PPC and PPF Pressure Powered Pumps

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 PPC or PPF. Select optional extras as required.
For liquid specific gravities from 0.9 to 0.65 consult Spirax Sarco.

Example :

Condensate Load	1640 kg/h
Steam pressure available for operating pump	5.2 bar g
Vertical lift from pump to the return piping	9.2 m
Pressure in the return piping (piping friction negligible)	1.7 bar g
Filling head on the pump available	0.3 m

Selection :

1. Calculate "H", the total lift or back pressure, against which the condensate must be pumped (see page 3).
   = (9.2 x 0.0981) + 1.7 = 2.6 bar g.
2. From capacity table, with 5.2 bar g inlet pressure and 2.8 bar g back pressure, choose a size 1½ pump which has a capacity of 1725 kg/h.

Note from capacity factor charts (on page 2)

A. Pump capacity filling head is 0.6m: 1.2 x 1725 = 2070 kg/h

B. Pump capacity using compressed air: 1.12 x 1725 = 1932 kg/h (% Back pressure/Motive pressure is 2.6 ÷ 5.2 = 50%)

Capacity kg/h

When installed with recommended filling head above top of pump of 0.3m (& liquid specific gravity 0.8 - 1.0)

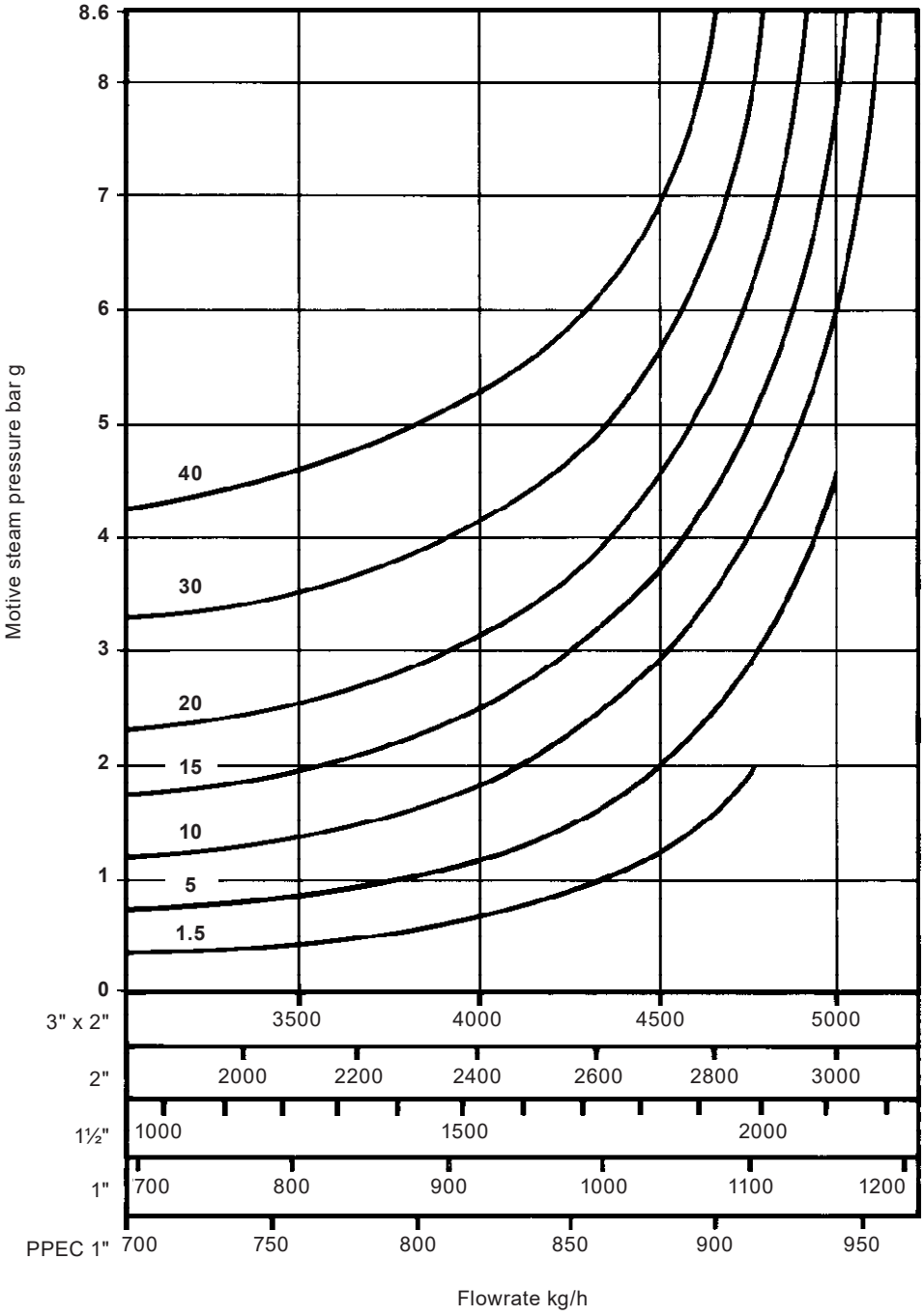
Operating Inlet Pressure bar g	Total Lift or Back Pressure* bar g	Capacity (kg/h)			
		Pump Size			
		1	1½	2	3 x 2
8.6	1.0	1180	2134	3042	5130
8.6	2.8	1090	2043	2860	4808
8.6	4.1	1044	1768	2724	4626
6.9	1.0	1180	2088	2996	5080
6.9	2.8	1090	1907	2769	4717
6.9	4.1	1000	1634	2633	4490
5.2	1.0	1135	1907	2996	5080
5.2	2.8	1090	1725	2633	4444
5.2	4.1	908	1544	2270	3855

Operating Inlet Pressure bar g	Total Lift or Back Pressure* bar g	Capacity (kg/h)			
		Pump Size			
		1	1½	2	3 x 2
3.4	0.69	1090	1816	2906	4900
3.4	1.7	1044	1680	2633	4444
3.4	2.8	908	1453	2179	3720
1.7	0.34	1044	1907	2769	4717
1.7	0.69	953	1771	2542	4553
1.7	1.0	908	1498	2315	3945
0.69	0.14	908	1498	2315	3945
0.69	0.34	817	1316	1861	3174
0.34	0.14	726	1226	1725	2811

* Back pressure is the lift height (H) in metres x 0.0981 plus pressure bar g in return line, plus downstream piping friction pressure drop in bar calculated at the lesser of six times the actual flow rate or 20,000 l/h.

Capacities chart, Capacity multiplying Factors for other filling heads (table) and **Capacity multiplying Factors for motive gas supplies (other than steam) (table)** are on page 2

Capacities

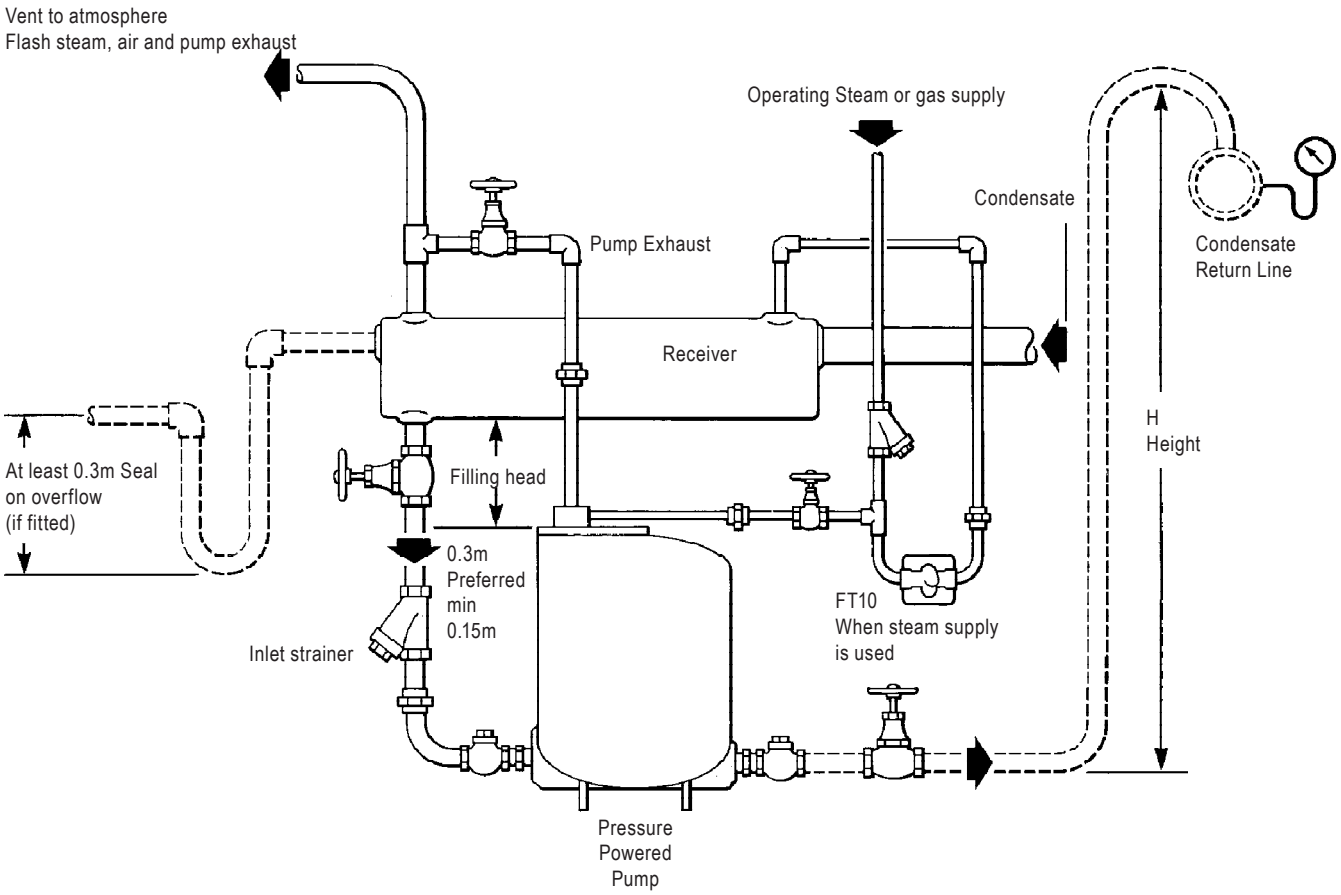

Motive steam pressure bar g
8.6
8
7
6
5
4
3
2
1
0
40
30
20
15
10
5
1.5
3" x 2"
3500
4000
4500
5000
2"
2000
2200
2400
2600
2800
3000
1½"
1000
1500
2000
1"
700
800
900
1000
1100
1200
PPEC 1"
700
750
800
850
900
950
Flowrate kg/h

Capacity multiplying Factors for other filling heads

Filling Head m	Capacity multiplying Factors Pump Size			
	1	1½	2	3 x 2
0.15	0.7	0.7	0.7	0.84
0.3	1.0	1.0	1.0	1.0
0.6	1.2	1.2	1.2	1.08
0.9	1.35	1.35	1.35	1.20
1.2	—	—	—	—
1.8	—	—	—	—
2.1	—	—	—	—

Capacity multiplying Factors for motive gas supplies (other than steam)

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



Recommended installation of pressure powered pump when fitted to a vented receiver. Flash steam must be vented or condensed ahead of pump inlet. Application details will dictate which of the following options will be necessary to accomplish this.

Inlet reservoir piping

When draining a single piece of equipment and a receiver is not supplied ahead of the pump, install with sufficient piping as given in the table below, and use a 0.3m minimum filling head. This will prevent any flooding of the equipment while the pump is discharging.
Metres of reservoir piping above top of pump when pressure powered pump is installed without a receiver.
Pump sizes 1, 1½, 2 and 3 x 2.

Liquid Load kg/h	Inlet Check Valve and Pipe Size			
	1	1½	2	3
277 or Less	1.2m			
454	2m	1.2m		
681	3m	1.5m	1.2m	
908	4m	1.8m	1.5m	
1362		3m	2.1m	
1816		3.6m	3m	
2270			3.6m	1.2m
2724				1.5m
3178				1.8m
3632				2.1m
4086				2.4m
4540				2.7m
9994				3m

Inlet receiver capacities

Sufficient receiver volume is needed above the filling head level to accept the condensate reaching the pump during the discharge stroke. The receiver can be a length of pipe of large diameter or a tank. A vent for flash steam and any incondensable gas is essential and an overflow may be provided as shown.

Pump Size	Receiver Capacity Minimum		Suggested Receiver Size using standard Piping	Min Vent Pipe Size		Recommended Overflow	
						Pipe	Size
ins	Litres	Galls		mm	ins	mm	ins
1	7	1½	0.60 m 24" of 6"	50	2	40	1½
1½	16	3½	0.65 m 26" of 8"	65	2½	50	2
2	24	5½	0.65 m 26" of 10"	80	3	65	2½
3	39	8½	1.10m 44" of 10"	100	4	80	3