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Accumulators and Receivers

Catalog C-1, October 2007



ENGINEERING YOUR SUCCESS.

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Suction Line Accumulators

Design

The function of a suction line accumulator in a heat pump or refrigeration system is to catch and hold any unused portion of the system charge. The device must also prevent liquid slugging of the compressor and excessive refrigerant dilution of the compressor oil.

The accumulator must return refrigerant and oil to the compressor at a sufficient rate to maintain both system operating efficiency and proper crankcase oil level. To make sure these tasks are accomplished, system designers must consider the following items:

- A properly sized and protected oil return orifice is required to ensure positive oil (and refrigerant) return to the compressor
- The accumulator must have sufficient internal volume
- The pressure drop across the accumulator should be as low as possible

Oil return at a minimum flow rate is controlled by the outlet U-tube size. Refrigerant and oil will be returned to the compressor by pressure drop across the orifice metering area and the liquid head above the orifice. Other design requirements include safe working pressure, agency approvals and corrosion resistance.

Figure 1 illustrates a typical accumulator with an inlet deflector. The shape of the deflector directs the inlet flow in a slightly downward tangential direction.

The inlet to the U-tube is located behind the inlet deflector to prevent liquid carry-over and is bell-shaped to reduce the sudden contraction loss of the high-velocity gas. The U-tube diameter is selected to minimize pressure drop at high flow rates yet provide adequate oil return at low flow rates.

Other features include a 50 x 60 mesh screen to protect the oil return orifice, an anti-siphon hole and a fusible alloy plug in the accumulator. The anti-siphon hole located near the outlet of the U-tube prevents liquid from siphoning into the outlet tube and compressor during an off-cycle. The fusible alloy

plug is generally a U.L. requirement since it is a safety device to protect against excessive pressure in the event of a fire.

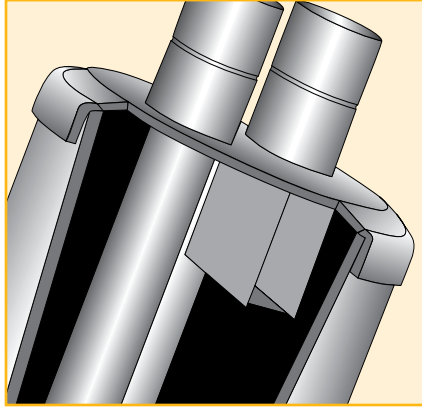


Figure 1
Typical accumulator with inlet deflector baffle.

Selection

Accumulator selection can be fine-tuned for best performance. This involves the sizing of the accumulator and the sizing of the orifice. The controlling factor for both types is the type of metering device used in the system. In systems using a **fixed orifice**, the accumulator holding capacity should be about 70% of the system charge. This provides adequate holding capacity during operation with blocked or fouled heat exchanger coils. The resulting high discharge/low suction pressure condition will result in more liquid refrigerant in the accumulator. The oil return orifice size should be small to prevent excess liquid refrigerant being returned to the compressor. For these systems, a 0.040 inch (1.02 mm) diameter orifice is the recommended starting point.

Systems with a **thermostatic expansion valve (TEV)**, the accumulator holding capacity should be approximately 50% of the system charge. At startup and after defrost the bulb of the TEV is warm. Until the valve regains control, the accumulator plays a role in preventing liquid slugging of the compressor. The accumulator must also contend with off cycle refrigerant migration. At shut-down, the accumulator is the coldest component in the system. This results in migration of liquid refrigerant to the device. This type of system needs to return the refrigerant to circulation more quickly than the fixed orifice

system. For these systems, a 0.055 inch (1.4 mm) diameter orifice allows quick return of the liquid refrigerant. The recommended sizes of the orifices can be further tested for optimum results. Other size orifices are possible to satisfy the characteristics required by the system designer.

New Refrigerants

The introduction of alternative refrigerants and oils requires reviewing the design of components within the system, including suction accumulators. As previously stated, the accumulator is the coldest component in the system. The new refrigerants and oils may or may not be fully miscible in the temperature range the accumulator normally operates. The oil and refrigerant can separate into oil rich and refrigerant rich layers in the accumulator, with the refrigerant rich layer at the bottom. The oil return orifice would be located in the refrigerant rich layer.

The solution to this problem is to provide active mixing of the layers in the accumulator. This is accomplished by the shape and position of the inlet deflector and outlet U-tube. The inlet flow stream is directed tangentially into the liquid layers in the bottom of the accumulator. The resulting circulation of the liquid past the off center U-tube forces a mixing of the oil and refrigerant layers.

Field Replacement

The accumulator should be changed when a compressor is replaced. The old accumulator may contain contaminants from the problem that caused the compressor failure. There may also be considerable oil remaining from the first compressor if a gradual loss of refrigerant caused the failure. This amount coupled with the oil in the replacement compressor may create an oil overcharge condition.

Steel Suction Line Accumulators

U-Tube Style Accumulators

The U-tube accumulator design is a result of extensive laboratory testing plus detailed investigation of the various accumulators currently available. It takes into account essential requirements such as safe holding volume (relative to the system's total charge), protected flow control for positive refrigerant and oil return, and minimum pressure drop across the accumulator.

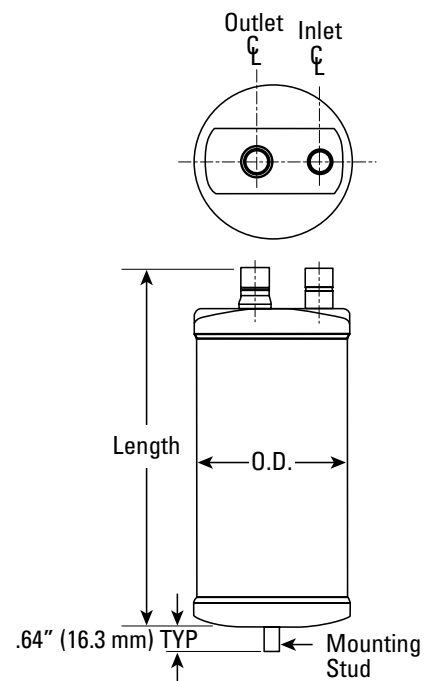
Parker offers standard accumulator models designed for application on heat pump and refrigeration systems from 1/4 ton (.88 kW) through 12 tons (42.2 kW). Liquid refrigerant holding requirements of suction accumulator may vary by application.

Features and Benefits

- Solid copper connections
- U-tube design for maximum flow of refrigerant and minimum oil entrapment
- Inlet flow deflector guides refrigerant toward wall for smooth tangential flow and gradual expansion
- U-tube entrance is positioned behind the inlet flow deflector to prevent unwanted liquid refrigerant from entering and damaging compressor
- Metering orifice matched to system capacity assures optimum liquid refrigerant and oil flow back to compressor
- Protective screen and orifice assembly on U-tube protects against contaminants affecting metering function
- Fittings and U-tube are matched to accumulator holding capacity and total system charge for minimum pressure drop and maximum refrigerant flow
- U.L. listed for 355 psig (24.5 bar) maximum working pressure. File No. SA5172
- Powder coating surpasses 500 hour ASTM salt spray
- Integral 430°F (221°C) fuse plugs (U.L. File No. SA5441)

Dimensions and Flow Data

Refer to pages 5 and 6 for dimension values and flow data.



Steel Suction Line Accumulators - Specifications - Tons, psi, °F

Model Number	Conn. Inches (ODF)	Dimensions (Inches)		Capacity Ounces* (wt.)	Evap. Temp. °F	Recommended capacity in tons of refrigeration									
		Length	O.D.			R-22 & R-404A		R-134a		R-407C		R-410A		R-507	
						Tons @ 1 psi	Min. Tons	Tons @ 1 psi	Min. Tons	Tons @ 1 psi	Min. Tons	Tons @ 1 psi	Min. Tons	Tons @ 1 psi	Min. Tons
PA3060-10-4	1/2	10.35	3	35	40	2.00	0.35	1.67	0.30	1.97	0.46	1.93	1.44	1.48	0.27
PA3060-10-5	5/8	10.35	3	35	-20	1.33	0.21	0.69	0.11	1.32	0.11	1.30	0.42	0.93	0.16
PA3060-15-5	5/8	15.05	3	55	40	2.10	0.35	1.75	0.30	2.07	0.46	2.02	1.44	1.55	0.27
					-20	1.40	0.21	0.73	0.11	1.39	0.11	1.36	0.42	0.98	0.16
PA3060-15-6	3/4	15.05	3	54	40	2.30	0.35	1.92	0.30	2.27	0.46	2.22	1.44	1.70	0.27
					-20	1.53	0.21	0.80	0.11	1.52	0.11	1.49	0.42	1.07	0.16
PA4065-9-5C	5/8	9.62	4	60	40	2.96	0.35	2.47	0.30	2.92	0.46	2.85	1.44	2.19	0.27
					-20	1.98	0.21	1.03	0.11	1.96	0.11	1.93	0.42	1.39	0.16
PA4065-9-6C	3/4	9.62	4	58	40	3.00	0.35	2.53	0.30	2.96	0.46	2.89	1.44	2.20	0.28
					-20	2.00	0.21	1.05	0.11	1.98	0.11	1.95	0.42	1.40	0.16
PA5083-9-6C	3/4	9.62	5	89	40	3.82	0.57	3.19	0.49	3.77	0.69	3.68	2.16	2.82	0.46
					-20	2.55	0.35	1.32	0.18	2.53	0.16	2.48	0.63	1.79	0.27
PA5083-9-7C	7/8	9.63	5	86	40	3.90	0.57	3.21	0.49	3.85	0.69	3.76	2.16	2.80	0.46
					-20	2.60	0.35	1.33	0.18	2.58	0.16	2.53	0.63	1.80	0.27
PA5083-12-7C	7/8	12.88	5	125	40	5.41	0.88	4.51	0.75	5.34	0.96	5.21	3.03	4.00	0.70
					-20	3.61	0.54	1.87	0.28	3.58	0.22	3.52	0.88	2.53	0.41
PA5083-11-7C	7/8	11.33	5	108	40	4.38	0.57	3.21	0.43	4.32	0.69	4.22	2.16	3.23	0.46
					-20	2.92	0.35	1.33	0.16	2.89	0.16	2.84	0.63	2.04	0.27
PA5083-11-6C	3/4	11.33	5	111	40	3.85	0.57	3.21	0.49	3.80	0.69	3.71	2.16	2.84	0.46
					-20	2.56	0.35	1.33	0.18	2.54	0.16	2.49	0.63	1.80	0.27
PA5083-15-7C	7/8	15.34	5	156	40	6.20	0.88	5.17	0.75	6.12	0.96	5.97	3.03	4.58	0.70
					-20	4.13	0.54	2.15	0.28	4.09	0.22	4.02	0.88	2.90	0.41
PA5083-17-7C	7/8	17.25	5	179	40	6.20	0.88	5.17	0.75	6.12	0.96	5.97	3.03	4.58	0.70
					-20	4.13	0.54	2.15	0.28	4.09	0.22	4.02	0.88	2.90	0.41
PA6125-15-9C	1-1/8	15.00	6	211	40	9.00	3.00	8.83	1.97	8.88	1.57	8.67	4.93	7.30	3.00
					-20	4.30	0.80	4.31	0.50	4.26	0.36	4.19	1.43	3.40	0.80
PA6125-15-11C	1-3/8	15.25	6	214	40	12.00	3.00	12.05	1.97	11.85	1.57	11.56	4.93	9.80	3.00
					-20	5.80	0.80	5.82	0.50	5.75	0.36	5.65	1.43	4.60	0.80
PA6125-18-9C	1-1/8	18.00	6	264	40	8.80	3.00	8.84	1.97	8.69	1.57	8.48	4.93	7.20	3.00
					-20	4.30	0.80	4.31	0.50	4.26	0.36	4.19	1.43	3.40	0.80
PA6125-18-11C	1-3/8	18.00	6	267	40	11.00	3.00	11.05	1.97	10.86	1.57	10.59	4.93	9.10	3.00
					-20	5.40	0.80	5.42	0.50	5.35	0.36	5.26	1.43	4.20	0.80
PA6125-20-11C	1-3/8	20.25	6	302	40	11.00	3.00	11.05	1.97	10.86	1.57	10.59	4.93	9.10	3.00
					-20	5.40	0.80	5.42	0.50	5.35	0.36	5.26	1.43	4.20	0.80
PA6125-22-11C	1-3/8	22.81	6	352	40	11.00	3.00	11.05	1.97	10.86	1.57	10.59	4.93	9.10	3.00
					-20	5.40	0.80	5.42	0.50	5.35	0.36	5.26	1.43	4.20	0.80

* Holding capacity of R-22 at 40°F. Divide by 0.7 to obtain recommended maximum system charge on fixed orifice systems. Consult Parker for availability.

Steel Suction Line Accumulators - Specifications - kW, bar, °C

Model Number	Conn. Inches (ODF)	Dimensions (mm)		Capacity Grams*	Evap. Temp. °C	Recommended capacity in kW of refrigeration									
		Length	O.D.			R-22 & R-404A		R-134a		R-407C		R-410A		R-507	
						kW @ 0.07 bar	Min. kW	kW @ 0.07 bar	Min. kW	kW @ 0.07 bar	Min. kW	kW @ 0.07 bar	Min. kW	kW @ 0.07 bar	Min. kW
PA3060-10-4	1/2	263	76	992	4.4	7.03	1.23	5.87	1.06	6.93	1.62	6.79	5.06	5.20	0.95
PA3060-10-5	5/8	263	76	992	-29	4.68	0.74	2.43	0.39	4.64	0.39	4.57	1.48	3.27	0.56
PA3060-15-5	5/8	382	76	1559	4.4	7.39	1.23	6.15	1.06	7.28	1.62	7.10	5.06	5.45	0.95
					-29	4.92	0.74	2.57	0.39	4.89	0.39	4.78	1.48	3.45	0.56
PA3060-15-6	3/4	382	76	1531	4.4	8.09	1.23	6.75	1.06	7.98	1.62	7.81	5.06	5.98	0.95
					-29	5.38	0.74	2.81	0.39	5.35	0.39	5.24	1.48	3.76	0.56
PA4065-9-5C	5/8	244	102	1701	4.4	10.4	1.23	8.69	1.06	10.3	1.62	10.0	5.06	7.70	0.95
					-29	6.96	0.74	3.62	0.39	6.89	0.39	6.79	1.48	4.89	0.56
PA4065-9-6C	3/4	244	102	1644	4.4	10.6	1.23	8.90	1.06	10.4	1.62	10.2	5.06	7.74	0.99
					-29	7.03	0.74	3.69	0.39	6.96	0.39	6.86	1.48	4.92	0.56
PA5083-9-6C	3/4	244	127	2523	4.4	13.4	2.00	11.2	1.72	13.3	2.43	12.9	7.60	9.92	1.62
					-29	8.97	1.23	4.64	0.63	8.90	0.56	8.72	2.22	6.30	0.95
PA5083-9-7C	7/8	245	127	2438	4.4	13.7	2.00	11.3	1.72	13.5	2.43	13.2	7.60	9.85	1.62
					-29	9.14	1.23	4.68	0.63	9.07	0.56	8.90	2.22	6.33	0.95
PA5083-12-7C	7/8	327	127	3544	4.4	19.0	3.09	15.9	2.64	18.8	3.38	18.3	10.7	14.1	2.46
					-29	12.7	1.90	6.58	0.99	12.6	0.77	12.4	3.09	8.90	1.44
PA5083-11-7C	7/8	288	127	3062	4.4	15.4	2.00	11.3	1.51	15.2	2.43	14.8	7.60	11.4	1.62
					-29	10.3	1.23	4.68	0.56	10.2	0.56	9.99	2.22	7.17	0.95
PA5083-11-6C	3/4	288	127	3147	4.4	13.5	2.00	11.3	1.72	13.4	2.43	13.0	7.60	9.99	1.62
					-29	9.00	1.23	4.68	0.63	8.93	0.56	8.76	2.22	6.33	0.95
PA5083-15-7C	7/8	390	127	4423	4.4	21.8	3.09	18.2	2.64	21.5	3.38	21.0	10.7	16.1	2.46
					-29	14.5	1.90	7.56	0.99	14.4	0.77	14.1	3.09	10.2	1.44
PA5083-17-7C	7/8	438	127	5075	4.4	21.8	3.09	18.2	2.64	21.5	3.38	21.0	10.7	16.1	2.46
					-29	14.5	1.90	7.56	0.99	14.4	0.77	14.1	3.09	10.2	1.44
PA6125-15-9C	1-1/8	381	152	5982	4.4	31.7	10.6	31.1	6.93	31.2	5.52	30.5	17.3	25.7	10.6
					-29	15.1	2.81	15.2	1.76	15.0	1.27	14.7	5.03	12.0	2.81
PA6125-15-11C	1-3/8	387	152	6067	4.4	42.2	10.6	42.4	6.93	41.7	5.52	40.7	17.3	34.5	10.6
					-29	20.4	2.81	20.5	1.76	20.2	1.27	19.9	5.03	16.2	2.81
PA6125-18-9C	1-1/8	457	152	7484	4.4	30.9	10.6	31.1	6.93	30.6	5.52	29.8	17.3	25.3	10.6
					-29	15.1	2.81	15.2	1.76	15.0	1.27	14.7	5.03	12.0	2.81
PA6125-18-11C	1-3/8	457	152	7569	4.4	38.7	10.6	38.9	6.93	38.2	5.52	37.2	17.3	32.0	10.6
					-29	19.0	2.81	19.1	1.76	18.8	1.27	18.5	5.03	14.8	2.81
PA6125-20-11C	1-3/8	514	152	8562	4.4	38.7	10.6	38.9	6.93	38.2	5.52	37.2	17.3	32.0	10.6
					-29	19.0	2.81	19.1	1.76	18.8	1.27	18.5	5.03	14.8	2.81
PA6125-22-11C	1-3/8	579	152	9979	4.4	38.7	10.6	38.9	6.93	38.2	5.52	37.2	17.3	32.0	10.6
					-29	19.0	2.81	19.1	1.76	18.8	1.27	18.5	5.03	14.8	2.81

* Holding capacity of R-22 at 4.4°C. Divide by 0.7 to obtain recommended maximum system charge on fixed orifice systems. Consult Parker for availability.

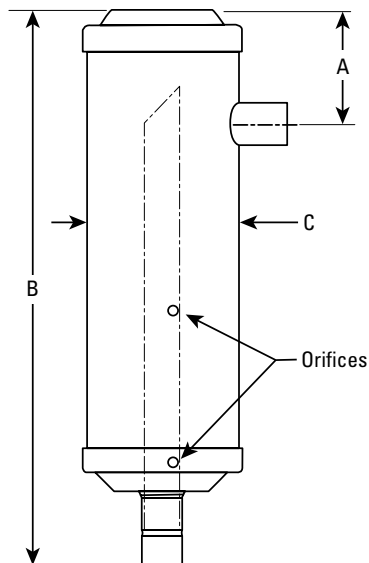
Stand Pipe Style Steel Accumulators - OEM

Features and Benefits

- Available in 2-1/2 (64 mm), 3 (76 mm) and 4 (102 mm) inch diameters
- Copper and copper plated steel fittings
- Standard fitting sizes: 3/4 ODF and 7/8 ODF other sizes available upon request
- Dual screened orifice design, various orifice sizes available
- U.L. listed file no. SA5172, CSA certified



Dimensions



Specifications

Model Number	Connection Size (Inches)	'A'		'B'		'C'		Orifice Diameter		Volume	
		Inches	mm	Inches	mm	Inches	mm	Inches	mm	Cu. In.	cm ³
P3060-11-6C	3/4 ODF	2.25	57.2	11.00	279	3.00	76	0.060	1.52	41.5	680
P3060-13-7C	7/8 ODF	2.25	57.2	13.00	330	3.00	76	0.060	1.52	50.0	819
P3060-13-7C	7/8 ODF	2.25	57.2	13.00	330	3.00	76	0.060	1.52	50.0	819

Vertical, Horizontal, and Stand-Pipe Copper Accumulators - OEM

Parker's Vertical, Horizontal, and Stand-Pipe Copper Accumulators hold unused system charge to prevent liquid slugging of the compressor and excessive refrigerant dilution of the compressor oil.

Applications

- Low temperature refrigeration and heat-pump applications
- Residential air conditioning systems

Features and Benefits

- Accumulators available in vertical (inlet and outlet on same end), horizontal (inlet and outlet on opposite ends), and stand-pipe designs
- Stand-pipe design can be made with or without an orifice to meter oil return to the compressor
- Systems using a rotary compressor should use a stand-pipe accumulator including a screened baffle and an oil-return orifice for maximum system performance
- A wide variety of O.D. and volume sizes are designed to meet the unique requirements of a system
- Bifurcated ODF solder in a variety of sizes provide for easy installation



1-1/8" Copper Accumulator

Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
032185-00	500	34.5	3/8	1/4	8.25	210	1.97	32.3	1.13	28.7

1-3/16" Copper Accumulator

Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
056268-00	400	27.6	3/8	3/8	5	127	4.41	72.3	1.19	30.2
051639-03	400	27.6	3/8	3/8	6.5	165	5.88	96.4	1.19	30.2
056039-01	400	27.6	3/8	5/16	6.5	165	5.88	96.4	1.19	30.2
056039-02	400	27.6	5/16	5/16	6.5	165	5.88	96.4	1.19	30.2

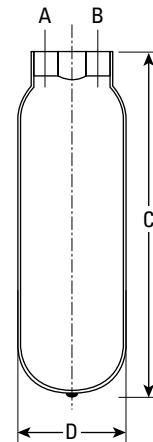
1-3/8" Copper Accumulator

Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
057375-00	300	20.7	3/8	3/8	7.06	179	2.77	45.4	1.38	35.1
056380-01	300	20.7	3/8	3/8	6	152	6.86	112	1.38	35.1

1-5/8" Copper Accumulator

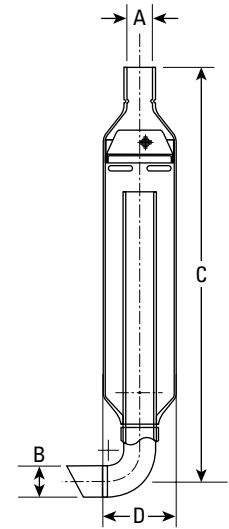
Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
056238-01	400	27.6	5/16	1/4	4	102	6.54	107	1.63	41.4
056689-02	400	27.6	3/8	3/8	4	102	6.54	107	1.63	41.4
057337-00	400	27.6	1/2	1/2	5	127	8.40	138	1.63	41.4
057302-00	400	27.6	5/16	5/16	5.13	130	8.65	142	1.63	41.4
057203-00	400	27.6	1/2	5/8	6	152	10.27	168	1.63	41.4
057995-00	500	34.5	3/8	3/8	5.5	140	2.61	42.8	1.63	41.4
056326-02	400	27.6	1/4	1/4	7	178	12.14	199	1.63	41.4
056472-01	400	27.6	3/8	3/8	8	203	14.00	229	1.63	41.4
056463-01	400	27.6	1/2	1/2	10	254	17.74	291	1.63	41.4
056463-02	400	27.6	3/8	3/8	10	254	17.74	291	1.63	41.4

Dimensions

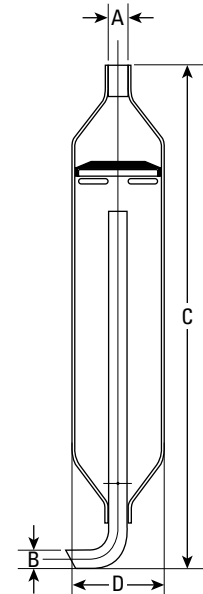


1-1/8" Copper Stand Pipe Accumulator

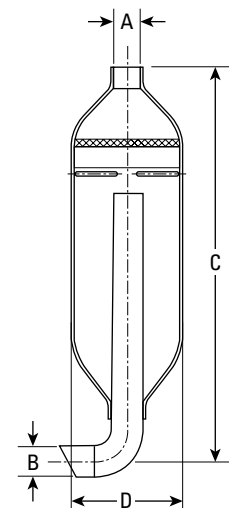
Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
032014-00	325	22.4	3/8	0.477	6.44	164	2.48	40.6	1.13	28.7
071440-00	325	22.4	1/2	0.589	7.25	184	2.14	35.1	1.13	28.7

Dimensions**1-7/8" Copper Stand Pipe Accumulator**

Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
071442-00	325	22.4	3/8	3/8	10.2	259	14.98	245	1.88	47.6

**2-1/4" Copper Stand Pipe Accumulator**

Part Number	Maximum Rated Pressure		Standard Nominal Sizes (Inches)		Overall Length (C)		Internal Volume		Diameter (D)	
	PSIG	bar	Inlet (A)	Outlet (B)	Inches	mm	Cu. In.	cm ³	Inches	mm
032236-00	325	22.4	1/2	0.616	8.19	208	14.87	244	2.25	57.2



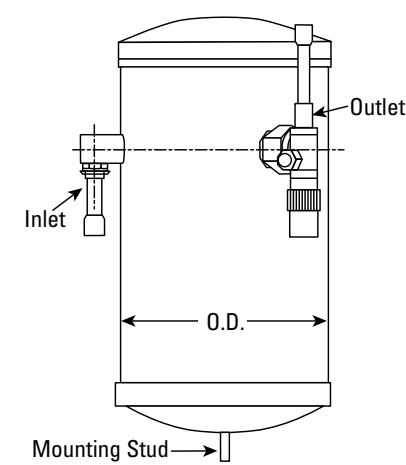
Steel Receivers

Features and Benefits

- Designed for refrigerant storage during normal operation and system pump down
- Allows the system to adjust to varying system conditions and loads
- Available in 4" (102 mm), 5" (127 mm), and 6" (152 mm) diameters (2-1/2" (64 mm) and 3" (76 mm) diameter vertical and horizontal receiver models available – Consult Parker)
- Available up to 36 inches (914 mm) in length
- Integral 430°F (221°C) fuse plug
- Valve is shipped unassembled
- PTFE gasket seal for valve
- UL file number SA5195 and CSA file number LR46423
- Powder coating surpasses 500 hour ASTM salt spray



Dimensions



Specifications

Model Number	Diameter (O.D.)		Inlet Fitting (Inches) (A)	Outlet Fitting (Inches) (B)	Overall Length (C)		Holding Capacity R-22 & R-134a	
	Inches	mm			Inches	mm	lbs.	kg
PR4095-10-2C	4	102	1/4 ODF	1/4 ODF	10	254	4	1.8
PR5109-10-2C	5	127	1/4 ODF	1/4 ODF	10	254	6	2.7
PR5109-10-3C			3/8 ODF	3/8 ODF				
PR6125-12-3C	6	152	3/8 ODF	3/8 ODF	12	305	10	4.5
PR6125-18-4C	6	152	1/2 ODF	1/2 ODF	18	457	16	7.3

Holding capacity calculated at 90% system charge at 90°F (32°C) for R-22 & R-134a. For R-404A & R-507 multiply by 0.9.



CLIMATE CONTROL

- Accumulators
- CO₂ controls
- Electronic controllers
- Filter-driers
- Hand shut-off valves
- Heat exchangers
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves



AEROSPACE

- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes



ELECTROMECHANICAL

- AC/DC drives & systems
- Electric actuators, gantry robots & slides
- Electrohydraulic actuation systems
- Electromechanical actuation systems
- Human machine interfaces
- Linear motors
- Stepper motors, servo motors, drives & controls
- Structural extrusions



FILTRATION

- Analytical gas generators
- Compressed air & gas filters
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators



FLUID & GAS HANDLING

- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Quick disconnects
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters



HYDRAULICS

- Diagnostic equipment
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Quick disconnects
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters



PNEUMATICS

- Air preparation
- Brass fittings & valves
- Manifolds
- Pneumatic actuators, grippers, valves, controls & accessories
- Quick disconnects
- Rotary actuators
- Rubber & thermoplastic hose & couplings
- Structural extrusions
- Thermoplastic tubing & fittings
- Vacuum generators, cups & sensors



PROCESS CONTROL

- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds



SEALING & SHIELDING

- Dynamic seals
- Elastomeric o-rings
- EMI shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management



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