typical Installation



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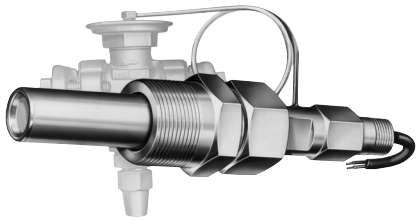
Capacities and Selection

Capacity in Tons of Refrigeration

These ratings are based on vapor free (subcooled) liquid refrigerant entering the expansion valve (86°F for Refrigerant 717) and standard factory setting. Because of the artificial superheat provided by the electric heater, the Level-Master will have a greater capacity than a conventional thermostatic expansion valve. For selections for other refrigerants, contact R/S.



REFRIGERANT 717 Ammonia CAPACITIES

LMC VALVE TYPE	NOMINAL CAPACITY	EVAPORATOR TEMPERATURE °F																			
		40° to 0°					-10°					-20°					-40°				
		PRESSURE DROP ACROSS VALVE – psi																			
		80	100	120	140	160	100	120	140	160	180	100	120	140	160	180	100	120	140	160	180
D	1	0.94	1.06	1.16	1.25	1.34	0.98	1.07	1.15	1.23	1.31	0.86	0.94	1.01	1.08	1.15	0.59	0.65	0.70	0.75	0.80
	2	2.69	3.01	3.30	3.56	3.80	2.77	3.04	3.28	3.50	3.71	2.44	2.67	2.88	3.08	3.26	1.68	1.85	1.99	2.13	2.26
	5	6.08	6.80	7.45	8.05	8.60	6.26	6.85	7.41	7.91	8.39	5.51	6.03	6.52	6.97	7.39	3.81	4.17	4.51	4.82	5.11
	10	11.0	12.3	13.5	14.6	15.6	11.3	12.4	13.4	14.4	15.2	9.96	10.9	11.8	12.6	13.4	6.89	7.56	8.18	8.74	9.26
	15	15.0	16.8	18.4	19.9	21.3	15.4	16.9	18.3	19.6	20.8	13.6	14.9	16.1	17.2	18.3	9.41	10.3	11.1	11.9	12.6
A	20	17.8	19.8	21.8	23.5	25.1	18.2	20.0	21.6	23.1	24.5	16.0	17.6	19.0	20.3	21.6	11.1	12.2	13.2	14.0	14.9
	30	30.0	33.6	36.8	39.7	42.4	30.9	33.8	36.5	39.0	41.4	27.2	29.8	32.2	34.3	36.4	18.8	20.6	22.2	23.7	25.2
	50	42.7	47.7	52.3	56.5	60.4	43.9	48.1	52.0	55.6	58.9	38.6	42.4	45.8	48.9	51.9	26.7	29.3	31.6	33.8	35.9
	75	75.1	84.0	92.0	99.4	106	77.3	84.6	91.4	97.5	103	68.0	74.5	80.5	85.9	91.1	47.0	51.5	55.7	59.4	63.0
	100	106	118	130	140	150	108	120	129	138	146	95.6	105	113	122	129	66.1	72.8	78.4	84.0	89.1

These factors include corrections for liquid refrigerant density and net refrigerating effect, and are based on an average evaporating temperature of 0°F. However, they may be used for any evaporator temperature from -40°F to 40°F since the variation in the actual factors across this range is insignificant.

REFRIGERANT	LIQUID TEMPERATURE ENTERING TXV °F											
	0°	10°	20°	30°	40°	50°	60°	70°	80°	86°	90°	100°
	CORRECTION FACTOR, CF LIQUID TEMPERATURE											
717	1.27	1.24	1.20	1.17	1.14	1.11	1.08	1.05	1.02	1.00	0.99	0.96

EXAMPLE: At -20°F evaporator, 160 psi pressure drop and 50°F liquid temperature, the capacity of an LMC-DA-10 (for ammonia) is 12.6 x 1.11 = 14.0 tons.

Ordering Instructions:

Complete Control Valve and Element:

1. Valve type, per specification table. If an external equalizer is required, add "E" as the sixth letter. EXAMPLE: LMC-AAE-20
2. Connection sizes and tubing lengths, if other than standard.
3. Electrical characteristics.

SPECIFICATIONS

COMPLETE CONTROL VALVE & ELEMENT		ELEMENT ONLY	DISCHARGE TUBE Inches	STANDARD CONNECTIONS Inches Sizes shown in BOLD figures will be furnished unless otherwise specified.	
INTERNAL EQUALIZER	①EXTERNAL EQUALIZER			INLET	OUTLET
LMC-DA-1	LMC-DAE-1	LMC 23AL	1/32	1/4, 3/8, or 1/2 FPT	
LMC-DA-2	LMC-DAE-2		1/16		
LMC-DA-5	LMC-DAE-5		5/64		
LMC-DA-10	LMC-DAE-10		7/64		
LMC-DA-15	LMC-DAE-15		5/32		
LMC-AA-20	LMC-AAE-20	LMC 12AL	1/8	1/2 or 3/4 FPT	
LMC-AA-30	LMC-AAE-30		5/32		
LMC-AA-50	LMC-AAE-50		3/16		
LMC-AA-75	LMC-AAE-75		–	3/4 FPT	
LMC-AA-100	LMC-AAE-100		–		

① Standard External Equalizer Connection (1/8" FPT) available when specified.

LMC Element Only:

Specify voltage, wattage, and type number as shown in "Element Only" column. (A 15-watt heater is supplied as standard. For applications below -60°F evaporating temperature, specify a special 25-watt heater.)

Electrical Specifications

15-watt, 120v or 240v any frequency AC or DC. 120v-25w, 240v-25w, 24v-25w and 24v-15w or 25w are available on special order at additional charge.

Standard Tubing Length

10 feet – Other lengths in integrals of 5 feet available on special order.

Replacement Parts

Internal parts kits – Same as standard thermostatic expansion valves. Specify valve type and port size.

Heater Element Assembly

Consists of heater element, lead wire, protective thermostatic switch, and moisture proof seal.

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Sight Glass

R/S offers a sight glass with flange connections for use on ammonia systems. By using the sight glass, one can be assured that solid liquid enters the thermostatic expansion valve. The sight glass can be used to diagnose system problems, and thus eliminate flash gas in the liquid entering the TXV.

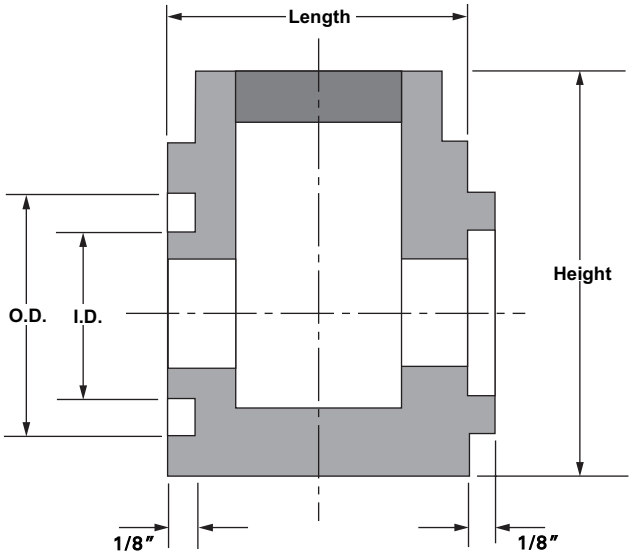
These sight glasses are specifically designed for ammonia system use. The glass is fused into a steel body, which is then cadmium plated. Two sizes of flange connections permit attaching the sight glass into the system conveniently. The smaller flange size will mate with R/S Type DA thermostatic expansion valve, MA5A3 solenoid valve, and XD-074 strainer. The larger size will mate with Type AA thermostatic expansion valve, MA17A3 solenoid valve, and 8006 strainer. The mating flanges, gaskets, and bolts should be ordered separately. The bolt length varies according to the assembly being made.

The sight glasses are suitable for a safe working pressure of 500 psig. The appropriate dimensions are shown in the table and drawing below.

During installation of the sight glass, tighten the bolts carefully and uniformly to avoid putting an undue strain on the glass. The plating gives these products initial corrosion resistance. However, for long term use in an ammonia plant, they should be painted to obtain further corrosion protection.

SPECIFICATIONS									
SIGHT GLASS PART NO.	FLANGE GROOVE OD x ID	USED WITH R/S PART NUMBER			BOLT LENGTH Inches	BOLT DIAMETER Inches	DIMENSIONS – Inches		NET WEIGHT Lbs.
		TXV	FLANGE ① FPT	GASKET ② PART NO.			HEIGHT	LENGTH	
108351	1-1/8 x 3/4	DA	1/4, 3/8 or 1/2	207658	3	7/16	1.87	1.36	3/4
108352	1-3/4 x 1-1/4	AA	1/2, 3/4 or 1	207657	5	1/2	2.25	1.88	1-1/2

① Flanges are supplied with TXV. Flanges can be ordered as part kits.
② One gasket is supplied with sight glass. Gaskets can be ordered separately.



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General Information

Warranties

All Refrigerating Specialties products are warranted against defect in workmanship and materials for a periodof one year from date of shipment from originating factory. This warranty is in force only when products are properly installed, field assembled, maintained and operated in use and service, as specifically stated in Refrigerating Specialties Catalogs or Bulletins for normal refrigeration applications, unless otherwise approved in writing by Refrigerating Specialties 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, 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 OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND IN NO EVENT IS REFRIGERATING SPECIALTIES RESPONSIBLE FOR ANY CONSEQUENTIAL DAMAGES OF ANY NATURE WHATSOEVER. No employee, agent, dealer or other person is authorized to give any warranties on behalf of Refrigerating Specialties, nor to assume, for Refrigerating Specialties, any other liability in connection with any of its products.

For More Information

Consult our web site **www.parker.com/rs** for the most current bulletins and catalog information on all our products.

Safe Operation

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 Bulletin RSB prior to installation or servicing work. Where cold refrigerant liquid lines are used, it is necessary that certain precautions by 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. (Tags are available for this purpose from the factory.) 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.

General Information

Factory Repair and Rebuilding For the convenience of our customers, we have a standard factory repair and rebuilding service. Repairable returned regulators are disassembled, cleaned, sandblasted, worn parts replaced, reassembled and repainted. For quickest service, it is advisable that this be done during the off peak season.

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Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyerís order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's proucts are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyerís offer, Acceptance of Sellerís products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Sellerís delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INC. INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special-tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter ëIntellectual Property Rightsí). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Sellerís obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Sellerís sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Sellerís control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

Parker Hannifin Corporation
Refrigerating Specialties (R/S)
Broadview, IL 60155

WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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Parker Hannifin Corporation
Refrigerating Specialties (R/S)
Broadview, IL 60155

Parker Hannifin Corporation
Refrigerating Specialties (R/S) Division
2445 South 25th Avenue
Broadview, IL 60155-3891
Phone: (708) 681-6300 or 1-800-506-4261
Fax: (708) 681-6306 or 1-800-424-7109
RSD_info@parker.com
www.parker.com/rs

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