



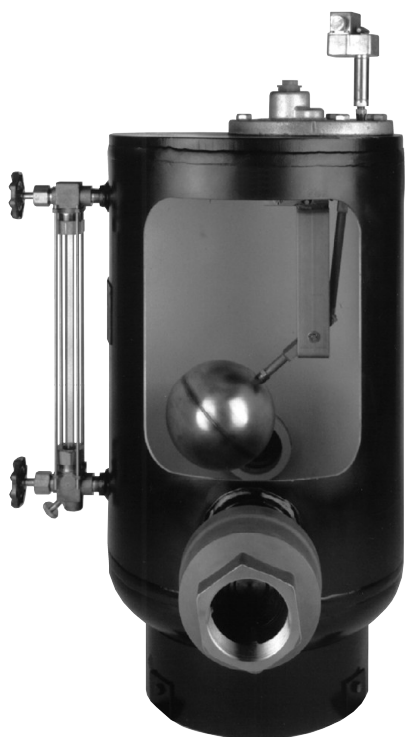
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Technical Data

SD 9902D

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

CONDENSATE COMMANDER PUMP

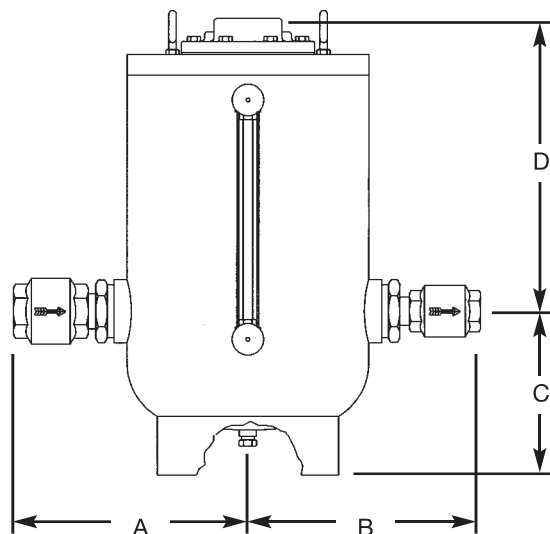


Condensate Commander Pump

Dimensions							Weight Lbs.
Size	A	B	C	D†	E*	F	
1"x 1"	13 ³ / ₈	13 ³ / ₈	11	21 ³ / ₄	9	17 ³ / ₄	168
1 1/2"x 1 1/2"	14 ³ / ₄	14 ³ / ₄	11	21 ³ / ₄	9	17 ³ / ₄	170
2"x 2"	15	15	11	21 ³ / ₄	9	17 ³ / ₄	173
3"x 2"	16 ¹ / ₂	15	11	21 ³ / ₄	9	17 ³ / ₄	185

*Add 5" for Water Gage.

† Allow additional 21" clearance for maintenance.



The Spence Condensate Commander Pump is driven by pressurized gas or steam. Operation without electrical connections makes it the preferred choice for remote or hazardous locations. Required suction head is negligible as optimal performance is achieved at only 12 inches. The stainless steel snap acting mechanism in continuous compression is unaffected by turbulence and the single spring assures long service life without adjustment or maintenance. The head assembly is available to retrofit other manufacturer's tanks. Self centering supply and exhaust valves provide reliable performance and are lapped for tight shutoff.

The Spence Condensate Commander Pump will remove condensate as well as acids and other process fluids that may be incompatible with conventional pumps. It performs well with high back pressure, low pressure and vacuum systems and can be used in a sump or other submerged application. An ASME code stamped fabricated steel tank is standard.

RATINGS (Maximum Inlet Conditions)

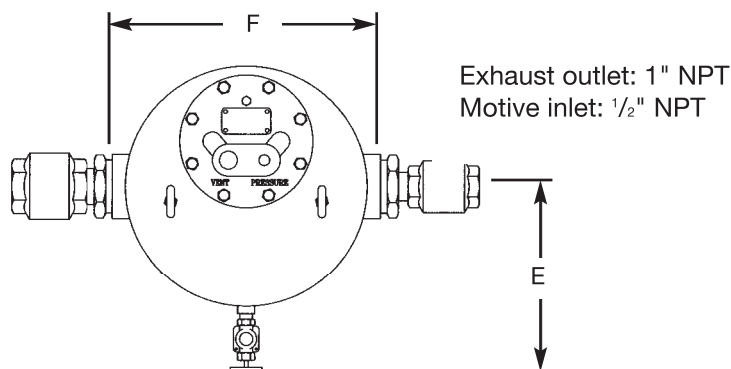
PMO: Max. Operating Pressure	200 psi
TMO: Max. Operating Temperature	400°F
PMA: Max. Allowable Pressure	200 psi
TMA: Max. Allowable Temperature	650°F

Options

- Glass Water Gage
- Cycle Counter
- Check Valves
- Insulating Jacket
- Skid Mount
- Supply Pressure Regulator
- Drain Line for Freeze Protection

Applications

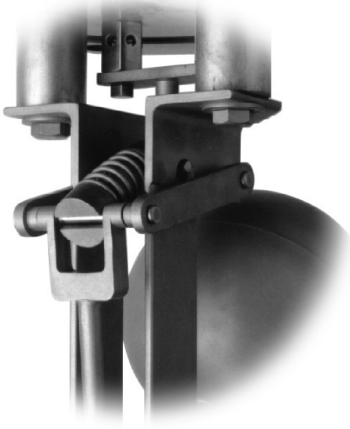
- Remote Locations
- Hazardous Locations
- Vacuum Systems
- Low Pressure Systems
- High Back Pressure Systems
- Heat Exchangers
- Process Steam Equipment
- Sumps or Submerged Areas
- Hazardous Process Fluids



SD 79902D/9803

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FEATURES & BENEFITS



Lifetime Spring Warranty

Patented single spring mechanism design eliminates pump breakdown due to spring failure. The snap acting mechanism uses this unique single spring technology to actuate the valves with the spring in compression. The dependability of the rugged stainless steel mechanism offers the maximum in reliability and service life.

Superior Valve Technology

The inlet supply and vent valves feature lapped valves and seats for tight shutoff. The stainless steel construction resists corrosion. Unique floating ball design and hardened sealing surface of the supply valve provide long service life. The floating ball has an infinite number of potential seating surfaces.

The spring assisted stainless steel lift check valves provide high quality and reliable performance. The floating disc also has infinite seating surfaces. The all stainless steel valve is corrosion resistant.

EXHAUST



MOTIVE



APPLICATIONS

Collection of Condensate

- Remote Locations such as tank farms
- Low pressure and vacuum systems
- Condensate systems with high backpressure
- High capacity process applications such as heat exchangers

Electrical Service is Unavailable or Prohibited

- Remote locations
- Hazardous locations

Submerged Areas

- Sumps or low lying areas
- Manholes

Hazardous Fluids

- Process fluids that may be difficult for conventional electric pump technology to handle

SELECTION GUIDELINES

To correctly select a Condensate Commander Pump that meets the requirements of the application, some specific data is needed.

1. Condensate load in lbs/hr. *
2. Motive pressure available (air or steam).
3. Total lift in feet (hydraulic head).
4. Pressure in return piping.
5. Filling head available in inches (recommended minimum of 12 inches).

EXAMPLE 1, Steam motive:

1. Condensate Load: 4,000 lb/hr.
2. Steam pressure available: 50 psig
3. Total vertical lift: 20 ft.
4. Pressure in return piping: 10 psig
5. Filling head available: 12 inches
For filling head other than 12 inches, multiply capacity by correction factor found in Table 3.

SOLUTION:

1. Calculate total back pressure. Back pressure is the total head in feet multiplied by 0.433 plus the pressure in the return piping.

$$(20 \text{ ft.} \times .433) + 10 \text{ psig} = 19$$

2. Select from the Pump Capacity Table a pump with 50 psig motive pressure and greater than 19 (25) psig total back pressure: a 1½" x 1½" Condensate Pump.

EXAMPLE 2, Air motive:

(conditions same as Example 1)

1. To determine correction factor for air, divide total back pressure from Example 1 by motive pressure available (BP÷MP).

$$19 \div 50 = 38\%$$

Correction factor from Table 2 is 1.10

2. Divide required condensate load by correction factor.

$$4000 \div 1.10 = 3636$$

Select from the Pump Capacity Table (Table 1) a 1½" x 1½" Condensate Pump.

*CONVERSIONS:

GPM to lbs/hr.: GPM x 500

Lbs/hr to GPM: Lbs/hr. x .002

Lbs/hr to KG/hr: Lbs/hr. x .454

Capacity Correction Factors for Motive Gas Supply other than Steam								
% 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

TABLE 2

Pump Capacity Table—(lbs/hr)						
Operating Pressure Inlet (psig)	Total Backpressure (psig)	Stainless Steel Check Valves				
		1"x1"	1½"x1½"	2"x2"	3"x2"	3"x2" Duplex
5	2	1900	3100	4800	6300	12,600
10	5	2100	3400	5900	7700	15,400
	2	2200	3800	8900	11,800	23,600
25	15	2300	3900	6600	8800	17,600
	10	2400	4500	8600	11,400	22,800
	5	2600	4900	10,600	14,100	28,200
50	40	2300	3700	5500	6100	12,700
	25	2600	4300	8100	10,800	21,600
	10	2700	4600	10,700	14,200	28,400
75	60	2300	3900	4800	6900	13,800
	40	2700	4400	8000	10,500	21,000
	15	2900	4800	11,400	15,200	30,400
100	80	2300	3700	5500	7400	14,800
	60	2500	4200	6700	9000	18,000
	40	2700	4800	9000	12,000	24,000
	15	3100	5300	11,600	15,400	30,800
125	115	2100	3600	4300	5600	11,200
	100	2200	3800	5200	6900	13,800
	80	2400	4200	6600	8800	17,600
	60	2600	4500	8600	11,400	22,800
	40	3000	5200	10,100	13,400	26,800
	15	3100	5500	12,200	16,000	32,000
150	120	2200	3800	5800	9900	19,800
	100	2400	4100	6300	10,700	21,400
	80	2600	4500	6800	11,600	23,200
	60	2800	4900	7600	13,100	26,200
	40	3200	5700	8000	13,500	27,000
	15	3400	6000	8400	17,500	35,000

TABLE 1

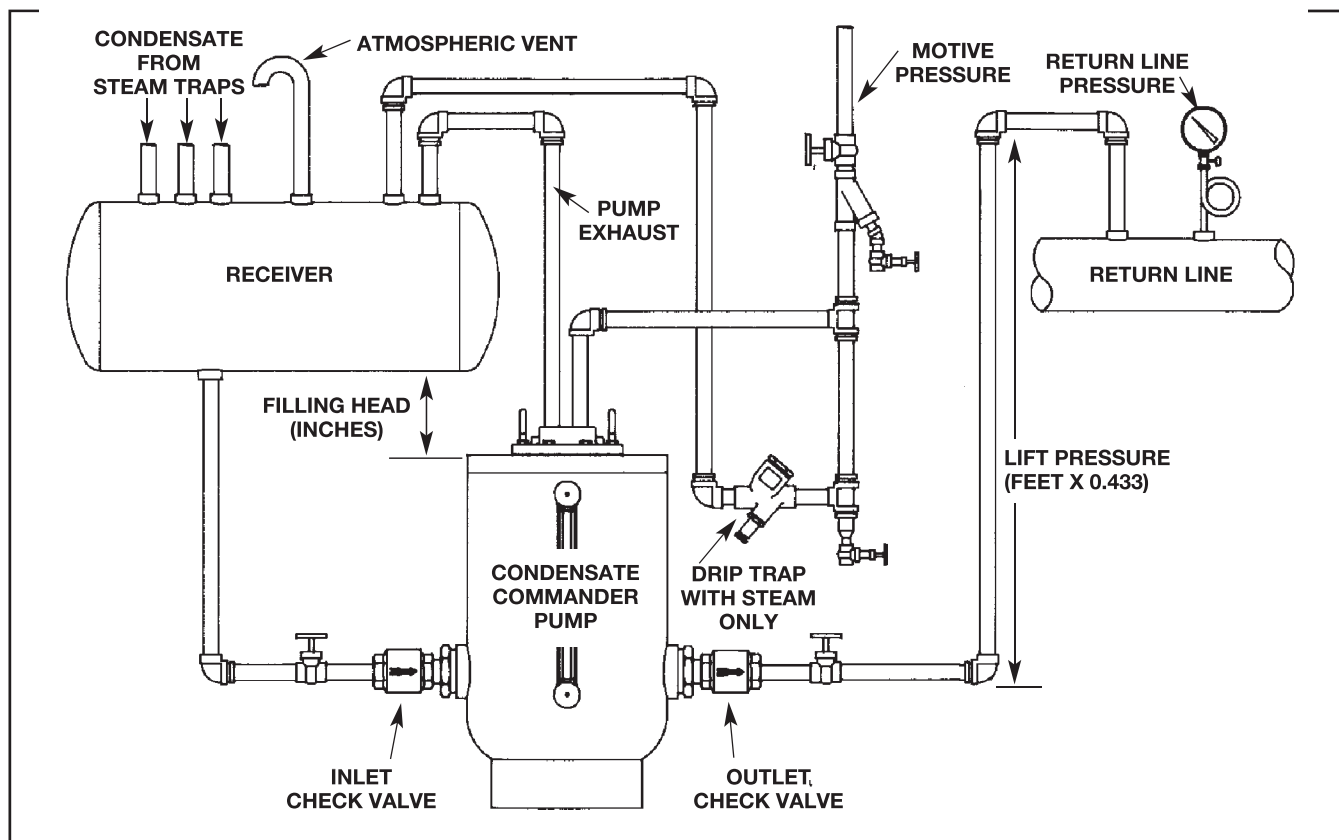
Capacity Correction Factor for Filling Head Variation				
Filling Head (inches)	Check Valve and Piping Size Inches			
	1"	1½"	2"	3" x 2"
6	0.70	0.70	0.70	0.84
12	1.00	1.00	1.00	1.0
24	1.20	1.20	1.20	1.08
36	1.35	1.35	1.35	1.20

TABLE 3

APPLICATIONS

Vented Receiver

To efficiently drain condensate from an open system, the vented receiver should be horizontally located a minimum of twelve inches above the pump. To allow for sufficient volume of condensate and flash vapor, the receiver must be sized adequately to permit the complete separation of flash vapor from condensate. The receiver may be either an ASME coded tank or a length of large diameter pipe.



Typical Installation of a Condensate Commander Pump with a Vented Receiver

Condensate is being pumped from a vented receiver to an overhead elevated condensate return line that may contain pressure. For safety, the pump exhaust and receiver should be vented to atmosphere if steam is used for the motive pressure.

Vented Receiver Sizing Table

Receiver size based on 36" OAL

Flash Vapor (lbs/hr)	Pipe Diameter (inches)	Vent Line Size (inches)
75	4	1½
150	6	2
300	8	3
600	10	4
900	12	6
1200	16	6
2000	20	8

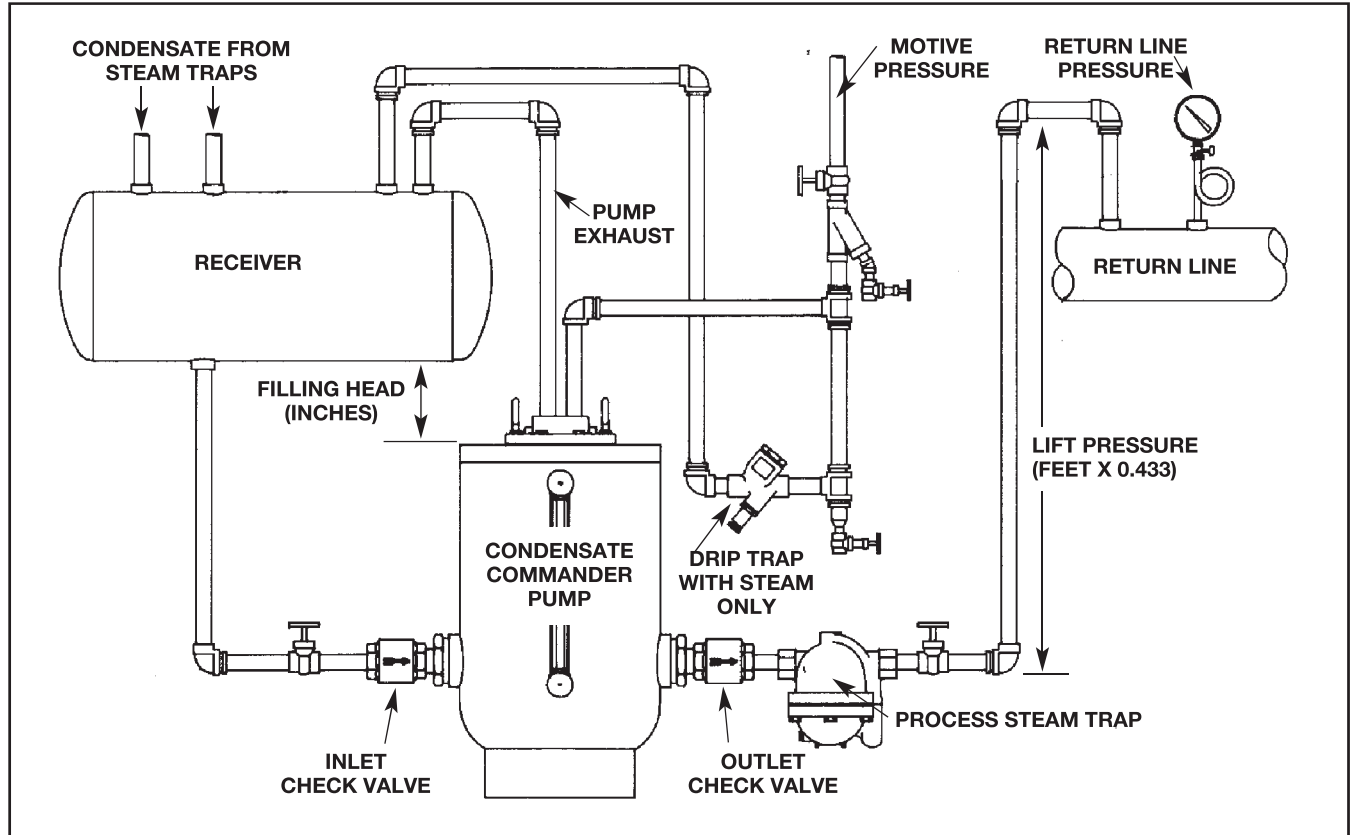
Percent of Flash Steam Formed

Initial Steam Pressure psig	Sat. Temp. °F	Receiver Tank Pressure, psig							
		0	5	10	20	30	40	50	75
10	239	3.0	2.0	0	0	0	0	0	0
25	267	5.7	4.1	3.0	1.0	0	0	0	0
50	298	9.0	7.4	6.2	4.3	2.6	1.0	0	0
75	320	11.3	10.8	8.6	6.7	5.0	3.7	2.5	0
100	338	13.3	11.7	10.6	8.7	7.0	5.7	4.6	2.2
125	353	14.8	13.4	12.2	10.3	8.7	7.4	6.3	3.8

APPLICATIONS

Inlet Receiver

To efficiently drain condensate in a closed system, the receiver should be horizontally located a minimum of twelve inches above the pump to allow for sufficient condensate collection. The receiver must be sized to provide the minimum condensate capacity required to prevent equipment flooding. The receiver may be either an ASME coded tank or a length of large diameter pipe. A safety relief valve may be required.



Typical Installation of a Condensate Commander Pump in a Closed System

Condensate is flowing from a pressurized system to another pressurized system with greater pressure. Both the inlet and return line may be elevated. This installation will also service a high capacity process installation using a pressurized receiver.

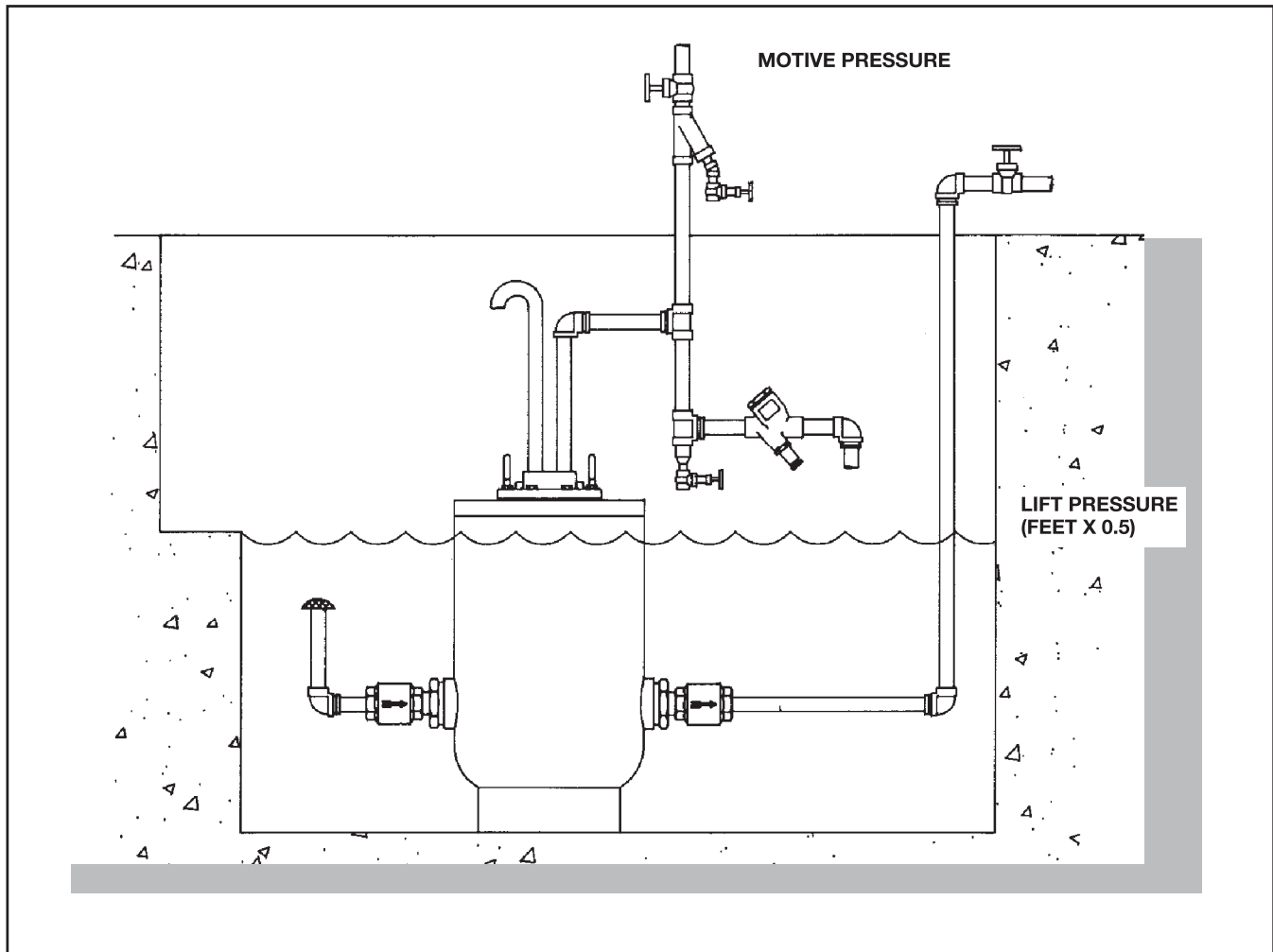
Inlet Receiver Sizing Table

Liquid (lb/hr)	Receiver Pipe Size (feet)				
	3"	4"	6"	8"	10"
>500	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

APPLICATIONS

Submerged Pump

Condensate Commander Pumps can pump liquids from low lying areas such as manholes, steam pits or any area that may collect liquid or flood. The non-electric feature makes it a good choice if steam or any other gas is readily available for use as the driving force.



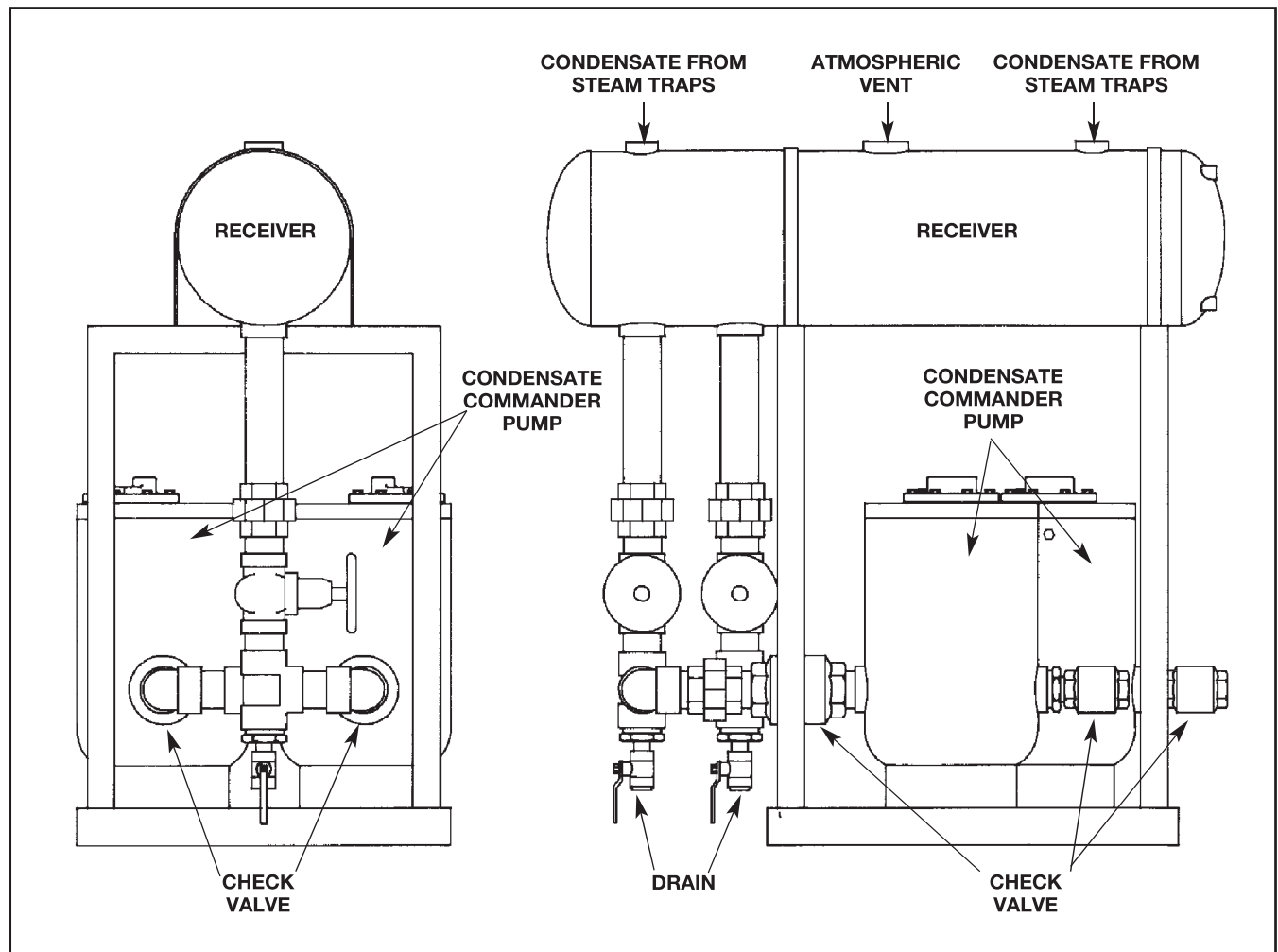
Typical Installation of a Condensate Commander Pump in a Submerged Application

Liquid is pumped from a sump, manhole or other low-lying area where it may accumulate. For back pressure applications, multiply the total vertical lift by .5 plus any back pressure in the return line.

OPTIONS

Skid Mounted System

Where the condensate load exceeds the capacity of one Condensate Commander Pump, multiple pumps may be used in tandem. Skid mounted units may be simplex (one pump), duplex (two pumps), triplex (three pumps) or quadruplex (four pumps). The units are equipped with a receiver, Condensate Commander Pump(s) and all necessary piping fully connected and ready for use.



Typical Duplex Condensate Commander Pump Skid Mount System

The skid mount systems are designed to provide a complete condensate collection and condensate pump unit ready to pipe. All necessary connections are in place. The filling head dimension has already been determined.

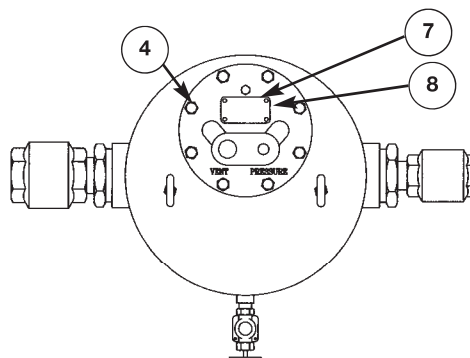
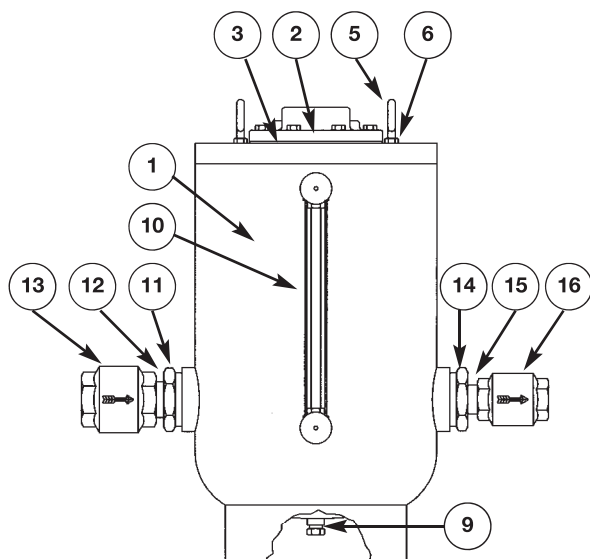
OPERATING PRINCIPLE

The vent valve is open, the pressure supply valve is closed and the float is positioned in the lower part of the tank as the condensate or other liquid enters the tank through the inlet check valve. As the tank fills with liquid, the float rises to the point where the spring mechanism snaps past the center position. The compressed spring instantly closes the vent valve and opens the pressure supply. This allows pressure into the tank which forces the liquid through the outlet check valve.

As the liquid level falls, the float lowers to the point where the spring mechanism snaps past the center position which immediately closes the pressure supply valve and opens the vent valve. The pressure in the tank decreases, allowing liquid to flow through the inlet check valve, repeating the cycle.

Parts List

Item No.	Description	Material	1" x 1"	1 1/2" x 1 1/2"	2" x 2"	3" x 2"
1	Tank Weldment	Steel	0014164	0014164	0014164	0014164
2	Trip Mechanism w/Flange	DI/St/SS	0014161	0014161	0014161	0014161
3	Gasket	Non-asbestos	0621155	0621155	0621155	0621155
4	Bolt, Hex Head	Steel	0046626	0046626	0046626	0046626
5	Eye Bolt	Steel	0030396	0030396	0030396	0030396
6	Nut	Steel	05-02856-00	05-02856-00	05-02856-00	05-02856-00
7	Nameplate	Aluminum	0028249	0028249	0028249	0028249
8	Drive Screw	Steel	0028250	0028250	0028250	0028250
9	Pipe Plug, 1/2" NPT	Steel	05-03775-00	05-03775-00	05-03775-00	05-03775-00
10	Water Level Gage	Bronze	0018125	0018125	0018125	0018125
11	Inlet Reducer	M. Iron	05-15043-00	05-15042-00	05-15123-00	—
12	Inlet Nipple	Steel	05-02807-00	05-15404-00	05-15121-00	05-15416-00
13	Inlet Check Valve	Stainless Steel	0016294	0016295	0016292	0016293
14	Outlet Reducer	M. Iron	05-15043-00	05-15042-00	05-15123-00	05-15123-00
15	Outlet Nipple	Steel	05-02807-00	05-15404-00	05-15121-00	05-15121-00
16	Outlet Check Valve	Stainless Steel	0016294	0016295	0016292	0016292
	Condensate Pump Sub-assembly	Steel	0014163	0014163	0014163	0014163
	Cycle Counter		0016296	0016296	0016296	0016296
	Insulating Jacket		0014162	0014162	0014162	0014162



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