

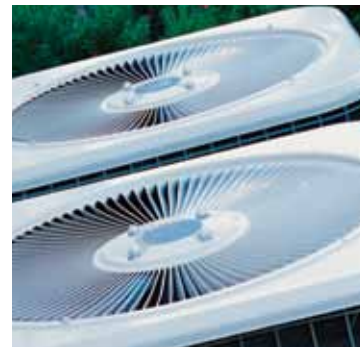


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# 611H Flo-Con Pressure Regulators & Valves

Catalog F-2, February 2012



ENGINEERING YOUR SUCCESS.

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### **FOR USE ON REFRIGERATION and/or AIR CONDITIONING SYSTEMS ONLY**

Catalog F-2, February 2012, supersedes Catalog F-2, January 2008 and all prior publications.

## Product Overview

With more than 35 years of commercial refrigeration control valve design and manufacturing experience, the Parker Flo-Con product line has evolved to include a wide variety of regulators, solenoid valves, and in-line check valves designed for precise and reliable control in both supermarket and field built halocarbon systems. Included in this expanded family of refrigeration components are high capacity pilot operated regulators and solenoid valves in extended port and connection size combinations. The highest capacity non-flanged regulators and solenoid valves available in the industry are included in this unique combination of control valves. Considering their application in larger systems, one control valve may be used in place of a

competitor's parallel valve combination in some instances.

Parker Flo-Con pilot operated regulators are modular by design, and are superior to direct operated valves in their ability to maintain a precise control of set point, despite changes in load. With a parabolic plug design as a standard feature throughout this line of regulators, a linear relationship exists between the main valve opening and the valve's capacity. The result is a steady set point and precise control, even at varying or low flow conditions.

As an added benefit, Parker Flo-Con pilot operated solenoid valves in the SC series utilize the same bodies, cartridges, and solenoid coil assemblies as their

(S)PORT and A8 regulator counterparts. In many instances, capacities can be changed by simply changing cartridges, a feature common throughout both lines of regulators and solenoid valves.

Parker Refrigerating Specialties product bulletins are also available for all valve types covered throughout this section. Product bulletins cover a variety of details such as dimensions, cutaway views, and specific information related to valve operation, which is not included within the context of this catalog. Product bulletin numbers are referenced in the selection guide matrix on page 63 and are readily available upon request.

### A8 Pressure Regulators

Initially introduced as the A7, the current A8 pressure regulator is designed with flexibility in mind, covering both high and low side applications in commercial refrigeration systems. A dual range spring, standard in all A8 regulators (with the exception of the differential version), allows the valve to control at any set point within a 10" Hg to 400 psi (250mm Hg to 27.6 bar) pressure range. Three body sizes define the A8 line. The A8A is the smallest of the three, the A81 covers the mid-range applications, and the A82 is the largest. Along with the standard A8 inlet pressure regulator, optional variations include inlet regulators with electric shut off features (A8AS, A81S, A82S) and wide opening or bypass features (A8\_B). In addition, outlet pressure regulators (A8\_OE), outlet regulators with electric shut-off features (A8\_OES), differential pressure regulators (A8\_L), and differential regulators with wide opening features (A8\_BL) round out the product line. Eight different "port" sizes (capacity cartridges) are available in the A8 family of regulators with connection sizes ranging from 7/8" (22mm) up to 2-5/8" (66mm). All A8 regulators are ductile iron bodied valves with brazed copper couplings. Valve cartridges are also made of ductile iron. A water resistant class "H" coil enclosed in a general purpose coil housing is supplied as standard with any A8 regulator version. Solenoid coils can be supplied either with twin leads or with DIN connectors.



### (S)PORT / (S)PORT II Evaporator Pressure Regulators

The (S)PORT and (S)PORT-II pressure regulators are a unique line of valves designed specifically for evaporator pressure control in commercial supermarket applications. All (S)PORT regulators are designed to control in a pressure range of 10" Hg to 120 psig (250mm Hg to 8.3 bar). The (S)PORT, has a ductile iron body and cartridge assembly. The (S)PORT-II, a more recent addition to the line, is made of completely corrosion resistant materials including aluminum bronze bodies and cartridge assemblies, and stainless steel bolts and adjusting stems. (S)PORT regulators are available in three common versions typically applied on low side applications: A standard upstream pressure regulator, or PORT, a regulator combined with an electric shut-off feature, or (S)PORT, and a unique combination of electric shut and bypass feature, the (S)PORT-B. The (S)PORT version is typically applied on a refrigeration circuit utilizing hot gas for defrosting purposes, while the (S)PORT-B offers the same capability in addition to a wide opening, or bypass feature, for quick pull down during start



## Product Overview continued

up or after a circuit's hot gas defrost period has been terminated. A water resistant class F coil and open frame coil housing is standard on the (S)PORT regulator line. Solenoid coils with DIN connectors can also be supplied.

### SC Solenoid Valves

The "SC" line of solenoid valves were designed to complement (S)PORT pressure regulators in both appearance and construction. Components such as valve bodies, cartridges, solenoid operators, and solenoid coils are interchangeable between the SC solenoid and (S)PORT regulator lines of valves. Like the (S)PORT regulator, the SC solenoid is available with either ductile iron materials (both body and cartridge) or corrosion resistant aluminum bronze materials. With the (S)PORT regulator and SC solenoid combination, any suction line control requirement can be satisfied while maintaining reliable performance and common appearance. The SC line of solenoids utilizes the same water resistant class F coil and open frame coil housing which is standard with the (S)PORT line of regulators.



### A9 Pressure Regulators

A9 outlet pressure regulators utilize a compact design unique to the Refrigerating Specialties line of regulators, and are applied most typically as hot gas bypass or receiver pressure control valves. Four port sizes ranging from 3/8" (9mm) through 1-1/8" (28mm) are available. Utilizing a pilot operated design for stable control of set point, the A9E is typically used as a hot gas bypass regulator. The A9E regulator, when used in a hot gas bypass application, is externally equalized to suction pressure, or the pressure being controlled. Through years of reliable performance, it has become a standard on a variety of OEM equipment where precise suction pressure control is required for stable system operation. The A9, an internally equalized regulator which senses and controls immediate downstream pressure, is typically applied as a receiver pressure control valve for those systems using regulators for condenser pressure control on air cooled condensers.



### CK4A In Line Check Valves

CK4A in line check valves are versatile spring closing disc check valves, used for most hot gas and liquid line applications. The CK4 series of check valves are a flanged family of check valves, utilizing a gasketed refrigeration style tongue-and-groove ODS flange for commercial applications. Eight port sizes are available ranging from 1/2" (13mm) through 4" (100mm). Up through and including the 2" port size valve, three different ODS connection sizes are available for each port size valve to accommodate a reduced capacity valve in larger lines. All valves are made to tight seat leakage specifications, utilizing a lapped metal-to-metal seat design. The pressure drop required to open the valve fully is about .75 psi. Because of its spring closing design, CK4 check valves can be installed in both vertical and horizontal pipe lines.



# (S)PORT & (S)PORT-II Evaporator Pressure Regulators

## Features and Benefits

- Highest capacity commercial regulator in the industry
- Solder in place without disassembly
- Interchangeable capacity cartridges
- Low pressure drop
- Manual opening stem
- Variations include electric shut-off along with bypass and shut-off feature
- (S)PORT-II with corrosion resistant aluminum bronze construction
- All stainless steel bolts, stem, locking nut, piston and plug
- Dual voltage 208/240/60 Hz coil

## Specifications

- Design pressure (M.R.P.): 450 psig (31.0 bar)
- Minimum fluid temperature: -40°F (-40°C)
- Operating range: 10" Hg to 120 psig (250 mm Hg to 8.3 bar)
- UL listed (except 50 Hz versions), file SA5473
- CSA certified, file LR20991-14

## Standard Voltages

- 120V/60Hz, 110V/50Hz
- 208V/240V/60Hz, 220V/50Hz
- 240V/50Hz
- 240V/60Hz, 220V/50Hz (DIN)
- 240V/50Hz (DIN)



## Nomenclature (Example)

<b>S</b>	<b>P</b>	<b>OR</b>	<b>T</b>	<b>II</b>	<b>B</b>	<b>7</b>	<b>11</b>
Electric Shut-Off	Parker	Open on Rise of Inlet Pressure	Inlet Pressure "Tap" or Fitting	Aluminum Bronze Version	Bypass Feature	Port Size in Eighths of an Inch	Connection Size in Eighths of an Inch

## (S)PORT Port/Connection Size Combinations

Type	Port Size			Connection Sizes Available
	Connection	Inches	mm	
(S)PORT or (S)PORT-II	03	3/8	9	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	05	5/8	15	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	07	7/8	22	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	09	1-1/8	28	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	11	1-3/8	35	09, 11, 13, 17 (1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
(S)PORT	13	1-5/8	42	13, 17, 21 (1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm)
	17	2-1/8	54	17, 21 (2-1/8"/54mm, 2-5/8"/66mm)
	21	2-5/8	66	21 (2-5/8"/66mm)

**Note:** (S)PORT-II regulators have same port/connection combinations as standard (S)PORT regulators but are not available in the 13, 17, or 21 port size versions.

# Technical Information

**Description:** Unlike other Parker Flo-Con regulators, (S)PORT regulators utilize a unique numbering system identifying port & connection size values in eighths of an inch (see previous page). For example, a 7/8" port size by 1-1/8" connection size valve would be identified as a (S)PORT 07-09, with the valves port size being the first numerical value in the description (in eighths of an inch), and the connection size being the second value. All (S)PORT cartridges are externally stamped with the plug or port size using this same numbering system for field identification purposes. (S)PORT evaporator pressure regulators are available in two versions, each with their own distinct material characteristics; the original (S)PORT, and the (S)PORT-II. The original (S)PORT utilizes a ductile iron body with brazed copper couplings along with a ductile iron cartridge assembly. The original (S)PORT is available in eight port sizes ranging from a 3/8" (03) to 2-5/8" (21) and with connection sizes up to 2-5/8" (21). A 1/4" SAE flare access fitting is standard on the upstream side of the valve's cartridge assembly. An open frame, class F leaded coil is provided as standard with all (S)PORT regulators. A class H coil with DIN connector is also available with certain voltages.

The (S)PORT-II, a more recent introduction, is made completely with corrosion resistant materials. Both the body and cartridge are an aluminum-bronze material, with the adapter and bonnet being aluminum. In addition, stainless steel bonnet bolts and adjusting stems are standard on all (S)PORT-II regulators. In contrast to the original (S)PORT, five port sizes are offered with the (S)PORT-II style of regulator, ranging from 3/8" (03) to 1-3/8" (11). The same open-frame coil housing which is standard on the (S)PORT is supplied with the (S)PORT-II. The access fitting on the (S)PORT-II is located on the upstream side of the valve body, and positioned to easily connect a gauge fitting for servicing. The (S)PORT-II

design specifically targets the rigorous application of a commercial evaporator pressure regulator — particularly those applications with hot gas defrost circuits. The corrosion resistant design of the (S)PORT-II is capable of withstanding the cooling and heating cycles to which these types of regulators are continually exposed.

All (S)PORT regulators are designed to be applied as a low side (evaporator) pressure regulator only. They are capable of being set to control pressures within a 10" to 120 psig (250mm Hg through 8.3 bar) range. For high side regulator applications, the Flo-Con A8 regulator should be considered.

**Variations:** PORT or PORT-II: Standard Inlet pressure regulator. (S)PORT or (S)PORT-II: Inlet pressure regulator with an electric shut-off feature. (S)PORT-B or (S)PORT-II-B: Inlet pressure regulator with an electric shut-off and electric wide opening, (or bypass) feature.

**Installation:** (S)PORT regulators use a spring loaded solenoid plunger design which assists the plunger in closing off tightly against the solenoid pilot seat regardless of position or orientation. The regulator can therefore be installed in either a horizontal or vertical pipe line regardless of the type of (S)PORT valve being installed (i.e. with or without a pilot solenoid).

When brazing in line, typically a wet cloth wrapped around the valve body is recommended to dissipate heat. **If a valve is disassembled prior to installation, always have the correct gasket/ O-ring kit available for reassembly.** The internal cartridge-to-body O-ring will need to be replaced prior to reassembly.

**Adjustment:** Adjustment of a regulator set point requires that the pressure being controlled be monitored by an accurate pressure gauge. Turning the

valves adjusting screw clockwise (into the bonnet) compresses the range spring and subsequently raises the valves set point. Conversely, turning the adjusting stem counter-clockwise will decrease the valves set point. Adjusting the set point of a (S)PORT regulator must be made with the solenoid energized, and the manual opening stem turned in. The inlet side solenoid only is required to be energized to adjust the set point on a (S)PORT-B. Depending on system design and system conditions, the pressure gauge may reflect some delay before a change in a regulator's set point actually results in a change in the pressure being maintained.

**Electrical:** All (S)PORT regulator versions utilize a molded water resistant class "F" solenoid coil with open frame housing as standard. A class "H" DIN coil is also available with certain voltages. Coils are designed to operate with line voltage from 85% to 110% of rated coil voltage. Operating with a coil voltage above or below these limits may result in coil burnout. Also, operating with a coil voltage below this limit will result in lowering the valves maximum opening pressure differential, or MOPD. Power consumption during normal operation will be 10 watts or less. The 208/240/60 Hz wide voltage range coil used on all (S)PORT regulators is rated at 280 MOPD. All other coils are rated at 300 MOPD.

**Ordering Guide:** Specify valve type (PORT, (S)PORT, (S)PORT-II, etc.), port and connection size in eighths of an inch (port size indicated first), and voltage, if applicable.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Tons)

**R-22**

Evap Temp °F Evap Pressure psig	Pressure Drop psi	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
50°F 84.0 psig	1	0.74	1.88	2.65	3.37	5.97	8.90	15.66	20.06
	3	1.26	3.20	4.53	5.77	10.20	15.22	26.77	34.25
	5	1.59	4.08	5.77	7.36	12.99	19.41	34.09	43.60
	10	2.15	5.55	7.91	10.11	17.75	26.58	46.55	59.45
40°F 68.5 psig	1	0.67	1.70	2.40	3.06	5.42	8.08	14.22	18.20
	3	1.14	2.90	4.10	5.23	9.24	13.79	24.24	31.01
	5	1.44	3.68	5.22	6.66	11.73	17.53	30.79	39.36
	10	1.92	4.98	7.11	9.09	15.92	23.87	41.76	53.30
30°F 54.9 psig	1	0.61	1.54	2.17	2.77	4.90	7.31	12.86	16.46
	3	1.02	2.61	3.70	4.72	8.33	12.43	21.85	27.95
	5	1.29	3.31	4.69	5.99	10.55	15.77	27.67	35.36
	10	1.70	4.43	6.34	8.12	14.19	21.30	37.21	47.46
20°F 43.0 psig	1	0.55	1.39	1.96	2.49	4.41	6.58	11.57	14.82
	3	0.92	2.34	3.32	4.23	7.47	11.16	19.59	25.06
	5	1.15	2.95	4.19	5.36	9.42	14.10	24.71	31.57
	10	1.49	3.91	5.62	7.20	12.54	18.85	32.88	41.89
10°F 32.7 psig	1	0.49	1.24	1.75	2.23	3.95	5.89	10.37	13.27
	3	0.81	2.09	2.96	3.78	6.66	9.95	17.46	22.33
	5	1.01	2.61	3.72	4.76	8.35	12.51	21.91	27.98
	10	1.29	3.41	4.92	6.33	10.96	16.51	28.74	36.57
0°F 23.9 psig	1	0.43	1.11	1.56	1.99	3.52	5.25	9.24	11.82
	3	0.72	1.85	2.62	3.35	5.89	8.81	15.46	19.76
	5	0.88	2.30	3.28	4.20	7.35	11.01	19.27	24.58
	10	1.09	2.93	4.27	5.49	9.46	14.29	24.79	31.50
-10°F 16.4 psig	1	0.38	0.98	1.38	1.76	3.12	4.65	8.18	10.47
	3	0.63	1.62	2.31	2.95	5.18	7.75	13.58	17.34
	5	0.76	1.99	2.86	3.67	6.39	9.60	16.77	21.38
	10	0.91	2.47	3.64	4.70	8.02	12.17	21.02	26.64
-20°F 10.1 psig	1	0.34	0.86	1.22	1.55	2.74	4.09	7.19	9.20
	3	0.54	1.41	2.01	2.57	4.50	6.75	11.81	15.08
	5	0.65	1.71	2.47	3.17	5.50	8.27	14.41	18.34
	10	0.73	2.04	3.04	3.94	6.65	10.14	17.41	21.98
-30°F 4.8 psig	1	0.29	0.75	1.06	1.36	2.39	3.57	6.28	8.03
	3	0.46	1.21	1.73	2.22	3.87	5.81	10.15	12.95
	5	0.54	1.44	2.09	2.70	4.65	7.02	12.18	15.47
	10	0.56	1.61	2.46	3.22	5.32	8.19	13.93	17.49
-40°F 0.5 psig	1	0.25	0.65	0.92	1.18	2.07	3.10	5.43	6.95
	3	0.39	1.02	1.47	1.89	3.28	4.94	8.60	10.95
	5	0.43	1.18	1.74	2.25	3.84	5.83	10.07	12.75
	10	0.43	1.23	1.90	2.52	4.06	6.31	10.63	13.34

Capacities are based on 100°F liquid, 10°F superheat at valve inlet, and are maximum for the conditions listed. For each 10°F liquid is below 100°F, INCREASE capacity values by 4%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of 3 psi should be used in the regulator selection process. If a pressure drop of more than 3 psi is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a 3 psi pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Kilowatts)

**R-22**

Evap Temp °C Evap Pressure bar	Pressure Drop bar	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
10°C 5.8 bar	0.07	2.57	6.53	9.20	11.71	20.76	30.95	54.47	69.74
	0.2	4.27	10.88	15.37	19.59	34.65	51.70	90.91	116.34
	0.4	5.88	15.07	21.35	27.25	48.04	71.78	126.04	161.16
	0.8	7.86	20.39	29.11	37.24	65.23	97.77	171.09	218.37
5°C 4.8 bar	0.07	2.36	5.98	8.43	10.74	19.03	28.37	49.93	63.93
	0.2	3.90	9.95	14.07	17.93	31.70	47.30	83.16	106.41
	0.4	5.35	13.73	19.48	24.87	43.80	65.49	114.92	146.90
	0.8	7.08	18.44	26.39	33.79	59.07	88.62	154.91	197.59
0°C 4 bar	0.07	2.15	5.46	7.70	9.81	17.38	25.91	45.59	58.37
	0.2	3.55	9.06	12.82	16.34	28.87	43.10	75.74	96.90
	0.4	4.84	12.45	17.69	22.59	39.74	59.44	104.25	133.21
	0.8	6.32	16.56	23.78	30.48	53.13	79.80	139.31	177.56
-5°C 3.2 bar	0.07	1.96	4.97	7.01	8.93	15.82	23.59	41.51	53.14
	0.2	3.22	8.22	11.64	14.84	26.20	39.13	68.74	87.93
	0.4	4.35	11.23	15.99	20.43	35.89	53.72	94.14	120.25
	0.8	5.60	14.77	21.29	27.32	47.46	71.41	124.44	158.45
-10°C 2.6 bar	0.07	1.77	4.51	6.36	8.11	14.35	21.41	37.66	48.21
	0.2	2.90	7.43	10.53	13.43	23.68	35.38	62.14	79.46
	0.4	3.89	10.08	14.38	18.39	32.24	48.30	84.56	107.96
	0.8	4.90	13.05	18.91	24.31	42.05	63.40	110.23	140.19
-15°C 1.98 bar	0.07	1.60	4.07	5.75	7.32	12.96	19.33	34.01	43.53
	0.2	2.60	6.67	9.47	12.08	21.29	31.82	55.84	71.39
	0.4	3.45	8.98	12.84	16.44	28.75	43.12	75.40	96.19
	0.8	4.23	11.40	16.62	21.42	36.83	55.68	96.53	122.56
-20°C 1.46 bar	0.07	1.44	3.66	5.17	6.59	11.65	17.38	30.57	39.12
	0.2	2.32	5.96	8.46	10.81	19.02	28.45	49.89	63.75
	0.4	3.03	7.93	11.38	14.59	25.43	38.20	66.68	84.99
	0.8	3.58	9.80	14.43	18.65	31.81	48.27	83.35	105.59
-25°C 1.0 bar	0.07	1.28	3.27	4.62	5.89	10.42	15.55	27.34	34.98
	0.2	2.05	5.28	7.52	9.61	16.88	25.27	44.27	56.54
	0.4	2.62	6.93	9.99	12.83	22.27	33.52	58.39	74.34
	0.8	2.95	8.27	12.32	15.98	26.98	41.15	70.66	89.23
-30°C 0.63 bar	0.07	1.14	2.91	4.11	5.24	9.26	13.83	24.30	31.09
	0.2	1.79	4.64	6.63	8.48	14.86	22.27	38.96	49.73
	0.4	2.24	5.97	8.67	11.16	19.26	29.07	50.49	64.18
	0.8	2.35	6.78	10.28	13.42	22.31	34.27	58.37	73.39
-40°C 0.04 bar	0.07	0.88	2.25	3.19	4.07	7.18	10.73	18.83	24.07
	0.2	1.32	3.47	5.00	6.42	11.16	16.78	29.26	37.26
	0.4	1.51	4.19	6.22	8.07	13.66	20.80	35.78	45.23
	0.8	1.49	4.24	6.50	8.56	13.99	21.61	36.59	45.92

Capacities are based on 40°C liquid, 5°C superheat at valve inlet, and are maximum for the conditions listed. For each 5°C liquid is below 40°C, INCREASE capacity values by 7%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of .20 bar should be used in the regulator selection process. If a pressure drop of more than .20 bar is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a .20 bar pressure drop, and should not be considered for these types of systems.



# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Tons)

## R-134a

Evap Temp °F Evap Pressure psig	Pressure Drop psi	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
50°F 45.4 psig	1	0.58	1.47	2.07	2.64	4.67	6.96	12.25	15.68
	3	0.97	2.48	3.51	4.48	7.90	11.80	20.73	26.51
	5	1.21	3.12	4.44	5.67	9.96	14.91	26.14	33.39
	10	1.57	4.13	5.94	7.61	13.25	19.92	34.74	44.25
40°F 35.1 psig	1	0.51	1.31	1.84	2.35	4.16	6.20	10.91	13.97
	3	0.86	2.20	3.11	3.97	7.00	10.47	18.38	23.49
	5	1.06	2.75	3.92	5.01	8.79	13.16	23.05	29.43
	10	1.35	3.58	5.18	6.65	11.52	17.36	30.20	38.43
30°F 26.1 psig	1	0.46	1.16	1.64	2.08	3.69	5.50	9.67	12.38
	3	0.75	1.93	2.75	3.51	6.17	9.23	16.18	20.68
	5	0.92	2.40	3.43	4.39	7.69	11.53	20.16	25.72
	10	1.14	3.06	4.46	5.74	9.89	14.95	25.93	32.93
20°F 18.4 psig	1	0.40	1.02	1.44	1.84	3.25	4.85	8.52	10.90
	3	0.65	1.69	2.40	3.07	5.39	8.07	14.14	18.07
	5	0.79	2.08	2.98	3.82	6.66	10.00	17.47	22.27
	10	0.94	2.58	3.79	4.89	8.36	12.68	21.90	27.75
10°F 11.9 psig	1	0.35	0.89	1.26	1.61	2.84	4.25	7.46	9.55
	3	0.56	1.46	2.08	2.67	4.67	7.00	12.25	15.64
	5	0.67	1.77	2.56	3.29	5.70	8.58	14.95	19.04
	10	0.75	2.12	3.15	4.09	6.91	10.54	18.09	22.85
0°F 6.5 psig	1	0.30	0.78	1.10	1.40	2.47	3.69	6.49	8.30
	3	0.48	1.25	1.79	2.29	4.00	6.01	10.50	13.39
	5	0.56	1.49	2.17	2.79	4.81	7.26	12.61	16.02
	10	0.57	1.68	2.55	3.34	5.53	8.51	14.48	18.19
-10°F 2.0 psig	1	0.26	0.67	0.95	1.21	2.13	3.19	5.59	7.15
	3	0.40	1.05	1.52	1.95	3.39	5.09	8.88	11.30
	5	0.45	1.23	1.80	2.33	3.98	6.03	10.41	13.20
	10	0.46	1.27	1.98	2.62	4.22	6.58	11.03	13.74

Capacities are based on 100°F liquid, 10°F superheat at valve inlet, and are maximum for the conditions listed. For each 10°F liquid is below 100°F, INCREASE capacity values by 4%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of 3 psi should be used in the regulator selection process. If a pressure drop of more than 3 psi is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a 3 psi pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Kilowatts)

## R-134a

Evap Temp °C Evap Pressure bar	Pressure Drop bar	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
10°C 3.13 bar	0.07	2.05	5.03	7.25	9.30	16.50	24.60	43.20	55.20
	0.2	3.38	8.73	12.10	15.60	27.60	41.30	72.50	92.60
	0.35	4.31	10.90	15.70	20.20	35.80	53.50	93.80	119.90
	0.7	5.54	14.50	20.90	26.90	47.50	71.00	124.60	159.20
5°C 2.48 bar	0.07	1.85	4.54	6.54	8.42	14.90	22.20	39.00	49.90
	0.2	3.02	7.56	10.90	14.00	24.80	37.10	65.10	83.10
	0.35	3.82	9.73	14.00	18.10	31.90	47.70	83.70	106.90
	0.7	4.82	12.80	18.40	23.70	41.80	62.50	109.70	140.20
0°C 1.92 bar	0.07	1.65	4.07	5.87	7.56	13.40	20.00	35.00	44.80
	0.2	2.68	6.75	9.73	12.50	22.10	33.10	58.00	74.20
	0.35	3.36	8.62	12.40	16.00	28.30	42.20	74.10	94.70
	0.7	4.13	11.10	16.00	20.60	36.40	54.40	95.50	122.00
-5°C 1.42 bar	0.07	1.47	3.64	5.24	6.75	11.90	17.80	31.30	40.00
	0.2	2.36	5.98	8.61	11.10	19.60	29.30	51.40	65.70
	0.35	2.92	7.56	10.90	14.00	24.80	37.10	65.00	83.10
	0.7	3.49	9.54	13.80	17.70	31.30	46.80	82.10	104.90
-10°C .993 bar	0.07	1.30	3.23	4.65	5.99	10.60	15.80	27.80	35.50
	0.2	2.06	5.25	7.57	9.75	17.20	25.80	45.20	57.70
	0.35	2.50	6.57	9.47	12.20	21.50	32.20	56.50	72.20
	0.7	2.88	8.08	11.60	15.00	26.50	39.60	69.50	88.80
-15°C .625 bar	0.07	1.15	2.85	4.10	5.28	9.34	14.00	24.50	31.30
	0.2	1.78	4.57	6.59	8.49	15.00	22.40	39.30	50.30
	0.35	2.12	5.64	8.12	10.50	18.50	27.60	48.50	61.90
	0.7	2.32	6.71	9.68	12.50	22.00	32.90	57.70	73.80
-20°C .3149 bar	0.07	1.00	2.50	3.60	4.63	8.19	12.20	21.50	27.40
	0.2	1.52	3.94	5.68	7.31	12.90	19.30	33.90	43.30
	0.35	1.76	4.77	6.87	8.85	15.60	23.40	41.00	52.40
	0.7	1.87	5.46	7.88	10.10	17.90	26.80	47.00	60.00

Capacities are based on 40°C liquid, 5°C superheat at valve inlet, and are maximum for the conditions listed. For each 5°C liquid is below 40°C, INCREASE capacity values by 7%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of .20 bar should be used in the regulator selection process. If a pressure drop of more than .20 bar is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a .20 bar pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Tons)

## R-404A

Evap Temp °F Evap Pressure psig	Pressure Drop psi	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
50°F 104.7 psig	1	0.63	1.60	2.26	2.87	5.09	7.59	13.36	17.10
	3	1.08	2.74	3.87	4.93	8.71	13.00	22.87	29.26
	5	1.37	3.49	4.94	6.30	11.12	16.60	29.17	37.32
	10	1.85	4.78	6.80	8.68	15.26	22.84	40.03	51.14
40°F 86.4 psig	1	0.56	1.43	2.02	2.57	4.55	6.79	11.95	15.30
	3	0.96	2.44	3.45	4.40	7.78	11.61	20.42	26.13
	5	1.22	3.11	4.40	5.62	9.91	14.80	25.99	33.24
	10	1.64	4.23	6.03	7.71	13.52	20.25	35.47	45.29
30°F 70.3 psig	1	0.50	1.27	1.80	2.29	4.05	6.04	10.64	13.62
	3	0.85	2.17	3.07	3.91	6.91	10.31	18.13	23.19
	5	1.07	2.75	3.90	4.98	8.77	13.11	23.02	29.43
	10	1.43	3.72	5.31	6.79	11.89	17.83	31.19	39.80
20°F 56.2 psig	1	0.45	1.13	1.59	2.03	3.59	5.36	9.43	12.07
	3	0.75	1.92	2.71	3.46	6.10	9.11	16.01	20.48
	5	0.94	2.42	3.44	4.39	7.72	11.55	20.26	25.90
	10	1.24	3.24	4.64	5.94	10.38	15.58	27.21	34.70
10°F 44.0 psig	1	0.39	0.99	1.40	1.79	3.16	4.72	8.30	10.63
	3	0.66	1.68	2.38	3.03	5.35	8.00	14.04	17.96
	5	0.82	2.11	3.00	3.84	6.75	10.09	17.69	22.61
	10	1.06	2.79	4.01	5.15	8.96	13.47	23.49	29.92
0°F 33.5 psig	1	0.34	0.87	1.23	1.57	2.78	4.14	7.28	9.32
	3	0.57	1.46	2.08	2.65	4.67	6.98	12.25	15.66
	5	0.71	1.83	2.61	3.34	5.85	8.77	15.35	19.60
	10	0.90	2.38	3.44	4.42	7.66	11.54	20.07	25.53
-10°F 24.5 psig	1	0.30	0.76	1.07	1.37	2.42	3.61	6.34	8.11
	3	0.49	1.27	1.80	2.30	4.04	6.04	10.60	13.54
	5	0.60	1.57	2.25	2.87	5.03	7.54	13.18	16.81
	10	0.74	1.99	2.91	3.74	6.44	9.73	16.87	21.42
-20°F 16.8 psig	1	0.26	0.66	0.93	1.18	2.09	3.12	5.48	7.01
	3	0.42	1.08	1.54	1.97	3.46	5.18	9.08	11.59
	5	0.51	1.33	1.91	2.45	4.26	6.41	11.18	14.25
	10	0.60	1.64	2.41	3.12	5.31	8.06	13.91	17.61
-30°F 10.4 psig	1	0.22	0.56	0.80	1.01	1.79	2.67	4.70	6.01
	3	0.35	0.92	1.31	1.67	2.93	4.39	7.68	9.81
	5	0.42	1.11	1.60	2.06	3.56	5.37	9.34	11.88
	10	0.46	1.30	1.95	2.53	4.26	6.51	11.15	14.06
-40°F 5.0 psig	1	0.19	0.48	0.68	0.86	1.52	2.27	3.99	5.10
	3	0.29	0.76	1.09	1.40	2.45	3.67	6.41	8.17
	5	0.34	0.90	1.32	1.70	2.92	4.41	7.64	9.70
	10	0.34	0.99	1.52	1.99	3.27	5.06	8.56	10.73

Capacities are based on 100°F liquid, 10°F superheat at valve inlet, and are maximum for the conditions listed. For each 10°F liquid is below 100°F, INCREASE capacity values by 4%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of 3 psi should be used in the regulator selection process. If a pressure drop of more than 3 psi is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a 3 psi pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Kilowatts)

## R-404A

Evap Temp °C Evap Pressure bar	Pressure Drop bar	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
10°C 8.1 bar	0.07	2.15	5.46	7.70	9.80	17.37	25.90	45.59	58.37
	0.2	3.59	9.13	12.88	16.42	29.05	43.33	76.22	97.55
	0.4	4.95	12.67	17.94	22.89	40.38	60.32	105.95	135.51
	0.8	6.67	17.25	24.58	31.43	55.15	82.59	144.66	184.72
5°C 7.0 bar	0.07	1.94	4.93	6.96	8.86	15.69	23.40	41.18	52.73
	0.2	3.23	8.23	11.62	14.81	26.19	39.08	68.73	87.95
	0.4	4.44	11.39	16.14	20.60	36.32	54.27	95.28	121.83
	0.8	5.94	15.41	22.00	28.15	49.31	73.90	129.32	165.06
0°C 6.0 bar	0.07	1.75	4.44	6.27	7.98	14.14	21.08	37.10	47.50
	0.2	2.90	7.39	10.45	13.32	23.55	35.14	61.78	79.05
	0.4	3.97	10.20	14.47	18.47	32.54	48.64	85.35	109.11
	0.8	5.25	13.69	19.60	25.09	43.86	65.80	115.01	146.70
-5°C 5.1 bar	0.07	1.57	3.99	5.62	7.16	12.68	18.91	33.28	42.60
	0.2	2.59	6.61	9.35	11.92	21.07	31.45	55.27	70.71
	0.4	3.53	9.08	12.90	16.48	28.99	43.36	76.05	97.17
	0.8	4.61	12.07	17.34	22.22	38.73	58.18	101.55	129.43
-10°C 4.3 bar	0.07	1.40	3.56	5.02	6.39	11.32	16.88	29.70	38.03
	0.2	2.30	5.88	8.33	10.62	18.75	27.99	49.18	62.90
	0.4	3.11	8.03	11.43	14.61	25.66	38.42	67.32	85.98
	0.8	3.99	10.55	15.21	19.52	33.90	51.01	88.88	113.16
-15°C 3.6 bar	0.07	1.24	3.16	4.46	5.68	10.06	15.00	26.40	33.79
	0.2	2.03	5.20	7.37	9.41	16.59	24.79	43.53	55.66
	0.4	2.72	7.06	10.07	12.88	22.57	33.82	59.20	75.57
	0.8	3.42	9.12	13.22	17.00	29.39	44.32	77.03	97.95
-20°C 3.0 bar	0.07	1.10	2.80	3.95	5.03	8.91	13.29	23.38	29.92
	0.2	1.79	4.58	6.50	8.30	14.62	21.86	38.36	49.03
	0.4	2.36	6.16	8.81	11.28	19.72	29.59	51.73	65.99
	0.8	2.89	7.80	11.38	14.67	25.20	38.12	66.04	83.84
-25°C 2.5 bar	0.07	0.97	2.46	3.48	4.43	7.84	11.69	20.56	26.31
	0.2	1.56	4.00	5.69	7.27	12.78	19.12	33.52	42.83
	0.4	2.03	5.32	7.64	9.79	17.06	25.63	44.73	57.00
	0.8	2.38	6.55	9.65	12.47	21.25	32.27	55.68	70.51
-30°C 2.0 bar	0.07	0.84	2.15	3.04	3.88	6.85	10.22	17.97	22.99
	0.2	1.34	3.47	4.94	6.31	11.08	16.59	29.06	37.11
	0.4	1.71	4.54	6.55	8.41	14.58	21.96	38.24	48.67
	0.8	1.91	5.37	8.03	10.42	17.56	26.81	45.98	58.03
-40°C 1.3 bar	0.07	0.63	1.60	2.27	2.90	5.11	7.64	13.42	17.16
	0.2	0.96	2.52	3.61	4.62	8.07	12.11	21.16	26.97
	0.4	1.15	3.13	4.60	5.94	10.15	15.39	26.60	33.72
	0.8	1.14	3.24	5.07	6.70	10.81	16.85	28.25	35.19

Capacities are based on 40°C liquid, 5°C superheat at valve inlet, and are maximum for the conditions listed. For each 5°C liquid is below 40°C, INCREASE capacity values by 7%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of .20 bar should be used in the regulator selection process. If a pressure drop of more than .20 bar is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a .20 bar pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Tons)

## R-507

Evap Temp °F Evap Pressure psig	Pressure Drop psi	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
50°F 109 psig	1	0.66	1.66	2.34	2.98	5.29	7.88	13.88	17.77
	3	1.12	2.85	4.02	5.12	9.06	13.51	23.77	30.42
	5	1.42	3.63	5.13	6.55	11.56	17.26	30.34	38.81
	10	1.93	4.97	7.07	9.04	15.89	23.77	41.67	53.24
40°F 89.8 psig	1	0.59	1.49	2.10	2.68	4.74	7.07	12.44	15.93
	3	1.00	2.55	3.60	4.58	8.11	12.09	21.27	27.22
	5	1.27	3.24	4.59	5.85	10.33	15.42	27.09	34.65
	10	1.71	4.41	6.29	8.04	14.11	21.13	37.01	47.26
30°F 73.3 psig	1	0.52	1.33	1.88	2.39	4.23	6.31	11.11	14.23
	3	0.89	2.27	3.21	4.09	7.22	10.78	18.94	24.24
	5	1.12	2.88	4.08	5.20	9.17	13.71	24.07	30.77
	10	1.50	3.89	5.56	7.11	12.45	18.67	32.66	41.69
20°F 58.8 psig	1	0.47	1.18	1.67	2.13	3.76	5.61	9.88	12.64
	3	0.79	2.01	2.84	3.62	6.40	9.55	16.79	21.47
	5	0.99	2.54	3.60	4.60	8.10	12.11	21.26	27.17
	10	1.31	3.40	4.88	6.24	10.91	16.37	28.60	36.48
10°F 46.1 psig	1	0.41	1.05	1.48	1.88	3.33	4.96	8.73	11.18
	3	0.69	1.77	2.50	3.19	5.64	8.42	14.78	18.91
	5	0.86	2.23	3.17	4.04	7.11	10.63	18.65	23.82
	10	1.12	2.95	4.24	5.44	9.46	14.22	24.81	31.62
0°F 35.2 psig	1	0.36	0.92	1.30	1.65	2.93	4.36	7.68	9.83
	3	0.60	1.55	2.19	2.80	4.93	7.37	12.93	16.54
	5	0.75	1.94	2.76	3.53	6.19	9.26	16.23	20.72
	10	0.95	2.52	3.65	4.68	8.12	12.23	21.28	27.08
-10°F 25.8 psig	1	0.32	0.80	1.13	1.44	2.56	3.81	6.71	8.58
	3	0.52	1.34	1.90	2.43	4.28	6.40	11.22	14.34
	5	0.64	1.67	2.38	3.05	5.33	7.99	13.98	17.84
	10	0.79	2.13	3.09	3.98	6.86	10.37	17.98	22.84
-20°F 17.8 psig	1	0.27	0.70	0.98	1.25	2.22	3.31	5.81	7.44
	3	0.45	1.15	1.64	2.09	3.68	5.51	9.65	12.32
	5	0.54	1.42	2.03	2.60	4.54	6.82	11.91	15.18
	10	0.64	1.75	2.58	3.33	5.69	8.63	14.91	18.89
-30°F 11.1 psig	1	0.23	0.60	0.85	1.08	1.91	2.85	5.00	6.40
	3	0.38	0.98	1.40	1.79	3.13	4.69	8.20	10.47
	5	0.45	1.19	1.71	2.20	3.81	5.74	9.99	12.72
	10	0.50	1.41	2.10	2.73	4.60	7.01	12.03	15.19
-40°F 5.5 psig	1	0.20	0.51	0.72	0.92	1.62	2.43	4.26	5.45
	3	0.31	0.82	1.17	1.50	2.62	3.94	6.88	8.77
	5	0.36	0.97	1.42	1.82	3.14	4.74	8.23	10.45
	10	0.37	1.08	1.65	2.16	3.57	5.50	9.34	11.72

Capacities are based on 100°F liquid, 10°F superheat at valve inlet, and are maximum for the conditions listed. For each 10°F liquid is below 100°F, INCREASE capacity values by 4%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of 3 psi should be used in the regulator selection process. If a pressure drop of more than 3 psi is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a 3 psi pressure drop, and should not be considered for these types of systems.

# Suction Capacities – A8, (S)PORT & SC

## A8, (S)PORT & SC – Suction Capacities (Kilowatts)

**R-507**

Evap Temp °C Evap Pressure bar	Pressure Drop bar	03 3/8" 9mm	05 5/8" 15mm	07 7/8" 22mm	09 1-1/8" 28mm	11 1-3/8" 35mm	13 1-5/8" 42mm	17 2-1/8" 54mm	21 2-5/8" 66mm
10°C 7.5 bar	0.07	2.25	5.70	8.03	10.23	18.13	27.03	47.58	60.92
	0.2	3.74	9.53	13.45	17.14	30.32	45.24	79.57	101.83
	0.4	5.18	13.24	18.74	23.90	42.18	63.00	110.67	141.55
	0.8	6.98	18.04	25.70	32.85	57.67	86.35	151.27	193.19
5°C 6.3 bar	0.07	2.03	5.16	7.28	9.27	16.42	24.48	43.09	55.17
	0.2	3.38	8.61	12.16	15.50	27.42	40.91	71.94	92.07
	0.4	4.66	11.93	16.91	21.57	38.04	56.84	99.80	127.62
	0.8	6.24	16.17	23.07	29.51	51.72	77.50	135.65	173.16
0°C 5.26 bar	0.07	1.84	4.66	6.57	8.37	14.83	22.11	38.91	49.82
	0.2	3.04	7.76	10.97	13.98	24.71	36.88	64.83	82.96
	0.4	4.17	10.71	15.20	19.40	34.17	51.08	89.65	114.60
	0.8	5.53	14.41	20.61	26.39	46.14	69.21	121.01	154.38
-5°C 4.3 bar	0.07	1.65	4.19	5.91	7.53	13.34	19.89	35.00	44.81
	0.2	2.73	6.96	9.84	12.55	22.17	33.10	58.18	74.43
	0.4	3.72	9.57	13.59	17.36	30.54	45.68	80.13	102.40
	0.8	4.87	12.75	18.30	23.45	40.89	61.42	107.24	136.70
-10°C 3.5 bar	0.07	1.48	3.76	5.30	6.75	11.95	17.82	31.36	40.14
	0.2	2.43	6.22	8.80	11.22	19.80	29.57	51.96	66.46
	0.4	3.29	8.50	12.09	15.45	27.15	40.63	71.21	90.97
	0.8	4.25	11.19	16.12	20.69	35.96	54.09	94.28	120.08
-15°C 2.8 bar	0.07	1.32	3.35	4.73	6.02	10.66	15.89	27.96	35.80
	0.2	2.16	5.52	7.82	9.97	17.59	26.28	46.16	59.03
	0.4	2.89	7.50	10.69	13.67	23.97	35.91	62.87	80.27
	0.8	3.66	9.73	14.08	18.10	31.32	47.21	82.10	104.44
-20°C 2.1 bar	0.07	1.17	2.97	4.20	5.34	9.46	14.11	24.82	31.77
	0.2	1.90	4.87	6.91	8.82	15.54	23.23	40.77	52.12
	0.4	2.52	6.56	9.38	12.01	21.01	31.51	55.10	70.30
	0.8	3.10	8.35	12.17	15.67	26.97	40.76	70.68	89.75
-25°C 1.6 bar	0.07	1.03	2.62	3.70	4.72	8.35	12.45	21.90	28.03
	0.2	1.66	4.27	6.07	7.75	13.63	20.39	35.76	45.70
	0.4	2.17	5.69	8.16	10.46	18.24	27.40	47.84	60.98
	0.8	2.58	7.05	10.37	13.40	22.87	34.69	59.92	75.92
-30°C 2.1 bar	0.07	0.90	2.30	3.25	4.14	7.32	10.92	19.20	24.56
	0.2	1.44	3.71	5.28	6.75	11.86	17.75	31.10	39.72
	0.4	1.84	4.87	7.02	9.02	15.66	23.56	41.05	52.27
	0.8	2.08	5.82	8.67	11.25	19.00	28.97	49.76	62.86
-40°C 0.38 bar	0.07	0.68	1.73	2.45	3.12	5.51	8.22	14.44	18.47
	0.2	1.04	2.72	3.90	4.99	8.71	13.08	22.85	29.13
	0.4	1.25	3.41	4.99	6.44	11.03	16.70	28.89	36.65
	0.8	1.25	3.58	5.58	7.36	11.94	18.55	31.20	38.95

Capacities are based on 40°C liquid, 5°C superheat at valve inlet, and are maximum for the conditions listed. For each 5°C liquid is below 40°C, INCREASE capacity values by 7%. (\*Sizing charts are also available for Crankcase Pressure Regulators in sizes to 2-1/8 port only.)

**Note:** Due to conditions encountered with refrigeration circuits utilizing hot gas for defrosting purposes, a **maximum** pressure drop of .20 bar should be used in the regulator selection process. If a pressure drop of more than .20 bar is considered, the regulator could become restrictive after the termination of a defrost cycle, thereby requiring an extended pull down period. The **shaded** areas of the suction tables designate regulator capacities above a .20 bar pressure drop, and should not be considered for these types of systems.

# A8 Pressure Regulator

## Features and Benefits

- Dual range spring for flexibility in application
- Highest capacity commercial regulator in the industry
- Molded Class H coil construction
- Internally pilot operated
- Manual opening stem
- Interchangeable capacity cartridges
- Inlet, outlet or differential control capability
- Solder in place without disassembly
- Inlet access fitting as standard
- Electric shut-off and electric wide open variations
- Excellent regulation at light loads
- DIN coil assemblies available

## Specifications

- Control range: 10" Hg to 400 psig (250mm Hg to 27.6 bar)
- Minimum fluid temperature: -40°F (-40°C)
- Design Pressure (M.R.P.): 450 psig (31.0 bar)
- UL listed (except 50 Hz versions), file SA5473
- CSA certified, file LR20991-14

## Standard Voltages

- 120V/60Hz, 110V/50Hz
- 240V/60Hz, 220V/50Hz
- 280V/60Hz
- 240V/60Hz, 220V/50Hz (DIN)
- 240V/50Hz (DIN)



## Nomenclature (Example)

A8	A	BL	7/8"	1-1/8"
Valve Family	Body Size	Optional Variation (see chart)	Port Size in Inches	Connection Size in Inches

**Valve Types:** A8A, A81, A82. All are inlet pressure regulators. Optional adaptor functions are as follows:

"S" Suffix	Inlet Regulator with Electric Shut-Off
"B" Suffix	Inlet Regulator with Electric Bypass Feature
"L" Suffix	Differential Pressure Regulator
"BL" Suffix	Differential Regulator with Electric Bypass Feature
"OE" Suffix	Outlet Pressure Regulator
"OES" Suffix	Outlet Pressure Regulator with Electric Shut-Off

## A8 Port/Connection Size Combinations

Type	Port Size		Connection Sizes Available
	Inches	mm	
A8A	3/8	9	5/8"/15mm, 7/8"/22mm, 1-1/8"/28mm
	5/8	15	5/8"/15mm, 7/8"/22mm, 1-1/8"/28mm
	7/8	22	7/8"/22mm, 1-1/8"/28mm
A81	5/8	15	1-1/8"/28mm, 1-3/8"/35mm
	7/8	22	1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm
	1-1/8	28	1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm
	1-3/8	35	1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm
A82	1-5/8	42	1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm
	2-1/8	54	1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm
	2-5/8	66	1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm

# Technical Information

**Description/Variations:** A8 Pressure regulators can conveniently be identified by three primary types: inlet, outlet, and differential regulator versions. Inlet pressure regulators open on a rise in inlet pressure above the valve's set point, and close when the inlet pressure drops below the valve's set point.

Outlet pressure regulators maintain a constant outlet or downstream pressure. Outlet regulators will open when outlet pressure falls below the valves set point and close when the outlet pressure is above it's set point.

Differential pressure regulators will open when the pressure difference across the regulator is greater than the valves set point. Conversely, they will close when the pressure difference across the valve is below the valve's set point.

In addition, these three categories of valves, inlet, outlet, and differential, can also have optional variations added to the basic regulator, such as an electric shut-off feature, or bypass (electric wide opening) feature. Please refer to the inside back cover of this condensed catalog for a complete listing of all A8 regulator variations and their typical applications.

**Pressure Ranges:** All A8 series inlet and outlet pressure regulators feature a wide pressure range, 10" Hg to 400 psig (250mm Hg to 27.6 bar), thus allowing flexibility in application. Differential pressure regulators offer a single range spring capable of being set within a range of 0 to 120 psig (0 to 8.3 bar). Since it is the pressure difference across the valve which is being controlled with any differential regulator version (not inlet pressure), this range is appropriate for any application, whether applied on the low side or high side of the system. For example, discharge regulators will certainly be exposed to pressures exceeding 120 psig under normal operation. However, they are most typically set to control at about a 25 psi

differential for hot gas supply purposes for defrost. Since this 25 psi set point easily falls within the range of this regulator, it is an appropriate pressure range for the application.

**Installation:** For those A8 regulators having an integral pilot solenoid feature, the solenoid operators utilize a spring loaded solenoid plunger design, which assists the plunger in closing off tightly against the solenoid pilot seat regardless of position or orientation. The regulator can therefore be installed in either a horizontal or vertical pipe line regardless of valve variation. Those A8 regulators that have no pilot solenoid can also be installed in a similar manner.

When brazing in line, typically a wet cloth wrapped around the valve body is recommended to dissipate heat. **If a valve is disassembled prior to installation, always have the correct gasket/ O-ring kit available for reassembly.** The internal cartridge-to-body O-ring will need to be replaced prior to reassembly.

**Adjustment:** Adjustment of a regulator's set point requires that the pressure being controlled be monitored by an accurate pressure gauge. Turning the valve's adjusting screw clockwise (into the bonnet) compresses the range spring and subsequently raises the valves set point. Conversely, turning the adjusting stem counter-clockwise will decrease the valve's set point. Adjusting the set point of an A8AS, A81S, or A82S regulator must be made with the solenoid energized, and the manual opening stem turned in. The adjustment of an A8AB, A81B, or A82B must be made with the solenoid de-energized, and the manual opening stem turned in.

**Electrical:** All A8 regulator versions utilize a molded water resistant class "H" solenoid coil with a "general purpose" coil housing as standard. A class "H" DIN coil is also available with certain voltages. Coils are designed to

operate with line voltage from 85% to 110% of rated coil voltage. Operating with a coil voltage above or below these limits may result in coil burnout. Also, operating with a coil voltage below this limit will result in lowering the valves' maximum opening pressure differential, or MOPD.

**Ordering Guide:** Specify valve type, port and connection size, and voltage, if applicable.

**Note:** For A8 valve suction capacity tables, please reference pages 7-14 of this catalog.



# A9 Pressure Regulators

## Features and Benefits

- Pilot operated for precise control of set point
- External or internal equalizer
- Available with integral electric shut-off
- Solder in place without disassembly
- Molded class H coil construction
- DIN coil assemblies available

## Specifications

- Two pressure ranges: Range A = 10" Hg vacuum to 120 psig (250 mm hg to 8.3 bar) (hot gas bypass range)  
Range B = 80 psig to 220 psig (5.6 to 15.2

- bar) (typical application - receiver pressure regulator)
- Minimum fluid temperature: -40°F (-40°C)
- Design Pressure (M.R.P.): 450 psig (31.0 bar)
- All models UL listed, file SA5473
- CSA certified A9S & A9SE, file LR20991-14

## Standard Voltages

- 120V/60Hz, 110V/50Hz
- 240V/60Hz, 220V/50Hz
- 208V/60Hz
- 240V/60Hz, 220V/50Hz (DIN)
- 240V/50Hz (DIN)

## Nomenclature (Example)

<b>A9</b>	<b>S</b>	<b>E</b>	<b>5/8"</b>	<b>7/8"</b>
<b>Valve Family</b>	<b>Integral Solenoid/Electric Shut-Off</b>	<b>Externally Equalized</b>	<b>Port Size in Inches</b>	<b>Connection Size in Inches</b>

A9	Outlet Pressure Regulator
A9S	Outlet Pressure Regulator with Electric Shut-Off Feature
A9E	Externally Equalized Outlet Pressure Regulator
A9SE	Externally Equalized Outlet Pressure Regulator with Electric Shut-Off Feature

## A9 Port/Connection Size Combinations

Port Size		Connection Sizes Available
Inches	mm	
3/8	9	5/8"/15mm, 7/8"/22mm, 1-1/8"/28mm
5/8	15	5/8"/15mm, 7/8"/22mm, 1-1/8"/28mm
7/8	22	5/8"/15mm, 7/8"/22mm, 1-1/8"/28mm
1-1/8	28	1-1/8"/28mm

**Description:** The A9 family of pilot operated outlet pressure regulators are ductile iron bodied valves with brazed copper couplings. The A9 is "internally equalized" to outlet pressure by means of a small channel or passage drilled through the outlet of the adapter which effectively communicates downstream pressure to the pilot section of the valve. The regulator therefore reacts to and controls the immediate outlet pressure of the control valve. When used as a receiver pressure regulator, range "B" should be designated when ordering.

The A9E is an "externally equalized" outlet pressure regulator and is usually applied as a hot gas bypass regulator. For those applications where the dis-

charge gas is introduced into the inlet of the evaporator, an A9E is typically used with a small pilot line connected from the compressor suction to the external fitting on the regulator. Installed in this manner the valve senses and responds to compressor suction pressure while piped to feed discharge gas to the inlet of the evaporator. Since it is the suction pressure that the regulator is responding to and ultimately controlling, a range "A" regulator should be designated when ordering an A9E or A9SE for this application.

**Installation:** A9 regulators can be mounted either in a vertical or horizontal line with the refrigerant flow in the direction of the arrow on the body. These



regulators may be soldered into the line without disassembly. A wet cloth should be wrapped around the valve and the soldering flame should be directed away from the valve body.

**Adjustment:** Loosen the adjusting stem seal nut and turn the adjusting stem clockwise to raise the set point of the regulator. Turn the adjusting stem counter clockwise (into the bonnet) compresses the range spring and subsequently raises the valve's set point. Conversely, turning the adjusting stem counterclockwise will decrease the valve's set point. For a range "A" valve, one complete turn of the adjusting stem will result in a change in set point of about 16 psi (1.1 bar). One complete turn of the adjusting stem on a range "B" regulator will change the set point approximately 25 psi (1.7 bar). The set point adjustment of an A9S or A9SE must be made with the pilot solenoid energized.

**Electrical:** A9S and A9SE regulators utilize a molded water resistant Class "H" solenoid coil with a general purpose coil housing which meets NEMA 3R and 4 requirements. A class "H" DIN coil is also available with certain voltages. Power consumption during normal operation will be 11 watts or less. The coils are designed to operate with a line voltage from 85% to 110% of rated coil voltage. Operating with a line voltage above or below these limits may result in coil burn out.

**Ordering Guide:** Specify valve type, range, port and connection size. If shut off ("S") variation is included, specify voltage and frequency.

# CK4 Check Valve

## Features and Benefits

- Spring-loaded, in-line check valve
- Compact size, mounts in any position
- A minimum pressure difference of .75 psi (.05 bar) required to fully open valve
- Several ODS connection sizes available for most port size valves
- Positive spring closing action
- Lapped, metal to metal stainless steel or chrome plated seat
- Various flanged connections available

## Specifications

- Design pressure (MRP): 500 psig, (32 bar)
- Minimum fluid temperature: -40°F (-40°C)
- UL listed, file SA5473
- CSA certified, file LR20991-14



## Nomenclature (Example)

CK	4A	4
Check Valve	Flanged Body Style	Port Size

## CK4 Port/Connection Size Combinations

Type	Port Size		Connection Sizes Available
	Inches	mm	
CK4A-2	1/2	13	1/2"/13mm, 5/8"/15mm, 7/8"/22mm, (13mm, 15mm, 22mm)
CK4A-3	3/4	20	7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm
CK4A-4	1	25	1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm
CK4A-6	1-1/4	32	1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm
CK4A-8	2	50	1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm
CK4A-9	2-1/2	65	2-5/8"/66mm, 3-1/8"/78mm
CK4A-0	3	75	3-1/8"/78mm, 3-5/8"/91mm
CK4A-16	4	100	4-1/8"/103mm

**Description:** CK4A check valves allow flow in one direction only, and will prevent backward flow of refrigerant should the outlet pressure increase even slightly above the valve's inlet pressure. The CK4A check valve is a flanged spring closing valve which utilizes a corrosion resistant, stainless steel or chrome plated lapped seat. This material and type of construction ensures reliable closing action and minimum seat leakage.

Typical applications for large commercial refrigeration systems include condenser liquid drain check valves, and condenser bypass lines. As a bypass check valve, it is usually installed downstream of a receiver pressure regulator. In this application, the CK4A check valve prevents back-flow through the receiver pressure regulator and into the discharge line in the event of a system shut-down.

CK4A check valves utilize mating flanges. In most instances, ODS flanges with copper couplings provide various connection sizes to match the valve to the line. The flanges used are two bolt refrigeration style (tongue and groove) on all valves up to and including 1" (25mm) port size, and four bolt on 1-1/4" (32mm) through 4" (100mm) port size.

**Installation:** Because of their spring closing construction, CK4A check valves can be mounted in any position in either a vertical or horizontal line. The valve must be installed with the arrow pointing in the direction of flow. After installing the CK4A between its flanges, tighten the flange bolts evenly.

**Ordering Guide:** Specify the CK4A port size and the connection size of the ODS flange.

# Liquid Drain Capacities – CK4A

## CK4A – Liquid Drain Capacities (Tons)

**R-22**

Cond Temp °F Sat Pressure psig	Evaporator Temperature	Pressure Drop psi	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
75°F 132.0 psig	-40°F	0.75	9.9	20.7	37.9	55.3	134.0	203.8	326.2	611.5
		3	19.8	41.4	75.7	110.7	267.9	407.7	652.3	1223.1
	0°F	0.75	10.5	21.9	40.1	58.6	141.9	216.0	345.6	648.0
		3	21.0	43.8	80.2	117.3	283.9	432.0	691.2	1295.9
	40°F	0.75	11.0	23.0	42.1	61.6	149.0	226.8	362.8	680.3
		3	22.0	46.0	84.2	123.1	298.0	453.6	725.7	1360.7
95°F 182.0 psig	-40°F	0.75	8.9	18.6	34.1	49.9	120.7	183.7	294.0	551.2
		3	17.8	37.3	68.2	99.7	241.5	367.5	587.9	1102.4
	0°F	0.75	9.5	19.8	36.3	53.1	128.6	195.7	313.0	587.00
		3	19.0	39.7	72.7	106.2	257.1	391.3	626.1	1173.9
	40°F	0.75	10.0	20.9	38.3	56.0	135.5	206.2	330.0	618.7
		3	20.0	41.8	76.6	112.0	271.1	412.5	660.0	1237.5
115°F 243.0 psig	-40°F	0.75	7.9	16.6	30.3	44.3	107.3	163.2	261.2	489.7
		3	15.9	33.1	60.6	88.6	214.5	326.5	522.4	979.4
	0°F	0.75	8.5	17.7	32.5	47.5	115.0	174.9	279.9	524.8
		3	17.0	35.5	65.0	95.0	229.9	349.9	559.8	1049.6
	40°F	0.75	9.0	18.8	34.4	50.3	121.8	185.3	296.5	555.9
		3	18.0	37.6	68.8	100.6	243.5	370.6	593.0	1111.8

Note: Shading is for readability purposes only.

## CK4A – Liquid Drain Capacities (Kilowatts)

**R-22**

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
25°C 9.2 bar	-40°C	0.05	33.7	70.3	128.8	188.2	455.6	693.3	1109.2	2079.8
		0.21	69.0	144.1	263.9	385.6	933.7	1420.8	2273.3	4262.4
	-20°C	0.05	35.5	74.1	135.8	198.4	480.4	731.0	1169.7	2193.1
		0.21	72.8	152.0	278.2	406.7	984.5	1498.2	2397.1	4494.6
	0°C	0.05	37.2	77.6	142.1	207.7	502.8	765.1	1224.2	2295.4
		0.21	76.2	159.0	291.2	425.6	1030.4	1568.0	2508.8	4704.1
30°C 10.9 bar	-40°C	0.05	32.2	67.2	123.0	179.7	435.1	662.1	1059.3	1986.2
		0.21	65.9	137.6	252.0	368.3	891.6	1356.8	2170.9	4070.4
	-20°C	0.05	34.0	71.0	129.9	189.9	459.7	699.5	1119.2	2098.5
		0.21	69.6	145.4	266.2	389.1	942.1	1433.6	2293.7	4300.7
	0°C	0.05	35.6	74.4	136.2	199.0	481.9	733.3	1173.3	2199.9
		0.21	73.0	152.4	279.1	407.9	987.6	1502.8	2404.6	4508.5
35°C 12.6 bar	-40°C	0.05	30.6	64.0	117.1	171.2	414.4	630.6	1009.0	1891.8
		0.21	62.8	131.1	240.0	350.8	849.3	1292.3	2067.7	3877.0
	-20°C	0.05	32.4	67.7	124.0	181.2	438.8	667.7	1068.4	2003.2
		0.21	66.5	138.8	254.1	371.4	899.3	1368.5	2189.5	4105.4
	0°C	0.05	34.1	71.1	130.2	190.3	460.8	701.3	1122.0	2103.8
		0.21	69.8	145.8	266.9	390.1	944.4	1437.2	2299.4	4311.5

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – CK4A

## CK4A – Liquid Drain Capacities (Tons)

### R-134a

Cond Temp °F Sat Pressure psig	Evaporator Temperature	Pressure Drop psi	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
75°F 78.6 psig	-40°F	0.75	8.9	18.6	34.1	49.8	120.6	183.5	293.6	550.5
		3	17.8	37.2	68.2	99.6	241.2	367.0	587.2	1101.0
	0°F	0.75	9.7	20.4	37.3	54.5	131.9	200.7	321.1	602.0
		3	19.5	40.7	74.5	108.9	263.7	401.3	642.1	1204.0
	40°F	0.75	10.5	22.0	40.3	58.9	142.7	217.2	347.5	651.5
		3	21.1	44.1	80.7	117.9	285.4	434.3	695.0	1303.0
95°F 113.8 psig	-40°F	0.75	7.9	16.4	30.0	43.9	106.2	161.7	258.6	485.0
		3	15.7	32.8	60.0	87.8	212.5	323.3	517.3	969.9
	0°F	0.75	8.7	18.1	33.2	48.5	117.3	178.5	285.6	535.6
		3	17.3	36.2	66.3	96.9	234.6	357.0	571.3	1071.1
	40°F	0.75	9.5	19.8	36.2	52.9	128.0	194.8	311.6	584.2
		3	18.9	39.5	72.3	105.7	256.0	389.5	623.2	1168.5
115°F 158.4 psig	-40°F	0.75	6.8	14.2	25.9	37.9	91.7	139.5	223.2	418.6
		3	13.6	28.3	51.8	75.7	183.4	279.0	446.5	837.1
	0°F	0.75	7.6	15.8	29.0	42.4	102.6	156.1	249.7	468.2
		3	15.2	31.7	58.0	84.7	205.1	312.1	499.4	936.4
	40°F	0.75	8.4	17.4	31.9	46.7	113.0	172.0	275.2	516.0
		3	16.7	34.9	63.9	93.4	226.0	344.0	550.4	1031.9

Note: Shading is for readability purposes only.

## CK4A – Liquid Drain Capacities (Kilowatts)

### R-134a

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
25°C 5.5 bar	-40°C	0.05	30.2	63.1	115.4	168.7	408.5	621.6	994.6	1864.9
		0.21	61.9	129.2	236.6	345.8	837.2	1273.9	2038.3	3821.8
	-20°C	0.05	32.8	68.4	125.3	183.2	443.5	674.8	1079.7	2024.5
		0.21	67.2	140.3	256.8	375.4	908.8	1383.0	2212.8	4149.0
	0°C	0.05	35.3	73.7	134.9	197.1	477.3	726.3	1162.0	2178.8
		0.21	72.3	151.0	276.4	404.0	978.1	1488.4	2381.5	4465.3
30°C 6.7 bar	-40°C	0.05	28.5	59.6	109.1	159.5	386.2	587.7	940.3	1763.1
		0.21	58.5	122.2	223.7	326.9	791.5	1204.4	1927.0	3613.2
	-20°C	0.05	31.1	65.0	118.9	173.8	420.9	640.5	1024.8	1921.5
		0.21	63.8	133.1	243.8	356.3	862.6	1312.6	2100.2	3937.9
	0°C	0.05	33.6	70.1	128.4	187.7	454.4	691.5	1106.5	2074.6
		0.21	68.8	143.8	263.2	384.7	931.3	1417.3	2267.6	4251.8
35°C 7.8 bar	-40°C	0.05	26.9	56.1	102.8	150.3	363.8	553.6	885.7	1660.7
		0.21	55.1	115.1	210.7	307.9	745.5	1134.5	1815.2	3403.4
	-20°C	0.05	29.4	61.5	112.5	164.5	398.2	606.0	969.5	1817.9
		0.21	60.3	126.0	230.6	337.1	816.1	1241.8	1986.9	3725.5
	0°C	0.05	31.9	66.6	121.9	178.2	431.5	656.6	1050.6	1969.8
		0.21	65.4	136.5	249.9	365.2	884.3	1345.6	2153.0	4036.9

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – CK4A

## CK4A – Liquid Drain Capacities (Tons)

### R-404A

Cond Temp °F Sat Pressure psig	Evaporator Temperature	Pressure Drop psi	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
75°F 161.2 psig	-40°F	0.75	6.6	13.8	25.3	37.0	89.6	136.3	218.0	408.8
		3	13.2	27.6	50.6	74.0	179.1	272.6	436.1	817.7
	0°F	0.75	7.4	15.5	28.3	41.4	100.3	152.6	244.1	457.7
		3	14.8	31.0	56.7	82.8	200.5	305.2	488.2	915.5
	40°F	0.75	8.1	17.0	31.1	45.5	110.1	167.6	268.1	502.7
		3	16.3	34.0	62.2	91.0	220.2	335.2	536.2	1005.5
95°F 219.4 psig	-40°F	0.75	5.5	11.5	21.0	30.7	74.3	113.0	180.8	339.1
		3	11.0	22.9	42.0	61.4	148.6	226.1	361.7	678.2
	0°F	0.75	6.3	13.1	23.9	35.0	84.7	128.9	206.3	386.8
		3	12.5	26.2	47.9	70.0	169.4	257.8	412.6	773.5
	40°F	0.75	7.0	14.6	26.7	39.0	94.3	143.5	229.7	430.6
		3	13.9	29.1	53.3	77.9	188.7	287.1	459.3	861.3
115°F 290.9 psig	-40°F	0.75	4.3	9.0	16.4	24.0	58.2	88.5	141.7	265.6
		3	8.6	18.0	32.9	48.1	116.4	177.1	283.3	531.2
	0°F	0.75	5.0	10.5	19.3	28.2	68.3	103.9	166.3	311.8
		3	10.1	21.1	38.6	56.4	136.6	207.8	332.6	623.5
	40°F	0.75	5.7	12.0	21.9	32.1	77.6	118.1	188.9	354.3
		3	11.5	24.0	43.9	64.1	155.2	236.2	377.9	708.5

Note: Shading is for readability purposes only.

## CK4A – Liquid Drain Capacities (Kilowatts)

### R-404A

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
25°C 11.2 bar	-40°C	0.05	22.2	46.4	85.0	124.3	300.9	457.9	732.6	1373.6
		0.21	45.6	95.2	174.3	254.7	616.6	938.4	1501.4	2815.1
	-20°C	0.05	24.7	51.6	94.4	138.0	334.1	508.5	813.6	1525.4
		0.21	50.6	105.7	193.5	282.8	684.8	1042.1	1667.3	3126.2
	0°C	0.05	27.0	56.4	103.2	150.8	365.1	555.6	889.0	1666.9
		0.21	55.3	115.5	211.5	309.1	748.3	1138.7	1822.0	3416.2
30°C 13.1 bar	-40°C	0.05	20.5	42.8	78.4	114.5	277.3	421.9	675.1	1265.8
		0.21	42.0	87.7	160.6	234.7	568.2	864.7	1383.5	2594.1
	-20°C	0.05	22.9	47.9	87.7	128.1	310.2	472.0	755.2	1415.9
		0.21	47.0	98.1	179.6	262.5	635.6	967.3	1547.6	2901.8
	0°C	0.05	25.2	52.6	96.3	140.8	340.8	518.6	829.8	1555.9
		0.21	51.6	107.8	197.4	288.5	698.5	1062.9	1700.6	3188.6
35°C 15.1 bar	-40°C	0.05	18.7	39.1	71.5	104.6	253.2	385.2	616.4	1155.7
		0.21	38.3	80.1	146.6	214.3	518.8	789.5	1263.2	2368.6
	-20°C	0.05	21.1	44.1	80.7	118.0	285.6	434.7	695.5	1304.0
		0.21	43.3	90.4	165.4	241.8	585.4	890.8	1425.3	2672.5
	0°C	0.05	23.4	48.8	89.3	130.5	315.9	480.8	769.2	1442.3
		0.21	47.9	99.9	183.0	267.4	647.5	985.3	1576.5	2955.9

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – CK4A

## CK4A – Liquid Drain Capacities (Tons)

**R-507**

Cond Temp °F Sat Pressure psig	Evaporator Temperature	Pressure Drop psi	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
75°F 167.0 psig	-40°F	0.75	6.6	13.7	25.1	36.6	88.7	134.9	215.9	404.8
		3	13.1	27.4	50.1	73.2	177.3	269.8	431.7	809.5
	0°F	0.75	7.3	15.2	27.9	40.7	98.6	150.1	240.2	450.3
		3	14.6	30.5	55.8	81.5	197.3	300.2	480.4	900.7
	40°F	0.75	8.0	16.7	30.5	44.6	108.1	164.5	263.1	493.4
		3	16.0	33.4	61.1	89.3	216.1	328.9	526.2	986.7
95°F 226.0 psig	-40°F	0.75	5.5	11.6	21.2	30.9	74.9	114.0	182.3	341.9
		3	11.1	23.1	42.3	61.9	149.8	227.9	364.7	683.8
	0°F	0.75	6.3	13.1	23.9	35.0	84.6	128.8	206.0	386.3
		3	12.5	26.1	47.8	69.9	169.3	257.6	412.1	772.7
	40°F	0.75	6.9	14.5	26.5	38.7	93.8	142.8	228.4	428.3
		3	13.9	29.0	53.0	77.5	187.6	285.5	456.8	856.5
115°F 301.0 psig	-40°F	0.75	4.5	9.3	17.1	25.0	60.5	92.1	147.3	276.2
		3	8.9	18.7	34.2	50.0	121.0	184.2	294.7	552.5
	0°F	0.75	5.2	10.8	19.8	28.9	69.9	106.4	170.3	319.3
		3	10.3	21.6	39.5	57.8	139.9	212.9	340.6	638.7
	40°F	0.75	5.8	12.2	22.3	32.6	78.9	120.0	192.0	360.0
		3	11.7	24.3	44.6	65.1	157.7	240.0	384.0	719.9

Note: Shading is for readability purposes only.

## CK4A – Liquid Drain Capacities (Kilowatts)

**R-507**

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	CK4A2 1/2" 13mm	CK4A3 3/4" 20mm	CK4A4 1" 25mm	CK4A6 1-1/4" 32mm	CK4A8 2" 50mm	CK4A9 2-1/2" 65mm	CK4A0 3" 75mm	CK4A16 4" 100mm
25°C 11.6 bar	-40°C	0.05	22.1	46.1	84.3	123.3	298.5	454.2	726.7	1362.5
		0.21	45.2	94.4	172.9	252.6	611.6	930.8	1489.2	2792.3
	-20°C	0.05	24.3	50.8	93.1	136.0	329.4	501.2	802.0	1503.7
		0.21	49.9	104.2	190.8	278.8	675.0	1027.2	1643.5	3081.7
	0°C	0.05	26.5	55.4	101.4	148.2	358.8	546.0	873.6	1637.9
		0.21	54.3	113.5	207.8	303.7	735.3	1118.9	1790.3	3356.8
30°C 13.5 bar	-40°C	0.05	20.5	42.8	78.3	114.5	277.1	421.7	674.7	1265.1
		0.21	42.0	87.7	160.5	234.6	567.9	864.2	1382.8	2592.7
	-20°C	0.05	22.7	47.5	87.0	127.1	307.7	468.2	749.2	1404.7
		0.21	46.6	97.3	178.2	260.5	630.6	959.6	1535.4	2878.8
	0°C	0.05	24.9	52.0	95.2	139.1	336.8	512.5	820.0	1537.5
		0.21	51.0	106.5	195.1	285.1	690.2	1050.3	1680.5	3150.9
35°C 15.6 bar	-40°C	0.05	18.9	39.4	72.2	105.5	255.5	388.8	622.1	1166.5
		0.21	38.7	80.8	148.0	216.3	523.7	796.9	1275.0	2390.6
	-20°C	0.05	21.1	44.1	80.8	118.0	285.7	434.8	695.7	1304.5
		0.21	43.3	90.4	165.5	241.9	585.6	891.1	1425.8	2673.4
	0°C	0.05	23.2	48.5	88.9	129.9	314.5	478.5	765.7	1435.6
		0.21	47.6	99.5	182.1	266.2	644.5	980.7	1569.2	2942.2

Note: Shading is for readability purposes only.

# Condenser Pressure Control

## For Air Cooled Condensers

Parker Flo-Con regulators provide the wide range of adjustment of condenser and receiver pressures required for the most efficient operation of large air-cooled condenser systems. The regulators are an integral part of the refrigeration system and provide direct control of condenser and receiver pressures to achieve satisfactory system operation with minimum energy consumption.

Condenser pressure control is needed for one or more of the following reasons:

1. To maintain sufficient receiver pressure to ensure flow of an adequate amount of liquid to the evaporator for proper temperature control and adequate refrigeration capacity.
2. To permit start up during cold weather conditions by quickly developing adequate receiver pressure.
3. To provide an ample supply of hot gas for defrosts, reheat or heat reclamation systems.
4. To prevent flash gas in the liquid lines.

With no pressure control, at very low ambient temperatures the cold liquid may be at almost saturated conditions because of the low condensing pressure. The lack of sub-cooling may cause the liquid to evaporate when

the liquid lines pass through warm areas or where pressure drops take place (filters, valves, etc.). The presence of flash vapor would affect the performance of expansion valves, eroding seats, causing irregular flow, and reducing capacity.

## Types of systems

Two systems of variable condenser pressure control are shown on the next page. Figure 1 shows a Liquid Drain Control Method using a regulator in the liquid line to provide the desired condenser pressure.

This method is ideal for large capacity systems since a smaller regulator is required for liquid line than for discharge line.

Figure 2 shows a Discharge Gas Control Method using a regulator in the discharge line. In both cases a bypass regulator is used to control the receiver pressure by feeding it with high-pressure gas as necessary.

This method is particularly suitable for systems requiring hot gas defrost, heat reclaim, and for ease of start up of systems with a cold receiver.

## Valve Functions

Valve A in Figure 1 is an Inlet Pressure Regulator in the liquid drain line from the condenser, and senses the condenser pressure. The regulator closes as the condenser pressure drops below the set point, thus back flooding the condenser and reducing the inside surface area available for condensing.

Valve B in Figures 1 and 2 is an Outlet Pressure Regulator in the bypass line from compressor discharge to the condenser liquid drain line. This valve senses the receiver pressure and opens when the pressure drops below the set point, thus maintaining the receiver pressure.

Valve C in Figures 1 and 2 is an In-line Check valve in the liquid drain line to prevent higher pressure from backing up into the condenser during low ambient conditions when the compressor is idle.

Valve D in Figure 2 is an Inlet Pressure Regulator in the compressor discharge line. This regulator senses the discharge pressure and closes as the pressure drops below the set point, thus maintaining the discharge pressure at the desired level.

Figure 1 — Liquid drain method, condenser pressure control. See page 62 for symbol legend.

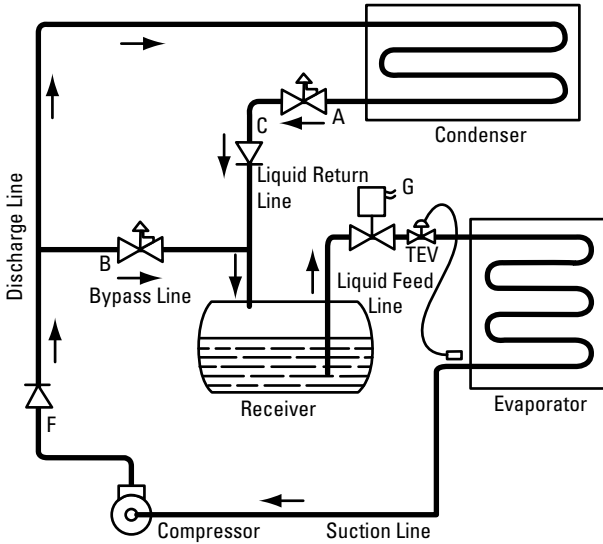


Figure 2 — Discharge gas control method, condenser pressure control. See page 62 for symbol legend.

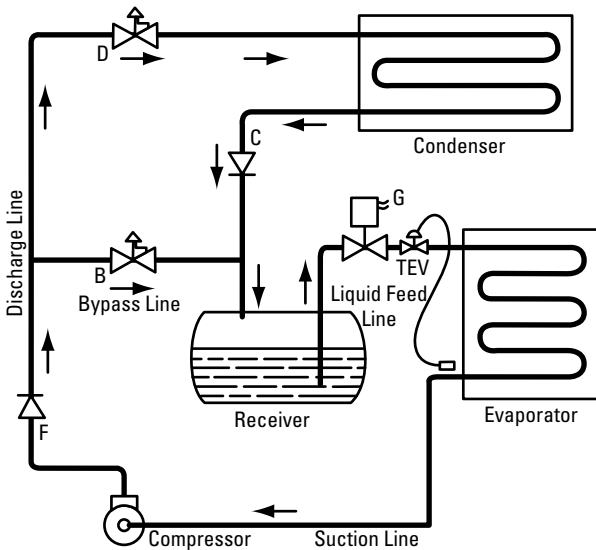
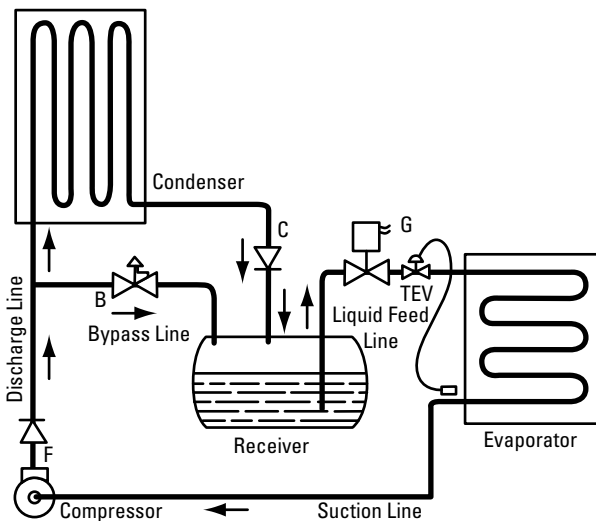


Figure 3 — Receiver pressure control isolated bypass method. See page 62 for symbol legend.



Valve Legend				
Label	Valve Function	Application	Design	Selection Page
A	Inlet Pressure Regulator	Liquid Drain	A8	63
B	Outlet Pressure Regulator	Condenser Bypass	A9 or A8_OE	63
C	Check Valve	Liquid Drain	CK4A	63
D	Inlet Pressure Regulator	Discharge Pressure	A8	63
E	Check Valve	Condenser Bypass	CK4A	63
F	Check Valve	Compressor Discharge	CK4A	63
G	Solenoid Valve	Liquid Feed	SC	63



# Liquid Drain Capacities – A8

## A8 – Liquid Drain Capacities (Tons)

**R-22**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Pressure Drop psi	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 132.0 psig	-40°F (0.5)	3	8.7	22.1	31.2	39.7	70.4	104.8	184.6	236.5
		6	12.4	31.3	44.1	56.1	99.5	148.3	261.1	334.4
	0°F (24.0)	3	9.3	23.5	33.0	42.0	74.5	111.1	195.6	250.5
		6	13.1	33.2	46.7	59.4	105.4	157.1	276.7	354.3
	40°F (68.5)	3	9.7	24.6	34.7	44.1	78.3	116.6	205.4	263.1
		6	13.7	34.8	49.0	62.4	110.7	164.9	290.5	372.0
95°F 182.0 psig	-40°F (0.5)	3	7.9	19.9	28.1	35.7	63.4	94.5	166.4	213.1
		6	11.1	28.2	39.7	50.6	89.7	133.6	235.3	301.4
	0°F (24.0)	3	8.4	21.2	29.9	38.1	67.5	100.6	177.2	227.0
		6	11.9	30.0	42.3	53.8	95.5	142.3	250.6	321.0
	40°F (68.5)	3	8.8	22.4	31.5	40.1	71.2	106.1	186.8	239.2
		6	12.5	31.7	44.6	56.8	100.7	150.0	264.2	338.3
115°F 243.0 psig	-40°F (0.5)	3	7.0	17.7	25.0	31.8	56.3	84.0	147.9	189.4
		6	9.9	25.1	35.3	44.9	79.7	118.7	209.1	267.8
	0°F (24.0)	3	7.5	19.0	26.7	34.0	60.4	90.0	158.4	202.9
		6	10.6	26.9	37.8	48.1	85.4	127.2	224.1	287.0
	40°F (68.5)	3	7.9	20.1	28.3	36.1	64.0	95.3	167.8	215.0
		6	11.2	28.5	40.1	51.0	90.4	134.8	237.4	304.0

Note: Shading is for readability purposes only.

## A8 – Liquid Drain Capacities (Kilowatts)

**R-22**

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 9.2 bar	-40°C (0.0)	0.2	29.7	75.3	106.0	134.9	239.3	356.5	627.9	804.2
		0.4	42.0	106.4	149.9	190.8	338.4	504.2	888.0	1137.3
	-20°C (1.4)	0.2	31.3	79.4	111.7	142.2	252.3	376.0	662.1	848.0
		0.4	44.3	112.2	158.0	201.2	356.8	531.7	936.4	1199.3
	0°C (4.0)	0.2	32.8	83.1	117.0	148.9	264.1	393.5	693.0	887.5
		0.4	46.4	117.5	165.4	210.5	373.5	556.5	980.0	1255.2
30°C 10.9 bar	-40°C (0.0)	0.2	28.4	71.9	101.2	128.8	228.5	340.5	599.6	768.0
		0.4	40.1	101.7	143.1	182.2	323.2	481.5	848.0	1086.1
	-20°C (1.4)	0.2	30.0	75.9	106.9	136.1	241.4	359.8	633.6	811.4
		0.4	42.4	107.4	151.2	192.5	341.4	508.8	896.0	1147.5
	0°C (4.0)	0.2	31.4	79.6	112.1	142.7	253.1	377.1	664.2	850.6
		0.4	44.4	112.6	158.5	201.8	357.9	533.3	939.3	1203.0
35°C 12.6 bar	-40°C (0.0)	0.2	27.0	68.5	96.4	122.7	217.6	324.3	571.1	731.5
		0.4	38.2	96.8	136.3	173.5	307.8	458.6	807.7	1034.5
	-20°C (1.4)	0.2	28.6	72.5	102.1	129.9	230.5	343.4	604.8	774.6
		0.4	40.5	102.5	144.3	183.7	325.9	485.7	855.3	1095.4
	0°C (4.0)	0.2	30.1	76.1	107.2	136.4	242.0	360.6	635.1	813.5
		0.4	42.5	107.7	151.6	193.0	342.3	510.0	898.2	1150.4

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – A8

## A8 – Liquid Drain Capacities (Tons)

### R-134a

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Pressure Drop psi	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 78.6 psig	-40°F (14.7 in. hg)	3	7.9	19.9	28.0	35.7	63.3	94.4	166.2	212.9
		6	11.1	28.2	39.7	50.5	89.6	133.5	235.0	301.0
	0°F (6.5)	3	8.6	21.8	30.7	39.0	69.3	103.2	181.7	232.8
		6	12.2	30.8	43.4	55.2	97.9	145.9	257.0	329.2
		3	9.3	23.6	33.2	42.3	75.0	111.7	196.7	251.9
		6	13.2	33.3	46.9	59.8	106.0	158.0	278.2	356.3
95°F 113.8 psig	-40°F (14.7 in. hg)	3	6.9	17.6	24.7	31.5	55.8	83.1	146.4	187.5
		6	9.8	24.8	34.9	44.5	78.9	117.6	207.1	265.2
	0°F (6.5)	3	7.7	19.4	27.3	34.7	61.6	91.8	161.7	207.1
		6	10.8	27.4	38.6	49.1	87.1	129.8	228.7	292.9
		3	8.3	21.1	29.8	37.9	67.2	100.2	176.4	225.9
		6	11.8	29.9	42.1	53.6	95.1	141.6	249.5	319.5
115°F 158.4 psig	-40°F (14.7 in. hg)	3	6.0	15.1	21.3	27.1	48.2	71.8	126.4	161.8
		6	8.5	21.4	30.2	38.4	68.1	101.5	178.7	228.9
	0°F (6.5)	3	6.7	16.9	23.9	30.4	53.9	80.3	141.4	181.0
		6	9.5	24.0	33.7	42.9	76.2	113.5	199.9	256.0
		3	7.4	18.7	26.3	33.5	59.4	88.5	155.8	199.5
		6	10.4	26.4	37.2	47.3	83.9	125.1	220.3	282.1

Note: Shading is for readability purposes only.

## A8 – Liquid Drain Capacities (Kilowatts)

### R-134a

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 5.5 bar	-40°C (373 mm hg)	0.2	26.6	67.5	95.0	120.9	214.5	319.7	563.0	721.1
		0.4	37.7	95.4	134.4	171.0	303.4	452.1	796.2	1019.8
	-20°C (91.4 mm hg)	0.2	28.9	73.3	103.2	131.3	232.9	347.1	611.2	782.8
		0.4	40.9	103.6	145.9	185.7	329.4	490.8	864.4	1107.1
		0.2	31.1	78.9	111.0	141.3	250.7	373.5	657.8	842.5
		0.4	44.0	111.5	157.0	199.8	354.5	528.2	930.3	1191.5
30°C 6.7 bar	-40°C (373 in. hg)	0.2	25.2	63.8	89.8	114.3	202.8	302.2	532.3	681.7
		0.4	35.6	90.2	127.0	161.7	286.9	427.4	752.7	964.1
	-20°C (91.4 mm hg)	0.2	27.5	69.5	97.9	124.6	221.1	329.4	580.1	743.0
		0.4	38.8	98.3	138.5	176.2	312.6	465.8	820.4	1050.7
		0.2	29.6	75.1	105.7	134.6	238.7	355.7	626.3	802.2
		0.4	41.9	106.2	149.5	190.3	337.5	503.0	885.8	1134.5
35°C 7.8 bar	-40°C (373 in. hg)	0.2	23.7	60.1	84.6	107.7	191.1	284.7	501.4	642.1
		0.4	33.6	85.0	119.7	152.3	270.2	402.6	709.1	908.1
	-20°C (91.4 mm hg)	0.2	26.0	65.8	92.6	117.9	209.1	311.6	548.8	702.9
		0.4	36.7	93.0	131.0	166.7	295.8	440.7	776.2	994.1
		0.2	28.1	71.3	100.4	127.8	226.6	337.7	594.7	761.7
		0.4	39.8	100.8	141.9	180.7	320.5	477.6	841.0	1077.2

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – A8

## A8 – Liquid Drain Capacities (Tons)

### R-404A

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Pressure Drop psi	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 161.2 psig	-40°F (2.7)	3	5.8	14.8	20.8	26.5	47.0	70.1	123.4	158.1
		6	8.3	20.9	29.5	37.5	66.5	99.1	174.6	223.6
	0°F (33.5)	3	6.5	16.6	23.3	29.7	52.7	78.5	138.2	177.0
		6	9.2	23.4	33.0	42.0	74.5	111.0	195.4	250.3
	40°F (86.4)	3	7.2	18.2	25.6	32.6	57.8	86.2	151.8	194.4
		6	10.2	25.7	36.2	46.1	81.8	121.9	214.6	274.9
95°F 219.4 psig	-40°F (2.7)	3	4.8	12.3	17.3	22.0	39.0	58.1	102.4	131.1
		6	6.9	17.4	24.4	31.1	55.2	82.2	144.8	185.4
	0°F (33.5)	3	5.5	14.0	19.7	25.1	44.5	66.3	116.8	149.5
		6	7.8	19.8	27.9	35.5	62.9	93.8	165.1	211.5
	40°F (86.4)	3	6.2	15.6	21.9	27.9	49.5	73.8	130.0	166.5
		6	8.7	22.0	31.0	39.5	70.1	104.4	183.9	235.5
115°F 290.9 psig	-40°F (2.7)	3	3.8	9.6	13.5	17.2	30.6	45.5	80.2	102.7
		6	5.4	13.6	19.1	24.4	43.2	64.4	113.4	145.2
	0°F (33.5)	3	4.5	11.3	15.9	20.2	35.9	53.4	94.1	120.6
		6	6.3	16.0	22.5	28.6	50.7	75.6	133.1	170.5
	40°F (86.4)	3	5.1	12.8	18.1	23.0	40.8	60.7	107.0	137.0
		6	7.2	18.1	25.5	32.5	57.6	85.9	151.3	193.7

Note: Shading is for readability purposes only.

## A8 – Liquid Drain Capacities (Kilowatts)

### R-404A

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 11.2 bar	-40°C (0.3)	0.2	19.6	49.7	70.0	89.1	158.0	235.5	414.7	531.1
		0.4	27.8	70.3	99.0	126.0	223.5	333.0	586.5	751.1
	-20°C (2.0)	0.2	21.8	55.2	77.7	98.9	175.5	261.5	460.5	589.8
		0.4	30.8	78.1	109.9	139.9	248.2	369.8	651.3	834.1
	0°C (4.9)	0.2	23.8	60.3	84.9	108.1	191.8	285.8	503.3	644.6
		0.4	33.7	85.3	120.1	152.9	271.2	404.1	711.7	911.5
30°C 13.1 bar	-40°C (0.3)	0.2	18.1	45.8	64.5	82.1	145.6	217.0	382.2	489.4
		0.4	25.6	64.8	91.2	116.1	205.9	306.9	540.4	692.2
	-20°C (2.0)	0.2	20.2	51.2	72.1	91.8	162.9	242.7	427.5	547.5
		0.4	28.6	72.5	102.0	129.9	230.4	343.3	604.5	774.3
	0°C (4.9)	0.2	22.2	56.3	79.3	100.9	179.0	266.7	469.7	601.6
		0.4	31.4	79.6	112.1	142.7	253.1	377.2	664.3	850.8
35°C 15.1 bar	-40°C (0.3)	0.2	16.5	41.8	58.9	75.0	133.0	198.1	348.9	446.9
		0.4	23.3	59.2	83.3	106.0	188.0	280.2	493.5	632.0
	-20°C (2.0)	0.2	18.6	47.2	66.4	84.6	150.0	223.6	393.7	504.2
		0.4	26.3	66.7	94.0	119.6	212.2	316.1	556.8	713.1
	0°C (4.9)	0.2	20.6	52.2	73.5	93.5	165.9	247.3	435.4	557.7
		0.4	29.1	73.8	103.9	132.3	234.7	349.7	615.8	788.7

Note: Shading is for readability purposes only.

# Liquid Drain Capacities – A8

## A8 – Liquid Drain Capacities (Tons)

**R-507**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Pressure Drop psi	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 167.0 psig	-40°F (5.5)	3	5.8	14.6	20.6	26.3	46.6	69.4	122.2	156.5
		6	8.2	20.7	29.2	37.1	65.9	98.1	172.8	221.3
	0°F (35.2)	3	6.4	16.3	22.9	29.2	51.8	77.2	136.0	174.1
		6	9.1	23.0	32.5	41.3	73.3	109.2	192.3	246.3
	40°F (89.8)	3	7.0	17.9	25.1	32.0	56.8	84.6	148.9	190.8
		6	10.0	25.3	35.6	45.3	80.3	119.6	210.6	269.8
95°F 226.0 psig	-40°F (5.5)	3	4.9	12.4	17.4	22.2	39.3	58.6	103.2	132.2
		6	6.9	17.5	24.6	31.4	55.6	82.9	146.0	187.0
	0°F (35.2)	3	5.5	14.0	19.7	25.1	44.4	66.2	116.6	149.4
		6	7.8	19.8	27.8	35.4	62.9	93.7	164.9	211.3
	40°F (89.8)	3	6.1	15.5	21.8	27.8	49.3	73.4	129.3	165.6
		6	8.7	21.9	30.9	39.3	69.7	103.8	182.8	234.2
115°F 301.0 psig	-40°F (5.5)	3	3.9	10.0	14.1	17.9	31.8	47.4	83.4	106.8
		6	5.6	14.1	19.9	25.3	44.9	67.0	117.9	151.1
	0°F (35.2)	3	4.6	11.6	16.3	20.7	36.7	54.7	96.4	123.5
		6	6.5	16.3	23.0	29.3	52.0	77.4	136.3	174.6
	40°F (89.8)	3	5.1	13.0	18.3	23.3	41.4	61.7	108.7	139.2
		6	7.3	18.4	25.9	33.0	58.6	87.3	153.7	196.8

Note: Shading is for readability purposes only.

## A8 – Liquid Drain Capacities (Kilowatts)

**R-507**

Cond Temp °C Sat Pressure bar	Evaporator Temperature	Pressure Drop bar	A8 3/8" 9mm	A8 5/8" 15mm	A8 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 11.6 bar	-40°C (0.4)	0.2	19.5	49.3	69.4	88.4	156.8	233.6	411.3	526.8
		0.4	27.5	69.7	98.2	125.0	221.7	330.3	581.7	745.1
	-20°C (2.1)	0.2	21.5	54.4	76.6	97.5	173.0	257.8	454.0	581.4
		0.4	30.4	77.0	108.4	137.9	244.7	364.6	642.0	822.3
	0°C (5.2)	0.2	23.4	59.3	83.5	106.2	188.4	280.8	494.5	633.3
		0.4	33.1	83.8	118.0	150.2	266.5	397.1	699.3	895.7
30°C 13.5 bar	-40°C (0.4)	0.2	18.1	45.8	64.5	82.1	145.5	216.9	381.9	489.2
		0.4	25.6	64.7	91.2	116.0	205.8	306.7	540.1	691.8
	-20°C (2.1)	0.2	20.1	50.8	71.6	91.1	161.6	240.8	424.1	543.2
		0.4	28.4	71.9	101.2	128.8	228.6	340.6	599.8	768.1
	0°C (5.2)	0.2	22.0	55.6	78.3	99.7	176.9	263.6	464.2	594.5
		0.4	31.1	78.7	110.8	141.0	250.2	372.7	656.4	840.7
35°C 15.6 bar	-40°C (0.4)	0.2	16.7	42.2	59.4	75.7	134.2	200.0	352.2	451.1
		0.4	23.6	59.7	84.1	107.0	189.8	282.8	498.1	637.9
	-20°C (2.1)	0.2	18.6	47.2	66.5	84.6	150.1	223.6	393.8	504.4
		0.4	26.4	66.8	94.0	119.6	212.2	316.3	557.0	713.3
	0°C (5.2)	0.2	20.5	52.0	73.1	93.1	165.2	246.1	433.4	555.1
		0.4	29.0	73.5	103.4	131.7	233.6	348.0	613.0	785.0

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Tons)

**R-22**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 132.0 psig	-40°F (0.5)	140	3	1.5	3.8	5.3	6.8	12.0	17.9	31.4	40.2
		180		1.4	3.6	5.1	6.5	11.4	17.1	30.0	38.4
		220		1.4	3.5	4.9	6.2	11.0	16.4	28.8	36.9
		140	6	2.1	5.3	7.5	9.6	16.9	25.2	44.3	56.7
		180		2.0	5.1	7.2	9.1	16.1	24.1	42.3	54.2
		220		1.9	4.9	6.9	8.8	15.5	23.1	40.7	52.0
	0°F (24.0)	140	3	1.6	4.0	5.6	7.2	12.7	18.9	33.3	42.6
		180		1.5	3.8	5.4	6.8	12.1	18.1	31.8	40.7
		220		1.4	3.7	5.2	6.6	11.6	17.4	30.6	39.1
		140	6	2.2	5.6	7.9	10.1	17.9	26.7	47.0	60.1
		180		2.1	5.4	7.6	9.7	17.1	25.5	44.9	57.4
		220		2.0	5.2	7.3	9.3	16.4	24.5	43.1	55.1
	40°F (68.5)	140	3	1.6	4.2	5.9	7.5	13.3	19.9	34.9	44.7
		180		1.6	4.0	5.6	7.2	12.7	19.0	33.4	42.7
		220		1.5	3.8	5.4	6.9	12.2	18.2	32.1	41.1
		140	6	2.3	5.9	8.3	10.6	18.8	28.1	49.3	63.1
		180		2.2	5.6	8.0	10.2	18.0	26.8	47.1	60.3
		220		2.1	5.4	7.7	9.8	17.2	25.7	45.3	57.9
95°F 182.0 psig	-40°F (0.5)	140	3	1.6	4.1	5.8	7.4	13.0	19.4	34.2	43.8
		180		1.5	3.9	5.5	7.0	12.4	18.4	32.4	41.5
		220		1.5	3.7	5.2	6.7	11.8	17.6	31.0	39.7
		140	6	2.3	5.8	8.2	10.4	18.4	27.5	48.3	61.8
		180		2.2	5.5	7.7	9.9	17.5	26.1	45.8	58.6
		220		2.1	5.2	7.4	9.4	16.7	24.9	43.8	56.1
	0°F (24.0)	140	3	1.7	4.4	6.1	7.8	13.9	20.7	36.4	46.6
		180		1.6	4.1	5.8	7.4	13.2	19.6	34.5	44.2
		220		1.6	4.0	5.6	7.1	12.6	18.8	33.1	42.3
		140	6	2.4	6.2	8.7	11.1	19.6	29.2	51.4	65.8
		180		2.3	5.8	8.2	10.5	18.6	27.7	48.8	62.4
		220		2.2	5.6	7.9	10.1	17.8	26.5	46.7	59.7
	40°F (68.5)	140	3	1.8	4.6	6.5	8.3	14.6	21.8	38.4	49.1
		180		1.7	4.4	6.2	7.8	13.9	20.7	36.4	46.6
		220		1.6	4.2	5.9	7.5	13.3	19.8	34.8	44.6
		140	6	2.5	6.5	9.2	11.7	20.7	30.8	54.2	69.4
		180		2.4	6.2	8.7	11.1	19.6	29.2	51.4	65.8
		220		2.3	5.9	8.3	10.6	18.8	28.0	49.2	63.0
115°F 243.0 psig	-40°F (0.5)	140	3	1.7	4.4	6.2	7.9	14.0	20.9	36.8	47.1
		180		1.6	4.1	5.8	7.4	13.2	19.6	34.5	44.2
		220		1.5	3.9	5.5	7.1	12.5	18.6	32.8	42.0
		140	6	2.4	6.2	8.8	11.2	19.8	29.6	52.0	66.5
		180		2.3	5.8	8.2	10.5	18.6	27.7	48.8	62.4
		220		2.2	5.6	7.8	10.0	17.7	26.4	46.4	59.3
	0°F (24.0)	140	3	1.9	4.7	6.7	8.5	15.0	22.4	39.4	50.5
		180		1.7	4.4	6.2	8.0	14.1	21.0	37.0	47.3
		220		1.7	4.2	5.9	7.6	13.4	20.0	35.2	45.0
		140	6	2.6	6.7	9.4	12.0	21.2	31.7	55.7	71.3
		180		2.5	6.3	8.8	11.3	19.9	29.7	52.3	66.9
		220		2.3	5.9	8.4	10.7	18.9	28.2	49.7	63.6
	40°F (68.5)	140	3	2.0	5.0	7.1	9.0	15.9	23.7	41.7	53.4
		180		1.8	4.7	6.6	8.4	14.9	22.3	39.2	50.2
		220		1.8	4.5	6.3	8.0	14.2	21.2	37.3	47.7
		140	6	2.8	7.1	10.0	12.7	22.5	33.6	59.0	75.5
		180		2.6	6.6	9.4	11.9	21.1	31.5	55.4	70.9
		220		2.5	6.3	8.9	11.3	20.1	29.9	52.6	67.4

**Note:** Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Kilowatts)

## R-22

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 9.2 bar	-40°C (0.0)	60	0.2	5.1	13.0	18.4	23.4	41.5	61.9	108.9	139.4
		80		4.9	12.5	17.6	22.5	39.8	59.4	104.4	133.7
		100		4.7	12.1	17.0	21.7	38.4	57.2	100.7	128.9
		60	0.4	7.2	18.4	26.0	33.2	58.6	87.5	153.8	196.8
		80		6.9	17.6	24.9	31.8	56.2	83.9	147.5	188.7
		100		6.7	17.0	24.0	30.6	54.2	80.8	142.1	181.8
	-20°C (1.4)	60	0.2	5.4	13.8	19.4	24.7	43.8	65.3	114.8	147.0
		80		5.2	13.2	18.6	23.7	42.0	62.6	110.1	141.0
		100		5.0	12.7	17.9	22.9	40.5	60.3	106.2	135.9
		60	0.4	7.6	19.4	27.4	35.0	61.8	92.3	162.2	207.5
		80		7.3	18.6	26.3	33.5	59.3	88.5	155.5	198.9
		100		7.0	17.9	25.4	32.3	57.1	85.2	149.8	191.7
	0°C (4.0)	60	0.2	5.7	14.4	20.3	25.9	45.8	68.3	120.2	153.9
		80		5.4	13.8	19.5	24.8	43.9	65.5	115.3	147.6
		100		5.2	13.3	18.8	23.9	42.3	63.1	111.1	142.2
		60	0.4	8.0	20.3	28.7	36.6	64.7	96.6	169.7	217.2
		80		7.6	19.5	27.5	35.1	62.0	92.6	162.7	208.2
		100		7.4	18.8	26.5	33.8	59.8	89.2	156.8	200.7
30°C 10.9 bar	-40°C (0.0)	60	0.2	5.3	13.6	19.1	24.4	43.2	64.3	113.2	145.0
		80		5.1	13.0	18.3	23.3	41.3	61.6	108.3	138.7
		100		4.9	12.5	17.6	22.4	39.7	59.2	104.2	133.4
		60	0.4	7.5	19.1	27.1	34.5	61.0	91.0	160.0	204.7
		80		7.2	18.3	25.9	33.0	58.3	87.0	153.0	195.8
		100		6.9	17.6	24.9	31.7	56.1	83.7	147.2	188.3
	-20°C (1.4)	60	0.2	5.6	14.3	20.2	25.7	45.6	68.0	119.6	153.2
		80		5.4	13.7	19.3	24.6	43.6	65.0	114.4	146.5
		100		5.2	13.2	18.6	23.7	42.0	62.6	110.1	141.0
		60	0.4	7.9	20.2	28.6	36.4	64.4	96.1	169.0	216.3
		80		7.6	19.3	27.3	34.8	61.6	91.9	161.6	206.8
		100		7.3	18.6	26.3	33.5	59.3	88.5	155.5	199.0
	0°C (4.0)	60	0.2	5.9	15.0	21.2	27.0	47.8	71.3	125.4	160.6
		80		5.7	14.4	20.3	25.8	45.7	68.2	120.0	153.6
		100		5.4	13.8	19.5	24.8	44.0	65.6	115.4	147.8
		60	0.4	8.3	21.2	30.0	38.2	67.5	100.8	177.2	226.7
		80		8.0	20.3	28.7	36.5	64.6	96.4	169.5	216.8
		100		7.7	19.5	27.6	35.1	62.1	92.7	163.0	208.6
35°C 12.6 bar	-40°C (0.0)	60	0.2	5.5	14.1	19.8	25.3	44.8	66.7	117.4	150.3
		80		5.3	13.4	18.9	24.1	42.7	63.6	112.0	143.4
		100		5.1	12.9	18.2	23.1	41.0	61.1	107.5	137.7
		60	0.4	7.8	19.9	28.1	35.8	63.2	94.3	165.9	212.3
		80		7.4	18.9	26.7	34.1	60.3	89.9	158.2	202.4
		100		7.1	18.2	25.7	32.7	57.9	86.4	151.8	194.3
	-20°C (1.4)	60	0.2	5.9	14.9	21.0	26.8	47.4	70.7	124.4	159.2
		80		5.6	14.2	20.0	25.5	45.2	67.4	118.6	151.8
		100		5.4	13.6	19.2	24.5	43.4	64.7	113.9	145.8
		60	0.4	8.3	21.0	29.7	37.9	67.0	99.9	175.7	224.8
		80		7.9	20.0	28.3	36.1	63.8	95.2	167.5	214.3
		100		7.6	19.2	27.2	34.6	61.3	91.4	160.8	205.8
	0°C (4.0)	60	0.2	6.2	15.6	22.1	28.1	49.8	74.2	130.6	167.2
		80		5.9	14.9	21.0	26.8	47.5	70.8	124.5	159.4
		100		5.6	14.3	20.2	25.7	45.6	68.0	119.6	153.1
		60	0.4	8.7	22.1	31.2	39.8	70.3	104.9	184.5	236.1
		80		8.3	21.1	29.7	37.9	67.0	100.0	175.9	225.1
		100		7.9	20.2	28.6	36.4	64.4	96.0	168.9	216.1

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Tons)

## R-134a

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm	
75°F 78.6 psig	-40°F (14.7 in. hg)	140	3	1.1	2.9	4.1	5.2	9.2	13.7	24.1	30.8	
		180		1.1	2.8	3.9	5.0	8.8	13.1	23.0	29.5	
		220		1.0	2.7	3.7	4.8	8.4	12.6	22.2	28.4	
		140	6	1.6	4.1	5.8	7.3	12.9	19.3	33.9	43.4	
		180		1.5	3.9	5.5	7.0	12.4	18.5	32.5	41.5	
		220		1.5	3.7	5.3	6.8	11.9	17.8	31.2	39.9	
	0°F (6.5)	140	3	1.2	3.2	4.5	5.7	10.0	15.0	26.3	33.7	
		180		1.2	3.0	4.3	5.4	9.6	14.3	25.2	32.2	
		220		1.1	2.9	4.1	5.2	9.2	13.8	24.2	31.0	
		140	6	1.7	4.4	6.3	8.0	14.2	21.2	37.1	47.5	
		180		1.7	4.2	6.0	7.7	13.5	20.2	35.5	45.4	
		220		1.6	4.1	5.8	7.4	13.0	19.4	34.1	43.6	
	40°F (35.1)	140	3	1.3	3.4	4.8	6.1	10.9	16.2	28.5	36.5	
		180		1.3	3.3	4.6	5.9	10.4	15.5	27.3	34.9	
		220		1.2	3.1	4.4	5.7	10.0	14.9	26.2	33.6	
		140	6	1.9	4.8	6.8	8.7	15.3	22.9	40.2	51.4	
		180		1.8	4.6	6.5	8.3	14.6	21.9	38.4	49.1	
		220		1.7	4.4	6.3	8.0	14.1	21.0	36.9	47.2	
	95°F 113.8 psig	-40°F (14.7 in. hg)	140	3	1.2	3.1	4.4	5.6	9.9	14.8	26.0	33.2
			180		1.2	3.0	4.2	5.3	9.4	14.0	24.7	31.6
			220		1.1	2.8	4.0	5.1	9.0	13.4	23.6	30.3
			140	6	1.7	4.4	6.2	7.9	14.0	20.8	36.6	46.8
			180		1.6	4.2	5.9	7.5	13.3	19.8	34.8	44.5
			220		1.6	4.0	5.6	7.2	12.7	19.0	33.3	42.6
0°F (6.5)		140	3	1.3	3.4	4.8	6.2	10.9	16.3	28.7	36.7	
		180		1.3	3.3	4.6	5.9	10.4	15.5	27.2	34.9	
		220		1.2	3.1	4.4	5.6	9.9	14.8	26.1	33.4	
		140	6	1.9	4.8	6.8	8.7	15.4	23.0	40.4	51.7	
		180		1.8	4.6	6.5	8.3	14.6	21.9	38.4	49.1	
		220		1.7	4.4	6.2	7.9	14.0	20.9	36.8	47.1	
40°F (35.1)		140	3	1.5	3.7	5.3	6.7	11.9	17.8	31.3	40.0	
		180		1.4	3.6	5.0	6.4	11.3	16.9	29.7	38.0	
		220		1.3	3.4	4.8	6.1	10.9	16.2	28.5	36.4	
		140	6	2.1	5.3	7.5	9.5	16.8	25.1	44.1	56.4	
		180		2.0	5.0	7.1	9.0	16.0	23.8	41.9	53.6	
		220		1.9	4.8	6.8	8.7	15.3	22.8	40.1	51.3	
115°F 158.4 psig		-40°F (14.7 in. hg)	140	3	1.3	3.3	4.6	5.9	10.4	15.6	27.4	35.1
			180		1.2	3.1	4.4	5.5	9.8	14.6	25.8	33.0
			220		1.2	2.9	4.1	5.3	9.4	14.0	24.5	31.4
			140	6	1.8	4.6	6.6	8.4	14.8	22.0	38.7	49.6
			180		1.7	4.4	6.2	7.9	13.9	20.7	36.4	46.6
			220		1.6	4.1	5.9	7.5	13.2	19.7	34.7	44.3
	0°F (6.5)	140	3	1.4	3.7	5.2	6.6	11.7	17.4	30.7	39.3	
		180		1.4	3.5	4.9	6.2	11.0	16.4	28.8	36.9	
		220		1.3	3.3	4.6	5.9	10.5	15.6	27.5	35.2	
		140	6	2.0	5.2	7.3	9.3	16.5	24.7	43.3	55.5	
		180		1.9	4.9	6.9	8.8	15.5	23.2	40.7	52.1	
		220		1.8	4.6	6.6	8.4	14.8	22.1	38.8	49.6	
	40°F (35.1)	140	3	1.6	4.0	5.7	7.3	12.9	19.2	33.8	43.3	
		180		1.5	3.8	5.4	6.8	12.1	18.1	31.8	40.7	
		220		1.4	3.6	5.1	6.5	11.5	17.2	30.3	38.7	
		140	6	2.2	5.7	8.1	10.3	18.2	27.2	47.8	61.1	
		180		2.1	5.4	7.6	9.7	17.1	25.5	44.9	57.4	
		220		2.0	5.1	7.2	9.2	16.3	24.3	42.7	54.7	

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Kilowatts)

## R-134a

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 5.5 bar	-40°C (373 mm hg)	60	0.2	3.9	10.0	14.1	18.0	31.8	47.4	83.4	106.7
		80		3.8	9.6	13.5	17.2	30.5	45.5	80.0	102.4
		100		3.6	9.2	13.1	16.6	29.4	43.9	77.2	98.8
		60	0.4	5.5	14.0	19.9	25.4	44.8	66.9	117.4	150.1
		80		5.3	13.5	19.1	24.4	43.0	64.2	112.7	144.1
		100		5.1	13.0	18.4	23.5	41.4	61.9	108.7	139.0
	-20°C (91.4 mm hg)	60	0.2	4.3	10.8	15.3	19.5	34.5	51.5	90.5	115.8
		80		4.1	10.4	14.7	18.7	33.1	49.4	86.9	111.2
		100		3.9	10.0	14.2	18.1	31.9	47.7	83.8	107.3
		60	0.4	5.9	15.2	21.6	27.6	48.6	72.6	127.5	163.0
		80		5.7	14.6	20.7	26.4	46.6	69.7	122.3	156.4
		100		5.5	14.1	20.0	25.5	45.0	67.2	118.0	150.9
	0°C (1.9)	60	0.2	4.6	11.7	16.5	21.0	37.1	55.4	97.4	124.6
		80		4.4	11.2	15.8	20.2	35.6	53.2	93.5	119.7
		100		4.2	10.8	15.3	19.4	34.4	51.3	90.2	115.5
		60	0.4	6.4	16.4	23.2	29.7	52.3	78.1	137.2	175.4
		80		6.1	15.7	22.3	28.5	50.2	75.0	131.7	168.3
		100		5.9	15.2	21.5	27.5	48.4	72.3	127.0	162.4
30°C 6.7 bar	-40°C (373 mm hg)	60	0.2	4.1	10.3	14.6	18.6	32.9	49.0	86.2	110.4
		80		3.9	9.9	14.0	17.8	31.5	47.0	82.6	105.7
		100		3.7	9.5	13.5	17.1	30.3	45.2	79.6	101.8
		60	0.4	5.7	14.5	20.6	26.3	46.4	69.3	121.7	155.6
		80		5.4	13.9	19.7	25.2	44.4	66.3	116.5	149.0
		100		5.2	13.4	19.0	24.2	42.8	63.9	112.2	143.4
	-20°C (91.4 mm hg)	60	0.2	4.4	11.3	15.9	20.2	35.8	53.4	94.0	120.3
		80		4.2	10.8	15.2	19.4	34.3	51.2	90.0	115.2
		100		4.1	10.4	14.7	18.7	33.0	49.3	86.7	111.0
		60	0.4	6.2	15.9	22.5	28.6	50.5	75.5	132.6	169.6
		80		5.9	15.2	21.5	27.4	48.4	72.3	126.9	162.3
		100		5.7	14.6	20.7	26.4	46.6	69.6	122.2	156.3
	0°C (1.9)	60	0.2	4.8	12.2	17.2	21.9	38.7	57.7	101.5	129.9
		80		4.6	11.6	16.4	20.9	37.0	55.3	97.2	124.4
		100		4.4	11.2	15.8	20.2	35.7	53.2	93.6	119.8
		60	0.4	6.7	17.1	24.2	30.9	54.6	81.5	143.2	183.1
		80		6.4	16.4	23.2	29.6	52.2	78.0	137.1	175.3
		100		6.2	15.8	22.4	28.5	50.3	75.1	132.0	168.8
35°C 7.8 bar	-40°C (373 mm hg)	60	0.2	4.2	10.7	15.0	19.2	33.9	50.6	89.0	113.9
		80		4.0	10.2	14.4	18.3	32.4	48.3	85.0	108.7
		100		3.8	9.8	13.8	17.6	31.1	46.4	81.7	104.5
		60	0.4	5.9	15.0	21.2	27.1	47.8	71.4	125.5	160.6
		80		5.6	14.3	20.3	25.9	45.7	68.2	119.8	153.2
		100		5.4	13.8	19.5	24.9	43.9	65.5	115.1	147.3
	-20°C (91.4 mm hg)	60	0.2	4.6	11.7	16.5	21.0	37.1	55.4	97.4	124.7
		80		4.4	11.1	15.7	20.0	35.4	52.9	93.0	119.0
		100		4.2	10.7	15.1	19.3	34.1	50.8	89.4	114.4
		60	0.4	6.4	16.4	23.3	29.7	52.4	78.2	137.4	175.8
		80		6.1	15.7	22.2	28.3	50.0	74.6	131.1	167.7
		100		5.9	15.1	21.3	27.2	48.0	71.7	126.0	161.2
	0°C (1.9)	60	0.2	5.0	12.6	17.8	22.7	40.2	60.0	105.5	135.1
		80		4.7	12.1	17.0	21.7	38.4	57.3	100.8	129.0
		100		4.6	11.6	16.4	20.9	36.9	55.1	96.9	124.0
		60	0.4	7.0	17.8	25.2	32.1	56.7	84.7	148.9	190.4
		80		6.7	17.0	24.1	30.7	54.2	80.9	142.1	181.8
		100		6.4	16.3	23.1	29.5	52.1	77.7	136.6	174.7

Note: Shading is for readability purposes only.



# Discharge Capacities – A8

## A8 – Discharge Capacities (Tons)

## R-404A

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
75°F 161.2 psig	-40°F (2.7)	140	3	1.2	3.2	4.5	5.7	10.1	15.1	26.5	33.9
		180		1.2	3.0	4.3	5.4	9.6	14.3	25.2	32.3
		220		1.1	2.9	4.1	5.2	9.2	13.7	24.1	30.9
		140	6	1.8	4.5	6.3	8.1	14.3	21.3	37.5	47.9
		180		1.7	4.3	6.0	7.7	13.6	20.2	35.6	45.5
		220		1.6	4.1	5.8	7.3	13.0	19.4	34.1	43.6
	0°F (33.5)	140	3	1.4	3.6	5.0	6.4	11.3	16.9	29.7	38.0
		180		1.3	3.4	4.8	6.1	10.8	16.0	28.2	36.1
		220		1.3	3.2	4.6	5.8	10.3	15.4	27.0	34.6
		140	6	2.0	5.0	7.1	9.0	16.0	23.9	41.9	53.7
		180		1.9	4.8	6.7	8.6	15.2	22.7	39.8	51.0
		220		1.8	4.6	6.4	8.2	14.5	21.7	38.1	48.8
	40°F (86.4)	140	3	1.5	3.9	5.5	7.0	12.4	18.5	32.6	41.7
		180		1.5	3.7	5.2	6.7	11.8	17.6	31.0	39.7
		220		1.4	3.6	5.0	6.4	11.3	16.9	29.7	38.0
		140	6	2.2	5.5	7.8	9.9	17.6	26.2	46.1	58.9
		180		2.1	5.2	7.4	9.4	16.7	24.9	43.8	56.0
		220		2.0	5.0	7.1	9.0	16.0	23.8	41.9	53.6
95°F 219.4 psig	-40°F (2.7)	140	3	1.3	3.2	4.6	5.8	10.3	15.3	27.0	34.5
		180		1.2	3.0	4.3	5.5	9.7	14.4	25.4	32.5
		220		1.1	2.9	4.1	5.2	9.2	13.7	24.1	30.9
		140	6	1.8	4.6	6.5	8.2	14.5	21.7	38.2	48.8
		180		1.7	4.3	6.1	7.7	13.7	20.4	35.9	45.9
		220		1.6	4.1	5.8	7.3	13.0	19.4	34.1	43.6
	0°F (33.5)	140	3	1.5	3.7	5.2	6.6	11.7	17.5	30.8	39.4
		180		1.4	3.5	4.9	6.2	11.0	16.4	28.9	37.1
		220		1.3	3.3	4.7	5.9	10.5	15.6	27.5	35.2
		140	6	2.0	5.2	7.4	9.4	16.6	24.7	43.5	55.7
		180		1.9	4.9	6.9	8.8	15.6	23.3	40.9	52.4
		220		1.8	4.7	6.6	8.4	14.8	22.1	38.9	49.8
	40°F (86.4)	140	3	1.6	4.1	5.8	7.4	13.1	19.5	34.3	43.9
		180		1.5	3.9	5.4	6.9	12.3	18.3	32.2	41.3
		220		1.4	3.7	5.2	6.6	11.7	17.4	30.7	39.2
		140	6	2.3	5.8	8.2	10.4	18.5	27.6	48.5	62.0
		180		2.1	5.5	7.7	9.8	17.4	25.9	45.6	58.3
		220		2.0	5.2	7.3	9.3	16.5	24.6	43.3	55.4
115°F 290.4 psig	-40°F (2.7)	140	3	1.2	3.2	4.5	5.7	10.0	15.0	26.4	33.7
		180		1.1	2.9	4.1	5.2	9.3	13.8	24.3	31.1
		220		1.1	2.7	3.9	4.9	8.7	13.0	22.9	29.3
		140	6	1.8	4.5	6.3	8.0	14.2	21.2	37.3	47.7
		180		1.6	4.1	5.8	7.4	13.1	19.5	34.4	44.0
		220		1.5	3.9	5.5	7.0	12.3	18.4	32.3	41.4
	0°F (33.5)	140	3	1.5	3.7	5.2	6.7	11.8	17.6	30.9	39.6
		180		1.3	3.4	4.8	6.1	10.9	16.2	28.5	36.5
		220		1.3	3.2	4.5	5.8	10.2	15.3	26.9	34.4
		140	6	2.1	5.2	7.4	9.4	16.7	24.9	43.8	56.0
		180		1.9	4.8	6.8	8.7	15.4	22.9	40.3	51.6
		220		1.8	4.5	6.4	8.2	14.5	21.6	38.0	48.6
	40°F (86.4)	140	3	1.7	4.2	5.9	7.6	13.4	20.0	35.1	45.0
		180		1.5	3.9	5.5	7.0	12.4	18.4	32.4	41.5
		220		1.4	3.7	5.2	6.6	11.6	17.3	30.5	39.1
		140	6	2.3	6.0	8.4	10.7	19.0	28.3	49.7	63.7
		180		2.2	5.5	7.7	9.9	17.5	26.1	45.8	58.7
		220		2.0	5.2	7.3	9.3	16.4	24.5	43.1	55.2

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Kilowatts)

## R-404A

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 11.2 bar	-40°C (0.3)	60	0.2	4.3	10.9	15.4	19.6	34.7	51.7	91.0	116.5
		80		4.1	10.4	14.7	18.7	33.1	49.4	86.8	111.2
		100		3.9	10.0	14.1	17.9	31.8	47.4	83.4	106.8
		60	0.4	6.0	15.4	21.7	27.7	49.0	73.1	128.5	164.5
		80		5.8	14.7	20.7	26.4	46.7	69.7	122.6	156.9
		100		5.5	14.1	19.9	25.4	44.9	66.9	117.7	150.6
	-20°C (2.0)	60	0.2	4.8	12.1	17.1	21.7	38.5	57.4	101.1	129.4
		80		4.5	11.6	16.3	20.8	36.8	54.8	96.4	123.5
		100		4.4	11.1	15.6	19.9	35.3	52.6	92.6	118.5
		60	0.4	6.7	17.1	24.1	30.8	54.4	81.2	142.7	182.7
		80		6.4	16.3	23.0	29.4	51.9	77.4	136.2	174.2
		100		6.1	15.6	22.1	28.2	49.8	74.3	130.7	167.3
	0°C (4.9)	60	0.2	5.2	13.2	18.7	23.8	42.1	62.8	110.4	141.4
		80		5.0	12.6	17.8	22.7	40.2	59.9	105.4	134.9
		100		4.8	12.1	17.1	21.8	38.6	57.5	101.2	129.5
		60	0.4	7.3	18.7	26.4	33.6	59.5	88.7	156.0	199.6
		80		7.0	17.8	25.2	32.1	56.7	84.6	148.8	190.4
		100		6.7	17.1	24.2	30.8	54.4	81.2	142.8	182.8
30°C 13.1 bar	-40°C (0.3)	60	0.2	4.3	11.0	15.5	19.8	35.0	52.2	91.8	117.5
		80		4.1	10.5	14.7	18.8	33.3	49.6	87.3	111.7
		100		3.9	10.0	14.1	18.0	31.9	47.5	83.6	107.0
		60	0.4	6.1	15.5	21.9	28.0	49.4	73.8	129.7	166.0
		80		5.8	14.8	20.8	26.6	47.0	70.1	123.3	157.8
		100		5.5	14.1	20.0	25.4	45.0	67.1	118.0	151.1
	-20°C (2.0)	60	0.2	4.8	12.3	17.3	22.1	39.1	58.4	102.7	131.5
		80		4.6	11.7	16.5	21.0	37.2	55.5	97.6	125.0
		100		4.4	11.2	15.8	20.1	35.6	53.1	93.5	119.7
		60	0.4	6.8	17.4	24.5	31.3	55.3	82.5	145.1	185.7
		80		6.5	16.5	23.3	29.7	52.6	78.4	137.9	176.5
		100		6.2	15.8	22.3	28.5	50.3	75.1	132.0	169.0
	0°C (4.9)	60	0.2	5.3	13.5	19.1	24.3	43.0	64.1	112.9	144.5
		80		5.1	12.9	18.1	23.1	40.9	61.0	107.3	137.4
		100		4.8	12.3	17.4	22.1	39.2	58.4	102.8	131.5
		60	0.4	7.5	19.1	27.0	34.4	60.8	90.7	159.5	204.1
		80		7.1	18.1	25.6	32.7	57.8	86.2	151.5	193.9
		100		6.8	17.4	24.5	31.3	55.3	82.5	145.1	185.7
35°C 15.1 bar	-40°C (0.3)	60	0.2	4.3	11.0	15.6	19.8	35.1	52.3	92.1	117.9
		80		4.1	10.4	14.7	18.7	33.2	49.5	87.1	111.5
		100		3.9	10.0	14.0	17.9	31.7	47.3	83.2	106.5
		60	0.4	6.1	15.6	22.0	28.1	49.6	74.0	130.2	166.7
		80		5.8	14.7	20.8	26.5	46.9	70.0	123.1	157.6
		100		5.5	14.1	19.9	25.3	44.8	66.8	117.5	150.4
	-20°C (2.0)	60	0.2	4.9	12.4	17.5	22.3	39.6	59.0	103.9	133.0
		80		4.6	11.8	16.6	21.1	37.5	55.8	98.3	125.8
		100		4.4	11.2	15.8	20.2	35.8	53.3	93.8	120.1
		60	0.4	6.9	17.6	24.8	31.7	56.0	83.5	146.9	188.1
		80		6.5	16.6	23.5	29.9	52.9	79.0	138.9	177.8
		100		6.2	15.9	22.4	28.6	50.5	75.4	132.6	169.7
	0°C (4.9)	60	0.2	5.4	13.8	19.4	24.7	43.8	65.3	114.9	147.1
		80		5.1	13.0	18.4	23.4	41.4	61.8	108.7	139.2
		100		4.9	12.4	17.5	22.3	39.6	59.0	103.8	132.9
		60	0.4	7.6	19.5	27.5	35.0	61.9	92.4	162.5	208.0
		80		7.2	18.4	26.0	33.1	58.6	87.4	153.7	196.7
		100		6.9	17.6	24.8	31.6	55.9	83.4	146.7	187.7

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Tons)

## R-507

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm	
75°F 167.0 psig	-40°F (5.5)	140	3	1.3	3.2	4.5	5.8	10.2	15.2	26.8	34.3	
		180		1.2	3.1	4.3	5.5	9.7	14.5	25.5	32.6	
		220		1.2	2.9	4.1	5.3	9.3	13.9	24.4	31.2	
		140	6	1.8	4.5	6.4	8.2	14.4	21.5	37.8	48.4	
		180		1.7	4.3	6.1	7.8	13.7	20.5	36.0	46.0	
		220		1.6	4.1	5.8	7.4	13.1	19.6	34.4	44.1	
	0°F (35.2)	140	3	1.4	3.6	5.0	6.4	11.4	16.9	29.8	38.2	
		180		1.3	3.4	4.8	6.1	10.8	16.1	28.3	36.3	
		220		1.3	3.3	4.6	5.8	10.3	15.4	27.1	34.8	
		140	6	2.0	5.0	7.1	9.1	16.0	23.9	42.1	53.9	
		180		1.9	4.8	6.8	8.6	15.2	22.8	40.0	51.2	
		220		1.8	4.6	6.5	8.3	14.6	21.8	38.3	49.0	
	40°F (89.8)	140	3	1.5	3.9	5.5	7.0	12.4	18.6	32.7	41.8	
		180		1.5	3.7	5.2	6.7	11.8	17.6	31.0	39.7	
		220		1.4	3.6	5.0	6.4	11.3	16.9	29.7	38.1	
		140	6	2.2	5.5	7.8	9.9	17.6	26.2	46.1	59.0	
		180		2.1	5.2	7.4	9.4	16.7	24.9	43.8	56.1	
		220		2.0	5.0	7.1	9.0	16.0	23.9	42.0	53.7	
	95°F 226.0 psig	-40°F (5.5)	140	3	1.3	3.3	4.7	6.0	10.6	15.7	27.7	35.5
			180		1.2	3.1	4.4	5.6	9.9	14.8	26.1	33.4
			220		1.2	3.0	4.2	5.3	9.5	14.1	24.8	31.8
			140	6	1.8	4.7	6.6	8.4	14.9	22.2	39.1	50.1
			180		1.7	4.4	6.2	7.9	14.0	20.9	36.8	47.1
			220		1.6	4.2	5.9	7.6	13.4	19.9	35.1	44.9
0°F (35.2)		140	3	1.5	3.7	5.3	6.7	11.9	17.8	31.3	40.1	
		180		1.4	3.5	5.0	6.3	11.2	16.7	29.5	37.7	
		220		1.3	3.4	4.7	6.0	10.7	15.9	28.1	35.9	
		140	6	2.1	5.3	7.5	9.5	16.9	25.1	44.2	56.6	
		180		2.0	5.0	7.0	9.0	15.9	23.7	41.6	53.3	
		220		1.9	4.7	6.7	8.5	15.1	22.5	39.6	50.7	
40°F (89.8)		140	3	1.6	4.2	5.9	7.5	13.2	19.7	34.7	44.4	
		180		1.5	3.9	5.5	7.0	12.4	18.6	32.7	41.8	
		220		1.5	3.7	5.3	6.7	11.9	17.7	31.1	39.8	
		140	6	2.3	5.9	8.3	10.6	18.7	27.9	49.0	62.7	
		180		2.2	5.5	7.8	9.9	17.6	26.2	46.1	59.0	
		220		2.1	5.3	7.4	9.5	16.7	25.0	43.9	56.2	
115°F 301.0 psig		-40°F (5.5)	140	3	1.3	3.3	4.7	6.0	10.6	15.8	27.8	35.7
			180		1.2	3.1	4.4	5.5	9.8	14.6	25.8	33.0
			220		1.1	2.9	4.1	5.2	9.3	13.8	24.3	31.1
			140	6	1.9	4.7	6.7	8.5	15.0	22.4	39.4	50.4
			180		1.7	4.4	6.2	7.8	13.9	20.7	36.4	46.6
			220		1.6	4.1	5.8	7.4	13.1	19.5	34.4	44.0
	0°F (35.2)	140	3	1.5	3.9	5.4	6.9	12.3	18.3	32.2	41.2	
		180		1.4	3.6	5.0	6.4	11.3	16.9	29.8	38.1	
		220		1.3	3.4	4.7	6.0	10.7	16.0	28.1	36.0	
		140	6	2.1	5.5	7.7	9.8	17.4	25.9	45.6	58.3	
		180		2.0	5.0	7.1	9.1	16.0	23.9	42.1	53.9	
		220		1.9	4.8	6.7	8.5	15.1	22.6	39.7	50.8	
	40°F (89.8)	140	3	1.7	4.3	6.1	7.8	13.8	20.6	36.3	46.5	
		180		1.6	4.0	5.7	7.2	12.8	19.1	33.6	43.0	
		220		1.5	3.8	5.3	6.8	12.1	18.0	31.7	40.6	
		140	6	2.4	6.1	8.7	11.1	19.6	29.2	51.3	65.7	
		180		2.2	5.7	8.0	10.2	18.1	27.0	47.5	60.7	
		220		2.1	5.4	7.6	9.6	17.1	25.4	44.8	57.3	

Note: Shading is for readability purposes only.

# Discharge Capacities – A8

## A8 – Discharge Capacities (Kilowatts)

## R-507

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	A8A 3/8" 9mm	A8A 5/8" 15mm	A8A 7/8" 22mm	A81 1-1/8" 28mm	A81 1-3/8" 35mm	A82 1-5/8" 42mm	A82 2-1/8" 54mm	A82 2-5/8" 66mm
25°C 11.6 bar	-40°C (0.4)	60	0.2	4.3	11.0	15.6	19.8	35.1	52.3	92.1	117.9
		80		4.1	10.5	14.9	18.9	33.5	50.0	87.9	112.6
		100		4.0	10.1	14.3	18.2	32.2	48.0	84.5	108.1
		60	0.4	6.1	15.6	22.0	28.0	49.6	74.0	130.1	166.5
		80		5.8	14.9	21.0	26.8	47.3	70.6	124.1	158.8
		100		5.6	14.3	20.2	25.7	45.4	67.8	119.3	152.6
	-20°C (2.1)	60	0.2	4.8	12.2	17.2	21.9	38.7	57.8	101.6	130.1
		80		4.6	11.6	16.4	20.9	37.0	55.1	97.0	124.2
		100		4.4	11.2	15.8	20.1	35.5	53.0	93.2	119.4
		60	0.4	6.7	17.2	24.3	30.9	54.7	81.7	143.6	183.7
		80		6.4	16.4	23.2	29.5	52.2	77.9	137.0	175.3
		100		6.2	15.8	22.3	28.4	50.2	74.9	131.6	168.4
	0°C (5.2)	60	0.2	5.2	13.3	18.7	23.8	42.2	62.9	110.7	141.7
		80		5.0	12.7	17.9	22.7	40.3	60.1	105.7	135.3
		100		4.8	12.2	17.2	21.9	38.7	57.7	101.6	130.0
		60	0.4	7.3	18.7	26.4	33.7	59.6	88.9	156.4	200.1
		80		7.0	17.9	25.2	32.2	56.9	84.9	149.2	191.0
		100		6.7	17.2	24.2	30.9	54.6	81.5	143.4	183.4
30°C 13.5 bar	-40°C (0.4)	60	0.2	4.4	11.2	15.8	20.1	35.7	53.2	93.6	119.8
		80		4.2	10.7	15.0	19.2	33.9	50.6	89.0	114.0
		100		4.0	10.2	14.4	18.4	32.5	48.5	85.3	109.3
		60	0.4	6.2	15.8	22.4	28.5	50.4	75.2	132.3	169.3
		80		5.9	15.1	21.3	27.1	47.9	71.5	125.7	160.9
		100		5.7	14.4	20.4	26.0	45.9	68.5	120.5	154.2
	-20°C (2.1)	60	0.2	4.9	12.4	17.6	22.4	39.6	59.1	103.9	133.0
		80		4.7	11.8	16.7	21.3	37.7	56.2	98.8	126.5
		100		4.5	11.4	16.0	20.4	36.1	53.8	94.8	121.3
		60	0.4	6.9	17.6	24.8	31.6	56.0	83.5	146.9	187.9
		80		6.6	16.7	23.6	30.1	53.2	79.4	139.6	178.7
		100		6.3	16.0	22.6	28.8	51.0	76.1	133.8	171.3
	0°C (5.2)	60	0.2	5.4	13.6	19.2	24.5	43.3	64.6	113.7	145.6
		80		5.1	13.0	18.3	23.3	41.2	61.5	108.2	138.5
		100		4.9	12.4	17.5	22.3	39.5	58.9	103.7	132.8
		60	0.4	7.6	19.2	27.2	34.6	61.3	91.4	160.7	205.7
		80		7.2	18.3	25.8	32.9	58.2	86.9	152.8	195.6
		100		6.9	17.5	24.8	31.6	55.8	83.3	146.5	187.4
35°C 15.6 bar	-40°C (0.4)	60	0.2	4.5	11.3	16.0	20.4	36.1	53.8	94.6	121.1
		80		4.2	10.7	15.1	19.3	34.1	50.9	89.6	114.7
		100		4.0	10.3	14.5	18.4	32.6	48.7	85.6	109.6
		60	0.4	6.3	16.0	22.6	28.8	51.0	76.0	133.7	171.1
		80		6.0	15.1	21.4	27.3	48.2	71.9	126.5	161.9
		100		5.7	14.5	20.4	26.0	46.1	68.7	120.9	154.8
	-20°C (2.1)	60	0.2	5.0	12.7	17.9	22.8	40.3	60.1	105.8	135.5
		80		4.7	12.0	16.9	21.5	38.2	56.9	100.2	128.2
		100		4.5	11.5	16.2	20.6	36.5	54.4	95.8	122.6
		60	0.4	7.0	17.9	25.3	32.2	57.0	85.0	149.5	191.4
		80		6.7	16.9	23.9	30.5	53.9	80.4	141.5	181.1
		100		6.4	16.2	22.9	29.1	51.5	76.9	135.2	173.1
	0°C (5.2)	60	0.2	5.5	13.9	19.7	25.0	44.4	66.2	116.4	149.1
		80		5.2	13.2	18.6	23.7	42.0	62.6	110.2	141.1
		100		5.0	12.6	17.8	22.7	40.2	59.9	105.4	134.9
		60	0.4	7.7	19.7	27.8	35.4	62.7	93.5	164.5	210.6
		80		7.3	18.6	26.3	33.5	59.3	88.5	155.7	199.3
		100		7.0	17.8	25.2	32.1	56.7	84.6	148.8	190.5

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Tons)

**R-22**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm	
75°F 132.0 psig	-40°F (0.5)	140	0.75	1.7	3.5	6.4	9.4	22.8	34.7	55.5	104.0	
		180		1.6	3.4	6.2	9.0	21.8	33.1	53.0	99.4	
		220		1.5	3.2	5.9	8.6	20.9	31.9	51.0	95.6	
		140	3	3.4	7.0	12.8	18.8	45.4	69.1	110.6	207.4	
		180		3.2	6.7	12.3	17.9	43.4	66.0	105.7	198.1	
		220		3.1	6.4	11.8	17.2	41.7	63.5	101.5	190.4	
	0°F (24.0)	140	0.75	1.8	3.7	6.8	10.0	24.1	36.7	58.8	110.2	
		180		1.7	3.6	6.5	9.5	23.1	35.1	56.2	105.3	
		220		1.6	3.4	6.3	9.2	22.2	33.8	54.0	101.3	
		140	3	3.6	7.4	13.6	19.9	48.1	73.2	117.2	219.7	
		180		3.4	7.1	13.0	19.0	46.0	70.0	111.9	209.9	
		220		3.3	6.8	12.5	18.3	44.2	67.2	107.6	201.7	
	40°F (68.5)	140	0.75	1.9	3.9	7.2	10.5	25.4	38.6	61.7	115.7	
		180		1.8	3.7	6.8	10.0	24.2	36.9	59.0	110.6	
		220		1.7	3.6	6.6	9.6	23.3	35.4	56.7	106.3	
		140	3	3.7	7.8	14.3	20.9	50.5	76.9	123.0	230.7	
		180		3.6	7.5	13.6	19.9	48.3	73.5	117.5	220.4	
		220		3.4	7.2	13.1	19.2	46.4	70.6	113.0	211.8	
	95°F 182.0 psig	-40°F (0.5)	140	0.75	1.8	3.8	7.0	10.2	24.8	37.7	60.4	113.2
			180		1.7	3.6	6.7	9.7	23.5	35.8	57.3	107.5
			220		1.7	3.5	6.4	9.3	22.5	34.3	54.9	102.9
			140	3	3.7	7.6	14.0	20.4	49.5	75.3	120.4	225.8
			180		3.5	7.2	13.3	19.4	46.9	71.4	114.3	214.3
			220		3.3	6.9	12.7	18.6	44.9	68.4	109.4	205.1
0°F (24.0)		140	0.75	2.0	4.1	7.5	10.9	26.4	40.2	64.3	120.5	
		180		1.9	3.9	7.1	10.4	25.1	38.1	61.0	114.4	
		220		1.8	3.7	6.8	9.9	24.0	36.5	58.4	109.5	
		140	3	3.9	8.1	14.9	21.8	52.7	80.2	128.3	240.5	
		180		3.7	7.7	14.1	20.7	50.0	76.1	121.7	228.2	
		220		3.5	7.4	13.5	19.8	47.8	72.8	116.5	218.4	
40°F (68.5)		140	0.75	2.1	4.3	7.9	11.5	27.8	42.4	67.8	127.1	
		180		2.0	4.1	7.5	10.9	26.4	40.2	64.3	120.6	
		220		1.9	3.9	7.1	10.4	25.3	38.5	61.6	115.5	
		140	3	4.1	8.6	15.7	22.9	55.5	84.5	135.2	253.5	
		180		3.9	8.1	14.9	21.8	52.7	80.2	128.3	240.6	
		220		3.7	7.8	14.3	20.8	50.4	76.7	122.8	230.2	
115°F 243.0 psig		-40°F (0.5)	140	0.75	2.0	4.1	7.5	11.0	26.7	40.6	64.9	121.7
			180		1.9	3.9	7.1	10.3	25.0	38.1	61.0	114.3
			220		1.8	3.7	6.7	9.8	23.8	36.2	58.0	108.7
			140	3	3.9	8.2	15.0	22.0	53.3	81.0	129.7	243.1
			180		3.7	7.7	14.1	20.6	50.0	76.1	121.7	228.2
			220		3.5	7.3	13.4	19.6	47.5	72.3	115.7	216.9
	0°F (24.0)	140	0.75	2.1	4.4	8.1	11.8	28.6	43.5	69.6	130.5	
		180		2.0	4.1	7.6	11.1	26.8	40.8	65.3	122.5	
		220		1.9	3.9	7.2	10.5	25.5	38.8	62.1	116.5	
		140	3	4.2	8.8	16.1	23.6	57.1	86.8	138.9	260.5	
		180		4.0	8.3	15.1	22.1	53.6	81.5	130.4	244.5	
		220		3.8	7.9	14.4	21.0	50.9	77.5	124.0	232.5	
	40°F (68.5)	140	0.75	2.2	4.7	8.6	12.5	30.3	46.1	73.7	138.2	
		180		2.1	4.4	8.0	11.7	28.4	43.2	69.2	129.7	
		220		2.0	4.2	7.6	11.2	27.0	41.1	65.8	123.4	
		140	3	4.5	9.3	17.1	25.0	60.4	92.0	147.2	276.0	
		180		4.2	8.8	16.0	23.4	56.7	86.3	138.1	259.0	
		220		4.0	8.3	15.2	22.3	53.9	82.1	131.3	246.3	

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Kilowatts)

**R-22**

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm	
25°C 9.2 bar	-40°C (0.0)	60	0.05	5.8	12.2	22.3	32.7	79.1	120.3	192.5	360.9	
		80		5.6	11.7	21.4	31.3	75.8	115.4	184.7	346.2	
		100		5.4	11.3	20.7	30.2	73.1	111.3	178.0	333.8	
		60	0.21	11.9	24.9	45.6	66.7	161.4	245.6	392.9	736.7	
		80		11.4	23.9	43.7	63.9	154.8	235.5	376.8	706.5	
		100		11.0	23.0	42.2	61.6	149.2	227.0	363.2	681.0	
	-20°C (1.4)	60	0.05	6.2	12.9	23.6	34.4	83.4	126.9	203.0	380.6	
		80		5.9	12.3	22.6	33.0	80.0	121.7	194.7	365.1	
		100		5.7	11.9	21.8	31.8	77.1	117.3	187.7	351.9	
		60	0.21	12.6	26.3	48.1	70.3	170.2	258.9	414.3	776.8	
		80		12.1	25.2	46.1	67.4	163.2	248.3	397.3	745.0	
		100		11.6	24.3	44.5	65.0	157.3	239.3	383.0	718.0	
	0°C (4.0)	60	0.05	6.4	13.5	24.7	36.0	87.3	132.8	212.5	398.3	
		80		6.2	12.9	23.7	34.6	83.7	127.4	203.8	382.1	
		100		6.0	12.5	22.8	33.3	80.7	122.8	196.5	368.4	
		60	0.21	13.2	27.5	50.3	73.6	178.1	271.0	433.6	813.0	
		80		12.6	26.4	48.3	70.5	170.8	259.9	415.8	779.7	
		100		12.2	25.4	46.5	68.0	164.6	250.5	400.8	751.5	
	30°C 10.9 bar	-40°C (0.0)	60	0.05	6.1	12.7	23.2	33.9	82.2	125.0	200.1	375.1
			80		5.8	12.1	22.2	32.5	78.6	119.6	191.4	358.9
			100		5.6	11.7	21.4	31.3	75.7	115.1	184.2	345.4
			60	0.21	12.4	25.9	47.4	69.3	167.8	255.4	408.7	766.2
			80		11.9	24.8	45.4	66.3	160.6	244.3	390.9	733.0
			100		11.4	23.8	43.7	63.8	154.5	235.1	376.2	705.3
-20°C (1.4)		60	0.05	6.4	13.4	24.5	35.9	86.8	132.1	211.4	396.4	
		80		6.1	12.8	23.5	34.3	83.1	126.4	202.3	379.2	
		100		5.9	12.3	22.6	33.0	80.0	121.7	194.7	365.0	
		60	0.21	13.1	27.4	50.1	73.2	177.3	269.9	431.8	809.6	
		80		12.5	26.2	47.9	70.1	169.6	258.1	413.0	774.4	
		100		12.1	25.2	46.1	67.4	163.2	248.4	397.4	745.2	
0°C (4.0)		60	0.05	6.7	14.0	25.7	37.6	91.0	138.5	221.6	415.5	
		80		6.4	13.4	24.6	36.0	87.1	132.5	212.0	397.6	
		100		6.2	12.9	23.7	34.6	83.8	127.5	204.1	382.6	
		60	0.21	13.7	28.7	52.5	76.8	185.9	282.9	452.6	848.7	
		80		13.1	27.4	50.3	73.5	177.8	270.6	433.0	811.9	
		100		12.6	26.4	48.4	70.7	171.1	260.4	416.6	781.2	
35°C 12.6 bar		-40°C (0.0)	60	0.05	6.3	13.1	24.1	35.2	85.2	129.6	207.4	388.9
			80		6.0	12.5	23.0	33.6	81.3	123.7	197.8	371.0
			100		5.8	12.0	22.1	32.2	78.0	118.8	190.0	356.3
			60	0.21	12.9	26.9	49.2	71.9	174.1	265.0	424.0	795.0
			80		12.3	25.6	46.9	68.6	166.1	252.7	404.3	758.1
			100		11.8	24.6	45.1	65.9	159.5	242.7	388.3	728.0
	-20°C (1.4)	60	0.05	6.7	13.9	25.5	37.3	90.2	137.3	219.6	411.8	
		80		6.4	13.3	24.3	35.5	86.0	130.9	209.5	392.8	
		100		6.1	12.8	23.4	34.1	82.6	125.8	201.2	377.3	
		60	0.21	13.6	28.5	52.1	76.2	184.4	280.6	449.0	841.8	
		80		13.0	27.1	49.7	72.6	175.8	267.6	428.1	802.8	
		100		12.5	26.1	47.7	69.7	168.9	257.0	411.1	770.9	
	0°C (4.0)	60	0.05	7.0	14.6	26.8	39.1	94.7	144.2	230.7	432.5	
		80		6.7	13.9	25.5	37.3	90.4	137.5	220.0	412.5	
		100		6.4	13.4	24.5	35.8	86.8	132.1	211.3	396.2	
		60	0.21	14.3	29.9	54.7	80.0	193.7	294.7	471.5	884.1	
		80		13.6	28.5	52.2	76.3	184.7	281.0	449.6	843.1	
		100		13.1	27.4	50.1	73.2	177.3	269.9	431.8	809.6	

**Note:** Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Tons)

## R-134a

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm
75°F 78.6 psig	-40°F (14.7 in hg)	140	0.75	1.3	2.7	4.9	7.2	17.5	26.6	42.6	79.9
		180		1.2	2.6	4.7	6.9	16.7	25.5	40.8	76.5
		220		1.2	2.5	4.6	6.7	16.1	24.5	39.2	73.6
		140	3	2.6	5.4	9.8	14.4	34.8	52.9	84.6	158.7
		180		2.5	5.1	9.4	13.7	33.2	50.6	80.9	151.8
		220		2.4	4.9	9.0	13.2	32.0	48.7	77.9	146.0
	0°F (6.5)	140	0.75	1.4	3.0	5.4	7.9	19.1	29.1	46.6	87.4
		180		1.4	2.8	5.2	7.6	18.3	27.9	44.6	83.6
		220		1.3	2.7	5.0	7.3	17.6	26.8	42.9	80.5
		140	3	2.8	5.9	10.7	15.7	38.0	57.8	92.5	173.5
		180		2.7	5.6	10.3	15.0	36.4	55.3	88.5	165.9
		220		2.6	5.4	9.9	14.4	35.0	53.2	85.1	159.6
	40°F (35.1)	140	0.75	1.5	3.2	5.9	8.6	20.7	31.5	50.4	94.6
		180		1.5	3.1	5.6	8.2	19.8	30.2	48.3	90.5
		220		1.4	2.9	5.4	7.9	19.1	29.0	46.4	87.1
		140	3	3.0	6.3	11.6	17.0	41.1	62.6	100.1	187.8
		180		2.9	6.1	11.1	16.2	39.3	59.9	95.8	179.6
		220		2.8	5.8	10.7	15.6	37.8	57.6	92.1	172.8
95°F 113.8 psig	-40°F (14.7 in hg)	140	0.75	1.4	2.9	5.3	7.8	18.8	28.7	45.9	86.0
		180		1.3	2.8	5.1	7.4	17.9	27.3	43.6	81.8
		220		1.3	2.7	4.9	7.1	17.2	26.1	41.8	78.4
		140	3	2.8	5.8	10.6	15.5	37.5	57.1	91.3	171.2
		180		2.6	5.5	10.1	14.7	35.6	54.2	86.8	162.7
		220		2.5	5.3	9.7	14.1	34.2	52.0	83.2	155.9
	0°F (6.5)	140	0.75	1.5	3.2	5.9	8.6	20.8	31.7	50.7	95.0
		180		1.5	3.1	5.6	8.2	19.8	30.1	48.2	90.3
		220		1.4	2.9	5.4	7.8	19.0	28.9	46.2	86.6
		140	3	3.1	6.4	11.7	17.1	41.4	63.0	100.8	189.1
		180		2.9	6.1	11.1	16.3	39.4	59.9	95.8	179.7
		220		2.8	5.8	10.7	15.6	37.7	57.4	91.8	172.2
	40°F (35.1)	140	0.75	1.7	3.5	6.4	9.4	22.7	34.6	55.3	103.7
		180		1.6	3.3	6.1	8.9	21.6	32.9	52.6	98.6
		220		1.5	3.2	5.8	8.5	20.7	31.5	50.4	94.5
		140	3	3.3	7.0	12.8	18.7	45.2	68.8	110.0	206.3
		180		3.2	6.6	12.1	17.7	42.9	65.3	104.6	196.0
		220		3.0	6.4	11.6	17.0	41.1	62.6	100.2	187.8
115°F 158.4 psig	-40°F (14.7 in hg)	140	0.75	1.5	3.1	5.6	8.2	19.9	30.3	48.4	90.8
		180		1.4	2.9	5.3	7.7	18.7	28.5	45.6	85.4
		220		1.3	2.8	5.0	7.4	17.8	27.1	43.4	81.4
		140	3	2.9	6.1	11.2	16.4	39.7	60.3	96.5	181.0
		180		2.8	5.8	10.5	15.4	37.3	56.7	90.8	170.2
		220		2.6	5.5	10.0	14.7	35.5	54.0	86.5	162.1
	0°F (6.5)	140	0.75	1.6	3.4	6.3	9.2	22.2	33.9	54.2	101.6
		180		1.5	3.2	5.9	8.6	20.9	31.8	51.0	95.5
		220		1.5	3.1	5.6	8.2	19.9	30.3	48.5	91.0
		140	3	3.3	6.8	12.5	18.3	44.4	67.5	108.0	202.5
		180		3.1	6.4	11.8	17.2	41.7	63.5	101.5	190.4
		220		2.9	6.1	11.2	16.4	39.7	60.4	96.7	181.3
	40°F (35.1)	140	0.75	1.8	3.8	6.9	10.1	24.5	37.3	59.7	111.9
		180		1.7	3.6	6.5	9.5	23.1	35.1	56.2	105.3
		220		1.6	3.4	6.2	9.1	22.0	33.4	53.5	100.3
		140	3	3.6	7.5	13.8	20.2	48.9	74.4	119.0	223.1
		180		3.4	7.1	13.0	19.0	46.0	69.9	111.9	209.8
		220		3.2	6.8	12.4	18.1	43.8	66.6	106.6	199.8

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Kilowatts)

## R-134a

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm
25°C 5.5 bar	-40°C (373 mm hg)	60	0.05	4.5	9.3	17.1	25.0	60.6	92.2	147.4	276.5
		80		4.3	9.0	16.4	24.0	58.2	88.5	141.6	265.5
		100		4.1	8.7	15.9	23.2	56.1	85.4	136.6	256.2
		60	0.21	9.1	19.0	34.8	50.9	123.2	187.5	300.1	562.6
		80		8.7	18.3	33.4	48.9	118.3	180.0	288.1	540.1
		100		8.4	17.6	32.3	47.1	114.1	173.7	277.9	521.1
	-20°C (91.4 mm hg)	60	0.05	4.9	10.1	18.6	27.2	65.7	100.0	160.1	300.1
		80		4.7	9.7	17.8	26.1	63.1	96.1	153.7	288.2
		100		4.5	9.4	17.2	25.2	60.9	92.7	148.3	278.1
		60	0.21	9.9	20.7	37.8	55.3	133.8	203.6	325.8	610.8
		80		9.5	19.8	36.3	53.1	128.4	195.5	312.7	586.4
		100		9.2	19.1	35.0	51.2	123.9	188.6	301.7	565.7
	0°C (1.9)	60	0.05	5.2	10.9	20.0	29.2	70.8	107.7	172.3	323.0
		80		5.0	10.5	19.2	28.1	67.9	103.4	165.4	310.2
		100		4.8	10.1	18.5	27.1	65.6	99.8	159.6	299.3
		60	0.21	10.6	22.2	40.7	59.5	144.0	219.1	350.6	657.4
		80		10.2	21.3	39.1	57.1	138.2	210.4	336.6	631.1
		100		9.9	20.6	37.7	55.1	133.4	203.0	324.7	608.9
30°C 6.7 bar	-40°C (373 mm hg)	60	0.05	4.6	9.7	17.7	25.9	62.7	95.3	152.5	286.0
		80		4.4	9.3	17.0	24.8	60.0	91.3	146.1	274.0
		100		4.3	8.9	16.3	23.9	57.8	88.0	140.8	264.0
		60	0.21	9.4	19.7	36.1	52.7	127.6	194.2	310.7	582.5
		80		9.0	18.9	34.5	50.5	122.2	185.9	297.5	557.8
		100		8.7	18.2	33.3	48.6	117.7	179.1	286.6	537.3
	-20°C (91.4 mm hg)	60	0.05	5.0	10.5	19.3	28.2	68.3	103.9	166.3	311.7
		80		4.8	10.1	18.5	27.0	65.4	99.5	159.3	298.6
		100		4.7	9.7	17.8	26.0	63.0	95.9	153.5	287.7
		60	0.21	10.3	21.5	39.3	57.4	139.1	211.6	338.6	634.8
		80		9.8	20.6	37.6	55.0	133.2	202.7	324.2	608.0
		100		9.5	19.8	36.3	53.0	128.3	195.2	312.3	585.6
	0°C (1.9)	60	0.05	5.4	11.4	20.8	30.5	73.7	112.2	179.5	336.6
		80		5.2	10.9	20.0	29.2	70.6	107.5	172.0	322.4
		100		5.0	10.5	19.2	28.1	68.1	103.6	165.7	310.7
		60	0.21	11.1	23.2	42.4	62.0	150.1	228.5	365.6	685.4
		80		10.6	22.2	40.6	59.4	143.8	218.8	350.1	656.4
		100		10.2	21.4	39.1	57.2	138.5	210.8	337.2	632.3
35°C 7.8 bar	-40°C (373 mm hg)	60	0.05	4.8	10.0	18.3	26.7	64.6	98.3	157.3	294.9
		80		4.6	9.5	17.4	25.5	61.7	93.9	150.3	281.7
		100		4.4	9.2	16.8	24.5	59.3	90.3	144.5	270.9
		60	0.21	9.7	20.3	37.2	54.4	131.7	200.4	320.7	601.3
		80		9.3	19.4	35.5	51.9	125.8	191.4	306.2	574.1
		100		8.9	18.7	34.2	49.9	120.9	184.0	294.4	552.0
	-20°C (91.4 mm hg)	60	0.05	5.2	10.9	20.0	29.2	70.7	107.6	172.2	322.9
		80		5.0	10.4	19.1	27.9	67.6	102.8	164.5	308.4
		100		4.8	10.0	18.4	26.8	65.0	98.9	158.2	296.6
		60	0.21	10.7	22.3	40.7	59.6	144.2	219.4	351.0	658.2
		80		10.2	21.2	38.9	56.9	137.7	209.5	335.2	628.5
		100		9.8	20.4	37.4	54.7	132.4	201.4	322.3	604.2
	0°C (1.9)	60	0.05	5.7	11.8	21.7	31.7	76.6	116.6	186.6	349.8
		80		5.4	11.3	20.7	30.2	73.2	111.4	178.2	334.2
		100		5.2	10.9	19.9	29.1	70.4	107.1	171.4	321.3
		60	0.21	11.5	24.1	44.2	64.5	156.2	237.7	380.4	713.2
		80		11.0	23.0	42.2	61.6	149.2	227.0	363.2	681.0
		100		10.6	22.1	40.5	59.2	143.4	218.2	349.2	654.7

Note: Shading is for readability purposes only.



# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Tons)

## R-404A

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm
75°F 161.2 psig	-40°F (2.7)	140	0.75	1.4	3.0	5.4	7.9	19.2	29.3	46.8	87.8
		180		1.4	2.8	5.2	7.6	18.3	27.8	44.5	83.5
		220		1.3	2.7	5.0	7.2	17.5	26.7	42.6	80.0
		140	3	2.8	5.9	10.8	15.8	38.4	58.4	93.4	175.1
		180		2.7	5.6	10.3	15.1	36.5	55.5	88.8	166.4
		220		2.6	5.4	9.9	14.4	34.9	53.1	85.0	159.3
	0°F (33.5)	140	0.75	1.6	3.3	6.1	8.9	21.5	32.8	52.5	98.3
		180		1.5	3.2	5.8	8.5	20.5	31.2	49.9	93.5
		220		1.4	3.0	5.5	8.1	19.6	29.8	47.7	89.5
		140	3	3.2	6.6	12.1	17.7	42.9	65.4	104.6	196.1
		180		3.0	6.3	11.5	16.9	40.8	62.1	99.4	186.3
		220		2.9	6.0	11.0	16.1	39.1	59.5	95.1	178.4
	40°F (86.4)	140	0.75	1.7	3.7	6.7	9.8	23.7	36.0	57.6	108.0
		180		1.7	3.5	6.4	9.3	22.5	34.2	54.8	102.7
		220		1.6	3.3	6.1	8.9	21.5	32.8	52.4	98.3
		140	3	3.5	7.3	13.3	19.5	47.2	71.8	114.8	215.3
		180		3.3	6.9	12.7	18.5	44.8	68.2	109.2	204.7
		220		3.2	6.6	12.1	17.7	42.9	65.3	104.5	195.9
95°F 219.4 psig	-40°F (2.7)	140	0.75	1.4	3.0	5.5	8.1	19.6	29.8	47.6	89.3
		180		1.4	2.8	5.2	7.6	18.4	28.0	44.8	84.1
		220		1.3	2.7	5.0	7.2	17.5	26.7	42.6	80.0
		140	3	2.9	6.0	11.0	16.1	39.1	59.4	95.1	178.3
		180		2.7	5.7	10.4	15.2	36.7	55.9	89.5	167.7
		220		2.6	5.4	9.9	14.4	34.9	53.2	85.1	159.5
	0°F (33.5)	140	0.75	1.6	3.4	6.3	9.2	22.3	34.0	54.3	101.9
		180		1.6	3.2	5.9	8.7	21.0	32.0	51.1	95.9
		220		1.5	3.1	5.6	8.3	20.0	30.4	48.6	91.2
		140	3	3.3	6.9	12.6	18.4	44.5	67.8	108.5	203.4
		180		3.1	6.5	11.8	17.3	41.9	63.8	102.0	191.3
		220		2.9	6.2	11.3	16.5	39.9	60.7	97.0	182.0
	40°F (86.4)	140	0.75	1.8	3.8	7.0	10.3	24.8	37.8	60.5	113.4
		180		1.7	3.6	6.6	9.7	23.4	35.6	56.9	106.7
		220		1.6	3.4	6.3	9.2	22.2	33.9	54.2	101.6
		140	3	3.7	7.7	14.0	20.5	49.6	75.5	120.8	226.4
		180		3.4	7.2	13.2	19.3	46.7	71.0	113.6	213.0
		220		3.3	6.8	12.5	18.3	44.4	67.5	108.0	202.6
115°F 290.4 psig	-40°F (2.7)	140	0.75	1.4	2.9	5.4	7.9	19.1	29.1	46.5	87.2
		180		1.3	2.7	5.0	7.3	17.6	26.8	42.9	80.5
		220		1.2	2.6	4.7	6.9	16.6	25.3	40.4	75.8
		140	3	2.8	5.9	10.8	15.8	38.2	58.1	92.9	174.2
		180		2.6	5.4	10.0	14.5	35.2	53.6	85.7	160.8
		220		2.5	5.1	9.4	13.7	33.2	50.5	80.7	151.4
	0°F (33.5)	140	0.75	1.7	3.5	6.3	9.3	22.4	34.1	54.6	102.4
		180		1.5	3.2	5.9	8.6	20.7	31.5	50.4	94.5
		220		1.4	3.0	5.5	8.1	19.5	29.7	47.5	89.0
		140	3	3.3	6.9	12.7	18.5	44.8	68.2	109.1	204.5
		180		3.1	6.4	11.7	17.1	41.3	62.9	100.6	188.7
		220		2.9	6.0	11.0	16.1	38.9	59.2	94.8	177.7
	40°F (86.4)	140	0.75	1.9	3.9	7.2	10.5	25.5	38.8	62.0	116.3
		180		1.7	3.6	6.6	9.7	23.5	35.8	57.3	107.4
		220		1.6	3.4	6.3	9.2	22.2	33.7	53.9	101.2
		140	3	3.8	7.9	14.4	21.0	50.9	77.5	123.9	232.4
		180		3.5	7.3	13.3	19.4	47.0	71.5	114.4	214.4
		220		3.3	6.8	12.5	18.3	44.2	67.3	107.7	201.9

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Kilowatts)

## R-404A

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm	
25°C 11.2 bar	-40°C (0.3)	60	0.05	4.9	10.2	18.7	27.3	66.1	100.5	160.9	301.6	
		80		4.7	9.7	17.8	26.0	63.1	96.0	153.5	287.9	
		100		4.5	9.3	17.1	25.0	60.6	92.2	147.5	276.5	
		60	0.21	10.0	20.8	38.1	55.7	134.9	205.3	328.5	615.9	
		80		9.5	19.9	36.4	53.2	128.7	195.9	313.4	587.7	
		100		9.1	19.1	34.9	51.1	123.6	188.1	300.9	564.3	
	-20°C (2.0)	60	0.05	5.4	11.3	20.7	30.3	73.4	111.6	178.6	334.9	
		80		5.2	10.8	19.8	28.9	70.0	106.6	170.5	319.7	
		100		5.0	10.4	19.0	27.8	67.3	102.3	163.7	307.0	
		60	0.21	11.1	23.1	42.3	61.9	149.8	228.0	364.8	683.9	
		80		10.6	22.1	40.4	59.0	143.0	217.5	348.1	652.6	
		100		10.1	21.2	38.8	56.7	137.3	208.9	334.2	626.6	
	0°C (4.9)	60	0.05	5.9	12.4	22.7	33.1	80.2	122.0	195.2	366.0	
		80		5.7	11.8	21.6	31.6	76.5	116.5	186.3	349.4	
		100		5.4	11.3	20.8	30.4	73.5	111.8	178.9	335.5	
		60	0.21	12.1	25.3	46.3	67.6	163.7	249.1	398.6	747.4	
		80		11.5	24.1	44.2	64.5	156.2	237.7	380.4	713.2	
		100		11.1	23.2	42.4	62.0	150.0	228.3	365.2	684.8	
	30°C 13.1 bar	-40°C (0.3)	60	0.05	4.9	10.3	18.8	27.5	66.6	101.4	162.2	304.2
			80		4.7	9.8	17.9	26.2	63.4	96.4	154.3	289.3
			100		4.5	9.4	17.2	25.1	60.7	92.4	147.8	277.1
			60	0.21	10.1	21.0	38.5	56.2	136.1	207.2	331.5	621.5
			80		9.6	20.0	36.6	53.5	129.4	197.0	315.1	590.9
			100		9.2	19.1	35.0	51.2	124.0	188.6	301.8	565.9
-20°C (2.0)		60	0.05	5.5	11.5	21.1	30.8	74.5	113.4	181.5	340.2	
		80		5.2	10.9	20.0	29.3	70.9	107.9	172.6	323.6	
		100		5.0	10.5	19.2	28.0	67.9	103.3	165.3	310.0	
		60	0.21	11.3	23.5	43.0	62.9	152.3	231.7	370.8	695.2	
		80		10.7	22.3	40.9	59.8	144.8	220.3	352.5	660.9	
		100		10.2	21.4	39.2	57.3	138.7	211.0	337.6	633.0	
0°C (4.9)		60	0.05	6.1	12.6	23.1	33.8	81.9	124.6	199.4	373.9	
		80		5.8	12.0	22.0	32.2	77.9	118.5	189.6	355.5	
		100		5.5	11.5	21.1	30.8	74.6	113.5	181.7	340.6	
		60	0.21	12.4	25.8	47.3	69.1	167.3	254.7	407.5	764.0	
		80		11.8	24.6	45.0	65.7	159.1	242.1	387.3	726.3	
		100		11.3	23.5	43.1	62.9	152.4	231.9	371.0	695.6	
35°C 15.1 bar		-40°C (0.3)	60	0.05	4.9	10.3	18.9	27.6	66.8	101.6	162.6	304.8
			80		4.7	9.8	17.9	26.1	63.2	96.2	153.9	288.5
			100		4.5	9.3	17.1	24.9	60.3	91.8	146.9	275.5
			60	0.21	10.1	21.1	38.6	56.4	136.6	207.8	332.5	623.5
			80		9.6	19.9	36.5	53.4	129.2	196.6	314.6	589.8
			100		9.1	19.0	34.9	51.0	123.4	187.7	300.4	563.2
	-20°C (2.0)	60	0.05	5.6	11.6	21.3	31.1	75.3	114.6	183.4	343.9	
		80		5.3	11.0	20.2	29.5	71.3	108.5	173.6	325.5	
		100		5.0	10.5	19.2	28.1	68.1	103.6	165.8	310.9	
		60	0.21	11.4	23.8	43.6	63.7	154.1	234.5	375.2	703.5	
		80		10.8	22.5	41.2	60.2	145.8	221.8	354.9	665.5	
		100		10.3	21.5	39.3	57.5	139.2	211.8	338.9	635.4	
	0°C (4.9)	60	0.05	6.2	12.9	23.6	34.4	83.3	126.8	202.9	380.4	
		80		5.8	12.2	22.3	32.6	78.9	120.0	192.0	360.0	
		100		5.6	11.6	21.3	31.1	75.3	114.6	183.4	343.8	
		60	0.21	12.6	26.3	48.2	70.4	170.5	259.4	415.0	778.2	
		80		11.9	24.9	45.6	66.6	161.2	245.4	392.6	736.1	
		100		11.4	23.8	43.5	63.6	153.9	234.3	374.8	702.8	

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Tons)

**R-507**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm	
75°F 167.0 psig	-40°F (5.5)	140	0.75	1.4	3.0	5.5	8.0	19.4	29.6	47.3	88.8	
		180		1.4	2.9	5.2	7.6	18.5	28.1	45.0	84.4	
		220		1.3	2.7	5.0	7.3	17.7	27.0	43.1	80.9	
		140	3	2.9	6.0	11.0	16.0	38.8	59.0	94.4	176.9	
		180		2.7	5.7	10.4	15.2	36.8	56.1	89.7	168.2	
		220		2.6	5.4	10.0	14.6	35.3	53.7	86.0	161.2	
	0°F (35.2)	140	0.75	1.6	3.3	6.1	8.9	21.6	32.9	52.7	98.8	
		180		1.5	3.2	5.8	8.5	20.6	31.3	50.1	93.9	
		220		1.5	3.0	5.6	8.1	19.7	30.0	48.0	90.0	
		140	3	3.2	6.7	12.2	17.8	43.1	65.6	105.0	196.9	
		180		3.0	6.3	11.6	16.9	41.0	62.4	99.8	187.2	
		220		2.9	6.1	11.1	16.2	39.3	59.8	95.6	179.3	
	40°F (87.8)	140	0.75	1.8	3.7	6.7	9.8	23.7	36.1	57.7	108.2	
		180		1.7	3.5	6.4	9.3	22.5	34.3	54.9	102.9	
		220		1.6	3.3	6.1	8.9	21.6	32.9	52.6	98.6	
		140	3	3.5	7.3	13.4	19.5	47.2	71.9	115.0	215.7	
		180		3.3	6.9	12.7	18.6	44.9	68.3	109.4	205.0	
		220		3.2	6.6	12.2	17.8	43.0	65.5	104.8	196.4	
	95°F 226.0 psig	-40°F (5.5)	140	0.75	1.5	3.1	5.7	8.3	20.1	30.6	48.9	91.7
			180		1.4	2.9	5.3	7.8	18.9	28.8	46.1	86.4
			220		1.3	2.8	5.1	7.4	18.0	27.4	43.9	82.3
			140	3	3.0	6.2	11.3	16.6	40.1	61.0	97.6	183.0
			180		2.8	5.8	10.7	15.6	37.7	57.4	91.9	172.3
			220		2.7	5.5	10.2	14.9	36.0	54.7	87.5	164.1
0°F (35.2)		140	0.75	1.7	3.5	6.4	9.4	22.7	34.6	55.3	103.7	
		180		1.6	3.3	6.0	8.8	21.4	32.5	52.1	97.6	
		220		1.5	3.1	5.8	8.4	20.4	31.0	49.6	93.0	
		140	3	3.3	7.0	12.8	18.7	45.3	68.9	110.3	206.8	
		180		3.2	6.6	12.1	17.6	42.7	64.9	103.9	194.7	
		220		3.0	6.3	11.5	16.8	40.6	61.8	98.9	185.5	
40°F (87.8)		140	0.75	1.9	3.9	7.1	10.4	25.2	38.3	61.3	114.9	
		180		1.8	3.7	6.7	9.8	23.7	36.1	57.7	108.2	
		220		1.7	3.5	6.4	9.3	22.6	34.4	55.0	103.1	
		140	3	3.7	7.8	14.2	20.7	50.2	76.4	122.3	229.2	
		180		3.5	7.3	13.4	19.5	47.3	72.0	115.1	215.9	
		220		3.3	7.0	12.7	18.6	45.0	68.5	109.7	205.6	
115°F 301.0 psig		-40°F (5.5)	140	0.75	1.5	3.1	5.7	8.3	20.2	30.7	49.1	92.1
			180		1.4	2.9	5.3	7.7	18.7	28.4	45.5	85.3
			220		1.3	2.7	5.0	7.3	17.6	26.8	42.9	80.5
			140	3	3.0	6.2	11.4	16.7	40.3	61.4	98.2	184.1
			180		2.8	5.8	10.5	15.4	37.3	56.8	90.9	170.3
			220		2.6	5.4	10.0	14.5	35.2	53.6	85.7	160.7
	0°F (35.2)	140	0.75	1.7	3.6	6.6	9.6	23.3	35.5	56.8	106.5	
		180		1.6	3.3	6.1	8.9	21.6	32.9	52.6	98.6	
		220		1.5	3.1	5.8	8.4	20.4	31.0	49.6	93.1	
		140	3	3.4	7.2	13.2	19.3	46.6	71.0	113.5	212.9	
		180		3.2	6.7	12.2	17.8	43.1	65.6	105.0	196.9	
		220		3.0	6.3	11.5	16.8	40.7	61.9	99.1	185.8	
	40°F (87.8)	140	0.75	1.9	4.1	7.4	10.9	26.3	40.0	64.0	120.1	
		180		1.8	3.8	6.9	10.1	24.3	37.0	59.3	111.1	
		220		1.7	3.5	6.5	9.5	23.0	35.0	55.9	104.9	
		140	3	3.9	8.1	14.9	21.7	52.6	80.0	128.0	240.0	
		180		3.6	7.5	13.7	20.1	48.6	74.0	118.4	222.0	
		220		3.4	7.1	13.0	19.0	45.9	69.8	111.7	209.4	

Note: Shading is for readability purposes only.

# Discharge Capacities – CK4A

## CK4A – Discharge Capacities (Kilowatts)

**R-507**

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop bar	CK4A 1/2" 13mm	CK4A 3/4" 20mm	CK4A 1" 25mm	CK4A 1-1/4" 32mm	CK4A 2" 50mm	CK4A 2-1/2" 65mm	CK4A 3" 75mm	CK4A 4" 100mm
25°C 11.6 bar	-40°C (0.4)	60	0.05	4.9	10.3	18.9	27.6	66.8	101.7	162.8	305.2
		80		4.7	9.9	18.0	26.4	63.8	97.1	155.4	291.4
		100		4.5	9.5	17.3	25.3	61.3	93.3	149.4	280.0
		60	0.21	10.1	21.1	38.6	56.4	136.5	207.8	332.4	623.3
		80		9.6	20.1	36.8	53.8	130.3	198.3	317.3	595.0
		100		9.3	19.3	35.4	51.7	125.2	190.6	304.9	571.7
	-20°C (2.1)	60	0.05	5.5	11.4	20.8	30.5	73.8	112.3	179.6	336.8
		80		5.2	10.9	19.9	29.1	70.4	107.2	171.5	321.6
		100		5.0	10.4	19.1	28.0	67.7	103.0	164.8	309.1
		60	0.21	11.1	23.3	42.6	62.2	150.7	229.3	366.9	687.9
		80		10.6	22.2	40.6	59.4	143.8	218.9	350.2	656.6
		100		10.2	21.3	39.1	57.1	138.2	210.3	336.5	631.0
	0°C (5.2)	60	0.05	5.9	12.4	22.7	33.2	80.4	122.3	195.7	366.9
		80		5.7	11.8	21.7	31.7	76.7	116.8	186.8	350.3
		100		5.5	11.4	20.8	30.5	73.7	112.2	179.5	336.6
		60	0.21	12.1	25.3	46.4	67.8	164.1	249.8	399.6	749.3
		80		11.6	24.2	44.3	64.7	156.7	238.4	381.5	715.3
		100		11.1	23.2	42.5	62.2	150.5	229.1	366.5	687.3
30°C 13.5 bar	-40°C (0.4)	60	0.05	5.0	10.5	19.2	28.1	67.9	103.3	165.4	310.0
		80		4.8	10.0	18.3	26.7	64.6	98.3	157.3	295.0
		100		4.6	9.6	17.5	25.6	62.0	94.3	150.8	282.8
		60	0.21	10.3	21.4	39.2	57.3	138.8	211.2	337.9	633.6
		80		9.8	20.4	37.3	54.5	132.0	200.9	321.4	602.6
		100		9.4	19.5	35.8	52.3	126.5	192.6	308.1	577.7
	-20°C (2.1)	60	0.05	5.6	11.6	21.3	31.1	75.4	114.8	183.6	344.3
		80		5.3	11.1	20.3	29.6	71.7	109.2	174.7	327.5
		100		5.1	10.6	19.4	28.4	68.8	104.7	167.5	314.0
		60	0.21	11.4	23.8	43.6	63.7	154.1	234.5	375.2	703.6
		80		10.8	22.6	41.4	60.5	146.6	223.1	356.9	669.2
		100		10.4	21.7	39.7	58.0	140.5	213.8	342.1	641.5
	0°C (5.2)	60	0.05	6.1	12.7	23.3	34.1	82.5	125.6	201.0	376.8
		80		5.8	12.1	22.2	32.4	78.5	119.5	191.2	358.5
		100		5.6	11.6	21.3	31.1	75.3	114.6	183.3	343.7
		60	0.21	12.5	26.0	47.7	69.7	168.7	256.7	410.7	770.0
		80		11.9	24.8	45.3	66.3	160.4	244.1	390.6	732.4
		100		11.4	23.7	43.5	63.5	153.8	234.0	374.5	702.1
35°C 15.6 bar	-40°C (0.4)	60	0.05	5.1	10.6	19.4	28.4	68.7	104.5	167.2	313.4
		80		4.8	10.0	18.4	26.9	65.0	98.9	158.3	296.8
		100		4.6	9.6	17.6	25.7	62.2	94.6	151.4	283.8
		60	0.21	10.4	21.7	39.7	58.0	140.3	213.6	341.7	640.7
		80		9.8	20.5	37.6	54.9	132.9	202.2	323.5	606.6
		100		9.4	19.6	35.9	52.5	127.0	193.3	309.3	579.9
	-20°C (2.1)	60	0.05	5.7	11.9	21.7	31.7	76.8	116.8	186.9	350.5
		80		5.4	11.2	20.5	30.0	72.7	110.6	177.0	331.9
		100		5.1	10.7	19.6	28.7	69.5	105.8	169.3	317.4
		60	0.21	11.6	24.2	44.4	64.8	156.9	238.8	382.1	716.5
		80		11.0	22.9	42.0	61.4	148.6	226.1	361.8	678.3
		100		10.5	21.9	40.1	58.7	142.0	216.1	345.8	648.4
	0°C (5.2)	60	0.05	6.2	13.0	23.9	34.9	84.5	128.6	205.7	385.7
		80		5.9	12.4	22.6	33.1	80.0	121.8	194.8	365.3
		100		5.7	11.8	21.6	31.6	76.5	116.4	186.3	349.3
		60	0.21	12.8	26.7	48.8	71.3	172.7	262.8	420.5	788.5
		80		12.1	25.2	46.2	67.5	163.5	248.8	398.2	746.5
		100		11.6	24.1	44.2	64.6	156.3	237.9	380.6	713.6

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities – A9 & A8\_0

## A9 & A8\_0 – Condenser Bypass Capacities (Tons)

**R-22**

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm	
75°F 132.0 psig	-40°F (5.5)	140	10	3.5	9.9	28.1	39.8	14.4	36.9	52.4	66.9	117.8	176.0	308.9	
		180		3.6	10.1	28.7	40.6	14.8	38.0	54.0	68.9	121.4	181.4	318.4	
		220		3.7	10.3	29.3	41.5	15.1	38.9	55.2	70.4	124.1	185.5	325.5	
		140	15	4.3	12.3	35.0	49.9	17.9	46.2	65.8	84.1	147.6	221.1	387.3	
		180		4.4	12.5	35.7	50.9	18.4	47.6	67.8	86.7	152.2	227.9	399.2	
		220		4.5	12.8	36.5	52.0	18.8	48.7	69.3	88.7	155.6	233.0	408.1	
	0°F (35.2)	10	140	3.7	10.5	29.8	42.2	15.3	39.2	55.6	70.9	124.9	186.8	327.7	
			180	3.8	10.7	30.4	43.1	15.7	40.4	57.3	73.1	128.7	192.5	337.8	
			220	3.9	10.9	31.1	44.0	16.1	41.3	58.5	74.7	131.6	196.8	345.3	
		140	15	4.6	13.0	37.1	53.0	18.9	49.0	69.8	89.2	156.5	234.4	410.6	
		180		4.7	13.3	37.8	54.0	19.5	50.5	71.9	91.9	161.3	241.6	423.2	
		220		4.8	13.6	38.7	55.2	20.0	51.6	73.5	94.0	164.9	247.0	432.6	
	40°F (87.8)	10	140	3.9	11.0	31.4	44.4	16.0	41.1	58.4	74.5	131.3	196.3	344.4	
			180	4.0	11.2	32.0	45.3	16.5	42.4	60.2	76.8	135.3	202.3	355.0	
			220	4.1	11.5	32.7	46.2	16.9	43.4	61.5	78.5	138.3	206.8	362.9	
		140	15	4.8	13.7	39.0	55.6	19.9	51.4	73.3	93.7	164.4	246.3	431.3	
		180		4.9	13.9	39.8	56.7	20.5	53.0	75.6	96.6	169.5	253.8	444.6	
		220		5.0	14.2	40.6	58.0	21.0	54.2	77.2	98.7	173.3	259.5	454.5	
	95°F 182.0 psig	-40°F (5.5)	140	10	2.9	8.1	23.0	32.4	11.7	30.0	42.5	54.3	95.8	143.0	251.2
			180		2.9	8.2	23.4	32.9	12.1	30.9	43.7	55.8	98.5	147.1	258.3
			220		3.0	8.4	23.9	33.6	12.3	31.5	44.7	57.0	100.6	150.2	263.8
			140	15	3.5	9.9	28.4	40.2	14.5	37.3	53.0	67.6	119.0	178.0	312.1
			180		3.6	10.1	28.9	41.0	14.9	38.3	54.4	69.5	122.4	183.0	321.0
			220		3.7	10.3	29.5	41.8	15.2	39.2	55.6	71.0	125.0	186.9	327.9
0°F (35.2)		10	140	3.1	8.6	24.5	34.5	12.5	32.0	45.4	57.9	102.2	152.6	268.0	
			180	3.1	8.8	24.9	35.1	12.9	32.9	46.7	59.5	105.0	156.9	275.5	
			220	3.2	8.9	25.5	35.9	13.2	33.7	47.7	60.8	107.3	160.2	281.5	
		140	15	3.8	10.6	30.2	42.9	15.4	39.7	56.5	72.1	126.9	189.7	332.8	
		180		3.8	10.8	30.8	43.7	15.9	40.9	58.1	74.1	130.4	195.1	342.2	
		220		3.9	11.0	31.4	44.6	16.2	41.7	59.3	75.7	133.3	199.3	349.6	
40°F (87.8)		10	140	3.2	9.1	25.9	36.4	13.2	33.8	47.9	61.1	107.8	161.1	282.9	
			180	3.3	9.2	26.3	37.1	13.6	34.8	49.3	62.8	110.9	165.6	290.9	
			220	3.4	9.4	26.9	37.9	13.9	35.5	50.3	64.2	113.2	169.1	297.1	
		140	15	4.0	11.2	31.9	45.3	16.3	41.9	59.6	76.1	133.8	200.2	351.1	
		180		4.1	11.4	32.5	46.1	16.8	43.1	61.3	78.2	137.6	205.9	361.1	
		220		4.1	11.6	33.2	47.0	17.1	44.0	62.6	79.9	140.6	210.3	368.8	
115°F 243.0 psig		-40°F (5.5)	140	10	2.4	6.8	19.3	27.1	9.9	25.2	35.7	45.5	80.3	119.9	210.7
			180		2.5	6.9	19.6	27.5	10.1	25.8	36.5	46.5	82.2	122.7	215.7
			220		2.5	7.0	20.0	28.1	10.3	26.3	37.2	47.5	83.9	125.2	220.0
			140	15	3.0	8.4	23.8	33.6	12.2	31.2	44.2	56.4	99.4	148.5	260.8
			180		3.0	8.5	24.1	34.1	12.5	31.9	45.2	57.7	101.8	152.1	267.0
			220		3.1	8.6	24.6	34.7	12.7	32.6	46.2	58.9	103.8	155.1	272.4
	0°F (35.2)	10	140	2.6	7.3	20.7	29.2	10.6	27.1	38.3	48.8	86.3	128.8	226.3	
			180	2.6	7.4	21.0	29.6	10.9	27.7	39.2	50.0	88.3	131.8	231.7	
			220	2.7	7.5	21.4	30.1	11.1	28.3	40.0	51.0	90.1	134.5	236.3	
		140	15	3.2	9.0	25.5	36.1	13.1	33.5	47.4	60.5	106.7	159.5	279.9	
		180		3.2	9.1	25.9	36.6	13.4	34.3	48.6	62.0	109.3	163.3	286.6	
		220		3.3	9.3	26.4	37.3	13.6	35.0	49.5	63.2	111.5	166.6	292.4	
	40°F (87.8)	10	140	2.8	7.7	22.0	30.9	11.3	28.7	40.6	51.8	91.6	136.7	240.2	
			180	2.8	7.8	22.3	31.4	11.5	29.4	41.6	53.0	93.7	139.9	245.9	
			220	2.9	8.0	22.8	32.0	11.8	30.0	42.4	54.1	95.6	142.7	250.8	
		140	15	3.4	9.5	27.1	38.3	13.8	35.5	50.3	64.2	113.2	169.2	297.0	
		180		3.4	9.7	27.5	38.8	14.2	36.3	51.5	65.7	115.9	173.2	304.1	
		220		3.5	9.8	28.0	39.6	14.5	37.1	52.6	67.1	118.2	176.7	310.2	

**Note:** Shading is for readability purposes only.

# Condenser Bypass Capacities - A9 & A8\_0

## A9 & A8\_0 - Condenser Bypass Capacities (Kilowatts)

R-22

Cond Temp °F Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm
25°C 9.2 bar	-40°C (0.4)	60	0.7	12.9	36.1	103.0	145.7	52.6	135.1	191.7	244.7	431.1	644.4	1130.8
		80		13.1	36.8	104.9	148.4	53.6	137.6	195.2	249.2	438.9	656.2	1151.5
		100		13.4	37.5	107.0	151.3	54.7	140.3	199.1	254.1	447.6	669.1	1174.3
		60	1	15.5	43.8	124.9	178.0	63.8	164.7	234.5	299.8	526.4	788.0	1380.7
		80		15.8	44.6	127.2	181.3	65.0	167.7	238.9	305.3	536.0	802.5	1406.1
		100		16.1	45.5	129.8	184.9	66.2	171.1	243.6	311.3	546.7	818.4	1434.0
	-20°C (2.1)	60	0.7	13.6	38.1	108.7	153.8	55.6	142.6	202.3	258.3	455.0	680.1	1193.5
		80		13.8	38.8	110.7	156.6	56.6	145.2	206.0	263.0	463.3	692.5	1215.4
		100		14.1	39.6	112.9	159.7	57.7	148.1	210.1	268.2	472.4	706.2	1239.4
		60	1	16.4	46.2	131.8	187.8	67.3	173.8	247.4	316.2	555.3	831.3	1456.6
		80		16.7	47.1	134.2	191.3	68.5	177.0	252.0	322.0	565.5	846.6	1483.4
		100		17.0	48.0	136.9	195.1	69.9	180.5	257.0	328.4	576.7	863.4	1512.8
	0°C (5.2)	60	0.7	14.2	40.0	113.9	161.1	58.2	149.4	211.9	270.5	476.5	712.3	1250.1
		80		14.5	40.7	116.0	164.0	59.3	152.1	215.8	275.5	485.2	725.4	1273.0
		100		14.8	41.5	118.3	167.3	60.4	155.1	220.1	280.9	494.8	739.7	1298.2
		60	1	17.2	48.4	138.0	196.7	70.4	181.9	259.1	331.1	581.4	870.4	1525.1
		80		17.5	49.3	140.06	200.3	71.7	185.3	263.8	337.2	592.1	886.4	1553.1
		100		17.8	50.2	143.3	204.2	73.2	189.0	269.1	343.9	603.8	904.0	1583.9
30°C 10.9 bar	-40°C (0.4)	60	0.7	11.6	32.6	92.9	131.1	47.5	121.6	172.4	220.0	387.9	579.7	1017.7
		80		11.8	33.2	94.5	133.4	48.3	123.8	175.5	223.9	394.8	589.9	1035.7
		100		12.1	33.8	96.4	136.0	49.2	126.2	178.9	228.2	402.4	601.3	1055.8
		60	1	14.0	39.4	112.2	159.4	57.3	147.6	209.9	268.2	471.5	705.4	1236.8
		80		14.2	40.1	114.2	162.3	58.3	150.3	213.6	272.9	479.9	717.9	1258.8
		100		14.5	40.8	116.5	165.4	59.5	153.2	217.8	278.2	489.2	731.9	1283.2
	-20°C (2.1)	60	0.7	12.3	34.5	98.2	138.7	50.2	128.7	182.4	232.7	410.3	613.1	1076.5
		80		12.5	35.1	100.0	141.2	51.1	130.9	185.6	236.8	417.6	623.9	1095.5
		100		12.8	35.8	101.9	143.9	52.1	133.5	189.2	241.4	425.7	636.1	1116.7
		60	1	14.8	41.6	118.7	168.6	60.6	156.1	222.0	283.5	498.5	745.9	1307.7
		80		15.1	42.3	120.8	171.6	61.7	158.9	225.9	288.5	507.3	759.1	1330.9
		100		15.3	43.2	123.1	174.9	62.9	162.0	230.3	294.1	517.2	773.8	1356.8
	0°C (5.2)	60	0.7	12.9	36.2	103.1	145.5	52.7	135.0	191.4	244.2	430.5	643.3	1129.5
		80		13.1	36.8	104.9	148.1	53.6	137.4	194.8	248.5	438.1	654.7	1149.5
		100		13.4	37.5	107.0	151.0	54.7	140.1	198.5	253.3	446.6	667.4	1171.8
		60	1	15.5	43.6	124.5	176.8	63.6	163.7	232.8	297.4	522.9	782.3	1371.6
		80		15.8	44.4	126.7	180.0	64.7	166.6	236.9	302.6	532.2	796.2	1395.9
		100		16.1	45.3	129.1	183.5	66.0	169.9	241.5	308.5	542.5	811.7	1423.1
35°C 12.6 bar	-40°C (0.4)	60	0.7	10.6	29.7	84.6	119.3	43.3	110.7	156.8	200.0	352.9	527.2	925.9
		80		10.8	30.2	86.1	121.3	44.0	112.6	159.4	203.4	358.9	536.0	941.5
		100		11.0	30.8	87.7	123.6	44.8	114.7	162.5	207.2	365.5	546.2	959.3
		60	1	12.7	35.8	102.0	144.6	52.1	134.0	190.3	243.0	427.6	639.5	1121.8
		80		13.0	36.4	103.8	147.0	53.0	136.2	193.5	247.1	434.9	650.3	1140.8
		100		13.2	37.1	105.7	149.8	54.0	138.8	197.2	251.7	443.1	662.6	1162.4
	-20°C (2.1)	60	0.7	11.2	31.5	89.7	126.5	45.9	117.4	166.3	212.1	374.2	559.0	981.8
		80		11.4	32.0	91.3	128.6	46.6	119.4	169.1	215.7	380.5	568.4	998.3
		100		11.7	32.6	93.0	131.0	47.5	121.6	172.3	219.7	387.7	579.1	1017.1
		60	1	13.5	37.9	108.1	153.2	55.2	142.0	201.7	257.5	453.2	677.8	1188.9
		80		13.7	38.6	110.0	155.8	56.2	144.4	205.1	261.8	460.9	689.2	1209.0
		100		14.0	39.3	112.1	158.8	57.2	147.1	209.0	266.8	469.6	702.3	1232.0
	0°C (5.2)	60	0.7	11.8	33.1	94.3	133.0	48.2	123.4	174.8	223.0	393.4	587.7	1032.2
		80		12.0	33.7	95.9	135.2	49.0	125.5	177.7	226.7	400.0	597.5	1049.5
		100		12.2	34.3	97.8	137.8	50.0	127.9	181.1	231.0	407.6	608.8	1069.3
		60	1	14.2	39.9	113.6	161.1	58.0	149.2	211.9	270.6	476.3	712.3	1249.5
		80		14.4	40.5	115.6	163.8	59.0	151.8	215.5	275.2	484.4	724.3	1270.6
		100		14.7	41.3	117.8	166.9	60.2	154.6	219.6	280.4	493.5	738.0	1294.7

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities - A9 & A8\_0

## A9 and A8\_0 - Condenser Bypass Capacities (Tons)

## R-134a

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm	
75°F 78.6 psig	-40°F (5.5)	140	10	2.4	6.9	19.6	28.0	10.0	25.9	36.9	47.2	82.8	124.0	217.1	
				180	2.5	7.1	20.3	29.1	10.6	27.4	39.0	49.9	87.5	131.1	229.5
				220	2.6	7.4	21.1	30.2	11.0	28.4	40.5	51.8	90.8	136.1	238.3
		180	15	3.0	8.6	24.5	35.6	12.5	32.7	47.0	60.3	105.1	157.9	275.5	
				140	3.1	8.9	25.4	36.9	13.2	34.6	49.7	63.8	111.1	166.9	291.2
				220	3.2	9.2	26.4	38.3	13.7	35.9	51.6	66.2	115.3	173.2	302.3
	0°F (35.2)	140	10	2.7	7.5	21.4	30.7	10.9	28.3	40.4	51.7	90.7	135.8	237.8	
				180	2.8	7.8	22.2	31.8	11.6	30.0	42.7	54.7	95.8	143.6	251.4
				220	2.9	8.1	23.1	33.0	12.0	31.1	44.4	56.8	99.5	149.1	260.9
		180	15	3.3	9.4	26.8	38.9	13.6	35.8	51.4	66.0	114.9	172.6	301.2	
				140	3.4	9.7	27.8	40.4	14.4	37.8	54.4	69.7	121.4	182.5	318.4
				220	3.5	10.1	28.8	41.9	15.0	39.3	56.4	72.4	126.0	189.4	330.5
	40°F (87.8)	140	10	2.9	8.1	23.2	33.2	11.9	30.7	43.8	56.0	98.2	147.2	257.7	
				180	3.0	8.4	24.1	34.5	12.5	32.5	46.3	59.2	103.8	155.6	272.4
				220	3.1	8.8	25.0	35.8	13.0	33.7	48.1	61.5	107.8	161.5	282.7
		180	15	3.6	10.1	29.0	42.1	14.7	38.7	55.7	71.4	124.3	186.8	325.9	
				140	3.7	10.5	30.1	43.7	15.6	40.9	58.8	75.5	131.4	197.5	344.5
				220	3.8	10.9	31.2	45.3	16.2	42.5	61.1	78.3	136.4	205.0	357.6
95°F 113.8 psig	-40°F (5.5)	140	10	2.0	5.5	15.8	22.4	8.0	20.7	29.5	37.6	66.2	99.0	173.6	
				180	2.0	5.7	16.3	23.2	8.5	21.9	31.1	39.7	69.8	104.4	183.1
				220	2.1	5.9	16.9	24.0	8.8	22.7	32.2	41.2	72.4	108.3	189.9
		180	15	2.4	6.8	19.5	28.0	10.0	25.9	36.9	47.3	82.8	124.1	217.1	
				140	2.5	7.1	20.2	29.0	10.5	27.3	39.0	49.9	87.3	130.9	229.0
				220	2.6	7.3	21.0	30.1	10.9	28.3	40.4	51.7	90.6	135.8	237.5
	0°F (35.2)	140	10	2.2	6.1	17.5	24.8	8.9	22.9	32.6	41.7	73.3	109.6	192.2	
				180	2.3	6.3	18.1	25.7	9.4	24.2	34.4	43.9	77.3	115.6	202.7
				220	2.3	6.6	18.7	26.6	9.8	25.1	35.7	45.6	80.2	119.9	210.3
		180	15	2.7	7.6	21.6	31.0	11.0	28.6	40.8	52.3	91.5	137.2	240.0	
				140	2.8	7.8	22.4	32.1	11.6	30.2	43.1	55.1	96.5	144.7	253.2
				220	2.9	8.1	23.2	33.3	12.0	31.3	44.7	57.2	100.1	150.1	262.6
	40°F (87.8)	140	10	2.4	6.7	19.1	27.1	9.7	25.1	35.7	45.5	80.1	119.8	210.1	
				180	2.5	6.9	19.8	28.1	10.3	26.5	37.6	48.0	84.5	126.4	221.6
				220	2.6	7.2	20.5	29.1	10.7	27.4	39.0	49.8	87.6	131.1	229.9
		180	15	2.9	8.3	23.6	33.8	12.0	31.2	44.6	57.1	99.9	149.8	262.0	
				140	3.0	8.5	24.4	35.0	12.7	32.9	47.1	60.2	105.4	158.0	276.4
				220	3.1	8.9	25.3	36.3	13.2	34.2	48.8	62.4	109.3	163.9	286.7
115°F 158.4 psig	-40°F (5.5)	140	10	1.6	4.6	13.0	18.4	6.6	17.0	24.2	30.8	54.3	81.2	142.6	
				180	1.7	4.7	13.4	19.0	7.0	17.9	25.4	32.4	57.1	85.3	149.8
				220	1.7	4.9	13.9	19.6	7.2	18.5	26.3	33.5	59.1	88.4	155.1
		180	15	2.0	5.6	16.1	22.9	8.2	21.2	30.1	38.5	67.6	101.2	177.4	
				140	2.1	5.8	16.6	23.6	8.6	22.2	31.7	40.4	71.1	106.4	186.4
				220	2.1	6.0	17.2	24.5	8.9	23.0	32.8	41.9	73.6	110.2	193.1
	0°F (35.2)	140	10	1.8	5.1	14.6	20.6	7.5	19.1	27.1	34.6	61.1	91.2	160.2	
				180	1.9	5.3	15.1	21.3	7.8	20.1	28.5	36.4	64.1	95.8	168.3
				220	2.0	5.5	15.6	22.1	8.1	20.8	29.5	37.7	66.4	99.3	174.3
		180	15	2.2	6.3	18.0	25.7	9.2	23.7	33.8	43.2	75.9	113.5	199.0	
				140	2.3	6.5	18.6	26.5	9.7	24.9	35.5	45.4	79.7	119.3	209.1
				220	2.4	6.8	19.3	27.4	10.0	25.8	36.8	47.0	82.6	123.6	216.6
	40°F (87.8)	140	10	2.0	5.7	16.2	22.8	8.3	21.2	30.0	38.3	67.5	100.9	177.1	
				180	2.1	5.9	16.7	23.6	8.7	22.2	31.5	40.2	70.9	106.0	186.1
				220	2.2	6.1	17.3	24.4	9.0	23.0	32.7	41.7	73.5	109.8	192.7
		180	15	2.5	7.0	19.9	28.3	10.2	26.2	37.3	47.7	83.8	125.4	219.7	
				140	2.6	7.2	20.6	29.3	10.7	27.6	39.2	50.1	88.0	131.7	230.9
				220	2.7	7.5	21.3	30.3	11.1	28.5	40.6	51.9	91.2	136.5	239.2

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities - A9 & A8\_0

## A9 & A8\_0 – Condenser Bypass Capacities (Kilowatts)

R-134a

Cond Temp °F Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm
25°C 5.5 bar	-40°C (0.4)	60	0.7	8.9	25.1	71.6	102.3	36.5	94.6	134.9	172.5	302.5	453.1	793.3
		80		9.2	25.9	74.0	105.9	37.8	97.8	139.6	178.5	312.9	468.8	820.7
		100		9.5	26.8	76.6	109.6	39.1	101.3	144.4	184.7	323.8	485.1	849.4
		60	1	10.7	30.5	87.3	126.4	44.5	116.4	167.1	214.1	373.4	560.8	979.1
		80		11.1	31.6	90.3	130.8	46.0	120.4	172.9	221.6	386.3	580.2	1013.0
		100		11.5	32.7	93.4	135.4	47.6	124.6	178.9	229.3	399.8	600.5	1048.4
	-20°C (2.1)	60	0.7	9.6	27.2	77.8	111.2	39.7	102.8	146.6	187.5	328.7	492.4	862.0
		80		10.0	28.2	80.4	115.0	41.0	106.3	151.7	193.9	340.0	509.4	891.9
		100		10.3	29.2	83.3	119.0	42.5	110.0	156.9	200.7	351.9	527.2	923.0
		60	1	11.6	33.1	94.7	137.2	48.2	126.3	181.3	232.4	405.2	608.6	1062.6
		80		12.1	34.3	98.0	142.0	49.9	130.7	187.6	240.4	419.3	629.7	1099.4
		100		12.5	35.5	101.4	146.9	51.7	135.3	194.2	248.8	433.9	651.7	1137.8
	0°C (5.2)	60	0.7	10.4	29.3	83.7	119.8	42.7	110.7	157.9	201.9	354.0	530.3	928.5
		80		10.8	30.4	86.6	123.9	44.2	114.5	163.3	208.9	366.2	548.7	960.6
		100		11.1	31.4	89.7	128.2	45.8	118.5	169.0	216.2	379.0	567.8	994.1
		60	1	12.5	35.6	101.9	147.6	51.9	135.9	195.1	250.1	436.0	654.9	1143.3
		80		13.0	36.9	105.4	152.7	53.7	140.6	201.9	258.7	451.1	677.5	1182.9
		100		13.4	38.2	109.1	158.1	55.6	145.6	208.9	267.7	466.9	701.2	1224.2
30°C 6.7 bar	-40°C (0.4)	60	0.7	8.0	22.5	64.1	91.3	32.7	84.4	120.2	153.7	269.8	404.0	707.8
		80		8.2	23.2	66.2	94.4	33.8	87.3	124.3	158.9	279.0	417.7	731.9
		100		8.5	24.0	68.5	97.6	35.0	90.3	128.6	164.4	288.7	432.1	757.2
		60	1	9.6	27.2	77.7	111.9	39.6	103.2	147.7	189.2	330.6	496.0	867.1
		80		9.9	28.1	80.4	115.7	41.0	106.7	152.8	195.6	341.9	512.9	896.7
		100		10.3	29.1	83.1	119.7	42.4	110.4	158.1	202.4	353.7	530.7	927.7
	-20°C (2.1)	60	0.7	8.7	24.5	69.9	99.6	35.7	92.2	131.2	167.7	294.5	440.9	772.5
		80		9.0	25.3	72.3	103.0	36.9	95.3	135.7	173.4	304.5	455.9	798.8
		100		9.3	26.2	74.8	106.6	38.2	98.6	140.4	179.4	315.0	471.6	826.4
		60	1	10.5	29.6	84.7	122.0	43.2	112.5	161.0	206.2	360.4	540.7	945.2
		80		10.8	30.7	87.6	126.1	44.7	116.3	166.5	213.2	372.7	559.1	977.4
		100		11.2	31.7	90.6	130.5	46.2	120.4	172.3	220.6	385.6	578.4	1011.2
	0°C (5.2)	60	0.7	9.4	26.5	75.6	107.7	38.6	99.6	141.8	181.3	318.3	476.6	835.0
		80		9.7	27.4	78.2	111.3	39.9	103.0	146.7	187.4	329.2	492.8	863.4
		100		10.1	28.3	80.9	115.2	41.3	106.6	151.7	193.9	340.5	509.8	893.3
		60	1	11.3	32.0	91.5	131.7	46.6	121.5	173.9	222.6	389.2	583.9	1020.7
		80		11.7	33.1	94.6	136.2	48.2	125.6	179.8	230.2	402.4	603.8	1055.4
		100		12.1	34.3	97.9	140.9	49.9	130.0	186.0	238.2	416.4	624.6	1091.9
35°C 7.8 bar	-40°C (0.4)	60	0.7	7.2	20.3	58.0	82.4	29.6	76.3	108.4	138.5	243.5	364.3	638.8
		80		7.5	21.0	59.9	85.1	30.6	78.8	112.0	143.1	251.6	376.4	660.1
		100		7.7	21.7	62.0	88.0	31.6	81.5	115.8	148.0	260.2	389.3	682.6
		60	1	8.7	24.6	70.1	100.5	35.8	92.8	132.5	169.6	297.0	445.1	778.9
		80		9.0	25.4	72.4	103.8	37.0	95.9	137.0	175.2	306.9	460.0	804.9
		100		9.3	26.2	74.9	107.4	38.2	99.2	141.6	181.2	317.3	475.6	832.3
	-20°C (2.1)	60	0.7	7.9	22.3	63.6	90.3	32.5	83.6	118.9	151.9	267.1	399.6	700.6
		80		8.2	23.0	65.7	93.3	33.6	86.4	122.9	156.9	276.0	412.8	723.9
		100		8.5	23.8	68.0	96.5	34.7	89.4	127.0	162.3	285.4	426.9	748.6
		60	1	9.5	26.9	76.8	110.1	39.2	101.7	145.2	185.7	325.3	487.6	853.2
		80		9.8	27.8	79.4	113.7	40.5	105.1	150.0	191.9	336.1	503.8	881.6
		100		10.2	28.7	82.1	117.6	41.9	108.6	155.1	198.4	347.6	521.0	911.7
	0°C (5.2)	60	0.7	8.6	24.2	69.0	98.0	35.2	90.8	129.0	164.8	289.9	433.6	760.3
		80		8.9	25.0	71.3	101.3	36.4	93.8	133.3	170.3	299.5	448.0	785.6
		100		9.2	25.9	73.7	104.7	37.7	97.0	137.9	176.1	309.7	463.3	812.4
		60	1	10.3	29.2	83.3	119.3	42.5	110.2	157.4	201.3	352.7	528.6	925.0
		80		10.7	30.1	86.0	123.3	43.9	113.9	162.6	208.0	364.4	546.2	955.8
		100		11.0	31.2	89.0	127.5	45.4	117.8	168.2	215.1	376.8	564.8	988.4

Note: Shading is for readability purposes only.



# Condenser Bypass Capacities - A9 & A8\_0

## A9 and A8\_0 – Condenser Bypass Capacities (Tons)

## R-404A

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8A0E 3/8" 9mm	A8A0E 5/8" 15mm	A8A0E 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm
75°F 161.2 psig	-40°F (5.5)	140	10	2.2	6.2	17.7	25.0	9.1	23.2	32.9	42.0	74.0	110.6	194.2
		180		2.3	6.5	18.5	26.1	9.6	24.7	35.0	44.7	78.7	117.6	206.5
		220		2.4	6.8	19.2	27.2	10.0	25.7	36.5	46.6	82.1	122.7	215.3
		140	15	2.8	7.8	22.2	31.5	11.3	29.2	41.5	53.0	93.2	139.5	244.5
		180		2.9	8.1	23.1	32.8	12.0	31.0	44.2	56.4	99.1	148.4	260.1
		220		3.0	8.4	24.1	34.2	12.5	32.4	46.0	58.8	103.4	154.7	271.2
	0°F (35.2)	10	140	2.5	7.0	19.9	28.1	10.2	26.1	37.0	47.2	83.2	124.4	218.3
			180	2.6	7.3	20.8	29.3	10.8	27.8	39.3	50.2	88.5	132.2	232.2
			220	2.7	7.6	21.6	30.5	11.3	28.9	41.0	52.3	92.3	137.9	242.1
		140	15	3.1	8.7	24.9	35.4	12.7	32.8	46.6	59.5	104.6	156.6	274.4
		180		3.2	9.1	25.9	36.9	13.5	34.8	49.6	63.3	111.3	166.5	291.9
		220		3.4	9.5	27.0	38.4	14.1	36.3	51.7	66.0	116.0	173.6	304.3
	40°F (87.8)	10	140	2.7	7.7	21.9	31.0	11.2	28.7	40.8	52.0	91.7	137.0	240.5
			180	2.9	8.0	22.9	32.3	11.9	30.6	43.3	55.3	97.5	145.7	255.8
			220	3.0	8.4	23.8	33.7	12.4	31.9	45.2	57.7	101.7	151.9	266.7
		140	15	3.4	9.6	27.4	38.9	14.0	36.0	51.3	65.5	115.1	172.3	302.0
		180		3.6	10.0	28.5	40.6	14.9	38.3	54.5	69.7	122.4	183.2	321.1
		220		3.7	10.4	29.7	42.3	15.5	40.0	56.9	72.6	127.7	191.0	334.9
95°F 219.4 psig	-40°F (5.5)	140	10	1.6	4.6	13.0	18.4	6.7	17.0	24.1	30.8	54.3	81.1	142.5
		180		1.7	4.8	13.5	19.0	7.1	18.0	25.5	32.5	57.4	85.8	150.7
		220		1.8	4.9	14.1	19.8	7.3	18.8	26.6	33.9	59.8	89.3	156.9
		140	15	2.0	5.7	16.2	23.0	8.3	21.3	30.2	38.6	68.0	101.6	178.3
		180		2.1	5.9	16.9	23.8	8.8	22.5	32.0	40.8	71.9	107.5	188.6
		220		2.2	6.2	17.5	24.8	9.1	23.5	33.3	42.5	74.8	111.9	196.3
	0°F (35.2)	10	140	1.9	5.3	15.0	21.1	7.7	19.6	27.7	35.3	62.4	93.2	163.7
			180	2.0	5.5	15.5	21.9	8.1	20.7	29.3	37.4	66.0	98.5	173.2
			220	2.0	5.7	16.2	22.8	8.4	21.6	30.5	38.9	68.7	102.6	180.2
		140	15	2.3	6.5	18.6	26.3	9.5	24.4	34.7	44.2	77.9	116.5	204.4
		180		2.4	6.8	19.3	27.3	10.1	25.8	36.7	46.8	82.4	123.2	216.3
		220		2.5	7.1	20.1	28.4	10.5	26.9	38.2	48.7	85.8	128.3	225.1
	40°F (87.8)	10	140	2.1	5.9	16.8	23.6	8.6	21.9	31.0	39.5	69.8	104.3	183.2
			180	2.2	6.1	17.4	24.5	9.1	23.2	32.8	41.8	73.9	110.3	193.8
			220	2.3	6.4	18.1	25.5	9.4	24.1	34.1	43.5	76.9	114.8	201.7
		140	15	2.6	7.3	20.8	29.4	10.6	27.3	38.7	49.4	87.1	130.2	228.5
		180		2.7	7.6	21.6	30.5	11.2	28.9	41.0	52.3	92.1	137.7	241.7
		220		2.8	7.9	22.5	31.8	11.7	30.1	42.6	54.4	95.9	143.3	251.6
115°F 290.4 psig	-40°F (5.5)	140	10	1.2	3.3	9.4	13.2	4.8	12.3	17.4	22.1	39.1	58.4	102.7
		180		1.2	3.4	9.7	13.6	5.0	12.9	18.2	23.2	41.0	61.1	107.5
		220		1.3	3.5	10.0	14.1	5.2	13.4	18.9	24.1	42.5	63.5	111.6
		140	15	1.5	4.1	11.7	16.5	6.0	15.4	21.8	27.7	49.0	73.1	128.4
		180		1.5	4.2	12.1	17.0	6.3	16.1	22.8	29.1	51.3	76.6	134.5
		220		1.6	4.4	12.5	17.6	6.5	16.7	23.6	30.2	53.2	79.5	139.6
	0°F (35.2)	10	140	1.4	3.9	11.2	15.7	5.7	14.6	20.7	26.3	46.5	69.5	122.1
			180	1.4	4.1	11.5	16.2	6.0	15.3	21.6	27.6	48.7	72.7	127.9
			220	1.5	4.2	12.0	16.8	6.2	15.9	22.4	28.6	50.6	75.5	132.7
		140	15	1.7	4.9	13.9	19.6	7.1	18.2	25.8	32.9	58.1	86.8	152.4
		180		1.8	5.0	14.3	20.2	7.5	19.1	27.0	34.5	60.8	90.8	159.6
		220		1.9	5.2	14.9	20.9	7.7	19.8	28.0	35.8	63.1	94.3	165.6
	40°F (87.8)	10	140	1.6	4.5	12.9	18.0	6.6	16.8	23.7	30.2	53.4	79.7	140.1
			180	1.7	4.6	13.2	18.6	6.9	17.5	24.8	31.6	55.9	83.4	146.6
			220	1.7	4.8	13.7	19.2	7.1	18.2	25.7	32.8	58.0	86.6	152.2
		140	15	2.0	5.6	15.9	22.5	8.1	20.9	29.5	37.7	66.5	99.3	174.4
		180		2.1	5.8	16.4	23.1	8.5	21.8	30.9	39.4	69.6	104.0	182.6
		220		2.1	6.0	17.0	24.0	8.9	22.7	32.1	40.9	72.2	107.9	189.5

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities - A9 & A8\_0

## A9 & A8\_0 – Condenser Bypass Capacities (Kilowatts)

## R-404A

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm	
25°C 11.2 bar	-40°C (0.4)	60	0.7	8.0	22.4	63.9	90.1	32.6	83.6	118.5	151.2	266.7	398.5	699.6	
				80	8.3	23.3	66.3	93.6	33.9	86.8	123.1	157.0	276.9	413.7	726.4
				100	8.6	24.2	68.9	97.3	35.2	90.2	127.9	163.2	287.7	429.9	754.8
		80	1	9.7	27.3	77.8	110.5	39.7	102.4	145.5	185.9	326.9	489.1	857.5	
				10.1	28.3	80.8	114.8	41.3	106.3	151.1	193.0	339.4	507.8	890.4	
				10.5	29.4	84.0	119.3	42.9	110.4	157.0	200.6	352.7	527.7	925.2	
	-20°C (2.1)	60	0.7	8.9	25.0	71.1	100.4	36.4	93.2	132.1	168.5	297.1	443.9	779.4	
				80	9.2	25.9	73.9	104.3	37.8	96.7	137.1	175.0	308.5	460.9	809.3
				100	9.6	26.9	76.8	108.4	39.2	100.5	142.5	181.8	320.5	479.0	840.9
		80	1	10.8	30.4	86.6	123.0	44.2	113.9	161.9	206.8	363.7	544.1	954.0	
				11.2	31.5	89.9	127.7	45.9	118.3	168.1	214.8	377.6	565.0	990.6	
				11.6	32.8	93.4	132.7	47.7	122.9	174.7	223.2	392.4	587.1	1029.3	
	0°C (5.2)	60	0.7	9.8	27.3	77.9	110.0	39.8	102.1	144.7	184.6	325.5	486.3	853.9	
				80	10.1	28.4	80.9	114.2	41.4	106.0	150.2	191.7	337.9	505.0	886.6
				100	10.5	29.5	84.1	118.7	43.0	110.1	156.1	199.2	351.1	524.7	921.2
		80	1	11.8	33.2	94.7	134.6	48.4	124.6	177.2	226.4	398.0	595.5	1044.0	
				12.3	34.5	98.4	139.8	50.2	129.4	184.0	235.0	413.3	618.3	1084.1	
				12.7	35.8	102.2	145.2	52.2	134.5	191.2	244.2	429.4	642.5	1126.4	
30°C 13.1 bar	-40°C (0.4)	60	0.7	6.9	19.3	55.1	77.6	28.1	72.0	102.0	130.1	229.6	342.9	602.3	
				80	7.2	20.0	57.1	80.5	29.2	74.7	105.8	134.9	238.0	355.6	624.5
				100	7.4	20.8	59.3	83.5	30.3	77.5	109.8	140.1	247.1	369.1	648.4
		80	1	8.4	23.5	66.9	94.8	34.2	87.9	124.8	159.3	280.5	419.4	735.8	
				8.7	24.3	69.4	98.3	35.4	91.1	129.4	165.2	290.8	434.9	762.9	
				9.0	25.3	72.0	102.1	36.8	94.6	134.3	171.5	301.9	451.5	792.0	
	-20°C (2.1)	60	0.7	7.8	21.7	61.9	87.2	31.6	80.9	114.6	146.2	257.9	385.2	676.6	
				80	8.0	22.5	64.1	90.4	32.8	83.9	118.8	151.5	267.4	399.4	701.5
				100	8.3	23.4	66.6	93.8	34.0	87.1	123.3	157.3	277.6	414.7	728.3
		80	1	9.4	26.3	75.1	106.4	38.3	98.6	140.0	178.7	314.6	470.4	825.3	
				9.7	27.3	77.8	110.3	39.8	102.2	145.1	185.3	326.2	487.8	855.7	
				10.1	28.3	80.8	114.5	41.3	106.1	150.7	192.4	338.6	506.4	888.4	
	0°C (5.2)	60	0.7	8.5	23.9	68.2	96.1	34.9	89.2	126.3	161.1	284.3	424.7	745.9	
				80	8.9	24.8	70.7	99.6	36.1	92.5	131.0	167.1	294.8	440.3	773.4
				100	9.2	25.8	73.4	103.4	37.5	96.0	136.0	173.4	306.0	457.1	802.9
		80	1	10.3	29.0	82.7	117.1	42.2	108.5	154.1	196.8	346.4	518.0	908.7	
				10.7	30.1	85.7	121.4	43.8	112.5	159.8	204.0	359.2	537.1	942.2	
				11.1	31.2	89.0	126.1	45.5	116.8	165.9	211.8	372.9	557.6	978.2	
35°C 15.1 bar	-40°C (0.4)	60	0.7	6.0	16.7	47.7	67.1	24.4	62.3	88.2	112.4	198.5	296.5	520.9	
				80	6.2	17.3	49.3	69.4	25.2	64.5	91.2	116.4	205.5	306.8	539.0
				100	6.4	18.0	51.2	72.0	26.2	66.9	94.6	120.7	213.1	318.2	559.0
		80	1	7.2	20.3	57.9	81.8	29.6	75.9	107.6	137.4	242.1	361.8	635.0	
				7.5	21.0	59.9	84.7	30.6	78.5	111.4	142.2	250.5	374.4	657.2	
				7.8	21.8	62.1	87.8	31.7	81.4	115.5	147.4	259.8	388.3	681.5	
	-20°C (2.1)	60	0.7	6.8	19.0	54.1	76.1	27.7	70.7	100.0	127.6	225.2	336.3	590.9	
				80	7.0	19.7	56.0	78.8	28.6	73.1	103.5	132.0	233.1	348.1	611.6
				100	7.3	20.4	58.1	81.7	29.7	75.9	107.4	136.9	241.7	361.0	634.2
		80	1	8.2	23.0	65.5	92.7	33.5	85.9	121.9	155.6	274.2	409.8	719.3	
				8.5	23.8	67.8	95.9	34.7	88.9	126.2	161.0	283.7	424.1	744.4	
				8.8	24.7	70.4	99.5	35.9	92.2	130.8	167.0	294.3	439.8	772.0	
	0°C (5.2)	60	0.7	7.5	21.1	60.1	84.5	30.7	78.5	111.1	141.7	250.1	373.5	656.3	
				80	7.8	21.8	62.2	87.5	31.8	81.2	115.0	146.6	258.9	386.6	679.2
				100	8.1	22.6	64.5	90.7	33.0	84.2	119.2	152.0	268.5	400.9	704.3
		80	1	9.1	25.5	72.7	102.8	37.2	95.3	135.2	172.6	304.1	454.6	797.8	
				9.4	26.4	75.3	106.4	38.5	98.7	140.0	178.6	314.7	470.4	825.7	
				9.8	27.4	78.0	110.3	39.9	102.3	145.1	185.2	326.4	487.9	856.3	

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities – A9 & A8\_0

## A9 and A8\_0 – Condenser Bypass Capacities (Tons)

## R-507

Cond Temp °F Sat Pressure psig	Evaporator Temperature (Sat Pres) psig	Discharge Temp °F	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8A0E 3/8" 9mm	A8A0E 5/8" 15mm	A8A0E 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm	
75°F 167.0 psig	-40°F (5.5)	140	10	2.3	6.4	18.4	25.9	9.4	24.0	34.1	43.5	76.6	114.5	201.0	
				180	2.4	6.7	19.2	27.1	10.0	25.7	36.4	46.4	81.9	122.4	214.9
				220	2.5	7.0	20.1	28.3	10.5	26.8	38.0	48.5	85.6	127.8	224.5
		180	15	2.8	8.0	22.8	32.5	11.7	30.1	42.8	54.6	96.0	143.7	251.9	
				140	3.0	8.4	23.9	34.0	12.5	32.1	45.7	58.4	102.7	153.6	269.3
				220	3.1	8.8	25.0	35.5	13.0	33.6	47.8	61.0	107.2	160.5	281.3
	0°F (35.2)	140	10	2.6	7.2	20.5	28.9	10.5	26.8	38.0	48.5	85.6	127.9	224.6	
				180	2.7	7.5	21.4	30.3	11.2	28.7	40.7	51.9	91.5	136.7	240.1
				220	2.8	7.9	22.4	31.6	11.7	30.0	42.5	54.2	95.6	142.8	250.8
		180	15	3.2	8.9	25.5	36.2	13.0	33.5	47.7	60.9	107.1	160.3	281.0	
				140	3.3	9.3	26.7	37.9	13.9	35.9	51.0	65.2	114.5	171.4	300.4
				220	3.5	9.8	27.9	39.6	14.5	37.5	53.3	68.1	119.6	179.0	313.9
	40°F (87.8)	140	10	2.8	7.9	22.5	31.8	11.5	29.5	41.8	53.3	94.1	140.6	246.8	
				180	2.9	8.3	23.6	33.2	12.3	31.5	44.7	57.0	100.6	150.2	263.8
				220	3.1	8.6	24.6	34.7	12.9	32.9	46.7	59.6	105.1	157.0	275.6
		180	15	3.5	9.8	28.0	39.8	14.3	36.8	52.4	66.9	117.6	176.0	308.5	
				140	3.6	10.3	29.3	41.6	15.3	39.4	56.0	71.5	125.7	188.1	329.8
				220	3.8	10.7	30.6	43.5	16.0	41.1	58.5	74.7	131.3	196.5	344.5
95°F 226.0 psig	-40°F (5.5)	140	10	1.8	5.0	14.1	19.8	7.2	18.4	26.1	33.2	58.7	87.6	154.0	
				180	1.8	5.2	14.7	20.7	7.7	19.6	27.8	35.4	62.5	93.3	164.0
				220	1.9	5.4	15.3	21.6	8.0	20.5	29.0	36.9	65.2	97.4	171.1
		180	15	2.2	6.1	17.5	24.7	8.9	22.9	32.5	41.5	73.1	109.3	191.8	
				140	2.3	6.4	18.2	25.8	9.5	24.4	34.7	44.2	77.9	116.5	204.4
				220	2.4	6.7	19.0	26.9	9.9	25.5	36.2	46.1	81.3	121.5	213.3
	0°F (35.2)	140	10	2.0	5.6	16.0	22.6	8.2	20.9	29.6	37.8	66.7	99.7	175.1	
				180	2.1	5.9	16.7	23.5	8.7	22.3	31.6	40.3	71.1	106.2	186.6
				220	2.2	6.1	17.5	24.5	9.1	23.3	32.9	42.0	74.2	110.8	194.7
		180	15	2.5	7.0	19.9	28.1	10.1	26.0	36.9	47.1	83.0	124.1	217.9	
				140	2.6	7.3	20.7	29.3	10.8	27.7	39.3	50.2	88.5	132.3	232.1
				220	2.7	7.6	21.6	30.6	11.3	28.9	41.1	52.4	92.3	138.0	242.2
	40°F (87.8)	140	10	2.2	6.3	17.9	25.1	9.1	23.3	33.0	42.1	74.3	111.0	195.1	
				180	2.3	6.5	18.6	26.2	9.7	24.9	35.2	44.9	79.2	118.3	207.8
				220	2.4	6.8	19.4	27.3	10.2	25.9	36.7	46.8	82.6	123.4	216.8
		180	15	2.8	7.8	22.1	31.2	11.3	29.0	41.1	52.4	92.4	138.1	242.4	
				140	2.9	8.1	23.0	32.6	12.0	30.9	43.8	55.9	98.4	147.2	258.3
				220	3.0	8.4	24.0	34.0	12.6	32.2	45.7	58.3	102.7	153.5	269.5
115°F 301.0 psig	-40°F (5.5)	140	10	1.3	3.7	10.7	15.0	5.5	13.9	19.7	25.1	44.3	66.1	116.3	
				180	1.4	3.9	11.1	15.5	5.8	14.7	20.8	26.5	46.9	70.0	123.0
				220	1.4	4.0	11.5	16.2	6.0	15.3	21.7	27.6	48.8	72.8	128.1
		180	15	1.7	4.7	13.2	18.7	6.8	17.3	24.5	31.3	55.2	82.5	144.9	
				140	1.7	4.8	13.7	19.4	7.2	18.3	26.0	33.1	58.4	87.3	153.3
				220	1.8	5.0	14.3	20.1	7.5	19.1	27.0	34.5	60.8	90.9	159.6
	0°F (35.2)	140	10	1.6	4.4	12.5	17.5	6.4	16.3	23.0	29.3	51.8	77.3	136.0	
				180	1.6	4.5	12.9	18.2	6.8	17.2	24.3	31.0	54.8	81.8	143.8
				220	1.7	4.7	13.5	18.9	7.0	17.9	25.3	32.3	57.1	85.2	149.7
		180	15	1.9	5.4	15.5	21.8	7.9	20.2	28.6	36.5	64.4	96.2	169.0	
				140	2.0	5.6	16.0	22.6	8.4	21.4	30.3	38.6	68.2	101.8	178.8
				220	2.1	5.9	16.7	23.5	8.7	22.3	31.5	40.2	71.0	106.0	186.2
	40°F (87.8)	140	10	1.8	5.0	14.2	19.9	7.3	18.5	26.1	33.3	58.9	87.9	154.5	
				180	1.8	5.2	14.7	20.6	7.7	19.6	27.6	35.2	62.3	93.0	163.5
				220	1.9	5.4	15.3	21.5	8.0	20.4	28.8	36.7	64.9	96.8	170.2
		180	15	2.2	6.2	17.5	24.7	9.0	22.9	32.5	41.4	73.1	109.2	191.8	
				140	2.3	6.4	18.2	25.6	9.5	24.3	34.4	43.8	77.4	115.5	203.0
				220	2.4	6.6	18.9	26.7	9.9	25.3	35.8	45.6	80.5	120.3	211.3

Note: Shading is for readability purposes only.

# Condenser Bypass Capacities – A9 & A8\_0

## A9 & A8\_0 – Condenser Bypass Capacities (Kilowatts)

**R-507**

Cond Temp °C Sat Pressure bar	Evaporator Temperature (Sat Pres) bar	Discharge Temp °C	Pressure Drop psi	A9 3/8" 9mm	A9 5/8" 15mm	A9 7/8" 22mm	A9 1-1/8" 28mm	A8AOE 3/8" 9mm	A8AOE 5/8" 15mm	A8AOE 7/8" 22mm	A810E 1-1/8" 28mm	A810E 1-3/8" 35mm	A820E 1-5/8" 42mm	A820E 2-1/8" 54mm
25°C 11.6 bar	-40°C (0.4)	60	0.7	8.3	23.4	66.6	94.0	34.0	87.2	123.6	157.7	278.1	415.5	729.6
		80		8.7	24.4	69.4	98.0	35.5	90.9	128.8	164.3	289.8	433.0	760.3
		100		9.1	25.4	72.3	102.0	37.0	94.7	134.2	171.2	301.9	451.0	792.0
		60	1	10.1	28.4	80.9	114.8	41.3	106.3	151.1	193.0	339.5	507.8	890.5
		80		10.5	29.6	84.3	119.6	43.0	110.8	157.5	201.2	353.8	529.3	928.1
		100		10.9	30.8	87.8	124.6	44.8	115.4	164.1	209.5	368.5	551.3	966.8
	-20°C (2.1)	60	0.7	9.2	25.9	73.8	104.1	37.7	96.6	136.9	174.6	307.9	460.1	807.9
		80		9.6	27.0	76.9	108.5	39.3	100.6	142.6	182.0	320.9	479.5	841.9
		100		10.0	28.1	80.1	113.0	40.9	104.8	148.6	189.5	334.3	499.4	877.0
		60	1	11.2	31.4	89.4	127.0	45.7	117.6	167.1	213.5	375.5	561.7	985.0
		80		11.6	32.7	93.2	132.3	47.6	122.6	174.2	222.5	391.3	585.4	1026.5
		100		12.1	34.1	97.1	137.8	49.6	127.7	181.4	231.7	407.6	609.8	1069.3
	0°C (5.2)	60	0.7	10.1	28.3	80.6	113.7	41.2	105.5	149.5	190.7	336.3	502.4	882.3
		80		10.5	29.5	84.0	118.5	42.9	109.9	155.8	198.7	350.5	523.6	919.4
		100		10.9	30.7	87.5	123.4	44.7	114.5	162.2	207.0	365.0	545.4	957.7
		60	1	12.2	34.2	97.6	138.5	49.8	128.3	182.4	232.9	409.7	612.9	1074.7
		80		12.7	35.7	101.7	144.4	51.9	133.7	190.1	242.8	427.0	638.7	1120.0
		100		13.2	37.2	105.9	150.4	54.1	139.3	198.0	252.9	444.8	665.3	1166.7
30°C 13.5 bar	-40°C (0.4)	60	0.7	7.3	20.6	58.6	82.5	29.9	76.6	108.5	138.4	244.2	364.7	640.7
		80		7.6	21.4	61.0	85.9	31.2	79.8	113.0	144.1	254.3	379.8	667.1
		100		8.0	22.3	63.5	89.5	32.5	83.1	117.6	150.0	264.7	395.4	694.5
		60	1	8.9	24.9	70.9	100.5	36.2	93.1	132.2	168.8	297.1	444.3	779.5
		80		9.2	25.9	73.9	104.6	37.7	97.0	137.7	175.7	309.4	462.6	811.7
		100		9.6	27.0	76.9	108.9	39.3	101.0	143.3	183.0	322.1	481.7	845.1
	-20°C (2.1)	60	0.7	8.2	22.9	65.3	92.0	33.4	85.4	120.9	154.3	272.2	406.6	714.3
		80		8.5	23.9	68.0	95.8	34.8	88.9	125.9	160.6	283.5	423.4	743.7
		100		8.9	24.9	70.8	99.8	36.2	92.6	131.1	167.2	295.1	440.8	774.3
		60	1	9.9	27.7	79.0	111.9	40.4	103.7	147.2	187.9	330.9	494.8	868.0
		80		10.3	28.9	82.3	116.5	42.0	108.0	153.3	195.7	344.6	515.2	903.9
		100		10.7	30.0	85.7	121.3	43.8	112.4	159.6	203.7	358.7	536.4	941.1
	0°C (5.2)	60	0.7	9.0	25.2	71.7	101.0	36.7	93.8	132.8	169.4	298.9	446.5	784.3
		80		9.4	26.2	74.7	105.2	38.2	97.7	138.3	176.4	311.3	464.9	816.6
		100		9.7	27.3	77.8	109.5	39.7	101.7	144.0	183.6	324.0	484.0	850.2
		60	1	10.8	30.4	86.7	122.7	44.3	113.7	161.5	206.2	363.0	542.7	952.2
		80		11.3	31.7	90.2	127.8	46.1	118.4	168.2	214.7	378.0	565.2	991.6
		100		11.7	33.0	94.0	133.1	48.0	123.3	175.1	223.5	393.5	588.4	1032.3
35°C 15.6 bar	-40°C (0.4)	60	0.7	6.5	18.2	51.7	72.8	26.5	67.6	95.6	122.0	215.4	321.6	565.0
		80		6.8	18.9	53.8	75.7	27.5	70.3	99.5	126.8	224.0	334.4	587.7
		100		7.0	19.7	56.0	78.8	28.6	73.1	103.5	132.0	233.0	347.9	611.4
		60	1	7.8	22.0	62.6	88.4	32.0	82.0	116.3	148.4	261.6	391.0	686.3
		80		8.1	22.8	65.1	92.0	33.3	85.3	121.0	154.4	272.1	406.7	713.8
		100		8.5	23.8	67.7	95.7	34.6	88.7	125.9	160.6	283.1	423.1	742.6
	-20°C (2.1)	60	0.7	7.3	20.4	58.1	81.8	29.7	76.0	107.5	137.1	242.1	361.4	635.1
		80		7.6	21.2	60.5	85.1	30.9	79.0	111.8	142.6	251.8	375.9	660.5
		100		7.9	22.1	62.9	88.5	32.2	82.2	116.3	148.3	261.9	391.1	687.1
		60	1	8.8	24.6	70.2	99.3	35.9	92.1	130.6	166.6	293.6	438.9	770.4
		80		9.1	25.6	73.1	103.3	37.3	95.8	135.8	173.3	305.4	456.5	801.3
		100		9.5	26.7	76.0	107.4	38.8	99.6	141.3	180.3	317.8	474.9	833.6
	0°C (5.2)	60	0.7	8.1	22.6	64.2	90.4	32.8	83.9	118.8	151.5	267.4	399.3	701.7
		80		8.4	23.5	66.8	94.0	34.2	87.3	123.5	157.5	278.2	415.3	729.8
		100		8.7	24.4	69.5	97.8	35.5	90.8	128.5	163.9	289.4	432.1	759.2
		60	1	9.7	27.2	77.5	109.6	39.6	101.6	144.1	183.9	324.1	484.4	850.3
		80		10.1	28.3	80.6	114.0	41.2	105.7	149.9	191.3	337.1	503.9	884.4
		100		10.5	29.4	83.9	118.6	42.9	110.0	155.9	199.0	350.7	524.2	920.1

Note: Shading is for readability purposes only.

# Hot Gas Bypass

Hot gas bypass is a method of compressor capacity control that has been utilized in the refrigeration and air conditioning industry for many years. A significant number of refrigeration and air conditioning systems operate at full capacity no more than 20% of their running time. As a result, many compressors operating above fifteen horsepower are equipped with cylinder unloading devices whereby the capacity of the compressor can effectively be reduced. The need for automatic hot gas bypass becomes evident, however, for those systems having compressors that do not possess cylinder unloading, or for those systems with unloading capability, but without or lacking suction pressure control between the last stage of unloading and 0% capacity.

A hot gas bypass system is designed to **artificially** load the compressor upon a decrease in evaporator load for one or more of the following reasons:

- To prevent the operation of the compressor at unacceptably low suction pressures, which could result in oil

pumping, compressor cycling, temperature variation, and eventual compressor or motor failure.

- To prevent a significant drop in evaporator temperature where constant conditions are required.
- To prevent the frosting of the evaporator coil, which can cause a loss of capacity due to the restricted air flow.

Basic hot gas bypass systems are illustrated in Figures 4 and 5.

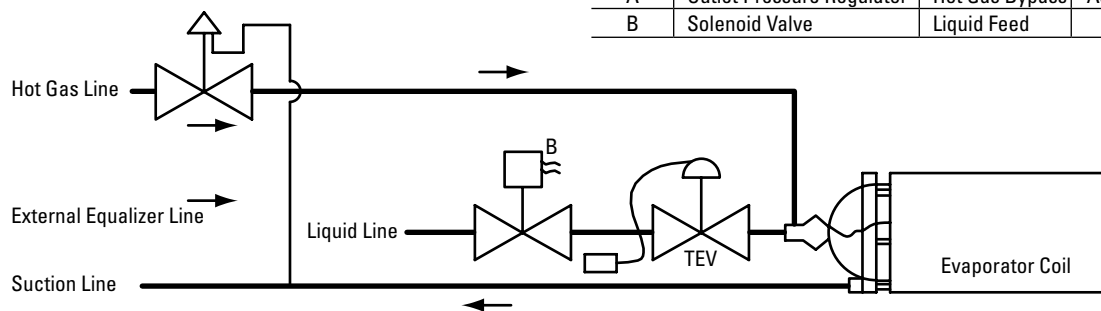
A portion of the refrigerant discharge gas is bypassed around the condenser and thermostatic expansion valve, effectively reducing the flow of refrigerant available for cooling. In addition to the reduction in refrigeration effect due to the reduced liquid refrigerant flow through the condenser and expansion valve, the heat content of the hot gas bypassed compared to the suction gas will add load, further reducing the refrigeration effect of the evaporator.

Compressor suction pressure is the principal condition being controlled with any hot gas bypass system. Therefore,

whenever discharge gas is introduced into the inlet of the evaporator by means of a hot gas bypass regulator, the regulator must be used with an external equalizer connected to the compressor suction main, and at a point downstream of any evaporator pressure regulator which may be used. In this manner, any pressure drop conditions due to distributors, evaporator circuiting, or valves will not affect the operation of the hot gas bypass regulator.

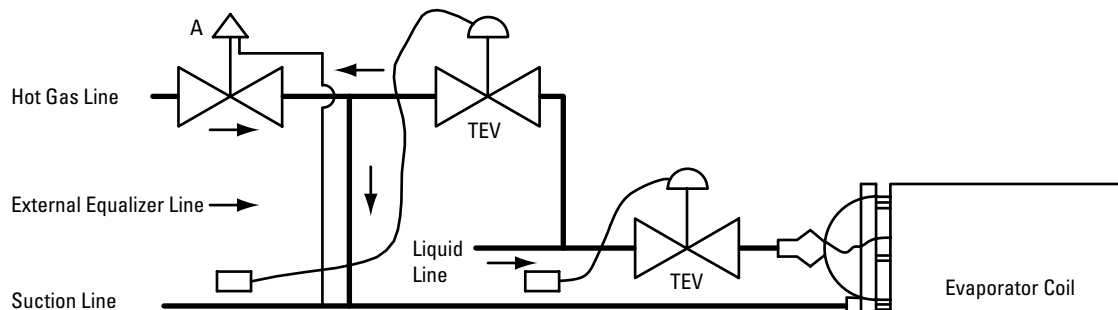
The two commercial regulators recommended for hot gas bypass applications are the Refrigerating Specialties A9E, and A8\_OE series. The A9E is physically the smaller of the two valve types, covering port sizes of 3/8" through 1-1/8", and was originally designed specifically for hot gas bypass applications. The A8 series covers three different body sizes, the A8AOE, A81OE, and A82OE, and cover a much larger capacity range, with port sizes as large as 2-1/8".

**Figure 4** — Hot gas bypass to entrance of evaporator. See page 62 for symbols legend.



Valve Legend				
Label	Valve Function	Application	Design	Selection Page
A	Outlet Pressure Regulator	Hot Gas Bypass	A9 or A8_OE	63
B	Solenoid Valve	Liquid Feed	SC	63

**Figure 5** — Hot gas bypass to suction with liquid injection. See page 62 for symbol legend.



# Hot Gas Bypass Capacities – A9 & A8\_0

## A9 & A8\_0 – Hot Gas Bypass Capacities (Tons)

**R-22**

Cond Temp °F	Discharge Temp °F	A9 3/8"	A9 5/8"	A9 7/8"	A9 1-1/8"	A8AOE 3/8"	A8AOE 5/8"	A8AOE 7/8"	A810E 1-1/8"	A810E 1-3/8"	A820E 1-5/8"	A820E 2-1/8"
86°F	140	1.4	4.1	12.0	19.1	6.0	17.1	25.8	33.6	56.2	86.0	147.0
	180	1.5	4.3	12.4	19.9	6.3	17.8	26.8	34.9	58.4	89.4	152.8
	220	1.5	4.5	12.9	20.6	6.5	18.5	27.8	36.2	60.6	92.7	158.6
100°F	140	1.6	4.8	13.8	22.3	7.0	19.8	30.3	39.8	65.3	100.9	170.9
	180	1.7	5.0	14.4	23.3	7.3	20.7	31.7	41.6	68.3	105.5	178.7
	220	1.8	5.2	15.0	24.3	7.6	21.6	33.1	43.4	71.2	110.0	186.3
110°F	140	1.8	5.2	15.1	24.4	7.6	21.7	33.2	43.8	71.5	110.5	187.0
	180	1.9	5.5	15.9	25.7	8.0	22.8	34.9	46.0	75.1	116.1	196.5
	220	1.9	5.7	16.6	26.9	8.4	23.8	36.5	48.1	78.7	121.5	205.8
120°F	140	1.9	5.7	16.4	26.5	8.2	23.5	36.0	47.5	77.5	119.8	202.8
	180	2.0	6.0	17.3	28.0	8.7	24.8	38.1	50.2	81.9	126.6	214.4
	220	2.1	6.3	18.2	29.4	9.2	26.1	40.0	52.8	86.2	133.2	225.5

## A9 & A8\_0 – Hot Gas Bypass Capacities (Kilowatts)

**R-22**

Cond Temp °C	Discharge Temp °C	A9 9mm	A9 15mm	A9 22mm	A9 28mm	A8AOE 9mm	A8AOE 15mm	A8AOE 22mm	A810E 28mm	A810E 35mm	A820E 42mm	A820E 54mm
30°C	60	4.9	14.6	42.1	67.3	21.2	60.2	90.6	118.0	197.5	302.5	517.1
	80	5.1	15.1	43.6	69.7	22.0	62.4	93.8	122.1	204.5	313.1	535.4
	100	5.3	15.6	45.1	72.0	22.7	64.5	97.0	126.3	211.5	323.8	553.7
40°C	60	5.9	17.4	50.3	81.4	25.4	72.2	110.8	145.8	238.4	368.4	623.7
	80	6.1	18.2	52.5	84.9	26.5	75.3	115.5	152.0	248.6	384.2	650.4
	100	6.4	18.9	54.6	88.3	27.5	78.4	120.2	158.1	258.7	399.7	676.6
45°C	60	6.4	18.8	54.5	88.1	27.4	78.1	119.8	157.9	257.9	398.6	674.7
	80	6.7	19.7	57.0	92.2	28.7	81.8	125.5	165.4	270.1	417.4	706.7
	100	7.0	20.6	59.5	96.3	30.0	85.4	131.0	172.6	282.0	435.7	737.6
50°C	60	6.8	20.2	58.4	94.5	29.4	83.8	128.6	169.4	276.7	427.6	723.9
	80	7.2	21.3	61.5	99.5	31.0	88.3	135.4	178.4	291.4	450.3	762.2
	100	7.5	22.3	64.5	104.3	32.5	92.5	141.9	187.0	305.4	471.9	798.9

## A9 & A8\_0 – Hot Gas Bypass Capacities (Tons)

**R-134a**

Cond Temp °F	Discharge Temp °F	A9 3/8"	A9 5/8"	A9 7/8"	A9 1-1/8"	A8AOE 3/8"	A8AOE 5/8"	A8AOE 7/8"	A810E 1-1/8"	A810E 1-3/8"	A820E 1-5/8"	A820E 2-1/8"
86°F	140	1.0	2.8	8.2	13.2	4.1	11.8	17.9	23.4	38.8	59.7	101.5
	180	1.0	3.0	8.7	14.1	4.4	12.5	19.0	24.9	41.3	63.5	108.0
	220	1.1	3.2	9.2	14.9	4.7	13.3	20.2	26.4	43.7	67.3	114.4
100°F	140	1.1	3.3	9.6	15.5	4.8	13.8	21.1	27.9	45.5	70.3	119.1
	180	1.2	3.6	10.3	16.6	5.2	14.8	22.7	29.8	48.8	75.3	127.6
	220	1.3	3.8	11.0	17.7	5.5	15.7	24.1	31.8	52.0	80.3	135.9
110°F	140	1.2	3.7	10.6	17.2	5.4	15.3	23.4	30.8	50.4	77.8	131.7
	180	1.3	4.0	11.5	18.5	5.8	16.5	25.2	33.2	54.3	83.9	142.0
	220	1.4	4.2	12.3	19.8	6.2	17.6	27.0	35.6	58.1	89.8	152.1
120°F	140	1.4	4.0	11.6	18.8	5.9	16.7	25.6	33.7	55.1	85.2	144.2
	180	1.5	4.4	12.6	20.5	6.4	18.2	27.8	36.7	59.9	92.6	156.7
	220	1.6	4.7	13.6	22.0	6.9	19.5	30.0	39.5	64.5	99.7	168.7

## A9 & A8\_0 – Hot Gas Bypass Capacities (Kilowatts)

**R-134a**

Cond Temp °C	Discharge Temp °C	A9 9mm	A9 15mm	A9 22mm	A9 28mm	A8AOE 9mm	A8AOE 15mm	A8AOE 22mm	A810E 28mm	A810E 35mm	A820E 42mm	A820E 54mm
30°C	60	3.4	10.0	28.9	46.6	14.5	41.4	63.0	82.3	136.5	210.0	357.1
	80	3.6	10.6	30.5	49.2	15.4	43.8	66.6	87.0	144.3	222.0	377.6
	100	3.8	11.1	32.2	51.9	16.2	46.1	70.2	91.7	152.1	233.9	398.0
40°C	60	4.1	12.2	35.2	57.0	17.8	50.5	77.5	102.1	166.8	257.8	436.4
	80	4.4	13.0	37.6	60.8	18.9	53.9	82.7	108.9	178.0	275.0	465.5
	100	4.7	13.8	39.9	64.5	20.1	57.2	87.7	115.6	188.9	291.8	494.0
45°C	60	4.5	13.3	38.5	62.2	19.4	55.2	84.6	111.5	182.2	281.5	476.6
	80	4.8	14.3	41.3	66.7	20.8	59.2	90.8	119.6	195.4	302.0	511.2
	100	5.1	15.2	44.0	71.1	22.2	63.1	96.8	127.5	208.3	321.8	544.8
50°C	60	4.9	14.4	41.6	67.3	21.0	59.7	91.6	120.7	197.2	304.7	515.8
	80	5.3	15.6	45.0	72.7	22.7	64.5	99.0	130.4	213.0	329.1	557.2
	100	5.6	16.7	48.2	77.9	24.3	69.1	106.0	139.6	228.1	352.5	596.7

# Hot Gas Bypass Capacities – A9 & A8\_0

## A9 & A8\_0 – Hot Gas Bypass Capacities (Tons)

### R-404A

Cond Temp °F	Discharge Temp °F	A9 3/8"	A9 5/8"	A9 7/8"	A9 1-1/8"	A8AOE 3/8"	A8AOE 5/8"	A8AOE 7/8"	A810E 1-1/8"	A810E 1-3/8"	A820E 1-5/8"	A820E 2-1/8"
86°F	140	1.5	4.4	12.6	20.2	6.3	18.0	27.2	35.5	59.2	90.8	155.0
	180	1.6	4.7	13.6	21.8	6.9	19.5	29.4	38.3	63.9	98.0	167.3
	220	1.7	5.1	14.6	23.4	7.4	20.9	31.5	41.1	68.6	105.2	179.6
100°F	140	1.6	4.9	14.0	22.7	7.1	20.1	30.8	40.5	66.4	102.6	173.6
	180	1.8	5.3	15.3	24.8	7.7	22.0	33.7	44.3	72.5	112.1	189.7
	220	1.9	5.7	16.6	26.8	8.4	23.8	36.5	48.0	78.6	121.4	205.5
110°F	140	1.7	5.1	14.9	24.0	7.5	21.3	32.7	43.1	70.3	108.7	184.0
	180	1.9	5.7	16.4	26.5	8.3	23.6	36.1	47.6	77.8	120.1	203.4
	220	2.1	6.2	17.9	29.0	9.0	25.7	39.5	52.0	85.0	131.3	222.2
120°F	140	1.8	5.3	15.4	24.9	7.8	22.1	33.9	44.6	72.9	112.7	190.7
	180	2.0	6.0	17.3	28.0	8.7	24.9	38.1	50.2	82.0	126.8	214.6
	220	2.2	6.6	19.1	31.0	9.6	27.5	42.1	55.5	90.7	140.1	237.2

## A9 & A8\_0 – Hot Gas Bypass Capacities (Kilowatts)

### R-404A

Cond Temp °C	Discharge Temp °C	A9 9mm	A9 15mm	A9 22mm	A9 28mm	A8AOE 9mm	A8AOE 15mm	A8AOE 22mm	A810E 28mm	A810E 35mm	A820E 42mm	A820E 54mm
30°C	60	5.2	15.3	44.3	71.0	22.3	63.4	95.7	124.7	208.3	319.3	545.3
	80	5.5	16.4	47.5	76.0	23.9	68.0	102.5	133.6	223.2	342.1	584.2
	100	5.9	17.5	50.6	81.1	25.5	72.5	109.3	142.5	238.1	364.8	623.1
40°C	60	5.9	17.5	50.6	81.8	25.5	72.6	111.3	146.6	239.5	370.1	626.6
	80	6.4	19.0	55.0	88.9	27.7	78.9	121.0	159.4	260.5	402.5	681.4
	100	6.9	20.5	59.3	96.0	29.9	85.1	130.6	171.9	281.0	434.3	735.1
45°C	60	6.2	18.3	52.9	85.6	26.7	76.0	116.5	153.5	250.7	387.4	655.9
	80	6.8	20.1	58.2	94.1	29.3	83.5	128.1	168.8	275.7	426.1	721.2
	100	7.4	21.9	63.3	102.4	31.9	90.9	139.3	183.6	299.9	463.4	784.4
50°C	60	6.4	18.8	54.3	87.9	27.4	78.0	119.5	157.5	257.3	397.6	673.1
	80	7.1	21.0	60.7	98.2	30.6	87.1	133.6	176.1	287.6	444.4	752.4
	100	7.8	23.1	66.8	108.0	33.6	95.8	146.9	193.6	316.2	488.6	827.1

## A9 & A8\_0 – Hot Gas Bypass Capacities (Tons)

### R-507

Cond Temp °F	Discharge Temp °F	A9 3/8"	A9 5/8"	A9 7/8"	A9 1-1/8"	A8AOE 3/8"	A8AOE 5/8"	A8AOE 7/8"	A810E 1-1/8"	A810E 1-3/8"	A820E 1-5/8"	A820E 2-1/8"
86°F	140	1.5	4.6	13.2	21.1	6.6	18.9	28.5	37.1	62.0	95.0	162.3
	180	1.7	4.9	14.3	22.9	7.2	20.5	30.8	40.2	67.2	102.9	175.8
	220	1.8	5.3	15.4	24.6	7.7	22.0	33.2	43.2	72.2	110.6	189.0
100°F	140	1.7	5.1	14.8	24.0	7.5	21.3	32.6	42.9	70.3	108.6	183.8
	180	1.9	5.6	16.3	26.3	8.2	23.3	35.8	47.0	77.0	119.1	201.6
	220	2.1	6.1	17.6	28.5	8.9	25.3	38.8	51.0	83.5	129.1	218.5
110°F	140	1.9	5.5	15.9	25.7	8.0	22.8	35.0	46.1	75.3	116.3	196.9
	180	2.1	6.1	17.6	28.5	8.9	25.3	38.8	51.1	83.5	129.0	218.4
	220	2.3	6.7	19.3	31.1	9.7	27.6	42.4	55.8	91.2	141.0	238.6
120°F	140	2.0	5.8	16.7	27.0	8.4	24.0	36.8	48.5	79.2	122.3	207.1
	180	2.2	6.5	18.8	30.5	9.5	27.0	41.5	54.6	89.3	137.9	233.5
	220	2.4	7.2	20.8	33.6	10.5	29.8	45.8	60.3	98.5	152.2	257.7

## A9 & A8\_0 – Hot Gas Bypass Capacities (Kilowatts)

### R-507

Cond Temp °C	Discharge Temp °C	A9 9mm	A9 15mm	A9 22mm	A9 28mm	A8AOE 9mm	A8AOE 15mm	A8AOE 22mm	A810E 28mm	A810E 35mm	A820E 42mm	A820E 54mm
30°C	60	5.4	16.0	46.4	74.3	23.4	66.4	100.1	130.5	218.0	334.1	570.7
	80	5.8	17.3	49.9	79.9	25.1	71.4	107.7	140.3	234.4	359.2	613.6
	100	6.2	18.4	53.3	85.3	26.9	76.3	115.0	149.8	250.4	383.7	655.5
40°C	60	6.3	18.6	53.7	86.8	27.1	77.1	118.2	155.6	254.3	393.0	665.3
	80	6.9	20.3	58.6	94.8	29.5	84.1	129.0	169.8	277.6	428.9	726.1
	100	7.4	21.9	63.3	102.3	31.9	90.8	139.3	183.4	299.7	463.1	784.0
45°C	60	6.6	19.7	56.9	91.9	28.7	81.6	125.1	164.8	269.3	416.1	704.4
	80	7.3	21.7	62.7	101.4	31.6	90.0	138.0	181.8	297.0	458.9	776.9
	100	8.0	23.6	68.2	110.3	34.4	97.9	150.1	197.7	323.0	499.1	844.9
50°C	60	6.9	20.5	59.2	95.8	29.8	85.0	130.3	171.7	280.4	433.4	733.6
	80	7.7	22.9	66.3	107.2	33.4	95.1	145.9	192.2	313.9	485.1	821.2
	100	8.5	25.2	72.8	117.7	36.7	104.4	160.1	211.0	344.6	532.5	901.5

# Discharge Regulators for Supermarket Applications

The Parker Refrigerating Specialties Division has built a reputation as a principal supplier of reliable, high side control valves to the supermarket industry. One of the more critical applications on a commercial refrigeration system where hot gas is utilized for defrosting purposes is the use of a regulator in the discharge line. Refrigerating Specialties types A81BL or A82BL have become a standard for many supermarket rack manufacturers specifically for this application.

The “BL” version of an A8 regulator in a discharge application serves two functions. The valve is either in a wide open (or bypassed) position with its solenoid energized to facilitate a minimum pressure drop through the valve when no refrigeration circuits are calling for defrost. In this mode, the valve essentially is acting as a low pressure drop solenoid in an opened position. When a refrigeration circuit begins a defrost sequence

however, the solenoid on the discharge A8\_BL regulator is de-energized (via the defrost program), thereby converting the valve into a differential pressure regulator.

A differential regulator communicates outlet pressure into the valve’s bonnet in order to compensate range spring pressure with downstream pressure. The set point of the valve thus becomes the sum of spring pressure plus outlet pressure. Whatever the range spring pressure is set for effectively becomes the pressure difference the valve will maintain from its inlet to outlet. If, for example, the regulator was set to maintain a 25 psi set point, the valve will regulate and maintain an upstream pressure 25 psi higher than its downstream pressure, regardless of fluctuations in downstream pressure. In this application, the regulator ensures that the hot gas pressure supplied to a circuit for defrost purposes will be high enough to overcome the

pressure drop through the supply line, the losses through valves and fittings, and through the evaporator coil. The defrost condensate exits the evaporator and is then introduced, at an elevated pressure, back into the liquid line.

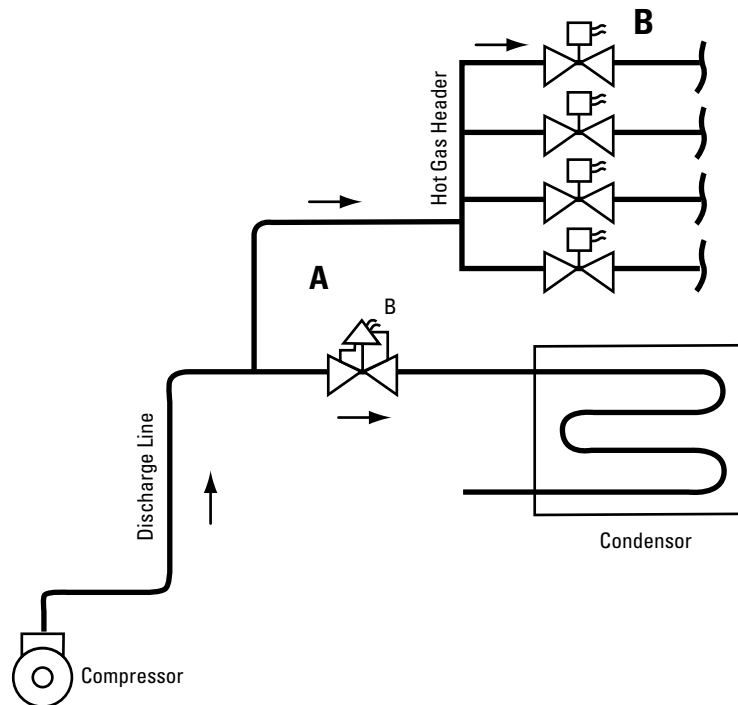
Because each system may vary due to any number of design considerations, the A81BL and A82BL regulators are field adjustable. The regulator can therefore be adjusted to determine the most efficient set point while ensuring that each evaporator defrosts in a timely and thorough manner.

For larger systems that exceed the capacity of the A8 regulator line, Refrigerating Specialties offers a higher capacity flanged valve for discharge applications, the A4AB or A4ABL.

For sizing, please see “Discharge Capacities” on pages 54 – 55.

**Figure 6** — Discharge regulator for supermarket applications. See page 62 for symbols legend.

Valve Legend				
Label	Valve Function	Application	Design	Selection Page
A	Inlet Pressure Regulator	Discharge Pressure	A8	63
B	Solenoid Valve	Liquid Feed	SC	63





# Crankcase Pressure Regulators

Crankcase pressure regulators, also known as “CPRs” or “holdback” regulators, are outlet pressure regulators installed in the suction line which prevent an excessive downstream pressure regardless of fluctuations in load or inlet conditions. Flo-Con types A8AOE, A810E, and A820E comprise the line of outlet pressure regulators that can be applied as crankcase pressure regulators.

When system conditions occur that allow suction pressures to increase appreciably above normal operating levels, a crankcase regulator should be applied. Without a downstream regulator, which

effectively throttles down the suction pressure to the compressor, a compressor motor overload condition can occur. Such conditions are likely during pull down after a hot gas defrost period, or during system start-up. An A8-OE outlet regulator will gradually close when the downstream pressure begins to rise above the valve’s set point, and will gradually open when the outlet pressure falls below its set point, effectively preventing the compressor suction pressure from exceeding the regulator’s set point.

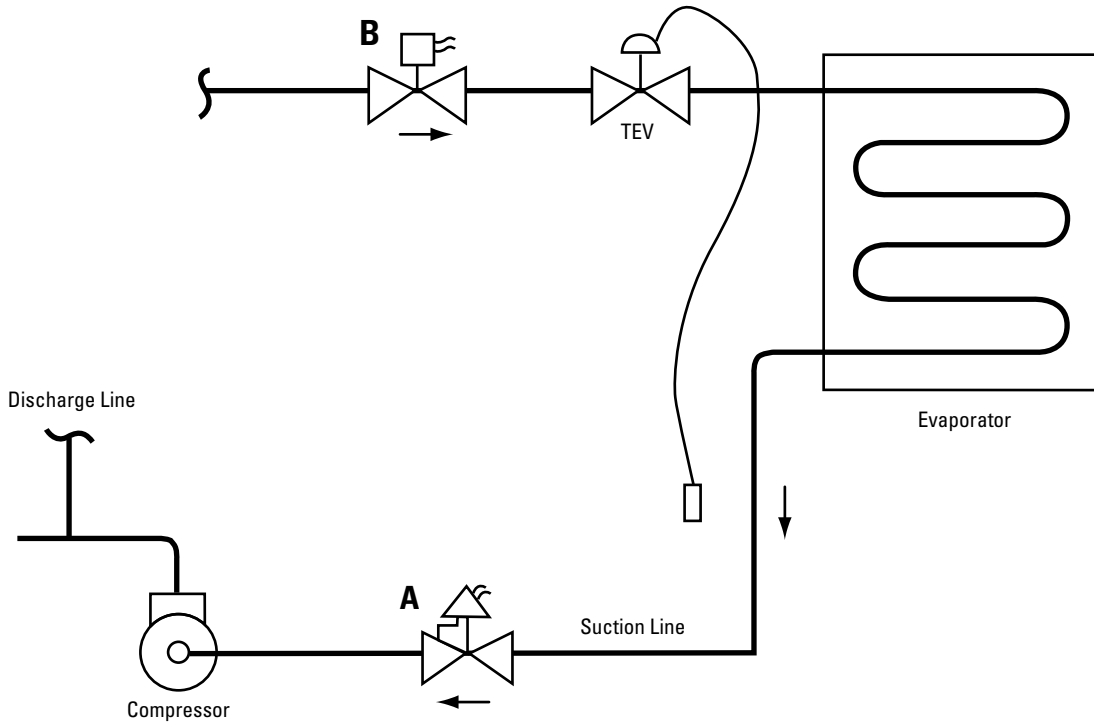
No crankcase regulator can maintain its set for pressure if branch lines feed

into the main suction line downstream of the regulator. For that reason, it is important that no lines feed into the suction line between the regulator and the compressor.

(For sizing, please reference suction capacity charts for A8 regulators on pages 7 through 14.)

**Figure 7** — Crankcase pressure regulator application. See page 62 for symbols legend.

Valve Legend				
Label	Valve Function	Application	Design	Selection Page
A	Outlet Pressure Regulator	Discharge Pressure	A8	63
B	Solenoid Valve	Liquid Feed	SC	63



# SC Suction Solenoid Valves

## Features and Benefits

- Highest capacity non-flanged valve in the industry
- Available with 208V/240V/60Hz wide range voltage coil
- Low pressure drop, internally pilot operated
- All stainless steel bolts, stem, piston and plug
- Manual opening stem
- Solder in place without disassembly
- Molded class "F" coil construction
- DIN coil assemblies available
- Interchangeable capacity cartridges. Same as those used on (S)PORT EPRs

## Specifications

- Design Pressure (M.R.P.): 450 psig (31.0 bar)
- Maximum opening pressure differential (MOPD): 300 psig (20.7 bar). (Except 208/240V/60Hz wide voltage range coil)
- Minimal fluid temperature: -40°F (-40°C)
- UL listed (except 50 Hz versions), file SA5473
- CSA certified, file LR20991-14

## Standard Voltages

- 120V/60Hz, 110V/50Hz
- 208V/240V/60Hz, 220V/50Hz
- 240V/50Hz
- 240V/60Hz, 220V/50Hz (DIN)
- 240V/50Hz (DIN)



## Nomenclature (Example)

<b>SC</b>	<b>1 or 2</b>	<b>11</b>	<b>11</b>
<b>Suction Solenoid</b>	<b>Body Size</b>	<b>Port Size in Eighths of an Inch</b>	<b>Connection Size in Eighths of an Inch</b>

## SC Port/Connection Size Combinations\*

Type	Port Size			Connection Sizes Available
	Connection	Inches	mm	
SC1 or SC-II	03	3/8	9	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	05	5/8	15	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	07	7/8	22	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	09	1-1/8	28	07, 09, 11, 13, 17 (7/8"/22mm, 1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
	11	1-3/8	35	09, 11, 13, 17 (1-1/8"/28mm, 1-3/8"/35mm, 1-5/8"/42mm, 2-1/8"/54mm)
SC2	13	1-5/8	42	13, 17, 21 (1-5/8"/42mm, 2-1/8"/54mm, 2-5/8"/66mm)
	17	2-1/8	54	17, 21 (2-1/8"/54mm, 2-5/8"/66mm)
	21	2-5/8	66	21 (2-5/8"/66mm)

\*Note: Completely corrosion resistant SC-II solenoids with aluminum bronze bodies and cartridge assemblies have same port/connection combinations as standard SC solenoids, but are not available in the 13, 17, or 21 port size versions.

**Description:** The SC series of commercial solenoids was developed as a flexible, low pressure drop, suction line solenoid valve, in a wide range of port and connection sizes. With cartridge (port) sizes available up to 2-5/8" (66mm) in size, SC solenoids offer the greatest capacity of any non-flanged commercial solenoid in the industry. The unique design of the SC solenoid is a mirror image of the (S)PORT regulator line, utilizing the same cartridges, solenoid coil

assemblies, bodies, and internal parts as those used in the construction of the (S) PORT regulators. With this flexible line of suction line solenoids complementing the complete line of (S)PORT regulators, a wide range of high capacity, suction line refrigeration control valves are now available from a single source.

Along with (S)PORT regulators, SC solenoids are manufactured with ductile iron bodied valves with brazed copper

couplings, and are suitable for most common commercial refrigerants along with certain oils. The SC solenoid may be opened by means of a manual opening stem for servicing or in case of an electrical power failure.

The SC-II series of valves are manufactured with completely corrosion resistant materials including aluminum bronze bodies and cartridge assemblies, and stainless steel adaptor bolts. Cartridges,

## SC Suction Solenoid Valves

and solenoids are interchangeable with the (S)PORT-II regulator line.

**Variations:** SC1/ SC-II Solenoids: Five port sizes, from 3/8" (9mm) through 1-3/8" (35mm). SC2 Solenoid: three port sizes, from 1-5/8" (42mm) through 2-5/8" (66mm).

**Installation:** SC solenoid valves can be mounted either in a vertical or horizontal line with the refrigerant flow in the direction of the arrow on the body. These valves may be soldered into the line without disassembly. When brazing in line, typically a wet cloth wrapped

around the valve body is recommended to dissipate heat. **If a valve is disassembled prior to installation, always have the correct gasket/ O-ring kit available for reassembly.** The internal cartridge-to-body O-ring will need to be replaced prior to reassembly.

**Electrical:** SC commercial solenoid valves utilize a molded water resistant Class "F" solenoid coil with an open frame coil housing that meets NEMA 3R and 4 requirements. A class "H" DIN coil is also available with certain voltages. Power consumption during normal operation will be 10.2 watts or less.

All coils except for the 208/240V/60Hz version operate with a 300 psi (20.7 bar) maximum opening pressure differential (MOPD). The 208/240V/60Hz coil operates with a 280 psi (19.3 bar) MOPD.

All coils are designed to operate with a line voltage from 85% to 110% of rated coil voltage. Operating with a line voltage above or below these limits may result in coil burn out.

**Ordering Guide:** Specify valve type (SC1, SC-II or SC2), port and connection size, coil voltage, and frequency.

**Note:** For SC valve suction capacity tables, please reference pages 7 - 14 of this catalog.

### SC1/SC2 Liquid Capacities in Evaporator Tons

Based on 100°F Condensing, 40°F Evaporator and no flashing through the valve for the pressure drop listed.

Port Size	R-22 2 psi Pressure Drop	R-22 4 psi Pressure Drop	R-134a 2 psi Pressure Drop	R-134a 4 psi Pressure Drop	R-404A 2 psi Pressure Drop	R-404A 4 psi Pressure Drop	R-507 2 psi Pressure Drop	R-507 4 psi Pressure Drop
03 (3/8")	6	9	6	9	4	6	4	6
05 (5/8")	14	20	13	19	9	12	9	13
07 (7/8")	22	31	21	29	14	19	14	20
09 (1-1/8")	35	50	33	47	22	31	23	32
11 (1-3/8")	49	69	46	65	30	43	32	45
13 (1-5/8")	78	110	73	104	48	68	50	71
17 (2-1/8")	117	165	110	156	72	102	76	107
21 (2-5/8")	156	220	147	207	96	136	101	143

### SC1/SC2 Liquid Capacities in Evaporator Kilowatts

Based on 37.7°C Condensing, 4.4°C Evaporator and no flashing through the valve for the pressure drop listed.

Port Size	R-22 0.14 bar Pressure Drop	R-22 0.27 bar Pressure Drop	R-134a 0.14 bar Pressure Drop	R-134a 0.27 bar Pressure Drop	R-404A 0.14 bar Pressure Drop	R-404A 0.27 bar Pressure Drop	R-507 0.14 bar Pressure Drop	R-507 0.27 bar Pressure Drop
03 (9mm)	23	32	21	30	14	20	15	21
05 (15mm)	50	71	47	67	31	44	32	46
07 (22mm)	78	110	73	103	48	68	50	71
09 (28mm)	123	174	116	164	76	107	80	113
11 (35mm)	172	243	162	229	106	150	111	157
13 (42mm)	274	387	258	365	169	239	177	251
17 (54mm)	411	581	387	547	253	358	266	376
21 (66mm)	548	775	516	729	338	477	354	501

# Abbreviations and Terminology

## Abbreviations

A (Amp)	Ampere
BTU/hr	British Thermal Units per Hour
BTU/min.	British Thermal Units per Minute
°C	Degrees Celsius or Centigrade
cm <sup>2</sup> (sq. cm)	Square centimeters
CPR	Crankcase Pressure Regulator
CSA	Canadian Standards Association
°F	Degrees Fahrenheit
EPR	Evaporator Pressure Regulator
ft (')	Feet
in (")	Inches
hg	Mercury
Hz	Hertz (frequency, cycles per second)
ID	Inside diameter
kcal/h	Kilocalories per hour
kg	Kilogram
kg/cm <sup>2</sup>	Kilogram per square centimeter
kW	Kilowatts
lbs	Pounds
lbs/min	Pounds per minute
m	Meter
m <sup>3</sup> /h	Cubic meters per hour
mm	Millimeter
mm hg	Millimeters mercury equivalent vacuum
MOPD	Maximum Opening Pressure Differential
NEMA	National Electrical Manufacturers Association
NPT	National Pipe Thread
OD	Outside Diameter
ODS	Outside Diameter Sweat or tubing O.D., which can be soldered into fitting
psi	Pounds per square inch
psig	Pounds per square inch gauge
sq. cm (cm <sup>2</sup> )	Square centimeters
SWP	Safe Working Pressure
TEV	Thermostatic Expansion Valve
UL	Underwriters Laboratories, Inc.
V	Volts

## Explanation of Terminology

**Design pressure (SWP):** The maximum allowable working pressure for which a valve or regulator is designed.

**Evaporator temperature:** Saturated temperature in the evaporator.

**Maximum fluid temperature:** The highest normally allowable internal temperature for a particular valve.

**Maximum Opening Pressure Differential:** The maximum difference between the pressure at the valve inlet and the pressure at the valve outlet at which a solenoid will open consistently (MOPD).

**Minimum fluid temperature:** The lowest normally allowable internal temperature for a particular valve assuming a clean, oil-free fluid and the absence of thermal or pressure shock.

**Net weight:** The weight of a particular valve. Does not include shipping cartons.

**Pressure drop:** The pressure difference between the pressure at the valve inlet and the pressure at the valve outlet.

**Shock:** A sudden, violent increase in pressure; can be caused by a rapid change in temperature, pressure, velocity, or direction.

**Valve or regulator capacity:** All capacities are maximum for the conditions listed at each table. No "reserve capacity" is included in this catalog.

### Conversions to metric:

- 1 ton = 200 BTU/min
- 1 ton = 3024kcal/hr
- 1 kW = .2844 ton
- 1 kW = 56.89 BTU/min
- 1 kW = 860 kcal/hr
- 1 bar = 1.0197 kg/cm<sup>2</sup>
- 1 bar = 14.5 psi
- 1 ATM = .98 bar = 14.7 psi

## Control Valve Symbols and Functions



**Inlet Pressure Regulator**  
(Opens on a rise in inlet pressure. Closes when inlet pressure is below set-point)



**Outlet Pressure Regulator**  
(Opens on a drop in outlet pressure. Closes when outlet pressure is above set-point)



**Differential Pressure Regulator**  
(Opens on a rise in pressure difference. Closes when pressure difference is below set-point or above set-point)



**Inlet Pressure Regulator w/Electric Shut-off**  
(Opens on a rise in inlet pressure when energized. Closes when inlet pressure is below set-point or when de-energized)



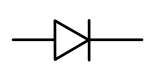
**Inlet Pressure Regulator w/Electric Bypass**  
(Opens on a rise in inlet pressure when de-energized. Wide open when energized)



**Inlet Pressure Regulator w/Electric Shut-off and Electric Bypass**  
(Opens on a rise in inlet pressure when "S" solenoid energized. Wide open with "B" solenoid energized. Closes with both solenoids de-energized)



**Solenoid Valve**  
(Opens when energized. Closes when de-energized)



**Check Valve**  
(Permits flow in one direction)

# Parker Refrigerating Specialties

## Commercial Control Valves – Selection Guide

Valve Type	Valve Description	Typical Applications	Reference Bulletin
A8A, A81, A82	Inlet, or Upstream Pressure Regulator	Evaporator Pressure Control Discharge Pressure Regulator Liquid Drain Regulator Defrost Relief Regulator	Bulletin 25-94B
A8AS, A81S, A82S	Inlet Pressure Regulator w/Electric Shut-Off Feature	Evaporator Pressure Control	
A8AB, A81B, A82B	Inlet Pressure Regulator w/Electric Bypass Feature	Discharge Pressure Regulator	
A8AL, A81L, A82L, A4AL	Differential Pressure Regulator	Discharge Pressure Regulator Liquid Feed Regulator	
A8ABL, A81BL, A82BL, A4ABL	Differential Pressure Regulator w/ Electric Bypass Feature	Discharge Pressure Regulator Liquid Feed Regulator	
A8AOE, A81OE, A82OE	Outlet Pressure Regulator	Crankcase Pressure Regulator Hot Gas Bypass Regulator Receiver Pressure Regulator	Bulletin 25-94B
A8AOES, A81OES, A82OES	Outlet Pressure Regulator w/ Electric Shut-Off Feature	Hot Gas Bypass Regulator	
PORT, PORT-II	Inlet, or Upstream Pressure Regulator	Evaporator Pressure Control	Bulletins 26-01 & 26-02
(S)PORT, (S)PORT-II	Inlet Pressure Regulator w/ Electric Shut-Off Feature	Evaporator Pressure Control	
(S)PORT-B, (S)PORT-II-B	Inlet Pressure Regulator w/ Electric Shut-Off and Bypass Features	Evaporator Pressure Control	
A9	Outlet Pressure Regulator	Receiver Pressure Regulator	Bulletin 25-95D
A9E	Outlet Pressure Regulator w/ External Equalizer	Hot Gas Bypass Regulator	
A9S	Outlet Pressure Regulator w/ Electric Shut-Off Feature	Receiver Pressure Regulator	
A9SE	Outlet Pressure Regulator w/ Electric Shut-Off Feature and External Equalizer	Hot Gas Bypass Regulator	
CK4A	Flanged in Line Check Valve	Liquid Drain Check Valve Condenser Bypass Check Valve	Bulletin 50-16C
SC1, SC2	Suction Line Solenoid Valves	Control (open/close) of Suction Lines for Defrost Hot Gas Feed Solenoid Liquid Supply Solenoid	Bulletin 33-00

## OFFER OF SALE

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

1. **Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at [www.parker.com/saleterms/](http://www.parker.com/saleterms/). Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.

2. **Price Adjustments; Payments.** Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. **Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.

4. **Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. This warranty is made only to Buyer and does not extend to anyone to whom Products are sold after purchased from Seller. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

5. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.

6. **LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN**

**IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. **Contingencies.** Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.

8. **User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

9. **Loss to 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 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.

10. **Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. 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 manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and 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.

11. **Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.

12. **Improper use and indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

13. **Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

14. **Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

15. **Entire Agreement.** This agreement constitutes the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior

or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

16. **Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. **Termination.** This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. **Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

19. **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 Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). 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 a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's 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 a Product 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 the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product 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 Products 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 Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. **Taxes.** Unless otherwise indicated, 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 Products.

21. **Equal Opportunity Clause.** For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.





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