

spirax/sarco®

The Pivotrol Pump® Patent Pending Selection and Sizing

How to Select and Size

From the inlet pressure, back pressure and filling head conditions given below, select the pump size and check valve package which meets the capacity requirement of the application.

Specify pump body, type PTC or PTF. Select optional extras as required.

For GPM, multiply the capacities below by 0.002.

For kg/h, multiply the capacities below by 0.454.

For liquid specific gravities from 0.9 to 0.65, consult Spirax Sarco.

* Back pressure is the lift height (H) in feet x 0.433 plus psig in return line, plus downstream piping friction pressure drop in psig calculated based on the maximum instantaneous discharge rate of the respective pump selected. (See TIS Sheets)

Note: To achieve rated capacity, pump must be installed with check valves supplied by Spirax Sarco. Use of a substitute check valve may effect the performance of the pump.

Capacity lb/h When installed with recommended filling head above top of pump.

Condensate load

Steam pressure available for operating pump

Vertical lift from pump to the return piping

Pressure in the return piping (piping friction negligible)

Filling head on the pump available

7000 lb/h

80 psig

30 feet

25 psig

12 inches

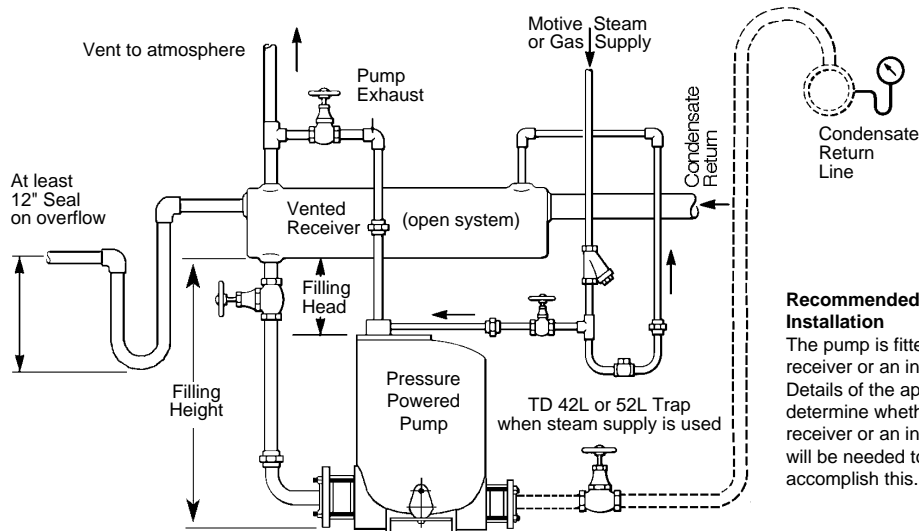
Solution:

1. Calculate "H", the total lift or back pressure, against which the condensate must be pumped. = (30 x 0.433) + 25 = 38 psig
2. From capacity table, with 80 psig inlet pressure and 40 psig back pressure, choose a 2" x 2" pump with stainless steel check valves, which has a capacity of 6,935 lb/h.

Note from capacity multiplying factor charts:

A. Pump capacity if filling head is 24": 1.16 x 6,935 = 8045 lb/h

B. Pump capacity using compressed air: 1.12 x 6,935 = 7767 lb/h



Recommended Installation

The pump is fitted with vented receiver or an inlet reservoir. Details of the application will determine whether a vented receiver or an inlet reservoir will be needed to accomplish this.

Vented Receiver (Open System)

To drain condensate from a single or multiple source an "open" system, a vented receiver should be installed in a horizontal plane above and ahead of the pump. Sufficient receiver volume is needed above the filling head level to accept the condensate reaching the receiver during the pump discharge stroke. More important, the receiver must be sized to allow sufficient area for complete flash steam separation from the condensate. The chart below shows proper vented receiver sizing (per criteria set forth in the A.S.H.R.A.E. Handbook) based on the amount of flash steam present. If the receiver is sized as shown below, there will be sufficient volume for condensate storage and sufficient area for flash steam separation. The receiver can be a length of large diameter pipe or a tank.

Pump size - up to 3" x 2"

Flash Steam up to —	Pipe Size Diameter	Pipe Size Length	Vent Line Diameter
75 lb/h	4"	36"	1-1/2"
150 lb/h	6"	36"	2"
300 lb/h	8"	36"	3"
600 lb/h	10"	36"	4"
900 lb/h	12"	36"	6"
1200 lb/h	16"	36"	6"
2000 lb/h	20"	36"	8"

Inlet Reservoir Piping (Closed System)

To drain condensate from a single piece of equipment in a "closed" system, a reservoir should be installed in a horizontal plane above and ahead of the pump. Sufficient reservoir volume is needed above the filling head level to accept the condensate reaching the reservoir during the pump discharge stroke. The chart below shows minimum reservoir sizing, based on condensate load, needed to prevent equipment flooding during the pump discharge stroke. The reservoir can be a length of large diameter pipe or a tank.

Pump size - up to 3" x 2"

Liquid lb/h	Reservoir Pipe Size			
	3"	4"	6"	8" 10"
500 or Less	2"			
1000	2"			
1500	3"	2"		
2000	3.5"	2"	1"	
3000		3"	2"	
4000		4"	2"	1"
5000		6"	3"	2"
6000			3"	2"
7000			3"	2"
8000			4"	2"
9000			4.5"	3" 2"
10,000			5"	3" 2"
11,000			5"	3" 2"

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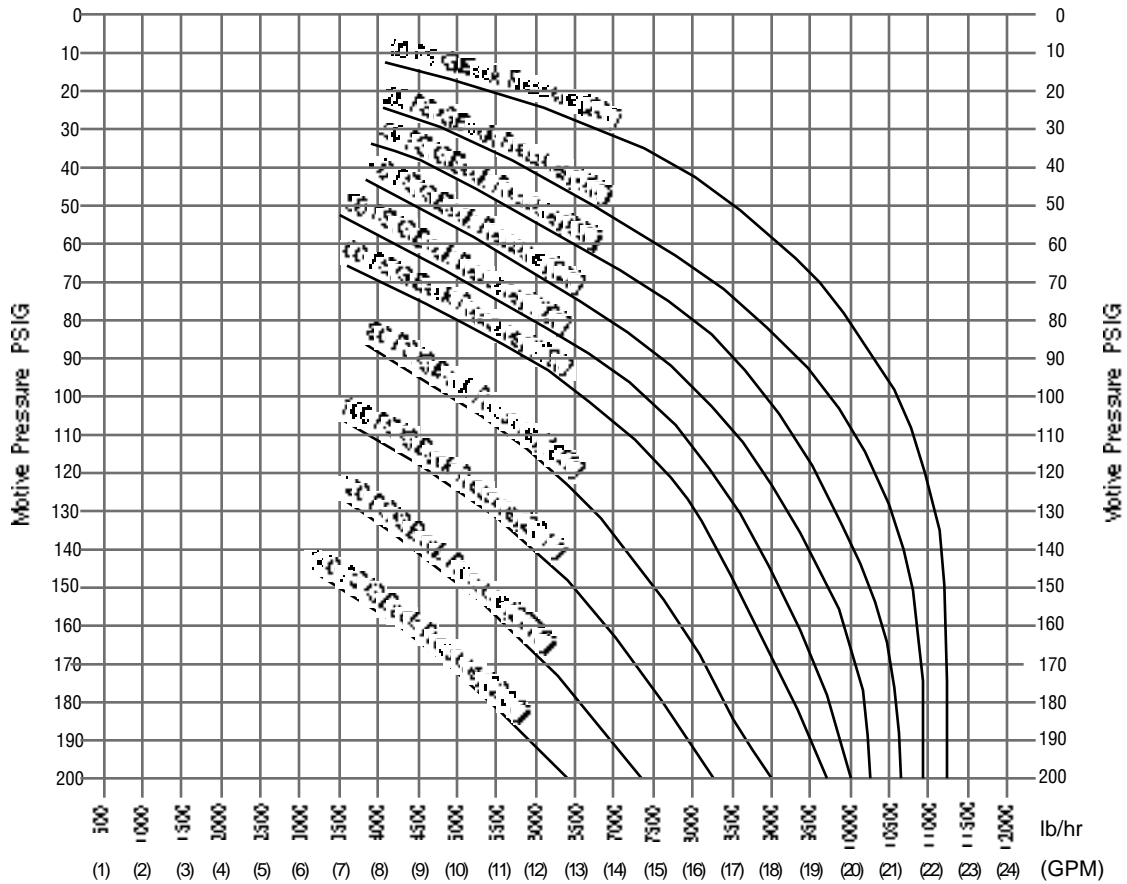
Selection and Sizing

Motive Pressure psig	Back Pressure psig	2" x 2" PTC/PTF		3" x 2" PTC/PTF		3" x 2" PTF-HTF	
		12" Filling Head	lb/hr	12" Filling Head	lb/hr	12" Filling Head	lb/hr
200	180	-	-	-	-	-	-
200	160	-	-	5250	-	3518	-
200	140	6375	-	7375	-	4941	-
200	120	7375	-	9440	-	6325	-
200	100	8250	-	11145	-	7467	-
200	80	9000	-	12565	-	8419	-
200	60	9685	-	14260	-	9554	-
200	50	10000	-	14875	-	9966	-
200	40	10310	-	15690	-	10512	-
200	30	10635	-	16310	-	10928	-
200	20	10950	-	17000	-	11390	-
200	10	11195	-	17640	-	11819	-
180	160	xxxx	-	3750	-	2513	-
180	140	5425	-	6335	-	4244	-
180	120	6685	-	8555	-	5732	-
180	100	7760	-	10375	-	6951	-
180	80	8600	-	11980	-	8027	-
180	60	9450	-	13625	-	9129	-
180	50	9830	-	14375	-	9631	-
180	40	10230	-	15150	-	10151	-
180	30	10560	-	15875	-	10636	-
180	20	10895	-	16665	-	11166	-
180	10	11195	-	17505	-	11728	-
160	140	4250	-	4860	-	3256	-
160	120	5750	-	7500	-	5025	-
160	100	7040	-	9375	-	6281	-
160	80	8065	-	11135	-	7460	-
160	60	9105	-	12940	-	8670	-
160	50	9565	-	13750	-	9213	-
160	40	9990	-	14565	-	9759	-
160	30	10440	-	15400	-	10318	-
160	20	10870	-	16270	-	10901	-
160	10	11195	-	17315	-	11601	-
140	120	4625	-	6085	-	4077	-
140	100	6120	-	8145	-	5457	-
140	80	7420	-	10065	-	6744	-
140	60	8625	-	12120	-	8120	-
140	50	9190	-	13000	-	8710	-
140	40	9690	-	13940	-	9340	-
140	30	10245	-	14875	-	9966	-
140	20	10760	-	15840	-	10613	-
140	10	11195	-	17045	-	11420	-
120	100	4700	-	6300	-	4221	-
120	80	6475	-	8625	-	5779	-
120	60	7845	-	10970	-	7350	-
120	50	8530	-	12100	-	8107	-
120	40	9240	-	13160	-	8817	-
120	30	9865	-	14250	-	9548	-
120	20	10535	-	15280	-	10238	-
120	10	11065	-	16655	-	11159	-
100	80	4995	-	6260	-	4194	-
100	60	6620	-	9255	-	6201	-
100	50	7500	-	10680	-	7156	-
100	40	8370	-	12040	-	8067	-
100	30	9145	-	13310	-	8918	-
100	20	9900	-	14460	-	9688	-
100	10	10630	-	16100	-	10787	-
80	60	5010	-	6485	-	4345	-
80	50	6000	-	8435	-	5651	-
80	40	6935	-	10185	-	6824	-
80	30	7970	-	11750	-	7873	-
80	20	8870	-	13250	-	8878	-
80	10	10000	-	15190	-	10177	-
60	50	4250	-	5000	-	3350	-
60	40	5315	-	7485	-	5015	-
60	30	6360	-	9625	-	6449	-
60	20	7460	-	11580	-	7759	-
60	10	9190	-	13750	-	9213	-
50	40	4440	-	5500	-	3685	-
50	30	5625	-	8125	-	5444	-
50	20	6730	-	10315	-	6911	-
50	10	8690	-	12755	-	8546	-
40	30	4630	-	5750	-	3853	-
40	20	5850	-	8700	-	5829	-
40	10	7930	-	11470	-	7685	-
30	20	4810	-	5810	-	3893	-
30	15	5475	-	8000	-	5360	-
30	10	6820	-	9690	-	6492	-
20	15	4375	-	5375	-	3601	-
20	10	5210	-	7450	-	4925	-
15	10	4375	-	6000	-	4020	-

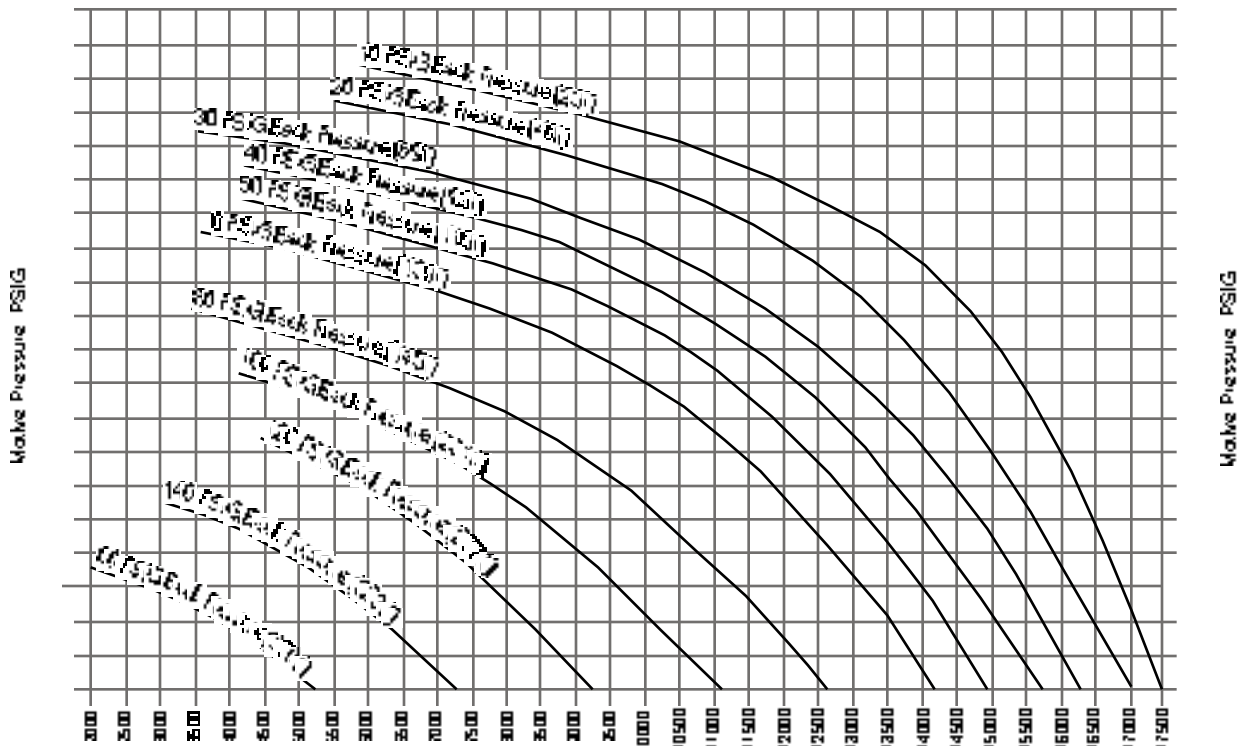
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Capacity Charts

2" x 2" Pivotrol® Pump



3" x 2" Pivotrol® Pump



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Capacity Multiplying Factors for other Filling Heads

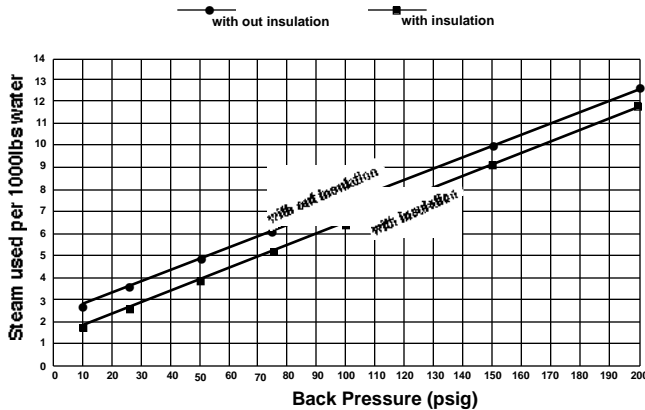
Filling Head		Check valve and piping size, pump type	
Inches	mm	2" x 2" PTC/PTF	3" x 2" PTC/PTF
-3.0	-76	0.47	-
-1.0	-25	0.66	0.40
0.0	0	0.76	0.43
6.0	152	0.90	0.69
12.0	305	1.00	1.00
18.0	457	1.08	1.02
24.0	610	1.16	1.04
36.0	914	1.38	1.17
48.0	1219	1.48	1.25

Capacity Multiplying Factors for Motive Gas Supply (other than steam)

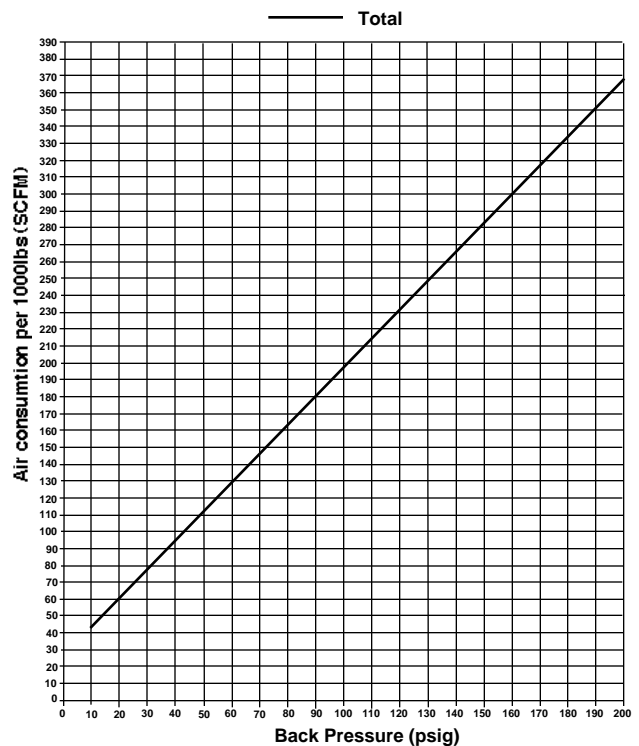
2" and 3" x 2" PTC / PTF

										% Back Pressure VS. Motive Pressure (bp / MP)
10%	20%	30%	40%	50%	60%	70%	80%	90%		
1.04	1.06	1.08	1.10	1.12	1.15	1.18	1.23	1.28		Capacity Multiplying Factors

PIVOTROL® Steam consumption chart



PIVOTROL® Air consumption chart



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